

## TECTARIA GROUP: ARTHROPTERIS

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### TAXONOMY

In the first installment of the Fern series of Flora Malesiana (Holtum 1959), the genus *Arthropteris* was listed as part of the *Nephrolepis* group, together with *Nephrolepis* and *Oleandra*. Since then, molecular studies (Liu et al. 2007; Schuettpehlz & Pryer 2008) have indicated a position in the Tectariaceae (Smith et al. 2006), the Malesian representatives of which (except *Arthropteris*) were treated in Flora Malesiana as the *Tectaria* group (Holtum 1991).

Within the *Tectaria* group, *Arthropteris* is aberrant in the long-creeping rhizome and the abscising fronds.

*Arthropteris* was revised for Malesia by Holtum (1966), who recognized 6 species. Here we distinguish only two, considering *A. caudata*, *A. repens* and *A. wollastonii* no more than extremes of a considerable variability, while we identify the slender Malesian specimens assigned by Holtum to *A. beckleri* with *A. palisotii*, not with the Australian *A. beckleri*.

*References:* Holtum, R.E., List of Malaysian pteridophytes. Flora Malesiana, Ser. II, 1 (1959) II–III. — Holtum, R.E., *Arthropteris* in Malesia. Blumea 14 (1966) 225–229. — Holtum, R.E., *Tectaria* Group. Flora Malesiana, Ser. II, 2 (1991) 1–132. — Liu, H.M., X.C. Zhang, W. Wang, Y.L. Qiu & Z.D. Chen, Molecular phylogeny of the fern family Dryopteridaceae inferred from chloroplast *rbcL* and *atpB* genes, *Int. J. Pl. Sci.* 168 (2007) 1311–1323. — Schuettpehlz, E. & K.M. Pryer, Fern phylogeny inferred from 400 leptosporangiate species and three plastid genes. *Taxon* 56 (2008) 1037–1050. — Smith, A.R., K.M. Pryer, E. Schuettpehlz, P. Korall, H. Schneider & P.C. Wolf, A classification for extant ferns. *Taxon* 55 (2006) 705–731.

### DISTRIBUTION

The distribution of *Arthropteris* is restricted Pantropical (Hovenkamp & Leonardía, in prep.), with the greatest diversity in Africa and Madagascar (c. 5 species), and the Pacific region (c. 8 species), from Australia and New Caledonia to Juan Fernandez Islands, but not on Mainland South America. There are two species in Malesia.

*Reference:* Hovenkamp, P. & A.A.P. Leonardía, A conspectus of the genus *Arthropteris*. In prep.

## ARTHROPTERIS

*Arthropteris* J.Sm. in Hook.f., Fl. New Zealand 2 (1854) 43; Backer & Posth., Varenfl. Jav. (1939) 88; Copel., Gen. Fil. (1947) 90; Fern Fl. Philipp. 1 (1958) 189; Holtum, Revis. Fl. Malaya 2, 2nd ed. (1968) 634; Tagawa & K.Iwats., Fl. Thailand 3. Pteridophytes (1985) 178; G.H.Bell, Fl. Australia 48 (1998) 440. — Type: *Arthropteris tenella* (G.Forst.) J.Sm.

*Rhizome* long-creeping, terete, irregularly branching. *Fronde*s alternating in two rows, irregularly spaced. *Stipes* articulated to an elongated, stipe-like phyllopodium; articula-

tion often swollen, abscission plane oblique. *Scales* round to ovate or narrowly ovate; peltate, more or less abundant on the rhizome; on the phyllopodia, stipes and rhachis smaller, pseudopeltate to nearly basifix, less abundant. *Indument* on rhizome and rhizome scales, if present, consisting of matted hairs; on fronds consisting of multicellular hairs, straight or curved, simple to glandular, increasingly dense distally. *Lamina* pinnate to bipinnatifid, in outline narrowly ovate to linear-lanceolate; pinnae articulated, sessile, margins entire, crenate, dentate-serrate or lobed; second-order divisions, where present, sometimes dentate; apical pinna distinct and articulated or continuous with rhachis. *Venation* free. *Sori* one to several on ends of secondary veins, indusiate or not. *Indusia*, if present, round-reniform, glabrous or with simple or glandular hairs on surface and margin.

#### KEY TO THE SPECIES OF ARTHROPTERIS

- 1a. Phyllopodia 8–60 mm long, pinnae with equal or somewhat unequal base, midrib straight towards the attachment, attachment usually more or less medial, pinnate crenate-serrate to more deeply incised. . . . . **1. A. articulata**
- b. Phyllopodia to 5 mm long, pinnae with strongly asymmetric base, midrib curved towards the attachment at the basiscopic corner, pinnae entire to crenate-serrate . . . . . **2. A. palisotii**

#### 1. *Arthropteris articulata* (Brack.) C.Chr.

- Arthropteris articulata* (Brack.) C.Chr., Index Filic. Suppl. 3 (1934) 26; Holttum, Blumea 14 (1966) 228. — Type: U.S. Exploring Expedition 1838–42 (K, US), Fiji.
- Nephrodium webbianum* Hook., Sp. Fil. 4 (1862) 85. — *Arthropteris webbiana* (Hook.) Alston, J. Bot. 77 (1939) 288. — Type: *Webb s.n.* (K), Ambon.
- Arthropteris kingii* Copel., Philipp. J. Sci., Bot. 6 (1911) 80; Alderw., Handb. Suppl. (1917) 133; Copel., Philipp. J. Sci. 73 (1940) 356. — Type: *Copeland 332* (MICH), New Guineas, Lakekamu.
- Polypodium wollastonii* Ridl., Trans. Linn. Soc. London, Bot. 9 (1916) 262. — *Arthropteris wollastonii* (Ridl.) Holttum, Blumea 14 (1966) 229. — Type: *C. Boden Kloss s.n.* [2.1913] (BM, K), New Guinea.
- Arthropteris dolichopoda* Alderw., Nova Guinea 14 (1924) 5. — Types: *Lam 934* (K, UC), *Lam 1283* (U, UC, US).
- Arthropteris orientalis* auct. non C.Chr.: Copel., Fern Fl. Philipp. 1 (1958) 190.
- Polypodium harpophyllum* auct. non Kuntze: C.Chr., Ann. Jard. Bot. Buitenzorg 15 (1898) 150 pl. XVI, 22a, b.

*Rhizome* 1–2 mm diam., reddish black to red-brown, in cross-section more or less quadrangular, sclerified peripherally only; scales with matted hairs, appressed, overlapping, narrowly ovate, 1.5–3 by 0.6–1 mm, reddish black at area of attachment, cell-walls in centre thickened, semi-clathrate, somewhat darker in the acumen, reddish brown, margin lacerate with cilia. *Phyllopodia* 1.5–6.5 cm apart, 0.8–6 cm long, 1 mm diam., reddish black to -brown to and including the rhachis; hairs dense, simple, very short, septation obscure. *Stipes* 2.5–8 cm long, 1 mm diam. *Fronds* pinnate to bipinnatifid, 10–24 by 4–9 cm, widest below the middle, gradually tapering to an acute to long-acuminate apex. *Lateral pinnae* 12–19 pairs, 8–14 mm apart, triangular-oblong, sometimes slightly falcate, 27–50 by 8–18 mm; base very broadly cuneate,

sometimes inequilateral, tri-nerved, acroscopic margin parallel to nearly parallel to the rhachis, sometimes concave, sometimes extended into an auricle; basiscopic margin at c. 45° to the rhachis; midrib straight, margin serrate-crenate to lobed almost to the costa; apex rounded to acuminate; lower pinnae reduced, slightly reflexed (but curving forwards); upper pinnae gradually reduced, merging into apex. *Second-order divisions*, where present, nearly touching, triangular, 1–8 by 1.5–4 mm, with entire, sometimes dentate-serrate margin; apex acute to obtuse. *Apical pinna* continuous with rhachis and adjacent lateral pinnae, apex acuminate to caudate. *Secondary veins* forked several times. *Indument* on both surfaces of the pinnae consisting of simple, longish hairs on costa and margins and glandular, nearly sessile hairs on lesser veins. *Hydathodes* clear, sometimes obscured by a nearby hair, level with lamina. *Sori* medial or in more deeply divided fronds near the margins of the secondary divisions, 1–1.5 mm diam., indusia with glandular hairs.

Distribution — East Malesia to Pacific Islands (Fiji). In *Malesia*: Sulawesi, Moluccas, New Guinea.

Ecology — Epiphytic, on trunks, rarely epilithic or terrestrial, in forest, often in riverine forest but also on ridges or in ravines. Altitude: sea level to c. 1100 m.

Note — This species is superficially similar to the African *A. orientalis* (J.F.Gmel.) Posth. and *A. monocarpa* (Cordem.) C.Chr. and has often been confused with these. It can best be distinguished by the narrow ovate rhizome scales. *Arthropteris wollastonii* is somewhat more robust than typical *A. articulata*, with deeply divided pinnae and more longly acuminate apices, but the distinctions are not sharp.

## 2. *Arthropteris palisotii* (Desv.) Alston

*Arthropteris palisotii* (Desv.) Alston, Bol. Soc. Brot., ser. 2, 30 (1956) 6; B.M.Allen, Gard. Bull. Singapore 20, 4 (1964) 381; Holttum, Blumea 14 (1966) 226; S.B.Andrews, Ferns Queensland (1990) 245; G.H.Bell, Fl. Australia 48 (1998) 448. — *Aspidium palisotii* Desv., Ges. Naturf. Berl. Mag. 5 (1811) 320. — Type: *Palisot de Beauvois s.n.* (holo P; iso BM), Oware.

*Aspidium ramosum* P.Beauv., Fl. Oware (1818) 254, t. 91, f. 1. — *Arthropteris ramosa* (P.Beauv.) J.Sm., Hist. Fil. (1875) 225; Copel., Polypod. Phil. Isl. (1905) 46. — Type: *Palisot de Beauvois s.n.* (holo P; iso BM), Oware.

*Aspidium subpectinatum* Blume, Enum. Pl. Javae (1828) 145. — Type: *Blume s.n.* (L? not found, K), Java.

*Nephrolepis trichomanoides* J.Sm., J. Bot. (London) 3 (1841) 413, nom. nud.; Kunze, Bot. Zeitung (Berlin) 6 (1848) 236; C.Presl, Epimel. Bot. (1851) 44. — Lectotype: *Cuming 101* (here selected, L; iso P), Philippines.

*Arthropteris glabra* Copel., in Perkins, Fragm. Fl. Philipp. (1905) 178; Copel., Polypod. Phil. Isl. (1905) 46; Alderw., Handb. (1908) 155; Copel., Fern Fl. Philipp. (1960) 190. — Type: *Merrill 740* (K, US), Philippines.

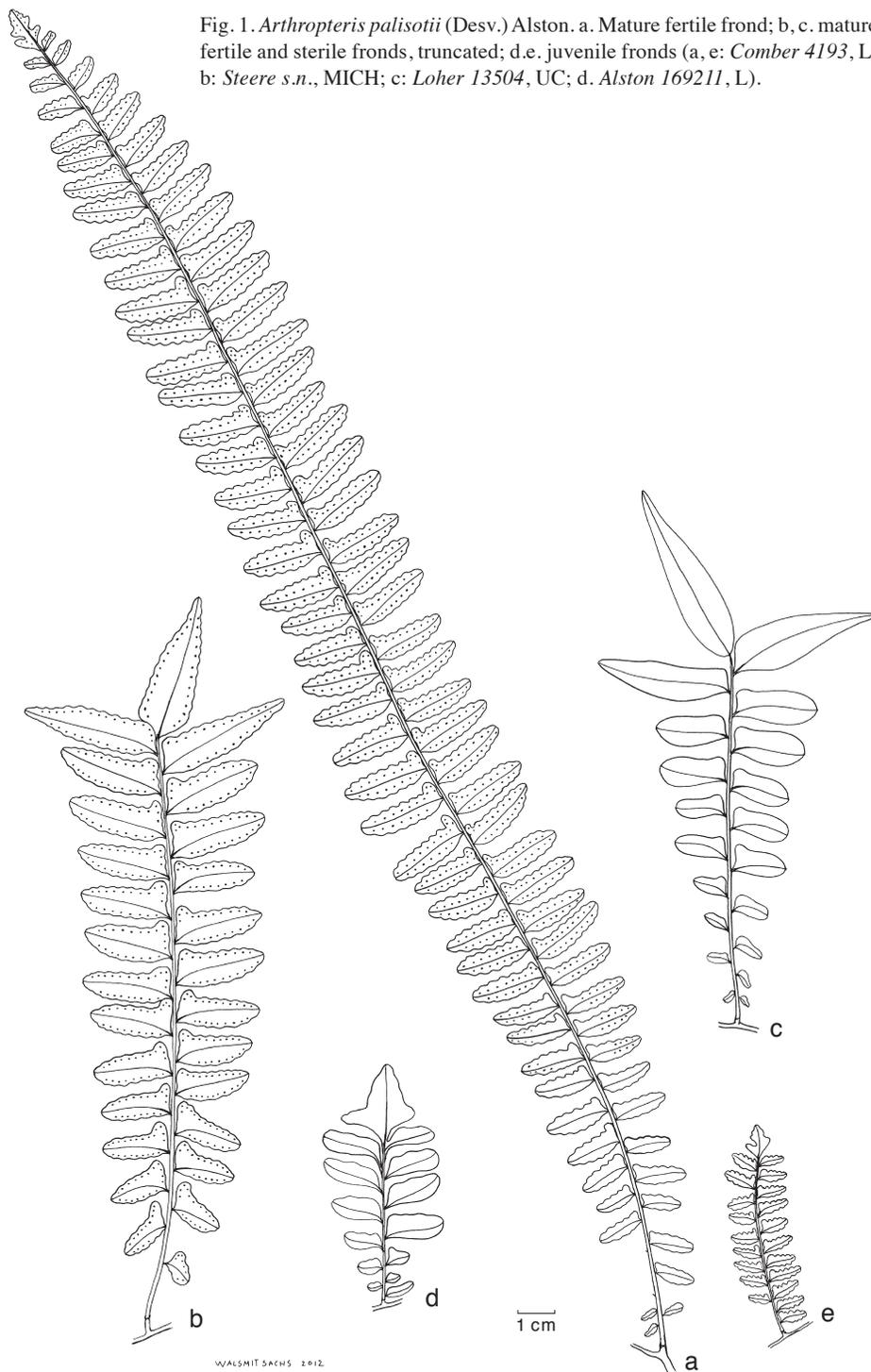
*Arthropteris caudata* Rosenst., Feddes Repert. Spec. Nov. Regni Veg. 8 (1910) 163; Alderw., Handb. Suppl. (1916) 133; Holttum, Blumea 14 (1966) 227. — Type: *Bamler 92* (BO, L, NY, P, S, UC), New Guinea.

*Arthropteris oblanceolata* Alderw., Bull. Jard. Bot. Buitenzorg II, 20 (1915) 6; Handb. Suppl. (1917) 134. — Type: *Sa-anam* (Lieut. Hulstijn's Exploration Expedition) (holo BO; iso BM, L), Obi Isl.

*Nephrolepis obliterated* auct. non R.Br.: Hook., Sp. Fil. 4 (1862) 154. — *Arthropteris obliterated* auct. non (R.Br.) J.Sm.: C.Chr., Index Fil. (1906) 62; Alderw., Handb. (1908) 155; Handb. Suppl. (1916) 133; Backer & Posth., Varenfl. Jav. (1939) 88; Copel., Fern Fl. Philipp. 1 (1958) 190.

*Arthropteris beckeri* auct. non (Hook.) Mett: Holttum, Blumea 14 (1966) 228.

Fig. 1. *Arthropteris palisotii* (Desv.) Alston. a. Mature fertile frond; b, c. mature fertile and sterile fronds, truncated; d, e. juvenile fronds (a, e: *Comber 4193*, L; b: *Steere s.n.*, MICH; c: *Loher 13504*, UC; d: *Alston 169211*, L).



*Rhizome* 1–2 mm diam., stramineous to reddish brown, patched with matted hairs; scales appressed, deciduous, narrowly ovate, 0.75–2 by 0.5–1 mm, reddish black, in centre with strongly thickened cell-walls, sometimes covered by red-brown hairs, margins with sessile or slightly elongate glandular hairs. *Phyllopodia* 9–50 mm apart, to 5 mm long, 1–2 mm diam., stramineous to reddish brown; glabrous. *Stipes* to 8 mm long, 1–3 mm diam.; increasingly more abundantly hairy towards the rhachis, hairs simple, short, straight to curved, septation obscure. *Rhachis* sparsely to densely hairy on lateral and abaxial surfaces, glabrous on adaxial surface. *Lamina* pinnate, 25–50 by 2.5–6.5 cm, gradually tapering towards base, often gradually tapering towards apex. *Pinnae* 25–45 pairs, 5–14 mm apart, trapezoidal-oblong to triangular, slightly falcate, 9–55 by 3–12 mm; base strongly unequal, acroscopic margin parallel to nearly parallel to the rhachis, auricled, basisopic margin strongly narrowed, perpendicular to nearly perpendicular to the rhachis; midrib curved towards the point of attachment in the basisopic corner, margins crenate-serrate, sometimes entire; apex rounded; lower pinnae reflexed, almost reduced to auricles, upper pinnae reduced and merging with the apical pinna or not reduced and distinct from the apical pinna. *Apical pinna* articulated to rhachis, more or less distinct from adjacent lateral pinnae, or sometimes merging with rhachis and adjacent lateral pinnae, 8–37(–72) by 6–12(–20) mm, narrowly ovate, apex acute; apical pinnae aborted in epilithic fronds. *Secondary veins* forked once, or several times on basal auricle. *Indument* on both surfaces absent or consisting of simple, straight or curved hairs, sparser towards distal end of costa. *Hydathodes* clearly visible, rarely covered with lime-scales. *Sori* supramedial,  $\pm 1.5$  mm diam., indusia surface glabrous, rarely hairy, margin entire, rarely toothed. — **Fig. 1.**

**Distribution** — Wide paleotropic, from West Africa (Ivory Coast) to the Pacific (Tahiti), north to Japan, south to Australia (New South Wales). Throughout *Malesia*, but rare in Peninsular Malaysia, Borneo (Sabah only) and Sulawesi.

**Ecology** — Mostly epiphytic, on tree trunks, also on rocks or terrestrial.

**Notes** — 1. This species is highly variable in size, degree of marginal serration, position of the sori and the development of the frond apex. Fronds may be truncated in their development, resulting in a conform pseudoterminal pinnae as large or larger than the subterminal pinnae. When this occurs directly above the narrowed base, the resulting frond is very distinctly inversely triangular in shape. Such fronds may be normally fertile. When the apex is normally developed, the terminal segment is more or less triangular, and connected to the reduced upper pinnae.

2. *Arthropteris palisotii* has been widely considered identical to *Nephrolepis obliterated* R.Br., which is, however, a true *Nephrolepis*.

3. A slender form with a more delicate lamina, more deeply cut pinnae and medial sori is found throughout the range, and has been identified as *A. beckleri* or *A. repens*. *Arthropteris beckleri* is here considered as separate from, though very close to *A. palisotii*, from which it is distinguishable mainly by its slender stature and the presence of long hairs on the lamina. It is restricted to Australia.