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THE FERN-GENUS ARCYPTERIS UNDERWOOD (Dictyopteris PresI sensu Fée)

R. E. HOLTTUM*

SUMMARY

1. The genus *Arcypteris* Underw. *(Dictyopteris* Presl *sensu* Pée) is maintained as different from *Tectaria* Cav. and redefined. It is considered very closely related to *Pleocnemia* Presl.

2. Four species are recognized.

3. The following new combinations are made: *Arcypteris irregularis* (Presl) Holttum (basinym: *Polypodium irregulare* Presl), *A. macrodonta* (Fée) Holttum (basinym: *Dictyopteris macrodonta* Presl ex Fée), *A. brongniariii* (Bory) Holttum (basinym: *Polypodium brongniartii* Bory), and *A. gigantea* (Ces.) Holttum (basinym: *Nephrodium giganteum Ces.).*

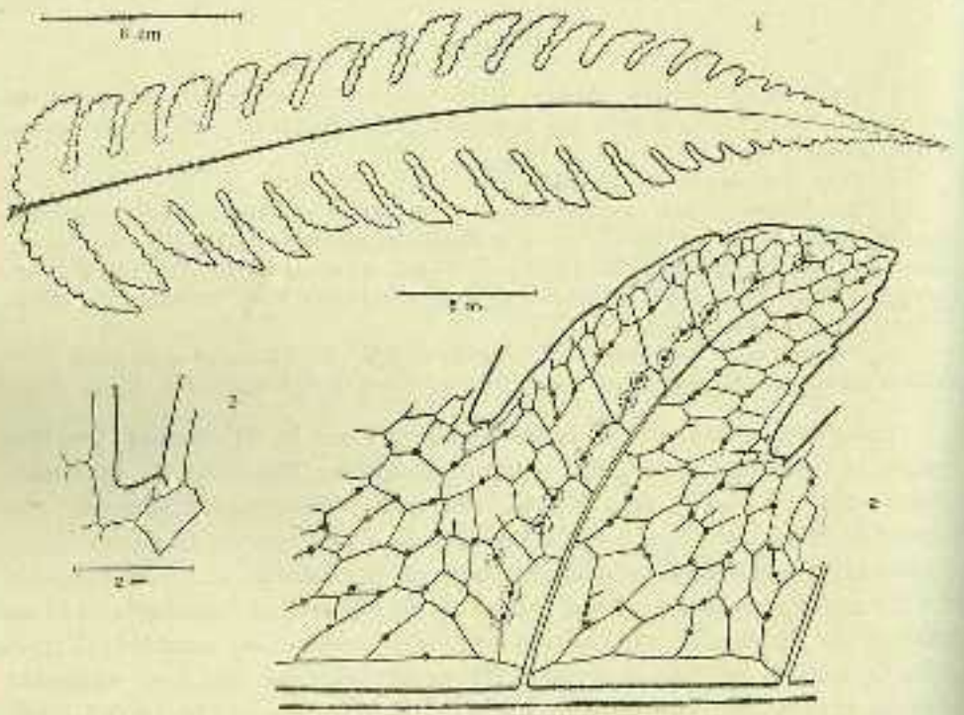
4s. Reductions to synonymy are: *Aspidium differme* Blume to *Arcypteris irregularis* (Presl) Holtt., and *Polypodium pteroides* Presl to *A. brongniartii* (Bory) Holtt.

The genus *Dictyopteris,* as proposed by Presl in "Tentamen Pteridographiae," included two quite distinct elements. The first, *D. attenuata (Polypodium Brownii),* is a Polypodioid fern with creeping rhizome; the second element consists of the three closely allied species *D. macrodonta, D. pteroides* and *D. irregularis.* Fee later (Gen. Fil. 267 *pl. 21 A)* excluded the first element, and confined the genus to the second, quoting and illustrating the species *D. macrodonta* and *D. pteroides.* He omitted *D. irregularis,* but as he quoted Presl's figure of that species, it is apparent that he considered it to be identical with *D. macrodonta.* In 1903 Underwood proposed a new genus *Arcypteris,* with *A. difformis* (Bl.) Underw. as sole species. This name is synonymous with *Dictyopteris irregularis* Presl; a new generic name was necessary because the name *Dictyopteris* had previously been used for a genus of Algae, but "difformis" is not the earliest species epithet.

The name *Dictyopteris* was adopted by Beddome and Van Alderwerelt van Rosenburgh for ferns of the *Tectaria* alliance which have no indusia. Jn their usage, it included true species of *Tectaria,* and also species which I consider should be placed in the genera *Pleocnemia* and *Arcypteris* as strictly defined. In a paper published in 1931 *(in* Flora

*Professor of Botany, University of Malaya, Singapore.

125: 407-415), Alice Landmann discussed the genus in the sense of Van Alderwerelt van Rosenburgh, and concluded that separation from *Tectaria* on the basis of the characters of venation and lack of indusia is not warranted; but she did not mention the sinus-teeth, nor give an indication that *Pleocnemia* and *Arcypteris* have characters in common which separate them from the rest of Christensen's *Tectaria*.



FIGS. 1-3, *Arcypteris irregularis* (Pr.) Holtt., cult. Singapore; fig. 1, a single pinnule; fig. 2, venation of one lobe of fig. 1, showing position of sori; fig. 3, sinus-tooth and adjacent venation.

As noted in my paper on *Pleocnemia* (Holttum *in* Reinwardtia 1: 171.. 1951), that genus and *Arcypteris* differ notably from *Tectaria* in various characters not mentioned by previous authors, namely narrow toothed rhizome-scales, complex vascular anatomy of stipe, the presence of sinus-teeth, and the character and distribution of hairs and glandular hairs. The glandular hairs were shown by Fee (as present in the sori) in one of his figures, but not mentioned in his text nor referred to in any later publication I have seen. The distinction between *Arcypteris* and *Pleocnemia*

is in the venation, with which is correlated the less deeply divided nature of the lamina and the lack of sinus-teeth in some of the lower sinuses.

Omitting the characters which it shares with *Pleocnemia*, *Arcypteris* is distinguished as follows:

Fronds bipinnatifid or bipinnate; venation of narrow costal and costular areoles, and beyond these irregular 4- to 6-sided areoles, without free included veins (an exceptional very short vein may occur) occupying the whole of the rest of the lamina, with few free marginal veins; sinus-teeth broad and sometimes lacking in the lower sinuses; sori more or less round in shape, sometimes confluent, at vein junctions, always (in known species) without indusia; glands in sori spherical, usually red.

KEY TO THE SPECIES OF ARCYPTERIS

1. Fronds normally bipinnatifid; the largest sometimes bipinnate near the base; sori scattered irregularly . . . . . 1. *A. irregularis*
1. Fronds amply bipinnate
   2. Sori in a row on each side of a costule, midway between costule and margin, usually distinct . . . . . 2. *A. macrodonta*
   2. Sori confined to the margins of the lobes, often more or less confluent
      3. Pinnules of sub-basal pinnae to 12 cm long and 2 cm wide at the base; base cuneate, not adnate . . . . . 3. *A. brongniartii*
      3. Pinnules of sub-basal pinnae about 4 cm long and 8 mm wide, adnate to the raehis . . . . . 4. *A. gigantea*

1. A. irregularis (Presl) Holttum, *comb.nov.*

Polypodium irregulare Presl, Rel. Haenk. 1: 25. 1825 (basinym of new combination).

Aspidium difforme Bl., Enum. PL Jav. 160. 1828. — *Dictyopteris difformis* (Bl.) Moore, Index 90. 1858; Bedd., Hand. 300. — *Arcypteris difformis* (Bl.) Underw. *in* Bull. Torr. Club 30: 678. 1903.

Stock short, stout, erect or suberect but not arborescent, the apex and bases of the stipes densely clothed with long narrow rather dark brown scales. Stipes to about 80 cm long, stout, green when living and pale when dry, glabrescent except for the scales at the base. Lamina to at least 100 cm long and 60 cm wide, deeply bipinnatifid, or bipinnate towards the base, with numerous opposite pinnae, the lowest largest and much produced basiscopically, the basal basiscopic pinnule to 20 cm or more long and 6 cm wide, free, sessile, deeply lobed, usually much longer than the next."Sub-basal pinnae to about 40 cm long and 12 cm wide, on large fronds pinnate at the base with a few pairs of sessile and usually more or less adnate pinnules, the distal part deeply lobed; lobes falcate, the longest with crenate margins and acute apex, the shorter more distal lobes entire with blunt apex, lobes usually about 1 cm wide, lower sinuses rounded at the base, upper narrowly angled with' a broad tooth in the angle; upper pinnae gradually less deeply lobed, the uppermost grading into the deeply lobed deltoid apex of the lamina. Raehis and base of costae

above with short erect multicellular hairs (ferruginous when dry) ; costae (except at base), costules, veins and surfaces glabrous above. Rachises below glabrescent or bearing rather stiff multicellular hairs up to 1 mm long; costae below bearing similar hairs, at least at the base; costules and veins usually hairless but often with small round red glands, similar to those in the sori. Texture of lamina firm-herbaceous, colour rather light green, drying brown-olivaceous. Veins forming single narrow areoles along either side of costae between one costule and the next, and shorter areoles on either side of the costules, the whole of the rest of the lamina filled with more or less elongated 4—6-sided areoles, very few with an included free vein. Sori small, close, usually scattered irregularly, exindusiate, round or often extending along the veins and sometimes confluent, the sporangia often bearing round red glands either near the annulus or on a hair attached to the stalk. Spores with folded perispore.

DISTRIBUTION. — Throughout Malaysia, and northwards into Tenasserim, Siam and Cambodia; in Malaya, a common terrestrial forest fern.

In Malaya this species is fairly uniform, the only notable variation being that some plants with very large fronds have several pairs of pinnae pinnate at the base, and these often have rather large crowded sori, which are arranged in a row on each side of the costules of the lobed pinnules, with additional sori also. It seems to me however that there is no clear-cut distinction between these bipinnate and the smaller simply pinnate fronds.

2, A. macrodonta (Fée) Holttum, *comb. nov.*

Dictyopteris macrodonta Presl, Tent. Pterid. 194. 1836 (nom. nud.); Fée, Gen. Fil. 267 *pi. 21 fig. AS.* 1850 (basinym of new combination). — *Phegopteris macrodonta* , Mett., Pheg. and Aspid. 31, no. 68. 1858. — *Tectaria irregularis* var. *macrodon* Copel, *in* Philip. J. Sci. 2 C: 417. 1907. — *Tectaria macrodus* C. Chr., Ind. Fil., Suppl. 3. 181. 1934.

Differs from *A. irregularis* in having the pinnae conspicuously pinnate, the pinnules sessile, unequally cuneate at the base (broader on the acroscopic side), their margins lobed one third (or sometimes more) towards the costa; sori in two close rows, one on either side of each costule, often somewhat confluent, with additional sori near the sinuses in the broader pinnules.

DISTRIBUTION. — Philippines.

The specific epithet "macrodon" was given in manuscript to this species by Reinwardt prior to 1836, but the first valid publication of the name was by Fée, whose description was very brief but accompanied by an excellent figure. Copeland *(I.c.)* considered this not very clearly distinguished from typical *A. irregularis.* The specimens I have seen however seem quite distinct, and Christensen maintained the species. The few bipinnate specimens of *A. irregularis* gathered in Malaya differ from the

Philippine specimens of *A. macrodonta* in having many additional irregularly arranged sori in the lobes outside the rows adjacent to the costules. Even in the largest specimens the pinnules are adnate to the rachis and they are less deeply lobed than in *A. macrodonta.*

3. A. brongniartii (Bory) Holttum, *comb. nov.*

Polypodium pteroides Presl, Rel. Haenk, .1: 25. 1825 (non Retz. 1791).

Polypodium brongniartii Bory, Dup. Voy. Bot. 1: 263 *t. SU.* 1828 (basinym of new combination). — *Tectaria irregularis* var. *brongniartii* Copel., Philip. J. Sci. 2 C: 417. 1907.

Differs from *A. macrodonta* in having the sori submarginal, in the lobes of the pinnules only, often more or less confluent. A sub-basal pinna I have seen is 45 cm long, with about 9 free pinnules on each side below the terminal lamina, the pinnules to 12 cm long and 2 cm wide at the base, the base unequally cuneate and even slightly stipitate, not broadly adnate to the rachis.

DISTRIBUTION. — Philippines.

4. A. gigantea (Cesati) Holttum, *comb. nov.*

Nephrodium giganteum Cesati, Rendic. R. Acad. Napoli 16: 26. 1877 (basinym of new combination); C. Chr. *in* Dansk Bot. Ark. 9: 49. 1937.

Polypodium andaiense Baker *in* Beccari, Malesia 3: 45. 1886.

The following is Christensen's description of Cesati's type specimen:

"Stipe ca. 75 cm long, blackish castaneous below with a dense mass of crisped, narrow, rufous, linear scales, upwards like rachis cinnamon-coloured with few scales, trisulcate above and minutely puberulous in the furrows. Lamina 70 cm or more long, subcoriaceous, bipinnatifid or partly bipinnate, the short apex pinnatifid with an even (not lobed) wing between the segments. Pinnae subopposite, at distances of 6—8 em, the basal ones with three much elongated pinnatifid pinnules on the lower side, the basal one 11 cm long, equally pinnatifid on the upper and outer part of the lower side, middle pinnae of large fronds up to 30 cm long, broadly lanceolate, acuminate, fully pinnate in the lower third, upwards pinnatifid to a wing 3—4 mm wide, of smaller fronds pinnatifid throughout; free pinnules patent, at distances of 2 cm broadly adnate to costa, oblong, about 4 cm long by 8 mm wide, obtuse, crenate, the segments similar, more oblique. Costae minutely glanduloso-puberulous above (upperside otherwise glabrous), rather chaffy beneath with small brown scales, the under surface microscopically glanduloso-puberulous. Venation pleocnemioid with one narrow costal areole and usually one row of angular areoles outside the costular ones; included veinlets none. Sori small, dark brown, in1—2 irregular rows close to the edges of the segments, exindusiate."

DISTRIBUTION. — New Guinea (type from Andai, NW New Guinea).

I have examined the type of *P. andaiense* at Kew. It consists of two detached pinnae, which agree in all characters with Christensen's description. This species approaches *Pleocnemia* in venation, owing to the narrow lamina of the pinnules (which admits of little anastomosis of veins), but there can be no doubt that it belongs to *Arcypteris* and not to *Pleocnemia*, owing to its close resemblance to *A. brongniartii*. It differs from all species of *Pleocnemia* in its adnate pinnules, and in their shallow lobes.

The sinus-teeth (as seen in the type of *P. andaiense)*, occurring m the distal sinuses only, are short and broad. The spores have a folded perispore, with rather much anastomosis of the folds.

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MALAYSIAN LICHENS—III*

P. GROBNHART **

CYANOPORINA GROENH., AN INTERESTING LICHEN FROM JAVA

Amongst the lichens sent by the late Mr C. C. Schroter at Tjibodas (West Java), a peculiar blue-grey species drew my attention. At first sight I intended to assign it provisionally to Collemaceae indeterminatae, but on closer examination I doubted whether it was really a species of Collemaceae. Therefore. I examined it more carefully, with the following result.

The granular thallus grows in smaller to larger patches over mosses, lichens, and detritus on bark. Soredia and isidia are absent and the thallus is not surrounded by a dark hypothalline line.

The granular appearance of the thallus is caused by the relatively large gonidia, which belong to Stygonemataceae. The yellowish green cells are rounded, angular to semilunate, 8—12μ, wide and 10—15 μ *long;* one or more of them are enclosed within a gelatinous, colourless to pale citrine sheeth 4—6 μ thick. These clusters of gonidia are held together by the thalline hyphae constituting in this way a homoiomeric thallus.

There is some resemblance with the thallus of Moriolaceae but in this family the gonidia are totally surrounded with a network of short hyphae lying close together. In the thallus of *Cyanoporina*, as I call this new lichen, such a network does not exist. The hyphae lie irregularly around the gonidia and cover them but partly. These gonidial hyphae are 2—3μ thick and possess very short cells. The thalline hyphae are 3μ, thick, with inconspicuous lumen.

Even with the aid of a dissecting microscope the perithecia are almost* invisible. Most of them are covered by the granules of the thallus. Yet the thallus is abundantly fruiting and in sections perithecia are always present. They are globose, 110—130μ in diameter, pale fulvescent to yellowish, with a pseudoparenchymatic wall 10—12 μ thick, composed of densely interwoven hyphae. I could, not discover a pore. The paraphyses are diffluent and only fragments were found.

* For the other papers of this series, *see* Bull, bot, Gdns Buitenzorg III 17: 198*203.* 1941 and Reinwardtia 1: 33-39. 1950.

** Lichenologist, Herbarium Bogoriense, Kebun Raya Indonesia.