BLUMEA 23 (1977) 205-218

STUDIES IN THE FAMILY THELYPTERIDACEAE XII. THE GENUS AMPHINEURON HOLTTUM[1])

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SUMMARY

The genus is re-described and its status discussed. A key to all known species is provided, and a full synonymy and description for each, with discussions on the complex synonymies of *A. terminans* and *A. opulentum*. Ten species are recognized and 23 basionyms reduced to synonymy. One new species, *A. tildeniae* from Tahiti, is described and the following new combinations are made: *A. tonkinense* (C. Chr.) Holttum, *A. subattenuatum* (Rosenst.) Holttum, *A. paraphysophorum* (v. A. v. R.) Holttum, *A. attenuatum* (O. Kuntze) Holttum, *A. distinctum* (Copel.) Holttum, *A. ceramicum* (v. A. v. R.) Holttum.

AMPHINEURON

Amphineuron Holttum, Blumea 19 (1971) 45.

Caudex erect, or *rhizome* short-creeping or long-creeping; scales narrow, setiferous; stipe minutely hairy, scaly at base (scales throughout in *A. distinctum*). *Lamina* often very large, pinnate, pinnae ± deeply lobed, basal pinnae much narrowed at their bases; in a few species 1—2 pairs of irregularly-placed and -shaped small pinnae sometimes present below normal ones; aerophores at bases of pinnae usually narrowly elliptic and (when dry) discoloured, not swollen; veins pinnate in pinna-lobes, simple, basal veins either free and passing to the margin separately, or connivent at the sinus-membrane, or anastomosing to form an excurrent vein, these conditions sometimes not constant on a single frond, in one species two pairs passing to the sides of the sinus-membrane without anastomosing; sinus-membrane usually ending in a prominent tooth (as seen when dry); short acicular hairs always present on lower surface, also small glandular hairs of varying size which are spherical with very short stalk to pyriform, larger resinous sessile glands also present in some species. *Sori* usually near apices of veins and in some species confined to the pinna-lobes, indusiate or not; indusia usually bearing glands and/or hairs; sporangia with slender stalks which may bear a short hair translucent at its base with spherical glandular tip (apparently all one cell, in *A. distinctum* a hair of 3 cells with glandular tip), no hairs nor glands normally present on body of sporangium (small capitate hairs sometimes in *A. subattenuatum*); *spores* usually dark, irregularly rugose or with irregular thick ± branched ridges which may sometimes anastomose.

Type species: *Amphineuron opulentum* (Kaulf.) Holttum.

Distribution: apart from the type species, two specimens of *A. terminans* from Africa, and the new *A. tildeniae* from Tahiti, the genus is confined to S.E. Asia, Malesia and part of Melanesia. The type species is naturalized at various places in Central America and the West Indies, and has an apparently natural distribution from East Africa to Tahiti.

[1]) XI in Kew Bull. 31, 2 (1976) 293—339.

It is probable that this genus is closely allied to *Christella* (see Holttum in Kew Bull. 31, 1976: 293—339). The two genera agree in spores, but *Amphineuron* always has the basal pinnae much narrowed at the base, and the lower pinnae are never gradually reduced (small basal pinnae, if present, are abruptly smaller and irregular in spacing, size and occurrence); the glands on stalks of sporangia appear to be different but need more careful study. The new species from Tahiti here described is somewhat intermediate between *Amphineuron* and *Christella* in the shape of its basal pinnae.

The species may be divided into two groups, one with conspicuous indusia, the other with indusia small or lacking; the latter group are also firmer in texture and sometimes have sessile resinous glands which are not present in the first group; these glands need examination in fresh material. The second group are almost entirely Malesian, most abundant in New Guinea. I have found it difficult to decide how to distinguish between species in this group, partly because glands are sometimes destroyed in the process of drying specimens (whether by heat or by pre-treatment with alcohol) and partly owing to differences in size of frond between specimens on which different species have been based; more field work is needed. In the indusiate group there has been much confusion between *A. opulentum* and *A. terminans* which are both variable.

Because of differences in venation, some species have been placed in *Thelypteris* and some in *Cyclosorus*; the similarity between *A. immersum* with quite free veins and *A. opulentum* with irregular anastomosis was one of the facts which first caused me to see that a separation on venation alone between *Thelypteris* (or *Lastrea* in Copeland's arrangement) and *Cyclosorus* was unnatural. There is some irregularity of anastomosis in other species also; Copeland placed some specimens of the Philippine species *A. attenuatum* in *Lastrea* (as *L. erubescens*) and some in *Cyclosorus*.

KEY TO THE SPECIES OF AMPHINEURON

1a. Indusium rather large, persistent except in *A. tonkinense*; veins slender, slightly prominent both sides 2
b. Indusium small, almost hidden by sporangia at maturity of sorus, or apparently lacking; texture of lamina firm, veins not prominent either side 7
2a. Rhizome long-creeping; pinnae lobed half-way to costa or less deeply; apex of frond ± pinna-like 3
b. Rhizome short-creeping or erect; pinnae lobed more than half-way to costa; apical lamina not pinna-like 4
3a. Sori confined to pinna-lobes; veins 6—9 pairs, basal pair making a broad angle with long excurrent vein to sinus; 1—1½ pairs veins passing to sides of sinus-membrane **1. A. terminans**
b. Sori not confined to pinna-lobes; veins *c.* 15 pairs, none anastomosing but 2 pairs passing to sides of sinus-membrane . . . . . **2. A. tonkinense**
4a. Pinnae lobed to 1 mm from costa or more deeply; basal veins quite free or uniting to form a very short excurrent vein 5
b. Pinnae lobed less deeply; basal veins anastomosing with a distinct excurrent vein on most parts of a frond 6
5a. Sori immersed; basal veins not meeting at sinus . . . . . **3. A. immersum**
b. Sori not immersed; basal veins meeting just below sinus, sometimes with a very short excurrent vein . . . . . **4. A. subattenuatum**
6a. Basal pinnae not auricled on acroscopic base; basal veins sometimes free; indusia fringed with glands . . . . . **5. A. opulentum**

b. Basal pinnae auricled on acroscopic base, auricle acute with forked veins; indusia not fringed with glands . . . . . **6. A. tildeniae**

7a. Hairs more than ½ mm long present on both sides of costa; stipe and lower surface of rachis ± scaly throughout . . . . . **7. A. distinctum**

b. All hairs on costae very short; scales confined to base of stipe 8

8a. Lower surface of pinna-lobes between veins bearing short acicular hairs, upper surface usually bearing short capitate hairs . . . . . **8. A. attenuatum**

b. Acicular hairs lacking on lower surface between veins, no capitate hairs between veins on upper surface 9

9a. Pinnae lobed to *c.* 2 mm from costa; basal veins often anastomosing. **9. A. ceramicum**

b. Pinnae lobed to *c.* 1 mm from costa; basal veins passing to sides of sinus-membrane. **10. A. paraphysophorum**

1. **Amphineuron terminans** (Hook.) Holttum

A. terminans (Hook.) Holttum, Amer. Fern J. 63 (1973) 82. — *Nephrodium terminans* Hook., Spec. Fil. 4 (1862) 73, excl. syn. *N. conioneuron* Fée & *Lastrea malaccensis* Presl. — *Thelypteris terminans* Tagawa & Iwatsuki, Acta Phytotax. Geobot. 26 (1975) 169. — Type: *Wallich 386*, Burma, Kamoun (=Kumon) (K).

Nephrodium oreopteris Fée, Gen. Fil. (1852) 306, *non* (Ehrh.) Desv. 1827. — Type: *Cuming 48*, Luzon (orig. ?; iso in G, K, LE, W).

Dryopteris decora Domin, Bibl. Bot. 20, Heft 85 (1913) 48. — *Cyclosorus decorus* Ching, Bull. Fan Mem. Inst. Biol. Bot. 10 (1941) 244. — *Thelypteris decora* Reed, Phytologia 17 (1968) 271. — Type: *Domin*, N.E. Queensland, Yarraba (PR ?; not seen).

Thelypteris wagneri Fosb. & Sachet, Smiths. Contr. Bot. 8 (1972) 6, excl. syn. *Polypodium pteroides* Retz. — Type: *Raciborski*, Java (US).

Aspidium pteroides auct. non (Retz.) Sw.: Sw. in Schrad., J. Bot. 1800, 2 (1801) 33, *fide* Ching; Bl., Enum. Pl. Jav. (1828) addenda to p. 151; not *Polypodium pteroides* Retz.

Nephrodium unitum auct. non (L.) R. Br.: Hook. & Arn., Bot. Beechey Voy. (1833) 256; Hook., Gen. Fil. (1840) t. 48B, fig. 6 *tantum*.

Aspidium obtusatum auct. non Sw.: Mett., Farngatt. IV (1858) 103 *quoad* syn. *Nephrodium oreopteris* Fée *tantum*.

Nephrodium pteroides auct. non (Retz.) J. Sm.: J. Sm., Cat. Cult. Ferns (1857) 54 & Ferns Brit. & For. (1866) 139; Bak., Syn. Fil. (1867) 289 excl. loc. Samoa; Bedd., Handb. Ferns Br. India (1883) 269; Racib., Fl. Btzg 1 (1898) 183.

Aspidium pteroides var. *b* Mett., Ann. Mus. Bot. Lugd.-Bat. 1 (1864) 231, *excl. syn. omn.*; also var. *c quoad A. schwenkii* Bl.

Dryopteris pteroides auct. non (Retz.) O. Kuntze: C. Chr., Ind. Fil. (1905) 287, *p.p.*; v. A. v. R., Handb. Mal. Ferns (1908) 209.

Dryopteris obtusata auct. non (Sw.) Ballard: Ballard, Kew Bull. (1932) 75; not *Aspidium obtusatum* Sw.

Dryopteris interrupta auct. non (Willd.) Ching: Ching, Lingn. Sci. Journ. 12 (1933) 566; Backer & Post., Varenfl. Java (1939) 56; not *Pteris interrupta* Willd.

Cyclosorus interruptus auct. non (Willd.) Ching: Ching, Bull. Fan Mem. Inst. Biol. Bot. 8 (1938) 184; Holttum, Rev. Fl. Malaya 2 (1955) 262, fig. 149; Copel., Fern Fl. Philip. (1960) 361.

Cyclosorus interruptus var. *hirsutus* Ching, Bull. Fan Mem. Inst. Biol. Bot. 8 (1938) 186. — *Thelypteris opulenta* var. *hirsuta* Fosb., Smiths. Contr. Bot. 8 (1972) 6. — Lectotype (Fosberg): *Rock 1716*, Thailand, Chiengmai Prov. (US; K).

Rhizome long-creeping, *c.* 5 mm diameter (dry); *stipe* commonly to 50 cm long, ± flushed dull reddish, scales 8 mm long, narrow, hairy. *Frond* to 80 cm long, pinnae to 25 pairs, at base sometimes a few irregular very small pinnae below normal ones; basal large pinnae narrowed at their bases; apex of frond usually quite pinna-like but variable. Largest *pinnae* commonly 17—20 × 1.7—2.0 cm, exceptionally longer but not more than 2 cm wide; base of middle and upper pinnae broadly cuneate to truncate; apex acuminate; edges commonly lobed, *c.* 0.3 towards costa or less deeply, sometimes to 0.5, lobes as

wide as long (or wider) with broad asymmetric apex and forward-pointing tip; costules 4—5 mm apart, usually at less than 60°; veins 6—9 pairs, basal pair spreading at a broad angle to costule and forming a rather long excurrent vein, next veins very oblique, 1 or 2 to sides of sinus-membrane; lower surface of rachis, costae, costules, and veins bearing short acicular hairs, longer hairs usually lacking, subsessile spherical rather pale glandular hairs abundant on distal veins, usually few and smaller on lower veins, very short acicular hairs often present between veins; upper surface of costa bearing antrorse pale acicular hairs, similar hairs scattered on costules and veins. *Sori* close to margins of pinna-lobes, not on lower veins; indusia large, thin, often with some short acicular hairs on surface and a few small glandular hairs which are usually not marginal.

Distribution: Ceylon & S. India, Burma to Hainan and Macao (Beechey), throughout Malesia to New Guinea, northern Queensland; one specimen from central Africa and one from Fernando Po.

Notes. The first published name based on a specimen of this species was *Nephrodium oreopteris* Fée; I have seen isotypes. In his monograph of 1858 Mettenius placed Fée's name and *Pteris interrupta* Willd. as synonyms of *Aspidium obtusatum* Sw. (no. 244) and cited *Cuming 48* (type of *N. oreopteris*) as a specimen which he had seen. He listed *A. pteroides* (Retz.) Sw. as a separate but allied species (no. 243).

In 1862 Hooker described *Aspidium terminans*, a name given by *Wallich* to his no. *386* from Burma. Hooker cited 15 specimens, one of them being *Cuming 48*, but he did not refer to *N. oreopteris* Fée. He erroneously added as synonyms *N. conioneuron* Fée and *Lastrea malaccensis* Presl. He placed *A. obtusatum* Sw. as a synonym of *Nephrodium propinquum* R. Br. and also, with doubt, *A. pteroides* Sw.

Mettenius reviewed this situation in 1864, describing three varieties of a species which he named *Aspidium pteroides*, with *N. terminans* Hook. as a synonym. Mettenius's *A. pteroides* var. *a* corresponds to *Amphineuron opulentum* of the present treatment; he cited *N. conioneuron* Fée as a synonym. His descriptions of var. *b* and var. *c* do not clearly differentiate the two. Under var. *b* he cited as synonyms *Polypodium pteroides* Retz., *Aspidium opulentum* Kaulf. and *A. extensum* Bl.; under var. *c* he cited *A. obtusatum* Sw. (1806) and Willd. (1810), also *A. schwenkii* Bl., a MS name represented by a specimen from Blume in Hooker's herbarium which is *A. terminans*.

In Synopsis Filicum (p. 289) Baker resolved this complexity by recognizing two species *N. extensum* (Bl.) and *N. pteroides* (Retz.), placing *N. terminans* Hook. as a synonym of the latter after transferring to *N. extensum* the two alien species cited by Hooker. He did not cite *A. obtusatum* Sw., but left one to infer that he agreed with Hooker's treatment of it as a synonym of *N. propinquum* R. Br. which (following Mettenius's treatment of 1864) he united with *N. unitum*.

Baker's solution was in general accepted by subsequent authors, including Beddome, and in Christensen's Index Filicum (1905) we find *Pteris interrupta* Willd., *Aspidium obtusatum* Sw. and *N. terminans* Hook. cited as synonyms of *Dryopteris pteroides* (Retz.) O. Kuntze.

This situation persisted until in 1932 a number of specimens from the Retzius herbarium at Lund were sent on loan to Kew for examination in connection with the Flora of Madras then in preparation. Among the specimens was the type of *Polypodium pteroides* which was examined by Ballard (Kew Bull. no. 2, 1932: 75) and by Ching, then visiting Kew (Lingnan Sci. J. 12: 566; 1933). Ballard stated that the type belonged to the genus *Aspidium* as delimited in Index Filicum by Christensen. Ching stated that it was 'nearest to, or perhaps identical with' *Aspidium fuscipes* Wall. Sledge confirmed this by publishing the name *Tectaria paradoxa* (Fée) Sledge, with *P. pteroides* Retz. as a synonym (Kew Bull. 27, 1972:

413). But Fosberg and Sachet refused to believe Ching's statement on the grounds that he erroneously cited the origin of the type as Madras instead of Ceylon (Smiths. Contr. Bot. 8: 7. 1972).

There is a photograph of Retzius's type at Kew, and there can be no doubt that it is a *Tectaria*. The venation is so different from that of a Thelypteroid fern that I cannot believe Mettenius saw it. Ching saw a specimen (probably from Java) named *A. pteroides* in Swartz's herbarium which corresponds to *Amphineuron terminans*, and believed that Swartz was the first author to misinterpret *P. pteroides* Retz. It seems probable that Blume did the same when he cited a specimen from West Java as *Aspidium pteroides* in Enum. Pl. Jav. (I have not seen the specimen) and Blume may have misled Mettenius.

Ballard's solution was to substitute the name *Dryopteris obtusata* (Sw.) Ballard for *Dryopteris pteroides sensu* Ind. Fil. *A. obtusatum* Sw. was accepted by Willdenow (Spec. Pl. 5: 241. 1810) as the correct name for the earlier *Pteris interrupta* Willd. (*A. obtusatum* being the first name in the correct genus). Neither Ballard nor Ching understood this, but Ching did see the type of *P. interrupta* (bearing the name *A. obtusatum*) in the Willdenow herbarium, stated that it belonged to the species named *Dryopteris pteroides* in Ind. Fil. and noted its agreement with the published figure of *Pteris interrupta*. Recognizing that the latter was the earliest name, Ching published the new combination *Dryopteris interrupta* which he later changed to *Cyclosorus interruptus*. Ching's interpretation was accepted by most authors until Fosberg and Sachet disputed his identification of the Willdenow specimen.

Fosberg and Sachet found a sheet in the BM herbarium bearing detached pinnae of the types of *Pteris interrupta* Willd. and *Aspidium obtusatum* Sw. authenticated in the handwriting of Swartz. The two were identical, and proved to belong to the variable species then commonly known as *Cyclosorus gongylodes* (Schkuhr) Link; Fosberg and Sachet noted the characteristic glands on the lower surface. They did not see the type of *P. interrupta* in the Willdenow herbarium, but I examined this in 1972 and confirmed their judgement (Amer. Fern J. 63: 81. 1973); I would use for it the binomial *Cyclosorus interruptus* (Willd.) Ching, though in a different sense from Ching's.

Cyclosorus gongylodes is the type species of *Cyclosorus* Link. As restricted by me (Blumea 19: 21. 1971) this genus consists of a complex of closely related forms which have not yet been clearly distinguished. Fronds of *Cyclosorus s. str.* have thin flat scales on the lower surface of costae and rather large red glands scattered (usually sparsely) on the lower surface of the lamina, and similar glandular cells are at the ends of hairs on stalks of sporangia. Though detached pinnae of *Amphineuron terminans* are often very similar in shape and venation to *Cyclosorus interruptus* (I have sometimes confused the two at first sight) the pallid smaller glands of the former and their occurrence mainly on the veins near the apices of pinna-lobes, are always distinctive; *Amphineuron terminans* has no flat scales on its costae (such scales are rare in *Thelypteridaceae*), and its spores are different.

The fact that Mettenius confused *A. obtusatum* Sw. with *Amphineuron terminans* is difficult to understand, as he was generally a very acute observer of dermal appendages (more so than any other 19th century pteridologist) for which reason Christensen often trusted his judgement (he so informed me personally). I can only suppose that Mettenius never saw an authentic specimen of *A. obtusatum*. He treated all *Cyclosorus s. str.* under *Aspidium unitum* in his work of 1864. Hooker correctly associated *A. obtusatum* with *Nephrodium propinquum* R. Br. but under *A. unitum* he had much confusion.

Hooker's description of *N. terminans* is better than most of his descriptions of Thelypteroid ferns, and the fact that 14 out of 15 specimens cited (all bearing his identification except the erroneous one) are correct is an indication of the distinctive nature of the

species (under the names of many Thelypteroid ferns he cited specimens belonging to several distinct species). As synonyms he cited *N. conioneuron* Fée and *Lastrea malaccensis* Presl, the types of both of which differ so much from his description that they may be regarded as implicitly excluded. Hooker did not have Fée's type (*Gardner 51* from Ceylon); the only duplicate I have seen is at Vienna. But Hooker cannot have overlooked Mettenius's description of *N. conioneuron*, and I think he probably entered this name in error for *N. oreopteris*, an isotype of which he had and cited among the specimens. He did have the type of *L. malaccensis* (*Cuming 391*) and I think it is significant that he did not write the name *N. terminans* on it as he did on the other 14 specimens. In Synopsis Filicum (p. 289) Baker cited *N. conioneuron* and *L. malaccensis* under *N. extensum*, thereby correcting Hooker, but (doubtless under the influence of Mettenius) he adopted the name *N. pteroides* in place of Hooker's *N. terminans*.

In his treatment of this species (as *Cyclosorus interruptus*) in 1938, Ching described a variety *hirsutus*, distinguished by dense short pubescence on the lower surfaces and indusia. Every specimen of *A. terminans* which I have examined has more or less abundant short hairs on all parts of the lower surface and there are nearly always some hairs on indusia. Thus Ching's description does not distinguish his variety clearly. It is not more pubescent than *Wallich 386*, and is only different in the deeper lobing of pinnae (a little more than half-way to the costa). In venation and glandular hairs it is not different. Fosberg and Sachet transferred it to *Thelypteris opulenta*, presumably on account of the frond-apex and deeper lobing. There is a difference between the indusia of *A. terminans* and *A. opulentum* which they do not mention. The indusium of the latter is always fringed with glands and never bears more than a few scattered short acicular hairs on the surface. The indusium of *A. terminans* is not fringed with glands and bears a variable number of acicular hairs on the surface, a few glands sometimes among them. By this test Ching's variety belongs to *A. terminans*, but I do not think it is worth varietal rank. Several specimens at Kew from north Thailand are similar, but they grade into typical *A. terminans*.

2. Amphineuron tonkinense (C. Chr.) Holttum, *comb. nov.*

Dryopteris tonkinensis C. Chr., Bull. Mus. Hist. Nat. Paris II, 6 (1934) 102. — *Thelypteris tonkinensis* Ching, Bull. Fan Mem. Inst. Biol. Bot. 6 (1936) 292; Tard. & C. Chr. in Fl. Gén. Indoch. 7, pt. 2 (1941) 370, fig. 43: 3, 4. — *Lastrea tonkinensis* Copel., Gen. Fil. (1947) 140. — Type: *Colani*, Dec. 1926, Tonkin, *Herb. Hanoi no. 3415* (BM, Herb. C. Chr., one frond on 3 sheets).

Rhizome long-creeping (fronds 10 cm or more apart), 1 cm diameter (dry); *stipe* 60—70 cm long, glabrous, scaly near base. *Frond* 80—100 cm or more long, pinnae 16—30 pairs; basal pinnae gradually narrowed in basal 8 cm, several successive pairs gradually less narrowed; apical lamina almost pinna-like with 1 adnate small pinna and 1—2 others of transitional size; texture firm, drying red-brown. Largest *pinnae* 30—45 cm long, 2.3—3 cm wide, long-acuminate, sometimes with entire caudate tip, lobed half-way to costa; lobes falcate, subdeltoid, narrowed to acute tip; costules 5—6 mm apart; veins to 15 pairs, lower ones very oblique, basal acroscopic vein stopping at base of sinus-membrane, next 1—2 pairs passing to sides of membrane; lower surface of lamina slightly verrucose, sparse small yellow sessile or subsessile glandular hairs on veins and costules; upper surface with short hairs on costa, rarely on costules. *Sori* medial, rather large, not confined to pinna-lobes; indusia firm, glabrous, soon caducous; a multicellular hair with dark round terminal cell on stalk of sporangium.

Distribution: Tonkin, Kwangsi.

Note. Tard. & C. Chr. cite 7 collections from Tonkin. From Kwangsi I have seen

Morse 76 and *76a* (both at Kew) from Lungchow, near the Tonkin border. *Balansa 30* from Tonkin has the note '*Chaîne calcaire de Than-Moi, dans les dépressions humides et ombrageuses*' (B, G). Christensen wrongly stated that this species lacks indusia; I have seen a few on the type and on *Morse 76*.

3. **Amphineuron immersum** (Bl.) Holttum

A. immersum (Bl.) Holtt. in Nayar & Kaur, Comp. to Bedd. (1974) 203. — *Aspidium immersum* Bl., Enum. Pl. Jav. (1828) 156; Racib., Fl. Btzg 1 (1898) 169. — *Lastrea immersa* Moore, Ind. Fil. (1857) lxxxix; Bedd., Ferns Br. India (1867) t. 252; Handb. (1883) 234; Handb. Suppl. (1892) 53; Copel., Fern Fl. Philip. (1960) 327. — *Nephrodium immersum* Hook., Spec. Fil. 4 (1862) 112. — *Dryopteris immersa* Kuntze, Rev. Gen. Pl. 2 (1891) 813; v. A. v. R., Handb. (1908) 188. — *Thelypteris immersa* Ching, Bull. Fan Mem. Inst. Biol. Bot. 6 (1936) 306; Holttum, Rev. Fl. Malaya 2 (1955) 243. — *Parathelypteris immersa* Ching, Acta Phytotax. Sinica 8 (1963) 303. — T y p e: *Blume*, Java (L, 908.335 — 404).

Lastrea caudiculata Presl, Epim. Bot. (1851) 36; Holttum, Novit. Bot. Inst. Bot. Univ. Carol. Prag. 1968 (1969) 35. — T y p e: *Cuming s.n.*, Philippines (PRC).

Lastrea verrucosa Presl, Epim. Bot. (1851) 36; Copel., Fern Fl. Philip. (1960) 327; Holttum l.c. — T y p e: *Cuming 72*, Philippines (PRC; K).

? Dryopteris diversifolia v. A. v. R., Bull. Dép. Agr. Ind. Néerl. 18 (1908) 7; Handb. 189. — T y p e: *Raap 27*, Batu Isl. (BO).

Dryopteris besukiensis v. A. v. R., Bull. Jard. Bot. Btzg II, 1 (1911) 7; Handb. Suppl. (1917) 7. — L e c t o t y p e (selected here): *Koorders 15436*, Java, Besoeki, Idjen (BO; L).

Thelypteris subimmersa Ching, Bull. Fan Mem. Inst. Biol. Bot. 6 (1936) 306. — *Parathelypteris subimmersa* Ching, Acta Phytotax. Sinica 8 (1963) 303. — T y p e: *S. K. Lau 1395*, Hainan (PE, not seen).

Caudex thick, short, erect; *stipe* to 70 cm or more long, green when fresh, basal scales to 15 mm long. *Lamina* to 120 cm or more long (often fertile at a smaller size), pinnae numerous, close, texture thin, drying pale-olivaceous, 1—2 pairs of irregularly spaced small pinnae sometimes at base of frond. Largest *pinnae* of type 25 × 3 cm, largest seen 45 × 5 cm, lobed to 1 mm from costa or more deeply; lobes separated by wide sinuses, almost at right angles to costa, not falcate, distal lobes more oblique; costules of type 3.5 mm apart, on largest fronds seen 6 mm; veins 14—20 pairs, basal acroscopic vein ending beside short sinus-membrane, basiscopic vein to edge above base of sinus; lower surface of costae and costules hairless on type except near apex of pinnae, on other specimens bearing a variable number of slender acicular hairs up to 1 mm long, costules and veins usually bearing small yellow glands (abundant on type), between veins sometimes short erect acicular hairs and small capitate hairs; upper surface with antrorse hairs on costae and scattered hairs on costules and veins. *Sori* supramedial, in depressions in lamina; indusia thin, with a variable fringe of short yellow capitate hairs; sporangia and spores as in *A. opulentum*.

D i s t r i b u t i o n: Assam to S. China, Malesia, N. Queensland, New Hebrides, New Caledonia, Loyalty Islands.

N o t e. *Dryopteris diversifolia* v. A. v. R. was described from a very small but fertile plant, with lamina only 12 cm long, largest pinna 4.2 × 1.2 cm; apart from size it agrees with larger plants referred to the present species. Eryl Smith collected a specimen in Timor (no. *2432*, K) which has a definitely creeping rhizome but is otherwise not distinct; the largest fertile pinnae are 15 × 1.6 cm; glandular hairs on lower surface are all minute, rather generally scattered (not mainly on veins) with short acicular hairs between the veins and longer acicular hairs on veins and costules. It might be a hybrid with *A. opulentum*.

4. Amphineuron subattenuatum (Rosenst.) Holttum, *comb. nov.*

Dryopteris subattenuata Rosenst., Fedde Repert. 10 (1912) 332. — *Lastrea subattenuata* Copel., Gen. Fil. (1947) 140. — *Thelypteris subattenuata* Reed, Phytologia 17 (1968) 317. — T y p e: *Bamler 37*, N. E. New Guinea, Logaueng, 300 m (S—PA).

Caudex short, erect; *stipe* to at least 50 cm, stramineous, basal scales 10 × 1.5 mm, thin. *Lamina* 150 cm or more long, pinnae well-spaced, lowest large ones with very narrow base bearing narrow auricles 5 mm long on both sides; reduced pinnae 1—3 pairs similarly auricled; texture thin. Largest *pinnae* 35 × 2.5—3.5 cm, lobed to 1—1.5 mm from costa, lobes separated by wide sinuses, almost at right angles to costa, not falcate, tips broadly rounded; costules 6 mm apart on large pinnae; veins 15—20 pairs, basal veins spreading at a wide angle, tips of both usually touching sides of short sinus-membrane or sometimes uniting to form a very short excurrent vein; lower surfaces generally bearing a variable number of very small colourless spherical glands, sometimes also very short acicular hairs; upper surface of costa bearing pale acicular hairs 0.6 mm long, few hairs on costules, between veins a variable number of short acicular and capitate hairs. *Sori* a little supramedial, not immersed; indusia bearing very small glandular hairs; sporangia sometimes with a small capitate hair near annulus; *spores* pale, with rather highly prominent thick ± branched ridges.

D i s t r i b u t i o n: Eastern New Guinea, low country to 1200 m, in fairly exposed positions near streams in forest.

N o t e. *Rosenstock* distributed specimens in his sets of New Guinea exsiccatae with no. *80*, coll. *Bamler*; one such specimen at BM is mixed with *A. immersum*. Other specimens: *Schlechter 14523*, Toricelli Mts, 600 m; *Womersley & Holttum NGF 17692*, near Lae; *A. N. Millar NGF 23497*, Papua, Kokoda, 350 m; *B. S. Croxall 4436*, Papua, Baiyer River, 1200 m; *A. N. Millar NGF 48565*, near Lae, Bupu river.

5. Amphineuron opulentum (Kaulf.) Holttum

A. opulentum (Kaulf.) Holtt., Blumea 19 (1971) 45 — *Aspidium opulentum* Kaulf., Enum. Fil. Chamisso (1824) 238. — *Nephrodium opulentum* Presl, Tent. Pterid. (1836) 81. — *Thelypteris opulenta* Fosberg, Smiths. Contr. Bot. 8 (1972) 3, excl. syn. *Nephrodium terminans*. — T y p e: *Chamisso*, Guam (LE).

Nephrodium impressum Desv., Mém. Soc. Linn. Paris 6 (1827) 259. — *Dryopteris impressa* Posth., Verh. K. Akad. Wetens. Amst. 36, 5 (1937) 14; Backer & Posth., Varenfl. Java (1939) 57. — *Thelypteris impressa* Reed, Phytologia 17 (1968) 284. — T y p e: unrecorded collector, Timor (P).

Aspidium extensum Bl., Enum. Pl. Jav. (1828) 156. — *Nephrodium extensum* Moore, Ind. Fil. (1858) 91; Hook., Spec. Fil. 4 (1862) 72 excl. syn. *N. caudiculatum* Sieb. and *N. hudsonianum* Brack., t. 240 A, fig. 3, 4 *tantum*; Bedd., Handb. (1883) 269. — *Dryopteris extensa* Kuntze, Rev. Gen. Pl. 2 (1891) 812; v. A. v. R., Handb. (1908) 210. — *Cyclosorus extensus* Ching, Bull. Fan Mem. Inst. Biol. Bot. 8 (1938) 182; Holtt., Rev. Fl. Mal. 2 (1955) 264, fig. 50; Copel., Fern Fl. Philip. (1960) 368. — *Thelypteris extensa* Morton, Amer. Fern J. 49 (1959) 113; Schelpe, Fl. Zambes. Pterid. (1970) 193; A. R. Smith, Univ. Cal. Publ. Bot. 59 (1971) 77. — T y p e: collector not cited, Pulu Pinang (L; fragment at K).

Lastrea malaccensis Presl., Epim. Bot. (1851) 35. — T y p e: *Cuming 391*, Malacca (PRC; K).

Nephrodium conioneuron Fée, Gen. Fil. (1852) 308. — *Aspidium conioneuron* Mett., Farngatt. IV (1858) 102. — T y p e: *Gardner 51*, Ceylon (Orig.?; iso in W).

Aspidium nephrodioides Hook., Spec. Fil. 4 (1862) 42, t. 235, *non* Klotzsch 1847. — *A. hookeri* Bak., Syn. Fil. (1867) 257, *non* Kl. 1847. — *Dryopteris orbicularis* C. Chr., Ind. Fil. (1905) 281, *nom. nov.* — *Thelypteris orbicularis* Reed, Phytologia 17 (1968) 299. — T y p e: *Seemann*, Indian Archipelago (K).

Nephrodium punctatum Parish *ex* Bedd., Ferns Br. India (1866) t. 131; Bak., Syn. Fil. ed. 2 (1874) 503. — T y p e: *Parish*, Moulmein, Burma (K).

Nephrodium parasiticum var. *multijugum* Clarke, Trans. Linn. Soc. II Bot. 1 (1880) 533. — T y p e: *Wallich 348 p.p.*, Penang (K).

Nephrodium wakefieldii Bak., Ann. Bot. 5 (1891) 326. — *Dryopteris wakefieldii* C. Chr., Ind. Fil. (1905) 301. — T y p e: *Wakefield*, Mombasa (K).

Dryopteris incerta Domin *ex* C. Chr., Ind. Fil. Suppl. II (1917) 15. — *Aspidium pteroides* var. *terminans* F. M. Bailey, Dep. Agr. Bull. Bot. V (1892) 27; Lithogr. Ferns Queensld (1892) t. 129B; Queensland Flora 4 (1902) 1976. — *Dryopteris sp. nov.?*, Domin, Bibl. Bot. 20, Heft 85 (1913) 49. — *Cyclosorus incertus* Ching, Bull. Fan Mem. Inst. Biol. Bot. 10 (1941) 245. — *Thelypteris incerta* Reed, Phytologia 17 (1968) 284. — T y p e: 'tropical Queensland' (not seen).

Dryopteris sulfurea E. Brown, Bishop Mus. Bull. 89 (1931) 23. — *Cyclosorus sulfurea* Copel., Gen. Fil. (1947) 143. — *Thelypteris sulfurea* Reed, Phytologia 17 (1968) 318. — T y p e: *Brown 193*, Marquesas (BISH).

Aspidium pteroides var. *a*, also var. *b* in part, Mett., Ann. Mus. Bot. Lugd.-Bat. 1 (1864) 231, not *Polypodium pteroides* Retz.

Rhizome short-creeping; *stipe* to 70 cm long, slightly rufescent, short-hairy in groove, basal scales to 10 mm long, hardly 1 mm wide. *Frond* to 80 cm, pinnae to 25 pairs or more, reduced basal pinnae sometimes present, basal large pinnae much narrowed towards their bases, not auricled; apex of frond narrowly acuminate, deeply lobed and grading to upper pinnae. Largest *pinnae* commonly to 25 × 2.5 cm, largest seen 40 × 3.5 cm, lobed about 3/5 to 3/4 towards costa; lobes slightly oblique and falcate, apices rounded; costules commonly 4 mm apart, on large sterile pinnae to 6 mm; veins 8—10 pairs, basal pair touching sides of sinus-membrane or meeting below it at a varying angle to produce an excurrent vein; lower surface of rachis, costae and costules bearing very short acicular hairs with scattered longer ones (to 0.5 mm) on costules, veins, sinus-membranes and edges, small yellowish glandular hairs variously distributed along costules and veins, surface between veins usually with some short erect acicular hairs and small colourless to yellowish capitate hairs; upper surface with pale acicular hairs on costae, scattered on costules and veins. *Sori* confined to lobes of pinnae or rarely on lower veins also, supramedial, in slight depressions in lamina; indusia thin, shrivelled when old, bearing marginal glandular hairs and sometimes a few short acicular hairs on surface; sporangia with slender stalks which bear short hairs with glandular tips like the glands on indusia.

D i s t r i b u t i o n: East Africa, Seychelles, S. India, Ceylon, Burma, Peninsular Thailand, Hainan, throughout Malesia (but not in Java?), N. Queensland, Islands of the Pacific eastwards to Tahiti, Austral Islands and Marquesas, Hawaii?; naturalized at various places in Central America and the West Indies. The only Hawaiian record is a specimen '*in Mr Baldwin's collection*' without locality, mentioned by Hillebrand under *Nephrodium terminans*; there is a duplicate at BM.

N o t e s. This species received three names, from different collections, within a few years: *Polypodium opulentum* Kaulf. from Guam (1824), *Nephrodium impressum* Desv. from Timor (1827) and *Aspidium extensum* Bl. from Pulu Pinang, possibly the modern Penang (1828). Mettenius placed *P. opulentum* as a synonym of *P. pteroides* Retz. and in this was followed by all others until Ballard and Ching examined Retzius's type (see discussion under *A. terminans*). Mettenius placed *N. impressum* as a doubtful species and it so remained until Posthumus saw the type at Paris and in 1937 substituted Desvaux's name for *A. extensum* Bl. which had previously been used by almost all authors. It was not until 1972 that Fosberg and Sachet adopted the Kaulfuss name, on the grounds that there is only one species in Guam to which it could apply. Their usage is here confirmed as a result of my examination of the type at Leningrad in 1976.

Mettenius (1858) was the first author to publish a critical description, under the name *Aspidium conioneuron* (Fée) Mett.; he noted for the first time the inconstancy of venation, even on a single pinna, which is a characteristic feature not observed by Blume (Mettenius omitted *A. extensum* Bl. from this publication).

Hooker in 1862 described *Nephrodium extensum* (Bl.) and figured a specimen he had received from Blume, but he did not understand how to distinguish the species, citing

specimens which belong to other species which I place in different genera. Fig. 2 and 4 on Hooker's t. 240A are drawn from Blume's specimen but fig. 1, 2, 5 from another of a different species which I have not located in Hooker's herbarium. In the same volume Hooker described separately another specimen as *Aspidium nephrodioides* because he believed the (young) indusia to be peltate, though in fact they are reniform with overlapping basal lobes as shown in Fitch's drawing on t.235; the specimen is also peculiar in having very wide pinnae, but the venation and glands are characteristic. Hooker attached little importance to the presence and nature of glandular hairs.

In 1864 Mettenius united this species with *A. terminans* and attempted to distinguish three varieties. His var. *a* is clearly the present species, but he included *A. extensum* Bl. as a synonym under var. *b*, for which reason I think he cannot have seen Blume's specimen.

Beddome and later authors correctly observed the variable venation, which is ignored by Fosberg and Sachet in their discussion under *Thelypteris opulenta*. Instead they propose the nature of the frond-apex as the main character distinguishing between *A. opulentum* and *A. terminans*; in my judgement it is a less distinctive character than venation, and the indusium provides other characters also.

This species is very widely distributed and shows a good deal of variation in the details of the occurrence of glands and hairs, but I do not see a clear separation into varieties except possibly in the Marquesas Islands.

In Micronesia (type locality of *A. opulentum*) the glands on lower surface of veins are pallid (hardly yellowish), more abundant on distal veins than on lower ones; it is interesting to note that this is the normal condition of *A. terminans*.

In the Marquesas is an apparently distinct local variety (co-existing with the typical one) with very copious yellow glands on and near the veins, with a fair number in the spaces between veins; this is *Dryopteris sulfurea* E. Brown.

In Malesia and S. E. Asia decidedly yellow glands are always abundant along all veins, those on distal ones not more numerous nor largest.

Specimens from East Africa often have sori on basal veins and rather copiously hairy indusia; there are not enough specimens to show how constant are these traits.

Prof. I. Manton examined cytologically a plant sent by me from Singapore and found it to be tetraploid; it is not known whether a corresponding diploid form occurs. Both diploid and tetraploid plants of *A. terminans* are reported from southern India but the two have not been compared as regards general morphology. Both *A. opulentum* and *A. terminans* are variable and it is possible that hybrids exist. Artificial production of hybrids should not be difficult and might help to clarify the taxonomic situation.

6. **Amphineuron tildeniae** Holttum, *sp. nov.*

A. opulento affinis, differt: pinnis inferioribus normalibus rudimentariisque basi acroscopice auriculatis; auriculis 10—12 mm longis, acutis, venulis furcatis instructis; glandulis (vel pilis capitatis) paginae inferioris omnibus minutis; venis infimis semper anastomosantibus, saepe soriferis; indusiis pilis acicularibus brevibus vestitis, interdum ad marginem pilis parvis capitatis praeditis.

Type: *J. E. Tilden 359*, Tahiti, Paea (K; BM, B, G, BISH).

Largest *pinnae* 31 × 2.5 cm, lobed ½—¾ towards costa; lower surface of rachis, costae, costules and veins bearing short acicular hairs and very small capitate hairs, hairs of both kinds rarely present between veins; *sori* supramedial, not immersed; mature sporangia not seen.

Additional specimens. Tahiti: *Nightingale s.n.* (K), *Garrett 24 ex* Mus. Godeffroy (B); Cook Is.: *T. F. Cheeseman 771*, Rarotonga, 'lower parts of the island and valleys of the interior, not uncommon' (K).

Note. These plants agree with *Christella* in their auriculate lower pinnae but differ in the abrupt reduction of irregular lower pinnae. The species needs further study from specimens with mature sori.

7. **Amphineuron distinctum** (Copel.) Holttum, *comb. nov.*

Dryopteris distincta Copel., Univ. Cal. Publ. Bot. 18 (1942) 220. — *Cyclosorus distinctus* Copel., Gen. Fil. (1947) 142; Philip. J. Sci. 78 (1951) 444, pl. 26. — *Thelypteris distincta* Reed, Phytologia 17 (1968) 273. — Type: *Bamler W. 11*, N. E. New Guinea, Wareo, 150 m (UC).

Dryopteris longissima var. *novoguineensis* Rosenst., Hedwigia 56 (1915) 351, not *Goniopteris longissima* Brack. — Type: *Bamler 132*, N. E. New Guinea, Wareo (B).

Stipe dark at base, distally dull reddish, minutely hairy, bearing narrow scales throughout, basal scales 12 mm long; lower surface of rachis also bearing narrow scales or their wart-like bases. Basal *pinnae* narrowed in basal 4 cm, base 4 mm wide. Largest pinnae 25 × 3 cm, rather short-acuminate, lobed to 1½—2 mm from costa, lobes slightly oblique, slightly falcate; costules 4—4½ mm apart; veins to 18 pairs, not prominent, basal pair uniting with short excurrent vein to sinus or both passing to sides of sinus-membrane; lower surface of rachis sparsely short-hairy, of costae bearing copious spreading hairs more than 0.5 mm long, fewer on costules and veins, between veins copious slender erect acicular hairs and small ± yellowish capitate hairs; upper surface of costae bearing thick spreading acicular hairs and small capitate hairs, short acicular and capitate hairs between veins. *Sori* infra-medial, exindusiate; a hair of 3 cells on sporangium-stalk, distal cell club-shaped, orange; *spores* dark.

Note. Only known from original locality. At W is a specimen of Rosenstock's New Guinea exsiccatae no. *243*, coll. Bamler at Wareo, 600 m, March 1914. The scaliness of stipe and rachis, and copious acicular hairs of lower surfaces are distinctive; hairs on stalks of sporangia are also peculiar.

8. **Amphineuron attenuatum** (Kuntze) Holttum, *comb. nov.*

Aspidium attenuatum Kunze *ex* Mett., Farngatt. IV (1858) 96, *non* Sw. 1801. — *Nephrodium attenuatum* Bak., Syn. Fil. (1867) 263, *non* T. Moore 1858. — *Dryopteris attenuata* Kuntze, Rev. Gen. Pl. 2 (1891) 812, *nom. nov.* — *D. stenobasis* C. Chr., Ind. Fil. (1905) 294, *nom. nov. superfl.* — *Thelypteris stenobasis* Ching, Bull. Fan Mem. Inst. Biol. Bot. 10 (1941) 254. — *Mesoneuron attenuatum* Ching, Acta Phytotax. Sinica 8 (1963) 326. — *Thelypteris attenuata* Morton, Contr. U.S. Nat. Herb. 38 (1967) 35. — Type: *Cuming 327*, Samar (US; iso in K, L., SING, B, BRI, E, G, LE).

Dryopteris superficialis v. A. v. R., Bull. Jard. Bot. Btzg II, 20 (1913) 12; Handb. Suppl. (1917) 155. — Type: *Sa-anam 124*, Moluccas, Obi Isl. (BO; iso in L).

Dryopteris erubescens auct. non (Hook.) C. Chr.: Chr., Philip. J. Sci. 2C (1907) 210. — *Lastrea erubescens auct. non* (Hook.) Copel.: Copel., Fern Fl. Philip. (1960) 329.

Cyclosorus alatellus auct. non (Christ) Copel.: Copel., Fern Fl. Philip. (1960) 341, *excl. syn.*

Caudex short, erect (*teste* M. G. Price); *stipe* to at least 60 cm long, glabrous, slightly flushed with red, basal scales thin, to *c.* 10 × 1 mm. *Lamina* to 80 cm or more long; several pairs lower pinnae much narrowed at their bases; texture firm, brittle when dry. Largest *pinnae* 30 × 2 cm, lobed to *c.* 1½ mm from costa, apex gradually attenuate sometimes with a cauda 3—5 cm long; lobes slightly oblique and falcate with rounded tips; costules to 4—4½ mm apart; veins to 18 pairs, basal pair with upcurved tips passing to sides of

sinus-membrane or rarely joining just below the membrane; lower surface of costae and costules bearing scattered minute capitate hairs, between veins short erect acicular hairs and glandular hairs of varying size from minute capitate hairs to rather large red resinous sessile glands; upper surface of costa bearing very short capitate hairs with a few acicular hairs distally, scattered similar hairs between veins. *Sori* somewhat inframedial, lower ones divergent; indusia small, copiously glandular; sporangia with short (unicellular?) glandular hairs on stalk; *spores* dark, rugose.

Distribution: Philippines (Luzon, Samar, Mindanao), N. Celebes (*Alston 16051*), Obi Island.

Note. I have placed *Dryopteris superficialis* v. A. v. R. as a synonym, though I have not seen indusia on the type specimen nor glands on the lower surface; in other respects it is not distinguishable.

9. Amphineuron ceramicum (v. A. v. R.) Holttum, *comb. nov.*

Phegopteris ceramica v. A. v. R., Bull. Dép. Agr. Ind. Néerl. 18 (1908) 15; Handb. (1908) 506. — Type: *Treub*, Ceram (BO).

Polypodium erubescens var. *amboinensis* Hook., Spec. Fil. 4 (1862) 236; Syn. Fil. (1867) 306. — Type: from Amboina, ex *Herb. Webb.* (K; iso in FI, P).

Dryopteris logavensis Rosenst., Fedde Repert. 10 (1912) 332. — Lectotype: *Bamler L. 34* (S—PA; iso in BM).

Phegopteris mamberamensis v. A. v. R., Bull. Jard. Bot. Btzg II, 24 (1917) 3; Handb. Suppl. (1917) 516. — Type: *Thomson 645*, W. New Guinea, Mamberamo River (BO; iso in L).

Dryopteris moluccana C. Chr., Dansk Bot. Ark. 9, 3 (1937) 64. — Type: *Forbes 3273*, Amboina (BM; iso in B).

Dryopteris pseudostenobasis Copel., J. Arn. Arb. 10 (1929) 176. — *Cyclosorus pseudostenobasis* Ching, Bull. Fan Mem. Inst. Biol. Bot. 10 (1941) 248. — *Lastrea pseudostenobasis* Copel., Philip. J. Sci. 78 (1951) 425. — *Thelypteris pseudostenobasis* Reed, Phytologia 17 (1968) 306. — Type: *Brass 1000*, Papua, Vailala River (UC; iso in G).

Cyclosorus alatellus auct. non (Christ) Copel.: Copel., Philip. J. Sci. 78 (1951) 445, *p.p.*, not *Nephrodium alatellum* Chr.

Rhizome short-creeping or suberect; *stipe* to 80 cm long, densely scaly at base, scales *c.* 10 × 1 mm. *Lamina* to 100 cm or more long; bases of lower pinnae gradually contracted to a narrow wing along costa, rudimentary basal pinnae not seen; texture firm, brittle when dry. Largest *pinnae* to 45 × 3.5 cm, lobed to 2—2½ mm from costa, apex caudate-acuminate (cauda to 3 cm long); lobes subfalcate, obtuse; costules 4—4½ mm apart; veins *c.* 15 pairs, basal ones spreading at a wide angle to costule with upcurved ends parallel touching sides of sinus-membrane or united below it; lower surface bearing some resinous sessile glands between veins and smaller glands, acicular hairs rare; very short capitate hairs and acicular hairs variably present on upper surface of costae. *Sori* medial, on all veins to base, lower ones little divergent; indusia small, bearing copious orange-red glands; *spores* very dark.

Distribution: Moluccas (Amboina, Halmahera, Ceram), New Guinea, New Ireland, Solomon Islands; at altitudes up to 1000 m, near rivers.

Notes. Solomon Island plants appear to lack glands on lower surface and indusia but this may be due to treatment in drying; they are otherwise typical.

The type of *Phegopteris ceramica* has small fronds, and I could not see glands on it, but typical specimens have also been found in the island. If local study should show that there are two species in Ceram, one small and one large, the epithet *logavensis* should be given

to the large one. On some distribution labels Rosenstock wrote *logavengensis* but the published name was *logavensis*.

10. **Amphineuron paraphysophorum** (v. A. v. R.) Holttum, *comb. nov.*

Dryopteris paraphysophora v. A. v. R., Bull. Jard. Bot. Btzg III, 2 (1920) 143. — T y p e: *C. J. Brooks 250S*, Sumatra, Lebong Tandai (BO; iso in BM).
? *Dryopteris kiauensis* C. Chr., Dansk Bot. Ark. 9, 3 (1937) 64. — T y p e: *Endert 4632* (wrongly cited as *4433* which is type of *D. endertii* C. Chr.), E. Borneo, W. Kutai, Kiau, 700 m (BO; iso in L, SING).
? *Dryopteris superficialis* v. A. v. R., Bull. Jard Bot. Btzg III, 5 (1922) 199 *quoad pl. Sumatr.*

Rhizome not known; *stipe* at least 80 cm long, basal 20 cm copiously scaly, scales *c.* 7 mm long. *Lamina* 100 cm or more long; basal pinnae stalked 2 mm, basal 10 pairs of lobes gradually shorter, base very narrow. *Pinnae* to 35 × 3 cm, caudate-acuminate, lobed to 1 mm from costa; costules 3—3½ mm apart; veins 15—20 pairs, basal ones with upcurved tips touching sinus-membrane; lower surface of costa bearing very short pale capitate hairs, large yellow to orange ± pyriform glandular hairs scattered on veins and surface between them; upper surface of costa bearing minute capitate hairs. *Sori* medial; indusia small, copiously glandular; *spores* dark.

N o t e s. Only known with certainty from the type, above described.

The type of *D. kiauensis* C. Chr. has pinnae to 18 × 1.5 cm; indusia and glands have not been detected. But specimens from Mt Kinabalu in N. Borneo are similar in size and bear glands (it should be noted that Endert's locality Kiau is not the same as Kiau on the foothills of Mt Kinabalu). All Bornean specimens are deeply lobed; those seen in addition to the type collection of *D. kiauensis* are: *Clemens 29765* in part (part is *A. immersum*), Kinabalu, Tenompok; *Kokawa & Hotta 1291*, Kinabatangan (distributed as *Thelypteris erubescens*). A specimen collected by *Teuscher* in N.W. Borneo (L) is sterile, with pinnae 3 cm wide, glandular as type of *A. paraphysophora*.

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Numbers refer to the serial numbers of species in the present paper. New names are in **bold type.**