

NOTES ON TAXONOMY AND NOMENCLATURE IN THE GENUS
LYGODIUM (SCHIZAEACEAE)

by

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SUMMARY

Due to various causes, the early history of both taxonomy and nomenclature in the genus *Lygodium* is very confused. As a result, a number of problems arise which need fuller discussion than is possible in Flora Malesiana. Such problems are here discussed, concerning most of the species native in Malaysia. The new combination *Lygodium auriculatum* (Willd.) Alston is published, and a new typification of the species *Ophioglossum scandens* L. is proposed.

NOTE BY R. E. HOLTUM

The first draft of this paper was prepared by the late Mr. A. H. G. ALSTON, during the course of a revision of the genus *Lygodium* which he was undertaking for Flora Malesiana. He left this revision unfinished, and I have completed it. I have also revised and largely re-written the present paper, but in essentials it follows his original, except that I have differed from his judgement on the nomenclatural problem presented by the species *L. polystachyum*. References to literature, where not cited, may be found in Christensen's Index Filicum; they will also be cited fully in Flora Malesiana.

LYGODIUM POLYSTACHYUM Wall, ex Moore

SYNONYMS : *Hydroglossum pinnatifidum* Willd. 1802, p.p. — *Lygodium pinnatifidum* (non Sw. 1803) Prantl 1881.

Willdenow based the species *H. pinnatifidum* on two quite different specimens, which are still in his herbarium at Berlin, and he combined characters from both specimens in his description. One specimen, sterile, belongs to the species later called *L. polystachyum* by Wallich; the other, fertile, is *L. flexuosum* (L.) Sw. The specific epithet *pinnatifidum* is derived from the sterile specimen, but the description contains no further information about that specimen. In the discussion, Willdenow pointed out how his new species was distinct in both sterile and fertile fronds, without emphasizing the one rather than the other. As the distribution

of the species, Willdenow gave only the Malabar coast, whence came the fertile specimen; evidently he did not know that the sterile specimen represents a species only occurring in the region from northern Malaya to Yunnan.

In 1803, Swartz transferred the species to his genus *Lygodium* under the following circumstances. He cited *Ugena polymorpha* Cav. as a synonym, and also Rheede, Hort. Malab. 12, t. 33; Rheede's figure (which showed only a fertile frond) had been cited both under *Ugena polymorpha* Cav. and *Hydroglossum pinnatifidum* Willd. Thus Swartz used the name *Lygodium pinnatifidum* to refer to Willdenow's fertile specimen, and in effect he typified the species by that specimen. The name *L. pinnatifidum* was used in the same sense, though somewhat more broadly, by Hooker and Baker, in Synopsis Filicum (1868). They used the name *L. polystachyum* Wall.- ex Moore (1859) for the species represented by Willdenow's sterile specimen.

The only subsequent author who took any notice of Willdenow's sterile specimen was Prantl, in his monograph of the family Schizaeaceae (1881). He took the sterile specimen as the type of the species *L. pinnatifidum*, and put *L. polystachyum* Wall, as a synonym. But before that time Swartz, Hooker and Baker had clearly interpreted the species in the other way, and their decision should be followed. This was recognized by Christensen (Index Filicum, 1905), who placed *L. pinnatifidum* (Willd.) Sw. as a synonym of *L. flexuosum* (L.) Sw., and used the name *L. polystachyum* Wall, ex Moore for the species represented by the sterile specimen.

LYGODIUM MICROPHYLLUM (Cav.) R.Br.

SYNONYMS: *Ugena microphylla* Cav. 1801. — *Lygodium scandens* sensu Prantl 1881, C. Chr. Ind. Fil. 1905 etc., Swartz 1801 (*p.p.* tantum) non *Ophioglossum scandens* L.

Cavanilles gave a figure, from which the identity of his species cannot be doubted. Prantl regarded Cavanilles' species as a synonym of *O. scandens* L., by a process of selecting as type of the latter a drawing from Rumphius (Herb. Amb. vol. 6, t. 32, f.2). But this figure was not cited in the first edition of Linnaeus' Species Plantarum (it was cited in the second edition) and therefore cannot serve as the type of *O. scandens* L. The question of selecting another type for *O. scandens* L. therefore needs to be considered; and this consideration leads to the conclusion that the interpretation of *Lygodium scandens* (L.) Sw. given by Christensen in his Index Filicum, and followed by most modern authors, cannot be main-

tained. As a result, the name *L. microphyllum* (Cav.) R.Br. must be used for what Christensen called *L. scandens*.

In the first edition of *Species Plantarum*, p. 1063, Linnaeus first quoted a phrase-name from his *Hortus Cliffortianus* (1737). The specimen on which this name was based is in the British Museum, and is the tropical American species later called *Lygodium volubile* by Swartz. (In *Hort. Cliff.*, Linnaeus gave a distribution in tropical America, and also quoted the works of Breyne and Morison mentioned below).

Linnaeus next referred to his *Flora Zeylanica* (1748), where he gave a description of a specimen collected by Hermann in Ceylon (no. 374). This specimen is a fertile one; next to it in the Hermann herbarium is no. 375, which is a sterile form of the same species as no. 374. Linnaeus based his *O. flexuosum* on no. 375, not realizing that the two represented different conditions of the same plant.

Linnaeus further gave references to three published illustrations: (a) Breyne *Cent.* 185, t.96; (b) Morison (a figure copied from Breyne); (c) Rheede, *Hort. Malab.* 12, p.65, t.33. The drawing of Breyne and Morison represents a plant from Brazil, recognized by Swartz in 1803 as *L. venustum* Sw. Rheede's plate is not a good one, but almost certainly represents *L. flexuosum* (it was so recognized by Clarke, *Trans. Linn. Soc. Bot.* 1, 584, 1880).

Thus *OpMoglossum scandens* L. is based on:

- i. a specimen of *L. volubile* Sw.
- ii. a specimen of *O. flexuosum* L.
- iii. drawing of *L. venustum* Sw.
- iv. a drawing *O. flexuosum* L.

The initial descriptive phrase from *Hort. Cliff.* covers all these; we have to choose one of them as the type of the species. As Swartz has already segregated two of them as other species, we are left with the Hermann specimen of *O. flexuosum* and the drawing representing the same species. Hermann's specimen should thus be the type of *O. scandens* L., and *O. scandens* becomes a synonym of *O. flexuosum* L.

L. microphyllum (Cav.) R. Br. is the most easily distinguished of all oriental species of *Lygodium*, both vegetatively (creeping rhizome, elongate primary rachis-branches, articulate leaflets which are rarely lobed) and in its spores. But in the past these distinctions have not always been recognized, and the distribution of the species has sometimes been inaccurately stated. For example, Hope recorded the species from Chitral (western Kashmir) but probably he had seen *L. japonicum*, which does occur in Kashmir.

LYGODIUM JAPONICUM (Thunb.) Sw.

The following species were placed as synonyms in Christensen's Index; the type specimens of all have also been seen by Mr Alston, who confirmed their status: *L. disseetum* Desv. (Paris), *L. chaerophylloides* Desv. (Paris), *L. microstachyurn* Desv. (Paris), *L. tenue* Bl. (Leiden). Mr Alston also saw authentic material of *L. miarophyllum* Link at Leiden.

In Malaysia, this species has never been found wild in Sumatra, the Malay Peninsula and Borneo (that is, in the more continuously wet parts of the region), nor in the west of Java, but occurs north of Malaysia from Burma and Siam to China and Japan. Probably its distribution in Malaysia is in some way governed climatically, but the nature of the control is not known. The species will grow in cultivation in Singapore, but not vigorously, and is evergreen in the climate which has no dry season. Possibly the fronds are seasonal in growth, dying down in the dry season in its natural habitats. As grown under glass at Kew, the fronds die in the autumn and new ones appear in the spring. The Kew plant is a tetraploid, and very vigorous. Perhaps diploids also occur in nature but their existence has not been demonstrated.

LYGODIUM SALICIFOLIUM Presl

This species appears to intergrade in some measure with *L. flexuosum* (L.) Sw., and in Holttum, Ferns of Malaya (p.57) the two are united, but typical conditions of the two species are quite distinct. It is possible that hybridization occurs, but no experimental investigation has been made. *L. flexuosum* has the wider distribution; probably *L. salicifolium* is confined to moister habitats or regions with a shorter dry season.

L. salicifolium differs from *L. flexuosum* in the following characters: stalk of each leaflet thickened at junction with lamina (old leaflets sometimes break off at this thickening, but not freely as they do in *L. miarophyllum*); all leaflets stalked and all of about equal length (distal ones smaller and sessile in *L. flexuosum*); basal leaflets usually simple, or, if lobed at the base, the lobes small and spreading almost at right angles (in *L. flexuosum* usually with elongate oblique basal lobes or often with free quaternary leaflets). Specimens referred to *L. salicifolium* are:

FORMOSA. *Oldham* 9 (K). INDO-CHINA. Annam: *Dalat*, *Squires* 751 (K); *Cochinchina*: *Thorel* (BM). SIAM. *Sriracha*, *Nongkaw*, 70 m, *Marcan* 1216 (BM), *E. Smith* 979a (BM); *Koh Samet*, *H. M. Smith* 535 (BM); *Bandon*, *E. Smith* 2216 (BM). MALAYA. *Kedah*: *Langkawi Isl.*, *Dayang Bunting*, *Robinson* (K). *Penang*: *Wallich* 175 (K,BM,L), 2200

(BM) ; *Lady Dalhousie* (BM). Perak: *Scortechini* (BM) ; Waterfall, Taiping, *Mattheiv* (K) ; Larut, 300 ft, *Kunstler 2975* (K). Kelantan: Batu Papan, Sungei Keteh, *Nur S.F. 12080* (K). Malacca: *Maingay 3195* (K). Singapore: *Cuming 365* (W, type, K, BM). SUMATRA: south Sumatra, *Menzies* (BM). Riouw Arch.: P. Papan, *Biinnemeijer 7825* (BO, L). JAVA: Bantam, Sadjira, Lebak, *Kuhl & van Hasselt* (L) ; Batavia, Depok, *Jensen* (BM). N. BORNEO: Tenom, 700-1000 ft, *Gibbs 2802* (K) ; without locality, *Hose* (BM). NEW GUINEA: Sattelberg, 900 m, *Bamler ed. Ros. 108* (BM, L) ; Kubuna, 100 m, *Brass 5686* (BO, BM, K). Kei Is.: *Jensen 334* (BO).

LYGODIUM FLEXUOSUM (L.) SW.

SYNONYMS: *Ophioglossum flexuosum* L. 1753. — *O. scandens* L. 1753, p.p. typ. — *Ugena polymorpha* Cav. 1801. — *Hydroglossum pinnatifidum* Willd. 1802, p.p. typ. — *Lygodium pinnatifidum* Sw. 1803 — *Lygodium jiolymorphum* H.B.K. 1815. non sensu HBK, nee sensu C. Chr. Ind. Fil. (1905) 413. — *L. pilosum* Desv. 1827. — *L. serrulatum* Bl. 1828. — *L. pinnatifidum sensu* Hk. & Bak. Syn. Fil. 1868, p.p.

The type of this species is Hermann 375 from Ceylon (BM) ; Linnaeus cited no other reference. The type is part of a sterile frond of a young plant, and thus does not show the normal pinnate condition of secondary branches of the frond, but there can be no doubt of its identity. The fertile frond preserved with it by Hermann (no 374) was called *Ophioglossum scandens* by Linnaeus, and we are here selecting this specimen as type of the species *O. scandens* (see discussion above under *L. microphyllum*) which thus becomes as synonym of *L. flexuosum*.

The specimen described and illustrated by Cavanilles under the name *Ugena polymorpha* was collected by Nee in Luzon. In 1815 Humboldt, Bonpland and Kunth transferred the name to *Lygodium* and used it for a species of tropical America. Swartz had however published the name *L. venustum* for the latter species in 1803. In the same paper of 1803, Swartz also noted that Cavanilles' figure of *U. polymorpha* matched one by Rheede cited under *Ophioglossum scandens* by Linnaeus and also cited by Willdenow under *Hydroglossum pinnatifidum*; for this species Swartz made the new combination *L. pinnatifidum* (see discussion under *L. polystachyum*). In our opinion *L. pinnatifidum*, as so defined by Swartz, is not distinct from *L. flexuosum*.

The tropical American species *L. venustum* Sw. is certainly closely allied to *L. flexuosum* of Asia and Malaysia, but the two appear to be distinct, and were so treated by Prantl in his monograph of the family in 1881. But Prantl placed *L. polymorphum* as a synonym of *L. venustum*,

apparently not realizing that the former was published earlier (he gave 1801 for both); judging from Cavanilles's figure, and following the interpretation of HBK, he thought that the type of *L. polymorphum* had been wrongly localized and that it was in fact from tropical America. Christensen, knowing that *U. polymorpha* Cav. had precedence over *L. venustum* Sw., used the name *L. polymorphum* for the tropical American species, with *L. venustum* as a synonym. However, as Cavanilles cited *Ophioglossum scandens* L. as a synonym of *Ugena polymorpha*, the latter name is illegitimate, and thus the problem of the localization of the type specimen does not arise; and the name *L. venustum* should be restored for the tropical American species.

Lygodium pilosum Desv. was based on a fragmentary specimen probably to be referred to *L. flexuosum* (the type, at Paris, consists of two leaflets only). The type of *L. elegans* Desv. 1811 is sterile and doubtful.

The species *L. serrulatum* Bl. is represented by several sheets from Java so named by Blume at Leiden; they are all referable to *L. flexuosum*, according to our concept of that species. A specimen collected by Zippel at Buitenzorg is marked as the type. A specimen collected in Bantam by Van Hasselt, also labelled *L. serrulatum* by Blume, is however *L. salicifolium*.

Lygodium auriculatum (Willd.) Alston, *comb. nov.*

SYNONYMS: *Hydroglossum auriculatum* Willd., Sp. Pl. 5 (1810) 84. — *Ugena semihastata* Cav. 1801, *nom. illegit.*, *excl. syn.* — *L. semihastatum* Desv. 1827.

As Cavanilles cited the earlier name *Ophioglossum flexuosum* L. as synonym, he ought to have adopted the name *flexuosum* for the specimens he was describing. His name *U. semihastata* is therefore illegitimate, though his illustration (prepared from Philippine specimens collected by Née) clearly shows that he had a species quite distinct from *L. flexuosum*. The next available name for the Philippine species is *Hydroglossum auriculatum* Willd., which has not hitherto been transferred to *Lygodium*.

In the branching of the frond, this species is near *L. trifurcatum* Bak.j and also near *L. borneense* v.A.v.R. (both further discussed below). In all three species the secondary branches are once or twice dichotomous. *L. borneense* is the least branched, and is distinct in the cuneate bases of its leaflets and in its smooth spores (however, one collection of *L. borneense* from Johore, growing near quite typical specimens, has somewhat cordate bases, but its fertile leaflets are much larger than those of *L. auriculatum*).

L. trifurcatum shares with *L. auriculatum* the character of strongly cordate outer bases of sterile leaflets, but differs in having the lamina of fertile leaflets reduced to a narrow wing along the costae and veins. *L. altum* (Clarke) Ching, of Burma, has a similar cordate base of sterile leaflets, but its secondary branch-systems are fully pinnate, the sterile leaflets simple with symmetrical cordate base (not paired and cordate on one side as is usual in *L. auriculatum*).

Née collected *L. auriculatum* at Oaz, Camarines Prov., Luzon, probably near Nabua, where he noted the use of the climbing rachises for making hats. He also collected *L. auriculatum* in the Mariannas. The following specimens illustrate the distribution of this species (the specimen from Perak, on which Beddome and van Alderwerelt based a record of *L. semihastatum* from the Malay Peninsula, is *L. salicifolium* Pr.) :

INDOCHINA. Annam: Dong Trang near Nhatrang, *Evrard* 452 (K); Cochinchina: Tseung Daing, *Pierre* (K). PHILIPPINES. Polillo Is., *Fox* P. N. H. 8901 (BM) ; Luzon: Bataan, Lamao Reserve, Mt Mariveles, 300 ft, *Williams* 210 (K); Laguna, Mt Maquiling, *Matthew* (K); Tayabas, Malicboi, *Topping* (Sp. Blanc. 739, BM, K) ; Sampalok, 100 m, *Copeland* 210 (BM); Camarines, Paracale, *Ramos & Edano* B. S. 33501 (K); Samar: Cuming 337, part (BM,K) ; Mindanao: Agusan, Cabadbaran, Mt Urdaneta, *Elmer* 14005 (K,L). EASTERN BORNEO: *Rutten* 11 (U).

LYGODIUM TRIFURCATUM Baker

The type is *Milne* 511 from the Solomon Islands (at Kew). The distribution of the species is on the islands to the north and east of New Guinea; on the mainland is the closely allied species *L. dimorphum* Copel. (see below). Bangka is mentioned by Van Alderwerelt as a locality for *L. trifurcatum*, but the specimen (Batoe Roesak, Berkhout, 29.8.1886, BO), is *L. longifolium* (Willd.) Sw. A Bornean specimen named *L. trifurcatum* by Christensen (Mt Poi, Mjöberg) is *L. circinnatum* (Burm.) Sw. Christ recorded *L. trifurcatum*. from Celebes; we have not seen the specimen and doubt the correctness of the identification. Specimens of this species seen include the following:

LOUISIADE ISL.: *Macgillivray* (K, syntype) ; Rossel Is., *Mac Gregor* H (K). SOLOMON IS.: Bougainville, Tavera R., Empress Augusta Bay, *Wakefield* 1133 (BM); Shortlands Is., *Guppy* 114, 115 (BM); Treasury Is., *Guppy* 22 (BM), 43, 297 (juvenile plants, BM) ; Kolombangara, Kuzi, Brown 1169B (BM); Malarta, Bannani, *Brown* 959 (BM) ; Tulagi, *Lever* (BM); San Cristoval, Makeria Harbour, *Milne* 211 (K, type, BM), Sharks

Bay, *Milne* 591 (K, syntype) ; Waimamura, *Brass* 2630 (L) ; Ugi, *Veitch* (K, syntype). NEW HEBRIDES: *Manicolla*, *Richards* (K).

LYGODIUM DIMORPHUM Copel.

SYNONYM: *L. novoguineense* Brause.

Both *L. dimorphum* and *L. novoguineense* were based on the same collection of Copland King. This species, which has been collected at several places from the eastern end of New Guinea to Amboyna, is closely allied to *L. trifurcatum* Bak. It differs from the latter species in the form of both sterile and fertile fronds, the leaflets of the former being very strongly cordate-auriculate at the base, of the latter more copiously branched. Specimens are as follows: AMBOYNA: *Labillardiere* (BM); no collector's name (L); *C. B. Robinson* 1981 (BM, K, BO). NEW GUINEA: Western N. Guinea: *Lam* 497 (U,L) ; Mamberamo R., 60 m, *Docters van Leeuwen* 9668 (L,BO) ; Rouffaer R., 175 m, *Docters van Leeuwen* 10092 (L,BO); Mt Cyclops, 1000 ft, *Cheesman* 174 (BM, juvenile) ; Eastern N. Guinea: Fly River, *d'Albertis* (K) ; no locality, *Copland King* 134 (type; phot, at BM); *C. Hartmann* s.n. 1887 (BM); Central Division, Laloki River area, 1800 ft, *Wakefield* 1289 (BM) ; Milne Bay Distr., 200 m, *Hoogland* 4340 (BM,L) ; Isoarava, 3500 ft, *Carr* 15485 (BM,L); Goodenough Bay, *C. King* 80 (BM); Rouna, 1400 ft, *Carr* 12479 (BM,K,L): no locality, *Ledermann* 10512 (BM); Sameri, *Fitzgerald* 79 (K). BISMARCK ARCH., New Ireland, *Peekel* 6, 154 (K).

LYGODIUM BORNEENSE V.A.V.R.

This species has a fairly wide range of distribution, but has not often been collected. In all cases where habitat conditions are recorded, specimens were obtained in fresh-water swamp-forest; in two cases in Sarawak this was near limestone hills, but the Johore locality is not near limestone. The leaflets of *L. borneense* are always simple and are larger than those of any other Malaysian species; the fertile lamina is not appreciably reduced as compared with sterile leaflets. For a note on comparison with *L. auriculatum* and *L. trifurcatum*, see above, under *L. auriculatum*. Specimens of *L. borneense* seen are as follows:

SUMATRA: Mentawai Is., Siberut, *Kloss* S. F. 14469 (K). MALAYA. Johore: S. Sedili, *Corner* S. F. 26053 (K,BO), *Holtum* s.n. 30.3.1941(K). BORNEO. Sarawak: Baram, *C. Hose* 345 (K); Niah, swamp near limestone, *Synge* S. 571 (K); N. Borneo: Sandakan, *Creagh* (K); near Sandakan, heavy shade, *Cox* 322 (BM); Tawao, *Elmer* 20827 (BM, L,K) ; Sandakan,

Elmer 20198 (BM,L,K); KALIMANTAN: W. Koetai, in Swamp, *Posthumus* 2094 (L); W. Koetai, Moeara, Andjaloeng, *Endert* 2057 (BO); Kom-beng, *Endert* 5191 (BO); S. E. Borneo, *Hubert Winkler* 2722 (BM,K,L); Tanah Bumbu, Batoelitjin, *van Slooten* 2145 (L); Samarinda, *Rutten* 40 (BO). TALAUD IS.: P. Karakelang, 60 m, *Lam* 25U (L,BO).

LYGODIUM LONGIFOLIUM (Willd.) Sw.

SYNONYMS: *Hydroglossum longifolium* Willd. 1802 — *L. digitatum* Presl 1825 (?) — *L. teysmannii* v.A.v.R., Bull. Dép. Agr. Ind. Néerl. 18 (1908) 5; Handb. Mai. Ferns (1908) 111, 801; Suppl. (1917) 115. — *L. circinnatum* var. *cristatum* v.A.v.R., *I.e.* — *L. derivatum* v.A.v.R., Bull. Jard. Bot. Btzg III, 5 (1922) 213.

Willdenow described *Hydroglossum longifolium* from a fertile specimen collected on the Malabar coast of southern India. He published a figure, which was obviously prepared from part of the type specimen (now at Berlin), of which we have seen a photograph. This specimen shows a tendency to a pinnate condition of branching of the secondary branch-systems, which is a feature of a Malaysian species usually called *L. digitatum* Pr. (see Holtum, Ferns Mai. 55, 1954). The two characters however which most clearly distinguish this Malaysian species are the finely serrate edges of sterile leaflets (such leaflets are absent from Willdenow's specimen) and coarsely, unevenly, warty spores; these characters contrast with the very smooth thickened edges of sterile leaflets and the finely verrucose spores of *L. circinnatum* (Burm.) Sw., of which *L. longifolium* has usually been considered a synonym. Through the courtesy of the Director of the Botanical Museum at Berlin, spores of Willdenow's type have been made available for inspection, and they prove identical with those of the Malaysian ferns usually called *L. digitatum*; the name *L. longifolium* should therefore replace *L. digitatum* for these ferns.

A specimen from southern India (now at Kew) figured by Beddome as *L. dichotomum* (Ferns S. India t.62) agrees with *L. longifolium* in sterile leaflets and in spores; also in a tendency to pinnate branching of fertile parts of fronds. The latter tendency is more fully developed in some Malaysian specimens, and we regard the type of *L. derivatum* v.A.v.R. as an extreme form of this (the secondary rachis-branches are sub-pinnate, with two alternate tertiary branches, the lower one itself carrying two lateral leaflets; spores unfortunately are young).

The type collection of *L. digitatum* Presl was made by Haenke in Luzon; we have not seen it. Presl later cited other specimens (Suppl. Tent.

Pterid. 100, 1845), including *Wallich* 176 ("Penang & Singapore") which is certainly *L. longifolium*, but he appears to have cited also specimens of *L. circinnatum*. He did not cite *Cuming All.*, which is labelled Luzon at Kew, but is one of the numbers of uncertain origin (see Rolfe in Kew Bull 1908, 119.).

The type specimen of *L. teysmannii* v.A.v.R. is at Utrecht. In its sterile leaflets it agrees with *L. longifolium* as regards the toothed edges. The branching is near that of the type of *L. derivatum*, but less complex. Unfortunately the spores are young and do not show distinctive surface features.

L. longifolium is not as robust in growth as *L. circinnatum*, nor so widely distributed. It occurs in Hainan and in Travancore, but apart from these places it is only known in Malaysia, chiefly in Western Malaysia. It surely must occur in the Burma-Siam-Indochina region, but we have seen no specimens, nor any from Java and south-eastern Malaysia. Specimens are as follows:

TRAVANCORE: *Johnston* (K; figured in *Beddome, Ferns S. India* t.62). HAINAN: *McClure* 20133 (K); *Tsang Wai-Tak* 346 (K); *Tsang & Fung* 672 (K). SUMATRA: Djambi, *Posthumus* 727 (L); Pulau Pisang, *Teysmann* 1597 (B), 2304 (BO,U, type of *L. teysmannii*). Bangka: *Bilnemeijer* 2411 (BO,L), 2248 (BO); *Huitema* 32 (BO); *Berkhout s.n.* 29.8.1886 (BO). Lingga Arch.: *Bünnemeijer* 6808 (BO, type of *L. derivatum*). Riouw Arch.: P. Papan, *Bünnemeijer* 6478 (L,BO), 7823 (L,BO); P. Bintan, *Bünnemeijer* 6132, 6138 (BO,L). MALAYA. Penang & Singapore, *Wallich* 176 (K); Singapore: *Kunstler* 259 (K); P. Ubin, *Molesworth Allen* 2046 (BM); Nee Soon Forest, *Molesworth Allen* 2551 (BM); Perak: *Scortechini* (BM); Temengoh, *Ridley* 14242 p.p. (K); Penang: *Delessert* (L); Kelantan: *Nur S. F.* 12124 (K); Pahang: Endau, *Evans s.n.* Aug. 1917 (K); Malacca: *Maingay* 1821 (L), 3196 (K); Johore: Kluang, *Holtum S.F.* 9363 (K). BORNEO. N. Borneo: *Burbidge* (BM,K); Sandakan, *Creagh* (K); Labuan, *Motley* 138 (K); Sarawak: Miri, *C. Hose*, May 1894 (BM); Lambir, *Wallace* 61 (BM); Kuching, *Miss Brooke* 8068 (BM,L); KALIMANTAN: Samarinda, *Rutten* 26, (BO); E. Borneo: *Rutten* 52, 426 (U). CELEBES: Toli², *Alston* 15620 (BM, a small and doubtful specimen). Not certainly localized: *Cuming* 417 (K, labelled Luzon, but this is uncertain).

LYGODIUM CIRCINNATUM (Burm.) Sw.

SYNONYMS: *Ophioglossum circinnatum* Burm. 1768.— *O. pedatum* Burm. 1768.— *Ugena dichotoma* Cav. 1801.— *U. macrostachya* Cav. 1801.— *Lygodium heterophyllum* Presl 1825.— *L. basilanicum* Christ 1907.

Burman published *O. pedatum* and *O. circinnatum* in the same book,¹ *L. pedatum* on the page preceding *L. circinnatum*. The identity of the two was recognized by Blume (1828), who gave preference to the name *circinnatum* (sometimes printed *circinatum*, but not so in the original). Both names were transferred to the genus *Lygodium* by Swartz. Recognizing page priority, Merrill used the name *L. pedatum* in preference to *L. circinnatum* (Philip. J. Sc. 19, 1921, 336).

In his commentary on type specimens of Cavanilles (Dansk Bot. Ark. 9, pt.3, 1937) Christensen stated that he had not seen the types of *Ugena dichotoma* and *U. macrostachya*. The excellent illustrations given by Cavanilles are however in our opinion sufficient evidence of the identity of these species with *L. circinnatum*. We have not seen the type of *L. heterophyllum* Pr.; it was reduced to *L. circinnatum* by Prantl in his monograph of 1881.

The species *L. longifolium* (Willd.) Sw. has often been confused with *L. circinnatum*; it was reduced to *L. circinnatum* by Prantl in his monograph of 1881. For a note on differences of the sterile leaflets and the spores, see above under *L. longifolium*. Another difference is to be found in the dormant apices of the primary rachis-branches. In *L. circinnatum* these are broad, and usually sunken in dried specimens (not in living plants), and the hairs on them are rather sparse, pale, and have no thickened bases. The dormant apex in *L. longifolium* is more prominent, and has many darker hairs which have swollen bases.

LYGODIUM MERRILLII Copel., April 1907.

SYNONYMS: *L. subaereolatum* Chr., June 1907. — *L. matthewii* Copel. 1908.

L. merrillii was described from fertile specimens from Mindoro, *L. mattheivii* from sterile specimens from Mt Maquiling, Luzon. Mr Alston saw at Paris the type of *L. subaereolatum* Chr. from Kwei-Chow, and in Herb. Christensen at the British Museum is a sketch and fragment of a specimen from Tonkin.

In Malaysia, the species has been collected several times in the Philippines, otherwise only near Kuching in Sarawak, and in southern Sumatra. The plants are large, and strikingly distinct from other species. They appear always to grow in forest, requiring more shade than most species of *Lygodium*, but no special ecological conditions have been reported. Malaysian specimens are:

PHILIPPINES. Mindoro: Mt Halcon, 300 m, Merrill 6057 (type of *L. merrillii*; not seen). Luzon: Mt Maquiling, *Matthew s.n.* 5.3.1907,

6.3.1907 (K), *Elmer* 17993 (K); *Ramos & Edano* B. S. 29035 (K); *Ramos* B. S. 23444 (BM,K,L) ; *Sulit* P.N.H. 2986 (L); *Mendoza* P.N.H. 17233 (BM,K,L); Laguna Prov., *Mabesa* F.B. 26122 (K). BORNEO. Sarawak: Matang, 2000 ft, *Matthew* s.n. 28.11.1912 (K). Sumatra: Lebong Tandai, Benkoelen, near stream in shady forest, *Brooks* 24S (BM).

LYGODIUM VERSTEEGII Chr. 1909.

SYNONYM: *L. moskowskii* Brause 1912.

Brause's species was described from fertile specimens, which do not show the reticulate venation so characteristic of the sterile leaflets; but the branching habit of *L. versteegii* is so distinctive that we have no doubt that Brause's species, showing this habit, should be united to it. The specimens we have seen are all from New Guinea. Copeland also recorded the species in Luzon (Philip. J. Sc. Bot. 6,68, and 11,41), a record copied by van Alderwerelt (Handb. Suppl. 499) and by Christensen (Ind. Suppl. II, 50), but we have not seen specimens. New Guinea specimens seen are as follows:

W. NEW GUINEA: Nord Rivier, *Versteeg* 1400 (P, type, BO); Door-roan R., 200 m, *Lam* 1386 (BO); Bernhard Camp, Idenburg R., 800 m, *Brass* 13411 (BM,L). N. E. NEW GUINEA: Ledermann 7075 (BM) ; Palmer R., ridge forest, 100 m, *Brass* 7138 (BM,L); Morobe Distr., *Sattelberg* 4240 ft, *Clemens* 6528 (BM).
