

CHAPTER 7

GENERAL CONCLUSION

The *Microsorium punctatum* (L.) Copel. complex (Polypodiaceae) is a common species which has a widespread distribution in various forest types of temperate and tropical parts of the Old World. It was found that the taxonomic status of this species is still dubious due to its great variations in frond-form, sizes, and venation patterns. Because of these this plant group was called as a species complex (Bosman, 1991; Nootboom, 1998). The finding of additional new species in this plant group (Smith & Hoshizaki, 2000; Boonkerd and Nootboom 2001; Boonkerd, 2006) made doubtful taxonomic relationships among these species. In this research, *M. punctatum* (L.) Copel. complex is represented by 21 taxa according to Nootboom (1997), Boonkerd and Nootboom (2001), and Boonkerd (2006). To solve this problem morphological, anatomical, molecular studies as well as morphometric analyses were carried out.

It is evident that eight species, namely *M. glossophyllum*, *M. siamense*, *M. thailandicum*, *M. membranaceum*, *M. musifolium*, *M. punctatum*, *M. steerei*, and *M. whiteheadii* are members of the *M. punctatum* (L.) Copel. complex based on the morphological and anatomical studies. The following characters, i.e. frond color, stipe, venation pattern, rhizome scale and habitat are taxonomically useful to distinguish these taxa.

Two techniques of numerical taxonomy were used to investigate the variation of morphological and anatomical characters of taxa in the *M. punctatum* complex based on both qualitative and quantitative characters. The results suggested that *M. membranaceum*, *M. siamense*, and *M. thailandicum* are distinct taxa. Likewise, *M. musifolium* and *M. glossophyllum*, which were previously treated as synonyms of *M. punctatum* (L.) Copel. by Nootboom (1997), are additional two distinct species based on the results of morphometric analyses. In contrast, it was found that *M. whiteheadii* and *M. steerei* are rather close and should not recognize as distinct species. These findings corresponds to the results obtained from morphological studies that *M. whiteheadii* and *M. steerei* are similar, but differ in some features, such as character of general venation pattern, scale arrangement, density of roots on rhizomes, and rhizome characters.

Geographically speaking, *M. steerei* and *M. whiteheadii* are separated (Bosman, 1991; Nooteboom, 1997; Smith & Hoshizaki, 2000), but should be treated as conspecific taxa. Because of this finding, it seems appropriate to treat these taxa as infraspecific taxa of *M. steerei* viz. *M. steerei* var. *steerei* and *M. steerei* var. *whiteheadii*.

In addition, the six most important characters that have separated the eight species are stipe length, number of sori rows between adjacent secondary veins, sori diameter, sori density, primary-areole width, and spore width. According to the results from numerical study two new combinations are given here.

M. steerei (Harr.) Ching

M. steerei (Harr.) Ching, *Bull. Fan Mem. Inst. Biol.* 4: 306. 1933. -- *Polypodium steerei* Harr., *J. Linn. Soc., Bot.* 16. (1877) 32. – **Type:** *Steere s.n.* (lecto, proposed by Price (1982) 202; holo MICH; iso K!), -10-1873, Taiwan, Ape's Hill, Takow

a. var. **steerei**

M. steerei (Harr.) Ching, *Bull. Fan Mem. Inst. Biol.* 4: 306. 1933. – *Polypodium steerei* Harr., *J. Linn. Soc., Bot.* 16. (1877) 32. – **Type:** *Steere s.n.* (lecto, proposed by Price (1982) 202; holo MICH; iso K!), -10-1873, Taiwan, Ape's Hill, Takow

Polypodium tokinensis Baker, *J. Bot.* 28 (1890) 266. – **Type:** *Balansa 148* (holo K!; iso P!), Tonkin, Takeuin, ner Quang Yen.

Polypodium playfairii Baker, *Ann. Bot. (Oxford)* 5. (1891) 474. – **Type:** *Playfair 383*, (holo K!), Taiwan, Ape's Hill.

b. var. **whiteheadii** (A.R. Sm. & Hoshiz.) S. Petchsri, *comb. & stat. nov.*

Microsurum whiteheadii A.R. Sm. & Hoshiz., *Novon* 10(4) (2000) 411. – **Type:** *Reggie Whitehead s.n.* (holo UC; iso BO, L!, MO, US), 2-6-1997, Sumatra, Weastern Sumatra, Prov. Paya Khambu, Koto District, 30 Km from Bukit Tinggi, 900 m.

Finally, it is also found that the other synonyms and infraspecific taxa within *M. punctatum* (Table 2.1) should be placed in *M. punctatum*, so this species is still a very variable species.

The RAPD technique was used to detect the genetic diversity of taxa in the *M. punctatum* complex. The result from this study pointed out in the same direction and in agreement with both general morphological, anatomical studies and morphometric analyses. It was also found that the two varieties of *Microsorium punctatum*, i.e. *M. punctatum* var. *serratum* and *M. punctatum* var. *grandiceps* are still recognized.

In conclusion, based on the overall results from this study the *M. punctatum* (L.) Copel. complex comprise of eight taxa namely *M. glossophyllum* (Copel.) Copel., *M. siamense* Boonkerd, *M. thailandicum* Boonkerd & Noot., *M. membranaceum* (D. Don) Ching, *M. musifolium* (Blume) Copel., *M. punctatum* (L.) Copel., *M. steerei* (Harr.) Ching var. *steerei*, and *M. steerei* (Harr.) Ching var. *whiteheadii* (A.R. Sm. & Hoshiz.) S. Petchsri. In all, *Microsorium punctatum* is still a very variable species.

According to the great variations in many characters viz. frond form, size, and venation patterns, distribution of sori on lamina and geographical distribution; it is reasonable to tentatively classify the variations of the complex in to 8 taxa. The following is a simplified key to identify taxa and its description in the *M. punctatum* (L.) Copel. complex based on the output obtained from DELTA (Dallwitz et al., 1993).

Key to taxa

- 1a. Living fronds iridescent blue-green 2
- 1b. Living fronds light to dark green 3
- 2a. Midrib slightly raised on both surfaces; rhizome scales peltate; frond elliptic, base narrowly angustate; hydathodes distinct **1. *M. siamense***
- 2b. Midrib grooved on the upper surface; rhizome scales pseudopeltate; frond narrowly elliptic to linear, base attenuate; hydathodes indistinct **2. *M. thailandicum***
- 3a. Scale margins entire, clathrate with hyaline margins; rhizome not white waxy 4
- 3b. Scale margins denticulate or dentate, clathrate throughout or opaque; rhizome often waxy, at least sometimes waxy under the scales 5

- 4a. Stipe present, up to 10 cm long; lamina membranaceous, base narrowly angustate; scales distinctly or slightly spreading, pseudopeltate, central region with long hair; sori forming into 2-4 irregular rows **3. *M. membranaceum***
- 4b. Stipe absent or indistinct; lamina firm-herbaceous or subcoriaceous, base truncate to obtuse; scales appressed, peltate, central region glabrous; sori forming more than 4 irregular rows **7. *M. musifolium***
- 5a. Lamina usually shorter than 40 cm long, with only short glandular hairs 6
- 5b. Lamina up to 100 cm long, with only scales, or with a few scales and short glandular hairs 7
- 6a. Rhizome white waxy, phyllopodia obscure; stipe distinct, less than 2 mm diam., lamina base narrowly angustate **6. *M. steerei* var. *steerei***
- 6b. rhizome not white waxy, phyllopodia distinct; stipe absent or obscure, up to 5 mm diam., lamina base attenuate **5. *M. steerei* var. *whiteheadii***
- 7a. Scales opaque and blackish, more than two cell layers thick; stipe less than 2 cm long; lamina with only scales; all veins distinct; sorus present in costal areoles
..... **4. *M. glossophyllum***
- 7b. Scales translucent and brownish, one cell layer thick; stipe up to 12 cm long; lamina with a few scales and short glandular hairs; all veins more or less immersed and vague (at least in living specimen); sorus absent in costal areoles **8. *M. punctatum***

1. *Microsorium siamense* Boonkerd Blumea 51 (2006) 143. **Type:** Yala, Thailand, *P.V. Fern 1* (holotype, L; isotype, BCU)

Rhizome creeping, 3.3–4.1 mm diam., approximately cylindrical, not white waxy, bundle sheaths not differentiated, vascular bundles in cylinder 9–10, sclerenchyma strands 60–240, roots densely set; scales peltate, densely set, widest near the base, slightly spreading, ovate to triangular, up to 1.3 by 3.1 mm, margin denticulate, apex acuminate to slightly caudate, clathrate throughout, dark black on central region. *Phyllopodia* more or less distinct, 2.8–3.9 mm apart; stipe present, 35.3–44.3 mm long, 2.4–2.6 mm diam., raised on lower surface, slightly raised on upper surface. *Fronde*s monomorphic, subcoriaceous, iridescent blue-green in color when living; lamina elliptic, up to 13.6 by 4.2 cm, index 3.1–3.8, widest about or above the middle of leaf length, base narrowly angustate, the stipe more or less winged, margin entire undulate, apex acute to long acuminate, with short glandular hairs, scales and acicular hairs absent. *Venation pattern:*

connecting veins forming a row of about equally sized areoles between two adjacent vein and no prominent veinlet situated parallel to the veins, all veins or secondary and smaller veins more or less immersed and vague, free veinlet simple and once- forked, angle between primary and secondary vein 28–32 -degree. *Sori* mostly irregularly scattered on simple free or on 2 or 3 connective veins; round, superficial, usually occupying the upper (apical) half portion of the lamina, 10–13 cm², 1.3–1.4 mm diam., absent in the marginal areoles, occasionally present in costal areoles; paraphyses present, sporangium annulus 20–22 -celled; indurated cells 11–14. *Spores* concavo-convex, yellow, 32.5–35 by 50–52.5 μm.

Distribution. — Endemic, Thailand (Yala).

Ecology. — In rock crevices on moist rock of limestone hill in semi-shade, 100 m altitude.

Specimens examined. — Thailand: P.V. fern 1 (BCU, L); S.P. 20, 26, 39, 60, 62 (BCU).

2. *Microsorium thailandicum* Boon. & Noot. Blumea 46 (2001) 581. **Type:** Chumphon, Thailand, *T. Boonkerd 1442* (holotype, L; isotype, BCU).

Rhizome 4.9–5.2 mm diam., approximately cylindrical, not white waxy; bundle sheaths not differentiated, vascular bundles in cylinder 8–12, sclerenchyma strands 40–245, roots densely set. Scales pseudopeltate, sometimes some peltate, densely set, widest near the base, slightly spreading, ovate, or triangular, 2.6–3.3 mm long, 1–1.2 mm wide, margin denticulate, apex acuminate to slightly caudate, clathrate throughout, dark black on central region. *Phyllopodia* more or less distinct, 3–3.9 mm apart; stipe present, 10.8–13.2 mm long, 2.7–3.2 mm diam., raised on lower surface, grooved on upper surface. *Fronde*s monomorphous, subcoriaceous, iridescent blue-green in color when living; lamina narrowly elliptic, 21.3–39.6 cm long, 1.2–1.9 cm wide, index 12.8–25.2, the widest indistinct, base attenuate, the stipe more or less winged, margin entire, apex long acuminate, with short glandular hairs, scales and acicular hairs absent. *Venation pattern:* the first connecting vein forming one row of small primary costal areoles parallel to the costa, other larger areoles in a row between two veins like in type 1, all veins or secondary and smaller veins more or less immersed and vague (at least in living specimen), free veinlet simple or once- or twice- forked, angle between primary and secondary vein 47–52 -degree. *Sori* mostly irregularly scattered on simple free or on 2 or

3 connective veins; round or slightly elongate, slightly immersed, usually occupying the upper (apical) half portion of the lamina, 15–23 cm², 1.2–1.4 mm diam., absent in the marginal areoles, occasionally present in costal areoles; paraphyses present; sporangium annulus 20–31-celled; indurated cells 15–20. *Spores* concavo-convex, yellowish hyaline, 27.5–37.5 by 42.5–47.5 µm.

Distribution. — Endemic, Thailand (Chumphon).

Ecology. — In rock crevices on rather dry rock-ceiling of limestone hill in semi-shade, 250–300 m altitude. Its blue leaf iridescence is still retained when was introduced to a home garden where it is not really in deep shade as was in natural habit.

Specimens examined. — Thailand: Boonkerd 1442 (BCU, L); S.P. 2, 6, 49, 64, 71, 88, 120, 121 (BCU).

3. *Microsorium membranaceum* (D. Don) Ching Bull. Fan Mem. Inst. Biol. 4 (1933) 309; — *Polypodium membranaceum* D. Don, Prodr. Fl. Nepal. (1825) 2. — [*Colysis membranacea* J. Sm., Cult. Ferns (1857) 11 nom. Illeg.] — **Type:** *Wallich* (K!, iso B!), Nepal.

Polypodium hymenodes Kunze, Linnaea 23 (1850) 279/319. — **Type:** *Kunze* s.n. (B!), cult. Leipzig.

Polypodium membranaceum var. *grandifolium* Aldrew., Malayan Ferns (1909) 649. — **Type:** *Wallich* 282 (holotype K!; isotype, BM!), Nepal.

Rhizome 2.3–9.8 mm diam., approximately cylindrical or dorso-ventrally flattened; not white waxy; bundle sheaths not differentiated, vascular bundles in cylinder 15–20; sclerenchyma strands 54–97, roots densely set; *scales* pseudopeltate, apically densely set, otherwise more or less sparsely set, slightly spreading, ovate, or triangular, up to 8 by 2.5 mm, margin entire, apex acute, clathrate except the hyaline marginal region, central region bearing multiseptate hairs at least when young. *Phyllopodia* more or less distinct, 0.8–5.3 mm apart; stipe present, 0.6–4.4 mm long, 2.6–7.2 mm diam., raised on lower surface, slightly raised on upper surface. *Fronde*s monomorphic or slightly dimorphic; membranaceous, light to dark green in color; lamina narrowly elliptic to narrowly ovate; 18.9–94.9 by 1.4–13.8 cm, index 4–13.6, widest below or about the middle of leaf length; base narrowly angustate, the stipe winged for considerable part, margin entire, apex acuminate, with short glandular hairs, scales and acicular hairs absent. *Venation pattern:* connecting veins forming a row of about equally sized areoles between two adjacent vein

and no prominent veinlet situated parallel to the veins, or the first connecting vein forming one row of small primary costal areoles parallel to the costa, other larger areoles in a row between two veins like in type 1; all veins distinct, free veinlet simple or once to twice-forked, angle between primary and secondary vein 13–31°-degree. *Sori* forming into 2–4 irregular rows parallel to each pair of secondary veins, round or slightly elongate; superficial or slightly immersed on the whole surface of the lamina, or usually occupying the upper (apical) half portion of the lamina, 5–22 cm², 1.1–3.2 mm diam., absent in the marginal areoles, generally present in costal areoles; paraphyses absent; sporangium annulus 16–23-celled; indurated cells 10–13. *Spores* concavo-convex, yellow, 27.5–47.5 by 47.5–82.5 µm.

Distribution. — Nepal; Sikkim; Bhutan; India; Srilanka; Burma; S China; Taiwan; N Thailand; N Laos; N Vietnam; Philippine.

Ecology. — Epiphyte, epilithic, or terrestrial in evergreen or deciduous forest, 600–2,600 or up to 4,000 m altitude.

Specimens examined. — Burma: Lace 4894 (K); Topping 4200 (K) — Ceylon: Abeyesiri 55 (K); Beddome 339 (K); Gardner 1298 (K); Hooker 1145 (K), 1298 (K); Skinner 4828 (K); Sledge 543 (K), 832 (K); Walker 25 (K), 1834 (K) — Himalaya: Barnerji et al. 1313 (K), 2604 (K), 26957 (K); Henry 339 (K); Jalconer 68 (K); Konar 56 (K); Stachey & Winterbottom 1 (K); Stewart 21169 (K); Treutler 661 (K); Trotter 246 (K), 730 (K); Watt 101087 (K) — India: Jati 10 (K); Beddome 67 (K), 101 (K), 159 (K), 177 (K); Clarke 21388 (K), 27186 (K), 33720 (K); Gamble 14409 (K), 14870 (K); Haines 5379 (K); Jacquemont 11600 (K); Madhusoodanan CU29683 (K); Manickam 31442 (K); Mooney 128 (K); Nair 51452 (K); Narasimtan 165111 (K); Ramamoorthy 256 (K); Saldanha 421 (K), 641 (K), 717 (K), 820 (K), 14457 (K), 14800 (K), 15068 (K), 17959 (K) — Indo-China: Matthew 1967 (K) — Nepal: Bliss 41 (K), 51 (K), 189 (K); Gamble 1925 (K), 4847 (K); J.J. 6061 (K); Keke 902 (K); Khasya 1867 (K); Khwaunju 1259 (K); Maddine 1867 (K), Mense 343 (K) — Philippines: Elmer 5873 (K), 8367 (K); Merrill 11691 (K) — Sikkim: Balkar 339 (K), Gamble 884 (K), 4000 (K), 6366 (K), 6367 (K), 9699 (K); Sinchal 339 (K); Treutler 661 (K) — Thailand: Garrett 59 (K), H.B.G. Garrett 59b (K), 591 (K); Larsen et al. 2314 (K); Iwatsuki 9600 (K), 15642 (K); Shimizu 10102 (K); Smith 1187 (K) — Vietnam: Balansa 1990 (K).

4. *Microsorium glossophyllum* (Copel.) Copel. Gen. Fil. (1947) 196. — **Type:** *King 388*, (BM, P), Papua New Guinea, Mt Gewagewa. — *Pleopeltis megalosoroides* Aldrew., Nova Guinea 14 (1924) 39. — **Type:** *Lam 1365* (holotype, L; isotype, B), Papua New Guinea, near Doorman River.

Rhizome 4.1–11.7 mm diam., approximately cylindrical, often waxy, at least sometimes waxy under the scales; bundle sheaths collenchymatous, vascular bundles in cylinder 10–20, sclerenchyma strands 53–94, roots very densely set (forming a thick mat); *scales* pseudopeltate, densely set, widest near the base, slightly spreading, ovate, 2.3–5.9 mm long, 0.8–1.7 mm wide, margin denticulate, apex acuminate, opaque, central region glabrous. *Phyllopodia* more or less distinct, 2.6–10.2(–25.8) mm apart; stipe present, 1.1–14.6 mm long, 2.1–7.9 mm diam., raised on lower surface, slightly raised on upper surface. *Fronde* monomorphic, firm-herbaceous; *lamina* narrowly obovate to broad oblanceolate, 49.3–146.2 cm long, 3.2–14.8 cm wide, index 6.8–16.9, widest about or above the middle of leaf length, base narrowly cuneate, the stipe winged for considerable part, margin entire, apex acute to acuminate, with a few scales, short glandular hairs and acicular hairs absent. *Venation pattern*: connecting veins forming a row of about equally sized areoles between two adjacent vein and no prominent veinlet situated parallel to the veins, all veins distinct, free veinlet simple and once-forked, angle between primary and secondary vein 21–42°-degree. *Sori* mostly irregularly scattered on simple free or forming irregular rows parallel to each pair of secondary veins; round, superficial, absent from the basal parts for 1/5–4/5 of total length of lamina; 10–30 cm², 1.2–2.8 mm diam., absent in the marginal areoles, occasionally present in costal areoles; paraphyses absent; sporangium annulus 18–23-celled; indurated cells 13–16. *Spores* plano-convex to concavo-convex, hyaline, 25–42.5 by 45–70 µm.

Distribution. — Papua New Guinea (Type); Irian Jaya; Solomon Is.

Ecology. — Epiphyte (low) or terrestrial, rarely epilithic on limestone, volcanic rocks, brown loam and clay. Often nest-forming, 80–2,800 m altitude.

Specimens examined. — *Microsorium glossophyllum* (Copel.) Copel. — Irian Jaya: Johns 7995 (K); Leeuwenberg 9853 (K); McDonald 3829 (K); Widjaja 4293 (K) — Papua New: Blackwood 188 (K); Braithwaite 4721 (K), 4866 (K, P); Brass 11319 (K), 23055 (K), 24483 (K), 29549 (K), 29786 (K), 30498 (K), 31569 (K), 32403 (K); Bulmer 103837 (K); Carr 7660 (B), 13015 (B), 13340 (K); Clemens 7133 (B); Conn & Kairo 152 (K); C. King 388 (P, **type**); Croft 151 (K), 203 (L), 451 (L), 533 (L), 568 (K), 1728

(K), 65719 (L); Leland et al. 65641 (L); Edelfelt 220 (P); Flenley 2084 (K); Vinas 5974 (K), 60249 (K); Gay 1086 (K); Hoogland et al. 6877 (K); van Mettenius 276 (B); Nakaike 408 (K); Parris 7751 (K), 9251 (K), 9479 (K); Sand 1780 (K); Veldkamp & Stevens 5911 (K), 6793 (L); Verdcourt 5113 (K); Vink 16534 (L), 17568 (L); Wakefield 1437 (K); Walker 548 (K); Whitmore 1045 (K); Womersley 6820 (K), 11092 (K).

Pleopeltis megalosoides Alderw. — Papua New: Lam 1365 (L. **type**).

5. *Microsorium steerei* var. *whiteheadii* (A.R. Sm. & Hoshiz.) S. Petchsri, *comb. & stat. nov*

***Microsorium whiteheadii* A.R. Sm. & Hoshiz.** Novon 10 (2000) 411. — **Type:** *Whitehead* s.n. (isotype, L), Sumatra, near Paya Khumbu.

Rhizome 5.2–6 mm diam., approximately cylindrical or dorso-ventrally slightly flattened; not white waxy; bundle sheaths not differentiated, vascular bundles in cylinder 50–80; sclerenchyma strands 98–113, roots very densely set (forming a thick mat); *scales* pseudopeltate, moderately densely set, brown; slightly spreading, ovate; 3.1–5 mm long, 1.5–3.2 mm wide, margin erose-denticulate to dentate, apex attenuate, clathrate throughout, central region glabrous, or central region bearing multiseptate hairs at least when young. Phyllopodia obscure, 4.2–5.2 mm apart; stipe absent or indistinct, 0.2–1 mm long, 5.4–6.2 mm diam., not or slightly raised on both surfaces. *Fronde* monomorphous, coriaceous, light to dark green in color; lamina broad to narrowly oblanceolate; 27.6–35.5 cm long, 5.5–7.9 cm wide, index 3.1–5.8, widest about or above the middle of leaf length, base attenuate, the stipe more or less winged; margin entire, apex round to acute, or acuminate, with short glandular hairs, scales and acicular hairs absent. *Venation pattern*: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other larger areoles in a row between two veins like in type 1; all veins or secondary and smaller veins more or less immersed and vague (at least in living specimen); free veinlet simple and once-forked, angle between primary and secondary vein 38–45-degree. *Sori* mostly irregularly scattered on simple free on the whole surface of the lamina or forming irregular rows parallel to each pair of secondary veins; round, superficial, 14–19 cm², 1.2–1.8 mm diam., absent in the marginal areoles, generally absent in costal areoles; paraphyses present; sporangium annulus 19–28-celled; indurated cells 18–20. *Spores* concavo-convex, yellow, 27.5–37.5 by 42.5–47.5 µm.

Distribution. — Western Sumatra (type).

Ecology. — Growing on limestone outcrops, 900 m altitude.

Specimens examined. — Sumatra: Whitehead s.n. (L, **type**), Kampu 1, 2, 3, 4, 5 (BCU).

6. *Microsorium steerei* var. *steerei* (Harr.) Ching Bull. Fan Mem. Inst. Biol. 4 (1933) 306; — **Type:** *Steere* s.n., (K; isotype, P), Taiwan, Ape's Hill, Takow.

Polypodium tonkinense Baker, J. Bot. 28 (1890) 266. — **Type:** *Balansa* 107, 148 (K; isotype, P), Tonkin, near Quan Yen.

Polypodium playfairii Baker, Ann. (London) 5 (1891) 474. — **Type:** *Playfair* 383 (K), Taiwan, Ape's Hill.

Rhizome 2.5–7.1 mm diam., approximately cylindrical, often waxy, at least sometimes waxy under the scales; bundle sheaths not differentiated, vascular bundles in cylinder 10–15; sclerenchyma strands 50–100, roots densely set; *scales* pseudopeltate, apically densely set, otherwise more or less sparsely set; distinctly spreading, ovate, or triangular; 2.1–5.9(–23.7) mm long, 0.7–1.4 mm wide, margin denticulate, apex acuminate, clathrate throughout, central region glabrous. Phyllopodia distinct, 1.7–7.9 mm apart; stipe present, 0.6–22.6 mm long, 0.5–2.7 mm diam., sharply raised on upper and lower surface. *Fronde*s monomorphic or slightly dimorphic, subcoriaceous, light to dark green in color; lamina narrowly elliptic to narrowly obovate to linear; 16.2–56.1 cm long, 1.9–6.5 cm wide, index 4–19.4, widest about or above the middle of leaf length or indistinct, base narrowly angustate, the stipe winged for considerable part, margin entire, apex acuminate, with short glandular hairs, scales and acicular hairs absent. *Venation pattern:* connecting veins forming a row of about equally sized areoles between two adjacent vein and no prominent veinlet situated parallel to the veins, all veins or secondary and smaller veins more or less immersed and vague (at least in living specimen), free veinlet simple or once- or twice- forked, angle between primary and secondary vein 34–61 -degree. *Sori* mostly irregularly scattered on simple free or forming irregular rows parallel to each pair of secondary veins; round, superficial or slightly immersed, on the whole surface of the lamina or usually occupying the upper (apical) half portion of the lamina, 10–60 cm², 1.1–1.6 mm diam., absent in the marginal and costal areoles; paraphyses absent; sporangium annulus 18–24 -celled; indurated cells 10–17. *Spores* concavo-convex, hyaline, 27.5–40 by 42.5–55 µm.

Distribution. — Taiwan; China; Vietnam.

Ecology. — By slope, under wood on limestone, 100–200 m altitude.

Specimens examined. — *M. steerei* (Harr.) Ching — China: Christensen 1339 (BM), 3418 (BM); Henry 1895 (K), 1951 (K); Kew H1905/85 (K); Suruhoe 82 (K) — Formosa: B20 0091734 (B) — Hanoi, Vietnam: d' Alleizette herb s.n. (P) — Kew, England: Edward 38 (K), 2411 (K); Kew A.D. 19 (K) — Philippines: Loher 867 (K); Vidal 4041 (K) — Tokin, Vietnam: Balansa 45 (P), 70 (P); Bon 1274 (P), Cadière 30 (P), 99 (P); Christ 1940 (P); Giesenhagen 1910 (P); Pételot (Colani) 1339 (P), 1789 (BM), 4871 (P), 4911 (P) — Taiwan: Balansa 198 (K), J.B. Steere (s.n.) (P, **type**).

P. tokinense Baker — Tokin, Vietnam: Balansa 107 (P, **type**), 148 (P, **type**).

P. playfairii Baker — Taiwan: Playfair 383 (K, **type**).

7. *Microsorium musifolium* Copel. Univ. Calif. Publ. Bot. 16 (1929) 112; *Polypodium musifolium* Blume, Enum. Pl. Javae (1828) 134. *Pleopeltis musifolium* T. Moore, Index Filic. (1857) lxxviii. *Drynaria musifolia* J. Sm., Cult. Ferns (1857) 14. — **Type:** Blume (s.n.), (holotype, L!), Java, near Buitenzorg.

Rhizome 3.8–10.8 mm diam., approximately cylindrical or dorso-ventrally slightly flattened, not white waxy; bundle sheaths collenchymatous, vascular bundles in cylinder 19–20, sclerenchyma strands 45–87, roots very densely set (forming a thick mat); *scales* peltate, apically densely set, otherwise more or less sparsely set, appressed, ovate, 2.1–4.5 mm long, 1–2.1 mm wide, margin entire, apex acuminate, with hyaline marginal region, central region glabrous. Phyllopodia distinct; 2.4–8.8 mm apart; stipe absent or indistinct, 0.8–12.7 mm long, 2.8–9.1 mm diam., raised on lower surface, slightly raised on upper surface. *Fronde*s monomorphic, (firm-)herbaceous, light to dark green in color; lamina narrowly obovate to broad oblanceolate, 43.4–138.1 cm long, 5.3–13.6 cm wide, index 5.9–16.4, widest about or above the middle of leaf length, base truncate to obtuse, the stipe more or less winged, margin entire, apex acute to acuminate, with a few scales and short glandular hairs, acicular hairs absent. *Venation pattern:* connecting veins forming a row of about equally sized areoles between two adjacent vein and no prominent veinlet situated parallel to the veins, all veins distinct, free veinlet simple and once-forked, angle between primary and secondary vein 21–44-degree. *Sori* mostly irregularly scattered on simple free on the whole surface of the lamina or usually occupying the upper (apical) half portion of the lamina, or forming irregular rows parallel to each pair of secondary veins; round, superficial, 15–62 cm², 1.1–1.8 mm diam., absent in the marginal areoles,

occasionally present in costal areoles; paraphyses absent; sporangium annulus 17–20-celled; indurated cells 13–15. *Spores* concavo-convex, hyaline, 27.5–42.5 by 37.5–57.5 μm .

Distribution. — Southern Burma; Peninsular Malaysia; Singapore; Sumatra; Java; Borneo; Philippines: Luzon, Catanduanes and Mindanao; Papua New Guinea.

Ecology. — Primary rain forest, in stream beds or near streams. Low epiphyte or epilithic, 100–900 m altitude. Often cultivated in botanical gardens.

Specimens examined. — Borneo: Elmer 20871 (P); Enders 4022 (L); Hose 1827 (K), 1894 (K); Inder 4022 (K); Iwatsuki et al. 3252 (K); Jaman 4036 (K); Kato et. al B3252 (L) — Java: Bernardi 234 (B); Blume s.n. (L, **type**); Zollinger 3005 (P) — Malay Peninsula: Henderson 19708 (BM) — Malaysia: Beddome 1911 (K); Henderson 19704 (K); King 192 (K); Littke 469 (L); Matthew 1928 (K); Yapp 575 (K); Turneau 836, 905 (K); Unesco Limestone Exp. 635 (K) — Papua New: Lauterbach 567 (P); Ledermann 7695 (B), 8549 (B), 8743 (B); Schlechter 2764 (B) — Philippines: Copeland 1537 (B); EBL 1537 (P); Elmer 10500 (K, L); Vanoverberg 3678 (P) — Sarawak: Elmer 20871 (K); Gay 132 (K); Hancock 342 (K); Hose 1827 (BM); J. Smith 1859 (BM) — Singapore: Corner 30247 (K); Haniff 21028 (K) — Sumatra: Brooks 357 (BM); Hancock 1892 (K); Lau 1796 (K); de Wide & de Wide 12385 (L).

8. *Microsorium punctatum* (L.) Copel. Univ. Calif. Publ. Bot. 16 (1929) 111; — *Acrostichum punctatum* L., Sp. Pl. ed. 2 (1763) 1524. — *Polypodium punctatum* Sw., J. Bot. (Schrader) 1800 (1801) 21, non Thunb. (1784). — *Phymatodes lingalata* C. Presl, Tent. Pterid. (1836) 198. — *Pleopeltis punctata* Bedd., Suppl. Ferns S. India (1876) 22. — **Type:** *Fothergill* s.n. (n.v., not found in LINN), China.

Polypodium polycarpon Sw., J. Bot. (Schrader) 1800 (1801) 21, non. Illeg., non Cavanilles. — **Type:** *Thunberg* s.n. (n.v.), Java.

Polypodium polycarpon Cav., Descr. Pl. (1801) 246. *Niphobolus polycarpus* Spr., Syst. Veg. 4 (1827) 45. — *Phymatodes polycarpa* C. Presl, Tent. Pterid. (1836) 198, t. 8 f. 19. — *Pleopeltis polycarpa* T. Moore, Index Filic. (1857) lxxviii. — *Microsorium polycarpon* Tardieu, Fl. Madag. Fam 5 (1960) 114. — **Type:** *Née* s.n. (n.v.).

Polypodium irioides Poiret., Encycl. 5 (1804) 513. — *Phymatodes irioides* C. Presl, Tent. Pterid. (1836) 196. — *Microsorium irioides* Fée, Mém. Foug. 5. Gen. Filic. (1852)

268, t. 20B. — *Pleopeltis iriodes* T. Moore, Index Filic. (1857) Ixxviii. — **Type:** *Beddome 48/341* (isotype, K; photo B, BM), India, *Commerson* (holotype, P), Mauritius.

Polypodium ambiguum Blume, Enum. Pl. Javae add. (1828) 125 — **Type:** *Reinwardt* (L).

Polypodium glabrum Wall. ex Roxb., Calc. J. Nat. Hist. 4 (1844) 482, non Burman (1768). — **Type:** *Wallich 281* (isotype, BM, K), India, near Calcutta, *J. Smith* (K), India.

Phymatodes sessilis C. Presl, Tent. Pterid. (1863) 198. — *Polypodium sessile* Kaulf. ex Kunze, Bot. Zeit. (Berlin) 6 (1848) 116. — *Microsorium sessile* Fée, Mém. Foug. 5. Gen. Filic. (1852) 268. — *Pleopeltis sessilis* T. Moore, Index Filic. (1857) Ixxvii. — **Type:** *Sieber 31* (B, BM, K) Mauritius.

Polypodium millisorum Baker, J. Linn. Soc. Bot. 15 (1877) 109. — *Pleopeltis millisora* Alderw., Bull. Dép. Agric. Indes Néerl. 27 (1909) 8. — **Type:** *Moseley 3412* (BM, K), Little Kai Is.

Polypodium validum Copel. In Perkins, Fragm. Fl. Philipp. 3 (1905) 191. — *Microsorium validum* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 295. — **Type:** *Copeland 973* (n.v.), Philippine, Mindanao, Davao.

Polypodium punctatum ssp. *subdrynariaceum* H. Christ, Bull. Herb. Boissier 2 (1906) 994. — *Polypodium punctatum* var. *subdrynariaceum* Alderw., Malayan Ferns (1909) 654. — **Type:** *Ridley 8935* (holotype P), Sreangoon, near Singapore.

Polypodium punctatum ssp. *subirideum* H. Christ, Bull. Herb. Boissier 2 (1906) 994. — *Polypodium punctatum* var. *subirideum* Alderw., Malayan Ferns (1909) 654. — *Microsorium subirideum* Copel., Gen. Fil. (1947) 197. — **Type:** *Elmer 5884* (holo K, iso P), Philippine, Castilla, Baguio, Benguet, *Endert 1506* (L), Java.

Polypodium antrophyoides Alderw., Bull. Dép. Agric. Indes Néerl. 18 (1908) 22. — **Type:** *Forbes 3119* (BM), Sumatra, Palembang.

Polypodium neoguineense Copel., Philipp. J. Sci. 6, Bot. (1911) 89. — *Pleopeltis neoguineensis* Alderw., Malayan Ferns Suppl. 1 (1917) 390. — *Microsorium neoquineense* Copel., Gen. Fil. (1947) 196. — **Type:** *King 335, Thomas 11536* (lectotype, K; photo BM), Papua New Guinea, Lakekamu.

Rhizome 2.2–11.1 mm diam., approximately cylindrical, often waxy, at least sometimes waxy under the scales; bundle sheaths not differentiated, vascular bundles in cylinder 15–20, sclerenchyma strands 50–100, roots very densely set (forming a thick mat); *scales* pseudopeltate, sometimes peltate, apically densely set or otherwise more or

less sparsely set, slightly spreading, narrowly ovate to ovate or triangular, 1.5–5.6 mm long, 0.7–2.6 mm wide, margin dentate to denticulate, apex acuminate, clathrate throughout to subclathrate, central region glabrous. Phyllopodia more or less distinct, 1.6–13.7 mm apart. *Fronde*s monomorphic or slightly dimorphic, firm-herbaceous to subcoriaceous or coriaceous, light to dark green in color; lamina narrowly elliptic to narrowly ovate to narrowly obovate to broad to narrowly oblanceolate to linear; 27.9–171.9 cm long, 2.6–19.2 cm wide, index 5.6–28.8, widest about or above the middle of leaf length, base cordate to narrowly angustate, the stipe winged for considerable part, margin entire, or entire undulate, or sinuate (in cultivar variety), apex rotundate to acuminate, with a few scales and short glandular hairs, acicular hairs absent; stipe present, 0.7–9.9 mm long, 2.5–7.9 mm diam., sharply raised on upper and lower surface. *Venation pattern*: connecting veins forming a row of about equally sized areoles between two adjacent vein and no prominent veinlet situated parallel to the veins, or the first connecting vein forming one row of small primary costal areoles parallel to the costa, other larger areoles in a row between two veins like in type 1; all veins or secondary and smaller veins more or less immersed and vague (at least in living specimen), free veinlet simple and once-forked, angle between primary and secondary vein 20–56°-degree. *Sori* mostly irregularly scattered on simple free veins on the whole surface of the lamina, or forming irregular rows parallel to each pair of secondary veins, round, superficial, 14–74 cm², 0.9–2.3 mm diam., absent in the marginal areoles, generally absent in costal areoles; paraphyses absent; sporangium annulus 10–26-celled; indurated cells (10–)12–18(–20). *Spores* plano-convex, hyaline, or yellowish hyaline, 22.5–37.5 by 40–65 µm.

Distribution. — Paleotropics and subtropics.

Ecology. — Epiphyte, but also epilithic or terrestrial in various types of forest, sometimes in savannah but also in wet places in streambeds, up to 2,800 m altitude.

Specimens examined. — *M. punctatum* (L.) Copel. — Annobon Is.: Skinn 283 (K) — Australia: Melville et al. 3669 (K); Wall 11232 (K) — Cameroon: Fris et al 7120 (K); Hepper 8682 (K); Mildbraed 4426 (B); Preuss 2 (B), 309 (B); Sermolli 5232 (K), 7219 (K), 7244 (K) — Congo: Anton Cupffert 337 (K); Leonard 1618 (K) — China: Esquirol 3601 (P); Rosenstock 99678 (B); Ying 1657 (K) — Christmas Is.: Andrews 108 (K); Allen 7 (K), 173 (K); Mitchell 132 (K), 154 (K); du Puy 7 (K); Wace 4 (K), 42 (K) — Ethiopia: Meyer 7997 (K) — Fiji: Brownlie 1304 (L); Seemann 728 (L) — Gabon: Jeffrey 208 (K); Louis et al. 950 (P) — Ivory Coast: Viane 16 (K) — Java: Mousset 166

(P) — Kenya: Lucas 230 (K) — Madagascar: M.R. Decary 17754 (P); Perrier 1747 (P) — Micronesia: Bryan 1114 (K), 1167 (K) — Nigeria: J.M. Baker 84 (K) — Nongowa: Bakshi 207 (K) — Papua New Guinea: Brass 29373 (L); Croft 1129 (K); Forster 10852 (K); Hartley 11536 (L); Holttum 15702 (K, L); Jermy (& Rankin) 8220 (K); Leeuwenberg 10647 (L); Sand 2695 (K); Schlechter 16304 (P); Walker 7884 (L) — Philippines: Elmer 8263 (L) — Polynesian: B20 0099749 (B) — South Africa: B20 0099 607 (B), Rudatis 1369 (P) — Sulawesi: Bünnemeijer 12427 (L); de Joncheere 1325 (L); T.G. Walker T12316 (L) — Sumatra: Lütjeharms 4750 (L), 5151 (K), 5159 (K) — Tahiti: Forsberg 14149 (K); Savatier 987 (P); Sloover P195 (P); Vesco 1847 (P) — Tanzania: Bidgood 4775 (K); Balslev 342 (K) — Thailand: Bunk 384 (K); H.B.G. Garrett 288 (P); Murata et. al. 16387 (K) — Uganda: Dümmer 472 (K); Faden 69-946 (K); Glokudler 288 (K), 1458 (K), 1488 (K); Hafashimane 357 (K); Jackson 123 (K); Lecerber 2042 (K), 2617 (K); Sangster 630 (K); Tweedie 2432 (K) — Vietnam: Cadière 98 (K).

M. punctatum ssp. *subirideum* Christ — Borneo: Ashton 19060 (K) — Cameroon: Tchinye 89 (K) — Fiji: Brownlie 16074 (L) — Java: van Balgooy 4628 (K); Botavae 74 (K); Endert 15062 (L, **type**); Inaeteay 173 (K); de Vriese & Teijsmann 32 (K), 325 (K) — Madagascar: Humblot 666 (L); Perrier 6149 (P) — Malaccan: No. 908302245 (L) — Malay Peninsular: Ernst 11045 (K); Hooker 526 (K); G. King's collector (= Kunstler) 5069 (K); Parrell 11385 (K); Ridley 1917 (K) — McLucas: van Borssom Waalkes 3228 (K); Buwalda 4159, (K) 6052 (K); Parris 11051 (K), 11720 (K); Robinson 1954 (K) — Papua New Guinea: Brass 25458 (K, L); Carr 12148 (K); Croft 61266 (K), 61160 (K); Floyd 5682 (K); Køie 1149 (K); Kulong 11582 (L); Sands 2118 (K); Schodde 3026 (L); Stevens 58710 (K) — Philippines: Castro 5910 (L); Copeland 1535 (B), 1776 (P); Elmer 5884 (K, P, **type**), 7854 (P, L), 7991 (K), 10920 (K), 16863 (K); Gutierrez 117367 (K); Hatierg 171 (K); Ramos 14779 (K) — Sarawak: Christensen 529 (BM); Parris 6900 (K) — Solomon Is.: Jarrett 68 (L) — Tahiti: Braithwaite 2570 (P) — Thailand: van Beusekom et al. 258 (B, BM); Phengkai 683 (B); Christensen 529; Floto 7237 (K); Hennipman 3065 (BM); Larsen 2597 (K), 5078 (K); Murata et al. 17674 (K); Tem 11209(K).

M. punctatum ssp. *subdrynariaceum* Christ — Annobon Is.: Melville 2023 (K) — Australia: Coveny & Hind 6900 — Bali: Holstvoogd 772 (L), 844 (L) — Borneo: Ashton 19060 (K); Combes 4097; Ismail 2744 (K) — Burma: Dickason 7637 (L); Wallace 191 (K) — Ceylon: Hooker 3799 (K) — China: Cavalerie (& Fortunat) 4012 (P); Fung 20053 (K); Rochers 2634 (P) — Congo: Ben 438; Gutzwiller 1305 (K); Thollon 1304 (P)

— Fiji: Brownlie 8454 (L) — Gabon: Leeuwenberg 13492 (K) — Guinea: Caruallo 2279 (K), 4235 (K); Jacques-Fé'lix 864 (P) — India: Abraham 666 (K); Bhargava et al. 2836 (L); Cusclah 17347 (K); Gough 3243 (K), 6055, 8289, 16350; Jarrett 766 (K), 784(K); J.D.H. 750 (K), 2223 (K); Manickam 31220 (K); Miller 1364 (K); Mooney 2383 (K); Paush 1931 (K); Piggott 2103 (K); Saldaha 12517 (K), 16392 (K); Sunanda 9557 (K); Tessier 19067 (K) — Irian Jaya: Nooteboom 5915 (K); Sands 6730 (K) — Ivory Coast: Viane 828 (K) — Java: Bakhuizen van den Brink 5739 (L); Hooker 1867 (K); Matthew 1928 (K); Mousset 20; Pleyte 57, 265; Rosenstock 20 (K); de Vriese 26 (K); Zollinger 1028 (K) — Kenya: Verdcourt 3919 (K) — Kl. Soenda Eil.: Elbert 913 (L) — Liberia: Wide 3876 (K) — Malay Peninsular: Castel 1961 (K); Piggott 2973 (K); Rodin 177 (K), 245 (K), 569 (K); Ridley 6554 (K); Turneau 904 (K); Yapp 296 (K) — Malaysia: Littke 394 (L) — Mayetta: Pascal 923 (P) — McLucas: van Borssom Waalkes 3053 (K), 3288 (K), 3238 (K); Buwalda 6052 (K); Eyma 3254 (K) — New Caledonia: Franc 11448 (P) — New Hebrides: Braithwaite 2306 (L), 2570 (L); Bourdy 306 (L, **type**); Savi 340 (L) — Nigeria: Chapman 3132 (K) — Reunion: Cadet 3824 (P) — Papua New Guinea: Croft 199 (K), 61578 (L), 65453 (K); Darbyshire 624 (K); Gay 405 (K), 1031 (K); Hoogland 10588 (K); Lam 1108 (K); van Royen 3474 (K); Schultze 104 (B)— Philippines: Elmer 22330 (K); Foxworthy 42135 (B); Ramos 973 (P); Ridsdale 5567 (K); Wenzel 2611 (B) — Sarawak: Kandau 62458 (K); Paul 64665 (K) — Singapore: Ridley 8935 (P, **type**) — Solomon Is.: Braithwaite 43701 (L); Brass 2756 (P); Beer 7768 (L); Whitmor 4321 (L) — South Africa: Schelpe 5032 (P) — Sulawesi: Coode 6251 (L); Darnaedi 2107 (K); Hennipman 5112 (L), 5462, 5981 (L) — Sumatra: Buwalda 6978 (K); Darnaedi 71 (K); Surbeck 1082 (L) — Tahiti: Braithwaite 4136 (P) — Taiwan: Tagawa 1853 (K) — Tanzania: Balslev 342 (K)— Thailand: Garrett 288 (K); Iwatsuki et al. 10900 (K); Larsen 3096 (K) — Timor: Bloembergen 3424 (K) — Uganda: Hafashimane 26 (K); Katendo 1187 (K); Thomas 145 (K) — Vietnam: Pételot (Colani) 2898 (P), 4101 (B); M. Semesle 580 (P); Tsiang 29192 (K), 36090 (K); Vieillard 459 (P).

Polypodium irioides Poiret — Australia: Heward 183 (K); Hooker 1820 (K) — Borneo: Korthals 113 (B), 973 (B) — Bhutan: Nuttall 1867 (K) — Ceylon: Beckett 648 (B) — China: Henry 10899 (B, K); Lungchow 83 (K); Matthew 1907 (K); Tutcher 10771 (K) — Congo: Louis 1417(K), 1932 (K) — India: B 200099652 (B); Beddome 48/341 (K); I.S. Gamble 16350 (K); Wallich 1837 (P) — Java: Jati 875 (L); Korthals 148 (L), 527 (L), 684 (L); Slanse 6314 (L); Zollinger 935 (B) — Malay Peninsular: Castel 15193

(K); Chusan 1847 (K); Hose 4823 (K); Matthew 2 (K), 4 (K) — Mauritius Is.: M. Boivin 891 (P), 1014 (P) — New Caledonia: Deplanche 198 (L); Germain 40 (L); Moore 30 (L); Noumea 29 (L), 199 (L); Pancher 506 (P) — Nigeria: Jones 16952 (K) — Papua New: Avon 370 (L) — Sarawak: Cooks 1909 (K) — Tahiti: Hooker 1867 (K); Maire 10775 (K); Moseley 6447 (K); Vieillard 10775 (K) — Uganda: Thomas 1369 (K) — Vietnam: Braker 4136 (P); Phustouve 34 (K).

M. validum (Copel.) Ching — Kl. Soenda Eil.: Schmitz 5169A (L), F7 (L) — Malaccan: Lam 3717 (L) — Philippines: Copland 275 (BM), 15356 (B); Elmer 9946 (BM, K, L), 13813 (L), 13598 (B, BM, K, P); Mathew 1928 (K); Merrill 7331 (P); Ramos 14862 (P), 31419 (P); USC 288 (L); Wenzel 1216 (BM)— Sumatra: Jacobson 10 (L); Lütjeharms 4990 (K).

P. glabrum Wallich — India: Wallich 281 (BM, K, **type**) — Ivory cost: Chevalier 21088 (P) — Java: R.B. le lunde 156 (P) — Malay Peninsular: Hooker 1803 (K); Maitban 281 (K) — Mozambique: Rehmann 8674 (P) — New Caledonia: Pancher 186 (P).

P. millisorum Baker — McLucas: Moseley 3412 (K, **type**) — Papua New: Brass 24220 (BM); Moseley 1874 (BM0; Wakefield 1435 (BM).

M. sessile Kze. — Mauritius: Sieber (Syn. Fil.) 31 (B, BM, K).

P. polycarpon Cav. — Cameroon: Bos 4106 (K); Leeuwenberg 5032 (P), 6651 (B, K, P); Thorold 28 (BM), 87 (K)— Comoro Is.: Benson 106 (BM), 1293 (BM) — Congo: de Néré 332 (P), 1412 (P); Wide et al. 3734 (B) — India: Bhargava et al. 6356 (K) — Ivory Cost: Leeuwenberg 1785 (K), 2542 (K) — Liberia: Linder 759 (K); Deighton 6056 (P); Wide et al. 3734 (K, P) — Madagascar: Barrett & Dorr 201 (P)— McLucas: Buwalda 6052 (L) —Micronesia: Hutchison 1139 (K) — Nyasaland: Chapeua 581 (BM) — Nigeria: Wright 4 (K) — Sierraleone: Deighton 6056 (K) — South AF: Chase 5220 (BM); Melsetter 46915 (BM); Mitchell 378 (BM); Schelpe 5032 (BM), 5225 (BM) — Tanganyika: Glover 263 (K) — Uganda: Dawkins 389 (K) — Thailand: Bloembergen 18 (K); den Hoed 909 (K); Kostermans 59 (K).

M. punctatum (L.) Copel. cv. *serratum* — Borneo: Ender 2358 (L).

M. neoquineense Copel. — Papua New: Thomas 11536 (K, **type**).