

Mosses of Mt. Trus Madi, Sabah, Malaysia.

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Abstract. A species list of mosses collected in Mt. Trus Madi, Sabah, between 10 September and 10 October 1996 is presented. A total of 153 taxa were collected, of which 11 are new to Borneo and five new to Sabah.

INTRODUCTION

Mount Trus Madi (2642 m) is the second highest mountain in Malaysia (Kitayama *et al.*, 1993) with an estimated area of 220 ha. It is located in the western part of Sabah (5°35'N, 116°30'E) on the borderline of the Tambunan and Keningau districts (Figure 1). The mountain is at the centre of Trus Madi Forest Reserve (175, 877 ha) which is classified as a Class II Forest Reserve, or Commercial Forest, i.e. can be logged to support timber and other products (Sabah Forestry Department, 1989). As the surrounding area is being logged, the mountain is likely to become an island of trees in the near future. Thus, the objective of this work was to collect and to preserve the mosses of Trus Madi as herbarium specimens, and to record them before the habitat is cleared. The mountain has not been studied for its bryoflora.

Collections were mainly made by the first author along the walking trails from the Hydrological

Forestry Station to the summit of Mt. Trus Madi. A few collections were also made below 900m, about 4 km west from the Forestry Station (Figure 1). A total of 320 specimens of mosses were collected and studied and out of these 153 taxa were identified. This represents ? of the 468 taxa reported for Sabah and nearly ½ of the 339 taxa reported from Mt. Kinabalu (Touw 1978; Frahm *et al.* 1990; Mohamed 1995; Akiyama *et al.* 2001). By and large, the moss flora of Mt. Trus Madi is typical of the Malesian region. Considering the small area surveyed in this study this indicates that Mt. Trus Madi has a rich moss flora.

The specimens are deposited at the Universiti Malaysia Sabah Herbarium (BORNEENSIS) and duplicates are at The Manchester Museum Herbarium (MANCH) and The Natural History Museum, London (BM). An asterisk (*) indicates a species which has not been previously recorded from Sabah and a double asterisks (***) indicates a species which is new to Borneo.

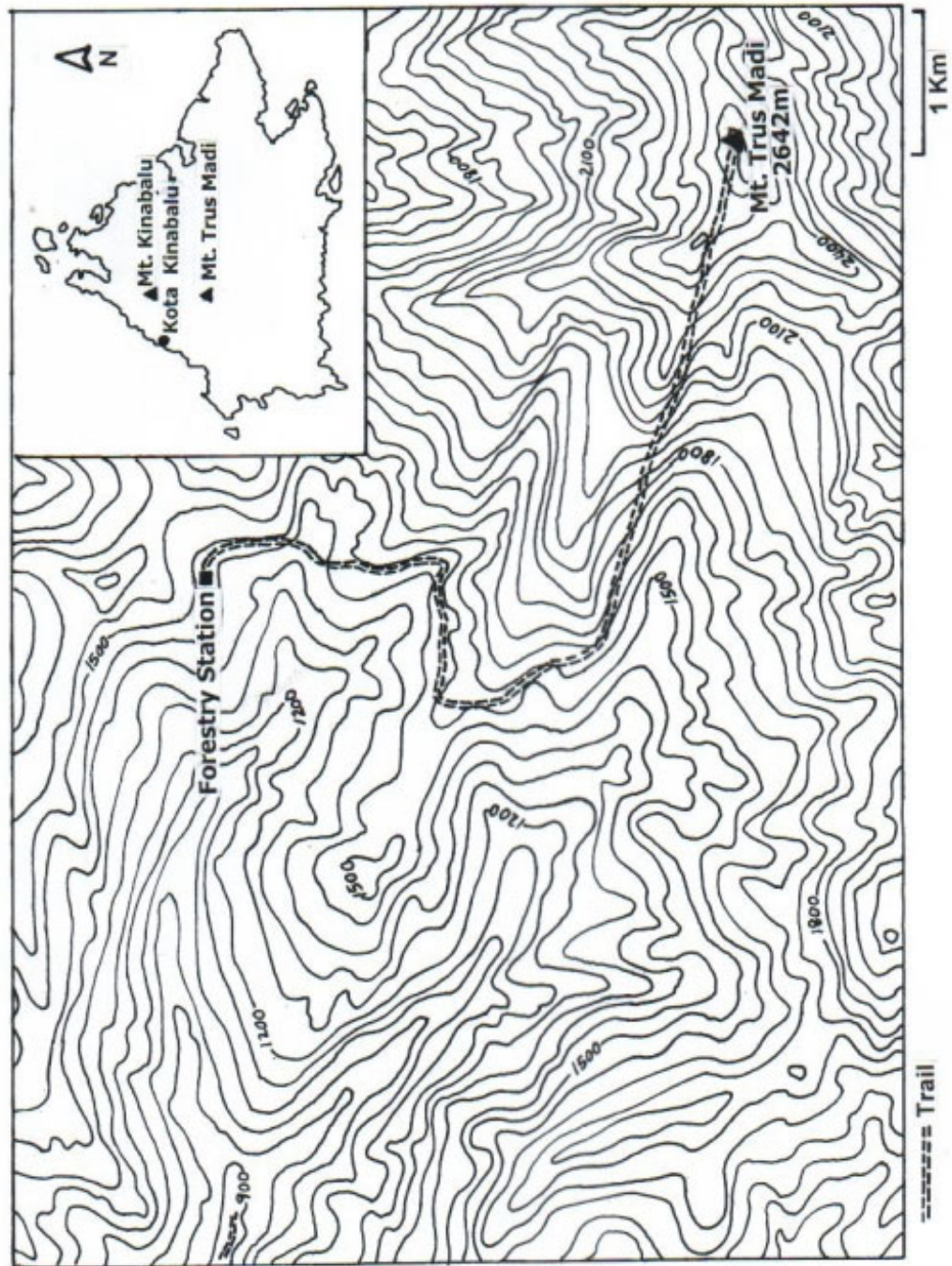


Figure 1: Map showing the collecting trail and the location of Mt. Trus Madi in the state of Sabah (inserted).

SPECIES LIST

SPHAGNACEAE

Sphagnum junghuhnianum Dozy & Molk. On humus in moist shaded area along the trail, 1700 m, M. Suleiman 196.

Sphagnum sericeum C. Muell. On humus in partially shaded ground, 1950 m, M. Suleiman 204.

POLYTRICHACEAE

Pogonatum cirratum subsp. **macrophyllum** (Dozy & Molk.) Hyvönen. On moist clay, partially shaded, 1500 m, M. Suleiman 148.

Pogonatum flexicaule Mitt. Habitat as above, 820 m, M. Suleiman 303.

Plants small for the species, only 3.5 cm tall (excluding seta), and the leaf margins serrate almost to base of limb.

****Pogonatum tahitense** Schimp. in Besch. On soil between gravel in an open area, 1400 m, M. Suleiman 255. The uppermost cells of the lamellae are irregularly paired, possess thinner walls and appear rounded in side view. This species is recorded in China, Hawaii, Marquesas and Society Islands. Until now, in Malesia, it has only been found in Java (Hyvönen, 1989).

Pogonatum neesii (C. Muell.) Dozy. Habit as above, 1440 m, M. Suleiman 238.

Racelopus pilifer Dozy & Molk. On rock in an exposed slope, 352 m, M. Suleiman 352a.

DAWSONIACEAE

Dawsonia beccarii Broth. & Geh. On clay in an open slope, 1500 m, M. Suleiman 154.

****Dawsonia lativaginata** Wijk. On clay in partially shaded slope, 1460 m, M. Suleiman 159. This species was previously only known from Irian Jaya and Papua New Guinea (Hyvönen 1986).

Dawsonia superba Grev. On humus in partially shaded area along trail, 1500 m, M. Suleiman 147.

FISSIDENTACEAE

Fissidens areolatus Griff. On soil, 1480 m, M. Suleiman 57.

Fissidens crassinervis Lac. var. **crassinervis**. On moist acidic soil, 670 m, M. Suleiman 328.

Fissidens crassinervis Lac. var. **laxus** (Sull. &

Lesq.) A. Eddy. On soil, 1470 m, M. Suleiman 3d.

****Fissidens guangdongensis** Z. Iwats & Z.-H. Li. On rock, 1530 m, M. Suleiman 176. This Chinese species is very distinct from other Malesian *Fissidens* by having its costae ceasing 6-8 cells below the leaf apex. It has also been recorded recently from Japan (Suzuki & Iwatsuki, 1999).

Fissidens hollianus Dozy & Molk. On bark of a shrub, near ground, 750 m, M. Suleiman 363.

Fissidens wichurae Broth. & Fleisch. On soil, 1530 m, M. Suleiman 176b. Recorded in Malay Peninsula and New Guinea (Iwatsuki & Mohamed, 1987) and recently in Mt. Kinabalu (Akiyama *et al.* 2001).

DICRANACEAE

Braunfelsia edentula (Mitt.) Wijk & Marg. On trunk of a tree, 2260 m, M. Suleiman 217.

Campylopus ericoides (Griff.) Jaeg. On clay between gravel in an open ground, 1500 m, M. Suleiman 150a.

Campylopus exasperatus (Nees & Blum.) Brid. As in above, M. Suleiman 150b.

Campylopus micholitzii C. Muell. ex Fleisch. On tree trunk, 1480 m, M. Suleiman 58.

Campylopus umbellatus (Arn.) Par. On soil between gravel in an open ground, 1400 m, M. Suleiman 66.

Cryptodicranum armitii (C. Muell.) Bartr. On rotten log in moist partially shaded trail, 1820 m, M. Suleiman 110.

Dicranella setifera (Mitt.) Jaeg. On clay between gravel, 1500 m, M. Suleiman 153.

Dicranodontium fleischerianum Schultze-Motel. On humus covering trunk of a tree, 1880 m, M. Suleiman 78.

Dicranoloma assimile (Hampe) Par. On humus, open slope, 1510 m, M. Suleiman 116.

Dicranoloma billardierei (Brid. ex Anon.) Par. On humus in moist partially shaded ground, 1860 m, M. Suleiman 97.

Dicranoloma blumii (Nees.) Par. On moist peat covering trunk of a tree, 1880 m, M. Suleiman 77. With all the characteristics of the species but the leaf tips are not strongly crimped.

Dicranoloma reflexum (C. Muell.) Ren. On trunk of log, 1880 m, M. Suleiman 72.

Leucoloma molle (C. Muell.) Mitt. On bark of a

rotten tree, 1470 m, M. Suleiman 20.

Microdus brasiliensis (Duby) Thér. On moist clay soil, 670 m, M. Suleiman 329.

Microdus miquelianus (Mont.) Besch. On clay soil in an open ground, 940 m, M. Suleiman 336.

***Trematodon longicollis** Michx. On clay soil, 780 m, M. Suleiman 297. Widely distributed and reported in Malay Peninsula, Papua New Guinea, the Philippines and Java but not previously seen in Borneo (Eddy 1988).

LEUCOBRYACEAE

Leucobryum aduncum Dozy & Molk. var. **aduncum**. On wet clay by a stream, 680 m, M. Suleiman 232.

Leucobryum aduncum Dozy & Molk var. **scalare** (C. Müll. ex Fleisch.) A. Eddy. On rotten log, 1450 m, M. Suleiman 161.

Leucobryum bowringii Mitt. On clay soil, 1470 m, M. Suleiman 2. Recorded in Sarawak and Kalimantan and recently in Mt. Kinabalu (Akiyama *et. al.* 2001).

Leucobryum candidum (P. Beauv.) Wils. On rotten log, 1470 m, M. Suleiman 45.

Leucobryum javense (Brid.) Mitt. On moist peat, 1720 m, M. Suleiman 130.

Leucobryum arfakianum C. Muell. Ex Geh. On root of a tree, 1480 m, M. Suleiman 39.

****Leucobryum scabrum** Lac. On rotten log, 1740 m, M. Suleiman 120. Reported in Malay Peninsular (Eddy 1990) and the Philippines (Tan & Iwatsuki 1991).

Octoblepharum albidum Hedw. Around the nodes of *Bambusa* sp. In partially shaded forest, 760 m, M. Suleiman 302d.

Schistomitrium apiculatum (Dozy & Molk.) Dozy & Molk. On tree bark, 1800 m, M. Suleiman 115.

Schistomitrium nieuwenhuisii Fleisch. On tree branch, 1520 m, M. Suleiman 172.

Schistomitrium robustum Dozy & Molk. On twigs, 1750 m, M. Suleiman 200.

CALYMPERACEAE

Arthrocormus schimperi Dozy & Molk. On humus covering a trunk of a tree in a partially shaded forest, 1040 m, M. Suleiman 345b.

Calymperes fasciculatum Dozy & Molk. On tree bark, partially shaded, 1470 m, M. Suleiman

49. Much reduced, plant only 1 cm tall, but with all the characters of this species.

Calymperes serratum Braun ex C. Muell. On tree bark, fully shaded, 1200 m, M. Suleiman 355c. Shoots smaller than normal for this species, less than 10 mm high.

Exostratum blumei (Nees ex Hampe) L.T. Ellis. On tree root, fully shaded forest, 650 m, M. Suleiman 650.

Leucophanes octoblepharioides Brid.. On bamboo nodes, 760 m, M. Suleiman 302b.

Mitthyridium jungquilianum (Mitt.) Robinson. On tree bark, fully shaded forest, 650 m, M. Suleiman 304.

Mitthyridium repens (Harv.) Robinson. On rotten tree, 740 m, M. Suleiman 357b.

Mitthyridium undulatum (Dozy & Molk.) Robinson. On branches of shrubs, 730 m, M. Suleiman 356.

Syrrhopodon albidus Thwait. & Mitt. Bark of tree, 1740 m, M. Suleiman 127.

Syrrhopodon albovaginatus Schwaegr. On rotten log, 770 m, M. Suleiman 361.

Syrrhopodon gardneri (Hook.) Schwaegr. Tree bark, 1480 m, M. Suleiman 55a.

Syrrhopodon japonicus (Besch.) Broth. On moist peat, 1480 m, M. Suleiman 51.

***Syrrhopodon hispidissimus** Dix. On bark of tree, 650 m, M. Suleiman 315. A strange form as the leaves possess unusually thick marginal ribs. Leaf shoulders are sharply serrate to two-thirds extent down sheath. Previously recorded elsewhere in Malesia (Eddy 1990).

Syrrhopodon involutus Schwaegr. Humus on forest floor, 1500 m, M. Suleiman 167.

Syrrhopodon laevis (Dix.) Mohamed & Reese. Tree bark, 1880 m, M. Suleiman 92.

Syrrhopodon muelleri (Dozy & Molk.) Lac. Root of tree, 650 m, M. Suleiman 313. This specimen has shoots only 7mm high with leaves 6 x 0.3 mm, and costae minutely papillose abaxially.

Syrrhopodon spiculosus Hook. & Grev. On upper side of decorticated log, 740 m, M. Suleiman 358d.

Syrrhopodon tristichus Nees ex Schwaegr. On a climber (*Korthalsia* sp.), 1530 m, M. Suleiman 179.

POTTIACEAE

Weissia controversa Hedw. On soil, 780 m, M. Suleiman 291. The peristome of this specimen is colourless or slightly yellow, not reddish as observed by Eddy (1990).

ORTHOTRICHACEAE

Macromitrium clemensiae Bartr. On trunk of *Eugenia kinabaluensis* Stapt., 2260 m, M. Suleiman 216. With all the characteristics of the species except that the shoots are larger, with leaves up to 3.5 mm long. Distally the costae are long-excurrent, forming hyaline aristae up to 1 mm long.

****Macromitrium longipilum** A. Br. *in* C. Muell. On branch of a decaying log, 1980 m, M. Suleiman 209. This specimen has setae up to 3.3 cm long which are smooth throughout. Eddy (1996) describes setae in this species as 2.5 cm long and minutely papillose under high magnification. Previously known from Java and Sumatra (Eddy 1996).

Macromitrium ochraceoides Dix. On branch, by a stream, 1400 m, M. Suleiman 267.

Macromitrium ochraceum (Dozy & Molk.) C. Muell. On rotten log, 1520 m, M. Suleiman 168. This specimen has short, broadly lanceolate leaves, 3.2 x 1.3 mm which rather quickly narrow to broadly acute apices.

Macromitrium perdensifolium Dix. On tree bark, 1730 m, M. Suleiman 123. The calyptrae in this collection are completely smooth and hairless, similar to those in *Macromitrium longipilum*.

BRYACEAE

Bryum clavatum (Schimp.) C. Muell. On gravel, 1390 m, M. Suleiman 67.

Bryum coronatum Schwaegr. On clay soil in a burned area, 1500 m, M. Suleiman 152.

Orthodontium infractum Dozy & Molk. On humus covering a stump, partially shaded, 2260 m, M. Suleiman 215.

Rhodobryum giganteum (Schwaegr.) Par. On thin sandy soil covering boulder by stream, 1420 m, M. Suleiman 285a.

MNIACEAE

Plagiomnium rhynchophorum (Hook.) Kop. On climber near a stream, 1420 m, M. Suleiman 280a.

RHIZOGONIACEAE

Pyrrhobryum spiniforme (Hedw.) Mitt. On rotten log in a wet condition, near a stream, 1420 m, M. Suleiman 283.

Rhizogonium lamii Reim. On trunk of a fallen tree, 1620 m, M. Suleiman 186.

BARTRAMIACEAE

Philonotis bartramoides (Griff.) Griffin & Buck. On moist clay, along road side close to a stream, 660 m, M. Suleiman 330.

Philonotis secunda (Dozy & Molk.) Bosch & Lac. Between gravel along road side, 1400 m, M. Suleiman 254. The cells of the lamina in this collection are only weakly prorate but it is best placed in this variable species.

HYPNODENDRACEAE

Hypnodendron dendroides (Brid.) Touw. On stump, 1510 m, M. Suleiman 145.

Hypnodendron diversifolium Broth. & Geh. On tree root, 1480 m, M. Suleiman 38.

RACOPILACEAE

Racopilum spectabile Reinw. & Hornsch. On root of a fern among other creeping mosses, 1400 m, M. Suleiman 248.

PTEROBRYACEAE

****Oedocladium fragile** Card. On a climber beside stream, 1420 m, M. Suleiman 282c. This species is distributed in Japan, Taiwan, Hong Kong, Vietnam and so far has only been recorded in the Philippines for Malesian region (Iwatsuki 1979).

Symphysodontella cylindracea (Mont.) Fleisch. On bark of rotten tree, 1470 m, M. Suleiman 28. The leaf margin in this species is usually entire (Magill 1980), but in this collection the margin at the leaf apex is denticulate (sometimes with teeth extending distally from midleaf). In all other features this specimen matches those characteristic of *S. cylindracea*.

GAROVAGLIACEAE

Garovaglia elegans (Dozy & Molk.) Bosch & Lac. On rotten branch, near a stream, 1430 m, M. Suleiman 287.

Garovaglia cf. powellii Mitt. On dead branch,

770 m, M. Suleiman 298. Unusual for this species in having broadly acute leaf apices, leaf margin dentate and cells toothed at the back with teeth up to 50 μm high.

METEORACEAE

Aerobryidium crispifolium (Broth. & Geh.) Fleisch. ex Broth. On twigs, near a stream, 1410 m, M. Suleiman 272.

Aerobryopsis wallichii (Brid.) Fleisch. On fallen twigs, near a stream, 1410 m, M. Suleiman 274.

Floribundaria floribunda (Dozy & Molk.) Fleisch. On twigs, by a stream, 1420 m, M. Suleiman 278.

Floribundaria intermedia Thér. On stump, 780 m, M. Suleiman 295a.

Floribundaria pseudofloribunda Fleisch. On stump, 780 m, M. Suleiman 293.

Meteorium polytrichum Dozy. & Molk. On rotten twigs, by a stream, 1410 m, M. Suleiman 270.

Papillaria fuscescens (Hook.) Jaeg. On fallen twigs, by a stream, 1410 m, M. Suleiman 273.

NECKERACEAE

Himantocladium cyclophyllum (C. Muell.) Fleisch. On trunk of *Pterospermum* sp., 780 m, M. Suleiman 296a.

Homaliodendron flabellatum (Sm.) Fleisch. On climber, by a stream, 1420 m, M. Suleiman 279.

Neckeropsis gracilenta (Bosch & Lac.) Fleisch. On small branch, 650 m, M. Suleiman 314.

Pinnatella ambigua (Bosch & Lac.) Fleisch. As in *Himantocladium cyclophyllum*, M. Suleiman 296b.

DALTONIACEAE

****Daltonia armata** Bartr. Around the nodes of a bamboo, 760 m, M. Suleiman 301. Previously recorded from Malay Peninsula, Sumatra and the Philippines (Mohamed & Robinson 1991). In this collection, the leaf shape is less carinate than is usual in this species. This is probably due to its habitat.

****Daltonia contorta** C. Muell. On bark of *Blumea balsamifera* DC., 1390 m, M. Suleiman 262. Previously recorded from Malay Peninsula, Java and the Philippines (Mohamed & Robinson 1991).

CALLICOSTELLACEAE

Callicostella papillata (Mont.) Mitt. On burned and rotten tree, 760 m, M. Suleiman 300.

HOOKERIACEAE

Actinodontium ascendens Schwaegr. On trunk of a bamboo tree, 780 m, M. Suleiman 301a.

Actinodontium raphidostegum (C. Muell.) Bosch & Lac. On tree bark, 1390 m, M. Suleiman 264a.

Hookeriopsis utacamundiana (Mont.) Broth. On stone-wall, near a stream, 1420 m, M. Suleiman 281.

DISTICHOPHYLLACEAE

Distichophyllum malayense Damanhuri & Mohamed. On a rotten log, 1050 m, M. Suleiman 340b.

Distichophyllum mittenii Bosch & Lac. On a rotten log, 1050 m, M. Suleiman 340a.

HYPOPTERYGIACEAE

Cyathophorella spinosa (C. Muell.) Fleisch. On a climber, by a stream, 1420 m, M. Suleiman 282.

Lopidium trichocladon (Bosch & Lac.) Fleisch. On tree bark, fully shaded, 1200 m, M. Suleiman 355a. Plants atypically small, only 12 mm tall, leaves broadly acute to obtuse, mucronate; amphigastral leaves with strong excurrent costae, up to 165 μm long.

THUIDIACEAE

Pelekium velatum Mitt. On decaying tree, 770 m, M. Suleiman 299.

Thuidium cymbifolium (Dozy & Molk.) Dozy & Molk. On wet boulder, near a stream, 1410 m, M. Suleiman 275.

BRACHYTHECIACEAE

Brachythecium plumosum (Hedw.) Bruch & Schimp. On upper side of a rock, by a stream, 1410 m, M. Suleiman 269.

Rhynchostegium celebicum (Lac.) Jaeg. On root of a fern, 1400 m, M. Suleiman 248.

Rhynchostegium javanicum (Bel.) Besch. On tree stump, 780 m, M. Suleiman 295.

SEMATOPHYLLACEAE

Acanthorrhynchium papillatum (Harv.)

Fleisch. On decorticated log, 650 m, M. Suleiman 308.

Acroporium convolutum (Bosch & Lac.) Fleisch. On tree stump, 1040 m, M. Suleiman 338a.

Acroporium diminutum (Brid.) Fleisch. On trunk of treelet, 1850 m, M. Suleiman 104.

Acroporium johannis-winkleri Broth. On rotten log, 1470 m, M. Suleiman 8.

Acroporium secundum (Reinw. & Hornsch.) Fleisch. On humus, 1880 m, M. Suleiman 89.

Acroporium stramineum var. **hamulatum** (M. Fleisch.) B.C.Tan. On tree trunk, 1680 m, M. Suleiman 194.

Acroporium stramineum (Reinw. & Hornsh.) M. Fleisch. var. **stramineum**. On decaying wood, 1880 m, M. Suleiman 71.

Isocradiella surcularis (Dix.) Tan & Mohamed. On trunk of treelet, 1470 m, M. Suleiman 48a.

Macrohymenium muelleri Dozy & Molk. On rotten log, 1480 m, M. Suleiman 163.

Mastopoma armitii (Broth. & Geh.) Broth. On rotten log, 1480 m, M. Suleiman 164.

Mastopoma denticulatum Dix. On tree bark, 1860 m, M. Suleiman 98. Seta up to 4.3 cm, almost twice as long as reported by Dixon (1935).

Mastopoma unciifolium (Broth.) Card. On rotten tree, 1470 m, M. Suleiman 7.

Mastopoma uncinifolium (Broth.) Broth. On humus, 1670 m, M. Suleiman 191.

Meiothecium jagorii (C. Muell.) Broth. On tree bark, 1390 m, M. Suleiman 264.

** **Radulina elegantissima** (Fleisch.) Buck & B.C. Tan. On rotten tree, 670 m, M. Suleiman 327. Previously recorded from Malay Peninsula and Java.

***Radulina hamata** (Dozy & Molk.) Buck & B.C. Tan. On rotten log, 1470 m, M. Suleiman 18. Previously recorded from Malay Peninsula, Java, Sumatra and Kalimantan.

Rhaphidostichum piliferum (Broth.) Broth. On tree twigs, 220 m, M. Suleiman 223.

Taxithelium alare Broth. On trunk of a small tree, 1570 m, M. Suleiman 183.

Taxithelium instratum (Brid.) Broth. On rotten tree, near a stream, 670 m, M. Suleiman 331e.

Taxithelium cf. **isocladium** (Bosch & Lac.) Ren. & Card. On trunk of a small tree, 760 m, M. Suleiman 364.

Taxithelium kerianum (Broth.) Broth. On

twigs, 780 m, M. Suleiman 292.

Taxithelium magnum Fleisch. On trunk of a shrub, 1470 m, M. Suleiman 17.

Taxithelium vernieri (Duby) Besch. On rotten tree, 1410 m, M. Suleiman 268b.

Trichosteleum albifolium Dix. On tree trunk, 740 m, M. Suleiman 357.

Trichosteleum boschii (Dozy & Molk.) Jaeg. On a climber, 1800 m, M. Suleiman 113.

***Trichosteleum pseudo-mammosum** Fleisch. On rotten log, 660 m, M. Suleiman 318b. Recorded from Sarawak.

Trichosteleum saproxylophilum (C. Muell. Hal.) B.C. Tan, Schof. & Ramsay. On tree root, 660 m, M. Suleiman 323.

****Trichosteleum singaporense** Fleisch. On rotten log, 660 m, M. Suleiman 306.

****Trichosteleum stigmatosum** Mitt. On rotten log, 740 m, M. Suleiman 358.

***Trichosteleum stissophyllum** (Hampe) Jaeg. On tree bark, 1530 m, M. Suleiman 144b.

Trismegistia rigida (Mitt.) Broth. On tree root, 1510 m, M. Suleiman 174.

Warburgiella circinata Dix. On rotten branch, 1860 m, M. Suleiman 98.

Warburgiella cupressinoides C. Muell & Broth. On tree stump, 1520 m, M. Suleiman 169.

Warburgiella subleptorrhynchoides (Fleisch.) Fleisch. On rotten log, 2340 m, M. Suleiman 230.

HYPNACEAE

Ctenidiadelphus spinulosus Fleisch. On rotten tree stump, 1400 m, M. Suleiman 266.

Ectropothecium dealbatum (Reinw. & Hornsch.) Jaeg. On rotten tree, 670 m, M. Suleiman 331a.

Ectropothecium incubans (Reinw. & Hornsch.) Jaeg. On rotten tree, 660 m, M. Suleiman 325.

Ectropothecium monumentorum (Duby) Jaeg. On rotten log, 1030 m, M. Suleiman 337.

Ectropothecium ptychophyllum Nishimura. On tree root, 1480 m, M. Suleiman 40.

Isopterygium albescens (Hook.) Schwaegr. On rotten tree, 1470 m, M. Suleiman 60a.

Isopterygium bancanum (Lac.) Jaeg. On bark of a small tree, 1530 m, M. Suleiman 178.

Isopterygium minutirameum (C. Muell.) Jaeg. On stump of treelet, 650 m, M. Suleiman 312.

Trachythecium verrucosum (Jaeg.) Fleisch. On rotting stump, 1400 m, M. Suleiman 266a.

Vesicularia reticulata (Dozy & Molk.) Broth. On rotten tree, near stream, 670 m, M. Suleiman 331b.

Acknowledgements

Sincere thanks to Dr B.C. Tan, Dr A. Damanhuri Mohamed, Mr L.T. Ellis and Mr. Yong Kien Thai for helping with the identification of the specimens. Special thank to Dr B.C. Tan and two other anonymous reviewers for reviewing the manuscript and to Mr. Zainal Awang for his assistance during the collecting trips. We also wish to thank Sabah Forestry Department for providing us with the site map and allowing us to stay at their Hydrology Station during the collecting trips. This work was financially supported by the Universiti Malaysia Sabah to whom grateful acknowledgement is made.

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