Journal of Tropical Biology and Conservation 19: 167–182, 2022 ISSN 1823-3902
E-ISSN 2550-1909

Research Article

The mosses of Mount Tambuyukon, Kinabalu Park, Malaysian Borneo

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Received 17 August 2022|Reviewed 03 October 2022|Accepted 05 October 2022|Published 15 October 2022
https://doi.org/10.51200/jtbc.v19i.3964

ABSTRACT
A total of 103 species, two subspecies and two varieties of mosses in 55 genera and 26 families were collected from Mount Tambuyukon in August 2008. This represents ca. 16.3% of the mosses reported from Sabah and ca. 13.9% of the mosses reported for Borneo. Amongst the 107 taxa, three species of mosses are new for Sabah, namely *Acroporium aciphyllum* Dixon, *Garovaglia baeuerlenii* (Geh.) Paris and *Macromitrium angustifolium* Dozy & Molk. The largest moss family collected here is Sematophyllaceae (13 taxa) followed by Leucobryaceae (11 taxa), and both Dicranaceae and Orthotrichaceae (10 taxa). In conclusion, Mount Tambuyukon sustains a rich and interesting moss flora, including several rare and endemic species.

Keywords: Borneo, moss flora, Mount Tambuyukon.

Introduction
Mount Tambuyukon (2,580 m), despite being the third highest mountain in Malaysia, is left far behind in terms of botanical research as compared to Mount Kinabalu. Many bryologists have visited the latter mountain since the 19th century leading to numerous reports on bryophytes published since. However, there is no report on the bryophyte flora of Mount Tambuyukon although it is located very close to Mount Kinabalu. This could be due to poor accessibility to Mount Tambuyukon until recent decades.

Thus far, only a few species of bryophytes have been reported from Mount Tambuyukon, such as *Ectropothecium ptychofolium* Nishimura (Nishimura, 1984), *Dicranoloma assimile* (Hampe) Ren., *D. blumei* (Nees) Ren. and *D.*

brevisetum (Dozy & Molk.) Paris (Klazenga, 1999). These collections were made by Willem Meijer in the 1950s and are housed in Rijksherbarium Leiden, the Netherlands. Unfortunately, Meijer's collection from Mount Tambuyukon was not studied as a whole but only mentioned in several monographs and taxonomic publications on bryophytes (Frahm et al., 1990). Hence, this study is the first attempt to document the moss species that are found on Mount Tambuyukon.

Methodology

Mosses were collected over a period of four days from 12–15 August 2008, on the eastern side of Mount Tambuyukon (**Table 1**). All habitats found along and beside the existing climbing trail from Monggis Substation (N6°12'4.4", E116°44'58.7") to the summit (6°11'56.49"N, 116°39'41.44"E) of the mountain were surveyed. Due to heavy rain during the fieldtrip, only 194 moss specimens were collected, which covered the elevation from the foothill (200 m a.s.l.) to the summit zone (2500 m a.s.l.).

The classification of moss families and genera is based on Goffinet and Buck (2020), while species names and authority are based on the Tropicos database. Specimens were deposited at the BORNEENSIS Herbarium (BORH) of Universiti Malaysia Sabah, with duplicates in Sabah Parks Herbarium (SNP) and in the University of Malaya Herbarium (KLU).

Table 1. Collection details of mosses collected at Mount Tambuyukon.

Collection No.	Collection detail
MS-DPM 3547-3571	Mt. Tambuyukon, Monggis Substation to Kopuakan Camp (Km 8), lowland forest, 12 August 2008.
MS-DPM 3572-3612	Mt. Tambuyukon, Kopuakan Camp (Km8) to Musang Camp (Km 10), montane forest, 13 August 2008.
MS-DPM 3613-3759	Mt. Tambuyukon, Musang Camp (Km10) to the summit, mossy forest, 14 August 2008.
MS-DPM 3760-3775	Mt. Tambuyukon, Musang Camp (Km 10) to Monggis Substation, 15 August 2008.

Note: MS-DPM = Monica Suleiman and Dunstan Polus Masundang.

Results and Discussion

A total of 107 taxa consisting of 103 species, two subspecies and two varieties in 55 genera and 26 families of mosses were collected from Mount Tambuyukon (**Appendix 1**). This number is far less than what has been reported from Mount Kinabalu; only 27% of the 386 taxa of mosses that are reported for the latter mountain. This difference may be due to the limited collection time spent on the upper montane and summit region of the mountain. Bad weather during the field trip also prevented the team from collecting more specimens and hampered exploration to areas away from the main trail. Nonetheless, among the collection was a species new to science, *Bryobrothera tambuyukonensis* (Akiyama & Suleiman, 2015). This collection has also contributed three new records for Sabah, namely *Acroporium aciphyllum*, *Garovaglia baeuerlenii* and *Macromitrium angustifolium*. In addition, four taxa of mosses that were collected during this visit are new records for Kinabalu Park, namely *Braunfelsia dicranoides*, *Ectropothecium elegantipinnatum*, *Macromitrium salakanum* and *Macrohymenium muelleri*. This is indeed a fairly significant contribution to the bryoflora of the park.

It is worth pointing out that amongst the 107 taxa collected, four species are Bornean endemics, namely *Bryobrothera tambuyukonensis*, *Ectropothecium ptychofolium*, *Macromitrium ochraceoides* and *Schlotheimia rubiginosa*. Borneo holds only about 10 endemic species of mosses, which is ca. 1.30% of the 772 taxa of mosses recorded from Borneo. Hence, ca. 40% of the Bornean endemic species are found here, which indicates the importance of Mount Tambuyukon in the conservation of bryophytes flora.

The largest moss family collected here is Sematophyllaceae with 12 species and one variety, followed by Leucobryaceae with 14 species, Dicranaceae with 10 species and Orthotrichaceae with nine species and one variety. Sematophyllaceae is known to have a wide elevational range; it was collected from 500 m to 2500 m a.s.l. Meanwhile, members of the Dicranaceae and Orthotrichaceae were mostly collected at an elevation above 1,200 m. It is interesting to note that members of Dawsoniaceae and Sphagnaceae are not represented here, although these two families are abundant on other mountains in Sabah, such as Mount Kinabalu (Akiyama et al., 2001) and Mount Trus Madi (Suleiman & Edwards, 2002). More explorations, especially to other parts of the mountain and the summit region are needed to determine a more comprehensive understanding about the moss flora of this mountain.

Acknowledgements

We would like to thank Sabah Parks for the research permit and assistance rendered by their staff at Monggis Substation. Thank you also to Dunstan Polus Masundang for assisting in the field. This trip was partially funded by a research grant from Nagao Natural Environment Foundation (NEF) Japan to MS.

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Appendix 1. Species checklist of mosses from Mount Tambuyukon

Species marked with an asterisk (*) are new to Kinabalu Park and double asterisks (**) are new to Sabah. MS-DPM denotes M. Suleiman and D.P. Masundang.

BARTRAMIACEAE

Breutelia arundinifolia (Duby) M. Fleisch.
On humus, 1550 m alt., MS-DPM 3682.
In Borneo, this species has only been reported from Mount Kinabalu and Mount Trus Madi.

Breutelia kinabaluensis Dixon.
On humus, 2250 m alt., MS-DPM 3750.
Mount Tambuyukon is a new locality for this species, beside Mount Kinabalu, in Borneo (Suleiman et al., 2006).

Philonotis secunda (Dozy & Molk.) Bosch & Sande Lac.
On gravel, 830 m alt., MS-DPM 3569.

BRYACEAE

Bryum russulum Broth. & Geh.
On boulders and humus, 2150–2300 m alt., MS-DPM 3721, 3728, 3738b, 3747, 3754.
This is a large *Bryum* species and is known to be disjunctive in its distribution. The plant is thus far only reported from New Guinea, Sulawesi, Borneo and Thailand (Frahm et al., 2009). In Borneo, the species was formerly only known to Mount Kinabalu (Ochi, 1971; Akiyama et al., 2001).

CALYMPERACEAE

Calymperes fasciculatum Dozy & Molk.
On tree trunk, 1200 m alt., MS-DPM 3595.

Mitthyridium luteum (Mitt.) H. Rob.
On tree trunk, 550 m alt., MS-DPM 3556.

Syrrhopodon trachyphyllus Mont.
On tree trunk, 1200 m alt., MS-DPM 3594.

Syrrhopodon muelleri (Dozy & Molk.) Sande Lac.
On tree buttress, 520 m alt., MS-DPM 3550.

Syrrhopodon tristichus Nees *ex* Schwägr.
On treelet trunk, 1550 m alt., MS-DPM 3688.

DALTONIACEAE
Benitotania elimbata H. Akiyama, T. Tamag. & M. Suleiman
On shrub and tree trunks, 1400–1480 m alt., MS-DPM 3617, 3649, 3654, 3656, 3647, 3667.
Some of the specimens have filamentous gemmae on branch tips; the gemmae are papillose and branched.

Calyptrochaeta remotifolia (Müll. Hal.) Z. Iwats., B.C. Tan & Touw.
On rock and trunk of shrub, 1450–1600 m alt., MS-DPM 3653, 3699.

Distichophyllum cuspidatum (Dozy & Molk.) Dozy & Molk.
On trunk of shrub, 1630 m alt., MS-DPM 3697.

Distichophyllum malayense Damanhuri & Mohamed
On trunk of shrub, 1550 m alt., MS-DPM 3691.

Distichophyllum subcuspidatum Nog. & Z. Iwats.
On rotten log, 750 m alt., MS-DPM 3574.

Bryobrothera tambuyukonensis H. Akiyama & M. Suleiman
On treelet trunks and climber, 1450–1670 m alt., MS-DPM 3640, 3687, 3690, 3698, 3700, 3702, 3704.
This species was described as a new species based on the specimens collected in this study and from Sungai Imbak Forest Reserve (Akiyama & Suleiman, 2015). This is also the first record of the *Bryobrothera* genus in Borneo.

DICRANACEAE
**Braunfelsia dicranoides* (Dozy & Molk.) Broth.
On tree base and trunk, 1450–1550 m alt., MS-DPM 3631, 3679.
The only record of this species in Borneo was from Crocker Range Park (Suleiman et al., 2017).

Braunfelsia cf. *enervis* (Dozy & Molk.) Paris
On tree trunks and climber, 1450–1550 m alt., MS-DPM 3630, 3661, 3674.
These specimens have short and broadly ovate leaves, as in *B. enervis,* but some leaves are clearly costate. This is the second record of this species in Sabah.

Braunfelsia edentula (Mitt.) Wijk & Margad.
On tree trunks, humus and boulders, 1450–2450 m alt., MS-DPM 3645, 3666, 3671, 3681, 3724, 3729, 3759.
Specimens MS-DPM 3645, 3666 and 3671 are small for the species and green-brown in colour, as opposed to large and yellow-brown in typical ones.

Dicranoloma assimile (Hampe) Broth. *ex* Renauld
On humus and tree base, 1350–1450 m alt., MS-DPM 3612, 3629, 3766.

Dicranoloma billarderii (Brid.) Paris
On humus, 1400–1450, MS-DPM 3619, 3628.

Dicranoloma blumei (Nees) Broth. *ex* Renauld
On tree trunks, 1400–1450 m alt., MS-DPM 3615, 3660, 3626, 3627.

Dicranoloma braunii (Müll. Hal.) Paris
On tree trunks and rotten logs, 750–1550 m alt., MS-DPM 3573, 3596, 3620, 3762a, 3684.

Dicranoloma brevisetum (Dozy & Molk.) Paris
On tree trunks, 1350–1520 m alt., MS-DPM 3602, 3762b, 3685, 3764, 3765.

Dicranoloma aff. *daymannianum* E.B. Bartram
On tree trunk, 1150m alt., MS-DPM 3585.
The specimen is a soft-textured *Dicranoloma*, which looks like *D. braunii* in the field but the former has stem central strand and teeth of costa are scattered. It is close to *D. daymannianum* but its leaves are not brittle (Klazenga, 1999).

Leucoloma molle (Müll. Hal.) Mitt.
On tree trunk, 1150 m alt., MS-DPM 3584.

FISSIDENTACEAE
Fissidens crassinervis Sande Lac.
On soil, 1170 m alt., MS-DPM 3587.

Fissidens crispulus Brid.
On rock, 780 m alt., MS-DPM 3582a.

Fissidens javanicus Dozy & Molk.
On soil and tree root, 780 m alt., MS-DPM 3580, 3581.

Fissidens nobilis Griff.
On boulder, 750 m alt., MS-DPM 3565.

Fissidens pallidus Hook. F. & Wils.
On soil, 550 m alt., MS-DPM 3558.

Fissidens pellucidus Hornsch.
On rock, 780 m alt., MS-DPM 3582b.

Fissidens cf. *polypodioides* Hedw.
On soil, 1170 m alt., MS-DPM 3586.

HYPNACEAE
Ctenidium sp.
On tree trunk, 1450 m alt., MS-DPM 3652.

**Ectropothecium elegantipinnatum* (Müll. Hal.) A. Jaeger
On rotten log, 1450 m alt., MS-DPM 3625.
This is a common species in Borneo but has rarely been reported. In Sabah, it has been reported from Maliau Basin Conservation Area (Mohamed et al., 2010; Suleiman et al. 2017).

Ectropothecium ptychofolium Nishimura
On rotten log, 1300 m alt., MS-DPM 3598.
This distinctive species is endemic to Borneo. It was previously collected from Mount Tambuyukon by Willem Meijer (Nishimura, 1984).

Ectropothecium sp. 1
On rock and humus, 2150–2230 m alt., MS-DPM 3727, 3746.

Ectropothecium sp. 2
On boulder, 1450 m alt., MS-DPM 3659.

HYPNODENDRACEAE
Hypnodendron dendroides (Brid.) Touw
On humus and rotten log, 1200–1900 m alt., MS-DPM 3592, 3714.

Hypnodendron diversifolium Broth. & Geh.
On tree root, 2000 m alt., MS-DPM 3718.

Dendro-hypnum milnei subsp. *korthalsii* (Bosch & Sande Lac. *ex* Paris) N.E. Bell, A.E. Newton & D. Quandt
On boulder by a river, 750 m alt., MS-DPM 3575.

Dendro-hypnum reinwardtii subsp. *caducifolium* (Herzog) N.E. Bell, A.E. Newton & D. Quandt
On tree trunk and buttress, 1400–1800 m alt., MS-DPM 3618, 3693, 3713.

HYPOPTERYGIACEAE
Lopidium struthiopteris (Brid.) M. Fleisch.
On tree trunk, 750 m alt., MS-DPM 3566.

LEUCOBRYACEAE
Campylopus comosus (Schwägr.) Bosch & Sande Lac.
On rotten log, 1200 m alt., MS-DPM 3593.

Campylopus exasperatus (Nees & Blume) Brid
On boulders and humus, 2150–2250 m alt., MS-DPM 3725, 3732, 3736, 3738, 3745, 3749.

Campylopus flagellifer (Müll. Hal.) A. Jaeger
On rotten log and tree trunk, 1900–2450 m alt., MS-DPM 3715, 3755.
This species is only known from Borneo, South India, Sri Lanka and Thailand (Frahm et al., 2009). Thus far, this is the second record of this species for Borneo (Frahm & Mohamad, 1987).

Cladopodanthus speciosus (Dozy & Molk.) M. Fleisch.
On rotten log, 750 m alt., MS-DPM 3568.

Dicranodontium uncinatum (Harv.) J. Jaeger [syn. *D. fleischerianum* W. Schultze-Motel var. *fleischerianum*]
On humus, 2470 m alt., MS-DPM 3757.

Leucobryum chlorophyllosum Müll. Hal.
On tree buttress, 520 m alt., MS-DPM 3551.
Leucobryum javense (Brid.) Mitt.
On humus, 1350 m alt., MS-DPM 3767.

Leucobryum sanctum (Nees *ex* Schwägr.) Hampe.
On rotten logs, 520–850 m alt., MS-DPM 3549, 3771.

Leucobryum sumatranum Broth. *ex* M. Fleisch.
On humus, 1350–1400 m alt., MS-DPM 3609, 3760.

Schistomitrium apiculatum (Dozy & Molk.) Dozy & Molk.
On tree trunk, 1400 m alt., MS-DPM 3621.

Schistomitrium mucronifolium (A. Braun ex Müll. Hal.) M. Fleisch.
On tree trunk, 1350 m alt., MS-DPM 3643, 3763.

METEORIACEAE
Cryptopapillaria sp.
On boulders in open areas, 2200 m alt., MS-DPM 3723, 3738a.
This species has the leaf characteristics of the genus but has different habits. The plant is much larger than the only *Cryptopapillaria* species (viz. *C. fuscescens* (Hook.) M. Menzel) known to Borneo. Unlike *C. fuscescens* which has flaring and auriculate leaf base, it is gradually narrow to insertion in this plant.

Pseudotrachypus wallichii (Brid.) W.R. Buck
On boulder, 600 m alt., MS-DPM 3560.

MNIACEAE
Plagiomnium succulentum (Mitt.) T.Kop.
On boulder by a river, 750 m alt., MS-DPM 3578.

MYURIACEAE
Oedicladium rufescens (Reinw. & Hornsch.) Mitt.
On treelet trunk, 1350 m alt., MS-DPM 3761.

Piloecium pseudorufescens (Hampe) Müll. Hal. *ex* Broth.
On tree trunk, 550 m alt., MS-DPM 3553.

NECKERACEAE

Circulifolium exiguum (Bosch & Sande Lac.) S. Olsson, Enroth & D. Quandt
On tree trunk, 650 m alt., MS-DPM 3561.

Circulifolium microdendron (Mont.) S. Olsson, Enroth & D. Quandt
On boulder, 550 m alt., MS-DPM 3554.

Homaliodendron flabellatum (Sm.) M. Fleisch.
On tree root, 750 m alt., MS-DPM 3577.

Neckeropsis cyclophylla (Müll. Hal.) S. Olsson, Enroth & D. Quandt
On boulder, 750 m alt., MS-DPM 3576.

OCTOBLEPHARACEAE

Octoblepharum albidum Hedw.
On tree trunk, 800 m alt., MS-DPM 3770.

ORTHOTRICHACEAE

***Macromitrium angustifolium* Dozy & Molk.
On tree and shrub trunks and boulder in open and partially shaded areas, 1480–2200 m alt., MS-DPM 3664, 3668, 3677a, 3709, 3733, 3740.
Thus far, this species has only been reported from West Kalimantan in Borneo. It was previously reported from China, Papua New Guinea, Japan and the Philippines.

Macromitrium blumei Nees *ex* Schwägr.
On tree and shrub trunks and branch as well as boulders in open and partially shaded areas, 1480–2200 m alt., MS-DPM 3669, 3676, 3677b, 3680, 3730, 3735, 3737.

Macromitrium blumei var. *zollingeri* (Mitt. *ex* Bosch & Sande Lac.) S.L. Guo, B.C. Tan & Virtanen [syn. *M. zollingeri* Mitt. *ex* Bosch & Sande Lac.]
On treelet trunk, 1450 m alt., MS-DPM 3642.

Macromitrium cuspidatum Hampe
On shrub and tree trunk, 1400 m alt., MS-DPM 3614, 3646.

Macromitrium longipilum A.Braun *ex* Müll. Hal.
On tree trunks, 1450–1550 m alt., MS-DPM 3658, 3663, 3678.

This species is the largest member of the genus in Borneo, with distributional range restricted to the Malesian region. Although the species is highly polymorphic in its vegetative character, it can generally be recognised by the presence of its long piliferous costa and robust size.

Macromitrium ochraceoides Dixon
On boulders and shrub branch in open and partially shaded areas, 2230 m alt., MS-DPM 3741, 3742, 3743.
This Bornean endemic species is closely allied to *M. ochraceum* and has been considered as a form of the latter by Eddy (1996). However, *M. ochraceoides* can always be distinguished from *M. ochraceum* by the presence of long-piliferous costa and smooth laminal cells at the lower half of the leaf which are not found in the latter species. Although this species is common at the higher elevation of Mount Kinabalu, and now reported for Mount Tambuyokon, it has never been collected outside of Kinabalu Park.

Macromitrium ochraceum (Dozy & Molk.) Müll. Hal.
On tree trunk and rotten log in open and partially shaded areas, 1200–1450 m alt., MS-DPM 3590, 3641.

**Macromitrium salakanum* Müll. Hal.
On fallen branch, 550 m alt., MS-DPM 3552.
A common species in Malesia region, with distributional range extended eastward to Solomon Islands and New Caledonia. This species is morphologically allied to *M. angustifolium*, which could only be separated from the latter species by its long-lingulate perichaetial leaves that end in a blunt or obtuse apex, whereas the leaf apex is acuminate in *M. angustifolium*.

Schlotheimia rubiginosa C.H. Wright
Fallen from tree canopy, 1720 m alt., MS-DPM 3708.
A Bornean endemic species with very narrow distributional range. Formerly, it was only collected from higher elevation of Mount Kinabalu, at upper montane to subalpine forest, and Mount Tambuyokon is now the second locality known for this species. The species is easily recognised by its robust plant size with its peculiar reddish-brown colour. In addition to these, the species is characterized by having long oblong leaves with obtuse to retuse apex, and prorate basal laminal cells.

Schlotheimia wallisii Müll. Hal.
On tree trunk and base of shrubs, 1480–1520m, MS-DPM 3665, 3672, 3675.

In Borneo, this species has only been reported from Mount Kinabalu 79 years ago (Suleiman et al., 2006).

POLYTRICHACEAE
Pogonatum cirratum (Sw.) Brid. subsp. *cirratum*
On soil, 800 m alt., MS-DPM 3564.

Pogonatum cirratum subsp. *fuscatum* (Mitt.) Hyvönen
On rock, 1400 m alt., MS-DPM 3608.

Pogonatum cirratum subsp. *macrophyllum* (Dozy & Molk.) Hyvönen
On soil, 1300 m alt., MS-DPM 3599.

Pogonatum piliferum (Dozy & Molk.) Touw
On soil, 1170 m alt., MS-DPM 3588.

POTTIACEAE
Barbula consanguinea (Thwaites & Mitt.) A. Jaeger
On boulder, 700 m alt., MS-DPM 3772.

Hydrogonium orientale (F. Weber) Jan Kučera
On soil, 830 m alt., MS-DPM 3570.

Pseudosymblepharis bombayensis (Müll. Hal.) P.Sollman
On boulders in open and partially shaded areas 1550–2200 m alt., MS-DPM, 3683, 3722, 3731, 3734, 3739.

PTEROBRYACEAE
Calyptothecium recurvulum (Müll. Hal. *ex* Broth.) Broth.
On tree trunk, 750 m alt., MS-DPM 3579.
This large species is fairly common in lower montane forests in Sabah, especially along rivers.

Cryptogonium phyllogonioides (Sull.) Isov.
On tree trunk, 400–550 m alt., MS-DPM 3559, 3775.

Neolindbergia rigida (Bosch & Sande Lac.) M. Fleisch.
On tree trunk, 800 m alt., MS-DPM 3571.

PTYCHOMNIACEAE

****Garovaglia baeuerlenii** (Geh.) Paris

On humus and tree trunk, 1670–1900 m alt., MS-DPM 3703, 3716.

This species has only been reported twice from Borneo; both records are from Sarawak (Suleiman et al., 2006).

Garovaglia sp.

On tree trunk, 700 m alt., MS-DPM 3567.

PYLAISIADELPHACEAE

Clastobryum indicum (Dozy & Molk.) Dozy & Molk.

On trunk of treelet, 1450 m alt., MS-DPM 3623.

Isocladiella surcularis (Dixon) B.C.Tan & Mohamed

On tree trunk, 750 m alt., MS-DPM 3774.

Trismegistia calderensis (Sull.) Broth.

On boulder and shrub trunk, 1600 m alt., MS-DPM 3692, 3706.

Trismegistia lancifolia (Harv.) Broth.

On rotten log, 760 m alt., MS-DPM 3562.

Trismegistia panduriformis (C.H.Wright) Broth.

On trunk of shrub, 1550 m alt., MS-DPM 3689.

RACOPILACEAE

Racopilum spectabile Reinw. & Hornsch.

On rotten rock, logs and tree root, 700– 1760 m alt., MS-DPM 3563, 3572, 3591, 3712.

RHIZOGONIACEAE

Pyrrhobryum spiniforme (Hedw.) Mitt.

On tree buttress, 500 m alt., MS-DPM 3548.

Rhizogonium graeffeanum (Müll. Hal.) A.Jaeger.

On tree base, 1300 m alt., MS-DPM 3601.

SEMATOPHYLLACEAE

A*canthorrhynchium papillatum* (Harv.) M.Fleisch.

On rotten log, 500 m alt., MS-DPM 3547.

****Acroporium aciphyllum** Dixon
On humus, 1750 m alt., MS-DPM 3711.
Dixon (1935) first reported this species for Borneo (Sarawak) but without citing any reference material. Thus, this finding represents the second record of this species in Borneo and confirms its presence on this island.

Acroporium convolutum (Sande Lac.) M.Fleisch.
On rotten log, 550–900 m alt., MS-DPM 3555, 3583.

Acroporium diminutum (Brid.) M. Fleisch.
On tree and shrub trunks, 1650–1750 m alt., MS-DPM 3701, 3710.

Acroporium lamprophyllum Mitt.
On shrub trunk, 1450 m alt., MS-DPM 3657.

Acroporium macro-turgidum Dixon
On humus and rotten log, 2100 m alt., MS-DPM 3719, 3720.
This species is the largest member of the genus. It is only known from the Malay Peninsula and Borneo, and thus far this is the second record for Sabah.

Acroporium rigens (Broth. *ex* Dixon) Dixon
On humus and rotten logs, 1200–1450 m alt., MS-DPM 3589, 3624.

Acroporium rufum (Reinw. & Hornsch.) M. Fleisch.
On tree trunk, 2150 m alt., MS-DPM 3726.

Acroporium hyalinum (Reinw. *ex* Schwägr.) Mitt. var. *hyalinum*
On tree trunks and humus, 1400–2470 m alt., MS-DPM 3616, 3694, 3758.

Acroporium hyalinum var. *hamulatum* (M. Fleisch.) M.S. Chua & B.C. Ho
On trunk of shrub, 1450 m alt., MS-DPM 3655.

Acroporium strepsiphyllum (Mont.) B.C. Tan
On shrub trunk, 1480 m alt., MS-DPM 3670.

Clastobryophilum bogoricum (Bosch & Sande Lac.) M. Fleisch.
On tree trunk, 1450 m alt., MS-DPM 3651.

***Macrohymenium muelleri* Dozy & Molk.

On tree trunks of shrub and tree, 2300–2450 m alt., MS-DPM 3744, 3748, 3752, 3756.

The members of this genus are characterized by having inner peristome teeth that are much longer than those found at the outer peristome row, which is unique among the members of Sematophyllaceae.

THUIDIACEAE

Thuidium pristocalyx (Müll. Hal.) A. Jaeger

On rotten log, 720 m alt., MS-DPM 3773.

TRACHYLOMATACEAE

Trachyloma indicum Mitt.

On root of tree, 1350 m alt., MS-DPM 3613.

The apical leaves cells of this specimen are not pitted, in contrast to Hyvonen (1989). This species has the habits and size of *Hypnodendron reinwardtii*, and thus difficult to distinguish in the field, but the inconspicuous costa and asymmetric leaves will separate it from the latter.