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MOSSES OF GUNUNG HALIMUN NATIONAL PARK, WEST JAVA, INDONESIA

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ABSTRACT

TAN, BENITO C.; HO, BOON-CHUAN; LINIS, VIRGILIO; ISKANDAR, EKA A.P.; NURHASANAH, IPAH; DAMAYANTI, LIA; MULYATI, SRI; HAERIDA, IDA. 2006. Mosses of Gunung Halimun National Park, West Java, Indonesia. *Reinwardtia* 12(3): 205–214. — 150 species of mosses in 74 genera and 25 families are reported for the first time from Gunung Halimun National Park (GHNK) in West Java. Three mosses are new to the Indonesia flora (*Distichophyllum collenchymatosum*, *D. malayense* and *Fissidens kinabaluensis*), and another four mosses represent new records for Java (*Dicranodontium asperulum*, *Daltonia armata*, *Glossadelphus bilobatus* and *Syrrhopodon semiliber*). In additions, seven can be classified as uncommon mosses in the Malesian region. This shows that the forests of GHNK deserve a high priority of protection not only for the island of Java, but also for Indonesia and Malesia as well.

Keywords: Gunung Halimun National Park, Java, Indonesia, mosses, biodiversity

ABSTRAK

TAN, BENITO C.; HO, BOON-CHUAN; LINIS, VIRGILIO; ISKANDAR, EKA A.P.; NURHASANAH, IPAH; DAMAYANTI, LIA; MULYATI, SRI; HAERIDA, IDA. 2006. Lumut dari Taman Nasional Gunung Halimun, Jawa Barat, Indonesia. *Reinwardtia* 12(3): 205–214. — Untuk pertama kalinya dilaporkan bahwa terdapat 150 jenis lumut daun yang termasuk ke dalam 74 marga dan 25 suku dari Taman Nasional Gunung Halimun di Jawa Barat. Terdapat tiga lumut daun yang tercatat baru untuk flora Indonesia (*Distichophyllum collenchymatosum*, *D. malayense* dan *Fissidens kinabaluensis*), dan empat jenis lainnya untuk Jawa (*Dicranodontium asperulum*, *Daltonia armata*, *Glossadelphus bilobatus* dan *Syrrhopodon semiliber*). Sebagai tambahan, tujuh jenis lainnya dikategorikan sebagai lumut daun yang tidak umum ditemukan untuk daerah Malesia. Hal ini menunjukkan bahwa hutan di Taman Nasional Gunung Halimun pantas mendapatkan prioritas perlindungan tidak hanya untuk pulau Jawa, tapi juga untuk Indonesia dan Malesia.

Kata kunci: Taman Nasional Gunung Halimun, Jawa, Indonesia, biodiversitas.

INTRODUCTION

Covering 40,000 hectares, the Gunung Halimun National Park (GHNP) [106°21' to 106°38'E and 6°37' to 6°51'S], which was formally established in 1997, is the largest preserved primary forests in West Java. The park has a steep and much dissected topology, with the highest peaks reaching 1,929 m (G Halimun Utara). The rainfall varies between 4,000 and 6,000 annually, with a distinct dry season occurring from May/June to September when the precipitation decreases to around 200 mm per month on average. The average daily temperature is 20°-30° C. The dominant vegetation consists of lowland dipterocarp forest from 500-900(-1,000) m, the submontane transition forest from 1,000-1,500 m, and the montane lauraceous-ericaceous forest at attitudes above 1,500 m (see Harada et al. 2003). The diversity of seed plants and pteridophytes are reported to be high consisting of about 1,000 species, but very little is known about the bryophytes of this national park.

In 2005, the office of SEAMEO-BIOTROP in Bogor offered a workshop to introduce the biodiversity, ecology and conservation of Malesian bryophytes and lichens to selected ASEAN participants, Indonesian postgraduate students, and national park staff. A two days (Sept 10 and 11, 2005) field trip was organized to visit the montane forest on Gn Kendeng, and to explore the richness of mosses in the lowland rain forest along the Cikaniki-Citalahab Loop Trail between 600 to 1,000 m. A set of moss collections was made, identified, and deposited at the herbarium of BIOTROP Office, Bogor Herbarium (BO) and SINU Herbarium.

Below we present a summary of our moss survey made for Gn Halimun. Relevant information on local distribution and abundance, elevation range, and substrates are reported for all the species identified, while taxonomic synonymy and comments are provided for selected mosses where necessary. The names of individual collectors of moss specimens are listed for each of the species entries for reference.

Our study of some 300 packets of mosses collected from the two days visit to GHNP shows that the indigenous moss flora is quite diverse and rich in taxa, consisting of 150 species of mosses in 74 genera and 25 families. This represents about 1/5 of the moss diversity of Java Island (see Fleischer 1904-1923). Three mosses are confirmed new to the Indonesia flora (*Distichophyllum collenchymatosum*, *D. malayense* and *Fissidens kinabaluensis*), and another four mosses represent

new records for Java (*Dicranodontium asperulum*, *Daltonia armata*, *Glossadelphus bilobatus* and *Syrrophodon semilibera*). In additions, seven can be classified as uncommon mosses in the Malesian region. These are *Acroporium longicaule*, *Fissidens hyalinus*, *Distichophyllum jungermannioides*, *Dendrocyathophorum decolyi*, *Pogonatum camusii*, *P. rutteri*, and *Thamnobryum ellipticum*. This shows that the forests of GHNP deserve a high priority of protection not only for the island of Java, and also for Indonesia and Malesia as well.

The GHNP is rather unique in having a high concentration of species in some moss genera within the small forested areas that we surveyed. These genera are *Acroporium* (10 spp.), *Fissidens* (10 spp.), *Distichophyllum* (9 spp.), *Syrrophodon* (7 spp.), *Leucobryum* (6 spp.) and *Pogonatum* (5 spp.). On the other hand, the areas explored by us do not seem to harbour some of the widespread moss taxa found in nearby Gn Salak and Gn Gedeh-Pangerango, such as *Arthrocormus schimperi* (Dozy & Molk.) Dozy & Molk., *Fissidens ceylonensis* Dozy & Molk., *Funaria hygrometrica* Hedw., *Isopterygium minutirameum* (Muell.Hal.) A.Jaeg., *Leucophanes octoblepharioides* Brid., *Neckeropsis lepinea* (Mont.) M.Fleischer, and *Rhodobryum giganteum* (Schwaegr.) Paris (cf. Möller 1919; Fleischer 1904-1923; Crum 1959). This seemingly paradoxical pattern of distribution of moss species at GHNP is most likely an artifact of our limited collections made along the two forested trails chosen for the inventory exercise.

List of Mosses found on Gn Halimun arranged alphabetically first by family, and then, by genera and species.

BARTRAMIACEAE

Philonotis hastata (Duby) Wijk & Margad. [syn. *Philonotis laxissima* Mitt.] – in wet shaded sites in tea plantation and coconut grove, ca 1,000 m. Coll. V. Linis.

Philonotis revoluta Bosch & Sande Lac. – on wet soil and bark of tree trunk in settlement, ca 700 m. Colls. B.-C. Ho, K.-T. Yong.

BRYACEAE

Bryum apiculatum Schwaegr. – on soil and roof tiles at the park station in Cikaniki, ca 700-800 m. Colls. B.-C. Ho, V. Linis.

Brachymerium nepalense Hook. – common on tree trunks in tea plantation, ca 700 m. Colls. B.-C. Ho, V. Linis. An early report on the bryophytes growing in tea plantation in Central Java also mentioned this species growing abundantly on trunks of tea plants (Pancho 1979).

CALYMPERACEAE

Calymperes fasciculatum Dozy & Molk. – on tree trunk, wood stump, and log, ca 1,000–1,400 m. Colls. V. Linis, K.-T. Yong.

Calymperes serratum A.Braun ex. Muell.Hal. – on tree trunk, ca 1,000 m. Colls. B.-C. Ho, V. Linis. Only one collection is found during the survey, but the species is not rare in Malesian lowland rain forests.

Exostratum blumei (Nees ex Hampe) L.T.Ellis – common, on shaded tree trunks, 1,000–1,400 m. Colls. B.-C. Ho, S. Lee, M. Massora, V. Linis.

Mitthyridium fasciculatum Dozy & Molk. – on small and large tree trunks. Colls. B.-C. Ho, V. Linis, K.-T. Yong.

Mitthyridium fasciculatum subsp. *cardotii* (M.Fleisch.) B.C.Tan & L.T.Ellis [syn. *M. cardotii* (M.Fleisch.) H.Rob.] – on tree trunk and branches, 900–1,200 m. Colls. B.-C. Ho, K.-T. Yong.

Mitthyridium fasciculatum subsp. *obtusifolium* (Lindb.) M.Menzel [syn. *M. obtusifolium* (Lindb.) H.Rob.] – on tree trunk and logs, 1,000–1,600 m. Coll. V. Linis.

Mitthyridium flavum (Muell.Hal.) H.Rob. – on tree trunk and branches, 1,000–1,600 m. Colls. B.-C. Ho, V. Linis.

Mitthyridium jungquilianum (Mitt.) H.Rob. – on tree trunk and root mass of epiphytic fern, 1,000–1,100 m. Coll. V. Linis.

Mitthyridium repens (Harv.) H.Rob. – on tree trunk, rare at elevation higher than 1,000 m. Coll. V. Linis.

Syrrhopodon gardneri (Hook.) Schwaegr. – uncommon in the study sites, on soil, ca 1,300 m. Coll. V. Linis.

Syrrhopodon muelleri (Dozy & Molk.) Sande Lac. – on tree trunk, ca 1,100 m. Colls. B.-C. Ho, V. Linis.

Syrrhopodon parasiticus (Sw. ex Brid.) Paris – on tea plants in open area, ca 1,000 m. Colls. B.-C. Ho, V. Linis. The presence of gemmae on the leaf costa, instead of at leaf tip, is characteristic of this species. The species is not common in primary forests in Java.

Syrrhopodon prolifer var. *albidus* (Thwaites & Mitt.) Orban & W.D. Reese [syn. *S. albidus* Thwaites & Mitt.] – on branches, twigs and dead wood, 1,200–1,600 m. Colls. B.-C. Ho, V. Linis, K.-T. Yong.

Syrrhopodon semiliber (Mitt.) Besch. [Plate 2, G & H] – on tree trunks, ca 1,000 m. Colls. B.-C. Ho, K.-T. Yong. The specimen of this species is similar to *S. parasiticus* in having many filamentous gemmae growing on the surface of leaf costa, but differs from the latter in having multipapillose leaf cells (see Reese and Lin 1991). The specimen from Gn Halimun has many oblong to oblanceolate, and few ovate-lanceolate, leaves.

Syrrhopodon spiculosus Hook. & Grev. – uncommon in the study sites, on tree trunk, ca 1,000 m. Colls. B.-C. Ho, V. Linis. The species is rather abundant in lowland rain forest in Malesian region at lower elevations.

S. tristichus Nees ex Schwaegr. – common in forest at high elevations, on tree trunks, 1,200–1,600 m. Colls. B.-C. Ho, V. Linis.

DICRANACEAE

Campylopodium medium (Duby) Giese & Frahm – on disturbed soil in tea plantation, ca 950–1,000 m. Colls. S. Lee, V. Linis. The curved setae of this species, when fresh, is diagnostic.

Campylopus subericoides R.S.Williams – on soil and log in open sites, 1,200–1,600 m. Colls. B.-C. Ho, S. Lee, V. Linis, K.-T. Yong.

Dicranodontium asperulum (Mitt.) Broth. – uncommon, on decaying logs, 1,350–1,600 m. Coll. V. Linis. The caducous leaves with a single thick and broad costa are characteristic. New to Java Island.

Dicranoloma assimile (Hampe) Paris – on tree trunks, branches and logs, 1,300–1,600 m. Colls. B.-C. Ho, V. Linis, K.-T. Yong.

Dicranoloma blumei (Nees) Paris – on tree trunks, near summit of Gn Kendeng, above 1,600 m. Coll. V. Linis. This species has the longest and most cylindrical leaves among its congeners.

Dicranoloma braunii (Muell.Hal.) Paris – on tree trunks, from 1,000–1,600 m. Colls. B.-C. Ho, V. Linis.

Dicranoloma leucophyllum (Hampe ex Sande Lac.) Paris – on tree trunks, 1,300–1,600 m. Colls. V. Linis, K.-T. Yong.

Leucoloma celebesiae Broth. – locally rare, on tree trunks, ca 1,000 m. Colls. B.C. Ho, V. Linis.

Leucoloma molle (Muell.Hall.) Mitt. – locally common, on trunks, branches, logs and root masses, 1,100–1,600 m. Colls. *B.-C. Ho*, *V. Linis*, *B.C. Tan*. The partially naked stem and branches caused by the caducous leaves are characteristic of this species.

Microdus miquelianus (Mont.) Besch. – on disturbed soils around village near tea plantation, ca 800–1,000 m. Coll. *B.-C. Ho*.

Trematodon longicollis Michx. – on soil bank in tea plantation, ca 1,000 m. Coll. *V. Linis*. The long “giraffe-like” capsular neck and the erect capsule are distinctive for this species.

DIPHYSCIACEAE

Diphyscium mucronifolium Mitt. [syn. *D. involutum* Mitt.] – on boulders by the trail bank along Loop Trail. Colls. *V. Linis*, *B.C. Tan*. The asymmetrically large and sessile capsule covered by the long excurrent costae of perichaetial leaves is distinctive. The claim of the species as endemic to Java, Sumatra, Borneo, the Philippines and Japan (see Triono et al. 2002) is a misnomer for an indigenous species.

DITRICHACEAE

Garckea flexuosa (Griff.) Margad. & Nork. [syn. *G. phascoides* Muell. Hal.; *G. comosa* (Dozy & Molk.) Wijk & Margad.] – on soil in open, disturbed sites, 900–1,000 m. Colls. *B.-C. Ho*, *K.-T. Yong*.

FISSIDENTACEAE

Fissidens crassinervis Sande Lac. – common along forest trail, on soil from 1,000–1,300 m. Colls. *V. Linis*, *E.A.P. Iskandar*, *K.-T. Yong*.

Fissidens crispulus Brid. [syn. *F. zippelianus* Dozy & Molk.] – common, on rocks and soil inside forest, from 700–1,000 m. Colls. *E.A.P. Iskandar*, *V. Linis*.

Fissidens hollianus Dozy & Molk. – on rocks, soil, stream bank and root stumps, from 1,000–1,100 m. Colls. *B.-C. Ho*, *E.A.P. Iskandar*, *S. Lee*, *V. Linis*, *B.C. Tan*, *L. Damanyanti*. A small population of this species was found growing on an abandoned rubber slipper submerged in a stream along the Loop Trail. The multipapillose leaf cells,

coupled with the rough seta, are diagnostic for this species.

Fissidens hyalinus Hook. & Wilson – rare to uncommon, on wet, deeply shaded soil bank and rocks by the stream, ca 1,000 m. Coll. *E.A.P. Iskandar*. The absence of a costa is unique and distinctive for this species.

Fissidens javanicus Dozy & Molk. – on rocks near stream, ca 1,000 m. Colls. *E.A.P. Iskandar*, *S. Lee*.

Fissidens kinabaluensis Z.Iwats. – on soil, ca 1,000 m. Coll. *E.A.P. Iskandar*. The narrow and sharply pointed leaf apices, the pluripapillose leaf cells, and the presence of hyaline nodule help to identify this species. The report of this species from Indonesia in Li and Iwatsuki (2001) is based on the wrong geographical placement of Mt. Kinabalu of Sabah in Indonesia. Other localities reported for this species in Malesia are from Malaysian Borneo and Papua New Guinea. Our report here is the first confirmed record for Indonesia.

Fissidens nobilis Griff. – on soil and wet rocks by stream, ca 1,000 m, along Loop Trail. Colls. *E.A.P. Iskandar*, *S. Lee*, *V. Linis*, *Radhiah Zakaria*. This is the largest plant of *Fissidens* in GHNP.

Fissidens papillosus Sande Lac. – not common, on tree trunk, ca 1,000 m. Coll. *V. Linis*.

Fissidens pellucidus Hornsch. [syn. *F. laxus* Sull. & Lesq.] – on forest soil and rocks, from 700–1,500 m. Colls. *E.A.P. Iskandar*, *K.-T. Yong*.

Fissidens serratus Muell.Hal. – rare, on root stump, ca 1,300 m. Coll. *V. Linis*.

HOOKERIAACEAE

Actinodontium ascendens Schwaegr. – surprisingly rather common in the two study sites, on bamboo stems and decayed logs, ca 1,000 m. Colls. *B.-C. Ho*, *V. Linis*, *K.-T. Yong*.

Callicostella papillata (Mont.) Mitt. – common, on wet logs, root stumps, and rocks by stream, ca 1,000 m, along Loop Trail. Colls. *B.-C. Ho*, *V. Linis*, *K.-T. Yong*.

Callicostella prabaktiana (Muell.Hal.) Bosch & Sande Lac. – on wet rocks, c 1,050 m, along Loop Trail. Coll. *B.-C. Ho*.

Calypstrochaeta remotifolia (Muell.Hal.) Z. Iwats., *B.C. Tan* & *Touw* – on tree trunks and decayed logs, ca 1,000–1,200 m, rather common along the Loop Trail, especially

- towards the side of Citalahab, but rare on the trail to Gn Kendeng from the Cikaniki station. Colls. *B.-C. Ho, V. Linis, K.-T. Yong.*
- Cyclodictyon blumeinum* (Muell.Hal.) Kuntze – uncommon, on rotten log in deep shade, ca 1,000 m. Coll. *B.-C. Ho.*
- Daltonia armata* E.B.Bartram – uncommon, on tree trunks and dead leaf sheath of palm, ca 900–1,100 m, along trail to Gn Halimun and also along the Citalahab Loop Trail. Colls. *B.-C. Ho, V. Linis.* This is an uncommon species in Malesia. It is a new moss record for Java.
- Distichophyllum collenchymatosum* Cardot [Plate 2, F] – on root stumps in deep forest, ca 1,600 m. Colls. *V. Linis, K.-T. Yong.* In Malesia, this widespread temperate Asiatic species is known previously only from the Philippines. It is new to Indonesia.
- Distichophyllum jungermannioides* (Muell.Hal.) Bosch & Sande Lac. [Plate 1, D] – uncommon, on tree bases, from 980–1,050 m. Coll. *K.-T. Yong.*
- Distichophyllum malayense* Damanhuri & Mohamed [Plate 1, A] – rare, on decayed logs inside forest, ca 1,000 m. Coll. *B.-C. Ho.* The species has similar leaf morphology like *Distichophyllum nymanii* M.Fleisch. See Damanhuri and Mohamed (1986) for the distinction between these two taxa. New to Indonesia.
- Distichophyllum mittenii* Bosch & Sande Lac. – common, on various wet substrates in forest, from 900–1,600 m. Colls. *B.-C. Ho, V. Linis, Sri Mulyati, K.-T. Yong, L. Damanyanti.*
- Distichophyllum nigricaulle* Mitt. ex Bosch & Sande Lac. var. *nigricaulle* [syn. *D. gracilicaule* M.Fleisch.] [Plate 1, C] – not so common, on exposed palm roots, and soil inside forest, ca 900–1,300 m. Coll. *B.-C. Ho.* The synonymy of this species and its varietal treatment follows Tan and Robinson (1990).
- Distichophyllum nigricaulle* var. *cirratum* (Renauld & Cardot) M.Fleisch. [Plate 1, D] – very common, on various wet substrates along forest trails, ca 980–1,500 m. Colls. *B.-C. Ho, V. Linis, Sri Mulyati, B.C. Tan, K.-T. Yong, Radhiah Zakaria.* The broad leaf border and the area of seemingly smaller cells near the leaf margin than near the costa are characteristic of this variety (see Tan and Robinson 1990).
- Distichophyllum osterwaldii* M.Fleisch. – on wet rocks in shade near stream, ca 950 m. Coll. *B.-C. Ho.* This is the largest plant of

Distichophyllum found in GHNP growing to 2–3 cm.

- Distichophyllum subnigricaulle* Broth. – uncommon, on wet shaded soil near creek, from 900–1,100 m. Colls. *B.-C. Ho.* The uniformly large leaf cells are distinctive.
- Distichophyllum tortile* Dozy & Molck. ex Bosch & Sande Lac. – on soil bank near stream, ca 900–1,000 m. Coll. *B.-C. Ho, L. Damanyanti.* This species was found also growing on an abandoned rubber slipper submerged in a stream along the Loop Trail.
- Distichophyllum undulatum* Dozy & Molck. ex Bosch & Sande Lac. [Plate 2, A] – not uncommon, on rotten logs and soil in forest, from 1,000–1,500 m. Colls. *Sri Mulyati, Radhiah Zakaria.* The irregularly and weakly toothed leaf margin, with a narrow and indistinctive border at leaf apex, is diagnostic for this *Distichophyllum*.

HYPNACEAE

- Ectropotheciella distichophylla* (Hampe ex Dozy & Molck.) M.Fleisch. – on shaded soil and tree trunk base, half way along the Loop Trail, ca 1,000 m. Coll. *B.C. Tan.* The strongly prorate leaf cells is characteristic for this species.
- Ectropothecium buitenzorgii* (Bél.) Mitt. – common, on tree trunks, rocks and logs, ca 1,000–1,600 m. Colls. *S. Lee, V. Linis.* The regularly pinnate branching habit is quite distinctive.
- Ectropothecium dealbatum* (Reinw. & Hornsch.) A.Jaeg. – on log, ca 1,200 m. Coll. *B.-C. Ho.*
- Ectropothecium ichnotocladum* (Muell.Hal.) A. Jaeg. – on trunks in tea plantation, ca 1,000 m. Coll. *S. Lee.*
- Glossadelphus bilobatus* (Dixon) Broth. – on wet rocks covered with soil, ca 1,000 m., also on deeply shaded rocks by a creek in Citalahab. Colls. *V. Linis, B.C. Tan.* The taxonomic distinction between this species and *Phyllodon lingulatus* (Cardot) W.R.Buck [syn. *Glossadelphus lingulatus* (Cardot) M.Fleisch.; *G. laevifolius* (Mitt.) E.B.Bartram] needs clarification. In his revision of the genus, Tixier (1988) distinguished *G. bilobatus* from the latter by its conduplicate bilobed lateral leaves. But this feature is illustrated in Noguchi (1994) for Japanese specimens of *P. lingulatus*. It is possible that the two taxa are synonymous. The key character used to separate the two species shown in the Chinese revision of the

genus *Glossadelphus* (Jia and Wu 2004), which sees a double-toothed apical leaf margin in *G. bilobatus*, but not in *P. lingulatus*, is not supported by the specimens of these two species. Tixier (1988) had classified both species in the Section *Anastigma* (Cardot) M.Fleisch. sharing the same doubly toothed apical leaf margin. *Glossadelphus bilobatus* is a new species record for Java.

Glossadelphus cf. *micro-similans* (Dixon) E.B.Bartram [syn. *Taxithelium micro-similans* Dixon] – on tree trunk, near the GHNP station at Citaniki, ca 950 m. Coll. V. Linis. The collection compares well with the illustrations of this species in Dixon (1935) and the description prepared by Bartram (1939). The plants look like a specimen of *Taxithelium instratum* without the seriate papillae on leaf cells. The leaves are broadly ovate to ovate, and have a distinctly constricted base consisting of a few enlarged, thin-walled, and coloured, alar cells. The leaf apices are variable, mostly obtuse, at times apiculate, rarely short acuminate, but always strongly serrate, and forming a few irregularly crowded teeth at the leaf tip. The laminal cells are smooth, and linear, with sharp ends, but not “minutely papillose at the apical angles” as reported by Bartram (1939), neither “spiculose” as described by Dixon (1935). Tixier (1988) was not correct to consider this a synonym of *G. similans* (Bosch & Sande Lac.) M.Fleisch.

Isopterygium albescens (Hook.) A.Jaeg. – common, on stem bases, soil and logs, 1,200–1,600 m. Colls. V. Linis, K.-T. Yong.

Isopterygium bancanum (Sande Lac.) A.Jaeg. – on dead log, ca 1,000 m. Coll. B.-C. Ho.

Pseudotaxiphyllum pohliaecarpum (Sull. & Lesq.) Z.Iwats. – common, on soil, 1,200–1,400 m. Colls. B.-C. Ho, V. Linis, K.-T. Yong. The purplish color of the population is both attractive and characteristic.

Trachythecium micropyxis (Broth.) E.B.Bartram – on rock, ca 1,000 m. Coll. V. Linis. The strongly mammillose exothecial cells of the capsule help in the correct identification.

Vesicularia dubyana (Muell.Hal.) Broth. – on soil and rotten logs, ca 800–1,000 m. Coll. B.C. Tan.

Vesicularia montagnei (Bél.) Broth. – on rocks in stream along Loop Trail. Coll. V. Linis.

Vesicularia reticulata (Dozy & Molk.) Broth. – on wood, rocks and root stumps in wet places, ca 1,000 m. Coll. B.-C. Ho, L.

Damanyanti. A small population was found growing on an abandoned rubber slipper submerged in a stream along the Loop Trail.

HYPNODENDRACEAE

Hypnodendron dendroides (Brid.) Touw – on logs and root stumps in forest, 1,000–1,400 m. Colls. B.-C. Ho, V. Linis, K.-T. Yong.

Hypnodendron diversifolium Broth. & Geh. – on forest floor along the trail to summit of Gn Kendeng. Coll. B.-C. Ho.

Hypnodendron milnei Mitt. ssp. *korthalsii* (Paris) Touw – common on forest floor at higher elevations from 1,000–1,500 m along the trail to summit of Gn Kendeng, and on shaded wet rocks along Loop Trail. Colls. B.-C. Ho, V. Linis.

Hypnodendron reinwardtii (Schwaegr.) Lindb. ex A.Jaeg. – on tree bases, from 980–1,600. Colls. V. Linis, K.-T. Yong.

HYPOPTERYGIACEAE

Dendrocycathoporum decolyi (Broth. ex M.Fleisch.) Kruijer [syn. *D. paradoxum* (Broth.) Dixon] – on tree trunks and rocks, ca 1,000 m. Colls. B.-C. Ho, V. Linis. This is an uncommon species in Malesia, but surprisingly rather common in some places in the two study sites on Gn Halimun.

Lepidium struthiopteris (Brid.) M.Fleisch. [syn. *L. trichocladon* (Bosch & Sande Lac.) M.Fleisch.] – locally very common, on tree trunks, 1,000–1,500 m. Colls. B.-C. Ho, V. Linis, K.-T. Yong.

LEUCOBRYACEAE

Leucobryum aduncum Dozy & Molk. – on tree trunks, soil and logs. Colls. B.-C. Ho, M. Massora.

Leucobryum aduncum var. *scalare* (Muell.Hal. ex M.Fleisch.) A.Eddy – on root stumps. Coll. V. Linis.

Leucobryum aduncum var. *teysmannianum* (Dozy & Molk.) T.Yamaguchi [syn. *L. pentastichum* Dozy & Molk.] – rather common locally, on tree trunks and logs at higher elevation. Colls. B.-C. Ho, S. Lee, V. Linis, M. Massora. The clearly five spiral rows of leaves is distinctive for this variety.

Leucobryum arfakianum Muell.Hal. ex Geh. – on tree trunks and soil. Colls. V. *Linis*, M. *Massora*.

Leucobryum chlorophyllosum Muell.Hal. – on log, soil and root stump. Colls. B.-C. *Ho*, V. *Linis*, M. *Massora*. This has the smallest plant size among species of *Leucobryum*.

Leucobryum javense (Brid. ex Schwaegr.) Mitt. – common, on tree trunks, boulders and soil. Colls. B.-C. *Ho*, V. *Linis*, M. *Massora*. This species is the biggest in *Leucobryum*.

Leucobryum juniperoideum (Brid.) Muell.Hal. – on tree trunk. Coll. M. *Massora*.

Leucobryum cf. *sericeum* Broth. ex Geh. – on soil. Coll. M. *Massora*.

Leucophanes angustifolium Renauld & Cardot. – common, locally abundant, on tree trunks, logs and soil, from 1,000–1,500 m. Colls. B.-C. *Ho*, V. *Linis*.

Octoblepharum albidum Hedw. - on tree trunks near tea plantation. Coll. V. *Linis*.

Schistomitrium nieuwenhuisii M.Fleisch. – on decaying log. Coll. M. *Massora*.

LEUCOMIACEAE

Leucomium strumosum (Hornsch.) Mitt. [syn. *L. aneurodictyon* (Muell.Hal.) A.Jaeg.] – on soil in shaded bank along the Loop Trail, ca 1,000 m. Coll. B.C. *Tan*. The narrowly lanceolate to lanceolate and acuminate leaves, coupled with large and broadly fusiform leaf cells, and the absence of leaf costa, identify easily this species.

METEORIACEAE

Aerobryidium filamentosum (Hook.) M.Fleisch. – common, on trunks and branches inside forest, from 800–1,000 m. Colls. B.-C. *Ho*, V. *Linis*, B.C. *Tan*.

Barbella flagellifera (Cardot) Nog. – on palm tree trunks and branches inside forest, from 600 to 1,600 m near summit of Gn Kendeng. Colls. B.-C. *Ho*, V. *Linis*, *Ipah Nurhasanah*.

Barbella pendula (Sull.) M. Fleisch. [syn. *B. elongata* R.S.Williams] – on branches and twigs in forest, from 800–1,050 m. Colls. B.-C. *Ho*, V. *Linis*, *Ipah Nurhasanah*.

Floribundaria floribunda (Dozy & Molk.) M.Fleisch. – on branches, from 1,000–1,200 m. Colls. B.-C. *Ho*, *Ipah Nurhasanah*.

Meteorium polytrichum Dozy & Molk. [syn. *M. miquelianum* (Muell.Hal.) M.Fleisch.] – on

branches and tree trunk, from 600–1,200 m. Colls. B.-C. *Ho*, *Ipah Nurhasanah*.

Meteorium subpolytrichum (Besch.) Broth. – on branches in forest, from 800–1,100 m. Also in Citalahab tea plantation. Colls. B.-C. *Ho*, V. *Linis*, *Ipah Nurhasanah*.

Papillaria fuscescens (Hook.) A.Jaeg. – on branches in forest, from 800–1,000 m. Colls. V. *Linis*, *Ipah Nurhasanah*.

NECKERACEAE

Himantocladium plumula (Nees) M.Fleisch. – on tree trunk, ca 1,100 m. Coll. V. *Linis*.

Homaliodendron exiguum (Bosch & Sande Lac.) M.Fleisch. – rather common on tree trunks and rocks along Loop Trail, ca 1,000–1,200m. Colls. B.-C. *Ho*, V. *Linis*.

Homaliodendron flabellatum (Sm.) M.Fleisch. – very common, on tree trunks, root stumps and decayed logs, from 1,000–1,400 m. Colls. B.-C. *Ho*, V. *Linis*, K.-T. *Yong*.

Pinnatella ambigua (Bosch & Sande Lac.) M.Fleisch. – on tree trunk in forest, ca 1,100 m. Coll. V. *Linis*.

Pinnatella mucronata (Bosch & Sande Lac.) M.Fleisch. – on tree trunk in forest, ca 1,000 m. Colls. B.-C. *Ho*, V. *Linis*.

ORTHOTRICHACEAE

Macromitrium blumei Nees ex. Schwaegr. – rather common, on tree trunks, branches and logs, from 1,200 m to near summit of Gn Kendeng. Colls. B.-C. *Ho*, V. *Linis*, K.-T. *Yong*.

Macromitrium fuscescens Schwaegr. [syn. *M. miquelii* Mitt. ex Bosch & Sande Lac.] – on stem, ca 1,000 m, near tea plantation. Coll. B.-C. *Ho*.

POLYTRICHACEAE

Pogonatum camusii (Thér.) Touw [syn. *Racelopodopsis subcostata* Dixon & Herzog] – rare, on rocks and soil, ca 1,600 m. Colls. B.-C. *Ho*, S. *Lee*, V. *Linis*.

Pogonatum cirratum (Sw.) Brid. – on soil in shaded bank, trail to Gn Kendeng. Coll. B.-C. *Ho*

Pogonatum macrophyllum Dozy & Molk. [syn. *Pogonatum cirratum* (Sw.) Brid. ssp. *macrophyllum* (Dozy & Molk.) Hyvönen] – very common, on soil and rocks in deep shade along trail banks, 900–1,350 m. Colls. B.-C. *Ho*, V. *Linis*.

Pogonatum neesii (Muell.Hal.) Dozy – on soil in open sites and disturbed road sides, 900–1,100 m. Colls. *B.-C. Ho, S. Lee, V. Linis, K.-T. Yong.*

Pogonatum rutteri (Thér. ex Dixon) Dixon [syn. *Pseudoracelopus rutteri* (Thér. ex Dixon) A. Eddy] – rare, on shaded soil, ca 900–1,050 m. Colls. *B.-C. Ho, V. Linis, K.-T. Yong.* The leaf appearance of this species is not *Pogonatum*-like owing to the absence of lamellae on the ventral side of the leaf.

POTTIACEAE

Barbula indica (Hook.) Spreng. – common on soil in tea plantation. Coll. *B.-C. Ho.*

Barbula javanica Dozy & Molk. – on roots near creek, ca 1,000 m. Coll. *V. Linis.*

Hyophila involuta (Hook.) Jaeg.- common on cement walls in Citalahab village, ca 900 m. Coll. *V. Linis.*

PTEROBRYACEAE

Garovaglia elegans (Dozy & Molk.) Hampe ex Bosch & Sande Lac. [syn. *Endotrichella pilifera* Broth.] – on fallen branches and tree trunks inside forest and also on trees in open sites near tea plantation and Cikaniki Station, 700–1,000 m, Colls. *B.-C. Ho, V. Linis, K.-T. Yong.*

Pterobryopsis crassicaulis (Muell.Hal.) M. Fleisch. – common at higher elevation, on tree trunks and decayed logs, 1,000–1,600 m. Colls. *B.-C. Ho, V. Linis, K.-T. Yong.*

Symphysodon neckeroides Dozy & Molk. – common, on tree trunks, inside forest, 900–1,000 m. Colls. *V. Linis, K.-T. Yong.*

Symphysodontella attenuatula M.Fleisch. – on tree trunks, 1,000–1,600 m. Colls. *B.-C. Ho, S. Lee, V. Linis, K.-T. Yong.*

Symphysodontella cylindracea (Mont.) M.Fleisch. – on tree trunk, 1,000–1,500 m. Colls. *B.-C. Ho, V. Linis, K.-T. Yong.*

Trachyloma indicum Mitt. – very common, on tree trunks, 900–1,600 m. Colls. *B.-C. Ho, V. Linis, K.-T. Yong.*

RACOPILACEAE

Racopilum spectabile Reinw. & Hornsch. – on rock, ca 1,000 m. Coll. *B.-C. Ho.*

Racopilum spectabile var. *subisophyllum* Herzog [syn. *Racopilum johannis-winkleri* Broth.] – on rock by the stream along the Loop Trail, ca 1,000 m. Colls. *B.-C. Ho, V. Linis.* The distal leaves on stem and branches of this species are not arranged in three ranks.

RHIZOGONIACEAE

Pyrrhobryum spiniforme (Hedw.) Mitt. – common, on tree trunks, plants becoming bigger at higher elevations, 1,000–1,400 m. Colls. *B.-C. Ho, V. Linis, K.-T. Yong.*

SEMATOPHYLLACEAE

Acanthorrhynchium papillatum (Harv.) M. Fleisch. – on tree trunk, ca 1,250 m. Coll. *V. Linis.*

Acroporium adpersum (Hampe) Broth. – on trunks and branches, ca 1,000 m. Colls. *S. Lee, V. Linis.*

Acroporium convolutum (Bosch & Sande Lac.) M.Fleisch. var. *elatum* (Dixon) B.C.Tan – on tree trunks, rotten wood and root stumps, ca 900–1,400 m. Colls. *B.-C. Ho, V. Linis.*

Acroporium diminutum (Brid.) M.Fleisch. – common, on branches, small stems and logs, 1,200–1,600 m. Colls. *V. Linis, B.C. Tan.*

Acroporium johannis-winkleri Broth. – common, on logs, root stumps and trunk bases, ca 1,200–1,400 m. Colls. *B.-C. Ho, V. Linis.*

Acroporium lamprophyllum Mitt. – common, on fallen trunks, logs and branches, 1,000–1,400 m. Colls. *B.-C. Ho, V. Linis.*

Acroporium longicaule (Sande Lac.) M. Fleisch. – locally common, hanging from branches or on tree trunks, 1,400–1,600 m. Colls. *B.-C. Ho, V. Linis, K.-T. Yong.* This is an uncommon Malesian species, but locally quite abundant on tree trunks and branches. .

Acroporium rigens (Dixon) Dixon – on tree trunks and branches, ca 1,500–1,600 m. Colls. *S. Lee, V. Linis, K.-T. Yong.*

Acroporium secundum (Reinw. & Hornsch.) M.Fleisch. – on dead branches, ca 1,000 m. Coll. *V. Linis.*

Acroporium stramineum (Reinw. & Hornsch.) M.Fleisch. – common, on trunks and branches in forest, also on shaded stems in tea plantation, 900–1,600 m. Colls. *B.-C. Ho, V. Linis, K.-T. Yong.*

Acroporium stramineum var. *turgidum* (Mitt.) B.C.Tan – on wet, shaded slope. Coll. *V. Linis.*

- Acroporium strepsiphyllum* (Mont.) B.C.Tan in Touw – rather common, on logs, branches and root stumps, 1,200–1,650 m. Colls. *B.-C. Ho, V. Linis*.
- Brotherella falcata* (Dozy & Molk.) M.Fleisch. – rare, on tree trunk, ca 1,600. Coll. *Nina R. Djuita*. The broadly lanceolate, concave leaves, with short acuminate and toothed apex, are quite similar to the temperate Asiatic species, *B. henonii* (Duby) M.Fleisch. But the latter does not develop a pendant habit as in *B. falcate* (see Tan and Jia 1999).
- Clastobryum cuculligerum* (Sande Lac.) Tixier – on fallen branches, ca 1,000–1,200 m. Colls. *K.-T. Yong, B.C. Tan*.
- Clastobryum epiphyllum* (Renauld & Cardot) B.C. Tan & Touw [syn. *C. papillosum* R.S.Williams] – on wood, ca 1,000 m. Coll. *K.-T. Yong*.
- Clastobryum indicum* (Dozy & Molk.) Dozy & Molk. – on tree trunks in forest, ca 1,200 m, trail to Gn Kendeng. Coll. *V. Linis*. The confusion between this species and *C. conspicuum* M.Fleisch. had been clarified by Tan and Iwatsuki (1992). The Gn Halimun specimen of this species looks just like the illustration of this species published in Fleischer (1904–1923), especially the drawing of its somewhat long seta with erect capsule and recurved outer peristome teeth (when dry). But the leaves of the specimens from Gn Halimun are mostly oblong-lanceolate.
- Isocradiella surcularis* (Dixon) B.C.Tan & Mohamed – common on small stems in forest, 1,100–1,600 m. Colls. *B.C. Ho, V. Linis, B.C. Tan*. The numerous long, flagellate branches found near or at the tip of branches are characteristic.
- Meiothecium hamatum* (Muell.Hal.) Broth. – on fallen branch, ca 1,000 m. Coll. *K.-T. Yong*. The hamate leaf tips of this species are characteristic.
- Meiothecium microcarpum* (Hook.) Mitt. – on coconut tree trunk in Citalahab village and the tea plantation. Coll. *B.C. Tan*. The single, whitish and papillose peristome teeth identify the species easily in the field.
- Papillidiopsis stissophylla* (Hampe & Muell.Hal.) B.C.Tan & Y.Jia [syn. *Trichosteleum stissophyllum* (Hampe & Muell.Hal.) A.Jaeg.] – on rock in wet place, ca 1,000 m. Coll. *B.-C. Ho*.
- Radulina elegantissima* (M.Fleisch.) W.R.Buck & B.C.Tan [syn. *Trichosteleum elegantissimum* M.Fleisch.] – on decaying log, trail margin, ca 1,000 m. Coll. *B.C. Tan*. This species has

not been interpreted as a distinct species by many people. The distinction between this and *R. hamata* is well outlined by Fleischer (1904–1923). In our observation, the slender plant habit, about half the size of *R. hamata*, is a distinctive character for identifying *R. elegantissima*.

- Radulina hamata* (Dozy & Molk.) W.R.Buck & B.C.Tan – common, on log, root stump and tree base, 1,000–1,200 m. Colls. *B.-C. Ho, V. Linis, B.C. Tan, K.-T. Yong*.
- Sematophyllum subpinnatum* (Brid.) E.Britton var. *tristiculum* (Mitt.) B.C.Tan & Y.Jia – common, on palm trunks in village, 700–900 m. Colls. *B.-C. Ho, S. Lee, V. Linis, K.-T. Yong*. Pancho (1979) also reported this moss from trunks and leaves of tea plans in Central Java.
- Taxithelium instratum* (Brid.) Broth. in Renauld & Cardot – on log and trunk of tree fern, ca 1,000–1,500 m. Coll. *V. Linis*.
- Taxithelium lindbergii* (A.Jaeg.) Renauld & Cardot – on logs, branches and tree trunks, ca 1,100–1,600 m. Colls. *B.-C. Ho, V. Linis, K.-T. Yong*.
- Taxithelium magnum* M.Fleisch. – on branches, ca 1,250 m. Coll. *B.C. Tan, K.-T. Yong*. This species is close to *T. lindbergii*, but differs in being larger plant, with more or less erect-spreading (not falcate) leaves, and a series of weakly developed papillae on cell lumen. Its type locality is on Gn Gedeh.
- Taxithelium nepalense* (Schwaegr.) Broth. - on lianas, logs and branches, ca 1,000–1,200 m. Colls. *S. Lee, V. Linis*.
- Trichosteleum boschii* (Dozy & Molk.) A.Jaeg. – on log and tree root, ca 1,000 m. Colls. *S. Lee, V. Linis, K.-T. Yong*.
- Trichosteleum stigosum* Mitt. – on log, ca 1,000 m. Coll. *B.-C. Ho, L. Damanyanti*. A small population of this species was found growing on an abandoned rubber slipper submerged in a stream along the Loop Trail.
- Trismegistia calderensis* (Sull.) Broth. – on root stumps and logs, ca 1,400–1,600 m. Colls. *B.-C. Ho, V. Linis, K.-T. Yong*.
- Trismegistia rigida* (Reinw. & Hornsch.) Broth. – common, on root stumps, tree trunks, logs and soil, ca 900–1550 m. Colls. *B.-C. Ho, V. Linis, K.-T. Yong*.

THAMNOBRYACEAE

- Thamnobryum ellipticum* (Bosch & Sande Lac.) Nog. & Z.Iwats. – locally common, forming

large populations on wet boulders by the stream along Loop Trail, ca 1,000 m. Colls. B.-C. Ho, V. Linis, B.C. Tan. The wiry stem and branches with unicostate leaves are characteristic. The wet habitat also helps in its identification.

THUIDIACEAE

Claopodium assurgens (Sull. & Lesq.) Cardot – on tree trunk, ca 1,000 m. Coll. B.-C. Ho.

Pelekium versicolor (Muell. Hal.) Touw – on decayed log, ca 1,200. Coll. B.-C. Ho.

Thuidium cymbifolium (Dozy & Molk.) Dozy & Molk. – on rocks, logs, stream bank and forest soil, from 1,000–1,200 m. Colls. B.-C. Ho, V. Linis, K.-T. Yong.

Thuidium pristocalyx (Muell.Hal.) A.Jaeg. – on logs and tree bases, from 1,000–1,200 m. Colls. V. Linis, Ipah Nurhasanah., B.C. Tan, K.-T. Yong.

TRACHYPODACEAE

Trachypus humilis Lindb. – on tree trunk, ca 1,000 m. Coll. V. Linis.

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