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# New and Biogeographically Noteworthy Records of Philippine Mosses from Mindanao Island

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**Abstract.** Sixteen new records of Philippine mosses, namely, *Acroporium ramicola, Atractylocarpus comosus, Campylopus flagelliferus, Ectropothecium ptychofolium, Fissidens guangdongensis, Garovaglia bauerlenii, Holomitrium stenobasis, Hypnodendron auricomum, Leucobryum boninense, Macromitrium archboldii, Meiotheciella papillosa, Neolindbergia cladomnioides, Rhynchostegiella vriesei, Schlotheimia emarginato-pilosa, Symphysodontella parvifolia* and *Trichosteleum singapurense* are reported. *Atractylocarpus* and *Meiotheciella* are two new generic records for the country. Additional Mindanao records of five uncommon mosses in the Philippines, i.e., *Claopodium assurgens, Cryptogonium phyllogonioides, Erpodium biseriatum, Meiothecium bogoriense* fo *tenuissima* and *Papillaria leuconeura*, are also reported.

The large and diverse Philippine moss flora has a modern checklist (Tan and Iwatsuki 1991). The history and progress of Philippine bryology was reviewed and summarized by Tan (1992) who discussed in detail the floristic composition and affinity of the archipelagic moss flora (see also Tan 1984). In these publications, Mindanao was mentioned as an important island, albeit with a still incompletely known flora, which may hold critically the key to a better understanding of the origin and evolution of the entire Philippine moss flora.

In recent years, the island of Mindanao has been alleged to have a different geological origin and plate tectonic history from the rest of the islands forming the Philippine archipelago (Hall 1998). As such, this second largest and most southern island of the country may harbour important floristic and bryogeographical information that needs to be documented before the local forests become completely decimated.

To date, Mindanao Island has a total of 187 genera and 314 species of mosses (cf. Tan

and Iwatsuki 1991), 50 of which are known only from this island. The rest are found also in Luzon and the Visayas Islands. Among the 50 species of Philippine mosses known from Mindanao, 4% are widespread in the tropics, 60% are Malesian taxa, 21% have an Australasian link, 10% have a Bornean link, and only 6% have a continental Asiatic connection. Clearly, the moss flora of Mindanao has a strong southern and Australasian influence compared to other large islands in the country (see also Tan 1998).

We report below sixteen new records of Philippine species collected recently from Mindanao, and additionally, five taxa of Mindanao mosses that present noteworthy local range extensions. Of the 16 new records of Philippine mosses, two are primarily continental Asiatic in range, seven are widespread Malesian species, two are Bornean-Mindanao endemic, and five are Australasian/Oceanian taxa reaching the Philippines (mainly Mindanao).

For reference purpose, vouchers of the new Philippine moss records are preserved at the herbaria of SINU of the National University of Singapore, the herbarium of the Central Mindanao State University (CMSU), and the personal herbarium of Mr. U. Schwarz.

*Acroporium ramicola* (Hampe) Broth. [Family Sematophyllaceae] –

According to Tan (1994), this is a difficult species to interpret and identify. Having erect, spreading and acicular leaves when dry, it is like a large version of the common *A. diminutum* (Brid.) Fleisch. The leaf cells of *Acroporium ramicola* are clearly unipapillose whereas the leaf cells of *A. diminutum* are generally smooth, occasionally prorate. *Acroporium ramicola* also looks like *A. convolutum* (Bosch & Sande Lac.) Fleisch. The latter, however, has ovate-lanceolate leaves, quite unlike the narrowly lanceolate and tightly involute leaves of *A. ramicola*.

The present species was first described from Sarawak of Borneo and later reported from Papua New Guinea (Tan 1994). The new Philippine (Mindanao) record would seem to indicate that the species is probably widely scattered across the region but overlooked by plant collectors.

**Specimen studied**: Mt. Kalatungan, Bukidnon Province, 2080 m elev., on log, May 1999, coll. *L. Lubos K147* (SINU, herbarium of CMSU).

*Atractylocarpus novoguineensis* (Broth. & Geh.) Norris & Kop. (syn. *A. comosus* Dix.) [Family Dicranaceae] –

*Atractylocarpus* is a new generic record for the Philippine moss flora. The species is also known in the literature by its synonyms, *A. dicranoides* Dix. and *A. comosus* Dix. It is a bright green, silky plant with long setaceous leaf apices. The leaf lamina is narrowly lanceolate with a broad costa and the areolation is *Campylopus*-like. The capsules are erect and oblong. The geographical range of this species is from New Guinea, Sulawesi to Borneo (Eddy 1988), as well as in Sumatra, Bhutan and Nepal (J. Eggers *et al*. 1998). Its presence in the southern Philippines is therefore not unexpected.

**Specimen studied**: Mt. Apo, Lake Venado, Davao del Sur Province, 2210 m elev., March 1999, coll. *U. Schwarz 3765* (SINU; personal herbarium of Schwarz).

*Campylopus flagelliferus* (C. Muell.) Jaeg. [Family Dicranaceae] -

This is a rather widespread species in the tropics and yet only a few records are reported from the Malesian region, which include Peninsula Malaya, Borneo and New Guinea. The species is easily identified by the presence of flagellate branchlets at the terminal of stems and branches that serve as vegetative propagules. The Philippine specimen was identified by J.-P. Frahm. It is reported here as new to the Philippines.

**Specimens studied**: Mt. Apo, Lake Venado, Davao del Sur Province, ca 2210 m elev., March 1999, coll. *U. Schwarz 3818, 3821* (SINU; personal herbarium of Schwarz).

*Claopodium assurgens* (Sull. & Lesq.) Card. [Family Thuidiaceae] -

This species is mainly continental Asiatic in range reaching south to Batan Island in northern Luzon (see Tan and Iwatsuki 1991) and disjunctively, in Java (Fleischer 1904-1923). The Mt. Apo record represents a significant extension of range in the Philippines. *Claopodium assurgens* can be easily distinguished from the widespread tropical *C. prionophyllum* Broth. by its broadly ovate to triangular stem leaf outline. Watanabe (1972) provided good illustrations and key characters to differentiate the two taxa.

**Specimen studied**: Mt. Apo, Lake Agko area, North Cotabato Province, ca 1240-1490 m, Aug 1999, *F. Schumm and U. Schwarz 4993* (SINU; personal herbarium of Schwarz).

*Cryptogonium phyllogonioides* (Sull.) Isov. [Family Pterobryaceae] –

This distinctive species is identified by its complanate and pseudo-distichous phyllotaxy. Most of the leaves are cymbiform or conduplicately folded and are without costa.

The present record is new to the province of Bukidnon that forms the high plateau of Mindanao. Although infrequent in Mindanao and Palawan, the species, in spite of its fairly large size, is not known from Luzon and the Visayan island groups. It appears to be an Oceanic taxon reaching westward to the Philippines and Peninsula Malaya.

**Specimens studied**: Mt. Kalatungan, Bukidnon Province, 2565 m elev., on tree trunk, May 1999, coll. *L. Lubos K206, K205* (SINU; herbarium of CMSU).

*Ectropothecium ptychofolium* Nishimura [Family Hypnaceae] -

This species is known for decades as a Bornean endemic under its synonyms, *Ptychophyllum borneense* Broth. and *P. aureum* Herz. & Dix. On the basis of leaf alar and capsular morphology, it was transferred to *Ectropothecium* by Nishimura (1984) who also provided a new name for this taxon. As a member of *Ectropothecium*, the species is easily identified by its large size, triangular-lanceolate and strongly plicate leaves with a large basal row of thick walled cells. More importantly is the development of a large, hyaline and decurrent cell at the basal corner of the stem and branch leaves. The latter is a typical feature of many species of *Ectropothecium*. The Philippine specimen is sterile and the species is new to the Philippine flora.

**Specimen studied**: Mt. Lumot, southwest of Gingoog City, Misamis Oriental Province, on tree trunk, Aug 1999, *F. Schumm & U. Schwarz 4094* (SINU; personal herbarium of Schwarz).

*Erpodium biseriatum* (Aust.) Aust. [Family Erpodiaceae] -

The present collection is the second one from the Philippines; the first collection hailed from Musuan in Bukidnon Province of Mindanao. The species is morphologically unique among mosses in having a complanate, biseriate and incubous leaf arrangement like that seen in many hepatics. Its sporophyte, however, with persistent seta and capsule, is typical of mosses.

The species is widespread pantropically but always locally infrequent. In Asia, populations of *E. biseriatum* are found mostly on large tree trunks in disturbed forests or on planted trees around human settlements.

**Specimen studied**: Mt. Kalatungan, Bukidnon Province, 2650 m elev., on tree trunk, May 1999, coll. *L. Lubos K220* (SINU; herbarium of CMSU).

*Fissidens guangdongensis* Iwats. & Z.-H. Li [Family Fissidentaceae] -

This is actually not a rare entity in tropical Southeast Asia and its discovery in the Philippines is not surprising. The species was recognized formally from *F. pellucidus* Hornsch. (syn. *F. laxus* Sull. & Lesq.) in the publication

of Li (1985). *Fissidens guangdongensis* is easily identified from *F. pellucidus* by its percurrent to short costa reaching several cells below the leaf apex. The actual range is shown to be from southern China to Japan (Suzuki and Iwatsuki 1999), and now, the Philippines. With more careful research, the species should eventually be found also on Luzon Island. We also have seen specimens of *Fissidens guangdongensis* from Peninsular Malaya and Singapore.

**Specimen studied**: Mt. Lumot, southwest of Ginoog City, Misamis Oriental province, on wet ground, ca 1490 m, Aug 1999, *F. Schumm & U. Schwarz 4715* (SINU; personal herbarium of Schwarz).

*Garovaglia bauerlenii* (Geh.) Par. [Family Pterobryaceae] -

This is a large and beautiful species of *Garovaglia* characterized by a tumid foliation with strongly rugose as well as plicate leaves. According to Hyvönen (1989), the leaves are broadly ovate. The leaf apices are abruptly acute to gradually acuminate and the leaf base has neither auricular nor decurrent development. The species seems uncommon in the Malesian region having been collected sporadically from Peninsular Malaya and Papua New Guinea, and now, Mindanao. It is a new moss record for the Philippine archipelago.

**Specimens studied**: Mt. Kalatungan, Bukidnon Province, 2305 m elev., rotten log, May 1999, coll. *L. Lubos K178* (SINU; herbarium of CMSU); Mt. Lumot, southwest of Ginoog City, Misamis Oriental Province, on trunk, 1110-1140 m elev., Aug 1999, *F. Schumm & U. Schwarz 4116, 4719* (SINU; personal herbarium of Schwarz).

*Holomitrium stenobasis* Dix. [Family Dicranaceae] – Fig. 1: a-f.

This is a unique species of *Holomitrium* that is strinkingly similar to some pottiaceous genera, such as *Tortella* and *Pseudosymblepharis*, in having cirrate to strongly contorted leaves when dry. The leaves are lanceolate-linear and long acuminate, and are without alar development. But the peristome and the smooth leaf areolation are dicranaceous. Eddy (1988) reported it as a Malesian endemic with widespread distribution from New Guinea to Sumatra. In spite of this claim, it is reported here for the first time from the Philippines.

**Specimen studied**: Mt. Apo, Lake Venado, Davao del Sur Province, 2210 m elev., March 1999, coll. *U. Schwarz 3764* (SINU; personal herbarium of Schwarz).

*Hypnodendron auricomum* Broth. & Geh. [Family Hypnodendraceae] –

*Hypnodendron auricomum* is a relatively common Malesian species found in many high mountains south of the Philippines. Hence, it is most welcome to see this among our Mindanao collections.

Among its congeners, the species is distinctive in having an umbellate branching habit with a long stipe and numerous appressed stipe leaves (Norris and Koponen 1996). In New Guinea, the species is reportedly rather variable in plant size, being larger at higher elevations (Touw 1971).

The addition of this species to the Mindanao flora highlights the past Gondwanic connection of the island flora.

**Specimen studied**: Mt. Kalatungan, Bukidnon Province, 2020 m elev., on rotten log, May 1999, coll. *L. Lubos K103* (SINU; herbarium of CMSU).

*Leucobryum boninense* Sull. & Lesq. [Family Leucobryaceae] -

This species is new to the Philippines. The size of Mindanao plants approaches that of *L. javense* (Schwaegr.) Mitt., but the plant habit looks more like a *L. bowringii* Mitt. The species identity was confirmed by Dr. T. Yamaguchi (1999, *pers. comm*.) who wrote that "althought the (Mindanao) plants are larger that those of typical *L. boninense*, the leaf shape and the proration of abaxial leaf cells are similar to the typical form." Although the species was

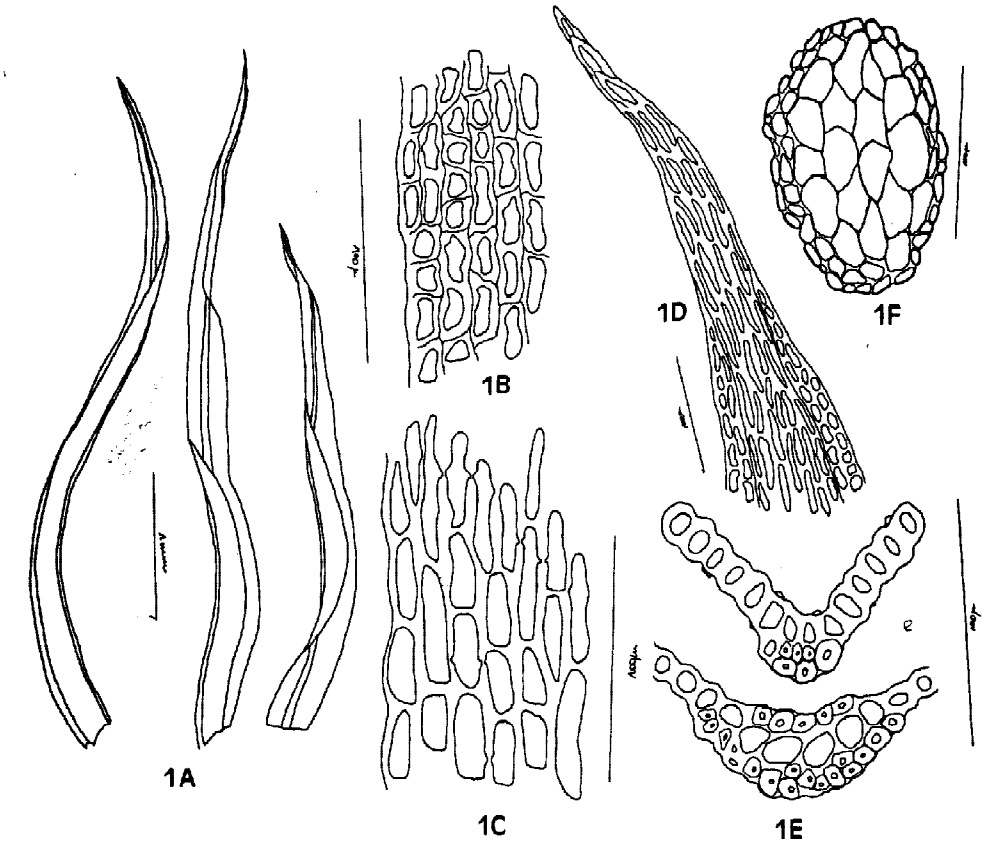


**Fig. 1.** *Holomitrium stenobasis* Dix. (based on *Schwarz 3764*): 1A. Leaves; 1B. Marginal leaf cells; 1C. Basal leaf cells; 1D. Leaf apex; 1E. Leaf cross sections; 1F. Stem cross section. [Scale bar for Fig. 1A is 1 mm; all other bars are 100 µm].

reported in Yamaguchi (1993) as ranging from Japan, China to Taiwan, it is probably well distributed in Malesia. *Leucobryum boninense* appears to be new not just to the Philippines, but also to Malesia.

**Specimens studied**: Mt. Kalatungan, Bukidnon Province, 2045 m elev., on tree trunk, May 1999, coll. *L. Lubos K130* (SINU; herbarium of CMSU); Mt. Lumot, southwest of Ginoog City, Misamis Oriental Province, on trunk, ca 1500 m elev., Aug 1999, *F. Schumm & U. Schwarz 4126* (SINU; personal herbarium of Schwarz).

*Macromitrium archboldii* Bartr. [Family Orthotrichaceae] – Fig. 2: a-e.

This chestnut to reddish brown New Guinean endemic species of *Macromitrium* is rather distinctive. The plant habit approximates that of *M. ochraceum* (Dozy & Molk.) C. Muell. in having similarly twisted and narrowly ovate-lanceolate leaves when dry. The leaf apices are characteristically long-acuminate and rugose. The upper leaf margins are irregularly serrate and notched near apex. The apical leaf cells are oblong and oval, as well as mammillose or

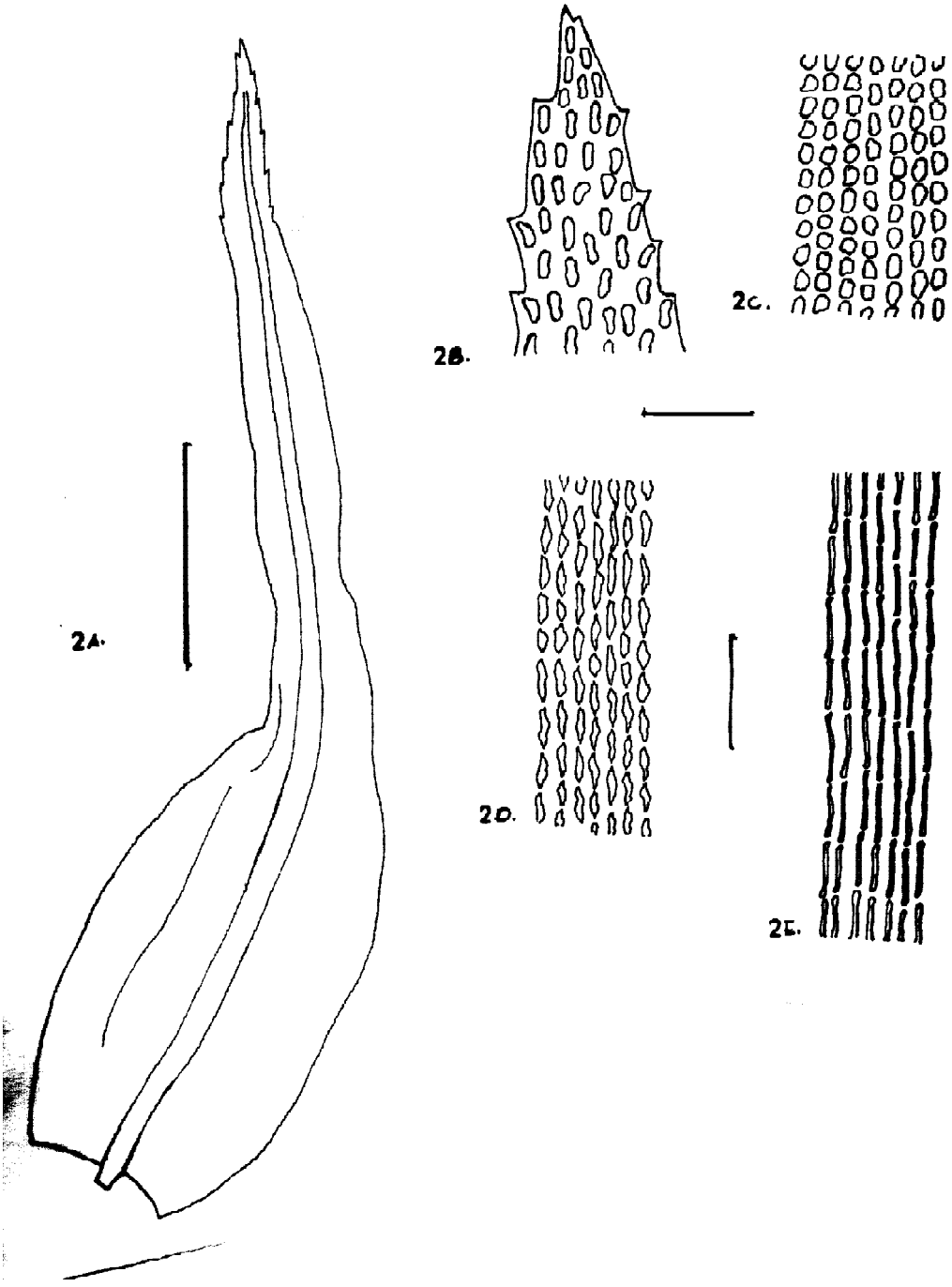


**Fig. 2.** *Macromitrium archboldii* Bartr. (based on *Amoroso, s.n.*): 2A. Branch leaf; 2B. Leaf apex; 2C. Upper leaf cells; 2D. Medial leaf cells; 2E. Basal leaf cells. [Scale bar for Fig. 2A is 1 mm; all other scale bars are 50 µm].

bulging, while the basal leaf cells are smooth, linear and straight to curved. In contrast, the basal leaf cells of *M. ochraceum* are curved and tuberculate. Although the Mindanao collection has no sporophyte to confirm its identify, we are comfortable naming it *M. archboldii* based on the combined leaf characters and good illustration of the species published by Vitt *et al*. (1995). It is a noteworthy addition to the Philippine moss flora.

**Specimen studied**: Mt. Kitanglad, Bukidnon Province, on tree trunk, Jan 1993, coll. *V. Amoroso, s.n.* (SINU; herbarium of CMSU).

*Meiotheciella papillosa* (Broth.) B. C. Tan, Schof. & Ramsay [Family Sematophyllaceae] –

*Meiotheciella* is a segregate genus of *Meiothecium* characterized by having unipapillose leaf cells, among other characters. The genus and the species are both new records for the Philippine flora. The plants are small, half the size of the widespread *Meiothecium microcarpum* (Hook.) Mitt. or about the size of *M. bogoriense* Fleisch. The leaves of the Mindanao plants are ovate and narrowly recurved on both sides. The leaf cells are mostly short oval becoming oblong at leaf base. Tan, Schofield and Ramsay (1998) provided a good illustration of the taxon.

*Meiotheciella papillosa* is now known from the Philippines (Mindanao), Java, New Caledonia and Australia (Queensland). It should be sought for from the intervening islands in the Malesian region.

**Specimens studied**: Mt. Kalatungan, Bukidnon Province, 1210 m elev., on tree of Artocarpus, coll. *L. Lubos K1.A* (SINU; herbarium of CMSU); Mt. Apo, Ilomavis to Kidapawan, North Cotabato Province, *F. Schumm & U. Schwarz 5008, 5029, 5032* (SINU; personal herbarium of Schwarz). .

*Meiothecium bogoriense* Fleisch. fo. *tenuissima* Fleisch. [Family Sematophyllaceae]

This is a distinctive form of *Meiothecium bogoriense* with caducous leaves described by Fleischer (1904-1923) from Java and Singapore. The Mt. Apo collection is the first Philippine record for this taxon.

**Specimen studied**: Mt. Apo, Ilomavis to Kidapawan, North Cotabato Province, on coconut palm, 750 m elev., Aug 1999, *F. Schumm & U. Schwarz 4470* (SINU; personal herbarium of U. Schwarz).

*Neolindbergia cladomnioides* Akiyama [Family Prionodontaceae] - Fig. 3: a-e.

The species is new to the Philippine flora. It was first described from Mt. Kinabalu in Sabah of Malaysia by Akiyama *et al*. (1991) and subsequently found also in East Kalimantan. Its presence in Mindanao is an indication of the close phytogeographical relationship between Mindanao and Sabah State of Borneo. The species is unique in the genus in having rather large, stout and ascending shoots with strongly plicate and serrate leaves. The erect shoots measure to 8-10 cm long and 2-3 mm wide. An excellent illustration of this species can be found in Akiyama *et al*. (1991).

**Specimen studied**: Mt. Matutum, South Cotabato Province, ca 2000 m elev., on rotten logs, July 1999, coll. *L. Lubos M29* (SINU; herbarium of CMSU).

*Papillaria leuconeura* (C. Muell.) Jaeg. [Family Meteoriaceae] –

The species has a previous but doubtful report from Mt. Makiling on Luzon Island (see Tan & Iwatsuki 1991). The new collection from Mindanao confirms its presence in the Philippine archipelago. Compared to the widespread and somewhat similar *P. fuscescens* (Hook.) Jaeg., the present species can be identified by having more tightly appressed leaves when dry. More importantly, the hastate leaf outline is a diagnostic feature of *P. leuconeura*. Noguchi (1976) published an excellent illustration of this species.

*Papillaria leuconeura* has a wide range in Asia distributed from India, Indochina,

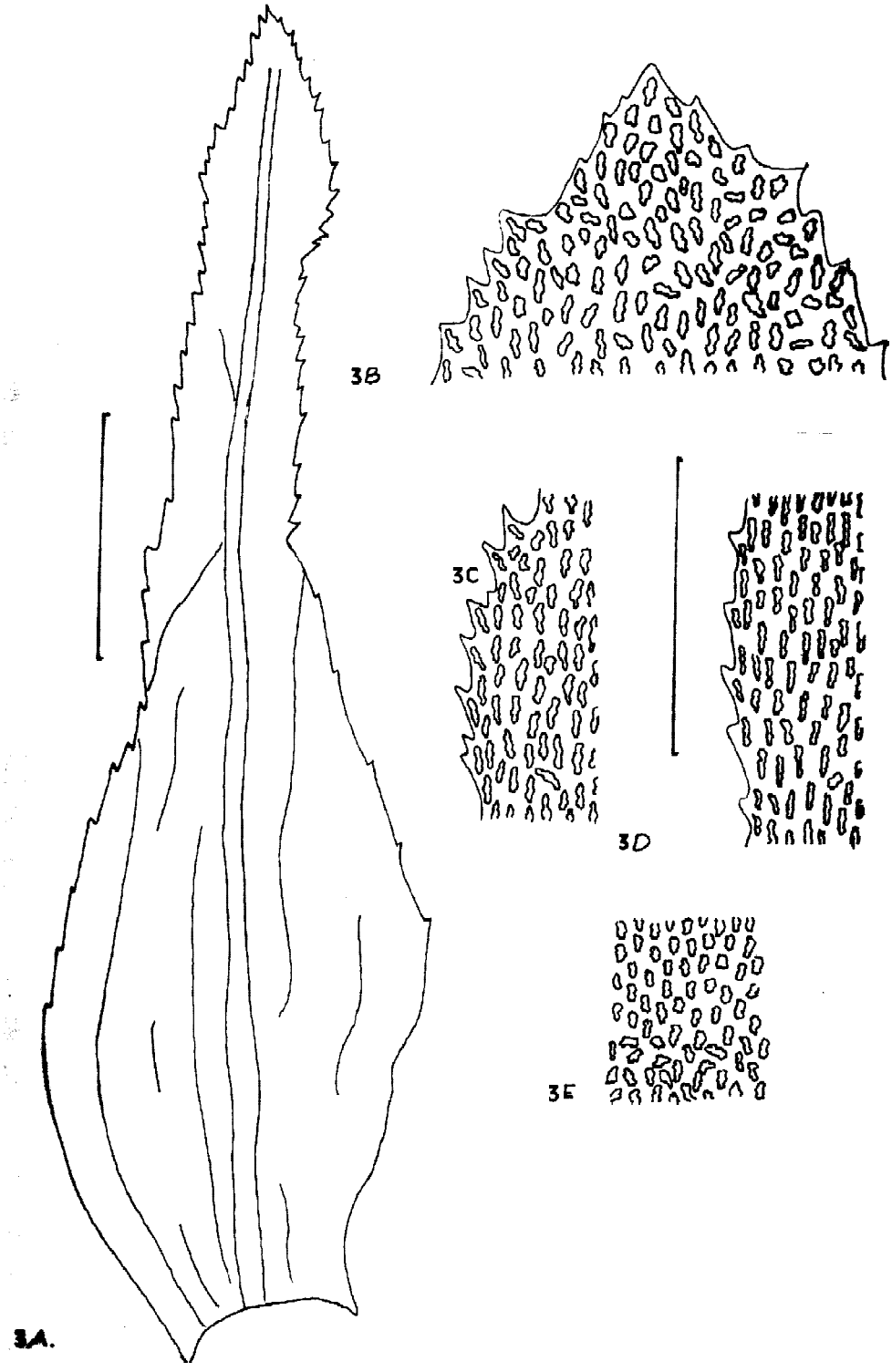


**Fig. 3.** *Neolindbergia cladomnioides* Akiyama (based on *Lubos M29*): 3A. Stem leaf; 3B. Leaf apex; 3C. Upper leaf margin; 3D. Lower leaf margin; 3E. Medial leaf cells. [Scale bar for Fig. 3A is 1 mm; all other scale bars are 0.1 mm].

Malesia to New Caledonia.

**Specimen studied**: Mt. Kalatungan, Bukidnon Province, 1705 m elev., on tree branches, May 1999, coll. *L. Lubos K38* (SINU; herbarium of CMSU).

*Rhynchostegiella vriesei* (Dozy & Molk.) Broth. [Family Brachytheciaceae] – Fig. 4: a-k.

This species is best identified among the Philippine Brachytheciaceae by its narrowly lanceolate and serrulate leaves, in addition to the rough setae. Species of *Rhynchostegium* may have similar lanceolate and serrulate leaves, but the setae are smooth. *Rhynchostegiella vriesei* is another widespread Malesian species reported for the first time from the Philippines.

**Specimen studied**: Mt. Apo, Marbel River campsite, North Cotabato Province, 1480 m elev., March 1999, coll. *U. Schwarz 3776* (SINU; personal herbarium of Schwarz).

*Schlotheimia emarginato-pilosa* Herz. [Family Orthotrichaceae] –

This is the smallest species of *Schlotheimia* in the Philippines. The plants look like a miniature of *S. wallisii* C. Muell. With thickly tomentose branches, twisted leaves when dry, and aristate leaf apices, the plants also looks like a small species of *Leptostomum*. However, the tuberculate basal leaf cells help to place the specimen in the genus *Schlotheimia*. Formerly known from Ceram, Sulawesi and New Guinea (Eddy 1996), its extension to southern Philippines on the Mindanao Island is a welcome.

**Specimen studied**: Mt. Kitanglad, Bukidnon Province, on tree trunks, 1890 m elev., *F. Schumm & U. Schwarz 4333* (SINU; personal herbarium of Schwarz).

*Symphysodontella parvifolia* Bartr. [Family Pterobryaceae] -

According to Hyvönen (1989), this species is unique in the genus in having distinctly long apiculate leaf apices. The ascending shoots of the Philippine (Mindanao) plants are flabellate in branching pattern. Several flagellate tertiary branches are conspicuously formed distally. The species is known from the Lesser Sunda Islands, Moluccas Islands and New Guinea (Magill 1980; Touw 1992). It is reported here for the first time from the Philippines.

**Specimen studied**: Mt. Kalatungan, Bukidnon Province, 1595 m elev., on forest ground, May 1999, coll. *L. Lubos K15* (SINU; herbarium of CMSU).

*Trichosteleum singapurense* Fleisch. [Family Sematophyllaceae] –

This is most likely an under-collected species in western Malesia. It is at present known disjunctively from Singapore (type locality and rather common), Peninsula Malaya, Flores and Hainan (China). In many herbaria specimens, the species is either confused or synonymized with *T. boschii* (Dozy & Molk.) Jaeg. The latter differs in having strong leaf cell papillae and reflexed upper leaf margins. According to Tan and Jia (1999), the Chinese plants of *T. singapurense* are smaller and with ovate-lanceolate, but not so concave, leaves. The species is new to the Philippine flora.

**Specimen studied**: Mt. Apo, Lake Venado, Davao del Sur Province, 2210 m elev., March 1999, coll. *U. Schwarz 3758* (SINU; personal herbarium of U. Schwarz).

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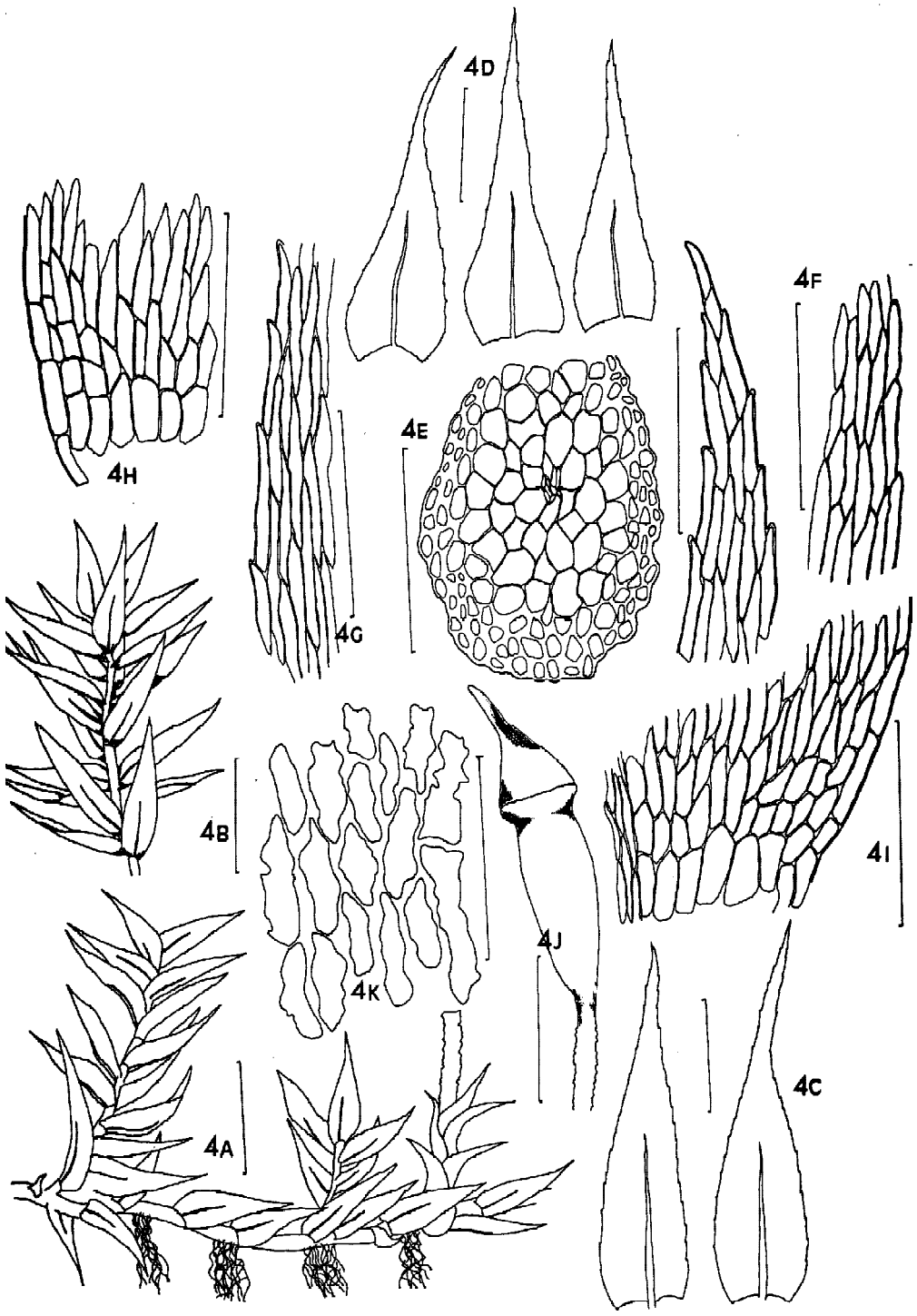


**Fig. 4.** *Rhynchostegiella vriesii* (Dozy & Molk.) Broth. (based on *Schwarz 3776*): 4A. Plant habit; 4B. Branch habit; 4C. Branch leaves; 4D. Stem leaves; 4E. Stem cross section; 4F. Upper and apical leaf cells; 4G. Leaf margin; 4H & 4I. Basal leaf cells; 4J. Capsule with papillose seta; 4K. Exothecial cells of capsule. [Scale bar for Figs. 4A, 4B and 4J is 1 mm; bar for Figs. 4C & 4D is 0.5 mm; all other bars are 100 µm].

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