

Article

**Taxonomic studies of mosses of Seram and Ambon
(Moluccas, East Malesia) collected by Indonesian-Japanese
Botanical Expeditions VIII*.
Meteoriaceae, Hookeriaceae, and Trachypodaceae.**

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Abstract

Mosses of Seram and Ambon Islands are reported based on our collections of the botanical expeditions to the islands. This paper is the eighth part of our report. It includes Meteoriaceae (6 genera and 8 species), Hookeriaceae s. str. (i.e. excluding the members of Daltoniaceae) (5-15), and Trachypodaceae (1-1).

Introduction

The present paper reports on the Meteoriaceae, Hookeriaceae, and Trachypodaceae of the Seram and Ambon Islands, the Moluccas, on the basis of materials collected during Indonesian-Japanese Botanical Expeditions in 1984-'85 and 1986. For the general introduction and geography of the islands and detailed collection sites, see Akiyama (1989).

In citation of specimens, the collector name (*H. Akiyama*) is omitted for economizing space. All specimens are kept at HYO and some duplicates in BO, L, MO, and NY.

METEORACEAE

Menzel & Schultze-Motel (1994) reported *Trachycladiella aurea* (Mitt.) Menzel (= *Floribundaria nipponica* Nog.) from Seram on the basis of the specimen stored at BM. This species was not found among our collections.

Key to the genera
[mostly based on Noguchi (1976)]

1. Branches distinctly terete. Leaf angles definitely auriculate 2
1. Branches mostly flattened (excluding *Aerobrydium crispifolium*). Leaf angles not or slightly

- auriculate 3
2. Lamina cells with several papillae over cell lumen or on longitudinal walls *Papillaria*
2. Lamina cells with a single papilla over cell lumen *Meteorium*
3. Setae longer than 20 mm 4
3. Setae shorter than 10 mm 5
4. Branches terete; leaves strongly undulate *Aerobrydium*
4. Branches flattened; leaves not undulate *Aerobryopsis*
5. Lamina cells with several papillae over cell lumen and longitudinal walls *Floribundaria*
5. Lamina cells with single or rarely two papillae over cell lumen *Pseudobarbella*

Genus *Aerobrydium* Fleisch. ex Broth.

1. *Aerobrydium crispifolium* (Broth. & Geh.) Fleisch. ex Broth., Nat. Pflanz. 1 (3): 821 (1906); Noguchi, J. Hattori Bot. Lab. 41: 292 (1976).

Specimens examined. CENTRAL SERAM: Kanikeh - Wae Angsela, 1280 m, C-8708; Wae Angsela - Wae Huhu, 1290-2000 m, C-8726 (c.sp.); G. Uwelehu near Hatuolo, 630-1000 m, C-9223; Wae Waya - Wolu, 1100 m, C-10430; Hau Harnoe - Piliiana, 800 m, C-15423 (c.sp.).

Habitat. On branches of shrubs and trees in lower montane forests.

*Continued from J. Fac. Sci. Univ. Tokyo III, 15:219-254(1993).

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Distribution. Borneo, Celebes, New Guinea.

Note. Noguchi (1976) distinguished the two genera, *Aerobryopsis* and *Aerobrydium* mainly on the basis of ornamentation of exostome teeth; *Aerobrydium* has exostome teeth that are papillose above and striolate below, while *Aerobryopsis* has those papillose throughout. As Noguchi (1971) and Norris & Koponen (1985) pointed out, however, *Aerobrydium crispifolium* has exostome teeth that are papillose throughout; I confirmed this feature by examining our collections. In addition, lamina cells of *A. crispifolium* are distinctively porose and visible, which are common features among the species of *Aerobryopsis*. Thus, I agree with Norris & Koponen (1985) and only tentatively place this species under *Aerobrydium*. The genus *Aerobrydium* itself can be distinguished from *Aerobryopsis* by the features that Buck (1994; p.54) has noted.

Genus *Aerobryopsis* Fleisch.

Key to the species

1. Plants small; leaves laxly appressed to stems
..... 1. *A. leptosigmata*
1. Plants large; leaves more or less complanate, wide-spreading 2. *A. longissima*

1. *Aerobryopsis leptosigmata* (Geh.) Fleisch., Hedwigia 44: 306 (1905); Fleischer, Musci Fl. Buitenzorg 4: 787 (1907); Noguchi, J. Hattori Bot. Lab. 41: 305 (1976); Norris & Koponen, Acta Bot. Fennica 131: 39 (1985).

Specimens examined. CENTRAL SERAM: Kanikeh - Wae Angsela, 750-1290 m, C-8666; Kanikeh - Selmena, 620-820 m, C-9092; Maraina - Hatuolo, 600-700 m, C-9184; Hatumete - Hoale Pass, 620 m, C-10540; Maneuratu - G. Musamutua, 560 m, C-16401.

Habitat. On branches of trees and shrubs in primary and secondary lower montane forests.

Distribution. Malaysian Peninsula, Vietnam, Sumatra, Java, Philippines, New Guinea.

Note. No specimen among our collections bears sporophytes.

2. *Aerobryopsis longissima* (Dozy & Molk.) Fleisch., Hedwigia 44: 305 (1905); Bartr., Philippine J. Sci. 68: 221 (1939).

Aerobryopsis wallichii auct. non (Brid.) Fleisch., sense Noguchi, J. Hattori Bot. Lab. 41: 295 (1976); Norris & Koponen, Acta Bot. Fennica 131: 38 (1985).

Specimens examined. EAST AMBON: Air Besar, 10 m, C-2384; Liang, 0-5 m, C-14525. WEST SERAM: in the vicinity of Buria, 180 m, C-10079; G. Tiang Bendera, 800 m, C-15547 (c.sp.). CENTRAL

SERAM: in the vicinity of Roho, 60 m, C-8455; Roho - Kanikeh, 60-600 m, C-8520 (c.sp.); in the vicinity of Kanikeh, 600 m, C-8605 (c.sp.); ibid., 800 m, C-8564 (c.sp.); Kanikeh - Wae Angsela, 750-1290 m, C-8691 (c.sp.); Wae Angsela - Wae Huhu, 1740 m, C-8815; Wae Huhu - Owae Puku, 2160 m, C-8878; Kanikeh - Selmena, 620-820 m, C-9079 (c.sp.); Maraina - Hatuolo, 600-700 m, C-9174 (c.sp.); in the vicinity of Elemata Makualaina, 100 m, C-9326; Wae Niniyoa - Wae Puo, 800 m, C-9593 (c.sp.); Wae Niniyoa - Wae Puo, 1030 m, C-9643 (c.sp.); ibid., 1170 m, C-9672 (c.sp.); in the vicinity of Wae Ili, 1050 m, C-9748 (c.sp.); Hatu - Piliana, 150 m, C-10181a; Wolu - Wae Waya, 360 m, C-10305 (c.sp.); Wae Waya - Kokan, 910 m, C-10336; ibid., 1010 m, C-10417 (c.sp.); Hatumete - Hoale Pass, 300 m, C-10479; ibid., 610 m, C-10545 (c.sp.); ibid., 1730 m, C-10717 (c.sp.); ibid., 300 m, C-10738 (c.sp.); Wae Saunule - Wae Nua, 110-560 m, C-14601 (c.sp.); along Wae Nua, 430 m, C-14672; Wae Nua - G. Mapahue, 110-190 m, C-14672; Piliana - Hau Harnoe, 500 m, C-15106 (c.sp.); Ena Puti - Hau Harnoe, 1040 m, C-15355; Hau Harnoe - Piliana, 600 m, C-15429 (c.sp.); Saunule - Batu Kapal, 5-100 m, C-15461 (c.sp.); Wae Heka Heka - Wae Pasola Hatu, 430 m, C-16031 (c.sp.); ibid., 460 m, C-16041 (c.sp.); Losa - Nihehata, 1030 m, C-16581 (c.sp.).

Habitat. Long pendent from branches and trunks of trees in primary and secondary forests. Rarely on stumps of coconut trees on seashore (C-14525).

Distribution. Widely distributed throughout Asia and Oceania.

Note. This species has a long and complicated history in scientific naming. Noguchi (1974) first treated *Neckera longissima* Dozy & Molk. as a synonym of *Hypnum wallichii* Brid. Thus, he used the name *Aerobryopsis wallichii* (Brid.) Fleisch. Recently, however, Buck (1994) recognized these two as different species and suggested the use of the name *Aerobryopsis longissima* (Dozy & Molk.) Fleisch. I followed his suggestion in this report.

Some plants collected in Seram and Ambon show different features from typical ones; C-10079 has rather thin-walled, indistinctly pitted lamina cells, and C-14252 grows on rather dry tree stumps and does not bear pendulous branches.

Judging from my observations in Seram, plants inhabiting at higher elevations (C-8815, 8878, and 10717, for examples) are usually somewhat larger than those in lower elevations.

Genus *Floribundaria* Fleisch.

Key to the species

1. Laminal cells pluripapillose 1. *F. floribunda*

1. Laminal cells with 1 to 3 papillae

..... 2. *F. pseudofloribunda*

1. *Floribundaria floribunda* (Dozy & Molk.) Fleisch., Hedwigia 44: 302 (1905); Bartr., Philippine J. Sci 68: 224 (1939); Noguchi, J. Hattori Bot. Lab. 41: 271 (1976); Norris & Koponen, Acta Bot. Fennica 131: 34 (1985).

Specimen examined. WEST SERAM: in the vicinity of Buria, 180 m, C-10078, 10080 (c.sp.). CENTRAL SERAM: in the vicinity of Roho, 60 m, C-8454; Roho - Kanikeh, 60-600 m, C-8472, 8496; Kanikeh - Wae Angsela, 710 m, C-8611 (c.sp.); ibid., 750-1290 m, C-8684, 8701 (c.sp.); ibid., 1300 m, C-8718; Wae Angsela - Wae Huhu, 1290-2000 m, C-8734 (c.sp.); ibid., 1420 m, C-8750 (c.sp.); Kanikeh - Selmena, 620 - 820 m, C-9075; in the vicinity of Elemata Makualaina, 100 m, C-9309; G. Hausane, 400-650 m, C-9404, 9424; in the vicinity of Sawai, 0-130 m, C-9511; Rumah Sokat Batu, 190 m, C-9922; Hatu - Piliana, 150 m, C-10183; Wae Waya - Kokan, 1040 m, C-10419 (c.sp.); Hatumete - Hoale Pass, 580 m, C-10553 (c.sp.); Wae Salune - Wae Nua, 100-560 m, C-14605; along Wae Nua, 110-190 m, C-14643 (c.sp.); G. Watane, 1740 m, C-15028 (c.sp.); Ena Puti - G. Sinaunia, 2250 m, C-15253; Ena Puti - Hau Harnoe, 1700 m, C-15366; Hau Harnoe - Piliana, 750 m, C-15420 (c.sp.); Wae Pasola Hatu - G. Meseleinan, 570 m, C-16089 (c.sp.).

Habitat. Pendent from branches of shrubs and trees in secondary or primary lowland and montane forests.

Distribution. Widely distributed in Asia, Oceania, Australia and Africa.

2. *Floribundaria pseudofloribunda* Fleisch., Hedwigia 44: 302 (1905); Fleisch., Musci Fl. Buitenzorg 3: 822 (1907); Bartr., Philippine J. Sci. 68: 225 (1939); Noguchi, J. Hattori Bot. Lab. 41: 275 (1976); Norris & Koponen, Acta Bot. Fennica 131: 35 (1985).

Specimen examined. CENTRAL SERAM: in the vicinity of Roho, 60 m, C-8410, 8425, 8450; Roho - Kanikeh, 60-600 m, C-8494; Selmena - Maraina, 700-800 m, C-9116; in the vicinity of Elemata Makualaina, 100 m, C-9300; Sawai - Wae Niniyoa, 70-210 m, C-9553; Wae Niniyoa - Wae Puo, 200-1000 m, C-9558; Rumah Sokat Batu, 160 m, C-9916; Piliana - Hatu, 200 m, C-10243; Hatumete - Hoale Pass, 340 m, C-10480.

Habitat. Growing on branches and trunks of shrubs and trees in secondary or disturbed, lowland or lower montane forests.

Distribution. Widely distributed throughout Malaysia.

Note. *Floribundaria pseudofloribunda* has a distinct four-ranked leaf arrangement and rarely develops pendulous branches. It grows at lower altitudes than *F. floribunda*. It is notable that we did not encounter any plants of this species with sporophytes.

Genus *Meteorium* Dozy & Molk.

1. *Meteorium buchananii* (Brid.) Broth., Nat. Pflanz. 1: 818 (1906); Ganglee, Mosses Eastern India and Adjacent Regions, 2: 1293 (1976); Norris & Koponen, Acta Bot. Fennica 131: 31 (1985).

Specimens examined. Larger form. CENTRAL SERAM: Wae Huhu - Owae Puku, 2160 m, C-8879; ibid., 2230 m, C-8883 (c.sp.); around the summit of G. Owae Puku, 2800-2900 m, C-8994; Wae Niniyoa - Wae Puo, 800 m, C-9594; Wae Waya - Kokan, 1100 m, C-10428a (c.sp.); Hatumete - Hoale Pass, 1010 m, C-10624; ibid., 1480 m, C-10684 (c.sp.); around the summit of G. Watane, 1650 m, C-14991a; Ena Puti - Hau Harnoe, 1600 m, C-15383 (c.sp.); Losa - Nihehata, 1300 m, C-16602.

Smaller form. CENTRAL SERAM: Roho - Kanikeh, 60-600 m, C-8500; Kanikeh - Wae Angsela, 750 m, C-8628; Maraina - Hatuolo, 600-700 m, C-9128 (c.sp.), C-9148 (c.sp.); in the vicinity of Elemata Makualaina, 100 m, C-9324 (c.sp.); Elemata Makualaina - Kaloa, 80-150 m, C-9429; Hatumete - Hoale Pass, 580 m, C-10554 (c.sp.); Saunule - Batu Kapal, 5-100 m, C-15463 (c.sp.).

Habitat. Pendent from branches of shrubs and trees in primary or secondary montane forest (larger form) or in secondary lowland forests (smaller form).

Distribution. Widely distributed throughout Asia and Oceania.

Note. We treated *Meteorium buchananii* here in the wider sense as Ganglee (1976) and Norris & Koponen (1985) stated, and did not follow that presented by Noguchi (1976) who maintained the narrower species concept and recognized several other species closely related to the species.

It should be pointed out that among our collections we were able to distinguish two main forms; one of which was larger in size and growing at higher elevations, and the other smaller and inhabiting lower altitudes. The larger form was usually found associated with *Papillaria* species.

Genus *Papillaria* Jaeg. & Sauerb.

Although we found only *Papillaria fuscescens* among our collections, another species, *P. leuconeura* (C. Muell.) Jaeg., was previously reported from Seram (Bosch & Sande Lac., 1862; Noguchi, 1976).

1. *Papillaria fuscescens* (Hook.) Jaeg., Ber. S. Gall. Naurw. Ges. 1875-76: 270 (1877); Fleisch., Musci Fl. Buitenzorg 3: 756 (1907); Bartr., Philippine J. Sci. 68: 218 (1939); Noguchi, J. Hattori Bot. Lab. 41: 247 (1976); Norris & Koponen, Acta Bot. Fennica 131: 30 (1985).

Specimens examined. CENTRAL SERAM: Wae Huhu - Owae Puku, 2230 m, C-8884 (c.sp.; capsule immersed); Wae Huhu - Owae Puku, 2630 m, C-8929; Wae Puo - Wae Ili, 1200 m, C-9674 (c.sp.); around the summit of G. Roihelu, 1220 m, C-9829 (c.sp.); G. Uwelehu near Hatuolo, 990 m, C-9203 (branches are slender and flagella-like at the tips, and drop off easily); Wae Waya - Kokan, 910 m, C-10371; Hatumete - Hoale Pass, 600 m, C-10562; Wae Nua - G. Mapahue, 770 m, C-14726; G. Watane, 1380-1900 m, C-14991b; around the summit of G. Watane, 1840 m, C-15033 (c.sp.; seta 2 mm long and capsules emergent);

Habitat. Pendent from branches of shrubs and trees in secondary and primary montane forests. One specimen (C-8929) grows on tree trunks on the sunny and open mountain ridge in subalpine zone.

Distribution. Widely distributed throughout Asia.

Note. Branch leaves of Seram plants are cordate at base and have much wider leaf insertion compared with the description and figures given by Noguchi (1976). Though he used these features to distinguish *P. fuscescens* and *P. leuconoura*, it is difficult to distinguish them in sterile conditions. The figures provided by Norris & Koponen (1985) agree well with our plants.

Genus Pseudobarbella Nog.

1. *Pseudobarbella ancistrodes* (Ren. & Card.) Manuel, Bryologist 80: 596 (1977); Norris & Koponen, Acta Bot. Fennica 131: 44 (1985)

Synonym: *Meteoriopsis ancistrodes* (Ren. & Card.) Broth., Nat. Pflanz. 1: 826 (1906); Fleisch., Musci Fl. Buitenzorg 3: 838 (1907); Bartr., Philippine J. Sci. 68: 230 (1939)

Meteoriopsis reclinata (C. Muell.) Fleisch. ex Broth. var. *ancistrodes* (Ren. & Card.) Nog., J. Hattori Bot. Lab. 41: 338 (1976).

Specimen examined. CENTRAL SERAM: Roho - Kanikeh, 60-600 m, C-8501.

Habitat. Pendent from branches of trees on riverbanks in secondary lowland forest.

Distribution. Himalayas, China, Malesia.

HOOKERIACEAE

Key to the genera

1. Plants blackish green; upper leaf margin deeply

dentate (costa single; lamina cells with strongly sinuate walls)..... *Acrophyllum*

1. Plants dark or pale green; upper leaf margin serrate, crenate or entire..... 2
2. Costa single *Bryobrothera*
2. Costa double 3
3. Costa weak, sometimes indistinct..... 4
3. Costa distinct, reaching at least the middle of the leaf length 5
4. Plants growing on shrub leaves; ascending shoot usually caudate *Dimorphocladon*
4. Plants growing on branches; ascending shoot usually eretely foliate, rarely complanate, not forming caudate apex (excluding *C. torquescens*) *Chaetomitrium*
5. Leaves bordered; lamina cells round to hexagonal, smooth..... *Cyclodictyon*
5. Leaves not bordered; lamina cells oval, rhomboidal to linear, more or less papillose *Callicostella*

Genus Acrophyllum Vitt & Crosby

This is a very distinctive genus among mosses in the thick and strongly sinuate lamina cells. Regarding sporophytic features, however, it does not differ from other genera of the Hookeriaceae.

Two species, *Acrophyllum dentata* (Hook. f. & Wils.) Vitt & Crosby and *A. javense* (Dix. ex Froehl.) Iwats., have been reported in Malesia (Tan & Robinson, 1990). According to Tan & Robinson (1990), *Acrophyllum javense* widely distributed in Malesia is distinguishable from *A. dentata*, having its main distribution in the southern hemisphere including New Guinea, in the acute to acuminate leaf apex and the much more strongly erose leaf margins.

1. *Acrophyllum javense* (Dix. ex Froelich) Iwats., Tan & Touw in Touw, J. Hattori Bot. Lab. 44: 149 (1978); Tan & Robinson, Smithsonian Contrib. Bot. 75: 4 (1990). (Fig. 1)

Specimens examined. CENTRAL SERAM: Hatumete - Hoale Pass, 1630 m, C-10698, 10699; Hau Harnoe - Ena Puti, 1550 m, C-15170.

Habitat. On moist humus or rotten logs on riverbanks in primary montane forests.

Distribution. Luzon, Mindanao, Mindoro, Sumatra, Java, Flores, New Guinea, New Hebrides.

Note. Plants of Seram Island are different from those collected in other localities; they have deciduous leaves, and ascending shoots are totally naked except for the apical protion.

The specimen C-10699 bears smooth or minutely papillose rhizoids at the basal ventral part of the stems. Similar rhizoids also arise from the apical parts of stem leaves.

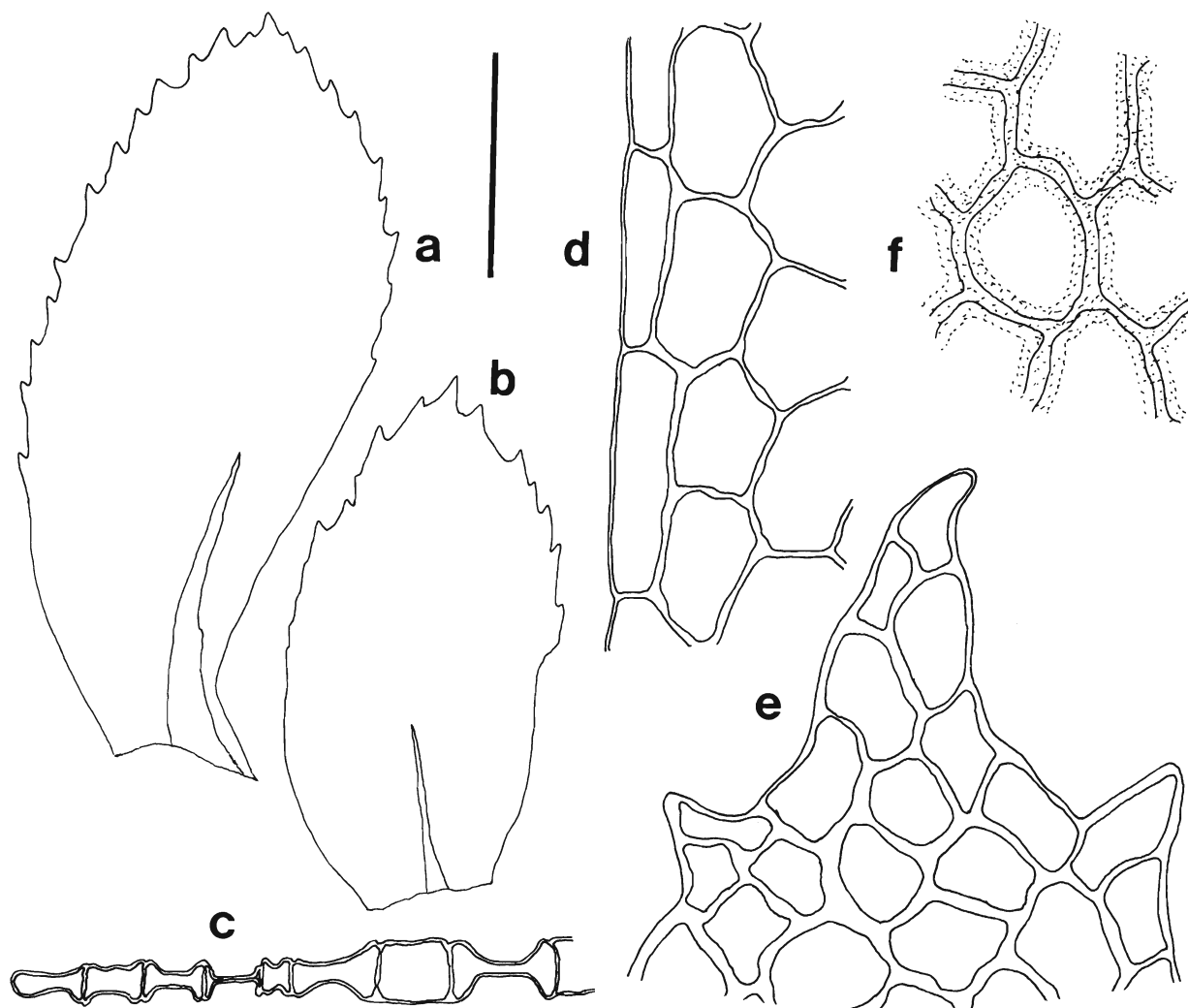


Fig. 1. *Acrophyllum javense*. a & b: leaves. c: transverse section of a middle part of branch leaf. d: basal part of branch leaf. e: apex of branch leaf. f: lamina cells of middle part of branch leaf. Use the scale bars as 0.25 mm for a-b, for 0.06 mm for others. All are drawn from C-15170.

Genus *Bryobrothera* Thér.

Though the familial position of this genus has been unclear, Norris & Robinson (1979) newly found sporophytes and proposed that it be classified under the Hookeriaceae on the basis of peristome morphology. But it should be noted that their concept of the Hookeriaceae is wider compared to that accepted in the present series of reports (Akiyama, 1990) or other workers (for example, Miller, 1971; Crosby, 1974).

1. *Bryobrothera crenulata* (Broth. & Par.) Thér., Rev. Bryol. 47: 26 (1920); Norris & Robinson, Bryologist 82: 306 (1979); Tan & Robinson, Smithsonian Contrib. Bot. 75: 6 (1990).

Specimen examined. WEST SERAM: at the summit of G. Totaniwel, 1150 m, C-15791.

Habitat. On shrub branches in mossy forests.

Distribution. Australia (Queensland), Fiji, New Caledonia, Solomon. Seram Island is westernmost of the distribution range of this species.

Note. The specimen reported here contains only poorly developed plants that are much smaller than the usual ones collected at other localities described above. In addition, stems of the Seram plants are only distantly foliate, while usual plants are densely foliate.

Tan & Robinson (1990) referred to the report of *Calomnion* cf. *complanata* by Akiyama (1988, 1990) (= *Calomnion seramensis* Vitt, see Vitt 1995; he, however, overlooked both papers) and regarded it as just a mistaken of *Bryobrothera crenulata*. But, this is not the case; I found both genera among our collections. The occurrence of *Bryobrothera crenulata* on Seram Island is again confirmed here.

Genus *Callicostella* (C. Muell.) Mitt.

The genus *Callicostella* is most widely distributed in Malesia among the members of the Hookeriaceae. The popular species in the region, *C. papillata*, however, was not found among our collections.

Tan & Robinson (1990) made an important observation that leaf shapes and the degree of papillation of lamina cells of *C. probaktiana* and *C. papillata* were much influenced not only by leaf position (lateral vs ventral) but also by the environmental conditions. According to them, sometimes the two types of leaves can be found on the same stem. I have confirmed their observation using our collections of *Callicostella probaktiana* (Fig. 2 e-i); some plants showed intermediate leaf shape and degree of papillation of lamina cells between *C. probaktiana* and *C. papillata*. *Callicostella armata*, however, does not show this kind of dimorphism.

Key to the species

1. Leaves sharply dentate; lamina cells with tall papillae; setae scabrous.....1. *C. armata*
1. Leaves serrate or crenate; lamina cells mostly smooth (sometime uppermost cells with low papillae); setae smooth or papillose
.....2. *C. probaktiana*

1. *Callicostella armata* Herz., Hedwigia 57: 238 (1916). (Fig. 2, a-d)

Type: Seram, Hoale Pass, ca. 1100 m, *Streese-mann 37* (holotype JE!).

Specimens examined. WEST SERAM: at the summit of G. Tiang Bendera, 790 m, *C-15546* (c.sp.). CENTRAL SERAM: Hoale, *Streese-mann 37* (JE); in the vicinity of Kanikeh, 600 m, *C-8569* (c.sp.); Kanikeh - Wae Angsela, 600-750 m, *C-8616* (c.sp.); Wae Niniyoa - Wae Puo, 800 m, *C-9600* (c.sp.), *C-9644* (c.sp.); Wae Puo - Wae Ili, 800-1000 m, *C-9705* (c.sp.); Wolu - Wae Waya, 360 m, *C-10295* (c.sp.); Hatumete - Hoale Pass, 600 m, *C-10502* (c.sp.); Piliana - Hau Harnoe, 560 m, *C-15109* (c.sp.); *ibid.*, 750 m, *C-15425* (c.sp.); Wae Pasola Hatu - G. Meseleinan, 820 m, *C-16130* (c.sp.).

Habitat. On rotten logs and boulders on streambeds in lower montane forests.

Distribution. Known only in Seram.

Note. *Callicostella armata* was originally described in central Seram, Hoale Pass by Herzog (1916). He pointed out that the longer leaf apices and scabrous setae could be used in distinguishing it from the closely related and geographically much widely distributed species *C. papillata*. Our specimens well agree with his description. It seems, however, that there are no other morphological features effectively distinguishing these two species.

Callicostella loriae C. Muell. ex Fleisch., reported in New Guinea (Fleischer, 1908), also has papillose setae. Further study is required to determine the real relationship of this species to *Callicostella armata*.

2. *Callicostella probaktiana* (C. Muell.) Bosch & Sande Lac., Bryol. Javanica 2: 40 (1862); Bartr., Philippine J. Sci. 68: 265 (1939); Tan & Robinson, Smithsonian Contib. Bot. 75: 7 (1990). (Fig. 2, e-i)

Specimens examined. WEST SERAM: in the vicinity of Buria, 300 m, *C-10092* (c.sp.); Tanagohyang - G. Sia Putti, 550 m, *C-15607* (c.sp.); *ibid.*, 760 m, *C-15625* (c.sp.); Tanagohyang - Kali Ani, 5-100 m, *C-15652* (c.sp.), *C-15675* (c.sp.); Tihulale - G. Totaniwel, 650 m, *C-15763*. CENTRAL SERAM: Hatuolo - Elemata Makualaina, 100-600 m, *C-9269* (c.sp.); in the vicinity of Sawai, 0-130 m, *C-9487* (c.sp.); Piliana - Hatu, 100 m, *C-10237* (c.sp.); Wae Salune - Wae Nua, 100-560 m, *C-14622* (c.sp.); *ibid.*, 110-560 m, *C-14625* (c.sp.); along Wae Nua, 110-190 m, *C-14667* (c.sp.); Wae Nua - G. Mapahue, 110 m, *C-12678* (c.sp.); Piliana - G. Watane, 800 m, *C-14984* (c.sp.); Hunisi - Wae Heka Heka, 350 m, *C-15971*; Wae Pasola Hatu - G. Meseleinan, 670 m, *C-16220* (c.sp.).

Habitat. On boulders at streamsides or rotten logs on forest floors in lowland or lower montane forests.

Distribution. Widely distributed in Malesia; Indochina, Solomon Islands, New Caledonia.

Note. *C-15607* differs from typical plants in distinctly papillose setae, leaves with crenate margin, and totally smooth lamina cells.

Genus *Cyclodictyon* Mitt.

1. *Cyclodictyon blumeianum* (C. Muell.) O. Kuntze, Rev. Gen. Pl. 2: 835 (1891); Fleisch., Musci Fl. Buitenzorg 3: 1016; Bartr., Philippine J. Sci. 68: 264 (1939); Tan & Robinson, Smithsonian Contr. Bot. 75: 11 (1990).

Specimens examined. CENTRAL SERAM: Kanikeh - Wae Angsela, 900 m, *C-8697* (c.sp.); Wae Angsela - Wae Huhu, 1500 m, *C-8778* (c.sp.); in the vicinity of Piliana, 360 m, *C-10215*; Hatumete - Hoale Pass, 680 m, *C-10580*, *C-10584* (c.sp.); Makaliki Spring near Piliana, 340 m, *C-14828* (c.sp.); Hau Harnoe - Piliana, 750 m, *C-15435* (c.sp.); Nihehata - Hatumete, 820 m, *C-16767* (c.sp.).

Habitat. On rotten logs or boulders at streambeds in lowland and montane forests.

Distribution. Widely distributed throughout Southeast Asia and the Pacific Islands.

Note. Plants of *C-14828* were collected from

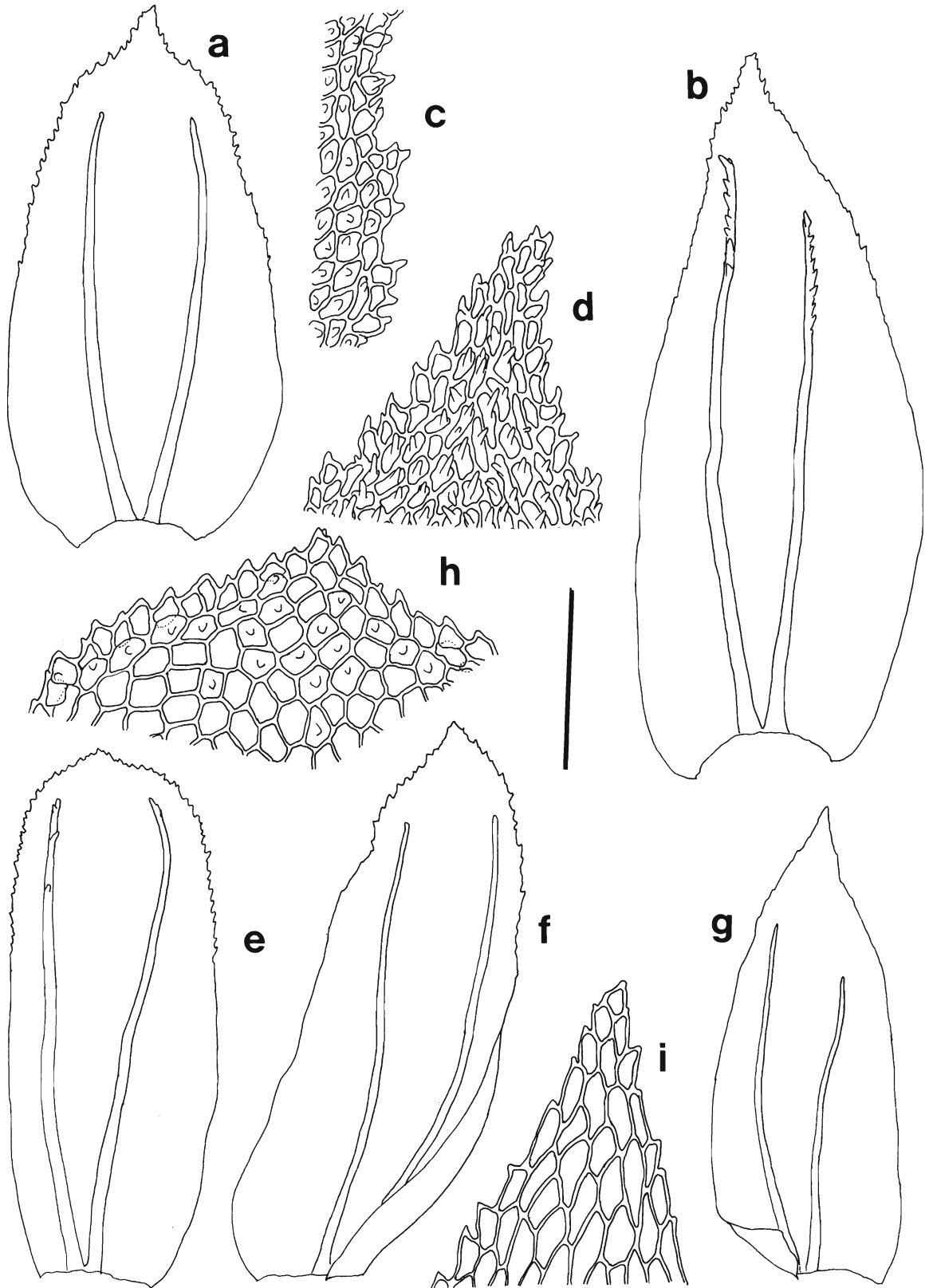


Fig. 2. *Callicostella armata* (a-d; C-9644) and *Callicostella probaktiana* (e-i; C-14667). a-b & e-g: branch leaves. c: upper margin of branch leaf. d, h-i: apex of branch leaf. Use the scale bar as 0.25 mm for a-b & e-g, as 0.06 mm for others.

substrata submerged in water at the Makaliki Spring near Tehoru village. Their leaves were wider than those of usual plants.

Genus *Chaetomitrium* Dozy & Molk.

According Bosch & Sande Lacoste (1862), four species were described by the specimens formerly collected on Seram Island; they are *Chaetomitrium philippinense* (Mont.) Bosch & Sande Lac., *C. torquescens* Bosch & Sande Lac., *C. acanthocarpum* Bosch & Sande Lac., and *C. vrieseanum* Bosch & Sande Lac. The former three species were found among our collections, but I was unable to find *C. philippinense*; for details concerning this species, see the note under *C. papillifolium*.

Chaetomitrium fimbriatum (Dozy & Molk.) Bosch & Sande Lac. has been reported in Ambon Island. Though this species was originally reported in Borneo and New Guinea, it is not the case. Examining the original labels of the syntypes, I found that one of them (*Zippelius s.n.*, L1) was collected at "New Guinea, Amboina"; "Amboina" is the old name of the central city of Ambon Island.

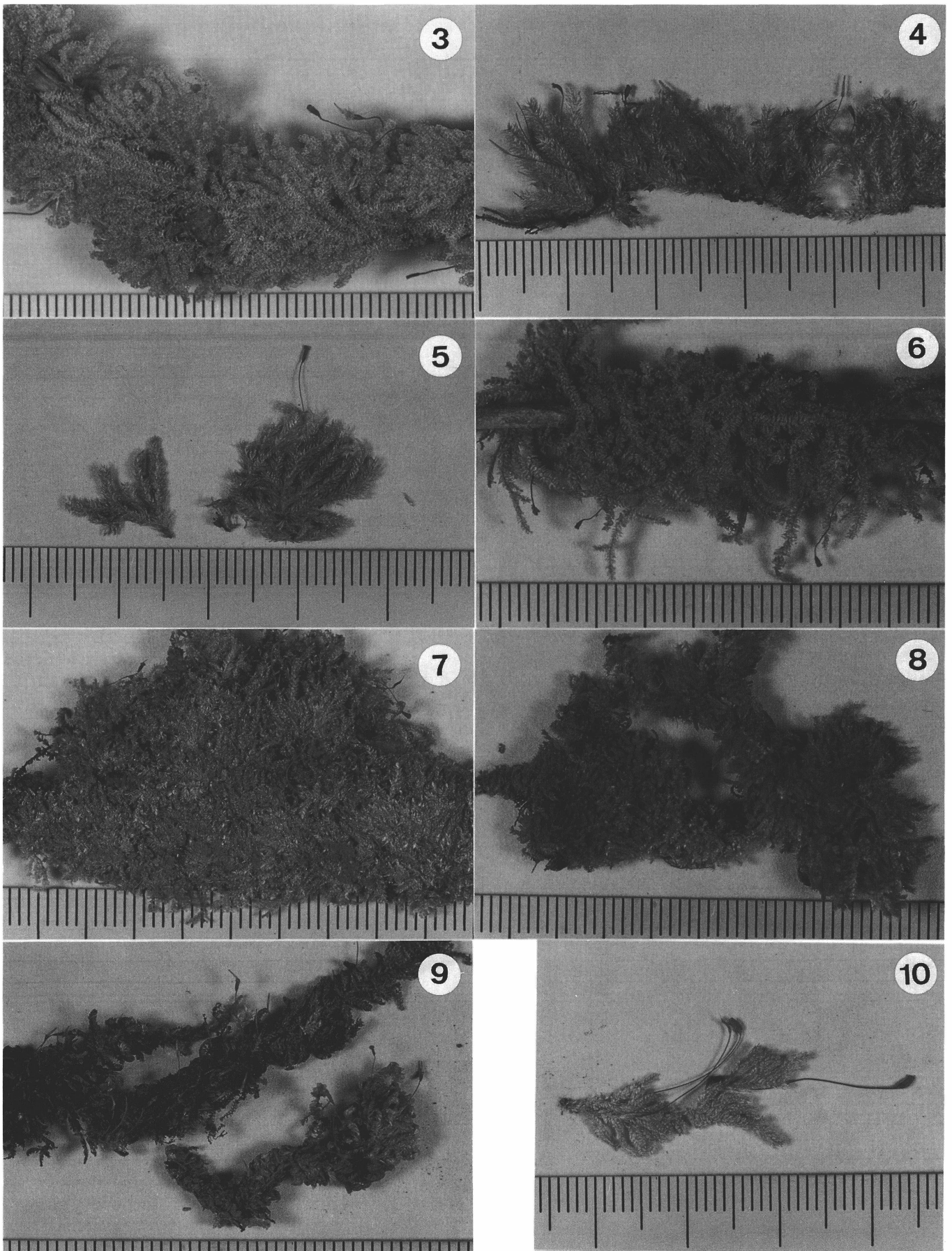
Species of the genus *Chaetomitrium* have been distinguished from each other by a combination of several morphological characteristics, such as leaf shape, the shape of papillae on lamina cells of branch leaves, the length and degree of papillation on the surface of setae, the shape of calyptrae, etc., thus, their "variation" has not been considered adequately. In the present report, I took the same attitude, that is, each species of the genus was recognized and identified mainly on the basis of the above features. It is important to accumulate ample specimens from various places to obtain any rational conclusion on their morphological variation and classification.

The shape and size of stem and branch leaves of each species are strongly differentiated even in a single plant. Thus, in the "Key to the species" and descriptions of each species presented below, we refer to branch leaves. In addition, identification of our collections much depended to the concept of Bartram (1961) in his 'key to the species'.

Key to the species

1. Branch leaves squarrose or squarrose-recurved 2 (Sect. *Acanthophyllae*)
1. Branch leaves erect, erect-spreading, or widely spreading with incurved apices 3 (Sect. *Leiocarpae*)
2. Capsule wall spinose 1. *C. acanthocarpum*
2. Capsule wall smooth 10. *C. vrieseanum*
3. Branches distinctly complanately foliate 2. *C. elegans*

3. Branches various, but not complanately foliate 4
 4. Setae longer than 30 mm, usually ca. 40 mm 8. *C. aff. subplicatum*
 4. Setae shorter than 30 mm 5
 5. Upper lamina cells with high stellate papillae on back (setae ca. 20 mm long, setose throughout; branch leaves widely spreading, apices incurved) 7. *C. aff. spinosum*
 5. Upper lamina cells smooth or with simple papillae 6
 6. Branch leaves distinctly falcate-secund like *Pylaisiella* species; capsules upright. (Branch leaves not concave; lamina cells more or less thick-walled; upper lamina cells well prorate; setae ca. 8 mm long, weakly papillose above, smooth below; calyptra pilose above, almost naked at base, cucullate) 4. *C. papillifolium*
 6. Branch leaves neither falcate nor secund; capsules more or less inclined 7
 7. Plants pinnately branched; setae smooth. (Branch leaves concave and margins distinctly incurved; lamina cells of branch leaves smooth on back; setae ca. 20 mm long; calyptra cucullate, almost naked at base) 5. *C. perlaeve*
 7. Plants irregularly bipinnately branched; setae setose or papillose 8
 8. Plants inhabiting montane forests (1000-1400 m alt.); lamina cells of branch leaves with high proration (usually spinose) on back; costa distinct, reaching one-third of leaf length. (Branch leaves spreading in dry conditions, 0.4-0.9 mm long, margins with simple teeth; setae 9-12 mm long, setose above, smooth below; calyptrae pilose above, fringed and naked at base) 6. *C. cf. spinosum*
 8. Plants inhabiting lowland riparian forests (lower than 400 m alt.); lamina cells of branch leaves smooth or with low proration; costa very short or indistinct 9
 9. Upper lamina cells of branch leaves with proration at upper corner. (Branch leaves acuminate, densely serrate at margins; each tooth distinctly gemminate. Setae sparsely setose above, 6-10 mm long; calyptrae campanulate, densely pilose to the base, fringed at base) 3. *C. orthorrhynchum*
 9. Lamina cells of branch leaves smooth. (Plants small; setae ca. 10 mm long; capsules slightly inclined, ca. 1.2 mm long. Setae papillose throughout; calyptrae with short hairs above, naked and entire at base) 9. *C. torquescens*
1. *Chaetomitrium acanthocarpum* Bosch & Sande Lac., Bryol. Javanica 2: 53 (1862); Fleisch., Musci Fl. Buitenzorg 3: 1063 (1908). (Fig. 3)



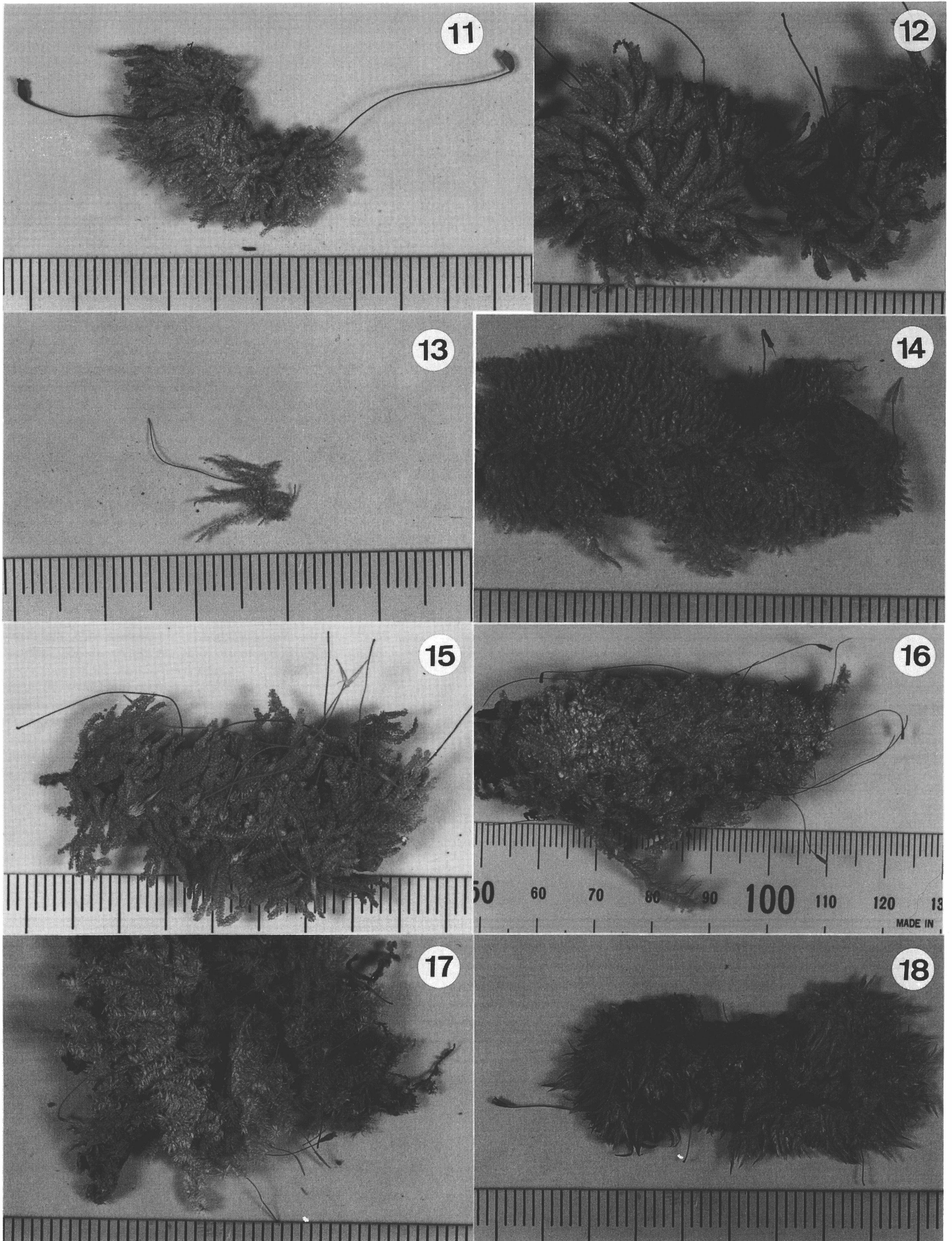
Figs. 3-10. Photographs of *Chaetomitrium*.

3: *C. acanthocarpum* (C-15958) . 4: *C. elegans* (C-10150) .

5: *C. elegans* (specimen originally identified as *C. pseudopapillifolium* ; left, Robbins 2172, right, Robbins 2496) .

6: *C. orthorrhynchum* (C-15958bis) . 7: *C. orthorrhynchum* (C-10484) . 8: *C. orthorrhynchum* (C-10015) . 9: *C. papillifolium* (C-9288) .

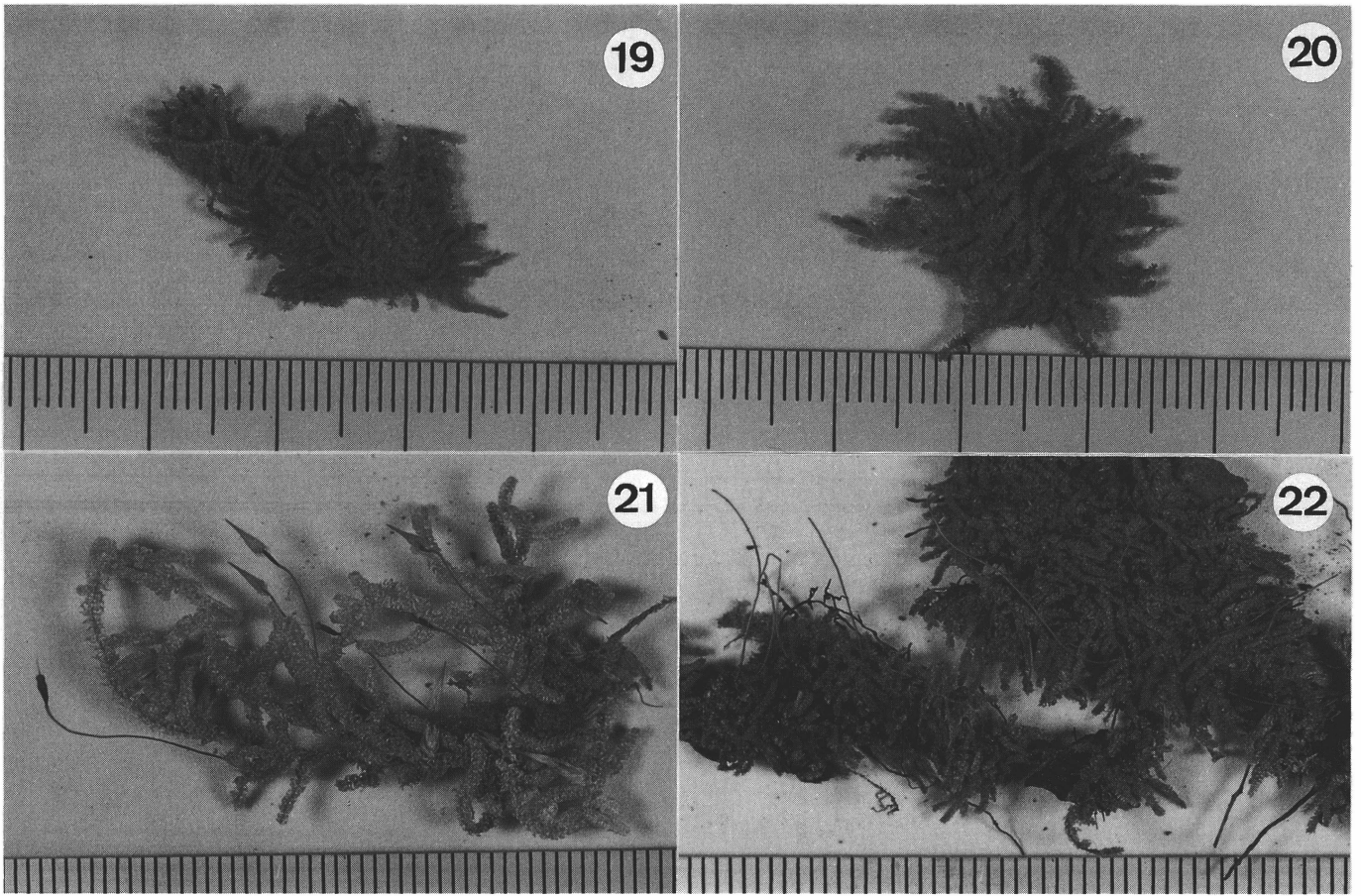
10: *C. perlaeve* (holotype) .



Figs. 11-18. Photographs of *Chaetomitrium*.

11: *C. perlaeve* (C-10603). 12: *C. perlaeve* (C-15082). 13: *C. perlaeve* (isotype of *C. wildei*). 14: *C. cf. spinosum* (C-15384).

15: *C. aff. spinosum* (C-16011). 16: *C. aff. subplicatum* (C-8516). 17: *C. torquescens* (C-15475). 18: *C. torquescens* var. *barbatum* (isotype)



Figs. 19-22. Photographs of *Chaetomitrium*.

19: *C. viriseanum* (holotype). 20: *C. papuanum* (isotype). 21: *C. viriseanum* (C-16096). 22: *C. viriseanum* (C-9246).

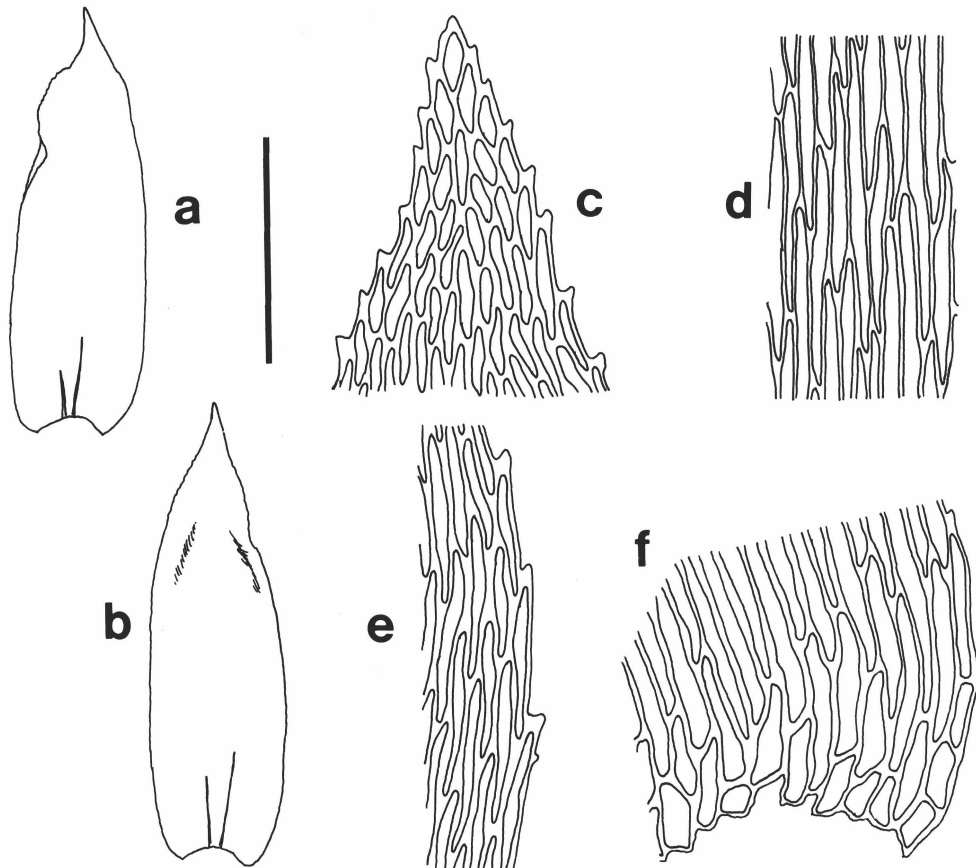


Fig. 23. *Chaetomitrium elegans*. a & b: branch leaves. c: leaf apex. d: median lamina cells. e: upper margin of branch leaf. f: basal part of branch leaf. Use the scale bar as 0.6 mm for a & b, 0.06 mm for others. All are drawn from C-9524.

Specimens examined. CENTRAL SERAM: in the vicinity of Elemata Makualaina, 100 m, *C-9313* (c.sp.); G. Kakihari near Elemata Makualaina, 100–300 m, *C-9372* (c.sp.); Hunisi - Wae Heka Heka, 350 m, *C-15958* (c.sp.).

Habitat. On shrub branches in riparian forests.

Distribution. New Guinea.

Note. *Chaetomitrium acanthocarpum* can be distinguished from other *Chaetomitrium* species in 1) the squarrose branch leaves, and 2) the densely setose setae and capsules.

2. *Chaetomitrium elegans* Geh., *Biblioth. Bot.* 13: 6 (1889). (Figs. 4, 5 & 23)

Type. New Guinea, Fly River, *W. Baeuerlen 99* (Lectotype H-BR! selected by Norris on the herbarium label in 1986)

Synonym. *Chaetomitrium subelegans* C. Muell. in *Fleisch., Musci Fl. Buitenzorg* 3: 1058 (1908), nom. nud. in synonym.

Chaetomitrium pseudopapillifolium Bartr., *Brittonia* 13: 375 (1961). Type: Papua New Guinea, Sepik District, Track to Tring, off Wewak-Maprik road, on fallen branch from crown in forest, 13 Aug. 1959, *Robbins 2172*. (Isotype in L!) *Syn. Nov.*

Specimens examined. WEST SERAM: Batu Putih and Batu Soli near Buria, 350 m, *C-10019* (c.sp.); G. Nakaela near Sawai, *C-10150* (c.sp.). CENTRAL SERAM: in the vicinity of Sawai, 0–130 m, *C-9524* (c.sp.). EAST SERAM: G. Simfakan near Bula, 10–150 m, *C-10826* (c.sp.).

Habitat. On tree trunks or limestone boulders at rather dry and shaded places in lowland forests.

Distribution. Philippines (Tan & Robinson, 1990), New Guinea.

Note. The distinctive morphological features of this species are; (1) glossy plants with complanate branch foliation, (2) flat branch leaves, (3) smooth lamina cells of branch leaves, (4) smooth or weakly papillose setae in the upper part, and (5) campanulate calyptra that are pilose at base.

Chaetomitrium elegans differs from the other species of the genus not only in the morphological features described above but also in its peculiar habitat preference; it grows on tree trunks or limestone boulders. In addition, it seems to prefer rather drier conditions compared with other species of the genus.

We examined the isotype specimen of *Chaetomitrium pseudopapillifolium* Bartr. (*Robbins 2172*, L!; Fig. 5) and found that it was conspecific with *C. elegans*.

There are additional three species of the genus that have distinctly complanate foliation. They are *Chaetomitrium lancifolium* Mitt., *C. weberi* Broth,

and *C. tahitense* (Sull.) Mitt. var. *deplancheri* (Besch.) Wijk & Marg. Three of these species share smooth lamina cells and short, only slightly papillose setae. We were not able to examine the type specimens, but judging from their original descriptions they are probably conspecific.

3. *Chaetomitrium orthorrhynchum* (Dozy & Molk.) Bosch & Sande Lac., *Bryol. Javanica* 2: 45 (1862); *Fleisch., Musci Fl. Buitenzorg* 3: 1048 (1908); Bartr., *Philippine J. Sci.* 68: 270 (1939). (Figs. 6–8 & 24)

Basionym. *Hookeria orthorrhyncha* Dozy & Molk., *Ann. Sci. Natur., Bot. ser.* 3, 2: 305 (1844). Type: Sumatera, *Korthals s.n.* (L!)

Synonym. *Chaetomitrium divergence* Dix., *Ann. Bryol.* 5: 159 (1932). Type: Dutch New Guinea, van Gelderen rivier, 100 m alt., *May 1926, W. M. Docters van Leeuwen s.n.* (holotype BM!). *Syn. Nov.*

Chaetomitrium finisterrae Dix. & Herz. in *Herz., Hedwigia* 66: 350 (1926). Type: Dutch-Neuguinea, Finisterregebirge, ca. 800 bis 1000 m, spaerlich anderen Moosen beigemengt, 1925, *G. Eiffert s.n.* (holotype in JE!). *Syn. Nov.*

Specimens examined. WEST SERAM: Batu Putih and Batu Soli in the vicinity of Buria, 350 m, *C-10015* (c.sp.). CENTRAL SERAM: G. Kakihari near Elemata Makualaina, 100–300 m, *C-9375* (c.sp.); Wolu - Wae Waya, 250 m, *C-10271* (c.sp.); Hatumete - Hoale Pass, 340 m, *C-10484* (c.sp.); Hunisi - Wae Heka Heka, 350 m, *C-15958bis* (c.sp.); Maneuratu - G. Musamutua, 210 m, *C-16339*; Losa - Nihehata, 650 m, *C-16533* (c.sp.), *C-16556* (c.sp.).

Habitat. On shrub branches at rather shaded places in lowland forests.

Distribution. Luzon, Negros, Mindanao, Sumatra, Java, Borneo, New Guinea.

Note. The distinguishing features of this species are; (1) plants small for the genus, (2) branches terete to more or less complanately foliate, (3) branch leaves long acuminate, margins with bifid serration (4) lamina cells prorate at the upper corner, (5) seta 7–8 mm long, sparsely spinose above, bluntly papillose or smooth below, and (6) calyptra campanulate and pilose at base.

Examining a number of specimens collected throughout Malesia, this species can be characterized by the branch leaves with bifid serration. Some plants of our collections (*C-10015*, *10484*, *16339*, *16533*, and *16556*), however, have smaller (0.4–0.6 mm long) branch leaves with simple serration at leaf margins (Fig. 24 f–o). I tentatively treat these incongruities as a variation of widely variable *C. orthorrhynchum*.

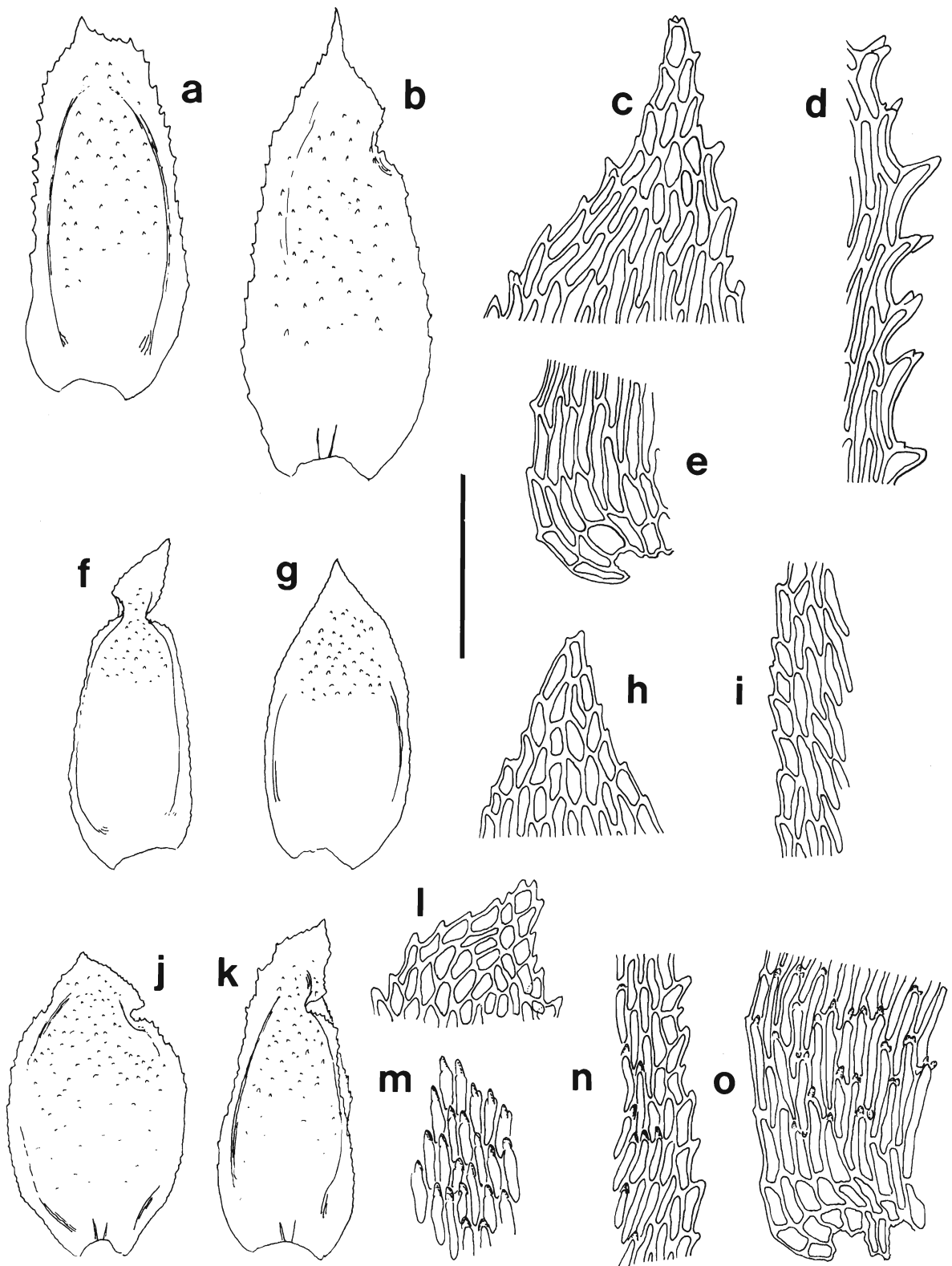


Fig. 24. *Chaetomitrium orthorrhynchum*. a-b, f-g & j-k: branch leaves. c, h, l: leaf apices. d, i, n: upper leaf margins. e & o: basal part of branch leaves. m: upper lamina cells of branch leaf. a: C-9375. b-e: C-10271. f-i: C-16339. j-o: C-16533. Use the scale bar as 0.25 mm for a-b, f-g & j-k, 0.06 mm for others.

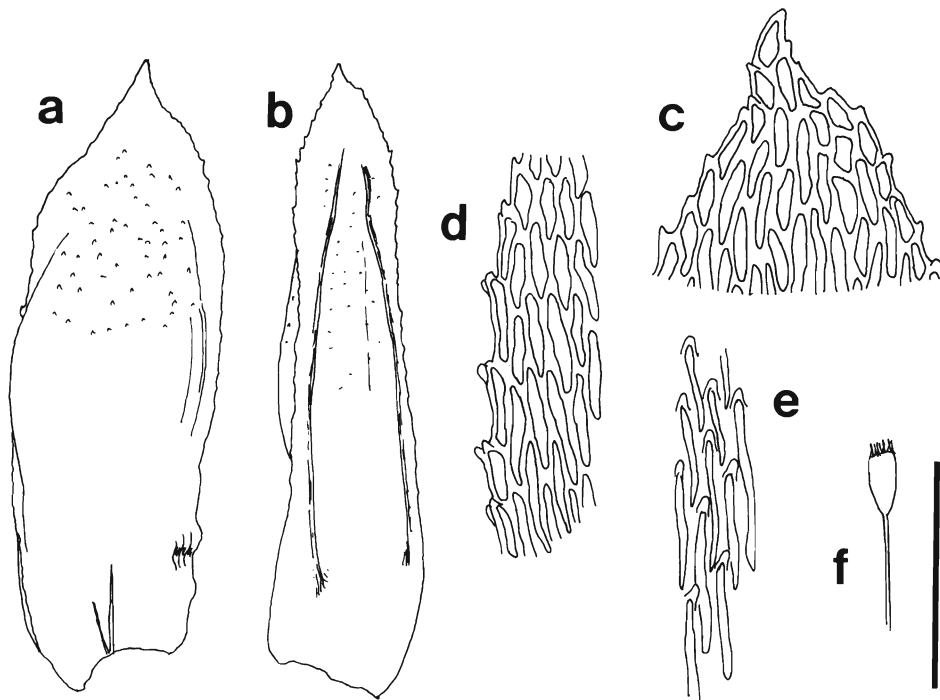


Fig. 25. *Chaetomitrium papillifolium*. a & b: branch leaves. c: leaf apex. d: upper margin of branch leaf. e: median lamina cells. f: capsule. Use the scale bar as 0.25 mm for a & b, 0.06 mm for others. All are drawn from C-9288.

This species also resembles *Chaetomitrium papillifolium*. For their distinction, see note under the latter species.

4. *Chaetomitrium papillifolium* Bosch & Sande Lac., Bryol. Javanica 2: 50 (1862); Fleisch., Musci Fl. Buitenzorg 3: 1052 (1908). (Figs. 9 & 25)

Synonym. *Chaetomitrium geheebii* Broth., Oefv. Finsk. Vet. Ak. Foerh. 37: 165 (1895). Type: Nova-Guinea, Camp I, *MacGregor 25 (351?)* (Lectotype H-BR!, selected by Norris on the herbarium label in 1986) **Syn. Nov.**

Specimen examined. Hatuolo - Elemata Makualaina, 100 m, C-9288 (c.sp.).

Habitat. On shrub branches on riverbanks in lowland forests.

Distribution. Widely distributed in Malesia; Sri Lanka, Indochina.

Note. This species is unique among the genus in its falcate-second branch leaves in dry conditions. Other distinguishing features are as follows; (1) branch leaves lanceolate, slightly concave, shortly acuminate or acute at apex, margins crenate with geminate low teeth, (2) lamina cells with low proration, (3) setae 8 mm long, papillose above, smooth below, (4) capsules upright or slightly inclined, asymmetrical, smooth, and (5) calyptra pilose, glabrous and entire at the base.

Chaetomitrium papillifolium mostly resembles *C. orthorrhynchium*, but the latter differs in larger

branch leaves, serrate leaf margins with geminate teeth, only sparsely spinose setae, and the fringed calyptrae.

Chaetomitrium papillifolium also resembles *C. philippinense* (Mont.) Bosch & Sande Lac.; the latter species had been reported from Seram in Bosch & Sande Lac. [1862; also cited in Fleischer (1908) and Bartram (1939)]. They differ only in the shape of leaf apex; it is acuminate in *C. papillifolium*, while it is acute in *C. philippinense*. Examining a number of specimens collected widely in Southeast Asia, however, I consider that it is difficult to recognize such a difference as specific demarcation.

Dixon (1919) synonymized *C. geheebii* with *C. tahitense* var. *deplancheri* because he regarded that the degree of concavity of branch leaves and seta length to be variable and cannot be used for specific criteria. He, however, referred only New Hebrides plants, and did not examine the type or specimens collected in the type localities. The lectotype specimen of *C. geheebii* selected by Norris (on the herbarium label of *MacGregor 25*, H-BR!) has branch leaves which are strongly falcate-second in dry conditions. Therefore, I treated *C. geheebii* as a synonym of *C. papillifolium*, not of *C. tahitense* var. *deplancheri*.

5. *Chaetomitrium perlaeve* Dix., J. Linn. Soc. Bot. 45: 489 (1922); Bartr., Bryologist 48: 121 (1945). (Fig. 10-13 & 26 a-q)

Type: Dutch New Guinea, Mt. Carstensz, the

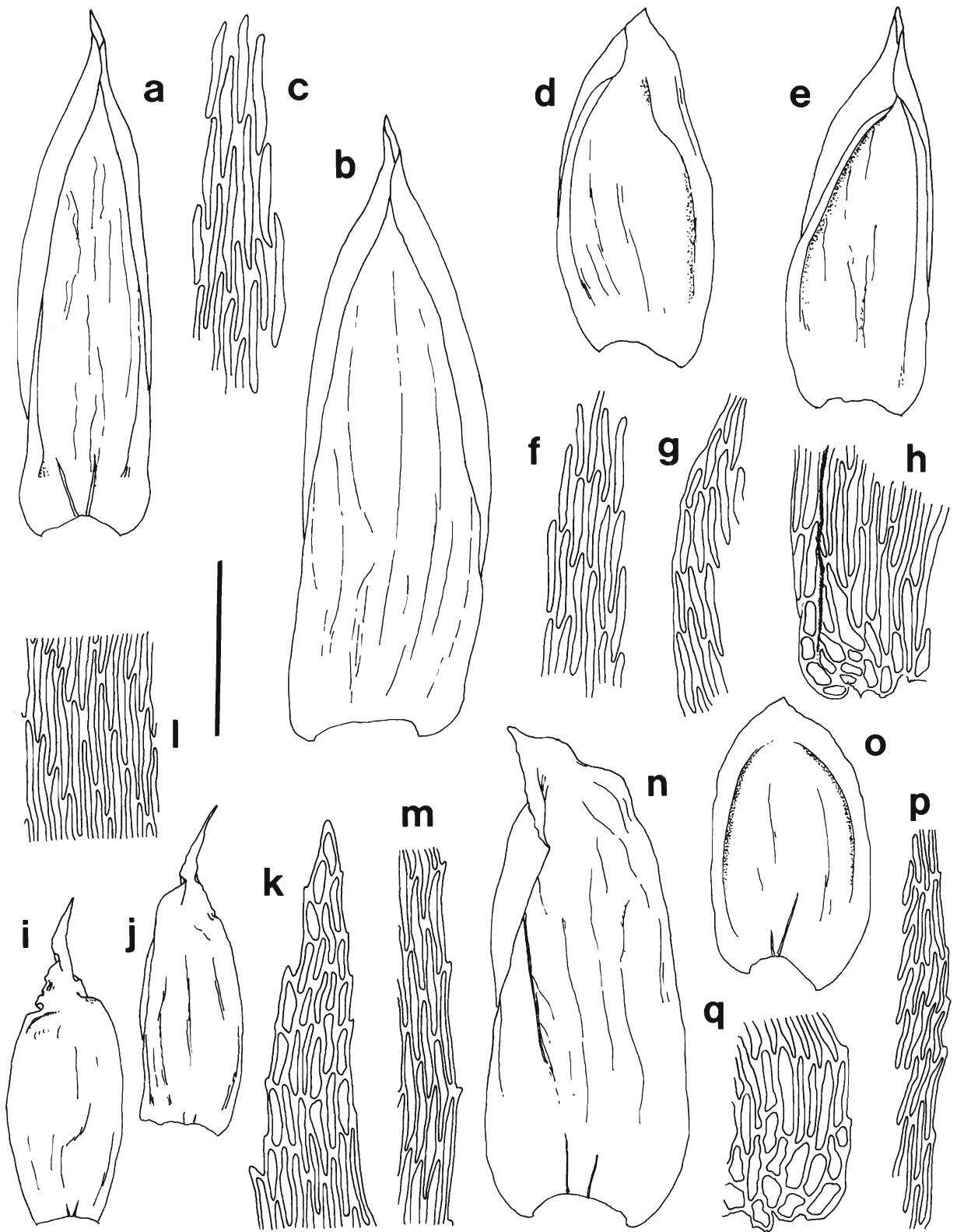


Fig. 26. *Chaetomitrium perlaeve*. a-b, d-e, i-j & n-o: branch leaves (note that i & j are 5/12 scale of others). k: leaf apex. c, f & l: median lamina cells of branch leaves. g, m & p: upper leaf margins. h & q: basal part of branch leaves. Use the scale bar as 0.6 mm for a-b, d-e & n-o, 0.25 mm for i&j, and as 0.06 mm for others. a-c: holotype of *Chaetomitrium perlaeve*. d-h: C-10603. i-m: C-15082. o-q: isotype of *Chaetomitrium wildei*.

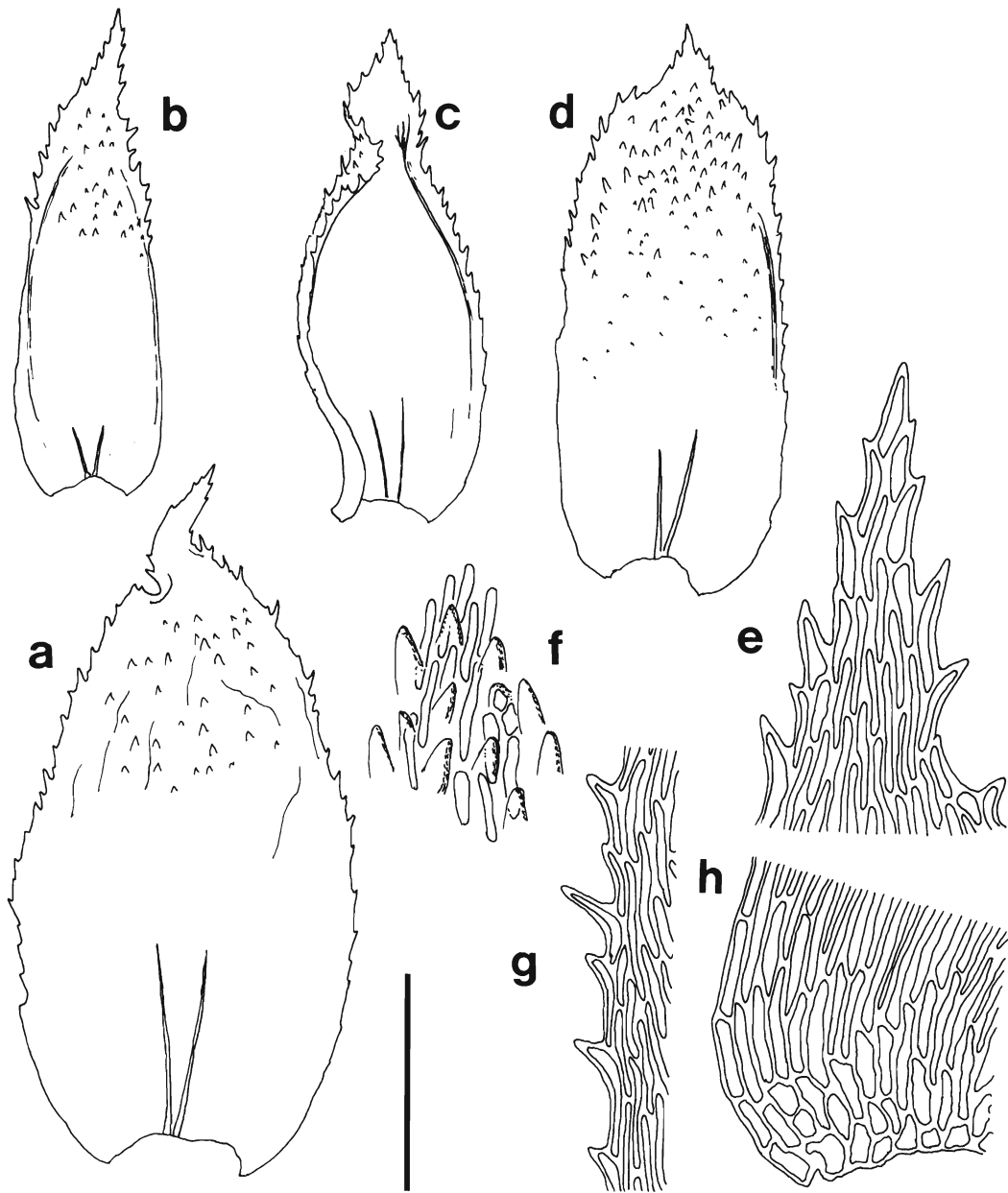


Fig. 27. *Chaetomitrium* cf. *spinosum*. a: stem leaf. b-d: branch leaves. e: branch leaf apex. f: lamina cells of branch leaf. g: upper margin of branch leaf. h: basal part of branch leaf. Use the scale bar as 0.25 mm for a-d, as 0.06 mm for others. a-b: *C-16510*. c: *C-16745*. d-h: *C-10445*.

third camp, 800 m, *C. Boden Kloss, Jan. 2, 1913* (holotype in BM!)

Synonym. *Chaetomitrium wildei* Zant., *Nova Guinea, Bot. 10* (16): 315 (1964). Type: New Guinea, Sibil-valley, Sangjar, 1500 m, *de Wilde 857b*. (isotype in LI). **Syn. Nov.**

Specimens examined. **CENTRAL SERAM:** Hatumete - Hoale Pass, 880m, *C-10603* (c.sp.); Piliana - G. Watane, 1000m, *C-14896* (c.sp.); Piliana - Hau Harnoe, 1350 m, *C-15082* (c.sp.).

Habitat. On shrub branches and climbers at rather dry or mesic places in lower montane forests.

Distribution. New Guinea.

Note. The distinguishing features of this species are; (1) lucid plant color, (2) teretely foliate branches in dry conditions, (3) plicate branch leaves with acuminate and strongly incurved apices, (4) crenulate or entire leaf margins, (5) smooth lamina cells, (6) long (ca. 20-24 mm long) and smooth setae, and (7) cucullate and sparsely pilose calyptra with entire base. Seram plants have shorter branch leaves (0.5-0.7 mm long) than those of the type (longer than 1.0 mm long), but in other features they match well.

We examined the isotype specimen of *Chaetomitrium wildei* Zant. (*A. de Wilde 857b, Aug. 19, 1959*;

Ll; Fig. 13 & 26 n-q). Though its branch leaves are distinctly crisped in dry conditions, but *C. wildei* does not differ in other features from *C. perlaeve*. Thus, we treated these two species to be conspecific. In addition, *C. friedenes* Norris & Kop., reported in New Guinea and described based on sterile specimens, has branch leaves similar to those of *C. perlaeve*. They also might be conspecific.

One specimen among our collection (C-15082, Figs. 12 & 26 i-m) shows some differences from the typical ones: it has glossy appearance in dry conditions and terete branch foliation, and its branch leaves are much shorter with acuminate apices than usual plants. In addition, it has minutely but distinctly papillose setae and mitrate, pilose calyptra with fringed base.

6. *Chaetomitrium* cf. *spinosum* Bartr., Brittonia 9: 49 (1957). (Figs. 14 & 27)

Plant relatively small, yellowish green, slightly glossy. Stems densely pinnately branched; branches to 5 mm long, densely and roundly foliate. Branch leaves widely spreading in dry conditions, ovate to oblong-ovate, to 0.7 mm long, concave, constricted above, acute; margins erect, slightly recurved above, deeply serrate upper half, teeth simple and not geminate; costa shortly bifid, short; lamina cells spinose at upper end on back, especially at upper half.

Perichaetial leaves to 2.3 mm long, lanceolate, acuminate, ciliate-dentate above. Seta 9 - 14 mm long, setose throughout or papillose at base. Capsules horizontal to pendent, smooth. Calyptrae cucullate, setulose above, entire and without cilia at base.

Specimens examined. CENTAL SERAM: Wae Angsela - Kanikeh, 1200 m, C-9037 (c.sp.); Wae Puo - Wae Ili, 1070 m, C-9696a (c.sp.); Wae Waya - Kokan, 1100 m, C-10445 (c.sp.); Piliانا - Hau Harnoe, 1340 m, C-15080 (c.sp.); Ena Puti - Hau Harnoe, 1040 m, C-15384 (c.sp.); Wae Pasola Hatu - G. Meseleinan, 980 m, C-16163 (c.sp.); Nihehata - Hatumete, 1200 m, C-16754 (c.sp.).

Habitat. Forming a dense and compact tuft on slender, horizontally spreading shrub branches at forest slopes or streamsides in montane forests.

Distribution. New Guinea.

Note. This species is distinctive in its peculiar habitat from the other species of *Chaetomitrium* of Seram and Ambon, that is, it grows at much higher elevations than other species. The morphological features, coarsely serrate leaf margin and long spines on the backs of upper lamina cells, are also characteristic.

Judging from the original description, Seram plants differ from the typical *Chaetomitrium spinosum* Bartr. that has longer branch leaves (to 1.5 mm long). These two species, however, coincide in other

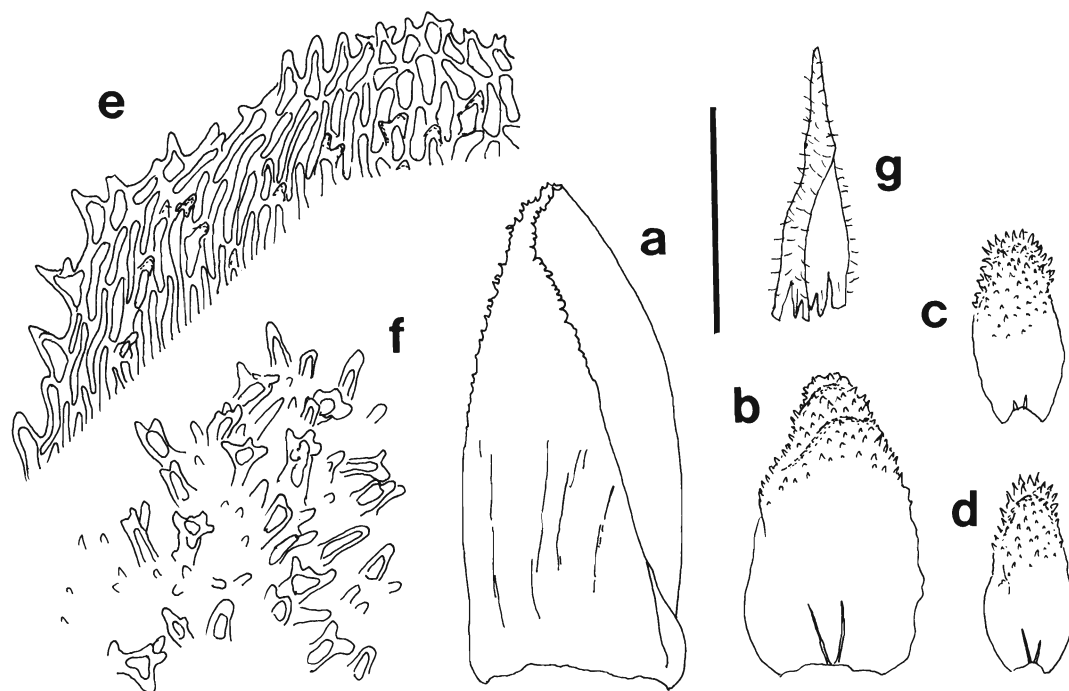


Fig. 28. *Chaetomitrium* aff. *spinosum*. a: perichaetial leaf. b: stem leaf. c-d: branch leaves. e: branch leaf apex. f: upper lamina cells of branch leaf. g: calyptra. Use the scale bar as 0.6 mm for a-d & g, as 0.06 mm for e-f. All are drawn from C-16011.

features. Unfortunately, we could not examine the type specimen of *C. spinosum*, and more detailed examination of this species should be left for future study.

7. *Chaetomitrium* aff. *spinosum* Bartr. (Figs. 15 & 28)

Plants small, yellowish green, not glossy. Stems pinnate, branches to 6 mm long, roundly foliate, terete in dry conditions, 1 mm wide with leaves. Branch leaves widely spreading and upper half curved inwards (but not squarrose) in dry conditions, widely ovate, to 0.5 mm long, deeply concave, incurved and round at apex; margins densely serrate, narrowly incurved; costa double, short; lower lamina cells linear; upper lamina cells becoming shorter above, and a half number of the cells with tall spines at upper corner with apices bifid or stellately papillose. Stem leaves similar to branch leaves but larger (to 0.8 mm long). Perichaetial leaves ovate-lanceolate, concave, plicate, round at apex, densely serrate at upper half. Setae to 22 mm long, setose to the base. Capsules pendent, smooth. Calyptra mitrate or cucullate, shortly setulose, campanulate and without cilia at base.

Specimen examined. CENTRAL SERAM: Wae Heka Heka - Wae Pasola Hatu, 500 m, *C-16011*.

Habitat. On branches of shrubs at streamsides in lower montane forests.

Note. Total appearance of this species is similar to those of *Chaetomitrium spinosum* or *C. cf.*

vriseanum. The distinctive features of this species are; (1) leaves short and widely ovate, concave with round apex, (2) upper lamina cells strongly spinose, (3) perichaetial leaves round at apex, and (4) setae to 22 mm long, and distinctly setose to the base.

Judging from the original description and authentic specimens (*Breass 22218*, determined by Bartram, H!, L!), this species most resembles *Chaetomitrium spinosum* Bartr. reported in New Guinea, in the shape and deep concavity of branch leaves, and long, setose setae; but spines at the upper corner of lamina cells are much taller than those of *C. spinosum* (Fig. 28-f), and stellately divided on the top (Fig. 28-f). In addition, *C. spinosum* has much shorter setae (9-14 mm long) than this species.

8. *Chaetomitrium* aff. *subplicatum* Bartr., *Bryologist* 48: 122 (1945); Zanten, *Nova Guinea, Botany* 16: 314 (1964). (Figs. 16 & 29)

Relatively robust plants, pale yellowish green, distinctively glossy. Stems regularly pinnately branched; branches to 10 mm long, 2 mm wide with leaves, densely and roundly foliate, sometimes cuspidate at apex. Branch leaves laxly spreading, oblong-lanceolate, to 1.4 mm long, deeply concave (naviculate), constricted below apex, acute to acuminate; costa double, short; lamina cells totally smooth on both sides, linear, thick-walled below, becoming short-rhomboid near apex. Perichaetial leaves lanceolate to narrowly acuminate, to 2.2 mm long,

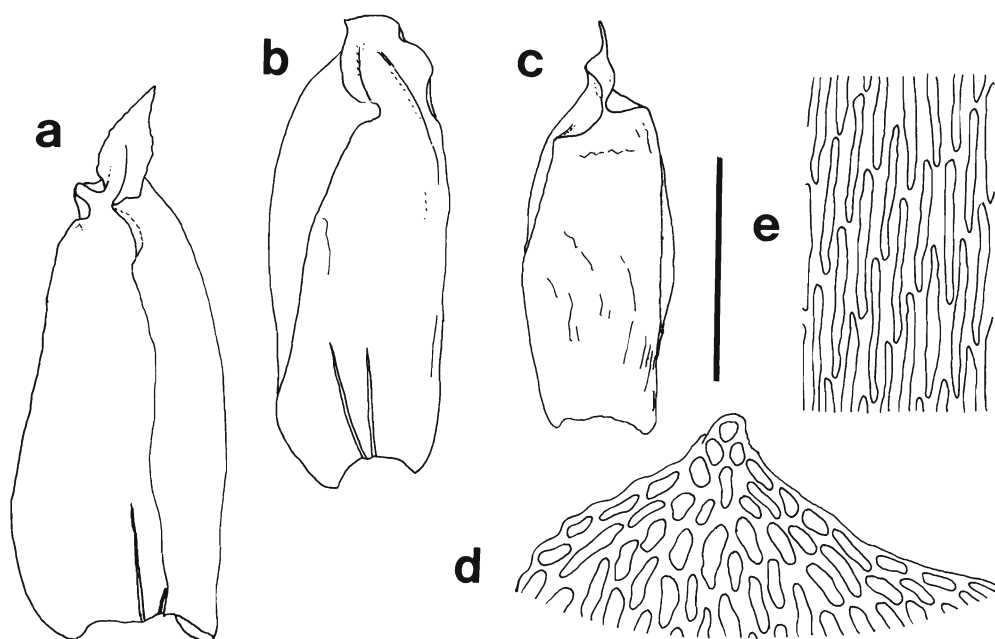


Fig. 29. *Chaetomitrium* aff. *subplicatum*. a-c: branch leaves. d: branch leaf apex. e: median lamina cells of branch leaves. Use the scale bar as 0.6 mm for a-c, as 0.06 mm for others. a-b & d-e: *C-9292b*. c: *C-8516*.

plicate, weakly serrate above the shoulder. Seta 30 – 40 mm long, faintly papillose at uppermost part, or smooth throughout. Capsules short-cylindrical, upright to slightly inclined. Calyptra cucullate, sparsely haired, cleft and long-ciliate at base.

Specimens examined. CENTRAL SERAM: Roho – Kanikeh, 60–600 m, *C-8516* (c.sp.); in the vicinity of Elemata Makualaina, 100 m, *C-9292b*.

Habitat. Forming soft, loose tuft on shrub branches beside streams in lowland forests. New Guinean plants of *C. subplicatum* were reported to grow at much higher elevations (around 1500 m in altitude) by Bartram (1945) and Zanten (1964).

Note. The distinctive features of this species are the long and almost smooth setae, and the naviculate branch leaves with smooth lamina cells. This species and *Chaetomitrium subplicatum* share these features. Judging from the original description, however, it differs from *C. subplicatum* Bartr. in cucullate calyptra that are sparsely haired above and long-ciliate at the base. Regarding calyptra morphology, Zanten (1964) wrote that *C. subplicatum* are "mostly more or less deeply cleft on one side, occasionally with one rather deep split and one or two small splits. There occur longer or shorter, erect, fugaceous hairs all over its surface which become setulose near apex." As in the case of above species, we leave more detailed examination of this species for future study, because we were not able to examine the type specimens of *C. subplicatum*.

Another species, *Chaetomitrium longisetum* Bartr., are also characterized by long and smooth setae. Isotype of *C. longisetum* (New Guinea, Mt. Wilhelm, Sept. 1938, Brass & Myer-Dress 9890, L!) , however, differs from usual *Chaetomitrium* spp.; its alar regions of branch leaves are scarcely differentiated, and the costae are variable from shortly bifid to long (up to 1/2 of leaf length) and single. In addition, *C. longisetum* has branch leaves gradually narrowing into long apices as seen in the species of the genus *Cirriphyllum*. I consider that this does not belong to genus *Chaetomitrium*.

9. *Chaetomitrium torquescens* Bosch & Sande Lac., Bryol. Javanica 2: 47 (1862); Fleisch., Musci Fl. Buitenzorg 3: 1054 (1908). (Fig. 17)

Type: Ceram, *de Vries s.n.* (one of the syntypes, L!, H!)

Specimens examined. CENTRAL SERAM: in the vicinity of Elemata Makualaina, 100 m, *C-9301* (c.sp.); Saunule – Batu Kapal, 5–100 m, *C-15472* (c.sp.), *C-15475* (c.sp.); Nihehata – Hatumete, 180 m, *C-16778* (c.sp.).

Habitat. On shrub branches in moist places (usually riverbanks) in lowland forests.

Distribution. Java, New Guinea.

Note. The distinguishing features of this species include (1) small plants of bright light-green color, (2) sparse branching of stems, (3) widely spreading branch leaves in dry conditions, (4) short setae (ca. 10 mm long) that are distinctly papillose at the upper half, smooth below, and (5) pilose calyptra that are naked and entire at the base.

This species usually bears filamentous gemmae in leaf axils of distinctively specialized caudate branches.

Dixon (1942) described a new variety, *Chaetomitrium torquescens* var. *barbatum* Dix. (*C. E. Carr 12176*, isotype L!; see Fig. 18) on the basis of its constantly fringed calyptra with rather sparse and short hairs. Examining the isotype, it is clear that it differs from the type variety in branch leaves tightly appressed to stems, and also in much larger capsules. Two specimens formerly collected in Ambon (*Robbins 2293 & 2300*, H!, L!) well agree with *C. torquescens* var. *barbatum*

10. *Chaetomitrium vrieseanum* Bosch & Sande Lac., Bryol. Javanica 2: 54 (1862). (Figs. 19–22 & 30)

Type: Ceram, *de Vries s.n.*, (holotype, L!, isotype H-BR!)

Synonym. *Chaetomitrium papuanum* Bartr., Brittonia 9: 49 (1957). Type: Papua New Guinea, Milne Bay Dist., Mt. Dayman, north slopes, 800 m alt. (*Brass 23453*, isotype in H!). Syn. Nov.

Chaetomitrium rigidulum Broth. in Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Suedsee: 94 (1900). Type: New Guinea, Kaiser Wilhelmsland; Wald am Gogol, Oberlauf, an duennen zweigen, *Lauterbach 1091 p.p.* (Lectotype H-BR! selected by Norris on herbarium label in 1986). Syn. Nov.

Specimens examined. CENTRAL SERAM: in the vicinity of Kanikeh, 600 m, *C-8582* (c.sp.); G. Uwelehu near Hatuolo, 630–1000 m, *C-9246* (c.sp.); in the vicinity of Elemata Makualaina, 100 m, *C-9292a* (c.sp.); Wae Pasola Hatu – G. Meseleiana, 530 m, *C-16096* (c.sp.); Hunisi – G. Salela, 350 m, *C-16332*

Other specimens examined. North Moluccas, Halmahera: Akelamo, Oba, 0 34 N, 127 36 E, 25 m alt., *Vogel 45080* (L!). Papua New Guinea: *A. Bellamy B-161* (L!); Koitaki, 1500 ft., *Carr 12176-a* (L!); Sepik Dist., Abaunti Subdiv., along Yapa, 180 m alt., *Hoogland & Craven 10716* (L!; intermingled with *Chaetomitrium robbinsii* Bartr.); Eastern Highland Dist., Kassam, 1370 m alt., *Brass 32435* (L!; identified as *Chaetomitrium papuanum*).

Habitat. On branches of shrubs along rivers and streams in lowland forests.

Distribution. Moluccas, New Guinea.

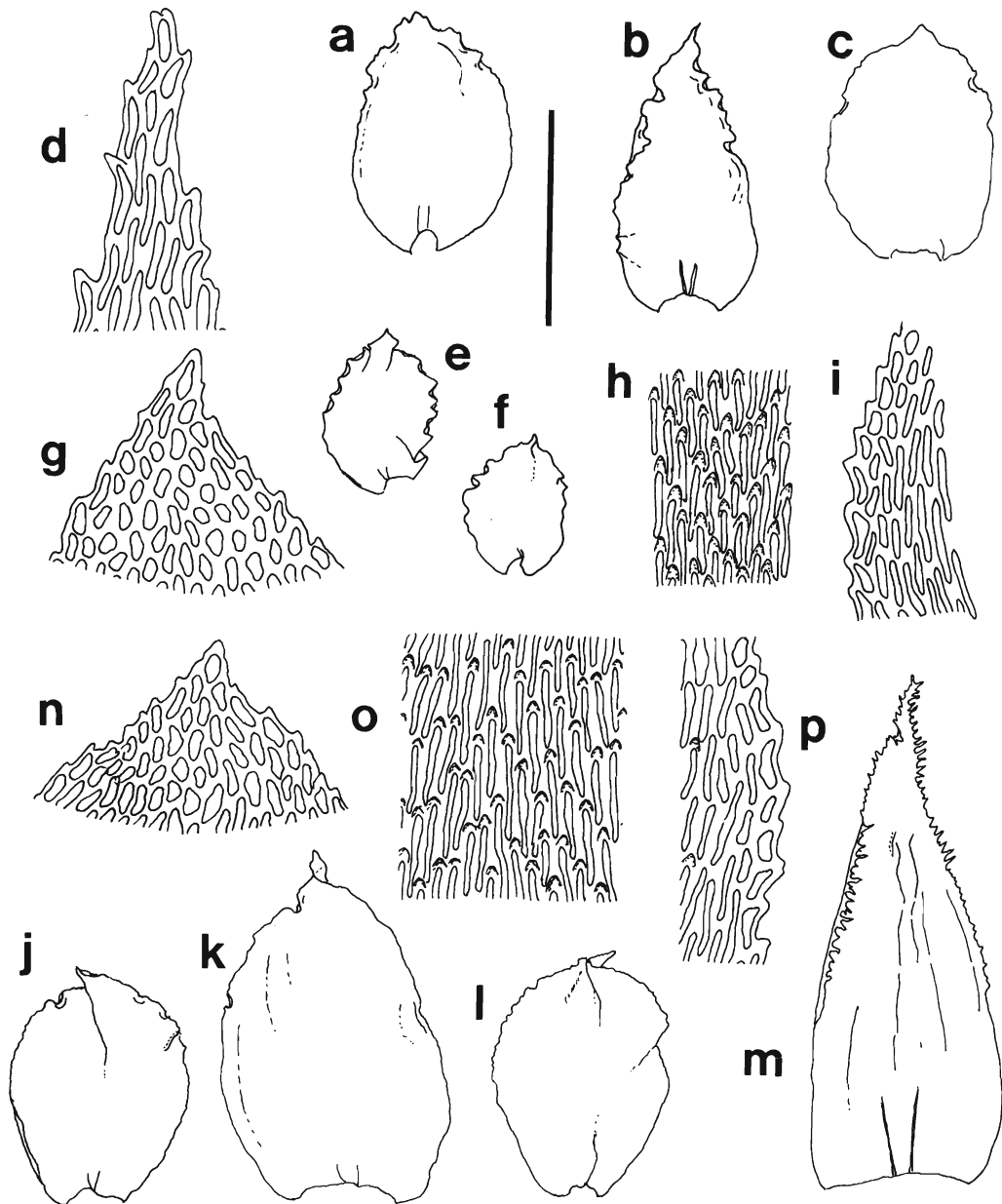


Fig. 30. *Chaetomitrium vrieseanum*. a-c, e-f & j-l: branch leaves. d, g & n: branch leaf apices. h & o: median lamina cells of branch leaves. i & p: upper margins of branch leaves. m: perichaetial leaf. Use the scale bar as 0.6 mm for a-c, e-f, j-m, as 0.06 mm for others. a-d: isotype of *Chaetomitrium papuanum*, Brass 23453. (holotype of *C. vrieseanum*, de Vries s.n.) j & n-p: C-16096. k: Bellamy B161. l: C-8582.

Note. The distinctive features of this species are as follows; (1) branches teretely foliate, (2) branch leaves orbicular to circular, round or shortly apiculate at apex, and squarrose in dry conditions, (3) branch leaf margins distinctly undulate, (4) perichaetial leaves lanceolate, densely serrate at upper half, (5) setae 10 - 15 mm long, strongly setose to the base, (6) capsules smooth, and (7) calyptrae mitrate, densely pilose, crenulate and long ciliate at base.

Plants of our collections show some discrepancy from features observed in the holotype of *Chaetomit-*

rium vrieseanum; plants of our collections are much larger in size (compare Figs. 19 and 21) and margins of branch leaves are only faintly undulate. In contrast, plants of the isotype differ from those of the holotype; they resemble Seram plants and have rather flat leaf margins.

In addition to the flat leaf margins of Seram plants, two other specimens among our collections (C-9246 and C-16332) differ from the typical *C. vrieseanum* in (1) deeply concave, only minutely crenulate branch leaves, and (2) low proration at the

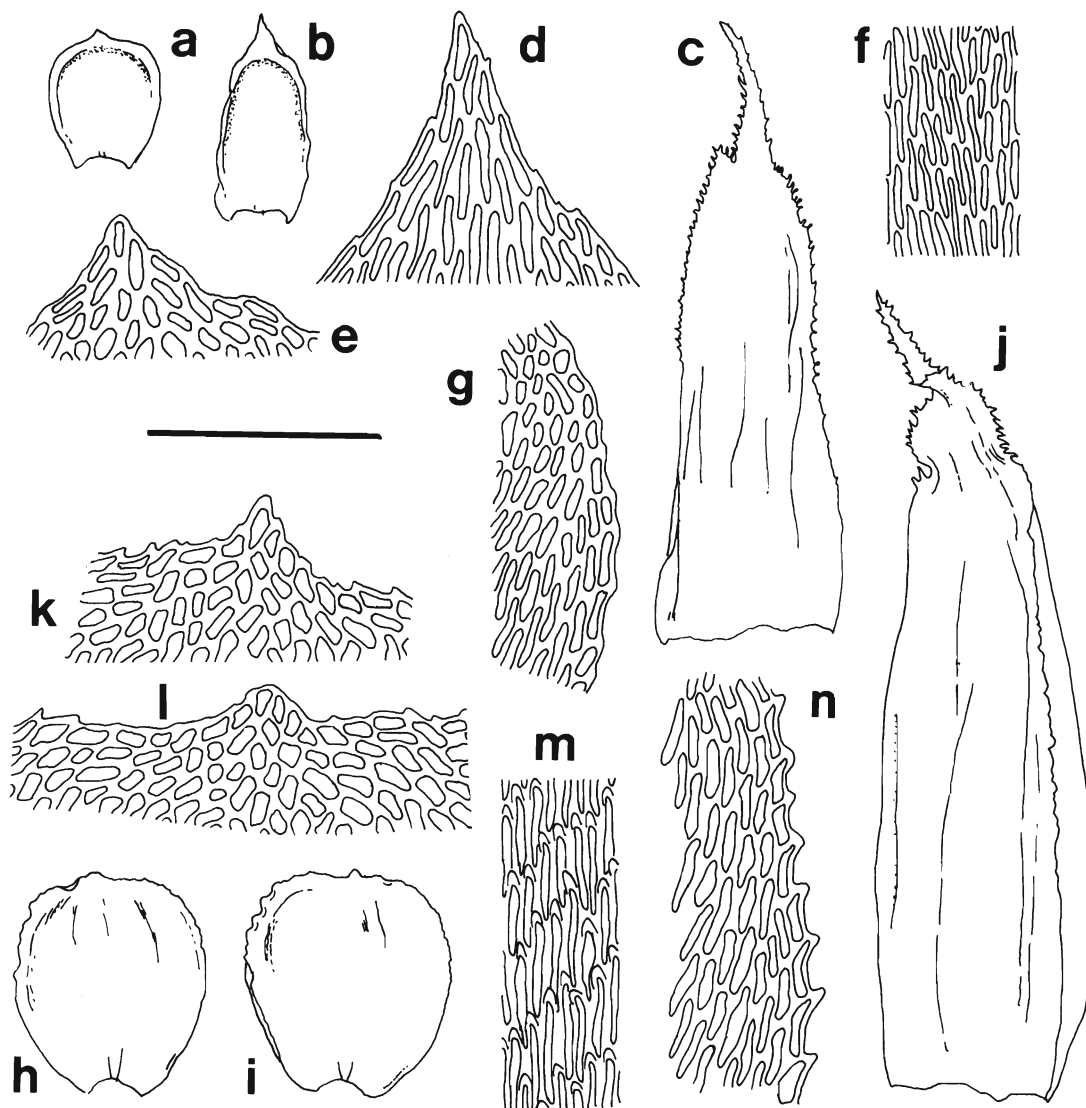


Fig. 31. *Chaetomitrium vrieseanum*. a-b & h-i: branch leaves. c & j: perichaetial leaves. d-e & k-l: branch leaf apices. f & m: median lamina cells of branch leaves. g & n: upper leaf margins of branch leaves. Use the scale bar as 0.6 mm for a-c & h-j, as 0.06 mm for others. a-g: C-9246. h-n: Brass 32435.

upper corner of lamina cells (see Figs. 22 & 31 a-g). We also tentatively treat them as a variation of this variable species *C. vrieseanum*.

One specimen identified as *Chaetomitrium papuanum* by Bartram (*L. J. Brass 32435*, L!; Figs. 20 & 31 h-n) differs from other specimens treated as *C. vrieseanum* in the present report; it has obovate branch leaves with truncate apex. It is a unique feature among the genus *Chaetomitrium*, and the specimen probably represents a new species.

Although I was unable to examine the type specimens of *Chaetomitrium recurvifolium* Fleisch., this species might be synonymous with *C. vrieseanum* judging from the original description and figures.

When describing *Chaetomitrium roemeri* Fleisch., Fleischer (1911) compared it with *C. vrieseanum*. Though *C. vrieseanum* resembles *C.*

roemeri in branch foliation pattern and shape and size of branch leaves, *C. roemeri* differs from *C. vrieseanum* in (1) the serrate and flat leaf margins, and (2) the smooth setae. In contrast, *C. roemeri* resembles *C. laevisetum* Dix. (Dutch New Guinea, Mt. Carstensz, Camp III, 2500 ft., Jan. 1913 Kloss 29, BM!), and *C. roemeri* can be distinguished from *C. laevisetum* only by the much longer setae (ca. 2.5 cm long) of the latter species.

Genus *Dimorphocladon* Dix.

1. *Dimorphocladon borneense* Dix., *J. Bot.* **60**: 109 (1922); Dix., *J. Siam Soc. Nat. Hist. Suppl.* **10**: 17 (1935).

Specimens examined. CENTRAL SERAM: Selmena - Maraina, 700-800 m, C-9114 (c.sp.); in

the vicinity of Elemata Makualaina, 100 m, *C-9310* (c.sp.).

Habitat. On leaves of shrubs along streams in secondary lowland or lower montane forests.

Distribution. Malaysian Peninsula, Sumatra, Borneo (Sarawak, West and South Kalimantan).

Note. I had misidentified and reported this species as *Aptychella* sp. (Akiyama, 1993). For the characteristic features of this species, see Akiyama (1993). In addition to the previous report (Akiyama, 1993), we also confirmed that it also occurs in the Malaysian Peninsula (*Akiyama 674* and many others, HYO!) and South Kalimantan (*Akiyama B-24636* and many other specimens, HYO!).

TRACHYPODACEAE

Only one genus of the family was found among our collections.

Genus *Trachypus* Reinw. & Hornsch.

1. *Trachypus bicolor* Reinw. & Hornsch., Nova Acta Acad. Leop.-Carol. 14 (2), Suppl. 708 (1829); Bartr., Philippine J. Sci. 68: 194 (1939); Norris & Koponen, Acta Bot. Fennica 131: 5 (1985).

Specimens examined. CENTRAL SERAM: Wae Angsela - Wae Huhu, 1510 m, *C-8786*; *ibid.*, 1870 m, *C-8834*; Wae Huhu - Owae Puku, 2230 m, *C-8885* (c.sp.); *ibid.*, 2870 m, *C-8943*; on the summit of G. Owae Puku, 2800-2900 m, *C-8966*; Hatumete to Hoale Pass, 1600 m, *C-10697*; around the summit of G. Watane, 1650 m, *C-15004* (c.sp.); Hau Harnoe - Ena Puti, 1860 m, *C-15146*; Ena Puti - G. Sinaunia, 2250 m, *C-15258*; Nihehata to G. Hoale Besar, 1450 m, *C-16710*.

Habitat. On tree trunks (including tree ferns) and rotten logs on mountain ridges or in subalpine savannah. Plants growing at sunny places tend to show blackish colors.

Distribution. Widely distributed throughout tropical and subtropical areas.

Note. Branch leaves of some plants (*C-8834* and *C-16710*) are well crispate.

Some plants among our collections (*C-8943*, *10697*) have numerous flagelliform branchlets on stems and branches. They are deciduous and easily drop off and thus seem to be effective for asexual reproduction of this species.

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