

Bryophyte flora of the Huon Peninsula, Papua New Guinea. XVIII.

Polytrichaceae and Buxbaumiaceae (Musci)

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Hyvönen, J. 1986: Bryophyte flora of the Huon Peninsula, Papua New Guinea. XVIII. Polytrichaceae and Buxbaumiaceae (Musci). — In: Koponen, T. (ed.), Bryophyte flora of the Huon Peninsula, Papua New Guinea. XIV–XIX:107–149. — Acta Bot. Fennica 133. ISBN 951-9469-27-3 ISSN 0001-5369

In Western Melanesia the family Polytrichaceae is represented by the genera *Dawsonia* R. Br., *Notoligotrichum* G. L. Sm., *Oligotrichum* Lam. & Cand., *Pogonatum* P. Beauv., *Polytrichadelphus* Bartr., *Polytrichastrum* G. L. Sm., *Polytrichum* Hedw., *Pseudoracelopus* Broth. and *Racelopus* Dozy & Molk. and the family Buxbaumiaceae by *Buxbaumia* Hedw. and *Diphyscium* Mohr. Five names are reduced to synonyms, and lectotypes are selected for *Pogonatum cirratum* (Sw.) Brid. and *P. wallisii* (C. Müll.) Jaeg. (= *P. urnigerum* (Hedw.) P. Beauv.). The presence of *Pogonatum alpinum* (Hedw.) Röhl. (= *Polytrichastrum alpinum* (Hedw.) G. L. Sm.), *P. junghuhnianum* (Dozy & Molk.) Dozy & Molk. var. *incurvum* (Dozy & Molk.) Dozy & Molk., *P. macrophyllum* Dozy & Molk., *P. spurio-cirratum* Broth., *P. submacrophyllum* Herz. and *P. subulatum* (Brid.) Brid. in Western Melanesia is doubtful and they are excluded from the flora. *Oligotrichum javanicum* (Hampe) Dozy & Molk. is newly recorded for Western Melanesia. The paper includes keys to Western Melanesian species, as well as descriptions, illustrations and distributional data. Total range, nomenclatural notes and discussions on taxonomy are also included.

Key words: Buxbaumiaceae, Musci, nomenclature, Papua New Guinea, Polytrichaceae, Solomon Islands, taxonomy, West Irian.

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I. INTRODUCTION

This paper belongs to a series dealing with the bryophyte flora of the Huon Peninsula, Papua New Guinea. Despite its name the flora of whole Western Melanesian area, e.g. West Irian, Papua New Guinea and Solomon Islands, is treated. Important background information relating to the abbreviated presentation of collecting localities and geographic ranges is presented in the first and seventh parts of this series (Koponen & Norris 1983, Norris & Koponen 1985b). The XVII part of the series is Koponen and Norris (1986). In addition to the collections by T. Koponen and D. H. Norris, specimens sent for verification or identification from many herbaria are cited. The large and representative material sent by H. Streimann (CBG) should especially be mentioned.

II. Family POLYTRICHACEAE Schwaegr. in Willd.

Previous information on most members of the Polytrichaceae of the study area is rather scattered. However, the Austro-Malesian genus *Dawsonia* R. Br. has been monographed several times, most recently by Zanten (1973). This paper follows the treatment of Smith (1971), accepting his newly proposed genera. Nine of Smith's 20 genera are present in Western Melanesia but some of the genera will be reduced in Touw's forthcoming monograph of *Racelopus* Dozy & Molk. and its close relatives (Touw in litt.).

Key to the Polytrichaceae

1. Stems with dawsonioid central strand – composite of hydroids and sclerenchyma (Fig. 5a) *Dawsonia* p. 109
1. Stems with polytrichoid central strand – solid hydrom-cylinder (Fig. 5b) or with poorly differentiated central strand (Fig. 5c)

2. Lamellae absent or reduced to distal vestiges
..... *Racelopus* and *Pseudoracelopus* pp. 134, 135
2. Lamellae developed on leaves
3. Adaxial (ventral) lamellae less than 10, developed only on costa *Oligotrichum* p. 140
3. Lamellae more than 25, not restricted to costa
4. Leaf-apex setaceous
4. Leaves acute but not setaceous
5. Leaves with widely inflexed margin
..... *Polytrichum juniperinum* p. 120
5. Leaves with plane to erect margin
6. Apical cells of lamellae distinctly pyriform in cross-section, elamellate portion of leaf-margin 3–4 cell-rows wide *Polytrichadelphus archboldii* p. 116
6. Apical cells round to ovate, elamellate portion of leaf-margin 5–7 cell-rows wide
..... *Polytrichastrum longisetum* p. 117
7. Apical cells of lamellae papillose
7. Apical cells of lamellae smooth
8. Apical cells coarsely papillose (Fig. 9h)
8. Apical cells very finely papillose (Fig. 12j)
9. Leaf apex acute, sheath wider than blade
..... *Pogonatum urnigerum* p. 122
9. Leaf apex obtuse and cucullate, sheath not distinctly wider than blade *Notoligotrichum australe* p. 138
10. Apical cells distinctly pyriform in cross-section
..... *Polytrichadelphus archboldii* p. 116
10. Apical cells truncate to rounded
..... *Pogonatum neesii* p. 127
11. Leaves with widely inflexed margin
..... *Polytrichum juniperinum* p. 120
11. Leaf-margins plane to erect
12. Lamellae crenate or distinctly lobed in side view
.....
12. Lamellae essentially straight in side view
13. Lamellae irregularly crenate or lobed in side view
.....
13. Lamellae crenate in side view
14. Leaf blade 0.2–0.5 mm wide, lamellae 28–40, leaf apex gradually narrowed
..... *Pogonatum microphyllum* p. 122
14. Leaf blade 0.6–1.0 mm wide, lamellae 46–60, leaf apex fairly abruptly narrowed
..... *Pogonatum tubulosum* p. 125
15. Lamellae 1–3, exceptionally up to 4 cells high
..... *Pogonatum subtortile* p. 129
15. Lamellae 5–8 cells high
..... *Polytrichadelphus archboldii* p. 116
16. Lamellae 4–6 cells high
..... *Polytrichastrum longisetum* p. 117
16. Lamellae 1–2 cells high, in some cases up to 3 cells high *Pogonatum cirratum* p. 131

Genus *Dawsonia* R. Br. 1811

The genus *Dawsonia* was most recently monographed by Zanten (1973). Earlier revisions were made by Burges (1949) and Wijk (1957). The present paper follows Zanten's work in which more complete information about the taxa can be found. The authors of the Huon Peninsula series have ordinarily avoided the recognition of

subspecific categories (Koponen & Norris 1985). This paper continues the procedure and avoids recognition of the varieties of *D. beccarii* Broth. & Geh. and *D. longifolia* (Bruch & Schimp.) Zant. This approach is especially justified in the latter because of the specimens intermediate between the two recognised varieties. In this paper the order of the species follows reversely the hypothetical phylogeny of the genus (see Zanten 1973). This presentation makes it possible to give the species in continuing order of resemblance.

All species of the genus occurring in Western Melanesia belong to sect. *Superba* Schlieph. & Geh. emend. G. L. Sm. and thus have the typical "dawsonioid" central strand (see Fig. 5a) consisting of both sclerenchyma and hydroids. Cross-sections of the stems are easily distinguished from those of other Polytrichaceae. However, the large size of most species of *Dawsonia* normally makes cross-sections unnecessary.

Key to the species of Dawsonia (mostly according to Zanten 1973)

- 1. Lamellae straight in side view (Fig. 3a) 2
- 1. Lamellae crenate in side view (Fig. 3g) 4
 - 2. Outer walls of apical lamellar cells strongly and regularly incrassate, the lateral and cross walls clearly thinner; seta short, (0.5-)0.7-1 cm long 2. *D. gigantea*
 - 2. Outer walls of the apical lamellar cells as thick as the other walls; seta (1.5-)2.5-4.0 cm long 3
- 3. Lamellae low and compact, usually hard to remove from the blade, 2-3(-4) cells high, apical lamellar cells predominantly about 3 times as long as high, rhomboidal cells usually present in lower part of lamellae 1. *D. grandis*
- 3. Lamellae (3-)4-5 cells high, easily removed from the blade, most of the apical lamellar cells as long as high 3. *D. longifolia*
- 4. Blade up to 11 mm long, swelling-tissue occupying less than 2/3 (usually about 1/2) of the blade immediately above sheath apex 7. *D. beccarii*
- 4. Blade over 11 mm long 5
- 5. Outer wall of apical lamellar cells strongly incrassate ... 5. *D. pullei*
- 5. Outer wall of apical lamellar cells not excessively thickened 6
- 6. Blade 19-28 mm long, more or less spirally twisted when dry; lamellae 3-4(-5) cells high; crenation either distinct or rather weak 4. *D. papuana*
- 6. Blade (9-)11-17 mm long, not or hardly spirally twisted when dry; lamellae 4-6 cells high, markedly crenate, swelling-tissue occupying about 2/3 of the blade width immediately above sheath apex 6. *D. lativaginata*

1. *Dawsonia grandis* Schlieph. & Geh. in Geh. (Figs. 1a, 3a).

Rev. Bryol. 23:76. 1896. — Type: Papua New Guinea. Milne Bay: Mt. Dayman, 1894 *W. Armit Jr. 616*, (JE, lectotype cf. Zanten 1973; BM, BRI?, GRO, H-BR! isolectotypes).

Plants erect and large with stems (14-)27-58 cm high, the leafy part 7.0-31 cm. Leaves nearly appressed to widely spreading — usually erect-spreading when dry, widely spreading to squarrose when moist. Blade (18-)20-41 mm long, mostly 30-35 mm, width 0.85-1.30 mm. Leaves usually straight, margin inflexed or plane when dry, plane when moist. Lamellae 2-3(-4) cells high, hard to remove, apical row straight as seen in side view, cells mostly longer than high, in lower rows quite often with obliquely rhomboidal cells. Seta 2.7-4.0 cm long, papillose, capsule 0.8-1.4 cm long.

Illustrations: Zanten 1973: pl. IVa, IXc, Xf.

The shallow, compact, not easily removed lamellae make this species easy to identify. *D. longifolia* usually has higher and easily removed lamellae, and the other species of the ecrenate complex, *D. gigantea* C. Müll. ex Geh., shows distinct incrassation of the outer wall of the cells in its apical row of lamellae. The height of the stem and ± straight, very long leaves with predominantly inflexed margins are typical features at least in this material which separate *D. grandis* from the other species of the genus.

D. grandis has a wide altitudinal range (1 450-2 900 m), and it grows almost exclusively (nine out of ten specimens) in primeval rainforest. As a terrestrial species it grows mainly on shady forest floor, substrates being: soil (7 specimens), humus (1) and stump (2).

Range on the Huon Peninsula: 2g. 33947. 6o. 32923. 8h. 31446. 9c. 30203. 9d. 61577. 9k. 61718. 10c. 28598. 10e. 28788. 10f. 29042. 10o. 59793.

Range in Western Melanesia (Koponen et al. 1986). West Irian. 2. 4. 6. 7. Papua New Guinea 10. 12. 14-17. 20. 22. 25.

Total range (Zanten 1973): As 4: Ind PNG. — Map: Zanten 1973: 20 (map E).

2. *Dawsonia gigantea* C. Müll. ex Geh. (Figs. 1b, 3b)

Rev. Bryol. 23: 77. 1896. — Type: Indonesia. West Irian. Manokwari: Mt. Arfak, ad Hatam (5 000-7 000 ft), VII. 1875 *O. Beccari 160* (JE, lectotype, cf. Zanten 1973; GRO, H-BR!, L, isolectotypes).

Plants erect and large with stems up to 35 cm high, the leafy part 10–20 cm. Leaves erect-spreading to spreading when dry, spreading to squarrose when moist. Blade 18–28 mm long, 0.7–0.8 mm wide, margin inflexed or plane when dry, plane when moist. Lamellae 3–4 cells high, straight in side view, the apical cells always with a strongly incrassate outer wall, about as high as long to ca. 3 times as long as high. Seta very short, 0.8–1.0 cm, very finely striated. Capsule 7–9 mm long (Zanten 1973).

The description above is based only on the two Western Melanesian specimens which were at hand for the study in H. For a more thorough description based on larger material see Zanten (1973).

Illustrations: Geheeb 1898: tab. XI, Zanten 1973: pl. Va–b, IXd, Xe.

D. giganteum was not present in this material and no earlier records exist from Morobe Province. The easternmost collections are from West Sepik (Zanten 1973).

Range on the Huon Peninsula: None.

Range in Western Melanesia (Koponen et al. 1986): West Irian. 2. 3. 6. 7. Papua New Guinea. 9.

Total range (Zanten 1973): As 4: Ind PNG. — Map: Zanten 1973: 20 (map E).

3. *Dawsonia longifolia* (Bruch & Schimp.) Zant. (Figs. 1c, 3c)

Lindbergia 4: 133. 1977. — *Polytrichum longifolium* Bruch & Schimp. in B. S. G., Bryol. Eur. 4: 256. 1844 (fasc. 21–22 Mon. 2).

Dawsonia superba Grev., Ann. Mag. Nat. Hist. 19: 226. 1847. — Synonymized by Zanten (1977).

Plants erect, medium-sized to large, with stems (5.0–)18–46 cm high, the leafy part 3.0–14 cm. Leaves nearly appressed to widely spreading when dry, widely spreading to squarrose when moist. Blade 17–28 mm long, width 0.8–1.0 mm. Leaves usually straight, margins inflexed or plane when dry, always plane when moist. Lamellae 4–5 cells high, apical row straight or very shallowly crenate as seen in side view, cells of the apical row as high as long to slightly higher than long. Sporophytes observed only in three Western Melanesian specimens; seta 1.5–3.4 cm high, papillose, capsule 1.1–1.2 cm long.

Illustrations: Greville 1847: pl. XII; Brotherus 1925: 521

(fig. 796); Sainsbury 1955: 42 (fig. 1); Wijk 1957: 12 (fig. 3:2), 13 (fig. 4:2), (as *D. pulchra* Wijk): 10 (fig. 2), 12 (fig. 3:1), 13 (fig. 4:1); Zanten 1973 (as var. *longifolia*): pl. IVb, e, f, IXa, Xb, (as var. *superba*): pl. IVc, d, IXb, Xc; Scott & al. 1976: 77 (pl. 6).

According to Zanten (1973), *D. longifolia* includes two varieties which were earlier treated as distinct species (Wijk 1957). In the present material there are five specimens of *D. longifolia* and two of them (one with a sporophyte) belong to var. *superba* (Grev.) Zant., the three others show characters of both varieties. In Papua New Guinea, the only previous record of var. *longifolia* (Bruch & Schimp.) Zant. is doubtful and so assignment of all our material to var. *superba* is not inappropriate. However, seeing the three specimens with intermediate characters strengthen my resolve to exclude varieties from this presentation.

D. longifolia is distinguished from *D. grandis* by its higher lamellae, its shorter stems and leaves, and by the different apical cells of lamellae. The lamellae are usually not absolutely straight in side view but neither are they distinctly crenate as in *D. papuana* F. Müll. ex Geh.

D. longifolia has a wide altitudinal range (1 500–3 350 m) on the Huon Peninsula. It grows both in primeval (3 specimens) and disturbed forests (2), on sunny trail banks as well as in full shade. It is mainly terrestrial (4 specimens). Only once was it collected on twigs.

Range on the Huon Peninsula: 6w. 62780a. 9l. 61982, 62163. 10e. 28765. 10n. 59756.

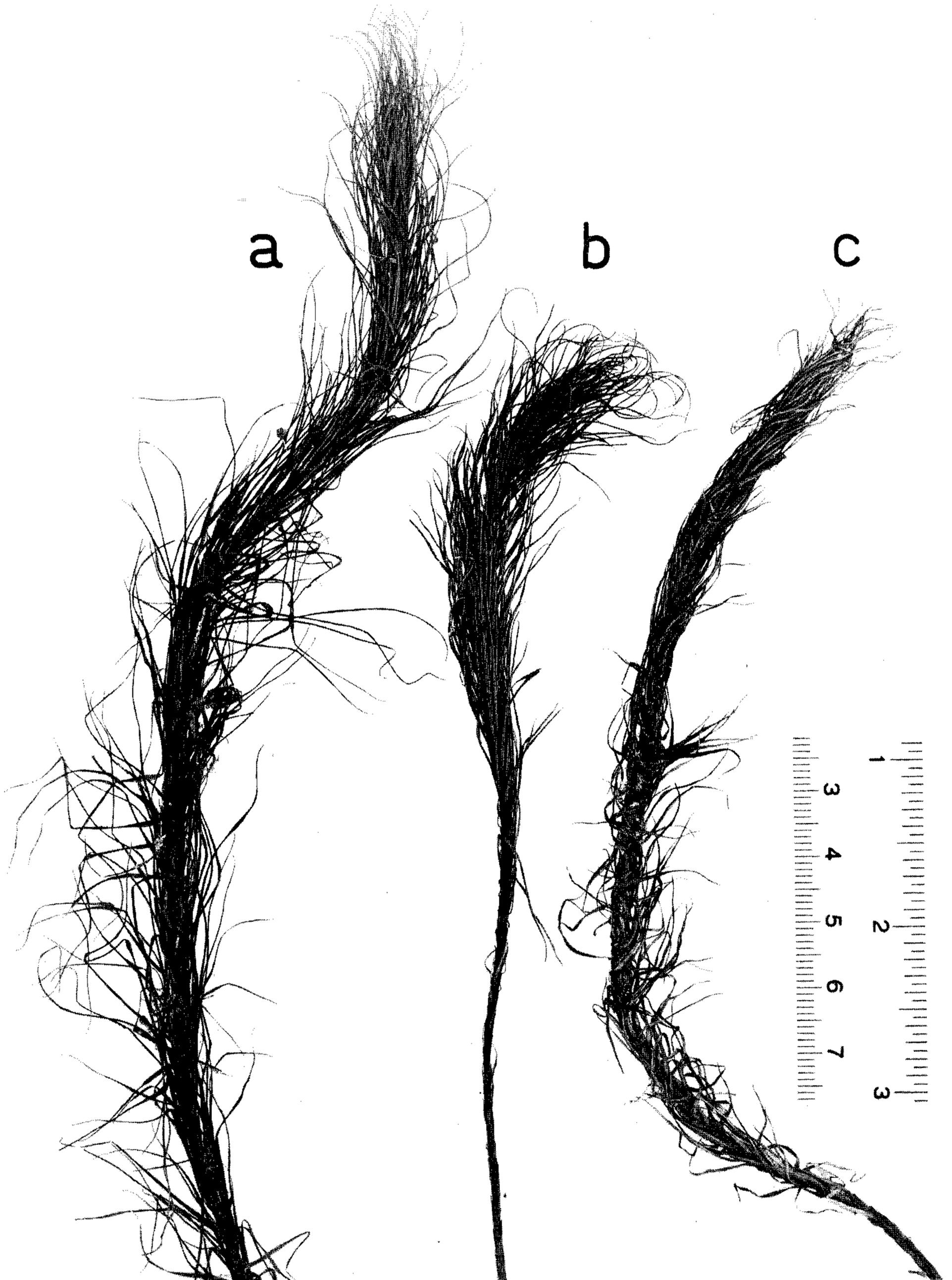
Range in Western Melanesia (Koponen et al. 1986): West Irian. 2. 4. 6. 7. Papua New Guinea. 12. 14. 15. 20.

Total range (Zanten 1973): As 4: Ind Ma Phi PNG; Austr 1; Austr 2. — Map: Zanten 1973: 20 (map D).

4. *Dawsonia papuana* F. Müll. ex Geh. (Figs. 2a, 3d, 4a, 5a)

Rev. Bryol. 23: 76. 1896. — *D. superba* Grev. var. *papuana* F. Müll. ex. Geh., Rev. Bryol. 23: 74. 1896, *nom. inval. prov.* — Type: Papua New Guinea. Central: Mt. Musgrave 25.VI.1889 W. MacGregor 362 (JE, lectotype cf. Zanten 1973; BM, GRO, H-BR!, L, isolectotypes).

Plants erect, medium-sized to large, with stems (14–)18–53 cm high, leafy part 4.0–29 cm. Leaves erect-spreading to spreading when dry, widely spreading to squarrose when moist. Blade 15.0–28.5 mm long, width (0.80–)1.00–1.35 mm. Leaves from straight or crisped to strongly spiralled when dry, margin inflexed to



Figs. 1a-c. — a. *Dawsonia grandis* Schlieph. & Geh. in Geh. (Koponen 28598). — b. *D. gigantea* C. Müll. ex Geh. (Royen & Sleumer 7066, H). — c. *D. longifolia* (Bruch & Schimp.) Zant. (Norris 62780a). — Metric scale on left and English scale on right.

plane when dry, plane when moist. Lamellae 3–4(–5) cells high, apical cells enlarged, usually as long as high. Seta 2.8–4.0 cm long, papillose, capsule 0.8–1.2 cm long.

Illustrations: Zanten 1973: pl. Vc, d, VIIIh, XIa; Héban 1976: 234 (pl. 1: 2–3).

Dawsonia papuana is the most abundant species of the genus in the present material. Typical specimens, large plants with distinctly crenate, quite low lamellae, are easily identified. Specimens with shallow crenation resemble *D. longifolia*, but these specimens can usually be identified when a sufficient number of lamellae are observed. In *D. papuana* at least some lamellae are crenate in side view and the lamellae are never straight. Specimens with short stems and very short leaves may bring difficulties. However, the leaf margin on *D. lativaginata* Wijk is at least in the present material consistently “high” as is that of *D. beccarii* (Figs. 4b, c). The leaf-margin of *D. papuana* is consistently “low and compact” (Fig. 4a).

On the Huon Peninsula *D. papuana* was collected at medium to high elevations (1900–3100 m). It is primarily a plant of undisturbed forests (16 out of 18 specimens were collected in primeval forest). *D. papuana* is a terrestrial species growing in shady habitats on soil (14 specimens) and humus (3). Only one specimen was collected on a tree trunk.

Range on the Huon Peninsula: 1a. 34577. 1b. 34688. 1e. 65123, 65114. 2e. 33874. 2u. 64189. 3f. 29844. 3h. 60151. 4c. 878. 4g. 66761. 4h. 67024, 67026. 6n. 32920. 6z. 63477. 6A. 63762. 8b. 31017. 9f. 30554. 9j. 61109.

Range in Western Melanesia (Koponen et al. 1986): West Irian. Hubrecht Mts. (Zanten 1973). 7. Papua New Guinea. 11. (Present report), 12–17. 20. Solomon Islands. 31.

Total range (Zanten 1973): As 4: PNG; Oc: Sol. — Map: Zanten 1973: 20 (map C).

5. *Dawsonia pullei* Fleisch. & Reim. in Reim. (Figs. 2b, 3e)

Hedwigia 69: 134. 1929. — Type: Indonesia. West Irian. Jayawijaya: Mt. Hellwig, 1800 m, 17.XII.1912 A. Pulle 727 (BM, GRO, L, U, cf. Zanten 1973).

Stems erect, 12–51 cm high, the leafy part 5.0–17 cm of the stem. Leaves relatively remotely set, erect-spreading when dry, widely spreading to squarrose when moist. Blade of the leaves 17–28 mm long and 0.75–1.0 mm wide, strongly

spirally twisted, in its upper part tightly coiled inwards when dry, margins plane, only slightly inflexed. Lamellae 3–4 cells high, distinctly crenate as seen in side view, the apical cells enlarged and predominantly higher than long, the outer walls distinctly incrassate. Seta 3–4 cm long, papillose, but smooth or nearly so at base. Capsule 8–12 mm long. (Sporophytic characters after Zanten, 1973).

Illustrations: Zanten 1973: pl. III m, n, VIIc, VIII f, XI b.

D. pullei has not been found on the Huon Peninsula but it has been collected in the Morobe Province (see below).

Range on the Huon Peninsula: None.

Range in Western Melanesia (Koponen & al. 1986): West Irian. 7. Papua New Guinea. 9. 12. Track to Mt. Kaindi, 4 km W of Wau, 2230 m, 22.V.1982 Streimann 19893; Ekuti Div., Bulolo-Aseki Road, 33 km WSW of Bulolo, 2260 m, 17.VI.1982 Streimann 20330, 20346 (CBG, LAE, H!, NICH, NY), 20330 also in GRO.

Total range: Endemic to New Guinea (Zanten 1973). — Map: Zanten 1973: 20 (map F).

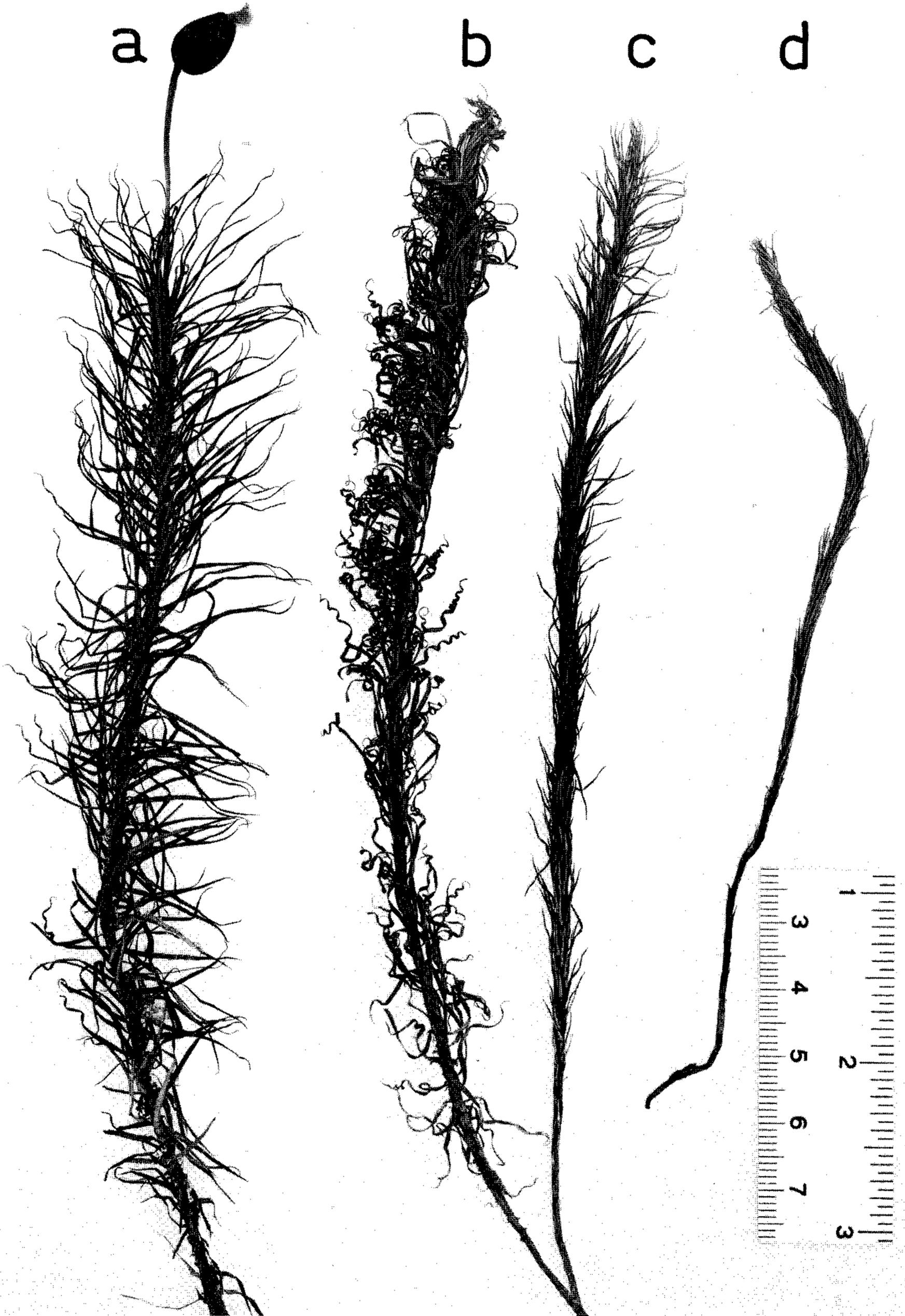
6. *Dawsonia lativaginata* Wijk (Figs. 2c, 3f, 4b)

Rev. Bryol. Lich. 26: 16. 1957. — Type: Indonesia. Jayawijaya: Mt. Wilhelmina, 7 km NE of summit, alt. 3560 m, IX.1938 Brass & Myer-Drees 9623 (GRO, holotype; BRI, FH, L, isotypes).

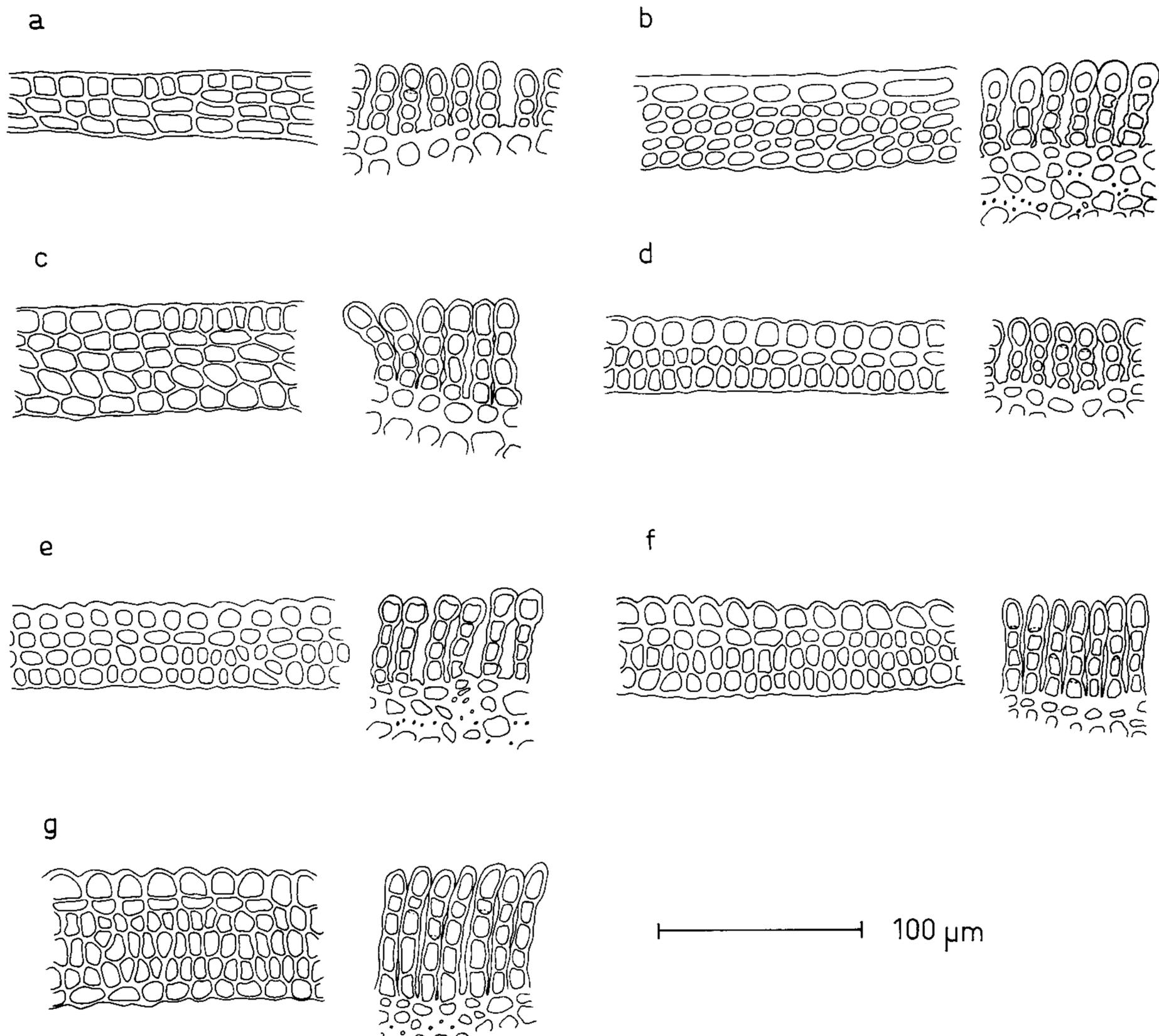
Plants erect, medium sized to large, with stems 15.5–38.0 cm high, the leafy part (4.5)6.0–19 cm. Leaves appressed to widely spreading when dry, widely spreading to squarrose when moist. Blade (9.0)11–17 mm long and 0.70–0.95 mm wide, usually straight, margins usually inflexed when dry, plane when moist, swelling tissue occupying 2/3 of the blade width at that point. Lamellae 4–6 cells high, distinctly crenate as seen in side view, cells of the apical row predominantly higher than long or as high as long. Sporophytes present in only one specimen. Seta 3.3 cm long, papillose, more weakly so towards the base. Capsule 10 mm long.

Illustrations: Wijk 1957: 12 (fig. 3:3), 13 (fig. 4:3), 15 (fig. 5:1); Smith 1971: 45 (fig. 61); Zanten 1973: pl VII d, e, VIII g, XI d.

D. lativaginata and *D. beccarii* are usually easy to distinguish from the other species of the genus by their slender habit in dry condition. But at least in the present material it is difficult



Figs. 2a-d. — a. *Dawsonia papuana* F. Müll. ex Geh. (Koponen 30554). — b. *D. pullei* Fleisch. & Reim. in Reim. (Streimann 20346, H). — c. *D. lativaginata* Wijk (Koponen 32785). — d. *D. beccarii* Broth. & Geh. in Geh. (Norris 62220). — Metric scale on left and English scale on right.



Figs. 3a–g. — Lamellae in side view and cross-section. — a. *Dawsonia grandis* Schlieph. & Geh. in Geh. (Koponen 28788). — b. *D. gigantea* C. Müll. ex Geh. (Royen & Sleumer 7066, H). — c. *D. longifolia* (Bruch & Schimp.) Zant. (Norris 59756). — d. *D. papuana* F. Müll. ex Geh. (Koponen 30554). — e. *D. pullei* Fleisch. & Reim. in Reim. (Streimann 20346, H). — f. *D. lativaginata* Wijk (Koponen 32785). — g. *D. beccarii* Broth. & Geh. in Geh. (Norris 62220). — Use the 100 μm scale for all the figures.

to separate the two species. The specimens of *D. lativaginata* with consistently long leaves (from 11 up to 17 mm) and with very well-developed swelling-tissue (2/3 of the blade width) are easily identified but there are specimens difficult to identify (32774 and especially 32770, representing apparently the same clone). I prefer to determine these specimens as *D. lativaginata*, since the specimens have leaves up to 13 mm long and the swelling-tissue is well-developed, consisting 2/3 of the blade width. More material and field observations are, however, needed to clarify whether *D. lativaginata* is a species of its own or whether it would be better treated as a variety of

D. beccarii (cf. also Zanten 1973). At least on the basis of the present material distinguishing *D. lativaginata* from *D. papuana* is quite easy by the leaf-margin (see the discussion under *D. papuana*).

D. lativaginata is a high elevation plant; collections were made at altitudes of 2 850–3 570 m. It is a plant of both open and shaded, closed habitats. Three specimens were collected in primeval forest, two in scrub, two in savanna and one in grassland. The species is exclusively terrestrial, growing on soil (6 specimens) and humus (2).

Range on the Huon Peninsula: 6a. 62404. 6c. 32078. 6j. 63230. 6k. 32770, 32774. 6l. 32785. 6w. 62780b. 6x. 62975.

Range in Western Melanesia (Koponen et al. 1986): West Irian. 7. Papua New Guinea. 12. 14–17.

Total range (Zanten 1973): As 4: Ind PNG. — Map: Zanten 1973: 20 (map F).

7. *Dawsonia beccarii* Broth. & Geh. in Geh. (Figs. 2d, 3g, 4c)

Rev. Bryol. 23: 78. 1896. — Type: Indonesia. West Irian. Manokwari: Mt. Arfak ad Hatam (5 000–7 000 ft), VII. 1875 *O. Beccari* 159 (H-BR! holotype; GRO, JE, L, isotypes).

Dawsonia altissima C. Muell. ex Broth. & Geh. in Geh., Rev. Bryol. 23: 78. 1896. *nom. nud. in syn.*

Dawsonia filicaulis Geh., Rev. Bryol. 23: 74, 78. 1896. *nom. inval. in syn.*

Dawsonia limbata Dix., J. Linn. Soc. Bot. 45: 486. 1922. — Type: Indonesia. West Irian. Paniai: Mt. Carstensz, Camp VIa, 3 050 ft, 16.I.1913 *C. Boden Kloss* 18 (BM, holotype; GRO, L, isotypes).

Dawsonia crispifolia Dix., J. Linn. Soc. Bot. 45: 486. 1922.

Dawsonia crispata Dix. ex Broth. in Engler & Prantl: Nat. Pflanzenfam. Ed. 2, 11: 521. 1925, err. pro. *D. crispifolia* Dix. — Type: Indonesia. West Irian. Paniai: Mt. Carstensz, Camp XIII–XI, 8 075–10 300 ft, *C. Boden Kloss* 21 (BM, holotype; GRO, isotype).

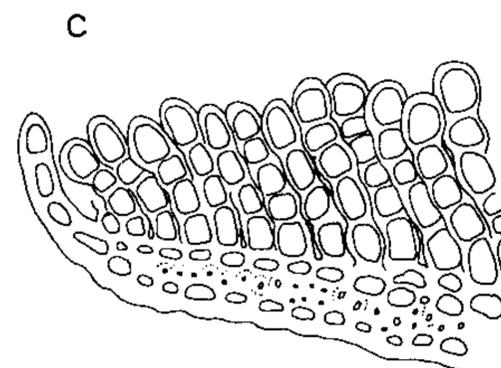
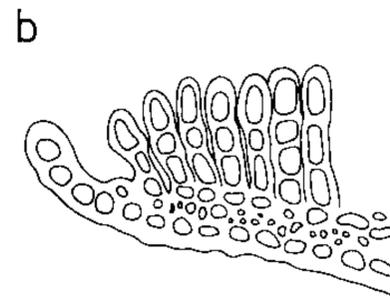
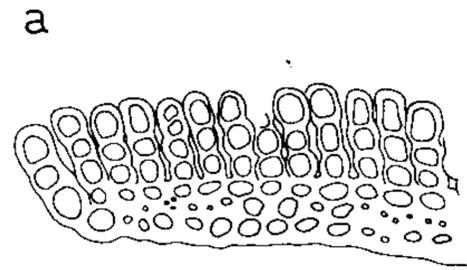
Polytrichadelphus papuanus Bartr., Brittonia 9: 56. 1957. — Type: Papua New Guinea. Milne Bay: Goodenough Island, east slopes, eroding ground on a grassy spur ridge, 1 450 m, *Brass* 24702 (FH, holotype).

Dawsonia robbinsii Bartr., Rev. Bryol. Lich. N. S. 30: 207. 1961. — Type: Papua New Guinea. Enga: Wabag Area, Sau Valley along road to Kompam, N of Wabag, clay bank of roadside, 7 000 ft, 10.VII.1960 *Robbins* 2850 (FH, holotype; GRO, L, isotypes).

All synonyms according to Zanten (1973).

Plants erect, medium-sized, with stems (3.5–) 9.5–25 cm high, the leafy part (1.0–) 5.5–10 cm. Leaves usually appressed (sometimes widely spreading) when dry, widely spreading (in some cases squarrose) when moist. Blade 6.5–10 mm long, width 0.55–0.70(–0.80) mm. Leaves usually straight, margins inflexed when dry, plane when moist. Swelling-tissue situated at transition from blade to sheath, consisting ca. 1/2 of the blade width at that point. Lamellae 4–7 cells most usually 5 cells high, apical row distinctly crenate as seen in side view, cells usually higher than long. Seta 2.0–3.4 cm high, papillose, capsule 0.7–1.0 cm long.

Illustrations: Geheeb 1898: tab. XII; Dixon 1922 (as *D. crispifolia*): pl. 28 (fig. 3), (as *D. limbata*): pl. 28 (fig. 4); Noguchi 1953: 21 (fig. 10: 14–17); Zanten 1973 (as var. *beccarii*): pl. VIg–k, VIIIc, Xh, (as var. *limbata*): pl. VIa–f, VIIIe, XIc, photo II, (as var. *longivaginata*): pl. VIIa, VIII d, Xg; Hébant 1976 (as var. *limbata*): 234, pl. 1 (fig. 4).



100 μm

Figs. 4a–c. — Leaf margin cross-sections. — a. *Dawsonia papuana* F. Müll. ex Geh. (*Koponen* 30554). — b. *D. lativaginata* Wijk (*Koponen* 32785). — c. *D. beccarii* Broth. & Geh. in Geh. (*Norris* 62220). — Use the 100 μm scale for all the figures.

For the separation from *D. lativaginata*, see the discussion above.

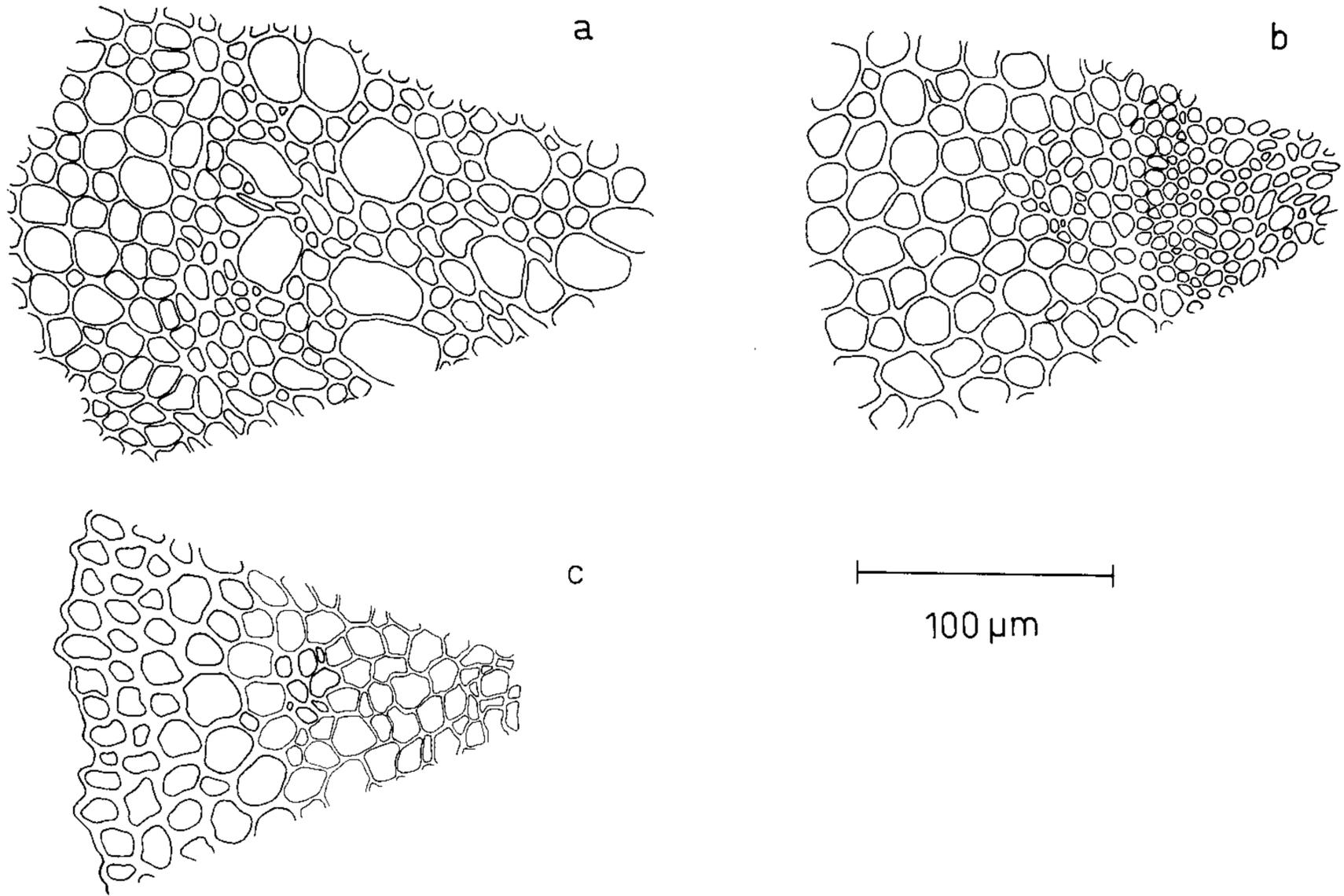
According to Zanten (1973), *D. beccarii* consists of three varieties. The four specimens from the Huon Peninsula I refer to var. *limbata* (Dix.) Zant. & P. Heuk.

On the Huon Peninsula *D. beccarii* was collected between 2 280–2 850 m. It grows in mesic to moist habitats in open and sunny places. It is mostly a terrestrial species growing on soil (3 specimens), and occasionally on cliff (1). According to Streimann's extensive collections, *D. beccarii* seems to be a common pioneer plant of exposed habitats such as trail and road banks.

Range on the Huon Peninsula: 6a. 62220, 62282. 8c. 31109. 8g. 31405.

Range in Western Melanesia (Koponen et al. 1986): West Irian. 2. 6. 7. Papua New Guinea. 12–17. 20. 22. 23.

Total range (Zanten 1973): As 4: Ind Ma Phi PNG. — Map: Zanten (1973): 20 (map B).



Figs. 5a–c. — Stem cross-sections. — a. *Dawsonia papuana* F. Müll. ex Geh. (Koponen 30554). — b. *Pogonatum cirratum* (Sw.) Brid. (Koponen 31259). — c. *Pseudoracelopus philippinensis* Broth. (Norris 49901). — Use the 100 µm scale for all the figures.

Doubtful species

Dawsonia lamii Reim.

Hedwigia 69: 134. 1929. — Type: Indonesia. West Irian. Jayawijaya: in reg. flum. Mamberamo, in monte Doorman, 2480 m, 11.XI.1920 H. J. Lam 1980.

Wijk (1957) gives *D. lamii* as a synonym of *D. pullei* and Zanten (1973) does the same with hesitation. According to him, the species could as well be referred as a synonym of *D. papuana*. Obviously *D. lamii* is conspecific either with *D. papuana* or *D. pullei* and does not represent a species of its own (cf. Reimers 1929, Zanten 1973).

Genus *Polytrichadelphus* (C. Müll.) Mitt. 1860

Nearly 50 species have been described in the genus *Polytrichadelphus* almost exclusively occurring in the Southern Hemisphere — in South America and Austro-Melanesian region. Wijk et al. (1967) accepted 28 species and according to the preliminary study by Smith (1971), the number of species is still too high. In Western

Melanesia the genus is represented by only one species, *P. archboldii* Bartr. *P. papuanus* of Goodenough Island is conspecific with *Dawsonia beccarii* (Zanten 1973).

Polytrichadelphus archboldii Bartr. (Figs. 6a–k)

Lloydia 5: 291, fig. 62A–B. 1942. — Type: Indonesia. West Irian. Jayawijaya: Mt. Wilhelmina, Brass 10423 (FH holotype, not seen); Mt. Wilhelmina, stones along small river, open place, Middlecamp, 3400 m. Brass 9689 (FH, paratype, not seen).

Plants medium-sized to robust, light-green above, older parts turning dark brown. Erect stems stiff, loosely caespitose, 30–210 mm tall, the leafy part 15–160 mm, lower parts bracteate, stems reddish-brown, pentagonal in cross-section with polytrichoid central strand, base procumbent with thick hyaline rhizoid-cover, trigonal in cross-section. Leaves linear-lanceolate, quite distantly situated, appressed to erect-spreading when dry, widely spreading to squarrose when moist, sheathing the stem. Blade of the leaves (3–)5–7 mm long and 0.50–0.75 mm wide. Leaf apex acuminate to setaceous with

very fragile brown or hyaline hair-point. Lamina of the leaves multistratose with unistratose margin consisting of 2–4 cell-rows without lamellae, narrowly inflexed and dentate especially near the apex. Teeth sharp and small, formed of 1–4 cells. Leaf point and costa essentially smooth at back or with few small teeth at the apex. Cells of the lamina quadrate to shortly rectangular, 12–18 μm . Lamellae 38–47, remotely set on the blade, 6–8 cells high, crenate as seen in side view, cells rectangular or subquadrate, 8–10 \times 12–18 μm , apical cells not geminate, mostly higher than long, wide pyriform in cross-section, outer walls slightly or strongly incrassate, smooth or very finely papillose. Sheath of the leaves bluntly ovate, gradually or abruptly narrowed to the blade, 1.4–2.1 mm long and 1.3–2.1 mm wide, cells elongated rectangular, 10–14 \times 50–110 μm . Dioicous. Perigonal bracts wide ovate with short and narrow lamina covered with few lamellae. Antheridia 1.1–1.35 mm long with uniseriate paraphyses, some paraphyses with multiseriate upper part, ligulate. Male plants elongated by annual innovations. Perichaetial leaves setaceous, blade 6.0–12 mm long, width ca. 0.6 mm, with fragile hair-point of 2–4 mm. Sheath oblong, 2.4–3.5 \times 1.6–2.1 mm, leaf-cells as in cauline leaves. Seta terminal, sometimes pseudolateral by innovation, solitary and straight, 27–60 mm long, red and smooth. Capsules inclined, light to dark brown. Urn oblong, lunate in cross-section with two sharp ridges on upper side, 4–6 mm long. Cryptoporic stomata restricted to base of urn. Exothecial cells polygonal, 20–40 μm , walls firm but distinctly incrassate only at base of urn. Operculum red, subulate, 2.5–3.0 mm long. Diaphragm differentiated with transversely elongated flat cells. Peristome with 64 lingulate, yellowish teeth, 110–190 μm long, basal membrane brown, 70–140 μm high. Spores round to ovate, 12–14 μm in diameter, dark yellowish.

Illustrations: Bartram 1942: 286 (fig. 62A–B); Smith (1971): 42 (fig. 58).

By its habit *P. archboldii* may be confused with three other, fairly large species of the Polytrichaceae with essentially straight leaves in dry condition. They are mostly restricted to fairly high altitudes in Western Melanesia. Of these four, *Polytrichum juniperinum* Hedw. with its unique, broadly inflexed leaf-margins is easily identified even with a hand-lens. The other three

are most easily identified on the basis of the apical cells of lamellae. Finely papillose (or smooth) and regularly crenate apicals of *Polytrichadelphus archboldii* are clearly different from those of *Polytrichastrum longisetum* (Brid.) G. L. Sm. and *Pogonatum urnigerum* (Hedw.) P. Beauv. The latter species has coarsely papillose apicals and those of *Polytrichastrum longisetum* are straight in side view and essentially smooth. Some specimens of *Dawsonia beccarii* with exceptionally closely set leaves may also resemble *Polytrichadelphus archboldii*, the cross-section of the stem, however, reveals the typical “dawsonioid” central-strand (see Fig. 5a), which is an easy and reliable way to confirm the identification.

P. archboldii occurs at 1 950 to 3 570 m and on the Huon Peninsula it was collected only above 3 000 m growing on open, savanna, scrub and grassland on mesic and moist sites. Substrates were soil (6 specimens), sand (1) and basic rock (1).

Range on the Huon Peninsula: 6b. 31946, 31954, 31926. 6d. 32173, 6k. 32734, 32737, 32740. 6x. 63093.

Range in Western Melanesia (Koponen et al. 1986): West Irian. 7. Papua New Guinea. 12. (Present report); 13. 14. Mt. Hagen-Enga Road, near Tomba sawmill, 26 km NNW of Mt. Hagen, 2 680 m, 23.VI.1982 *Streimann 20630* (CBG, H!, LAE, NICH, NY); Tabibuga Road, Jimi Valley, 14 km N of Banz, 1 950 m, 25.VI.1982 *Streimann 20852* (CBG, H!, LAE, NICH); Jimi-Waghi Divide, 9 km N of Banz, 2 400 m, 25.VI.1982 *Streimann 20856* (CBG, H!, LAE, NICH, NY); 15.

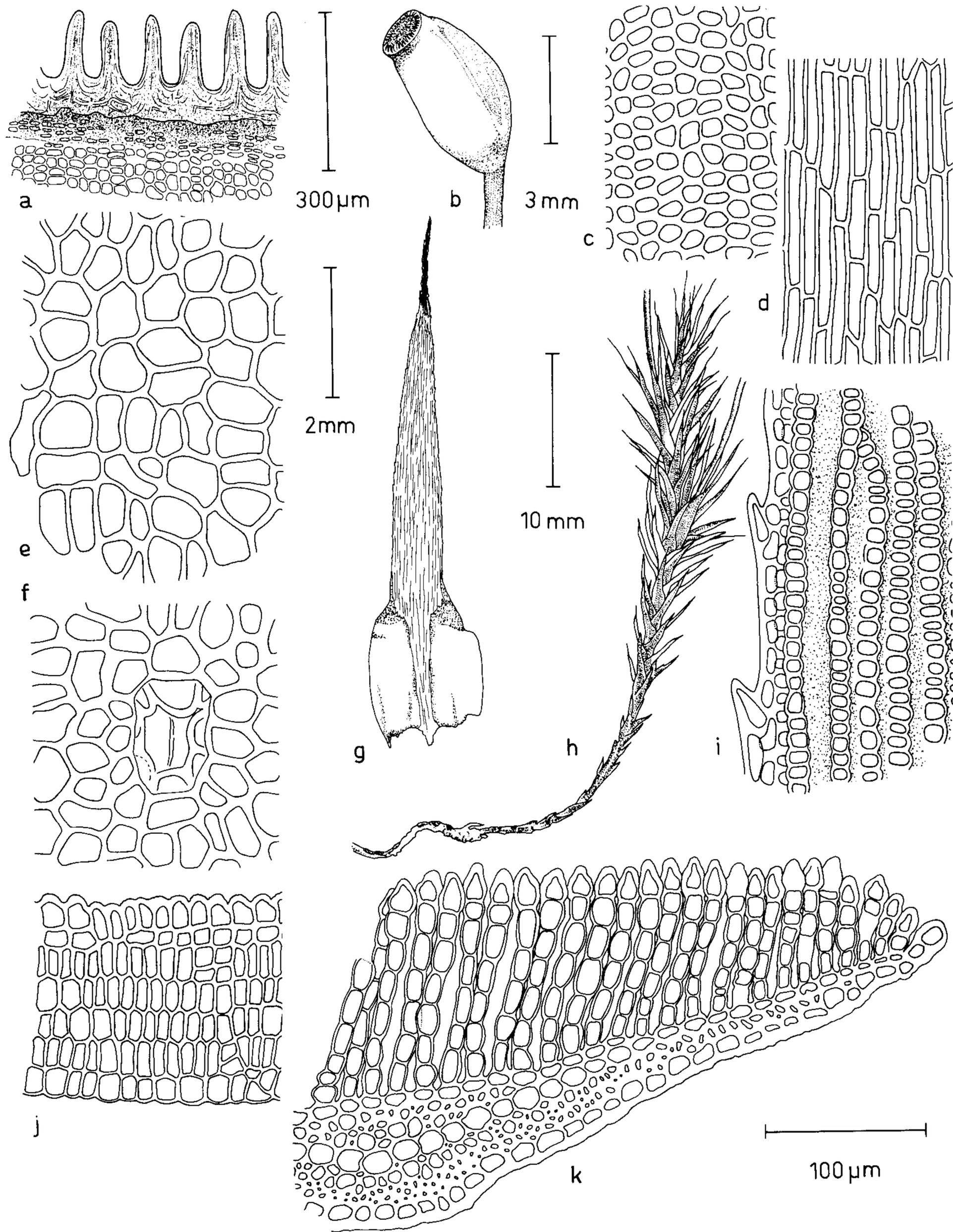
Total range: Endemic to New Guinea.

Genus *Polytrichastrum* G. L. Sm. 1971

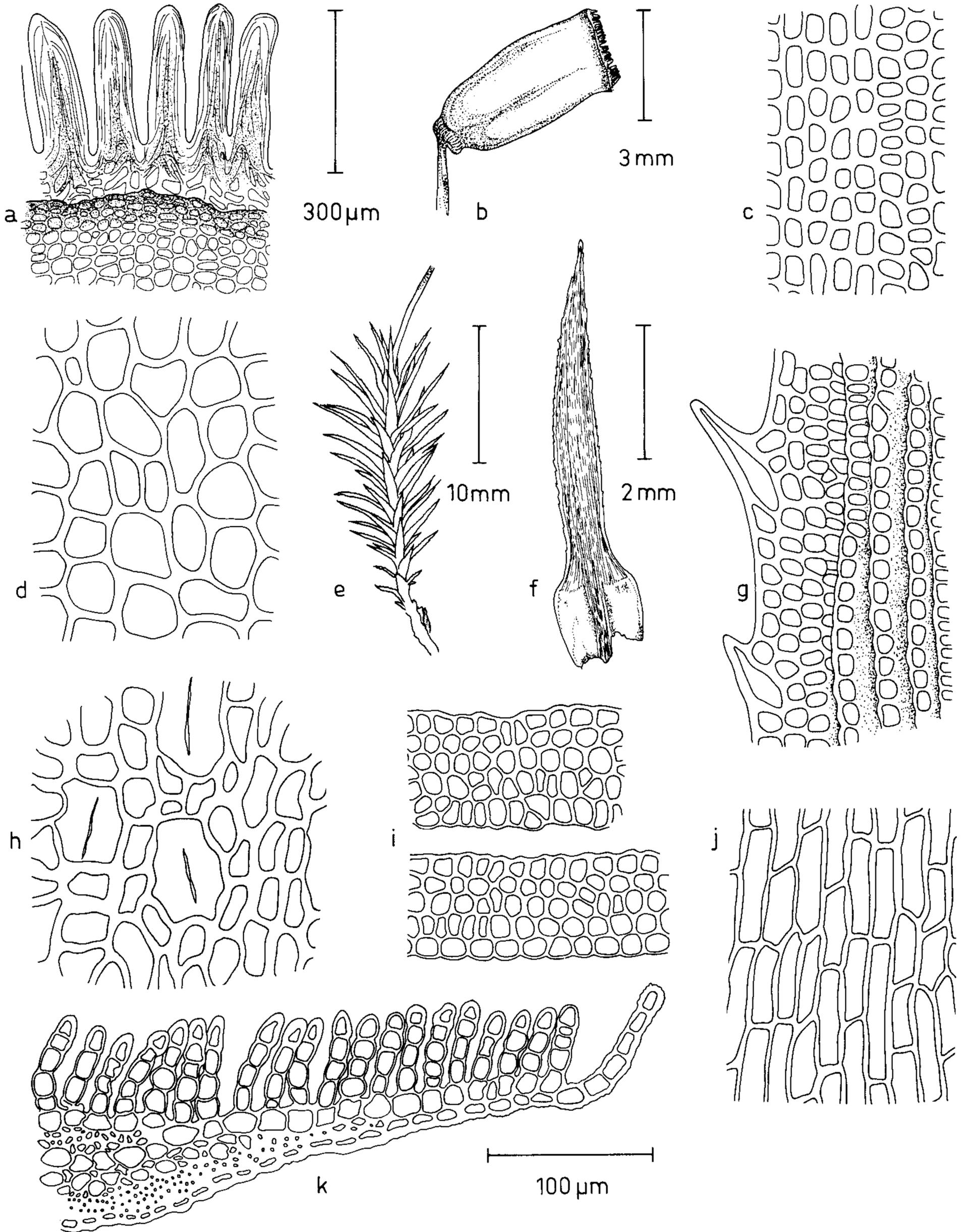
I prefer to follow the newest thorough study of the Polytrichaceae (Smith 1971) and accept genus *Polytrichastrum*, mainly separated from the traditional *Polytrichum* Hedw. Two species, *P. longisetum* and *P. alpinum* (Hedw.) G. L. Sm. have been reported from Western Melanesia. The presence of the latter species is, however, based on one misidentified specimen of *Pogonatum urnigerum*. *P. longisetum* has not been found after the report by Bartram (1942).

Polytrichastrum longisetum (Brid.) G. L. Sm. (Figs. 7a–k)

Mem. New York Bot. Gard. 21(3): 35. 1971 — *Polytrichum longisetum* Sw. ex Brid., J. f. Bot. 1800(1): 286. 1801 (Apr.).
Polytrichum gracile Menz. ex anon. [Hoppe?], Bot. Zeit.



Figs. 6a-k. Polytrichadelphus archboldii Bartr. (Koponen 31962). — a. Peristome. b. Moist capsule. c. Median dorsal laminar cells. d. Median sheath cells. e. Exothecial cells. f. Stoma. g. Leaf. h. Moist plant. i. Margin of leaf and lamellae from above. j. Lamella in side view. k. Cross-section of leaf. — Use the 300 μm scale for a, the 3 mm scale for b, the 2 mm scale for g, the 10 mm scale for h and the 100 μm scale for c-f and i-k.



Figs. 7a-k. *Polytrichastrum longisetum* (Brid.) G. L. Sm. (a, b and h from *Brass & Myer-Drees* 7743, the others from *Brass* 9154, both FH). — a. Peristome. b. Moist capsule. c. Median dorsal laminar cells. d. Exothecial cells. e. Moist plant. f. Leaf. g. Margin of leaf and lamellae from above. h. Stoma. i. Lamellae in side view. j. Median sheath cells. k. Cross-section of leaf. — Use the 300 μm scale for a, the 3 mm scale for b, the 100 μm scale for c-d and g-k, the 10 mm scale for e and the 2 mm scale for f.

Regensb. 1: 74. 1802 (8 Mar.). — Synonymized by Bridel (1827).

Plants medium-sized to fairly large, erect stems stiff, solitary to loosely caespitose, 20–75 mm tall, the leafy part up to 45 mm of the stem. Plants mainly dull green to brownish-green, stems reddish brown, rhizoids at the base. Leaves linear lanceolate, quite crowded, appressed when dry, erect-spreading when moist, sheathing the stem. Blade of the leaves 3.8–5.8 mm long, leaf apex slightly to distinctly denticulate. Leaf margin somewhat inflexed, especially in the upper part, dentate and unistratose, 5–7 cell rows without lamellae. Leaves gradually narrowed from sheath to blade. Sheath elliptical, 1.1–1.4 mm wide. Laminal cells rectangular, 8–12 × 44–80 μm. 37–43 lamellae 4–6 cells high, cells of the lamellae quite uniform, quadrate to shortly rectangular. Dioicous. Perigonia and perichaetia terminal. Seta 43–60 mm long, smooth and red. Capsule with 4 distinct ridges, rectangular. Peristome with basal membrane and ca. 50 lingulate teeth (some of these compound). Operculum rostrate, calyptra hairy. Spores finely papillose, 14–20 μm in diameter.

The description is based on the only two specimens which have been collected in Western Melanesia.

Illustrations: Osada 1966: 26–27 (figs. 12–13).

In the specimen *Brass 9743* (FH!) the small size of spores (14 μm) and the fairly low basal membrane of the peristome are characters tending toward *P. formosum* (Hedw.) G. L. Sm. On the basis of the vegetative characters it is, however, best treated as *P. longisetum*. Only two specimens have been collected in Western Melanesia, both of them at altitudes over 3 000 m.

For distinguishing characters from the other species with similar habit, see the discussion under *Polytrichadelphus archboldii*.

Range of the Huon Peninsula: None.

Range in Western Melanesia (Koponen et al. 1986): 7.

Total range (mostly according to Wijk et al. 1967): Eur As 1, 2; Chi Ja, As 4; Ind PNG, 5, Am 1, 6, Austr. 2.

Genus *Polytrichum* Hedw. 1801

In Western Melanesia the large genus *Polytrichum* is represented by only one, nearly cosmopolitan species, *P. juniperinum*.

Polytrichum juniperinum Hedw. (Figs. 8a–k)

Spec. Musc. 89, 18 fig. 6–10. 1801.

Plants medium-sized to rather large, erect stems stiff, mainly loosely caespitose, 15–125 mm tall, the leafy part 15–80 mm of the stem, lower part bracteate. Usually only the apical part of the plants green, older parts being brown. Stem base procumbent with hyaline rhizoids. Leaves linear lanceolate, in most cases crowded, appressed to erect-spreading when dry, erect-spreading to squarrose when moist, sheathing the stem. Blade of the leaves 3.0–8.5 mm long, leaf apex setaceous with brown, sharply dentate hair-point. Leaf margin broadly inflexed, lamina covering the lamellae entirely in the upper part of the leaf. Lamellae (5–)6–8 cells high, distinctly crenate (notched) or straight in side view, cells of the lamellae usually equal-sized, outer walls of the apical cells strongly incrassate. Dioicous. Perigonia and perichaetia terminally situated. Seta stout, 20–52 mm long, smooth, red to orange brown. Capsule rectangular, with 4 distinct ridges and differentiated neck. Peristome with 64 lingulate teeth and basal membrane. Operculum rostrate. Calyptra hairy.

Illustrations: Sainsbury 1955: 32 (fig. 2); Osada 1966: 8, 10 (figs. 3–4); Gangulee 1969: 169 (fig. 78).

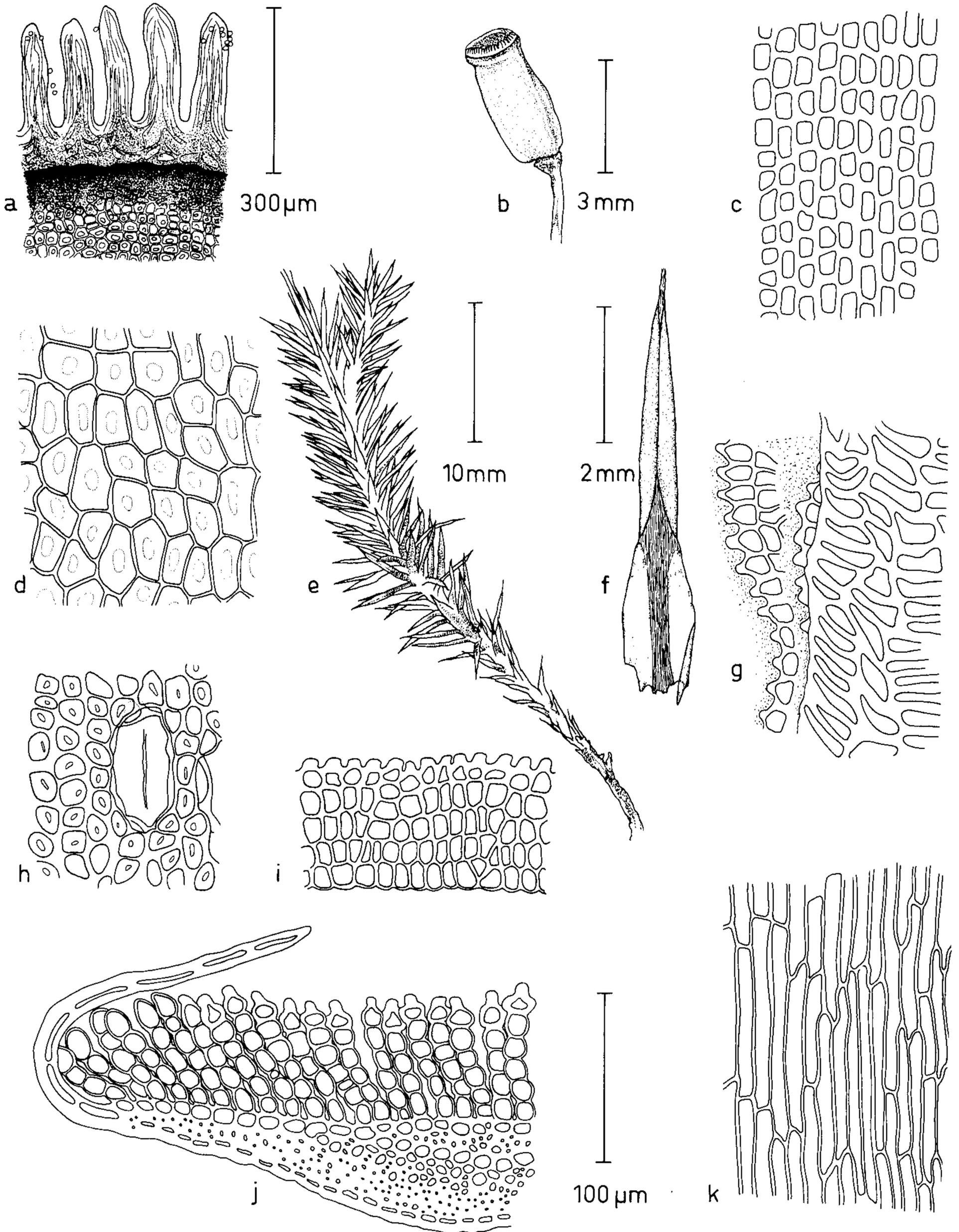
Because of the leaves with long hair-point *P. juniperinum* may be confused with *Polytrichadelphus archboldii* (see also the discussion under that species). The broadly inflexed leaf-margins of *Polytrichum juniperinum* are, however, immediately diagnostic.

On the Huon Peninsula *P. juniperinum* was collected at fairly high altitudes from 2 450 to 3 600 m. It occurs mainly on open, sunny places mainly in high-altitude savanna (6 sites) or in scrub (3), on a wide variety of substrates; soil (7 specimens), humus (3), rotten wood (8) and living tree (4).

Range on the Huon Peninsula: 1b. 34689. 2f. 33903. 4c. 986. 4h. 66829, 66862. 6a. 31519, 31527, 31721, 62206, 62226. 6b. 31993, 62462, 62528. 6e. 32255, 62838. 6g. 32434. 6k. 32773. 6u. 62745A. 8a. 30896, 30900, 31078. 8f. 31344.

Range in Western Melanesia (Koponen et al. 1986): Papua New Guinea. 12. 16. 17. Mt. Giluwe, 2 km E of summit, 4 000 m, 12.IX.1982 *Streimann 24294, 24303* (CBG, HI, LAE, NICH); 21. Subdistrict Kokoda, Mt. Kenive, 3 000 m, 31.VII.1974 Croft et al., (*LAE 65241*, BM, BRI, CANB!, FH, L), 22.

Total range: Cosmopolitan.



Figs. 8a–k. *Polytrichum juniperinum* Hedw. (Koponen 31519). — a. Peristome. b. Moist capsule. c. Median dorsal laminar cells. d. Exothecial cells. e. Moist plant. f. Leaf. g. Margin of leaf and lamellae from above. h. Stoma. i. Lamella in side view. j. Cross-section of leaf. k. Median sheath cells. — Use the 300 μm scale for a, the 3 mm scale for b, the 100 μm scale for c–d and g–k, the 10 mm scale for e and the 2 mm scale for f.

Genus *Pogonatum* P. Beauv. 1804

This large, mainly tropical genus is represented by six species in Western Melanesia. Wijk et al. (1967) give 182 species in the genus and some are still being described. Even in 1847 Hampe stressed the need for critical revision of "exotic" *Pogonatum* species. Smith (1971) in his general study of the family assumed the actual number of species not to exceed ca. 100. Consequently, this brief study gives five new synonymizations.

1. *Pogonatum urnigerum* (Hedw.) P. Beauv. (Figs. 9a-i)

Prodr. Cinq. Six. Fam. Aethéog. Mousses Lycopod. 84. 1805. — *Polytrichum urnigerum* [L. ex] Hedw., Spec. Musc. 100. 22 fig. 5-7. 1801.

Pogonatum wallisii (C. Müll.) Jaeg., Ber. St. Gall. Naturw. Ges. 1873-1874: 260. 1875 (Adumbratio 1: 722) — *Polytrichum wallisii* C. Müll., Linnaea 37: 171. 1872 "i". — Type: Philippines. Luzon. *G. Wallis* 1870. Hb. C. Müll. (H-BR!), lectotype, *nov.*; NY, isolectotype, cf. Smith 1971). — Synonymized by Smith (1971).

Dawsonia papillata Zant., Nova Guinea Bot. 16: 358. 1964. — Type: Indonesia. West Irian. Jayawijaya: Mt. Antares, below Camp 42, terrestrial in shade with *Dawsonia lativaginata*, 3 200 m, 21.VII.1959 Zanten 669 (L, holotype; GRO, NY, isotypes; not seen). — Synonymized by Smith (1971).

Plants medium-sized to robust, erect stems stiff, solitary, in some cases loosely caespitose, 40-180 mm tall, the leafy part 17-130 mm of the stem, lower part bracteate. Predominantly only the apical part of the plants greyish-green, older parts turning dark brown or blackish. Stem base shortly procumbent with rhizoids. Leaves linear-lanceolate, mostly crowded, appressed to erect spreading (widely spreading) when dry, erect spreading to squarrose when moist, sheathing the stem. Blade of the leaves (2.6-)4.0-13 mm long and 0.5-0.7 mm wide, leaf apex acuminate, usually with few, small and sharp teeth at the back. Sheath of the leaves ovate, 1.3-3.1 mm long and 1.1-2.2 mm wide. Leaf margin very narrowly inflexed, dentate almost along the whole length, unistratose with 3-4 cell-rows without lamellae. Lamellae 46-52, 5-8 cells high, cells quadrate to shortly rectangular, 6.0-18 μ m, apical cells with distinctly coarsely papillose outer wall, inner walls incrassate, cells enlarged or about the same size as in lower rows. Both ventral and dorsal stereid bands of the leaves strong. Laminal cells irregular, 6.0-

20 μ m, walls strongly incrassate, cells along the costa shortly rectangular. No sporophytes observed in the specimens from Western Melanesia.

Illustrations: Bartram 1939: pl. 29 (fig. 509); Zanten 1964: pl. XXXIII (fig. 5a-d); Osada 1965: 180 (fig. 3m-u); Gangulee 1969: 46 (fig. 66).

As suggested by Bartram (1939) and Smith (1971) I consider *P. wallisii* synonymous with *P. urnigerum*. The material from New Guinea shows larger plants with longer leaves than those of northern latitude *P. urnigerum*. Still the lamellae and cross-section of leaves are similar to "typical" *P. urnigerum*.

For the distinction from the other large Polytrichaceae of the area, see the discussion under *Polytrichadelphus archboldii*.

On the Huon Peninsula *P. urnigerum* is a high-elevation plant, all specimens being collected above 3 000 m in savanna, grassland or scrub. It grew on soil (3 specimens), cliff (2) and stump (1).

Range on the Huon Peninsula: 6b. 62652. 6e. 32231, 62859. 6g. 32415. 6j. 63227, 63245. 6x. 63061.

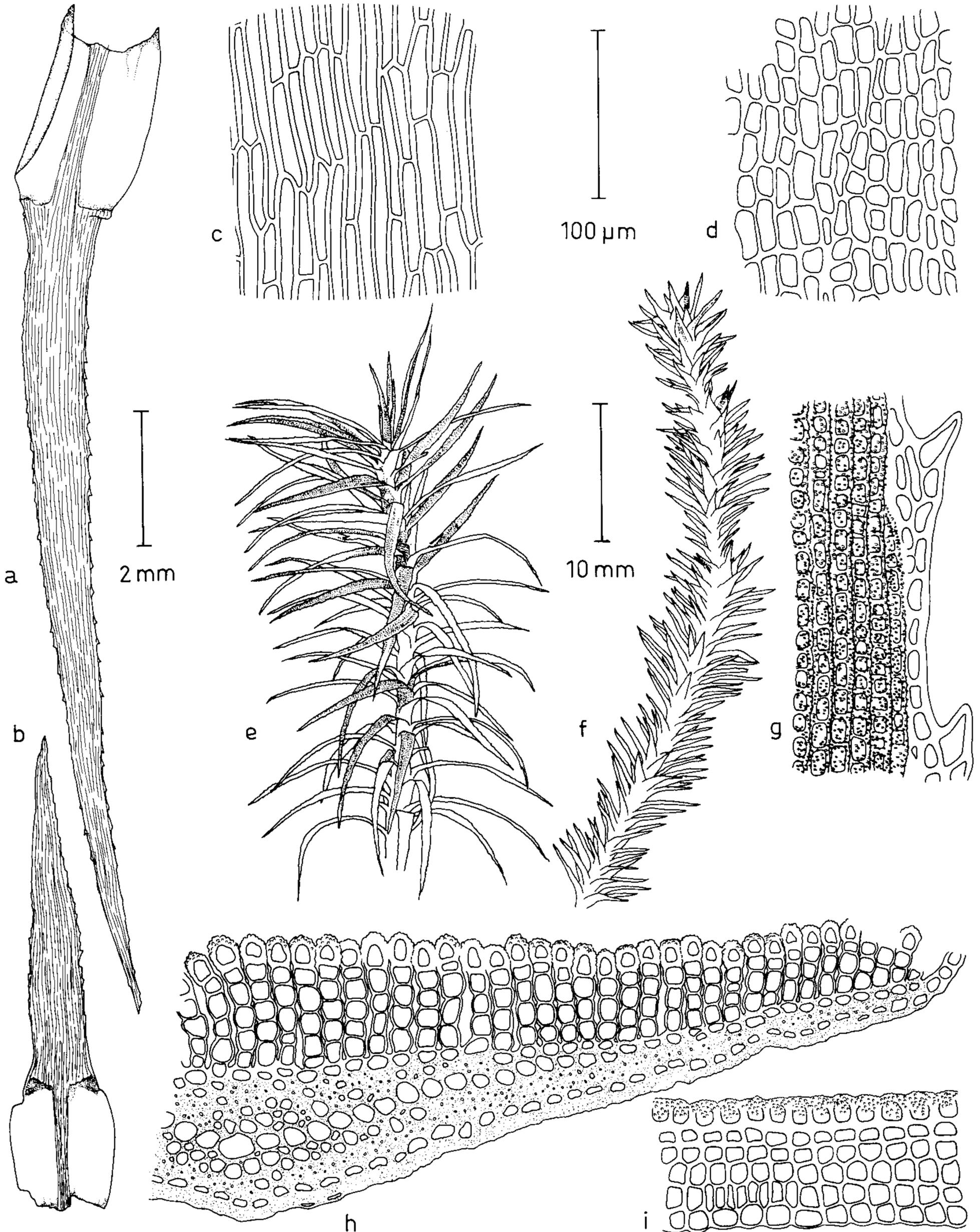
Range in Western Melanesia (Koponen et al. 1986): West Irian. 7. Papua New Guinea. 12. (Present report). 15. L. Aunde, 3 km SE of Mt. Wilhelm, 3 660 m, 14.XII.1982 *Mundua* 125 (CBG, H!, LAE, NICH); 16. 17. Mt. Giluwe, N slopes, ca. 3 600-3 700 m, 25.X.1968 Zanten 683369, Mt. Giluwe, tussock grassland, 11 000 ft, VII.1967 *McVean* 267338 (COLO!).

Total range (mostly according to Gangulee 1969): Eur As 1, As 2: Chi Ja Ko; As 3: In Ne; As 4: Ind Phi PNG; 5; Afr 1; Am 1, 3.

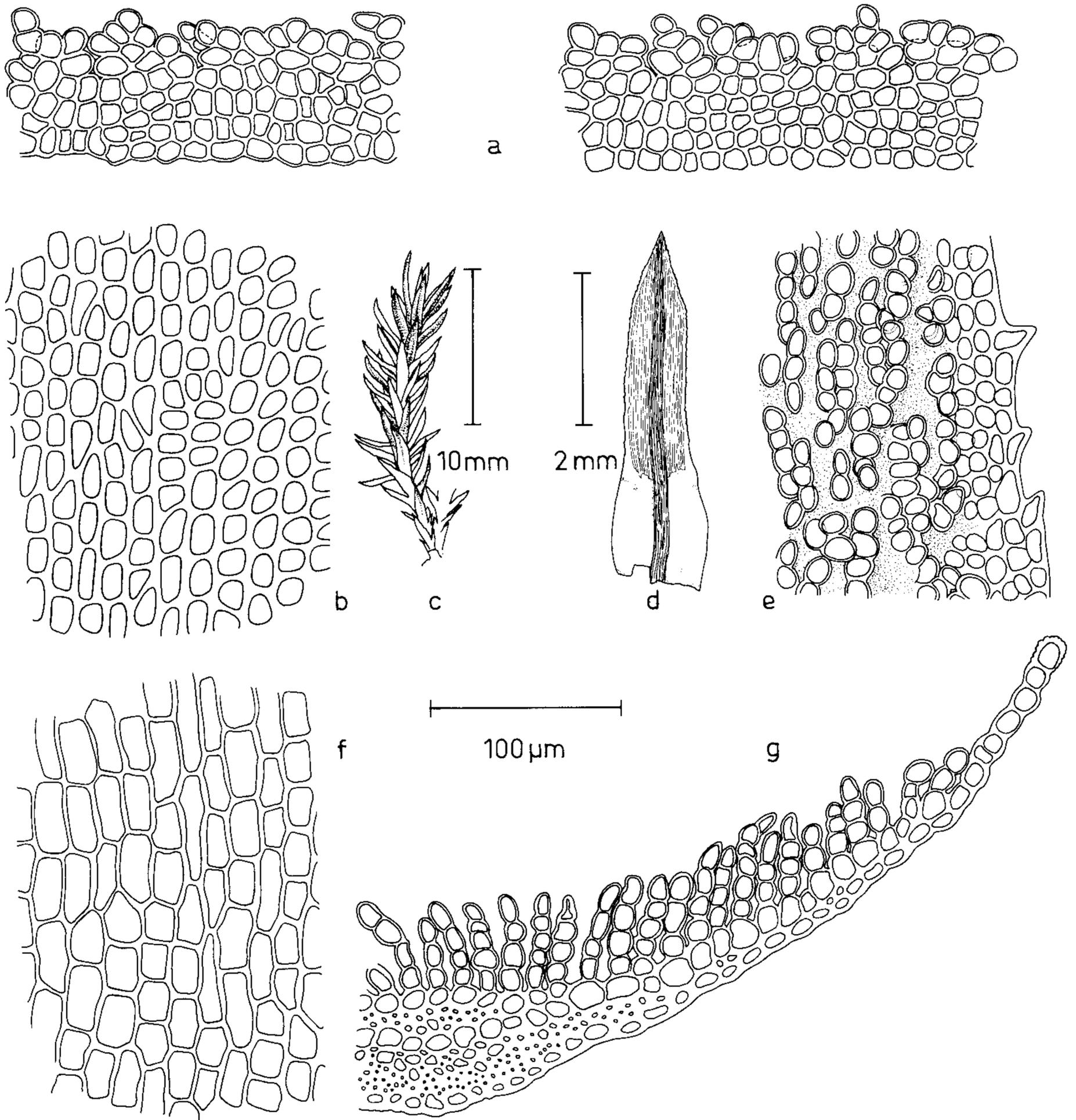
2. *Pogonatum microphyllum* (Dozy & Molk.) Dozy & Molk. (Figs. 10a-h)

Bryol. Jav. 1: 39. 29. 1856. — *Polytrichum microphyllum* Dozy & Molk., Pl. Jungh. 3: 326. 1854.

Plants medium-sized, erect stems stiff, loosely caespitose, 10-25 mm tall, the leafy part being 5.0-18 mm of the stem. Plants light brownish to olivaceous. Stems reddish brown, rounded pentagonal in cross-section with polytrichoid central strand, stem base with hyaline rhizoids. Leaves wide linear-lanceolate, crowded, incurved when dry and erect-spreading in moist condition, widely sheathing the stem, slightly larger above, bracteate below. Blade of the leaves 2.8-4.8 mm long and 0.6-1.0 mm wide. Leaf apex acute and fairly abruptly narrowed and slightly



Figs. 9a-i. *Pogonatum urnigerum* (Hedw.) P. Beauv. (b and f from Norris 62859, the others from Norris 62652). — a-b. Leaves. c. Median sheath cells. d. Median dorsal laminar cells. e-f. Moist plants. g. Margin of leaf and lamellae from above. h. Cross-section of leaf. i. Lamella in side view. — Use the 2 mm scale for a-b, the 100 μ m scale for c-d and g-i and the 10 mm scale for e-f.



Figs. 10a–g. *Pogonatum microphyllum* (Dozy & Molk.) Dozy & Molk. (Streimann & Tamba 12165, H). — a. Lamellae in side view. b. Median dorsal laminar cells. c. Moist plant. d. Leaf. e. Margin of leaf and lamellae from above. f. Median sheath cells. g. Cross-section of leaf. — Use the 100 μm scale for a–b and e–g, the 10 mm scale for c and the 2 mm scale for d.

cucullate. Costa strong rust brown or concolorous, subpercurrent, sharply dentate in the apex. Leaf margins erect, unistratose, with the marginal 4–5 cell-row elamellate, dentate ca. 1/2 to about whole length of blade, teeth fairly small, formed of 1–3 cells. Laminar cells subquadrate to rectangular with incrassate walls, 6.0–12 \times 12–25 μm , along costa longer and towards margins becoming gradually shorter. Lamellae

46–60, 5–7 cells high, quite tightly set on blade, distinctly crenate and usually irregularly lobed in side-view. Apical cells ovate, 10 \times 10–12 μm in side-view, round to ovate as seen above, lower cells polygonal, 10 \times 6.0–14 μm , with firm walls. Sheath of the leaves ovate, gradually narrowed to the blade, 1.0–1.6 \times 1.0–1.6 mm, cells rectangular, 10–14 \times 30–70 μm , with firm walls. Dioicous. Perigonia terminal, bracts ovate with

short blade. Lamellae and cells as in the cauline leaves. Antheridia 0.9–1.1 mm long, paraphyses biseriate distally. Perichaetial leaves fairly similar with cauline leaves, blade narrower and sheath making up a larger proportion of the total leaf-length, cells and lamellae like in cauline leaves. Seta terminal, solitary, straight and smooth, 18–43 mm long, orange to dark red. Capsule dark brown, oblong, 2.6–3.6 mm with five longitudinal ridges. Exothecium mammillose, cells polygonal with firm walls, 16–20 × 30–40 μm, without stomata. Diaphragm with a few rows of dark reddish, transversely elongated cells. Peristome with 32 lingulate, ca. 160–200 μm long, dark reddish teeth. Basal membrane high, ca. 120 μm. Calyptra acute, hairy and light brown, 5–7 mm long. Spores 8.0–10 μm in diameter, round, yellowish.

Illustrations: Dozy & Molkenboer 1855(1856?): tab. XXIX; Bartram 1939: pl. 29 (fig. 501).

Macroscopically, dry specimens of *P. microphyllum* are most easily confused with small forms of *P. urnigerum*. The apical cells of the lamellae are, however, strongly papillose in the latter but essentially smooth in *P. microphyllum*. Distinctly wide leaves with tightly set lamellae and firm appearance (leaves only moderately twisted and incurved in dry condition) are the distinguishing characters from other small *Pogonatum*-species of the area. In some cases the lamellae of *P. microphyllum* resemble in side view to some degree those of *Polytrichadelphus archboldii*. Structure of the apex, in the latter setaceous or at least very gradually narrowed, and general appearance of leaves make confusion most unlikely. For distinction from *P. tubulosum* Dix., see the discussion under that species.

In Western Melanesia *P. microphyllum* has been collected at the altitudes of ca. 950–1 930 m in open habitats.

Range on the Huon Peninsula: None.

Range in Western Melanesia (Koponen et al. 1986): 12. Aseki-Menyamya Road, Spreader Divide, 11 km NW of Aseki, 1 930 m, 21.I.1981 *Streimann & Tamba 12165* (CBG, H!, LAE); 15/16, 16. Lapegu, 6 km SW of Goroka, 1 520 m, 11.IV.1982 *Streimann 18376*; 21.

Total range (Bartram 1939): As 4: Ind Phi PNG.

3. *Pogonatum tubulosum* Dix. (Figs. 11a–k)

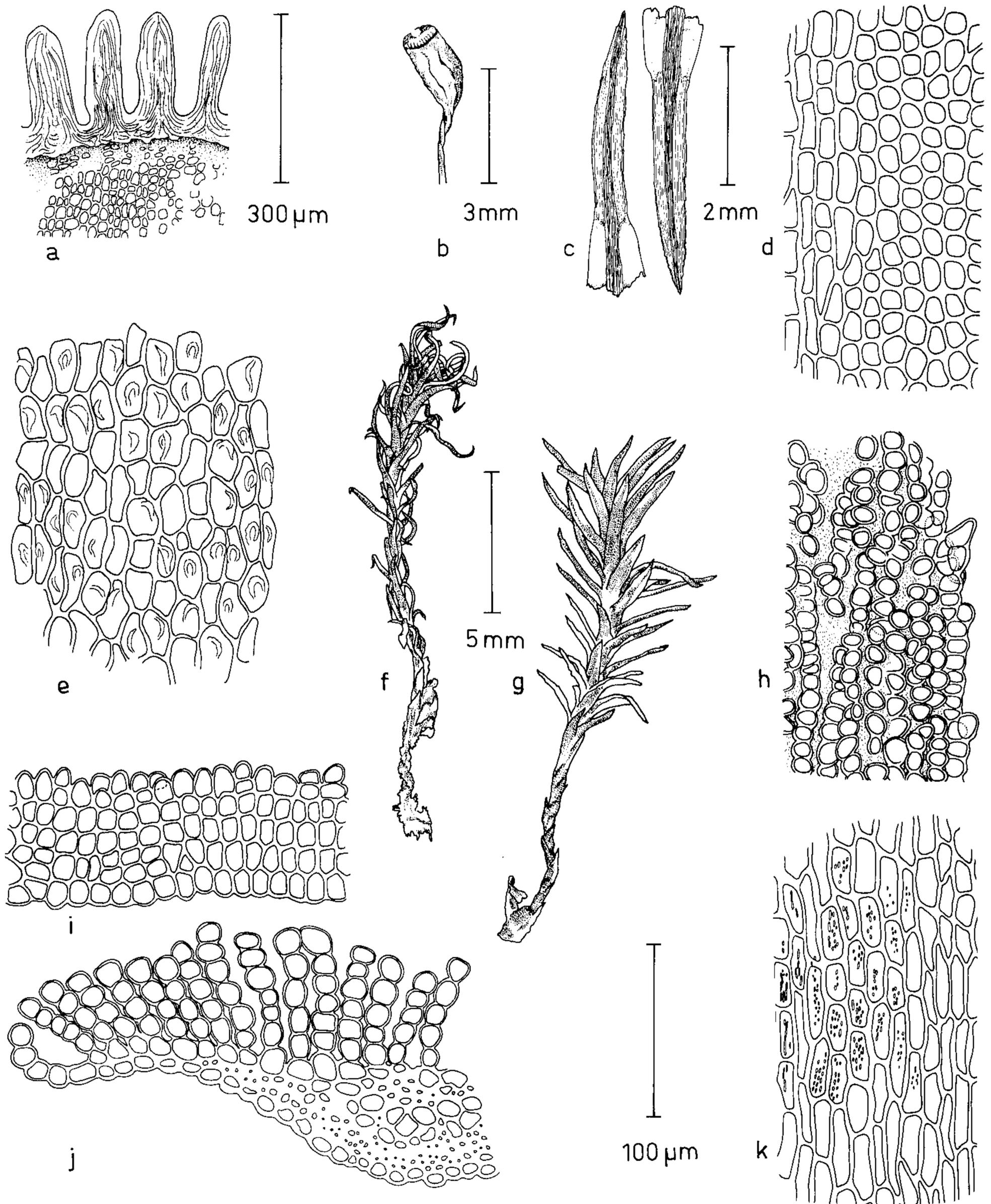
J. Bot. 80: 34. 1942. (Jan.) — Type: Papua New Guinea. Central: above Port Moresby, Uniri River, rocks, ca.

2 000 m. 18.I.1936. *Carr 15194* (BM!, holotype).

Pogonatum humile Bartr., *Lloydia* 5: 291. 1942. (Dec.), *syn. nov.* — Type: Indonesia. West Irian. Jayawijaya: Mt. Wilhelmina, Middlecamp: stones along small river, open place, 3 400 m, IX.1938 *Brass & Myer-Drees 9690* (FH!, holotype).

Plants small to medium-sized, erect stems stiff, loosely caespitose, 5.0–33 mm tall, the leafy part 5.0–30 mm of the stem. Plants brownish-green to dark green, stems reddish-brown, rounded pentagonal in cross-section with polytrichoid central strand, hyaline rhizoids restricted to the stem-base. Leaves linear-lanceolate, fairly distant, incurved when dry, erect to widely spreading when moist, sheathing the stem. Blade of the leaves 1.7–4.2 mm long and 0.2–0.5 mm wide, leaf apex acute and gradually narrowed, leaf margin distinctly inflexed when dry, unistratose and elamellate in 3–6 cell-rows, dentate ca. 1/2–3/4 of the blade length. Costa brown, dentate at back in the apex, subpercurrent. Dorsal stereid band strong, filling almost the entire leaf width. Cells of the lamina incrassate, rounded quadrate to transversely ovate towards the margins, 6.0–10 μm, rectangular along the costa, 8.0–10 × 20–40 μm. Lamellae 28–40, fairly tightly set on the blade, 4–7 cells high, crenate or irregularly lobed as seen in the side view, cells polygonal, 6.0–12 μm, apicals smooth, rounded 10–12 × 12–18 μm, retuse to rounded in cross-section (some of them divided-geminate), round to transversely ovate as seen above. Sheath of the leaves 0.8–1.2 × 0.7–1.1 mm, ovate, cells narrow and long, 8.0–12 × 20–70 μm. Dioicous. Perigonal bracts wide ovate with short and narrow lamina. Antheridia terminal, 0.60–0.75 mm long with uniseriate paraphyses. Perichaetial leaves linear-lanceolate, blade 2.5–5.0 mm and sheath up to 2.4–3.0 mm long, cells as in cauline leaves (sheath cells up to 120 μm long). Seta terminal, solitary and straight, 25–35 mm long, smooth, orange to red. Capsule oblong, slightly dorsiventral, with 4–6 ridges, 2.4–4.0 mm long. Exothecium mammillose, exothecial cells rounded polygonal, 10–30 μm. Stomata absent. Diaphragm reddish-brown, weakly differentiated. Peristome with 32 reddish-brown, lingulate teeth, 160–240 μm long. Operculum rostrate. Calyptra hairy, rostrate, 5–6 mm long. Spores 8–10 μm in diameter, round and yellow.

Illustrations: Zanten 1964: pl. XXXIII (fig. 4a–c).



Figs. 11a-k. Pogonatum tubulosum Dix. (a-b and e from *Streimann 13903*, H, the others from *Koponen 35025*). — a. Peristome. b. Moist capsule. c. Leaves. d. Median dorsal laminar cells. e. Exothecial cells. f. Dry plant. g. Moist plant. h. Margin of leaf and lamellae from above. i. Lamella in side view. j. Cross-section of leaf. k. Median sheath cells. — Use the 300 μm scale for a, the 3 mm scale for b, the 2 mm scale for c, the 100 μm scale for d-e and h-k and the 5 mm scale for f-g.

Small size and extremely narrow, incurved leaves with wide costa make *P. tubulosum* easy to identify. Nearest relatives in Western Melanesia seem to be *P. microphyllum* and *P. neesii* (C. Müll.) Dozy. From the latter *P. tubulosum* is easily distinguished by its totally smooth apical cells of the lamellae. Its leaves are also normally narrower than those of *P. neesii*. *P. microphyllum* normally has larger leaves, which are more crowded on the stem. Apical cells of the lamellae are also more irregular.

In Western Melanesia *P. tubulosum* has been collected at the altitude of 400–2 700 m growing on soil and cliff in fairly open habitats.

Range on the Huon Peninsula: None.

Range in Western Melanesia (Koponen et al. 1986): West Irian. 7. Papua New Guinea. 9. 12. Slate & Gumi Creek Divide, 17 km W of Bulolo, 2 100 m, 30.I.1981 *Streimann 13903* (in *P. neesii* specimen, CBG, H!, LAE), 13. Sawmill between Larajan and Kandep, 9 000 ft, VII 1967 *McVean 267375* (in *P. neesii* specimen, COLO!); 14. Kagamuga forestry station, 9 km E of Mt. Hagen, 1 580 m, 13.VI.1982 *Streimann 20150* (CBG, H!, LAE, NICH), 1 600 m, 2.VII.1982 *Streimann 21945* (CBG, H!, LAE, NICH, NY); 17. Munia logging area, 14 km NW of Ialibu, 2 300 m, 8.IX.1982 *Streimann 23284* (CBG, H!, LAE, NICH, NY); 20.

Total range: Endemic to New Guinea.

4. *Pogonatum neesii* (C. Müll.) Dozy (Figs. 12a–k)

Ned Kruidk. Arch. 4(1): 75. 1856. — *Polytrichum neesii* C. Müll., Syn. Musc. Frond. 2: 563. 1851.

Pogonatum junghuhnianum (Dozy & Molk.) Dozy & Molk., Bryol. Jav. 1: 40, tab. XXXI. 1856. — Synonymized by Dixon (1927).

Pogonatum klossii Dix., Linn. Soc. J. Bot. 45: 483. 1922, *syn. nov.* — Type: Indonesia. West Irian. Paniai: Mt. Carstensz, Camp VIa, 3 050 ft, 16.I.1913 *Boden Kloss 20* (BM!, holotype).

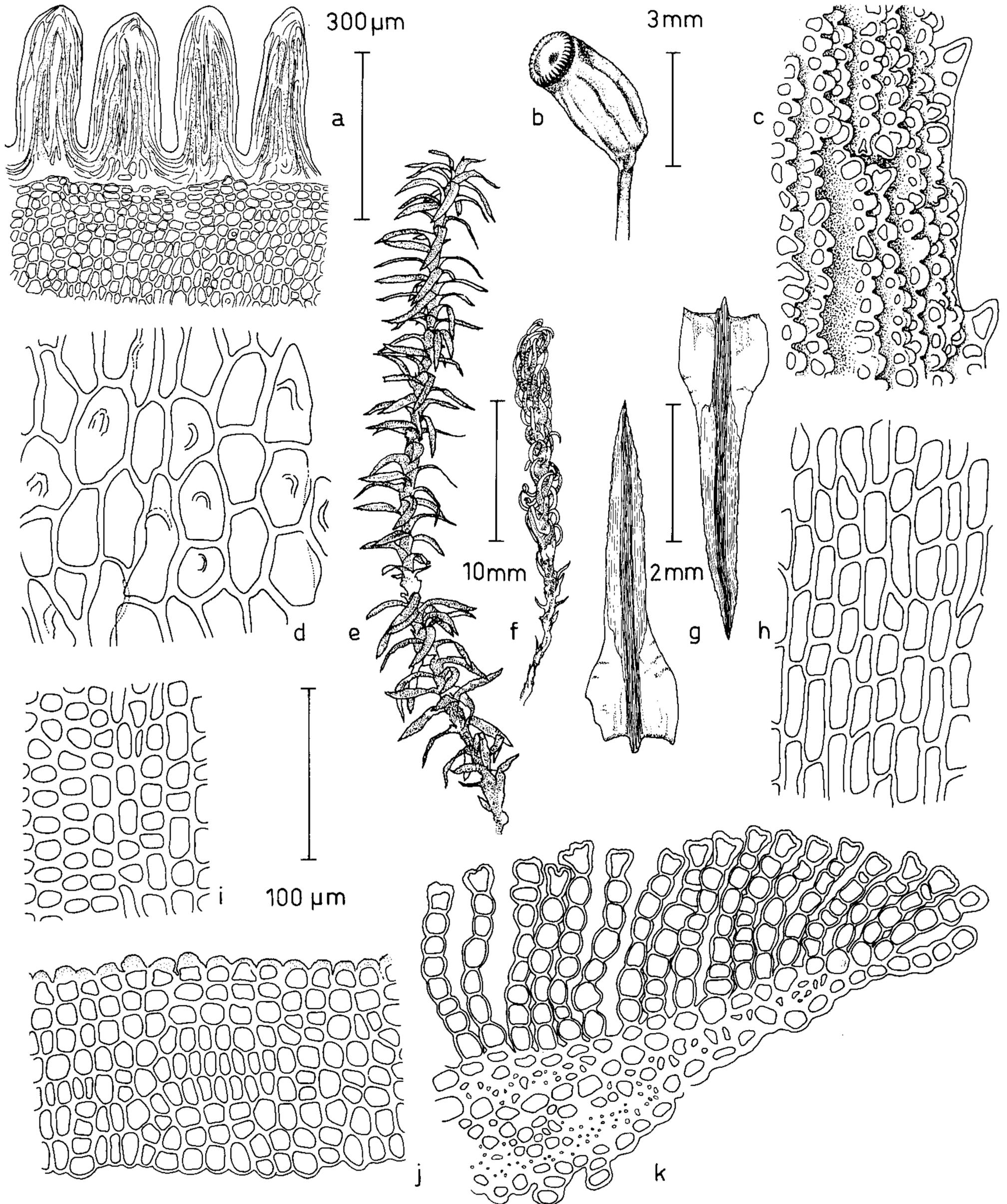
Plants medium-sized, erect stems stiff, loosely caespitose, 20–55 mm tall, the leafy part being 10–25 mm of the stem, leaves about equal in size or slightly larger above. Plants predominantly pale green. Stems reddish-brown, rounded pentagonal in cross-section with polytrichoid central strand, stem base trigonal in cross-section with hyaline rhizoids concentrated on base of old leaves. Leaves linear lanceolate, distant, contorted to incurved when dry, erect-spreading to squarrose when moist, widely sheathing the stem. Blade of the leaves 3.0–4.5 mm long and 0.40–0.65 mm wide, leaf apex acute and sharply dentate on margins and costa. Costa strong, but

not distinct, showing little color differentiation, subpercurrent. Leaf margins plane, unistratose, elamellate in 2–4 cell-rows, dentate ca. 2/3 of the blade length, teeth multicellular. Margins inflexed in apical part in dry condition. Lamellar cells rounded subquadrate to shortly rectangular with incrassate walls, 12–14 × 12–20 μm, along costa longer. In young leaves cells distinctly papillose. Lamellae 32–38, 4–6 cells high, remotely set on blade, strongly crenate in side-view, apical cells differentiated with strongly papillose and in many cases incrassate outer wall, higher than long, 8.0–10 × 10–16 μm, transversely ovate as seen above, lower cells subquadrate to irregularly rectangular, 8.0–12 × 10–14 μm, with firm walls. Sheath ovate to widely ovate, abruptly or gradually narrowed to the blade, 0.95–1.35 × 0.95–1.30 mm, cells rectangular with firm walls, 10–14 × 10–50 μm. Dioicous. Perigonia terminal, bracts wide ovate with short blade. Lamellae and cells like in cauline leaves. Antheridia 1.1–1.4 mm long with uniseriate paraphyses. Male plants sometimes elongated by annual innovations. Perichaetial leaves resembling cauline leaves, but with longer sheath, up to 4 mm, the upper part of sheath sinuate denticulate, otherwise cells as in cauline leaves. Seta terminal or pseudolateral by the growth of subperichaetial innovations, solitary, straight and smooth, bright to dark red, 30–45 mm. Capsules inclined, arenaceous, oblong, 3–4 mm with 5–6 ridges. Exothecial cells polygonal, ca. 20–35 μm, with firm walls and distinctly mammillose, especially in the upper part of the capsule. Operculum rostrate, cells as in exothecium but with thinner walls and slightly mammillose. Diaphragm weakly differentiated, with transversely elongated reddish-brown cells, ca. 12 × 30 μm. Peristome with 32 lingulate teeth, reddish-brown and 250 μm long, basal membrane essentially wanting or up to 40 μm high. Spores 10 μm in diameter.

Illustrations: Dozy & Molkenboer 1856: tab. XXXI & XXXVI; Fleischer 1923: 1589 (fig. 251).

Finely papillose, fairly high apical cells of crenate lamellae are a unique character of *P. neesii* distinguishing it from all other species of the genus in Western Melanesia. Light (hyaline) margins of leaves are also typical and observed in majority of the specimens. This character is easily seen even with a hand-lens.

P. klossii is conspecific with *P. neesii* based



Figs. 12a-k. Pogonatum neesii (C. Müll.) Dozy (f from Norris 59940 the others from Rau 711, H). — a. Peristome. b. Moist capsule. c. Margin of leaf and lamellae from above. d. Exothecial cells. e. Moist plant. f. Dry plant. g. Leaves. h. Median sheath cells. i. Median dorsal laminar cells. j. Lamella in side view. k. Cross-section of leaf. — Use the 300 μm scale for a, the 3 mm scale for b, the 100 μm scale for c–d and h–k, the 10 mm scale for e and f and the 2 mm scale for g.

upon my examination of the type from BM. The diagnostic characters given by Dixon (1922) are too variable to be effective in distinguishing the two species.

On the Huon Peninsula *P. neesii* was collected at mid-altitudes, from 1 200–1 900 m. It grows mainly on bare ground (5 specimens) along trails. One specimen was taken at base of a tree growing along trail. According to Streimann's large collections, the species seems to be very common on bare ground in open habitats.

Range on the Huon Peninsula: 10a. 28291. 10e. 28797. 10f. 28851. 10k. 59180. 10n. 59763. 10o. 59940.

Range in Western Melanesia (Koponen et al. 1986): West Irian. 7. Papua New Guinea. 12–16, 17. Munia logging area, 14 km NW of Ialibu, 2 300 m, 8.IX.1982 *Streimann* 23277. Forestry station, Onim, 14 km NNW of Ialibu, 2 250 m, 10.IX.1982 *Streimann* 23537, 13.IX.1982 24522, (CBG, H!, LAE, NICH, NY); Pauende logging area, 16 km NNW of Ialibu, 2 350 m, 15.IX.1982 *Streimann* 24723 (CBG, H!, NICH, NY). 20. Near Koke village, Bereina-Angabanga River road, 35 km ENE of Bereina, 600 m, 14.II.1981 *Streimann & Naoni* 16365 (CBG, H!, LAE, NICH, NY, UPNG).

Total range: As 2: Chi Ja Ko; As 3: Ba Bhu Bu In Ne Si Sri Tha Vi; As 4: Ind Phi PNG; Oc.

5. *Pogonatum subtortile* (C. Müll.) Jaeg. (Figs. 13a–m)

Ber. St. Gall. Naturw. Ges. 1873–1874: 256. 1875. — *Polytrichum subtortile* C. Müll., Syn. Musc. Frond. 1: 216. 1849. — Type: Indonesia. Java, *Zollinger* 853 (H-BR!, syntype).

Pogonatum subcucullatum Dix., J. Bot. 80: 34. 1942, *syn. nov.* — Type: Indonesia. West Irian. Tjenderawasih: Japen Isl., Mt Eiori, Camp 2, 2 000 ft, IX.1938 *Cheesman* 120 (BM!, holotype).

Plants medium-sized to large, loosely caespitose, 15–90 mm tall, the leafy part 10–65 mm of the stem. Plants yellowish to green, stems reddish-brown, pentagonal in cross-section with polytrichoid central strand, hyaline rhizoids restricted to the stem base. Leaves wide linear-lanceolate, fairly distant, erect-spreading to widely spreading, contorted and incurved when dry, erect to widely spreading when moist, loosely sheathing the stem, lower leaves bracteate. Blade of the leaves 2.1–4.5 mm long, width 0.7–1.4 mm, apex acute, costa light brown, 110–180 μm wide, ventral stereid band weakly differentiated, dorsal one with incrassate cell-walls, distinct, shortly excurrent to subpercurrent with sharp teeth dorsally near the apex, margin plane, dentate along the whole length, in some cases also the sheath margin weakly dentate, uni-

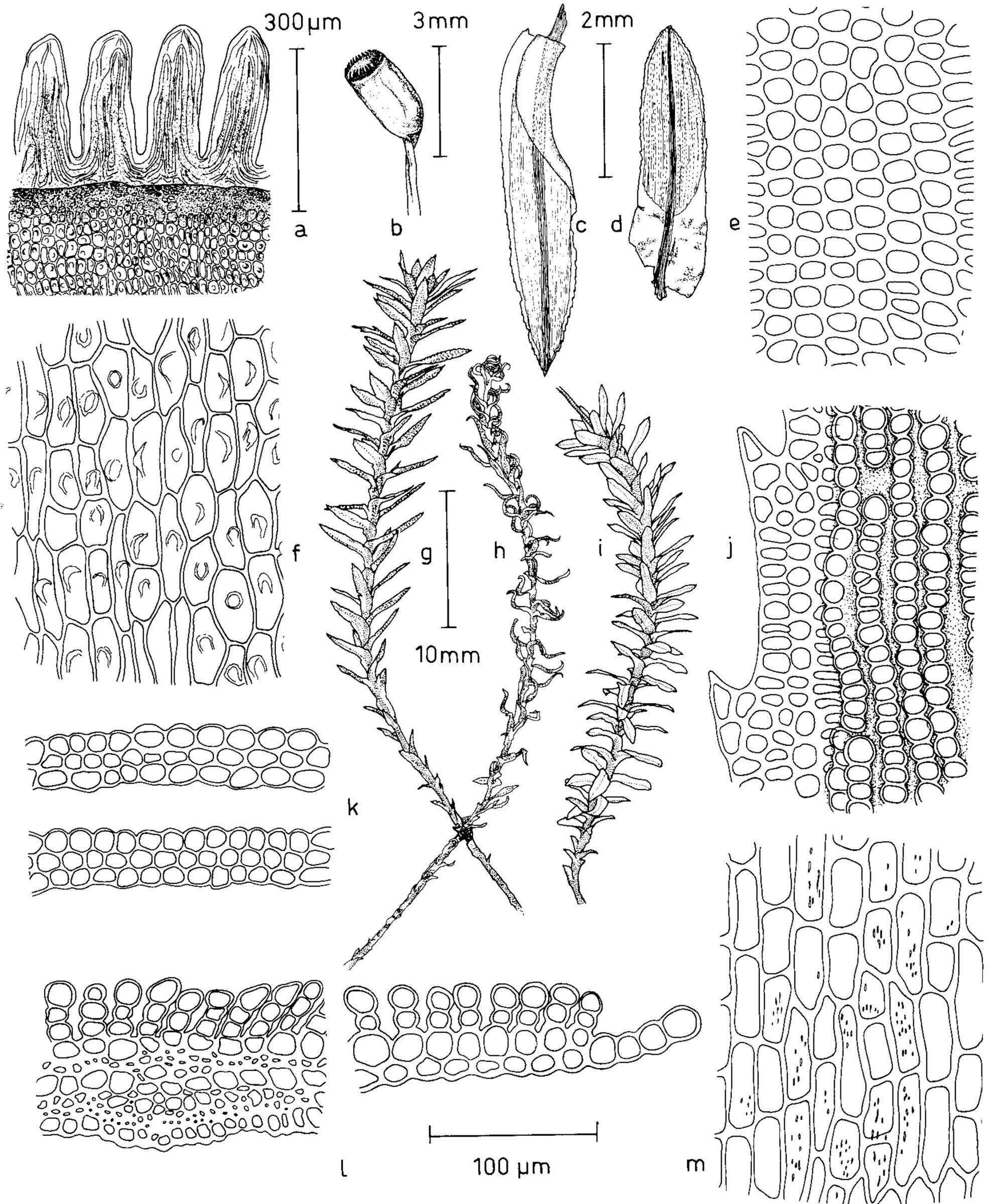
stratose margin elamellose in 4–7(–12) cell-rows. Laminar cells transversely ovate to round with incrassate walls, 6.0–14 \times 12–20 μm , along costa elongated rectangular 6.0–10 \times 14–50 μm . Lamellae 44–64, remotely set on the blade, 1–3(–4) cells high, crenate in side view, apicals not distinctly differentiated, transversely ovate to round as seen above, smooth, cells of the lamellae rounded rectangular to polygonal 6.0–16 μm , some cells up to 20 μm . Sheath of the leaves 0.8–1.6 \times 0.6–1.4 mm, cells rectangular, elongated, 10–14 \times 20–80 μm , with distinct cuticular thickenings. Dioicous. Perigonial bracts wide ovate with short lamina bearing lamellae 3–4 cells high, remotely set, lamellae and cells similar to those of cauline leaves. Antheridia 0.7–1.3 mm long with uniseriate paraphyses, upper part being biseriate. Male plants sometimes elongated by annual innovations. Perichaetial leaves narrow linear-lanceolate, 0.3–0.6 mm wide, sheath up to 2.5 mm long, and 1.8 mm wide, cells and lamellae as in cauline leaves. Seta terminal or pseudolateral by subperichaetial innovations, solitary and straight, 25–45 mm, orange to red and smooth. Capsule inclined, slightly dorsiventral, urn with 7–10 ridges, brown, 2.5–5.0 mm long. Exothecial cells polygonal, mammillose, 10–30 μm , with firm walls. Diaphragm with many rows of dark red cells. Peristome with 32 lingulate dark red teeth, ca. 200 μm long. Operculum rostrate, 0.5–0.7 mm long. Calyptra hairy, 5.6–6.7 mm long. Spores round and yellowish, 8.0–10 μm in diameter.

Illustrations: Smith 1971: 67 (fig. 107).

On the basis of its wide leaves and remotely set, low lamellae *P. subtortile* is usually easily identified. *P. cirratum* (Sw.) Brid. is another species of about the same size, and it has contorted leaves. It is, however, easily distinguished by the more tightly set lamellae, narrower and longer leaves and especially by well-developed stereid-bands consisting of cells with extremely incrassate walls. Apical cells of lamellae are also essentially smooth in side-view, but always crenate in *P. subtortile*.

The plants collected in different parts of Papua New Guinea with widely acute apex and subpercurrent costa (Figs. 13f, h) represent a rather peculiar form, which, I do not believe worthy of taxonomic recognition.

On the Huon Peninsula *P. subtortile* was col-



Figs. 13a-m. *Pogonatum subtortile* (C. Müll.) Jaeg. (a-b, d, f and i from *Koponen 34840*, the others from *Koponen 31107*). — a. Peristome. b. Moist capsule. c-d. Leaves. e. Median dorsal laminar cells. f. Exothecial cells. g. and i. Moist plants. h. Dry plant. j. Margin of leaf and lamellae from above. k. Lamellae in side view. l. Cross-section of leaf. m. Median sheath cells. — Use the 300 μm scale for a, the 3 mm scale for b, the 2 mm scale for c-d, the 100 μm scale for e-f and j-m and the 10 mm scale for g-i.

lected at the altitudes of 2 280–2 550 m in open grassland growing on cliff (2 specimens) and soil (1).

Range on the Huon Peninsula: 8c. 31107. 8f. 31317. 8g. 31382.

Range in Western Melanesia (Koponen et al. 1986): West Irian. 3. Papua New Guinea. 8. 9. 12. (Present report). *P. cirratum* (Wade & McVean 34215, COLO!) and *P. junghuhnianum* var. *incurvum* (Zanten 683301, COLO!) in Streimann (1983) are *P. subtortile*. 20. Near Koke village, Bereina-Angabanga River Road, 35 km ENE of Bereina, 600 m, 14.II.1981 Streimann & Naoni 16367 (CBG, H!, LAE, NY, UPNG); 31. above Tasi-camp along track to Malukuna, ca. 500–600 m, 25.IX.1968 Zanten 682487 (H!).

Total range: As 4; Ind PNG; Oc.

6. *Pogonatum cirratum* (Sw.) Brid. (Figs. 5b, 14a–k)

Bryol. Univ. 2: 110. 1827. — *Polytrichum cirratum* Sw., J. f. Bot. 1800(2): 175, 176. tab. 4. 1801. — Type: Indonesia, Java. Thunberg 25818 (UPS!, lectotype, nov.).

Pogonatum serpentinum Müll. ex Par., Ind. Bryol. 987. 1897, nom. nud., syn. nov. — *Polytrichum serpentinum* C. Müll. ex Par., Ind. Bryol. 987. 1897, nom. inval. in. synonym. — Original collection: Papua New Guinea. Central: distr. Moresby, in montosis MoRoka, 1 300 m, VIII.1893 Loria sub. n:o 758. Bryotheca E. Levier (H-BR!).

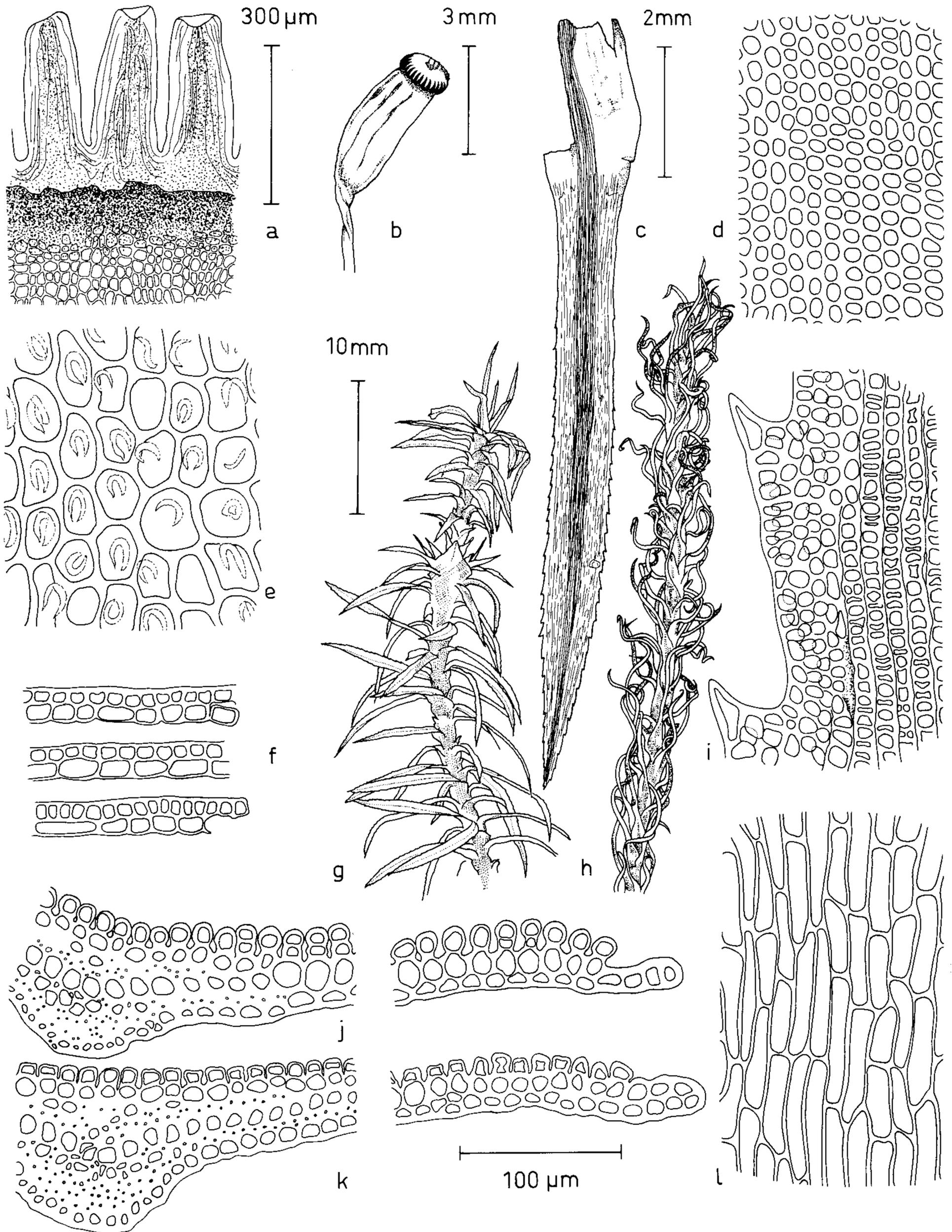
Plants medium-sized to robust, erect stems stiff, solitary or loosely caespitose, 25–210 mm tall, the leafy part 15–135 mm of the stem, lower part bracteate. Plants light green to olivaceous above, brownish-green to dark green below, stems reddish-brown, pentagonal in cross-section with polytrichoid central strand, stem base rounded trigonal in cross-section with fascicles of brownish hyaline rhizoid. Leaves linear-lanceolate, fairly distant, erect to widely spreading and contorted when dry, widely spreading to squarrose when moist, sheathing the stem, blade of the leaves 5.0–11 mm long, width 0.7–1.1 mm, apex acute with teeth on margins and back of costa, margin erect when dry, plane when moist, bistratose (sometimes partly unistratose), with 2–5 marginal elamellate cell-rows, dentate ca. 1/2–5/6 of the blade-length, teeth multicellular. Laminal cells round to transversely ovate, 8.0–14 μ m. Lamellae 55–80, fairly tightly set on blade, 1–2 (rarely 3) cells high, straight in side-view, apical cells solitary or rarely geminate, rounded subquadrate to transversely ovate as seen above, in side-view subquadrate to higher than long, 6.0–12 \times 6.0–14 μ m, lower cells subquadrate to longer than high 6.0–10 \times 10–

20 μ m. Sheath of leaves ovate, gradually narrowed to blade, 1.7–2.8 \times 1.7–2.5 mm, cells rectangular, 8.0–14 \times 10–80 μ m. Dioicous. Perigonial bracts wide ovate with short lamina bearing 1–2 cells high lamellae and dentate margins, cells like in cauline leaves. Antheridia terminal, 0.95–1.7 mm long with narrow uniseriate paraphyses. Male plants sometimes elongated by annual innovations. Perichaetial leaves narrow linear-lanceolate, blade 8.0–12 mm long and 0.60–0.95 mm wide, sheath longer than in cauline leaves. Cells similar to those of cauline leaves. Seta terminal or sometimes pseudolateral by subperichaetial innovations, solitary and straight, 30–55 mm, orange to dark reddish-brown, smooth. Capsule inclined and brown, oblong, 3.0–6.0 mm, slightly dorsiventral with 6–7 distinct ridges, stomata absent. Exothecial cells polygonal, 20–40 μ m, with incrassate walls. Operculum rostrate, 0.7–1.6 mm long, calyptra hairy, 7–8 mm long. Diaphragm differentiated with many rows of transversely elongated dark red cells. Peristome with 32 lingulate dark reddish teeth, 240–320 μ m long, basal membrane 40–80 μ m high. Spores 8–10 μ m in diameter, yellow.

Illustrations: Swartz 1801: tab. 4; Dozy & Molkenboer 1856: tab. XXXIV.

The large species of the genus *Pogonatum* with at least partly biseriate margin and low and undifferentiated lamellae represent the most difficult group of the whole family in the area. The numerous specimens available for the study were collected from different habitats demonstrating wide variation without clear-cut distinctive characters. I interpret the variation to result merely from different ecological conditions being without any taxonomical significance. Therefore, only one species, *P. cirratum*, is reported for the study area (see also discussion under *P. submacrophyllum* Herz.).

The clearest difference between the Western Melanesian plants and the majority of specimens collected on the Indonesian islands Borneo, Java and Sumatra, including the types, is seen in structure of the sheath. The sheath margin is entire in Western Melanesian plants and clearly dentate in the specimens collected in west in Indonesia. The proportion of geminate apical cells of the lamellae is also much higher in plants collected on Java and surrounding areas. Specimens from the Philippines are, however,



Figs. 14a-l. *Pogonatum cirratum* (Sw.) Brid. (e from *Koponen 31259*, j from *Koponen 28768*, the others from *Koponen 30235*). — a. Peristome. b. Moist capsule. c. Leaf. d. Median dorsal laminar cells. e. Exothecial cells. f. Lamellae in side view. g. Moist plant. h. Dry plant. i. Margin of leaf and lamellae from above. j-k. Cross-sections of leaves. l. Median sheath cells. — Use the 300 μm scale for a, the 3 mm scale for b, the 2 mm scale for c, the 100 μm scale for d-f and i-l and the 10 mm scale for g-h.

status of the taxon at the specific level highly doubtful.

The study of the type material of both *P. macrophyloides* (H-BR!) and *P. submacrophyllum* (JE!) showed them to be conspecific.

Pogonatum subulatum (Brid.) Brid.

Bryol. Univ. 2: 122. 1827. — *Polytrichum subulatum* Menz ex Brid., J. f. Bot. 1800. 1(2): 287. 1801.

In Western Melanesia there exists only one uncertain (cf.) record by Streimann (1983) of this Australian species. I studied the specimen and it is *P. subtortile*. More thorough study of the two species based on large material including the types is, however, needed to clarify their relationship.

Key to the species of *Racelopus* and *Pseudoracelopus*

1. Leaf-cells nearly homogenous, elongated throughout *Racelopus pilifer*
1. Leaf-cells elongated at base, polygonal in upper part 2
2. Leaf-apex obtuse and apiculate *Pseudoracelopus philippinensis*
2. Leaf-apex gradually narrowed *Pseudoracelopus misimensis*

Genus *Racelopus* Dozy & Molk. 1856

The genus *Racelopus* was described by Dozy and Molkenboer (1856) based on the material collected by Holle in Java, Indonesia. According to Smith (1971), the genus has two species, the type species, *R. pilifer* Dozy & Molk., being present in Western Melanesia.

Racelopus pilifer Dozy & Molk. (Figs. 15a–j)

Bryol. Javan. 1: 37. 27. 1856.

Polytrichum dozyanum C. Müll., Bot. Zeit. 15: 531. 1857, cf. C. Müll. l. c.

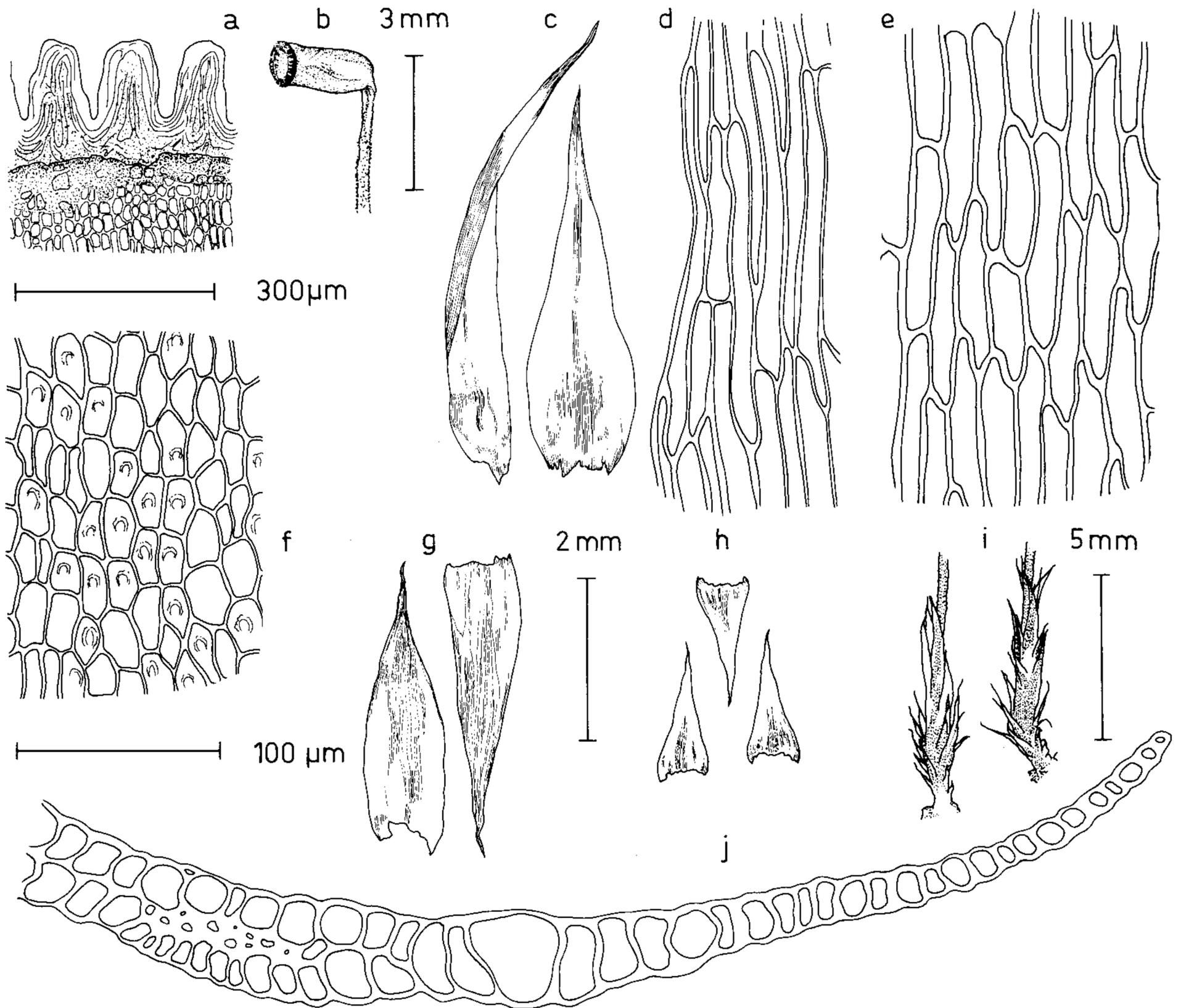
Plants minute, yellowish-green. Stems without branches, 0.6–1.2 mm tall, reddish-brown with differentiation of outer and inner cortical cells and with central strand poorly defined. Hyaline rhizoids restricted to stem base. Leaves

elongate-triangular, fairly crowded, appressed to erect-spreading, slightly larger above. Leaves without lamellae, 1.4–2.5 mm long, widest near the base, 0.7–1.0 mm. Leaf apex acute, margin plane, in some leaves sinuate denticulate near the base. Cells of the lamina elongate, 12–20 × 120–150 μm, with firm walls, becoming gradually longer towards the apex. Costa only slightly differentiated with a single band of stereids, 120–160 μm wide. Dioicous. Male plants not observed in this material, although numerous sporophytes were present. Perichaetial leaves linear lanceolate, 5–6 mm long, cells similar to those of the cauline leaves but somewhat longer and narrower, 10–14 × 160–240 μm. Seta terminal, solitary and straight, 20–25 mm long, red and strongly papillose. Capsule inclined with age, light to dark brown. Urn oblong 2–3 mm, with 6–10 distinct longitudinal ridges, without differentiated neck and stomata. Exothecial cells rounded rectangular, 10–25 × 20–50 μm, with strong walls. Operculum rostrate, 1.2–1.3 mm long. Calyptra hairy, light brown, rostrate and 3–5 mm long. Diaphragm weakly differentiated with 2–4 rows of reddish-brown cells. Peristome with 32 lingulate dark reddish-brown teeth, 80–120 μm long, with transparent margin. Spores 8 μm in diameter, essentially smooth and grayish green.

Illustrations: Dozy & Molkenboer 1855 (1856?): tab. XXVII; Fleischer 1923: 1578 (fig. 249); Brotherus 1925: 496 (fig. 774); Bartram 1939: pl. 29 (fig. 497); Smith 1971: 12 (fig. 12), 68 (fig. 124); Tan & Alvarez 1981: 172 (figs 11–13).

R. pilifer differs from the other Polytrichaceae of the area by its extremely small size. From *Pseudoracelopus philippinensis* Broth. it is easily distinguished by the leaf characters and size of the plants. The latter species has lingulate leaves, bluntly toothed above with collenchymatous cells. The apex is obtuse and apiculate. The leaves of *R. pilifer* are gradually tapered into an acute apex. The lamina has narrow and elongate cells throughout.

In Western Melanesia *R. pilifer* grows in moist conditions mostly on cliffs and boulders along streams at 400–1 400 m. It is not present in the Koponen and Norris collections but it was collected in Morobe Province by H. Streimann. Other collections in Western Melanesia are from West Sepik Province and from the Solomon Islands. The plant has also been found in West Irian.



Figs. 15a-j. *Racelopus pilifer* Dozy & Molk. (Koponen 36036). — a. Peristome. b. Moist capsule. c. Inner perichaetial leaves. d. Upper laminar cells and margin of leaf. e. Median laminar cells. f. Exothecial cells. g. Outer perichaetial leaves. h. Leaves. i. Moist plants. j. Cross-section of leaf. — Use the 300 µm scale for a, the 3 mm scale for b, the 2 mm scale for c and g-h, the 100 µm scale for d-f and j and the 5 mm scale for i.

Range on the Huon Peninsula: None.

Range in Western Melanesia (Koponen et al. 1986): West Irian. 1. 7. Papua New Guinea. 9. 12. Aseki-Madamna Track, 1 km SW of Aseki, 1350 m, 23.I.1981 *Streimann 12454* (CBG, H!, LAE). Solomon Islands. 23. 29. Kolombangara Island. Near Mt. Veve, 1200-1400 m, 12.VIII.1977 *Norris 49320* (H!).

Total range (Fleischer 1923, Bartram 1939): As 3: Tha; As 4: Ma Ind Phi PNG.

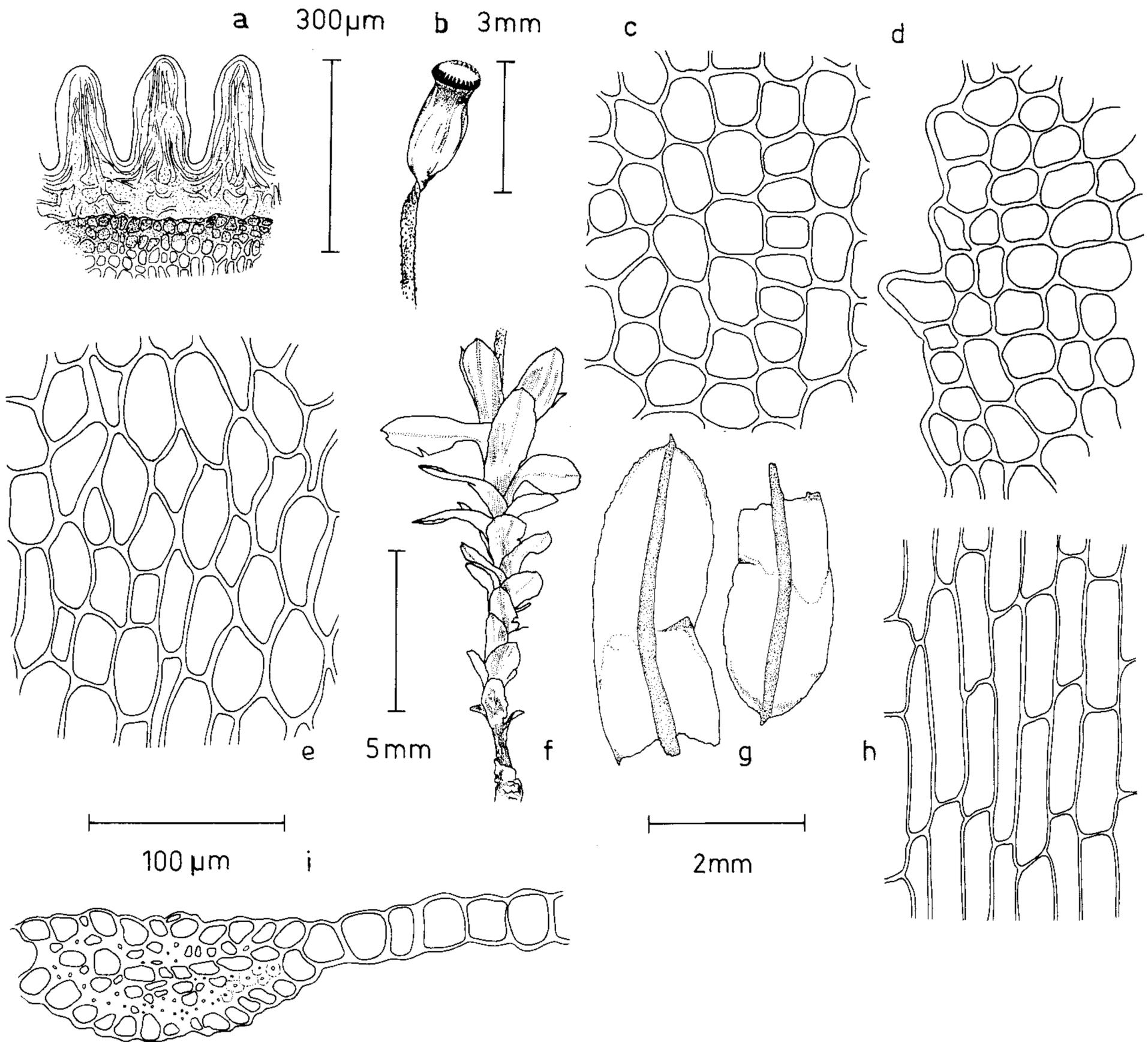
Genus *Pseudoracelopus* Broth. 1910

According to Smith (1971) *Pseudoracelopus* consists of six species, two of which occur in Western Melanesia.

1. *Pseudoracelopus philippinensis* Broth. (Figs. 5c, 16a-i)

Öfv. Finska Vet. Soc. Förh. 52 A(7): 2. 2. 1910.

Plants minute to small, yellowish to dark green. Stems unbranched, 5-10 mm tall, reddish-brown, with differentiation of outer and inner cortical cells, and with central strand extremely inconspicuous. Rhizoids hyaline, restricted to stem base. Leaves lingulate, rather distinct, erect-spreading and in dry condition incurved, becoming gradually longer above. Blade of the leaves without lamellae, 0.8-1.4 × 2.0-3.5 mm. Leaf apex obtuse and apicu-



Figs. 16a–i. *Pseudoracelopus philippinensis* Broth. (Norris 49901). — a. Peristome. b. Moist capsule. c. Upper median laminar cells. d. Upper leaf margin. e. Exothecial cells. f. Moist plant. g. Leaves. h. Lower median laminar cells. i. Cross-section of leaf. — Use the 300 μm scale for a, the 3 mm scale for b, the 100 μm scale for c–e and h–i, the 5 mm scale for f and the 2 mm scale for g.

late. Leaf margin plane, dentate near the apex. Cells of the lamina polygonal, distinctly collenchymatous, 12–30 μm in diameter, gradually elongated near the base, 10–20 \times 30–100 μm . Costa shortly excurrent, relatively strong, dark green to brown with two stereid bands, up to 120 μm wide, the ventral band thin, the dorsal one consisting of several cell-rows. Dioicous. Male plants not observed in this material. Perichaetial leaves elongate-lingulate, 4–5 mm long, cells similar to those of cauline leaves. Seta terminal, solitary and straight, 18–20 mm long,

orange to red and strongly papillose. Capsule inclined with age, arenaceous. Urn oblong 2.3–3.5 mm, with 6–8 distinct longitudinal ridges, without differentiated neck and stomata. Exothecial cells rectangular and slightly mammillose, 14–20 \times 40–50 μm . Operculum rostrate. Calyptra hairy, light brown, rostrate and up to 4 mm long. Diaphragm differentiated, dark reddish-brown, with transversely elongated cells. Peristome with 32 lingulate, dark reddish-brown teeth, 100–180 μm long, with more or less apparent hyaline part in the middle. Spores 6–

8 μm in diameter, essentially smooth and yellow.

Illustrations: Brotherus 1910: taf. II (figs. 1–18); Bartram 1939: pl. 29 (fig. 495); Smith 1971: 12 (fig. 10), 68 (fig. 119); Chen 1978: 307 (fig. 394); Rosario 1979: 126 (fig. 97); Tan & Alvarez 1981: 172 (figs. 17–19).

In the three minute species of Polytrichaceae of Western Melanesia the blade of the leaves is reduced. This character is most inconspicuous in *P. philippinensis*. From the other two species it is easily separated by having obtuse leaves. The strongly collenchymatous laminar cells are also remarkable, even though existing as well in some specimens of *P. misimensis* Bartr. The cell-walls of the last mentioned species are however, predominantly totally incrassate. (See also the discussion under *Racelopus pilifer*.)

P. philippinensis has been collected from near sea level to 2 100 m, mostly on open ground. The plant was not present in the Koponen and Norris material but it has been collected in Morobe and West Sepik Provinces in Papua New Guinea and in the Solomon Islands.

Range in the Huon Peninsula: None.

Range in Western Melanesia (Koponen et al. 1986): Papua New Guinea. 9. 12. Slate and Gumi Creek Divide, 17 km W of Bulolo, 30.I.1981 *Streimann 13905* (CBG, H!), 20. Solomon Islands. 29. Kolombangara Island. NW side of island, 0–100 m, 11.VIII.1977 *Norris 50061* (H!); 1 000–1 200 m, 13.VIII.1977 *Norris 49803, 49901* (H!). 33. San Cristobal Island. S of Manighai, 600–720 m, 27.VII.1977 *Norris 49101* (H!).

Total range: As 4: Ma Phi PNG; Oc: Car Fij. Sol.

2. *Pseudoracelopus misimensis* Bartr. (Figs. 17a–j)

Blumea 10: 150. 1960. — Type: Papua New Guinea. Papua Islands: Misima Isl., Mt. Sisa, N slopes, bare, open ground on old mining claim, 300 m, *Brass 27464* (L, not seen).

Plants minute, yellowish to grey-green. Stems unbranched, 2.3–4.5 mm tall, reddish-brown with differentiation of outer and inner cortical cells and with central strand poorly defined. Hyaline rhizoids restricted to stem base. Leaves triangular to triangular-lingulate, rather distant, erect-spreading and in dry condition curved, becoming gradually larger above. Blade of the leaves without lamellae, except vestiges of lamellae in apical part of some leaves, 3.0–3.5 mm long, widest near the base, 1.1–1.4 mm. Leaf apex rounded acute and apiculate, leaf margin

plane, entire throughout to very slightly dentate above. Cells of the lamina polygonal, with strongly incrassate cell-walls, 10–25 μm , gradually elongated near the base, 20 \times 60–150 μm . Costa slightly excurrent, relatively strong, light brown, with strong and thick dorsal stereid band, 130–180 μm wide, ventral band with only a few cells. Dioicous. Male plants not observed in present material. Perichaetial leaves linear-lanceolate, 4.5 mm long, cells similar to those of cauline leaves. Seta terminal, solitary and straight, 16–20 mm long, orange to dark red and strongly papillose. Capsule inclined with age, arenaceous. Urn oblong, 2.0–2.4 mm, with 6–7 longitudinal ridges, without differentiated neck and stomata. Exothecial cells rectangular and slightly mammillose, 20–25 \times 60 μm . Operculum rostrate, 1.0 mm long. Calyptra hairy, light brown, rostrate, 4.8 mm long. Diaphragm differentiated with several rows of dark reddish-brown, transversely elongated cells. Peristome with 32 lingulate dark reddish-brown teeth, ca. 100 μm long. Spores 6 μm in diameter, essentially smooth and yellow.

Illustrations: Smith 1971: 68 (fig. 118).

P. misimensis is easily distinguished from *Racelopus pilifer* by its clearly differentiated, shortly excurrent nerve. For distinctions from *P. philippinensis*, see the discussion above.

P. misimensis has been collected at 300–1 220 m on open ground. The plant was not present in this material but has been collected by G. Argent in Morobe Province on the Huon Peninsula. It is also recorded from the Papuan Islands (Misima Isl.) by Bartram (1960).

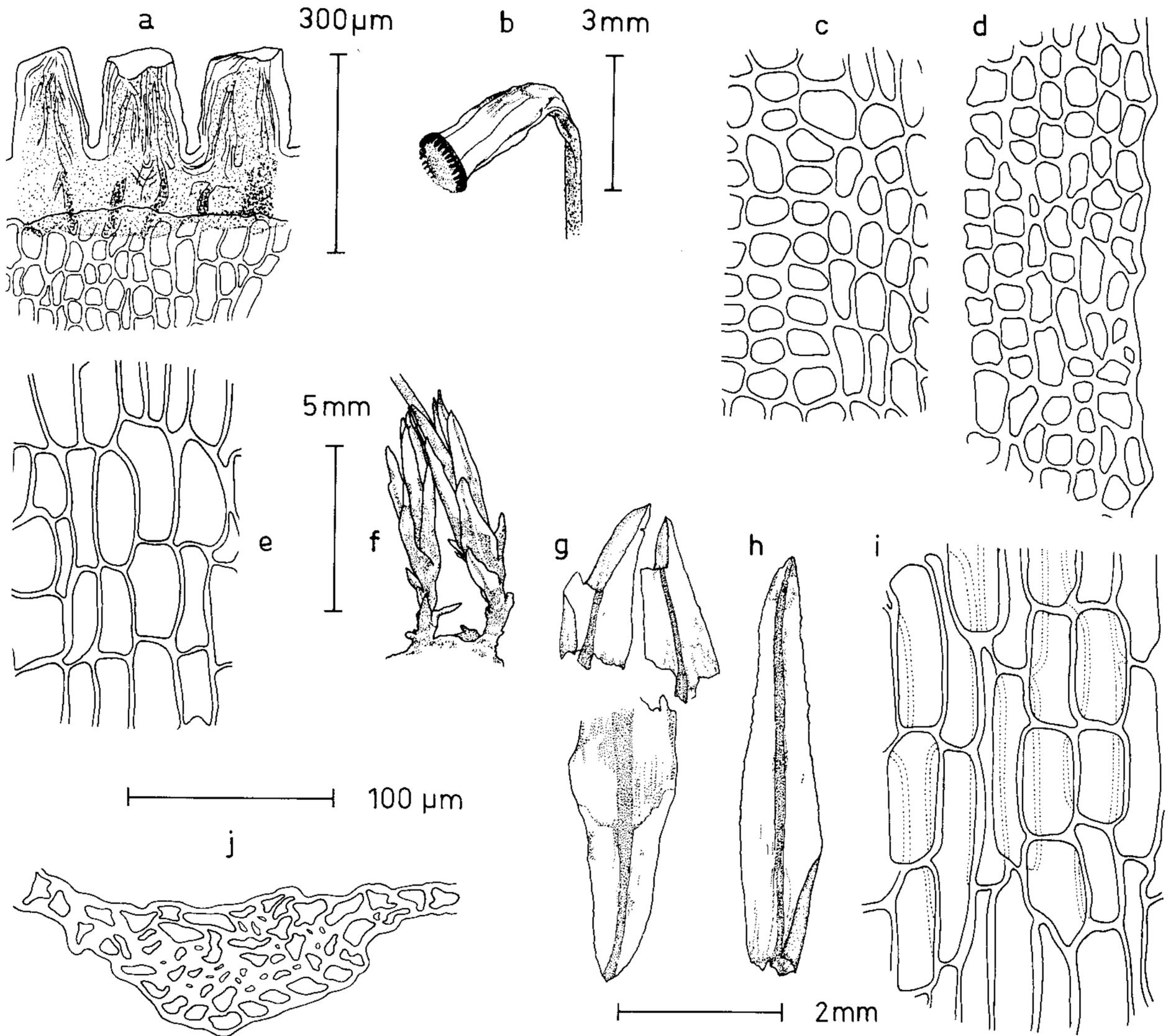
Range on the Huon Peninsula: 12. Mindik, alt. 4 000 ft, *G. Argent N.G.B.F. 28/4/71/23*. (H!, LAE!).

Range in Western Melanesia (Koponen et al. 1986): Papua New Guinea. 12, 23. Solomon Islands. 33.

Total range: As 4: PNG; Oc: Fij.

Genus *Notoligotrichum* G. L. Sm. 1971

I follow Smith's (1971) treatment of the bipolar genus *Psilopilum* Brid. He assigned the southern species to a new genus *Notoligotrichum*, including one species originally described in the genus *Polytrichadelphus*. All except two species are plants of the Southern Hemisphere. In Western Melanesia the genus is represented by *N. australe* (Hook. f. & Wils.) G. L. Sm.



Figs. 17a–j. *Pseudoracelopus misimensis* Bartr. (Norris 49102). — a. Peristome. b. Moist capsule. c. Upper median laminar cells. d. Upper leaf margin. e. Exothecial cells. f. Moist plants. g. Leaves. h. Inner perichaetial leaf. i. Lower median laminar cells. j. Cross-section of leaf. — Use the 300 μm scale for a, the 3 mm scale for b, the 100 μm scale for c–e and i–j, the 5 mm scale for f and the 2 mm scale for g–h.

Notoligotrichum australe (Hook. f. & Wils.) G. L. Sm. (Figs. 18a–j)

Mem. New York Bot. Gard. 21: 51. 1971. — *Polytrichum australe* Hook. f. & Wils., Fl. New Zeal. 2: 95. 87 f. 6. 1854. — *Psilopilum australe* (Hook. f. & Wils.) Mitt., J. Linn. Soc. Bot. 4: 97. 1859.

Plants small, erect stems stiff, growing in cushions or loosely caespitose, 10–25 mm tall, the leafy part 4.0–15 mm of the stem. Plants brownish, stems reddish-brown, rounded pentagonal in cross-section with polytrichoid central strand, hyaline rhizoids restricted to the

stem base. Leaves wide linear-lanceolate, bracteate below, crowded and about equal in size, incurved when dry, erect-spreading in moist condition, sheathing the stem. Blade of the leaves 1.5–3.0 mm long and 0.45–0.90 mm wide. Leaf apex obtuse and cucullate. Leaf margin broadly erect with 7–9 elamellate cell-rows, totally entire. Cells of the lamina irregularly subquadrate to shortly rectangular, $8.0\text{--}10 \times 10\text{--}18 \mu\text{m}$, with incrassate cell-walls, becoming gradually longer towards the costa and shorter towards the margin. Lamellae 50–56, fairly tightly set on the blade, 6–8 cells high, distinctly crenate as seen in

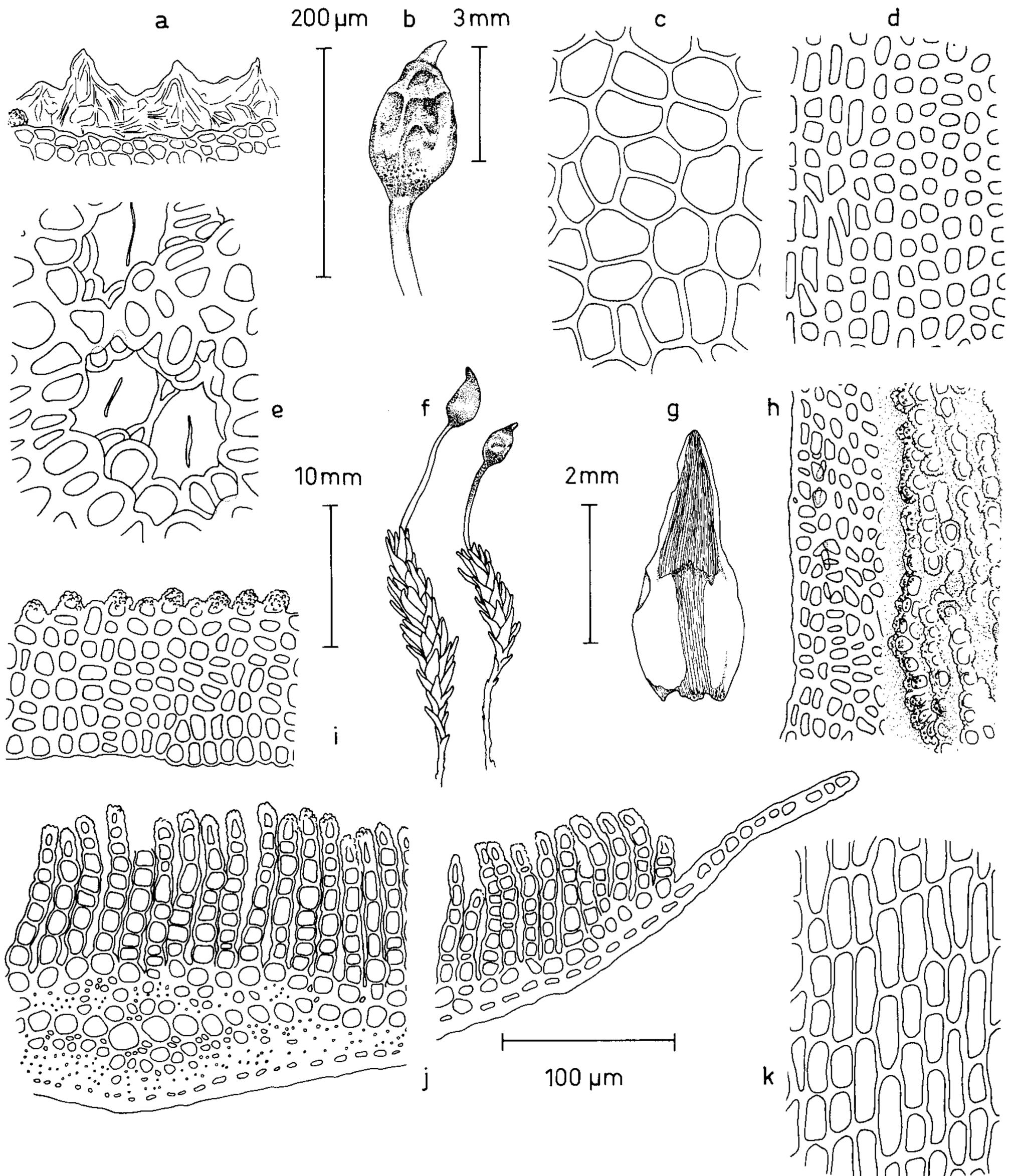


Fig. 18a-k. *Notoligotrichum australe* (Hook. f. & Wils.) G. L. Sm. (McVean 267286, CANB). — a. Peristome. b. Moist capsule. c. Exothecial cells. d. Median dorsal laminar cells. e. Stoma. f. Moist plants. g. Leaf. h. Margin of leaf and lamellae from above. i. Lamella in side view. j. Cross-section of leaf. k. Median sheath cells. — Use the 200 μm scale for a, the 3 mm scale for b, the 100 μm scale for c-e and h-k, the 10 mm scale for f and the 2 mm scale for g.

side-view, cells irregularly rounded or rectangular, $6.0\text{--}10 \times 10\text{--}16 \mu\text{m}$, apical cells solitary, strongly papillose, roundish as seen above, rounded triangular in side-view, $10\text{--}16 \times 12\text{--}20 \mu\text{m}$. Sheath of the leaves only slightly expanded, $1.00\text{--}1.30 \times 0.90\text{--}1.85 \text{ mm}$, cells rectangular with firm walls, $10\text{--}12 \times 16\text{--}50 \mu\text{m}$. Stereid bands of the leaves fairly well developed, cells with strongly incrassate walls, dorsal band $200\text{--}300 \mu\text{m}$ wide, ventral one narrower, formed of separate cell groups. Dioicous. Male plants not observed in the material at hand for this study. Perichaetial leaves linear-lanceolate, blade of the leaves $1.4\text{--}2.0 \text{ mm}$ long, sheath up to 2.3 mm , cells similar to those of cauline leaves. Seta terminal, solitary, $7.0\text{--}13 \text{ mm}$ long, orange to dark red, smooth. Capsules nearly erect, reddish to dark brown. Urn terete, constricted at the mouth, $2.1\text{--}3.4 \text{ mm}$ long and $0.4\text{--}0.8 \text{ mm}$ wide, cryptoporic stomata restricted to the base. Exothecial cells polygonal, with firm walls, $10\text{--}40 \mu\text{m}$. Operculum dark red, subulate, $0.6\text{--}1.5 \text{ mm}$ long. Diaphragm gradually differentiated with many rows of transversely flattened cells. Hyaline, fragile peristome with 16 acute, triangular teeth, ca. $30 \mu\text{m}$ high. Spores $20 \mu\text{m}$ in diameter, round to ovate, yellow and strongly papillose.

Illustrations: Hooker 1855: tab. 87 (fig. 6); Smith 1971: 48 (fig. 67).

N. australe is seldom confused with any other species of the family. Its general appearance in dry condition may, however, resemble that of *Pogonatum*-species with stout, firm leaves, e.g. *P. urnigerum* and *P. microphyllum*. By its entire leaves it is, however, readily distinguished. When sporophytes are present there is no possibility for misidentification.

In New Guinea the plant has so far been collected only on Mt. Wilhelm at over $4\ 300 \text{ m}$.

Range on the Huon Peninsula: None.

Range in Western Melanesia: Papua New Guinea. 15. Wade & McVean (1969).

Total range: Afr 4; As 4; PNG; Austr 1, 2.

Genus *Oligotrichum* Lam. & Cand. 1805

In Western Melanesia the genus is represented by two, according to Smith (1971), distantly related species, *O. javanicum* (Hampe) Dozy &

Molk. and *O. novae-guineae* (Bartr.) G. L. Sm. They both are rare being so far recorded only once.

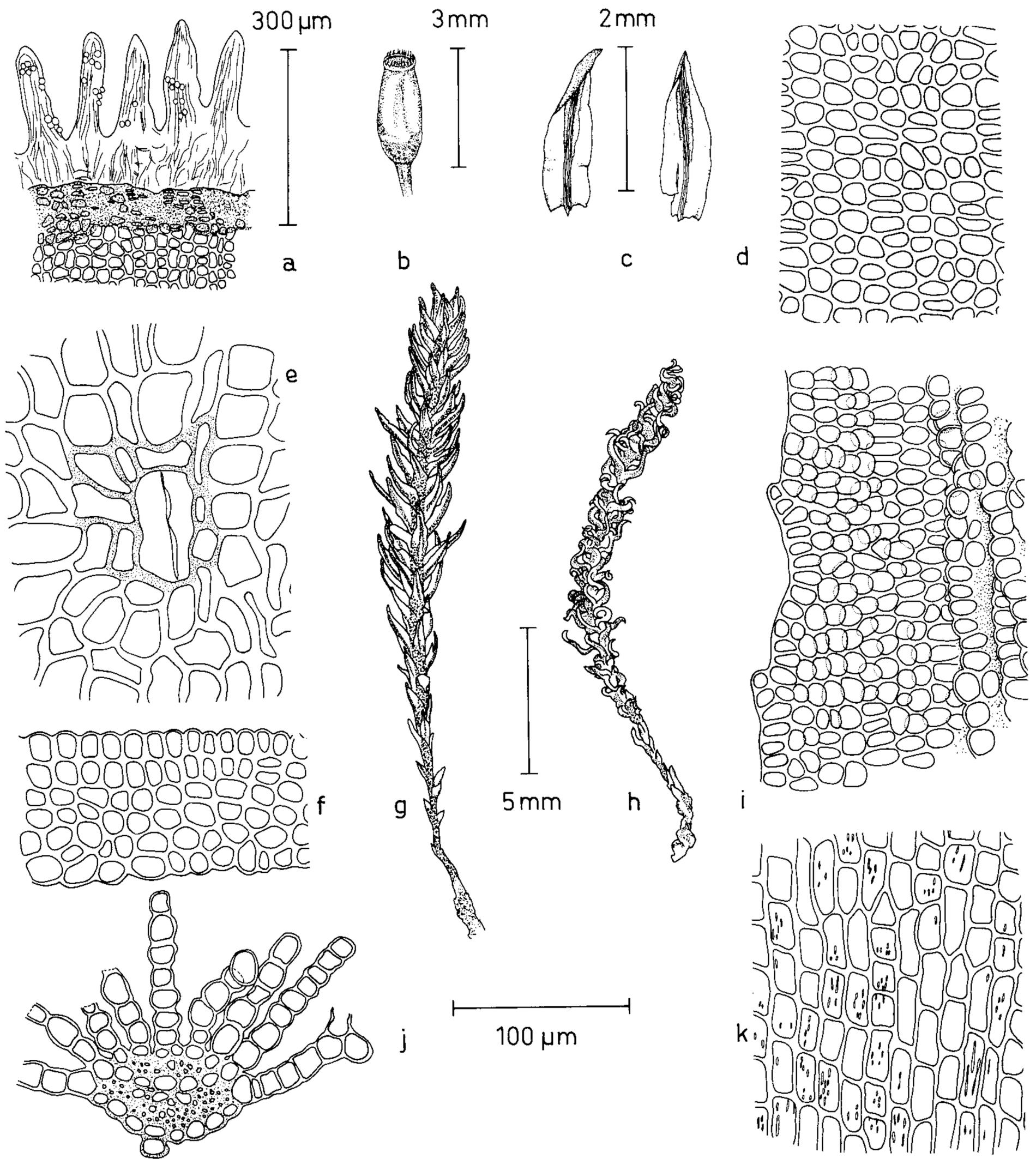
Key to the species of *Oligotrichum*

1. Leaf-apex acute and cucullate, costa shortly excurrent or percurrent *Oligotrichum javanicum* p. 140
1. Leaf-apex obtuse, costa subpercurrent
..... *Oligotrichum novae-guineae* p. 142

1. *Oligotrichum javanicum* (Hampe) Dozy & Molk. (Figs. 19a–l)

Bryol. Jav. 1: 37. 28. 1856 — *Catharinea javanica* Hampe, Icon. Musc. 22. 1844.

Plants small, erect stems stiff, loosely caespitose or forming cushions, $10\text{--}20 \text{ mm}$ tall, the leafy part $5.0\text{--}15 \text{ mm}$ of the stem. Plants brown to olivaceous. Stems reddish-brown, rounded pentagonal in cross-section with polytrichoid central strand, hyaline rhizoids restricted to stem base. Leaves fairly wide linear-lanceolate, erect-spreading and incurved or contorted when dry, erect-spreading when moist, sheathing the stem, fairly crowded, about equal in size, lowest leaves bracteate. Blade of the leaves $1.8\text{--}2.1 \text{ mm}$ long and $0.6\text{--}0.8 \text{ mm}$ wide, apex acute and cucullate, costa strong, brown, shortly excurrent or percurrent, with teeth or some low abaxial lamellae developed in apical part. Leaf margin with blunt, very small teeth ca. $1/2\text{--}3/4$ of the blade length. Lamina unistratose, costa $110\text{--}120 \mu\text{m}$ wide, ventral stereid band much narrower and sometimes formed by clusters of cells, laminar cells polygonal with firm walls, $6.0\text{--}20 \mu\text{m}$, becoming gradually longer and rectangular towards the middle of the costa, ca. $10 \times 20 \mu\text{m}$, near the margin slightly flattened transversely. Lamellae 7–9, restricted to ventral side of costa, some reduced lamellae developed on costa and lamina also on dorsal side, lamellae 6–8 cells high, crenate in side-view, outer walls of apical cells thin, round to ovate as seen above, cells polygonal to rounded subquadrate or rectangular, $10\text{--}20 \mu\text{m}$. Sheath of the leaves only slightly expanded, rounded rectangular, $0.40\text{--}0.70 \times 0.60\text{--}1.05 \text{ mm}$, cells with cuticular thickenings, quadrate to rectangular $10\text{--}14 \times 10\text{--}50 \mu\text{m}$. Dioicous. Perigonal bracts wide with reduced blade carrying some lamellae, cells



Figs. 19a-k. Oligotrichum javanicum (Hampe) Dozy & Molk. (a-b and e from *Koponen 31963*, the others from *Koponen 32180*). — a. Peristome. b. Moist capsule. c. Leaves. d. Median dorsal laminar cells. e. Lower exothecial cells with stoma. f. Lamella in side view. g. Moist plant. h. Dry plant. i. Margin of leaf and lamellae from above. j. Cross-section of leaf. k. Median sheath cells. — Use the 300 μm scale for a, the 3 mm scale for b, the 2 mm scale for c, the 100 μm scale for d-f and i-k and the 5 mm scale for g-h.

approximately as in the cauline leaves. Paraphyses uniseriate with biseriate yellowish-brown upper part. Antheridia 0.55–0.7 mm long, terminal. Perichaetial leaves linear-lanceolate, nar-

row, with much reduced lamina, blade 1.7–2.1 mm long, sheath much longer than in cauline leaves, up to 2.8 mm, cells similar to those of cauline leaves, sheath cells up to 140 μm. Seta

terminal, 28–35 mm long, smooth and red. Capsule erect, essentially terete with some indistinct ridges, 3.1–3.4 mm long. Cryptopore stomata restricted on the lower half of the capsule. Exothecial cells polygonal with firm walls, 20–60 μm , essentially smooth, some of the cells only slightly bulging. Diaphragm dark reddish-brown, gradually differentiated with many rows of transversely elongated cells. Operculum rostellate, short, 0.85 mm. Peristome dark yellow with 32 lingulate, ca. 160 μm long teeth, basal membrane ca. 65 μm . Spores 10–12 μm in diameter, round and yellow.

Illustrations: Hampe 1844: tab. XXII; Dozy & Molkenboer 1855 (1856?): tab. XXVIII; Fleischer 1923: 1580 (fig. 250); Smith 1971: 48 (fig. 76).

The species of the genus *Oligotrichum* are easily distinguished from other Western Melanesian Polytrichaceae by their leaves with few lamellae developed only on the costa. *O. javanicum* is distinguished from *O. novae-guineae* by its acute leaves having also abaxial (dorsal) lamellae.

Collections on the Huon Peninsula are the first record of the species in Western Melanesia. Both specimens were taken at altitudes over 3000 m growing on rock in mesic, open habitats.

Range on the Huon Peninsula: 6b. 31963. 6d. 32180.

Range in Western Melanesia: Papua New Guinea. 12. (Present report).

Total range: As 4: Ind PNG.

2. *Oligotrichum novae-guineae* (Bartr.) G. L. Sm. (Figs. 20a–i)

Mem. New York Bot. Gard. 21: 49. 1971. — *Atrichum novae-guineae* Bartr., Rev. Bryol. Lichenol. 30: 206. 1961. — Type: Papua New Guinea. Enga: Wabag area, Ambum-Marimuni Div., track to Marimuni from the Upper Ambum valley, montane rain forest, epixylic, 10 300 ft, 26.VII.1960 Robbins 3035 (FH!, holotype).

Plants small, erect stems stiff, loosely caespitose, 7.0–18 mm tall, the leafy part 5.0–15 mm of the stem. Plants olivaceous to brown, stems reddish-brown, pentagonal in cross-section with polytrichoid, weakly differentiated central strand, hyaline rhizoids restricted to the stem base. Leaves fairly distant, about equal in size, lowest leaves bracteate, lingulate, sheath not actually differentiated, 2.1–2.8 mm long and

0.8–1.4 mm wide. Leaf apex obtuse, margin plane with small blunt teeth, ca. 1/2–3/4 of the leaf length. Costa c. 90 μm wide, brown, subpercurrent. Lamina unistratose, cells polygonal to transversely rounded rectangular, 10–30 μm , on the costa longitudinally rectangular, 10 \times 30 μm . Cells in the sheathing part elongated rectangular to subquadrate 5–10 \times 10–70 μm , cell-walls firm but not distinctly incrassate. Six to seven adaxial lamellae restricted to the costa, 3–5 cells high, crenate in side view. Apical cells round to ovate as seen above with extremely thin outer wall, lamellar cells polygonal to rectangular, 10–20 μm . Dioicous. Perigonial leaves wide bracteate with reduced blade with lamellae. Antheridia terminal, 0.7–0.9 mm long, paraphyses uniseriate with yellowish-brown, bi- to triseriate upper part. Perichaetial leaves linear-lanceolate, with narrow, reduced lamina, 1.5–2.1 mm long, sheath up to 3.1 mm long, cells different from those of the cauline leaves with sheath cells up to 130 μm long. Seta terminal, straight, smooth and dark red. Capsule inclined, essentially terete, dark brown, exothecial cells polygonal with firm walls, 20–30 μm , essentially smooth. Operculum rostrate, 0.65 mm long.

The plant is so far known only from the type collection. It is best distinguished from *O. javanicum* by its obtuse leaves and the absence of abaxial lamellae.

Range on the Huon Peninsula: None.

Range in Western Melanesia: Papua New Guinea: 13. Bartram (1961).

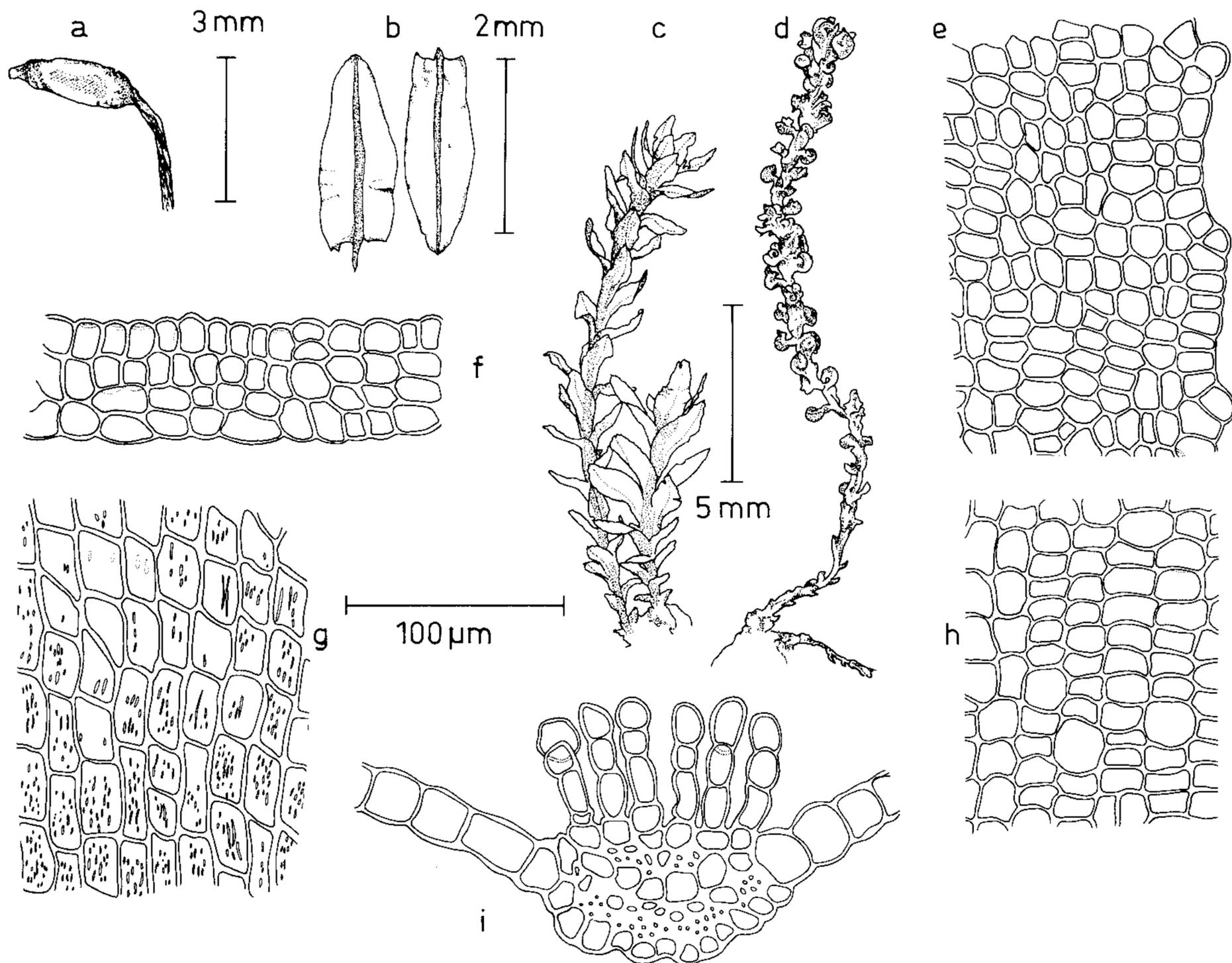
Total range: Endemic to Papua New Guinea.

III. Family BUXBAUMIACEAE Schwaegr. in Willd.

I follow Crosby's (1977) and Vitt's (1982) treatment of the genera *Buxbaumia* Hedw. and *Diphyscium* Mohr, and include them within the same family.

Genus *Diphyscium* Mohr 1803

The genus is credited with 22 species in Wijk et al. (1962) and some species have been described since then. Seven species are recorded in Austro-Malesian region, two of them being present in Western Melanesia, *D. loriae* C. Müll. and *D. involutum* Mitt. As already stated by Norris



Figs. 20a–i. *Oligotrichum novae-guineae* (Bartr.) G. L. Sm. (Robbins 3035, FH holotype). — a. Moist capsule. b. Leaves. c. Moist plant. d. Dry plant. e. Upper leaf margin. f. Lamella in side view. g. Median sheath cells. h. Median dorsal laminar cells. i. Cross-section of leaf. — Use the 3 mm scale for a, the 2 mm scale for b, the 5 mm scale for c–d and the 100 μm scale for e–h.

(1981), the number of described species will probably be much reduced by a modern, critical revision based on large material.

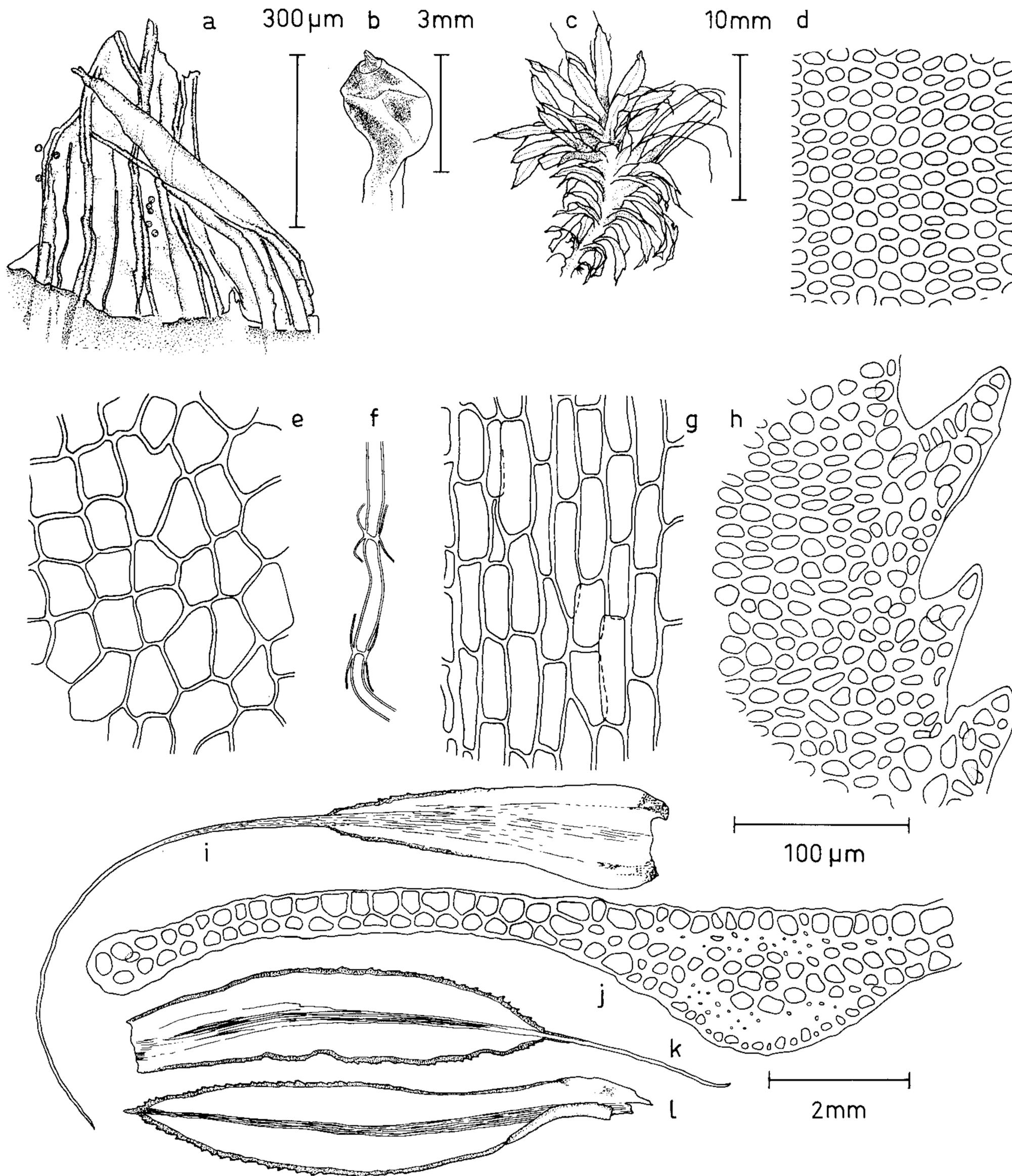
This genus is unusual in having a bistratose lamina with oblique walls, a multistratose, thickened leaf-margin and decorticated axillary hairs (Fig. 21f). For the generic characters in more detail, see Norris (1981).

1. *Diphyscium loriae* C. Müll. (Figs. 21a–l)

Hedwigia 36: 334. 1897. — Type: Papua New Guinea. Central: district Moresby, in montosis Mo-roka, 1300 m, VIII.1893 *L. Loria* in herb Levier (not seen).

Plants medium-sized, stems fairly soft, loosely caespitose, 2–25 mm high. Plants olivaceous to dark green. Stems pale brown or hyaline, with

slight differentiation of outer and inner cortical cells, polygonal in cross-section, 6.0–24 μm , with cell-walls becoming gradually more incrassate towards outer cells, brownish rhizoids restricted to the stem base. Leaves elongated lingulate, crowded or fairly distant, gradually longer above, twisted when dry, erect- to widely spreading when moist, 2.3–9.0 mm long and 0.3–1.5 mm wide. Leaf apex acuminate, costa strong, with dorsal and ventral stereid band, 80–200 μm wide, brown and shortly excurrent. Lamina bistratose, margin multistratose, dentate ca. 2/3 of the leaf length, teeth multicellular. Cells of the lamina round to transversely ovate, 4.0–12 \times 10–16 μm with incrassate walls, cells of the abaxial costa surface with strongly incrassate walls, 4.0–6.0 \times 16–40 μm , cells at the leaf base rectangular



Figs. 21a-l. *Diphyscium loriae* C. Müll. (Koponen 35868). — a. Peristome. b. Moist capsule. c. Moist plant. d. Median dorsal laminar cells. e. Exothecial cells. f. Fracture of axillary hair. g. Cells of leaf-base. h. Margin of leaf. i. and k. Perichaetial leaves. j. Cross-section of leaf. l. Leaf. — Use the 300 μm scale for a, the 3 mm scale for b, the 10 mm scale for c, the 100 μm d-h and j and the 2 mm scale for i and k-l.

with thin walls, $10-18 \times 40-80 \mu\text{m}$. Axillary hairs attached to the leaf near its insertion, $6-8 \mu\text{m}$ thick with ruptured outer wall of elongated cells. Autoicous. Outer perichaetial leaves like cauline leaves but with gradually longer apiculus, up to 5.1 mm long. Inner perichaetial leaves with reduced blade, 1.85–4.50 mm long and 0.75–1.40 mm wide with a long apiculus of 4.0–6.0 mm, cells like those at the base of cauline leaves. Capsule immersed with an extremely short seta, 1.4 mm. Capsule ovoid, dorsiventral and asymmetric, 2.4 mm long, light yellowish-brown. Exothecial cells polygonal, $26-40 \mu\text{m}$, with fairly firm walls. Outer peristome irregularly crenate, brownish, inner peristome hyaline with sixteen 0.55 mm long folds. Spores $12 \mu\text{m}$ in diameter, round and strongly papillose.

According to the present collections, the Western Melanesian species of the genus *Diphyscium* are easily distinguished. *D. loriae* has leaves with prominent teeth and those of *D. involutum* are totally entire.

On the Huon Peninsula only one specimen was collected at the altitude of 2 100–2 400 m in open, montane forest on moist, shaded soil. Koponen's collections from East and West Sepik (Norris & Koponen 1985a) show *D. loriae* to be a plant of mid- and low altitude rainforests (50–1 300 m) growing on boulders and cliffs.

Range on the Huon Peninsula: 4g. 66622.

Range in Western Melanesia (Koponen et al. 1986): Papua New Guinea: 9. 10. 12. (Present report), 20.

Total range: Endemic to Papua New Guinea.

2. *Diphyscium involutum* Mitt. (Figs. 22a–h)

J. Proc. Linn. Soc. Bot. Suppl. 1: 149. 1859.

Plants small to medium-sized, stems fairly soft, loosely caespitose, 1.0–14 mm high, light brownish-green to light green. Stems pale brown with slight differentiation of outer and inner cortical cells, polygonal, $6.0-20 \mu\text{m}$ in diameter, walls becoming gradually more incrassate towards the outer rows. Stem base with many brownish rhizoids, stems branched below. Leaves elongated lingulate, narrowed below the mid-point, in upper part crowded, becoming gradually much longer above, twisted and incurved when dry, erect- to widely spreading when moist, 2.8–7.6 mm long and 0.6–1.3 mm

wide. Leaf apex acuminate, costa strong with differentiated dorsal and ventral stereid bands, $60-100 \mu\text{m}$ wide, brown and shortly excurrent. Lamina bistratose, margin totally entire and multistratose. Cells of the lamina round to slightly transversely flattened, $6.0-12 \mu\text{m}$ with distinctly incrassate walls, cells fairly uniform on the whole blade except the base, being rectangular with quite thin walls, $10-16 \times 30-100 \mu\text{m}$. Axillary hairs attached at the leaf insertion on the leaf, $6-8 \mu\text{m}$ thick with typically ruptured outer walls (decorticated). Autoicous. Outer perichaetial leaves like the cauline leaves but with gradually longer apiculus, up to 3.5 mm. Inner perichaetial leaves with reduced blade consisted of cells resembling those of the sheathing part of cauline leaves, blade 2.4–3.4 mm long and 0.5–0.9 mm wide with a long apiculus, 3.4–6.8 mm long. Archegonia brown, venter 1.2 mm and neck 0.9 mm long. Seta extremely short, capsule ovoid, slightly dorsiventral, light yellowish-brown, 1.6–2.8 mm long. Operculum rostrate, ca. 1.0 mm long. Spores $10 \mu\text{m}$ in diameter, round and strongly papillose.

Illustrations: Bartram 1939: pl. 28 (fig. 491); Gangulee 1969: 63 (fig. 27).

For the distinction from *D. loriae*, see the discussion above.

The species was not present in the collections from the Huon Peninsula. According to the few specimens known from Western Melanesia, *D. involutum* grows on rocks in forests at the altitudes of 400–1 600 m.

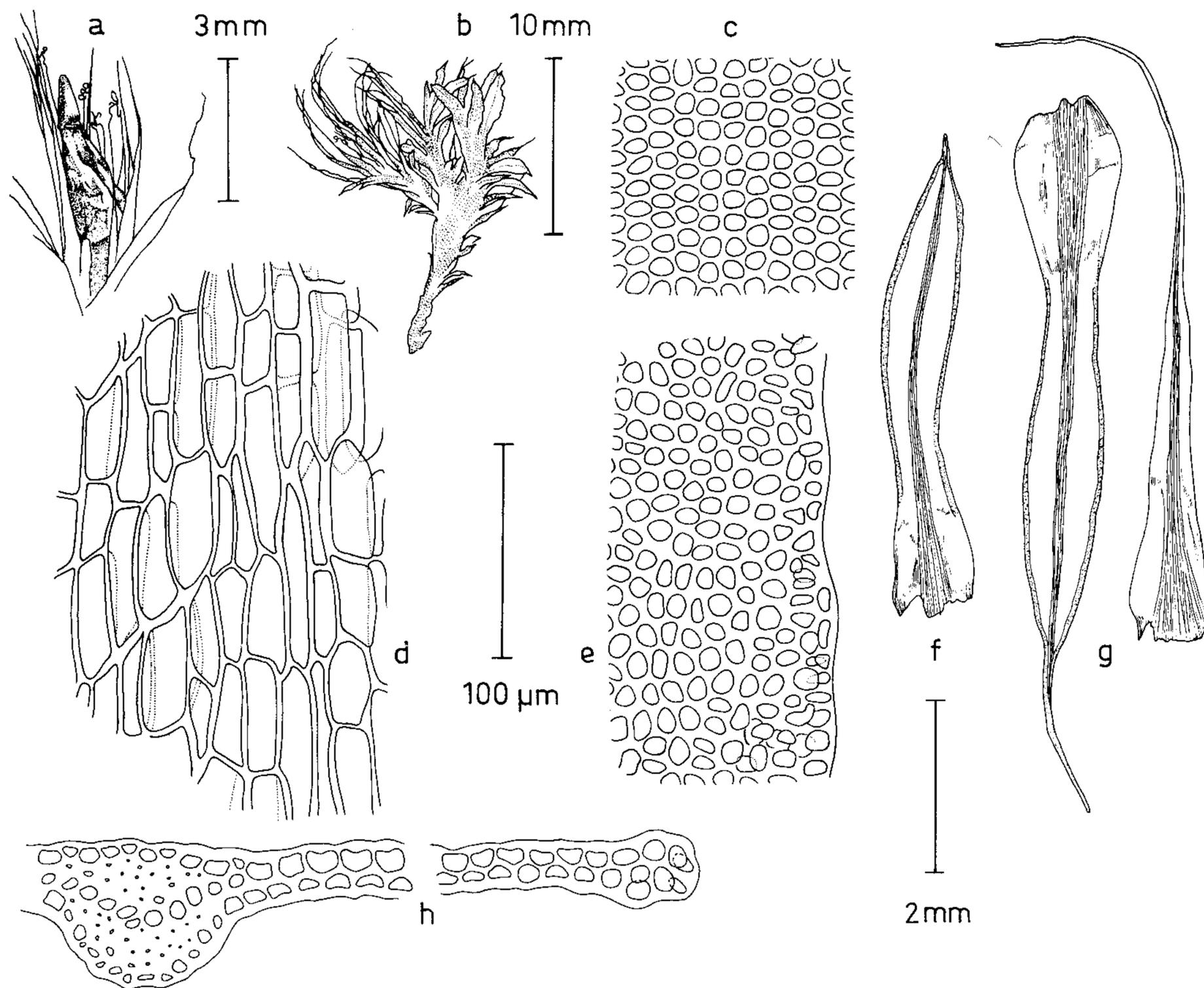
Range on the Huon Peninsula: None.

Range in Western Melanesia: Papua New Guinea. 12. Gurakor Creek, Lae-bulolo Road, 450 m, 29.VI.1981 *Bellamy 1254* (CBG, H!, LAE, NICH, NY); 20. Kuriva logging area, 52 km N of Port Moresby, 400 m, 4.II.1981 *Streimann & Vinas 14372* (CBG, H!, LAE); 23. Solomon Islands. 29. Kolombangara Island, N of Vanga river on NW side of island, 300–900 m, 13.VIII.1977 *Norris & Roberts 49923* (H!); 1 000–1 200 m, 13.VIII.1977 *Norris & Roberts 49842, 49858* (H!); near Mt. Veve in center of island, 1 400–1 600 m, 12.VIII.1977 *Norris & Roberts 49736, 49750* (H!).

Total range: As 2: Chi Ja; As 3: In Sri; As 4: Phi PNG.

Genus *Buxbaumia* Hedw. 1801

In Western Melanesia this small, fairly widely distributed genus is represented by *B. javanica* C. Müll. By its unique, dorsiventral capsule and



Figs. 22a–h. *Diphyscium involutum* Mitt. (Brass 24894, FH). — a. Moist capsule. b. Moist plant. c. Median dorsal laminar cells. d. Cells of leaf-base. e. Margin of leaf. f. Leaf. g. Perichaetial leaves. h. Cross-section of leaf. — Use the 3 mm scale for a, the 10 mm scale for b, the 100 μm scale for c–e and h and the 2 mm scale for f–g.

reduced gametophyte the plant is easily distinguished from all the other moss species of the area.

Buxbaumia javanica C. Müll. (Figs. 23a–f)

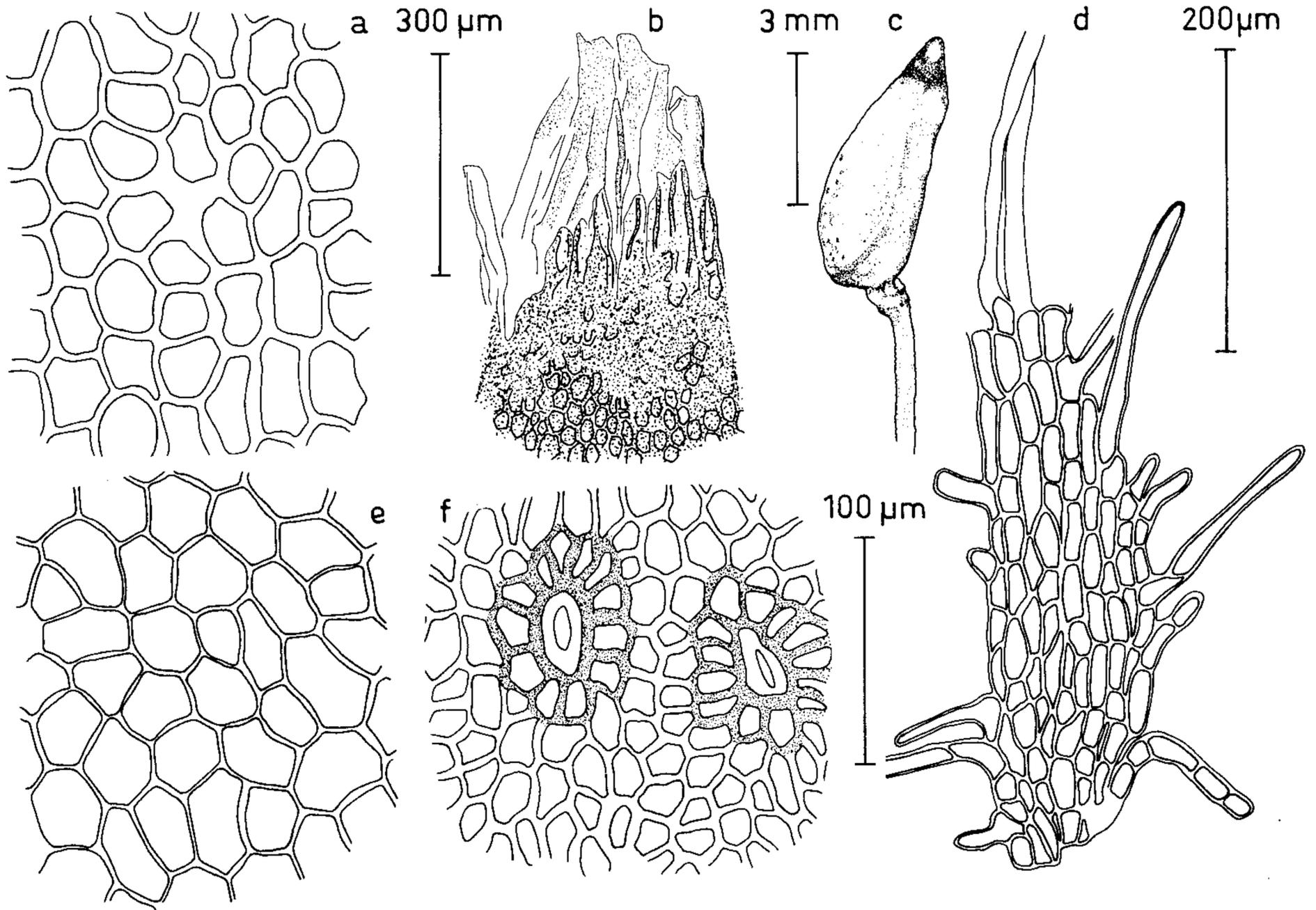
Syn. Musc. Frond. 1: 152. 1849.

Plants minute, scattered. Leaves small, up to 0.4 mm long, scale-like, fringed at the margins, nerve absent, cells rectangular with fairly thin walls, $10\text{--}14 \times 20\text{--}40 \mu\text{m}$. Rhizoids prominent, finely papillose and brown. Seta 16–27 mm long, roughly papillose, orange to dark red. Capsule inclined, ovoid and dorsiventral with more or less flattened upper side, brown, 5–6 mm long

with distinct neck. Exothecial cells polygonal to rectangular, $16\text{--}40 \mu\text{m}$, with firm walls. Cryptoporic stomata restricted to the neck. Operculum 0.8 mm long, conical and obtuse. Peristome double, outer peristome dark brown, formed of irregular teeth, shorter than the inner one, inner peristome formed of 32 folds, finely papillose, 0.8 mm high, yellowish hyaline. Spores round to ovate, finely but distinctly papillose, yellowish-green, $12\text{--}18 \mu\text{m}$ in diameter.

Illustrations: Dozy & Molkenboer 1854: tab. XXIV (20–28); Fleischer 1923: 1569 (fig. 247); Bartram 1939: pl. 28 (fig. 490).

For the diagnostic characters, see the generic discussion above.



Figs. 23a-f. *Buxbaumia javanica* C. Müll. (Norris 62734A). — a. Exothecial cells on “upper” side of capsule. b. Peristome. c. Moist capsule. d. Leaf. e. Exothecial cells on “lower” side of capsule. f. Stoma. — Use the 100 µm scale for a and e-f, the 300 µm scale for b, the 3 mm scale for b and the 200 µm scale for d.

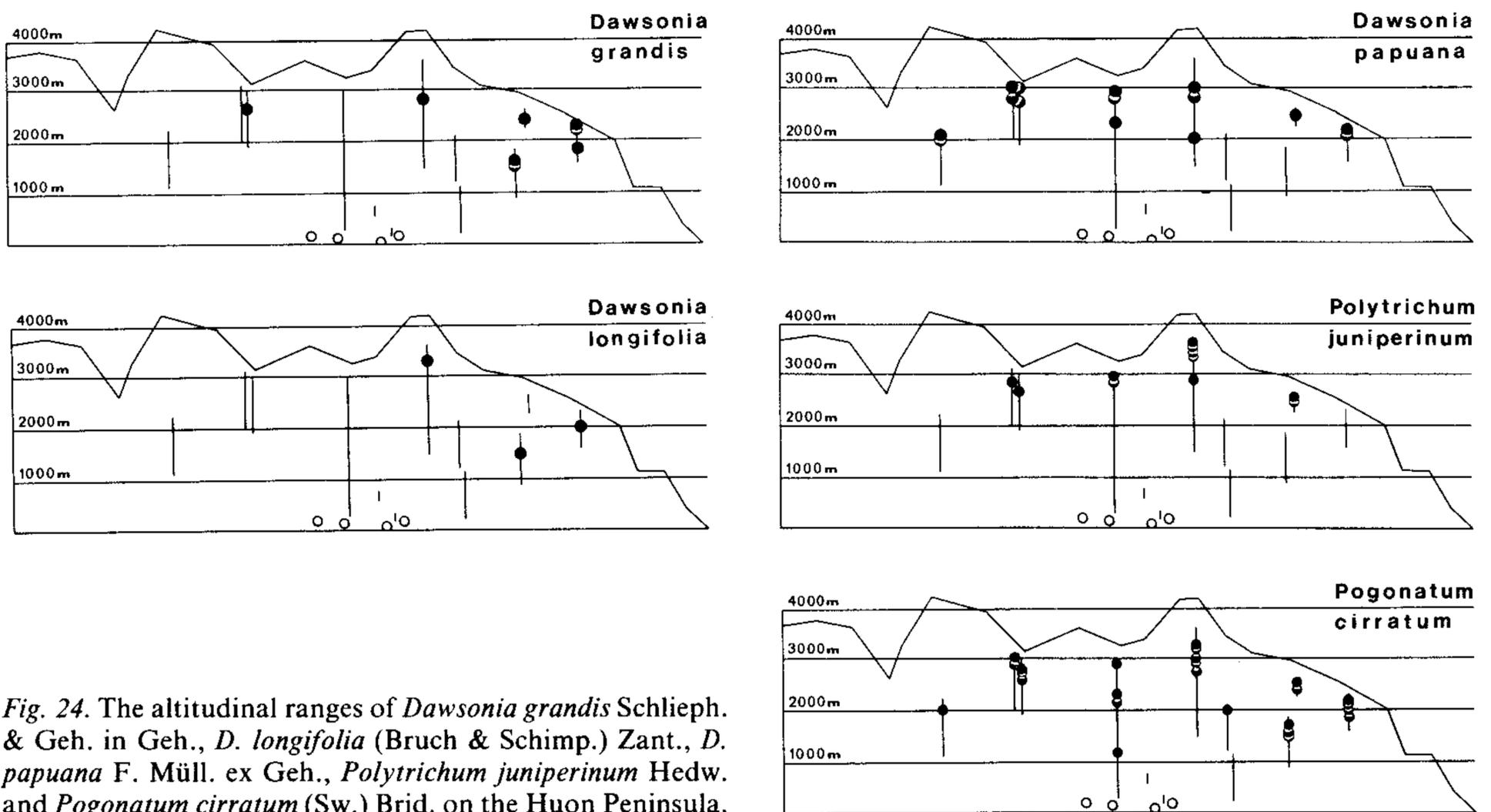


Fig. 24. The altitudinal ranges of *Dawsonia grandis* Schlieph. & Geh. in Geh., *D. longifolia* (Bruch & Schimp.) Zant., *D. papuana* F. Müll. ex Geh., *Polytrichum juniperinum* Hedw. and *Pogonatum cirratum* (Sw.) Brid. on the Huon Peninsula.

On the Huon Peninsula *B. javanica* was collected at the altitudes of 3 300–3 400 m growing exclusively on stumps and trunks of treeferns in open grasslands. It may be more common than the present collections show, because a large percentage of the specimens were hidden under grasses which covered the bases of treeferns (D.H. Norris, pers. comm.).

Range on the Huon Peninsula: *6b.* 31815, 31830, 62550. *6e.* 62850. *6u.* 62734A.

Range in Western Melanesia: Papua New Guinea. *12.* (Present report), *15.* Wade & McVean 1969.

Total range: As 4: Ind Phi PNG. — Map: Ladyzhenskaya 1934: 301 (map 2).

ACKNOWLEDGEMENTS

I am greatly indebted to Prof. Timo Koponen for introducing me to the subject and his guidance during the work. I wish to thank Dr. Pekka Isoviita, Prof. Daniel H. Norris, Dr. Sinikka Piippo and Dr. Andries Touw for their advice and valuable comments on the manuscript. Prof. Norris also revised the language. The Curators of BM, CANB, COLO, FH, GRO, JE, L, LAE, NY, S and UPS are acknowledged for loaning the specimens. The abundant material sent as exchange by Dr. Heinar Streimann (CBG) is greatly appreciated. I would also like to thank Miss Anne Sairanen, M.Sc. for the illustrations and Mrs. Sigbrith Launos for technical assistance. The work was financially supported by Alfred Kordelin Foundation and the Academy of Finland by grant (no. 01/921) to Prof. Koponen.

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INDEX TO GENERIC, SPECIFIC AND INFRASPECIFIC NAMES

An asterisk (*) means that the lectotype has been proposed in this paper. The names of the taxa excluded here from Western Melanesian flora are in parenthesis. The accepted names are in **boldface** and the names proposed as new synonyms are marked *syn. nov.*

- | | | | |
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