

The family Calymperaceae (Bryophyta) in Australia. Part 3: The genus *Mitthyridium*

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Abstract

Each of the nine *Mitthyridium* (Mitt.) H. Rob. species known from Australia is described and illustrated in detail, and a key to species and distribution maps are provided.

Introduction

This is the third paper in a series constituting a synopsis of the moss family Calymperaceae in Australia. The first paper (Seppelt *et al.* 2021a) provided a key to the genera of Calymperaceae in Australia, and the second paper (Cairns *et al.* 2021) treated the genera *Arthroscormus* Dozy & Molk., *Exostratum* L.T. Ellis and *Leucophanes* Brid. This paper treats the genus *Mitthyridium* (Mitt.) H. Rob., of which nine species are currently known from Australia.

In the following treatment the descriptions are based on the work of Nowak (1980), Reese *et al.* (1986a, 1986b), Eddy (1990) and Reese and Stone (2012), our own observations in the field, and our studies of a representative sample of collections held in Australian herbaria, supplemented by our own collections. The notation !d indicates that a high-resolution digital image of a specimen has been seen via JSTOR Global Plants (www.plants.jstor.org).

Mitthyridium (Mitt.) H. Rob., *Phytologia* 32: 432 (1975). *Thyridium* Mitt., *J. Linn. Soc. Bot.* 10: 188 (1868), *non* Nitschke (1867).

Type species: *Syrrophodon fasciculatus* Hook. & Grev. (= *Mitthyridium fasciculatus* (Hook. & Grev.) H. Rob.)

Plants with creeping primary stems and ascending branches, forming mats or low tufts, green or yellowish-green; rhizoids abundant on primary stems, dark reddish-brown to purple. Branch leaves lanceolate to

acuminate or oblong-linear, flexuose-spreading from a sheathing hyaline base, the lamina unistratose and usually markedly flexuose or undulate, variously shrunken and crisped when dry; margins conspicuously bordered below by a flat, unistratose border which narrows upwards and often vanishes well below leaf apex, usually denticulate with projecting cells; apex variable from acute to obtuse. Upper lamina cells small, obscure or pellucid, pluripapillose. Cells of marginal border linear, prosenchymatous (thick-walled), smooth or with sparse papillae. Leaf base composed mainly of a pair of lattices of much larger thin-walled, rectangular hyaline cells (hyaline lamina), usually sharply differentiated from chlorophyllose lamina cells, often with pores. Costa well developed, ending in or just below the apex, smooth in lower half, sometimes roughened in acumen; in section usually with 4 guide cells, well-developed adaxial and abaxial stereid bands and differentiated epidermal layers, typically resembling epidermal cells in upper limb. Dioicous. Male and female plants similar. Sporophytes rarely produced, terminal at branch tips. Perichaetia inconspicuous, inner bracts not usually much different from normal leaves. Seta slender, elongate, smooth. Capsule exerted, cylindrical, similar to that of *Syrrhopodon* in form and peristome; operculum with a long slender rostrum. Calyptra cucullate, deciduous. Gemmae fusiform-clavate, usually produced in abundance from adaxial or both sides of the tip of the costa, sometimes enclosed in a funnel-shaped expansion of the leaf apex.

Etymology: Mitten + *Thyridium* (from Greek *thyridion*, a little door or window), referring to William Mitten, the author of the original but illegitimate name *Thyridium*, and the transparent lattice of thin-walled hyaline cells in the leaf base.

Notes: When Mitten (1868) erected the genus *Thyridium*, that name was pre-dated by the fungal genus *Thyridium* Nitschke (1867). Robinson (1975) therefore replaced it with the name *Mitthyridium*. Although in leaf morphology resembling both *Syrrhopodon* and *Calymperes*, the creeping primary stems and broad, flat marginal border in the leaves easily differentiate *Mitthyridium*. The genus occurs throughout Malesia and Polynesia and extends to tropical Asia and northern Australia, with a single species in Africa. Most species are found in low-altitude oceanic habitats.

Reese and Stone (2012) included nine species for Australia, which we accept here, except that *Mitthyridium luteum* (Mitt.) H. Rob., replaces the name *M. papuanum* (Mitt.) Broth. for Australian material (see the discussion under *M. luteum*). Reese and Stone (2012) cautioned that some species are ‘uncomfortably close to one another and difficult to circumscribe satisfactorily, but others are quite distinct’, and decried the ‘lack of sharp morphological discontinuities among the species’ that made ‘the taxa appear to blend almost imperceptibly with one another’. A detailed molecular study of this genus seems to be needed in order to more clearly delimit the species.

The following key, based on the key in Reese and Stone (2012), may be used to differentiate the Australian species.

Key to the species of *Mitthyridium* in Australia

- 1 Tips of at least some leaves tubular or funnel-shaped..... 2
- 1: Tips of leaves plane or with erect margins, or \pm involute, not tubular or funnel-shaped 3
- 2 Tips of at least some leaves funnel-shaped, lacking a coarsely mammillose tubular portion; leaf border very broad at shoulders, mostly 100–150 μm wide. Gemmae often abundant, barely emergent beyond the funnel-shaped receptacle at the leaf tip **M. constrictum**
- 2: Tips of at least some leaves tubular, the tubular portion often coarsely mammillose; leaf border narrow at shoulders, mostly 60–70 μm wide. Gemmae inconspicuous, emergent from tubular tips of gemmiferous leaves **M. crassum**
- 3 Leaves with conspicuously flaring shoulders..... **M. fasciculatum**
- 3: Leaves mostly broadest at shoulders, mostly not conspicuously flared 4
- 4 Leaves mostly tightly crispate when dry; oblong, mostly less than 2 mm long; margins sharply toothed at shoulders and above, with spreading teeth..... **M. repens**
- 4: Leaves variously contorted when dry but not crispate, lanceolate to linear, mostly more than 2 mm long; margins toothed or entire, if toothed, the teeth not spreading..... 5
- 5 Leaves long relative to width; limb of most leaves 2 or more times length of sheathing base 6
- 5: Leaves short relative to width; limb of most leaves only about 1–1.5 times length of sheathing base..... 8
- 6 Leaf margins entire, rarely weakly denticulate; limb \pm involute **M. leucoloma**

- 6: Leaf margins regularly denticulate to serrate; limb plane.....7
- 7 Leaf limb oblong-acuminate, tapering abruptly distally into an acute apex; most leaves about 0.5 mm wide at mid-limb, broadly linear, narrowed abruptly to an acute apex; border ending well below leaf apex; hyaline lamina reaching 1/4–1/2 leaf length, rounded to broadly acute distally, chlorophyllose lamina cells extending well down margin **M. luteum**
- 7: Leaf limb long-acuminate, tapering gradually to an acute apex; most leaves about 0.25 mm wide at mid limb, narrowly linear to lanceolate-acuminate, tips gradually acuminate; border reaching almost to leaf apex; hyaline lamina short, 1/5 or less of leaf length, narrowly to broadly scalariform distally to ± truncate **M. subluteum**
- 8 Leaves oblong-lanceolate, tapering above to a narrowly acute apex; apex narrow, slightly expanded at tip; margins serrate, at least in upper part; border ending about mid-leaf; hyaline lamina narrowly to broadly scalariform distally; gemmae borne adaxially on narrow tips of leaves **M. perundulatum**
- 8: Leaves lingulate to lingulate-lanceolate, narrowing rather abruptly to an acute apex; margins ±entire to denticulate, entire in upper part; border ending well above mid-leaf; lamina cells smooth in lower part, papillose distally, small, upper lamina cells obscured by papillae; distal margins of hyaline lamina mostly broadly rounded; gemmae borne adaxially and abaxially on apex of costa **M. flavum**

1. *Mitthyridium constrictum* (Sull.) H. Rob., *Phytologia* 32: 432 (1975). *Calymperes constrictum* Sull., *U.S. Expl. Exped.*, *Musci* 17: 17, Pl. 3: a (1874).

Type citation: 'Hab. Sandwich Islands.'

Type: United States, Hawaii, s. loc., Sept 1840 – Apr 1841, *W. Sullivant s.n.*, as 'constricta'; lectotype (designated by Nowak 1980): FH, not seen; isolectotype: NY, not seen.

Illustration: Nowak (1980: 43).

Plants glossy yellowish-green above, rich brown in older parts, forming loose tangles, branches often considerably elongate, to 5 cm. Leaves mostly 2–3 mm long or slightly longer, 1.0–1.2 mm wide in the shoulder, oblong-acuminate, the tips constricted just below the flared funnel-shaped apex that forms the gemma receptacle; margins mostly denticulate; border very broad at base of chlorophyllose lamina, up to 130 µm wide at shoulders, narrowing towards the insertion and in the limb, disappearing below the flared leaf apex. Cells of leaf limb thick walled with corner thickenings and irregular, somewhat stellate lumina, pluripapillose throughout and strongly mammillate at leaf constriction, irregular in outline, c. 8–15(–18) µm long and wide; cells of expanded leaf apex smooth, with rounded to elongate-ovoid lumina. Hyaline lamina sharply defined but small for genus, margins broadly rounded to almost truncate distally, of 15–20 rows of cells. Costa smooth adaxially, ending at base of flared apex, abaxially scabrid with projecting mammillae. Gemmae often abundant, barely emergent to projecting beyond the funnel-shaped receptacle at the leaf tip, 230–400 µm in length. Sporophytes not seen in Australian material. (Fig. 1)

Diagnostic characters: Reese and Stone (2012) indicate that the gemmae are 'scarce, barely emergent'. In the specimen used for illustration there are abundant elongate gemmae that project clearly beyond the receptacle. Many or most leaves develop the flared funnel-shaped apex but may not produce gemmae. Brown rhizoids may also develop from the abaxial side of leaf tips.

With its characteristic leaf form, *M. constrictum* is easily distinguished. The leaves are tightly incurved and crisped when dry, superficially resembling *M. repens*. The straggly growth habit, highly modified leaf apex, broad leaf border and relatively narrow hyaline lamina region are useful guides for recognition.

Distribution: North-eastern Queensland between Mossman and Cardwell (Fig. 10.1). Also known from Cambodia, Malesia, Papua New Guinea, Philippines, French Polynesia, American Samoa, Oceania.

Habitat: Tree trunks and logs up to 1000 m in tropical rainforest.

Selected specimen seen: Queensland: Bellenden Ker, Goldsborough Track, 7 Sept 1987, *I.G. Stone 24574* (MEL 2326319).

Etymology: Latin *constrictum* (narrowed), referring to the constriction of the leaf below the apex.

Typification: The US Exploring Expedition, on which Sullivant made his Pacific collections, was in Hawaii from Sept 1840 to April 1841. Three specimens are listed on the HUH database (FH0060234, FH01146517 and FH01146518), all collected in the Sandwich Islands (Hawaii). Which of these is the lectotype is not known.

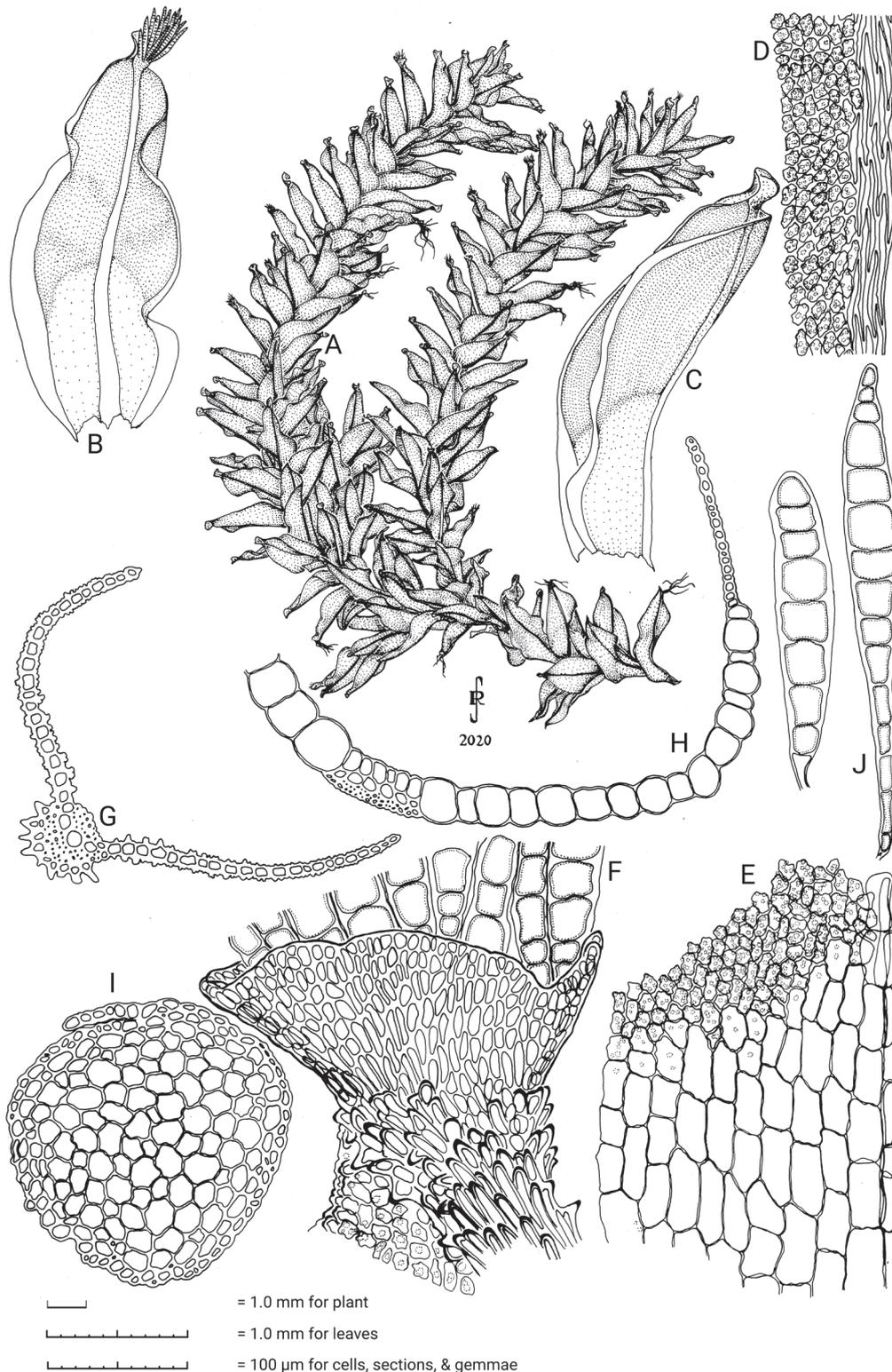


Fig. 1. *Mitthyridium constrictum* (Sull.) H.Rob. **A:** Habit of plants, drawn moist. **B, C:** Leaves with gemma receptacle and gemmae. **D:** Marginal cells of mid lamina. **E:** Cells of upper hyaline lamina region and lower chlorophyllous lamina. **F:** Detail of cells of gemma receptacle and abaxial surface of distal end of costa. **G:** Section of leaf lamina. **H:** Section of sheathing base of leaf. **I:** Stem section. **J:** Gemmae. Drawn from *I.G.Stone 24574*.

2. *Mitthyridium crassum* (Broth.) H.Rob., *Phytologia* 32: 432 (1975). *Syrhodon crassus* Broth., *Öfvers. Finska Vetensk.-Soc. Förh.* 40: 166. (1898).

Original material: 'Patria. British New Guinea, Milne Bay, in montibus prope Mita 2000' (W. Micholitz n 133)'

Type: Papua New Guinea: Milne Bay, Feb. 1895, *W. Micholitz 133*; lectotype (designated by Nowak 1980): H-BR, not seen; isolectotypes: FH not seen, S not seen, W not seen, BM000662145!d.

Illustration: Nowak (1980: 53).

Plants small to medium sized, glossy, pale green, usually with short stems and branches, gregarious or in compact tufts. Leaves spreading when moist, variously contorted when dry, lanceolate-acuminate from a broadened base, 2–3 mm long, slightly undulate, \pm plicate; leaf margins strongly inrolled towards the apex, weakly scabrid below apex; strongly bordered below, border narrowing upwards and disappearing well below the apex, weakly denticulate or almost entire, border 50–80 μ m wide at shoulders. Cells of limb 5–10 μ m long, 5–8 μ m wide, thick walled, with irregular rounded to stellate lumina, smooth to weakly papillose except in tubular part of upper limb where often conspicuously papillose-bulging. Hyaline lamina broadly scalariform, reaching 1/4–1/3 leaf length, ending in a broad angle above, 14–20 cell rows wide. Gemmae inconspicuous, emergent from tubular tips of gemmiferous leaves, the cell walls very thick. Sporophytes not known. (Fig. 2)

Diagnostic characters: Reese *et al.* (1986a) included *M. crassum* in their descriptions of *Mitthyridium* species from the Huon Peninsula, Papua New Guinea, based on a report from Nowak (1980). They commented that the species is ‘fairly distinct by its tubular and often conspicuously papillose leaf tips, broad border at the shoulders, and thick-walled cells’, but noted the similarity of its leaves with those of *M. wallisii* (Müll.Hal.) H.Rob. ‘under the microscope’. They further commented that the funnel-shaped leaf tips of *M. wallisii* are distinctive, and the tightly crispate dry leaves of the species distinguish it from the loosely contorted dry leaves of *M. crassum*, although they acknowledged that some specimens appear intermediate between the two species and suggested that they represent extremes of a single variable species. Menzel and Schultze-Motel (1990) treated *M. crassum* as a taxonomic variety of *M. wallisii*, a view not followed by Reese and Stone (2012). Illustrations in Eddy (1990) of leaves, leaf apices and cells of *M. wallisii* (p.148, fig. 260) and *M. crassum* (p.148, fig. 261) suggest that the leaves of the latter are longer, the limb is more tapered and less inrolled at the apex, and the lamina cells are less irregular in outline, but such differences are not unusual in any species of the genus. He later commented (p. 149) that ‘some leaves [of *M. wallisii*] are scarcely different from those of *M. crassum*. Eddy (1990) stated that *M. wallisii* was distributed around the coasts of tropical Asia and Malesia and extended to northern Australia (although there are no herbarium records from Australia). We do not discount the possibility that the two species are conspecific, but prefer to maintain them as distinct species until this is demonstrated.

Reese (1997) described gemmae in the Calymperaceae. He noted that in gemmiferous leaves of *M. crassum*, most gemmae arise on the abaxial surface of the costa, outside the tubular tip, although a few gemmae may arise on the adaxial tip inside the tube, as in *M. constrictum*. The two species are easily separated by their gemmiferous leaf tips – tubular in *M. crassum*, funnel-shaped in *M. constrictum*.

Distribution: North-eastern Queensland from Mossman south to Tully (Fig. 10.2). Also known from Malesia, Philippines, New Guinea, American Samoa.

Habitat: Grows on trees, logs, rarely on rocks, usually below 600 m altitude.

Selected specimens seen: Queensland: Daintree National Park, Mossman Gorge, just east of Mossman, 8 June 1989, *W.D.Reese 17405* (MEL 2333052A); Daintree National Park, Mossman Gorge, 26 Aug 1999, *H.Streimann 64450* (CANB 607755.1).

Etymology: Latin *crassum* (thick), referring to the thick-walled cells of the upper leaf lamina. Nowak (1980) mistakenly attributed the name to the robust habit of the plant.

Typification: The collecting date is taken from an annotation on the isotype in BM. This specimen was annotated as an isolectotype by Nowak ‘by my selection’ in 1979, as above.

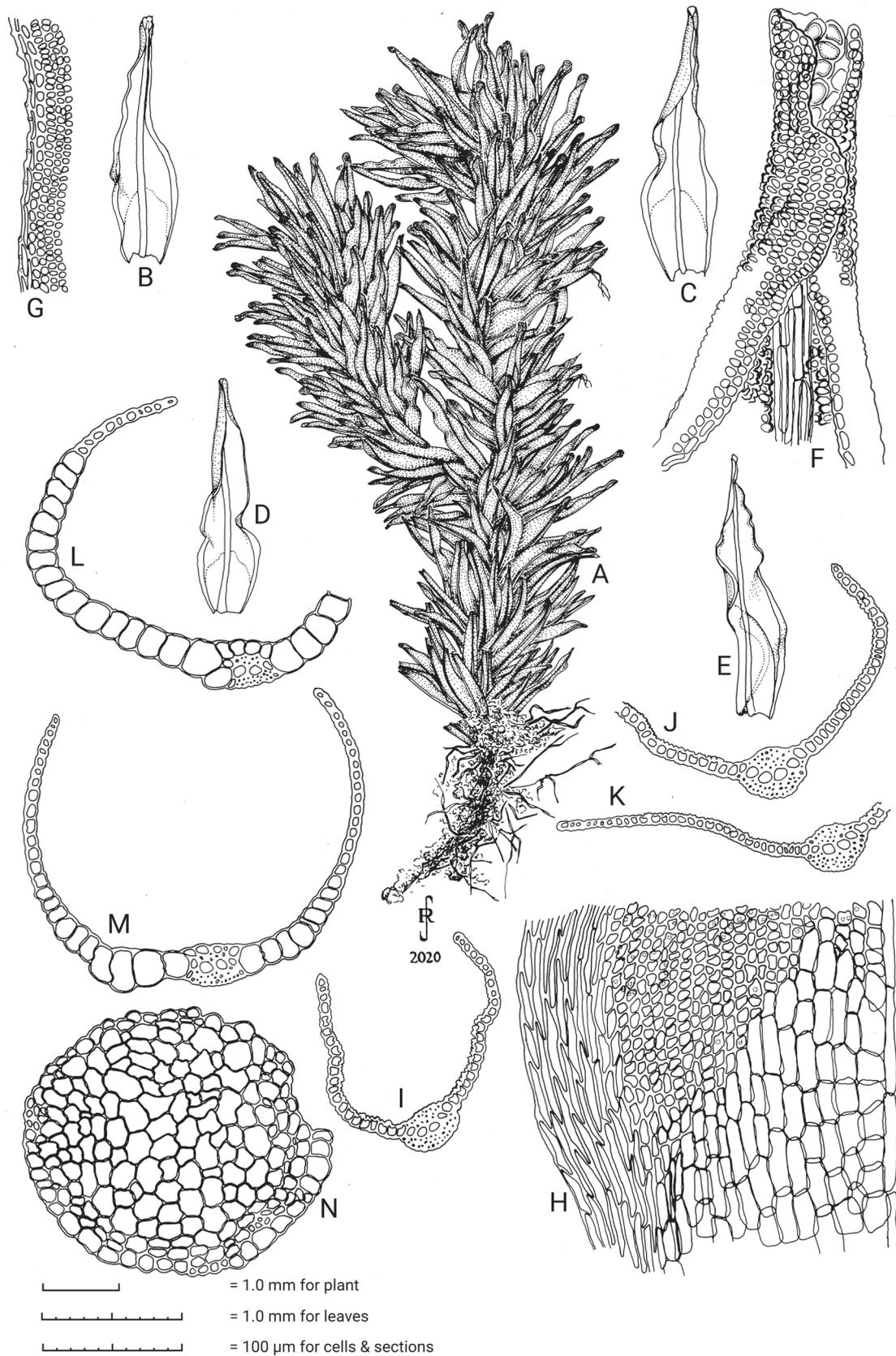


Fig. 2. *Mitthyridium crassum* (Broth.) H. Rob. **A:** Habit of plant, drawn moist. **B–E:** Stem leaves. **F:** Detail of leaf apex. **G:** Upper lamina marginal cells. **H:** Marginal, chlorophyllose and hyaline lamina cells around distal end of hyaline lamina. **I–K:** Sections of upper leaf lamina. **L, M:** Sections of sheathing part of leaf base. **N:** Stem section. Drawn from *W.D. Reese 17408*.

3. *Mitthyridium fasciculatum* (Hook. & Grev.) H. Rob., *Phytologia* 32: 433 (1975). *Syrrhopodon fasciculatus* Hook. & Grev., *Edinburgh J. Sci.* 3: 225. (1825).

Original material: 'Hab. Island of Ternate, Mr. Dickson. Sincapore, Dr Wallich.'

Type: Indonesia: Ternate, 1809, *D. Dickson s.n.* lectotype (designated by Menzel and Schultze-Motel 1990): BM-000662280!d; isolectotypes: E, FH, G, GL, NY.

Illustrations: Nowak (1980: 105, 107), Reese and Lin (1991: 369).

Plants robust for the genus, dull green to yellowish-brown; primary stems elongate, to 10 cm long, branches elongate ascending, to 4 cm long. Leaves 3–4 mm long, 1.0–1.3 mm wide, patent when moist, \pm erect when dry and the limb somewhat curved; base suberect sheathing, strongly flared at shoulders, the limb triangular lanceolate tapering to an acute or subacute serrulate apex; lamina irregularly flexuose or undulate; border broad at shoulders, 80–110 μ m wide, composed of 12–20 rows of narrow thick-walled cells, gradually narrowing upwards and disappearing shortly below leaf apex. Cells of limb thick-walled, irregularly quadrate to oval-rectangular, to c. 6 μ m wide, minutely pluripapillose on both surfaces partially obscuring the cells. Hyaline lamina reaching 1/4–1/3 leaf length, broadly truncate distally; chlorophyllose lamina not or scarcely decurrent down margins inside border. Gemmae rare, sparse, pale, warty, fusiform, arising adaxially and abaxially on leaf tips (Eddy 1990, notes gemmae usually abundantly produced from unmodified leaves). Sporophytes not found in Australian material. Eddy (1990) stated: 'Fruit frequent; seta 6–12 mm long; capsule cylindrical.' (Fig. 3)

Diagnostic characters: The species is readily distinguished by its large size, dull aspect and sprawling habit. The leaves have serrulate margins which, together with the conspicuously flared shoulders, wide borders and truncate hyaline lamina, are distinctive under the microscope. *Mitthyridium luteum* may be equally coarse but the hyaline lamina is relatively shorter and the leaf shoulders less obviously flared.

Reese and Lin (1991) described the gemmae as frequent but inconspicuous in specimens from China, and did not find sporophytes. In Australian collections we have seen, sporophytes are common and gemmae are scarce. *Mitthyridium fasciculatum* is the only Australian species of to produce gemmae from the tips of short, linear stacks of cells known as gemmipars (Reese 2001).

Distribution: Common and conspicuous in eastern Queensland, from the Iron Range as far south as Fraser Island (Fig. 10.3). A widespread eastern palaeotropical species also known from Madagascar, Mauritius and Seychelles, south east Asia, China (Hainan), Thailand, Malesia, Philippines, Papua New Guinea, Fiji, Western Samoa.

Habitat: Trees, logs and rocks in wet forest and rainforest to about 1000 m elevation.

Selected specimens seen: Queensland: Fishery Creek on slopes of Mt Bellenden Ker, near Gordonvale, epiphyte on trees near weir, 3 Oct 2004, *A. Cairns & D. Meagher B-327* (BRI AQ649271); Mossman Gorge, Daintree National Park, epiphyte in lowland riparian rainforest, 13 May 2013, *D.A. Meagher & A. Cairns WT-184* (BRI AQ1016931); Cedar Bay Road, north of Bloomfield River, 6 Aug 1979, *I.G. Stone 15827* (BRI AQ0874603).

Etymology: Latin *fasciculatum* (a small bundle), referring to the long, clustered branches.

Typification: The island of Ternate is in the Indonesian Maluku Islands (Moluccas). One sheet in E (E00011728/29/30) contains three sets of specimens (labelled in pencil A, B and C, equating to 28/29/30), with a stamp 'Greville herb.' and in ink 'Ternate New Zealand Dickson' and 'Menzies herb', presumably merely a mislabelling.

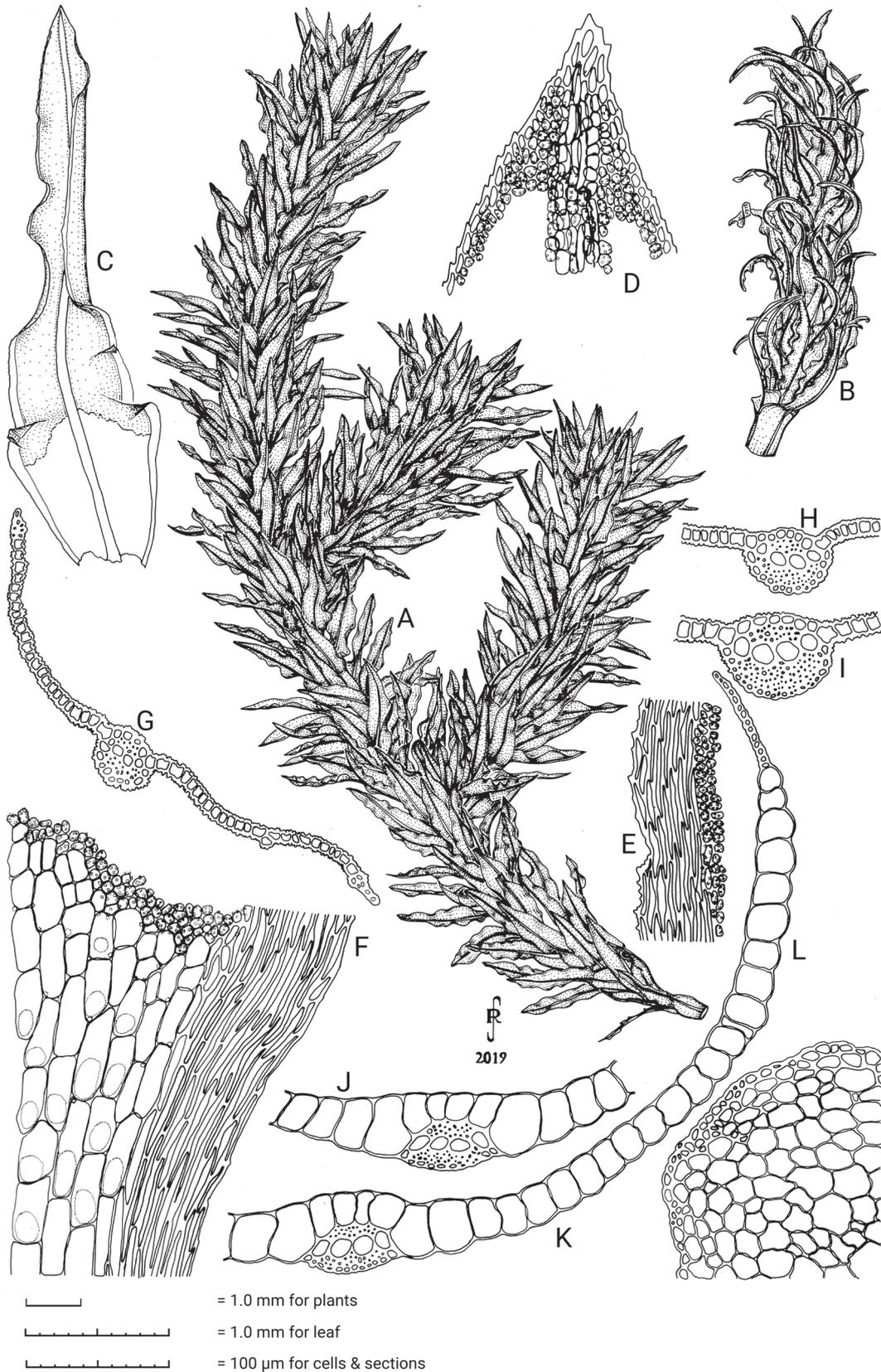


Fig. 3. *Mitthyridium fasciculatum* (Hook. & Grev.) H. Rob. **A:** Habit of plant, drawn moist. **B:** Branch, drawn dry. **C:** Stem leaf. **D:** Cells of leaf apex, adaxial view. **E:** Lower mid-lamina marginal cells. **F:** Cells of shoulder region of leaf. **G:** Section of upper limb of leaf. **H, I:** Costal sections from mid-limb. **J, K:** Sections of sheathing base of leaf. **L:** Part stem section. Drawn from *I.G. Stone 15827*.

4. *Mitthyridium flavum* (Müll.Hal.) H.Rob., *Phytologia* 32: 433 (1975). *Syrrhopodon flavus* Müll.Hal., *Bot. Zeitung (Berlin)* 13: 763. (1855).

Original material: 'Patria. Java: inter alios muscos specimina pauca manca inveni'

Type: Indonesia: Java, *s.d.* [before 1855], *s.coll.* holotype: B (presumably destroyed).

Illustrations: Reese *et al.* (1986b: 50), Reese and Lin (1991: 371), Ellis (2015: 337, Fig. 1).

Plants small, green to yellowish green, forming low-growing thin, straggling (occasionally dense) mats; branches mostly short, less than 1 cm long, occasionally longer, often hook-shaped at the tips; rhizoids glossy reddish-brown, arising from under side of stems, occasionally also from leaf tips. Leaves 1.5–3.0 mm long, c. 0.6 mm wide at shoulders, lingulate to lingulate-lanceolate, not or only slightly broader at shoulders, narrowing rather abruptly towards an acute apex; lamina gently undulate; margins \pm entire to denticulate, entire in upper part; border at shoulders 30–50 μ m wide, narrowing upwards, disappearing well below apex, sometimes not much above mid leaf. Lamina cells smooth in lower part, papillose distally, small, 5–7 μ m wide, upper lamina cells obscured by papillae; hyaline lamina reaching 1/4–1/3 leaf length, margins typically broadly rounded to acutely angled upwards to costa, cells in 15–20 rows. Costa smooth, ending shortly below leaf apex. Gemmae pale, \pm warty, borne both adaxially and abaxially on apex of costa. Sporophytes not seen in Australian collections; in Malesian specimens with a seta 3–8 mm long, capsule typical of the genus. (Fig. 4)

Diagnostic characters: *Mitthyridium flavum* is quite common and often abundant in northern Queensland. The straggly habit, short branches, and the broad, short, oblong or somewhat acuminate and abruptly pointed leaves are distinctive. The species may be mistaken for *M. perundulatum* having short, broad leaves, but the leaf margins there are undulate and sharply toothed above and most leaves are narrowly acuminate, not abruptly pointed as in *M. flavum*. *Mitthyridium luteum* also has abruptly short-pointed leaves but they are usually much larger, 3–4 mm long and with margins denticulate almost to the leaf tip, and the cells of the leaf limb are smooth or minutely papillose. Branches of *M. flavum* are mostly short while those of *M. luteum* are often elongate.

Eddy (1990) noted that sporophytes were common in Malesia. However, none have been found in Australian collections.

Distribution: Known from Melville Island, Northern Territory and north-eastern Queensland as far south as Finch Hatton Gorge, inland of Mackay (Fig. 10.4). Widely distributed and frequent throughout tropical Africa, Asia; Sri Lanka, Cambodia, China (Hainan, Yunnan), scattered through lowland Malesia, especially coastal regions, Philippines, Papua New Guinea.

Habitat: Epiphytic on tree trunks, palm trunks and vines in lowland rainforest (including *Licuala* rainforest), on shoreline trees and mangroves, and occasionally on rotting logs, to 500 m elevation.

Selected specimens seen: Queensland: Bramston Beach, near Babinda, 7 Nov 2014, *A.J.Franks AJF1411006A* (BRI AQ0910194); Cape Tribulation Road, c. 4 miles north of Daintree River Ferry, 22 May 1974, *D.H.Norris 42685* (BRI AQ0760391).

Etymology: Latin *flavum* (golden or reddish yellow), referring to the overall colour of the type specimen in the dried state.

Typification: Because the protologue states this species was described on the basis of a small specimen [*specimina pauca manca*, all having singular endings suggest a single find of a few shoots only] found among other mosses, it seems likely that an isotype does not exist. If no original material can be found a neotype would need to be selected.

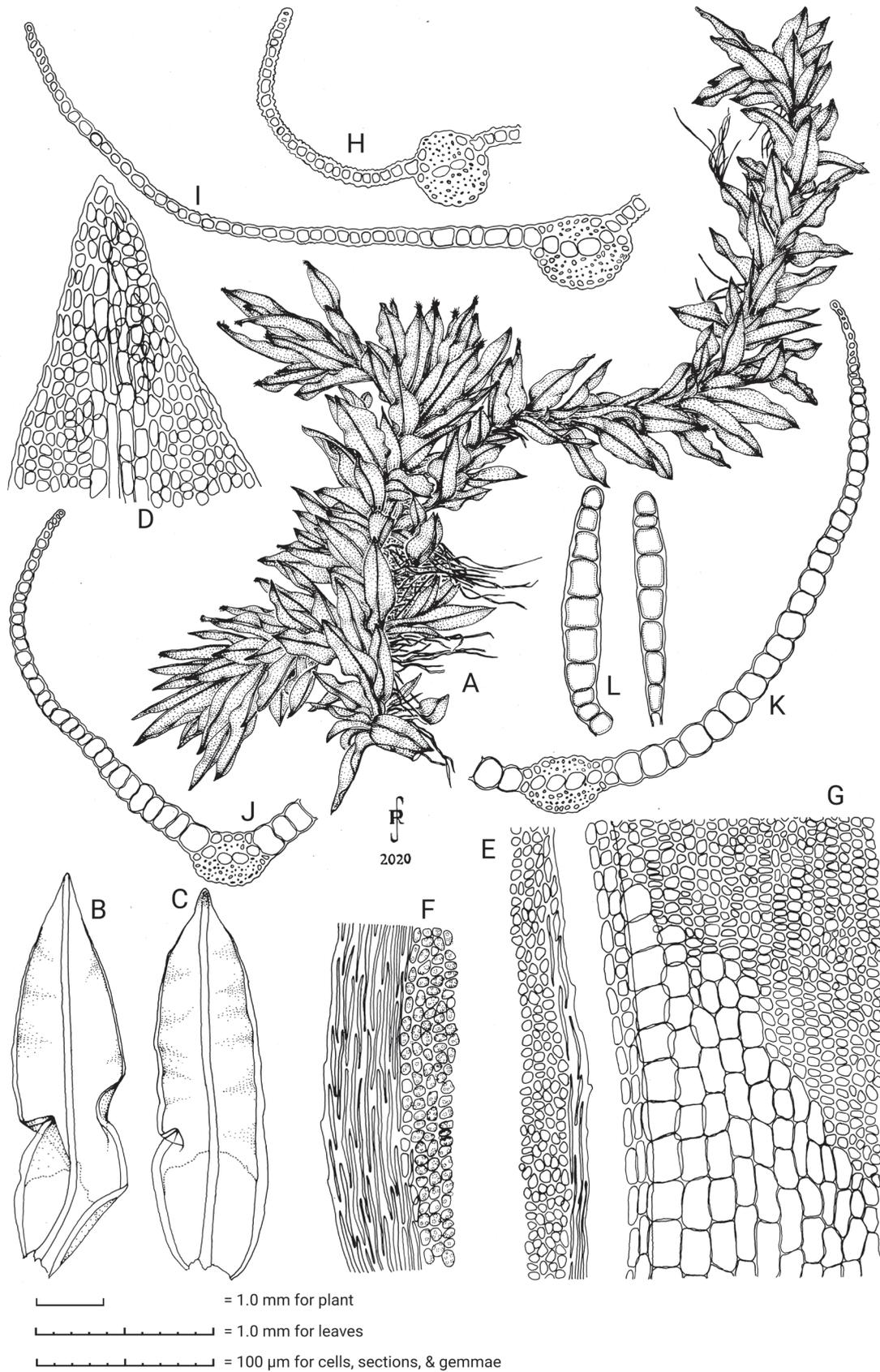


Fig. 4. *Mitthyridium flavum* (Müll.Hal.) H.Rob. **A:** Habit of plant, drawn moist. **B, C:** Stem leaves. **D:** Cells of leaf apex. **E:** Marginal cells near leaf apex (papillae omitted for clarity). **F:** Marginal cells of lower mid-lamina. **G:** Cells of upper end of hyaline lamina. **H, I:** Sections of upper and middle leaf lamina. **J, K:** Sections of leaf sheathing base. **L:** Gemmae. Drawn from *D.H.Norris* 42685.

5. *Mitthyridium leucoloma* (Müll.Hal.) H.Rob., *Phytologia* 32: 433 (1975). *Syrrhopodon leucoloma* Müll.Hal., *Bot. Jahrb. Syst.* 5: 86. (1883).

Original material: None cited.

Type: Papua New Guinea: *s.d.* [August 1875, see note below], *F.Naumann s.n.* holotype: B (presumed destroyed); lectotype (designated here): BM000662463!d.

Illustration: Nowak (1980: 82).

Plants robust, green, yellowish-green to yellow-brown, somewhat glossy, forming loose soft tangled mats; stems and branches elongate, up to 5 cm long. Leaves mostly to 4.0 mm long, moderately flared at shoulders; stiff when moist, recurved-spreading, when dry incurved but not strongly contorted; limb involute wet or dry, weakly undulate; margins entire, except at extreme apex, rarely with weak denticulations; border 60–70 µm at shoulders, with 8–11 rows of cells, narrowing upwards and disappearing below the apex. Cells of limb smooth to finely papillose, upper lamina cells small, 5–6 µm wide. Hyaline lamina reaching 1/4–1/3 leaf length, cells in 20–30 rows, distal margins arched, irregular in outline, upper cells of hyaline lamina commonly interdigitising with chlorophyllose cells of limb, the chlorophyllose lamina cells decurrent down margins and costa. Costa strong, often reddish. Gemmae sparse, pale green to brownish, borne adaxially and abaxially on costa at leaf tip. Sporophytes frequent. Calyptra c. 3 mm long. Seta 5–6 mm long, red. Capsule exserted, 1.5–2.0 mm long. Operculum 1.0–1.5 mm long. Peristome teeth reddish-yellow, slender, c. 300 µm tall, papillose, with transverse sutures. Spores 15–21 µm in diameter, papillose. (Fig. 5)

Diagnostic characters: *Mitthyridium leucoloma* resembles *M. fasciculatum*, but its glossy appearance, entire leaf margins and lack of flaring shoulders are diagnostic. Eddy (1990) also regarded *M. leucoloma* as similar in habit to *M. luteum* but noted that ‘it differs in its rigid leaves, broader leaf tip and stout costa’, describing the costa, as in Australian specimens, as ‘strong, often reddish’. It was treated by Reese *et al.* (1986 a, b) as a synonym of *M. obtusifolium* (Lindb.) H.Rob., but later regarded as a distinct species following Nowak (1980) and Eddy (1990). Eddy (1990) noted that *M. leucoloma* was almost endemic to Malesia, with its main occurrence in New Guinea and neighbouring islands. Nowak (1980) extended the range northwards to the Philippines and the Australian collections have extended the species range further to the south east.

Distribution: Occurs in far north Queensland from Torres Strait to Conway Range, east of Proserpine (Fig. 10.5). Known elsewhere from the Philippines, Malesia, Papua New Guinea, New Britain.

Habitat: Epiphytic on tree and palm trunks and on fallen timber in lowland rainforest and mangroves.

Selected specimen seen: Queensland: Cairns Botanic Gardens, 26 Aug 1989, *I.G.Stone* 25399 (BRI AQ0760393).

Etymology: Greek *leukos* (white) + *loma* (border), referring to the pale border of elongate cells on the margins of the leaves.

Typification: The original publication was titled ‘Die auf der Expedition S.M.S. Gazelle von Dr. Naumann gesammelten Laubmoose’ and the species was published in section 3 (‘Nova Guinea’). BM000662463 was collected by Friedrich Naumann in 1875 and is annotated in script ‘*Syrrhopodon leucoloma* C. Müll. Insulae inter Novam Guineam & [?Talvate Boyma], Sept 1875 Dr. F. Naumann’, and is also annotated ‘isotype’ by Bill Reese, although no holotype has been discovered. Regardless, there is no doubt that this is original material. Since no specimen traceable to the Berlin herbarium (where Müller’s herbarium was kept) has surfaced since its almost complete destruction in 1943, we consider it appropriate to designate BM000662463 as lectotype.

A chart in the account of the route of the voyage (Anonymous 1889: foldout facing page 252) shows that the *Gazelle* left Bougainville Island (now part of Papua New Guinea) on 28 August 1875 and sailed south and then west in the Solomon Sea before turning south for Australia, making no landfall before arriving at Brisbane on 29 September. The date on the lectotype therefore must be incorrect. The type locality would have to be New Hanover (Lavongai), New Ireland (Latangai), New Britain or Bougainville Island, the only landfalls made by the *Gazelle* between clearing the Galewo Straits at the western end of New Guinea on 25 June and arriving at Brisbane (Anonymous 1889: foldout facing page 160). All these islands are in Papua New Guinea.

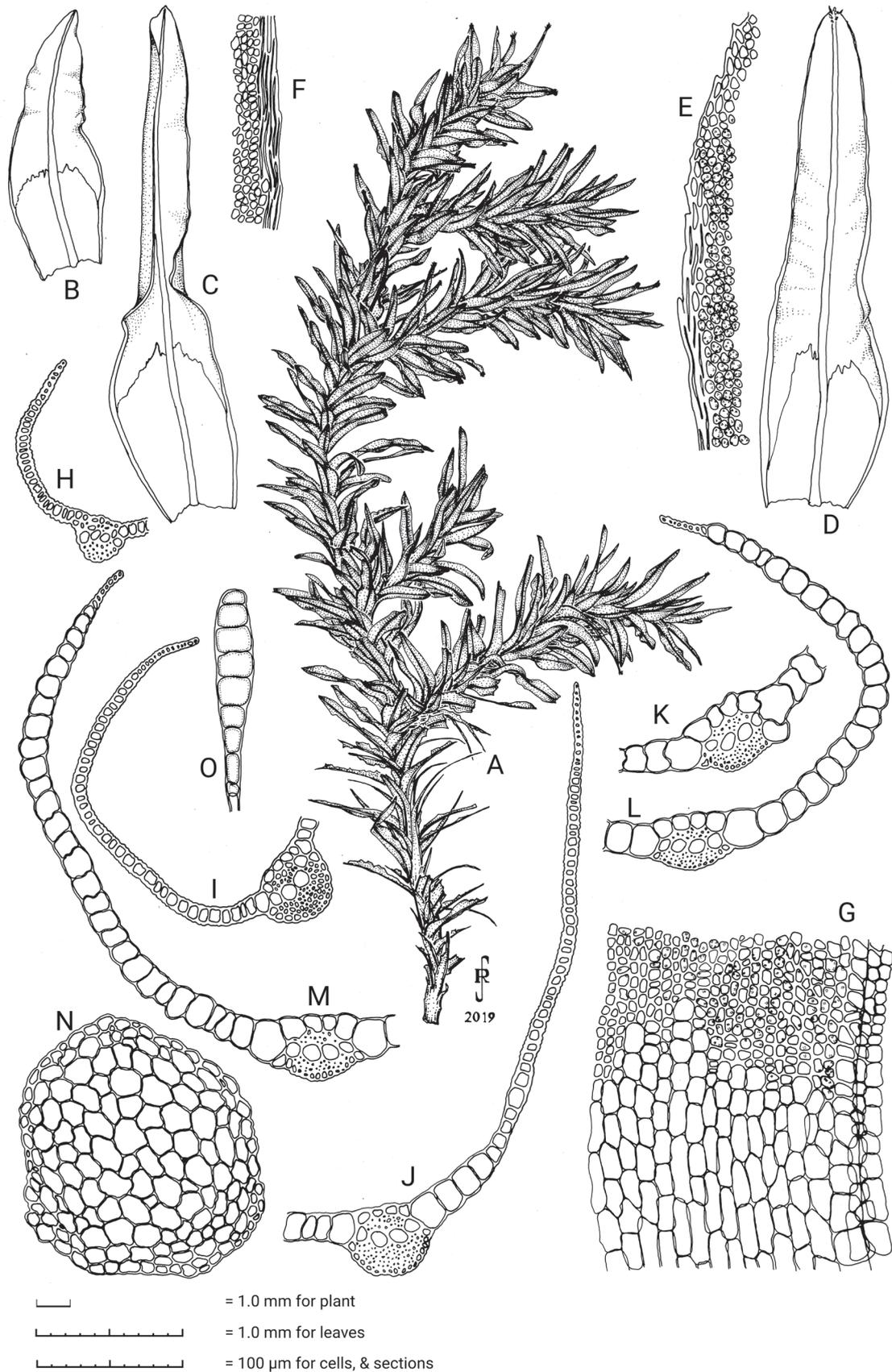


Fig. 5. *Mitthyridium leucoloma* (Müll.Hal.) H. Rob. **A:** Habit of plant, drawn moist. **B–D:** Leaves. **E:** Marginal cells from just below leaf apex. **F:** Mid lamina marginal cells (papillae omitted for clarity). **G:** Cells from distal end of hyaline lamina. **H, I:** Sections of leaf limb. **J:** Sections of leaf shoulder region. **K–M:** Sections of sheathing leaf base. **N:** Stem section. **O:** Gemma. Drawn from *I.G.Stone* 25399.

6. *Mitthyridium luteum* (Mitt.) H.Rob., *Phytologia* 32: 433 (1975). *Thyridium luteum* Mitt., *J. Linn. Soc. Bot.* 10: 188 (1868).

Original material: ‘Hab. Tutuila. No. 106. Ovalan [= Ovalau], Figi Islands, on stones in the mountains, Milne’

Type: Fiji: Ovalau (‘Ovalan’), *s.d.* [1852–1853], *Milne 106*. lectotype (designated by Nowak 1980): BM000662425!d; isolectotype: NY01127905!d. Residual syntype: American Samoa: Tutuila, *s.d.* [10–24 Oct 1849], *T.Powell 106*. syn: BM000662460!d, NY01127901!d.

Syrrhopodon papuanus Broth., *Öfvers. Finska Vetensk.-Soc. Förh.* 37: 156 (1895); *Thyridium papuanum* (Broth.) Fleisch., *Musci Fl. Buitenzorg* 1: 232 (1904); *Mitthyridium papuanum* (Broth.) H.Rob., *Phytologia* 32: 434 (1975).

Original material: ‘Patria. New Ireland, umbi anno 1893 detexit W. Micholitz’.

Type: New Ireland, Oct 1893, *W. Micholitz* [94] Lectotype (designated by Nowak 1980): BM, not seen.

Illustrations: Nowak (1980: 138; also page 131 as *M. papuanum*).

Plants robust, in loose soft tangled mats, yellowish-green, somewhat glossy, profusely branched; branches short or long, often curved near tips. Leaves mostly 3–4 mm long, broadly linear from a scarcely broadened base, broadly acuminate, narrowed abruptly to an acute apex; spreading when moist, incurved with inrolled margins when dry, margins denticulate almost to leaf tip; border 30–40 µm wide at shoulders, of 4–8 rows of hyaline cells, narrowing above and disappearing well below leaf apex; cells of limb small, 5–8 µm wide, smooth to minutely papillose. Hyaline lamina short, reaching 1/4–1/2 leaf length, of 20–30 rows of cells, demarcation rounded to broadly acute, chlorophyllose lamina cells extending well down margin. Gemma clavate, infrequent, arising adaxially and abaxially on costa from a small area just below apex. Sporophytes not seen in Australian material. (Fig. 6)

Etymology: Latin *luteum* (yellow), presumably referring to the overall colour of the dried type specimen.

Distribution: Rather rare in north-eastern Queensland, from Cape Tribulation as far south as Tully (Fig. 10.6). Elsewhere known in Malesia from Java, West Irian, Borneo, Papua New Guinea; Philippines; and in Oceania from Fiji, Samoa, Tahiti, Society Islands, Solomon Islands.

Habitat: Tree trunks, branches and twigs, and occasionally on soil, in rainforest from near sea level to 900 m.

Diagnostic characters: The description above is based on Australian material which Reese and Stone (2012) considered to belong to *Mitthyridium papuanum*. Nowak (1980) stated that *M. papuanum* is closely related to *M. luteum* as both have similar tapered leaf tips, although she considered *Mitthyridium papuanum* (Broth.) H.Rob. to be a separate species, based on small differences in the ratio of leaf length to width, the width of the hyaline leaf margin, and the lengths of the operculum, inner peristome teeth, operculum beak and seta. The gametophytic differences are very minor and could easily be accounted for by the inherent variability of *M. luteum* noted by Eddy (1990, p.140). Nowak (1980) stated that the operculum in *M. papuanum* is significantly shorter than that of *M. luteum*, although her illustrations of the species (on pages 131 and 138) show an operculum of similar length. Similarly, she stated that the seta in *M. papuanum* was up to three times longer than the seta in *M. luteum*, although her illustrations show setae of similar lengths. Reese *et al.* (1986a,b) placed *M. papuanum* in synonymy with *M. luteum*, as did Eddy (1990). Although they were treated as separate species by Reese and Stone (2012), we cannot see that there is sufficient evidence to justify this, and treat them here as conspecific.

Eddy (1990) noted that the coarse/robust habit of *M. luteum* may result in misidentification with *M. fasciculatum*. However, he noted that ‘the latter has more pronounced shoulders and cancellinae [hyaline lamina] which occupy a greater proportion of the leaf, as well as a costa that is decidedly roughened in the upper limb’. A ‘roughened costa’ is not included in Eddy’s (1990) description of *M. fasciculatum*, although illustrations of the leaf sections (Eddy 1990, Fig. 251 K, p.136) clearly show this. Australian specimens of *M. fasciculatum* examined and illustrated here (see *M. fasciculatum* Fig. 3 G) have a smoother costa than their Malesian counterparts, not dissimilar to that of *M. luteum* (Fig. 6 J, K). *Mitthyridium leucoloma* also resembles *M. luteum* in its robust habit; see under that species for differences.

Selected specimens seen: Queensland: JCU Canopy Research Facility site, near Thompson Creek, Daintree to Bloomfield Road, 44 km NNE Mossman, 26 Aug 1999, *A.Cairns B-191* (BRI); Creek along Ella Bay Road, c. 3 km from Flying Fish Point, 31 Oct 2014, *A.J.Franks AJF1410016* (BRI AQ0910081).

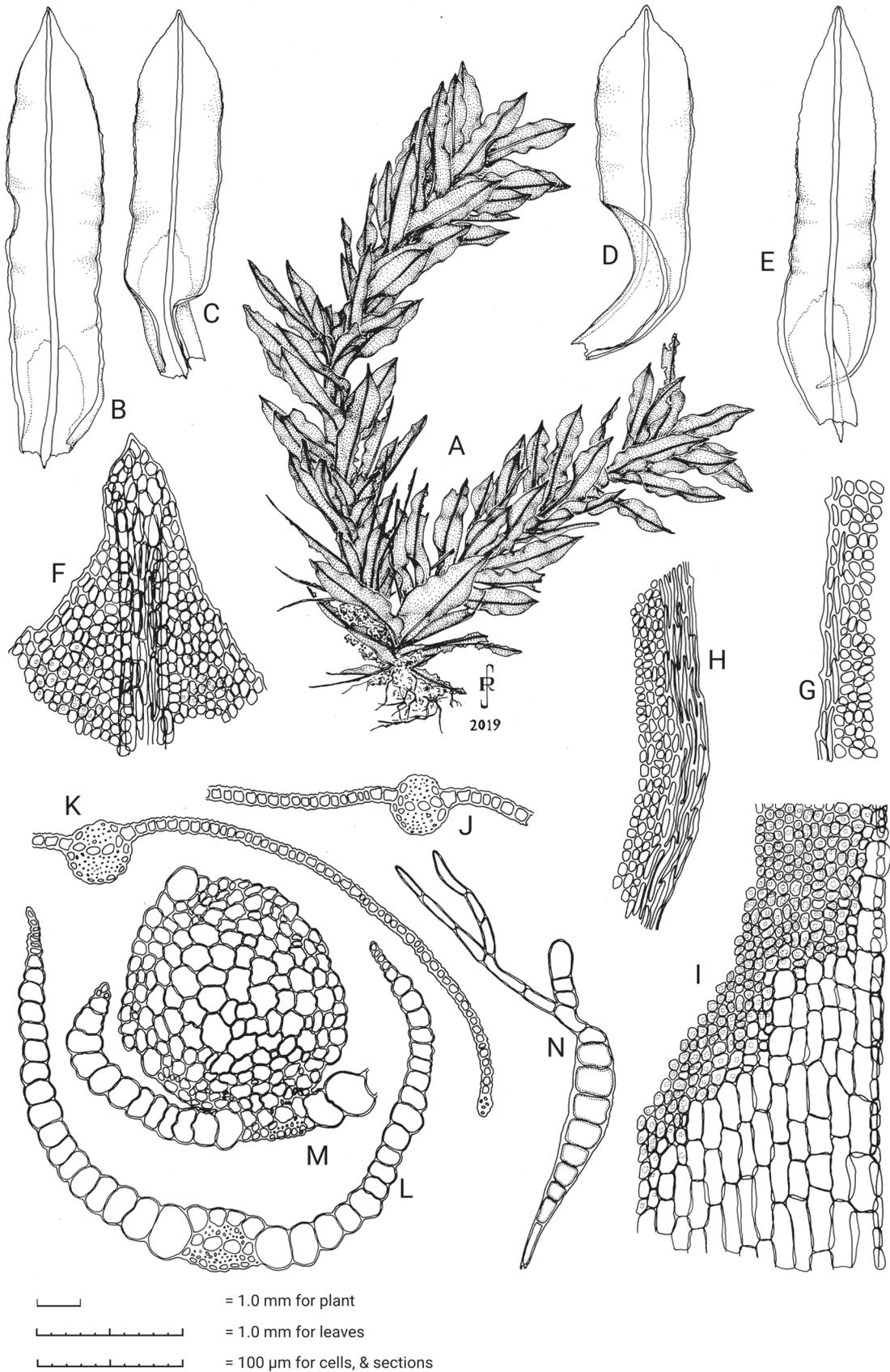


Fig. 6. *Mitthyridium luteum* (Mitt.) H. Rob. **A:** Habit of plant, drawn moist. **B–E:** Leaves. **F:** Cells of leaf apex, abaxial view. **G:** Cells of mid limb margin. **H:** Cells of leaf margin in shoulder region. **I:** Cells of distal hyaline lamina. **J, K:** Sections of costa and leaf limb. **L:** Section through hyaline lamina. **M:** Stem section. **N:** Germinating gemma. Drawn from A.J. Franks AJF1410016.

7. *Mitthyridium perundulatum* (Broth.) H.Rob., *Phytologia* 32: 434 (1975). *Syrrhopodon perundulatus* Broth., *Fl. Schutzgeb. Südsee* 83 (1900).

Original material: 'Kaiser Wilhelmsland: Wald am Gogol-Mittellauf, an Baumrinde (Lauterbarch n.970^b), Milne-Bai, im Gebirge bei Mita 200 m, an Baumzweigen (Micholitz n. 134).'

Type: Papua New Guinea: forest near Gogol River, *s.d.* [1889–1900], *C.A.Lauterbach 970b*. lectotype (designated by Nowak 1980: 151: BM000662171!d. Residual syntypes: Milne Bay, Feb 1895, *W.Micholitz 134*. syn: PC-0100853!d, PC0100854!d, BM000662225!d.

Illustrations: Dozy and Molkenboer (1856: 57, as *Syrrhopodon jungquilianus*), Reese and Stone (1995: 21).

Plants small to medium sized, green or yellowish-green; stems relatively short, to 5–6 cm, branches to 1.5 cm long, in compact sods or tufts. Leaves oblong-lanceolate, mostly 2.0–2.5 mm long, tapering above to a narrowly acute apex; apex narrow, slightly expanded at tip, commonly consisting of costa and narrow wings of a few lamina cells; leaf margins serrate, at least distally; cells of limb smooth to minutely papillose; border in shoulder region 10–12 cells wide, narrowing upwards and disappearing about mid leaf; hyaline lamina very short, reaching 1/4–1/3 leaf length, narrowly to broadly scalariform distally, acutely angled to costa. Gemmae frequent, usually inconspicuous, adaxial on narrow tips of leaves. Sporophytes not seen in Australian material. (Fig. 7)

Diagnostic characters: *Mitthyridium perundulatum* could be confused with *M. flavum*, but the leaves of *M. flavum* are broader, shorter, oblong or somewhat acuminate and abruptly pointed. The leaves of *M. luteum* (as *M. papuanum* in Reese and Stone 2012) may be abruptly short-pointed but are usually much longer, 3–4 mm long and denticulate almost to the leaf tips. Akiyama and Reese (1993) noted that the species was 'like a miniature version of *M. undulatum*' (not recorded from Australia) but in that species the leaves are broadly acuminate and the border of hyaline cells extends nearly to the leaf tip. *Mitthyridium perundulatum* is also similar to *M. jungquilianum* (Mitt.) H.Rob., but there the leaves are linear to linear-lanceolate from a broader base, broadly toothed where bordered, the lamina cells smooth to finely papillose adaxially and abaxially, and the distal margins of the hyaline lamina rounded to obliquely truncate. Reese *et al.* (1986b) treated *M. perundulatum* as a synonym of *M. jungquilianum*. *Mitthyridium jungquilianum* is also similar to *M. flavum* and *M. subluteum*, although, as Reese *et al.* (1986b) pointed out, there are significant differences between the species. Nevertheless, they noted that some Malaysian specimens they examined seemed to grade towards *M. flavum* or *M. subluteum*. Reese and Stone (2012) retained *M. perundulatum*, noting that Australian specimens of this species had been previously misidentified as *M. jungquilianum* and *M. undulatum* (neither of which has been recorded from Australia). See also discussion under *M. subluteum*.

Distribution: Occurs in north-eastern Queensland from Cape Tribulation to Cardwell (Fig. 10.7). Also known from Malesia, North Borneo, Moluccas, Papua New Guinea.

Habitat: Epiphytic on trees and vines in rainforest, mostly at low elevations but occasionally higher, up to 400 m.

Etymology: Latin *per-* (very) + *undulatum* (undulate), referring to the crispate leaves when dry.

Selected specimen seen: Queensland: Graham Range communication towers access road, Bramston Beach, 7 Nov 2014, *A.J.Franks AJF1411006C* (BRI AQ0910193).

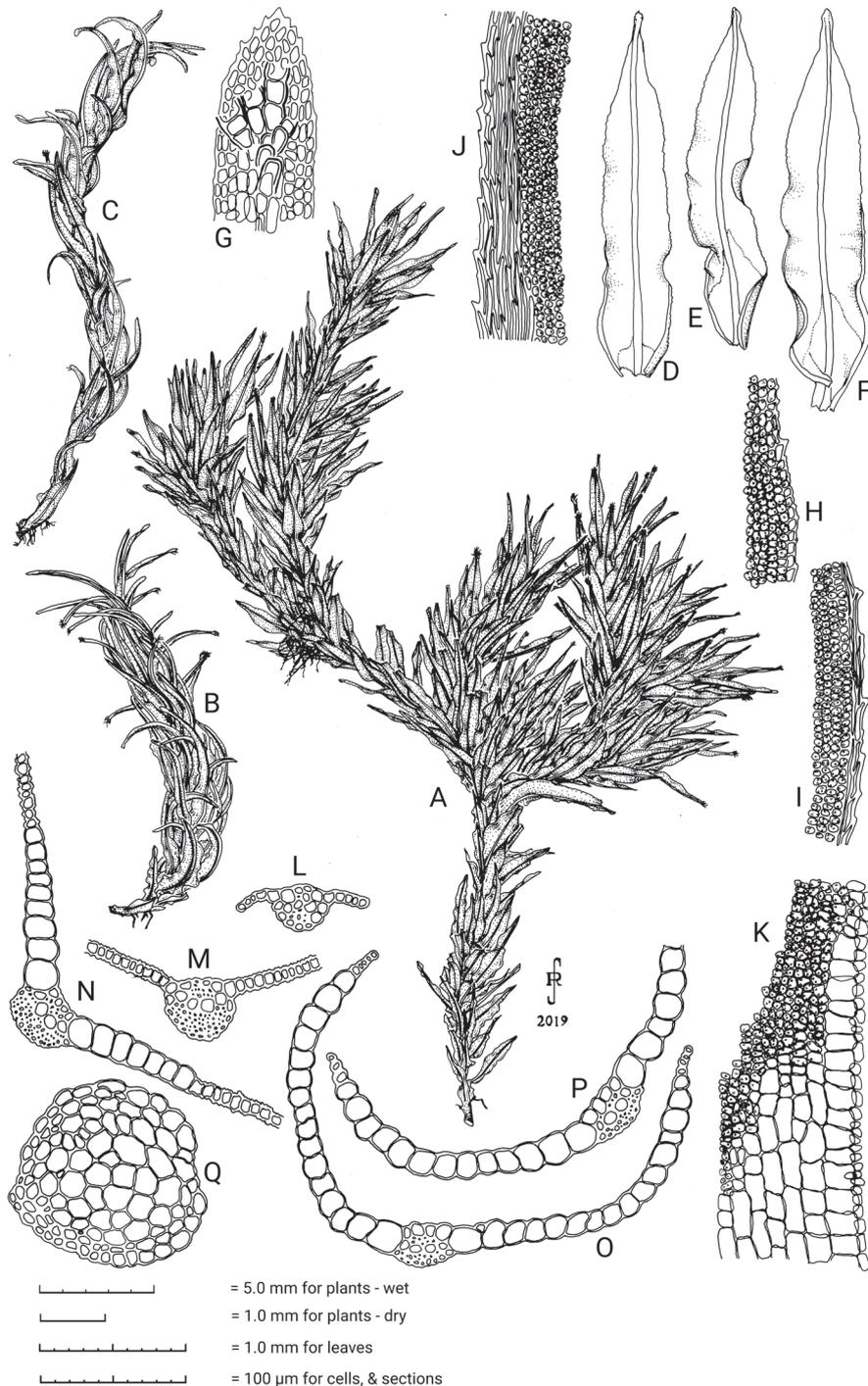


Fig. 7. *Mitthyridium perundulatum* (Broth.) H. Rob. **A:** Habit of plant, drawn moist. **B, C:** Branches, drawn dry. **D–F:** Leaves. **G:** Cells of leaf apex, adaxial view. **H:** Cells of upper lamina margin. **I:** Cells of mid lamina margin. **J:** Marginal cells at level of distal end of hyaline lamina. **K:** Cells of the distal end of hyaline lamina. **L:** Section of leaf apex showing costa and narrow lamina wings. **M:** Section of mid leaf limb. **N–P:** Sections of sheathing base of leaf. **Q:** Stem section. Drawn from A.J. Franks AJF1411006C.

8. *Mitthyridium repens* (Harv.) H. Rob., *Phytologia* 32: 434 (1975). *Syrrhodon repens* Harv. in Hook., *Icon. Pl. Rar.* 1: 22. (1836).

Original material: None cited

Type: Malaysia, Penang, *s.d.*, Wallich *s.n.* holotype: BM000676840!d.

Syrrhodon undulatus Broth. & Geh., *Öfvers. Finska Vet.-Soc. Förhandl.* 42: 96 (1900), *nom. illeg.*, *non S. undulatus* Müll. Hal., *Bot. Zeitung (Berlin)* 2: 727 (1844).

Original material: 'Patria. Queensland, Bellenden Ker Range (Mrs Gribble in herb. Melbourne).'

Type: Australia: Queensland: Bellenden Ker Range, *E. Gribble s.n.* holotype ?MEL-2146712B, not seen; isotype: ?H-BR.

Illustrations: Nowak (1980: 97, 169, 199, 201 as *M. louisiadum*), Reese *et al.* (1986b: 51), Ellis and Tan (1999: 28).

Plants small and compact, forming dense mats or low turfs, yellowish-green; branches short, densely foliate, 5–6 mm tall, rarely more. Leaves lingulate with pronounced shoulders, 1–2 mm long, c. 0.5 mm wide, spreading when moist, tightly crisped when dry; margins broadly bordered below, 10–12 rows of elongate thick-walled cells at shoulders, border narrowing above and ending below apex; margins conspicuously dentate; apex broad, rounded-obtuse and apiculate. Lamina cells small, 5–6 µm wide, thick-walled with irregular rounded lumina, finely papillose, cells obscured by papillae. Hyaline lamina reaching 1/4–1/3 leaf length, rounded to ±transverse above, with lamina cells decurrent down margins and against costa. Gemmae sparse but usually present, arising from both surfaces of tip of costa of unmodified leaves, inconspicuous, green, 100–150 µm long. Sporophytes apparently uncommon. Calyptra 1.0–1.5 mm long. Seta reddish, 3–5 mm long. Capsule exerted, 1.0–1.5 mm long; operculum c. 1 mm long, falling with calyptra. Peristome teeth yellowish, c. 160 µm tall, transversely barred, slightly papillose. Spores 15–18 µm in diameter. (Fig 8)

Diagnostic characters: Reese (1994) stated that *M. repens* 'includes populations of plants that range from very small to rather large, yet otherwise in agreement with one another.' However, in Australia this is one of the most distinctive species of the genus, recognisable by its small stature, short oblong leaves that are crispate when dry, and leaves having a broad border and the margins having sharp, spreading teeth. It is similar in size to *M. flavum*, but more compact. The broader lower leaf border with coarse serrations is diagnostic.

Distribution: North-eastern Queensland, from Torres Strait to Ingham (Fig. 10.8). Also known in tropical Asia from Sri Lanka, Andaman Islands, Myanmar, Thailand, Philippines, Malesia, Papua New Guinea, Fiji.

Habitat: Grows on trees, vines, shrubs, stumps, dead wood and rock in rather open forest, mostly at or near sea level but ranging up to 500 m elevation.

Etymology: Latin *repens* (creeping), referring to the creeping, prostrate habit.

Selected specimens seen: Queensland: The Boulders, 'Wonga Walk', 6 km W of Babinda, 25 Aug 1999, *H. Streimann 64400* (CANB 607704.1); Emmagen Creek crossing, Cape Tribulation Road, Daintree National Park, 11 May 2013, *D.A. Meagher & A. Cairns WT-159* (BRI AQ1016931); Heathlands Resource Reserve, Captain Billy track, 13 Mar 2017, *S.L. Thomson, B. Anau et al. SLT 17015* (BRI AQ1019729).

Typification: Long (1995) provided a detailed account of taxa published by Harvey (1836) in J.D. Hooker's *Icones Plantarum*, which were validly published by William Harvey as illustrations accompanied by short captions. Full descriptions, apparently prepared at the same time by Harvey (Long 1995: 6), were subsequently published in Harvey and Hooker (1840). On page 8 of Harvey and Hooker's volume, the locality for the specimen of *Syrrhopodon repens* illustrated by Harvey (1836: t. XXII) was given as 'Hab. Penang; on the bark of trees, over which it creeps in wide patches'. The collector was noted as Nathaniel Wallich (Harvey and Hooker 1840: 1), who visited Penang in 1822 (Long 1995: 3). Harvey had worked on Wallich's moss collections between April 1834 and July 1835 (Long 1995: 6), so there can be no doubt that Wallich was the collector of the material illustrated by Harvey.

BM000676840 (herb. Wilson) is annotated 'H.1204 *Syrrhopodon repens* Harvey H. Ic. Pl. t. 22 f. 4 (origl spⁿ) E. Indies Wallich.' and, in another hand, 'type'. We therefore take that to be original material. Long (1995: 22) noted that the original material in Harvey's herbarium in Trinity College, Dublin (TCD) is given as 'Nepal, Wallich 79', but he considered Penang to be the correct locality because all reports from Nepal were considered erroneous, based on mislabelled Wallich material. Long (1995: 22) noted the existence of another likely specimen of H.1204 in BM (herb. Hooker), but we have not seen it.

BM000676839 is annotated 'H.653. "Orthotrichum undulatum" H. Greville. Ternate J.D. 93 (*Syrrhop. repens* Harvey', with a further note 'Differs only from Harvey's spⁿ in the leaves not being furnished with a pellucid border.' BM000676841 (herb. Wilson) is annotated 'H.653 "Orth. undulatum H. Grev. Mss" Ternate J.D. Leaves mod' spreading crowded, denticulate with pellucid border, undulated. Capsule pale elliptical and calyptra (fide Hook.) pilose. *Syrrhopodon* ?sp.' Then in a different hand, '*S. repens* Harvey' (twice) and 'original specⁿ'. BM 000676838 and BM000676842 (herb. Wilson) have similar annotations and the same herbarium number, H.653.

We interpret the annotations on the 'H.653' specimens to refer to a manuscript name '*Orthotrichum undulatum*' used by Greville, based on J.D. Hooker 93 collected on the island of Ternate in Indonesia, and that this material was identified as *S. repens* subsequent to the publication of *S. repens*. The annotation 'original

specⁿ on BM000676841 we take to refer to the original specimen of ‘*Orthotrichum undulatum*’, not *S. repens*. Thus, we considered that the only original material of *S. repens* is the specimen BM000676840, and as the only original material this specimen is therefore the holotype (Art. 9.1(b)), as indicated above.

Because the protologue of *Syrrophodon undulatus* Broth. & Geh. cites only material ‘in herb. Melbourne’, that material must be considered the original material. A likely holotype in MEL is filed under Bryidae, collected in 1895 on Bellenden Ker by Mrs Gribble, but a thorough search of MEL collections is needed in case multiple gatherings or specimens exist there.

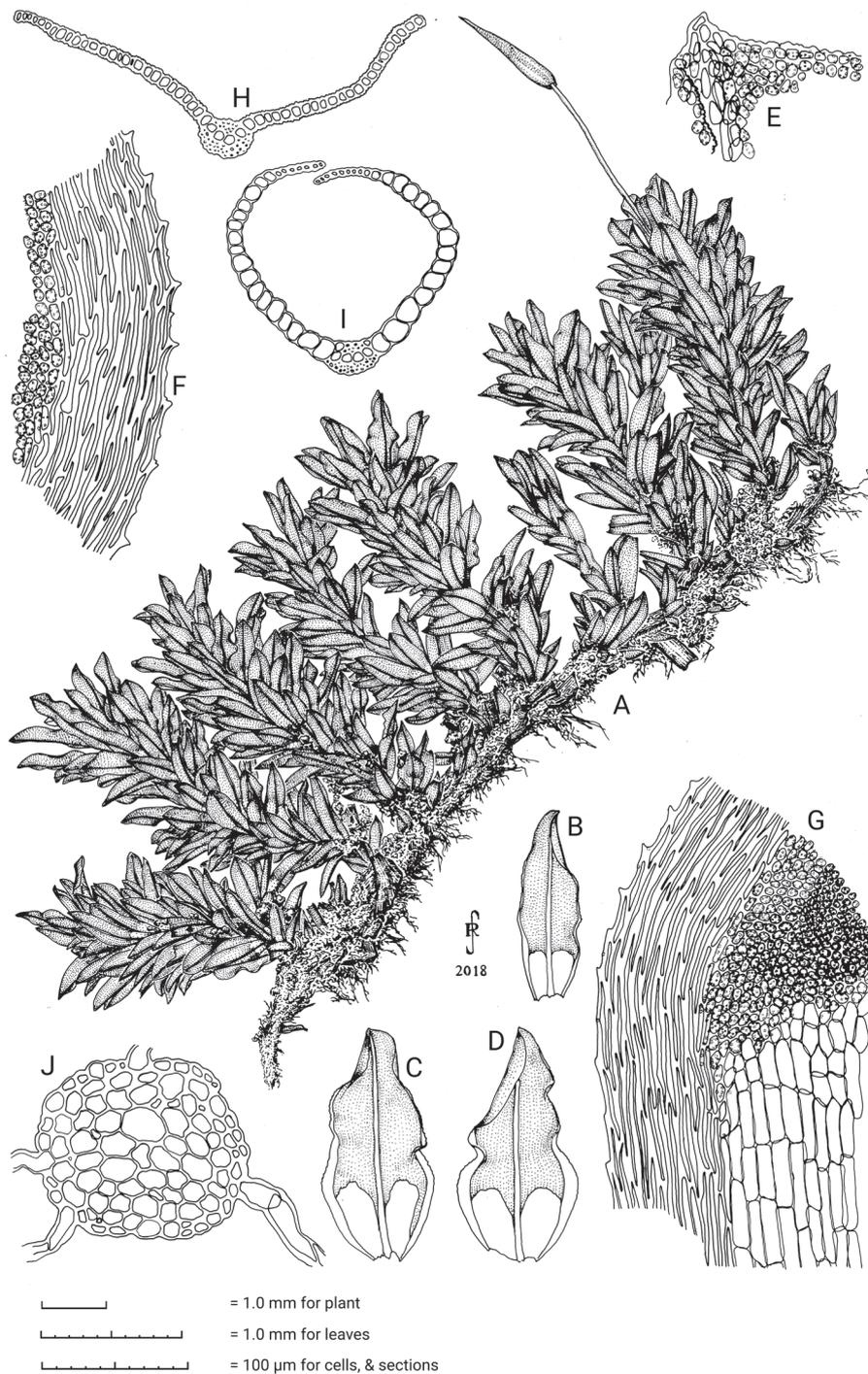


Fig. 8. *Mitthyridium repens* (Harv.) H.Rob. **A:** Habit of plant, drawn moist. **B–D:** Branch leaves. **E:** Cells of leaf apex. **F:** Cells from lower limb of leaf, just above shoulder region. **G:** Cells of leaf shoulder. **H:** Section of middle leaf lamina. **I:** Section through sheathing base of leaf. **J:** Stem section. Drawn from: S.L. Thomson, B. Anau et al. SLT 17015.

9. *Mitthyridium subluteum* (Müll.Hal.) Nowak, *Bryophyt. Biblioth.* 20: 144 (1980). *Codonoblepharum subluteum* Müll.Hal., *J. Mus. Godeffroy* 3(6): 67 (1874).

Original material: 'Patria. Upolu et Savaii.'

Type: Samoa: Upolu, 1864, *E. Graeffe s.n.* lectotype (designated by Nowak 1980: 144): H, not seen; isolectotypes: BM000662456!d, BM000662457!d, NY.

Illustration: Nowak (1980: 145).

Plants green to yellowish, forming loose soft tangles or thin spreading mats. Stems and branches elongate. Leaves (1–)2.0–3.5 mm long, narrowly linear to lanceolate-acuminate, sheathing base not or only slightly wider than limb, tips gradually acuminate, not expanded at apex, erect-spreading when moist, margins \pm undulate; loosely curled-contorted when dry; margins dentate, typically undulate, strongly bordered almost to apex; cells of limb thick-walled, with small lumina, smooth to finely and minutely papillose; hyaline lamina short, reaching 1/5 or less of leaf length, narrowly to broadly scalariform distally to \pm truncate. Gemmae inconspicuous, few in number, arising from both surfaces at leaf tips. Sporophytes not seen in Australian material. (Fig. 9)

Diagnostic characters: Eddy (1990) and Menzel and Schultze-Motel (1990) include *M. subulatum* as a synonym of *M. jungquilianum* (Mitt.) H. Rob., a species widely distributed in Malesia and the western Pacific Islands, together with *M. perundulatum*. Eddy (1990) also indicated that, apart from being much smaller and of more delicate stature, *M. jungquilianum* seemed similar to *M. luteum*, although the hyaline lamina is much shorter. After examining many specimens from Malesia and the western Pacific, Eddy (1990) postulated that there may be a clinal series of forms. Further study, particularly at the molecular level, is needed to clarify the relationships of these forms and species. Reese *et al.* (1986a) also suggested that *M. subluteum* may be a much smaller and more delicate form of *M. luteum*. They further indicated that *M. jungquilianum* had a grass-like appearance when dry 'due to the inrolling of the leaf lamina' and further that *M. flavum* differed in its broader leaves that are only 'folded when dry, not tubular and curved to resemble grass' and by its entire-margined leaves. The hyaline lamina of *M. subluteum* is very short relative to the total length of the leaf compared to that in *M. jungquilianum*. However, this is at odds with the illustration (Fig. 253, p. 137) of the leaves of the latter species in Eddy (1990), where they are also depicted as short relative to total leaf length.

In the absence of further study and definitive evidence to the contrary, it seems prudent to retain *M. subluteum* as the name applied to the Australian material. *Mitthyridium jungquilianum* (basionym *Syrrophodon jungquilianus* Mitt 1856) has nomenclatural priority over *M. subluteum* (basionym *Syrrophodon subluteus* Müll.Hal. 1874) should the two species be united.

Distribution: North-eastern Queensland from Cape Tribulation south to Cardwell (Fig. 10.9). Also known from Malesia, Philippines, Solomon Islands, western Samoa, Fiji, and reported from Gabon in western Africa.

Habitat: Grows on trees, shrubs, logs, rarely on rock, in moist rainforests, to 1300 m altitude.

Selected specimen seen: Queensland: Graham Range communication towers access road, Bramston Beach, 8 Nov 2014, *A.J. Franks AJF1411013* (BRI AQ0910211).

Etymology: Latin *sub* (almost) + *luteum* (yellow), referring to the great similarity to *Mitthyridium luteum* at first glance.

Typification: The collection date is taken from an annotation in BM-000662457.

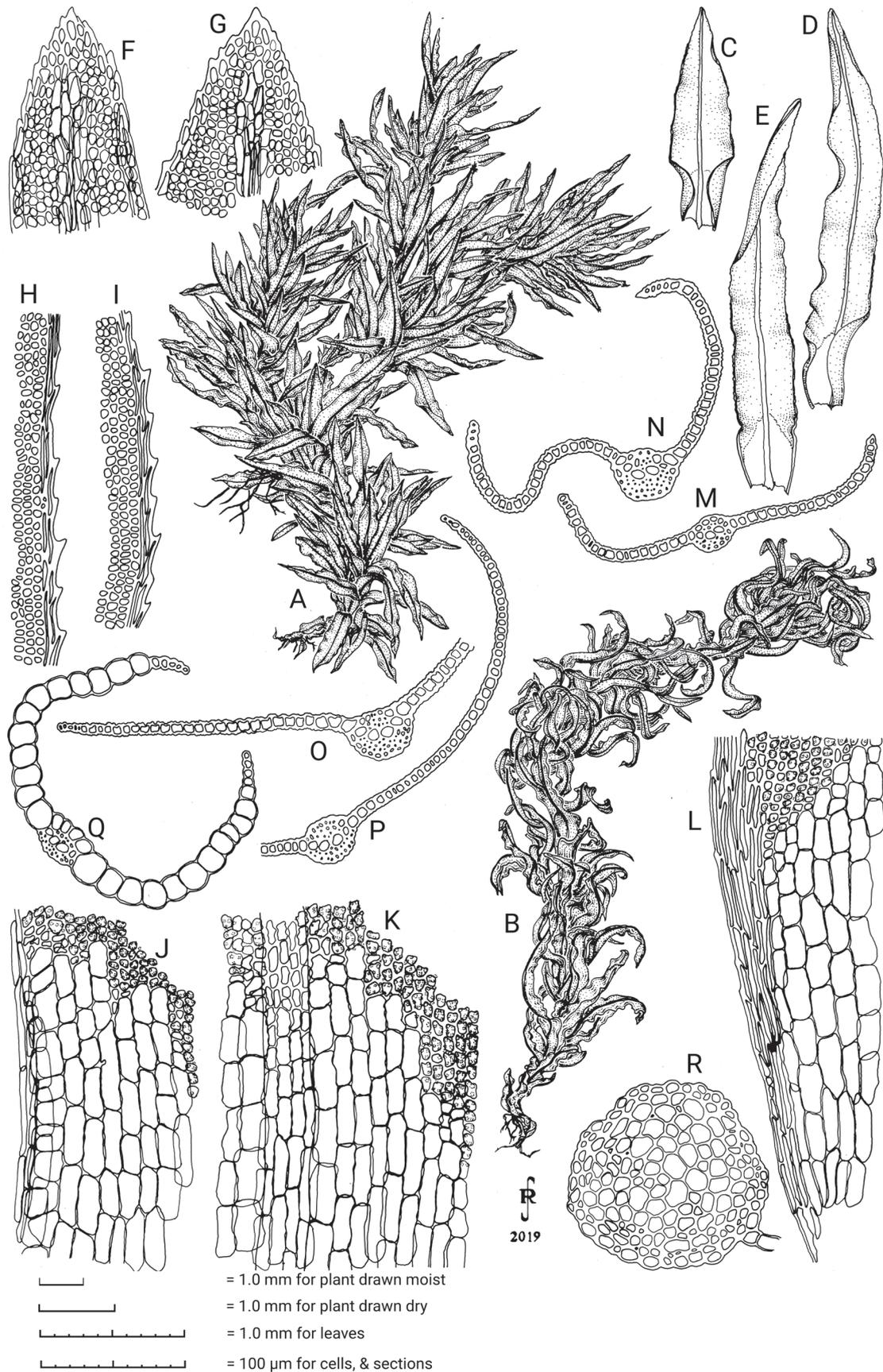


Fig. 9. *Mitthyridium subluteum* (Müll.Hal.) Nowak. **A:** Habit of plant drawn moist. **B:** Habit of plant drawn dry. **C–E:** Leaves. **F, G:** Cells of leaf apex (F – adaxial; G – abaxial). **H, I:** Mid lamina marginal cells, papillae omitted for clarity. **J, K:** Cells of hyaline lamina adjacent to costa. **L:** Cells of hyaline lamina and marginal border. **M–P:** Sections of leaf limb. **Q:** Section of sheathing leaf base. **R:** Stem section. Drawn from A.J.Franks AJF1411013.



Fig. 10. Distribution of *Mitthyridium* species in Australia. **1** *Mitthyridium constrictum*, **2** *Mitthyridium crassum*, **3** *Mitthyridium fasciculatum*, **4** *Mitthyridium flavum*, **5** *Mitthyridium leucoloma*, **6** *Mitthyridium luteum*, **7** *Mitthyridium perundulatum*, **8** *Mitthyridium repens*, **9** *Mitthyridium subluteum*. (Source: Australasian Virtual Herbarium, accessed October 2020)

Acknowledgments

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