
Five New Species of *Macromitrium* (Musci: Orthotrichaceae), with a Key to the Species of *Macromitrium* in Central America

Bruce Allen

Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166-0299, U.S.A.

ABSTRACT. *Macromitrium crosbyorum* sp. nov., *M. echinatum* sp. nov., *M. frustratum* sp. nov., *M. picobonitum* sp. nov., and *M. sejunctum* sp. nov. are described based on Central American material. A key to the species of *Macromitrium* in Central America is given. The 30 Central American species of *Macromitrium* are arranged into 7 informal groups.

Macromitrium is a sizable genus, about 350–400 species, of medium- to large-sized pleurocarpous mosses. The last treatment of the genus that included Central America was Grout (1946), which attributed 24 species to the region. The genus is often found on upper tree branches in the forest canopy, but it also commonly occurs on tree trunks and can be found on rocks and soil in open, drier habitats. Most *Macromitrium* species have elimbate leaves with short upper leaf cells and elongate to linear, tuberculate basal leaf cells, mitrate calyptrae, and short, truncate exostome teeth that are fused for most of their lengths. However, the genus is morphologically complex, and there are *Macromitrium* species with various combinations of limbate leaves, long upper leaf cells, short basal leaf cells, non-tuberculate basal cells, cucullate calyptrae, and long, narrowly triangular, non-fused exostome teeth. As a result, the genus is difficult to characterize or cleanly separate from a number of segregate genera (e.g., *Groutiella*, *Macrocoma*, *Cardotiella*) recognized for groups of species with short basal leaf cells in combination with some other distinctive feature.

Vitt (1994) recognized three distinctive groups for the 10 *Macromitrium* species in Mexico. The 30 Central American *Macromitrium* species are more diversified and variable than those of Mexico. They include 5 species new to science, which are described below in preparation for the next volume of the *Moss Flora of Central America* (Allen, 1994).

Macromitrium crosbyorum B. H. Allen & Vitt, sp. nov. TYPE: Costa Rica. San José: along Inter American Highway, ca. 10 km NW of summit at La Ascension, 9°37'N, 83°48'W, Crosby & Crosby 6089 (holotype, MO; isotypes, ALTA, CR, NY, US). Figure 1.

Species haec a *M. subcirroso* inter alia foliorum cellulis isodiametris, crasse unipapillosis costisque percurrentibus differt.

Plants large, greenish red to yellowish red. Stems creeping to 7 cm, branches 2–3 cm long, reddish tomentose below. Leaves keeled, erect below, flexuous to spirally contorted and undulate above dry, erect-patent wet, (3–)4–6 mm long, 1 mm wide, lanceolate, acuminate; margins undulate, serrate above, frequently serrulate to near the base, recurved below, erect to plane above, swollen basal teeth at leaf insertion absent; costae percurrent; upper interior cells 8–20 μm , rounded and collenchymatous, isodiametric to rhombic, stoutly unipapillose to mammillose, upper marginal cells narrow and elongate forming a \pm distinct border, basal cells long rectangular, incrassate and porose, densely tuberculate, 26–44 μm long. Dioicous. Setae 7–10 mm long, smooth. Capsules 1.5–2.0 mm long, ovoid to cylindrical, plicate. Annulus non-revolvible, with fragments adhering to capsule mouth. Exostome teeth truncate, 320–424 μm high, yellow, densely papillose-striate, united and forming a membrane, \pm reflexed at tips, splitting into eight pairs of teeth with age; endostome hyaline, lightly papillose, basal membrane 80–90 μm high, segments 60–80 μm high. Opercula rostrate, 1–1.5 mm long. Spores anisosporous, 14–20 μm , smooth to lightly papillose and 30–48(–54) μm , densely papillose. Calyptrae mitrate, deeply laciniate, naked, 5 mm long.

Habitat. On tree trunks, logs, and rocks; 3130–3333 m.

Macromitrium crosbyorum is a large moss with undulating leaves and isodiametric, collenchymatous, mammillose to stoutly unipapillose upper leaf cells. It has long, narrow marginal leaf cells that form a variably distinct border. *Macromitrium subcirrosus* C. Müller differs from it in having elongated upper leaf cells, an excurrent costa, and elimbate leaves. *Macromitrium scoparium* Mitten is similar to *M. crosbyorum* in having limbate leaves, isodiametric upper leaf cells, and tuberculate basal leaf cells but differs in having smaller, narrower,

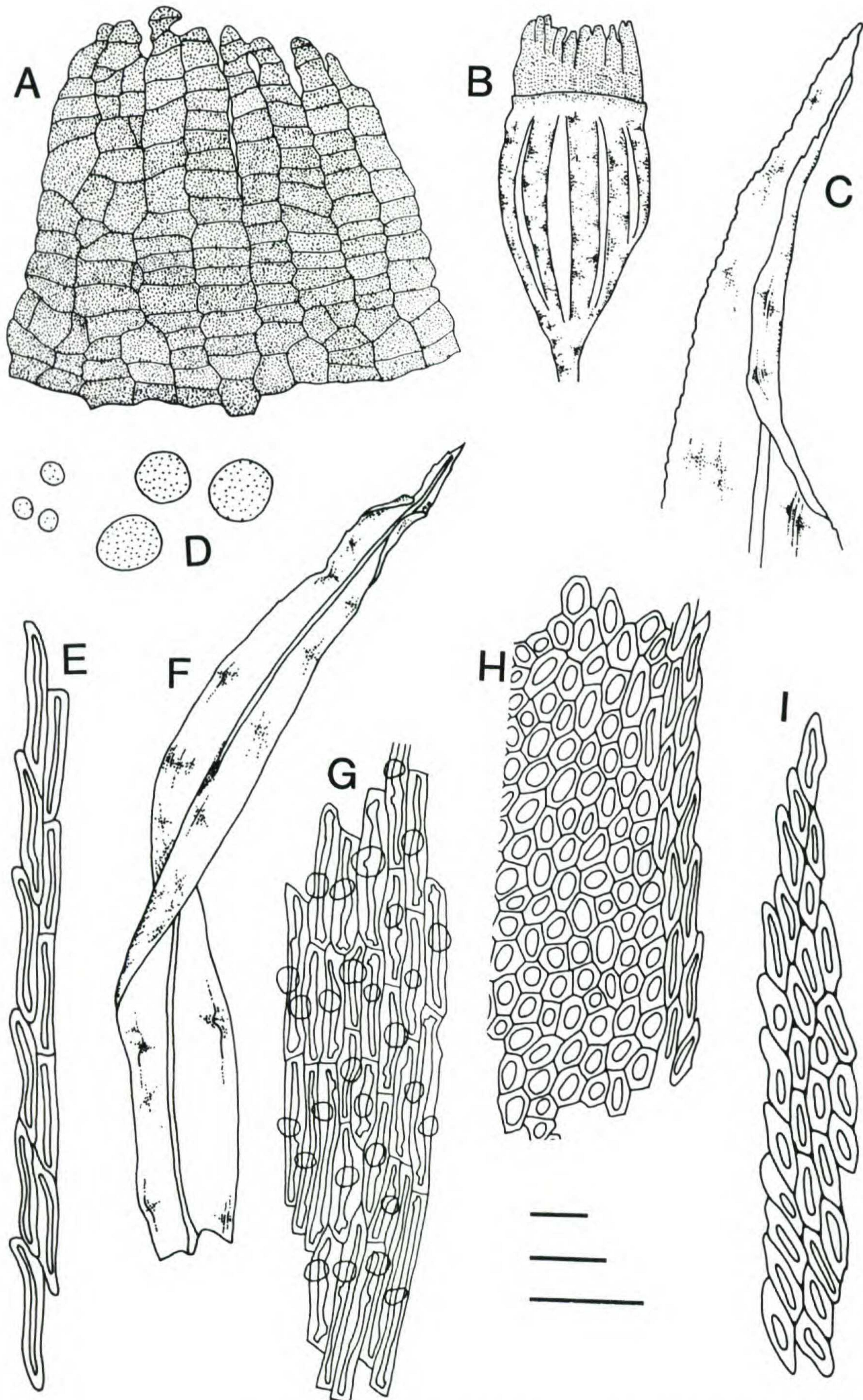


Figure 1. *Macromitrium crosbyorum* B. H. Allen & Vitt. —A. Exostome. —B. Capsule. —C. Leaf apex. —D. Spores. —E. Upper leaf margin. —F. Leaf. —G. Basal leaf cells. —H. Median leaf cells. —I. Apical leaf cells. Scales in mm: top = 0.5 (B); middle = 0.5 (F); bottom = 0.05 (A, D, E, G–I); bottom = 0.2 (C).

non-undulate leaves and smooth to weakly bulging upper leaf cells.

Some leaves of *M. crosbyorum* have weakly developed limbidia and could be confused with those of *M. cirrosum* (Hedwig) Bridel or *M. oblongum* (Taylor) Mitten. *Macromitrium crosbyorum* differs from both species in having broader, erect-patent, undulate leaves and stoutly unipapillose upper leaf cells. *Macromitrium cirrosum* further differs from it in having smooth capsules and upper leaf cells in distinct longitudinal rows.

Paratypes. COSTA RICA. **San José:** summit of Pan American Highway at Cerro de la Muerte, 9°30'N, 83°45'W, *Crosby 3906* (MO). PANAMA. **Bocas del Toro:** Cordillera de Talamanca, 2 airline km SW of the main peak of Cerro Fábrega along the NW ridge of the massif, 9°08'N, 82°53'W, *Davidse et al. 25327* (CR, MICH, MO, NY, PMA, US).

Macromitrium echinatum B. H. Allen, sp. nov.

TYPE: Panama. Bocas del Toro: vicinity of Fortuna Dam, 2.8 road-miles along pipeline road leaving Chiriquí Grande road at Continental Divide, 8°55'N, 82°08'W, *Allen 5655* (holotype, MO; isotype, PMA). Figure 2.

Species haec a *M. fuscoareo* inter alia foliis torsivis, non-ampectibus, limbatis, exostomatium dentibus 16, lanceolatis, libris, calyptris hirsutis differt.

Plants large, yellowish green above, brown below. Stems weakly creeping, branches to 5 cm long, weakly tomentose. Leaves keeled, erect to erect-flexuous below, tightly spirally twisted and undulate above when dry, squarrose-spreading to squarrose-recurved when wet, 7–10 mm long, 0.8–1 mm wide, linear-lanceolate, setaceous-acuminate; margins revolute at base, plane above, sharply serrate in upper ½, swollen basal teeth at leaf insertion absent; costae long excurrent; upper interior cells 28–50 $\mu\text{m} \times 10 \mu\text{m}$, linear-rhomboidal, incrassate and porose, smooth, upper marginal cells longer and narrower forming a \pm distinct border, basal cells not tuberculate, to 66 μm long, linear-rectangular to linear-rhomboidal, incrassate and porose. Dioicous. Setae 5–6 mm long, smooth. Capsules 2 mm long, oval to oblong-cylindrical, smooth or weakly furrowed when dry, wrinkled at neck. Annulus non-revolvibile, with fragments adhering to capsule mouth. Exostome teeth narrowly triangular, 280 μm high, separate except at base where they are united into a short membrane 60 μm high, red-yellow, thickly papillose; endostome rudimentary, 120–160 μm high, basal membrane low, segments yellowish-hyaline, weakly papillose. Opercula erect-rostrate, 1 mm long. Spores anisosporous, 20–28 μm , round, nearly smooth, thin-walled and 36–50, irregularly

oblong, oval, or rounded, lightly papillose, thick-walled. Calyptrae mitrate, deeply laciniate, densely hirsute, 3–4 mm long.

Habitat. On tree trunks, upper branches, and occasionally on ground; 850–1150 m.

Macromitrium echinatum is a robust moss with non-clasping, spirally twisted, limbate leaves, long, incrassate, and porose upper leaf cells, non-tuberculate basal leaf cells, densely hairy calyptrae and 16 separate, narrowly triangular exostome teeth that are divided most of their lengths. The only other Central American species with free exostome teeth, *M. greenmanii*, has shorter, elimbate leaves, tuberculate basal leaf cells, isodiametric upper leaf cells, furrowed capsules, papillose setae, and naked calyptrae.

This species is close to *M. fuscoareum* Bartram, which differs in having weakly serrate leaves that are erect and tightly clasping at base, longer setae, and naked calyptrae. The intact peristome of *M. fuscoareum* is unknown.

Paratypes. PANAMA. **Bocas del Toro:** Fortuna Dam region, along pipeline service road, 8°45'N, 82°15'W, trail in forest, *McPherson 7846G* (MO); vicinity of Fortuna Dam, 2.8 road-miles along pipeline road leaving Chiriquí Grande road at Continental Divide, 8°55'N, 82°08'W, *Allen 5688* (DUKE, H, MICH, MO, NY, PMA, US).

Macromitrium frustratum B. H. Allen, sp. nov.

TYPE: Honduras. Lempira: Montana de Celaque, summit of Cerro la Castilla, ca. 12 km SW of Gracias, 14°33'N, 88°41'W, on trunk of *Pinus*, *Allen 11542* (holotype, MO; isotypes, DUKE, H, MICH, NY, TEFH, US). Figure 3.

Species haec a *M. longifolio* inter alia foliorum apicibus longis, fragilibus setisque laevibus differt.

Plants robust, greenish yellow to greenish brown. Stems strongly creeping, branches 5 cm long, moderately tomentose. Leaves keeled, erect below, flexuous to spirally twisted and undulate above when dry, erect-patent to erect-spreading when wet, 4–7 mm long, 0.5 mm wide, linear-lanceolate, long-acuminate into a fragile apex up to 3 mm long; margins plane to undulating, entire to serrulate below, serrate above with one to several large, multicellular teeth on the leaf acumen, swollen basal teeth at leaf insertion absent, recurved below, erect to plane above; costa percurrent to shortly excurrent; upper interior cells 6–12 \times 6–8 μm , quadrate to rounded, incrassate not porose, smooth to weakly bulging, in distinct longitudinal rows, upper marginal cells at times longer and narrower than interior cells forming a weakly differentiated border; basal cells

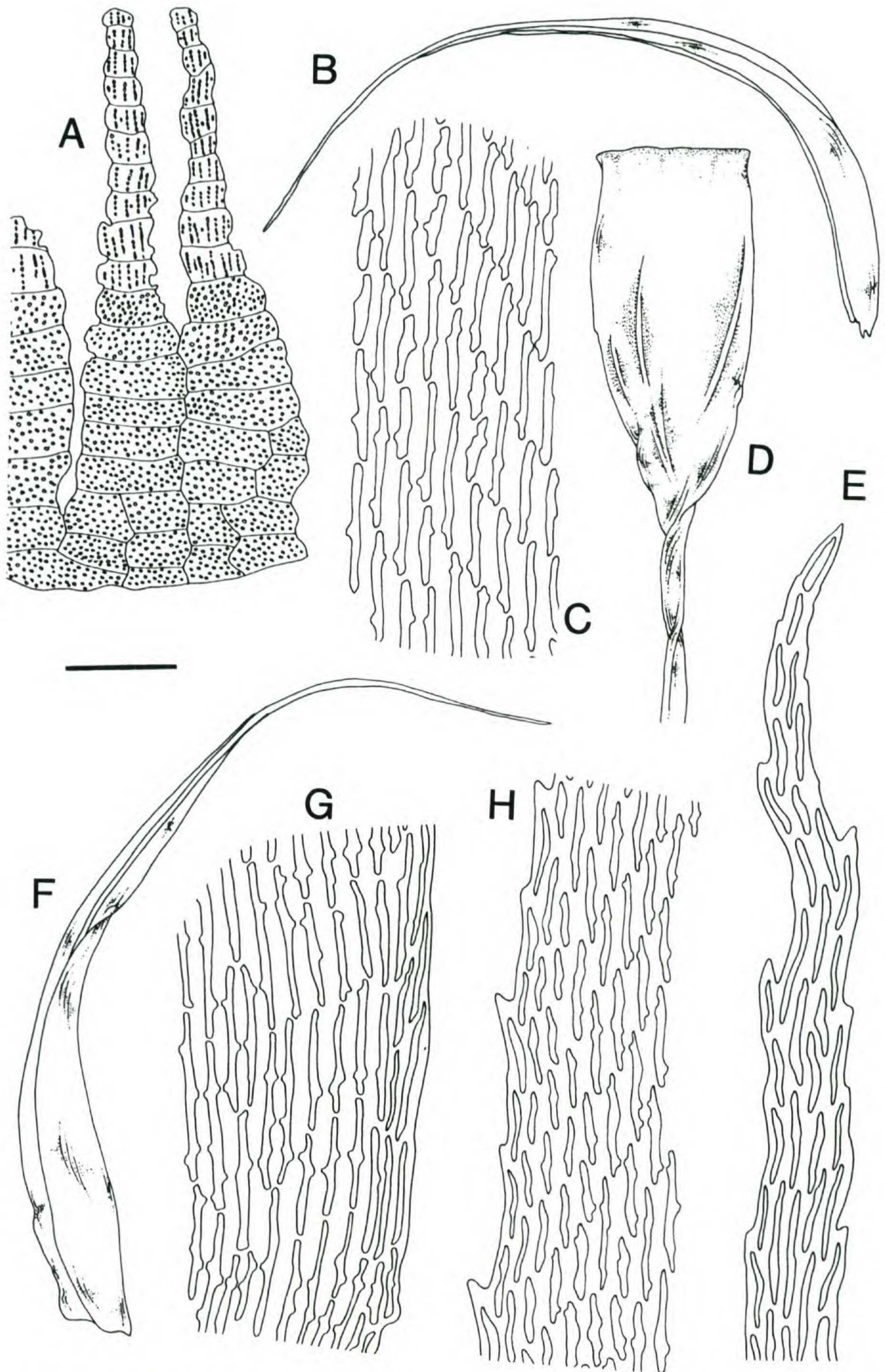


Figure 2. *Macromitrium echinatum* B. H. Allen. —A. Exostome. —B & F. Leaves. —C. Basal cells near the costa. —D. Capsule. —E. Leaf apex. —G. Basal cells at leaf margin. —H. Upper leaf cells at margin. Scale in mm: = 0.05 (A, C, E, G, H); = 0.5 (D); = 1.0 (B, F).

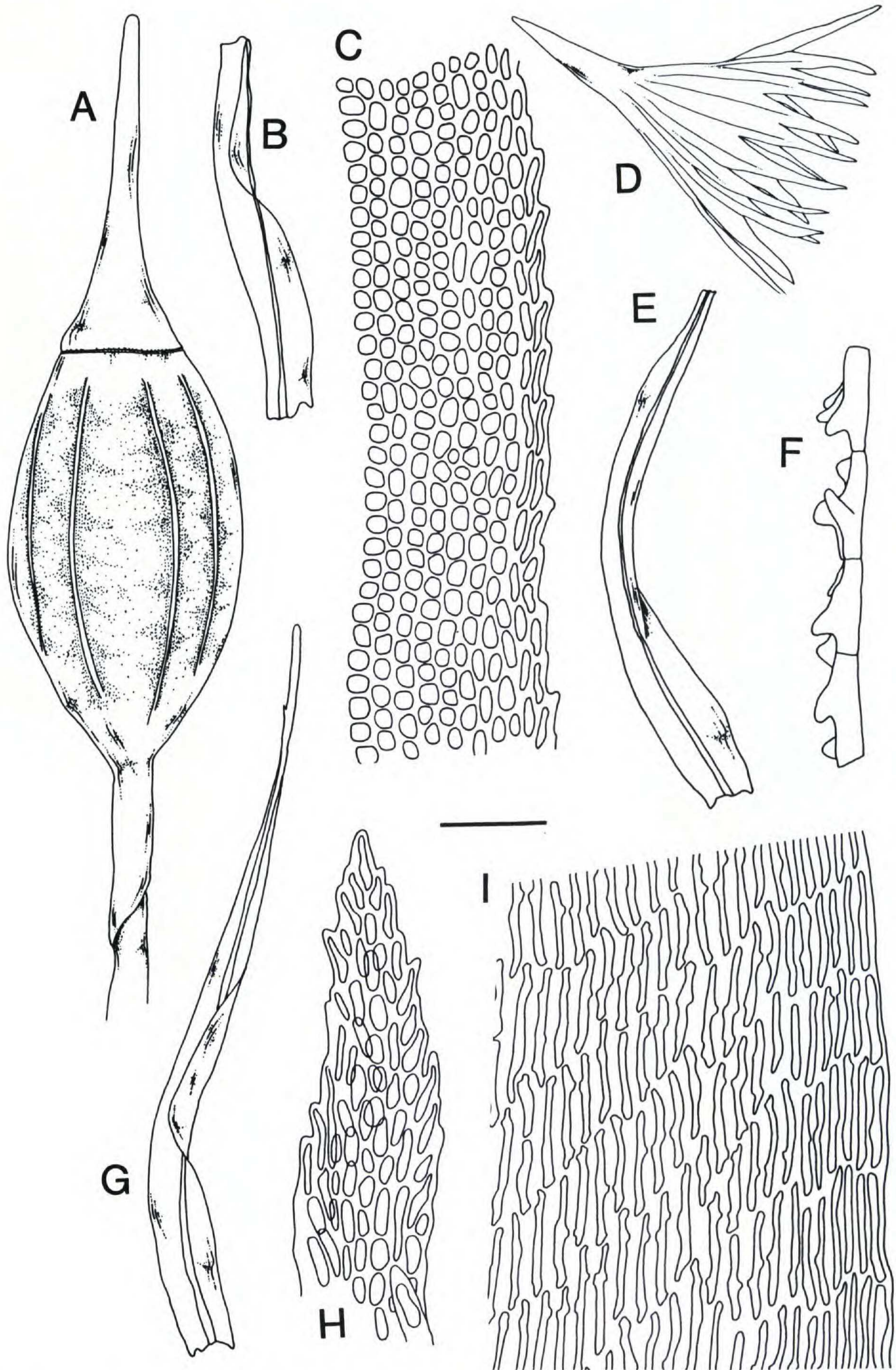


Figure 3. *Macromitrium frustratum* B. H. Allen. —A. Capsule and operculum. —B, E & G. Leaves. —C. Leaf margin and median leaf cells. —D. Calyptra. —F. Tuberculae leaf cells seen on edge. —H. Leaf apex and apical leaf cells. —I. Leaf margin and basal leaf cells. Scale in mm: = 0.05 (C, F, H, I); = 0.5 (A); = 1.0 (D); = 0.91 (B, E, G).

weakly tuberculate, 24–40 μm long, long-rectangular, incrassate and porose. Dioicous. Setae 5–8 mm long, smooth; capsules 2–3 mm long, cylindrical, furrowed; annulus non-revoluble, with fragments adhering to capsule mouth; opercula rostrate, 1–1.5 mm long; exostome teeth truncate, 240 μm high, yellow, densely papillose, fused into an erect membrane at base \pm free at tips, endostome hyaline, weakly papillose, basal membrane 160 μm high, segments 80 μm high. Spores anisosporous, 10–14 μm , smooth, hyaline and 18–30 μm , papillose, yellow-brown. Calyptrae mitrate, deeply lacinate, naked, 3 mm long.

Habitat. On tree trunks and branches; 1676–2827 m.

Macromitrium frustratum is a robust species with linear-lanceolate leaves and long (up to 3 mm), fragile apices. It is a high-elevation, cloud forest species very similar to and often occurring mixed with *M. longifolium* (Hooker) Bridel. *Macromitrium longifolium*, however, has intact leaf apices and papillose setae. *Macromitrium frustratum* has leaf cells in distinct longitudinal rows, a feature also found in *M. cirrosum*, with which it has been confused. *Macromitrium cirrosum* is a smaller plant with intact leaf apices and smooth capsules.

Macromitrium picobonitum B. H. Allen, sp. nov. TYPE: Honduras. Atlántida: El Porvenir, Pico Bonito National Park, along trail at and above ridge camp, 15°38'N, 86°52'W, Allen 17488 (holotype, MO; isotype, TEFH). Figure 4.

Species haec a *M. cirroso* apicibus foliorum longis hyalinisque cellulis superis marginalibus longis angustis differt.

Plants medium, green to greenish yellow above, brown below. Stems creeping, branches 15 mm long, moderately tomentose. Leaves keeled, erect below, flexuous to spirally twisted and undulate above when dry, erect-patent to erect-spreading when wet, 3–6 mm long, 0.5 mm wide, linear-lanceolate, long-acuminate into a hyaline hair-tip; margins plane to undulating, entire to serrulate below, serrate above, swollen basal teeth at leaf insertion absent, recurved below, erect to plane above; costa excurrent to 360 μm ; upper interior cells 6–14 \times 6–8 μm , rounded to short-rectangular, incrassate not porose, bulging mammillose, in distinct longitudinal rows, upper marginal cells often longer and narrower than interior cells forming a weakly differentiated border; basal cells tuberculate, 25–50 μm long, long-rectangular, incrassate

and porose. Dioicous. Setae 5 mm long, smooth; capsules 1–2 mm long, cupulate to hemispheric, smooth or weakly furrowed at neck; annulus non-revoluble, with fragments adhering to capsule mouth; opercula rostrate, 1 mm long; exostome teeth truncate, 160 μm high, orange, densely papillose, fused into an erect membrane at base \pm free at tips, endostome yellowish to hyaline, weakly papillose, projecting beyond the exostome. Spores anisosporous, 14–18 μm , and 20–30 μm , smooth to lightly papillose, yellow-brown. Calyptrae mitrate, deeply lacinate, naked, 3 mm long.

Habitat. On tree fern, trunks of *Liquidambar*, and small trees or shrubs; 1500–1630 m.

Macromitrium picobonitum is very close to *M. cirrosum*. The species are sporophytically identical, but *M. cirrosum* differs gametophytically from *M. picobonitum* in having a shorter, concolorous, excurrent costa and shorter upper marginal cells that only very rarely form an indistinct border. These two species are the smallest members of a species complex that includes *M. longifolium*, *M. frustratum*, and *M. oblongum*. All three species differ from *M. picobonitum* and *M. cirrosum* in having strongly furrowed capsules. In addition, *M. longifolium* has papillose setae, *M. frustratum* long, fragile leaf apices, and *M. oblongum* swollen basal marginal teeth and exostome teeth 280–300 μm high. *Macromitrium scoparium* may also belong to this complex. As in *M. picobonitum*, *M. scoparium* has a variously developed leaf border of narrow, elongated cells, but it differs in having longer upper leaf cells and concolorous leaf apices.

Paratypes. HONDURAS. Atlántida: El Porvenir, Pico Bonito National Park, along trail from confluence to ridge camp, 15°38–39'N, 86°51–52'W, Allen 17366, 17370, 17373 (all MO, TEFH).

Macromitrium sejunctum B. H. Allen, sp. nov. TYPE: Honduras. Olancho: Sierra de Algata, La Chorrera below Montana Bibilonia, Rio Lara, 15 km NNW of Catacamas, 14°59'N, 85°56'W, Allen 12483 (holotype, MO; isotypes, NY, TEFH). Figure 5.

Species cellulis costalibus brevibus mamillatis, cellulis basalibus brevibus, marginibus foliorum erosis dentatisque apicibus foliorum fragilibus a congeneribus diversa.

Plants medium, dark green. Stems moderately creeping, branches 1.5–2.5 cm long, tomentose below. Leaves weakly keeled, erect below, flexuous to spirally contorted above dry, erect-patent and undulate when wet, 2–3 mm long, 0.8 mm wide, lanceolate, broadly acute, or acuminate into a fragile

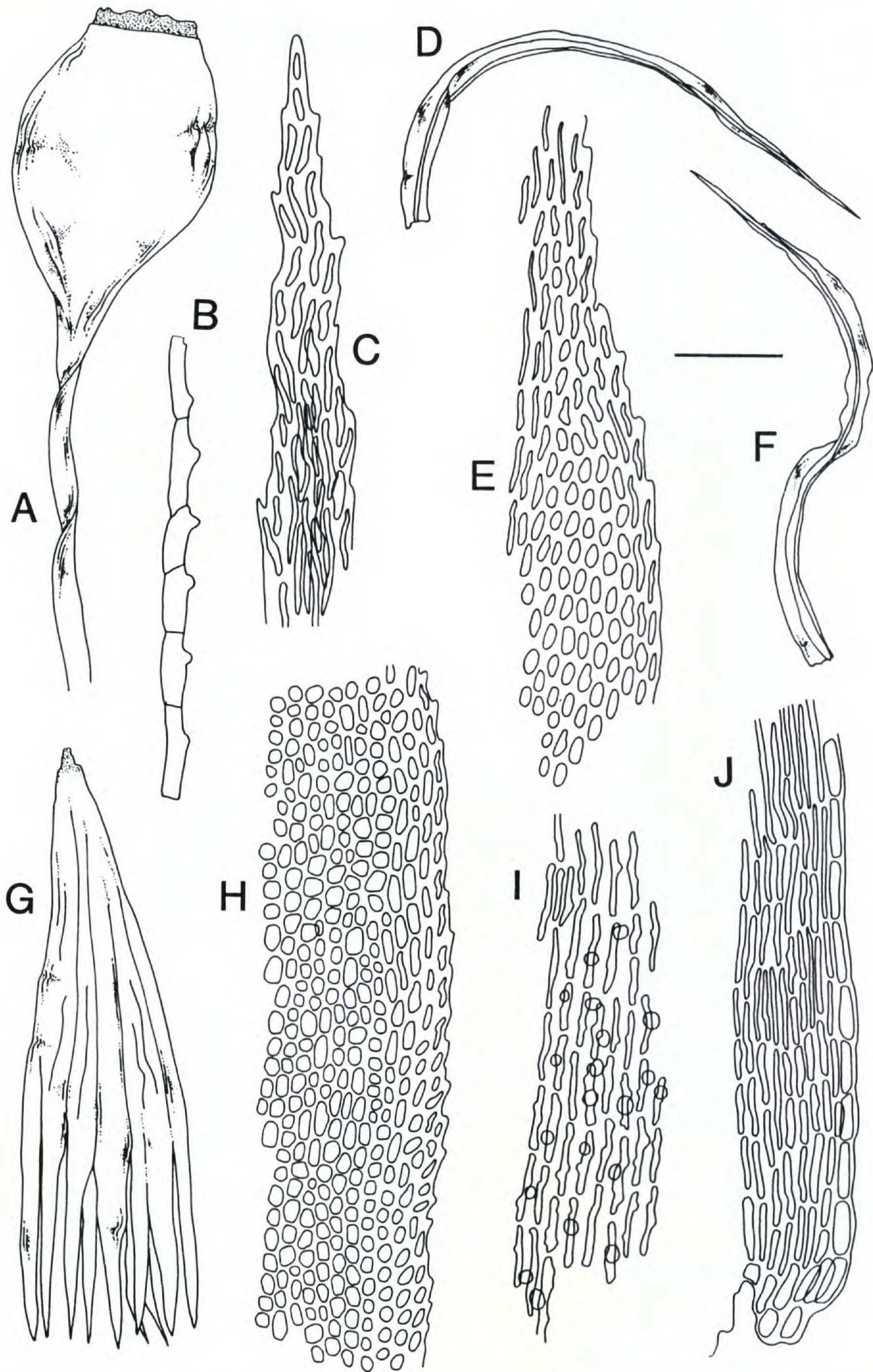


Figure 4. *Macromitrium picobonitum* B. H. Allen. —A. Capsule. —B. Tuberculate leaf cells seen on edge. —C. Leaf apex. —D & F. Leaves. —E. Upper leaf cells at base of acumen. —G. Calyptra. —H. Median leaf cells. —I. Basal leaf cells near costa. —J. Basal leaf cells at margin. Scale in mm: = 0.5 (B, C, E, H, I, J); = 0.5 (A, G); middle = 0.91 (D, F).

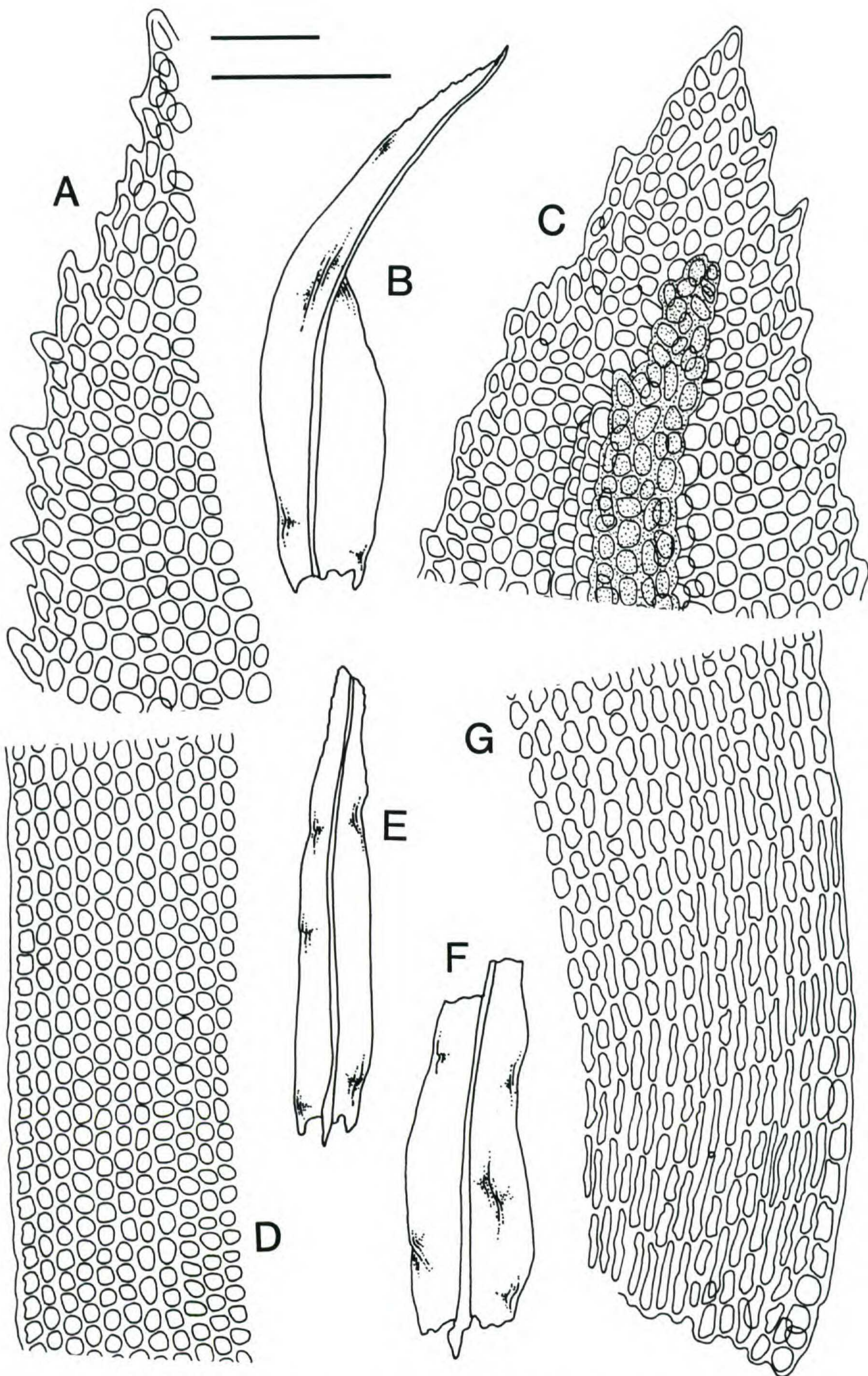


Figure 5. *Macromitrium sejunctum* B. H. Allen. —A. Upper leaf margin and cells. —B, E & F. Leaves. —C. Leaf apex and upper leaf cells. —D. Median leaf margin and cells. —G. Basal leaf margin and cells. Scales in mm: top = 0.05 (A, C, D, G); bottom = 1.0 (B, E, F).

leaf tip; margins erose-dentate above, swollen basal teeth at leaf insertion absent, but commonly with rhizoids from basal marginal cells, recurved below, plane above; costa ending below the apex to percurrent, dorsal surface covered in upper 1/3 by rounded, mammillose cells; upper interior cells 8–12 μm, firm-walled hexagonal, smooth to mammillose, upper marginal cells not differentiated; basal cells not or weakly tuberculate, short, 20–28 μm long at the extreme base, rectangular, incrassate, not or weakly porose. Sporophyte unknown.

Habitat. On branch in dry forest; 1100–1500 m.

Macromitrium sejunctum is marked by its fragile leaf apices, erose-dentate upper leaf margins, dorsal costal surface in upper 1/3 covered by short, mammillose cells, and short basal cells that lack tuberculae or have a few very weak tuberculae. It has the general aspect of *M. punctatum* (Hooker & Greville) Bridel, and that species also has short, non-tuberculate basal leaf cells, but *M. punctatum* has firm leaf apices, serrate leaf margins, and elongate cells on the upper dorsal surface of the costa. There are two other species of *Macromitrium* in Central America with fragile leaf apices (*M. fragilicuspis* Cardot and *M. frustratum*); both have elongate, more strongly tuberculate basal leaf cells. *Macromitrium fragilicuspis* also has entire leaf margins, while *M. frustratum* is a larger plant with narrowly lanceolate leaves (to 7 mm) and elongate cells on the dorsal surface of the costa. In leaf form, cellular aereolation, and the mammillose cells on the dorsal surface of the costa, *M. sejunctum* resembles *Cardotiella*; it differs from that genus in lacking enlarged, basal marginal teeth.

Groutiella chimborazense (Spruce ex Mitten) Florschütz subsp. *reesei* Vitt is also similar in having fragile leaf apices, short basal leaf cells, and the upper dorsal surface of the costa covered by short, mammillose cells. In addition, the leaves of *G. chimborazense* subsp. *reesei* are bordered at the base by a single row of short-rectangular, thin-walled cells that are identical to those found in *Macromitrium sejunctum*. *Groutiella chimborazense* subsp. *reesei* differs from *M. sejunctum* in having upper leaf margins entire or bulging mammillose rather than erose-dentate.

Paratypes. HONDURAS. **Atlántida:** El Porvenir, Pico Bonito National Park, along trail from confluence to ridge camp, 15°38–39'N, 86°51–52'W, Allen 17367 (MO, TEFH).

As would be expected from such a species-rich genus, *Macromitrium* has many distinctive characters. However, it is difficult to subdivide the ge-

nus, because its character states occur in reticulating combinations, making it impossible to find any significant correlation of characters. The 30 *Macromitrium* species in Central America are arranged below into 7 informal groups that bring together species that share at least one of seven distinctive features (Table 1). The groups are intended to help in the handling of this large genus and may or may not represent monophyletic units.

Group 1. *Macromitrium leprieurii* Montagne and *M. dubium* Schimper ex C. Müller.

Group 2. *Macromitrium flavopilosum* Williams, *M. standleyi* Bartram, *M. subcirrosum* C. Müller, *M. trichophyllum* Mitten, and *M. ulophyllum* Mitten.

Group 3. *Macromitrium altituberculatum* Bartram, *M. contextum* Hampe, *M. fragilicuspis* Cardot, *M. guatemalense* C. Müller, *M. oblongum* (Taylor) Mitten, and *M. podocarpi* C. Müller.

Group 4. *Macromitrium microstomum* (Hooker & Greville) Schwaegrichen and *M. richardii* Schwaegrichen.

Group 5. *Macromitrium aureum* C. Müller, *M. cirrosum* (Hedwig) Bridel, *M. frustratum* B. H. Allen, *M. greenmanii* Grout, *M. longifolium* (Hooker) Bridel, *M. parvirete* Bartram, *M. picobonitum* B. H. Allen, and *M. sharpii* Crum ex Vitt.

Group 6. *Macromitrium crosbyorum* B. H. Allen & Vitt, *M. echinatum* B. H. Allen, *M. fulgescens* Bartram, *M. fusco-aureum* Bartram, and *M. scoparium* Mitten.

Group Incertae. *Macromitrium punctatum* (Hooker & Greville) Bridel and *M. sejunctum* B. H. Allen.

Key to the Species of *Macromitrium* in Central America

- | | | |
|-------|---|----|
| 1. | Leaf apices fragile, commonly broken | 2 |
| 1. | Leaf apices not fragile or commonly broken | 4 |
| 2(1). | Leaf apices abruptly rounded and narrowed to the acumens, margins entire or evenly crenulate, basal cells strongly tuberculate at base | |
| | <i>M. fragilicuspis</i> Cardot | |
| 2. | Leaf apices gradually narrowed to the acumens, margins serrate, serrulate, or erose-dentate; basal cells not or weakly tuberculate at base | 3 |
| 3(2). | Leaves 2–3 mm long, erose-dentate above; basal leaf cells rectangular, non-porose, upper dorsal surface of costa with short, mammillose cells | |
| | <i>M. sejunctum</i> B. H. Allen | |
| 3. | Leaves 4–7 mm long, serrulate to serrate above; basal leaf cells linear, porose; dorsal surface of costa with long, smooth cells | |
| | <i>M. frustratum</i> B. H. Allen | |
| 4(1). | Upper leaf cells porose; all cells greater than 2:1 | 5 |
| 4. | Upper leaf cells not porose; most cells less than 2:1 | 14 |
| 5(4). | Leaves 10–15 mm long | 6 |

Table 1. Distinguishing features of the *Macromitrium* groups. Character states: *plant size*, s small, m medium, l large; *leaf border*, + present, - absent; *upper leaf cells*, lin linear, e elongate, iso isodiametric; *basal leaf cells*, lin linear, s short rectangular; *swollen teeth on basal margin*, + present, - absent; *calyptra*, m mitrate, c cucullate; *capsules*, p puckered, x smooth or furrowed.

Groups	1	2	3	4	5	6	Incertae
Plant size	l	l	l,m,s	m,s	l,m	m	m
Leaf border	-	-	-	-	-	+	-
Upper leaf cells	lin	e	iso	iso	iso	iso,e	iso
Basal leaf cells	lin	lin	lin	lin	lin	lin	s
Basal margin	-	-	+	-	-	-	-
Calyptra	c	m	m	m	m	m	m
Capsules	x	x	x	p	x	x	x

5.	Leaves 4-9(-10) mm long	7	15.	Basal cells tuberculate	20
6(5).	Leaves clasping at base, squarrose above; upper leaf margins serrate; basal leaf cells smooth		16(15).	Upper marginal leaf cells longer and narrower than inner cells	17
	. . . . . <i>M. trichophyllum</i> Mitten		16.	Upper leaf cells homogenous	18
6.	Leaves spreading at base; erect-spreading above; upper leaf margins ciliate-dentate; basal leaf cells tuberculate		17(16).	Leaves linear, 7-10 mm long	
	. . . . . <i>M. standleyi</i> Bartram			. . . . . <i>M. fulgescens</i> Bartram	
7(5).	Costa long-excurrent into a naked awn 1-2 mm long		17.	Leaves lanceolate, 4-6 mm long	
	. . . . . <i>M. flavopilosum</i> Williams			. . . . . <i>M. scoparium</i> Mitten	
7.	Costa percurrent or short excurrent	8	18(16).	Upper leaf cells pluripapillose	
8(7).	Leaves broadly lanceolate, 0.4 mm or more wide $\frac{2}{3}$ the distance from leaf base	9		. . . . . <i>M. richardii</i> Schwaegrichen	
8.	Leaves linear-lanceolate, 0.2-0.3 mm wide $\frac{2}{3}$ the distance from leaf base	10	18.	Upper leaf cells smooth, mammillose or stoutly unipapillose	19
9(8).	Leaves strongly undulate; basal cells weakly tuberculate or smooth		19(18).	Leaf cells linear in lower $\frac{1}{2}$ - $\frac{2}{3}$, margins entire, cells smooth; capsules puckered at mouth	
	. . . . . <i>M. ulophyllum</i> Mitten			. . . . . <i>M. microstomum</i> (Hooker & Greville) Schwaegrichen	
9.	Leaves smooth or weakly undulate; basal cells strongly tuberculate		19.	Leaf cells rectangular in lower $\frac{1}{3}$, margins serrate to serrulate, cells mammillose to stoutly unipapillose; capsules smooth at mouth	
	. . . . . <i>M. subcirrosium</i> C. Müller			. . . . . <i>M. punctatum</i> (Hooker & Greville) Bridel	
10(8).	Basal leaf cells tuberculate		20(15).	Most leaves 2 mm or less long	21
	. . . . . <i>M. scoparium</i> Mitten		20.	All leaves greater than 2 mm long	23
10.	Basal leaf cells smooth	11	21(20).	Leaves ligulate, obtuse-mucronate, plicate	
11(10).	Leaves shortly acuminate to apiculate . . . . .			. . . . . <i>M. altituberculosum</i> Bartram	
	. . . . . <i>M. leprieurii</i> Montagne		21.	Leaves oblong-lanceolate or lanceolate, obtuse-apiculate, apiculate, or cuspidate; not plicate	22
11.	Leaves long-acuminate to subulate	12	22(21).	Leaves with basal cells strongly tuberculate, elongate cells only at outer portion of the leaf base, basal margins entire	
12(11).	Leaves plane above; costa ending well below apex . . . . .			. . . . . <i>M. sharpii</i> Crum ex Vitt	
	. . . . . <i>M. dubium</i> Schimp ex C. Müller		22.	Leaves with basal cells weakly tuberculate; elongate cells filling the lower one-third of the leaf, basal margins with swollen, hyaline teeth	
12.	Leaves keeled above; costa percurrent or excurrent	13		. . . . . <i>M. podocarpi</i> C. Müller	
13(12).	Leaves clasping at base, squarrose above, weakly serrate; calyptrae naked; peristome teeth not known		23(20).	Upper marginal cells oblong to oblong-linear, longer and narrower than interior cells forming a \pm distinct border	24
	. . . . . <i>M. fuscoaureum</i> Bartram		23.	Upper marginal cells rounded to hexagonal-rounded, identical to the interior cells	25
13.	Leaves spreading at base, erect-spreading above, sharply serrate; calyptrae hairy; exostome of 16, deeply divided, narrowly triangular teeth		24(23).	Leaves strongly undulate; upper cells mammillose to stoutly unipapillose; capsules furrowed	
	. . . . . <i>M. echinatum</i> B. H. Allen			. . . . . <i>M. crosbyorum</i> B. H. Allen & Vitt	
14(4).	Leaves erose-dentate above; upper dorsal surface of costa with short, mammillose cells				
	. . . . . <i>M. sejunctum</i> B. H. Allen				
14.	Leaves crenulate, serrulate, serrate, or dentate above; upper dorsal surface of costa with long, smooth cells	15			
15(14).	Basal leaf cells smooth	16			

<p>24. Leaves not or weakly undulate; upper cells smooth or weakly bulging; capsules smooth . . . <i>M. scoparium</i> Mitten</p> <p>25(23). Leaf apices cuspidate; costa abruptly excurrent <i>M. parvirete</i> Bartram</p> <p>25. Leaf apices acute to acuminate; costa percurrent to gradually excurrent 26</p> <p>26(25). Basal leaf margins with enlarged, hyaline teeth at insertion 27</p> <p>26. Basal leaf margins entire or mammillose 29</p> <p>27(26). Leaves linear-lanceolate, 4–6 mm long, apex long-acuminate . . . <i>M. oblongum</i> (Taylor) Mitten</p> <p>27. Leaves lanceolate, 2–3 mm long, apex acute 28</p> <p>28(27). Leaves undulose, margins regularly serrate to serrulate, costa ending below apex; capsules furrowed dry; calyptra sparsely hairy to naked <i>M. guatemalense</i> C. Müller</p> <p>28. Leaves rugose, margins irregularly dentate, costa excurrent; capsules</p>	<p>smooth to weakly and irregularly furrowed dry; calyptra naked <i>M. contextum</i> Hampe</p> <p>29(26). Setae smooth 30</p> <p>29. Setae papillose 31</p> <p>30(29). Capsules smooth <i>M. cirrosum</i> (Hedwig) Bridel</p> <p>30. Capsules furrowed <i>M. aureum</i> C. Müller</p> <p>31(29). Exostome of 16 short, truncate teeth <i>M. longifolium</i> (Hooker) Bridel</p> <p>31. Exostome of 16 narrowly triangular teeth <i>M. greenmanii</i> Grout</p>
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