

A TAXONOMIC TREATMENT OF *DALTONIA*
(MUSCI: DALTONIACEAE) IN THE AMERICAS

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ABSTRACT

The moss genus *Daltonia* (Daltoniaceae) is revised for the Americas. This treatment recognizes eight species (*Daltonia bilimbata*, *D. jamesonii*, *D. lindigiana*, *D. macrotheca*, *D. marginata*, *D. ovalis*, *D. pulvinata*, and *D. splachnoides*) within this region. A key to the species, along with descriptions, images and distributional ranges are recorded for each species.

KEY WORDS: *Daltonia*, Daltoniaceae

RESUMEN

El género *Daltonia* (Daltoniaceae) fue revisado para las Américas. Este tratamiento reconoce ocho especies (*Daltonia bilimbata*, *D. jamesonii*, *D. lindigiana*, *D. macrotheca*, *D. marginata*, *D. ovalis*, *D. pulvinata*, y *D. splachnoides*) de esta región. Se incluye una clave para especies, descripciones, imágenes y distribución geográfica de cada especie.

Daltonia Hook. & Taylor was first published by Hooker and Taylor (1818) based on two taxa previously attributed to *Neckera* by Hedwig (1801) and Smith (1814). Later work uncovered that the name *Daltonia* was in fact illegitimate due to it containing the lectotype of an earlier described genus *Cryphaea* (Mohr in Weber 1813). For more information on the conservation of the name *Daltonia* consult Crosby (1968). Bridel (1827) recognized it as a monospecific genus consisting of *D. splachnoides*. Since Bridel-Brideri's treatment, well over 100 names have been attributed to *Daltonia*. Crosby et al. (2000) listed 60 species as being currently accepted, although many have not been reexamined since their original description.

Brotherus (1907, 1925), Fleischer (1908), Jaeger and Sauerbeck (1879) and Schimper (1855) classified *Daltonia* within a broadly defined Hookeriaceae. Miller (1971) removed *Daltonia* from the Hookeriaceae and raised it to the family level. Buck (1987, 1988), Buck et al. (2005), Crosby (1974) and Whittemore and Allen (1989) have maintained *Daltonia* within its own family although other genera incorporated within the family have fluctuated considerably. Currently *Daltonia* is classified as one of 14 genera within the family Daltoniaceae (Buck et al. 2005).

Species of *Daltonia* are distributed in the tropics to semi-tropics world-wide. They primarily occur at higher elevations on the trunks and branches of trees and to a much lesser extent on soil or rocks. They can be recognized by their generally small size, sparingly branched or unbranched gametophores, pinnately branched rhizoids, bordered, single costate leaves, and mitrate, ciliate calyptrae.

Measurements and description of leaves are those taken from the middle of the gametophore. Locality data and elevation listed in brackets [] is my best estimate when this is lacking from the information on the herbarium packet. Based on examination of material deposited at BM, BR, CANB, DUKE, E, EGR, FH, G, H, HIRO, JE, L, MELU, MO, NICH, NY, PC, S, U, and W, I recognize 8 species as occurring in the Americas: *D. bilimbata* Hampe, *D. jamesonii* Taylor, *D. lindigiana* Hampe, *D. macrotheca* Mitten, *D. marginata* Griffith, *D. ovalis* Taylor, *D. pulvinata* Mitten and *D. splachnoides* (Smith) Hooker & Taylor.

Daltonia Hook. & Taylor, Muscol. Brit. 80. 1818. *Neckera* sect. *Daltonia* (Hook. & Taylor) Wallr., Fl. Crypt. Germ. 1:217. 1831.

Plants small to medium-sized, small to large tufts. Stems ± erect, simple or branching irregularly, the branches not differentiated, evenly foliate; in cross section with orange, thick-walled cells surrounding larger, hyaline, thin-walled cells, central strand none; rhizoids usually confined to bases of stems but occasionally reaching

higher, smooth; pseudoparaphyllia none; axillary hairs (2–)4-celled, the basal one short, brown, the upper longer, hyaline. Leaves isophyllous, usually densely foliate, contorted or not, erect or spiraling about stem, variously shaped, \pm symmetric, acute to acuminate, keeled; margins bordered by several rows of narrow, elongate cells, usually broader below, entire, plane or recurved; costa single, ending $\frac{1}{2}$ – $\frac{4}{5}$ the leaf length or rarely higher; cells variously shaped, smooth, colored or not across the insertion; alar cells not differentiated. Asexual propagula present or not, clustered at leaf base or at times occurring over the lamina or at leaf apex, elongate, fusiform or rarely muriform when larger. Autoicous or synoicous. Perichaetia small; leaves few, erect, ovate to ovate-lanceolate, acute to acuminate; margins obscurely bordered or not differentiated, entire or irregularly serrulate, plane or recurved; costa none or very weak, cells variously shaped. Setae elongate, papillose in upper portion, or rarely throughout or \pm smooth; capsules erect to \pm inclined, ovoid to \pm cylindrical; exothecial cells quadrate to rectangular or irregular, collenchymatous or not; annulus none; operculum conic-rostrate; peristome double, attached near the mouth, yellow to light orange, exostome teeth triangular, not bordered or shouldered, recurved or \pm erect, papillose to spiculose throughout, on front surface with a straight to \pm zig-zag median line, perforate or not, not furrowed; endostome papillose to spiculose, basal membrane low, segments linear, ca. as long as the teeth, cilia none. Spores spherical, papillose or \pm smooth. Calyptrae mitrate, ciliate at base, naked, smooth to \pm roughened above.

KEY TO THE SPECIES

1. Leaves erect and not much contorted.
 2. Mature leaves generally \leq 2.25 mm long.
 3. Leaf apex \pm acute; elongate juxtacostal cells not evident; upper portion of seta noticeably papillose or rarely \pm smooth _____ **D. splachnoides**
 3. Leaf apex cuspidate to attenuate; elongate juxtacostal cells (sometimes emerging from the end of the costa) usually noticeably evident; seta \pm smooth _____ **D. ovalis**
 2. Mature leaves generally $>$ 2.5 mm long.
 4. Leaf border not much distinguishable in shape or color from basal lamina cells; leaves \pm linear-lanceolate _____ **D. lindigiana**
 4. Leaf border and laminal cells noticeably distinguishable from each other; leaves not linear-lanceolate.
 5. Leaf border very broad from base to ca. midleaf; elongate juxtacostal cells lacking _____ **D. bilimbata**
 5. Leaf border not strong beyond the basal area; elongate juxtacostal cells usually evident in some portion of the lamina _____ **D. ovalis**
1. Leaves not erect or if \pm erect somewhat contorted.
 6. Laminal cells \pm lenticular throughout _____ **D. marginata**
 6. Laminal cells not lenticular throughout.
 7. Leaf cells \pm rectangular to quadrate to near the apex _____ **D. jamesonii**
 7. Leaf cells not rectangular or squarrose beyond mid leaf.
 8. Leaves oblong-lanceolate to ligulate, \pm horizontally arranged around stem; hyaline propagula frequently present _____ **D. pulvinata**
 8. Leaves \pm linear to ovate-lanceolate, usually somewhat constricted above base, border easily frayed, not horizontally arranged around stem, \pm lax, exposing the stem to view; hyaline propagula not usually present _____ **D. macrotheca**

1. *Daltonia bilimbata* Hampe, *Linnaea* 32:151. 1863. (**Fig. 1**). PROTOLOGUE: COLOMBIA: Cundinamarca, Bogotá, Monserate, 2800 m, *Lindig 2056a* (BM!).

Daltonia compressa Mitt., *J. Linn. Soc., Bot.* 12:400. 1869. PROTOLOGUE: COLOMBIA: Andes Bogotenses, *Weir 349* (FH!, NY!, S!).

Daltonia peruviana Mitt., *J. Linn. Soc., Bot.* 12:401. 1869. PROTOLOGUE: PERU: Andes Peruviana, Cordillera de Raneo, Sachapata, *Lechler s.n.* (NY!), *syn. nov.*

Daltonia subirrorata Broth., *Biblioth. Bot.* 87:129. 1916. PROTOLOGUE: BOLIVIA: Incacorral, alt. 2200 m, *Herzog 4950* (H-BR!, W!). There is a collection from Leiden with *Herzog 4950* on the label from the same location and data as the collection at H-BR but with the name *D. trachydonta* on the label. It contains only *D. marginata*. The collection from Vienna containing the type material, contains mostly *D. marginata*, but has also three stems of *D. bilimbata*. The material from H-BR consists of only one plant of *D. bilimbata*.

Plants medium-sized, bright yellow to yellow-green, in small to large tufts. Stems 5–15 mm high, not much branched. Leaves laxly erect, \pm flexuose when dry, erect to erect-spreading when moist, 2.25–4 mm long, oblong-lanceolate, acute; margins narrowly revolute on one or both sides, border \pm confluent at apex, 0–2 cells wide above, 10–16 cells wide at base (sometimes narrower in small plants); costa ending ca. $\frac{3}{4}$ – $\frac{4}{5}$ the leaf length; upper cells short-linear to \pm rhombic, median cells short-rectangular to short-linear, basal cells rectangular, \pm quadrate, cells at insertion mostly concolorous with laminal cells or sometimes light orange. Asexual

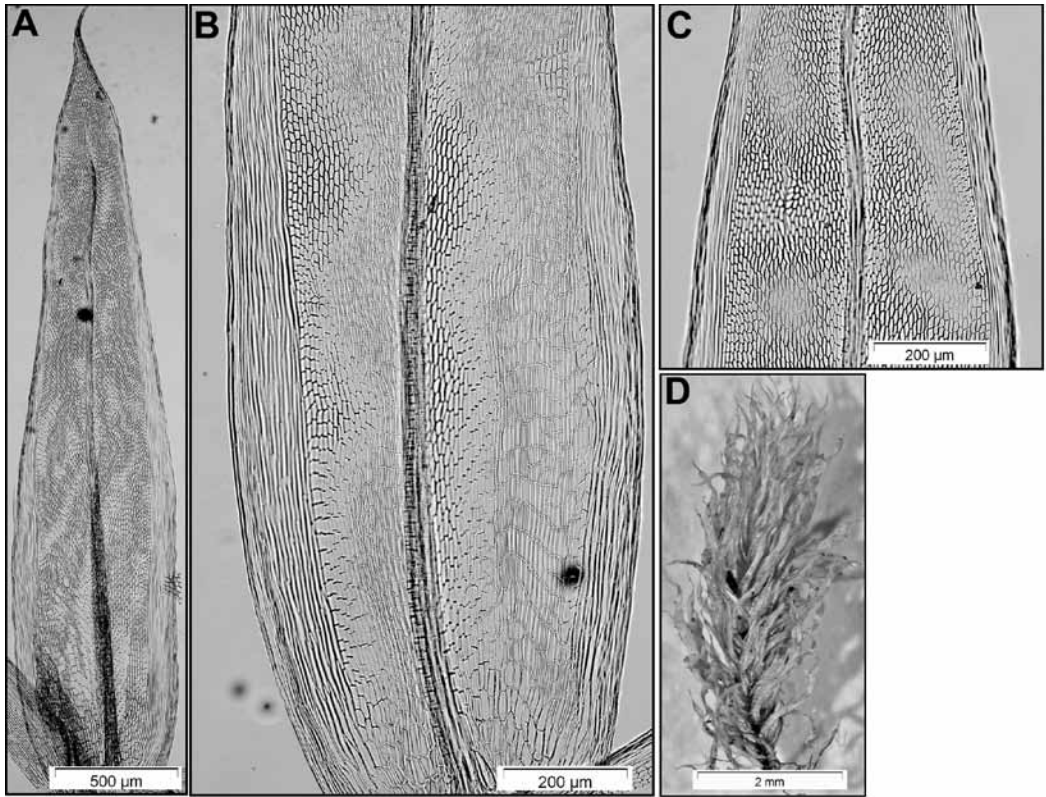


FIG. 1. *Daltonia bilimbata*. A. leaf outline; B. bottom half of leaf showing border and laminal cells; C. upper portion of leaf; D. habit.

propagula medium-large (70–170 µm), hyaline, fusiform. Setae elongate, smooth to slightly roughened in upper portion, red, 8–16 mm long, lightly twisted; capsules brown to bronze, ovoid-cylindric, 1–1.2 mm long; exothecial cells thick-walled, quadrate in upper portion, ± rectangular near base of urn; exostome teeth yellow, papillose to spiculose throughout; endostome segments yellow, papillose throughout. Spores finely papillose, 14–19 µm diam.

Daltonia bilimbata with its broad, basal border (quite distinct from the inner laminal cells) is unlikely to be confused with other members of the genus. The inner basal cells are somewhat reminiscent of those of *D. ovalis* and *D. pulvinata* in their generally quadrate nature but otherwise distinct from those species.

In overall leaf shape *D. bilimbata* and *D. marginata* are fairly similar when viewed under the microscope but the cell shape (consistently oval throughout in *D. marginata*) along with the generally contorted nature of the *D. marginata* plants when dry will easily separate the two. When plants of *D. pulvinata* are on the large size they can exhibit a broad border like *D. bilimbata* and both exhibit roughly similar cell patterns throughout the lamina. This could lead to confusion but plants of *D. pulvinata* have leaves that are almost always somewhat spiraling about the stem while plants of *D. bilimbata* generally have leaves that are erect. A collection from Panama (Allen 9062, MO) is a good example, with both species occurring in the same collection.

When plants of *D. bilimbata* are on the small size the border is not as pronounced and the leaves may somewhat resemble those of *D. macrotheca*. Characters useful in separating these two taxa are the more globose, brown capsule of *Daltonia bilimbata* versus a more conical shaped, greenish tinged urn (before fully mature) in *D. macrotheca*. Also the leaves of *D. bilimbata* tend to be more erect and closer appressed than those of *D. macrotheca* which tend to be somewhat contorted and wider spaced so that the stem is usually visible.

Daltonia bilimbata inhabits roughly the same type habitats and elevational ranges as the two most common species in the Western Hemisphere, *D. marginata* and *D. splachnoides*, and it is not uncommon to find either or both in collections containing *D. bilimbata*.

Illustrations.—Fig. 1, Bartram (1931, Pl. 4 figs. 11, 13 (as *D. peruviana*).

Habitat.—Epiphytic on canopy twigs and tree trunks between 2200–3200(–3680) m.

Representative specimens examined: **BOLIVIA. Cochabamba**: Chapare, Canton Tablas, Camino a Tablas, ca. 8 km N de carratera nueva (Cochabamba/Santa Cruz), 17°07'S, 65°54'W, 2550 m, *Churchill et al.* 21083 (MO). **BRAZIL. Espírito Santo**: Serra de Caparaó National Park, 20°30'S, 41°48'W, 2500 m, *Schäfer-Verwimp & Verwimp* 11502 (MO). **COLOMBIA. Boyacá**: Nueva Granada, Monserate, [5°49'N, 73°35'W, 2800 m], *Lindig s.n.* (L); Cundinamarca: Páramo between Cogua and San Cayetano, Laguna Verde, [5°11'N, 74°02'W], 3680 m, *Cleef 6401a* (U); Nariño: Municipio Pasta between km 29–30 on Pasto-San Francisco road (Putumayo), 1°10'N, 77°07'W, 3300 m, *Churchill & Rengifo M.* 17538-B (NY). **COSTA RICA. Cartago**: just SE of summit of Cerro de la Muerte ridge, 45.7 km SE of El Empalme (3.2 km W of W entrance to Villa Milla), 8°36'N, 83°46'W, 3050 m, *Crosby* 13132A (MO); San José: La Palma area on regional road 220 beyond San Jerónimo, 10°03'N, 83°59'W, 1640 m, *Crosby & Crosby* 5895A (MO). **ECUADOR. Carchi**: 8 km from Julio Andrade, 0°39'N, 77°43'W, 3000 m, *Sastre-Dejesús* 723 (NY); Loja: Parque Nacional Podocarpus, 6–7 km SE of park entrance along Hwy 39, S of city of Loja, 4°03'S, 79°10'W, 2700 m, *Buck* 39536 (NY). **Pichincha**: Cordillera Occidental, Río El Cinto below Lloa, S slope Volcán de Pichincha, 0°15'S, 78°37'W, 2770 m, *Steere* 26994 (NY); Tungurahua: Montana Agoyan, 10 km E of Banos, 1°23'S, 78°22'W, 2000 m, *Holm-Nielsen & Jeppesen* 253 (U). **HONDURAS. Olancho**: Sierra de Algalta, Montana Babilonia. La Picucha & saddle between peaks, 13 km NNW of Catacamas, 14°57'N, 85°55'W, 2354 m, *Allen* 12736A (MO). **MEXICO. Puebla**: between Acapulco and Cuetzalan, [19°30'N, 98°00'W], 1500 m, *Sharp et al.* 1097b (MO). **PANAMA. Bocas del Toro**: Cerro Colorado, 4.3 mi above Chami camp, 8°35'N, 81°45'W, 1700 m, *Allen* 5249A (MO). **Chiriquí**: along road to summit of Volcán Baru, 8°45'N, 82°30'W, 3000 m, *Allen* 9062 (MO). **PERU. Amazonas**: Chachapoyas, Chanchillo, 42 km behind Balsas in the direction of Leimebamba, [06°45'S, 77°54'W], 3200 m, *Hegewald & Hegewald* 6747a (MO). **Ayacucho**: Huanta, 25 km from Tapuna in direction of Ayna (30 km from Ayna), [12°44'S, 73°28'W], 2200 m, *Hegewald & Hegewald* 9034 (MO). **Cajamarca**: Cajamarca, low bridge (Chalchuayacu) between Encanada and Celedin, [06°58'S, 78°15'W], 3550 m, *Hegewald & Hegewald* 6616 (MO). **VENEZUELA. Merida**: Distrito Libertador, El Valle, a 12 kms NE from Merida, Quebrada de La Cana, 08°36'N, 71°09'W, 2400 m, *Griffin et al.* 38 (MO).

2. *Daltonia jamesonii* Taylor, London J. Bot. 7:283. 1848. (**Fig. 2**). PROTOLOGUE: ECUADOR: Pichincha, summit of Mt. Pichincha, 1847, *Jameson s.n.* (FH!).

Daltonia jamesonii var. *laevis* Herzog, Biblioth. Bot. 87:128. 1916. PROTOLOGUE: [BOLIVIA]: Auf schwarzer Erde an feuchten Felsen der Cerros de Malaga, ca. 4000 m, *Herzog* 4415 (FH!, JE!), *syn. nov.*

Plants small to large, golden-brown to bronze or black, in small to rather large tufts. Stems stiffly erect, simple or with a few erect branches, orange to orange-red, (10–)20–60 mm high, branching irregularly. Leaves imbricate, noticeably contorted when dry, ± helically spiraling at apex of stem, erect with flexuose tips and not much contorted when moist, (1.1–)1.4–2.6 mm long, broadly ovate, abruptly acuminate; margins narrowly revolute throughout, border ± confluent at apex or ending subpercurrently, 0–3 cells wide above, 4–16 cells wide at base; costa ending ca. $\frac{3}{4}$ – $\frac{5}{6}$ the leaf length; upper cells short-rhombic, firm-walled, median cells quadrate to short-rectangular, basal cells rectangular to quadrate, orange across the insertion, ± concave on both surfaces (seen in cross-section). Asexual propagula medium-sized (ca. 50–60 µm), sparse, orange-red, muriform, occurring over lamina. Setae elongate, smooth, orange-dark red, 12–20(–25) mm long, lightly twisted at apex; capsules erect, maroon, ovoid-cylindric, 1–2 mm long; exothelial cells irregular to ± quadrate or hexagonal, firm-walled; exostome yellow, densely papillose throughout; endostome segments yellow, densely papillose throughout, perforate to ± eroded on the inner surface. Spores finely papillose, 17–25 µm diam.

Daltonia jamesonii is very distinctive from the other members of *Daltonia* occurring in the New World. The plants generally are found growing in rather large tufts, matted together at the base. All collections examined in the New World except one were taken from elevations of 4000 m or greater.

The deeply keeled leaves form a broad median fold when viewed under the microscope. The quadrate arranged, rather large cells compose the bottom $\frac{2}{3}$ of the lamina before giving way to short, rhomboidal cells above. In cross section the cells of the lamina are somewhat concave on both surfaces. Other members of the genus exhibit flat or slightly convex surfaces on the cell walls.

Morphologically *D. jamesonii*, particularly when on the small side, resembles *D. himalayensis* from India and SE Asia. The collections of *D. himalayensis* that I have examined were generally taken from elevations lower (2400–3500 m) than those where *D. jamesonii* is found and most were growing on twigs while *D. jameso-*

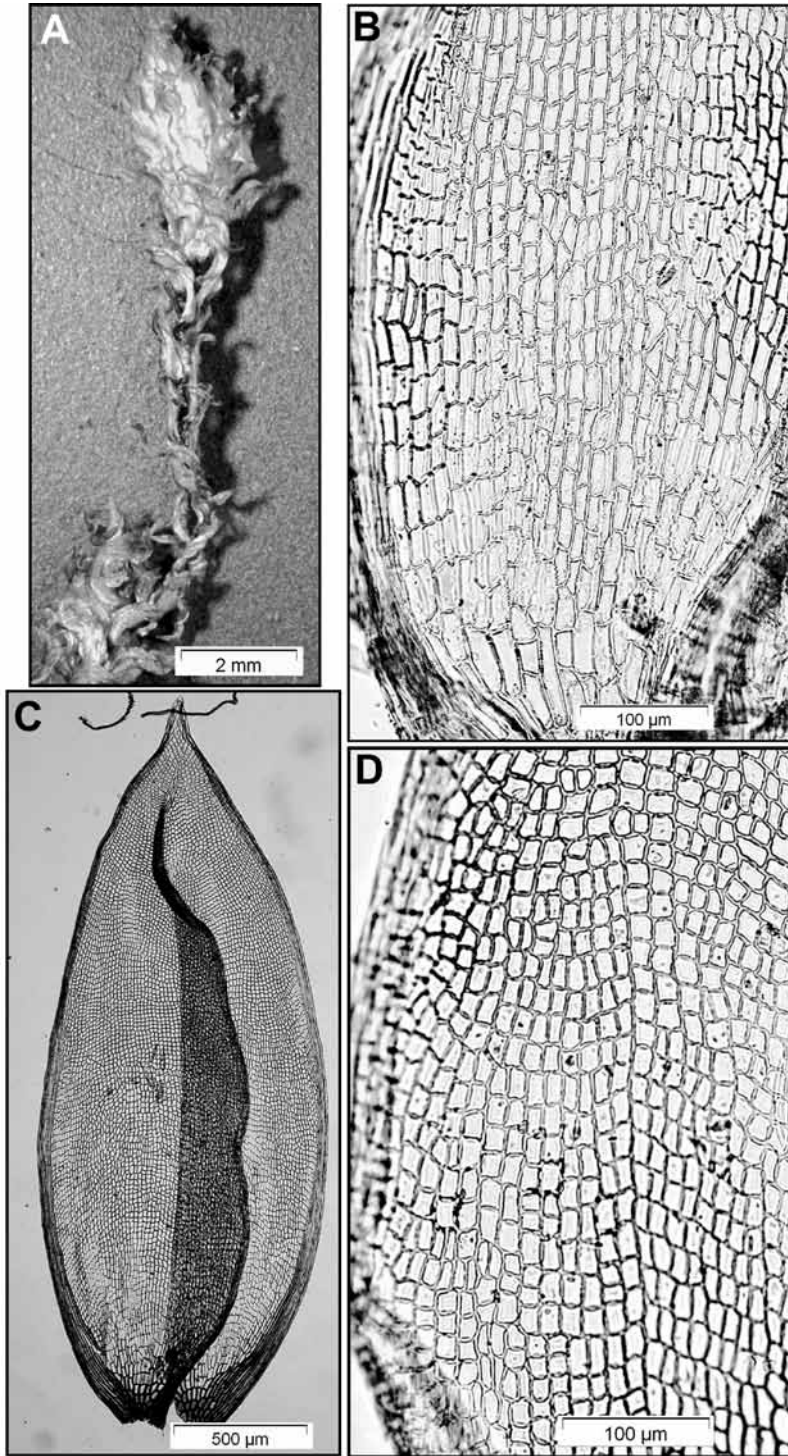


FIG. 2. *Daltonia jamesonii*. A. habit; B. lower portion of leaf; C. leaf outline; D. middle portion of leaf.

nii is primarily a rock dwelling or terrestrial moss. The only other *Daltonia* consistently found at elevations typically occupied by *D. jamesonii* is *D. ovalis*. These two are easily distinguished from one another by the elongate juxtacostal cells in *D. ovalis* as well the substrate on which each is generally found. The only collections of *D. jamesonii* that I have examined outside of the Andean region were collected in Papua New Guinea on similar substrates and at high elevations (3550–4200 m).

Illustrations.—Fig. 2; Bartram (1931, Pl. 3 fig. 8).

Habitat.—On rocks (volcanic, bedrock) or terrestrial, occurring in páramos and punas or high elevational bogs, at (3730–)4000–4700 m.

Representative specimens examined: **BOLIVIA. Cochabamba**: Cerros de Malaga, [18°24'S, 65°35'W], 4000 m, *Herzog 4415* (JE, L). **La Paz**: Inquisivi Cumbre Sayaguira. Headwaters of Río Sayaguira, ca. 2.5 km S of Estancia Huana Hkota, [17°03'S, 67°17'W], 4650 m, *Lewis 87373* (L, MO, U); Prov. Larecaja, Nevado Jankho Uma, above Mina St. Antonio, across canyon from Millipaya, [15°51'S, 68°34'W], 4500 m, *Lewis 79-1537* (MO, NY). **COLOMBIA. Boyacá**: Cordillera Oriental, Sierra Nevada del Cocuy, Alto Ritacueva, [6°25'N, 72°27'W], ca. 4600 m, *Barclay & Juajibioy 7349* (MO); Sierra Nevada del Cocuy, Páramo Concavo. 3.5 km al NNW del morro Pulpito del Diablo, [7°07'N, 72°43'W], 4335 m, *Cleef 8540b* (U). **Caldas**: Nevado del Ruiz, 4 km NNE of the cone of Volcano La Olleta, [4°54'N, 75°22'W], 4150 m, *Cleef & Florschütz 6004* (U). **Nariño**: Municipio de Túquerres, Páramo del Volcán Azufral [1°04'N, 77°41'W], 3730 m, *Ramírez P. 6850* (NY). **ECUADOR. Pichincha**: summit of Mt. Pichincha, [00°10'S, 78°36'W], 4690 m, *Jameson s.n.* (FH).

3. *Daltonia lindigiana* Hampe, Ann. Sci. Nat., Bot. V, 4:363. 1865. (Fig. 3). PROTOLOGUE: COLOMBIA: Cundinamarca, Bogotá, Boqueron, 2700 m, Jul 1859, *Lindig 2023* (BM!, H-BR!, L!, NY!)

Daltonia irrorata Mitt., J. Linn. Soc., Bot. 12:399. 1869. PROTOLOGUE: COLOMBIA: Andes Bogotenses, Boqueron prope Bogotá infra rupium stillicidia, ad ramulos emortuos saxaque (8500 ped.), *Weir 193, 294, 336, 338* (SYNTYPE: NY!).

Daltonia stenophylla Mitt., J. Linn. Soc., Bot. 12:402. 1869. PROTOLOGUE: ECUADOR: Andes Quitensis, in montibus Tungurahua (8000 ped.), *Spruce 568* (BM!, E!, H-SOL!, NY!), *syn. nov.* Mitten cites two collections by *Spruce* (#567, #568) in the original description. The description does not in my opinion give a clear indication as to what plant he was talking about as both *D. lindigiana* and *D. splachnoides* are both present along with *D. marginata* in the collection at BM. From the key I believe it is reasonable to assume he was referring to *D. lindigiana*. The type collections at NY contain *D. splachnoides* (#567) and *D. lindigiana* (#568) in one envelope and another packet above these contains an additional #568 which contains *D. splachnoides*. The larger #568 collection at BM contains *D. lindigiana*, *D. marginata* and *D. splachnoides*. The smaller #568 envelope contains only *D. splachnoides*. The #568 collection at H-SOL contains both *D. lindigiana* and *D. marginata*. The #568 collection at E contains only *D. lindigiana*.

Daltonia stenoloma Besch., Ann. Sci. Nat., Bot. VI, 10:277. 1881. PROTOLOGUE: LA RÉUNION: G. de l'isle; *Lèpervanche* (BM!, PC!). Arts (2005) moved this name from the synonymy of *D. angustifolia* var. *strictifolia* to *D. angustifolia* var. *angustifolia*, both of which I have placed in synonymy with *D. splachnoides*. The type fits well within my concept of *D. lindigiana*. The plants are much larger than those of *D. splachnoides* and they also have the characteristic hyaline gemmae so commonly seen in *D. lindigiana*.

Daltonia stewartii R.S. Williams, Bryologist 27:38. 1924. PROTOLOGUE: ECUADOR: Chatham Island, *Stewart 2782* (NY!).

Plants small to medium, yellow to golden brown, small to large tufts. Stems dark orange to maroon, (5–)10–45 mm high, branching irregularly. Leaves closely imbricate, nearly straight and erect when dry (rarely somewhat contorted in depauperate collections), ± spreading when moist, (1.5–)2–3 mm long, narrowly lanceolate, apex acute to acuminate; margins recurved on one or both sides throughout, borders ± confluent at apex, 0–3 cells wide above, 8–12 cells wide at base and not much distinguished from inner basal cells; costa ca. ¾ the leaf length or more; upper cells narrowly rhomboidal or somewhat lens shaped, median cells narrowly rhomboidal to linear, basal cells linear to long rectangular. Asexual propagula at times numerous, medium- (50–70 µm) to large-sized (90–110 µm), hyaline, spindle shaped, occurring at base of lamina. Setae elongate, smooth or quite scabrous, dark red, 10–12 mm long, shorter in reduced forms; capsules erect, golden brown, ovoid-cylindric, 0.75–1.0 mm long; exothecial cells subquadrate to mostly irregular, firm-walled; exostome teeth ± erect, yellow, densely papillose throughout, fenestrate along the entire length of the teeth with the exception of the basal region; endostome segments densely papillose throughout. Spores finely papillose to ± smooth, 13–18 µm diam.

Daltonia lindigiana is not likely to be confused with other members of the genus when the plants are larger, as those represented by the type collection of Lindig from Colombia. Confusion with *D. splachnoides* is likely when the plants are smaller. A suite of characters that are generally present even in the smaller plants that will help to separate the two are discussed below. *Daltonia lindigiana* has basal border cells and inner lamina cells that are not much differentiated in color or shape, whereas in *D. splachnoides* the basal border is generally

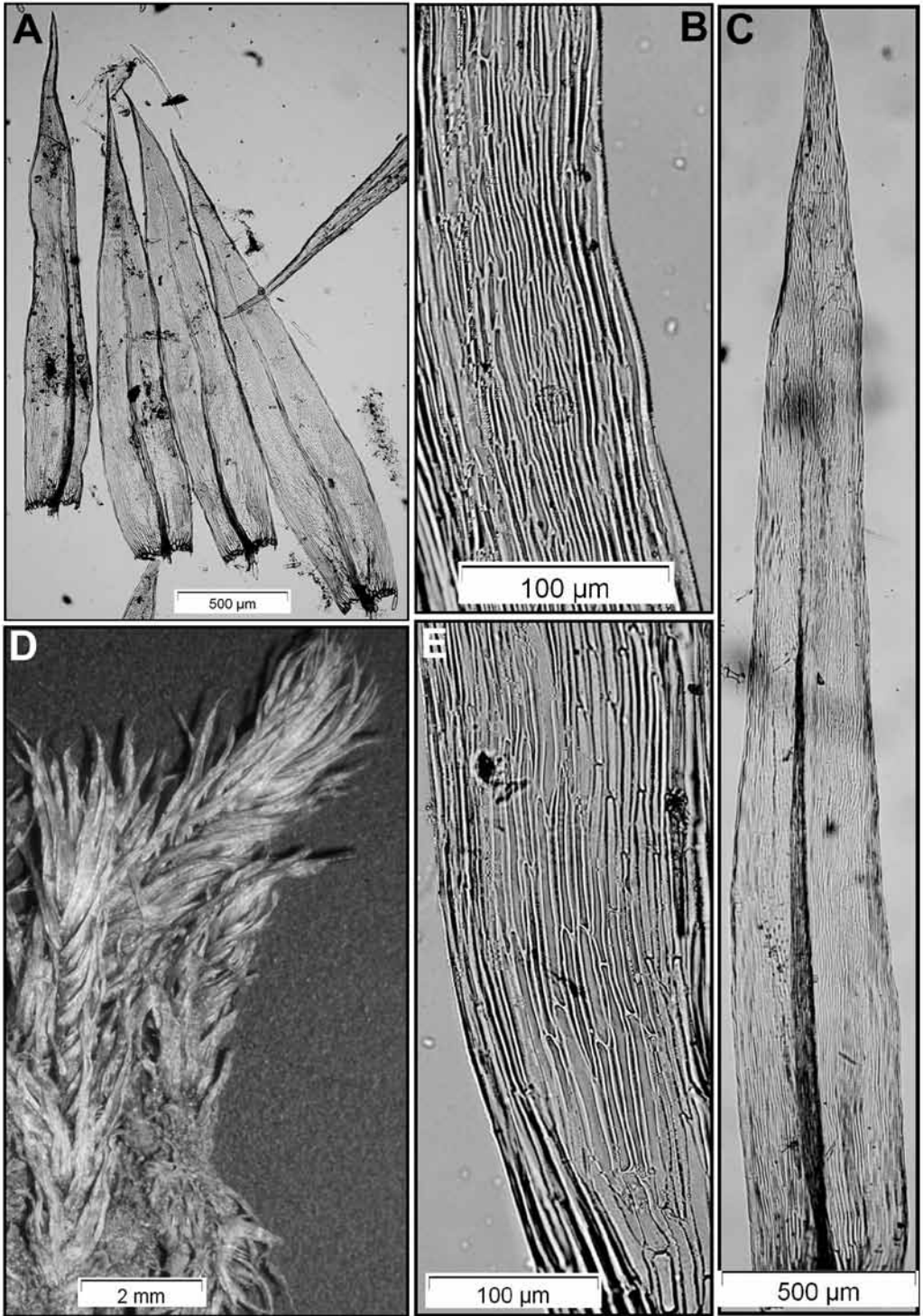


FIG. 3. *Daltonia lindigiana*. A, C. leaf outline; B. upper portion of leaf showing the linear cells; D. habit; E. lower portion of leaf.

narrower and of a different color than the generally quadrate, inner lamina cells. Additionally the leaves of *D. lindigiana* are usually straight and erect when dry in comparison to the generally more twisted leaves of *D. splachnoides*. The frequent presence of hyaline propagula on the lower lamina of *D. lindigiana* as well as the usually smooth to slightly roughened upper seta will also help in separating the two although at times the seta characteristic will be of little value when viewed alone as I have seen specimens of *D. lindigiana* with very scabrose upper setae as well as *D. splachnoides* plants with relatively smooth setae.

The plants that I have called *D. lindigiana* from the West Indies are generally markedly smaller than those from the mainland and the Galapagos Islands. The majority of smaller *D. lindigiana* collections were labeled as *D. stenophylla*.

Illustrations.—Fig. 3; Williams (1924, Pl. 7 fig. 1–11 as *D. stewartii*); Bartram (1931, Pl. 3 fig. 9, Pl. 4 fig. 10 as *D. stenophylla*); Sharp et al. (1994, fig. 577 as *D. stenophylla*); Arts (2005, fig. 15 (1–12) as *D. angustifolia*).

Habitat.—On the trunks of trees and shrubs, in humid forests to subpáramo, (500–)1000–3425 m.

Representative specimens examined: **COLOMBIA**. **Boyacá**: Andes Bogatenses, Boqueron prope Bogotá [4°55'N, 73°22'W], 2615 m, *Weir 193, 294, 336, 338* (NY). **Cundinamarca**: Bogotá, Boqueron [4°45'N, 73°54'W], 2700 m, *Lindig 2023* (BM, H-BR, L, NY). **Cundinamarca**: San Cayetano [5°18'N, 74°04'W], 2820 m, *Cleef 6592c* (U). **Nariño**: Pasto, Serrania del Morasurco, NE of the city of Pasto, 1°16'N, 77°14'W, 3425 m, *Ramirez 11200* (MO). **COSTA RICA**. **Cartago**: along Inter American Highway, bamboo brake about 8 km NW of summit of La Ascensión, 9°37'N, 83°47'W, 3200 m, *Crosby & Crosby 5832* (MO). **Puntarenas**: Reserva Biologica de Bosque Nubosa de Monte Verde, 10°15'N, 85°05'W, 1500–1600 m, *Crosby 9968* (MO). **San José**: La Palma area on regional road 220 beyond San Jerónimo, 10°03'N, 83°59'W, 1640 m, *Crosby & Crosby 5895* (MO). **DOMINICAN REPUBLIC**. **La Vega**: 13.8 km S of Valle Nuevo, 44.7 km S of Constanza, vicinity of pyramids, [18°48'N, 70°41'W], 2277 m, *Steere 22722* (NY); The Pyramids, 40 km S of Constanza on road to San José de Ocoa, 18°45'N, 70°37'W, 2338 m, *Buck 14058* (NY). **ECUADOR**. **Galapagos**: Chatham Island, [0°55'S, 89°34'W], *Stewart 2782* (NY). **Napo**: summit of Cordillera de Huacamayos, on Baeza-Tena road 6–15 km S of Cosanga, in cloud forest [0°36'S, 77°52'W], 2165 m, *Steere 27653A* (NY). **Pichincha**: vicinity of Río Alambi, along road leading W from Nono toward Tandayapa. N slopes of Mt. Pichincha, 0°05'S, 78°30'W, 2340 m, *Crosby 10575* (MO). **HONDURAS**. **Ocotepeque**: Montaña del Caddado, 13 km E of Nueva Ocotepeque & Cerro El Cocal, 12 km NE of Nueva Ocotepeque, 14°27'N, 89°04'W, 2090 m, *Allen 14424* (MO). **Olancho**: Sierra de Algalta, Montaña Babilonia. La Picucha & saddle between peaks, 13 km NNW of Catacamas, 14°57'N, 85°55'W, 2354 m, *Allen 12736* (MO). **MEXICO**. **Puebla**: between Acapulco and Cuetzalan [19°30'N, 98°00'W], 1500 m, *Sharp et al. 1077-a* (MO). **PANAMA**. **Bocas del Toro**: Cerro Colorado, 4.3 mi above Chami camp, 8°35'N, 81°45'W, 1700 m, *Allen 5249* (MO). **PERU**. **Amazonas**: Chachapoyas, Calla Calla, [6°13'S, 77°51'W], 3100 m, *Hegewald & Hegewald 6963b* (MO). **PUERTO RICO**. **Ponce**: Cordillera Central, Caribbean National Forest, Toro Negro Division, along Hwy 143 at km 21.7–22, 18°18'N, 65°47'W, 1400 m, *Buck 16218* (NY). **Rio Grande**: summit of El Yunque, Sierra de Loquillo, [18°19'N, 65°47'W, 1060 m], *Steere 6417* (FH, NY). **ST. VINCENT**: [13°08'N, 61°13'W], *Guilding s.n.* (NY).

4. *Daltonia macrotheca* Mitt., J. Linn. Soc., Bot. 12:402. 1869. (Fig. 4). PROTOLOGUE: ECUADOR: Andes Quitenses, Chimborazo in sylvis Cinchonae inter *Lepidopilum chloroneuron*, *Spruce s.n.* (NY!).

Daltonia tenuifolia Mitt. J. Linn. Soc., Bot. 12:402. 1869. PROTOLOGUE: ECUADOR: [Chimborazo] Andes Quitensis, Pallatanga (6000 ped.), *Spruce 561* (FH!, NY!), *syn. nov.*

Plants small to large, yellow-green, in small to large tufts. Stems orange-black, 5.0–55 mm high, branches infrequent. Leaves lax, ± flexuose dry or wet, ± constricted near bottom 1/3 of lamina, 1.75–2.25 mm long, linear-lanceolate to ovate-lanceolate, apex acuminate; margin narrowly revolute throughout, border 1–3 cells wide at above, 6–12 cells wide at base; costa ending ca. 3/4 leaf length; median-upper cells rhomboidal, short linear to elongate hexagonal, basal cells short rectangular to short linear, ± bulging, thin-walled, ± light-dark orange colored across the insertion. Asexual propagula small (10–30 µm) to medium-sized (60–70 µm), hyaline, fusiform, occurring near leaf base. Setae smooth to slightly papillose in upper 1/2, red, 5–14 mm long; capsule dark brown, cylindric, 1.0–2.0 mm long; exothecial cells quadrate to ± irregular; exostome light orange, papillose, fenestrate in upper 1/2; endostome segments light orange, papillose. Spores not noticeably ornamented, 15–18 µm diam.

The plants represented by the type of *D. macrotheca* are quite distinctive in comparison to the “normal” expression of the species. Stems of the type measure as much as 55 mm in height while most other collections rarely exceed 1 cm in height. One can hardly find fault with Mitten describing both *D. macrotheca* and *D. tenuifolia* in the same publication as the size differences between the two types are quite striking but if my interpretation is correct such size variation occurs among several members of the genus (i.e., *D. jamesonii*, *D. lindigiana*, *D. ovalis*, *D. pulvinata*). I believe that the plants represented by the type of *D. macrotheca* are just an

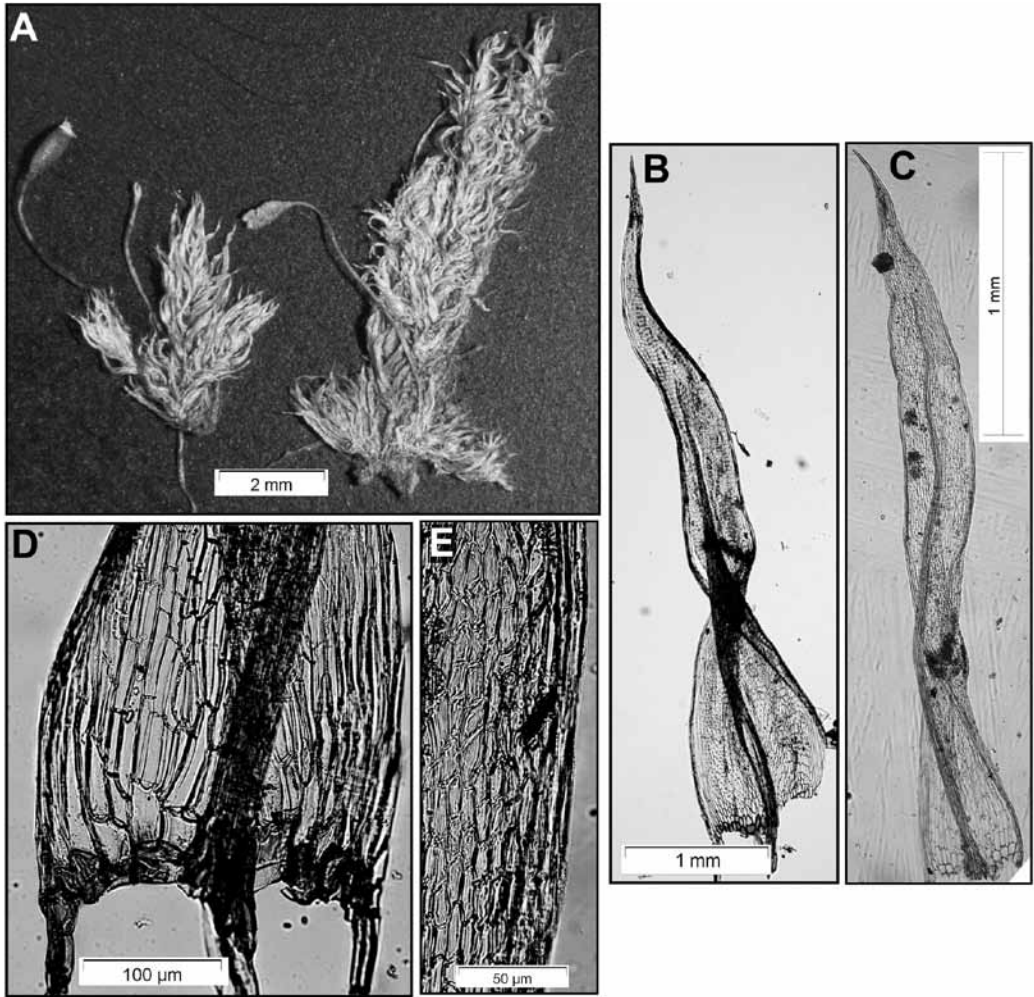


FIG. 4. *Daltonia macrotheca*. A. habit (notice the relatively large capsule which can aid in separation of small plants from *D. splachnoides*); B–C. leaf outlines showing the constriction in the basal portion of the leaf which is a characteristic of this species; D. basal portion of leaf showing the somewhat bulging basal cells; E. mid-laminal cells.

anomaly as I have seen no collections other than the type that comes close to reaching their height and I find it hard to believe that plants of such a stature would not have been extensively collected if it was the norm for the species. I have chosen to maintain the name *D. macrotheca* instead of *D. tenuifolia* because the type of *D. macrotheca* is in much better condition than the latter and it shows the morphological characteristics that diagnostic for the species very well. Even when small the plants of *D. macrotheca* have leaves that are somewhat constricted about $\frac{1}{3}$ from the base. The lax, flexuose nature of the leaves generally allows the stem to be seen clearly which is uncharacteristic of the other species of the genus. The species most likely to be confused with *D. macrotheca* is *D. splachnoides*. Besides the previous mentioned characteristics these two can be separated by the relatively smooth seta of *D. macrotheca* versus the noticeably papillose upper seta of *D. splachnoides*. The capsule of *D. macrotheca* is also generally much larger than that of *D. splachnoides*. Another characteristic that is useful in separating the two is that *D. macrotheca* generally has an area of bulging cells in the inner basal area that is not present in *D. splachnoides*.

Illustrations.—Fig. 4; Bartram (1931, Pl. 3 fig. 6, Pl. 4 fig. 16 as *D. tenuifolia*); 1949, fig. 131 G–H as *D. tenuifolia*); Sharp et al. (1994, fig. 575 a–f as *D. tenuifolia*).

Habitat.—On tree trunks and twigs, 1300–2680 m.

Representative specimens examined: **BOLIVIA. Cochabamba:** Carrasco, El Limbo, camino antigua al Chapare, 17°08'S, 65°38'W, 2080 m, *Mogro & Altamirano* 398 (MO). **COSTA RICA. Cartago:** Dos Amigos area, near 73 km marker on Inter American Highway, SE of El Empalme, 9°37'N, 83°50'W, 2680 m, *Crosby & Crosby* 8581 (MO). **San José:** Cerro Daser area, 6 km along road that turns off W from national road 4, 5 km S of Asseri, 10 km SSE of San José, 9°50'N, 84°07'W, 2250 m, *Crosby & Crosby* 8560 (MO). **ECUADOR. Pichincha:** along road 71 from Interamerican Highway toward Santo Domingo de los Colorados, 0°20'S, 78°40'W, 2600 m, *Crosby* 10487 (MO). **HONDURAS. Comayagua:** from Agua Amarilla to San Jose del Los Planes, ca. 11–15 km E of Lake Yojoa, 14°47'N, 87°51'W, 1500 m, *Allen* 13992 (MO). **MEXICO. Oaxaca:** on hwy 175, ca. 23 km N of Ixtlan de Juarez, [17°20'N, 96°29'W], 2100 m, *Norris & Taranto* 16415 (MO). **PANAMA. Chiriqui:** ca. 5.4 km from El Hato Volcán on road to Las Lagunas, [8°46'N, 82°38'W], 1300 m, *Correa* 1440B (MO). **PERU. Cusco:** Aguas Calientes near Machu Picchu, [8°50'S, 74°41'W], 2100 m, *Hegewald & Hegewald* 8724 (MO). **VENEZUELA.** Portuguesa: 15 km to the E of Chabasquen, 67 km NNE of Guanare, 9°27'N, 69°54'W, 1485 m, *Steyermark et al.* 126799B (MO).

5. *Daltonia marginata* Griff., *Calcutta J. Nat. Hist. Misc. Arts Sci. India* 3:270. 1842. (**Fig. 5**). PROTOLOGUE: INDIA: Khasia Hills, Mawflong, *Griffith* 330 (H-BR!).

Daltonia longifolia Taylor, *London J. Bot.* 7:284. 1848. PROTOLOGUE: ECUADOR: Pichincha, on [Mt.] Pichincha near Quito, *Jameson* s.n. (FH!), *syn. nov.*

Daltonia contorta Müll. Hal., *Synopsis Muscorum Frondosorum omnium hucusque Cognitorum* 2:660. 1851. PROTOLOGUE: Habitat insulam Javae, sine loco, *Blume* s.n. (?), *syn. nov.*

Daltonia flexifolia Mitt., *J. Proc. Linn. Soc., Bot., Suppl.* 2:146. 1859. PROTOLOGUE: NEPAL: *Wallich* s.n. (NY!), *syn. nov.*

Daltonia scaberula Mitt., *J. Proc. Linn. Soc., Bot., Suppl.* 2:146. 1859. PROTOLOGUE: CEYLON: *Thwaites* s.n. (NY!).

Daltonia patula Mitt., *J. Linn. Soc., Bot.* 7:162. 1863, *illegitimate, later homonym.* *Daltonia mittenii* Kis, *Proc. Third Meeting Bryologists Central & East Europe* 220. 1984. PROTOLOGUE: Fernando Po [Isla Bioko, Equatorial Guinea], Peak Clarence, alt. 7,000 ft, with *Neckera pennata*, *Mann* s.n. (BM!, NY!), *syn. nov.*

Daltonia brasiliensis Mitt., *J. Linn. Soc., Bot.* 12:399. 1869. PROTOLOGUE: BRAZIL: Brasilia, Sierra de Piedada, porv. Minas Geraes, *Gardner* 78 (H-SOL!, NY!), *syn. nov.*

Daltonia aristata Geh. & Hampe, *Vidensk. Meddel. Dansk Naturh. For. Kjøben. ser. IV*, 1:121. 1879. PROTOLOGUE: BRAZIL: Prope São Paulo, May–Aug 1879, *Puiggari* s.n. (FH!, H-BR!, L), *syn. nov.* The collection at L contains a small amount of *D. splachnoides* as well.

Daltonia latimarginata Besch., *Ann. Sci. Nat. Bot.*, VI, 10:277. 1881. PROTOLOGUE: LA RÉUNION: Ravine sèche, associé au *D. minor*, et plaine des Palmistes, G. de l'Isle; sommet de la rivière des Roches, *P. Lepervanche* s.n. (BM!), *syn. nov.*

Daltonia intermedia Renauld & Cardot, *Bull. Soc. Bot. Belg.* 33(2):127. 1894[1895], *illegitimate, later homonym.* *Daltonia cardotii* Bizot & Onr., *Rev. Bryol. Lichénol.* 42:851. 1976. PROTOLOGUE: MADAGASCAR: Grand Comore (Humblot), in jugo Ikongo, *Dr. Besson* s.n. (PC!), *syn. nov.*

Daltonia longicuspidata Müll. Hal., *Bull. Herb. Boissier* 5:201. 1897. PROTOLOGUE: GUATAMALA: Coban, Dec 1885, *d. v. Turckheim* (H-BR!) [published as *D. longo-cuspidata* an invalid, orthographic variant], *syn. nov.*

Daltonia dusenii Müll. Hal. ex Broth., *Bot. Jahr. Syst.* 24:259. 1897. PROTOLOGUE: [CAMEROON]: Mt. Kamerun, Bomana, ca. 1000 m, 19 Jul 1892. *Dusén* 776 (H-BR!), *syn. nov.*

Daltonia latimarginata var. *madagassa* Renauld, *Prodrome de la Flore Bryologique de Madagascar des Mascareignes et des Comores* 292. 1898. PROTOLOGUE: MADAGASCAR: Ankeranadinika, 1400 m, *Dorr* s.n. (PC!) *syn. nov.*

Daltonia dussii Broth. in Urb., *Symb. Antill.* 3:426. 1903. PROTOLOGUE: LESSER ANTILLES: Martinique, inter Ajoupa and Bouillon, ad ramulos arborum ramisima, Aug 1901, *Duss* 345 (H-BR!).

Daltonia contorta var. *humilis* M. Fleisch., *Die Musci der Flora von Buitenzorg* 3:962. 1908. PROTOLOGUE: West-Java oberhalb Tjibeureum 2000 m, *Fleischer* s.n.; um Tjibodas auf Blättern 1500 m, *Fleischer* s.n.; bei Tjipannas in härten an Aesten 1000 m, *Fleischer* s.n., (FH!) – 3 syntypes on same sheet), *syn. nov.*

Daltonia latolimbata Broth., *Biblioth. Bot.* 87:129. 1916. PROTOLOGUE: BOLIVIA: Incacorral, alt. 2200 m, *Herzog* 4950/a (JE!), *syn. nov.* The isotype material at Jena contains two packets. The upper packet labeled *Herzog* 4950 from (W) contains both *D. bilimbata* and *D. marginata*. The lower packet contains only *D. marginata*. Some of the plants differ only in that some leaves have elongate juxtacostal cells in the basal region. When taken into context with other taxa in the genus which exhibit cells of this nature to varying degrees, particularly *D. ovalis*, I don't believe it enough to warrant recognition at the species level, particularly when "normal" plants of *D. marginata* are present in the sample.

Daltonia euryloma P. de la Varde, *Rev. Bryol. Lichén.* 18:18. 1949. PROTOLOGUE: CAMEROON: Bambuto, alt. 2000 m, epiphyte sur brindilles, *M. Jacques-Félix* 5434 (NY!, PC!), [packet also contains *D. splachnoides*], *syn. nov.*

Daltonia plicata P. de la Varde, *Arvik. Bot., Andra Serien* 3:181. 1955. PROTOLOGUE: Afrique orientale, [Mbarara]: Bujuku Valley, in the lower part of the ericaceous belt, 3150 m, *O. Hedberg* 345e (PC!), *syn. nov.*

Plants small to medium-sized, yellow to golden brown, small to medium tufts. Stems orange, 5–15(–30) mm

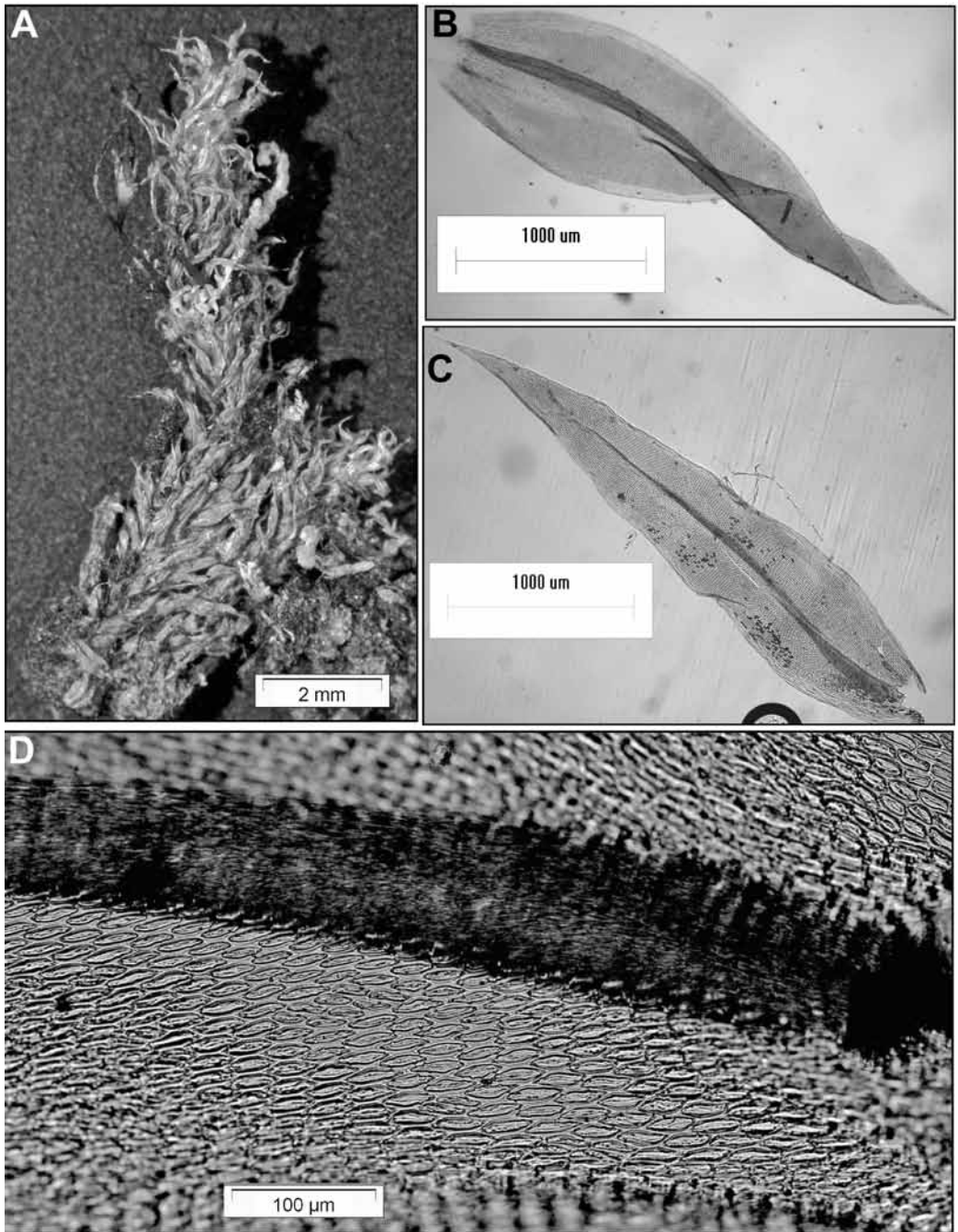


FIG. 5. *Daltonia marginata*. A. habit; B–C. leaf outlines (B. “*brasiliensis*” leaf morphology, C. “*aristata*” leaf morphology); D. laminal cells showing the characteristic oval shape which occur throughout the lamina with the exception of the very basal area of the leaf which can have somewhat rectangular to quadrate cells.

high, rarely branching. Leaves spirally contorted when dry, erect to erect-spreading, not much contorted when moist, 1.5–3.0 mm long, broadly-ovate lanceolate to oblong-ligulate to lanceolate, apex acute to acuminate; margins plane, border 1–2(–3) cells wide above, 6–12(–16) wide at base, plane; costa ending ca. $\frac{3}{5}$ – $\frac{4}{5}$ leaf length; median-upper cells lenticular, often in oblique rows, basal cells lenticular to short linear becoming more or less rectangular a few rows above the insertion, light-dark orange colored across the insertion. Asexual propagula infrequent, medium to large-sized (90–450 μ m), hyaline or light orange, fusiform or rarely branched and with rhizoids forming (Allen 12301, MO), occurring on stem. Setae papillose in upper $\frac{1}{2}$ or rarely to the base, reddish, 5–12 mm long; capsules reddish brown, ovoid to cylindric, 0.8–1.5 mm long; exothecial cells subquadrate to irregular; exostome yellow, papillose to spiculose; endostome segments yellow, papillose to spiculose. Spores faintly papillose, 111–8 μ m diam.

Illustrations.—Fig. 5; Dozy & Molkenboer (1862, Tab. 155 fig. 1–46 as *D. contorta*); Brotherus (1925, fig. 592 A–E as *D. contorta*); Bartram (1931, Pl. 3 fig. 2, 3 as *D. braziliensis*, 4 as *D. aristata*, Pl. 4 fig. 16 as *D. latolimbata* (incorrectly labeled as fig. 14 in the plate explanations); Bartram (1933, fig. 137 a–f as *D. contorta*); Bartram (1939, Pl. 19 fig. 319 as *D. contorta*); Bartram (1949, fig. 131 D–F); Potier de la Varde (1957, fig. 3 1–7 from holotype *D. constricta*); Welch (1966, figs. 131–138); Tan & Robinson (1990, fig. 12 as *D. contorta*); Mohamed & Robinson (1991, figs. 30–36 as *D. contorta*); Sharp et al. (1994, fig. 574 a–f); Churchill & Linares (1995, fig. 56 g–m); Kis (1996, fig. 1 1–3 from holotype *D. latolimbata*); Buck (1998 Pl. 1 fig. 7–10); Gradstein et al. (2001, fig. 105 J–P); Buck (2003, fig. 83 A–F).

Habitat.—On twigs and tree trunks primarily although occasionally growing on bamboo or leaves, in humid and cloud forest, (350–)1000–3000(–4000) m.

Daltonia marginata is one of the most widespread and easiest species within the genus to identify. The contorted leaves when dry combined with the lenticular cells throughout the lamina (with the exception of the most basal area) are two characteristics which will separate it from the other species within the genus. The only species likely to be confused with *D. marginata* is *D. pulvinata* which also exhibits somewhat oval cells in the distal half of the lamina and has leaves which are contorted as well. The more horizontal arrangement of the leaves around the stem in *D. pulvinata* as well as the generally quadrate nature of the basal cells will aid in separation of the two which are frequently found growing together. The other species found quite often with *D. marginata* is the far ranging *D. splachnoides* which is easily identified from *D. marginata* by its generally smaller size as well as having leaves that are not markedly contorted.

The leaf shape of *D. marginata* can be quite variable which has led to quite a number of extraneous names being associated with the species. When viewed in the extreme forms such as the type of *D. latolimbata* with its very broad ovate-lanceolate leaves and elongate juxtacostal cells versus the type of *D. marginata* which is on the opposite end of the size spectrum for the species and bears more or less small, narrow, lanceolate leaves one can certainly see how mistakes could have been made in assigning new names to a plant that exhibits such morphological plasticity when it comes to leaf size and shape. Regardless of the shape or size the two aforementioned characteristics, contorted leaves and lenticular cells throughout the lamina, remain consistent across the spectrum.

Representative specimens examined: **BELIZE**. Toledo: Columbia River Forest Reserve, Little Quartz ridge, along trail from HLS 500 to peak, 16°24'N, 89°06'W, 1045 m, Allen 18958 (MO). **BOLIVIA**. Antioquia: Valdivia Municipio, carretera a Briceno, al lado de Quebrada El Oro, 7°07'S, 75°47'W, 1695 m, Churchill et al. 18351 (MO). Cochabamba: Carrasco, Serrania Siberia. ca. 4 km oeste de El Churo, 17°48'40"S, 64°46'44"W, 2720 m, Churchill et al. 22636 (MO). La Paz: Nor Yungas, 20 km SW of Yolosa junction on road to Unduavi, 16°18'S, 67°50'W, 2500 m, Crosby 13592 (MO). Potosí: Inca Corral, [18°04'S, 65°50'W], 2200 m, Herzog 4950 (L). Santa Cruz: Manuel M. Caballero 11 km este de Siberia, 1 km por San Mateo, 17°50'S, 64°41'W, 2540 m, Churchill et al. 21884 (MO). Tarija: Arce, Municipio de Padcaya. Reserva Natural Alarachi, Zona Alarachi, Cerro Los Tejerinas, 22°11'S, 64°36'W, 2025 m, Churchill et al. 23402 (MO). **BRAZIL**. Minas Gerais: Pocos de Caldas, Morro São Domingos, 21°48'S, 46°34'W, 1580 m, Schäfer-Vervimp & Vervimp 14424 (BR, MO); Rio de Janeiro, [22°54'S, 43°14'W], van Deventer s.n. (L). São Paulo: Mun. Guapiara, Serra Paranapiacaba, Fazenda Intercalles, slopes of Morro do Mirante, 24°16'S, 48°25'W, 900 m, Vital & Buck 20467A (NY). **CHILE**. Arauco: Hwy P-80-R, 3 km E of Antiquina, 38°02'S, 73°21'W, 350 m, Ireland & Bellolio 33520 (MO). **COLOMBIA**. Antioquia: Caldas Municipio, Vereda La Corrala, cerca de Medellín, 6°17'N, 75°32'W, 2360 m, Churchill et al. 15557 (MO). Boyacá: Nueva Granada, Tequendama, [05°44'N, 74°16'W], 2500 m, Lindig s.n. (L). Cauca: Municipio de Popayán, ca. 10–12 km from Popayán, Hacienda Cantaclaro de Mauricio Pinzon, 02°31'N, 76°34'W, 1800 m, Churchill & Franco 16587-c (NY). **Nariño**: Municipio Pasta,

Vereda Daza, 10–12 km de Pasto via a Buesaco, 1°15'N, 77°16'W, 2890 m, *Churchill et al.* 16666 (MO). **Putamayo:** San Francisco, entre El Río Blanco and San Francisco, 1°10'N, 76°49'W, 2650 m, *Ramírez et al.* 8528 (MO). **COSTA RICA. Alajuela:** grounds of Rancho Trebol, 10°30'N, 84°30'W, 1400 m, *Crosby* 3796 (MO). **Cartago:** Madre Selva area, near Río Macho, 2 km along road which turns NE from Inter American Highway 10 km SE of El Empalme, 9°42'N, 83°53'W, 2450 m, *Crosby & Crosby* 5843 (MO). **Heredia:** Las Vueltas area, 18 km N of San Jose, 10°06'N, 84°03'W, 2100 m, *Crosby & Crosby* 5996 (MO). **Puntarenas:** Las Cruces, 8°48'N, 83°01'W, 1200 m, *Gomez* 25379 (MO). **San José:** La Palma area on regional road 220 beyond San Jerónimo, 10°03'N, 83°59'W, 1640 m, *Crosby & Crosby* 5890 (MO, U). **CUBA. Granma:** Sierra Maestra near Pico Bayamesa, 20°03'N, 76°35'W, 1350 m, *Pöcs* 9066/DF (EGR). **Santiago de Cuba:** La Gran Piedra, from base of peak near lodge to summit, 19°59'N, 75°35'W, 1100 m, *Buck* 7647A (NY). **DOMINICAN REPUBLIC. Barahona:** above Montaña Nueva, 17 km N of Cabral, then 24 km E to “El Gajo”, 18°18'N, 71°16'W, 1310 m, *Buck* 8165 (NY). **Independencia:** along the Carretera Internacional near the crest of the Sierra de Meiba range along Haitian border, 18°40'N, 71°30'W, 1850 m, *Norris et al.* 6039 (NY). **La Vega:** vicinity of Constanza on road to Valle Nuevo, [18°52'N, 70°43'W], 1400 m, *Allard* 16564 (NY). **Santiago:** Pico Diego de Ocampo, 19°35'N, 70°44'W, *Judd* 1590 (NY). **ECUADOR. Azuay:** 21 km S of Sigsig on road to Gualaquiza, 3°06'S, 78°48'W, 2928 m, *Buck* 39321A (NY). **Galápagos:** Isla Santa Cruz, top of Cerro Maternidad, 0°32'S, 90°20'W, 675 m, *van der Werff* 1778 (U). **Morona-Santiago:** along Gualaceo-Gral. L. Plaza Gutierrez (“Limón”) Hwy, 25.8 km SE of bridge at entrance to Maylas Reserva Ecología Natural, 23.6 km SE of shrine at crest of mountain, 3°00'S, 78°27'W, 2240 m, *Buck* 39275 (NY). **Napo:** 8.9 km S of Cosanga, on road to Tena, 0°40'S, 77°51'W, 1800 m, *Churchill & Sastre-Dejesús* 13626 (NY). **Pichincha:** W slope of Pasachoa, ca. 30 km SSE of Quitto, 0°25'S, 78°28'W, 2900 m, *Buck* 10120 (NY). **Tungurahua:** 14–19 km W of Baños along road 78, slopes above left bank of Río Pastaza, 1°25'S, 78°25'W, 1800 m, *Crosby* 10621 (MO). **Zamora-Chinchipec:** Cordillera de Sabanilla, ca. 44 km S of Vilcabomba on road to Zumba (Hwy 39), 4°30'S, 79°08'W, 2800 m, *Buck* 39508B (NY). **HAITI. Departement de l'Ouest:** vicinity of Furcy, 15°25'N, 72°19'W, 1300 m, *Leonard* 4620b (NY). **Sud'est:** Massif de la Selle, 8 km N of Sequin on road to Kenscoff, 15°21'N, 72°15'W, 1900 m, *Buck* 9454 (NY). **HONDURAS. Comayagua:** Cordillera de Montecillos Montana de San Jaunillo, trail between Cerro San Jaunillo & La Danta, 14°30'N, 87°52'W, 2020 m, *Allen* 11031 (MO). **Cortes:** Cusucu National Park, along Río Cusucu from Park Hdq. to Cascada del Río Cusucu ca. 22 km W of San Pedro Sula & 16 km S of Cuyamel, 15°30'N, 88°13'W, 1570 m, *Allen* 14364 (MO). **Lempira:** Montaña de Celaque, quebrada along stream below Camp Don Tomás, 14°34'N, 88°39'W, 2040 m, *Allen* 11251 (MO). **Ocotepeque:** Montaña del Candado, 13 km E of Nueva Ocotepeque & Cerro El Cocal, 12 km NE of Nueva Ocotepeque, 14°27'N, 89°04'W, 2090 m, *Allen* 14488A (MO). **Olancho:** La Muralla Biological Reserve, 8 km NNW of La Union, 15°05'N, 86°44'W, 2354 m, *Allen* 12851 (MO). **JAMAICA. Portland:** just N of Hardwar Gap, [18°00'N, 76°30'W], 1230 m, *Griffin* 1104 (MO, NY). **MEXICO. Hidalgo:** Honey Station, [20°30'N, 99°00'W], *Pringle* 10487 (L, MO, NY). **Oaxaca:** along road N of Llano de Las Flores N of Oaxaca [16°54'N, 96°00'W], 2250 m, *Iwatsuki & Sharp* 5341 (MO). **Puebla:** between Acapulco and Cuetzalan, [19°30'N, 98°00'W], 1500 m, *Sharp et al.* 1097-b (MO). **Veracruz:** Jalapa Municipio, 17 km NE of Jalapa along Mex Rte 140, 19°32'N, 96°55'W, 2150 m, *Reese* 4590-b (MO). **PANAMA. Bocas del Toro:** Cerro Colorado, 4.3 mi above Chami camp, 8°35'N, 81°45'W, 1700 m, *Allen* 5249A (MO). **Coclé:** N of El Valle de Antón, base of Cerro Pilón, 8°35'N, 80°10'W, 1000 m, *Crosby* 4392B (MO). **Veraguas:** 10.4 km along road leading NW from Escuela Agrícola “Alto de Piedra,” 5.4 km NW of Santa Fé, 8°30'N, 81°05'W, 350 m, *Crosby* 10150A (MO). **PERU. Ayacucho:** La Mar, 3 km from Ayna in the direction of Ayacucho, 12°39'S, 73°55'W, 1500 m, *Hegewald & Hegewald* 9044 (MO). **Cusco:** Suchubamba, just S of southern border of Manu Park on road 100, 3000 m, *Majestyk* 4952 (pers. coll.). **Huanuco:** Aguas Calientes near Machu Picchu, 8°50'S, 74°41'W, 2100 m, *Hegewald & Hegewald* 8790 (MO). **Pasco:** Oxapampa, Río Yamaquizu valley 16 km from turn off main road, 10°37'S, 75°22'W, 2550 m, *Smith* C-25 (MO). **PUERTO RICO. Jayuya:** along E of Jayuya, km 30 on road to Ciales, 18°17'N, 66°32'W, *Steere* 6081 (NY). **Ponce:** Cordillera Central, Caribbean National Forest, Toro Negro Division, along Hwy 143 at km 20, 18°18'N, 65°47'W, 1500 m, *Buck* 15999 (NY). **VENEZUELA. Aragua:** along highway in the vicinity of Colonia Tovar, 10°25'N, 67°17'W, 1800 m, *Pursell* 9294 (MO). **Portuguesa:** 15 km to the E of Chabasquen, 67 km NNE of Guanare, 9°27'N, 69°54'W, 1485 m, *Steyermark et al.* 126799B (MO).

6. *Daltonia ovalis* Taylor, London J. Bot. 5:66. 1846. (**Fig. 6**). PROTOLOGUE: ECUADOR: on trunks of trees, on Cayambe, about 14,000 ft. 20 Oct 1827, *Jameson* s.n. (HOLOTYPE: FH!; ISOTYPES: E!, NY!).

Daltonia cucullata Hampe, Linnaea 32:151. 1863. PROTOLOGUE: COLOMBIA: Bogotá, Los Laches, 2800 m, Sep [1859], *Lindig* 2023b (BM!). The type of *D. cucullata* resembles the type of *D. ovalis* closely. Both plants have leaves on the smaller side as well as having the elongate juxtacostal cells in very thin bands and in some leaves these elongate cells are virtually absent.

Daltonia trachydonta Mitt., J. Linn. Soc., Bot. 12:400. 1869. PROTOLOGUE: ECUADOR: Andes Quitensis, Cayambe, una cum *D. ovalis*, *Jameson* s.n. (NY!), *syn. nov.*

Daltonia androgyna Geh. & Hampe, Flora 64:405. 1881. PROTOLOGUE: [BRAZIL]: Apiahy, Sep 1879, *Puiggari* 985b (BM!, H-BR!, NY!), *syn. nov.* [The type at BM contains three small groups of plants, the two on the left are *D. ovalis*, the one at the right is *D. pulvinata*. The collection at H-BR contains only two plants both of which are *D. marginata*. The collections made by Puiggari (#892) a month earlier in the same location are plants of *D. pulvinata*. Another collection at L (likely isotype) contains four small groups of plants all of which are *D. ovalis*.]

Daltonia valdiviae Herzog, Hedwigia 64:15. 1923. PROTOLOGUE: CHILE: An Baumrinde im Stadtpark von Valdivia, Dec 1911, *Herzog* 5268 (FH!, JE!). Plants are on the small size but clearly represent *D. ovalis*. Hyaline gemmae are present on the leaf bases.

Daltonia rufescens Broth., Bernice P. Bishop Mus. Bull. 40:24. 1927. PROTOLOGUE: HAWAII: West Maui, mountain ridges, on trunks, elev. 1500 m, *D. D. Baldwin* 148 (H-BR!, FH!), *syn. nov.*

Daltonia brevinervis E.B. Bartram, Bull. Torrey Bot. Club 58:37. 1931. PROTOLOGUE: COLOMBIA: Páramo El Boqueron near Bogotá, 3300 m, *Troll* 2176 (JE!), *syn. nov.*

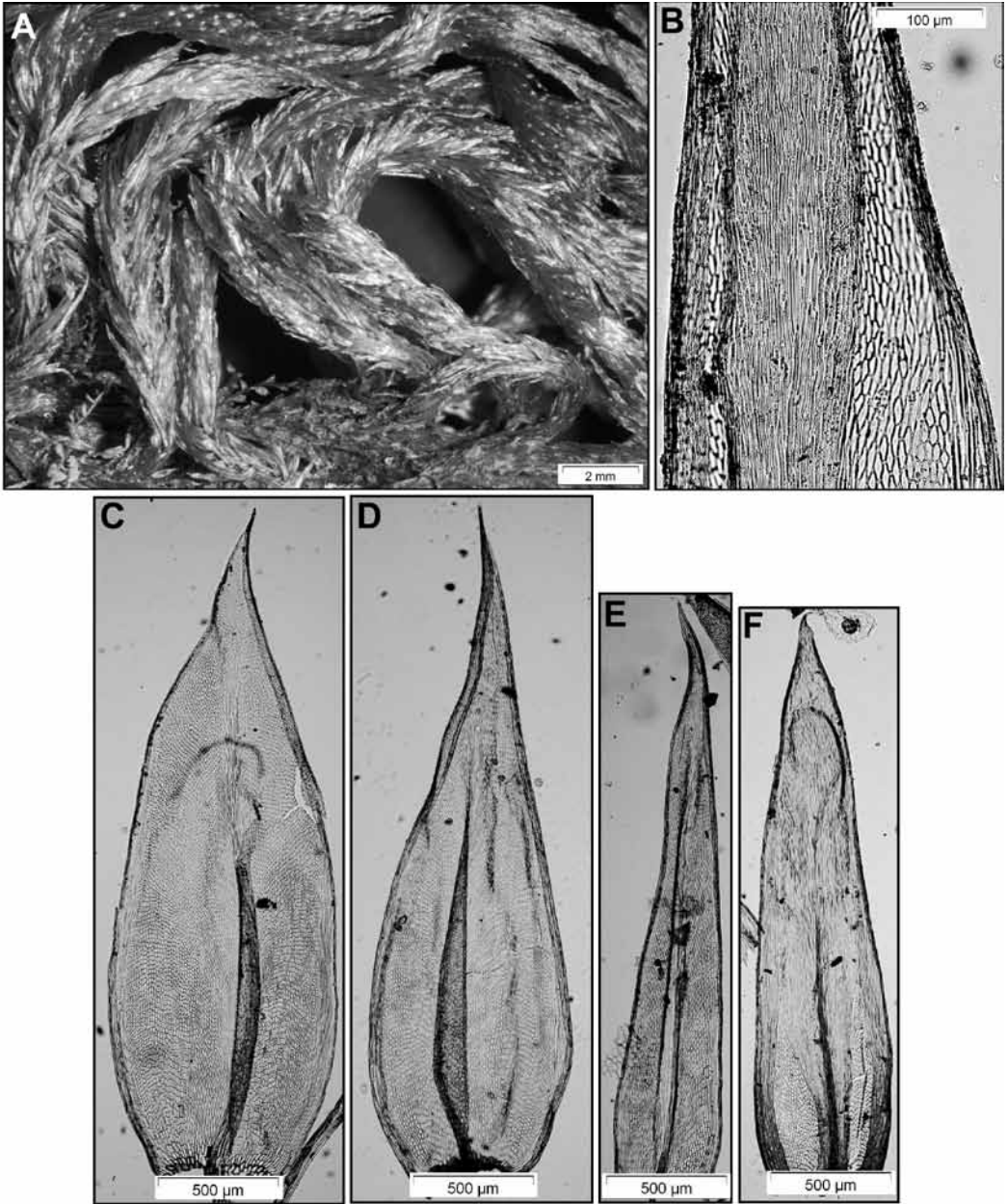


FIG. 6. *Daltonia ovalis*. A. habit; B. upper portion of lamina showing the broad band of elongated juxtacostal cells characteristic of the “*brevinervis*” and “*fenestrellata*” plants; C–F. from left to right “*gomezii*”, “typical” *ovalis*, “*brevinervis*”, “*fenestrellata*.”

Daltonia trachydonia Mitt. ex E.B. Bartram, Bull. Torrey Bot. Club 58:43. 1931, *nom illeg.*, *orthographic variant*.

Daltonia gomezii Crosby, Brenesia 4:10. 1974. PROTOLOGUE: COSTA RICA. Cartago: NW of La Ascensión, Crosby & Crosby 6130 (MO!), *syn. nov.*

Daltonia fenestrellata D.G. Griffin, Brittonia 32:214. 1980. PROTOLOGUE: COLOMBIA. Meta: Cerro Nevado de Sumapaz, Quebrada El Buque, 3350 m, Clef 7820 (U!).

Plants small to medium-sized, yellow-green to golden brown, in small to rather large tufts. Stems black, 10–50 mm high, branching irregularly. Leaves laxly erect-imbricate or moderately spiraling (in smaller plants), apex \pm curved to downward pointing when dry, erect to erect-spreading when moist, (1–)1.5–3 mm long, ovate-lanceolate to ligulate, cuspidate to long attenuate; margins narrowly revolute throughout, borders \pm confluent at apex or ending subpercurrently, 0–2 cells wide above, 6–14 cells wide at base; costa ending ca. $\frac{1}{2}$ – $\frac{3}{4}$ the leaf length; upper cells short-rhomboidal, firm-walled, median cells short rectangular-short linear/rhombic, basal cells short-rectangular to \pm quadrate, orange across the insertion. Asexual propagula small (10–30 μ m), orange-red, or larger (70–200 μ m), hyaline propagula present as well, ellipsoid to fusiform or rarely muriform, occurring over lamina. Setae smooth to slightly roughened in upper portion, red, 8–13 mm long; capsules erect, brown to \pm maroon, ovoid-cylindric, 1.0–1.5 mm long; exothecial cells subquadrate to hexagonal, firm-walled; exostome teeth orange at base becoming yellow above, densely spiculate throughout; endostome segments yellow, densely spiculate throughout. Spores finely papillose, 14–24 μ m diam.

Illustrations.—Fig. 6; Brotherus (1927, Pl. 6 fig. 20 from holotype *D. rufescens*); Bartram (1931, Pl. 3 fig. 7 as *D. brevinervis*, Pl. 4 fig. 18); Potier de la Varde (1955, fig. 28 A–K from holotype *D. plicata*); Matteri (1975, Lam. II figs. 1–9 as *D. trachyodonta*); Griffin (1980, figs. 1–8 as *D. fenestrellata*).

Habitat.—On twigs of trees and shrubs, rarely on bamboo nodes or rocks, occurring in páramos and cloud forests, at (1640–)3100–4300 m.

The variability in overall stem size, leaf shape, border width and extent and location of the elongate juxtacostal cells has helped to create confusion in this species. The only other *Daltonia* species in the Americas which exhibit at times, abundant, elongate juxtacostal cells are *D. lindigiana* and *D. marginata*.

Depauperate populations of *D. ovalis*, which sometimes consists of leaves with only a narrow band of elongate juxtacostal cells might be mistaken for *D. splachnoides*. The presence in *D. splachnoides* of sporophytes with markedly scabrose setae and relatively small capsules in comparison to relatively smooth setae and larger capsules of *D. ovalis* will help in distinguishing the two taxa. Larger plants of *D. splachnoides* are generally separable from *D. ovalis* by the consistently acute, plane leaf apex of *D. splachnoides* versus the subulate, cuspidate to attenuate apex of *D. ovalis*.

The more robust plants of *D. pulvinata* at times exhibit a very close similarity in leaf morphology although plants of *D. ovalis* generally have a more prominent attenuation at the leaf apex. The two can usually be separated by the frequent presence of larger, hyaline gemmae in *D. pulvinata* although I have seen similar gemmae in a few collections of *D. ovalis*. *Daltonia pulvinata* also generally has some plants with leaves horizontally spiraling about the stem while the leaves of *D. ovalis* are consistently erect.

The growth form represented by the type collections of *D. brevinervis* and *D. fenestrellata* is markedly different from “normal” *D. ovalis* plants. These plants have smaller leaves (1–1.5 mm long) that are narrowly ovate to ligulate-lanceolate with a generally downward curved, cuspidate apex. Some collections have this atypical form growing alongside “normal” *D. ovalis* and in some cases plants exhibit both types of leaves on the same stem. Collections by Churchill *et al.* 22772 (MO), van der Werff & Gudino 11457 (MO) and Cleef 7817 (U) contain plants that exhibit the wide array of variation in this species. A collection from Costa Rica (Arts CR 13/33 (BR)) is an excellent specimen for showing the extreme variation in size of the plants with the larger plants situated directly above the smaller ones on the same grass culm.

Characteristics that remain fairly stable are the golden brown color of the plants, the dark-orange cells across the insertion, the small orange-red propagula occurring over the lamina, elongate juxtacostal cells (often extending outwardly beyond the costa apex or at times fairly indistinctive (only 1–2 rows adjacent to the costa)), short, rectangular or quadrate arranged basal-mid laminal cells and a generally smooth or very lightly papillose seta. Most collections examined were taken from 3000 m or higher elevations.

Representative specimens examined: **BOLIVIA. Cochabamba:** Chapare, 80 km de Villa Tunari, between Locotal-Coroni, carretera nuevo Cochabamba-Santa Cruz, 17°12'S, 65°58'W, 2600 m, Churchill 22728 (MO). **La Paz:** Franz Tamayo, Area Natural de Manejo Integrado Apolobamba, 14°41'03"S, 69°05'35"W, 4150 m, Fuentes *et al.* 8311 (MO); Murillo, Mina San Luis, carretera de Nor Yungas, 16°18'57"S, 67°56'W, 3700 m, Churchill *et al.* 22772 (MO). **Santa Cruz:** Manuel M. Caballero, Serranía de Siberia, small lagoon E of Siberia, 17°50'S, 64°45'W, 2880 m, Churchill *et al.* 22029 (MO). **CHILE:** Valdivia, An Baumrinde im Stadtpark von Valdivia, Dec 1911, Herzog 5268 (FH, JE).

COLOMBIA. **Boyacá:** Municipio Chita, carretera Chita-Socha subiendo el Cardón, [6°11'N, 72°29'W], 3400 m, *Escobar A. & Santa 509* (NY). **Caldas:** Villamaría Municipio, cerca km 214 carretera que conduce el Nevado del Ruiz, 4°55'N, 75°21'W, 3575 m, *Churchill & Betancur 17923* (MO). **Cauca:** Volcán Purace, Cabeceras Río Vinagre, [2°19'N, 76°24'W], ca. 3800 m, *Cleef & Fernández P. 640* (U). **Cundinamarca:** an der Rinde von Vorpostenbaumchen, Páramo El Boqueron near Bogotá, [5°20'N, 73°42'W], 3300 m, *Troll 2176* (JE, S); Páramo Cruz Verde [4°34'N, 74°02'W, 3300 m, *Onraedt 78.A.9888* (BR). **Meta:** Cerro Nevado del Sumapaz, Quebrada El Buque, [3°56'N, 74°07'W], 3350 m, *Cleef 7820* (U). **Nariño:** Pasto Municipio, Volcán Galeras, in páramo, 1°12'N, 77°20'W, 3900 m, *Churchill & Rengifo M. 17476* (MO). **Quindío:** Cerca de La Linea, between Armenia and Ibagué, 4°28'N, 75°33'W, 3140 m, *Churchill 17197* (MO). **Risaralda:** Municipio de Santa Rosa de Cabal, cerca Hda. La Sierra, 4°49'N, 75°29.5'W, 3700 m, *Wolf 9* (U). **Santander:** Municipio Cerrito, carretera Presidente-Cerrito, Páramo del Almorzadero, [6°51'N, 72°42'W], 3750 m, *Escobar A. & Santa 290* (NY). **COSTA RICA.** **Alajuela:** vicinity of Crater of Volcán Poás, 32 km NW of N of city center of San José, 10°11'N, 84°14'W, 2500 m, *Crosby & Crosby 5896* (MO). **Cartago:** along Inter American Highway, bamboo brake about 8 km NW of summit of La Ascensión, 9°37'N, 83°47'W, *Crosby & Crosby 6130* (MO). **Heredia:** Las Vueltas area, 18 km N of San José, 10°06'N, 84°03'W, 2100 m, *Crosby & Crosby 5996* (MO). **San José:** Parque Nacional Tapanti, Macizo de la Muerta, Reserva Forestal Los Santos, summit of Cerro de la Muerta, W of Ruta 2 between Km 89 and 90, *Chusquea*-shrub páramo, 9°33'17"N, 83°45'24"W, 3500 m, *Buck 44214* (NY). **ECUADOR.** **Azuay:** 24 km S of Sigsig on road to Gualaquiza, 3°07'S, 78°49'W, 3265 m, *Buck 39330* (NY). **Carchi:** along road Tulcan-Maldonado, W of Tufino, 0°45'N, 77°55'W, 3730 m, *Buck 10217* (NY). **Cotopaxi:** Volcán Cotopaxi, NW slope, road from Panamerican Highway to Parque Nacional Cotopaxi, [0°41'S, 78°26'W], 3500 m, *Frahm & Gradstein 14* (U). **Imbabura:** Cordillera Oriental, road up N slope of Volcán de Cayambe, 0°07'N, 78°00'W, 3877 m, *Steere 26867* (NY). **Loja:** Pass on the road Loja-Zamora, [4°0'S, 79°13'W], 2900 m, *van der Werff 9454* (MO). **Napo:** Cerro Sumaco, [0°35'S, 78°38'W], 3750 m, *Madison 6938* (U). **Pichincha:** Cordillera Oriental along Quito-Baeza highway, just W of pass, [1°15'S, 78°12'W], 3800 m, *Steere & Balslev 25705* (NY). **Zamora-Chinchipe:** Cordillera de Sabanilla, ca. 44 km S of Vilcabomba on road to Zumba (Hwy 39), 4°30'S, 79°08'W, 2800 m, *Buck 39508B* (NY). **HONDURAS.** **Lempira:** Montaña de Celaque, Río Naranjo, ca. 10 km SW of Gracias, small peak SE of Camp Don Tomás, 14°32'N, 88°39'W, 2100–2370 m, *Allen 12008A* (MO). **MEXICO.** **Hidalgo:** Honey Station, [20°30'N, 99°00'W], *Pringle 10487* (L, MO, NY). **PANAMA.** **Chiriquí:** along road to summit of Volcán Baru, 8°27'N, 82°18'W, 1800–3400 m, *Allen 9160A* (MO). **PERU.** **Amazonas:** Chachapoyas, Calla Calla, [6°13'S, 77°51'W], 3100 m, *Hegewald & Hegewald 6963* (MO). **Ayacucho:** Huanta, between Tambo and Ayna, [12°47'S, 73°58'W], 3825 m, *Hegewald & Hegewald 9105* (MO). **Junín:** Huancayo, 56 km from Huancayo in direction of Parihuanca, 14 km from Chilifruta, [11°35'S, 74°35'W], 3650 m, *Hegewald & Hegewald 9271* (MO). **VENEZUELA.** **Aragua:** along highway in the vicinity of Colonia Tovar, [10°25'N, 67°17'W, 2000 m], *Pursell 9294* (MO). **Mérida:** Rangel, Sierra de Santo Domingo, [8°54'N, 71°00'W], 3500 m, *Griffin 1236* (MO).

7. *Daltonia pulvinata* Mitt., J. Linn. Soc., Bot. 12:398. 1869. (Fig. 7). PROTOLOGUE: COLOMBIA: Andes Bogotenses, prope Bogotá, Weir (HOLOTYPE: NY!).

Daltonia revoluta Broth., Philippine J. Sci. 5:156. 1910. PROTOLOGUE: PHILIPPINES: Luzon, Province of Benguet, Mount Pulog, *For. Bur. 16405 Curran, Merritt & Aschokke* (FH!, H-BR!).

Daltonia mildbraedii Broth., Wissenschaftliche Ergebnisse der Deutschen Zentral Afrika-Expedition 1907–1908, Botanik 2:164. 1910. PROTOLOGUE: Rugege-Wald: An Ästen spärlich, ca. 1200 m (Sep 1907), *J. Mildbraed 861* (H-BR!), [type packet has label information that appears to have elev. as 1900 m and a collection date of Aug 1907] *syn. nov.*

Daltonia pellucida Herzog, Biblioth. Bot. 87:128. 1916. PROTOLOGUE: BOLIVIA: Auf Baumstäben im Nebelwald über Comarapa, ca. 2600 m, *Herzog 4214, 4281, 4294* (JE!), *syn. nov.*

Daltonia constricta P. de la Varde, Rev. Bryol. Lichénol. 26:4. 1957. PROTOLOGUE: MOZAMBIQUE: Gorongosa mountain near Gogogo peak, 5800 ft, 6 Jul 1955, *E. Schelpe 5575a* (BM!, PC!), *syn. nov.*

Daltonia onraedtii Bizot, Rev. Bryol. Lichénol. 40:126. 1974. PROTOLOGUE: LA RÉUNION. Plaine des Cafres, aux sources Reilhac, sur un arbre isolé, *M. Onraedt 147* (PC!).

Plants small to medium-sized, yellow-olive green, in small to rather large tufts. Stems erect, orange to red, 3–15 mm high, rarely branching. Leaves markedly flexuose when dry, ± perpendicular and loosely arranged around stem, 1.0–2.5 mm long, oblong-lanceolate to oblong-ligulate, apex acute to acuminate, ± slightly falcate when wet; margins narrowly revolute on one or both sides, borders confluent at apex, 1–2 cells wide above, 8–16 cells wide at base; costa ending $\frac{3}{5}$ – $\frac{3}{4}$ the leaf length; upper cells short rhomboidal to linear to lenticular, mid laminar cells short rectangular to ± pentagonal/hexagonal or lenticular, basal cells short-rectangular to ± bulging hexagonal, ± quadrate. Asexual propagula medium-sized (60–75 µm) to large (125 µm), often numerous, hyaline (sometimes becoming darker when larger), fusiform, usually occurring in groups at the confluence of the leaf and stem. Setae papillose or ± smooth in upper half, orange-red, 4–11 mm long; capsules erect, olive-green to brown or ± bronze, ± cylindric, 1.0–2.0 mm long; exothecial cells quadrate to pentagonal/hexagonal or irregular, firm-walled; exostome pale yellow, papillose; endostome segments pale yellow, papillose. Spores relatively smooth to lightly papillose, 13–19 µm diam.

Illustrations.—Fig. 7; Bartram (1931, Plate 3 fig. 1, Plate 4 fig. 12 as *D. pellucida*); Sharp et al. (1994, fig. 573 a–e).

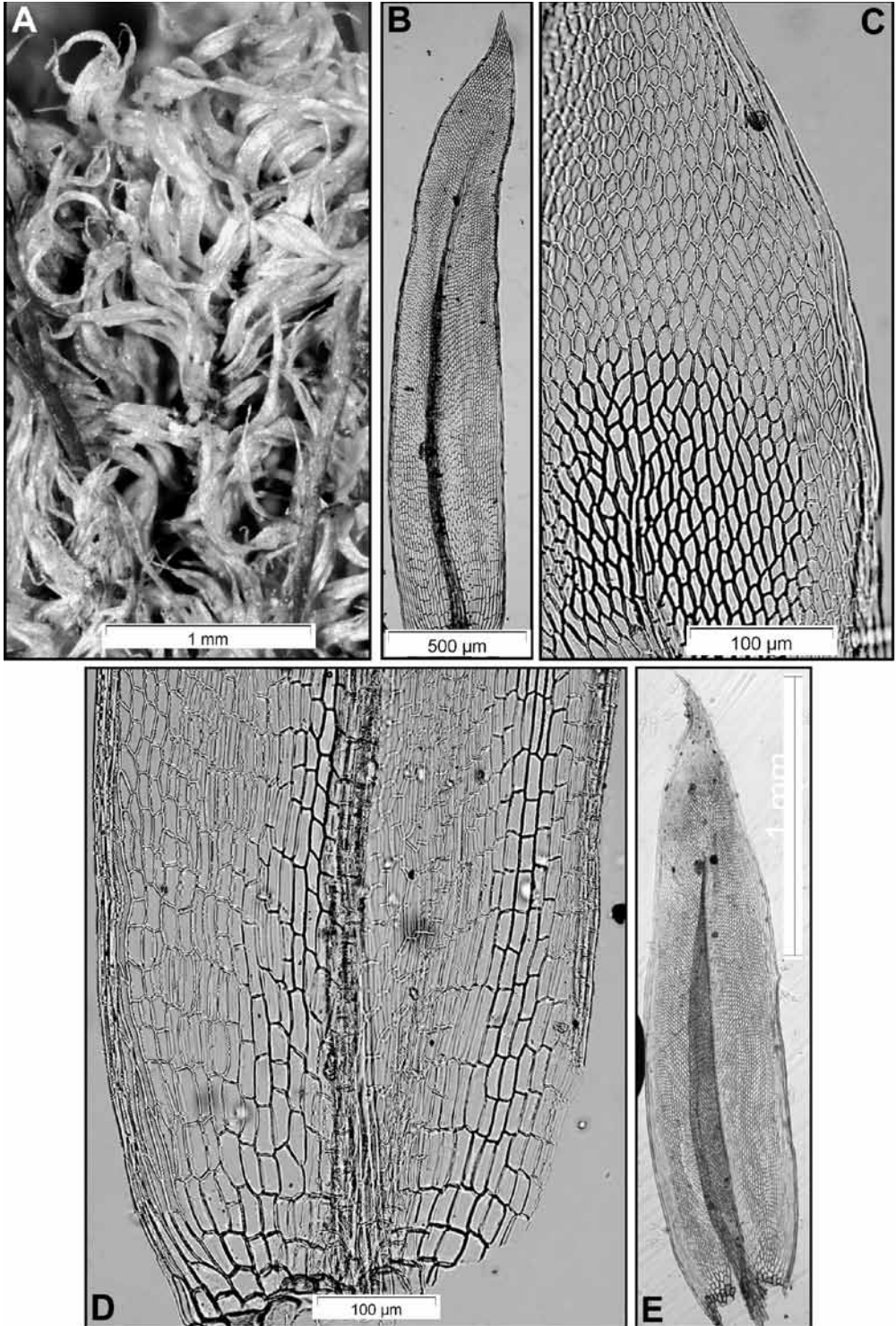


FIG. 7. *Daltonia pulvinata*. A. habit; B., E. leaf outlines; C. mid to upper leaf cells; D. basal cells.

Habitat.—On tree trunks and branches, (700–)1200–3800(–4200) m.

Daltonia pulvinata is generally very easy to recognize. Most collections have some plants with the horizontally, spiraling leaves around the stem that are not much evident in other members of the genus. At times plants of *D. jamesonii* have leaves somewhat spiraling near the branch apex but in that species the leaves have cells that are quadrate throughout most of the lamina whereas the cells of *D. pulvinata* are somewhat quadrate only in the bottom 1/3 of the lamina and predominately lenticular in the upper 2/3 of the lamina. Clusters of hyaline gemmae are frequently found near the insertion of leaves in the bottom half of the plant.

From the material I have examined it is not uncommon for *D. pulvinata* to be growing with *D. ovalis* and *D. splachnoides* and to a lesser extent *D. marginata*.

Representative specimens examined: **BELIZE**. Toledo: Columbia River Forest Reserve, limestone sink between Union camp and Camp 1, 16°22'N, 89°07'W, 700 m, *Allen 18677* (MO). **BOLIVIA**. Cochabamba: Chapare, Canton Paracti, Cordillera El Ronco, carretera antigua Chapare, 17°14'S, 65°42'W, 3800 m, *Churchill 20579-A* (MO). La Paz: Inquisivi, along the Arco Pongo trail between Japo and Cargadero, SW slope of Cerro Ventanani ca. 2 km N of Japo and 28 km NE of Inquisivi, 16°45'S, 66°56'W, 3800–3830 m, *Lewis 87-747* (MO). **BRAZIL**. Espirito Santo: Mun. Iuna, Parque Nacional do Caparaó, along trail from Terreirão to the summit of Pico da Bandeira, 20°25'S, 41°43'W, 2620 m, *Vital & Buck 11791* (NY). Minas Gerais/Rio de Janeiro: Serra do Itatiaia, [22°22'S, 44°42'W, 2000 m], *Dusen s.n.* (NY). São Paulo: Serra de Mantiqueira, Campos do Jordão, Pico do Itapeva, [22°44'S, 45°35'W], 2020 m, *Schäfer-Verwimp & Verwimp 6925* (MO). **COLOMBIA**. Antioquia: Municipio Medellín, Abajo de Boqueron, ca. 25 km NE of Medellín, 6°20'N, 75°10'W, 2500 m, *Churchill et al. 13948-B* (MO). Boyacá: El Cocuy Municipio, carretera El Cocuy subiendo a Chita, 6°02'N, 75°08'W, 3750 m, *Escobar 434* (MO). Caldas: Villamaria Municipio, cerca km 214 carretera que conduce el Nevado del Ruiz, 4°55'N, 75°21'W, 3575 m, *Churchill & Betancur 17923* (MO). Nariño: Municipio Pasta, bosque de la granja de Botana, 1°10'N, 77°15'W, 3000–3200 m, *Ramirez P. 3136* (MO). Puntarenas: Reserva Biológica de Bosque Nuboso de Monteverde, 10°15'N, 85°05'W, 1500–1600 m, *Crosby 9968*(MO). **COSTA RICA**. Cartago: just SE of summit of Cerro de la Muerte ridge, 45.7 km SE of El Empalme (3.2 km W of W entrance to Villa Milla), 8°36'N, 83°46'W, 3050 m, *Crosby 13134A* (MO). Puntarenas: Coto Brus Canton, 8°46'N, 83°03'W, 1100–1400 m, *Dauphin 1981* (MO). **ECUADOR**. Cotopaxi: N slopes of Mt. Cotopaxi, 0°40'S, 78°25'W, 3500 m, *Crosby 10716* (MO). Pichincha: Just W of NASA tracking station on lower, western slope of Loma Ruminahui Central, 0°37'S, 78°34'W, 3450 m, *Crosby 10602* (MO). **HONDURAS**. Comayagua: from Agua Amarilla to San José del Los Planes, ca. 11–15 km E of Lake Yojoa., 14°30'N, 88°53'W, 1850–2100 m, *Allen 12301* (MO). Cortes: Cusuco National Park, along Río Cusuco ca. 22 km W of San Pedro Sula & 16 km S of Cuyamel, 15°31'N, 88°14'W, 1500 m, *Allen 14085* (MO). Lempira: Montaña de Celaque, along Río Arquegual, 7.5 km SW of Gracias, 14°34'N, 88°39'W, *Allen 11163* (MO). **Ocotepaque**: Montaña del Candado, 13 km E of Nueva Ocotepaque & Cerro El Cocal, 12 km NE of Nueva Ocotepaque, 14°27'N, 89°04'W, 2200 m, *Allen 14488A* (MO). **Santa Bárbara**: E slope of Mt. Santa Bárbara, trail to minor peak, ca. 7 km N of El Mochito, 14°55'N, 88°07'W, 2220–2640 m, *Allen 11668* (MO). **MEXICO**. Hidalgo: Honey Station, [20°30'N, 99°00'W], *Pringle 10487* (L, MO, NY). **PANAMA**. Chiriqui: along road to summit of Volcán Baru, 8°45'N, 82°30'W, 3000 m, *Allen 9062* (MO). **PERU**. Amazonas: Chachapoyas, km 405 on Leymebamba-Balsas road, 6°45'S, 77°48'W, 3200 m, *Smith C401C* (MO). Apurimac: Abancay, behind the Socchaccasa Pass, 32 km from Abancay in the direction of Cusco, 13°36'S, 72°42'W, 4000 m, *Hegewald & Hegewald 8920* (MO). **Cajamarca**: Cajamarca, low bridge (Chalchuyacu) between Encanada and Celedin, 6°58'S, 78°15'W, 3350 m, *Hegewald & Hegewald 6614a*, (MO). **Cusco**: Anta, Indahuacho SW Cusco and Abancay, 13°28'S, 72°09'W, 3400 m, *Hegewald & Hegewald 8885* (MO). **Junin**: Huancayo, 56 km from Huancayo in direction of Parihuanca, 14 km from Chilifruta, 11°35'S, 74°35'W, 3650 m, *Hegewald & Hegewald 9270* (MO). **La Libertad**: Otuzco, near Usquil, 7°49'S, 78°25'W, 3100 m, *Hegewald & Hegewald 7203* (MO). **VENEZUELA**. Mérida: Distrito Rangel, Sierra de Santo Domingo, Páramo de Mucubají near Laguna Negra, [8°28'N, 71°05'W], 3550 m, *Griffin et al. 960* (MO).

8. *Daltonia splachnoides* (Sm.) Hook. & Taylor, *Musc. Brit.* 80. 1818. (**Fig. 8**). *Neckera splachnoides* Sm., *English Bot.* 36:2564. 1814. *Hookeria splachnoides* (Sm.) Hook., *English Bot.* 5, 1:74. 1836, *hom. illeg.* PROTOLOGUE: IRELAND: Secawn mountain near Dublin, *D. Taylor 56* (BM!).

Daltonia angustifolia Dozy & Molk., *Ann. Sci. Nat. Bot.*, sér. III, 2:302. 1844. PROTOLOGUE: BORNEO: sine loco, *Korthals s.n.* (L!), *syn. nov.* *Daltonia pusilla* Hook. f. & Wilson, *Flora Tasmaniae* 2:221. 1859. PROTOLOGUE: TASMANIA: near springs on Mount Wellington (very scanty specimen), growing on dead twigs, with *Hypnum aciculare*, *Oldfield 67* (NY!).

Daltonia longinervis Mitt., *J. Proc. Linn. Soc.* 7:163. 1863. PROTOLOGUE: [EQUATORIAL GUINEA]: Cameroon mountains and River Niger, Clarence peak, Fernando Po [Isla Bioko], with *Stereodon nitidifolius*, *Mann s.n.* (BM!, NY!), *syn. nov.*

Daltonia gracilis Mitt., *J. Linn. Soc., Bot.* 12:402. 1869. PROTOLOGUE: ECUADOR: Andes Quitensis, in sylvia Canelos, ad folia et ramulos præcipue Bambusarum (3000 ped.), *Spruce 560* (BM!, NY!), *syn. nov.* The type at NY consist mostly of *D. gracilis* but there is a little of *D. marginata* as well. The isotype at BM consists mostly of *D. marginata*.

Daltonia fendleri Müll. Hal., *Linnaea* 42:491. 1879. PROTOLOGUE: VENEZUELA: circa Valencia, *Fendler 131* (FH!, H- SOL!, W!).

Daltonia angustifolia var. *gemmaeophylla* M. Fleisch., *Die Musci der Flora von Buitenzorg* 3:959. 1908. PROTOLOGUE: WEST JAVA: Buitenzorg, am Gedeh und Pangerango (FH!), *syn. nov.*

Daltonia minuta Thér., *Rev. Bryol. N.* sér 3:39. 1930. PROTOLOGUE: CONGO BELGE: Mt. Ninagongo, *D. H. Linder 2170* (PC!), *syn. nov.*

Daltonia pseudostenophylla E.B. Bartram, *Bernice P. Bishop Mus. Bull.* 101:189. 1933. PROTOLOGUE: HAWAII: on branches in wet forest, trail to Nakalalua swamp, western Maui, alt. 4300 ft, 6 Feb 1930, *E.B. Bartram 435* (FH!), *syn. nov.*

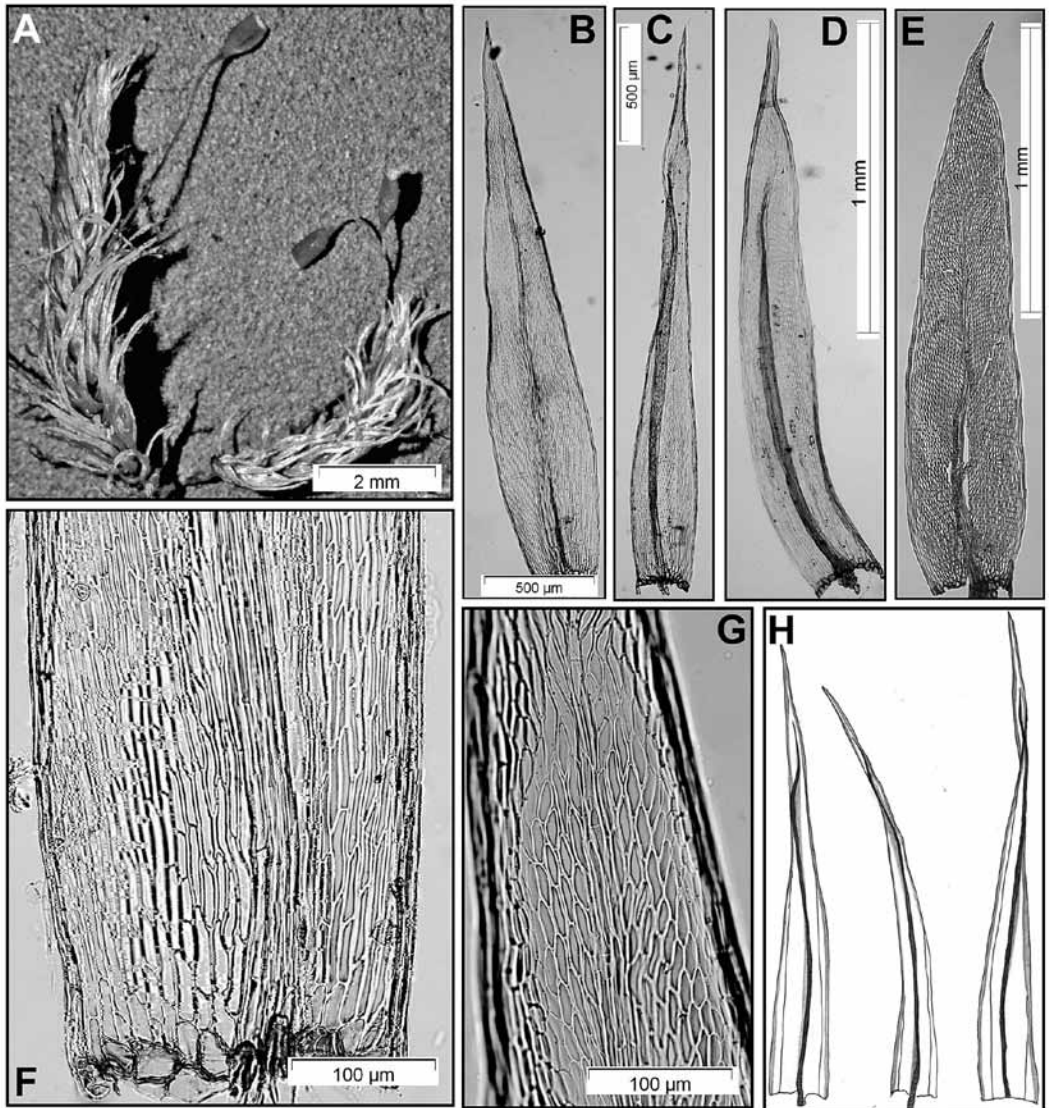


FIG. 8. *Daltonia splachnoides*. A. habit; B–E, H. leaf outlines (*H. "angustifolia"* drawn by G. Kis); F. basal lamina; G. cells of upper lamina.

Daltonia tortifolia Demaret & P. de la Varde, Bull. Jardin Bot. l'État 25:353. 1955. PROTOLOGUE: CONGO BELGE [Democratic Republic of the Congo]: District es lacs Edouard et Kivu, Ruwenzori, callon de la Kérére, 3750 m, *Demaret 5369* (BR!), *syn. nov.*

Daltonia tristaniensis Dixon in Christopherson, Results of the Norwegian Scientific Expedition to Tristan de Cuhna 48:39. 1960.

PROTOLOGUE: on tree fern, above Burntwood, Tristan de Cuhna, 600 m, 10 Jan 1938, *Christopherson & Mejlund s.n.* (BM!), *syn. nov.*

Plants small, yellow-green to bronze, in small to medium-sized tufts. Stems erect, orange, 3–10 mm high, branches infrequent to common. Leaves \pm erect, 1.5–2.5 mm long, linear-lanceolate, apex acute; margins narrowly recurved throughout, border 1–2 cells wide above, 5–8 cells wide at base, narrowly recurved throughout, costa ending ca. $\frac{3}{4}$ – $\frac{4}{5}$ leaf length; upper cells short-linear, median and basal cells short-rectangular to short-linear, thin-walled, light to dark orange across the insertion. Asexual propagula infrequent, small (15–25 μ m), orange, fusiform, occurring over the lamina. Setae generally papillose in upper half or occasionally \pm

smooth, 3–6(–10) mm long; capsules brown-bronze, cylindrical-ovoid, 0.5–1.2 mm long; exothecial cells rectangular to irregular; exostome yellow, papillose to spiculose; endostome segments yellow, spiculose. Spores papillose, 12–16 μm diam.

Daltonia splachnoides is the most far ranging member of the genus. It is known from all continents except Antarctica. It is perhaps due to this wide ranging existence that it bears so many superfluous names. One constant is the small size of the plants which are generally less than 6–7 mm tall although they are occasionally a little larger. Likewise the capsule is on average the smallest in the genus with perhaps the exception of *Daltonia apiculata* which is only found in southeastern Asia.

The species most likely to cause confusion in identifications of *D. splachnoides* are *D. ovalis*, *D. lindigiana* and *D. macrotheca* when these plants are on the smaller end of their size range. Characteristics useful in separating *D. splachnoides* from these three can be found under the relevant discussions above.

Illustrations.—Fig. 8; Hooker & Taylor (1818, Tab. 12); Dozy & Molkenboer (1862, Tab. 154, figs. 1–40 as *D. longipedunculata*); Fleischer (1908, fig. 165 a–i as *D. angustifolia*); Thériot (1930, fig. 7(1–8) as *D. minuta*); Bartram (1931, Pl. 4, fig. 17 *D. gracilis*); Bartram (1933, fig. 140 a–f as *D. pseudostenophylla*); Bartram (1939, Pl. 19, fig. 320 as *D. angustifolia*); Bartram (1949, fig. 131 1–J as *D. gracilis*); Welch (1966, figs. 122–130 as *D. gracilis*); Matteri (1975, Lam, III figs. 1–8 as *D. gracilis*); Gangulee (1977, fig. 735 as *D. angustifolia*); Tan & Robinson (1990, fig. 14 as *D. angustifolia*); Mohamed & Robinson (1991, figs. 23–29 as *D. angustifolia*); Sharp et al. (1994, fig. 576 a–e as *D. gracilis*); Churchill & Linares (1995, fig. 56 a–f as *D. gracilis*); Lin & Tan (1995, fig. 25 A–E as *D. angustifolia*); Buck (1998, Pl. 1, figs. 1–6 as *D. stenophylla*); Wu et al. (2002, Pl. 399, figs. 1–5 as *D. angustifolia*); Arts (2005, fig. 15, 1–12 as *D. angustifolia*).

Habitat.—Generally on twigs and tree trunks, rarely on rock or soil, occurring primarily between 1000–2700 meters but collections have been examined from near sea level to ca. 3700 meters.

Representative specimens examined: **BOLIVIA. Cochabamba:** Carrasco, Serrania Siberia, ca. 11 km oeste de El Churo, 17°45'S, 64°48'W, 2500 m, *Churchill et al.* 22560-A (MO). **La Paz:** Prov. Sud Yungas, 3.1 km SE of Unduavi bridge on old road, 16°11'S, 67°32'W, 3000 m, *Solomon* 8723 (MO). **Santa Cruz:** Manuel M. Caballero 11 km este de Siberia, 1 km por San Mateo en camino Nuevo, 17°50'S, 64°41'W, 2540 m, *Churchill et al.* 21884, (MO). **Tarija:** Arce, Municipio de Padcaya. Reserva Natural Alarachi, Zona Alarachi, Cerro Los Tejerinas, 22°11'S, 64°36'W, 2025 m, *Churchill et al.* 23402 (MO). **BRAZIL. Minas Gerais:** Pocos de Caldas, Morro São Domingos, 21°48'S, 46°34'W, 1580 m, *Schäfer-Verwimp & Verwimp* 14424 (BR, EGR, MO). **Rio de Janeiro:** Parque Nacional de Itatiaia, Pico das Agulhas Negras, N of Engo Passos and 13.1 km NE of União, 22°23'S, 44°41'W, 2370 m, *Vitt* 21572 (MO). **Santa Catarina:** Serra Geral, Serra Rio do Rastro, ca. 12 km W of Bom Jardim da Serra on road to Lauro Muller, at rim of summit plateau, 28°22'S, 49°32'W, 1470 m, *Vital & Buck* 12347 (NY). **São Paulo:** Serra de Mantiqueira, Campos do Jordão, Pico do Itapeva, 21°44'S, 46°35'W, 2020 m, *Schäfer-Verwimp & Verwimp* 6925 (MO). **CANADA. British Columbia:** Bigsby Inlet, on S side of first lake, head of inlet, Moresby Island, Queen Charlotte Islands, 50°38'N, 131°46'W, [150 m], *Schofield* 45167 (DUKE). **CHILI. Biobío:** Región VIII, Arauco, Huilquehue stream, 37°52'S, 73°14'W, 179m, *Ireland & Bellolio* 33611 (MO). **Los Lagos:** Osorno, between El Pato and Salto del Indio, along Ruta Internacional 215, Parque Nacional Puyehue, 40°34'S, 73°09'W, 750 m, *Deguchi* 31423 (HIRO). **COLOMBIA. Antioquia:** Municipio Medellín, Abajo de Boqueron, ca. 25 km NE of Medellín, 6°20'N, 75°10'W, 2500 m, *Churchill et al.* 13948-B (MO). **Boyacá:** Andes Bogatenses, Boqueron prope Bogotá, [4°55'N, 73°22'W, 2615 m], *Weir* 119 (NY). **Cundinamarca:** San Cayetano, 5°18'N, 74°04'W, 2820 m, *Cleef* 6592c (U). **Nariño:** Municipio de Pasto, between km 13–15 along road from Pasto to Laguna de la Concha, 01°12'N, 77°12'W, 3000 m, *Churchill & Arbelaez* 15963-b (NY). **COSTA RICA. Alajuela:** grounds of Rancho Trebol, 10°30'N, 84°30'W, 1400 m, *Crosby & Crosby* 3796 (MO). **Cartago:** Dos Amigos area, near 73 km marker on Inter American Highway, SE of El Empalme, 9°37'N, 83°50'W, 2680 m, *Crosby & Crosby* 5952A (MO). **Heredia:** Las Vueltas area, 18 km N of San Jose, 10°06'N, 84°03'W, 2100 m, *Crosby & Crosby* 6012(MO). **Puntarenas:** Coto Brus Canto, 8°46'N, 83°03'W, 1250 m, *Dauphin* 1981 (MO). **San José:** 13 km SE of El Empalme, 9°40'N, 83°51'W, 2600 m, *Crosby & Crosby* 5833 (MO). **CUBA. Santiago de Cuba:** Sierra Maestra, Gran Piedra, 20°05'N, 75°37'W, 1130 m, *Pöcs & Reyes* 9047/X (EGR). **DOMINICA. Parish St. George:** Giraudel, on the way to the summit of Mt. Anglais, 15°17'N, 61°22'W, 1 m, *Hegewald & Hegewald* 9555 (MO). **DOMINICAN REPUBLIC. La Estrella:** Sierra de Neiba, along road from La Descubierta to Hondo Valle, from 8–15 km N of Angel Feliz, 18°42'N, 71°45'W, 1630 m, *Buck* 4577 (NY). **Santiago:** Pico Diego de Ocampo, 19°35'N, 70°44'W, 1230 m, *Judd* 1590 (NY). **ECUADOR. Azuay:** 21 km S of Sigsig on road to Gualaquiza, 3°06'S, 78°48'W, 2928 m, *Buck* 39321A (NY). **Morona-Santiago:** along Gualaaceo-Gral. L. Plaza Gutierrez ("Limón") Hwy, 25.8 km SE of bridge at entrance to Maylas Reserva Ecología Natural, 23.6 km SE of shrine at crest of mountain, 3°00'S, 78°27'W, *Buck* 39275 (NY). **Napo:** 6 km E of Papallacta, 0°25'S, 78°05'W, 2880 m, *Buck* 9993 (NY). **Pichincha:** Volcan Pichincha, N slope along trail in water catchment area (Yanacochoa), 0°10'S, 78°35'W, 3700 m, *Buck* 9754 (NY). **GUADALOUPE:** Basse Terre, La Soufriere, Aufstieg von der Südostseite ostlich vom Parkplatz "Savane a Mulets," 1450 m, *Schäfer-Verwimp & Verwimp* 22555 (NY). **HONDURAS. Comayagua:** Cordillera de Montecillos Montaña de San Jaunillo, trail between Cerro San Jaunillo & La Danta, 14°30'N, 87°52'W, 2020 m, *Allen* 11031 (MO). **Cortes:** Cusuco National Park, along Rio Cusuco ca. 22 km W of San Pedro Sula & 16 km S of Cuyamel, 15°52'N, 88°14'W, 1500 m, *Allen* 14085 (MO). **Lempira:** Montaña de Celaque trail from Camp Don Tomás to first ridge,

14°34'N, 88°39'W, 2400 m, *Allen 11269* (MO). **Ocotepaque:** Montaña del Candado, 13 km E of Nueva Ocotepaque & Cerro El Cocal, 12 km NE of Nueva Ocotepaque, 14°27'N, 89°04'W, 2090 m, *Allen 14501* (MO). **Olancho:** Sierra de Algalta, Montaña Babilonia, La Picucha & saddle between peaks, 13 km NNW of Catacamas, 14°57'N, 85°55'W, 2354 m, *Allen 12736A* (MO). **JAMAICA. Parish St. Thomas:** between Portland Gap and Blue Mountain Peak, [18°15'N, 77°30'W], 2100 m, *Hegewald & Hegewald 8064* (MO). **Portland:** just N of Hardwar Gap, [18°00'N, 76°30'W], 1230 m, *Griffin 1104* (MO). **MEXICO. México:** Ocuilan, Lagunas de Zempoala, 19°40'N, 99°19'W, 2900 m, *Pócs 9546/D* (EGR). **Oaxaca:** along road N of Llano de Las Flores N of Oaxaca, [16°54'N, 96°00'W], 2250 m, *Iwatsuki & Sharp 5341* (MO). **Puebla:** between Acapulco and Cuetzalan, [19°30'N, 98°00'W], *Sharp et al. 1097-a* (MO). **Veracruz:** Jalapa Municipio, 17 km NE of Jalapa along Mex Rte 140., 19°32'N, 96°55'W, 2150 m, *Reese 4590-b* (MO). **NICARAGUA. Rivas:** Ometepe Island, [11°32'N, 85°42'W, 60 m], *B.S. s.n.* (FH). **PANAMA. Bocas del Toro:** Cerro Colorado, ca. 12 mi above Camp Chami, 8°35'N, 81°45'W, 1435 m, *Allen 5085A* (MO). **Chiriquí:** along road from gatehouse to summit of Volcán Baru, 8°45'N, 82°30'W, 3000 m, *Allen 9062A* (MO). **PERU. Amazonas:** Chachapoyas, Calla Calla between Balsas and Leimebamba, [6°13'S, 77°51'W], 3100 m, *Hegewald & Hegewald 6948a* (MO). **Apurímac:** Andahuaylas, Quebrada Pallcamayo near Huancarama, [13°39'S, 73°05'W], 3700 m, *Hegewald & Hegewald 5745* (MO). **Cajamarca:** Contumaza, Cerro Cunanten, [7°22'S, 78°51'W], 2900 m, *Hegewald & Hegewald 7326* (MO). **Cusco:** Suchubamba, just S of southern border of Manu Park on road 100, 3000 m, *Majestyk 4952* (pers. herb.). **Huanuco:** Aguas Calientes near Machu Picchu, [8°50'S, 74°41'W], 2100 m, *Hegewald & Hegewald 8790* (MO). **La Libertad:** Otuzco, near Usqui, [7°49'S, 78°25'W], 3100 m, *Hegewald & Hegewald 7203a* (MO). **PUERTO RICO. Jayuya:** high ridge trail from Toro Negro reservoir to Jayuya, [18°13'N, 66°35'W, 320 m], *Steere 6863* (NY). **VENEZUELA. Aragua:** along highway in the vicinity of Colonia Tovar, [10°25'N, 67°17'W], 1800 m, *Pursell 9294* (MO). **UNITED STATES. California:** San Francisco, Mt. Davidson summit area, [37°44'N, 122°27'W], 264 m, *Toren 9465* (pers. herb.), *Shevock 31555* (NY). **VENEZUELA. Aragua:** along highway in the vicinity of Colonia Tovar, [10°25'N, 67°17'W], 1800 m, *Pursell 9294* (MO).

APPENDIX

Index to new synonymy within *Daltonia*

- | | |
|--|--|
| <i>D. androgyna</i> Geh. & Hampe = D. ovalis | <i>D. longicuspidata</i> Müll. Hal. = D. marginata |
| <i>D. angustifolia</i> Dozy & Molk = D. splachnoides | <i>D. longifolia</i> Taylor = D. marginata |
| <i>D. aristata</i> Geh. & Hampe = D. marginata | <i>D. longinervis</i> Mitt. = D. splachnoides |
| <i>D. brasiliensis</i> Mitt. = D. marginata | <i>D. mildbraedii</i> Broth. = D. pulvinata |
| <i>D. brevinervis</i> E.B. Bartram = D. ovalis | <i>D. minuta</i> Thér. = D. splachnoides |
| <i>D. constricta</i> P. de la Varde = D. pulvinata | <i>D. mittenii</i> Kis = D. marginata |
| <i>D. contorta</i> Müll. Hal. = D. marginata | <i>D. pellucida</i> Herzog = D. pulvinata |
| <i>D. contorta</i> var. <i>humilis</i> M. Fleisch. = D. marginata | <i>D. peruviana</i> Mitt. = D. bilimbata |
| <i>D. dusenii</i> Müll. Hal. ex Broth. = D. marginata | <i>D. plicata</i> P. de la Varde = D. marginata |
| <i>D. eurylopa</i> P. de la Varde = D. marginata | <i>D. pseudostenophylla</i> E.B. Bartram = D. splachnoides |
| <i>D. flexifolia</i> Mitt. = D. marginata | <i>D. rufescens</i> Broth. = D. ovalis |
| <i>D. gomezii</i> Crosby = D. ovalis | <i>D. stenoloma</i> Besch. = D. lindigiana |
| <i>D. gracilis</i> Mitt. = D. splachnoides | <i>D. stenophylla</i> Mitt. = D. lindigiana |
| <i>D. intermedia</i> Renaud & Cardot = D. marginata | <i>D. tenuifolia</i> Mitt. = D. macrotheca |
| <i>D. jamesonii</i> var. <i>laevis</i> Herzog = D. jamesonii | <i>D. tortifolia</i> Demaret & P. de la Varde = D. splachnoides |
| <i>D. latimarginata</i> Besch. = D. marginata | <i>D. trachyodonta</i> Mitt. = D. ovalis |
| <i>D. latimarginata</i> var. <i>madagassa</i> Renaud = D. marginata | <i>D. tristaniensis</i> Dixon in Christopherson = D. splachnoides |
| <i>D. latolimbata</i> Broth. = D. marginata | |

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