
Five New Species of *Chusquea* (Poaceae: Bambusoideae) and a New Combination

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ABSTRACT. Five new species, *Chusquea falcata*, *C. subulata*, *C. barbata*, *C. spathacea*, and *C. pulchella*, are described and illustrated. One new combination, *Chusquea attenuata* (Doell in Martius) L. G. Clark, is proposed for a Brazilian species originally described as an *Arundinaria*, based on a vegetative specimen.

During the course of floristic and phylogenetic studies in the neotropical woody bamboo genus *Chusquea* Kunth, I have discovered a number of species new to science, of which five are described here. A previously poorly known species of *Arundinaria* Michaux from Brazil is transferred to *Chusquea*, and the new combination is made.

Chusquea falcata L. G. Clark, sp. nov. TYPE: Ecuador. Loja: Parque Nacional Podocarpus, above Nudo de Cajanuma, wet montane forest around "Centro de Información," 2,800–3,000 m, 14–15 May 1988 (fl), B. Øllgaard, J. E. Madsen & L. Christensen 74116 (holotype, QCA; isotype, AAU). Figure 1A–D.

Culmi ca. 1–1.5 cm diametro, 1.5–3(6–8) m alti; erecti ad basim, interdum arcuati ad apicem. Folia culmorum 18–32 cm longa, fragilia, glabra; vaginae 17–30 cm longae, (7–)10–20-plo longiores quam lamina; laminae 1.2–2.7 cm longae. Gemma centralis rotundata. Ramificatio infravaginalis; rami subsidiarii cujusvisque nodi 30–60. Folia cujusvisque complementi 3–4; laminae 7.8–20 cm longae, 0.4–0.85 cm latae, ratio long.:lat. = (11–)17.5–35, apice setosae, basi rotundato-attenuatae. Paniculae (5–)7–16 cm longae, angustae. Spiculae (4.6–)5.1–6.5 mm longae, falcatae, nitidae. Glumae 2, squamiformes. Lemmata sterilia 2, mucronata. Lemma fertile 4.3–5.7 mm longum, mucronatum.

Culms ca. 1–1.5 cm diam., 1.5–3(6–8) m tall, erect at base, scandent to arching above. Internodes terete, usually glabrous, sometimes scabrous below the nodes. Culm leaves 18–32 cm long, just surpassing the next node, abaxially glabrous, brittle, eventually deciduous, juncture of sheath and blade abaxially indistinguishable or nearly so; sheaths 17–30 cm long, (7–)10–20 times as long as the blade, the overlapping margin ciliate, not fused at the base; blades 1.2–2.7 cm long, triangular, erect, persistent, adaxially pubescent, apex subulate; girdle 1–3 mm

wide, glabrous; inner ligule ca. 0.5 mm long, ciliate, pubescent. Nodes at mid-culm with the circular central bud subtended by numerous smaller subsidiary buds in a constellate arrangement; sheath scar dipping below the bud/branch complement; supranodal ridge a visible but not prominent line. Branching infravaginal; central branch sometimes developing; leafy subsidiary branches 30–60 per node, 11–27 cm long, sometimes rebranching from the base. Foliage leaves 3–4 per complement; sheaths glabrous, the overlapping margin ciliate, a tuft of cilia present on each side of the sheath apex, cilia ca. 1 mm long; blades 7.8–20 cm long, 0.4–0.85 cm wide, L:W = (11–)17.5–35, adaxially usually glabrous but sometimes hispid toward the base of the midrib, abaxially usually glabrous, sometimes sparsely pilose, not tessellate or only weakly so, apex setose, base rounded-attenuate; pseudopetiole 1.5–2 mm long, adaxially hispidulous, abaxially glabrous; outer ligule a short, usually ciliate rim, 0.3–0.5 mm long; inner ligule 0.5–0.6 mm long, truncate, abaxially pubescent. Panicles (5–)7–16 cm long, narrow, the base usually either retained within the subtending sheath or just fully exerted; rachis ± flattened at the base, angular above, glabrous, the edges scabrous, the basal bract 1.5–4 mm long, papery, pubescent, ciliate; branches 2–3 cm long at the base, angular, glabrous to scabrid, the lower branches ascending to appressed, the upper branches appressed; pedicels 1–4 mm long, angular, glabrous to scabrid. Spikelets (4.6–)5.1–6.5 mm long, falcate, shiny. Glumes 2, scalelike, obtuse, abaxially sparsely pubescent toward the apex; glume I 0.4–0.9 mm long, ca. $\frac{1}{8}$ the spikelet length, 1-nerved; glume II 1–1.8 mm long, ca. $\frac{1}{6}$ the spikelet length, 1–3-nerved. Sterile lemmas 2, mucronate, glabrous; sterile lemma I 1.6–2.9 mm long, ca. $\frac{1}{2}$ the spikelet length, 3-nerved; sterile lemma II 2.7–4 mm long, ca. $\frac{2}{3}$ the spikelet length, 3- or 5-nerved. Fertile lemma 4.3–5.7 mm long, mucronate, glabrous, 5- or 7-nerved. Palea 4.2–5.3 mm long, subequal to the fertile lemma, bimucronulate, 4-nerved, sulcate only toward the apex, the sulcus scabrous-hispid. Stamens 3; anthers 2.7 mm long. Lodicules 3; anterior pair 2.1 mm long, posterior one 1.8 mm long, all apically ciliate. Fruit unknown.

Distribution. Endemic to upper montane forests and heath scrub in southern Ecuador; (2,400–) 2,800–3,500 m.

Chusquea falcata is characterized by brittle culm leaves that just surpass the next higher node, infravaginal branching, a circular central bud, somewhat narrow foliage leaf blades, narrow panicles, and shiny, falcate spikelets, for which it is named. It is not clear from the label data of the flowering specimens whether any of the flowering events represented a gregarious bloom. *Chusquea falcata* is apparently a narrow endemic from southern Ecuador, a distribution shared by several additional, as yet undescribed, species of *Chusquea*.

Paratypes. ECUADOR. **Azuay:** eastern Cordillera, 4–6 km N of the village of Sevilla de Oro, 6 Aug. 1945 (fl), *Camp E-4764* (NY). **Loja:** Parque Nacional Podocarpus, Cajanuma, Sendero al Mirador, 2,900 m, 1 June 1992, *Clark et al. 1105* (AAU, ISC, MO, QCA, QCNE, US); pass on old road between Loja and Saraguro, about 10 km S of Saraguro, 3,250 m, 3 June 1992, *Clark et al. 1121* (AAU, ISC, MO, QCA, QCNE, US); carretera Loja–Yangana, desvío al Parque Nacional Podocarpus, E del Nudo de Cajanuma, 2,880–3,000 m, 14 Mar. 1989 (fl), *Freire F. 1329* (QCA); Loma del Loro, 6 km S of Saraguro on road to Loja, 3,200 m, 11 Feb. 1985 (fl), *Halling & Andersson 21924* (QCA); carretera Yangana–Toledo, 2,800–3,200 m, 28 dic. 1988 (fl), *Jaramillo 10623* (QCA); Loma del Oro, 2,800–3,250 m, *Jaramillo et al. 8794* (QCA); Parque Nacional Podocarpus, Cajanuma, at Casa de Predesur, 2,850 m, 21–22 Feb. 1985, *Laegaard 53611* (AAU); road Vilcabamba–Valladolid, at pass, 2,800–2,900 m, 28 Feb. 1985 (fl), *Laegaard 53754* (AAU); in pass approximately 10 km S of Saraguro, 3,500 m, 31 Aug. 1985, *Laegaard 55157B* (AAU); Cordillera del Loro, 50 km N of Loja, just before descending toward Saraguro, along road to radar station, 3,000–3,200 m, 8 May 1987 (fl), *van der Werff & Palacios 9410* (QCNE); 12 km S of Saraguro on the road to Loja, just over the pass in an area called “La Bajada del Piche,” 3,100 m, 29 May 1980, *Young 142* (US). **Loja/Zamora–Chinchipe:** at pass on road from Zamora to Loja, just above the intersection of the old and new highways, 2,800 m, 31 May 1992, *Clark et al. 1100* (AAU, ISC, MO, QCA, QCNE, US); carretera Loja–El Paso–Zamora, El Paso, 2,800 m, 15 Mar. 1989 (fl), *Freire F. 1365* (QCA). **Zamora–Chinchipe:** road Vilcabamba–Valladolid, Km 5 S of provincial border, 2,400 m, 28 Feb. 1985, *Laegaard 53747* (AAU); along road Loja–Zamora, SW of the pass, 2,800 m, 2 Sep. 1985, *Laegaard 55173A & B* (AAU).

Chusquea subulata L. G. Clark, sp. nov. TYPE: Ecuador. Pichincha: on the road N from Calacali to San José de Niebli, 2,750 m, 2 May 1980 (fl), *S. M. Young 124* (holotype, QCA; isotypes, NY, US). Figure 1E–H.

Culmi (4–)6–8(–10) cm diametro, (3–)7–10 m alti, erecti ad basim, interdum arcuati ad apicem. Folia culmorum 23–47.5 cm longa; vaginae 19–45 cm longae,

(5–)10–22.6-plo longiores quam lamina, abaxialiter pubescentes ad basim; laminae 1.3–4 cm longae. Gemma centralis triangularis. Ramificatio extravaginalis; rami subsidiarii cujusquisque nodi 16–30. Folia cujusquisque complementi 4–5; laminae 11–23 cm longae, (0.9–)1.3–2 cm latae, ratio long.:lat. = 8.4–17.4, apice setosae, basi rotundatae vel rotundato-attenuatae. Paniculae (7.5–)10–26 cm longae, angustae. Spiculae (7.2–)8–10 mm longae, pubescentes. Glumae 2, squamiformes. Lemmata sterilia 2, subulata. Lemma fertile (6.6–)7.2–8.6 mm longum, subulatum.

Culms (4–)6–8(–10) cm diam., (3–)7–10 m tall, erect at the base, arching toward the apex. Internodes ± deeply sulcate above the bud/branch complement, glabrous or pubescent. Culm leaves 23–47.5 cm long, the juncture of the sheath and blade abaxially obscure; sheath 19–45 cm long, (5–)10–22.6 times as long as the blades, abaxially usually pubescent toward the base and otherwise glabrous, rarely completely hispid-pubescent, the overlapping margin ciliate, margins not fused at the base; blades 1.3–4 cm long, triangular, erect, persistent, adaxially pubescent, adaxially usually glabrous, rarely hispid-pubescent, the apex subulate or subulate-setose; girdle ca. 3 mm wide, glabrous; inner ligule 1–3 mm long, ciliate, not extending completely to either margin. Nodes with one triangular central bud subtended by several to numerous smaller subsidiary buds in a constellate arrangement; sheath scar dipping slightly below the bud/branch complement. Branching extravaginal; central branch sometimes developing at the upper nodes; leafy subsidiary branches 16–30 per node, 30–50 cm long, sometimes basally rebranching. Foliage leaves 4–5 per complement; sheaths glabrous, rarely hispid-pubescent between the nerves, the overlapping margin ciliate; blades 11–23 cm long, (0.9–)1.3–2 cm wide, L:W = 8.4–17.4, adaxially glabrous, abaxially glabrous or pilose, not tessellate to weakly so, the apex setose, the base rounded to rounded-attenuate; pseudopetiole 2–5 mm long, glabrous; outer ligule 0.7–1(–2) mm long, ciliolate or glabrous; inner ligule 1–4 mm long, usually rounded, abaxially pubescent. Panicles (7.5–)10–26 cm long, the base often retained within the subtending sheath; rachis ± complanate below, becoming angular toward the apex, glabrous, scabrid, or glabrous at the base and scabrous-pubescent toward the apex; branches appressed to ascending, angular, scabrous to short pubescent, the lower ones 3–8 cm long; pedicels 1–3(–4) mm long, angular, scabrous. Spikelets (7.2–)8–10 mm long, linear. Glumes 2, scalelike, acute or obtuse, less than $\frac{1}{10}$ the spikelet length, abaxially pubescent; glume I 0.6–0.8(–1) mm long, usually 1-nerved; glume II 0.8–1(–1.4) mm long, 1-, 2-, or 3-nerved. Sterile lemmas 2, subulate, abaxially

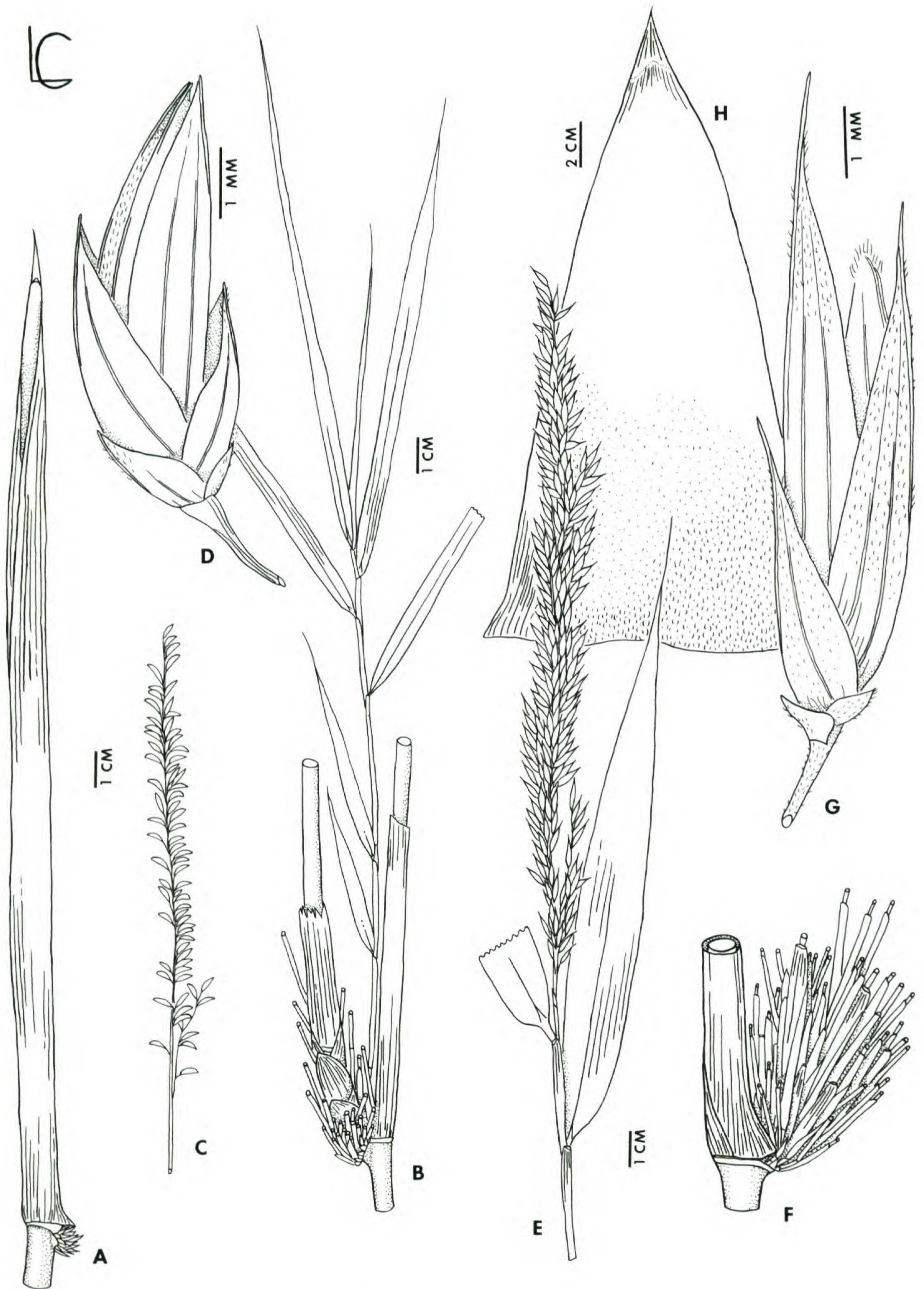


Figure 1. *Chusquea falcata* L. G. Clark and *Chusquea subulata* L. G. Clark. A-D. *Chusquea falcata* (A, B, Clark et al. 1100; C, Camp E-4764; D, Jaramillo 10623). —A. Young node and internode showing the culm leaf, emerging subsidiary branches, and infravaginal branching. —B. Mature branch complement with a developed central

pubescent; sterile lemma I ca. $\frac{1}{2}$ the spikelet length, (3.1–)3.8–4.6 mm long, 3- or 5-nerved; sterile lemma II ca. $\frac{1}{5}$ the spikelet length, 5.8–7.7 mm long, 5-nerved. Fertile lemma (6.6–)7.2–8.6 mm long, subulate, abaxially pubescent toward the apex, 7- or 9-nerved. Palea 5.5–6.9 mm long, bimucronulate, ciliate at apex, sulcate only toward the apex, 4- or 6-nerved. Lodicules 3; anterior pair 1.2–1.5 mm long, posterior one 0.8–1.3 mm long, all apically ciliate. Stamens 3; anthers 3.8–5 mm long. Caryopsis 3.5 mm long, dark reddish brown; hilum linear; embryo 0.6 mm long.

Distribution. Often on steep slopes in upper montane forest in central Ecuador with two disjunct populations in the Central Cordillera of Colombia; 2,260–2,800 m.

Distinguished by its strongly subulate sterile and fertile lemmas, for which it is named, *Chusquea subulata* is also characterized by culms usually ca. 6–8 cm in diameter and ca. 7–10 m tall, extravaginal branching, foliage leaf blades 11–23 cm long and more or less ovate toward the base with setose apices, narrow panicles with the branches and pedicels appressed, and spikelets (7.2–)8–10 mm long. This species is similar in many respects to the common *Chusquea scandens* Kunth, and the two species are likely closely related. However, *C. scandens* is easily distinguished by its open panicles with spreading branches and pedicels, and spikelets 5.5–7.7(–8.6) mm long with only mucronate sterile and fertile lemmas. Vegetatively, *C. scandens* is less robust, reaching only 1–2.5 cm in diameter and 2–6(–8) m in height. The foliage leaf blades of *C. scandens* are 6–17 cm long, and more or less lanceolate, and the apex is at most short setose (Clark, unpublished data).

Except for the two disjunct populations in the Central Cordillera of Colombia, *Chusquea subulata* is restricted to central Ecuador. This distribution pattern is analogous to that of *C. albilanata* L. G. Clark & Londoño, which also has most of its populations in central Ecuador, with one disjunct population in the Eastern Cordillera of Colombia (Clark & Londoño, 1991). The two species are not closely related, and at present, no other species of *Chusquea* with this distribution pattern are known.

According to label data, most of the Ecuadorian populations of this species underwent a mass flowering from 1979 to 1980. One of the Colombian populations (Clark *et al.* 261) flowered gregariously at about this time, although the other population (Clark & Londoño 379) flowered out of synchrony in 1988. The only other flowering specimen was collected in 1949 (Acosta-Solis 14459), which suggests a flowering cycle of about 30 years, but mass flowering of the Imbabura population was not confirmed for the 1979–1980 flowering event. Caryopses are known only from Clark *et al.* 261, and it is not known if the Ecuadorian populations regenerated from seeds or rhizomes.

Paratypes. COLOMBIA. **Quindío:** 13 km above Salento on the road to La Ceja, 2,860 m, 28 Jan. 1988 (fl), Clark & Londoño 379 (COL, ISC, TULV, US). **Tolima:** Cerro Bravo, road from Manizales to Bogotá, not far from the Caldas border, 2,750 m, 12 Feb. 1982 (fl), Clark *et al.* 261 (COL, ISC, US). ECUADOR. **Imbabura:** area Macho–Loma, sección Shanshipamba, 2,500 m, 17 Nov. 1949 (fl), Acosta-Solis 14459 (US). **Pichincha:** Reserva Geobotánica Pululahua, camino a Lulumbamba, 1,800–3,356 m, 3 Nov. 1987 (fl), Cerón M. 2567 (ISC); road descending to the crater of Pululahua, about 7 km from the road to Calacali and 5 km from the entrance to the Reserva Geobotánica Pululahua, 2,800 m, 26 Aug. 1992 (fl), Clark *et al.* 307 (ISC, QCA, US); old Quito–Santo Domingo road, E of Chiriboga, western slope, 2,560 m, 27 Aug. 1982 (fl), Clark *et al.* 315 (ISC, QCA, US); along road between Nono and Nanegal, between Nono and Tandayapa, 8.8 km before Tandayapa, 2,660 m, 16 Dec. 1979 (fl), Croat 49333 (MO, US); pass between Otavalo and San José de las Minas, 3,000 m, 6 Apr. 1979, Holm-Nielsen 16798 (QCA); crater of Pululahua, 100 m from the old road, 2,600 m, 5 Apr. 1979 (fl), Holm-Nielsen 17058 (AAU, QCA); Lloa valley, 2,600 m, 18 May 1980 (fl), Holm-Nielsen 23521 & 23554 (AAU); growing along the Saloya river at Km 34.5 from Quito and also just above Guarumal bridge, 21 Aug. 1945, McClure 21412 (US); Quito, in the Parque Alameda, where it is planted in the border of shrubs around the lake, 2,800 m, 23 Oct. 1945, McClure 21427 (ISC, US); 24 km E of Tandapi on the road from Santo Domingo to Quito, 8,100 ft., 3 Aug. 1980 (fl), Wunderlin *et al.* 8709 (AAU, MO—1 sheet); 10 km NW of Nono on road to Nanegal, steep slope next to Alambi River in cloud forest, 2,410 m, 11 Jan. 1980, Young 52 (QCA, US); 17 km W of Lloa, 27 Jan. 1980 (fl), Young 58 (QCA, US); 9 km W of the town of Nono on the road to Nanegalito, 2,410 m, 15 June 1980 (fl), Young 173 (NY, QCA, US); 67 km E of Santo Domingo on the new road to Quito, 2,260 m, 15 June 1980 (fl), Young 174 (QCA, US).

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branch and a foliage leaf complement. —C. Inflorescence. —D. Spikelet. E–H. *Chusquea subulata* (E, Cerón 2567; F, G, Young 124; H, Young 173). —E. Inflorescence with a subtending foliage leaf. —F. Branch complement showing extravaginal branching. —G. Spikelet. —H. Culm leaf, abaxial view.

Chusquea barbata L. G. Clark, sp. nov. TYPE: Peru. Pasco: Prov. Oxapampa, Serranía de San Matías, W slope, E of Loma Linda, 400–700 m, 15 June 1983 (fl), *A. Gentry, D. Smith & N. Jaramillo 42007* (holotype, MO; isotypes, ISC, US). Figure 2.

Culmi ignoti. Gemma centralis triangularis. Ramificatio extravaginalis; rami subsidiarii cujusquisque nodi 20–25. Laminae foliorum 7.7–11.7 cm longae, 0.6–0.9 cm latae, ratio long.:lat. = 11.8–13.8, apice acuminato-mucronatae, basi rotundato-attenuatae. Inflorescentiae constantes ex 1(–3) spiculis, per 4–6 bracteas subtentis; bracteae curvinerves. Spiculae 9.1–12.1 mm longae. Glumae valde redactae, cupuliformes. Lemmata sterilia 2, scabrida, mucronata, curvinervia. Lemma fertile 9.7–11.1 mm longum, subulatum, barbatum ad medium, pili ca. 1 mm longi, vitrei, rigidi, cinnamomei.

Culms unknown, described as a vine on the label. Internodes 2 mm diam., ca. 24 cm long, terete. Culm leaves unknown. Nodes with a \pm triangular central bud subtended by ca. 20–25 subsidiary branches; nodal line dipping somewhat below the branch complement; supranodal ridge \pm prominent; nodal region 4–6 mm wide, relatively large. Branching extravaginal; the more robust subsidiary branches 8–12 per node, 35–70 cm long, whiplike, bearing foliage leaves and/or spikelet clusters, the slender, short subsidiary branchlets terminating in spikelets. Foliage leaf sheaths scabrid, the overlapping margin ciliate, the cilia glassy, reddish gold, following the curve of the internode; blades 7.7–11.7 cm long, 0.6–0.9 cm wide, L:W = 11.8–13.8, adaxially and abaxially glabrous, but adaxially one primary nerve next to the midrib prominent and scabrous for nearly the full length, not tessellate, apex acuminate-mucronate, base rounded-attenuate, one margin glabrous, the other minutely serrulate; pseudopetiole 2 mm long, hispidulous; outer ligule 0.7–1 mm long, ciliolate, abaxially hispid-pubescent on the upper 0.6–0.8 mm, this part also usually a darker brown; inner ligule 1–1.5 mm long, rounded, abaxially pubescent. Inflorescence usually consisting of a solitary spikelet terminating a short, slender subsidiary branch, sometimes the branch bearing one or two additional spikelets, the base of the branch covered by the 4–6 small bracts subtending each spikelet; bracts 0.8–3.6 mm long, acute to mucronate, the lateral nerves curving strongly toward the apex, often almost connecting with the adjacent nerve, apparently lacking buds in their axils; internode (pedicel) between the uppermost subtending bract and the spikelet 0.5–1 mm long, glabrous, somewhat ridged. Spikelets 9.1–12.1 mm long, \pm laterally compressed. Glumes 2?, minute, apparently present as a glabrous cupule 0.1–0.3 mm long.

Sterile lemmas 2, scabrid, mucronate, 7- or 9-nerved, the lateral nerves curving strongly toward the apex; sterile lemma I 4.1–5.7 mm long, ca. $\frac{1}{2}$ the spikelet length; sterile lemma II 5.7–8 mm long, ca. $\frac{2}{3}$ the spikelet length. Fertile lemma 9.7–11.1 mm long, subulate, scabrid, 7- or 9-nerved, the lower $\frac{1}{2}$ heavily bearded except along the keel, the hairs ca. 1 mm long, glassy, stiff, reddish gold or dark reddish gold. Palea 8.5–9 mm long, shorter than the fertile lemma, bimucronulate, scabrid, 4- or 6-nerved, weakly 2-keeled, the sulcus with a few scattered glassy hairs. Stamens 3, anthers 3.7–4.4 mm. Lodicules 3; anterior pair 2.4 mm long, basally strongly swollen, apically ciliate, the posterior one 1.8 mm, apparently with one filament adnate on each margin for about $\frac{1}{2}$ the length. Fruit unknown.

This unusual species is known only from the type specimen, and no habitat information is available. In addition to the heavily bearded fertile lemmas, for which the species is named, *C. barbata* possesses two other synapomorphies: the inflorescences of one to three spikelets, and the strongly curving lateral nerves of the bracts and sterile lemmas. The apparent fusion of two of the filaments to the posterior lodicule is also unique, but given the advanced condition of most of the spikelets on the available specimens, it is not possible to confirm the presence of this feature. In this specimen, there are both more robust, well-developed subsidiary branches and slender, short subsidiary branches that terminate directly in spikelets (i.e., the “inflorescences”), but it is not known if the two sizes of subsidiary branches are produced during normal vegetative growth.

Correct interpretation of the spikelets and inflorescences of this species is complicated by the apparent reduction in these structures. The single fertile floret and two sterile lemmas are readily recognizable, and disarticulate together as in other species of *Chusquea* (Fig. 2C, arrow). Based on this homology, the small cupule that remains at the apex of the flowering axis is assumed to represent the two reduced glumes. Extreme reduction or loss of the glumes is known in other species of *Chusquea*, such as *C. fendleri* Munro, *C. coronalis* Soderstrom & C. Calderón, and *C. depauperata* Pilger (Clark, 1989). The internode between the subtending bracts and the cupule is the pedicel.

If we accept the structure described above as the spikelet, then the spikelet and the branch it terminates constitute the inflorescence. The four to six small bracts at the base of the branch, subtending the spikelet(s), most likely represent either the cataphylls that normally appear at the base of a subsidiary branch in *Chusquea*, in which case the rest



Figure 2. *Chusquea barbata* L. G. Clark (*Gentry et al.* 42007). —A. Segment of subsidiary branch showing spikelet clusters. —B. Branch complement with foliage leaves. —C. Detail of one spikelet cluster showing two spikelets; arrow indicates line of disarticulation. —D. Subtending spikelet bract showing the curvature of the nerves.

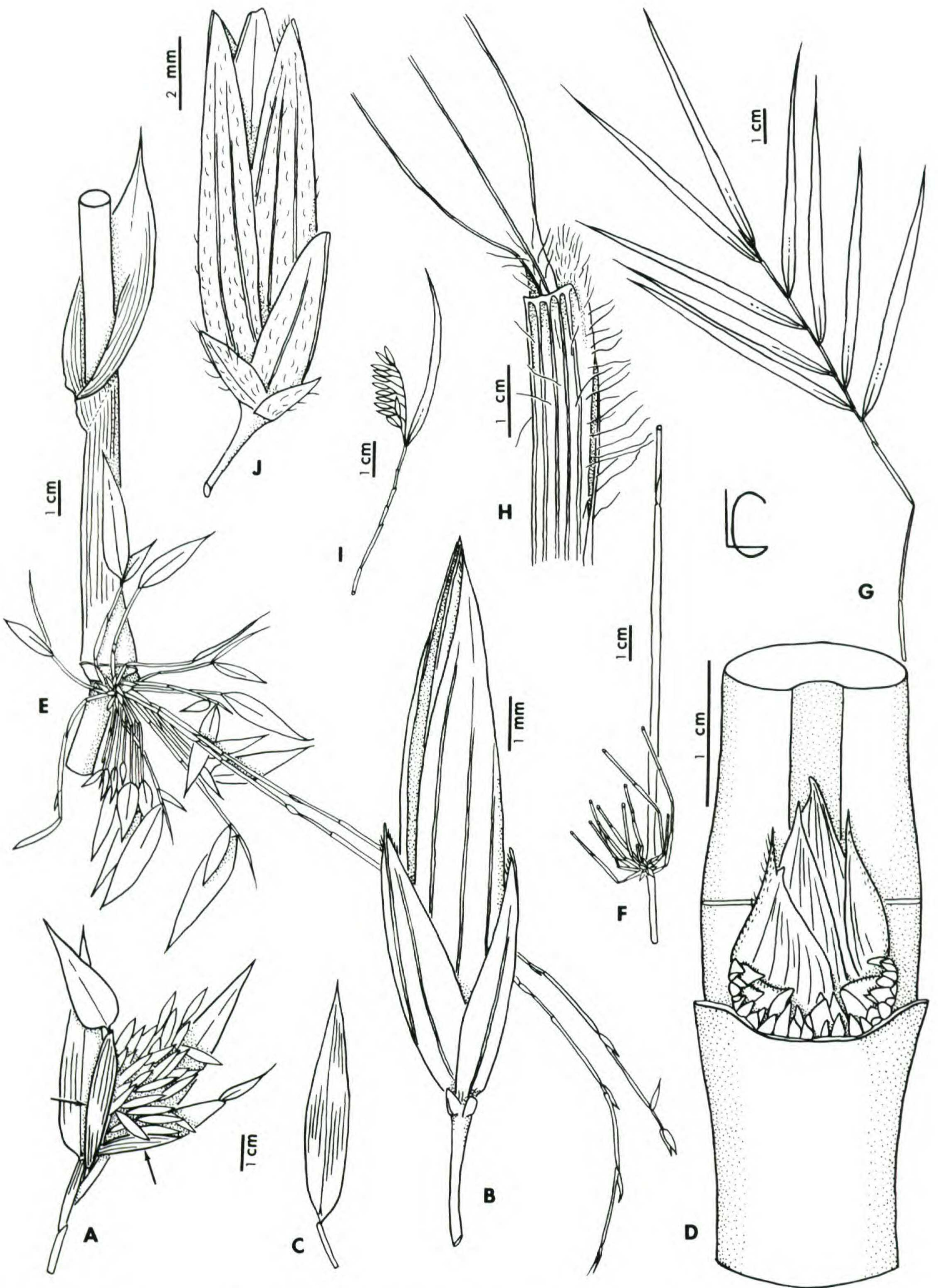


Figure 3. *Chusquea spathacea* McClure ex L. G. Clark and *Chusquea pulchella* L. G. Clark. A-E. *Chusquea spathacea* (A, B, Haught 4512; C-E, Clark & Londoño 588). —A. Inflorescence showing two subtending spathe-like bracts (arrows). —B. Spikelet. —C. Foliage leaf. —D. Bud complement. —E. Node and internode showing the culm leaf, dimorphic subsidiary branches, and infravaginal branching. F-J. *Chusquea pulchella* (F-H, Clark & Windisch

of the inflorescence is totally lost, or they may represent the retention of bracts at the base of the inflorescence branches, with concomitant loss of the branches themselves and the peduncle. In the rare cases where one or two additional spikelets are present on a branch, the base of the branch is clothed by two of these bracts, then one or two short spikelet-bearing axes appear in close succession, and then the terminal spikelet subtended by three or four of the bracts is observed. The lateral spikelet(s) is also subtended by three or four bracts. This suggests extreme condensation of all the axes associated with the inflorescence, including the branch upon which it is normally borne. It must be noted that the specimens upon which these observations are based probably represent higher orders of branching, and that the subsidiary branches of the main culm might produce somewhat more elaborated inflorescences. Observations of inflorescence production at higher orders of branching in *C. capituliflora* Trinius and other species, however, indicate that inflorescences produced by the subsidiary branches of the main culm are reiterated more or less faithfully at higher orders of branching.

The possibly plesiomorphous retention of reduced inflorescence bracts is known in *Chusquea* sect. *Longiprophyllae* L. G. Clark (Clark, 1990) and the *Rettbergia* group within *Chusquea* (Clark, unpublished data), although they are not usually as well developed as in *C. barbata*. The racemose inflorescences of *C. simpliciflora* Munro consist of three to four spikelets (Clark, 1989), and may be interpreted as reduction from the more typically paniculate inflorescences of *Chusquea*. Short, sparsely branched paniculate inflorescences with a series of subtending, bractlike leaves are found in *C. tenella* Nees and *C. ramosissima* Lindman (Clark, unpublished data). At present, it seems most parsimonious to assume that the one-spikeleted inflorescences of *C. barbata* represent reduction from the type of inflorescences found in these species, with the retention of at least some inflorescence bracts.

The vining habit and morphology of the bud/branch complement of *C. barbata* suggest an affinity to the *Rettbergia* group. In particular, the shape of the central bud and the dimorphic subsidiary branches are very similar to those of *C. ramosissima*, although that species has infravaginal branching. Although no other species of *Chusquea* exhibit the heavily bearded fertile lemmas of *C. barbata*,

short, stiff, glassy hairs on the fertile lemmas (and sometimes also on the sterile lemmas and glumes) are found in a number of species of the *Rettbergia* group, including *C. capituliflora*, *C. capitata* Nees, and *C. urelytra* Hackel. Until additional material becomes available, and this species is studied in more detail, *C. barbata* is tentatively allied with the *Rettbergia* group of *Chusquea*.

Chusquea spathacea McClure ex L. G. Clark, sp. nov. TYPE: Colombia. Magdalena: forest on trail above "Africa" (Sierra Perijá), 1,700 m, 16 Dec. 1944 (fl), *O. Haught 4512* (holotype, COL; isotype, US). Figure 3A–E.

Culmi ca. 1 mm diametro, 2–6 m longi, erecti ad basim, interdum scandentes. Folia culmorum 9.8–19.2 cm longa, glabra, leviter glauca juventute; vaginae 4.5–11 cm longae, 0.85–1.6-plo longiores quam lamina; laminae 4–9 cm longae, cordatae. Gemma centralis triangularis, gemmae subsidiariae dimorphae. Ramificatio infravaginalis; rami subsidiarii robusti cujusquisque nodi 2–3; rami subsidiarii parviores cujusquisque nodi 16–30. Folia cujusquisque complementi 8–12; vaginae plerumque maculatae; laminae 4.6–8 cm longae, 0.8–1.2 cm latae, ratio long.: lat. = 4.7–8, apice breviter setosae, basi rotundatae. Paniculae 2–4 cm longae, secundae, subcontractae, subtentae 2 bracteis spathiformibus. Spiculae 8.8–10.3 mm longae, glabrae. Glumae 2, cupuliformes. Lemmata sterilia 2, mucronata, ad mediam spiculam attingentes. Lemma fertile 7.8–9.4 mm longum, mucronatum.

Culms ca. 1 cm diam., 2–6 m long, erect at the base, scandent and climbing above, sometimes vining. Internodes 13.5–15 cm long, \pm terete to shallowly sulcate above the bud/branch complement, glabrous, mottled purple and green, lightly glaucous especially when young. Culm leaves 9.8–19.2 cm long, glabrous, exposed surfaces lightly glaucous when young, juncture of sheath and blade an inverted "V"; sheaths 4.5–11 cm long, 0.85–1.6 times as long as the blades, \pm triangular; blades 4–9 cm long, triangular, erect, persistent, base cordate, the margins somewhat ruffled near the base, apex short setose; girdle 0.2–0.5 cm wide, glabrous, a short skirt present at the juncture of the sheath and girdle; inner ligule 3–4 mm long, slightly irregular, apically ciliolate. Nodes with one triangular central bud subtended by 20–25 smaller subsidiary buds and 2–3 larger subsidiary buds in a constellate arrangement; sheath scar dipping slightly below the bud/branch complement; supranodal ridge present but not prominent. Branching infravaginal; central

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726; I, *Davidse et al. 10950*; J, *Clark & Oliveira 939*). —F. Branch complement with culm leaf. —G. Foliage leaf complement. —H. Ligular area of foliage leaf. —I. Inflorescence. —J. Spikelet.

branch often developing; robust subsidiary branches 2–3 per node, 27–50 cm long, whiplike, rebranching, smaller leafy subsidiary branches 16–30 per node, 15–22 cm long, occasionally rebranching, divergent. Foliage leaves 8–12 per complement; sheaths glabrous, often mottled, a few cilia present at the apex of the overlapping margin; blades 4.6–8 cm long, 0.8–1.2 cm wide, L:W = 4.7–8, adaxially glabrous, abaxially glabrous with a tuft of hairs at the base, not tessellate or weakly so, base rounded, apex short setose, one margin glabrous, the other ciliate; pseudopetiole ca. 1 mm long, glabrous; outer ligule 0.2–0.4 mm long; inner ligule 1–1.5 mm long, truncate to rounded. Panicles 2–4 cm long, secund, \pm contracted, base retained within the subtending sheath; subtended by usually 2 spatheate bracts, the sheaths 2.4–3.2 cm long, expanded, \pm stramineous to translucent at the margins, sometimes slightly mottled, blades 1.3–3.8 cm long, green; rachis triquetrous, glabrous to scabrous-pilose, the edges scabrous; branches secund, angular, scabrous-pubescent, most with a well-developed pulvinus at their bases, spreading, the lower branches 1–1.5 cm long; pedicels 1–2 mm long, angular, scabrous-pubescent, spreading. Spikelets 8.8–10.3 mm long, glabrous, terete or dorsally compressed. Glumes 2, 0.1–0.3 mm long, scalelike, minute, less than $\frac{1}{50}$ the spikelet length. Sterile lemmas 2, ca. $\frac{1}{2}$ the spikelet length, mucronate, 3-nerved; sterile lemma I 3–4.6 mm long; sterile lemma II 3.6–5.1 mm long. Fertile lemma 7.8–9.4 mm long, mucronate, apically ciliate, 7- or 9-nerved. Palea 8.2–9.6 mm long, bimucronulate, 4- or 6-nerved, sulcate for nearly the full length, the sulcus adaxially pubescent toward the apex. Lodicules 3, apically ciliate; anterior pair 2 mm long, basally swollen, the posterior one 1.5 mm long. Stamens 3; anthers 4.6–5.2 mm long. Fruit unknown.

Distribution. Montane forests on the Colombian side of the Sierra de Perijá; 1,700–2,400 m.

Chusquea spathacea is named for the well-developed, spathe-like bracts that subtend the inflorescences. From notes deposited at the U. S. National Herbarium, it is clear that F. A. McClure many years ago recognized this as a distinct species and chose the epithet “*spathacea*” for it, although he never formally described the species. Other features that characterize *C. spathacea* include culm leaves with the sheath and blade more or less equal in length and the blade cordate; dimorphic subsidiary buds/branches; infravaginal branching; foliage leaf blades abaxially with a tuft of hairs at the base; contracted panicles; and glabrous spikelets 8.8–10.3 mm long with minute, cupulelike glumes.

The somewhat vining habit, infravaginal branching, and the contracted panicle subtended by spathe-like bracts (Fig. 3A, arrows) of *C. spathacea* clearly indicate an affinity with the Brazilian *Rettbergia* group of *Chusquea*. The presence of 1–4 spathe-like bracts subtending the inflorescence appears to be a synapomorphy for the *Rettbergia* group (Clark, unpublished data), and thus *C. spathacea* is placed here. *Chusquea pallida* Munro, from northwestern Colombia and Venezuela, also shares these features and therefore is also classified as a member of the *Rettbergia* group.

Paratypes. COLOMBIA. **Cesar:** Mpio. Manaure, Serranía de Perijá, via Manaure–Sabana Rubia, near the Venezuelan border, between Finca Inglaterra and El Cinco, 2,200 m, 24 July 1989, Clark & Londoño 588 (COL, ISC, K, MO, NY, TULV, US). **Magdalena:** Sierra de Perijá, 8 km ENE of Manaure, 44 km E of Valledupar, 5 km from the Venezuelan border, 2,375 m, 2 Feb. 1945 (fl), Grant 10772 (ISC, US, WIS).

Chusquea pulchella L. G. Clark, sp. nov. TYPE: Brazil. São Paulo: BR-116, ca. Km 517, heading N to São Paulo, Rio Braço Feio, ca. 60 m before the spring, 560 m, 48°19'W, 24°57'S, 19 Mar. 1991 (fl), L. Clark & W. Oliveira 939 (holotype, SP; isotypes, ISC, MO, SJRP, US). Figure 3F–J.

Culmi 2–3 mm in diametro, 2–3 m alti, scandentes. Folia culmorum 10–12 cm longa, persistentia; vaginae 9.8–11.2 cm longae, 9.8–12.4-plo longiores quam lamina; laminae 0.9–1 cm longae, triangulares. Ramificatio infravaginalis; ramus centralis evolutus; rami subsidiarii cujusvisque nodi 20–36, 13–40 cm longi. Folia cujusvisque complementi 7–10; vaginae pilosae ad apicem; laminae 3.5–7.1 cm longae, 0.25–0.5 cm latae, ratio long.:lat. = 11.7–14(–24), apice acuminatae, basi attenuatae vel rotundato-attenuatae. Paniculae ca. 2 cm longae, subapertae. Spiculae 5.5–5.8 mm longae. Glumae 2, acutae. Lemmata sterilia 2, acutae vel acuto-mucronatae, inaequales. Lemma fertile 4.7–5 mm longum, obtusum.

Culms 2–3 mm diam., 2–3 m tall, climbing, scandent, often intertwined with other vegetation. Internodes terete, 9.5–15 cm long, glabrous. Culm leaves 10–12 cm long, persistent, juncture of sheath and blade abaxially obscure; sheaths 9.8–11.2 cm long, 9.8–12.4 times as long as the blade, abaxially retrorsely scabrous, the overlapping margin ciliate, not fused at the base; blades 0.9–1 cm long, triangular, erect, persistent, abaxially glabrous, apex subulate; girdle ca. 1 mm wide, pilose; inner ligule not seen. Nodes at mid-culm with the sheath scar \pm horizontal but dipping strongly below the bud/branch complement; supranodal ridge obscure. Branching infravaginal; central branch always de-

veloped, as robust as the main culm; leaf subsidiary branches constellate, 20–36 per node, 13–40 cm long, geniculate, sometimes rebranching from the basal nodes. Foliage leaves 7–10 per complement; sheaths pilose toward the apex, often fully pilose at lower branch nodes, a tuft of cilia present on one side at the apex, the overlapping margin ciliate toward the apex; blades 3.5–7.1 cm long, 0.25–0.5 cm wide, L:W = 11.7–14(–24), adaxially glabrous, abaxially tomentose, a tuft of hairs present at the base, not tessellate, apex acuminate, base attenuate to rounded-attenuate, the margins serrulate at the base, becoming nearly ciliate at the apex; pseudopetiole ca. 1 mm long, pilose; outer ligule 0.1–0.2 mm long, glabrous; inner ligule 0.3–0.5 mm long, truncate. Panicles ca. 2 cm long, \pm open, just fully exerted from the subtending sheath; rachis \pm flattened, hispid-pubescent on the first internode, glabrous above; branches 0.5 cm long at the base, angular, glabrous, ascending, usually subtended by a small bract 0.1–1.3 mm long; pedicels 1–2 mm long, angular, glabrous, often subtended by a minute bract. Spikelets 5.5–5.8 mm long. Glumes 2, acute, abaxially sparsely pubescent; glume I 0.9–1.1 mm long, ca. $\frac{1}{10}$ the spikelet length, 1-nerved; glume II 1.2–1.7 mm long, ca. $\frac{1}{5}$ the spikelet length, 1- or 3-nerved. Sterile lemmas 2, acute to acute-mucronate; sterile lemma I 2.5–2.7 mm long, ca. $\frac{1}{2}$ the spikelet length, sparsely pubescent on the lower half, 3-nerved; sterile lemma II 4.5–5.2 mm long, nearly as long as the spikelet, sparsely pubescent, 5-nerved. Fertile lemma 4.7–5 mm long, blunt, sparsely pubescent, 7-nerved. Palea 5–5.5 mm long, usually overtopping the fertile lemma, blunt, 4- or 6-nerved, sulcate only at the apex, the sulcus scabrous-pubescent. Stamens 3? (spikelets too old to determine the number with certainty); anthers 2.6 mm long. Lodicules 3; anterior pair 1.4 mm long, posterior one 0.9–1.2 mm long. Fruit unknown.

Distribution. Apparently endemic to southeastern Brazil in the state of São Paulo along the Rio Braço Feio in Atlantic forest and secondary forest; 530–680 m.

Chusquea pulchella is a delicate, somewhat viny species characterized by culms 2–3 mm in diameter; 20–36 subsidiary branches per node; 7–10 foliage leaves per complement with pilose sheaths and blades 0.25–0.5 cm wide; spikelets 5.5–5.8 mm long; and unequal sterile lemmas with sterile lemma I about $\frac{1}{2}$ the spikelet length, and sterile lemma II nearly as long as the spikelet. Although this species lacks any spathelike bracts subtending the inflorescence, it is clearly allied with other species of the *Rettbergia* group within *Chusquea* based on its viny

habit, infravaginal branching, and spikelet morphology.

This species is very similar to *C. sellowii* Ruprecht and *C. oligophylla* Ruprecht (= *C. discolor* Hackel) in size and habit, and approaches *C. oligophylla* in its nearly ciliate leaf margins. *Chusquea pulchella* can be distinguished easily from these two species, however, by its narrow leaves, 0.25–0.5 cm wide as opposed to 0.8–1.6 cm wide in *C. sellowii* and usually 0.5–1.1 cm wide in *C. oligophylla* (Clark, unpublished data). In addition, the sterile lemmas of *C. pulchella* are strongly unequal, whereas the sterile lemmas in both *C. sellowii* and *C. oligophylla* are subequal or only moderately unequal. The spikelet proportions of *C. pulchella* most closely resemble those of *C. bambusoides* (Raddi) Hackel, but the spikelets of *C. bambusoides* are usually twice as long and the glumes are apically acuminate. Vegetatively, *C. bambusoides* is much more robust, with larger culms, fewer branches per node, and much larger foliage leaves with the blades (1–)1.5–3 cm wide (Clark, unpublished data).

A ten-year flowering cycle is suggested by the two flowering collections of *C. pulchella*, which came from the same population, although a shorter flowering cycle is possible.

Paratypes. BRAZIL. **São Paulo:** BR-116, ca. Km 517, heading N to São Paulo, Rio Braço Feio, ca. 60 m before the spring, 530 m, 4 Mar. 1990, Clark & Windisch 726 (ISC, MO, SP, SJRP, US); ca. 38 km SW of Jacupiranga along Hwy. 116 to Curitiba, 680 m, 8 Mar. 1976 (fl), Davidse et al. 10950 (ISC, MO, US).

Chusquea attenuata (Doell in Martius) L. G. Clark, comb. nov. Basionym: *Arundinaria attenuata* Doell in Martius, Fl. Bras. 2(3): 170. 1880. TYPE: Brazil. Minas Gerais: in silvaticis umbr. montis Itacolomi, Aug. 1824, Riedel s.n. (holotype, LE; isotypes, KR, US fragment).

McClure (1973: 38) included this species in his list of species excluded from *Arundinaria* as “4. *Arundinaria* ? *attenuata* Doell; *species sedis mihi incertae etiam nunc manet.*” The type specimen is vegetative, which accounts for his confusion about the placement of this species. However, the photograph of the LE specimen mounted with the fragments that constitute the US isotype clearly shows the circular central bud with several subsidiary branches per node that is characteristic of *Chusquea*. Later collections from Itacolomi (*Chase* 9379, *Macedo* 5108) and Caraça (*Irwin et al.* 29242, *Clark & Morel* 714) match the type perfectly. Both *Macedo* 5108 and *Irwin et al.* 29242 were collected during the same gregarious flowering event, and the

spikelet morphology confirms that this species is indeed a *Chusquea*, and that the species is distinct. More detailed studies of this species are underway, but *C. attenuata* appears to be restricted to Minas Gerais.

In the original description (Doell in Martius, 1880: 170), Doell indicated that this species represented "*Arundinaria distans ex parte*." According to a note by Agnes Chase (dated 1936 in her hand) that is attached to the US isotype fragment, the type of *Arundinaria distans* Trinius consisted of four sheets numbered 1 through 4. Sheets 1 and 2 agree with Trinius's description of *A. distans* [= *Colanthea distans* (Trinius) McClure], but Mrs. Chase stated that Sheet 4 represents a different species that "agrees perfectly with the description of *Arundinaria attenuata* Doell and is undoubtedly the type specimen of that species." No reference was made to Sheet 3. Mrs. Chase also referred to a note made by A. S. Hitchcock during a 1907 visit to St. Petersburg. According to this note, there was a loose annotation label by Doell with Sheet 4 identifying this specimen as *Arundinaria attenuata* Doell. This label apparently was lost subsequently.

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