A new species of *Chusquea* sect. *Longifoliae* from Ecuador

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*Chusquea robusta* from Ecuador is described as new. It is illustrated and compared and contrasted with *Chusquea antioquensis* (from Colombia), the species to which it is most similar. *Chusquea robusta* is distinguished by its large size (culms up to 7 cm in diameter), for which it is named, and also by its relatively small culm leaf blades, more or less horizontal junction of the culm leaf sheath and blade, abaxially pilose foliage leaf blades with an excentric midrib, relatively large spikelets ([11-] 12-15.5 mm long], and lengths of glumes III and IV relative to the spikelet length. A majority of the spikelets exhibit an elongated rachilla internode between glumes I and II, a feature not observed in other species of *Chusquea*. Keys to the species of *Chusquea* sect. *Longifoliae*, to which the new species belongs, are presented.

An estimated 30 species of *Chusquea*, including representatives of both *Chusquea* subg. *Swallenochloa* (McClure) L. G. Clark and *Chusquea* subg. *Chusquea*, are known from Ecuador. One of these is described in this paper as part of work toward a treatment of the bamboo diversity of Ecuador for the Flora of Ecuador.

The most notable feature of this new species is its size. When the senior author first saw this species in 1982, it appeared to be a *Guadua* Kunth from a distance. Upon closer examination, it became obvious that it was instead a *Chusquea* Kunth, but one with culms as much as 7 cm in diameter. To date, the largest described species of *Chusquea* are *C. pittieri* Hack. and *C. antioquensis* L. G. Clark & Londoño, both of which can reach 5.5 cm in diameter, but this new bamboo species is now the record-holder.

Further study of herbarium specimens of this new bamboo revealed several features that placed it unambiguously in *Chusquea* sect. *Longifoliae* L. G. Clark: infravaginal branching; numerous constellate subsidiary buds/branches; long, narrow foliage leaves; reduced glumes I and II; and shortly awn-tipped glumes III, IV, and lemmas (Clark 1989). Within sect. *Longifoliae*, however, these Ecuadorian specimens did not match any described species, although they were most similar to the Colombian *C. antioquensis*. We therefore describe and illustrate *C. robusta* as a new species. We provide a revised key to the species of sect. *Longifoliae* and a morphological comparison of *C. robusta* and its presumed sister species, *C. antioquensis*. Two Mexican species, *C. aperta* L. G. Clark and *C. nelsonii* Scribn. & J. G. Sm., were placed in this section in Judziewicz et al. (1999), but further study is required to establish their true affinities, so they are not included in the keys presented here.
TAXONOMIC TREATMENT

Key to the Species of Chusquea Sect. Longifoliae
(based on vegetative specimens)
1a. Thin, curly leafless fibrillar branchlets interspersed with the normal, leafy subsidiary branches; internodes scabrous; foliage leaf blades with the base rounded to rounded-truncate.................................................................C. scabra (Costa Rica)
1b. Fibrillar branchlets absent; internodes usually smooth, rarely scabrous just below the nodes; foliage leaf blades with the base attenuate to rounded-attenuate.
2a. Foliage leaf blades abaxially distinctly tomentose or pilose.
3a. Foliage leaf blades abaxially tomentose, 15-27 cm long; culm leaf sheaths abaxially glabrous; culms 6-9 m tall, 1.3-4 cm in diameter...............C. tomentosa (Costa Rica)
3b. Foliage leaf blades abaxially pubescent or pubescent only basally and scabrid to glabrous apically; culms (5-) 7-12 m tall, 3-7 cm in diameter.........................C. robusta (Ecuador)
2b. Foliage leaf blades abaxially glabrous or sometimes with sparse, scattered hairs.
4a. Foliage leaf blades 0.6-1.3 cm wide and subsidiary branches 18-30 per node; base of culm leaf blade cordate.........................C. longifolia (Panama to Chiapas, Mexico)
4b. Foliage leaf blades 0.3-1.4 cm wide and subsidiary branches 24-80 (-100) per node; base of culm leaf blade linear.
5a. Foliage leaf blades (0.5-) 0.7-1.4 cm wide, L: W = 11-27; internodes terete.............................................................C. grandiflora (Panama, Colombia)
5b. Foliage leaf blades 0.3-0.9 cm wide, L: W = 18-55 (-65); internodes flattened or shallowly sulcate above the bud/branch complement.
6a. Juncture of culm leaf sheath and blade an inverted “V”; culm leaf blades 9.7-21 cm long, the base as wide as the sheath apex.................................................................C. antioquensis (Colombia)
6b. Juncture of culm leaf sheath and blade a more or less horizontal line, sometimes slightly convex; culm leaf blades 2.6-12 cm long, the base narrower than the sheath apex.
7a. Subsidiary branches 24-65 per node; inner ligules of foliage leaves 0.5-4 mm long.........................................................C. patens (Costa Rica, Panama)
7b. Subsidiary branches 50-80 (-100) per node; inner ligules of foliage leaves to 1.5 mm long.
8a. Foliage leaf blades with the base attenuate, L: W = (26-) 30-48 (-54); culm leaf sheaths 4.4-6.6 times as long as the blades.........................................................C. subtilis (Costa Rica)
8b. Foliage leaf blades with the base rounded-attenuate, L: W = 20-40 (-45); culm leaf sheaths 1.5-5.4 times as long as the blades .............................................................C. foliosa (Costa Rica, Mexico)

Key to the Species of Chusquea sect. Longifoliae
(based on flowering and vegetative specimens)
1a. Synflorescences open, primary branches strongly spreading, sometimes deflexed.
2a. Glumes I and II no more than 1/10 the spikelet length; spikelets 6.9-11.2 mm long; foliage leaf blades 0.4-0.9 cm wide, L: W = 18-48 ..........C. patens (Costa Rica, Panama)
2b. Glume I ca. 1/5 and glume II ca. 1/3 the spikelet length; spikelets 9.7-12.6 mm long; foliage leaf blades (0.5-) 0.7-1.4 cm wide, L: W = 11-27 .......C. grandiflora (Panama, Colombia)
Chusquea robusta L.G. Clark & Losure, sp nov. TYPE: Ecuador. Pichincha: Saloya river valley NE of Hacienda La Favorita, 11 Nov 1945 (fl), F.A. McClure 21431 (holotype, QCA!; isotypes, ISC!, US!, AAU). Fig. 1.

Culmi (5-)7-12 m alti, 3-7 cm diam. Internodia 22-32 cm longa, glabra, sulcata. Folia culmorum 15-37 (-40) cm longa, 1-1.5-plo longiores quam internodam; vaginae 13.5-31 cm longae, (2.3-) 4-11 (-13)-plo longiores quam laminam, abaxialiter pubescentes ad basim, scabridae vel glabrae ad apicem, junctura cujusvagina laminae linearis; cingulum ca. 3 mm latum, pubescentes; laminae 3-6 (-12) mm longae, triangularae, persistentes, glabrae vel scabridae, apice acuminati. Ramificatio infravaginalis; rami subsidiarii cujusquisque nodi 40-60, 15-45 cm longi. Folia cujusquisque complementi 2-5; vaginae striatae, marginibus ciliis, apicibus prolongatis; laminae 8-21 cm longae, 0.3-0.7 cm latae, long./lat. = (16-)21-38(-41), adaxialiter scabridae, abaxialiter pilosae, costae excentricae. Synflorescentia 6-16 cm longa, paniculata, angusta. Spiculae (11-)12-15.5 mm longae; gluma I 0.5 mm longa, internoda rachillorum inter gluma I et II saepe elongata 0.5-2 mm longa; gluma II 1-1.5 mm longa, purpurea, cupulata; gluma III (4.5-) 5-7 mm longa, 1/3-1/2longior quam spiculam, breviteraristata; gluma IV 7-10 mm longa, 1/2-2/3longior quam spiculam, breviter aristata; lemma 12-15 mm longum; palea 9-11 mm longa.

Woody Bamboo. Culms (5-) 7-12 m tall, 3-7 cm diam; internodes 22-32 cm long, glabrous, sulcate above the bud/branch complement. Culm leaves 15-37 (-40) cm long, persistent, 1-1.5 times as long as the internodes, juncture of the sheath and blade horizontal to slightly convex; sheaths 13.5-31 cm long, (2.3-) 4-11 (-13) times as long as the blade, abaxially densely to sparsely pubescent basally and scabrid/ glabrous apically, margins ciliate; girdle ca. 3 mm wide, pubescent; inner ligule ca. 2-3
Figure 1. *Chusquea robusta*. A. Culm leaf, abaxial view. B. Foliage leaf complement. C. Foliage leaf, ligular area. D. Synflorescence. E. Spikelet. F. Glumes I and II, closeup showing the elongated rachilla internode. (A, C-F based on McClure 21431; B based on Young 90)
mm, entire to very shortly ciliate; blades 3-6 (-12) cm long, triangular, persistent, abaxially glabrous to scabrid, adaxially longitudinally furrowed, pubescent, apex acuminate, often broken off in pressed specimens. Nodes with one triangular central bud subtended by numerous subsidiary buds in several rows in a crescent arrangement; nodal line horizontal, dipping below the bud/branch complement; supranodal ridge pronounced, 4-8 mm above the nodal line. Branching infravaginal; leafy subsidiary branches 40-60 per node, 15-45 cm long, not re-branching. Foliage leaves 2-6 per complement; sheaths striate, margins ciliate, apex prolonged and bearing villous hairs; outer ligule ca. 0.5 mm, glabrous, rounded; inner ligule ca. 0.7 mm, brown-purplish, pubescent; pseudopetiole 1-2 mm long; blades 8-21 cm long, 0.3-0.7 cm wide, L:W = (16-) 21-38 (-41), linear-lanceolate, adaxially retorsely scabrid, abaxially pilose, midrib clearly offset from leaf center, prominent abaxially, margins serrulate, + cartilaginous, base attenuate, apex acuminate to shortly aristate. Synflorescences 6-16 cm long, narrow, paniculate, subtended by a pale bract 1.5-5 mm long, or arising from the foliage leaf sheaths; rachis angular, twisted, scabrid; pedicels 2-10 (-15) mm long, angled. Spikelets (11-) 12-15.5 mm long; glume I reduced to a 0.5 mm long brown-purplish bract, 60-70% of spikelets with a rachilla internode 0.5-2 mm long between glumes I and II, the internode 0.1-0.2 mm long in the remainder; glume II 1-1.5 mm long, brown-purple, scabrous, cup-shaped; glumes III and IV navicular, awn-tipped, abaxially scabrid, sparsely ciliate along the apical margins, 7-9 nerves; glume III (4.5-) 5-7 mm long, 1/3-1/2 the spikelet length; glume IV 7-10 mm long, ca. 1/2-2/3 the spikelet length; lemma 12-15 mm long, awn-tipped, 7-9 nerves, abaxially scabrid; palea 9-11 mm long, 2-keeled, faintly 7-9 nerves. Flowers not seen. Fruit not seen.

Chusquea robusta is named for its robust culms and general aspect. The elongated rachilla internode found between glumes I and II in 60-70% of the spikelets is a highly unusual character in Chusquea. The two flowering collections in which this feature appears are almost certainly from the same population; given that it is not uniformly present in the spikelets of this population, additional flowering material from other populations is needed to confirm whether this is characteristic of C. robusta. For the present, this character, as well as spikelet size and the ratio of glume III and IV length to spikelet length, clearly differentiate flowering specimens of C. robusta from the closely allied species C. antioquensis, which is known from the same mountain range as C. robusta but from further north in Colombia. Vegetatively the two are quite similar, but can be distinguished by the horizontal junction of the culm leaf sheath and blade, as well as the eccentric midrib of the foliage leaf and the abaxially pilose foliage leaf blades, in C. robusta (Table 1).

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<thead>
<tr>
<th>Character</th>
<th>C. robusta</th>
<th>C. antioquensis</th>
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<tbody>
<tr>
<td>spikelet length</td>
<td>(11-) 12—15.5 mm</td>
<td>(7.9—) 8.6—10 (— 11) mm</td>
</tr>
<tr>
<td>0.5-2 mm long internode between glumes I and II</td>
<td>present in 60—70% of spikelets</td>
<td>absent</td>
</tr>
<tr>
<td>ratio of glume III length to total spikelet length</td>
<td>1/3—1/2</td>
<td>1/2—2/3</td>
</tr>
<tr>
<td>ratio of glume IV length to total spikelet length</td>
<td>1/2—2/3</td>
<td>ca. 4/5</td>
</tr>
<tr>
<td>juncture of culm leaf sheath and blade</td>
<td>linear</td>
<td>distinctly notched or v’d</td>
</tr>
<tr>
<td>culm length</td>
<td>15—37 cm</td>
<td>38—65 cm</td>
</tr>
<tr>
<td>foliage leaf midrib</td>
<td>excentric</td>
<td>centric</td>
</tr>
<tr>
<td>foliage leaf blade pubescence</td>
<td>pilose</td>
<td>glabrous</td>
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This species is known from four collections in the mountainous region of northern Ecuador. The two collections for which the location is known precisely were both from disturbed cloud forest habitats at elevations between 2000 and 2100 m.

*Chusquea robusta* was first collected in flower in 1945. Another flowering collection was made in 1982. Since the two collections appear to be from the same population, this could indicate a 37-year flowering cycle, which would be typical for species of *Chusquea* (Judziewicz et al. 1999). However, further observation of the species will be necessary to confirm this.

One vegetative collection from northern Ecuador, *S.M. Young* 90, was examined and used in defining the species concept of *C. robusta*. Other vegetative collections from southern Ecuador examined, *P. Lozano* 927 (ISC, LOJA) and *L.G. Clark, R. Townsend & P. Lozano* 1626 (ISC, LOJA, QCA) clearly belonged to *Chusquea* sect. *Longifoliae*, but could not be determined as either *C. robusta* or *C. antioquensis*. Although these specimens, from the province of Zamora-Chinchipe, closely resemble both *C. robusta* and *C. antioquensis*, they do not have sulcate internodes and their foliage leaves are wider than those observed in either named species. Until flowering material or collections from other southern populations are available, we refer these specimens to an entity called *C. aff. robusta*.

Additional specimens examined.

**ECUADOR.** Pichincha: Old Quito-Sto. Domingo road, 54-55 km from Quito, 4.9 km west of Chiriboga, western slope, 2100 m, 27 Aug 1982 (fl), L. Clark, C. Calderon & E. Asanza 312 (ISC, QCA, US); old road from Quito to Santo Domingo, about 55 km from Quito, W of Chiriboga, 1850 m, 7 Jun 1992, L. Clark 1132 (AAU, ISC, MO, QCA, US). Napo: 36 km south of Baeza on the road to Tena, 2070 m, 28 Mar 1980, S. M. Young 90 (QCA, US ).

**ACKNOWLEDGMENTS**

Travel to Ecuador by Clark was supported by a Foreign Travel Grant from Iowa State University. Fieldwork was conducted under the auspices of the Pontificia Universidad Católica del Ecuador (Herbario QCA) and a grant to Simon Laegaard from the Danish National Science Foundation. Clark thanks Simon Laegaard (AAU), Benjamin Øllgaard (AAU) and Pablo Lozano (LOJA) for valuable assistance with the fieldwork and the Gonzalo Alcivar family for their hospitality in Ecuador. Anna Gardner assisted with final preparation of the line drawing.

**LITERATURE CITED**
