A New Species of *Guadua* (Poaceae, Bambusoideae, Bambuseae) and Synopsis of the Genus in Argentina and Neighboring Regions

Author(s): Mabel A. Lizarazu , Zulma E. Rûgolo de Agrasar , and Andrea S. Vega
Source: Systematic Botany, 38(4):1062-1075. 2013.
Published By: The American Society of Plant Taxonomists
URL: http://www.bioone.org/doi/full/10.1600/036364413X674779

Systematic Botany (2013), 38(4): pp. 1062–1075

DOI 10.1600/036364413X674779

A New Species of *Guadua* (Poaceae, Bambusoideae, Bambuseae) and Synopsis of the Genus in Argentina and Neighboring Regions

Mabel A. Lizarazu,[1,3] Zulma E. Rúgolo de Agrasar,[1] and Andrea S. Vega[2]

[1]Instituto de Botánica Darwinion, Labardén 200, C.C. 22, B1642HYD San Isidro, Argentina.
[2]Cátedra de Botánica Agrícola, Facultad de Agronomía, Universidad de Buenos Aires, Avenida San Martín 4453, C1417DSE Ciudad Autónoma de Buenos Aires, Argentina.
[3]Author for correspondence (mlizarazu@darwin.edu.ar)

Communicating Editor: Jennifer A. Tate

Abstract—A new species of *Guadua* from the Atlantic forest in Argentina, ***Guadua variegata***, is described and illustrated. ***Guadua variegata*** is compared to other taxa distributed in Argentina, Bolivia, Paraguay, Uruguay, and southern Brazil in a key and a table based on exomorphological characters. Additional micromorphological characters of foliage leaf blades and cauline epidermis of *G. variegata* are included. Lectotypes of *G. paniculata* and *G. tessmannii* are here designated.

Resumen—Se describe e ilustra ***Guadua variegata***, una nueva especie propia de la selva misionera de la Argentina. ***Guadua variegata*** es comparada con los taxones distribuidos en la Argentina, Bolivia, Paraguay, Uruguay y Sur de Brasil, en una clave y una tabla basadas en caracteres exomorfológicos. Se incluyen estudios micromorfológicos de la epidermis caulinar y foliar de *G. variegata*. Se lectotipifica aquí a *G. paniculata* y *G. tessmannii*.

Keywords—*Guadua variegata*, taxonomy.

Bamboos are forest grasses that comprise at least 90 woody and herbaceous genera and 1,200 species worldwide (McClure 1966; Clark 1995; Judziewicz et al. 1999). Twenty-one woody bamboo genera occur in the New World (Judziewicz et al. 1999) and are found in Brazil, the northern and central Andes, and Mexico (the areas of highest bamboo diversity and endemism), as well as the Guayana Highlands (Clark 1990; 1995).

Guadua Kunth is a genus of woody bamboos native from Mexico to Uruguay and Argentina, not found in Chile and the West Indies. Species range from sea level to 2,200 m, but are more abundant and diverse at elevations below 1,500 m (Judziewicz et al. 1999).

Guadua shows great economic importance in America (Londoño 2009). One of the species, *G. angustifolia* Kunth, has been successfully cultivated in Cuba, Puerto Rico, Trinidad and Tobago, Bolivia, and Brazil (Londoño 2000; Lizarazu and Vega 2012). This species is closely related to local economic development in some Colombian regions (Londoño 1998) and is considered as the world's third largest bamboo in the world with culms up to 35 m high and ca. 25 cm in diameter (Cruz Ríos 2009). Due to physical and mechanical properties, including its great flexibility for earthquake-resistant buildings, it is considered among the 20 most important species of bamboo worldwide (Cruz Ríos 2009).

In Argentina, *Guadua* comprises four taxa: *G. chacoensis* (Rojas) Londoño and P. M. Peterson, *G. paraguayana* Döll, *G. trinii* (Nees) Nees ex Rupr. (Lizarazu and Vega 2012), and *G. tagoara* (Nees) Kunth subsp. *tagoara* (Lizarazu et al. 2012), growing at Paraná and Uruguay riversides and adjacent zones (Soderstrom and Londoño 1987). *Guadua angustifolia* and *G. paniculata* Munro are excluded from Argentina (Lizarazu and Vega 2012).

Guadua belongs to *Guaduinae* Soderstr. and R. P. Ellis, a monophyletic subtribe, supported by molecular (Guala et al. 2000; Clark et al. 2007) and micromorphological data. Papillae associated with stomata is characteristic for most bamboos, but *Guadua* species (except for *G. paniculata*) are unusual in that they lack stomatal associated papillae on the abaxial leaf surface (Judziewicz et al. 1999; Cruz Ríos 2009). Recent studies based on morphology and *rpl16* intron sequence data showed that subtribe *Guaduinae* may be derived from *Arthrostylidiinae* Soderstr. and R. P. Ellis (Judziewicz and Clark 2007) but later molecular work, including analyses of the *rpl16* intron, have not supported that hypothesis (Sungkaew et al. 2009). *Guadua* can be distinguished from the other genera of *Guaduinae* by their large thorny culms with culm leaves that lack fimbriae and bands of hairs in the nodal region (Judziewicz et al. 1999).

Leaf anatomical characters can be useful at many levels of classification, including species and varieties in bamboos (Soderstrom and Ellis 1987). Leaf anatomical studies on South American species of woody bamboos are scarce (Metcalfe 1956, 1960; Renvoize 1987). In South America, Freier (1941), Rúgolo de Agrasar and Rodriguez (2002, 2003), Londoño et al. (2002), and Panizzo (2012), among others, have studied leaf and culm anatomy in native species of *Guadua*.

Regarding *Guadua*, Metcalfe (1960) studied leaf micromorphology and leaf anatomy in transverse section in only one species from Venezuela (*G. paniculata*), as well as Panizzo (2012) in *G. chacoensis*. Montiel et al. (2006 a, b, c, d, e) analyzed the leaf surface of several species (*G. angustifolia*, *G. amplexifolia* J. Presl, *G. angustifolia* var. *bicolor* Londoño, *G. paniculata*, and *G. macclurei* Pohl and Davidse).

The main objective of the present paper is to describe and illustrate *Guadua variegata*, a new species from Misiones forest (Argentina), as another contribution to ongoing taxonomic work on *Guadua* in Argentina and neighboring regions. This new species has been collected sterile since 1886 and remained to be described. Also provided is a synopsis of the species distributed in Argentina (5), Bolivia (8), Paraguay (3), Uruguay (2), and southern Brazil (8), a key for the identification of taxa, and a comparative table based on exomorphological characters. Additional micromorphological characters of foliage leaf blades and culms of *G. variegata* are also provided. This paper includes a list of additional material examined, iconography, geographical distribution, habitat, phenology, and uses of the species. Lectotypes of *G. paniculata* and *G. tesmannii* are here designated.

Materials and Methods

Exomorphology—Morphological characters (vegetative and reproductive) were recorded in field trips and in herbarium material. Specimens belonging to the following herbaria were examined: BA, BAA, BAB, CTES, FLOR, FURB, HB, HBR, ICN, JOI, LIL, MBM, PACA, RB, SI, SP, SPF, and UPCB (acronyms after Thiers 2012). Type images were seen from B, BM, BR, COL, G, HAL, K, MO, NY, P, PH, S, TCD, and US.

Micromorphology—Micromorphological observations were based on herbarium material. Segments of the middle portion of the penultimate foliage leaf blade of an innovation as well as the middle portion of internodes were selected and cleaned in xylene for 1.5 hr with an ultrasonic cleaner (Cleanson, model CS 1106, Argentina). The material was air-dried, mounted and coated with a gold-palladium (40 %– 60%) alloy by a Thermo VGScientific and then observed using a Phillips XL 30 (Phillips, The Netherlands) scanning electron microscope (SEM) at the Museo Bernardino Rivadavia and Zeiss, SUPRA 40 (Zeiss, Germany) at the Centro de Microscopía Avanzada (CMA, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires), both in Argentina.

Taxonomic Treatment

Guadua variegata Lizarazu sp. nov.—TYPE: ARGENTINA. Misiones, Dpto. San Pedro, Arroyo Biguá, junto a la cascada, 17 Dec 1980 veg!, *Z. Rúgolo de Agrasar 878* (holotype: SI!; isotype: US, Photo SI!).

Guadua variegata is distinguished by foliage leaves with blades variegated, yellowish with greenish margins and branch complement extremely long, ca. 7 m. It differs from *Guadua trinii* in having foliage leaf blades with midnerve eccentric, strongly tessellate, adaxially subglabrous or glabrous; pseudopetiole hirsute on both surfaces; foliage leaf sheath auriculate, with fimbriae 5-7 mm long, 7-10 in each margin.

Perennial, caespitose, forming a compact clump. Rhizomes sympodial, pachymorph, short-necked; neck ca. 3 cm long; buds solitary at all or most of its nodes, asymmetrically dome-shaped, with a subcircular margin. Culms ca. 10 m high, 1.5-3.5 cm diam., 0.3-0.7 cm thick-walled, thorny, erect with long branches, scandent, hollow, green, terete, basal internodes ca. 5-7 cm long and upper ones 18-20 cm long, opaque; young culms furrowed, strongly scabrous and tomentose, indument persistent at maturity, hairs shining and iridescent. Nodes with nodal line and supranodal ridge distant from each other in ca. 1 cm; supranodal ridge 3-5 mm long, with 2-3 curved thorns, the central one is dominant. Culm leaves 31-38 ×12-18 cm, persistent; sheaths 19-25 cm long, lacking auricles, adaxially shiny and glabrous, abaxially opaque and puberulent; outer ligule 2-3 mm long, reduced to a rim of cilia; inner ligule pilose, straight inserted; blades 12.5-15.5 × 6.5-12.5 cm, 1.6-1.7 times the length of the sheath, erect, triangular, strongly tessellate, apex mucronate. Axillary buds solitary, triangular, prophyllate with margins fused. Branch complement ca. 7 m long, internodes 6-7.5 cm long, 6 mm diam., ca. 2.5 mm thick-walled, scabrous, exceptionally subglabrous, with whitish, shining, and deciduous hairs. Nodes of the branch complement pubescent, hairs whitish, with 3-5 thorns. Foliage leaves with sheaths longitudinally furrowed, persistent, slightly scabrous; auricles ca. 0.5 mm long, with fimbriae 5-7 mm long, 7-10 in each side of the sheath, whitish, scabrous, circinate; inner ligule ca. 0.5 mm long, membranaceous, entire, puberulous; outer ligule a rim, margin minutely ciliate; auricule present, pseudopetiole 1.5-2 × 1.25 mm, oblong, stramineous, hirsute in both surfaces; blades 2.5-4.5 × 1-1.2 cm, variegated, yellowish with greenish margins, oblong or broadly lanceolate, abruptly attenuate toward the apex, base asymmetric, subrounded, midnerve eccentric, 8-10-nerved, with 3 marginal scabrous nerves at both sides of midnerve, strongly tessellate, margin with prickles, abaxially glabrous and adaxially subglabrous or glabrous. Figures 1–4.

Etymology—The specific epithet refers to their variegated foliage leaf blades, which are yellowish with greenish margins.

Geographical Distribution and Ecology—*Guadua variegata* occurs in forests in Misiones province, Argentina (Fig. 5). This species was collected by G. Niederlein in 1886. Almost 100 years later (1980 and 2011) plants were found vegetatively growing in the same Department of Misiones. Flowering has never been observed or documented. In 2011, three clumps, 1-2 m diam., were found growing on both sides of Arroyo Biguá, next to *Guadua trinii* and *Merostachys spp.* populations. *Guadua variegata* forms a compact clump, almost impenetrable, with long, scandent, and thorny branches. Culms are scabrous and show dense pilosity. Culm leaves are persistent at maturity.

Additional Material Examined—ARGENTINA. Misiones: Dpto. San Pedro, entre San Pedro y Campiñas de Américo, 26°37′60″S, 54°7′60″W, 6 Dec 1886 veg!, *Niederlein 2111* (BA, SI); Arroyo Biguá, 26°37′56″S, 54°4′21″W, 507 m, 11 Oct 2011 veg!, *Lizarazu 62* (SI).

Micromorphology of Guadua variegata—Culm Epidermis—Ribs evident. Long cells 2-3 × 1.5-2 μm, with wavy walls, without papillae. Silica cells 3-5 × 7-8 μm, square to dumbbell, frequent, alternating with the long cells. Prickle hairs 15-20 × 9.5-14 μm, dispersed. Stomatal complex 16-23 × 7-10 μm, slightly sunken, dome shaped, elliptic. Macrohairs with large epidermal cells surrounding its base. Microhairs absent.

Abaxial foliage leaf-blade epidermis—Long cells 80-115 × 6-7 μm, variable in length, with thin sinuous walls. Papillae absent. Short cells 25-46.7 × 6-8.4 μm, with thin sinuous walls. Silica bodies 5-9 × 11-16 μm in costal zones; 3.8-6.6 × 7.2-11.4 μm in intercostal zones. Suberose cells not seen. Macrohairs absent. Microhairs 51.4-64 × 7.4-8.8 μm long (basal cell 30-36 μm long, apical cell 30-33 μm long). Prickle hairs 28-46 × 9-14 μm, frequent. Stomatal complex 25-35 × 11.7-15 μm, dome-shaped, between short cells.

Adaxial foliage leaf-blade epidermis—Long-cells 51-64 × 6.4-8.5 μm, variable in length, with thin sinuous walls. Papillae absent. Short cells 18.7-32 × 5.7-10 μm, with thin sinuous walls. Silica bodies 5-9 × 10-17 μm, vertically elongated, dumb bell shaped, constricted. Macrohairs ca. 220 640 × 12-13 μm, rarely present. Microhairs 39.4-53.3 × 6.9-9.7 μm (basal cell 24-30 μm, apical cell 23-24 μm), abundant. Prickle hairs 21-25.5 × 12-18 μm, abundant. Stomatal complex 18.3-24 × 9.8-12.2 μm, dome-shaped between short cells.

Affinities—*Guadua variegata* is morphologically similar to *G. trinii* but differs in having foliage leaf blades with midnerve eccentric, strongly tessellate, adaxially subglabrous or glabrous; pseudopetiole hirsute on both surfaces; foliage leaf sheath auriculate, with fimbriae 5-7 mm long, 7-10 in each margin (Table 1). Foliage leaves have blades variegated, yellowish with greenish margins, and branch complement is extremely long, ca. 7 m.

Observation—Subtribe *Guaduinae* has a large number of stomata on both leaf blade surfaces (Judziewicz et al. 1999) and shows papillae surrounding the usually numerous adaxial stomata (Judziewicz and Clark 2007). However, we observed papillae in subsidiary cells on adaxial surface of foliage leaf blades only in *G. paraguayana* and *G. sarcocarpa*. *Guadua ciliata* Londoño and Davidse and *G. paniculata*

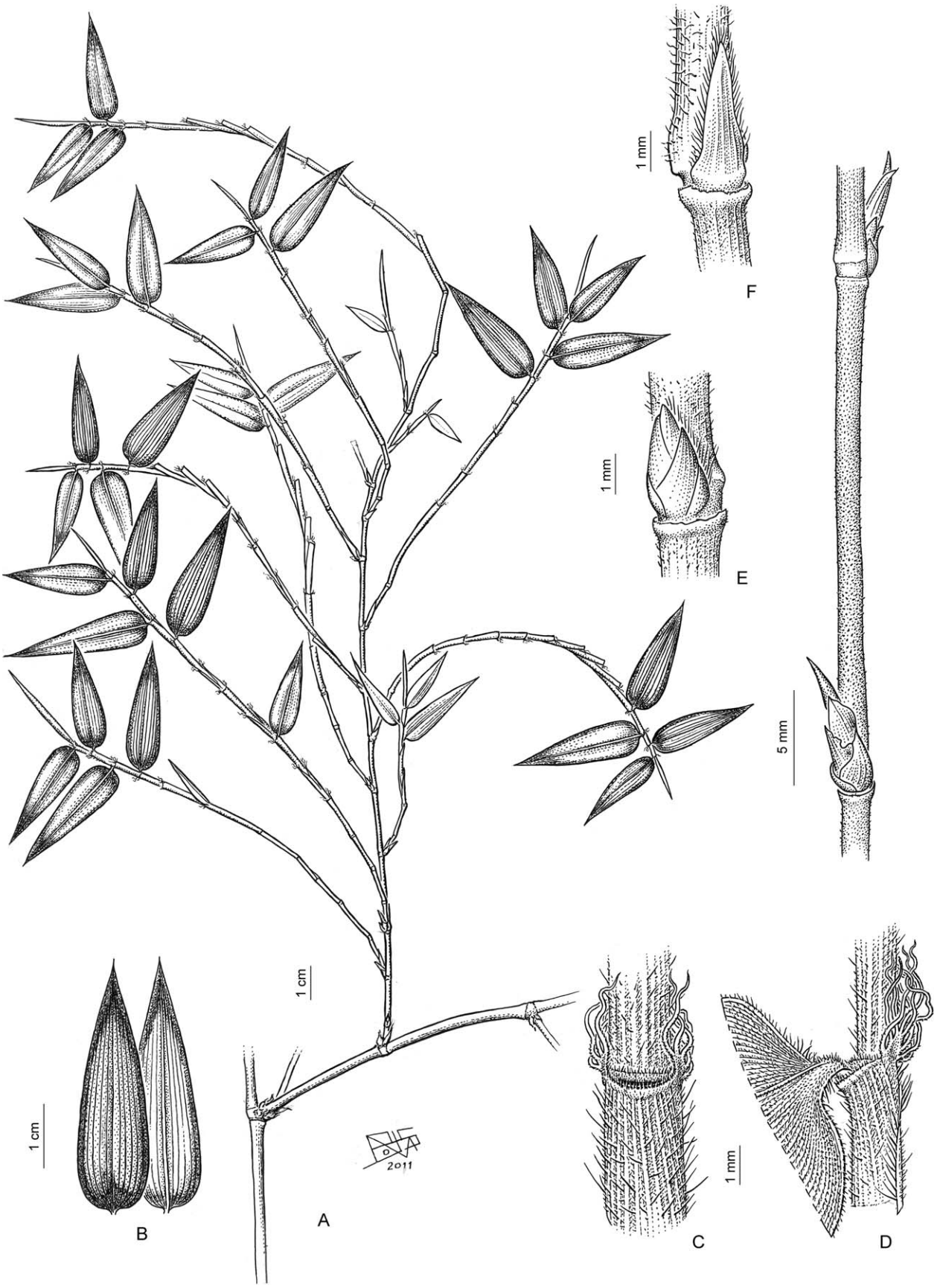

FIG. 1. *Guadua variegata*. A. Branch complement. B. Foliage leaf blades, ventral and dorsal view. C. Foliage leaf sheath (leaf blade deciduous), showing outer and inner ligule and fimbriate auricle. D. Foliage leaf in lateral view, showing leaf sheath, fimbriate auricle, outer and inner ligule, pseudopetiole, and part of the leaf blade. E. Bud complement composed of a single axillary bud. F. Prophyll enclosing the single axillary bud and sheath scar. G. Culm internode and developing buds [A–G from *Rúgolo 878* (SI)].

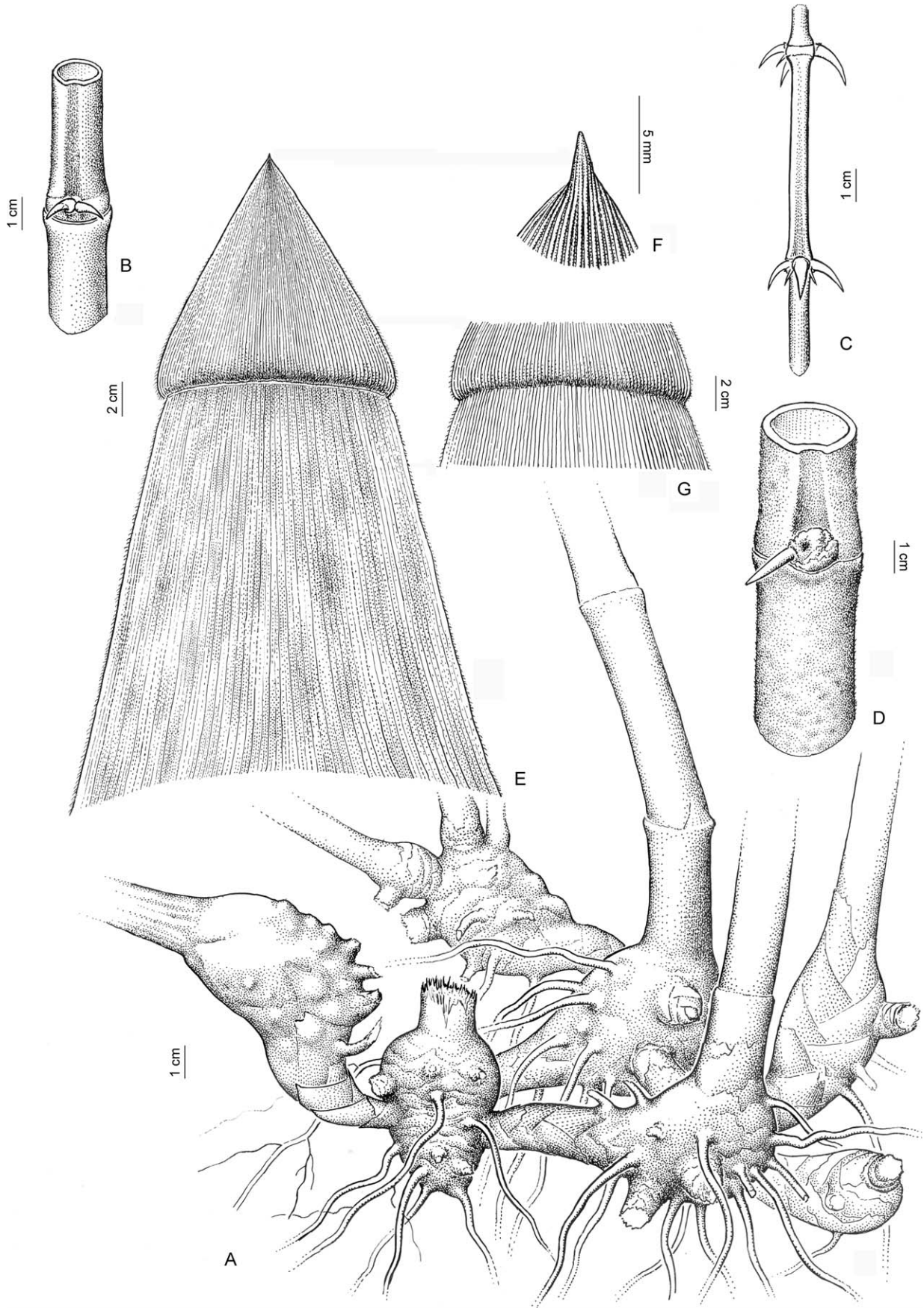

FIG. 2. *Guadua variegata*. A. Short-necked pachymorph sympodial rhizome. B–D. scabrous culms showing thorns in the branch complement: B–C. Young culms furrowed. D. Mature culm. E. Culm leaf, ventral view. F. Culm leaf blade apex, detail in dorsal view. G. Culm leaf outer ligule, detail in dorsal view. [A–F. from *Lizarazu 62* (SI)].

FIG. 3. *Guadua variegata*. A. Habit. B. Young culm. C. Hollow mature culm in longitudinal section. D. Thorny branch complement. E. Base of a hollow mature culm in transverse section. F. Branch complement. G. Variegata foliage leaf blades, adaxial surface. H. Culm leaf, dorsal view. I. Culm leaf, ventral view. J. Young rhizome. K–L. Pachymorph sympodial rhizome. [A–L. from *Lizarazu 62* (SI)]. Scale bars: A, 50 cm; B, H–I, 5 cm; C, 10 cm; K–L, 2 cm; D–G, J, 1 cm.

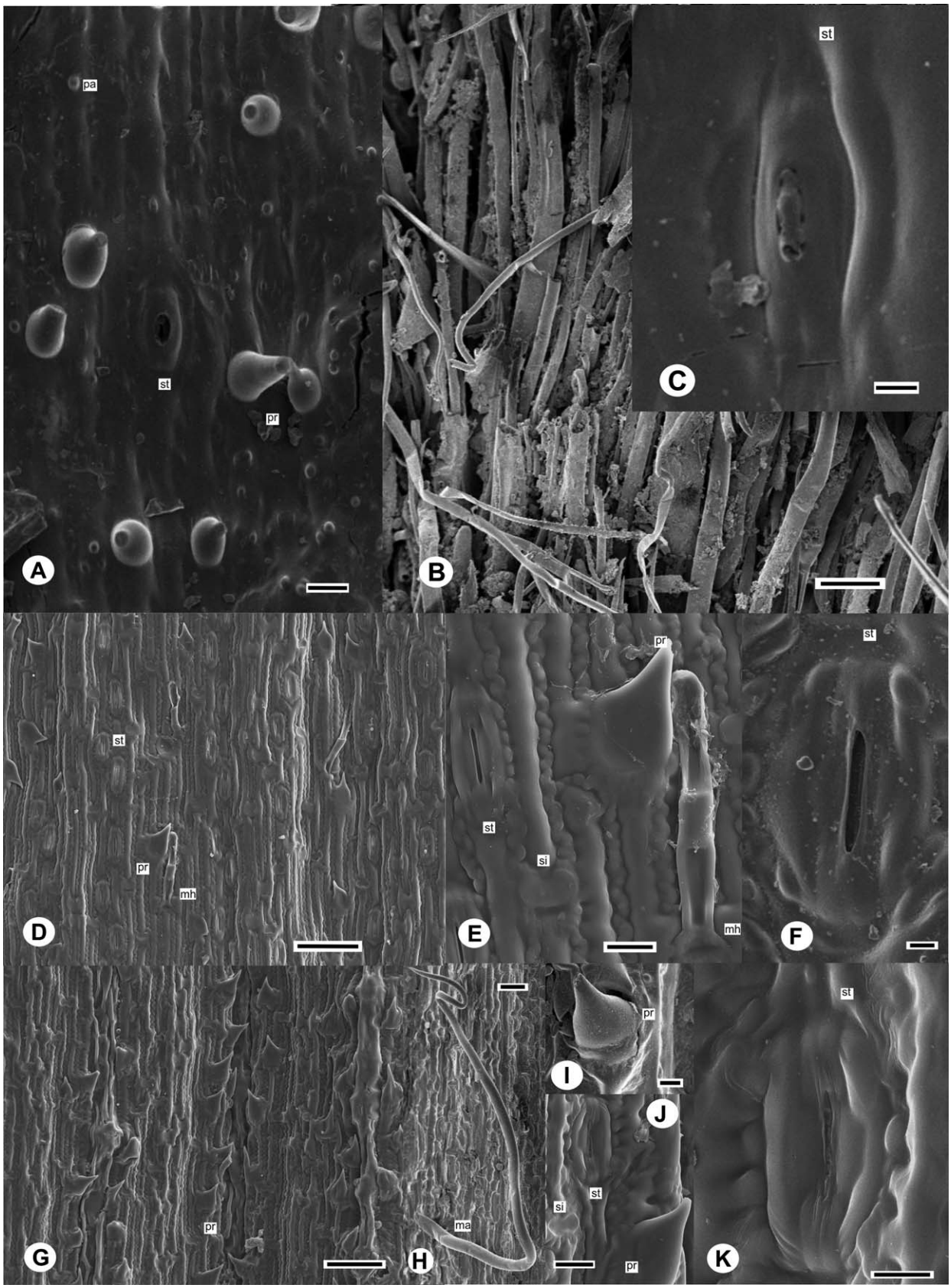

FIG. 4. SEM photographs of *Guadua variegata.* A–B. Cauline epidermis, adult culm. A. General view. B. Macrohair, detail, young culm. C. Cauline epidermis, young culm. C. Stomatal complex lacking papillae. D–F. Foliage leaf blade epidermis, abaxial surface. D. General view. E. Stomatal complexes lacking papillae, prickle hair, and microhair, detail. F. Stomatal complex lacking papillae. G–K. Foliage leaf blade epidermis, adaxial surface. G. General view. H. Macrohairs, detail. I–J. Prickle hair, stomatal complexes, detail. K. Stomatal complex lacking papillae. [A–C, F, H–I from *Lizarazu 62* (SI); D–E, G, J–K from *Nierdelein 2111* (SI)]. Scale bars: B, 100 µm; D, G, 50 µm; H, 30 µm; A, E, J, 10 µm; I, K, 5 µm; C, 3 µm; F, 2 µm. Abbreviations: ma. macrohairs, lc. long cells, mh. microhairs, p. papillae, pr. prickles, sc. short cells, st. stomatal complexes.

FIG. 5. Geographical distribution of *Guadua variegata* based on herbarium specimens.

TABLE 1. Comparative exomorphological characters in species of *Guadua* (*G. chaparensis* was based on literature data).

Characters	*G. chacoensis*	*G. chaparensis*	*G. glomerata*	*G. paniculata*	*G. paraguayana*	*G. sarcocarpa*	*G. superba*	*G. tagoara*	*G. trinii*	*G. variegata*	*G. weberbaueri*
Culm leaves (Ratio: sheath/blade)	3-4	7.6-4	4.3-4	0.7-1	2-3	4.5-5	1.5-2.3	4-7	1.1 – 2.2	1.6-1.7	5-9
Culm leaves, insertion of the inner ligule.	oblique	curved	curved	slightly curved	curved	more or less straight	curved	oblique	straight	straight	curved
Culm leaves, auricle	absent	absent	not seen	present	present	present	not seen	absent	absent. rarely present	absent	absent
Culm, internode	hollow	hollow	almost solid or solid	almost solid or solid	solid	almost solid or solid	almost solid or solid	hollow	hollow	hollow	hollow
Culm, indument and surface	glabrous and smooth	densely pubescent, glabrous at maturity	strigose	glabrous	scabrous	scabrous	glabrous	glabrous, rarely pubescent	tomentose and scabrous	tomentose, glabrous at maturity	subglabrous.
Culm, diameter (cm)	8-15	7-12	1-4.5	2-6	2-4	8-10	10-15	6-10(-15)	3-5(-7)	1.5-3.5	3-8(-12)
Foliage leaf sheath, indument	glabrous	subglabrous	glabrous	hirsute	hirsute	glabrous	glabrous or subglabrous	glabrous	pubescent	hirsute	subglabrous
Foliage leaf blade (Ratio: length/width)	11-26	8-13	5-6.25	12-15	8-10	6-9	13-16	4-9	8.5-10	3.2-4	4-8
Foliage leaf blade, nerves	not tessellate	tessellate	not tessellate	tessellate	tessellate	tessellate	tessellate	strongly tessellate	tessellate	strongly tessellate	strongly tessellate
Foliage leaf blade, midnerve	centric	eccentric	centric	centric	eccentric	centric	centric	slightly eccentric	centric	eccentric	eccentric
Foliage leaf blade, number of nerves	8-14	11-14	20-21	10-12	9-10	17-22	11-13	15-20	7-10	8-10	14-15
Foliage leaf blade, indument, adaxial surface	glabrous or subglabrous	glabrous	glabrous	puberulous or glabrous	glabrous or subglabrous	glabrous	glabrous	glabrous	pubescent	subglabrous or glabrous	glabrous
Pseudopetiole, length (mm)	2-3	2-4	5	2-3	2-2.5	6-7	5	4-10(-15)	1-2	1.5-2	6-7
Pseudopetiole, indument, adaxial surface	pubescent	puberulous	glabrous	hirsute	pubescent	glabrous or subglabrous	glabrous	glabrous or slightly hispid	tomentose	hirsute	glabrous
Pseudopetiole, indument, abaxial surface	glabrous	glabrous	subglabrous	hirsute	glabrous	glabrous	glabrous	glabrous	tomentose	hirsute	tomentose
Fimbriae, length (mm)	3-4	absent	6-10	6	5-10 (-14)	10	not seen	7-10(-15)	1.7-4	5-7	25
Fimbriae, number in each margin	3-5	absent	11	4-6	3-5	absent	not seen	20	6-7	7-10	15-24
Auricle	absent	absent	absent	present	present	absent	absent	present	absent	present	absent

exhibit papillae on both surfaces and these are completely absent in *G. angustifolia*, *G. calderoniana* Londoño and Judz., *G. chacoensis*, *G. macclurei*, *G. tagoara*, *G. trinii*, *G. uncinata* Londoño and L. G. Clark, and *G. variegata.*

Key to the Identification of the Species of *Guadua* in Argentina, Bolivia, Uruguay, Paraguay, and Southern Brazil, based on Vegetative Characters.

1. Culms solid or hollow, thick-walled, lumen less than 50% of its diameter. Culm leaves auriculate 2
   2. Foliage leaves with a hirsute sheath, auriculate; pseudopetiole 2-3 mm long. Culm leaves with sheath as long, smaller or longer than blade 3
      3. Culms smooth. Culm leaves with sheath as long or smaller than blade (sheath/blade ratio: 0.7-1). Foliage leaf blade with midnerve centric; pseudopetiole hirsute on both surfaces ..... *G. paniculata*
      3. Culms scabrous. Culm leaves with sheath notoriously longer than blade (sheath/blade ratio: 2-3). Foliage leaf blade with midnerve eccentric; pseudopetiole adaxially pubescent and abaxially glabrous ..... *G. paraguayana*
   2. Foliage leaves with a glabrous or subglabrous sheath, lacking auricles; pseudopetiole 5-7 mm long. Culm leaves with sheath notoriously longer than blade 4
      4. Culms 1-4.5 cm diam., strigose. Foliage leaf blades not tessellate; pseudopetiole abaxially subglabrous ..... *G. glomerata*
      4. Culms 8-15 cm diam., glabrous. Foliage leaf blades tessellate; pseudopetiole abaxially glabrous 5
         5. Culm leaves with sheath/blade ratio: 4.5-5, inner ligule insertion more or less straight, margin ciliate. Culms 8-10 cm diam. Foliage leaf blade length/width ratio: 6-9, 17-22-nerved; pseudopetiole 6-7 mm long ..... *G. sarcocarpa*
         5. Culm leaves with sheath/blade ratio: 1.5-2.3, inner ligule insertion curved, margin smooth. Culms 10-15 cm diam. Foliage leaf blade length/width ratio: 13-16; 11-13-nerved; pseudopetiole ca. 5 mm long ..... *G. superba*
1. Culms hollow, thin-walled, lumen more than 50% of its diameter. Culm leaves lacking auricles 6
   6. Culm leaf sheath as long or twice the length of blade (sheath/blade ratio: 1.1-2.2), inner ligule insertion straight. Foliage leaf sheath pubescent or hirsute; pseudopetiole 1-2 mm long. Culms tomentose or scabrous 7
      7. Foliage leaves with blades completely green, midnerve centric, length/width ratio: 8.5-10, tessellate, adaxially pubescent; pseudopetiole tomentose; sheaths pubescent, lacking auricles, with fimbriae 1.7-4 mm long, 6-7 in each margin. Culms 3-5(-7) cm diam ..... *G. trinii*
      7. Foliage leaves with variegated blades, pale yellow with greenish margins, midnerve eccentric, length/width ratio: 3.2-4, strongly tessellate, adaxially glabrous or subglabrous; pseudopetiole hirsute; sheaths hirsute, auriculate, with fimbriae ca. 5.7 mm long, 7-10 in each margin. Culms 1.5-3.5 cm diam ..... *G. variegata*
   6. Culm leaf sheath 3 or more times longer than blade (sheath/blade ratio: 3-9); inner ligule insertion oblique or curved, never straight. Foliage leaf sheath glabrous or subglabrous; pseudopetiole 2-10(-15) mm long. Culms glabrous or subglabrous 8
      8. Culm leaves with sheath/blade ratio: 3-4. Foliage leaves with blades length/width ratio: 11-26, not tessellate, midnerve centric; fimbriae 3-4 mm long, 3-5 in each margin ..... *G. chacoensis*
      8. Culm leaves with sheath/blade ratio: 4-9. Foliage leaves with blades length/width ratio: 4-13, tessellate, midnerve eccentric; fimbriae 7-25 mm long, 7-24 in each margin 9
         9. Culm leaf blade with apex acuminate, adaxially pubescent, inner ligule insertion oblique. Foliage leaves auriculate, sheaths glabrous ..... *G. tagoara*
         9. Culm leaf blade with apex mucronate, adaxially hispid, inner ligule insertion curved. Foliage leaves lacking auricles, sheaths subglabrou 10
            10. Culm leaf blade with mucro 3-3.5 mm long. Foliage leaves with blade length/width ratio: 4-8, strongly tessellate, 14-15-nerved; pseudopetiole 6-10 mm long, adaxially glabrous and abaxially tomentose; fimbriae 16-20 mm long ..... *G. weberbaueri*
            10. Culm leaf blade with mucro 1.2-1.5 mm long. Foliage leaves with blade length/width ratio: 8-13, tessellate, 11-14-nerved; pseudopetiole 2-4 mm long, adaxially puberulous and abaxially glabrous; fimbriae absent ..... *G. chaparensis*

1. Guadua chacoensis (Rojas) Londoño & P. M. Peterson, Novon 2 (1): 41. 1992. *Bambusa chacoensis* Rojas, Bull. Acad. Int. Géogr. Bot. 26 (4): 157. 1918. *Guadua angustifolia* subsp. *chacoensis* (Rojas) S. M. Young & Judd, Ann. Missouri Bot. Gard. 79 (4): 763. 1992.—TYPE: ARGENTINA. Chaco. Dpto. Bermejo: General Vedia, riberas del Río de Oro, 23 Jul 1974, *C. L. Quarín et al. 2384* (neotype: CTES! designated by Londoño and Peterson Novon 2: 41. 1992; isoneotypes: F photo SI!, G photo SI!, K photo SI!, MO, RB photo SI!, SI!, US photo SI!). The same collections also designated as neotype by Young and Judd, Ann. Missouri Bot. Gard. 79: 763. 1992.

Iconography—Londoño and Peterson (1992: 42, Fig. 1. C); Lizarazu and Vega (2012: 60).

Vernacular Names—Argentina: "Tacuara" (*Rojas 11719*, SI), "Tacuaruzú", "Tacuara guazú" (*Rodríguez 486*; BAA), "Tacuara pytá" (*Quarín et al 3182*, BAA); Bolivia: "Tacuara" *(Nee 36861,* SI) and Paraguay: "Tacuara" (*Rojas 2311,* SI), "Yatevó" (*Rojas 13547*, BAA).

Geographic Distribution and Ecology—It occurs in gallery forests along streams and rivers, and is distributed in Bolivia, Paraguay, Uruguay, Brazil, and Argentina (Lizarazu and Vega 2012).

Uses—Culms are used in construction and decoration of houses and in the manufacture of rustic furniture (Lizarazu and Vega 2012).

Phenology—The most recent mast flowering event, with the subsequent death of plants, started in 2008 in the provinces of Misiones, Corrientes, Chaco, Tucuman, and Buenos Aires. This flowering event occurred after 28 years of vegetative growth (Vega and Cámara Hernández 2008) and flowering extended for three years (Londoño and Peterson 1992; Lizarazu and Vega 2012).

Additional Specimens Examined—ARGENTINA. Buenos Aires: Cult. en el Jardín Botánico de la Facultad de Agronomía, 12 Jun 2008 fl!, *Vega & San Martín 17* (BAA). Chaco: Dpto. unidentified, Casa Lata, 28 Jul 1944 fl!, *Rojas 11719* (LIL, SI). Corrientes: Dpto. Capital, Arroyo Riachuelo y Ruta 12, 15 Aug 1974 fl!, *Quarin 2402* (BAB, CTES, ICN, LIL, MBM, SI). Dpto. Concepción, Campo San Antonio, 28° 43′17″S, 58°22′56″W, 28 Jun 2001 veg!, *Keller 1028* (CTES). Dpto. Empedrado, Ruta 12 y río Empedrado, 24 Oct 1975 veg!, *Quarín 3210* (BAA, CTES, SI). Dpto. General Alvear, Alvear, Feb 1945 fl!, *Meyer s.n.* Herb. Parodi 15095, 15098 (BAA). Dpto. General Paz, Estancia San José, 14 Nov 2006 fl!, *Schinini 36841* (CTES, MBM, SI). Dpto. Ituzaingó, Isla Apipé Grande, Puerto San Antonio, 8 Dec 1973 fl!, *Krapovickas et al. 23851* (BAA, CTES, ICN, LIL, MBM, SI)

Dpto. Mburucuyá. Parque Nacional Mburucuyá-Potrero 2 chico, embarcadero. Bosque higrófilo marginal del estero Santa Lucía, 19 Oct 2006 fl!, *Arbo 9431* (CTES). Dpto. Mercedes, Macrosistema Iberá, Estancia Rincón del Diablo, alrededores del casco, 28°44′S, 58°2′W, 4 Dec 1998 veg!, *Arbo 8269* (CTES, SI). Dpto. Santo Tomé, Ruta 41, Galarza. Reserva Natural Provincial del Iberá, Laguna de Luna. 28°5′S, 56°47′W, 26 Apr 1995 veg!, *Arbo 6599* (CTES). Misiones: Dpto. Capital, Posadas, Arroyo Itaembé, hab. a orilla del río Paraná, Dec 1943 fl!, *Matus* s. n. (BAA). Dpto. Eldorado, Alto Paraná, alrededor del puerto, interior de selva de Takuaruzú, 27 Mar 2002 veg!, *Keller 1681* (CTES. Dpto. Iguazú, Puerto Iguazú. Barrio San Lucas. Orillas del Río Paraná, 25 Jul 2010 veg!, *Lizarazu 34* (SI). Dpto. Leandro N. Alem, 6 km de Cerro Azul, 8 Nov 1970 veg!, *Maruñak 150* (CTES). Dpto. Libertador Gral. San Martín, vicinity of Puerto Leoni, 75-100 m, 12/21 Jul 1914 fl!, *Curran 677* (BAA, NY, US). Dpto. Montecarlo. Caraguatay, orillas del río Paraná, 25/30 Dec 1943 fl!, *Porta 108* (BAA). Dpto. San Ignacio, Peñón de la Reina Victoria, 14 Jan 1976 fl!, *Krapovickas & Cristóbal 28759* (BAA, CTES, LIL, SI). Tucumán: Dpto Capital, San Miguel de Tucumán, Jardín Bótanico del Instituto Lillo, 26 Aug 2009 fl!, *Zavala 18* (SI). BOLIVIA. Dpto. Santa Cruz: Ichilo, 17°30′20″S, 63°40′W, 31 Jul 1987 fl!, *Nee 35467* (CTES, LIL). BRAZIL. Paraná: Munic. Foz do Iguaçu, Parque Nacional do Iguaçu, Rio Sao Joao, 14 Jun 1989 fl!, *Hatschbach 53238* (CTES, BR, MBM, SP, UPCB). Santa Catarina: Munic. Brusque, Azambuja, 1951 fl!, *Reitz 3772* (FLOR, HB, HBR, US). PARAGUAY. Asunción: barranca del río de Oro Chaco Argentino, monte ribereño próximo del río Paraguay, 29 Jul 1944 fl!, *Rojas 11790* (BAA, LIL). Cordillera: Valenzuela, Pendiente de Serrania, 26 May 1945 veg!, *Rojas 12775* (BAA). Guairá: Villarica. Orillas del Río Tebicuary, entre Coronel Oviedo y Colonia Independência, 15 Oct 1957 fl!, *Burkart 18741*(LIL, MBM, SI). Ñeembucú: Rio Tebicuary Guazu, Salitre Cué, Jan 1944 fl!, *Pavetti & Rojas 10959* (BAA). San Pedro: Colonia Nueva Germânia, Dec 1916 fl!, *Rojas 2311* (BAA, MO, SI). Dpto unidentified: ad ripas, flum. Paraná, Jul 1885/1895 fl!, *Hassler 209* (BAA). URUGUAY. Artigas: costa del Uruguay, May 1938 veg!, *Lombardo 2648* (BAA).

2. GUADUA CHAPARENSIS Londoño and Zurita, J. Bot. Inst. Texas 2 (1): 25. 2008.—TYPE: BOLIVIA. Cochabamba: Prov. Carrasco, Distrito Chapare, Israel, orilla del Río Sajta, 270 m, 17°12′33″S, 64°49′47″W, 8 Aug 2004, *E. Zurita & J. Huaranca 302* (holotype: BOLV; isotypes: BOL, COL, TULV, US).

Iconography—Londoño and Zurita (2008: 32, Fig. 2. A–E).

Vernacular Names—Bolivia: "Tacuara hembra" or "Tacuara" (Londoño and Zurita 2008).

Geographic Distribution and Ecology—Only known from type locality.

Uses—Culms are used by local communities to make fences, walls, water containers, and for conducting water (Londoño and Zurita 2008).

3. GUADUA GLOMERATA Munro, Trans. Linn. Soc. London 26 (1): 79. 1868. *Bambusa glomerata* (Munro) McClure, Smithsonian Contr. Bot. 9: 66. 1973.—TYPE: BRAZIL. Amazonas. Habitat in Brazilia, in vicinibus Barra, Gapo de Rio Negro, Dec 1850–Mar 1851, *R. Spruce 1196* (holotype: K- 433045 Photo SI!, isotypes: BM, G-00099470 Photo SI!, G-00099472 Photo SI!, K- 433048 Photo SI!; NY-00381188 Photo SI!, P-00625566 Photo SI!, P-00625567 Photo SI!, TCD-00381188 Photo SI!, US-79114 Photo SI!).

Vernacular Names—Peru: "Morona" (Tovar 1993); Brazil: "Taboquinha" (Judziewicz et al. 1999).

Geographic Distribution and Ecology—It grows in tropical forests on riversides, at 120-260 m (Renvoize 1998), and in the Amazon basin, along seasonally flooded riverbanks, with the bases of the plants submerged in water (Londoño and Clark 2002).

Uses—In Colombia it is used by the Ticunas to construct a framework to dry and paint bank (cortex) fabric. The Ka'apor, Guajaras, and other Amazonian tribes utilize branches to make hunting arrows. Its use for lances, arrows, arrowheads, knives, and fishing harpoons is common to all Amazonian tribes; knives of guaduas were used ceremonially by the Shuar, Quijos, Macushi, and Huarayos to cut the umbilical cords of newborns and also in circumcision and other genital mutilation (Judziewicz et al. 1999).

Additional Specimens Examined—PERU: Dpto. Loreto, Prov.: Maynas, Vicinity of Iquitos ca. 120 m, 1977 fl!, *Revilla 3580* (SI); Nueva Esperanza Río Itaya, 17 Dec 1976 fl!, *Revilla 48* (SI).

4. GUADUA PANICULATA Munro, Trans. Linn. Soc. London 26 (1): 85. 1868. *Arundarbor paniculata (*Munro) Kuntze, Revis. Gen. Pl. 2: 761. 1891. *Bambusa paniculata* (Munro) Hack., Oesterr. Bot. Z. 53: 195. 1903. *Bambusa munroi Hack.,* Repert. Spec. Nov. Regni Veg. 7 (149-151): 374. 1909.—TYPE: BRAZIL: Brazil Pernambuco: Rio Preto, *G. Gardner 2981* (Lectotype here designated: P-625579 Photo SI!; isolectotypes. B-304471 Photo SI!; BM-797675 Photo SI!, BM-797676 Photo SI!, G-99469 Photo SI!, G-99468 Photo SI!, G-99467 Photo SI!, K-18888 Photo SI!, MO-797676 Photo SI!, P-625578 Photo SI!, TCD-455 Photo SI!, US-825699 (fragm.) Photo SI!. Syntype: Inter Porto Imperial et Junil, ad flum. Tocantins. 1869 fl!, *Burchell 8852* (BR-6863227, BR-686358 (fragm, US-79109), K-307852, P625582; Photo SI!).

Chusquea spinosa E. Fourn. ex Hemsl., Biol. Cent- Amer., Bot. 3: 587. 1885. *Chusquea spinosa* E. Fourn., México. PL. 2. 131. 1886. TYPE: México. inter La Galera et Pochutla, in declivitae occidentali Cordillerarum, 1,000 ft, Oct, *Liebman 130* (holotype: C; isotype: US-2972546, fragm.).

Iconography—Hammel et al. (2003: 697).

Vernacular Names—Bolivia: "Guapá" (*Killeen 752*, SI); Brazil: "Taboca" (Judziewicz et al. 1999), Mexico: "Otate amargo" (Judziewicz et al. 1999); Venezuela: "Carrizo" (Judziewicz et al. 1999).

Geographic Distribution and Ecology—It is distributed from western Mexico, Central America, Colombia, Venezuela, and Bolivia, at 100-1,000 m (Londoño and Judziewicz 1991). It grows in areas with annual precipitation between 500-600 mm (Londoño and Clark 1998). *Guadua paniculata* is also found in Brazil and Northern Paraguay (Parodi 1936), and cited for Argentina (Zuloaga et al. 1994, 2008; Londoño 2000) on the basis of specimens collected by Molfino in Misiones, and deposited in BA and BAA. According to Parodi (1936) these specimens correspond to *G. paniculata* but its origin is uncertain. No other specimens were collected in Argentina, so this species is not confirmed in this country (Lizarazu and Vega 2012).

Uses—Culms provide the matrix for the traditional mud and tile roof of local construction and are used to make pig-proof fences for vegetable gardens; it is palatable (Killeen 1990).

Phenology—In Bolivia the species flowered in May 1977 and October 1987 (Killeen 1990).

Additional Specimens Examined—BOLIVIA. Santa Cruz: Velazco. 10 May 1977 veg!, *Krapovickas & Schinini 32436* (CTES). Aprox. 400 m San Ignacio, 32 km hacia N, 3 km tras la comunidad San Javierito, estancia El Encanto, guapazal en el camino viejo a la estancia, 27 Nov 1987 veg!, *Bruderreck 44* (SI). Nuflo de Chavez, Río Quizer 10 km N of San Ramon, 16°30′S, 62°40′W, 300 m, 14 Jan 1987 veg!, *Killeen 2305* (SI). Est. San Josecito, 5 km NE of Concepción, 16°5′S, 62°5′W, 480 m, 16 Jan 1985 veg!, *Killen 752* (SI). BRAZIL. Mato Groso: Vicinity of Garapú. 13°12′S, 52°34′W, 300-400 m, 29 Sep 1964 veg!, *Irwin & Soderstrom 6433* (SI). Vicinity of Xavantina. 14°40′S, 52°20′W, 300-400 m, 27 Sep 1964 veg!, *Irwin & Soderstrom 6399* (SI). Acre: 125 km from Rio Branco on road to Porto Velho, 9°45′S, 66°20′W, 200 m, 4 Mar 1976 veg!, *Calderon & Soderstrom 2306* a-b (MO, SI); 26 Sep 1964 veg!, *Irwin & Soderstrom 6331* (SI). Distrito Federal: 700-1,000 m, 23 Aug 1964 veg!, *Irwin & Soderstrom 5464* (SI);

28 Aug 1964 veg!, *Irwin & Soderstrom 5696* (SI). Ca. 6 km de Curralinho, 15°35′S, 48°15′W, 28 Feb 1992 veg!, *Filgueiras & Zuloaga 2229* (SI). Goiás: Serra do Caiapó. 3.5 km S of Caiapinia on road to Jataí. 17°12′S, 51°47′W, 800-1000 m, 22 Oct 1964 veg!, *Irwin & Soderstrom 7187* (MO, SI). PARAGUAY. Sierras de Amambay: In altaplanitie et declivibus. 1907-1908, *Roja, s. n.* (Herbarium Hassler 10713) fl! (BAA, LIL, SI). Ruta 3, 20 km S de Bella Vista. 22°11′S, 56°30′W, 240 m, 16 Nov 1996 veg!, *Schinini & Barrail 31688* (CTES, SI). MEXICO. Oaxaca. Between Ciudad M. Alemán and Sayula. 20 m, 5 Oct 1977 veg!, *Soderstrom 2240* (SI). VENEZUELA. Bolivar: Gran Sabana, ca 10 km SW of Karaurin Tepui at junction of Río Karaurin and Río Asadon (Río Sanpa). 5°19′N, 61°3′W, 900-1,000 m, 23 Apr 1988 veg!, *Liesner 23656* (MO, SI). Delta Amacuro: Dpto Tucupita, just SW of Los Castillos de Guyana, 62°24′W, 8°33′W, 50 m, 6 Apr 1979 fl!, *Davidse & Gonzalez 16632* (MO, SI). Territorio Federal Amazonas: Dpto Río Negro, Neblina Massif, bongo (dugout) trip down Río Mawarinuma for ca. 2 km NW from base camp at mouth of canyon, 0°50′N, 66°10′W, 140 m, 31 Mar 1984 fl!, *Stannard 451* (SI).

5. GUADUA PARAGUAYANA Döll, Fl. Bras. 2 (3): 179. 1880. *Bambusa paraguayana* (Döll) Bertoni, Anales Ci. Parag., ser. 2, 2: 159. 1918.—TYPE: Paraguay, "Bords du fleuve Paraguay prox. l´Assomption", 17 Apr 1874, *B. Balansa 133* (holotype, not located, isotypes, BAA!, BM Photo SI!, BR Photo SI!, G Photo SI!, LE Photo SI!, P Photo SI!, US Photo SI!).

Iconography—Lizarazu and Vega (2012: 61).

Vernacular Names—Argentina: "Picana" (Rúgolo de Agrasar and Molina 2006), "Picanilla" (*Parodi 11141*, BAA); "Tacuara ganchosa" (*Schulz 3679*, BAA); Bolivia: "Taquarembó" (Judziewicz et al. 1999) and Paraguay: "Picanilla" (*Rojas 3542*, BAA).

Geographic Distribution and Ecology—It is distributed from Bolivia, Brazil, Paraguay, and Argentina. It grows on the banks of the rivers Parana and Paraguay (Lizarazu and Vega 2012).

Uses—Culms have been used to form the frame of the roofs of rustic buildings (Lizarazu and Vega 2012) and as human food (Judziewicz et al. 1999).

Additional Specimens Examined—ARGENTINA. Chaco: Dpto. San Fernando, Vilelas, 21 Nov 1942 veg!, *Schulz 3679* (BAA, BAB, CTES, SI). Dpto. 1 de Mayo, Cerca Boca, Nov 1934 veg!, *Schulz 3101* (CTES). Corrientes: Dpto. Isla del Paraná, ca. Curuzú Chalí, 10 Apr 1968 fl!, *Burkart et al. 26828* (BAA, LIL, SI). Dpto. Saladas, Estancias Tatacuan. Feb 1917 fl!, *Hauman s. n.* (BA-40580). Dpto. General Paz, Lomas de Vallejos. 29 Dec 1973 veg!, *Schinini 6965* (CTES). Dpto. Capital Paz, Cambá-Punta. 18 Sep 1963 veg!, *Schulz 12391* (CTES). Entre Ríos: Dpto. Federación. Rincon del Mocoretá a orillas del rio Uruguay, 16 Apr 1960 veg!, *Burkart 21634* (SI). Santa Fé: Dpto. Gral. Obligado, Puerto Piracuacito, 27 May 1939 fl!, *Meyer 2558* (BAA, LIL). BRAZIL. Bahia: Dpto. Amazonas, Banks of the Rio Negro near its confluence with the Rio Solimoes, by refinery in Manaus, 16 Mar 1976 veg!, *Calderon & Soderstrom 2355* (SI). PARAGUAY. Parque botánico, barranca anegadiza del río Paraguay, Jan 1921 fl!, *Rojas 3542* (BAA). Alto Parana: s.l., 16 May 1945 fl!, *Bertoni 1356* (LIL), Central: Ruta 2, Arroy Mboiy, orilla de arroyo, 2 Mar 1975 fl!, *Schinini 10956* (CTES). Cordillera: Valenzuela.12 Dec 1956 fl!, *Sparre & Vervoorst 988* (LIL). Pte. Hayes: s.l., 4 Nov 1950 veg!, *Sparre & Vervoorst 261* (LIL).

6. GUADUA SARCOCARPA Londoño and P. M. Peterson. Syst. Bot. 16 (4): 631. 1991.—TYPE: PERU. Cuzco: Cuenca del Río Ucayali, in an area of 400,000 hectares between the Ríos Tambo and Urubamba, ca. 12°30′S 72°58′W, growing in recent alluvial soils, hills up to 400 m, 13 Aug 1982, *Reategui s.n.* (holotype: US-2979647 Photo SI!; isotypes: US-2979646 Photo SI!, US-2979649 Photo SI!, US-2979648 Photo SI!, US-2979645 Photo SI!).

Iconography—Londoño and Peterson (1991: 632, Fig. 1. A–J. Fig. 2 A–O. Fig. 3. A–D).

Vernacular Names—Bolivia: "Capiro, Huata, Paca" (Londoño and Peterson 1991), Peru: "Paca Negra" (Olivier and Poncy 2009).

Geographic Distribution and Ecology—It grows in transitional bamboo forests from southern Amazonian Peru to Acre, Brazil, at 0-500 m (Londoño and Peterson 1991; Londoño 2000), and Bolivia (Judziewicz et al. 1999).

Uses—The natives eat the boiled fruits and new shoots (Londoño and Peterson 1991).

Additional Specimens Examined—BOLIVIA. La Paz: Prov. Sud Yungas. Camino de Sapecho hacia la Colonia Tarapacá, 650 m, 5 Sep 1992 fl!, *Seidel et al. 5862-A* (SI).

7. GUADUA SUPERBA Huber, Bol. Mus. Goeldi Hist. Nat. Ethnogr. 4: 479. 1904.—TYPE: BRAZIL. Acre. Rio Purus, bom lugar, Lago Redondo, Feb 1904, *J. Huber 4230* (holotype: MG Photo SI!; isotypes: MO-2902922 Photo SI!, US-1441733 Photo SI!).

Guadua tessmannii Pilg., Notizbl. Bot. Gart. Berlin-Dahlem 10 (100): 124. 1927. *Bambusa tessmannii* (Pilg.) McClure, Smithsonian Contr. Bot. 9: 68. 1973.—TYPE: PERU: Ost-Peru. Loreto Mittlerer Ucayali, Yarina Cocha, Sumpfgebiet am See, 155 m, Oct 1925, *Tessmann 5441* [holotype B fragm (destroyed); lectotype here designated: S-5445 Photo SI!, isolectotypes: US-79104 Photo SI!, G-00099466 Photo SI!, NY-00381189 Photo SI!, NY-00381190 Photo SI!].

Vernacular Names—Bolivia: "Tacuarembó" (Judziewicz et al. 1999); Brazil: "Rafu" (Londoño and Judziewicz 1990), "Marona" (Judziewicz et al. 1999); Peru: "Marona" (Tovar 1993), "Shiquillo" (*Mexia 6410*, SI).

Geographic Distribution and Ecology—Native to the Amazon rainforest in South America (Tovar 1993). The species is distributed in Bolivia, Brazil, Ecuador, Guyana, French Guyana, Peru, and Suriname (Londoño 2000).

***Notes*:** The labels of the specimens conserved at MG and MO indicate that it was collected by André Goeldi, although these plants were collected by J. Huber, a Swiss botanist who worked at Museo Goeldi. Huber explored Amazonian Brazil between 1894-1904 (Stafleu and Cowan 1976).

Guadua tessmannii Pilg. is here lectotypified since the holotype was destroyed by fire in Berlin in 1943 (R. Vogt, in litt.); specimen S-5445 is designated as the lectotype.

Additional Specimens Examined—BRAZIL. Acre, 11 Mar 1976 fl!, *Calderon 2340* (CTES, SI). Mato Groso: Presidente Marques, M. Marmoré, 11 Oct 1923 fl!, *Kuhlmann 590* (SI). ECUADOR. Napo: Cantón Lago Agrio, Dureno, Comunidad indígena Cofán, 0°2′S, 76°42′W, 350 m, 11 Mar 1986 veg!, *Cerón 258* (SI). PERU. Loreto: Iquitos, left bank of Rio Marañon above Rancho Indiana, overflowed bank, 110 m, 22 Jan 1932 fl!, *Mexia 6410* (LIL, SI).

8. GUADUA TAGOARA (Nees), Enum. Pl. 1: 434. 1833. *Bambusa tagoara* Nees, Fl. Bras. Enum. Pl. 2: 532. 1829. *Arundarbor tagoara* (Nees) Kuntze, Revis. Gen. Pl. 2: 761. 1891.—TYPE: Brazil. Brazilia: "habitat in sylvis altitudine: 1800 ped in adscensu montis, Serra do mar dicti, euntibus versus Guarantingueta, provinciae S. Pauli", *Martius s.n.* (holotype: BR, isotype: BR Photo SI!).

Bambusa barbata Trin., Mém. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 3, 1(6): 627. 1835. *Nastus barbatus* (Trin.) Rupr., Bambuseae 42, t. 17. 1839—TYPE: BRAZIL., 1824 ó 1829, *L. Riedel 520* (holotype: LE; isotype: G Photo SI!, MO Photo SI!, K Photo SI!, P Photo SI!, US-2809286 Photo SI!, US-2809287 Photo SI!).

Bambusa distorta Nees, Linnaea 9 (4): 470. 1834. *Guadua distorta* (Nees) Rupr., Bambuseae 41, t. 16, f. 59. 1839. *Arundarbor distorta* (Nees) Kuntze, Revis. Gen. Pl. 2: 761. 1891.—TYPE: Brazil, *F. Sellow s.n.* [holotype: B (destroyed); lectotype: US-557556 Photo SI!, isolectotype: ex US-2809292 Photo SI!]. Lectotype designated by Lizarazu et al. 2012, Darwiniana 50 (1): 163.

Bambusa spinosissima Hack., Oesterr. Bot. Z. 53 (5): 197. 1903. *Guadua spinosissima* (Hack.) E. G. Camus, Bambusées 1: 112. 1913. TYPE: Brazil: Santa Catarina, Jul 1888, *E. Ule 878* (holotype: W; isotypes: US-822345 Photo SI!, US-2809338 Photo SI!).

GUADUA TAGOARA SUBSP. GLAZIOVII (Hackel) Londoño & L.G. Clark. Novon 12(1): 76. 2002. *Bambusa glaziovii* Hack. Oesterr. Bot. Z. 53(5): 194. 1903. *Guadua glaziovii* (Hack.) E.G. Camus. Bambusées 1: 108. 1913.—TYPE: BRAZIL, Brasilia: Rio de Janeiro. No date, *A. F. M. Glaziou 17450* (holotype: W-12235 photo SI!; isotypes: K000433067 photo SI!, P-00625589 photo SI!, US-2809297, US-734826, W-12236 photo SI!)

Guadua longifimbriata E.G. Camus. Bambusées 1: 113. 1913. *Bambusa longifimbriata* (E.G. Camus) McClure. Smithsonian Contr. Bot. 9: 66. 1973.—TYPE: BRAZIL. Rio de Janeiro. 29 Feb 1872. *A. F. M. Glaziou 5717* (holotype: P-00625587 photo SI!; isotypes: K-000433068 photo SI, P-00625586 photo SI!, P-00625588 photo SI!, US-1021625)

Geographic Distribution and Ecology—This subspecies only occurs in the Atlantic forest of the state of Rio de Janeiro (Londoño and Clark 2002).

Additional Specimens Examined—BRAZIL. Rio de Janeiro. 29 Feb 1872 (fl), *Glaziou 17450* (BAA). Parque Nacional da Tijuca, Bom Retiro, 25 Feb 1972 (veg), *Soderstrom 1854* (RB); Macaé de Cima, a 3 km São João, 3 Aug 1992 (veg), *Londoño 716* (RB).

GUADUA TAGOARA (Nees) Kunth SUBSP. TAGOARA

Iconography—Lizarazu et al. (2012: 163. Fig. 1 A–D and 165 pp. Fig. 2 A–H).

Vernacular Names—Brazil:"Taquaruçu", "taquara", "taboca", "tagoara", "tagoaraci", "Taquara grossa", "Takuarussú" (Judziewicz et al. 1999; Lizarazu et al. 2012).

Geographic Distribution and Ecology—It grows in the Atlantic forests at 50-1,200 m. It is distributed in Brazil and Argentina (Lizarazu et al. 2012).

Uses—Culms can be used in building huts, shelters, water pipes and as a fire starter (Londoño and Clark 2002).

Phenology—Londoño and Clark (2002) considered that *G. tagoara* flowers every two years and it is not followed by clump death. The analysis of herbarium material indicates that its life cycle is close to 30 years, with sporadic pre-masting flowering events (Lizarazu et al. 2012). The duration of the life cycle of *Guadua* species inhabiting Argentina has been determined to be around 30 years (Parodi 1955; Vega and Cámara Hernández 2008).

Additional Specimens Examined—ARGENTINA. Misiones: Dpto. General Manuel Belgrano, Isla Grande, Río Iguazú Superior, 27 Jan 2005 veg!, *D. Ciarmiello et al. s.n.* (SI-108581 a-b). BRAZIL. Bahía: Mun. de Jequié, Road Jequié-Ipiaú, ca. 40 Km SE of Jequié, 175 m, 16 May 1976 veg!, *Calderon et al. 2439* (SI). Espírito Santo: Mun. de Marechal Floriano, Domingos Martins, BR-262, km 42, before Marechal Floriano, 20°21′S, 40°37′W, 530 m, 21 Feb 1990 veg!, *Clark & Morel 691* (RB). Paraná: Mun. de Antonina, Rio Pequeno, 10 Oct 1974 fl!, *Hatschbach 33640* (CTES, MBM). Mun. de Campina Grande do Sul, Figueira, Rio Capivari, 19 Dec 1972 fl!, *Hatschbach 31014* (CTES, HB, MBM). Mun. de Capão Bonito,"in silva prim", 27 Mar 1915 fl!, *Dusen 16878* (BAA, SI). Rio de Janeiro: Mun. Cachoeira de Macacu, 22°27′S, 42°39′W, 980 m, 30 Apr 1972 fl!, *Soderstrom & Sucre 1978* (RB). Mun. de Itatiaia, Parque Nacional de Itatiaia, road to Maromba, near Hotel Simon, 22°26′S, 44°37′W, 1,000 m, 12 Feb 1990 veg!, *Clark et al. 670* (RB). Mun. de Macaé, Macaé de Cima, Reserva Ecológica, Sitio Tacuara-oca, por la trocha a Cascada Preta, 8 Mar 1992 veg!, *Londoño & Sarahyba 720* (RB). Mun. de Nova Friburgo, Maçai de Lima, Nascente do Rio das Flores, florestas pluvial tropical costeira, 1,000 m, 28 Nov 1986 veg!, *Martinelli et al. 12008* (RB, SI). Mun. de Petrópolis, Vale de Bom Sucesso, "Caixa d Água", 22°25′S, 43°7′W, 720 m, 6 May 1972 veg!, *Soderstrom & Sucre 1985* (RB). Mun. de Teresópolis, 16 km S of Itaipara, Serra dos Órgãos, Montane Forest, 950 m, 26 Mar 1976 fl!, *Davidse et al. 11420* (MBM). Santa Catarina: Mun. de Blumenau, Mata da Companhia Hering, 25 Oct 1954 fl!, *Reitz & Klein 2283* (HB, HBR, PACA). Mun. de Lauro Müller, Vargem Grande, 1 Jul 1958 fl!, *Reitz & Klein 6732* (FLOR, HB, MBM). San Pablo: Mun. de Boacaina, Base of Serra da Boacaina, road Areias-S. José de Barreiro, km 251, 22°38′S, 44°38′W, 740 m, 15 Jan 1990 veg!, *Clark & Morel 624* (RB). Mun. de Mairiporã, Serra da Cantareira, 18 May 1904 fl!, *Hammar 6116* (SP).

9. GUADUA TRINII (Nees) Nees ex Rupr., Bambuseae 40: 38. 1839. *Bambusa trinii* Nees, Linnaea 9(4): 469. 1834. *Arundarbor trinii* (Nees) Kuntze, Revis. Gen. Pl. 2: 761. 1891.—TYPE: Brazil. Brazilia, *Sellow s.n.* (holotype: B; isotypes: BAA!, BR Photo SI!, G Photo SI!, K Photo SI!, LE, P Photo SI!; US Photo SI!).

Guadua trinii (Nees) Nees ex Rupr. var. *scabra* Döll, Fl. Brás. 2(3): 179. 1880.—TYPE. Brazil. Prope Lagoa Santa in silvae margine ad Lapa Vermelha frequens

Bambusa tacuara Arechav., Anales Mus. Nac. Montevideo 1 (6): 550. 1897.—TYPE. Uruguay. Dpto. Tacuarembó, Cerro de la ceniza, Oct., *D. Pantaleón Pintos s.n.* (holotype: MVM).

Bambusa riograndensis Dutra, Revista Agric Rio Grande 7. 1903. *Guadua riograndensis* (Dutra) Herter, Revista Sudamer. Bot. 6(5-6): 148. 1940.—TYPE: Brazil. Rio Grande, São Leopoldo, Aug 1902, *J. Dutra 419* (holotype: not located; isotypes: BAA!, SI!; US Photo SI!).

Guadua tomentosa Hack. & Lindm., Kongl. Svenska Vetenskapsakad. Handl. 34(6): 20. 1900. *Bambusa tomentosa* (Hack. & Lindm.) McClure. Smithsonian Contr. Bot. 9: 68. 1973. TYPE. Brazil. Braziliae civit Rio Grande do Sul, "Col. Ijuhy in regione silvarum primarum haud raro", Apr 1893, *C. A. M. Lindman 1433* (holotype: S; isotypes: BAA!, US Photo SI!, P Photo SI!).

Iconography—Lizarazu and Vega (2012: 62).

Vernacular Names—Argentina: "Tacuaruzú", "Tacuara brava", "Caña brava", "Yatevó", "Tacuara" (*Guaglianone 2179*, SI); Brazil: "Tacuara brava", "Taquaruçu", "Taboca", "Taquara", and "Taquara-assú", "Tacuarussú", "Taquara-assú, "Yatevó" (Judziewicz et al. 1999).

Geographic Distribution and Ecology—It is distributed in southern Brazil, Uruguay and Argentina. It grows in the Atlantic forests forming dense clumps almost impenetrable (Parodi 1936).

Uses—This species is used in the construction of walls of huts (Burkart 1969, Nicora and Rúgolo de Agrasar 1987) and also has been used in the paper industry (Smith et al. 1981).

Phenology—This species grows vegetatively for ca. 30 yr. and flowers for two years, after flowering and fruiting, the clumps died completely. The fruits then fell to the ground and germinated (Parodi 1955).

Additional Specimens Examined—ARGENTINA. Buenos Aires: Cult. Jard. Bot. Lucien Hauman, 21 Nov 1984 fl!, *Camara-Hernandez s. n.*

(BAA-19309, CTES, LIL); Delta del Paraná, Chaná Miní, 14 Jan 1923 fl!, *Parodi 4931* (BAA); 14 Jan 1923 fl!, *Hauman s.n.* (BA, CTES); Isla del Río Ceibo, 25 Nov 1932 veg!, *Burkart 4628* (CTES). Corrientes: Dpto. Alvear, ruta 40 y Bañado Cuay Chico, 20 Jul 1982 fl!, *Tressens et al. 2094* (BAA, BAB, CTES, ICN, LIL). Dpto. Capital, Isla Poriahú. Rio Paraná, 8 Nov 1983 veg!, *Neiff 1574* (CTES). Dpto. S. Martín, La Cruz, 10 Nov 1936 veg!, *Parodi 12576* (BAA). Dpto. Santo Tomé. Ayo. Chimiray, 23 Sep 1974 veg!, *Krapovickas 26263* (CTES). Entre Ríos: Dpto. Islas del Ibicuy, Delta del Paraná, arroyo Martínez, 13 Oct 1944 veg!, *Boelcke 963* (BAA). Dpto. Concordia, arroyo Ayuí, 26 Jan 1927 veg!, *Burkart 1008* (BAA, SI). Dpto. Federación, s.l., 16 Feb 1945 veg!, *Schulz 566* (LIL). Dpto. Delta del Paraná, Isla La Chilena, 28 Feb 1938 veg!, *Burkart 8983* (SI). Misiones: Dpto. Candelaria, Bonpland, 11 Dec 1906 veg!, *Van de Venne* BA-40583 (BA, SI). Dpto Concepción, 28 Jan 1926 veg!, *Parodi 6972* (BAA). Dpto. General Manuel Belgrano, Ruta Nac.14 de Bdo. de Irigoyen a Tobuna, 17 Km. del empalme con ruta Prov. 17, 26°23′S, 53°48′W, 1 Mar 1995 veg!, *Zuloaga et al. 5143* (CTES, SI). Dpto. Guaraní. Predio Guaraní. Sendero CIFOR en Selva, 15 Sep 1988 veg!, *Tressens 6030* (CTES). Dpto. Iguazú, Cataratas, pasarela. Salto Bozzeti, 26 Sep 1990 fl!, *Guaglianone 2486* (SI). BRAZIL. Río Grande do Sul: Canoas, 7 Sep 1933. fl!, *Rambo 879* (BAA, LIL). PARAGUAY. Caazapá: Tavai, castor cué, 5 Aug 1989 veg!, *Basualdo 2618* (CTES). URUGUAY. Artigas: Costa del Río Uruguay, May 1938 fl!, *Lombardo 2647* (BAA). Miguelete: Montevideo, May 1934 fl!, *Mato 442* (CTES). Río Negro: Río Uruguay Balneario Las Cañas, 21 Dec 1965 fl!, *Del Puerto-Marchesi 5630* (BAA). Rocha: Río Cebollatí, frente a la Charqueada, 20 Feb 1948 veg!, *Castellanos 18625* (LIL, MO, SI). Treinta y tres: Tacuarembó, 28 Sep 1928 veg!, *Herter 3747* (CTES).

10. Guadua weberbaueri Pilg., Repert. Spec. Nov. Regni Veg. 1: 152. 1905. *Bambusa weberbaueri* (Pilg.) McClure, Smithsonian Contr. Bot. 9: 68. 1973.—TYPE: PERU. San Martín: Moyobamba, in formatione "Matorral" dicta frequens, rarius in silvis ad locos humidiores, 800-900 m, florens mense Auguste 1904, *Weberbauer 4562* (lectotype: MOL 7883; isolectotypes: US-79101 (fragm.) Photo SI!, BOL, COL, G-99459 Photo SI!, TULV, US). Lectotype designated by Londoño and Zurita, J. Bot. Res. Inst. Texas 2 (1): 34. 2008.

Guadua sarcocarpa subsp. *purpuracea* Londoño & P.M. Peterson, Syst. Bot. 26(4): 635. 1991.—TYPE: PERU. Cuzco: Prov. Quispicanchis: along trail directly S of Quincemil, ca. 13°30′S, 71°35′W, ca. 1,100 m, 11 Oct 1976. *Wasshausen & Encarnación 760* (holotype: US-2957344 Photo SI!; isotypes: K-433075 Photo SI!, MO-3109262 Photo SI!, NY-22508 Photo SI!, USM).

Iconography—Renvoize (1998: 30, Fig. 2C); Londoño and Zurita (2008: 32, Fig. 2A–E).

Vernacular Names—Bolívia: "Marona, paca" (Renvoize 1998) and Peru: "Ipa", "Marona", "Paca" (Judziewicz et al. 1999), "Paca blanca" (Olivier and Poncy 2009).

Geographic Distribution and Ecology—It is distributed in Colombia, Peru, Ecuador, Venezuela, and Bolivia, where it grows in humid forests at 170-2,800 m (Renvoize 1998). Based on field observations, *G. weberbaueri* appears to be found mainly on ancient terraces and on river banks with poorly-drained soils (Olivier and Poncy 2009).

Uses—In Perú, the internodes are used by Piros and Machigueras tribes in the construction of musical instruments, snares to catch macaws, arrows, as well as to make dyes (Judziewicz et al. 1999).

Additional Specimens Examined—BOLIVIA. Santa Cruz: Prov: Andrés Ibáñez, 12 km E of center of Santa Cruz, on road to Cotoca, 20 Feb 1987 veg!, *Nee 34188* (SI). Beni, Ballivan, Forest island at Espíritu Viejo, 4 Apr 1987 fl!, *Renvoize 4671* (SI).

BRAZIL. Acre: 52 km from Rio Branco on road to Sena Madureira, 9°41′S, 67°49′W, 285 m, 28 Feb 1976 veg!, *Calderon & Soderstrom 2286* (MO, SI).

Acknowledgments. We are indebted to the curators of the herbaria for making the material available, Ana Castro for her valuable help during field trips and two anonymous reviewers for helpful comments on this manuscript. This work received financial support through grants UBACyT 20020100100641, UBACyT 20020110100080, and PICT-2006 # 2495.

Literature Cited

Burkart, A. 1969. Guadua. pp. 32–35, in *Gramíneas. Flora Ilustrada de Entre Ríos*, ed. A. Burkart. Buenos Aires: Colección Científica del Instituto Nacional de Tecnología Agropecuaria.

Clark, L. G. 1990. Diversity and biogeography of Neotropical bamboos (Poaceae: Bambusoideae). *Sociedade Botânica do Brazil* 4: 125–132.

Clark, L. G. 1995. Diversity and distribution of the Andean woody bamboos (Poaceae: Bambusoideae), pp. 501–512 in *Biodiversity and conservation of neotropical montane forests*. eds. S. P. Churchill, H. Balslev, E. Forero, and J. Luteyn. New York: New York Botanical Garden.

Clark, L. G., S. Dransfield, J. Triplett, and J. G. Sánchez-Ken. 2007. Phylogenetic relationships among the one-flowered, determinate genera of Bambuseae (Poaceae: Bambusoideae), pp. 315–332. in *Monocots: comparative biology and evolution. Poales*, eds. J. T. Columbus, E. A. Friar, J. M. Porter, L. M. Prince, and M. G. Simpson. Claremont, California: Rancho Santa Ana Botanic Garden.

Cruz Ríos, H. 2009. Bambú-Guadua, *Guadua angustifolia* Kunth: Bosques naturales en Colombia. Plantaciones comerciales en México, ed. H. Cruz Ríos. Pereira: Gráficas Olímpicas S.A.

Freier, F. 1941. Contribución al estudio de la anatomía foliar de las especies del género "*Chusquea*" de la Flora Argentina. *Revista Argentina de Agronomía* 8: 364–379.

Guala, G. E. H., D. Bogler, J. Sadle, and J. Francisco-Ortega. 2000. Molecular evidence for polyphyly in the genus *Apoclada*. *Bamboo Science and Culture* 14: 15–20.

Hammel, B. E., M. H. Grayum, C. Herrera, and N. Zamora. 2003. *Manual de Plantas de Costa Rica, Vol. III. Monocotiledóneas*, pp. 696–698. Eds. V. C. Hollowell, A. McPherson, D. Gunter, K. Brown and B. Mack. St. Louis: Missouri Botanical Garden Press.

Judziewicz, E. J. and L. G. Clark. 2007. Classification and biogeography of New World grasses: Anomochlooideae, Pharoideae, Ehrhartoideae, and Bambusoideae. *Aliso* 23: 303–314.

Judziewicz, E. J., L. G. Clark, X. Londoño, and M. J. Stern. 1999. *American bamboos*. Washington D. C.: Smithsonian Institution Press.

Killeen, T. J. 1990. The Grasses of Chuquitania, Santa Cruz, Bolivia. *Annals of the Missouri Botanical Garden* 77: 125–201.

Lizarazu, M. A. and A. S. Vega. 2012. Guadua. Pp. 59–63 in *Flora vascular de la República Argentina, Monocotyledoneae, Poaceae: Aristidoideae a Pharoideae*. Vol III, tomo 1, eds. F. O. Zuloaga, Z. E. Rúgolo & A. M. Anton. Córdoba: Graficamente Ediciones.

Lizarazu, M. A., Z. E. Rúgolo de Agrasar, and A. S. Vega. 2012. Nueva cita de *Guadua tagoara* (Poaceae, Bambusoideae, Bambuseae) en la Argentina. *Darwiniana* 50: 162–169.

Londoño, X. 1998. A decade of observations of a *Guadua angustifolia* plantation in Colombia. *The Journal of the American Bamboo Society* 12: 37–45.

Londoño, X. 2000. Guadua. Pp. 58–62 in Catalogue of New World Grasses (Poaceae): I Subfamilies *Anomochlooideae, Bambusoideae, Ehrhartoideae, and Pharoideae*, eds. E. J. Judziewicz; R. J. Soreng; G. Davidse, P. M. Peterson; T. S. Filgueiras and F. O. Zuloaga. *Contributions from the United States National Herbarium* 39: 1–128.

Londoño, X. 2009. Usos y potencialidades de los bambúes en Sur América. Botânica Brasileira: futuro e compromissos: 236–243. 60° Congreso Nacional de Botánica, Feira de Santana, Bahia, Brasil.

Londoño, X. and L. G. Clark. 1998. Eight new taxa two new reports of Bambuseae (Poaceae: Bambusoideae) from Colombia. *Novon* 8: 408–428.

Londoño, X. and L. G. Clark. 2002. Three taxa of *Guadua* (Poaceae: Bambusoideae) from South America. *Novon* 12: 64–76.

Londoño, X. and E. J. Judziewicz. 1990. Guadua, pp. 233–243, in Flora of the Guianas. Series A: Phanerogams, Fascicle. 187. Poaceae (Gramineae), ed. A. R. A. Görts-Van Rijn. Koenigstein: Koeltz Scientific Books. 1–727 pp.

Londoño, X. and E. J. Judziewicz. 1991. A New Species of *Guadua, G. calderoniana* (Poaceae: Bambuseae), with Notes on the Genus in Bahia, Brazil. *Novon* 1: 27–32.

Londoño, X. and P. M. Peterson. 1991. *Guadua sarcocarpa* (Poaceae: Bambuseae), a New Species of Amazonian Bamboo with Fleshy Fruit. *Systematic Botany* 16: 630–638.

Londoño, X. and P. M. Peterson. 1992. *Guadua chacoensis* (Poaceae: Bambuseae), its taxonomic identity, morphology, and affinities. *Novon* 2: 41–47.

Londoño, X. and L. E. Zurita. 2008. Two new species of *Guadua* (Bambusoideae: Guaduinae) from Colombia and Bolivia. *Journal of the Botanical Research Institute of Texas* 2: 25–34.

Londoño, X., G. C. Camayo, N. M. Riaño, and Y. López. 2002. Characterization of the anatomy of *Guadua angustifoli* (Poaceae: Bambusoideae) culms. *The Journal of the American Bamboo Society* 16: 18–31.

McClure, F. A. 1966. *The bamboos: A fresh perspective*. Washington, D. C.: Smithsonian Institution Press.

Metcalfe, C. R. 1956. Some thoughts on the structure of bamboo leaves. *Botanical Magazine* 69: 391–400.

Metcalfe, C. R. 1960. *Anatomy of the Monocotyledons. I. Gramineae*. Oxford: Clarendon Press.

Montiel, M., V. M. Jiménez, and E. Guevara. 2006a. Caracterización anatómica ultraestructural de las variantes "Atlantica", "Sur" y "Cebolla" del bambú, *Guadua angustifolia* (Poaceae: Bambusoideae) de Costa Rica. *Revista de Biologia Tropical* 54: 1–12.

Montiel, M., V. M. Jiménez, and E. Guevara. 2006b. Ultraestructura del bambú *Guadua angustifolia* var. *bicolor* (Poaceae: Bambusoideae), presente en Costa Rica. *Revista de Biologia Tropical* 54: 13–19.

Montiel, M., V. M. Jiménez, and E. Guevara. 2006c. Ultraestructura del bambú *Guadua amplexifolia* (Poaceae: Bambusoideae) presente en Costa Rica. *Revista de Biologia Tropical* 54: 21–28.

Montiel, M., V. M. Jiménez, and E. Guevara. 2006d. Ultraestructura del bambú *Guadua paniculata* (Poaceae: Bambusoideae) de Costa Rica. *Revista de Biologia Tropical* 54: 29–34.

Montiel, M., V. M. Jiménez, and E. Guevara. 2006e. Ultraestructura del bambú *Guadua macclurei* (Poaceae: Bambusoideae) de Costa Rica. *Revista de Biologia Tropical* 54: 35–42.

Nicora, E. and Z. E. Rúgolo de Agrasar. 1987. Los géneros de Gramíneas de América Austral. Buenos Aires: Editorial Hemisferio Sur.

Olivier, J. and O. Poncy. 2009. A taxonomical revision of *Guadua weberbaueri* Pilg. and *Guadua sarcocarpa* Londoño & P. M. Peterson (Poaceae). *Candollea* 64: 171–178.

Panizzo, C. C. 2012. Potencial uso forrajero del follaje de *Guadua chacoensis* (Poaceae, Bambusoideae, Bambuseae) en sistemas ganaderos del noreste argentino. M. S. Thesis. Buenos Aires: Facultad de Agronomía, Universidad de Buenos Aires.

Parodi, L. R. 1936. Las Bambúseas Indígenas en la Mesopotamia Argentina. *Revista Argentina de Agronomía* 3: 229–305.

Parodi, L. 1955. La floración de la tacuara brava ("Guadua trini"). *Revista Argentina de Agronomía* 22: 134–136.

Renvoize, S. A. 1987. A survey of leaf-blade anatomy in grasses X. *Kew Bulletin* 42: 201–207.

Renvoize, S. A. 1998. *Gramíneas de Bolivia*. Kew: Royal Botanic Garden.

Rúgolo de Agrasar, Z. E. and M. F. Rodriguez. 2002. Cauline anatomy of native woody bamboos in Argentina and neighboring areas: epidermis. *Botanical Journal of the Linnean Society* 138: 45–55.

Rúgolo de Agrasar, Z. E. and M. F. Rodriguez. 2003. Culm anatomy of native woody bamboos in Argentina and neighboring areas: cross section. *The Journal of the American Bamboo Society* 17: 28–43.

Rúgolo de Agrasar, Z. E. and A. M. Molina. 2006. Guadua. Pp. 64–68 in *Flora Chaqueña, Argentina (Formosa, Chaco y Santiago del Estero)*. Familia Gramíneas, eds. A. M. Molina and Z. E. Rúgolo de Agrasar. Buenos Aires: Colección Científica del Instituto Nacional de Tecnología.

Smith, L. B., D. C. Wasshausen, and R. M. Klein. 1981. *Flora Ilustrada Catarinense*. I PARTE. Fascículo: Gramíneas. Géneros: 1. *Bambusa* até 44. *Chloris*, ed. R. Reitz. Itajaí, Santa Catarina: Brasil.

Soderstrom, T. R. and R. P. Ellis. 1987. The position of bamboo genera and allies in a system of grass classification. Pp. 225–238 in *Grass systematics and evolution*, eds. T. R. Soderstrom, K. W. Hilu, C. S. Campbell, and M. E. Barkworth. Washington. D. C.: Smithsonian Institution Press.

Soderstrom, T. R. and X. Londoño. 1987. Two new genera of Brazilian bamboos related to *Guadua* (Poaceae: Bambusoideae: Bambuseae). *American Journal of Botany* 74: 27–39.

Stafleu, F. A. and R. S. Cowan. 1976. *Taxonomic literature.* Vol. 1: A–G, Ed. 2. Regnum Vegetabile Bohn: Scheltema and Holkema. Utrecht. 1–508 pp.

Sungkaew, S., C. M. A. Stapleton, N. Salamin, and T. R. Hodkinson. 2009. Non-monophyly of the woody bamboos (Bambuseae; Poaceae): a multi-gene region phylogenetic analysis of Bambusoideae s.s. *Journal of Plant Research* 122: 95–108.

Thiers, B. 2012. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/ih.

Tovar, O. 1993. Las Gramíneas (POACEAE) del Perú. *Ruizia* 13: 1–480.

Vega, A. S. and J. Cámara Hernández. 2008. La floración de *Guadua chacoensis* (Poaceae, Bambusoideae, Bambuseae). *Revista de la Facultad de Agronomía* 28: 107–110.

Zuloaga, F. O., E. G. Nicora, Z. E. Rúgolo de Agrasar, O. Morrone, J. Pensiero, and A. M. Cialdella. 1994. Catálogo de la Familia Poaceae en la República Argentina. *Monographs in Systematic Botany from the Missouri Botanical Garden* 47: 1–178.

Zuloaga, F. O., O. Morrone, and M. Belgrano. 2008. Catálogo de las Plantas Vasculares del Cono Sur (Argentina, Sur de Brazil, Chile, Paraguay y Uruguay), Vol. 1 Pteridophyta, Gymnospermae y Monocotyledoneae. *Monographs in Systematic Botany from the Missouri Botanical Garden* 107: 1–983.