

Two New Species of *Chusquea* (Poaceae, Bambuseae) from Northwestern Argentina

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Abstract—*Chusquea* Kunth (Poaceae, Bambusoideae, Bambuseae) is the largest bamboo genus in the world. Approximately 13 species of *Chusquea* occur in the southern Andes of Argentina and Chile and all of them are endemic. In the present work, two new species found in high-altitude grasslands of the Andes mountain range in northwestern Argentina, *Chusquea egluma* and *Chusquea floribunda*, are described and illustrated. Morphological and anatomical characters are described and two identification keys for the Andean *Chusquea* species from northwestern Argentina are provided, one based on morphological characters (vegetative and reproductive), and the other on anatomical characters (culm and leaf epidermis and cross section). The new taxa and related species are compared in tables based on characters of taxonomic value.

Resumen—*Chusquea* Kunth (Poaceae, Bambusoideae, Bambuseae) es el género de bambúes más grande del mundo. Aproximadamente, 13 especies de *Chusquea* habitan en los Andes australes de Argentina y Chile, y todos ellos son endémicos. En el presente trabajo, se describen e ilustran dos nuevas especies de bambúes leñosos que habitan en pastizales de altura en los Andes del noroeste de la Argentina, *Chusquea egluma* y *Chusquea floribunda*. Se describen caracteres morfológicos y anatómicos, y se presentan dos claves de identificación de las especies andinas de *Chusquea* del noroeste de la Argentina, una basada en caracteres morfológicos (vegetativos y reproductivos) y otra, en caracteres anatómicos (epidermis y sección transversal caulinar y foliar). Se presentan tablas comparativas de caracteres de valor taxonómico de los nuevos taxones y especies relacionadas.

Keywords—Andes, Bambusoideae, high altitude grasslands, taxonomy.

Bamboos occur in almost every tropical, subtropical and temperate forest around the world. Neotropical woody bamboos range from approximately 24°N latitude in northern Mexico to 47°S latitude in Chile and, except for deserts, are distributed nearly continuously throughout Central and South America. In the fast-disappearing Andean montane forest, bamboos are usually found along forest edges or in gaps but where deforestation is extreme they are often restricted to the moist sometimes steep, still-vegetated ravines with running water. Also, in temperate regions of South America, woody bamboos are well known as understory dominants in Andean-Patagonian beech forests of Argentina and Chile (Judziewicz et al. 1999).

Chusquea was first recognized as a genus by Kunth in 1822 from collections made during the famous South American expeditions of Humboldt and Bonpland (1799–1804). *Chusquea* Kunth (Poaceae, Bambusoideae, Bambuseae) comprises an estimated 159 species, making it the largest bamboo genus in the world (Fisher et al. 2009). The genus is defined by its uniform spikelet structure comprising four glumes, one female-fertile floret and the absence of a rachilla extension in addition to papillate subsidiary cells in the foliar stomatal complexes (Clark 1997; Fisher et al. 2009). *Chusquea* is distributed from Mexico to Argentina and Chile with a large group of endemic species in Brazil and a few disjunct species. It has the widest latitudinal range of any bamboo genus and the widest altitudinal range. The species of *Chusquea* are often significant, sometimes dominant, components of montane forest and high-altitude grassland vegetation, where they can be aggressive colonizers (Judziewicz et al. 1999). All major groups within this genus occur in the Andes, thus establishing this area as a primary center of diversity (Clark 1995).

Approximately 13 species of *Chusquea* occur in the austral Andes of Argentina, southern Bolivia and Chile and all of them are endemic (Renvoize 1998; Morrone et al. 2008; Guerreiro and Rúgolo 2012). Parodi (1941) reviewed the species of *Chusquea* from Argentina, describing two new species, *C. deficiens* Parodi and *C. argentina* Parodi, the latter of

which was later considered a synonym of *C. culeou* E. Desv. (Judziewicz et al. 1999). Currently, seven species of *Chusquea* are found in Argentina: *C. culeou* E. Desv., *C. deficiens* Parodi, *C. lorentziana* Griseb., *C. montana* Phil., *C. ramosissima* Lindm., *C. tenella* Nees y *C. valdiviensis* E. Desv. (Morrone et al. 2008; Guerreiro and Rúgolo 2012).

In the present work, two new species of *Chusquea* occurring sympatrically in high-altitude grasslands of the Andes mountain range in northwestern Argentina (Salta Province) are described and illustrated on the basis of vegetative and reproductive characters. In addition, anatomical characters of the culms and the foliage leaf blades are provided. Two identification keys for the Andean *Chusquea* species from northwestern Argentina are presented, and a comparison of the characters of taxonomic value of these species is included.

MATERIALS AND METHODS

Morphology—The descriptions are based on specimens collected in Salta Province, Argentina, and include: habit, culm, nodes, internodes, foliage leaf, inflorescence, spikelet, glumes, sterile lemmas, fertile lemma, palea, lodicules, and caryopses (Clark 1989). Also, specimens belonging to the following herbaria were examined: BA, BAA, CORD, CTES, JUA, K, LIL, MCNS, P, SI and W (Thiers 2012).

Micromorphology—The middle portion of foliage leaf blades and the middle third of the internodes of developed culms were selected for anatomical studies. Small epidermal fragments of culms and small fragments of foliage leaves were placed in glass tubes with xylol and exposed to ultrasound for approximately six hrs to eliminate superficial wax and impurities. The material was dehydrated and coated with gold-palladium. Photomicrographs of leaf and culm epidermis were obtained using a scanning electron microscope Philips XL30 TMP at the Museo de Ciencias Naturales “Bernardino Rivadavia” in Buenos Aires, Argentina. The following superficial characters were observed in leaf and culm epidermis: ribs and furrows, long cells, papillae, stomatal apparatus, silica bodies, prickle hairs, microhairs and macrohairs (Ellis 1979; Rúgolo de Agrasar and Rodríguez 2002).

In order to obtain foliage leaf cross sections, herbarium material was boiled in water with commercial use detergent for several hours before making the sections manually. The histological sections were stained with safranin and mounted in glycerine-gelatine (D’Ambrosio de Argüeso 1986). The culm material was placed in plastic tubes with ethylenediamine

4% for two weeks before preparing anatomical sections using a sliding microtome. The histological sections were stained with safranin and fast-green and mounted in Canada balsam (D'Ambrosio de Argüeso 1986). Leaf and culm cross sections were observed and photographed with a light microscope Nikon Microphot FXA. To describe the leaf cross section, the following characters were considered: ribs and furrows, epidermal cells, bulliform cells, fusoid cells, vascular bundles, chlorenchyma and sclerenchyma (Ellis 1976; López Soto et al. 2009). For the description of the culm cross sections, the following characters were considered: epidermis, hypodermis, cortical parenchyma, sclerenchyma and vascular bundles (peripheral, transitional and central). The transitional vascular bundles are situated towards the middle of the culm walls. The number of vascular bundle cycles, their position and the size and shape of peripheral, transitional and central vascular bundles were also considered. To determine the position of vascular bundles, the phloem location in relation to the stem cortex was taken into consideration (Xishen et al. 2002; Rúgolo de Agrasar and Rodríguez 2003).

TAXONOMIC TREATMENT

Chusquea egluma Guerreiro & Rúgolo, sp. nov.— TYPE: ARGENTINA. Salta: Guachipas, Pampa Grande, Cerro Pirgua, pastizal serrano de altura, 25°55'55.69" S, 65°34'23.27" W, 2116 m, 5 Dec 2010, fl. *Leach s.n.* (SI 157665) (holotype: SI!, 2 sheets).

Chusquea egluma is similar to *C. depauperata* Pilg. but it differs from it for its solid culm, internodes 10–13.5 cm long, foliage leaf blades 9–13 cm long with prominent, developed midrib, pseudopetioles 1.5–2.5 mm long, inner ligules 1.5–2.5 mm long, and spikelet with sterile lemmas almost as long as the fertile lemma.

Culms 2.5–3 m tall, 2–5 mm in diameter, erect, solid. Internodes 10–13.5 cm long, smooth. Nodes glabrous, infranodal ridge prominent, one central bud flanked by many subsidiary buds linearly arranged. Branching intravaginal. Branches occasionally rebranching. Culm leaf not seen. Foliage leaf sheath nerved, minutely scabrous. Foliage leaf blades 9–13 cm long, 5–7 mm wide, linear, glabrous, margins minutely scabrous, not tessellate, prominent midrib, base attenuate; pseudopetioles 1.5–2.5 mm long, glabrous; outer ligule a short, glabrous rim; inner ligules 1.5–2.5 mm long, acuminate, membranous, minutely scabrous dorsally. Flowering branch complement with inflorescences borne terminally and leafy branches. Inflorescences to 7 cm long and 1 cm wide, narrow, with a few spikelets and short appressed branches, not fully exerted from the subtending sheath. Spikelets 4–6 mm long, pubescent, slightly purplish at the base. Glumes absent. Sterile lemmas 2, > ½ the spikelet length, distal third pubescent, awn-tipped; lower sterile lemmas 3.2–3.5 mm long, 1-nerved, nerve scabrous; upper sterile lemmas 3.5–4.5 mm long, 3-nerved, nerves scabrous. Fertile lemmas 4–4.5 mm long, 7-nerved, nerves scabrous, pubescent, slightly ciliate apex. Paleas 3–4 mm long, 2-nerved, nerves and apex slightly ciliate, purplish apex, glabrous. Lodicules ca. 1 mm long, bifid apex. Stamens 3, immature. Caryopses not seen. Figure 1.

Etymology—The epithet *egluma* refers to the lack of glumes.

Geographic Distribution and Ecology—This species occurs in Argentina, Salta Province, in grasslands above 2,000 m altitude, on east-facing, steep slopes. At present it is only known from the holotype.

Observations—*Chusquea egluma* is characterized by its lack of glumes. This feature is also present in *C. depauperata* Pilg., found in high altitude grasslands in Bolivia and Peru, from which *C. egluma* is distinguished by its longer internodes,

longer foliage leaves, greater inner ligule and longer pseudopetiole; also by its developed midrib, which in *C. depauperata* is hardly distinguishable (Clark 1989). Moreover, in *C. depauperata*, the culm is fistulose and the sterile lemmas reach half the spikelet length whilst in *C. egluma*, the culm is solid and the sterile lemmas are almost as long as the fertile lemma. Based on its morphology, this species may be classified as a member of subg. *Swallenochloa* (McClure) L.G. Clark, sect. *Swallenochloa* (McClure) L.G. Clark (Clark 1989, 1997). The specimen collected was in a very early stage of flowering; the spikelets were immature and the anthers were not fully developed, as seen in Fig. 1.

Micromorphology—Foliage leaf blade abaxial epidermis: Long cells with straight walls and abundant, small, rounded papillae with thin walls, irregularly arranged. Sunken stomatal apparatus long and narrow, rectangular in outline, with parallel-sided subsidiary cells, 17 µm long and 4 µm wide, arranged in a single row adjoining the costal zones. Dumb-bell, cross-shaped and intermediate silica bodies, all with round ends, in midrib and costal zones associated with prickle hair rows. Prickle hairs with large base and short barb, developed from the apex of the base; frequent in costal zones in rows associated with silica bodies. Leaf margin with one row of angular prickles. Bicellular microhairs with basal cell more than 2x longer than the distal cell, markedly elongated, infrequent in costal zones. Macrohairs absent (Fig. 2A).

Foliage leaf blade adaxial epidermis: Long cells with wavy walls. In intercostal zones, small, rounded papillae with thin walls, irregularly arranged on long cells. Stomata absent. Saddle-shaped and squarish silica bodies in rows alternating with long cells in costal zones. Isolated prickle hairs with short barb. Microhairs, macrohairs absent.

Culm epidermis: Ribs and shallow furrows present. Papillate long cells with straight walls. One papillus per cell centrally positioned, large, unthickened and elongated. Infrequent stomata complex, long and narrow, 28 µm long and 9 µm wide with parallel-sided subsidiary cells, rectangular in outline, located in furrows. Silica bodies not evident. Isolated prickle hairs with medium sized base and short barb in costal zones. Barb develops from the apex of the base, slightly raised. Scarce bicellular microhairs (only basal cell remains); long basal cell with expanded base, parallel-sided. Macrohairs absent (Fig. 2B).

Foliage leaf blade cross section: Lamina expanded. Adaxial ribs over vascular bundles and shallow furrows between all vascular bundles. Outer walls thickened and covered by a distinct, thick cuticle continuous over the epidermal cells. Bulliform cells fan-shaped situated at bases of furrows. Fusoid cells present or absent; when present, successive, separated by numerous chlorenchyma cells. Vascular bundles, which number 34–42, with variable arrangement, progressively fewer first and more third order bundles towards the margin. Developed midrib not projecting abaxially; with adaxial, small, equidimensional, sclerenchymatous girder in contact with the bundle sheath and well-developed abaxial girder in contact with epidermis, narrowing towards bundle. Small, pointed cap of sclerenchyma at the margin, not in contact with the lateral bundle (Fig. 2C).

Culm cross section: Culm solid. Outer walls thickened and covered by a distinct, thick cuticle continuous over a single layer of epidermal cells. One layer of hypodermic cells and cortical parenchyma formed by 3 layers of sclerified cells.

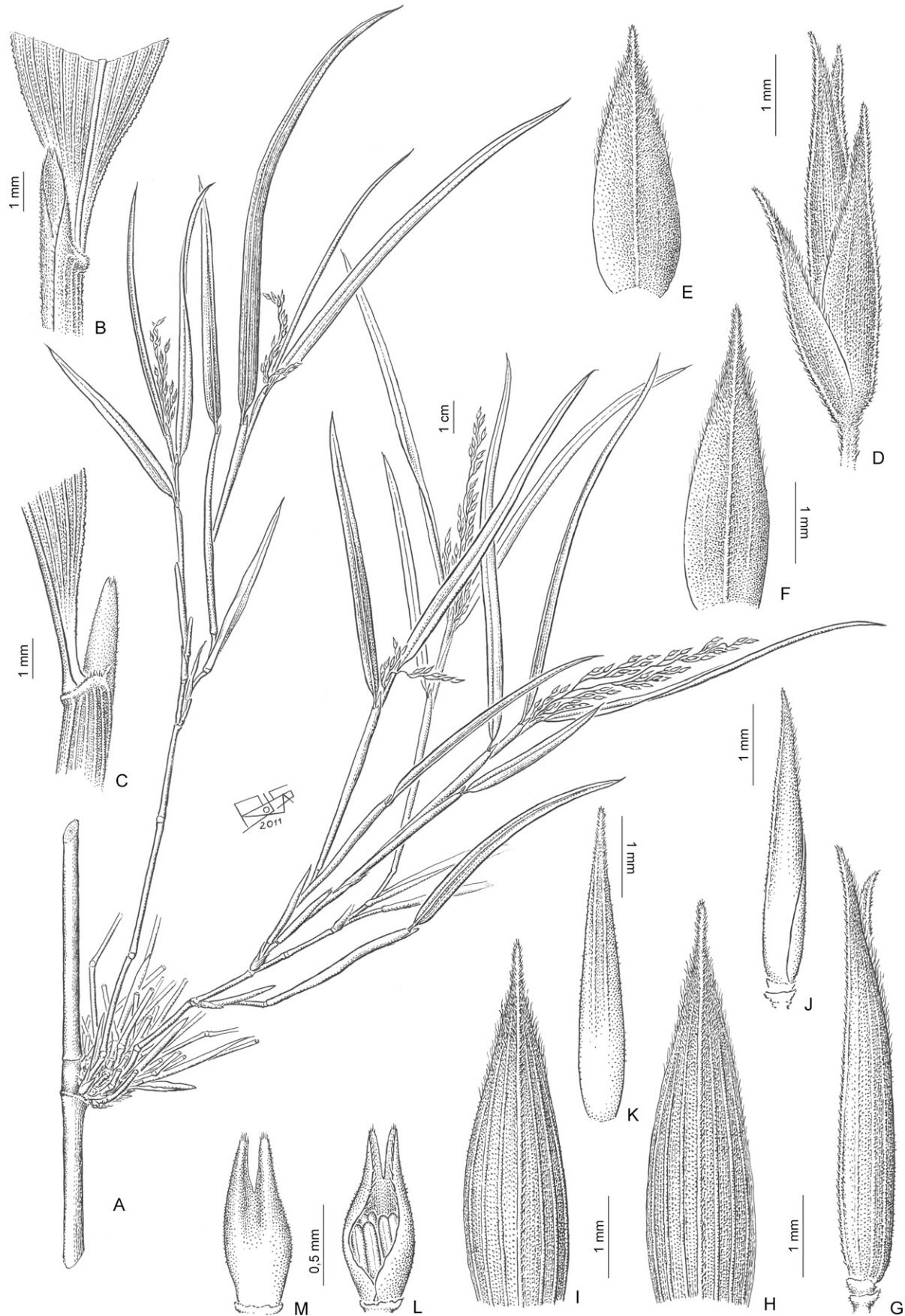


FIG. 1. *Chusquea egluma*. A. Fragment of culm with a flowering branch complement. B. Inner ligule and basal third of foliage leaf. C. Outer and inner ligule. D. Spikelet. E. Lower sterile lemma, dorsal view. F. Upper sterile lemma, dorsal view. G. Anthecium, lateral view. H–I. Fertile lemma, dorsal view. J. Palea, lateral view. K. Palea, dorsal view. L. Posterior lodicules and immature stamens. M. Posterior lodicules, dorsal view [from *Leach s. n.* (SI 157665)].

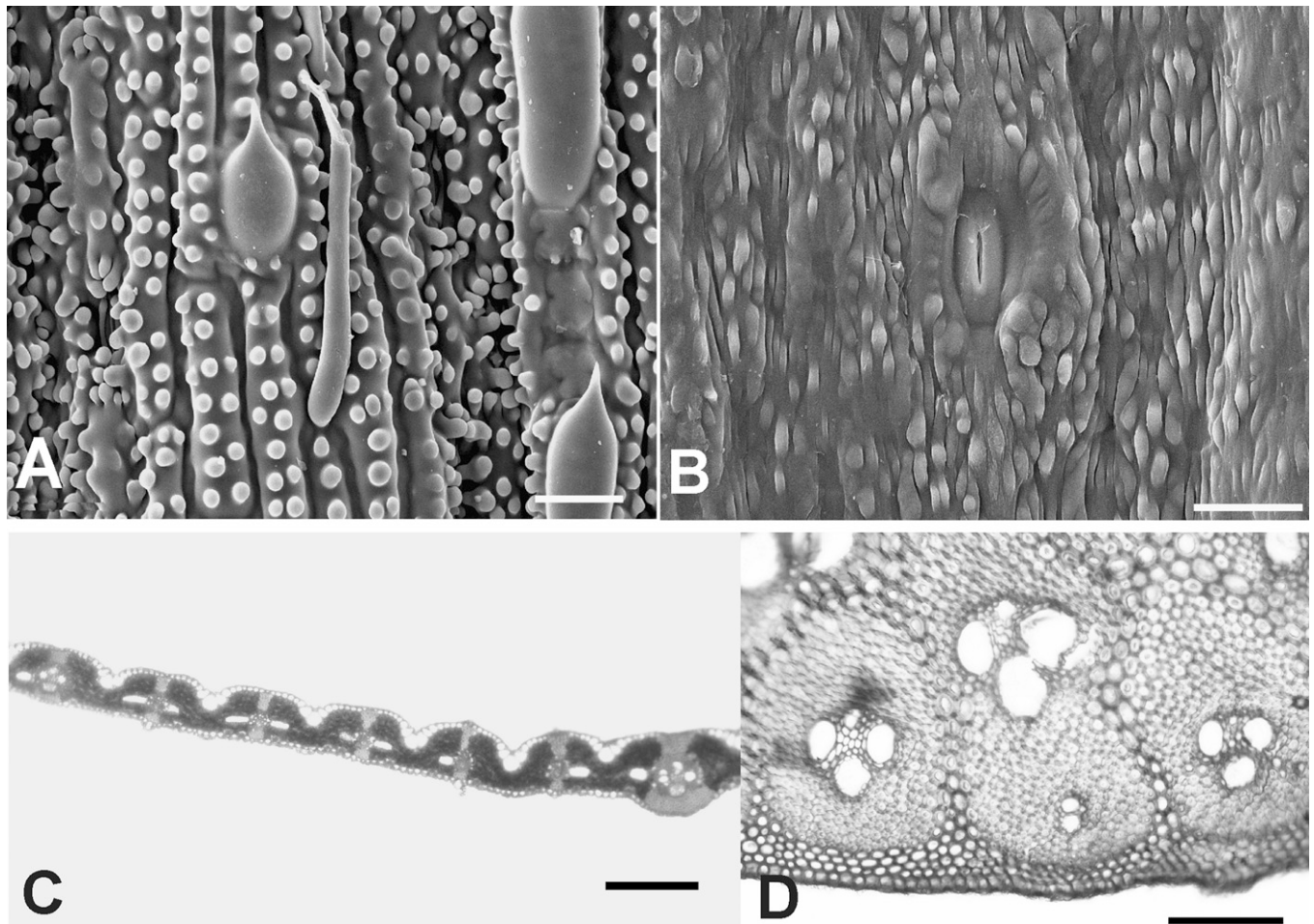


FIG. 2. Micromorphological characters of *Chusquea egluma*. A. Foliage leaf blade abaxial epidermis scanning electron micrograph. B. Culm epidermis scanning electron micrograph. C. Foliage leaf blade cross section light microscope micrograph. D. Culm cross section light microscope micrograph. Scale bars: A - B: 20 μ m; C: 200 μ m; D: 100 μ m; [from *Leach s. n.* (SI 157665)].

Vascular bundles in 5 cycles. Phloem oriented in different directions. Peripheral vascular bundles with a continuous well-developed sheath of sclerenchymatic cells, more developed in relation to the protoxylem and metaxylem sides. Transitional vascular bundles surrounded by a continuous layer of sclerenchyma, thickest on metaxylem and protoxylem sides. Central vascular bundles 197 μ m wide and 153 μ m long, ovate, depressed, with a discontinuous sclerenchymatic sheath with two caps in connection with phloem and protoxylem (Fig. 2D).

Chusquea floribunda Guerreiro & Rúgolo, sp. nov.— TYPE: ARGENTINA. Salta: Guachipas, Pampa Grande, Cerro Pirgua, pastizal serrano de altura, 25°55'55.69" S, 65°34'23.27" W, 2116 m, 5 Dec 2010, fl. *Leach s.n.* (SI 158827) (holotype: SII, 2 sheets; isotypes: MO, US).

Chusquea floribunda is similar to *C. lorentziana* Griseb., from which it differs by its erect habit, pulvinate pseudopetioles 1–2 mm long, inflorescences up to 35 cm long, and pubescent paleas with scabrous central nerves.

Culms 2.5–4 m tall, 1.2–1.7 cm in diameter, erect, solid. Internodes 15–18 cm long, smooth. Nodes glabrous, infranodal ridge prominent, one central bud subtended by numerous subsidiary buds. Culm leaf 26 cm long, in the one example seen, ligule inconspicuous, abaxially scabrous,

adaxially smooth, glabrous. Foliage leaf blades 9–12 cm long and 4–7 mm wide, linear, glabrous, midrib prominent, abaxially projecting, margins thickened; pseudopetioles 1–2 mm long, glabrous, with a glabrous pulvinate; outer ligule a short, pubescent rim; inner ligules 1.5–2.5 mm long, rounded apex, glabrous, minutely scabrous in lateral side. Flowering branch complement with up to 38 branches present, the central dominant. Inflorescences up to 35 cm long, borne terminally, rebranching, branches appressed, initially erect, leafless or with very few leaves with persistent sheath and deciduous blades. Spikelets 8–9 mm long. Pedicels 1–3 mm long, pubescent. Glumes 2, acuminate, distal third pubescent; lower glumes 2 mm long, 1-nerved, awn-tipped; upper glumes 3.5–4 mm long, 3-nerved. Sterile lemmas 2, distal third pubescent; lower sterile lemmas 4–6 mm long, 3–5-nerved, awn-tipped; upper sterile lemmas 5–6 mm long, 5-nerved, awn-tipped. Glumes and lower sterile lemmas deciduous. Fertile lemmas 7 mm long, 5–7-nerved, awn-tipped, distal third pubescent. Paleas 8 mm long, 4-nerved, central nerves scabrous, pubescent near the apex. Lodicules 3, 1.5 mm long, ciliate. Stamens and anthers not seen. Caryopses cylindrical, 5–6 mm long, glabrous, hilum linear, as long as the caryopses; embryo small, less than 1/4 the length of the caryopses, endosperm dry. Apex with fragments of the styles. Figure 3.

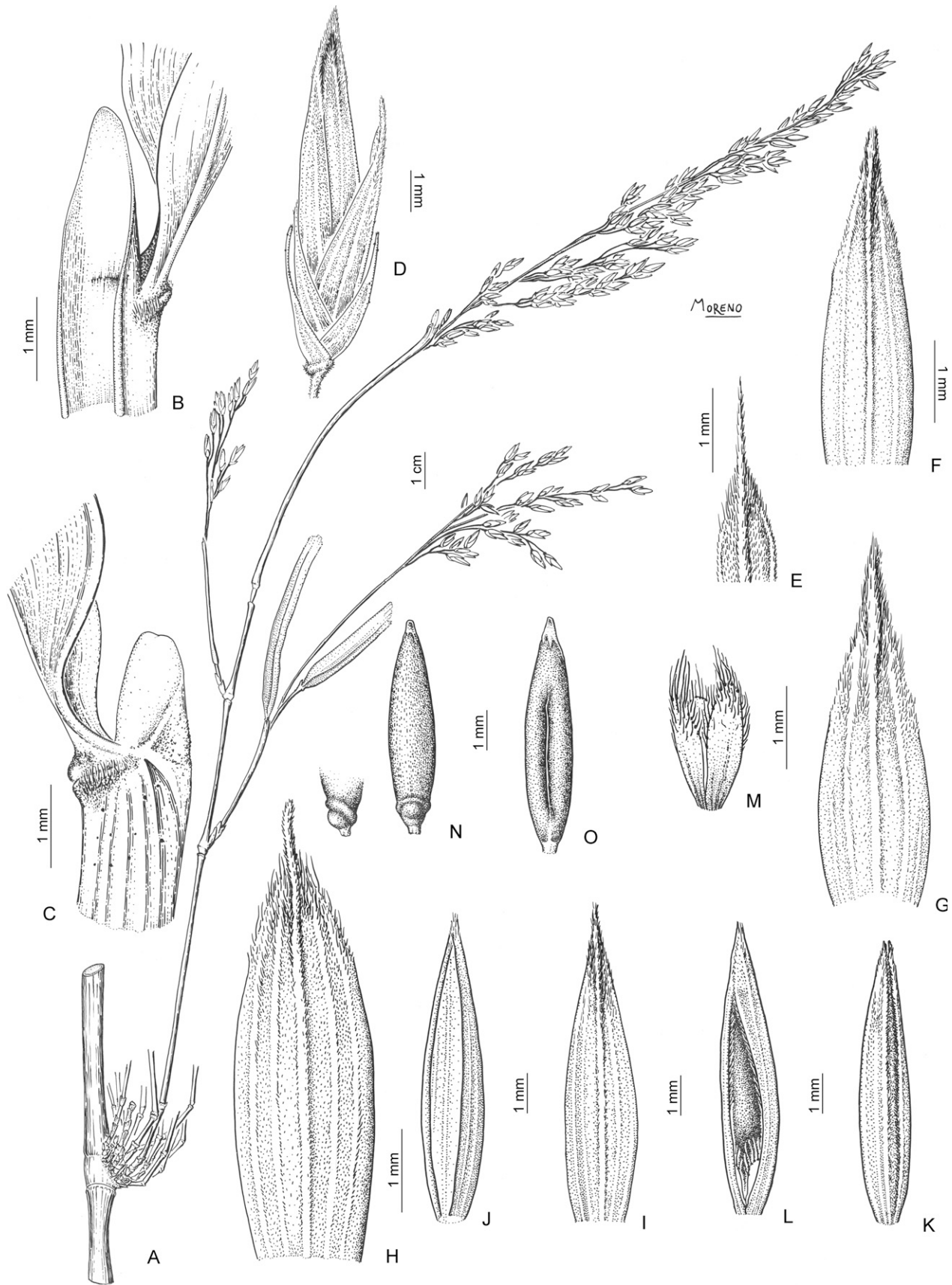


FIG. 3. *Chusquea floribunda*. A. Fragment of culm with a flowering branch complement. B. Inner and outer ligule and pseudopetiole. C. Inner and outer ligule, pulvinate pseudopetiole. D. Spikelet. E. Fragment of lower glume, dorsal view. F. Upper glume, dorsal view. G. Lower sterile lemma, dorsal view. H. Upper sterile lemma, dorsal view. I. Fertile lemma, dorsal view. J. Palea, ventral view. K. Palea, dorsal view. L. Palea, lodicules and caryopses. M. Lodicules. N. Caryopses, dorsal view, and embryo, lateral view. O. Caryopses, ventral view, showing hilum [from *Leach s. n.* (SI 158827)].

Etymology—The epithet *floribunda* refers to the abundance of spikelets in the holotype collection.

Geographic Distribution and Ecology—*Chusquea floribunda* is found in the east-facing, steep slopes of the Andes mountain range of northwestern Argentina, in high-altitude grasslands above 2,000 m altitude.

Additional Material Examined—ARGENTINA. Jujuy: Dr. Manuel Belgrano, Quebrada de Jaire, 6 Mar 1987, veg., *Cabrera et al.* 34300 (SI).

Observations—This specimen shows a very advanced stage of the flowering process and a great amount of fully developed caryopses.

Micromorphology—Foliage leaf blade abaxial epidermis: Long cells with wavy walls and a single row of large, rounded, simple or compound papillae. Rounded, ovoid stomatal complex 22 µm long and 8 µm wide, with low dome-shaped subsidiary cells, arranged in two rows of stomata in each intercostal zone adjacent to one another. Dumb-bell shaped silica bodies in costal zones associated with prickle hair rows. Frequent prickle hairs with large base and short barb, developed basally from the apex of the base, arranged in rows in costal zones. Scarce bicellular microhairs in costal zones, with basal cell more than 2x longer than distal cell, markedly elongated; distal cell with rounded apex. Macrohairs absent (Fig. 4A).

Foliage leaf blade adaxial epidermis: Long cells with wavy walls and a single row of large, rounded, simple papillae. Stomata absent. Squarish silica bodies with irregular outlines alternating with long cells. Scarce prickle hairs with short barb. Isolated bicellular microhairs, markedly elongated, basal and distal cell approximately equal in length. Macrohairs absent.

Culm epidermis: Ribs and furrows not evident. Long cells ca. 20 µm long, with slightly wavy walls. Papillae, silica

bodies, stomata, prickle hairs, microhairs and macrohairs absent (Fig. 4B).

Foliage leaf blade cross section: Lamina expanded. Shallow furrows. Outer walls thickened and covered by a distinct, thick cuticle continuous over the epidermal cells. Fan-shaped bulliform cells located at the base of furrows. Fusoid cells successive, separated by numerous chlorenchyma cells. Vascular bundles, which number 42, with variable arrangement, progressively fewer first and more third order bundles towards the margin. Developed midrib projecting abaxially with adaxial, small, equidimensional, sclerenchymatous girder in contact with the bundle sheath and well-developed abaxial girder in contact with epidermis, narrowing towards bundle. Small, pointed cap of sclerenchyma at the margin, not in contact with the lateral bundle (Fig. 4C).

Culm cross section: Culm solid. Outer walls thickened and covered by a distinct, thick cuticle continuous over a single layer of epidermal cells. One layer of hypodermic cells and cortical parenchyma formed by 3 layers of sclerified cells. Vascular bundles in 8 cycles. Phloem oriented in different directions. Peripheral vascular bundles surrounded by a sheath of sclerenchyma more developed in connection with protoxylem and phloem. Transitional vascular bundles with a continuous layer of sclerenchymatic cells, thickest on protoxylem and phloem sides. Central vascular bundles 257 µm wide and 265 µm long, elliptical, surrounded by a discontinuous sclerenchymatic sheath more developed in relation to the phloem and protoxylem (Fig. 4D).

The morphological and micromorphological characters of *Chusquea egluma* and *C. floribunda* are compared with those of related and sympatric species of *Chusquea* (*C. deficiens* Parodi, *C. depauperata* Pilg. and *C. lorentziana* Griseb.) in Tables 1 and 2.

KEY FOR IDENTIFICATION OF ANDEAN *CHUSQUEA* SPECIES FROM NORTHERN ARGENTINA BASED ON MORPHOLOGICAL CHARACTERS (VEGETATIVE AND REPRODUCTIVE)

1. Culms erect, up to 4 m high; plants occurring in high altitude grasslands; glumes 2 or absent 2
2. Culms 12–17 mm diameter; internodes 15–18 cm long; pseudopetioles with pulvinule; flowering branch complement leafless or with very few leaves; inflorescences up to 35 cm long; spikelets 8–9 mm long; glumes 2 *C. floribunda*
2. Culms 2–5 mm diameter; internodes 10–13.5 cm long; pseudopetioles without pulvinule; flowering branch complement with leafy branches; inflorescences up to 7 cm long; spikelets 4–6 mm long; glumes absent *C. egluma*
1. Culms arching, clambering, up to 7 m high; plants occurring in montane rainforests; glumes 2 3
3. Pseudopetioles pubescent; foliage leaves with inner ligules < 1 mm long and blades 4–9 cm long, pubescent in the basal part; spikelet 11–12 mm long; glumes reduced, < 0.5 mm long *C. deficiens*
3. Pseudopetioles glabrous; foliage leaves with inner ligules 1–2 mm long and blades 5–15 cm long, glabrous; spikelet 8–9.5 mm long; glumes developed, pubescent or scabrous, unequal, lower glumes 2.5–3 mm long, upper glumes 3.2–4.5 mm long *C. lorentziana*

KEY FOR IDENTIFICATION OF ANDEAN *CHUSQUEA* SPECIES FROM NORTHERN ARGENTINA BASED ON MICROMORPHOLOGICAL CHARACTERS (CULM AND LEAF EPIDERMIS AND CROSS SECTION)

1. Culm vascular bundles with phloem always oriented towards the external face; silica bodies present on culm epidermis; foliage leaf blades with very noticeable adaxial ribs and deep furrows; leaf margins with a well-developed rounded cap of sclerenchyma 2
2. Culm epidermis with long cells without papillae; prickle hairs and microhairs absent; culm central vascular bundles ovate, depressed; leaf abaxial epidermis with long cells with straight walls and macrohairs present *C. deficiens*
2. Culm epidermis with papillate long cells; prickle hairs and microhairs present; culm central vascular bundles elliptical; leaf abaxial epidermis with long cells with wavy walls and macrohairs absent *C. lorentziana*
1. Culm vascular bundles with phloem oriented in different directions; silica bodies absent on culm epidermis; foliage leaf blades with shallow furrows; leaf margins with a small pointed cap of sclerenchyma 3

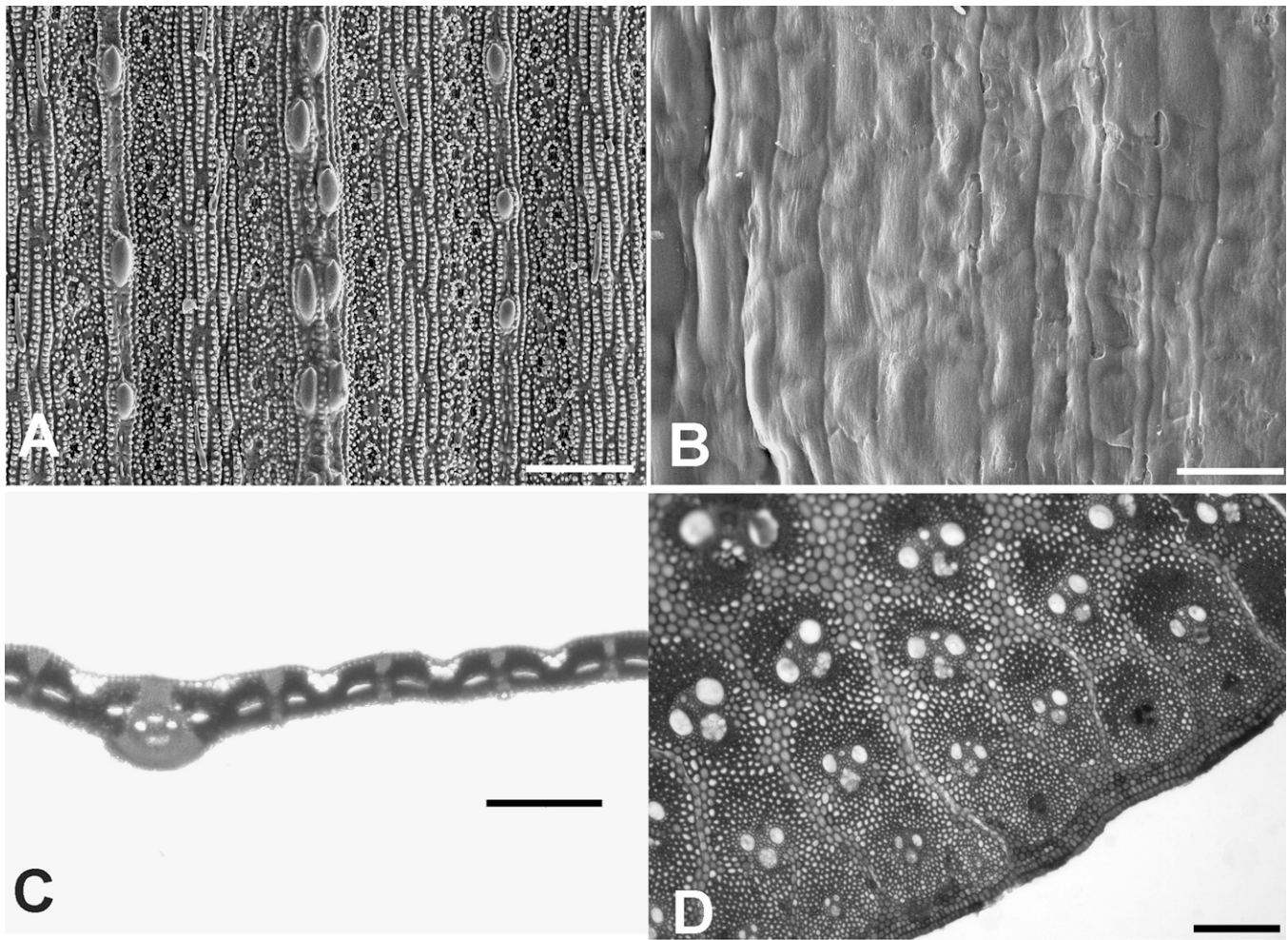


FIG. 4. Micromorphological characters of *Chusquea floribunda*. A. Foliage leaf blade abaxial epidermis scanning electron micrograph. B. Culm epidermis scanning electron micrograph. C. Foliage leaf blade cross section light microscope micrograph. D. Culm cross section light microscope micrograph. Scale bars: A: 100 μm ; B: 20 μm ; C–D: 200 μm [from Leach s. n. (SI 158827)].

TABLE 1. Comparative diagnostic characters among species of *Chusquea*. ¹According to Guerreiro and Rúgolo (2012). ²According to Clark (1989).

	<i>C. deficiens</i> ¹	<i>C. depauperata</i> ²	<i>C. egluma</i>	<i>C. floribunda</i>	<i>C. lorentziana</i> ¹
Habitat	Montane rainforest	High-altitude grasslands	High-altitude grasslands	High-altitude grasslands	Montane rainforest
Culm habit	Arching	Erect	Erect	Erect	Arching
Culm	Solid	Fistulose	Solid	Solid	Solid
Culm diameter	7–8 mm	5 mm	2–5 mm	12–17 mm	3–25 mm
Foliage leaf blade length	4–9 cm	3–5 cm	9–13 cm	9–12 cm	5–15 cm
Pseudopetiole	Pubescent, without pulvinule	Glabrous, without pulvinule	Glabrous, without pulvinule	Glabrous, with pulvinule	Glabrous, without pulvinule
Glumes	2	Absent	Absent	2	2

TABLE 2. Comparative micromorphological characters among species of *Chusquea*. ¹According to Guerreiro et al. (2011); ²According to Guerreiro et al. (unpubl. data).

	<i>C. deficiens</i> ¹	<i>C. egluma</i>	<i>C. floribunda</i>	<i>C. lorentziana</i> ²
Leaf blade abaxial epidermis: long cell walls	Straight	Straight	Wavy	Wavy
Culm epidermis: papillae	Absent	Abundant, simple	Absent	Abundant, simple
Culm epidermis: Silica bodies	Saddle and square shaped	Absent	Absent	Dumbbell and square shaped
Leaf blade cross section: distinct midrib	Not projecting	Not projecting	Projecting abaxially	Projecting abaxially
Leaf blade cross section: marginal sclerenchyma	Developed, rounded	Small, pointed	Small, pointed	Developed, rounded
Culm cross section: phloem orientation	Exterior	Different directions	Different directions	Exterior

3. Culm epidermis with long cells without papillae, stomata, prickle hairs and microhairs absent; culm vascular bundles arranged in 8 cycles; culm central vascular bundles elliptical; leaf blades with fusoid cells; leaf abaxial epidermis with long cells with wavy walls *C. floribunda*
3. Culm epidermis with papillate long cells, stomata, prickle hairs and microhairs present; culm vascular bundles arranged in 5 cycles; culm central vascular bundles ovate, depressed; leaf blades with fusoid cells or not; leaf abaxial epidermis with long cells with straight walls *C. egluma*

DISCUSSION

Among the woody bamboos, *Chusquea* has long been recognized as a large and diverse genus. In this paper, two new species of *Chusquea* endemic to the Andes of northwestern Argentina, *C. egluma* and *C. floribunda*, have been described. They inhabit a phytogeographic area known as the montane forest, between 1500 and 2500 m above sea level. In this area, between patches of deciduous and coniferous forests where *Chusquea deficiens* and *C. lorentziana* occur, high-altitude grasslands are found. There, grasses such as *Festuca hieronymi* Hack., *Deyeuxia colorata* Beetle [= *Calamagrostis rosea* (Griseb.) Hack.], among others, are dominant. The climate is temperate-cold with abundant precipitation, some falling as snow. Some of these grasslands are usually engaged in livestock grazing (Cabrera 1971). Ing. Agr. Roberto Neumann, an expert in the flora of this area, sent the specimens described in this paper to the Instituto de Botánica Darwinion (SI) for identification, and reported their use by locals in ceilings, roofs, and to make shelves (R. Neumann, pers. comm.).

After a thorough revision of some of the main herbarium collections in Argentina and the world, no other specimen was found that could be identified as *Chusquea egluma* and only one specimen was found that was identified as *Chusquea floribunda*. Therefore, these new species are narrowly endemic (Clark 1997).

Clark (1995, 1997) speculated that the combination of a single, large, indeterminate bud per node that has the ability to reiterate the branching and growth of the main culm plus a number of smaller, determinate buds that produce leafy branches, such that the photosynthetic surface expands quickly, has allowed these bamboos to compete effectively for light in their forest environment. Once multiple, dimorphic buds appeared, variations in bud number, arrangement and branching were relatively easy to achieve as these species evolved to occupy the many niches available in the topographically and climatologically complex mountain systems where *Chusquea* is found today. There are many undescribed species and almost certainly others will be found as fieldwork continues in the montane forests that occur along the Andes of South America.

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