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New records of *Chusquea* (Poaceae: Bambusoideae: Bambuseae) in Bolivia

Carolina Guerreiro[1], M. Carolina Peichoto[2] & Andrea S. Vega[3]

Summary. *Chusquea deficiens* Parodi and *C. floribunda* Guerreiro & Rúgolo, described as endemic to Argentina, are cited for the first time in Bolivia. Morphological diagnostic characters as well as those related to the ecology of *C. deficiens* and *C. floribunda* are compared in a table with those of allied and sympatric species. Also, a map showing their updated distribution is included.

Key Words. Andes, Argentina, *Chusquea deficiens*, *C. floribunda*, distribution.

Introduction

Bamboos occur in almost every tropical, subtropical and temperate forest around the world. Neotropical woody bamboos are distributed nearly continuously throughout Central and South America (Judziewicz *et al.* 1999). 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 Kunth is the most diverse genus of Neotropical woody bamboos, with c. 174 described species (Ruiz Sanchez *et al.* 2014). *Chusquea* shows the widest latitudinal range of any bamboo genus, 24°N in Mexico to 47°S in Chile, and the widest altitudinal range, from sea level to over 4,000 m. The species of *Chusquea* are often significant, sometimes dominant, components of montane forest and high-altitude grassland vegetation, where they can be aggressive colonisers (Judziewicz *et al.* 1999). All major groups within this genus occur in the Andes, thus establishing this area as a primary centre of diversity (Clark 1995). Following the recent taxonomic submergence of *Neurolepis* Meisn. within *Chusquea* (Fisher *et al.* 2009, 2014), diagnostic morphological characters for *Chusquea* are spikelets with two glumes, two sterile lemmas and a single fertile floret lacking a rachilla extension, as well as the presence of two papillae on subsidiary cells of the foliar stomatal complex. Within *Chusquea*, anatomical characters are a useful tool for the identification of species (Guerreiro & Rúgolo de Agrasar 2014; Guerreiro *et al.* 2014) on the basis that they are mostly monocarpic, with long vegetative periods, so sterile specimens are often collected.

According to recent taxonomic treatments, 18 species of *Chusquea* are reported in Bolivia (Guerreiro 2014; Guerreiro *et al.* 2014) and 11 species are cited in Argentina (Guerreiro & Rúgolo de Agrasar 2012, 2013, 2014; Lizarazu *et al.* 2013). One of them, *C. deficiens* Parodi, a rare woody bamboo found in montane forests of the Andes of northwestern Argentina, was described in 1941 and it was only known from the type collection for over 70 years. Recently, new records of *C. deficiens* were found under unidentified herbarium specimens so its morphological and anatomical structure and geographical distribution were revised and updated (Guerreiro *et al.* 2011).

The recently described new species *Chusquea floribunda* Guerreiro & Rúgolo is found in the east-facing, steep slopes of the Andes mountain range of northwestern Argentina, in high-altitude grasslands between 1,500 and 2,500 m above sea level (Guerreiro & Rúgolo de Agrasar 2013). It is only known from two collections, therefore it is considered narrowly endemic (Clark 1997).

New records of *Chusquea* are here reported as a contribution to the study of bamboo diversity in southern South America. Based on herbarium investigations and anatomical studies, *C. deficiens* and *C. floribunda* are cited for the first time in Bolivia. A comparative table (Table 1) based on morphological

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[1] Instituto de Botánica Darwinion (CONICET-ANCEFN), Labardén 200, CC 22, B1642HYD, San Isidro, Buenos Aires, Argentina. e-mail: cguerreiro@darwin.edu.ar
[2] Instituto de Botánica del Nordeste (UNNE-CONICET), Facultad de Ciencias Agrarias, Universidad Nacional del Nordeste, Sargento Cabral 2131, 3400, Corrientes, Argentina.
[3] Cátedra de Botánica General, Facultad de Agronomía, Universidad de Buenos Aires, Av. San Martín 4453, C1417DSE, Ciudad Autónoma de Buenos Aires, Argentina.

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Table 1. Comparative diagnostic characters among species of *Chusquea* from Departments of Chuquisaca and Santa Cruz, Bolivia (Guerreiro 2014). Symbols: +, present; -, absent.

	C. deficiens	*C. delicatula*	*C. floribunda*	*C. longipendula*	*C. lorentziana*	*C. picta*	*C. scandens*
Habit	arching	arching	erect	arching	arching	arching	arching
Culm, diam. (mm)	7 – 8	2 – 5	12 – 17	5 – 15	3 – 25	2 – 8	2 – 20
Branch length (cm)	10 – 25	3 – 8	15 – 35	10 – 25	12 – 60	6 – 22	15 – 40
Foliage leaf blade, length (cm)	4 – 9	1.5 – 4.5	9 – 12	5 – 8	5 – 15	4 – 10	5 – 18
Foliage leaf blade, width (mm)	4 – 8	3 – 4	4 – 7	4 – 8	4 – 8	2.5 – 6	10 – 25
Foliage leaf blade, length to width ratio	8 – 16	8 – 10	15 – 26	8 – 16	12 – 25	12 – 28	5 – 11
Foliage leaf blade, abaxial indument	hirsute	glabrous	glabrous	glabrous	glabrous	glabrous	glabrous
Foliage leaf blade, adaxial indument	glabrous	hispidulous	glabrous	glabrous	glabrous	glabrous	glabrous
Pseudopetiole, indument	pubescent	glabrous	glabrous	glabrous	glabrous	glabrous	glabrous
Pseudopetiole, pulvini	-	-	+	-	-	-	+
Inflorescence length (cm)	5 – 7	1.5 – 3	20 – 35	4 – 6	5 – 15	3 – 11	8 – 20
Spikelet, length (mm)	11 – 12	4.5 – 7	8 – 9	9 – 11	8 – 9.5	7 – 10	5 – 8
Spikelet, indument	glabrous	glabrous	scabrous in the upper third	glabrous	glabrous	glabrous	pubescent
Relative development of lower glume	<1/10	<1/10	1/4 – 1/2	<1/10	1/4	<1/10	1/10
Relative development of upper glume	<1/10	<1/10	1/4 – 1/2	<1/10	1/3	<1/10	1/10
Relative development of lower sterile lemma	1/2	1/2 – 3/4	1/2	1/2 – 3/4	1/2	1/2 – 3/4	1/2
Relative development of upper sterile lemma	1/2	1/2 – 3/4	3/4	1/2 – 3/4	3/4	1/2 – 3/4	3/4
Sterile lemmas, apex	awned-tipped	acuminate	awned-tipped	acuminate	acuminate or mucronate	acuminate or mucronate	mucronate
Fertile lemma, apex	awned-tipped	acuminate	awned-tipped	acuminate	mucronate	obtuse or acuminate	acuminate
Habitat	montane rainforest	montane rainforest	high-altitude grasslands	montane rainforest	montane rainforest	montane rainforest	montane rainforest
Geographic distribution	Bolivia and Argentina	Peru and Bolivia	Bolivia and Argentina	Bolivia	Bolivia and Argentina	Peru and Bolivia	Colombia, Ecuador, Peru and Bolivia
Altitude (m)	700 – 1700	1200 – 3100	2000 – 2100	1300 – 1500	1100 – 2600	2400 – 3600	2100 – 3500

features of taxonomic value and a map showing their updated distributions (Map 1) are included.

Materials and Methods

As part of an ongoing study of woody bamboos native to southern South America, unidentified specimens from CTES, SI and US (Thiers 2014) were studied. Specimens were identified based on comparative analysis of morphological and anatomical characters.

Results

Chusquea deficiens *Parodi* (1941: 335); Guerreiro *et al.* (2011: 179); Guerreiro & Rúgolo de Agrasar (2012: 54). Type: Argentina, Salta, Cerros de Maíz Gordo, Jan. 1939, fl., *Devoto et al.* 1010 (holotype BAA-773!; isotypes SI!, US-1815753!).

ILLUSTRATION. Guerreiro *et al.* 2011: 180 – 181.

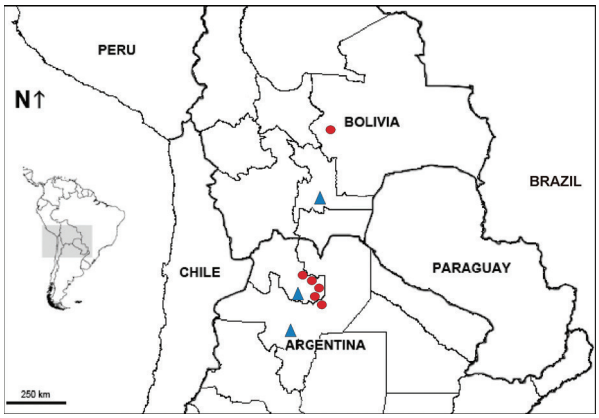
DISTRIBUTION. Northwestern Argentina (Provinces of Jujuy and Salta) and Bolivia (Map 1).

SPECIMENS EXAMINED. ARGENTINA. Jujuy: Ledesma, 15 – 20 km NW de Calilegua, cerca del límite con el Parque Nacional Calilegua, 23°39'26.4"S, 64°46'41.4"W, 700 – 1000 m, 8 July 1999, veg., *Tolaba et al.* 1831 (MCNS); Santa Bárbara, Sierras de Santa Bárbara, 11 July 1901, veg., *Fries* 280 (W); cerros de Maíz Gordo, 42 km de Palma Sola, 24°17'S, 64°19'W, 1050 m, 22 Feb. 1998, veg., *Morrone et al.* 2934 (SI); Valle Grande, 23°39'S, 64°56'W, 1300 m, 15 Feb. 1995, veg., *Deginani et al.* 835 (SI). **BOLIVIA.** Santa Cruz: Florida, ruinas incas de Samaipata, 120 km W de Santa Cruz de la Sierra, 18°10'S, 63°50'W, 1700 m, 2 June 1987, veg., *Killeen* 2493 (CTES, US-3179744).

HABITAT. *Chusquea deficiens* is found in montane forests of the Andes mountain range, on wet slopes, between 700 – 1,700 m above sea level. It was collected on rocky slopes and grassy hilltops with sandstone outcrop, surrounded by scrubby vegetation found in ravines and sheltered spots.

CONSERVATION STATUS. Data Deficient (DD).

NOTES. This species is currently known from 6 collections, of which only the type specimen is in reproductive state.



Map 1. Geographic location of collected specimens of *Chusquea deficiens* and *C. floribunda*. ● all known specimens of *C. deficiens;* ▲ all known specimens of *C. floribunda.*

Chusquea floribunda *Guerreiro & Rúgolo* (Guerreiro & Rúgolo de Agrasar 2013: 393). Type: Argentina, Salta, Guachipas, Pampa Grande, Cerro Pirgua, 25°55'55.69"S, 65°34'23.27"W, 2100 m, 5 Dec. 2010, fl., *Leach* s.n. (holotype SI-158827!; isotypes MO!, US!).

ILLUSTRATION. Guerreiro & Rúgolo de Agrasar 2013: 394.

DISTRIBUTION. Northwestern Argentina (Province of Salta) and Bolivia (Map 1).

SPECIMENS EXAMINED. ARGENTINA. Jujuy: Dr Manuel Belgrano, Quebrada de Jaire, 6 March 1987, veg., *Cabrera et al.* 34300 (SI). **BOLIVIA.** Chuquisaca, Sud Cinti, c. 300 m N del campamento Rinconada del Bufete, 20°49'49"S, 64°22'28"W, 2050 m, 13 May (no year), veg., *Holst et al.* 4625 (CTES-0510939).

HABITAT. *Chusquea floribunda* is found on steep slopes of the Andes mountain range, in high-altitude grasslands above 2,000 m altitude and in low semideciduous west-facing cloud forest, dominated by *Viburnum* L., *Ilex* L. and *Clethra* L. species, with an open understory and few epiphytes.

CONSERVATION STATUS. Data Deficient (DD).

NOTES. This narrowly endemic species is currently known from 3 collections, of which only the type specimen is in the reproductive state.

Discussion

Among the woody bamboos, *Chusquea* has long been recognised as a large and diverse genus. In this paper, *C. deficiens* and *C. floribunda* are cited for the first time in southern Bolivia. With the addition of these new records, 20 species are now found in Bolivia.

Morphological characters and those related to the ecology of *Chusquea deficiens* and *C. floribunda* are compared in Table 1 with those of allied and sympatric species in Bolivia (*C. delicatula* Hitchc., *C. longipendula* Kuntze, *C. lorentziana* Griseb., *C. picta* Pilg. and *C. scandens* Kunth).

These species, among others, inhabit a phytogeographic area known as the Yungas montane rainforest, between 700 and 3,600 m above sea level. In this area, between patches of deciduous, semideciduous and coniferous forests, high-altitude grasslands are found, some of which may be used for livestock grazing (Cabrera 1971). In open areas, where no trees occur,

and on road sides, several species of straggling *Chusquea*, Ericaceae Juss. and Lycopodiaceae P. Beauv. ex Mirb. are dominant (S. Beck, pers. comm.). The climate is temperate cold, with daily presence of clouds and mean temperature around 9 – 10 °C. Annual precipitation ranges from 4000 – 5000 mm, some falling as snow (Gerold *et al.* 2008).

According to Clark (2001), Andean woody bamboos of Bolivia have been poorly collected and not fully described. Also, lack of identification keys added to the long vegetative periods prior to flowering and the frequent collection of sterile specimens, hinder a complete knowledge of woody bamboos, causing many specimens to remain unidentified or misidentified in herbarium collections.

Because of its great diversity, much taxonomic work remains to be done in *Chusquea*. The species of this genus occupy the many niches available in the topographically and climatologically complex Andean mountain system (Clark 1995, 1997). There are many undescribed species and almost certainly others will be found as fieldwork continues in the forests that occur along the Andes of South America.

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