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A NEW SPECIES OF *PUYA* (BROMELIACEAE) FROM THE VENEZUELAN ANDES

Una nueva especie de *Puya* (Bromeliaceae) de los Andes venezolanos

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ABSTRACT

A new species of *Puya* Molina (Bromeliaceae) from the Venezuelan Andes, *P. guaramacalana* Stergios, Caracas, Dorr & S.M. Niño, is described and illustrated. Morphologically this new species belongs in *Puya* subgenus *Puyopsis* (Baker) L.B.Sm. where it most closely resembles two other species with simple peduncles and nutant inflorescences, *P. nutans* L.B.Sm. from Ecuador and *P. venezuelana* L.B.Sm. from northern Colombia and Venezuela. Characters to distinguish these three Andean species are discussed.

Key words: Bromeliaceae, Guaramacal, páramo El Pumar, *Puya*, Trujillo State, Venezuela

RESUMEN

Se describe e ilustra una nueva especie de *Puya* Molina (Bromeliaceae) de los Andes venezolanos, *P. guaramacalana* Stergios, Caracas, Dorr & S.M. Niño. Morfológicamente esta nueva especie pertenece a *Puya* subgénero *Puyopsis* (Baker) L.B.Sm. la cual se asemeja a las especies con pedúnculos simples e inflorescencias nutantes, *P. nutans* L.B.Sm. de Ecuador y *P. venezuelana* L.B.Sm. de Colombia y Venezuela. Se evalúan caracteres que permiten distinguir entre estas tres especies andinas.

Palabras clave: Bromeliaceae, estado Trujillo, Guaramacal, páramo El Pumar, *Puya*, Venezuela

INTRODUCTION

The neotropical genus *Puya* Molina consists of 180-220 species (Holst 1997; Hornung-Leoni & Sosa 2006; Dorr 2014; Luther 2014). In Venezuela, ten species are currently recognized and all but two of them occur in the Andes where they are usually found on open slopes at higher elevations (Smith 1971; Smith & Downs 1974; Holst 1994, 1997; Dorr *et al.* 2000; Holst & Vivas 2008; Morillo *et al.* 2009; Gouda 2012; Dorr 2014).

In the Flora of Guaramacal, which treats the vascular flora of a national park in the Andes of Portuguesa and Trujillo states, Dorr and Stergios in Dorr (2014) recognized two species of *Puya*, *P. aristeguietae* L.B.Sm. and *P. venezolana* L.B.Sm. The former is a robust herb to 3 m tall with an erect peduncle and showy white flowers. The latter as circumscribed in the Flora of Guaramacal is a more diminutive herb to 1 m tall with a nutant inflorescence and blue or greenish-blue flowers. The discussion in the flora concerning this latter species, however, indicated that there were a number of characters that distinguished the Guaramacal collections from those made in the nearby Páramo de Guirigay (Mérida and Trujillo states) which is the type locality of *P. venezolana*. The Guaramacal collections made in the isolated Páramo El Pumar represent a species distinct from *P. venezolana* and the species is described here as *P. guaramacalana* Stergios, Caracas, Dorr & S.M. Niño. A third species of *Puya*, also confounded with *P. venezolana*, occurs in Guaramacal (Dorr *et al.* 2000; Dorr 2014). Its identity remains problematic because it is known at present only from a sterile collection (*Stergios & Zambrano 17654* (PORT)) made near the summit of the isolated Fila de Agua Fria. This third species found in Guaramacal National Park is not, however, conspecific with the new species described here.

MATERIALS AND METHODS

El Pumar, a remote páramo area on the north slope of the Guaramacal National Park at around 2600 m asl, SE of Boconó, Trujillo State, is one of a diverse array of natural ecosystems within the Park. Botanical exploration in this area, as part of an on-going vascular flora inventory for the entire Park, a cooperative effort by the BioCentro of the Universidad Nacional Experimental Ezequiel Zamora in Guanare, Venezuela, and the Department of Botany, the National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA, was begun in 2000. Specimens of a *Puya* suspected as being undescribed were collected in fruit only (*Stergios et al. 18873*

(PORT, US)). Subsequent missions were carried out in an effort to obtain flowering specimens, finally occurring in March, 2007 (the flowering period is short, lasting only several weeks), permitting the confirmation of an undescribed species of *Puya*, and the designation of the holotype of *P. guaramacalana*. The field collections were compared to known taxa published to date within subgenus *Puyopsis* and with similar characteristics, as well as type specimens and other collections of these species (K, PORT, US, VEN). Later missions gathered additional flowering specimens (*Stergios et al.* 21774) from the same population, which re-enforced the conclusions of this study.

RESULTS AND DISCUSSION

Puya guaramacalana Stergios, Caracas, Dorr & S.M. Niño, sp. nov. (Fig. 1, 2, 3)

Puya venezuelana auct., non L.B.Sm., Dorr & Stergios in Dorr, Smithsonian Contr. Bot. 100: 37, fig. 24H. 2014.

Type: VENEZUELA: **TRUJILLO:** Municipio Boconó, Parque Nacional Guaramacal, Páramo El Pumar, vertiente norte, SE de Boconó (UTM: 19364614 E, 1021651 N), páramo abierto, 2600 m snm, 15/03/2007, *B. Stergios, R. Caracas, A. Bencomo, L. Briceño & A. Terán* 21074 (Holotype: PORT; Isotypes: K, NY, SEL, US, VEN).

Stout, scapose, unbranched, erect, *herbs*, 50-75 (-100) cm tall at anthesis. *Leaves* numerous, densely rosulate, ensiform, 16-29 cm long, 1.5-2 cm wide at center, glabrous and lustrous above, minutely cinereous- or silvery-squamose below; leaf margins with minute, rather dark, chestnut-brown coloured spines, 0.5 mm long, distributed uniformly ± 2 mm apart along the margins except near leaf apices; basal sheaths lunate-suborbicular, 4-5 cm wide, 2-4 cm long, with a 0.5-1.5 cm dark castaneous upper marginal band, with a light castaneous area below this band. *Peduncle* solitary, ± 8 mm in diameter, abruptly nutant at apex, rose-lavender, sparsely cinerescent-pilose near base, soon glabrous; peduncular bracts erect, slightly imbricate (apices only overlapping adjacent bases), otherwise the peduncle naked with 4-5 cm separating adjacent bracts; the lower peduncular bracts subfoliaceous, 8 cm long, their apices long-acuminate, 3.5-4 cm long, minutely but firmly barbed; the upper peduncular bracts broadly elliptic, 4 cm long, their apices apex short-acuminate, 2-3 cm long, entire or only barely subserrulate, pale rose to pale greenish-rose. *Inflorescence* at anthesis nutant, simple, narrowly and slightly strobilate, broadly conical to subovoid, 7-8 cm long, 2.5-3 cm wide at apex, then extending 13-16 cm further down the peduncle, the

primary 4 bracts gradually thinning out, merging with the sterile peduncular bracts; the flowering bracts at or near the apex similar to the peduncular bracts but more orbicular, 3 cm long, 3 cm wide, apices caudate to broadly mucronate, slightly exceeding the sepals. *Flowers* loosely clustered at or immediately around the nodding peduncle apex, showy; pedicels 3-5 mm long, thickened, ferrugineous-tomentose; sepals narrowly oblong, obtuse, 20 mm long, 8 mm wide stramineous-villous; petals oblong, obtuse, 3-3.5 cm long, 0.7 cm wide, prussian or indigo blue, the stamens spreading at anthesis. Stamens slightly shorter than the petals, the basifixed anthers 6 mm long, bright-yellow at anthesis. Pistil 30-31 mm long; the trisulcate ovary dark in colour, 7-8 mm long; the trilobed stigma with a showy, bright white barb of semi-translucent, succulent, hair-like projections. *Infructescence* erect when mature. *Fruit* an obclavoid, loculicidal capsule dehiscing longitudinally that is tardily septicidal, 2-2.5 cm long, 8 mm wide, outer surface with blackened pustule-like dots, locule margins thickened. *Seeds* 1-2 mm in diameter, gongylode-deltoid with a darkened, globose centre surrounded by a narrow, semi-translucent, greenish-brown margin.

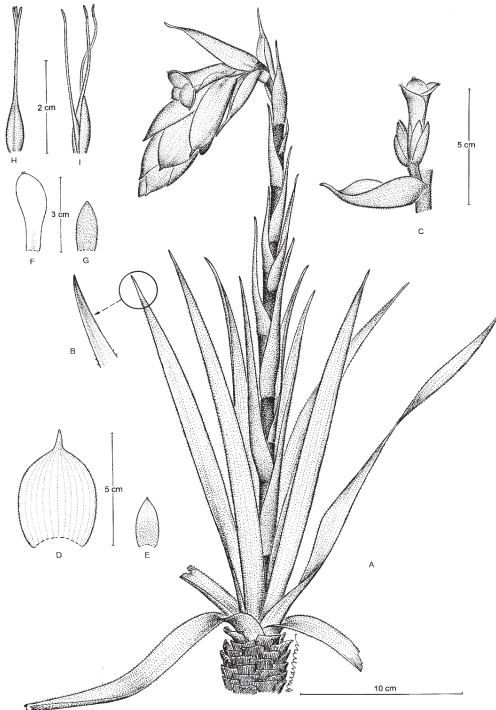


Fig. 1. *Puya guaramacalana* Stergios, Caracas, Dorr & S.M. Niño. **a.** Habit. **b.** Leaf apex and margin. **c.** Upper peduncular bract subtending a single flower. **d.** Lower (primary) bract. **e.** Floral bract. **f.** Petal. **g.** Sepal. **h.** Gynoecium.



Fig. 2. Habit and habitat of *Puya guaramacalana* (photo by Ramón Caracas).



Fig. 3. Flower of *Puya guaramacalana* showing the relative position at anthesis of floral bracts, petals, anthers, and stigma.

Paratypes: VENEZUELA. **TRUJILLO:** Municipio Boconó, Parque Nacional Guaramacal, slope forests of El Pumar, SE of Boconó, (UTM: 19-364614E; 1021651N), 2600 m elevation on old mule trail to caserío de Guaramacal, in páramo, 27/12/2000, *B. Stergios, L.J. Dorr & S.M. Niño 18873* (PORT, US); Parque Nacional Guaramacal, Páramo El Pumar, lomerío paramero pedregoso abierto, 2600 m snm, 15/04/2014, *B. Stergios, R. Caracas, A. Bencomo & M. Hidalgo 21774* (IVIC, MER, NY, PORT, SEL, US, VEN).

Etymology: the name of this new species reflects its apparently restricted range. Currently *Puya guaramacalana* is known only from the Guaramacal National Park in Trujillo State, Venezuela.

Distribution and ecology: *Puya guaramacalana* is known only from a small, approximately $\frac{1}{4}$ ha population restricted to an exposed, rocky slope in the isolated Páramo El Pumar, which is in the south-western part of Guaramacal National Park in Trujillo State, Venezuela. This population (as well as the species) appears to be threatened by the “oso frontino” or Andean bear (*Tremarctos ornatus* F.G. Cuvier 1825), which consumes the young leaf buds and flowering shoots. Anecdotal evidence (Ramón Caracas, pers. observ.) suggests that the bear’s preferred food *P. aristeguietae* (Fig. 4, Goldstein 1999), which was once common within the Park, has been virtually eliminated by over feeding and as a consequence these herbivores have increased their pressure on *P. guaramacalana*. These observations suggest that *P. guaramacalana* is Critically Endangered (CR2b(v)) following IUCN criteria (IUCN 2001) because this new species has a limited range and the consumption of plants by bears will lead to a decline in the number of mature individuals.

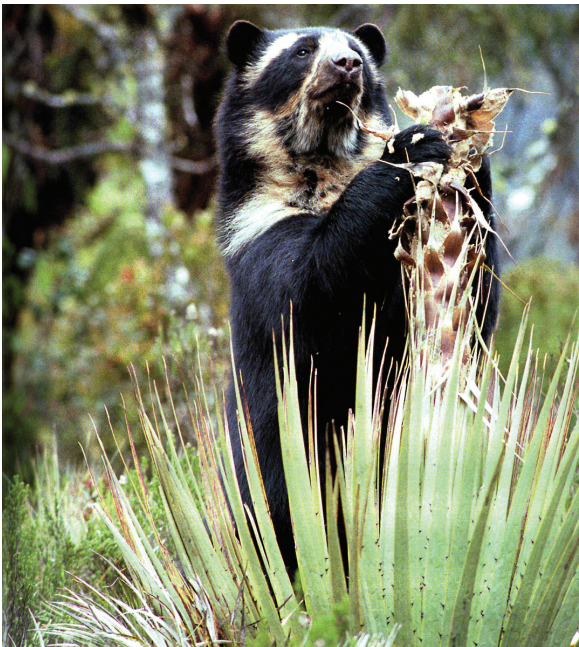


Fig. 4. An “oso frontino” (Andean bear) in the process of devouring a plant of *Puya aristeguietae* (photo by Imaru Lameda Camacaro).

Puya guaramacalana is most similar morphologically to *P. venezuelana* with a similar-sized strobiloid inflorescence and blue flowers. However, *P. guaramacalana* differs markedly by its minute (0.5 mm long), more delicate and regularly distributed spines on leaf margins, its partially naked peduncle with widely-spaced and sparsely overlapping bracts, and its rather loosely compacted inflorescence apex with fewer and larger, showy flowers that project visibly from within the bracts (Table 1).

The general appearance of the peduncle of *Puya nutans* also is similar to that of this new species. However, the peduncular bracts of *P. nutans* are imbricate and mostly conceal the main axis of the inflorescence. The margins of the upper peduncular bracts of the Ecuadorean species are spiny especially near their apices whilst those of *P. guaramacalana* are entire or subserrulate. The inflorescence apex of *P. nutans* is much broader than it is in *P. guaramacalana* (4-5 versus 2.5-3 cm in diameter), and it has green (versus blue) flowers. Also the spines on the leaf margins of *P. nutans* differ from those of *P. guaramacalana*; they are stouter and larger (1-2 versus 0.5 mm long) (Table 1).

In the morphologically based classification adopted by Smith & Downs (1974), *Puya guaramacalana* belongs to *Puya* subgenus *Puyopsis* (Baker) L.B.Sm. because its inflorescences and branches are fertile throughout. In the nominate subgenus, the only other subgenus that Smith & Downs (1974) recognised, inflorescences have branches that are sterile in large part towards the apex. Hornung-Leoni & Sosa (2008) using a morphological data set, argued that *Puya* subgenus *Puyopsis* is paraphyletic, but they made their argument on the basis of clades that do not have strong statistical support. Interestingly, Jabaily & Sytsma (2013) using a molecular dataset, did not recover a similar relationship in their study of the genus nor did they confirm the subgeneric classification of Smith & Downs (1974). Instead, Jabaily & Sytsma (2013) argued that the 200 species of *Puya* resolve to two major clades, one restricted to lowland and costal habitats in central Chile and the other restricted almost exclusively to the Andes. Furthermore, they presented data that all of the *Puya* taxa north of the Río Marañon Valley form a monophyletic group.

In Smith & Downs (1974), *Puya guaramacalana* keys to a couplet that includes two other Andean species, *P. nutans* L.B.Sm. and *P. venezuelana* L.B.Sm. All three species have nutant inflorescences with a single series of bracts and narrow sepals. *Puya nutans* was described from the Páramo de Tinajillas in Azuay province, Ecuador, and although it was long thought to be narrowly endemic it has since been collected in nearby Morona-Santiago

Table 1. Characters distinguishing three Andean species of *Puya* with simple, strobiliform inflorescences.

Species	Leaf margins	Peduncle	Upper peduncular bracts	Petals
<i>P. guaramacalana</i>	Spines to 0.5 mm long, antrorse	Scape ± naked, bracts scarcely overlapping	Broadly elliptic, margins entire, membranous, opaque	Blue
<i>P. nutans</i>	Spines 1–2 mm long, antrorse	Scape concealed, bracts densely imbricate	Trullate or angular-ovate, margins toothed, subchartaceous, opaque	Green
<i>P. venezolana</i>	Spines 4–6 mm long, antrorse and retrorse	Scape concealed, bracts imbricate	Trullate or angular-ovate, margins denticulate, membranous, translucent	Blue

province (Luther, in Jørgensen & León-Yáñez 1999). Likewise, *P. venezolana*, which was described from the Páramo de Guirigay in Trujillo State, Venezuela, was thought to have a very small, restricted range but it now also is reported from Mérida State as well as from northern Colombia, where it is known from Arauca, Cesar and Norte de Santander departments (Hornung & Gaviria 1999, 2000; Hornung-Leoni & Sosa 2006; Morillo *et al.* 2009; Bernal *et al.* 2015). *Puya guaramacalana* appears to be restricted to the Páramo El Pumar in Venezuela.

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