



Podagrostis colombiana sp. nov. (Poaceae): a new genus record and species for Colombia

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Summary. *Podagrostis colombiana* sp. nov. (Poaceae: Poeae: Agrostidinae), is described and illustrated from high-elevation paramo of the Sierra Nevada de Santa Marta, Colombia. This endemic species constitutes a new genus record for Colombia and is only the second species of *Podagrostis* to be described from the Neotropics. It can be distinguished from all other species of *Podagrostis* in having leaf blades 6 – 15 cm long that are involute and acicular, plants that form small tussocks, spikelets 2.8 – 4 mm long, 3-veined upper glumes with well-developed lateral veins, and anthers c. 1.5 mm long.

Resumen. *Podagrostis colombiana* (Poaceae: Poeae: Agrostidinae) se describe e ilustra como una nueva especie, endémica de los páramos de la Sierra Nevada de Santa Marta, Colombia. Esta especie constituye el primer registro del género para Colombia y esta es la segunda especie descrita del Neotrópico. La nueva especie se distingue del resto de las especies de *Podagrostis* por la combinación de varias características, tales como la naturaleza de sus hojas (largas, 6 – 15 cm long., involutas y aciculares), la constitución de pequeñas matas densas, espiguillas de 2.8 – 4.0 mm long., gluma superior 3-nervia con nervios laterales conspicuos, y anteras c. 1.5 cm long.

Key Words. Endemic species, Gramineae, grass, Neotropics, paramo, taxonomy.

Palabras clave. Especies endémicas, Gramineae, gramíneas, Neotrópicos, páramo, taxonomía.

Introduction

Podagrostis (Griseb.) Scribn. & Merr. belongs within the tribe Poeae R.Br., subtribe Agrostidinae Fr., which are characterised by single-flowered spikelets (Saarela *et al.* 2017; Soreng *et al.* 2017). The genus currently comprises four taxa, with three of these being found in North America: two from alpine and subalpine meadows and screes of the western U.S.A. [*P. humilis* (Vasey) Björkman; *P. thurberiana* (Hitchc.) Hultén] and one from Alaska and western Canada [*P. aequivalvis* (Trin.) Scribn. & Merr.]. Only one species, *P. sesquiflora* (E.Desv.) Parodi ex Nicora, is known from South America, occurring in high-Andean regions of Argentina and Chile (Soreng *et al.* 2003 onwards; Rúgolo de Agrasar 2012). *Podagrostis* has been considered a synonym of *Agrostis* L. (e.g. Pohl & Davidse 1994). However, grass taxonomists have since considered the genus distinct and this is corroborated and accepted in recent phylogenetic research and classifications (Kellogg 2015; Soreng *et al.* 2015, 2017; Saarela *et al.* 2017). Saarela *et al.* (2017) found *Podagrostis aequivalvis* to be placed in a maximally supported clade that included *Agrostis*, *Polypogon* Desf.,

Calamagrostis bolanderi Thurb., and four other species of *Calamagrostis* Adans./*Deyeuxia* Clarion ex P.Beauv. A strongly supported basal lineage sister to the rest of the taxa within this clade comprised *Podagrostis aequivalvis* and *Calamagrostis bolanderi*.

Morphologically, *Podagrostis* differs from currently circumscribed *Agrostis* in its combination of a relatively long palea and, usually, the prolongation of the rachilla beyond the base of the floret as a short glabrous stub. *Podagrostis* can also be confused with taxa currently circumscribed as either *Calamagrostis* or *Deyeuxia* but generally differs in having florets with a glabrous callus or a callus with poorly developed hairs, an absence of an awn, a rachilla extension that, if present, is glabrous, and an upper glume with poorly developed lateral veins.

Knowledge of the grasses present in Colombia has advanced in recent years with the production of checklists (Giraldo-Cañas 2011, 2013; Giraldo-Cañas *et al.* 2016) that currently cite 165 genera and 840 species of grass for the country, including 72 endemics (Giraldo-Cañas *et al.* 2016). While the three authors were undertaking revision of *Poa* L. specimens in the

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COL herbarium, Bogota, a specimen of an undescribed species of *Podagrostis* was discovered, which adds a further genus and endemic species to the country checklist (Giraldo-Cañas *et al.* 2016). This specimen, along with a subsequent specimen discovered in the K herbarium, was collected from paramo vegetation of the Sierra Nevada de Santa Marta, an area known for hosting a number of endemics including two species of the only endemic grass genus of Colombia, *Agrostopoa* Davidse, Soreng & P.M.Peterson (2009).

The geography of the Sierra Nevada de Santa Marta is distinct; it is considered an isolated 'island' of high-elevation paramo habitat on the northernmost tip of Colombia (Morales *et al.* 2007). The current situation regarding collecting in the Sierra Nevada de Santa Marta is complicated due to access issues controlled by indigenous tribes. Most of the known grass collections from these high-elevation paramos were made prior to the 1980's during expeditions by collectors Harriet G. Barclay and Pedro Juajibioy C. in January to February 1959, Jose Quatrecasas and Rafael Romero-Castañeda in October to November 1959, and Joseph H. Kirkbride Jr. & Enrique Forero-González in July and December 1972 (Universidad Nacional de Colombia biovirtual collections database 2018). The improbability of being able to make further collecting trips to the type locality any time soon has prompted us to describe this species from the two collections at COL, K and MO. Here we describe and illustrate the new species and new genus record for Colombia, *Podagrostis colombiana*, and provide habitat information and notes on how to differentiate it from similar species.

Methods

Accepted species follow Soreng *et al.* (2003 and onwards). Herbarium acronyms follow Thiers (continuously updated). In this treatment, glabrous means without pubescence (in the sense of slender, relatively soft hairs). Smooth indicates no prickly-hairs with broad bases and/or hooked or pointed apices (i.e., pubescence can occur on a smooth surface, and a rough or scabrous surface can be glabrous).

Taxonomic Treatment

Podagrostis colombiana Sylvester & Soreng **sp. nov.**
Type: Colombia, Depto. Magdalena, Sierra Nevada de Santa Marta, paramo de Macotama, alrededores de cabeceras de Rio Ancho, growing in rocks of slope above second lake, above valley of Rio Ancho, station 13, c. 3850 m, 17 Feb. 1959, *H. G. Barclay & P. Juajibioy C.* 7052 (holotype COL-000184708!; isotype MO-1089752 [digital image!]).

<http://www.ipni.org/urn:lsid:ipni.org:names:77197203-1>

Tufted perennial forming short dense tufts with short vertical or oblique rhizomes and erect shoots and entire glossy basal sheaths, leaves form a basal mat to 22 cm tall that is slightly shorter than the exerted culms. *Tillers* extravaginal and intravaginal; *prophylls* 1.8 – 3 cm long, keels antrorsely scabrous. *Culms* striate, 17 – 27 cm tall, 0.3 – 0.4 mm wide, erect, slightly exerted from the basal foliage, densely papilliate, rarely lightly scabrous; *nodes and internodes* terete, culms smooth below the nodes, nodes smooth, densely papilliate, rarely lightly scabrous, not lustrous, nodes hidden in the sheaths with no nodes exposed at flowering; *uppermost node* 5 – 6 cm from base, smooth; *uppermost internode* not pronouncedly longer than the sheath, c. 13 cm long. *Sheaths* weakly striate, weakly keeled; *flag leaf sheaths* at least 10.5 cm long; *upper culm sheaths* tightly encircling the culm, glabrous, smooth, no papillae seen; *basal leaf sheaths* c. 3 cm long, tightly encircling the culm, glabrous, antrorsely scaberulous near margins, no papillae seen, longer than the internodes, older basal sheaths glossy and intact or breaking up transversely. *Ligules* not stipulate; *upper culm ligules* 5 – 5.5 mm long, broadly decurrent with the sheaths, acuminate, hyaline, without notable lateral keels, apices entire, abaxial surface moderately scabrous; *lower culm ligules* 2.5 – 3 mm long, broadly decurrent, acute, abaxially scabrous, with notable lateral and keel veins; *ligules of innovations* similar in most aspects to lower culm ligules, scarious to chartaceous. *Leaf blades* isomorphic, 6 – 15 cm long, c. 0.5 mm diam. when rolled, strongly involute, filiform, cylindrical to subcylindrical in outline, indurate, erect to slightly curved, glabrous, abaxial blade surface densely scabrous in the vicinity of the ligule, smooth above that, densely papilliate, adaxial blade surface smooth, with no prominent veins apart from a distinct groove in the centre, papilliate at least close to the margins, apex tapers into a sharply pungent point; *flag leaf blade* not seen (grazed). *Inflorescence* a slender contracted sparsely-flowered panicle 2.5 – 4.5 cm long, c. 0.5 cm wide, contracted, linear, tawny-purple, sparsely spiculate, somewhat interrupted towards the base, spikelets present from near the base; *main panicle axis* terete, glabrous, smooth or slightly scabrous in lines, densely papilliate, lower internode 1.1 – 1.4 cm long; *panicle branches* erect to steeply ascending; *primary panicle branches* 1 (– 3) at lowest nodes, 1 – 2 cm long, bearing 9 – 13 spikelets per branch, terete, glabrous, almost smooth to sparsely scabrous distally, densely papilliate throughout; *pedicels* much shorter than the spikelets, 0.1 – 1.5 mm long, glabrous, smooth or sometimes with lines of scabers, densely papilliate. *Spikelet* 1-flowered, moderately laterally compressed, disarticulating above the glumes; glumes, lemma and palea not noticeably asymmetrical. *Glumes* 2.8 – 4 mm long, equal to subequal,

the lower glume 0 – 0.5 mm shorter than the upper glume, the lower glume 0.5 – 0.8 mm wide, often noticeably wider ($\times 0 - 25\%$ wider) than the upper glume, membranous, purplish grading to a scarious bronzy margin, lustrous to sublustrous, scabrous distally on the keels, surface densely papillate and appearing muriculate, edges smooth, apices acute, entire; *lower glume* 1-veined; *upper glume* 3-veined, lateral veins reaching from $\frac{1}{2}$ to $\frac{2}{3}$ the length of the glume from the base; *floret* usually included in the glumes, slightly shorter, reaching, or slightly surpassing the apex of the lower glume, sometimes slightly surpassing the apex of the upper glume. *Lemma* 2.6 – 3.7 mm long, fusiform in outline, margins inrolled around the palea, slightly more indurate than the glumes, brownish-purple and scarious towards the apex, glabrous, smooth except slightly scabrous on the keel and sides near the apex, apex abruptly acute, 5-veined, veins generally not evident; *awn* absent. *Palea* 0.05 – 0.2 (– 0.5 mm) shorter than the lemma, hyaline, scarious, keels closely spaced with the keel flanges slightly broader than the gap between the keels, scaberulous and notable, smooth between the keels, apex acute and entire. *Callus* base rounded and slightly dorsally compressed above, short, glabrous. *Rachilla* to 0.4 mm long, absent or rudimentary, glabrous, smooth. *Lodicules* c. 0.4 mm long, 2, membranaceous, lanceolate with a lateral cusp, longer than broad. *Anthers* 1.5 – 1.6 mm long, 3 in number. *Ovary* c. 0.6 mm long, small, firm, styles 2, stigmas plumose, short. *Caryopsis* c. 1.5 mm long, c. 0.5 mm wide, shape indistinct, slightly laterally compressed in cross section, hilum 0.2 mm long, obovate, ventral groove shallow and narrow and not conspicuous, honey brown and dark purple at base, embryo c. 0.4 mm long, apex with remains of style bases that are adjacent, <0.1 mm long, and remains of short plumose stigmas; *endosperm* firm (Fig. 1; scanned images of the COL holotype and MO isotype can be found at the following links, respectively: <http://www.biovirtual.unal.edu.co/en/collections/detail/206089/>; <http://www.tropicos.org/Image/100568035>).

RECOGNITION. *Podagrostis colombiana* can be distinguished from all other species of *Podagrostis* in having long leaf blades that are involute and acicular, plants that form small tussocks (vs leaf blades usually short and flat or folded, rarely involute, not tussock forming), spikelets often large, 2.8 – 4 mm long (vs 1.6 – 2.5 mm in all species apart from *P. aequivalvis* where spikelets 2 – 4 mm long), upper glume 3-veined with well-developed lateral veins (vs 1-veined or 3-veined at base), rachilla absent or rudimentary and glabrous to 0.4 mm long (vs absent, rudimentary and glabrous or to 1 mm long and pilose) and anthers c. 1.5 mm long (vs <1 mm).

DISTRIBUTION. South America: Colombia. Known only from two collections from the Sierra Nevada de Santa Marta. Little information is found on the *M. T. Dawe* 689 specimen label apart from “alta zona” [high region]. The type specimens were collected from the

paramo Macotama near the headwater of the Rio Ancho in the northwestern flank of the Sierra Nevada de Santa Marta.

SPECIMENS EXAMINED. COLOMBIA. Magdalena: Sierra Nevada de Santa Marta, paramo de Macotama, alrededores de cabeceras de Rio Ancho, growing in rocks of slope above second lake, above valley of Rio Ancho, station 13, c. 3850 m, 17 Feb. 1959, *H. G. Barclay* & *P. Juajibioy* C. 7052 (holotype COL-000184708!; isotype MO-1089752 [digital image!]). Magdalena: Sierra Nevada de Santa Marta, high regions, Jan. 1917, *M. T. Dawe* 689 (K!).

HABITAT AND ECOLOGY. High-elevation paramo. The type specimen was growing on a rocky slope amongst grass paramo at elevations of 3800 m. The species might to be under grazing pressure since the upper blades of the type specimen were abruptly broken.

CONSERVATION STATUS. Vulnerable (DD). As insufficient information is available for the *M. T. Dawe* 689 specimen, *Podagrostis colombiana* is here considered as known from only a single locality i.e. a ‘very small or restricted population’ of the IUCN (2017) threat criteria. While access issues controlled by local indigenous tribes of the paramo of the Sierra Nevada de Santa Marta may provide some form of general habitat protection from e.g. mining (Pérez-Escobar *et al.* 2018), the same access issues make it impossible to determine the abundance of this taxon or specific threats to it.

ETYMOLOGY. The species epithet refers to the country Colombia, as this is the first species of *Podagrostis* recorded for the country.

VERNACULAR NAMES AND USES. None recorded.

NOTES. The well-developed lateral veins of the upper glume, large anthers and tussock forming habit gives this new species certain affinities with *Calamagrostis* s.l., especially as certain Andean species of *Calamagrostis* subsect. *Stylagrostis* (Mez) Escalona (most species from this subsection recently transferred to *Deschampsia* P.Beauv.; Saarela *et al.* 2017) are found with similar characters. However, spikelet morphology, including the usually completely glabrous spikelets, florets lacking a stipe, and florets almost reaching to sometimes equalling the length of the glumes, suggest this species is allied to *Podagrostis*. The specimen obviously differs from *Agrostis* by the presence of a rachilla extension and a well-developed palea, although these characters are shared by some species of *Agrostis*.

Not only is this the first species of *Podagrostis* recorded for Colombia (Giraldo-Cañas 2011, 2013; Giraldo-Cañas *et al.* 2016), but this is also the only species of *Podagrostis* recorded in the paramo ecosystem to date (Luteyn 1999; Laegaard 2005). The only species of *Podagrostis* recorded for South America is *P. sesquiflora* from high-Andean Argentina and Chile. *Podagrostis sesquiflora* has flat and stiff leaf blades, 1 – 6.5 cm long \times 0.5 – 2.5 mm wide (vs strongly involute,

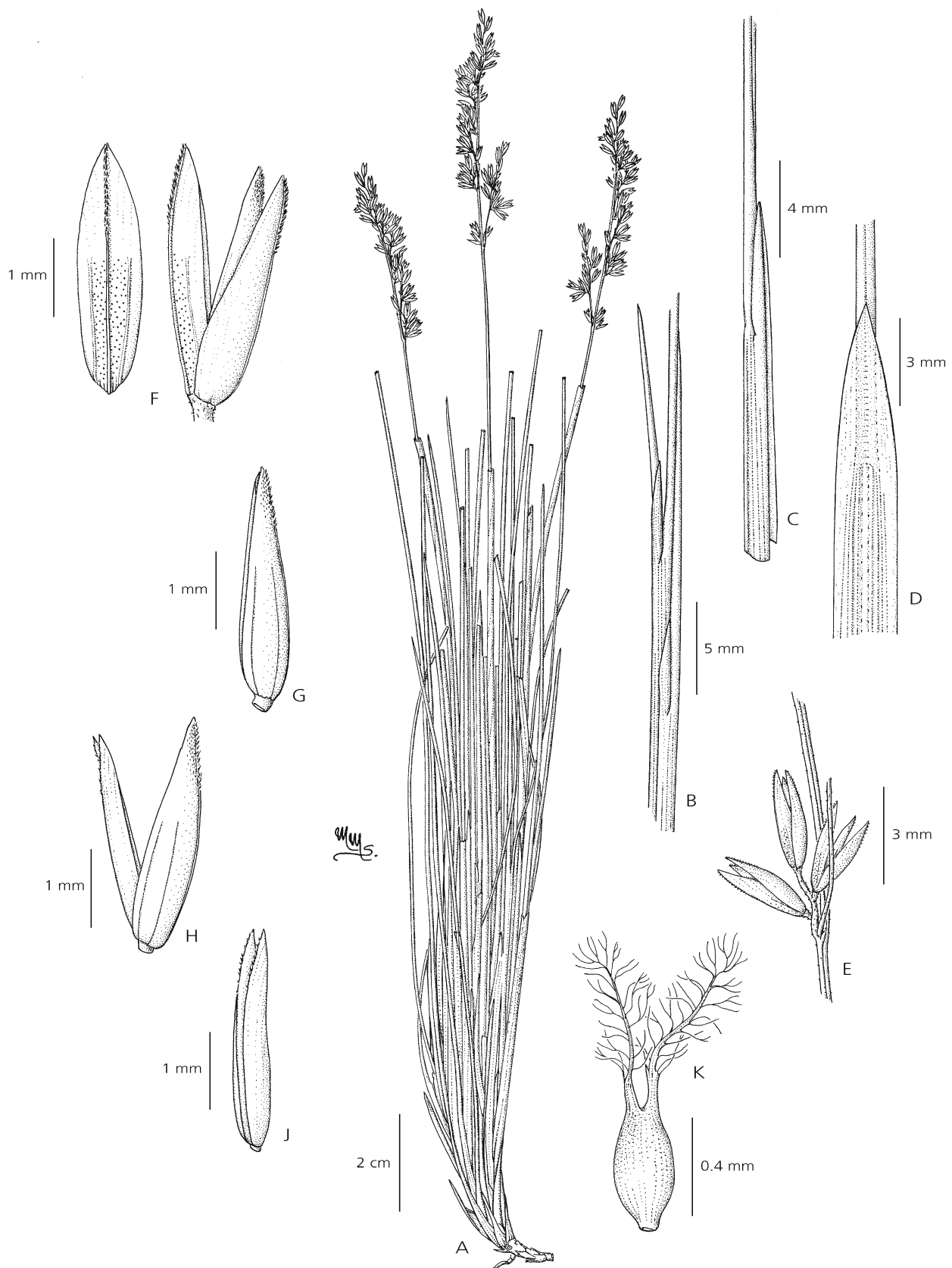


Fig. 1. *Podagrostis colombiana*. A habit; B close-up of ligular area of leaves, lateral view; C ligule, lateral-view; D ligule, adaxial view; E close-up of an inflorescence branch; F spikelet lateral view [right] and dorsal view of the upper glume [left]; G closed floret, lateral view; H floret, lateral view, with lemma and palea opened; J palea, lateral view; K ovary. All from *Barclay & Juajibioy* 7052 (COL). DRAWN BY MARCELA MORSA.

filiform, cylindrical to subcylindrical in outline, indurate, 6 – 15 cm long, c. 0.5 mm diam. when rolled, in *P. colombiana*), spikelets 2 – 2.5 mm long (vs 2.8 – 4 mm long), upper glumes 1-veined (vs 3-veined), lemma 1.9 – 2.1 mm long (vs 2.6 – 3.6 mm long), callus with short hairs 0.1 – 0.2 mm long (vs completely glabrous), anthers 0.4 – 0.6 mm long (vs c. 1.5 mm long), among other characters.

Podagrostis aequivalvis sometimes has involute leaf blades and spikelets as long as 4 mm, but is easily differentiated in having shorter blades to 6 cm long, not being tussock-forming, glumes 1-veined, a rachilla extension that is pilose and 0.6 – 1 mm long, and anthers < 1 mm long, among other things.

The new species *Deschampsia santamartensis* Sylvester & Soreng (Sylvester *et al.* 2019), possibly related to *D. hackelii* (Lillo) Saarela known from high-Andean regions of northwest Argentina and Chile (Rúgolo de Agrasar 2012: 201), has also been found near the type locality of the new species in the Sierra Nevada de Santa Marta, Colombia, and bears certain similarities to *Podagrostis colombiana*. These similarities include completely glabrous spikelets, lack of awn, and usually a lack of a rachilla extension, or this being highly reduced to a glabrous bristle c. 0.4 mm long. However, *P. colombiana* can be easily distinguished by its acicular involute leaf blades that form small tussocks, a more lax inflorescence and spikelets lacking stipitate florets (vs broad folded leaf blades, a rigid condensed inflorescence and spikelets with florets extended on a stipitate base in *Deschampsia santamartensis*).

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