
A New Species of *Agrostis* (Poaceae, Pooideae, Poeae, Agrostidinae) from the Andean Páramos of Colombia and Ecuador

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ABSTRACT. *Agrostis laegaardii* A. M. Molina & Rúgolo (Poaceae), a new species restricted to the high páramos from Colombia and Ecuador, is described and illustrated. It is morphologically most similar to *A. breviculmis* Hitchc. but differs in spikelet length, pedicel apex, glume texture, relative distance between upper glume and floret, lemma and palea length, and the presence of an awn on the lemma. Micromorphology of the spikelet is discussed, and a Trichodium net is reported on the epidermis of the lemma. A distribution map and a key to the Colombian and Ecuadorean species of *Agrostis* L. with contracted inflorescences are provided.

Key words: Agrostidinae, *Agrostis*, high páramos, Trichodium net.

The grass subtribe Agrostidinae Fr. (Poaceae, Poeae) is composed of 409 species distributed in 11 genera (Soreng et al., 2017). One of these genera is *Agrostis* L., which comprises about 224 species (Soreng et al., 2017) and has a wide geographical distribution in temperate and cold regions of both hemispheres and in mountains of tropical and subtropical regions. In America, two important centers of species diversification are present, one in the Andean Patagonian region of Argentina and Chile, where many native species occur, some of them endemic (Rúgolo de Agrasar & De Paula, 1978; Nicora & Rúgolo de Agrasar, 1987; Rúgolo de Agrasar & Molina, 1990, 1992, 1993, 1998), and the other in the southwestern United States and Mexico (Molina & Rúgolo de Agrasar, unpubl. data). In Ecuador, there are several contributions on *Agrostis* (Sodirol, 1889, 1930; Hitchcock, 1927; Espinosa, 1949; Acosta Solís,

1969; Jørgensen & Ulloa Ulloa, 1994), and 11 species have been cataloged in Jørgensen and León-Yáñez (1999). Recent studies of Colombian grasses (García-Ulloa et al., 2005) included four new records in *Agrostis*. Later, Giraldo-Cañas (2011) prepared an inventory of the Colombian species of Poaceae and reported 14 species of *Agrostis*.

The present work is part of a taxonomic revision of *Agrostis* for the Neotropical regions of America (Molina & Rúgolo de Agrasar, unpubl. data). *Agrostis laegaardii* A. M. Molina & Rúgolo, a new species from the páramos of Colombia and Ecuador, is here described and illustrated and its known geographic distribution is provided. Details of the spikelet, as well as the epidermis of the lemma, are analyzed and SEM photomicrographs are included. A key to differentiate *A. laegaardii* from morphologically similar taxa in this region is provided.

In *Agrostis*, the morphology of the inflorescence is useful for the identification of species (Rúgolo de Agrasar & Molina, 1992, 1998). Two different types of inflorescences are recognized: contracted inflorescences with more or less appressed branches and lax inflorescences with divergent branches at maturity that do not exceed the total length of the inflorescence. The inflorescences of *A. laegaardii* belong to the first type, as do those of several other taxa of *Agrostis* in Ecuador (i.e., *A. boyacensis* Swallen & García-Barr., *A. breviculmis* Hitchc., *A. foliata* Hook. f., *A. meyenii* Trin., *A. toluensis* Kunth var. *toluensis*, and *A. toluensis* var. *andicola* (Pilg.) Rúgolo & A. M. Molina) and Colombia (*A. stolonifera* L. var. *palustris* (Huds.) Farw.). The morphologically most similar species to *A. laegaardii* is *A. breviculmis*, which is widely distributed in South

America, where it occurs in high mountains from Colombia to Chile and Argentina (Rúgolo de Agrasar & Molina, 1992, 1993, 1998). These two species differ from the others in Colombia and Ecuador in being caespitose plants with short rhizomes, forming basal cushions, and having convolute, chartaceous leaf blades with navicular apices and glumes with shiny prickly hairs along the keel.

MATERIALS AND METHODS

Macromorphological, micromorphological, and anatomical studies were carried out using specimens from AAU, BAB, QCA, QCNE, SI, and US (Thiers, 2019), according to traditional taxonomic methods. A list of selected material examined is presented (Appendix 1).

For micromorphological studies the spikelets were selected from herbarium specimens, cleaned with xylene, and coated with a gold-palladium (40%/60%) alloy using a sputter coater (Thermo Fisher Scientific, West Sussex, U.K.). The micromorphology of the spikelets was analyzed with a Phillips XL 30 (Phillips, Eindhoven, the Netherlands) Scanning Electron Microscope (SEM) at the Museo Bernardino Rivadavia (Buenos Aires, Argentina). Observations were made of the abaxial epidermis of the lemmas (middle zone) of spikelets attached in the middle zone of the inflorescence branches.

The texture of the glumes was compared with their anatomy at the middle zone in transverse section, according to traditional techniques (D'Ambrogio de Argüeso, 1986). The anatomical description of the glumes in cross section follows the terminology proposed by Ellis (1976).

TAXONOMIC TREATMENT

Agrostis laegaardii A. M. Molina & Rúgolo, sp. nov.

TYPE: Ecuador. Pichincha-Napo: on N-side of Volcán Antisana app. 12 km along dirt rd. from Hacienda Antisana, 78°10'W 00°27'S, 4600–4650 m, in old moraines, soil partly unconsolidated due to solifluction, 15 May 1992, *S. Laegaard 102881* (holotype, AAU!; isotypes, BAB!, QCA!, QCNE!). Figure 1.

Diagnosis. *Agrostis laegaardii* A. M. Molina & Rúgolo is distinguished from *A. breviculmis* Hitchc. by having spikelets (1.7–)2–3.3 mm long (vs. 1.6–2[–2.5] mm long), pedicels slightly dilated toward the apex, cupuliform (vs. apex not dilated, truncate); glumes membranous (vs. chartaceous), lower glume narrowly ellipsoid (vs. navicular); distance between upper glume and floret (0.5–)0.7–1 mm (vs. 0.3–0.5 mm); lemma (1.4–)1.7–2 mm long, awned, dorsal awn (1.6–)2.3–3 mm long, apex shortly 4-awned, 0.5–0.6 mm long (vs. lemma 1.2–1.4 mm long, awnless or mucronulate, apex 4-mucronate), and palea 0.4–0.5 mm long (vs. 0.2–0.3 mm long).

Perennial herbs 6–18 cm tall, caespitose, forming hemispherical cushions; rhizomes 0.5–1 mm diam., internodes ca. 5 mm. Innovations intravaginal and extravaginal. Culms erect, simple, shining, smooth. Leaves up to half as long as culms; sheath smooth, papyraceous, striate, longer than internodes, those of flowering shoots broader than their leaf blades, glabrous; ligule 1–2 mm, membranous, truncate, decurrent with sheath, apex obtuse, abaxially glabrous or minutely scabrous; blade 1.5–5 cm × 1–2 mm, convolute, rigid, straight or recurved, abaxially shining, glabrous; adaxial surface and margins scabrous; apex obtusely navicular. Inflorescence 2–5 cm × 3–6 mm, exerted at maturity; lateral branches alternate, appressed, minutely scabrous or glabrous; pedicels of spikelets 1.5–4 mm, slightly dilated toward apex, cupuliform, glabrous or minutely scabrous. Spikelets (1.7–)2–3.3 mm, yellowish with purple tint. Glumes persistent on inflorescence, membranous, narrowly ellipsoid, subequal, 1-nerved, keeled (V-shaped in cross-section), apex acute, adaxial surface minutely scabrous on the upper half; lower glume with abundant shiny prickly hairs along keel; upper glume with abundant shiny prickly hairs along upper 2/3–3/4 of keel. Stipe between upper glume and floret-callus (0.5–)0.7–1 mm, rachilla extension above floret absent. Callus rounded, with 2 lateral tufts of short hairs 0.1–0.2 mm. Lemma (1.4–)1.7–2 mm, 5-nerved, membranous, scabrous, apex with 4 minute awns, middle nerve prolonged in a dorsal awn (1.6–)2.3–3 mm, straight or flexuous, minutely scabrous, inserted in middle to upper third of lemma, exerted from glumes; abaxial epidermis with Trichodium net. Palea 0.4–0.5 mm, hyaline, nerves not evident. Lodicules 2, 0.3–0.6 mm, lanceolate, unlobed, hyaline. Stamens 3; anthers 0.7–1 mm, purple at maturity. Ovary glabrous. Immature caryopsis brownish, longitudinally grooved; hilum punctiform; endosperm dry.

Phenology. Flowering occurs from February to May.

Etymology. *Agrostis laegaardii* is dedicated to Simon Laegaard, botanist and specialist in Poaceae and native flora of Ecuador, who collected the type and much of the known material.

Geographic distribution and habitat. *Agrostis laegaardii* is found in the high páramos of Colombia and Ecuador, forming dense tufts. In Ecuador the species was collected in the provinces of Pichincha, Napo, Pastaza, Cotopaxi, Tungurahua, and Chimborazo (Fig. 2), inhabiting a pajonal moorland according to the classification of moors proposed by Hofstede et al. (2002). In Colombia, *A. laegaardii* was collected near the Nevado del Ruiz, an active stratovolcano (Mejía et al., 2012). All these collections belong to the Andean

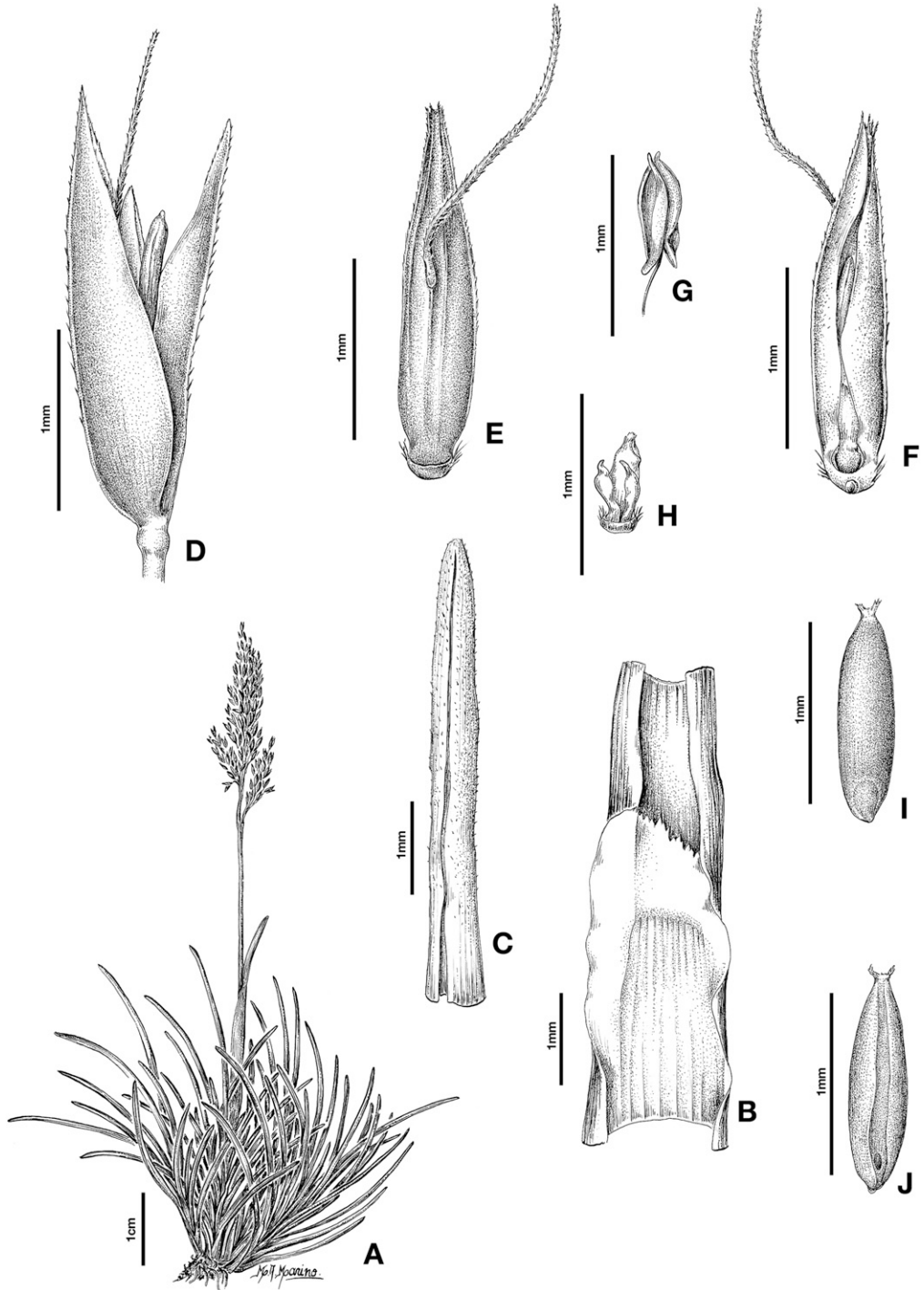


Figure 1. *Agrostis laegaardii* A. M. Molina & Rùgolo. —A. Habit. —B. Ligule, ventral view. —C. Apex of the leaf. —D. Lateral view of spikelet. —E. Floret, dorsal view. —F. Floret, ventral view. —G. Stamen. —H. Callus, lodicules, and palea in ventral view. —I. Caryopsis, dorsal view. —J. Caryopsis, ventral view. All based on *Laegaard 102881* (QCNE).

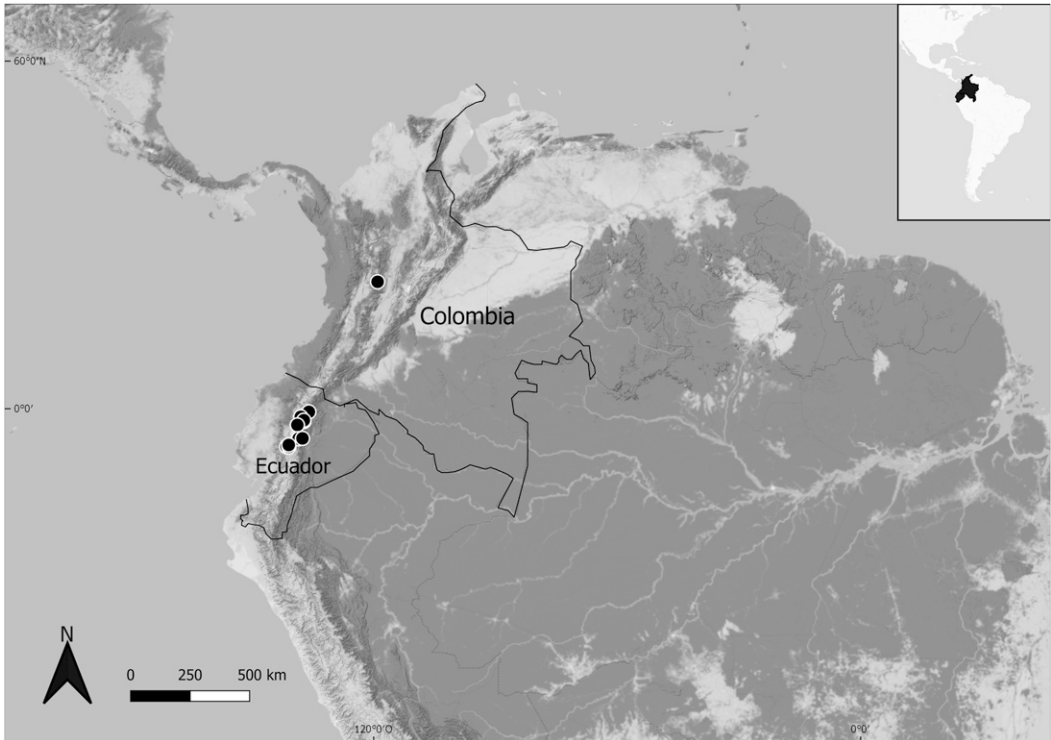


Figure 2. Geographic distribution of *Agrostis laegaardii* A. M. Molina & Rúgolo.

páramos, which represent a biogeographical region of great biological diversity (Llambí & Cuesta, 2014). These ecosystems have endemic species, provide fundamental environmental services, and are spaces of cultural importance for various traditional and local populations (Llambí & Cuesta, 2014). Human activities (raising livestock and crops) have transformed the páramos and caused impacts on the environment (Llambí & Cuesta, 2014). According to our records, more than 20 years have elapsed since the last collection of *A. laegaardii*. Therefore, field trips are necessary to target areas for conservation and sustainable management.

Notes. In addition to the characters mentioned above, *Agrostis laegaardii* and *A. breviculmis* also differ in the anatomy of the glumes in cross section. In *A. laegaardii*, the glumes have a standard V shape (i.e., between 45° and 90° to each other; Ellis, 1976) and at the margins they have only one cell layer of thickness (abaxial epidermis), whereas in *A. breviculmis* the glumes have a narrow V shape (that is, less than 45° between them; Ellis, 1976) and at the margins they are two cell layers thick (adaxial and abaxial epidermis).

The structure of the lemma epidermis in *Agrostis* has been studied by Björkman (1960), Rajbhandari (1985), Romero García et al. (1988), and Rúgolo de Agrasar and

Molina (1992, 1998). Björkman (1960) analyzed and described transverse thickening bars on the outer tangential cell walls of the abaxial lemma epidermis and called them “Trichodium net.” The presence of Trichodium net may be related to the palea development and texture. In *Agrostis*, species with a reduced palea exhibit Trichodium net, while it is absent in those species in which the palea reaches half the length of the floret (Björkman, 1960; Rajbhandari, 1985; Romero García et al., 1988; Rúgolo de Agrasar & Molina, 1992, 1998). For this reason, Björkman (1960) considered that the occurrence or absence of a Trichodium net was the most useful character in the subgeneric classification of *Agrostis*. *Agrostis laegaardii* exhibits a reduced palea and its lemma epidermis has a well-developed Trichodium net (Fig. 3). According to the classification proposed by Widén (1971), *A. laegaardii* exhibits a Trichodium net type I. This network is fully developed with thickened transverse ribbons almost as wide as, or wider than, the non-thickened parts of the outer epidermis cell wall.

Paratypes. COLOMBIA. **Caldas–Tolima:** Páramo del Ruiz, 3700–4200 m, 26 Dec. 1936, *Chardon 5021* (US). ECUADOR. **Chimborazo:** upper WSW slopes of Volcán Chimborazo, 500 m S of (below) the Whymper refuge, 4750 m, 78°50'W, 01°28'S, 7 Feb. 1988, *Molau & Eriksen 2985* (AAU, QCNE); Volcán Chimborazo, above the lower

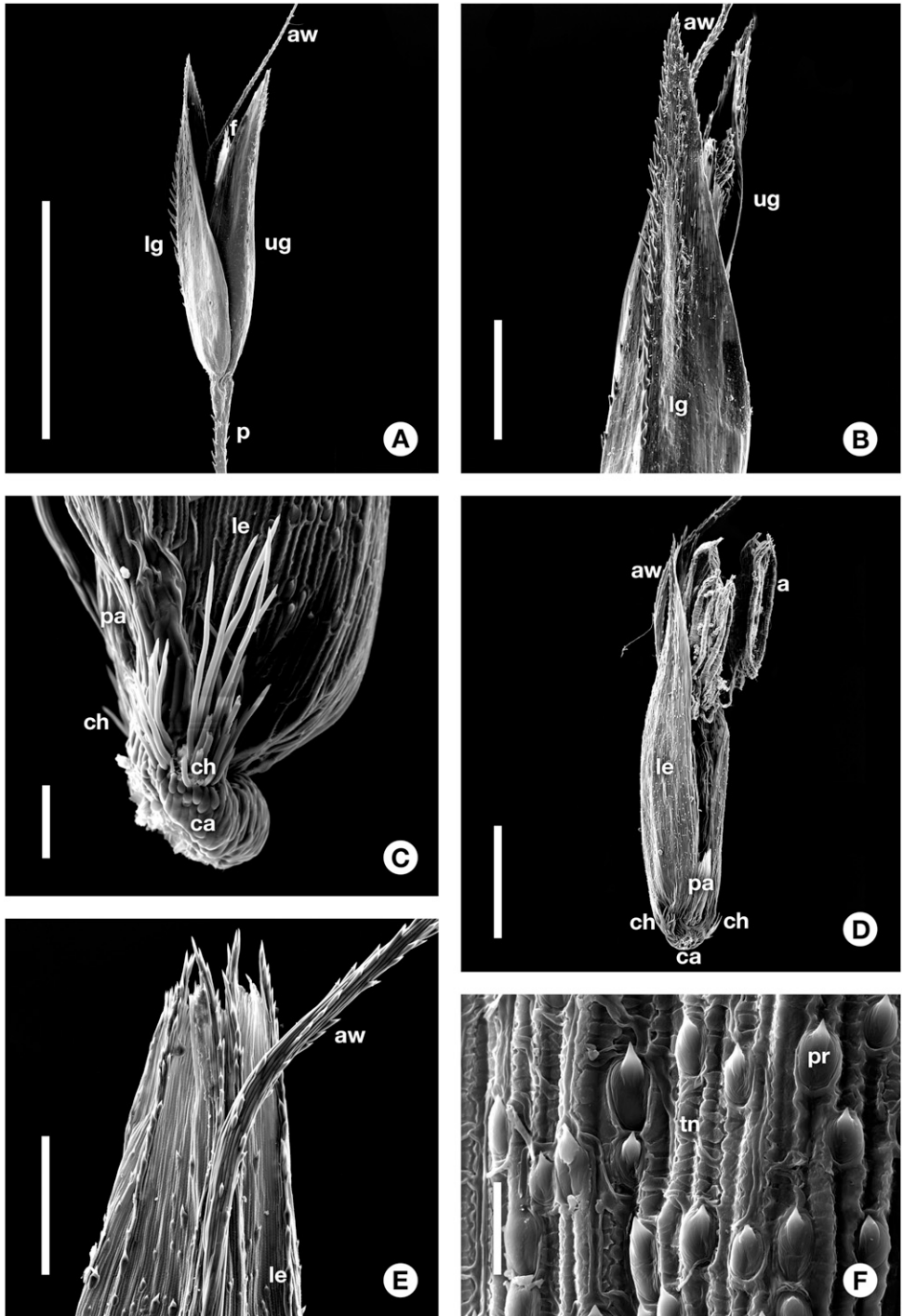


Figure 3. *Agrostis laegaardii* A. M. Molina & Rúgolo. SEM microphotographs. —A. Lateral view of spikelet. —B. Upper part of the spikelet, dorsal view of the lower glume. —C. Base of the floret, callus, and callus hairs. —D. Lateral view of the palea. —E. Dorsal view of lemma apex, in the foreground part of the dorsal lemma awn. —F. Lemma epidermis. Bars: A = 2 mm; B, D = 500 μ m; C = 50 μ m; E = 200 μ m; F = 20 μ m. A–D from *Laegaard 102877* (QCNE); E, F from *Molau & Eriksen 2985* (QCNE). Abbreviations: a, anther; aw, awn; ca, callus; ch, callus hairs; f, floret; le, lemma; lg, lower glume; p, pedicel; pa, palea; pr, prickle; tn, Trichodium net; ug, upper glume.

Refugio (4840 m), 5070 m, 78°50'W, 01°28'S, 11 May 1992, *Laegaard 102822* (QCNE); campsite above Río Alao, 3350–3550 m, 20 May 1990, *Peterson et al. 9195* (US); betw. Urbina & Mt. Chimborazo, 3600–4500 m, 4 Oct. 1923, *Hitchcock 21982* (US). **Napo**: Laguna San Marcos, NE of Volcán Cayambe, extensive flat plain S of the lake, 3370 m, 77°58'W, 00°07'S, 8 July 1980, *Laegaard 34011* (SI), *Laegaard 34061* (SI); NW slope of Antisana, Lago Mauca-Machay, 4350 m, 78°10'W, 00°27'S, 2 Nov. 1979, *Laegaard 20730* (SI); Volcán Antisana, 4600 m, 00°30'W, 78°10'S, 22 July 1997, *Laegaard 2745* (AAU); W side of Mt. Cayambe, 4050–4350 m, 22–23 July 1943, *Little & Paredes 6881* (US). **Napo–Pastaza**: alrededores de Llanganates, entre Anchiliví y Río Burro Potrero, al este de Romo Páramo, 3500–3620 m, 30 Aug. 1959, *Barclay*

& *Juajibioy 9172* (US). **Pichincha**: Pifo-Pintag, in valley 2 1/2 hour horse ride above Inga Monserrat, 3625–3725 m, 78°17'W, 00°19'S, 11 Apr. 1992, *Laegaard 102236* (AAU). **Pichincha–Cotopaxi**: Volcán Cotopaxi, NE slope at rd. to El Refugio, 4600–4800 m, 78°25'W, 00°38'S, 2 Oct. 1976, *Ollgaard & Balslev 9977* (AAU). **Pichincha–Napo**: on N side of Volcán Antisana, ca. 12 km along dirt rd. from Hacienda Antisana, 4410–4830 m, 78°10'W, 00°27'S, 15 May 1992, *Laegaard 102877* (QCNE); same loc., on old moraine, 4700 m, 15 May 1992, *Laegaard 102890* (AAU). **Tungurahua**: Cordillera de Llanganates, Páramo de Jaramillo, 4000–4250 m, 78°22'W, 01°10'S, Nov. 1984, *Laegaard 53315* (AAU); Mt. Carihuairazo, 4400 m, 22 Sep. 1939, *Asplund 8467* (US).

KEY TO *AGROSTIS* SPECIES OF COLOMBIA AND ECUADOR HAVING A CONTRACTED INFLORESCENCE AT MATURITY WITH MORE OR LESS APPRESSED BRANCHES

1. Plants stoloniferous, 30–100 cm high; palea 0.7–1.1 mm *A. stolonifera* L. var. *palustris* (Huds.) Farw.
- 1'. Plants rhizomatous, 3–30(–51) cm high; palea 0.1–0.7 mm.
 2. Leaf blades convolute, rather rigid, 0.5–2 mm wide; plants caespitose, with thick short rhizomes, internodes 1–2 mm.
 3. Spikelets (1.7–)2–3.3 mm; pedicels slightly dilated toward apex, cupuliform; glumes membranous, standard V shape in transverse section; lower glume narrowly ellipsoid; distance between upper glume and floret (0.5–)0.7–1 mm; lemma (1.6–)1.7–2 mm, dorsal awn (1.6–)2.3–3 mm long, apex shortly 4-awned, 0.5–0.6 mm long; palea 0.4–0.5 mm *A. laegaardii* A. M. Molina & Rúgolo
 - 3'. Spikelets 1.6–2(–2.5) mm; pedicel not dilated at apex, truncate; glumes chartaceous, narrowly V-shaped in transverse section; lower glume navicular; distance between upper glume and floret 0.3–0.5 mm; lemma 1.2–1.4 mm, apex 4-mucronate, awnless or mucronulate; palea 0.2–0.3 mm *A. breviculmis* Hitchc.
 - 2'. Leaf blades conduplicate or flat, rather soft, 1–6 mm wide; plants with thin, well-developed rhizomes, sometimes creeping, internodes 7–9 mm.
 4. Floret awnless, mucronate or rarely with a subapical short awn ca. 1.2 mm long; leaf blades 1.5–2 mm wide.
 5. Lemma 1.7–2.6 mm; glumes subequal, both scabrous along upper third of keel; pedicels smooth, exceptionally minutely scabrous *A. meyenii* Trin.
 - 5'. Lemma 1.4–1.5 mm; glumes unequal, lower glume longer than upper one, lower glume scabrous along entire length of keel, upper glume smooth or scabrous in upper third on surface; pedicels scabrous *A. boyacensis* Swallen & García-Barr.
 - 4'. Floret awned, the awn 2–6 mm, geniculate and twisted, exerted from glumes; leaf blades 1–6 mm wide.
 6. Spikelets 3.5–4 mm; floret 1/2 the length of the spikelet; inflorescence 1–2.5 cm wide, with lateral branches up to 7 cm long; leaf blades 2–6 mm wide *A. foliata* Hook. f.
 - 6'. Spikelets (2–)2.5–3(–3.5) mm; floret ca. 2/3 the length of the spikelet; inflorescence 0.5–1.5 cm wide, with lateral branches 0.5–1.5 cm long; leaf blades 1–4(–5) mm wide.
 7. Awn inserted at the lower 1/3 of the back of the lemma *A. toluensis* Kunth var. *toluensis*
 - 7'. Awn inserted in the upper or middle 1/3 of the back of the lemma *A. toluensis* var. *andicola* (Pilg.) Rúgolo & A. M. Molina

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- Appendix I. Selected material examined.
- Agrostis boyacensis* Swallen & García-Barr. COLOMBIA. **Boyacá:** Nevado del Cocuy, Alto Valle de Las Lagunillas, 4000–4300 m, 12 Sep. 1938, *Cuatrecasas & García Barriga 1459* (US).
- Agrostis breviculmis* Hitchc. COLOMBIA. **Amazonas:** Nueva Granada, 1783–1808, *Muis 6079* (MA). **Cundinamarca:** Chisacá-Sumapaz, Reserva de Bosque Andino, subida de Chisacá, 3200 m, 13 Sep. 1994, *Fernández Alonso et al. 11628* (MA). **Santander:** E de Bucaramanga, 2700 m, 18 Dec. 1948, *Araque Molina & Barkley 18 S389* (LIL); Páramo de Santurbán, near Vetas, 3950–4160 m, 17 Jan. 1927, *Killip & Smith 17573* (P). ECUADOR. **Azuay:** Parque Nacional Cajas, NW of Cuenca, 3700 m, 21 Apr. 1990, *Peterson et al. 8855* (QCNE); Cumbeona, Páramo grassland, 21 Sep. 1987, *Ramsay & Merrow-Smith 651* (QCNE). **Bolivar:** Rd. Ambato–Guaranda, 12 km W of intersection betw. old & new rd., 4150 m, 1 Aug. 1985, *Laegaard 54815* (QCNE). **Carchi:** Volcán Chiles, 9 km of Tufiño, páramo espletias, 10 Mar. 1992, *Laegaard 101676* (QCNE). **Chimborazo:** Collanes Valley, Páramo de Los Altares, 3 Sep. 1987, *Ramsay et al. 356* (QCNE); 7 km along páramo rd. from new rd. Ambato–Guaranda towards Carihuairazo, 15 Feb. 1999, *Laegaard 19595* (QCNE); Urbina, toward to Monte Chimborazo, páramo, 4250 m, 24 July 1939, *Asplund 7797* (B, LIL, P). **Cotopaxi:** Páramo de Laguna Salayampe, E of Latacunga, 14–15 May 1985, *Laegaard 54141* (QCNE); Filo N NE del Volcán Cotopaxi, 4000 m, 19 Dec. 1979, *Halloy A-835, A-822* (LIL); SW slope of the volcano, 4000 m, 3 July 1939, *Asplund 7492* (LIL, P); Oct. 1856, *Remy s.n.* (P). **Imbabura:** NE side of Cayambe Mtn., 12 Dec. 1961, *Cazalet & Pennington 5753* (B). **Napo:** Laguna San Marcos, NE of Volcán Cayambe, extensive flat plain S of the lake, predominantly marshy, 77°58'W, 00°07'N, 3370 m, 8 July 1980, *Ollgaard et al. 34011* (SI), *Ollgaard et al. 34061* (SI); NW slope of Antisana, Lago Mauca-Machay, windswept high plain with extended swampy areas, 78°10'W, 00°27'S, 4350 m, 2 Nov. 1979, *Holm-Nielsen 20730* (SI). **Pichincha:** Páramo de Mojanda, 24–27 June 1984, *Laegaard 52321* (QCNE); Laguna Mauca-Machay, lado WNW del Antisana, 4330 m, 28 Jan. 1980, *Halloy B-40* (LIL); vic. of Quito, gravelly páramo, 3800 m, 30 May 1939, *Asplund 6605* (LIL); Pichincha, 5 June 1931, *Benoist 4410* (P); Eablahuasi sur les pentes NW du Pichincha, 21 May 1931, *Benoist 4347* (P). **Tungurahua:** along trail Mesa Tablon to Limpiojongo of Laguna Pisayambo, 14 Jan. 1999, *Laegaard 19454* (QCNE).
- Agrostis foliata* Hook. f. COLOMBIA. **Caldas:** Cordillera Central, Páramo del Quindío, 4100–4300 m, 15–20 Aug. 1922, *Pennell & Hazen 9855* (WU), 9956 (BAA, WU); vertiente occidental, Nevado del Ruiz, 4300–4500 m, 5 May 1940, *Cuatrecasas 9262* (LIL); 31 Oct. 1952, *Humbert et al. 27064* (P). **Cauca:** Cordillera central, vertiente occidental, abajo del Puracé en la Quebrada del Arroyo San Juan, 3900–3650 m, 24 July 1943, *Cuatrecasas 14731* (P); 3700–3900 m, 12 June 1922, *Pennell & Killip 6568* (WU); faldas del Volcán del Puracé, 3650–3850 m, *Cleef 618* (P). **Tolima:** Cordillera Central, Nevado del Tolima, 4400 m, 15 May 1932, *Cuatrecasas 2513* (MA); *Cuatrecasas 2984* (BAA, MA); Lomas du Pie du pico Tolima, *Goudot s.n.* (P). ECUADOR. **Carchi:** Páramo del Ángel, Oct. 1978, *Roig s.n.* (MERL); Volcán Chiles along rd. 9 km W of Tufiño, 10 Mar. 1992, *Laegaard 101677* (QCNE); Tulcán, frontera con Colombia, faldas del Volcán Chiles, Nov. 1993, *Palacios 11859* (QCNE); Cantón Tulcán, Páramo, Rancho Morán, 3200 m, 13 July 1935, *Mexia 7498* (BAA); Tulcán–Maldonado rd., 4 km W of Tufiño, Monte Redondo área, 3475 m, 12 Apr. 1978, *Luteyn 5710* (P). **Chimborazo:** El Altar, N side of the volcano, Canonigo peak, *Sklenar 88-3* (NY). **Cotopaxi:** Parque Nacional Cotopaxi, Río Pita, bosque pluvial sub-alpino, 4000 m, 14 Dec. 1990, *Ceron 12595* (QCNE). **Napo:** Rd. Pifo–Papallacta, N of antennas at Paso de la Virgen, superpáramo, 4250–4400 m, 13 Mar. 1985, *Laegaard 53860* (QCNE). **Pichincha:** Dec. 1864, *Isern 132 b* (MA); Laguna de Hoyas, Páramo de Guamaní, 9 Mar. 1987, *Ramsay 226* (QCNE); along rd. to Refugio, Cayambe volcano, 4400–4500 m, 1 Mar. 1988, *Laegaard 70495* (QCNE); Km. 48 rte. Quito–Papallacta, cordillera oriental, 4000 m, 1 May 1947, *Aubert de la Rue s.n.* (P); Páramos de Pichincha, Oct. 1856, *Remy s.n.* (P); Pichincha, 4500 m, 9 Nov. 1946, *Aubert de la Rue s.n.* (P); Monte Pichincha, Sep. 1887, *Sodiño s.n.* (W); Monte Pichincha near Quito, 4100–4500 m, 17 Aug. 1923, *Hitchcock 21053* (BAA); *Crescit in arenis vulc.* Intis Pichincha, 4500 m, July 1918, *Mille s.n.* (BAB, Q). **Pichincha-Napo:** Volcán Antisana, betw. Campamento IMAP & Laguna Micacocha, moist & dry grass-páramo, swamps around the lake, 7 Mar. 1992, *Laegaard 101598* (QCNE); Jan. 1865, *Isern 145* (MA). **Tungurahua:** N slopes of Volcán Tungurahua, *Ramsay et al. 254* (QCNE); along trail Mesa Tablon to Limpiojongo S of Laguna Pisayambo, superpáramo without traces of fires, 14 Jan. 1999, *Laegaard 19457, 19480* (QCNE); Cordillera de Llanganates, páramo de Jaramillo, 2–4 Nov. 1984, *Laegaard 53292* (QCNE); ca. 5 km SE of Laguna Pisayambo, Las Tolas, 3900–4000 m, 13 June 1999, *Laegaard 19428* (QCNE); Cantón Patate, Parque Nacional Llanganates, faldas del cerro Pan de Azúcar, Páramo

de Soguillas–Cerro Pan de Azúcar, 13 Oct. 1998, *Vargas et al.* 2817 (QCNE); volcano, humid area above tree limit, 18–19 Nov. 1983, *Korning & Thomsen* 47336 (QCNE).

Agrostis toluensis Kunth var. *toluensis*. ECUADOR. **Azuay:** Mt. Azuay, *Spruce* 6097 (BAA, K, US). **Bolivar:** ca. Km. 20 Guaranda–Riobamba, 3300–3400 m, 10 July 1990, *Laegaard* 71726 (QCNE). **Loja:** Old Campamento y Fierro Urco, 8 Sep. 1998, *Laegaard* 19112 (QCNE). **Pichincha:** 5 June 1931, *Benoist* 4401, 4402 (P).

Agrostis toluensis Kunth var. *andicola* (Pilg.) Rúgolo & A. M. Molina. ECUADOR. **Azuay:** Páramos de Soldadas–Angas, 14 Feb. 1988, *Laegaard* 70114 (QCNE). **Bolivar:** 45.7 km SW of Ambato on Hwy. to Guarando, 3 May 1990, *Peterson* 8977 (QCNE); Cruces de Los Arenales, 78°54'W, 01°25'S, 4160–4200 m, 1 Mar. 1992, *Laegaard* 101494 (BAB, QCNE). **Cañar:** Panamerican Hwy., entre Cañar y Biblian, 29 Aug. 1984, *Laegaard* 52758 (QCNE). **Chimborazo:** In pascuis Monte Chimborazo, *Sodiro s.n.* (P); betw. Urbina & Mt. Chimborazo, 3600–4500 m, 4 Oct. 1923, *Hitchcock* 21999 (F, US); crescit in páramos Chimborazo, 1890, *Sodiro* 11/6 (Q); Cruce de Los Arenales–Chimborazo Km 5. dune-sand, 11 May 1992, *Laegaard* 102782 (QCNE); Collanes Valley, Páramo de los

Altares, 3 Sep. 1987, *Ramsay & Merrow-Smith* 384 (QCNE); camino de Riobamba a Pallatanga, Oct. 1978, *Roig s.n.* (MERL); Parque Nacional Sangay, near Campanilla, 78°29'W, 1°38'S, 3300–3500 m, 24 Mar. 1984, *Laegaard* 51876 A (QCNE). **Cotopaxi:** Illiniza N & Illiniza S, 4750 m, 2 May 1990, *Peterson* 8968 (QCNE); Parque Nacional Cotopaxi, 25 Feb. 1992, *Laegaard* 101445 (QCNE). **Imbabura:** Lago San Marcos, Cayambe, 25 Nov. 1961, *Cazalet & Pennington* 5328 (B); SW slopes of the Volcano Cotacachi, 9 Nov. 1983, *Boysen et al.* 45647 (QCNE). **Loja:** along rd. to Fierro Urco, ca. 10 km from main rd. Loja–Saraguro, 8 June 1998, *Laegaard* 18860 (QCNE). **Napo:** Cordillera de los Llanganates, Laguna Encantada, Lakeshore, 78°12'W, 01°11'S, 3400 m, 17 Mar. 1983, *Holm-Nielsen* 41977, 41991 (SI). **Napo-Pastaza:** NE of Cayambe Mtn., 12 Dec. 1961, *Cazalet & Pennington* 5579 (B). **Pichincha:** crescit in silv. occidental prope Pichincha, Aug. 1889, *Sodiro s.n.* (Q); Laguna Negra de Mojanda, 29 Feb. 1997, *Laegaard* 101485 (QCNE); ca. Cotocollao, Aug. 1886, *Sodiro s.n.* (BAB, Q); ca. de Quito, Mar. 1886, *Sodiro* 232/2 (Q, W). **Tungurahua:** Cantón Patate, Parque Nacional Llanganates, 14 Oct. 1998, *Vargas et al.* 2881 (QCNE); Km. 33.4, Zumbagua–Latacunga, 78°45'W, 00°55'S, 3885 m, 26 July 2001, *Laegaard et al.* 21468 (SI).