



New species of *Bulbostylis* (Cyperaceae) from South America

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ABSTRACT

During the revision of the genus *Bulbostylis* for Brazil four new species were found, which are proposed here. *Bulbostylis amazonica*, *B. decidua*, *B. minensis* and *B. wanderleyana* are fully described, illustrated, and compared to other South American species.

RESUMO

Quatro novas espécies de *Bulbostylis* foram descobertas durante a revisão deste gênero para o Brasil e estão sendo propostas neste trabalho: *Bulbostylis amazonica*, *B. decidua*, *B. minensis* e *B. wanderleyana*. Todas as espécies são descritas e ilustradas. Além disso, comparação com outras espécies sul americanas é feita.

INTRODUCTION

Bulbostylis Kunth (1837: 205) comprises approximately 213 species (Govaerts *et al.* 2015), and occurs primarily in tropical and subtropical regions with centers of diversity in South America (especially Brazil) and Africa (López 1996). The existing Brazilian species were previously described in the following publications: Nees (1842) mentions 14 species under the genus *Oncostylis* Nees (1842: 86); Lindman (1900) lists 13 species; Barros (1960) lists seven species found in the state of Santa Catarina; Bertels (1966) mentions five species found in the state of Rio Grande do Sul; López (2008) lists 18 species found in southern Brazil (the states of Paraná, Santa Catarina, and Río Grande do Sul); and Prata (2004) cited the occurrence of 44 species for all of Brazil. More recently, Alves *et al.* (2009, 2010) cited the occurrence of 50 species in Brazil, not counting the four undescribed species cited by Prata (2004) that are described here.

MATERIAL AND METHODS

Dried herbarium specimens were studied and used for these descriptions. Sixty herbaria were visited or provided specimens on loan (the latter marked with an asterisk) and are listed below, according to the acronyms used by Thiers (Continuously updated), except for the institution not indexed in *Index Herbariorum* (in italics): ALCB, ASE, B, BHCB*, BM, BOTU*, CEN*, CEPEC, CESJ*, COR, CPAP, CTES, EAC, ESA, FCQ, GENT, GHSP*, GUA, HAS, HB, HBR, HEPH*, HRB, HRCB, HTINS*, HUEFS, HUFU, IAC, IAN, IBGE*, ICN, INPA, IPA, K, JPB, M, MAC, MBM, MG, MIRR*, NY, PACA, P, PEL*, PMSP*, R, RB, SI, SP, SPF, SPSF*, UB*, UEC, UFG, UFP, UESC, *UFSC* (*Universidade Federal de Santa Catarina*), UFRR*, VEN, VIC*.

Observations of fruits were made using a JOEL 5800 LV scanning electron microscope (SEM) at the Universidade de São Paulo, and a MEV Stereoscan 600 at the Universidad Nacional del Nordeste-Secretaría General de Ciencia y Técnica, Corrientes, Argentina (UNNE-SECyT). Observations were performed at 15 and 25 kV and digital photographs were taken.

TAXONOMIC TREATMENT

1. *Bulbostylis amazonica* Prata & M.G.López, *sp. nov.* Type:—BRAZIL. Amazonas: Rio Negro, Temedauí, river bank 2 hours below Tapuruquara, 04 September 1979, K. Kubitzki, Calderón & H.H. Poppendieck 79–120, (holotype MG!, isotypes INPA, EAFM). Figures 1 and 2.

Bulbostylis amazonica has anthelate inflorescences with the spikelets united in fascicles similar to those found in *B. fasciculata* Uittien and *B. vestita* (Kunth) C.B. Clarke. *Bulbostylis amazonica* differs from these two species in having hispid leaves and scapes and 3–9 fascicles, each on a developed branch, with each fascicle having 2–10 spikelets.

Perennial, caespitose, 10–35 cm tall, the base pale castaneous and not thickened. Leaves 6–18 × 0.02 cm, 1/2 the length of the scape; sheaths 1.5–3 cm long., membranaceous, glabrous except for the oblique and densely ciliate apex, the trichomes white; blade erect, setaceous, glabrous, the adaxial surface concave, the abaxial surface slightly canaliculate, the margins thickened, antrorsely-scabrous. Scape 0.6 mm diam., cylindrical, longitudinally linear, glabrous. Involucral bracts 3–5, sub-erect, leaflike, glabrous the basal bract 1–2 cm long, much shorter than the inflorescence, sometimes slightly exceeding the inflorescence, the base dilated, the margins ciliate. Inflorescence 0.5–2 × 0.5–1.5 cm, anthelate, simple, with 3–9 fascicles on each developed branch, each fascicle with 2–10 spikelets, some more developed than others. Spikelets 4–5 × 1–2 mm, ovoid, with 3–9 flowers. Glumes 1–1.3 × 0.6–0.8 mm, deciduous at maturity, leaving a scar on the spikelet axis, lanceolate, navicular, membranaceous, pale castaneous, trinerved, the apex acute, the mucro excurrent and straight, the surface papillose and pubescent, the margins hyaline, lacerate and ciliate. Flowers with 3 stamens, the anthers 0.4 mm long, linear; the style trifold 0.5 mm long, the branches 0.3 mm long. Achene 0.4–0.6 × 0.3–0.4 mm, obovoid, trigonous, trilobate, the base attenuate, dark castaneous at maturity, the surface reticulate, shiny, formed by pentagonal to hexagonal cells, silica bodies plane in superficial view, the stylopodium persistent, pyramidal, dark castaneous, 1/8 the length of the achene.

Habitat and distribution:—Venezuela and Brazil (Amazonas, Pará and Mato Grosso). Non-flooded (terra firme) forests, open savannas (campinas), white-sand savannas (campinaranas). In sandy soil.

Paratypes:—BRAZIL. Amazonas: Rio Cuieiras, 50 km, 01 April 1974, Ongley, J.C. & Ramos, J.F.P21765 (NY). Rio Cuieiras, 2 km do Rio Cuieiras a 2 km below mouth of Rio Bracinho, 14 November 1973, Prance, G.T. 17927 *et al.* (NY). Estrada Terra Preta Km 2, ramo Manaus Manacapuru, 5 km de Cacau Pereira, 18 July 1975, Prance, G.T. 23516 *et al.* (NY). Barcelos: 14 km ao NW da ponta SW da Serra de Aracá, 00°48'N, 63°21'W, July 1985, Huber, O. 10715 *et al.* (NY). Manaus: Igarapé do Passarinho, 2 November 1961, Rodrigues, W. 3252 & Coelho, L. (NY). Km 63, Estrada Manaus Itacoatiara, 17 November 1968, Prance, G.T. 9065 *et al.* (NY). Estrada Manaus Itacoatiara, Rio Urubu, 5 April 1967, Prance, G.T. 4792 *et al.* (NY). Estrada Manaus-Caracará, km 62, Reserva INPA, 5 February 1974, Steward, W.C. P20218 & Ramos, J.F. (NY). Ponta Negra: Banks of Rio Negro, 22 May 1968, Philcox, D. 4832 *et al.* (NY). Ponta Negra, 16–18 km N de Manaus no Rio Negro, 17 December 1974, Gentry, A. 13389 (NY). Presidente Figueiredo: Rodovia BR-174, Manaus-Caracas, ao longo da estrada, 14 November 1999, Alves, M. 1674 & Amorim, A. (NY). Mato Grosso: Parque Nacional do Xingú, Aldeia dos Camaiurás, 1965, Coelho, D. 15857 (NY). Pará: Oriximiná, Rio Mapuera a 30 km da Cachoeira Porteira, margem esquerda a 5 km da margem do rio, 30 June 1980, Cid, C.A. 1216, Ramos J. & Mota C.D. (NY). VENEZUELA: Bolívar: Roscio, sabanas y arbustales en el valle del Río Guarí, aprox. 2 km al N de la entrada al Hato “La Divina Pastora”, al W de la carretera Luepa-Santa Elena, 4°43'N, 61°03'W, 900 m, 25 July 1983, Huber, O. 7849 & Alarcon, C. (NY).

Notes:—*Bulbostylis amazonica* has anthelate inflorescences with the spikelets united in fascicles. These characters are similar to those found in two other South American species: *Bulbostylis fasciculata* Uittien (1926: 338) and *Bulbostylis vestita* (Kunth) C.B. Clarke (1900: 87). *Bulbostylis fasciculata* differs in having 3–5 spikelets with the central one sessile and the others at the ends of elongate axes versus inflorescence with 3–9 fascicles on developed branch, each fascicle with 2–10 spikelets, located generally in the same length, sometimes any more developed than others. *Bulbostylis vestita* differs from *B. amazonica* in having hispid leaves and scapes.

Attempting to identify specimens of *Bulbostylis amazonica* using the key to species in the Flora of the Venezuelan Guyana (Kral 1998) results in an identification as *Bulbostylis junciformis* (Kunth) C.B. Clarke ex Moore (1895: 512). The latter differs from *B. amazonica* in having longer achenes (0.7–0.8 mm) and a recurved mucro on the glumes.

In his treatment of *Oncostylis junciformis* (Kunth) Nees (1842: 86) described several varieties and forms. None of the infraspecific variation described by him matches the morphology of *Bulbostylis amazonica*, nor does the distribution of any of those taxa match that of the new species. Nevertheless, *B. amazonica* is similar to *B. junciformis* in general habit and inflorescence structure. The differences between these two species are presented in Table 1.



FIGURE 1. A–G. *Bulbostylis amazonica* Prata & M.G.López. A. Habit. B. Inflorescence. C. Spikelet. D. Flower. E. Sheath with portion of leaf. F. Scale, dorsal and ventral view. G. Achene (K. Kubitzki *et al.* 79–120, MG).

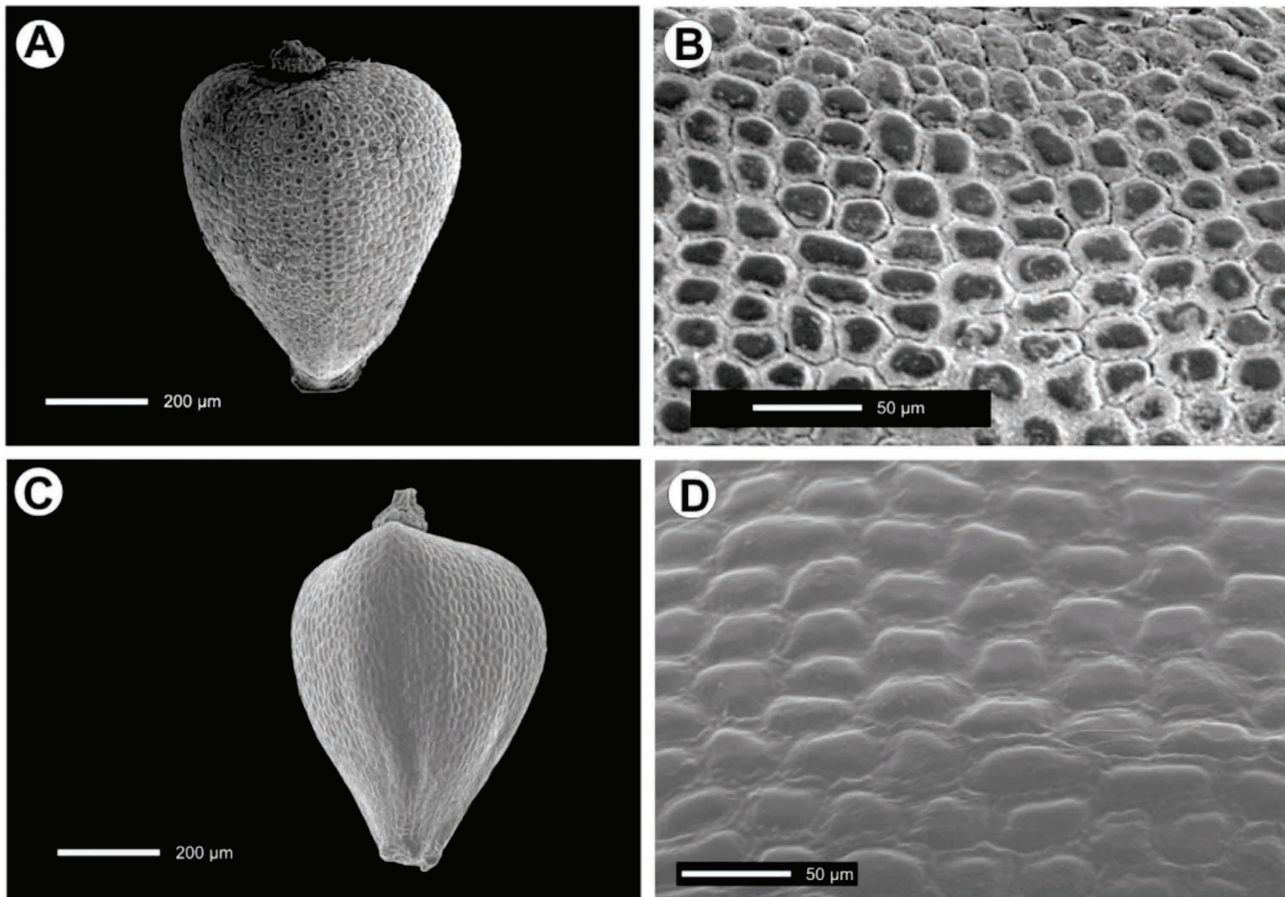


FIGURE 2. Scanning electron microscope photographs of achenes of *Bulbostylis*. A–B. *B. junciformis* (Kunth) C.B. Clarke. A. Achene. B. Achene surface detail. C–D. *B. amazonica* Prata & M.G.López (K. Kubitzki *et al.* 79–120, MG). C. Achene. D. Achene surface detail (W. Mantovani 47, SP).

TABLE 1. Comparison between the treated species.

	<i>B. amazonica</i>	<i>B. consanguinea</i>	<i>B. decida</i>	<i>B. emmerichiae</i>	<i>B. junciformis</i>	<i>B. minensis</i>	<i>B. sellowiana</i>	<i>B. wanderleyana</i>
Leaves	1/2 the length of the scape	1/3–1/2 the length of the scape	1/6 the length of the scape	1/3–1/4 the length of the scape	1/2 the length of the scape	1/3–2/3 the length of the scape	1/2–2/3 the length of the scape	1/4 the scape length
Involucral bracts	3–5, leaflike, glabrous	3–10, leaflike, glabrous	1–3, leaflike, glabrous	2–3, leaflike, glabrous	3–6, leaflike, glabrous	3, leaflike, glabrous	2–4, glumelike	5–6, leaflike, base dilated, densely ciliate
Glumes	1–1.3 x 0.6–0.8 mm, apex acute, the mucro excurrent and straight, surface papillose and pubescent	2–3.7 x 2–2.6 mm, apex short-mucronate, surface pubescent	2.3–2.5 x 2–2.3 mm, apex acute short-mucronate, the mucro recurved, surface papillose	4.5–6.5 x 1.5–3 mm, apex acute with reddish hairs, no mucro, surface pubescent	1.5–2.2 x 1.2–1.6 mm, apex acute, short-mucronate, the mucro recurved, surface pubescent	2–2.5 x 1.5–2 mm, apex acute, short-mucronate, surface glabrous	3.8–4 x 1.3–2.1 mm, apex obtuse, without a mucro, surface pubescent	2–3.2 x 2.3 mm, the apex rounded, without a mucro, surface scabrous
Anthers	0.4 mm	ca. 1 mm	1 mm	1.4 mm	ca. 1 mm	0.9 mm	2.7–3 mm	0.5 mm
Achenes	0.4–0.6 x 0.3–0.4 mm, obovoid, surface reticulate, shiny, stylopodium 1/8 the length of the achene, persistent	1.4–1.6 x 0.8–1 mm, obcordate, surface transversely rugose, stylopodium 1/3 the length of the achene, persistent	1.3–1.5 x 1–1.3 mm, obovoid, surface transversely rugose, stylopodium 1/8 the length of the achene, deciduo	1–1.5 x 0.9–1 mm, pyriform, surface transversely rugose, stylopodium 1/4 the length of the achene, deciduo	0.7–0.8 x 0.5–0.6 mm, obconic, surface reticulate, stylopodium 1/8 the length of the achene, persistent	0.7–0.9 x 0.5–0.6 mm, obovoid, surface tuberculate, stylopodium 1/8 the length of the achene, persistent	1.2–1.3 x 1.2 mm, obcordate, surface transversely rugose, stylopodium 1/8 the length of the achene, frequently deciduous	1.2 x 0.6–0.8 mm, obovoid, surface with horizontal waves formed by vertically rectangular cells, stylopodium 1/6 the length of the achene, persistent

2. *Bulbostylis decidua* Prata & M.G. López, *sp. nov.* Type:—BRAZIL. Ceará: Cascavel, 10 km após a lagoa de Cascavel, 22 May 2000, R. Amado 260 (holotype EAC!, isotype SP!). Figure 3 and 4.

Bulbostylis decidua can be distinguished from other species of *Bulbostylis* by the deciduous stylopodium, the reduced leaf blades, and the tubercles on the achenes.

Cespitose annual, 23–35 cm tall, the base pale castaneous and not thickened. Leaves 1/6 the length of the scape, the sheaths 1.5–4.5 cm, membranaceous, slightly pilose, pale castaneous, longitudinally striate, oblique and ciliate apex, the cilia deciduous, the trichomes white, 0.2 cm long; blade reduced, 0.5–4 cm long. Scape 0.5 mm diam., ribbed, glabrous, canaliculate. Involucral bracts 1–3, leaflike, glabrous, the base dilated, the margins scabrous, the basal bract 0.5–1 cm long., not exceeding the inflorescence. Inflorescence 1.3–4 × 1–2 cm, anthelate, simple, 1–3 spikelets. Spikelets 8–10 × 3–4 mm, ovoid, pedicellate. Glumes deciduous, 2.3–2.5 × 2–2.3 mm, obovoid, navicular, coriaceous, pale castaneous medially, dorsally trinerved on the midvein, the apex acute, short mucronate, the mucro recurved, the surface papillose, the margins ciliate. Flowers with 3 stamens, the anthers 1 mm long., the style 1 mm long., trifid, the branches 0.5 mm long. Achene 1.3–1.5 × 1–1.3 mm, obovoid, cream, trigonous, the base attenuate, the angles thickened, surface transversely rugose, shiny, tubercles present, mainly near the angles, the stylopodium deciduous, 1/8 the length of the achene.

Habitat and distribution:—The species is known only from the type locality in the state of Ceará and from the municipality of São Gonçalo (S04°11.6'35", W38°13.6'02") in the state of Paraíba. Open savannas in sandy soil.

Paratypes:—BRAZIL. Paraíba: São Gonçalo, 17 March 1936, *Luetzelburg* 26937 (NY).

Notes:—The diagnostic characters that distinguish *Bulbostylis decidua* from other species of *Bulbostylis* are the deciduous stylopodium, the reduced leaf blades, and tubercles on the achenes. It can be distinguished from other species with a deciduous stylopodium (*B. emmerichiae*) by the characters listed in Table 1.

3. *Bulbostylis minensis* Prata & M.G. López, *sp. nov.* Type:—BRAZIL. Minas Gerais: Santana do Riacho, Serra do Cipó, 3–5 km norte de Palácio, 03 April 2001, Prata *et al.* 1157 (holotype ASE!, isotype SP!). Figure 5 and 6.

Bulbostylis minensis resembles *B. junciformis* in its inflorescence structure but differs from the latter in its glabrous involucral bracts and glumes and its tuberculate achene surface.

Cespitose perennial, 20–32 cm tall, the base castaneous, not thickened. Leaves 12–21 × 0.02 cm, 1/3–2/3 the length of the scape; sheaths 1.5–3 cm long, membranaceous, pale castaneous, longitudinally lined, glabrous except for the oblique and densely ciliate apex, the trichomes white, ±4 mm long.; blade capillary, glabrous, erect, the adaxial face smooth to longitudinally lined, the abaxial face canaliculate-reticulate, the margins scabrous. Scape 0.4–0.5 mm diam., cylindrical, ribbed, glabrous. Involucral bracts 3, leaflike, glabrous, the base dilated, the margins hyaline and thickened, scabrous, the basal bract longest, 1–3.5 cm long, exceeding the inflorescence, the others gradually diminishing in size. Inflorescence 0.5–1 × 0.5–1.3 cm, capitate, hemispherical, one head per scape, 4–15 spikelets. Spikelets 3–7 × 1–1.5 mm, lanceolate, 17–21 flowers, sessile. Glumes 2–2.5 × 1.5–2 mm, persistent, lanceolate, navicular, membranaceous, pale castaneous, the keel trinerved, the apex acute, short mucronate, the surface glabrous, papillose, the margins hyaline, thickened, irregular, ciliate, sterile glumes absent. Flowers with 3 stamens, the anthers 0.9 mm long, the connective prolonged, the style 1.5 mm long, trifid. Achene 0.7–0.9 × 0.5–0.6 mm, obovoid, trigonous, castaneous, the angles thickened, cream, shiny, the base attenuate, the surface tuberculate, the silica body prominent, the apex trilobed, the stylopodium persistent, dark castaneous, triangulate, 1/8 the length of the achene.

Habitat and distribution:—Known only from the Serra do Cipó in the state of Minas Gerais. Occurs in rocky meadows (campo rupestre).

Paratypes:—BRAZIL. Minas Gerais: Serra do Cipó, Santana do Riacho, afloramento rochoso das Canela-de-Ema-gigantes, próximo à portaria do Ibama Alto Palácio, 16 November 1995, *J.A. Lombardi* 1028 (BHCB). Santana do Riacho, estrada para Conceição do Mato dentro, Km 110, 19°16'57" S, 43°43'41" W, Parna Serra do Cipó, 30 November 2000, Prata, *A.P.* 1065 *et al.* (SP). Posto do Ibama, Portal do Palácio, 19°14'48" S e 43°30'36" W, 30 November 2000, Prata, *A.P.* 1077 *et al.* (SP). Diamantina, 20 km S de Diamantina, na estrada para Curvelo, 1250 m alt., 18°20' S, 43°40' W, 24 November 1985, Thomas, *W.W.* 4901 *et al.* (SPF).

Notes:—*Bulbostylis minensis* resembles *B. junciformis* in its inflorescence structure. It differs, however, in the characters listed in Table 1 and in Figure 2 A–B.

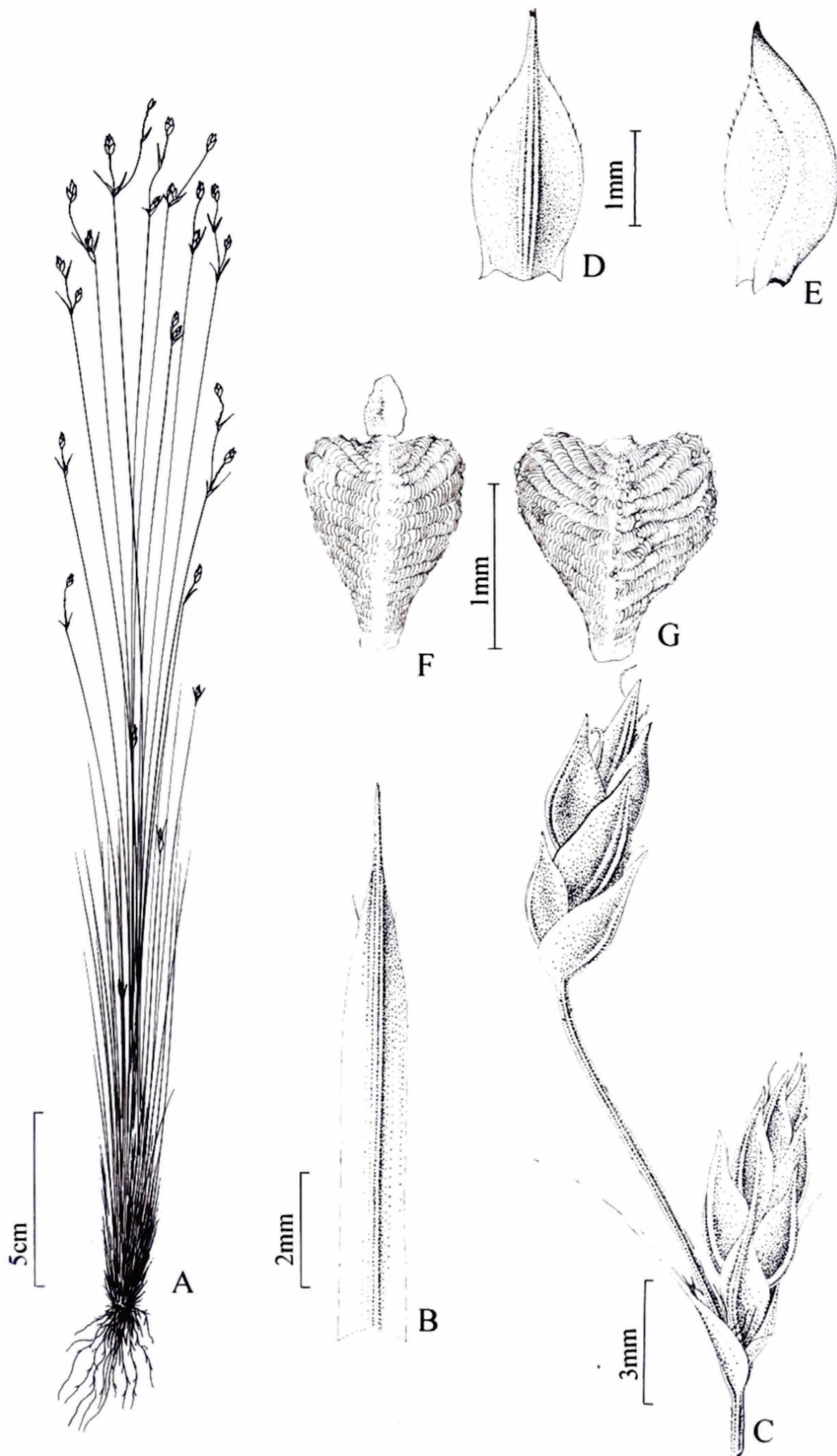


FIGURE 3. A–G. *Bulbostylis decidua* Prata & M.G. López. A. Habit. B. Sheath Leaf. C. Inflorescence detail. D–E. Scale, D. Dorsal view. E. Lateral view F–G. Achene. (R. Amado 260, EAC).

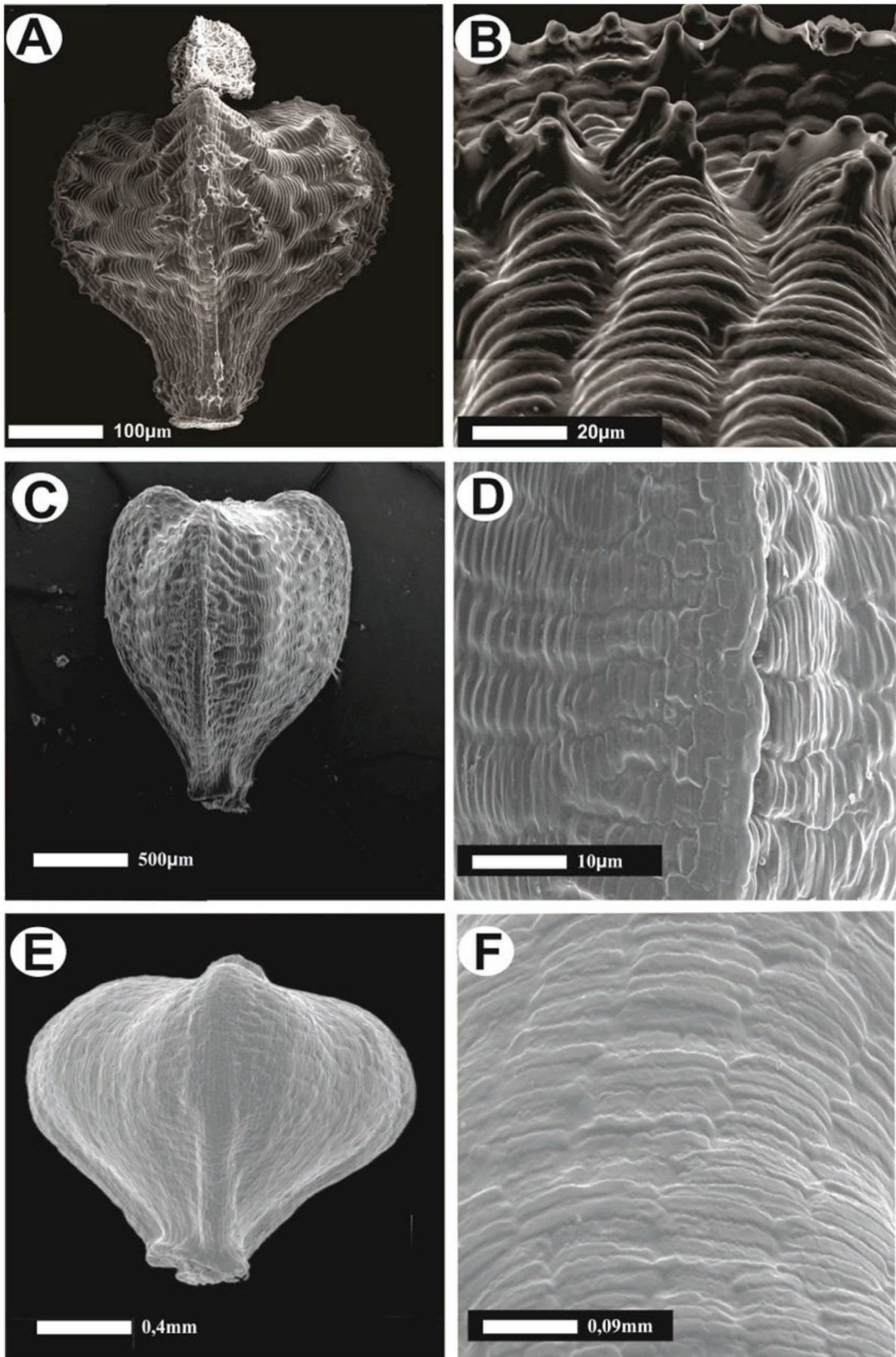


FIGURE 4. Scanning electron microscope photographs of achenes of *Bulbostylis*. A–B. *B. decida* Prata & M.G.López. A. Achene B. Achene surface detail. C–D. *B. emmerichiae* T.Koyama (R.C. Mendonça & D. Alvarenga 625, IBGE). C. Achene D. Achene surface detail. E–F. *B. sellowiana* (Kunth) Palla (Hassler 9429, G) E. Achene. F. Achene surface detail. (R. Amado 260, EAC).

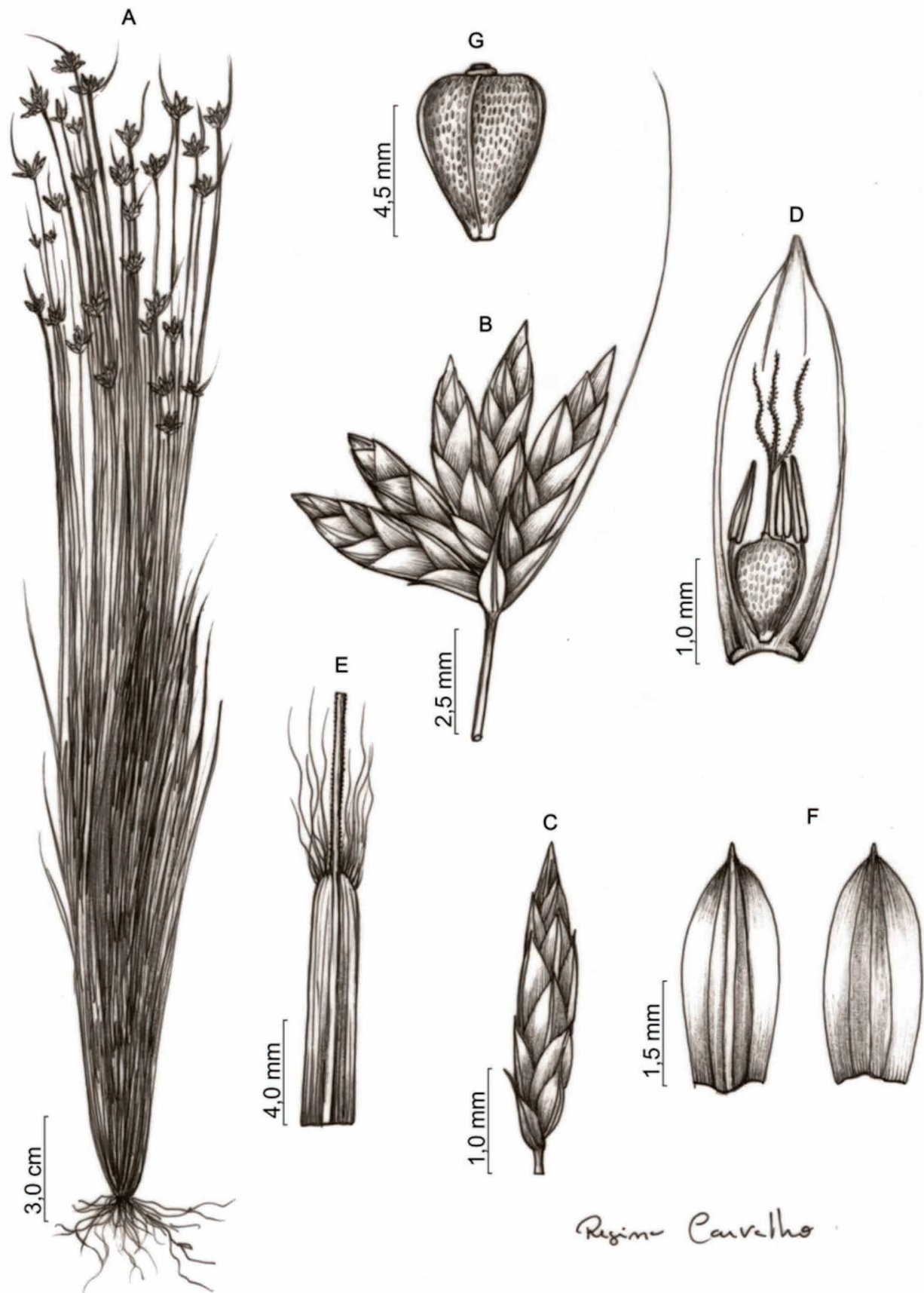


FIGURE 5. A–G. *Bulbostylis minensis* Prata & M.G.López. A. Habit. B. Inflorescence. C. Spikelet. D. Flower. E Sheath with portion of leaf. F. Scale, ventral and dorsal view. G. Achene. (Prata *et al.* 1157, SP).

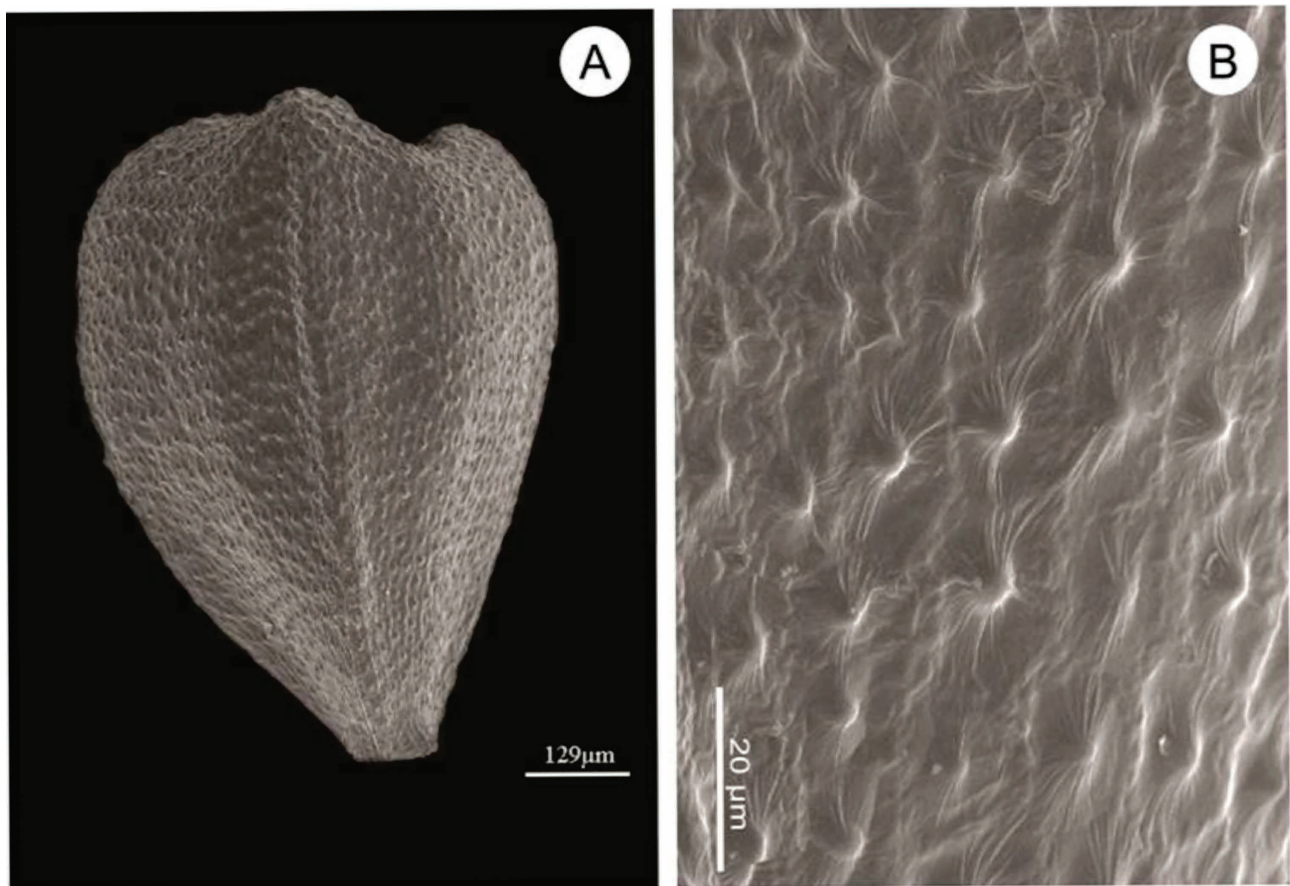


FIGURE 6. Scanning electron microscope photographs of achenes of *Bulbostylis*. A–B. *B. minensis* Prata & M.G.López. A. Achene. B. Achene surface detail. (Lombardi 1028, BHCB).

4. *Bulbostylis wanderleyana* Prata & M.G.López, *sp. nov.* Type:—BRAZIL. São Paulo: Itararé, 25 April 2000, Prata *et al.* 859 (holotype ASE!, isotype SP!, CTES!, NY!, UFP!). Figure 7 and 8.

This species is similar to *Bulbostylis consanguinea* (Kunth) C. B. Clarke (1908: 110) in the structure of the inflorescence but differs in having shorter and broader leaves, setaceous involucre bracts, shorter anthers, and a smoother achene surface.

Perennial, caespitose herb, 6.3–50 cm tall, the base light brown, not thickened. Leaves 4.5–(9)15 × 0.3–0.5 cm, 1/4 the length of the scape; leaf blade setaceous, the abaxial face canaliculate, the adaxial face concave, ferruginous-speckled, the margin scabrous; sheaths 2.5–7 cm long, membranaceous, ferruginous, the apex oblique, densely hairy, the hairs 3–8 mm long. Scape 3.5(11)–49 × 0.3–0.5 cm, with 8–10 longitudinal ribs, ferruginous-speckled, glabrous. Involucre bracts 5–6, setaceous, the base dilated, densely ciliate, the 1–2 lowermost longest, 2–5.5 cm long, overtopping the inflorescence. Inflorescence anthelate, compound, 0.5–1.5 × 0.3–4 cm; spikelets 5–8, the central one sessile, the rest on divergent rays, the first order (4)7, 0.2–1 cm long, the second order 1–2, 0.3–0.6 cm long. Spikelets 2–5 × 2–3 mm, ovoid, with 5–8 flowers. Glumes 2–3.2 × 2.3 mm, ferruginous, the margins reddish, the keel reddish, rounded, naviculate, papery, ciliate, the surface scabrous. Flowers with 3 stamens, the style 1 mm long., the anthers 0.5 mm long., apiculate, with prolonged connective. Achene 1.2 × 0.6–0.8 mm, obovoid, trigonous, narrowed at the base, surface with horizontal waves formed by vertically rectangular cells, with style base cylindrical, dark-brown, 1/6 the length of the achene.

Habitat and distribution:—Brazil (the States of Minas Gerais, São Paulo and Paraná) and Argentina. The taxon grows in cerrado and grassland, on sandy soils.

Paratypes :—BRAZIL. Minas Gerais: Poço de Caldas, Represa Bortovan, 14 January 1965, *O. Leoncini* 462 (R). Paraná: s.d, *Hatschbach*, G. 5108 (MBM). February 1960, *Perreira*, E. 5438a (HB). November 1964, *Dombrowski*, L. 834 *et al.* (MBM). São Paulo: Itararé, August 1995, *Souza*, V.C. 8818 (ESA, SP). 24 04 25S, 49 03 09 W, November 1994 (UEC). August 1995, *Souza*, V.C. *et al.* (ESA). Silveiras, April 1951, *Segadas-Viana* 3050 (R). May 1951, *Brade*,

A.C. 20884 (R). ARGENTINA. Misiones, Dep. Gral. Manuel Belgrano. Ruta Provincial 17. Campinas de América, cementerio. 21 October 2006, Keller, H.A. 3705 (CTES).

Notes:—The species is named in honor of Dr. Maria das Graças Lapa Wanderley, of the Institute of Botany of São Paulo. This species is similar to *Bulbostylis consanguinea* in the structure of the inflorescence (Figure 7). They differs in the features presented in Table 1 as well as those depicted in Figure 8.

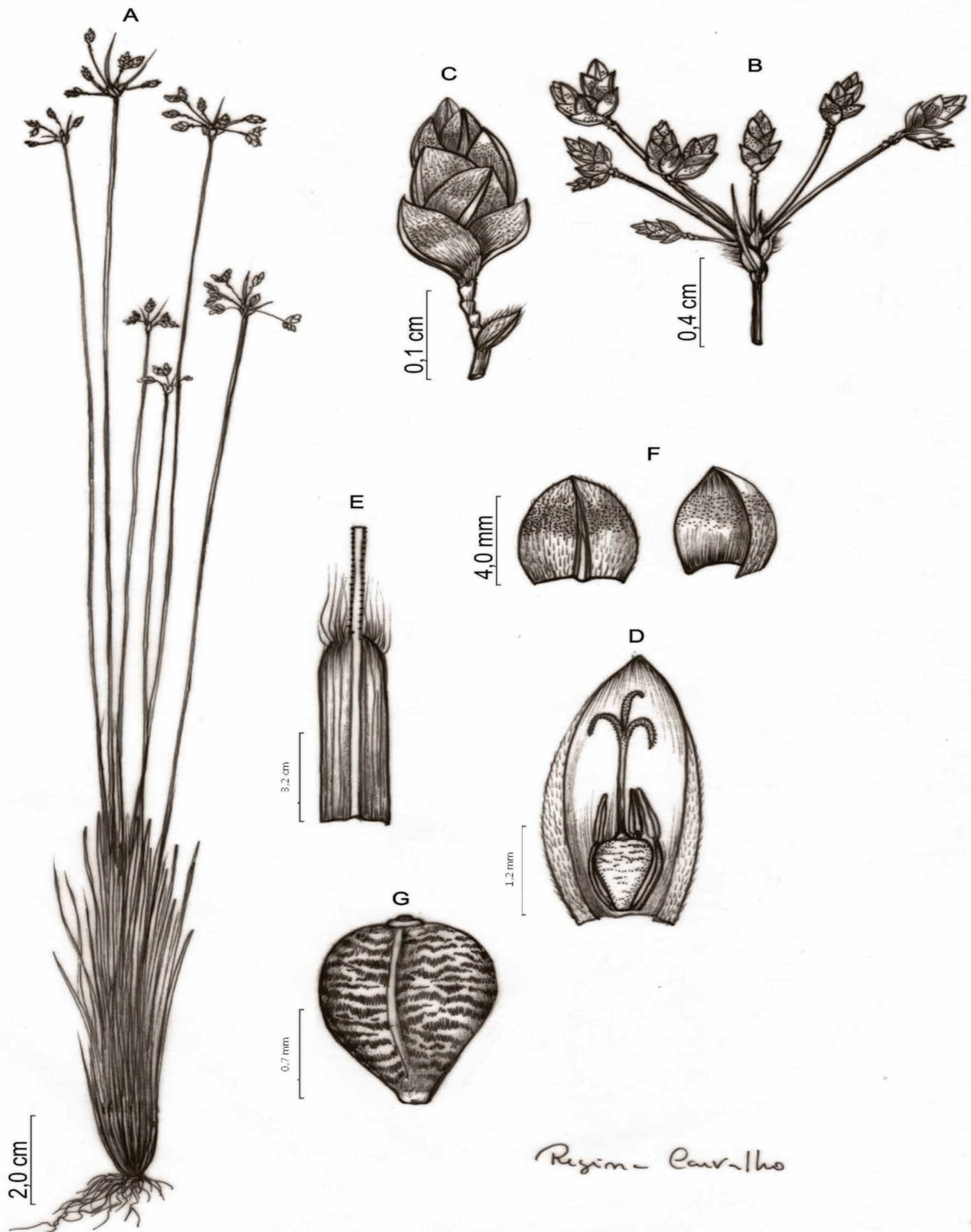


FIGURE 7. A–I. *Bulbostylis wanderleyana* Prata & M.G.López. A. Habit. B. Detail of Inflorescence. C. Spikelet. D. Flower. E. Leaf Sheath. F. Scale, ventral and dorsal view. G. Achene. (Prata *et al.* 859, ASE).

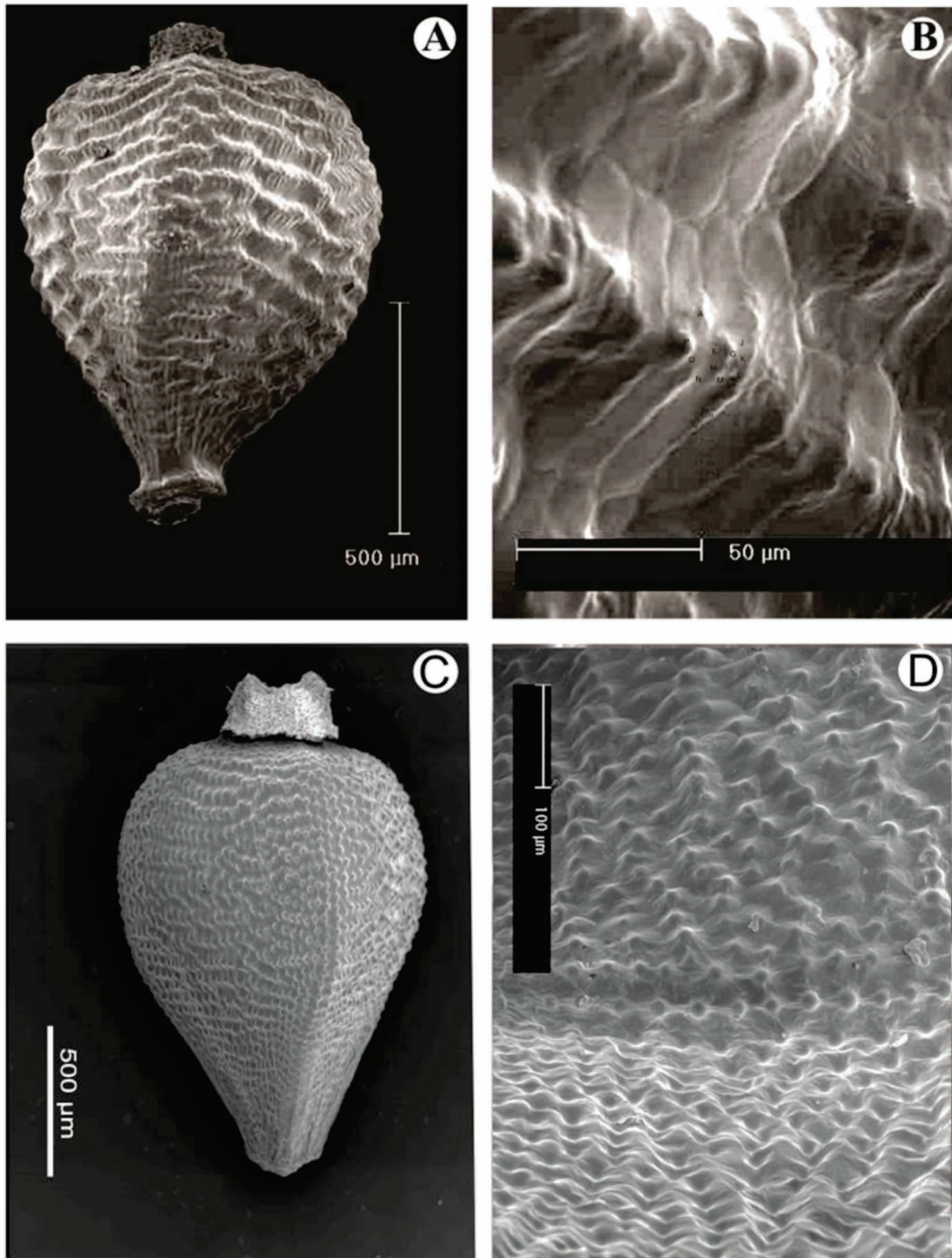


FIGURE 8. Scanning electron microscope photographs of achenes of *Bulbostylis*. A–B. *B. wanderleyana* Prata & M.G.López (Prata *et al.* 859, ASE). A. Achene B. Achene surface detail. C–D. *B. consanguinea* (Kunth) C.B. Clarke. C. Achene D. Achene surface detail (Batalha & Mantovani 60, SP).

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