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Two new species of *Cypella* (Iridaceae: Tigridieae) from Rio Grande do Sul, Brazil

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Abstract

Cypella luteogibbosa and *C. magnicristata* are described, illustrated and have their taxonomic affinities discussed. The former is related with *C. fucata*, but differs by white flowers (*vs.* pallide orange) and divergent adaxial crests of style apices (*vs.* convergent). From *Cypella osteniana* the new species differs by 1-flowered spathes (*vs.* 2-flowered), spatulate outer tepals, 10–12 mm wide (*vs.* obovate, 15–17 mm wide), inner tepals with a yellow hump abaxially, and keel-shaped distally (*vs.* without a hump, and folded distally), and anthers with narrowed connective (0.6–0.9 mm *vs.* 1.4–1.8 mm). *Cypella magnicristata* is related with *C. armosa*, but differs mostly by obovate outer tepals, 38–44 × 22–25 mm (*vs.* spatulate, 36–40 × 12–16 mm), larger inner tepals (22–24 × 15–16 mm *vs.* 14–18 × 10–12 mm), and longer filiform filaments (5.5–6.4 mm *vs.* 3–3.5 mm). From *C. exilis* the new species differs mostly by diameter of flowers (60–70 mm *vs.* 38–48 mm), bigger size of outer tepals (38–44 × 22–25 *vs.* 32–36 × 12–16 mm), larger inner tepals (22–24 × 15–16 *vs.* 12–15 × 8–9 mm), and length of crests of style apices (6–7 mm *vs.* 4–5 mm).

Resumo

Cypella luteogibbosa e *C. magnicristata* são descritas, ilustradas e têm suas afinidades taxonômicas comentadas. A primeira é relacionada com *C. fucata*, mas se separa pelas flores brancas (*vs.* pálido alaranjadas) e cristas adaxiais do ápice do estilete divergentes (*vs.* convergentes). De *Cypella osteniana* a nova espécie difere pelas espatas com uma flor (*vs.* duas flores), pelas tépalas externas espatuladas, com 10–12 mm de largura (*vs.* obovadas, com 15–17 mm de largura), pelas tépalas internas providas de corcunda de cor amarela na face abaxial, e formato de quilha na parte distal (*vs.* desprovidas de corcunda, e dobradas na parte distal), e pelas anteras com conectivo estreito (0.6–0.9 mm *vs.* 1.4–1.8 mm). *Cypella magnicristata* é relacionada com *C. armosa*, mas difere principalmente pela forma obovada das pétalas externas, que medem 38–44 × 22–25 mm (*vs.* espatuladas, de 36–40 × 12–16 mm), pelas tépalas internas maiores (22–24 × 15–16 mm *vs.* 14–18 × 10–12 mm), e pelos filamentos mais longos e filiformes (5.5–6.4 mm *vs.* 3–3.5 mm). De *C. exilis*, a nova espécie difere principalmente pelo diâmetro das flores (60–70 mm *vs.* 38–48 mm), pelo maior tamanho das tépalas externas (38–44 × 22–25 *vs.* 32–36 × 12–16 mm), dimensão das tépalas internas (22–24 × 15–16 *vs.* 12–15 × 8–9 mm), e pelo comprimento das cristas adaxiais do ápice do estilete (6–7 mm *vs.* 4–5 mm).

Key words: Biodiversity, Brazilian flora, section *Cypella*, Pampa Biome, Taxonomy

Introduction

Cypella Herbert (1826: t. 2637) is a genus of bulbous plants with pleated leaves, which comprises about 25 species known from Argentina, Bolivia, Brazil, Uruguay, Paraguay and Peru (Goldblatt & Manning 2008,

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Ravenna 2009). The majority of the species are found in northwest Argentina and neighboring areas (Ravenna 2009, Deble 2012). A total of 13 species and two subspecies are accepted from Brazil, and the endemic status of *C. catharinensis* Ravenna (2005: 39) and *C. pabstiana* Ravenna (1981b: 18) is recognized (Eggers 2012). Deble *et al.* (2012) added *Cypella discolor* Ravenna (1981b: 16) as endemic to Brazil, occurring exclusively in southwest Rio Grande do Sul state.

The generic delimitation of *Cypella* is still controversial: Baker (1892) included *Larentia* Klatt (1882: 362) and *Phalocallis* Herbert (1839: t. 3710) in *Cypella*; Foster (1945) also placing *Hesperoxiphion* Baker (1877: 127) in the genus. Ravenna (1977, 1981a, 1981c, 1983) recognized all four genera and described *Kelissa* Ravenna (1981c: 106) and *Onira* Ravenna (1983: 204). Roitman & Castillo (2007) and Goldblatt & Manning (2008) merged the genera *Phalocallis*, *Kelissa*, and *Onira* in *Cypella*, but they recognized *Larentia* and *Hesperoxiphion* as distinct. In a recent contribution, Ravenna (2009) re-established all these genera and proposed a taxonomic key to distinguish them.

The genus *Cypella sensu stricto* is characterized by medium-sized plants, with mostly shades of yellow, white or pale to deep blue to violet flowers with broadly clawed and conspicuous dark transverse banding, with blades of inner tepals glabrous, and conduplicate style arms, often crested at apex, with two longer and one shorter adaxial crests, and also 2-lobed abaxial crest (Ravenna 1981a, Ravenna 1981b, Goldblatt & Manning 2008, Ravenna 2009).

Current studies on the genus *Cypella* of Rio Grande do Sul (Brazil) revealed two new species from the western region of this state; both species belong to section *Cypella* and are subsequently described.

Taxonomy

Cypella luteogibbosa **Deble, *sp. nov.*** (Figures 1, 3A–B, and 4)

Type:—BRAZIL. Rio Grande do Sul: Quaraí, 28 km ao sul do trevo para o Passo da Guarda, 19 October 2010, fl., fr., *L. P. Deble & A. S. de Oliveira-Deble 10265* (holotype: PACA!).

A Cypellae fucatae cui maxime proxima foliis linear-ellipticis (non anguste linearis), perigonium album (non pallide aurantiacum) et stigmatae lobi divergentibus (non convergentibus) differt. A Cypellae ostenianae valde proxima, spatha uniflora (non biflora), tepala exteriora spathulata, 10–12 mm lata (non obovata, 15–17 mm lata), productis bene differt.

Plant up to 15–35 cm high above the soil, underground stem up to 10 cm long. Bulb ovoid, outer cataphylls darker brown, 20–35 mm × 20–30 mm, prolonged in a short collar. Basal leaves green at anthesis 2–4; blades linear-elliptic, plicate, apex acute, 10–26 × 0.2–0.5 cm. Flowering stems 10-27 cm long, 2-3 branched. Spathes 2–3, herbaceous, pallid-green, bivalved, one-flowered, pedunculate, peduncles 1.8–3 cm long; outer valve 1.4–2.2 cm long, the inner 2.5–3 cm long, both with membranous edges and orange longitudinal glandular strips; pedicel filiform, 2.8–3.2 cm long. Flowers predominately white, 28–36 mm diameter. Tepals whorls sharply dissimilar: outer tepals white, spatulate, 18–22 mm × 10–12 mm, panduriform, patent distally, dark purplish-brown veined, and with orange glandular trichomes concentrate in proximal half. Inner tepals geniculate-revolute, 8–9 mm × 8.5–9 mm, proximal half with adaxial surface striated, distal portion keel-shaped, and a light yellow macula and dark-purple dots; abaxial surface mostly white, with a yellow hump. Filaments cream-white or pallid pink, 2–2.4 mm long, at the base bulbiform and connate; anthers oblong 3.2–3.5 mm × 0.7–1 mm; connective white to cream, locules dark-brown, pollen ochraceous. Ovary pallid-green, 5–6 mm × 1.8–2.1 mm, with orange glandular dots scattered. Style 7–8 mm long. Style arms channeled, 3–4 mm long. Crests at the style apex 3, adaxial crests 3.4–4.2 mm long, one abaxial crest lobed, 0.5–0.8 mm long. Capsule obovate-oblong, 14–21 mm × 5.5–7.5 mm. Seeds oblong to obconical, angulated, reddish-brown, epidermis papillose striate, 1.5–2 mm long.

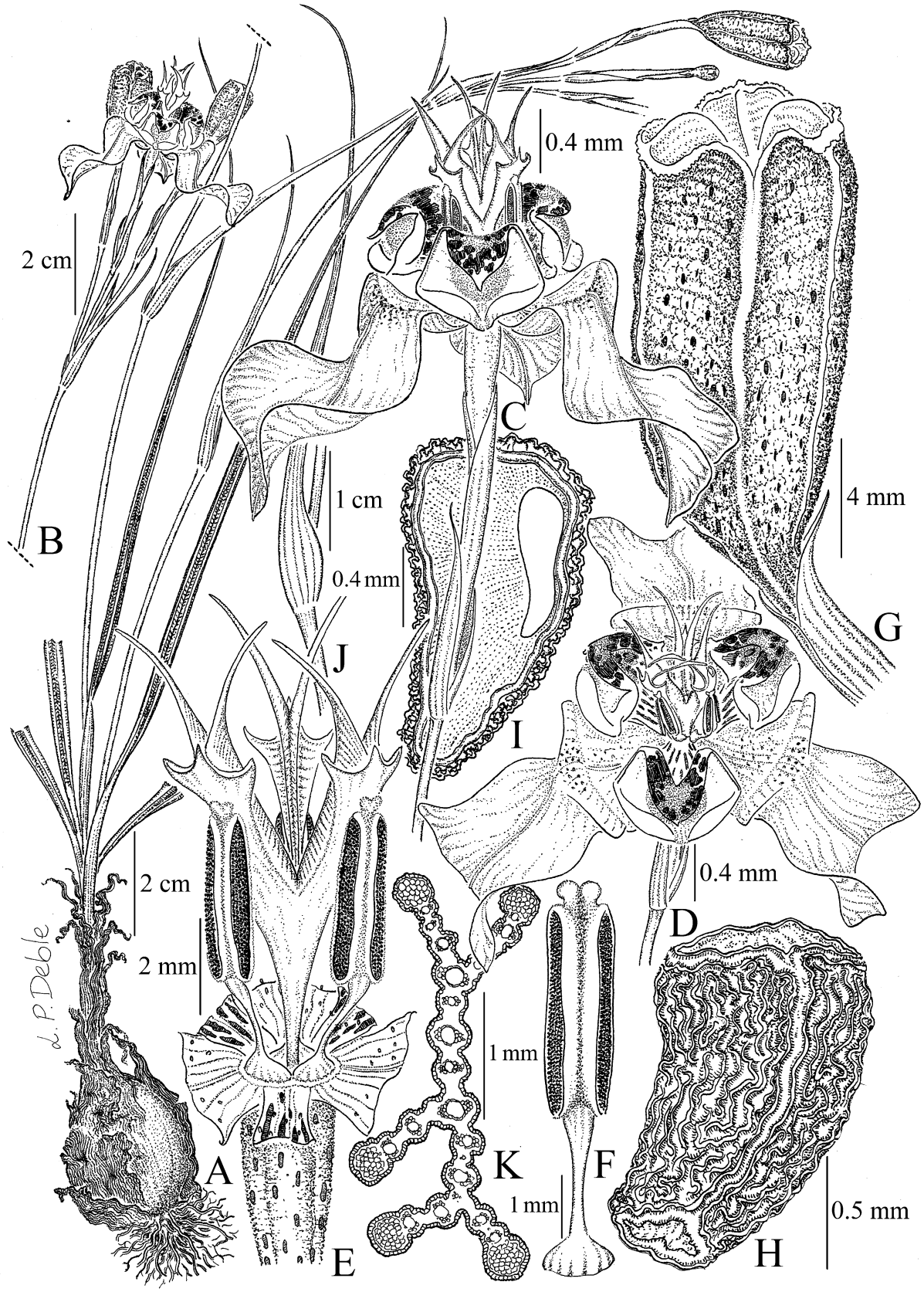

FIGURE 1. *Cypella luteogibbosa*. **A**. Habit. **B**. Distal part of the plant. **C**. Flower, lateral view. **D**. Flower, upper view. **E**. Flower, tepals removed. **F**. Stamen. **G**. Capsule. **H**. Seed. **I**. Seed, longitudinal section. **J**. Stem bract. **K**. Leaf in cross section (from *Deble & Oliveira-Deble 10265*).

Distribution and habitat:—*Cypella luteogibbosa* is endemic to Quaraí municipality, in southwest Rio Grande do Sul, Brazil (Figure 4). Individuals grow on stony grasslands.

Phenology:—Specimens with flowers and capsules can be found between October-December. The flowers open only one day, during the morning, and close early afternoon.

Conservation status:—*Cypella luteogibbosa* occurs in an extent of occurrence smaller than 300 km^2 and the area of occupancy is less than 10 km^2. Only four populations are known, each composed by just a few individuals. According to the IUCN Red List (IUCN 2011) the species can be assigned to Critically Endangered risk category (CR, B2a, b(iii), and D) due to the very small area of occupancy, few individuals known, decline in the quality of habitat and few places of occurrence.

Etymology:—From the Latin *luteous* meaning yellow and *gibbosus* that mean hump, and referring to shape of inner tepals with a yellow hump on abaxial surface.

Additional specimens examined (paratypes):—BRAZIL. Rio Grande do Sul: Quaraí, Cerro do Jarau, entre rochas, October 2010, *F. S. Alves 17* (PACA!); cerro do Jarau, stony grasslands, 30°10’21.55”S, 56°32”10.33”W, 16 December 2010, *L. P. Deble & A. S. de Oliveira-Deble 11604* (PACA!); 12 km east of the city, on stony grassland, after fire, 30°26’32.64”S, 56°19”39.98”W, 9 November 2011 (PACA!).

Comments:—*Cypella luteogibbosa* is closely related to *Cypella fucata* Ravenna (1981b: 18), both species displaying small habit, one-flowered spathes, and darker purplish-brown veined outer tepals. However, *C. luteogibbosa* differs by the shape and size of basal leaves, white perigone, size and shape of inner tepals and divergent adaxial crests of style apices. The new species also resembles *Cypella osteniana* Beauveard (1923: 165), but that species differs by two-flowered spathes, shape of outer tepals, shape and size of inner tepals, and broader connective of anthers. *Cypella luteogibbosa* may be distinguished from *C. fucata* and *C. osteniana* based on the characters listed in the Table 1.

TABLE 1. Comparison of *Cypella luteogibbosa* and its morphologically related species.

Character/Species	*C. fucata*	*C. osteniana*	*C. luteogibbosa*
Number of basal leaves	absent or up to 2	1–2	2–4
Shape and size of basal leaves (cm)	narrowly linear, 10–16 × 0.1–0.3	narrowly linear, 9–15 × 0.1–0.3	linear-elliptic, 10–26 × 0.2–0.5
Spathes	1-flowered	2-flowered	1-flowered
Flower color	pallid orange	white	white
Shape of outer tepals	spatulate	obovate	spatulate
Size of outer tepals (mm)	17–24 × 10–12	19–24 × 15–17	18–22 × 10–12
Shape of inner tepals	folded blade in all the length; abaxially without a hump	folded blade in all the length; abaxially without a hump	folded blade only basally, and apically keel-shaped; abaxially with a hump
Size of inner tepals (mm)	7–8 × 6–7	7–8 × 6.5–7.5	8–9 × 8.5–9
Crests on style apices	convergent	divergent	divergent
Width of connective (mm)	0.8–1.2	1.4–1.8	0.6–0.9
Size of capsules (mm)	10–14 × 5–7	12–14 × 6–7	14–21 × 6–7.5
Habitat	mostly grasslands	stony grasslands	stony grasslands
Geographical distribution	Northwest Uruguay, Northeast Argentina and Southern Brazil	Central and Northeast Uruguay	Quaraí municipality, Rio Grande do Sul state, Brazil

Cypella magnicristata* Deble, *sp. nov. (Figures 2, 3C–D, and 4)

Type:—BRAZIL. Rio Grande do Sul: Quaraí, Jarau, 30°11'34.07"S, 56°29"58.86"W, 17 February 2011, fl., fr., *L. P. Deble & A. S. de Oliveira-Deble 12816* (holotype PACA!)

A Cypellae armosae cui maxime proxima tepala exteriora obovata, 22–25 mm lata (non spathulata, 12–16 mm lata), tepala interiora 22–24 mm longa, 15–16 mm lata (non 14–18 mm longa, 10–12 mm lata), filamenta 5.5–6.4 mm longa (non 3–3.5 mm longa) et antherae 8–9 mm longae (non 7–7.5 mm longae) differt.

Plant up to 30–40 cm high above the soil, underground stems up to 15 cm long. Bulb ovoid, cataphylls dark-brown, 30–40 mm × 25–35 mm, prolonged in a collar up to 10 cm. Leaves at anthesis absent. Flowering stems 18–32 cm long, 2–4 times branched. Spathes 4–5, herbaceous, pallid-green, bivalved, one-flowered, pedunculate, peduncles 3.5–6 cm long; outer valve 2.2–2.8 cm long, the inner 4.2–5.5 cm long, both with membranous edges covered with sparse dark brown longitudinal glandular strips; pedicel filiform, 4–5.5 cm long. Flowers predominately golden-yellow, 60–70 mm diameter. Tepals whorls sharply dissimilar: outer tepals golden-yellow, obovate, 38–44 mm × 22–25 mm, yellow veined, panduriform, patent distally. Inner tepals geniculate-recurved, 22–24 mm × 15–16 mm, proximal half densely covered with purple striation on the adaxial surface, distal region with a white-cream spot and oblique dark-purple stripes; abaxial surface mostly yellow. Filaments yellow, light pink and white cream spotted, filiform, 5.5–6.4 mm long, base slightly dilated; anthers linear-oblong 8–9 mm × 1.2–1.8 mm; connective white-cream, narrowed, locules dark-brown, pollen ochraceous. Ovary pallid-green, 9–10 mm × 2.8–3.4 mm, scattered with brown glandular dots. Style 6–7 mm long. Style arms channeled, 9–10 mm long, crests at the apex 3, adaxial crests linear-lanceolate, 6–7 mm long, abaxial crest lobed, 1 mm long. Capsule obovate, 15–20 mm × 7–9 mm. Seeds oblong to obconical, angulated, reddish-brown, epidermis papillose striate, 2–2.5 mm long.

Distribution and habitat:—*Cypella magnicristata* is narrowly endemic to the Jarau locality, Quaraí municipality, in southwest Rio Grande do Sul, Brazil (Figure 4). Individuals grow on grasslands.

Phenology:—Specimens with flowers and capsules can be found between November-March. The flowers bloom late at night and wither around mid-morning.

Conservation status:—*Cypella magnicristata* occurs in an extent of occurrence smaller than 10 km^2, and the three collections belong to a single population. According to the IUCN Red List (IUCN 2011) the species can be assigned as Critically Endangered (CR, B1, B2a, b(iii), and D) due to the very small extent of occurrence, area of occupancy, few individuals known, decline in the quality of habitat and a single place of occurrence.

Etymology:—From the Latin *magnus* meaning big and *cristatus* that mean crested, and referring to longer adaxial crests of style apices.

Additional specimens examined (paratypes):—BRAZIL. Rio Grande do Sul: Quaraí, Jarau, on grasslands, 30°12'01.50"S, 56°30"20.63"W, 16 December 2010, *L. P. Deble & A. S. de Oliveira-Deble 11606* (PACA!); Jarau, 3 km south of Cerro do Jarau, on grasslands, 30°12'00.13"S, 56°32"08.62"W, 9 November 2011, *L. P. Deble & A. S. de Oliveira-Deble 12821* (PACA!); cultivated, from seeds of Deble & Oliveira-Deble 11606, 4 March 2012, *L. P. Deble & A. S. de Oliveira-Deble 13018* (PACA!).

Comments:—*Cypella magnicristata* is closely related to *C. armosa* Ravenna (1981b: 20), both species have large flowers, long and narrowed anthers, and style apice with long adaxial crests. However, *C. magnicristata* differs by the large and obovate outer tepals, the size of inner tepals, and also by the stamens with longer and filiform filaments. The new species also resembles *Cypella exilis* Ravenna (1981a: 492), but the latter differs by its smaller and orange flowers, smaller size of outer and inner tepals, and shorter adaxial crests on the style apices. *Cypella magnicristata* may be distinguished from *C. armosa* and *C. exilis* based on the characters listed in the Table 2.

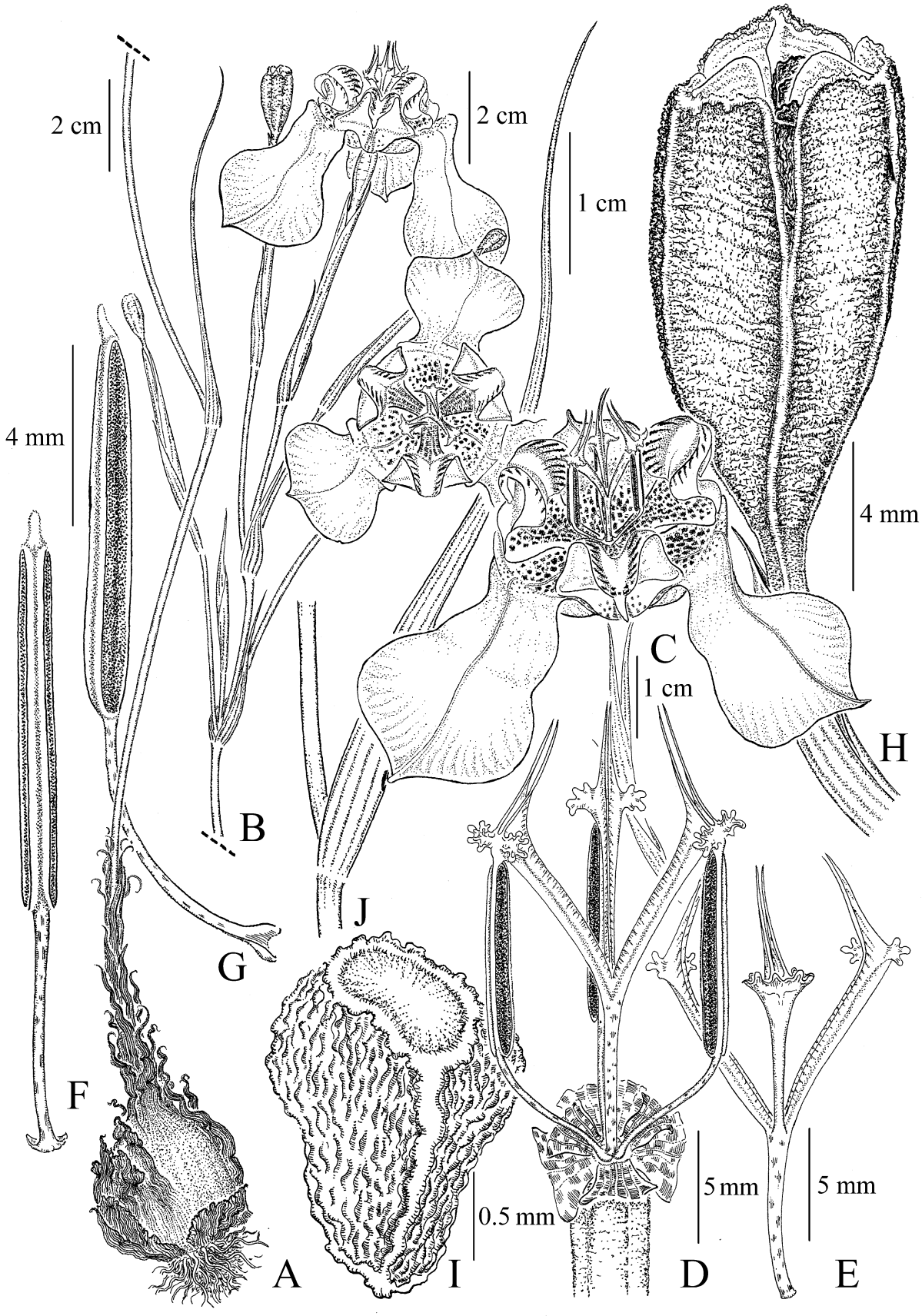

FIGURE 2. *Cypella magnicristata.* **A**. Basal part of the Plant. **B**. Distal part of the plant. **C**. Flower, lateral view. **D**. Flower with tepals removed. **E**. Gynoecium **F.** Stamen, dorsal view. **G**. Stamen, lateral view. **H**. Capsule. **I**. Seed. **J**. Stem bract. **A–C** from *Deble & Oliveira-Deble 12816;* **D–J** from *Deble & Oliveira-Deble 13018*).

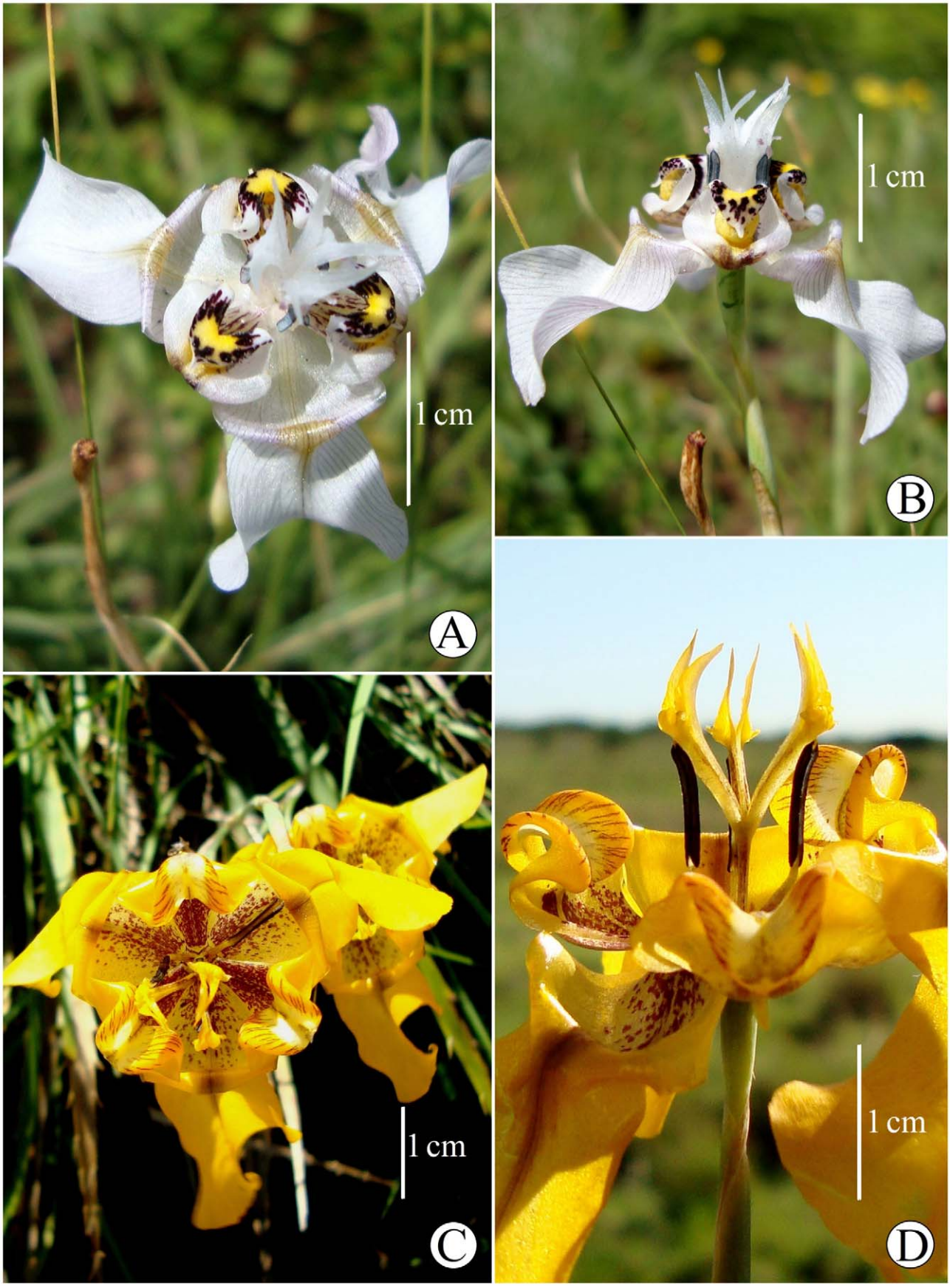

FIGURE 3. *Cypella luteogibbosa*. **A**. Flower, upper view. **B**. Flower, lateral view. *Cypella magnicristata*. **C**. Flower, upper view. **D**. Flower, showing the androgynoecium apparatus. (**A–B** from *Deble & Oliveira-Deble 10265*; **C–D** from *Deble & Oliveira-Deble 12816*).

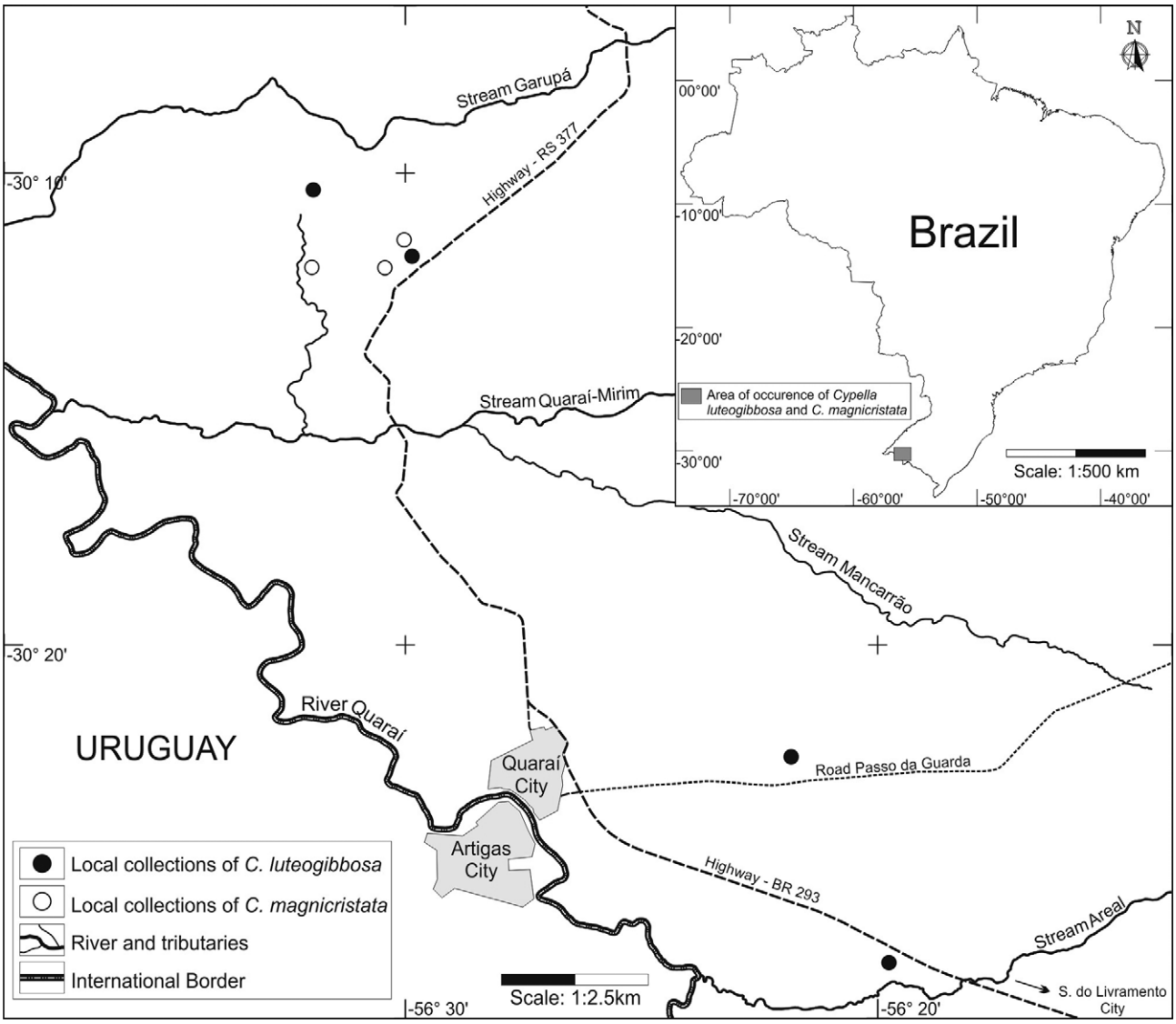

FIGURE 4. Geographic distribution of *Cypella luteogibbosa* and *C. magnicristata*.

TABLE 2. Comparison of *C. magnicristata* and its morphologically related species

Character/Species	*C. armosa*	*C. exilis*	*C. magnicristata*
Number of basal leaves	absent or up to 2	1–2	absent
Shape and size of basal leaves (cm)	narrowly linear, 10–16 × 0.1–0.3	narrowly linear, 9–15 × 0.1–0.3	---
Flower color	light yellow to yellow	orange	golden-yellow
Flower diameter (mm)	48–65	38–48	60–70
Shape of outer tepals	spatulate	spatulate	obovate
Size of outer tepals (mm)	36–40 × 12–16	32–36 × 12–16	38–44 × 22–25
Size of inner tepals (mm)	14–18 × 10–12	12–15 × 8–9	22–24 × 15–16
Length of crests on style apices (mm)	5.5–7.5	4–5	6–7
Filament (mm)	3–3.5	3–4	5.5–6.4
Anther (mm)	7–7.5	6–7	8–9
Habitat	temporary inundate pastures and bogs	grasslands and stony grasslands	grasslands
Geographical distribution	Northeast Argentina, Paraguay and West of Rio Grande do Sul state, Brazil	Uruguay and Rio Grande do Sul state, Brazil.	Quaraí municipality, Rio Grande do Sul state, Brazil

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Appendix 1. Examined specimens of *Cypella armosa, C. exilis, C. fucata* and *C. osteniana*.

***Cypella armosa* Ravenna:**—ARGENTINA. Corrientes: Concepcíon, Flowers lemon-coloured, grassland on medium-high, to fairly low ground, sandy soil, 22 February 1988, *T. M. Pedersen 15126* (CTES). BRAZIL. Rio Grande do Sul: Garruchos, 28°11'49.75"S, 55°36'59.29"W, em campo hidromórfico, flores amarelo-claro, manchadas de vinho, 1 February 2006, *L. P. Deble & A. S. Oliveira-Deble 7183* (SI). PARAGUAI. Estancia la Condrina, campo inundado, hierba, flores amarillas, 26 April 1985, *R. Duré & C. Benitez 540* (CTES, PY).

***Cypella exilis* Ravenna:**—BRAZIL. Dom Pedrito, Ponche Verde, on grasslands and pastures, orange flowers, 4 cm diameter, adaxial crests up to 4 mm, 19 October 2011, *L. P. Deble & A. S. de Oliveira-Deble 12408* (PACA). Pinheiro Machado, on grassland orange flowers, adaxial crests up to 5 mm, 16 October 2008, *L. P. Deble & A. S. de Oliveira-Deble 12408* (SI). URUGUAY. Cerro Largo, Aceguá, on grasslands and adjacent stony, orange flowers, 4 cm diameter, adaxial crests up to 4 mm, 11 December 2011, *L. P. Deble, A. S. de Oliveira-Deble* & *J. B. Rodrigues 12522* (PACA, SI).

***Cypella fucata* Ravenna:**—ARGENTINA. Corrientes: Monte Caseros, on grasslands, 18 December 2010, *L. P. Deble & A. S. de Oliveira-Deble 11649* (PACA). BRAZIL. Rio Grande do Sul: Caçapava do Sul, Pedra do Segredo, on grasslands, 23 December 2009, *L. P. Deble & A. S. de Oliveira-Deble 11032* (PACA). Quaraí, Jarau, 30°12'09.32"S, 56°32"43.74"W, on sandy soils and grasslands, 16 December 2010, *L. P. Deble & A. S. de Oliveira-Deble 11621* (PACA).

***Cypella osteniana* Beauverd:**—URUGUAY. Cerro Largo, 23 February 1938, *B. Rosengurtt 2569* (MVFA). Cerro de las Cuentas, 32°36'21"S, 54°36'53"W, 24 January 2007, *L. P. Deble & A. S. de Oliveira-Deble 7911* (SI). Melo, 17 km southeast of Melo, 32°30'56"S, 54°04'13"W, 18 February 2006, *L. P. Deble & A. S. de Oliveira-Deble 7294* (SI).