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THREE NEW SPECIES OF THE GENUS *CYPELLA* (IRIDACEAE, TIGRIDIEAE)

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Abstract. Deble, L. P.; F. da S. Alves & A. S. de O. Deble. 2015. Three new species of the genus *Cypella* (Iridaceae, Tigridieae). *Darwiniana*, nueva serie 3(2): 235-253.

Three new species of *Cypella* section Nais from South America are described and illustrated: *C. charruana, C. gloriana*, and *C. uliginosa*. *Cypella charruana* occurs in Santana do Livramento (southern Brazil) and in Rivera and Artigas (northern Uruguay). It is related to *C. suffusa*; however, it can be easily separated by its one-flowered spathes, outer tepals with narrowed claws, longer antheral filaments, and bigger anthers. *Cypella gloriana* is only found in São Vicente do Sul (central-western Rio Grande do Sul State, Brazil); this species is closely related to *C. pusilla* from which it can be separated by its larger perigone with shallower and broader concavity, outer tepals with narrowed claws, inner tepals with blades markedly narrowed and longer towards the apex, and with glandular trichomes spreading in a small area, stamens shorter, with porrect filaments, smaller anthers, and broader connective tissue. *Cypella uliginosa* occurs in bogs from Entre Ríos and Corrientes in northeastern Argentina; it morphologically resembles *C. crenata* and *C. laxa*; however, *C. uliginosa* can be distinguished from both species by its flowers with pale translucent and shallow central concavity, inner tepals blade plicate with a deep central depression, marked by a darker area covered by ochraceous glandular trichomes, and erect or slightly porrect style branches, with the stigmatic trichomes prolonged on the proximal portion of the adaxial crests. *Cypella charruana* and *C. gloriana* are recognized as critically endangered, while the data of *C. uliginosa* are insufficient to establish criteria of threat. Data about phenology, geographic distribution, conservation, plus comparative tables to segregate these three new species from the related taxa, and a key to differentiate species of the section Nais are supplied.

Keywords. Bulbous; geophyte; grasslands; taxonomy.

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Se describen e ilustran tres nuevas especies de *Cypella* pertenecientes a la sección Nais para América del Sur: *C. charruana, C. gloriana* y *C. uliginosa*. La primera ocurre en Santana do Livramento (sur de Brasil) y en Artigas y Rivera (norte del Uruguay). *Cypella charruana* es afín a *C. suffusa*, distinguiéndose por las espatas unifloras, tépalos internos con unguículo más angosto, filamentos más largos y anteras más grandes. *Cypella gloriana* fue encontrada solamente en la Ciudad de São Vicente do Sul (centro-oeste del estado de Rio Grande de Sur, Brasil) y se relaciona con *C. pusilla*, de la que se separa por su perigonio más grande, con concavidad central más amplia y menos profunda, tépalos externos con unguículo más angosto, tépalos internos con lámina más angosta y más largas arriba, con tricomas

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glandulares distribuidos en una área más angosta, estambres más cortos con filamentos inclinados hacia atrás, anteras más cortas y conectivo amplio. *Cypella uliginosa* ocurre en los esteros de las Provincias de Entre Ríos y Corrientes, nordeste de Argentina, y está relacionada con *C. crenata* y *C. laxa*, diferenciándose por sus flores con una depresión central poco profunda, pálida, hialina, laminas de los tépalos internos plegada con una profunda depresión central, marcada por una área negra cubierta por tricomas glandulares de color ocráceo y ramas del estilo erectas o poco inclinadas hacia atrás, con la porción estigmática prolongada hasta la mitad de las crestas adaxiales. *Cypella charruana* y *C. gloriana* son reconocidas como críticamente amenazadas, mientras que los datos de *C. uliginosa* son insuficientes para establecer algún criterio de amenaza. Se suministran datos sobre fenología, distribución geográfica, y conservación, junto con tablas para separar las especies nuevas de sus especies afines y una clave para la separación de las especies de la sección Nais.

Palabras clave. Bulbos; campos; geófitos; taxonomía.

INTRODUCTION

Cypella Herbert s.s. includes ca. 25 species (Ravenna, 2005; 2009) restricted to temperate South America and contains medium-sized plants with 1-2 flowered spathes, often yellow or orange with broadly clawed tepals. A dense area of glandular trichomes is located in a central depression of the inner tepals, and the style is slender below, with branches well developed, compressed, usually divided above into prominent acute crests and with a transverse stigmatic surface on the abaxial surface at the base of the crests (Ravenna, 2003; Goldblatt & Manning, 2008; Ravenna, 2009; Deble et al., 2015). Some authors have a wider concept of the genus *Cypella*, including *Phalocallis* Herbert, *Kelissa* Ravenna and *Onira* Ravenna (Roitman & Castillo, 2007; Goldblatt & Manning, 2008; Roitman et al., 2008). On the other hand, Chauveau et al. (2012) suggest *Cypella* is polyphyletic, with *Cypella hauthalii* (Kuntze) Foster forming a strongly supported clade with *Onira unguiculata* (Baker) Ravenna and *Kelissa brasilienis* (Baker) Ravenna, while *Cypella aquatilis* Ravenna, *C. herbertii* (Herbert) Herbert, *C. osteniana* Beauverd, and *C. pusilla* (Link & Otto) Bentham & Hooker ex Jackson are placed in another clade, and *Phalocallis* is considered a separate genus.

Ravenna (2003) segregated *Cypella* into three sections: Cypella, Nais Ravenna, and Ionella. The first section includes *Cypella herbertii*, the type of the genus, and its related species, the name Ionella, was not validly published, and was created by Ravenna to encompass *Cypella hauthalii*. The section Nais was described basis on the urceolate shape of the perigone and arcuate-recurved inner tepals of *Cypella aquatilis* Ravenna, the type of the section, *C. crenata* (Vellozo) Ravenna, and *C. pusilla*. In subsequent studies, the following species were described under *Cypella* sect. Nais: *Cypella curuzupensis* Ravenna, *C. discolor* Ravenna, *C. laeta* Ravenna, *C. laxa* Ravenna, and *C. suffusa* Ravenna (Ravenna, 1981b; 2009).

Recent advances in the phylogeny of the genus *Cypella* have demonstrated the infrageneric treatment as artificial, since the genus is recognized as polyphyletic (Chauveau et al., 2012). Nevertheless, the sections Cypella and Nais, which encompass the majority of known species, are well defined and the morphological attributes that distinguish both groups are recognized as reliable to identify species (Ravenna, 2009; Deble et al., 2012a; 2012b; 2012c).

The diversity of *Cypella* has been underestimated, and many species have been rediscovered or newly described (Ravenna, 2005, 2009; Deble et al., 2012a; 2012b; 2012c; Chauveau et al., 2014; Deble et al. 2015). Based on the study of herbarium specimens and recent collected specimens, three new species belonging to the section Nais are here described, illustrated, and compared to related species. In addition, habitat information, geographical distribution, phenology, and conservation data are supplied. A key to distinguish the species of the section Nais is included.

MATERIAL AND METHODS

Collections from wild populations of *Cypella* were performed in northeastern Argentina (Corrientes, Entre Ríos, and Misiones Provinces), southern Brazil (Paraná, Rio Grande do Sul, and Santa Catarina States), central and southern Paraguay, and Uruguay, between October 2012 and January 2015. Additionally, specimens of *Cypella* (including types and digital images) from the following herbaria were analyzed: CTES, FCQ, FLOR, HAS, HBR, ICN, MVM, MVFA, PACA, PY, SGO and SI (Thiers, 2015). The morphological description is based on the examined material, and the terminology follows Ravenna (1981a, 1981b), Goldblatt & Manning (2008), and Beentje (2010). A stereoscopic microscope QUIMIS 766 was used for the elaboration of illustrations, and the details were drawn based on dried material, as well as cultivated living plants. Images were registered using a SONY DSC-HX300 photographic camera. Geographical coordinates of the collection sites and populations found were recorded using a Garmiam GPS MAP 60 CSx GPS receiver (Global Positioning System). The software GPS TrackMaker Professional - Version 4.9 (GTM PRO) was used to draft the cartographic base, organized in the system WGS 84 (World Geodetic System 1984), resulting in the species distribution map.

RESULTS AND DISCUSSION

Cypella charruana Deble & F. S. Alves, **sp. nov.** TYPE: Brazil. Rio Grande do Sul: Santana do Livramento, on the border with Uruguay, in the spring of the Quaraí River, in the midst of native grassland in moist soil on volcanic rock from the Serra Geral geological formation, 30° 57' 44.34'' S, 55° 43' 33.68'' W, 15-XI-2014 (fl, fr), *L. P. Deble, A. S. de Oliveira-Deble & F. S. Alves 15108* (holotype, SI!; isotypes, MVFA!, PACA!). Figs. 1, 2, 6A-B.

Cypella charruana belongs to section Nais, and it is closely related to C. suffusa, however the spathes are shortly pedunculate, the claws of outer tepals are narrowed, and the stamens and styles are longer.

Plant 20–40 cm long, underground stems 5–12 cm long. Bulb subglobose to ovoid, 25–35 × 20–35 mm, prolonged in a collar up to 10 cm, sheathing the underground stem; cataphylls dark-brown, broadly ovate, apex truncate or acute. Basal leaves at anthesis 2–6, blades plicate, linear-ensiform, 14–26 × 0.2–0.5 cm. Cauline leaf 1, in the distal third of the stem, bracteiform, 3.5–9.5 × 0.1–0.5 cm, basally sheathing the stem. Flowering stems 7–14 cm long, 2–3 times branched. Spathes 1–3 per branch, 3.2–3.6 × 0.4–0.5 cm, herbaceous, pale-green, bivalved, one-flowered, pedunculate, peduncles 1.4–2.8 cm long; outer valve 1.7–2.5 cm long, the inner 3–3.5 cm long, both with membranous edges covered with short parallel dark-brown longitudinal glandular strips and dots in the distal third. Flowers predominately golden-yellow, 40–55 mm diameter; concavity of the tepals 30–38 mm diameter, 18–25 mm depth. Pedicel filiform, 3–3.5 cm long. Tepal whorls sharply dissimilar: outer tepals oblong, 34–40 mm long, panduriform, yellow-veined, concave at the base 14.5–19 mm, reflexed distally; outer tepal blades 20–28 × 15–19 mm, erect in proximal third, then revolute; outer tepal claws stained purplish-brown, narrowly cuneate, 11–14 mm long, 2–2.5 mm wide at the base, and 4–5 mm wide at the apex, trichomes scattered, more abundant in the proximal half of the claw; inner tepals arcuate–recurved, 22–28 mm long, the proximal 2/3 erect-patent, slightly inclinate, then curved upward, the distal 1/3 incurved and strongly reclinate; inner tepal blades 7.5–10 mm wide, mostly yellow, with a yellow-cream central depression densely covered by glandular trichomes, surrounded by yellow with purplish-brown oblique short stripes; inner tepal claws stained purplish-brown, narrowly cuneate, 10–11 mm long, 1.8–2.2 mm wide at the base, and 4.5–6 mm wide at the apex, trichomes scattered, more abundant in the proximal half of the claw. Staminal filaments slender, filiform, 8.4–10.5 mm long, slightly porrect, ochraceous to light yellow, dilated at the base, fused for 0.5–0.8 mm; anthers oblong 8–9.5 × 1.4–1.8 mm; connective yellow, 0.4–0.5 mm wide, pollen yellow or ochraceous. Ovary obovate–oblong, green, 6–8 × 2–3 mm. Style 8–9 mm long; style branches channeled, 9–10 mm long, crests at the apex 3, translucent and yellowish, adaxial crests lanceolate, 4.5–6.5 mm long, abaxial crest deltate, 1–1.5

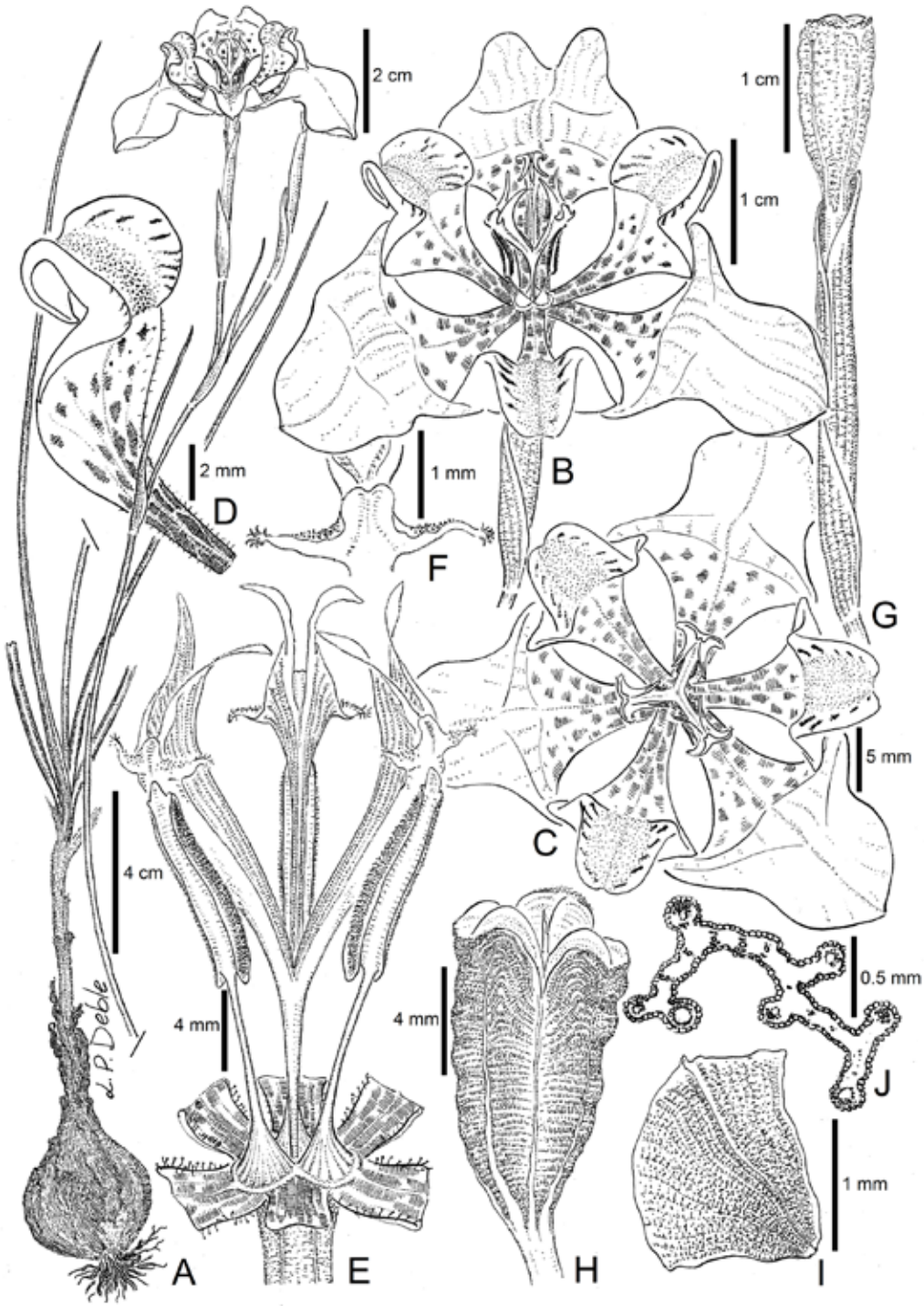

Fig. 1. *Cypella charruana.* **A,** habit. **B,** flower, lateral view. **C,** flower, frontal view. **D,** inner tepal. **E**, flowers, tepals removed. **F**, stigmatic portion of the crests of the style branches. **G**, spathe with immature capsule. **H**, capsule. **I**, seed. **J**, leaf cross section. **A–J** from *Deble et al. 15108* (PACA).

mm long. Capsule obovate–oblong, 10–12 × 7–8 mm. Seeds oblong to obconical, angulate, light–brown, epidermis papillose striate, 2–2.5 mm long.

Etymology. Refers to "Charrua", pre-historic human groups of hunters and gatherers, who inhabited the grasslands from the north of Río de La Plata.

Distribution and habitat. *Cypella charruana* has been found on the border between Santana do Livramento municipality, southern Brazil, and Rivera and Artigas departments, northern Uruguay, in the front of the geomorphologic unit "Cuesta de Haedo" or "Planalto da Campanha" (Müller Filho, 1970; IBGE, 1986), in high interfluvial sources, among native grasslands in moist soils, generally clayey and not very deep, developing on volcanic rocks to the "Serra Geral" geological formation (Gordon Júnior, 1947; Paulipetro, 1981; Melfi et al. 1988). The specimens grow between 220–380 m. Andrés Gonzalez (Faculdad de Agronomía, Montevideo, Uruguay) found two populations from Artigas and Rivera departments; these populations were georeferrenced, but due to the small number of individuals, no vouchers were made (Andrés Gonzalez, pers. com.).

Observations. *Cypella charruana* is easily distinguished from its related species by the shape of the outer tepals claws, and longer style and stamens. The perigone shape of this new species is very distinct and resembles the perigone of species of *Phalocallis.* This new species is placed in *Cypella* mainly by the inner tepals shape, and style branches with two acute adaxial crests, and one abaxial crest (vs. broad petaloid adaxial crests and lack adaxial crest in *Phalocallis*). Despite the morphological peculiarities, the species is undoubtedly related to *C. suffusa* and also to *C. gloriana*, this last described below, and can be distinguished from the former mainly by its one-flowered spathes, narrower claws of outer tepals, and longer filaments and larger anthers. From *C. gloriana* the new species differs by the pedunculate spathes, and larger floral parts. *C. ravenniana* is also similar to

Fig. 2. Geographic distribution of *Cypella charruana.* Figura en color en la versión en línea http://www.ojs.darwin.edu.ar/index.php/darwiniana/article/view/666/661

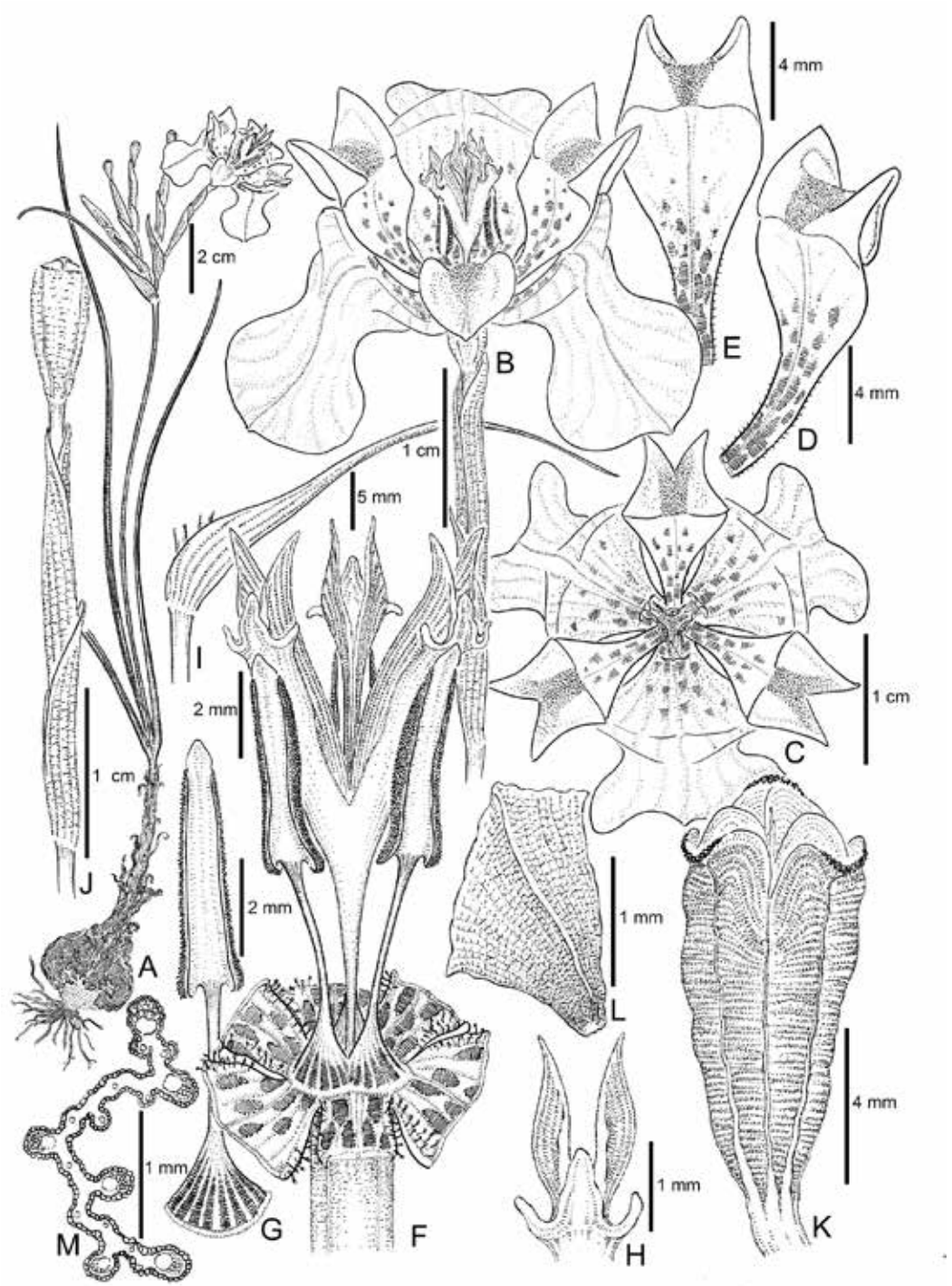

Fig. 3. *Cypella gloriana*. **A,** habit. **B,** flower, lateral view. **C,** flower, frontal view. **D**, inner tepal, lateral view. **E,** inner tepal, frontal view. **F,** flowers, tepals removed. **G**, stamen. **H**, crests of the style branches. **I,** caulinar leaf. **J**, spathe. **K,** capsule with immature capsule. **L,** seed. **M**, leaf cross section. **A-M** from *Deble et al. 15034* (PACA).

C. charruana, however can be separated by its shortly pedunculate spathes, broad outer tepal claws, and smaller size of stamens and styles. Additional features to distinguish *Cypella charruana* from related species are listed in the Table 1.

Specimens with flowers and capsules can be found between November-January. The flowers bloom in the morning and wither around midday. On cloudy days the flowers remain open until the afternoon.

Cypella charruana occurs in less than 100 km² and the area of occupancy is smaller than 10 km², moreover the populations are composed by few individuals and require highly specific habitats. Silviculture and agriculture have increased in the last ten years in the area that *C. charruana* occurs, resulting in a direct threat to the conservation of this species by destroying the natural habitat. Two populations of *C. charruana* were found in the "Área de Proteção Ambiental – APA do Ibirapuitã", a nature conservation unit ranked as sustainable use (Brasil, 1992; Brasil, 2000); however, these populations are not protected, because the preferred environments of *C. charruana* have been invaded and uncharacterized by *Eragrostis plana* Nees (Poaceae) an exotic grass, native to Africa, which has invasive and allelopathic behavior (Coelho, 1986; Coelho, 2000; Medeiros et al., 2004; Medeiros & Focht, 2007; Medeiros et al., 2009). According to the IUCN Red List (IUCN, 2012) the species could be assigned as Critically Endangered (Cr, B1, B2a, b(iii), and D) due to the small extent of occurrence, reduced area of occupancy, few known individuals, highly specific habitat, and direct threats observed.

Specimens examined

BRAZIL. **Rio Grande do Sul**. Santana do Livramento, on the border with Uruguay, source of Quaraí River, in the midst of native grasslands in moist soil on volcanic rock, 30° 58' 43,52" S, 55° 44' 57,88" W, 15-XI-2014, *Deble et al. 15109* (MVFA, SI); on the border with Uruguay, source of Quaraí River, in the midst of native grasslands in moist soil on volcanic rock, 30° 58' 43,52" S, 55° 44' 57,88" W, 15-XI-2014, *Deble et al. 15110* (SI); in the source of Ibirapuitã River in moist soil, 30° 47' 16,10" S, 55° 38' 02,80" W, 2-I-2015, *Deble & de Oliveira-Deble 15111* (PACA); in moist soils of native grasslands, 30° 38' 57,95" S, 55° 41' 22,48" W, 2-I-2015, *Deble & de Oliveira-Deble 15112* (SI).

URUGUAY. **Artigas**. Suelo rocoso al margen del arroyo Sepulturas, 35º 55' 23" S, 56º 06' 14" W, 24-I-2015, *Berazategui et al. 2762* (MVFA).

Cypella gloriana Deble & F. S. Alves, sp. nov. TYPE: Brazil. Rio Grande do Sul, São Vicente do Sul, Cerro da Glória, at the base of the hill in the northern flank, amid the native grasslands on place of soil sandy and stony soil, 29° 45' 29,35" S, 55° 01' 43,07" W, 25-X-2014 (fl., fr.), *L. P. Deble, F. S. Alves & M. I. P. Deble 15034* (holotype, SI; isotypes, MVFA, PACA). Figs. 3, 4, 6C-D.

Cypella gloriana belongs to section Nais, and it is closely related to C. pusilla, however the flowers have larger diameter of the central concavity, the inner tepal blades are narrower and longer with glandular area spreading in a small area above, the stamens show filaments smaller and porrect, and the anthers display broader connective.

Plant 8–22 cm long, underground stems 2–6 cm long. Bulb subglobose to ovoid, slightly compressed, 12–20 × 10–20 mm, prolonged in a collar up to 3 cm, sheathing the underground stem; cataphylls dark-brown, broadly ovate, apex truncate or acute. Basal leaves at anthesis 2–5, blades plicate, and narrowly linear-ensiform, 8–25 × 0.1–0.3 cm. Cauline leaf reduced at one bract, in the distal third of the stem, 2.5–9.5 × 0.05–0.2 cm, at the base sheathing the base of spathes. Flowering stems 7–12 cm long, unbranched or with 2–3 branches up to 1 cm long. Spathes 2–5 per branch, 2.2–3 × 0.2–0.3 cm, herbaceous, pale-green, bivalved, one-flowered, sessile or shortly pedunculate, peduncles up to 0.8 cm long; outer valve 1.2–1.8 cm long, the inner 2.1–2.9 cm long, both with membranous edges covered with short parallel dark–brown longitudinal glandular strips and dots in the distal third. Flowers predominately yellow, 25–35 mm diameter; concavity of the tepals 18–24 mm diameter, 8–12 mm depth. Pedicel filiform, 2.5–3.5 cm long. Tepal whorls sharply dissimilar: outer tepals oblong, 22–27 mm long, yellow veined, concave at the base 8.5–12 mm, reflexed distally or

Table 1. Characters to distinguish *Cypella charruana* and *C. gloriana* from related species.

Character/Species	*C. charruana*	*C. gloriana*	*C. pusilla**	*C. ravenniana***	*C. suffusa****
Plant height (cm)	20–40	8–22	10–25	8–27	25–50
Shape and size of basal leaves (cm)	linear-ensiform, 14–26 × 0.2–0.5	narrowly linear-ensiform, 8–25 × 0.1–0.3	narrowly linear-ensiform, 8–16 × 0.1–0.3	linear 10–22 × 0.2–0.4	narrowly linear 16–25 × 0.1–0.2
Shape and size of cauline leaf (cm)	bracteiform, 3.5–9.5 × 0.1–0.5	bracteiform, 2.5–9.5 × 0.05–0.2	bracteiform, 2–6.5 × 0.1–0.2	linear-ensiform, 6.5–11.2 × 0.3–0.5	narrowly linear-ensiform 7–14 × 0.05–0.1
Spathes per branch	1–3	2–5	2–3	2–4	1–2
Size of spathes (cm)	3.2–3.6 × 0.4–0.5	2.2–3 × 0.2–0.3	2.4–3 × 0.2–0.3	3.6–4.8 × 0.3–0.5	2.8–3.6 × 0.3–0.5
Peduncles of spathes length (cm)	1.4–2.8	up to 0.8	up to 0.5	0.5–1.8	2.5–5.5
Flowers per spathe	1	1	1	1	2
Flower color and diameter (cm)	golden-yellow, 4–5.5	yellow, 2.5–3.5	light-yellow, 2.2–3	shiny yellow, 3.8 – 5.5	shiny golden-yellow, 3.2–4.4
Claws of outer tepals shape	narrowly cuneate	cuneate	cuneate	cuneate	narrowly cuneate
Inner tepals size (mm)	22–28 × 7.5–10	16–20 × 6–7	15–17 × 8–9	23–27	16–20 × 9–10
Anthers length and connective width (mm)	8–9.5 and 0.4–0.5	4.5–5.5 and 0.5–0.7	6–7 and 0.6–0.7	6.5–7.8 and 0.9 –1.2	6–7 and 0.4–0.5
Filaments shape and length (mm)	slender filiform, 8.4–10.5, fused for 0.5–0.8	filiform, 4.5–5, fused for 0.8–1.1	filiform, 5.5–6.5, fused for 0.6–0.8	filiform 5.9–6.5 fused for 0.3 – 0.5	filiform, 5–6, fused for 0.7–0.9
Style length (mm)	8–9	5.5–6.5	4.5–5.5	6.5–8	7–8
Style branches features and length, and shape and length of adaxial crests (mm)	totally free, 9-10, lanceolate, 4.5–6.5	totally free, 5–6, ovate-lanceolate 1.5–2.5	connected in proximal third, 4–5, ovate-lanceolate 1.5–2.5	totally free, 6–7, lanceolate, 4.5–7	totally free, 4–5, lanceolate, 2.5–4
Habitat	high interfluvial areas and sources, among native grassland in clayed and moist soil	area of colluvial deposits, with sandy soils and stony	sandy grasslands and stony grasslands	stony grasslands,	native grasslands among the forest in

Table 1. Continued.

Geographical distribution	Santana do Livramento, southern Rio Grande do Sul State, Brazil, and Artigas and Rivera Departments, northern Uruguay	center-west Rio Grande do Sul State, Brazil	west, east and southern Rio Grande do Sul State, Brazil	southern Misiones, and northeast Corrientes Provinces, Argentina, and western and northwestern Rio Grande do Sul State, Brazil	center Misiones Province, Argentina

* BRAZIL. Rio Grande do Sul: Alegrete, Pedras Mouras, fl. fr., 06-III-2011, *Deble et al. 12833* (PACA). Caçapava do Sul, Guaritas, 30°50'32"S, 53°30'06"W, fl. fr., 17-IV-2011, *Deble et al. 13116* (PACA). Canguçu, estrada para Guarda Velha, fl., 02-V-2006, *Schneider 1260* (ICN). ** ARGENTINA. Corrientes: Ituzaingó, San Carlos, 14, 27° 47' 12,6" S, 55° 54' 24,2" W, fl. and fr., 11-XII-2014, *Keller & Franco 12557* (CTES). Santo Tomé, paraje Península, 28° 19' 48" S, 55° 40' 53,7" W, 15-IV-2014, fl, fr, *Keller et al. 12073* (CTES). Candelaria: Ruta prov. 3, de cerro Corá a ruta nac. 12, 27º 30' S, 55º 37' W, 23-III-1998, *Zuloaga et al. 6572* (SI). ***ARGENTINA. Misiones: Cainguás, predio UNLP, 1, 27° 06' 44" S, 54° 58' 23" W, 15-III-2000, *Biganzoli et al. 830* (Holotype SI029497!, isotype CTES). Private Reserve Valle del arroyo Cuñá Pirú, 27° 06' 44,18" S, 54° 58' 24,96" W, 23-XII-2014, *Deble & Alves 15081* (PACA, SI).

revolute; outer tepal blades yellow, slightly panduriform, 15–20 × 10–12 mm, erect in proximal third, then revolute; outer tepal claws stained purplish–brown or pale–brown, cuneate, 6.5–7.5 mm long, 2.8–3.3 mm wide at the base, and 6–7 mm wide at the apex, trichomes scattered, more abundant in the proximal half of the claw; inner tepals arcuate-recurved, 16–20 mm long, the proximal 2/3 erect–patent, slightly inclined, then curved upward, with a depression in the distal portion, then the distal 1/3 incurved and strongly reclined; inner tepal blades 6–7 mm wide, mostly yellow, with a shiny yellow-cream central depression densely covered by glandular trichomes, surrounded by a lateral high part yellow, without stains; inner tepal claws stained purplish-brown or pale-brown, narrowly cuneate, 7–8 mm long, 1.2–1.8 mm wide at the base, and 4–5 mm wide at the apex, trichomes scattered, more abundant in the proximal half of the claw. Staminal filaments filiform 4.5–5 mm long, porrect, dull-yellow, base dilated purple stained, fused for 0.8–1.1 mm; anthers oblong 4.5–5.5 × 1.2–1.4 mm; connective light-yellow, 0.5–0.7 mm wide, pollen greenish-yellow to ochraceous. Ovary obovate, green, 5–6 mm × 2–2.5 mm. Style 5.5–6.5 mm long; style branches channeled, 5–6 mm long, crests at the apex 3, translucent and yellowish, adaxial crests lanceolate, 1.5–2.5 mm long, abaxial crest deltate, 1 mm long. Capsule obovate, 7–10 mm × 5–6 mm. Seeds oblong to obconical, angulate, light-brown, epidermis papillose striate, 1.5–2 mm long.

Etymology. The epithet *gloriana* refers to the place of occurrence of this species, at the base of the hill denominated "Cerro da Glória", in São Vicente do Sul municipality, Rio Grande do Sul State, Brazil.

Distribution and habitat. *Cypella gloriana* was only found in the hill locally known as "Cerro da Glória" in São Vicente do Sul Municipality, central-western Rio Grande do Sul State, Brazil. The specimens grow at the base of the hill, in an area of colluvial deposits, where the soil is sandy and very stony, at elevations between 100–180 m. According to Reckziegel & Robaina (2008), the colluvial deposits of Cerro da Glória are the contact of two distinct lithological conditions, the medium-gra-

ined sandstone of the "Formação Guará" and the fine-grained sandstone with micaceous minerals of the "Formação Sanga do Cabral". The lithopedological conditions resulting are peculiar and not very abundant in the region, which could explain, in part, the high level of endemism of *C. gloriana*. A restricted geographic range associated to mountains is reported for two other species of the genus, *Cypella trimontina* Ravenna (Ravenna 2009: 2), micro-endemic in the locality of Tres Cerros, La Cruz, San Martín Department, Corrientes, Argentina, and *C. magnicristata* Deble (Deble et al., 2012: 63), narrowly endemic in the range of hills of the "Cerro do Jarau", Quaraí Municipality, Rio Grande do Sul State, Brazil.

Observations. *Cypella gloriana* is closely related to *C. pusilla,* both species are short, with sessile or almost sessile spathes and small flowers. In dried material, these species are difficult to distinguish. However, *Cypella gloriana* can be separated from *C. pusilla* mainly by its bigger perigone with broader and less depth concavity, outer tepals with narrowed claws, inner tepals with blades markedly narrower, and longer upwards, and with glandular trichomes spreading in a small area, stamens shorter, with porrect filaments, smaller anthers, and broader connective. *Cypella gloriana* differs from *C. charruana, C. ravenniana,* and *C. suffusa* by its sessile or almost sessile spathes, and by the smaller size of all floral organs. Additional features that distinguish *C. gloriana* from its allies are listed in the Table 1.

Specimens with flowers and capsules were found between October-November. The flowers bloom in the morning and wither around midday. On cloudy days flowers remain opened until afternoon.

Cypella gloriana occurs in less than 10 km^2 and the area of occupancy is smaller than 2 km^2, where all individuals known belong to a single population. Though several individuals compose this

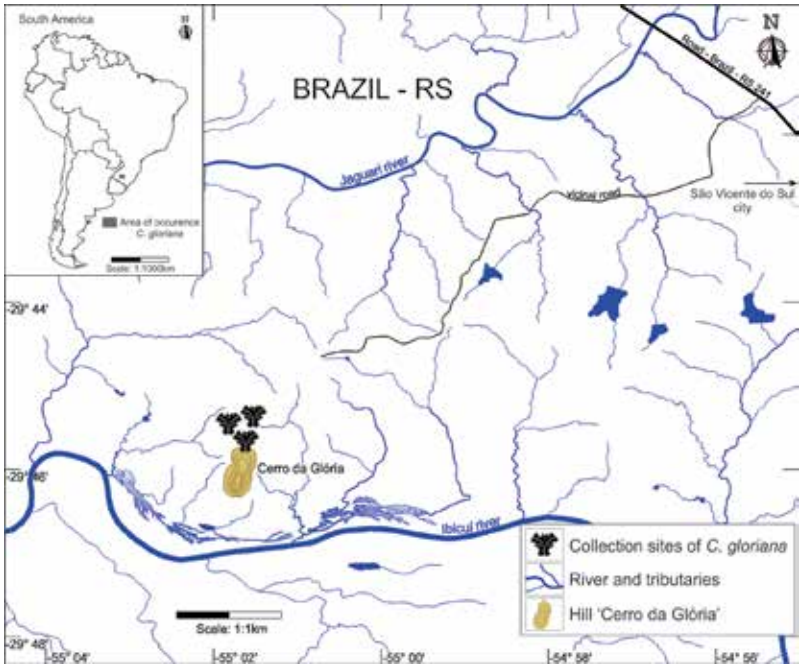

Fig. 4. Geographic distribution of *Cypella gloriana.* Figura en color en la versión en línea http://www.ojs.darwin.edu.ar/index.php/darwiniana/article/view/666/661

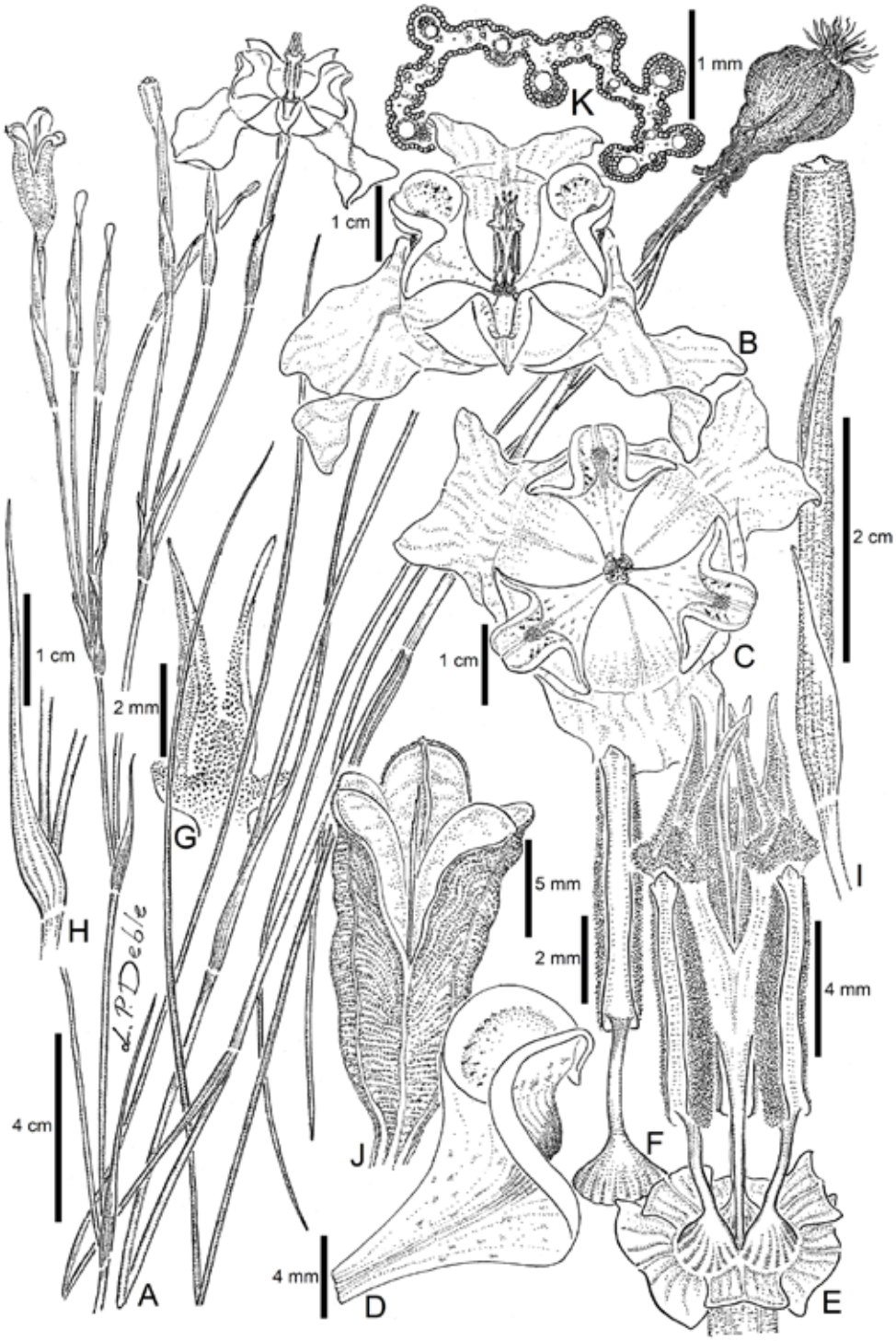

Fig. 5. *Cypella uliginosa*. **A,** habit. **B,** flower, lateral view. **C,** flower, frontal view. **D**, inner tepal. **E**, flowers, tepals removed. **F**, stamen. **G**, crests of the style branches. **H,** caulinar leaf, from distal branch. **I,** spathe, with immature capsule. **J**, capsule. **K**, leaf, cross section. **A–K** from *Deble et al. 15181*(MVFA).

population, the specimens are highly threatened by intensification of the agriculture and by mineral extraction, mainly to earthmoving of routes. According to the IUCN Red List (IUCN, 2012) the species could be assigned as Critically Endangered (CR, B1, B2a, b(iii)) due to the small extent of occurrence, reduced area of occupancy, the single population known, decline in the quality of habitat, and a probably low genetic variability.

Specimens examined

BRAZIL. **Rio Grande do Sul**. São Vicente do Sul, on sandy grasslands, 29° 45' 27,62'' S, 55° 01' 36,72'' W, 2-XI-2012, *Deble & de Oliveira-Deble 12376* (PACA, SI); São Vicente do Sul, Cerro da Glória, base of the Hill, sandy grasslands, among stones, 29° 45' 44,92'' S, 55° 01' 38,61'' W, 25-X-2014, *Deble et al. 15035* (PACA, SI).

Cypella uliginosa Deble & F. S. Alves, **sp. nov.** TYPE: ARGENTINA. Corrientes: San Martín, La Cruz, Provincial Route 114, close to the "Bañado Guaviravi", in boggy land, flowers pale-yellow, 29° 10' 07,15'' S, 56° 42' 51,30'' W, 22-XII-2014 (fl., fr.), *L. P. Deble & F. S. Alves 15181* (holotype, SI; isotype, MVFA). Figs. 5, 6E-F, 7.

Cypella uliginosa belongs to section Nais, and it is closely related to C. laxa, however differs by its inner tepal blade deeply folded, filaments erect, and style with fused branches in the proximal part.

Plant 50–120 cm long, underground stems 14–20 cm long. Bulb subglobose, 20–30 × 20–30 mm, prolonged in a short collar up to 2 cm, sheathing the proximal part of the undergrown stem; cataphylls brown to stramineous, broadly ovate, apex cute, often fimbriate. Basal leaves at anthesis 1–2, blades plicate, linear–ensiform, 32–58 × 0.2–0.6 cm. The most basal cauline leaf in the proximal third of the stem, 25–54 × 0.3–1 cm, at the base sheathing the base of the stem; the upper leaves gradually smaller, the most distal bracteiform, ovate–lanceolate, 1.5–3.5 × 0.5–1 cm, at the base sheathing the basal part of the peduncles. Flowering stems 40–85 cm long, with 2–5 branches in the distal third. Spathes 2–5 per branch, 3.2–3.8 × 0.2–0.4 cm, herbaceous, pale-green, bivalved, one–flowered, pedunculate, peduncles 3.5–9.4 cm long; outer valve 1.9–2.5 cm long, the inner 2.2–3.7 cm long, both with membranous edges covered with sparse parallel light-brown longitudinal glandular strips. Flowers yellow or whitish–cream, 40–50 mm diameter; concavity of the tepals 26–30 mm diameter, and 6–10 mm depth. Pedicel filiform, 3.5–4 cm long. Tepal whorls sharply dissimilar: outer tepals oblong, 36–40 mm long, panduriform, concave at the base for 13–16 mm, yellow or cream veined, reflexes distally; outer tepal blades yellow or whitish-cream, 28–32 × 15–18 mm, provides of a pale–brown or purplish–brown central stripe in the proximal half, erect in proximal third, then revolute; outer tepal claws white-cream or light-yellow, translucent, without stains, with the central stripe of the blades becoming erased distally, broadly cuneate, 7.5–9.5 mm long, 5.4–7.5 mm wide at the base, and 13–14 mm wide at the apex, with scattered trichomes. Inner tepals patent-geniculate, recurved, 15–20 mm long, the proximal 2/3 patent, then curved, with a deep depression in the distal portion, then the distal 1/3 incurved and strongly reclined; inner tepal blades 13–15 mm wide, deeply folded, mostly yellow or whitish-cream, with a darker central depression densely covered by glandular trichomes, surrounded by a lateral high part yellow or cream, with purplish-blue spots or short stripes; inner tepal claws white-cream or light-yellow, translucent, without stains, cuneate, 8–9 mm long, 1.5–1.8 mm wide at the base, and 4–5 mm wide at the apex, with trichomes scattered. Staminal filaments filiform 3–4 mm long, erect or slightly porrect, purple at both ends, and light–purple in the middle part, base dilated light–purple or stained purple, fused for 0.9–1.2 mm; anthers oblong 7.5–8.5 × 2–2.2 mm; connective purple at both ends, and light–purple in the middle part, 0.5–0.7 mm wide, pollen ochraceous to dark–brown. Ovary obovate-oblong, pale-green, 8–10 × 2.2–3 mm. Style 5–5.5 mm long; style branches channeled, 5–6 mm long, slightly porrect, connected in the proximal half, crests at the apex 3, purplish-yellow, adaxial

crests lanceolate, 4–5 mm long, abaxial crest deltate, 1–1.5 mm long, densely covered by stigmatic trichomes extending up to proximal part of adaxial crests. Capsule clavate-oblong, 16–22 × 7–9 mm. Seeds not seen.

Etymology. From the Latin "uliginosus" that means boggy soils, and refers to the habitat of this species, growing exclusively on bogs.

Distribution and habitat. *Cypella uliginosa* occurs in bogs of Entre Ríos and Corrientes Provinces, northeastern Argentina. The individuals grow exclusively in boggy soils, in the Argentinean eco-regions of "Pampa", "Campos y Malezales", "Esteros del Iberá" and most likely also in the eco-region of "Espinal" (for the eco-regions in Argentina see Burkart et al., 1999; Brown & Pacheco, 2006). Despite only three populations are known, it can be rather frequent because their typical habitat is very abundant in northeastern Argentina. The presence of few herbaria specimens is likely owed to the difficulty of collecting in boggy areas, and to the visualization of the plants given the vegetative parts are easily hidden behind the grasses. Furthermore, the bulbs are usually underground about 20 cm, being difficult to obtain.

Observations. *Cypella uliginosa* is easily segregated from other species of the section Nais, mainly by the perigone with scarcely deep central concavity, and inner tepals with deeply folded blade. Despite these peculiarities, this species morphologically resembles *C. crenata* and *C. laxa,* these two species also grow on bogs, and display similar habit and long pedunculate spathes. However, *C. uliginosa* can be distinguished from *C. crenata* by its flowers with yellow or whitish-cream tepals, the inner tepals with folded blades, the stamens with shorter filaments and bigger anthers, and style branches connected at the proximal half. The new species differs from *C. laxa* in the following aspects: tepals with claws pallid translucent, with few deep central concavity, blade of inner tepals deeply folded, with a deep central depression, marked by a darker area covered by ochraceous glandular trichomes, and erect or slightly porrect style branches, with stigmatic trichomes prolonged on the proximal portion of the adaxial crests. The shape of the perigone resembles that of *C. curuzupensis*, however this species displays shorter height, and much smaller flowers. Additional features to distinguish *C. uliginosa* from related species are listed in the Table 2.

It was verified that individuals with whitish-cream flowers display spathes with shorter inner valves, and consequently the pedicels stay visible in the distal third. These specimens grow sympatrically with the typical individuals, however no intermediary forms were observed. Other morphological differences were not detected with further studies being necessary to check if these two variations found are enough to recognize these specimens at distinct taxonomic levels.

Specimens with flowers and capsules were collected between November and December. The flowers bloom in the morning and wither around midday. On cloudy days the flowers remain open until mid afternoon.

Cypella uliginosa ranges more than 50,000 km^2, and the area of occupancy known is smaller than 1,000 km^2. Only three populations have been registered, which are moreover severely fragmented. Besides this, further collections in the area of occurrence of this species are necessary to increase and update information about *C. uliginosa*. This species was found growing only in swamp areas. These environments have been extensively used by man, suggesting *C. uliginosa* could be endangered. However, with the actual data available this species is previously ranked according with IUCN Red List (IUCN, 2012) as Insufficient Data available.

Specimens examined

ARGENTINA. **Corrientes**. Depto. Santo Tomé, Paraje Galarza, "campo inundable, pajonal de *Andropogon lateralis*, todas las piezas florales amarillas", 28° 06' 02'' S, 56° 40' 61'' W, 23-XI-1999, *Arbo et al. 8420* (CTES). **Entre Ríos**. Depto. Colón, Ubajay, National Park El Palmar, in bogs, flowers yellow, 31° 53' 02,32'' S, 58° 14' 11,87'' W, 21-XII-2014, *Deble & Alves 15179* (SI); Ubajay, National Park El Palmar, in bogs, flowers whitish-cream, 31° 53' 02,32'' S, 58° 14' 11,87'' W, 21-XII-2014, *Deble & Alves 15180* (SI).

Key to species of section Nais

1. Spathes two-flowered 2
1. Spathes one-flowered 4
2(1). Basal leaves 10-25 mm broad, often obtuse. Spathes 25-35 mm long. Plants growing on fast-flowing water ..... *Cypella aquatilis*
2. Basal leaves 1-6 mm broad, often acute. Spathes 33-45 mm long. Plants growing on grasslands 3
3(2). Flowers ochraceous-yellow, veins dark. Spathes 2-4 per branch. Inner tepal blades with dark ochraceous glandular trichomes surrounded by abundant, oblique dark-purple stripes. Filaments free, slightly porrect ..... *C. laeta*
3. Flowers golden-yellow, veins yellow. Spathes 1-2 per branch. Inner tepal blades with yellowish glandular trichomes surrounded by few, oblique purples stripes. Filaments adhered to style in the proximal half ..... *C. suffusa*
4 (1). Outer tepals abruptly clawed, distal part of the claw 4-5 mm wide, Outer and inner tepal claws similar in shape and size. Filaments 8.4-10.5 mm long. Anthers 8-9.5 mm long ..... *C. charruana*
4. Outer tepals merely clawed, distal part of the claw 6-11 mm wide. Inner tepal claws much narrower than the outer tepal claws. Filaments and anthers smaller (except *C. rivularis*) 5
5 (4). Spathes with peduncles (1) 2.5-11 cm long. Plants growing on bogs or along grasslands streams, bulbs developed in most soils 6
5. Spathes sessile or peduncles up to 2.5 cm long. Plants growing on grasslands or stony, bulbs developed in dry soils 10
6 (5). Outer and inner tepals brown spotted. Filaments 6.4-9.3 mm long ..... *C. rivularis*
6. Outer tepals not spotted. Inner tepals with reddish-brown spots, sometimes absent or scarce. Filaments 2.8-6 mm long 7
7 (6). Inner tepals patent-geniculate, deeply folded, glandular trichomes scattered at the bottom of the fold 8
7. Inner tepals arcuate-recurved, not folded, glandular trichomes on the top of the blade 9
8 (7). Plants 50-120 cm high. Spathes per branch 2-5, peduncle of the spathes 3.5-9.4 cm long. Filaments 3–4 mm long, up to ½ the length of the anthers ..... *C. uliginosa*
8. Plants 25–50 cm high. Spathes per branch 1-2, peduncle of the pathes 1-4.5 cm long. Filaments 5.5-6 mm long, as long as the anthers ..... *C. curuzupensis*
9 (7). Flowers orange, blades thickened. Inner tepals 22-28 × 7.5-10 mm. Southern Minas Gerais, Brazil. ..... *C. crenata*
9. Flowers yellow, blades thin. Inner tepals 16-20 × 11-15 mm. Southern Paraguay, Northeastern Argentina, and Southern Brazil ..... *C. laxa*
10 (5). Spathes densely pruinose. Flowers white. Outer tepals purplish-brown veined ..... *C. discolor*
10. Spathes non pruinose or scarcely pruinose. Flowers yellow. Outer tepals yellow or orange veined 11
11 (10). Spathes 2.2-3 × 0.2-0.3 cm, sessile or peduncles up to 8 mm. Perigone 23-35 mm diameter. 12
11. Spathes 3.6-4.8 × 0.3-0.5, pedunculate, peduncles 5-18 mm long. Perigone 38-55 mm diameter …. *C. ravenniana*
12 (11). Inner tepals 6-7 mm wide, glandular trichomes spreading on a small area, 1.5-2.5 mm wide. Filaments 4.5-5 mm long ..... *C. gloriana*
12. Inner tepals 8-9 mm wide, glandular trichomes spreading on a broad area, 4-5 mm wide. Filaments 5.5-6.5 mm long ..... *C. pusilla*

CONCLUSIONS

The total number of species in *Cypella* sect. Nais is now thirteen, with descriptions of *C. charruana*, *C. gloriana*, and *C. uliginosa*. Except *C. crenata* endemic to swamp areas among "cerrado" in southern Minas Gerais State, southeastern Brazil, the other species grow exclusively in northeastern Argentina (Corrientes, Entre Ríos, and Misiones Provinces), southern Brazil (Paraná, Rio Grande do Sul, and Santa Catarina States), central and southern Paraguay, and Uruguay. The geographic distribution of these three new species reinforce the high diversity of the genus in northeastern Argentina, northern Uruguay, and southern and western Rio Grande do Sul State, Brazil, showing that the grasslands

Table 2. Characters to distinguish *Cypella uliginosa* from related species.

Character/Species	*C. crenata*	*C. curuzupensis*	*C. laxa*	*C. uliginosa*
Plant height (cm)	60–120	25–50	55–135	50–120
Shape and size of basal leaves (cm)	narrowly linear-ensiform, 16–40 × 0.06–0.1	narrowly linear-ensiform, 15–30 × 0.07–0.2	narrowly linear-ensiform, 12–45 × 0.06–0.2	linear-ensiform, 32–58 × 0.2–0.6
Shape and size of cauline leaf (cm)	Narrowly inear-ensiform, 8.5–25 × 0.1–0.3	bracteiform, 2.5–9.5 × 0.05–0.2	linear-ensiform, 13–54 × 0.1–0.2	narrowly linear-ensiform 25–54 × 0.3–1
Spathes per branch	1–2	1–2	1–2	2–5
Size of spathes (cm)	3.6–4.8 × 0.2–0.4	3.2–3.5 × 0.2–0.3	3.4–5 × 0.2–0.3	3.2–3.8 × 0.2–0.4
Peduncles of spathes length (cm)	4–8	1–4.5	4–11	3.5–9.4
Flowers per spathe	1	1	1	1
Perigone color and diameter (cm)	orange, 3.5–4.5	golden-yellow, 3–4	yellow, 3.5–5	yellow or whitish-cream, 4–5
Claws of outer tepals shape	Cuneate	narrowly cuneate	cuneate	cuneate
Inner tepals size (mm)	22–28 × 7.5–10	16–20 × 9–11	16–20 × 11–15	15–20 × 13–15
Anthers length and connective width (mm)	6–7 and 0.7–0.8	5.5–6.5 and 0.9–1	7–8.5 and 0.7–0.8	7.5–8.5 and 0.4–0.5
Filaments shape and length (mm)	slender filiform, 5–5.5, connected for 0.5–0.8	slender filiform, 5.5–6, connected for 0.5–0.7	filiform, 2.8–4, connected for 0.3–0.5	filiform, 3–4, connected for 0.9–1.2
Style length (mm)	6–7	3.5–4.5	5.5–6.5	5–5.5
Style branches features and length, and shape and length of adaxial crests (mm)	totally free, 5-6, lanceolate, 4.5–6.5	connected in proximal third, 5–6, ovate-lanceolate 3–3.5	connected in proximal third, 4–5, lanceolate 2.5–3.5	connected in proximal half, 5–6, lanceolate, 4–5
Habitat	moist soils	moist soils	moist soils	moist soils
Geographical distribution	southern Minas Gerais State, southeast Brazil	southern Paraguay	southern Brazil, southern and eastern Paraguay, and northeast Argentina	northeast Argentina

*BRAZIL. Minas Gerais: Caldas, 22-XI-1874, *Regnell III-1216* (S1). ** PARAGUAY. Villa Rica: Mbubevo, *Hansen 3871* (SI). *** BRAZIL. Paraná: Tijucas do Sul, *Hatschbach 25400* (MBM, CTES). PARAGUAY. Alto Paraná: Reserva Biológica Itabó, *Caballero Marmori1326* (PY, CTES).

of these regions are the richest in number of taxa of *Cypella* sect. Nais. Moreover, the majority of these species should be recognized as threatened, mainly because of the reduced distribution area of the greater part of the taxa, specific habitat of occurrence, and decline in the quality of habitat, mainly by intense use of the grasslands by man. Actions for the conservation of these environments are urgently needed so these species do not become extinct in nature.

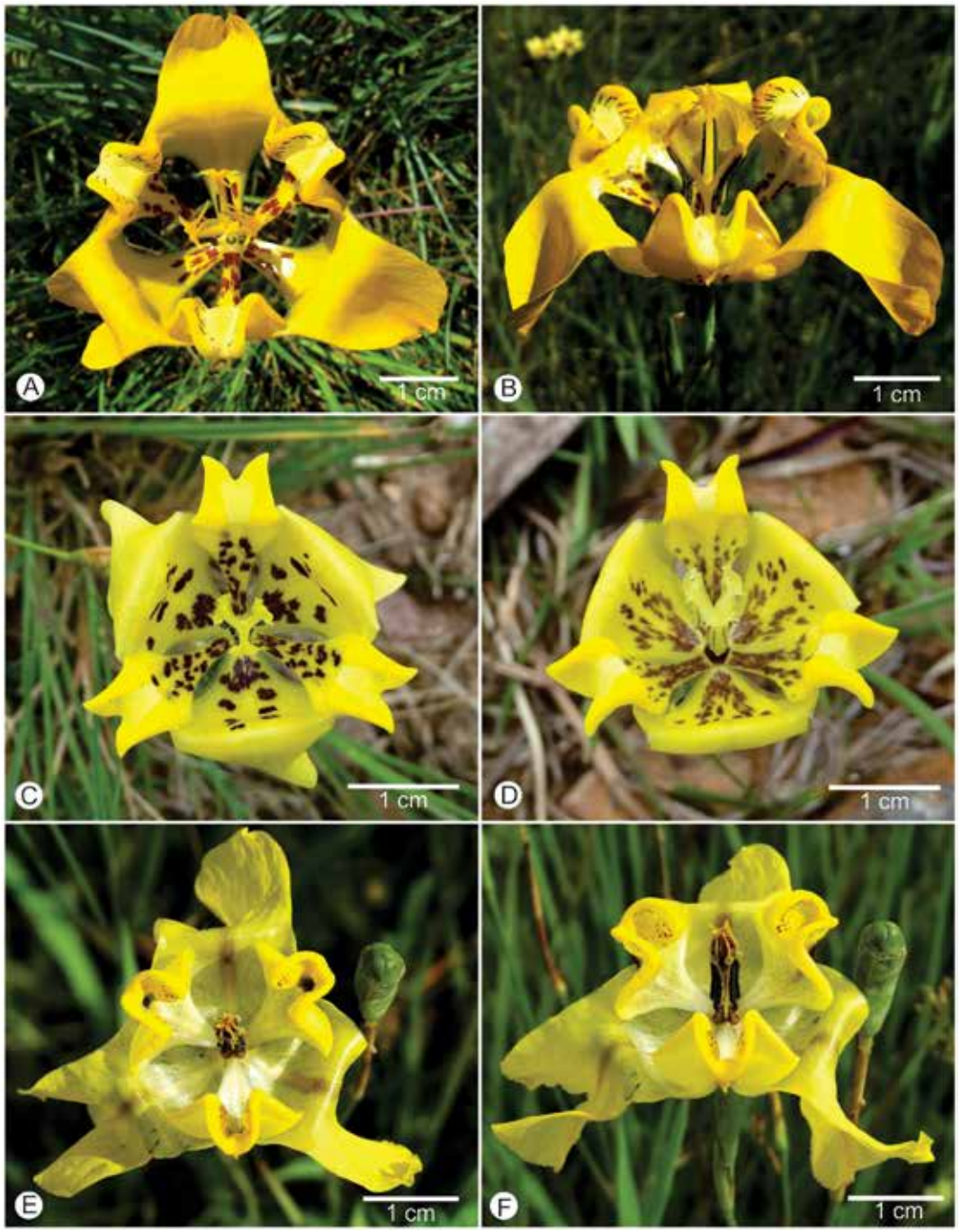

Fig. 6. *Cypella charruana.* **A,** flower, upper view. **B,** flower, lateral view. *Cypella gloriana.* **C,** flower, upper view. **D**, flower, inclined view. *Cypella uliginosa.* **E**, flower, upper view. **F**, flower, lateral view. **A–B,** from *Deble et al. 15108*; **C,** from *Deble et al. 15034*; **D,** from *Deble et al. 15035*; **E–F,** from *Deble et al. 15181*. Figura en color en la versión en línea http://www.ojs.darwin.edu.ar/index.php/darwiniana/article/view/666/661

Fig. 7. Geographic distribution of *Cypella uliginosa.* Figura en color en la versión en línea http://www.ojs.darwin.edu.ar/index.php/darwiniana/article/view/666/661

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