






Advances towards a revision of *Phalocallis*: taxa of the Southeast South American Grasslands

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Abstract. Advances towards a revision of *Phalocallis*: taxa of the Southeast South American Grasslands

In this first contribution towards a comprehensive revision of the genus *Phalocallis* (Iridaceae), deals with the species occurring in the Southeast South American Grasslands (SESA Grasslands), including those taxa that also spread beyond this region through neighboring areas. Four species are recognized: *P. coelestis*, *P. crassispatha*, *P. leucopepla* and *P. plumbea*. The first one, *P. coelestis* is taxonomically defined, while *P. plumbea* is rehabilitated from its synonym, and the main differences between both taxa are commented. *Herbertia platensis* is considered a new synonym of *P. coelestis*, while *Tigridia exaltata* is a new synonym of *P. plumbea*. Lectotypes are designated for *Herbertia platensis*, *P. coelestis* and *P. plumbea*. For *T. exaltata*, lectotype and epitype are indicated. *P. crassispatha* and *P. leucopepla* are new species proposed herein. All species are described and illustrated in detail, and information is inferred for each taxon on etymology, popular names and uses, specimens examined, phenological data, distribution and habitat, and conservation status. To enrich the information mentioned in the work, a geographic distribution map and a table with the main distinctive characteristics between the taxa are presented.

Key words: Argentina, Brazil, Iridaceae, Paraguay, taxonomy, Tigridiaceae, Uruguay.

Resumen. Avances hacia una revisión de *Phalocallis*: taxones de los Pastizales del Sudeste Sudamericano

En esta primera contribución hacia una revisión integral del género *Phalocallis* (Iridaceae), se tratan las especies presentes en los Pastizales del Sudeste Sudamericano (SESA Pastizales), incluyendo aquellos taxones que también se expandieron más allá de esta región a través de áreas vecinas. Se reconocen cuatro especies: *Phalocallis coelestis*, *P. crassispatha*, *P. leucopepla* y *P. plumbea*. *P. coelestis* se define taxonómicamente, mientras que *P. plumbea* se rehabilita a partir de su sinónimo, y se comentan las principales diferencias entre ambos taxones. *Herbertia platensis* se considera un nuevo sinónimo de *P. coelestis*, mientras que *Tigridia exaltata* es un nuevo sinónimo de *P. plumbea*. Se designan lectotipos para *Herbertia platensis*, *P. coelestis* y *P. plumbea*. Para *T. exaltata*, se indican el lectotipo y el epitipo. *P. crassispatha* y *P. leucopepla* son nuevas especies propuestas aquí. Todas las especies se describen e ilustran detalladamente, y para cada taxón se incluye información sobre etimología, nombres populares y usos, especímenes examinados, datos fenológicos, distribución y hábitat, y estado de conservación. Para complementar la información mencionada en el trabajo, se presenta un mapa de distribución geográfica y una tabla con las principales características distintivas de los taxones.

Palabras-clave: Argentina, Brasil, Iridaceae, Paraguay, taxonomía, Tigridiaceae, Uruguay.

Phalocallis Herbert (1839: 3710) is a small South American genus comprising between 3 and 5 species (Ravenna 2003a, Ferreira 2021). However, it still appears in some databases with only *P. coelestis* (Lehmann 1826: 17) Ravenna (1977: 9) as a valid taxon (POWO 2025).

Phalocallis was erected by Herbert mainly based in differences in style shape, dehiscence of capsules, and seed morphology of *Cypella plumbea* Lindley (1838: 71). After, Klatt (1862, 1882) and Baker (1877) recognized *Phalocallis* as a segregated genus, composed only by *P. plumbea*

Accepted on October 1, 2025.

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(Lindley 1838: 71) Herbert (1839: 3710). Kuntze (1891) transferred six species for *Phalocallis*, since he recognized *Cypella* Herbert as illegitimate. Baker (1892) in his *<Handbook of Irideae>* changed the view first established by himself in *<Systema Iridacearum>* (Baker 1877) and recognized *Cypella* in a broad sense, including as synonyms the genus *Hesperoxiphion* Baker (1877: 127), *Larentia* Klatt (1882: 362) and *Phalocallis*. The majority of subsequent authors followed the concept adopted in Baker's Handbook of Irideae (e.g. Rusby 1896, Baker 1903, Spegazzini 1917, Beauverd 1923, Diels 1930, Foster 1945, Foster 1946, Foster 1950).

At first Ravenna (1964) recognized *Cypella* in a broad sense, establishing four subgenera: *Cypella*, *Phalocallis* (Herbert 1839: pl. 3710) Ravenna (1964: 53), *Hesperoxiphion* (Baker 1877: 127) Ravenna (1964: 53, not formally published) and *Viruflos* Ravenna (1964: 53). But then, Ravenna (1977) changes his concept when studying living plants of several species of South American Iridaceae, and based on his observations he began to refine the generic limits of some American genera, and following the concept adopted by Herbert (1839) and Baker (1877) he recognized some genera of Iridaceae previously listed in *Cypella* as segregated, among them *Phalocallis*. For this genus, Ravenna listed three species: *P. coelestis*, *P. geniculata* (Klatt 1871: 517) Ravenna (1977: 9), and *P. oreophila* (Spegazzini 1917: 44) Ravenna (1977: 9). After, Ravenna (2003a) proposed a review of the genus recognizing these three taxa cited and added for the Paraguayan dry Chaco the new *P. oreophila* Spegazzini f. *flava* Ravenna (2003a: 7). According to Ravenna, the genus is distributed in subtropical and tropical areas of North Argentina, Paraguay, Southeastern Bolivia, and Brazil. On the other hand, Roitman *et al.* (2008), Goldblatt & Manning (2008), and Huyalla & Wood (2012) continued to address *Phalocallis* under *Cypella*. Nonetheless, morphological, anatomical and molecular data evidences *Phalocallis* as aligned to the subtribe Tigridiinae, while *Cypella* belongs to the subtribe Cipurinae (Ravenna 2009, Chauveau *et al.* 2012, Deble & Alves 2020, Ferreira 2021, Santos & Deble 2022, Deble 2025).

In this first contribution towards a revision of the genus *Phalocallis*, we deal with the species of the genus occurring in the region of the *<Pastizales del Sureste de América del Sur>* (Southeastern

South America Grasslands, sensu Di Giacomo & Krapovickas 2005, Azpiroz *et al.* 2012). All species are described, illustrated, and information on etymology, popular names and uses, specimens examined, phenological data, distribution and habitat, conservation status, maps and table are made available.

Material and Methods

Specimen review, morphological analysis and geographic distribution—The research was carried out by field surveys, and analysis of herbarium specimens, including digital images (herbaria B, BR, C, CTES, FCQ, G, HDCE, FURG, ICN, K, LE, LP, M, MVHM, MBM, MVM, MVFA, MVJB, NY, P, PACA, PY, SI, SMDB, US; acronyms according to Thiers 2025+). The morphological data mentioned in the text and the terminology used follow Goldblatt & Manning (2008), Beentje (2010) and Deble (2025). The description of the taxa is based on morphological characteristics of plants observed in natural habitat, cultivated specimens and on dry material. For the conservation status of the studied species, the method of Bachman *et al.* (2011) was applied through the GeoCAT platform, which consists of inserting the occurrence points of the species individually. The software considers the number of populations and the distance between them to calculate the extension of occurrence and the area of occupancy.

Study area—The *<Pastizales del Sureste de América del Sur>* (SESA Grasslands, from the English acronym of Southeast South American Grasslands, sensu Di Giacomo & Krapovickas 2005, Azpiroz *et al.* 2012) comprises the most extensive grassland area in South America, with approximately 1,000,000 km², forming an arc around the Plata basin, and covering the east and northeast of Argentina, central and southern Paraguay, southern Brazil and all Uruguayan territory, and includes four regions: *<Pampa>* and *<Campos>* both forming the *<Pastizales del Río de la Plata>* (as defined by Soriano *et al.* 1992), the *<Campos de Altitude>* of southern Brazil and the *<Chaco húmedo>* (Clay *et al.* 2008) (Table 1, Figure 1). The SESA Grasslands roughly encompasses the Pampean and Espinal phytogeographic provinces sensu Cabrera & Willink (1980), and parts of the Chaco and Paranaense phytogeographic provinces. This region is an important hotspot of biodiversity and endemism, with more

than 12,500 species reported for the Brazilian Campos region. (Andrade et al. 2018, Andrade et al. 2023). From Iridaceae, tribe Tigridieae are recognized 75 taxa, 65 of them endemics of the SESA (Deble 2022). Some of the taxa herein treated also can occur out of the SESA Grasslands, and occasionally extent its geographic distribution on grasslands within a forest matrix corresponding to the Misiones

Rainforest (Paraná Phytogeographic province) and the Atlantic Forest (Atlantic phytogeographic province).

Elaboration of figures—For the elaboration of figures 1 and 13, it was utilized the software ArcMap version 10.7, and the features were created from the base titled Topographic. The base map used for both figures is titled “National Geographic World Map.”

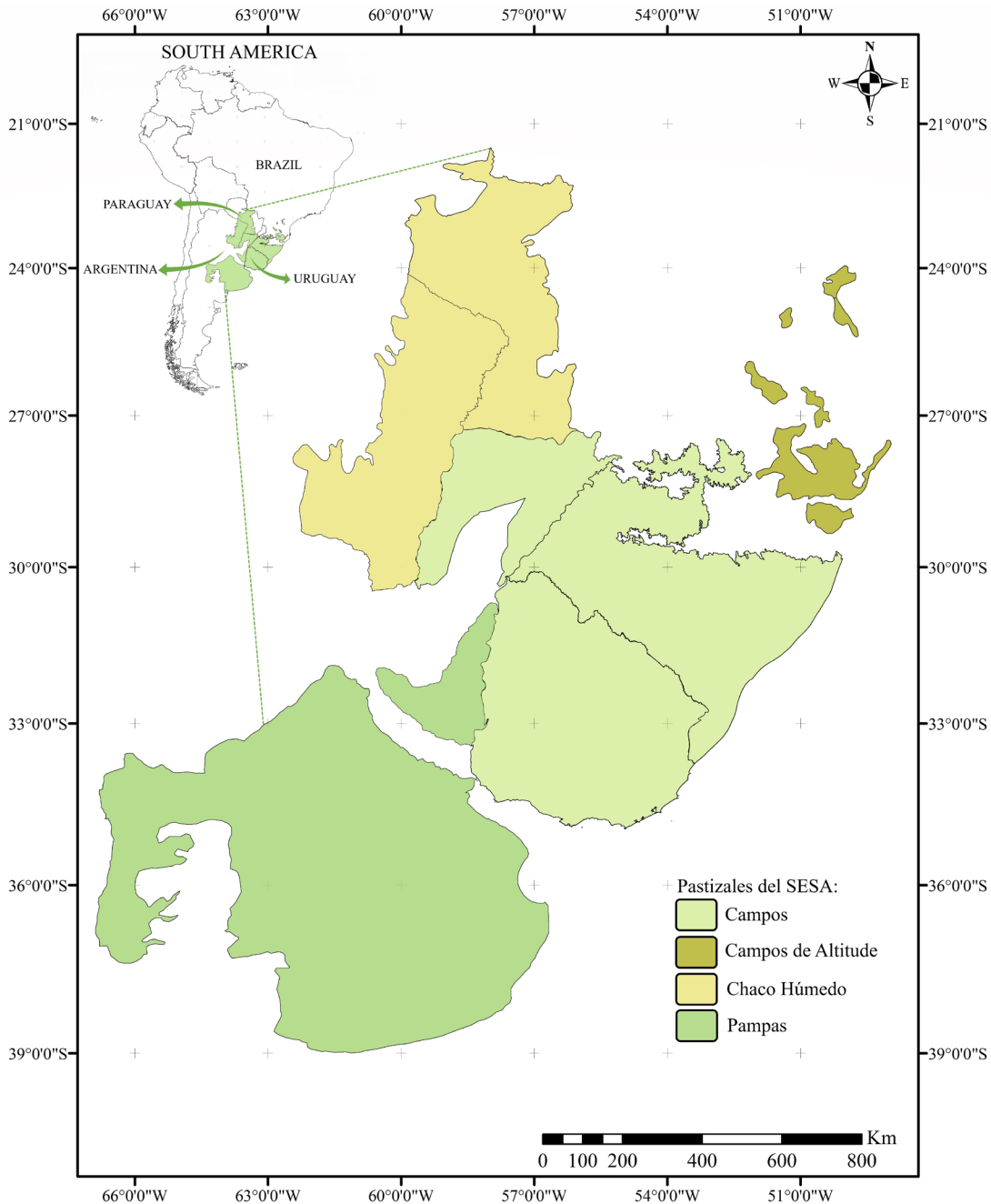


Figure 1. Map of the SESA Grasslands.

Using this layer, the SESA and species geographic distribution maps were created. The boundaries established by Soriano *et al.* (1992) and Di Giacomo & Krapovickas (2005) were followed to characterize areas understood as <Campos> with necessary adaptations to establish the map of the SESA Grasslands To better define the ranges of these formations, in addition to the aforementioned base map, ecoregion and geological maps of Argentina, Brazil, and Paraguay were used, as well as, for Brazil, the shape of the <new limits of the Biomes of Brazil> (IBGE 2019). To prepare Figure 13, only

the base map was used, defining the polygon of the range species. Figures 2, 3 and 4 were originally published respectively in Herbert (1839: pl. 3710), Jacques (1841: pl.2), and Van Houtte (1848: 395). Figures 5, 6, 9 and 10 were used watercolor on Bristol paper, and the illustrations are performed on different specimens of *Phalocallis coelestis*, *P. crassispatha*, *P. leucopepla* and *P. plumbea*. For the elaboration of Figures 7, 8, 11 and 12 were used photographs of specimens in nature or in cultivation and the boards were edited in the Adobe Photoshop program, version 23.x.

Table 1. Regions of the SESA Grasslands and their main characteristics.

	Río de La Plata Grasslands		Campos de Altitude	Chaco húmedo
	Campos	Pampas		
Characteristics	flat to undulating grassland ecosystems, developed in shallow or deep soils with varied geological formations and from different geological periods, which include sedimentary, plutonic, extrusive and metamorphic rocks, resulting in greater diversity of environments.	a complex of flat or undulating grassland ecosystems developed on shallow or deep soils, on Tertiary and Quaternary sedimentary formations. Including flooded areas, mountainous formations of ancient plutonic and metamorphic rocks, from the La Ventana and Tandil complexes.	high grassland ecosystems in a mosaic of forest vegetation, developed in shallow or deep soils, on Jurassic and Cretaceous basalt rocks. Including flooded areas, lakes, saxicolous refuges and rocky escarpments.	complex of grassland and forest ecosystems developed on sedimentary formation of Paleozoic to quaternary. Including flooded or periodic flooded areas, lakes mainly associated with palm groves others heliophile trees.
Main plant formations and ecosystems	grasslands, wetlands, and mountainous systems. Increase in the percentage of grasses with C4 metabolic cycle towards the north. Phanerophytic element in the southern portion is restricted to gallery forests or heliophile tree communities (<i>Prosopis affinis</i> , <i>Parkinsonia aculeata</i> , <i>Vachellia caven</i>), and in the northern portion it includes hillside forests, flooded forests, <serranias> vegetation, and palm groves (<i>Butia</i> spp.).	grassland, wetlands, and mountainous systems. Predominance of grasses with C3 metabolic cycle. P h a n e r o p h y t i c element is restricted to gallery forests or heliophile tree communities (<i>Prosopis</i> spp., <i>Vachellia</i> spp., <i>Aspidosperma quebracho-branco</i>) or palm groves (<i>Butia yatay</i>).	rolling grasslands, rock formations, and escarpments. Grasses with C3 and C4 metabolic cycle. Phanerophytic elements are common, with elements typical of these formations (<i>Araucaria angustifolia</i> , <i>Butia eriospatha</i> , <i>Drymis brasiliensis</i>) and originating from the Atlantic and Paraná phytogeographic provinces.	predominantly flat environments, mosaic of grasslands, heliophile tree communities and forests. Predominance of grasses with C4 metabolic cycle. P h a n e r o p h y t i c elements are Fabaceae, Anacardiaceae, palm trees (<i>Copernicia</i> , <i>Butia</i> , and <i>Syagrus</i>) and Cactaceae, and mosaic with savanna fragments <Cerrados>.

Typifications—The proposed typifications are in accordance with the standards established by the International Code of Nomenclature for algae, fungi, and plants (Turland *et al.* 2025).

Results and discussion

Phalocallis Herbert, Botanical Magazine 65: pl.

3710. 1839.

≡ *Cypella* subg. *Phalocallis* (Herbert) Ravenna, Revista Instituto Municipal de Botanica. Buenos Aires 2: 53. 1964.

Flowers actinomorphic, straight, fugacious, with a shallow or deep central depression. Tepals, 6, connivant at the base slightly adnate. Outer tepals, 3, distinctly larger than the inner tepals;



Figure 2. *Phalocallis plumbea*, original illustration of Herbert (1839: pl. 3710).

outer tepals blade broadly obovate, nearly circular or spatulate, slightly patent to revolute; outer tepals claw cuneate, with long glandular trichomes scattered. Inner tepals, 3, YHG oblique-recurved or ascendant-erect; inner tepals blade nearly rectangular, then curved upward, the distal one-third incurved and strongly reclinate, densely hairy in proximal part and covered with a carpet of lipidic trichomes upward, surrounded by a lateral high part, densely hairy; inner tepals claw linear-cuneate to cuneate, densely speckled with darker colors. Stamens, 3, positioned below the style branches. Staminal filaments, slightly adnate at

the base or fused up to $\frac{3}{4}$ of total length in a conical column, slightly porrect distally, anthers slightly porrect to oblique, with the connective thickened at the lateral ends, dehiscence longitudinal, which initiates the opening near at the apex; ochraceous to dark-blue thecae; pollen whitish, ochraceous, gray or blue. Ovary angled or compressed, claviform or oblong, trilocular, pluriovulate. Style slender towards the base, at apex thickened, 3-branched in its distal half; branches ascending or erect-ascending, crested at top; crests two, peltate, both adaxial, stigmatic portion auriculate, extending into the dorsal part of both crests. Capsule obovate-clavate or obovate-oblong, angled, with thin walls. Seeds obconical, semispherical or nearly circular, angled or strongly compressed, epidermis smooth or folded.

Plants herbaceous, bulbous, with fibrous and thickened roots, sometimes prolonged in a rhizome, and nearly ovoid to oblong bulbs; cataphylls fleshy, the outermost brownish-orange or yellowish-brown, the innermost yellow or white-cream. Leaves greenish-yellow, green or bluish-green, plicate, rigid, with blade and leaf-sheath very different. Spathes pedunculate, 2–5-flowered; valves two, the outer one smaller or subequal than the inner one, both plicate in cross section. Pedicels terete, surrounded by a bracteole; bracteole flat, plicate or convolute, membranous and translucent or with shape and texture

similar of the valves.

Typus: *Cypella plumbea* Lindley, Edwards's Botanical Register 24(Misc.): 71. 1838.

Observation—*Phalocallis* can be recognized essentially by its bulbs with fleshy and yellow or reddish-orange cataphylls, by its plicate leaves, anatomical characterized by bundles of lignified fibers, by its spathes containing two plicate valves of subequal length with additional bracts involving the flower pedicels, and inflorescence with two or more flowers per spathe (Ravenna 2003a, Ferreira 2021, Santos & Deble 2022). The flowers are often lilac-bluish or blue, fugacious, with tepals whorls sharply dissimilar, being the inner tepals smaller, and with the blade hairy and having a complex

arrangement tridimensional, and its claws are ascendant or patent, while the outer tepals are often oblong, pandurate, and slightly patent or reflexes, with abruptly clawed tepals (Ravenna 2003a, Goldblatt & Manning 2008). Ravenna (2009) mentioned the shape of style and style branches as diagnostic to distinguish *Phalocallis* and *Cypella*.

Since the style in the first genus is petaloid, and the style-branches have two rounded crests at top with the stigmatic area in two ear appendices, while *Cypella* displays not petaloid style, and style-branches with three acute crests, two of them adaxial and one abaxial, having a perpendicular stigmatic area. However, morphological and molecular data showed that *Phalocallis* is not related to *Cypella* (subtribe Cipurinae, p.p.), and presents uncertain taxonomic affinities with the genus *Gelasine* Herbert within the subtribe Tigridiinae (Chauveau *et al.* 2012, Pastori *et al.* 2018, Deble 2025).

***Phalocallis coelestis* and *P. plumbea*, end of a synonymy**

Phalocallis coelestis is considered the well-known species of the genus, given its relatively wide geographical distribution and common cultivation in European gardens and other parts of the world since the mid-19th century. However, the identity of *P. coelestis* requires explanation, given that the main species cultivated in Europe, which served as the basis for the description of different taxa, such as *P. plumbea* and *Tigridia exaltata* Jacques (1841: 16, pl.2), has showy flowers, a long ovary with a longitudinal groove, large fruits with seeds strongly compressed, winged, almost circular or broadly elliptical (Figure 2, 3 and 4). These morphological characteristics do not correspond to those found in other South American taxa identified as *P. coelestis*, which apparently demonstrates that linked to the name *P. coelestis* there is a complex of different taxa. However, in order to delimit this group of species, it is essential to typify names and define synonyms. *Marica coelestis* is the oldest of these names, having been described by Lehmann (1826: 17), who established the taxon from material grown at the Horto Botanico Hamburguensi. The description of Lehmann is quite succinct and contains no information on the origin of the material.



Figure 3. *Tigridia exaltata*, original illustration of Jacques (1841: pl.2).

Marica coelestis was forgotten for over 100 years, since during the second half of the 19th century and 20th century, *Cypella plumbea* [*P. plumbea*] was the main name to which these taxa were linked. Van Houtte (1848) and Planchon & Van Houtte (1853 [1854]) were the first to establish *Tigridia coelestis* as the older name, recognizing <Le *T. coelestis*, Hort. Berol. (*P. plumbea* W. Herb. Flore, IV, p. 395. *T. azurea*, Hort. *Cypella plumbea*, Lindl.) est encore une espèce mexicaine, dont l'introduction est due à M. Otto du jardin botanique de Berlin, de qui nous l'avons recue en 1836, dans les circonstances que nous avons narrées dans le IV vol. page 395 de la Flore>.



Figure 4. *Phalocallis plumbea* original illustration from Horto Van houtteano (Van Houtte 1848: 395).

Van Houtte (1848) further explained that *<la plante en question, dont M. Lindley attribue l'introduction, à l'état vivant, en Angleterre, vers 1837, à un anglais (Frédéric Dickson), (ce que nous ne prétendons point contester), était toutefois déjà connue dès longtemps, à Berlin, sous le nom de Tigridia celestis, et M. Van Houtte, étant Directeur du Jardin Botani- que de Bruxelles, avait remarqué, dès 1836, aussi, dans cet établissement, cette même Iridée, dont l'étiquette portait le nom de M. Otto (alors Directeur du Jardin bot. de Berlin): Iridée qu'il multiplia avec empressement, à cause de sa beauté, et dont il expédia beaucoup d'individus en Anglerre!>*. However, Klatt (1862, 1871, 1882) and Baker (1877, 1892) maintain

Cypella [Phalocallis] plumbea as valid and this interpretation is reproduced in other studies. Diels (1930) proposed the name *Cypella coelestis* (Lehmann 1826: 17) Diels (1930: 498) and, later, Ravenna (1964) when reducing *Phalocallis* to the level of a subgenus of *Cypella*, listed the three valid names within this subgenus, among them, *Cypella coelestis*. Later, Ravenna (1977), upon rehabilitating *Phalocallis*, transferred *Marica coelestis* to *Phalocallis* and established *Cypella plumbea* [*P. plumbea*] as a synonym. The descriptions of *P. coelestis* reproduced by Ravenna (2003a, 2003b) and Ravenna & Deble (2023) are based on a mixture of different species, evidenced by the size of the perigone, ovary, fruit and seed shape, which probably contributes to the misinterpretation of the species in recent decades. Thus, given the need to establish valid names, and its synonyms, a review of names, protologues and types was carried out, demonstrating that *P. coelestis* and *P. plumbea* are distinct taxa. The mentioned species are described and illustrated below, with their synonyms and necessary typifications established.

Phalocallis coelestis (Lehmann) Ravenna, Noticiario Mensual, Museo Nacional de Historia Natural. Santiago de Chile 249: 9. 1977. Bas.: *Marica coelestis* Lehmann, Index Seminum Hamburgensis 1826: 17. 1826. ≡ *Cipura coelestis* (Lehmann) Heynhold, Nomenclator Botanicus Hortensis 1: 197. 1840. ≡ *Cipura northiana* var. *coelestis* (Lehmann) C. Morren, Annales de la Société Royale d'Agriculture et de Botanique de Gand 5: 209. 1849. *Cypella coelestis* (Lehmann) Diels, Natürlichen Pflanzenfamilien ed. 2, 15a: 498. 1930. Typus: not indicate in the protologue. Lectotypus (**hic locus designatus!**): BRAZIL. Without precise place: without date *<Brasilia Sello> F. Sellow s.n.* (lectotypus K001183782 digital image seen!). Figures 6, 7, 13.

Observation—The type of *Marica coelestis* is not indicated in the protologue. Later, Lehmann (1830: 379) gives a more complete description and refers *<Habitat in Brasilia>*. However, in the HBG herbarium there is no collection of *Phalocallis coelestis* that can be considered a type. At this time, Friedrich Sellow (1789-1831) was the main person responsible for sending material from Brazil to Europe and it is assumed that the material cultivated

in the Horto Botanico Hamburgensi came from a donation from the Horto Botanico Berolinensi, which had collections by the aforementioned Prussian naturalist. It is important to highlight that the donation/exchange of materials between botanical gardens has been a common practice for centuries (Neves 2024) and many duplicates of Sellow's collections were distributed to different institutions. In herbarium B, there were collections of *P. coelestis* carried out by Sellow, according to the analysis of duplicates of this herbarium deposited in other institutions (BR, K and LE Herbaria). Based on the recovery of information and analysis of historical exsiccate, the collection deposited in K was chosen as the lectotype, because it contains a complete specimen, in excellent condition of preservation, and because it is the only one that contains the indication <in Brasilia, Sello> (K001183782 digital image seen!). It is important to emphasize that in the same lectotype assembly there are seeds of *P. plumbea*, coming from material cultivated in England (K001183782 digital image seen!). Other Sellow collections were found at BR and LE herbaria, but these should be excluded as isolectotypes because they have different information on the label. The collection deposited at the BR herbarium indicates <in Brasilia 3958, Sello> (BR0000033075709 digital image seen!). The exsiccate contains an incomplete specimen of *Phalocallis coelestis* with mature spathes but without flowers and fruits, and a branch of *Gelasine elongata* containing a spathe with several immature fruits. The specimen in LE indicates <Montevideo 800, Sello> (LE00001278 digital image seen!). The collection in LE includes a specimen of *P. coelestis* with spathes containing immature fruits and pedicels, while on the right is a specimen of *G. elongata* with spathes containing immature fruits.

= *Tigridia coelestis* Lehmann, Index Seminum Hamburgensis 1826: 17. 1826. (nom. nud.).

= *Herbertia platensis* Spegazzini ex L.H. Bailey, *The Standard Cyclopedia of Horticulture* 3: 1476. 1919. ≡ *Herbertia platensis* Spegazzini, *Revista de la Facultad de Agronomía y Veterinaria, La Plata. La Plata [Argentina]: La Facultad* 1(1-4): 81. 1895 [nom. nud.]. ≡ *Cypella platensis* Spegazzini, *Physis*, Buenos Aires 3: 45. 1917 [pro syn. *Cypella plumbea*]. ≡ *Polia platensis* Spegazzini, *Physis*, Buenos Aires 3: 45. 1917 [sph. form. *Pohlia*]. Typus: Not indicated in the protologue. Lectotypus (**hic locus designatus!**): ARGENTINA. Buenos Aires, C. Spegazzini s.n. [ex Museo Spegazzini, LPS 11155] (lectotypus LP075829!) (**Syn. nov.**).

Observation—*Herbertia platensis* is a name that appeared in a list of species from which

Spegazzini collected seeds and sent for cultivation at the Buenos Aires Botanical Garden (Gallastegui 1895). Later, this name, together with the variations *Polia* [*Pohlia*] and *Cypella platensis*, are often referred to the same taxonomic entity in some horticultural studies, but without a formal description, e.g. Burgerstein & Abel 1898, Garden's Chronicle 1900, Arnott 1901, Cook 1903 and Robinson 1906. Spegazzini (1917) considered *C. platensis* as a synonym of *C. plumbea*, although he recognized that <Los ejemplares platenses se apartan algo del tipo descripto y figurado en la Flora Brasiliensis del Martius por tener la parte inferior y la uña de los tépalos de color indigo muy oscuro con rayas transversales blancas>, furthermore he indicates that <Habiéndola comunicado a mis amigos y corresponsales con el nombre de *Cypella* (*Pohlia*) *platensis* los conocidos jardineros de Nápoles Herb y Wulle publicaron en sus catálogos una buena descripción en alemán y un lindo cliché de ella bajo el nombre de *Pohlia* (*Herbertia*) *Platensis*>. Later, in 1919 (and not 1915, as is often erroneously stated), Bailey described the taxon as subordinated to *Herbertia*, carrying out a formal description. In the <Catálogo de las Plantas Vasculares del Conosur> the taxon is listed as doubtful (Roitman et al. 2008, IBODA 2025), while in *Reflora H. platensis* is recognized as a synonym of *H. lahue* (Eggers 2025). During the review of the LP herbarium, it was possible to locate a specimen identified by Spegazzini himself as <*Cypella platensis*>, which was chosen as the lectotype.

Description—Herb 40–120 cm tall, underground stems 8–16 cm long. Roots fasciculate, straw-colored, thickened. Bulb ovoid, oblong or obconic, 30–50 × 25–30 mm, prolonged in a rigid collar 6–11 cm long; cataphylls bright, reddish-orange or orange, yellowish near to base, smooth, the older ones with grooves, broadly ovate-lanceolate, apex acuminate. Basal leaves at anthesis 1–2, 35–70 cm long; blades bluish-green, linear-elliptic or linear-lanceolate 22–45 × 1.4–3 cm; leaf-sheath plicate, narrower towards the apex, 12–28 × 0.5–1 cm. The most basal cauline leaf in the proximal third of the stem, 24–46 cm long; blades elliptic, 12–31 × 1.2–2.6 cm, base obtuse, apex slightly acute; leaf-sheath plicate, 12–20 × 0.5–1 cm; the upper leaves gradually smaller the most distal bracteiform, ovate-lanceolate, 5–7 × 0.4–0.6 cm, at the base sheathing the basal part of peduncles.

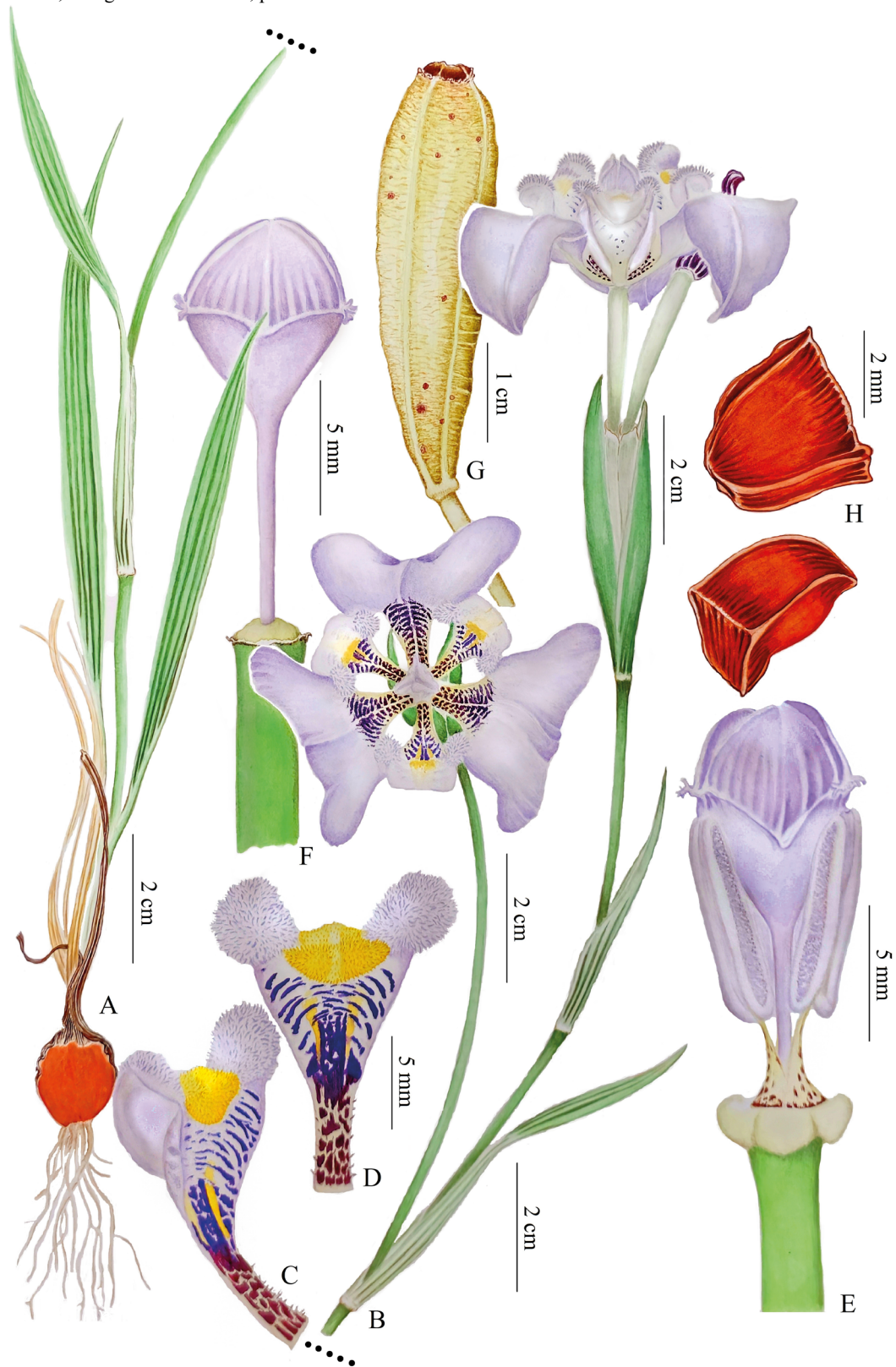


Figure 5. *Phalocallis coelestis*. A, Basal part of the plant. B, Flowering stem. C, Inner tepal, lateral view. D, Inner tepal, frontal view. E, Flower with tepals removed. F, Gynoecium. G, Capsule. H, Seeds.

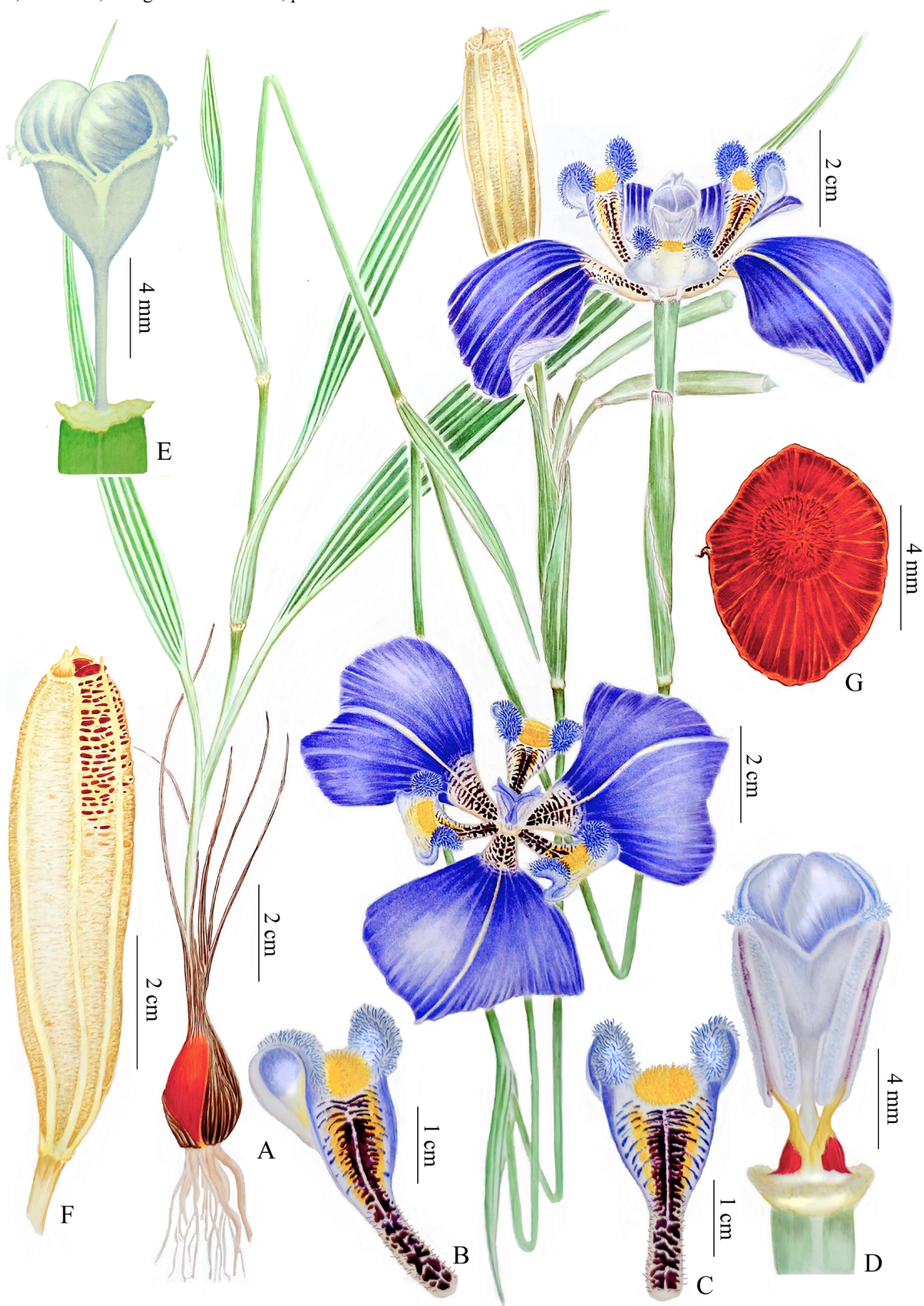


Figure 6. *Phalocallis plumbea*. A, Plant. B, Inner tepal, lateral view. C, Inner tepal, frontal view. D, Flower with tepals removed. E, Gynoecium. F, Capsule. G, Seed.

Flowering stems 28–90 cm long, 2–4-branched in its distal half. Spathes 1–3 per branch, oblong, 40–55 × 5–8 mm, herbaceous, pallid bluish-green, bivalved, 2-flowered, pedunculate, peduncles 6–16 cm long; outer valve 28–46 mm long, obtuse-apiculate at the top; the inner 40–54 mm long, obtuse at the top, with membranous and hyaline edges covered with sparse parallel glandular strips; pedicel filiform, 45–65 mm long, with 1–2 flat and hyaline bract. Flowers 50–65 mm diameter, sky-blue to dark indigo-blue, the concave part and claws with reddish-brown macules; central concavity 20–28 mm diameter, and 14–18 mm depth. Tepal whorls notably dissimilar. Outer tepals broadly obovate, panduriform, 34–48 × 30–38 mm long, concave at the base for 15–18 mm; blades 22–34 × 30–38 mm, sky-blue to dark indigo-blue, with the central vein pallid blue, revolute, apices rounded or truncate, apiculate; claws cuneate, 10–12 mm long, 3–4 mm wide at the base, and 6–8 mm wide at the apex, ochre colored, densely purplish-brown stained. Inner tepals oblique-recurved, 18–21 × 10–14 mm (up to 16 mm in dry specimens), the proximal half slightly ascendant, then curved upward, the distal one-third incurved and strongly reclinate; blades predominately blue or violet-blue, with a yellow or gold-yellow central part, with purplish-brown stripes and stains, densely hairy in proximal part and covered with lipid trichomes upward, surrounded by a lateral high part, blue colored and densely hairy; claws narrowly cuneate, 7–8 mm long, 2–2.5 mm wide at the base, and 2.5–3 mm wide at the apex, ochre colored, densely reddish-brown stained. Filaments conic 3–3.5 mm long, slightly inclined, base thickened, yellowish, purplish stained, attached for 1.5–2.5 mm; anthers oblong 7–9 × 1.7–2.1 mm; connective light-blue or bluish-cream, 1.1–1.5 mm, thecae dark indigo-blue or dark violet-blue, pollen greyish-blue or blue. Ovary pallid-green, narrowly oblong, slightly angled, 15–24 × 2–3 mm. Style 12–16 mm long. Style branches petaloid, slightly porrect, 6–7 mm long, attached for ½ of total length; crests at the apex 2, blue, semispherical, 3–4 mm. Capsule oblong or obclavate, angled, 35–50 × 10–13 mm. Seeds slightly compressed, shine, semispherical, 3.5–5 × 3–4.5 mm, reddish-brown, thickened in the margin, epidermis smooth.

Etymology—From Latin, the adjective *caeruleus* means of the <color blue>, <sky blue>, <cerulean>, a reference to the blue colored perigone of the species.

Vernacular names and uses—There are no vernacular names recorded in native regions of *Phalocallis coelestis*, although it is given popular names when cultivated. In the United States, the species is known as <goblet-flower>, and in Italy as <tigridia-platense> or <tigridia-azzurro>. In the past, the species may have had similar names and uses reported from *Phalocallis crassispatha*, since it is found in places where native human populations no longer exist or are lacking in character, but thrived in the past. Due to the beauty of its flowers, the species is cultivated in Europe (e.g. France, Italy) and in the United States. However, it is rarely used for this purpose in South America, even where it is native.

Additional specimens examined—ARGENTINA. Buenos Aires: Punta Lara, 4 January 1940, *G. Dawson* 940 (LP 0075825 image seen!). Buenos Aires: without precise place, without date, *C. Spegazzini* s.n. (LP0075824 image seen!). Entre Ríos: Colón, Parque Nac. El Palmar, Paseo La Glorietta, 27 February 1993, *N. Bacigalupo*, *E. Nicora* & *A. Vizini* 1602 (SI174551!). BRAZIL. Without precise place, January 1900, *J. Cantera* 147 (K002210096 image seen!). Paraná: Guarapuava, Cachoeira dos Turcos, 13 February 1969, *G. Hatschbach* 21167 (MBM 114571!). São Mateus do Sul, rio Potinga, 9 February 1966, *G. Hatschbach* *et al.* 13809 (MBM22232!). Santa Catarina: Capão Alto, BR116, km 301, entre Vacaria (RS) e Lages (SC), 11 March 2014, *G. Heiden* & *C.T. Oliveira* 2164 (ECT5435!). Capivari de Baixo, Serra Geral, en lugares pantanosos do campo, February 1891, *E. Ule* 1914 (P02066865 image seen!). Lages, Km 23-24 South of Lages, 17 March 1957, *L.B. Smith*, *R.M. Klein* 12231 (US01327729 image seen!). Mirim Doce, Fazenda Agropecuária, interior unidade amostral, banhado, 9 February 2019, *A. Kassner-Filho* *et al.* 4765 (FURB62763!). São José do Cerrito, 10 February 2023, *A. Kassner-Filho* & *D. Santos* 8916 (FURB74256!). Rio Grande do Sul: without precise place <in Brasília 3958, Sello> [ebenda von Alegrete über die Misiones durch den nördlichen Teil des Staates nach Porto Alegre, sensu Urban (1893)], May to November 1826, *F. Sellow* 3958 (BR0000033075709 digital image seen!); Without additional data, 31 July 1878 (K001732716 image seen!). Arroio dos Ratos, Granja Faxinal, 11 March 1984, *K. Hagelund* 15190 (ICN193993!). Cambará do Sul, Parque Nacional Aparados da Serra, rochas do arroio Perdiz, 23 June 1980, *J. Waechter* 1628 (ICN477111!); Lageado das Margaridas, 16 January 2016, *L. Eggers* & *O. Chauveau* 973 (ICN187393!). Parador Casa da Montanha, estrada interna Fazenda Camarinhas, 17 January 2016, *L. Eggers* & *O. Chauveau* 977 (ICN187394!). Cerrito, BR293, 8 April 2018, *G. Heiden* & *J.R.V. Iganci* 2436 (ECT5465 image seen!). Guaíba, BR116, km307, Fazenda São Maximiano, 19 November 1995, *N.I. Matzenbacher* s.n. (ICN110416!). Jaquirana, Jaquirana <p.S. Frsco de Paula, in paludosis altissime graminosis>, 20 February 1952, *B. Rambo* s.n. (PACA4052! MBM39441!); em campo úmido, próximo a turfeira, 7 March 2012, *P.J.S. Silva-Filho* 1577 (ICN190250!); RS110, Km48, 20 January 2017, *L. Eggers* & *O. Chauveau* 1024 (ICN194538!). Passa Sete, Botucaraí, 1 January 2021, *J. Shaefer* s.n. (ICN203142!).



Figure 7. *Phalocallis coelestis*. A, Plant. B, Flower, inclined view, showing the spathe. C, Flower, upper view. D, Flower, with outer tepals and one inner tepal removed. E, Inner tepal, frontal view. F and G, Androgynocium, in two different views. H and I, Gynocium, in two different views. J, Capsule. K, Seeds. L, Spathe, lateral view. M, Detail of indumentum of inner tepal. N, Detail of Stigmatic region of crests of style branch. O, Style branches, upper view.

Pinhal da Serra/Esmeralda, rio Tigre, 22 January 2008, *T.B. Guimarães & C.R. Grippa* 1374 (ICN183090!). Porto Alegre, morro São Pedro, Ecociência Espaço de Conservação, 2 April 2006, *R. Setubal* 122 (ICN150038!); culta ex São Lourenço do Sul, 7 January 2012, *L. Eggers* 703 (ICN190601!). São Francisco de Paula, 5 March 1998, *S. Diesel s.n.* (US3397298 digital image seen!). São José dos Ausentes, região campo rupestres entremeados com mata nebulosa ou de Araucária, 700-1000m s.n.m., January 2000, *M. Sobral et al.* 8988 (ICN123165!). URUGUAY. Without precise place, without date, <Montevideo 800, Sello>[in Uruguay und Rio grande do Sul, auf der Reise von Montevideo nach Porto Alegre sensu Urban (1893)], 1822-1823, *F. Sellow* 800 (LE00001278 digital image seen!). Río Negro, Campo Bichadero, río Negro y arroyo Yapeyú, 29 December 1997, *E. Marchesi & M. Vignale s.n.* (MVFA 27360); Balza al Norte de río Negro, 20 March 1914, *M.B. Berro* 7278 (MVFA!). Rivera, alrededores en lugar húmedo, 20 January 1944, *D. Legrand* 3502 (MVM18540!). Tranqueras, Arroyo Sauzal, camino a Portones Negros, 28 March 1985, *E. Marchesi, Ziliani & Berrutti s.n.* (MVFA 17550); Las Taquaras, Cofusa, 3 March 2009, *C. Brussa & F. Muñoz s.n.* (MVJB 27538!); Ruta 5, km 490, Arroyo curticerías, 12 December 1997, *E. Marchesi & I. Grela s.n.* (MVFA27148!). Tacuarembó, Gruta de Los Cuervos, 9 March 1966, *B. Rosengurt & Del Puerto* 10012 (MVFA!). FRANCE. Saint-Jouin-de-Blavou, La Chamotière, en culture, plante achetée à la pépinière Ellebore, originaire du Brésil, 15 July 2023, *L. Eggers & O. Chauveau* 1115 (P00837201 image seen!).

Phenology—*Phalocallis coelestis* flowers from December to April and bears fruit from January to May. From May onwards, the species enters vegetative dormancy and begins to produce new leaves only in late November. The flowers open only once, in the early morning (8 a.m.) and wither around midday. On cloudy days, the flowers may remain open until mid-afternoon. According to observations of cultivated material, *P. coelestis* is self-pollinated, and fruit production with viable seeds is abundant.

Distribution and Habitat—Specimens occur in wetlands and streams on grasslands and high grasslands since the sea level up 1,000m altitude, in an extent of occurrence (EOO) of 342,360 km² and area of occupancy (AOO) of 132 km², along the Southern Brazil (Paraná Santa Catarina and Rio Grande do Sul), to the northern, central-western, and southwestern Uruguay, reaching the Plata Basin, near the mouth of the Uruguay River from the north of Buenos Aires and south of Entre Ríos provinces (Argentina) to the vicinity of the municipality of Ubajay in the east of the same province. The bulbs grow in deep, hydromorphic soils, developed on gray or dark soils of rocks of different origins, but mainly intrusive igneous and basalt.

Conservation status—*Phalocallis coelestis* has an extent of occurrence (EOO) of 342,360 km² and area of occupancy (AOO) of 132 km². Populations are fragmented and contain few individuals. Furthermore, the occurrence sites are under anthropogenic pressure, mainly from human occupation and agriculture, indicating the need for monitoring to determine whether the species may be considered threatened in the near future (IUCN 2012, IUCN 2024).

Phalocallis plumbea (Lindley) Herbert, Botanical Magazine 65: pl. 3710. 1839. Bas. *Cypella plumbea* Lindley, Edwards's Botanic Register 24(Misc.): 71. 1838. Typus: not indicate in the protologue. Lectotypus (**hic locus designatus!**). ARGENTINA. Buenos Aires: without date <*Buenos Ayres Tweedie*> *J. Tweedie s.n.* (lectotypus K001731428 digital image seen!). Figures 2, 3, 4, 5, 8 and 13.

Observation—Lindley (1838: 71-72) refers to the origin of the species <*A Mexican plant, raised from seeds imported by George Frederick Dickson (...)*>. Dickson (1787-1859) lived in Buenos Aires and Montevideo (1807-1821) at the beginning of the 19th century, and sent a large quantity of botanical material to England, mainly collections from British settlers in South America and naturalists. At this time, John Tweedie (1775-1862) was one of the most important collectors of material, mainly from Argentina and the La Plata basin. Fortunately, in the herbarium K there is a collection by Tweedie <*Buenos Ayres Tweedie*> (K001731428 digital image seen!) in an excellent state of preservation, and with the same morphological characteristics indicated in the protologue by Lindley, being chosen as lectotype. The watercolor reproduced by Herbert, although very beautiful, is not indicated as a type, since the illustrated material comes from a different place than the type, according to the following information: <*Some bulbs of this plant have been raised in England from Mexican seeds, and others have been received by Mr. Anderson of the Chelsea Garden, from Mr. Otto at Berlin (...). The specimen here represented flowered in the autumn at Spofforth, being on the latter importation*> (Herbert 1839: pl. 3710).

= *Tigridia exaltata* Jacques, *Annales de flore et de pomone* 10: 16, pl. 2 1841. Typus: not indicated in the protologue. Lectotypus (**hic locus designatus!**): Illustration of *Annales de flore et de pomone* 10: plate 2. Epitypus (**hic locus designatus!**): FRANCE. Île-de-France: Yvelines, Versailles, chez le Jardinier Truffant que le cultive en pleine terre, le 30 juillet 1838 [or 1858]. (epitypus K001617521 digital image seen!) (syn. nov.).

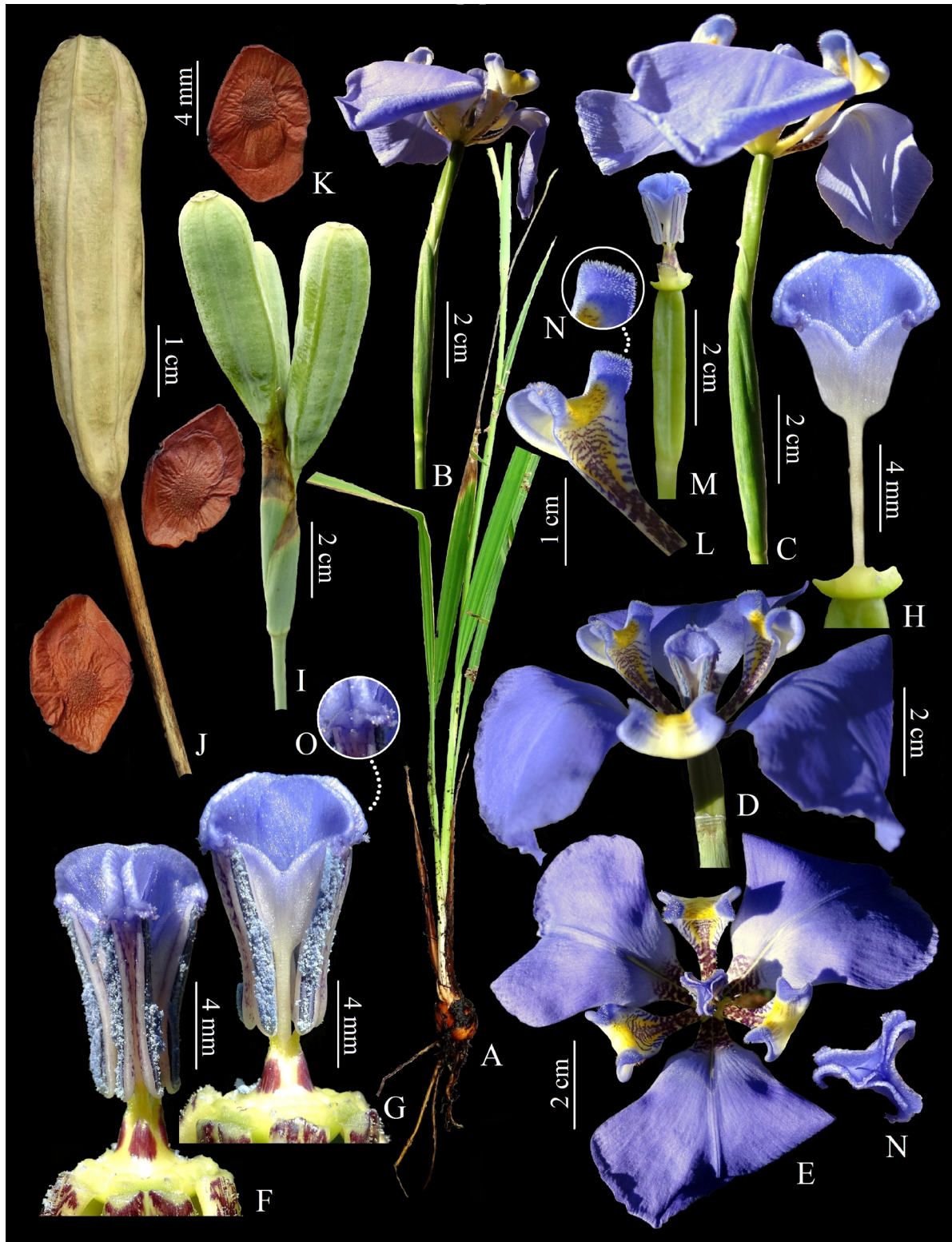


Figure 8. *Phalocallis plumbea*. A, Basal part of the plant. B, Distal part of the plant. C, Flower, lateral view, showing the spathe. D, Flower, inclined view. E, Flower, upper view. F and G, Androgynoeceum, in two different views. H, Gynoeceum. I, Spathe with mature capsules. J, Capsule. K, Seeds. L, Inner tepal, inclined view. M, Gynoeceum, lateral view, showing the ovary. N, Detail of indumentum of inner tepal. O, Detail of stigmatic region of crests of branch. P, Style branches, upper view.

Observation—Jacques (1841: 16, pl.2) described *Tigridia exaltata*, based on material cultivated in Paris, and indicated that < *J'en ai récolté les graines, en 1839, dans un jardin de Paris, où la plante est actuellement perdue; on n'a pu m'indiquer son lieu originaire. Ces graines, semées aussitôt la récolte, ont donné plusieurs pieds qui ont fleuri en juillet et août de cette année 1841*>. The plate represents the apex of a flowering plant, where it is possible to observe the long ovary, with a longitudinal groove, characteristic of *Phalocallis plumbea*. The illustration was chosen as a lectotype and, to complement it, an epitype was chosen, from material in an excellent state of preservation and with the same morphological characteristics mentioned in the protologue, cultivated in Île-de-France, Yvelines, Versailles. The date of collection is not clear on the label; however, it is assumed to have been in 1838 or 1858.

= *Tigridia azurea* Anon., Flore des serres, et des jardins de l'Europe 9: 139. 1853[1854] (nom. nud.)

Description—Herb 35–55 cm tall, underground stems 6–8 cm long. Roots fasciculate, straw-colored, thickened. Bulb ovoid or oblong-ovoid, 30–55 × 20–35 mm, prolonged in a rigid collar 3–6 cm long; cataphylls bright, reddish-orange or orange, yellowish near to base, smooth, the older ones with grooves, broadly ovate-lanceolate, apex acuminate. Basal leaves at anthesis (0) 1–3, 38–55 cm long; blades bluish-green, elliptic-lanceolate 28–35 × 1.2–3.5 cm; leaf-sheath plicate, narrower towards the apex, 8–19 × 0.3–0.9 cm. The most basal cauline leaf in the proximal third of the stem, 14–26 cm long; blades elliptic, 6–11 × 0.8–1.8 cm, base obtuse, apex acute; leaf-sheath plicate, 8–14 × 0.7–1.2 cm; the upper leaves gradually smaller the most distal bracteiform, ovate-lanceolate, 6–8 × 0.4–0.6 cm, at the base sheathing the basal part of peduncles. Flowering stems 25–45 cm long, 1–2-branched in its distal half. Spathes 1–3 per branch, narrowly oblong, 55–90 × 7–11 mm, herbaceous, pallid bluish-green, bivalved, 3–4-flowered, pedunculate, peduncles 8–18 cm long; outer valve 45–62 mm long, obtuse-apiculate at the top; the inner 54–89 mm long, truncate-apiculate at the top, with membranous and hyaline edges covered with sparse parallel glandular strips; pedicel filiform, 50–75 mm long, with one flat and hyaline bract. Flowers 65–90 mm diameter, bluish-white, pallid-blue, lead-blue, violet-blue or indigo-blue, the concave part and claws with

reddish-brown macules; central concavity 25–30 mm diameter, and 10–12 mm depth. Tepal whorls notably dissimilar. Outer tepals broadly obovate, panduriform, 42–51 × 40–45 mm long, concave at the base for 16–18 mm; blades 35–38 × 40–45 mm, bluish-white, pallid-blue, lead-blue, violet-blue or indigo-blue, with a central vein yellowish in proximal half, become bluish at top, slightly patent, apices rounded, apiculate; claws cuneate, 9–11 mm long, 4–5 mm wide at the base, and 8–8.5 mm wide at the apex, yellowish, densely purplish-brown stained. Inner tepals ascendant-recurved, 20–24 × 14–17 mm, the proximal half slightly ascendant, then curved upward, the distal one-third incurved and strongly reclinate; blades predominately violet-blue or indigo-blue, with a white-cream to yellow central part, with purplish-brown stripes and stains, densely hairy in proximal part and covered with lipid trichomes upward, surrounded by a lateral high part, blue colored and densely hairy; claws narrowly cuneate, 7–8 mm long, 2.5–3 mm wide at the base, and 3–4 mm wide at the apex, yellowish, densely reddish-brown stained. Filaments conic 3–4 mm long, slightly inclined, base thickened, yellowish, with a purple dorsal macula, attached for 1.5–2.5 mm; anthers oblong 8–10 × 1.8–2.3 mm; connective light-blue, 1.2–1.8 mm, with purplish-blue stains, thecae dark violet-blue, pollen greyish-blue or blue. Ovary pallid-green, narrowly oblong 18–35 × 2–5 mm, with a longitudinal groove. Style 16.5–19 mm long. Style branches petaloid, slightly correct, 7–8.5 mm long, attached for ½ of total length; crests at the apex 2, blue, semispherical, 3–4 mm. Capsule oblong, angled, 55–80 × 10–18 mm. Seeds strongly compressed, winged, shine, nearly circular or broadly elliptic 6–8 × 5.5–7 mm, reddish-brown, thickened in the margin, epidermis smooth, except in a nearly central, circular and verrucose area.

Etymology—From the Latin the adjective *plumbeus* means <leaden>, <made of lead>, a reference to the lead-colored perigone of the material described by Lindley.

Vernacular names and uses—In the places where *Phalocallis plumbea* occur, there are no records of vernacular names, although when cultivated it is given popular names. In France <tigridie-élève> or <tigridie-bleu>, in England and Australia <blue-tiger-iris> in United States <goblet-flower>.

In the past, the species may have had similar names and uses reported from *Phalocallis crassispatha*, since it is found in places where native human populations no longer exist or are lacking in character, but thrived in the past. Due to the beauty of its flowers, the species is cultivated in Europe (e.g., France and England), Australia, United States and other parts of the world. However, it is rarely used for this purpose in South America, even where it is native.

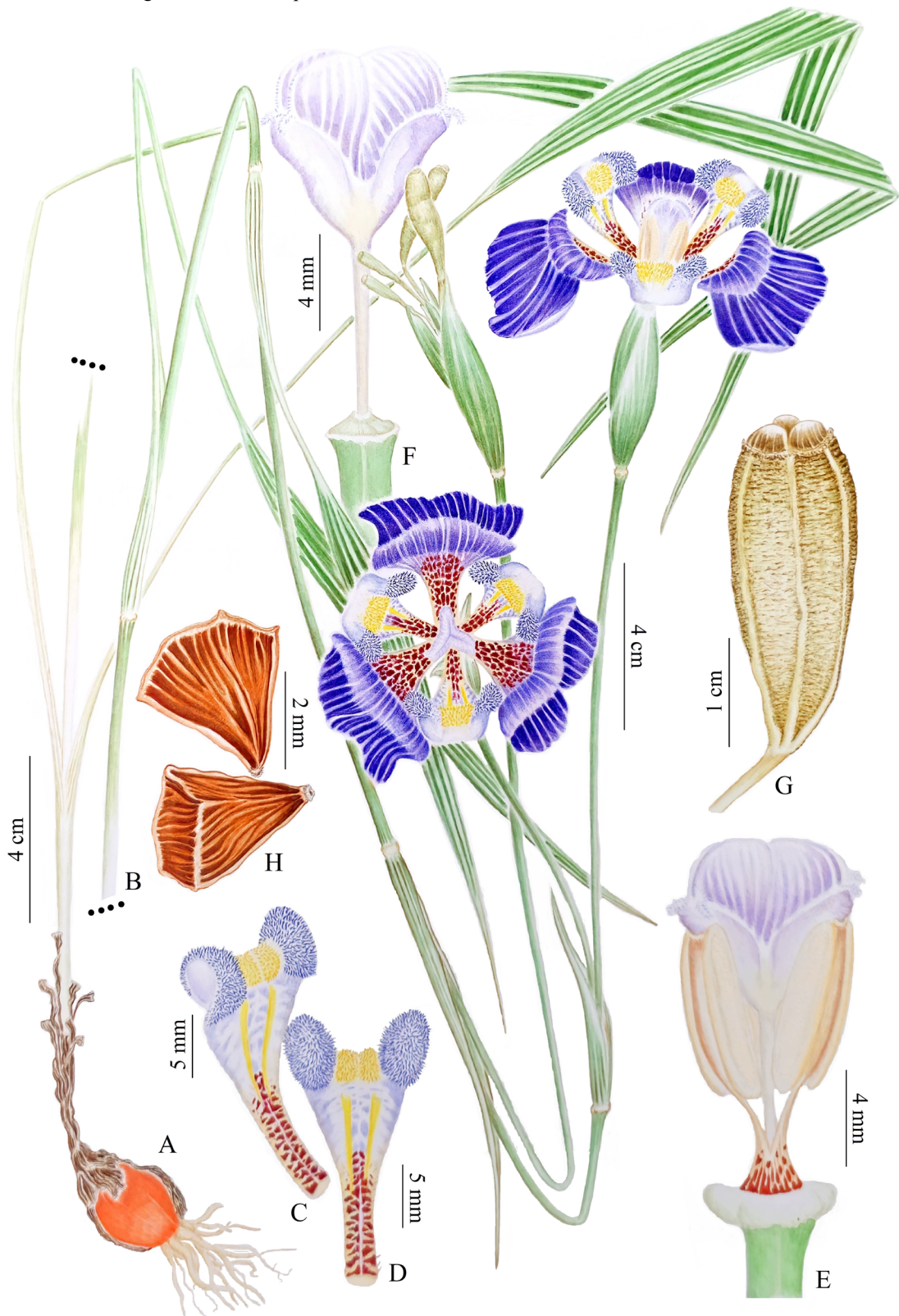
Additional specimens examined—ARGENTINA. Entre Ríos: Concordia, alrededores de Salto Grande, 22 January 1977, *N. S. Troncoso et al.* 1702 (SI174550!). Concordia, Puente Alvear sobre ruta 14, bajos del Yaquerí, 11 January 1990, *N.M. Bacigalupo, E. Guaglianone & R. Fortunato* 1238 (SI174548!). Concordia, Est. Exp. INTA, 18 October 1971, *A. Burkart* 28587 (SI28587!). Delta del Paraná, Río Ceibo, 25 November 1932, *A. Burkart* 5078 (SI174549!). BRAZIL. Santa Catarina: Caçador, 10 January 2021, *C. Welker s.n.* (ICN180246!). Imbituba, Praia do Rosa, 31 December 2013, *L.P. Deble & A.S. Oliveira* 12981 (ICN). Urubici, Parque Nacional de São Joaquim, Santa Bárbara, trilha da Cascatinha, 1400ms.m, 25 January 2019, *L.A. Funez et al.* 8575 (FURB64322!). Rio Grande do Sul: Canela, Parque Estadual do Caracol, vale abaixo da cachoeira, 28 December 1972, *P. Pellizzaro et al. s.n.* (ICN21828!). Pelotas, BR116, Km 499, 27 November 2003, *L. Eggers & T.T. Souza-Chies* 39 (ICN180238!); I.A.S. [Instituto Agrônomo do Sul], beira do banhado, 6-7 January 1955, *J. Costa Sacco* (PEL1526!). São José dos Ausentes, Fazenda dos Sonhos, 16 January 2009, *C.R. Bussato* 490 (ICN160652!). URUGUAY. Without precise place, without date, *J. Arechavaleta* 2599 (MVM18538!). Cerro Largo, Palleros, Estancia Gallinal, January 1926, *G. Herter s.n.* [ex Herbarium Corn. Osten 18372] (MVM18536!). Montevideo: bañados de las cercanías de Montevideo, January 1898, *J. Cantera* 22 (K002210047 image seen!); Cerro melones, 20 November 1876, *M. Fruchard s.n.* (P02167405 image seen!), in uliginosis, December 1870, *Gibert* (MVM18541!); Tacuarembó [location in the city of Montevideo?], 30 October 1875, *M. Fruchard s.n.* (P02065111 image seen! P02065112 image seen!). San Carlos, in palustris, 8 December 1884, *J. Arechavaleta* (MVM18542!). San José, Sta Lucia, 16 January 1932, *C. Osten* 21846a (MVM!), idem, in paludosis, 28 January 1919, *C. Osten* 14708 (MVM18539). Cultivated specimens: ENGLAND, London, Isleworth-cultivated, August 1896, *A. Worsley* (K001183783 image seen!). FRANCE. Île-de-France: Paris. Jardins das plantes, Conches, 5 November 1856 [ex herbarium A. Gay] (K001732717 image seen!).

Doubtful specimens—ARGENTINA. Corrientes. Santo Tomé, San Alonso, Est. Timbauva, 97m s.n.m., bañado, 07 January 2021, *H.A. Keller & J.L. Rojas* 14350 (CTES0066697!); Estancia San Francisco, 23km NW de Gobernador Virasoro, 5 December 1970, *A. Krapovickas et al.* 17213 (CTES0480260!); 29km E de Ruta Nac. 14, caminho a Colonia Garabí, em pântano, 3 December 1970, *A. Krapovickas* 16980 (CTES0530769!).

Phenology—*Phalocallis plumbea* flowers from October to January and bears fruit from November to February. From May onwards, the species enters vegetative dormancy and begins to produce new leaves in August-September. The flowers open only once, in the early morning (8 a.m.) and wither around midday. On cloudy days, the flowers may remain open until mid-afternoon. It was observed that individuals in a population synchronize flowering on cloudy days preceding rainy periods. According to observations of cultivated material, *P. plumbea* is self-pollinated, and fruit production with viable seeds is abundant.

Distribution and Habitat—Specimens occur from the Atlantic coast of Santa Catarina (Brazil), to the basin of the La Plata river, reaching the mouth of the Uruguay river, then along wetlands, around the Uruguay river, in the province of Entre Ríos (Argentina) and, reaching the high grasslands, along wetlands and river streams in the northeast of Rio Grande do Sul and southeast of Santa Catarina, between 750 and 1,450 m above sea level, in a extent of occurrence (EOO) of 432,505 km² and area of occupancy (AOO) of 88 km². The bulbs and vegetative part are submerged in water, both in flooded areas of the Uruguay Basin and in seawater along the Atlantic coast. Populations of this species have been observed on the coast of Santa Catarina (municipality of Imbituba), growing directly between rocks and coastal slopes, where they can thrive with their entire basal half submerged in seawater.

Conservation status—*Phalocallis plumbea* has an extent of occurrence (EOO) of 432,504.621 km² and area of occupancy (AOO) of 88 km². Populations are fragmented and contain few individuals. Furthermore, the occurrence sites are under anthropogenic pressure, mainly from by the expansion of human populations in coastal areas and the agriculture in high grasslands, which caused the extinction of populations, mainly in Uruguay and Argentina. A 50% reduction in the extent of occurrence and area of occupancy is estimated in the recent decades. Thus, based on the current geographic distribution, the number of known populations, and the pressure these populations suffer, the species can be considered Vulnerable, according the following criteria: C1, 2B + D1 (IUCN 2012, IUCN 2024).



Figures 9. *Phalocallis crassispatha*. A, Basal part of the plant. B, Flowering stem. C, Inner tepal, lateral view. D, Inner tepal, frontal view. E, Flower with tepals removed. F, Gynoecium. G, Capsule. H, Seeds.

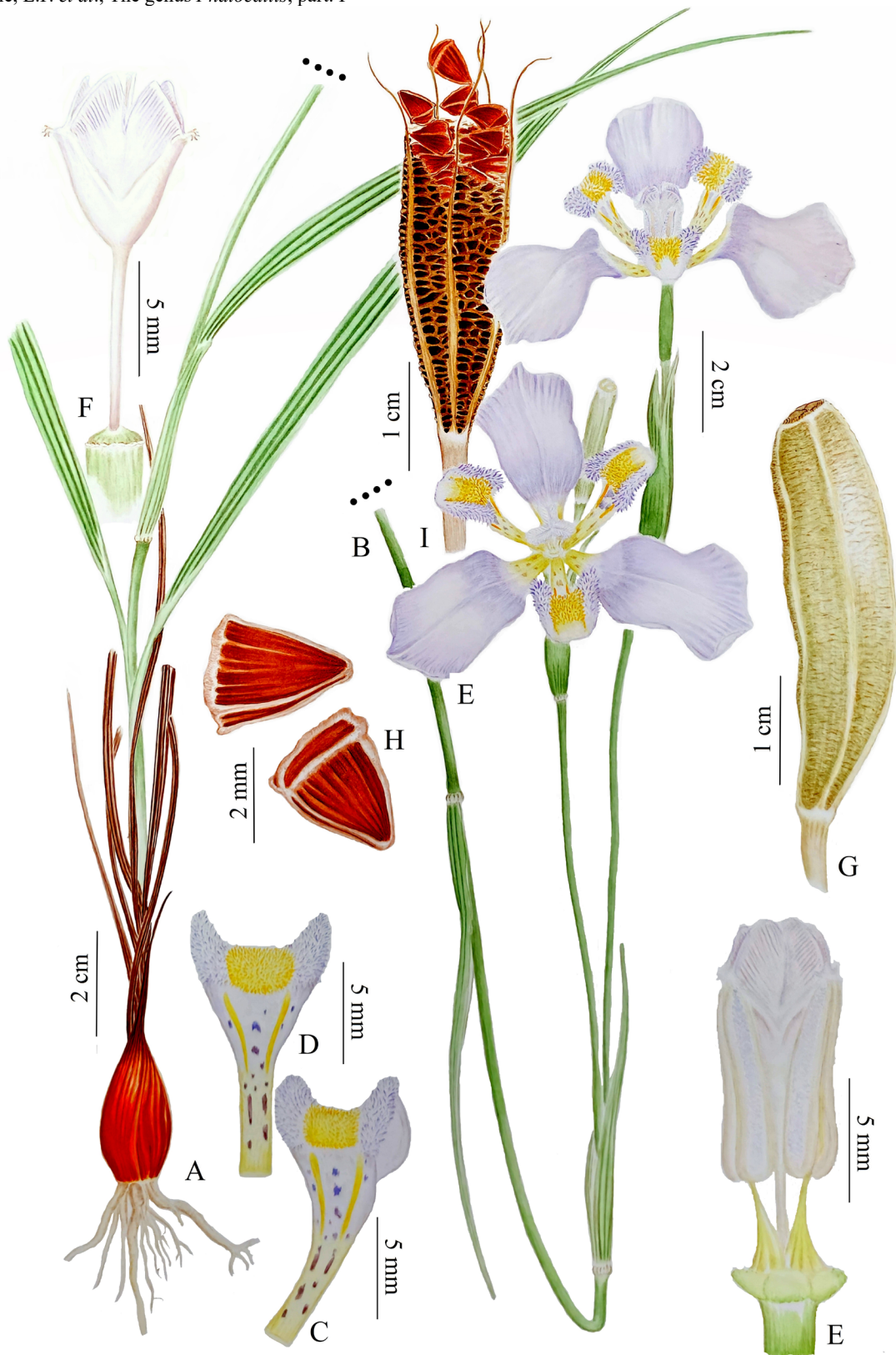


Figure 10. *Phalocallis leucopepla*. A, Basal part of the plant. B, Flowering stem. C, Inner tepal, lateral view. D, Inner tepal, frontal view. E, Flower, with tepals removed. F, Gynoecium. G, Capsule. H, Seeds. I, Dry capsule, during the seed release period.

Observation—The material cited as doubtful differs in its shorter ovary (14–20 mm), by its perigone with a deeper central depression and by its stamens with thicker connective. As none of these specimens have mature fruits, it was not possible to analyze seeds, a diagnostic characteristic for the recognition

of *Phalocallis plumbea*. It is also important to point out that the area where these specimens occur is close to the geographic distribution of *Phalocallis crassispatha*, and further studies would be needed to verify whether these specimens correspond to an intermediate form between both taxa.

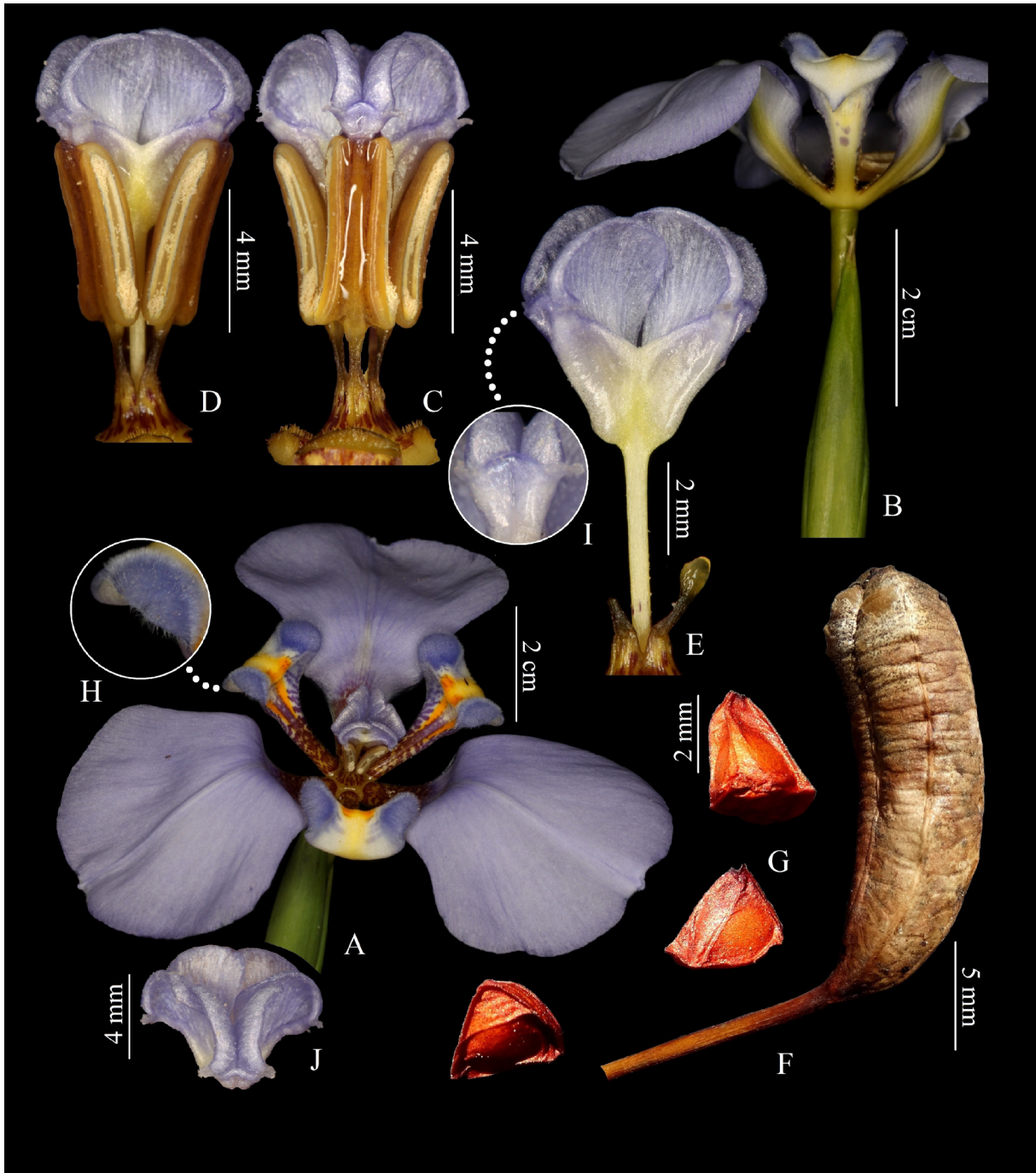


Figure 11. *Phalocallis crassispatha*. A, Flower, inclined view. B, Flower, lateral view. C and D, Androgynoeceum, in two different views. E, Gynoeceum. F, Capsule. G, Seeds. H, Detail of indumentum of inner tepal. I, Detail of Stigmatic region of crests of style branch. J, Style branches, upper view.

Description of new species

***Phalocallis crassispatha* Deble & H.A. Keller, sp. nov.**

Typus: ARGENTINA. Misiones: Oberá, Campo Viera, Colonia Yazá, borde de bosque de *Acca sellowiana*, suelo rocoso, 11 December 2013, H.A. Keller & M.M. Franco 11947 (holotypus: CTES0061331! isotypus: ICN187406!). Figure 9, 10 and 13.

urn:lsid:ipni.org:names:77373310-1

Phalocallis crassispatha differs from *P. coelestis* by its basal leaves with leaf-sheath with 30–54 cm × 0.1–0.3 cm, with its distal ⅓ free and become convoluted, resembling a terete petiole (vs. leaf-sheath plicate, narrower towards the apex, 12–28 × 0.5–1 cm), by its spathes width (9–14 mm vs. 5–8 mm), with 3–5 flowers (vs. 2 flowers), by its anthers broadly oblong, 6–8.5 × 2.4–3.3 mm (vs. oblong 7–9 × 1.7–2.1 mm) with wider connective of different color (1.6–2.4 mm wide, ochre-yellow to caramel-color vs. 1.1–1.5 mm wide, light-blue or bluish-cream), by its thecae ochre-yellow (vs. thecae dark indigo-blue or dark violet-blue), by its pollen white-cream or yellow-cream (vs. pollen greyish-blue or blue) and by its shorter ovary (10–14 × 1.8–2.4 mm vs. 15–24 × 2–3 mm).

Description—Herb 25–60 cm tall, underground stems up to 20 cm long. Roots fasciculate, straw-colored, thickened. Bulb oblong or obconic, 30–45 × 15–20 mm, prolonged in a collar formed from the accumulation of old cataphylls, quite folded or spiraled; cataphylls bright, reddish-brown or reddish-orange, smooth, the older ones with grooves, broadly ovate-lanceolate, apex long acuminate. Basal leaves at anthesis 1–3, 74–104 cm long; blades bluish-green, narrowly elliptic-lanceolate 28–50 × 1–2.4 cm; leaf-sheath 30–54 × 0.1–0.3 cm, at the base involving the stem, then the distal ⅓ are free and become convoluted, resembling a terete petiole. The most basal cauline leaf in the proximal third of the stem, 35–64 cm long; blades linear-elliptic or elliptic, ensiform, 21–36 × 1–1.6 cm, base obtuse, apex acute; leaf-sheath 11–24 cm × 0.1–0.3 cm, at the base involving the stem, then the distal half are free and become convoluted, resembling a terete petiole; the upper leaves gradually smaller the most distal bractiform, plicate, lanceolate, 6–12 × 0.4–0.5 cm, at the base sheathing the basal part of peduncles. Flowering stems 30–45 cm long, 2–4-branched in its distal half. Spathes 1–2 per branch, oblong 35–55 × 9–14 mm, herbaceous, pallid bluish-green, bivalved, 3–5-flowered, pedunculate,

peduncles 8–18 cm long; outer valve 30–52 mm long, obtuse-apiculate at the top; the inner 34–55 mm long, obtuse or truncate apiculate at the top, brownish at the edges, covered with darker parallel strips; pedicel filiform, 30–55 mm long, with a pallid-green or brownish-green straight or slightly curved bract. Flowers 40–60 mm diameter, violet-blue, indigo-blue or dark indigo-blue, the concave part and claws with reddish-brown macules; central concavity 20–30 mm diameter, and 15–18 mm depth. Tepal whorls notably dissimilar. Outer tepals broadly obovate, panduriform, 42–51 × 40–45 mm long, blue, concave at the base for 16–18 mm; blades 20–30 × 20–25 mm, violet-blue, indigo-blue or dark indigo-blue, with the central vein ochre-yellow in proximal half, become at the same color of the blade at the top, revolute, apices rounded or truncate, apiculate; claws cuneate, 8–10 mm long, 2–2.5 mm wide at the base, and 7–8 mm wide at the apex, ochre-yellow, densely purplish-brown stained. Inner tepals ascendant-recurved, 16–21 × 11–13 mm, the proximal half slightly ascendant, then curved upward, the distal one-third incurved and strongly reclinate; blades predominately violet-blue, with a white-cream to yellow upper central part, then orange towards the base, with purplish-brown stripes and stains, densely hairy in proximal part and covered with lipid trichomes upward, surrounded by a lateral high part, blue colored and densely hairy; claws narrowly cuneate, 8–9 mm long, 1.8–2 mm wide at the base, and 2–2.3 mm wide at the apex, ochre-yellow, densely reddish-brown stained. Filaments conic 4–5 mm long, slightly inclined, base thickened, ochre-yellow or dull-orange, densely covered by purplish-brown or brown stripes and stains, attached for 1–1.5 mm; anthers broadly oblong 6–8.5 × 2.4–3.3 mm; connective ochre-yellow to caramel-color, 1.6–2.4 mm, thecae ochre-yellow, pollen white-cream or yellow-cream. Ovary pallid-green, oblong, 10–14 × 1.8–2.4 mm, slightly angled. Style 15–16.5 mm long. Style branches petaloid, slightly porrect, 6–7 mm long, attached for ½ of total length; crests at the apex 2, blue or violet-blue, semispherical, 3–4 mm. Capsule oblong or obclavate, angled, 25–40 × 10–16 mm. Seeds compressed, conic or nearly triangular, 2–3.5 × 1.5–2.5 mm, bronze-color, thickened in the margin, epidermis slightly folded.

Etymology—From the Latin adjective *crassus* (= thick, coarse) + feminine noun *spatha* (= spatula), in allusion to the thick spathes that the taxon possesses.

Vernacular names and uses—The Guaraní of the Ava Chiripa group in central Misiones Province, Argentina, call this species <mborevi ka'a> (tapir herb) and use its bulbs to treat heart diseases (Victoriano Duarte pers. comm.). This use is possibly associated with the doctrine of signature, and is also common for other plants with swollen organs (like cardiac muscle), such as orchid pseudobulbs. Likewise, other plant species related to tapirs, such as <mborevi po> (tapir hand) *Doryopteris nobilis* (T. Moore) C. Chr. (Pteridaceae) and <mborevi tyne> (tapir urine) *Corymborkis flava* (Sw.) Kuntze (Orchidaceae), are used for the same type of diseases, based on the belief that tapirs heal themselves of heart problems while resting with their hooves pressed against their chests (Keller, 2007). The Guaraní of the southern area of Misiones call the species <karugua ka'a> (praying mantis herb) and use the orange bulbs in magical procedures to attract the opposite sex (Pablo Ramos pers. comm.), as is very common among the Guaraní for species of “animal plants” (Keller, 2011).

Additional specimens examined (Paratypes)—ARGENTINA. Misiones: Apóstoles, 30 November 1943, *A. Burkart* 14409 (SI0095714!). Candelaria-Loreto, abra matoral, orilla arroyo, lug. alto, 16 November 1951, *J.E. Montes* 11160 (LP0075827 image seen!). Candelaria, Pastizal, sobre roca aflorante, 2 December 2013, *H.A. Keller*, *H.F. Romero* & *M.M. Franco* 11862 (CTES0054063!). Candelaria: Parque Federal Campo San Juan, bañado cercano a la desembocadura del arroyo Santa Ana, 27 21 46 S, 55 37 26 W, 115 m s.m., 2 November 2021, *A.M. Panizza* & *C.A. Zanotti* 391 (CTES0072956! SI!). Capital, Fachinal, pastizal en bajo, 7 November 2015, *H.A. Keller* & *M. Franco* 13106 (CTES0061932!). Guaraní, Predio Guaraní, salto de arroyo Paraíso, selva marginal, 14 April 2006, *H.A. Keller* 3534 (CTES0480292!); Predio Guaraní, isla pequeña en cauce, 14 January 2006, *H.A. Keller* & *G.T. Prance* 3358 (CTES0480293!). Leandro Alem, ruta nac. 14, entre General Güemes y San José, campo abierto, 17 November 2011, *F. O. Zuloaga* & *N.B. Deginani* 13352 (CTES0059630! SI164522!). Loreto, campo alterado, cerca del arroyo, 106m, 5 January 2010, *H.A. Keller* & *N.G. Paredes* 7862 (CTES0021369!). Oberá, Campo Vieira, Colonia Yazá, ca. Escuela prov. El Yazá, pastizal sobre suelo rocoso, 22 January 2008, *H.A. Keller* & *M.M. Franco* 4736 (CTES0009168!); ruta 103, puente sobre arroyo Ramón, bañado, 24 January 2011, *H.A. Keller* 9565 (CTES0036323!) Pidapoy, 8 December 1941, *M. Biraben* 5405 (LP075826!). BRAZIL. Rio Grande do Sul: Giruá, Granja Sodol, March 1964, *K. Hagelund* 1764 (ICN1931992!). PARAGUAY. Alto Paraná, *K. Fiebrig* 6219 (G00038387 image seen!).

Doubtful specimens—PARAGUAY. Asunción: Piribebuy, in

pratis humidis, October 1895, *E. Hassler* 1298 (P02167144 image seen!). Caazapá, Tapyta, 13 February 2001, *J. Herrera* 387 (CTES0480259!). Cordillera [Paraguari]: Choló, in valle fluminis Y-acá, in paludosis pr Choló, February 1900, *E. Hassler* 7131 (G00004672 image seen!). Paraguari: Guarapi, November 1879, *B. Balansa* 3019 (P02167164 image seen!). San Pedro: [San Estanislao], in campo pr Tapiraguay [Tapiracuai], December 1898 [1899], *E. Hassler* 5964 (G00038385 image seen! G00038386 image seen!).

Phenology—*Phalocallis crassispatha* flowers from November to April. Two collections display mature capsules (CTES0054063! CTES0480292!), the first-one from December and the second from April. Flowers open in the morning, but additional data regarding the start and end time of anthesis are not reported. Unfortunately, cultivated material from Giruá (Rio Grande do Sul state, Brazil) did not thrive in cultivation, which prevented a more accurate analysis of the pollination, resting period and budding of the species.

Distribution and Habitat—The species occur in southern Misiones province (Argentina), north-western Rio Grande do Sul state (Brazil) and south-eastern Paraguay, in an extent of occurrence (EOO) of 71,369 km² and area of occupancy (AOO) of 68 km². Specimens grow in low grasslands, and along stream banks on well-developed gray or red soils, but also on shallow soils or crevices in basaltic outcrops.

Conservation status—*Phalocallis crassispatha* has an extent of occurrence (EOO) of 71,369 km² and area of occupancy (AOO) of 68 km². Populations are fragmented and contain few individuals. Furthermore, the occurrence sites are under anthropogenic pressure, mainly by agriculture. Thus, based on the current geographic distribution, the number of known populations, and the pressure these populations suffer, the species can be considered Vulnerable according the following criteria: C1, 2B + D1 (IUCN 2012, IUCN 2024).

Observation—The collections mentioned as doubtful specimens cannot be attributed with certainty to *P. crassispatha* because they are incomplete, the leaves have a thicker leaf-sheath and the spathes are larger.

Phalocallis leucopepla Deble & H.A. Keller, **sp. nov.**

Typus: BRAZIL. Rio Grande do Sul: Itaqui, Passo do Itú, “em banhado ca. 2 km do cerro do Gavião”, 17 January 2017, *L.P. Deble* & *F. S. Alves* 16304 (holotypus ICN!). Figures 10, 12 and 13.

[urn:lsid:ipni.org:names:77373311-1](https://nomenclature.ipni.org/names/77373311-1)



Figure 12. *Phalocallis leucopepla*. A, flowering stem. B, Bulb and basal part of the plant (the arrow indicates the rhizome). C, Flower, lateral view, showing the spathe. D, Flower, upper view. E, Flowers with tepals removed, except a inner tepal. F, Inner tepal, lateral view. G and H, Androgynocium, in two different views. I and J, Gynoecium, in two different views. K, Capsule. L, Seeds. M, Style branches, upper view. N, Detail of indumentum of inner tepal. O, Detail of Stigmatic region of crests of style branch.

Phalocallis leucopepla differs from *P. coelestis* by its basal leaves with longer and narrow blades (56–85 × 0.8–1.3 cm vs. 22–45 × 1.4–3 cm), by its perigone of a different color, by its outer tepals slightly patent (vs. revolute), smaller and with different shape (obovate-oblong or spatulate, 28–36 × 9–20 mm vs. broadly obovate, 34–48 × 30–38 mm), by its narrow inner tepals (6–10 mm wide vs. 10–14 mm wide), by its stamens with filaments greenish-yellow attached for 0.4–0.7 mm (vs. yellowish, purplish stained, attached for 1.5–2.5 mm), by its anthers with narrow connective of different color (0.6–1 mm, greenish-yellow with scarce ochre-yellow stains vs. light-blue or bluish-cream, 1.1–1.5 mm), by its thecae pallid greenish-yellow (vs. dark indigo-blue or dark violet-blue), by its pollen grayish-white or white (vs. greyish-blue or blue), and by its style branches with peltate and bright-white crests (vs. style branches with semispherical and blue crests).

Description—Herb 60–90 cm tall, underground stems 10–15 cm long. Roots fasciculate, straw-colored, thickened, sometimes prolonged in a rhizome; rhizomes with up to 15 cm long and 0.6–1 cm diameter. Bulb oblong or obconic, 20–35 × 15–25 mm, prolonged in a rigid collar 3–6 cm long; cataphylls bright, reddish-orange or orange, yellowish near to base, smooth, broadly ovate-lanceolate, apex long acuminate. Basal leaves at anthesis 2–3, bluish-green to green, with a fine white pulverulent coating in the sheet and veins of the blades, that disappears on older leaves, 66–95 cm long; blades bluish-green to green, linear-elliptic 56–85 × 0.8–1.3 cm; leaf-sheath plicate, narrower towards the apex, 9–16 × 0.3–0.5 cm. The most basal cauline leaf in the proximal third of the stem, 34–56 cm long; blades narrowly elliptic-ensiform, 24–46 × 0.6–0.9 cm, base obtuse, apex acuminate; leaf-sheath plicate, 7–15 × 0.4–0.7 cm; the upper leaves gradually smaller the most distal lanceolate, 4.5–8 × 0.4–0.6 cm, at the base sheathing the basal part of peduncles. Flowering stems 45–75 cm long, 2–3-branched in distal half. Spathes 1–3 per branch, narrowly oblong 38–51 × 4–6 mm, herbaceous, pallid-green, bivalved, two-flowered, pedunculate, peduncles 8.5–29 cm long; outer valve 37–47 mm long, the inner 38–51 mm long, acute or acuminate at the top, with membranous and hyaline edges covered with sparse parallel glandular strips; pedicel filiform, 40–55 mm long. Flowers 50–65 mm diameter, pallid-lilac, pallid-blue or bluish-white, the concave part and claws with scarce brown macules; central

concavity 18–23 mm diameter, and 8–11 mm depth. Tepal whorls notably dissimilar. Outer tepals obovate-oblong or spatulate, panduriform, 28–36 × 9–20 mm, concave at the base for ca. 10 mm; blades 18–26 × 9–20 mm, lilac, pallid-blue or bluish-white, slightly patent, with the central vein white or lilac, apices rounded or cuneate, apiculate; claws cuneate, 7–8 mm long, 3.5–4 mm wide at the base, and 6.5–7.5 mm wide at the apex, cream-yellow, with scarce brown stains. Inner tepals ascendant-recurved, 15–20 × 6–10 mm, the proximal half slightly ascendant, then curved upward, the distal one-third incurved and strongly reclined; blades predominately white or pallid-lilac, 6–10 mm wide, with a yellow or golden-yellow central part, with scarce brown stains, densely hairy in proximal part and covered with lipid trichomes upward, surrounded by a lateral high part, pallid-lilac or predominately white colored and densely hairy; claws narrowly cuneate, 7–8 mm long, 1.5–2.5 mm wide at the base, and 2–3 mm wide at the apex, cream-yellow, with scarce brow stains. Filaments conic 3.5–4.2 mm long, slightly inclined, base thickened, greenish-yellow, translucent, attached for 0.4–0.7 mm; anthers oblong 6.5–7.5 × 1.5–2 mm; connective greenish-yellow with scarce ochre-yellow stains, 0.6–1 mm, thecae pallid greenish-yellow, pollen grayish-white or white. Ovary pallid-green, narrowly oblong 12–20 × 2–3 mm, with longitudinal grooves. Style 12.5–13.5 mm long. Style branches petaloid, slightly porrect, 4–5 mm long, attached for ½ of total length; crests at the apex 2, bright-white, translucent, peltate, 3–3.5 mm. Capsule oblong, 25–55 × 9–14 mm. Seeds conic, angled, ca. 3.5–5 × 3–4 mm, orange-brown, thickened in the margin, epidermis smooth.

Etymology—From the Greek the adjective λευκός (= bright, become white, white) + from the Latin the neuter noun peplum (= honorific cloak of Minerva, ceremonial cloak for the use of gods and ladies of the high aristocracy) in allusion to the gynoeceum, with white-translucent crests that together form a delicate structure very similar to a cloak or veil.

Vernacular names and uses—Unknown. However, some populations in southern Misiones province occur in the same range as *P. crassispatha*, which

suggests that *P. leucopepla* may receive the same popular name and uses as *P. crassispatha*.

Additional specimens examined (Paratypes)—ARGENTINA. Corrientes: Ituzaingó, Playadito, 7km W de Colonia Liebig, pantanícola, entre el pasto, 20 January 1993, A. Schinini 27578 (CTES0553617!). San Martín, La Cruz, Provincial Route 114, close to the “Bañado Guaviravi”, 22 December 2014, L.P. Deble & F.S. Alves 15188 (CTES0064988!). Misiones: Guaraní, camino al Salto Golondrina, por picada Interventor Pomar (entrada ruta nac. 14), 8 November 2000, M.E. Múlgura de Romero *et al.* 2409 (SI203262!). San Ignacio, pastizal en bañado, 95m s.n.m., 15 January 2010, H.A. Keller & N.G. Paredes 8134 (CTES0022608!). PARAGUAY. Without precise place, *P. Jorgensen* 4530 (LP0075831 image seen!). Alto Paraná: Estancia Río Bonito, South of Forest III, swamp, 28 February 1996, E.M. Zardini, L. Guerrero & F. V. da Silva 44715 (P02065110 image seen!). *idem*, 28 November 1995, E.M. Zardini & L. Guerrero 43864 (G0004726 image seen!).

Phenology—*Phalocallis leucopepla* flowers from November to February and bears fruit from late December to April. From

April onwards, the species enters vegetative dormancy and begins to produce new leaves in October–November. The flowers open only once, in the morning (8 a.m.) and wither around midday. On cloudy days, the flowers may remain open until mid-afternoon. According to observations of cultivated material, *P. leucopepla* is self-pollinated; however, fruit production with viable seeds are not abundant.

Distribution and Habitat—The species displays an extent of occurrence (EOO) of 37,210 km² and area of occupancy (AOO) of 28 km². In northeast Argentina (Eastern Corrientes and southern Misiones provinces), southern Brazil (western Rio Grande do Sul state) and southeast Paraguay (Alto Paraná department). Specimens occur in wetlands. The bulbs grow in deep, hydromorphic soils, developed on sedimentary rocks.

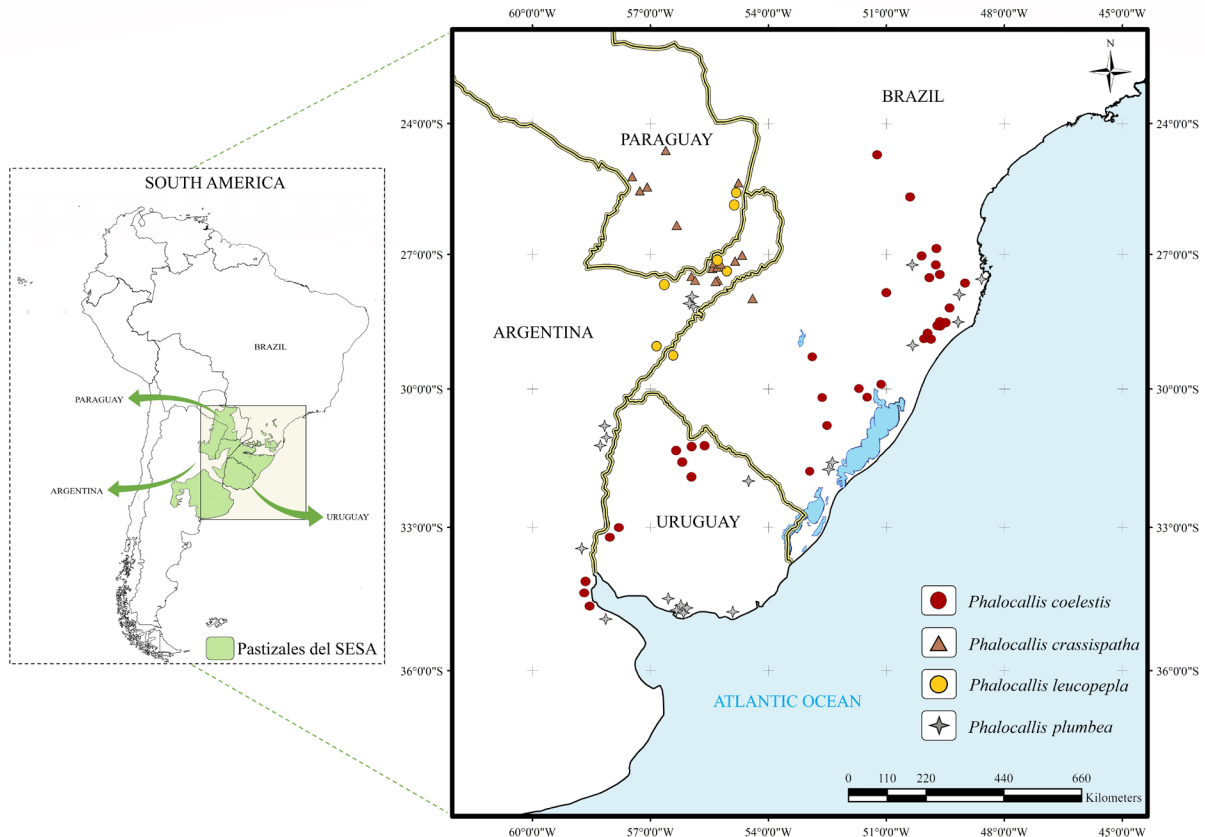


Figure 13. Map of geographic distribution of species.

Table 2. A comparison of selected characters differing among the species of *Phalocallis* occurring in SESA grasslands.

Character/species	<i>Phalocallis coelestis</i>	<i>Phalocallis crassispatha</i>	<i>Phalocallis leucopepla</i>	<i>Phalocallis plumbea</i>
Plant height (cm)	40–120	25–60	60–90	35–55
Basal leaf length (cm)	35–70	74–104	66–95	38–55
Shape and size of leaf-blade (cm)	linear-elliptic or linear-lanceolate 22–45 × 1.4–3	narrowly elliptic-lanceolate 28–50 × 1–2.4	linear-elliptic 56–85 × 0.8–1.3	narrowly elliptic-lanceolate 28–35 × 1.2–3.5
Shape and size of leaf-sheath (cm)	plicate, narrower towards the apex, 12–28 × 0.5–1	30–54 × 0.1–0.3 cm, distal ⅓ are free and become convoluted, resembling a terete petiole	plicate, narrower towards the apex, 9–16 × 0.3–0.5	plicate, narrower towards the apex, 8–19 × 0.3–0.9
Cauline leaf length (cm)	24–46	35–64	34–56	14–26
Shape and size of cauline leaf-blade (cm)	elliptic, 12–31 × 1.2–2.6	linear-elliptic or elliptic, ensiform, 21–36 × 1–1.6	narrowly elliptic-ensiform, 24–46 × 0.6–0.9	elliptic, 6–11 × 0.8–1.8
Shape and size of cauline leaf-sheath (cm)	plicate, 12–20 × 0.5–1	11–24 cm × 0.1–0.3 distal half are free and become convoluted, resembling a terete petiole	plicate, 7–15 × 0.4–0.7	plicate, 8–14 × 0.7–1.2
Shape and size of spathes (cm)	oblong, 40–55 × 5–8	oblong, 35–55 × 9–14	narrowly oblong 38–51 × 4–6 mm	narrowly oblong, 55–90 × 7–11 mm
Perigone diameter and depth (mm)	50–65, central concavity 20–28 mm diameter, and 14–18 mm depth.	40–60, central concavity 20–30 mm diameter, and 15–18 mm depth	50–65, central concavity 18–23 mm diameter, and 8–11 mm depth	65–90, central concavity 25–30 mm diameter, and 10–12 mm depth.
Shape and size of outer tepals (mm)	broadly obovate, 34–48 × 30–38 mm	broadly obovate, 42–51 × 40–45	obovate-oblong or spatulate, 28–36 × 9–20	broadly obovate, 42–51 × 40–45
Shape and size of inner tepals (mm)	oblique-recurved, 18–21 × 10–14 mm	ascendant-recurved, 16–21 × 11–13	ascendant-recurved, 15–20 × 6–10	ascendant-recurved, 20–24 × 14–17
Filaments shape and size (mm)	conic, 3–3.5, attached for 1.5–2.5	conic, 4–5, attached for 1–1.5	conic, 3.5–4.2 attached for 0.4–0.7	Conic, 3–4 mm attached for 1.5–2.5
Anthers size (mm)	7–9 × 1.7–2.1	6–8.5 × 2.4–3.3	6.5–7.5 × 1.5–2	8–10 × 1.8–2.3
Connective color and width (mm)	light-blue or bluish-cream, 1.1–1.5	ochre-yellow to caramel-color, 1.6–2.4	greenish-yellow with scarce ochre-yellow stains, 0.6–1	light-blue, with purplish-blue stains, 1.2–1.8
Ovary size and shape (mm)	narrowly oblong, slightly angled, 15–24 × 2–3	oblong, 10–14 × 1.8–2.4	narrowly oblong 12–20 × 2–3	narrowly oblong, with a longitudinal groove 18–35 × 2–5 mm
Style length (mm)	12–16	15–16.5	12.5–13.5	16.5–19
Style crests shape and size (mm)	semispherical, 3–4	semispherical, 3–4	peltate, 3–3.5	semispherical, 3–4
Shape and size of capsules (mm)	oblong or obclavate, angled, 35–50 × 10–13	oblong or obclavate, angled, 25–40 × 10–16	oblong, 25–55 × 9–14	oblong, angled, 55–80 × 10–18
Shape and size of seeds (mm)	slightly compressed, semispherical, 3.5–5 × 3–4.5	compressed, conic or nearly triangular, 2–3.5 × 1.5–2.5	slightly compressed, conic, angled, ca. 3.5–5 × 3–4	strongly compressed, winged, nearly circular or broadly elliptic 6–8 × 5.5–7 mm

Conservation status—*Phalocallis leucopela* has an extent of occurrence (EOO) of 37,210 km² and area of occupancy (AOO) of 28 km². The Populations are fragmented and contain few individuals. Furthermore, the habitats where the species occurs are under strong pressure due to the conversion of wetlands into agricultural land. According to IUCN criteria the species should be considered Vulnerable (Criteria D1, 2), due to the number of known populations and the reduction of wetland areas throughout the geographic distribution of *Phalocallis leucopepla*, (IUCN 2012, IUCN 2024).

Discussion

Phalocallis coelestis and *P. plumbea* are recognized as different species, the main distinguishing characteristics of *P. coelestis* are the shorter spathes (40–55 × 5–8 mm vs. 55–90 × 7–11 mm), fewer flowers per spathe (1–2 vs. 3–4), smaller perigone, with a deep central concavity (50–65 mm diameter, central concavity 20–28 mm diameter, and 14–18 mm depth vs. 65–90 mm diameter, central concavity 25–30 mm diameter, and 10–12 mm depth), size and shape of inner tepals (inner tepals oblique-recurved, 18–21 × 10–14 mm [up 16 mm in dry specimens] vs. inner tepals ascendant-recurved, 20–24 × 14–17 mm [up 20 mm in dry specimens]), smaller ovary with different shape (15–24 × 2–3 mm, slightly angled vs. 18–35 × 2–5 mm, with a longitudinal groove), smaller capsules (oblong or obclavate, angled, 35–50 × 10–13 mm vs. oblong, angled, 55–80 × 10–18 mm) and size and shape of seeds (slightly compressed, semispherical, 3.5–5 × 3–4.5 mm, epidermis smooth vs. strongly compressed, nearly circular or broadly elliptic 6–8 × 5.5–7 mm, reddish-brow, thickened in the margin, epidermis smooth, except in a nearly central, circular and verrucose area).

Phalocallis crassispatha is morphologically similar to *P. coelestis*, and also resembles *P. plumbea*. However, differs from *P. coelestis* by its leaf-sheath of basal leaves with 30–54 cm × 0.1–0.3 cm, with its distal ⅓ free and become convoluted, resembling a terete petiole (vs. leaf-sheath plicate, narrower towards the apex, 12–28 × 0.5–1 cm), by its spathes width (9–14 mm vs. 5–8 mm), with 3–5 flowers (vs. 2 flowers), by its anthers broadly oblong, 6–8.5 × 2.4–3.3 mm (vs. oblong 7–9 × 1.7–2.1 mm) with wider connective of different color (1.6–2.4 mm wide, ochre-yellow

to caramel-color vs. 1.1–1.5 mm wide, light-blue or bluish-cream), by its thecae ochre-yellow (vs. thecae dark indigo-blue or dark violet-blue), by its pollen white-cream or yellow-cream (vs. pollen greyish-blue or blue) and by its shorter ovary (10–14 × 1.8–2.4 mm vs. 15–24 × 2–3 mm). From *P. plumbea* differs in almost all characteristics listed above as segregated to *P. coelestis*, except for the spathes width, and number the flower per spathe, but others morphological features that should be listed as distinguishable of *P. crassispatha* are the smaller perigone, with a deep central concavity (40–60 mm diameter, central concavity 20–30 mm diameter, and 15–18 mm depth vs. 65–90 mm diameter, central concavity 25–30 mm diameter, and 10–12 mm depth), the size of inner tepals (16–21 × 11–13 mm vs. inner tepals ascendant-recurved, 20–24 × 14–17 mm), the smaller ovary (10–14 × 1.8–2.4 mm vs. 18–35 × 2–5 mm), the smaller capsules (oblong or obclavate, angled, 25–40 × 10–16 mm vs. oblong, angled, 55–80 × 10–18 mm) and the size and shape of seeds (slightly compressed, conic or nearly triangular, 2–3.5 × 1.5–2.5 mm, epidermis slightly folded. vs. strongly compressed, nearly circular or broadly elliptic 6–8 × 5.5–7 mm, reddish-brow, epidermis smooth, except in a nearly central, circular and verrucose area).

Phalocallis leucopepla is recognized as a new species entirely related to *P. coelestis*, both species display similar vegetative aspect, two-flowered spathes, similar size and shape of spathes and ovary. Nevertheless, *P. leucopepla* differs from *P. coelestis* by its basal leaves with longer and narrow blades (56–85 × 0.8–1.3 cm vs. 22–45 × 1.4–3 cm), by its perigone of a different color, by its outer tepals slightly patent (vs. revolute), smaller and with different shape (obovate-oblong or spatulate, 28–36 × 9–20 mm vs. broadly obovate, 34–48 × 30–38 mm), by its narrow inner tepals (6–10 mm wide vs. 10–14 mm wide), by its stamens with filaments greenish-yellow attached for 0.4–0.7 mm (vs. yellowish, purplish stained, attached for 1.5–2.5 mm), by its anthers with narrow connective of different color (0.6–1 mm, greenish-yellow with scarce ochre-yellow stains vs. light-blue or bluish-cream, 1.1–1.5 mm), by its thecae pallid greenish-yellow (vs. dark indigo-blue or dark violet-blue), by its pollen grayish-white or white (vs. greyish-blue or blue), and by its style branches with peltate and bright-white crests (vs. style branches with semispherical and blue crests).

Considerations

The *Phalocallis* species occurring in SESA Grasslands are morphologically similar, which makes identification challenging, especially when only herbarium material is available. This was probably the reason for underestimating the number of species in the regional flora, since in this treatment four species are recognized: *P. coelestis*, *P. crassispatha*, *P. leucopepla* and *P. plumbea*. *P. coelestis* is the most common species in SESA Grasslands, occurring in hydromorphic environments in the three southern states of Brazil, as well as in Uruguay and Argentina. The species can be recognized, among others characters, by its two-flowered spathes, by its slender, angular ovary, and by its slightly compressed, semispherical seeds. *P. plumbea*, in turn, is rehabilitated from the synonymy of *P. coelestis*, and is easily identified by its large flowers (up to 90 mm in diameter) and long ovaries and fruits, as well as its strongly compressed, nearly circular or broadly elliptical seeds. *P. crassispatha* is a new species based on a set of distinctive characteristics, such as the leaf-sheath of basal leaves resembling a terete petiole, wider spathes, the anthers broadly oblong, with wider connective and shorter ovary. *P. leucopepla* is a new species based mostly on basal leaves with longer and narrow blades, dull lilac or whitish perigone, narrower inner tepals, anthers with narrow connective, and style branches with peltate and bright-white crests. These species occur mainly in flooded or periodically flooded environments. *P. crassispatha*, on the other hand, is adapted to drier locations and is also found in grassland or rocky fields, but always near streams and creeks. *P. crassispatha*, *P. leucopepla*, and *P. plumbea* are considered threatened species, classified as Vulnerable (VU) according to IUCN criteria.

Acknowledgements

The authors express their sincere gratitude to Amalia Suarez (SI), Gelina Piesko (CTES), and Piero Marchionni (LP) for kindly sending images of exsiccates. We thank Christian Zanotti and Fabiano Alves for kindly providing photos of *Phalocallis crassispatha* and *P. leucopepla*, respectively. We are also grateful to Federico Capula (Darwinion Institute) for providing bibliography.

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