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CAROLINA COSTA ALFF

ERIOCAULACEAE IN SUBTROPICAL SOUTH AMERICA

Porto Alegre
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Dissertação apresentada ao Programa de Pós-Graduação em Botânica da Universidade Federal do Rio Grande do Sul como um dos requisitos para a obtenção do título de Mestra em Botânica.

Orientadora: Profª Drª Silvia Teresinha Sfoggia Miotto (UFRGS)
Coorientador: Prof. Dr. Thomas Stützel (RUB)

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Porto Alegre, 20 de Abril de 2020.

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LIST OF ABBREVIATIONS

AOO	Area of Occurrence
ARG	Argentina
B	Herbarium Berolinense (Botanic Garden and Botanical Museum Berlin-Dahlem), Berlin, Germany
BAB	Herbario del Instituto de Recursos Biológicos (Instituto Nacional de Tecnologia Agropecuaria), Buenos Aires, Argentina
BAF	Herbario del Museo de Farmacobotánica Juan Aníbal Domínguez (Facultad de Farmacia y Bioquímica, Universidad de Buenos Aires), Buenos Aires, Argentina
BBB	Herbario del Departamento de Biología, Bioquímica y Farmacia (Universidad Nacional del Sur), Bahía Blanca, Argentina
BM	The Natural History Museum Herbarium, London, England
BR	Meise Botanic Garden Herbarium (National Botanic Garden of Belgiun), Meise, Belgiun
C	Museum Botanicum Hauniense (University of Copenhagen), Copenhagen, Denmark
CAPES	Coordenação de Aperfeiçoamento de Pessoal de Nível Superior
CGE	*Campos Gerais*
CNPq	Conselho Nacional de Desenvolvimento Científico e Tecnológico
CORD	Herbario del Museo Botánico Córdoba, Córdoba, Argentina
CPG	Coastal Plain Grasslands
CR	Critically Endangered
CRI	Herbário Pe. Dr. Raulino Reitz (Universidade do Extremo Sul Catarinense), Criciúma, Santa Catarina, Brazil
CTES	Herbário do Instituto de Botánica del Nordeste, Corrientes, Argentina
DD	Data Deficient
EFC	Herbário da Escola de Florestas Curitiba, Curitiba, Paraná, Brazil
EOO	Extent of Occurrence
F	Herbário do Field Museum of Natural History, Chicago, United States
FLOR	Herbário da Universidade Federal de Santa Catarina, Florianópolis, Santa Catarina, Brazil

FURB	Herbário Dr. Roberto Miguel Klein (Universidade Regional de Blumenau), Blumenau, Santa Catarina, Brazil
FZB	Fundação Zoobotânica do Rio Grande do Sul
G	Geneva Herbarium (Conservatoire et Jardin botaniques de la Ville de Genève), Geneva, Switzerland
HAS	Herbário Alarich Schultz (FZB-RS), Porto Alegre, Rio Grande do Sul, Brazil
HBG	Herbarium Hamburgense (University of Hamburg), Hamburg, Germany
HBR	Herbário Barbosa Rodrigues, Itajaí, Santa Catarina, Brazil
HCF	Herbário da Universidade Tecnológica Federal do Paraná, Curitiba, Paraná, Brazil
HTG	High Altitude Tropical Grasslands
HUCS	Herbário da Universidade Federal de Caxias do Sul, Caxias do Sul, Rio Grande do Sul, Brazil
HUEFS	Herbário da Universidade Estadual de Feira de Santana, Feira de Santana, Bahia, Brazil
HUFU	Herbário Uberlandense (Universidade Federal de Uberlândia), Uberlândia, Minas Gerais, Brazil
HURG	Herbário da Universidade de Rio Grande, Rio Grande, Rio Grande do Sul, Brazil
ICN	Herbário do Instituto de Ciências Naturais (UFRGS), Porto Alegre, Rio Grande do Sul, Brazil
IUCN	International Union for Conservation of Nature
JE	Herbarium Haussknecht (Friedrich-Schiller-Universität Jena), Jena, Germany
K	Kew Herbarium (Royal Botanic Gardens Kew), London, England
LabTax	Laboratório de Angiospermas (UFRGS)
LC	Least Concern
LE	Herbarium of higher plants of Komarov Botanical Institute RAS, Saint Petersburg, Russia
LL	Lundell Herbarium (University of Texas), Austin, United States
LP	Herbário do Museo de La Plata (Facultad de Ciencias Naturales y Museo), La Plata, Argentina
M	Botanische Staatssammlung München
MBM	Herbário do Museu Botânico Municipal, Curitiba, Paraná, Brazil

MES	Mesopotamia region
MPUC	Herbário do Museu da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil
MS	Mato Grosso do Sul, Brazil
MVFA	Herbário Bernardo Rosengurtt (Facultad de Agronomía, Universidad de la República), Montevideo, Uruguay
NY	New York Botanical Garden Herbarium, New York, United States
P	Muséum National d'Histoire Naturelle Herbarium, Paris, France
PACA	Herbário Porto Alegre Colégio Anchieta (Unisinos), São Leopoldo, Rio Grande do Sul, Brazil
PAM	*Pampas* domain
PAR	Paraná, Brazil
PEL	Herbário da Universidade Federal de Pelotas, Capão do Leão, Rio Grande do Sul, Brazil
PPGBot	Programa de Pós-Graduação em Botânica (UFRGS)
R	Herbário do Museu Nacional do Rio de Janeiro, Rio de Janeiro, Rio de Janeiro, Brazil
RB	Herbário do Jardim Botânico do Rio de Janeiro, Rio de Janeiro, Rio de Janeiro, Brazil
RGS	Rio Grande do Sul, Brasil
RUB	Ruhr-Universität Bochum, Germany
S	Swedish Museum of Natural History, Stockholm, Sweden
SCA	Santa Catarina, Brazil
SHG	Subtropical Highland Grasslands
SI	Herbário do Instituto de Botánica Darwinion, Buenos Aires, Argentina
SP	São Paulo, Brazil
SPF	Herbário da Universidade de São Paulo, São Paulo, São Paulo, Brazil
SSA	Subtropical South America
U	National Herbarium Netherland (Utrecht University), Utrech, Netherlands
UEC	Herbário da Universidade Estadual de Campinas, Campinas, São Paulo, Brazil
UFRGS	Universidade Federal do Rio Grande do Sul, Brazil
UPCB	Herbário do Departamento de Botânica da Universidade Federal do Paraná, Curitiba, Paraná, Brazil

UPS	The Museum of Evolution Herbarium (Uppsala University), Uppsala, Sweden
US	United States National Herbarium (Smithsonian Institution), Columbia, United States
VU	Vulnerable
Z	Zürich Herbaria (Universität Zürich), Zürich, Switzerland

SUMMARY

Chapter I

Eriocaulaceae in subtropical South America

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Eriocaulaceae in subtropical South America

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Abstract

Eriocaulaceae comprises ten genera and ca. 1400 species with a mostly pantropical distribution, and few temperate taxa. The two main diversity centres of the family are in South America, where more than 800 species occur, many of them endemic. We present a taxonomic revision of Eriocaulaceae in subtropical South America, encompassing northeastern Argentina, southern Brazil, eastern Paraguay and Uruguay. Identification keys to the genera and species, morphological descriptions, information on etymology, geographic distribution, ecological aspects, diagnoses, and taxonomic and nomenclatural notes are presented. Preliminary conservation status assessments are provided for ten selected species. We recognize six genera and 30 species in the study area, mostly inhabiting wetlands in grasslands ecosystems. Eleven lectotypifications are suggested, and 15 inadvertent lectotypifications were found, four of them requiring second-step lectotypifications. Three new synonyms are proposed. Ten taxa previously cited for the study area are excluded. Despite the decreasing richness southwards subtropical South America, nearly 35% of the species are restricted, most of them are endemic and here evaluated as threatened of extinction for the first time.

Keywords: Everlasting Plants, Poales, Southern Cone Flora, Taxonomy, Wetlands

Resumo

Eriocaulaceae compreende dez gêneros e cerca de 1400 espécies com distribuição predominantemente pantropical, e uma minoria de táxons temperados. Os dois principais centros de diversidade da família estão na América do Sul, onde mais de 800 espécies ocorrem,

muitas delas endêmicas. Nós apresentamos uma revisão taxonômica de Eriocaulaceae na América do Sul subtropical, compreendendo o nordeste da Argentina, o sul do Brasil, o leste do Paraguai e o Uruguai. A revisão inclui chaves de identificação para gêneros e espécies, descrições morfológicas, informações sobre etimologia, distribuição geográfica, aspectos ecológicos, diagnoses e notas taxonômicas e nomenclaturais. Avaliações preliminares do estado de conservação de dez espécies selecionadas são fornecidas. Nós reconhecemos seis gêneros e 30 espécies na área de estudo, habitando principalmente áreas úmidas em ecossistemas campestres. Onze lectotipificações são sugeridas, e 15 lectotipificações inadvertidas foram encontradas, quatro delas necessitando de lectotipificações de segundo passo de lectotipificação. Três novos sinônimos são propostos. Dez táxons previamente citados para a área de estudo são excluídos. Apesar da riqueza descrescente em direção ao sul da América do Sul subtropical, quase 35% das espécies são restritas, a maioria endêmica e aqui avaliada como ameaçada de extinção pela primeira vez.

Palavras-chave: Áreas Úmidas, Flora do Cone Sul, Poales, Sempre-vivas, Taxonomia

Introduction

Eriocaulaceae Martinov (1820: 237) comprises ten genera and ca. 1400 species with pantropical distribution, including minor temperate taxa (Giulietti & Hensold 1990, Stützel 1998, Giulietti *et al.* 2012, Alves *et al.* 2015). The world richest genera are *Eriocaulon* Linnaeus (1753: 87) and *Paepalanthus* Martius (1834: 28), with 400–800 and about 500 species, respectively, followed by *Syngonanthus* Ruhland (1900: 487), with 120–150 species (Giulietti *et al.* 2012, Watanabe *et al*. 2015) (Tab. 1).

Eriocaulaceae is monophyletic, as well as its two subfamilies proposed by Ruhland (1903): Eriocauloideae, including *Eriocaulon* and *Mesanthemum* (Körnicke 1856: 572), and Paepalanthoideae, which includes the remaining genera. This classification is corroborated by phylogenetic studies carried out in the last decades (e.g. Stevens 2001 onwards, Andrade *et al.* 2010, Giulietti *et al.* 2012). Despite this, changes such as synonymizations and recircunscriptions of genera have been made (e.g. Hensold & Giulietti 1991, Andrade *et al*. 2011, Parra *et al.* 2010). *Paepalanthus*, the richest genus of Paepalanthoideae, remains polyphyletic in its current conception (Trovó *et al.* 2013a). Giulietti (1997), based on cladistic studies, suggested the segregation of *Paepalanthus* into different morphologically cohesive

genera, although considering this change premature at that time. This seems to be the trend in view of the publication of *Actinocephalus* (Körnicke 1863: 321) Sano (2004: 99), and the conclusions of Giulietti *et al.* (2012), emphasizing the existence of in progress analysis aiming to produce a new classification of *Paepalanthus*. However, Andrade *et al.* (2010), in order to make this genus monophyletic, suggested the inclusion of the related genera *Actinocephalus*, *Blastocaulon* Ruhland (1903: 223), *Lachnocaulon* Kunth (1841: 497), and *Tonina* Aublet (1775: 856) under *Paepalanthus s.l.* Eriocaulaceae as a whole, especially the richest genera, remains taxonomically poorly known and requiring revisions, being several new species for science described in the last decades (e.g. Sano 1998b, Echternacht *et al*. 2011, Giulietti & Silva 2016, Tissot-Squalli & Sauthier 2017, Trovó *et al.* 2018). Additionally, phylogenetic studies require a larger sampling, with most of the taxa not being included in the phylogenies (e.g. Trovó *et al.* 2013).

Morphologically, Eriocaulaceae is easily distinguished from the other families within Poales by its dense indeterminate inflorescences, traditionally treated as capitula, and by the spiraperturate polen grains with spinose exine (Borges *et al.* 2009, Stützel & Trovó 2013). The differentiation between the two subfamilies is traditionally based on floral characters (Ruhland 1903). Eriocauloideae presents androecium with two whorls of stamens developed, and glandular petals, while Paepalanthoideae has androecium with a single whorl of stamens developed, and eglandular petals (Ruhland *l.c.*). Concerning generic and infrageneric delimitation, characters such as the fusion of the calyx and corolla are applied, frequently making the identification of the taxa a difficult task. Moreover, there is a large number of species and infraspecific taxa of difficult diagnose, a great amount of synonyms (occasionally considered valid), besides herbaria collections with many misidentifications in the study area, and lack of sampling.

South America is home to the two main diversity centres of Eriocaulaceae, with more than 800 species estimated (Govaerts 2020). The Espinhaço Range, in Brazil, accounts ca. 500 spp. from the 630 estimated in this country (almost 36% of the global richness), and the isolated plateaus (*tepuis*) of the Guiana Shield present 94 spp. (Hakki & Hensold 2007, Giulietti *et al.* 2012, BFG 2015). Many species belong to endemic genera from the Neotropics, such as *Actinocephalus*, *Comanthera* Smith (1937: 38), and *Rondonanthus* Herzog (1931: 210), with several species known for being narrowly restricted (Hensold & Giulietti 1991, Sano 2004, Echternacht *et al.* 2015).

Towards the subtropical region of South America, between the 23.5°S and 35°S parallels, approximately, the diversity decreases, with some species reaching its southernmost distribution near the Tropic of Capricorn (Giulietti & Hensold 1990). In this region, Eriocaulaceae was briefly cited by naturalists when describing landscapes and vegetation (e.g. Saint-Hilaire 2002), specific studies occurring mostly from the 20th century onwards, in the scope of regional floras (e.g. Arechavaleta 1902, Molfino 1922, Herter 1930, 1935, Castellanos 1945, Abbiatti 1946a, 1946b, Herter 1954, Moldenke & Smith 1976, Giulietti 2008, Sano 2014, Giulietti *et al*. 2018). These studies, despite providing the basis for identifying the taxa of Eriocaulaceae from this region, are mostly requiring updates, occasionally presenting incomplete or not comparable morphological descriptions, and identification keys with few or dubious diagnostic features. Taxonomic and nomenclatural novelties (including numerous re-evaluations of infraspecific categories) were mostly presented by the North American botanist Harold Normann Moldenke, in a series of notes (e.g. Moldenke 1949, 1951, 1953). Lately, other authors have presented novelties and changes relating to the genera *Eriocaulon* and *Paepalanthus* in southern Brazil (Trovó *et al*. 2014, Oliveira & Bove 2015, Alff *et al*. 2019).

Recent surveys, mainly dating from 1980's onwards, are leading to a better systematic understanding of the group, including taxonomic, morphological, anatomical and molecular data (Giulietti *et al*. 2012). The majority of the studies on Eriocaulaceae in South America is based on floristic approaches, which are leading to advances in the knowledge of this family, providing more complete descriptions, and solving nomenclatural issues (e.g. Silva & Trovó 2014, Andrino *et al.* 2015, Trovó *et al.* 2015). Based on this, we present a comprehensive taxonomic revision of Eriocaulaceae in subtropical South America, including identification keys to genera and species, morphological descriptions of the taxa, and images, as well as information on etymology, distribution, ecological aspects, diagnoses, and taxonomic and nomenclatural notes. Preliminary conservation status assessments are provided for ten selected species which are considered restricted or that slightly exceeded the study area.

Materials & methods

Study area:—The circumscription of the subtropical South America (SSA), as applied here, follows the Köppen-Geiger climate classification, encompassing the Humid Subtropical climate (Cfa) and the Temperate Oceanic climate (Cfb) (Peel *et al.* 2007, Alvares *et al.* 2014). Thus, the study area includes northeastern Argentina (provinces of Corrientes, Entre Ríos,

Misiones, Santa Fe, also part of Buenos Aires, Chaco, Córdoba, Formosa, La Pampa and Santiago del Estero), southern Brazil (states of Paraná, Rio Grande do Sul and Santa Catarina), eastern Paraguay (departments of Alto Paraná, Amambay, Caaguazú, Caazapá, Canindeyú, Central, Concepción, Cordillera, Guairá, Itapúa, Misiones, Ñeembucú, Paraguarí and San Pedro) and the entire Uruguay (Fig. 1). The subtropical portions of Mato Grosso do Sul and São Paulo states, midwestern and southeastern Brazil, respectively, were disconsidered in our analysis, having been well sampled and addressed in the literature (e.g. Sano & Giulietti 2012, Trovó & Sano 2010b, BFG 2015).

Taxonomic treatment:—The methods applied here were based on the steps of taxonomic revision summarized and clarified by Maxted (1992), based on Davis & Heywood (1963). We adopted the morphological species concept, in which a species is considered a gathering of natural populations distinguished by discontinuous morphological traits (Aldhebiani 2018, based on Cronquist 1978). The specimens were measured using caliper, millimetric structures being observed in the stereomicroscope. When a single species is cited within a genus, its morphological description was adjusted to contemplate distinctive characters of the genus as well. Only synonyms related to the circumscribed study area are cited in our treatment. The complete list of synonyms is referred in the general notes of each species. New synonyms are indicated by "syn. nov.", "ex descr." being used when the access to the type specimens or images of the type specimens was not possible. Abbreviations of authors' names, when applied, follow the International Plant Names Index (2020). The terminology used in the morphological descriptions follows Beentje (2010) and also Stutzel & Trovó (2013) for inflorescences. Nomenclatural implications are in agreement with the International Code of Nomenclature for algae, fungi and plants (Shenzhen Code) (Turland *et al*. 2018). Complementary literature was used to interpretate nomenclatural issues concerning types, such as McNeill (2014) and Prado *et al*. (2015).

Herbaria revision:—Around 3000 collections were personally examined at the following herbaria: BAB, BBB, CRI, EFC, FLOR, FURB, HAS, HBR, HUCS, HURG, ICN, LP, MBM, MPUC, PACA, PEL, RB, SI and UPCB (acronyms according to Thiers 2020 continuously updated). Other collections were examined exclusively through online images databases, such as JSTOR Global Plants (2000 onwards) and Reflora Virtual Herbarium (2020). Specimens without collector number, as well as the analysed images, have their respective barcode or herbarium number indicated. Collections from adjacent areas (e.g. Mato Grosso do Sul and São Paulo, Brazil) are cited as additional examined material to complement

information on distribution and conservation, or when descriptions were complemented with samples from outside the study area.

Field expeditions:—Twenty-two field expeditions were carried out in Argentina and Southern Brazil, from 2018 to 2019 (Tab. 2). We collected about 110 specimens corresponding to 13 species of Eriocaulaceae, all housed at ICN herbarium, with duplicates available for other institutions. The collection procedures followed Fidalgo & Bononi (1989). The remaining species from SSA were observed exclusively in herbaria.

Geographic distribution and ecological data:—Geographic distribution and ecological data, such as preferential habitat and flowering periods, were based on information from literature, our analysed material from herbaria and own fieldwork. Collections lacking geographic coordinates had their location georeferenced by approximation using Google Earth online. Collections with vague geographical information were disconsidered for coordinate reconstruction. The georeferenced data were uploaded to ArcGIS 10.1 for the distribution maps, in which a single georeferenced point was used per locality.

Conservation status assessments:—Ten species had their preliminary conservation status evaluated according to IUCN (2017) categories and criteria. They were chosen based on their distribution restricted or mostly occurring in the study area. For these selected species, GeoCAT (Bachman *et al*. 2011) was used to calculate the extent of occurrence (EOO) and area of occupancy (AOO) based on the georeferenced data. The results were discussed based on the current knowledge of the species and field observations.

Results & discussion

Comparative richness, distribution patterns and endemisms

Thirty species of Eriocaulaceae distributed in six genera occur in SSA, 11 species (35% of the total) are restricted to this region or slightly surpass its boundaries. The highest richness is in southern Brazil, which encompasses all the confirmed species so far, followed by Paraguay (6 spp.), Argentina (4 spp.) and Uruguay (3 spp.) (Fig. 2, Tab. 3). Argentina shares three species with Paraguay, and one with Uruguay. Paraguay and Uruguay do not share any species. The most frequently recorded species in SSA are *Eriocaulon gomphrenoides* Kunth (1841: 548), *E. sellowianum* Kunth (1841: 545) and *Syngonanthus caulescens* (Poiret 1813: 162) Ruhland (1903: 267), which are widely distributed, and found in most of the countries in the study area.

In southern Brazil, the states of Paraná and Santa Catarina present the same richness (23 spp.), and share 16 species. Twenty-three species represent less than half the richness found in São Paulo, with 51–57 species (Sano & Giulietti 2012, BFG 2015, Trovó & Sano 2016). Rio Grande do Sul has 11 confirmed species, almost half the number observed in the other two southern states, all of them shared with Santa Catarina, and eight with Paraná. This is the only area in SSA with recorded occurrences of *Comanthera*, accounting six genera, the largest number in comparison to the other countries and Brazilian states in the study area, which vary from two to five genera. Concerning restricted taxa, Santa Catarina has two species exclusive from highland areas: *Eriocaulon reitzii* Moldenke & L.B.Sm. (Moldenke 1973b: 430) and *Paepalanthus kleinii* (Moldenke & L.B.Sm.) Trovó (Moldenke 1973b: 431, Trovó *et al.* 2014: 218). We did not confirm any species restricted to Paraná and Rio Grande do Sul.

Based on the species composition and their geographical distribution, focusing on the elevation ranges in which they occur, we summarize three main patterns in the study area: I) Widespread (distributed regardless of elevation ranges); II) Highlands; and III) Lowlands (Tab. 1).

Widespread:—From the 30 confirmed species of Eriocaulaceae in SSA, 13 species do not present occurrence conditioned to altitudinal ranges, not being exclusively from highlands or lowlands. Here, we highlight *Actinocephalus polyanthus* (Bongard 1831: 622) Sano (2004: 103), *Leiothrix flavescens* (Bongard 1831: 628) Ruhland (1903: 231) and *Syngonanthus caulescens*, widely distributed species with geographical and ecological disjunctions already observed by previous authors (e.g. Sano 1998a, Trovó *et al.* 2008). Despite their large extension of occurrence or large subpopulations, some of these species are not frequently observed in the SSA because of their occurrence in very specific sites, not always easily accessible.

Highlands:—Eleven species in SSA occur exclusively in highland grasslands (above 800 m elev.), which, in the study area, are located in southern Brazil. These highlands can be splitted in distinct biomes, based on their geological history and species composition (Iganci *et al.* 2011). In a general view, we consider the following classification within the highland grasslands: a) Subtropical Highland Grasslands (SHG), in the Serra Geral plateau, underlain by basaltic rocks; b) High Altitude Tropical Grasslands (HTG), in the Serra do Mar mountain range, underlain by granitic rocks; and c) *Campos Gerais* (CGE), embracing an arc-shaped area west of the Devonian Scarp, in the second plateau of Paraná, presenting sandstone outcrops and spreading to southern São Paulo state (Maack 1968). The SHG and HTG are here used following Iganci *et al*. (2011), the first being correspondent to the *Campos de Cima da Serra*

region (Fortes 1959), both included in the Atlantic domain. The CGE, here treated as a distinct formation based on Maack (1968), is also partially included in the Cerrado domain (synonimous to Tropical Savanna according to Iganci *et al*. 2011).

From the highlands species, three are endemic to the SHG: *Eriocaulon reitzii*, *Paepalanthus bellus* Moldenke (1962b: 391) and *Paepalanthus kleinii*, this last being known only from the type collection. Despite not being endemic to SHG, *E. gomphrenoides* and *P. catharinae* Ruhland (1903: 147) are the most frequently observed species of Eriocaulaceae in this biome, both presenting extensive and numerous subpopulations, reaching hundreds of individuals in a single site. *Paepalanthus caldensis* Malme (1901: 29) occurs exclusively in highlands from southeastern to southern Brazil, being also recorded in SHG, but is not endemic to this biome or restricted to SSA. *Paepalanthus hatschbachii* Moldenke (1950: 224) is the only endemic species to the HTG in SSA, with few collections made in Paraná and northeastern Santa Catarina.

Most of the taxa recorded in Paraná occurs preferentially in CGE, following the edge of the Devonian Scarp. However, we did not find any endemic species to CGE. *Paepalanthus albovaginatus* Silveira (1928: 233) and *P. tessmanii* Moldenke (1949: 169), for example, are most recorded in this region but are not endemic, its remaining collections having been made in the HTG of Santa Catarina, in the border with Paraná. In the study area, *Comanthera xeranthemoides* (Bong.) L.R.Parra & Giulietti (2010: 1145) and *P. paulensis* Ruhland (1903: 211) occur only in the northermost portion of the CGE, in the Cerrado domain, where these species find its southern distribution limit.

Lowlands:—Six species in SSA occur exclusively in lowlands (below 800 m elev.), two of them are endemic. The most inland distribution of Eriocaulaceae in SSA seems to be strongly related to the La Plata basin, especially the Paraguay and Middle-Paraná subbasins (as conceived by Berbery & Barros 2002), where almost 26% of all the confirmed species occur. This area, from central Paraguay to western Paraná, southern Brazil, passing through northeastern Argentina, is a large floodplain, with grasslands and marshes (Burkart *et al.* 1999). In Paraguay, records of Eriocaulaceae are found exclusively at east of the Paraguay river (Giulietti *et al.* 2018), with no records in the Dry Chaco, at west, as conceived by Cacciali (2010). In Argentina, the distribution is restricted to the northeast region, occurring mainly in the humid *Mesopotamia Argentina*, in Corrientes and Misiones provinces, less frequently in the easternmost Chaco province (Abbiatti 1946a). In the last one, the innermost record of Eriocaulaceae in SSA is found, represented by *Eriocaulon macrobolax* Körnicke (1863: 484).

There are species typically occuring from central Paraguay to western Paraná, some of them reaching Mato Grosso do Sul state or southeastern Brazil, such as the *E. macrobolax* and *Paepalanthus balansae* Ruhland (1903: 151) (Giulietti *et al.* 2018). We relate this distribution, as well as the floristic similarity among the cited territories, to the river basin, which acts as a corridor to some species (e.g. Arzamendia & Giraudo 2009), also to the existence of portions of *Cerrado* in eastern Paraguay (Mereles 2013, Velazco *et al*. 2018).

The Coastal Plain Grasslands (CPG) are here highlighted as a distinct formation within both the Atlantic and the *Pampas* domains. The CPG occur from approximately Laguna, southern coast of Santa Catarina, southwards Uruguay (Rambo 1954). Nine species of Eriocaulaceae occurs in the region, two of them endemic: *Eriocaulon itapevense* Alff & Stützel (2019: 199) and *E. magnificum* Ruhland (1903: 48), both occurring in the Atlantic domain, the second being also found in the southern coast of Rio Grande do Sul, in the *Pampas* domain. *Syngonanthus chrysanthus* (Bongard 1831: 628) is not considered endemic to the CPG, once it is currently sparsely recorded in Bertioga, southern coast of São Paulo (e.g. Sano & Giulietti 2012). However, collections of this species are mostly from the mid coast of Santa Catarina to Montevideo, Uruguay, near the La Plata river, representing the southermost distribution of Eriocaulaceae in SSA. Other two species occur preferably in the CPG, despite being distributed regardless altitudinal ranges, *Actinocephalus polyanthus* and *E. modestum* Kunth (1841: 547). Outside the CPG, the only recorded species of Eriocaulaceae are the widely distributed *E. gomphrenoides* and *S. caulescens*, both also occurring in distinct elevations.

Habitats

Eriocaulaceae in SSA is most frequently found in wetlands environments in grasslands ecosystems (e.g. Moldenke & Smith 1976, Irgang & Gastal-Jr. 1996). Most of these wetlands are commonly known as *banhados* (in southern Brazil), also *esteros*, *humedales* or *pantanos* (in Argentina, Paraguay and Uruguay), and not always have a clear classification on their typology (e.g. Abbiatti 1946a, Moldenke & Smith 1976). These areas can be peatbogs, edges of lagoons and streams, and even small shallow ponds or temporarily flooded locations. In our study area, *Eriocaulon* occurs exclusively in wetlands *s.l.* (according to Irgang & Gastal-Jr. 1996). Species of the remaining genera occasionally occur in well-drained soils, some of them being able to tolerate flooding periods (e.g. *Leiothrix flavescens*, *Syngonanthus chrysanthus*), or are found in humid slopes with rocky outcrops, frequently covered by fog (e.g. *Paepalanthus*

albovaginatus, *P. planifolius*). *Actinocephalus polyanthus* is observed inhabiting dunes, ravines and dry grasslands, habitats usually with occurrence of fire. Individuals of this species displaying burned leaves were collected in more than one occasion during our survey.

Floral visitors and associated fauna

We observed several insects, including beetles (Coleoptera), flies (Diptera), and even Meliponini bees (Hymenoptera, Apidae) visiting inflorescences of Eriocaulaceae (Fig. 4). Still, studies on floral visitors and information on interaction animal-plant in general applied to this family are very sparse. Studies on reproductive biology are also incipient, with information mostly based on morphology and casual inferences (Ramos *et al*. 2005). Ramos *et al.* (*l.c*.) cite several authors that have speculated about the pollination system in Eriocaulaceae, considering anemophily, entomophily or both (mixed or ambiphilic system). In this sense, Wolowski & Freitas (2015), based on extensive literature review, point Eriocaulaceae as a group predominantly pollinizated by small insects, offering nectar and pollen as reward. Species of Eriocaulaceae are also able to provide other services to small animals, as already indicated by previous authors (e.g. Castellani *et al.* 1995, Oriani & Scatena 2009).

Analyses specifically related to floral visitors and associated fauna, from the species included in our study area, were found for *Actinocephalus polyanthus* (Galitzki *et al.* 2013, Martins 2013). Galitzki *et al.* (2013) highlighted the richness of ants (Hymenoptera, Formicidae) in this species, although it was not tested whether these insects were, in fact, playing a role in pollinatinon. At least eight species of ants were also found in dead post-reproductive plants of *A. polyanthus*, using them as nesting sites (Cereto *et al.* 2011). Martins (2013), who studied the biodiversity of animals associated to *A. polyanthus* in the coast of Santa Catarina, concluded that 77% of the ca. 150 recorded animal species (mainly insects) used the plant, not only the reproductive portion, as shelter. This information was congruent with a previous survey focusing on Coleoptera, in which 60% of the recorded specimens (from 35 species/morfospecies) were using the plant as shelter, the majority of them hidden in the inflorescences (Martins & Albertoni 2009). Stützel (1998) also cites the occurrence of parasites in Eriocaulaceae, including larvae of Diptera in *Eriocaulon megapotamicum* Malme (1935: 8) (= *E. magnificum*).

During our field expeditions, other small arthropods, such as spiders (Araneae), were seen in the capitula of *Eriocaulon* species, silk being frequently found below the inflorescences,

forming small nets between the capitula and scapes (Fig. 4, C–E). Silk yarns occasionally connected one plant to another, frequently near edges of ponds and lakes. At least two genera of spiders belonging to distinct families were identified on the capitula of *Eriocaulon itapevense*: *Eustala* sp. (Araneidae), an orb-weaver spider; and *Misumenops* sp. (Thomsidae), a crab-spider. According to Romero (2005), several studies reveal that many Oxyopidae, Thomsidae, Salticidae and a single species of Araneidae live strictly associated to species or groups of plants that share morphological features (e.g. rosettes, glandular trichomes). At least in Bromeliaceae, mutualistic relations involving spiders are proved more common than previously thought (Romero *et al*. 2006). In Eriocaulaceae, Figueira & Vasconcellos-Neto (1991) found *Alpaida quadrilorata* (Eugène Simon, 1897), Araneidae, which apparently inhabits only *Paepalanthus bromelioides* Silveira (1908: tab. 18), in Minas Gerais, southeastern Brazil. These spiders benefit from the shelter, also using the plant architecture to construct their webs. Raizer & Amaral (2001) state that the richness and composition of spiders can be associated to structural complexity in species of aquatic macrophytes, what may explain why these arthropods have a preference for some species of Eriocaulaceae.

Concerning amphibians, the biologist Patrick Colombo (FZB-RS) related the occurrence of at least two species of treefrogs (Anura, Hylidae) in the rosettes of *Eriocaulon* in southern Brazil (pers. comm.): *Dendropsophus sanborni* (Schmidt, 1944) (Fig. 4, F), probably in *E. gomphrenoides*, based on the provided location, and *Scinax tymbamirim* (Nunes, Kwet & Pombal, 2012). In southern Brazil, new species of toads (Anura, Bufonidae) were recently described inhabiting rosettes of *Eriocaulon*: *Melanophryniscus biancae* (Bornschein, Baldo, Pie, Firkowski, Ribeiro & Corrêa, 2015), in the Serra do Quiriri, High Altitude Tropical Grasslands of Santa Catarina; and *M. vilavelhensis* (Steinbach-Padilha, 2008), in the *Campos Gerais* of Paraná. The first species was observed using the rosettes of *Eriocaulon ligulatum* (Vellozo 1829: 36) L.B.Smith (1939: 5) (as identified by Bornschein *et al.* 2015) for reproduction, eggs being laid in the cisterns formed by its leaves (three to nine eggs accounted per plant). The second species was found both in non-specified species of *Eryngium* Linnaeus (1753: 232), Apiaceae, and *Eriocaulon*, also with eggs in the cisterns.

Uses

We did not find any current use of the native subtropical South American Eriocaulaceae in the study area. Although, Lindman (1906) observed that the inflorescences of *Paepalanthus*

polyanthus Kunth (1841: 516) (= *Actinocephalus polyanthus*) were once used as cut flowers in Rio Grande do Sul. *Syngonanthus chrysanthus* is cultivated as an ornamental potted plant and sold as "Mikado", a cultivar patented by Bak & Steur (2008), at least in Europe and North America, as can be verified in some websites specialized in ornamentals. This species was also considered suitable for growing and commercialization according to Gomes da Costa *et al.* (2013). Abbiatti (1946a) mentioned that *Syngonanthus elegans* (Bongard 1831: 635) Ruhland 1903: 275 [= *Comanthera elegans* (Bong.) L.R.Parra & Giulietti (2010: 1139)], which is not native from SSA, was sold in floricultures in Argentina, being the capitula dyed different colours. This same species is cited as cultivated near Diamantina, Minas Gerais, southeastern Brazil, being one of the most commercialized everlasting-plant in this region (Giulietti *et al.* 1988, Giulietti *et al.* 1996). It is one of the species currently used to fake flowers in ornamental small cacti sold in great market chains in southern Brazil.

Taxonomic treatment

Eriocaulaceae Martinov (1820: 237)

Annual or perennial herbs, monoecious. **Leaves** usually rosulate, distichous equitant, more frequently spirally arranged, not unusual decaying leaves persisting at the base of the rosette. **Scapes** few or numerous per plant, bearing a single racemous capitulum or a group of capitula (*Paepalanthus* subg. *Platycaulon*). **Spathes** with distal opening transversal or oblique, the capitulum leaving the sheath by a secondary lateral slit, sometimes the distal opening ruptured in a characteristic manor caused by the relative growth of sheath and capitulum. **Inflorescences** composed of indeterminate capitula, sometimes arranged in complex inflorescences. **Capitula** usually whitish, surrounded by an involucrum of sterile bracts, generally with staminate and pistillate flowers. **Flowers** unisexual, 2 or 3-merous, heterochlamydeous, frequently pedicellate, each flower in the axil of a floral bract, the latter lacking for the inner flowers in *Comanthera*, *Lachnocaulon*, and *Syngonanthus*. **Staminate flowers** with both whorls of stamens developed (4 or 6 stamens in Eriocauloideae) or only the inner whorl developed (2 or 3 stamens in Paepalanthoideae), anthers 2-thecate and 4-sporangiate. **Pistillate flowers** hypogynous, ovary 2 or 3-carpellate, each locule with a single pendulous ovule, styles forming column or free, stigmatic branches and nectariferous appendages (Paepalanthoideae) free or fused to the styles. **Fruit** a loculicidal capsule. **Seeds** 0.5–1 × 0.2–0.6 mm, elliptical to ovoid

or globose, yellowish to amber or brownish, seed coat with a characteristic ornamentation originating from the inner layer of the outer integument, this ornamentation being of diagnostic value.

Key to the genera of Eriocaulaceae in subtropical South America

1. Petals with black glands; staminate flowers with both whorls of stamens developed; gynoecium with fused styles, nectariferous appendages absent ..... (Eriocauloideae) *Eriocaulon*
- Petals without black glands; staminate flowers with only the inner whorl of stamens developed; gynoecium with free styles, nectariferous appendages present …….……. (Paepalanthoideae) 2
2. Pistillate flowers with petals fused at the middle ……...……..……..…. 3
- Pistillate flowers with free petals …….....…..……..…… 4
3. Flowers with sepals and petals equal or similar in length; staminate flowers with petals fused up to the distal third; seeds surface reticulate ……...…… *Syngonanthus*
- Flowers with sepals shorter than petals; staminate flowers with petals fused up to the mid porton; seeds surface rugose ……... *Comanthera*
4. Gynoecium with stigmatic branches and nectariferous appendages fused at different levels; seeds surface longitudinally striate ……...…….…...……...….. *Leiothrix*
- Gynoecium with stigmatic branches and nectariferous appendages free or fused only at the base; seeds surface reticulate ……..……...……..... 5
5. Capitula in globose umbels leaving from lateral leafy branches ..…….....… *Actinocephalus*
- Capitula directly at the apex of the scapes, or in globose umbels leaving from elongated stems ..……..…..…… *Paepalanthus*

1. Actinocephalus (Körnicke 1863: 321) Sano (2004: 103)
Lectotype (designated by Sano 2004: 99):—*Actinocephalus polyanthus* (Bong.) Sano

1.1. Actinocephalus polyanthus (Bong.) Sano (2004: 103). *Paepalanthus polyanthus* (Bong.) Kunth (1841: 516). *Eriocaulon polyanthum* Bongard (1831: 622). Type:—BRAZIL. [Minas Gerais]: In pratis humidis glareosis Serra da Lapa, November 1824, *L.Riedel 1065* (holotype LE; isotypes LE 00001100, LE 00001101 images!, B, P). **Figures 5–7.**

Herbs 24–54 cm high. **Leaves** spirally arranged, 7.9–18 × 1–1.4 cm, linear-lanceolate, slightly falcate, patent to porrect, chartaceous, apex acute, hyaline trichomes up to 3 mm long on both surfaces. **Reproductive axis** 12.8–34.5 cm long, arising from the basal rosette. **Lateral**

branches 9.8–26 cm long, leaving from the reproductive axis. **Bracts** spirally arranged in the elongated axis, 3.5–15 × 0.6–1.3 cm, and lateral branches, 2–2.4 × 0.4–0.6 cm, similar to the leaves, bracts insertion villose. **Spathes** 8–9 mm long, apex oblique, sparsely ciliate. **Scapes** 2.2–2.8 cm long, hyaline trichomes up to 2 mm long. **Capitula** single, radial, bell-shaped, 2–4 mm diameter, arranged in umbeliform-manner at the apex of lateral leafy branches. **Involucral bracts** in 2 or 3 series, 1.8–2 × 0.8–1 mm, elliptical to slightly obovate, apex acute to slightly mucronate, stramineous to brownish, margins eventually hyaline, white trichomes up to 0.3 mm long at the apex margins. **Floral bracts** very similar to the involucral bracts. **Flowers** 3-merous, frequently more staminate than pistillate flowers in each capitulum. **Staminate flowers** ca. 2 mm long, pedicel up to 0.7 mm long; sepals free, at most slightly fused at the base, 1.3–2 × 0.2–0.3 mm, oblanceolate to linear, apex obtuse, stramineous, darker towards the apex, sparse white trichomes up to 0.4 mm long at the apex margins; petals fused up to the distal third, forming an infundibuliform corolla up to 1.4 mm long, 6-lobed, stramineous to golden, glabrous; a single whorl of stamens developed, stamens 3, up to 1 mm long, anthers pale. **Pistillate flowers** 2–2.5 mm long, sessile; sepals free, similar to the observed in the staminate flowers; petals free, equal, 1.5–1.8 × 0.3–0.5 mm, elliptical, apex acute, cream to stramineous, trichomes up to 0.8 mm long at the apex margins; gynoecium 3-carpellate, ca. 2 mm long, stramineous to amber, ovary 3-carpellate, ca. 0.6 mm long, 3 stigmatic branches and 3 nectariferous appendages fused at the same level, slightly surpassing the stigmatic branches. **Seed coat** reticulate.

Illustrations:—Bongard (1831: Tab. II), Ruhland (1903: 198), Moldenke & Smith (1976: 59), as *P. polyanthus*, Sano (1998a: 204, 2004: 101), Trovó *et al.* (2008: 637) [line-drawings].

Etymology:—*Actinocephalus* means “radial heads” (from the Greek, *aktínos* = ray, *kephale* = head). The specific epithet *polyanthus* refers to the numerous flowers of *A. polyanthus* (from the Greek, *poly* = many, *anthos* = flower) (Moldenke & Smith 1976, Gledhill 2008).

Distribution and habitat:—Northeastern to southern Brazil (Paraná, Rio Grande do Sul and Santa Catarina). *Actinocephalus polyanthus* occurs mainly in the *Campos Gerais* of Paraná and in the Coastal Plain Grasslands of Rio Grande do Sul and Santa Catarina. It is rare and sparsely recorded in the Serra Geral plateau. It inhabits grasslands associated with dunes, ravines or rocky outcrops, usually in sandy and well-drained soils, up to 1185 m elevation (Fig. 7).

Phenology:—Flowering throughout the year, mainly from November to February.

Nomenclatural notes:—Sano (1998a) considered *Riedel 2065* erroneously as the original material examined by Bongard (1831). Sano (2004) and Trovó *et al*. (2015) indicated *Riedel 1065* (LE) as holotype, what is consistent with the information mentioned in the protologue. We did not have access to the holotype inferred by these authors, only to two images of duplicates also housed at LE (cited by them as isotypes). Moreover, we found references in the literature to other duplicates at B and P (Sano 2004, Trovó *et al.* 2015). Although, according to Sano (pers. comm.), there was a clear indication of a single specimen at LE used by Bongard to describe the species.

General notes:—*Actinocephalus polyanthus*, in contrast to the other species of the genus, is hapaxanthic (or monocarpic), each plant flowering only once during its lifetime and dying just after. It can be observed in the field, when the plants start to dry and desintegrate soon after the flowering and fruiting period. Generally, it can be verified in an entire generation of specimens within a subpopulation. Vegetative rosettes, that may be among reproductive specimens, are individually difficult to recognize or distinguish from those of other species.

For a complete list of synonyms see Sano (2004).

Examined material:—BRAZIL. **Paraná**: Balsa Nova, Serra do São Luiz by the Rodovia do Café, 1100 m elev., 14 January 1965, *L.B.Smith et al. 14441* (HBR!); Balsa Nova, São Luiz do Purunã, 25°35’03”S 49°38’07”W, 2 March 2008, *F.S.Meyer & C.Simão 598* (UPCB!); Balsa Nova, estrada Tamanduá-Ponte dos Arcos, 25°28’44”S 49°42’34”W, 1044 m elev., 18 December 2013, *J.T.Motta et al. 4230* (MBM!); Balsa Nova, São Luiz do Purunã, 25°28’10.3”S 49°38’44.4”W, 1185 m elev., 3 March 2019, *C.L.Ribeiro et al. 306* (ICN!). Jaguariaíva, 26 October 1977, *L.T.Dombrowski 9007 & P.S.Neto 261* (MBM!); Jaguariaíva, Fazenda Samambaia, 800 m elev., 10 June 1993, *A.Lacerda & M.C.Portes 15* (EFC!); Jaguariaíva, Parque Estadual do Cerrado, 22 October 2000, *A.Uhlmann et al. 334* (MBM!); Jaguariaíva, Parque Estadual do Cerrado, 900 m elev., 3 June 2005, *C.V.Roderjan 1760* (EFC!); Jaguariaíva, Parque Estadual do Cerrado, 24°09’45”S 49°39’10”W, 29 November 2013, *E.D.Lozano & D.P.Saridakis 2077* (MBM!). Palmeira, Faz. Sta. Rita, 16 January 1951, *A.Mattos 4390* (HBR!, MBM!); Palmeira, Witmarsum, 1000 m elev., 12 November 1963, *R.Klein 4580?* (HBR!); Palmeira, January 1967, *L.T.Dombrowski 2274 & Y.S.Kuniyoshi 2017* (MBM!); Palmeira, 18 January 1967, *L.T.Dombrowski 2751 & Y.S.Kuniyoshi 2093* (MBM!); Palmeira, 3 December 1972, *L.T.Dombrowski 4495* (MBM!); Palmeira, Córrego da Anta, 1 December 1974, *G.Hatschbach 35574* (LP!, MBM!); Palmeira, Fazenda Santa Rita, 14

November 1979, *L.T.Dombrowski 10880* (MBM!); Palmeira, Rio do Salto, 14 January 1981, *L.T.Dombrowski 12390 & C.Scherer 350* (MBM!); Palmeira, Canyon do Rio Tibagi, 28 November 1993, *S.H.Sasaki et al. s.n.* (MBM barcode 411099!); Palmeira, Rio dos Papagaios, BR-277, 17 November 1998, *G.Hatschbach et al. 68810* (MBM!); Palmeira, Recanto dos Papagaios, 3 February 1999, *J.M.Cruz et al. 92* (FURB!, MBM!); Palmeira, Capela Nossa Senhora das Pedras, 10 November 2005, *J.M.Silva et al. 4430* (MBM!, SI!); Palmeira, Recanto dos Papagaios, 25°27'58"S 49°46'06"W, 10 December 2013, *E.D.Lozano & M.E.Engels 2219* (MBM!); Palmeira, Rodovia BR-376, 25°22'29"S 49°48'40"W, 17 December 2013, *E.D.Lozano 2374* (MBM!); Palmeira, Fazenda Boiada, 25°17'09"S 49°51'45"W, 19 December 2013, *E.D.Lozano 2463* (MBM!). Piraí do Sul, October 1980, *L.T.Dombrowski 13413* (MBM!); Piraí do Sul, Fazenda Esterco, 24°25'34"S 50°00'29"W, 28 November 2013, *E.D.Lozano & D.P.Saridakis 1976* (MBM!). Ponta Grossa, Rio Tibagi, 900 m elev., 12 December 1965, *R.Reitz & R.M.Klein 17478* (HBR!); Ponta Grossa, Fortaleza, 13 December 1969, *G.Hatschbach 23211* (MBM!); Ponta Grossa, Rio Tibagi, Rodovia do Café, 3 November 1975, *R.Kummrow 953* (MBM!); [Ponta Grossa?], limit between Ponta Grossa and Palmeira, gorge of the Rio Tibagi at the point where BR-376 highway crosses, ca. 25°20'S 49° 50'W, ca. 1000 m elev., 16 November 1977, *L.R.Landrum 2568* (MBM!); Ponta Grossa, BR 277, rio Tibagi, 28 November 1985, *C.V.Roderjan & Y.S.Kuniyoshi 459* (EFC!); Ponta Grossa, Canyon Guartelá, 23 November 1992, *I.P.Lima 5* (MBM!); Ponta Grossa, Parque Vila Velha, 21 December 1997, *C.Mansan 546* (HAS!); Ponta Grossa, Buraco do Padre, 24 November 1999, *C.B.Poliquesi et al. 641* (MBM!); Ponta Grossa, Parque Estadual de Vila Velha, Fortaleza, 25°14'24"S 49°59'37"W, 951 m elev., 1 September 2010, *M.Verdi et al. 5644* (FURB!); Ponta Grossa, Parque Estadual de Vila Velha, 25°14'00"S 49°59'57"W, 965 m elev., 20 January 2013, *M.Savarais 540* (MBM!); Ponta Grossa, Parque Estadual de Vila Velha, 25°14'51" 49°59'31"W, 18 December 2013, *E.D.Lozano 2411* (MBM!). [Porto Amazonas] Palmeira, 25°28'28"S 49°53'31.6"W, 899 m elev., 17 October 2009, *M.G.Caxambu & E.L.Siqueira 2752* (MBM!); Porto Amazonas, BR-277, Cachoeira Caldeirão, 16 August 2010, *V.C.Martin 15* (MBM!). Tibagi, vale do Rio Iapó, Canion de Guartelá, 1100 m elev., 25 May 1990, *C.V.Roderjan & Y.S.Kuniyoshi 868* (EFC!). **Rio Grande do Sul**: Barra do Ribeiro, Lagoa das Capivaras, 19 May 2003, *M.L.Abruzzi 4870, 4871* (HAS!); Barra do Ribeiro, 30°28'13.5"S 51°16'41.9"W, 15 December 2008, *A.A.Schneider 1629* (ICN!). Fortaleza dos Valos, Voçoroca do Ivaí, 29°00'05.57"S 53°27'05.41"W, 397 m elev., 24 January 2019, *C.C.Alff & C.Rabuske-Silva 166* (ICN!); Fortaleza dos Valos, Voçoroca do Ivaí, 29°00'16.7"S

53°26’59.4”W, 11 February 2019, *J.Schaefer & R.Rigon 866* (ICN!). Rio Grande, Quitéria, 28 November 1986, *B.E.Irgang s.n.* (HURG 1100!); Rio Grande, Ilha dos Marinheiros, 19 November 2001, *T.Arigany s.n.* (HAS 42835!); Rio Grande, Ilha dos Marinheiros, 25 January 2005, *L.F.P.Lima 113* (ICN!); Rio Grande, Ilha dos Marinheiros, 32°00’26”S 52°07’15”W, 10 November 2009, *G.Heiden et al. 1156* (ICN!, MBM!); Rio Grande, Ilha dos Marinheiros, 31°59’23.1”S 52°07’05.7”W, 8 July 2018, *C.C.Alff & C.Rabuske 140* (ICN!); Rio Grande, Quitéria, 32°00’41.4”S 52°14’45.5”W, 8 m elev., 9 July 2018, *C.C.Alff & C.Rabuske 141* (ICN!). São José do Norte, Praia do Nilo, 6 November 2009, *J.Cordeiro et al. 3249* (MBM!). Torres, fronteira N do parque turístico, 26 November 1972, *J.C.Lindeman s.n.* (ICN 20912!); Torres, São Brás, 9 November 1972, *B.E.Irgang s.n.* (ICN 20790!); Torres, Campo Bonito, 19 December 1978, *J.L.Waechter & L.R.M.Baptista 1084* (ICN!). **Santa Catarina**: Balneário Gaivota, 29°13’59.6”S 49°39’00.5”W, 19 m elev., 30 January 2019, *C.C.Alff & C.Rabuske-Silva 178* (ICN!); Balneário Gaivota, 29°13’23.8”S 49°38’32.3”W, 20 m elev., 30 January 2019, *C.C.Alff & C.Rabuske-Silva 183* (ICN!); Balneário Gaivota, 29°13’10.2”S 49°38’27”W, 20 m elev., 30 January 2019, *C.C.Alff & C.Rabuske-Silva 184* (ICN!). Florianópolis, 1935, *A.Bruxel SJ s.n.* (PACA 6874!); Florianópolis, 13 December 1938, *A.Sehnem SJ s.n.* (PACA 3160!); Florianópolis, Ilha de Santa Catarina, Lagoa da Conceição, 3 m elev., 25 November 1965, *R.M.Klein & Bresolin 6392* (FLOR!, HBR!); Florianópolis, 5 November 1972, *H.Jakobi s.n.* (UPCB 19724!); Florianópolis, 22 January 1985, *S.C.A.Rego s.n.* (ICN 88166!); Florianópolis, Ilha de Santa Catarina, Praia da Joaquina, 3 February 1991, *J.I.Dalbó s.n.* (FLOR 21054!); Florianópolis, Ilha de Santa Catarina, Dunas da praia da Joaquina, 2 m elev., 25 February 1993, *D.B.Falkenberg 6105* (FLOR!); Florianópolis, Praia da Joaquina, 4 October 1997, *E.Crestani s.n.* (FURB barcode FURB23770!); Florianópolis, Ilha de Santa Catarina, entre a Lagoa da Conceição e a Praia da Joaquina, 10 November 2011, *R.E.Ardissone 296* (FLOR!); Florianópolis, Praia da Joaquina, Parque Municipal Dunas da Lagoa da Conceição, 27°37’30.01”S 48°27’07.05”W, 15 October 2013, *H.C.Bloemer 7* (FURB!); Florianópolis, Joaquina, Dunas da Lagoa da Conceição, 27°37’45”S 48°27’16”W, 5 m elev., 5 September 2014, *L.A.Funez 3051* (FURB!). Lages, 950 m. elev., 10 January 1951, *A.Sehnem 5454* (PACA!, SI!); Lages, 10 January 1951, *B.Rambo SJ 49611* (HBR!, PACA!, SI!); Lages, 800 m elev., 26 January 1952, *R.Reitz 4687* (HBR!); Lages, 26 January 1952, *R.Reitz 4738* (PACA!); Lages, 1935, *A.Bruxel SJ s.n.* (PACA 7072!); Lages, Morro Pinheiro Seco, east of Lages, 900–950 m elev., 15 January 1957, *L.B.Smith & R.Reitz 10972* (HBR!). Mafra, 10 km of Tinguí on the road to Mafra, 800 m elev., 2 February 1957, *L.B.Smith & R.M.Klein 10634*

(HBR!). Palhoça, Campo do Massiambú, 5 m elev., 19 December 1952, *R.Reitz 4900* (HBR!); Palhoça, Maciambú Pequeno, 14 December 1979, *T.M.Pedersen 12707* (MBM!); Palhoça, Três Barras, 3 December 2010, *J.Cordeiro et al. 4069* (MBM!). [Passo de Torres] Araranguá, Curralinhos, 15 m elev., 17 November 1944, *R.Reitz C863* (HBR!); Passo de Torres, Curralinhos, 7 December 1944, *R.Reitz s.n.* (PACA 32004!). Porto União, east of Valões (Irineópolis) on the road to Canoinhas, 750 m elev., 17 December 1956, *L.B.Smith & R.Reitz 8630* (HBR!, LP!).

2. Comanthera L.B.Smith (1937: 38)

Type:—*Comanthera linderi* L.B.Smith (1937: 38) [= *C. kegeliana* (Körnicke 1863: 438) Moldenke (1966: 218)]

2.1. Comanthera xeranthemoides (Bong.) L.R.Parra & Giulietti (2010: 1145). *Eriocaulon xeranthemoides* Bongard (1831: 635). Syntypes:—BRAZIL. [Minas Gerais]: Habit locis paludosis in Serra da Chapada, September 1827, *L.Riedel s.n.* (BR barcode 860207 image!, LE). **Figures 8–9.**

Herbs 15.5–28.5 cm high. **Leaves** spirally arranged, 2.7–16.6 × 0.2–0.4 cm, linear-lanceolate, usually falcate, ascending to slightly recurvate, slightly coriaceous, apex acute to apiculate, hyaline trichomes up to 0.3 mm long on the abaxial surface. **Spathes** 4–7 mm long, apex oblique, indument as observed in the leaves. **Scapes** 14.8–25 cm long, glabrescent or with hyaline trichomes up to 0.2 mm long. **Capitula** solitary, radial, cupuliform, 8.5–9 mm diameter. **Involucral bracts** in 7–9 series, 1.5–2.5 × 1–1.5, ovate, wider towards the inner series, apex acute, slightly mucronate, stramineous to slightly saffron, glabrous. **Floral bracts** only in the peripheral flowers, lacking towards the centre of the capitula. **Flowers** 3-merous, hyaline in both staminate and pistillate flowers. **Staminate flowers** ca. 5.5 mm long, pedicel ca. 2.5 mm long; sepals slightly fused at the base, 2.5–2.8 × 0.3–0.6 mm, lanceolate, apex obtuse to acute; petals very similar to the sepals, but slightly larger, ca. 3 mm long; a single whorl of stamens developed, 3 stamens, ca. 2.5 mm long, anthers pale. **Pistillate flowers** not observed.

Illustrations:—Echternacht (2012: 171) [line-drawings], Echternacht (2012: 172) [photographs plate].

Etymology:—*Comanthera* means "pilose anther" (from the Greek, *koma* = hair, trichomes; *anthera* = anther), based on what Smith (1937) assumed to be a staminate flower of *C. linderi*, currently a synonym of *C. kegeliana*, according to Echternacht (2012). However, this "staminate flower" is, in fact, a pistillate flower elevated over the capitulum for seed shed. The specific epithet *xeranthemoides* refers to the general aspect of the capitula and possibly to their traditional use as everlasting plants, similarly to *Xeranthemum* L. (1753: 857), Asteraceae (from the Ancient Greek, *xeros* = dry, *anthos* = flower; from the Latin, *oides* = alike, resembling) (Gledhill 2008).

Distribution and habitat:—Widely distributed in Bolivia, Brazil, Colombia, Guayana and Venezuela. This species reaches its southernmost distribution in southern Brazil, where it is restricted to northern *Campos Gerais*, Paraná. It inhabits moist sandy soils, between 700–900 m elevation (Fig. 9).

Phenology:—Sporadically recorded in May, July and November.

Nomenclatural notes:—The collection *L.Riedel s.n.* (LE) was indicated as holotype of *C. xeranthemoides* by Parra *et al.* (2010) and Echternacht (2012). We did not have access to this material, only to its duplicate at BR (considered an isotype by Moldenke 1953 and the previously cited authors). We assume that these collections are, in fact, syntypes, requiring lectotypification.

General notes:—For a complete list of synonyms see Echternacht (2012).

Examined material:—BRAZIL. **Paraná**: Jaguariaíva, 25 May 1914, *G.Jönsson 438-a* (NY barcode 00538317 image!, S S17-9046 image!); Jaguariaíva, Parque Estadual do Cerrado, Rio Santo Antônio, 22 July 2000, *V.Linsingen 331* (MBM!); Jaguariaíva, Parque Estadual do Cerrado, campo alagado próximo ao rio Santo Antônio, 24°09'57"S 49°40'00", 5 November 2010, *T.H.Aguiar & E.M.Francisco 114* (HCF barcode HCF000008011 image!).

Additional examined material:—BRAZIL. **São Paulo**: [Itaberá], Estrada para Itararé, 24°04'55.1"S 49°11'40.8"W, 655 m elev., 4 May 2019, *C.L.Ribeiro et al. 307* (ICN!). Itararé, 24°05'06"S 49°12'06"W, 14 November 1994, *V.C.Souza et al. 7259* (PEL!).

3. Eriocaulon Linnaeus (1753: 87)

Lectotype (designated by Hitchcock 1923: 514):—*Eriocaulon decangulare* Linnaeus (1753: 87)

Annual or perennial herbs (only the latter in the study area), rosulate, occasionally the rosettes forming a stout trunk of 50 cm or more, covered by rotten leaves and roots. **Leaves** distichous equitant or spirally arranged (both forms in some species), forming cisterns (similar to Bromeliaceae) in the larger species. **Scapes** few or numerous per rosette. **Capitula** single, bilateral or radial, rarely composed of several racemous subunits, white. **Flowers** 2 or 3-merous (only the latter in the study area); epipetalous glands on the adaxial surface of the petals, 0.1–0.5 × 0.1 mm, apical or subapical, black. **Staminate flowers** with sepals free or fused to an adaxial spathe, petals free or slightly fused at the base, both whorls of stamens developed, 4 or 6 stamens (only the latter in the study area), anthers black or pale. **Pistillate flowers** with sepals and petals free, gynoecium with 2 or 3-carpellate ovary, column of styles ending in 2 or 3 stigmas (only the trimerous condition in the study area), nectariferous appendages absent. **Seed** coat reticulate, almost smooth in some species.

Etymology:—*Eriocaulon* means "lanuginose stem" (from the Greek, *érion* = wool, *kaulos* = stem), based on the first described species of the genus (Kral 1989, Gledhill 2008).

Key to the species of *Eriocaulon* in subtropical South America

1. Capitula composed of several racemous subunits ……..……..…….…..... *E. macrobolax*
- Capitula single …..……..…….……..……... 2
2. Capitula bilateral, reniform ……..…..……...…….…..... *E. gomphrenoides*
- Capitula radial, hemispheric to ovoid or globose ….……....……..…..……..… 3
3. Leaves apex ending in a conspicuous apical pore; spathes ca. twice the length of the leaves, never hidden in the basal rosettes …..…….……...…..... *E. sellowianum*
- Leaves apex with apical pore absent or inconspicuous; spathes equal or smaller than the leaves, more or less hidden in the basal rosettes ……...……..……. 4
4. Plants generally flowering up to 25 cm high; leaves up to 10 mm wide, spirally arranged ……...… 5
- Plants generally flowering higher than 40 cm high; leaves more than 15 mm wide, distichous equitant or spirally arranged ……..…….…….…….……...……. 6
5. Leaves coriaceous to crassus, recurvate; capitula ovoid; staminate flowers with sepals free or slightly fused at the base ……..……..... *E. crassiscapum*
- Leaves membranaceous to coriaceous, usually ascending; capitula hemispheric to globose; staminate flowers with sepals fused up to the distal third, forming a spathaceous calyx ……..….. *E. modestum*
6. Spathes apex transversal ……..…….....…… *E. helichrysoides*

- Spathes apex oblique or toothed ….……...……..…….…..……...… 7

7. Leaves up to 8.5 cm long; spathes apex frequently toothed; floral bracts up to 3.2 mm long; staminate flowers with median petals presenting obtuse apex ……...…….. *E. reitzii*

- Leaves more than 15 cm long; spathes apex oblique; floral bracts larger than 3.5 mm long; staminate flowers with median petal presenting attenuate apex ……. 8

8. Leaves, spathes and scapes pubescent; leaves apex strongly cucullate, pungent to touch; spathes slit 40–180 mm long; involucral bracts larger than 4.5 mm long ……..….. *E. itapevense*

- Leaves, spathes and scapes glabrous; leaves apex slightly cucullate to cucullate, not pungent to touch; spathes slit 22–30 mm long; involucral bracts up to 4.1 mm long ……...……..... *E. magnificum*

3.1. Eriocaulon crassiscapum Bongard (1831: 628). Lectotype (designated here):—BRAZIL. [Minas Gerais]: In paludibus inter os Prados et Barbacena, June 1824, *L.Riedel 296* (lectotype LE barcode 00002808 image!; isolectotype LE barcode 00002807 image!). **Figures 10–11.**

Herbs 8–9.5 cm high. **Leaves** spirally arranged, 0.7–1.5 × 0.1–0.3 cm, linear-lanceolate, recurvate, coriaceous to crassus, apex acute, glabrous. **Spathes** 1–2.3 cm long, apex 2–4-toothed, frequently lacerate, glabrous. **Scapes** 4–9.4 cm long, glabrous. **Capitula** single, radial, ovoid, 3–4 mm diameter, very congest aspect. **Involucral bracts** in 2 series, 2–2.4 × 1 mm, obovate to oblanceolate, apex round, less frequently acute, eventually lacerate in the outermost series, stramineous, slightly blackish towards the apex, glabrous, not uncommon older bracts becoming reflexed, even pendulous, beneath the capitula. **Floral bracts** ca. 2 × 0.7 mm, oblanceolate to rhombic-spathulate, apex acute, colour pattern similar in the involucral bracts, glabrous except for hyaline trichomes up to 0.5 mm at the base. **Staminate flowers** 1.5–2 mm long, pedicel up to 0.1 mm long; sepals free or slightly fused at the base, 1–1.3 × 0.2 mm, oblanceolate, apex obtuse or acute, cream to slightly stramineous, greyish at the apex, sparse white trichomes up to 0.1 mm long at the apex margins and on the abaxial surface; petals fused, forming a spathaceous calyx up to 1 mm long, median petal 0.8–1 mm long, apex obtuse or acute, cream, indument similar to the observed in the sepals, plus trichomes on the adaxial surface, lateral petals reduced to lobes up to 0.6 mm long, similar to the median petals, but with attenuate apex; stamens length not observed, anthers black. **Pistillate flowers** ca. 2 mm long, pedicel up to 0.2 mm long; sepals free or slightly fused at the base, 1.5–1.6 × 0.2–0.4 mm, oblanceolate, apex acute, colour pattern as observed in the staminate flowers, sparse white trichomes up to 0.1 mm long at the apex margins; petals free, slightly unequal, median petal 1.5–2 × 0.2–0.6 mm, oblanceolate to spathulate, apex acute, sometimes slightly curved and

bending towards the top of the flower, hyaline to slightly cream, indument as observed in the sepals, lateral petals ca. 1.5 × 0.2–0.3 mm, similar to the median petals, but oblanceolate to lanceolate, apex acute; gynoecium 1.2–1.5 mm long, stramineous, ovary ca. 0.5 mm long, column and stigmas almost twice as long as the ovary.

Illustrations:—Ruhland (1903: 52), Abbiatti (1946a: 327, 330), Moldenke & Smith (1976: 25) [line-drawings].

Etymology:—The specific epithet *crassiscapum* refers to the thick aspect of the scapes (from the Latim, *crassus* = thick, *scapum* = scape) (Moldenke & Smith 1976).

Distribution and habitat:—Northeastern to southern Brazil (Paraná), where it is restricted to few localities in northern *Campos Gerais*. It inhabits moist sandy soils, between 700–900 m elevation (Fig. 11).

Phenology:—Flowering from October to November.

Diagnosis:—*Eriocaulon crassiscapum* is morphologically similar to *E. modestum*, from which it differs mainly by the generally shorter measures (including vegetative and reproductive features), ovoid capitula (*vs*. hemispheric to globose capitula), and staminate flowers with sepals free or slightly fused at the base (*vs.* staminate flowers with sepals fused up to the distal third, forming a spathaceous calyx). Also, *E. crassiscapum* displays rosettes with recurved leaves, while *E. modestum* usually presents ascending leaves.

Nomenclatural notes:—The lectotype here chosen was based on the larger number of specimens, agreeing with the suggestion made by Chagas (2017), unpublished.

General notes:—Castellanos (1945), Abbiatti (1946a) and Giulietti (2008) cite *E. crassiscapum* in Misiones province, Argentina, all based on *A.A.Muniez s.n.* (BA 16373), September 1919. Although, we did not have access to this material, thus not being able to confirm its occurrence in Argentina.

Examined material:—BRAZIL. **Paraná**: [Jaguariaíva] Jaguariahyva, 25 October 1910, *P.Dusén 10493* (S 17-5176, 17-5179 images!). [Telêmaco Borba] Tibagi, Fazenda Monte Alegre, 14 November 1952, *G.Hatschbach 2861* (MBM!).

Additional examined material:—BRAZIL. [**Minas Gerais**]: Triângulo Mineiro, July 1963, *A.R.Schultz 3414* (ICN!). **São Paulo**: Analândia, Cachoeira do Escorrega, 22°07’55”S 47°42’35”W, 725 m elev., 5 May 2016, *L.S.B.Calazans 603* (ICN!).

3.2. Eriocaulon gomphrenoides Kunth (1841: 548). Lectotype (designated here):—BRAZIL. “Brasilia meridionalis”, [Rio Grande do Sul: between Quaraí and the Pelotas River, May–

October 1826, according to Herter (1945: 130)], *F.Sellow 3890* (lectotype B barcode B 10 0244418 image!; isolectotypes B barcode B 10 0244417 image!, K barcode K000587226 image!, NY barcode 00102631 [fragments] image!). **Figures 12–14.**

= *Eriocaulon arechavaletae* Herter (1935: 125). *Eriocaulon latifolium* Arechavaleta (1902: 21) *nom. illeg.* Type:—URUGUAY. *J.Arechavaleta 19?* (MVFA?), **syn. nov**. **ex descr.**

Herbs 25–90 cm high. **Leaves** spirally arranged, 10–64.5 × 1–5 cm, linear-lanceolate, ascending, coriaceous, hyaline at the margins, apex obtuse, slightly cucullate to cucullate, glabrous, frequently ceraceous. **Spathes** 7.5–47 cm long, apex transversal, slightly acute, glabrous, frequently ceraceous. **Scapes** 9–90 cm long, glabrous. **Capitula** single, bilateral, frequently reniform, with a sulcus dividing them in two hemispheres, 7–20 mm diameter, not unusual echinate (especially the smaller capitula). **Involucral bracts** in 2–4 series, 5.3–5.5 × 2.3–3 mm, ovate, external series wider in relation to the inner ones, apex acute, stramineous, glabrous or glabrescent, at most presenting sparse white trichomes up to 0.1 mm long on the abaxial surface. **Floral bracts** 4–4.5 × 0.4–1.7 mm, lanceolate to slightly oblanceolate, apex acute to attenuate, entirely stramineous or stramineous at base and apex, mid portion blackish, white trichomes up to 0.3 mm long at the distal third, on the margins and abaxial surface. **Staminate flowers** 2.8–3.8 mm long, pedicel up to 0.5 mm long; sepals free, 2–2.3 × 0.5–0.6 mm, oblanceolate to spathulate, apex round to obtuse, greyish or black, not unusual stramineous at base, indument as observed in the floral bracts, but more sparse, plus hyaline trichomes up to 1.7 mm long at the lower portion; petals slightly fused at the base, 1–1.5 × 0.5–0.9 mm, spathulate, apex obtuse, cream, white trichomes up to 0.5 mm long at the distal third, on the margins and adaxial surface, plus hyaline trichomes up to 1.5 mm long; stamens up to 1.3 mm long, anthers black. **Pistillate flowers** 3.5–3.8 mm long, pedicel up to 0.3 mm long; sepals free, 2.5–3 × 0.4–1 mm, as observed in the staminate flowers, but with white trichomes up to 0.3 mm long, and denser hyaline trichomes; petals free, unequal, median petals 2.5–3.3 × 0.9–1 mm, lateral petals 2–2.5 × 0.6–0.7 mm, spathulate, apex obtuse, mostly cream, greyish to blackish towards the base, indument as observed in the staminate flowers; gynoecium 2–2.5 mm long, ovary 0.7–1 mm long, light black, column and stigmas stramineous.

Illustrations:—Moldenke & Smith (1976: 9), as *E. ligulatum* [line-drawings], Moldenke & Smith (1976: 16–17) [photographs plates].

Etymology:—The specific epithet *gomphrenoides* refers to the similarity of the capitula to the inflorescences of *Gomphrena* Linnaeus (1753: 224), Amaranthaceae (from the Latin, *gomphraena* = amaranth, *oides* = alike, resembling) (Moldenke & Smith 1976).

Distribution and habitat:—Argentina (Misiones), southeastern to southern Brazil (Paraná, Rio Grande do Sul, and Santa Catarina), and Uruguay (non-specified department). *Eriocaulon gomphrenoides* occurs mainly in the Subtropical Highland Grasslands, forming extensive subpopulations in Rio Grande do Sul and Santa Catarina, southern Brazil. In Paraná, it is more frequently recorded in Curitiba and nearby localities, reaching the High Altitude Tropical Grasslands. It is occasionaly recorded in the *Pampas* domain of Rio Grande do Sul, southern Brazil, and Uruguay, and its most inland distribution is in Misiones, northeastern Argentina. It inhabits moist to marshy soils and peatbogs up to 1100 m elevation (Fig. 14).

Phenology:—Flowering from September to May, more frequently until November.

Diagnosis:—*Eriocaulon gomphrenoides* differs from the other large species of *Eriocaulon* with transversal spathes by the bilateral capitula, frequently reniform, with a sulcus dividing them in two hemispheres. In Argentina, it was occasionaly misidentified as *E. macrobolax* (e.g. Castellanos 1945), a species bearing capitula composed by several racemous subunits and hidden involucral bracts (*vs.* single capitula and conspicuous involucral bracts in *E. gomphrenoides*), as already pointed by Abbiatti (1946a, 1946b). It is also similar to *E. helichrysoides*, due to vegetative features and transversal spathes, but this species displays radial capitula, hemispheric to globose.

Nomenclatural notes:—Kunth (1841) only provides the information "Brasilia meridionalis. (Sellow.)" in the protologue of *E. gomphrenoides*, collection which was latter referred by Ruhland (1903) as *F.Sellow 3890* at B. In this herbarium, two sheets corresponding to this collection were found, one of them containing the handwriting information "Ex Herb. Kunth" (barcode B 10 0244418). As *F.Sellow 3890* has more than one sheet housed at B, plus duplicates in other herbaria, they are syntypes and require lectotypification. Chagas (2017) chose the sheet B barcode B 10 0244417 as lectotype of *E. gomphrenoides*, but did not validated this lectotypification, so we chose to indicate the second sheet due to the reference to Kunth's herbarium.

Relating to the non specified procedence of the type collection, Herter (1945) indicates that *F.Sellow 3890* was collected in Rio Grande do Sul, between Quaraí ("Quaraim") and the Pelotas River, near Vacaria municipality, in the border with Santa Catarina, southern Brazil, between May and October 1826. Based on Sellow's collection number and the flowering period

of *E. gomphrenoides*, predominantly during Springtime, we infer that the type specimens were collected in the Serra Geral plateau, where extensive subpopulations of this species are frequently observed.

General notes:—Distinctly from Chagas (2017), we consider *E. arechavaletae* a synonym of *E. gomphrenoides*, what is reassured by our findings about the type location of the last species, collected in Rio Grande do Sul (Herter 1945), as previously mentioned. Even if the morphological differentiation made by Chagas between specimens from southeastern Brazil (treated by this author as *E. gomphrenoides*) and SSA specimens (treated as *E. arechavaletae*) is consistent for the differentiation of species of *Eriocaulon*, the name *E. gomphrenoides* has priority for the specimens from SSA. Moreover, Chagas (2017) considers the possibility of the type specimens of *E. gomphrenoides* have been collected between Santa Catarina, Paraná and São Paulo states, although the author stated that this species is "endemic from southeastern Brazil", pointing São Paulo as the probable type location.

Despite we did not have access to the type collection of *E. arechavaletae*, we proposed the synonymization under *E. gomphrenoides* based on the original description provided by Arechavaleta (1902), which suits our analysed specimens.

Examined material:—ARGENTINA. **Misiones:** General Manuel Belgrano, Bernardo de Irigoyen, naciente del río Pepirí Guazú, 800 m elev., ca. 26°15'S 53°38'W, 20 November 1995, *E.R.Guaglianone et al. 2955* (SI!). San Pedro, 17 October 1975, *E.M.Zardini et al. 926* (LP!, SI!). BRAZIL. **Paraná**: Campina Grande do Sul, Taquari, 7 October 1996, *C.B.Poliquesi & J.Cordeiro 583* (UPCB!). Coronel Domingo Soares, Abarracamento, 26°23'49"S 51°53'57"W, 1038 m elev., 23 September 2013, *J.T.Motta et al. 4119* (ICN!). Curitiba, Campos do Capão da Imbuia, 31 August 1964, *L.T.Dombrowski 350 & Y.Saito 159* (PEL!); Curitiba, 8 September 1996, *J.C.Lindeman & H.Haas 2419* (MBM!); Curitiba, Bairro Capão da Imbuia, 1 August 1967, *N.Imaguire 120* (MBM!). General Carneiro, Fazenda Santa Cândida, Banhado Curicaca, 1 November 2005, *C.Bona et al. 306* (UPCB!). Guaratuba, Serra do Araçatuba, 9 November 1983, *R.Kummrow 2413* (UPCB!). [Lapa?], estrada da Lapa, 28 September 1955, *R.Braga s.n.* (UPCB 641!). Piraquara, próximo ao Rio Iraí, 11 November 1992, *S.R.Ziller 282* (MBM!); Piraquara, 3 September 2004, *C.R.Sakagami et al. s.n.* (UPCB 50284!); Piraquara, várzea do Rio Piraquara, 25 August 2005, *M.Reginato 527* (UPCB!); Piraquara, margem do Rio Piraquara, 29 August 2008, *M.Fritsch et al. 268* (UPCB!); Piraquara, Mananciais da Serra, 4 September 2008, *J.M.Cruz & J.Cordeiro 291* (MBM!); Piraquara, 25°30'48"S 49°01'35"W, 873 m elev., 4 October 2012, *F.Santos-Silva et al. 138*

(UPCB!). Ponta Grossa, nascente do Rio Tibagi, 3 September 2009, *C.Snak & B.O.Andrade 231* (UPCB!); Ponta Grossa, nascente do Rio Tibagi, 49°49’29”S 25°16’25”W, 1096 m elev., 20 September 2009, *B.O.Andrade 374* (MBM!). São José dos Pinhais, Vossoroca, 2 November 1952, *G.Hatschbach 2868* (LP!, MBM!, SI!); São José dos Pinhais, Guatupê, 4 September 1986, *J.Cordeiro & J.M.Silva 354* (BAB!, PEL!, UPCB!); São José dos Pinhais, Guatupê, 20 October 1994, *O.S.Ribas & J.M.Cruz 691* (FLOR!, PEL!). Tijucas do Sul, Ribeirão da Taboada, 11 October 1961, *G.Hatschbach 8311* (UPCB!). **Rio Grande do Sul**: Bom Jesus, Barragem Rio dos Touros, 28°38’45”S 50°17’04”W, 1015 m elev., 16 September 2014, *E.Barboza et al. 4166* (FLOR!, HUCS!). [Cambará do Sul], Cambará p. São Francisco de Paula, February 1948, *B.Rambo 36785* (PACA!); [Cambará do Sul], Taimbesinho p. São Francisco de Paula, 5 November 1951, *B.Rambo 52183* (HBR!, PACA!); [Cambará do Sul], Taimbesinho p. São Francisco de Paula, 13 November 1953, *B.Rambo 54575* (HBR!, PACA!); Cambará do Sul, Fortaleza dos Aparados, 17 September 1976, *B.E.Irgang s.n.* (ICN 32414!); [Cambará do Sul], Taimbezinho, 1977, *S.Boechat s.n*. (ICN 41929!); Cambará do Sul, Fortaleza, 13 September 1978, *A.Görgen 453* (MPUC!); Cambará do Sul, Fortaleza, 18 September 1981, *O.Bueno 3066* (HAS!); [Cambará do Sul], perto de Cambará do Sul, na rodovia para São Francisco de Paula, 20 December 1984, *J.Mattos & N.Model 27224* (HAS!); Cambará do Sul, trilha da Cachoeira do Tigre Preto, 29°04’21”S 49°59’18”W, 997 m elev., 22 October 2017, *C.C.Alff et al. 50* (ICN!); Cambará do Sul, trilha da Pedra do Segredo, após travessia da cachoeira do Tigre Preto, 7 February 2018, *C.C.Alff & C.Rabuske 123* (ICN!). Canela, próximo à entrada do Hotel Laje de Pedra, 13 October 1988, *O.Bueno 5476* (HAS!). Caxias do Sul, Vila Oliva para Caxias, 1 January 1946, *B.Rambo 30866* (PACA!); Caxias do Sul, Vila Oliva, 4 km em direção de Ana Rech, 29 October 1985, *M.L.Abruzzi 1031* (HAS!). Encruzilhada do Sul, Cerro dos Mouras, Fazenda Xafri, 8 September 1995, *J.A.Jarenkow 2718* (PEL!). Esmeralda, Fazenda do Guabiju, 850 m elev., 30 September 2000, *A.Velho s.n*. (HUCS 23963!). Farroupilha, 15 October 1957, *Camargo 2102* (PACA!). Giruá, Granja Sodol, October 1963, *K.Hagelund 1244* (ICN!). Gramado, 11 October 1953, *A.R.Schultz 1086* (ICN!); Gramado, Lago Negro, 14 September 1968, *A.G.Ferreira 479* (ICN!); Gramado, 18 September 1971, *J.C.Lindeman & B.E.Irgang s.n*. (ICN 8116!). Jaquirana, 29°05’03”S 50°13’58”W, 963 m elev., 16 October 2018, *C.C.Alff & C.Rabuske 157* (ICN!). Montenegro, Linha Pinhal, 500 m elev., 11 September 1947, *A.Sehnem 2941* (PACA!, SI!); Montenegro, Linha Pinhal, 550 m elev., February 1952, *A.Sehnem 5704* (FLOR!, PACA 86653!). [Muitos Capões] Esmeralda, Estação Ecológica de Aracuri, 19 September 1982, *J.L.Waechter 1900* (ICN!); [Muitos

Capões] Esmeralda, Estação Ecológica de Aracuri, 6 November 1982, *J.L.Waechter 1908* (ICN!); [Muitos Capões] Esmeralda, Estação Ecológica de Aracuri, November 1984, *J.R.Stehmann 380* (ICN!). Nova Prata, Estação Experimental Fitotécnica, 25 September 1985, *J.Mattos & M.H.Bassan 28571* (HAS!). Palmares do Sul, próximo ao Rio Bacupau, 30°17'52"S 50°28'49"W, 19 September 1994, *N.Silveira 12631* (HAS!); Palmares do Sul, 30°16'20"S 50°29'20"W, 10 m elev., 22 October 2011, *F.Gonzatti 214* (HUCS!, MBM!). Rio Grande, Quinta, 26 October 1996, *P.Brack 658* (ICN!); Rio Grande, 3 October 2016, *C.L.Duarte et al. s.n.* (HURG 5636!). [Salvador do Sul], Kappesberg para Montenegro, July 1945, *E.Friederichs s.n*. (PACA 30670!); [Salvador do Sul], Montenegro, São Salvador, 23 October 1945, *E.Friedrichs s.n.* (SI!); [Salvador do Sul] Montenegro, São Salvador, 24 October 1945, *E.Friederichs s.n*. (LP barcode 069223!). São Francisco de Paula, km 5 na rodovia para Canela, 11 November 1987, *J.Meyer et al. 102* (HAS!); São Francisco de Paula, CPCN Pró-Mata, 29 September 1995, *B.Harter s.n.* (MPUC 21135!); São Francisco de Paula, RS-020, estrada para Cambará do Sul, 850 m elev., 13 October 2001, *R.Wasum 1166* (HUCS!, MBM!); São Francisco de Paula, condomínio Alpes de São Francisco, 10 August 2002, *A.Leonhardt & M.L.Lorscheitter s.n*. (ICN 119039!); São Francisco de Paula, 15 November 2002, *J.Paz 18* (ICN!); São Francisco de Paula, Fazenda Capão do Ipê, 29°07'24"S 50°38'13"W, 830 m elev., 23 October 2004, *R.Wasum 2198* (HUCS!); São Francisco de Paula, Banhado Amarelo, 1 November 2004, *C.Scherer & L.R.M.Baptista s.n.* (ICN 126392!, 126401!); São Francisco de Paula, Banhado Amarelo, 29 October 2005, *C.Scherer & L.R.M.Baptista s.n*. (ICN 126432!); São Francisco de Paula, Parque Estadual do Tainhas, Passo do S, 31 January 2006, *R.Schmidt 1347* (HAS!); São Francisco de Paula, Banhado Amarelo, 1 September 2006, *M.L.Lorscheitter & L.R.M.Baptista s.n.* (ICN 172894!); São Francisco de Paula, Banhado Amarelo, 27 October 2006, *M.L.Lorscheitter & L.R.M.Baptista s.n.* (ICN 174779!); São Francisco de Paula, Banhado Amarelo, 25 November 2006, *M.L.Lorscheitter & L.R.M.Baptista s.n.* (ICN 174707!); São Francisco de Paula, Banhado Amarelo, 25 May 2007, *M.L.Lorscheitter & L.R.M.Baptista s.n.* (ICN 174709!); São Francisco de Paula, Banhado Amarelo, 7 July 2007, *M.L.Lorscheitter & L.R.Baptista s.n.* (ICN 174714!); São Francisco de Paula, turfeira do Banhado Amarelo, 22 May 2008, *M.L. Lorscheitter & L.R.M.Baptista s.n.* (ICN 1722895!, 174711!, 174712!, 174713!); São Francisco de Paula, Banhado Amarelo, 29°19'13.1"S 50°08'05.1"W, 1000 m elev., 6 February 2018 (remaining scapes and bracts), *C.C.Alff & C.Rabuske 110* (ICN!); São Francisco de Paula, BR-453 (Rota do Sol), 29°17'24.9"S 50°14'36.4"W, 916 m elev., 6 February 2018, *C.C.Alff & C.Rabuske 115* (ICN!); São Francisco

de Paula, em frente ao condomínio Alpes de São Francisco, 29°27’25”S 50°36’37”W, 901 m elev., 15 October 2018, *C.C.Alff & C.Rabuske-Silva 151* (ICN!); São Francisco de Paula, Banhado Amarelo, 29°19’13”S 50°08’05”W, 1000 m elev., 15 October 2018, *C.C.Alff & C.Rabuske-Silva 156* (ICN!); São Francisco de Paula, estrada Casa Verde-Pedra Lisa, 28°58’45”S 50°34’56”W, 916 m elev., 16 October 2018, *C.C.Alff & C.Rabuske-Silva* 158 (ICN!). [São José dos Ausentes] Bom Jesus, topo da Serra da Rocinha, 1450 m elev., 28 October 1974, *M.L.Porto et al. 1099* (ICN!); [São José dos Ausentes] Bom Jesus, Serra da Rocinha, 20 October 1978, *K.Hagelund 12531* (ICN!); [São José dos Ausentes] Bom Jesus, Serra da Rocinha, 12 November 1987, *J.Meyer et al. 207* (HAS!); São José dos Ausentes, Serra da Rocinha, 28°47’55”S 49°57’12”W, 1200 m elev., 17 October 2018, *C.C.Alff & C.Rabuske-Silva 160* (ICN!). Viamão, Varzinha, 16 September 1995, *J.Larocca & R.Balbueno 95082* (ICN!). **Santa Catarina**: Bom Jardim da Serra, logo após o fim da estrada da Serra do Rio do Rastro, 21 October 2017, *C.C.Alff et al. 39* (ICN!). Caçador, Fazenda dos Carneiros, 1100 m elev., 28 October 1962, *R.Reitz & R.M.Klein 13772* (HBR!). Campo Alegre, 4 km south of Campo Alegre on the road to Jaraguá do Sul, 900–1000 m elev., 6 November 1956, *L.B.Smith & R.M.Klein 7351* (HBR!); Campo Alegre, Morro do Iqueririm, 1500 m elev., 5 September 1957, *R.Reitz & R.M.Klein 4794* (HBR!). [Correia Pinto?] Lages, 25 km north of Lages, by Rio Bandeirinhas, 800–900 m elev., 4 December 1956, *L.B.Smith & R.M.Klein 8242* (HBR!). Curitibanos, Ponte Alta do Norte, 900 m elev., 24 October 1962, *R.Reitz & R.M.Klein 13403* (HBR!). Garuva, Morro do Campo Alegre, 7 October 1960, *R.Reitz & R.M.Klein 10120* (HBR!, PACA!); Garuva, Serra do Quiriri, 16 May 2008, *J.M.Silva et al. 6605* (MBM!); [Garuva] Campo Alegre, Campos do Quiriri, 26°02’12”S 48°57’12”W, 4 November 2014, *L.A.Funez et al. 4009* (FLOR!). Ireneópolis, Valões 26 October 1962, *R.Reitz & R.M.Klein 13580* (HBR!, PACA!); Ireneópolis, Valões, 750 m elev., 26 October 1962, *R.Reitz & R.M.Klein 15580* (FLOR!). Lages, 51 km south of Lages, along the Estrada da Rodagem Federal, ca. 900 m elev., 3 December 1956, *L.B.Smith & R.M.Klein 8204* (HBR!); Lages, portal da cidade, 11 October 2006, *A.A.Schneider 1308* (ICN!). Major Vieira, Rio da Serra, 26°38’24”S 50°24’00”W, 1009 m elev., 27 October 2010, *A.Korte & A.Kniess 3840* (MBM!). Matos Costa, 1000 m elev., 27 October 1962, *R.Reitz & R.M.Klein 13744* (HBR!). Porto União, Fazenda Frei Rogério, 750 m elev., 26 October 1962, *R.Reitz & R.M.Klein 13618* (HBR!). Rancho Queimado, margem da BR-282, 900 m elev., 29 September 1986, *D.B.Falkenberg et al. 3470* (FLOR!); Rancho Queimado, 27°41’21”S 49°02’18”W, 811 m elev., 17 October 2017, *C.C.Alff et al. 20* (ICN!). Santa Cecília, Campo Alto, 1200 m elev., 25 October 1962, *R.Reitz & R.M.Klein 13478*

(HBR!). [Santa Cecília] Campo Alto, BR-116, sentido Lages (SC) - Vacaria (RS), 19 October 2006, *E.S.G.Guarino et al. 1156* (FLOR!). São Bento do Sul, APA Rio Vermelho/Humbold, 26°16'21"S 49°15'41"W, 1009 m elev., 11 October 2010, *M.Verdi & S.Dreveck 5736* (HUCS!); São Bento do Sul, 14 September 2018, *C.Rabuske-Silva et al. 356* (ICN!). São Joaquim, Granja Invernadinha, 28 October 1961, *J.Mattos 9394* (HAS!). São José do Cerrito, 950 m elev., 31 October 196?, *R.M.Klein 4336* (HBR!). Timbó do Sul, Serra da Rocinha, 18 November 2008, *J.M.Silva et al. 7350* (MBM!). Urubici, alto do Morro da Igreja, 1700 m elev., 8 December 2000, *G.Hatschbach et al. 71670* (MBM!); Urubici, Parque Nacional São Joaquim, 21 January 2001, *H.Longhi-Wagner & R.Garcia 7385* (ICN!); Urubici, Morro da Igreja, 27 December 2007, *A.Zanin & B.H.Santos 1463* (FLOR!); Urubici, Morro da Igreja, 28°07'39"S 49°28'50"W, 1 December 2012, *R.Trevisan & S.Venturi 1278* (FLOR!, ICN!).

3.3. Eriocaulon helichrysoides Bongard (1831: 631), "elichrysoides". Lectotype (designated here):—BRAZIL. [São Paulo]: In paludis, Rio Pardo, September 1826, *L.Riedel 480* (lectotype LE barcode LE00002814 image!; isolectotype LE barcode LE00002815 image!). **Figures 15–17.**

Herbs 26.5–71 cm high. **Leaves** spirally arranged, 15–57.5 × 0.5–3.5 cm, linear-lanceolate, ascending, coriaceous, hyaline at the margins, apex obtuse, slightly cucullate to cucullate, glabrous. **Spathes** 7.5–42.5 cm long, apex transversal, truncate to slightly acute, glabrous. **Scapes** 11–69.2 cm long, glabrous. **Capitula** single, radial, hemispheric to globose, 19–25 mm diameter, echinate. **Involucral bracts** in 2–3 series, 2–8 × 3–5.3 mm, ovate, external series wider in relation to the inner ones, apex obtuse to acute, stramineous, less frequently greyish to brownish in the centre, margins hyaline, glabrous. **Floral bracts** 7–8.2 × 1–1.5 mm, narrowly oblanceolate (considerably narrowing towards the inner ones), apex acute to attenuate, mainly cream or stramineous, eventually blackish towards the base, white trichomes up to 0.1 mm long on the abaxial surface. **Staminate flowers** 5–6 mm long, pedicel up to 0.5 mm long; sepals free, 4–4.5 × 0.3–0.7 mm, oblanceolate to narrowly spathulate, apex acute, cream to greyish, white trichomes up to 0.3 mm long at the distal third, on the margins and abaxial surface; petals free, slightly unequal, median petals ca. 2 × 0.5 mm, elliptical to slightly spathulate, apex obtuse, cream, white trichomes up to 0.4 mm long (mainly at the apex of the median petals), lateral petals ca. 1.5 × 0.2 mm, similar to the median petals; stamens up to 1.8 mm long, anthers cream or black. **Pistillate flowers** 3.5–5 mm long, pedicel up to 0.5 mm long;

sepals free 3–3.5 × 0.5–1.2 mm, oblanceolate, apex acute, stramineous or blackish, white trichomes up to 0.2 mm long at the apex margins, plus very sparse hyaline trichomes ca. 1 mm long at the lower portion, on the abaxial surface; petals free, slightly unequal, median petals 2.4–2.8 × 0.8–0.9 mm, lateral petals 2–2.2 × 0.4–0.5 mm, oblanceolate, acute to slightly attenuate, stramineous, white trichomes up to 0.4 mm long at the apex margins, more sparse on the adaxial surface, plus hyaline trichomes ca. 0.3 mm long; gynoecium 2–3.2 mm long, ovary ca. 0.8 mm long, amber to dark-brown, column and stigmas amber.

Illustrations:—Bongard (1831: Tab. XXVII), Giulietti *et al.* (2018: 10) [line-drawings].

Etymology:—The specific epithet *helichrysoides* refers to the similarity of the capitula to the inflorescences of the genus *Helichrysum* Miller (1754: without page, as "Elichrysum"), Asteraceae (from the Greek, *helios* = sun, *khrusós*= gold, *oides* = alike, resembling) (Gledhill 2008).

Distribution and habitat:—Southeastern to southern Brazil (Paraná and Santa Catarina), and Paraguay (Alto Paraná). *Eriocaulon helichrysoides* occurs mainly in the *Campos Gerais* of Paraná, southern Brazil, being also recorded in eastern Paraguay, near the border with Paraná. Southwards, a single record of this species was found in Florianópolis, in the Isle of Santa Catarina, not being recollected since 1967. It inhabits moist to marshy soils, usually between 700–900 m elevation (Fig. 17).

Phenology:—Flowering from July to September.

Diagnosis:—*Eriocaulon helichrysoides* is morphologically similar to *E. gomphrenoides*, as compared in the diagnosis of the later. The involucral and floral bracts of *E. helichrysoides* are remarkably long when compared to the flowers, conferring a robust and echinate aspect to the capitula, similar to that of the genus *Helichysum*, Asteraceae. Both involucral and floral bracts reach ca. 8 mm long, while staminate and pistillate flowers are up to 6 mm long. This features are remarkable in the type specimens, and are useful for field identification.

Nomenclatural notes:—Chagas (2017) refers the lectotypification of *E. helichrysoides*, indicating the Appendix III in his thesis (in fact, Appendix II), which corresponds to the later published Chagas *et al.* (2018). Although, the referred lectotypification was not made by these authors, once their goal was to revaluate the names under *Dupatya* proposed by Vellozo (1829, 1831). Thus, we indicate LE barcode LE00002814 as lectotype, based on the given location which most matches the protologue.

General notes:—There are specimens from Paraná, mainly collected in northeastern *Campos Gerais*, that slightly differ in their general aspect (presenting smaller length and width of the leaves, and smaller diameter of the capitula) from those occurring in southeastern Brazil and Paraguay (Figs. 15–16). Chagas (2017) classified some of our analyzed collections from Paraná as a distinct species, yet unpublished (e.g. *E.Barbosa et al. 2673*, *G.Felitto et al. 146*, and *V.Linsingen 281*, which is Fig. 15), but we did not find enough characters to segregate these specimens from *E. helichrysoides* in our survey, opting for their maintenance under this name.

Examined material:—BRAZIL. **Paraná:** [Guarapuava?] Fazenda Três Capões, 23 km de Guarapuava sentido Cascavel, 26 September 2006, *J.Cordeiro 352* (MBM!). Jaguariaíva, Parque Estadual do Cerrado, Rio Santo Antônio, 26 July 2000, *V.Linsingen 280, 281* (MBM!); Jaguariaíva, Fazenda Rondon, 20 August 2010, *E.Barbosa et al. 2673* (MBM!); Jaguariaíva, Fazenda Rondon, 27 July 2011, *E.Barbosa et al. 3119* (MBM!). Palmeira, Cercado, 16 September 2008, *J.Cordeiro et al. 2990* (MBM!). Piraí do Sul, Pousada Serra do Pirahy, 24°16’33.2”S 50°00’39.6”W, 2 September 2013, *E.D.Lozano & D.P.Saridakis 1476, 1479, 1480, 1481* (RB!); Piraí do Sul, Chácara Santa Rita, 24°16’33.4”S 50°00’51.3”W, 3 September 2013, *E.D.Lozano & D.P.Saridakis 1489* (RB!); Piraí do Sul, Fazenda Barbante, propriedade da Iguaçu Celulose, 24°15’09.4”S 49°34’59.6”W, 4 September 2013, *E.D.Lozano & D.P.Saridakis 1507* (RB!); Piraí do Sul, Fazenda Esterco, propriedade da Iguaçu Celulose, 24°15’12.2”S 50°00’10.5”W, 4 September 2013, *E.D.Lozano & D.P.Saridakis 1519* (RB!). Ponta Grossa, BR-277, Fazenda Cambiju, 26 July 2012, *G.Felitto et al. 324* (MBM!). Tibagi, Parque Estadual do Guartelá, 19 August 2011, *G.Felitto et al. 146* (MBM!). **Santa Catarina**: Florianópolis, Ilha de Santa Catarina, Reta da Ressacada, 2 m elev., 28 September 1967, *R.M.Klein & Bresolin 7592* (FLOR!, HBR!, ICN!). PARAGUAY. **Alto Paraná:** [Hernanderias], Refugio Biológico de Tatí Yupí, 5 km de Hernanderias, 8 September 1987, *G.C. Marmori 1411* (MBM!); [Hernanderias], Tati Jupi, 9 September 1987, *E.Buttura 1061* (MBM!).

3.4. Eriocaulon itapevense Alff & Stützel (2019: 199). Type:—BRAZIL. Rio Grande do Sul: Torres, Parque Estadual de Itapeva, Lagoa do Simão, 29°22’38”S 49°46’21”W, 30 June 2018, *C.C.Alff & C.Rabuske 132* (holotype ICN!, isotypes FLOR!, ICN!, MBM!, PACA!, RB!, SPF!). **Figures 18–20.**

Herbs 40–120 cm high. **Leaves** distichous equitant to spirally arranged, 32–78 × 2–5.5 cm, linear-lanceolate, ascending, coriaceous to crassus, apex acute, cucullate to strongly cucullate, pungent, trichomes hyaline up to 1.5 mm long on both surfaces. **Spathes** 24–45 cm long, apex oblique, lateral slit 40–180 mm, indument as observed in the leaves. **Scapes** 50–110 cm long, hyaline trichomes up to 0.6 mm long. **Capitula** single, radial, hemispheric to globose, 10–15 mm diameter. **Involucral bracts** in 3–5 series, 4.5–5.5 × 2.5–4 mm, ovate to lanceolate, external series wider in relation to the inner ones, apex attenuate, stramineous, margins and abaxial surface glabrescent, at most puberulent. **Floral bracts** 4.5–6.2 × 1–2 mm, lanceolate, apex long-attenuate, stramineous at base and apex, mid portion light-black, white trichomes up to 0.2 mm long at the distal third, on the margins and abaxial surface. **Staminate flowers** 2.5–4.2 mm long, pedicel up to 1.5 mm long; sepals free, 2–2.8 × 0.8–1 mm, oblanceolate to spathulate, apex acuminate, light-black to black, indument as observed in the floral bracts, plus hyaline trichomes up to 1 mm long on the abaxial surface; petals slightly fused at the base, unequal, median petals 2.5–3 × 1–1.2 mm, lateral petals 1.8–2 × 0.3–0.5 mm, oblanceolate to spathulate, apex attenuate, cream, indument as observed in the floral bracts, but on both surfaces, denser on the adaxial one, plus hyaline trichomes 2–3 mm long; stamens up to 1.3 mm long, anthers black. **Pistillate flowers** 3.8–6 mm long, pedicel up to 0.5 mm long; sepals free, 2–5 × 1–1.3 mm, as observed in the staminate flowers, but usually darker; petals free, unequal, median petal 2.5–5 × 1.1–2 mm, rhombic-spathulate, apex obtuse or acute to attenuate, cream, blackish towards the base, lateral petals 2.1–4 × 0.8–1.2 mm, spathulate to oblanceolate, apex obtuse to acute, colour pattern as observed in the median petals, indument as observed in the staminate flowers, but with a greater amount of hyaline trichomes within the corolla; gynoecium 2.5–3 mm long, ovary ca. 1 mm long, black, column and stigmas stramineous.

Illustrations:—Alff *et al.* (2019: 202) [line-drawings], Alff *et al.* (2019: 203–204, 207) [photographs plate] .

Etymology:—The specific epithet *itapevense* refers to the type locality Itapeva, in Torres, Rio Grande do Sul, southern Brazil, meaning “flat stone” (from the Tupi-Guarani, *ita* = stone, *peba* = flat) (Alff *et al.* 2019).

Distribution and habitat:—Brazil (Rio Grande do Sul, and Santa Catarina). This species is endemic to the Coastal Plain Grasslands, in the Atlantic domain, occurring in few localities of the southern coast of Santa Catarina and northern coast of Rio Grande do Sul. It inhabits moist to marshy soils, associated with lagoons, up to ca. 30 m elevation (Fig. 20).

Phenology:—Flowering from June to October, less frequently from January to February.

Conservation:—*Eriocaulon itapevense* is Critically Endangered (CR) according to the IUCN (2017) criteria B2a+bii,iii. Its extent of occurrence (EOO) is 120.352 km² and its area of occupancy (AOO) is 0.050 km² (cell width of 0.1 km). Although this species is included in three protected areas in Rio Grande do Sul, southern Brazil (Guarita State Park, Itapeva State Park, and Lagoa Itapeva Environmental Protection Area), it is extremely threatened by growing habitat conversion due to the drainage of wetlands for rural use and human occupation.

Diagnosis:—*Eriocaulon itapevense* is morphologically most similar to *E. magnificum*, from which it is distinguished by the height up to 120 cm (*vs*. height up to 80 cm), indument pubescent (*vs.* absent, glabrous), spathe slit 40–180 mm long (*vs*. spathe slit 22–30 mm), capitula up to 15 mm diameter (*vs*. capitula up to 12 mm), involucral bracts 4.5–5.5 × 2.5–4 (*vs*. involucral bracts 2–4.1 × 1–2.5 mm), and floral bracts 4.5–6.2 × 1–2 (*vs.* floral bracts 3.5–3.8 × 0.6–1 mm). The colour of the leaves, spathes and scapes in *E. itapevense* is typically greyish due to the presence of indument, and the apex of the leaves are strongly cucullate, even pungent to touch, while the colour of the leaves, spathes and scapes in *E. magnificum* is typically bright-green, and the apex of the leaves are not so strongly cucullate as in the first species, configuring good auxiliar characters for field identification. Besides morphological features, *E. itapevense* and *E. magnificum* have distinct distribution ranges along the CPG, the first one being more restricted.

Eriocaulon itapevense is also morphologically similar to *E. reitzii* based on the presence of indument, the first being distinguished by height 40–120 cm high (*vs.* height 29–30.5 cm high), leaves 32–78 × 2–5.5 cm (*vs*. leaves 6–8.5 × 0.4–1 cm), spathes 24–45 cm long (*vs.* spathes 7–18.5 cm long), apex oblique, with lateral slit 25–40 mm, more frequently toothed (*vs*. apex oblique, lateral slit 40–180 mm, always entire), scapes 50–110 cm long (*vs*. scapes 23–27 cm long), capitula 10–15 mm diameter (*vs*. capitula 8–9.5 mm diameter), involucral bracts 4.5–5.5 × 2.5–4 mm (*vs.* involucral bracts 3.5–4.5 × 2–2.8 mm), floral bracts 4.5–6.2 × 1–2 mm (*vs*. floral bracts 3–3.2 × 0.4–0.5 mm), staminate flowers with median petals 2.5–3 mm long (*vs.* median petals 1.7–2 mm long), and lateral petals 1.8–2 mm long (*vs.* lateral petals ca. 1.3 mm long), pistillate flowers 3.8–6 mm long, with pedicel up to 0.5 mm long (*vs*. pistillate flowers ca. 3 mm long, pedicel almost absent, up to 0.1 mm long). Besides measures, the shape, apex and colour of floral whorls slightly change from one species to another. The sepals of both staminate and pistillate flowers are oblanceolate to spathulate with acuminate

apex in *E. itapevense*, while they tend to be obovate with acute or obtuse apex (in the staminate and pistillate flowers, respectively) in *E. reitzii*. The median petals of the staminate flowers in *E. itapevense* are oblanceolate to spathulate with attenuate apex, and spathulate with obtuse apex in *E. reitzii*. In the pistillate flowers, the median petals of *E. itapevense* are rhombic-spathulate, the apex varying from obtuse or acute to attenuate, being oblanceolate with obtuse or acute to slightly acuminate apex in *E. reitzii*. The lateral petals are spathulate to oblanceolate in *E. itapevense*, and obovate to lanceolate in *E. reitzii*. The colour of the sepals are usually darker in the first species, and the second species displays remarkably crispate trichomes within the corolla. Also, *E. itapevense* is endemic to the CPG, and *E. reitzii* from the SHG, being under distinct environmental conditions.

Examined material:—BRAZIL. **Rio Grande do Sul**: Torres, Parque de Torres, 11 July 1972, *B.E.Irgang & A.M.Girardi s.n.* (ICN 27895!); Torres, 200 m de Torres para Florianópolis, 4 February 1982 (infertile), *T.Stützel s.n.* (ICN 51497!); Torres, entrada para Itapeva, 13 October 1984, *N.Silveira 1796* (HAS!); Torres, próximo ao posto da Corlac, BR-101, 27 September 1985, *R.Frosi et al. 411* (HAS!); Torres, Itapeva, próximo ao aeroporto, 19 January 1990, *N.Silveira 9102* (HAS!); Torres, Itapeva, 6 September 1993, *N.Silveira 11590* (HAS!); Torres, Itapeva, Parque Estadual de Itapeva, Lagoa do Simão, 29°22’38”S 49°46’21”W, 14 m elev., 28 August 2016, *C.Rabuske et al. 54* (ICN!); Torres, Itapeva, Parque Estadual de Itapeva, Lagoa do Simão, 29°22’37.8”S 49°46’22.1”W, 20 m elev., 03 February 2018 (remains of scapes and bracts), *C.C.Alff et al. 100* (ICN!); Torres, Campo Bonito, 29°22’21”S 49°46’45”W, 12 m elev., 30 June 2018, *C.C.Alff & C.Rabuske 133* (ICN!); Torres, Campo Bonito, Olhos d’Água, 29°20’39.95”S 49°46’28.19”W, 32 m elev., 21 September 2018, *M.Grings 1925* (ICN!); Torres, Itapeva, Parque Estadual de Itapeva, Lagoa do Simão, 27 October 2018, 29°22’38”S 49°46’21”W, 14 m elev., *C.C.Alff et al. 148* (ICN!). **Santa Catarina**: Passo de Torres, 29°18’04.7”S 49°42’21.9”W, 8 m elev., 30 January 2019, *C.C.Alff & C.Rabuske-Silva 176* (ICN!). São João do Sul, 6 September 1977, *K.Hagelund 11423* (ICN!). Sombrio p. Araranguá, 3 February 1946, *B.Rambo 37322* (PACA!); Sombrio, Araranguá, 8 m elev., 3 September 1945, *R.Reitz c1207* (HBR!, LP!).

3.5. Eriocaulon macrobolax Martius ex Körnicke (1863: 484). Lectotype (designated here):—BRAZIL. Minas Gerais: In udis deserti versus fluv. Rio S. Franc. vergentibus et in Serra de S. Antonio, *Martius s.n.* (lectotype M barcode M-0152634 image!; isolectotypes B barcode 10

0244405 [fragment] image!, BM barcode BM000885102 image!, M barcodes M-0152633, M-0152635 image!!). **Figures 14 and 21.**

= *Eriocaulon magnum* Abbiatti (1946a: 323). Type:—ARGENTINA. Chaco: Colonia Benítez, October 1945, *A.G.Schulz 6337* (holotype LP on 3 sheets 003160, 003161, 003162 images!; isotype LP 003163 image!).

Herbs 72.8–81.9 cm high. **Leaves** spirally arranged, 20–29.6 × 1.2–3 cm, linear-lanceolate, ascending, coriaceous, hyaline at the margins, apex obtuse, slightly cucullate, glabrous. **Spathes** 11.5–25 cm long, apex transversal, eventually splited, glabrous. **Scapes** 63.7–77.3 cm long, glabrous. **Capitula** composed of several racemous subunits, 13–21 mm diameter, displaying a dense and lumpy aspect. **Involucral bracts** completely hidden by the flowers. **Floral bracts** 3–3.5 × 0.8–1 mm, linear-oblanceolate to lanceolate, apex acute to slightly acuminate, stramineous, sparse white trichomes up to 0.2 mm long at the distal third, on the abaxial surface. **Staminate flowers** 4–4.5 mm long, pedicel up to 2 mm long; sepals slightly fused at the base, 2.5–3 × 0.4–0.5 mm, oblong to slightly oblanceolate, apex acute, stramineous, white trichomes up to 0.45 mm long at the distal third, on the abaxial surface and margins; petals fused up to the median third, 3-lobed, lobes slightly unequal, median lobes up to 1.5 mm long, lateral lobes up to 1.3 mm long, usually narrow, apex attenuate, cream to stramineous, white trichomes up to 0.4 mm long at the distal third, mainly on the margins; stamens up to 1.3 mm long, anthers colour not observed. **Pistillate flowers** ca. 3.5 mm long, sessile, at most presenting pedicel up to 0.2 mm long; sepals free, 3–3.5 × 0.5–0.7 mm, as observed in the staminate flowers, but stramineous to light-black; petals free, 2.5 × 0.9–1 mm, spathulate, apex obtuse to acute, cream, white trichomes up to 0.4 mm long at the distal third, on the margins and adaxial surface, plus hyaline trichomes up to near 1 mm long on the lower portion; gynoecium 2–2.3 mm long, ovary ca. 1 mm long, brownish, column and stigmas stramineous to amber, non-identified structures shorter than 0.1 mm long observed at the apex of the stigmas in some specimens.

Illustrations:—Castellanos (1945: tab. XIV, XV), as *E. arechavaletae*, Moldenke (1981: 254), as *E. singulare* Moldenke (1981: 253) [line-drawings].

Etymology:—The specific epithet *macrobolax* refers to the large size and lumpy aspect of the composed capitula (from the Ancient Greek, *makrós* = large, *bolax* = lump).

Distribution and habitat:—Argentina (Chaco, and Corrientes), southeastern to southern Brazil (Paraná), and Paraguay (Alto Paraná, Caaguazú, Cordillera, and Paraguarí). *Eriocaulon macrobolax* occurs mainly in eastern Paraguay and northeastern Argentina, being sparsely recorded in northwestern Paraná, southern Brazil. It inhabits marshy soils, ca. 400 m elevation (Fig. 14).

Diagnosis:—*Eriocaulon macrobolax* is morphologically similar to *E. gomphrenoides*, as compared in the diagnosis of the later.

Nomenclatural notes:—Körnicke (1863) did not cite the collector of the type material in the protologue of *E. macrobolax*, but he added the type location and institution where the original material was housed (M). More than one sheet of the correspondent collection (*Martius s.n.*) was found, plus duplicates in other herbaria, configuring syntypes and justifying a lectotypification. Here, we indicate M barcode M-0152634 as lectotype, based on the given location which most matches the protologue, in agreement with the suggestion made by Chagas (2017).

General notes:—Moldenke (1983) states that previous authors, including Körnicke (1863), give no indication of the compound capitula of *E. macrobolax*, and questions if they perhaps missed this important character. However, the specific epithet of *E. macrobolax* makes reference to the robust and lumpy aspect of the capitula, which is a result of the inflorescence arrangement in this species.

For a complete list of synonyms see Chagas (2017).

Examined material:—ARGENTINA. **Corrientes**: General Paz, Swamps of the Santa Lucía, in quagmire near Caacatí, 16 September 1982, *T.M.Pedersen 13409* (MBM!, SI!). Ituzaingó, Esteros del Iberá, July 2002, *M.Fiorito s.n.* (SI 47321!). Mburucuyá, Estancia Santa Teresa, 9 November 1952, *T.M.Pedersen 1891* (LP!); Mburucuyá, Estancia Santa Teresa, 11 October 1954, *A.Burkart 19441* (SI!); Mburucuyá, Estancia Santa Teresa, Laguna Tayi Paso, 11 October 1954, *A.L.Cabrera 11698* (LP!); Mburucuyá, Estancia Santa Teresa, 18 October 1954, *A.Burkart 19598* (SI!); [Mburucuyá?], Santa Teresa, Estancia, September 1967, *Fabris & Crisci 7121* (LP!). Mercedes, Laguna Iberá, costa oeste, 4 September 1997, *M.S.Ferrucci et al. 1253* (MBM!). Santo Tomé, Estancia Garruchos, 22 October 1954, *A.L.Cabrera 11887* (LP!); Santo Tomé, Garruchos, 22 October 1954, *A.Burkart 19736* (SI!). BRAZIL. **Paraná**: Cianorte, Nova Brasilia, 23°33’50.3”S 52°23’04.7”W, 12 November 2013, *E.D.Lozano et al. 1766* (MBM!). PARAGUAY. **Alto Paraná**: [Hernanderías], Reserva Biológica Itabó, 70 km N de CDE, 2 March 1980, *G.C.Marmori s.n.* (MBM barcode 149540!); Hernanderias, Tati

Jupy, 1 February 1987, *N.Buttura 1001* (MBM!). **Caaguazú**: about 10 km N or Caaguazú, 18 September 1988, *T.M.Pederesen 15038* (MBM!, SI!). **Cordillera**: Piribebuy, 15 km N de Paraguarí, 1 October 1967, *A.Krapovickas & C.L.Cristóbal 13474* (LP!, MBM!); Piribebuy, orillas del río Piribebuy, September 1988, *F.Mereles 1520* (SI!). **Paraguarí**: Chololó, 25°33'S 57°02'W, 16 October 1994, *A.Krapovickas et al. 45669* (MBM!). Parque Nacional de Ybycuí, Arroyo Corrientes, 6 October 1984, *L.Pérez 409* (SI!).

3.6. Eriocaulon magnificum Ruhland (1903: 48). Lectotype (inadvertently designated by Moldenke 1971: 276, second-step designated here):—BRAZIL. Santa Catarina: In der Sümpfen des Estive dos Pregos bei Tubarão, September 1890, *E.Ule 1689* (lectotype HBG barcode HBG-506594 image!; isolectotypes B barcode B 10 0184180 image!, HBG-506595 image!). **Figures 22–24.**

= *Eriocaulon ulaei* Ruhland (1903: 47). Lectotype (inadvertently designated by Moldenke 1970a: 482):—BRAZIL. [Santa Catarina]: In Torfsümpfen des Campo d'Una bei Laguna, January 1889, *E.Ule 1315* (lectotype B barcode B 10 106843 image!; isolectotypes LL barcode 00374613 [fragments] image!, Z).

= *Eriocaulon ulaei* var. *radiosum* (1903: 48), "radiosa". *Eriocaulon radiosum* (Ruhland) A.L.R.Oliveira (2015: 185). Lectotype (inadvertently designated by Moldenke 1970a: 482):—BRAZIL. Santa Catarina: [Florianópolis], Sumpfwiesen am Lagoa, Insel Sa. Catharina, February 1887, *E.Ule 639* (lectotype B barcode B 10 0184189 image!; isolectotype: LL barcode 00374614 [fragments] image!, Z).

= *Eriocaulon deslandesii* Silveira (1928: 421). Lectotype (inadvertently designated by Moldenke 1973c: 29):—BRAZIL. Rio Grande do Sul: Rio Grande, Estação de Povo Novo, 7 October 1928, *J.Deslandes s.n.* (lectotype R on 3 sheets barcodes R000126565, R000126565a, R000126565b images!; isolectotypes US barcode 00088253 [fragments and photo] image!).

= *Eriocaulon megapotamicum* Malme (1935: 8). Lectotype (inadvertently designated by Moldenke 1969: 279, second-step designated here):—BRAZIL. Rio Grande do Sul: Povo Novo pr. Pelotas, In palude 12 November 1901, *G.O.Malme 406* (lectotype S S-R-2053 image!; isolectotype S S05-5749 image!).

Herbs 30–83 cm high. **Leaves** distichous equitant to spirally arranged, 15–55 × 0.6–2.7 cm, linear-lanceolate, ascending, coriaceous, apex acute, slightly cucullate to cucullate, glabrous.

Spathes 9.5–74.5 cm long, apex oblique, lateral slit 22–30 mm, glabrous. **Scapes** 23–73 cm long, glabrous. **Capitula** single, radial, hemispheric to globose, 7–12 mm diameter. **Involucral bracts** in 3–4 series, 2–4.1 × 1–2.5 mm, ovate, external series wider in relation to the inner ones, apex acute to slightly attenuate, stramineous, more rarely greyish to light-black, glabrous. **Floral bracts** 3.5–3.8 × 0.6–1 mm, lanceolate to slightly oblanceolate, apex long-attenuate, stramineous, darker towards the margins, white trichomes up to 0.2 mm long at the distal third, on the margins and abaxial surface. **Staminate flowers** 3.8–4.5 mm long, pedicel up to 1.5 mm long; sepals free, 2–2.5 × 0.5–1, obovate to oblanceolate, slightly concave, apex acute to slightly acuminate, stramineous at the very base, greyish to blackish towards the apex, white trichomes as observed in the floral bracts, plus hyaline trichomes up to 0.4 mm long on the abaxial surface; petals fused at the base, unequal, median petals 2–3 × 0.6–1 mm, oblong, apex attenuate, cream, lateral petals, 1.7–2.5 × 0.5–0.6 mm, similar to the median petals, indument as observed in the floral bracts, plus hyaline trichomes up to 2 mm long; stamens up to 1.3 mm long, anthers black. **Pistillate flowers** 3.8–4.1 mm long, pedicel up to 0.3 mm long; sepals free, 2.5–3 × 0.7–1.1, as observed in the staminate flowers, but usually darker; petals free, unequal, median petals 3.5–4 × 1–2 mm, oblanceolate to spathulate, rarely long-spathulate, apex obtuse to acute, rarely attenuate, cream, gradually becoming greyish or blackish towards the base, lateral petals 2–3.2 × 0.8–1 mm, similar to the median petals, but slightly obovate to oblanceolate, apex obtuse, indument as observed in the staminate flowers, but presenting a greater amount of hyaline trichomes within the corolla; gynoecium 2.5–2.7 mm long, ovary 0.8–1 mm long, black, column and stigmas stramineous.

Illustrations:—Moldenke & Smith (1976: 13) [line-drawings].

Etymology:—The specific epithet *magnificum* refers to the robust and magnificent habit of the species (from the *Latin*, *magnificum* = magnificent) (Moldenke & Smith 1976).

Distribution and habitat:—Brazil (Rio Grande do Sul and Santa Catarina). This species is endemic to the Coastal Plain Grasslands, occurring from the mid coast of Santa Catarina to the southern coast of Rio Grande do Sul, where it is more common. Its occurrence in the Uruguayan coast is not fully discarded. It inhabits marshy soils, usually associated with lagoons, up to 30 m elevation (Fig. 24).

Phenology:—Flowering sporadically throughout the year, usually blooming from December to February.

Conservation:—*Eriocaulon magnificum* is Endangered (EN) according to the IUCN (2017) criteria B2a+bii,iii,iv. Its extent of occurrence (EOO) is 24,344.351 km² and its area of

occupancy (AOO) is 96.000 km² (cell width of 2 km). Although it is widely distributed along the Coastal Plain Grasslands and is included in at least one protected area in Rio Grande do Sul, southern Brazil (Tupancy Municipal Natural Park), it is threatened by growing habitat conversion due to the drainage of wetlands for rural use and urban occupation.

Diagnosis:—*Eriocaulon magnificum* is morphologically most similar to *E. itapevense*, as compared in the diagnosis of the later. Also is historicaly confused with *E. reitzii*, being also compared in the diagnosis of this species.

Nomenclatural notes:—Moldenke (1971) cites the collection *Ule 1689* in "Hg" (HBG) as isotype of *E. magnificum*, wich can be considered an inadvertent lecotypification according to Prado *et al.* (2015). Still, there are two materials of the type collection (*E.Ule 1689*) at HBG, requiring second-step lectotypification according to the Article 8.3 of the *Shenzhen Code* (Turland *et al.* 2018). We chose the sheet HBG-506594 because it was seen by Ruhland based on the handwriting identification.

Concerning the cited synonyms, a second-step lectotypification was also applied to *E. megapotamicum*, once there are two sheets of the type collection at S, first mentioned by Moldenke (1969). We followed his labels in both herborized material, which differentiated them in "Type" and "Isotype", considering the first as lectotype. About the type collection of *E. ulaei*, dating from 1889, its protologue refers Rio de Janeiro, Brazil, as the type locality. It configures a mistaken information, once Ernst Ule lived in Santa Catarina since 1883, only moving to Rio de Janeiro in 1891 (Borges *et al*. 2018). Besides, the label contains the information "In Torfsümpfen des Campo d'Una bei Laguna", Laguna which is a well known locality in the southern coast of Santa Catarina. This mistake is here corrected. Finally, the type of *E. deslandesii* is composed of three sheets corresponding to *J.Deslandes s.n.* at R, all of them containing the same information, the same labels from *Herbarium Silveira*, and presenting sequential barcode numbers. Thus, being considered a lectotype organized in more than one sheet.

General notes:—The type specimen of *E. magnificum* at HBG (HBG-506594) was identified as *E. ulaei* by Ruhland, author of both names, fact previously pointed by Moldenke (1971, 1972). This author, in a further study (Moldenke 1973c), states that the american botanist Lyman Bradford Smith and himself examined the type collection of *E. deslandesii* at R and "found to be identical to *E. magnificum*". Moreover, Moldenke (1976) says that *E. megapotamicum* is extremely similar to *E. magnificum*, and cites Rambo (1950), who already pointed that he could not differentiate these taxa. Rambo (1954) considered that *E.*

megapotamicum is “a species of doubtful value” (our translation), and that it is identical to *E. magnificum*.

Oliveira & Bove (2015) cited *E. deslandesii* and *E. reitzii* as synonymous of *E. magnificum*, refering *E. megapotanicum* and *E. ulaei* as valid names, and elevating *E. ulaei* var. *radiosum* to *E. radiosum*. The morphological characters cited by these authors were not sufficient to support these species, especially *E. radiosum*. In common, all the cited taxa were described as presenting robust habit, lanceolate leaves longer than spathe, and hemispherical to/or spheric capitula. A single comparable feature was found, the spathe apex, refered as acute in *E. magnificum*, laciniate in both *E. megapotamicum* and *E. ulaei*, and acuminate in *E. radiosum*. Other diagnostic features were not available for at least one of the taxa (e.g. width of the leaves, shape and colour of the floral bracts). We did not observe distinct spathe apex in our material, describing it as oblique, with a lateral slit, a very stable feature among all our examined specimens. This description is congruent with the protologues of *E. magnificum* and its suggested synonyms (“oblique fissae”). Regarding *E. reitzii*, we consider it a valid species, presenting a set of morphological characters which justify its maintenance as a distinct taxon, as well as geographical disjunction and distinct ecological preferences (see the diagnosis of *E. reitzii*).

Examined material:—BRAZIL. **Rio Grande do Sul**: [Arroio do Sal] Torres, Areia Branca, January 1975, *K.Hagelund 9037* (ICN!); [Arroio do Sal] Torres, Rondinha Nova, 3 September 1986, *M.H.Bassan et al. 647* (HAS!); [Arroio do Sal] Osório, Praia de Rondinha Nova, 25 July 1988, *N.Silveira & C.Mondin 6496*, *6497* (HAS!); Arroio do Sal, 26 November 1989, *A.F.Bellan s.n.* (MPUC 11086!); Arroio do Sal, Rondinha Nova, 29°30’15.8”S 49°51’15.4”W, 20 December 2017, *C.C.Alff et al. 62* (ICN!); Arroio do Sal, Rondinha Velha, Parque Natural Municipal Tupancy, Lagoa Tupancy, 29°29’21.6”S 49°50’45”W, 3 February 2018, *C.C.Alff & C.Rabuske 92* (ICN!); Arroio do Sal, 29°27’37.2”S 49°49’13.1”W, 15 m elev., 3 February 2018, *C.C.Alff & C.Rabuske 96* (ICN!); Arroio do Sal, Rondinha Nova, 29°30’06”S 49°51’33”W, 30 June 2018, *C.C.Alff & C.Rabuske-Silva 130* (ICN!). Balneário Pinhal, RS-786, 30°15’25.8”S 50°19’24.2”W, 17 m elev., 1 February 2018, *C.C.Alff & C.Rabuske 73* (ICN!); Balneário Pinhal, RS-040, 30°12’50.7”S 50°17’29.7”W, 8 m elev., 1 February 2018, *C.C.Alff & C.Rabuske 75* (ICN!); Balneário Pinhal, Lagoa Rondinha, 30°13’56.7”S 50°15’17.1”W, 3 m elev., 1 February 2018, *C.C.Alff & C.Rabuske 79* (ICN!). Capão da Canoa, 4 February 1982, *T.Stützel s.n.* (ICN 51498!); Capão da Canoa, 7 June 1985, *J.L.Waechter 2129* (ICN!); Capão da Canoa, Praia de Atlântida, 2 July 1988, *L.Eggers 103*

(ICN!); [Capão da Canoa] Xangri-lá, Praia de Atlântida, 26 February 1995, *R.Záchia et al. 1709* (HAS!); Capão da Canoa, Fazenda Pontal, 17 November 1997, *T.Strehl s.n.* (HAS 91817!); Capão da Canoa, Estrada do Mar, 29°44'02.1"S 50°01'26.1"W, 18 m elev., 1 February 2018, *C.C.Alff & C.Rabuske 88* (ICN!). Cidreira, 5 km da cidade, sede do camping, próximo à lagoa, 20 March 1991, *N.Silveira 10837* (HAS!); Cidreira, Fazenda Azaléia, 30°05'14.2"S 50°13'53.5"W, 14 August 2017, *R.M.Senna 1704* (HAS!); Cidreira, dunas Salinas-Oásis, 3 January 2018, *V.L.Bittencourt 186* (ICN!); Imbé, Imara, RS-786, 29°53'16"S 50°05'46.6"W, 12 m elev., 1 February 2018, *C.C.Alff & C.Rabuske 83* (ICN!). Mostardas, Lagoa dos Barros, Solidão, 10 m elev., 9 January 2018, *R.Wasum 4389* (HUCS!); Mostardas, estrada para a Lagoa do Bacupari, 30°32'08"S 50°26'32"W, 17 January 2018, *V.L.Bittencourt 292* (ICN!). [Osório], Fazenda do Arroio p. Osório, 4 January 1950, *B.Rambo SJ 45243* (HBR!, PACA!); [Osório], Fazenda do Arroio p. Osório, 3 March 1950, *B.Rambo SJ 46190* (HBR!); [Osório], Fazenda do Arroio p. Osório, 14 April 1950, *B.Rambo S.J. 46813* (PACA!); [Osório], Fazenda do Arroio p. Osório, September 1957, *B.Rambo SJ 61454* (PACA!); [Osório], Osório p. Arroio do Sal, 4 June 1976, *L.Arzivenco s.n.* (ICN 48542!); Osório, Lagoa das Traíras, 29°52'07"S 50°11'13"W, 5 m elev., 6 January 2015, *C.Demeda 36* (HUCS!). Palmares do Sul, Lagoa Bacopari, 13 February 1991, *J.A.Jarenkow 1836* (PEL!); Palmares do Sul, Lagoa da Porteira, 28 August 2004, *J.Mauhs s.n.* (PACA 94188!). Rio Grande, 3 October 2016, *C.I.Duarte et al. s.n.* (HURG 5632!). [São José do Norte?], Estreito, January 1992, *P.Tagliani s.n.* (HURG 2250!). Tapes, Fazenda Joaquim Mello, 28 January 2003, *M.L.Abruzzi 4487* (HAS!); Tapes, Fazenda São Miguel, 21 May 2003, *M.L.Abruzzi 4904* (HAS!). Torres, 11 February 1954, *B.Rambo SJ 54863* (HBR!, PACA!); Torres, Estrada do Mar, 29°24'21.6"S 49°47'43.8"W, 15 m elev., 20 November 2015, *R.Trevisan & L.Pereira-Silva 1672* (FLOR!); Torres, Praia Webber, 29°24'12.2"S 49°47'03.9"W, 17 m elev., 3 February 2018, *C.C.Alff & C.Rabuske 99* (ICN!); Torres, Praia Real, 29°25'38.8"S 49°48'15.7"W, 30 m elev., 30 January 2019, *C.C.Alff & C.Rabuske-Silva 171* (ICN!). Tramandaí para Osório, 12 February 1933, *B.Rambo SJ 135* (LP!, PACA!); Tramandaí, 12 February 1933, *B.Rambo S.J. 33981* (PACA!). Xangri-lá, Estrada do Mar, 29°49'40.9"S 50°04'03.9"W, 16 m elev., 1 February 2018, *C.C.Alff & C.Rabuske 86* (ICN!). **Santa Catarina**: [Araranguá], Morro dos Conventos, 16 November 1971, *J.C.Lindeman s.n.* (ICN 9135!); Araranguá, Morro dos Conventos, 4 June 2011, *A.Nuernberg & A.S.Mello 1038* (FLOR!). Balneário Gaivota, 29°13'36.2"S 49°38'38.2"W, 17 m elev., 30 January 2019, *C.C.Alff & C.Rabuske-Silva 180* (ICN!). [Palhoça], Massiambú para Palhoça, 5 m elev., 16 July 1953, *R.Reitz 6893* (PACA!).

3.7. Eriocaulon modestum Kunth (1841: 547). Lectotype (designated by Moldenke & Smith 1976: 29, second-step designated here):—BRAZIL. Santa Catarina: [Florianópolis] Insula Ste. Catharinae, 1834, *Gaudichaud 103* (lectotype P barcode P00135277 image!; isolectotypes B barcode B 10 0244396 image!, G, P barcodes, P00745137, P00745140 images!). Remaining syntypes:—BRAZIL. Bahia: Palmeiras, "Campos St. João", May 1931 1837, *B.Luschnath s.n.* (LE). **Figures 11, and 25–26.**

= *Eriocaulon candidum* Moldenke (1950: 389). Type:—BRAZIL. Rio Grande do Sul: Tramandaí, in arenosis paludosis, 30 October 1949, *A.R.Schultz 700* (holotype NY barcode 00102615 image!; isotype ICN!).
= *Eriocaulon moldenkei* Herter (1950: 164). Type:—URUGUAY. Canelones: Parque Plata, in paludibus littoralis arenosis, 3–4 m elev., 7 December 1947, *W.G.F.Herter 2110* (holotype CTES; isotypes B barcode B100244394 image!, CTES barcode CTES0000151 image!, BR, G, F 1319310, 1319311 images!, NY barcode 00102644 image!, PACA!, S S-R-2056 image!).

Herbs 6–37 cm high. **Leaves** spirally arranged, 1.5–13 × 0.1–0.4 cm, linear-lanceolate, ascending, eventually recurved, membranaceous to coriaceous, apex obtuse to acute, glabrous. **Spathes** 0.7–7 cm long, apex 2–3-toothed to lacerate, glabrous. **Scapes** 5–34 cm long, eventually flexuous, glabrous. **Capitula** single, radial, hemispheric to globose, 4–9 mm diameter. **Involucral bracts** in 1–3 series, 1.5–2 × 1–1.3 mm, elliptical to slightly obovate, apex round to obtuse, stramineous to black (especially dark previously to the anthesis), glabrous. **Floral bracts** 2.3–2.5 × 0.4–1 mm, linear-lanceolate to slightly oblanceolate, apex acute to attenuate, color pattern as displayed by the involucral bracts, white trichomes up to 0.15 mm long at the distal third, on the margins and abaxial surface. **Staminate flowers** 2–2.6 mm long, pedicel 0.4–0.5 mm long; sepals fused up to the distal third forming a spathaceous calyx 2–2.3 × 0.6–1 mm, apex 3-lobed, lobes obtuse, stramineous at the base, greyish to blackish towards the apex, white trichomes up to 0.2 mm long at the distal third, on the margins and abaxial surface; petals fused at the base, unequal, median petal ca. 1.5 × 0.6 mm, oblanceolate, apex obtuse, usually curved and bending on the top of the flower, lateral petals reduced to lobes up to 1 mm long, apex obtuse, cream, white trichomes up to 0.4 mm long at the distal third, on the margins and adaxial surface; stamens up to 1.3 mm long, anthers black. **Pistillate flowers** 2.2–3.2 mm long, pedicel up to 0.2 mm long; sepals free, 2–2.3 × 0.2–0.5 mm, oblanceolate, apex round to obtuse, colour pattern as observed in the staminate flowers;

petals free, unequal, median petal 2.3–2.5 × 0.6 mm, oblanceolate, apex round to obtuse, lateral petals 2–2.2 × 0.3–0.4 mm, oblanceolate to slightly spathulate, apex also round to obtuse, cream, white trichomes up to 0.3 mm long at the distal third, on the margins and adaxial surface; gynoecium ca. 2.5 mm long, ovary ca. 0.5 mm long, stramineous, column and stigmas also stramineous.

Illustrations:—Körnicke (1863: pl. 62), Moldenke & Smith (1976: 25) [line-drawings].

Etymology:—The specific epithet *modestum* refers to the small and discreet habit (from the Latin, *modestum* = modest) (Moldenke & Smith 1976).

Distribution and habitat:—Widely distributed, from northern to southern Brazil (Paraná, Rio Grande do Sul, and Santa Catarina), and Uruguay (Canelones). In the study area, *E. modestum* occurs mainly in the Coastal Plain Grasslands, from the mid coast of Santa Catarina, southern Brazil, southwards Canelones, Uruguay. In Paraná, this species was sparsely recorded in the *Campos Gerais*, above 800 m elevation. It inhabits moist to marshy soils, eventually associated with lagoons, usually up to 30 m elevation (Fig. 11).

Phenology:—Flowering from September to May.

Diagnosis:—*Eriocaulon modestum* is morphologically similar to *E. crassiscapum*, as compared in the diagnosis of the later.

Nomenclatural notes:—Moldenke & Smith (1976) cites "Lectótipo – "Insula S. Catharinae [Gaudichaud]". P, holótipo, B, isótipo." concerning one of the syntypes of *E. modestum*. Thus, inadvertently designating the collection at P as lectotype, based on Prado *et al.* (2015). Although, more than one sheet corresponding to this collection is found at P, justifying the second-step lectotypification, following the Article 8.3 of the *Shenzhen Code* (Turland *et al*. 2018).

General notes:—During this survey, we observed morphological variations within *E. modestum*, especially in leaves length, width and consistency, according to the water availability in the environment. Specimens growing in moist sandy soils tend to display smaller and more coriaceous leaves, while those growing in flooded areas tend to grow taller and display membranaceous leaves.

Examined material:—BRAZIL. **Paraná**: Balsa Nova, Ponte dos Arcos, 5 January 2006, *C.Kozera & O.P.Kozera 2814* (MBM!, UPCB!). Ponta Grossa, 6 December 1903, *P.Dusén 2467* (SI!). **Rio Grande do Sul**: Arambaré, Lagoa dos Patos, 31°00'28.8"S 51°29'35.7"W, 27 September 2014, *Vinícius et al. s.n.* (MPUC 20856!); Arambaré, Lagoa dos

Patos, 31°00’28.8”S 51°29’35.7”W, 27 September 2014, *Gabriela et al. s.n.* (MPUC 20858!). Balneário Pinhal, 30°12’25”S 50°19’24”W, 17 m elev., 1 February 2018, *C.C.Alff & C.Rabuske 72* (ICN); Balneário Pinhal, Lagoa Rondinha, 30°13’56”S 50°15’17”W, 3 m elev., 1 February 2018, *C.C.Alff & C.Rabuske 77* (ICN!). Barra do Ribeiro, Lagoa das Capivaras, 19 May 2003, *M.L.Abruzzi 4867* (HAS!). Capão da Canoa, RS-786, 2 km de Rainha do Mar em direção à Xangri-lá, 28 November 1988, *M.Neves 1116* (HAS!); Capão da Canoa, RS-786, 2 km de Rainha do Mar, 28 November 1988, *O.Bueno 5711* (HAS!); [Capão da Canoa] Arroio do Sal, Arroio Teixeira, 4 November 2009, *J.Cordeiro et al. 3248* (MBM!); [Capão da Canoa] Capão Novo, 27 November 2010, *E.Pasini 524* (HUCS!). Cidreira, 7 May 1950, *A.R.Schultz 743* (ICN!); Cidreira, Lagoa das Éguas, 14 October 1988, *H.Longhi-Wagner & I.Boldrini 1747* (ICN!); Cidreira, perto da Lagoa Fortaleza, 5 December 1988, *H.M.Longhi-Wagner & I.Boldrini 1931* (ICN!). Imbé, Imara, 29 December 2018, *C.C.Alff & C.Rabuske-Silva 163* (ICN!). [Mostardas], Fazenda das Almas p. Mostardas, January 1945, *P.Buck s.n.* (PACA 26394!); Mostardas, Fazenda Bernardo Velho, 7 January 1945, *P.Buck s.n.* (LP barcode 068799!); Mostardas, Parna Lagoa do Peixe, Lagoa do Pai João, 15 April 1991, *N.Silveira 10885, 10911* (HAS!); Mostardas, Parna Lagoa do Peixe, 16 April 1991, *M.L.Abruzzi 2347* (HAS!); Mostardas, Parna Lagoa do Peixe, Sede do Parque, 21 January 1992, *C.Costa 78* (HAS!); Mostardas, Lagoa São Simão, 8 m elev., 7 January 2008, *R.Wasum 4340* (HUCS!, MBM!); Mostardas, Lagoa São Simão, 7 January 2008, 10 m elev., *A.Butzke 1056* (HUCS!, MBM!); Mostardas, Lagoa do Ponche, 10 m elev., 11 January 2008, *E.Pasini 233* (HUCS!); Mostardas, Solidão, Lagoa dos Barros, 10 m elev., 8 January 2008, *R.Wasum 4375* (HUCS!); Mostardas, Lagoa do Bacopari, 30°32’38”S 50°24’53”W, 5 October 2018, *C.C.Alff & C.Rabuske-Silva 149* (ICN!). [Osório], Lagoa da Pinguela para Osório, 8 May 1950, *B.Rambo 47053* (PACA!); Osório, Lagoa das Traíras, 29°52’08”S 50°11’13”W, 6 m elev., 28 November 2014, *C.Demeda 3* (BAB!, FLOR!, HUCS!). Palmares do Sul, Lagoa da Porteira, 31 May 2001, *J.Mauhs s.n.* (PACA 87411!); Palmares do Sul, 19 May 2003, *M.LAbruzzi 4789* (HAS!); [Palmares do Sul], Quintão, Lagoa da Porteira, 27 May 2004, *C.Foss & G.Fausti s.n.* (PACA 103194!); Palmares do Sul, Lagoa do Capão Alto, 26 November 2011, 30°24’33”S 50°20’37”W, 10 m elev., *F.Gonzatti 239* (HUCS!, MBM!). Rio Grande, 29 November 1984, *C.Cordazzo s.n.* (HURG 853!, PEL 8303!); Rio Grande, Ilha dos Marinheiros, 14 May 1985, *G.Pedralli et al. s.n.* (HURG 1080!); Rio Grande, Ilha dos Marinheiros, 28 November 1985, *B.E.Irgang et al. s.n.* (HURG 2014!); Rio Grande, FURG, 26 November 1986, *B.E.Irgang et al.* (HURG 1249!). São José do Norte, October 1984, *I.Azambuja s.n.* (HURG 830!). Santa

Vitória do Palmar, Estação Ecológica do Taim, 4 November 1985, *J.A.Jarenkow et al. 264* (PEL!); Santa Vitória do Palmar, Praia do Hermenegildo, November 2012, *C.Vogel-Ely 526* (ICN!). Tapes, Lagoa Comprida, 28 January 2003, *M.L.Abruzzi 4475* (HAS!). [Torres], Paraíso para Torres, 12 November 1954, *B.Rambo 56190* (PACA!); Torres, Itapeva Norte, 4 November 2009, *J.Cordeiro et al. 3198* (MBM!); Torres, 29°23'44"S 49°47'09"W, 20 November 2015, *R.Trevisan & L.Pereira-Silva 1671* (FLOR!, ICN!); Torres, Praia Real, 29°25'38.8"S 49°48'15.7"W, 30 m elev., 30 January 2019, *C.C.Alff & C.Rabuske-Silva 172* (ICN!). Tramandaí, 15 November 1973, *A.Sehnem 13907* (PACA!); Tramandaí, 10 November 1981, *T.Stützel s.n.* (ICN 51499!). Viamão, Itapuã, 5 January 1984, *M.Sobral 3142* (FLOR!). **Santa Catarina**: Araranguá, entrada do Balneário Arroio Silva, Lagoa Azul, 28°57'39"S 49°25'34"W, 6 February 2014, *J.P.R.Ferreira & R.Trevisan 571* (FLOR!). Balneário Gaivota, 29°13'36.2"S 49°38'38.2"W, 17 m elev., 30 January 2019, *C.C.Alff & C.Rabuske-Silva 182* (ICN!). Florianópolis, Ilha de Santa Catarina, Jurerê, 5 m elev., 19 October 1965, *R.M.Klein & Bresolin 6277* (FLOR!, ICN!); Florianópolis, Ilha de Santa Catarina, Rio Vermelho, 5 m elev., 12 April 1994, *D.B.Falkenberg & F.A.Silva-Filho 6658* (FLOR!); Florianópolis, Ilha de Santa Catarina, Parque Municipal das Dunas da Lagoa da Conceição, 24 November 2004, *T.B.Guimarães & D.B.Falkenberg 746* (FLOR!); Florianópolis, Ilha de Santa Catarina, Parque Municipal das Dunas da Lagoa da Conceição, 20 December 2004, *T.B.Guimarães & D.B.Falkenberg 840* (FLOR!, ICN!); Florianópolis, Ilha de Santa Catarina, Parque Municipal das Dunas da Lagoa da Conceição, 25 January 2005, *T.B.Guimarães & D.B.Falkenberg 911* (FLOR!, ICN!); Florianópolis, Joaquina, Dunas da Lagoa da Conceição, 27°37'45"S 48°27'16"W, 5 m elev., 5 September 2014, *L.A.Funez 3039* (FURB!). Içara, Praia do Rincão, 28 February 1988, *G.Beneton 392* (HAS!). Laguna, Praia do Mar Grosso, 14 March 2005, *G.Hatschbach et al. 79146* (MBM!). Palhoça, Campo do Massiambú, 5 m elev., 5 February 1953, *R.Reitz 5605* (HBR!). Sombrio, Araranguá, 10 m elev., 19 September 1945, *R.Reitz C1244* (HBR!, LP!, MBM!, PEL!, UPCB!). URUGUAY. **Canelones:** La Floresta, 6 November 1933, *C.Osten 22940b* (LP!). Near the mouth of the Arroyo Solís Chico, 4 December 1955, *T.M.Pedersen 3653* (LP!).

3.8. Eriocaulon reitzii Moldenke & L.B.Smith (1973b: 430). Type:—BRAZIL. [Santa Catarina: Rancho Queimado] São José, Serra da Boa Vista, 1200 m elev., 24 October 1957, *R.Reitz & R.M.Klein 5428* (holotype US barcode 00088289 image!; isotypes HBR [2 sheets]!, LL barcode 00374593 image!). **Figures 24, and 27–28.**

Herbs 29–30.5 cm high. **Leaves** spirally arranged, 6–8.5 × 0.4–1 cm, linear-lanceolate to lanceolate, ascending, slightly coriaceous, apex acute, slightly cucullate in the younger leaves, hyaline trichomes up to 1 mm long on both surfaces. **Spathes** 7–18.5 cm long, apex oblique, lateral slit 25–40 mm, more frequently toothed, with 2 teeth, indument as observed in the leaves. **Scapes** 23–27 cm long, hyaline trichomes up to 0.2 mm long. **Capitula** single, radial, hemispheric to globose, 8–9.5 mm diameter**. Involucral bracts** in 1–2 series, 3.5–4.5 × 2–2.8 mm, ovate, apex acute, external series wider in relation to the inner ones, stramineous, at most light-black towards the mid portion, glabrous. **Floral bracts** 3–3.2 × 0.4–0.5 mm, lanceolate, apex acute to attenuate, stramineous at the base, blackish towards the mid portion or apex, white trichomes up to 0.2 mm long at the distal third, on the margins and abaxial surface, sparse on the very apex, plus sparse hyaline trichomes up to 0.4 mm long on the mid portion, also on the abaxial surface. **Staminate flowers** 3–3.5 mm long, pedicel up to 0.6 mm long; sepals free, 2–2.5 × 0.2–0.9 mm, obovate to oblanceolate, apex acute, stramineous at the base, blackish towards the apex, white trichomes similar as observed in the floral bracts, plus hyaline trichomes up to 0.4 mm long on the abaxial surface; petals fused up to ca. 1 mm long, unequal, median petals 1.7–2 × 1 mm, spathulate, apex obtuse, cream, white trichomes similar as observed in the sepals, lateral petals ca. 1.3 × 0.7 mm, similar to the median petals; stamens 1–1.2 mm long, anthers black. **Pistillate flowers** ca. 3 mm long, pedicel almost absent, up to 0.1 mm long; sepals free, 2–2.5 × 0.9–1 mm, obovate, apex obtuse, colour pattern and indument as observed in the staminate flowers, but with denser trichomes at the apex; petals free, unequal, median petals 2.5–3 × 1 mm, oblanceolate, apex obtuse or acute to slightly acuminate, cream, lateral petals 1.8–2.5 × 1 mm, similar to the median petals, but obovate to oblanceolate, indument as observed in the staminate flowers, but presenting a greater amount of hyaline trichomes within the corolla, particularly crispate, mainly on the adaxial surface; gynoecium ca. 2 mm long, ovary ca. 1 mm long, brownish, column and stigmas amber.

Illustrations:—Moldenke & Smith (1976: 13) [line-drawings].

Etymology:—The specific epithet *reitzii* honours the Brazilian botanist Raulino Reitz (1919–1990), remarkable researcher of the Flora of Santa Catarina and director of the HBR herbarium (Moldenke & Smith 1976).

Distribution and habitat:—Brazil (Santa Catarina). Endemic to the Subtropical Highland Grasslands of Santa Catarina, occuring in the region known as *Campo dos Padres*, being most recorded in Rancho Queimado municipality. It inhabits moist to marshy soils, associated with bogs and streams, between 1000–1565 m elevation (Fig. 24).

Phenology:—Flowering from October to November, less frequently in January.

Conservation:—*Eriocaulon reitzii* is Critically Endangered (CR) according to the IUCN (2017) criteria B2a. Its extent of occurrence (EOO) is 25.578 km² and its area of occupancy (AOO) is 0.120 km² (cell width of 0.2 km). Besides presenting a restricted distribution, this species is not recorded in any protected area. The sites where it is recorded are traditionally used for cattle grazing, more recently also becoming noticed touristic spots. The overgrazing might configures a threat to its subpopulations.

Diagnosis:—*Eriocaulon reitzii* is morphologically similar to *E. magnificum*, from which it differs by the height up to 30.5 cm high (*vs.* height up to 83 cm high), indument pilose to pubescent (*vs.* indument absent, glabrous), leaves 6–8.5 cm long (*vs*. leaves 15–55 cm long), spathes up to 18.5 cm long (*vs*. spathes up to 74.5 mm long), apex oblique, with lateral slit up to 40 mm long, or toothed (*vs*. apex oblique, with lateral slit up to 30 mm long, entire), scapes up to 27 mm long (*vs.* scapes up to 73 mm long), capitula up to 9.5 mm diameter (*vs*. capitula up to 12 mm long), floral bracts 3–3.2 × 0.4–0.5 mm (*vs*. 3.5–3.8 × 0.6–1 mm), staminate flowers 3–3.5 mm long (*vs*. staminate flowers 3.8–4.5 mm long), with pedicel up to 0.6 mm long (*vs*. pedicel up to 1.5 mm long), median petals 1.7–2 × 1 mm (*vs*. median petals 2–3 × 0.6–1 mm), spathulate (*vs*. oblong), apex obtuse (*vs*. apex attenuate), lateral petals ca. 1.3 × 0.7 mm (*vs*. lateral petals 1.7–2.5 × 0.5–0.6 mm), pistillate flowers ca. 3 mm long (*vs*. pistillate flowers 3.8–4.1 mm long), sepals 2–2.5 mm long (*vs.* sepals 2.5–3 mm long), and median petals 2.5–3 mm long (*vs*. median petals 3.5–4 mm long). Besides morphological features, the species differ in their geographical distribution and are under distinct environmental conditions, *E. reitzii* being endemic to the SHG, while *E. magnificum* is endemic to the CPG.

Eriocaulon reitzii is also morphologically similar to *E. itapevense* due to the presence of indument, as compared in the diagnosis of the later.

Nomenclatural notes:—Divergences in the location data of the type collection and protologue were observed. The labels refer São José as the type locality, while the protologue states that it is Rancho Queimado, both in Santa Catarina. São José encompassed the region of Rancho Queimado until the 1960s, which was latter emancipated, explaining the use of this locality instead of São José by Moldenke (1973b) and Moldenke & Smith (1976).

General notes:—Despite the type specimens of *E. reitzii* present trichomes, Moldenke (1973b) describes this species as glabrous, leading to misidentifications observed in herbaria. Even Moldenke himself eventually misidentified some specimens of *E. reitzii*, relating them to *E. magnificum*, which is, in fact, glabrous. An example is an isotype of *E. reitzii* at HBR

included as examined material of *E. magnificum* by Moldenke & Smith (1976). Curiously, the identification of this collection was made in 1974, one year after the publication of *E. reitzii*. A similar situation occurs with *R.Reitz & R.M.Klein 10251* (HBR!), referred as *E. ulaei* var. *radiosum* by these same authors, but corresponding to *E. reitzii*.

Recently, Oliveira & Bove (2015) proposed *E. reitzii* as a synonym of *E. magnificum*, claiming that there were no distinct features between the two species. Chagas (2017), despite recognizing *E. reitzii* and *E. magnificum* as distinct taxonomic entities, provides a morphological characterization and a distribution range which, in our view, are based on two distinct morphotypes, one corresponding to *E. reitzii*, and other to *E. gomphrenoides* (this last encompassing the majority of his examined material). Despite the absence of trichomes in the protologue, we agree with Moldenke (1973b) about the remaining features in the morphological description of *E. reitzii*, as well as the presented geographical distribution.

Examined material:—BRAZIL. **Santa Catarina**: [Bom Retiro?], Campo dos Padres, 24 January 1957, *B.Rambo 60229* (PACA!). Rancho Queimado, 1152 m elev., 27°40’31”S 49°09’21.6”W, 17 November 2015, *R.Trevisan & L.Pereira-Silva 1659* (ICN!, FLOR!); [Rancho Queimado] São José, Serra da Boa Vista, 1000 m elev., 15 October 1960, *R.Reitz & R.M.Klein 10251* (HBR!); Rancho Queimado, Morro da Boa Vista, 1014 m elev., 27°41’20”S 49°08’29”W, 17 October 2017, *C.C.Alff et al. 24* (ICN!). Urubici, Campo dos Padres, 1554 m elev., 27°58’54.06”S 49°19’51.05”W, 13 November 2011, *A.L.Gasper et al. 2966* (FURB!).

3.9. Eriocaulon sellowianum Kunth (1841: 545). Lectotype (designated here):—BRAZIL. *F.Sellow s.n.* (lectotype B barcode B 10 0244390 image!; isolectotype B barcode B 10 0244385 image!). **Figures 29–31.**

= *Eriocaulon caaguazuense* Ruhland (1906: 519), “caaguazuensis”. Lectotype (designated here):—PARAGUAY. [Caaguazú]: In viciniis Caaguazú, February 1905, *E.Hassler 8885* (lectotype B barcode B 10 0244431 image!; isolectotypes G barcodes G00004579, G00195507 images!, S S-R-2040 image!), **syn. nov.**

= *Eriocaulon sellowianum* var. *paranense* (Moldenke) Moldenke & L.B.Smith (1973c: 37). *Eriocaulon paranense* Moldenke (1949:166). Type:—BRAZIL. Paraná: Florestal, 29 km a leste de Curitiba, estrada Curitiba–Paranaguá, 930 m elev., 13 December 1947, *G.Tessmann 2751* (holotype NY barcode 00102650 image!; isotype MBM!).

Herbs 37.5–50 cm high. **Leaves** spirally arranged, 1.5–4.5 × 0.1–0.5 cm, linear-lanceolate, ascending, not unusual recurvate, coriaceous, apex obtuse to retuse, ending in a conspicuous apical pore, glabrous. **Spathes** 2.5–9.7 cm long, far surpassing the basal rosette, apex toothed, 2 to 4 teeth, less frequently obliquous, glabrous. **Scapes** 29–49 cm long, glabrous. **Capitula** single, radial, hemispheric to globose, 7–12 mm diameter. **Involucral bracts** in 3–4 series, 2–2.5 × 1.2–1.5 mm, external series elliptical to obovate, inner series lanceolate, usually narrower in relation to the external ones, apex obtuse to acute (usually becoming acute towards the inner series), eventually erose to lacerate, stramineous or dull-brown to dark-brown, frequently darker along the margins, glabrous except for sparse white trichomes at the apex, on the margins and abaxial surface. **Floral bracts** 3–3.5 × 1–1.2 mm, obtrullate to trullate-spathulate, apex attenuate to acuminate, stramineous with hyaline margins, sometimes darker at the margins of the wider portion, sparse white trichomes up to 0.15 mm long at the distal third, on the margins and both surfaces, hyaline trichomes up to 2 mm long on the lower portion. **Staminate flowers** 3.5–4 mm long, pedicel up to 0.5 mm long; sepals free, 2–2.3 × 0.3–0.5 mm, oblanceolate to slightly obtrullate, apex obtuse to acute, less frequently attenuate, cream, eventually blackish towards the apex, margins frequently hyaline; petals fused at the base, forming tube up to 1.5 mm long, 3-lobed, lobes remarkably unequal, median lobes 2.5–3 × 0.3–0.5 mm, apex attenuate, usually curved and bending towards the top of the flower, lateral lobes up to 2 mm long, apex attenuate, cream to light-brown, white trichomes up to 0.2 mm long, mainly on the adaxial surface, sparse on the margins and abaxial surface, denser in the median petals; stamens up to 1.5 mm long, anthers black. **Pistillate flowers** 3.5–4 mm long, pedicel up to 0.4 mm long; sepals free, 2.5–3.3 × 0.2–0.9 mm, as observed in the staminate flowers; petals free, unequal, median petals 3.3–3.5 × 0.6–0.9 mm, eventually lacking the epipetalous gland, lateral petals 2–2.2 × 0.4–0.5 mm, oblanceolate to oblong, apex obtuse, cream, indument as observed in the staminate flowers; gynoecium ca. 2.5 mm long, ovary ca. 0.7 mm long, stramineous, column and stigmas also stramineous.

Illustrations:—Moldenke & Smith (1976: 25), as *E. sellowianum* var. *paranense*, Giulietti *et al.* (2018: 10), as *E. caaguazuense* [line-drawings].

Etymology:—The specific epithet *sellowianum* honours the German naturalist Friedrich Sellow (1789–1831), remarkable collector of the Brazilian Flora (Moldenke & Smith 1976).

Distribution and habitat:—Argentina (Corrientes), southeastern to southern Brazil (Paraná, and Santa Catarina), and Paraguay (Alto Paraná, Caaguazú, and San Pedro). In the

study area, *E. sellowianum* occurs mainly in eastern Paraguay and in Paraná, southern Brazil. In this state, it is recorded in the *Campos Gerais*, in the *Campos de Palmas* (*sensu* Maack 1968), included in the Subtropical Highland Grasslands, and in the High Altitude Tropical Grasslands. Southwards, this species reaches western Santa Catarina. In Argentina a single record of *E. sellowianum* was found in Corrientes. It inhabits moist to wet soils, between 700–1300 m elevation (Fig. 31).

Phenology:—Flowering from November to February.

Diagnosis:—*Eriocaulon sellowianum* differs from the other species of the genus in the study area by the apex of the leaves ending in conspicuous apical pores, and spathes ca. twice the length of the leaves, never included in the basal rosettes.

Nomenclatural notes:—Kunth (1841) does not mention collector number in the protologue of *E. sellowianum*, only "Brasilia meridionalis. (Sellow.)". We designated the collection *F.Sellow s.n.* at B (barcode B 10 0244390) as lectotype based on the handwriting information "Ex Herb. Kunth" in the label.

Ruhland (1903) cites the location "Prov. Paraná, Caxambú, auf Campos" related to the collection *F.Sellow 5137*. Although, this information is found neither in *F.Sellow s.n.* (B) nor in *F.Sellow 5137* (BR barcode 000000659594 image!). Recently, Chagas (2017) designated *F.Sellow 5737* as lectotype of *E. sellowianum*, considering this number correspondent to *F.Sellow s.n.* at B. This author discuss the type location of these collections, and suggests that they were probably collected in Minas Gerais or São Paulo, southeastern Brazil. Our analysed images of the collection *F.Sellow 5737* mention at most "Brasilia".

According to Herter (1945), *F.Sellow 5137* was collected between Paraná and São Paulo. Closer collection numbers of other species from Paraná were found, containing the same location, Caxambú, cited by Ruhland (1903). Caxambú belonged to Palmas, Paraná, until 1919, when it became a district of Chapecó, Santa Catarina, and in the 1960's was emancipated as Caxambú do Sul. Once *E. sellowianum* is recorded in Chapecó and nearby municipalities, the information on location provided by Ruhland (1903) may be geographically consistent with the type locality of *E. sellowianum*. However, if *F.Sellow 5737* is the correct number, it corresponds to São Paulo state (Herter 1945). We rather cite as type material only the collections strictly identified as *F.Sellow s.n.* at B, once we can not assure they correspond to *F.Sellow 5137* or *5737*, as previously treated by Ruhland (1903) and Chagas (2017).

General notes:—Concerning synonymizations, divergent opinions are found in the literature. Moldenke & Smith (1976) segregates *E. sellowianum* var. *sellowianum* from *E.*

sellowianum var. *paranense* by the leaves 1–2 cm length, patent, (*vs.* leaves 3–6 cm length, mostly erect or suberect), and involucral bracts entirely pale (*vs.* involucral bracts generally more or less blackish). These authors states that both taxa co-occur at least in Paraná and Santa Catarina, southern Brazil.

Oliveira & Bove (2015) considered *E. sellowianum* var. *paranense* a synonym of *E. sellowianum*, but mistakenly point the collection *L.B.Smith et al. 15667* as type of the variety. Nevertheless, Chagas (2017) considers *E. sellowianum* var. *paranense* a synonym of *E. caaguazuense*, described for Paraguay. Moreover, this author excluded some specimens from the type collection of *E. sellowianum*, which he classifies as *E. caaguazuense*. The lectotype here designated (B barcode B 10 0244390), for example, presents one specimen excluded by this author.

Distinctly from Oliveira & Bove (2015), Chagas (2017) considered *E. sellowianum* restricted to southeastern Brazil, and circumscribed *E. caaguazuense* (in his conception, including *E. sellowianum* var. *paranense*) to northeastern Argentina, midwestern to southern Brazil and Paraguay. He differs *E. sellowianum* from *E. caaguazuense* by the leaves lanceolate-triangular (*vs.* leaves linear-lanceolate), incrassate (*vs.* slightly incrassate), and involucral bracts brown to stramineous (*vs*. involucral bracts black or rarely griseous). The arrangement of the foliose rosette is also cited as a diagnostic feature between the two species, but both are described as "depressed-globose".

Relating to the colour of the involucral bracts, considered a diagnostic character by Moldenke & Smith (1976) and Chagas (2017), the protologues of *E. sellowianum* and *E. caaguazuense* present the information "fuscecenti-stramineae" (stramineous, becoming castaneous or dusky) and "omnes brunneae" (completely brown), respectively. The involucral bracts of *Eriocaulon paranense* are described as dark-brown by Moldenke (1949).

Recently, Giulietti *et al.* (2018) highlighted different vegetative and floral characters between *E. sellowianum* and *E. caaguazuense*, opting for the maintenance of these taxa as two distinct taxonomic entities. In the provided key to the genus in Paraguay, *E. sellowianum* is distinguished from *E. caaguazuense* by the involucral and floral bracts elliptical, and sepals of the staminate flowers fused at the base (*vs*. involucral bracts obovate, and sepals of the staminate flowers free). When comparing these key characters to other morphological descriptions of both *E. sellowianum* and *E. caaguazuense*, we observed that they vary depending on the author (e.g. Ruhland 1903, Moldenke & Smith 1976, Chagas 2017). Kunth (1841) does not make reference to this character when describing *E. sellowianum*, but Ruhland

(1903) cite them as “rarius connata, plerumque libera” (rarely connate, generally free). Moldenke & Smith (1976) describes the staminate flowers of this species with sepals posteriorly fused or free. Chagas (2017) describes fused sepals forming a spathaceous calyx. Based on these distinct descriptions of the fusion in the sepals, we are considering it variable within *E. sellowianum*, not consisting in a reliable character for differentiation in this case.

Examined material:—ARGENTINA. Corrientes: Sto. Tomé, Garruchos, 12 November 1976, *Guaglianone et al. 5* (SI!). BRAZIL. **Paraná**: Balsa Nova, Ponte dos Arcos, 19 April 2005, *C.Kozera 2671* (MBM!); Balsa Nova, Ponte dos Arcos, 6 April 2006, *C.Kozera & A.Sanches 3162* (MBM!). Campo Largo, Ferraria, 1 February 1983, *R.Kummrow 2203* (MBM!). Candói, Fazenda Capão Redondo, 25°25’25”S 51°48’12”W, 12 December 2013, *E.D.Lozano & M.E.Engels 2292* (MBM!). Curitiba, Estrada Federal a Rio Negro, km 12, March 1952, *A.Frenzel 1952* (MBM!); Curitiba, Capão da Imbuia, 5 November 1957, *R.Lange s.n.* (UPCB 1189!); Curitiba, 10 km E of Curitiba, 23 February 1967, *J.C.Lindeman & J.H.Haas 4601* (HBR!, MBM!, RB!); Curitiba, Vila Higienópolis, 22 December 1971, *G.Hatschbach 25558* (MBM!); [Curitiba?], 5 km E de Curitiba, BR-116, 2 February 1973, *A.Krapovickas et al. 23102* (LP!); Curitiba, Rio Atuba, 30 October 1973, *G.Hatschbach 32730* (MBM!); Curitiba, Espandilha, 1 January 1975, *G.Hatschbach 35636* (LP!, MBM!); Curitiba, Lago Azul, 24 January 1984, *G.Hatschbach 47567* (MBM!); Curitiba, Lago Azul, 1 December 1984, *G.Hatschbach 48847* (MBM!, UPCB!); Curitiba, Parque Náutico, 20 January 1989, *J.Cordeiro 604* (MBM!); Curitiba, Jardim das Américas, 5 November 1992, *J.Cordeiro & C.B.Poliquesi 887* (MBM!); Curitiba, Jardim Petrópolis, 16 December 1992, *J.M.Silva & I.S.Silva et al. 1180* (MBM!); Curitiba, Jardim Petrópolis, 7 January 1993, *A.C.Cervi & C.M.Carneiro 4051* (UPCB!); Curitiba, Vila Macedo, 9 September 1993, *O.S.Ribas & J.Cordeiro 587* (MBM!). Guarapuava, 10 km ao oeste de Guarapuava, 1100 m elev., 14 December 1965, *R.Reitz & R.M.Klein 17625* (FLOR!, HBR!); [Guarapuava?], Fazenda Família Maack, BR-277, a 2 km de Guarapuava, sentido Cascavel, 23 January 2007, *J.Cordeiro 407* (MBM!); Guarapuava, Rodovia BR-277, 25°22’59”S 51°30’40”W, 11 December 2013, *E.D.Lozano & M.E.Engels 2238* (ICN!, MBM!); Guarapuava, Rodovia BR-277, 25°22’25”S 51°30’03”W, 11 December 2013, *E.D.Lozano & M.E.Engels 2261* (MBM!). [Horizonte], 13 km de Horizonte, camino a Palmas, BR-280, 1400 m elev., 27 January 1985, *A.Krapovickas & C.L.Cristóbal 39676* (MBM!). Ipiranga, Faxinal do Tanque, 20 December 1970, *G.Hatschbach 25898* (MBM!). Lapa, Parque Estadual do Monge, 25°46’30”S 49°42’02”W, 17 December 2014, *E.D.Lozano et al. 2879* (MBM!). Palmas, Estrada Palmas-Ponte Serrada, 5 December

1971, *G.Hatschbach et al. 28255* (MBM!); Palmas, 8 km south of Palmas, 5 December 1971, *L.B.Smith et al. 15667* (FLOR!, HBR!); Palmas, Fazenda Coxilhão, 26°34'14"S 51°41'27"W, 1260 m elev., 6 January 2010, *L.P.Sousa 52* (MBM!, UPCB!); Palmas, Fazenda Coxilhão, nascente do Rio da Dama, afluente do Rio Chopin, 1260 m elev., 11 February 2010, *L.P.Souza 95* (UPCB!); Palmas, Horizonte, próximo à Usina Eólica, 14 December 2011, *J.M.Silva et al. 8109* (MBM!); Palmas, Refúgio de Vida Silvestre dos Campos de Palmas, 26°32'08.3"S 51°36'22.7"W, 1300 m elev., 19 January 2013, *S.Campestrini et al. 242* (FLOR!); Palmas, Refúgio de Vida Silvestre dos Campos de Palmas, 26°32'08.3"S 51°36'22.7"W, 1300 m elev., 19 January 2013, *S.Campestrini 244* (FLOR!, ICN!); Palmas, REVIS Campos de Palmas, 26°31'25"S 51°38'35"W, 1238 m elev., 25 November 2013, *S.Campestri et al. 784* (FLOR!, ICN!); Palmas, Refúgio de Vida Silvestre de Palmas, Fazenda São Pedro, 26°31'32"S 51°40'28"W, 13 December 2013, *E.D.Lozano & M.E.Engels 2321* (MBM!); Palmas, Refúgio de Vida Silvestre de Palmas, Fazenda São Pedro, 26°32'35"S 51°38'44"W, 13 December 2013, *E.D.Lozano & M.E.Engels 3088* (MBM!); Palmeira, 6 km west of Rodovia do Café turnoff, Papagaio, 900–930 m elev., 21 January 1965, *L.B.Smith & R.M.Klein 14932* (HBR!); Palmeira, Rodovia do Café, km 49, 1000 m elev., 12 December 1965, *R.Reitz & R.M.Klein 17469* (HBR!); Palmeira, Rodovia BR-277, próximo do Haras Valente, 4 February 1999, *G.Hatschbach & S.R.Ziller 68958* (EFC!); Palmeira, Estância São Rafael, 10 February 2004, *E.Barbosa et al. 849a* (MBM!). Piraí do Sul, Serra das Furnas (base), 19 December 1961, *G.Hatschbach 8723* (MBM!). Piraquara, Florestal, 26 December 1948, *G.Hatschbach 1191* (MBM!, PACA!, SI!); Piraquara, 17 December 1950, *G.Hatschbach 2057* (UPCB!); Piraquara, Col. S. Roque, 950 m elev., 6 February 1971, *G.Hatschbach 26306* (MBM!); Piraquara, Purgatório, 22 December 1981, *R.Kummrow 1627* (MBM!); Piraquara, Rio Iraí, 4 December 1992, *S.R.Ziller & A.Bufrem 329* (EFC!, MBM!); Piraquara, Medianeira, 1 February 2005, *T.Lobato et al. 10* (MBM!); Piraquara, Mananciais da Serra, 1000 m elev., 23 January 1986, *C.V.Roderjan & Y.S.Kunioyshi 505* (EFC!); Piraquara, Mananciais da Serra, 12 February 1987, *J.Cordeiro & P.I.Oliveira 434* (MBM!); Piraquara, 10 February 2012, *E.Barbosa & J.Cordeiro 3362a* (MBM!). Ponta Grossa, 24 December 1971, *P.L.Krieger 11376* (MBM!); Ponta Grossa, Vila Velha and surrounding area, 25°15'S 50°W, ca. 900 m elev., 15 November 1977, *L.R.Landrum 2749* (MBM!); Ponta Grossa, formador do rio Tibagi, cruzamento BR-376, 21 January 1999, *S.R.Ziller & F.Galvão 1714* (EFC!, MBM!); Ponta Grossa, Nascente do Rio Tibagi, 25°16'25"S 49°49'29"W, 1096 m elev., 10 January 2009, *B.O.Andrade 201* (MBM!); Ponta Grossa, Nascente do rio Caracará, Embrapa, 25°09'08"S 50°05'16"W, 860 m elev., 21

September 2009, *L.P.Sousa 3* (MBM!); Ponta Grossa, Nascente do rio Caracará, afluente do Rio Tibagi, 860 m elev., 26 January 2010, *L.P.Souza 86* (UPCB!). São José dos Pinhais, Col. Muricy, 30 November 1978, *G.Hatschbach 41881* (MBM!); São José dos Pinhais, Mergulhão, 30 November 1988, *J.M.Silva & J.Cordeiro 607* (ICN!, MBM!, UPCB!); São José dos Pinhais, 20 October 1994, *O.S.Ribas & J.M.Cruz 692* (MBM!). Tijucas do Sul, Rincão, 14 December 1972, *G.Hatschbach 30992* (MBM!); Tijucas do Sul, Ambrósios, 10 January 1992, *O.S.Ribas & D.D.Guimarães 388* (MBM!). Tuneiras do Oeste, Estrada Boiadeira, ca. 2 km E da ReBio das Perobas, 23°55'01"S 52°38'46"W, 12 November 2013, *E.D.Lozano et al. 1779* (MBM!). **Santa Catarina**: Água Doce, Campos de Palmas, 3 km north of Herciliópolis, ca. 26°47'S 51°32'W, 1100–1200 m elev., 5 December 1964, *L.B.Smith & R.M.Klein 13632* (HBR!). Campo Erê p. Chapecó, 24 January 1952, *R.Reitz 4740* (PACA!). Chapecó, 24 km west of Campo Erê, Fazenda Campo São Vicente, 900–1000 m elev., 26–28 December 1956, *L.B.Smith et al. 9451* (HBR!); Campo Erê, 8 km west of Campo Erê, ca. 26°22'S 53°06'W, 900–1000 m elev., 7 December 1964, *L.B.Smith & R.M.Klein 13784* (HBR!, LP!). Irani, Campo de Irani, 700–900 m elev., 15 December 1964, *L.B.Smith & R.M.Klein 13988* (HBR!); Irani, Campo do Irani, 1000 m elev., 28 December 1963, *R.Reitz & R.M.Klein 16400* (HBR!). Joaçaba, campos of Palmas, 77 km west of Caçador, 1000–1300 m elev., 24 December 1956, *L.B.Smith & R.Reitz 9187* (HBR!). Mafra, 750 m elev., 26 January 1953, *R.Reitz 5281* (HBR!). PARAGUAY. **Alto Paraná:** in regione fluminis Alto Paraná, October 1909, *K.Fiebrig 5696* (SI!). Reserva Biológica Itabó, 70 km N de CDE, 19 October 1987, *G.Caballero-Marmori 1911* (MBM!). **Caaguazú:** in viciniis Caaguazú, September 1905, *s.c. in Herb. Hassler 9425* (RB!); **San Pedro:** Villa San Pedro, December 1916, *T.Rojas 2033* (SI!). Colonia Nueva Germania, 1916, *T.Rojas 2034* (SI!).

4. Leiothrix Ruhland (1903: 225)
Type:—not found.

4.1. Leiothrix flavescens (Bong.) Ruhland (1903: 231). *Eriocaulon flavescens* Bongard (1831: 628). Lectotype (first-step inadvertently designated by Moldenke 1970b: 109, second-step designated here):—BRAZIL. [Minas Gerais?]: In humidis montis Itacolomi, August 1824, *L.Riedel 1479* (lectotype LE barcode LE 0002825 image!; isolectotypes K barcode K000640146 image!, LE barcode LE 00002824 image!, NY barcode 00468390 image!, P barcodes P01641674, P01641675 images!, S S-R-3179 image!). **Figures 32–34.**

Herbs 18–55 cm high, with hyaline trichomes up to ca. 0.5 mm long on both surfaces of the leaves, spathes and scapes, frequently capitate. **Leaves** spirally arranged in basal rosettes, 2–9 × 0.4–0.6 cm, linear-lanceolate, slightly falcate, ascending, coriaceous, apex obtuse. **Spathes** 3.8–11 cm long, apex 2-3-toothed, rarely oblique. **Scapes** 15–52 cm long. **Capitula** single, radial, hemispheric to globose, 0.6–11 mm diameter, fawn to golden. **Involucral bracts** in 2-pluriseriate series, 2.5–3 × 0.6–0.7 mm, ovate to lanceolate, apex acute to slightly acuminate, external series smaller than the inner ones, golden, hyaline trichomes up to 0.3 mm long on the margins and abaxial surface, eventually glabrescent. **Floral bracts** 3–3.2 × 0.3–0.4 mm, narrowly lanceolate to oblanceolate, apex acute to slightly acuminate, indument as observed in the involucral bracts. **Flowers** 3-merous. **Staminate flowers** 2.8–3 mm long, pedicel up to 1.2 mm long; sepals fused at the base, ca. 1.3 × 0.2 mm, narrowly oblanceolate, apex rounded or truncate, hyaline to golden, sparse hyaline trichomes at the apex; petals fused up forming tube up to 1 mm long, also hyaline to golden, indument as observed in the sepals; a single whorl of stamens developed, stamens 3, height not observed, anthers pale. **Pistillate flowers** 3–3.5 mm long, pedicel 0.5–1 mm long, colour and indument of sepals and petals similar to the observed in the staminate flowers; sepals free, ca. 2.5 × 0.3 mm, narrowly lanceolate to oblanceolate, apex acute to slightly acuminate; petals also free, very similar to the sepals, but slightly narrower, ca. 0.1 mm wide, hyaline trichomes ca. 1 mm long within the corolla, surrounding the gynoecium; gynoecium ca. 2 mm long, amber, ovary ca. 1 mm long, 3 stigmatic branches and 3 nectariferous appendages fused at distinct levels. **Seed coat** longitudinally striate.

Illustrations:—Bongard (1831: Tab. XXXV), Giulietti & Hensold (1991: 47) [line-drawings].

Etymology:—The specific epithet *flavescens* refers to the flavescent color shade of the capitula (from the Latin, *flavescens* = becoming yellow) (Moldenke & Smith 1976, Gledhill 2008).

Distribution and habitat:—Widely distributed in Brazil, Guayana, Peru and Venezuela. In the study area, *Leiothrix flavescens* is only recorded in southern Brazil (Paraná, Rio Grande do Sul, and Santa Catarina). In this region, its occurs mainly in the *Campos Gerais* of Paraná. In Rio Grande do Sul and Santa Catarina, the species is almost exclusively found in the Coastal Plain Grasslands, also in the Serra do Quiriri, High Altitude Tropical Grasslands of Santa Catarina, near the border with Paraná. It inhabits mountain tops and grasslands associated with lagoons, in moist to wet soils, up to 1300 m elevation (Fig. 34).

Phenology:—Flowering throughout the year, but mainly from September to February.

Nomenclatural notes:—Moldenke (1970b) cites only the isotypes of *Leiothrix flavescens* with the respective herbaria, and Giulietti & Hensold (1991) cite the collection *L.Riedel 1479* as "holotype, LE n.v.". Although, there is more than one sheet at LE herbarium, plus duplicates in other herbaria (as already mentioned by Moldenke 1970b), justifying the second-step lectotypification. The selected colection (barcode LE 0002825) presents the most similar information on location when compared to the protologue.

One of the collections at P (barcode P01641675) mentions "Brasilia: Taubaté" as the type locality, not in agreement with Giulietti & Hensold (1991). These authors states that "Itacolomi" refers to the Pico Itacolomi, in Minas Gerais, Brazil. However, "Itacolomi" is a frequent name in Brazil to designate rocky formations. According to Moldenke (1970b), the type location is São Paulo, Brazil.

General notes:—For a complete list of synonyms see Giulietti & Hensold (1991).

Examined material:—BRAZIL. **Paraná**: Arapoti, Barra do Perdizes, Rio das Cinzas, 11 March 1960, *G.Hatschbach 6907* (MBM!); Arapoti, Rio das Cinzas, Barra do Perdizes, 24 October 1961, *G.Hatschbach 8518* (UPCB!). Balsa Nova, Escarpa de São Luís do Purunã, 7 November 1998, *A.Dunaiski-Jr. & W.Amaral 888* (MBM!); Balsa Nova, Ponte dos Arcos, 29 March 2005, *C.Kozera & R.Kersten 2041* (MBM!); Balsa Nova, Ponte dos Arcos, 5 January 2006, *C.Kozera & O.P.Kozera 2826* (UPCB!); Balsa Nova, Ponte dos Arcos, 30 December 2006, *C.Kozera & O.P.Kozera 3356* (EFC!); Balsa Nova, Serra São Luiz do Purunã, 23 March 2009, *M.Selusniaki 2650* (MBM!); Balsa Nova, Serra São Luiz do Purunã, 25°26'11.1"S 49°39'01"W, 1183 m elev., 1 December 2011, *M.Parolin et al. s.n.* (MBM barcode 388851!); Balsa Nova, Serra de São Luiz do Purunã, 25°28'01"S 49°39'17"W, 1160 m elev., 22 January 2014, *J.Cordeiro et al. 5128* (MBM!). Campina Grande do Sul, subida para o Pico Camapuã, 28 July 2013, *E.D.Lozano et al. 1329* (MBM!). Carambeí, Castro, Rio S. João, 950 m elev., 17 December 1969, *R.Reitz & R.M.Klein 17908* (HBR!). Curitiba, Estrada a Pinhais, 13 km da cidade, 20 March 1952, *G.Tessmann & A.Frenzel s.n.* (MBM 4763!); Curitiba, Vila Higienópolis, 22 December 1971, *G.Hatschbach 28553* (MBM!); [Curitiba?], Estrada entre Curitiba e Ponta Grossa, km 38, 1150 m elev., 4 November 1977, *G.J.Shepherd & J.B.Andrade 6118* (MBM!). Guaratuba, Serra de Araçatuba, 1200–1300 m elev., 10 March 1959, *G.Hatschbach 5552* (HBR!, MBM!); Guaratuba, Serra de Araçatuba, 12 January 2004, *H.Longhi-Wagner et al. 8864* (ICN!); Guaratuba, Morro dos Perdidos, 20 April 2017, *I.Souza 195* (EFC!); [Guaratuba] Tijucas do Sul, Morro dos Perdidos, 13 September 2018, *C. Rabuske-Silva et al. 355* (ICN!). Jaguariaíva, Joaquim Murtinho, 1060 m elev., 10 October 1958,

G.Hatschbach 5131 (MBM!); Jaguariaíva, Parque do Cerrado, 31 March 2012, *R.E.Ardissone & P.Weber 190* (FLOR!). Lapa, Pedra da Gruta do Monge, 750 m elev., 6 November 2005, *R.Wasum et al.* 3133 (HUCS!); Lapa, arredores do Parque Estadual do Monge, 14 December 2013, *E.D.Lozano & M.E.Engels 2366* (MBM!). Morretes, Conjunto Marumbi, Cume do Pico Boa Vista, 9 February 2014, *E.D.Lozano & M.L.Brotto 2605* (MBM!). Palmeira, Rodovia do Café, Km 49, 1000 m elev., 12 December 1965, *R.Reitz & R.M.Klein 17467* (FLOR!, HBR!); Palmeira, Capão da Índia, 14 December 1998, *A.Dunaiski-Jr. & R.Johanson 1008* (MBM!); Palmeira, RPPN Botuquara, 28 February 2011, *A.Dunaiski-Jr. et al. 4135* (EFC!, MBM!); Palmeira, Fazenda Boiada, 14 March 2013, *E.D.Lozano & G.Felitto 1247* (MBM!); Palmeira, Recanto dos Papagaios, 25°27'55"S 49°46'06"W, 957 m elev., 18 December 2013, *J.T.Motta et al. 4154* (MBM!, specimen on the left). Piraí do Sul, Serra das Furnas, 30 April 2000, *J.Carneiro 946* (MBM!); Piraí do Sul, Serra das Furnas, 1100–1200 m elev., 16 January 1965, *L.B.Smith et al. 14564* (HBR!); [Piraí do Sul] Jaguariaíva, Joaquim Murtinho, 1050 m elev., 10 October 1958, *G.Hatschbach 5131* (HBR!). Piraquara, 22 km ao este de Curitiba, 7 January 1949, *G.Tessmann s.n*. (MBM barcode 265847!); Piraquara, estrada a Pinhais, 13 km de Curitiba, March 1952, *G.Tessmann & A.Frenzel s.n.* (MBM 80532!); Piraquara, Fazenda Experimental de Agronomia, 2 February 1972, *N.Imaguire 2777* (MBM!). Ponta Grossa, Vila Velha, 28 December 1970, *P.L.Krieger 9812* (MBM); [Ponta Grossa], Vila Velha, Reserva Estadual, 18 December 1971, *P.L.Krieger 11248* (MBM!); Ponta Grossa, Col. Wittmarsum, Slaviero, 28 November 1985, *Y.S.Kuniyoshi & C.V.Roderjan 4939* (MBM!); Ponta Grossa, Nascente do rio Tibagi, 25°16'25"S 49°49'29"W, 1096 m altitude, 14 October 2008, *B.O.Andrade 102* (MBM!); Ponta Grossa, nascente do Rio Tibagi, 25°16'25"S 49°49'29"W, 1096 m elev., 19 May 2009, *B.O.Andrade 335* (MBM!); Ponta Grossa, Fazenda Capão das Almas, 10 October 2012, *E.D.Lozano & V.A.Ariati 1084* (MBM!). Quatro Barras, Rio Taquari, 21 January 1975, *G.Hatschbach 35772* (MBM!). São José dos Pinhais, Cunhahy, 24 February 2004, *A.Dunaiski-Jr. & W.Amaral 2314* (MBM!); São José dos Pinhais, Cunhahy, 18 December 2004, *A.Dunaiski-Jr. & W.Amaral 2634* (MBM!). Sengés, Fazenda Morungava, Rio do Funil, 15 December 1958, *G.Hatschbach & R.B.Lange 5297* (MBM!); Sengés, próximo ao Mirante da Cachoeira do Corisco, 13 February 1993, *V.C.Souza et al. 2207* (MBM!, PEL!). Tibagi, Quartelá, Canyon Rio Iapó, 900 m elev., 10 November 1992, *G.Hatschbach & E.Barbosa 58176* (MBM)!; Tibagi, Canyon do Rio Iapó, 860 m elev., 7 November 1996, *E.P.Santos et al. 215* (UPCB!); Tibagi, Parque Estadual do Guartelá, 12 November 2011, *A.M.Charnei et al. 509* (UPCB!); Tibagi, Sítio Sete Quedas, 24°35'02.6"S 50°15'42.3"W,

1096 m elev., 28 November 2013, *M.G.Caxambu et al. 4942* (MBM!). Tijucas do Sul, Campina, 11 January 1983, *Y.S.Kuniyoshi & R.Kummrow 4601* (MBM!); Tijucas do Sul, Ambrósios, 10 January 1992, *O.S. Ribas & J. Cordeiro 394* (FLOR!, MBM!); Tijucas do Sul, Serra Papanduva, 1673 m elev., 7 February 2006, *J.Cordeiro et al. 2280* (MBM!); Tijucas do Sul, Serra Papanduva, 1650 m lev., 27 January 2010, *O.S.Ribas et al. 8375* (MBM!); Tijucas do Sul, Serra do Araçatuba, Morro do Araçatuba, 2 August 2015, *R.R.Völtz et al. 629* (EFC!). **Rio Grande do Sul**: Arroio do Sal, 26 November 1989, *A.F.Bellon s.n.* (MPUC 8208!). Barra do Ribeiro, perto da Lagoa das Capivaras, 27 January 2003, *M.L.Abruzzi 5087* (HAS!); Barra do Ribeiro, Lagoa das Capivaras, 19 May 2003, *M.L.Abruzzi 4869* (HAS!). Osório, Fazenda do Arroio, 4 January 1950, *B.Rambo 45183* (ICN!, SI!). Torres, 29°25'32.2"S 49°49'21.4"W, 18 November 2010, *P.J.S.Silva-Filho 1599* (ICN!); Torres, Haras Trevo de Ferro, 29°25'34.1"S 49°49'16.7"W, 13 December 2017, *E.D.Lozano & B.K.Canestraro 4067* (MBM!); Torres, Praia Real, 29°25'38.8"S 49°48'15.7"W, 30 m elev., 30 January 2019, *C.C.Alff & C.Rabuske-Silva 173* (ICN!). Xangri-lá, Praia de Atlântida, 26 February 1995, *R.Záchia et al. 1743* (HAS!). **Santa Catarina**: Garuva, Monte Crista, 800 m elev., 22 December 1957, *R.Reitz & R.M.Klein 5874* (FLOR!, HBR!); Garuva, Monte Crista, 900 m elev., 3 November 1960, *R.Reitz & R.M.Klein 10290* (HBR!); Garuva, Serra Quiriri, Rancho Paulo Sales, 1000 m elev., 12 May 2007, *F.C.S.Vieira 1911* (MBM!); Garuva, Serra do Quiriri, 16 May 2008, *J.M.Silva et al. 6604* (MBM!); Garuva, Campos do Quiriri, 29 January 2013, *E.Barboza et al. 3532* (MBM!); [Garuva] Campo Alegre, Campos do Quiriri, 26°01'29"S 48°58'37"W, 1300 m elev., 25 February 2014, *A.L.Gasper & L.A.Funez 3561* (FURB!). Palhoça, Campo do Massiambú, 5 m elev., 10 December 1952, *R.Reitz 4921* (HBR!, MBM!, PACA!); Palhoça, Três Barras, 3 December 2010, *J.Cordeiro et al.4067* (MBM!).

5. Paepalanthus Martius (1834: 28) *nom. cons.*

Neotype (designated by Giulietti *et al.* 1998):—*Paepalanthus erigeron* Martius ex Körnicke (1863: 390)

Annual or perennial herbs, rosulate, occasionally presenting elongated stems. **Leaves** spirally arranged. **Scapes** few or numerous per rosette, free, bearing a single racemous capitulum per scape, or fused, bearing a group of capitula (*Paepalanthus* subg. *Platycaulon*). **Capitula** single, radial, hemispheric to globose, or composed of several racemous subunits (*Paepalanthus* subg. *Platycaulon*), sometimes arranged in complex inflorescences, such as umbel-type. **Flowers** 2

or 3-merous. **Staminate flowers** with free or partially fused sepals, fused petals, a single whorl of stamens developed (2 or 3), anthers pale. **Pistillate flowers** with free of partially fused sepals, free petals, gynoecium with 2 or 3-carpellate ovary, styles with 2 or 3 stigmatic branches, free or fused, and 2 or 3 nectariferous appendages fused at the same level. **Seed** coat variable.

Etymology:—*Paepalanthus* makes reference to the surface of the capitula (from the Greek, *paipale* = flour, *anthos* = flower) (Moldenke & Smith 1976).

Key to the species of *Paepalanthus* in subtropical South America

1. Scapes fused up to the capitula or almost ..... (*Paepalanthus* subgenus *Platycaulon*) 2
- Scapes free ….……....……...…..……....……. 5
2. Scapes not fused beneath the capitula (0.5–1.4 cm) ……...… (section *Divisi*) *P. albovaginatus*
- Scapes fused up to the capitula ……...……..…..…..…… (section *Conferti*) 3
3. Leaves pilose; spathes apex ciliate; involucral bracts practically orbicular …….……. *P. pruinosus*
- Leaves glabrous or glabrescent (trichomes sparse or deciduous), rarely pilose; spathes apex glabrous; involucral bracts ovate …...……. 4
4. Leaves up to 36 cm long, and 1 cm wide, leaf margins of the same consistency of the rest of the blade, ciliated ……..……. *P. paulensis*
- Leaves up to 15 cm long, and 2.7 cm wide, leaf margins membranaceous, entirely glabrous …….……...…….. *P. planifolius*
5. Capitula in umbel-type inflorescence, scapes leaving from elongated stems; flowers 2-merous …… *P. chiquitensis*
- Capitula at the apex of the scapes leaving from the basal rosettes, never in elongated stems; flowers 3-merous ……..……....……..... 6
6. Leaves reaching 13–15.5 cm long; indument pilose to pubescent …….. 7
- Leaves reaching at most 6 cm long; glabrous or glabrescent (trichomes sparse or deciduous) …….…..... 8
7. Leaves apex breaking into narrow ribbons; spathes apex oblique, frequently bifid; involucral bracts stramineous ……...……. *P. balansae*
- Leaves apex attenuate; spathes apex transversal; involucral bracts dark-brown ……. *P. henriquei*
8. Involucral bracts brownish …….. 9
- Involucral bracts stramineous ……. 11

9. Leaves ca. 0.5 mm wide, linear; spathes 0.6–0.7 cm long; capitula 2–3 mm diameter; involucral bracts elliptical to slightly obovate …… *P. bellus*

- Leaves 1–6 mm wide, linear-lanceolate to lanceolate; spathes 1.5–6.5 cm long; capitula 3.5–9 mm diameter; involucral bracts ovate to slightly oblanceolate or slightly lanceolate …….. 10

10. Plants up to 14 cm high; leaves 1–3 mm wide, recurvate; spathes apex transversal, slightly acute, frequently lacerate; involucral bracts glabrous, except for sparse trichomes at the apex margins …….. *P. hatschbachii*

- Plants up to 52 mm high; leaves 2–6 mm wide, ascending; spathes apex 2–3-toothed, less frequently oblique; involucral bracts with hyaline trichomes on the margins and abaxial surface, in the transition from the scapes to the outermost series ……..…. *P. tessmannii*

11. Involucral bracts surpassing the capitula ……... *P. kleinii*

- Involucral bracts not surpassing the capitula ……...…….……... 12

12. Leaves entirely glabrous; spathes apex oblique; capitula 3–4 mm diameter ……. *P. caldensis*

- Leaves glabrous on both surfaces, but margins ciliate; spathes apex transversal, slightly acute; capitula 5–8.5 mm diameter ……...…… *P catharinae*

5.1. Paepalanthus albovaginatus Silveira (1928: 223), “albo-vaginatus”. Type:—BRAZIL. [Paraná]: In Serra das Furnas (In vicinia ex Serra do Monte Negro), prope rivulo Guaricanga, February 1916, *J.G.Michaeli s.n.* (holotype R barcode R 000179914 image!). **Figures 35–36.**

Herbs 11.5–27 cm high. **Leaves** spirally arranged, 7.5–22 × 0.2–0.4 cm, linear-lanceolate, slightly falcate, patent to porrect, chartaceous, apex acute to slightly apiculate, hyaline trichomes up to 10 mm long mainly on the margins, more sparse on both surfaces. **Spathes** 2.5–3.2 cm long, apex transversal, slightly acute, ciliate, with trichomes hyaline up to 1 mm long. **Scapes** 15–22 cm long, fused up to 0.5–1.4 cm beneath the capitula, glabrous. **Capitula** composed of 3 to 9 racemous subunits, 6–8.5 mm diameter each, capituliform, radial, hemispheric to globose. **Involucral bracts** in 4 series, ovate to orbicular, inner series remarkably wider in relation to the outermost series, apex acuminate, dark-brown, eventually stramineous, white trichomes up to 0.3 mm long mainly on the apex margins, more sparse on the abaxial surface, glabrescent. **Floral bracts** ca. 2.3 × 0.5 mm, oblanceolate, apex acuminate, dark-brown, puberulent on the margins. **Flowers** 3-merous, colour and indument of the sepals as observed in the floral bracts. **Staminate flowers** 2–2.3 mm long, pedicel up to 0.2 mm long; sepals free, 2 × 0.2–0.5 mm, oblanceolate to slightly spathulate; petals fused up to the distal third, forming an infundibuliform corolla ca. 1 mm long, hyaline to cream, glabrous; stamens

3, height not observed. **Pistillate flowers** 2–2.5 mm long, sessile; sepals free, 1.8–2 × 0.4–0.5 mm, oblanceolate, apex acuminate; petals free, equal, 1.5–1.7 mm long, lanceolate, apex acute, cream, white trichomes up to 0.3 mm long at the apex margins; gynoecium ca. 2 mm long, stramineous to brownish, ovary 3-carpelate, ca. 0.6 mm long, 3 stigmatic branches and 3 nectariferous appendages, these half the length of the stigmatic branches.

Illustrations:—Moldenke & Smith (1976: 63), Tissot-Squalli (1997b: 374, 377) [line-drawings].

Etymology:—The specific epithet *albovaginatus* refers to the pale colour of the spathes apex (from the Latin, *albus* = white, *vaginatus* = sheath, spathe) (Moldenke & Smith 1976, Gledhill 2008).

Distribution and habitat:—Southeastern to southern Brazil (Paraná and Santa Catarina). *Paepalanthus albovaginatus* occurs mainly in the *Campos Gerais* of Paraná, being also recorded in the Serra do Quiriri, in the High Altitude Tropical Grasslands of northern Santa Catarina, near the border with Paraná. It inhabits mountain tops, in moist soils and near rocky outcrops, between 860–1500 m elevation (Fig. 36).

Phenology:—Flowering from September to February, less frequently from May to August.

Conservation:—*Paepalanthus albovaginatus* is Critically Endangered (CR) according to the IUCN (2017) criteria B2a+biii. Its extent of occurrence (EOO) is 18,101.947 km² and its area of occupancy (AOO) is 0.440 km² (cell width of 0.2 km). It is recorded in at least two protected areas in Paraná, southern Brazil (Guartelá State Park, and Vila Velha State Park).

Diagnosis:—*Paepalanthus albovaginatus* differs from the other *Paepalanthus* subg. *Platycaulon* in the study area by the scapes fused up to 0.5–1.4 cm beneath the capitula (*vs.* scapes fused up to the capitula). In the study area, it is the only species belonging to the section *Divisi* Ruhland (1903: 201), reflecting its distinct morphology when compared to the other species of the subgenus (e.g. Tissot-Squalli 1997a, Scatena *et al.* 1998, Tissot-Squalli & Sauthier 2017).

General notes:—*Paepalanthus albovaginatus* var. *albobracteatus* Tissot-Squalli (1997b: 372) and *P. albovaginatus* var. *fuscobracteatus* Tissot-Squalli (1997b: 375) are not specified in our treatment. The first was described based on *L.M.Smith & R.M.Klein 7400*, from Campo Alegre, HTG of Santa Catarina (holotype R barcode R 000179880 image!; isotypes B barcode B 10 0247869 image!, HBR!, NY barcode 00501303 image!, US barcode 01932686 image!), while the second was based on *G.Hatschbach 22800*, from Balsa Nova, CGE of

Paraná (holotype K barcode K000983036 image!; isotype MBM!). Despite the types of the varieties were collected in distinct formations, we could not precisely segregate the referred taxa due to their polymorphic characters. We observed a wide range of morphological variations along the geographic distribution of *P. albovaginatus*, such as capitula composed of a variable number of racemous subunits, presenting distinct diameters, and involucral bracts with distinct colours (dark-brown or stramineous). According to Tissot-Squalli (pers. comm.), there are ongoing studies aiming to evaluate if these taxa are, in fact, varieties or a single morphologically variable species. Besides, the possibility of distinct species with occurrence of hybridism is not discarded.

A single specimen of *P. albovaginatus*, *J.Goergem s.n.* (ICN 50186!), from Rio Grande do Sul, southern Brazil, was found. The referred location (Tapes, near the Patos lagoon) is in the lowlands of the Coastal Plain, while all the remaining records of *P. albovaginatus* are from highlands, mainly in the *Campos Gerais* of Paraná, its southermost distribution found in the High-Altitude Tropical Grasslands of northern Santa Catarina. It is unlikely that the species occurs in lowlands in Rio Grande do Sul, the referred record being considered doubtful and thus not included in our examined material.

Examined material:—BRAZIL. **Paraná**: Balsa Nova, Serra S. Ana, 1100 m elev., 1 November 1969, *G.Hatschbach 22800* (K barcode K000983036 image!, MBM!); Balsa Nova, Serra São Luis, 1100 m elev., 18 September 1970, *G.Hatschbach 24712* (MBM!); Balsa Nova, Serra S. Luis, 25 October 1973, *G.Hatschbach 32963* (MBM!); Balsa Nova, Alto do Purunã, 14 December 1979, *G.Hatschbach 42657* (MBM!); Balsa Nova, Serra São Luis, 27 December 1984, *G.Hatschbach 48810* (FLOR!, MBM!); Balsa Nova, São Luis do Purunã, 9 September 1986, *R.Kummrow & P.Acevedo 2807* (UPCB!); Balsa Nova, Serra São Luiz do Purunã, 7 October 1996, *C.B.Poliquesi & E.Barbosa 590* (MBM!); Balsa Nova, Escarpa de São Luis do Purunã, 7 November 1998, *A.Dunaiski-Jr. & W.Amaral 883* (MBM!); Balsa Nova, Serra São Luís do Purunã, 5 October 2001, *J.M.Silva & O.S.Ribas 3476* (MBM!, SI!); Balsa Nova, Serra de São Luis do Purunã, 23 July 2010, *E.D.Lozano et al. 290* (MBM!); Balsa Nova, Serra São Luis do Purunã, 25°28’06.3”S 49°39’18.6”W, 1159 m elev., 4 September 2010, *E.L.Siqueira et al. 388* (MBM!); Balsa Nova, São Luiz do Purunã, Fazenda Tamanduá, 4 December 2013, *E.D.Lozano 2156* (MBM!). Campo Largo, Serra São Luiz, 6 January 1948, *R.Hertel 274* (MBM!); Campo Largo, Serra São Luis de Purunã, 18 September 1949, *G.Hatschbach 1461* (MBM!); Campo Largo, Serra São Luiz do Purunã, 4 October 1985, *A.C.Cervi et al. 2315* (UPCB!). Jaguariaíva, along road SW of Jaguariaíva at km 184, 15 October 1966,

J.C.Lindeman & J.H.Hass 3033 (HBR, MBM!); Jaguariaíva, along road SW of Jaguariaíva at km 184, 15 October 1966, *J.C.Lindeman & J.H.Hass 3036* (MBM!). Lapa, Eng. Bley, 26 September 1948, *G,Hatschbach 997* (MBM!); Lapa, Rio Passa Dois, 5 September 1969, *G.Hatschbach 22145* (UPCB!); Lapa, Volta Grande, 13 November 1999, *J.Cordeiro et al. 1583* (MBM!). Palmeira, Rodovia do Café, km 49, 1000 m elev., 12 December 1965, *R.Reitz & R.M.Klein 17461* (FLOR!, HBR!); Palmeira, Santa Rita, 26 October 1982, *G.Hatschbach 45702* (MBM!); Palmeira, Recanto dos Papagaios, 28 October 1996, *O.S.Ribas & M.F.Luz 1588* (MBM!, UPCB!); Palmeira, Rod. BR-277, Rio dos Papagaios, 17 November 1998, *G.Hatschbach et al. 68806* (UPCB!); Palmeira, Fazenda Santa Rita, 10 November 2005, *J.M.Silva et al. 4445* (SI!); Palmeira, Capela Nossa Senhora das Pedras, 10 November 2005, *J.M.Silva et al. 4483* (FURB!); Palmeira, Cercado, 22 September 2011, *J.M.Silva et al. 7828* (MBM!); Palmeira, BR-376, 17 December 2013, *E.D.Lozano 2368* (MBM!). Piraí do Sul, Estrada de Cerne, Serra das Furnas, 5 August 1960, *G.Hatschbach & A.P.Duarte* 7123 (MBM!); Piraí do Sul, Serra das Furnas, 16 July 1994, *N.Silveira 12342* (HAS!); Piraí do Sul, Fazenda Garrote, 8 August 2015, *E.D.Lozano & D.P.Saridakis 3030* (MBM!); Piraí do Sul, Pousada Serra do Pirahy, 2 September 2013, *E.D.Lozano & D.P.Saridakis 1475* (MBM!); Piraí do Sul, Fazenda Barbante, propriedade da Iguaçu Celulose, 4 September 2013, *E.D.Lozano & D.P.Saridakis 1508* (MBM!). Ponta Grossa, Vila Velha, 21 December 1952, *G.Hatschbach 2911* (MBM!); [Ponta Grossa] Limit between Mun. Ponta Grossa and Mun. Palmeira, gorge of the Rio Tibagi at point where BR 376 highway crosses (ca. 25°20'S 49°50'W), ca. 1000 m elev., 16 November 1977, *L.R.Landrum 2512* (MBM!); Ponta Grossa, Buraco do Padre, 27 October 1995, *O.S.Ribas & E.P.Santos 896* (MBM!); Ponta Grossa, Parque Estadual de Vila Velha, 23 September 1998, *A.L.S.Gatti et al. 180* (UPCB!); Ponta Grossa, Passo do Pupo, 3 August 2003, *C.V.Roderjan 1740* (EFC!); Ponta Grossa, UHE São Jorge, 15 September 2013, *R.S.Vieira & S.E.Abdala 214* (EFC!). Tibagi, Guartelá, Vale do rio Iapó, 1100 m elev., 25 May 1990, *Y.S.Kuniyoshi & C.V.Roderjan 5543* (EFC!); Tibagi, Guartelá, Canyon Rio Iapó, 900 m elev., 10 November 1992, *G.Hatschbach & E.Barbosa 58204* (MBM!); Tibagi, Quartelá, 23 December 1992, *A.C.Cervi 3991* (UPCB!); Tibagi, Parque Estadual do Guartelá, Rio Iapó, 2 September 1996, *S.R.Ziller & J.Santos 1587* (MBM!); Tibagi, Canyon do Rio Iapó, 860 m elev., 7 November 1996, *E.P.Santos et al. 214* (UPCB!); Tibagi, Parque Estadual do Guartelá, 1000 m elev., 29 October 2004, *G.S.Salvador et al. 27* (UPCB!); Tibagi, Parque Estadual do Guartelá, 27 September 2008, *M.Fritsch et al. 395* (UPCB!); Tibagi, Parque Estadual do Guartelá, 19 August 2011, *G.Felitto et al. 145* (HUCS!, MBM!); Tibagi, Parque Estadual do

Guartelá, 24 December 2012, *Y.S.Kuniyoshi s.n.* (EFC 13420!); Tibagi, P.E. do Guartelá, 7 July 2013, *E.D.Lozano et al. 1328* (MBM!); Tibagi, Sítio Sete Quedas, 24°04'58"S 50°03'30.7"W, 1078 m elev., 18 May 2014, *E.L.Siqueira et al. 1011* (FURB!); Tibagi, Parque Estadual do Guartelá, 24°34'06"S 50°15'31"W, 985 m elev., 13 October 2016, *R.R.Völtz et al. 986* (MBM!, UPCB!). **Santa Catarina**: Campo Alegre, Morro Iqueririm, 1300–1500 m elev., 8 November 1956, *L.B.Smith & R.M.Klein 7400* (B barcode B 10 0247869 image!, HBR!, NY barcode 00501303 image!, R barcode R 000179880 image!, US barcode 01932686 image!); Campo Alegre, Morro do Iquererim, 1400 m elev., 5 September 1957, *R.Reitz & R.M.Klein 4718* (HBR!); Campo Alegre, Morro do Iquererim, 1300 m elev., 18 October 1957, *R.Reitz & R.M.Klein 5300* (HBR!); Campo Alegre, Morro do Iquererim, 1400 m elev., 9 January 1958, *R.Reitz & R.M.Klein 6063* (HBR!); Campo Alegre, Serra Quiriri, Pedra da Flor, 1100 m elev., 14 January 1998, *O.S.Ribas et al. 2281* (MBM!); Campo Alegre, Serra do Quiriri, 29 December 1998, *J.M.Silva et al. 2756* (MBM!); Campo Alegre, Serra Quiriri, 1300 m elev., 29 September 2001, *O.S.Ribas et al. 3665* (MBM!, PACA!). Garuva, Serra do Quiriri, 25 October 2006, *J.M.Silva et al. 5171* (MBM!); Garuva, Campos do Quiriri, 29 January 2013, *E.Barboza et al.* 3534 (MBM!); [Garuva] Campo Alegre, Campos do Quiriri, 26°01'29"S 48°58'37"W, 1300 m elev., 25 February 2014, *A.L.Gasper & L.A.Funez 3573* (FURB!). Mafra, 11 km east of Mafra on the road to Tinguí, ca. 800 m elev., 8 December 1956, *L.B.Smith & R.M.Klein 8467* (HBR!); Mafra, Campo Novo, 750 m elev., 11 November 1962, *R.M.Klein 3802* (FLOR!, HBR!, MBM!).

Additional examined material:—BRAZIL. São Paulo: Itararé, pedreira de cobastalco, 24º18'02.6"S 49°12'46.3"W, 17 August 1994, *K.D.Barreto et al. 2971* (RB barcode 00652954 image!).

5.2. Paepalanthus balansae Ruhland (1903: 151). Lectotype (designated here):—PARAGUAY. Pastoreo-mi, à l'Est de la Cordillère de Villa-Rica, pâturages un peu secs, 25 September 1874, *B.Balansa 568* (lectotype B barcode B100247854 image!; isolectotypes BR barcode 000000855404 image!, G barcodes G00004573, G00195500 images!, K barcode K000587311 image!, LE barcode LE00001137 image!, NY barcode 00102796 image!, P barcodes P00713450, P00716650, P00716651 images!, S S-R-3866 image!; F 00045750 barcode [fragments] image!). **Figures 36–37.**

= *Paepalanthus balansae* var. *densiflorus* Moldenke (1962a: 162). Type:—BRAZIL. Paraná: Serra dos Dourados, October 1958, *R.Braga & R.Lange 92* (holotype LL barcode 00374665 image!), **syn. nov.**

Herbs 8.5–29 cm high. **Leaves** spirally arranged, 5–13 × 0.3–0.5 cm, linear-lanceolate, falcate, ascending, chartaceous, breaking into narrow ribbons towards the apex, hyaline trichomes up to 3 mm long on both surfaces, mainly towards the base, and up to 0.1 mm long on the margins. **Spathes** 3–4 cm long, apex oblique, frequently bifid, hyaline trichomes up to 0.1 mm long. **Scapes** 9.5–20 cm long, indument as observed on the spathes. **Capitula** single, radial, hemispheric to globose, 9–10 mm diameter. **Involucral bracts** in 3 series, ca. 4 × 1 mm, narrowly-lanceolate, apex acute, stramineous, hyaline trichomes ca. 0.1 mm long, mainly on the margins, less numerous on the abaxial surface. **Floral bracts** ca. 2.5 mm long, linear, apex attenuate, stramineous to dull-brown, white trichomes up to 0.6 mm long mainly on the margins, denser from the mid portion towards the apex. **Flowers** 3-merous. **Staminate flowers** 2.5–2.7 mm long, pedicel up to 0.5 mm long; sepals free, 1–1.7 × 0.3–0.5 mm, oblanceolate, apex acuminate, stramineous to dull-brown, white trichomes ca. 1 mm long at the distal third, mainly on the margins, also on the abaxial surface; petals fused up to the distal third, forming an infundibuliform corolla up to 1.4 mm long; stamens ca. 1 mm long. **Pistillate flowers** 2.5–3 mm long, pedicel up to 1 mm long; sepals ca. 1.5 × 0.4 mm, as observed in the staminate flowers; petals free, 2.1–2.5 × 0.4–0.5 mm, oblanceolate, apex acute to acuminate, stramineous, trichomes as observed in the sepals; gynoecium ca. 2 mm long, ovary ca. 0.7 mm long, amber, 3 stigmatic branches with visible entire apex, also amber, nectariferous appendages not observed.

Illustrations:—Giulietti *et al*. (2018: 20) [line-drawings].

Etymology:—The specific epithet *balansae* is in honor of the French botanist Gaspard Joseph Benedict Balansa (1825–1891).

Distribution and habitat:—Midwestern to southern Brazil (Paraná), and Paraguay (Amambay, and Caaguazú). In the study area, *P. balansae* occurs mainly in eastern Paraguay, being sparsely recorded in northeastern Paraná, southern Brazil. It inhabits moist to wet soils, ca. 450 m elevation (Fig. 36).

Phenology:—Flowering from August to October.

Conservation:—*Paepalanthus balansae* is Endangered (EN) according to the IUCN (2017) criteria B2a. Its extent of occurrence (EOO) is 47,458.622 km² and its area of occupancy

(AOO) is 24.000 km² (cell width of 2 km). This species is recorded in at least one protected area in Amambay, Paraguay (Cerro Corá National Park).

Diagnosis:—*Paepalanthus balansae* presents unique features, being distinguished from the other species by the leaves apex breaking into narrow ribbons, plus hyaline trichomes up to 3 mm long on both surfaces of the leaves, mainly towards the base, and up to 0.1 mm long on the margins, usually patent. When compared to *P. henriquei* Silveira & Ruhland (1903: 129), it is easily distinguished by the spathes apex oblique, frequently bifid (*vs*. spathes apex transversal), and involucral bracts stramineous (*vs.* involucral bracts dark-brown).

Nomenclatural notes:—*Paepalanthus balansae* var. *densiflorus* was described based on the collection *R.Braga & R.Lange 92* at LL. Its label indicates "Serra dos Dourados, October 1958", the same information cited in the protologue by Moldenke (1962a). However, there are two collections *R.Braga & R.Lange 92* at NY (barcode 00501296 image!) and US (barcode 01932715 image!) which indicate Cruzeiro do Oeste, 30 October 1959. Also, we found a collection presenting the same location and date of those referred at NY and US, but only by *R.Lange 92*, at MBM. Once the Serra dos Dourados is a district of Umuarama, Paraná, southern Brazil, which belonged to Cruzeiro do Oeste until the mid of 1960, these collections probably belong to a single gathering. The referred collections at NY and US present identification labels added by Moldenke dating from 1964 and 1962, respectively, but with no indication of type. Because it is not possible for us to assure they are original material, we rather not to classify them as isotypes by now.

Examined material:—BRAZIL. **Paraná**: Serra dos Dourados, Doradina, 30 October 1959, *R.Lange 92* (MBM!, possible isotype). PARAGUAY. **Amambay**: Cerro Corá, Parque Nacional, 8 August 1987, *F.Mereles 1051* (SI!); Cerro Corá, Parque Nacional Cerro Corá, 22°39'34"S 55°59'58"W, 31 August 2001, *M.M.Arbo et al. 8857* (HUEFS barcode HUEFS000086586 image!). Sierra de Amambay, August 1912–1913, *E.Hassler 11345* (P barcode P01724166 image!). **Caaguazú**: Yhú, in regione fluminis Yhú, October 1905, *E.Hassler 9499* (P barcode P01724167 image!, US barcode 01932714 image!); Yhú, 19 September 1988, *T.M.Pedersen 15045* (MBM!, SI!).

Additional examined material:—BRAZIL. **Mato Grosso do Sul**: [Coronel Sapucaia] Amambai, Coronel Sapucaia, Reserva Indígena, 14 October 1984, *G.Hatschbach & R.Kummrow 48461* (MBM!). Rodovia MS-295, Fazenda Bonanza, 35 km de Amambai, 8 February 1993, *G.Hatschbach et al. 58708* (MBM!).

5.3. Paepalanthus bellus Moldenke (1962b: 391). Type:—BRAZIL. Paraná: Guarapuava, Rio Coutinho, 21 October 1960, *G.Hatschbach 7394* (holotype NY; isotypes B barcode B 10 0247852 image!, HBR!, MBM!). **Figures 38–39.**

Herbs 3.5–10 cm high. **Leaves** spirally arranged, 6–9 × 0.5 mm, linear, ascending, slightly coriaceous, apex obtuse to slightly acute, hyaline trichomes ca. 0.5 mm long towards the base. **Spathes** 6–7 mm long, apex oblique, entire or lacerate, glabrous. **Scapes** 5–7.5 cm long, glabrous. **Capitula** single, hemispheric, 2–3 mm diameter. **Involucral bracts** in 1–2 series, 1–1.5 × 0.8–1 mm, elliptical to slightly obovate, apex obtuse to rounded, less frequently acute, dark-brown, becoming dull-brown or stramineous towards the base, whitish trichomes ca. 0.1 mm long on the margins, sparse hyaline up to 0.5 mm long towards the base, on the abaxial surface, not unusual glabrescent. **Floral bracts** ca. 1 × 0.3 mm long, lanceolate, apex acute, colour and whitish trichomes similar to the observed in the involucral bracts. **Flowers** 3-merous. **Staminate flowers** 1.4–1.5 mm long, pedicel up to 0.4 mm long; sepals free, ca. 1 × 0.3 mm, obovate to slightly oblanceolate, apex acute, intense dark-brown, practically black, white trichomes at the apex margins, similar as observed in the bracts; petals fused up to the distal third, forming an infundibuliform corolla ca. 1 mm long, cream, glabrous; stamens up to 0.4 mm long. **Pistillate flowers** 1–1.2 mm long, sessile; sepals 1–1.3 × 0.3–0.5 mm, similar to the observed in the staminate flowers, but with apex eventually obtuse, base markedly stramineous, and white trichomes up to 0.2 mm long; petals free, equal, 0.7–1 × 0.3–0.4 mm, obovate to slightly oblanceolate, apex acute, cream, even hyaline, trichomes ca. 0.25 mm long mainly at the apex margins; gynoecium ca. 1 mm long, ovary 3-carpellate, ca. 0.5 mm long, yellowish, 3 stigmatic branches and 3 nectariferous appendages ca. 0.5 mm long, amber to brownish.

Illustrations:—Moldenke & Smith (1976: 44), as *P. bryoides* (Riedel ex Bongard 1831: 624) Kunth (1841: 520) [line-drawings].

Etymology:—The specific epithet *bellus* refers to general aspect of the species (from the Latin, *bellus* = beautiful) (Gledhill 2008).

Distribution and habitat:—Southern Brazil (Paraná and Santa Catarina). *Paepalanthus bellus* is endemic to the Subtropical Highland Grasslands, occurring mainly in the third plateau of Paraná (or *Planalto de Guarapuava*, according to Maack 1968), reaching its southernmost distribution in western Santa Catarina. It inhabits mountain tops, in moist soils and near rocky outcrops, between 800–1022 m elevation (Fig. 39).

Phenology:—Flowering from October to January, also recorded in April.

Conservation:—*Paepalanthus bellus* is Critically Endagered (CR) according to the IUCN (2017) criteria B2a+biii. Its extent of occurrence (EOO) is 18,152.671 km² and its area of occupancy (AOO) is 0.240 km² (cell width of 0.2 km). This species is not recorded in any protected area.

Diagnosis:—*Paepalanthus bellus* is the smallest species of the genus found in the study area, reaching up to 10 cm high. It is distinguished from the other species by displaying smaller measures (including vegetative and reproductive portions), linear leaves, and dark-brown involucral bracts.

Nomenclatural notes: —Moldenke (1962b) refers the collection *G.Hatschbach 7391* as the type collection. However, the actual type is the collection *G.Hatschbach 7394*, confirmed by the identification label signed by Moldenke in the sheets vinculated to this number. The correction is presented here following the article 9.2 of the Shenzhen Code (Turland *et al.* 2018).

Examined material:—BRAZIL. **Paraná**: Candói, Rio Campo Real, 19 June 2004, *R.Goldenberg et al. 661* (UPCB!); Candói, Fazenda Capão Redondo, 25°15'08.9"S 51°28'52.2"W, 12 December 2013, *E.D.Lozano & M.E.Engels 2293* (MBM!). Guarapuava, Passo do Jacu, 12 December 1973, *G.Hatschbach 33472* (MBM!); Guarapuava, Rio Campo Real, 26 October 1980, *G.Hatschbach 43246* (MBM!). [Turvo] Guarapuava, Cachoeira dos Turcos, 14 January 1983, *G.Hatschbach 46027* (MBM!). Pitanga, Fazenda Nossa Senhora de Aparecida, 27 April 2010, *E.Barbosa & J.M.Silva 2637* (MBM!). **Santa Catarina**: Campo Erê, 8 km west of Campo Erê, ca. 26°22'S 53°06'W, 900–1000 m elev., 7 December 1964, *L.B.Smith & R.M.Klein 13760* (HBR!). [Irani] Joaçaba, Banks of the Rio Irani, 23 km east of Ponte Serrada, 600–800 m elev., 3 January 1957, *L.B.Smith & R.Reitz 9881* (HBR!).

5.4. Paepalanthus caldensis Malme (1901: 29). Lectotype (designated here):—BRAZIL. Minas Gerais: Caldas, loco uliginoso, 10 January 1874, *A.F.Regnell III 1268* (lectotype S S05-5771 image!; isolectotype US barcode 01094967 image!). Remaining sintypes:—BRAZIL. Minas Gerais: Caldas, *in ripa humida amnis Rio Verdinho*, 30 October 1873, *Mósen 764* (S S-R-3877, S05-5750 images!); Caldas, *in ripa umnis Ribeirão dos Bugios*, 5 October 1873, *Mósen 765* (JE barcode JE00019664 image!, S S-R-3878 image!); Caldas, *Capivary in uliginosis*, 1 December 1873, *Mósen 1054* (S S-R-3874 image!); Caldas, *Capivary locis apricis humidis*, 20 November 1873, *Mósen 1055* (S S-R-3875 image!); Caldas, *in ripa humidis amnis*

Ribeirão dos Bugios, 5 November 1875, *Mósen 4449* (S S-R-3876 image!); 1845, *Widgren s.n.* (S S-R-3879 image!). **Figures 39–41.**

= *Paepalanthus ruhlandii* Silveira ex Ruhland (1903: 159). Lectotype (designated here):—BRAZIL. Santa Catarina: [Lauro Muller] in Sümpfen auf Campos der Serra do Oratório, January 1890, *E.H.G.Ule* 1620 (lectotype P barcode P00716720 image!; isolectotype B barcode B 10 0247839 image!). Remaining sintypes:—BRAZIL. Minas Gerais: Maria de Fé, November 1899, *E.F.Sacupahy s.n.* (B barcode B 10 0247840 image!).

Herbs 6–15 cm high. **Leaves** spirally arranged, 1–3 × 0.1–0.4 cm, linear-lanceolate, ascending to slightly recurvate, membranaceous, apex acuminate to attenuate, glabrous. **Spathes** 1–2 cm long, apex oblique, even becoming attenuate, glabrous except for sparse hyaline trichomes up to 0.2 mm long at the very apex. **Scapes** 3–12 cm long, glabrous. **Capitula** single, radial, hemispheric to globose, 3–4 mm diameter. **Involucral bracts** in 1–2 series, 1–1.3 × 0.5–0.7 mm, ovate to slightly lanceolate, apex acute, stramineous, sparse hyaline trichomes up to 0.2 mm long at the apex margins. **Floral bracts** 0.9–1 × 0.2–0.3 mm, oblanceolate, apex obtuse, brownish, with a longitudinal stramineous line at the centre, glabrescent, sparse white trichomes at the apex, on the abaxial surface and margins. **Flowers** 3-merous, sepals of both staminate and pistillate flowers 0.9–1 × 0.3–0.4 mm, oblanceolate, apex obtuse, colour and indument as observed in the floral bracts. **Staminate flowers** 1–1.2 mm long, pedicel up to 0.2 mm long, hyaline trichomes up to 1 mm long leaving from the base; petals fused up to the distal third, forming an infundibuliform corolla up to 0.5 mm long, hyaline; stamens not observed. **Pistillate flowers** ca. 1 mm long, sessile; petals obovate to orbicular, apex rounded, hyaline, white trichomes up to 0.5 mm long at the apex, on both surfaces and margins; gynoecium ca. 1 mm long, yellowish, ovary 3-carpellate, 0.5 mm long, 3 stigmatic branches and 3 nectariferous appendages practically at the same height, the latter slightly smaller.

Illustrations:—Moldenke & Smith (1976: 44) [line-drawings].

Etymology:—The specific epithet *caldensis* refers to the type locality Caldas, in Minas Gerais, Brazil (Moldenke & Smith 1976).

Distribution and habitat:—Southeastern to southern Brazil (Paraná, Rio Grande do Sul, and Santa Catarina). *Paepalanthus caldensis* occurs exclusively in highlands, especially in the Subtropical Highland Grasslands, less frequently in the *Campos Gerais* and in the High

Altitude Tropical Grasslands. It inhabits mountain tops, in moist to wet soils, between 800–1610 m elevation (Fig. 39).

Phenology:—Flowering from November to March, less frequently in May.

Diagnosis:—*Paepalanthus caldensis* can be morphologically associated to other four species: *P. catharinae*, *P. hatschbachii*, *P. kleinii*, and *P. tessmannii*. These species are characterized by small rosettes, with leaves up to 6 mm long, linear-lanceolate to lanceolate, grass-like, as well as by the solitary capitula, with 3–9 mm diameter. However, *P. caldensis* is morphologically most similar to *P. catharinae*, because both present involucral bracts stramineous (*vs*. involucral bracts brownish in *P. hatschbachii* and *P. tessmannii*), not surpassing the capitula (*vs*. surpassing the capitula in *P. kleinii*). *Paepalanthus caldensis* is distinguished from *P. catharinae* by the leaves entirely glabrous (*vs*. leaves glabrous on both surfaces, but margins ciliate), spathes apex oblique (*vs*. spathes apex transversal, slightly acute), and capitula 3–4 mm diameter (*vs.* capitula 5–8.5 mm diameter). Moreover, *P. caldensis* displays leaves densely arranged, scapes straight but strongly twisted, especially when drying, and capitula of delicate aspect, configuring good auxiliar characters for field identification when compared to other similar species. *Paepalanthus caldensis* is especially difficult to distinguish from small specimens of *P. catharinae*, mainly due to fragmentation of the spathes apex, and young capitula.

Nomenclatural notes:—*Regnell III 1268* (US barcode 0088322) presents divergent information regarding the date of collection, pointed as 16 November 1864. We infer that an error in the label may have occurred, once the remaining information (locality and collector number) are the same of the other collections at S and US. Also, US barcode 01094967, presents a stamp “not type”, which may be a result of the handwriting date in the label. We opted for excluding the referred collection at US, once we can not assure it is, in fact, a duplicate based on the divergent data.

Concerning *P. ruhlandii*, Ruhland (1903) probably describe it based on the Silveira’s label, which says “Paepalanthus Ruhlandii Alv. Silv.”, in the type collection at B (barcode B 10 0247840). Later, Silveira (1928) cited the same name, making reference to Ruhland (1903).

Examined material:—BRAZIL. **Paraná**: General Carneiro, Fazenda Lageado Grande, Rio Neno, Alto do Salto Amazonas, 1 November 2004, *C.Bona et al. 187* (UPCB!). Lapa, Lageado Grande, 4 March 1960, *R.Braga 1503* (UPCB!); Lapa, Pedra da Gruta do Monge, 850 m elev., 6 November 2005, *R.Wasum et al. 3126* (HUCS!); Lapa, Pedra da Gruta do Monge, 850 m elev., 1 October 2007, *F.Marchett 602* (HUCS!). Palmas, Horizonte,

próximo à Usina Eólica, 14 December 2011, *J.M.Silva et al. 8110* (MBM!); Palmas, REVIS Campos de Palmas, 26°31’59”S 51°36’26”W, 1247 m elev., 25 November 2013, *S.Campestrini et al. 763* (FLOR!); Palmas, Refúgio de Vida Silvestre de Palmas, Fazenda São Pedro, Campos de Palmas, 26°19’24.5”S 51°23’03.7”W, 13 December 2013, *E.D.Lozano & M.E.Engels 2342* (MBM!). Palmeira, Rio Lajeado, 20 April 2000, *E.Barbosa et al. 479* (MBM!). Piraquara, Passo do Cercado, 30 October 1949, *G.Hatschbach 1555* (UPCB!). Tamarana, Rodovia Londrina-Mauá, km 74, 10 December 1986, *L.H.Soares et al. 21* (MBM!). Tibagi, Parque Estadual do Guartelá, 1000 m elev., 29 October 2004, *G.S.Salvador et al. 26* (UPCB!). Tijucas do Sul, Tabatinga, 907 m elev., 25°49’35”S 49°07’34”W, 14 May 2014, *J.M.Silva 8484* (ICN!). Turvo, propriedade da família Rickli, 25°02’25.6”S 51°33’37”W, 1028 m elev., 13 November 2009, *M.G.Caxambu & E.L.Siqueira 2872* (MBM!, mixed with *S. caulescens*). **Rio Grande do Sul**: Bom Jesus, Arroio do Fundo do Cilho, 28°29’17”S 50°26’01”W, 950 m elev., 7 January 2005, *R.Wasum 2304* (HUCS!, MBM!); Bom Jesus, Arroio do Fundo do Cilho, 950 m elev., 9 January 2005, *R.Wasum 2392* (HUCS!, MBM!); Bom Jesus, Fazenada do Cilho, 1000 m elev., 9 January 2005, *R.Wasum 2396* (HUCS!, mixed with *S. caulescens*). [Cambará do Sul], Taimbesinho perto de São Francisco de Paula, 18 December 1950, *B.Rambo 49400* (ICN!); [Cambará do Sul], banhado no planalto perto de Taimbezinho, 3 December 1971, *J.C.Lindeman et al. s.n.* (ICN 9357!); [Cambará do Sul], Itaimbezinho, 13 November 1972, *J.C.Lindeman et al. s.n.* (ICN 20866!); [Cambará do Sul], Taimbezinho, June 1977, *S.Boechat s.n.* (ICN 41931!); Cambará do Sul, Itaimbezinho, 27 December 1980, *J.Goergem s.n*. (ICN 50036!, 50037!); Cambará do Sul, Cascata dos Venâncios, 29 November 2010, *J.R.V.Iganci et al. 707* (ICN!); Cambará do Sul, Cabana do Parque Nacional de Aparados da Serra, 29°08’03”S 50°07’58”W, 5 December 2015, *F.Gonzatti 2269* (HUCS!). Canela, Parque Caracol, 4 January 1973, *M.L.Porto et al. s.n*. (ICN 22079!). Caxias do Sul, Vila Oliva, 29 October 1985, *S.A.Martins 525* (HAS!). Farroupilha, Estação Experimental de Fruticultura, 2 January 1958, *O.R.Camargo s.n.* (HAS 69769!); Farroupilha, Estação Experimental de Fruticultura, 2 January 1958, *O.R.Camargo s.n.* (HAS 69787!). São Francisco de Paula, Tainhas, 16 February 1946, *B.Rambo 33294* (SI!, mixed with *S. caulescens*); São Francisco de Paula, 29 November 1988, *M.Neves 1149* (HAS!); São Francisco de Paula, Parque Estadual do Tainhas, Passo do S, 30 November 2005, *R.M.Senna 1143* (HAS!); São Francisco de Paula, Parque Estadual do Tainhas, Passo do S, 31 January 2006, *R.Schmidt 1350* (HAS!); São Francisco de Paula, Linha Joá, 800 m elev., 21 November 2010, *E.Pasini* 592 (HUCS!); São Francisco de Paula, Parque das Cascatas, Lageado Grande,

10 January 2018, *V.L.Bittencourt 236* (ICN!); São Francisco de Paula, Parque Estadual de Tainhas, próximo do Passo do S, 29°05'09"S 50°22'04"W, 6 February 2018, *C.C.Alff & C.Rabuske 129* (ICN!); São Francisco de Paula, Parque Estadual de Tainhas, próximo da sede do parque, paralelo ao rio, 26 October 2019, *C.C.Alff et al. 229* (ICN!). [São José dos Ausentes], Serra da Rocinha p. Bom Jesus, 3 February 1953, *B.Rambo 53784* (MBM!, SI!); São José dos Ausentes, 17 December 2002, *B.E.Irgang et al. s.n.* (ICN 125390!). **Santa Catarina**: Água Doce, 8 km south of turn to the south in road east of Palmas, 6 December 1971, *L.B.Smith et al.* 15695 (FLOR!). [Bom Jardim da Serra] Bom Jardim, Fazenda da Laranja, 1400 m elev., 10 December 1958, *R.Reitz & R.M.Klein 7705* (FLOR!). Bom Retiro, 930 m elev., 8 January 1948, *R.Reitz C1975* (LP!). Lages, Vacas Gordas, 900 m elev., 1 November 1963, *R.M.Klein 4470* (FLOR!, MBM!); Lages, Coxilha Rica, 28°17'11"S 50°26'51"W, 1004 m elev., 16 January 2014, *S.Campestrini 857* (FLOR!). Lebon Régis, Rio dos Patos, 900 m elev., 6 December 1962, *R.M.Klein 3406* (FLOR!). São Bento do Sul, Serra Alta, 800 m elev., 26°16'48"S 49°21'47"W, 5 March 2016, *P.Schwirkowski 1639* (FURB!). Urubici, Salto Avencal, 10 October 2001, *G.Hatschbach et al. 72596* (MBM!); Urubici, Campo dos Padres, 1606 m elev., 27°59'02.05"S 49°19'04.05"W, 13 November 2011, *A.L.Gasper et al. 2984* (FURB!).

5.5. Paepalanthus catharinae Ruhland (1903: 147). Lectotype (inadvertently designated by Moldenke 1973d):—BRAZIL. Santa Catarina: [Lauro Muller] im Sumpfe am Rande der Serra do Oratorio, January 1890, *E.Ule 1621* (lectotype B barcode B 10 0247826 image!; isolectotypes CORD barcode CORD00002163 image!, HBG barcode HBG-506600 image!, P barcode P01762752 image!). **Figures 42–44.**

Herbs 15–38 cm high. **Leaves** spirally arranged, 5–12 × 0.4–0.6 cm, linear-lanceolate to lanceolate, ascending, membranaceous to slightly coriaceous, apex acuminate, glabrous except for hyaline trichomes up to 1.5 mm long at the apex margins. **Spathes** 3–5.5 cm, apex transversal, slightly acute, eventually slited, glabrous or sparsely ciliated. **Scapes** 5.5–35 cm long, glabrous. **Capitula** solitary, radial, hemispheric to globose, 5–8.5 mm diameter. **Involucral bracts** in 3 series, 2–2.5 × 1–1.5 mm, ovate to slightly lanceolate or oblanceolate, apex obtuse to acute, stramineous, hyaline at the margins, hyaline trichomes up to 0.2 mm long on the apex margins and abaxial surface. **Floral bracts** ca. 1.8 mm long, oblong, apex slightly acuminate, brownish, stramineous towards the base, white trichomes up to 0.3 mm long on the

very apex. **Flowers** 3-merous. **Staminate flowers** ca. 2 mm long, pedicel up to 0.6 mm long; sepals free, ca. 1.5 × 0.3 mm, oblanceolate, apex obtuse to truncate, colour and indument as observed in the floral bracts; petals fused up to the distal third, forming an infundibuliform corolla up to 1.2 mm long, hyaline to cream, glabrous; stamens not observed. **Pistillate flowers** ca. 2 mm long, sessile; sepals as observed in the staminate flowers, slightly larger, ca. 2 mm long; petals free, equal, 1.5–2 × 0.5–0.6 mm, oblanceolate, apex acute to slightly attenuate, hyaline to cream, white trichomes up to 0.6 mm long at the apex margins, sparse hyaline trichomes up to 0.6. mm long on the abaxial surface; gynoecium 1.8–2 mm long, stramineous to light-brown, ovary 3-carpellate, ca. 0.5 mm long, 3 stigmatic branches and 3 nectariferous appendages practically at the same height, the latter slightly smaller.

Illustrations:—Moldenke & Smith (1976: 44) [line-drawings].

Etymology:—The specific epithet *catharinae* refers to Santa Catarina, Brazil, where the type specimen was collected (Moldenke & Smith 1976).

Distribution and habitat:—Brazil (Paraná, Rio Grande do Sul, and Santa Catarina). This species occurs predominantly in the Subtropical Highland Grasslands, in Rio Grande do Sul and Santa Catarina. In this state, few records were found in the High Altitude Tropical Grasslands, and also in the *Campos Gerais* of Paraná, where the species reaches its northernmost distribution. It inhabits mountain tops, in moist to wet soils, between 840–1010 m elevation (Fig. 44).

Phenology:—Flowering from September to February, also recorded in April.

Conservation:—*Paepalanthus catharinae* is Endagered (EN) according to the IUCN (2017) criteria B2a+biii. Its extension of occurrence (EOO) is 50,827.902 km² and its area of occupancy (AOO) is 68.000 km² (cell width of 2 km). It is recorded in at least five protected areas in southern Brazil (Rio Grande do Sul: Aparados da Serra National Park, Aratinga State Ecological Station, and Serra Geral Biological Reserve; Santa Catarina: São Joaquim National Park, and Tabuleiro State Park). This species was previously classified as Vulnerable (VU) in Rio Grande do Sul, according to the criteria A2a (Rio Grande do Sul 2014).

Diagnosis:—*Paepalanthus catharinae* is morphologically similar to *P. caldensis*, as compared in the diagnosis of the later.

Examined material:—BRAZIL. **Paraná**: Balsa Nova, Ponte dos Arcos, 29 September 2005, *C.Kozera & A.Sanches 2397* (UPCB!). **Rio Grande do Sul**: [Bom Jesus], Aparados de Bom Jesus, 18 January 1950, *B.Rambo SJ 45408* (ICN!, SI!); Bom Jesus, Serra da Rocinha, 16 January 1978, *K.Hagelund 12106* (ICN!); [Bom Jesus?], Bom Jesus, São José dos Ausentes, 8

February 1988, *N.Silveira & D.Farias 5185* (HAS!). [Cambará do Sul], Taimbezinho perto de São Francisco de Paula, 18 December 1950, *B.Rambo 49439* (ICN!); Cambará, Itaimbezinho, 27 December 1980, *J.Goergem s.n*. (ICN 50017!); Cambará do Sul, Aparados da Serra, Itaimbezinho, 980 m elev., 12 November 1994, *R.Santos 160* (CRI!); Cambará do Sul, Trilha da Cachoeira do Tigre Preto, 29°04'21"S 49°59'18"W, 997 m elev., 22 October 2017, *C.C.Alff et al. 49* (ICN!); Cambará do Sul, Parque Nacional da Serra Geral, trilha do Tigre Preto, 7 Feburary 2018, *C.C.Alff & C.Rabuske 121* (ICN!); Cambará do Sul, Parque Nacional da Serra Geral, córrego na trilha da Pedra do Segredo, 7 February 2018, *C.C.Alff & C.Rabuske 122* (ICN!); Cambará do Sul, trilha da Pedra do Segredo, 7 February 2018, *C.C.Alff & C.Rabuske 124* (ICN!); Cambará do Sul, Faxinal, 29°08'46"S 50°04'30"W, 1009 m elev., 7 February 2018, *C.C.Alff & C.Rabuske 127* (ICN!); Cambará do Sul, Faxinal, 29°08'46"S 50°04'30"W, 1009 m elev., 7 December 2018, *C.C.Alff & C.Rabuske 128* (ICN!). Maquiné, Reserva Biológica da Serra Geral, 24 January 2005, *R.Schmidt 826* (HAS!); Maquiné, Reserva Biológica da Serra Geral, 28 January 2005, *R.Schmidt 979* (HAS!). Morrinhos do Sul, Cânion Tajuvas, 8 June 2019, *C.C.Alff et al. 225, 227* (ICN!). São Francisco de Paula, Tainhas, 16 February 1946, *B.Rambo SJ 32001* (SI!); São Francisco de Paula, estrada para Canela, 13 December 1978, *J.Mattos et al. 19819* (HAS!); São Francisco de Paula, encruzilhada para Canela, 3 December 1986, *J.Mattos & N.Silveira 30300* (HAS!); São Francisco de Paula, 29 November 1988, *M.Neves 1147* (HAS!); São Francisco de Paula, 29 November 1988, *N.Silveira 7574* (HAS!); São Francisco de Paula, 29 November 1988, *O.Bueno 5743* (HAS!); São Francisco de Paula, RS-235, 830 m elev., 21 October 2001, *R.Wasum 1195* (MBM!); São Francisco de Paula, 15 November 2002, *J.Paz 14* (ICN!); São Francisco de Paula, Condomínio Alpes de São Francisco, 15 November 2002, *A.Leonhardt & M.L.Lorscheitter s.n.* (ICN 119046!); São Francisco de Paula, Banhado Amarelo, 1 November 2004, *C.Scherer & L.R.M.Baptista s.n.* (ICN 126400); São Francisco de Paula, Estação Ecológica Estadual Aratinga, 5 January 2005, *R.M.Senna 689* (HAS!); São Francisco de Paula, Josafá, arredores das Estação Ecológica Estadual de Aratinga, 29 November 2005, *R.M.Senna 968* (HAS!); São Francisco de Paula, Banhado Amarelo, 1 September 2006, *M.L.Lorscheitter & L.R.M.Baptista s.n.* (ICN 174719!); São Francisco de Paula, Banhado Amarelo, 25 November 2006, *M.L.Lorscheitter & L.R.M.Baptista s.n*. (ICN 172897!); São Francisco de Paula, Banhado Amarelo, 27 April 2007, *M.L.Lorscheitter & L.R.M.Baptista s.n*. (ICN 174720!, 174721!); São Francisco de Paula, Banhado Amarelo, 25 May 2007 (apparently old inflorescences), *M.L.Lorscheitter & L.R.M.Baptista s.n*. (ICN 174718!); São Francisco de Paula, Banhado

Amarelo, 1 December 2007, *M.L.Lorscheitter & L.R.M.Baptista s.n.* (ICN 174723!); São Francisco de Paula, Banhado Amarelo, 23 August 2008 (apparently old inflorescences), *M.L.Lorscheitter & L.R.M.Baptista s.n.* (ICN 174722!); São Francisco de Paula, Banhado Amarelo, 9 January 2010, *M.L.Lorscheitter & L.R.M.Baptista s.n.* (ICN 174710!); São Francisco de Paula, Banhado Amarelo, 29°19'13"S 50°08'05"W, 1000 m elev., 6 February 2018, *C.C.Alff & C.Rabuske 108* (ICN!); São Francisco de Paula, estrada para o Banhado Amarelo, 29°19'10"S 50°08'14"W, 995 m elev., 6 February 2018, *C.C.Alff & C.Rabuske 112* (ICN!). [São José dos Ausentes] Bom Jesus, Serra da Rocinha, 1000 m elev., 18 January 1950, *A.Sehnem 4252* (FLOR!, SI!); [São José dos Ausentes] Serra da Rocinha p. Bom Jesus, February 1953, *B.Rambo SJ 53783* (SI!); [São José dos Ausentes], perto de Ausentes – Bom Jesus, 20 December 1969, *B.Irgang & A.Ferreira s.n.* (ICN 7398!); [São José dos Ausentes] Bom Jesus, Serra da Rocinha, 12 November 1987, *J.Meyer et al. 213* (HAS!); São José dos Ausentes, 17 December 2002, *B.E.Irgang et al. s.n.* (ICN 125389!, 125394!). **Santa Catarina**: [Garuva], Campo Alegre, Campos do Quiriri, 26°02'12"S 48°57'12"W, 4 November 2014, *L.A.Funez et al. 4010* (FLOR!). Major Vieira, Rio da Serra, 26°38'24"S 50°24'00"W, 1009 m elev., 27 October 2010, *A.Korte & A.Kniess 4796* (MBM!). Rancho Queimado, Serra da Boa Vista, 1000 m elev., 13 December 1960, *R.Reitz & R.M.Klein 10161* (FLOR!); Rancho Queimado, 27°41'20"S 49°02'15"W, 840 elev., 4 November 2013, *A.C.Cervi et al. 10023* (FLOR!, ICN!); Rancho Queimado, 27°41'32"S 49°00'85"W, 17 November 2015, *R.Trevisan & L.Pereira-Silva 1663* (FLOR!, ICN!); Rancho Queimado, Serra da Boa Vista, 29°39'58"S 49°09'02"W, *R.Trevisan & S.Venturi 1211* (FLOR!, ICN!). Santa Cecília, Campo do Areão, 1100 m elev., 19 December 1962, *R.Reitz & R.M.Klein 14169* (FLOR!, ICN!). São Bonifácio, P.E. Serra do Tabuleiro, 900 m elev., 24 October 2007, *C.V.Roderjan 1767* (EFC!). Timbé do Sul, subida da Serra da Rocinha, 12 November 1987, *N.Silveira et al. 5016* (HAS!); Timbé do Sul, 19 January 2001, *H.M.Longhi-Wagner & R.Garcia 7290* (ICN!). Urubici, Parque Nacional São Joaquim, 21 January 2001, *H.M.Longhi-Wagner & R.Garcia 7387b* (ICN!); Urubici, Morro da Igreja, 1800 m elev., 4 December 1992, *D.B.Falkenberg & F.A.Silva-Filho 5906* (FLOR!); Urubici, Morro da Igreja, 16 February 1995, *G.Hatschbach 61682* (ICN!, FLOR!); Urubici, Serra do Corvo Branco, 28°03'20"S 49°21'58,7"W, 13 December 2004, *L.Essi & R.Lüdtke 324* (ICN!); Urubici, Morro da Igreja, 28°07'29"S 49°28'50"W, 1 December 2012, *R.Trevisan & S.Venturi 1286* (FLOR!, ICN!); Urubici, Parque Nacional de São Joaquim, estrada para os campos de Santa Bárbara, 28°09'39.3"S 49°38'12"W, 1566 m elev., 8 December 2013, *P.Fiaschi 4086* (FLOR!); Urubici, Parque Nacional (PARNA) São Joaquim,

28°09’43.5”S 49°36’46.4”W, 1624 m elev., 8 December 2013, *R.Trevisan 1413* (FLOR!); Urubici, Morro da Igreja, 28°07’17”S 49°29’37”W, 4 July 2015, *R.Trevisan et al. 1719* (ICN!, FLOR!). Urupema, Fazenda Farofa, 27°55’00”S 49°52’45”W, 1423 m elev., 3 April 2007, *J.H.Sanches et al. 42* (MBM 382124!).

5.6. Paepalanthus chiquitensis Herzog (1924: 86). Type:—BOLIVIA. Chiquitos: Häufig in den Kämpfen des Cerro Santiago, 700–800 m elev., May 1907, *Herzog 114* (holotype L [fragments]). Epitype (designated by Trovó & Sano 2010a):—BOLIVIA. Velasco: Santa Cruz, Noel Kempff Mercado, National Park, 4 km east of Los Pierros encampment, ca. 14°35’S 60°53°W, ca. 200 m elev., 19 May 1995, *J.R.Abbott 16850* (epitype SPF barcode SPF 101003 image!). **Figures 45–46.**

For a complete description see Trovó *et al.* (2010).

Illustrations:—Trovó (2010: 136 [line-drawings], 137 and 138 [photographic plate]), Sano & Giulietti (2012: 182).

Etymology:—The specific epithet *chiquitensis* refers to the type locality Chiquitos, in Bolivia.

Distribution and habitat:—Widely distributed in Bolivia, northern to southern Brazil (Paraná), Colombia and Venezuela. In the study area, *P. chiquitensis* was only recorded in the *Campos Gerais*, northeastern Paraná, southern Brazil, inhabiting grasslands, ca. 780 m elevation (Fig. 46).

Phenology:—Continuously flowering according to Trovó (2010), but only recorded in early April in the study area.

Diagnosis:—*Paepalanthus chiquitensis* is the only confirmed species in subtropical South America displaying 2-merous flowers (thus included in the section *Diphyomene* Ruhland). The species is characterized by the robust habit, with height larger than 65 cm, and more than 30 scapes per plant (according to Trovó *et al.* 2010), the scapes leaving from elongated stems and forming an umbel-type inflorescence.

General notes:—The historical record of *P. chiquitensis* in Paraná, southern Brazil, extends its southernmost distribution, based on Trovó *et al*. (2013b). It was probably the specimen previously analysed by Sano (2014), but with no voucher material specified. Unfortunatelly, we did not find any other collection of this species in the study area. Also,

Marcelo Trovó did not see this species during field expeditions in Jaguariaíva (pers. comm.). For this reason, we consider *P. chiquitensis* probably extinct in the study area.

For a complete list of synonyms see Trovó & Sano (2010a).

Examined material:—BRAZIL. **Paraná**: [Jaguariaíva] Jaguariahyva opp., in campo, 780 m elev., 1 April 1915, *P.Dusén 16966* (MO 974021 image!, SI!).

5.7. Paepalanthus hatschbachii Moldenke (1950: 224). *Paepalanthus catharinae* var. *hatschbachii* (Moldenke) Moldenke & L.B.Smith (1973b: 430). Type:—BRAZIL. Paraná: Morretes, Pico Olimpo, 1547 m elev., 15 January 1950, *G.Hatschbach 1443?* (holotype NY barcode 00842353 image!; isotype MBM!). **Figures 47–48.**

Herbs 6–14 cm high. **Leaves** spirally arranged, 0.6–2.5 × 0.1–0.3 cm, linear-lanceolate, recurvate, membranaceous, apex acute to slightly acuminate, glabrous except for very sparse hyaline trichomes up to 0.2 mm long on the margins. **Spathes** 1.5–3 cm long, apex transversal, slightly acute, frequently lacerate, glabrous. **Scapes** 5–13 cm long, glabrous. **Capitula** solitary, radial, hemispheric to globose, 3.5–5.2 mm diameter. **Involucral bracts** in 1–2 series, 1.4–2 × 0.9–1 mm, ovate to slightly oblanceolate, apex obtuse to acute, brownish, usually lighter in the centre, becoming darker towards the margins and inner series, glabrous except for sparse white trichomes ca. 0.2 mm long at the apex margins. **Floral bracts** similar to the involucral bracts in size and shape, but with apex acute, brownish, stramineous at the very base, white trichomes up to 0.3 mm long on the apex margins, more sparse on the abaxial surface. **Flowers** 3-merous. **Staminate flowers** ca. 2 mm long, pedicel up to 0.2 mm long; sepals free, 1.5–1.8 × 0.2–0.3 mm, oblanceolate, apex obtuse, dark-brown, stramineous at the very base, eventually presenting a stramineous longitudinal line at the centre, white trichomes up to 0.2 mm long on the apex margins; petals fused up to the mid portion, forming infundibuliform corolla 0.5–1 mm long, 3-lobed, lobes apex acute, stramineous, glabrous; stamens 3, 1–1.3 mm long. **Pistillate flowers** 2–2.3 mm long, practically sessile, at most with pedicel up to 0.2 mm long; sepals free, 1.8–2 × 0.5–0.6 mm, colour and indument as observed in the staminate flowers, but also with sparse white trichomes on the abaxial surface; petals free, equal, 2.5 × 0.3–0.4 mm, oblanceolate, apex acute to slightly attenuate, hyaline to cream, white trichomes up to 0.4 mm long mainly on the apex margins, also on both surfaces; gynoecium amber to light-brown, ovary 3-carpellate, ca. 0.5 mm long, 3 stigmatic branches and 3 nectariferous appendages practically at the same height, the latter slightly smaller.

Etymology:—The specific epithet *hatschbachii* is in honor of the Brazilian botanist Gerdt Guenther Hatschbach (1923–2013), remarkable collector and founder of the MBM herbarium (Moldenke 1950).

Distribution and habitat:—Brazil (Paraná and Santa Catarina). This species is endemic to the High Altitude Tropical Grasslands, occurring in few localities of eastern Paraná and northeastern Santa Catarina, in the Serra do Quiriri montaneous region. It inhabits mountain tops, in moist to wet soils, between 1500–1600 m elevation (Fig. 50).

Phenology:—Flowering from November to January.

Conservation:—*Paepalanthus hatschbachii* is Critically Endangered (CR) according to the IUCN (2017) B2a+biii. Its extent of occurrence (EOO) is 938.213 km² and its area of occupancy (AOO) is 0.120 km² (cell width of 0.2 km). Besides presenting a restricted distribution, this species is not included in any protected area.

Diagnosis:—*Paepalanthus hatschbachii* is morphologically similar to *P. tessmannii*, differing from this species by the height up to 14 cm high (*vs*. height up to 52 cm high), leaves 1–3 mm wide, recurvate (*vs.* leaves 2–6 mm wide, ascending), spathes apex transversal, slightly acute, frequently lacerate (*vs*. spathes apex 2–3-toothed, less frequently oblique), and involucral bracts glabrous, except for sparse trichomes at the apex margins (*vs*. involucral bracts with hyaline trichomes on the margins and abaxial surface, in the transition from the scapes to the outermost series).

The species was also found misidentified as *P. caldensis*, mainly due to the similar height and aspect of the leaves, but differs by the spathes apex transversal, slightly acute, glabrous (*vs.* spathes apex oblique, ciliate), and involucral bracts brownish (*vs*. involucral bracts stramineous). Moreover, *P. hatschbachii* is endemic to HTG, while *P. caldensis*, even presenting a wider distribution in the study area, occurs mainly in SHG.

Nomenclatural notes:—The isotype of *P. hatschbachii* at MBM presents the same information of the holotype, althought the collector number was probably miswrited as 1743.

General notes:—*Paepalanthus hatschbachii* is here revalidated as species, since its variety status was established by Moldenke (1973b). Despite this species being morphologically related to *P. catharinae*, Moldenke identified many specimens of *P. hatschbachii* as *P. tessmannii* in herbaria. The brownish involucral bracts of both *P. hatschbachii* and *P. tessmannii*, as well as its co-occurrence in the Serra do Quiriri, probably led to the several misidentifications in herbaria, contributing to the neglect of *P. hatschbachii* in the past decades.

Examined material:—BRAZIL. **Paraná**: Campina Grande do Sul, Cerro Verde, 10 November 2013, *R.S.Vieira 303* (EFC!). [Guaratuba] Morretes, Serra da Prata, próximo à Torre da Prata, 8 December 1998, *E.Barbosa et al. 230* (MBM!). **Santa Catarina**: Campo Alegre, Serra do Iquererim, 1300 m elev., 19 November 1992, *J.Cordeiro & C.B.Poliquesi 925* (MBM!); Campo Alegre, Serra do Quiriri, 29 December 1998, *J.M.Silva et al. 2794* (MBM); Campo Alegre, Serra Quiriri, próximo à torre de rádio, 1500 m elev., 28 December 1999, *J.Cordeiro et al. 1706* (MBM!); Campo Alegre, Serra do Quiriri, 1500 m elev., 27 December 2004, *O.S.Ribas et al. 6528* (MBM!).

5.8. Paepalanthus henriquei Silveira & Ruhland (1903: 129). Lectotype (inadvertently designated by Moldenke 1975a: 491):—BRAZIL. Minas Gerais: Serra de Ibitipoca, June 1896, *H.Magalhães s.n.* (lectotype B barcode B100247770 image!; isolectotypes LL barcode 00374726 [fragment] image!, Z). **Figures 49–50.**

Herbs 14–22 cm high. **Leaves** spirally arranged, 9–15.5 × 0.4–0.5 cm, linear-lanceolate, slightly falcate, chartaceous, apex attenuate, hyaline trichomes up to 0.5 mm long, especially visible on the margins. **Spathes** 4–4.5 cm long, apex transversal, eventually toothed, with 3 or 4 teeth, markedly ciliate, hyaline trichomes as observed in the leaves. **Scapes** 12–21 cm long, hyaline trichomes up to 0.2 mm long on the scapes. **Capitula** solitary, hemispheric, slightly obconical in the transition from the scapes to the capitula, 6–8.5 mm diameter. **Involucral bracts** in 4–5 series, 3–3.2 × 1.5–3.5 mm (first series bracts narrower), ovate, apex attenuate to acuminate, dark-brown, slightly lighter at the apex, trichomes up to 0.6 mm long on the margins and more sparse on the abaxial surface. **Floral bracts** not observed. **Flowers** 3-merous; **Staminate flowers** 2–3 × 1–1.2 mm, pedicel up to 0.2 mm long; sepals free, equal, 1.5–2 × 0.3–0.5 mm, oblanceolate, apex acuminate, dark-brown; petals fused forming tube up to 1.7 mm long, cream to slightly golden, apex ciliate, trichomes up to 0.2 mm long; stamens up to 2 mm long, filaments cream, anthers stramineous to golden. **Pistillate flowers** 2.2–2.4 × 1–1.5mm, pedicel ca. 0.4 mm long; sepals equal, fused at the base, 2.5–2.7 × 0.5–0.6 mm, oblong to oblanceolate, apex ensiform, golden to light-brown, frequently darker at the apex, trichomes up to 0.6 mm long on the apex margins; petals equal, free, 2 × 0.5 mm, oblanceolate, apex ensiform to acuminate, stramineous to golden, trichomes up to 0.1 mm long on the apex margins; gynoecium 2–2.2 mm long, ovary ca. 0.7 mm long, dark-brown, stigmatic branches

ca. 1.3 mm long, all fused up to ca. 0.2 mm, apex bifid, golden to light brown, twice as long as the nectariferous appendages.

Illustrations:—Moldenke & Smith (1976: 44) [line-drawings].

Etymology:—The specific epithet *henriquei* is in honor of the Brazilian botanist Henrique Carlos de Magalhães Gomes (Moldenke & Smith 1976).

Distribution and habitat:—Southeastern and southern Brazil (Santa Catarina). This species occurs disjunctly in Minas Gerais, southeastern Brazil, and Santa Catarina, where it was recorded exclusively in Lages municipality, in the Subtropical Highland Grasslands. It was found inhabiting mountain tops, in moist soils near rocky outcrops, ca. 950 m elevation (Fig. 52).

Phenology:—Flowering and fruiting on January.

Diagnosis:—*Paepalanthus henriquei* can be morphologically compared to *P. balansae*, as cited in the diagnosis of the later.

General notes:—*Paepalanthus henriquei* was only recorded in a single locality from Santa Catarina, Lages municipality, in 1951. For more than 60 years it has not been recollected, being considered Extinct (EX) in this state (Santa Catarina 2014). Other subpopulations are found exclusively in the Serra do Ibitipoca, Minas Gerais, in the Serra da Mantiqueira mountain range (Ruhland 1903, Trovó *et al.* 2015). Ferreira *et al.* (2011) refers this species as "endemic to the Ibitipoca State Park", not being frequently found, and Giulietti *et al*. (2009) include it in the list of rare Brazilian plants.

Examined material:—BRAZIL. **Santa Catarina**: Lages, 10 January 1951, *B.Rambo SJ 49606* (HBR!, PACA!); Lages, 950 m elev., 10 January 1951, *A.Sehnem 5453* (MBM!, PACA!, SI!).

5.9. Paepalanthus kleinii (Moldenke & L.B.Sm.) Trovó (2014: 218). *Paepalanthus leiseringii* Ruhland (1903: 216) var. *kleinii* Moldenke & Smith (1973b: 431). Type:—BRAZIL. Santa Catarina: [Correia Pinto?] Lages, by Rio Bandeirinhas, 23 km north of Lages, 800–900 m elev., 4 December 1956, *L.B.Smith & R.M.Klein 8241* (holotype US barcode 00088362 image!; isotypes HBR!, LL barcode 00374739 image!, NY barcode 00102892 image!, R barcode R00140535 image!). **Figures 44 and 51.**

For a complete description see Trovó *et al*. (2014).

Illustrations:—Moldenke & Smith (1976: 63), Trovó *et al.* (2014: 219) [line-drawings].

Etymology:—The specific epithet *kleinii* is in honor of the Brazilian botanist and ecologist Roberto Miguel Klein (1923–1992), remarkable researcher of the Flora of Santa Catarina (Moldenke & Smith 1976, Trovó *et al.* 2014).

Distribution and habitat:—Brazil (Santa Catarina). This species is endemic to the Subtropical Highland Grasslands, being only recorded near Lages municipality, in Santa Catarina, southern Brazil. It was found inhabiting marshy soils, between 800–900 m elevation (Fig. 44).

Phenology:—Flowering in December.

Conservation:—*Paepalanthus kleinii* is considered either Data Deficient (DD) or Critically Endangered (CR) according to the IUCN (2011) criteria B1,B2ai, and B2aiv, according to Trovó *et al.* (2014). This species was not recollected since the type collection, having passed just over 60 years since then, and its exact location is uncertain.

Diagnosis:—*Paepalanthus kleinii* differs from both *P. caldensis* and *P. catharinae* by the involucral bracts surpassing the capitula, displaying an echinate aspect (*vs*. involucral bracts not surpassing the capitula).

5.10. Paepalanthus paulensis Ruhland (1903: 211). Lectotype (inadvertently designated by Moldenke 1975b: 111):—BRAZIL. São Paulo: Serra da Bocayna, September 1879, *W.Schwacke 1936* (lectotype B barcode B 10 0243910 image!; isolectotypes RB barcode 00538386 image!, LL barcode 00374767 [fragments] image!). **Figures 52–53.**

Herbs 46–50 high cm. **Leaves** spirally arranged, 11–36 × 0.5–1 cm, linear-lanceolate, ascending, apex attenuate, slightly mucronate, hyaline trichomes sparsely seem in the margins. **Spathes** 10–18 cm long, apex transversal, truncate, glabrous. **Scapes** fused up to the capitula, 15–45 cm long, glabrous. **Capitula** composed by several racemous subunits congestedly arranged, globose, the composed capitula 10–18 mm diameter. **Involucral bracts** in 1–2 series, surrounding each subunit, 1.5–5 × 1.9–2 mm, ovate, apex acute to attenuate, eventually slightly acuminate, brown, hyaline trichomes ca. 0.1 mm long on the abaxial surface and margins. **Floral bracts** not observed. **Flowers** 3-merous. **Staminate flowers** 2.4–2.6 mm long, sessile; sepals 2–2.6 × 0.3–0.4 mm, oblanceolate, almost oblong, apex acuminate to mucronate, brown, slightly lighter at the centre and puberulent at the apex margins; petals fused up to the distal

third, forming infundibuliform corolla ca. 1.5 mm long, cream to hyaline; stamens ca. 1 mm long. **Pistillate flowers** ca. 3 mm long, pedicels not observed; sepals fused at the base, ca. 3 × 0.9 mm, oblanceolate, apex acute to slightly mucronate, light-brown, darker towards the distal third, puberulent on the margins, becoming remarkably rigid and recurved when ready to disperse the diaspores; petals free, equal, 2–2.5 × 0.4–0.5 mm, oblanceolate, apex acute, stramineous to golden, white trichomes up to 0.6 mm long at the very apex margins; gynoecium ca. 2 mm long, ovary 3-carpellate, ca. 1.3–1.5 mm long, dark-brown to blackish, 3 stigmatic branches and 3 nectariferous appendages practically at the same height, amber.

Etymology:—The specific epithet *paulensis* refers to São Paulo, Brazil, where the type specimen was collected.

Distribution and habitat:—Southeastern to southern Brazil (Paraná). In the study area, *P. paulensis* occurs exclusively in northern *Campos Gerais*, in Paraná. It inhabits mountain tops, between 850–1300 m elevation (Fig. 55).

Phenology:—Flowering from September to November.

Diagnosis:—*Paepalanthus paulensis* is morphologically similar to *P. planifolius*, being distinguished by the height 46–50 cm high (*vs.* height 30–36 cm high), leaves up to 36 cm long, and 1 cm wide (*vs*. leaves up to 15 cm long, and 2.7 cm wide), with margins of the same consistency of the rest of the blade, ciliated (*vs*. margins conspicuously thinner than the rest of the blade, entirely glabrous). Both species are also morphologically similar to *P. pruinosus*, being distinguished by the leaves with pilose indument (*vs*. leaves glabrous or glabrescent), spathes apex glabrous (*vs.* spathes apex ciliate), and involucral bracts ovate (*vs.* involucral bracts practically orbicular). Moreover, *P. paulensis* occurs strictly in CGE in the study area, while the subpopulations of *P. planifolius* are mainly concentrated in HTG of Paraná, and the subpopulations of *P. pruinosus* are most recorded in SHG of Santa Catarina.

Examined material:—BRAZIL. **Paraná**: Carambeí, estrada para o Rio São João, Alto Carambeí, 2 November 2013, *E.D.Lozano & M.E.Engels 1702* (MBM!). Piraí do Sul, Joaquim Murtinho, 18 November 1976, *G.Hatschbach 39220* (MBM!); Piraí do Sul, Pousada Serra do Pirahy, 2 September 2013, *E.D.Lozano & D.P.Saridakis 1477*, *1478* (MBM!); Piraí do Sul, Chácara Santa Rita, 3 September 2013, *E.D.Lozano & D.P.Saridakis 1490* (MBM!). Ponta Grossa, Passo do Pupo, 12 October 1995, *C.B.Poliquesi & J.M.Silva 460* (MBM!); Ponta Grossa, Fazenda Capão das Almas, 9 October 2012, *G.Felitto & E.D.Lozano 383* (MBM!). Tibagi, Taipa de Pedra, 19 October 1993, *G.Hatschbach & J.Cordeiro 59673* (MBM!); Tibagi, Parque Estadual do Guartelá, Rio Iapó, 2 September 1996, *S.R.Ziller & J.Santos 1564* (MBM!);

Tibagi, Parque Estadual do Guartelá, 19 August 2011, *G.Felitto et al. 147* (MBM!); Tibagi, Guartelá, Sítio São Sebastião, 21 September 2013, *E.L.Siqueira et al. 766* (MBM!).

5.11. Paepalanthus planifolius (Bong.) Körnicke (1863: 413). *Eriocaulon planifolium* Bongard (1831: 629). Lectotype (inadvertently designated by Moldenke 1975b: 254):—BRAZIL. [Minas Gerais]: In umbrosis humidiusculis prope Passagen et in monte Itacolumi, August 1824, *Riedel 395* (lectotype LE; isolectotypes B barcode B100243895 image!, G, K barcode K000640060 image!, P, U barcode 0001798 image!). **Figures 53–55.**

Herbs 30–36 cm high. **Leaves** spirally arranged, 10–15 × 1–2.7 cm, linear lanceolate, ascending, slightly coriaceous, apex acute to slightly attenuate, glabrous. **Spathes** 11–15 cm long, apex tranversal, glabrous. **Scapes** fused up to the capitula, 19–31 cm long, glabrous. **Capitula** composed by several racemous subunits congestedly arranged, globose, the composed capitula 6–10.5 mm diameter. **Involucral bracts** in a single series, ca. 2 × 1.5 mm, ovate, apex acute to slightly attenuate, light-brown, slightly lighter towards the apex, hyaline trichomes 0.2–0.4 mm long on the margins, rarely on the abaxial surface. **Floral bracts** similar to the involucral bratcs, but slightly longer and thinner, ca. 2.5 × 1 mm wide. **Flowers** 3-merous. **Staminate flowers** ca. 2 mm long, pedicels not observed; sepals 0.8–2 × 0.4–0.5 mm, oblanceolate, apex slightly obtuse to acuminate, strongly dark-brown, practically black, glabrous; petals fused up to the distal third, forming an infundibuliform corolla ca. 1.5 mm long, cream to hyaline, glabrous at least on the outside; stamens 1–1.4 mm long, anthers visible outside the corolla and calyx, cream. **Pistillate flowers** 3–3.2 mm long, pedicels not observed, hyaline trichomes up to 1.5 mm long leaving fom the base; sepals fused at the base, 2.5 × 0.6–1 mm , oblanceolate, apex obtuse, stramineous at the base, dark-brown to blackish towards the apex, glabrous, becoming remarkably rigid and recurved when ready to disperse the diaspores; petals free, equal, 2–2.3 × 1 mm, obovate, apex attenuate, cream to hyaline, slightly golden, white trichomes up to 0.4 mm long at the apex margins; gynoecium ca. 2.7 mm long, ovary 3-carpellate, ca. 0.7 mm long, dark-brown, 3 stigmatic branches cream, clearly bifid, and 3 nectariferous appendages amber, these ca. half the length of the first.

Illustrations:—Körnicke (1863: plate 52), Ruhland (1903: 209) [line-drawings].

Etymology:—The specific epithet *planifolius* refers to the flat aspect of the leaves (from the Latin, *planus* = flat, *folius* = leaves) (Moldenke & Smith 1976).

Distribution and habitat:—Southeastern to southern Brazil (Paraná, Rio Grande do Sul, and Santa Catarina). In the study area, *P. planifolius* occurs mainly in the High Altitude Tropical Grasslands of Paraná, being more sparse in the highlands of Santa Catarina. In Rio Grande do Sul, it is extremely rare, with a single record from Cidreira, in the Coastal Plain Grasslands. It typically inhabits mountain tops, in moist soils and near rocky outcrops, between 950–1600 m elevation (Fig. 55).

Phenology:—Possibly flowering throughout the year, but recorded from June to March.

Diagnosis:—*Paepalanthus planifolius* is morphologically similar to *P. paulensis*, as compared in the diagnosis of the later.

General notes:—For a complete list of synonyms see Tissot-Squalli (1997c).

Examined material:—BRAZIL. **Paraná**: Antonina, Pico do Paraná, 6 January 2000, *A.Dunaiski et al. 1508* (MBM!). Balsa Nova, Ponte dos Arcos, 1 November 2005, *C.Kozera & A.Sanches 2473* (MBM!). Campina Grande do Sul, Serra do Capivary Grande, 6 August 1961, *G.Hatschbach 8261* (HBR!, MBM!); Campina Grande do Sul, Morro Siririca, 8 October 1967, *N.Imaguire 221* (UPCB!); Campina Grande do Sul, Serra Capivari Grande, 1700 m elev., 20 November 1969, *G.Hatschbach 22965* (HBR!); Campina Grande do Sul, Morro Capivari, 1600 m elev., 20 September 1970, *N.Imaguire 454* (MBM!); Campina Grande do Sul, Serra Capivari, 1500 m elev., 8 February 1971, *G.Hatschbach 26328* (MBM!); Campina Grande do Sul, Serra Capivari Grande, 18 July 1986, *J.Cordeiro & F.J.Zelma 313* (MBM!, UPCB!); Campina Grande do Sul, Serra do Capivari, 1200–1300 m elev., 24 August 1989, *V.Nicolack & O.S.Ribas 8* (MBM!); Campina Grande do Sul, Serra do Capivari, 1300 m elev., 4 October 1989, *J.M.Silva & J.Cordeiro 697* (MBM!); Campina Grande do Sul, Morro Capivari Grande, 1450 m elev., 11 July 1996, *Y.S.Kuniyoshi & F.Galvão 5918* (MBM!); Campina Grande do Sul, Capivari Grande, 1450 m elev., 23 October 1997, *C.V.Roderjan 1435* (MBM!); Campina Grande do Sul, Morro Camapuã, 9 November 1999, *E.Barbosa et al. 389* (MBM!); Campina Grande do Sul, Serra Ibitiraquire, Morro Tucum, 1739 m elev., 24 October 2000, *J.Cordeiro et al. 1763* (MBM!); Campina Grande do Sul, Serra Ibitiraquire, Morro Camapuã, 22 September 2006, *J.M.Silva & E.Barbosa 5068* (MBM!); Campina Grande do Sul, Morro Capivari Grande, 1600 m elev., 4 March 2007, *P.B.Schwartsburd & A.M.X.Lima 1286* (UPCB!); Campina Grande do Sul, Serra do Capivari, Pico Capivari Médio, 25°00'S 48°00'W, 1552 m elev., 16 August 2009, *R.R.Völtz 50* (UPCB!); Campina Grande do Sul, Conjunto Ibitiraquire, Morro Ciririca, 10 October 2010, *E.D.Lozano & V.Ariati 413* (MBM!); Campina Grande do Sul, Morro do Capivari, 1575 m elev., 17 March 2011, *A.Dunaiski-Jr. 4212* (EFC!,

MBM!); Campina Grande do Sul, Morro Camapuã, 1400 m elev., 5 November 2011, *G.Felitto et al. 197* (MBM!); Campina Grande do Sul, 25°07'44.2"S 48°49'16.8"W, 1462 m elev., 2 February 2012, *M.G.Caxambu et al. 3689* (FLOR!); Campina Grande do Sul, Serra do Ibitiraquire, Morro Itapiroca, 10 November 2013, *R.R.Völtz & G.H.Santos 637* (EFC!); Campina Grande do Sul, Morro Capivari Mirim, 25°05'08.1"S 48°30'08.3"W, 19 July 2014, *E.D.Lozano et al. 2697* (MBM!); Campina Grande do Sul, Morro Camapuã, 25°15'20"S 48°51'24"W, 1580 m elev., 31 July 2014, *M.Savarais 370* (MBM!); Campina Grande do Sul, Morro Camapuã, 23 August 2014, *C.L.Ribeiro et al. 131* (EFC!). Campo Largo, Serra São Luís de Puruña, 18 September 1949, *G.Hatschbach 1500* (MBM!, PACA!, SI!); Campo Largo, Rio Papagaios, 25 September 1960, *G.Hatschbach 7303* (MBM!). Guaratuba, Serra do Araçatuba, 1300 m elev., 9 November 1983, *R.Kummrow 2422* (MBM!). Jaguariaíva, 23 October 1911, *P.Dusén 13260* (SI!); Jaguariaíva, Vale do Codó, 13 October 2006, *J.M.Silva et al. 5088* (MBM!). Lapa, Gruta do Monge, 5 October 1958, *G.Hatschbach 5063* (HBR!, MBM!); Lapa, Colônia Witmarsum, 25°47'34"S 49°48'00"W, 952 m elev., 5 October 2012, *R.C.Forzza et al. 7332* (UPCB!); Morretes, Serra da Prata, próximo à Torre da Prata, 8 December 1998, *E.Barbosa et al. 246* (MBM!); Morretes, Serra da Igreja, 23 July 2014, *C.T.Blum 1750* (EFC!). Palmeira, Rodovia do Café, Rio Tibagi, 27 September 1973, *G.Hatschbach 32597* (MBM!); [Palmeira?] Rio dos Papagaios, 4 October 1985, *A.C.Cervi et al. 2329* (UPCB!); Palmeira, Recanto dos Papagaios, 28 October 1996, *O.S.Ribas & M.F.Luz 1589* (FLOR!, MBM!). Piraquara, Serra do Emboque, 1200 m elev., 14 October 1970, *G.Hatschbach 24944* (MBM!); Piraquara, Morro do Canal, 18 September 2004, *E.J.Stange 18* (UPCB!); Piraquara, Parque Estadual do Pico Marumbi, Morro do Canal, 18 September 2011, *B.K.Canestraro 750* (MBM!); Piraquara, Parque Estadual Pico Marumbi, Morro do Canal, 25°30'52"S 49°00'26"W, 1292 m elev., 4 October 2012, *R.C.Forzza et al. 7293* (UPCB!); Piraquara, Parque Estadual Pico do Marumbi, Morro do Canal, 28 June 2013, *M.E.Engels et al. 1093* (MBM!); Piraquara, Morro do Canal, 20 September 2015, *O.M.R.Bizarro 115* (EFC!). [Ponta Grossa] Vila Velha,18 October 1961, *G.Pabst 6787 & E.Pereira 6946* (MBM!); [Ponta Grossa] Vila Velha, Reserva Estadual, 18 December 1971, *P.L.Krieger 11321* (MBM!); Ponta Grossa, Rio dos Papagaios, 28 October 1983, *A.C.Cervi et al. 2226* (UPCB!); Ponta Grossa, Fazenda Capão das Almas, 10 October 2012, *E.D.Lozano & V.A.Ariati 1074* (MBM!). Tijucas do Sul, Serra Papanduva, 18 September 1997, *J.M.Silva et al. 2001* (MBM!). **Rio Grande do Sul**: Cidreira, Fazenda Azaléia, 13 October 2012, *E.Valduga 462* (ICN!, HUCS!). **Santa Catarina**:

Rancho Queimado, às margens da BR-282, 27°41’10”S 49°02’01”W, 483 m elev., 29 November 2012, *R.Trevisan & S.Venturi 1206* (FLOR!).

5.12. Paepalanthus pruinosus Ruhland (1903: 210). Lectotype (inadvertently designated by Moldenke 1975d: 321):—BRAZIL. Santa Catarina: [Rancho Queimado] In Torfsümpfen der Boa Vista, Serra do Mar, 950 m elev., *E.Ule 580* (lectotype B on 2 sheets barcodes B 10 0106854, B 10 0106855 [fragments] images!; isolectotypes HBG barcode HBG-506605 image!, LL barcode 00374780 [fragments] image!). **Figures 56–58.**

Herbs 26–55 cm high. **Leaves** spirally arranged, 6–25 × 1–2.5 cm, linear-lanceolate, ascending, slightly coriaceous, larger specimens occasionally with hyaline margins, apex acute to attenuate, slightly mucrononate, hyaline trichomes up to 0.2 mm long on the margins, more sparse and whitish on both surfaces. **Spathes** 7.5–15 cm long, apex transversal, frequently slited (at least in the herborized material), ciliate, trichomes similar to the observed on the leaves. **Scapes** fused up to the capitula, 16–49 cm long, whitish trichomes up to 0.2 mm long. **Capitula** composed by several racemous subunits congestedly arranged, globose, the composed capitula 6–9 mm diameter. **Involucral bracts** in 2–3 series surrounding each subunit, 3 × 2.3–2.5 mm, practically orbiculate, apex acuminate, light-brown to brown, margins ciliate, trichomes similar as observed in the other portions, white. **Floral bracts** not observed. **Flowers** 3-merous. **Staminate flowers** 2–2.5 mm long, sessile or with pedicel up to 0.7 mm long; sepals 1.8–2 × 0.4–0.5 mm, oblanceolate, apex almost truncate to acuminate, dark-brown, apex margins slightly puberulent, or with white trichomes up to 0.4 mm long at the apex margins; petals fused up to the distal third, forming an infundibuliform corolla ca. 0.7 mm long, eventually acute or slightly 3-lobed, hyaline, glabrous except for very sparse white trichomes up to 0.15 mm long at the apex margins; stamens height not observed, anthers visible outside the corolla and calyx, stramineous. **Pistillate flowers** ca. 2.7 mm long, pedicel up to 0.3 mm long; sepals fused at the base, 2.5 × 0.4–0.6 mm, oblanceolate, apex acuminate, light-brown, darker towards the apex, white trichomes ca. 0.2 mm long at the apex margins, becoming remarkably rigid and recurved when ready to disperse the diaspores; petals free, equal, 2–2.3 × 1 mm, oblanceolate to slightly ovate, apex acuminate, cream to slightly golden, white trichomes up to 0.15 mm long on the apex margins; gynoecium 2–2.5 mm long, ovary 3-carpellate, 0.7– 1 mm long, light-brown to brown, 3 stigmatic branches, and 3 nectariferous appendages, these slightly smaller than the first, stramineous to amber.

Illustrations:—Moldenke & Smith (1976: 63), as *P. planifolius* var. *globulifer* (Silveira) Moldenke & L.B.Sm. (1973e: 355) [line-drawings].

Etymology:—The specific epithet *pruinosus* may refers to environmental conditions (*frosty environment*) or, what is more likely in this species, to the aspect of the leaves in these conditions (*glistening with frost*) (from the Latin, *pruinosus* = frosted) (Gledhill 2008).

Distribution and habitat:—Brazil (Santa Catarina). *Paepalanthus pruinosus* occurs mainly in the Subtropical Highland Grasslands, in the *Campo dos Padres* region, Santa Catarina. This species is also recorded in Palhoça and in the Serra do Quiriri, middle coast and High Altitude Tropical Grasslands in northern Santa Catarina, near the border with Paraná, respectively. It inhabits mainly mountain tops, in moist to wet soils, between 950–1300 m elevation (Fig. 60).

Phenology:—Flowering from October to December and February.

Conservation:—*Paepalanthus pruinosus* is Critically Endangered (CR) according to the IUCN (2017) criteria B2a+biii. Its extent of occurrence (EOO) is 7,056.488 km² and its area of occupancy (AOO) is 0.240 km² (cell width of 0.2 km). This species is not included in any conservation unit, and the main area where it occurs is traditionally used for cattle grazing, more recently also becoming a noticed touristic spot, specially for trekking. The overgrazing may configures a threat to the subpopulations of *P. pruinosus*. The conservation status of this species was not evaluated in any regional assessment.

Diagnosis:—*Paepalanthus pruinosus* is morphologically similar to *P. paulensis*, as compared in the diagnosis of the later.

Nomenclatural notes:— We considered the material at B as a holotype on two sheets. Besides the same herbarium labels, the sheets present the handwriting identification “I” and “II”, indicating sequential sheets belonging to a single gathering.

The labels of the type collections of *P. pruinosus* indicates Boa Vista, in the Serra do Mar mountain range. Ruhland (1903) mistakenly cites Minas Gerais, southeastern Brazil, as type location, but Ernst Ule was living in Santa Catarina, southern Brazil, when the type specimens were collected (Borges *et al*. 2018). In Santa Catarina, Boa Vista may refer to more than one location in the *Campo dos Padres* region, Serra Geral plateau (not Serra do Mar). Based on the elevation provided in the labels (950 m elev.), it is possible to infer that Boa Vista correspond to the Morro da Boa Vista, in Rancho Queimado municipality, not to the Serra da Boa Vista, in Urubici (ca. 1800 m elev.). These observations agree with the results of Luana Sauthier (pers. comm.).

Examined material:—BRAZIL. **Santa Catarina**: Alfredo Wagner, BR-282, Morro do Trombudo, 1150 m elev., 7 December 2000, *G.Hatschbach et al. 71586* (MBM!). Campo Alegre, Serra do Iqueririm, 1300 m elev., 19 November 1992, *J.Cordeiro & C.B.Poliquesi 927* (MBM!). Garuva, Morro do Campo Alegre, 1300 m elev., 7 October 1960, *Reitz & Klein 10060* (FLOR!, HBR!, MBM!). Palhoça, Campo do Massiambú, 5 m elev., 5 February 1953, *Reitz 5604* (HBR!). [Rancho Queimado] São José, 1300 m elev., 2 February 1953, *Reitz 5417* (HBR!); [Rancho Queimado] São José, 1250 m elev., 25 November 1956, *Smith, Reitz & Klein 7959* (HBR!); [Rancho Queimado] São José, Serra da Boa Vista, 1200 m elev., 24 October 1957, *Reitz & Klein 5376* (HBR!); Rancho Queimado, Serra da Boa Vista, 1000 m elev., 10 October 1960, *Reitz & Klein* 10368 (HBR!); Rancho Queimado, Serra da Boa Vista, 1000 m elev., 13 October 1960, *Reitz & Klein 10169* (HBR!). [Santo Amaro da Imperatriz] Palhoça, Pilões, 200 m elev., 26 October 1956, *Reitz & Klein 3924* (HBR!).

5.13. Paepalanthus tessmannii Moldenke (1949: 169). Type:—BRAZIL. Piraquara, ca. 22 km este de Curitiba, 15 January 1949, *G.Tessmann 3781* (holotype NY barcode 00842354 image!, isotype MBM!). **Figures 44 and 59.**

Herbs 10.5–52 cm high. **Leaves** spirally arranged, 2.5–6 × 0.2–0.6 cm, linear-lanceolate to lanceolate, ascending, membranaceous to slightly coriaceous, apex acute to slightly acuminate, glabrous. **Spathes** 2.7–6.5 cm long, apex toothed, with 2–3 teeth, glabrous except for very sparse hyaline trichomes up to 0.1 mm long at the very apex margins, less frequently oblique. **Scapes** 9.5–49 cm long, indument similar to the observed in the spathes. **Capitula** solitary, radial, hemispheric to globose, 4–9 mm diameter. **Involucral bracts** in 3–4 series, 2–2.5 × 1–1.3 mm, ovate to slightly lanceolate, apex obtuse to acute, entirely light-brown, white trichomes up to 0.5 mm long on the margins, hyaline tricomes up to ca. 1 mm long on the abaxial surface, in the transition from the scapes to the outermost series. **Floral bracts** 2 × 0.1–0.2 mm long, ligulate, apex acute, light brown, white trichomes ca. 0.3 mm long on the apex margins. **Flowers** 3-merous; sepals similar in both staminate and pistillate flowers, free, 1.5–2 × 0.2–0.4 mm, oblanceolate, apex, acute, light-brown, white trichomes up to 0.4 mm long on the apex margins. **Staminate flowers** 2–2.3 mm long, pedicel up to 0.2 or 1 mm long; petals fused up at least to the mid portion or to the distal third, forming an infundibuliform corolla 1–1.5 mm long, cream to slightly stramineous, glabrous; stamens not observed. **Pistillate flowers** 2–3 mm long, pedicel up to 0.5 mm long; petals free, equal, 1.5–2 × 0.4 mm, oblanceolate, apex

attenuate, cream, white trichomes up to 1 mm long at the apex, on both surfaces and margins; gynoecium ca. 2.5 mm long, amber to light-brown, ovary 3-carpellate, ca. 0.7 mm long, 3 stigmatic branches, and 3 nectariferous appendages practically at the same height, the latter slightly smaller.

Illustrations:—Sano & Giulietti (2012: 182) [line-drawings].

Etymology:—The specific epithet *tessmannii* is in honor of the German explorer, etnographer and plant collector Günter Tessmann (1884–1969) (Moldenke & Smith 1976).

Distribution and habitat:—Southeastern to southern Brazil (Paraná and Santa Catarina). In the study area, *P. tessmannii* occurs mainly in the *Campos Gerais* of Paraná and in the Serra do Quiriri, in the High Altitude Tropical Grasslands of Santa Catarina. It inhabits mountain tops, in peat bogs and near streams, in moist to wet soils, between 850–1500 m elevation (Fig. 44).

Phenology:—Flowering from October to February.

Diagnosis:—*Paepalanthus tessmannii* is morphologically similar to *P. hatschbachii*, as compared in the diagnosis of the later. Some specimens were also found misidentified as *P. catharinae*, mainly due to the similar height and aspect of the leaves, but P. tessmannii can be distinguished by the involucral bracts brownish (*vs*. involucral bratcs stramineous). Moreover, *P. tessmannii* occurs mainly in the *Campos Gerais* and in the HTG, while *P. catharinae* is practically restricted to the SHG.

Examined material:—BRAZIL. **Paraná**: Balsa Nova, Serra de São Luiz, 1100 m elev., 12 December 1965, *Reitz & Klein* 17457 (FLOR!, HBR!); Balsa Nova, Alto do Purunã, 14 December 1979, *G.Hatschbach 42658* (MBM); Balsa Nova, Recanto dos Papagaios, Campos Gerais, 25°16’30.3”S 49°27’36.5”W, 10 December 2013, *E.D.Lozano & M.E.Engels 2182* (MBM!). Carambeí, margem do Rio São João, Campos Gerais, 24°32’08.2”S 50°04’27”W, 2 November 2013, *E.D.Lozano & M.E.Engels 1656* (MBM!). Curitiba, Jardim Petrópolis, 5 November 1992, *J.M.Silva 1164* (MBM!); Curitiba, Campos do Capão da Imbuia, 16 October 1964, *L.T.Dombrowski 595 & Y.Saito 386* (PEL!). Imbituva, Rio Imbituvinha, 20 October 1969, *G.Hatschbach 22500* (MBM!). Guaratuba, Serra de Araçatuba, 1 December 1998, *J.M.Silva et al. 2658* (MBM!); Guaratuba, Serra do Araçatuba, 1300 m elev., 25 February 2000, *J.M.Silva et al. 3269* (MBM!). Jaguariaíva, Rio Jaguariaíva, 13 November 1974, *G.Hatschbach 35441* (MBM!); Jaguariaíva, Lajeado Butiá, estrada para Fazenda Rondon, 19 November 2010, *J.Cordeiro et al. 3970* (MBM!). Lapa, Col. Mariental, 28 October 1952, *G.Hatschbach 3147* (HBR!, MBM!, PACA!, UPCB!). Morretes, Pilão de Pedra, 4 December

1960, *G.Hatschbach & E.Moreira 6810* (MBM!). Palmeira, Fazenda Santa Rita, 13 October 1982, *G.Hatschbach 45676* (MBM!); Palmeira, Rio dos Papagaios, 25 October 1983, *Cervi et al. 2212* (MBM!, UPCB!); [Palmeira?], Rio dos Papagaios, 10 October 1985, *A.C.Cervi et al. 2321* (UPCB!); Palmeira, Rio dos Papagaios, 3 December 1987, *Krul et al. 111* (MBM!); Palmeira, Recanto dos Papagaios, 28 October 1996, *O.S.Ribas & M.F.Luz 1591* (MBM!); Palmeira, Palmeira, Cercado, Chapadão, 16 September 2008, *J.Cordeiro et al. 2987* (MBM!); Palmeira, Recanto dos Papagaios, 25°27'55"S 49°46'06"W, 957 m elev., 18 December 2013, *J.T.Motta et al. 4154* (MBM!, specimen on the right). Piraquara, Mananciais da Serra, 22 November 1983, *P.I.Oliveira 775* (MBM!); Piraquara, Medianeira, 12 November 2003, *J.Cordeiro 2149* (MBM!); Piraquara, 25°30'48"S 49°01'35"W, 873 m elev., 4 October 2012, *F.Santos-Silva et al. 137* (UPCB!); Piraquara, próximo ao reservatório Piraquara II, estrada para o Morro do Canal, Campos de Curitiba, 25°18'20.9"S 49°00'18"W, 30 October 2013, *E.D.Lozano 1609* (MBM!). [Ponta Grossa], limit between Mun. Ponta Grossa and Mun. Palmeira, gorge of the Rio Tibagi, at point where BR-376 highway crosses, 25°20'S 49°50'W, 1000 m elev., 16 November 1977, *L.R.Landrum 2535* (MBM!); Ponta Grossa, Botuquara, 24 November 1999, *C.B.Poliquesi et al. 680* (MBM!); Ponta Grossa, Itaiacoca, 4 October 2007, *J.M.Silva et al. 6097* (MBM!); Ponta Grossa, Nascente do Rio Tibagi, 25°S16'25"S 49°49'29"W, 1096 m elev., 28 September 2008, *B.O.Andrade 84* (MBM!, UPCB!); Ponta Grossa, Nascente do Rio Tibagi, 25°S16'25"S 49°49'29"W, 1096 m elev., 31 October 2008, *B.O.Andrade 123* (MBM!); Ponta Grossa, Fazenda Capão das Almas, 9 October 2012, *G.Felitto & E.D.Lozano 386* (MBM!). São José dos Pinhais, Rodovia BR-277, Rio Pequeno, 7 November 1996, *O.S.Ribas et al. 1593* (MBM!); São José dos Pinhais, Rio Pequeno, 18 October 1998, *O.S.Ribas 2744* (MBM!); São José dos Pinhais, Aeroporto Afonso Pena, 10 October 2009, *A.C.L.Miranda et al. 262* (MBM!). Tibagi, Guartelá, Canyon do Rio Iapó, próximo à Cascata Ponte de Pedra, 900 m elev., 10 November 1992, *G.Hatschbach & E.Barbosa 58193* (MBM!). Tijucas do Sul, Rincão, 21 October 1977, *G.Hatschbach 40448* (MBM!); Tibagi, nascente do Rio Tibagi, 19 November 2009, *E.D.Lozano & B.O.Andrade 184* (ICN!, MBM!). **Santa Catarina**: Campo Alegre, Serra do Quiriri, 29 December 1998, *J.M.Silva et al.* 2733 (HUCS!, ICN!, MBM!); Campo Alegre, Serra Quiriri, próximo à Torre de Rádio, 1500 m elev., 28 December 1999, *J.Cordeiro et al. 1699* (MBM!). Garuva, Serra do Quiriri, 25 October 2006, *J.M.Silva et al. 5173* (MBM!); [Garuva] Campo Alegre, Campos do Quiriri, 26°021'2"S 48°57'12"W, 4 November 2014, *L.A.Funez et al. 4011, 4012* (FLOR!);

Garuva, Serra do Quiriri, 26°01’47”S 48°57’50”W, 1300 m elev., 26 November 2015, *J.M.Silva & M.L.Brotto 9169* (MBM!).

6. Syngonanthus Ruhland (1900: 487)
Type:—not found.

Annual or perennial herbs, very variable habit. **Leaves** spirally arranged in basal rosettes or in elongated stems. **Scapes** few or numerous per rosette. **Capitula** solitary, radial, sometimes arranged in complex inflorescences, such as umbel-like. **Floral bracts** only in the peripheral flowers, lacking towards the centre of the capitula. **Flowers** 2 or 3-merous (only the latter in the study area). **Staminate flowers** with free sepals and fused petals, a single whorl of stamens developed, stamens 2 or 3 (only the latter in the study area), anthers pale. **Pistillate flowers** with free sepals and petals fused in the mid portion, gynoecium with 2 or 3-carpellate ovary, styles with 2 or 3 stigmatic branches, and 2 or 3 nectariferous appendages separating at the same level (only the 3-merous condition in the study area). **Seed coat** reticulate.

Etymology:—*Syngonanthus* means “fused flowers” (from the Greek, *syngonos* = fused, *anthos* = flower) (Moldenke & Smith 1976).

Key to the species of *Syngonanthus* in the subtropical South America

1. Species with short or long elongated stems; capitula in an umbel-type inflorescence at the apex of elongated stems ……...…… 2
- Species with elongated stems absent; capitula at the apex of the scapes, leaving directly from the basal rosettes ……....
2. Leaves spirally arranged in the elongated stems, slightly bifid ……..…… *S. caulescens*
- Leaves spirally arranged in a basal rosettes, absent in the elongated stems, apex slightly obtuse ….... 3
3. Elongated stems up to 1.5 cm long, hidden by the basal rosettes; involucral bracts 2–3.5 mm, oblong to oblanceolate, apex mucronate ……..……..… *S. fischerianus*
- Elongated stems up to 15 cm long, conspicuous; involucral bracts 3.8–4 mm, linear-lanceolate to lanceolate, apex acute ……...……...… *S. helminthorrhizus*
4. Larger rosettes, with leaves up to 6.5 cm long; scapes up to 26 cm long; fawn to golden capitula …… *S. chrysanthus*
- Smaller rosettes, with leaves up to 2.5 cm long; scapes up to 38 cm high; cream capitula …… *S. nitens*

6.1. Syngonanthus caulescens (Poir.) Ruhland (1903: 267). *Eriocaulon caulescens* Poiret (1813: 162). Lectotype (designated by Trovó *et al.* 2015: 256):—FRENCH GUIANA: Cayenne, *s.d.*, *Poiret s.n.* (lectotype P 162057; isolectotype P 162058). **Figures 60–63.**

= *Syngonanthus caulescens* var. *proliferus* Moldenke (1958: 329). Type:—BRAZIL. Santa Catarina: Porto União, Fazenda Frei Rogério, 12 km southeast of Porto União, ca. 750 m elev., 18 December 1956, *L.B.Smith & R.Reitz 8681* (holotype US barcode 00088449 image!; isotype HBR!).

Herbs 3–31.5 cm long. **Leaves** 0.2–3 × 0.01–0.6 cm, spirally arranged in elongated stems, linear to lanceolate, ascending, membranaceous, apex slightly bifid, glabrous. **Elongated stems** absent or up to 19 cm long. **Spathes** 1.5–3 cm long, oblique, even attenuate, glabrous. **Scapes** 3.5–18 cm long, sparse hyaline trichomes ca. 0.2 mm long. **Capitula** solitary, hemispheric to globose, echinate aspect, 5–5.5 mm diameter, hyaline to cream, arranged in umbeliform-manner at the apex of the elongated stems. **Involucral bracts** in 3–4 series, 2–2.5 × 0.7–0.8 mm, slightly oblanceolate to lanceolate, slightly longer towards the inner series, apex acute, hyaline, glabrous. **Flowers** 3-merous. **Staminate flowers** ca. 2 mm long, pedicel 0.5–1 mm long, hyaline trichomes ca. 1 mm long leaving from the base; sepals 1.5 × 0.3–0.4 mm, slightly oblanceolate to lanceolate, apex acute, hyaline, glabrous; petals fused up to the distal third, forming an infundibuliform corolla up to 1 mm long, slightly 3-lobed, hyaline, glabrous; stamens not observed. **Pistillate flowers** ca. 2 mm long, sessile; sepals as observed in the staminate flowers; petals fused in the mid portion, equal, 1 × 0.3–0.4 mm, oblanceolate, slightly spathulate, apex obtuse, hyaline to cream, glabrous except for sparse hyaline trichomes up to 0.2 mm long at the apex margins; gynoecium ca. 1 mm long, cream or yellowish, ovary 3-carpellate, ca. 0.5 mm long, stigmatic branches and nectariferous appendages barely observed.

Illustrations:—Ruhland (1903: 268), Castellanos (1945: Tab. XX), Moldenke & Smith (1976: 85), Parra (1998: 222) [line-drawings].

Etymology:—The specific epithet *caulescens* refers to the presence of stem (from the Latin, *caulescens* = with a stem) (Moldenke & Smith 1976).

Distribution and habitat:—Widely distributed species, occurring from Mexico to southern South America. In the study area, *S. caulescens* occurs in Argentina (Corrientes, and Misiones), southern Brazil (Paraná, Rio Grande do Sul, and Santa Catarina), and Paraguay

(Alto Paraná, Amambay, Cordillera, Guairá, Paraguarí, and San Pedro), in a wide range of wetlands environments. It inhabits moist to wet soils, up to 1238 m elevation (Fig. 65).

Phenology:—Flowering throughout the year, but mainly from September to May.

Diagnosis:—*Syngonanthus caulescens* differs from the other species of the genus in the study area by displaying elongated stems with spirally arranged leaves, and capitula arranged in an umbel-type inflorescence at the stems apex. Acaulescent specimens are frequently observed, but can be identified by the leaves linear-lanceolate to lanceolate, membranaceous, with slightly bifid apex (see Stützel 1984: 92), and by the delicate and echinate aspect of the capitula.

General notes:—According to Giulietti (2008) and Echternacht (2012), *S. caulescens* reaches Uruguay (Maldonado and Rivera departments), but we did not see any collection of *S. caulescens* from this country. For a preliminary list of synonyms see Echternacht (2012).

Examined material:—ARGENTINA. **Corrientes:** Berón de Astrada, Toroy, 13 December 1944, *G.J.Schwarz 340* (BAB!). Concepción, Carambola, 3 February 1987, *T.M.Pedersen 14827* (SI!); Concepción, Estancia Tranquera de Hierro, 66 km al NE de Chavarría, camino a Concepción, ca. 6 km al E de la ruta, aprox.. 28°35’S 58°04-05’W, 3 December 1996, *M.M.Arbo et al. 6992* (MBM!, SI!). Ituzaingó, Isla Apipé Grande, Puerto San Antonio, 10 December 1973, *A.Krapovickas et al. 24178* (SI!); Ituzaingó, Esteros del Iberá, Laguna Isipó, ca. 27°52’S 56°49’W, 15 November 1976, *M.M.Arbo et al. 1427* (SI!). La Cruz, Estancia del Olmedo, 10 November 1936, *A.Burkart 7893* (SI!). Mburucuyá, Estancia Santa Teresa, 9 October 1954, *A.Burkart* 19384 (SI!); Mburucuyá, Estancia Santa Teresa, 11 October 1954, *A.Burkart 19453* (SI!). Paso de Los Libres, pantanos próximos a Laguna Brava, ca. 29°44’S 57°05’W, 3 November 1973, *M.N.Correa 5212* (BAB!, SI!); Paso de Los Libres, 15 December 1974, *A.Burkart et al. 30776* (SI!). San Martin, Reserva Natural Provincial del Ibera, costa W de la laguna Ibera, 9 December 1992, *S.G.Tressens et al. 4307* (MBM!). San Roque, Chavarría, 18 November 1977, *A.Schinini & C.Quarín 14525* (MBM!). **Misiones:** Concepción, Estancia de Elsa Prates sobre el río Uruguay, 28°05’50”S 55°32’30”W, 160 m elev., 29 January 2004, *F.Biganzoli et al. 1709* (SI!). Garupa, 5 March 1990, *F.M.Rodriguez 104* (BAB!, SI!). San Ignacio, Santo Pipó, 8 September 1950, *Diem 1594* (SI!). BRAZIL. **Paraná**: Araucária, margens do Rio Iguaçu, 17 October 1959, *R.Braga 98* (UPCB!). Balsa Nova, Cemitério Tamanduá, 21 March 1999, *S.R.Ziller 1772* (EFC!); Balsa Nova, Ponte dos Arcos, 29 March 2005, *C.Kozera & R.Kersten 2015* (EFC!, MBM!); Balsa Nova, Ponte dos Arcos, 11 May 2005, *C.Kozera 2672* (EFC!); Balsa Nova, Ponte dos Arcos, 7 July 2005, *C.Kozera 3242* (EFC!);

Balsa Nova, Ponte dos Arcos, 5 January 2006, *C.Kozera & O.P.Kozera 2810* (EFC!, MBM!); Balsa Nova, Ponte dos Arcos, 5 January 2006, *C.Kozera 3194* (EFC!); Balsa Nova, Ponte dos Arcos, 12 January 2006, *C.Kozera & O.P.Kozera 2873* (MBM!, UPCB!); Balsa Nova, Serra São Luis do Purunã, 9 February 2012, *A.C.Cervi & J.M.Silva 9962* (MBM!). Campo Largo, 9 October 1964, *L.T.Dombrowski 524* (PEL!); Campo Largo, São Luís do Purunã, 13 November 2001, *A.Dunaiski-Jr. et al. 1756* (EFC!). Cianorte, 15 November 2005, *M.G.Caxambu 923* (MBM!); Cianorte, Nova Brasilia, Estrada Boiadeira, 23°33'50.3"S 52°23'04.7"W, 12 November 2013, *E.D.Lozano et al. 1764* (MBM!). Curitiba, ca. 900 m elev., 15 October 1914, *P.Dusén 15619* (SI!); [Curitiba], fundos do aeroporto Afonso Pena (lado oeste), April 1958, *A.Mattos & H.Moreira s.n.* (UPCB 1155!); Curitiba, 15 October 1961, *C.Stellfeld s.n.* (UPCB 5867!). Guarapuava, 10 km ao oeste de Guarapuava, 1100 m elev., 14 December 1965, *Reitz & Klein 17620* (FLOR!); Guarapuava, Rio São Jerônimo, 2 April 2003, *C.Kozera s.n.* (EFC 9766!). General Carneiro, Banhado Curicaca, 22 February 2005, *C.Bona 264* (UPCB!). Jaguariaíva, Rio das Mortes, estrada Jaguariaíva-Sengés, 7 November 1996, *E.P.Santos et al. 207* (UPCB!); Jaguariaíva, Parque Estadual do Cerrado, Rio Santo Antônio, 29 August 2000, *V.Linsingen 324* (MBM!); Jaguariaíva, Parque Estadual do Cerrado, 24°09'S 50°18'W, 12 November 2011, *F.R.Maia et al. 13* (UPCB!); Jaguariaíva, Parque do Cerrado, 31 March 2012, *R.E.Ardissone & P.Weber 177* (FLOR!); Jaguariaíva, Parque do Cerrado, 31 March 2012, *R.E.Ardissone 212* (FLOR!). Lapa, Assentamento Contestado, 7 March 2002, *O.S.Ribas et al. 4518* (MBM!); Lapa, pedra da Gruta do Monge, 25°46'23"S 49°42'06"W, 996 m elev., September 2006, *R. Wasum et al. 3481* (HUCS!). Palmas, REVIS de Campos de Palmas, 26°31'25"S 51°38'35"W, 1238 m elev., 25 November 2013, *S.Campestrini et al. 783* (FLOR!). Palmeira, 1952, *A.Mattos s.n.* (UPCB 843!); Palmeira, Rodovia do Café, km 49, 1000 m elev., 17 December 1965, *Reitz & Klein 17472* (FLOR!); Palmeira, BR-277, km 156, próximo ao pedágio, 20 April 2000, *E.Barbosa et al. 466* (ICN!, MBM!, PACA!); Palmeira, Recanto dos Papagaios, 9 March 2007, *J.M.Silva & J.Cordeiro 5573* (MBM!); Palmeira, Cercado, 15 November 2008, *E.Barbosa et al. 2396* (MBM!); Palmeira, Capela Nossa Senhora das Pedras, 12 June 2010, *A.C.Cervi et al. 9896* (MBM!); Palmeira, Pulgas, 28 June 2011, *J.M.Silva et al. 7811* (MBM!); Palmeira, Fazenda Boiada, 14 March 2013, *E.D.Lozano & G.Felitto 1248* (MBM!); Palmeira, Recanto dos Papagaios, 25°27'55"S 49°46'06"W, 957 m elev., 18 December 2013, *J.T. Motta et al. 4159* (EFC!, FURB!); Palmeira, Colônia Quero-Quero, 10 March 2012, *E.Barbosa & J.M.Silva 3392* (MBM!). Piraquara, Mananciais da Serra, 22 November 1983, *P.I.Oliveira 778* (MBM!); Piraquara, Medianeira, 1 February 2005,

S.S.C.Silva et al. 13 (MBM!); Piraquara, próximo ao reservatório Piraquara II, estrada para o Morro do Canal, 25°30’58”S 49°00’50”W, 30 October 2013, *E.D.Lozano 1607* (ICN!); Piraquara, Mananciais da Serra, Caminho do Trentino, 25°48’35”S 49°12’39”W, 916 m elev., 18 March 2015, *J.M.Silva et al. 8815* (MBM!). Ponta Grossa, Rio dos Papagaios, 28 October 1983, *A.C.Cervi et al. 2211* (UPCB!); Ponta Grossa, Fazenda Santana, 20 February 2003, *O.S.Ribas et al. 5025* (MBM!); Ponta Grossa, 49°49’29”S 25°16’25”W, 1096 m elev., 6 February 2008, *B.O.Andrade 157* (MBM!); Ponta Grossa, 49°49’29”S 25°16’25”W, 1096 m elev., 4 June 2009, *B.O.Andrade 350* (MBM!); Ponta Grossa, nascente do rio Caracará, Embrapa, 25°09’08”S 50°05’16”W, 860 m elev., 26 January 2010, *L.P.Souza 35* (MBM!, UPCB!); Ponta Grossa, nascente do rio Caracará, Embrapa, 25°09’08”S 50°05’16”W, 860 m elev., 13 October 2010, *L.P.Souza 128* (MBM!, UPCB!); Ponta Grossa, Fazenda Capão das Almas, 10 October 2012, *E.D.Lozano & V.A.Ariati 1081* (MBM!); Ponta Grossa, Parque Estadual de Vila Velha, 25°08’42.4”S 49°35’35.1”, 18 December 2013, *E.D.Lozano 2425* (MBM!). Porto Amazonas, Fazenda São Roque, 3 February 1972, *R.Kummrow 1065* (MBM!). Quatro Barras, 8 January 1991, *J.M.Silva & D.D.Guimarães 913* (FLOR!). São José dos Pinhais, Mergulhão, 30 November 1988, *J.Cordeiro & J.M.Silva 589* (FLOR!, UPCB!); São José dos Pinhais, Col. Santos Andrade, 11 December 1986, *J.Cordeiro & G.Hatschbach 377* (UPCB!). Sengés, Fazenda Morungava, Rio do Funil, 15 December 1958, *G.Hatschbach & R.B.Lange 5316* (UPCB!); [Sengés] Jaguariaíva, Parque Estadual do Cerrado, 24°08’25.4”S 49°25’19.6”W, 21 April 2007, *F.S.Meyer & L.Von-Lisingen 345, 346* (MBM!); Sengés, PCH Fazenda Entre Rios, 24°07’17”S 49°37’26”W, 625 m elev., 26 March 2016, *J.M.Silva 9255* (MBM!). Tibagi, Fazenda Pinheirinho, 1 November 2012, *G.Felitto et al. 430* (MBM!); Turvo, propriedade da família Rickli, 25°02’25.5”S 51°33’37”W, 1028 m elev., 13 November 2009, *M.G.Caxambu & E.L.Siqueira 2872* (MBM!, mixed with *P. caldensis*). **Rio Grande do Sul**: Alegrete, 29°47’26”S 55°23’33”W, 103 m elev., 27 November 2015, *C.Vogel-Ely 527* (ICN!). Barra do Ribeiro, Lagoa das Capivaras, 19 May 2003, *M.L.Abruzzi 4760* (HAS!). Bom Jesus, Rio dos Touros para Bom Jesus, 13 January 1942, *B.Rambo SJ 8482* (PACA!); Bom Jesus, Arroio Capivari Grande, 15 January 1942, *B.Rambo SJ 8775* (PACA!); Bom Jesus, 16 January 1942, *B.Rambo SJ 9063* (PACA!); Bom Jesus, 6 January 1958, *Camargo 3143* (PACA!); Bom Jesus, Fazenda Potreirinhos, 4 December 1977, *O.R.Camargo 5604* (HAS!); Bom Jesus, Fazenda do Cilho, 6 January 2005, 1050 m elev., *R.Wasum 2298* (HUCS!, ICN!, MBM!); Bom Jesus, Fazenda do Cilho, 1000 m elev., 9 January 2005, R.Wasum 2396 (HUCS!, mixed with *P. caldensis*). Cambará do Sul, 26 January 1948, *Rambo 36783* (ICN!); [Cambará do Sul],

Cambará p. São Francisco de Paula, February 1948, *B.Rambo SJ 36783* (ICN!, PACA!); Cambará do Sul, Faxinal, 29°08’46.5”S 50°04’30.9”W, 1009 m elev., 7 February 2018, *C.C.Alff & C.Rabuske 125, 126* (ICN!). [Canela] Gramado, Caracol, February 1924, *E.Schweiger s.n.* (ICN 44803!); Canela, 4 January 1941, *Irmão Edesio 5556* (ICN!); Canela, Parque Estadual do Caracol, 27 December 1972, *M.L.Porto et al. s.n.* (ICN 21702!); Canela, February 1986, *M.Sobral & R.Silva s.n.* (FLOR 20048!). Caxias do Sul, 1943, *Irmão Augusto s.n.* (PACA 11809!); Caxias do Sul, Vila Oliva p. Caxias, 1 January 1946, *B.Rambo SJ* 30865 (PACA!); Caxias do Sul, Vila Oliva, 900 m elev., 23 January 1947, *A.Sehnem 2450* (PACA!); Caxias do Sul, Vila Oliva p. Caxias, 8 February 1955, *B.Rambo SJ 56722* (PACA!); Caxias do Sul, Vila Seca, Apanhador, 780 m elev., 8 January 2003, *L.Scur 979* (HUCS!, MBM!); Caxias do Sul, Fazenda Pedro Hoffmann, 28°57’39.5”S 50°56’08.7”W, 839 m elev., 15 December 2012, *M.Grizzon 120* (FLOR!, FURB!, HAS!, HUCS!). Cidreira, Fazenda Azaléia, 30°05’12”S 50°13’55”W, 10 m elev., 11 March 2012, *F.Gonzatti 439* (HUCS!, MBM!). Dom Pedro de Alcântara, margem leste da Lagoa Itapeva, 17 December 2008, *P.J.S.Silva-Filho 6* (ICN!). Jaquirana para São Francisco de Paula, 20 February 1952, *B.Rambo SJ 52087* (PACA!). Morrinhos do Sul, Morrinhos para São Francisco de Paula, 7 February 1952, *B.Rambo SJ 52140* (PACA!). Mostardas, Parna Lagoa do Peixe, Lagoa do Pai João, 15 April 1991, *N.Silveira 10892* (HAS!); Mostardas, Parna Lagoa do Peixe, Sede do Parque, 21 January 1992, *C.Costa 80* (HAS!); Mostardas, Parna Lagoa do Peixe, Sede do Parque, 21 January 1992, *M.L.Abruzzi 2418* (HAS!). [Muitos Capões] Esmeralda, Estação Ecológica de Aracuri, 12 December 1982, *J.L.Waechter 1960* (PEL!); Muitos Capões, Lajeado Bonito, PCH Lajeado Bonito, 28°28’15”S 51°21’38”W, 678 m elev., 10 February 2012, *M.Verdi & B.O.Boeni 6163* (FURB!); Muitos Capões, Ituim, Fazenda São Pedro, PCH São Pedro, 28°31’37”S 51°22’37”W, 620 m elev., 9 February 2012, *M.Verdi & B.O.Boeni 6142* (FURB!). [Osório], Fazenda do Arroio p. de Osório, 6 March 1950, *B.Rambo SJ 46148* (ICN!); [Osório], Fazenda do Arroio p. Osório, 6 March 1950, *B.Rambo SJ 46178* (PACA!); [Osório], Fazenda do Arroio p. Osório, 4 January 1950, *B.Rambo SJ 45228* (PACA!); [Osório], Fazenda do Arroio p. Osório, 23 January 1958, *B.Rambo SJ 63602* (PACA!); Osório, Lagoa do Peixoto, 29°53’06”S 50°16’14”W, 4 m elev., 29 November 2014, *C.Demeda 21* (BAB!, FLOR!, FURB!, HUCS!); Osório, Lagoa das Traíras, 29°52’08”S 50°11’13”W, 6 m elev., 22 April 2015, *C.Demeda 104* (HUCS!). Pareci Novo, Pareci para Montenegro, 14 January 1949, *B.Rambo SJ 39773* (PACA!). [Porto Alegre], Vila Manresa p. Porto Alegre, 1933, *B.Rambo SJ 33980* (PACA!); [Porto Alegre], Morro da Glória, Vila Manresa p. Porto Alegre, 16 January 1933, *B.Rambo SJ*

134 (PACA!). Quaraí, Cerro do Jarau, 30°12’2.06”S 56°30’38,13”W, 17 December 2011, *P.J.S.Silva-Filho 1411* (ICN!). Santana do Livramento, Assentamentos, 30°42’21”S 55°23’21”W, 19 December 2013, *R.A.X.Borges et al. 1279* (ICN!). São Francisco de Assis, estrada São Francisco de Assis-Alegrete, 61 km após São Francisco, 6 December 1973, *M.L.Porto 657* (ICN!). São Francisco de Paula, 10 August 2002, *J.Paz 1* (ICN!); São Francisco de Paula, 8 February 2003, *J.Paz 50* (ICN!); São Francisco de Paula, 17 May 2003, *J.Paz 110, 111* (ICN!); São Francisco de Paula, Josafá, arredores da Estação Ecológica Estadual Aratinga, 27 April 2005, *R.Schmidt 1227* (HAS!); São Francisco de Paula, Passo do S, Parque Estadual do Tainhas, 30 January 2006, *R.Schmidt 1348, 1349* (HAS!); São Francisco de Paula, Banhado Amarelo, 22 May 2008, *M.L.Lorscheitter & L.R.M.Baptista s.n.* (ICN 174787!); São Francisco de Paula, Banhado Amarelo, 22 August 2008, *M.L.Lorscheitter & L.R.M.Baptista s.n.* (ICN 174715!); São Francisco de Paula, Banhado Amarelo, 23 August 2008, *M.L.Lorscheitter & L.R.M.Baptista s.n.* (ICN 172898!, 174717!); São Francisco de Paula, estrada para a Serra do Umbu (RS-484), 27 December 2013, *C.T.Blum 1287* (EFC!); São Francisco de Paula, estrada para o Banhado Amarelo, 29°19’01.9”S 50°09’08”W, 983 m elev., 6 February 2018, *C.C.Alff & C.Rabuske 104, 106* (ICN!); São Francisco de Paula, Banhado Amarelo, 29°19’13.1”S 50°08’05.1”W, 1000 m elev., 6 February 2018, *C.C.Alff & C.Rabuske 109* (ICN!); São Francisco de Paula, estrada para o Banhado Amarelo, 29°19’10”S 50°08’14”W, 995 m elev., 6 February 2018, *C.C.Alff & C.Rabuske 113* (ICN!); São Francisco de Paula, Parque Estadual Tainhas, próximo ao Passo do S, 29°05’09.1”S 50°22’04.6”W, 6 February 2018, *C.C.Alff & C.Rabuske 118, 119* (ICN!). São Gabriel, 30°06’10”S 54°18’44”W, 133 m elev., 30 October 2014, *C.Vogel-Ely & D.Lucas 418* (ICN!). São João do Polêsine, Vale Vêneto, 28 February 1956, *A.Sehnem 1373* (PACA!). São José dos Ausentes, Serra da Rocinha para Bom Jesus, 14 February 1947, *B.Rambo SJ 35244* (PACA!); São José dos Ausentes, Serra da Rocinha para Bom Jesus, 18 January 1950, *B.Rambo SJ 45414* (PACA!); São José dos Ausentes, Vale das Trutas, 22 May 2002, *R.M.Senna 231* (HAS!). São Leopoldo, 1907, *F.Theissen SJ s.n.* (PACA 7655!, 7965!); São Leopoldo, Rio dos Sinos, 10 December 1948, B.Rambo *SJ 38682* (PACA!); Soledade, 28°52’45”S 52°25’36.8”W, 7 November 2018, *C.Rabuske-Silva et al. 377* (ICN!). Tapes, Fazenda Joaquim Mello, Lagoa do Cerro, 28 January 2003, *M.L.Abruzzi 4429* (HAS!); Tapes, Fazenda Joaquim Mello, 28 January 2003, *M.L.Abruzzi 4486* (HAS!); Tapes, Fazenda Nair Heller, 19 May 2003, *M.L.Abruzzi 4839* (HAS!); Tapes, Fazenda São Miguel, 30°40’35”S 51°24’03”W, 50 m elev., 15 December 2015, *C.R.Silva & J.Iganci 482* (ICN!). Taquari, 12 December 1957, *Camargo 2906* (PACA!); Taquari, 14 December 1957, *Camargo 2957*

(PACA!). Tavares, Parna Lagoa do Peixe, Estrada "Veia Terra", 10 December 1990, *N.Silveira 10691* (HAS!). Torres, Itapeva, banhado na lagoa dos Simões, 25 January 1941, *Schultz 325* (ICN!); Torres, Pôrto Estácio, 25 November 1967, *L.R.M.Baptista s.n.* (ICN 4750!); Torres, 10 January 1971, *K.Hagelund 6112* (ICN!); Torres, Parque de Torres, 13 June 1972, *B.Irgang & A.M.Girardi s.n.* (ICN 27897!); Torres, 3 km NW de Torres, ao lado da estrada Torres-BR-101, 27 December 1972, *J.Lutzenberger s.n.* (ICN 21190!); Torres, 9 January 1973, *K.Hagelund 6610* (ICN!); Torres, Faxinal, 19 December 1977, *J.L.Waechter & V.Citadini 679* (ICN!); Torres, Faxinal, 20 December 1978, *Waechter 1093* (ICN!); Torres, June 1983, *M.Sobral 2107* (FLOR!); Torres, Itapeva, 9 January 1986, *N.Silveira 4228* (HAS!); Torres, beira da Lagoa Itapeva, 27 March 1987, *K. Hagelund 16132* (ICN!); Torres, Itapeva, 31 December 1987, *N.Silveira 5041* (HAS!); Torres, Itapeva, próximo ao aeroporto, 19 January 1990, *N.Silveira 9107* (HAS!); Torres, Butiazal, 8 December 1994, *M.Ritter 787* (ICN!); Torres, Itapeva, Parque Estadual de Itapeva, Lagoa Simão, 23 February 2005, *R.M.Senna 779* (HAS!); Torres, Itapeva, Parque Estadual de Itapeva, Lagoa do Simão, 29°22'37.8"S 49°46'22.1"W, 20 m elev., 3 February 2018, *C.C.Alff et al. 101* (ICN!); Torres, Tamboriqui, próximo da Lagoa Itapeva, 29°22'33"S 49°47'37.4"W, 18 m elev., 3 February 2018, *C.C.Alff & C.Rabuske 103* (ICN!). Tramandaí, 6 November 1943, *Irmão Augusto s.n.* (MPUC 230!). [Tupanciretã] Tupanciretan, 29 January 1942, *B.Rambo SJ 9717* (PACA!). [Vacaria], Fazenda da Ronda p. Vacaria, 2 January 1947, *B.Rambo SJ 54685* (PACA!); Vacaria, Refugiados, Parque das Cachoeiras, 28°39'53"S 50°54'53"W, 738 m elev., 26 March 2017, *F.Gonzatti 3447* (HUCS!). [Viamão], campo do Varejão para Itapoan, 29 December 1948, *B.Rambo SJ 39320* (PACA!); Viamão, Grota, 31 January 1968, *Irgang 319* (ICN!). **Santa Catarina**: Caçador, Fazenda dos Carneiros, 1100 m elev., 7 December 1962, *R.M.Klein 3470* (FLOR!, MBM!). Capetinga para Chapecó, 23 January 1952, *R.Reitz 4737* (PACA!). Florianópolis, Ilha de Santa Catarina, Santo Antônio de Lisboa, 8 November 1989, *M.H.Queiroz 115* (FLOR!); Florianópolis, Ilha de Santa Catarina, Parque do Rio Vermelho, final da estrada geral da praia, 0.5 m elev., 28 December 1994, *D.B.Falkenberg & M.L.Souza 6770* (FLOR!, ICN!, PEL!, UPCB!). Garuva, Alto Quiriri, 26°02'21"S 48°57'16"W, 1200 m elev., 4 November 2014, *L.A.Funez et al. 4013* (FURB!). Irani, Campo do Irani, 1000 m elev., 26 December 1963, *Reitz & Klein 16405* (FLOR!, MBM!). Lages, 10 January 1951, *B.Rambo SJ 49585* (PACA!). [Passo de Torres], banhado entre as dunas e o Rio Mampituba, margem norte, 3 September 1972, *J.C.Lindeman s.n.* (ICN 20749!). Porto União, Fazenda Frei Rogério, 750 m elev., 6 January 1962, *Reitz & Klein 11593* (FLOR!, PACA!). Rancho Queimado, Serra da Boa Vista, no limite

entre os municípios de Rancho Queimado e Alfredo Wagner, próximo à BR-283, 27°40’27”S 49°09’15”W, 1129 m elev., 29 November 2012, *R.Trevisan & S.Venturi 1223* (FLOR!); Rancho Queimado, Posto da Polícia Rodoviária Federal, 27°41’11”S 49°02’02”W, 847 m elev., 17 November 2015, *R.Trevisan & L.Pereira-Silva 1667* (FLOR!). Santo Amaro da Imperatriz, Parque Estadual da Serra do Tabuleiro, 27°44’38”S 48°47’10”W, 400 m elev., 29 November 2011, *M. Verdi et al. 5972* (FURB!). São Joaquim, January 1957, *J.Mattos 4668* (HAS!). Sombrio para Araranguá, 1 February 1946, *B.Rambo SJ 31472* (PACA!). [Santa Rosa do Sul] Sombrio, 29°08’01”S 49°42’03”W, 2 m elev., 21 November 2015, *R.Trevisan & L.Pereira-Silva 1686* (FLOR!). PARAGUAY. **Alto Paraná:** Reserva Biológica Itabó, 70 km N de CDE, 16 January 1979, *G.Caballero-Marmori 1910* (MBM!); Reserva Itabó de Itaipu Binacional, ca. 25°50’S 54°30’W, 15–25 m elev., 16 October 1984, *D.R.Brunner et al. 938* (SI!). **Amambay:** Bella Vista, 15 December 1983, *R.Vanni et al. 280* (MBM!). **Cordillera:** San Bernardino, October 1915, *Rojas s.n. in herb. Osten 8331* (BAB!); San Bernardino, October 1915, *E.Hassler 1522* (SI!). Valenzuela, 27 December 1950, *G.J.Schwarz 11393* (SI!). **Guairá:** Colonia Independencia, 29 March 1972, *T.M.Pedersen 10095* (MBM!, SI!). **Paraguarí:** camino de Paraguarí a Piribebuy, ca. 25°37’S 57°15’W, 24 October 2000, *R.Kiesling et al. 9808* (SI!). Piraretá, 12 December 1992, *E.Nicora et al. 9921* (SI!). **San Pedro:** Lima, Estancia Carumbé, 26 November 1969, *T.M.Pedersen 9400* (SI!).

6.2. Syngonanthus chrysanthus (Bong.) Ruhland (1903: 256). *Eriocaulon chrysanthum* Bongard (1831: 628). Type:—BRAZIL. Habit prope Rio-Janeiro, 1828, *Lindley s.n.* (holotype LE). **Figures 64–66.**

= *Paepalanthus morulus* Kunth (1841: 533). *Eriocaulon morulum* (Kunth) Steudel (1855: 36). Lectotype (designated here):—BRAZIL. Brasilia meridionalis, *F.Sellow d2404?* (lectotype B barcode B 10 0250305 image!; isolectotypes B barcode B 10 0250306 image!, BR barcode 00000860145 image!, K barcode K000640211 image!, S S-R-3900 image!). Former syntypes:—BRAZIL. Santa Catarina: [Florianópolis] Insula St. Catharinae, 1835?, *Gaudichaud 104* (B barcode B 10 0250307 image!, G barcode G00099200 image!).

= *Paepalanthus arechavaletae* Koernicke ex Arechavaleta (1902). *Leiothrix arechavaletae* Ruhland (1903) 238, *nom. illeg.* Lectotype (designated here):—URUGUAY. Montevideo: bañados de Carrasco, en arenoso y humedo, December 1874, *J.Arechavaleta & Balpardo 2561*

(lectotype B barcode B 10 0244382 image!; isolectotypes B barcode B 10 0244381 image!, G barcode G00099059 image!, MVFA barcode MVFA0000036 image!).

Herbs 7–28 cm high. **Leaves** spirally arranged, 1–6.5 × 0.1–0.15 cm, linear, patent to ascending, coriaceous, apex slightly obtuse, glabrescent, at most with hyaline trichomes up to 0.2 mm long on both surfaces. **Spathes** 1.5–3.5 cm long, oblique, even attenuate, indument as observed in the leaves. **Scapes** 4.5–26 cm long, hyaline trichomes up to 0.4 mm long, denser. **Capitula** solitary, hemispheric to globose, 5–8 mm diameter, fawn to golden. **Involucral bracts** in 3–4 series, 2.2–3.5 × 1–1.2 mm, slightly obovate to oblanceolate, longer and wider towards the inner series, apex obtuse to acute, stramineous, glabrous. **Flowers** 3-merous. **Staminate flowers** ca. 2.5 mm long, pedicel up to 1.4 mm long; sepals ca. 1 × 0.4 mm, oblaceolate, apex acute, hyaline, hyaline trichomes up to 0.2 at the apex margins; petals fused up to the distal third, forming an infundibuliform corolla ca. 1 mm long, hyaline to cream, glabrous; stamens not observed. **Pistillate flowers** 3–3.2 mm long, pedicel up to 1 mm long; sepals free, equal, 2 × 0.3–0.4 mm, lanceolate, apex attenuate, hyaline, glabrous; petals fused at the mid portion, equal, 0.8 × 0.2–0.3 mm, similar to the sepals; gynoecium ca. 1.5 mm long, ovary 3-carpellate, ca. 0.5 mm long, amber, surrounded by densely arranged hyaline trichomes up to 1.2 mm long, 3 hyaline stigmatic branches, nectariferous appendages not observed.

Illustrations:—Moldenke & Smith (1976: 85) [line-drawings].

Etymology:—The specific epithet *chrysanthus* refers to the golden aspect of the flowers (from the Ancient Greek, *khrusós*= gold, *anthus* = flowers) (Moldenke & Smith 1976).

Distribution and habitat:—Southeastern to southern Brazil (Rio Grande do Sul and Santa Catarina), and Uruguay (Canelones, and Montevideo). This species occurs especially in the Coastal Plain Grasslands, from the mid coast of Santa Catarina, southern Brazil, southwards Uruguay. Despite not a single record in Paraná was found, the occurrence of *S. chrysanthus* in this state is not fully discarded, once this species is also recorded in the southern coast of São Paulo, southeastern Brazil. It inhabits preferentially sandy moist soils, up to 20 m elevation (Fig. 68).

Phenology:—Flowering from September to February, less frequently from March to August.

Conservation:—*Syngonanthus chrysanthus* is Endangered (EN) according to the IUCN (2017) criteria B2a+bii,iii,iv. Its extent of occurrence (EOO) is 99,316.717 km² and its area of occupancy (AOO) is 112.000 km² (cell width of 2 km). It is widely distributed along

the Coastal Plain, being recorded in at least nine protected areas only in southern Brazil (Rio Grande do Sul: Guarita State Park, Itapeva State Park, Itapuã State Park, Lagoa do Peixe National Park, Taim Ecological Station, and Tupancy Municipal Natural Park; Santa Catarina: Dunas da Lagoa da Conceição Municipal Park, Rio Vermelho State Park, and Tabuleiro State Park). Despite this, it is threatened by growing habitat conversion due to the drainage of wetlands for rural use and urban expansion.

Diagnosis:—*Syngonanthus chrysanthus* is morphologically similar to *S. nitens*, from which it is distinguished by the height up to 28 cm high (*vs.* height up to 38 cm high), larger rosettes, with leaves up to 6.5 cm long (*vs.* leaves up to 2.5 cm long), smaller scapes, up to 26 cm long (*vs*. scapes up to 35 cm long), and fawn to golden capitula (*vs*. cream capitula). The distinct proportions between the rosettes and scapes can also be useful for field identification, as well as the apex of the involucral bracts, obtuse to acute in *S. chrysanthus*, and rounded to obtuse in *S. nitens*. Besides morphological features, the first species occurs mainly in the lowlands of CPG, while *S. nitens* usually inhabits high-altitude areas.

Nomenclatural notes:—All the sheets at B, from both Sellow and Gaudichaud, present the handwriting information "Ex Herb. Kunth". One of the collections made by Sellow was chosen as lectotype, following the observations of Echternacht (2012), who assumed that Kunth (1841) possibly based the description of *P. morulus* on these collections. Echternacht (*l.c*.) cited the collection at K as lectotype, while we rather choose B barcode B 10 0250305, which presents the indication of Kunth's herbarium. One of the collections at B (barcode B 10 0250306) has the number "d2404" just beneath "Ex reliquiis Sellowianis", and may be an indication of Sellow's numeration, not available in the other cited sheets. If this number is correct, this collection was made in Rio Grande do Sul, according to Herter (1945).

Concerning the synonyms *P. arechavaletae* and *L. arechavaletae*, Echternacht (2012) did not consider them homotypic. She states that the two sheets at B are correspondent to two distinct holotypes, one of *P. arechavaletae*, other of *L. arechavaletae*. Although, they are all considered original material, based on the article 9.4 of the *Shenzen Code* (Turland *et al*. 2018), being syntypes in our view. Thus, we chose as lectotype the second sheet at B (barcode B 10 0244382), which presents more than one specimen and in better conditions than the first sheet.

General notes:—*Syngonanthus chrysanthus* is morphologically extremely variable, reaching from minute rosettes with a single capitulum to rosettes up to 15 cm diameter with more than a hundred capitula. The collection *A.Sehnem 13268* (PACA!) was not included as examined material. It indicates Cambará do Sul, Rio Grande do Sul, in SHG, as the location

where the specimens were collected. However this configures a mistaken information, diverging from our results on the distribution and habitat of *S. chrysanthus*. The specimens present roots with remains of sand, what reinforces this statement.

For a preliminary list of synonyms see Echternacht (2012).

Cultivar 'Mikado':—As already mentioned, *S. chrysanthus* is target of a patent by Bak & Steur (2008) relating to a cultivar named "Mikado". From our point of view, this cultivar does not differ morphological and phenollogically from our examined specimens of *S. chrysanthus.* We suggest the revaluation of the patent US 7,348,476 B2. We highlight that this patent is not in agreement with the European patent standarts, which grant exception to patentability to naturally-obtained plants and seeds, according to the article 53 of the European Patent Convention.

Examined material:—BRAZIL. **Rio Grande do Sul**: Arambaré, 31°00'28.8"S 29°35'73"W, 27 September 2014, *Vinícius et al. s.n*. (MPUC 20857!). [Arroio do Sal], Mar Verde, 21 December 1981, *Augusto s.n*. (MPUC 10937!); Arroio do Sal, Praia da Âncora, 4 November 2007, *F.Marchett 665* (HUCS!); [Arroio do Sal] Torres, [Balneário Atlântico] Praia Azul, 29°28'21.7"S 49°49'43.7"W, 20 November 2015, *R.Trevisan & L.Pereira-Silva 1674* (FLOR!); Arroio do Sal, Rondinha Nova, 29°30'15.8"S 49°51'15.4"W, 30 December 2017, *C.C.Alff et al. 61* (ICN!); Arroio do Sal, Rondinha Nova, 29°30'12.2"S 49°51'21.3"W, 30 December 2017, *C.C.Alff et al. 63* (ICN!); Arroio do Sal, Rondinha Nova, 29°30'11.9"S 49°51'23.1"W, 2 January 2018, *C.C.Alff et al. 64* (ICN!); Arroio do Sal, Estrada do Mar, 29°32'01.5"S 49°54'52.6"W, 21 m elev., 1 February 2018, *C.C.Alff & C.Rabuske 89* (ICN!); Arroio do Sal, Rondinha Velha, Parque Natural Municipal Tupancy, 29°29'23.3"S 49°50'46.4"W, 3 February 2018, *C.C.Alff & C.Rabuske 91* (ICN!); Arroio do Sal, Praia Azul, 29°28'16.8"S 49°49'44.8"W, 14 m elev., 3 February 2018, *C.C.Alff & C.Rabuske 95* (ICN!); Arroio do Sal, após a Praia Azul, 29°26'45.2"S 49°48'34.2"W, 16 m elev., 3 February 2018, *C.C.Alff & C.Rabuske 97* (ICN!); Arroio do Sal, Rondinha Nova, 29°30'06"S 49°51'33"W, 30 June 2018, *C.C.Alff & C.Rabuske-Silva 131* (ICN!). Balneário Pinhal, 1° trevo de acesso, 30°12'25.8"S 50°19'24.2"W, 17 m elev., 1 February 2018, *C.C.Alff & C.Rabuske 71* (ICN!); Balneário Pinhal, Lagoa Rondinha, 30°13'56"S 50°15'17"W, 3 m elev., 1 February 2018, *C.C.Alff & C.Rabuske 78* (ICN!). Barra do Ribeiro, campo de dunas perto da Lagoa das Capivaras, 27 January 2003, *M.L.Abruzzi 5088* (HAS!); Barra do Ribeiro, Lagoa das Capivaras, 19 May 2003, *M.L.Abruzzi 4866* (HAS!); Barra do Ribeiro, Lagoa das Capivaras, 8 December 2003, *M.L.Abruzzi 5002, 5007* (HAS!). Capão da Canoa para Tramandaí, 28

November 1988, *N.Silveira 8059* (HAS!); Capão da Canoa, Arroio Teixeira, 22 November 1991, *I.A.Santos 1398* (MPUC!). Cidreira, 26 January 1975, *L.Arzivenco s.n*. (ICN 44304!); Cidreira, 10 m elev., 15 December 2011, *E.Valduga 196* (FURB!, HUCS!, MBM!); Cidreira, Salinas, 30°08'09.6"S 50°11'18.9"W, 8 m elev., 1 February 2018, *C.C.Alff & C.Rabuske 80, 82* (ICN!). [Imbé] Tramandaí, Santa Teresinha, 27 November 1977, *H.Melo s.n*. (ICN 35799!); Imbé, Imara, RS-786, 29°53'16"S 50°05'46.6"W, 12 m elev., 1 February 2018, *C.C.Alff & C.Rabuske 84* (ICN!); Imbé, Imara, 29 December 2018, *C.C.Alff & C.Rabuske-Silva 164* (ICN!). Mostardas, Parna Lagoa do Peixe, 30 km antes de Mostardas, 9 December 1990, *M.L.Abruzzi 2198* (HAS!); Mostardas, Parna Lagoa do Peixe, Sede do Parque, 21 January 1992, *C.Costa 77* (HAS!); Mostardas, Lagoa do Peixe, 15 July 1999, *Dany & Fernando s.n*. (HURG 1794!); Mostardas, Praia do Bacopari, 30°32'36"S 50°24'45"W, 0 m elev., 15 November 2007, *E.Pasini 205* (HUCS!); Mostardas, Solidão, Lagoa dos Barros, 8 m elev., 8 January 2008, *R.Wasum 4367* (FURB!, HUCS!); Mostardas, Lagoa do Bacopari, 30°32'32"S 50°25'01"W, 5 October 2018, *C.C.Alff & C.Rabuske-Silva 150* (ICN!). Osório, 4 January 1950, *B.Rambo SJ 45229* (ICN!); [Osório], Fazenda do Arroio p. de Osório, 6 March 1950, *B.Rambo SJ 46129* (ICN!, PACA!); Osório, 28 November 1988, *O.Bueno 5293* (HAS!); Osório, Lagoa das Traíras, 29°52'08"S 50°11'13"W, 6 m elev., 28 November 2014, *C.Demeda 2* (BAB!, FURB!, FLOR! HUCS!). Palmares do Sul, Lagoa do Bacopari, 8 December 2002, *V.F.Kinupp & B.E.Irgang 2550* (ICN on 2 leaves!); Palmares do Sul, Lagoa da Porteira, 24 August 2004, *J.Mauhs s.n.* (PACA 94189!); Palmares do Sul, Lagoa da Porteira, 12 January 2005, *J.Mauhs & M.S.Marchioretto s.n*. (PACA 103203!); Palmares do Sul, próximo à Lagoa Capão Alto, 30°24'33"S 50°20'37"W, 10 m elev., 26 November 2011, *F.Gonzatti 246* (FURB!, HUCS!). Rio Grande, Quinta, 26 October 1996, *P.Brack 655* (ICN!); Rio Grande, Estrada do Senandes, 6 December 1996, *B.Irgang & C.Gastal s.n.* (HURG 1326!); Rio Grande, FURG, Campus Carreiros, 13 October 2010, *U.S.Jacobi s.n*. (HURG 4491!); Rio Grande, Povo Novo, 8 July 2018 (old flowers), *C.C.Alff & C.Rabuske 136* (ICN!). Santa Vitória do Palmar, Estação Ecológica do Taim, 13 December 1986, *F.A.Silva-Filho 682* (ICN!). [São José do Norte?], Estreito, January 1993, *P.Tagliani s.n.* (HURG 2259!). São José do Norte, Praia do Nilo, 6 November 2009, *J.Cordeiro et al. 3251* (MBM!). Tavares, Parna Lagoa do Peixe, Fazenda Haroldo Brum, 9 December 1990, *N.Silveira 10601* (HAS!); Tavares, Parna Lagoa do Peixe, Estrada "Veia Terra", 10 December 1990, *N.Silveira 10693* (HAS!). Torres, Itapeva, 10 January 1941, *Schultz 324* (ICN!); Torres, Paraíso para Torres, 12 November 1954, *B.Rambo SJ 56191* (HBR!); Torres, Praia dos padres, 12 December 1958, *A.Sehnem 7269* (PACA!);

Torres, Morro do Farol, 6 February 1965, *A.R.Schultz 4050* (ICN!); Torres, 10 January 1971, *K.Hagelund 6104* (ICN!); Torres, 19 January 1971, *K.Hagelund 6248* (ICN!); Torres, 18 April 1972, *M.S.Borges s.n*. (MPUC 1616!); Torres, Parque Estadual da Guarita (Parque de Torres), 10 July 1972, *J.Lindeman & M.L.Porto s.n.* (ICN 27896!); Torres, 21 January 1973, *K.Hagelund 6670* (ICN!); Torres, Itapeva, 22 January 1974, *K.Hagelund 7602* (ICN!); Torres, Itapeva, 21 December 1987, *J.L.Waechter 2276* (FLOR!); Torres, Itapeva, 31 December 1987, *N.Silveira 5029* (HAS!); Torres, Itapeva Norte, 4 November 2009, *J.Cordeiro et al. 3203* (MBM!); Torres, 29°25'32.24"S 49°49'21.40W, 18 November 2010, *P.J.S.Silva-Filho 1600, 1601* (ICN!); Torres, Haras Trevo de Ferro, 29°25'34.1"S 49°49'16.7"W, 13 December 2017, *E.D.Lozano & B.K.Canestraro 4069* (MBM!); Torres, Praia Real, 29°24'12.2"S 49°47'03.9"W, 14 m elev., 3 February 2018, *C.C.Alff & C.Rabuske 98* (ICN!); Torres, Itapeva, Parque Estadual de Itapeva, Lagoa do Simão, 29°22'37.8"S 49°46'22.1"W, 20 m elev., 3 February 2018, *C.C.Alff et al. 102* (ICN!); Torres, Praia Real, 29°25'38"S 49°48'15"W, 30 m elev., 30 January 2019, *C.C.Alff & C.Rabuske-Silva 174* (ICN!). Tramandaí, January 1947, *E.Henz SJ s.n*. (PACA 47453!). [Viamão], Itapoã, Praia dos Arcos, 28 December 1975, *L.Arzivenco s.n*. (ICN 42333!); Viamão, margem leste da Lagoa Negra, 26 November 1979, *C.W.Ribeiro s.n.* (HAS 11143!); Viamão, Parque Estadual de Itapuã, Praia de Fora, 23 January 1990, *L.H.Pankowski 84, 85* (HAS!); Viamão, Itapuã, 5 January 1984, *M.Sobral 3149* (FLOR!); Viamão, Itapuã, Lagoa do Palácio, 1 June 2001, *M.Giasson s.n*. (ICN 158958!). [Xangri-lá], Rainha do Mar, January 1977, *Normann 927* (ICN!); Xangri-lá, 2 km da praia de Rainha do Mar em direção à Xangri-lá, 28 November 1988, *M.Neves 1115* (HAS!); Xangri-lá, Praia de Atlântida, 26 February 1995, *R.Záchia et al. 1741* (HAS!); Xangri-lá, Estrada do Mar, 29°49'40.9"S 50°04'03.9"W, 16 m elev., 1 February 2018, *C.C.Alff & C.Rabuske 87* (ICN!). **Santa Catarina**: Araranguá, atrás do Morro dos Conventos, 15 November 1971, *J.C.Lindeman & M.L.Porto s.n.* (ICN 9123!); Araranguá, Morro dos Conventos, 4 June 2011, *A.Nuernberg & A.S.Mello 1056* (FLOR!); Araranguá, Morro dos Conventos, 28°56'04"S 49°21'49"W, 50 m elev., 26 December 2016, *L.A.Funez 5859* (FURB!). Balneário Arroio do Silva, Arroio do Silva para Araranguá, 19 February 1955, *B.Rambo SJ 56850* (HBR!); Balneário Gaivota, 29°13'59"S 49°39'00"W, 19 m elev., 30 January 2019, *C.C.Alff & C.Rabuske-Silva 179* (ICN!); Balneário Gaivota, 29°13'36"S 49°38'38"W, 17 m elev., 30 January 2019, *C.C.Alff & C.Rabuske-Silva 181* (ICN!). Florianópolis, Canasvieiras p. Florianópolis, 20 December 1947, *A.Sehnem SJ 3005* (HBR!, PACA!); Florianópolis, Jurerê, 5 m elev., 19 October 1965, *Klein & Bresolin 6279* (FLOR!, HBR!); Florianópolis, Canasvieiras, 2 m elev., 22 December 1965,

Klein et al. 6476 (FLOR!, HBR!); Florianópolis, Ilha de Santa Catarina, Rio Vermelho, 26 October 1984, *M.L.Souza & D.B.Falkenberg 424* (FLOR!, MBM!); Florianópolis, Ilha de Santa Catarina, dunas da praia da Joaquina, 2 m elev., 15 November 1992, *D.B.Falkenberg et al. 5969* (FLOR!, MBM!); Florianópolis, Rio Tavares, Lagoa da Conceição, 4 January 1994, *A.B.Andrade 9* (FLOR!, ICN!, MBM!); Florianópolis, Ilha de Santa Catarina, Parque do Rio Vermelho, final da estrada geral da praia, 0,5–1 m elev., 28 December 1994, *D.B.Falkenberg & M.L.Sousa 6771* (FLOR!, ICN!, MBM!, UPCB!); [Florianópolis], Isla Sta. Catalina, Canasvieiras, 26 January 1997, *Stienstra 261* (SI!); Florianópolis, Ilha de Santa Catarina, Parque Municipal das Dunas da Lagoa da Conceição, próximo ao estacionamento da Joaquina, 20 December 2004, *T.B.Guimarães & D.B.Falkenberg 881* (FLOR!); Florianópolis, Rio Tavares, Lagoinha Pequena, 27°39’27”S 48°28’38”W, 9 January 2011, *A.Nuernberg & A.S.Mello s.n.* (FLOR 60294!); Florianópolis, Ilha de Santa Catarina, Rio Tavares, Lagoinha Pequena, 9 November 2011, *A.Nuernberg & A.S.Mello 393* (FLOR!); Florianópolis, Ilha de Santa Catarina, entre a Lagoa da Conceição e a Praia da Joaquina, 10 November 2011, *R.E.Ardissone 297* (FLOR!); Florianópolis, Lagoa Pequena, 27°39’10”S 48°28’35”W, 26 March 2013, *P.Weber & A.S.Mello 253* (FLOR!); Florianópolis, Joaquina, Dunas da Lagoa da Conceição, 27°37’45”S 48°27’16”, 5 m elev., 5 September 2014, *L.A.Funez 3037* (FURB!); Florianópolis, Costão do Santinho, 27°27’00”S 48°22’20”W, 5 m elev., 28 November 2015, *L.A.Funez 4824* (FURB!). Içara, Balneário Rincão, 28°48’18”S 49°13’05”W, 26 m elev., 9 December 2010, *A.Korte & M.J.Rigon-Jr 5556* (FURB!). Laguna, Praia da Teresa, 10 m elev., 12 December 2000, *G.Hatschbach et al. 71831* (MBM!). Palhoça, Campo do Massiambú, 18 December 1952, *P.R.Reitz 4825* (HBR!); 5 February 1953, *P.R.Reitz 5567* (HBR!); Palhoça, Campo do Massiambú, 5 m elev., Palhoça, Campo do Massiambu, 24 September 1953, *Reitz & Klein 991* (HBR!); Palhoça, Campo do Massiambu, 3 m elev., 4 November 1953, *Reitz & Klein 1355* (HBR!); Palhoça, Guarda do Embaú, Parque Estadual do Tabuleiro, 27°54’17”S 48°35’58”W, 15 m elev., 2 December 2010, *A.Korte 5282* (FURB!); Palhoça, Três Barras, 3 December 2010, *J.Cordeiro et al. 4062* (MBM!). [Passo de Torres], Bela Torres, 0 m, 15 November 2005, *F.Marchett 445* (HUCS!, MBM!). URUGUAY. **Canelones:** Balneario Parque del Plata, Arroyo Solis Chico, 4 February 1948, *A.Burkart 17532* (SI!). Santa Ana, 34°47’37”S 55°26’52”W, 13 January 2006, *M.Bonifacino & K.Wilson 2063* (SI!).

Additional examined material:—BRAZIL. **São Paulo:** [Bertioga], Boracéia?, Petrobrás, rodovia Rio-Santos, 17.7 km antes do trevo para Mogi das Cruzes, M.C.E.Amaral

& B.Bittrich 96 (UEC barcode UEC062182 image!); Bertioga, 11 March 2008, *s.c. s.n.* (HUFU barcode HUFU00029481 image!).

6.3. Syngonanthus fischerianus (Bong.) Ruhland (1903: 256). *Eriocaulon fischerianum* Bongard (1831: 627). Type:—BRAZIL. Minas Gerais: probably *Langsdorff s.n.* (holotype LE barcode LE00001074 image!). **Figures 67–69.**

= *Syngonanthus breviracemosus* Diogo (1923: 28). Type:—BRAZIL. Santa Catarina: In campis Curitybanus, *Fr.Müller 36* (holotype R).
= *Syngonanthus fischerianus* var. *hatschbachii* Moldenke (1974: 403). Type:—BRAZIL. Paraná: Curitiba, Rio Atuba, 30 October 1973, *G.Hatschbach 32760* (holotype LL barcode 00374863 image!).

Herbs 22–39.5 cm high. **Leaves** spirally arranged, 1–6 × 0.05–0.1 cm, filiform, ascending, membranaceous, apex slightly obtuse, glabrescent, at most with hyaline trichomes up to 0.5 mm long. **Stem** absent or short, 0.5–1.5 cm long, hidden by the leaves, indument as observed in the leaves. **Spathes** 5–8.8 cm long, apex oblique, with lateral slit up to 15 mm long, frequently becoming toothed, with 2 to 6 teeth, indument similar to the observed in the other portions. **Scapes** 14–27 cm long, glabrescent or pilose, indument similar to the observed in the other portions. **Capitula** solitary, radial, hemispheric to globose, 3.5–6.5 diameter, hyaline to cream. **Involucral bracts** in 5–6 series, 2–3.5 × 0.8–1 mm, oblong to oblanceolate, wider towards the inner series, apex mucronate, stramineous to slightly hyaline, glabrous. **Flowers** 3-merous. **Staminate flowers** ca. 3.3 mm long, pedicel up to 1.3 mm long, hyaline trichomes up to 1 mm long leaving from the base; sepals free, equal, 2–2.5 × 0.3–0.5 mm, lanceolate, apex attenuate, hyaline, glabrous; petals fused up to the distal third, forming an infundibuliform corolla ca. 1 mm long, hyaline to cream, glabrous; stamens not observed. **Pistillate flowers** ca. 3 mm long, at most with pedicel 0.3–0.6 mm long, indument as observed in the staminate flowers; sepals as observed in the staminate flowers; petals fused at the mid portion, equal, 1.5 × 0.2–0.4 mm, oblanceolate, apex obtuse, hyaline, glabrous except for very sparse hyaline trichomes up to 0.15 mm long at the apex, on the abaxial surface; gynoecium ca. 1.5 mm long, cream to yellowish, ovary 3-carpellate, ca. 0.6 mm long, 3 stigmatic branches and 3 nectariferous appendages, the first slightly surpassing the latter.

Illustrations:—Moldenke & Smith (1976: 63) [line-drawings].

Etymology:—The specific epithet *fischerianus* is in honor of the German-born botanist Friedrich Ludwig von Fischer (1782–1854), director of the St. Petersburg Botanical Garden, in Russia (Moldenke & Smith 1976).

Distribution and habitat:—Southeastern to southern Brazil (Paraná and Santa Catarina). In the study area, this species occurs mainly in the High Altitude Tropical Grasslands, in Paraná and Santa Catarina, less frequently in the Subtropical Highland Grasslands. It inhabits mountain tops, in moist to wet soils, between 900–1200 m elevation (Fig. 71).

Phenology:—Flowering from November to January, less frequently in March and September.

Diagnosis:—*Syngonanthus fischerianus* can be morphologically related to *S. helminthorrizus*, being distinguished from this species by the elongated stems up to 1.5 mm long, hidden by the basal rosette (*vs.* elongated stems up to 15 cm long, conspicuous), leaves 1–6 cm long (*vs*. leaves 2–5.5 mm long), and involucral bracts 2–3.5 mm long, oblong to oblanceolate, with mucronate apex (*vs.* involucral bracts 3.8–4 mm, linear-lanceolate to lanceolate, with acute apex). Also, *S. fischerianus* occurs typically in highlands, while *S. helminthorrhizus* occurs in lower elevation ranges, in the influence area of the Paraguay-Paraná rivers.

General notes:—Types and synonyms here cited follow Echternacht (2012).

Examined material:—BRAZIL. **Paraná**: Guaratuba, Serra de Araçatuba, 1300 m elev., 10 March 1959, *G.Hatschbach 5548* (HBR!); Guaratuba, Serra de Araçatuba, 12 January 2004, *H.Longhi-Wagner et al. 8862* (ICN!); Guaratuba, Morro dos Perdidos, 25°31’56.4”S 48°34’20.6”W, 12 February 2014, *E.D.Lozano et al. 2619* (MBM!); Guarapuava, BR-277, 25°13’33”S 51°18’14.3”W, 11 December 2013, *E.D.Lozano & M.E.Engels 2239* (MBM!). Jaguariaíva, Lajeado Butiá, estrada para Fazenda Rondon, 19 November 2010, *J.Cordeiro et al. 3972* (MBM!). Palmeira, Cercado, 16 September 2008, *J.Cordeiro et al. 2988* (MBM!). Piraí do Sul, Fazenda Nova Era, 24°23’56”S 49°51’20.75”W, 1190 m elev., 15 February 2013, *M.L.Brotto et al. 960* (HUCS!, MBM!). São José dos Pinhais, Col. Roseira, 18 October 1980, *G.Hatschbach 43215* (MBM!). Tijucas do Sul, Morro dos Perdidos, 13 September 2018, *C.Rabuske-Silva et al. 354* (ICN!). **Santa Catarina**: Água Doce, 28,5 km southeast of Horizonte (Paraná), Campos de Palmas, 1000–1200 m elev., 3 December 1964, *L.B.Smith & R.Klein 13451* (HBR!). Campo Alegre, Morro Iqueririm, 1300–1500 m elev., 9–10 December 1956, *L.B.Smith & R.Klein 8536* (HBR!); Campo Alegre, Morro do Iqueririm, 1300 m elev.,

10 January 1958, *Reitz & Klein 6104* (HBR!). Campo Erê, 6 km west of Campo Erê, 900–1000 m elev., 6 July 1964, *L.B.Smith & R.Klein 13685* (HBR!). Curitibanos, 3 km from Ponte Alta, between Ponte Alta and Curitibanos, 800–900 m elev., 4 December 1956, *L.B.Smith & Klein 8260* (HBR!); Curitibanos, Marombinhas, 950 m elev., 28 November 1971, *L.B.Smith & R.Klein 15476* (HBR!). Garuva, Monte Crista, 900 m elev., 20 December 1960, *Reitz & Klein 10445* (FLOR!, HBR!); Garuva, Campos do Quiriri, 29 January 2013, *E.Barboza et al. 3502* (MBM!); Garuva, Alto Quiriri, 26°02'21"S 48°57'16"W, 1200 m elev., 4 November 2014, *L.A.Funez et al. 4014* (FURB!). Irani, Campo de Irani, 700–900 m elev., 15 December 1964, *L.B.Smith & R.Klein 13984* (HBR!). Matos Costa, 1200 m elev., 9 December 1962, *R.Klein 3612* (FLOR!, HBR!, PACA!). Porto União, Fazenda Frei Rogério, 12 km southeast of Porto União, ca. 750 m elev., 18 December 1956, *L.B.Smith & Reitz 8707* (HBR!); Porto União, 20 December 1956, *L.B.Smith & Pe.R.Reitz 8911* (HBR!). Santa Cecília, Campo Alto, 1200 m elev., 19 December 1962, *Reitz & Klein* 14230 (HBR!).

6.4. Syngonanthus helminthorrhizus (Mart. ex Körn.) Ruhland (1903: 261). *Paepalanthus helminthorrhizus* Martius ex Körnicke (1863: 443). Lectotype:—BRAZIL. In prov. Goyazensi, *Pohl s.n*. (lectotype? BR 860293 image!). **Figures 69–70.**

Herbs 30–41 cm high, hyaline trichomes up to 0.3 mm long on the leaves (both surfaces), frequently capitate, denser in the elongated stems, spathes and scapes. **Leaves** spirally arranged, 2–5.5 × 0.05–0.1 cm, linear, ascending, coriaceous, apex attenuate. **Elongated stems** 14–15 cm long, arising from the basal rosette, not bearing leaves. **Spathes** 5–6 cm long, apex oblique, lateral slit ca. 0.8 cm. **Scapes** 10.5–25.5 cm long. **Capitula** solitary, radial, hemispheric to globose, 5–11 mm diameter, arranged in umbelliform-manner at the apex of elongated stems. **Involucral bracts** in 2–3 series, 3.8–4 × 0.8–1 mm, linear-lanceolate to lanceolate, outermost series smaller, inner series narrower, apex acute, stramineous, hyaline trichomes up to 0.1 mm long on the margins and abaxial surface, frequently capitate. **Flowers** 3-merous. **Staminate flowers** ca. 3.5 mm long, pedicel up to 1 mm long; sepals 2.3–2.5 × 0.3–0.5 mm, oblanceolate to lanceolate, apex acute to attenuate, hyaline to slightly stramineous, hyaline trichomes up to 0.4 mm long on the abaxial surface; petals fused up to the distal third, forming an infundibuliform corolla up to 2 mm long, hyaline, glabrous; stamens height not measured, anthers visible outside the corolla, yellow. **Pistillate flowers** not observed.

Illustrations:—Giulietti *et al.* (2018: 20) [line-drawings].

Etymology:—The specific epithet *helminthorrhizus* refers to the aspect of the roots (From the Ancient Greek, *helminthos* = worm, *rhizoûs* = roots) (Gledhill 2008).

Distribution and habitat:—Midwestern to southern Brazil (Paraná). In the study area, *S. helminthorrhizus* was recorded exclusively in western Paraná. It inhabits moist to wet soils, ca. 495 m elevation (Fig. 71).

Phenology:—Flowering in October.

Diagnosis:—*Syngonanthus helminthorrhizus* is morphologically similar to *S. fischerianus*, as compared in the diagnosis of the later.

Nomenclatural notes:—The lectotype here cited follows Echternacht (2012), who stated that Körnicke (1863) based this species description on an unpublished manucript writen by Martius. Echternacht (*l.c.)* also cites that several collections are cited in the protologue, requiring lectotypification. However, we did not have access to other collections besides the one at BR.

General notes:—According to Giulietti *et al*. (2018), this species also occurs in the Amambay department, Paraguay, being considered rare by these authors, but we did not have access to their cited specimen.

Examined material:—BRAZIL. **Paraná**: Tuneiras do Oeste, 23°55’00.1”S 52”44’35.8”W, 495 m elev., 8 October 2013, *M.G.Caxambu et al. 4808* (MBM!); Tuneiras do Oeste, ca. 2 km da ReBio das Perobas, 12 November 2013, *E.D.Lozano et al. 1780* (MBM!).

6.5. Syngonanthus nitens (Bong.) Ruhland (1903: 254). *Eriocaulon nitens* Bongard (1831: 633). Lectotype (inadvertently designated by Moldenke):—BRAZIL. [Minas Gerais]: *Brasilia prope Prados*, June 1824, *L.Riedel 295* (lectotype LE; isolectotypes B barcode B100250266 image!, G barcode G00301710 image!, K barcode K000587255 image!, P barcode P00761871 image!, S S-R-6021 image!, U barcode U0001820 image!, UPS). **Figures 66 and 71.**

= *Syngonanthus nanus* Moldenke (1949: 175). Type:—BRAZIL. Paraná: Palmeira, December 1936, *Ceccato 118* (holotype NY barcode 00103675 image!).

=*Syngonanthus chrysanthus* var. *castrensis* Moldenke & L.B.Sm. (1973b: 431). Type:—BRAZIL. Paraná: Castro, November 1950, *J.Vidal III-74 & Silva Araujo s.n.* (holotype R 77012; isotype US barcode 00088450 [fragments and photo] image!).

Herbs 13.5–38 cm high. **Leaves** spirally arranged, 1.5–2.5 × 0.05–0.2 cm, linear, coriaceous, apex slightly obtuse, glabrescent, at most with sparse hyaline trichomes up to 0.5 mm long. **Spathes** 3–4 cm long, apex oblique, hyaline trichomes up to 0.5 mm long. **Scapes** 8.5–35 cm long, glabrescent to pilose, hyaline trichomes up to 0.1 mm long. **Capitula** solitary, radial, hemispheric to globose, 8–9.5 mm diameter, cream. **Involucral bracts** in 4–5 series, 1–2 × 0.8–1 mm, oblong to oblanceolate, wider towards the inner series, apex rounded to obtuse, slightly stramineous, cream to hyaline towards the inner series, glabrous. **Staminate flowers** 2.5–2.7 mm long, pedicel up to 1 mm long; sepals free 1.5–2 × 0.4, oblanceolate, apex slightly attenuate, cream to hyaline, glabrous, at most with sparse hyaline trichomes up to 0.3 mm long at the apex margins, even more sparse on both surfaces; petals fused up to the distal third, forming an infundibuliform corolla ca. 1 mm long, hyaline, glabrou; stamens not observed. **Pistillate flowers** 2–2.3 mm long, pedicel up to 0.5 mm long; sepals as observed in the staminate flowers; corolla and gynoecium not observed, imature.

Illustrations:—Parra (1998: 236), Giulietti *et al.* (2018: 20) [line-drawings].

Etymology:—The specific epithet *nitens* refers to the shining aspect of the species, which is popularly known as “golden-grass” (from the Latin, *nitens* = shining) (Moldenke & Smith 1976).

Distribution and habitat:—Widely distributed in Brazil, Colombia, Paraguay and Venezuela. In the study area, *S. nitens* occurs in southern Brazil (Paraná and Santa Catarina), and Paraguay (Amambay, Caaguazú, and San Pedro). In southern Brazil, this species occurs mainy in the *Campos Gerais* of Paraná, being also recorded in the *Campos do Quiriri*, High Altitude Tropical Grasslands of northern Santa Catarina. It usually inhabits mountain tops, in moist to wet soils and near rocky outcrops, between 900–1400 m elevation (Fig. 68).

Phenology:—Flowering from September to February.

Diagnosis:—*Syngonanthus nitens* is morphologically similar to *S. chrysanthus*, as compared in the diagnosis of the later.

Nomenclatural notes:—Moldenke (1977) mentions that the typical form of *S. nitens* is apparently based on the collection *L.Riedel 295* at LE, configuring an inadvertent lectotypification, based on Prado *et al*. (2015). We did not have access to this collection, but we assume that the inadvertent lectotype is correct, once Echternacht also cites the collection at LE as main material (treated as holotype by this author).

Examined material:—BRAZIL. **Paraná**: Balsa Nova, São Luiz do Purunã, 21 September 1978, *L.T.Dombrowski 9807* (MBM!). Carambeí, estrada para o Rio São João, Alto

Carambeí, 25°32’31.8”S 50°04’20.3”W, 2 November 2013, *E.D.Lozano & M.E.Engels 1693* (MBM!). Jaguariaíva, Fazenda Cajurú, source of Rio Cajurú, ca. 24°10’S 49°19’W, 1000–1100 m elev., 18 January 1965, *L.B.Smith et al. 14787* (HBR!); Jaguariaíva, Fazenda Rondon, 20 August 2010, *E.Barbosa et al. 2691* (MBM!). Palmeira, Cercado, Chapadão, 16 September 2008, *J.Cordeiro et al. 2978* (MBM!). Piraí do Sul, BR-151, 1 km S da ponte do rio Lambari, 15 October 1997, *G.Hatschbach et al. 67072* (FURB!); Piraí do Sul, Pousada Serra do Pirahy, 24°16’33.2”S 50°00’39.6”W, 2 September 2013, *E.D.Lozano & D.P.Saridakis 1474* (MBM!); Piraí do Sul, Chácara Santa Rita da Serra, 24°14’45.4”S 50°00’51.3”W, 3 September 2013, *E.D.Lozano & D.P.Saridakis 1488* (MBM!); Piraí do Sul, Fazenda Barbante, propriedade da Iguaçu Celulose, 24°15’09.4” 49°34’59.6”W, 4 September 2013, *E.D.Lozano & D.P.Saridakis 1506* (MBM!). Ponta Grossa, Vila Velha para Ponta Grossa, September 1945, *G.Hatschbach 156* (PACA!); Ponta Grossa, Rio Tibagi, Rodovia do Café, 900 m elev., 12 December 1965, *Reitz & Klein 17497* (FLOR!); [Ponta Grossa], Parque Estadual de Vila Velha, 12 September 2012, *A.R.Silva s.n.* (MBM barcode 394530!). Tibagi, Taipa de Pedra, 19 October 1993, *G.Hatschbach & J.Cordeiro 59671* (FLOR!, PEL!); Tibagi, Parque Estadual do Guartelá, Rio Iapó, 16 September 1996, *S.R.Ziller 1506* (MBM!); Tibagi, Parque Estadual do Guartelá, 29 October 2004, *C.R.Sakagami et al. 182* (UPCB!); Tibagi, Parque Estadual do Guartelá, 23 September 2005, *M.Reginato 2005* (UPCB!); Tibagi, Parque Estadual do Guartelá, 26°16’54”W 50°13’10”W, 26 September 2008, *A.E.Muelbert et al. 39* (UPCB!); Tibagi, Parque Estadual do Guartelá, 16 July 2009, *J.Meirelles & W.S.Mancinelli 359* (UPCB!); Tibagi, Parque Estadual do Guartelá, 19 August 2011, *E.D.Lozano et al. 754, 757* (HUCS!, MBM!); Tibagi, P.E.do Guartelá, 7 July 2013, *E.D.Lozano et al. 1316* (MBM!); [Tibagi], Guartelá, 24°30’06.8”S 50°26’30.1”W, 1201 m elev., 2 October 2014, *S.M.Lo s.n.* (UPCB 80679!). **Santa Catarina**: Campo Alegre, Serra Quiriri, 1400 m elev., 29 September 2001, *O.S.Ribas et al. 3658* (MBM 262625 image!). PARAGUAY. **Amambay:** Cerro Corá, Parque Nacional, 8 August 1987, *F.Mereles 1046* (SI!). **Caaguazú:** Yhu, 19 September 1988, *T.M.Pedersen 15053* (SI!). **San Pedro:** Villa San Pedro, December 1916, *T.Rojas 2031* (SI!).

Doubtful and excluded taxa

Most of the taxa below are included in this section because their occurrence is cited in at least one of the following studies: Moldenke & Smith (1976), Giulietti (2008), Sano (2014), BFG

(2015), Giulietti *et al*. (2018), and Zuloaga *et al* (2019). These taxa are presented and briefly discussed below.

Actinocephalus polyanthus var. bifrons (Silveira) Sano (2004: 104). *Paepalanthus bifrons* Silveira (1928: 206). Type:—BRAZIL. Minas Gerais: [Couto de Magalhães de Minas] In campis in Chapada do Couto, April 1918, *Silveira 681* (holotype R on 6 sheets barcodes R 0018098, R 0018098a, R 0018098b, R 0018098c, R 0018098d, R 0018098e images!).

Nomenclatural notes:—The holotype citation follows Sano (2004), however we treated it as a gathering organized on more than one sheet.

General notes:—*Paepalanthus bifrons* was proposed by Silveira (1928) exclusively based on the distinct colour of the capitula (Sano 1998), thus being further treated as a variety by Sano (2004). Silveira (*l.c.*) makes reference to this variety in Rio Grande do Sul, southern Brazil, presenting an image of Josué Deslandes in the Ilha dos Marinheiros, Rio Grande, in the state coast, next to a subpopulation of a species which he identifies as *P. bifrons* (Fig. 74). However, we collected and analyzed several materials from this same location, being treated as the typical *A. polyanthus*, in agreement with previous authors who states that *A. polyanthus* var. *bifrons* is restricted to the region of Diamantina, in Minas Gerais, southeastern Brazil (Trovó *et al.* 2008). Therefore, we discard the occurrence of this taxon the study area.

Eriocaulon dictyophyllum Körnicke (1856: 600). Syntypes:—BRAZIL. [Minas Gerais] In arenosis udis ripae fluvii S. Francisci, prope vicum Salgado, prov. Minarum, August 1818, *Martius s.n.* (M barcodes M0152651, M0152652 images!). [São Paulo] in aquis fluentibus prope Batataes, June 1834, *Riedel 2303* (B barcode B100244430 image!, G, K, LE barcode 00002809 image!, P, U barcode 0008293 image!).

Nomenclatural notes:—Chagas (2017) chose as lectotype of this species the collection *Martius s.n.*, M barcode M0152651, segregating *Riedel 2303* as a new species for science (excluded syntypes). Although, this lectotypification was not validated.

General notes:—Moldenke & Smith (1976) cite this species for Santa Catarina, southern Brazil. Nevertheless, the single pointed material, *E.Ule 1382* (P barcode P01879336 image!), corresponds to *E. modestum* in our opinion. Based on this, we discard the occurrence of *E. dictyophyllum* in the study area.

Eriocaulon leptophyllum Kunth (1841: 549). Lectotype (inadvertently designated by Moldenke 1969: 261):—BRAZIL. [Rio Grande do Sul]: [1825], *F.Sellow d2513* (lectotype B barcode B 10 0244407 image!; isolectotype barcode B 10 0244408 image!).

= *Eriocaulon argentinum* A.Cast. (1945: 83). Type:—[illustration] Gen. et Sp. Pl. Argent. 3: 83. 1945 (based on *Niederlein 2257*, according to Abbiatti 1946b).

Nomenclatural notes:—The type collection, *Sellow d2513*, present divergent information relating to the type location. The sheet corresponding to the inadvertent lectotype mentions only "Brasilia meridionali", while the second sheet is labeled "Montevideo", in Uruguay, fact already pointed by Moldenke (1969). Although, Sellow's number of collection corresponds to Rio Grande do Sul, southern Brazil, probably somewhere between Porto Alegre and São Leopoldo, according to Herter (1945).

General notes:—We prefered to include *E. leptophyllum* as a doubtful species due to its strong similarity to other species of the genus, such as *E. modestum*, and the cited divergences relating to the type specimens. Distinctly from *E. modestum*, our analysed specimens presented staminate flowers with sepals fused at the base or fused up to median portion (*vs*. staminate flowers with sepals fused up to the distal third, forming a tubulose calyx), floral character which is mentioned by some authors (e.g. Abbiatti 1946a, Giulietti *et al*. 2018). In this matter, Ruhland (1903) describes sepals fused up to the mid portion, but expresses doubt about the length of this fusion ("sepala 3, ad medium (vel etiam ultra?) in spatham antice fissam connata"). Once Kunth (1841) does not present a description of the staminate flowers, not observed in the type material, and we had few specimens for comparison, it is difficult to confirm the reliability of this character and assure that *E. leptophyllum* corresponds, in fact, to the many specimens further identified as this species. Besides this character, these specimens previously classified as *E. leptophyllum* are usually smaller than many of the examined specimens of *E. modestum*, and their capitula display a compact aspect, even ovoid, similarly to *E. crassiscapum* and *E. cinereum* R.Brown (1810: 254), this last being recorded in midwestern Brazil according to BFG (2015) and Chagas (207).

In the study area, the described morphotype is typically related to *E. leptophyllum*, occurring in northeastern Argentina (Corrientes, and Misiones), and southern Brazil (Paraná). According to Giulietti *et al.* (2018), this species also occurs in eastern Paraguay (Alto Paraná,

and Guairá). The collections from Paraná are from the municipalities of Guaíra (border with Mato Grosso do Sul state, and Paraguay), and Jaguariaíva, in the northest region. Curiously, besides the type location, we did not find specimens corresponding to this morphotype southwards Paraná. Actually, we observed that the specimens identified as *E. leptophyllum* in herbaria, collected in Rio Grande do Sul and Santa Catarina, southern Brazil, and Uruguay, fit better in *E. modestum*, including those mentioned by Moldenke & Smith (1976).

Eriocaulon ligulatum (Vell.) L.B.Smith (1939: 124). *Dupatya ligulata* Vellozo (1829: 36). Lectotype (designated by Chagas *et al.* 2018):—[illustration] Original parchment plate of Florae fluminensis deposited at the Manuscript Section of the Biblioteca Nacional of Rio de Janeiro, and later published in Vellozo, Fl. Flumin. Icones 1: t. 86. 1831.

General notes:—We observed the existence of historical impasses relating the taxonomic circumscription of *E. ligulatum*, *E. gomphrenoides* and *E. helichrysoides*. Most of the specimens collected in the study area and identified as *E. ligulatum* correspond, in fact, to *E. gomphrenoides*, as well as to *E. helichrysoides*. These misidentifications are probably due to the poor description and illustration of *E. ligulatum* in the protologue. According to Chagas *et al.* (2018), this illustration is dubious, and can be representative of "several members of a group of robust *Eriocaulon* species with truncate spathes". These authors provide a table comparing several taxa of Eriocaulaceae, including the ones described by Vellozo and other related species. Nevertheless, between the three cited species, the data overlap in several features, such as leaf indument, capitulum shape, involucral bracts shape, as well as shape and indument of the petal (pistillate flowers). The only striking differences occur between *E. ligulatum* and the other referred species, including the involucral bracts apex and sepal indument. Considering only the characters pointed by Chagas *et al.* (*l.c*), all our analysed material from the SSA fits better under *E. gomphrenoides* and *E. helichrysoides*, not *E. ligulatum*. According to our adopted circumscription, *E. gomphrenoides* is easily distinguished by the bilateral and reniform capitula, while the morphotypes related to *E. ligulatum* and *E. helichrysoides* always have radial capitula. Agreeing not being possible to establish a satisfatory circumscription of *E. ligulatum* based on the protologue, we based our conception of this species in the lectotype of a currently accepted synonym, *E. vaginatum* Körnicke (1863: 483), collection *Sellow 99* (B barcode B 10 0184188 image!), as well as its remaining syntypes.

The difficulties arise when we tried to apply the characters provided in the previously referred survey to differentiate *E. ligulatum* from *E. helichrysoides*, both with radial capitula. Sano & Giulietti (2012) point the echinate aspect of the capitula, a consequence of the floral bracts longer than the flowers, in *E. helichrysoides*, character which is not observed in *E. ligulatum*.

Oliveira & Bove (2015) cite some diagnostic features, among them the involucral bracts surpassing the diameter of the capitula in *E. helichrysoides*, without comparison for *E. ligulatum*. Moreover, the echinate aspect of the capitula is also cited, a consequence of the floral bracts with acuminate apex, similarly to Sano & Giulietti (2012). The floral bracts with acuminate apex are also cited for *E. ligulatum*, but with no mention to the general aspect of the capitula. Most of the other characters are the same for both species.

Chagas (2017) differs *E. helichrysoides* from *E. ligulatum* by the larger capitula, 14–20 mm diamater (*vs*. 10–12 mm diameter), involucral bracts of the external series longer than the flowers (*vs.* equal or smaller than the flowers), cream (*vs*. brown), with acute apex (*vs.* rounded to obtuse), sepals usually stramineous (*vs*. blackish), and anthers cream or olive (*vs.* olive). In the notes of *E. ligulatum*, however, this author mentions the similarity between the two species, including the colour of the involucral and floral bracts cream, stramineous or brown, disagreeing with his own diagnosis. The apex of the involucral bracts are also cited by Chagas *et al*. (2018), plus other reproductive characters of the pistillate flowers, such as indument of the sepals (glabrous in *E. ligulatum*, and pilose in *E. helichrysoides*).

Based on the set of characters provided by these authors, we fit our analysed specimens in a broad concept of *E. helichrysoides*, but we think that the differentiation between this taxon and *E. ligulatum* should be better analysed, once they present a great amount of similarities, difficulting the identification even by specialists on Eriocaulaceae, as observed in some herbaria, given that identification labels from different taxonomists were divergent in many of the analysed collections. While the specimens from Paraguay are strongly compatible with the type specimens of *E. helichrysoides*, the specimens from southern Brazil are harder to fit in this species, mainly due to their general aspect and smaller measurements.

Eriocaulon missionum A.Cast. (1945: 88). Type:—ARGENTINA. Misiones: Posadas, 15 January 1907, *Spegazzini s.n.* (holotype BAF barcode BAR00000032 [fragments and line-drawings] image!).

Nomenclatural notes:—The type collection image of *E. missionum* was examined through JSTOR (2000 onwards), and consists of fragments accompanied by line-drawings, these being very likely the originals of the illustrations exhibited in the protologue. As it is not possible to identify this taxon based on the remaining fragments of the holotype, we think that an epitype must be chosen. So far, we are not able to indicate any collection as epitype, only suggesting its necessity for further studies.

General notes:—Abbiatti (1946b) observed the existence of a new species for science during her first survey on the Argentinean Eriocaulaceae, referred by this author as previously published by Castellanos (1945). Based on the available morphological data, it is possible to infer that *E. missionum*, if a valid taxonomic entity, as confirmed by Abbiatti (1946b), is closer related to other typically small species of *Eriocaulon*, such as *E. crassiscapum* and *E. modestum*. Because of the poor information we have about *E. missionum*, we prefer to include it as a doubtful species. We highlight the fact that the type collection is from Misiones, Argentina, where it is also recorded the dubious *E. leptophyllum*. For example, some collections present identification labels of both taxa at SI (e.g. *A.Cardozo et al. 282*!, *E.R.Guaglianone et al. 905*!).

Eriocaulon modestum f. viviparum Herzog ex Moldenke (1973b: 432). Type:—BRAZIL. Bahia: [Formosa do Rio Preto], Rio Preto, August 1912–1913, *P.von Luetzelburg 15510* (holotype M barcode 0152631 image!; isotype NY barcode 001022643 image!).

General notes:—Moldenke & Smith (1976) cite *E. modestum* f. *viviparum* for Paraná, southern Brazil, based on the collection *Dusén 2467* (R). We did not have access to this collection, not being able to confirm its identification. However, Chagas (2017), in his appendix IV, suggests that *E. modestum* f. *viviparum* is a synonym of a new species for science, being distributed in western Bahia and northwestern Minas Gerais, Brazil, being thus discarded in our study area.

Eriocaulon weddellianum A.L.R.Oliveira (2015: 187). *Eriocaulon sellowianum* var. *longifolium* Moldenke (1951: 417). Type:—BRAZIL. [Goiás] Prov. de Goyaz: Salinas, 1844, *Weddell 2138* (holotype BR; isotypes P barcodes P01724145, P01724146, P01724147 images!).

General notes:—This species is cited for Paraná, southern Brazil, based on the collection *G.F.J.Pabst 10145* (RB), firstly referred by Moldenke & Smith (1976) as *E. sellowianum* var. *longifolium*. This variety was described by Moldenke (1951) due to its "leaves usually more than an inch long (up to 6 cm long), thin-membranous, and pellucid". The analysed material from our study area correspond to *E. sellowianum,* including specimens identified as the cited variety by Moldenke at MBM. Thus, we discard the occurrence of *E. wedellianum* in the study area.

Eriocaulon sp.

General notes:—A single specimen from the Serra do Quiriri, High Altitude Tropical Grasslands of Santa Catarina, similar to the morphotypes included as *E. helichrysoides* from Piraí do Sul, Paraná, was not included as examined material of any known species, due to the lacking of more collections to proper analyse, as well as field expeditions in the cited region being here considered doubtful. The collection was made by *J.Cordeiro & C.B.Poliquesi 929*, in 19 November 1992, and is housed at MBM. The referred specimen displays smaller measurements, and leaves especially recurved, almost falcate. It was previously identified as *Eriocaulon* cf. *ulaei* by Nancy Hensold, in 1993, being further considered a new species by Chagas (2017, unpublished).

Leiothrix flavescens var. polystemma (Silveira) Giulietti & Hensold (1991: 49). *Leiothrix polystemma* Silveira (1928: 293). Type:—BRAZIL. Minas Gerais: Baraúna, April 1918, *Silveira 737* (holotype R on 4 sheets barcodes 000137864, 000137864a, 000137864b, 000137864c images!).

= *Leiothrix polystemma* var. *robusta* Silveira (1928: 294). Type:—Brazil. Paraná: secus margines fluminis Pirahy, prope Estação Pirahy, E.F.S.Paulo – Rio Grande, February 1916 *Michaeli s.n.* (holotype R barcode 000137863 image!).

Nomenclatural notes:—Regarding *L. flavescens* var. *polystemma*, both Silveira (1928) and Giulietti & Hensold (1991) did not specify the main material among the specimens of the type collection at R. Although, theres is a holotype label in the first sheet (barcode 000137864)

by Giulietti. As the labels of the *Herbarium Silveira* are the same in all the sheets, and their barcodes are sequential, we assume they can be treated as a holotype organized in four parts.

General notes:— *Leiothrix flavescens* var. *polystemma* is cited for Paraná by Giulietti & Hensold (1991), based on the synonym *L. polystemma* var. *robusta*, which the type was collected near the Piraí River. We did not examine the type specimens in person, but we are considering all our analysed material of *L. flavescens* as typical, fiting in the protologue description.

Paepalanthus bryoides (Riedel ex Bong.) Kunth (1841: 520). *Eriocaulon bryoides* Riedel ex Bongard (1831: 624). Lectotype (inadvertently designated by Moldenke (1973a: 160):— BRAZIL. [Minas Gerais]: In cavitatis? rupium Serra da Lapa, November 1824, *Riedel 1406?* (lectotype L barcode LE00001141 image!; isolectotypes B barcode B 10 0247844 image!, S S-R-3872 image!, U barcode 0001780 image!).

Nomenclatural notes:—Bongard (1831) and Kunth (1841) did not provide Riedel's number of collection of the type specimens, only the locality and habitat ("in rupibus, locis umbrosis Serra da Lapa"). The first author also provided the month and year of collection, November 1824. Although, Moldenke (1973a) cites *Riedel 1416* at L as holotype of this species. Prior to Moldenke (1973a), Ruhland (1903) cited this same collection, but probably referring to the duplicate at B. As the protologue does not specify Riedel's number, and none of the examined material previously cited as type perfectly fits the protologue in relation to the location description, we can not assure if they are, in fact, original material. If Ruhland (1903) and Moldenke (1973a) are proved to be correct, than Moldenke (*l.c.*) made an inadvertent lectotypification, according to Prado *et al.* (2015) and Turland *et al*. (2018). A single collection *Riedel s.n.* containing Serra da Lapa as location and corresponding to *P. bryoides* was also found at BR (barcode 000000861763 image!). Besides an isotype label by Moldenke, this collection at BR presents a handwriting label that informs "cited as Riedel 1416 in Pflanzen. 4 (30): 159 (1903)".

General notes:—*Paepalanthus bryoides* was cited by Moldenke & Smith (1976) in Southern Brazil. Although, we identified the analyzed specimens as *P. bellus*, thus discarding the occurrence of *P. bryoides* in the study area. We based our decision on the analysis of the type specimens, as well as their geographical disjunction, following the observations of Marcelo Trovó (pers. comm.).

Paepalanthus decorus Abbiatti (1949: 307). Type:—BRAZIL. Rio Grande do Sul: Uruguayana, 1 March 1909, *s.c. 16389 in herb. Spegazzini* (holotype LP on 2 sheets!).

Nomenclatural notes:—*Paepalanthus decorus* was described based on specimens supposely collected by Carlos Spegazzini, not being recollected for more than 100 years. However it is difficult to assure that he was, in fact, the collector of the type specimens. The plants from Spegazzini's herbarium, now housed at LP, are a result of several expeditions made by him and collaborators (Katinas *et al.* 2000). In the type collection of *P. decorus*, only the herbarium number is available, with no specific reference to the collector or the initials C.S., which Spegazzini used in the plants he had collected. Also, Katinas *et al.* (*l.c.*) present a table with the main expeditions carried out by Spegazzini, and Rio Grande do Sul, southern Brazil, is not cited among the several locations provided.

General notes:—Abbiatti (1949) classify *P. decorus* in *Paepalanthus* sect. *Diphyomene*, based on Ruhland (1903), and also states that this species is closer related to *P. flaccidus* (Bongard 1831: 636) Kunth (1841: 511), being distinguished by the smaller length of the stems, longer scapes, involucral bracts surpassing the disc of flowers, and pedicellate pistillate flowers. We consider *P. decorus* a doubtful species due to its strong similarity with *P. flaccidus*, and poor information on the site of collection, which is not compatible with Spegazzini's expeditions, according to Katinas *et al.* (2000).

Paepalanthus planifolius var. globulifer (Silveira) Moldenke & L.B.Smith (1973e: 355). *Paepalanthus globulifer* Silveira (1928: 240). Type:—BRAZIL. [Minas Gerais]: In campis humosis humidisque in serra do Cipó, April 1909, *Silveira 551* (holotype R on 2 sheets barcodes R 000179915, R 000179915a images!).

General notes:—Moldenke & Smith (1976) identified as *P. planifolius* var. *globulifer* several specimens from the municipalities of Garuva, Palhoça, Rancho Queimado, and Santo Amaro da Imperatriz, in Santa Catarina, southern Brazil. These collections actually correspond to *P. pruinosus*, as already pointed by Tissot-Squalli (1997a), and confirmed by us. Thus, we discard the occurrence of the cited variety in the study area.

Paepalanthus striatus Ruhland (1903: 149). Lectotype (designated by Trovó & Sano 2010b):—BRAZIL. São Paulo: Campos da Bocaina, dans le bois près des sources du Rio Parahybo, 10 Ferbuary 1876, *A.Glaziou 7994* (lectotype B barcode B 10 0247654 image!; isolectotypes C barcodes C10011026, C10011027 images!, G barcode G00099156 image!, K barcode K000587306 image!, LL barcode 00374812 [fragments] image!, P barcodes P00716732, P00716733, P00716734 images!). Remaining syntype:—BRAZIL. São Paulo: Serra da Bocayna, September 1879, *W.Schwacke 1912* (B barcode B 10 0247653 [fragments] image!).

General notes:—*Paepalanthus striatus* is cited by Sano (2014) and BFG (2015) for Paraná, southern Brazil. Few collections previously identified as this species were found at MBM, all corresponding to *P. tessmannii* in our opinion. Despite their similarity, Sano & Giulietti (2012) consider them as distinct species, and it is possible to observe other distinctive characters besides the colour of the floral bracts in the respective descriptions of each species, such as indument, shape and apex of the involucral and floral bracts.

Syngonanthus anthemidiflorus (Bong.) Ruhland (1903: 258). *Eriocaulon anthemidiflorum* Bongard (1831: 636). Syntypes:—BRAZIL. [Minas Gerais]: Serra da Lapa, habitat in paludosis, November 1924, *L.Riedel 1409* (B, BR barcode 000000860091 image!, G barcode G00301758 image!, K barcode K000640205 image!, LE, OXP, P barcode P00761881 image!, UPS).

Nomenclatural notes:—Echternacht (2012) cites the collection at LE as holotype, but we assume that the correct decision would be to choose a lectotype, once this collection presents duplicates in several herbaria. Here, we prefer to treat them as syntypes, once this species does not occur in our study area.

General notes:—The reference collection from Argentina, *A.de Llamas s.n.* (BAF), cited by Castellanos (1945) and Giulietti (2008), was not examined by us. However, *S. anthemidiflorus* is endemic to the Espinhaço Range, Minas Gerais, Brazil, occurring from Ouro Preto (in the south) to Grão Mogol (in the north), according to Echternacht (2012), being discarded in our study area by now.

Syngonanthus gracilis (Bong.) Ruhland (1903: 249). *Eriocaulon gracile* Bongard (1831: 634). Type:—BRAZIL. [Minas Gerais]: Habit in umbrosis siccis montis Itacolomi, August 1824, *L.Riedel s.n.* (holotype LE).

General notes:—*Syngonanthus gracilis* is cited for the study area by several of the mentioned authors. Although, its occurrence in the SSA is doubtful, based on our analysed material and a recent synopsis of the genus *Syngonanthus* that cites this species for northeastern and southeastern Brazil (Echternacht 2012). Most of the analysed specimens referred to as *S. gracilis* are acaulescent specimens of *S. caulescens* (including the ones cited by Moldenke & Smith 1976). At least in southern Brazil, the occurrence of *S. gracilis* is discarded. One of the collections cited by Giulietti *et al.* (2018), *E.Hassler 9436* (P barcode P01765725 image!), and it seems to fit better in their own description of *S. nitens*, mainly due to the larger height and longer scapes than the described for *S. gracilis*.

Final considerations

As a result of our field expeditions, ca. 110 collections of Eriocaulaceae were added to the ICN herbarium. This institution now presents the most representative collection of this family at least in Rio Grande do Sul, encompassing all the confirmed taxa that occur in this state. Specimens from Santa Catarina and Paraná are also housed at ICN, some of them configuring requested donations from FLOR.

A new endemic species to the Coastal Plain grasslands of Southern Brazil, *E. itapevense*, was described in the first year of our studies (Appendix I). In herbaria, two isotypes were identified, from *E. moldenkei* at PACA, and from *E. candidum* at ICN, both names currently synonyms of *E. modestum*. We also found a possible isotype of *P. balansae* var. *densiflorus* at MBM, which needs further confirmation.

Despite nomenclatural issues concerning types are not in an effective publication, as requested by the *Shenzen Code* (Turland *et al.* 2018), some measures (mainly lectotypifications) are indicated in our taxonomic treatment, to be further published and validated. Ten lectotypifications are proposed, and 15 inadvertent lectotypifications were found, four of them requiring second-step lectotypifications. Three new synonyms are suggested: *E. arechavaletae* under *E. gomphrenoides*, *E. caaguazuense* under *E. sellowianum*, and *P. balansae* var. *densiflorus* under *P. balansae*. Two species are reestablished, *E. reitzii*,

from *E. magnificum* (based on Oliveira & Bove 2015), and *P. hatschbachii*, from *P. catharinae* var. *hastschbachii*. Both occurring restricted to highlands, and being considered endemic to the Subtropical Highland Grasslands and High Altitude Tropical Grasslands, respectively.

The ten following taxa had their occurrence excluded in the study area, at least until new evidences are found to support it: *Actinocephalus polyanthus* var. *bifrons*, *Eriocaulon dictyophyllum*, *E. modestum* f. *viviparum*, *E. wedellianum*, *Leiothrix flavescens* var. *polystemma*, *Paepalanthus bryoides*, *P. planifolius* var. *globulifer*, *P. striatus*, *Syngonanthus anthemidiflorus*, and *S. gracilis*. In our view, further studies are necessary to clarify the taxonomic identity of four species included in *Eriocaulon*, being them: *E. helichrysoides*, *E. leptophyllum*, *E. ligulatum*, and *E. missionum*. Approaches based on morphometry, cytogenetics and molecular biology may be desirable to understand the full variation of these taxa. Some morphotypes from the Serra do Quiriri montaneous region, northern Santa Catarina and northeastern Paraná, southern Brazil, as well as Misiones, in the Argentine Mesopotamia, are particularly in need of more detailed studies, including extensive fieldwork. We also highlight the necessity of studies encompassing floral visitors and associated fauna, mainly due to the cited observations concerning small invertebrates and amphibians.

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Numerical list of species of Eriocaulaceae in subtropical South America

1. *Actinocephalus polyanthus* (Bong.) Sano
2. *Comanthera xeranthemoides* (Bong.) L.R.Parra & Giul.
3. *Eriocaulon crassiscapum* Bong.
4. *E. gomphrenoides* Kunth
5. *E. helichrysoides* Bong.
6. *E. itapevense* Alff & Stützel
7. *E. macrobolax* Mart. ex Körn.
8. *E. magnificum* Ruhland
9. *E. modestum* Kunth
10. *E. reitzii* Moldenke & L.B.Sm.
11. *E. sellowianum* Kunth
12. *Leiothrix flavescens* (Bong.) Ruhland
13. *Paepalanthus albo-vaginatus* Silveira
14. *P. balansae* Ruhland
15 *P. bellus*
16. *P. caldensis* Malme
17. *P. catharinae* Ruhland
18. *P. chiquitensis* Herzog
19. *P. hatschbachii* Moldenke
20. *P. henriquei* Silveira & Ruhland
21. *P. kleinii* (Moldenke & L.B.Sm) Trovó
22. *P. paulensis* Ruhland
23. *P. planifolius* (Bong.) Körn.
24. *P. pruinosus* Ruhland

25. *P. tessmannii* Moldenke
26. *Syngonanthus caulescens* (Poir.) Ruhland
27. *S. chrysanthus* (Bong.) Ruhland
28. *S. fischerianus* (Bong.) Ruhland
29. *S. helminthorrhizus* (Mart. ex. Körn.) Ruhland
30. *S. nitens* (Bong.) Ruhland

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S.c. *s.n.* [HUFU barcode HUFU00029481] (28). **S.c.** *s.n.* [*16389 in herb. Spegazzini*] (19).

Abbott, J.R. 16850 (18). **Abruzzi, M.L.** 1031 (4), 2198 (28), 2347 (9), 2418 (27), 4429 (27), 4475 (9), 4486 (27), 4487 (8), 4760 (27), 4789 (9), 4839 (27), 4866 (28), 4867 (9), 4869 (12), 4870 (1), 4871 (1), 4904 (8), 5002 (28), 5007 (28), 5087 (12), 5088 (28). **Aguiar, T.H.** 114 (2). **Alff, C.C.** 20 (4), 24 (9), 39 (4), 49 (17), 50 (4), 61 (28), 62 (8), 63 (28), 64 (28), 71 (28), 72 (9), 73 (8), 75 (8), 77 (9), 78 (28), 79 (8), 80 (28), 82 (28), 84 (28), 86 (8), 87 (28), 88 (8), 89 (28), 91 (28), 92 (8), 95 (28), 96 (8), 97 (28), 98 (28), 99 (8), 100 (6), 101 (27), 102 (28), 103 (27), 104 (27), 106 (27), 108 (17), 109 (27), 110 (4), 112 (17), 113 (27), 115 (4), 118 (27), 119 (27), 121 (17), 122 (17), 123 (4), 124 (17), 125 (27), 126 (27), 127 (17), 128 (17), 129 (16), 130 (8), 131 (28), 132 (6), 133 (6), 136 (28), 140 (1), 141 (1), 148 (6), 149 (9), 150 (28), 151 (4), 156 (4), 157 (4), 158 (4), 160 (4), 163 (9), 164 (28), 166 (1), 171 (8), 172 (9), 173 (12), 174 (28), 176 (6), 178 (1), 179 (28), 180 (8), 181 (28), 182 (9), 183 (1), 184 (1), 225 (17), 227 (17), 229 (16). **Amaral, C.C.E.** 96 (28). **Andrade, A.B.** 9 (28). **Andrade, B.O.** 84 (26), 102 (12), 123 (26), 157 (27), 201 (11), 335 (12), 350 (27), 374 (4). **Arbo, M.M.** 1427 (27), 6992 (27), 8857 (14). **Ardissone, R.E.** 177 (27), 190 (12), 212 (27), 296 (1), 297 (28). **Arechavaleta, J.** 2561 (28). **Arigany, T.** *s.n.* [HAS 42835] (1), **Arzivenco, L.** *s.n.* [ICN 42333] (28), *s.n.* [ICN 44304] (28), *s.n.* [ICN 48542] (8). **Augusto** *s.n.* [MPUC 10937] (28). **Azambuja, I.** *s.n.* [HURG 830] (9).

Balansa, B. 568 (14). **Baptista, L.R.M.** *s.n.* [ICN 4750] (27). **Barbosa, E.** 230 (2), 246 (24), 389 (24), 466 (27), 479 (16), 849a (11), 2396 (27), 2637 (15), 2673 (5), 2691 (31), 3119 (5), 3362a (11), 3392 (27), 3502 (29), 3532 (12), 3534 (13). **Barboza, Z.** 4166 (4). **Barreto, K.D.** 2971 (13). **Bassan, M.H.** 647 (8). **Bellan, A.F.** *s.n.* [MPUC 8208] (12), *s.n.* [MPUC 11086] (8). **Beneton, G.** 392 (9). **Biganzoli, F.** 1709 (27). **Bittencourt, V.L.** 186 (8), 236 (16), 292 (8). **Bizarro, O.M.R.** 115 (24). **Bloemer, H.C.** 7 (1). **Blum, C.T.** 1287 (27), 1750 (24). **Boechat, S**. *s.n.* [ICN 41929] (4), *s.n.* [ICN 41931] (16). **Bona, C.** 187 (16), 264 (27), 306 (4). **Bonifacino, M.** 2063 (28). **Borges, M.S**. *s.n.* [MPUC 1616] (28). **Borges, R.A.X.** 1279 (27). **Brack, P.** 655 (28), 658 (4). **Braga, R.** *s.n.* [UPCB 641] (4), 92 (14), 98

Gabriela *s.n.* [MPUC 20858] (9). **Gasper, A.L.** 2966 (10), 3561 (12), 3573 (13). **Gatti, A.L.S.** 180 (13). **Gaudichaud** 103 (9), 104 (28). **Giasson, M**. *s.n.* [ICN 158958] (28). **Goldenberg, R.** 661 (15). **Gonzatti, F.** 214 (4), 239 (9), 246 (28), 439 (27), 2269 (16), 3447 (27). **Goergem, J.** *s.n.* [ICN 50017] (17), *s.n.* [ICN 50036] (16), *s.n.* [ICN 50037] (16). **Görgen, A.** 453 (4). **Grings, M.** 1925 (6). **Grizzon, M.** 120 (27). **Guarino, E.S.G.** 1156 (4). **Guaglianone/Guagliaone, E.R.** 5 (11), 2955 (4). **Guimarães, T.B.** 746 (9), 840 (9), 881 (28), 911 (9).

Hagelund, K. 1244 (4), 6104 (28), 6112 (27), 6248 (28), 6610 (27), 6670 (28), 7606 (28), 9037 (8), 11423 (6), 12106 (17), 12531 (4), 16132 (27). **Harter, B.** *s.n.* [MPUC 21135] (4). **Hassler, E.** 1522 (27), 8885 (11), 9499 (140, 11345 (14). **Hatschbach, G.** 156 (31), 997 (13), 1191 (11), 1443? (20), 1461 (13), 1500 (24), 1555 (16), 1583 (13), 2057 (11), 2868 (4), 2911 (13), 3147 (26), 5063 (24), 5131 (12), 5297 (12), 5316 (27), 5548 (29), 5552 (12), 6810 (26), 6907 (12), 7123 (13), 7303 (24), 7394 (15), 8261 (24), 8311 (4), 8518 (12), 8723 (11), 22145 (13), 22500 (26), 22800 (13), 22965 (24), 23211 (1), 24712 (13), 24944 (24), 25558 (11), 25898 (11), 26306 (11), 26328 (24), 28553 (12), 28255 (11), 30992 (11), 32597 (24), 32730 (11), 32760 (29), 32963 (13), 33472 (15), 35441 (26), 35574 (1), 35636 (11), 35772 (12), 39220 (23), 40448 (26), 41881 (11), 42657 (13), 42658 (26), 43215 (29), 43246 (15), 45676 (26), 45702 (13), 46027 (15), 47567 (11), 48461 (14), 48810 (13), 48847 (11), 58163 (26), 58176 (12), 58204 (13), 58708 (14), 59671 (31), 59673 (23), 61682 (17), 67072 (31), 68806 (13), 68810 (1), 68958 (11), 71586 (25), 71670 (4), 71831 (28), 72596 (16), 79146 (9). **Heiden, G.** 1156 (1). **Henz, E**. *s.n.* [PACA 47453] (28). **Hertel, R.** 274 (13). **Herter** 2110 (9). **Herzog** 114 (18).
Iganci, J.R.V. 707 (16). **Imaguire, N.** 120 (4), 221 (24), 454 (24), 2777 (12). **Irgang, B.E.** *s.n.* [HURG 1100] (1), *s.n.* [HURG 1249] (9), *s.n.* [HURG 1326] (28), *s.n.* [HURG 2014] (9), *s.n.* [ICN 7398] (17), *s.n.* [ICN 20790] (1), *s.n.* [ICN 27895] (6), *s.n.* [ICN 27897] (27), *s.n.* [ICN 32414] (4), *s.n.* [ICN 125389] (17), *s.n.* [ICN 125390] (16), *s.n.* [ICN 125394] (17), 319 (27). **Irmão Augusto** *s.n.* [MPUC 230] (27), *s.n.* [PACA 11809] (27). **Irmão Edésio** 5556 (27).

Jacobi, U.S. *s.n.* [HURG 4491] (28). **Jakobi, H.** *s.n.* [UPCB 19724] (1). **Jönsson, G.** 438-a (2). **Jarenkow, J.A.** 264 (9), 1836 (8), 2718 (4).

Kiesling, R. 9808 (27). **Kinupp, V.F.** 2550 (28). **Klein/Klein, R./Klein, R.M.** 3406 (16), 3470 (27), 3612 (29), 3802 (13), 4336 (4), 4470 (16), 4580? (1), 6277 (9), 6279 (28), 6392 (1), 6476 (28), 7592 (1). **Korte, A.** 3840 (4), 4796 (17), 5282 (28), 5556 (28). **Kozera, C.** *s.n.* [EFC 9766] (27), 2015 (27), 2041 (12), 2397 (17), 2473 (24), 2671 (11), 2672 (27), 2810 (27), 2814 (9), 2826 (12), 2827 (27), 3162 (11), 3194 (27), 3242 (27), 3356 (12). **Krapovickas, A.** 13474 (7), 23102 (11), 24178 (27), 39676 (11), 45669 (7). **Krieger, P.L.** 9812 (12), 11248 (12), 11321 (24), 11376 (11). **Krul** 111 (26). **Kummrow,**

Neves, M. 1115 (28), 1116 (9), 1147 (17), 1149 (16). **Nicolack, V.** 8 (24). **Nicora, E.** 9921 (27). **Normann** 927 (28). **Nuernberg, A.** *s.n.* [FLOR 60294] (28), 393 (28), 1038 (8), 1056 (28).

Oliveira, P.I. 775 (26), 778 (27). **Osten, C.** 22940b (9).

Pabst, G. 6787 (24). **Pankowski, L.H.** 84 (28), 85 (28). **Parolin, M.** *s.n.* [MBM barcode 388851] (12). **Pasini, E.** 205 (28), 233 (9), 524 (9), 592 (16). **Paz, J.** 14 (17), 18 (4), 50 (27), 110 (27), 11 (27). **Pedersen, T.M.** 1891 (7), 3653 (9), 9400 (27), 10095 (27), 12707 (1), 13409 (7), 14827 (28), 15053 (31), 15038 (7), 15045 (14). **Pedralli, G.** *s.n.* [HURG 1080] (9). **Pérez, L.** 409 (7). **Pohl** *s.n.* [BR 860293] (30). **Poiret** *s.n.* [P 162057] (27). **Poliquesi, C.B.** 460 (23), 583 (4), 590 (13), 641 (1), 680 (26). **Porto, M.L.** *s.n.* [ICN 21702] (27), *s.n.* [ICN 22079] (16) 657 (27), 1099 (4).

Queiroz, M.H. 115 (27).

Rabuske, C./Rabuske-Silva, C./Silva, C.R. 54 (6), 354 (29), 355 (12), 356 (4), 377 (27), 482 (27). **Rambo, B.** 134 (27), 135 (8), 8482 (27), 8785 (27), 9063 (27), 9717 (27), 30865 (27), 30866 (4), 31472 (27), 32001 (17), 33294 (16 mixed with 27), 33980 (27), 33981 (8), 35244 (27), 36783 (27), 36785 (4), 37322 (6), 38682 (27), 39320 (27), 39773 (27), 45183 (12), 45228 (27), 45229 (28), 45243 (8), 45414 (27), 45480 (17), 46129 (28), 46148 (27), 46178 (27), 46190 (8), 46813 (8), 47053 (9), 49400 (16), 49439 (17), 49585 (27), 49606 (21), 49611 (1), 52087 (27), 52140 (27), 52183 (4), 53783 (17), 53784 (16), 54575 (4), 54685 (27), 54863 (8), 56190 (9), 56191 (28), 56772 (27), 56850 (28), 60229 (10), 61454 (8), 63602 (27). **Reginato, M.** 527 (4), 2005 (31). **Regnell, A.F.** III 1268 (16). **Rego, S.C.A.** *s.n.* [ICN 88166] (1). **Reitz/Reitz, P.R./Reitz, R.** *s.n.* [PACA 32004] (1), C863 (1), c1207 (6), C1244 (9), C1975 (16), 991 (28), 1355 (28), 3924 (25), 4687 (1), 4718 (13), 4737 (27), 4738 (1), 4740 (11), 4794 (4), 4825 (28), 4900 (1), 4921 (12), 5281 (11), 5300 (13), 5376 (25), 5417 (25), 5428 (10), 5567 (28), 5604 (25), 5605 (9), 5874 (12), 6063 (13), 6104 (29), 6893 (8), 7705 (16), 10060 (25), 10120 (4), 10161 (17), 10169 (25), 10251 (10), 10290 (12), 10368 (25), 10445 (29), 11593 (27), 13403 (4), 13478 (4), 13580 (4), 13618 (4), 13744 (4), 13772 (4), 14169 (17), 14230 (29), 15580 (4), 16400 (11), 16405 (27), 15457 (26), 17461 (13), 17467 (12), 17469 (11), 17472 (27), 17478 (1), 17497 (31), 17620 (27), 17625 (11), 17980 (12). **Ribas, O.S.** 388 (11), 394 (12), 587 (11), 691 (4), 692 (11), 896 (13), 1588 (13), 1589 (24), 1591 (26), 1593 (26), 2281 (13), 2744 (26), 3658 (31), 3665 (13), 4518 (27), 5025 (27), 6528 (20), 8375 (12). **Ribeiro, C.L.** 131 (24), 306 (1), 307 (2). **Ribeiro, C.W.** *s.n.* [HAS 11143] (28). **Riedel** *s.n.* [BR barcode 860207] (2), 295 (31), 296 (3), 395 (24), 480 (5), 1065 (2), 1406? (15),1479 (12). **Ritter, M.** 787 (27). **Roderjan, C.V.** 459 (1), 505 (11), 868 (1), 1435 (24), 1740 (13), 1760 (1), 1767 (17). **Rodriguez, F.M.** 104 (27). **Rojas/Rojas, T.** *s.n.* [*in herb. Osten 8331*] (27), 2031 (31), 2033 (11), 2034 (11).

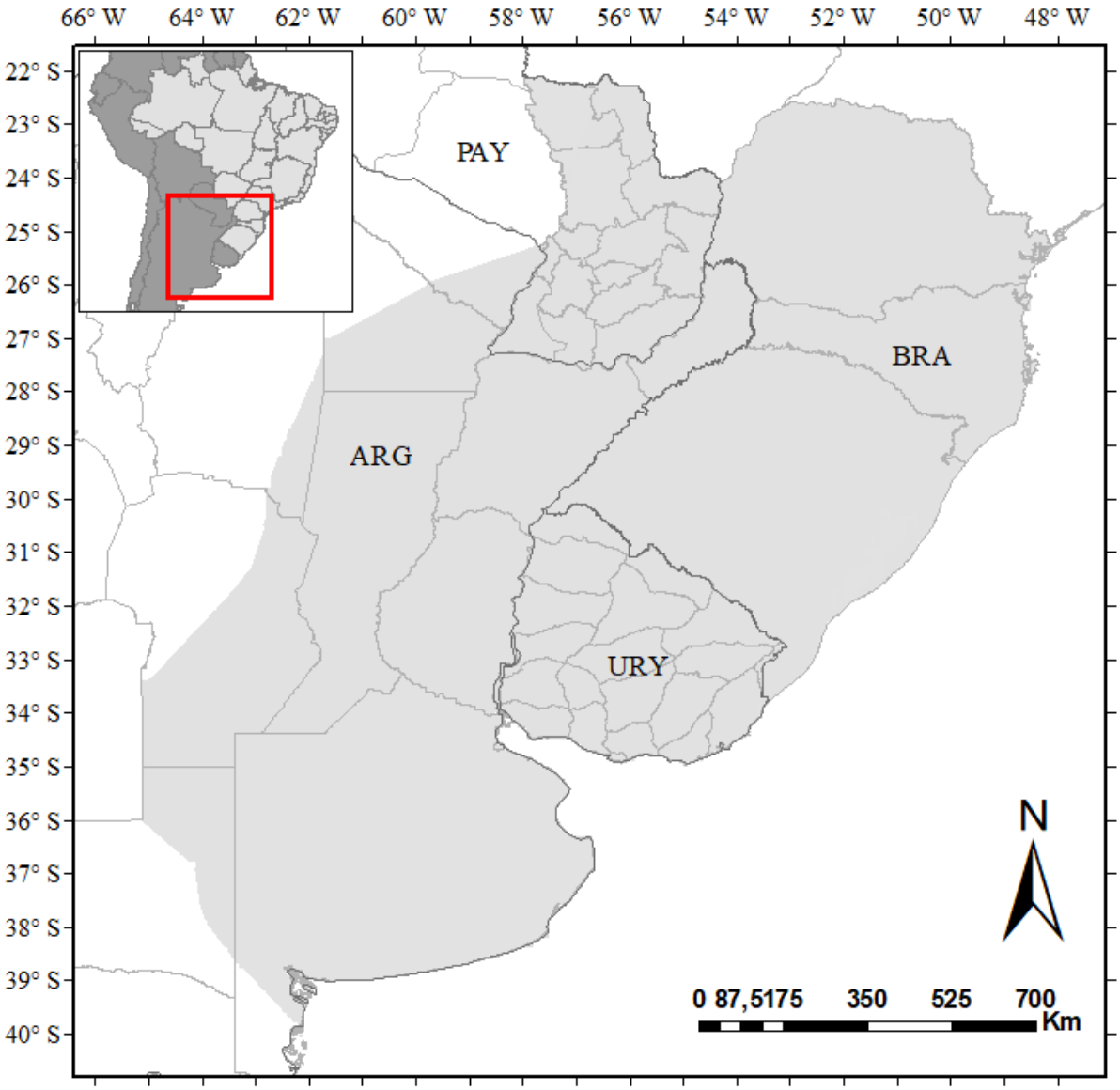

FIGURE 1. Map of the study area (grey area) in South America, encompassing northeastern Argentina (ARG), southern Brazil (BRA), eastern Paraguay (PAY) and Uruguay (URY).

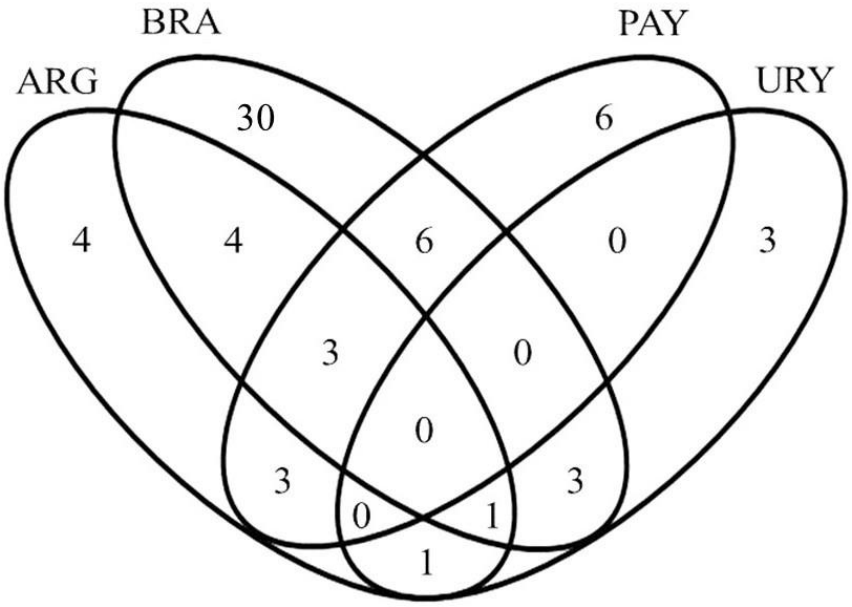

FIGURE 2. Venn diagram depicting number of exclusive and shared species among the countries in subtropical South America (ARG = Argentina; BRA = Southern Brazil; PAY = Paraguay; URY = Uruguay).

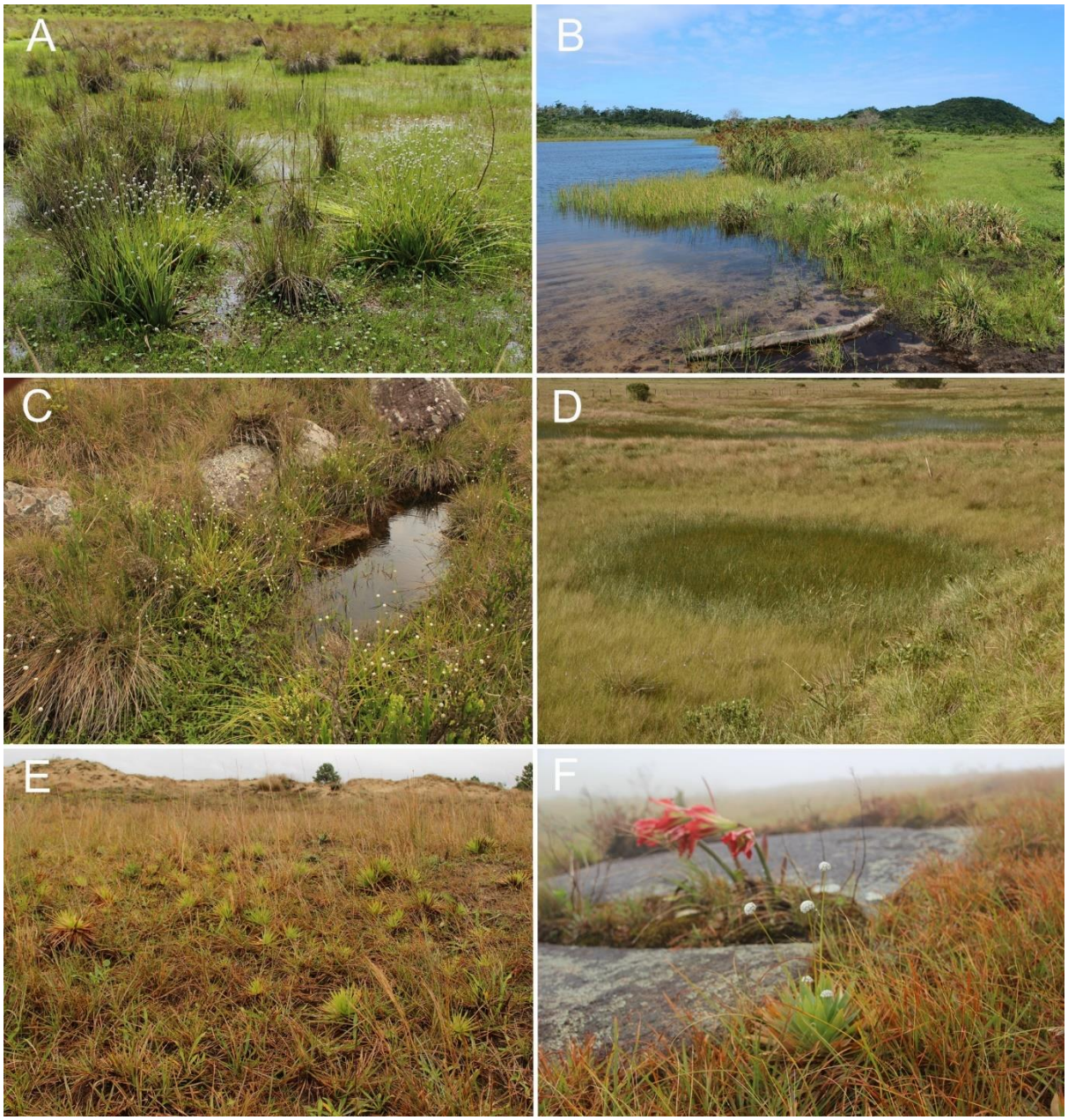

FIGURE 3. Typical habitats of Eriocaulacae in subtropical South America. A) Bog with *Eriocaulon gomphrenoides*, in the Subtropical Highland Grasslands. B) Edge of lagoon with *E. itapevense*, in the Coastal Plain Grasslands. C) Stream with *E. reitzii*, in the Subtropical Highland Grasslands. D) Small shallow pond surrounded by distinct species of Eriocaulaceae, in the Coastal Plain Grasslands. E) Dunes with *Actinocephalus polyanthus*, in the Coastal Plain Grasslands. F) Shallow moist soil with *Paepalanthus planifolius*, near rocky outcrop, in the High-Altitude Tropical Grasslands. Images A, E, and F by Cassio Rabuske da Silva, B by Carolina Costa Alff, C by Josimar Külkamp, and D by Thomas Stützel.

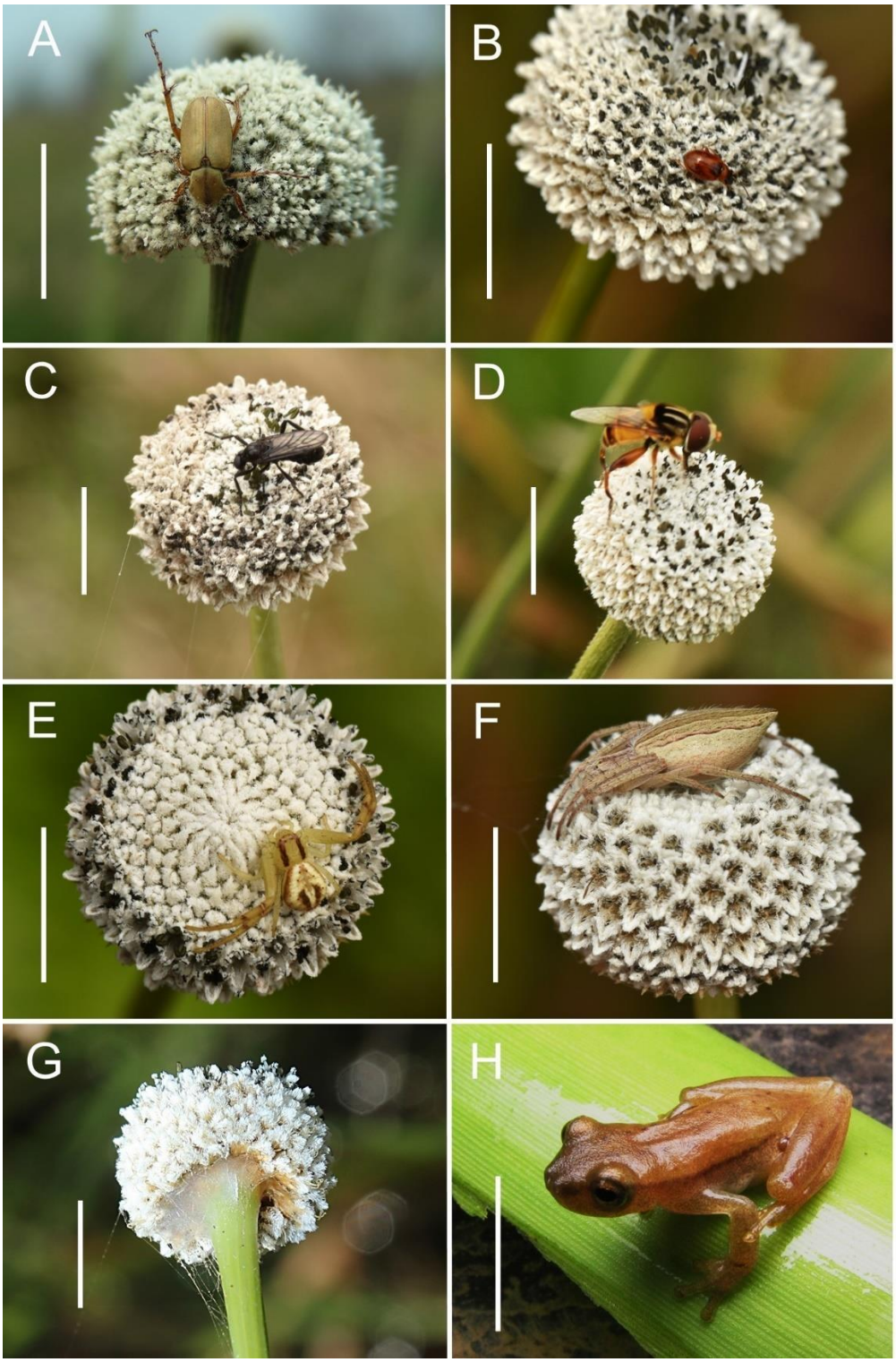

FIGURE 4. Floral visitors and associated fauna in Eriocaulaceae in subtropical South America. A) Capitulum of *Paepalanthus planifolius* with Coleoptera. B–D) Capitula of *Eriocaulon itapevense* with Coleoptera (B), non-identified insect (C), Diptera (D), and two distinct genera of spiders, *Misumenops* (E) and *Eustala* (F). G) Capitulum of *E. magnificum* displaying a small silk web. H) Treefrog *Dendropsophus sanborni* found in rosette of *Eriocaulon* sp. Scale bars: A–G) 0,5 mm; H) 9 mm. Images A–F by Thomas Stützel, G by Cassio Rabuske da Silva, and H by Patrick Colombo.

FIGURE 5. *Actinocephalus polyanthus* (Eriocaulaceae) from Barra do Ribeiro, Rio Grande do Sul, southern Brazil (*A.A.Schneider 1629*, ICN barcode 00044147).

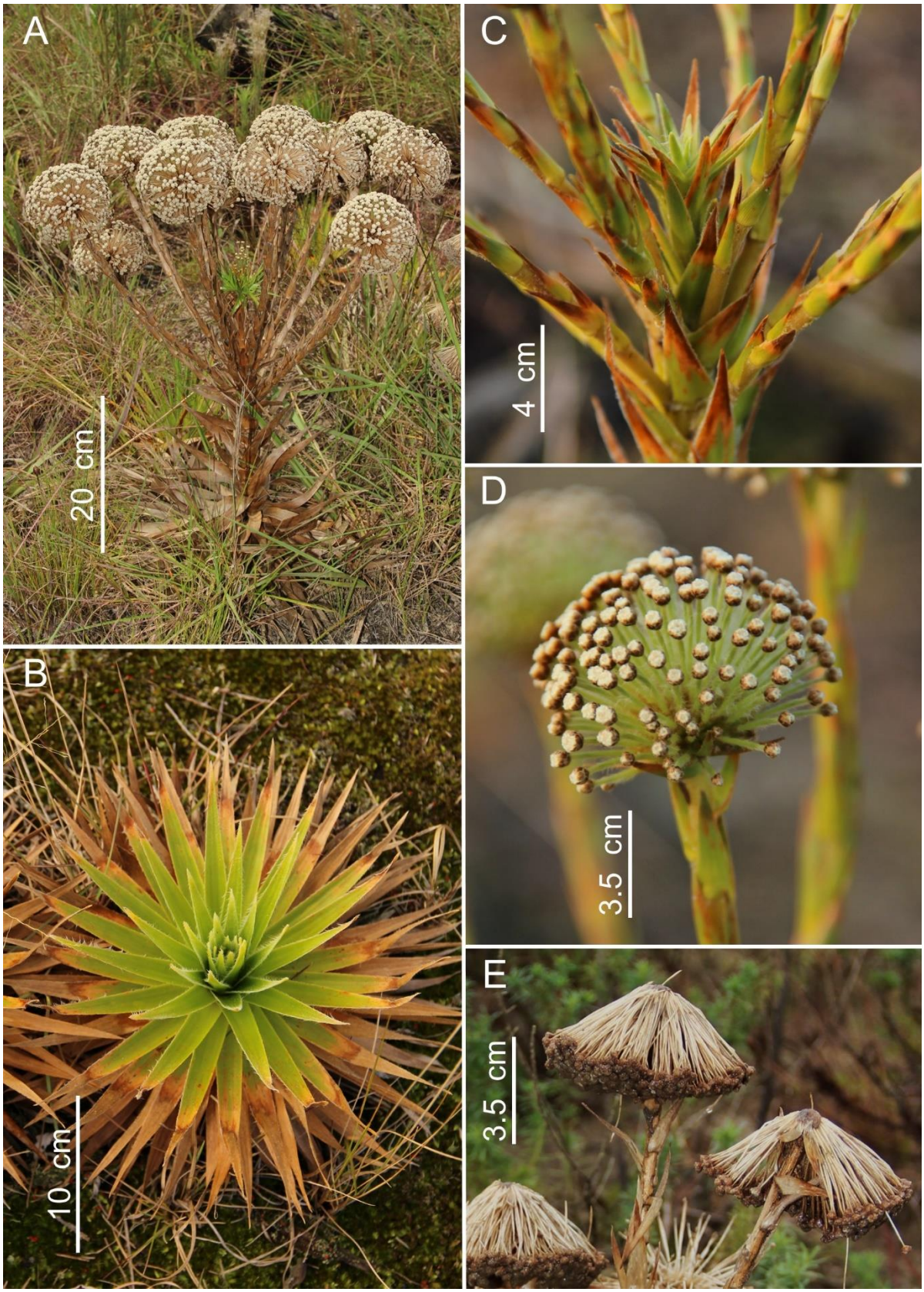

FIGURE 6. *Actinocephalus polyanthus* (Eriocaulaceae). A) Habit. B) Basal rosette in top view. C) Branches at the apex of the reproductive axis. D) Umbel of capitula. E) Decaying inflorescences ready to dispersion. Images A–E by Cassio Rabuske da Silva.

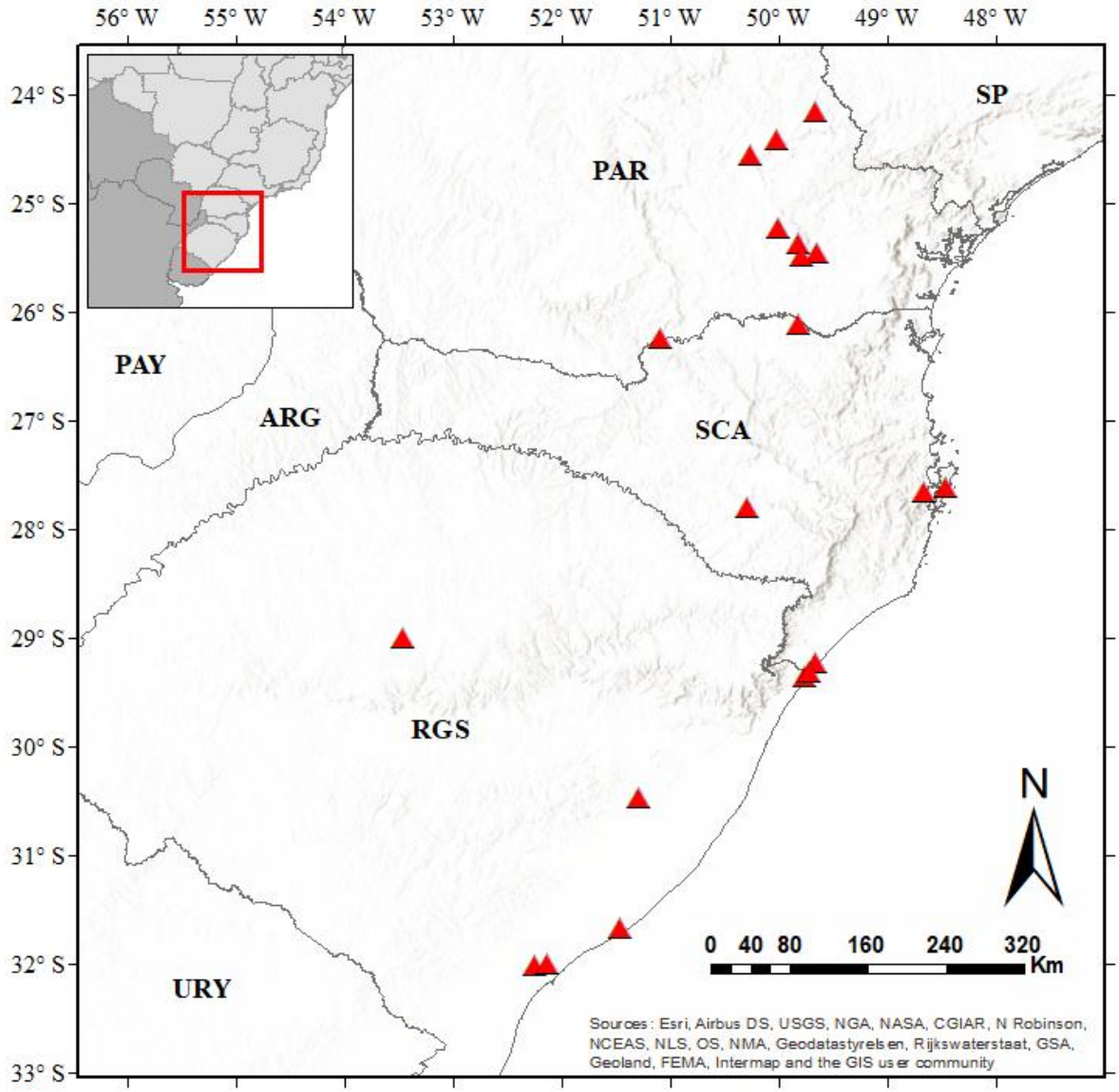

FIGURE 7. Distribution map of *Actinocephalus polyanthus* (Eriocaulaceae) (red triangle) in subtropical South America (ARG = Argentina; PAR = Paraná; PAY = Paraguay; RGS = Rio Grande do Sul; SCA = Santa Catarina; SP = São Paulo; URY =Uruguay).

FIGURE 8. *Comanthera xeranthemoides* (Eriocaulaceae) from Jaguariaíva, Paraná, southern Brazil (*V.Linsingen 331*, MBM 272343).

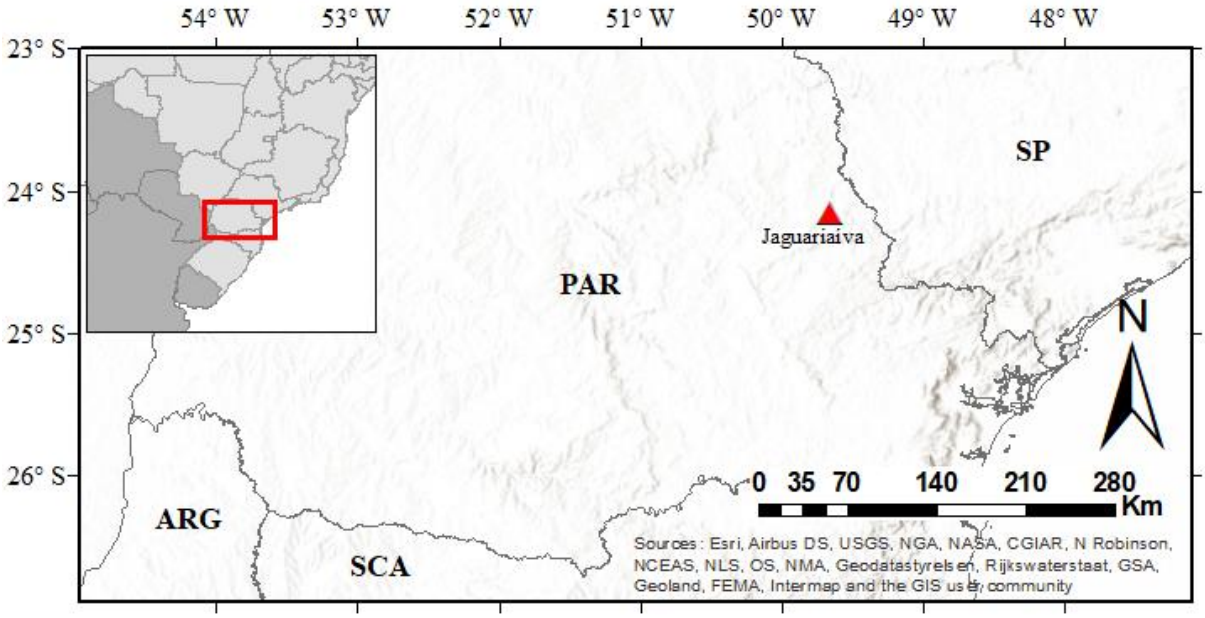

FIGURE 9. Distribution map of *Comanthera xeranthemoides* (Eriocaulaceae) (red triangle) in subtropical South America, occurring exclusively in Jaguariaíva, northeastern Paraná, southern Brazil (ARG = Argentina; PAR = Paraná; SCA = Santa Catarina; SP = São Paulo).

FIGURE 10. *Eriocaulon crassiscapum* (Eriocaulaceae) from Tibagi, Paraná, southern Brazil (*G.Hatschbach* 2861, MBM 37352).

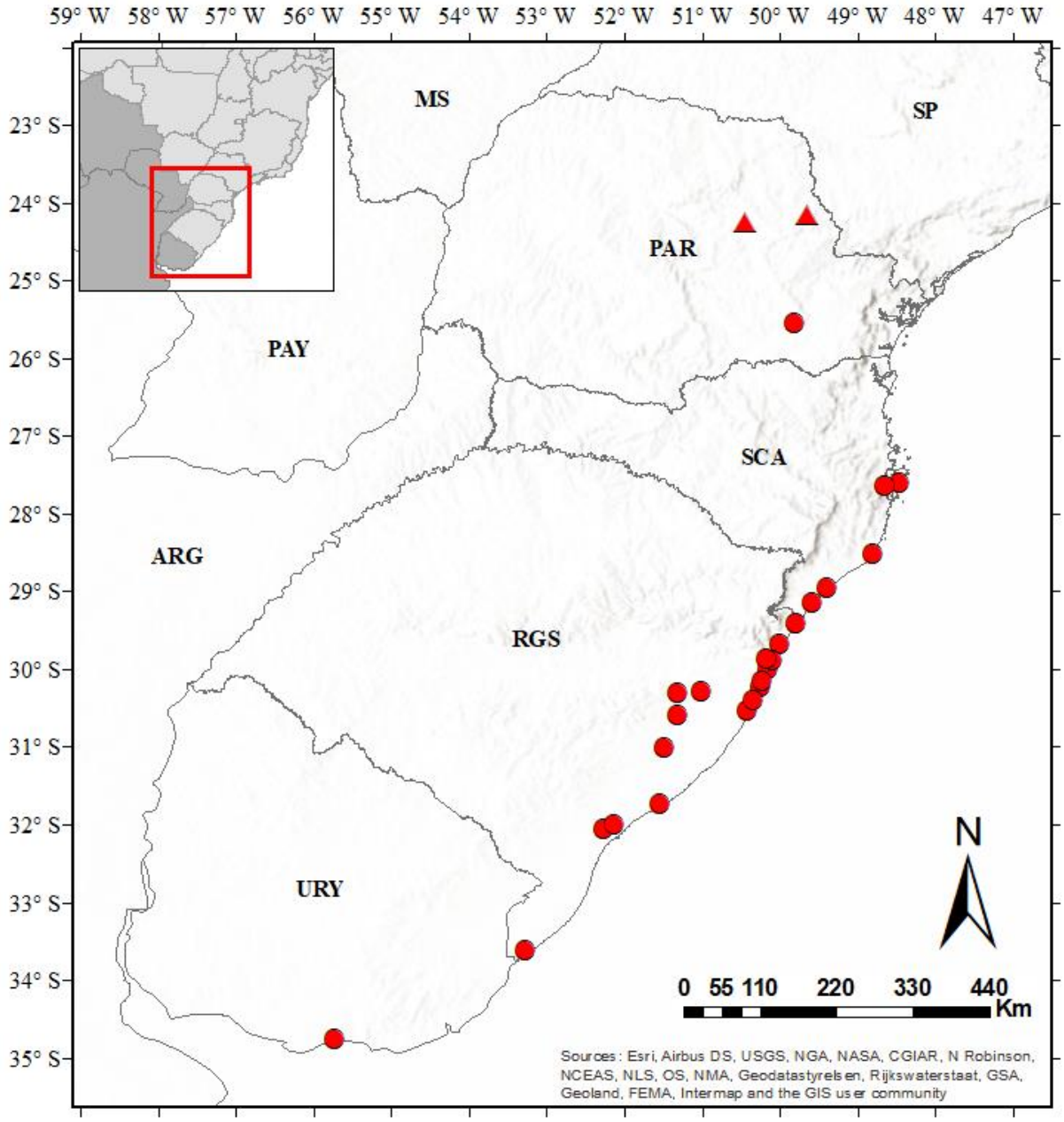

FIGURE 11. Distribution map of *Eriocaulon crassiscapum* (red triangle) and *E. modestum* (Eriocaulaceae) (red circle) in subtropical South America (ARG = Argentina; MS = Mato Grosso do Sul; PAR = Paraná; PAY = Paraguay; SCA = Santa Catarina; SP = São Paulo; URY = Uruguay).

FIGURE 12. *Eriocaulon gomphrenoides* (Eriocaulaceae) from Jaquirana, Rio Grande do Sul, southern Brazil (*C.C.Alff & C.Rabuske Silva 157*, ICN barcode 00044149).

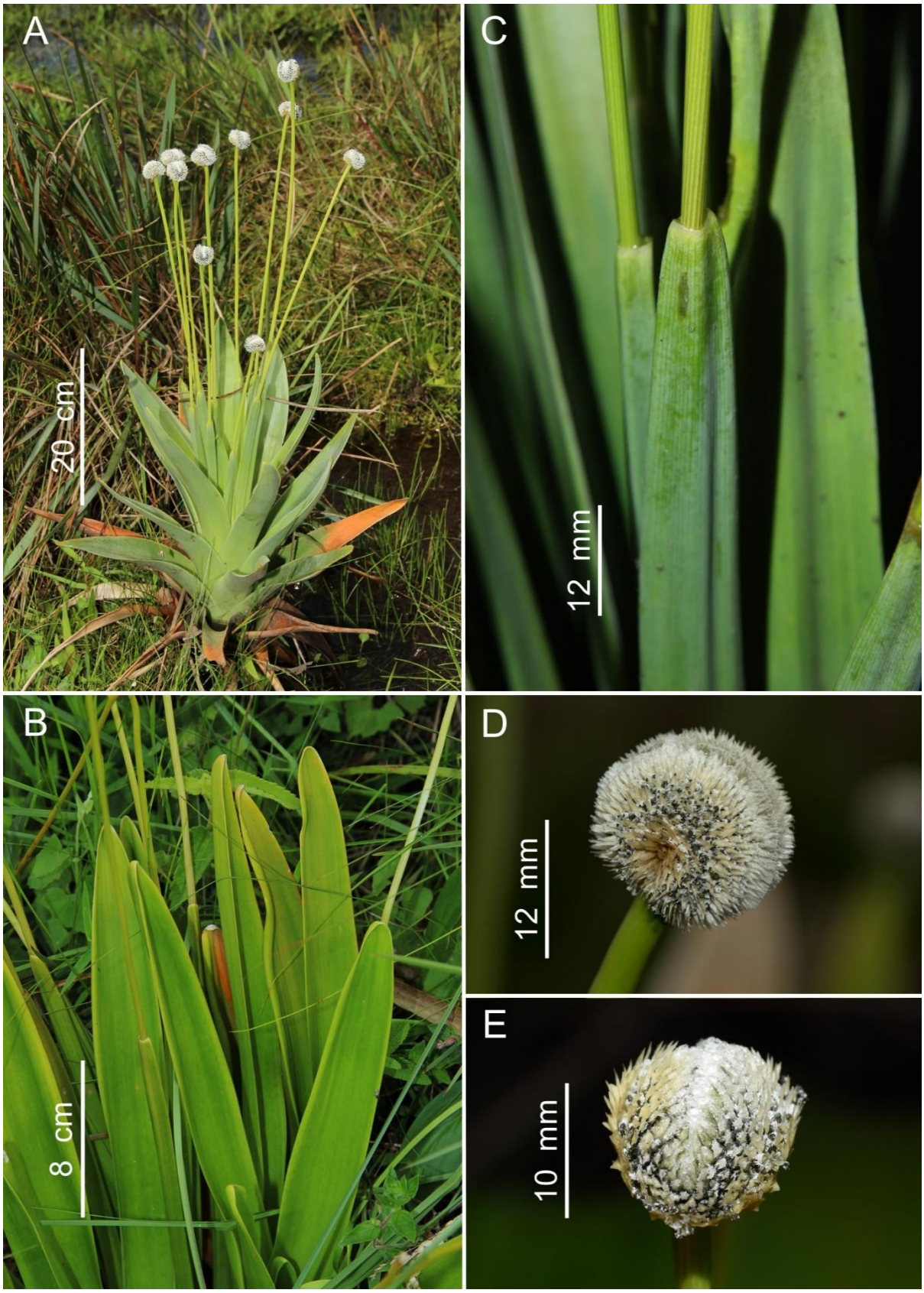

FIGURE 13. *Eriocaulon gomphrenoides* (Eriocaulaceae). A) Habit. B) Detail of the leaves. C) Spathes apex. D) Capitulum in lateral view. E) Capitulum in frontal view. Images A–C by Cassio Rabuske da Silva, D by Martin Grings, and E by Martin Molz.

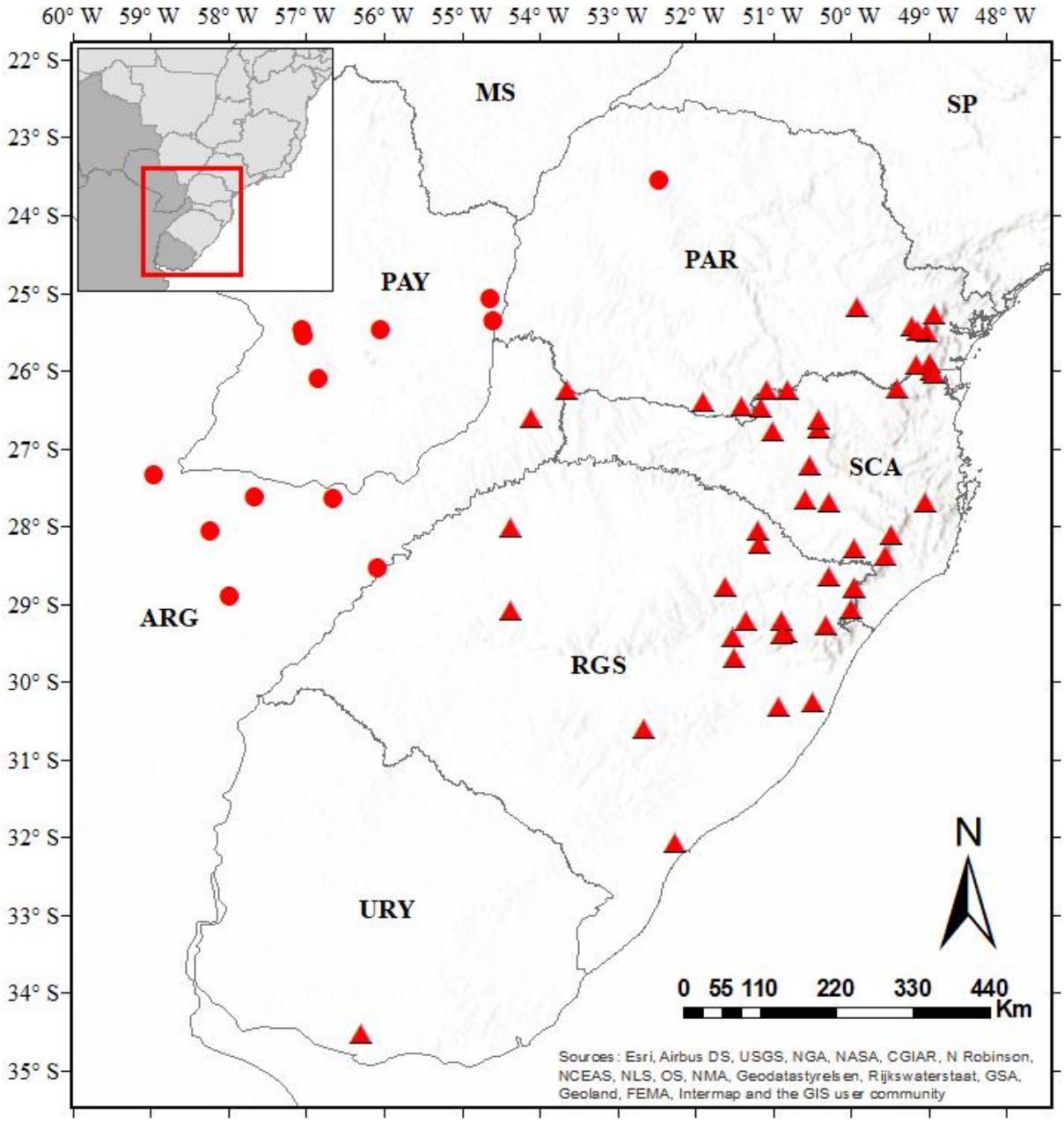

FIGURE 14. Distribution map of *Eriocaulon gomphrenoides* (red triangle) and *E. macrobolax* (Eriocaulaceae (red circle) in subtropical South America (ARG = Argentina; MS = Mato Grosso do Sul; PAR = Paraná; PAY = Paraguay; RGS = Rio Grande do Sul; SCA = Santa Catarina; SP = São Paulo; URY =Uruguay).

FIGURE 15. *Eriocaulon helichrysoides* (Eriocaulaceae) from Jaguariaíva, Paraná, southern Brazil (*V.Linsingen 281*, MBM barcode 272345).

FIGURE 16. *Eriocaulon helichrysoides* (Eriocaulaceae) from Hernanderias, Alto Paraná, Paraguay (*E.Buttura 1061*, MBM barcode 272345).

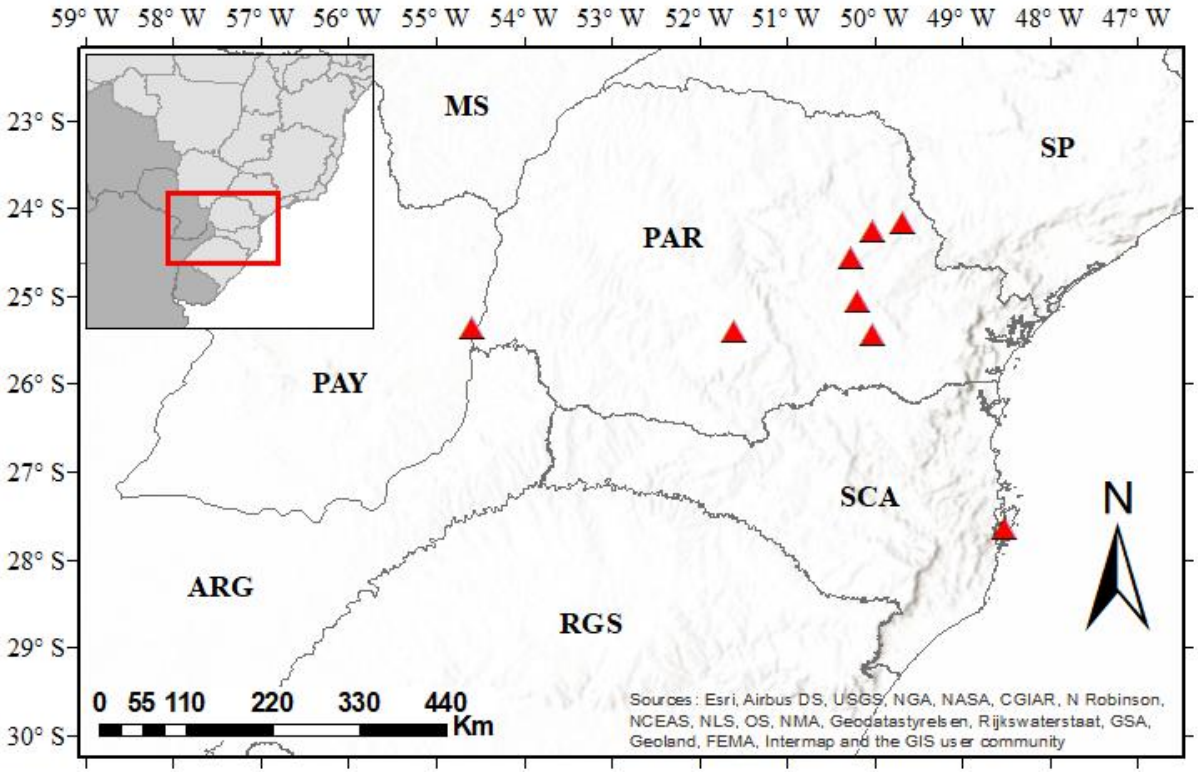

FIGURE 17. Distribution map of *Eriocaulon helichrysoides* (Eriocaulaceae) (red triangle) in subtropical South America (ARG = Argentina; MS = Mato Grosso do Sul; PAR = Paraná; PAY = Paraguay; RGS = Rio Grande do Sul; SCA = Santa Catarina; SP = São Paulo).

FIGURE 18. Holotype of *Eriocaulon itapevense* (Eriocaulaceae) from Torres, Rio Grande do Sul, southern Brazil (*C.C.Alff & C.Rabuske 132*, ICN barcode 00040748).

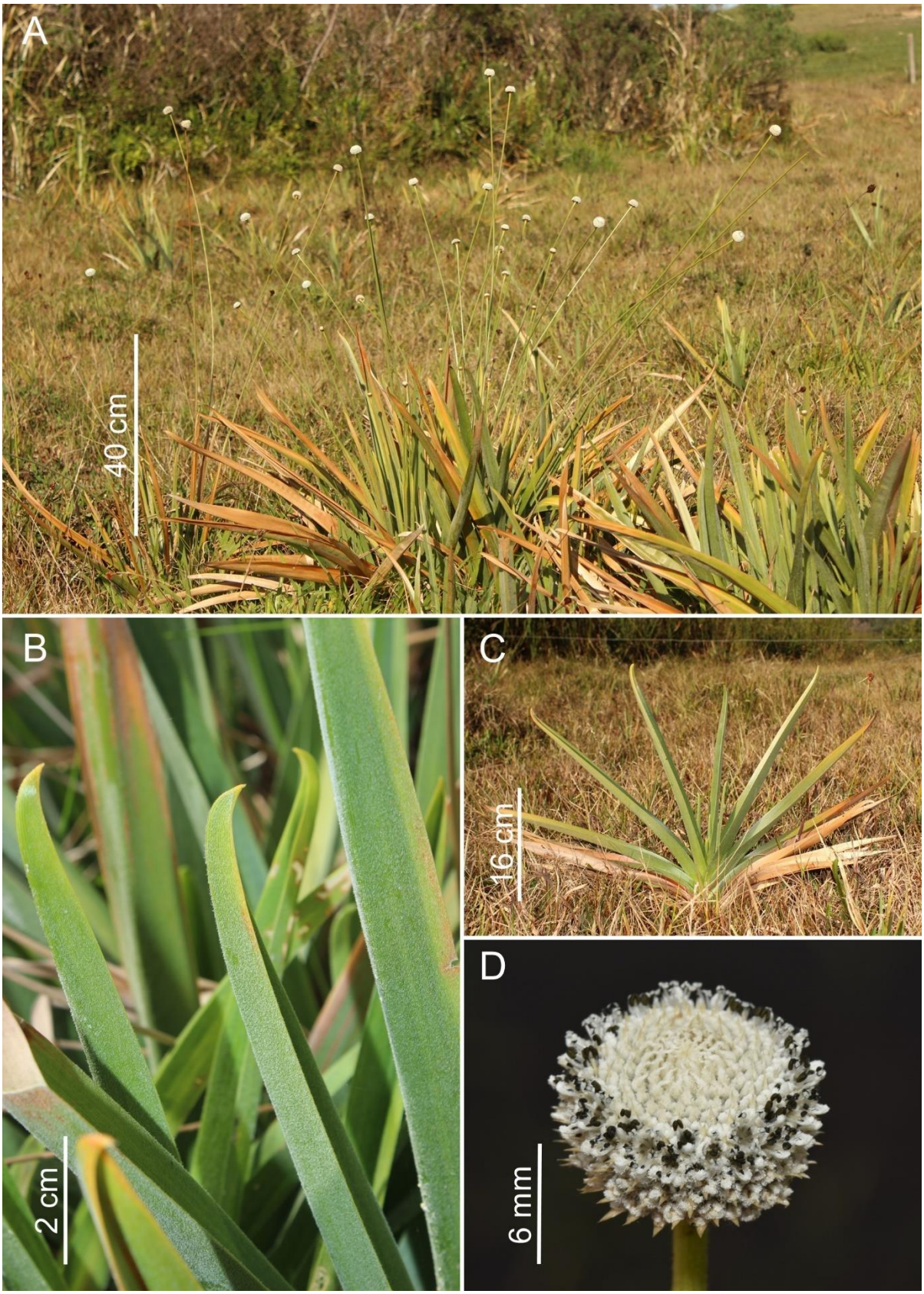

FIGURE 19. *Eriocaulon itapevense* (Eriocaulaceae). A) Habit. B) Detail of the leaves. C) Young specimen displaying leaves with distichous echitant arrangement. D) Capitulum displaying staminate flowers. Images A–C by Cassio Rabuske da Silva, and D by Thomas Stützel.

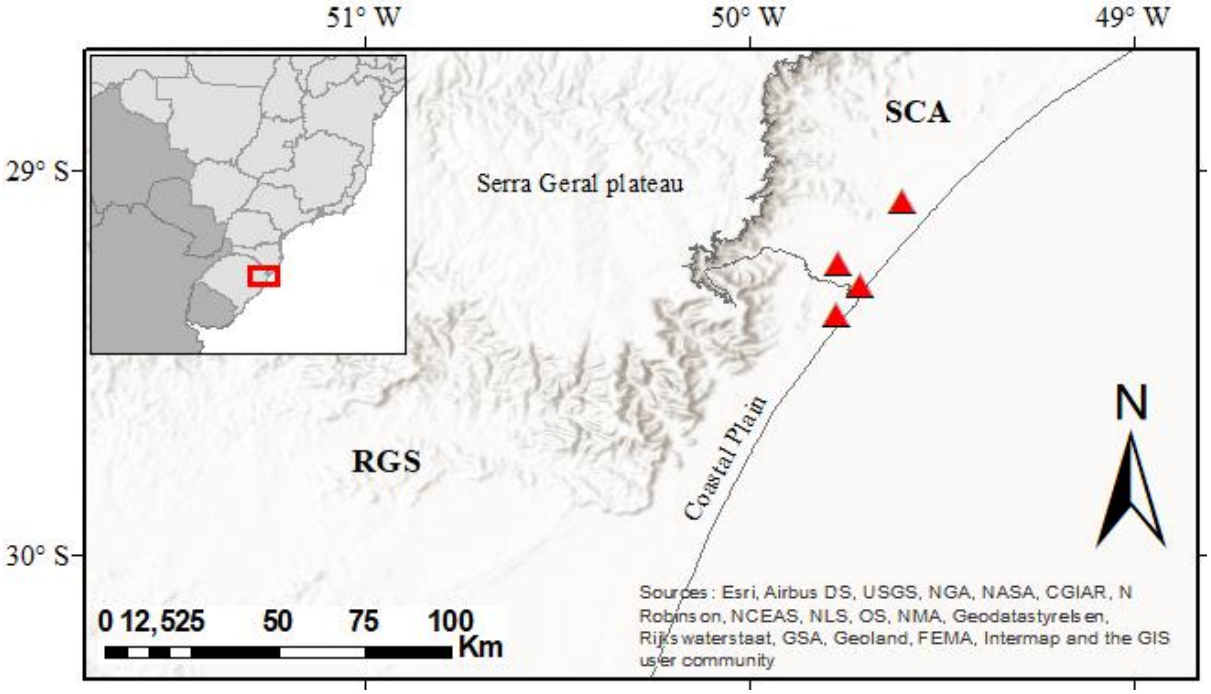

FIGURE 20. Distribution map of *Eriocaulon itapevense* (Eriocaulaceae) (red triangle).

FIGURE 21. *Eriocaulon macrobolax* (Eriocaulaceae) from General Paz, Corrientes, Argentina (*T.L.Pedersen 13409,* MBM barcode 83026).

FIGURE 22. *Eriocaulon magnificum* (Eriocaulaceae) from Arroio do Sal, Rio Grande do Sul, southern Brazil (*C.C.Alff & C.Rabuske-Silva 130*, ICN barcode 00044148).

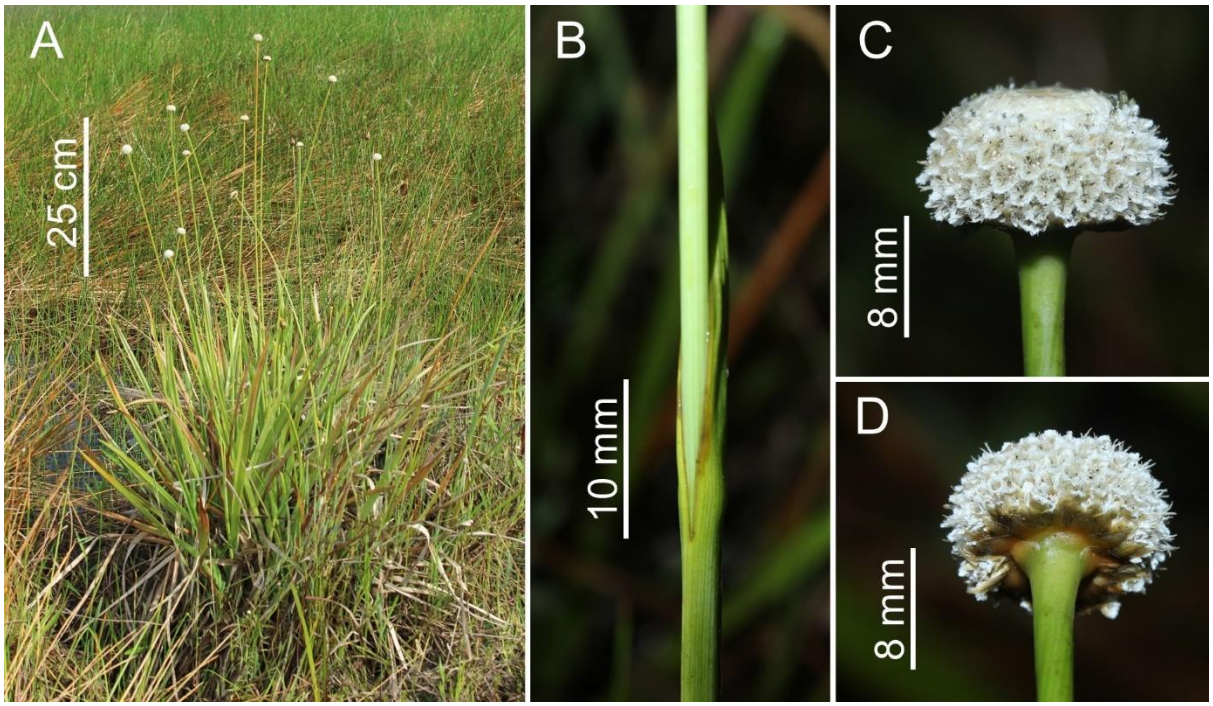

FIGURE 23. *Eriocaulon magnificum* (Eriocaulaceae). A) Habit. B) Spathe slit. C) Capitulum in lateral view. D) Capitulum displaying involucral bracts. Images: A–D by Cassio Rabuske da Silva.

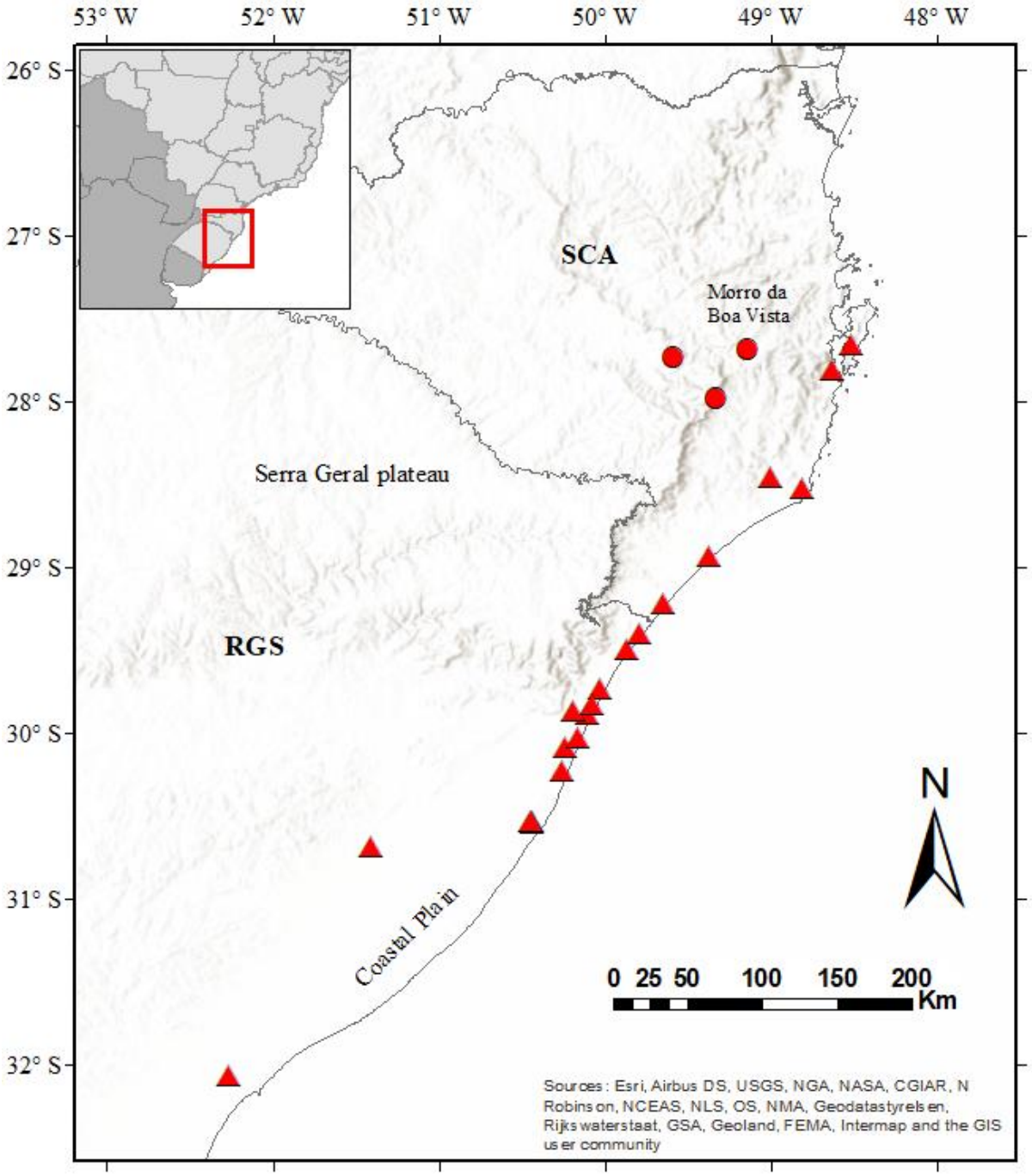

FIGURE 24. Distribution map of *Eriocaulon magnificum* (red triangle) and *E. reitzii* (Eriocaulaceae) (red circle) (RGS = Rio Grande do Sul; SCA = Santa Catarina).

FIGURE 25. *Eriocaulon modestum* (Eriocaulaceae) from Mostardas, Rio Grande do Sul, southern Brazil (*V.L.Bittencourt 284*, ICN barcode 00044239).

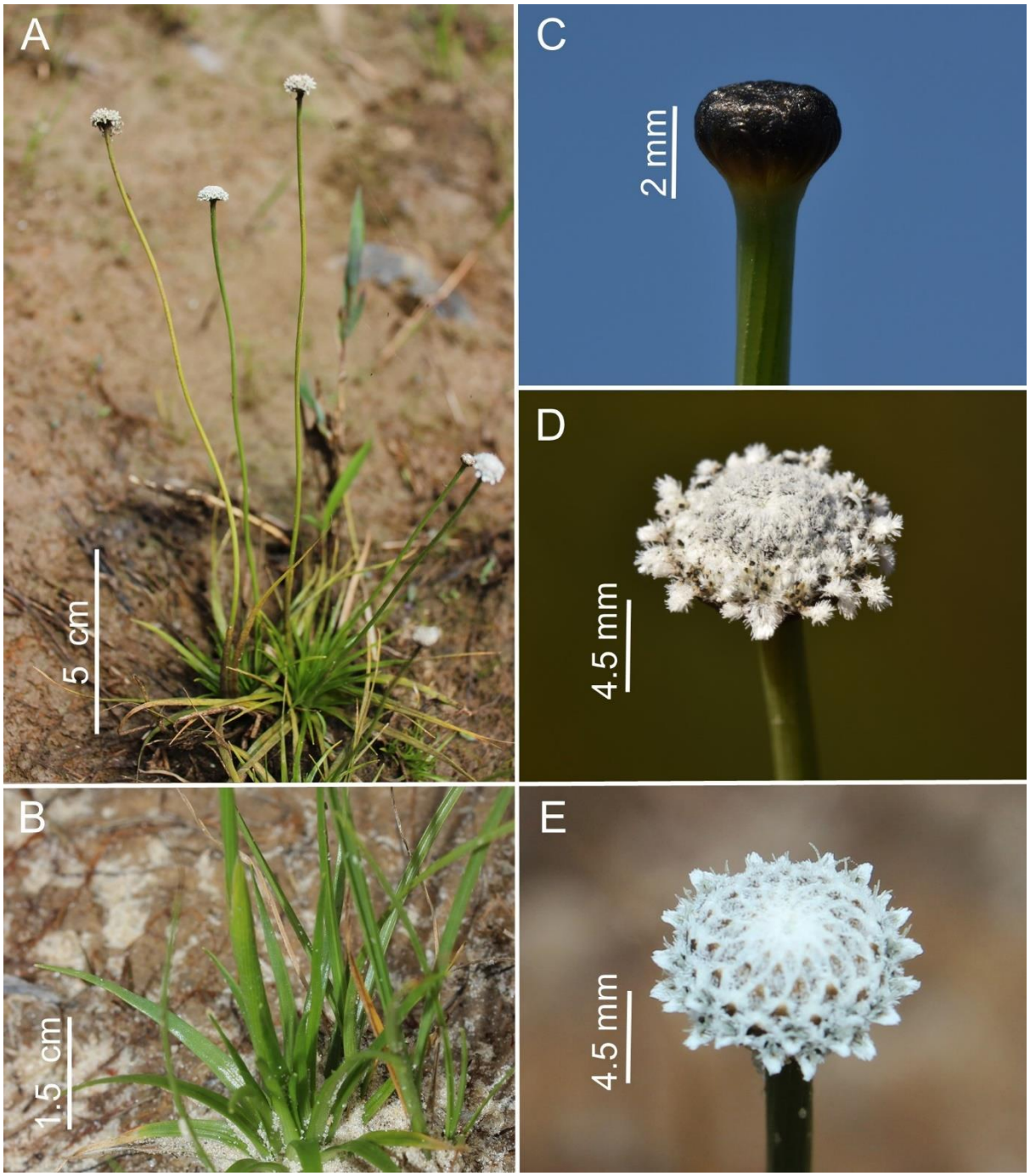

FIGURE 26. *Eriocaulon modestum* (Eriocaulaceae). A) Habit. B) Spathe. C) Involucral bracts before anthesis. D) Capitulum displaying staminate flowers. E) Capitulum displaying pistillate flowers. Images A–B and E by Cassio Rabuske da Silva, and C–D by Thomas Stützel.

FIGURE 27. *Eriocaulon reitzii* (Eriocaulaceae) from Rancho Queimado, Santa Catarina, southern Brazil (*C.C.Alff et al. 24*, ICN barcode 00044150).

FIGURE 28. *Eriocaulon reitzii* (Eriocaulaceae) in the type-location, Rancho Queimado, Santa Catarina, southern Brazil. Image by Josimar Külkamp.

FIGURE 29. *Eriocaulon sellowianum* (Eriocaulaceae) from São José dos Pinhais, Paraná, southern Brazil (*J.M.Silva & J.Cordeiro 607*, ICN barcode 000444151).

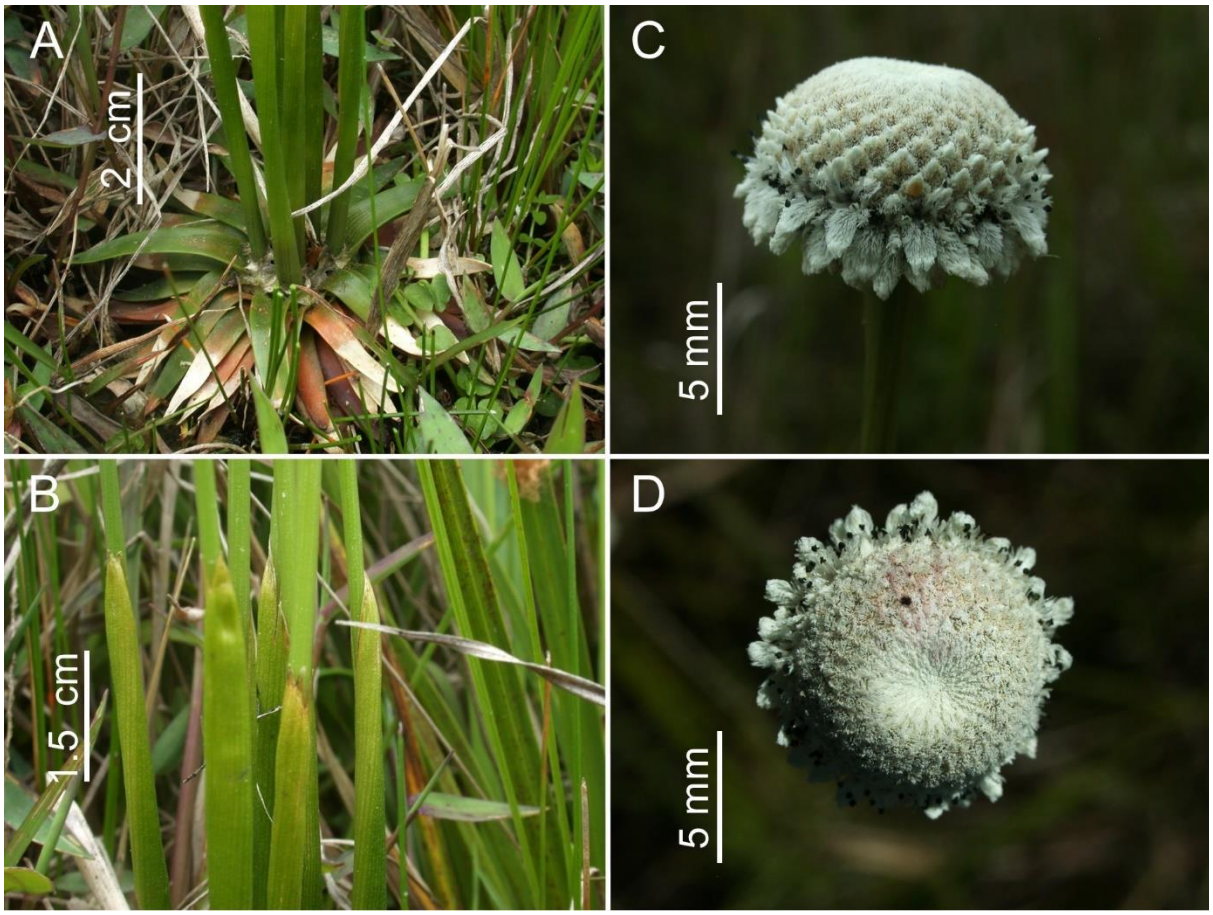

FIGURE 30. *Eriocaulon sellowianum* (Eriocaulaceae). A) Basal rosette. B) Spathes apex. C) Capitulum in lateral view. D) Capitulum in top view. Images A–D by Thomas Stützel.

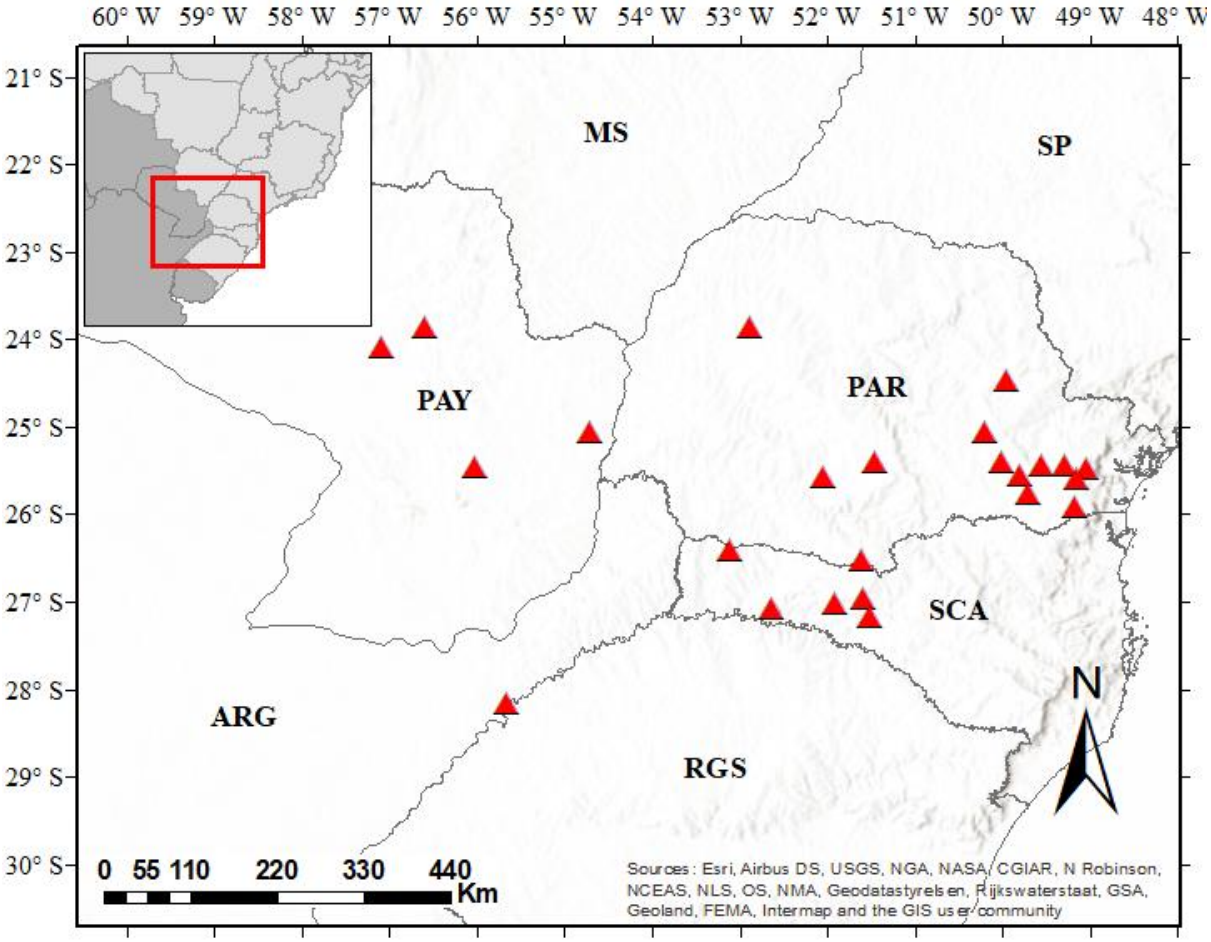

FIGURE 31. Distribution map of *Eriocaulon sellowianum* (Eriocaulaceae) (red triangle) in subtropical South America (ARG = Argentina; MS = Mato Grosso do Sul; PAR = Paraná; PAY = Paraguay; SCA = Santa Catarina; SP = São Paulo).

FIGURE 32. *Leiothrix flavescens* (Eriocaulaceae) from Torres, Rio Grande do Sul, southern Brazil (*C.C.Alff & C.Rabuske-Silva 173*, ICN barcode 00044152).

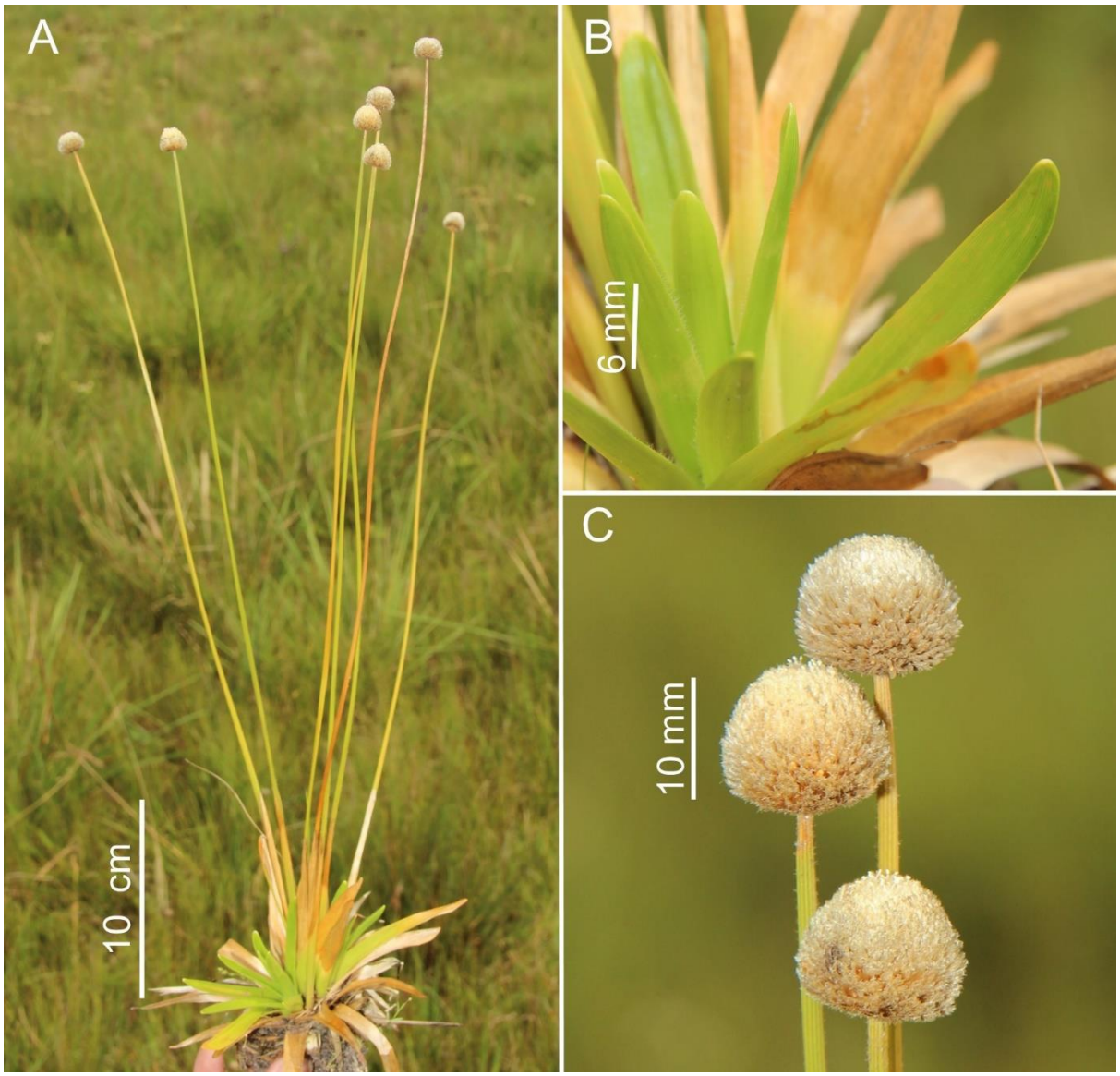

FIGURE 33. *Leiothrix flavescens* (Eriocaulaceae). A) Habit. B) Detail of the leaves. C) Capitula. Images A–C by Cassio Rabuske da Silva.

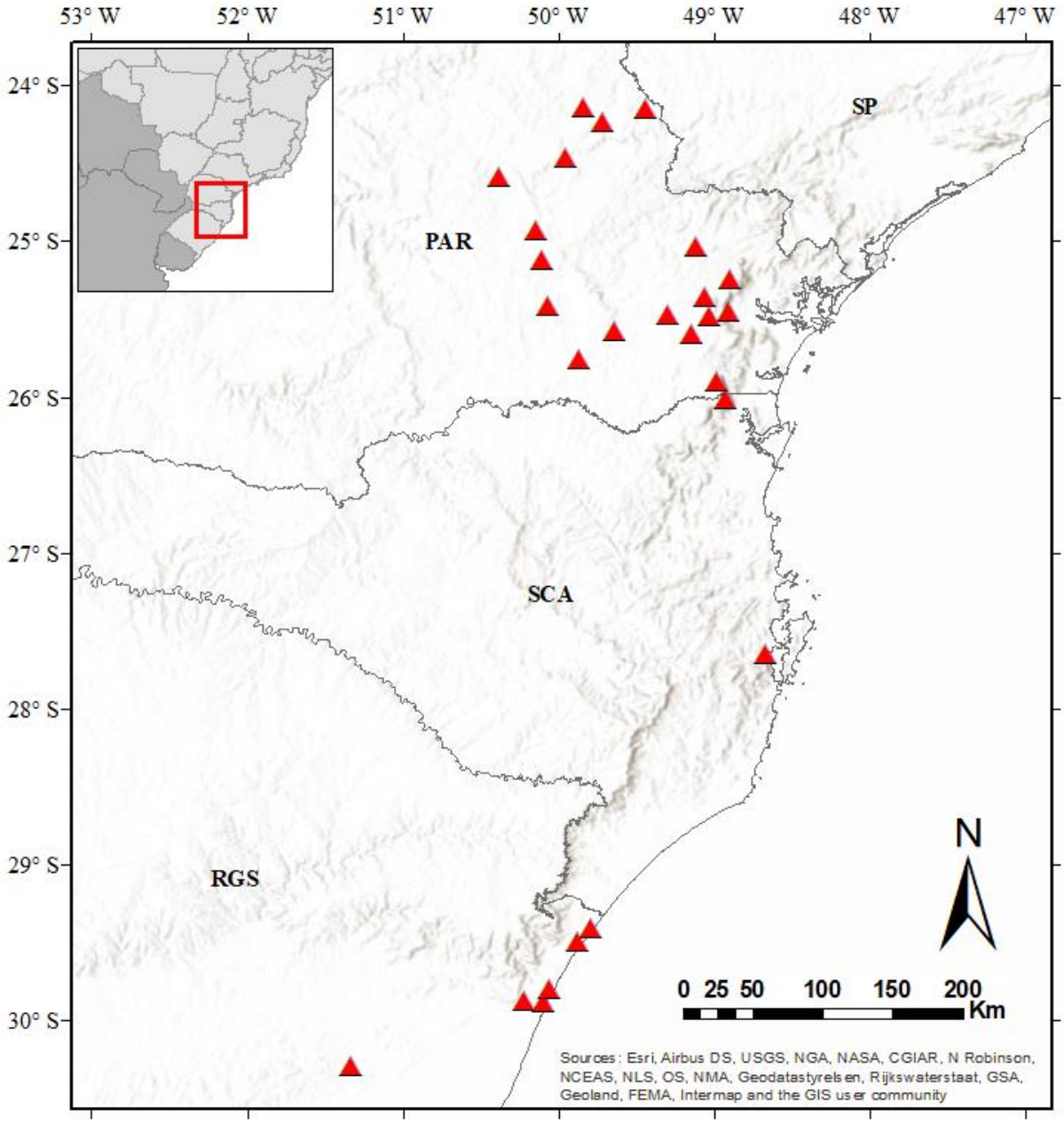

FIGURE 34. Distribution map of *Leiothrix flavescens* (Eriocaulaceae) (red triangle) in subtropical South America.

FIGURE 35. *Paepalanthus albovaginatus* (Eriocaulaceae) from Balsa Nova, Paraná, southern Brazil (*G.Hatschbach 48810*, FLOR barcode FLOR0009260).

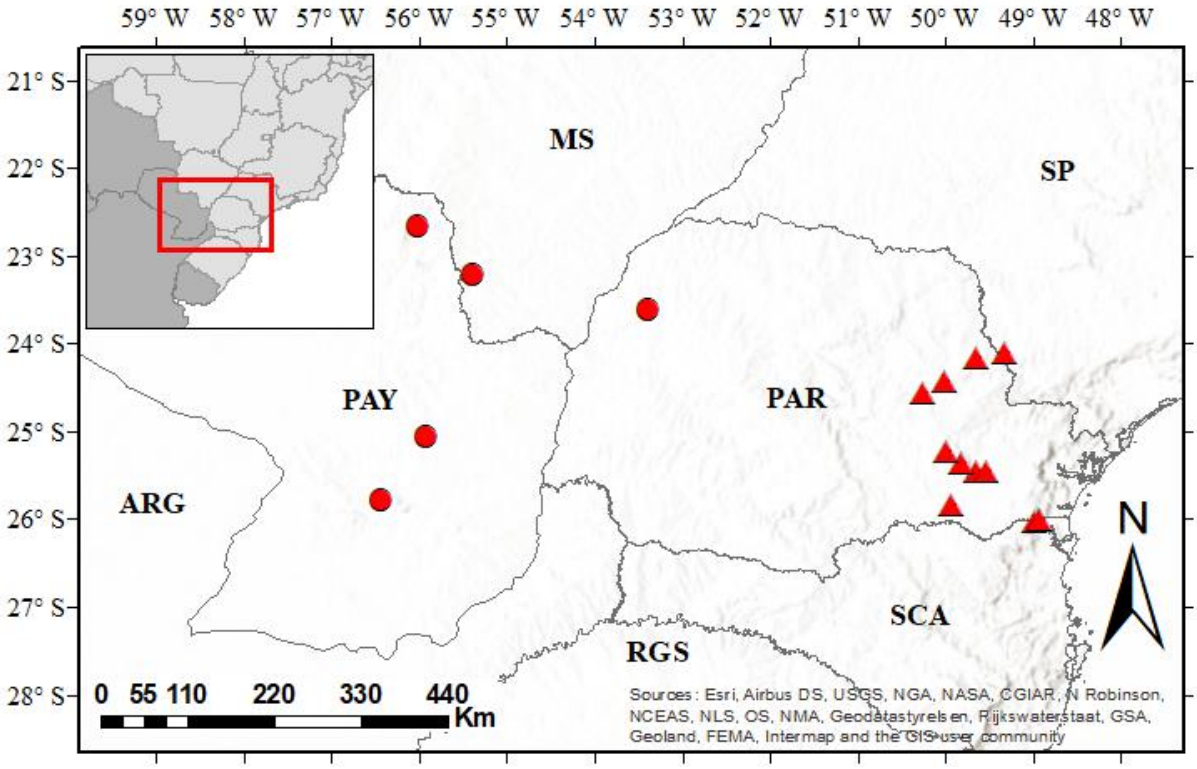

FIGURE 36. Distribution map of *Paepalanthus albovaginatus* (red triangle) and *P. balansae* (Eriocaulaceae) (red circle) (ARG = Argentina; MS = Mato Grosso do Sul; PAR = Paraná; PAY = Paraguay; RGS = Rio Grande do Sul; SCA = Santa Catarina; SP = São Paulo).

FIGURE 37. *Paepalanthus balansae* (Eriocaulaceae) from Yhu, Caaguazú, Paraguay (*T.M.Pedersen 15045*, MBM 127349).

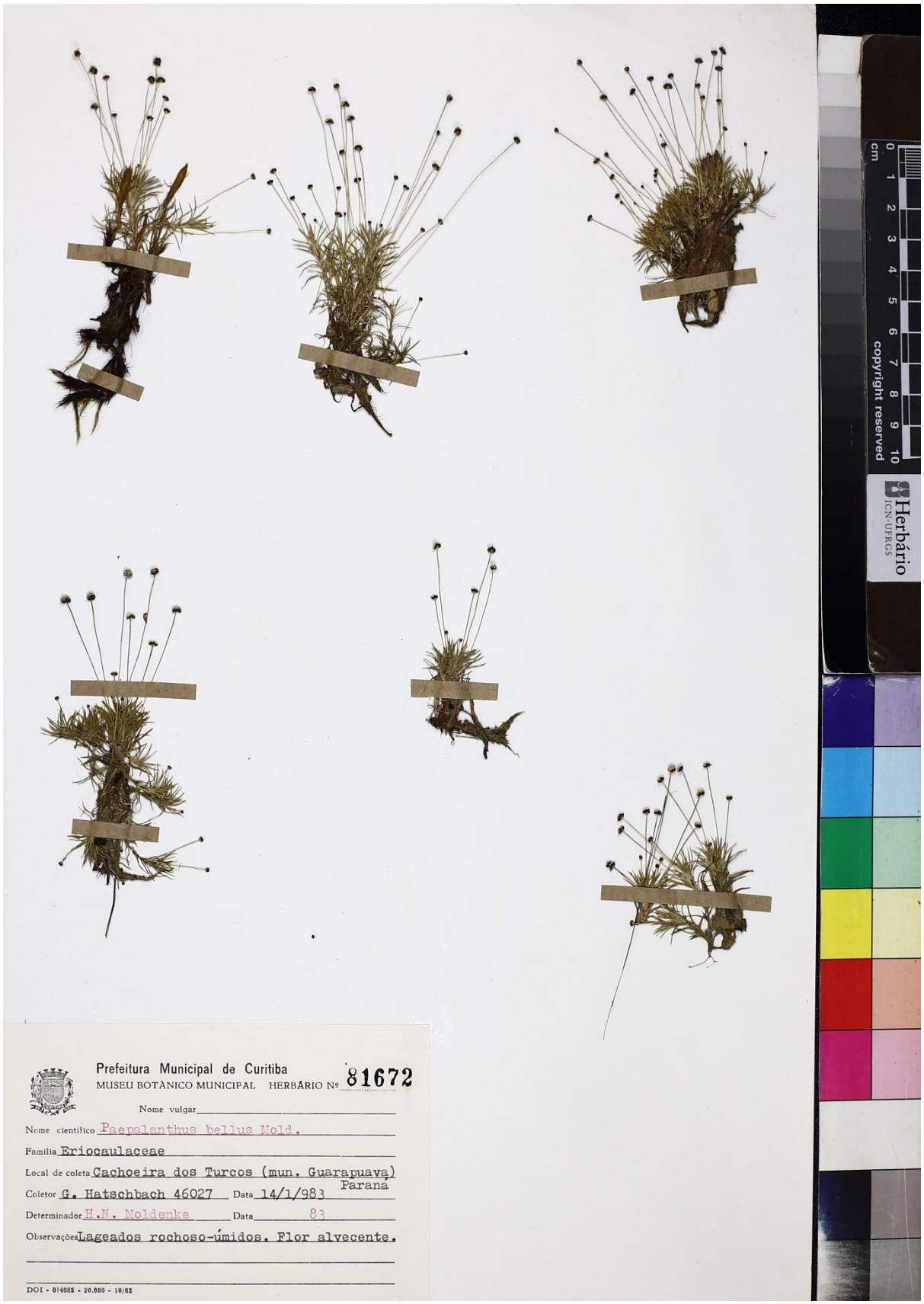

FIGURE 38. *Paepalanthus bellus* (Eriocaulaceae) from Guarapuava, Paraná, southern Brazil (*G.Hatschbach 46027*, MBM 81672).

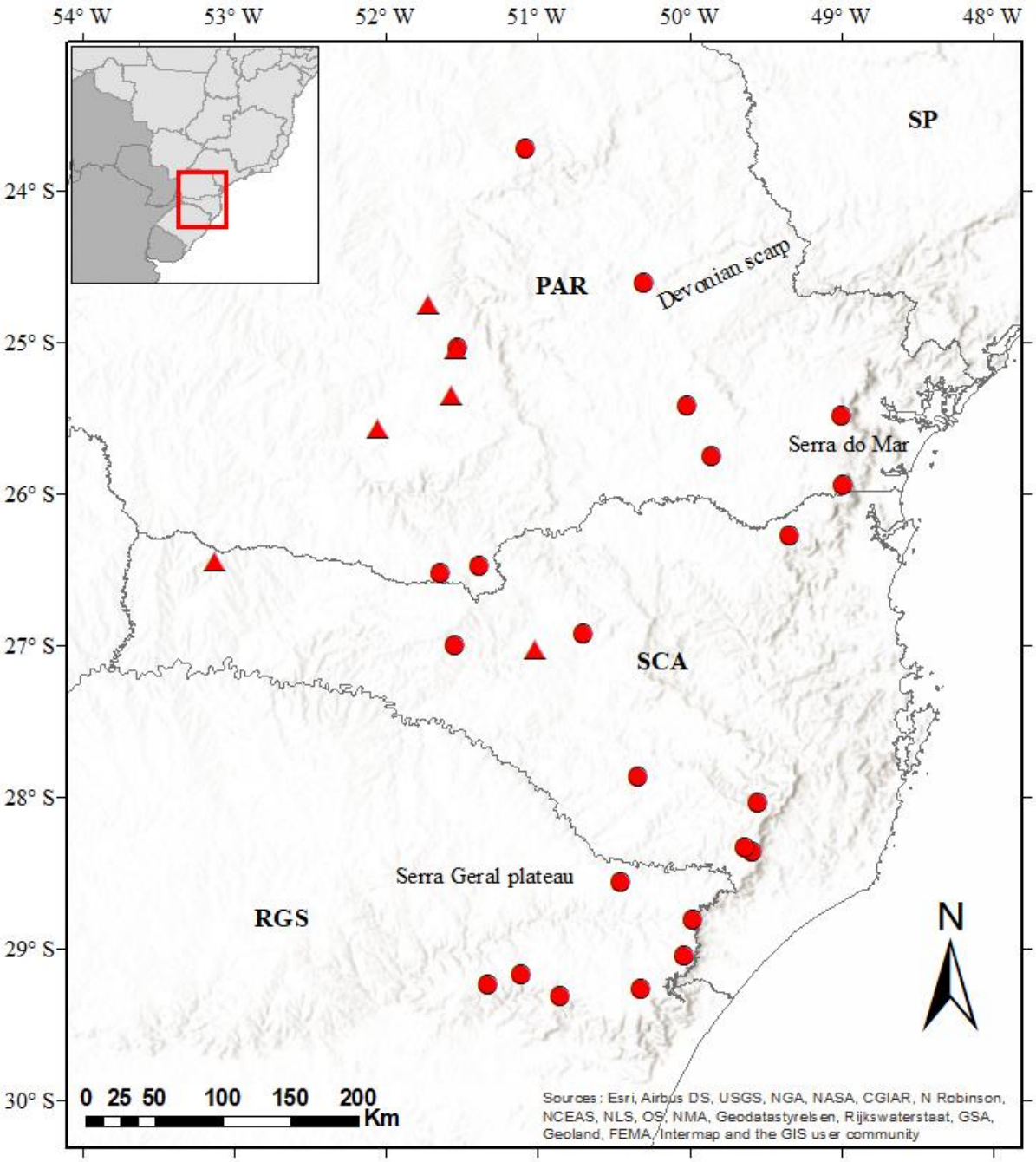

FIGURE 39. Distribution map of *Paepalanthus bellus* (red triangle) and *P. caldensis* (Eriocaulaceae) (red circle) in subtropical South America (PAR = Paraná; RGS = Rio Grande do Sul; SCA = Santa Catarina; SP = São Paulo).

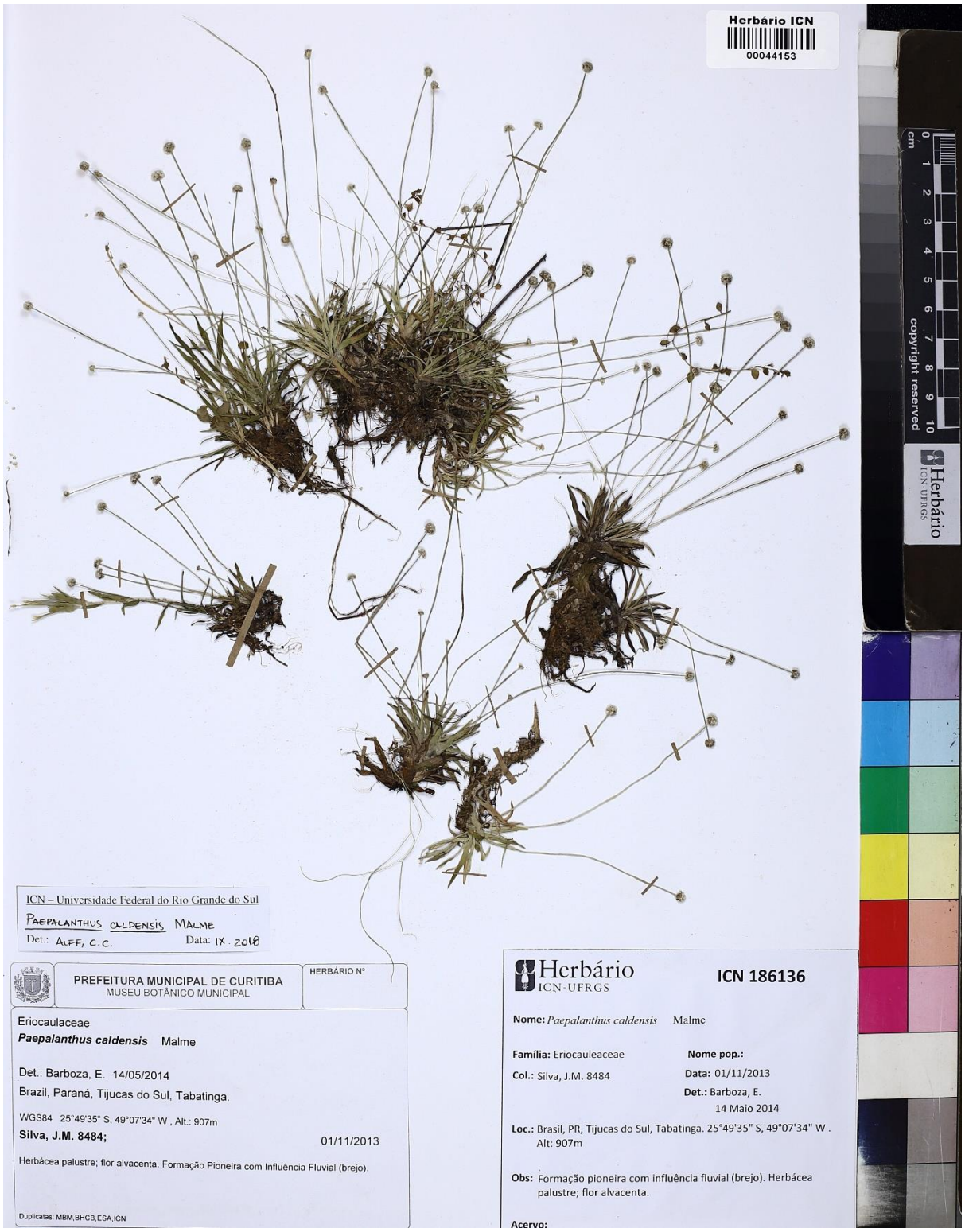

FIGURE 40. *Paepalanthus caldensis* (Eriocaulaceae) from Tijucas do Sul, Paraná, southern Brazil (*J.M.Silva 8484*, ICN barcode 00044153).

FIGURE 41. Subpopulation of *Paepalanthus caldensis* (Eriocaulaceae) near the Tainhas River, in São Francisco de Paula, Rio Grande do Sul, southern Brazil. Image: Isadora Quintana.

FIGURE 42. *Paepalanthus catharinae* (Eriocaulaceae) from São Francisco de Paula, Rio Grande do Sul, southern Brazil (*A.Leonhardt & M.L.Lorscheitter s.n.*, ICN barcode 00044212).

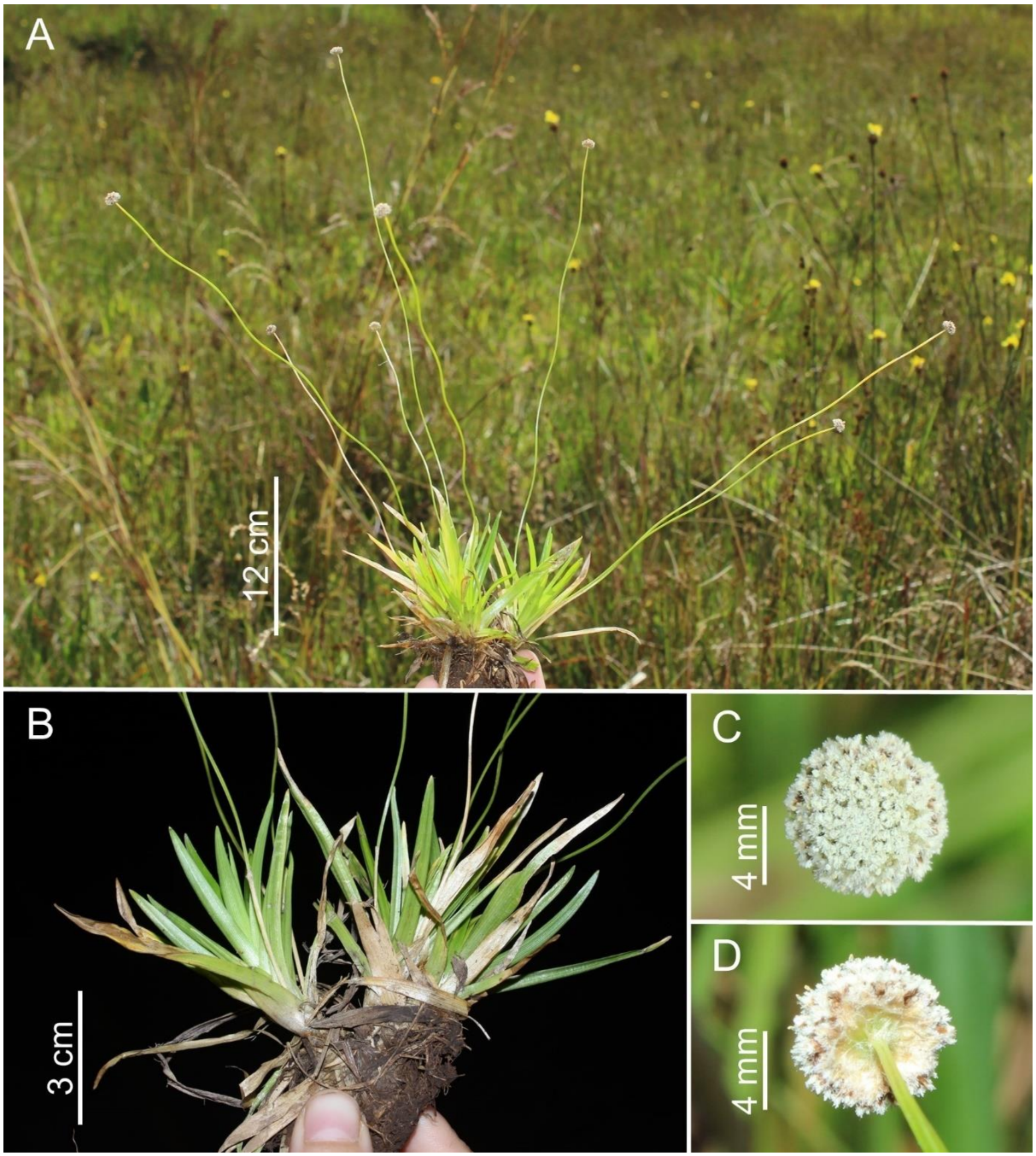

FIGURE 43. *Paepalanthus catharinae* (Eriocaulaceae). A) Habit. B) Basal rosettes. C) Capitulum in top view. D) Capitulum displaying involucral bracts. Images A–D by Cassio Rabuske da Silva.

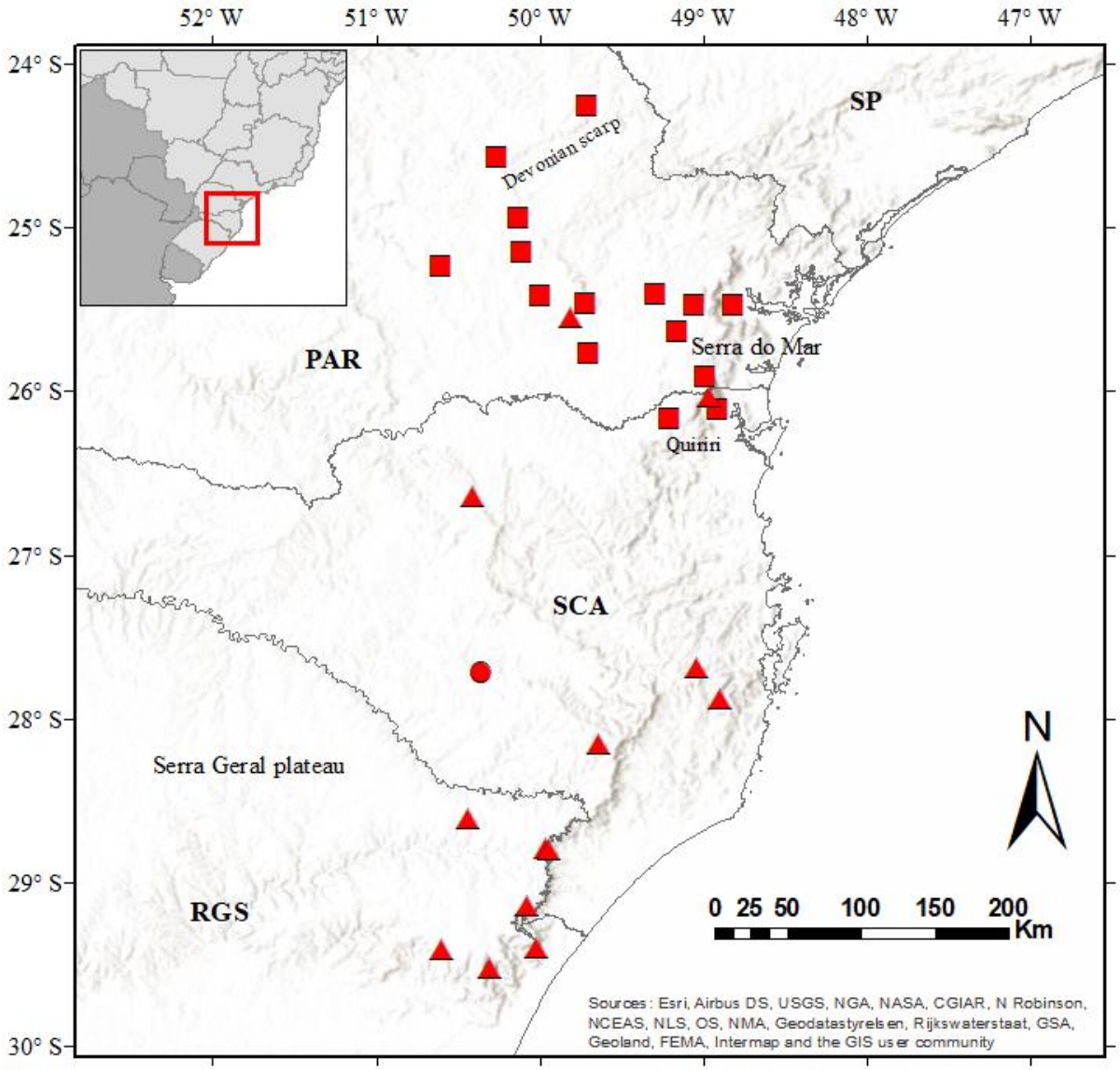

FIGURE 44. Distribution map of *Paepalanthus catharinae* (red triangle), *P. kleinii* (red circle), and *P. tessmannii* (Eriocaulaceae) (red square) in subtropical South America (PAR = Paraná; RGS = Rio Grande do Sul; SCA = Santa Catarina; SP = São Paulo).

FIGURE 45. *Paepalanthus chiquitensis* from Jaguariaíva, Paraná, southern Brazil (*Dusén 16966*, SI 31610). Scale bar: 6 cm.

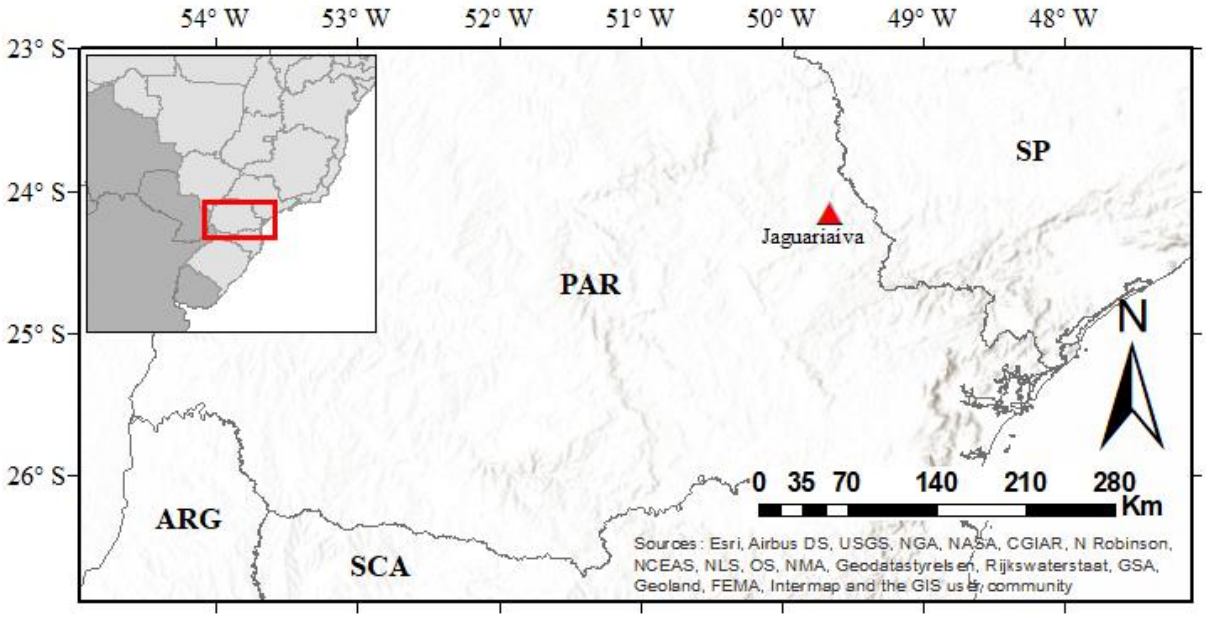

FIGURE 46. Distribution map of *Paepalanthus chiquitensis* (Eriocaulaceae) (red triangle) in subtropical South America, occurring exclusively in Jaguariaíva, northeastern Paraná, southern Brazil (ARG = Argentina; PAR = Paraná; SCA = Santa Catarina; SP = São Paulo).

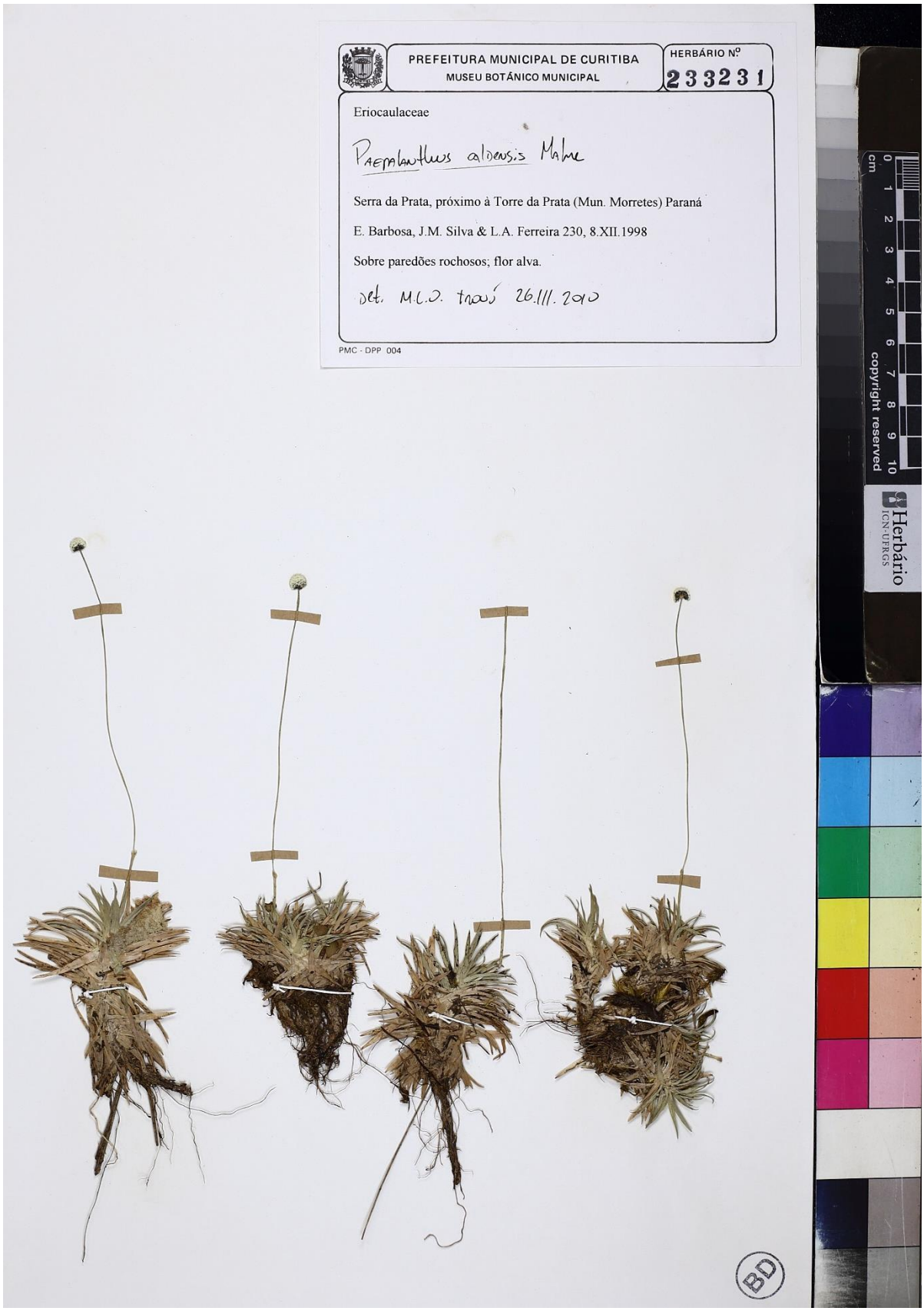

FIGURE 47. *Paepalanthus hatschbachii* (Eriocaulaceae) from Morretes, Paraná, southern Brazil (*E.Barbosa et al. 230*, MBM 233231).

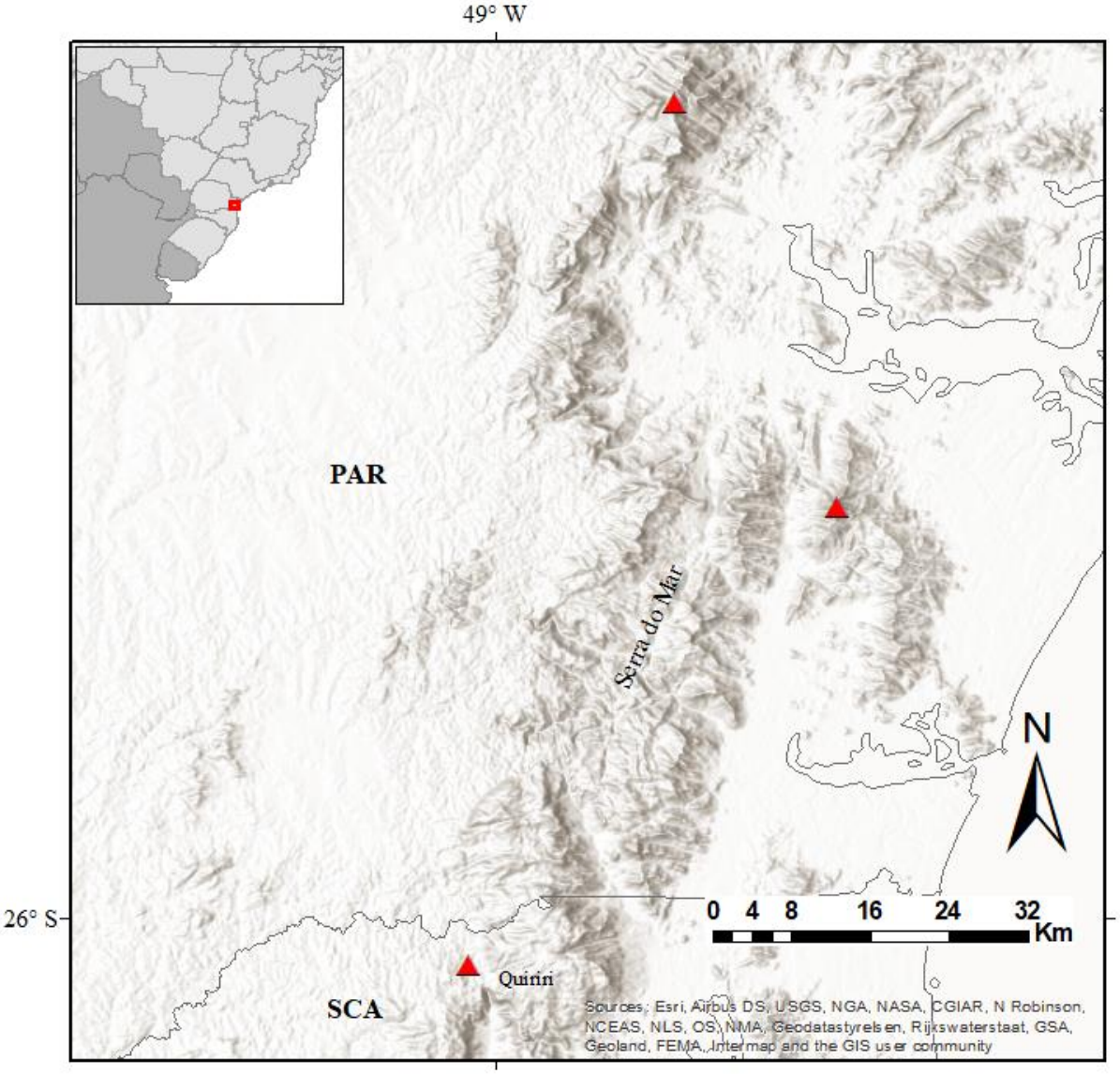

FIGURE 48. Distribution map of *Paepalanthus hatschbachii* (Eriocaulaceae) (red triangle).

FIGURE 49. *Paepalanthus henriqueii* (Eriocaulaceae) from Lages, Santa Catarina, southern Brazil (*A.Sehnem s.n.*, MBM 276506).

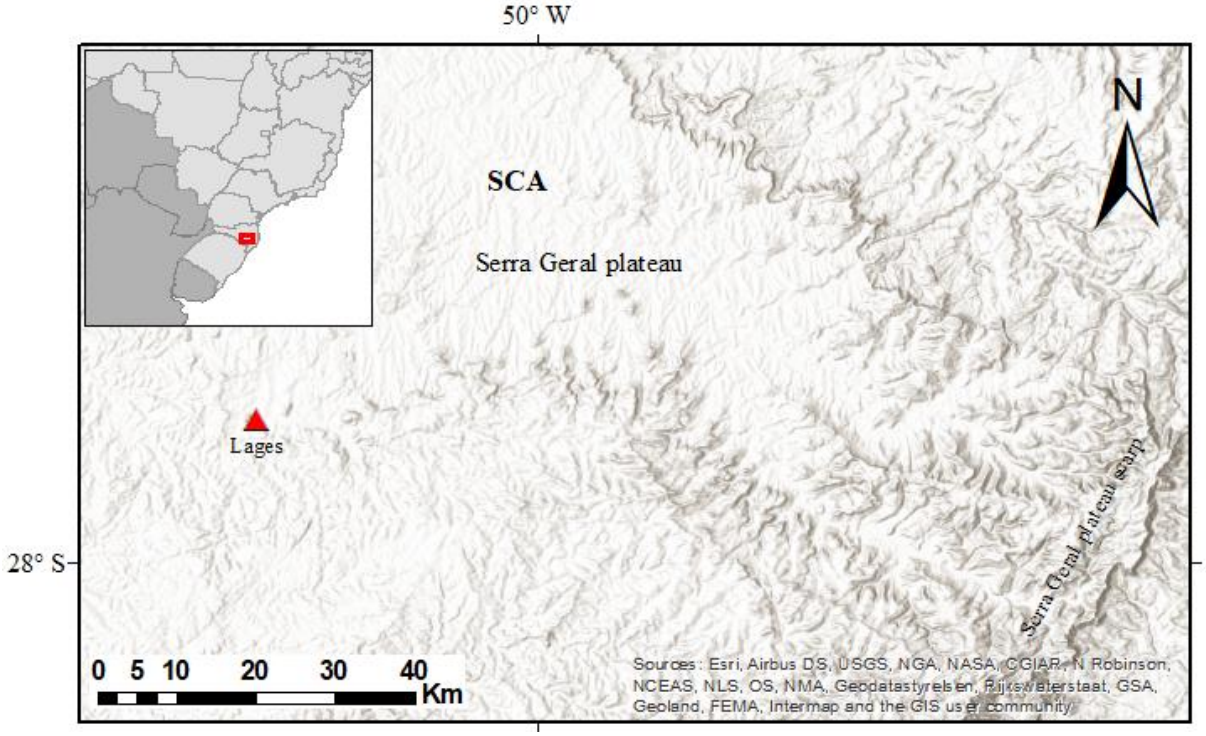

FIGURE 50. Distribution map of *Paepalanthus henriquei* (Eriocaulaceae) (red triangle) in subtropical South America, occurring exclusively in Lages, Santa Catarina, southern Brazil (SCA = Santa Catarina).

FIGURE 51. Holotype of *Paepalanthus kleinii* (Eriocaulaceae) from near Lages, Santa Catarina, southern Brazil (*L.B.Smith & R.Klein 8241*, US barcode 00088362). Image available from JSTOR Global Plants (2000 onwards).

FIGURE 52. *Paepalanthus paulensis* (Eriocaulaceae) from Tibagi, Paraná, southern Brazil (*E.L.Siqueira et al. 766*, MBM barcode 407444).

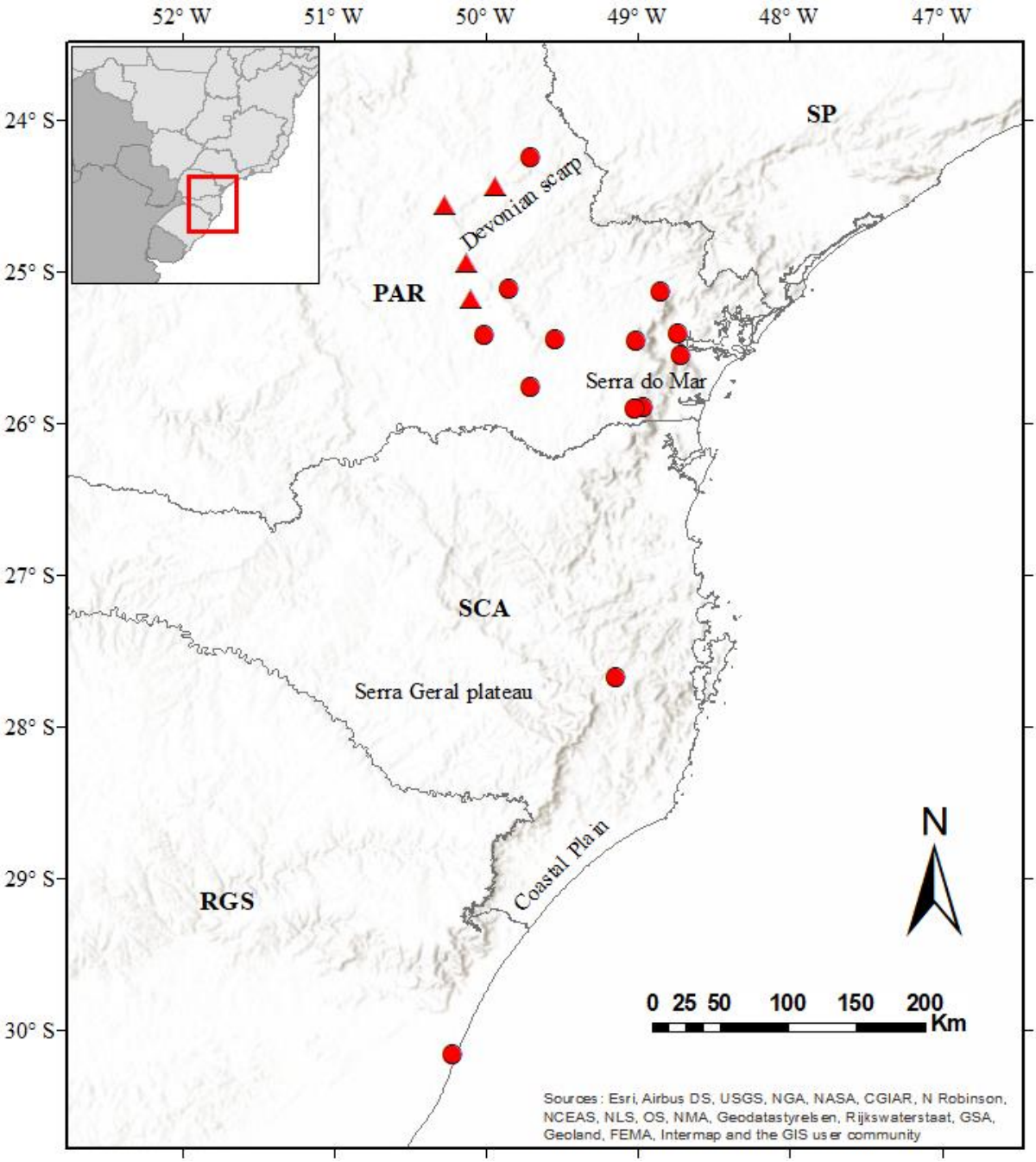

FIGURE 53. Distribution map of *Paepalanthus paulensis* (red triangle) and *P. planifolius* (Eriocaulaceae) (red circle) in subtropical South America (PAR = Paraná; RGS = Rio Grande do Sul; SCA = Santa Catarina; SP = São Paulo).

FIGURE 54. *Paepalanthus planifolius* (Eriocaulaceae) from Campina Grande do Sul, Paraná, southern Brazil (*C.Rabuske-Silva et al. 351*, ICN barcode 00044161).

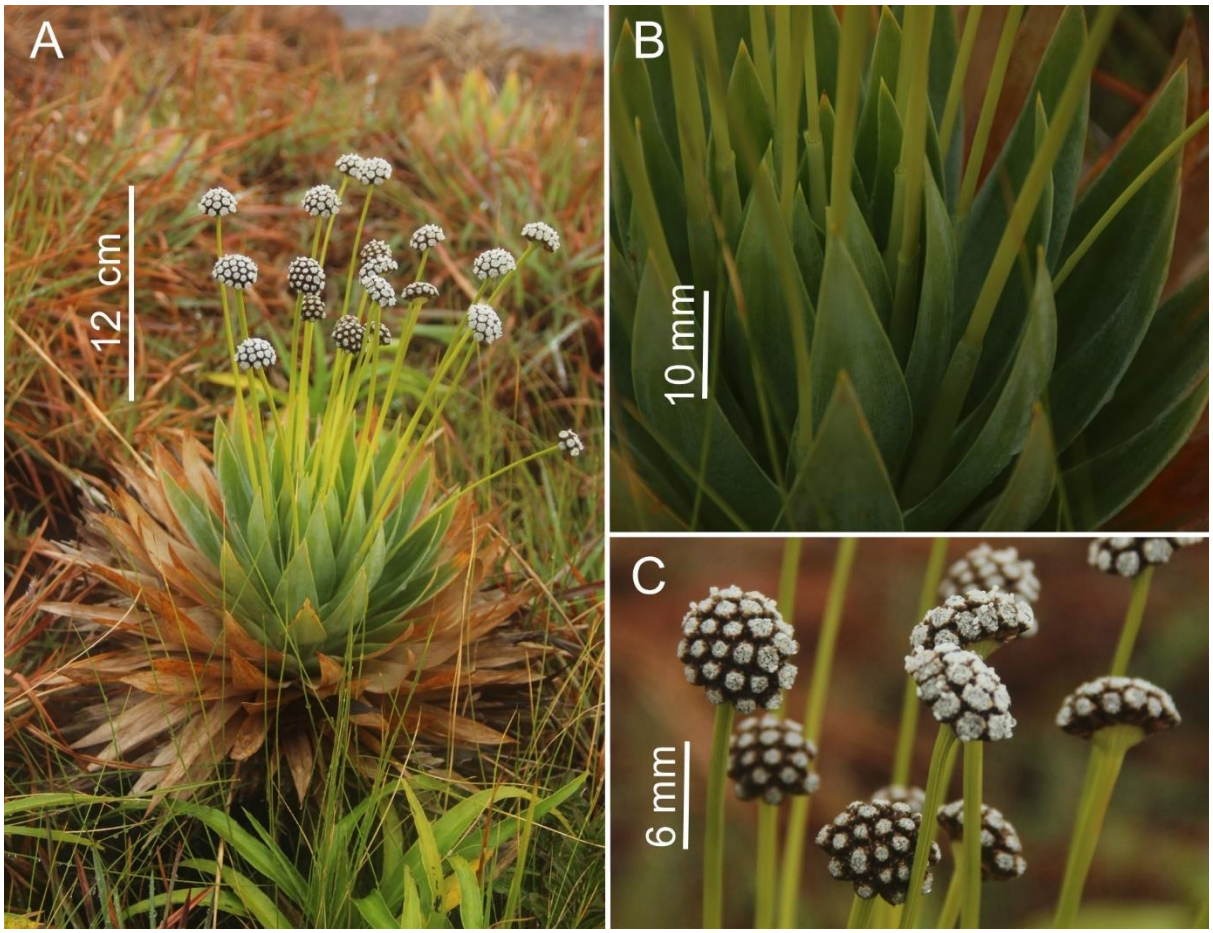

FIGURE 55. *Paepalanthus planifolius* (Eriocaulaceae). A) Habit. B) Detail of the leaves and spathes apex. C) Capitula. Images A–C by Cassio Rabuske da Silva.

FIGURE 56. *Paepalanthus pruinosus* (Eriocaulaceae) from Rancho Queimado, Santa Catarina, southern Brazil (*R.Trevisan & L.Pereira-Silva 1662*, ICN barcode 00044155).

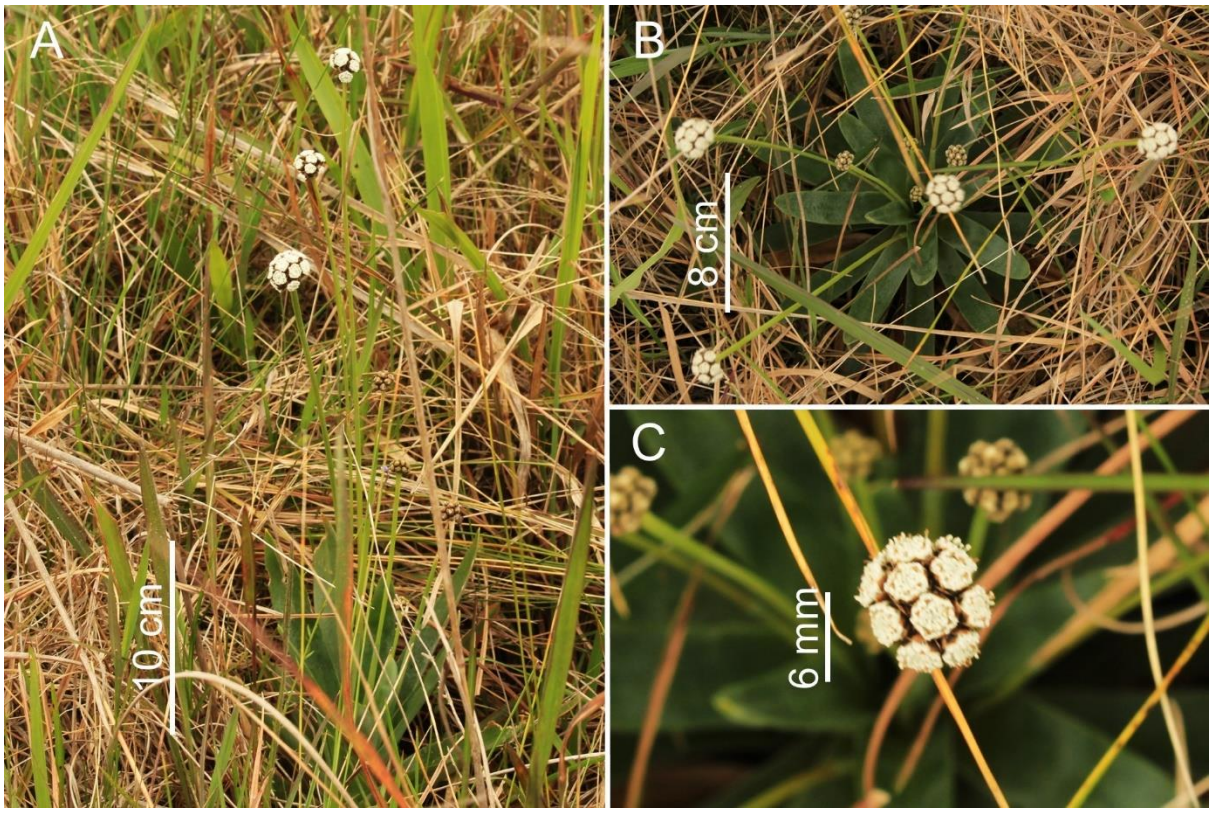

FIGURE 57. *Paepalanthus pruinosus* (Eriocaulaceae). A) Habit. B) Basal rosette in top view. C) Capitulum in top view. Images A–B by Josimar Külkamp.

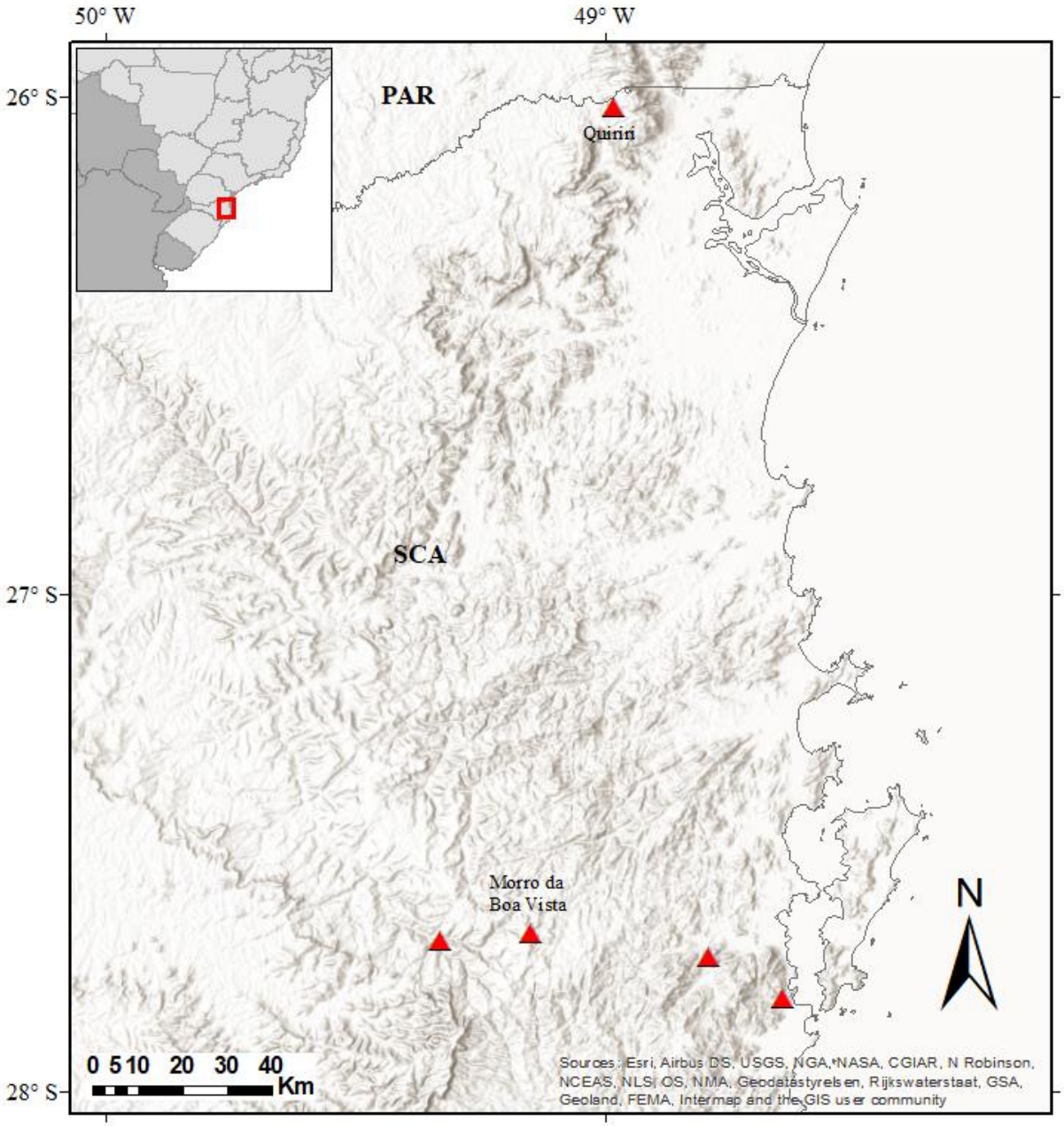

FIGURE 58. Distribution map of *Paepalanthus pruinosus* (Eriocaulaceae) (red triangle) (PAR = Paraná; SCA = Santa Catarina).

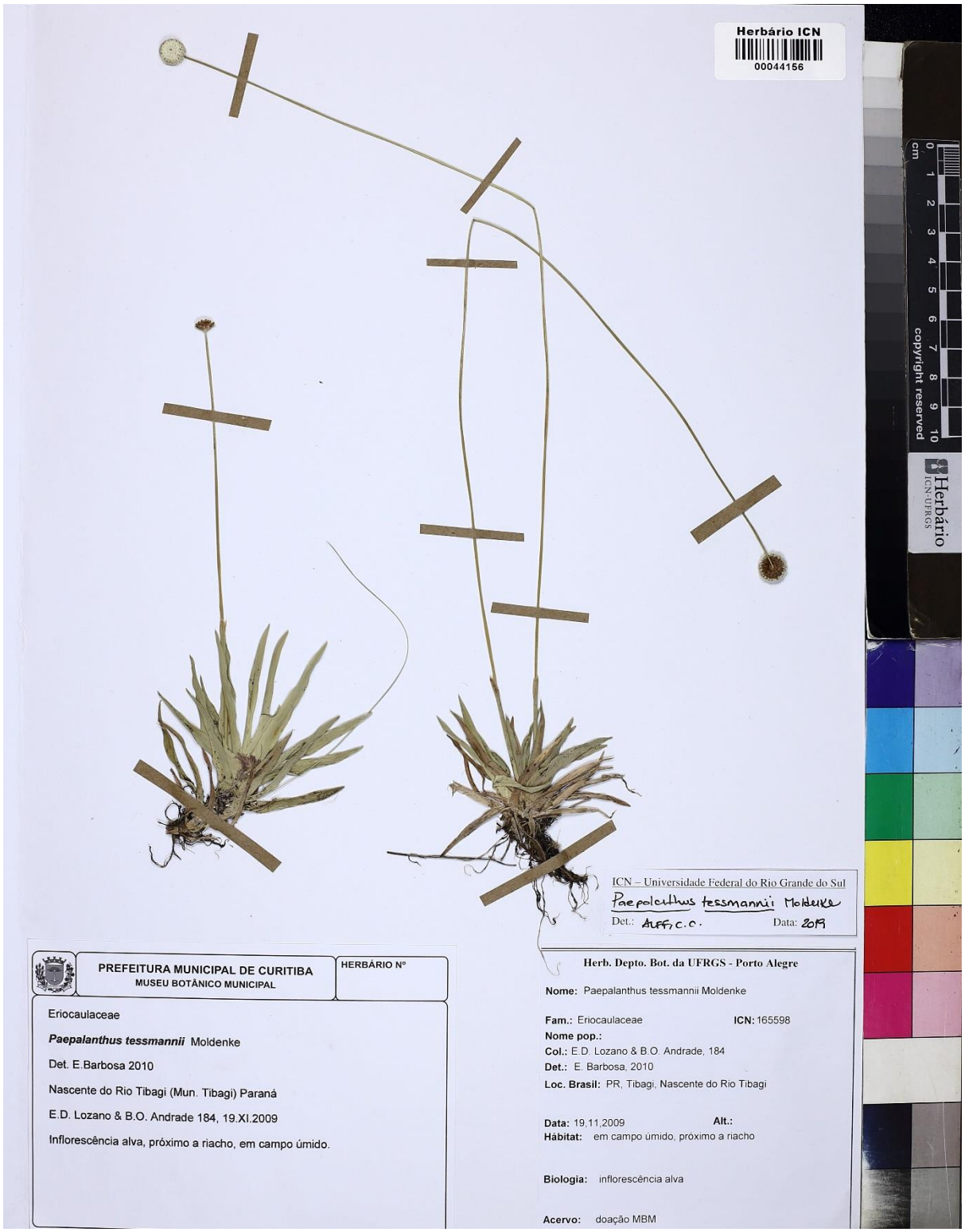

FIGURE 59. *Paepalanthus tessmannii* (Eriocaulaceae) from Tibagi, Paraná, southern Brazil (*E.D.Lozano & B.O.Andrade 184*, ICN barcode 00044156).

FIGURE 60. Acaulescent and short-stemmed specimens of *Syngonanthus caulescens* (Eriocaulaceae) from São Francisco de Paula, Rio Grande do Sul, southern Brazil (*C.C.Alff & C.Rabuske 113*, ICN barcode 00044157).

FIGURE 61. Typical specimens of *Syngonanthus caulescens* (Eriocaulaceae) from Torres, Rio Grande do Sul, southern Brazil (*C.C.Alff & C.Rabuske 103*, ICN barcode 44158).

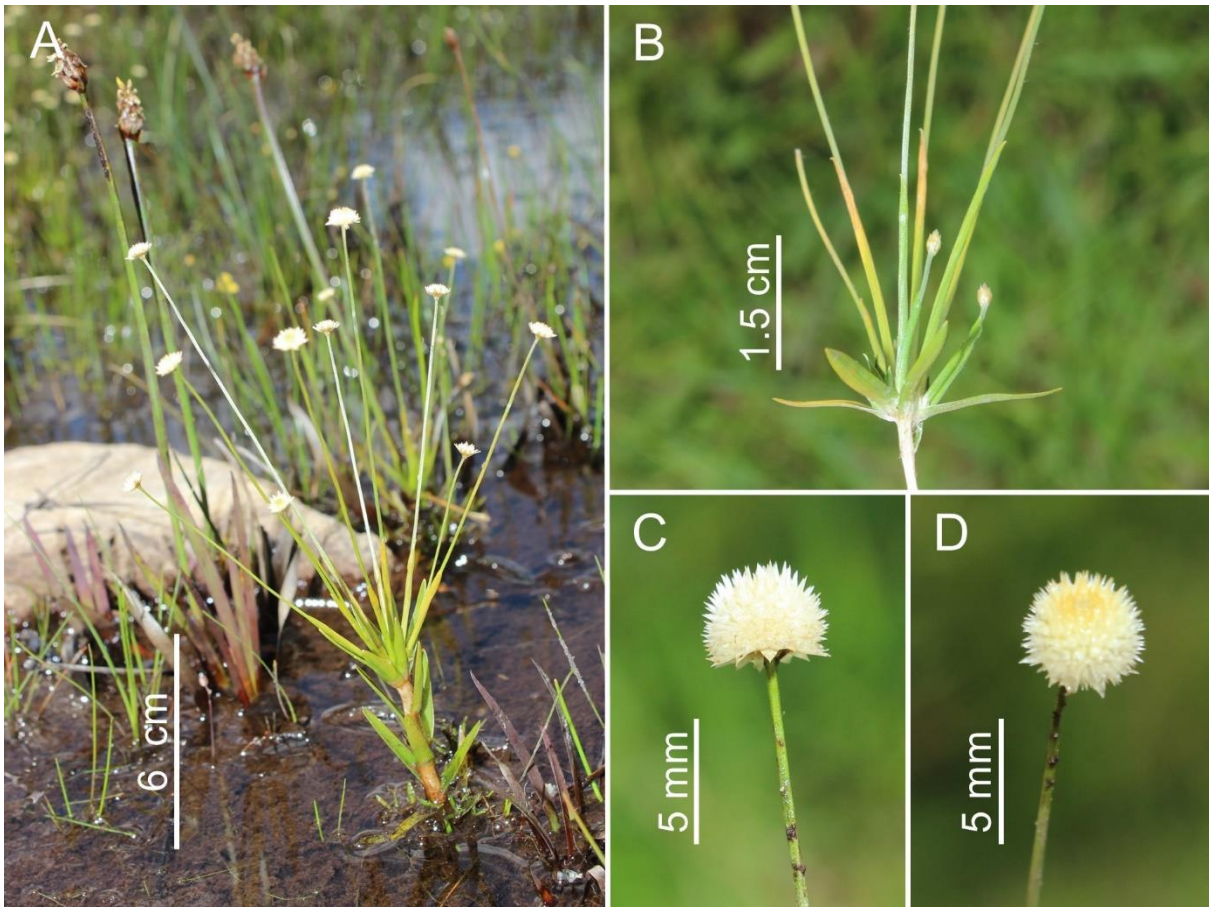

FIGURE 62. *Syngonanthus caulescens* (Eriocaulaceae). A) Habit. B) Scapes leaving from the apex of the elongated stem. C) Capitulum in lateral view. D) Capitulum in top view. Images A–D by Cassio Rabuske da Silva.

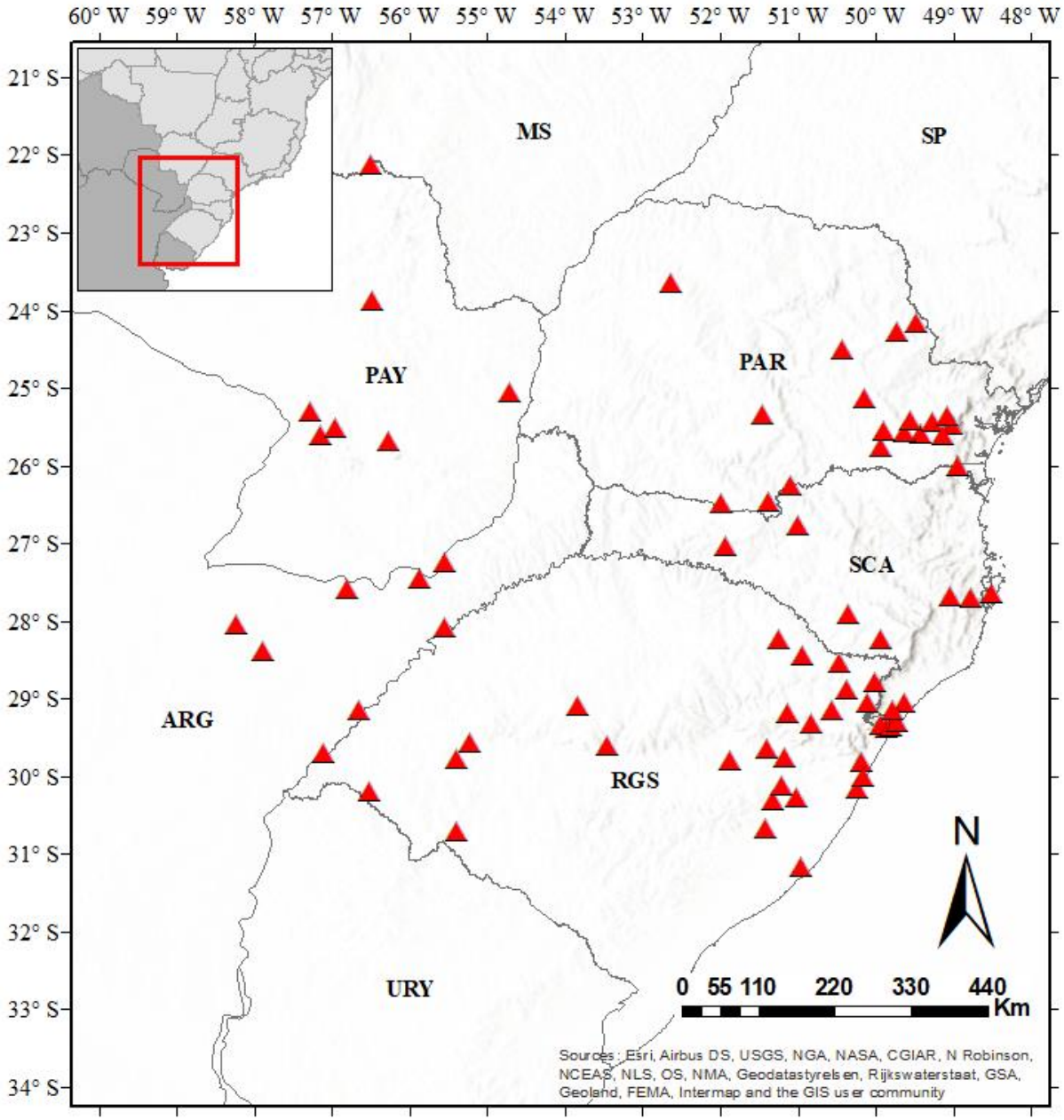

FIGURE 63. Distribution map of *Syngonanthus caulescens* (Eriocaulaceae) (red triangle) in subtropical South America (ARG = Argentina; MS = Mato Grosso do Sul; PAR = Paraná; PAY = Paraguay; RGS = Rio Grande do Sul; SCA = Santa Catarina; SP = São Paulo; URY = Uruguay).

FIGURE 64. *Syngonanthus chrysanthus* (Eriocaulaceae) from Torres, Rio Grande do Sul, southern Brazil (*C.C.Alff et al. 102*, ICN barcode 00044159).

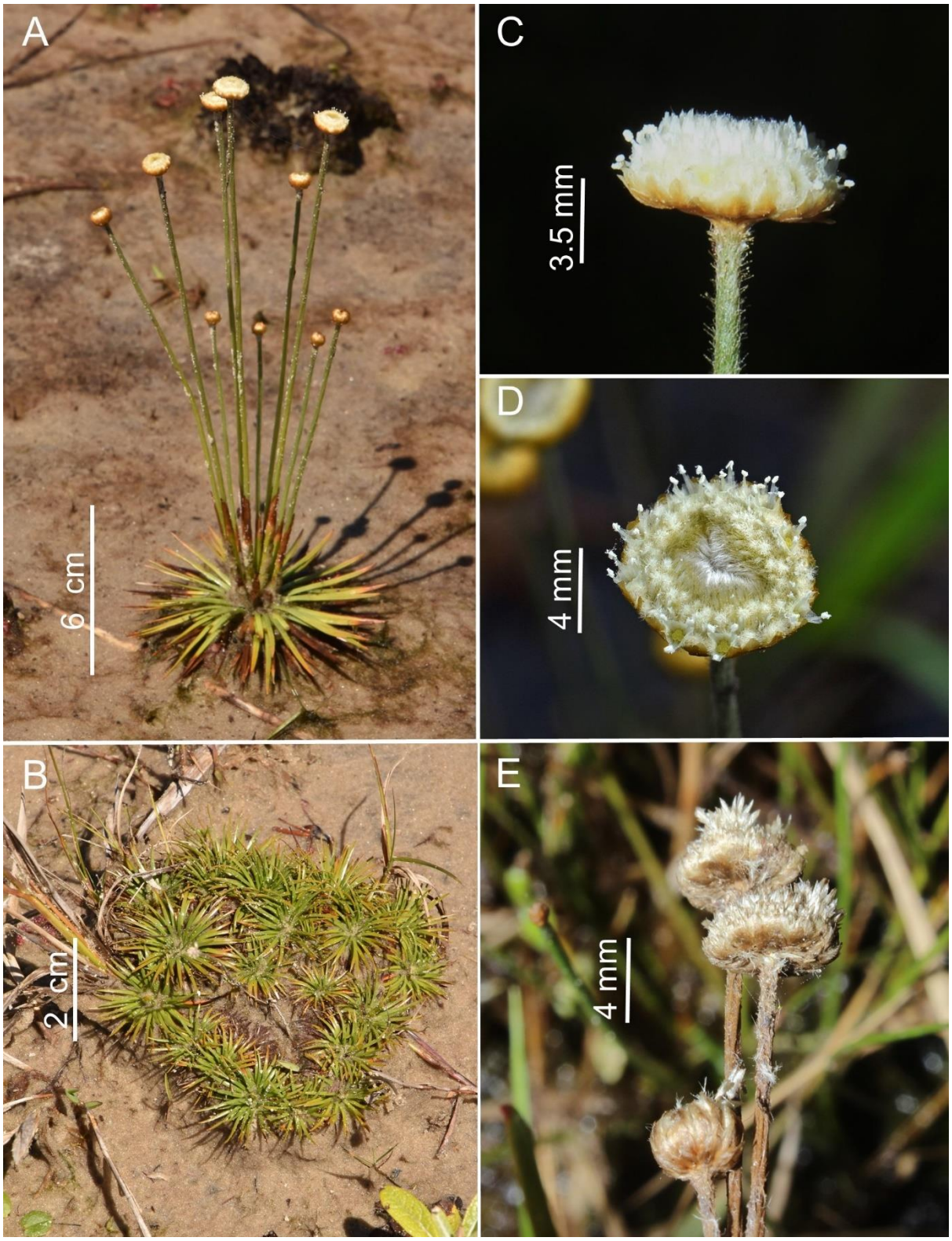

FIGURE 65. *Syngonanthus chrysanthus* (Eriocaulaceae). A) Habit. B) Young infertile specimens arranged in circle, the central and older specimen which originated the group already not visible. C) Capitulum in lateral view at the apex of a pilose scape. D) Capitulum in top view displaying staminate flowers. E) Old capitula with diaspores ready to dispersion. Images A–B by Thomas Stützel, C and E by Cassio Rabuske da Silva, and D by Martin Molz.

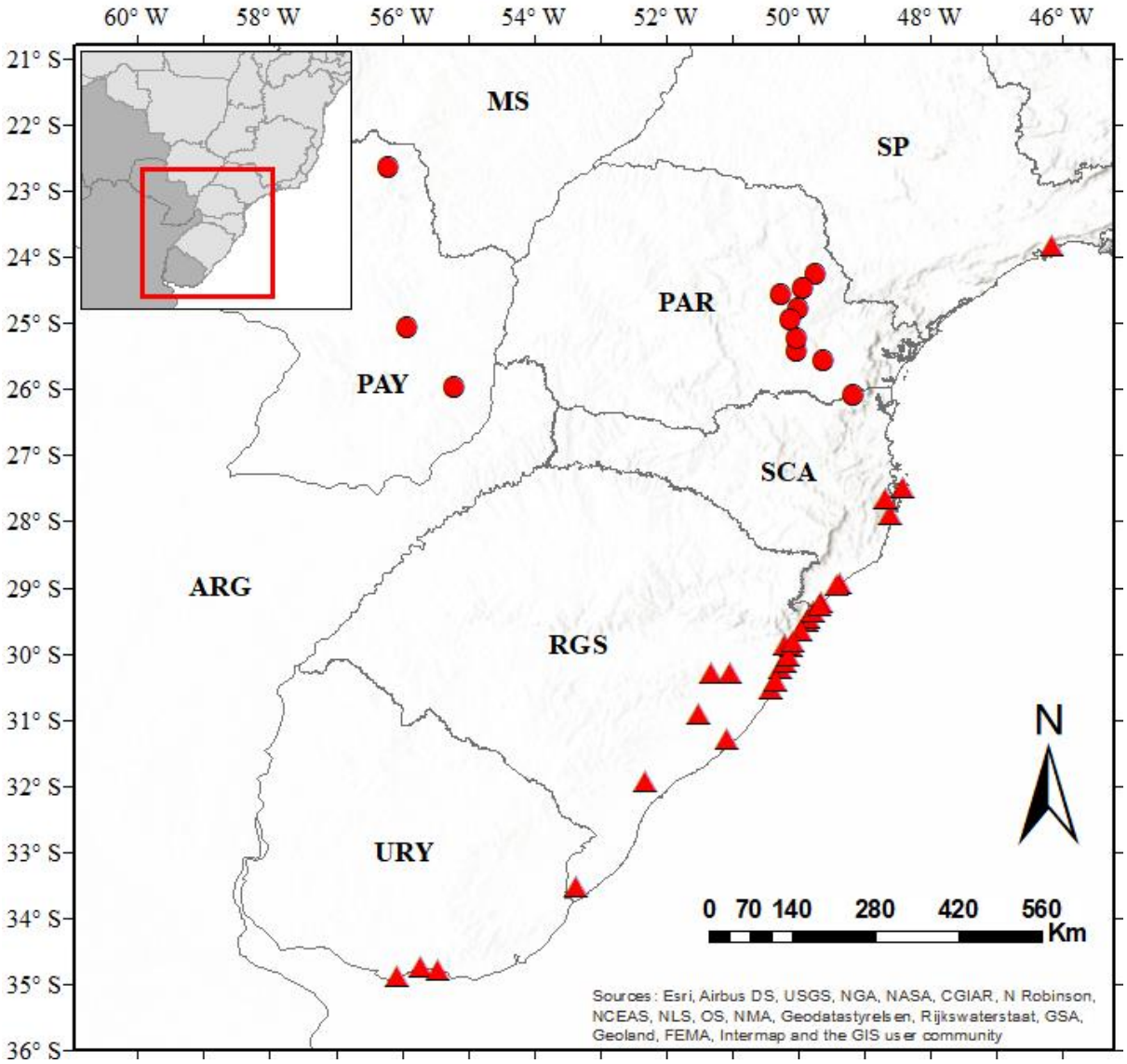

FIGURE 66. Distribution map of *Syngonanthus chrysanthus* (red triangle) and *S. nitens* (Eriocaulaceae) (red circle) in subtropical South America (ARG = Argentina; MS = Mato Grosso do Sul; PAR = Paraná; PAY = Paraguay; RGS = Rio Grande do Sul; SCA = Santa Catarina; SP = São Paulo; URY = Uruguay).

FIGURE 67. *Syngonanthus fischerianus* (Eriocaulaceae) from Guaratuba, Paraná, southern Brazil (*H.Longhi-Wagner et al. 8862*, ICN barcode 00044160).

FIGURE 68. Rosettes of *Syngonanthus fischerianus* (Eriocaulaceae) with remaining old scapes. Image by Cassio Rabuske da Silva.

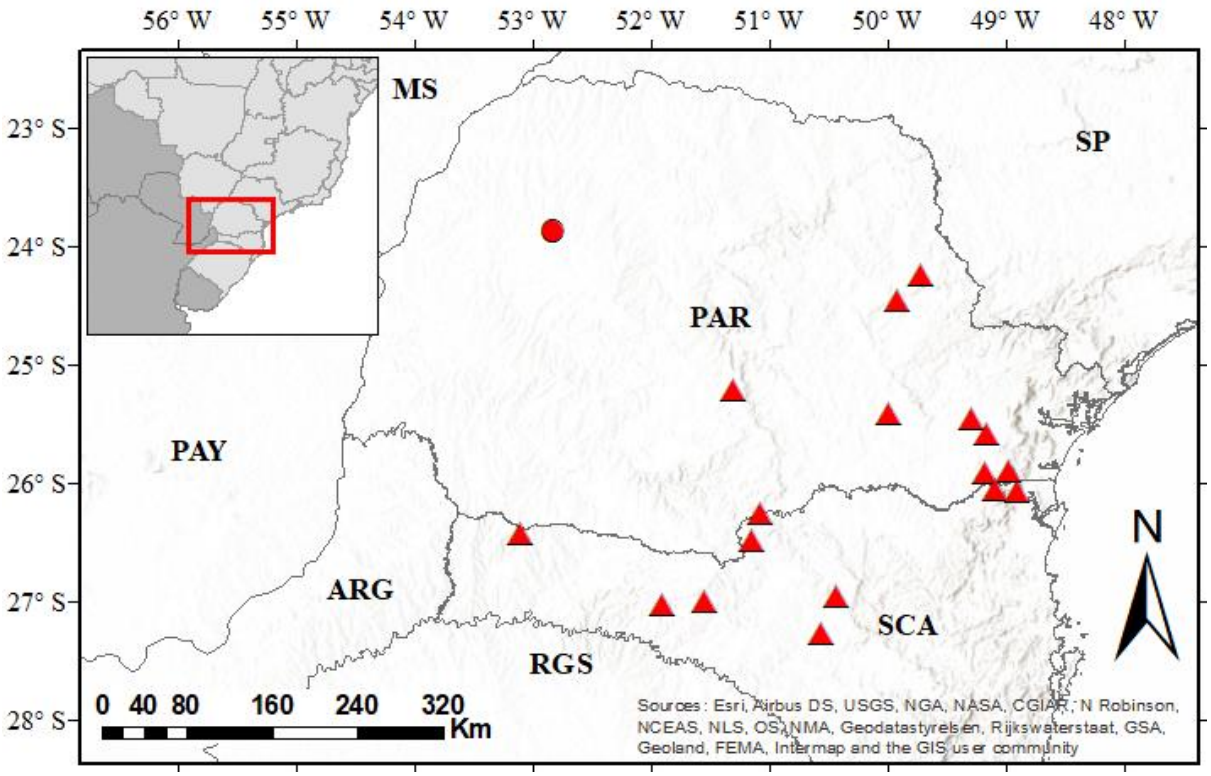

FIGURE 69. Distribution map of *Syngonanthus fischerianus* (red triangle) and *S. helminthorrhizus* (Eriocaulaceae) (red circle) in subtropical South America (ARG = Argentina; MS = Mato Grosso do Sul; PAR = Paraná; RGS = Rio Grande do Sul; SCA = Santa Catarina, SP = São Paulo).

FIGURE 70. *Syngonanthus helminthorrhizus* (Eriocaulaceae) from Tuneiras do Oeste, Paraná, southern Brazil (*M.G.Caxambu et al. 4808*, MBM barcode 407548).

FIGURE 71. *Syngonanthus nitens* (Eriocaulaceae) from Ponta Grossa, Paraná, southern Brazil (*P.L.Krieger 10830*, MBM 254275).

FIGURE 72. Image extracted from Silveira (1928), Tabula CCLIV ("Ilha dos Marinheiros – Rio Grande – Campo de *Paepalanthus bifrons*. Phot. do sr. Josué Deslandes").

TABLE 1. Genera of Eriocaulaceae currently accepted, respective estimated global number of species, distribution worldwide and references.

Genus	Estimated global number of species	Distribution worldwide	References
Eriocaulon L.	400–800	Africa, America, Asia, Europe and Oceania	Giulietti & Hensold 1990, Giulietti *et al*. 2012
Paepalanthus Mart.	500	Africa and Central to South America	Giulietti & Hensold 1990, Giulietti *et al*. 2012
Syngonanthus Ruhland	120–150	Africa and America	Watanabe *et al*. 2015
Actinocephalus (Bong.) Sano	49	South America (Brazil)	Sano 2004, Costa & Sano 2013
Leiothrix Ruhland	50	South America	Giulietti et al. 1995, Giulietti & Silva 2016
Comanthera L.B.Sm.	40	South America	Echternacht *et al.* 2015
Mesanthemum Körn.	17	Africa	Liang *et al*. 2019
Lachnocaulon Kunth	7	North to Central America (Cuba)	Giulietti & Hensold 1990
Rondonanthus Herzog	6	South America (Guiana Shield)	Giulietti & Hensold 1990, Hensold & Giulietti 1991
Tonina Aubl.	1	Central to South America	Giulietti & Hensold 1990
Total estimated number	1140–1620		

TABLE 2. Field expeditions carried out from 2018 to 2020 in subtropical South America, period of occurrence and source of the financial resources used (CPG = Coastal Plain Grasslands; PAM = *Pampas* domain; SHG = Subtropical Highland Grasslands).

Country / province or state / ecoregion	**Estimated number of expeditions**	**Period**	**Source of the financial resources**
Argentina / Buenos Aires / PAM	1	December 2019	CNPq (Silvia T.S. Miotto); personal
Brazil / Paraná / other (Curitiba)	1	August 2019	CAPES; CNPq (Silvia T.S. Miotto)
Brazil / Rio Grande do Sul / CPG	12	January 2018 February 2018 June 2018 July 2018 October 2018 December 2018 January 2019 March 2019 April 2019 October 2019 November 2019 December 2019	CNPq (Silvia T.S. Miotto); personal
Brazil / Rio Grande do Sul / SHG	5	October 2017 February 2018 October 2018 June 2019 October 2019	CAPES; personal
Brazil / Rio Grande do Sul / PAM	1	February 2019	personal
Brazil / Rio Grande do Sul / other (Fortaleza dos Valos)	1	January 2019	CAPES
Brazil / Santa Catarina / CPG	1	January 2019	CAPES; personal
Total estimated number	22		

TABLE 3. Confirmed taxa of Eriocaulaceae in subtropical South America, respective occurrence and total number of species per country (ARG = Argentina; BRA = Brazil; PAY = Paraguay; URY = Uruguay; 0 = absence; 1 = presence; I = Widespread; II = Highlands; III = Lowlands).

Species	**ARG**	**BRA**	**PAY**	**URY**	**Pattern**
*Actinocephalus polyanthu*s (Bong.) Sano	0	1	0	0	I
Comanthera xeranthemoides (Bong.) L.R.Parra & Giul.	0	1	0	0	I
Eriocaulon crassiscapum Bong.	0	1	0	0	I
E. gomphrenoides Kunth	1	1	0	1	I
E. helichrysoides Bong.	0	1	1	0	I
E. itapevense Alff & Stützel	0	1	0	0	III
E. macrobolax Mart. ex Körn.	1	1	1	0	III
E. magnificum Ruhland	0	1	0	0	III
E. modestum Kunth	0	1	0	1	I
E. reitzii Moldenke & L.B.Sm.	0	1	0	0	II
E. sellowianum Kunth	1	1	1	0	I
Leiothrix flavescens (Bong.) Ruhland	0	1	0	0	I
Paepalanthus albovaginatus Silveira	0	1	0	0	II
P. balansae Ruhland	0	1	1	0	III
P. bellus Moldenke	0	1	0	0	II
P. caldensis Malme	0	1	0	0	II
P. catharinae Ruhland	0	1	0	0	II
P. chiquitensis Herzog	0	1	0	0	I
P. hatschbachii Moldenke	0	1	0	0	II
P. henriquei Silveira & Ruhland	0	1	0	0	II
P. kleinii (Moldenke & L.B.Sm) Trovó	0	1	0	0	II
P. paulensis Ruhland	0	1	0	0	II
P. planifolius (Bong.) Körn.	0	1	0	0	I
P. pruinosus Ruhland	0	1	0	0	I

P. tessmannii Moldenke	0	1	0	0	II
Syngonanthus caulescens (Poir.) Ruhland	1	1	1	0	I
S. chrysanthus (Bong.) Ruhland	0	1	0	1	III
S. fischerianus (Bong.) Ruhland	0	1	0	0	II
S. helminthorrhizus (Mart. ex Körn.) Ruhland	0	1	0	0	III
S. nitens (Bong.) Ruhland	0	1	1	0	I
N° species	4	30	6	3	

TABLE 4. Confirmed taxa of Eriocaulaceae in southern Brazil, respective occurrence and total number of species per state (PAR = Paraná; RGS = Rio Grande do Sul; SCA = Santa Catarina; 0 = absence; 1 = presence).

Species	**PAR**	**RGS**	**SCA**
Actinocephalus polyanthus (Bong.) Sano	1	1	1
Comanthera xeranthemoides (Bong.) L.R.Parra & Giul.	1	0	0
Eriocaulon crassiscapum Bong.	1	0	0
E. gomphrenoides Kunth	1	1	1
E. helichrysoides Bong.	1	0	1
E. itapevense Alff & Stützel	0	1	1
E. macrobolax Mart. ex Körn.	1	0	0
E. magnificum Ruhland	0	1	1
E. modestum Kunth	1	1	1
E. reitzii Moldenke & L.B.Sm.	0	0	1
E. sellowianum Kunth	1	0	1
Leiothrix flavescens (Bong.) Ruhland	1	1	1
Paepalanthus albovaginatus Silveira	1	0	1
P. balansae Ruhland	1	0	0
P. bellus Moldenke	1	0	1
P. caldensis Malme	1	1	1
P. catharinae Ruhland	1	1	1
P. chiquitensis Herzog	1	0	0
P. hatschbachii Moldenke	1	0	1
P. henriquei Silveira & Ruhland	0	0	1
P. kleinii (Moldenke & L.B.Sm) Trovó	0	0	1
P. paulensis Ruhland	1	0	0
P. planifolius (Bong.) Körn.	1	1	1
P. pruinosus Ruhland	0	0	1

P. tessmannii Moldenke	1	0	1
Syngonanthus caulescens (Poir.) Ruhland	1	1	1
S. chrysanthus (Bong.) Ruhland	0	1	1
S. fischerianus (Bong.) Ruhland	1	0	1
S. helminthorrhizus (Mart. ex Körn.) Ruhland	1	0	0
S. nitens (Bong.) Ruhland	1	0	1
N° species	23	11	23

TABLE 5. Evaluated species of Eriocaulaceae, respective extent of occurrence (EOO) and area of occupancy (AOO), used cell width, preliminary conservation status and criteria according to the IUCN (2017) (DD = deficient data; EN = endangered; CR = critically endangered).

Evaluated species	**EOO (km2)**	**AOO (km2)**	**Cell width (km)**	**Preliminar conservation status**	**Criteria**
Eriocaulon itapevense Alff & Stützel	120.352	0.050	0.1	CR	B2a+bii,iii
E. magnificum Ruhland	24,344.351	96.000	2	EN	B2a+bii,iii,iv
E. reitzii Moldenke & L.B.Sm.	25.578	0.120	0.2	CR	B2a+biii
Paepalanthus albovaginatus Silveira	18,101.947	0.440	0.2	CR	B2a+biii
P. balansae Ruhland	47,458.622	24.000	2	EN	B2a
P. bellus Moldenke	18,152.671	0.240	0.2	CR	B2a+biii
P. catharinae Ruhland	50,827.902	68.000	2	EN	B2a+biii
P. hatschbachii Moldenke	938.213	0.120	0.2	CR	B2a+biii
P. pruinosus Ruhland	7,056.488	0.240	0.2	CR	B2a+biii
Syngonanthus chrysanthus (Bong.) Ruhland	99,316.717	112.000	2	EN	B2a+bii,iii,iv

Appendix I

A new species of *Eriocaulon* and an annotated checklist of Eriocaulaceae from the Coastal Plain grasslands of Southern Brazil

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A new species of *Eriocaulon* and an annotated checklist of Eriocaulaceae from the Coastal Plain grasslands of Southern Brazil

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Abstract

Eriocaulon itapevense, a new species from the Coastal Plain grasslands of Southern Brazil, is described and illustrated. The new species is morphologically similar to *E. magnificum*, from which it differs mainly by the pubescent and opaque-green to greyish leaves, spathes and scapes, the strongly cucullate and pungent leaf apex, the longer lateral slit of the spathe, the longer and wider involucral bracts, and the rhombic-spathulate median petals of the pistillate flowers. The description of the new species is accompanied by photos and line drawings, information on geographical distribution, habitat and a conservation status assessments. Additionally, we provide an annotated checklist and an identification key for the Eriocaulaceae from the Coastal Plain grasslands of Southern Brazil. Our checklist comprises five genera and nine species, including *Eriocaulon arechavaletae* and *Paepalanthus planifolius*, which are new records for this region.

Keywords: Atlantic Rainforest Domain, Eriocauloideae, Itapeva State Park, Pipeworts, Taxonomy

Resumo

Eriocaulon itapevense, uma nova espécie dos campos da Planície Costeira do Sul do Brasil, é descrita e ilustrada. A nova espécie é morfologicamente similar a *E. magnificum*, da qual difere principalmente por apresentar folhas, espatas e escapos pubescentes e verde-opacos a acinzentados, ápice das folhas fortemente cuculado e pungente, fenda lateral mais longa da espata, brácteas involucrais mais longas e mais largas, e pétalas médias das flores pistiladas rômbico-espatuladas. A descrição da nova espécie é acompanhada por imagens, informações sobre distribuição geográfica, hábitat e uma avaliação do *status* de conservação. Adicionalmente, são fornecidos um *checklist* comentado e uma chave de identificação de Eriocaulaceae dos campos da Planície Costeira do Sul do Brasil. Nosso checklist compreende cinco gêneros e nove espécies, incluindo *Eriocaulon arechavaletae* e *Paepalanthus planifolius*, que são novos registros para a região.

Palavras-chave: Eriocauloideae, Domínio da Mata Atlântica, Parque Estadual de Itapeva, Sempre-vivas, Taxonomia

Introduction

Eriocaulon Linnaeus (1753: 87) is the most widespread genus of Eriocaulaceae, comprising ca. 540 species distributed mainly in tropical and subtropical regions around the world (Giulietti & Hensold 1990, Stützel 1998, Govaerts 2018). In the Americas, Brazil has the highest richness in the genus, with ca. 50 species, especially in the Cerrado Domain (Oliveira & Bove 2015).

For Southern Brazil, 8–11 species of *Eriocaulon* are reported so far, typically inhabiting wetlands ecosystems (Moldenke & Smith 1976, Giulietti 2008, Oliveira & Bove 2015). The Coastal Plain grasslands (CPG) encompass the coast of Rio Grande do Sul (RS) and the southern coast of Santa Catarina (SC) (here considered from Passo de Torres to Laguna) (Boldrini 2009). The CPG in RS concentrate most of the wetlands in Southern Brazil, bearing a great richness of aquatic macrophytes (Irgang & Gastal-Jr. 1996, Rolon *et al*. 2010). Rambo (1954) cites only three species of *Eriocaulon* for the CPG in RS: *E. magnificum* Ruhland (1903: 48), *E. modestum* Kunth (1841: 547)

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and *E. megapotamicum* Malme (1935: 8). For the CPG in SC, Moldenke & Smith (1976) also cite three species: *E. magnificum* and *E. modestum*, plus *E. ulaei* Ruhland (1903: 47). *Eriocaulon megapotamicum* is considered restricted to RS and *E. ulaei* to SC.

Here we describe *Eriocaulon itapevense*, a new species known only from the Coastal Plain grasslands of Southern Brazil. The description is accompanied by photos and line drawings, as well as information about distribution, preferential habitat and a conservation status assessment. Additionally, we provide an updated checklist and an identification key of Eriocaulaceae from the CPG of Southern Brazil.

Material & Methods

The new species was found during the ongoing revision of Eriocaulaceae in Southern Brazil. Exsiccates from the following herbaria were examined: CRI, ECT, EFC, FLOR, FURB, HAS, HBR, HUCS, HURG, ICN, MPUC, PACA and PEL (acronyms according to Thiers 2018, continuously updated). Over 400 specimens of *Eriocaulon* from Southern Brazil were analyzed. Type-specimens were examined either directly or through the online database JSTOR Global Plants (2000 onwards). Regional literature referring to the family was consulted (Arechavaleta 1902, Herter 1930, 1935, 1954, Abbiatti 1946, Moldenke & Smith 1976, Giulietti 2008, Sano & Giulietti 2012, Giulietti *et al.* 2018). Additionally, we conducted six field expeditions in order to collect samples and observe the phenology of the new taxon, from February 2018 to January 2019, in Rio Grande do Sul and Santa Catarina. Seeds were examined using both optical and scanning electron microscopy (SEM). Morphological terms follow Beentje (2010). ArcGis 10.1 was used for the construction of the distribution map, each point corresponding to a single locality. The conservation status was evaluated according to IUCN (2017) criteria, using GeoCAT (Bachman *et al.* 2011) for geospatial analysis. Voucher material is cited for each species included in the checklist, and the respective conservation status and criteria in Rio Grande do Sul are also provided (Rio Grande do Sul 2014).

Taxonomic treatment

Eriocaulon itapevense Alff & Stützel *sp. nov.* (Figs. 1–5)

Type:—BRAZIL. Rio Grande do Sul: Torres, Parque Estadual de Itapeva, Lagoa do Simão, 29°22'38"S 49°46'21"W, 30 June 2018, *C.C.Alff & C.Rabuske 132* (holotype ICN!, isotypes FLOR!, K!, MBM!, NY!, RB!, SPF!).

Eriocaulon itapevense is morphologically similar to *E. magnificum*. The new species differs from *E. magnificum* mainly by height up to 120 cm (*vs.* up to 80 cm), leaves, spathes and scapes opaque green to greyish, with pubescent indument (*vs.* bright-green, glabrous), apex of the leaves strongly cucullate and pungent to touch (*vs.* slightly cucullate, not pungent to touch), spathe lateral slit 40–180 mm length (*vs.* 22–30 mm), capitulum up to 15 mm diameter (*vs.* up to 12 mm), capitulum receptacle up to 7 mm diameter (*vs.* up to 4 mm), involucral bracts 4.5–5 (5.5) × 2.5–4 mm (*vs.* 2–4.1 × 1–2.5 mm), pistillate flowers with median petals rhombic-spathulate (*vs.* spathulate), and epipetalous glands up to 0.5 mm long, frequently reaching the median third of the petals (*vs.* up to 0.2 mm long, never reaching the median third of the petals).

Perennial herbs, 40–120 cm high when flowering, pubescent, with trichomes hyaline up to 1.5 mm long on leaves and spathes (mostly capitate on the leaves), and 0.2–0.6 mm long on the scapes. **Roots** white, spongiose, articulated by transversal diaphragms in the aerenchyma. **Leaves** rosulate, distichous equitant in the vegetative phase, spirally in the flowering period, decaying leaves persisting at the base of the rosette, 32–78 × 2–5.5 cm, naviculate, linear-lanceolate, wider at the base, crassus, coriaceous, opaque-green to greyish, apex cucullate and pungent, flavescent. **Spathes** 24–45 cm long, apical opening very small, the growing capitula causing a lateral rupture where the capitula leaves the spathe, slit 40–180 mm long. **Scapes** 6–18 per rosette, in central (terminal) clusters, 50–110 cm long, 9–13-costate. **Capitula** solitary, hemispheric to globose, 10–15 mm diameter, white; receptacle 3.5–7 mm diameter, glabrous. **Involucral bracts** in 3–5 series, 4.5–5 (5.5) × 2.5–4 mm, patent, ovate to lanceolate, thinner at the margins, stramineous, apex attenuate, trichomes hyaline, sparse, up to 0.2 mm long on the margins and abaxial surface. **Floral bracts** 4.5–5 (6.2) × 1–1.5 (2) mm, naviculate, lanceolate, chartaceous, light black towards the margin at the median third, stramineous at base and apex, apex long-attenuate, trichomes white, 0.1–0.2 mm long, mainly appressed, on the margins and abaxial surface, forming a rhombic pilose area at the distal third. **Flowers** strictly unisexual, 3-merous, perianth similar in

flowers of both sexes; sepals equal, free, slightly concave, spathulate to oblanceolate, light black to black (usually darker in the pistillate flowers), apex acuminate; lateral petals different in shape and size from the median petal, larger and wider, indument similar as presented by the floral bracts, trichomes on both surfaces and margins (the abaxial surface usually less pilose), plus trichomes hyaline, crispate, 2–3 mm long, mainly within the corolla of the pistillate flower and on the gynophore; epipetalous glands 0.2–0.5 × 0.1 mm, irregular surface, black, deltoid to ovoid, subapical, frequently reaching the median third of the petal. **Staminate flowers** 2.5–4.2 × 1–2.5 mm (including up to 1.5 mm long pedicel); antophore up to 1 mm long; sepals 2–2.8 × 0.8–1 mm; petals slightly fused at the base, median petal 2.5–3 × 1–1.2 mm, cream, spathulate to oblanceolate, apex attenuate, lateral petals reduced, 1.8–2 × 0.3–0.5 mm, spathulate to oblanceolate, apex attenuate; diplostemonous, stamens 6 (3 of them epipetals), up to 1.3 mm long, included, dorsifixed, irregular surface, filaments cream to stramineous, ca. 1.1 mm long, anthers black, ca. 0.2 mm long, bithecal, elliptical, pistillode black, up to 0.1 mm long. **Pistillate flowers** 3.8–4.3 (6) × 2.5–3 (4.5) mm (including the up to 0.5 mm long pedicel); antophore ca. 1.5 mm long; sepals 2–3 (5) × 1–1.3 (1.5) mm; petals free, median petal 2.5–3 (5) × 1.1–1.4 (2) mm, rhombic-spathulate, apex obtuse or acute to attenuate, cream, becoming blackish towards the base, sometimes forming a well-delimited rhombic cream spot from median to distal third, lateral petals 2.1–2.5 (4) × 0.8–1.2 mm, spathulate to oblanceolate, apex obtuse to acute, color pattern as presented by the dorsal petal; gynophore up to 1 mm long; gynoecium 2.5–3 long, irregular surface, ovary hypogynous, 3-carpellate, ca. 1 mm long, black, styles forming a column and 3 stramineous stigmatic branches, twice as long as the ovary. **Fruit** a loculicidal capsule. **Seeds** 0.8–1 × 0.5–0.6 mm, elliptical, dull to bright brown; seed coat with hexagonal cells, transversely elongated, ca. three times as long as wide, ca. 35 cells in longitudinal direction and 12 along the circumference; primary projections mostly absent, sometimes present, columnar appendages of the transversal walls (secondary projections) 3 or 4 on either side, sometimes flanked by unthickened remains of the anticlinal wall and topped by remains of the periclinal wall of outer layer of the outer integument.

Distribution and habitat:—*Eriocaulon itapevense* is recorded only in the municipalities of Torres, Passo de Torres, São João do Sul and Sombrio, and is thus restricted to the Coastal Plain grasslands of Rio Grande do Sul and Santa Catarina states, Southern Brazil. The species grows in wetlands, in marshy and organic soils near lagoons, up to 32 m elevation (Fig. 4).

Etymology:—The specific epithet "*itapevense*" refers to the type-locality, Itapeva, in Torres municipality, Rio Grande do Sul, Brazil. From the tupi-guarani language meaning "flat stone" (*ita* = stone; *peba* = flat) (Ruschel 1966).

Phenology:—Flowers were observed from June to October, less frequently from January to February.

Conservation:—*Eriocaulon itapevense* is Critically Endangered (CR) according to IUCN (2017) criteria B2a+bii,iii. Its extent of occurrence (EOO) is 120.352 km² and its area of occupancy (AOO) is 0.050 km². The species is currently included within two protected areas: Itapeva State Park and Lagoa Itapeva Environmental Protection Area. The most abundant subpopulation of the species is located in Itapeva, in the Itapeva State Park, near the Lagoa do Simão. The subpopulation located in Campo Bonito, in the Lagoa Itapeva Environmental Protection Area, as well as the subpopulations from Santa Catarina (municipalities of Passo de Torres, São João do Sul and Sombrio), consists of a few sparse individuals, threatened by overgrazing and growing habitat conversion due to the drainage of wetlands for agricultural use and human occupation.

Paratypes:—BRAZIL. Rio Grande do Sul: Torres, Parque de Torres, 11 July 1972, *B.Irgang & A.M.Girardi s.n.* (ICN 27895!); Torres, na entrada para Itapeva, 13 October 1984, *N.Silveira 1796* (HAS!); Torres, próximo ao posto da Corlac, na BR-101, 27 September 1985, *R.Frasi, N.Silveira & N.Model 411* (HAS!); Torres, em Itapeva próximo ao aeroporto, 19 January 1990, *N.Silveira 9102* (HAS!); Torres, Itapeva, 6 September 1993, *N.Silveira 11590* (HAS!); Torres, Itapeva, Parque Estadual de Itapeva, Lagoa do Simão, 29°22'38"S 49°46'21"W, 14 m elev., 28 August 2016, *C.Rabuske, C.C.Alff & C.R.M.Reis 54* (ICN!); Torres, Itapeva, Parque Estadual de Itapeva, Lagoa do Simão, 29°22'37.8"S 49°46'22.1"W, 20 m elev., 3 February 2018 (remains of scapes and bracts), *C.C.Alff, C.Rabuske, R.Frizzo & U.Brocca 100* (ICN!); Torres, Campo Bonito, 29°22'21"S 49°46'45"W, 12 m elev., 30 June 2018, *C.C.Alff & C.Rabuske 133* (ICN!); Torres, Campo Bonito, Olhos d'Água, 29°20'39.95"S 49°46'28.19"W, 32 m elev., 21 September 2018, *M.Grings 1925* (ICN!); Torres, Itapeva, Parque Estadual de Itapeva, Lagoa do Simão, 27 October 2018, 29°22'38"S 49°46'21"W, 14 m elev., *C.C.Alff, T.Stützel & J.D.T.Carvalho* (ICN!). Santa Catarina: Passo de Torres, 29°18'04.7"S 49°42'21.9"W, 8 m elev., 30 January 2019, *C.C.Alff & C.Rabuske-Silva 176* (ICN!); São João do Sul, 6 September 1977, *K.Hagelund 11423* (ICN!); Sombrio, Sombrio p. Araranguá, 3 February 1946, *B.Rambo SJ 37322* (PACA!).

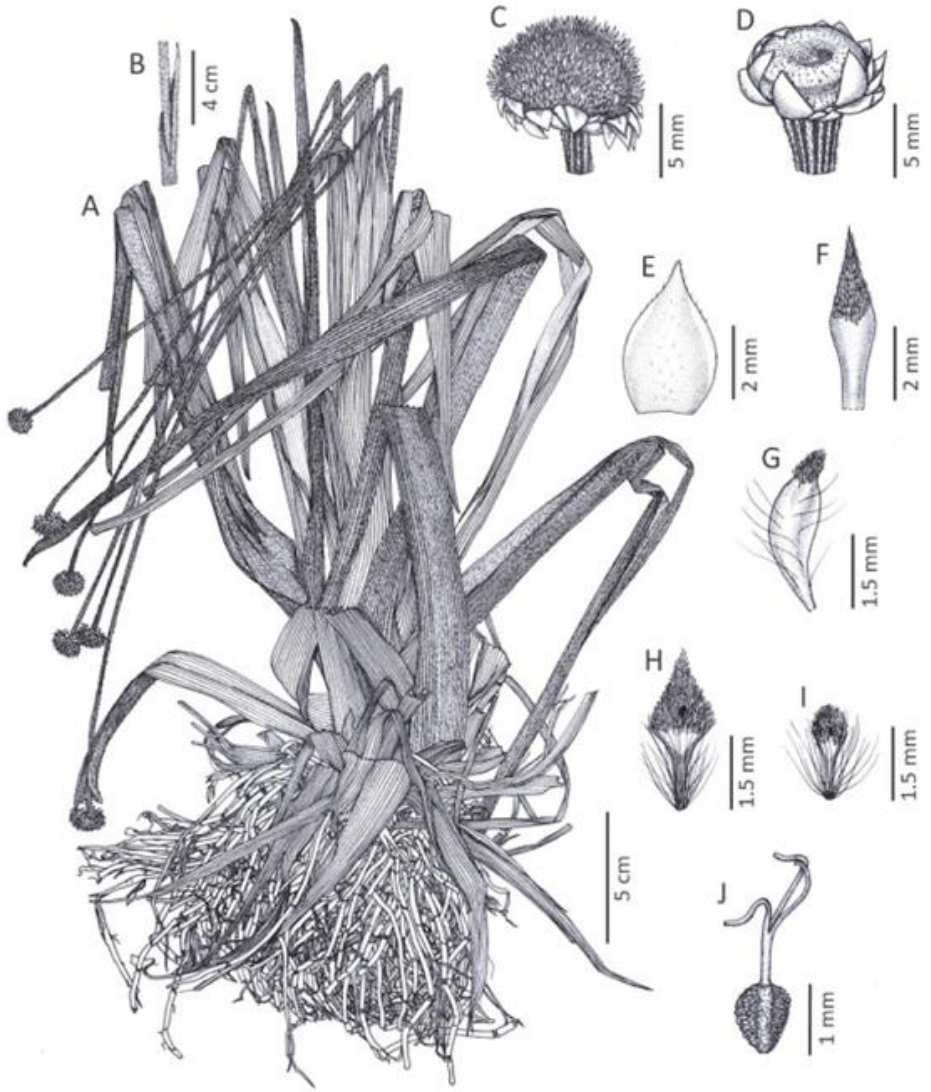

FIGURE 1. *Eriocaulon itapevense*. A) Habit. B) Spathe showing the lateral slit, after rupture by the growing capitulum. C) Capitulum. D) Receptacle surrounded by involucral bracts. E) Involucral bract. F) Floral bract. G) Sepal. H) Median petal of the pistillate flower. I) Lateral petal of the pistillate flower. J) Gynoecium. *C.Rabuske, C.C.Alff & C.R.M.Reis 54* (ICN 195207). Drawings by Anelise Scherer.

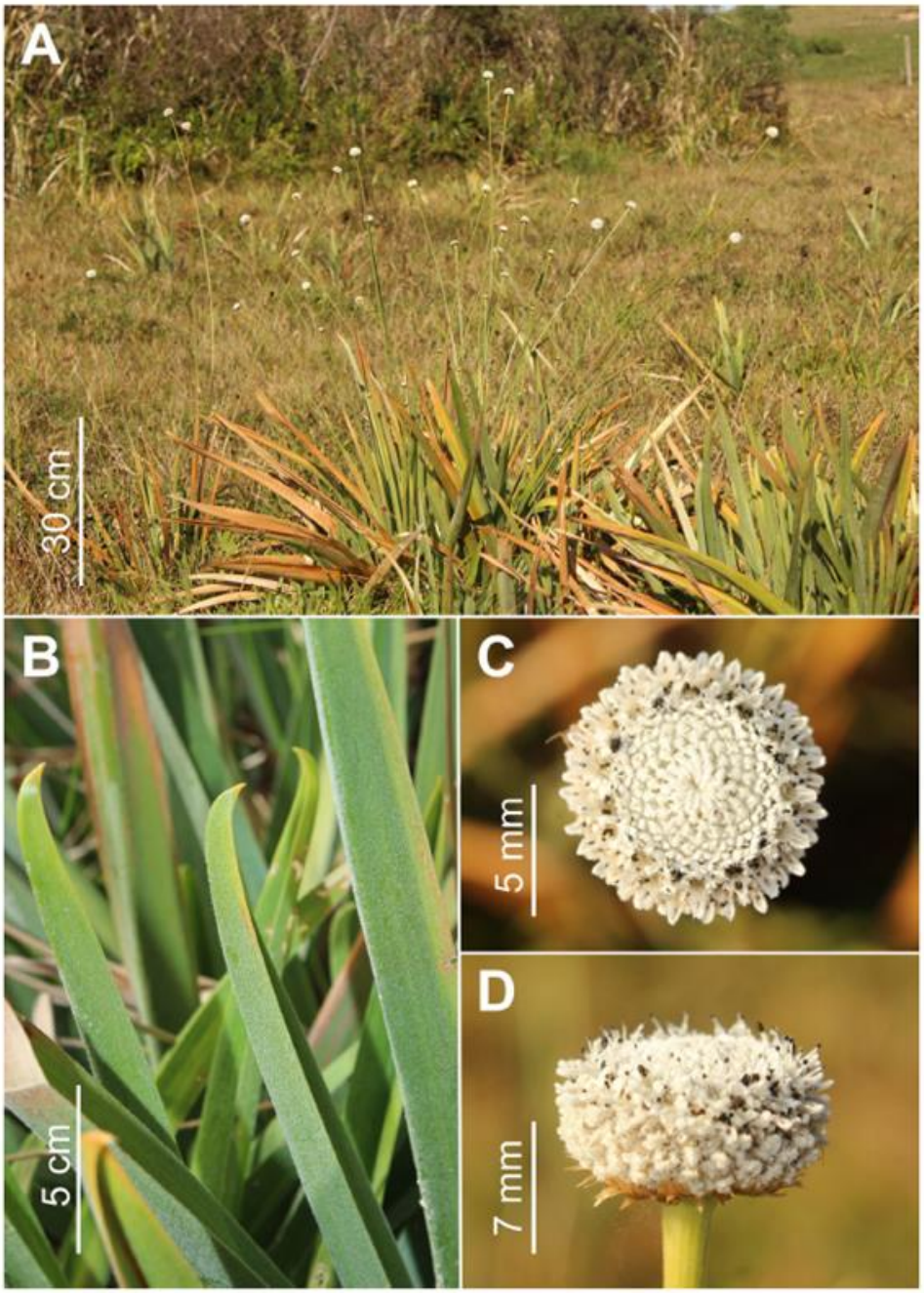

FIGURE 2. *Eriocaulon itapeverense*. A) Habit. B) Detail of the leaves. C–D) Capitulum. C) Top view of the capitulum. D) Lateral view of the capitulum. Images by Cassio Rabuske da Silva.

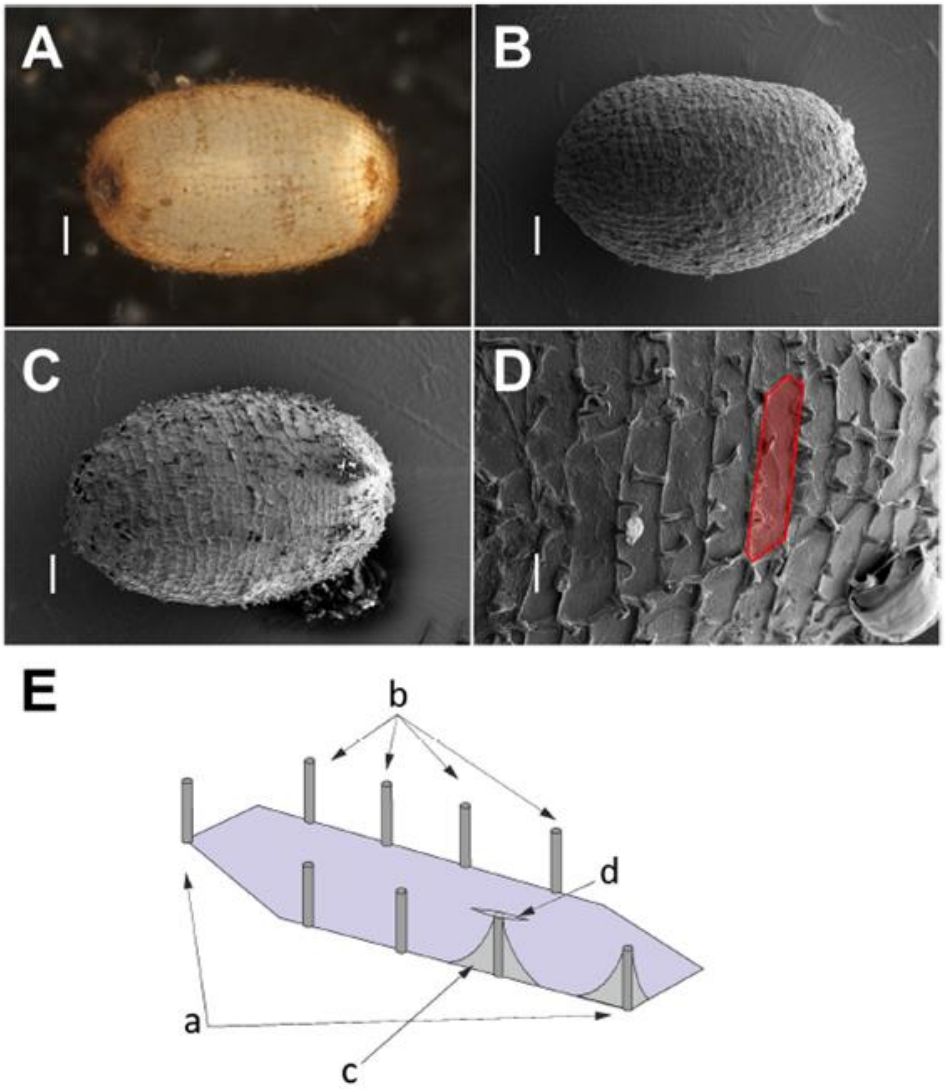

FIGURE 3. Seeds of *Eriocaulon itapevense*. A) Seed in light microscope. B–D) Seed in SEM microscope. B) Seed as released from the fruit. C–D) Seed after wetting and redrying. D) Detail of the seed surface, showing single cell delimitation (red). E) Single cell illustration, showing primary projections (a), secondary projections (b), remains of the unthickened anticlinal wall (c) and of the periclinal wall (d). Scale: A–C) 100 µm; D) 20 µm.

Comments:—Specimens of *Eriocaulon itapevense* were first collected in the 1940s, and are only now being described as distinct species, well over half a century later. The new species is represented in regional herbaria by less than 15 specimens. In the field, the new species stands out at a distance by its robust size and opaque-green to greyish color, resulting from the plentiful presence of trichomes, while the typical green of *E. magnificum* is bright and clear. The leaves in *E. itapevense* are stiffer when compared to *E. magnificum*, the apex of the leaves of the new species being strongly cucullate and pungent to touch, characters that are distinctive even in dried material. The apical opening of the spathe is very small at first, but changes into a long lateral slit in *E. itapevense* by rupturing caused by

the initial ascension of the growing capitulum (Fig. 5). The pistillate flowers in *E. itapevense* are densely covered in trichomes, concealing the epipetalous glands and the gynoecium, unlike in *E. magnificum*, which has fewer trichomes. Comparative diagnostic characters between the two species are provided (Table 1). Besides morphological characters, records in herbaria and fieldwork observations point to differences in their phenology, which might be better elucidated in further studies. While *E. magnificum* flowers all year, blooming during summer, the new species has a more restricted flowering period, from June to October, with sparse records from January and February.

TABLE 1. Comparative diagnostic characters of *Eriocaulon magnificum* and *E. itapevense*.

Diagnostic characters	***E. magnificum***	***E. itapevense***
Height	40–70 (80) cm	40–120 cm
Indument on leaves, spathes and scapes	glabrous	pubescent
Color of leaves, spathes and scapes	bright-green	opaque-green to greyish
Apex of the leaves	slightly cucullate, not pungent to touch	strongly cucullate and pungent to touch
Length of the spathe lateral slit	22–30 mm	40–180 mm
Diameter of the capitulum	(7) 9–12 mm	10–15 mm
Diameter of the capitulum receptacle	2.7–4 mm	3.5–7 mm
Length and width of the involucral bracts	2–4.1 × 1–2.5 mm	4.5–5 (5.5) × 2.5–4 mm
Shape of the median petal (pistillate flower)	spathulate	rhombic-spathulate
Color of the median petal (pistillate flower)	cream, gradually becoming greyish or blackish towards the base	cream, becoming blackish towards the base, sometimes forming a well-delimited rhombic cream spot from median to distal third
Length of the epipetalous glands	0.1–0.2 mm long, never reaching the median third of the petal	0.2–0.5 mm long, frequently reaching the median third of the petal

Checklist:—Rambo (1954) cites seven species of Eriocaulaceae for the Coastal Plain of Rio Grande do Sul: *Paepalanthus polyanthus* (Bongard 1831: 622) Kunth (1841: 516) (= *Actinocephalus polyanthus* (Bong.) Sano (2004: 103)), *Eriocaulon magnificum*, *E. megapotamicum*, *E. modestum*, *Leiothrix flavescens* (Bongard 1831: 628) Ruhland (1903: 231), *Syngonanthus caulescens* (Poiret 1813: 162) Ruhland (1903: 267) and *S. chrysanthus* (Bongard 1831: 628) Ruhland (1903: 256). Moldenke & Smith (1976) cite the same species for this formation in the southern portion of Santa Catarina, except for *E. megapotamicum* and *S. caulescens*, and with the addition of *E. ulaei* and *P. catharinae* Ruhland (1903: 147), thus also resulting in seven species.

Here we present an updated checklist, which includes nine species of Eriocaulaceae from the Coastal Plain grasslands of Southern Brazil (Table 2). Despite the current recognition of *Eriocaulon megapotamicum*, described for the southern part of the Patos Lagoon, in RS, the material we examined of this species actually corresponds to *E. magnificum*, in agreement with Rambo (1954). Thus, neither *E. megapotamicum* nor *E. ulaei* are included in our checklist, because no supporting voucher specimens were found. Further studies on the species of the *E. magnificum* complex are necessary before taxonomic changes can be made. The single specimen cited by Moldenke & Smith (1976) as *Paepalanthus catharinae* (*Reitz & Klein 22*, HBR!, US image!, S image!), corresponds to *E. modestum*. *Paepalanthus catharinae* is in fact a species endemic to the Subtropical Highland Grasslands (Iganci *et al*. 2011). Our checklist differs from the previous surveys also by the inclusion of *Eriocaulon arechavaletae* Herter (1935: 125), *E. itapevense* and *Paepalanthus planifolius* (Bongard 1831: 629) Koernicke (1963: 413), which are new records for the region.

Of the nine species recorded in our checklist, four are considered to be under threat in Rio Grande do Sul (Rio Grande do Sul 2014). This is because the Coastal Plain grasslands are an extremely threatened vegetation type in RS, with one of the highest conversion rates among the grasslands (Andrade *et al*. 2015, Bonilha *et al*. 2017). Frequent threats include invasion by exotic species, agricultural expansion (including silviculture), growing urban expansion

and associated impacts (Brack 2009). In Santa Catarina, none of the species cited in the checklist is included as threatened in the state list (Santa Catarina 2014).

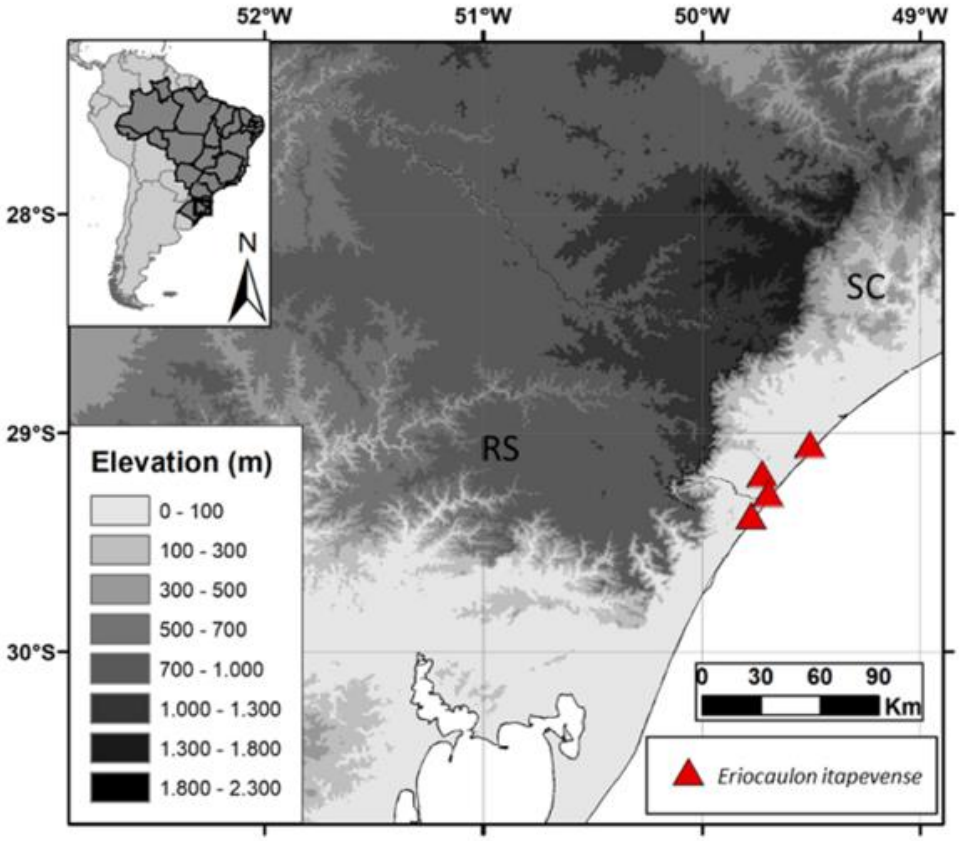

FIGURE 4. Distribution map of *Eriocaulon itapevense*, showing the known locations where the species occurs in Southern Brazil.

TABLE 2. Checklist of Eriocaulaceae from the Coastal Plain grasslands of Southern Brazil, respective conservation status and criteria in Rio Grande do Sul (RS), and designated voucher (VU = Vulnerable; EN = Endangered; CR = Critically Endangered; DD = Data Deficient).

Species	conservation status and criteria in RS	designated voucher
Actinocephalus polyanthus (Bong.) Sano	VU (A2a)	*C.C.Alff & C.Rabuske 140* (ICN!)
Eriocaulon arechavaletae Herter	DD	*P.Brack 658* (ICN!)
E. itapevense Alff & Stützel	CR (B2a+bii,iii)	*C.C.Alff & C.Rabuske 132* (ICN!)
E. magnificum Ruhland	VU (A2a)	*C.C.Alff & C.Rabuske 83* (ICN!)
E. modestum Kunth	VU (A2a)	*T.Stützel s.n.* (ICN 51499!)
Leiothrix flavescens (Bong.) Ruhland	DD	*C.C.Alff & C.Rabuske-Silva 173* (ICN!)
Paepalanthus planifolius (Bong.) Körn.	DD	*E.Valduga 462* (HUCS!)
Syngonanthus caulescens (Poir.) Ruhland	-	*C.C.Alff & C. Rabuske 103* (ICN!)
S. chrysanthus (Bong.) Ruhland	EN (A2a+4a; C1)	*C.C.Alff, C.Rabuske, R.Frizzo & U.Brocca 102* (ICN!)

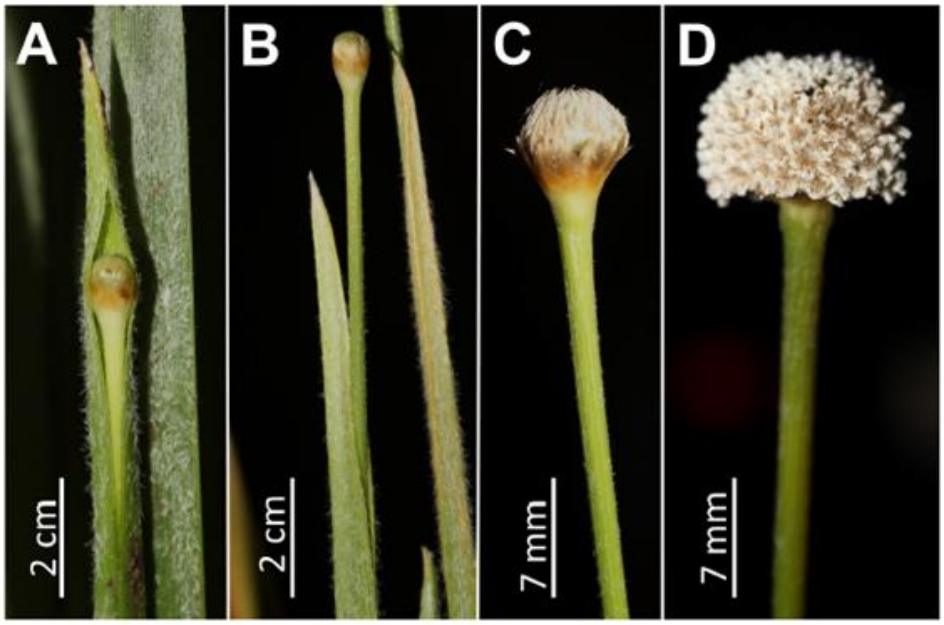

FIGURE 5. Development of the capitulum after the rupture of the spathe in *Eriocaulon itapevense*. A–B) Capitulum emerging from the spathe. C) Immature capitulum. D) Newly developed capitulum. Images by Cassio Rabuske da Silva.

Identification key to the species of Eriocaulaceae from the Coastal Plain grasslands of Southern Brazil

1. Petals with black glands; flowers diplostemonous, stamens 6 (Eriocauloideae) 2
- Petals without black glands; flowers isostemonous, stamens 3 (Paepalanthoideae) 5
2. Leaves with obtuse apex; capitula bilateral, reniform ..... *Eriocaulon arechavaletae*
- Leaves with acute to acuminate apex; capitula radial, hemispheric to globose 3
3. Small plants, flowering generally only up to 25 cm high; leaves up to 10 mm wide, always spirally arranged in basal rosettes; involucral bracts greyish to black ..... *E. modestum*
- Robust plants, flowering generally higher than 40 cm; leaves greater than 15 mm wide, distichous to spirally arranged in basal rosettes; involucral bracts straminеous 4
4. Leaves, spathes and scapes glabrous; apex of the leaves slightly cucullate, not pungent to touch; spathe lateral slit 22–30 mm; pistillate flowers with dorsal petals spathulate ..... *E. magnificum*
- Leaves, spathes and scapes pubescent; apex of the leaves strongly cucullate and pungent to touch; spathe lateral slit 40–180 mm; pistillate flowers with dorsal petals rhombic-spathulate ..... *E. itapevense*
5. Pistillate flowers with petals fused at the middle 6
- Pistillate flowers with petals free 7
6. Leaves membranaceous, lanceolate, apex slightly bifid, spirally arranged in elongated stems (acaulescent specimens also observed); capitula white, usually in an umbel-type inflorescence, with scapes leaving from the elongated stems ..... *Syngonanthus caulescens*
- Leaves coriaceous, linear, apex entire, always spirally arranged in basal rosettes; capitula brownish, scapes leaving from the basal rosette, never in elongated stems ..... *S. chrysanthus*
7. Capitula solitary or in clusters of few, not arranged in a complex inflorescence ..... *Leiothrix flavescens*
- Capitula arranged in a complex inflorescence 8
8. Capitula arranged in an umbelliform-manner at the apex of lateral leafy branches ..... *Actinocephalus polyanthus*
- Capitula composed of several capituliform subunits congestedly arranged at the apex of the scapes ..... *Paepalanthus planifolius*

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