UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL
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ESTUDO TAXONÔMICO E FILOGENÉTICO DO GÊNERO *RHYNCHOSPORA* (CYPERACEAE) SEÇÃO *LONGIROSTRES*

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Apresentação

Esta tese é apresentada da seguinte forma: uma introdução geral ao tema; seguido de três capítulos, em inglês, na forma de artigos já com formatação no modelo exigido pelas revistas em que serão submetidos e considerações finais.

Capítulo 1 – A taxonomic revision of *Rhynchospora* section *Longirostres* (Cyperaceae).

Revista pretendida: Phytotaxa (B1).

Capítulo 2 – Phylogeny of *Rhynchospora* section *Longirostres* (Cyperaceae).

Revista pretendida: American Journal of Botany (A2).

Capítulo 3 – Integrative taxonomy of the *Rhynchospora corymbosa* complex (Cyperaceae).

Revista pretendida: Perspectives in Plant Ecology, Evolution and Systematics (A1).

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RESUMO

Rhynchospora é um dos gêneros mais ricos de Cyperaceae, com cerca de 350 spp. As espécies estão distribuídas principalmente na América tropical, ocorrendo geralmente em áreas abertas e úmidas. Embora existam estudos recentes sobre o gênero, eles ainda são insuficientes e um grande número de seções ainda não foi revisado. *Rhynchospora* seção *Longirostres* tem 19 espécies. Algumas espécies na seção têm distribuição restrita e poucos dados de ocorrência. Assim, é provável que o risco de extinção destas esteja subestimado. Um dos motivos para este trabalho é que muito pouco ainda foi feito em relação à filogenia de *Rhynchospora*. Este estudo realizou: (1) um tratamento taxonômico através de revisão de literatura, de espécimes de herbários nacionais e internacionais e pesquisa de campo; (2) análises filogenéticas com o uso dos marcadores (ETS, ITS e *trnL-F*) e (3) um estudo taxonômico, ecológico e filogenético de parte do complexo *R. corymbosa*. Como resultado foi produzido uma revisão taxonômica que, com o suporte da filogenia, incluiu na seção, pela primeira vez *R. hassleri* (ex *R.* seção *Polycephalae*), excluiu *R. triflora* e revisou os limites de *R. corymbosa* com a sinônimização de espécies (*R. asperula*, *R. spectabilis*) e de diversas variedades. Também foram propostos ajustes taxonômicos como lectotipificações, neotipificações e exclusão de sinonímia.

Palavras-chave: ciperáceas, conservação, filogenia, Poales, sistemática, taxonomia;

ABSTRACT

Rhynchospora is one of the richest genus of Cyperaceae, with around 350 spp. The species are distributed mainly in tropical America, generally occurring in open and humid areas. Although recent studies on the genus exist, they are still insufficient and a large number of sections have not yet been revised. *Rhynchospora* section *Longirostres* has 19 species. Some species in the section have restricted distribution and little occurrence data. Thus, the risk of extinction of these is likely to be underestimated. One of the reasons for this work is that very little has been done in relation to the phylogeny of *Rhynchospora*. This study carried out: (1) a taxonomic treatment through literature review, specimens of national and international herbariums and field research; (2) phylogenetic analyzes using the markers (*ETS*, *ITS* and *trnL-F*) and (3) a taxonomic, ecological and phylogenetic study of part of the *R. corymbosa* complex. As a result, a taxonomic revision was produced which, with the support of phylogeny, included in the section, for the first time *R. hassleri* (ex *R.* section *Polycephalae*), excluded *R. triflora* and revised the limits of *R. corymbosa* with the synonymization of species (*R. asperula*, *R. spectabilis*) and of several varieties. Taxonomic adjustments such as lectotyping, neotyping and synonymy exclusion were also proposed.

Keywords: conservation, Cyperaceae, phylogeny, Poales, systematics, taxonomy;

SUMÁRIO

INTRODUÇÃO GERAL

Cyperaceae Juss. (1789: 26) compreende 109 gêneros e cerca de 5500 espécies (Govaerts & Simpson 2007) sendo a terceira maior família de monocotiledôneas. A família é cosmopolita ocorrendo em uma variedade de habitats que vão da tundra à floresta tropical, sendo frequentemente dominante em zonas úmidas (Goetghebeur 1998, Govaerts & Simpson 2007). Aproximadamente dois terços das espécies pertencem somente a seis gêneros: *Carex* L. (2000), *Cyperus* L. (950), *Rhynchospora* Vahl (350), *Eleocharis* R.Br. (200), *Fimbristylis* Vahl (200) and *Scleria* Berg. (200) (Goetghebeur 1998, Larridon *et al.* 2011, 2013, 2014, Global Carex Group 2015, Buddenhagen *et al.* 2017). Estima-se que no Brasil ocorra entre 600 a 700 espécies da família, incluídas em 39 a 44 gêneros (Alves *et al*. 2009), sendo *Rhynchospora* o gênero com maior riqueza de espécies. Estudos filogenéticos realizados por Muasya *et al.* (2009) apoiam a família como monofilética e Juncaceae como seu grupo-irmão, ambas inseridas na ordem Poales.

O gênero *Rhynchospora* é cosmopolita. Segundo Govaerts *et al.* (2013), esse gênero apresenta atualmente cerca de 350 espécies com concentração na América tropical. No Brasil, *Rhynchospora* é o gênero mais abundante da família, com cerca de 150 espécies (Alves *et al.* 2009).

As espécies de *Rhynchospora* se caracterizam pelas espiguetas com glumas de arranjo espiralado imbricado, (1–) 2–poucas glumas distais floríferas, com flores bissexuadas ou uma flor bissexuada e as superiores estaminadas, estilete único a bilobado, estilopódio persistente sobre o fruto e aquênio geralmente obovado e dorsiventralmente lenticular. As inflorescências podem ser corimbosas, paniculadas, anteliformes ou monocéfalas (Thomas 2020, Strong 2006; Goetghebeur 1998). Apresentam alta variabilidade morfológica, de plantas anuais com menos de 10 cm a perenes, rizomatosas, de até 3 m de altura.

Um estudo preliminar das relações filogenéticas na tribo Rhynchosporeae Nees (composta por *Rhynchospora* e *Pleurostachys*) foi realizado por Thomas *et al.* (2008), o qual evidenciou que *Pleurostachys* não foi sustentado como um clado separado, estando as espécies deste gênero incluídas no grande clado *Rhynchospora*. O gênero *Pleurostachys* Brongn. foi recentemente incorporado como uma seção de *Rhynchospora* (Thomas 2020). Os dois subgêneros atualmente aceitos em *Rhynchospora* (*Haplostylis* e *Rhynchospora*) não apresentaram monofiletismo e entre as seções abordadas, *Longirostres* Kunth foi uma das únicas a apresentar monofiletismo (Thomas *et al.* 2008).

Todavia os autores salientam que a amostragem para ambos os gêneros precisa ser ampliada para a obtenção de dados mais robustos.

A principal e mais completa revisão para o gênero foi a de Kükenthal (1949, 1950, 1951), que organizou *Rhynchospora* em dois subgêneros, cinco *Pars* (classificação informal entre subgênero e seção), 28 seções e contemplou 211 espécies.

Na classificação proposta por Kükenthal (1949, 1950, 1951), ainda hoje utilizada, as espécies do subgênero *Haplostylis* diferem do subgênero *Rhynchospora* (=*Diplostyleae sensu* Kükenthal) por apresentarem estilete indiviso ou bífido (dividido apenas na extremidade superior) *versus* estilete bilobado (cuja divisão alcança ou ultrapassa a metade do estilete). O subgênero *Haplostylis* foi dividido em duas *Pars* (partes): *Capitatae* e *Anthelatae*. A primeira apresenta sinflorescências formadas por um único glomérulo, a segunda com sinflorescências formadas por paniculódios, antelódios ou corimbódios. *Anthelatae* contém cinco seções, entre elas a seção *Longirostres*.

Rhynchospora seção *Longirostres* Kunth englobou os gêneros *Ephippiorhynchium* Nees e *Calyptrostylis* Nees. Atualmente, cerca de 115 nomes são listados para a seção *Longirostres*. Alves *et al.* (2009) reconhecem 17 espécies para o Brasil.

A maioria das espécies da seção ocorre em áreas úmidas e alagadas, tanto em áreas abertas como florestais, distribuída em regiões temperadas quentes e tropicais da América. Segundo Ueno & Koyama (1987), todas as espécies da seção são C_3. Esta seção se distingue de outras seções de *Rhynchospora* subgênero *Haplostylis* por suas espiguetas arranjadas em fascículos com ráquilas curtas entre os nós; estilopódio cônico a subulado e cerdas perigoniais rígidas que geralmente são dilatadas na base (Kükenthal 1949; Guaglianone 2001). As espécies da seção apresentam número cromossômico estável, n = 9 (Moore 1997; Luceño *et al*. 1998).

Os principais trabalhos taxonômicos na seção *Longirostres* foram os de Moore (1997) que estudou 14 espécies com foco no complexo *Rhynchospora corniculata* e de Guaglianone (2001) que trabalhou com 17 táxons da América Austral.

Neste trabalho, a análise de dados morfológicos e moleculares combinados tem como objetivo proporcionar um incremento à sistemática do gênero, uma vez que dados moleculares podem oferecer um grande número de caracteres informativos. Além disso, a taxonomia integrativa é imprescindível para o entendimento de comlexos de espécies como o de *R. corymbosa*. Além de testar o monofiletismo de *Rhynchospora* e as relações filogenéticas entre as espécies amostradas.

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Capítulo 1: Revisão taxonômica de *Rhynchospora* seção *Longirostres* (Cyperaceae)

RESUMO

Rhynchospora é um gênero com muitas seções (ca. 29) e espécies (ca. 350 spp) e está longe de ser taxonomicamente bem resolvida. As revisões taxonômicas recentes não abrangeram toda a seção *Longirostres*. Uma revisão taxonômica dessa seção é apresentada com base em literatura taxonômica, espécimes de herbário e pesquisa de campo. A seção contém dezoito espécies e uma subespécie. A maioria das variedades de *R. corymbosa* não é aceita, pois são os extremos das variações em alguns caracteres, mas apresentando uma grande continuidade entre todos eles. *R. hassleri* foi incluída pela primeira vez na seção e *R. triflora* foi excluída. A sinonimização entre R. scutellata e R. indianolensis foi desfeita, permitindo o reconhecimento da raridade de R. scutellata e a correta identificação de *R. indianolensis*. Três lectótipos e um neótipo foram designados. Também é apresentada uma chave de identifição a nível específico, assim como descrições e fotografias para todas as espécies.

Palavras-chave: complexo, tiririca, Poales

A taxonomic revision of *Rhynchospora* section *Longirostres* (Cyperaceae)

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ABSTRACT

Rhynchospora is a genus with many sections (ca. 29) and species (ca. 350 spp.) and is far from being well resolved taxonomically. The recent taxonomic reviews in *R. section Longiostres* did not covered the entire section. A taxonomic revision of this section is presented based on taxonomic literature, herbarium specimens and field work. The section contain eighteen species and one subspecies. Most *R. corymbosa* varieties where not accepted as they are the extremes of the variations in some characters, but there is a large continuum among all of them. *R. hassleri* was included in the section and *R. triflora* was excluded. The synonymization between *R. scutellata* and *R. indianolensis* was undone, allowing the recognition of the rarity of *R. scutellata* and the correct identification de *R. indianolensis*. Three lectotypes and a neotype were designated. A key to all species, descriptions and photographs of the species are also provided.

Keywords: beaksedges, species complex, Poales

INTRODUCTION

The family Cyperaceae Juss. (1789) comprises 109 genera and about 5500 species (Govaerts & Simpson 2007) and is the third largest family of monocots. It is cosmopolitan, occurring in a variety of habitats ranging from tundra to rainforest, often being dominant in wetlands (Simpson 1995). Approximately two-thirds of the species belongs to only six genera: *Carex* L. (2000), *Cyperus* L. (950), *Rhynchospora* Vahl (350), *Eleocharis* R.Br. (200), *Fimbristylis* Vahl (200) and *Scleria* Berg. (200) (Goetghebeur 1998, Larridon *et al.* 2011, 2013, 2014, Global Carex Group 2015, Buddenhagen *et al.* 2017). The family has about 500 specific or infraspecific taxa with economical or ethnobotanical importance, among them, 10 are *Rhynchopora* species (Simpson & Inglis 2001). Phylogenetic studies supported the family as monophyletic and Juncaceae as its

sister group on the order Poales (Muasya *et al*. 1998). Muasya *et al*. (2009) support the family division in the Mapanioideae and Cyperoideae subfamilies and accept 13 of the 14 tribes circumscribed by Goetghebeur (1998), with some changes in circumscription. Recent phylogenetic studies of Cyperaceae (Simpson *et al.* 2007; Muasya *et al*. 2009) positioned *Rhynchospora* with *Pleurostachys* Brongniart as the sister group in a large clade, in the subfamily Cyperoideae (sensu Goetghebeur 1998). Muasya *et al.* (2009) also proposed shifting the *Rhynchospora* and *Pleurostachys* clade from tribe Schoeneae to tribe Rhynchosporeae. Recently, based on molecular data, *Pleurostachys* was incorporated as a section of *Rhynchospora* (Thomas 2020).

The genus *Rhynchospora* is mostly pantropical. According to Buddenhagen *et al.* (2017) it has about 350 species with a concentration in tropical America. *Rhynchospora* species are characterized by spikelets formed with imbricate and spiral scales, rarely distichous, each scale subtending a flower, with proximal flowers bisexual, and more distal flowers functionally staminate, styles single to bilobed, with a persistent style base (stylopodium) on the fruit and achenes usually dorsiventrally lenticular. The synflorescences can be in the form of corymbodia, paniculodia, anthelodia or capitulae (Thomas 2020, Strong 2006, Goetghebeur 1998). The species are morphologically diverse, from annual plants less than 5 cm to rhizomatous perennials up to 3 m tall.

The most complete review of *Rhynchospora* was made by Kükenthal (1949, 1950, 1951). He organized *Rhynchospora* into two subgenera, five *Pars* (informal classification between subgenera and section), 28 sections, and 211 species. In his circunscription, *R.* sect. *Longirostres*, belong to the subgenus *Haplostylis* (Nees) Benth. & Hook.f and has spikelets in fascicles, rigid perianth bristles, fruit with a lateral gap or compressed-lenticular dense puncticulate or turgid-biconvex, with 11 species and 13 varieties [seven of *R. corymbosa* (L.) Britton].

Studies of phylogenetic relationships in the Rhynchosporeae tribe were carried out by Thomas *et al.* (2008) and Buddenhagen *et al.* (2017). The two subgenera of *Rhynchospora* accepted by Kükenthal (1949, 1950, 1951), *Haplostylis* and *Rhynchospora*, were not monophyletic and, among the sections covered, *Longirostres* Kunth was one of the few to appear as monophyletic.

Among the recent taxonomic studies of the genus *Rhynchospora* we highlight, Thomas (1992, 1994) on the Central American species and Thomas (1998) on the species of the

Venezuelan Guayana; Moore (1997) that studied 14 species of *R.* section *Longirostres* with focus on the North American *R. corniculata* complex. Guaglianone (2001) that worked with 17 taxa of *R.* sect. *Longirostres* in South America. Strong & Acevedo-Rodríguez (2005) on the genus in Puerto Rico and the Virgin Islands; and Strong (2006) on the genus in the Guianas.

Most species of *Rhynchospora* sect. *Longirostres* occur in wet and flooded areas, both in open and forested areas, in temperate to tropical regions of the Americas. According to Ueno & Koyama (1987), all species in the section are C_3. The species in the section have a stable chromosome number, n = 9 (Moore 1997; Luceño *et al.* 1998).

MATERIAL AND METHODS

This taxonomic revision is part of a research on *R.* sect. *Longirostres*, which also includes the phylogeny and biogeography of the group.

The study was based on a literature review and a morphological analysis of vegetative and reproductive characters of *Rhynchospora* specimens deposited in the following herbaria: BA, COR, CTES, CTESN, FLOR, FURB, HAS, HBR, HEPH, ICN, GH MBM, MPUC, MVFA, MVJB, MVM, NY, PACA, R, RB, SI, SP, SPF, UFP, UPCB, US, (herbarium acronyms from Thiers *et al*., 2020), and on high-resolution specimen images made available by many herbaria. Specimen identification was carried out by studying the original descriptions of the names of all taxa and comparing the specimens with type material and photographic images available on the JSTOR (2020) and virtual herbaria databases. Specimens collected by the authors are mainly deposited at the herbarium ICN. The terminology used in the descriptions was based mainly on Font-Quer (2001), Stearn (2004), and Beentje (2014). All measurements were based only on fully developed, dry structures. The measurements of structures less than 1 cm were made through ImageJ 1.46r software, using photographs of structures taken using a stereoscopic microscope. Culm length was measured from the base, just above the rhizome, to the apex of the highest inflorescence. Culm diameter was measured about two cm above the base not including the leaf sheath. Bract measurements are only of the blade. Spikelet length was measured from the point of insertion of the most basal scale to the apex of the distal scale, disregarding the pedicel and exserted stylopodium. Stamen were counted but the length, as well as that of the anther, were not measured because of the large variation in length that occurs during the maturation of the structures. In the measurement of the achene,

only the achene body was considered, without the bristle base (stipe) and without the stylopodium. The stylopodium and the stipe were measured separately. Structures such as spikelets, scales, achenes and stylopodia are described: (1) in their solid or three-dimensional form, for example, "fusiform spikelet"; (2) by their flat or two-dimensional shapes, for example, "obovate, biconvex achene" (frontal view and cross section, respectively); (3) or by the sum or approximation between the two types, for example, "ovoid navicular glume". However, when a structure is very narrow or compressed, only the flat shape, for example, "triangular style" can be used, since it is understood to be practically flat.

Images of many collections were obtained from the C.V. Starr Virtual Herbarium (http://sweetgum.nybg.org/science/vh/). Details of spikelets and achenes were obtained using a Nikon SMZ 800N stereoscopic microscope using the NIS Elements image stacking software to get good depth of field. The images were processed and managed using Adobe Photoshop CS5 12.0. Image treatments included removing the photo background, adjusting brightness, contrast, and color saturation.

TAXONOMIC TREATMENT

Rhynchospora Vahl, Enum. Pl. 2: 229. 1805 [as '*Rynchospora*'], *nom. et orth. conserv*. Type: *Rhynchospora alba* (L.) Vahl ≡ *Schoenus albus* L., Sp. Pl. 1: 44. 1753, *typ. conserv*.

Phaeocephalum Ehrh., Beitr. Naturk. [Ehrhart] 4: 146 (1789), *nom. inval.* Type: *Schoenus fuscus* L. ≡ *R. fusca* (L.) W.T.Aiton.
Dichromena Michaux, Fl. Bor.-Amer. 1: 37. 19 Mar 1803, *nom. rej.* Type: *D. leucocephala* Michx. = *R. colorata* (L.) H. Pfeiffer.
Calyptrostylis Nees, Linnaea 9(3): 295 (1834). Type: *C. rudgei* Nees, *nom. illeg.* = *R. gigantea* Link.
Cephaloschoenus Nees, Linnaea 9(3): 295 (1834). Type: *C. globosus* (Kunth) Nees = *R. globosa* (Kunth) Roemer & Schultes.
Ceratoschoenus Nees, Linnaea 9(3): 296 (1834). Type: *C. corniculatus* (Lam.) Nees = *R. corniculata* (Lam.) A.Gray.
Ephippiorhynchium Nees in Martius, Fl. Brasil. 2(1): 134. 1 Apr 1842. Type: *E. polycephalum* Nees ≡ *R. polycephala* Kunth, *nom. illeg.* = *R. holoschoenoides* (Rich.) Herter.

Synonyms cited above are only those used in this thesis and are related to the species of *Rhynchospora* section *Longirostres*. For a full synonymy of *Rhynchospora* see Koyama (1972).

Plants perennial or sometimes annual, caespitose, rhizomatous, stoloniferous or with caudex, roots usually fibrous. **Culm**, trigonous to occasionally cylindrical, shallowly to deeply channeled, smooth or antrorsely scabrous, glabrous or sometimes hirsute. **Leaves** basal and cauline, the sheaths green, brown or reddish; ligules absent or rarely present; blades flattened to plicate or occasionally involute, capillary or filiform, glabrous, hirsute,

scabrous or rarely papillose, the margins and abaxial midvein usually glabrous or antrorsely scabrous. **Synflorescence** with terminal or both terminal and lateral inflorescences, anthelodia, paniculodia, corymbodia, racemose, or head-like; involucral bracts filiform or folious, sometimes whitish at base; branches cylindrical, semi-cylindrical, triquetrous, crescentform or subcompressed branches, the margins scabrous, ciliate, or smooth. **Spikelets** ovoid, ellipsoid, lanceoloid or fusiform, cylindrical or subcompressed, one to several-flowered; scales spirally imbricate, rarely distichous, spreading with maturing achenes, ovate to lanceolate, navicular, with central keel, often mucronate or aristate, light to dark brown or ferrugineous or whitish; scales (1–) 2–5 (–9), the 1–3 basal ones sterile, the basal fertile scale always bearing a bisexual flower, the more distal scales bisexual, staminate or reduced. Perianth bristles present, rudimentary or absent, when present (1–) 6 (–20), antrorsely or rarely retrorsely scabrous, barbed, plumose, or sometimes smooth. **Stamens** 1–3 (–12). **Style** subulate, deeply bipartite, bifid or undivided, usually well exserted beyond apex of subtending scale. **Achene** oblong, ellipsoid, obpiriform, obovoid or subglobose, lenticular to biconvex to subcylindrical, sometimes with winged or wavy margins; surface smooth, punctate, papillate, cancellate or rugulose; stylopodium persistent, depressed, discoid, conoid, piramidal or subulate, rarely bilobed.

Rhynchospora section **Longirostres** Kunth, Enum. Pl. [Kunth] 2: 292 (1837). Type species: *Rhynchospora longirostris* (Michx.) Elliott = *Rhynchospora corniculata* (Lam.) A.Gray [non *Rhynchospora longirostris* (Nees) Steud. = *Rhynchospora amazonica* subsp. *guianensis* (Kük.) T.Koyama].

Plants perennial, robust, cespitose or rhizomatous. **Culms** stout to slender, erect, trigonous, channeled, usually ribbed, smooth or antrorsely scabrous distally along margins. Leaves basal and cauline, linear, broad to narrowly slender, usually flattened, carinate, smooth or scabridulous to scabrous along the margins and abaxial midvein, the apex attenuate to acuminate. **Synflorescence** with 0–10 lateral and a terminal inflorescence, usually of dense to diffuse compound anthelodia of fascicles, corymbiform, antheliform or umbelliform, with scabrous axis, the basal bracts subtending the inflorescences, leaf-like, generally shorter and narrower than leaf blades, distal involucral bracts becoming setaceous, scabridulous to scabrous; fascicles reduced, turbinate, hemispherical or globose. **Spikelets** lanceoloid, ovoid, ellipsoid, 2–5-flowered; lower 1–2 flowers bisexual, upper flowers staminate; 2–3 lower scales reduced

and sterile, fertile scales membranaceous, navicular, carinate, muticous or mucronate. Stamens 3, anthers linear, connective short. Style long, undivided to slightly bifid. Bisexual flower with 4–6 perianth bristles, rigid, slightly dilated at base, antrorsely barbellate sometimes with 1–3 much shorter, persistent on achene. **Achene** obovoid, ellipsoid, oblong or romboid, surface verrucose to transversely rugulose, borders straight to anfractuous; base attenuate, stipitate, appex round or truncate; stylopodium conical or subulate, surface scabridulous, more or less vertically channelled on both faces, base almost straight or shortly bilobed or deeply bilobed (sagittate) overlapping the achene apex on both faces.

Rhynchospora sect. *Longirostres* is distinguished from other sections of *Rhynchospora* subgenus *Haplostylis* by its antheliform or corymbiform synflorescence, spikelets arranged in fascicles formed on tips of terminal branches of the inflorescence; a stylopodium that is conical or subulate, and perianth bristles that are rigid and usually dilated at the base.

This section is comprised of species previously classified by Nees (1842) into two genera: *Ephippiorhynchium* Nees and *Calyptrostylis* Nees. The former was characterized by the subulate stylopodium, with a base narrower than the apex of the achene, including the current recognized species: *Rhynchospora amazonica*, *R. stenocarpa*, *R. trispicata* and *R. triflora*. The latter was characterized by a conical stylopodium with a base approximately the same width as the apex of the achene or just a slightly narrower (*R. gigantea*, *R. corymbosa* and *R. asperula*).

KEY TO THE SPECIES IN *RHYNCHOSPORA* SECTION *LONGIROSTRES*

1. Stylopodium conical, with its base as wide as or slightly narrower than the apex of the achene _____ 2

1’. Stylopodium subulate, with its base much narrower than the apex of the achene _____ 8

2. Achene with a ridge in the shape of an inverted “U” _____ 3

2’. Achene without a ridge in the shape of an inverted “U” _____ 4

3. Achene broadly obovoid, 2.9–3.3 mm wide _____ 17. *R. scutellata* (p. 101)

3’. Achene obovoid, 1.7–2.7 mm wide _____ 7. *R. indianolensis* (p. 65)

4. Synflorescence with 6–10 regularly spaced lateral inflorescences _____ 11. *R. organensis* (p. 83)

4’. Synflorescence with 1–5 irregularly spaced lateral inflorescences _____ 5

5. Achene with a brown line along the margin (lateral edge) _____ 12. *R. panduranganii* (p. 87)

5’. Achene without a brown line along the margin (lateral edge) _____ 6

6. Leaf margin very scabrous, cutting. Achenes 1.8–2.5 × 0.9–1.2 mm _____ 5. *R. gigantea* (p. 58)

6’. Leaf margin just scabrous, not cutting. Achenes 2.2–3 × 1.1–3 mm _____ 7

7. Stylopodium 1–1.6 mm wide at base, equal or generally larger than the achene body, with base deeply bilobed (sagittate) _____ 13. *R. pedersenii* (p. 89)

7’ Stylopodium 1–2.9 mm wide at base, the base almost straight or shortly bilobed or when deeply bilobed (sagittate) the stylopodium always shorter than the achene body _____. 4. *R. corymbosa* (p. 37)

8. Synflorescence with 5–9 lateral inflorescences _____ 0. *R. rostrata* (p. 94)

8’. Synflorescence with 1–4 lateral inflorescences _____ 9

9. Achene with lateral fusiform appendages at the base _____ 6. *R. hassleri* (p. 62)

9’ Achene without lateral fusiform appendages at the base _____ 10

10. Bracts of the fascicles membranaceous, hyaline, and dilated at the base _____ 9. *R. latibracteata* (p. 76)

10’. Bracts of the fascicles not membranaceous, hyaline, or dilated at the base _____ 11

11. Achenes up to 1.8 mm wide _____ 12

11’. Achenes over 2 mm wide _____ 13

12. Achenes up to 1 mm wide _____ 18. *R. stenocarpa* (p. 103)

12’. Achenes over 1 mm wide _____ 19. *R. trispicata* (p. 105)

13. Spikelets up to 9.2 mm long _____ 14

13’. Spikelets over 10 mm long _____ 15

14. Synflorescence with a single terminal glomerate head or a small anthelodium with a central head and 1–4 lateral heads. Stylopodium 3.1–5 mm long _____ 1. *R. amazonica* (p. 22)

14’ Synflorescence with a terminal inflorescence and 1–4 lateral ones, each composed of anthelodia of fascicles. Stylopodium 5.5–7.5 mm long _____ 19. *R.* rionegrensis (p. 94)

15. Bristles longer than 10 mm, twice the length of the achene or more _____ 16

15’. Bristles shorter than 10 mm, less than 1.5 times the length of the achene _____ 17

16. Plants scaly-rhizomatous _____ 8. *R. inundata* (p. 72)

16’. Plants not rhizomatous _____ 10. *R. macrostachya* (p. 78)

17. Longer bristles up to 4 mm, reaching about the middle to 2/3 of the achene body _____ 3. *R. corniculata* (p. 32)

17’. Longer bristles over 4 mm, reaching about the the appex of achene body _____ 18

18. Spikelets 11–18 mm long. The bristles reaching slightly below or less often slightly above the achene body. Stylopodium 9.6–22 mm long, 1.2–2.2 mm wide at base _____ 2. *R. careyana* (p. 28)

18’ Spikelets 10–11 mm long. The bristles reaching the lower half of the stylopodium. Stylopodium 9–10.4 mm long, 0.7–1.1 mm wide at base _____ 14. *R. pseudomacrostachya* (p. 92)

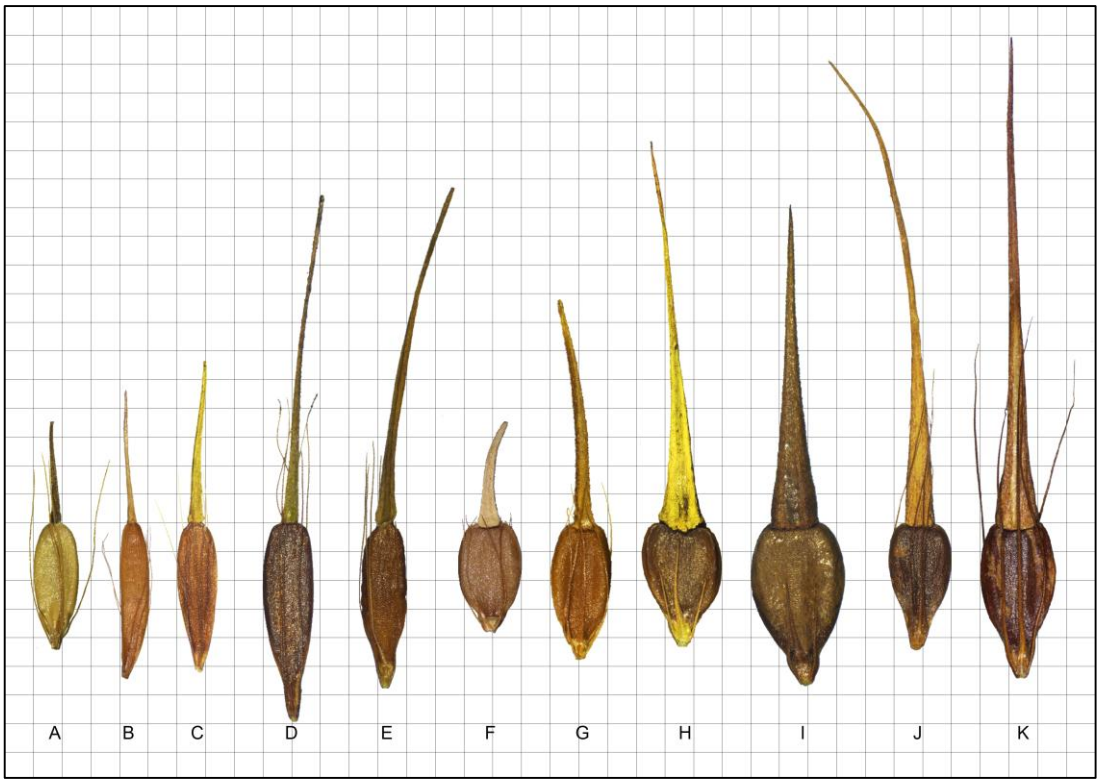

Fig. 1. Achenes. A. *R. hassleri* (*Halloy 4343*); B. *R. stenocarpa* (*Kozera 205*); C. *R. trispicata* (*Pott 3181*); D. *R. trispicata* (*Britton 9697*); E. *R. rostrata* (*Mendonça 534*); F. *R. amazonica* subsp. *amazonica* (*Forzza 6842*); G. *R. amazonica* subsp. *guianensis* (*Prance 3686*); H. *R. careyana* (*Naczi 17155*); I. *R. corniculata* (*Kral 83801*); J. *R. inundata* (*Tuckerman s.n.* NY11608); K. *R. macrostachya* (*Pierce 2500*). All specimens from NY. Grid = 1 mm.

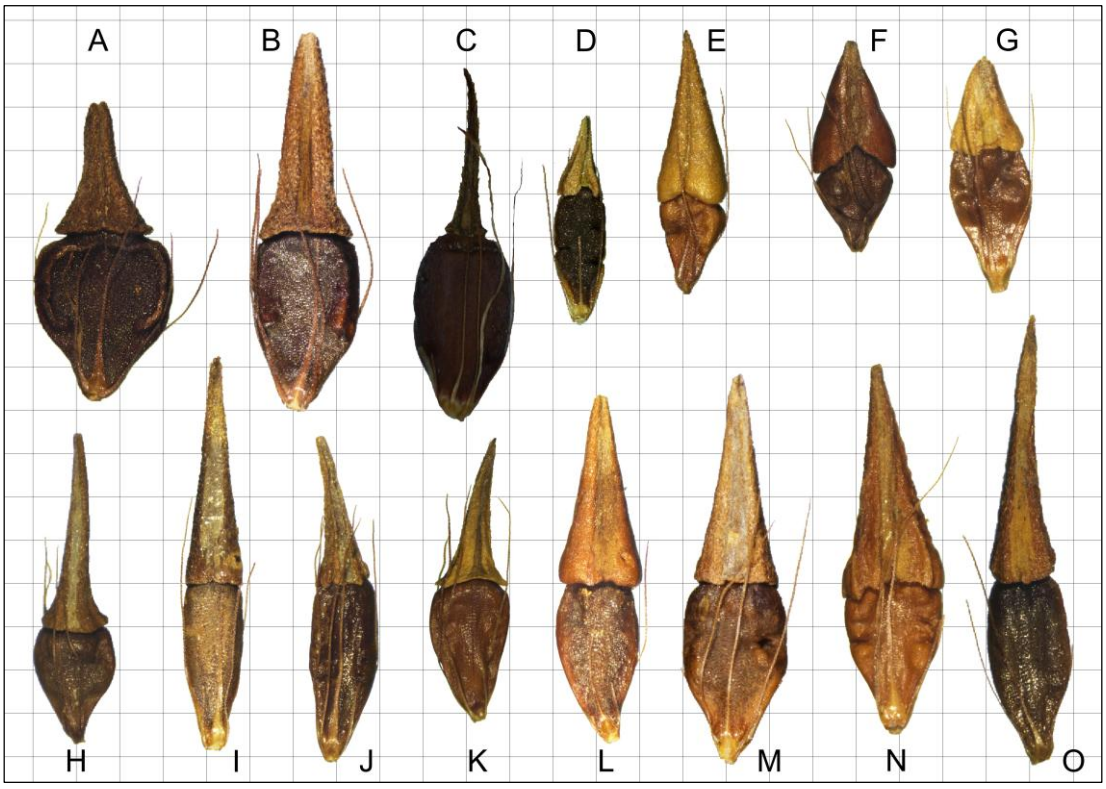

Fig. 2. Achenes. A. *R. scutellata* (*Wright 3406* NY); B. *R. indianolensis* (*Ravenel 160* NY); C. *R. latibracteata* (*Rosengurtt 8787* MVFA); D. *R. gigantea* (*Harley 19337* NY); E. *R. pedersenii* (*Ritter 3522* NY); F–N. *R. corymbosa* (F. *Uittien 387* NY; G. *Zardini 16464* NY; H. *Jativa 2122* NY; I. *Bartlell 19275* NY; J. *Irwin 12665* NY; K. *Tsugaru B-2287* NY; L. *Schweinfurth 1360* GH; M. *Pooley2103a* NY; N. *Burkart 8934* NY); O: *R. organensis* (*Barros 2431* NY). Grid = 1 mm.

1. ***Rhynchospora amazonica*** Poepp. & Kunth, in Kunth, Enum. Pl. [Kunth] 2: 292 1837. *Ephippiorhynchium longirostre* var. *amazonicum* (Poepp. & Kunth) Nees in Martius Fl. Bras. (Martius) 2(1): 136. 1842. *Dichromena amazonica* (Poepp. & Kunth) J.F. Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 11: 6. 1931. *Rhynchospora corniculata* subsp. *amazonica* (Poepp. & Kunth) H. Pfeiff., Repert. Spec. Nov. Regni Veg. 49: 76. 1940. Type: BRAZIL. "Prope Ega [Tefé-AM, Brazil] ad fluvium Amazonum, in sylvis siccis," *E.F. Poeppig 2573* (Holotype: B†, photo F0BN011120! in F ex B, isotype: HAL HAL109864). Lectoype (here designated): HAL 109864 [digital image!]. (Fig. 1F, 3).

Cespitose, short-rhizomatous, perennial, up to 100 cm tall. **Culm** 0.7–2 mm wide, erect, trigonous, channeled, antrorsely scabrous distally along margins. **Leaves** 3–15 basal, 1–2 cauline; sheaths 2–4 cm long; blades 4.5–68 cm × 3–6 mm, subflattened, antrorsely scabrous on margins and abaxial midvein, the apex acuminate. **Synflorescence** with a single terminal head-like fascicle or an anthelodium forming a central head-like fascicle with 1–4 lateral ones on scabridulous axes up to 6 cm long, the involucral bracts 3–5, leaf-like, scabridulous, up to 21 cm long; fascicle hemispherical 1.5–2.6 cm diam., with 12–50 spikelets. **Spikelets** 4–8 mm long, light green to pale yellow, ovoid-lanceoloid, subsessile, 2-flowered, lower flower bisexual, upper flower staminate; fertile scales 4.5–7 × 2.4–4.2 mm, membranaceous, carinate, mucronate. Stamens 3. Bisexual flower with 6 perianth bristles, the bristles up to 4.7 mm long, reaching slightly below or more often slightly above the achene body; style unbranched or shortly bifid, long exserted from the scales. **Achene** 3.2–4.3 × 2.2–3.1 mm, light-brown, obovoid-elliptic, surface verrucose, base short-stipitate, faces concave, the apex truncate and usually slightly spinulose; stylopodium 3.1–5 mm long, 0.6–1 mm wide at base, cream to yellow-brown, subulate, surface scabridulous, base overlapping the achene apex on both faces.

Distribution:— Northern Souh America, mostly on the Amazon Basin and the Guiana Shield. Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname and Venezuela.

Fig. 3. *Rhynchospora amazonica* subsp. *amazonica*. A. Habit; B. Spikelet; C. Achene. (A–C: *Forzza 6892* NY).

Habitat:— In wet areas such as marshy areas, swamps, seasonally flooded forest, riparian forest and river banks. Elevation: 0–285 m.

Distinguish features:— Differs from the other species in the section (except *R. latibracteata*) by the synflorescence with a single terminal head-like fascicle or a anthelodium a central head-like fascicle with 1–4 lateral ones. From *R. amazonica* subsp. *guianensis* also by its shorter stylopodium 3.1–5 mm (*vs.* 5.5–8 mm) and whitish scales (*vs*. brown scales). From *R. latibracteata* by its achene body without ridge in the shape of an inverted "U" and longer stylopodium 3.1–5 mm (*vs.* 2.8–3.2 mm).

Phenology:— Collected with fruits throughout the year.

Vernacular name:— Piripiri (Peru, *McDaniel, S. 19486*).

Discussion:— Kunth cites "Poeppig legit," without any number or herbarium reference. Boeckeler (1873) and Nees (1842) cited the type as "Poepp. herb. no 2573" and "Poepp. Fl. Amer. n. 2573". The holotype was never designated, the type from the B herbarium was destroyed, and an image of it is available in the F and US herbaria although it has no collector number it was considered by some authors as holotype (Guaglianone 2001, Strong 2006). The only other duplicate located is HAL109864 and here designated as lectotype.

Kükenthal (1949) cited the occurrence for Rio Grande do Sul state in Brazil, but this could not be confirmed. This may be a confusion with the same collection of Wettstein & Schiffner cited by Palla (1908) and already discussed. Since this specimen location is "Bei Rio grande bei S. Paulo Railway", and no Wettstein & Schiffner collection from Rio Grande do Sul was found. It may be a sample of *R. splendens*.

It is likely that the differences in the inflorescences of *Rhynchospora* sp.1 and *R. amazonica* are related to differences in pollination mechanisms. Costa *et al.* (2017) have shown that species of *Rhynchospora* with white spikelets and green involucral bracts, like *R. amazonica*, can be, at least in part, pollinated by insects. Species like *R.* sp.1, with darker spikelets and a dispersed, open inflorescence, are more likely to be pollinated by wind.

The citations of the species for the Brazilian state of Minas Gerais in Pivari *et al.* (2011) and Plantas Aquáticas do Brasil (2020) could not be confirmed.

Selected specimens:— BOLIVIA. **La Paz**: Iturralde, 10 June 1987, *Solomon, J.C. 17010* (NY);

BRAZIL. **Acre**: Cruzeiro do Sul, along Rio Moa, 20 Aug 1986, *T.B. Croat 62389* (SI); Vicinity of Porangaba, rio Juruá-Mirim, 21 May 1971, *Maas, P.J.M. P13186* (INPA, K, NY, P, R, U, US); **Amapá**: rio Araguari, between 1°47'N, 51°58'W and 1°26'N, 51°58'W, 7 September 1961, *Pires, J.M. 50750* (NY); **Amazonas**: Lábrea, by igarapé Caietitú, 1 November 1968, *Prance, G.T. 8183* (GH, INPA, K, NY, SI, U, US); Itacoatiara-Manaus, rodovia, km 21, 9 November 1963, *Oliveira, E. 2922* (UB); Manaus, 1 February 1978, *Hunziker, J. 9917* (SI); Manaus, Barra, February 1851, *Spruce, R. 1296* (P); Manaus, comunidade Santa Maria, rio Negro, 14 January 2011, *Kinupp, V.F. 4434* (RB); Manaus, in vicinibus Barra, December-March 1850-51, *Spruce, R. NY1193403*

(GH, NY); Manaus, in vicinibus Barra, December-March 1850-51, *Spruce, R. P264130* (P);Manaus, rio Cuieiras, igarapé do Tucunaré, 17 December 1961, *Rodrigues, W. 3965* (INPA); Manaus, Uypiranga, rio Negro, 21 December 1923, *Kuhlmann, J.G. 979* (RB, UB); Maraã, rio Japurá, 8 December 1982, *Plowman, T.C. 12396* (GH, K, NY, RB, UB, US); Maués, rio Parauarí, 4° 45'S, 57° 55'W, 14 July 1983, *Cid Ferreira, C.A. 4145* (NY); Muirapinima, lower rio Negro, 5 February 1944, *Baldwin Jr., J.T. 3375* (US); Tambaqui, rio Javari, 18 October 1976, *Prance, G.T. 23919* (GH, NY, U, US); Tefé, lago Tefé, mouth of Rio Bauana 13 December 1982, *Plowman, T.C. 12567* (NY, RB, UB); **Mato Grosso**: Rio Aripuanã, at base of Salto dos Dardanelos, 10°12'S, 59°21'W, 13 October 1973, *Berg, C.C. P18495* (GH, NY, R, US); Apiacás, rio Juruena, 8.891°S, 58.552°W, November 2007, *Sobral, M. 11316* (RB); Novo Mundo, margem do baixo Rio Cristalino, 29 September 2006, *Projeto Flora Cristalino 476* (K, NY); **Pará**: Jacareacanga, 19 January 1952, *Pires, J.M. 3959* (SP, US); Oriximina, 13 January 1968, *Silva, M. 1144* (NY, SP); **Rondônia**: rio Pacaás Novos, 7 August 1968, *Prance, G.T. 6850* (K, NY, P, R, US); **Roraima**: Caracaraí, rio Branco, 0°19'21"N, 61°44'29"W, elev. 27m, 21 March 2012, *Forzza, R.C. 6842* (NY); Caracaraí, 25 March 2012, *Martinelli, G. 17480* (RB, UFP);

COLOMBIA. **Amazonas**: *sine loc.*, October 1946, *Schultes, R.E. 46-188* (US); Puerto Nariño, 29 September 1991, *Kress, W.J. 91-3305* (NY, US); Raudal de Jirijirimo, 30 January 1952, *Schultes, R.E. 15011* (GH, NY, SI, US); **Meta**: Rio Cabra, 22 February 1969, *Pinto 986* (P); **Vaupés**: *sine loc.*, 23 January 1953, *Fernández, A. 1930* (US);

ECUADOR. Napo: Laguna Grande de Cuyabeno, 20 January 1984, *Laegaard, S. 51074* (GH, NY);

FRENCH GUIANA. **Camopi**: Massikiri village, 17 June 1970, *Oldeman B3395* (P); **Oyapock**: Maripa, 4 December 1948, *Rüe, A. 12* (P); *Rüe, A. 15* (P);

GUYANA. **Takutu**: Essequibo, 22 March 1994, *Henkel, T.W. 5258* (NY, US);

PERU. **Loreto**: Iquitos, 6 November 1940, *Asplund, E. 14359* (R, US); Iquitos, 3 August 1929, *Killip, E.P. 27001* (NY, US); Iquitos, 19 December 1974, *McDaniel, S. 19486* (NY); Iquitos, 4 November 1979, *McDaniel, S. 21359* (SI, US); Iquitos, río Momón, San Fernando, elev. 90-95 m. 19 August 1987, *S. McDaniel 29512* (MBM, NY, US); Iquitos, 29 November 1979, *Rimachi, M. 4696* (US); Maynas, 16 January 1986, *Vásquez, R. 7125* (SI); Punchana, 3 September 1991, *Rimachi, M. 9927* (US); Punchana, río Momón, elev. 90m, 25 August 1993, *Rimachi, M. 10706* (MBM); Sargento Lores, 21 May 1980, *McDaniel, S. 23805* (US);

SURINAME. **Sipaliwini**: Tapanahony, Ulemari river, 3°13'23"N, 54°15'38"W, 5 April 1998, *Raghoenandan, U. UVS17802* (U); Tapanahony, vicinity of Ulemari river, 3°13'17"N, 54°15'31'W, elev. 150 m, 5 April 1998, *Hammel, B. 21357* (NY, U);

VENEZUELA. **Amazonas**: Rio Negro, 01°49’N 65°44’W, 200 m, 5 November 1987, *Liesner, R. 22840* (NY); **Atures**: Capuana, 27 April 1979, *Davidse, G. 16802* (NY, SI, US); **Bolívar**: *sine loc.*, 14 April 1943, *Killip, E.P. 37476* (NY, US).

2. ***Rhynchospora careyana*** Fernald, Rhodora. 20: 140. 1918. *Ceratoschoenus macrostachyus* (Torrey ex A. Gray) A. Gray var. *patulus* Chapman, Fl. South. U.S., 529. 1860. *Rhynchospora corniculata* (Lamarck) A. Gray var. *patula* (Chapman) Britton, Trans. New York Acad. Sci. 11: 84 (1892). *Rhynchospora macrostachya* Torrey ex Gray var. *patula* (Chapm.) Chapm., Fl. South. U.S., ed. 3: 556 (1897). Types: UNITED STATES. *Chapman s.n.* (Holotype: NY!). Epitype (designated by Moore 1997): UNITED STATES. Georgia: Mitchell Co. both sides of Ga. 112, 3-4 mi. S of Camilla, ca. 20 mi. N of Cairo, 19 June 1996, *Kral, R. 86131* (US!; Isoepitypes: ALU, AUA, B 100296657!, BAYLU, BH, BM 838238 digital image!, BRCH, CM 2619 digital image!, CTB, DUKE 10000205 digital image!, F 45566F digital image!, FSU, GA, GH!, IBE, K, KANU, KNK, LSU 113217 & 113218 digital images!, MICH, MO 1334373 digital image!, MSC, MU 0226 digital image!, NCSC 0088 digital image!, NCU 11400 digital image!, NY!, OSC 1761 digital image!, P 264420 digital image!, PH 9351 & 9352 digital images!, RSA 0243 digital image!, TENN, TEX 0783 digital image!, US!, USCH 0024 digital image!, VDB, VPI, VSC, WAT, WILLI, WIS). (Fig. 1H, 5).

Cespitose and strongly clonal, perennial, up to 150 cm tall; rhizomes stoloniferous, scaly, 3–6 mm thick. **Culm** 3.5-7 mm wide, erect, trigonous, ribbed, smooth. **Leaves** 5–12 basal, 2–5 cauline; sheaths 3–16 cm long; blades up to 91 cm × 3–18 mm, flattened, scabridulous on margins and abaxial midvein, the apex attenuate. **Synflorescence** with a terminal and 2–4 lateral inflorescences, each of diffuse compound anthelodia of lax fascicles, fascicles with 2–12 spikelets; bracts leaf-like, scabrous, up to 15 cm long, usually not overtopping the inflorescence. **Spikelets** 11–18 mm long, lanceoloid, reddish-brown to orangish tint, pedicellate, 2–4-flowered, lowest 1–2 flower bisexual, upper 1–2 staminate; fertile scales 9–13 × 2.8–4.6 mm, ovate-lanceolate, membranaceous, carinate, midrib minutely scabrous, the apex acute to acuminate. Stamens 3. Bisexual flower with 4–6 perianth bristles, the bristles unequal to subequal on length, up to 9 mm long, reaching slightly below or less often slightly above the achene body. **Achene** 4–5.5 × 2.8–3.7 mm, pyriform to obovoid, fuscous to blackish, surface verrucose, base stipitate, margins thick, faces concave, the apex truncate and usually minutely spinulose; stylopodium 9.6–22 mm long, 1.2–2.2 mm wide at base, subulate, fawn to brownish orange, sulcate, surface scabridulous, base often overlapping the achene apex on both faces.

Distribution:— In Cuba, Jamaica (Moore 1997, Kral 2002) and the United States, on eastern coastal states from Louisiana to New Jersey.

Habitat:— In open acid wetlands, in or along the shallow edges of ponds, lakes, rivers, ditches, marshes, swamps, and flat depressions (Kral 2002). Elevation: up to 200 m.

Distinguish features:— Differs from *R. inundata* by perianth bristles slightly longer to slightly shorter than achene body (*vs.* perianth bristles about 2 times as long as fruit body, reaching the lower half stylopodium). And from *R. corniculata*, *R. macrostachya* and *R. pseudomacrostachya* by its coarse and scaly rhizomes.

Fig. 4. *Rhynchospora careyana.* A. Habit; B. Spikelet; C. Achene. (A–C: *Naczi 17155* NY).

Phenology:— Collected with fruits from June to October.

Vernacular name:— Carey's horned beaksedge; Broad fruit horned beaksedge.

Discussion:— For a discussion of the relation of this species with the complex *R. corniculata*, see *R. corniculata*.

Rhynchospora careyana often presents numerous dense clones by rhizome covering extensive areas. Often shares the habitat with *R. tracyi* Britton (1892: 84). Along ecotones in Florida, morphological intermediates between *R. careyana* and *R. inundata* and between *R. careyana* and *R. corniculata* are found. These morphological intermediates are believed to be the result of hybridization and subsequent introgression. Other evidence supporting hybridization was the presence of reduced seed set and increased levels of infection by the ovaricolous smut *Testicularia cyperi* on individuals from sympatric populations (Moore 1997).

According to Moore (1995) the original material of *Ceratoschoenus macrostachyus* var. *patulus* Chapman (= *R. careyana*.) was mixed and included material referable to *R. inundata* and also includes specimens that are intermediate between *R. careyana* and either *R. inundata* or *R. corniculata*. This has resulted in the uncertain application of *R. careyana*.

This species is treated as synonym of *R. corniculata* by Godfrey & Wooten (1979) who found no other difference between them, except for presence or absence of rhizomes.

Selected specimens:— UNITED STATES. "Southern Flora", *Chapman, A.L. NY2868202* (NY); "Southern Flora", *Chapman, A.L. NY2868204* (NY); **Alabama**: Baldwin Co., 28 June 1991, *Kral, R. 79276* (GH, NY); Baldwin Co., 15 August 1992, *Kral, R. 81510* (GH); Geneva Co., 24 June 1991, *Kral, R. 79102* (GH); Geneva Co., 17 June 1992, *Kral, R. 81174* (GH); Geneva Co., 22 August 1995, *Kral, R. 85594* (GH); **Delaware**: *sine loc*., July 1878, *Canby, W.M. NY2868220* (NY); **Florida**: Bay Co., 23 July 1991, *Kral, R. 79487* (GH); Citrus Co., 19 September 1958, *Kral, R. 7328* (GH); Collier Co., 10 October 1962, *Cooley, G.R. 9123* (GH); Dixie Co., 5 September 1957, *Godfrey, R.K. 56036* (GH); Dixie Co., 26 June 1956, *Redfearn Jr., P.L. 2520* (GH); Franklin Co., *Biltmore Herb. 1905* (GH, NY, US); Franklin Co., 10 July 1956, *Redfearn Jr., P.L. 2675* (GH, NY); Gulf Co., 9 July 1957, *Godfrey, R.K. 55570* (GH); Holmes Co., 21 July 1991, *Kral, R. 79408* (GH, NY); Indian River Co., 15 June 1957, *Kral, R. 4913* (GH); Lake Co., 1 July 1894, *Nash, G.V. 1254* (GH, NY, US); Leon Co., 23 July 1957, *Godfrey, R.K. 55679* (GH, NY); Leon Co., 17 August 1992, *Kral, R. 81554* (GH); Liberty Co., 24 July 1957, *Godfrey, R.K. 55698* (GH); Liberty Co., 10 July 1956, *Redfearn Jr., P.L. 2617* (GH, US); Miami-Dade Co., 31 October 1903, *Small, J.K. 1304* (NY); Miami-Dade Co., 29 June 1915, *Small, J.K. 6645* (NY); Orange Co., 17 July 1957, *Kral, R. 5246* (GH); Wakulla Co., 29 June 1955, *Godfrey, R.K. 53562* (GH, NY); Wakulla Co., 24 September 1955, *Godfrey, R.K. 53916* (GH); Wakulla Co., 6 August 1957, *Godfrey, R.K. 55861* (GH); Walton Co., 27 August 1991, *Kral, R. 79767* (GH); Walton Co., 16 August 2018, *Naczi, R.F.C. 17155* (NY); Washington Co., 27 September 1957, *Kral, R. 5966* (GH); Washington Co., 21 July 1991, *Kral, R. 79404* (GH, NY); Washington Co., 27

September 1957, *Kral, R. 5969a* (GH); **Georgia**: Bacon Co., 25 June 1993, *Kral, R. 82719* (GH, NY); Baker Co., 14 July 1992, *Kral, R. 81068* (GH, NY); Berrien Co., 20 July 1991, *Kral, R. 79368* (GH, NY); Mc Intosh Co., 16 August 1993, *Kral, R. 83094* (GH); Mitchell Co., 19 June 1996, *Kral, R. 86131* (GH, NY, US); Sapelo Island, 7 August 1956, *Duncan, W.H. 20404* (GH, US); Sumter Co., 5 July 1901, *Harper, R.M. 1004* (GH, NY, US); Woodbine Co., 3 August 1933, *Potter, D. GH5326* (GH); **Mississippi**: Hancock. Co., 14 July 1995, *Kral, R. 85249* (GH); Jackson Co., 20 August 1953, *Demaree, D. 3398* (GH); Jackson Co., 7 June 1995, *Kral, R. 84917* (GH); Perry Co., 20 June 1955, *Ray Jr., J.D. 6242* (GH); **North Carolina**: Antioch Bay, 25 August 2004, *Sorrie, B.A. 11386* (GH); Columbus Co., 28 August 1949, *Fox, W.B. 3278* (GH); **South Carolina**: Clarendon Co., 15 August 1959, *Godfrey, R.K. 1467* (GH).

3. ***Rhynchospora corniculata*** (Lam.) A. Gray, Ann. Lyceum Nat. Hist. New York 3: 205 (1835); *Schoenus corniculatus* Lamarck, Tabl. Encycl. 1: 137 (1791); *Ceratoschoenus corniculatus* (Lamarck) Nees, Linnaea 9(3): 296 (1834); Type: UNITED STATES. "E. Florida, Carolinia." (not located). (Fig. 1I, 6).

Schoenus longirostris Michaux, Fl. Bor.-Amer. 1: 35 (1803); *Ceratoschoenus longirostris* (Michx). A. Gray, Ann. Lyceum Nat. Hist. New York 3: 369 (1836). *Rhynchospora longirostris* (Michx). Elliott, Sketch Bot. S. Carolina [Elliott] 1: 59 (1816). Type: not designated.

Rhynchospora laxa Vahl, Enum. Pl. [Vahl] ii. 231. (1805). Type: not designated. [*nom. illeg.*] [*non* R.Br., *non* Benth., *non* Schult.].

Rhynchospora corniculata var. *interior* Fernald, Rhodora 20: 140 (1918). Type: UNITED STATES. southern Arkansas, F. L. Harvey, 24 (Holotype: GH!) [as *Rynchospora*].

Cespitose perennial, up to 200 cm tall. **Culm** up to 12 mm wide, erect, trigonous, channeled, smooth. **Leaves** 4–12 basal, 2–5 cauline; sheaths 3–8 cm long; blades up to 115 cm × 4–25 mm, subflattened, antrorsely scabrous on margins and abaxial midvein, the apex attenuate. **Synflorescence** with a terminal and 2–3 lateral inflorescences, each of diffuse compound anthelodia of fascicles; bracts leaf-like, scabrous, up to 59 cm long, often overtopping the inflorescence; fascicles lax, turbinate to hemispheric, with 3–20 spikelets. **Spikelets** 10–16 mm long, lanceoloid, brown or reddish-brown, pedicellate, 2–3-flowered, lower flower bisexual, upper 1–2 staminate; fertile scales 8–14 × 2.6–4.2 mm, membranaceous, carinate, short mucronate. Stamens 3. Bisexual flower with 4–6 perianth bristles, the bristles unequal to subequal, up to 4 mm long, reaching about the middle to 2/3 of the achene body. **Achene** 4.1–6.2 × 2.4–3.1 mm, obovoid to ellipsoid, greyish-brown to dark greyish-brown, surface verrucose, base narrowed, stipitate, margins thick, faces concave, the apex truncate and usually minutely spinulose; stylopodium 10.5–19 mm long, 1.2–1.8 mm wide at base, subulate, reddish-brown to honey-yellow, sulcate, surface scabridulous.

Distribution:— Southeast of the United States, extending westward until Texas and Oklahoma and northward until Missouri, Illinois, Indiana, Kentucky, Maryland and Delaware.

Habitat:— Swamps, marshes, ditches and shallows, mostly in basic to circumneutral, silty or muddy open sites (Kral 2002). Elevation: 0–550 m.

Distinguish features:— Differs from similar species (*R. macrostachya*, R. *pseudomacrostachya*, *R. careyana*, and *R. inundata*) by the shorter perianth bristles, reaching about the middle to 2/3 of the achene body.

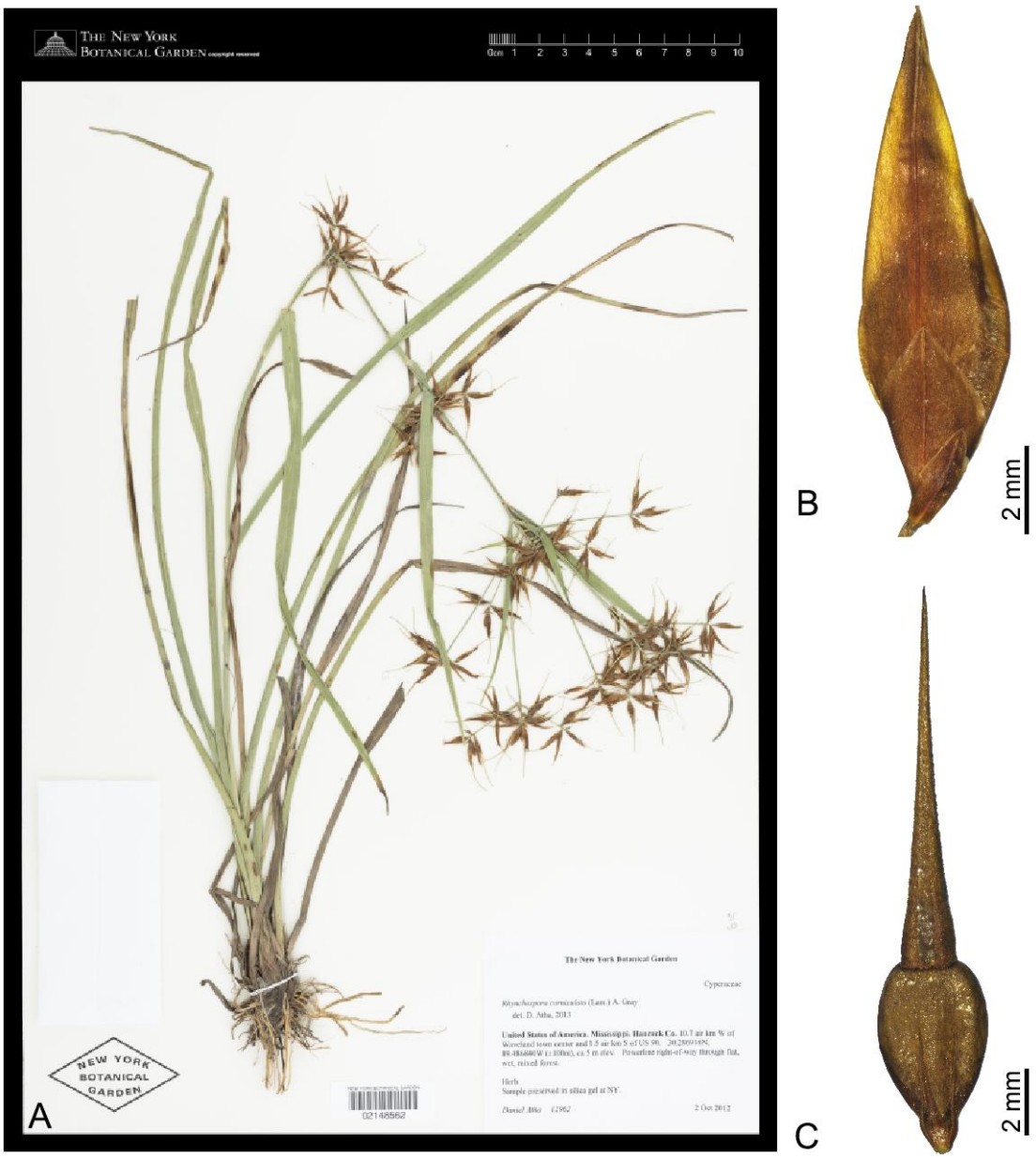

Fig. 5. *Rhynchospora corniculata*. A. Habit; B. Spikelet; C. Achene. (A: Atha 12962 NY; B–C: *Kral 83801* NY).

Phenology:— Collected with fruits from April to January.

Vernacular name:— Shortbristle horned beaksedge.

Discussion:— The *R. corniculata* complex of the eastern United States is comprised of four species: *R. careyana*, *R. corniculata*, *R. inundata* and *R. macrostachya*. Moore (1997) sees evidence of a possible hybridization with *R. careyana* (see. *R. careyana*).

Fernald (1918) called *R. corniculata* var. *interior* specimens of *R. corniculata* with base of the stylopodium as wide as the achene appex and with achene bodies at the lower length range of the species (4.5–5.3 × 2.4–2.6 mm).

This species appeared in some lists (Alves *et al.* 2009, Ulloa *et al.* 2020) as occuring in Brazil, because Barros (1960) and Guaglianone (2001) published *R. corniculata* var. *macrostachya* as a mistaken name for *R. pseudomacrostachya.* There is no records of *R. corniculata* in Brazil.

Selected specimens:— UNITED STATES. **Alabama**: *sine loc.*, *Buckley, S.B. NY2868916* (NY); Baldwin Co., 17 July 1995, *Kral, R. 85319* (GH); Barbour Co., 10 July 2002, *Gil, G. 2001-290* (NY); Bayette Co., 12 August 1975, *Kral, R. 56410* (SI); Claiborne, 7 October 1933, *Blanton, O. 28* (GH); Covington Co., 26 July 1991, *Kral, R. 79156* (GH); Decatur, 2 September 1884, *Smith, J.D. US819485* (GH, US); Houston Co., 1 August 1992, *Orzell, S.L. 20313* (NY); Mobile Co., 28 September 1947, *Jones, P. 1402* (GH); Mobile Co., 27 August 1991, *Kral, R. 79783* (GH, NY); Spring Hill, 25 August 1897, Bush, *B.F. 241* (NY); Theodora, 15 August 1940, *Potter, D. GH16830* (GH); Walker Co., 14 August 1956, Harper, *R.M. 4366* (GH); **Arkansas**: *sine loc*., 15 September 1940, *Demaree, D. 21605* (NY, US); *sine loc.*, 28 June 1942, *Demaree, D. 23558* (NY, US); *sine loc., ex herb. F.L. Harvey 24* (GH); Ashley Co., 19 July 1946, *Demaree, D. 25680* (GH); Central City, 31 August 1989, *Thompson, R.A. C981* (GH); Chicot Co., 19 October 1999, *Thomas, R.D. 164297* (NY); Clay Co., 25 August 1939, *Corning, P.O. 20348* (SI); Craighead Co., 29 July 1948, *Demaree, D. 27127* (GH, US); Lincoln Co., 15 August 1944, *Demaree, D. 25243* (GH); Little Rock, *ex herb. F.L. Harvey 5* (GH); Monroe Co., 16 July 1955, *Demaree, D. 37440* (GH); Prairie Co., 4 August 1955, *Demaree, D. 37774* (GH); Prairie Co., 13 August 1955, *Demaree, D. 37908* (GH); Pulaski Co., 12 July 1938, *Merrill, G.M. 421* (GH); Pulaski Co., 14 July 1938, *Merrill, G.M. 433* (GH); Pulaski Co., 3 October 1938, *Merrill, G.M. 1210* (GH); Saint Francis Co., 4 August 1955, *Demaree, D. 37787* (GH); Union Co., 25 June 1939, *Demaree, D. 19431* (GH, NY, US); Woodruff Co., 21 August 1981, *Heineke, T. 2695* (SI); **Delaware**: Kent Co., 18 August 2008, Longbottom, *W.D. 12025* (GH, NY, US); New Castle Co., 1 January 1942, *Long, B. 57752* (GH); Wilmington, August 1874, *Canby, W.M. GH2879747* (GH); **Florida**: *sine loc., Chapman, A.L. NY452149* (NY); *sine loc., Curtiss, A.H. 5070* (NY, US); *sine loc., Keeler, H.D. NY452150* (NY); Brevard Co., 10 September 1903, *Fredholm, A. 6005* (GH); Collier Co., 6 June 1966, *Lakela, O. 29961* (NY); Duval Co., 21 September 1971, *Morton, G.H. 4806* (NY); Franklin Co., 25 June 1936, *Correll, D.S. 5618* (GH, US); Franklin Co., 24 July 1957, *Godfrey, R.K. 55713* (GH); Gulf Co., 20 May 2016, *Longbottom, W.D. 25083* (NY); Holmes Co., 20 September 1956, *Kral, R. 2865* (GH); Jackson Co., 27 September 1957, *Kral, R. 5915* (GH); Jackson Co., 15 October 1958, *Monoson, H.L. 7* (NY); Jacksonville, July 1896, *Lighthipe, L.H. 453* (NY); Lake Co., 1 May 2008, *Longbottom, W.D. 11135* (NY); Lake Co., 1 May 2008, *Longbottom, W.D. 11174* (NY); Leon Co., 16 September 1957, *Godfrey, R.K. 55610* (GH); Leon Co., 23 July 1957, *Godfrey, R.K. 55680* (GH, NY); Madison Co., 24 June 1956, *Godfrey, R.K. 54926* (GH); Monroe Co., 2 May 1958, *Cooley, G.R. 6166* (GH); Monroe Co., 27 April 1952, *Robertson Jr., W.B. 225* (GH); Nassau Co., 16 May 2016, *Longbottom, W.D. 24815* (NY); Volusia Co., 3 May 2008, *Longbottom, W.D. 11243* (NY); Walton Co., 26 August 1991, *Kral, R. 79698* (SI); Washington Co., 30 July 1954,

Ford, E.S. 3782a (GH); **Georgia**: *sine loc*., 23 September 1978, *Duncan, W.H. 30516* (SP); Bacon Co., 25 June 1993, *Kral, R. 82728* (GH, MBM); Crisp Co., 23 June 1993, *Kral, R. 82655* (NY); Emanuel Co., 10 August 1995, *Kral, R. 85447* (GH); McIntosh Co., 6 July 1959, *Harmer, W.J. 741* (NY); McIntosh Co., 16 June 1960, *Harmer, W.J. 1100* (NY); Miller Co., 8 September 1947, *Thorne, R.F. 5222* (GH); Turner Co., 5 September 1935, *Svenson, H.K. 7077* (GH); **Indiana**: Palmyra, 13 October 1916, Deam, C.C. 22407 (GH); **Kentucky**: *sine loc*., *Short, C.W. NY2868956* (NY); **Louisiana**: Archibald, 4 July 1958, *Kral, R. 7092* (GH); Baton Rouge, 19 August 1938, *Correll, D.S. 10392* (GH); Benton, *Correll, D.S. 10132* (GH); Hammond, 30 June 1938, *Correll, D.S. 9257* (GH, NY); Kraemer, 19 July 1987, *Hill, S.R. 18193* (GH, NY); Lafayette, 5 July 1938, *Correll, D.S. 9352* (GH); Lafayette, 29 September 1957, *Reese, W.D. 1399* (GH); Lisbon, 14 September 1974, *Haynes, R.R. 4137* (GH); Marksville, 13 September 1912, *McAtee, W.L. 2211* (GH, US); Morgan City, 5 November 1985, *Pruski, J. 3133* (NY); New Orleans, *Ingalls NY2868935* (NY); Ouachita Co., 3 October 1958, *Kral, R. 3096* (GH); Ouachita Co., 20 May 1959, *Kral, R. 8975* (GH); Vicinity of Lake Charles, 1904, *Allison, A. 204* (GH, US); Vinton, 5 July 1950, *Webster, G.L. 3215* (GH, NY); **Maryland**: Dorchester Co., 27 August 1993, *Longbottom, W.D. 3725* (GH); Dorchester Co., 23 August 1997, *Longbottom, W.D. 4289* (GH); Kent Co., 3 September 2006, *Longbottom, W.D. 7836* (NY); Somerset Co., 28 August 2005, *Longbottom, W.D. 6545* (GH); Worcester Co., 13 October 1940, *Tatnall, R.R. 4758* (GH); **Mississippi**: Biloxi Co., 4 September 1900, *Lloyd, F.E. 376* (NY); Hancock Co., 24 August 1952, *Demaree, D. 33006* (GH); Hancock Co., 8 August 1954, *Demaree, D. 36011* (GH); Jackson Co., 16 August 1953, *Demaree, D. 33920* (GH, US); Jasper Co., 8 September 1967, *Jones, S.B. 15164* (NY); Lauderdale, 28 September 1967, *Jones, S.B. 14992* (GH); Leflore Co., 23 August 1955, *Ray Jr., J.D. 6107* (GH); Lincoln Co., 10 August 1955, *Ray Jr., J.D. 5397* (GH, NY); Ocean Springs, 8 August 1889, *Tracy, S.M. 127* (NY); Scott Co., 17 September 1940, *Clausen, R.T. 5383* (GH, NY); Starkville, 24 July 1888, *Tracy, S.M. NY2868947* (NY); Tishomingo, 8 August 1956, *Ray Jr., J.D. 7597* (GH); Walthall Co., 25 June 1956, *Ray Jr., J.D. 6539* (GH); Washington Co., 6 August 1986, *Bryson, C.T. 4697* (GH); **Missouri**: Campbell, 9 September 1910, *Bush, B.F. 6302* (GH, US); St. Louis, 19 August 1892, *Eggert, H. s.n.* (GH); Stoddard Co., 13 September 1919, *Palmer, E. 16401* (SI); **North Carolina**: *sine loc*., August 1888, *McCarthy 36* (GH, US); *sine loc*., *Williamson, C.S. NY2868951* (NY); Beaufort Co., 20 July 1938, *Godfrey, R.K. 5385* (GH, US); Bertie Co., 9 July 1958, *Ahles, H.E. 46197* (NY); Bertie Co., 28 October 1958, *Ahles, H.E. 52089* (GH); Bladen Co., 28 June 1897, *Biltmore Herb. 334* (GH, NY); Cartaret Co., 1 September 1938, *Godfrey, R.K. 6415* (GH, US); Columbus Co., 29 August 1938, *Godfrey, R.K. 6331* (GH, US); Columbus Co., 5 August 1955, *Wilbur, R.L. 4193* (GH); Greene Co., 8 July 1922, *Randolph, L.F. 767* (GH); Hertford Co., 18 July 1938, *Godfrey, R.K. 5236* (GH); Nash Co., 18 July 1938, *Godfrey, R.K. 5145* (GH, US); Richmond Co., 9 September 1999, *Sorrie, B.A. 10315* (GH); Sampson Co., 6 August 1938, *Godfrey, R.K. 5892* (GH, US); **Oklahoma**: Atoka Co., 15 May 1976, *Taylor, J. 21313* (GH); Choctaw Co., 25 September 1970, *Correll, D.S. 40018* (NY); Choctaw Co., 28 June 1981, *Hellquist, C.B. 14979* (GH); Leflore Co., 24 June 1948, *Waterfall, U.T. 8106* (GH); McCurtain Co., 11 September 1966, *Crutchfield, J.R. 2170* (NY); McCurtain Co., 12 July 1978, H*ellquist, C.B. 12945*

(GH); McCurtain Co., 28 June 1981, *Hellquist, C.B. 14994* (GH); McCurtain Co., 7 August 1948, *Waterfall, U.T. 8449* (GH); Pushmataha Co., 27 June 1981, *Hellquist, C.B. 15026* (GH); Pushmataha Co., 9 August 1948, *Waterfall, U.T. 8528* (GH); Stillwater, 19 June 1936, *Gruchy, J. 100* (NY); **South Carolina**: *sine loc., Gibbes, L.R. NY2868966* (NY); Aiken Co., 1 August 1952, *Batson, W.T. s.n.* (GH); Beaufort Co., 20 July 1927, *Wiegand, K.M. 592* (GH); Berkeley Co., 27 June 1939, *Godfrey, R.K. 128* (GH); Florence Co., 8 July 1927, *Wiegand, K.M. 590* (GH); Georgetown Co., 9 July 1939, *Godfrey, R.K. 350* (GH); **Tennessee**: Carroll Co., 27 August 1922, *Svenson, H.K. 421* (GH); Coffee Co., 24 August 1930, *Svenson, H.K. 4268* (GH); Marion Co., 16 July 1938, *Svenson, H.K. 9515* (GH, US); **Texas**: *sine loc., Hall, E. 721* (NY); *sine loc.*, 16 September 1902, *Reverchon, J. 3431* (GH, NY, US); Brazos Co., 24 July 1936, *Parks, H.B. 20769* (GH); Galveston Co., 13 June 1970, *Correll, D.S. 38996* (NY); Galveston Co., 8 May 1974, *Waller, F.R. 2666* (GH, SI); Galveston Co., 26 September 1974, *Waller, F.R. 3175* (GH); Gonzales Co., 23 August 1936, *Cory, V.L. 19193* (GH); Guadalupe Co., 9 August 1933, *Tharp, B.C. 44287* (GH); Harris Co., 1 August 1987, *Hill, S.R. 18442* (GH, NY); Harris Co., 17 May 1960, *Traverse, A. 1489* (GH); Houston Co., 10 June 1970, *Correll, D.S. 38941* (NY); Jefferson Co., 3 July 1939, *Lay, D.W. 27* (GH); Jefferson Co., 1888, *Nealley, G.C. NY2868941* (NY); Newton Co., 4 October 1934, *Cory, V.L. 1086*5 (GH); Orange Co., 15 November 1945, *Cory, V.L. 50864* (NY); Robertson Co., 16 June 1943, *Barkley, F.A. 13002* (GH); Smith Co., 14 May 1991, *Kral, R. 78809* (GH); Swan, 9 July 1902, *Reverchon, J. 2914* (GH, NY); **Virginia**: Brunswick Co., 13 September 1944, *Fernald, M.L. 14693* (GH); Caroline Co., 22 August 1938, *Fernald, M.L. 8985* (GH); George Co., 18 July 1936, *Fernald, M.L. 6058* (GH); George Co., 16 August 1938, *Fernald, M.L. 8984* (GH); Greensville Co., 17 July 1938, *Fernald, M.L. 8594* (GH); Greensville Co., 19 September 1938, *Fernald, M.L. 9281* (GH); Greensville Co., 14 September 1944, *Fernald, M.L. 14694* (GH); Prince George Co., July 1938, *Fernald, M.L. 8595* (GH); Princess Anne Co., 5 August 1934, *Fernald, M.L. 3784* (GH); Princess Anne Co., 8 September 1935, *Fernald, M.L. 4823* (GH); Provincetown, *Rhodes, W. NY2868955* (NY); Southampton Co., 22 June 1936, *Fernald, M.L. 5651* (GH); Southampton Co., 22 June 1936, *Fernald, M.L. 6009* (GH); Southampton Co., 14 September 1941, *Fernald, M.L. 13562* (GH); Southampton Co., 9 June 1893, *Heller, A.A. 1113* (GH); Sussex Co., 11 September 1945, *Fernald, M.L. 14906* (GH); Waverly, 20 July 1891, *Seymour, A.B. 91720* (GH); York Co., 18 September 1937, *Fernald, M.L. 7350* (GH).

4. ***Rhynchospora corymbosa*** (L.) Britton. Trans. New York Acad. Sci. 11: 84 (1892). [*non* Domin, *non* Hitchc.] *Scirpus corymbosus* L. Cent. Pl. II. 7 (1756). *Rhynchospora aurea* Vahl, Enum. Pl. [Vahl] ii. 229. (1805) [*non* Sieber ex Schult.] [*nom. superfl.*]. *Schoenus corymbosus* (L.) Pers., Syn. Pl. [Persoon] 1: 59 (1805). *Chaetospora aurea* Kunth, Nov. Gen. Sp. [H.B.K.] 1: 231 (1816) [*non* Nees] [*nom. superfl.*]. *Dichromena corymbosa* (L.) J.F.Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 11: 6 (1931). Lectotype [designated by Gordon-Gray, Strelitzia 2: 150 (1995)]: Habitat in India. *Anon., s.n.* (LINN 71-48 digital image!). (Fig. 2F–N, 7).

Schoenus surinamensis Rottböll., Descr. Icon. Rar. Pl. 68; Progr. 14 (1773) [*non* Sol.]. *Rhynchospora surinamensis* (Rottb.) Nees, Linnaea 9(3): 297 (1834). [*non* K. Schum.]. Lectotype (here deignated): SURINAME. *Rolander s.n.* (C 10010567 digital image!).

Schoenus floridus Rudge, Pl. Guian.: 15 (1805). *Rhynchospora florida* (Rudge) Schult., Mant. 2: 45 (1824). *Calyptrostylis florida* (Rudge) Nees, Fl. Bras. 2(1): 138 (1842). *Rhynchospora aurea* f. *florida* (Rudge) Lindm., Bih. Kongl. Svenska Vetensk.-Akad. Handl. 26(9): 27 (1900). *Rhynchospora corymbosa* var. *florida* (Rudge) Kük., Bot. Jahrb. Syst. 74: 417 (1949). Holotype: FRENCH GUIANA. *Martin s.n.* (BM 535244 digital image!).

Schoenus articulatus Roxb., Fl. Ind. 1: 184 (1820). *Rhynchospora articulata* (Roxb.) Schult., Mant. 2: 49 (1824). *Cephaloschoenus articulatus* (Roxb.) Nees, Edinburgh New Philos. J. 17: 266 (1834). *Calyptrostylis articulata* (Roxb.) Nees, J. Bot. (Hooker) 2: 394 (1840). Type unknown.

Calyptrostylis asperula Nees, Fl. Bras. (Martius) 2(1): 139 (1842). *Rhynchospora asperula* (Nees) Steud., Syn. Pl. Glumac. 2: 144 (1855). *Rhynchospora corymbosa* var. *asperula* (Nees) Kük., Bot. Jahrb. Syst. 74(3): 416. 1949. Type: BRAZIL. Santa Catarina, Florianópolis ("In insula S. Catharinae"), *Chamisso s.n.* (Holotype: not located; isotype: LE).

Rhynchospora spectabilis Hochst. ex C.Krauss, Flora 28: 760 (1845). Type: SOUTH AFRICA. Natal: In lacustribus af fluvium Umlaas, December 1839, *Krauss,F., 210* (Holotype: TUB 7433 digital image!; isotypes: BM 922688 digital image!, K 244821 & 244822 digital images!, MO 1515492 & 1515512 digital images!).

Rhynchospora macrocarpa Boeckeler, Linnaea 37: 629 (1873). Type: not designated.

Rhynchospora legrandii Kük. ex Barros, Darwiniana 5: 182 (1941). *Rhynchospora corymbosa* subsp. *legrandii* (Kük. ex Barros) Luceño & Vanzela, Canad. J. Bot. 76: 448 (1998). *Rhynchospora corymbosa* var. *legrandii* (Kük. ex Barros) Guagl., Darwiniana 39: 314 (2001). Type: URUGUAY. Dpto. Montevideo, Carrasco, 20 January 1938, *Legrand 1371* (Holotype: B; isotype: SI!).

Rhynchospora corymbosa var. *bonariensis* Barros, Anales Mus. Argent. Ci. Nat. "Bernardino Rivadavia" 41: 386 (1945). Lectotype [designated by Guaglianone. Darwiniana 39: 310 (2001)]: ARGENTINA. Distrito Federal, Belgrano, 8 January 1925, *Barros, M. 171* (BA!; isolectotype: SI!).

Rhynchospora corymbosa f. *angustirostris* Barros, Anales Mus. Argent. Ci. Nat. "Bernardino Rivadavia" 41: 388 (1945). *Rhynchospora corymbosa* var. *angustirostris* (Barros) Guagl., Darwiniana 39: 308 (2001). Lectotype [designated by Barros, Gen. Sp. Pl. Argent. 4(2): 316. (1947)]: ARGENTINA. Misiones. Dpto. San Pedro, Fracrán, 19-23 February 1924, *Hauman s. n., BA 24/775* (BA!).

Rhynchospora corymbosa f. *chacoensis* Barros, Anales Mus. Argent. Ci. Nat. "Bernardino Rivadavia" 41: 388 (1945). *Rhynchospora corymbosa* var. *chacoensis* (Barros) Svenson, Lilloa 14: 73 (1949). Lectotype

[designated by Barros, Gen. Sp. Pl. Argent. 4(2): 315. (1947)]: ARGENTINA. Chaco, Colonia Napalpi, December 1934, *Donat, A. 156*, (BA!; isolectotype: SI!).

Rhynchospora corymbosa var. *grandispiculosa* Kük., Bot. Jahrb. Syst. 74: 417 (1949). Lectotype [designated by Guaglianone, Darwiniana 39(3-4): 334 (2001)]: CENTRAL AFRICA. Seriba Ghattas, im Lande der Djur, 3 April 1869, *Schweinfurth, G.A., 1360* (PRE 0594464-0 digital image!, isolectotype: GH!, P 461852 digital image!) (Fig. 2L).

Rhynchospora corymbosa var. *singularis* Kük., Bot. Jahrb. Syst. 74: 417 (1949). Type: PARAGUAY. Cordillera von Villa-Rica, 1905, *Hassler, E. 8777* (Holotype: BM; isotypes: G 194961, 194962, 194963, 39450 & 39457 digital images!, P 265025 digital image!).

Cespitose perennial, up to ca. 200 cm tall. **Culm** 2–15 mm wide, trigonous, ribbed, often channeled, smooth to scabridulous along margins on the inflorescence area. **Leaves** 5–10 basal, 2–5 cauline; sheaths 2–9 cm long, basal sheaths often spongy and smooth, cauline sheaths often scabridulous; blades up to ca. 140 cm long, 6–21 mm wide, subflattened, scabrous on margins and abaxial midvein, the apex acuminate. **Synflorescence** with a terminal inflorescence and 1–5 lateral ones, sometimes corymbiform, each of usually lax compound anthelodia of fascicles, with scabrous axes up to 20 cm long, rarely with undeveloped axes, giving the inflorescence a glomerulate aspect; the involucral bracts up to 20 cm long, usually not overtopping the inflorescence, leaf-like, scabrous; fascicles generally with 5–25 spikelets or sometimes reduced to 1–2 spikelets,. **Spikelets** 4.5–10.2 mm long, ovoid to lanceoloid, reddish-brown, subpedicellate, 2–4-flowered, lower 1–2 flowers bisexual, upper 1–2 flowers staminate; fertile scales 4–7 × 1.7–3 mm, ovate, membranaceous, carinate, with mucron scabridulous. Stamens 3. Bisexual flower with 6 perianth bristles, sometimes with 1–2 much shorter, the larger bristles 3.1–7.9 mm long, usually reaching from the lower quarter to near the appex of the stylopodium. **Achene** 2.2–4.5 × 1.3–3.0 mm, from elliptic to widely obovoid, blackish to dark reddish-brown, sometimes with anfractuous borders, surface verrucose, base attenuate, stipitate, the apex generally truncate; stylopodium 1.4–6.6 mm long, 1–2.9 mm wide at base, conical, deltoid to narrowly triangular, brownish-yellow, surface scabridulous, vertically channelled on both faces, base almost straight or shortly bilobed or deeply bilobed (sagittate) overlapping the achene apex on both faces mainly on the sides.

Distribution:— Pantropical.

Habitat:— In open wet areas such as marshy areas, swamps, river banks, pasture, and rice fields. Elevation: Sea level to 1850 m.

Distinguish features:— The morphological variation in this species is very broad, and it is usually necessary to use a combination of characters to differentiate it from other species. But basically, it differs from *R. indianolensis* in having achene body without ridge in the shape of an inverted "U". From *R. panduranganii* it differs in the absence of a brown line along the margin (lateral edge) of the achene.

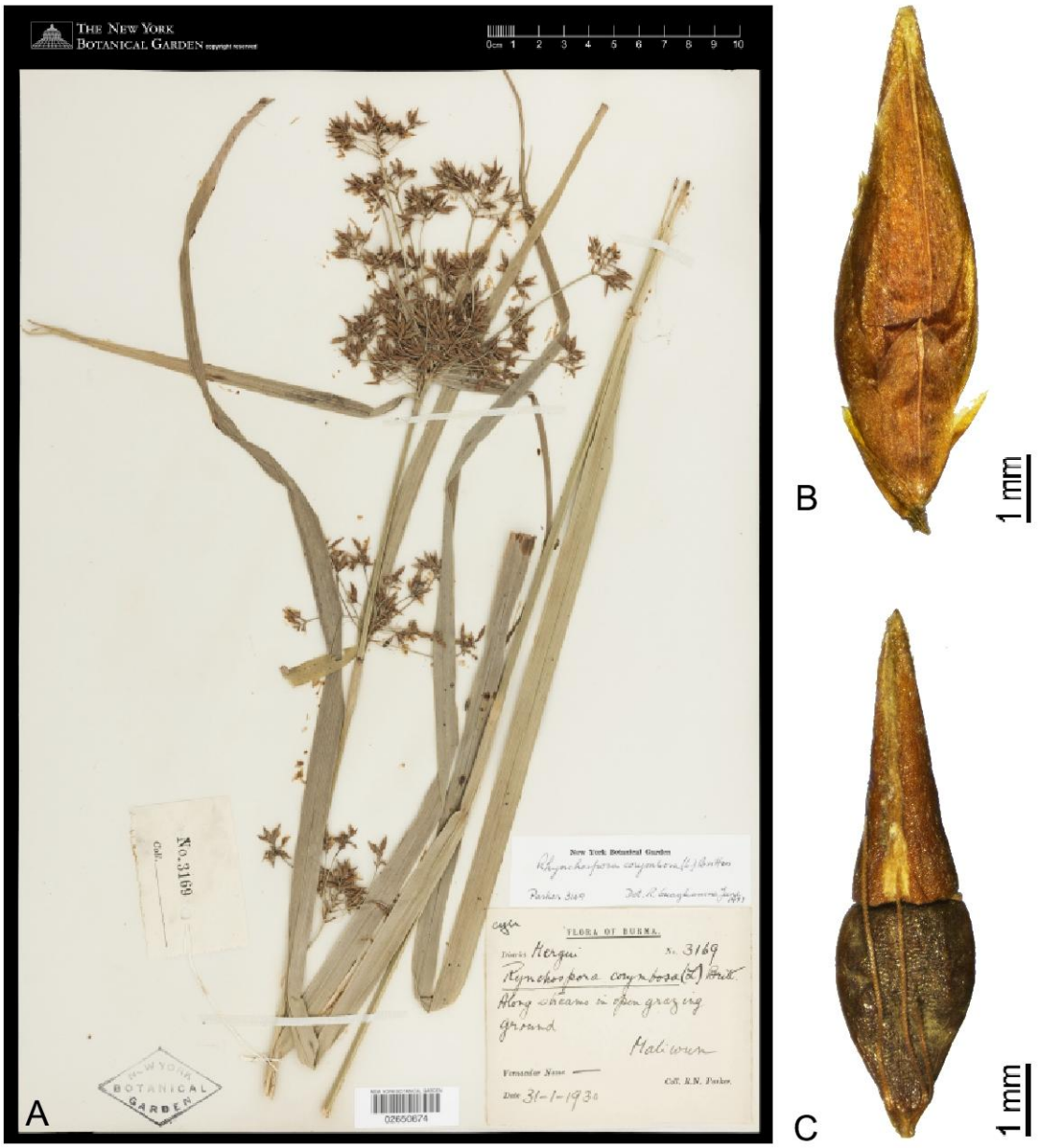

Fig. 6. *Rhynchospora corymbosa*. A. Habit; B. Spikelet; C. Achene. (A–C: *Parler 3169* NY).

Phenology:— Collected with fruits throughout the year.

Vernacular name:— China: 伞房刺子莞 *san fang ci zi guan* (Songyun & Simpson 2010); Dominican Republic: cortadera (*Jiménez, J. 84*); Puerto Rico: Junco pico (Strong & Acevedo-Rodríguez 2005).

Discussion:— Kükenthal (1949) distinguished eight varieties in this species. Three of them are clearly distinct species: "*organensis*" (= *R. organensis*), "*minor*" and "*puncticulata*" (both = *R. indianolensis*). The variety "*asperula*" (Fig. 2K) was a *comb. nov.* for *R. asperula* but its diagnostic characters (culms and axis scabrous and dense fascicles) can be found in other putative varieties, although Guaglianone (2001) considered it as distinct species. The variety "*florida*" (Fig. 2F) has diagnostic characters (inflorescence corymbiform, broad and lax) that can be considered the core of the variation range of the species in the Americas, and was considered by Guaglianone (2001) as synonym of the typical variety. The variety "*grandispiculosa*" (Fig. 2L) is characterized by spikelets conferted with 7–10 mm long. It was described with 19 syntypes, six of them South American specimens, including the type of *R. legrandii* and fifteen African specimens. Guaglianone (2001) analysed three of those and classified them as *R. spectabilis* (Fig. 2M), and put the variety as synonym of *R. spectabilis*. In the variety "*singularis*" only the specimen *Hassler 8777* was cited. It has inflorescence characteristics (fascicles reduced to 1–2 spikelets) similar of those found in *R. coymbosa* f. *chacoensis* (Fig. 2G) and was considered as synonym of it by Guaglianone (2001).

Barros (1941b, 1945) published four other taxa related to this species focusing on the achene to characterize them. All of them were treated as varieties of *R. corymbosa* by Guaglianone (2001) and are restricted to South America. Although Barros (1941b) attributed the authorship of *R. legrandii* (Fig. 2N) to Kükenthal. Kükenthal (1949) did not use this name in his review, but published the same type under the variety "*grandispiculosa*", as discussed above. The species was characterized by spikelets 8–10 mm long and fruit (with stylopodium) 7 mm long, and was restricted to Uruguay and north of Argentina. The variety "*bonariensis*" (Fig. 2I) was basically a larger plant, characterized by a broader inflorescence, achenes 4–4.5 mm long, stylopodium 4.5–5.5 mm and as wide as the achene at its base, bristles 6 mm long, and restricted to the banks of the Rio de la Plata and the islands of the Paraná River delta (Argentina). The form "*angustirostris*" (Fig. 2J) was characterized by elliptical achenes 4 × 1.8-2 mm, stylopodium 2.5–3 × 1 mm, and bristles 6–6.5 mm long, and restricted to northern Argentina, southern Brazil, and eastern Paraguay. The form "*chacoensis*" (Fig. 2G) was characterized by the stylopodium equal to or shorter than the length of the achene and the base slightly wider than the achene apex, and found in Bolivia, Paraguay and northern Argentina.

In the phylogeny in chapter two of this thesis the putative varieties of *R. corymbosa* are grouped by region (mostly continents) and not by its supposed variety.

In the chapter three of this thesis we did an integrative taxonomic study of *R. asperula* and the five varieties of *R. corymbosa* in South America (*angustirostris, bonariensis, corymbosa, chacoensis* and *legrandii*) (*sensu* Guglianone 2001) and concluded that the morphological separation of these taxa cannot sustained and that ecological and phylogenetic data also do not support the segregation of any of those taxa.

Moore (1997) did not accepted any of the varieties discussed above, and listed all of them as synonyms of *R. corymbosa*, including *R. organensis, R.asperula, R. legrandii* and *R. spectabilis*. Raynal (1971) and Gordon-Gray (1995) also accepted *R. spectabilis* as synonym of *R. corymbosa*.

Dey & Prasanna (2015) considered *R. panduranganii*, a recently described species of India, as a variety of *R. corymbosa*. See *R. panduranganii* for a discussion of these two species.

All of the twelve varieties of this species (excluding *R. panduranganii*) recognized by Barros (1941b, 1945), Kükenthal (1949) and Guaglianone (2001) occur in South America; only the typical variety occurs in Asia; three varieties in Africa; and two in North America. The huge confusion of classification among these taxa is understandable, since the extremes of the variations in some characters were described as new entities. But there is a large continuum among all of the characters, and innumerable possibilities of divisions in this highly variable species (or complex).

In the protologue of *Schoenus surinamensis* (Rottböll, 1773), no type is directly mentioned, there is only the mention of the plate "Tab. XXI. Fig. I." This same reference is found in specimen C10010567 from herbarium C, ex herbarium Rottböll. This is clearly the original specimen upon which the plate is based. It will be the designated lectotype.

Selected specimens:— ANGOLA. **Capango**: *sine loc.*, 25 September 1923, *Curtis, A.G. 380* (GH);

AUSTRALIA. **New South Wales**: Billinudgel, 27 August 1973, *Coveny, R. 5040* (US); Byron Bay, March 1929, *Meebold, A. 3340* (NY); **Queensland**: Cairns, 9 September 1981, *Degener, O. 36046* (NY); Aspley, 16 December 1930, *White, C.T. 7151* (NY); Brisbane, 25 May 1930, *Hubbard, C.E. 2817* (GH); Cape York Peninsula, 13 July 1948, *Brass, L.J. 19541* (GH); Ingham, 21 September 1959, *Lavery, H.J. US2382823* (US);

Maryborough, 8 October 1948, *Clemens, M.S. US2258343* (US); Moreton District, 30 March 1945, *Clemens, M.S. s.n.* (GH); *sine loc.*, 19 March 1932, *Brass, L.J. 2344* (NY); *sine loc.*, 28 May 1943, *Clemens, M.S. 42274a* (GH);

BELIZE. *sine loc.*, June 1933, *Lundell, C.L. 3805* (US); **Augustine**: El Cayo, 11 April 1960, *Hunt, D.R. 456* (US); **Belize**: *sine loc.*, 6 September 1973, *Croat, T.B. 24067* (CTES, GH, MBM, RB); **Maskall**: *sine loc.*, 3 September 1936, *O'Neill, H. 9039* (US); **Stann Creek**: *sine loc.*, 11 April 2008, *Naczi, R.F.C. 12237* (NY);

BOLIVIA. **Beni**: Ballivian, 5 November 1985, *Solomon, J.C. 14591* (NY); Ballivian, 17 November 1985, *Solomon, J.C. 14769* (NY); Lake Rogaguado, 4 November 1921, *Rudy, H.H. 1620* (US); Lake Rogaguado, 11 April 1921, *Rusby, H.H. 1642* (US); Prov. Ballivian, 8 November 1985, *Solomon, J.C. 14618* (NY); Prov. Cercado, 10 March 1999, *Orellana, M.R. 38* (SI); Trindad, 28 March 1992, *Chonono, V. 210* (SI); **La Paz**: Franz Tamayo, *Bang, M. 2331* (NY, US); **Santa Cruz**: Chiquitos, February 1950, *Cardenas, M. 4501* (US); Guarayos, 14 November 2011, *Nee, M.H. 58282* (NY); Ichilo, 31 October 1990, *Nee, M.H. 39619* (NY); Ichilo, 23 December 1990, *Nee, M.H. 43247* (NY); Ñuflo de Chavez, 18 February 1995, *Abbott, J.R. 16221* (NY, SI); Ñuflo de Chavez, 27 April 1977, *Krapovickas, A. 31769* (CTES); Ñuflo de Chavez, 28 March 2004, *Morrone, O. 4996* (CTES, SI); Santiesteban, 21 August 1987, *Nee, M.H. 35725* (NY); Santiesteban, 22 October 1990, *Nee, M.H. 39471* (NY); Sara, 3 October 1990, *Nee, M.H. 39093* (NY); Sara, 19 October 1990; Velasco, 7 July 1986, *Siedel, R. 744* (NY); Velazco, 7 May 1977, *Krapovickas, A. 32317* (CTES, MBM); Warnes, 4 December 2005, *Nee, M.H. 53632* (NY);

BOTSWANA. **Northern**: *sine loc.*, 8 November 1977, *Smith, P.A. 1175* (SI);

BRAZIL. *sine loc.*, 1 January 1922, *Belforge, H. RB482444* (RB); **Alagoas**: Quebrangulo, 28 December 1994, *Cervi, A.C. 7320* (NY); **Bahia**: Barra do Choça, 30 March 1977, *Harley, R.M. 20172* (NY, SPF); Rio de Contas, 31 March 2009, *Harley, R.M. 55901* (SPF); São Felipe, 22 February 1956, *Lordêlo, R.P. 6235* (SI); *sine loc.*, 5 March 1972, *Anderson, W.R. 36615* (NY); *sine loc.*, *Glocker, C.E.F. 595* (NY, US); *sine loc.*, 25 February 1971, *Irwin, H.S. 31013* (NY); *sine loc.*, 2 March 1971, *Irwin, H.S. 31310* (NY); **Distrito Federal**: Brasília, 14 March 1990, *Azevedo, M.L.M. 522* (NY); Brasília, 9 December 1980, *Heringer, E.P. 5842* (NY); Brasília, 18 August 1961, *Heringer, E.P. 8591* (NY, RB); Brasília, 18 August 1961, *Heringer, E.P. 8591/785* (FLOR); Brasília, 14 September 1965, *Irwin, H.S. 8299* (NY); Brasília, 3 October 1965, *Irwin, H.S. 8898* (NY); Brasília, 18 November 1958, *Pereira, E. 4852* (RB, SI); Sobradinho, 9 November 1977, *Taxonomy Class Of Univ De Brasilia 468* (NY, US); **Espírito Santo**: Linhares, July 1985, *Sobral, M. 4019* (ICN, MBM); **Goiás**: Alto Paraíso de Goiás, 21 October 1965, *Irwin, H.S. 9455* (NY); Alto Paraíso de Goiás, 12 February 1966, *Irwin, H.S. 12665* (NY); Caiapônia, 1 May 1973, *Anderson, W.R. 9552* (RB); Cavalcante, 9 March 1969, *Irwin, H.S. 24129* (NY, RB, US); Gouvelândia, 6 April 2014, *Morais, I.L. 2405* (JAR, FLOR); Gouvelândia, *Morais, I.L. 4199* (JAR, FLOR); Mozarlandia, 19 November 1999, *Bove, C.P. 614* (R); Posse, 5 April 1966, *Irwin, H.S. 14377* (NY); Quirinópolis, 27 May 2014,

Morais, I.L. 2603 (JAR, FLOR); **Mato Grosso**: Chapada dos Guimarães, 13 August 1997, *Hatschbach, G.G. 66824* (US); Ribeirão Cascalheira, 7 May 1968, *Ratter, J.A. 1321* (NY); *sine loc.*, 24 September 1968, *Harley, R.M. 10236* (NY); *sine loc.*, 7 June 1979, *Prance, G.T. 26077* (NY); **Mato Grosso do Sul**: Bonito, 9 December 2005, *Damasceno Jr., G.A. 3945* (COR, FLOR); Bonito, 9 September 2005, *Pott, V.J. 8201* (ICN); Brazlândia, 18 October 1972, *Hatschbach, G.G. 30527* (MBM, NY); Campo Grande, 15 July 1997, *Resende, U.M. 36* (SPF); Corumbá, 1 June 1993, *Hamilton, S. 30* (SPF); Ladário, 2 November 2005, *Oliveira, A.C. 19* (FLOR); Naviraí, 22 January 2003, *Kozera, C. 1781* (MBM, US); Rio Brilhante, 27 January 1970, *Hatschbach, G.G. 26146* (CTES, MBM, NY); **Minas Gerais**: Belo Horizonte, 18 December 1939, *Barreto, H.L.M. 10420* (NY); Belo Horizonte, 21 December 1958, *Heringer, E.P. 6541* (SP); Belo Horizonte, 30 January 1958, *Roth, L. 15143* (NY); Belo Horizonte, 12 March 1945, *Williams, L.O. 5962* (NY); Cambui, 25 February 1976, *Davidse, G. 10570* (SP); Campos Gerais, 8 February 1970, *Koyama, T.M. 13724* (ICN, NY, RB, SP); Cristália, 17 February 1969, *Irwin, H.S. 23436* (GH, NY, RB, US); Fonseca, 3 November 1962, *Pabst, G. 7190* (SI); Juiz de Fora, November 1969, *Krieger, P.L. 7789* (NY); Lagoa Santa, 11 March 1863, *Warming, E. NY938413* (NY); Leopoldina, 27 March 1976, *Davidse, G. 11428* (US); Marliéria, 22 September 1975, *Heringer, E.P. 15130* (NY); Medina, 20 March 1976, *Davidse, G. 11557* (CTES, SP); Morro do Pilar, 4 November 2014, *Silva Filho, P.J.S. 2129* (ICN); Patrocínio, 31 January 1970, *Irwin, H.S. 25773* (NY); Poços de Caldas, 17 November 1964, *Emmerich, M. 2078* (R); Santa Luzia, October 1824, *Riedel, L. 685* (SI, US); *sine loc.*, 28 February 1976, *Davidse, G. 10781* (NY); *sine loc.*, 1 November 1961, *Duarte, A.P. 5686* (NY, RB, SI); *sine loc.*, 14 January 1971, *Irwin, H.S. 30357* (NY, US); *sine loc.*, 14 January 1842, *Regnelli, A.F. 298* (US); *sine loc.*, October 1942, *Teodoro 42* (RB); Tiradentes, 12 November 2010, *Sobral, M. 13689* (RB); Tombos, 6 August 1935, *Mello Barreto 1432* (RB, US); Turvo, 24 April 1926, *Hoehne, W. ICN112083* (ICN); Uberlândia, *Araujo, G.M. 2378* (SPF); Varginha, 7 February 1970, *Koyama, T.M. 13705* (ICN, NY, SP); Viçosa, 29 December 1934, *Kuhlmann, J.G. RB00481674* (RB); **Pará**: Belem, 27 June 1944, *Baldwin Jr., J.T. 4552* (US); Belém, 29 June 1935, *Drouet, F. 1952* (GH); Breves, 21 September 1968, *Cavalcante, P.B. 2012* (NY); Jari, 5 August 1969, *Silva, N.T. 2592* (NY); Quatipuru, 2 April 1963, *Rodrigues, W.A. 5078* (NY, RB); Santarém, December 1931, *Costa, R.C.M. 199* (NY); *sine loc.*, 8 December 1947, *Fosberg, F.R. 29327* (NY, US); *sine loc.*, 3 November 1929, *Killip, E.P. 30404* (NY, US); *sine loc.*, July 1849, *Spruce, R. NY2618873* (NY); **Paraíba**: Areia, 29 September 1958, *Moraes, C. 1911* (SI); **Paraná**: Altônia, 26 January 2003, *Kozera, C. 1859* (MBM); Arapoti, 11 October 1968, *Hatschbach, G.G. 20002* (MBM); Araucária, 27 October 1973, *Dombrowski, L.Th. 4986* (CTES, MBM); Balsa Nova, 3 February 2012, *Caxambu, M.G. 3737* (MBM); Balsa Nova, 1 November 2005, *Kozera, C. 2532* (UPCB, RB); Balsa Nova, 21 November 2005, *Kozera, C. 2597* (ICN, UPCB); Balsa Nova, 25 November 2006, *Kozera, C. 3344* (MBM); Bituruna, 17 October 1966, *Hatschbach, G.G. 14942* (MBM); Cajuru, 9 November 1974, *Ferreira, L.F. 125* (CTES, MBM); Campo Mourão, 1978, *Lima, J.M. 297* (CTES, MBM); Campo Mourão, 1978, *Lima, J.M. 434* (CTES, MBM); Campo Mourão, 1978, *Lima, J.M. 480* (CTES, MBM); Campo Mourão, 12 December 2017, *Siqueira, E.L. 2428* (FLOR); Capitão Leônidas Marques, 21 March

1993, *Salino, A. UPCB30658* (UPCB); Colombo, 1 December 1972, *Dombrowski, L.Th. 4444* (CTES, FLOR, MBM, SPF); Curitiba, 20 December 1985, *Acra, L.A. 68* (UPCB); Curitiba, 16 September 1985, *Cordeiro, J. 165* (CTES, MBM); Curitiba, 12 November 1973, *Dombrowski, L.Th. 4773* (CTES, MBM); Curitiba, 21 November 1974, *Dombrowski, L.Th. 5432* (CTES, MBM); Curitiba, 10 December 1974, *Dombrowski, L.Th. 5567* (CTES, MBM); Curitiba, 7 October 1975, *Dombrowski, L.Th. 6062* (CTES, MBM); Curitiba, 29 December 1975, *Dombrowski, L.Th. 6267* (CTES, MBM); Curitiba, 5 November 1976, *Dombrowski, L.Th. 6660* (CTES, MBM); Curitiba, 30 October 1973, *Hatschbach, G.G. 32749* (CTES, MBM, NY); Curitiba, 30 December 1973, *Hatschbach, G.G. 33426* (MBM, NY); Curitiba, 23 February 1978, *Hatschbach, G.G. 41179* (CTES, MBM, NY); Curitiba, November 1966, *Kuniyoshi, Y.S. 1813* (MBM, US); Curitiba, 14 March 1985, *Oliveira, P.I. 869* (CTES, MBM); Diamante do Norte, 4 August 2009, *Whelan, M. 108* (MBM); Doutor Ulysses, 3 December 1999, *Hatschbach, G.G. 69844* (MBM, RB, US); Foz do Iguaçu, 16 March 1999, *Grant, J.R. 99-03274* (US); Foz do Iguaçu, 18 November 1966, *Lindeman, J.C. 3303* (MBM, NY, RB); Foz do Iguaçú, 23 March 2017, *Caxambu, M.G. 7779* (FLOR); Foz do Iguaçú, 2 November 2017, *Caxambu, M.G. 7968* (FLOR); Guarapuava, 13 January 1985, *Kummrow, R. 2666* (CTES, MBM, US); Ivaí, 15 March 1972, *Hatschbach, G.G. 29314* (CTES, MBM, NY); Jaguariaíva, 10 October 1999, *Linsingen, L. 47* (MBM); Matinhos, 23 September 1999, *Borgo, M. 569* (UPCB); Mato Rico, 13 April 2016, *Caxambu, M.G. 7328* (FLOR); Palmas, 4 December 1971, *Hatschbach, G.G. 28210* (CTES, MBM, NY, US); Palmas, 10 December 1992, *Longhi-Wagner, H.M. 2518* (CTES, ICN); Palmas, 3 April 2012, *Weber, P. 76* (FLOR); Palmas, 19 January 2013, *Weber, P. 195* (FLOR); Paranaguá, 29 April 1951, *Hatschbach, G.G. 2235* (MBM, SI); Paranaguá, 30 October 1966, *Hatschbach, G.G. 15189* (MBM, US); Pinhais, 19 February 2008, *Bona, C. 410* (MBM, UPCB); Pinhais, 13 November 1973, *Imaguire, N. 3408* (MBM); Pinhais, 21 April 2009, *Ristow, R. 52* (MBM); Piraí do Sul, 24 November 1980, *Hatschbach, G.G. 43363* (CTES, MBM); Piraquara, January 1968, *Dombrowski, L.Th. 2804* (MBM); Piraquara, 14 November 1975, *Dombrowski, L.Th. 6126* (CTES, MBM); Piraquara, 18 September 1978, *Dombrowski, L.Th. 9700* (CTES, MBM); Piraquara, 4 October 2012, *Forzza, R.C. 7316* (NY, RB, UPCB); Piraquara, 17 December 1950, *Hatschbach, G.G. 2064* (MBM, SI); Piraquara, 8 November 1984, *Kummrow, R. 2522* (CTES, MBM); Piraquara, 16 June 1950, *Tessmann, G. 3710* (MBM, US); Ponta Grossa, January 1950, *Araujo, A.C. 80* (SI); Ponta Grossa, 7 October 1969, *Hatschbach, G.G. 22324* (CTES, MBM); Ponta Grossa, 11 December 2007, *Lusa, M.G. 8* (UPCB); Pontal do Paraná, 25 April 2017, *Araujo, E.S. 74* (UPCB); Salto do Lontra, 11 October 1974, *Hatschbach, G.G. 35182* (MBM); Sao Jerônimo da Serra, 27 September 1970, *Hatschbach, G.G. 24838* (CTES, MBM, NY); São José dos Pinhais, 14 December 1971, *Dombrowski, L.Th. 3952* (CTES, MBM); São José dos Pinhais, 2 November 2004, *Silva, J.M. 4189* (MBM, US); São Mateus do Sul, 17 January 2006, *Silva, J.M. 4629* (MBM, NY, RB); *sine loc.*, 14 March 1976, *Davidse, G. 11248* (NY, SP); *sine loc.*, *Dusén, P.K.H. 3763* (R); *sine loc.*, 7 January 1911, *Dusén, P.K.H. 11082* (NY, US); *sine loc.*, 15 December 1965, *Reitz, R. 17687* (FLOR, HBR, NY,); *sine loc.*, 10 March 1949, *Rocha, G. 108* (RB); Tibagi, 26 October 2015, *Liesenfeld, V. 68* (FLOR); Tijucas do Sul, 21 October 1977, *Hatschbach, G.G. 40487* (CTES, MBM); Vila

Velha, 3 November 1928, *Hoehne, F.C. 25186* (SP); **Pernambuco**: Vitória, 1 April 1934, *Pickel, D.B. 3597* (SI, US); **Rio de Janeiro**: Angra dos Reis, 24 November 1950, *Brade, A.C. 20510* (RB); Magé, 14 January 1977, *Araujo, D.S.D. 1479* (NY); Silva Jardim, 18 April 1977, *Carauta, J.P.P. 2434* (NY, RB); Silva Jardim, 28 November 1995, *Pessoa, S.V.A. 862* (RB); **Rio Grande do Sul**: Alegrete, 7 December 1982, *Mattos, J.R. 23708* (HAS); Alegrete, 16 December 2011, *Trevisan, R. 1088* (FLOR); Arroio dos Ratos, 10 April 1982, *Hagelund, K 13875* (ICN); Bagé, 17 November 2003, *Hefler, S.M. 188* (ICN); Barra do Quaraí, 1 December 2016, *Weber, P. 581* (ICN, FLOR); Bom Jesus, 16 August 1996, *Camargo, O.R. 5582* (HAS); Bom Jesus, 5 December 1971, *Lindeman, J.C. ICN9462* (CTES, ICN, SI); Butiá, 3 January 2001, *Mondin, C. 2124* (PACA); Cachoeira, 4 January 1902, *Malme, G. 963* (R); Cachoeira do Sul, 20 January 1988, *Equipe de campo MPUC6528* (MPUC); Cachoeira do Sul, 21 January 1988, *Florence, J.C. MPUC6527* (MPUC); Cachoeira do Sul, April 1983, *Sobral, M. 1721* (ICN, SI); Cachoeira do Sul, 17 February 1978, *Susin, V.L.N. 36* (MPUC); Cambará do Sul, 24 March 1999, *Longhi-Wagner, H.M. 6055* (ICN, US); Cambará do Sul, 22 November 1996, *Longhi-Wagner, H.M. ICN112020* (ICN); Cambará do Sul, 12 February 1987, *Silveira, N. 4005* (HAS); Cambará do Sul, 28 March 1987, *Silveira, N. 7120* (HAS); Candelaria, 1 February 1971, *Porto, M.L. ICN009578* (ICN); Candelária, 1 February 1971, *Porto, M.L. ICN9578* (HAS); Canela, 2 January 1973, *Jung, J. ICN021919* (ICN); Canela, February 1986, *Sobral, M. 4922* (ICN, SI, SP); Capões, 30 June 1983, *Falkenberg, D.B. 614* (ICN); Carazinho, 28 January 1964, *Pereira, E. 8671* (RB); Caxias do Sul, 17 January 2003, *Scur, L. 1063* (US); Cerro Largo, 1 January 1943, *Buck, P. PACA10864* (MVFA, PACA); Cerro Largo, 20 November 1952, *Rambo, B. 53118* (PACA, SI); Derrubadas, 19 April 1982, *Sobral, M. 508* (ICN); Dom Pedro de Alcântara, 9 March 2012, *Silva Filho, P.J.S. 1527* (ICN); Eldorado do Sul, 7 October 2008, *Longhi-Wagner, H.M. 10525* (ICN); Esmeralda, 3 December 2002, *Mahus, J. ICN146291* (ICN); Esmeralda, 6 November 1982, *Waechter, J.L. 1924* (ICN); Estrela Velha, 4 February 2005, *Trevisan, R. 369* (ICN); Farroupilha, 15 November 1956, *Camargo, O.R. 186* (HAS); Farroupilha, 15 November 1956, *Camargo, O.R. 953* (PACA, SI); Glorinha, March 1983, *Neves, M. 264* (HAS); Gravataí, February 1983, *Abruzzi, M.L. 760* (HAS); Gravataí, 14 January 1991, *Araujo, A.C. 3* (ICN); Guaiba, 11 December 1986, *Mattos, J.R. 30715* (HAS); Guaíba, 24 January 1949, *Rambo, B. 40129* (CTES, PACA); Itaqui, 12 May 1985, *Stehmann, J.R. ICN062967* (ICN); Jaguari, December 1985, *Sobral, M. 4616* (ICN); Jaquirana, 5 October 2006, *Araujo, A.C. 1629* (ICN); Jaquirana, 14 January 2009, *Longhi-Wagner, H.M. 10680* (ICN); Lavras do Sul, 17 October 1971, *Lindeman, J.C. ICN8702* (HAS, SI); Manoel Viana, 2 December 2016, *Weber, P. 582* (ICN, FLOR); Marcelino Ramos, 1 January 1943, *Friderichs, E. PACA010859* (PACA); Montenegro, 31 May 1976, *Albuquerque, E. HAS61325* (HAS); Montenegro, 28 January 1965, *Clayton, W.D. 4405* (ICN, PACA, SP); Nonoai, March 1945, *Rambo, B. 28353* (PACA); Nova Prata, 15 November 1982, *Mattos, J.R. 25976* (HAS); Nova Prata, 15 November 1982, *Mattos, J.R. 25977* (HAS); Palmares do Sul, 11 January 2012, *Gonzatti, F. 359* (FLOR); Pantano Grande, 14 December 1972, *Lindeman, J.C. ICN21040* (HAS, ICN, SI); Parecí Novo, 28 November 1945, *Schnem, A. 1583* (SI); Pelotas, 11 November 1962, *Rosengurtt, B. 9235* (MVFA, SI); Pelotas, 4 December 1957, *Sacco, J.C. 794* (ICN); Porto Alegre, 6 November 1943, *Augusto, B.*

MPUC318 (MPUC); Porto Alegre, 29 January 1965, *Clayton, W.D. 4459* (PACA); Porto Alegre, 29 January 1965, *Clayton, W.D. 4459* (SP); Porto Alegre, 31 March 1978, *Dornelles, H.H. 9* (ICN); Porto Alegre, 1 December 1948, *Rambo, B. 38447* (CTES, US); Porto Alegre, 20 April 1949, *Rambo, B. 41154* (CTES, PACA); Porto Alegre, November 1922, *Schweiger, E ICN044706* (ICN); Porto Alegre, 23 June 2005, *Silveira, G.H. 351* (ICN, SI); Quaraí, 21 January 1986, *Mattos, J.R. 29494* (HAS); Quaraí, 9 January 1945, *Rambo, B. 26205* (MVFA, PACA); Quaraí, 17 December 2011, *Silva Filho, P.J.S. 1464* (ICN); Quaraí, 30 November 2016, *Weber, P. 577* (FLOR); Rio Grande, 25 November 2004, *Boldrini, I.I. 1256* (ICN); Rio Grande, 30 October 2006, *Trevisan, R. 675* (ICN); Rio Pardo, February 1923, *Jürgens, C. 61* (R, US); Rosário do Sul, 6 January 1991, *Longhi-Wagner, H.M. 2386* (ICN); Rosário do Sul, 29 November 2016, *Weber, P. 571* (ICN, FLOR, JAR); Rosário do Sul, 29 November 2016, *Weber, P. 575* (); Santa Maria, 8 January 1991, *Longhi-Wagner, H.M. 2447* (ICN); Santa Maria, 31 March 1977, *Mattos, J.R. 17069* (HAS); Santana do Livramento, 11 January 1997, *Araujo, A.C. 528* (ICN); Santana do Livramento, 14 November 2005, *Trevisan, R. 512* (ICN); Santana do Livramento, 14 November 2005, *Trevisan, R. 513* (ICN); São Francisco de Assis, 13 May 1985, *Stehmann, J.R. ICN088882* (ICN); São Francisco de Paula, 24 November 2006, *Trevisan, R. 726* (ICN); São Francisco de Paula, 19 December 1999, *Wasum, R. 369* (US); São Francisco de Paula, 17 December 2000, *Wasum, R. 835* (MBM, US); São Francisco de Paula, 4 November 2001, *Wasum, R. 1224* (MBM, US); São Francisco de Paula/Cambará, 1 January 2008, *Silva,V.L. PACA105766* (PACA); São Gabriel, 12 January 1997, *Araujo, A.C. 541* (ICN); São Gabriel, 28 November 2016, *Weber, P. 564* (ICN); São Jerônimo, April 1982, *Bueno, O. 3450* (HAS); São Jerônimo, April 1982, *Bueno, O. 3463* (HAS); São Jerônimo, April 1982, *Bueno, O. 3491* (HAS); São José dos Ausentes, 18 November 2007, *Trevisan, R. 859* (ICN); São José dos Ausentes, 18 November 2007, *Trevisan, R. 860* (ICN); São Leopoldo, 1 September 1943, *Rambo, B. 11691* (PACA); São Leopoldo, 10 December 1948, *Rambo, B. 38749* (CTES, PACA); São Leopoldo, January 1964, *Teixeira, B.C. 27* (NY, SP); São Miguel das Missões, 10 January 1997, *Araujo, A.C. 492* (ICN); São Pedro do Sul, January 1984, *Bueno, O. 3764* (HAS); São Pedro do Sul, May 1985, *Sobral, M. 3890* (ICN); *sine loc.*, 14 December 1972, *Lindeman, J.C. CTES42522* (CTES); *sine loc.*, 19 December 1972, *Lindeman, J.C. ICN021084* (ICN); *sine loc.*, 30 October 1971, *Lindeman, J.C. ICN8790* (CTES, ICN, SI); *sine loc.*, 7 January 1991, *Longhi-Wagner, H.M. 2414* (ICN); *sine loc.*, 10 April 1949, *Rambo, B. 40968* (CTES, PACA); Taquarí, 10 December 1957, *Camargo, O.R. 2863* (PACA); Tenente Portela, *Brack, P. ICN89194* (ICN); Torres, 7 August 1952, *Beetle, A.A. 1910* (US); Torres, 17 February 1992, *Longhi-Wagner, H.M. 2505* (CTES, ICN); Torres, November 2011, *Silva Filho, P.J.S. 1493* (ICN); Triunfo, 3 January 2002, *Nunes, S.M. MPUC10746* (MPUC); Triunfo, 10 January 2002, *Nunes, S.M. MPUC10909* (MPUC); Triunfo, 10 January 2002, *Silva Jr., A. PACA091027* (PACA); Triunfo, April 1983, *Sobral, M. 1619a* (ICN, SI); Tupanciretã, 29 January 1942, *Rambo, B. 9866* (PACA); Uruguaiana, 16 December 2011, *Silva Filho, P.J.S. 1410* (ICN); Uruguaiana, 16 December 2011, *Silva Filho, P.J.S. 1465* (ICN); Uruguaiana, 16 December 2011, *Trevisan, R. 1091* (FLOR); Uruguaiana, 1 December 2016, *Weber, P. 579* (ICN); Vacaria, 4 January 1947, *Rambo, B. 34826* (PACA); Venâncio Aires, December 1923, *Jürgens,*

C. 90 (R); Veranópolis, 29 December 1981, *Silveira, N. 135* (HAS); Veranópolis, 23 December 1983, *Silveira, N. 820* (HAS); Viamão, 31 March 1978, *Dornelles, H.H. 2* (ICN); Viamão, 16 February 2009, *Silva Filho, P.J.S. 233* (ICN); Viamão, 15 May 2010, *Silva Filho, P.J.S. 323* (ICN); Viamão, 27 April 2006, *Trevisan, R. 620* (ICN); Viamão, 27 April 2006, *Trevisan, R. 627* (ICN); Viamão, 20 November 2006, *Trevisan, R. 714* (ICN); x, 9 January 1997, *Araujo, A.C. 479* (ICN); x, 10 January 1997, *Araujo, A.C. 511* (ICN); **Santa Catarina**: Abelardo Luz, 29 December 1963, *Reitz, R. 16588* (SI); Água Doce, 26 November 2013, *Campestrini, S. 808* (FLOR); Água Doce, 4 December 1964, *Smith, L.B. 13570* (FLOR, HBR, US); Araquari, 10 March 2017, *Weber, P. 621* (FLOR); Araquari, 10 March 2017, *Weber, P. 622* (FLOR); Araranguá, 5 February 2014, *Ferreira, J.P.R. 566* (FLOR); Blumenau, 30 April 2014, *Nuernberg, A. 1354* (FLOR); Bom Jardim da Serra, January 1986, *Sobral, M. 4791* (SI); Bombinhas, 3 February 2012, *Nuernberg, A. 589* (FLOR); Caçador, 7 December 1962, *Klein, R.M. 3426* (HBR); Caçador, 9 January 1962, *Reitz, R. 11869* (HBR, SI); Caçador, 23 December 1956, *Smith, L.B. 9112* (HBR, R, SI, US); Caçador, 23 December 1956, *Smith, L.B. 9144* (HBR, NY, R, SI, US); Campo Alegre, 4 November 2014, *Funez, L.A. 4061* (FLOR); Canoinhas, 17 December 1956, *Smith, L.B. 8606* (HBR, R, SI, US); Chapecó, 26 December 1956, *Smith, L.B. 9412* (SI, US); Curitibanos, 9 January 1962, *Reitz, R. 11808* (HBR); Curitibanos, 10 January 1962, *Reitz, R. 11959* (HBR); Curitibanos, 22 February 1962, *Reitz, R. 12215* (FLOR, HBR, SI); Fachinal dos Guedes, 9 December 1961, *Smith, L.B. 13912* (HBR, R, US); Florianópolis, 7 October 1964, *Klein, R.M. 5927* (HBR, SI); Garopaba, 28 January 2005, *Silveira, G.H. 169* (ICN); Ipuaçu, 15 February 2001, *Silva Filho, F.A. 2078* (FLOR); Iraní, 29 December 1963, *Reitz, R. 16459* (HBR); Itajaí, 3 November 1948, *Reitz, R. 2276* (HBR); Itapema, 20 October 1994, *Araujo, A.C. 352* (HBR); Joinville, 17 November 2009, *Dreveck, S. 1276* (ICN); Lages, 22 November 2006, *Araujo, A.C. 1673* (ICN, NY); Lages, 1 November 1963, *Klein, R.M. 4473* (HBR, SI); Lages, 3 February 1963, *Reitz, R. 6640* (NY, SI, US); Lages, 17 December 1962, *Reitz, R. 14059* (FLOR, HBR, SI, US); Lages, 15 April 1963, *Reitz, R. 14932* (HBR, NY, SI, US); Lebon Régis, 6 December 1962, *Klein, R.M. 3358* (FLOR, HBR, SI, US); Mafra, 11 December 1962, *Klein, R.M. 3825* (HBR, SI); Navegantes, 28 January 2005, *Silveira, G.H. 182* (ICN); Papanduva, 7 December 1956, *Smith, L.B. 8411* (HBR, NY, R, SI, US); Porto União, 4 February 1957, *Smith, L.B. 10753* (HBR, R, RB); Porto União, 5 February 1957, *Smith, L.B. 10857* (HBR, R, US); Pôrto União, 22 April 1962, *Reitz, R. 12749* (HBR, SI, US); Riqueza, 16 October 1964, *Smith, L.B. 12596* (FLOR, NY, US); Santa Cecília, 2 January 1962, *Reitz, R. 11353* (HBR, SI); São Francisco do Sul, 8 January 2006, *Berger, J.Z. 262* (MBM); São Francisco do Sul, 13 December 2006, *Berger, J.Z. 572* (MBM); São João do Sul, 18 November 1984, *Falkenberg, D.B. 1931* (ICN); São Joaquim, 2 February 1958, *Mattos, J.R. 5340* (HAS); São Joaquim, *Mattos, J.R. 6608* (HAS); São Joaquim, *Mattos, J.R. 11329* (HAS); São Joaquim, 26 January 1965, *Mattos, J.R. 12203* (HAS); São José do Cerrito, 8 December 1992, *Longhi-Wagner, H.M. 2517* (CTES, ICN); *sine loc.*, 22 October 2005, *Trevisan, R. 430* (ICN); *sine loc.*, January 1891, *Ule, G. 1926* (SI); Treviso, 7 February 2014, *Ferreira, J.P.R. 516* (FLOR); Tubarão, September 1889, *Ule, G. 1376* (SI (img B)); Vargem, 4 April 2013, *Weber, P. 287* (FLOR); Videira, 24 February 1960, *Mattos, J.R. 7694* (HAS); **São Paulo**: Amparo, 24 August 1943, *Kuhlmann, M. 950* (ICN, SP);

Campinas, 4 May 1978, *Monteiro, R. 7696* (NY); Campinas, *Novaes, C. 1303* (US); Capao Bonito, 23 October 2007, *Forzza, R.C. 4739* (NY, RB); Gália, 15 March 1981, *Muniz, C.F.S. 372* (SP); Itanhaém, 7 October 1995, *Souza, V.C. 9197* (SPF); Itararé, 20 September 1999, *Prata, A.P. 639* (SP); Juquitiba, 8 March 1976, *Davidse, G. 10907* (SP); Lorena, 1 January 1922, *Delforge, H. RB6775* (RB); Marabá Paulista, 10 March 1981, *Muniz, C.F.S. 256* (SP); Mogi Guaçu, 12 December 1962, *Eiten, G. 5050* (FLOR); Mogi-Guaçu, 4 December 1959, *Eiten, G. 1528* (NY, SP); Mogi-Guaçu, 9 December 1959, *Eiten, G. 1544* (SP, US); Moji-Guaçu, 24 September 1980, *Muniz, C.F.S. 175* (NY, SI, SP, SPF, UFP); Monte Alegre do Sul, 25 July 1949, *Kuhlmann, M. 1863* (SP); Santa Rita do Passa Quatro, 4 December 2007, *Nicolau, S.A. 3435* (SP); Santos, 22 December 1938, *Guimarães, L.R. SP215354* (SP); São José do Rio Preto, 7 April 1965, *Marinis, G. 225* (SP); São Paulo, December 1932, *Brade, A.C. 12170* (R); São Paulo, 29 October 1964, *Corrêa, J.A. 30* (SP); São Paulo, 12 September 1944, *Hoehne, W. 1464* (NY, SI, SPF); São Paulo, 27 August 1948, *Hoehne, W. SPF12861* (NY); São Paulo, 13 December 1988, *Kral, R. 75985* (NY, SP); São Paulo, 11 November 1970, *Sendulsky, T. 1157* (ICN, SP, UFP,); Sao Roque, 2 December 1987, *Tsugaru, S. B-2287* (NY); *sine loc.*, 11 January 1995, *Barreto, K.D. 3529* (NY); *sine loc.*, 21 September 1932, *Hoehne, F.C. 29866* (NY, US); *sine loc.*, 28 April 1922, *Holway, E.W.D. 1790* (NY, US); *sine loc.*, 13 March 1981, *Muniz, C.F.S. 341* (SP); Teodoro Sampaio, 11 March 1981, *Muniz, C.F.S. 287* (NY, SP); **Tocantins**: Mateiros, 30 May 2008, *Cordeiro, J. 2791* (MBM);

BRUNEI. **Daerah Tutong**: Tutong District, 4 May 1992, *Johns, R.J. 7472* (GH); **Muara**: Pengkalan Batu, 30 June 1996, *Said, I.M. 16187* (GH); **Seria**: *sine loc.*, 5 December 1963, *Hotta, M. 12309* (NY); **Tutong**: *sine loc.*, 21 October 1989, *Forman, L.L. 960* (GH);

CAMBODIA. **Bokor**: *sine loc.*, 18 January 1926, *Smith, H.M. 292* (US);

CENTRAL AFRICA. Djur, 3 April 1869, *Schweinfurth, G.A., 1360* (PRE!);

CHINA. **Hainan**: Lin Fa Shan, 25 April 1928, *Tsang, W.T. 30* (GH, US); Lin Fa Shan, 31 July 1927, *Tsang, W.T. 226* (GH, NY, US); Sha Po Shan, 23 June 1928, *Tsang, W.T. 460* (GH, US); *sine loc.*, 1889, *Henry, A. 8551* (GH, NY); *sine loc.*, 26 March 1936, *Lau, S.K. 25873* (GH); Tai Pin, June 1935, *Gressitt, J.L. 1129* (US); **Kwangtung**: Hainan, 10 August 1933, *Liang, H.Y. 62492* (NY); **Yunnan**: Osh-meng-lung, August 1936, *Wang, C.W. 77740* (GH);

COLOMBIA. *sine loc.*, *Mutis, J.C. 2635* (US); *sine loc.*, *Mutis, J.C. 3746* (US); **Antioquia**: Santo Antonio de Pereira, August 1941, *Daniel, B. 2514* (US); Yolombó, 2 July 1989, *Callejas R. 7986* (US); **Cauca**: Chisquio, 3 February 1940, *Asplund, E. 10503* (US); Dolores, 24 November 1943, *Core, E.L. 74* (US); La Paila, 14 July 1853, *Holton, I.F. 110* (NY); Popayan, 30 July 1946, *Sneidern, K. 5595* (US); *sine loc.*, 13 August 1968, *Barkley, F.A. 380654* (GH, US); **Chocó**: Corregimiento El Valle, 25 April 1989, *Espina, J. 2994* (NY); Quibdo, April 1931, *Archer, W.A. 1798* (US); **El Cauca**: Aganche, 3 June 1922, *Pennell, F.W. 6266* (GH, NY, US); **El Valle**: Buenaventura, 12 November 1945, *Cuatrecasas, J. 19757* (US); Buenaventura, 5 February 1939, *Killip, E.P. 33032* (US); Isla del Guayabal, 12 February 1944, *Cuatrecasas, J. 16200* (US); **Meta**: Puerto Lopez,

11 January 1970, *Schuyler, A.E. 4115* (NY); San Martín, 12 September 1958, *Mejia, R.J. 1084* (US); **Nariño**: La Unión, 22 June 1986, *Benavides, O. 6855* (NY); **Vaupés**: *sine loc.*, 2 October 1939, *Cuatrecasas, J. 7124* (US);

CONGO. Marais de Stanley Pool, 14 July 1888, *Hens, F. B44* (P); **Epulu**: *sine loc.*, 1935, *Putman, P.T.L. 22* (GH); **Yembeshi**: *sine loc.*, *Devred, R. 1469* (NY); **Zitule**: *sine loc.*, 1931, *Lebrum, J. 2760* (US);

COSTA RICA. **Alajuela**: Los Chiles, 2 August 1949, *Holm, R.W. 785* (GH, NY); **Limon**: Limon, *Crow, G.E. 7496* (US); **Puntarenas**: Sierpe, 24 October 2001, *Aguilar, R.M. 6625* (NY);

CUBA. **Isla de la Juventud**: Jucaro, 20 February 1916, *Britton, N.L. 14629* (NY, US); *sine loc.*, May 1940, *León, Fr. 17876* (GH); Nueva Gerona, 6 February 1956, *Morton, C.V. 9980* (US); Santa Barbara, 27 December 1951, *Alain, B. 2095* (US); Santa Barbara, 4 February 1953, *Killip, E.P. 42593* (US); *sine loc.*, 10 March 1953, *Killip, E.P. 43069* (US); *sine loc.*, 6 January 1956, *Killip, E.P. 45329* (US); **Pinar del Río**: *sine loc.*, 6 September 1910, *Britton, N.L. 7034* (NY); *sine loc.*, 8 September 1910, *Britton, N.L. 7112* (NY); *sine loc.*, 24 April 1903, *Shafer, J.A. 359* (MBM, NY); **Villa Clara**: Santa Clara, 22 July 1920, *León, Fr. 9176* (NY);

DOMINICAN REPUBLIC. *sine loc.*, 29 March 1945, *Jiménez, J. 85* (US); **Bonao**: *sine loc.*, 6 June 1944, *Jiménez, J. 24* (US); **Central**: Prov. De Agua, 15 June 1926, *Ekman, E.L. H6388* (US); Prov. De Agua, 15 June 1926, *Ekman, E.L. NH6388* (US); **Cibao**: Sabana Grande de Boya, 11 May 1988, *Zanoni, T.A. 40865* (US); **Cotuy**: Vega, 28 January 1921, *Abbott, W.L. 729* (US); **Distrito Nacional**: Hato Nuevo, 27 March 1984, *Pimentel, J. 93* (GH); Isabela, 5 March 1981, *Zanoni, T.A. 11568* (NY); *sine loc.*, 23 February 1974, *Liogier, A.H. 21345* (NY); *sine loc.*, 6 March 1985, *Pimentel, J. 233* (NY); **El Seibo**: *sine loc.*, 10 April 1929, *Ekman, E.L. 14116* (NY); *sine loc.*, 4 August 1981, *Zanoni, T.A. 15865* (NY); *sine loc.*, 28 June 1982, *Zanoni, T.A. 21061* (NY); **Hato Mayor**: *sine loc.*, 29 April 1969, *Liogier, A.H. 15015* (NY); **Jarabacoa**: *sine loc.*, 24 March 1945, *Jiménez, J. 84* (US); **La Herradura**: *sine loc.*, November 1944, *Jiménez, J. 60* (US); **La Vega**: Juma Bejucal, 23 April 1981, *Zanoni, T.A. 12893* (NY); Juma Bejucal, 23 April 1981, *Zanoni, T.A. 12900* (NY); *sine loc.*, 15 July 1975, *Liogier, A.H. 23587* (NY); *sine loc.*, 29 January 1929, *Valeur, E.J. 388* (NY, US); **Piedra Branca**: La Vega, 8 January 1946, *Allard, H.A. 14498* (US); **Samaná**: *sine loc.*, 16 March 1969, *Liogier, A.H. 14437* (NY); *sine loc.*, 7 December 1982, *Zanoni, T.A. 24713* (NY); *sine loc.*, 21 March 1984, *Zanoni, T.A. 29422* (NY); **San Cristóbal**: *sine loc.*, 22 October 1946, *Howard, R.A. 9547* (GH, NY, US); *sine loc.*, 21 November 1970, *Liogier, A.H. 17708* (NY, US); **Sánchez Ramírez**: *sine loc.*, 8 April 1978, *Liogier, A.H. 9011-4* (NY); Samaná, 29 November 1920, *Abbott, W.L. 206* (US); **Santo Domingo**: Guabatico, 7 January 1929, *Ekman, E.L. H11051* (GH, US); Guabatico, 7 January 1929, *Ekman, E.L. NH11051* (US); Inquiry, January 1871, *Wright, C. 578* (US); Monseñor Nouel, 13 October 1973, *Liogier, A.H. 20412* (NY);

ECUADOR. **Esmeraldas**: Borbon, 5 August 1967, *Játiva, C. 2122* (NY, US); Borbon, 5 August 1967, *Játiva, C. 2125* (NY, US); **Galapagos Islands**: Indefatigable Island, 10 May 1932, *Howell, J.T. 9258* (GH); **Napo**: Cotundo, 1 May 1998, *Clark, J.L. 5489* (NY); Puerto Misahuallí, 4 September 1987, *Cerón, C.E. 2116* (NY); Tena, 14 November 1994, *Abbott, J.R. 15518* (NY); **Pastaza**: Canelos, 8 April 1989, *Thomas, W.W. 6676* (NY); Shell Mera, 3 April 1956, *Asplund, E. 20098* (NY); **Zamora-Chinchipe**: Zmora, 21 July 2004, *Croat, T.B. 91735* (SI, US);

EQUATORIAL GUINEA. **Malabo**: *sine loc.*, 10 December 1988, *Carvalho 3769* (US);

FIJI. *sine loc.*, 1878, *Horne, J. 994* (GH); **Nukulau**: *sine loc., ? US898874* (US); **Vanua Levu**: Thakaundrove, 26 December 1940, *Degener, O. 13904* (GH, US); Matawailevu, 5 August 1937, *John, H.S. 18236* (US); Nalotawa, 28 April 1947, *Smith, A.C. 4435* (NY, US); Nandrau, 31 July 1947, *Smith, A.C. 5399* (GH, NY, US); Ndeumba, 17 July 1955, *McKee, H.S. 2747* (US);

FRENCH GUIANA. **Cayenne**: Cayenne, 3 August 1982, *Fournier, A. 237* (NY); **Cayenne**: *sine loc.*, 20 October 1989, *Hoff, M. 5730* (NY, US); **Kaw**: *sine loc.*, 4 December 1999, *Raynal-Roques, A.M. 24767* (NY);

GUADALOUPE. *sine loc.*, 18 August 1893, *Duss, P. 3118* (US); *sine loc.*, 1894, *Duss, P. 3523* (US); *sine loc.*, 25 March 1978, *Raynal-Roques, A.M. 20242* (NY); *sine loc.*, 10 March 1934, *Rodriguez, L. 3011* (US); *sine loc.*, 13 September 1937, *Stehlé, H. 2848* (US); **Basse-Terre**: *sine loc.*, 17 November 1959, *Proctor, G.R. 20008* (GH, US); **Goyave**: *sine loc.*, 12 November 1982, *Jérémie, J. 993* (GH, US); **Montebello**: *sine loc.*, October 1938, *Questel, A. 4495* (US); **Riviére Saleé**: *sine loc.*, 17 March 1934, *Rodriguez, L. 3117* (US); **Sta. Rose**: *sine loc.*, 19 September 1937, *Stehlé, H. 2521* (US);

GUATEMALA. **Alta Vera Paz**: Coban, June 1887, *Türckheim, H. 1257* (GH, US); **Peten**: Tikal, 6 July 1959, *Lundell, C.L. 16225* (NY); **Puerto Barrios**: Izabal, 2 June 1922, *Standley, P.C. 24747* (US); *sine loc.*, 2 June 1905, *Pittier, H. 365* (US);

GUYANA. *sine loc.*, April 1891, *Jenman, G.S. 4553* (NY); **Demerara**: Naamryck, 31 March 1988, *Pipoly, J.J. 11260* (NY, US); *sine loc.*, 20 September 1951, *Forestry Dep. F3080* (NY); Wales, 4 December 1986, *Pipoly, J.J. 9102* (SI, US); **Essequibo**: West Demerara, *Horn, C.N. 11100* (US); **Georgetown**: *sine loc.*, 27 November 1919, *Hitchcock, A.S. 16995* (NY, US); **Kabakaburi**: Pomeroon, 10 February 1923, *Cruz, J.S. 3245* (US); **Mahaicony**: Georgetown, 14 October 1955, *Little Jr., E.L. 16852* (US); **Upper Demerara-Berbice**: Linden, 9 January 1920, *Hitchcock, A.S. 17417* (GH, NY);

HAITI. Grand'Anse, 15 November 1982, *Zanoni, T.A. 24286* (NY); Jarabacoa, 18 May 1963, *Augusto, B. 996* (NY);

HONDURAS. **Atlantida**: Tela, 10 November 1988, *MacDougal, J.M. 3433* (NY); **Copán**: *sine loc.*, 2 January 1983, *Molina, A. 32168* (NY); **Cortes**: *sine loc.*, 2 November 1988, *MacDougal, J.M. 3072* (NY); **El Paraíso**: El Junquillo, 26 April 1963, *Molina, A. 11867* (NY, US); El Junquillo, 12 June 1964, *Molina, A. 14160* (NY, US); **El Paraíso**:

sine loc., 20 July 1951, *Molina, A. 4028* (GH); Teupasenti, 21 July 1970, *Davidse, G. 2430* (NY); **Morazan**: El Zamorano, 15 June 1970, *Davidse, G. 2097* (NY);

HONG KONG. *sine loc.*, 3 June 1992, *Hu, S.Y. 20704* (GH); **Saiwan**: *sine loc.*, 17 July 1941, *Taam, Y.W. 2213* (GH, NY, US);

INDIA. *sine loc.*, November 1910, *Merblod, A. 12671* (US); **Assam**: Tirap river valley, 21 October 1945, *Belcher, R.O. 922* (US); **Bombay**: Gund, 11 May 1950, *Fernandes, J. 1382* (US); **Mysore**: Hassan, 8 July 1970, *Ramamoorthy, T.P. HFP306* (US); Hassan, 9 December 1969, *Saldanha, C.J. 15769* (US); **Tamil Nadu**: Namakkal, 21 April 1979, *Matthew, K.M. 22956* (GH);

INDONESIA. **Aer Kandis**: Rantau Parapat, 28 May 1932, *Toroes, R.S. 2623* (GH, US); **Asahan**: Hessa, 27 August 1928, *Toroes, R.S. 1113* (GH, US); Hoeta Bagasan, 7 September 1934, *Boeea, R.S. 6511* (US); Silo Maradja, 3 January 1927, *Bartlett, H.H. 6429* (US); *sine loc.*, 1918, *Bartlett, H.H. 350* (GH, US); Hoeta Tomoean Dolok, 17 November 1935, *Boeea, R.S. 8635* (US); **Batavia**: Rawa Tambaga, 28 September 1941, *Steenis, C.G.G.J. 12548* (GH); **Central Java**: *sine loc.*, *Brink, B. 3309* (US); **Java**: Preanger, 27 January 1923, *Winchel 1512B* (GH, US);**Kaju Arau**: *sine loc.*, 2 July 1953, *Borssum, J. 2838* (GH); **Kendari**: *sine loc.*, 2 March 1929, *Kjellberg, G. 620* (NY); **Koealoe**: *sine loc.*, 9 May 1927, *Bartlett, H.H. 7669* (US); **Labuhan Batu**: Rantau Prapat, 28 March 1932, *Toroes, R.S. 1630* (GH, US); Rantau Prapat, 28 March 1932, *Toroes, R.S. 1985* (GH, US); **Marbau**: Bilah Pertama, February 1928, *Toroes, R.S. 264* (NY); **North Sumatra**: Asahan, 15 June 1936, *Boeea, R.S. 9116* (GH, NY, US); **Palembang**: Pladjoe, 30 November 1938, *Rutter 13* (GH); **Raja Ampat**: Waigeo Island, 28 January 1955, *Royen, P. 5344* (GH); **Riouw**: Penjagoan, 29 June 1939, *Buwalda, P. 6843* (GH); **Selebes**: *sine loc.*, 24 October 1938, *Eyma, P.J. 4043* (GH); **Sigamata**: Rantau Parapat, 27 June 1932, *Toroes, R.S. 2965* (GH, US); Rantau Parapat, 27 June 1932, *Toroes, R.S. 3009* (US); Rantau Parapat, 27 June 1932, *Toroes, R.S. 3070* (GH, US); **South Kalimantan.** Bandjermasin, February 1930, *Franck, C.W. 264* (US); **Sulawesi**: Donggala, 14 May 1975, *Meijer, W. 10140* (US); **Tapianoeli**: Aek Roppak, 22 June 1933, *Toroes, R.S. 4782* (NY, US); Goenoeng Manaoen, 31 May 1933, *Toroes, R.S. 4438* (US); Si Hare-hare Djae, 15 July 1933, *Toroes, R.S. 5012* (US);**West Java**: Sindanglaya, June 1975, *Kuntze, O. 4811* (NY); **West Sumatra**: Simuna, 24 June 1953, *Borssum, J. 2285* (GH);

IVORY COAST. **Abidjan**: *sine loc.*, 10 October 1959, *Fosberg, F.R. 40442* (US);

JAMAICA. **Clarendon**: *sine loc.*, 22 March 1975, *Proctor, G.R. 34921* (GH, NY); **Clarendon**: Stasey Ville, 2 December 1915, *Harris, W. 12259* (GH); **Holland**: St. Elizabeth, 9 February 1961, *Proctor, G.R. 22066* (GH); **Middlesex**: St. Anns Bay, 19 March 1897, *Churchill, J.R. s.n.* (GH); **Portland Parish**: Port Antonio, 25 September 1906, *Britton, N.L. 859* (NY); Port Antonio, 1 April 1908, *Britton, N.L. 2572* (NY);

JAPAN. **Okinawa**: Kunigami, 9 July 1951, *Walker, E.H. 6078* (US); Yaeyama District, 20 April 1998, *Yonekura, K. 98310* (GH); **Ryukyu**: Nago-nachi, 4 June 1952, *Amano, T. 6987* (US); Yaeyama Gunto, 21 August 1951, *Walker, E.H. 6631* (US); **Taketomi**:

Okinawa, 2 May 2002, *Yasuda, K. 530* (GH); Okinawa, 4 June 2004, *Yasuda, K. 2698* (GH);

LIBERIA. **Grand Bassa**: Fishtown, 16 July 1896, *Dinklage, M. 1679* (SI); **Hinterland**: Reppues Town, August 1926, *Linder, D.H. 369* (GH); **Suacoco**: *sine loc.*, 16 March 1952, *Blickenstaff, M.L. 21* (US); **Webo**: Jabroke, 9 July 1947, *Baldwin Jr., J.T. 6507* (US);

MADAGASCAR. *sine loc.*, 1927, *Decary, M. 5308* (SI); **Fort Dauphin**: *sine loc.*, 20 September 1928, *Humbert, H. 5963* (US); **Karianga**: *sine loc.*, 22 January 1927, *Decary, M. 5568* (US); **Vatomandry**: *sine loc.*, November 1921, *Bathie, P. 14119* (US);

MALAWI. **Mzimba**: Distr. Mzuzu, Marymount dambo, 20 November 1973, *Pawek, J. 7511* (SI);

MALAYSIA. **Jindaram**: Nilai, 23 September 1957, *Shah, M. 142* (GH); **Moluccas**: Ceram, 27 August 1938, *Buwalda, P. 5850* (GH); Halmaheira, October 1952, *Idjan 148* (GH); Halmaheira, 19 September 1951, *Idjan 262* (GH); **Sabah**: Tawau, March 1923, *Elmer, A.D.E. 20924* (GH); **Sarawak**: 18 June 1929, *Clemens, J. 21355* (GH, NY); May 1908, *Foxworthy, F.W. 76* (US); **Selangor**: Sungai Tinggi, 13 October 1937, *Nur, Md. 34072* (GH); **Sungai Krian**: Perak, 5 July 1938, *Spare, G.H 34599* (GH);

MARTINIQUE. *sine loc.*, 1869, *Habn, M. 696* (GH);

MEXICO. **Chiapas**: Amatenango del Valle, 7 July 1966, *Breedlove, D.E. 14449* (NY); Amatenango del Valle, 27 July 1966, *Breedlove, D.E. 14593* (NY, US); Amatenango del Valle, 12 June 1945, *Matuda, E. 5880* (NY); Amatenango del Valle, 9 March 1988, *Perez, J.L. 334* (NY); La Trinitaria, 23 October 1971, *Breedlove, D.E. 21268* (NY); Ocozocoautla de Espinosa, 17 May 1972, *Breedlove, D.E. 25197* (NY); **Jalisco**: Autlán, 10 August 1949, *Wilbur, R.L. 2213* (GH, US); **Tabasco**: Balancan, 29 May 1929, *Matuda, E. 3222* (GH, US); Cárdenas, 27 June 1980, *Cowan, C. 3092* (NY); **Veracruz**: Coatzacoalcos, 2 January 1986, *Nee, M.H. 32440* (NY); Coatzacoalcos, 9 May 2003, *Ramos, C.H. 2348* (MBM); Jalapa, 16 April 1899, *Pringle, C.G. 8154* (GH, US); Tabasco, 28 January 1971, *Lot, A. 1243* (NY);

MICRONESIA. **Guam**: Inarajan, 13 March 1983, *Herbst, D. 7130* (US); Laguas, 26 January 1954, *Fosberg, F.R. 35563* (NY, US); Laguas, 14 April 1985, *Raulerson, L. 9782* (US); Mapao, 16 January 1954, *Fosberg, F.R. 35457* (NY, US); Mt. Santa Rosa, 6 May 1945, *Muennink, O.A. US1862095* (US); Piti Village, 10 November 1945, *Moore, G.C. 175* (US); *sine loc.*, 29 December 1953, *Fosberg, F.R. 35323* (NY, US); *sine loc.*, October 1911, *McGregor, R.C. 461* (US); *sine loc.*, *Mertens NY1297477* (NY); Talofofo River Valley, 24 February 1964, *Stone, B.C. 5021* (GH); Ylig, 2 July 1946, *Fosberg, F.R. 25326* (NY, US); **Moen Island**: Sapuk Peninsula, 31 July 1946, *Fosberg, F.R. 26027* (NY, US); **Ngarakabesang**: *sine loc.*, 23 March 1950, *Fosberg, F.R. 32282* (US); **Pohpei**: Pohnpei, July 1931, *Kanehira, R. 1513* (NY); Nett, 22 February 2009, *Perlman, S. 21392* (US); **Ponape**: *sine loc.*, 10 August 1946, *Fosberg, F.R. 26309* (US);

MYANMAR. *sine loc.*, 2 July 1949, *Glassman 2433* (US); *sine loc.*, August 1961, *Keenan, J. 740* (GH); *sine loc.*, 31 January 1930, *Parker, R.N. 3169* (NY); Tenasserim and Andamans, 1836, *Helfer, J.W. 6275* (NY);

NEW CALEDONIA. **Houailou**: *sine loc.*, 31 December 1960, *McKee, H.S. 7850* (US); **Isle of Pines**: *sine loc.*, 2 April 1971, *MacKee, M. 19* (NY);

NIGERIA. **Lagos**: *sine loc.*, 1927, *Hagerup, O. 758* (US); **Shaki**: *sine loc.*, 24 May 1900, illegible *3* (NY);

PANAMA. Barro Colorado Island, 10 February 1949, *Hunnewell, F.W. 18988* (GH); Colon, 30 August 1973, *Nee, M.H. 6686* (US); Colon, 6 October 1973, *Nee, M.H. 7286* (US); Colon, 17 May 1974, *Nee, M.H. 11721* (US); Colón, February 1850, *Fendler, A. 354* (US); Darlen Station, 19 January 1924, *Standley, P.C. 31644* (US); Old Bank island, 26 February 1941, *Wedel, H. 2129* (GH, US); Panama, 16 September 1911, *Hitchcock, A.S. 8132* (US); Panama, 17 September 1975, *Witherspoon, J.T. 8433* (US); *sine loc.*, 3 March 1983, *Hamilton, C. 3221* (NY); *sine loc.*, *Killip, E.P. 12188* (US); *sine loc.*, June 1923, *Maxon, W.R. 6856* (US);

PAPUA NEW GUINEA. Daru, 19 March 1968, *Millar, A.N. 35273* (GH); Guruguru, 30 June 1954, *Hoogland, R.D. 4221* (GH); Koitaki, 13 May 1935, *Carr, C.E. 12275* (NY); Kokoda, 28 September 1975, *Wiakabu, J. 70257* (GH); Lake Daviumbu, September 1936, *Brass, L.J. 7633* (GH); Milne Bay, 27 May 1964, *Henty, E.E. 16795* (GH); Misima, 21 July 1956, *Brass, L.J. 27441* (GH, US); Senajo, 17 July 1941, *Anta 135* (GH); Sepik River, 11 May 1929, *Herre, A.W. 242* (NY); Sibil valley, 1 June 1959, *Kalkman, C. 4193* (GH); *sine loc.*, *Brass, L.J. 25467* (GH, US);

PARAGUAY. *sine loc.*, 1901, *Hassler, E. 7968* (P, SI); *sine loc.*, December 1902, *Hassler, E. 8252* (NY); *sine loc.*, *Jörgensen, P. 3571* (SI, US); *sine loc.*, March 1924, *Rojas, T. 4821* (SI); **Alto Paraná**: Estancia Rio Bonito, 27 December 1994, *Zardini, E.M. 42002* (SI); Itakiri, 9 February 2003, *Lopez, M.G. 285* (SI); Bella Vista, 14 December 1997, *Schinini, A. 33862* (CTES, US); Bella Vista, 6 May 2001, *Zuloaga, F.O. 7294* (SI, US); Cerro Corá, 12 November 1999, *Zardini, E.M. 52561* (SI); Cerro Corá, 12 November 1999, *Zardini, E.M. 52581* (SI); Cerro Corá, 12 November 1999, *Zardini, E.M. 52584* (SI, US); Zanja Puitá, 7 March 1951, *Schwarz, G.J. 12085* (SI); **Baixo Paraná**: *sine loc.*, 23 March 1982, *Muniz, C.F.S. 437* (ICN, NY, SI, SP); **Caaguazú**: Arroyo Guaranungua, 1 December 1990, *Zardini, E.M. 24671* (SI); Caarayaó, 13 October 1980, *Casas, J.F. 4242B* (NY); Guayaqui, 22 May 1987, *Zardini, E.M. 2436* (SI); Ihú, 15 December 1982, *Schinini, A. 23065* (CTES, SI); Itakyry, 6 November 1990, *Marmori, G.C. Herb.Itaipú1910* (CTES); Juquiry, May 1917, *Rojas, T. 3074* (MVM, SI); *sine loc.*, 10 November 1990, *Zardini, E.M. 23727* (NY); *sine loc.*, 10 November 1990, *Zardini, E.M. 23894* (NY); *sine loc.*, 1 December 1990, *Zardini, E.M. 24758* (SI, US); Tavaí, 20 October 1988, *Mereles, F. 2362* (SI); Yhú, 5 February 2003, *Lopez, M.G. 197* (CTES, SI, US); Yutay, 29 December 1972, *Schinini, A. 5748* (CTES); **Caazapá**: San Juan Nepomuceno, May 1932, *Rojas, T. 5787* (SI); Yatay-mi, 22 March 1993, *Schinini, A. 27746* (CTES, SI); **Central**: Asunción, 31 December 1978, *Arenas, P. 758* (SI); Ayo.

Nhoiy, 1 January 1973, *Schinini, A. 5708* (CTES); Luque, 23 December 1985, *Mereles, F. 376* (CTES, SI); Luque, 16 January 1951, *Schwarz, G.J. 11698* (CTES); Nueva Italia, 7 December 1990, *Zardini, E.M. 24963* (SI); Patino, 27 February 1985, *Ortiz, M. 485* (CTES); Pindoty, 1 September 1990, *Zardini, E.M. 23136* (NY); Pirayú, 20 October 1978, *Mereles, F. 1* (CTES, SI); Puerto Guyrati, 24 February 1993, *Zardini, E.M. 35145* (NY); Puerto Guyrati, 4 March 1993, *Zardini, E.M. 35395* (SI); San Antonio, 10 February 1990, *Zardini, E.M. 19055* (NY); *sine loc.*, 1888, *Morong, T. 311* (US); Tavarory, 30 November 1990, *Zardini, E.M. 24404* (NY); Tavarory, 30 November 1990, *Zardini, E.M. 24472* (NY); Tavarory, 9 December 1990, *Zardini, E.M. 29214* (NY); Tavarory, 9 December 1990, *Zardini, E.M. 29312* (NY); Ypacarai, 3 December 1986, *Degen, R. 66* (CTES); **Concepción**: Itapucumí, February 1917, *Rojas, T. 3086* (SI); Paso Horqueta, 18 November 1993, *Zardini, E.M. 37422* (SI); **Cordillera**: Emboscada, 28 January 1987, *Bordas, E. 4114* (CTES, US); Emboscada, 25 February 1990, *Zardini, E.M. 19531* (NY); Meseta Ybytú Silla, 22 September 1988, *Zardini, E.M. 7405* (SI); Piribebuy, 10 January 1987, *Mereles, F. 783* (SI); *sine loc.*, 15 October 1951, *Burkart, A. 18600* (SI); *sine loc.*, February 1940, *Rojas, T. 8763* (SI); *sine loc.*, 18 November 1989, *Zardini, E.M. 16464* (NY); *sine loc.*, 18 November 1989, *Zardini, E.M. 16466* (NY); *sine loc.*, 23 December 1989, *Zardini, E.M. 17316* (US); *sine loc.*, 25 February 1990, *Zardini, E.M. 19110* (NY); *sine loc.*, 25 February 1990, *Zardini, E.M. 19312* (NY); *sine loc.*, 25 February 1990, *Zardini, E.M. 19388* (NY); *sine loc.*, 3 March 1990, *Zardini, E.M. 19612* (NY); *sine loc.*, 3 March 1990, *Zardini, E.M. 19704* (NY); *sine loc.*, 19 May 1990, *Zardini, E.M. 20034* (NY); *sine loc.*, 19 May 1990, *Zardini, E.M. 20430* (NY); Tobati, 27 November 1975, *Arenas, P. 1174* (CTES); **Guaira**: Ybytyruzú, 16 October 1989, *Zardini, E.M. 14971* (SI); Col. Independencia, 27 March 1993, *Schinini, A. 28073* (CTES, MBM); Colonia Independencia, 28 December 1989, *Mereles, F. 3731* (SI); Independencia, 31 March 1972, *Pedersen, T.M. 10135* (CTES, MBM, SI); Independencia, 21 December 1986, *Schinini, A. 25047* (CTES); Independencia, 26 March 1993, *Schinini, A. 27953* (CTES); Tebicuary, 12 January 1973, *Schinini, A. 5897* (SI); Tebicuary, 16 November 1990, *Zardini, E.M. 24106* (NY); **Itapúa**: Artigas, 22 March 1993, *Schinini, A. 27679* (CTES, MBM, SI); Cambyreta, 15 December 1992, *Nicora, E.G. 9952* (SI); Encarnación, 12 November 1945, *Montes, J.E. 7128* (SI); Isla Yacyretá, 23 October 2003, *Egea, J. 106* (SI); Puerto Cantera, 22 November 1948, *Montes, J.E. 3292* (SI, US); Yacyretá, 24 October 1999, *Zardini, E.M. 52090* (SI); Yacyreta dam island, 5 December 2002, *Zardini, E.M. 59264* (SI, US); **Misiones**: Santiago, 3 February 1955, *Pedersen, T.M. 3251* (CTES, SI, US); Santiago, 21 December 1965, *Pedersen, T.M. 7618* (CTES, SI); Santiago, 3 February 1988, *Schinini, A. 26157* (CTES); **Oriental**: Villarrica, *Jörgensen, P. 3551* (SI); **Paraguarí**: Macizo Acahay, 5 September 1988, *Zardini, E.M. 7034* (SI); Nueva Italia, 14 December 1989, *Zardini, E.M. 16921* (NY); Nueva Italia, 7 January 1990, *Zardini, E.M. 17843* (NY); Nueva Italia, 7 December 1990, *Zardini, E.M. 24825* (NY); Nueva Italia, 8 December 1990, *Zardini, E.M. 25109* (NY); Nueva Italia, 11 November 1991, *Zardini, E.M. 28606* (NY); Nueva Italia, 11 November 1991, *Zardini, E.M. 28650* (NY); Nueva Italia, 11 November 1991, *Zardini, E.M. 28719* (NY); Parque Nacional Ybycuí, 21 December 1988, *Zardini, E.M. 9043* (SI); *sine loc.*, 11 November 1989, *Zardini, E.M. 16142* (NY); *sine loc.*, 11 November 1989, *Zardini, E.M. 16162* (NY); **Presidente Hayes**:

cf., 22 October 2000, *Kiesling, R. 9777* (SI); *sine loc.*, October 1994, *Krapovickas, A. 45631* (CTES, SPF); **San Pedro**: Primavera, 17 August 1954, *Woolston, A.L. 300* (NY, SI, SP); San Estanislao, 13 February 1975, *Pedersen, T.M. 11039* (CTES, SI); **Tebicuary**: *sine loc.*, *Pravetti 11036* (SI); **Villa Rica**: *sine loc.*, January 1889, *Morong, T. 559* (NY, US);

PERU. **Áncash**: Laguna Conococha, 14 March 1988, *Bell, D. 88-165* (US); **Loreto**: Gran Pajonal, September 1971, *Scott, G.A.J. 713* (NY); Maynas, 27 August 1974, *Ayala, F. 660* (NY); Maynas, 23 October 1974, *Hendrix, L. 107* (NY); **Madre de Dios**: Laguna Coco Cocha, 3 June 1986, *Funk, V.A. 8392* (NY, US); **San Martin**: San Roque, January 1930, *Williams, L. 7122* (NY, US); Zepelacio, December 1933, *Klug, G. 3447* (NY, US);

PHILIPPINES. **Bukidnon**: Maramag, 1 June 1950, *Santos, J.V. 5040* (US); **Calapan**: Mindoro, April 1903, *Merrill, E.D. 897* (GH, NY, US); **Camarines**: Paracale, November 1918, *Edaño, G.E. 2-107* (GH); **Eastern Visayas**: Leyte, 6 July 1915, *Wenzel, C.A. 1437* (GH); **Island of Dumaran**: *sine loc.*, August 1913, *Escritor, L. 2-107* (GH); **Laguna**: *sine loc.*, August 1910, *Ramos, M. 510* (US); **Malaybalay**: *sine loc.*, 3 May 1954, *Santos, J.V. 6001* (US); **Mindanao**: Saguiaran, 26 February 1941, *Zwickey, A.L. 1145* (US); Bongabon, 5 April 1941, *Maliwanag, E. 165* (GH); **Mindoro**: Puerto Galera, 15 April 1935, *Bartlett, H.H. 13533* (GH); **Negros Oriental**: Lake Danao, *Edaño, G.E. 197* (GH); Lake Danao, August 1948, *Edaño, G.E. 2099-2* (GH); **Samar**: *sine loc.*, 2 October 1906, *Merrill, E.D. 5228* (NY, US); **Siasi**: *sine loc.*, January 1957, *Kondo, Y. PH38942* (US); **Sorsogon**: *sine loc.*, July 1915, *Ramos, M. 23312* (US); **Sulu**: Siasi, February 1957, *Kondo, Y. 38942* (GH); **Taytay**: Palawan, May 1913, *Merrill, E.D. 9286* (US);

PUERTO RICO. Bayamon, 11 April 1913, *Britton, N.L. 2901* (NY, US); Guaynabo, 13 January 1903, *Heller, A.A. 6398* (GH, NY, US); Guaynabo, 28 March 1885, *Sintenis, P. 1241* (US); Guaynabo, 19 July 1914, *Stevenson, J.A. 2094* (NY); Guaynabo, 10 March 1916, *Stevenson, J.A. 3984* (US); Manatí, 31 January 1927, *Britton, N.L. 8726* (NY); Mayagüez, 4 December 1957, *Sargent, F.H. 1343* (US); Mayagüez, 24 April 1913, *Stevens, F.L. 713* (NY); Rio Piedras, 9 February 1914, *Stevenson, J.A. 1290* (US); *sine loc.*, *Fisher, M.F. 47* (US); *sine loc.*, 7 August 1980, *Liogier, A.H. 30823* (NY); *sine loc.*, 11 November 1943, *Sargent, F.H. 3275* (US); *sine loc.*, 30 October 1884, *Sintenis, P. 872* (US); Toa Baja, 11 November 1960, *González Más, A. 1143* (NY, US);

SAMOA. **Ta'U**: Fusi, 17 January 1978, *Whistler, A. W1318* (US); *sine loc.*, 8 January 1991, *Whistler, A. 7971* (US); **Upolu**: Aleisa, 19 July 1973, *Whistler, A. W363* (US); *sine loc.*, 10 August 1905, *Rechinger, K.L. 308* (US); Tiavi, 12 August 1929, *Christophersen, E. 180* (NY);

SIERRA LEONE. **Bathurst**: *sine loc.*, 25 January 1927, *Dalziel, M. 8250* (US);

SINGAPORE. **MacRitchie reservoir**: *sine loc.*, 14 August 1948, *Sinclair, J. 4985* (US);

SOUTH AFRICA. **Natal**: Hlabisa, 20 July 1978, *Pooley, E.S. 2103a* (NY); Port Shepstone, Umlazi, 23 March 1966, *Ward, C.J. 5510* (PRE);

SRI LANKA. **Kalutara**: *sine loc.*, 14 February 1968, *Comanor, P.L. 1009* (NY, US); **Kotugoda**: Colombo, March 1971, *Jayasuriya, M. 152* (NY, US); Colombo District, 14 March 1975, *Waas, S. 1161* (US); **Ratnapura**: *sine loc.*, 20 March 1968, *Comanor, P.L. 1134* (GH, NY, US); *sine loc.*, *Fraser, G. US2257937* (US); *sine loc.*, *Thwaites, G.H.K. 199* (US); *sine loc.*, 1856, *Thwaites, G.H.K. 3036* (US);

SUDAN. Seriba Ghattas, 1869, *Schweinfurth, G.A. 1360* (GH);

SURINAME. *sine loc*., *Rolander, D., s.n*. C10010567 (C); **Coronie**: *sine loc.*, 13 June 1948, *Geyskes, D.C. US701003* (US); **Coronie**: *sine loc.*, 13 June 1948, *Lindeman, J.C. US2791462* (US); **Marowijn**: Moengo, 9 August 1933, *Lanjouw, J. 387* (NY); **Sipaliwini**: *sine loc.*, 19 January 1970, *Oldenburger, F.H.F. 1024* (NY);

TAIWAN. **Kiirun**: Taihoku-syu, 20 May 1934, *Tanaka, T. 17796* (US); *sine loc.*, *Henry, A. 1843* (NY);

THAILAND. **Krabi**: Klong Tawn, 19 September 2007, *Maxwell, J.F. 07-638* (GH); **Nakorn Nayok**: Muang, 1 May 2004, *Maxwell, J.F. 04-261* (GH); Muang, 15 December 2006, *Maxwell, J.F. 06-973* (GH); **Ranong**: Klong Nakha, 4 February 1979, *Koyama, T.M. 15235* (NY, US); **Savanhaket**: Nakai, 27 April 2007, *Maxwell, J.F. 07-236* (GH); **Songkla**: Haad Yai, 11 March 1986, *Maxwell, J.F. 86-160* (GH); **Takuapah**: *sine loc.*, 1972, *Larsen, K. 30972* (NY); **Tha Sae**: Chumphon, 27 January 2002, *Simpson, D.A. 1828* (NY); **Thung Kra Mang**: *sine loc.*, 1972, *Larsen, K. 31635* (NY);

TONGA. **Tongatapu Island**: *sine loc.*, June 1926, *Setchell, W.A. 15399* (GH, US); **Vava'u**: *sine loc.*, 19 May 1953, *Yuncker, T.G. 16028* (NY, US); *sine loc.*, 29 June 1990, *Whistler, A. 7456* (US);

TRINIDAD AND TOBAGO. Dabadie, 18 March 1920, *Britton, N.L. 736* (GH, US); Pitch Lake, 27 March 1920, *Britton, N.L. 1067* (US); *sine loc.*, 11 December 1961, *Aitikon, H.C. 5* (US); *sine loc.*, 16 October 1974, *Kuntze, O. 982* (US); Siparia, 30 May 1907, *Broadway, W.E. 2601* (US); Siparia, 9 February 1950, *Howard, R.A. 10396* (GH);

UGANDA. *sine loc.*, *Dümmer, R. 2590* (US); **Hoima**: *sine loc.*, 2 January 1910, *Mearns, E.A. 2668* (GH, NY, US);

URUGUAY. *sine loc.*, *Herter, W.G.F. 608b* (GH, RB, SI, US); *sine loc.*, *Marchesi, E.R. MVFA28658* (MVFA, SI); **Artigas**: Lenguazo, 20 March 1982, *Marchesi, E.R. MVFA16920* (MVFA); San Gregorio, March 1962, *Del Puerto MVFA2017* (MVFA); San Gregorio, 31 March 1962, *Del Puerto MVFA2085* (MVFA); **Canelones**: Solymar, 17 November 2006, *Callero, C. 847* (MVJB); **Cerro**: *sine loc.*, November 1875, *Arechavaleta, J. US3159805* (US); **Cerro Largo**: Arévalo, 29 December 2015, *Brussa, C. MVJB30122* (MVFA); **Durazno**: *sine loc.*, 20 October 1901, *Osten, C. 4303* (MVM); **Lavalleja**: Barra, 26 November 1947, *Herter, W.G.F. 608e-99828* (NY, RB, SI, US); *sine loc.*, 1 December 1979, *Marchesi, E.R. MVFA16441* (MVFA, SI); **Montevideo**: Carrasco, 16 February 1913, *Osten, C. 6500* (MVM, US); Montevideo, 21 November 1915, *Berro, M.B. 8260* (SI, MVFA); Montevideo, November 1865, *Gibert 522* (US);

Paysandú: Algorta, 6 November 1991, *Marchesi, E.R. MVFA20577* (MVFA, SI); Algorta, 6 November 1991, *Marchesi, E.R. MVFA20594* (MVFA, SI); **Rio Negro**: *sine loc.*, 6 November 1913, *Berro, M.B. 6986* (MVFA); *sine loc.*, 28 January 1936, *Rosengurtt, B. 242* (SI); Soriano, 23 January 1913, *Berro, M.B. 6480* (MVFA); Tres Bocas, 6 November 1992, *Marchesi, E.R. MVFA21329* (MVFA); Viraroes Sánchez, 20 November 1998, *Marchesi, E.R. MVFA28595* (MVFA); **Rivera**: *sine loc.*, 12 December 1997, *Marchesi, E.R. MVFA27128* (MVFA); Tranqueras, 3 March 2009, *Brussa, C. MVJB27549* (MVJB); Tranqueras, 3 March 2009, *Brussa, C. MVJB27551* (MVJB); **Rocha**: Cebolattí, 11 December 1986, *Armand MVFA18862* (MVFA); *sine loc.*, 2 December 2001, *Baez, F. SI160336* (SI); **Salto**: *sine loc.*, 22 November 1977, *Del Puerto MVFA14477* (MVFA); **San José**: Arazatí, 18 November 1934, *Rosengurtt, B. 484* (SI); Barra de Santa Lucia, 9 December 1906, *Osten, C. 4518* (MVM); Ciudad del Plata, December 1925, *Lombardo, A. 4865* (MVJB); Ciudad del Plata, October 1945, *Osorio, H. 595* (MVFA); Ciudad del Plata, 4 December 2017, *Weber, P. 610* (FLOR); *sine loc.*, 12 March 1911, *Berro, M.B. 6054* (SI, MVFA); **Soriano**: Vera, 11 October 1898, *Berro, M.B. 3135* (MVFA); **Tacuarembó**: Valle Eden, 2 December 2017, *Weber, P. 591* (FLOR); **Treinta y Tres**: *sine loc., Baez, F. 435* (CTES); Treinta y tres, 6 December 2017, *Weber, P. 618* (FLOR); Vergara, December 1932, *Herter, W.G.F. 90830* (US);

VANUATU. Efate, 15 July 1971, *Raynal, J. 16087* (GH); Reçu, 15 September 1936, *Rüe, A. US2394420* (US);

VENEZUELA. *sine loc.*, 23 January 1961, *Steyermark, J.A. 88751* (NY, RB); **Amazonas**: Rio Vasiva, 13 April 1946, *Cardona, F. 1476* (US); Sierra Parima, 23 March 1946, *Cardona, F. 1318* (US); **Anzoategui**: El Triguito, 21 August 1942, *Pittier, H. 15092* (US); Freites, 22 February 1998, *Fernández, A. 12247* (US); *sine loc.*, 28 December 1940, *Pittier, H. 14636* (US); **Bolívar**: Gran Sabana, 23 March 2006, *Gonto, R. 2703* (NY); Gran Sabana, 23 January 1993, *Kral, R. 81903* (NY, US); Gran Sabana, 21 December 1970, *Steyermark, J.A. 104158* (NY); Hato de Nuria, 12 January 1961, *Steyermark, J.A. 88368* (NY, US); Paso de Cardozo, 27 April 1942, *Killip, E.P. 37699* (US); **Carabobo**: Chirgua, 1 January 1939, *Alston, A.H.G. 5957* (US); **Delta Amacuro**: Morichito, May 1997, *Wilbert, W. 268* (NY); **Miranda**: Bachiller, 24 March 1978, *Steyermark, J.A. 116763* (NY); **Monagas**: Uracoa, March 2005, *Gonto, R. 1250* (NY); Ezequiel Zamora, October 1996, *Fernandez, A. 9211* (UFP)

VIETNAM. **Annam**: Tourane, May 1927, *Clemens, J. 3978* (NY, US); **Saigon**: Hocmon, 15 December 1957, *Walker, E.H. 8016* (US); **Tien Giang**: My Tho, 6 March 1911, *Robinson, C.B. s.n.* (NY); My Tho, 6 March 1911, *Robinson, E.A. 1005* (NY); **Tonkin**: Sai Wong Mo Shan, 18 May 1940, *Maxwell, J.F. 29974* (GH); *sine loc.*, 1862, *Thorel, M.D. 535* (GH, US); *sine loc.*, 1862, *Thorel, M.D. 536* (NY); *sine loc.*, 13 December 1936, *Tsang, W.T. 27400* (GH);

ZAMBIA. **Abercorn**: Lunzuwa, 14 June 1964, *Vesey-Fitzgerald, D.E.F. 4283* (NY); **Shiwa Ngandu**: *sine loc.*, 15 January 1959, *Robinson, E.A. 3220* (NY).

5. ***Rhynchospora gigantea*** Link, Jahrb. Gewächsk. 1(3): 76 (1820). *Calyptrostylis gigantea* (Link) Nees, Fl. Bras. (Martius) 2(1): 137 (1842). *Dichromena gigantea* (Link) J.F. Macbr., Publ. Field Columb. Mus., Bot. Ser. 11: 6 (1931). Type: BRAZIL ("Brasilia"). *Hoffmannsegg s.n.*, B-Willd 1129 (Holotype: B B-W01129 digital image!). (Fig. 2D, 8).

Rhynchospora scaberrima Boeckeler, Flora 63: 452 (1880). *Rhynchospora gigantea* var. *scaberrima* (Boeckeler) Kük., Bot. Jahrb. Syst. 74: 419 (1949). Type: BRAZIL. Rio de Janeiro, Santa Cruz, Fazenda Imperial de Santa Cruz, *Glaziou A., 11653* (Holotype: P 265351 digital image!, isotypes: C 10013404 digital image!, G 98422 digital image!, K 307821 digital image!, P 265352 & 265353 digital images!).

Cespitous-rhizomatous perennial, up to 170 cm tall. **Culm** 3–11 mm wide, erect, trigonous, ribbed, smooth. **Leaves** 4–13 basal, 2–4 cauline; sheaths 5–20 cm long, spongy on basal leaves, ventrally membranaceous; blades up to 150 cm × 7–22 mm, flattened, very scabrous on margins and abaxial midvein, veins well marked with cross partitions, the apex attenuate with pungent acumen. **Synflorescence** with 1–4 lateral and a terminal inflorescence, each composed of anthelodia of hemispherical to globose fascicles, with scabrous axes up to 11 cm long, the involucral bracts 5–15, leaf-like, scabrous, up to 50 cm long; fascicles 9–16 mm diam., with 12–40 spikelets. **Spikelets** 4.7–7 mm long, lanceoloid, reddish-brown, subsessile, 3–5-flowered, lower 1–2 flowers bisexual, upper flowers staminate; fertile scales 3.8–6.2 × 2.2–3.2 mm, membranaceous, carinate, short-mucronate. Stamens 3. Bisexual flower with 6 perianth bristles, the bristles up to 5.2 mm long, surpassing the upper half of the stylopodium. **Achene** 1.8–2.5 × 0.9–1.2 mm, oblong-obovoid, light-brown to blackish, surface verrucose to transversely rugulose, base short-stipitate, borders anfractuous; stylopodium 1.6–2.4 mm long, 0.9–1.2 mm wide at base, conical, triangular, light ivory to brownish-yellow, surface scabridulous, vertically channelled on both faces, base deeply bilobed (sagittate) overlapping the achene apex on both faces mainly on the sides.

Distribution:— West Indies, Central America and tropical South America. From southern Mexico to south and southern Brazil.

Habitat:— In wetlands, along the shallow edges of ponds, lakes, rivers, marshes, swamps, in sandy or muddy soils, including on sand dunes.

Distinguish features:— The species is characterized by its very scabrous leaves, with spongy basal sheaths, hemispheric to globose fascicles and small achenes 1.8–2.5 × 0.9–1.2 mm with anfractuous borders. Differs from *R. corymbosa* by the abaxial surface of leaves with cross partitions between veins, spikelets in globose clusters at branch tips and

smaller achenes 1.8–2.5 × 0.9–1.2 (*vs.* 2.2–4.3 × 1.3–3.0 mm). Differs from *R. pedersenii* by the less profuse and more lax inflorescence and the stylopodium equal to or shorter than the achene body, 1.6–2.4 mm long (*vs.* 2.8–5 mm long, usually larger than the achene body).

Fig. 7. *Rhynchospora gigantea*. A. Habit; B. Spikelet; C. Achene. (A–C: *Harley 19337* NY).

Phenology:— Collected with fruits throughout the year.

Discussion:— Boeckeler (1880) differentiated *R. scaberrima* by its more scabrous leaves, more distant inflorescences, larger spikelets, 6–7 mm (*vs.* 5 mm in *R. gigantea sensu* Boeckeler), and fuscous spikelet scales. Kükenthal (1949) recognized it as a variety of *R.*

gigantea. But these characteristics are within the normal range of variation of *R. gigantea* and maintenance of *R. scaberrima* as a species or a variety is not justified.

Selected specimens:— BELIZE. Belize, Sand Hill village, 16 April 2016, *Naczi, R.F.C. 16357* (NY); Stann Creek, 11 April 2008, *Naczi, R.F.C. 12229* (NY);

BRAZIL. **Alagoas**: Piaçabuçu, November 1987, *Esteves, G.L. 1944* (SPF); Piaçabuçu, 27 July 1988, Oliveira, S.S. 3 (SPF); **Bahia**: 1 April 1976, *Davidse, G. 11802* (SP, US); 8 March 1974, *Harley, R.M. 16968* (MBM, NY, RB, US); 1895, *Salzmann, P. US2254590* (R, US); Comandatuba, 25 January 1977, *Harley, R.M. 18246* (NY, SPF, US); Ilheus, 1821, *Riedel, L. SI1772* (SI); Jacobina, 31 March 1996, *Giulietti, A.M. PCD2692* (SPF); Morro do Chapéu, 3 March 1977, *Harley, R.M. 19337* (NY, SPF, US); Mucuri, 20 May 1980, *Mattos Silva, L.A. 775* (NY, SI); Porto Seguro, 20 March 1978, *Mori, S.A. 9760a* (NY, RB); Santa Cruz Cabrália, 6 April 1979, *Mori, S.A. 11666* (NY); **Pará**: July 1849, *Spruce, R. 73* (SI); Ilha de Marajó, 16 January 1992, *Rosa, N.A. 5564* (NY); **Pernambuco**: Ipojuca, 4 August 2007, *Leite, M.S. 406* (RB); Prazeres, 30 October 1932, *Pickel, D.B. 3132* (US); **Rio de Janeiro**: 1884, Glaziou, A.F.M. 11653 (SI); Cabo Frio, February 1951, *Mello Filho, L.E. 1138* (R); Cabo Frio, 22 April 1953, *Segadas-Vianna, F. 31* (R); Cabo Frio, 17 April 1952, *Smith, L.B. 6559* (US); Quissamã, 6 July 2005, *Bove, C.P. 1570* (R); Rio de Janeiro, 28 February 1932, *Brade, A.C. 11378* (GH, R); Rio de Janeiro, 17 July 1927, *Harshberger, J.W. 858* (US); Rio de Janeiro, 17 July 1927, *Harshberger, J.W.C. 3260* (NY); **Rio Grande do Norte**: Natal, 18 September 1946, *Wurdack, J. J. B-169* (US); **Santa Catarina**: Florianópolis, 9 November 2011, *Ardissone, R.E. 55* (FLOR); Florianópolis, 19 September 1996, *Falkenberg, D.B. 8265* (FLOR, FURB, ICN); Florianópolis, 17 July 1991, *Silva Filho, F.A. 928* (FLOR); Itapuá, 4 May 2012, *Weber, P. 97* (FLOR); Palhoça, 24 September 1953, *Reitz, R. 1030* (HBR, NY, US); Paulo Lopes, 27 November 2006, *Trevisan, R. 739* (ICN); **São Paulo**: 5 November 1956, *Hoehne, W. 4066* (MBM, NY, SPF); Praia Grande, 28 October 1898, *Loefgren, A. 9394* (GH, NY, SP, US);

CUBA. Pinar del Río, 23 December 1937, *Killip, E.P. 32348* (US); Pinar del Río, 7 December 1911, *Shafer, J.A. 10833* (GH, NY, US); Pinar del Río, 12 December 1911, *Shafer, J.A. 10931* (NY, US); *sine loc., Wright, C. 3790* (GH, NY, US);

FRENCH GUIANA. Cayenne, 3 August 1982, *Fournier, A. 238* (NY, SI); Crique Cabassou, 13 August 2002, *Granville, J.J. 15576* (US); Kaw, 16 February 2002, *Granville, J.J. 14654* (US); Mana, 14 April 1989, *Cremers, G. 10600* (US); Barima-Waini: 10 September 1997, *Andel, T.R. 1895* (US);

GUYANA. *sine loc.*, 23 March 1923, *Cruz, J.S. 3544* (GH, US); *sine loc.*, 10 May 1923, *Cruz, J.S. 3971* (GH, US); *sine loc.*, April 1889, *Jenman, G.S. 6123* (US); Barima-Waini, 3 April 1923, *Cruz, J.S. 3802* (GH, US); Demerara-Mahaica, 11 November 1991, *Gillespie, L.J. 4259* (US); Demerara-Mahaica, Timehri, 22 January 1992, *Hoffman, B. 782* (US); Demerara-Mahaica, Yarrowkabra, 28 June 1997, *Hollowell, T.H. 227* (US); Essequibo Isl-W. Demerara, Wales, 26 August 1955, *Little Jr., E.L. 16752* (US);

Georgetown, 22 October 1955, *Little Jr., E.L. 16934* (US); Georgetown, 25 November 1919, *Hitchcock, A.S. 16889* (GH, US); Hooroobea, April 1887, *Jenman, G.S. 3715* (SI); Pomeroon, 21 April 1989, *Gillespie, L.J. 1093* (US); Pomeroon-Supenaam, Pomeroon, 5 March 1991, *Horn, C.N. 4529* (US);

MEXICO. **Veracruz**: Minatitlan, 5 August 1958, King, *R.M. 1127* (US);

NICARAGUA. **Zelaya**: Bluefields, 14 December 1968, *Narvaez, E. 631* (GH);

PERU. **Loreto**: Iquitos, 3 October 1973, *Rimachi, M. 562* (NY);

PUERTO RICO. Bayamon, 3 April 1938, *Otero, J.I. 567* (GH); Dorado, 20 March 1922, *Britton, N.L. 6649* (NY); Dorado, 20 July 1960, *González Más, A. 350* (US); Manatí, 16 May 1962, *González Más, A. 2153* (US); Manatí, 16 May 1962, *González Más, A. 2154* (US); Manatí, 16 May 1962, *González Más, A. 2155* (US); Manatí, 12 April 1887, *Sintenis, P. 6672* (GH, US); Manatí, 13 March 1980, *Woodbury, R.O. 30438* (NY); Río Piedras, 26 March 1914, *Stevenson, J.A. 1675* (NY); San Juan, 1 February 1923, *Britton, N.L. 7184* (GH, NY); San Juan, 30 March 1899, *Heller, A.A. 980* (NY, US); Toa Baja, 13 November 1960, *González Más, A. 1145* (US); Vega Baja, 9 November 1960, *González Más, A. 1091* (NY, US); Vega Baja, 9 November 1960, *González Más, A. 1105* (NY); Vega Baja, 4 April 1995, *Liogier, A.H. 37416* (GH);

VENEZUELA, *sine loc.*, 25 June 1980, *Davidse, G. 18560* (MBM);

6. ***Rhynchospora hassleri*** C.B. Clarke, Bull. Herb. Boissier, sér. 2, 3: 1023 (1903). Type: PARAGUAY. In regione cursus superioris fluminis Apa. December 1902, *Hassler, E. 8255* (Holotype: K, isotypes: BM 524265 digital image!, G 4473 & 4474 digital images!, NY!, SI frag.!, UC 929410 digital image!). (Fig. 1A, 9).

Rhynchospora viridilutea C.B. Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8: 36 (1908). Lectotype (designated by T. Koyama, Mem. New York Bot. Gard. 23: 49. 1972): GUYANA. *Parker, s.n.* (K 632460 digital image!).

Rhynchospora squamulosa Kük., Repert. Spec. Nov. Regni Veg. 23: 201 (1926). Type: CUBA. Isla de Pinos, Ciénaga de Lanier, S of Loma Daquillo, at the edge of the ditch leading to Cayo del Res, in tembladeros, 1 December 1920, *Ekman, E. L. 12429* (Holotype: B†; isotype: S 05-5541 & 05-5542 digital images!, NY!). Lectotype (here designated): S 05-5542.

Rhizomatous perennial, up to 130 cm tall. **Culm** 3–6 mm wide, trigonous to triquetrous, ribbed. **Leaves** 4–11 basal, 1–3 cauline; sheaths up to 23 cm long, spongy on basal leaves; blades up to 90 cm × 7–16 mm, flattened, scabrous on margins and abaxial midvein, the apex attenuate. **Synflorescence** with a terminal inflorescence and 0–2 lateral ones, each of diffuse compound anthelodia of hemispherical (rarely globose) to turbinate fascicles; the basal involucral bract generally surpassing the respective inflorescence, leaf-like, scabrous, up to 25 cm long; fascicles up to 25 mm diam., with 2–25 spikelets. **Spikelets** 6.5–9.8 mm long, lanceoloid, golden to light brown, subsessile, 2–4-flowered, lower 1–2 flowers bisexual, upper flowers staminate; fertile scales 4.8–8.5 × 3–5.2 mm, with thin membranaceous margins, subcarinate, mucronate. Stamens 3. Bisexual flower with 6 perianth bristles, the bristles up to 8 mm long, surpassing the upper half of the stylopodium. **Achene** 3.9–4.7 × 1.6–2.1 mm, oblong-elipsoid, grayish-green to dark-brown, surface verrucose often iridescent, base stipitate with two lateral appendages fusiforms, the apex rounded; stylopodium 2.9–4.3 mm long, 0.3–0.5 mm wide at base, subulate, light ivory to brownish-yellow, surface scabridulous, base almost square in cross section.

Distribution:— Cuba, Central America and tropical South America. From Belize south to Paraguay and central Brazil.

Habitat:— In wet areas such as river banks, flooded savannas, marshy areas and swamps.

Distinguish features:— Differs from other *Rhynchospora* species by its achene with two lateral fusiform appendages at the base.

Phenology:— Collected with fruits throughout the year.

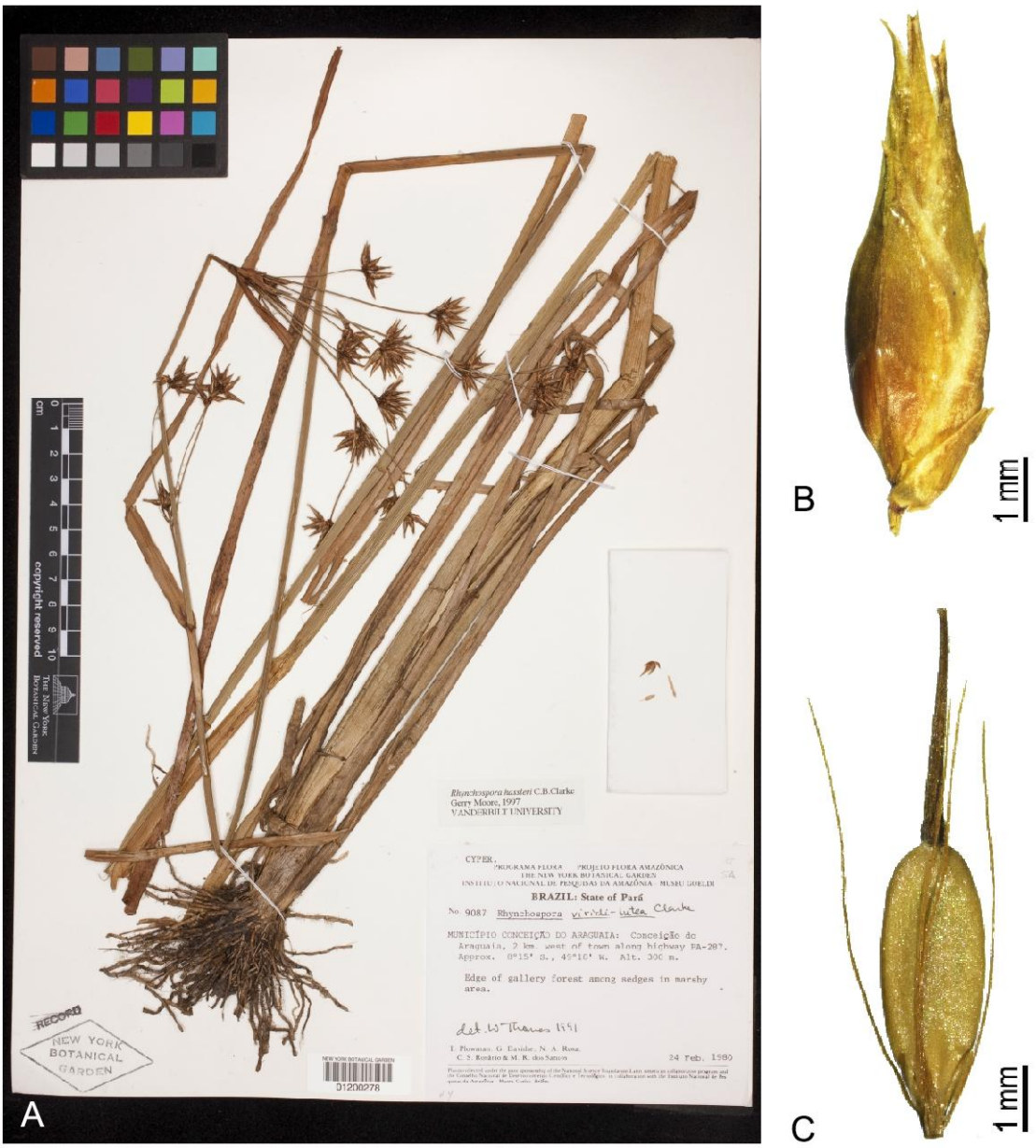

Fig. 8. *Rhynchospora hassleri*. A. Habit; B. Spikelet; C. Achene. (A: *Plowman 9087* NY; B–C: *Halloy 4343* NY).

Discussion:— *Rhynchospora hassleri* has some variation in the inflorescence structure, from a single terminal hemispherical fascicle to a compound anthelodia with up to 10 lateral axes in the terminal inflorescence.

Kükenthal (1949) considered *R. squamulosa, R. viridilutea and R. hassleri* as three distinct species of *R.* sect. *Polycephalae*, but only the types were cited as analysed specimens. Koyama (1979) was unable to differentiate the three putative species and synonymized them.

R. squamulosa is considered threatened on the Red List of the Vascular Flora of Cuba (Berazaín Iturralde *et al.* 2005). Strong & Acevedo-Rodriguez (2012) accepted it as an endemic species of Cuba. The species is also accepted by Govaerts & Simpson (2007).

Strong (2006) noted that *R. hassleri* might be better placed in *R.* sect. *Longirostres* based on spikelet and achene features, but retained it in *R.* sect. *Polycephalae.*

In the phylogeny on chapter two of this thesis *R. hassleri* is placed in the *R.* sect. *Longirostres*, grouped with *R. trispicata*.

Selected specimens:— BELIZE. Stann Creek, 17 April 1976, *Proctor, G.R. 35788* (GH); Stann Creek, All pines Oak savanna, 16 August 2003, *Farruggia, F. 610* (GH); Orange Walk District, 20 March 1987, *Davidse, G. 32818* (BM);

BOLIVIA. **Beni**: Cercado, 9 March 1999, *Orellana, M.R. 9* (SI); **Santa Cruz**: Velasco, Campos de San Ramón, 10 August 1995, *Halloy, S. 4343* (NY);

BRAZIL. **Amapá**: Mazagão, Lago do Maracá, 15 May 1983, *Rabelo, B.V.* 2212 (NY); **Goiás**: Alvorada do Norte, *Pereira-Silva, G. 8030* (CTES); Alvorada do Norte, *Pereira-Silva, G. 8037* (CTES); Formosa, 29 July 1998, *Oliveira, F.C.A. 786* (SP); **Mato Grosso**: Santa Cruz do Xingú, 9 March 2011, *Silva, D.R. 13* (RB); **Mato Grosso do Sul**: Bela Vista, 13 March 2004, *Hatschbach, G.G. 76983* (INPA, MBM, US); **Pará**: Conceição do Araguaia, 24 February 1980, *Plowman, T.C. 9087* (INPA, NY, US); Prainha, 6 December 1873, *Trail, J.W.H. 1202* (K);

CUBA. Isla de la Juventud, 1 December 1920, *Ekman, E.L. 12429* (NY, S);

GUYANA. *Parker K632460* (K).Barima-Waini, 21 October 1997, *Andel, T.R. 2519* (US); Cuyuni-Mazaruni, 11 July 1923, *Cruz, J.S. 4064* (GH, US); U. Takutu, Rupununi, 12 February 1994, *Henkel, T.W. 3737* (US);

NICARAGUA. **Zelaya**: Puerto Cabezas, 12 March 1971, *Svenson, H.K. 4555* (GH);

PARAGUAY. In regione cursus superioris fluminis Apa. December 1902, *Hassler, E. 8255* (BM, G, K, NY, SI, UC);

SURINAME. **Wanica**: Houttuinweg, February 1958, *Dirven, J.G. 625* (NY, US).

7. ***Rhynchospora indianolensis*** Small, Fl. Southeastern United States [Small]. 193: 1327 (1903) [as *Rynchospora*]. Type: UNITED STATES. Texas, Damp prairie near Indianola, 3 May 1869, *Ravenel, H.W. 160* (Holotype: NY!, isotypes: MO 256409 digital image!, US!). (Fig. 2B, 10).

Calyptrostylis florida var. *minor* Nees in Mart., Fl. Bras. 2(1): 138. (1842). *Rhynchospora corymbosa* var. *minor* (Nees) Kük., Bot. Jahrb. Syst. 74: 416 (1949). Type: not designated.

Rhynchospora florida var. *nigra* Griseb., Cat. Pl. Cub.: 246 (1866). Type: CUBA. *Wright, C. 3405* (Holotype: not located; isotypes: GH!, NY!, P 271990 & 271991 digital images!, US!, Y 45609 digital image!).

Rhynchospora pringlei Greenm., Proc. Amer. Acad. Arts 39: 69 (1903) [*non* C. B. Clarke]. Lectotype [designated by McVaugh, Fl. Novo-Gal. 13: 408 (1993)]: MEXICO. Michoacán, in swamps near Zamora, 25 Jul 1902, *Pringle, C.G. 8642* (GH!; isolectotypes: BKL 595 digital image!, ENCB 3191 digital image!, GOET 2913 digital image!, GZU 11781 digital image!, K 632404 digital image!, MEXU 6014 & 6013 digital images!, MIN 1002160 digital image!, MO 202919 digital image!, MSC 92727 digital image!, NY!, P 266602, 266603 & 266604 digital images!, PH 9366 digital image!, SI!, UC 144006 digital image! US!, VT 24091 digital image!).

Rhynchospora puncticulata Kük. ex Osten, Anales Mus. Nac. Montevideo ser. 2a, 3(2): 210 (214) (1931). *Rhynchospora corymbosa* var. *puncticulata* (Kük. ex Osten) Kük., Bot. Jahrb. Syst. 74(3): 416 (1949). Type: URUGUAY. Dpto. Salto, Dayman, 18 October 1896, *Osten, C. 3332* (Holotype: MVM!).

Rhynchospora puncticulata var. *pleiocephala* Osten, Anales Mus. Hist. Nat. Montevideo, ser. 2, 3: 214 (1931). Type: ARGENTINA. Formosa, Guaycolé, February 1918, *Joergensen 2869* (Holotype: MVM!; isotype: BA!, GH!).

Cespitose perennial, up to 120 cm tall. **Culm** 2–3.5 mm wide, trigonous, channeled, slightly antrorsely scabrous distally along margins. **Leaves** 3–9 basal, 2–4 cauline; sheaths 2.5–9 cm long; blades 9–65 cm × 3–8 mm, subflattened, scabrous on margins and abaxial midvein, the apex acuminate. **Synflorescence** with a terminal and 1–3 lateral inflorescences, each composed of anthelodia of hemispherical to globose fascicles or, less often, of lax fascicles; axes scabrous, up to 11 cm long, the involucral bracts leaf-like, scabrous, up to 23 cm long; fascicles 15–27 mm diam., with 5–30 spikelets. **Spikelets** 6.5–9 mm long, lanceoloid, reddish-brown, subsessile, 2-flowered, lower flower bisexual, upper flower staminate; fertile scales 5.5–8 × 2.5–3.4 mm, membranaceous, carinate and mucronate both scabrous. Stamens 3. Bisexual flower with 6 perianth bristles, the bristles up to 5.3 mm long, reaching the lower half of the stylopodium. Achene 3–4 × 1.7–2.7 mm, obovoid, dark reddish-brown, surface verrucose, base short-stipitate, faces concave with a ridge in the shape of an inverted "U", the apex truncate; stylopodium 2.1–4 mm long, 1.5–2.1 mm wide at base, conical, triangular, brownish-yellow surface scabridulous, the base almost straight.

Distribution:— Tropical and subtropical Americas. From Texas (United States) to Uruguay and northern Argentina.

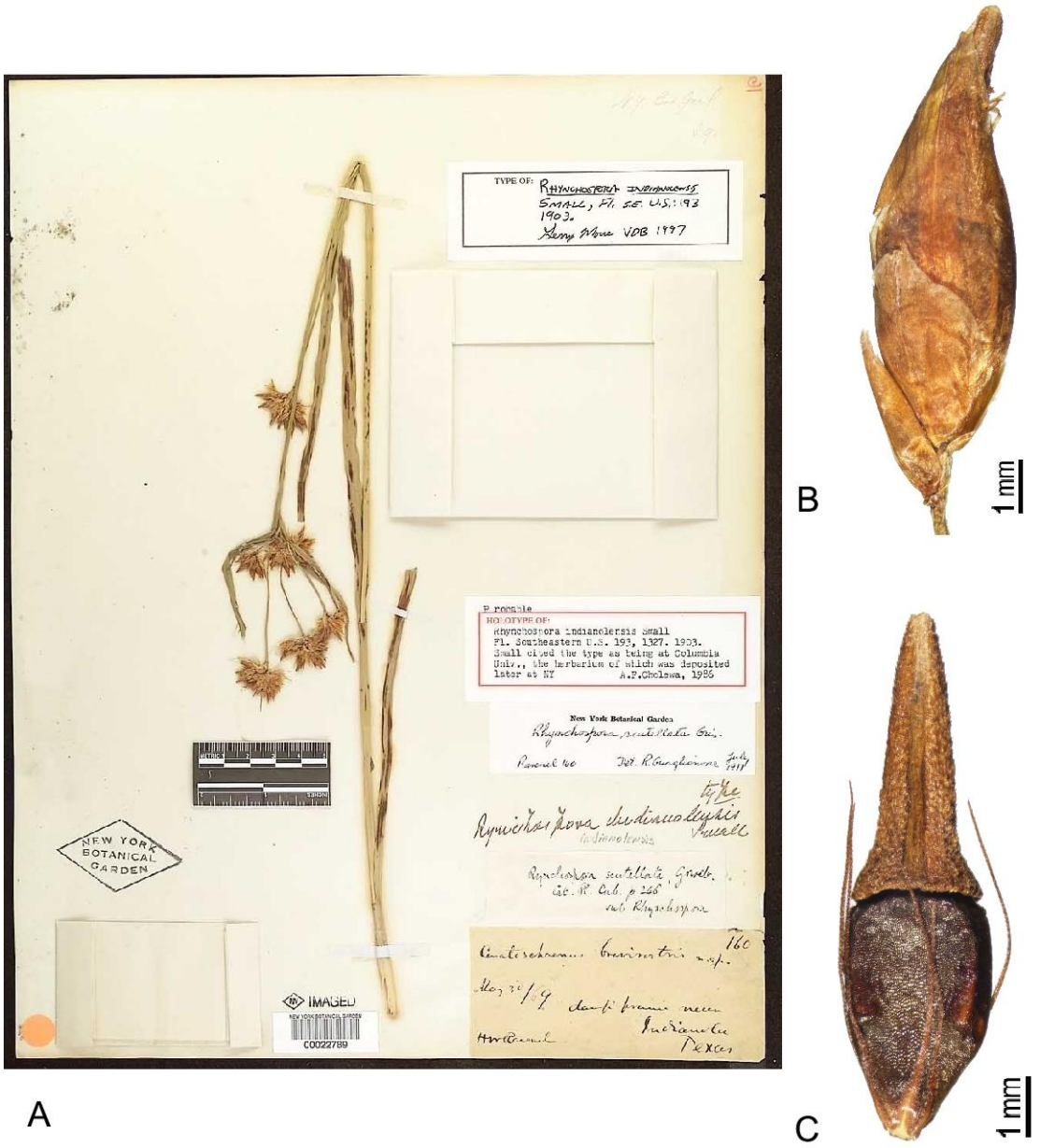

Fig. 9. *Rhynchospora indianolensis*. A. Habit; B. Spikelet; C. Achene. (A–C: *Ravenel 160* NY).

Habitat:— Open wetlands, silty shallows of pools, prairie swales. At the southern limit occurs on dry grasslands. Elevation: up to 100 m in the northern hemisphere, and up to 1000 m in the southern hemisphere.

Distinguish features:— Differs from *R. scutellata* in its narrower, obovoid achenes 1.7–2.7 mm wide, (*vs.* 2.9–3.3 mm wide, broadly obovoid) with a wider but less pronounced ridge in the shape of an inverted "U" on both faces. Differs from *R. latibracteata* in its conical (*vs.* subulate) stylopodium.

Phenology:— Collected with fruits throughout the year in the southern hemisphere and from early spring to summer (mostly from March to July) in the northern hemisphere.

Discussion:— Kükenthal (1949) treated this species as a synonym of *R. scutellata*, although apparently he was not sure of this relationship, since he put a question mark before listing it as a synonym and pointed out differences from the type of *R. scutellata* in the description of Small (1903). He cited only specimens from Cuba and the type of *R. indianolensis*, which he did not examine. He also treated this species as two varieties of *R. corymbosa*. On *R. corymbosa* var. *minor* he was mistaken in quoting the basionym *Calyptrostylis asperula* var. *minor* instead of *C. florida var. minor*. In this variety Kükenthal (1949) synonymized *R. pringlei* and *R. puncticulata* var *pleiocephala*. Guaglianone (2001) also synonymized *R. scutellata* and *R. indianolensis*, citing the type *Ravenel 160* as having a peculiar inflorescence that is found sporadically.

Grisebach (1866) separated the two taxa by describing, on the same page, *R. florida* var. *nigra* (= *R. indianolensis*) and *R. scutellata*, using sequential Wright collections as type specimens for each. Britton (1904) separated *R. indianolensis* from *R. scutellata*, placing *R. pringlei* as a synonym of the first. Moore (1997) also considered them as distinct species, also placing *R. pringlei* as a synonym of *R. indianolensis* and pointing out differences among the three, but emphasizing that there is intergradation between the two species above.

The separation of these two species might be controversial, but justifiable. Althought they seem to be very close, *R. scutellata* has unique achene characteristics not seen within the range of variation of *R. indianolensis*. Furthermore, their synonymization may present a risk of conservation for *R. scutellata*. Although extremely rare, it is not on Cuban IUCN Red List (Berazaín Iturralde *et al.* 2005), probably because it is confused with the much more common and widespread *R. indianolensis*.

Selected specimens:— ARGENTINA. **Buenos Aires**: Caraguatá, 11 December 1932, *Burkart, A. 5131* (SI); **Chaco**: Colonia Benitez, November 1932, *Schulz, A.G. 659* (CTES, SI); Colonia Benitez, December 1935, *Schulz, A.G. 1314* (SI); Colonia Benitez, 2 October 1959, *Schulz, A.G. 10538* (CTES, SI); Colonia Benitez, 18 November 1960, *Schulz, A.G. 11392* (CTES, SI); Colonia Florencia, 23 March 1965, *Schulz, A.G. 14853* (CTES); General Donovan, 26 May 1975, *Quarín, C.L. 3065* (CTES); Mayor, 28 December 1977, *Neiff, J. 860* (CTES); Pte. Hayes, 17 December 1986, *Mereles, F. 759* (CTES); San Fernando, 5 June 1974, *González, J.M. 44* (CTES); San Fernando, 30

August 1975, *Neiff, J. 448* (CTES); **Corrientes**: *sine loc*., 19 February 1975, *Pranse, J. 18890* (CTES); *sine loc*., 1 December 1950, *Pedersen, T.M. 887* (GH); Bella Vista, 28 September 1975, Irigoyen, J. 228 (CTES); Berón de Astrada, 14 January 1977, *Ahumada, O. 427* (CTES); Berón de Astrada, 15 January 1977, *Ahumada, O. 487* (CTES); Berón de Astrada, 16 January 1977, *Ahumada, O. 603* (CTES); Berón de Astrada, 28 October 1970, *Krapovickas, A. 16359* (CTES); Capital, 18 February 1978, *Ahumada, O. 1529* (CTES); Capital, 6 November 1986, *Charpin, A. 20163* (SI); Capital, December 1975, *Crovetto, R.M. 10129* (CTES); Capital, 10 December 1986, *Naranjo, C. 808* (SI); Capital, 3 April 1976, *Schinini, A. 12931* (CTES, NY); Concepción, 19 March 1969, *Pedersen, T.M. 9072* (CTES, US); Concepción, 2 December 1996, *Arbo, M.M. 6922* (CTES); Curuzú Cuatiá, 20 February 1979, *Ahumada, O. 2620* (CTES); Curuzú Cuatiá, 31 October 1973, *Burkart, A. 29751* (CTES, SI); Curuzú Cuatiá, 31 October 1973, *Burkart, A. 29758* (MBM, SI); Curuzú Cuatiá, 31 October 1973, *Burkart, A. 29761* (SI); Empedrado, 26 November 1954, *Carnevali, R. 438* (CTES); Empedrado, 27 November 1954, *Carnevali, R. 445* (CTES); Empedrado, 10 December 1955, *Carnevali, R. 574* (CTES); Empedrado, 12 February 1980, *Carnevali, R. 4187* (CTES); Empedrado, 15 December 1980, *Carnevali, R. 5835* (CTES); Empedrado, February 1949, *Crovetto, R.M. 5412* (SI); Empedrado, 22 October 1982, *Fernández, J.G. 944* (SI); Empedrado, 25 February 1977, *Pedersen, T.M. 11684* (GH, ICN, MBM, RB); Empedrado, 24 January 1974, *Quarín, C.L. 1999* (CTES); Empedrado, 27 February 1974, *Quarín, C.L. 2305* (CTES); Empedrado, 20 March 1998, *Schinini, A. 34413* (CTES); Empedrado, 6 March 1950, *Schwarz, G.J. 10016* (CTES); Esquina, 14 March 1975, *Krapovickas, A. 27752* (CTES); General Alvear, 9 February 1979, *Ahumada, O. 3099* (CTES); General Paz, 17 March 1978, *Ahumada, O. 2022* (CTES); General Paz, 18 March 1978, *Ahumada, O. 2066* (CTES); Goya, 26 November 1945, *Boelcke, O. 1398* (SI); Itatí, 28 February 1977, *Ahumada, O. 931* (CTES); Itatí, 14 February 1983, *Carnevali, R. 6072* (CTES); Ituzaingó, 9 April 1978, *Ahumada, O. 2268* (CTES, SI); Ituzaingó, 17 December 1981, *Carnevali, R. 4923* (CTES); Lavalle, 27 February 1970, *Carnevali, R. 6186* (CTES); Mburucuyá, 18 October 1954, *Burkart, A. 19600* (SI); Mburucuyá, 23 November 1997, *Vanni, R.O. 4098* (CTES); Mercedes, 6 November 1973, *Burkart, A. 29729* (SI); Mercedes, 14 October 1971, *Irigoyen, J. 83* (CTES); Mercedes, 22 June 1999, *Maruñak, V. 986* (CTES); Mercedes, 15 November 1977, *Schinini, A. 14365* (CTES); Mercedes, 17 November 1977, *Schinini, A. 14486* (CTES); Mercedes, 17 November 1977, *Schinini, A. 14487* (CTES); Mocoretá, April 1946, *Careiso 87* (SI); Monte Caseros, 21 February 1979, *Ahumada, O. 2790* (CTES); Monte Caseros, 19 February 1975, *Prause, J. CTES11335* (CTES); Monte Caseros, 22 January 1942, *Rosengurtt, B. 3689* (SI); Paso de los Libres, 17 February 1979, *Ahumada, O. 2535* (CTES); Paso de los Libres, 19 February 1979, *Ahumada, O. 2723* (CTES, SI); Paso de los Libres, 18 February 1979, *Ahumada, O. 3221* (CTES); Paso de los Libres, 13 January 2007, *Paula-Souza, J. 7139* (SI); Paso de los Libres, 6 November 1976, *Pedersen, T.M. 11380* (CTES, MBM, SI); Saladas, 30 March 1975, *Ahumada, O. 180* (CTES); Saladas, 17 October 1971, *Irigoyen, J. 55* (CTES); Saladas, 11 October 1974, *Schinini, A. 9677* (CTES); San Cosme, 26 February 1978, *Ahumada, O. 1647* (CTES); San Cosme, 26 February 1978, *Ahumada, O. 2468* (CTES); San Cosme, 14 February 1983, *Carnevali, R. 6080* (CTES); San Cosme, 20 February 1969, *Krapovickas, A. 14896* (CTES, GH);

San Cosme, 19 September 1971, *Tressens, S.G. 175* (CTES); San Luis del Palmar, 1 January 1966, *Krapovickas, A. 11793* (CTES, US); San Luis del Palmar, 23 January 1972, *Pire, S.M. 74* (CTES); San Luis del Palmar, 29 January 1972, *Quarín, C.L. 369* (CTES); San Martín, 5 February 1979, *Ahumada, O. 2924* (CTES); San Martín, 4 November 1973, *Neiff, J. 179* (CTES); San Miguel, 13 March 1978, *Ahumada, O. 1748* (CTES, SI); San Miguel, 15 March 1978, *Ahumada, O. 1895* (CTES); San Miguel, 26 November 1997, *Vanni, R.O. 4140* (CTES); San Tomé, 4 February 1979, *Ahumada, O. 3183* (CTES); Santo Tomé, 5 February 1979, *Ahumada, O. 3035* (CTES); Santo Tomé, 29 November 1970, *Krapovickas, A. 16641* (CTES, SPF); Sauce, 20 October 1977, *Ahumada, O. 1157* (CTES); Sauce, 9 October 1977, *Cristóbal, C.L. 1588* (CTES); Sauce, 10 October 1977, *Cristóbal, C.L. 1643* (CTES); **Entre Ríos**: *sine loc.*, 16 October 1971, *Burkart, A. 28504* (SI); *sine loc.*, 11 January 1945, *Schulz, C.R. 296* (GH); Colón, 10 June 1999, *Muñoz, J.D. 5467* (SI); Concordia, 16 December 1991, *Bacigalupo, N.M. 1529* (SI); Concordia, 17 December 1991, *Bacigalupo, N.M. 1550* (SI); Concordia, 12 March 1962, *Burkart, A. 23284* (SI); Concordia, 20 October 1971, *Burkart, A. 25830* (SI); Concordia, 21 October 1976, *Cabrera, A.L. 28087* (CTES); Concordia, 2 December 1995, *Guaglianone, E.R. 3060* (SI); Dep. Uruguay, 16 December 1981, *Guaglianone, E.R. 766* (CTES, MBM); Dep. Uruguay, 19 November 1964, *Pedersen, T.M. 7201* (SI); Federación, 21 November 1988, *Bacigalupo, N.M. 721* (SI); Federación, 22 November 1988, *Bacigalupo, N.M. 766* (SI); Federación, 14 December 1974, *Burkart, A. 30770* (CTES, SI); Federación, 11 December 1994, *Guaglianone, E.R. 2791* (NY, SI); Federación, 21 October 1961, *Pedersen, T.M. 6229* (GH, SI); Federación, 30 March 1995, *Schlund, H. ERA4539* (SI, ERA); Federación, 18 January 1977, *Troncoso, N.S. 1564* (SI); Federación, 8 December 1982, *Troncoso, N.S. 3648* (SI); Federal, December 1977, *Gautier, E.D. 3* (SI); La Paz, 1973, *Burkart, A. 29777* (CTES, SI); La Paz, 17 March 1995, *Schlund, H. ERA4551* (SI, ERA); La Paz, 29 January 1982, *Troncoso, N.S. 3334* (SI); San Salvador, 27 May 1999, *Muñoz, J.D. 5326* (SI); Uruguay, 1 February 1981, *Troncoso, N.S. 3111* (SI); **Formosa**: *sine loc*., *Jörgensen, P. 2869* (GH, MVM); *sine loc*., 5 October 1938, *Jörgensen, P. 3171* (SI); Capital, 22 September 1967, *Krapovickas, A. 13207* (CTES); Laishi, 26 February 1996, *Digiacomo, A. 136* (CTES); Pilcomayo, 19 October 1975, *Piccinini, B. 2702* (CTES); **Jujuy**: *sine loc*., 11 March 1976, *Ahumada, O. 327* (CTES, MBM, SI); *sine loc*., 14 March 1978, *Ahumada, O. 1822* (MBM); Capital, 20 January 1988, *Zuloaga, F.O. 3672* (SI); **Paso de los Libres**: Bonpland, 18 January 1945, *Hanola, F. 2130* (GH); **Santa Fe**: General Obligado, 14 February 1938, *Ragonese, A.E. 3186* (SI); General Obligado, 16 December 1979, *Lewis 962* (SI); General Obligado, December 1985, *Blanchoud, G. 2139* (CTES); General Obligado, 8 April 1987, *Blanchoud, G. 2305* (CTES); General Obligado, 7 October 1987, *Blanchoud, G. 2399* (CTES); General Obligado, 2 October 1984, *Pensiero, J.F. 1576* (SI); General Obligado, 23 December 1972, *Quarín, C.L. 695* (CTES, RB); Las Colonias, 4 March 1992, *Vegetti, A.C. 1124* (SI); Santo Tomé, 15 January 1929, *Parodi, L.R. 2655* (SI); Vera, 29 October 1985, *Bissio, J. 2006* (CTES); Vera, 7 November 1985, *Bissio, J. 2028* (CTES);

BELIZE. Toledo, beyond San Antonio, 7 August 1948, *Gentle, P.H. 6585* (NY);

BRAZIL. **Mato Grosso do Sul**: Bataiporã, 27 November 2009, *Souza, CM 2347* (FLOR); Miranda, 17 April 1972, *Hatschbach, G.G. 29582* (MBM, NY); **Minas Gerais**: Fonseca, rio Piracicaba, 3 November 1962, *G. Pabst 7190* (SI); **Rio Grande do Sul**: Alvorada, 14 February 2006, *Mondin, C. MPUC11511* (MPUC); Barra do Quaraí, 17 November 1984, *Sobral, M. 3384* (ICN, SI); Cachoeira do Sul, Out 1983, *M. Sobral 2633* (ICN, SI); Canela, Fl. Nac. Canela, February 1986, *M. Sobral 4922* (ICN, SI); Lavras do Sul, 17 October 1971, *J.C. Lindeman 8702* (ICN, SI); Porto Alegre, 6 November 1943, *Augusto, B. 204* (MPUC); Santana do Livramento, 7 February 2009, *Silveira, G.H. 747* (ICN); São Jerônimo, January 1982, *Nilson, A. 61* (HAS); Uruguaiana, 19 December 1972, *Lindeman, J.C. ICN21070* (CTES, ICN); Uruguaiana, arroio Imbaú, 15 November 1984, *M. Sobral 3324* (ICN, SI); **Santa Catarina**: Campos Novos, 21 December 1962, *Reitz, R. 14412* (HBR); Curitibanos, 900 m, 10 January 1962, *R. Reitz 11959* (SI); Lages, Morro do Pinheiro Seco, 950 m, 17 December 1962, *Reitz 14059* (FLOR, SI); Santa Cecilia, 900 m, 2 January 1962, *R. Reitz 11353* (SI);

CUBA. *sine loc., Wright, C. 3405* (US); Habana, 23 April 1931, *León, Fr. 14838* (GH); Pinar del Río, Candelaria, 17 May 1941, *León, Fr. 20048* (US); Pinar del Río, 6 March 1941, *León, Fr. 19591* (GH); Villa Clara, Cascajal, July 1941, *Howard, R.A. 5596* (GH);

PARAGUAY. *sine loc.*, January 1916, *Hassler, E. s.n.* (SI); **Alto Paraguay**: *sine loc.*, 25 April 1992, *Morrone, O. 272* (SI); Puerto Casado, January 1917, *Rojas, T. 3107* (SI); San Pedro, Primavera, 5-8 March 1954, *Woolston, A. 129* (SI); **Amambay**: Parque Cac. Cerro Corá, 22°35'S 58°5'W, 30 April 1992, *Morrone, O. 428* (SI); **Central**: *sine loc*., January 1888, *Morong, T. 1563* (GH, NY, SI, US); San Lorenzo, 24 October 1974, *Arenas, P. 945* (SI); Tavarory, 9 December 1991, *Zardini, E.M. 29244* (US); Trinidad, November 1943, *Pavetti 10697* (SI); Villeta, 16 November 1969, *Pedersen, T.M. 9319* (MBM); **Itapúa**: Yacyreta dam island. Reserve, Aña Cua, 27°23'45"S 56°39'08"W, 23 Oct 1999, *Zardini, E.M. 51819* (SI); **Paraguaré**: Lago Ypoá, November 1988, *Mereles, F. 1975* (SI); **Paraguarí**: Caapuçu, 17 January 1946, *Rojas, T. 13176* (SI); Nueva Italia, 8 December 1990, *Zardini, E.M. 25256* (US); **Presidente Hayes**: Qemkuket, 16 January 2010, *Arenas, P. 3775* (CTES, ICN); ruta Transchaco km 120, 25 April 1989, *Mereles, F. 3095* (SI);

UNITED STATES. **Texas**: *sine loc.*, 21 April 1924, *Fisher, G.L. US3201760* (US); *sine loc*., 25 May 2007, *Rosen, D.J. 4196* (ICN); *sine loc*., Summer 1938, *Silveus, W.A. s.n.* (GH); *sine loc., Silveus, W.A. US3157878* (US); Brewster Co., 30 May 1869, *Ravenel, H.W. 160* (NY, US); Jackson Co., 11 November 1958, *Hotchkiss, N. 7655* (US); Kemah, 21 April 1924, *Fisher, G.L. 385* (US); Matagorda Co., 25 July 1964, *Kral, R. 21060* (GH); Matagorda Co., 19 November 1998, *Carr, W.R. 17929* (MBM); Port Lavaca, 13 June 1923, *Tharp, B.C. 2138* (US); Port Lavaca, 15 June 1923, *Tharp, B.C. US1222653* (US); Refugio Co., 14 July 1981, *Hill, S.R. 10489* (GH, NY); Refugio Co., 21 July 1981, *Hill, S.R. 10593* (GH); Refugio Co., 12 November 1958, *Hotchkiss, N. 7660* (US); Wharton Co., 9 July 2007, *Rosen, D.J. 4307* (NY);

URUGUAY. **Artigas**: Arroyo Mandiyú, 17 February 2004, *Brussa, C. MVJB21626* (MVJB); *sine loc*., 3 February 1966, *Del Puerto MVFA5907* (SI); *sine loc*., 3 March 1944, *Rosengurtt, B. 4548* (SI); Belén, 23 January 1942, *Rosengurtt, B. 3766* (SI); Santa Rosa de Cuareim, November 1927, *Herter, W.G.F. 990* (GH, SI); Santa Rosa de Cuarein, *Herter, W.G.F. 82593* (SI); **Cerro Largo**: Palleros, January 1926, *Herter, W.G.F. MVM18692* (MVM); **Paysandú**: Queguay, 22 March 1940, *Rosengurtt, B. 3337* (SI); **Rio Negro**: Cerro Largo, December 1937, *Rosengurtt, B. 2349* (GH, SI); Puerto Viejo, Muelle, 19 November 2007, *S. Masciadri s.n.* (MVJB 27229); **Rivera**: ruta 29 hacia la represa Cuñapiru, 31°31'53"S 55°40'08"W, 131 m, 16 April 2010, *S.S. Denham* 324 (SI); Tranqueras, 1941, *Legrand, C.D. 2530* (MVM, SI); **Salto**: Picada de Pereyra, 30 January 1937, *Rosengurtt, B. 1007* (GH); **Tacuarembó**: *sine loc.*, *Legrand, C.D. 2056* (MVM); rio Tacuarembó, 12 May 1994, *del Puerto, O. 24220* (SI);

8. ***Rhynchospora inundata*** (Oakes) Fernald, Rhodora. 20: 139. 1918. *Ceratoschoenus macrostachyus* (Torrey ex A. Gray) A. Gray var. *inundatus* Oakes, Mag. Hort. Bot. 7: 185. (1841); *Rhynchospora macrostachya* Torrey ex A. Gray var. *inundata* (Oakes) Fernald, Rhodora 8: 164 (1906). Type: UNITED STATES. Massachusetts, Plymouth, West Pond, 1839, *Tuckerman s.n.* (Holotype: GH!; isotypes: NY!, US!). (Fig. 1J, 11).

Ceratoschoenus macrophyllus Tuck, in Amer. J. Sci. Arts 6(16): 232. 1848, *nom. utique rej. prop*, by Moore (1995). Type: not designated

Perennial, clonal, up to 115 cm tall; rhizomes slender, scaly up to 16 cm long, 2–6 mm wide. **Culm** up to 7 mm wide, erect, trigonous, ribbed, smooth. **Leaves** 5–10 basal, 2–3 cauline; sheaths 2–7 cm long; blades up to 91 cm × 5–11 mm, subflattened, scabridulous on margins and abaxial midvein, the apex attenuate. **Synflorescence** with a terminal and 2–4 lateral inflorescences, each a diffuse compound anthelodium of lax fascicles, the fascicles with 2–10 spikelets; bracts leaf-like, scabrous, up to 40 cm long, often overtopping the inflorescence. **Spikelets** 10–14 mm long, lanceoloid, reddish brown, pedicellate, 2–4-flowered, lower 1–2 flower bisexual, upper 1–2 staminate; fertile scales 8–12 × 2.3–4 mm, membranaceous, carinate, short mucronate. Stamens 3. Bisexual flower with 5–6 perianth bristles, up to 25 mm long, reaching the lower half stylopodium. **Achene** 4–5.2 × 2–3.2 mm, obovoid to ellipsoid, dark-brown, base attenuate to acuminate, stipitate, margins thick, surface verrucose horizontally finely striate, faces concave, the apex truncate and usually minutely spinulose; stylopodium 9.5–17.3 mm long, 0.8–1.6 mm wide at base, subulate, yellowish-orange, vertically sulcate, surface scabridulous, base straight.

Distribution:— West Indies and the United States, in the eastern and Gulf Coast states from Louisiana to Massachusetts.

Habitat:— In shallows of savanna ponds, interdunal pools (Kral 2002). Elevation: up to 100 m.

Distinguish features:— Differs from *R. careyana* by having perianth bristles about twice as long as fruit body, reaching the lower half of the stylopodium (*vs.* perianth bristles slightly longer to slightly shorter than achene body). Differs from *R. corniculata*, *R. macrostachya* and *R. pseudomacrostachya* by its slender and scaly rhizomes.

Phenology:— Collected with fruits from April to October.

Fig. 10. *Rhynchospora inundata*. A. Habit; B. Spikelet; C. Achene. (A &C: *Tuckerman s.n.* NY 1193417 isotype; B: *Strong 1694* NY).

Vernacular name:— Narrow-fruit beakrush.

Discussion:— See *R. careyana* for a discussion of the two species. Kükenthal (1949) did not treated *R. inundata* in his review, he just registered a note after *R. corniculata* var. *patula* (= *R. careyana*) that says *"R. inundata...ist mir unbekannt. Sie gehört möglicherweise hierher."* [*R. inundata* ... is unknown to me. It may belong here].

Moore (1995) proposed the rejection of the earlier, overlooked name, *Ceratoschoenus macrophyllus* Tuck., whose epithet is still available in *Rhynchospora*. We support this propose.

Selected specimens:— CUBA. Pinar del Rio, Laguna Jovero to Las Martinas, 18 December 1911, *Shafer, J.A. 11058* (NY);

JAMAICA. **Saint Elizabeth**: *sine loc.*, 6 August 1966, *Proctor, G.R. 27596* (GH, NY); Slipe, 27 September 1956, *Proctor, G.R. 15780* (GH);

UNITED STATES. **Alabama**: Covington Co., 1 June 1970, *Kral, R. 39497* (NY); Covington Co., 25 August 1991, *Kral, R. 79682* (NY); Covington Co., 17 July 1995, *Kral, R. 85331* (GH, NY); **Delaware**: Ellendale, *Canby, W.M. NY2879501* (NY); Sussex Co., 31 August 1936, *Tatnall, R.R. 2765* (GH); **Florida**: *sine loc.*, 17 June 1945, Brass, L.J. 15288 (GH, US); Bay Co., 22 September 1956, *Godfrey, R.K. 55102* (GH); Bay Co., 27 August 1991, *Kral, R. 79726* (GH, NY); Brevard Co., 19 April 1903, *Fredholm, A. 5813* (GH, US); Charlotte Co., 27 June 1956, *Adams, W.P. 225* (GH); Citrus Co., 7 June 1958, *Kral, R. 6698* (GH); Collier Co., 16 June 1956, *Adams, W.P. 214* (NY); Collier Co., 7 October 1965, *Lakela, O. 29264* (GH); Dade Co., *Garber, A.P. NY2879500* (NY); Indian River Co., 14 June 1957, *Kral, R. 4924* (GH); Jackson Co., 4 September 1979, *Jones, S.B. 23573* (NY); Jackson Co., 1 August 1992, *Orzell, S.L. 20359* (NY); Lafayette Co., 8 July 1992, *Orzell, S.L. 20073* (NY); Lake Co., 5 August 1958, *Kral, R. 7605* (GH); Lake Co., 1 May 1894, *Nash, G.V. 621* (GH, NY, US); Lake Co., 16 June 1894, *Nash, G.V. 1075* (GH, NY, US); Lake Co., 23 July 1894, *Nash, G.V. 1384* (GH, NY, US); Lake Co., 16 July 1894, *Nash, G.V. 1488* (GH, NY, US); Lake Co., 13 August 1985, *Thomas, W.W. 4913* (NY); Lee Co., 31 October 1970, *Gillis, W.T. 9933* (GH); Lee Co., July 1900, *Hitchcock, A.S. 426* (GH, US); Leon Co., 13 July 1955, *Godfrey, R.K. 53636* (GH, NY); Leon Co., 8 June 1950, *Redfearn Jr., P.L. 2256* (GH); Levy Co., 4 June 1958, *Godfrey, R.K. 56988* (GH); Levy Co., 9 May 2001, *Strong, M.T. 2676* (NY, US); Marion Co., 24 July 1985, *Hansen, B. 10434* (NY); Marion Co., 13 August 1985, *Thomas, W.W. 4910* (NY, SI); Palm Beach Co., 9 June 1970, *Cassen, P.M. 556* (GH); Pasco Co., 25 June 1958, *Kral, R. 7069* (GH, NY); St. Johns, 3 June 1958, *Godfrey, R.K. 56910* (GH); Sumter Co., 14 August 1998, *Strong, M.T. 1694* (NY, US); Taylor Co., 13 June 1956, *Kral, R. 2600* (GH); Wade Co., 11 April 1919, *Griscom, L. 9393* (GH); **Georgia**: Screven Co., 3 October 1940, *Eyles, D. 7562* (GH); **Massachusetts**: Plymouth, 8 August 1918, *Fernald, M.L. 333* (GH, US); Plymouth, 30 August 1928, *Griscom, L. 12695* (GH); Plymouth, 1846, *Robbins, J.W. s.n.* (GH); Plymouth Co., 30 August 1928, *Fernald, M.L. 831* (GH); Plymouth Co., 7 August 1918, *Fernald, M.L. 16409* (GH, NY); Plymouth Co., 8 August 1918, *Fernald, M.L. 16411* (GH, NY); Plymouth Co., 8 August 1918, *Fernald, M.L. NY2879491* (NY); Plymouth Co., *Gillman, H. NY2879490* (NY); Plymouth Co., *Meliotus, P.S. 4111* (GH); Plymouth Co., *Sorrie, B.A. 786* (GH); Yarmouth, 9 September 1985, *LeBlond, R. 180* (GH); **Mississippi**: Greene Co., 27 August 1991, *Kral, R. 79797* (NY); Hancock Co., 27 July 1994, *Bryson, C.T. 14000* (NY); Atlantic Co., 24 August 1983, *Carter, R. 3747* (NY); Camden Co., 10 September 1866, *Smith, C.E. NY2879515* (NY); Cape May Co., 10 September 1921, *Griscom, L. 10520* (GH); Cape May Co., 10 September 1921, *Mackenzie, M.M. NY2879514* (NY); Gloucester Co., 15 July 1892, *Heritage, B. NY2879485* (NY); Monmouth Co., *Knieskern, P.D. NY2879486* (NY); Ocean Co., 1 September 2001, *Naczi, R.F.C. 8828* (NY); Suffolk Co., 10 August 1922,

Ferguson, W.C. 1774 (NY); Suffolk Co., 22 September 1923, *Ferguson, W.C. 2628* (NY); Suffolk Co., 4 August 1929, *Ferguson, W.C. 7906* (NY); Suffolk Co., 31 August 1971, *Leggett, W.H. NY2879482* (NY); Suffolk Co., 30 August 1877, *Miller, E.S. 1479* (NY); Suffolk Co., 30 August 1877, *Miller, E.S. NY2879479* (NY); **North Carolina**: Carteret Co., 27 September 2008, *Thomas, W.W. 14695* (NY); **Rhode Island**: Providence Co., 1 September 1986, *Sorrie, B.A. 3611* (GH); **South Carolina**: Allendale Co., 9 August 1967, *Radford, A.E. 11412* (GH, NY, SP); Richland Co., 8 September 1995, *Nelson, J.B. 16891* (NY).

9. ***Rhynchospora latibracteata*** Guagl., Darwiniana 39: 318 (2001). Type: BRAZIL. Rio Grande do Sul, de Santa Maria a Júlio de Castilhos, 2 November 1962, *Rosengurtt 8787* (Holotype: MVFA!). (Fig. 2C, 12).

Cespitose perennial, up to 65 cm tall. **Culm** 2-3 mm wide, trigonous, channeled, slightly antrorsely scabrous distally along margins. **Leaves** 3–12 basal, 2–4 cauline; sheaths 2.5–14 cm long; blades 12–60 cm × 2–6 mm, subflattened, scabrous on margins and abaxial midvein, the apex acuminate. **Synflorescence** with a terminal and 1–3 lateral inflorescence, each composed of a single fascicle or anthelodium of turbinate to globose fascicles; with scabrous axes up to 15 cm, the involucral bracts 3–4, leaf-like, scabrous, up to 11 cm long, the smaller bracts membranaceous, hyaline, dilated at the base; fascicles 15–30 mm diam., with 6–27 spikelets. **Spikelets** 7.2–11 mm long, lanceoloid, reddish-brown, subsessile, 2–4-flowered, lower flower bisexual, upper 1–3 flower staminate; fertile scales 6.5–9 × 2.5–3.1 mm, ovate, membranaceous, carinate and long-mucronate both scabrous. Stamens 3. Bisexual flower with 6 perianth bristles, the bristles up to 6.5 mm long, reaching the lower half of the stylopodium. **Achene** 3.5–4.2 × 1.6–2.3 mm, obovoid, dark-reddish-brown, surface verrucose, the base attenuate short-stipitate, faces concave with a ridge in the shape of an inverted "U", the apex truncate, scabridulous; stylopodium 2.8–3.2 mm long, 1–1.3 mm wide at base, subulate, brownish-yellow, vertically sulcate, surface scabridulous, base almost straight.

Distribution:— Very rare, in southern Brazil and Uruguay.

Habitat:— In marshes. Elevation: 40–1030 m.

Distinguish features:— Differs from *R. amazonica* by its achene body with a ridge in the shape of an inverted "U" and shorter stylopodium 2.8–3.2 (*vs.* 3.1–5). Differs from *R. indianolensis* and *R. scutellata* in its subulate stylopodium, 1–1.3 mm wide at base (*vs.* both conical, 1.5–2.1 mm and 2.1–2.7 mm wide at base, respectively). From *R. scutellata* also differs in its narrower, obovoid achene 1.6–2.3 mm wide (*vs.* widely obovoid 2.9–3.3 mm) with broader but less pronounced ridge in the shape of an inverted "U" on each face.

Phenology:— Collected with fruits from October to December.

Discussion:— This species seems to be naturally rare, but the small number of known specimens may also be due to its recent description and its habit resembling that of *R.*

indianolensis, causing confusion in the identification. The specimen *Arechavaleta, J. s.n.* (MVM) was listed as a paratype of *R. puncticulata*, but the author highlights its diagnostic characteristic "*involucri foliolis exterioribus albescentibus*", not found in other types of *R. puncticulata*.

Fig. 11. *Rhynchospora latibracteata*. A. Habit; B. Fascicle with hyaline bracts; C. Spikelet; D. Achene. (A,C: *Lindeman s.n.* ICN8470 NY; B: *Rosengurtt 3005* MVFA; D: *Rosengurtt 8787* MVFA).

Analysed specimens:— BRAZIL. **Rio Grande do Sul**: Barra do Quaraí, 14 October 1971, *Lindeman, J.C. ICN8470* (CTES, ICN, NY); Cambará do Sul, December 1983, *Sobral, M. 2650* (ICN); Santa Maria a Julio de Castilhos, 2 November 1962, *Rosengurtt 8787* (MVFA); São Francisco de Paula, 22 November 2008, *Silva, J.M. 7395* (MBM);

URUGUAY. Río Negro: Arroyo Tres Árboles, 4 October 1939, *Rosengurtt B 3005* (MVFA); **Tacuarembó**: *sine loc.*, November 1899, *Arechavaleta, J. s.n.* (MVM).

10. ***Rhynchospora macrostachya*** Torrey ex A. Gray, Ann. Lyceum Nat. Hist. New York. 3: 206. (1835). [*non* Palla]. *Ceratoschoenus macrostachys* (Torrey ex A. Gray) Torrey, Ann. Lyceum Nat. Hist. New York 3: 369 (1836). *Rhynchospora corniculata* var. *macrostachya* (Torr. ex A. Gray) Britton, Trans. New York Acad. Sci. 11: 84 (1892). Lectotype (Moore 1997, ined.): UNITED STATES. Massachusetts, Amherst, *Hitchcock s.n.* (NY!). (Fig. 1K, 13).

Rhynchospora macrostachya var. *colpophylla* Fernald & Gale, Rhodora 42: 421 (1940). Type: UNITED STATES. Virginia, Prince George Co., muddy tidal shore of James River, Jordan Point, *Fernald, M.L. 8983* (Holotype: GH!).

Cespitose perennial, up to 170 cm tall. **Culm** up to 10 mm wide, trigonous, channeled, smooth. **Leaves** 4–8 basal, 2–4 cauline; sheaths 3–8 cm long; blades up to 90 cm × 4–20 mm, subflattened, scabrous on margins and abaxial midvein, the apex attenuate. **Synflorescence** with a terminal and 2–4 lateral inflorescences, each of dense to diffuse compound anthelodia of fascicles; bracts leaf-like, scabrous, up to 15 cm long; fascicles congested turbinate to hemispheric, with 3–18 spikelets. **Spikelets** 11–17 mm long, lanceoloid, brown or reddish brown, pedicellate, 2–3-flowered, lower flower bisexual, upper 1–2 staminate; fertile scales 8–14 × 2.4–4.2 mm, membranaceous, carinate, short mucronate. Stamens 3. Bisexual flower with 5–6 perianth bristles, the bristles up to 15 mm long, reaching approx. lower half of the stylopodium. **Achene** 5–6.2 × 2.4–3.6 mm, obovoid, reddish-brown to beige, surface verrucose, the base attenuate, stipitate, margins thick, faces concave, the apex truncate and usually minutely spinulose; stylopodium 17–23 mm long, 1.4–2.1 mm wide at base, subulate, reddish-brown to yellowish-brown, vertically sulcate, surface scabridulous.

Distribution:— Southeastern and eastern United States and Canada, extending westward to Texas, Oklahoma and Kansas, northward to Indiana and southern Michigan, northeastward to Maine and Nova Scotia, Canada (COSEWIC 2014).

Habitat:— In open wetlands, on lake and pond shores and marshes (Kral 2002). Elevation: up to 400 m.

Distinguish features:— Differs from *R. corniculata* and *R. inundata* by the absence of rhizomes. Differs from *R. corniculata* by its longer bristles, reaching approx. lower half of the stylopodium (*vs.* reaching about the middle to 2/3 of the achene body). From *R. pseudomachostachya* it differs by the absence of an inverted ‘‘U’’ shape on the achene faces.

Fig. 12. *Rhynchospora macrostachya*. A. Habit; B. Spikelet; C. Achene. (A: *Fergusson 6219* NY; B–C: *Pierce 2500* NY).

Phenology:— Collected with fruits from June to October.

Vernacular name:— Canada: Tall beakrush (COSEWIC 2014), Tall horned beak sedge.

Discussion:— This species was described as *R. macrostachya* by Gray (1835), later called *Ceratoschoenus macrostachyus* by Torrey (1836). In Oakes (1841) *R. inundata* was initially described as a variety of *R. macrostachya*, under the name *C. macrostachyus* var. *inundatus*. Chapman (1860, 1897) treated *R. careyana* as a variety of *R. macrostachya* under the names *C. macrostachyus* var. *patulus* and *R. macrostachya* var. *patula*. Britton (1892) treated *R. macrostachya* as a *R. corniculata* variety. Fernald (1940)

described *R. macrostachya* var. *colpophila* as a variety from the estuarine marshes of Maryland and Virginia, United States, but it has not been recognized in more recent works (Gleason & Cronquist 1991, Kral 2002, LeBlond 2012).

The species in considered Endangered in Canada, where it is known only along two acidic, peaty lakeshores in southwestern Nova Scotia, with about 700 individuals total in two subpopulations (COSEWIC 2014).

Selected specimens:— UNITED STATES. **Connecticut**: Litchfield Co., 25 August 1908, *Clark, H.S. GH766140* (GH); Litchfield Co., 15 August 1899, *Harger, E.B. GH766139* (GH); New Haven Co., 15 August 1912, Graves, *A.H. GH766136* (GH); New London Co., 22 August 1985, *Mehrhoff, L.J. 11701* (GH); New London Co., 1 September 1905, *Woodward, R.W. GH766132* (GH); North Guilford, 14 August 1906, *Bartlett, H.H. GH766137* (GH); Windham Co., 21 August 1919, Wea*therby, C.A. 4548* (GH); Windham Co., 30 August 1938, *Weatherby, C.A. 6908* (GH); Woodbury, 25 August 1910, *Blewitt, A.E. 496* (GH); **Delaware**: Kent Co., 22 August 2012, *Longbottom, W.D. 18079* (NY); Sussex Co., 27 June 2011, *Longbottom, W.D. 15602* (NY); Sussex Co., 5 September 1936, *Tatnall, R.R. 3164* (GH); **Georgia**: Leesburg, 29 August 1901, *Curtiss, A.H. 6891* (GH, US); Toombs Co., 9 August 1995, *Kral, R. 85429* (GH); **Indiana**: *sine loc.*, 26 September 2012, *Nieuwland, J.A. 10273* (SI, US); Dune Park, 6 September 1897, *Hill, E.J. 132* (GH); Dune Park, 11 September 1909, *Umbach, L.M. 216* (GH); Hanover, *Young, A.H. s.n.* (GH); Lake Co., 17 August 1930, *Deam, C.C. 49847* (GH); Millers Co., 4 September 1897, *Umbach, L.M. 648* (GH); Porter Co., 4 September 1920, *Pealtie, D.C. s.n.* (GH); **Kansas**: Aliceville, 23 June 1968, *Magrath, L.K. 2593* (GH); Allen Co., 6 July 1969, *Magrath, L.K. 4254* (GH); Anderson Co., 6 July 1969, *Magrath, L.K. 4256* (GH); Crawford Co., 1896, *Hitchcock, A.S. 863* (GH, US); **Maine**: York Co., 29 August 1999, *Eastman, L.M. s.n.* (GH); York Co., *Neal Jr., O.M. 2084* (GH); **Maryland**: *sine loc.*, August 1889, *Rusby, H.H. NY2879715* (NY); Patament River, 27 August 1902, *Shull, G.H. 283* (GH, NY); Queen Anne's Co., 14 September 1986, *Hill, S.R. 17372* (GH, NY); Wicomico Co., 8 September 1887, *Canby, W.M. NY2879718* (NY); Wicomico Co., September 1863, *Commons, A. NY2879720* (NY); Worcester Co., 30 August 2004, *Longbottom, W.D. 5342* (NY); **Massachusetts**: Barnstable Co., 10 September 1927, *Fernald, M.L. 552* (GH); Barnstable Co., 19 September 1913, *Fernald, M.L. 8957* (GH); Barnstable Co., 28 July 1918, *Fernald, M.L. 16400* (GH); Barnstable Co., 14 August 1918, *Fernald, M.L. 16401* (GH); Barnstable Co., 20 August 1918, *Fernald, M.L. 16402* (GH, NY); *ibidem*, *Fernald, M.L. 16403* (GH); *ibidem*, *Fernald, M.L. 16404* (GH); *ibidem*, Fernald, M.L. GH766097 (GH);Barnstable Co., 4 September 1918, *Fernald, M.L. 16405* (GH); *ibidem*, *Fernald, M.L. 16406* (GH); Barnstable Co., 12 September 1918, *Fernald, M.L. 16407* (GH); *ibidem*, *Fernald, M.L. 16408* (GH); Barnstable Co., 21 August 1919, *Fernald, M.L. 18076* (GH); Barnstable Co., 23 August 1919, *Fernald, M.L. 18077* (GH); *ibidem*, *Fernald, M.L. 18078* (GH); Barnstable Co., 26 August 1928, *Fogg Jr., J.M. 3731* (NY); Barnstable Co., 2 September 1928, *Fogg Jr., J.M. 3835* (GH); Barnstable Co., 7 September 1928, *Fogg Jr., J.M. 3895* (GH, NY); Barnstable Co., 5

September 1898, *Greenman, J.M. 436* (GH); Barnstable Co., 22 July 1993, *Jenkins, J. CE-78* (GH); Barnstable Co., 11 September 1901, *Murdoch Jr., J.M. 1023* (GH); Barnstable Co., 24 August 1913, *Murdoch Jr., J.M. 5244* (GH); Barnstable Co., 11 September 1901, *Murdoch Jr., J.M. GH766115* (GH); Barnstable Co., 31 July 1914, *Weatherby, C.A. GH766105* (GH); Barnstable Town, 10 August 1908, *Sinnott, E.W. GH766091* (GH); Braintree Town, 30 August 1892, *Kidder, N.T. GH766065* (GH); Braintree Town, 27 October 2013, *Standley, L.A. GH766070* (GH); Bristol Co., 6 September 1925, *Sanford, S.N.F. GH766082* (GH); Cape Cod, 20 September 1980, *Countryman, W.D. 3174* (GH); Centreville, 17 August 1900, *Cheney, C.I. GH766088* (GH); Centreville, 12 September 1897, *Williams, E.F. GH766087* (GH); Franklin Co., *Flint, W.F. GH766118* (GH); Hampden Co., 4 September 1980, *Sorrie, B.A. 738* (GH); Hampden Co., 14 September 2002, *Zebryk, T. 7957* (GH); Norfolk Co., 4 September 1916, *Blake, S.F. 6536* (GH, US); Norfolk Co., 2 September 1870, *Boott, W. GH766067* (GH); Norfolk Co., 17 August 1911, *Driggs, A.W. GH766064* (GH); Plymouth Co., 13 September 1853, *Boott, W. GH766075* (GH); Plymouth Co., 26 August 1928, *Eaton, R.J. GH766080* (GH); Plymouth Co., 2 September 1913, *Fernald, M.L. 8956* (GH); Plymouth Co., 25 October 1914, *Fernald, M.L. 11316* (GH); Plymouth Co., *Oakes, W. NY2879730* (NY); Plymouth Co., 1846, *Robbins, J.W. GH766076* (GH); South Weymouth, 19 September 1978, *Faxon, E. GH766068* (GH); Weymouth Town, 9 September 1908, *Kennedy, G.G. GH766066* (GH); **Michigan**: Allegan Co., 2 August 1970, *Pierce, G.J. 1398* (NY); Allegan Co., 9 August 1970, *Pierce, G.J. 1443* (NY); Kalamazoo Co., 8 August 1938, *Hanes, C.R. 2268* (GH); Newaygo Co., 16 September 1970, *Pierce, G.J. 1565* (NY); Newaygo Co., 23 August 1978, *Pierce, G.J. 2500* (NY); **Mississippi**: Wayne Co., 21 July 1955, *Ray Jr., J.D. 5045* (GH); **Missouri**: Dates Co., 16 August 1894, *Demetrio, C.H. s.n.* (GH); **New Jersey**: Cape May Co., 30 August 1917, *Gershoy, A. 165* (GH); Cape May Co., 10 September 1921, *Griscom, L. 10513* (GH); Cape May Co., 16 August 1971, *Parker, C.F. s.n.* (GH); Cape May Co., 8 August 1915, *Stone, H.E. s.n.* (GH); Cape May Co., 16 September 1906, *Stone, W. 3660* (GH); Cape May Co., 4 September 1920, *Stone, W. 5441* (GH); *ibidem*, Stone, W. 5442 (GH); Cape May Co., 2 September 1929, *Wilkens, H. 300* (GH); Cold Spring, 16 September 1906, *Pelt, S.S. s.n.* (GH); Cumberland Co., 12 August 1923, *Bassett, G.W. s.n.* (GH); Gloucester Co., 8 August 1935, *Long, B. 47143* (GH); Sussex Co., 27 August 1938, *Clausen, R.T. 3528* (GH, NY); Sussex Co., 31 July 1938, *Edwards, J.L. NY2879688* (NY); Sussex Co., August 1917, *Mackenzie, M.M. 7987* (NY); **New York**: Long Island, 28 August 1872, *Leggett, W.H. NY2879683* (NY); Nassau Co., 15 August 1903, *Bicknell, E.P. 1048* (NY); Nassau Co., 15 August 1903, *Bicknell, E.P. NY2879693* (NY); Suffolk Co., 11 August 1936, *Cain, S.A. 1709* (NY); Suffolk Co., 31 August 1921, *Ferguson, W.C. 813* (NY); Suffolk Co., 11 August 1922, *Ferguson, W.C. 1790* (NY); Suffolk Co., 24 July 1923, *Ferguson, W.C. 2442* (NY); Suffolk Co., 11 August 1925, *Ferguson, W.C. 4302* (NY); Suffolk Co., 4 September 1927, *Ferguson, W.C. 6166* (NY); Suffolk Co., 10 September 1927, *Ferguson, W.C. 6219* (NY); Suffolk Co., 2 October 1927, *Ferguson, W.C. 6419* (NY); Suffolk Co., 31 August 1921, *Ferguson, W.C. NY2879696* (NY); Suffolk Co., 21 August 1950, *Gotes, B.N. 22096* (GH); Suffolk Co., 14 August 1923, *House, H.D. 9658* (GH); Suffolk Co., 18 August 1920, *John, H.S. 2606* (GH); Suffolk Co., 17 August 1938,

Muenscher, W.C. 6902 (GH); Suffolk Co., 19 August 1938, *Muenscher, W.L.C. 6903* (NY); Suffolk Co., 5 October 1934, *Svenson, H.K. 6386* (GH); Suffolk Co., 2 October 1936, *Svenson, H.K. 8195* (GH); Wading River, 1872, *Miller, E.S. 16* (GH); **North Carolina**: Beaufort Co., 25 August 1949, *Fox, W.B. 3195* (GH); Brunswick Co., 7 July 1938, *Godfrey, R.K. 4857* (GH, US); Cumberland Co., 14 October 1951, *Fox, W.B. 5639* (GH); Moore Co., 14 July 1938, *Godfrey, R.K. 5109* (GH, US); Moore Co., 10 August 1993, *Kral, R. 82959* (MBM); Onslow Co., 5 August 1946, *Wood Jr., C.E. 6524* (GH); **Oklahoma**: *sine loc*., 29 June 1891, Sheldon, C.S. 82 (SI, US); Pushmataha Co., 24 July 1978, *Taylor, J. 26869* (GH); Sapulka, 24 July 1894, *Bush, B.F. 657* (GH, US); **Rhode Island**: Cumberland, *Oldey, S.T. US225733* (US); Kent Co., *Congdon, J.W. GH766126* (GH); Kent Co., 22 September 1920, *Graves, C.B. GH766123* (GH); Washington Co., 24 August 1881, *Faxon, E. GH766129* (GH); Washington Co., 31 August 1919, *Woodward, R.W. GH766125* (GH); **South Carolina**: Berkeley Co., 12 July 1927, *Wiegand, K.M. 611* (GH); Charleston Co., 9 September 1982, *Boufford, D.E. 23074* (GH); Charleston Co., 19 July 1939, *Godfrey, R.K. 687* (GH); Charleston Co., 15 August 1939, *Godfrey, R.K. 1547* (GH); Georgetown Co., 9 July 1939, *Godfrey, R.K. 374* (GH); Lee Co., 26 July 1957, *Radford, A.E. 27326* (GH); Varnville, 12 September 1971, *Massey, J.R. 2961* (CTES, SP); **Tennessee**: Coffee Co., 17 August 1970, *Kral, R. 40680* (GH, MBM, US); Coffee Co., 21 August 1938, *Svenson, H.K. 8789* (GH); Coffee Co., 3 September 1987, *Wofford, B.E. 87-83* (GH); Coffee Co., 3 September 1987, *Wofford, B.E. 87-92* (GH); **Texas**: Jefferson Co., 28 August 2007, *Rosen, D.J. 4402* (ICN); **Virginia**: Camp Humphreys, 12 October 1924, *Blake, S.F. 8915* (GH); Caroline Co., 15 October 1941, *Fernald, M.L. 13897* (GH); Charles City Co., 18 September 1939, *Fernald, M.L. 11274* (GH); Charles City Co., 9 September 1941, *Fernald, M.L. 13565* (GH); Essex Co., 15 October 1941, *Fernald, M.L. 13898* (GH); Fairfax Co., 13 August 1910, *Dowell, P. 6456* (GH); James City Co., 22 August 1939, *Fernald, M.L. 10977* (GH); James City Co., 19 September 1939, *Fernald, M.L. 11275* (GH); King and Queen Co., 1 September 1940, *Fernald, M.L. 12591* (GH); King William Co., 14 October 1939, F*ernald, M.L. 11536* (GH); King William Co., 1 September 1940, *Fernald, M.L. 12590* (GH); Lanexa, 30 July 1921, *Grimes, E.J. 4155* (GH); New Kent Co., 16 September 1939, *Fernald, M.L. 11273* (GH); Norfolk Co., 6 September 1941, *Fernald, M.L. 13563* (GH); Norfolk Co., 6 September 1941, *Fernald, M.L. 13564* (GH); Norfolk Co., 11 October 1941, *Fernald, M.L. 13896* (GH); Norfolk Co., 14 September 1945, *Fernald, M.L. 14905* (GH); Suffolk Co., 2 October 1921, *Grimes, E.J. 4535* (GH).

11. ***Rhynchospora organensis*** C.B. Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8: 37 (1908). *Rhynchospora corymbosa* (L.) Britton var. *organensis* (C.B. Clarke) Kük., Bot. Jahrb. Syst. 74: 416. (1949). Type: BRAZIL. Rio de Janeiro, Organ Mountains, by the sides of streams, May 1837, *Gardner, M. 717* (Holotype: K 632450 digital image!; isotypes: G 227907 digital image!, K 632451 digital image!). (Fig. 2O, 14).

Cespitose perennial, up to 170 cm tall. **Culm** 2.3-4.8 mm wide, trigonous, channeled, slightly antrorsely scabrous along margins on the inflorescence area. **Leaves** 4–12 basal, 2–4 cauline; sheaths 2–6.2 cm long; blades up to 130 cm long, 1–2 mm wide, subflattened, scabrous on margins and abaxial midvein, the apex acuminate. **Synflorescence** with a terminal and 6–10 lateral inflorescences, each of mostly hemispheric anthelodium (corymbiform) of fascicles or less often of lax anthelodia; with scabrous axes up to 7 cm long, the involucral bracts up to 40 cm long, overtopping the inflorescence, leaf-like, scabrous; anthelodia when hemispheric to globose up to 10 cm diam. **Spikelets** 5.2–7.5 mm long, lanceoloid, reddish-brown, pedicelled, 2–4-flowered, lower flower bisexual, upper 1–3 flower staminate; fertile scales 4.5–6 × 2.1–3.3 mm, membranaceous, carinate, short-mucronate. Stamens 3. Bisexual flower with 6 perianth bristles, the bristles up to 5.5 mm long, reaching the lower half of the stylopodium. **Achene** 2.9–5 × 1.6–2.2 mm, oblong to obovoid, blackish to dark-reddish-brown, sometimes folded near the middle, falciform or forming a “C” or a “S” in lateral view, the surface verrucose, the base attenuate, stipitate, the faces concave, forming a ridge in the shape of an inverted “U”, the apex truncate; stylopodium 4.5–9.5 mm long, 1.1–1.6 mm wide at base, conical, narrowly triangular, brownish-yellow surface scabridulous, base almost straight or shortly bilobed.

Distribution:— Central America and tropical South America. From Belize and Guatemala south to Uruguay and northern Argentina.

Habitat:— On shaded or partially shaded flooded soils, streams banks, flooded grasslands, swamps, riparian forests. Elevation: up to 1000 m.

Distinguish features:— Differs from other species of the section (except *R. rostrata*) by the synflorescence with 6–10 regularly spaced, lateral inflorescences and with short axes. From *R. rostrata* it differs by having a conical, narrowly triangular stylopodium, 1.1–1.6 mm wide at base (*vs*. subulate and 0.4–0.7 mm wide at base).

Phenology:— Collected with fruits throughout the year.

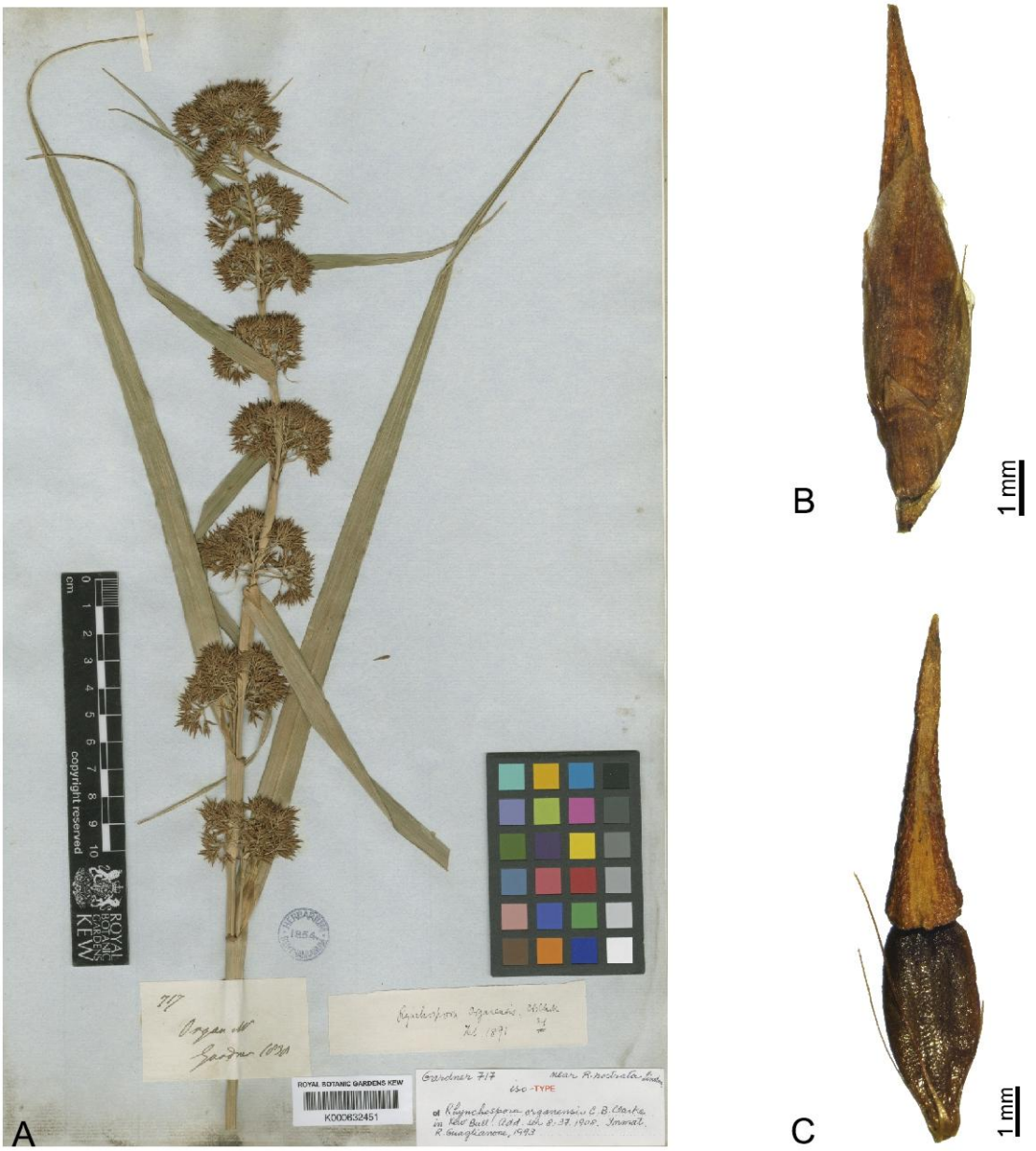

Fig. 13. *Rhynchospora organensis*. A. Habit; B. Spikelet; C. Achene. (A: *Gardner 717* K; B–C: *Barros 2413* NY).

Discussion:— Barros (1941a, 1945, 1947) mistakenly treated this species as *R. rostrata*. Moore (1997) treated this species as "*R.* sp. 1".

Selected specimens:— *sine loc.*, 21 November 1911, *Hicken SI3131* (SI); *sine loc.*, *Sellow, F. SI20151* (SI);

ARGENTINA. **Buenos Aires**: *sine loc.*, 27 October 1927, *Burkart, A. 1729* (SI); *sine loc.*, 23 August 1936, *Rosengurtt, B. 59* (SI); Campana, 3 October 1998, *Guaglianone, E.R. 3160* (SI); Chaná-Miní, 28 November 1927, *Parodi, L.R. 8143* (GH, SI); Cruz Colorada, 27 November 1931, *Cabrera, A.L. 1992* (NY); Cruz Colorada, 29 November 1928, *Parodi, L.R. 8694* (GH); Delta del Paraná, December 1952, *Bruckmann SI18380* (SI); Isla Martín Garcia, 11 January 1995, *Hurrell, J.A. 2291* (SI); La Plata, 4 January 1940, *Dawson, G. 934* (NY); La Plata, 26 October 1996, *Guaglianone, E.R. 3108* (SI);

Punta Chica, 4 December 1981, *Guaglianone, E.R. 764* (SI); San Isidro, 18 December 1938, *Barros, M. 2391* (CTES, NY); San Isidro, 20 January 1940, *Barros, M. 2404* (US); San Isidro, 20 January 1940, *Barros, M. 2413* (NY, SI); San Isidro, December 1941, *Barros, M. 2427* (SI); San Isidro, 17 October 1960, *Burkart, S. 24* (SI); San Isidro, 1 November 1995, *Guaglianone, E.R. 2813* (SI); San Isidro, 29 September 2009, *Múlgura de Romero, M.E. 4499* (SI); San Isidro, 20 October 1926, *Parodi, L.R. 7270* (SI); San Isidro, 21 October 1981, *Ulibarri, E.A. 1297* (NY, SI); Nuñez, 30 October 1924, *Clos, E.C. 1150* (ICN, SI); San Isidro, 18 December 1938, *Barros, M. 2483* (SI); **Chaco**: *sine loc.*, 1 August 1944, *Rojas, F. 12188* (NY); **Entre Ríos**: Colón, 16 October 1971, *Burkart, A. 28502* (NY, SI); Concordia, 7 December 1975, *Burkart, N.S.T. SI27100* (SI); Cruz Colorada, *Rosengurtt, B. 58* (SI); Delta del Paraná, 13 October 1944, *Boelcke, O. 965* (US); Islas del Ibicuy, 0 October 1944, *Burkart, A. 15053* (SI); **La Plata**: Santiago, 26 August 1934, *Cabrera, A.L. 3274* (NY, SP); **Misiones**: San Javier, 24 August 1978, *Cabrera, A.L. 29463* (SI);

BELIZE. *sine loc.*, November 1933, *Gentle, P.H. 893* (P, US); *sine loc.*, 6 September 1932, *Schipp, W.A. 914* (GH); **Baker's Pine Ridge**: *sine loc.*, June 1936, *Lundell, C.L. 7007* (US); **Belize**: *sine loc.*, 9 June 1973, *Davidse, G. 24067* (US); **Boomtown**: *sine loc.*, 16 September 1936, *O'Neill, H. 9036* (GH, US); *sine loc.*, 6 September 1936, *O'Neill, H. 9038* (US); **Maskall**: *sine loc.*, 19 April 1934, *Gentle, P.H. 1220* (GH, US); **New River**: Orange Walk, 6 September 1936, *O'Neill, H. 9040* (US); **Orange Walk**: *sine loc.*, 17 April 2016, *Naczi, R.F.C. 16389* (NY); **Salt Creek**: *sine loc.*, 15 September 1936, *O'Neill, H. 9037* (US); **Toledo**: *sine loc.*, 14 April 2008, *Naczi, R.F.C. 12256* (NY);

BRAZIL. **Minas Gerais**: Carangola, 6 August 1989, *Leoni, L.S. 822* (NY, RB); *sine loc.*, 12 October 1988, *Pedralli, G. 1428* (MBM); *sine loc.*, 1845, *Widgren, J.F. 1130* (US); Tombos, 6 July 1935, *Mello Barreto 1420* (NY, RB); Viçosa, 8 July 1930, *Mexia, Y.E.J. 4849* (GH, NY, US); **Paraná**: Jacareí, 27 August 1914, *Dusén, P.K.H. 873a* (GH); Matinhos, 27 June 1944, *Hertel, R 804* (SP); Paranaguá, 1 October 1950, *Hatschbach, G.G. 2104* (MBM, SI); Paranaguá, 13 June 1960, *Hatschbach, G.G. 7062* (MBM); Pontal do Paraná, 25 April 2017, *Araujo, E.S. 89* (UPCB); **Rio de Janeiro**: Magé, 20 October 1912, *Vidal, J. 4803* (R); Silva Jardim, 18 April 1977, *Araujo, D.S.D. 1622* (RB); **Rio Grande do Sul**: Barra do Ribeiro, 29 August 1990, *Larocca, J. HASU2515* (PACA); Bom Jardim, August 1977, *Ungaretti, I. 560* (HAS, SI); Cachoeira do Sul, November 1983, *Sobral, M. 2625* (ICN); Camaquã, 5 September 1999, *Mondin, C. 1880* (PACA); Encruzilhada do Sul, 16 November 1978, *Mattos, J.R. 19954* (HAS, SI); Encruzilhada do Sul, September 1985, *Sobral, M. 4191* (ICN); Esteio, 11 November 1955, *Rambo, B. 57302* (HBR); Osorio, February 1985, *Sobral, M. 3752* (SI); Osório, 16 August 1996, *Mattos, J.R. 20725* (HAS); Osório, 8 May 1950, *Rambo, B. 47014* (NY, PACA); Pelotas, 29 October 1955, *Vianna, E. ICN001204* (ICN); Piratini, 16 November 2003, *Hefler, S.M. 173* (ICN, SI); Porto Alegre, 25 June 1958, *Camargo, O.R. PACA063669* (PACA); Porto Alegre, 21 May 1977, *Longhi-Wagner, H.M. ICN35256* (ICN); Porto Alegre, 10 January 1933, *Orth, P.C. SP215356* (SP); Porto Alegre, 31 December 1948, *Rambo, B. 39356* (PACA, SI); Porto Alegre, 11 November 1955, *Rambo, B. 57312* (PACA); Porto Alegre,

November 1897, *Reineck, M. 26* (MVM, US); São Leopoldo, November 1941, *Leite, J.E. 331* (SP); São Leopoldo, September 1941, *Leite, J.E. 463* (NY); São Leopoldo, 1 July 1937, *Orth, P.C. 710* (GH, NY, PACA, SI, US); São Leopoldo, 18 July 1946, *Simas, H. PACA033454* (PACA, SI); *sine loc.*, 18 November 1955, *Sacco, J.C. 426* (PACA); *sine loc.*, 30 September 1946, *Schnem, A. 2161* (SI); *sine loc.*, 1907, *Theissen, F. 495* (PACA); Torres, 14 July 1972, *Irgang, B.E. ICN28211* (HAS, ICN, SI); Torres, 8 November 1972, *Lima, A.D. ICN020800* (ICN); Torres, 15 June 1984, *Silveira, N. 1528* (HAS, SI); Torres, June 1983, *Sobral, M. 2133* (SI); Torres, January 1935, *Vidal, J. R36811* (R); **Santa Catarina**: Campos Novos, 28 October 1963, *Klein, R.M. 4107* (HBR, SI); Navegantes, 28 August 1989, *Borgo, M. 468* (MBM); **São Paulo**: Cananéia, 8 October 1980, *Muniz, C.F.S. 202* (SP); Cananéia, 8 October 1980, *Muniz, C.F.S. 206* (SP); Mogi das Cruzes, 10 February 1997, *Nicolau, S.A. 1431* (SP); Paranapiacaba, September 1976, *Davis, P.H. 60510* (SP); Ribeirão Pires, 25 March 1922, *Holway, E.W.D. 1681* (US); Santo André, October 1976, *Davis, P.H. SP154630* (SP); São Paulo, 23 June 1954, *Hoehne, W. 4067* (MBM, SI, SPF); São Paulo, 10 July 1948, *Netto, A.A. 641* (SI); São Paulo, 10 July 1948, *Netto, A.A. Herb.M.B.4610* (SI); São Paulo, 10 July 1948, *Netto, A.A. SPF16573* (SPF);

COLOMBIA. **Chocó**: Quibdó, 22 January 1949, *Molina, J.A. 19ch052* (US);

GUATEMALA. **Livingston**: Izabal, 4 May 1906, *Lewton, F.L. 411* (US); *sine loc.*, March 1889, *Smith, J.D. 1848* (US); **Peten**: Lake Zotz, 18 May 1933, *Lundell, C.L. 3304* (US); **Puerto Barrios**: Izabal, 18 March 1905, *Kellerman, W.A. 4852* (US); Izabal, 2 June 1922, *Standley, P.C. 25129* (US); *sine loc.*, 21 February 1905, *Deam, C.C. 83* (GH, US);

PANAMA. *sine loc.*, 15 July 1927, *Kenoyer, L.A. 145* (US); *sine loc.*, 25 January 1918, *Killip, E.P. 4302* (US);

PARAGUAY. *Sierra Maracayú*, in regione fluminis Tapiraguay, 1898-1899, *Hassler, E. 4133* (NY, P, SI); **Caazapá**: Yuty, 10 September 1987, *Zardini, E.M. 3025* (SI); **San Pedro**: Río Corrientes, 19 June 1977, *Krapovickas, A. 32580* (CTES, MBM);

URUGUAY. **Durazno**: *sine loc.*, 30 September 1899, *Osten, C. 3818* (SI (img B)); **Florida**: Cerro Colorado, 4 October 1945, *Rosengurtt, B. 5549* (SI); **Rio Negro**: Isla Roman Chico, 15 November 2007, *Masciadri, S. MVJB27230* (MVJB); Isla Román Grande, 15 Nov 2007, *S. Masciadri s.n.* (MVJB 27231); **Rivera**: Aledaño, 26 November 2004, *Brussa, C. MVJB22106* (MVJB); **San José**: Arazoti, November 1934, *Rosa Mato, J. 654* (MVM).

12. ***Rhynchospora panduranganii*** Viji, Shaju & Geetha Kum., Kew Bull. 69(3)-9519: 1 (2014). *Rhynchospora corymbosa* var. *panduranganii* (Viji, Shaju & Geetha Kum.) Sang. Dey & Prasanna, Fasc. Fl. India 27: 38 (2015). Type: INDIA. Kerala,Wayanad Distr., 11°54'35.3"N 75°59'09.4"E, 18 October 2011, *Viji, A.R. 71033* (Holotype TBGT; isotypes CALI, MH).

Cespitose perennial, up to 200 cm tall. **Culm** 0.5–1 mm wide, trigonous to triquetrous, striate, scabridulous distally along margins, pale-brown. **Leaves** 4–7 basal and cauline; sheaths 4–10 cm long; blades 35–180 cm × 7–15 mm, green, flattened, scabrous distally on margins and abaxial midvein, the apex attenuate. **Synflorescence** with a terminal and 2 lateral inflorescences, each of corymbiform anthelodium with dense fascicles, the involucral bracts 4–7, up to 15 cm long, leaf-like to setaceous, distally scabrous, the base dilated; inflorescences 4–6 cm diam., with 6–52 spikelets. **Spikelets** 6–8 mm long, lanceoloid, reddish-brown, pedicellate, 2–4-flowered, lower 2 flower bisexual, upper 1–2 flower staminate; fertile scales 3–7 × 1.5–4 mm, ovate, membranaceous, carinate and short-mucronate both scabrous. Stamens 3. Bisexual flower with 6 perianth bristles, the bristles up to 4.8 mm long, reaching the lower half of the stylopodium. **Achene** 3.2–3.5 × 1.8–2.5 mm, obovoid, dark-reddish-brown, surface verrucose, base short-stipitate, the apex truncate; stylopodium 4–4.5 mm long, 1–1.5 mm wide at base, conical, narrowly triangular, brownish-yellow, vertically sulcate, surface scabridulous, base almost straight. – Adapted from Viji *et al.* (2014).

Distribution:— Only known from India: Kerala, Wayanad Distr. in the Nilgiri Biosphere Reserve. (Viji *et al.* 2014).

Habitat:— In open marshy areas and evergreen forest margins. Elevation: 900 m. (Viji *et al.* 2014).

Distinguish features:— Differs from *R. indianolensis* in its more robust habit, a well-developed rhizome, wider leaf blades 7–15 mm (*vs.* 3–8 mm) [Adapted from Viji *et al.* (2014)]. From *R. corymbosa* it differs in having a brown line along the margin (lateral edge) of the achene. (Deepu & Thomas 2019)

Phenology:— Flowering and fruiting was observed from August to November. (Viji *et al.* 2014).

Discussion:— Viji *et al.* (2014) discribed the species and compared the species with *R. scutellata* (endemic to Cuba), but certainly referring to the widespread *R. indianolensis.*

However the majority of the diagnostic character measurements do not match those found in this study, nor those presented in *R. scutellata* sensu Guaglianone (2001). In the following year it was treated as a variety of *R. corymbosa*. Deepu & Thomas (2019) did a more robust morphological analysis comparing it to *R. corymbosa* from India and justifying the return of it to the status of species.

Viji *et al.* (2014) recommend a preliminary conservation assessment as Critically Endangered (CR).

No material of this species was found at the studied herbaria. The analysis of it was made through the available bibliography. For images and plates of this species see Viji *et al.* (2014) and Deepu & Thomas (2019).

13. ***Rhynchospora pedersenii*** Guagl., Darwiniana 39: 321 (2001). *Rhynchospora gigantea* Link var. *latifolia* H. Pfeiff., Repert. Spec. Nov. Regni Veg. 17: 236. 1921, [non *R. latifolia* (Baldwin ex Ell.) W.W. Thomas]. Type: BRAZIL. Paraná, prope Morretes, 19 November 1911, *Dusén 13427* (Holotype B; isotype: S 13-18416 digital image!, SI!). (Fig. 2E, 15).

Rhizomatous perennial, up to 120 cm tall. **Culm** 6–12 mm wide, erect, trigonous, ribbed, scabrous. **Leaves** 4–8 basal, 2–4 cauline; sheaths 5–18 cm long, scabridulous, blades up to 90 cm × 1.4–2.9 mm, flattened, dilated base, scabrous on margins and abaxial midvein, veins without cross partitions, the apex attenuate. **Synflorescence** with a terminal and 3–5 lateral inflorescences, each a profuse corymbiform anthelodium of fascicles, with numerous scabrous axes up to 9 cm long, the basal ones included in sheaths, the lower involucral bracts of the terminal inflorescence 3–4, leaf-like, well developed, scabrous, up to 15 cm long; fascicles with up to 15 spikelets. **Spikelets** 5.7–7 mm long, lanceoloid, reddish-brown, subsessile, 3-flowered, lower flower bisexual, upper 2 flowers staminate; fertile scales 3.5–5.5 × 1.7–2.7 mm, membranaceous, carinate, short-mucronate. Stamens 3. Bisexual flower with 6 perianth bristles, the bristles up to 4 mm long, reaching the lower half of the stylopodium. **Achene** 2.3–3 × 1.1–1.5 mm, obovoid to rhomboid, light-brown to reddish-brown, surface verrucose, base short-stipitate, borders anfractuous; stylopodium 2.8–5 mm long, 1–1.6 mm wide at base, conical, triangular to narrowly triangular, tumid, light ivory to brownish-yellow, surface finnely scabrous, vertically channelled on both faces, base deeply bilobed (sagittate) overlapping the achene apex on both faces mainly on the sides.

Distribution:— In Mexico, Central America (Guaglianone 2001), and South America, south to southern Brazil.

Habitat:— In wetlands, along the shallow edges of ponds, lakes, rivers, marshes, swamps.

Distinguish features:— Differs from *R. gigantea* by its leaf veins without cross partitions and lacking spongy sheaths, by the synflorescence with more lax fascicles, and the longer stylopodium, 2.8–5 mm long, usually longer than the achene body (*vs.* 1.6–2.4 mm long).

Phenology:— Collected with fruits throughout the year.

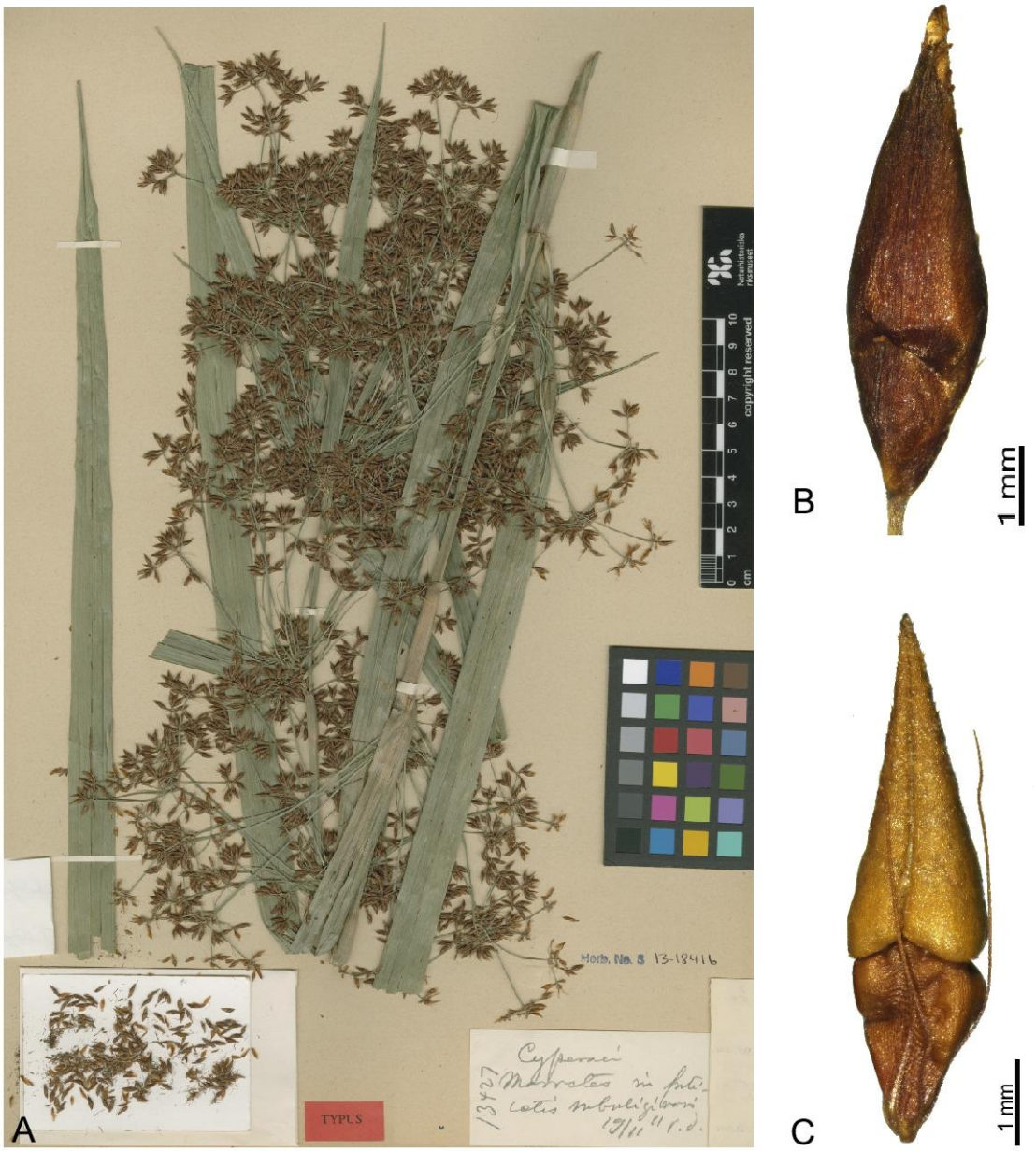

Fig. 14. *Rhynchospora pedersenii* . A. Habit; B. Spikelet; C. Achene. (A: *Dusén 13427* S; B–C: *Ritter 3522* NY).

Discussion:— Strong & Acevedo-Rodriguez (2005) excluded the occurence of this species from Puerto Rico and Virgin Islands, arguing that the material (*Otero 537*, MO n.v.) cited by Guaglianone (2001) is *R. corymbosa*.

Selected specimens:— BOLIVIA. **Beni**: Itenez, 30 October 1993, *Moraes, M. 1398* (SI); **Santa Cruz**: Florida, 24 December 1994, *Nee, M.H. 46125* (NY); Velasco, 1 October 1995, *Ritter, N. 2487* (CTES, NY); Velasco, 12 August 1996, *Ritter, N. 3522* (NY); **Tambopata**: Madre de Dios, 26 July 1993, *Cornejo, F. 715* (NY);

BRAZIL. **Amazonas**: *sine loc.*, 14 April 1974, *Junk, W.J. 31* (NY); *sine loc.*, 17 July 1974, *Junk, W.J. 36* (NY, SP); **Bahia**: Valença, 23 February 2000, *Jardim, J.G. 2796* (MBM, NY, SPF); **Minas Gerais**: Buenópolis, October 1988, *Harley, R.M. 24938* (SPF); **Rio de Janeiro**: Resende, 21 October 1981, *Carauta, J.P.P. 3857* (RB); Silva Jardim, 12

January 1994, *Vieira, C.M. 506* (RB); *sine loc.*, 10 February 2000, *Leite, B.M.B. 8* (R); **Santa Catarina**: Governador Celso Ramos, 19 November 1971, *Klein, R.M. 9952* (HBR); *sine loc.*, 26 November 1961, *Klein, R.M. 2835* (FLOR, HBR, SI, US); **São Paulo**: Iguape, 8 December 1987, *Tsugaru, S. B-2311* (GH); Juquiá, 15 October 1961, *Pabst, G. 5818* (SI); Juquiá, 15 October 1961, *Pereira, E. 5991* (SI);

COLOMBIA. **Santander**: Puerto Olaya, 15 June 1944, *Fassett, N.C. 25359* (NY, US);

ECUADOR. **Guayas**: Balzar, 20 March 1968, *Holm-Nielsen, L. 97* (CTES);

PERU. **Loreto**: Maynas, 24 October 1967, *Torres, J. 369* (GH); Saquena, 10 June 1978, *Rimachi, M. 3715* (US);

14. ***Rhynchospora pseudomacrostachya*** Gerry Moore, Guagl. & Zartman, Brittonia 54(4): 340 (2002). Type: BRAZIL. Santa Catarina, Lages, Rio Caveiras, along Estrada Federal south of Lages, alt. 900 m, 3 December 1956, *Smith, L.B. 8140* (Holotype: US!; isotypes: HBR!, R!, SI!). (Fig. 16).

Cespitose perennial, up to 150 cm tall. **Culm** 2.5-4 mm wide, trigonous, channeled, slightly antrorsely scabrous distally along margins. **Leaves** 3–11 basal, 4–8 cauline; sheaths up to 12 cm long; blades up to 90 cm × 1.5–3 mm, subflattened, scabrous on margins and abaxial midvein, base spongy on basal leaves; the apex acuminate. **Synflorescence** with a terminal and 2–3 lateral inflorescences, each composed of anthelodia of dense, turbinate, hemispherical, or globose fascicles; with scabrous axes up to 11 cm long, the involucral bracts leaf-like or setaceous, scabrous, up to 9 cm long; fascicles 3–6 cm diam., with 8–50 spikelets. **Spikelets** 10–11 mm long, lanceoloid, reddish-brown, subsessile, 2-flowered, lower flower bisexual, upper flower staminate; fertile scales 5–7.3 × 2.5–3.6 mm, membranaceous, carinate, muticous to minutely mucronate. Stamens 3. Bisexual flower with 5–6 perianth bristles, the bristles up to 8 mm long, reaching the lower half of the stylopodium. **Achene** 4.6–5.5 × 2.5–3.6 mm, obovoid, dark reddish-brown, surface verrucose, base attenuate, stipitate, faces concave with a ridge in the shape of an inverted "U", the apex rounded, upper margin spinulose; stylopodium 9–10.4 mm long, 0.7–1.1 mm wide at base, subulate, brownish-yellow, surface scabridulous, vertically sulcate, base almost straight.

Distribution:— Very rare, southern Brazil.

Habitat:— On marshes and river banks.

Distinguish features:— Differs from *R. rostrata* by its inflorescence structure, with 2–3 lateral inflorescences (*vs.* 5–9) and the obovoid achene with the upper margin spinulose (*vs.* oblong and upper margin smooth). From *R. macrostachya* it differs by its achene with concave faces with a ridge in the shape of an inverted "U" and shorter stylopodium 9–10.4 mm long (*vs.* 17–23 mm long).

Phenology:— Collected with fruits from October to January.

Discussion:— Moore (1997) called this species "*R.* sp. 2". Barros (1960) and Guaglianone (2001) treated it as *R. corniculata* var. *macrostachya*. The first author tried to find the species in two field trips to the type location and around, with no success.

Fig. 15. *Rhynchospora pseudomacrostachya*. (*Smith 8140* US).

Selected specimens:— **Rio Grande do Sul**: Passo Fundo, 20 October 1957, *Camargo, O. 2217* (PACA) **Santa Catarina**: Campos Novos, BR 282, 23 January 1997, *Araújo, A.C. 561* (ICN); Lajes, 3 December 1956, *Smith, L.B. 8140* (HBR, SI, US);

15. ***Rhynchospora* rionegrensis** P. Weber & W.W. Thomas, Phytotaxa 472(1): 57 (2020). *Calyptrostylis longirostris* Nees, J. Bot. (Hooker) 2: 394 (1840). *Ephippiorhynchium longirostre* (Nees) Nees in Martius, Fl. Bras. 2(1): 136. 1842. *Rhynchospora longirostris* (Nees) Steud. [*non* Elliott.], Syn. Pl. Glumac. 2(8-9): 145. 1855 [*nom. illeg.*]. *Rhynchospora amazonica* var. *guianensis* Kükenthal, Bot. Jahrb. Syst. 74(3): 425. 1949. *Rhynchospora amazonica* subsp. *guianensis* (Kük.) T. Koyama, Mem. New York Bot. Gard. 23: 28 (1972). TYPE:— GUYANA ("Guiana anglica interior"). *Schomburgk 915* (Holotype: B†; isotypes: BM 6511 digital image!, G 98436 & 98437 digital images!, K 632452 & 632453 digital images!, NY frag.!, P 264138 & 264139 digital images!, TCD 0469 digital image!, US!, W). Lectoype (here designated): K 632452. (Fig. 16).

Cespitose, short-rhizomatous, perennial, up to 150 cm tall. **Culm** 1-4 mm wide, erect, trigonous, channeled, antrorsely scabrous distally along margins. **Leaves** 6–12 basal, 2–4 cauline; sheaths 0.9–15 cm long; blades 17–50 cm × 6–15 mm, subflattened, antrorsely scabrous on margins and abaxial midvein, the apex acuminate. **Synflorescence** with a terminal and 1–4 lateral inflorescences, each composed of anthelodia of fascicles, with scabrous axis up to 8 cm long, the involucral bracts leaf-like, scabrous, up to 20 cm long; fascicles with 3–20 spikelets. **Spikelets** 6–9.2 mm long, light green to pale yellow, ovoid-lanceoloid, subsessile, 2-flowered, lower flower bisexual, upper flower male; fertile scales 4.8–8 × 2.5–4 mm, membranaceous, carinate, mucronate. Stamens 3. Bisexual flower with 6 perianth bristles, the bristles up to 6.5 mm long, reaching the base to the middle of the stylopodium; style unbranched or shortly bifid, long exserted from the scales. **Achene** 3.8–5.1 × 2.0–2.9 mm, light-brown, obovoid-elliptic, surface verrucose, base short-stipitate, faces concave, the apex truncate and usually slightly spinulose; stylopodium 5.5–8 mm long, 0.7–1 mm wide at base, cream to buff colored, subulate, surface scabridulous, base overlapping the achene apex on both faces.

Fig. 16. *Rhynchospora* sp1.. A. Habit; B. Spikelet; C. Achene. (A–C: *Prance 3686* NY).

It is likely that the differences in the inflorescences of *Rhynchospora rionegrensis* and *R. amazonica* are related to differences in pollination mechanisms. Costa *et al.* (2017) have shown that species of *Rhynchospora* with white spikelets and green involucral bracts, like *R. amazonica*, can be, at least in part, pollinated by insects. Species like *R. rionegrensis*, with darker spikelets and a dispersed, open inflorescence, are more likely to be pollinated by wind.

Distribution:— Northern South America. Brazil (Amazonas), Guyana and Venezuela (Amazonas and Bolívar). While the distribution of *Rhynchospora rionegrensis* covers a large area, its distribution is much more limited than that of *R. amazonica*.

Habitat:— Riparian forests, river banks, lagoon margins and flooded savannas, in most cases in proximity to black water (silt-free water high in tannins as found in the Rio Negro and its tributaries). Elevation: up to 400 m.

Distinguish features:— For many years, this species was considered a subspecies of *Rhynchospora amazonica* from which it differs by its synflorescence with lateral and terminal inflorescences (*vs.* only terminal inflorescences), fascicles loose, generally turbinate (*vs.* capitate, hemispherical to globose), scales brown (*vs.* whitish or pale tan), and larger stylopodium 5.5–7.5 mm (*vs.* 3.1–5 mm). Differs from *R. hassleri* by its obovoid-elliptic achenes 2.0–2.9 mm wide (*vs.* oblong-elipsoid achenes 1.6–2.1 mm wide).

Phenology:— Collected with fruits from October to April.

Studied specimens:— BRAZIL. **Amazonas**: *sine loc*. 12 December 1974, *Junk, K. 203* (SP); Barcelos, 8 February 1944, *Baldwin Jr., J.T. 3343* (US); Iranduba, Ilha da Marchantaria, 2 December 1982, *Junk INPA 109015* (INPA); Manaus, rio Cuieiras, igarapé do Tucunaré, 17 December 1961, *Rodrigues, W. 3966* (INPA); Manaus, rio Negro, Praia Grande, 13 February 1979, *Revilla, J. 4164* (NY); Manaus, Tarumã Grande, 3°2'S, 60°8'W, 9 November 1977, *Keel, S.H.K. 253* (NY, RB); Manaus-Itacoatiara Highway, km 201, rio Urubu, 16 December 1966, *Prance, G.T. 3686* (NY); Maués, 30 November 1946, *Pires, J.M. 152* (IAN); Rio Negro between Moreira and rio Arirahá 13 October 1971, *Prance, G.T. 15192* (MG, NY, US); Rio Negro between Moreira and rio Quinini,10 November 1971, *Prance, G.T. 16250* (INPA, NY); Rio Negro opposite to the city of Manaus, 12 November 1977, *Keel, S.H.K. 269* (NY, US); São Felipe, 12 March 1944, *Baldwin Jr., J.T. 3574* (US); São Gabriel, 23 February 1944, *Baldwin Jr., J.T. 3540* (US).

GUYANA. *Schomburgk 915* (BM, G, K, NY, P, TCD, US).

VENEZUELA. *sine loc. Stergios, B.G. 11681* (NY); **Amazonas**: Atures, 23 February 1985, *Carnevali, G. 1853* (SI); Rio Negro, 26 January 1992, *Stergios, B.G. 15506* (US); Río Negro, orillas del río Negro, Bajo Chimoni, 16 April 1985, *B. Stergios 8181* (SI); Río Negro, 15 April 2005, *Diaz, W. 7273* (US); San Carlos de Rio Negro, 30 January 1980, *Clark, H.L. 7307* (NY); San Carlos de Río Negro, 27 January 1980, *Liesner, R. 8637* (NY); San Fernando de Atabapo, 29 March 1950, *Curran, H.M. 122* (NY); Yapacana

National Park, 20 March 1953, *Maguire, B. 34590* (NY); **Bolívar**: Heres, 5 April 1984, *Huber, O. 9410* (NY).

Discussion:— See the discussion about the species at 1. *R. amazonica.*

According to some sources (Palla 1908, Nees 1842, Moore 1997, Strong 2006) Nees described *Calyptrostylis longirostris* Nees [= *R. amazonica* subsp. *guianensis*] in Companion Bot. Mag. 2: 394. 1836, but the publication ends on page 381, and there is not a single citation of *C. longirostris* nor is there any index reference of content beyond page 380. The species, however, is described on page 394 of J. Bot. (Hooker) 2: 394 (1840), the correct *opus principes*. At IPNI (2020) both publications are cited.

There is also the superfluous name *R. longirostris* Palla (1908), putting *Calyptrostylis longirostis* Nees in *Rhynchospora*, which had already been done by Steudel (1855). Palla cited the names of *R. amazonica* and *Ephippiorhyncium longirostre* [= R. sp.1] and only the specimen of Wettstein & Schiffner from "VI (June), 1901" from Rio grande, near S. Paulo railway, an unexpected location. The three specimens with these data in the W herbarium, as well as the image in the F herbarium were identified as *R. macrostachya* Palla [= *R. splendens* Lindm.] published on page 191 of the same work. The photos are from the *R. splendens* specimens. The species description is very short and says it has no perianth bristles, which reinforces the possibility of it being *R. splendens* and not *R.* sp.1 nor *R. amazonica*.

16. ***Rhynchospora rostrata*** Lindman, Bih. Kongl. Svenska Vetensk.-Akad. Handl. 26(9): 27 (1900). Lectotype [designated by Guaglianone, Darwiniana 39(3-4): 240 (2001)]: BRAZIL. Minas Gerais, between Tejuco and Veraba, In fulvis Veraba, 13 September 1827, *Burchell 5786* (K 496474 digital image!; isolectotype: P 271608 digital image!). (Fig. 1E, 17).

Cespitose perennial, up to 100 cm tall. **Culm** 2-4.2 mm wide, trigonous, channeled, slightly antrorsely scabrous along margins on the inflorescence area. **Leaves** 5–15 basal, 2–4 cauline; sheaths up to 7 cm long; blades up to 50 cm long, 1–1.4 mm wide, subflattened, scabrous on margins and abaxial midvein, the apex acuminate. **Synflorescence** with a terminal and 5–9 lateral inflorescences, each composed of mostly turbinate anthelodia (corymbiform) of fascicles or less often of lax anthelodia; with scabrous axes up to 5 cm long, the involucral bracts up to 50 cm long, overtopping the inflorescence, leaf-like, scabrous. **Spikelets** 8.8–11 mm long, lanceoloid, reddish-brown, pedicelled, 2–3-flowered, lower flower bisexual, upper 1–2 flower staminate; fertile scales 6.8–8.8 × 2–3.2 mm, membranaceous, carinate, short-mucronate. Stamens 3. Bisexual flower with 6 perianth bristles, the bristles up to 10.5 mm long, reaching the lower half of the stylopodium. **Achene** 4.5–5.7 × 1.5–2 mm, oblong, dark-reddish-brown, surface verrucose, base attenuate, stipitate, faces concave with a ridge in the shape of an inverted "U", the apex rounded; stylopodium 9.5–12.5 mm long, 0.4–0.7 mm wide at base, subulate, brownish-yellow, surface scabridulous, base almost square in cross section.

Distribution:— Central Brazil.

Habitat:— In the shallow part of rivers and streams. Elevation: 700–1100 m.

Distinguish features:— Differs from *R. organensis* by the stylopodium subulate with 0.4–0.7 mm wide at base (*vs.* conical, narrowly triangular with 1.1–1.6 mm wide at base). Differs from *R. pseudomacrostachya* by its inflorescence structure, with 5–9 lateral inflorescences (*vs.* 2–3 lateral inflorescences) and the achene oblong upper margin smooth (*vs.* obovoid with upper margin spinulose).

Phenology:— Collected with fruits from September to November.

Discussion:— Moore (1997) called this species "*R.* sp. 3". Kükenthal (1949) cited this species for Paraguay, but the specimen cited (*Hassler 4133*) is *R. organensis*. Barros

(1941a, 1945, 1947) mistakenly called *R. organensis* as *R. rostrata*, thus citing this species for Argentina.

Fig. 17. *Rhynchospora rostrata*. A. Habit; B. Spikelet; C. Achene. (A: *Irwin 7907* NY; B–C: *Mendonça 534* NY).

Analysed specimens:— BRAZIL. Chiefly Province of Goyaz, 30 November 1896, *Glaziou, A.F.M. 22353* Herb. Riedel (K); Goyaz, Morinhos, 20 October 1894, *Glaziou, A.F.M. 22353* (US); **Distrito Federal**: Brasília, 11 September 1985, *Mendonça, R.C. 523* (NY); Brasília Córrego Caixeta (Chácara do Sr. Gilberto), 5 November 1980, *Heringer, E.P. 5670* (K, NY); Paranoá, APA São Bartolomeu, 11 September 1985, *R.C. Mendonça 534* (NY, RB, SP); Sobradinho, 19 September 1964, *Prance, G.T. 59080* (NY, US, RB); **Goiás**: Formosa, rio Bezerra, 11 October 1997, *Alvarenga, D. 961* (K, NY, SI, SP); Morrinhos, 4 October 1976, *Hatschbach, G.G. 38922* (CTES, MBM, US); **Minas Gerais**:

sine loc., November 1834, *Riedel, L. s.n.* (K, SI); between Tejuco and Veraba, In fulvis Veraba, 13 September 1827, *Burchell 5786* (K, P, SI).

17. ***Rhynchospora scutellata*** Griseb., Cat. Pl. Cub.: 246 (1866). Type: CUBA. *Wright, C. 3406* (Holotype: GOET 2918 digital image!, isotypes: BM 938388 digital image!, GH!, K 632380 digital image!, MO 2059577 digital image!, NY!, P 271992 & 271993 digital images!, US!, YU 1021 digital image!). (Fig. 2A, 18).

Cespitose perennial, up to 90 cm tall. **Culm** 2.5–3.5 mm wide, trigonous, channeled, slightly antrorsely scabrous distally along margins. **Leaves** 4–9 basal, 2–4 cauline; sheaths 2.5–6.5 cm long; blades up to 53 cm × 5–8 mm, subflattened, scabrous on margins and abaxial midvein, the apex attenuate. **Synflorescence** with a terminal and 1–3 lateral inflorescences, each composed of anthelodia of turbinate fascicles; with scabrous axes up to 8 cm long, the lower involucral bracts leaf-like, upper setaceous, scabrous, up to 10 cm long; fascicles up to 2 cm wide., with 2–12 spikelets. **Spikelets** 6.5–7.8 mm long, ovoid, reddish-brown, subsessile, 2-flowered, lower flower bisexual, upper flower staminate; fertile scales 5.7–6.5 × 2.2–3.8 mm, membranaceous, carinate, mucronate. Stamens 3. Bisexual flower with 6 perianth bristles, the bristles up to 5.3 mm long, unequal, the larger reaching the lower half of the stylopodium. **Achene** 3.4–3.9 × 2.9–3.3 mm, widely obovoid, reddish-brown, surface verrucose, base short-stipitate, faces concave with a narrow and salient ridge in the shape of an inverted "U"; stylopodium 3–3.4 mm long, 2.1–2.7 mm wide at base, conical, triangular, brownish-yellow, surface minutely scabrous, vertically sulcate, base almost straight to shortly bilobed.

Distribution:— Very rare. Cuba.

Habitat:— Unknown.

Distinguish features:— Differs from *R. indianolensis* and *R. latibracteata* by its broadly obovoid achene, 2.9–3.3 mm wide (*vs.* 1.7–2.7 mm and obovoid and 1.6–2.3 mm and obovoid, respectively), and with narrower and a more pronounced ridge in the shape of an inverted "U" on the achene faces.

Phenology:— Unknown.

Discussion:— *R. scutellata* is close to *R. indianolensis*. See *R. indianolensis* for a discussion about the two species.

Specimens:— CUBA. *Wright, C. 3406* (BM, GH, GOET, MO, NY, P, US).

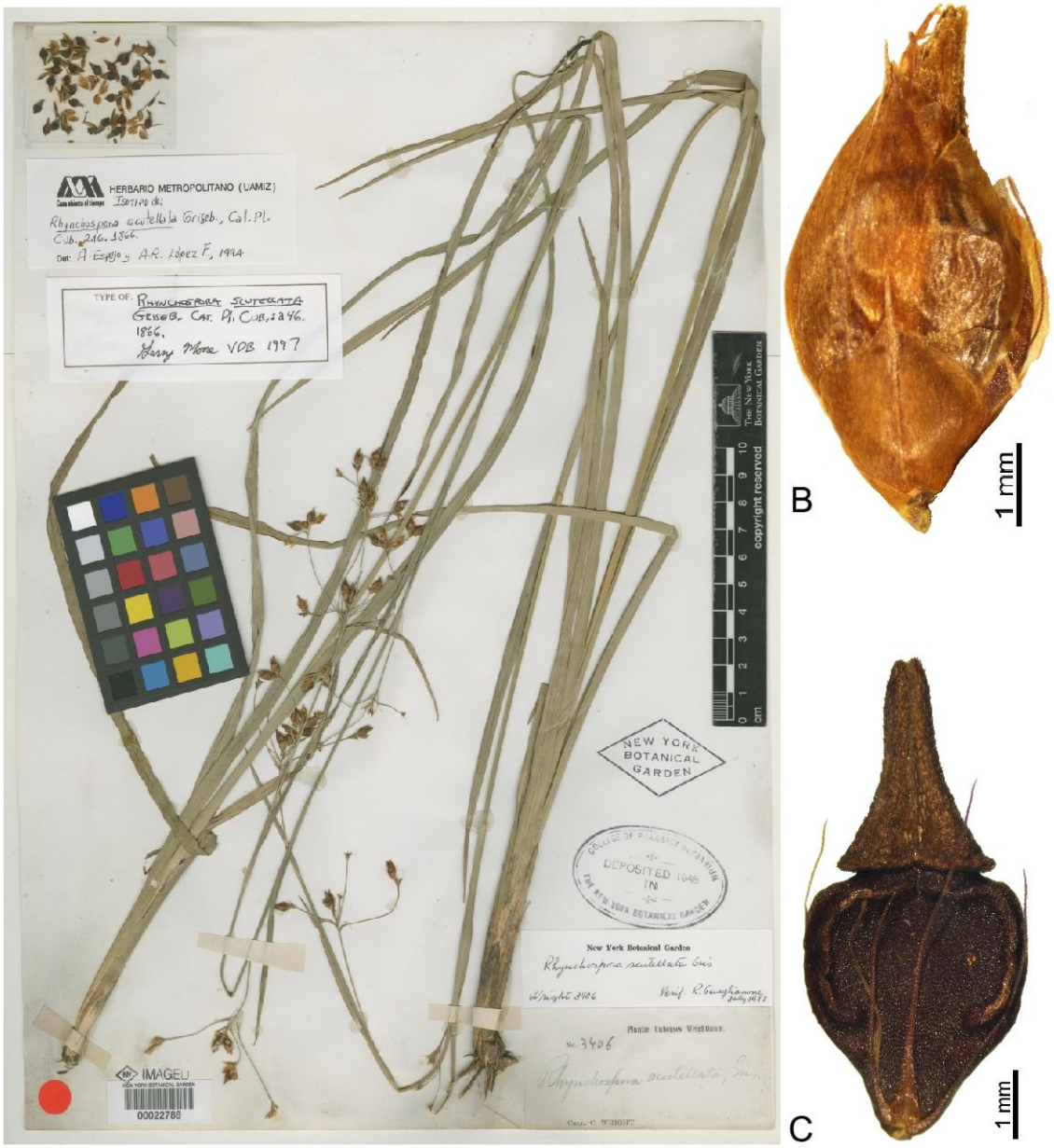

Fig. 18. *Rhynchospora scutellata*. A. Habit; B. Spikelet; C. Achene. (A–C: *Wright 3406* NY).

18. ***Rhynchospora stenocarpa*** Kunth, Enum. Pl. 2: 294 (1837). *Ephippiorhynchium stenocarpum* (Kunth) Nees, Fl. Bras. (Martius) 2(1): 136 (1842). Type: "Brasilia meridionalis" *Sellow s.n.* (B†, Type image F0BN011157). Neotype (here designated): BRAZIL. Mato Grosso do Sul, Mundo Novo, Estrada de acesso ao Porto Fragelis, 2 November 2002, *Kozera, C. 205* (MBM!; isoneotype: US!). (Fig. 1B, 19).

Rhizomatous perennial, up to 120 cm tall. **Culm** 3–4 mm wide, trigonous, ribbed. **Leaves** 4–7 basal, 1–3 cauline; sheaths up to 6 cm long; blades up to 28 cm × 3–5 mm, flattened, scabrous on margins and abaxial midvein, the apex attenuate. **Synflorescence** with a terminal and 0–2 lateral inflorescences, each composed of anthelodia of turbinate fascicles; the basal involucral bract up to 8 cm long leaf-like, scabrous; fascicles with 3–15 spikelets. **Spikelets** 6–7.6 mm long, lanceoloid, golden to light-brown, subsessile, 2-flowered, lower flower bisexual, upper flower staminate; fertile scales 5.2–6.2 × 1.4–1.8 mm, lanceolate, subcarinate, short-mucronate. Stamens 3. Bisexual flower with 6 perianth bristles, the bristles up to 5 mm long, slightly shorter to slightly longer than the achene body. **Achene** 4.3–5.2 × 0.8–1 mm, narrowly oblong, reddish-brown to dark- brown, surface verrucose, base stipitate, the apex rounded, minutely scabrous; stylopodium 4.3–4.6 mm long, 0.3–0.4 mm wide at base, subulate, brownish-yellow, surface minutely scabrous, base almost square in cross section.

Distribution:— Very rare, Brazil. From Minas Gerais south and west to Mato Grosso do Sul and Paraná.

Habitat:— On river banks.

Distinguish features:— Differs from R. *trispicata* by its shorter spikelet 6–7.6 mm (*vs.* 8–12.5 mm), smaller achene 4.3–5.2 × 0.8–1 mm (*vs.* 5–6.8 × 1.3–1.8 mm), and narrower stylopodium 0.3–0.4 mm wide at base (*vs.* 0.4–0.7 mm).

Phenology:— Collected with fruits from November to April.

Discussion:— Since no other duplicate of the original type is known, we designated a neotype. The specimen *Kozera 205* in the MBM herbarium was chosen because it is the most complete, with well-developed achenes and well conserved among the studied specimens.

Selected specimens:— BRAZIL. **Mato Grosso do Sul**: Mundo Novo, Estrada de acesso ao Porto Fragelis, 2 November 2002, *Kozera, C. 205* (MBM, US); **Minas Gerais**: *sine*

loc., 1845, *Widgren, J.F. US819725* (US); **Paraná**: Vila Alta, caminho para a lagoa Azul, rio Paraná, 24 January 2003, *Kozera, C. 206* (MBM, US); **São Paulo**: Mogi das Cruzes, 20 April 1889, *Glaziou, A.F.M. 17880* (NY, US); *sine loc.*, 1 April 1906, *Usteri, A. 10c* (NY).

Fig. 19. *Rhynchospora stenocarpa*. A. Habit; B. Spikelet; C. Achene. (A: *Kozera 205* MBM; B–C: *Kozera 205* NY).

19. ***Rhynchospora trispicata*** (Nees) Schrad. ex Steud., Syn. Pl. Glumac. 2: 145. 1855. *Ephippiorhynchium trispicatum* Nees in Martius, Fl. Bras. 2(1):136. 1842. Type: BRAZIL. "In campestribus udis provinc. Piauhy," *Martius 3232* (Holotype: M image!, frag. SI!). (Fig. 1C–D, 20).

Rhynchospora schmidtii Kük., Repert. Spec. Nov. Regni Veg. 23: 202 (1926). *Rhynchospora trispicata* subsp. *schmidtii* (Kük.) T.Koyama, Mem. New York Bot. Gard. 23: 81 (1972). Type: CUBA: Pinar del Rio, in a small laguna ca. 3 km south of Herradura, *Ekman, E.L., 17739* (Holotype: B 100296647 digital image!, isotype: B 100296646 digital image!, NY!).

Rhynchospora guianensis Lindeman & Dons., Acta Bot. Néerl. 20 (4): 440. 1971. Type: SURINAME; Sipaliwini Savanna, *Oldenburger & Norde 133* (Holotype: U 1553 digital image!; isotype: NY!).

Rhizomatous perennial, up to 150 cm tall. **Culm** 2–8 mm wide, trigonous, ribbed, channeled, distally scabrous. **Leaves** 4–11 basal, 2–4 cauline; sheaths up to 7 cm long; blades up to 90 cm × 3–12 mm, flattened, scabrous on margins and abaxial midvein, the apex attenuate. **Synflorescence** with a terminal and 1–2 lateral inflorescences, each of diffuse compound anthelodia of turbinate fascicles; the basal involucral bract up to 7 cm long leaf-like, scabrous; fascicles with 3–12 spikelets. **Spikelets** 8–12.5 mm long, lanceoloid, light to dark-brown, pedicellate, 2-flowered, lower flower bisexual, upper flower staminate; fertile scales 7.4–10 × 2–2.6 mm, ovate-lanceolate, subcarinate, muticous to short-mucronate, minutely scabrous. Stamens 3. Bisexual flower with 6 perianth bristles, the bristles up to 9.5 mm long, reaching the lower half of the stylopodium. **Achene** 5–6.8 × 1.3–1.8 mm, ellipsoid, reddish-brown to dark- brown, surface verrucose, slightly concave, base attenuate, long-stipitate 0.3–0.7 mm, the apex rounded, minutely scabrous; stylopodium 4–12 mm long, 0.4–0.7 mm wide at base, subulate, brownish-yellow, surface minutely scabrous, base almost square in cross section.

Distribution:— Tropical America. From Mexico and Cuba south to Paraguay and central Brazil.

Habitat:— In marshes, pond margins, river banks and wet savannas. Also in secondary forest, edges of forests, trails, roadsides, cut-over forests and other early successional habitats, and disturbed areas (Strong 2006). Elevation: up to 500 m.

Distinguish features:— Differs from *R. stenocarpa* by its larger spikelets 8–12.5 mm (*vs.* 6–7.6 mm), larger achenes 5–6.8 × 1.3–1.8 mm (*vs.* 4.3–5.2 × 0.8–1 mm) and wider stylopodium 0.4–0.7 mm wide at base (*vs.* 0.3–0.4 mm wide at base).

Fig. 20. *Rhynchospora trispicata*. A. Habit; B. Spikelet; C. Achene. (A: *Hatschbach 23527* MBM; B: *Nee 34631* NY; C: *Pott 3181* NY).

This species has a synflorescence structure very similar to that of the pantropical *R. triflora*, but it is easily distinguished by its larger, ellipsoid achenes, 5–6.4 × 1.3–1.8 mm with a verrucose surface (*vs.* obovoid, 3–4 mm × 1.9–2.2 mm, surface transversally rugose), and by the membranaceous spikelet scales (*vs.* coriaceous, and hard to remove).

Phenology:— Collected with fruits throughout the year.

Discussion:— Kükenthal (1949) describes *R. schmidtii* using three specimens from Cuba and distinguishes them from *R. trispicata* by characters such as larger size, broader leaves, larger achenes and bristles. However, these characteristics are within the range of

variation of the species in the Americas. Koyama (1972) recognizes that most of these distinctions seemed invalid, but larger stylopodium (10–11 mm long *vs.* 4.5–6 mm long) and bristles (9–11mm long *vs.* 4.5–8 mm long) and the geographical isolation of *R. schimidtii* in Cuba could justify their inclusion as a subspecies of *R. trispicata*. Although Cuban specimens actually have longer stylopodium, bristle and stipe when compared to specimens from Central and South America, we found a continuum of sizes of those characters along its area of occurrence. For exemple, the Mexican specimens *Brigada Vegetación Acuática 96* and *Barlow, F.D. 30/38D* with stylopodia and bristles with 8.1–8.4 mm long and 7.2–8 mm long respectively. Therefore, the synonymization of these taxa seems justified.

Selected specimens:— BELIZE. *sine loc.*, 25 February 1936, *Gentle, P.H. 1825* (GH, SI, US); *sine loc.*, 16 September 1936, *O'Neill, H. 9042* (SI, US); Salt Creek, 15 September 1936, *O'Neill, H. 9041* (GH, US); *sine loc.*, 1 May 1933, *Lundell, C.L. 3973* (US); **Stann Creek**: *sine loc.*, 3 January 2006, *Naczi, R.F.C. 11250* (NY); *sine loc.*, 11 April 2008, *Naczi, R.F.C. 12232* (NY); **Toledo**: *sine loc.*, 7 January 2006, *Naczi, R.F.C. 11245* (NY); *sine loc.*, 3 January 2006, *Naczi, R.F.C. 11253* (NY); *sine loc.*, 26 March 2006, *Naczi, R.F.C. 11322* (NY);

BOLIVIA. *sine loc.*, 7 May 1977, *Krapovickas, A. 32351* (CTES, MBM, SI); **Beni**: Ballivian, 19 October 1980, *Beck, S.G. 5198* (SI); Ballivian, 12 April 1981, *Beck, S.G. 5325* (SI); Ballivian, 17 November 1985, *Solomon, J.C. 14761* (SI); Itenez, 31 March 1987, *Nee, M.H. 34631* (NY, US); San Borja, 11 January 1986, *Franken, M. 126* (SI); Yacuma, 28 February 1987, *Beck, S.G. 13205* (SI); Yacuma, 2 March 1990, *Moraes, M. 1264* (SI); **Santa Cruz**: Ñuflo de Chavez, 28 September 2004, *Morrone, O. 4984* (CTES, SI); Sara, 14 December 1920, *Steinbach, J. 5215* (GH); Velasco, 4 May 1986, *Beck, S.G. 12365* (SI); Velasco, 9 April 1988, *Bruderreck, B. 279* (SI); Velasco, 19 May 1994, *Guillén, R. 1376* (CTES); Velasco, 2 May 1995, *Guillén, R. 3425* (SI);

BRAZIL. **Distrito Federal**: Brasília, 10 November 1983, *Pereira, B.A.S. 858* (SP); **Mato Grosso**: Bataguaçu, 14 February 1970, *Hatschbach, G.G. 23527* (MBM, NY, US); Jaraguarí, 13 February 1978, *Pedersen, T.M. 12251* (CTES, MBM, SI); Nova Xavantina, 24 October 1992, *Windisch, P.G. 7199a* (ICN); Poconé, 28 July 1977, *Allen, A. 1040* (RB); São José do Xingu, 8 March 2011, *Zappi, D.C. 3227* (RB); *sine loc.*, 24 November 1977, *Costa, J.S. 1249* (RB); *sine loc.*, 13 June 1966, *Irwin, H.S. 17080* (GH, NY, UPCB, US); **Mato Grosso do Sul**: Aquidauana, 26 April 1997, *Araujo, A.C. 692* (ICN); Aquidauana, 17 July 1969, *Hatschbach, G.G. 21938* (MBM); Aquidauana, 12 May 2002, *Hatschbach, G.G. 72847* (MBM, US); Aquidauana, 4 February 1991, *Pott, A. 5768* (SI); Aquidauana, 11 April 1991, *Salis, S.M. 409* (SI); Bela Vista, 16 February 1994, *Pedersen, T.M. 16055* (CTES); Corumbá, 18 November 2001, *Damasceno Jr., G.A. 2908* (MBM); Corumbá, 28 April 1996, *Pott, V.J. 3131* (MBM, UPCB); Corumbá, 30 April 1996, *Pott,*

V.J. 3181 (UPCB); **Minas Gerais**: Santana de Pirapama, 6 March 2009, *Zappi, D.C. 1758* (RB); **Roraima**: Mucajaí, 29 October 1998, *Prata, A.P. 575* (SP);

COSTA RICA. **Alajuela**: Los Chiles, 23 August 1990, *Crow, G.E. 7608* (US);

CUBA. **Pinar del Río**: *sine loc.*, 2 March 1911, *Britton, N.L. 9697* (NY, US); *sine loc.*, 21 October 1923, *Ekman, E.L. 17739* (NY);

FRENCH GUIANA: **Cayenne**: Iracoubo, Counami, 12 August 2007, *Delnatte, C. 1198* (US); Kourou, Dégrad Saramaca, 9 June 1989, *Cremers, G. 10657* (US); Roura, Bélizon, 1 June 1988, *Cremers, G. 10039* (US); Saint Elie, 15 September 1987, *Hahn, W. 3724* (US); Sinnamary, Corosonny, 25 March 2010, *Delprete, P.G. 11012* (US); **Saint Laurent du Maroni**: *sine loc.*, 21 March 1976, *Raynal-Roques, A.M. 18760* (US); Paul Isnard, 17 November 1986, *Skog, L.E. 7441* (US);

GUYANA. **Upper Takutu**: Rupununi, 19 August 1995, *Jansen-Jacobs, M. 10089* (US); Yupukari, 22 October 1996, *Horn, C.N. 11035* (US);

HONDURAS. **Gracias a Dios**: *sine loc.*, 17 May 1973, *Clewell, A. 4187a* (SI);

MEXICO. **Tabasco**: Balanca, 9 May 1939, *Matuda, E. 3127* (GH, US); Huimanguillo, 22 May 1963, *Barlow, F.D. 30/38D* (US); **Veracruz**: Rio Tonala, 19 September 1974, *Brigada Vegetación Acuática 96* (GH);

NICARAGUA. **Bihmona**: *sine loc.*, 7 July 1972, *Seymour, F.C. 5706* (SI, US);

PARAGUAY. Northern Paraguay, upstream of Rio Apa, February 1902, *Hassler, E. 8549* (NY, SI); **Alto Paraná**: *sine loc.*, 10 February 1997, *Dematteis, M. 565* (CTES); **Amambay**: Bella Vista, 24 June 1977, *Krapovickas, A. 32675* (SI); *sine loc.*, 19 March 1991, *Soria, N. 4404* (CTES);

VENEZUELA. **Apure**: Pedro Camejo, 28 February 1978, *Davidse, G. 14631* (SI); **Barinas**: *sine loc.*, February 1953, *Aristeguieta, L. 1582* (NY, US); **Bolívar**: Kamarata, 11 March 1967, *Koyama, T.M. 7560* (US); **Guárico**: Infante, December 1981, *Delascio, F. 11218* (US); Santa Rita, February 1982, *Susach, F. 630* (US); Santa Rita, February 1982, *Susach, F. 635* (US);

SPECIES EXCLUDED FROM THE SECTION

Rhynchospora triflora Vahl, Enum. Pl. 2: 232. (1805) [*non* M.A. Curtis]. *Schoenus triflorus* (Vahl) Poir., Encycl. [J. Lamarck & al.] Suppl. 2. 248 (1811). *Ephippiorhynchium triflorum* (Vahl) Nees, Fl. Bras. (Martius) 2(1): 136 (1842). *Dichromena triflora* (Vahl) J.F. Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 11: 6 (1931). Type: INDIA. "Habitat in India orientali", *Anon. C10010613* (Holotype: C 10010613 digital image!). (Fig. 21).

Rhynchospora stenorrhyncha Griseb., Fl. Brit. W. I. 575. 1864. Type: TRINIDAD AND TOBAGO. *Purdie s.n.* (Holotype: BM, isotype: GH!, GOET 6347 digital image!).

Rhynchospora triflora var. *papuana* Kük., Bot. Jahrb. Syst. 74: 427 (1949). Type: PAPUA NEW GUINEA. Gaima, Lower Fly River, east bank, shallow swamps in savannah forest, November 1936, *Brass, L.J. 8356* (Holotype: BM; isotypes: GH!, BRI 0159450 digital image!, U 1556 digital mage!).

Rhynchospora karuaiana Steyerm., Fieldiana, Bot. 28 (1): 43. f. 5L. (1951). Type: VENEZUELA. Bolivar, Río Karuai, *Steyermark 60334* (Holotype: F 0045581F digital image!, isotype: NY!).

Synonym exclusion: Cephaloschoenus ceylanicus Nees, Edinburgh New Philos. J. 17: 265. 1834. *Rhynchospora ceylanica* (Nees) Kunth, Enum. Pl. 2: 294. 1837. Type: SRI LANKA (Ceylon). *Macrae s.n.* (Holotype: E 386656 digital image!).

Rhizomatous perennial, up to 140 cm tall. **Culm** 2–4 mm wide, trigonous, ribbed, channeled, distally scabrous. **Leaves** 4–7 basal, 2–3 cauline; sheaths up to 20 cm long; blades up to 70 cm × 2–10 mm, flattened, scabrous on margins and abaxial midvein, the apex attenuate. **Synflorescence** with a terminal and 1–2 lateral inflorescences, each of diffuse compound anthelodia of turbinate fascicles; the basal involucral bract up to 27 cm long leaf-like, scabrous; fascicles with 2–6 spikelets. **Spikelets** 6–10.5 mm long, lanceoloid, dark-brown, pedicellate, 2–4-flowered, lower flower bisexual, upper 1–3 flowers staminate; fertile scales 4.5–7.5 × 2–3 mm, ovate-lanceolate, coriaceous, glossy, carinate, long-mucronate. Stamens 3. Bisexual flower with 6 perianth bristles, the bristles up to 6 mm long, reaching the lower half of the stylopodium. **Achene** 3–4 mm × 1.9–2.2 mm, ellipsoid, light-brown to dark-brown, surface transversally rugose, biconvex, base cuneate, stipitate, the apex rounded, smooth to minutely scabrous; stylopodium 4.3–6.5 mm long, 0.4–0.6 mm wide at base, subulate, brownish-yellow or greyish, surface minutely scabrous, base almost square in cross section.

Distribution:— Pantropical. Widely distributed in the tropics. In Americas from Mexico and West Indies south to Paraguay and southeastern Brazil. In Africa from western coast throught central Africa, east to Tanzania and Madagascar and south to South Africa (Raynal 1971, Haynes & Lye 1983, Gordon-Gray 1995). Along the tropical east Asia to Sri Lanka, Indo-China, Malaysia and Papua-New Guinea (Koyama 1979, Strong 2006).

Fig. 21. *Rhynchospora triflora*. A. Habit; B. Spikelet; C. Achene. (A: *Ekman 13245* NY; B–C: *Steyermark 127518* NY).

Habitat:— In marshes, pond margins, river banks and wet savannas. Elevation: up to 1600m.

Distinguish features:— Differs from *R. trispicata,* by its achenes obovoid, 3–4 mm × 1.9–2.2 mm, surface transversally rugose, (*vs.* ellipsoid, 5–6.4 × 1.3–1.8 mm with a verrucose surface.).

Phenology:— Collected with fruits throughout the year.

Discussion:— In the phylogeny in chapter two of this thesis and in a phylogeny using RAD-Seq (Thomas *et al*. ined.) *R. triflora* appears outside of *R.* section *Longirostres*, and

grouped with *R. holoschoenoides* and species of the section *Pluriflorae*. *R. triflora* has a structure of synflorescence and stylopodium similar to *R. trispicata*. However, stylopodium also resembles that of *R. holoschoenoides* and close species. The coriaceous glumes are similar to those found in the section *Pluriflorae* and the achene, both in shape and in ornamentation, also differ from the characteristics of *R.* section *Longirostres*.

The type specimen of *Cephaloschoenus ceylanicus* Nees (= *Rhynchospora ceylanica* (Nees) Kunth), analyzed by image (E386656) of JSTOR (2020) does not have any of the inflorescence (anthelae of dense fascicles), spikelet (glumes membranous, with hyaline margins) and achene (not rugose, with conical stylopodium) typical characteristics of *R triflora* and it certainly does not belong to this species.

Moore (1997) mistakenly cited *Wright 3389*, collected in Cuba as the type of *R. stenorhyncha*. Grisebach (1864) cited "Trinidad, *Pd.*", the abreviattion of *Purdie*.

Selected specimens:— BELIZE. **Belize**. 22 August 1936, *O'Neill, H. 9044* (GH, US); All Pines, 6 March 1931, *Schipp, W.A. 789* (GH, US);

BRAZIL. **Amazonas**: Cacaupereira, 28 June 1986, *Thomas, W.W. 5232* (NY, SI); **Mato Grosso do Sul**: Bela Vista, 13 March 2004, *Hatschbach, G.G. 77094* (MBM); Terenos, 20 February 1970, *Hatschbach, G.G. 23879* (MBM, NY); **Minas Gerais**: *sin. loc.*, April 1840, *Claussen, P. s.n.* (GH); **Rio de Janeiro**: Itatiaia, 5 October 1994, *Braga, J.M.A. 1378* (RB); **São Paulo**: São Paulo, 19 August 1948, *Hoehne, W. 696* (SPF);

CAMEROON. **Garoua**: Sanguere, 15 December 1964, *Raynal, J. 12534* (NY);

COLOMBIA. **Vichada**: Santa Rita, 26 December 1973, *Davidse, G. 5231* (MBM, NY, SI);

COSTA RICA. **Guanacaste**: La Cruz, 21 August 1981, *Gomez-Laurito, J. 7075* (SI);

CUBA. *sin. loc.*, *Wright, C. 3389* (NY, US); **Pinar del Río**: Herradura, 21 October 1923, *Ekman, E.L. 17738* (GH, NY); road to Coloma, 3 November 1923, *Ekman, E.L. 17913* (US); **Villa Clara**: Motembo, 3 January 1919, *León, Fr. 8622* (NY);

DOMINICAN REPUBLIC. **Duarte**: Pimentel, 22 July 1929, *Ekman, E.L. 13245* (GH, NY, US); **Santo Domingo**: Santo Domingo, 12 August 1929, *Ekman, E.L. 13312* (GH);

FRENCH GUIANA. **Corossony**: *sin. loc.*, 19 January 1978, *Raynal-Roques, A.M. 19868* (NY);

GHANA. **Wenchi**: *sin. loc.*, September 1978, *Morton, J.K. GC25077* (NY);

GUYANA. **Georgetown**: southwest of Lamaha, 27 November 1919, *Hitchcock, A.S. 17010* (GH, US); **Mahaica-Berbice**: Mahaicony-Abary rice area, 15 October 1955, *Little*

Jr., E.L. 16872 (US); Mahaicony-Abary rice area 18 October 1955, *Little Jr., E.L. 16900* (US); **Upper Takutu**: Yupukari, 22 October 1996, *Horn, C.N. 11051* (US);

INDIA. Habitat in India orientali, Anon. C10010613 (C);

MALAYSIA. **Pahang**: Tasek Bera, 29 July 1970, *Stone, B.C. 9424* (NY); Tasek Bera, 12 November 1975, *Stone, B.C. 12303* (US);

PANAMA. Panama, between Pacora and Chepo, 1 August 1938, *Woodson Jr., R.E. 1663* (GH, NY);

PAPUA NEW GUINEA. Gaima, Lower Fly River, November 1936, *Brass, L.J. 8356* (BM, GH!, BRI!, U!);

PARAGUAY. Upper Apa river., 27 July 1910, *Hassler, E. 8181* (GH, SI, US); **Amambay**: sierra de Amabay, *Rojas, T. 10030* (NY, SI);

SURINAME. **Wilhelminagebergte**: Zuid River., 26 September 1963, *Irwin, H.S. 57627* (NY);

TRINIDAD AND TOBAGO. *sin. loc. Broadway, W.E. s.n.* (GH); *sin. loc., Broadway, W.E. US2257522* (US); *sin. loc. Purdie s.n.* (GH, GOET);

VENEZUELA. **Bolívar**: Roscio, 22 June 1983, *Huber, O. 7582* (NY); Roscio, 2 December 1982, *Steyermark, J.A. 127518* (MBM); Santa Teresita de Kavanayén, 18 November 1944, *Steyermark, J.A. 60334* (F, NY); **Portuguesa**: Guanare, 24 June 1985, *Stergios, B.G. 8551* (NY);

ZAMBIA. *sin. loc.*, February 1971, *Khiêm, N. 169* (SI); **Kawambwa**: *sin. loc.*, 22 June 1957, *Robinson, E.A. 2361* (NY); **North-Western Province**: Mwinilunga, 17 April 1965, *Robinson, E.A. 6622* (NY).

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COLLECTOR INDEX

Specimens are cited by the name of the first collector. Indicated in parentheses the order number of the species to which it corresponds:

(1a) *Rhynchospora amazonica* subsp. *amazonica*; (1b) *R. amazonica* subsp. *guianensis*; (2) *R. careyana*; (3) *R. corniculata*; (4) *R. corymbosa*; (5) *R. gigantea*; (6) *R. hassleri*; (7) *R.. indianolensis*; (8) *R. inundata*; (9) *R. latibracteata*; (10) *R. macrostachya*; (11) *R. organensis*; (12) *R. panduranganii*; (13) *R. pedersenii*; (14) *R. pseudomacrostachya*; (15) *R. rostrata*; (16) *R. scutellata*; (17) *R. stenocarpa*; (18) *R. trispicata*.

Deguchi, K.: B-1681 (4);

Del Castillo: 501 (4);

Delascio, F.: 11218 (18);

Delnatte, C.: 1198 (18);

Delprete, P.G.: 11012 (18);

Demaree, D.: 3398 (2); 19431 (3); 19656 (3); 20348 (3); 21605 (3); 22217 (3); 23326 (3); 23558 (3); 25243 (3); 25680 (3); 27127 (3); 33006 (3); 33920 (3); 36011 (3); 37440 (3); 37774 (3); 37787 (3); 37908 (3);

Dematteis, M.: 565 (18);

Denham, S.S.: 145 (4);

Devred, R.: 1469 (4);

Diaz, W.: 7273 (1b);

Digiacomo, A.: 136 (7);

Dinklage, M.: 1679 (4);

Dirven, J.G.: 625 (6);

Dombrowski, L.Th.: 2804 (4); 3952 (4); 4444 (4); 4773 (4); 4986 (4); 5432 (4); 5567 (4); 6062 (4); 6126 (4); 6267 (4); 6660 (4); 9700 (4);

Dornelles, H.H.: 2 (4); 9 (4);

Dowell, P.: 6456 (10);

Dreveck, S.: 1276 (4);

Drouet, F.: 1952 (4);

Duarte, A.P.: 5686 (4);

Dümmer, R.: 2590 (4);

Duncan, W.H.: 20404 (2); 30516 (3);

Dusén, P.K.H.: 3763 (4); 11082 (4); 873a (11);

Duss, P.: 3118 (4); 3523 (4);

Edaño, G.E.: 197 (4); 2099-2 (4); 2-107 (4);

Edgar, P.T.: 146 (13);

Egea, J.: 106 (4);

Eiten, G.: 1528 (4); 1544 (4); 5050 (4);

Ekman, E.L.: 12429 (6); 14116 (4); 17739 (18); H11051 (4); H6388 (4);

Elmer, A.D.E.: 20924 (4);

Emmerich, M.: 2078 (4);

Escritor, L.: 2-107 (4);

Espina, J.: 2994 (4);

Esteves, G.L.: 1944 (5);

ex herb. F.L. Harvey: 5 (3); 24 (3);

Eyles, D.: 7562 (8);

Eyma, P.J.: 4043 (4);

Falkenberg, D.B.: 614 (4); 1931 (4); 8265 (5);

Farruggia, F.: 610 (6);

Fassett, N.C.: 25359 (13);

Fendler, A.: 354 (4);

Ferguson, W.C.: 813 (10); 1774 (8); 1790 (10); 2442 (10); 2628 (8); 4302 (10); 6166 (10); 6219 (10); 6419 (10); 7906 (8);

Fernald, M.L.: 333 (8); 552 (10); 831 (8); 3784 (3); 4823 (3); 5651 (3); 6009 (3); 6058 (3); 7350 (3); 8594 (3); 8595 (3); 8956 (10); 8957 (10); 8984 (3); 8985 (3); 9281 (3); 10977 (10); 11273 (10); 11274 (10); 11275 (10); 11316 (10); 11536 (10); 12590 (10); 12591 (10); 13562 (3); 13563 (10); 13564 (10); 13565 (10); 13896 (10); 13897 (10); 13898 (10); 14693 (3); 14694 (3); 14905 (10); 14906 (3); 16400 (10); 16401 (10); 16402 (10); 16403 (10); 16404 (10); 16405 (10); 16406 (10); 16407 (10); 16408 (10); 16409 (8); 16411 (8); 18076 (10); 18077 (10); 18078 (10);

Fernandes, J.: 1382 (4);

Fernández, A.: 1930 (1a); 12247 (4);

Fernández, J.G.: 944 (7);

Ferreira, J.P.R.: 516 (4); 566 (4);

Ferreira, L.F.: 125 (4);

Fisher, G.L.: 385 (7);

Fisher, M.F.: 47 (4);

Capítulo 2: Filogenia de *Rhynchospora* seção *Longirostres* (Cyperaceae)

RESUMO

Rhynchospora sect. Longirostres é um dos primeiros clados divergentes do gênero e possui dois complexos de espécies: o complexo Pantropical, *R. corymbosa* e o norte americano *R. corniculata*. Estudos moleculares anteriores de *Rhynchospora* indicaram que a seção é monofilética, mas apenas quatro das 18 espécies da seção foram incluídas. Aqui, a amostragem foi expandida para 14 espécies e três marcadores moleculares (ETS, ITS e *trnL-F*) para construir uma filogenia molecular da seção. Os resultados mostraram que a seção se torna monofilética com algumas mudanças taxonômicas. Deste modo *R. hassleri* deve ser incluída na seção, enquanto *R. triflora* e *R. hookeri* devem ser excluídas dela. A delimitação tradicional de dois grupos com base na morfologia do estilopódio (subulado vs. cônico) não foi totalmente refletida na filogenia.

Palavras-chave: ETS, ITS, *trnL-F*, complexo

Phylogeny of *Rhynchospora* sect. *Longirostres*

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ABSTRACT

Rhynchospora sect. *Longirostres* is one of the early divergent clades in the genus and has two species complex, the Pantropical *R. corymbosa* and the north american *R. corniculata*. Previous molecular studies of *Rhynchospora* indicated that the section is monophyletic, but just four of the 18 species of the section were included. Here, sampling was expanded to 14 species and three molecular markers (ETS, ITS and *trnL-F*) to build a molecular phylogeny of the section. Results showed that the section becomes monophyletic with a few taxonomic changes. Among those, *R. hassleri* should be included in the section, while *R. triflora* and *R. hookeri* should be excluded from it. The traditional delimitation of two groups based on stylopodium morphology (subulated *vs.* conical) was not fully reflected in the phylogeny.

Keywords: ETS, ITS, *trnL-F*, complex

INTRODUCTION

The genus *Rhynchospora* is pantropical and has approximately 350 species concentrated in tropical America (Buddenhagen *et al*. 2017, Strong 2006,). The genus is characterized by spikelets formed with imbricate and spiral scales, rarely distichous, each scale subtending a flower, with basal flowers bisexual, and more distal flowers functionally staminate, styles single to bilobed, with a persistent style base (stylopodium) on the fruit and achenes usually dorsiventrally lenticular. The synflorescences can be in the form of corymbodia, paniculodia, anthelodia or capitulae (Strong 2006, Goetghebeur 1998).

The most complete revision of the genus was made by Kükenthal (1949, 1950, 1951). He positioned *R.* sect. *Longirostres* in the subgenus *Haplostylis* (Nees) Benth. & Hook.f. with 11 species and 13 varieties (seven of *R corymbosa*) characterized by

spikelets in fascicles, rigid perianth bristles, fruit compressed-lenticular dense puncticulate or turgid-biconvex.

Only three published molecular phylogenies have focused on *Rhynchospora*. Thomas *et al*. (2009) used the traditional chloroplast marker *trnL-F* to clarify the relationship between *Pleurostachys* Brongn. and *Rhynchospora*. Buddenhagen *et al.* (2017) also used *trnL-F* with focus on the Eu-*Rhynchospora* group and Silva-Filho (2018) used ETS, ITS and *trnL-F* to redefine the sections *Tenues* Kük., *Laevinuces* Kük, and *Spermodontes* Kük. In Thomas *et al*. (2009), *R.* sect. *Longirostres* was monophyletic, but only represented by four specimens.

We relied on both chloroplast *trnL-F* and nuclear ETS and ITS markers to build a molecular phylogeny of *Rhynchospora* section *Longirostres* to clarify its limits, monophyly and the relationship among its species and infraspecific taxa.

MATERIALS AND METHODS

DNA sampling, extraction, amplification and sequencing

The molecular phylogenetic analysis comprised 31 currently recognised Cyperaceae taxa (species, subspecies and varieties including the outgroups *Carex purpurifera* Mack. and *Gahnia stokesii* F.Br., and 26 *Rhynchospora* species totalling 141 sequences of three markers: a plastidial intergenic spacer *trnL-F*, and two nuclear ribosomal spacers ITS and ETS. The taxa were chosen focusing on *R.* section *Longirostres* and on the *R. corymbosa* complex. Only four species of the section were not represented (*R. latibracteata* Guagl.; *R. panduranganii* Viji, Shaju & Geetha Kum.; *R. pseudomacrostachya* Gerry Moore, Guagl. & Zartman; and *R. scutellata* Griseb.). No sequences from GenBank were included. The samples are listed in Table 1.

The total genomic DNA was extracted from the tissue of dried leaves in silica gel and samples from herbarium collections of NY, and a few from US, GH and ICN (herbarium acronyms from Thiers 2020). DNA extraction was done using a modified protocol of Alexander *et al.* (2007) combined with the DNeasy Kit method from Qiagen. The markers selected for the analyses have already been widely used in phylogenetic studies of Cyperaceae and have proved to be phylogenetically informative in *Rhynchospora* and related genera (Semmouri *et al*. 2019, Silva Filho 2018, Thomas *et al.* 2009, Ghamkhar *et al*. 2007).

PCR amplification was carried out in 15 µL reaction volumes. For *trn*L-F we combined 0.7 µL of DNA, 7.5 µL of EconoTaq PLUS mastermix from Lucigen, 2 µL of each forward and reverse primers (3 mmol/L) and 2.8 µL of water. For ITS, we used the same recipe, but with 2.8 µL of betaine replacing the 2.8 µL of water. For ETS, we combined 1.25 µL of DNA, 7.5 µL of EconoTaq PLUS mastermix from Lucigen, 0.75 µL of each forward and reverse primers (3 mmol/L) and 0.75 µL of spermidine and 4 µL of water. Initial denaturation was set to 3 min at 96°C. After the cycles, an elongation period of 7 min at 72°C ended the reaction. For *trnL-F*, thirty-three PCR cycles were performed at 94°C for 45 sec, 58°C for 120 sec for each cycle. For ITS, thirty PCR cycles were performed at 94°C for 30 secs, 52°C for 60 sec, and 72°C for 120 sec for each cycle. For ETS, forty PCR cycles were performed at 95°C for 30 sec, 47°C for 30 sec, and 72°C for 90 sec for each cycle. The PCR products were electrophoresed on agarose gels stained with ethidium bromide to confirm a single product. Macrogen from New York, US carried out the sequencing. Primers used are listed in the Appendix.

Table 1. Voucher specimens and markers included in the analysis.

Name	**Voucher**	**ETS**	**ITS**	**trnLF**
Carex purpurifera	United States, Kentucky. *Dorey, J.E. 268* (NY)	X		X
Gahnia stokesii	French Polynesia, Rapa. *Perlman, S. 17939* (NY)	X		X
Rhynchospora alba	Ireland, Gaillimh. *Nee, M.H. 54658* (NY)		X	
R. albiceps	Brazil, Minas Gerais. *Costa 135* (NY)	X	X	X
R. amazonica subsp. *amazonica* 1	Brazil, Roraima. *Forzza, R.C. 6842* (NY)	X	X	
R. amazonica subsp. *amazonica* 2	Peru, Loreto. *McDaniel, S. 29512* (NY)		X	
R. amazonica subsp. *guianensis*	Venezuela, Amazonas. *Liesner, R. 8637* (NY)	X	X	
R. asperula 1	Mexico, Chiapas. *Perez, J.L. 334* (NY)	X	X	
R. asperula 2	Honduras, El Paraíso. *Davidse, G. 2430* (NY)	X		X
R. asperula 3	Brazil, Minas Gerais. *Silva Filho, P.J.S. 2129* (ICN)	X	X	X
R. asperula 4	Uruguay, Treinta y tres. *Weber, P. 618* (ICN)	X	X	X
R. asperula 5	Equatorial Guinea, Malabo. *Carvalho 3769* (US)	X		X
R. asperula 6	Brazil, Santa Catarina. *Weber, P. 621* (ICN)	X		X
R. careyana	United States, Florida. *Naczi, R.F.C. 17155* (NY)	X	X	X
R. consanguinea	Brazil, Minas Gerais. *Costa 144* (NY)			X

Name	Voucher	ETS	ITS	trnLF
R. corniculata	United States, Georgia. *Kral, R. 82655* (NY)	X	X	X
R. corymbosa var. *angustirostris* 1	Mexico, Chiapas. *Breedlove, D.E. 14449* (NY)	X		X
R. corymbosa var. *angustirostris* 2	Uruguay, Tacuarembó. *Weber, P. 591* (ICN)	X	X	X
R. corymbosa var. *chacoensis*	Colombia, Nariño. *Benavides 6855* (NY)	X	X	X
R. corymbosa var. *corymbosa* 1	Thailand, Ranong. *Koyama, T.M. 15235* (NY)			X
R. corymbosa var. *corymbosa* 2	Ecuador, Esmeraldas. *Játiva, C. 2122* (NY)	X		X
R. corymbosa var. *corymbosa* 3	China, Hong Kong. Hu, S.Y. 22425 (GH)	X		X
R. corymbosa var. *corymbosa* 4	Sri Lanka, Ratnapura. *Comanor, P.L. 1134* (NY)	X	X	X
R. corymbosa var. *corymbosa* 5	Samoa, Ta'u. *Whistler, A. 7971* (US)	X		X
R. corymbosa var. *corymbosa* 6	Malaysia, Borneo. Thomas, *W.W. 16832* (NY)	X	X	X
R. corymbosa var. *corymbosa* 7	Micronesia, Caroline Islands. *Perlman, S. 21392* (US)			X
R. corymbosa var. *florida* 1	Belize, Stann Creek. *Naczi, R.F.C. 12237* (NY)	X		X
R. corymbosa var. *florida* 2	Costa Rica, Limon. *Crow, G.E. 7496* (US)	X		X
R. corymbosa var. *legrandii*	Brazil, Rio Grande do Sul. *Weber, P. 551* (ICN)	X	X	X
R. exaltata	Brazil, Minas Gerais. *Leoni, L.S. 2992* (NY)	X	X	X
R. gigantea 1	Belize, Belize. *Naczi, R.F.C. 16357* (NY)	X	X	X
R. gigantea 2	Brazil, Bahia. *Thomas, W.W. 16407* (NY)	X		
R. gigantea 3	Brazil, Espírito Santo. *Marinero, F. V45-51* (MBM)	X	X	X
R. hassleri 1	Bolivia, Santa Cruz. *Halloy, S. 4343* (NY)	X	X	X
R. hassleri 2	Suriname, Wanica. *Dirven, J.G. 625* (NY)	X		
R. holoschoenoides	Brazil, Bahia. *Thomas, W.W. 16408* (NY)	X	X	
R. hookeri	Thailand, Kanchanaburi. *Kostermans 1324* (GH)	X	X	
R. indianolensis 1	Uruguay, Rio Negro. *Weber, P. 601* (ICN)	X	X	X
R. indianolensis 2	United States, Texas. *Rosen, D.J. 4307* (NY)	X	X	X
R. inundata	United States, Florida. *Strong, M.T. 1694* (NY)	X	X	X
R. macrostachya	United States, Maryland. *Longbottom, W.D. 5342* (NY)	X		X
R. organensis	Brazil, Santa Catarina. *Weber, P. 82* (ICN)		X	X
R. pedersenii 1	Bolivia, Santa Cruz. *Ritter, N. 3522* (NY)	X		
R. pedersenii 2	Bolivia, Beni. *Edgar, P.T. 146* (NY)	X		X
R. rostrata 1	Brazil, Distrito Federal. *Mendonça, R.C. 534* (NY)	X	X	X

Name	Voucher	ETS	ITS	trnLF
R. rostrata 2	Brazil, Distrito Federal. *Mendonça, R.C. 523* (NY)	X	X	X
R. setigera	Brazil, Paraná. *Hatschbach, G. 25351* (NY)			X
R. splendens	Brazil, Rio de Janeiro. *Guedes, R.R. 155* (NY)	X	X	X
R. stenocarpa	Brazil, Mato Grosso do Sul. *Kozera, C. 205* (US)		X	X
R. triflora 1	Zambia, North-Western Province. *Robinson, E.A. 6622* (NY)	X	X	
R. triflora 2	Suriname, Wilhelminagebergte. *Irwin, H.S. 57627* (NY)		X	X
R. triflora 3	Malaysia, Pahang. *Stone, B.C. 9424* (NY)			X
R. trispicata	Belize, Stann Creek. *Naczi, R.F.C. 11250* (NY)	X	X	X

Sequence Alignment and Phylogenetic Reconstruction

Sequences were treated in Geneious Prime (Kearse *et al*. 2012) and aligned using MAFFT Alignment (in Geneious). Alignments were manually checked with no need of refininig. The combined alignment (*trnL-F*+ITS+ETS) was concatenated using Geneious Prime. Partition analysis and evolutionary models of nucleotide substitution were defined by Partition Finder 2 (Lanfear *et al*. 2016), run through Anaconda (ASD 2016), using the algorithm PhyML 3.0 (Guindon *et al*. 2010). Model selection was based on the corrected Akaike information criterion (AICc). Models of evolution estimated by Partition Finder for MrBayes 3.2.2 (Ronquist *et al*. 2012) are presented in Table 2. Bayesian Inference and Maximum Likelihood analysis were performed on Cipres Science Gateway (Miller *et al*. 2010). Ten million generations were run using a Markov chain Monte Carlo method, with a sampling frequency of every 1000 generations and four chains. The burn in was 25%, and a 50% majority rule consensus tree was calculated to generate a posterior probability (PP) for each node. Statistics and other information ofthe DNA alignments are presented in Table 2.

Table 2. Data on individual markers and concatenated alignments.

	ETS	ITS	trnL-F	Concatenated
Model of evolution	GTR+I+G	GTR+G	GTR+G	partitioned by markers
Number of sequences	43	32	42	55
Length of aligned matrices (bp)	627	639	1339	2605

RESULTS

The concatenated trees presented 53 terminals, 40 of them from *Rhynchospora* sect. *Longirostres*, representing 14 species (77% of the species in the section). Nineteen terminals are from species and varieties of the *R. corymbosa* complex according to Kükenthal (1949) and Guaglianone (2001). The delimitation of these putative species and varieties is discussed in Chapters 1 and 3 of this thesis.

Bayesian Inference (BI) and Maximum Likelihood (ML) analyses showed very similar results in terms of topology and support. The topology of both trees was nearly identical. BI (Fig. 1) presented greater support, while the ML (Fig. 2) presented greater detail in the group that includes *R. hassleri, R. trispicata, R. amazonica* and *R. stenocarpa*, but with weak to moderate support. Since the BI is a more robust analysis, discussion will focus on the BI concatenated tree.

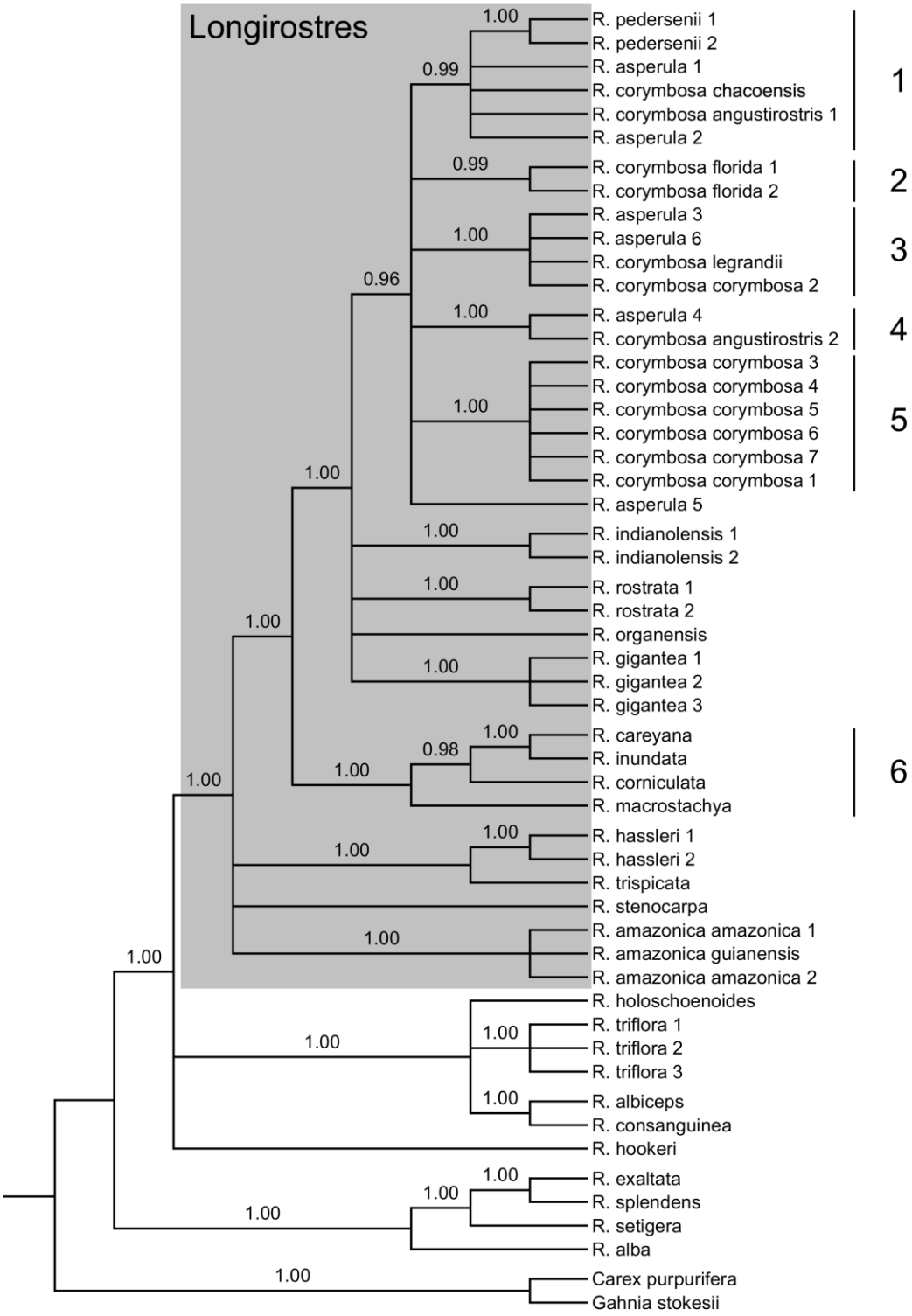

Fig. 1. Bayesian Inference tree based on combined ETS, ITS and *trnL-F*, showing posterior probability node support.

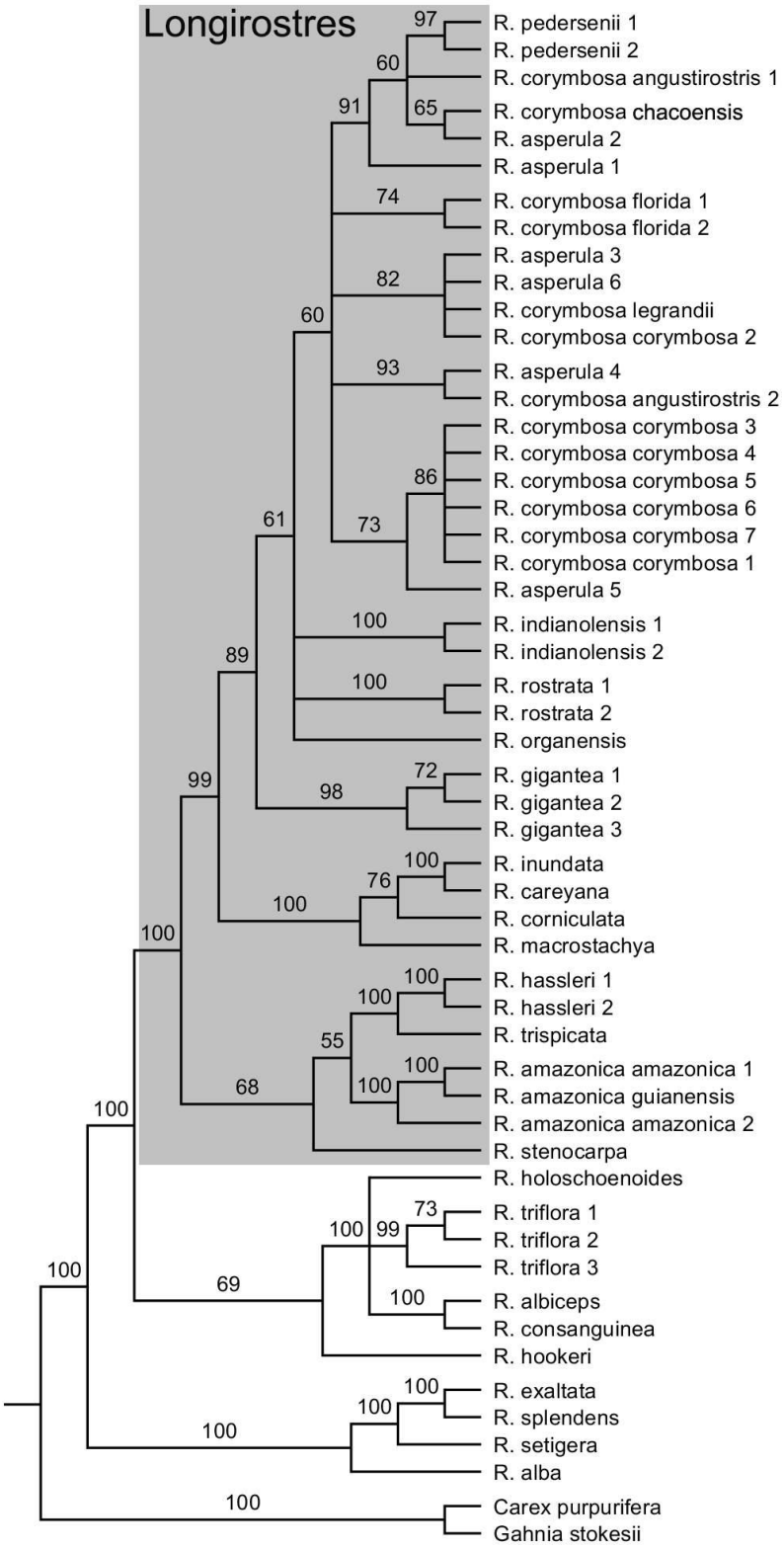

Fig. 2. Maximum Likelihood best tree based on combined ETS, ITS and *trnL-F*, showing bootstrap node support.

Rhynchospora corymbosa is a pantropical species with wide morphological variation. The *R. corymbosa* complex formed a large clade with five (ML) or six (BI) sub-clades,

both with moderate support. *Rhynchospora corymbosa* grouped with *R. asperula* mostly according to geography rather than morphology. The localities of origin of the samples seemed to be more predictive than the identification of the sample. In the BI tree (Fig. 1): In clade 1, two varieties of *R. corymbosa* (*angustirostris* and *chacoensis*) and *R. asperula* (from Mexico, Honduras and Colombia) grouped with an internal clade formed by two *R. pedersenii* specimens from Bolivia. In clade 2, the two samples of *R. corymbosa* var. *florida* are from Central America. In clades 3 and 4 the samples are from South America, again grouping *R. asperula* with varieties of *R. corymbosa*. In clade 5 the *R. corymbosa* var. *corymbosa* samples are from tropical Asia and the Pacific islands. *R. asperula* 5 from Africa (Equatorial Guinea) appears as sister to the clade 5 (ML) or to clades 1 to 5 (BI).

The *R. indianolensis, R. rostrata, R. organensis, R gigantea* and the *R. corymbosa* complex formed a polytomic clade. *Rhynchospora indianolensis* is represented by samples close to its northern and southern distribution limits (United States and Uruguay). Except for *R. rostrata*, all species of the superior clade (from *R. pedersenii* to *R. gigantea*) are characterized by their relatively shorter conical stylopodium when compared to the other species of *R.* section *Longirostres* which have long subulate stylopodium outside this clade.

The species of the *R. corniculata* complex (*R. careyana, R inundata, R. corniculata* and *R. macrostachya*) were grouped in clade 6. *Rhynchospora hassleri* appears grouped with *R. trispicata*. The *R. amazonica* clade appears closer to the *R. hasslerii* + *R. trispicata* clade only in the ML tree, but with weak support. Also, *R. stenocarpa* appears as sister of those three species with moderate support, also only in the ML tree. *R. amazonica* subsp. *guianensis* did not segregate from *R amazonica* subsp. *amazonica*.

Rhynchospora triflora, which has always been considered as belonging to this section, was recovered outside the *Longirostres* clade, along with *R. holoschoenoides*. *Rhynchospora hookeri*, which was also considered within *R.* sect. *Longirostres*, was also recovered in a clade that includes species from *R.* sect. *Pluriflorae* Kük. and *R.* sect. *Polycephalae* C. B. Clarke.

The BI trees for each marker are presented in the Appendix. The *trnL-F* gene tree had enough resolution to segregate the section (bootstrap support = X, posterior probability = X). Although with weak support (bootstrap = X, PP = x), the ITS recovered a clade with most of the species with subulate stylopodia,, ITS gene tree presented some incongruent relationships , such as the presence of *R. hookerii* within the section. The ETS showed

better resolution, segregating the *R. corymbosa* complex and the most of the species with subulate stylopodia with higher support.

DISCUSSION

As traditionally circumscribed *Rhynchospora* sect. *Longirostres* is not monophyletic. Therefore, *R. hassleri* should be included in the section and the *R. triflora* and *R. hookeri* excluded from it. This way the section become a monophyletic group with full support. The expanded sampling presented here confirmed previous results of Thomas *et al.* (2009) and Buddenhagen (2016) where the section was also monophyletic. Despite the monophyly of the section, the *R. corymbosa* complex is still the center of a taxonomic confusion. In recent studies based on morphology, there was no consensus on the circumscription and number of infra-specific taxa in this species. For instance, Kükenthal (1949) segregated the species into eight varieties, Barros (1941, 1945, 1947) recognized six varieties (*angustirostris, asperula, bonariensis, chacoensis, corymbosa* and *legrandii*) in Argentina and neighboring countries. Guaglianone (2001) recognizes the same varieties as Barros (1941, 1945, 1947) but raised *R. asperula* to the species level. In Chapter 3 of this thesis, the authors carry out an integrative taxonomic study of all taxa recognized by Guaglianone (2001) and pointed out that they represent extreme morphotypes within a single species. The morphometric analysis showed that there is a continuum in every analyzed character across every putative variety studied. The phylogeny revealed that the genetic proximity, reflected in the clusters, was more due to geographical rather than morphological proximity. Ecological data obtained from its locations of origin were also unable to point out trends that would help to segregate the supposed varieties.

Kukenthal (1949) treated *R. pedersenii* as *R. gigantea* var. *latifolia* Pfeiffer. Guaglianone (2001) raised it to the level of species. This species can present a much broader and more developed synflorescence than *R. corymbosa*. This, however, is not always observed in studied materials because, when its synflorescence is not fully developed, it resembles *R. corymbosa*. Its achenes have distinct characteristics, but close to those of *R. corymbosa* var. *florida*, with a short achene body and a stylopodium with a sagittate base. No specimens with intermediate characteristics between the two species were found, but the species seems to be relatively rare, despite its wide distribution (from Mexico to southern

Brazil). It is probably the first time that this species is associated with the *R. corymbosa* complex. Further comparative study will be needed.

Rhynchospora indianolensis was treated by Guaglianone (2001) as *R. scutellata*, an endemic species from Cuba, known only by its type specimens. Kükenthal (1949) treated part of this species as *R. scutellata* and part as two varieties, *R. corymbosa* var. *minor* (Martius) Kük. and *R. corymbosa* var. *puncticulata* Kük. Synflorescence and achenes features are very distinct from those of *R. corymbosa*.

Moore (1997) did an extensive comparative morphometric study with the four species of the *R. corniculata* complex (clade 6). The species seem to be well delimited although there are signs of hybridization between them. *Rhynchospora corniculata* is the type species of *R.* sect. *Longirostres*.

Kükenthal (1949) and Strong (2006) treated *R. hassleri* C.B. Clarke as belonging to section *Polycephalae*, along with *R. holoschoenoides* (Rich.) Herter, *R. splendens* Lindman, and *R. exaltata* Kunth. *R. hassleri* has features characteristic of species in *R.* sect. *Longirostres* such as the habit, the general structure of synflorecence, and the morphology of the achene, stylopodium, and bristles. Strong (2006), despite having kept the species in *R.* sect. *Polycephalae*, commented that it might be better placed in *R.* sect. *Longirostres.*

The pantropical *R. triflora* was treated by Kükenthal (1949), Moore (1997), Guaglianone (2001) and Strong (2006) in *R.* sect. *Longirostres*. Althought the synflorescence structure and stylopodium are similar to *R. trispicata*, the stylopodium also resembles that of *R. holoschoenoides* and related species. The coriaceous glumes are similar to those found in *R.* sect. *Pluriflorae*. (section of *R. albiceps* and *R. consanguinea*) and the achene, both in shape and ornamentation, also differs from the those of species in *R.* section *Longirostres*.

Kükenthal (1949) suggested that *R. hookeri* has intermediary features between *R.* sect. *Longirostres* and *R.* sect. *Racemosae* C.B. Clake. However, besides the stylopodium, this species has no resemblance with those of *R.* sect. *Longirostres*. Moore (1997) and Guaglianone (2001) did not address the species in their reviews.

TAXONOMIC TREATMENT

Rhynchospora section **Longirostres** Kunth, Enum. Pl. [Kunth] 2: 292 (1837). Type species: *Rhynchospora longirostris* (Michx.) Elliott = *Rhynchospora corniculata* (Lam.) A.Gray [non *Rhynchospora longirostris* (Nees) Steud. = *Rhynchospora amazonica* subsp. *guianensis* (Kük.) T.Koyama].

Plants perennial, robust, cespitose or rhizomatous. **Culms** stout to slender, erect, trigonous, channeled, usually ribbed, smooth or antrorsely scabrous distally along margins. Leaves basal and cauline, linear, broad to narrowly slender, usually flattened, carinate, smooth or scabridulous to scabrous along the margins and abaxial midvein, the apex attenuate to acuminate. **Synflorescence** with 0–10 lateral and a terminal inflorescence, usually of dense to diffuse compound anthelodia of fascicles, corymbiform, antheliform or umbelliform, with scabrous axis, the basal bracts subentending the inflorescences, leaf-like, generally shorter and narrower than leaf blades, distal involucral bracts becoming setaceous, scabridulous to scabrous; fascicles reduced, turbinate, hemispherical or globose. **Spikelets** lanceoloid, ovoid, ellipsoid, 2–5-flowered; lower 1–2 flowers bisexual, upper flowers staminate; 2–3 lower scales reduced and sterile, fertile scales membranaceous, navicular, carinate, muticous or mucronate. Stamens 3, anthers linear, connective short. Style long, undivided to slightly bifid. Bisexual flower with 4–6 perianth bristles, rigid, slightly dilated at base, antrorsely barbellate sometimes with 1–3 much shorter, persistent on achene. **Achene** obovoid, ellipsoid, oblong or romboid, surface verrucose to transversely rugulose, borders straight to anfractuous; base attenuate, stipitate, appex round or truncate; stylopodium conical or subulate, surface scabridulous, more or less vertically channelled on both faces, base almost straight or shortly bilobed or deeply bilobed (sagittate) overlapping the achene apex on both faces.

1. **Rhynchospora amazonica** Poepp. & Kunth, in Kunth, Enum. Pl. [Kunth] 2: 292 (1837).

1.a. **Rhynchospora amazonica** subsp. **amazonica** Poepp. & Kunth, in Kunth, Enum. Pl. [Kunth] 2: 292. 1837. *Ephippiorhynchium longirostre* var. *amazonicum* (Poepp. & Kunth) Nees in Martius Fl. Bras. (Martius) 2(1): 136. 1842. *Dichromena amazonica* (Poepp. & Kunth) J.F. Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 11: 6. 1931. *Rhynchospora corniculata* subsp. *amazonica* (Poepp. & Kunth) H. Pfeiff., Repert. Spec. Nov. Regni Veg. 49: 76. 1940. Type: BRAZIL. "Prope Ega [Tefé-AM, Brazil] ad fluvium Amazonum, in sylvis siccis," *E.F. Poeppig 2573* (Holotype: B†, isotype: HAL).

1.b. **Rhynchospora amazonica** subsp. **guianensis** (Kük.) T. Koyama, Mem. New York Bot. Gard. 23: 28 (1972). *Calyptrostylis longirostris* Nees, J. Bot. (Hooker) 2: 394 (1840). *Ephippiorhynchium longirostre* (Nees) Nees in Martius, Fl. Bras. 2(1): 136. 1842. *Rhynchospora longirostris* (Nees) Steud. [*non* Elliott.], Syn. Pl. Glumac. 2(8-9): 145. 1855 [*nom. illeg.*]. *Rhynchospora amazonica* var. *guianensis* Kükenthal, Bot. Jahrb. Syst.

74(3): 425. 1949. Type: GUYANA ("Guiana anglica interior"). *Schomburgk 915* (Holotype: B†; isotypes: BM!, G(2)!, K(2)!, NY frag.!, P(2)!, TCD!, US!, W).

2. **Rhynchospora careyana** Fernald, Rhodora. 20: 140. 1918. *Ceratoschoenus macrostachyus* (Torrey ex A. Gray) A. Gray var. *patulus* Chapman, Fl. South. U.S., 529. 1860. *Rhynchospora corniculata* (Lamarck) A. Gray var. *patula* (Chapman) Britton, Trans. New York Acad. Sci. 11: 84 (1892). *Rhynchospora macrostachya* Torrey ex Gray var. *patula* (Chapm.) Chapm., Fl. South. U.S., ed. 3: 556 (1897). Types: UNITED STATES. *Chapman s.n.* (Holotype: NY!)

3. **Rhynchospora corniculata** (Lam.) A. Gray, Ann. Lyceum Nat. Hist. New York 3: 205 (1835); *Schoenus corniculatus* Lamarck, Tabl. Encycl. 1: 137 (1791); *Ceratoschoenus corniculatus* (Lamarck) Nees, Linnaea 9(3): 296 (1834); Type: UNITED STATES. "E. Florida, Carolinia." (not located).

4. **Rhynchospora corymbosa** (L.) Britton. Trans. New York Acad. Sci. 11: 84 (1892). [*non* Domin., *non* Hitchc.]. *Scirpus corymbosus* L. Cent. Pl. II. 7 (1756). *Rhynchospora aurea* Vahl, Enum. Pl. [Vahl] ii. 229. (1805) [*non* Sieber ex Schult.] [*nom. superfl*.]. *Schoenus corymbosus* (L.) Pers., Syn. Pl. [Persoon] 1: 59 (1805). *Chaetospora aurea* Kunth, Nov. Gen. Sp. [H.B.K.] 1: 231 (1816) [*non* Nees] [*nom. superfl*.]. *Dichromena corymbosa* (L.) J.F. Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 11: 6 (1931). Lectotype [designated by Gordon-Gray, Strelitzia 2: 150 (1995)]: Habitat in India. *Anon., s.n.* (LINN 71-48!).

Schoenus floridus Rudge, Pl. Guian.: 15 (1805). *Rhynchospora florida* (Rudge) Schult., Mant. 2: 45 (1824). *Calyptrostylis florida* (Rudge) Nees, Fl. Bras. 2(1): 138 (1842). *Rhynchospora aurea* f. *florida* (Rudge) Lindm., Bih. Kongl. Svenska Vetensk.-Akad. Handl. 26(9): 27 (1900). *Rhynchospora corymbosa* var. *florida* (Rudge) Kük., Bot. Jahrb. Syst. 74: 417 (1949). Type: FRENCH GUIANA. *Martin s.n.* (BM!).

Calyptrostylis asperula Nees, Fl. Bras. (Martius) 2(1): 139 (1842). *Rhynchospora asperula* (Nees) Steud., Syn. Pl. Glumac. 2: 144 (1855). *Rhynchospora corymbosa* var. *asperula* (Nees) Kük., Bot. Jahrb. Syst. 74(3): 416. 1949. Type: BRAZIL. Santa Catarina, Florianópolis ("In insula S. Catharinae"), *Chamisso s.n.* (Holotype: not located; isotype: LE).

Rhynchospora legrandii Kük. ex Barros, Darwiniana 5: 182 (1941). *Rhynchospora corymbosa* subsp. *legrandii* (Kük. ex Barros) Luceño & Vanzela, Canad. J. Bot. 76: 448 (1998). *Rhynchospora corymbosa* var. *legrandii* (Kük. ex Barros) Guagl., Darwiniana 39: 314 (2001). Type: URUGUAY. Dpto. Montevideo, Carrasco, 20 January 1938, *Legrand 1371* (Holotype: B; isotype: SI!).

Rhynchospora corymbosa var. *bonariensis* Barros, Anales Mus. Argent. Ci. Nat. "Bernardino Rivadavia" 41: 386 (1945). Lectotype [designated by Guaglianone. Darwiniana 39: 310 (2001)]: ARGENTINA. Distrito Federal, Belgrano, 8 January 1925, *Barros, M. 171* (BA!; isolectotype: SI!).

Rhynchospora corymbosa f. *angustirostris* Barros, Anales Mus. Argent. Ci. Nat. "Bernardino Rivadavia" 41: 388 (1945). *Rhynchospora corymbosa* var. *angustirostris* (Barros) Guagl., Darwiniana 39: 308 (2001). Lectotype [designated by Barros, Gen. Sp. Pl. Argent. 4(2): 316. (1947)]: ARGENTINA. Misiones, Dpto. San Pedro, Fracrán, 19-23 February 1924, *Hauman s. n., BA 24/775* (BA!).

Rhynchospora corymbosa f. *chacoensis* Barros, Anales Mus. Argent. Ci. Nat. "Bernardino Rivadavia" 41: 388 (1945). *Rhynchospora corymbosa* var. *chacoensis* (Barros) Svenson, Lilloa 14: 73 (1949). Lectotype

[designated by Barros, Gen. Sp. Pl. Argent. 4(2): 315. (1947)]: ARGENTINA. Chaco, Colonia Napalpi, December 1934, *Donat, A. 156*, (BA!; isolectotype: SI!).

5. **Rhynchospora gigantea** Link, Jahrb. Gewächsk. 1(3): 76 (1820). *Calyptrostylis gigantea* (Link) Nees, Fl. Bras. (Martius) 2(1): 137 (1842). *Dichromena gigantea* (Link) J.F. Macbr., Publ. Field Columb. Mus., Bot. Ser. 11: 6 (1931). Type: BRAZIL. Habitat in Brasilia, *Hoffmannsegg s.n.*, B-Willd 1129 (Holotype: B).

6. **Rhynchospora hassleri** C.B. Clarke, Bull. Herb. Boissier, sér. 2, 3: 1023 (1903). Type: PARAGUAY. In regione cursus superioris fluminis Apa. December 1902, *Hassler, E. 8255* (Holotype: K!, isotype: BM!, G(2)!, NY!, frag. SI!, UC!).

7. **Rhynchospora indianolensis** Small, Fl. Southeastern United States [Small]. 193: 1327 (1903) [as *Rynchospora*]. Type: UNITED STATES. Texas: Damp prairie near Indianola, 3 May 1869, *Ravenel, H.W. 160* (Holotype: NY!, isotypes: MO(2)!, US!).

8. **Rhynchospora inundata** (Oakes) Fernald, Rhodora. 20: 139. 1918. *Ceratoschoenus macrostachyus* (Torrey ex A. Gray) A. Gray var. *inundatus* Oakes, Mag. Hort. Bot. 7: 185. (1841); *Rhynchospora macrostachya* Torrey ex A. Gray var. *inundata* (Oakes) Fernald, Rhodora 8: 164 (1906). Type: UNITED STATES. Massachusetts, Plymouth, West Pond, 1839, *Tuckerman s.n.* (Holotype: GH!; isotypes: NY!, US!).

9. **Rhynchospora latibracteata** Guagl., Darwiniana 39: 318 (2001). Type: BRAZIL. Rio Grande do Sul, de Santa Maria a Júlio de Castilhos, 2 November 1962, *Rosengurtt 8787* (Holotype: MVFA!).

10. **Rhynchospora macrostachya** Torrey ex A. Gray, Ann. Lyceum Nat. Hist. New York. 3: 206. (1835). [*non* Palla]. *Ceratoschoenus macrostachyus* (Torrey ex A. Gray) A. Gray. Ann. Lyceum Nat. Hist. New York 3: 369 (1836). *Rhynchospora corniculata* var. *macrostachya* (Torr. ex A. Gray) Britton, Trans. New York Acad. Sci. 11: 84 (1892). Lectotype (Moore 1997): UNITED STATES. Massachusetts, Amherst, *Hitchcock s.n.* (NY!).

11. **Rhynchospora organensis** C.B. Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8: 37 (1908). *Rhynchospora corymbosa* (L.) Britton var. *organensis* (C.B. Clarke) Kük., Bot. Jahrb. Syst. 74: 416. (1949). Type: BRAZIL. Rio de Janeiro, Organ Mountains, by the sides of streams, May 1837, *Gardner, M. 717* (Holotype: K!; isotypes: G!, K!).

12. **Rhynchospora panduranganii** Viji, Shaju & Geetha Kum., Kew Bull. 69(3)-9519: 1 (2014). *Rhynchospora corymbosa* var. *panduranganii* (Viji, Shaju & Geetha Kum.) Sang. Dey & Prasanna, Fasc. Fl. India 27: 38 (2015). Type: INDIA. Kerala, Wayanad Distr., 11° 54' 35.3" N 75° 59' 09.4" E, 18 October 2011, *Viji, A.R. 71033* (Holotype TBGT; isotypes CALI, MH).

13. **Rhynchospora pedersenii** Guagl., Darwiniana 39: 321 (2001). *Rhynchospora gigantea* Link var. *latifolia* H. Pfeiff., Repert. Spec. Nov. Regni Veg. 17: 236. 1921, [non *R. latifolia* (Baldwin ex Ell.) W.W. Thomas]. Type: BRAZIL. Paraná, prope Morretes in fruticetis subuliginosis, 19 November 1911, *Dusén 13427* (Holotype B; isotype: S!, SI!).

14. **Rhynchospora pseudomacrostachya** Gerry Moore, Guagl. & Zartman, Brittonia 54(4): 340 (2003). Type: BRAZIL. Santa Catarina, Mun. Lajes, Rio Caveiras, along Estrada de Rodagem Federal south of Lajes, 900 m, 3 December 1956, *Smith, L.B. 8140* (Holotype: US!; isotypes: HBR!, R!, SI!).

15. **Rhynchospora rostrata** Lindm., Bih. Kongl. Svenska Vetensk.-Akad. Handl. 26(9): 27 (1900). Lectotype [designated by Guaglianone, Darwiniana 39(3-4): 240 (2001)]: BRAZIL. Minas Gerais, between Tejuco and Veraba, In fulvis Veraba, 13 September 1827, *Burchell 5786* (K!; isolectotype: P!).

16. **Rhynchospora scutellata** Griseb., Cat. Pl. Cub.: 246 (1866). Type: CUBA. *Wright, C. 3406* (Holotype: GOET!, isotypes: BM!, GH!, MO!, NY(2)!, P(2)!, US!).

17. **Rhynchospora stenocarpa** Kunth, Enum. Pl. 2: 294 (1837). *Ephippiorhynchium stenocarpum* (Kunth) Nees, Fl. Bras. (Martius) 2(1): 136 (1842). Type: BRAZIL. "Brasilia meridionalis" *Sellow s.n.* (B†, Type image F0BN011157).

18. **Rhynchospora trispicata** (Nees) Schrad. ex Steud., Syn. Pl. Glumac. 2: 145. 1855. *Ephippiorhynchium trispicatum* Nees in Martius, Fl. Bras. 2(1):136. 1842. Type: BRAZIL. "In campestribus udis provinc. Piauhy," *Martius 3232* (Holotype: M, frag. SI!).

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APPENDIX

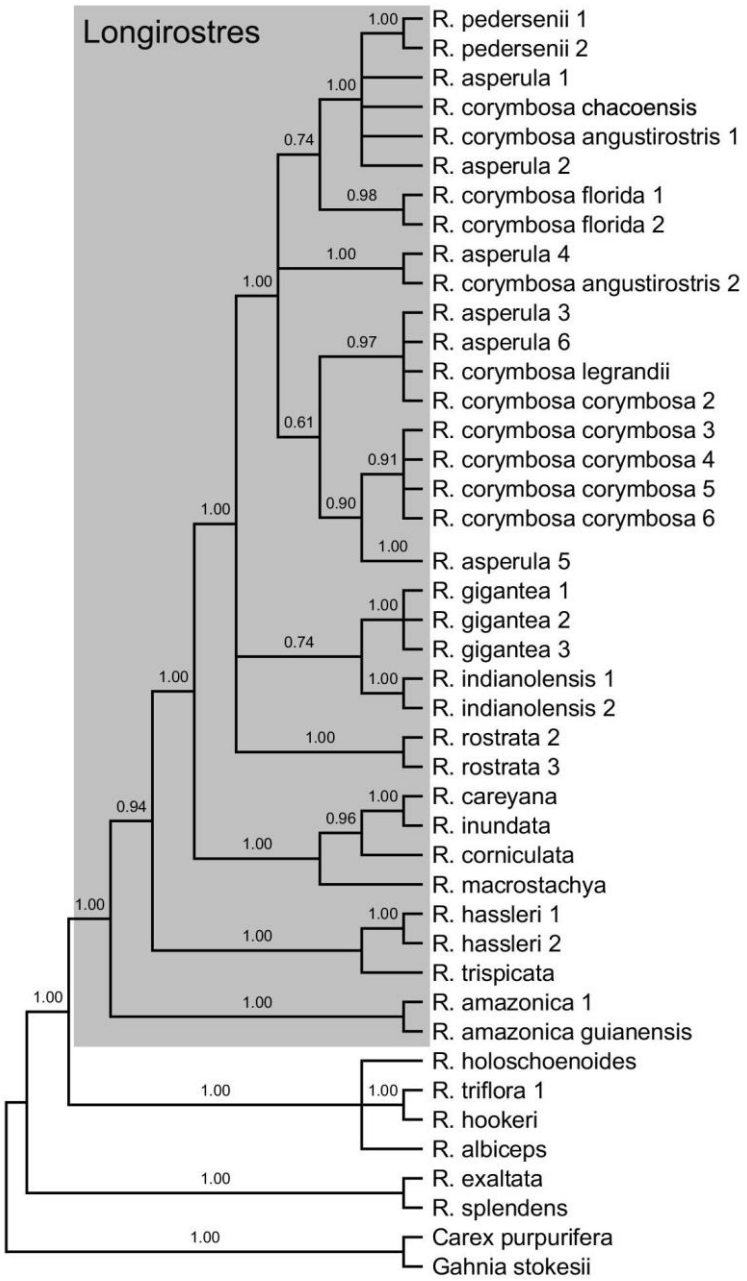

Fig. 4. Majority rule consensus tree from the Bayesian Inference of ETS, posterior probability are indicated.

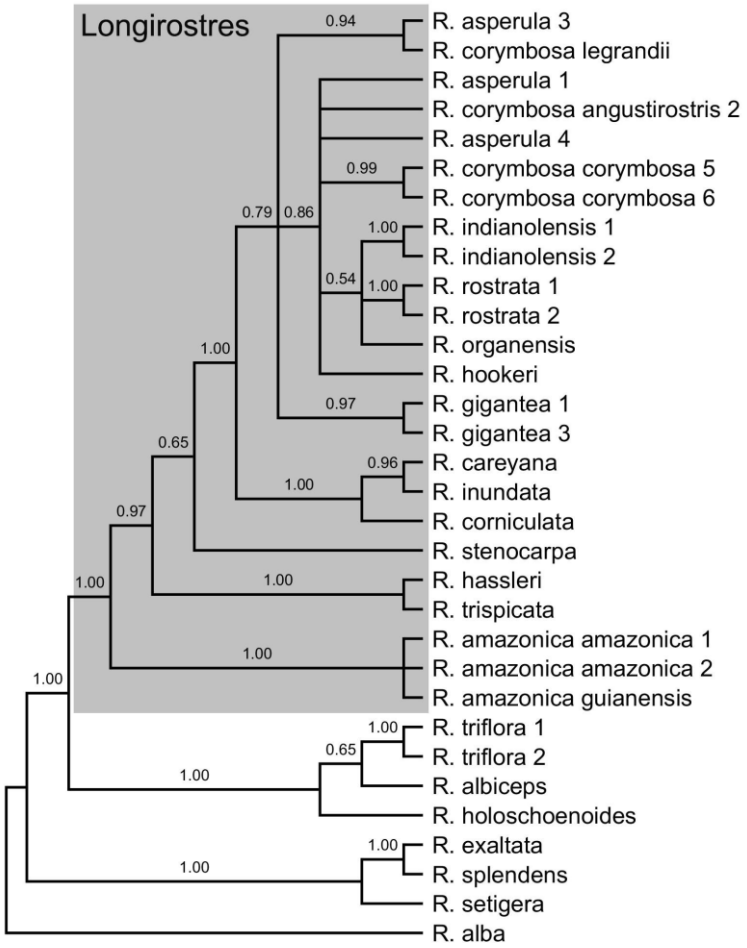

Fig. 5. Majority rule consensus tree from the Bayesian Inference of ITS, posterior probability are indicated.

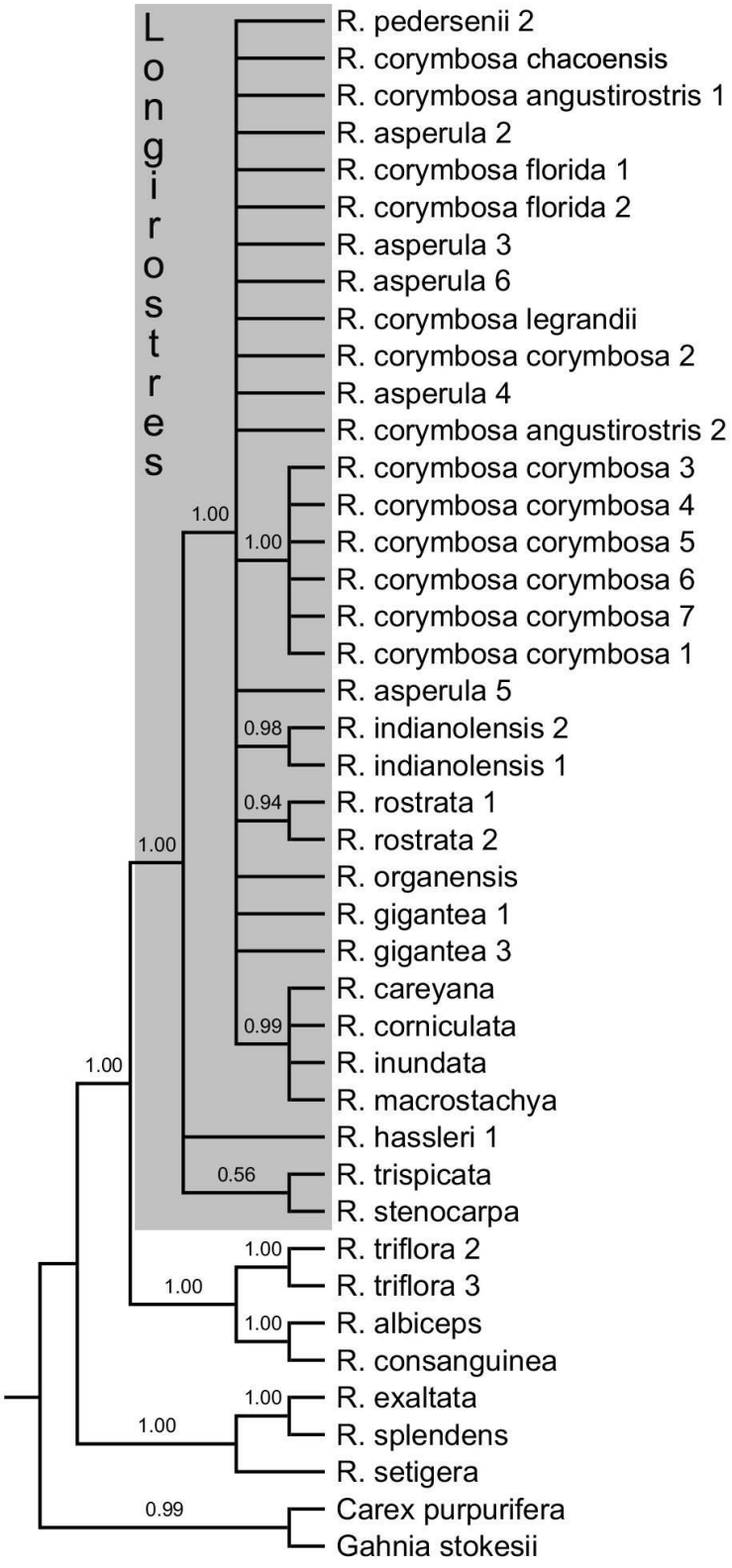

Fig. 6. Majority rule consensus tree from the Bayesian Inference of *trnL-F*, posterior probability are indicated.

PRIMER SEQUENCES.

Primers developed by Silva Filho (2018).

ETS

1F - (tm 60.2) – AGTTGTTCTTGGCGTGCTCT

1R - (tm 60.2) – GCAGGATCAACCAGGTAGCA

ITS

5i – AGGTGACCTGCGGAAGGATCATT

4i – GGGTAGTTCCCGCCTGACCTGG

trnL-F

c – CGAAATCGGTAGACGCTACG

f – ATTGAACTGGTGACACGAG

Capítulo 3: Taxonomia Integrativa do complexo *Rhynchospora corymbosa* (Cyperaceae)

RESUMO

Rhynchospora corymbosa é uma espécie extremamente variável e o centro de um complexo com pelo menos 11 entidades infra-específicas descritas. Seis delas, citadas para o sul da América do Sul, fazem parte deste estudo. A classificação e circunscrição destes complexos são muito problemáticas, apresentando caracteres diagnósticos muito próximos e por vezes sobrepostos. Aplicamos abordagens morfométricas, ecológicas e filogenéticas para avaliar se a classificação infraespecífica pode ser sustentada em termos de variação morfológica e ambiental. As análises estatísticas refletiram a alta variação e sobreposição na distribuição dos caracteres diagnósticos e a amplitude de variação das medidas dos caracteres diagnósticos foi maior que a publicada em revisões da seção. As variáveis ambientais mais preditivas foram temperatura média anual, variação diária média, isotermalidade e precipitação anual. Nas análises Cluster e NMDS, todas as variedades apareceram misturadas, sem padrão identificável. No geral, a análise morfométrica mostrou que há um continuo em cada um dos caracteres analisados, em todas as supostas variedades. A filogenia revelou que a proximidade genética, refletida nos agrupamentos, era devida mais à proximidade geográfica do que morfológica.

Palavras-chave: ITS, ETS, filogenia, Poales, complexo de espécies, *trnL-F*

Integrative taxonomy of the *Rhynchospora corymbosa* complex

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ABSTRACT

Integrative taxonomy gives priority to species delineation using multiple and complementary perspectives, emphasizing that describing morphological diversity does not require the naming of any single set of specimens. *Rhynchospora corymbosa* is an extremely variable species, and the center of a complex with at least 11 described infraspecific entities. Six of them cited for southern South America are part of this study. Their classification and circumscription are very problematic, presenting very close and sometimes overlapping diagnostic characters. We applied morphometric, ecological, and phylogenetic approaches to evaluate whether the infraspecific classification could be sustained in terms of morphological and environmental variation. The statistical analyses reflected the high variation and overlap in the morphometry of the diagnostic characters, and the range of variation in the measurements of diagnostic characters was greater than that published in section reviews. The most predictive environmental variables were annual mean temperature, mean diurnal temperature range, isothermality, and annual precipitation. In the Cluster and NMDS analyses, all varieties appeared mixed together, with no identifiable pattern. Altogether the morphometric analysis showed that there are continua in all analyzed characters across every putative variety. The phylogeny revealed that the genetic proximity reflected in the clusters was due more to geographical than morphological proximity.

Keywords: beaksedges, ITS, ETS, phylogeny, Poales, species complex, *trnL-F*

1. INTRODUCTION

Integrative taxonomy is defined as the science that aims to delimit the units of life's diversity from multiple and complementary perspectives (Dayrat 2005). Integrative approaches have been very useful in identifying diagnostic morphological characters in

species delimitation, enabling the understanding of how abiotic factors influence the geographical distribution of taxa, and whether these factors may be driving to specific changes in phenotypic variation patterns (Chandler & Crisp 1998, Henderson 2006, Sreekumar *et al*. 2006). Integrative taxonomy gives priority to species delineation using multiple and complementary perspectives, emphasizing that describing morphological diversity does not require the naming of any single set of specimens (Dayrat 2005). An integrative approach based on morphometry, ecological and molecular data were used recently to solve taxon delimitations in species complexes in *Carex* L. (Cyperacae) (Míguez *et al.* 2018), *Cypella* Herb. (Iridaceae) (Pastori *et al.* 2018), *Hypericum* L. (Hypericaceae) (Vogel-Ely *et al*. 2018), and *Pagamea* Aubl. (Rubiaceae) (Prata *et al*. 2018). Morphometrical analyses were also helpful in solving issues in the *Calamus javensis* Blume complex (rattan, Arecaceae) (Atria *et al.* 2017), showing the importance of these techniques in different angiosperm taxa.

Cyperaceae is one of the ten most diverse plant families in the world, comprising about 109 genera and 5,424 species (Govaerts & Simpson 2007). It has an almost cosmopolitan distribution, presenting an expressive floristic element and a physiognomic characterization of humid areas. Ecologically, in terms of total biomass and ecosystem services, the Cyperaceae family is one of the most important vascular plant families (Bryson & Carter 2008). In the family, the genus *Rhynchospora* Vahl (Vahl 1805) is one of the richest with about 350 species (WCSP 2020).

Rhynchospora corymbosa (L.) Britton (Britton 1892) belongs to section *Longirostres* Kunth, and was first described as *Scirpus corymbosus* L. (Linnaeus 1756) from India. It is characterized by the antheliform terminal inflorescence with numerous axes, up to the 3rd order; 1-5 (-6) lateral inflorescences; spikelets arranged in fascicles; a conical to pyramidal stylopodium; and the presence of hypogynous bristles (Kükenthal 1949, Thomas 1992, Guaglianone 2001, Strong 2006). It is, however, an extremely variable species in terms of the inflorescence branching, the variable density of spikelet fascicles, the size of spikelets, and the shape and length of the achenes and length of the stylopodium (Guaglianone 2001). The species is a complex with at least 11 described infraspecific taxa (WCSP 2020). Six of them cited for southern South America are part of this study. Their classification and circumscription are very problematic, with very close and sometimes overlapping diagnostic characters.

Despite the abundant infra-specific ranks, the complex also include other species that depending on the author are included in *R. corymbosa* or treated as an independent species. For instance, *R. corymbosa* var. *legrandii* was first described by Barros (1941) as *R. legrandii*, attributing authorship to Kükenthal. Kükenthal (1949), however, did not recognize *R. legrandii*, but cited a specimen of it (Osten 6500) under *R. corymbosa* var. *corymbosa* and its holotype (*Legrand 1371*) as the new *R. corymbosa* var. *grandispiculosa* Kük. Barros (1945) described the variety *R. corymbosa* var. *bonariensis*, and the forms *R. corymbosa* f. *angustirostris* and *R. corymbosa* f. *chacoensis*. Kükenthal (1949) listed six varieties, including *R. corymbosa* var. *asperula* (Nees) Kük. but did not include any of the four taxa studied by Barros (1945). Guaglianone (2001) recognized, as varieties of *R. corymbosa*, the four taxa described by Barros (1945) and treated *R. asperula* (Nees) Steud. (Steudel 1855) at the rank of species.

This study is part of a project on taxonomy, phylogeny and biogeography of *Rhynchospora* sect. *Longirostres*. Its aim is to investigate the morphological delimitation and ecological influence among the six varieties of *R. corymbosa* at the southern limit of its distribution in South America (from Bolivia to north of Argentina) to help solve taxonomic issues witin the species complex. Specifically, we tested for (1) morphological differentiation of *R corymbosa* varieties using 6 characters and a comprehensive sample of geo-referenced specimens and field observations, and (2) to discern their ecological variables. We tested (3) which morphological characters, if any, are the most useful in identifying each variety.

2. MATERIALS AND METHODS

2.1. Specimens and morphological data

A total of 146 herbarium specimens (Table 4 in Appendix) from 108 localities were selected as representative of the *Rhynchospora corymbosa* complex (Figure 1) at the southern end of its range in the Americas. We measured 62 specimens of *R. corymbosa* var. *asperula*; 27 of an unnamed variety that was incorrectly treated as *R. corymbosa* var. *corymbosa* by Guaglianone (2001) and Barros (1945, 1947) that here will be called var. 1; 22 of *R. corymbosa* var. *angustirostris* (including the lectotype); 12 of *R. corymbosa* var. *bonariensis* (including the lectotype and one paratype); 15 of *R. corymbosa* var. *chacoensis* (including the lectotype); and eight of *R. corymbosa* var. *legrandii* (including one paratype). The specimens were identified according to Guaglianone (2001) the most

recent revision of the group. The diagnostic characters for the *R. corymbosa* varieties are presented in Table 1. Specimen selection used two primary criteria: the presence of mature achenes and precise information about the collection locality (i.e. geographic coordinates or municipality). The specimens and achenes were analysed and photographed in 16 herbaria: BA, CTES, FLOR, GH, ICN, JAR, MBM, MVFA, MVJB, NY, R, RB, SI, SPF, UPCB, US (herbarium acronyms from Thiers 2020). The measurements of structures less than 1 cm long were made using ImageJ 1.46r software. Measurements were made on the morphological characters formally recognized as diagnostic (Guaglianone 2001) in the separation of six *Rhynchospora corymbosa* varieties in South America: (1) distance between the upper lateral and the terminal inflorescence, (2) length and (3) width of the terminal inflorescence, (4) number of lateral inflorescences, (5) spikelet length, (6) length and (7) width of the achene body and (8) stylopodium length. All traits were checked for multicollinearity, which was detected between length and width of the apical inflorescence ($r > 0.8$) and between length and width of the achene body. Thus, two new morphological variables were created: length/width terminal inflorescence ratio and length/width achene body ratio.

Due to absence of complete inflorescence in some specimens the datasets contained nine (1.5%) missing data.

Table 2. Diagnostic characters of *Rhynchospora corymbosa* varieties, according to Guaglianone (2001)

Varieties	Terminal inflorescence length (cm)	Terminal inflorescence width (cm)	Number of lateral inflorescences	Spikelet length (mm)	Achene length (mm)	Achene width (mm)	Stylopodium length (mm)
angustirostris	9-24	not described	1-4	7-8	3.5-4.1	1.8-2.2	2.5-3.8
asperula	8-14(-26)	6.5-12	2-6	(5-)6-7.5	2.8-3.1	1.3-1.6	2.4-4.5
bonariensis	7-17	not described	(2-)3-5	8-11	4-4.5	1.8-2	(4-)4.5-5
chacoensis	up to 10	not described	not described	6-8	3-3.2	2-2.3	2-2.8
legrandii	10-15	not described	1-4	8-10	3.2-3.5	1.8-2.5	4.5-6
var. 1 (as *corymbosa*)	6.5-20	7-20	1-4	5-8	2.5-3	1.5-2	2.5-3

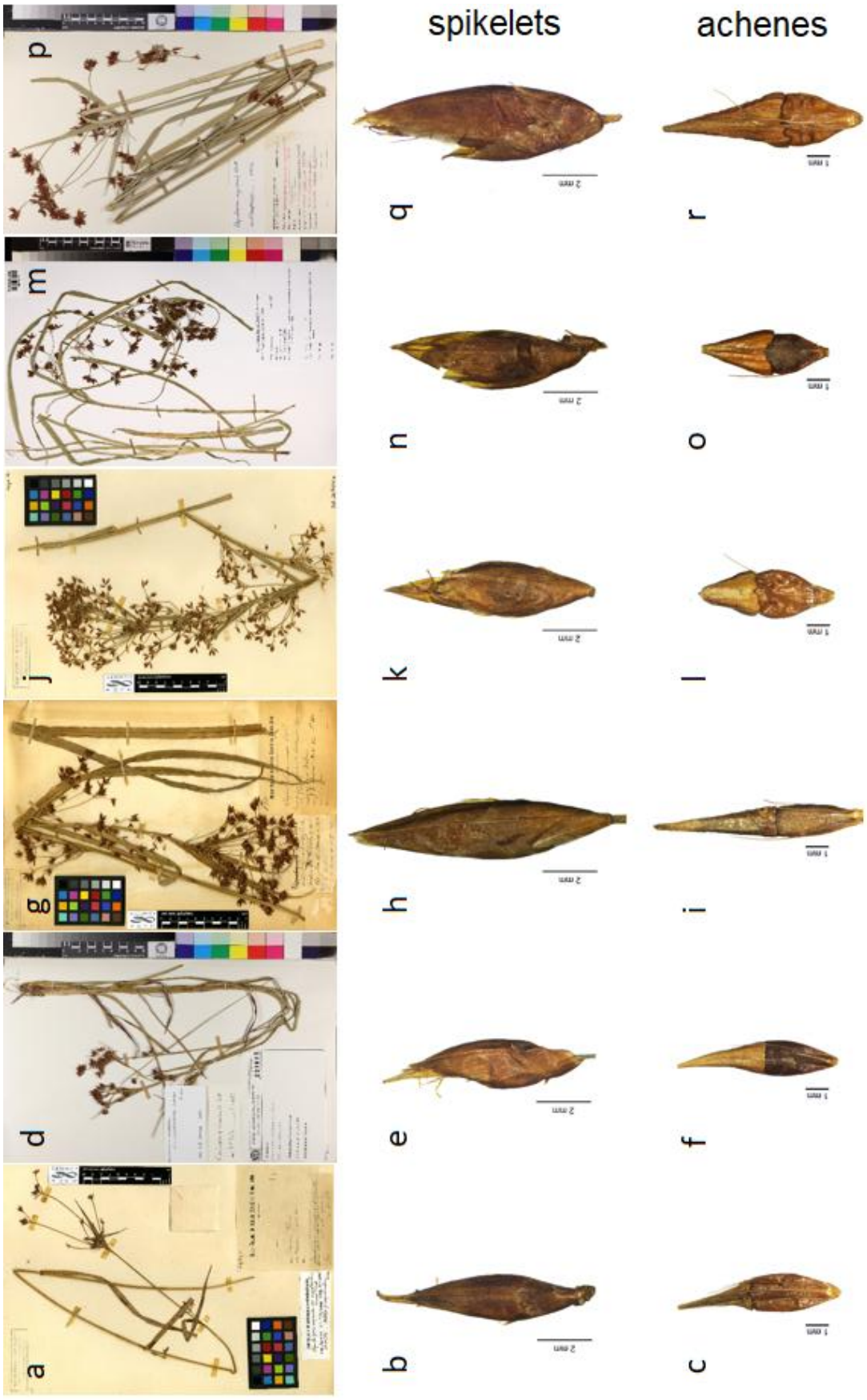

Figure 1. A-C. *Rhynchospora corymbosa* var. *angustirostris*; D-F. *Rhynchospora corymbosa* var. *asperula*; G-I. *Rhynchospora corymbosa* var. *bonariensis*; J-L. *Rhynchospora corymbosa* var. *chacoensis*; M-O. *Rhynchospora corymbosa* var. 1; P-R. *Rhynchospora corymbosa* var. *legrandii*;

2.3. Ecological data

To evaluate distributional response to environmental gradients, we built a database of environmental variables based on occurrence records. Nineteen climatic variables were from the WorldClim database – Global Climate Data (*https://www.worldclim.org/bioclim*): (1) annual mean temperature; (2) mean diurnal range (mean of monthly (max temp - min temp)); (3) isothermality (100 × mean diurnal range / temperature annual range); (4) temperature seasonality (standard deviation ×100); (5) max temperature of warmest month; (6) min temperature of coldest month; (7) temperature annual range (max temperature of warmest month - min temperature of coldest month); (8) mean temperature of wettest quarter; (9) mean temperature of driest quarter; (10) mean temperature of warmest quarter; (11) mean temperature of coldest quarter; (12) annual precipitation; (13) precipitation of wettest month; (14) precipitation of driest month; (15) precipitation seasonality (coefficient of variation); (16) precipitation of wettest quarter; (17) precipitation of driest quarter; (18) precipitation of warmest quarter; (19) precipitation of coldest quarter.

2.4. Analyses

To evaluate the morphological differentiation among varieties, we first performed a non-parametric analysis of variance (Kruskal-Wallis), since all traits did not meet the assumptions of normality and homogeneity of variance. For significant results, the varieties differences were evaluated through Dunn's test ($P<0.025$). We applied two multivariate analyses: hierarchical cluster analysis (HCA) using Ward's method and non-metric multidimensional scaling (NMDS). For both analyses, we normalized data by zero mean and unit variance, and used Euclidean distance as a dissimilarity measure. To assess the relationship between the morphology of species varieties and the climatic gradient, we fit all climatic variables into the NMDS ordination and assessed the significance of the variables through permutation tests. The non-correlated climatic variables exhibiting the highest R^2 scores were selected and interpreted according to their relationships with species varieties. A Mantel test, based on Pearson's product-moment correlation, was performed to seek a statistically significant relationship between morphological and environmental distance matrices (Legendre & Legendre, 2012). For this analysis, two matrices of equivalent size were used, one containing the environmental dataset and other containing the morphological dataset. All tests were performed in the R Statistical Environment (R Foundation for Statistical Computing, Vienna, AT; http://www.R-

project.org), using the packages dunn.test v.1.3.5 (Dinno 2017) and vegan v.2.5-5 (Oksane *et al.* 2019).

2.5. DNA sampling, extraction, amplification and sequencing

The molecular phylogenetic analysis comprised 22 currently recognised Cyperaceae taxa, including the outgroups *Carex purpurifera* Mack. and *Gahnia stokesii* F.Br., and eight taxa of the *Rhynchospora corymbosa* complex generating 81 sequences of three markers: a plastidial intergenic spacer *trnL-F*, and two nuclear ribosomal regions, ITS and ETS. The taxa were chosen focusing on the *R. corymbosa* complex. No sequences from GenBank were included. The samples are listed in Table 3. The data will be included in GenBank when this paper is accepted for publication.

The total genomic DNA was extracted from the tissue of dried leaves in silica gel and sampled from herbarium collections of the NY, a few from the US, GH and ICN (abbreviations from Thiers 2020). DNA extraction was done using a modified protocol of Alexander *et al.* 2007 combined with the DNeasy Kit method from Qiagen. The markers selected for the analyses have already been widely used in phylogenetic studies of Cyperaceae and have proved to be phylogenetically informative in *Rhynchospora* and related genera (Semmouri *et al*. 2019, Silva Filho 2018, Thomas *et al.* 2009, Ghamkhar *et al*. 2007)

PCR amplification was carried out in 15 µL reaction volumes. For *trn*L-F we combined 0.7 µL of DNA, 7.5 µL of EconoTaq PLUS mastermix from Lucigen, 2 µL of each forward and reverse primers (3 mmol/L) and 2.8 µL of water. For ITS, we used the same recipe, but with 2.8 µL of betaine replacing the 2.8 µL of water. For ETS we combined 1.25 µL of DNA, 7.5 µL of EconoTaq PLUS mastermix from Lucigen, 0.75 µL of each forward and reverse primers (3 mmol/L) and 0.75 µL of spermidine and 4 µL of water. Initial denaturation was set to 3 min at 96°C. After the cycles, an elongation period of 7 min at 72°C ended the reaction. For *trnL-F*, thirty-three PCR cycles were performed at 94°C for 45 sec, 58°C for 120 sec for each cycle. For ITS, thirty PCR cycles were performed at 94°C for 30 secs, 52°C for 60 sec, and 72°C for 120 sec for each cycle. For ETS, forty PCR cycles were performed at 95°C for 30 sec, 47°C for 30 sec, and 72°C for 90 sec for each cycle. The PCR products were electrophoresed on agarose gels stained with ethidium bromide to confirm a single product. The sequencing was carried out by Macrogen, New York, US. Primers used are listed in Appendix.

Table 3. Vouchers of all specimens included in the analysis

Name	Voucher	ETS	ITS	trnLF
Carex purpurifera	United States, Kentucky. *Dorey, J.E. 268* (NY)	X		X
Gahnia stokesii	French Polynesia, Rapa. *Perlman, S. 17939* (NY)	X		X
Rhynchospora alba	Ireland, Gaillimh. *Nee, M.H. 54658* (NY)		X	
R. amazonica subsp. *amazonica*	Brazil, Roraima. *Forzza, R.C. 6842* (NY)	X	X	
R. careyana	United States, Florida. *Naczi, R.F.C. 17155* (NY)	X	X	X
R. consanguinea	Brazil, Minas Gerais. *Costa 144* (NY)			X
R. corniculata	United States, Georgia. *Kral, R. 82655* (NY)	X	X	X
R. corymbosa var. 1	Colombia, Nariño. *Benavides 6855* (NY)	X	X	X
R. corymbosa var. *angustirostris* 1	Mexico, Chiapas. *Breedlove, D.E. 14449* (NY)	X		X
R. corymbosa var. *angustirostris* 2	Uruguay, Tacuarembó. *Weber, P. 591* (ICN)	X	X	X
R. corymbosa var. *asperula* 1	Mexico, Chiapas. *Perez, J.L. 334* (NY)	X	X	
R. corymbosa var. *asperula* 2	Honduras, El Paraíso. *Davidse, G. 2430* (NY)	X		X
R. corymbosa var. *asperula* 3	Brazil, Minas Gerais. *Silva Filho, P.J.S. 2129* (ICN)	X	X	X
R. corymbosa var. *asperula* 4	Uruguay, Treinta y tres. *Weber, P. 618* (ICN)	X	X	X
R. corymbosa var. *asperula* 5	Equatorial Guinea, Malabo. *Carvalho 3769* (US)	X		X
R. corymbosa var. *asperula* 6	Brazil, Santa Catarina. *Weber, P. 621* (ICN)	X		X
R. corymbosa var. *corymbosa* 1	Ecuador, Esmeraldas. *Játiva, C. 2122* (NY)	X		X
R. corymbosa var. *corymbosa* 2	China, Hong Kong. Hu, S.Y. 22425 (GH)	X		X
R. corymbosa var. *corymbosa* 3	Sri Lanka, Ratnapura. *Comanor, P.L. 1134* (NY)	X	X	X
R. corymbosa var. *corymbosa* 4	Samoa, Ta'u. *Whistler, A. 7971* (US)	X		X
R. corymbosa var. *corymbosa* 5	Malaysia, Borneo. Thomas, *W.W. 16832* (NY)	X	X	X
R. corymbosa var. *corymbosa* 6	Micronesia, Caroline Islands. *Perlman, S. 21392* (US)			X
R. corymbosa var. *corymbosa* 7	Thailand, Ranong. *Koyama, T.M. 15235* (NY)			X
R. corymbosa var. *florida* 1	Belize, Stann Creek. *Naczi, R.F.C. 12237* (NY)	X		X
R. corymbosa var. *florida* 2	Costa Rica, Limon. *Crow, G.E. 7496* (US)	X		X
R. corymbosa var. *legrandii*	Brazil, Rio Grande do Sul. *Weber, P. 551* (ICN)	X	X	X
R. gigantea	Brazil, Espírito Santo. *Marinero, F. V45-51* (MBM)	X	X	X

Name	Voucher	ETS	ITS	trnLF
R. holoschoenoides	Brazil, Bahia. *Thomas, W.W. 16408* (NY)	X	X	
R. indianolensis	Uruguay, Rio Negro. *Weber, P. 601* (ICN)	X	X	X
R. inundata	United States, Florida. *Strong, M.T. 1694* (NY)	X	X	X
R. macrostachya	United States, Maryland. *Longbottom, W.D. 5342* (NY)	X		X
R. organensis	Brazil, Santa Catarina. *Weber, P. 82* (ICN)		X	X
R. pedersenii 1	Bolivia, Santa Cruz. *Ritter, N. 3522* (NY)	X		
R. pedersenii 2	Bolivia, Beni. *Edgar, P.T. 146* (NY)	X		X
R. rostrata	Brazil, Distrito Federal. *Mendonça, R.C. 534* (NY)	X	X	X
R. trispicata	Belize, Stann Creek. *Naczi, R.F.C. 11250* (NY)	X	X	X

2.6. Sequence alignment and Phylogenetic reconstruction

Sequences were treated in Geneious Prime (Kearse *et al*. 2012) and aligned using MAFFT Alignment (in Geneious). Alignments were reviewed and refined manually when needed. The combined alignment (*trnL-F*+ITS+ETS) was concatenated using Geneious Prime. Partition analyses and evolutionary models of nucleotide substitution were defined by Partition Finder 2 (Lanfear *et al.* 2016), run through Anaconda (ASD 2016), using the algorithm PhyML 3.0 (Guindon *et al*. 2010). This was done using the corrected Akaike information criterion (AICc). Models of evolution estimated by Partition Finder for MrBayes 3.2.2 (Ronquist *et al.* 2012) are presented on Table 3. Bayesian Inference and Maximum Likelihood analysis were performed on Cipres Science Gateway (Miller *et al*. 2010). Ten million generations were run using a Markov chain Monte Carlo method, with a sampling frequency of every 1000 generations and four chains. The burn in was 25%, and a 50% majority rule consensus tree was calculated to generate a posterior probability (PP) for each node. Statistics and other information regarding the DNA dataset are presented in Table 3.

Table 3. Data of individual markers and concatenated alignments.

	ETS	ITS	trnL-F	Concatenated
Model of evolution	GTR+I+G	GTR+G	GTR+G	partitioned according markers
Number of sequences	43	32	42	55
Length of aligned matrices (bp)	627	639	1339	2605

3. RESULTS

3.1. Geographical distribution and environmental data

The distribution (Figure 2) of the specimens of *Rhynchospora corymbosa* included in the analyses presented an extent of occurrence of 3,102,695 km² over five countries, with a variation in latitude from 14.75° to 34.87° S and longitude between 43.39° and 63.33° W, and an elevation range from zero to about 1290 m a.s.l. Within our analysis, *R. corymbosa* var. *bonariensis* had the most restricted range, limited to the La Plata river delta and a couple of samples on the Brazil-Uruguay border. *Rhynchospora corymbosa* var. 1 and *R. corymbosa* var. *chacoensis* showed a high overlap in distribution and, in the southern part of their distributions, an overlap with *R. corymbosa* var. *asperula*. *Rhynchospora corymbosa* var. *asperula* had a geographical overlap with *R. corymbosa* var. *angustirostris* as well as *R. corymbosa* var. *legrandii* and was the variety with the widest distribution. Variety *legrandii* was mostly restricted to coastal areas and variety *angustirostris* to the highlands, with little overlap between them.

The average annual temperature varied from 14.7 °C to 26.0 °C. The mean diurnal range varied from 6.6 °C to 12.9 °C. The isothermality varied from 39.1 to 72.8. The maximum temperature ranged from 23.2 °C to 34.0 °C and the minimum temperature from 4.0 °C to 17.9 °C. The annual precipitation ranges from 779 mm to 2,105 mm and monthly precipitation ranged from 6 mm to 142 mm in the driest month and 95 mm to 306 mm in the wettest month.

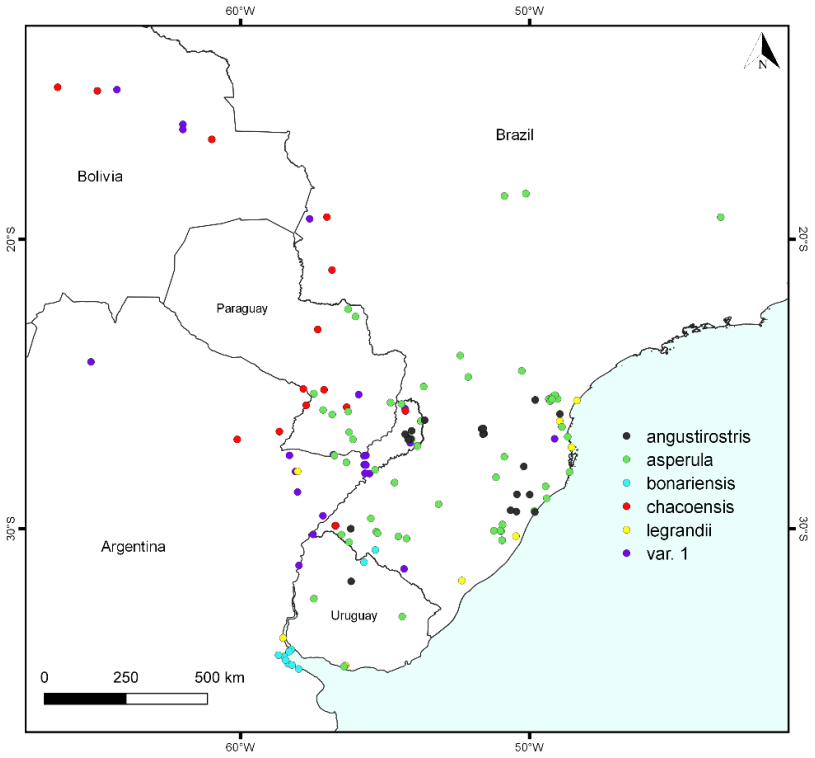

Figure 2. Geographical distribution of the analyzed varieties of *R. corymbosa*.

3.2. Morphometrical and Ecological analyses

In the box-plots (Figure 3), when the lateral inflorescence number, inflorescence size ratio and inflorescence distance were analyzed, characters clearly overlap among the varieties, although there were some statistical differences. This overlap demonstrates that those inflorescence characters are not useful for infra-specific differentiation. In spikelet length, var. *angustirostris*, var. *chacoensis* and var. 1 showed no difference among each other and also had a high overlap with var. *asperula*. Var. *legrandii* also showed no significant difference when compared to var. *chacoensis* and var. *bonariensis* and has a significant overlap with the latter. Almost the same situation occurred with stylopodium length, where var. *bonariensis* and var. *legrandii* came out very similar. Var. *angustirostris*, var. *chacoensis* and var. 1 also strongly overlapping with var. *asperula*.

In the cluster analysis of the morphological data (Figure 4 A, B) four clusters were revealed by HCA. In the clusters A, B and C, four of the six varieties appeared mixed together, with no identifiable pattern. Cluster A showed the var. *angustirostris* lectotype "angustirostris BA24/775" (*Hauman s.n. BA24/775* in the BA herbarium) paired with a specimen of var. *asperula*. The var. *chacoensis* lectotype "chacoensis 156" (*A. Donat 156* in the BA herbarium) grouped with two specimens of var. *angustirostris*. Cluster C had

most of the var. 1 and var. *chacoensis* specimens mixed with var. *asperula*. Cluster D formed two groups, one with most of the var. *bonariensis* specimens and other with all the var. *legrandii* mixed with some var. *bonariensis* and two var. *asperula*. In this group the var. *legrandii* paratype "legrandii 8934" (*A. Burkart 8934* in the SI herbarium) and the var. *bonariensis* paratype "bonariensis 106" (*S. Venturi 106* in the BA herbarium) paired together. The lectotype, "bonariensis 171" (*M. Barros 171* in the BA herbarium) also paired with a var. *legrandii* sample.

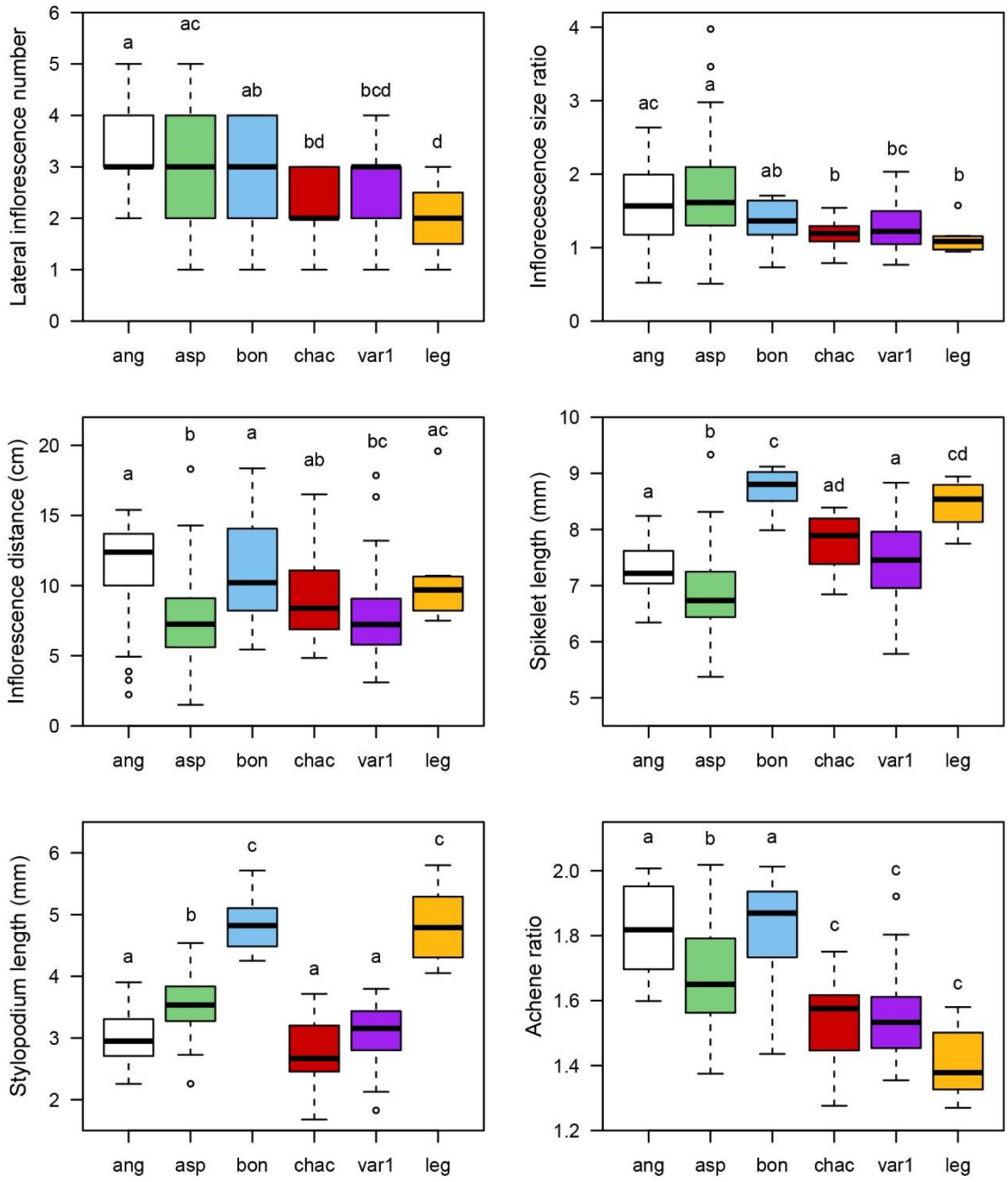

Figure 3. Box-plots representing the variation of discriminant characters in *R. corymbosa* varieties.

The NMDS analysis (Figure 5) resulted in two groups. The left side group, with most of the samples, included five varieties with no identifiable pattern, while the right side group included all the var. *bonariensis* mixed with most of the var. *legrandii*. The graph included the four arrows representing the most predictive environmental variables: Bio1 - Annual Mean Temperature; Bio 2 - Mean Diurnal Range; Bio3 - Isothermality; Bio12 - Annual Precipitation). Although they statistically explained 23% to 27% of the variation, they can not be related with any variety, since none had a recognizable pattern.

3.3. Phylogenetic analyses

The concatenated tree had 36 terminals, 19 of them from the *Rhynchospora corymbosa* complex, representing six varieties.

Bayesian Inference (BI) and Maximum Likelihood (ML) analyses showed very similar results in terms of topology and support. The structure of both trees was practically identical. BI (Figure 6) presented greater support. ML (Figure 7) presented greater detail in clade 1, and united *R. corymbosa asperula* 5 in clade 5. Since the Bayesian Inference is a more robust analysis, discussion will focus on the BI concatenated tree.

The *R. corymbosa* complex formed a large clade with five (ML) or six (BI) clades, both with moderate support. *Rhynchospora corymbosa* varieties grouped mostly according to the localities of origin of the samples, regardless of the variety of the sample. In the BI tree (Fig. 6): In clade 1, the varieties of *R. corymbosa* (from Mexico, Honduras and Colombia) grouped with an internal clade formed with two *R. pedersenii* samples from Bolivia. In clade 2, the two samples of *R. corymbosa* var. *florida* are from Central America. In clades 3 and 4, the samples are from South America while in clade 5, they are from tropical Asia and the Pacific. *Rhynchospora asperula* 5 from Africa (Equatorial Guinea) appears as sister to the clade 5 (ML) or to clades 1 to 5 (BI).

4. DISCUSSION

Barros (1945, 1947) and Guaglianone (2001) treated the variety here called “variety 1” as the typical variety of *Rhynchospora corymbosa*. Guaglianone (2001) probably followed Manuel Barros concept of this variety. Barros (1945) stated that the var. 1 is the one that he considered as belonging to the typical form for having seen it in several

collections determined by specialists as *R. aurea* Vahl (Vahl 1805), a synonym of *R. corymbosa*. We deduce that Barros never saw the type of *R. corymbosa*, from India.

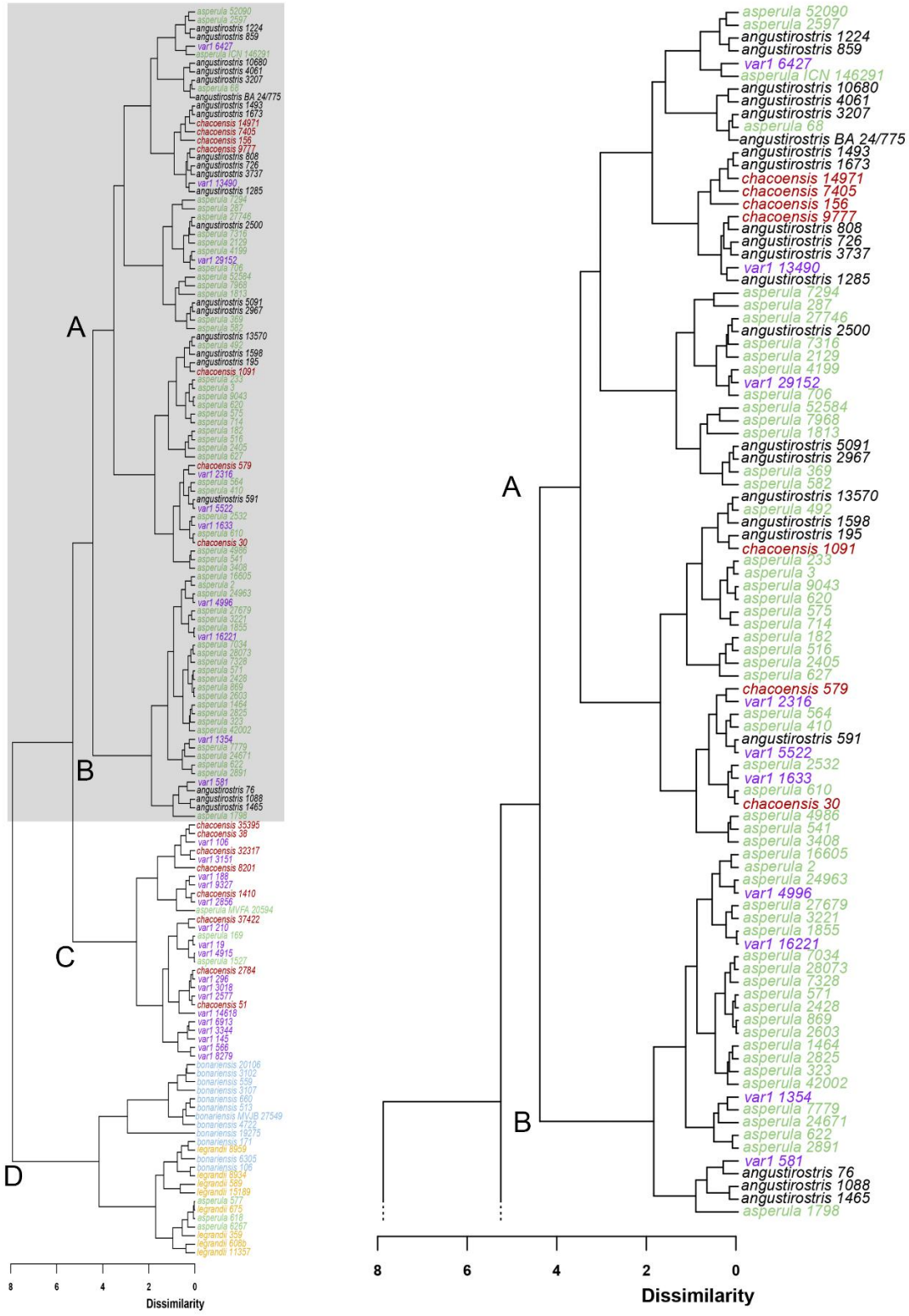

Figure 4A. Cluster dendrogram of *R. corymbosa* varieties based on five morphological characters (left). Detail of clusters A and B (right)

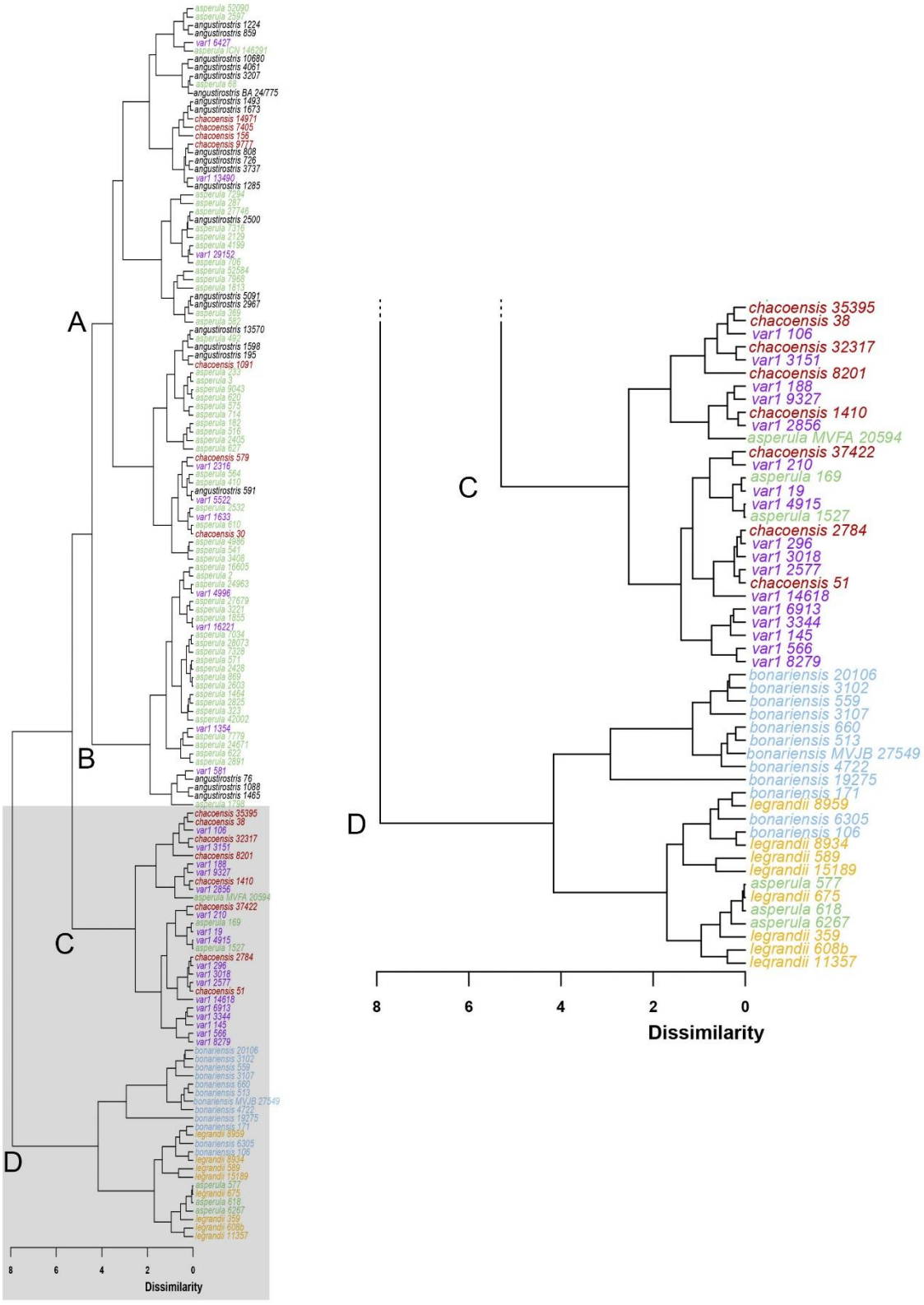

Figure 4B. Cluster dendrogram of *R. corymbosa* varieties based on five morphological characters. (left). Detail of clusters C and D (right)

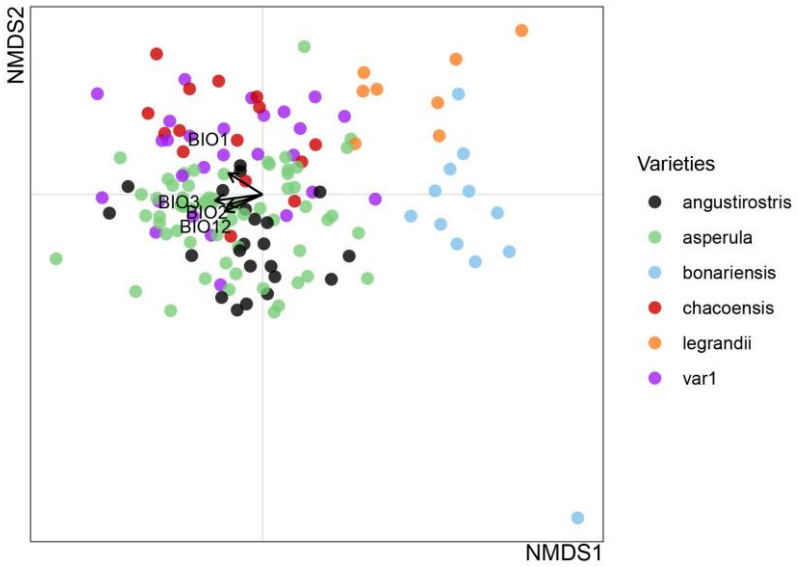

Figure 5. Ordination resulting from non-metric multidimensional scaling (NMDS). Environmental variables: Bio1. Annual Mean Temperature; Bio 2. Mean Diurnal Range; Bio3. Isothermality; Bio12. Annual Precipitation.

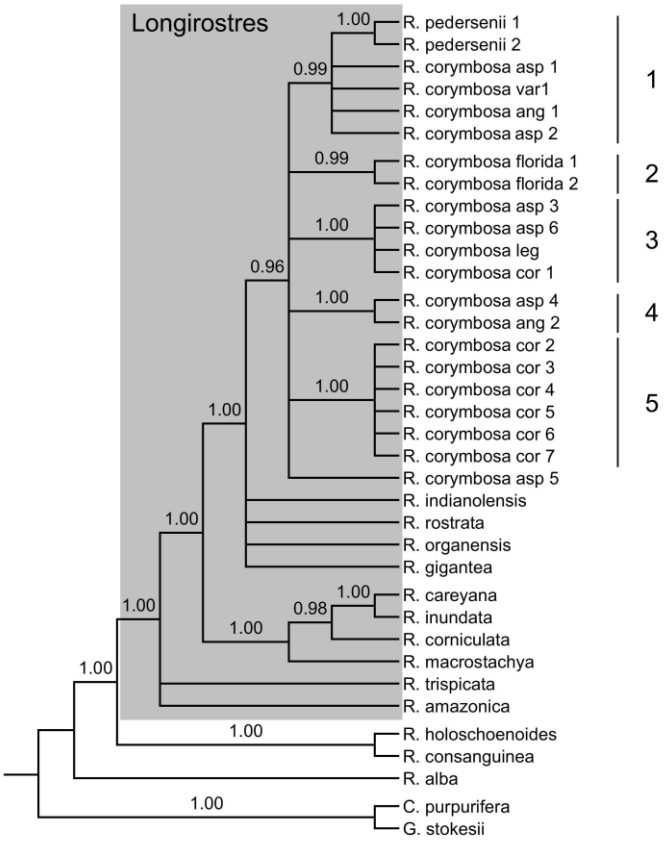

Figure 6. Phylogenetic analysis of the *Rhynchospora corymbosa* complex based on Bayesian Inference.

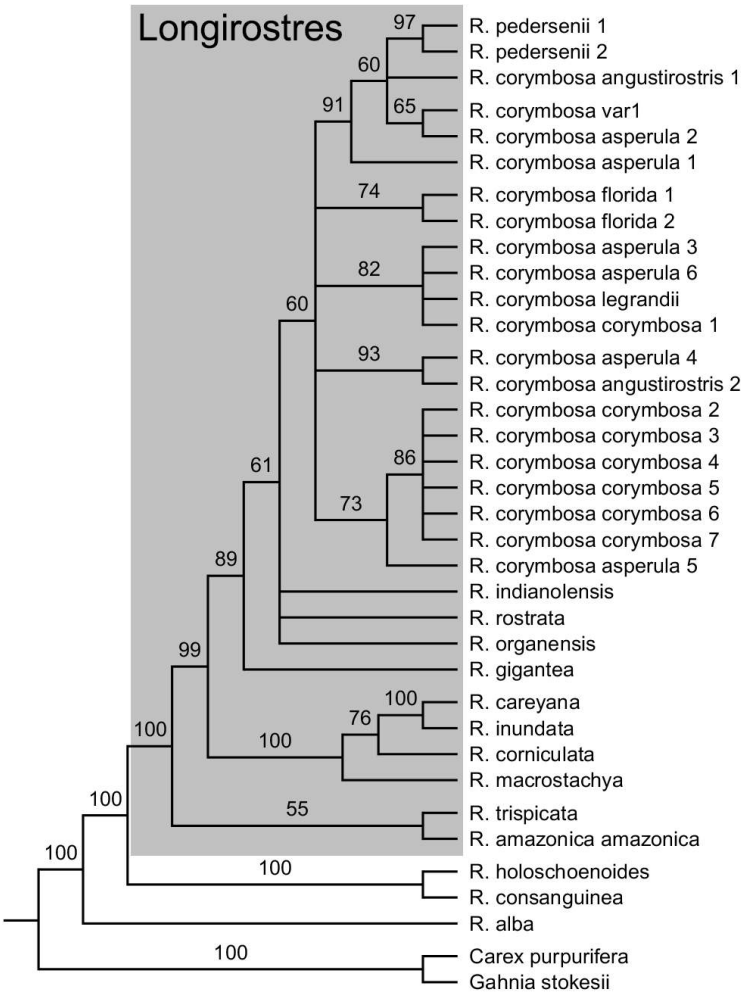

Figure 7. Phylogenetic analysis of the *Rhynchospora corymbosa* complex based on Maximum Likelihood.

The achenes of the type specimen of *R. corymbosa* var. *corymbosa* differs of those of var. 1 mainly in the stylopodium length 4.5-5.0 mm *vs.* 2.5-3.0 mm and the stylopodium base being sagittate *vs.* straight. Guaglianone (2001) described var. 1 (treated as var. *corymbosa*) as having both the achene and stylopodium each being 2.5-3.0 mm long and, in her taxonomic key, as "achene about the same length as the stylopodium, with 3-3.2 (-4) mm long". In addition to mismatched measurements, they overlap with the ones of var. *chacoensis*, (3-3.2 mm long achenes and 2-2.8 mm long stylopodium), causing confusion in the identification. Guaglianone (2001) also cited in the key anfractuous achenes margins for var. 1 but that also can be seen in other varieties, being very common in var. *asperula*. Barros (1945, 1947) distinguished var. 1 and var. *chacoensis* stating that the latter has (1) a stylopodium shorter or equal to the achene length and (2) is slightly wider than the achene. The first distinction was observed in 73% of samples of var. *chacoensis* and in 44% of var. 1. The second distinction was found in 73% of the var.

chacoensis (unrelated to the first distinction) and in 26% of var. 1; the mean width difference in those cases, however, was only 0.11 mm. Barros (1945, 1947), however, did not provide achene width nor stylopodium measurements in his description of var. *chacoensis*. As commented in the results, none of the analyzed characters provided differences significant enough to permit differentiating these varieties. In the phylogeny (Fig. 6 and 7), the var. *corymbosa* samples from paleotropics (tropical Asia and the Pacific islands) grouped in clade 5. In the ML tree this clade is sister to the African var. *asperula* 5. The Ecuadorian sample of var. corymbosa 1 grouped with Brazilian samples of var. *legrandii* and var. *asperula.*

Rhynchospora var. *angustirostris* was distinguished from the other varieties by its ellipsoid achene measuring 3.5-4 × 1.8-2.2 mm with smooth edges, its finely dotted surface, and stylopodium measuring 2.5-3.8 × 1-1.6 mm and slightly narrowing towards the apex (Guaglianone 2001; Barros 1945). Morphologically, this variety appears to be closer to var. *asperula* which differs by the achene shape, ellipsoid *vs.* obovoid with a truncate apex, but all measured achene structures as well as spikelet length in var. *angustirostris* were overlapped by those of var. asperula. In most analyzed characters, var. *angustirostris* samples were not statistically different from those of var. *chacoensis* or var. 1. In the phylogeny, the sample from Mexico (ang 1) appeared grouped with var. *asperula* (from Mexico and Nicaragua) and a var. 1 (from Colombia). The sample from Uruguay (ang 2) paired with an Uruguayan sample of var. *asperula*.

Guaglianone (2001) distinguished *R. asperula* from *R. corymbosa* by the upper lateral inflorescences very close to the terminal, almost forming part of it, spikelets arched when mature, and an obovoid-oblong achene 1.3–1.6 mm wide. The distance between the upper lateral and the terminal inflorescence of var. *asperula* did not differ from that in var. *bonariensis*, var. *chacoensis*, or var. *legrandii*, indicating that they are not good characters to separate the entity from the rest of the *R. corymbosa* complex. Also, only 38% of the achene width measurements of var. *asperula* were within the 1.3–1.6 mm interval. The actual width range varied between 1.27 and 2.58 mm. The arched spikelets are relatively common in var. *asperula* but can also be found in var. *angustirostris*, as in *P. Weber 76* (in the FLOR herbarium). Moreover, var. *asperula* had a larger range for every character analyzed and paired with almost all the other varieties (except for var. *bonariensis*) in the cluster analysis. In the phylogeny, var. *asperula* samples were spread throughout 4 of the

5 clades in the ML tree and grouped with var. 1, var. *angustirostris*, var. *corymbosa* and var. *legrandii*.

Rhynchospora var. *bonariensis* is the rarest among the studied. It was distinguished by achenes 4–4.5 mm × 1.8–2 mm and the stylopodium 4–5.5 mm with an almost straight base (Barros 1945; Guaglianone 2001). The achene length varied widely and about 71% were outside the range described. The stylopodium length was not significantly different from var. *legrandii*.

Kükenthal (1949) treated *R. pedersenii* as *R. gigantea* var. *latifolia* Pfeiffer. Guaglianone (2001) raised it to the level of species. This species has differences in synflorescence and achene characteristics that allow it to be distinguished from *R. corymbosa*. Also, no specimens with intermediate characteristics between the two species were found. But the morphological variation in the complex is so broad that it might include *R. pedersenii* as well. It is probably the first time that this species has been associated with the *R. corymbosa* complex. Further comparative study will be needed.

All the morphometric analysis showed that there is a continuum in every analyzed trait across every putative variety and the ranges of measurements of their structures are wider than initially described. What were named as varieties are just the extremes of variation in a few characters used to identify a morphologically diverse and widespread species. The phylogeny also confirms that there is no consistency in separating the species into varieties. The genetic proximity, reflected in the clusters, was more due to geographical rather than morphological similarity. It reflects in the high number of unidentified specimens of this group in all herbaria. Moreover, most of the time, only experts identify to the infraspecific level and yet there seems to be no consensus on taxonomic delimitation. For these reasons, we propose the synonymization of the varieties of the *R. corymbosa* complex.

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APPENDIX

Primer sequences. Primer developed by Silva Filho (2018).
ETS
1F - (tm 60.2) – AGTTGTTCTTGGCGTGCTCT
1R - (tm 60.2) – GCAGGATCAACCAGGTAGCA
ITS
5i – AGGTGACCTGCGGAAGGATCATT
4i – GGGTAGTTCCCGCCTGACCTGG
trnL-F
c – CGAAATCGGTAGACGCTACG
f – ATTGAACTGGTGACACGAG

Taxonomic information.

1. **Rhynchospora corymbosa** (L.) Britton. Trans New York Acad. Sc. 11: 84. 1892.

1.a. **Rhynchospora corymbosa** var. **corymbosa**. *Scirpus corymbosus* L., Cent. pl. 2: 7. 1756. *Rhynchospora aurea* Vahl, Enum. Pl. [Vahl] ii. 229. (1805) [*non* Sieber ex Schult.] [*nom. superfl*.]. Lectotype: "Habitat in India" (LINN 71.48 !), designated by K. Gordon-Gray, Strelitzia 2: 150. 1995.

1.b. **Rhynchospora corymbosa** var. **angustirostris** (Barros) Guagl. *R. corymbosa* f. *angustirostris* Barros, Anales Mus. Argent. Ci. Nat. "Bernardino Rivadavia" 41: 388. 1945. Lectoype: Misiones. Dpto. San Pedro: Fracrán, 19-23 February 1924, *Hauman s. n.*, BA 24/775 (BA!), designated by Barros, Gen. Sp. Pl. Argent. 4(2): 316. 1947.

1.c. **Rhynchospora corymbosa** var. **bonariensis** Barros, Anales Mus. Argent. Ci. Nat. "Bernardino Rivadavia" 41: 386. 1945. Lectotype: Argentina: Distrito Federal, Belgrano, 8-1-1925, *M. Barros 171* (BA!, isolectotype SI!) designated by Guaglianone, Darwiniana 39: 287-342. 2001

1.d. **Rhynchospora corymbosa** var. **chacoensis** (Barros) Svenson in Moldenke, Lilloa 14: 73. 1948. *R. corymbosa* f. *chacoensis* Barros, Anales Mus. Argent. Ci. Nat. "Bernardino Rivadavia" 41: 388. 1945. Lectotype: Argentina. Chaco: Colonia Napalpi, XII-1934, *A. Donat 156*, (BA!; isolectotype, SI!), designated by Barros, en Descole (ed.), *Gen. Sp. Pl. Argent*. 4(2): 315. 1947

Rhynchospora corymbosa var. *singularis* Kük., Bot. Jahrb. Syst. 74: 417. 1949. Type: Paraguay. Guairá. Cordillera de Villa Rica, in paludosis, I-1905, *Hassler 8777* (holotype BM, isotypes, G!, P!)

1.e. **Rhynchospora corymbosa** var. **legrandii** (Kük. ex Barros) Guagl., Darwiniana 39: 314. 2001. *R. corymbosa* subsp. *legrandii* (Kük. ex Barros) Luceño & Vanzela, Canad. J. Bot. 76: 448. 1998. *Rhynchospora legrandii* Kük. ex Barros, Darwiniana 5: 182. 1941. Type: Uruguay. *Dpto. Montevideo*: Carrasco, 20-I-1938 *Legrand 1371* (holotype B; isotype SI!).

2. **Rhynchospora asperula** (Nees) Steud., Syn. Pl. Glumac. 2: 144. 1855. *Calyptrostylis asperula* Nees en Mart., Fl. bras. 2 (1): 139. 1842. *R. corymbosa* var. *asperula* (Nees) Kük. en Engler, Bot. Jahrb. Syst. 74: 416. 1949. Type: "Brasil. In insula S. Catharinae. *Chamisso s.n."* (holotype, not located; isotype, LE).

Table 4. Samples and measurements analyzed. Elev: elevation (m); Coll. dat: Collection date (format YYYYMMDD); IDM: Inflorescence distance mean (cm); ILM: Inflorescence length mean (cm); IWM: Inflorescence width mean (cm); NLI: Number of lateral inflorescences; SpLM: Spikelet lenght mean (mm); ALM: Achene length mean (mm); AWM: Achene width mean; SLM: Stylopodium length mean (mm); SWM: Stylopodium width mean (mm);

Collector	number	Herbaria	variety	latitude	longitude	Elev	Coll. dat	IDM	ILM	IWM	NLI	SpLM	ALM	AWM	SLM	SWM
Abbott, J.R.	16221	SI	var. 1	-16.033333	-62.00	500	19950218	3.1	18.6	9.2	3	6.37	2.96	1.88	2.98	1.49
Aniasi, J.M.	660	BA	bonariensis	-34.708593	-58.22534	1	19251129	10	16.5	13.3	3	8.93	3.71	2.07	4.45	1.598
Araujo, A.C.	3	ICN	asperula	-29.854028	-50.938278	42	19910114	5.75	15.5	7.25	4	6.91	2.34	1.416	3.656	1.324
Araujo, A.C.	492	ICN	asperula	-28.404556	-54.675083	187	19970110	5.6	7.6	9.6	3	7.18	3.066	1.8	3.612	1.664
Araujo, A.C.	541	ICN	asperula	-30.340917	-54.262222	137	19970112	7.25	11.6	4.65	3	7.49	2.858	1.628	4.278	1.486
Araujo, A.C.	1673	ICN	angustirostris	-27.849389	-50.202389	800	20061122	13.42	17.361	8.70	4	7.65	3.62	2.18	2.82	1.37
Arbo, M.M.	8279	CTES, UPCB	var. 1	-28.733333	-58.033333	53	19981204	4.93	11.64	12.49	2	7.86	3.16	2.27	3.44	2.14
Arbo, M.M.	9327	CTES	var. 1	-28.023333	-58.1025	69	20061018	6.17	8.44	8.81	4	8.80	2.96	1.98	3.28	2.03
Barros, M.	171	SI	bonariensis	-34.537278	-58.446852	7	19251108	8.99	12.1	10.90		9.11	3.77	2.25	4.83	1.882
Bartlett, H.H.	19275	GH	bonariensis	-34.417335	-58.501483	2	19421221	14.1	18.1	11.1	4	8.75	3.53	1.27	4.52	1.19
Belgrano, M.J.	296	SI	var. 1	-27.466389	-58.313333	66	20050215	8.19	20.64	14.94	2	7.33	2.83	1.98	2.47	1.96
Belgrano, M.J.	706	SI	asperula	-27.133333	-53.883333	140	20061127	7.71	10.63	6.373	3	6.61	2.74	1.45	3.57	1.37
Biganzoli, F.	1633	SI	var. 1	-28.097222	-55.541667	160	20040128	5	5.843	5.21	2	8.07	3.19	2.01	3.42	2.02
Bona, C.	410	MBM, UPCB	asperula	-25.393389	-49.111139	893	20080219	7.37	11.00	7.45	2	7.72	2.85	1.71	3.59	1.57
Bruhl, J.J.	2316	SI	var. 1	-27.780556	-55.691667	152	20050108	5.30	10.7	10.04	4	7.54	3.25	1.84	3.55	1.68
Brussa, C.	MVJB_27549	MVJB	bonariensis	-31.155639	-55.733639	150	20090303	18.36	11.88	7.16	1	8.60	3.38	1.82	4.31	1.65
Burkart, A.	8934	SI	legrandii	-33.773056	-58.533889	3	19380228	8.91	14.52	12.515	1	8.65	3.31	2.29	5.01	2.37
Burkart, A.	8959	SI	legrandii	-33.773056	-58.533889	3	19380228	9.15	10.1	10.2	2	8.83	3.33	2.11	4.85	2.25
Cabrera, A.L.	29152	MBM	var. 1	-27.788111	-55.726389	192	19780212	5.4	6	7.6	2	6.52	3.03	1.58	3.33	1.64
Campestrini, S.	808	FLOR	angustirostris	-26.712222	-51.576944	1290	20131126	4.9365	7.7265	6.0735	4	7.57	3.58	1.95	2.54	1.36
Caxambu, M.G.	3737	MBM	angustirostris	-25.552528	-49.806611	836	20120203	14.04	13.1	15.596	3	7.55	3.64	2.00	2.81	1.28
Caxambu, M.G.	7328	FLOR	asperula	-24.759889	-52.126528	816	20160413	1.5	21.5	18.5	4	6.39	2.57	1.64	3.63	1.42
Caxambu, M.G.	7779	FLOR	asperula	-25.692667	-54.432944	188	20170323	4.5	10.8	6.1	3	6.13	2.50	1.68	3.48	1.50

Collector	number	Herbaria	variety	latitude	longitude	Elev	Coll. dat	IDM	ILM	IWM	NLI	SpLM	ALM	AWM	SLM	SWM
Caxambu, M.G.	7968	FLOR	asperula	-25.089528	-53.66925	696	20171102	10.45	6.75	3.8	2	6.44	2.98	1.56	4.17	1.38
Chonono, V.	210	SI	var. 1	-14.833333	-64.283333	160	19920328	8.689	18.402	12.876		6.88	2.46	1.78	2.98	1.76
Cocucci, A.A.	3018	SI	var. 1	-31.266667	-57.983333	49	20031118	6.276	9.187	7.79	3	7.29	2.78	1.92	2.74	1.83
Contreras, S.A.	51	MBM	chacoensis	-26.642778	-58.661389	63	20111020	7.827	15.65	13.141	3	7.26	3.15	2.11	2.37	2.08
Deginani, N.B.	1285	SI	angustirostris	-26.90	-54.116667	540	19990512	13.095	5.976	5.085		7.21	3.35	1.84	2.95	1.25
Deginani, N.B.	1598	SI	angustirostris	-26.85	-54.216667	480	20000303	15.074	12.112	8.865		7.24	3.00	1.72	3.31	1.16
Deginani, N.B.	1798	SI	asperula	-27.966667	-55.35	60	20000308	7.769	14.412	7.857	3	5.37	2.52	1.49	2.25	1.24
Denham, S.S.	145	SI	var. 1	-29.551667	-57.154167	68	20081213	16.304	14.165	10.272	2	7.80	3.41	2.18	3.21	2.19
Dombrowski, L.Th.	4986	MBM	asperula	-25.521083	-49.339167	887	19731027	8.6	13.5	7.3	3	7.63	3.39	1.89	4.09	1.60
Dombrowski, L.Th.	6267	MBM	asperula	-25.43725	-49.204389	890	19751229	6.3	17	16	3	8.06	3.17	2.11	4.33	1.94
Donat, A.	156	SI	chacoensis	-26.915755	-60.119711	85	193412	4.84	11.28	9.21	3	8.39	3.48	2.00	2.52	2.09
Dorneles, H.H.	2	ICN	asperula	-30.091018	-50.985003	25	19780331	7.8	14.9	7.8	3	6.37	2.738	1.574	3.252	1.468
Egea, J.	106	SI	var. 1	-27.439167	-56.787778	75	20031023	5.117	13.145	17.146	3	8.06	2.85	1.95	2.13	1.79
Ferreira, J.P.R.	516	FLOR	asperula	-28.535278	-49.448611	143	20140207	6	10.5	5.5	2	7.17	2.40	1.59	3.98	1.48
Ferreira, J.P.R.	566	FLOR	var. 1	-28.946667	-49.410278	8	20140205	7.14	8.57	6.961	2	7.86	3.00	2.17	3.72	2.29
Forzza, R.C.	7316	RB, UPCB, NY	asperula	-25.511111	-49.033611	863	20121004	8.338	8.966	7.2965	4	6.76	3.15	1.74	3.54	1.59
Funez, L.A.	4061	FLOR	angustirostris	-26.036667	-48.953333	1281	20141104	5.1	7	13.4	5	7.57	3.72	1.91	2.68	1.00
Goetghebour, P.	4722	US	bonariensis	-34.364988	-58.692937	10	19821219	5.44	9.25	7.23	3	9.07	3.75	1.90	4.25	1.638
Gonzatti, F.	359	FLOR	legrandii	-30.256861	-50.475	11	20120111	7.5	8	7	1	8.77	3.06	2.19	4.05	2.15
Guaglianone, E.R.	2825	SI, NY	asperula	-27.15	-53.883333	150	19951114	10.081	11.991	7.955	4	6.65	2.53	1.66	3.32	1.55
Guaglianone, E.R.	2891	SI	asperula	-26.90	-54.083333	450	19951116	8.2005	11.169	7.3745	3	6.18	2.19	1.40	3.84	1.25
Guaglianone, E.R.	2967	SI	angustirostris	-26.25	-53.633333	800	19951120	13.692	19.03	13.256	5	7.16	3.49	1.82	3.35	1.31
Guaglianone, E.R.	3102	SI	bonariensis	-34.183694	-58.256861	6	19981025	14.163	11.662	14.224	2	8.44	3.50	1.86	4.81	1.77
Guaglianone, E.R.	3107	SI	bonariensis	-34.17275	-58.249556	0	19961026	9.96	14.31	10.71	3	7.99	3.69	1.95	5.71	1.85
Guaglianone, E.R.	3151	MBM	var. 1	-24.236722	-65.182306	1087	19980130	8.95	15.09	16.49	3	8.38	3.13	2.09	2.78	1.84

Collector	number	Herbaria	variety	latitude	longitude	Elev	Coll. dat	IDM	ILM	IWM	NLI	SpLM	ALM	AWM	SLM	SWM
Hamilton, S.	30	SPF	chacoensis	-19.233333	-57.016667	90	19930601	6.987	10.899	10.048	3	7.94	3.51	2.23	3.71	2.63
Hatschbach, G.	15189	MBM, US	legrandii	-25.571833	-48.36525	6	19661030	19.558	16.61	17.54	3	8.94	3.48	2.74	5.80	2.70
Hauman,	BA_24/775	BA	angustirostris	-26.734362	-54.309765	606	19241223	14.33	12.26	6.8	2	7.04	3.46	1.73	2.95	1.13
Hefler, S.M.	188	ICN	var. 1	-31.386972	-54.34675	157	20031117	6.83	11.06	7.49	3	8.83	3.36	2.18	3.60	1.87
Herter, W.G.	608b	NY, SI	legrandii	-34.726746	-56.377662	4	19320214	10.23	15.17	13.15	3	7.75	3.12	2.38	4.72	2.48
Hurrell, J.	5522	SI	var. 1	-34.2175	-58.313944	2	20040125	17.83	20.14	17	3	7.87	3.17	1.86	3.80	1.84
Hurrell, J.	6305	MBM, SI	bonariensis	-34.245389	-58.326583	1	20061216	10.41	16.26	9.86	3	8.24	2.89	1.73	5.21	1.61
Imaguire, N.	3408	MBM	asperula	-25.385528	-49.126917	913	19731113	5.2	17.6	13.4	4	7.51	3.04	1.76	3.97	1.59
Keller, H.A.	13490	SI	var. 1	-25.86	-54.305833	300	20161122	11.55	12.02	11.67	4	7.17	3.17	1.81	2.66	1.56
Kiesling, R.	9777	SI	chacoensis	-25.166667	-57.833333	68	20001022	11.52	11.76	8.14	3	7.53	3.22	1.84	2.54	1.80
Kozera, C.	2532	UPCB	asperula	-25.552472	-49.807917	830	20051101	5.2	6.1	6.8	4	7.88	3.30	2.03	3.48	1.77
Kozera, C.	2597	UPCB	asperula	-25.552472	-49.807917	830	20051121	6.1	6.3	5	4	7.76	3.51	1.85	3.15	1.24
Kozera, C.	3344	MBM	var. 1	-25.552472	-49.807917	830	20061125	13.2	13.9	8.2	3	7.61	3.02	2.10	3.03	2.06
Krapovickas, A.	16605	MBM, UPCB	asperula	-27.70875	-56.343139	89	19701129	6	11	7.2	3	6.32	2.49	1.48	3.16	1.29
Krapovickas, A.	32317	CTES, MBM	chacoensis	-16.55	-61.00	400	19770507	9.25	20.22	18.66	3	8.30	3.15	2.19	2.96	2.20
Kuniyoshi, Y.S.	1813	MBM	asperula	-25.591222	-49.288917	891	196611	6.5	5.8	4	1	7.35	3.22	1.65	4.54	1.50
Liesenfeld, V.	68	FLOR	asperula	-24.546694	-50.274417	784	20151026	5.5	14.8	9.6	3	6.98	3.06	1.58	2.80	1.22
Longhi-Wagner, H.	10680	ICN	angustirostris	-28.812306	-50.439917	778	20090114	12.5	9.2	5.12	4	7.23	3.86	1.94	2.62	1.32
Mahus, J.	ICN_146291	ICN	asperula	-28.223417	-51.165806	909	20021203	6.25	9.7	7.45	3	8.23	3.648	1.93	3.77	1.9
Marchesi, E.R.	MVFA_20594	SI	asperula	-32.416667	-57.466667	91	19911106	8.52	7.26	6.73	2	9.33	3.57	2.26	2.73	1.83
Morais, I.L.	2405	JAR, FLOR	asperula	-18.426944	-50.133056	429	20140406	2.6	22.2	22.7	3	6.90	2.64	1.74	3.73	1.67
Morais, I.L.	2603	JAR, FLOR	asperula	-18.507778	-50.874722	558	20140527	10.6	16.3	10.1	2	6.76	2.79	1.74	3.49	1.60
Morais, I.L.	4199	JAR, FLOR	asperula	-18.426944	-50.133056	429	-	2.1	16.1	9.2	2	6.35	2.93	1.56	3.37	1.33
Morrone, O.	4996	CTES, SI	var. 1	-16.209444	-62.00	501	20040328	6.899	13.231	7.365	2	6.02	3.04	1.86	3.43	1.60
Múlgura de Romero, M.E.	1855	SI	asperula	-26.283333	-53.766667	840	19971214	3.936	11.115	6.016	1	6.36	3.13	2.01	2.98	1.91

Collector	number	Herbaria	variety	latitude	longitude	Elev	Coll. dat	IDM	ILM	IWM	NLI	SpLM	ALM	AWM	SLM	SWM
Múlgura de Romero, M.E.	2500	MBM, SI	angustirostris	-26.916667	-54.2	420	20001109	10.282	16.328	14.953	4	6.90	3.52	1.92	3.30	1.28
Múlgura de Romero, M.E.	2577	SI	var. 1	-27.033333	-54.133333	510	20001111	6.685	6.072	4	2	7.14	2.92	1.98	2.51	1.45
Múlgura de Romero, M.E.	2784	MBM, SI	chacoensis	-25.933333	-54.3	210	20001117	6.939	10.685	6.928	3	7.32	3.12	2.14	2.56	1.64
Múlgura de Romero, M.E.	2856	MBM, SI	var. 1	-27.466667	-55.666667	150	20001119	7.2235	10.073	9.4675	3	8.39	3.37	2.19	3.31	1.99
Múlgura de Romero, M.E.	3207	SI	angustirostris	-26.616667	-54.083333	510	20020310	15.397	16.032	8.966	3	6.80	3.76	1.92	2.87	1.20
Múlgura de Romero, M.E.	3221	SI	asperula	-26.283333	-53.766667	780	20020310	5.115	12.852	5.615	2	6.12	2.45	1.54	3.04	1.38
Nuernberg, A.	589	FLOR	legrandii	-27.1875	-48.5525	36	20120203	10.6	11.8	7.5	2	7.93	3.29	2.45	5.57	2.12
Nuernberg, A.	1354	FLOR	var. 1	-26.893361	-49.137917	39	20140430	10.7	6.1	3	2	5.78	2.69	1.85	3.63	1.79
Oliveira, A.C.	19	FLOR	var. 1	-19.295278	-57.613889	135	20051102	8.3	15.15	16.6	1	7.03	2.94	1.95	3.16	2.07
Oliveira, P.I.	869	MBM	asperula	-25.528278	-49.227528	877	19850314	7.76	10.265	8.05	2	6.72	2.89	1.79	3.53	1.73
Orellana, M.R.	38	SI	chacoensis	-14.874194	-64.961222	150	19990310	16.509	22.7	19.031	1	7.87	3.10	2.22	2.39	2.23
Pedersen, T.M.	11357	CTES, MBM, NY	legrandii	-28.016884	-58.028152	78	19761022	10.7	11.5	12	2	8.34	3.14	2.31	4.51	2.34
Pomerat, C.M.	20106	GH	bonariensis	-34.417335	-58.501483	2	19371205	14.035	16.295	10.685	2	8.58	3.80	1.89	4.95	1.868
Pott, V.J.	8201	ICN	chacoensis	-21.060833	-56.839167	560	20050909	6.353	11.069	8.439	2	8.28	3.45	2.21	1.68	1.85
Rodriguez, V.	559	GH, NY	bonariensis	-34.844007	-57.994536	3	19441130	13.24	18.01	12.945		8.86	3.98	2.12	5.18	1.818
Schinini, A.	27679	SI, MBM	asperula	-26.916667	-56.116667	138	19930322	6.499	12.099	4.63	4	6.16	2.56	1.58	3.22	1.47
Schinini, A.	27746	CTES, SI	asperula	-26.666667	-56.25	96	19930322	6.854	15.173	6.019	3	6.70	2.74	1.47	3.27	1.33
Schinini, A.	28073	MBM	asperula	-25.95	-56.283333	250	19930327	6.6	5.7	4.5	4	6.48	2.57	1.60	3.46	1.41
Silva Filho, P.J.S.	233	ICN	asperula	-30.068583	-51.019444	57	20090216	10.8	8.077	4.172	4	6.87	2.69	1.62	3.51	1.48
Silva Filho, P.J.S.	323	ICN	asperula	-30.06875	-51.238333	52	20100515	9.1	15.579	5.308	3	6.48	2.31	1.54	3.50	1.53
Silva Filho, P.J.S.	1410	ICN	chacoensis	-29.895056	-56.717861	126	20111216	8.387	12.15	12.773	2	8.39	3.44	2.16	3.47	2.33
Silva Filho, P.J.S.	1464	ICN	asperula	-30.200556	-56.510583	150	20111217	12.31	9.8	4.5	2	6.50	2.56	1.64	3.35	1.57
Silva Filho, P.J.S.	1465	ICN	angustirostris	-30.00	-56.189361	152	20111216	10.82	10.7	10.536	3	6.66	3.67	2.30	2.31	1.40
Silva Filho, P.J.S.	1493	ICN	angustirostris	-29.425611	-49.822611	10	201111	10.007	13.9	5.867	3	7.74	3.55	2.10	2.71	1.45
Silva Filho, P.J.S.	1527	ICN	asperula	-29.3855	-49.838583	20	20120309	9.246	6.04	6.421	4	6.86	3.03	1.97	2.90	1.33

Collector	number	Herbaria	variety	latitude	longitude	Elev	Coll. dat	IDM	ILM	IWM	NLI	SpLM	ALM	AWM	SLM	SWM
Silva Filho, P.J.S.	2129 *	ICN	asperula	-19.234722	-43.386389	670	20141104	6.647	11.6	5.529	3	6.73	2.72	1.55	3.22	1.54
Silveira, G.H.	169	ICN	asperula	-28.03875	-48.623139	14	20050128	5.647	22.39	5.635	3	6.89	3.14	2.09	3.14	1.57
Silveira, G.H.	182	ICN	asperula	-26.826389	-48.684806	122	20050128	9.676	9.135	6.96	3	7.33	2.69	1.77	3.86	1.73
Siqueira, E.L.	2428	FLOR	asperula	-24.01675	-52.403556	543	20171212	12.2	5.7	11.2	3	6.77	2.83	1.76	3.36	1.54
Smith, L.B.	13570	FLOR, R, SI	angustirostris	-26.733333	-51.616667	1100	19641204	13.74	17.14	7.89	3	7.09	3.51	2.07	3.44	1.32
Solomon, J.C.	14618	MO	var. 1	-14.75	-66.333333	250	19851108	5.257	14.719	7.92	3	7.19	3.03	2.23	1.83	1.95
Tressens, S.G.	5091	CTES, SI	angustirostris	-26.916389	-54.205	502	19941129	13.59	15.57	6.29	3	7.11	3.63	1.86	3.43	1.22
Trevisan, R.	369	ICN	asperula	-29.149444	-53.152583	375	20050204	2.6	11.3	7.7	3	6.90	2.844	1.442	3.452	1.324
Trevisan, R.	513	ICN	bonariensis	-30.733361	-55.340972	136	20051114	5.6	10.6	14.5	4	9.12	4.02	2.22	4.7075	1.715
Trevisan, R.	620	ICN	asperula	-30.400028	-50.956694	6	20060427	12.87	14.21	11.62	3	6.63	2.72	1.59	3.69	1.53
Trevisan, R.	627	ICN	asperula	-30.400028	-50.956694	6	20060427	13.19	26.9	10.26	4	6.89	2.64	1.74	4.32	1.65
Trevisan, R.	675	ICN	legrandii	-31.790889	-52.346056	2	20061030	7.52	10.45	10.18	2	8.43	3.49	2.24	4.10	2.40
Trevisan, R.	714	ICN	asperula	-30.400278	-50.955806	8	20061120	9.983	15	7.55	3	6.90	2.65	1.55	4.02	1.49
Trevisan, R.	726	ICN	angustirostris	-29.408056	-50.458306	820	20061124	12.27	13.99	5.308	3	7.62	3.87	2.19	2.95	1.39
Trevisan, R.	859	ICN	angustirostris	-28.822333	-49.998167	938	20071118	11.2	3.82	4.62	2	8.24	4.11	2.12	3.36	1.27
Trevisan, R.	1088	FLOR	angustirostris	-30.00	-56.189222	151	20111216	3.25	11.35	9.1	4	6.34	3.68	2.28	2.26	1.46
Trevisan, R.	1091	FLOR	chacoensis	-29.895056	-56.728611	121	20111216	14.436	15.641	11.45	2	7.39	3.17	1.97	3.26	2.29
Venturi, S.	106	BA, CTES, SI	bonariensis	-34.655835	-58.370657	8	19020510	7.43667	15.933	9.33	4	8.98	3.28	2.28	5.03	2.162
Wasum, R.	1224	MBM	angustirostris	-29.362222	-50.66	830	20011104	2.2	8.6	5.44	2	8.00	3.80	1.91	3.21	1.29
Weber, P.	76	FLOR	angustirostris	-26.551667	-51.662222	1059	20120403	3.851	9.44	4.45	3	6.61	3.54	1.97	2.83	1.32
Weber, P.	195	FLOR	angustirostris	-26.535944	-51.607583	1301	20130119	12.7	20.2	13	3	7.04	3.72	2.31	3.25	1.42
Weber, P.	287	FLOR	asperula	-27.513417	-50.876972	791	20130404	5.6	14	4.7	1	5.72	2.67	1.42	3.73	1.34
Weber, P.	564	ICN	asperula	-30.265833	-54.546111	117	20161128	9.2	13.2	13.5	2	7.62	3.27	1.98	3.82	1.73
Weber, P.	571	ICN, FLOR, JAR	asperula	-30.101667	-55.31	155	20161129	3.63333	5.5333	3.8667	3	6.67	2.60	1.62	3.41	1.47
Weber, P.	575	ICN	asperula	-30.155833	-55.263056	160	20161129	7.5	11.467	6.8	5	6.70	2.61	1.58	4.00	1.44

Collector	number	Herbaria	variety	latitude	longitude	Elev	Coll. dat	IDM	ILM	IWM	NLI	SpLM	ALM	AWM	SLM	SWM
Weber, P.	577	ICN	asperula	-30.460669	-56.248126	137	20161130	5.55	9.7	5.55	3		2.67	1.73	4.08	1.74
Weber, P.	579	ICN	chacoensis	-29.896111	-56.715	126	20161201	9.63333	18.133	14.833	2	7.89	3.59	2.06	3.31	2.39
Weber, P.	581	ICN, FLOR	var. 1	-30.196475	-57.494221	52	20161201	8.35	10	8.8	3	6.82	3.48	2.08	2.83	1.91
Weber, P.	582	ICN, FLOR	asperula	-29.645376	-55.496693	115	20161202	6	8.1	5.5667	5	7.25	3.05	1.55	3.81	1.45
Weber, P.	591 *	ICN	angustirostris	-31.818695	-56.178234	162	20171202	10.45	9.9	5.95	3	7.89	3.72	2.18	3.90	1.57
Weber, P.	610	ICN	asperula	-34.757821	-56.426875	5	20171204	8.4	13.2	6.1	3	7.92	3.42	2.14	3.63	1.73
Weber, P.	618	ICN	asperula	-33.035916	-54.411918	65	20171206	3.6	6.6	10.9	3	8.31	3.544	2.278	4.088	1.752
Weber, P.	622	ICN	asperula	-26.483333	-48.886667	17	20170310					6.40	2.82	1.80	3.87	1.69
Zardini, E.M.	7034	SI	asperula	-25.90	-57.15	500	19880905	10.83	12.75	5.19	2	6.60	2.91	1.81	3.52	1.54
Zardini, E.M.	7405	SI	chacoensis	-25.20	-57.116667	250	19880922	6.82	9.36	11.86	2	7.37	3.23	1.99	2.40	2.00
Zardini, E.M.	9043	SI	asperula	-26.05	-56.833333	329	19881221	7.52	13.2	5.89	3	6.73	2.64	1.56	3.68	1.42
Zardini, E.M.	14971	SI	chacoensis	-25.80	-56.333333	166	19891016	10.6433	14.177	13.88	2	7.91	3.07	1.90	2.70	1.99
Zardini, E.M.	24671	SI	asperula	-25.366667	-55.916667	291	19901201	3.91	3.64	2.55	4	6.26	2.52	1.83	3.92	1.67
Zardini, E.M.	24963	SI	asperula	-25.333333	-57.466667	95	19901207	9	8.92	5.64	2	6.10	2.65	1.60	3.51	1.52
Zardini, E.M.	35395	SI	chacoensis	-25.733333	-57.733333	63	19930304	6.51	11.59	10.06	3	8.11	3.34	2.45	2.67	2.52
Zardini, E.M.	37422	SI	chacoensis	-23.116667	-57.333333	90	19931118	11.69	11.48	9	2	6.84	2.66	2.09	3.15	2.20
Zardini, E.M.	42002	SI	asperula	-25.641667	-54.816944	209	19941227	7.76333	10.847	5.4333	1	6.55	2.43	1.62	3.13	1.48
Zardini, E.M.	52090	SI	asperula	-27.4725	-56.759444	63	19991024	3.49	9.3	6.78	4	7.55	3.25	1.63	3.20	1.63
Zardini, E.M.	52584	SI	asperula	-22.670278	-56.025833	261	19991112	14.28	10.86	3.88	3	6.68	3.08	1.53	3.75	1.44
Zuloaga, F.O.	4915	SI	var. 1	-27.80	-55.666667	237	19950225	7.5	11.14	8.23	2	6.83	3.02	1.97	2.91	1.95
Zuloaga, F.O.	6427	SI	var. 1	-28.083333	-55.70	120	19970921	9.19	16.89	8.43	2	8.71	3.21	1.78	3.56	1.74
Zuloaga, F.O.	6913	SI	var. 1	-27.483333	-55.733333	60	19990226	9.29	10.43	8.54	3	7.46	3.48	2.27	2.99	2.34
Zuloaga, F.O.	7294	SI	asperula	-22.416667	-56.283333	340	20010506	18.28	14.55	4.2	3	5.69	2.94	1.59	2.92	1.30

CONSIDERAÇÕES FINAIS

Esta tese é parte de um estudo filogenético, taxonômico e biogeográfico de *Rhynchospora* seção *Longirostres*. O estudo biogeográfico ainda está em curso e não foi incluído na tese. *Rhynchospora* seção *Longirostres*, ao que tudo indica, é um grupo monofilético e um dos mais basais em *Rhynchospora*. Sua compreensão é chave para o entendimento da evolução desse gênero tão diverso. Os resultados obtidos nesse trabalho, assim como os do estudo biogeográfico da seção, certamente contribuirão para o melhorar entendimento do gênero.

No Capítulo 1 apresentamos a mais completa revisão taxonômica já feita para *Rhynchospora* seção *Longirostres*. A revisão inclui, pela primeira vez, imagens e informações taxonômicas fundamentais para as dezoito espécies confirmadas. Também é a primeira vez que *R. hassleri* é incluída na seção. Propomos a exclusão da sinonímia entre *R. scutellata* e *R. indianolensis*. A primeira é uma espécie rara e considerada endêmica de Cuba, cujo nome estava sendo aplicado erroneamente como sinônimo da segunda espécie, de ampla distribuição. Esta confusão fazia com que o nome *R. indianolensis* fosse subutilizado e desconhecido mesmo em áreas de ocorrência da espécie e o potencial risco de ameaça de *R. scutellata* fosse subestimado. O estado de conservação das espécies da seção, segundo as categorias da IUCN, está sendo avaliado e deverá constar na publicação desta revisão taxonômica.

No Capítulo 2 apresentamos um estudo filogenético de *Rhynchospora* seção *Longirostres*, incluindo 14 das 18 espécies da seção, o qual deu suporte às alterações taxonômicas apresentadas no capítulo 1. Destacam-se a exclusão de *Rhynchospora triflora* da seção e a já citada inclusão de *R. hassleri*. A posição de *R. pedersenii* dentro de um clado do complexo *R. corymbosa* aponta a necessidade da ampliação do estudo desse complexo.

No capítulo 3 apresentamos um estudo da parte mais complicada do complexo *Rhynchospora corymbosa*, as variedades do Cone-Sul. Os dados coletados permitiram testar uma hipótese, formulada após a análise de milhares de exsicatas (estimada em mais de 3 mil só para o complexo): as supostas variedades seriam apenas os limites artificiais da variação de um pequeno número de caracteres que as definiam. As maior parte das variedades foram delimitadas, basicamente, por variações em comprimento e largura de aquênio e estilopódio e, por vezes, algumas características de inflorescência também entravam na diagnose. Porém essas características, que em *Rhynchospora* muita vezes

são delimitadores confiáveis para separar as espécies, no complexo *R. corymbosa* são extremamente variáveis. Como esses estados de caráter formam um grande contínuo, as tentativas de delimitação sempre pareceram um tanto arbitrárias, havendo na verdade, incontáveis formas de se delimitar esse conjunto multidimensional de caracteres. Quando se analisam poucos exemplares de cada variedade isso parece fazer sentido. Mas, se materiais adicionais são analisados percebe-se que o encaixe desses exemplares nos limites de variação das supostas variedades muitas vezes é incongruente e acompanhado de alguma dúvida ou critério subjetivo. Na prática, isso fazia com que nem os especialistas conseguissem identificar essas supostas variedades de maneira consistente. Os resultados apontaram para a sinonimização das variedades de *R. corymbosa*. Como citado acima, esse estudo deverá ser ampliado, incluindo exemplares asiáticos (variedade típica) e africanos (ex *R. spectabilis*) do complexo *R. corymbosa* e *R. pedersenii*.