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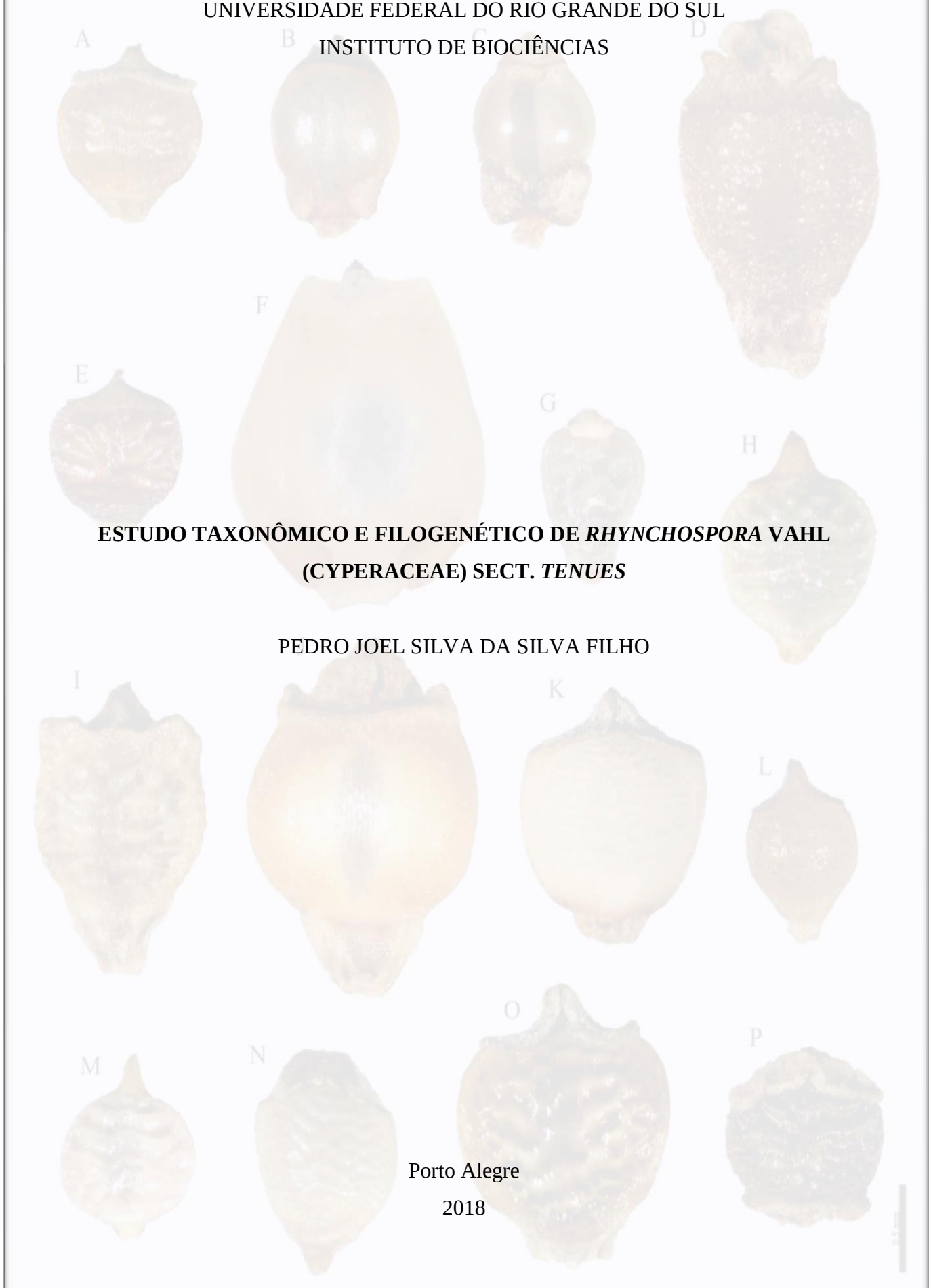

ESTUDO TAXONÔMICO E FILOGENÉTICO DE *RHYNCHOSPORA* VAHL (CYPERACEAE) SECT. *TENUES*

PEDRO JOEL SILVA DA SILVA FILHO

Porto Alegre
2018

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Resumo

O gênero *Rhynchospora* Vahl apresenta atualmente cerca de 400 espécies com concentração na América tropical. As espécies de *Rhynchospora* caracterizam-se principalmente pelas espiguetas com glumas dispostas espiraladamente, frutos do tipo aquênio, o qual é geralmente obovado e dorsiventralmente lenticular, com estilopódio persistente, e geralmente apresentam cerdas hipóginas. Quanto à classificação infragenérica, o trabalho mais completo e utilizado até hoje é o de Kükenthal, que divide *Rhynchospora* em dois subgêneros, cinco partes e 28 seções. Thomas *et al.* e Buddenhagen *et al.* realizaram estudos moleculares preliminares para testar a classificação infragenérica de Kükenthal. Os resultados mostram que, com algumas exceções, as seções testadas parecem ser monofiléticas. Como as seções *Laevinuces*, *Luzuliformes*, *Spermodontes* e *Tenues*, que fazem parte do grupo *Psilocaryae*, e ainda não foram mais profundamente estudadas e também foram subamostradas nos estudos moleculares anteriores, resolveu-se fazer uma análise taxonômica clássica, juntamente com uma análise filogenética combinada utilizando os marcadores nucleares ETS e ITS, e o marcador plastidial trnL-F para tentar resolver a classificação deste grupo. Os resultados mostraram que as seções *Laevinuces, Spermodontes* e *Tenues* não são monofiléticas, mas juntas formam um clado muito bem suportado, desta forma todas foram sinonimizadas em seção *Tenues*. Essa seção agora envolve 43 espécies no total, sendo 24 espécies aceitas mais 19 espécies novas. Através do conhecimento adquirido em campo, de referências bibliográficas, uma vasta revisão de herbário, esta tese apresenta uma nova chave para a seção *Tenues*, descrições e fotos de material de herbário, fotos de aquênios, e informação sobre hábitat e distribuição de todas as espécies. Cinco neótipos e quatorze lectótipos foram designados, bem como nove novas sinonimizações também foram feitas.

***Palavras-chave*—**tiririca, espécies novas, nomenclatura, Poales.

Abstract

The genus *Rhynchospora* Vahl comprises nearly 400 species with highest diversity in tropical America. *Rhynchospora* species are mainly characterized by having spikelets with spirally arranged glumes, fruits of the achene type, which is generally obovate and dorsiventrally lenticular, with persistent stylopodium, and with hypogynous bristles generally present. Regarding the infrageneric classification, the most complete and cited work is that of Kükenthal, which divides *Rhynchospora* into two subgenres, five parts and 28 sections. Thomas et al. and Buddenhagen et al. carried out preliminary studies to test Kükenthal's classification. The results showed that, with some exceptions, the sections appear to be monophyletic. Since sections *Laevinuces*, *Luzuliformes*, *Spermodontes* and *Tenues* are part of the *Psilocaryas* group, and have not yet been further studied and also subsampled in the former molecular studies, we decided to perform a classical taxonomic analysis, along with a combined phylogenetic analysis using the nuclear markers ETS and ITS, and the plastidial marker trnL-F to try to solve the issues of this group. Results showed that *Laevinuces*, *Spermodontes* and *Tenues* are not monophyletic but, grouped together, forming a well-supported clade, *Rhynchospora* sect. *Tenues*. Sect. *Luzuliformes* is monophyletic but not a sister clade of *Tenues*. *Rhynchospora* sect. *Tenues* now includes 43 species, 24 accepted species plus 19 new ones. With knowledge obtained in the field, from the literature and vast herbaria reviewed, this paper presents a new key for sect. *Tenues*, full descriptions along with pictures of herbarium collections, photos of achenes, and information about habitat and distribution. Five neotypes and fourteen lectotypes were designated, and nine new synonymizations were also done.

***Keywords*—**beaksedges, new species, nomenclature, Poales.

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Apresentação

Esta tese é apresentada da seguinte forma: uma introdução geral ao tema, seguido de três capítulos referente à tese, mais um artigo anexo:

Capítulo 1 – **Redefining *Rhynchospora* (Cyperaceae) sect. *Tenues*, a phylogenetic approach**

Capítulo 2 – **Taxonomic study of *Rhynchospora* (Cyperaceae) Sect. *Tenues***

Capítulo 3 – ***Rhynchospora rheophytica (Cyperaceae), a new species of from western Bahia, Brazil***

Anexo 1 – **Revision of *Rhynchospora* (Cyperaceae) sect. *Luzuliformes***

A formatação dos Capítulos 1 e 2, e Anexo 1 é baseada no modelo exigido para publicação na revista Systematic Botany (https://aspt.net/about/#.Wn3f2ejwZPZ), na qual o anexo 3 já foi publicado. A formatação do Capítulo 3 é baseada no modelo exigido para publicação na revista Brittonia (https://www.springer.com/cda/content/document/cda_downloaddocument/Brittonia_Instructions_For_Authors_2Feb2016.pdf?SGWID=0-0-45-1543069-p173750009), na qual o Capítulo 3 já foi publicado.

O artigo três trata da revisão taxonômica da seção *Luzuliformes* Kük., a qual fazia parte de um clado maior, quando da elaboração do projeto, mas que atualmente se encontra fora do escopo da tese. Inicialmente, as seções *Laevinuces*, *Luzuliformes*, *Spermodontes* e *Tenues* aparentavam formar um clado. Com o decorrer das análises moleculares, se concluiu que apesar de a seção *Luzuliformes* ser monofilética, ela divergiu mais cedo e se encontra na base do clado (*Dichromenae* + *Psilocaryae*) + (*Tenues*). Estes resultados só foram obtidos ao final do período do Doutorado, e como a seção *Luzuliformes* é pequena, a sua revisão taxonômica foi publicada antes na ocasião do exame de qualificação deste doutorado.

Introdução Geral

Segundo Muasya *et al.* (2009), Cyperaceae Juss. é uma família monofilética e irmã de Juncaceae Juss., ambas inseridas na ordem Poales (Stevens 2001 onwards). Cyperaceae compreende 109 gêneros e 5.424 espécies com distribuição quase cosmopolita (Govaerts *et al.* 2007). De acordo com Maguila (2015) e Larridon (2014), em torno da metade das espécies pertence a somente dois gêneros: *Carex* L. (~ 2000 espécies) e *Cyperus* L. (~ 950 espécies), respectivamente.

O gênero *Rhynchospora* está inserido na tribo Schoeneae, e dentro da subfamília Cyperoideae (Muasya *et al.* 2009, Simpson *et al.* 2007). Apesar de algumas espécies serem citadas para a África, Europa e Ásia, sua distribuição é, sobretudo, neotropical, sendo que a maioria das espécies está distribuída entre as latitudes 20°N e 20°S (Araújo 2001). Grande parte destas espécies é heliófita, habitando principalmente lugares abertos e úmidos, como margem de rios e lagoas, mas também são encontradas em terrenos secos, pedregosos e locais elevados, e até mesmo em ambientes sombreados, como bordas de mata de galeria e interiores de mata (Barros 1945, Guaglianone 1979, 1981, Bryson & Carter 2008).

O gênero *Rhynchospora* foi publicado por Vahl (1805) com 19 espécies, sendo que destas, três eram novas para a ciência e as outras estavam anteriormente incluídas em outros gêneros, principalmente *Schoenus* L. No mesmo século outros gêneros foram descritos e hoje se encontram sinonimizados em *Rhynchospora*, como *Dichromena* Michx., *Haloschoenus* Nees, *Spermodon* P. Beauv. ex T. Lestib., *Psilocarya* Torr. Muitos destes inclusive dão nomes às seções de Kukenthal (1949, 1950, 1951). Segundo Buddenhagen et al. (2017), esse gênero apresenta atualmente cerca de 400 espécies com concentração na América tropical.

As espécies de *Rhynchospora* caracterizam-se pelas espiguetas com glumas dispostas espiraladamente (Fig. I), as primeiras glumas (geralmente as duas ou três primeiras) são estéreis, e as seguintes floríferas. As glumas basais (com exceção das primeiras estéreis) geralmente apresentam flores bissexuadas, e é onde se desenvolvem os frutos. As distais podem apresentar flores bissexuadas ou somente estaminadas, e geralmente não desenvolvem frutos. Os frutos são do tipo aquênio, o qual é geralmente obovado e dorsiventralmente lenticular, com estilopódio persistente, e geralmente apresentam cerdas hipóginas (Fig. I; Goetghebeur 1998).

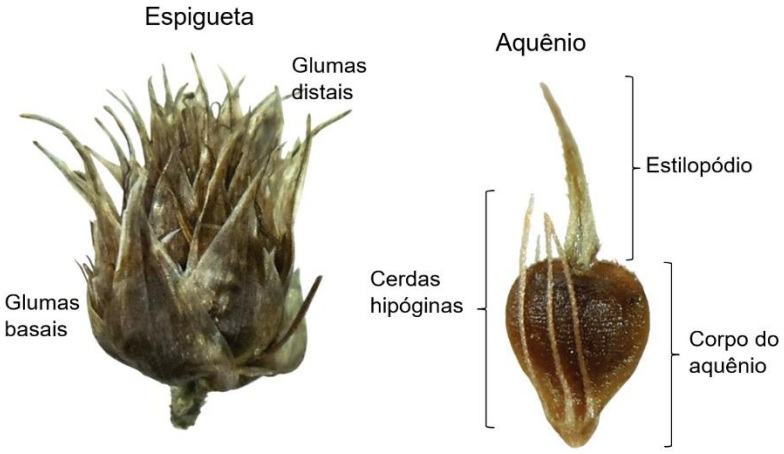

Figura I. Espigueta e aquênio de *Rhynchospora* (*R. conferta* e *R. holoschoenoides*, respectivamente) e suas principais estruturas.

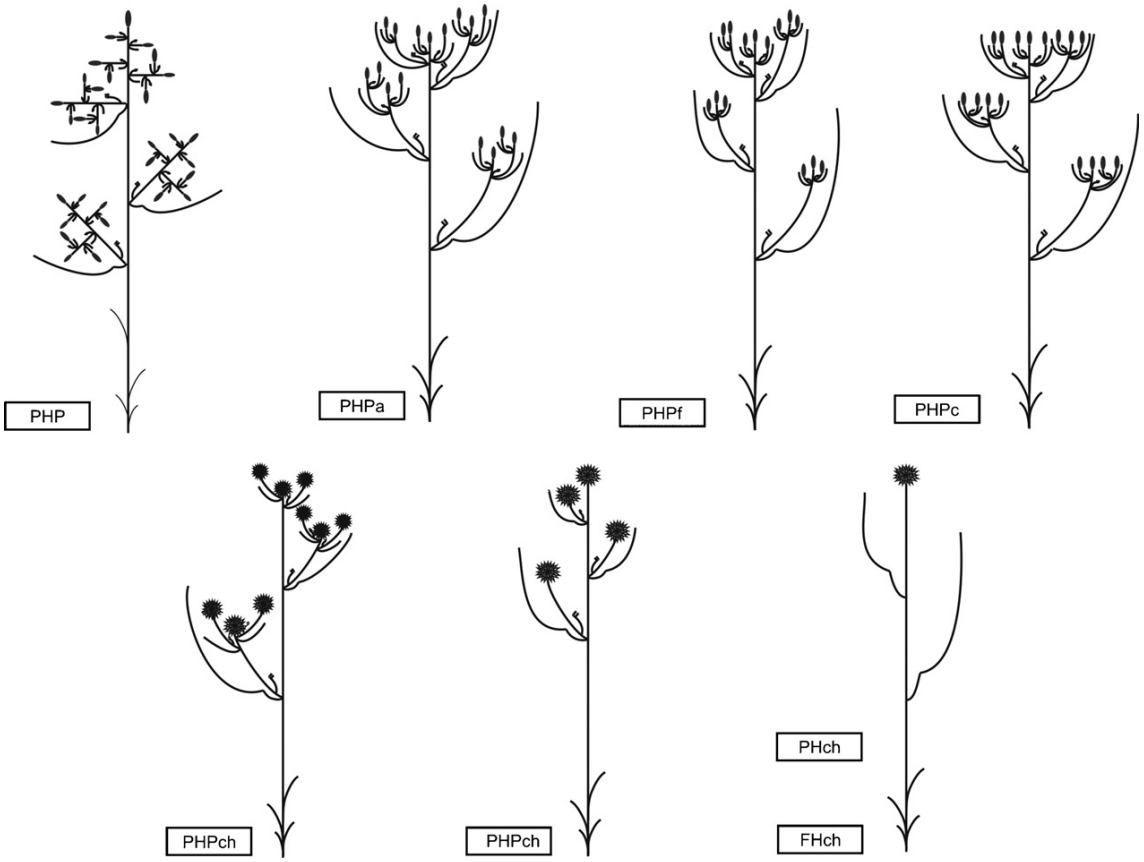

Figura II. Diversidade de sinflorescências em *Rhynchospora*. Tipo paniculódio parcialmente homogeneizado (PHP); tipo paniculódio parcialmente homogeneizado do subtipo antelódio (PHPa); tipo paniculódio parcialmente homogeneizado do subtipo fascículos (PHPf); tipo paniculódio parcialmente homogeneizado do subtipo corimbódio (PHPc); tipo paniculódio parcialmente homogeneizado do subtipo capítulo (PHPch); tipo capítulo parcialmente homogeneizado (PHch); tipo capítulo completamente homogeneizado (FHch). Apresentada por Lucero & Vegetti 2012.

As inflorescências são classificadas como corimbódios, paniculódios, antelódios, fascículos ou capítulos (definição simplificada de Lucero & Vegetti 2012; Fig. II). A terminação "odio" que é utilizada para a classificação das inflorescências de Cyperaceae, remete à proposta introduzida por Troll (1964). Ele as nomeia desta forma devido ao fato das inflorescências desta família serem indefinidas, diferente das inflorescências do tipo panícula, corimbo e antela que são definidas (Kukkonen 1994).

Quanto à classificação infragenérica, várias propostas já foram feitas (Kunth 1837, Nees 1842, Boeckeler 1873, Clarke 1900), mas o trabalho mais completo e utilizado até hoje é o de Kükenthal (1949, 1950, 1951), que se baseia nos estudos anteriores. Esta classificação é apresentada da seguinte maneira: dois subgêneros, cinco partes (classificação informal intermediária entre subgênero e as seções), 28 seções (Fig. III) e 211 espécies.

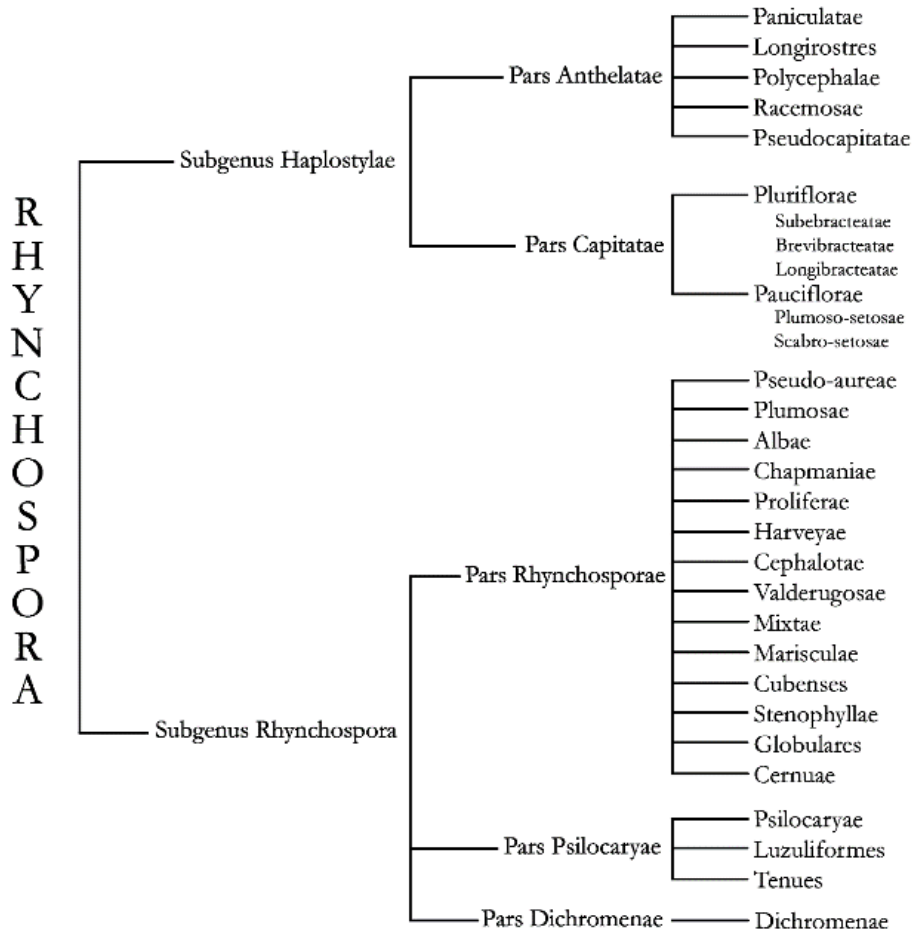

Figura III. Cladograma com a classificação infragenérica de Kükenthal, apresentado por Thomas *et al.* (2009).

Thomas *et al.* (2008) realizaram estudos moleculares preliminares para testar a classificação infragenérica de Kükenthal para os gêneros *Rhynchospora* e *Pleurostachys* Brongn. O estudo utilizou 41 sequências do marcador plastidial *trn*L-F de 22 das 28 seções de Kükenthal, mais três espécies de três seções do gênero *Pleurostachys*. Os resultados mostram que o gênero *Pleurostachys* está inserido dentro de *Rhynchospora*, e que, com algumas exceções, as seções testadas parecem ser monofiléticas. No entanto, a divisão nos subgêneros *Haplostylae* e *Rhynchospora* parece ser artificial (Fig. IV).

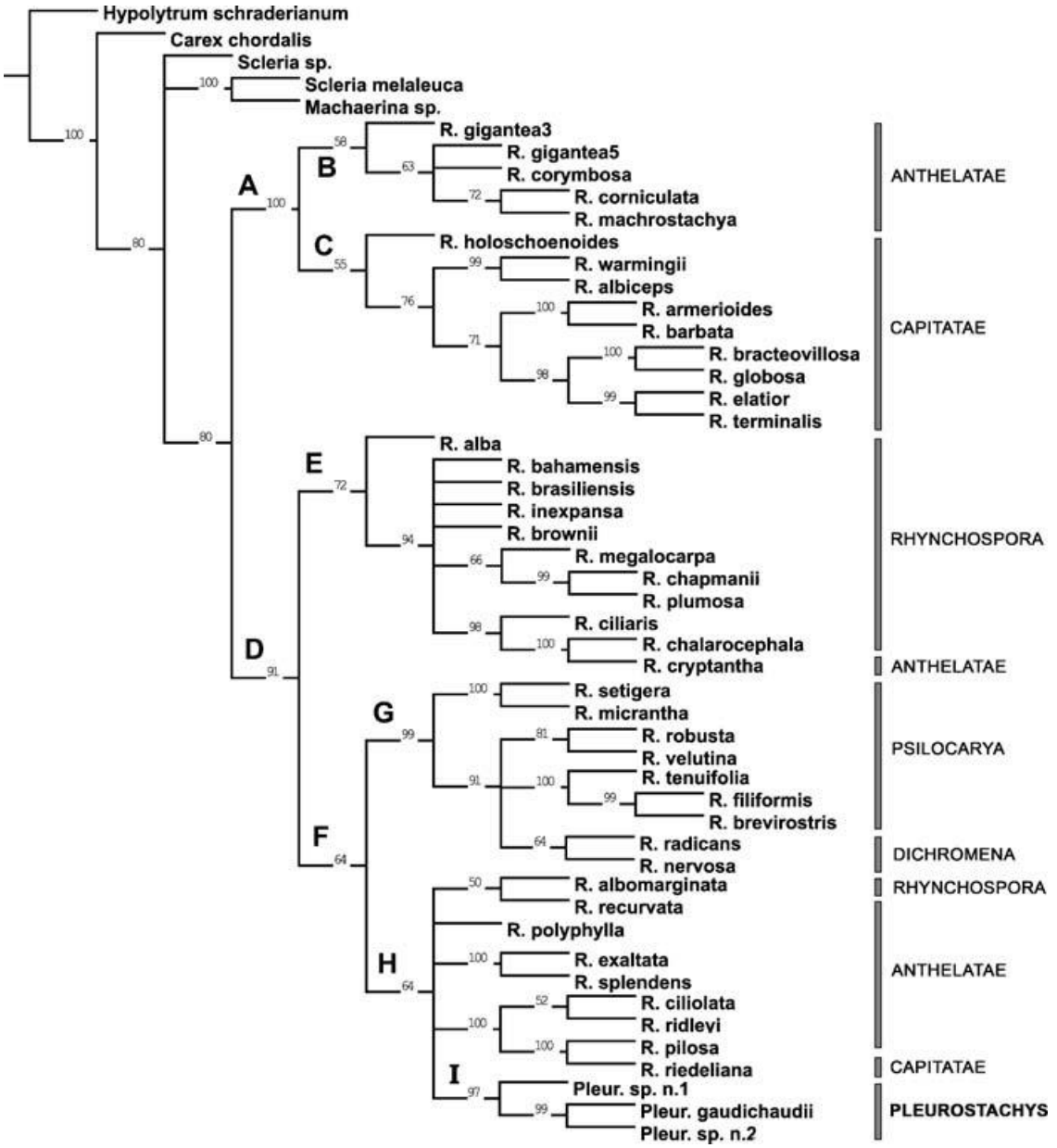

Figura IV. Árvore obtida por consenso estrito a partir das 16 árvores mais parcimoniosas de *trn*L-F. Os valores de suporte de bootstrap são apresentados em cada linha. Apresentado por Thomas *et al.* (2008).

Buddenhagen et al. (2017), utilizando as sequências de Thomas et al. (2008), e incluindo mais 39 sequências de *trn*L-F de espécies principalmente da América do Norte, chegaram a resultados muito parecidos, mostrando também que os subgêneros propostos por Kükenthal não são monofiléticos, mas que muitas seções parecem realmente formar clados, sendo necessário a inclusão de mais espécies para se confirmar essa hipótese. Estes estudos, juntamente com dados de "Next Generation Sequence" ainda não publicados (Buddenhagen et al., comunicação pessoal), mostram que o grupo *Dichromenae* parece estar inserido dentro do grupo *Psilocaryae*, e ambos formam um clado bem suportado. Como as seções *Laevinuces*, *Luzuliformes*, *Spermodontes* e *Tenues*, que fazem parte do grupo *Psilocaryae*, e ainda não foram mais profundamente estudadas e também foram subamostradas nos estudos moleculares anteriores, resolveu-se fazer uma análise taxonômica clássica, juntamente com uma análise filogenética combinada utilizando os marcadores nucleares ETS e ITS, e o marcador plastidial trnL-F para resolver a classificação deste grupo.

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Capítulo 1

Redefining *Rhynchospora* (Cyperaceae) sect. *Tenues*, a phylogenetic aproach

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***Abstract*—**We studied sections *Laevinuces* Kük., *Luzuliformes* Kük., *Spermodontes* Kük. and *Tenues* Kük. which, according to Kükenthal, are included in the *Psilocarya* group of subgenus *Rhynchospora* Vahl. Previous molecular studies of *Rhynchospora* indicate that sections *Psilocarya* and *Dichromena* group together in a clade and are sister to at least some species of the sections being studied here. Although the number of recognized species in these four sections is about 41, only four of these species were included in the phylogenetic studies cited above. As a result, the relationships among them are still not clear. To elucidate these relationships, we relied on chloroplast *trn*L-F and nuclear ETS and ITS markers to build a molecular phylogeny for *Rhynchospora*, emphasizing species in these four sections. Results showed that *Laevinuces*, *Spermodontes* and *Tenues* are not monophyletic but, grouped together, forming a well-supported clade, *Rhynchospora* sect. *Tenues*. Sect. *Luzuliformes* is monophyletic but not a sister clade of *Tenues*.

Keywords*—Rhynchospora*, ETS, ITS, *trn*L-F.

INTRODUCTION

The genus *Rhynchospora* (Cyperaceae), comprises nearly 400 species with highest diversity in tropical America. Several infrageneric classifications have been proposed over the past 180 years (Kunth 1837, Nees 1842, Boeckeler 1873, Clarke 1900), but the most complete and recent work is that of Kükenthal (1949, 1950, 1951). According to Kükenthal, sections *Laevinuces* Kük., *Luzuliformes* Kük., *Spermodontes* Kük. and *Tenues* Kük. are included in subgenus *Rhynchospora* Vahl, in a group ("Pars") *Psilocarya*, characterized by a deeply divided style, a lack of hypogynous bristles, and a synflorescence formed by more or less lax corymbs. Section *Psilocarya* (Kral & Thomas 1988) is also included in this group. "Pars" *Dichromena*, comprising only section *Dichromena*, was studied by Thomas (1984) and is closely related to *Psilocarya*.

The only two phylogenetic studies using molecular data of *Rhynchospora* used the universal chloroplast marker *trn*L-F (Thomas et al. 2009) and Next Generation Sequencing (Buddenhagen 2017, Buddenhagen Pers. Comm. 2017). Both indicate that the group *Psilocarya* is monophyletic if we include group *Dichromena* in it, and species of sections *Psilocarya* and *Dichromena* group together and are sister to at least some species of the sections *Spermodontes* and *Tenues*. The number of valid species already described for sects. *Laevinuces*, *Luzuliformes*, *Spermodontes* and *Tenues* is around 41 (Kükenthal 1950-51, Rocha & Luceño 2002, Strong 2005 & 2006, Thomas & Silva Filho 2017), and only four of these species were included in the phylogenetic studies cited above.

The relationship between sections *Laevinuces*, *Luzuliformes*, *Spermodontes* and *Tenues* is still not clear, and authors disagree on how to classify the species in these sections (Kükenthal 1950-51, Rocha & Luceño 2002, Strong 2006). Because morphological characters are overlapping and confusing, we proposed to reconstruct a molecular phylogeny relied on both chloroplast *trn*L-F and nuclear ETS and ITS markers for these four sections of *Rhynchospora*, including species from sects. *Psilocaryae* and *Dichromena*, as well as some outgroups.

MATERIALS AND METHODS

***Taxon sampling*—** We sampled 69 specimens of *Rhynchospora* for this study. These represent 44 terminals of 35 accepted species (Kükenthal 1949-51, Rocha & Luceño 2002, Strong 2005 & 2006, Thomas & Silva Filho 2017) for sections *Laevinuces*, *Luzuliformes*, *Spermodontes* and *Tenues* of Kükenthal (1950-51), plus 18 terminals of 13 as yet unidentified taxa, possibly new to science, and seven outgroups. Most of the species were sampled from herbarium collections of the New York Botanical Garden, a few from the US National Herbarium, and some from living plants during fieldwork in Brazil. Species names, collection and sequence information are listed in Table 1. In addition, we included several accessions of ETS, ITS and *trn*L-F sequences from GenBank (available at <https://www.ncbi.nlm.nih.gov/genbank/>) or sent by other researchers as outgroups, totaling 82 terminals in the concatenated analysis (Table 1).

Table 1. Vouchers of all specimens included in the analysis along with GenBank accession number. x = sequenced but not yet on GenBank; 0 = no sequence; *Lagen*. = *Lagenocarpus*; *Pleur*. = *Pleurostachys*; *R.* = *Rhynchospora*.

Species	Voucher	trnL-F	ETS	ITS
Lagen. rigidus	Brazil, *S. Costa 1045* (UEC)	MF 564247	x	MF 564226
Pleur. gaudichaudii	Brazil, Bahia, *W. Thomas 16319* (NY)	x	x	x
Pleur. stricta	Brazil, *Guaglianone & Sobral 9* (SI?)	x	x	x
Pleur. tenuiflora	Brazil, Rio de Janeiro, *Reginato 1479* (UFPR)	x	x	x
R. aff. sp. 5	Brazil, Minas Gerais, *R. Borges 121* (NY)	x	x	x
R. alba	USA, C. *Naczi 15601* (NY)	KX 659156	0	0
R. albida	Brazil, Amazonas, *S. M. Costa 1134* (NY)	x	0	x
R. aripoensis	Belize, Belize District, *R. F. C. Naczi 12263* (NY)	x	x	x
R. berteroi	Dominican Republic, *Abbott 21082* (NY01297165)	x	x	x
R. boeckeleriana	Brazil, Rio Grande do Sul, *A. C. Araújo 1664* (NY01145240)	x	x	x
R. brasiliensis	Brazil, Minas Gerais, Diamantina, *Thomas 16402* (NY02952580)	KX 659161	0	0
R. brevirostris	Brazil, Goiás, *W. R. Anderson 9528* (NY00923342)	x	x	x
R. caesionux	Brazil, Mato Grosso, *H. S. Irwin et al. 15955* (NY00939161)	x	x	x
R. caracasana	Brazil, Bahia, *M. L. Fonseca et al. 3032* (NY01921696)	x	x	x
R. chinensis	South Korea, *Jung 1010313* (AJOU)	JX 644724	0	0
R. confinis	Brazil, Rio Grande do Sul, *P. J. S. Silva Filho 2040* (ICN0015665)	x	x	x
R. contracta	Cuba, Holguín, *W. Thomas et al. 15010* (NY01198485)	x	x	x
R. corymbosa	*K. C. 75* (missing)	AY	0	0

		230044		
R. crinigera	Brazil, Rio Grande do Sul, *P. J. S. Silva Filho 2170* (ICN0181012)	x	x	x
R. depressirostris	Puerto Rico, Guayanés, *R. O. Woodburry s.n.* (NY00826349)	x	x	x
R. divergens	Belize, Belize District, *R. F. C. Naczi 11186* (NY)	x	x	x
R. emaciata 1	Brazil, Santa Catarina, *P. J. S. Silva Filho 1985* (ICN0178589)	x	x	x
R. emaciata 2	Brazil, Minas Gerais, *P. J. S. Silva Filho 2269* (ICN)	x	x	x
R. exaltata	Brazil, Bahia, *W. Thomas 16468* (NY02641701)	x	x	x
R. fallax	French Guyana, Savane Roche Annabelle, *G. Cremers 15261* (NY)	x	x	x
R. filiformis	Brazil, Paraíba, *W. Thomas 15665* (NY01738206)	x	x	x
R. fusca	USA, Delaware, *R. C. Naczi 12035* (NY)	KX 659158	0	0
R. gracillima	South Africa, Richard's Bay, *E. A. Robinson 5522* (NY)	x	x	x
R. hirsuta	Guyana, Rupununi, *M. J. Jansen-Jacobs et al. 5024* (NY03108123)	x	x	x
R. juncellus	Dominica, Syndicate State, *C. Whitefoord 3928* (NY01298496)	x	x	x
R. junciformis 1	French Guyana, Commune de Matoury, *P. G. Delprete 11289* (US3632360)	x	x	x
R. junciformis 2	Brazil, Amapá, *J. M. Pires 52381A* (NY02618901)	x	x	x
R. megapotamica	Brazil, Rio Grande do Sul, *P. J. S. Silva Filho 2075* (ICN0180917)	x	x	x
R. naardifolia	Brazil, Minas Gerais, *J. S. Martins s. n.* (ICN0193840)	x	x	x
R. nanuzae	Brazil, Bahia, *W. Thomas & J. Jardim 11129* (NY00095247)	x	x	x
R. patuligluma	Brazil, Goiás, *P. G. Delprete 10431* (NY01019131)	x	x	x
R. perrieri	South Africa, *M. C. Ward 2037* (NY)	x	x	x
R. pilosa	Brazil, Minas Gerais, *S. Martins 342* (HRCB51434)	KC 111775	0	0
R. praecincta	Brazil, Rio Grande do Sul, *P. J. S. Silva Filho 2188* (ICN0181030)	x	x	x
R. pubera	Brazil, Pernambuco, *W. Thomas 15756* (NY02351193)	x	x	x
R. pusilla	Belize, Belize District, *R. F. C. Naczi 16056* (NY)	x	x	x
R. rheophytica	Brazil, Bahia, *A. M. Amorin et al. 564* (NY)	x	x	x
R. riedeliana	Brazil, Minas Gerais, *W. Thomas 16401* (NY)	KX 659168	0	0
R. rigidifolia	Venezuela, Bolívar, *R. Kral et al. 81924* (NY03108126)	x	x	x
R. riparia	Brazil, Paraíba, *A. C. C. Almeida JPB-58055* (NY2499356)	x	x	x
R. robusta	Brazil, Minas Gerais, *W. Thomas 16403* (NY)	KX 659169	0	0
R. roraimae	Brazil, Amazonas, *R. C. Forzza 7279* (NY, RB)	x	x	x
R. rugosa	*Verboom 616* (BOL)	0	KJ 613580	KF 553455
R. sanariapensis 1	Venezuela, Amazonas, *A. Gröger 968* (NY)	x	x	x
R. sanariapensis 2	Venezuela, Amazonas, *R. Liesner & H. Clarke 8952* (NY)	x	x	x
R. saxisavanicola	Brazil, Amapá, *J. M. Pires 52381B* (NY02618901)	x	x	x
R. setigera	Brazil, Minas Gerais, *A. C. G. Costa 140* (NY)	x	x	x
R. sp. 1b	Brazil, Pará, *C. R. Sperling et al. 5646* (NY00668330)	x	x	x
R. sp. 1a	Brazil, Pará, *C. R. Sperling et al. 5615* (NY01201011)	x	x	x

R. sp. 2	Brazil, Minas Gerais, *W. Thomas & A. C. Galindo 16395* (NY02641704)	x	x	x
R. sp. 3	Belize, Toledo District, *R. F. C. Naczi 12124* (NY)	x	x	x
R. sp. 4	Brazil, Goiás, *P. G. Delprete 9769* (NY01145992)	x	x	x
R. sp. 5a	Brazil, Minas Gerais, *P. J. S. Silva Filho 2141* (ICN180983)	x	x	x
R. sp. 5b	Brazil, Minas Gerais, *P. J. S. Silva Filho 2247* (ICN)	x	x	x
R. sp. 6a	Brazil, Goiás, *H. S. Irwin et al. 21698* (NY00938833)	x	x	x
R. sp. 6b	Bolivia, Santa Cruz, *T. Killen 2045* (NY)	x	x	x
R. sp. 7	Brazil, Rio de Janeiro, *W. Thomas 16078* (NY02697508)	x	x	x
R. sp. 8a	Brazil, Bahia, *Harley et al. CFCR 7235* (NY)	x	x	x
R. sp. 8b	Brazil, Bahia, *A. C. Araújo et al. 1202* (NY02499205)	x	x	x
R. sp. 9	Brazil, Bahia, *R. M. Harley et al. 15950* (NY00636702)	x	x	x
R. sp. 10	Bolivia, Santa Cruz, *S. Gonzales & Soliz 2140* (NY)	x	0	x
R. sp. 11	Brazil, Mato Grosso, *M. F. Simon 2225* (NY02702286)	x	x	x
R. sp. 12	Brazil, Amazonas, *R. C. Forzza 6682* (NY02687558)	x	0	x
R. sp. 13	Venezuela, Cerro Camai, *B. Maguire 31831* (NY)	x	x	x
R. spruceana	Brazil, Goiás, *R. C. Forzza et al. 4679* (NY01018687)	x	x	x
R. subnipensis 1	Bahamas, Andros, *D. S. Correl & K. Godfrey 41300* (NY00668322)	x	x	x
R. subnipensis 2	Cuba, Pinar del Rio, *W. W. Thomas et al. 15978* (NY)	x	x	x
R. tenella	Guyana, *M. J. Jansen-Jacobs et al. 1839* (NY)	x	x	x
R. tenerrima 1	Brazil, Sergipe, *L. A. Gomes et al. 1029* (NY02098505)	x	x	x
R. tenerrima 2	Brazil, Minas Gerais, *P. J. S. Silva Filho 2131* (ICN0180973)	x	x	x
R. tenuis 1	Belize, Belize District, *R. C. Naczi 12154* (NY)	x	x	x
R. tenuis 2	Belize, Belize District, *R. C. Naczi 15237* (NY)	x	x	x
R. tenuis 3	Brazil, Rio Grande do Sul, *P. J. S. Silva Filho 2191* (ICN0181033)	x	x	x
R. tenuis 4	Brazil, Rio Grande do Sul, *P. J. S. Silva Filho 2301* (ICN)	x	x	x
R. tenuis 5	US-Hawaii, Hanalei District, *C. T. Imada 2001-59* (US3472280)	x	x	x
R. t. subsp. austrobrasiliensis	Brazil, Paraná, *T. Koyama et al. 13804* (NY00612404)	x	x	x
R. velutina	Brazil, Minas Gerais, *P. J. S. Silva Filho 2274* (ICN)	x	x	x

***DNA Extraction, PCR, and Sequencing*—**DNA was extracted from leaf material of herbarium specimens using a modified protocol of Alexander *et al.* 2007 combined with the DNeasy Kit method from Qiagen. We used the chloroplast DNA marker *trn*L-*trn*F (Taberlet et al. 1991), which was shown to be phylogenetically informative in previous studies on *Rhynchospora* (Thomas et al. 2009). We also used the nuclear DNA markers ETS (primer developed by us) and ITS (Roalson & Friar 2000), since they have been used at infrageneric level with good results in many studies of different Cyperaceae genera (Yano & Hoshino 2006, Muasya et al. 2014, Jiménez-Mejías et al. 2016). PCR amplification was carried out in 25 µL reaction volumes. For *trn*L-F we combined 1µL of DNA, 12.5µL of EconoTaq® PLUS mastermix from Lucigen, 9.5µL of water, and

1µL of forward and reverse primers (10 mmol/L). For ETS and ITS, we used 5µl of betaine plus 4.5 µl in place of the 9.5µL of water. For ITS, thirty PCR cycles were performed at 95°C for 30 secs, 52°C for 1 min, and 72°C for 2 min for each cycle. For ETS, thirty-two PCR cycles were performed at 95°C for 30 secs, 54°C for 30 secs, and 72°C for 1 min 20 sec for each cycle. For trnL-F, thirty-three PCR cycles were performed at 94°C for 45 secs, 58°C for 2 min for each cycle. A new pair of primers was developed for ETS using Geneious 9.0.5 (Kearse et al. 2012) and the primers/protocols used are listed in Appendix V. All of the PCR products were visualized on agarose gel containing Ethidium Bromide stain. Successfully amplified products were purified and sequenced by Macrogen USA from New York.

***Phylogenetic analyses*—**Bayesian Inference and Maximum Likelihood analysis were performed on Cipres Science Gateway (Miller et al. 2010). Sequences were assembled in Geneious 9.0.5 (Kearse et al. 2012) and aligned using MAFFT Alignment (implemented in Geneious). Alignments were reviewed and refined manually, and the combined analysis alignments were concatenated using Geneious. Partition analysis and evolutionary models of nucleotide substitution were defined by Partition Finder (Lanfear et al. 2012). This was done using the corrected Akaike information criterion (AICc) and branches linked. Models of evolution estimated by Partition Finder for MrBayes 3.2.2 (Ronquist et al. 2012) were: GTR+G for ETS and trnL-F; GTR+G+I for ITS; and GTR+G+I for RAXmL. 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. For RAXmL, a Maximum Likelihood analyses was run along with a bootstrap (10 runs and 1000 reps.).

RESULTS AND DISCUSSION

Both Bayesian Inference (BI, Fig. 1) and Maximum Likelihood (ML, Appendix I) show very similar results, differing mostly in nodes support, where BI shows a higher and more consistent values than ML. For this reason, discussion will focus on the BI trees.

In the concatenated BI analysis (Fig. 1) we used 82 terminals in total, with 69 of our own sequences, as well as nine from GenBank, and 3 shared by other researchers (Marcelo Reginato and Suzana Costa) and will soon be included in GenBank (Table 1). Few species do not have sequences for all markers, mainly the outgroups. Comparing the single analysis with the concatenated one, we concluded that this not affect tree topology in both cases. Sixty-two terminals of sects. *Laevinuces, Luzuliformes, Spermodontes* and *Tenues* are represented in the tree (Fig. 1), and include sequences from 44 of the 47 accepted species and 18 terminals as yet unidentified. Some species that are wide distributed or which have variable morphology are included more than once in order to test our species concepts. Almost all of these grouped together, suggesting that they are good species. *Rhynchospora tenuis* and *R. sp. 5* were the only that were separated, but they are almost side by side in a clade with very short branches and lower support (better evidenced by ML tree). Adding a more specfic marker along with additional samples and a deep taxonomic review will also help to clarify species concepts in this group.

Some species formerly grouped in section *Tenues* by Kükenthal (1950), as *Rhynchospora albida* (Nees) Boeckeler, *Rhynchospora caracasana* (Kunth) Boeckeler, *Rhynchospora nardifolia* (Kunth) Boeckeler and *Rhynchospora tenella* (Nees) Boeckeler grouped together with *Rhynchospora patuligluma* C.B. Clarke ex Lindm in the phylogenetic analysis. They form a well-supported clade at the base of group *Psilocarya* tree, forming a new section.

Section *Luzuliformes* appears to be monophyletic and sister to a clade of *Dichromenae*, *Laevinuces*, *Psilocarya*, *Spermodontes* and *Tenues*. It also includes *Rhynchospora contracta* (Nees) J. Raynal, considered by Kükenthal as being in sect. *Tenues*. The *Luzuliformes* clade is morphologically supported by the fact that all the species in sect. *Luzuliformes* have flat leaves and synflorescences composed of paniculodia.

Sections *Dichromena* and *Psilocarya* also form a clade, as evidenced by Buddenhagen et al. (2017) and are sister to *Laevinuces*, *Spermodontes* and *Tenues*. *Rhynchospora hirsuta* is at the base of this clade with a moderate yet acceptable PP value of 0.936. It was formerly considered as part of Kükenthal's sect. *Tenues*, but is clearly different by having densely pilose leaves culms, and aristas on the glumes; flat leaves;

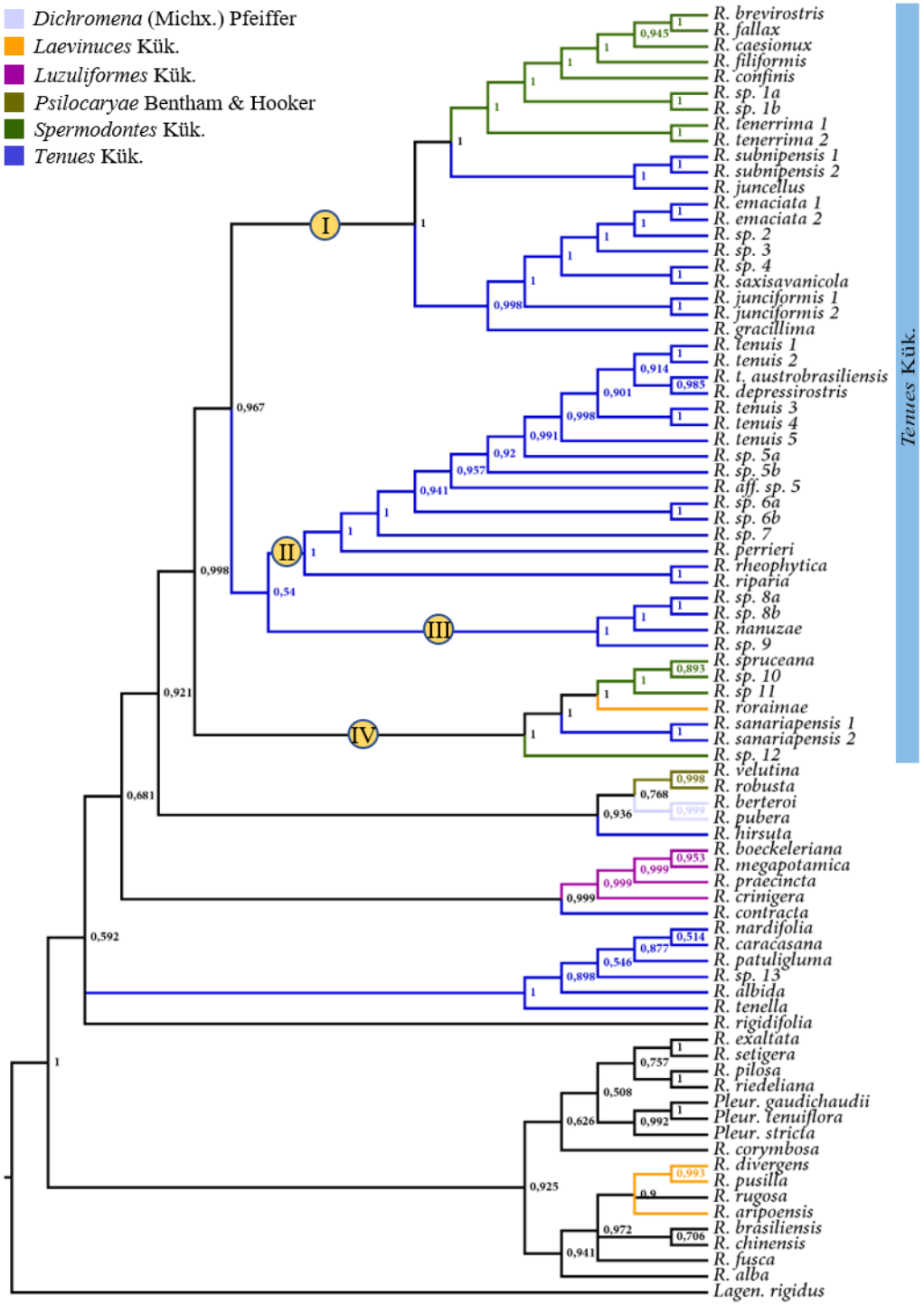

Figure 1. Bayesian Inference tree based on combined ETS, ITS and trnL-F of 82 samples of *Rhynchospora* showing posterior probability (PP) node support. Abbreviations at the tips: *R.* = *Rhynchospora*, *Pleur.* = *Pleurostachys* and *Lagen.* = *Lagenocarpus*.

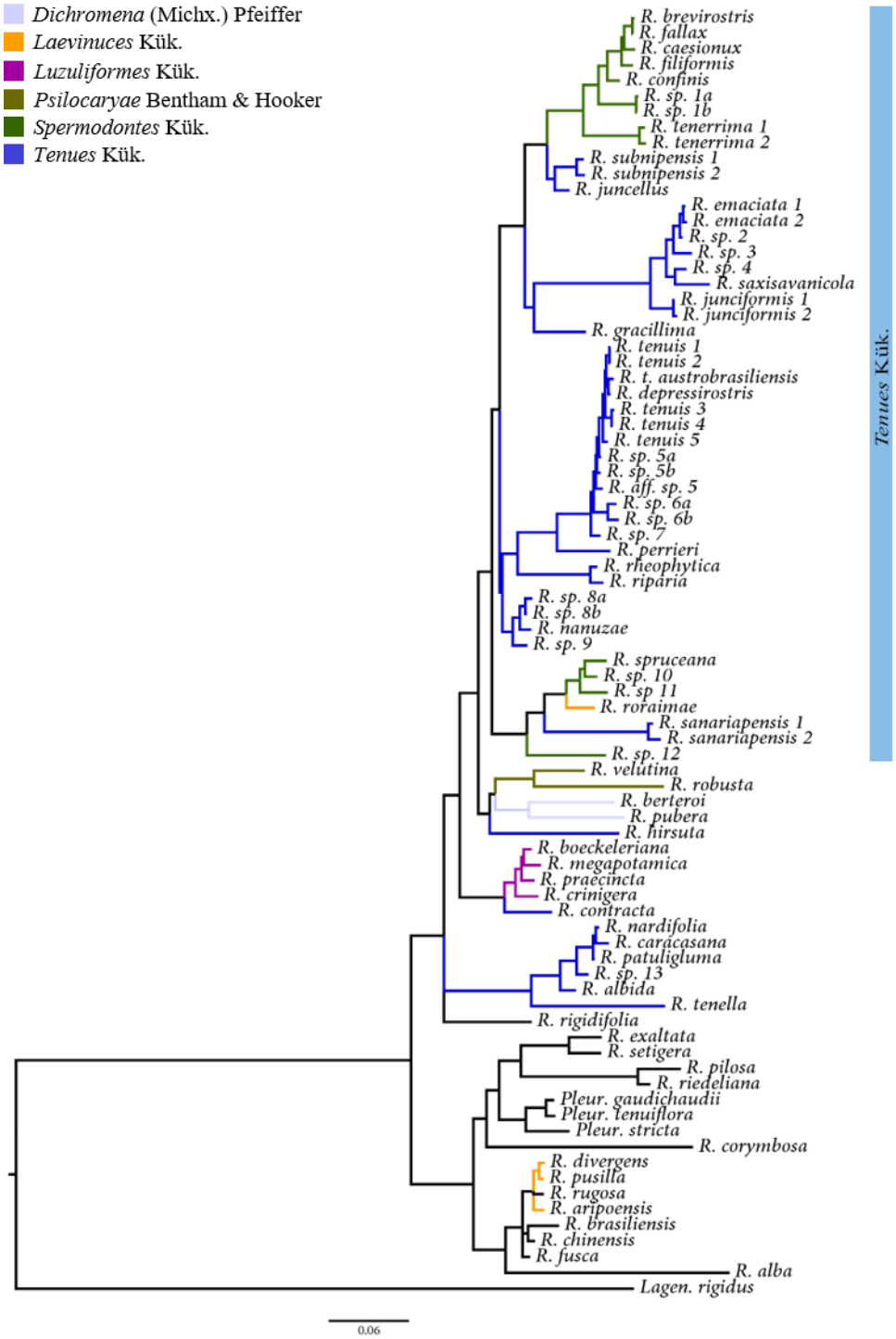

Figure 2. Combined ETS, ITS and trnL-F Bayesian Inference tree of 82 samples of *Rhynchospora* showing branch lengths. Abbreviations at the tips: *R.* = *Rhynchospora*, *Pleur.* = *Pleurostachys*, *Lagen.* = *Lagenocarpus*.

brown glumes with hyaline margins; and an alveolate-tuberculate achene surface with no clear lines. These characteristics are very similar to the ones found in sect. *Psilocarya*, and by including more samples from this section, *R. hirsuta* might group with it with higher support.

Individually, sections *Laevinuces*, *Spermodontes* and *Tenues* are clearly not monophyletic, but together they form a very well supported clade (PP = 0.998). For this reason, they are all synonymized here in sect. *Tenues* Kük. The species that were included in Kükenthal's sect. *Tenues* (1950) are found in seven separate clades, of which four still remains in our concept of sect. *Tenues*. Two main clades (I and II) separate two of the most common and controversial species, *Rhynchospora emaciata* and *R. tenuis*, with the first sometimes considered a variety of the second by Lindman (1900). The *Rhynchospora emaciata* clade, at the top of the tree, comprises eleven species from sect. *Tenues* Kük. and nine from sect. *Spermodontes* (including all species with smooth achenes and a rim on the top of achene around the stylopodium) with very good support value (PP = 0.967). With a few exceptions (*R. gracillima, R. juncellus, R. sp. 2* and *R. subnipensis*), all of the species have glumes with an aristate apex or at least short-aristate in basal glumes. The other big clade (II) that involves *R. tenuis*, has glumes that are mostly acute to mucronate at the apex, apparently a synapomorphy for this group. *Rhynchospora depressirostris* and *R. austrobrasiliensis* are very similar and form a strongly supported (PP = 0.985) clade in the middle of the *R. tenuis* samples. *Rhynchospora tenuis* samples from the same region group together with strong support (sample 1 and 2 from Belize, and 3 and 4 from Brazil), but not with strong support when grouped together, indicating that maybe they are different species or need more molecular information to solve this clade. Costa et al. (pers. comm.) used the nuclear ribosomal 5S-NTS region with good results to solve species complex issues in *Lagenocarpus*; this may be a useful method to better understand this *R. tenuis* complex in the future. Clade III is smaller and has no support as a sister of Clade II, but good support as a separate clade. Clade IV is composed of species from the three synonymized sections, all of which have aristate or short aristate glumes, as do the species of Clade III.

After Kükenthal's monograph (1949-51), few works have focused on the sections studied here. Rocha e Luceño (2002) treated sect *Tenues* but accepted Kükenthal's circumscription of the section. Strong (2006), in his taxonomic work of *Rhynchospora* in the Guyanas, considered only species from sect. *Spermodontes* present in Clade I (Fig. 1) as part of this section. *Rhynchospora spruceana* (= *R. graminea*), which Kükenthal

classified as being part of sect. *Spermodontes*, was considered as being in sect. *Tenues*. Strong also considered *R. contracta* and *R. roraimae* as being in sect. *Tenues*, which partially agrees with our results.

At the base of clade I, we find two species from the West Indies (*R. juncellus* and *Rhynchospora subnipensis*) as sister to the old *Spermodontes* species (PP = 1), and one African species (*R. gracillima*) at the base of *Tenues* Kük. (PP = 0.998). The same situation occurs in Clade II, where we find the other African species, *R. perrieri*, at the base o *R. tenuis* grade (PP = 1). Perhaps this has a biogeographical explanation and deserves further studies.

Of the three species included in sect. *Laevinuces* by Kükenthal, only *Rhynchospora roraimae* Kük. remained in sect. *Tenues*, the rest grouped with other species from group *Rhynchospora* Griseb. *Rhynchospora roraimae* is sister to a clade formed by *R. spruceana* and two new species (*Rhynchospora* sp. *10* and *11*) and is strongly supported (PP = 0.99). They have chartaceous glumes with hyaline or slightly hyaline margins and a stylopodium confluent with the achene body.

Trees were also performed individually for ETS, ITS and trnL-F molecular markers (Appendices II, III and IV). The ITS tree has good support values throughout the tree and agrees with both the combined analysis and NGS data from Buddenhagen (Pers. Comm. 2017); ITS seems to be the best marker used in this study. TrnL-F analysis shows high support values throughout the tree, but does not resolve some species complexes, such as the *R. tenuis* and *R. caracasana* clades. In spite of their high support values, it groups clades very strangely when compared to the combined BI and ML analysis, or the NGS results from Buddenhagen (Pers. Comm. 2017). It puts all the *Rhynchospora* outgroups in the middle and scatters clades from studied sections along the tree. This may happen because these basal clades have big deletions (ca. 25% of total sequence length), making them even more different than the outgroups because of information loss. ETS shows better results at a specific level, but exhibits a large basal polytomy, and is not useful for solving section issues in *Rhynchospora*. It also mixes the *R. caracasana* + *R. nardifolia* clade in the middle of *R. emaciata* clade, which was not observed with the other markers and the combined analysis. That might suggest some hybridization, but tests where not performed since the nuclear ITS tree doesn't show that divergence.

Branch lengths is variable along the tree (Fig. Fig 2) and clearly separates most of the terminals except for the one that includes *Rhynchospora tenuis*. This clade includes 10 terminals of which five are identified as *R. tenuis*, two from Brazil, two from Belize,

and one from Hawaii. This species, the type of the section, is the widest distributed in the section, occurring from Argentina to Mexico. One collection from Hawaii were also studied, maybe introduced there. It is very variable, and some species might yet be described or synonymized in this clade.

Our study elucidated that *Rhynchospora* sect. *Tenues* is bigger than Kükenthal thought, now comprising 23 species from sects. *Laevinuces, Spermodontes* and *Tenues*. Alone, none of these sections are monophyletic. *Rhynchospora tenuis* still needs complimentary molecular markers in the analysis to be better understood. A deeper taxonomic review along with a molecular aproach may lead to the description of new species.

TAXONOMIC TREATMENT

RHYNCHOSPORA SECT. *TENUES* (Kük.) Silva filho & Thomas. *Rhynchospora* sect. *Tenues* Kük. Bot. Jahrb. Syst. 75(2): 186. 1950.—TYPE (here designated): *Rhynchospora tenuis* Link. Jahrb. Gewächsk. 1(3): 76. 1820.

Rhynchospora sect. *Laevinuces* Kük. Bot. Jahrb. Syst. 75(3): 281. 1951.—TYPE (here designated): *Rhynchospora roraimae* Kük. Bot. Jahrb. Syst. 56(4, Beibl. 125): 19. 1921.

Rhynchospora sect. *Spermodontes* Kük. Bot. Jahrb. Syst. 75(3): 283, 1951.—TYPE (here designated): *Rhynchospora confinis* C. B. Clarke. Bull. Misc. Inform. Kew, Addit. Ser. 8: 40. 1908.

Annual or perennial. Culms flexuous. Leaves filiform or canaliculate and narrow, rarely flat. Sinflorescences formed by 1–4 generally lax corymbodia, anthelodia or rarely paniculodia. Spikelets alone or grouped in fascicles, from ovoid-lanceoloid to subuloid; usually only the first one or two basal flowers developing achenes, rarely three to five, which is mainly found in annual species. Glumes loosely imbricated. Stamens generally 3, sometimes two and rarely reduced just one. Stylus long, deeply bifid. Hypogynous bristles absent. Achene turgid-biconvex, transversely undulate-rugose, rugose or rugulose. Stylopodium triangular-subulate to depressed, sometimes decurrent on the edges of the achene.

Distribution and Habitat—Mainly tropical South America, with lower diversity on Central America, West Indies and just two species in the Old World. They inhabit open and humid places, mainly grasslands, outcrops and seasonally flooded areas.

SPECIES INCLUDED:

RHYNCHOSPORA BREVIROSTRIS Griseb., Cat. Pl. Cub. 246, 1866.—TYPE: CUBA. 1860-1864, *C Wright 3410* (LECTOTYPE: P; isolectotypes: G n.v., GH n.v., P, S n.v., YU n.v.).

RHYNCHOSPORA CAESIONUX Koyama, Brittonia 24(3): 281. 1972.—TYPE: BRAZIL: Mato Grosso, wet campo between campo cerrado and gallery forest, Xavantina-Cachimbo Road, 60 km from Xavantina, *Hunt & Ramos 5834* (LECTOTYPE: K).

RHYNCHOSPORA CONFINIS (Nees) C. B. Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8: 40. 1908. *Spermodon confinis* Nees, Fl. Bras. (Martius) 2(1): 119. 1842.—TYPE: BRAZIL: Brasilia centrali, *Pohl s. n.* (HOLOTYPE: W n. v.)

RHYNCHOSPORA DEPRESSIROSTRIS M.T. Strong, Brittonia 52(3): 241 (2000).—TYPE: PUERTO RICO: Dorado, 26 Jul 1913, *J.R. Johnston & J.A. Stevenson 889* (HOLOTYPE: US; isotypes: NY, UPR n.v.).

RHYNCHOSPORA DONSELAARII M.T. Strong, Novon 11(2): 268. 2001.—TYPE: SURINAM. Sipaliwini Savanna, wet valley, 27 Aug 1966, *J. van Donselaar 3618* (U).

RHYNCHOSPORA ELEGANTULA Maury, J. Bot. (Morot) 3: 209, fig. 10. 1889.—TYPE: VENEZUELA. Savanes d'Atures, bords de l'Orénoque, *J. Chaffanjon 274* (HOLOTYPE: P).

RHYNCHOSPORA EMACIATA M.T. (Nees) Boeck., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 31: 149. 1869 [1870]. *Haloschoenus emaciatus* Nees in Martius, Fl. Bras. 2(1): 121. 1842. *Rhynchospora tenuis* var. *emaciata* (Nees) Lindm., Bih. Kongl. Svenska Vetensk.-Akad. Handl. 26, Afd. 3, No. 9: 28. 1900.—TYPE: Brazil.

"In campis ad urbem S. Pauli et Ypanema prov. S. Pauli, tum in campis ad Villam da Campanha et in deserto ad flumen S. Francisci prov. Minarum", *Martius s.n.* (LECTOTYPE: M0274784; isolectotypes: M0274782, M0274783).

RHYNCHOSPORA FALLAX Uittien, Recueil Trav. Bot. Néerl. 22: 336. 1925. *Rhynchospora setacea* var. *fallax* (Uittien) Kük., Bot. Jahrb. Syst. 75 (3): 290. 1951. *Rhynchospora tenerrima* subsp. *fallax* (Uittien) T. Koyama, Mem. New York Bot. Gard. 23: 70. 1972.—TYPE: SURINAME. *Pulle 270* (holotype: U; isotypes: NY, P, US).

RHYNCHOSPORA FILIFORMIS Vahl, Enum. Pl. 2: 232. 1805. *Dichromena filiformis* (Vahl) Kunth, Enum. Pl. 2: 281. 1837; *Spermodon filiformis* (Vahl) Nees in Martius, Fl. Bras. 2(1): 118. 1842.—TYPE: PUERTO RICO. *Ledru s. n.* (HOLOTYPE: C-Vahl n.v.; isotype: P).

RHYNCHOSPORA GRACILLIMA Thwaites, Enumeratio Plantarum Zeylaniae 1860. —TYPE: SRI LANKA. 1866, *G. H. Thwaites 3818* (HOLOTYPE: K; isotypes: BR photo, G photo, GH photo, P (P00076708, P00076709), SING photo).

RHYNCHOSPORA JUNCELLUS C.B. Clarke Symb. Antill. (Urban). 2(1): 117. 1900. —TYPE: GUADELOUPE. *Anon 51* (syntype: BM); *Anon 6* (syntype: BM). FEDERATION OF SAINT KITTS AND NEVIS: St. Kitts, *F. Masson s.n.* (syntype: BM). MARTINIQUE: Oct 1867, *L. Hahn 375* (syntype: BM).

RHYNCHOSPORA JUNCIFORMIS (Kunth) Boeckeler, Flora 41: 646. 1858. *Dichromena junciformis* Kunth, Enum. Pl. [Kunth] 2: 279. 1837.—TYPE: FRENCH GUIANA. Sipaliwini Savanna, wet valley, 27 Aug 1966, *Poiteau 110* (HOLOTYPE: P n. v.; isotype: K).

RHYNCHOSPORA NANUZAE Rocha & Luceño, Hoehnea 29(3): 201 (203-204; fig. 6). 2002.—TYPE: BRAZIL. Minas Gerais, Serra do Cipó, 23 Apr 1996, *A. L. L. Vanzela 414* (HOLOTYPE: UFP; isotype: MA n.v., UFP).

RHYNCHOSPORA PERRIERI Cherm., Bull. Soc. Bot. France 69: 721. 1923.—TYPE: MADAGASCAR. Berizoka, Sep 1897, *H. Perrier de la Bâthie 305* (LECTOTYPE:

P00457060; isolectotype: P00457061).

RHYNCHOSPORA RHEOPHYTICA W. W. Thomas & P. J. S. Silva Filho, Brittonia, online first. 2017.—TYPE: BRAZIL. Bahia, Mun. Barreiras, Estrada para Brasília, BR 242, estrada no km 70 a partir da sede do município, ca. 23 km em direção à Cooperativa de Coti, cachoeira do Acaba Vida no Rio de Janeiro,11°53′40″S, 45°36′10″W, 12 Jun 1992, *A. M. Amorim et al. 564* (HOLOTYPE: CEPEC; isotypes: MO, NY, US).

RHYNCHOSPORA RIPARIA (Nees) Boeck., Linnaea 37: 561. 1873. *Haloschoenus riparius* Nees in Martius, Fl. Bras. 2(1): 120. 1842. *Dichromena riparia* (Nees) Steud., Syn. Pl. Glumac. 2: 136. 1855. *Rhynchospora tenuis* subsp. *riparia* (Nees) T. Koyama, Mem. New York Bot. Gard. 23: 78. 1972.—TYPE: BRAZIL. *Pohl 2637* (holotype: W†); Pará, Maracanã, Ilha de Algodoal, restinga da praia da Princesa, 22–25 May 1994, *M.N. Bastos et al. 1640* (NEOTYPE: MG; isoneotype: HAMAB n.v.), designated by L. J. C. Scheneider, Rodriguésia 68 (2): 664. 2017.

RHYNCHOSPORA RORAIMAE Kük. Bot. Jahrb. Syst. 56 (4, Beibl. 125): 19. 1921. —TYPE: VENEZUELA. "An Baechen auf dem Gipfel des Rorima", Dec 1909, *Ule 8542* (HOLOTYPE: B; ISOTYPES: IAN, K, MG, NY, SI photo, US).

RHYNCHOSPORA SANARIAPENSIS Steyerm., Fieldiana, Bot. 28: 46. 1951.—TYPE: VENEZUELA. Amazonas, vicinity of Sanariapo, *Steyermark 58469* (HOLOTYPE: F; isotype: VEN photo).

RHYNCHOSPORA SAXISAVANNICOLA M.T. Strong, Novon 15(3): 482 (-483, 480; fig. 2). 2005.—TYPE: FRENCH GUIANA. Mont Saint-Marcel, zone sud-est du massif, mares gravillonnaires de savana-roche, 02°23'00"N, 53°00'20"W, 18 Jul 2002, *J.J. DeGranville et al. 15283* (HOLOTYPE: US; isotypes: CAY n.v., NY n.v., P n.v.).

RHYNCHOSPORA SPRUCEANA C. B. Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8: 40. 1908.—TYPE: BRAZIL. Santarem, Spruce 627 (LECTOTYPE: K; isolectotype: P), designated by T. Koyama, Mem. New York Bot. Gard. 23: 77. 1972.

RHYNCHOSPORA SUBNIPENSIS Kük., Bot. Jahrb. Syst. 75(2): 193. 1950.

[*Rhynchospora nipensis* Kük., Repert. Spec. Nov. Regni Veg. 23: 207. 1926. *nom. nud.*]. —TYPE: CUBA. Prov. Oriente, Sierra de Nipe, auf Kiefernsavanen, Oct 1914, *E. L. Ekman 13082* (syntype: US); Rio Piedra in Pineten an grasigen Stellen, Jul 1914, *E. L. Ekman 1846* (syntype: S photo; US).

RHYNCHOSPORA TENERRIMA Nees ex Spreng., Syst. Veg. 4 (Curae posteriores): 26. 1827.—TYPE: WEST INDIES. "Nov. Holl." [an error for West Indies], *Kohaut s.n.*, distributed as *F. Sieber agrost. no. 116* (HOLOTYPE: AWH n. v.; isotypes: BR photo, H photo).

RHYNCHOSPORA TENUIS SUBSP. AUSTROBRASILIENSIS T. Koyama, Mem. New York Bot. Gard. 23: 78. 1972.—TYPE: BRAZIL. São Paulo, Parque do Estado, São Paulo, humid place, Hoehne 27416 (HOLOTYPE: NY; isotypes: SP, US).

RHYNCHOSPORA TENUIS SUBSP. TENUIS Willd. ex Link in Sprengel, Schrader, and Link, Jahrb. Gewächsk. 1(3): 76. 1818. *Dichromena linkii* J. F. Macbr., Publ. Field Mus. Nat. Hist. Bot. Ser. 11: 5. 1931, nom. nov., non *Dichromena tenuis* Steud., 1855.—TYPE: BRAZIL. *Humboldt s.n.* (HOLOTYPE: B†; isotype: HAL134381).

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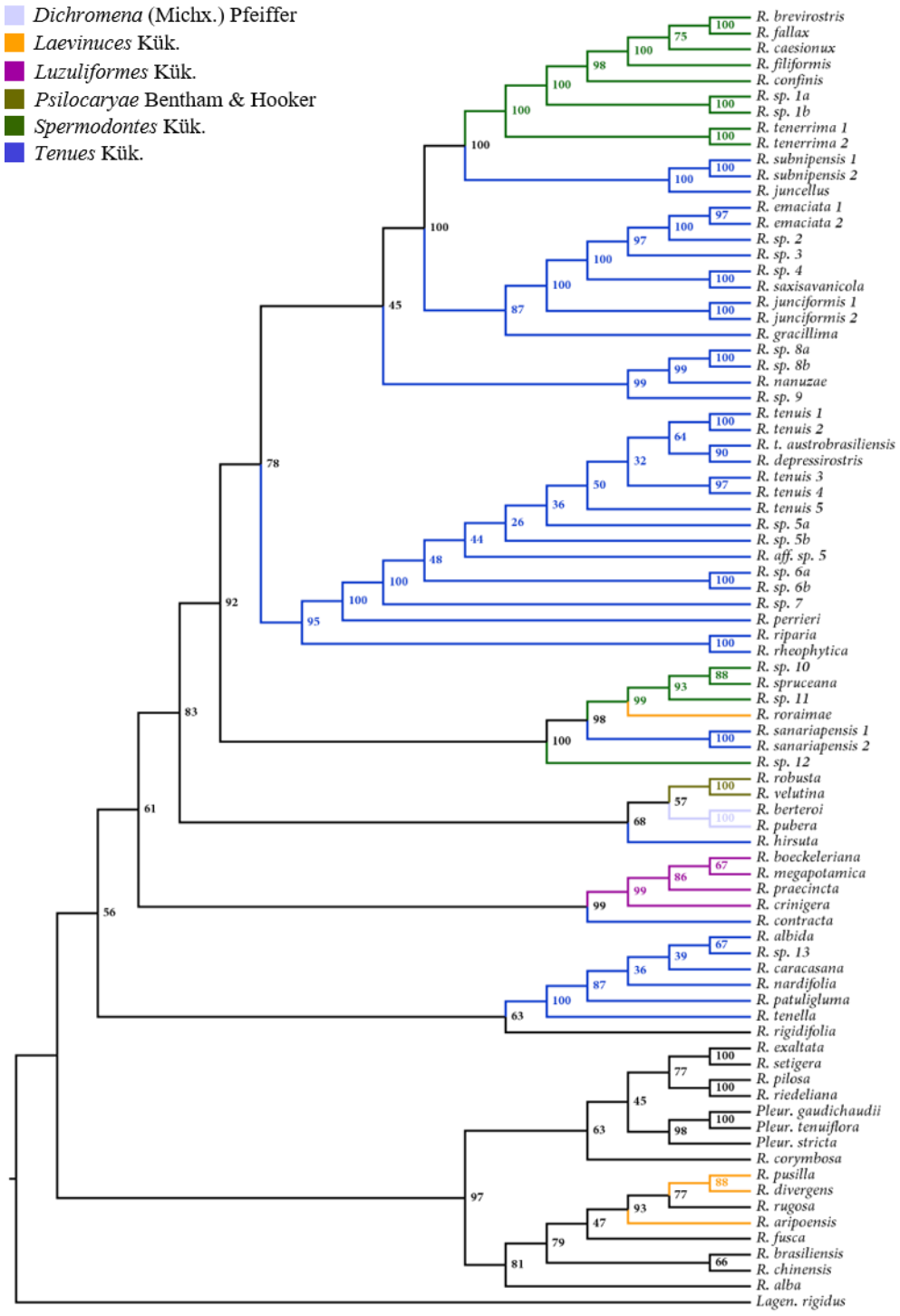
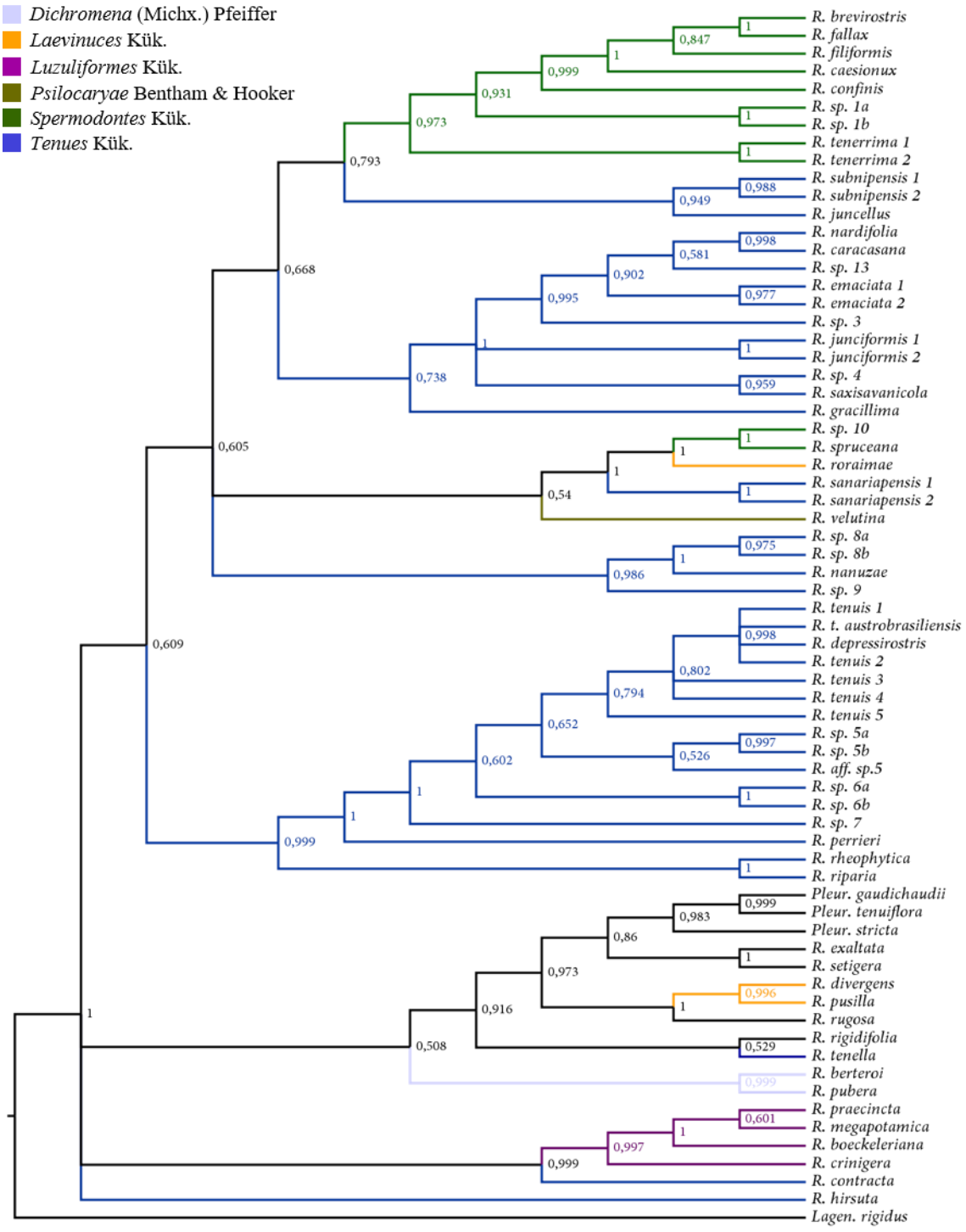
Combined ETS, ITS and trnL-F Maximum Likelihood (ML) tree of 82 samples of *Rhynchospora* showing bootstrap node support. Abreviations at the tips: *R.* = *Rhynchospora*, *Pleur.* = *Pleurostachys* and *Lagen.* = *Lagenocarpus*.



APPENDIX II – ETS

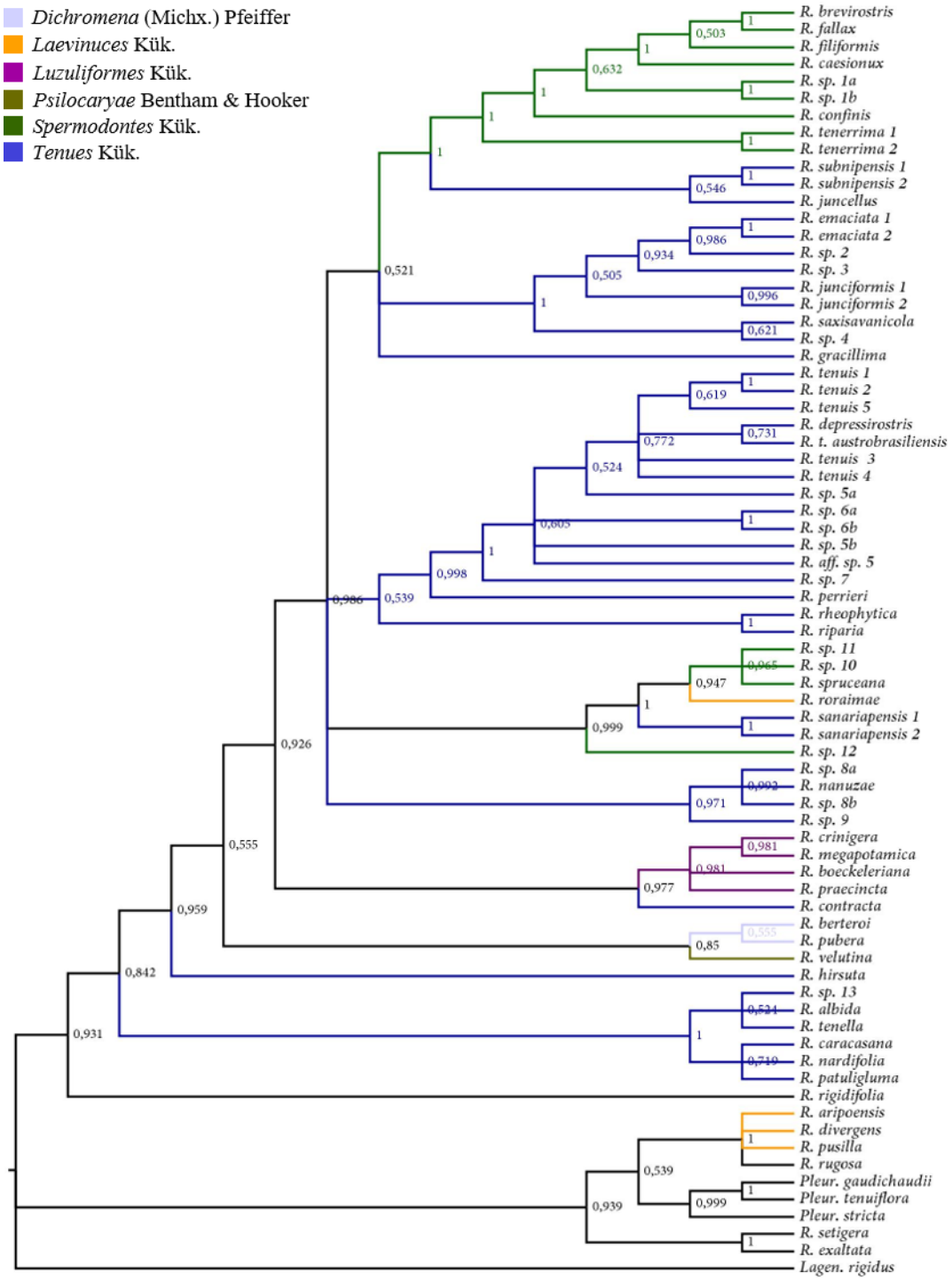
ETS Bayesian Inference tree of 68 samples of *Rhynchospora* showing posterior probability (PP) node support. Abreviations at the tips: *R.* = *Rhynchospora*, *Pleur.* = *Pleurostachys* and *Lagen.* = *Lagenocarpus*.



APPENDIX III – ITS

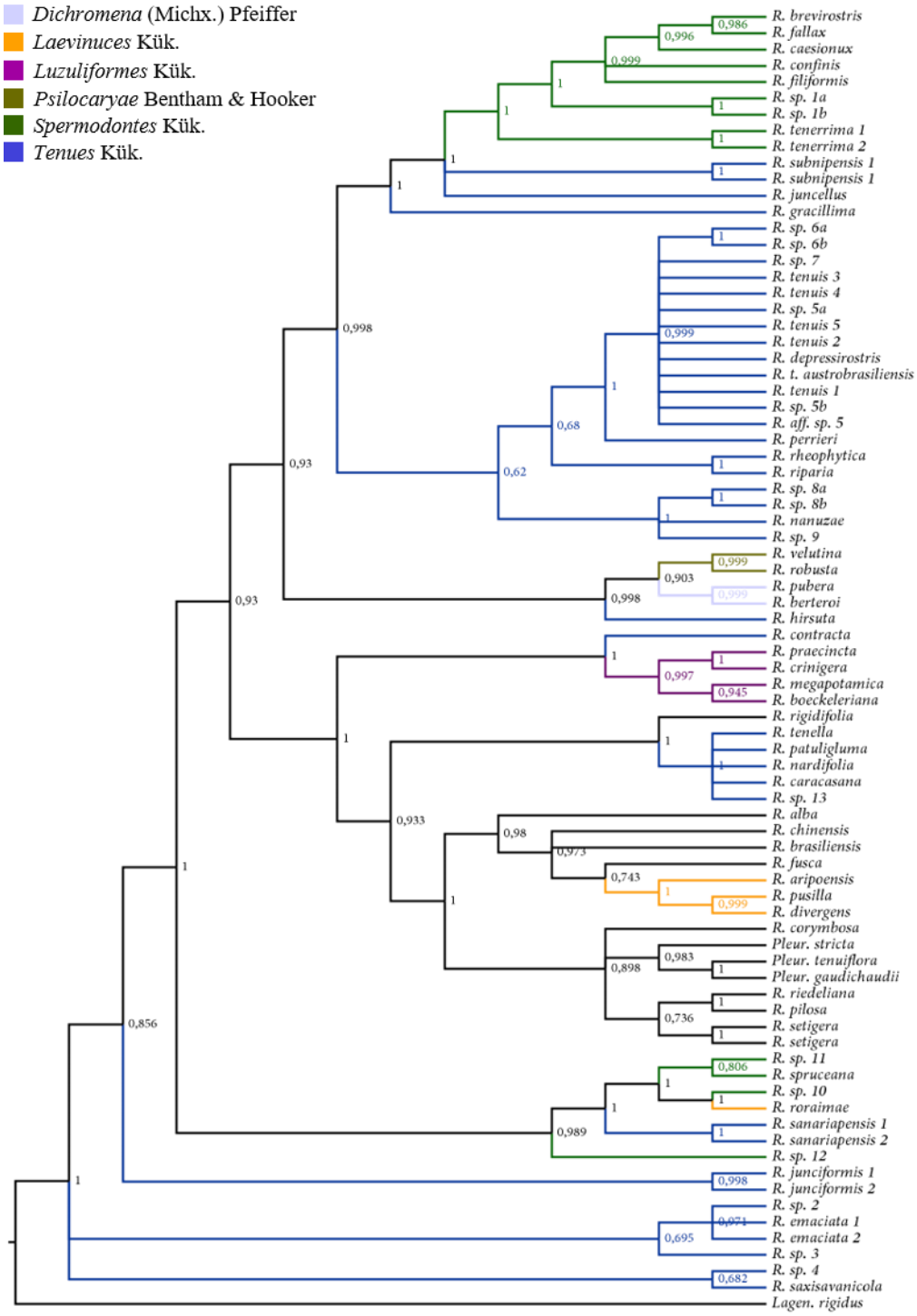
ITS Bayesian Inference tree of 74 samples of *Rhynchospora* showing posterior probability (PP) node support. Abreviations at the tips: *R.* = *Rhynchospora*, *Pleur.* = *Pleurostachys* and *Lagen.* = *Lagenocarpus*

.



APPENDIX IV – TRNL-F

trnL-F Bayesian Inference tree of 80 samples of *Rhynchospora* showing posterior probability (PP) node support. Abreviations at the tips: *R.* = *Rhynchospora*, *Pleur.* = *Pleurostachys* and *Lagen.* = *Lagenocarpus*.



APPENDIX – TRNL-F

Primers sequence and protocols applied during PCR experiments.

	Primer sequence	**Protocol (C°/time)**
ETS	1F - (tm 60.2) – AGTTGTTCTTGGCGTGCTCT 1R - (tm 60.2) – GCAGGATCAACCAGGTAGCA This primer was developed for this study using Geneious 9.0.5.	Premelt: 95° - 02:00 Denature: 95° - 00:30 Anneal: 52° - 00:30 Extension: 72° - 01:20 Final extension: 72° - 07:00 Cicles: 32x
ITS	5i – AGGTGACCTGCGGAAGGATCATT 4i – GGGTAGTTCCCGCCTGACCTGG Roalson & Friar (2000)	Premelt: 95° - 02:30 Denature: 95° - 00:30 Anneal: 52° - 01:00 Extension: 72° - 02:00 Final extension: 72° - 10:00 Cicles: 30x
trnL-trnF	c – CGAAATCGGTAGACGCTACG f – ATTGAACTGGTGACACGAG Taberlet et al (1991)	Premelt: 95° - 02:30 Denature: 94° - 00:45 Anneal/extension: 58° - 02:00 Final extension: 64° - 10:00 Cicles: 33x

Capítulo 2

Taxonomic study of *Rhynchospora* (Cyperaceae) sect. *Tenues*

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Abstract*—Rhynchospora*** is one of the richest genera of Cyperaceae, with about 400 spp. Species are mainly distributed in tropical America, often inhabiting open and humid areas. Although there are recent studies on the genus, they are still insufficient, and a large number of sections have not yet been reviewed. Section *Tenues* was recently recircumscribed and now includes sects. *Laevinuces* and *Spermodontes*. Some species were also removed from this groups, necessitating a new and complete taxonomic review of sections *Tenues*, considering all of these changes. With knowledge obtained in the field, from the literature and vast herbaria reviewed, this paper presents a new key for sect. *Tenues*, full descriptions of all the 24 accepted species plus 19 new ones, along with pictures of herbarium collections, photos of achenes, and information about habitat and distribution. Five neotypes and fourteen lectotypes were designated, and nine new synonymizations were also done.

***Keywords*—**beaksedges, new species, nomenclature, Poales, humid grasslands.

INTRODUCTION

Cyperaceae Juss is a monophyletic family and is sister to Juncaceae Juss., both are included in the order Poales (Stevens 2001 onwards, Chase et al., 2006, Givnish *et al*., 2006, Givnish *et al*. 2010). Cyperaceae comprises 109 genera and 5.424 species and have a subcosmopolitan distribution (Govaerts *et al*. 2007). According to Maguilla et al. (2015) and Larridon (2014), almost half of the species belong to only two genera: *Carex* L. (~2000 species) and *Cyperus* L. (~950 species), respectively.

According Muasya *et al.* (2009), and Simpson *et al.* (2007), the genus *Rhynchospora* is placed in the tribe Schoeneae, within the subfamily Cyperoideae. Although some species are cited for Africa, Europe and Asia, its distribution is mainly neotropical, and most species are distributed between latitudes 20° N and 20° S (Araujo 2001). Most of these species are heliophytic, inhabiting mainly open and humid areas, as margins of rivers and lakes, but also are found in dry, rocky and elevated locations, anthropized environments and even in shaded environments, such as edges and the herbaceous layer of forests (Barros 1945, Guaglianone 1979, 1981, Bryson & Carter 2008).

The genus *Rhynchospora* Vahl (1805) was published with 19 species, of which three were new to science and the others were previously included in other genera, especially *Schoenus* L. In the same century other genera were described and are currently synonymized within *Rhynchospora*, as *Dichromena* Michx., *Haloschoenus* Nees, *Spermodon* P. Beauv. ex T. Lestib. and *Psilocarya* Torr. Many of these gives name to latter Kukenthal (1949, 1950, 1951) sections. According to Buddenhagen et al. (2017), the genus *Rhynchospora* comprises nearly 400 species with highest diversity in tropical America.

Regarding the infrageneric classification, several proposals have been made during the past centuries (Kunth 1837, Nees 1842, Boeckeler 1873, Clarke 1900), but the most complete and cited work is that of Kükenthal (1949, 1950, 1951), which is based on the previous studies. This classification is presented as follows: subgenus *Haplostyleae* (Nees) Benth. & Hooker, and *Diplostyleae* Bentham & Hooker (=*Rhynchospora*). The first subgenus includes species with stylus entire or shortly bifid, consisting of the groups ("pars", informal classification used by Kükenthal, level among subgenera and sections) *Anthelatae* Kuk., recognized by synflorescences formed by paniculodia, antelodia or

corimbodia, which includes sections *Longirostres* Kunth, *Paniculatae* Boeckeler, *Polycephalae* Kük., *Pseudocapitatae* C.B. Clarke and *Racemosae* C.B. Clarke; and group *Capitatae* C.B. Clarke, recognized by synflorescences formed by capitate heads, which includes sections *Pauciflorae* Kuk. and *Pluriflorae* Kuk. The subgenus *Diplostyleae* Benth. & Hook. (=subgenus *Rhynchospora* Vahl), characterized by stylus deeply divided, consisting of the groups *Rhynchospora* Griseb., with hypogynous bristles always present, which includes sections *Albae* C.B. Clarke, *Cephalotae* Kük., *Cernuae* Gale, *Chapmaniae* Gale, *Cubenses* Gale, *Fuscae* C.B. Clarke, *Globular* Gale, *Harveyae* Gale, *Marisculae* Kük., *Mixtae* Kük., *Plumosae* C.B. Clarke, *Proliferae* Kük., *Pseudo-aureae* C.B. Clarke, *Stenophyllae* Kük. and *Valderugosae* Kük.; *Psilocarya* group (Torrey) CB Clarke, with hypogynous bristles absent, synflorescence formed by more or less lax corimbodia, which includes the sections *Laevinuces* Kük., *Luzuliformes* Kük., *Psilocaryae* Benth. & Hook., *Spermodontes* Kük. and *Tenues* Kük.; and group *Dichromenae* (Michx.) Pfeiffer, with unicapitate synflorescences and whitish to stramineous glumes, which has no defined section.

According to Kükenthal, section *Laevinuces* has 3 spp., *Luzuliformes* 3 spp., *Spermodontes* 6 spp. and *Tenues*. 20 spp. Later, many additional species were described (CITE). Manuel Barros (1945), working on Cyperaceae of Argentina, found 18 spp. in total, with 2 spp. of sect. *Luzuliformes*, 1 spp. of sect. *Spermodontes* and 1 spp. of sect. *Tenues*, showing a lower diversity of species to the south of South America. Thomas (1992), working on a synopsis of *Rhynchospora* in Mesoamerica, found 88 spp. in total, with 2 spp. of sect. *Laevinuces*, 3 spp. of sect. *Spermodontes* and 3 spp. of sect. *Tenues*, showing a lower diversity of species from these sections in that region, but not as low as to the south. Rocha & Luceño (2002), citing 11 species, was the only work that studied specifically sect. *Tenues*, but only for Brazil. Strong (2006), working with taxonomy and distribution of *Rhynchospora* in the Guianas, found 80 spp. in total, with 5 spp. from sect. *Spermodontes* and 15 spp. from sect. *Tenues*, showing that the highest diversity is probably concentrated in tropical South America. Flora do Brasil 2020 (em construção) cites 11 species of sect. Tenues, 7 of *Spermodontes* and 3 of *Luzuliformes*. In the Catalogue of the Vascular Plants of the Southern Cone (Zuloaga et al. 2008), it is cited 8 species of sect. *Tenues*, 1 of *Spermodontes* and 4 of *Luzuliformes*. Currently, for these four sections the total number of valid species described is 41 (Kükenthal 1950-51, Rocha & Luceño 2002, Strong 2005 & 2006, Thomas & Silva Filho 2017).

Section *Luzuliformes* has shown to be monophyletic and a sister clade of *Dichromenae*, *Laevinuces*, *Psilocarya*, *Spermodontes* and *Tenues* (Silva Filho et al. in preparation). It also includes *Rhynchospora contracta* (Nees) J. Raynal and *Rhynchospora subtilis* Boeckeler, both considered by Kükenthal as sect. *Tenues* and are morphologically supported by the fact that all the species in sect. *Luzuliformes* have synflorescences composed of paniculodia and flat leaves. Sections *Dichromenae* and *Psilocarya* also form a clade, as evidenced by Buddenhagen et al. (2017) and Silva Filho *et al.* (in preparation), and are sister of *Laevinuces*, *Spermodontes* and *Tenues*. These three sections are not monophyletic and were synonymized by Silva Filho *et al.* (in preparation) in sect. *Tenues* (Kük.) Silva Filho & Thomas. Some species of former sections *Tenues* (*Rhynchospora albida* (Nees) Boeckeler, *Rhynchospora caracasana* (Kunth) Boeckeler, *Rhynchospora nardifolia* (Kunth) Boeckeler and *Rhynchospora tenella* (Nees) Boeckeler) grouped together with *Rhynchospora patuligluma* C.B. Clarke ex Lindm. and form a well-supported clade that seems to be at the base of group *Psilocarya* tree, forming a new section (Silva Filho *et al.* in preparation). Of the three species of sect. *Laevinuces* cited by Kükenthal, only *Rhynchospora roraimae* Kük. remained in sect. *Tenues*, the rest grouped with other species from group *Rhynchospora* (Silva Filho *et al.* in preparation).

Regarding all of these novelties, we performed a complete taxonomic review of *Rhynchospora* sect. *Tenues* based on the last circumscriptions of Silva Filho *et al.* (in preparation). With the knowledge obtained in field trips, bibliographic and herbarium revisions, this paper presents a new key for sect. *Tenues*, full descriptions of all the 24 accepted species plus 19 new ones, along with information on each species, including pictures of herbarium specimens, photos of spikelets and achenes, and notes on habitat and distribution.

MATERIAL AND METHODS

Eight field trips were conducted to collect in several states of Brazil from 2014 to 2016, and includes the states of Rio Grande do Sul, Santa Catarina, Paraná, São Paulo, Minas Gerais and Amazonas. The collected material was deposited in the collection of the herbarium ICN (UFRGS), and the duplicates were sent to herbaria that loaned material for ICN, mainly to NY.

To analyze the circumscription of species, describe them and estimate their distribution, we analyzed a large number of exsiccate from the main herbaria of Brazil

(ALCB, CEN, CGMS, HRB, HUEFS, IAN, ICN, INPA, IPA, MBM, MG, PEUFR, R, RB, SP, SPF, UB, UFP, UPCB), Europe (BM, B, C, GZU, HAL, K, M, P, U, W, WU; focused on seeing type specimens) and United States of America (F, MO, NY, US), totalizing more than 10.000 collections. Some species were also viewed through Species Link (http://www.splink.org.br/) and Jstor Plants (http://plants.jstor.org/). Herbarium acronyms follow Thiers (2018).

For describing the species, we used the largest number of exsiccate as possible, trying to get the broader structure variation. Type specimens were observed mainly through herbarium revision, and a few from pictures sent by herbaria or seen on websites. The original descriptions were analyzed mainly through Biodiversity Heritage Library 2007 (<http://www.biodiversitylibrary.org/>) and Botanicus.org 2013 (<http://www.botanicus.org/>) websites.

All measurements were based only on fully developed, dry structures. The measures of achene lenghts do not include the length of the stylopodium which was measured separately. The terminology used in the descriptions was based on Stearn (1983), Kukkonen (1994), and Lucero & Vegetti (2012).

Since many species were misidentified, the geographical distribution of the species was obtained using exclusively data from the examined material. This material was selected based on distribution and morphological variation from the large number of collections analyzed, many from same locations. The geographic coordinates from the exsiccatae were copied just as they were written for no loss or alteration of information.

Pictures of many collections were obtained from the C.V. Starr Virtual Herbarium (NYBG, <http://sweetgum.nybg.org/science/vh/>) or digitized by NYBG herbarium staff and sent to the author. Details of achenes were obtained using a Nikon SMZ 800N stereoscopic microscope using the NIS Elements Image Stacking software to get good depth of field. Vouchers of achenes pictures are shown on table 1.

Table 1. Vouchers of the achenes shown on figures 1, 2 and 3.

Species	**Collector Number**
R. austrobrasiliensis	*F. C. Hoehne 27416* (NY)
R. brevirostris	*W. R. Anderson et al. 8031* (NY)
R. caesionux	*H. S. Irwin 15955* (NY)
R. confinis	*R. de Mello-Silva 11292* (NY)
R. depressirostris	*R. O. Woodbury s.n.* (NY)
R. donselaarii	*J. van Donselaar 3618* (U)
R. elegantula	*W. R. Anderson 10101* (NY)

R. emaciata	*Hatschbach 24011* (NY)
R. fallax	*G. Cremers 15261* (NY)
R. filiformis	*T. J. Killeen 5380* (NY)
R. gracillima	*Hall 913* (NY)
R. juncellus	*Brtiton & Cowell 564* (NY)
R. junciformis	*Aymard 5023* (NY)
R. nanuzae	*W. W. Thomas 11129* (NY)
R. perrieri	*Robinson 3698* (NY)
R. rheophytica	*Amorin 564* (NY)
R. riparia	*Davidse 17560* (NY)
R. roraimae	*Clarke 11767* (NY)
R. sanariapensis	*Guanchez 372* (NY)
R. saxisavanicola	*Steyermark 131233* (NY)
R. sp. 2	*C. R. Sperling et al. 5615* (NY)
R. sp. 3	*Davidse 15669* (NY)
R. sp. 4	*Hammel 17202* (NY)
R. sp. 5	*W. Thomas 16395* (NY)
R. sp. 7	*Eiten & Eiten 11014* (NY)
R. sp. 8	*Reitz & Klein 2754* (NY)
R. sp. 9	*Schultes 14244* (NY)
R. sp. 10	*W. Thomas* 16078
R. sp. 11	*Steyermark 107491* (NY)
R. sp. 12	*Irwin 21698* (NY)
R. sp. 13	Davidse 2882 (NY)
R. sp. 14	*Delprete 9769* (NY)
R. sp. 18	*Forzza 6682* (NY)
R. sp. 19	*Duarte 5804* (NY)
R. sp. 20	*Gonzales 2140* (NY)
R. sp. 21	*Torke 616* (NY)
R. sp. 22	*Harley 19555* (NY)
R. sp. 24	*Harley s. n.* (SPF 37035)
R. sp. 25	*Gutierrez 620A* (NY)
R. spruceana	*Forzza 4679* (NY)
R. subnipensis	*W. Thomas 15978* (NY)
R. tenerrima	*Wright 3407* (NY)
R. tenuis	*Pedersen 7733* (NY)

RESULTS

Rhynchospora sect. *Tenues* now includes 43 species, 24 accepted species plus 19 new ones. With knowledge obtained in the field, from the literature and vast herbaria reviewed, this paper presents a new key for sect. *Tenues*, full descriptions along with pictures of herbarium collections (Figs. 4–46), photos of achenes (Figs. 1–3), and

information about habitat and distribution. Five neotypes and fourteen lectotypes were designated, and nine new synonymizations were also done.

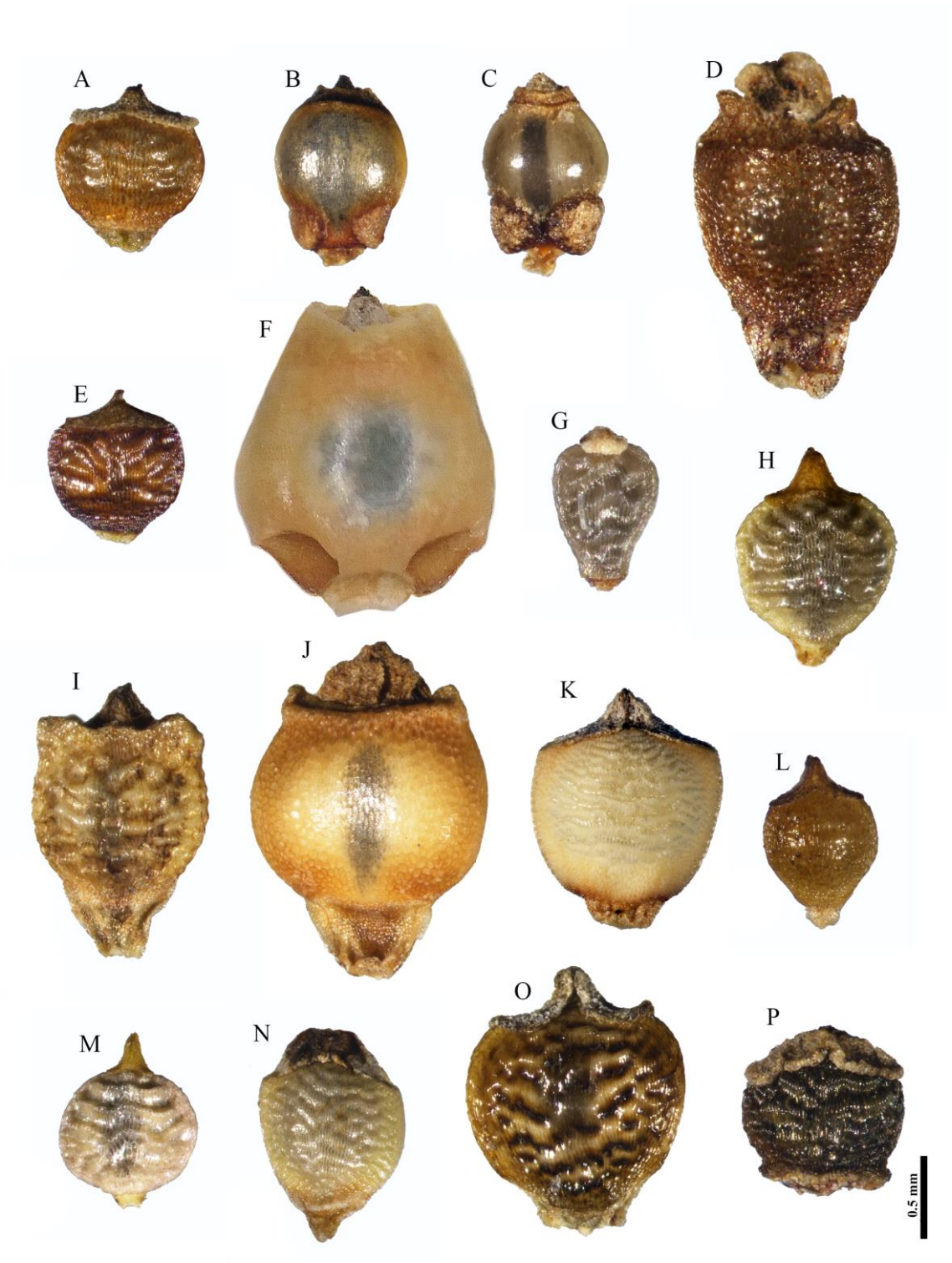

Fig. 1. Photos of the achenes. A. *Rhynchospora austrobrasiliensis*. B. *R. brevirostris*. C. *R. caesionux*. D. *R. confinis*. E. *R. depressirostris*. F. *R. donselaarii*. G. *R. elegantula*. H. *R. emaciata*. I. *R. fallax*. J. *R. filiformis*. K. *R. gracillima*. L. *R. juncellus*. M. *R. junciformis*. N. *R. nanuzae*. O. *R. perrieri*. P. *R. rheophytica*.

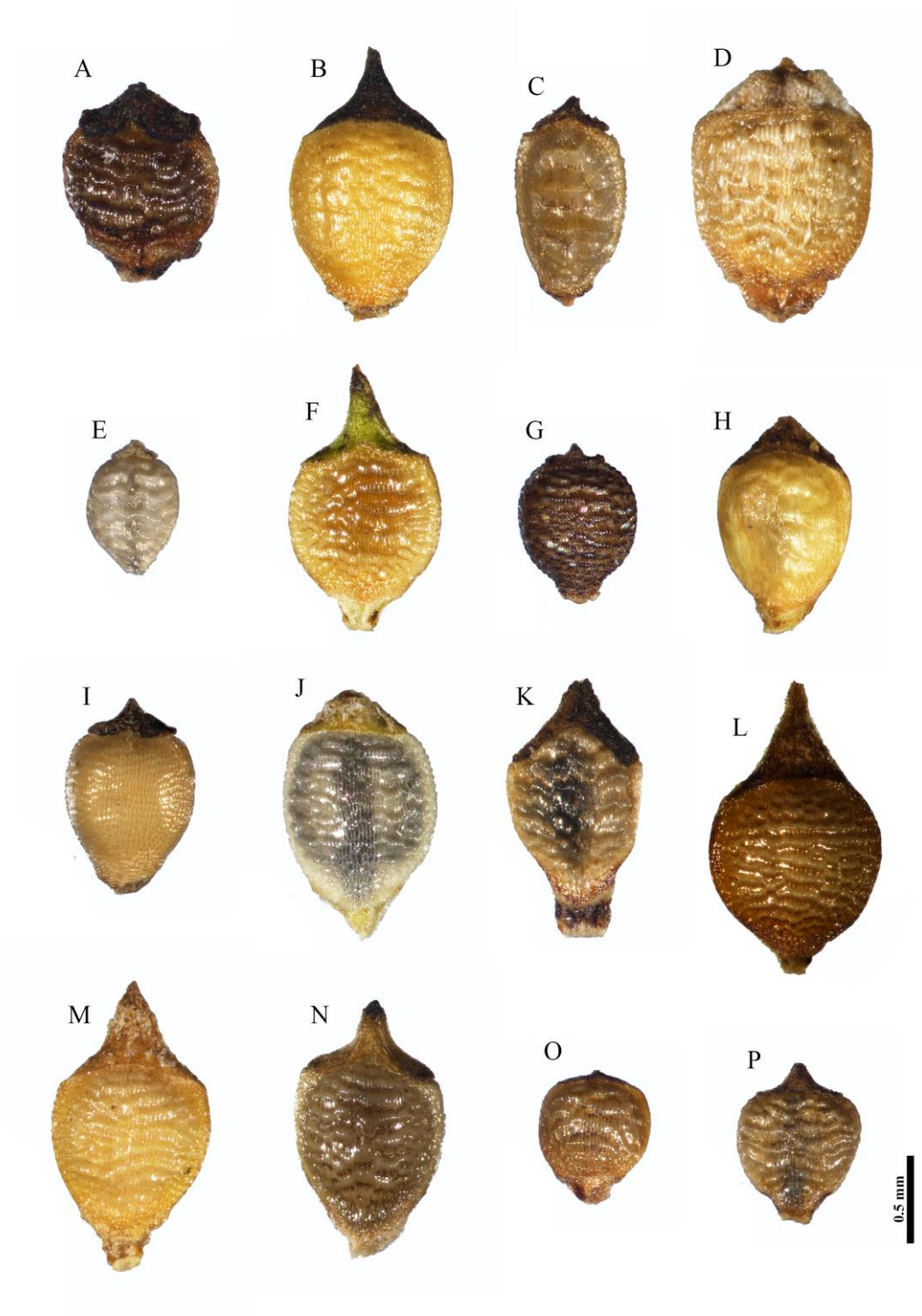

Fig. 2. Photos of the achenes. A. *Rhynchospora riparia*. B. *R. roraimae*. C. *R. sanariapensis*. D. *R. spruceana*. E. *R. saxisavannicola*. F. *R. subnipensis*. G. *R. sp. 2*. H. *R. sp. 3*. I. *R. sp. 4*. J. *R. sp. 5*. K. *R. sp. 7*. L. *R. sp. 8*. M. *R. sp. 9*. N. *R. sp. 10*. O. *R. sp. 11*. P. *R. sp. 12*.

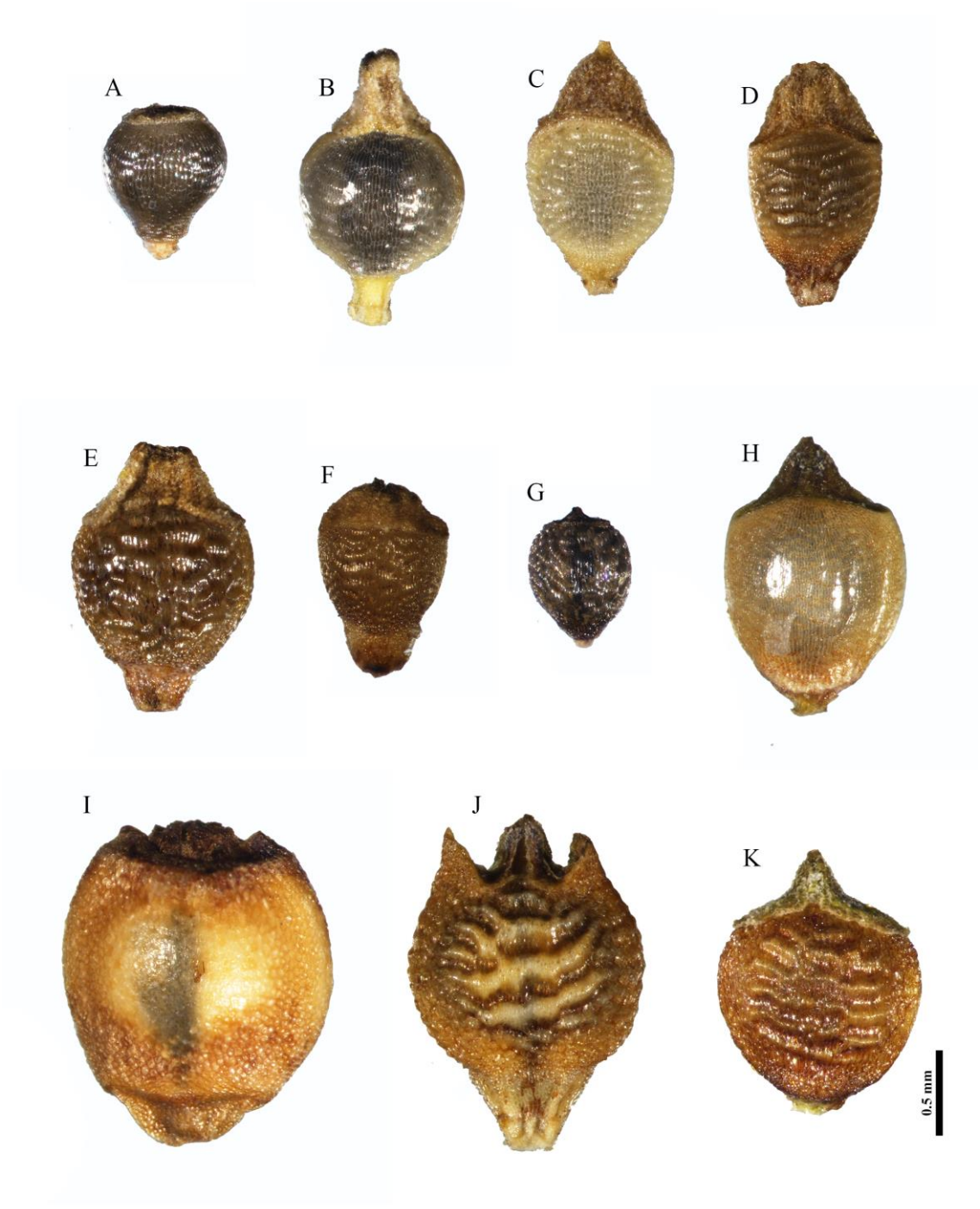

Fig. 3. Photos of the achenes. A. *Rhynchospora sp. 13*. B. *R. sp. 14*. C. *R. sp. 18*. D. *R. sp. 19*. E. *R. sp. 20*. F. *R. sp. 21*. G. *R. sp. 22*. H. *R. sp. 24*. I. *R. sp. 25*. J. *R. tenerrima*. K. *R. tenuis*.

TAXONOMIC TREATMENT

RHYNCHOSPORA Vahl.—Type: *R. alba* Vahl. Enum. Pl. [Vahl] ii. 236, partim. 1805. Description adapted from Kükenthal (1950).

Herbs perennial, rarely annual, caespitose or rhizomatous, rarely stoloniferous. Rhizomes short or elongated, covered by cataphylls. Stems trigonous, rigid or flexible, sometimes having a longitudinal groove, glabrous, scabrous or pilose at angles. Leaves linear, flat, filiform or canaliculate, with apex acute, glabrous to pilose, and may present scabrosities at the margins and veins. Sheath closed, ligulae absent, remaining entire after leaf senescence or dissociating into fibers. Synflorescences in most cases of the paniculodium type, formed by partial paniculodia, corimbodia, antelodia or capitate heads, and sometimes reduced to a single capitate head. Spikelets usually grouped into fascicles or solitary, sometimes in capitate heads, with color ranging from white to dark brown. Glumes spirally arranged, the lower sterile, and the following fertile, whereas at least the first flower is hermaphroditic, the other may be hermaphroditic or only male. Stamens 2 or 3, rarely 1, with filaments flattened and whitish, the anthers basifixed, the dehiscence rimose. Achenes biconvex, usually obovate, stramineous, olivaceous, brown or blackish, surface rugose, rugulose, scalariform, undulate, punctate, scrobiculate or almost smooth, the hypogynous bristles 3–6 (rarely 1–2 or 7–13), or absent. Ovary 2-carpellate, unilocular. Style thin and long, deciduous, entire or deeply bifid, sometimes shortly divided. Stylopodium persistent on the achene, pyramidal, conical, subulate, spatulate or lunate, base straight or bilobed, in some cases decurrent on the edges of the achene.

KEY TO THE *RHYNCHOSPORA* SUBGENERA, THE GROUPS OF SUGENUS *RHYNCHOSPORA*, AND THE SECTIONS OF GROUP *PSILOCARYA*. (Based on the classification of Kükenthal 1949, 1950, 1951)

1. Style entire or shortly bifid….....subgenus *Haplostyleae*
–. Style deeply bifid.....2. subgenus *Rhynchospora* (*Diplostyleae*)
2. Hypogynous bristles present.....group "*Eu-Rhynchospora"*
–. Hypogynous bristles absent….....3

3. Synflorescence composed of a single capitate head, the glumes mostly whitish.....group *Dichromenae*

–. Synflorescence composed of corymbodia, paniculodia or anthelodia, the glumes stramineous to brown (rarely whitish) …..…….....4. group *Psilocarya*

4. Leaves canaliculated or filiform (rarely flat), spikelets generally fusiform, lanceoloid or subuloid, the glumes membranaceous to subcoriaceous and loosely imbricate (rarely densely imbricate, and if so, the glumes subcoriaceous) …….....5

–. Leaves flat (rarely canaliculate), spikelets generally ovoid, the glumes chartaceous, or thinner and densely imbricate…….....6

5. Achene transversely rugose, rugulose or ondulate rugose.....sect. *Tenues*

–. Achene smooth…….....sect. *Laevinuces*

6. Synflorescence composed of corymbodia or anthelodia, spikelets generally producing more than five mature achenes, the glumes generally brown (rarely whitish) and often having some pilosity……..... sect. *Psilocaryae*

–. Synflorescence composed of paniculodia, spikelets producing no more than three mature achenes, the glumes stramineous or brown, always glabrous…….....…… sect. *Luzuliformes*

SECT. TENUES KÜK.

RHYNCHOSPORA SECT. *TENUES* Kük. Bot. Jahrb. Syst. 75(2): 186. 1950.—TYPE: *Rhynchospora tenuis* Link. Jahrb. Gewächsk. 1(3): 76. 1820. Designated by Silva Filho & Thomas (in preparation, chapter 2).

Rhynchospora sect. *Laevinuces* Kük. Bot. Jahrb. Syst. 75(3): 281. 1951.—TYPE: *Rhynchospora roraimae* Kük. Bot. Jahrb. Syst. 56(4, Beibl. 125): 19. 1921. Designated by Silva Filho & Thomas (in preparation, chapter 2).

Rhynchospora sect. *Spermodontes* Kük. Bot. Jahrb. Syst. 75(3): 283, 1951.—TYPE: *Rhynchospora confinis* C. B. Clarke. Bull. Misc. Inform. Kew, Addit. Ser. 8: 40. 1908. Designated by Silva Filho & Thomas (in preparation, chapter 2).

Annual or perennial. Culms flexuous. Leaves filiform or canaliculate and narrow, rarely flat. Synflorescences formed by 1–4 generally lax corymbodia, anthelodia or rarely

paniculodia. Spikelets single or grouped in fascicles, ovoid-lanceoloid to subuloid, usually only the first one or two basal flowers developing achenes, rarely three to five, mainly in annual species. Glumes loosely imbricate. Stamens generally 3, sometimes two and rarely reduced just one. Style long, deeply bifid. Hypogynous bristles absent. Achene turgid-biconvex, transversely undulate-rugose, rugose or rugulose. Stylopodium triangular-subulate to depressed, sometimes decurrent along edges of the achene.

Distribution and Habitat—Mainly tropical South America, with lower diversity in Central America and the West Indies, and only two species found in the Old World. They inhabit open and humid places, mainly grasslands, outcrops and seasonally flooded areas.

KEY TO THE SPECIES OF *RHYNCHOSPORA* SECT. *TENUES* KÜK.

1. All glumes acute to mucronate 2
–. At least some glumes aristate to short aristate …….....33
2. Basal glumes subcoriaceous, usually paler than the upper ones.....3
–. Basal glumes cartaceous or thinner, usually same color as the upper ones.....9
3. Plants annual, rhizomes always inconspicuous, old sheaths at base not present or very few, spikelets generally developing 3 or more achenes….....4
–. Plants perennial, rhizomes conspicuous or not, always presenting old sheaths at base, spikelets generally developing no more than two achenes 6
4. Achene transversely undulate-rugose with no swellings at base ……. *R. saxisavanicola*
–. Achene smooth with two cellular swellings on either side at base.....5
5. Coflorescences generally contracted, the spikelets often in contact with one another, spikelets 3-5 mm long .....*R. brevirostris*
–. Coflorescences open, spikelets separate and rarely in contact with one another, spikelets 6-9 mm long.....*R. caesionux*
6. Achene 1.9–2.2 × 1.5–1.9 mm, with two shallow pits on either side at base …….....*R. donselarii*
–. Achene 0.6–1.1 × 0.6–1.1 mm, with no pits at base 7
7. Spikelets subuloid-lanceoloid, achene 0.6–0.8 × 0.6–0.7 mm, obpyriform, pearl to greyish, stylopodium depressed..... *Rhynchospora* sp. 13

–. Spikelets ovoid-lanceoloid to lanceoloid, achene 0.9–1 × 0.8–1.1 mm, obovate-obtrullate to broadly obovate, stramineous to brown, stylopodium depressed-triangular ……...8

8. Spikelets 7–8.5 mm, developing three or more achenes .....*Rhynchospora* sp. 13

–. Spikelets 6–7 (–9), usually developing just one achene.....*R. spruceana*

9. Annual plants, rhizomes always inconspicuous, old sheaths at base not present or very few, spikelets generally developing 3 or more achenes…….....10

–. Plants perennial, rhizomes conspicuous or not, always presenting old sheaths at base, spikelets generally developing no more than two achenes ….....16

10. Synflorescences formed by paniculodia.....11

–. Synflorescences formed by corymbodia.....12

11. Basal glumes acute-mucronate at apex, achene transversely rugose, with 5–6 lines …… *Rhynchospora* sp. 22

–. Basal glumes obtuse at apex, achene surface transversely rugose-tuberculate, with 8–9 lines ……...……...…… *Rhynchospora* sp. 2

12. Culms 6–22 cm, spikelets ovoid-lanceoloid, achene surface rugose……....13

–. Culms 17–59 cm, spikelets lanceoloid, achene surface faintly transversely undulate-rugose……14

13. Anthers 0.7–1 mm long, achene 0.7–0.9 × 0.5–0.8 mm, broadly obovoid-obpyriform, stylopodium shallowly triangular …….....… *Rhynchospora* sp. 12

–. Anthers 1.2–1.5 mm long. Achene 0.9–1.1 × 0.8–1 mm, obovoid-obtrullate, stylopodium triangular-subulate….....……...… *Rhynchospora* sp. 10

14. Achene surface faintly transversely undulate-rugose, almost smooth....*R. juncellus*

–. Achene surface strongly transversely undulate-rugose.....15

15. Coflorescence somewhat contracted, spikelets 3.2–3.9 mm long, grouped in fascicles.....*R. sanariapensis*

–. Coflorescence open, spikelets (5–) 7–10 mm long, solitary and long pedicellate ..... *R. elegantula*

16. Coflorescences formed by a single fascicle.....17

–. Coflorescences formed by corymbodia…….....19

17. Leaves concentrated at base forming a rosette ..... *Rhynchospora* sp. 3

–. Leaves basal and cauline, distributed along the culms.....18

18. Spikelets 5–7.3 mm long, glumes brown, style base triangular……. *R. roraimae*

–. Spikelets 4–5 mm long, glumes stramineous, style base shallowly triangular ……..…… *Rhynchospora* sp. 4

19. Rhizomes clearly conspicuous…….20

–. Rhizomes inconspicuous…….…….23

20. Leaves concentrated at base forming a rosette …….....…….21

–. Leaves basal and cauline, distributed along the culms ……...…….…….22

21. Leaves reaching 2.5 mm wide, spikelets 5-9 mm long, anthers longer than 1.5 mm, stylopodium 0.3–0.6 mm height…….…… *Rhynchospora* sp. 19

–. Leaves no wider than 1mm, spikelets 5-6 mm long, anthers shorter than 1.5mm, stylopodium 0.2–0.3 mm height…….…… *Rhynchospora* sp. 21

22. Spikelets 5–7 mm long, generally solitary and arching, stylopodium 0.2–0.4, depressed-triangular……...*R. nanuzae*

–. Spikelets 3.7–5.2 mm long, grouped in fascicles and straight, stylopodium 0.4–0.8, triangular, tapering to a subulate tip.…….…….……*R. subnipensis*

23. Achene with two rounded protuberances on the base, stipe bilobed…….24

–. Achene with no protuberances on the base, stipe not bilobed……...25

24. Culms 50–113 cm, spikelets 5–6.5 mm long, glumes caducous in mature spikelets, style base semilunate, fissured in the middle…….……. *R. rheophytica*

–. Culms 10–50 cm, Spikelets 4–6 mm long, glumes perennial in mature spikelets, style base shallowly triangular, clearly bilobed at base…..……. *R. riparia*

25. Style base confluent with margin of achene…….…….…26

–. Style base not confluent with margin of achene…….……...28

26. Achene broadly obovoid-obtrullate, whitish to stramineous, stylopodium narrowly triangular, restricted to the Old World……...……. *R. gracillima*

–. Achene obovoid, stramineous to brown, stylopodium triangular to triangular-subulate, restricted to the New World…..…….27

27. Culms 19–34 cm, spikelets narrowly ellipsoid, glumes persistent after achenes mature…….…… *Rhynchospora* sp. 9

–. Culms 38–53 cm, spikelets narrowly lanceoloid, glumes caducous after achenes mature ……..….……..…. *Rhynchospora* sp. 8

28. Achene obovoid to obpyriform, stylopodium triangular to triangular-subulate …….……29

–. Achene broadly obovoid, stylopodium shallowly triangular to depressed-conical …….30

29. Coflorescences generally contracted, spikelets 4.8–6.3 mm long, anthers 2–2.4 mm long ……..…… *Rhynchospora* sp. 7

–. Coflorescences generally open, spikelets 3.7–5.2 mm long, anthers 1.2–1.5 mm long ....……...……...*R. subnipensis*

30. Spikelets 2.2–3.8 mm long, achene 0.7–0.9 × 0.7–1 mm, anthers 3, 0.8–1.1 mm ……..…29

–. Spikelets 3.2–5 mm long, achene 1–1.2 × 0.7–1.2 mm, anthers 2 or 3, 1–1.7 mm ……..…32

31. Coflorescences longer than wide, spikelets 2.5–3.8 mm, stylopodium shallowly triangular, bilobed at base, known only from South America ……R. *austrobrasiliensis*

–. Coflorescences wider than long, spikelets 2.2–2.8 mm long, stylopodium depressed-conical, not bilobed at base, known only from to Cuba ……...…. *R. depressirostris*

32. Coflorescences usually open, 0.7–5.7 × 0.7–9.7 cm, anthers 3, 1.2–1.7 mm long, known only from to Central and South America, and Hawaii……*R. tenuis*

–. Coflorescences always contracted, 0.6–1.7 × 0.5–1.3 cm, anthers 2, 1–1.2 mm long, known only from to Africa…..…….……. *R. perrieri*

33. Lower glumes subcoriaceous and usually shiny and paler than the upper one.….34

–. Lower glumes same consistency and color as the upper ones…...…..……...42

34. Plants annual, rhizomes always inconspicuous, old sheaths at base not present or very few, spikelets generally developing 3 or more achenes plants ……35

–. Plants perennial, rhizomes conspicuous or not, always presenting old sheaths at base, spikelets generally developing no more than two achenes …….…….36

35. Culms 23–30 cm, stylopodium 0.1 × 0.4–0.5 mm, depressed-semilunate …… *Rhynchospora* sp. 11

–. Culms 3.5–11 cm, stylopodium 0.1–0.2 × 0.1 mm, triangular.....*R. junciformis*

36. Spikelets developing three or more achenes…….37

–. Spikelets developing no more than 2 achenes……...……38

37. Achene 1.4–1.8 × 1.3–1.5 mm, broadly obovoid, surface smooth in the middle and foveolate near the edges, margin adjacent to stylopodium with a distinct rim …… *Rhynchospora* sp. 25

–. Achene 0.9–1.1 × 0.8–1 mm, obovoid, surface transversely undulate-rugose, margin adjacent to stylopodium without a distinct rim …… *Rhynchospora* sp. 20

38. Spikelets ≥ 7 mm, achene 1–2.2 mm long……...……..……39

–. Spikelets usually ≤ 6.5 mm (rarely reaching 8 mm in *R.* sp. 13, but then with achenes no longer than 0.8mm), achene 0.6–2.1 mm long…….…..40

39. Achene with two shallow pits on either side at base…..……*R. donselaarii*

–. Achene with no pits at base……...……*R. filiformis*

40. Achene 0.6–0.8 × 0.6–0.7 mm, pearl to greyish, surface finely transversely-rugulose…….… *Rhynchospora* sp. *13*

–. Achene 1.3–2.1 × 0.9–1.5 mm, stramineous to brown, surface transversely undulate-rugose…….……...…41

41. Achene apex with two teeth on the sides, stylopodium W shaped…..... *R. tenerrima*

–. Achene with a rim around the stylopodium, stylopodium triangular ……... *R. fallax*

42. Rhizomes clearly conspicuous…….43

–. Rhizomes inconspicuous…….....…46

43. Rhizomes bulbiform.....44

–. Rhizomes not bulbiform……..…….45

44. Spikelets 5–6.3 mm long, anthers 1.5-3 mm long, achene 0.9–1.1 × 0.6–0.8 mm, surface transversely undulate-rugose, stylopodium shallowly triangular to depressed-triangular…...……...*R. nanuzae*

–. Spikelets 5.6–8.8 mm long, anthers 3.1–3.3 mm long, achene 1.1–1.2 × 0.9–1.1 mm, surface smooth, stylopodium triangular …… *Rhynchospora* sp. 24

45. Spikelets 5.3–6.8 mm long, achene 1–1.1 × 0.8–0.9 mm, with no rim or teeth at apex around the stylopodium ……...……..… *Rhynchospora* sp. 14

–. Spikelets 6–9 mm long, achene 1.1–1.8 × 0.9–1.2 mm, with two teeth or at least a rim at apex around the stylopodium …….…..……. *R. confinis*

46. Coflorescences contracted, spikelets grouped in fascicles……..…….47

–. Coflorescences open, spikelets usually solitary and pedicellate…….…..…48

47. Culms 11–32 cm, leaves flat, spikelets 4.5–6.5 mm long, glumes white-stramineous. ……..…… *Rhynchospora* sp. 18

–. Culms 25–88 cm, leaves canaliculate, spikelets 9–1.1 mm long, glumes brown ……..… *Rhynchospora* sp. 5

48. Spikelets developing 3 or more achenes, achenes brown, stylopodium depressed-triangular…… *Rhynchospora* sp. 20

–. Spikelets developing no more than 2 achenes, achenes stramineous-grey, stylopodium triangular-subulate……*R. emaciata*

1. RHYNCHOSPORA AUSTROBRASILIENSIS

RHYNCHOSPORA AUSTROBRASILIENSIS (Koyama) Silva Filho & Thomas, *stat. nov.* Mem. New York Bot. Gard. 23: 78. 1972. *Rhynchospora tenuis* subsp. *austrobrasiliensis* T. Koyama, Mem. New York Bot. Gard. 23: 78. 1972. —TYPE: BRAZIL. São Paulo, Parque do Estado, São Paulo, humid place, *Hoehne 27416* (HOLOTYPE: NY; isotypes: ICN, SP, US).

Holoschoenus capillaris var. *minor* Nees in Martius, Fl. Bras. 2(1):121. 1842.—TYPE: BRAZIL. A Campis rudis prov. Minarum Generalium et S. Pauli, *Martius 3367* (HOLOTYPE: M n. v.).

Perennial, rhizomes inconspicuous. Culms 12–39 × 0.03–0.14 cm. Leaves flat to filiform 8–38 × 0.02–0.13 cm, concentrated at base forming a rosette; leaf sheath 0.4–3.8 cm long. Synflorescence comprising an apical and 1–4 axillary corymbodia, the corymbodia loose, rarely somewhat contracted or contracted, and composed of partial corymbodia, and these of fascicles of spikelets or single spikelets; apical corymbodium 0.7–3.8 × 0.6–5.3 cm, the axillary one 0.5–3.3× 0.3–3.5 cm. Spikelets 2.5–3.8 mm long, ovoid-lanceoloid; usually only the basal flowers developing achene. Glumes membranaceous, acute-mucronate at apex, persistent in mature spikelet; the basal ones pale brown, ovate-lanceolate, acute-mucronate at apex, margin not hyaline; the distal ones brown, lanceolate. Anthers 3, 0.8–0.9 mm long. Achene 0.7–0.9 × 0.7–1 mm, broadly obovoid, stramineous to brown, the surface transversely rugose, with 4–6 lines, obtuse-truncate at apex, without a rim around the stylopodium, obtuse at base, narrowing to a short (ca. 0.15 mm long) stipe. Stylopodium 0.1–0.3 × 0.5–0.9 mm, very shallowly triangular, bilobed at base, not confluent with achene, stramineous to brown.

Distribution and Habitat— South America, from south Brazil and Paraguay to Colombia and Guyana. Found in open and moist grasslands.

Selected examined material—BOLIVIA—**Santa Cruz**: Buena Vista, 10 Nov 1920,

J. Steinbach 3056 (NY).

BRAZIL—**Amazonas**: Humaitá, 22 Jun 1982, *L. O. A. Teixeira et al. 1313* (INPA). **Mato Grosso do Sul**: Aquidauana, 02 Feb 2006, *V. J. Pott & A. Pott 8777* (HMS n. v., ICN). **Paraná**: between Imbituva and Caetano at km 25, 2 Mar 1970, *T. Koyama et al. 13814* (SP, UFP). **Santa Catarina**: Curitibanos, Rod. BR-470, km 231, 11 Feb 1996, *O. S. Ribas et al. 1233* (MBM, NY). **São Paulo**: São Paulo, 6 Feb 1908, *J. Barbosa 35401* (SP, UFP).

COLOMBIA—**Tolima**: San Lorenzo, 30 Dec 1917, *F. W. Pennell 3537* (NY).

GUYANA—**Edo. Bolivar**: Piar, May 1989, *A. Fernandez 2870* (NY).

PARAGUAY—**Central**: Estero del Ypoá, 8 km S of Puerto Guyrati, around Arroyo Surubiy, 24 Feb 1993, *E. M. Zardini & L. Guerrero 35106* (NY).

Comments—Besides being very similar to *Rhynchospora tenuis*, this species has smaller spikelets, achenes and anthers. The stylopodium is also always shallowly triangular, sometimes also depressed, similar to *R. depressirostris*, but always bilobed at base. It also looks like that this species prefers permanently humid grasslands, where *R. tenuis* seems to inhabit seasonally dry grasslands.

Fig. 4. *Rhynchospora austrobrasiliensis* (Koyama) Silva Filho & Thomas, *F. C. Hoehne 27416* (isotype, NY00051587).

2. RHYNCHOSPORA BREVIROSTRIS

RHYNCHOSPORA BREVIROSTRIS Griseb., Cat. Pl. Cub. 246, 1866.—TYPE: CUBA. 1860-1864, *C. Wright 3410* (HOLOTYPE: GOET photo; isotypes: G photo, GH photo, P, S photo, YU photo). Misprinted in protologue as *C. Wright 3413* which is *R. cernua* Griseb.

Rhynchospora clarkei Rose, Contr. U.S. Natl. Herb. 10: 464. 1908. *Rhynchospora pringlei* C. B. Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8: 89. 1908, non Greenman, 1903; *Rhynchospora brevirostris* var. *clarkei* (Rose) Kük., Bot. Jahrb. Syst. 75: 287. 1951.—TYPE: MEXICO. Jalisco, *Pringle 2319* (LECTOTYPE: K; isolectotype: P, NY), designated by T. Koyama, Mem. New York Bot. Gard. 23: 31. 1972.

Rhynchospora brevirostris var. *truncata* Kük., Bot. Jahrb. Syst. 75: 287. 1951.—TYPE: BRAZIL. Pará, Maruay, *Von Luetzelburg 21158* (HOLOTYPE: B, M n.v.).

Annual. Culms 4.7–36 × 0.03–0.08 cm. Leaves canaliculate 2.9–20.6 × 0.03–0.19 cm, concentrated at base forming a rosette; leaf sheath 0.8–2.7 cm long. Synflorescence comprising an apical and 1–2 axillary corymbodia, the corymbodia contracted to somewhat contracted, rarely loose, composed of fascicles of spikelets; apical corymbodium 0.4–2.3 × 0.3–1.6 cm, the axillary one 0.3–1.1 × 0.2–1.0 cm. Spikelets 3–5 mm long, ovoid-lanceoloid; usually only the basal three flowers developing achenes. Glumes persistent in mature spikelet; the basal ones stramineous, largely ovate, subcoriaceous and aristate at apex, margin not hyaline; the distal ones pale brown, lanceolate, membranaceous, acute at apex. Anthers 2, 0,5–0,7 mm long. Achene 0.9–1.2 × 0.5–1 mm, rounded to elliptic-obovate, pale brown to grey, usually with a dark longitudinal band at the middle of the achene, the surface smooth, with no lines, obtuse at apex, with a short and thin rim around the stylopodium at the base, truncate at base, with two big swellings on either side, short (ca. 0.1 mm long) stipitate. Stylopodium 0.1–0.3 × 0.2–0.7 mm, obconic, truncate-concave at base, not confluent with achene, stramineous to brown.

Distribution and Habitat— From Brazil to Mexico, and West Indies. Found in open, low, and seasonally wet grasslands.

Selected examined material—BELIZE—**Toledo**: 28 Nov 1947, *P. H. Gentle 6348* (NY).

BOLIVIA—**Santa Cruz**: Velasco. Parque Nacional Noel Kempff M. Campamento Los Fierros, 03 May 1994, *B. Mostacedo et al.1558* (NY).

BRAZIL—**Amazonas**: Cacaupereira, 03°11'S, 60º07'W, 28 Jun 1986, *W. W. Thomas et al. 5229* (INPA, NY). **Bahia**: Chapadao Ocidental da Bahia, 29 Apr 1980, *R. M. Harley et al. 21962* (NY). **Distrito Federal**: Brasília, Fazenda Sucupira, 15°55'00"S, 48°01'00"O, 30 Apr 1999, *J. G. Faria & J. B. Pereira 299* (CEN). **Goiás**: Chapada dos Veadeiros, ca. 10km S. of Alto do Paraíso, 23 Mar 1969, *H. S. Irwin et al. 24945* (IAN). **Maranhão**: Balsas, 46°5'0"S, 7°35'0°W, 21 Mar 1997, *R. C. Oliveira & G. P. da Silva 640* (UFP). **Mato Grosso**: Serra do Roncador, Rio Turvo, ca. 210 km. N. of Xavantina, 27 May, 1966, *H. S. Irwin et al. 16086* (NY, UB). **Mato Grosso do Sul**: Campo Grande, 20°25'52,4"S, 54°42'04,0W, 24 Apr 2006, *S. A. Cunha et al. 97* (CGMS). **Minas Gerais**: Morro do Pilar, 19S14'05.6", 43W23'11.1", 4 Nov 2014, *Silva Filho et al. 2131* (ICN, NY). **Pará**: Belterra, beira do Rio Rapajós, Pindobal, 27 Oct 1947, *G. A. Black 47-1818* (IAN). **São Paulo**: Campinas, *J. C. Novaes 9317* (NY). **Tocantins**: Colinas de Tocantins, BR153, 8°04'S, 48°28'W, 1 Jul 1996, *M. Luceño et al.* EBNN 663 (UFP).

COLOMBIA—**Antioquia**: Mun. Caucasia, 09 Oct 1987, *A. E. Brant O. Escobar 1217* (NY). **Meta:** Villavicencio, 26-31 Aug 1917, *F. W. Pennell 1426* (NY).

CUBA—**Pinar del Río:** P. del Río City, shore of Laguna de Junco, 31 Oct 1923, E. L. Ekman 17863 (NY).

MEXICO—**Chiapas**: Angel Albino Corzo, 21 Oct 1980, *D. E. Breedlove 46649* (NY). **Durango**: 22°57'N, -104°38'W, 25 Sep 1985, *M. Gonzáles & S. Acevedo 1824* (NY). **Morelos**: Cuernavaca. near Cuernavaca, 11 Nov 1902, *C. G. Pringle 11207* (NY).

TRINIDAD AND TOBAGO—**Trinidad**: 24 Feb 1980, *C. D. Adams 14705* (NY).

VENEZUELA—**Carabobo**: La Cimaca, near San Diego, 31 Dec 1938, *A. H. G. Alston 5913* (NY).

Comments—Wide distributed and common species. Usually small and inflorescences subcontracted, but in rich and humid soil could develop more and form open synflorescences.

Fig. 5. *Rhynchospora brevirostris, E. L. Ekman 17863* (NY661355).

3. RHYNCHOSPORA CAESIONUX

RHYNCHOSPORA CAESIONUX Koyama, Brittonia 24(3): 281. 1972.—TYPE: BRAZIL. Mato Grosso, wet campo between campo cerrado and gallery forest, Xavantina-Cachimbo Road, 60 km from Xavantina, *Hunt & Ramos 5834* (HOLOTYPE: K).

Annual. Culms 7.5–38 (–50) × 0.03–0.08 cm. Leaves canaliculate 4–20 × 0.03–0.18 cm, concentrated at base forming a rosette; leaf sheath 0.5–1.9 cm long. Synflorescence comprising an apical and 1–2 axillary corymbodia, the corymbodia loose, composed of partial corymbodia and then of solitary spikelets; apical corymbodium 1.2–4.5 (–5.5) × 1.8–5 (–8) cm, the axillary one 0.9–2.1 (–3.7) × 0.9–2.1 (–4.4) cm. Spikelets 6–9 mm long, lanceoloid; usually only the basal two flowers developing achenes. Glumes persistent in mature spikelet; the basal ones stramineous, ovate, subcoriaceous and aristate at apex, margin not hyaline; the distal ones pale brown, lanceolate, membranaceous, mucronate-acute at apex. Anthers 3, 1.8-2.2 mm long. Achene 0.8–1 × 0.7–1.1 mm, rounded to elliptic-obovate, stramineous to grey, usually with a dark longitudinal band at the middle of the achene, the surface smooth, with no lines, obtuse-truncate at apex, with a short and thin rim around the stylopodium at the base, sometimes forming two prolongated teeth-like structures on either side of it, truncate-concave at base, with two big swellings on either side, medium (ca. 0.2 mm long) stipitate. Stylopodium 0.1 × 0.3–0.8 mm, obconic, truncate at base, not confluent with achene, stramineous to brown.

Distribution and Habitat— Endemic to Brazil. Found in open and wet grasslands, near water stream or ponds.

Selected examined material—BRAZIL—**Bahia**: Barreiras, 11°37’18”S, 46°2’30”W, *A. Cotrim 380 & 465* (HUEFS). **Goiás**: Posse, 13°57’42”S, 46°22’11”W, 08 Mar 2001, *M. L. Fonseca et al. 2465* (CEN). **Mato Grosso**: Ca. 60 km. N. of Xavantina. Serra do Roncador, 24 May 1966, *H. S. Irwin et al. 15955* (NY). **Tocantins**: Dianópolis, 11°46’S, 46°24’W, *M. Luceño et al. 598* (UFP); Mateiros, Parque Estadual do Jalapão, 10°36’08”S, 46°34’21”W, 14 Jun 2002, *T. B. Cavalcanti et al. 2764* (CEN).

Comments—Similar to *Rhynchospora brevirostris*, but with longer spikelets and open synflorescences.

Fig. 6. *Rhynchospora caesionux, H. S. Irwin et al.* 15955 (NY00939161).

4. RHYNCHOSPORA CONFINIS

RHYNCHOSPORA CONFINIS (Nees) C. B. Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8: 40. 1908. *Spermodon confinis* Nees, Fl. Bras. (Martius) 2(1): 119. 1842.—TYPE: BRAZIL. Distrito Federal, Brasília, 4 Feb 1966, *H. S. Irwin et al. 12258* (NEOTYPE (here designated): UB; isoneotypes: NY, MO). Brasilia centrali, *Pohl s. n.* (lost holotype: W†).

Rhynchospora stolonifera (Nees) Boeckeler, Linnaea 37: 562. 1873. *Haloschoenus stoloniferus* Nees, Fl. Bras. (Martius) 2(1): 120. 1842. *Dichromena stolonifera* (Nees) Steud., Syn. Pl. Glumac. 2(8-9): 136. 1855.—TYPE: BRAZIL. Minas Gerais, campis udis editis, *C. F. P Martius 3373* (LECTOTYPE (here designated): M); São Paulo, in umbrosis silvaticis ad Ypanema, *C. F. P Martius 3374* (former syntype: M).

Rhynchospora lundii Boeckeler, Vidensk. Meddel. Naturhist. Foren. Kjøbenhavn (1869) 147. —TYPE: BRAZIL. Jan 1834, Lund *s. n.* (HOLOTYPE: C10013399).

Rhynchospora palustris Boeckeler, syn. nov. Beitr. Cyper. 2: 24. 1890.—TYPE: BRAZIL. Minas Gerais, Barbacena, 27 Mar 1887, *J. H. R. Schenck 3328* (HOLOTYPE: C).

Rhynchospora heterolepis Boeckeler, syn. nov. Allg. Bot. Z. Syst. 1896, 94. —TYPE: BRAZIL. Minas Gerais, près du Rio dos Mortes Pequenos, 24 Jan 1889, *A. Glaziou 17870* (LECTOTYPE (here designated): P00264764; isolectotypes: P00264763, P00264765).

Perennial, rhizomes conspicuous, 0.1–0.25 cm thick. Culms 29–65 × 0.05–0.21 cm. Leaves canaliculate 13–44 × 0.08–0.23 cm, concentrated at base forming a rosette; leaf sheath 0.9–2.7 cm long. Synflorescence comprising an apical and 1–3 axillary corymbodia, the corymbodia contracted to somewhat contracted, rarely loose, composed

of fascicles of spikelets; apical corymbodium 1–3.8 × 1–4.7 cm, the axillary 1–2.4 × 0.8–3.3 cm. Spikelets 6–9 mm long, lanceoloid; usually the basal two flowers developing achene. Glumes persistent in mature spikelet; the basal ones stramineous, ovate-lanceolate, subcoriaceous and aristate at apex, margin not hyaline; the distal ones stramineous to pale brown, lanceolate, membranaceous, short aristate at apex. Anthers 3, 2-2.5 mm long. Achene 1.1–1.8 × 0.9–1.2 mm, obovate-obpyriform, stramineous to brown, the surface from almost smooth to foveolate, sometimes faintly transversely rugose in the middle, with 8–10 lines, truncate at apex, with a white to brown rim around almost all stylopodium or forming two teeth like projections, one on each side of achene, obtuse at base, narrowing to a long (ca. 0.4 mm long) stipe. Stylopodium 0.4–0.8 × 0.7–0.9 mm, depressed-triangular, truncate at base, not confluent with achene, brown.

Distribution and Habitat— From Argentina to Venezuela. Found in open and permanently moist grasslands, near water stream or ponds.

Selected examined material—ARGENTINA—**Corrientes**: Concepción, Paso Crucecita, 07 Mar 1967, *T. M. Pedersen 8078* (MBM).

BOLIVIA—**Santa Cruz**: Sara, Buenavista, 12 Feb 1925, *J. Steinbach 6924* (NY).

BRAZIL—**Bahia**: Barreiras, 11°53’S, 45°36’W, 27 Jun 1996, *M. Luceño et al. 578* (UFP). **Goiás**: Mineiros, 5 km ao leste do centro urbano, 01 Feb 1978, *T. M. Pedersen 12155* (MBM). **Mato Grosso**: Sidrelândia, Santa Fé, 23 Jan 1971, *G. Hatschbach 26062* (MBM). **Minas Gerais**: Três Corações. Rod. 3 Corações - S. Tomé das Letras, 04 Feb 1973, *G. G. Hatschbach & Z. Ahumada 31219* (NY). **Paraná**: Jaguaraíva, estrada para o Parque Estadual do Cerrado, 24º12'32.1"S, 0 49º41'W, 15 Jan 2004, *H. M. Longhi-Wagner et al. 8975* (HBR). **Santa Catarina**: Mafra, 26 January 1956, *R. Reitz 6715* (PACA). **São Paulo**: Itirapina, 12 Feb 2002, *J. L. S. Tannus 573* (ICN). **Rio Grande do Sul**: Campo Bom, 29°39' 41.6"S, 51°02'39.1"W, 1 Mar 2014, *Silva Filho 2040* (ICN).

PARAGUAY—**Cordillera**: Tobati, 23 Feb 1991, *E. Zardini & C. Velásquez 26622* (NY). **Itapúa**: Estancia "San Miguelito", Colonia Gral. Delgado, 05 Feb 1955, *T. M. Pedersen 3268* (NY).

VENEZUELA—**Bolivar**: 27 Jul 1983, *R. Kral & A. C. González 70548* (NY).

Comments— We searched for holotype of *Rhynchospora confin*is (Nees) C. B. Clarke in W and concluded that it was destroyed during World War II. The neotype designation was based on the protologue description.

Fig. 7. *Rhynchospora confinis*, *G. G. Hatschbach 31219* (NY00923754).

5. RHYNCHOSPORA DEPRESSIROSTRIS

RHYNCHOSPORA DEPRESSIROSTRIS M.T. Strong, Brittonia 52(3): 241 (2000). —TYPE: PUERTO RICO. Dorado, 26 Jul 1913, *J.R. Johnston & J.A. Stevenson 889* (HOLOTYPE: US; isotypes: NY, UPR n.v.).

Perennial, rhizomes inconspicuous. Culms 11.5–65 × 0.03–0.11 cm. Leaves flat to filiform 6–43 × 0.03–0.09 cm, concentrated at base forming a rosette; leaf sheath 0.4–4.4 cm long. Synflorescence comprising an apical and 1–2 axillary corymbodia, the corymbodia loose to somewhat contracted and composed of partial corymbodia, and these of fascicles of spikelets or single spikelets; apical corymbodium 0.8–5.2 × 0.7–3.6 cm, the axillary one 0.4–3.4 × 0.4–2.4 cm. Spikelets 2.2–2.8 mm long, ovoid-lanceoloid; usually only the basal flowers developing achene. Glumes stramineous, membranaceous, acute-mucronate at apex, persistent in mature spikelet; the basal ones ovate-lanceolate, margin not hyaline; the distal ones lanceolate. Anthers 3, 0.8–1.1 mm long. Achene 0.7–0.8 × 0.7–0.9 mm, broadly obovoid, golden-brown to brown, sometimes with a faintly dark longitudinal band at the middle of the achene, the surface transversely undulate-rugose, with 4–6 lines, obtuse-truncate at apex, without a rim around the stylopodium, obtuse at base, narrowing to a very short (ca. 0.05 mm long) stipe. Stylopodium 0.1 × 0.3–0.5 mm, depressed-conical, truncate at base, not confluent with achene, stramineous to brown.

Distribution and Habitat— Endemic to Puerto Rico. Found in open, white sand, wet savannas, near streams or ponds.

Selected examined material—PUERTO RICO—**Dorado**: 1 November 1964, *R. O. Woodbury s.n.* (NY). **Guayanés**: May 1970, *R. O. Woodbury s.n.* (NY). **Tortuguero**: Lagoon Natural Reserve, September 1968, *R. O. Woodbury s.n.* (NY).

Comments—Besides being very similar to *Rhynchospora austrobrasiliensis*, this species has coflorescences wider than long, spikelets 2.2–2.8 mm long, stylopodium depressed-conical, not bilobed at base, and is known only from to Cuba and *R. austrobrasiliensis* only from South America.

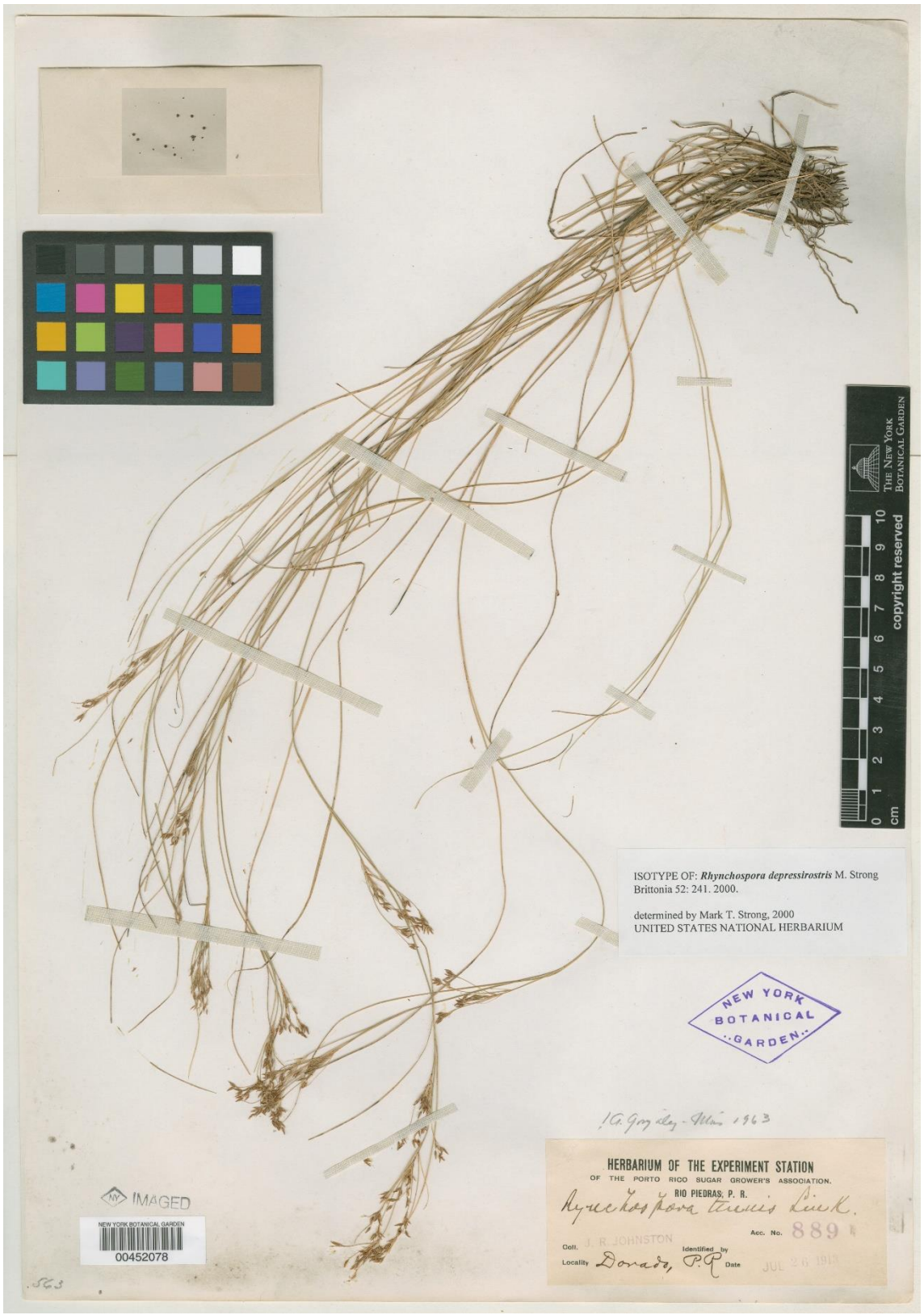

Fig. 8. *Rhynchospora depressirostris*, *J. R. Johnston 889* (isotype, NY00452078).

6. RHYNCHOSPORA DONSELAARII

RHYNCHOSPORA DONSELAARII M.T. Strong, Novon 11(2): 268. 2001.—TYPE: SURINAM. Sipaliwini Savanna, wet valley, 27 Aug 1966, *J. van Donselaar 3618* (HOLOTYPE: U).

Perennial, rhizomes conspicuous, 0.1–1.5 cm thick. Culms 7–21 × 0.05–0.12 cm. Leaves canaliculate 4–19 × 0.07–0.15 cm, concentrated at base forming a rosette; leaf sheath 0.9–2.6 cm long. Synflorescence comprising an apical and 0–2 axillary corymbodia, the corymbodia loose and composed of solitary spikelets; apical corymbodium 1.5–3.4 × 0.8–1.7 cm, the axillary one 1–1.8 × 0.3–1.2 cm. Spikelets 7–9 mm long, lanceoloid; usually only the basal flower developing achene. Glumes persistent in mature spikelet; the basal ones stramineous, ovate-lanceolate, subcoriaceous and mucronate to short aristate at apex, margin slightly hyaline; the distal ones pale brown, lanceolate, membranaceous, acute-mucronate at apex. Anthers 3, 1.5-2 mm long. Achene 1.9–2.2 × 1.5–1.9 mm, ovoid to broadly ovoid, stramineous to golden-brown, sometimes with a dark band at the middle of the achene, the surface, with no lines, apex truncate-concave, with a rim around the stylopodium at the base, sometimes with two prolongated teeth-like structures on either side of it, obtuse-truncate at base, with two shallow pits on either side, reducing to a short (ca. 0.25 mm long) stipe. Stylopodium 0.2–0.3 × 0.3–0.5 mm, triangular, truncate at base, not confluent with achene, pale stramineous.

Distribution and Habitat— Endemic to Surinam. Known only from the type collection made in the Sipalwini Savanna.

Comments—Species only known by the type.

Fig. 9. *Rhynchospora donselaarii* M. T. Strong, *Donselaar, J. van, 3618* (holotype, U0072120).

7. RHYNCHOSPORA ELEGANTULA

RHYNCHOSPORA ELEGANTULA Maury, J. Bot. (Morot) 3: 209, fig. 10. 1889.—TYPE: VENEZUELA. Savanes d'Atures, bords de l'Orénoque, J. *Chaffanjon 274* (HOLOTYPE: P).

Annual. Culms 8.5–27 (–41) × 0.02–0.09 cm. Leaves filiform to flat 2.5–10 × 0.03–0.15 cm, concentrated at base forming a rosette; leaf sheath 0.6–1.5 cm long. Synflorescence comprising an apical and 2–3 axillary corymbodia, the corymbodia loose and composed of partial corymbodia, and these of single spikelets; apical corymbodium 2.2–5.2 (–6.7) × 1.7–4.6 cm, the axillary one 1.7–2.5 × 0.8–1.7 cm. Spikelets (5–) 7–10 mm long, subuloid-lanceoloid; usually only the basal two flowers developing achenes. Glumes stramineous, acute-mucronate at apex, caducous in mature spikelets; the basal ones lanceolate, chartaceous, margin hyaline at the apex; the distal ones lanceolate, membranaceous. Anthers 3, 0.8–3 mm long. Achene 0.7–1.1 × 0.4–0.5 mm, narrowly obpyriform to narrowly oblong, ivory to grey, the surface transversely undulate-rugose, with 5–9 lines, truncate-concave at apex, without a rim around the stylopodium, but with a rim on achene sides along borders, obtuse at base, narrowing to a very short (ca. 0.05 mm long) stipe. Stylopodium 0.1 × 0.1 (–0.2) mm, shallowly-triangular, truncate at base, not confluent with achene, stramineous to pale brown.

Distribution and Habitat— Common in Venezuela, but also occurring in north Brazil and Colombia. Found in open and rocky humid grassland, sometimes in sandbanks near rivers.

Examined material—COLOMBIA—**Santa Cruz**: Velasco, Cerro Pelado, 14º31’54”S, 61º29’32”W, 30 Mar 1994, *R. Guillén & J. Surubí 1223* (MO n. v., NY, USZ n. v.)

BRAZIL—**Amazonas**: Barcelos, Rio Aracá, Serrinha, 20 Aug 2014, *S. M. Costa 1107* (ICN, INPA). **Pernambuco**: Bonito, 17 Sep 1997, *A. M. Miranda 2785* (HST n. v., HUEFS)

VENEZUELA—**Amazonas**: Atures, región del Caño Corocoro, al N del bajo Río Ventuari, 4º20’N, 66°35’W, 22 Aug 1978, *O. Huber 2396* (NY); Atures, sabanas de Santa Bárbara, em lar ibera S del Río Orinoco, río abajo de su confluencia con el Río Ventuari , 3º50’N, 67°08’W, 19 Jul 1980, *O. Huber 5365* (NY); Atures, región de Rincones de Cachorro, a unos 30 km. N de Puerto Ayachucho y a unos 5 km. al NE de Galipero,

5º48’N, 67°20’W, 23 Sep 1980, *O. Huber 5716 & 5732* (NY, U n. v). Atures, near Rincones de Cachorro, 30 km. N de Puerto Ayachucho (5º48’N, 67º20’W), 5 Nov 1980, *P. J. M. Maas & O. Huber 5138* (NY, VEM n. v.); Great Rapids of the Orinoco, Puerto Ayacucho, 1-1.5km E of Hotel Amazonas, 7 Nov 1953, *B. Maguire et al. 36042* (NY); Isla Carestia, a small island in the Rio Orinoco, ca. 5km NNW of Sanariapo, 2 Nov 1971, *G. Davidse 2882* (MO n. v., US). **Bolívar**: Cedeño, Cerro El Medano, 22.5 km. SW of Calcara, 7º36’N, 66º15’W, 2 Nov 1985, *K. Bruce et al. 2536* (US); Cedeño, 3km al SW de La Guabina, em la via a Los Pijiguaos, Cerro Manacal, 6º45’N, 66º31’W, Oct 2006, *A. Fernández & B. Manara* (NY, VEN n. v.); Río Caura, Laja Peña Negra, al sur de Las Trincheras (entre Las Trincheras y la confluencia del Río Nichare), 7ºN, 64º50’W, 4 Sep 1992, *Meier et al. 2723B* (US, VEN n. v.).

Comments— Most of specimens identified as *R. elegantula* in herbaria are in fact *R.* sp. *13*. They appear very similar species if not examined carefully, but the type of *R. elegantula* has a narrowly obpyriform to narrowly oblong achene, with the surface transversely undulate-rugose, with 5–9 lines and a shallowly-triangular stylipodium, whereas *R.* sp. *13*. has an obpyriform achene, with the surface faintly transversely rugulose-foveolate, with 8–11 lines, and a depressed stylopodium (Figs. 1G and 3A).

Fig. 10. *Rhynchospora elegantula*, *G. Davidse 2882* (US3261487).

8. RHYNCHOSPORA EMACIATA

RHYNCHOSPORA EMACIATA (Nees) Boeck., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 31: 149. 1869 [1870]. *Haloschoenus emaciatus* Nees in Martius, Fl. Bras. 2(1): 121. 1842. *Rhynchospora tenuis* var. *emaciata* (Nees) Lindm., Bih. Kongl. Svenska Vetensk.-Akad. Handl. 26, Afd. 3, No. 9: 28. 1900.—TYPE: BRAZIL. "In campis ad urbem S. Pauli et Ypanema prov. S. Pauli, tum in campis ad Villam da Campanha et in deserto ad flumen S. Francisci prov. Minarum", *Martius s.n.* (LECTOTYPE (here designated): M0274784; isolectype: M0274782, M0274783).

Rhynchospora leptostachya Boeck., Linnaea 37: 591. 1873.—TYPE: BRAZIL. *Sellow s.n.* (LECTOTYPE (here designated): P00265223; isolectotype: P00265224; lost holotype: B†).

Perennial, rhizomes inconspicuous. Culms 18–112 × 0.03–0.2 cm. Leaves canaliculate 8–81 × 0.03–0.13 cm, concentrated at base forming a rosette; leaf sheath 1.2–9.7 cm long. Synflorescence comprising an apical and 1–3 axillary corymbodia, the corymbodia loose and composed of partial corymbodia, and these of single spikelets; apical corymbodium 1.2–17.5 × 2.5–17 cm, the axillary one 1.3–7.5.5 × 1.4–13 cm. Spikelets 5.8–9 mm long, lanceoloid; usually only the basal two flowers developing achenes. Glumes pale brown, persistent in mature spikelet; the basal ones ovate-lanceolate, chartaceous, aristate to short-aristate at apex, margin not hyaline; the distal ones lanceolate, membranaceous, mucronate to short aristate at apex. Anthers 3, 1.8–2.4 mm long. Achene 0.8–1.1 × 0.7–1.2 mm, rounded to broadly-obovoid, greyish-ivory, usually with a dark longitudinal band at the middle of the achene, the surface transversely rugose, with 6–8 lines, obtuse-truncate at apex, without a rim around the stylopodium, obtuse at base, narrowing to a short to medium (ca. 0.25 mm long) stipe. Stylopodium 0.2–0.5 × 0.4–9 mm, triangular, bilobed at base, not confluent with achene, stramineous to pale brown.

Distribution and Habitat— From Argentina to the Guianas and Trinidad and Tobago. Found in open and permanently wet grasslands, swamps, near water stream or ponds.

Selected examined material—ARGENTINA—**Corrientes**: Concepción, 19 Jan

1968, *T. M. Pedersen 8745* (NY). **Entre Rios**: Gualeguaychú, 17 Mar 1962, A. E. Burkart et al. 23283 (NY).

BOLIVIA—**Beni**: Yacumã, 26 Feb 1987, *G. Beck 13158* (NY). **La Paz**: Iturralde, 26 Feb 1984, *G. Beck 10030* (NY). **Santa Cruz**: Velasco, 26 May 1994, *R. Guillén & R. Choré 1529* (NY).

BRAZIL—**Alagoas**: Marechal Deodoro, 18 Jun 2000, *M. Alves et al. 2085* (NY). **Amazônia**: Território do Guaporé, Rio Abuña, 8 Jul 1952, *J. F. Silva 262* (IAN). **Bahia**: Barreiras, 11°59'39"S, 45°34'52"W, *R. M. Harley et al. 53848* (HUEFS). **Distrito Federal**: Brasília, Reserva Ecológica do IBGE, 20 Feb 2001, *M. Alves 2285* (CEPEC, IBGE, IAN, NY, UFP). **Espírito Santo**: Guarapari, Parque Estadual de Setiba, 17 Jan 1996, *M. L. L. Martins 581* (UFP). **Goiás**: Chapada dos Veadeiros, 10km. S. of Slto do Paraíso, 23 Mar 1969, *H. S. Irwin et al. 24944* (IAN, NY). **Mato Grosso**: Barra do Garças, Serra do Roncador, 4 Oct 1968, *G. E. Eiten & L. Eiten 9085* (UB). **Mato Grosso do Sul**: Costa Rica, 19°02'22,0"S, 53°11'31,9"W, 5 Apr 2004, *V. J. Pott et al. 6963* (CGMS, ICN). **Minas Gerais**: Santana do Riacho, Serra do Cipó, 19°15'22"S, 43°33'05"W, 04 Nov 2014, *P. J. S. Silva Filho 2087* (ICN). **Paraná**: Balsa Nova, Ponte dos Arcos, 19 Apr 2005, *C. Kozera & R. Kersten 2126* (ICN). **Rio Grande do Sul**: Cambará do Sul, -29.083356, -50.180174, 06 Mar 2012, *P. J. S. Silva Filho 1506* (ICN). **Santa Catarina**: Garuva, Serra do Quiriri, 20°01'48.7"S, 48°57'41.3"W, 28 Jan 2014, *P. J. S. Silva Filho 1985* (ICN). **Sergipe**: São Domingos, Serra da Miaba, 18 Apr 2006, *A. C. Silva et al. s. n.* (UFP46897). **São Paulo**: Ponte de divisa de Itapeva com Itararé, 7 Feb 2000, *A. P. Prata et al. 690* (MBM, NY, MG, UFP, SP). **Tocantins**: Fortaleza do Tabocão, 20 Mar 1968, *H. S. Irwin 21562* (NY). No municipality defined, *J. B. E. Pohl 2455* (NY).

BRITISH GUIANA— Rupununi, 26 Sep 1963, *R. Goodland 891* (NY).

COLOMBIA— **Vichada**: Ca. 51 km E of Las Gaviotas along unimproved dirt road to Santa Rita, 26 Dec 1973, *G. Davidse & F. Llanos 5229* (NY).

PARAGUAY—**Paraguarí**: National Park Ybycu'í, 10 Feb 1993, *E. M. Zardini & T. Tilleria 35015* (K n. v., NY). **San Pedro**: Primavera, 29 Oct 1957, *A. L. Woolston 901* (NY)

PERU—**Madre de Dios**: Tambopata Province, 26 Feb 1990, *A. H. Gentry & P. Núñez 69564* (NY).

TRINIDAD AND TOBAGO— **Tobago**: North Aripo Savanna, 20 Nov 1979, *C. D. Adams 14581* (NY).

URUGUAY—**Canelones**: 24 Feb 1942, *B. Rosengurtt 3902* (NY).

VENEZUELA—**Amazonas**: Atabapo, 03 Jun 1978, *O. Huber 2052* (NY). **Apure**: Pedro Camejo, 2 Mar 1979, *G. Davidse & A. C. Gonzáles 15947* (NY). **Bolívar**: Urimán, 30 Apr 1953, *J. L. Steyermark 75313* (NY).

Comments—For a long time this species was considered a variety of *R. tenuis*. But phylogenic studies showed that it's not closed related to it, being in a different clade. Even being very similar to *R. tenuis* sometimes, it could be easily differentiated by have aristate glumes and paler achene.

Fig. 11. *Rhynchospora emaciata* (Nees) Boeckeler, *J. B. E. Pohl 2455* (NY00720018).

9. RHYNCHOSPORA FALLAX

RHYNCHOSPORA FALLAX Uittien, Recueil Trav. Bot. Néerl. 22: 336. 1925. *Rhynchospora setacea* var. *fallax* (Uittien) Kük., Bot. Jahrb. Syst. 75 (3): 290. 1951. *Rhynchospora tenerrima* subsp. *fallax* (Uittien) T. Koyama, Mem. New York Bot. Gard. 23: 70. 1972.—TYPE: SURINAME. *Pulle 270* (HOLOTYPE: U; isotypes: NY, P, US).

Annual. Culms 9–29 × 0.03–0.08 cm. Leaves flat to canaliculate 7.5–26 × 0.05–0.11 cm, concentrated at base forming a rosette; leaf sheath 0.4–4.5 cm long. Synflorescence comprising an apical and 1–2 axillary corymbodia, the corymbodia loose and composed of fascicles of spikelets and solitary spikelets; apical corymbodium 1.2–3.6 × 0.4–1.2 cm, the axillary one 0.6–1.3 × 0.2–1.3 cm. Spikelets 4.5–6 mm long, ovoid-lanceoloid; usually the basal two flowers developing achene. Glumes stramineous, persistent in mature spikelet; the basal ones stramineous, broadly ovate to ovate-lanceolate, subcoriaceous, short-aristate at apex, margin not hyaline; the distal ones lanceolate, membranaceous, acute-mucronate at apex, rarely short-aristate. Anthers 2, 1.7–2 mm long. Achene 1.3–1.8 × 0.9–1.2 mm, obovate, stramineous to brown, sometimes with a dark longitudinal band at the middle of the achene, the surface transversely rugose to undulate-rugose, with 5–6 lines, truncate at apex, with a rim around the stylopodium evenly, obtuse at base, narrowing to a medium (ca. 0.3 mm long) stipe. Stylopodium 0.2–0.5 × 0.8–0.1 mm, triangular, truncate at base, not confluent with achene, stramineous to brown.

Distribution and Habitat— Endemic to the Guianas region, French Guiana, Guyana and Suriname. Found on humid grasslands.

Selected examined material—FRENCH GUIANA—Roche Touatou, Long. 52°32', Lat. 2°57', *G. Cremers & J. J. Granville 13984* (CAY n. v., NY, P n. v.); savane-roche Anabelle, 10 May 1997, *G. Cremers 15261* (CAY n. v., NY)

GUYANA—Cayenne, 10 Sep 1980, *s. col. 6618* (NY); Nonts Balcra, 2 Oct 1980, *J. J. Granville 4093* (NY).

SURINAME—Tumuc Humac, 13 Aug 1993, *P. Acevedo-Rdgz. et al. 6016* (NY, US). Wihelmina Gebergte, 1 Sep 1963, *H. S. Irwin et al. 55323* (NY).

Comments—Molecular studies showed it's a different species from *R. tenerrima*. Easy recognized by the achene truncate at apex and triangular stylopodium.

Fig. 12. *Rhynchospora fallax* Uittien, *A. A. Pulle 270* (isotype, NY00720018).

10. RHYNCHOSPORA FILIFORMIS

RHYNCHOSPORA FILIFORMIS Vahl, Enum. Pl. 2: 232. 1805. *Dichromena filiformis* (Vahl) Kunth, Enum. Pl. 2: 281. 1837; *Spermodon filiformis* (Vahl) Nees in Martius, Fl. Bras. 2(1): 118. 1842.—TYPE: PUERTO RICO. *Ledru s.n.* (HOLOTYPE: C-Vahl n.v.; isotype: P).

Rhynchospora podosperma C. Wright in Sauvalle, Anales Acad. Ci. Méd. Habana 8: 87. 1871.—TYPE: CUBA. A Pinar del Rio y Coloma, *Wright 3791* (HOLOTYPE: GH photo; isotype: NY, P, US).

Rhynchospora longispicata Boeckeler, Linnaea 37: 600. 1873. —TYPE: FRENCH GUYANA. *Sagot 1389* (cited as *Sagot 389*) (LECTOTYPE: BM; isolectotype: C, K, P), designated by M. T. Strong & P. Acevedo-Rodríguez, Contr. U. S. Natl. Herb. 52: 347. 2005.

Perennial, rhizomes conspicuous, 0.1–0.2 cm thick. Culms 15–61 × 0.05–0.15 cm. Leaves canaliculate 3–51 × 0.03–0.25 cm, concentrated at base forming a rosette; leaf sheath 1–3.2 cm long. Synflorescence comprising an apical and 0–2 axillary corymbodia, the corymbodia loose and composed of solitary spikelets; apical corymbodium 1–5.6 × 1.4–5 cm, the axillary one 0.2–5 × 1–4 cm. Spikelets 8–1.2 mm long, lanceoloid; usually only the basal flower developing achene. Glumes short aristate, persistent in mature spikelet; the basal ones stramineous, ovate-lanceolate, subcoriaceous and short aristate, margin slightly hyaline; the distal ones brown, lanceolate. Anthers 3, 2.7-3.6 mm long. Achene 1–1.4 × 1–1.2 mm, rounded to broadly elliptic, stramineous to golden-brown, sometimes with a dark grey longitudinal band at the middle of the achene, the surface smooth in the middle and faintly foveolate along margins, with no lines, truncate to concave at apex, with a short and thin rim around the stylopodium at the base, and sometimes with two prolongated teeth-like structures on either side of it, obtuse-truncate at base, reducing to a long (ca. 0.4 mm long) stipe. Stylopodium 0.1–0.3 × 0.2–0.5 mm, triangular, truncate at base, not confluent with achene, brown.

Distribution and Habitat— Found in open and permanently wet grasslands, near water stream or ponds.

Selected examined material—BELIZE—**Belize District**: 8 Oct 1957, *P. H. Gentle 9385* (NY).

BOLIVIA—**Santa Cruz**: Velasco, 20 Apr 1993, *T. J. Killeen 5380* (NY).

BRAZIL—**Alagoas**: Marechal Deodoro, 18 Jun 2000, *M. Alves et al. 2085* (NY). **Amapá**: 03 Jun 1944, *J. T. Baldwin 4094* (NY). **Amazônia**: Rio Branco, Boa Vista, *16 Aug 1951, G. A. Black 51-12589* (IAN) **Bahia**: Saúde, Cachoeira do Paulista, 22 Feb 1993, *J. G. Jardim et al. 78* (NY). **Distrito Federal**: Brasília, Altos do Córrego Cabeça do Veado, 24 Feb 1981, *E. P. Heringer et al. 6306* (NY). **Goiás**: Chapada dos veadeiros, 23 Mar 1969, *H. S. Irwin et al. 24951* (RB). **Marahão**: Carolina, 13 Apr 1983, *M. F. F. da Silva et al. 1074* (NY). **Mato Grosso**: Guarantã do Norte, Serra do Cachimbo, 26 Apr 1997, *V. C. Souza et al. 15860* (NY). **Minas Gerais**: Uberlândia, 19°05'17.9"S, 48º08'32.5"W, 31 Jan 2002, *G. C. Oliveira 73* (HUFU). Pará: São Geraldo do Araguaia, 6°12'09"S, 48°34'21"W, *A. E. S. Rocha* (MG). **Pará**: Marudá, 24 Mar 2009, *L. K. M. Rodrigues 59* (IAN, MG, UFP). **Paraíba**: Mamanguape, Reserva Biológica Guaribas, 11 Feb 2012, *W. W. Thomas et al. 15665* (NY). **Rondônia**: Basin of rio Madeira, 18 Nov 1968, *G. T. Prance 8624* (NY). **Roraima**: Rio Branco, Aug 1909, *E. H. G. Ule 8073* (NY). **Tocantins**: Colinas de Tocantins, 8°04'S, 48°28'W, 1 Jul 1996, *M. Luceño et al. 637* (UFP).

COLOMBIA—**Meta**: Villavicencio, 1-2 Sep 1917, *F. W. Pennell 1622* (NY).

COSTA RICA—**San José**: 5 Sep 1974, *L. D. Gómez 24007* (NY).

CUBA—**Pinar del Río**: Hacienda San Julian, South of Guane, 26-27 Dec 1919, *F. León 6938* (NY).

DOMINICAN REPUBLIC—**Trujillo**: Savannah plant grows in bunches, *R. A. Howard E. S. Howard 9891* (NY).

FRENCH GUYANA—Campo de Passoura, 21 Oct 1954, *G. A. Black et Klein 54-17081* (IAN).

GUYANA—Vicinity of Karanambo, 26 Sep 1988, *P. J. M. Maas et al. 7697* (NY).

MEXICO—**Tabasco**: Huimanguillo, 31 Oct 1979, *C. Cowan 2588* (NY).

TRINIDAD AND TOBAGO— **Trinidad**: Piarco Savanna, 27 Feb 1920, *N. L. Britton et al. 66* (NY).

VENEZUELA—**Amazonas**: Atabapo, 14-28 Feb 1978, *Huber 1547* (NY). **Anzoátegui**: 21 Aug 1942, *H. Pittier 15079* (NY). **Apure**: Mantecal, 13 Oct 1983, *M. R. Tejos 15* (NY). **Bolívar:** Municipio Asc. Farreras, Jun 1990, S. *Elcoro 772* (NY).

Comments—Wide distributed and easy recognized by it's long stype.

Fig. 13. *Rhynchospora filiformis* Vahl, *J. G. Jardim 78* (NY00661417).

11. RHYNCHOSPORA GRACILLIMA

RHYNCHOSPORA GRACILLIMA Thwaites, Enumeratio Plantarum Zeylaniae 1860. — TYPE: SRI LANKA. 1866, *G. H Thwaites 3818* (HOLOTYPE: K n. v.; isotypes: BR photo, G photo, GH photo, P (P00076708, P00076709), SING photo).

Rhynchospora subquadrata Cherm., syn. nov. Bull. Soc. Bot. France 69: 720. 1923. *Rhynchospora gracillima* subsp. *subquadrata* (Cherm.) J.Raynal, Adansonia n.s., 7: 321. 1967.—TYPE: MADAGASCAR. Province et District de Tamatave, environs de Tamatave, 27 Sep 1912, *R. Viguier 397* (LECTOTYPE (here designated): P00457054; isolectotypes: B, P00457052, P00457053).

Rhynchospora testui Cherm., syn. nov. Arch. Bot., Arch. Bot., Caen iv. Mem. No. 7, 42. 1931.—TYPE: CENTRAL AFRICAN REPUBLIC. Marais du Mbi, sous affluent de la Kotto par le Dji, village de Mangapou, 75 Km W. de Yalinga, 26 Aug 1921, *G. Le Testu 3158* (LECTOTYPE (here designated); P00461857; isolectotypes: BR, P00461855, P00461856); Marais de la Pawa, sous affluent de la Kotto par la Banga, 90 Km W. de Yalinga, 23 Aug 1921, *G. Le Testu 3123* (remaining syntypes: BR photo, P (P00461858, P00461859); Près de la rivière Kpalato, Bambari, 14 Aug 1921, *C. Tisserant 411* (remaining syntype: P).

Perennial, rhizomes inconspicuous. Culms 14–86 × 0.03–0.14 cm. Leaves flat to canaliculate 7–61 × 0.04–0.19 cm, concentrated at base forming a rosette; leaf sheath 1.1–8.5 cm long. Synflorescence comprising an apical and 1–4 axillary corymbodia, the corymbodia loose, rarely subcontract, and composed of partial corymbodia, and these of single spikelets; apical corymbodium 1.8–4.8 × 1–4.9 cm, the axillary one 1.1–3.9 × 1–3.4 cm. Spikelets 5–8 mm long, ovoid-lanceoloid; usually the basal three or more flowers developing achenes. Glumes membranaceous, acute-mucronate at apex, persistent in mature spikelet; the basal ones stramineous to pale brown, ovate-lanceolate, margin not hyaline; the distal ones pale brown, lanceolate. Anthers 2, 1–1.2 mm long. Achene 1.1–1.6 × 0.9–1.5 mm, broadly obovoid-obtrullate, ivory, rarely with a faintly dark line longitudinally on the middle of the achene, transversely rugulose, with 14–18 lines, acute-

obtuse at apex, without a rim around the stylopodium, obtuse at base, narrowing to a short (ca. 0.2 mm long) stipe. Stylopodium 0.1–0.4 × 0.8–1.3 mm, shallowly triangular, bilobed at base, not confluent with achene, whitish to stramineous.

Distribution and Habitat—Africa and South Asia. Found in open and permanently wet grasslands, near water stream or ponds.

Selected examined material—DEMOCRATIC REPUBLIC OF THE CONGO—**Belgian Congo**: Bodangabo, 18 Feb 1955, *Evrard 267* (NY).

NIGERIA—Aug 1930, *H. V. Lely 481* (FHI photo).

REPUBLIC OF CAMEROON— savanes à l'E de Ngoro, 30 Mar 1963, *J & A. Raynal 10618* (NY).

IVORY COAST—**Touba**: near Fouénan, 8°08'N, 7°40'W, 3 Nov 1979, *A. P. M. de Kruif 613* (NY).

REPUBLIC OF GHANA—Kintampo, 11 Oct 1965, *J. B. Hall 913* (NY).

SOUTH AFRICA—Richard's Bay, 10 Jun 1963, *E. A. Robinson 5522* (NY).

TOGOLESE REPUBLIC—**Centrale**: Sokode, *Mahoux 2114* (US).

VIETNAM—**Phuc Yen Tonkin**: Nov 1935, *A. Petelot 5583* (NY).

ZAMBIA—**Mwinilunga District**: 7 km N of Kalene Hill, 16 Apr 1965, *E. A. Robinson 6590 & 6643* (UB).

ZIMBABWE—**Northern Rodhesia:** Lake Chila, 16 Jun 1956, *E. A. Robinson 1687* (NY); Mbereshi, 24 Jun 1957, *E. A. Robinson 2396* (NY).

Comments—Coflorescence number, plant size and achene and stylopodium shape are variable in this species. Not making clear the recognition of *Rhynchospora subquadrata* or *R. testui* as different species.

Fig. 14. *Rhynchospora gracillima* Thwaites, *A. P. M. de Kruif 613* (NY).

12. RHYNCHOSPORA JUNCELLUS

RHYNCHOSPORA JUNCELLUS C. B. Clarke, Symb. Antill. (Urban). 2(1): 117. 1900.—TYPE: GUADELOUPE. *Anon 51* (LECTOTYPE (here designated): BM); *Anon 6* (former syntype: BM). FEDERATION OF SAINT KITTS AND NEVIS: St. Kitts, *F. Masson s.n.* (former syntype: BM). MARTINIQUE: Oct 1867, *L. Hahn 375* (former syntype: BM).

Annual. Culms 17–59 × 0.04–0.13 cm. Leaves canaliculate 4–38 × 0.04–0.13 cm, concentrated at base forming a rosette; leaf sheath 0.4–3.8 cm long. Synflorescence comprising an apical and 2–4 axillary corymbodia, the corymbodia somewhat contracted and composed of fascicles of spikelets or single spikelets; apical corymbodium 0.9–4.3 × 0.5–3.4 cm, the axillary one 0.5–2.9 × 0.4–1.6 cm. Spikelets 3–6 mm long, lanceoloid; usually four or more flowers developing achenes. Glumes stramineous, membranaceous, mucronate at apex, caducous in mature spikelets; the basal ones ovate-lanceolate, margin slightly hyaline; the distal ones lanceolate. Anthers 2, 0.5–0.8 mm long. Achene 0.6–0.8 × 0.4–0.6 mm, obovoid to obovoid-obtrullate, stramineous to pale brown, the surface faintly transversely undulate-rugose, almost smooth, with 5–6 lines, acute-obtuse at apex, without a rim around the stylopodium, obtuse at base, narrowing to a short (ca. 0.1 mm long) stipe. Stylopodium 0.2–0.3 × 0.3–0.5 mm, narrowly triangular, bilobed at base, not confluent with achene, stramineous to brown.

Distribution and Habitat— West Indies and north Brasil. Found in moist grasslands.

Selected examined material—BRAZIL—**Pará**: Jaramacarú, 26 May 1957, *G. A> Black et al 57-19617* (IAN, UB); Jaramacarú, 27 May 1957, *W. A. Egler 283* (MG); Jaramacarú, 4 Jun 1957, *W. A. Egler 469* (MG).

DOMINICA— 1903, *F. E. Lloyd 32a* (NY). St. David. Rosalie, 1903, *F. E. Lloyd 700* (NY). **Syndicate State**: north-west slopes of Morne Diablotins, 8 Oct 1983, *C. Whitefoord 3928* (BM n. v., NY).

GUADALOUPE—**Basse Terre**: Hauteurs de Deshaies, chimin de Deshaies à Sainte-Rose, Sep 1909, *A. Duss 4123* (NY).

ST KITT'S— 8 Sep to 5 Oct 1901, *N. L. Britton & J. F. Cowell 564* (NY).

ST VINCENTS—Mar 1890, *H. H. & G. H. Smith s. n.* (K n. v., NY01321001).

Comments—There is a disjunction between Brazil and West Indies in this species.

Brazilian ones have a more open synflorescence, but the rest is very similar to the other specimens.

Fig. 15. *Rhynchospora juncellus C. B. Clarke, A. Duss 4123* (NY01298490).

13. RHYNCHOSPORA JUNCIFORMIS

RHYNCHOSPORA JUNCIFORMIS (Kunth) Boeckeler, Flora 41: 646. 1858. *Dichromena junciformis* Kunth, Enum. Pl. [Kunth] 2: 279. 1837.—TYPE: FRENCH GUYANA. Sipaliwini Savanna, wet valley, 27 Aug 1966, *Poiteau 110* (HOLOTYPE: P n. v.; isotype: K).

Rhynchospora junciformis var. *monocarpa* Kük., Bot. Jahrb. Syst. 56 (Beibl. 125): 19. 1921.—TYPE: BRAZIL. Amazonas. Rio Branco, Surumu, Felsen der Serra de Mairary, 1200 m, *Ule 8370* (HOLOTYPE: B photo).

Rhynchospora cordatachenia M. T. Strong, syn. nov. Novon 15(3): 480 (-482; fig. 1). 2005.—TYPE: FRENCH GUIANA. Environs de Cayenne, Savane du Gallion, 9 Sep 1979, A. Raynal-Roques 21566A (HOLOTYPE: US).

Annual. Culms 3.5–11 × 0.02–0.06 cm. Leaves canaliculate 2.7–8 × 0.02–0.03 cm, concentrated at base forming a rosette; leaf sheath 0.2–1.2 cm long. Synflorescence comprising an apical and 0–2 axillary corymbodia, the corymbodia contracted and composed of fascicles of spikelets; apical corymbodium 0.5–0.9 × 0.2–0.7 cm, the axillary one 0.4–0.6 × 0.2–0.7 cm. Spikelets 3–3.8 mm long, lanceoloid; usually only the basal two flowers developing achenes. Glumes persistent in mature spikelet; the basal ones stramineous, ovate-lanceolate, subcoriaceous and short-aristate, margin not hyaline; the distal ones pale brown, lanceolate, membranaceous, acute-mucronate at apex. Anthers 2, 0.6 mm long. Achene 0.7–0.8 × 0.7–0.8 mm, rounded o broadly ovoid, rarely broadly obovoid, stramineous to grey, sometimes with a dark longitudinal band at the middle of the achene, the surface transversely undulate-rugose, with 4–5 lines, obtuse at apex, without a rim around the stylopodium, obtuse at base to cordate, with a short (ca. 0.1 mm long) stipe. Stylopodium 0.2–0.3 × 0.1 mm, triangular, tapering to a subulate tip, bilobed at base, not confluent with achene, brown.

Distribution and Habitat— Brazil, Guyana and Suriname. Found in open, low, and seasonally wet grasslands.

Selected examined material—BRAZIL—**Amapá**: between rios Cujubim and Flechal, 7 Aug 1962, *J. M. Pires P. B. Cavalcante 52381A* (NY). **Maranhão**: Rio Tocantins, perto de Carolina, May 1950, *J. M. Pires & G. A. Black s. n.* (IAN59123); Santa Elena, 9 Jul 1978, *N. A. Rosa & O. C. Nascimento 2563* (MG); Santa Elena, 8 Jul 1978, *N. A. Rosa & O. C. Nascimento 2593* (MG). **Piauí**: Piracuruca, 04°05'20.9"S, 41º44'53.7"W, 23 Jul 2011, *M. R. A. Mendes 638* (TEPB n. v., UB) **Tocantins**: Colinas de Tocantins, 8°04'S, 48°28'W, 1 Jul 1996, *M. Luceño et al. 656* (UFP); Lagoa da Confusão, Reserva Indígena Carajá, 23 Mar 1999, *M. A. Silva et al. 4085* (NY).

GUYANA—**Manari:** 03°28'N, 59°41'W, 20 Oct 1979, *P. J. M. Maas & L. Y. T. Westra 3684* & 3765 (NY).

SURINAME—: **Wilhelmina Gebergte**: Zuid Rivier, 03°2000N, 56°2900W, 2 Jul 1963, *B. Maguire et al. 53969* (NY).

Comments— The types of both *Rhynchospora junciformis* and *R. cordatachenia* were examined. The first has achenes with obtuse and rounded-cordate bases. Stylopodium shape is variable among the material revised and seem to not have no strong relationship with the achene base, then we decided to synonymize both names. *Rhynchospora junciformis* var. *monocarpa* were only observed by a photo.

Fig. 16. *Rhynchospora junciformis* (Kunth) Boeckeler, *M. Aparecida da Silva 4085* (NY 00939187).

14. RHYNCHOSPORA NANUZAE

RHYNCHOSPORA NANUZAE Rocha & Luceño, Hoehnea 29(3): 201 (203-204; fig. 6). 2002.—TYPE: BRAZIL. Minas Gerais, Serra do Cipó, 23 Apr 1996, *A. L. L. Vanzela 414* (HOLOTYPE: UFP; isotypes: MA n.v., UFP).

Perennial, rhizomes conspicuous, bulbous, 0.1–0.6 cm thick. Culms 21–58 × 0.04–0.3 cm. Leaves canaliculate 9–23 × 0.03–0.17 cm, distributed equally along the culms; leaf sheath 0.7–5.9 cm long. Synflorescence comprising an apical and 1–3 axillary corymbodia, the corymbodia loose and composed of partial corymbodia, and these of solitary spikelets; apical corymbodium 1.2–5.7 × 0.8–4.7 cm, the axillary one 0.7–3.3 × 0.5–2.7 cm. Spikelets 5–6.3 mm long, fusiform to narrowly ellipsoid; usually only the basal flower developing achenes. Glumes brown, persistent in mature spikelet; the basal ones ovate-lanceolate, papyraceous and mucronate to short-aristate at apex, margin not hyaline; the distal ones lanceolate, membranaceous, acute-mucronate at apex. Anthers 3, 1.5-3 mm long. Achene 0.9–1.1 × 0.6–0.8 mm, obovate-obtrullate, greyish-ivory to stramineous, the surface transversely rugose, with 7–9 lines, acute-obtuse at apex, without a rim around the stylopodium, obtuse at base, with a short (ca. 0.18 mm long) stipe. Stylopodium 0.2–0.4 × 0.3–0.6 mm, shallowly triangular to depressed-triangular, bilobed at base, confluent with achene, brown.

Distribution and Habitat—Endemic to Brazil. Found in rocky grasslands and slopes of Cerrado.

Selected examined material—BRAZIL—**Bahia**: Rio de Contas, 13°32'S, 41°57'W, 24 Jun 1996, *M. Luceño et al. 14478 EBNN 453* (UFP). **Minas Gerais**: Itambé do Mato Dentro, 19°21'43"S, 43°19'55"W, 4 Nov 2014, *P. J. S. Silva Filho et al. 2139* (ICN); Jaboticatubas, Serra do Cipó, 11 Mar 1969, *G. Eiten & L. T. Eiten 11016* (NY).

Comments—In his treatment of *Rhynchospora tenuis* var. *antillana* Kük., Kükenthal cited some specimens from Brazil which are, in fact, *R. nanuzae*. The type specimens of *R. tenuis* var. *antillana* are from Cuba, and they were synonymized in this paper with *R. subnipensis*, all from Cuba.

Fig. 17. *Rhynchospora nanuzae* Rocha e Luceño, *G. Eiten 11016* (NY02422808).

15. RHYNCHOSPORA PERRIERI

RHYNCHOSPORA PERRIERI Cherm., Bull. Soc. Bot. France 69: 721. 1923.—TYPE: MADAGASCAR. Berizoka, Sep 1897, *H. Perrier de la Bâthie 305* (LECTOTYPE (here designated): P00457060; isolectotype: P00457061).

Perennial, rhizomes inconspicuous. Culms 8–47.5 × 0.05–0.4 cm. Leaves flat to canaliculate 4–33 × 0.04–0.18 cm, concentrated at base forming a rosette; leaf sheath 0.4–5.3 cm long. Synflorescence comprising an apical and 1–4 axillary corymbodia, rarely reduced to just a fascicle, the corymbodia contracted and composed of fascicles of spikelets; apical corymbodium 0.6–1.7 × 0.5–1.3 cm, the axillary one 0.6–1.1 × 0.3–0.9 cm. Spikelets 3.2–5 mm long, ovoid-lanceoloid; usually only the basal two flowers developing achene. Glumes acute-mucronate at apex, persistent in mature spikelet; the basal ones stramineous, ovate-lanceolate, chartaceous, margin not hyaline to slightly hyaline; the distal ones pale brown, lanceolate, membranaceous. Anthers 2, 1–1.2 mm long. Achene 1–1.2 × 0.9–1.1 mm, broadly obovoid-obpyriform, stramineous to pale brown, dark brown maculated, the surface transversely rugose, with 5–6 lines, acute-truncate at apex, without a rim around the stylopodium, obtuse at base, narrowing to a very short (ca. 0.1 mm long) stipe. Stylopodium 0.3–0.6 × 0.8–1 mm, shallowly triangular, bilobed at base, not confluent with achene, grey to dark brown.

Distribution and Habitat—Africa. Found in open and permanently wet grasslands, near water stream or ponds.

Selected examined material—MADAGASCAR— Sept 1955, *J. Bonu 8344* (NY).

SENEGAL—**Casamance**: Saré Doma, 5 Jan 1962, *J. Raynal 7836* (NY).

SOUTH AFRICA—**Kwa Zulu**: 23 Apr 1987, *M. C. Ward 2037* (NY).

ZAMBIA—**Mwinilunga District**: 16 Apr 1965, *E. A. Robinson 6643* (NY).

ZIMBABWE— **Southern Rhodesia**: Banks of R. Kafue, 4 May 1960, *E. A. Robinson 3698* (NY). Victoria Falls, 4 Apr 1956, *E. A. Robinson 1418* (NY).

Comments—One of the two old world species of *Rhynchospora* sect. *Tenues*. It is a bit similar with *R. fallax* and *R. tenerrima*, but is in a different clade in the phylogenetic analysis and the maculated achene, and shallowly triangular stylopodium with the bilobed base differentiate it from these species.

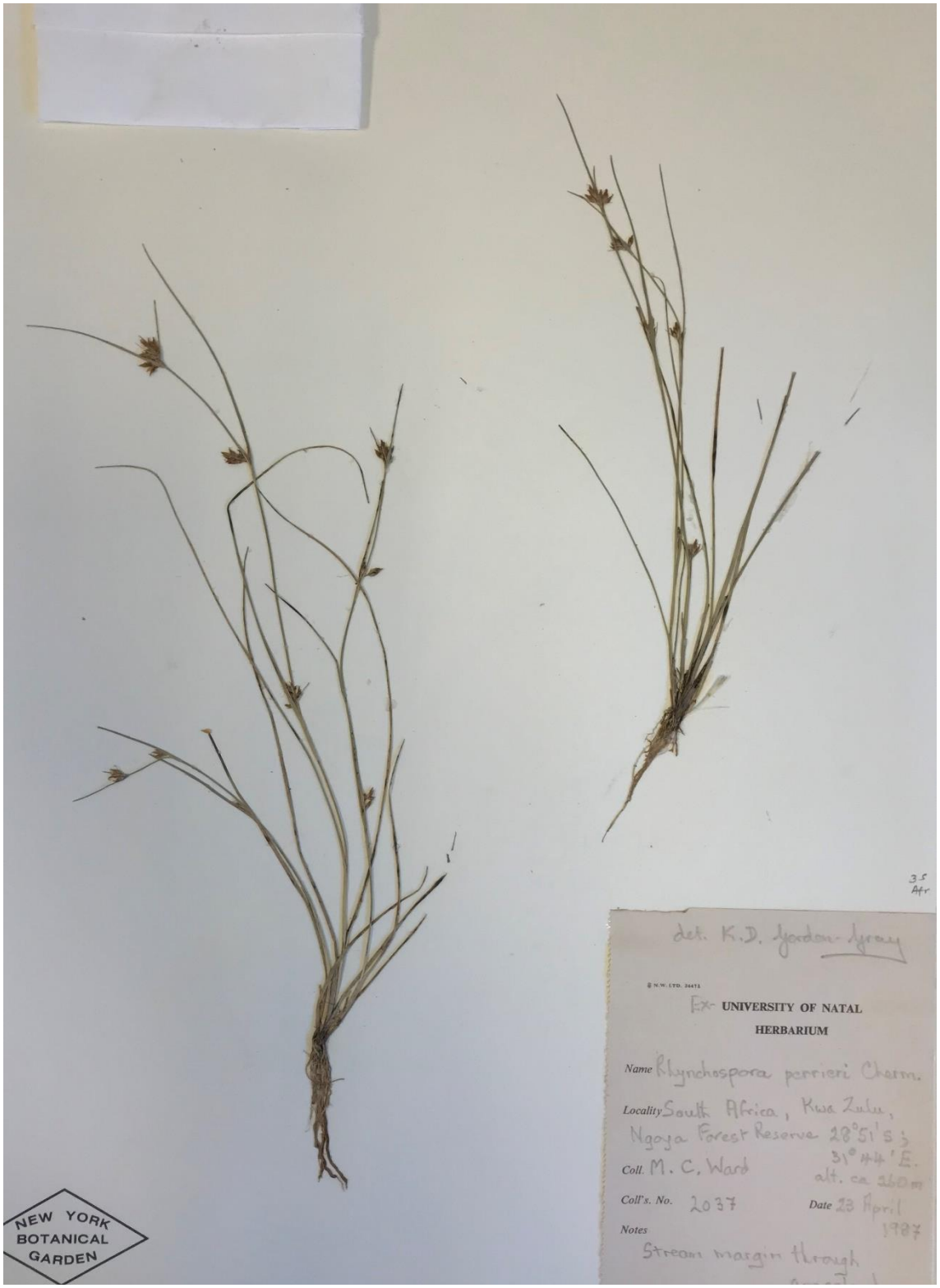

Fig. 18. *Rhynchospora perrieri* Cherm., *M. C. Ward 2037* (NY).

16. RHYNCHOSPORA RHEOPHYTICA

RHYNCHOSPORA RHEOPHYTICA W. W. Thomas & P. J. S. Silva Filho, Brittonia 70(1): 60-64, online first, DOI: 10.1007/s12228-017-9499-8. 2017.—TYPE: BRAZIL. Bahia, Mun. Barreiras, Estrada para Brasília, BR 242, estrada no km 70 a partir da sede do município, ca. 23 km em direção à Cooperativa de Coti, cachoeira do Acaba Vida no Rio de Janeiro,11°53′40″S, 45°36′10″W, 12 Jun 1992, *A. M. Amorim et al. 564* (HOLOTYPE: CEPEC; isotypes: MO, NY, US).

Perennial, rhizomes inconspicuous. Culms 50–113 × 0.04–0.15 cm. Leaves flat to canaliculate 9–16 × 0.07–0.15 cm, distributed equally along the culms; leaf sheath 0.5–4.6 cm long. Synflorescence comprising an apical and 3–4 axillary corymbodia, the corymbodia loose to somewhat contracted, rarely contracted, composed of partial corymbodia, and these of single spikelets or fascicles of spikelets; apical corymbodium 2–3.1 × 2.6–3.5 cm, the axillary one 1.6–2.7 × 1.8–3.1 cm. Spikelets 5–6.5 mm long, ovoid-lanceoloid; usually four or more flowers developing achenes. Glumes acute-mucronate at apex, caducous; the basal ones stramineous, ovate-lanceolate, subcoriaceous, margin hyaline; the distal ones brown, lanceolate, membranaceous. Anthers 3, 1.6–1.8 mm long. Achene 0.7–0.8 × 0.8–0.9 mm, rounded to broadly obovoid, stramineous to black, the surface transversely rugose, with 4–5 lines, obtuse-truncate at apex, without a rim around the stylopodium, truncate at base, with two rounded protuberances on the sides, ending in a short (ca. 0.1 mm long) bilobed stipe. Stylopodium 0.1–0.2 × 0.6–0.9 mm, semilunate, truncate-concave at base, fissured in the middle, not confluent with achene, pale stramineous.

Distribution and Habitat— Endemic to Brazil. Found found only in the beds of streams, up to the level of regularly occurring floods.

Examined material—BRAZIL—**Bahia**: Barreiras, 11°53’S, 45°36’W, 27 Jul 1996, *M. Luceño et al. 505* (UFP). **Maranhão**: Tutóia, *G. M. Conceição 516* (UFP). Pará: Marapanim, 15 Jun 1991, *N. Bastos et al. 966* (UFP). **Tocantins**: Mateiros, 10°35’S, 46°40’W, 04 May 2001, *A. B. Sampaio et al. 404* (CEN).

Comments—Similar to *R. riparia*, but is taller (culms 50–113 cm), spikelets 5–6.5 mm long and glumes caducous in mature spikelets.

Fig. 19. *Rhynchospora rheophytica* W. W. Thomas & P. J. S. Silva Filho, *A. M. Amorim et al. 564* (isotype, NY).

17. RHYNCHOSPORA RIPARIA

RHYNCHOSPORA RIPARIA (Nees) Boeck., Linnaea 37: 561. 1873. *Haloschoenus riparius* Nees in Martius, Fl. Bras. 2(1): 120. 1842. *Dichromena riparia* (Nees) Steud., Syn. Pl. Glumac. 2: 136. 1855. *Rhynchospora tenuis* subsp. *riparia* (Nees) T. Koyama, Mem. New York Bot. Gard. 23: 78. 1972.—TYPE: BRAZIL. Pará, Maracanã, Ilha de Algodoal, restinga da praia da Princesa, 22–25 May 1994, *M.N. Bastos et al. 1640* (NEOTYPE: MG; isoneotype: HAMAB n.v.), designated by L. J. C. Scheneider, Rodriguésia 68 (2): 664. 2017. BRAZIL. *Pohl 2637* (lost holotype: W†);

Dichromena canaliculata Steud., Syn. Pl. Glumac. 2: 136. 1855. *Rhynchospora canaliculata* (Steud.) Boeck., Flora 63: 451. 1880. *Rhynchospora tenuis* var. *maritima* Boeck., Linnaea 37: 612. 1873.—TYPE: BRAZIL. Rio de Janeiro, *Salzmann s.n.* (LECTOTYPE (here designated): P00271562; isolectotypes: B†, P00271559, P00271560, P00271561).

Haloschoenus capillaris var. *congestus* Nees in Martius, Fl. Bras. 2(1): 121. 1842. *Rhynchospora tenuis* var. *congesta* (Nees) Kük., Bot. Jahrb. Syst. 75: 191. 1950.—TYPE: BRAZIL. Bahia, Andaraí, 12°50'S, 41°19'W, 22 Jun 1996, M. *Luceño et al. 280* (NEOTYPE: UFP); *Nees 3619* (lost holotype: W†).

Rhynchospora rudioi Boeck., Flora 65: 27. 1882. TYPE:—BRAZIL. Sergipe: Santa Luzia do Itanhi, 15 Jun 2000, *M. Alves et al.* 2049 (NEOTYPE (here designated): UFP; isoneotype: CEPEC, NY,). Rio de Janeiro, *Rudio s.n.* (lost holotype: B†).

Perennial, rhizomes inconspicuous. Culms 10–50 × 0.03–0.2 cm. Leaves canaliculate 5–27 × 0.02–0.19 cm, concentrated at base forming a rosette; leaf sheath 0.4–2.3 cm long. Synflorescence comprising an apical and 0–2 axillary corymbodia, the corymbodia contracted to somewhat contracted and composed of partial corymbodia, and these of fascicles of spikelets; apical corymbodium 0.7–3.6 × 0.8–3.4 cm, the axillary one

0.7–2.1 × 0.6–3.2 cm. Spikelets 4–6 mm long, lanceoloid; usually only the basal flower developing achene. Glumes persistent in mature spikelet; the basal ones stramineous, ovate, chartaceous and mucronate to short-aristate at apex, margin slightly hyaline; the distal ones brown, lanceolate, membranaceous, mucronate at apex. Anthers 3, 1.2-1.5 mm long. Achene 0.6–0.9 × 0.7–1 mm, rounded to broadly obovate, stramineous to black, the surface transversely rugose, with 4–6 lines, obtuse-truncate at apex, without a rim around the stylopodium, truncate at base, with two rounded protuberances on the sides, ending in a short (ca. 0.1 mm long) bilobed stipe. Stylopodium 0.1–0.5 × 0.6–1 mm, shallowly triangular, bilobed at the base, not confluent with achene, pale stramineous to brown.

Distribution and Habitat— From Brazil to the Guianas region. Found in open and permanently wet grasslands, near water stream or ponds.

Selected examined material—BRAZIL—**Alagoas**: Marechal Deodoro, 18 Jun 2000, *M. Alves et al. 2083* (NY). **Amapá**: Oiapoque, 30 Nov 1949, *G. A. Black 49-8202* (UB). **Amazonas**: Estrada Manaus-Caracaraí, km 123, 02 Apr 1975, *A. Loureiro et al. s. n.* (INPA48350). **Ceará**: Fortaleza, 26 Sep 1935, *F. E. Drouet 2516* (NY). **Distrito Federal**: Brasília, 1793-1858, *C. E. F. von Glocker 277* (NY). **Maranhão**: Caxias, 4°44'S, 43°41'W, 3 Jul 1996, *M. Luceño et al. 748* (UFP). **Mato Grosso do Sul**: Caveira do Índio, 21 Jul 1976, *J. A. Ratter R.3310* (NY). **Minas Gerais**: Santana do Riacho, 27 Jan 1986, *H. Wagner 9574* (NY). **Pará**: Oriximiná, Rio Trombetas, 02 Jul 1980, *C. A. Cid et al. 1250* (INPA). **Paraíba**: João Pessoa, 21 Apr 2009, *A. C. Almeida JPB58055* (NY). **Pernambuco**: Tamandaré, 8°43'03.07"S, 35°05'38.6"W, 26 Sep 2001, *J. Cantarelli et al. 606* (IPA). **Rio de Janeiro**: Restinga do Cabo Frio, 8 Oct 1968, *D. Sucre 3813* (UFP). **Roraima**: Cauame, 14 Oct 1977, *L. Coradin 665* (NY). **Tocantins**: Mateiros, 10°33'0"S, 46°39'0"W, *R. Farias et al. 435* (UB).

BRITISH GUIANA— Sep 1937, *N. Y. Sandwith 1419* (NY).

FRENCH GUIANA— 13 Feb 1962, *Koch s. n.* (NY03108658).

GUYANA—Kaieteur National Park, 29 Aug 2006, *K. M. Redden 3879* (NY).

SURINAM—Zanderij II, 19 Oct 1944, *B. Maguire & G. Stahel 25030* (NY).

VENEZUELA—**Bolivar**: Canaima, 18 Jul 1972, *J. A. Steyermark 106324* (NY).

Comments—Sometimes culms bend over, touching the ground, producing new plantlets at the internodes. We searched for the holotypes of *Haloschoenus capillaris* var. *congestus* and *Rhynchospora rudioi* in W and B herbaria and concluded that both were lost during the World War II. The neotype designation was based on the protologue description.

Fig. 20. *Rhynchospora riparia* (Nees) Boeckeler, *B. Maguire & G. Stahel 25030* (NY03108648).

18. RHYNCHOSPORA RORAIMAE

RHYNCHOSPORA RORAIMAE Kük. Bot. Jahrb. Syst. 56 (4, Beibl. 125): 19. 1921. —TYPE: VENEZUELA. "An Buchen auf dem Gipfel des Roraima", Dec 1909, *Ule 8542* (HOLOTYPE: B; ISOTYPES: IAN, K, MG, NY, SI photo, US).

Perennial, rhizomes conspicuous, 0.4–0.8 cm thick. Culms 4–25 × 0.02–0.5 cm. Leaves canaliculate 6–18 × 0.02–0.1 cm, distributed equally along the culms; leaf sheath 0.3–3.5 cm long. Synflorescence comprising an apical and 0–2 axillary fascicles, the fascicles contracted, sometimes composed only of a solitary spikelet; apical fascicle 0.6–1.3 × 0.3–0.8 cm, the axillary one 0.5–1 × 0.1–0.2 cm. Spikelets 5–7.3 mm long, lanceoloid; usually only the basal two or three flowers developing achenes. Glumes brown, persistent in mature spikelet; the basal ones ovate, chartaceous, margin slightly hyaline, mucronate at apex; the distal ones ovate-lanceolate, membranaceous, acute-mucronate at apex. Anthers 3, sometimes 2 + 1 staminodium, 0.6-1 mm long. Achene 0.9–1.1 × 0.8–0.9 mm, obovate-obtrullate, stramineous, the surface faintly transversely rugose, almost smooth, with 6–7 lines, obtuse at apex, without a rim around the stylopodium, obtuse at base, narrowing to a very short (ca. 0.05 mm long) stipe. Stylopodium 0.3 × 0.7 mm, triangular, tapering to a subulate tip, concave at base, confluent with achene, brown.

Distribution and Habitat— Endemic to the highlands of the Guayana Shield. Found in rocky grasslands and slopes.

Selected examined material—BRAZIL—**Amazonas**: Santa Isabel do Rio Negro, 0°47'19"N, 66°01'23"W, 21 Sep 2012, *G. Martinelli et al. 17824* (ICN, RB); Santa Isabel do Rio Negro, 0°47'14"N, 66°01'26"W, 22 Sep 2012, *R. C. Forzza 7279* (ICN, RB, NY).

VENEZUELA—**Amazonas**: Atabapo, Cerro Marahuaca, cumbre, sección noroccidental, 16 Feb 1991, *J. A. Steyermark et al. 124396A* (NY). **Estado Bolivar**: Cerro Roraima, 5°12'N, 60°42'N, 26 Aug to 2 Sep 1976, *J. A. Steyermark et al. 112550* (INPA, VEM n. v.).

Comments—One of the most different species from sect. *Tenues*. Charachteristics as leaves distributed equally along the culms, synflorescences formed by fascicles and brown glumes are no common.

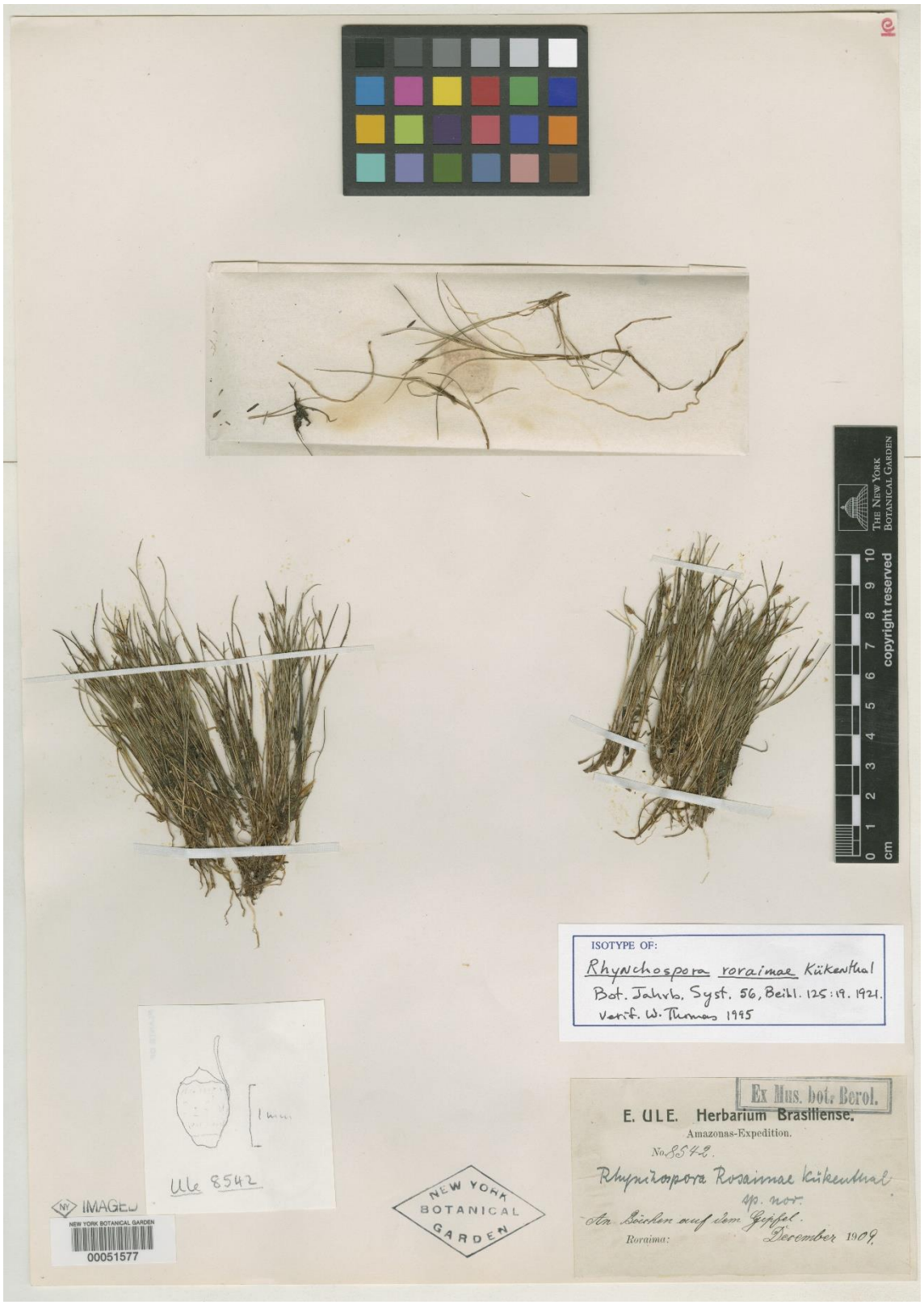

Fig. 21. *Rhynchospora roraimae* Kükenthal, *E. H. G. Ule 8542* (isotype, NY00051577).

19. RHYNCHOSPORA SANARIAPENSIS

RHYNCHOSPORA SANARIAPENSIS Steyerm., Fieldiana, Bot. 28: 46. 1951.—TYPE: VENEZUELA. Amazonas, vicinity of Sanariapo, *Steyermark 58469* (HOLOTYPE: F; isotype: VEN photo).

Annual. Culms 5–20 × 0.02–0.1 cm. Leaves flat 4–14 × 0.02–0.13 cm, concentrated at base forming a rosette; leaf sheath 0.4–1.5 cm long. Synflorescence comprising an apical and 0–2 axillary corymbodia, the corymbodia somewhat contracted and composed of dense fascicles of spikelets; apical corymbodium 0.6–2.5 × 0.6–2.1 cm, the axillary one 0.4–1.2 × 0.3–1.2 cm. Spikelets 3.2–3.9 mm long, lanceoloid; usually only the basal flower developing achenes. Glumes stramineous, membranaceous, acute-mucronate at apex, persistent in mature spikelet; the basal ones ovate-lanceolate, margin hyaline, lanceolate. Anthers 2, 0.6-0.8 mm long. Achene 0.8–1 × 0.4–0.5 mm, narrowly obovoid-obtrullate to narrowly oblong-obtrullate, stramineous to brown, the surface transversely undulate-rugose, with 4–7 lines, acute-truncate at apex, without a rim around the stylopodium, but with a rim on achene sides along borders, obtuse at base, narrowing to a very short (ca. 0.05 mm long) stipe. Stylopodium 0.1–0.2 × 0.2–0.3 mm, shallowly triangular, bilobed at the base, not confluent with achene, brown.

Distribution and Habitat— Brazil, Colombia, Guyana and Venezuela. Found in open, humid rocky grasslands.

Selected examined material—BRAZIL—**Amazônia**: Rio Branco, Rio Surumú, Serra do Mairary, Sep 1909, *E. Ule 8370* (IAN). **Pernambuco**: Maraial, Engenho do Curtume, Pedra do Uruçu, 08°47’47.8”S, 35°50’27.4”W, 22 Sep 2006, *M. Solbral-Leite 193* (UFP).

COLOMBIA—**Vaupes**: Urania, 27 Jun 1976, *J. L. Zarucchi 1716* (NY).

GUYANA—Bat Mountain, 02°10’41"N, 59°10’30"W, 25 Jul 1996, H. *D. Clarke et al. 2438* (US).

VENEZUELA—**Amazonas**: Isla Sebástian, 31 Jan 1980, *R. Liesner & H. Clark 8952* (MO n. v., NY). **Rio Negro**: Rio Pasimoni, 23-25 Jul 1985, *G. Davidse 27813* (MO n. v., NY).

Comments—A synflorescence formed by corymbodia, that are composed of dense fascicles of spikelets, along with a undulate-rugose achene surface makes this species unique in the section.

Fig. 22. *Rhynchospora sanariapensis* Steyerm., *J. L. Zarucchi 1716* (NY03108224).

20. RHYNCHOSPORA SAXISAVANNICOLA

RHYNCHOSPORA SAXISAVANNICOLA M.T. Strong, Novon 15(3): 482 (-483, 480; fig. 2). 2005.—TYPE: FRENCH GUIANA. Mont Saint-Marcel, zone sud-est du massif, mares gravillonnaires de savana-roche, 02°23'00"N, 53°00'20"W, 18 Jul 2002, *J.J. DeGranville et al. 15283* (HOLOTYPE: US; isotypes: CAY n.v., NY n.v., P n.v.).

Annual. Culms 6–13.5 × 0.02–0.07 cm. Leaves canaliculate 2.5–9 × 0.02–0.04 cm, concentrated at base forming a rosette; leaf sheath 0.4–2.1 cm long. Synflorescence comprising an apical and 1–2 axillary corymbodia, the corymbodia loose and composed of partial corymbodia or solitary spikelets; apical corymbodium 1.2–2.4 × 1–2.2 cm, the axillary one 0.7–1.1 × 0.6–1.9cm. Spikelets 3.2–4.2 mm long, lanceoloid; usually the basal three flowers developing achenes. Glumes caducous in mature spikelets; the basal ones stramineous, ovate, subcoriaceous and short aristate at apex, margin hyaline; the distal ones pale brown, lanceolate, membranaceous, acute at apex. Anthers 3, 0.5-1 mm long. Achene 0.5–0.7 × 0.4–0.5 mm, obovoid, greyish-stramineous, often with a dark grey longitudinal band at the middle of the achene, the surface transversely undulate-rugose, with 4–6 lines, obtuse at apex, without a rim around the stylopodium, obtuse at base, narrowing to an almost inconspicuous (ca. 0.02 mm long) stipe. Stylopodium 0.1 × 0.2 mm, shallowly triangular, bilobed at base, not confluent with achene, stramineous.

Distribution and Habitat— Brazil, Suriname and Venezuela. Found in open, humid or wet rocky grasslands.

Selected examined material—BRAZIL—**Mato Grosso**: Córrego do Porco, 7 May 1968, *J. A. Ratter 1342* (IAN, RB). **Pernambuco**: Bonito, Nov 2003, *J. R. Maciel & W. C. Silva 90-2003* (IPA); Maraial, 08°47’47.8”S, 35°50’27.4”W, 22 Sep 2006, *M. Sobral-Leite 193* (IPA).

SURINAME—Zuid Rivier. Bordering Kayser airstrip, 02 Jul 1963, *B. Maguire et al. 53967* (NY).

VENEZUELA—**Bolívar**: Cedeño. Rocky igneous forested slopes and bluffs of Cerro Medano, 02 Sep 1985, *J. A. Steyermark et al. 131233* (NY).

Comments—One of the species with smaller achenes in the section.

Fig. 24. *Rhynchospora saxisavannicola* M. T. Strong, *B. Maguire 53967* (NY03108233).

21. RHYNCHOSPORA SPRUCEANA

RHYNCHOSPORA SPRUCEANA C. B. Clarke, Bull. Misc. Inform. Kew, Addit. Ser. 8: 40. 1908. —TYPE: BRAZIL. Santarém, *Spruce 627* (LECTOTYPE: K; isolectotype: P), designated by T. Koyama, Mem. New York Bot. Gard. 23: 77. 1972.

Rhynchospora filiformis var. *latifolia* Uittien, Recueil Trav. Bot. Néerl. 22: 336. 1925.—TYPE: SURINAME. Para-Gebiet, Zanderij I, in der Savanne, *Essed 94* (LECTOTYPE: U), designated by M. T. Strong, Contr. U.S. Natl. Herb. 53: 150. 2006.

Rhynchospora graminea Uittien, Recueil Trav. Bot. Néerl. 32: 229. 1935.—TYPE: SURINAME. Zanderij I, savannah, *Lanjouw 339* (LECTOTYPE: U; isolectotypes: K, NY, US), designated by M. T. Strong, Contr. U.S. Natl. Herb. 53: 150. 2006.

Perennial, rhizomes conspicuous, 0.15–0.3 cm thick. Culms 21–60 × 0.05–0.21 cm. Leaves flat to canaliculate 5–31 × 0.06–0.35 cm, concentrated at base forming a rosette; leaf sheath 1–2.5 cm long. Synflorescence comprising an apical and 1–3 axillary corymbodia, the corymbodia loose and composed of partial corymbodia, and these of solitary spikelets; apical corymbodium 1.7–9 × 1.2–10 cm, the axillary one 0.7–7 × 0.9–7 cm. Spikelets 6–7 (–9) mm long, lanceoloid; usually only the basal flower developing achene. Glumes persistent in mature spikelet; the basal ones brown, ovate-lanceolate, subcoriaceous and aristate at apex, margin not hyaline or slightly hyaline; the distal ones pale brown, lanceolate, membranaceous, acute-mucronate at apex. Anthers 3, 2-2.4 mm long. Achene 0.9–1 × 0.8–1.1 mm, obovate-obtrullate, stramineous to brown, the surface transversely rugose, sometimes faintly foveolate along margins, with 5–7 lines, obtuse-truncate at apex, without a rim around the stylopodium, obtuse at base, narrowing to a medium-short (ca. 0.2 mm long) stipe. Stylopodium 0.2–0.4 × 0.8–1 mm, depressed-triangular, truncate-concave at base, not confluent with achene, pale stramineous to brown.

Distribution and Habitat— From Brazil to the Guianas. Found in open and permanently humid grasslands, near streams or ponds.

Selected examined material—GUYANA—**La Paz**: Iturralde, 17 Feb 1984, *R.*

Haase 120 (NY).

BRAZIL—**Bahia**: Palmeiras, Serras dos Lençois, 21 May 1980, *R. M. Harley et al. 22283* (NY). **Distrito Federal**: Brasília, Taguatinga, 29 Mar 1963, *E. Pereira 7438* (NY). **Goiás**: Guará, 20 Mar 1968, *H. S. Irwin et al. 21527* (NY, UB). **Mato Grosso**: Jaciara, 16°07'49.56"S, 55°09'37.44"W, 21 May 2009, *E. Ramos-Junior 9* (CGMS). **Mato Grosso do Sul**: Corumbá, 17°54'28"S, 57°34'22"W, 10 May 2003, *V. J. Pott et al. 6302* (CGMS). **Minas Gerais**: Reserva do Clube Caça e Pesca, 9 Apr 1999, *A. Barbosa et al. s. n.* (HUFU19573, SPF139711). **Pará**: Marapanim, Campina do Camará, 14 Jun 1979, *N. A. Rosa 3185* (NY); Santarém, 54°57' W, 02°29'S, 22 Apr 1989, *T. M. S. 32* (INPA). **Roraima**: Caracaraí, 1°23'44"N, 60°59'05"W, 13 Sep 2010, *J. D. Garcia et al. 1538* (INPA). **Tocantins**: Materios Parque Estadual do Jalapão, 12 Aug 2004, *J. M. Rezende et al. 958* (CEN).

GUYANA— Imbaimadai, on west side of airstrip, 29 Jul 2010, K. J. Wurdack et al. 5519 (NY).

SURINAME— Zandeij I, near airport, 9 Sep 1948, *J. Lanjouw & J. C. Lindeman 228* (IAN).

VENEZUELA—**Bolivar**: Roscio, 22 Jun 1983, *O. Huber & C. Alarcon 7574* (NY).

Comments—These is one of the few species that have wide and rigid leaves concentrated at the base of the plant. Rizomes are always very conspicuous in this species.

Fig. 23. *Rhynchospora spruceana* Clarke, *N. A. Rosa 3185* (NY02618938).

22. RHYNCHOSPORA SP. 2

RHYNCHOSPORA SP. 2 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BRAZIL. Pará, Serra dos Carajás, "2 km W of AMZA camp N-5", 13 May 1982, *C. R. Sperling et al. 5615* (HOLOTYPE: NY; isotypes: F, US).

Similar to *Rhynchospora tenuis*, differs by being annual, synflorescences composed of paniculodia and achene surface transversely rugose-tuberculate, with 8–9 lines.

Annual. Culms 6–47 × 0.04–0.12 cm. Leaves flat 4–25.5 × 0.03–0.11 cm, distributed equally along the culms; leaf sheath 0,8–2.8 cm long. Synflorescence comprising an apical paniculodium and 2–3 axillary paniculodia, all contracted and composed of partial paniculodia, and these of fascicles of spikelets; apical paniculodium 0.8–2 × 0.7–1.8 cm, the axillary one 0.7–1.4 × 0.5–1.3 cm. Spikelets 3.2–4.7 mm long, lanceoloid. Glumes persistent in mature spikelet; the basal ones stramineous, ovate, membranaceous, obtuse at apex, margin not hyaline; the distal ones pale brown, lanceolate, membranaceous, acute-mucronate at apex; usually the basal four or more flowers developing achene. Anthers 3, 0.6 mm long. Achene 0.6–0.7 × 0.4–0.5 mm, rounded-obovoid, stramineous to dark brown, the surface transversely rugose-tuberculate, with 8–9 lines, obtuse-truncate at apex, without a rim around the stylopodium, acute-obtuse at base, narrowing to a short stipe. Stylopodium 0.1 × 0.2 mm, shallowly triangular, bilobed at base, not confluent with achene, brown.

Distribution and Habitat—Endemic to Serra dos Carajás in Brazil. Found among scrubby vegetation on ferric rock outcrops.

Examined material—BRAZIL—**Pará**: Marabá, Serra dos Carajás, 19 Mar 1984, *A. S. L. da Silva et al. 1903* (MG, NY); Serra dos Carajás, 2km west of AMZA camp N-5, 6º04'S, 50º08'W , 13 May 1982, *C. R. Sperling et al. 5615* (F, INPA, MG, MO n. v., NY, US); Serra dos Carajás, 2km west of AMZA camp N-5, 6º04'S, 50º08'W , 13 May 1982, *C. R. Sperling et al. 5646* (INPA, MG, NY).

Comments—Species endemic to *canga* soils of Serra dos Carajás. One of the few species with flat leaves and synflorescence composed of paniculodia. Phylogenetic studies support its position inside o sect. *Tenues*.

Fig. 25. *Rhynchospora sp. 2*, *C. R. Sperling 5646* (NY00668330).

23. RHYNCHOSPORA SP. 3

RHYNCHOSPORA SP. 3 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: VENEZUELA. Territorio Federal Amazonas, Sierra Parima, 4º5'N, 64º40'24"W, 19 May 1973, *J. A. Steyermark 107491* (HOLOTYPE: NY; isotypes: VEN n.v.).

Similar to *Rhynchospora roraimae*, differs by having leaves concentrated at base forming a rosette, shorter spikelets and paler glumes.

Perennial, rhizomes inconspicuous. Culms 23–30 × 0.04–0.11 cm. Leaves canaliculate 5–18 × 0.03–0.1 cm, concentrated at base forming a rosette; leaf sheath 0.9–2.3 cm long. Synflorescence comprising an apical fascicle and 2–3 axillary fascicles, all contracted; apical fascicle 0.7–0.9 × 0.4–0.7 cm, the axillary one 0.6–0.7 × 0.3–0.5 cm. Spikelets 4–5.5 mm long, lanceoloid. Glumes persistent in mature spikelet; the basal ones pale brown, ovate to ovate-lanceolate, membranaceous, acute-mucronate at apex, margin not hyaline; the distal ones pale brown, lanceolate, membranaceous, acute-mucronate at apex; usually only the basal three flowers developing achenes. Anthers 3, 1 mm long. Achene 1–1.1 × 0.8–0.9 mm, obovate-obtrullate, stramineous, the surface faintly transversely undulate-rugose to almost smooth, with 5–6 lines, obtuse-truncate at apex, without a rim around the stylopodium, obtuse at base, narrowing to a short stipe. Stylopodium 0.2–0.4 × 0.7–0.9 mm, shallowly triangular, concave at base, confluent with achene, pale brown.

Distribution and Habitat— Venezuela. Found in open, humid rocky grasslands. Only known by the type.

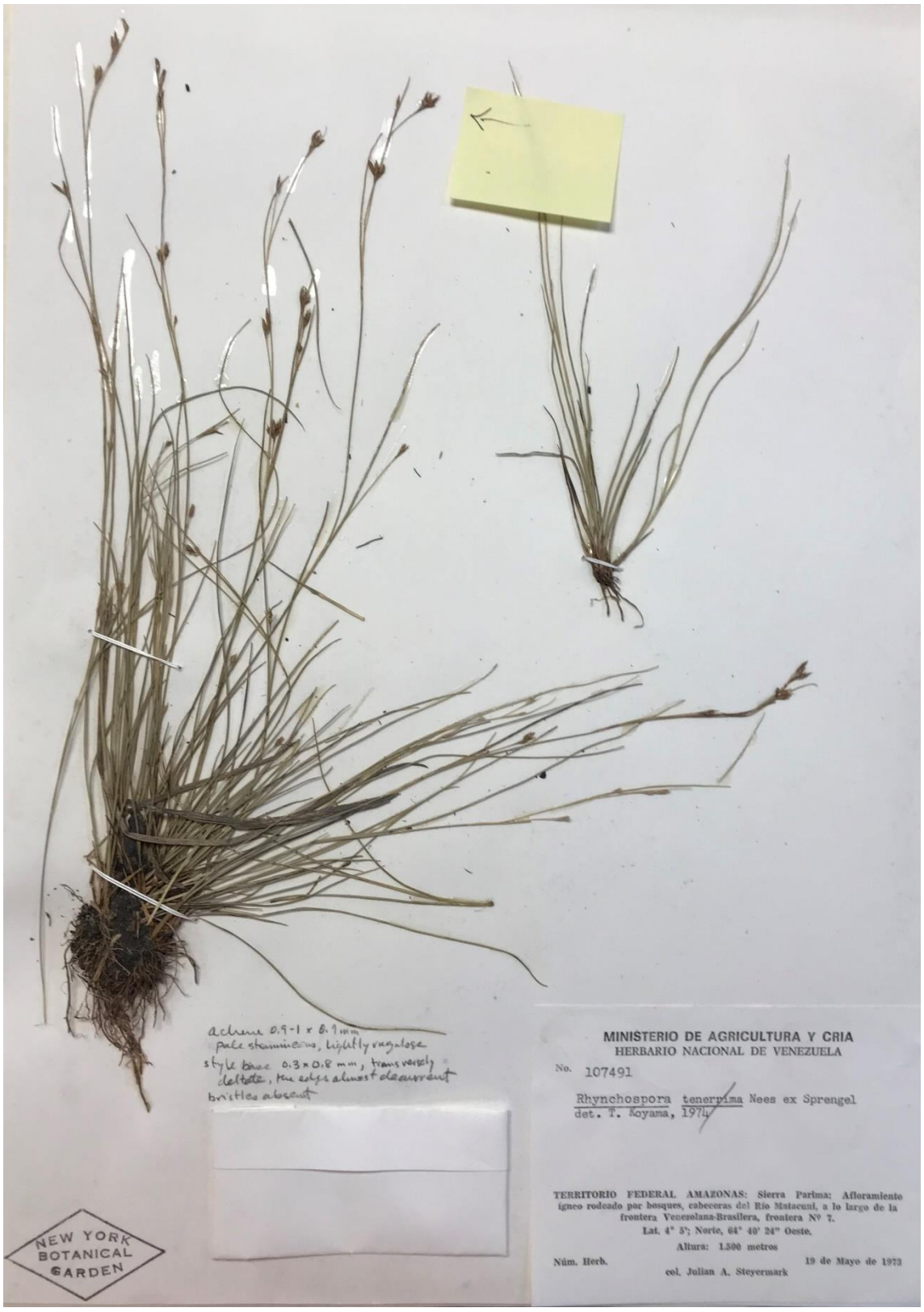

Fig. 26. *Rhynchospora sp. 3, J. A. Steyermark 107491* (holotype, NY).

24. RHYNCHOSPORA SP. 4

RHYNCHOSPORA SP. 4 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: COLOMBIA. Nariño: Road from El Espino to Tumaco, 30km W of Ricaurte, 10km W of Ataquer, El Mirador, Finca Santa Lucia, 01º17'N 78º07'W, 9 Dec 1988, *B. Hammel 17202* (HOLOTYPE: NY).

Similar to *Rhynchospora roraimae*, differs by having shorter spikelets and paler glumes, and achenes with 12-14 lines and a depressed triangular stylopodium.

Perennial, rhizomes inconspicuous, 0.1–0.5 cm thick. Culms 11–32 × 0.03–0.07 cm. Leaves canaliculate 4.5–10.5 × 0.02–0.05 cm, distributed equally along the culms; leaf sheath 0.4–1.3 cm long. Synflorescence comprising an apical fascicle and one axillary fascicle or single spikelet; apical fascicle 0.4–0.7 × 0.2–0.6 cm, the axillary one 0.4–0.6 × 0.1–0.3 cm. Spikelets 4–5 mm long, lanceoloid. Glumes persistent in mature spikelet; the basal ones stramineous, ovate-lanceolate, membranaceous, acute at apex, margin not hyaline; the distal ones stramineous, lanceolate, membranaceous, acute at apex; usually only the basal two flowers developing achenes. Anthers 3, 1mm long. Achene 0.9–1 × 0.6–0.8 mm, obovate, stramineous to brown, the surface faintly transversely rugulose, with 12–14 lines, obtuse-truncate at apex, without a rim around the stylopodium, obtuse at base, narrowing to a very short stipe. Stylopodium 0.2–0.3 × 0.4–0.5 mm, depressed-triangular, bilobed at base, not confluent with achene, brown.

Distribution and Habitat—Endemic to Colombia. On steep wet rock face along road.

Comments—Only known by the type.

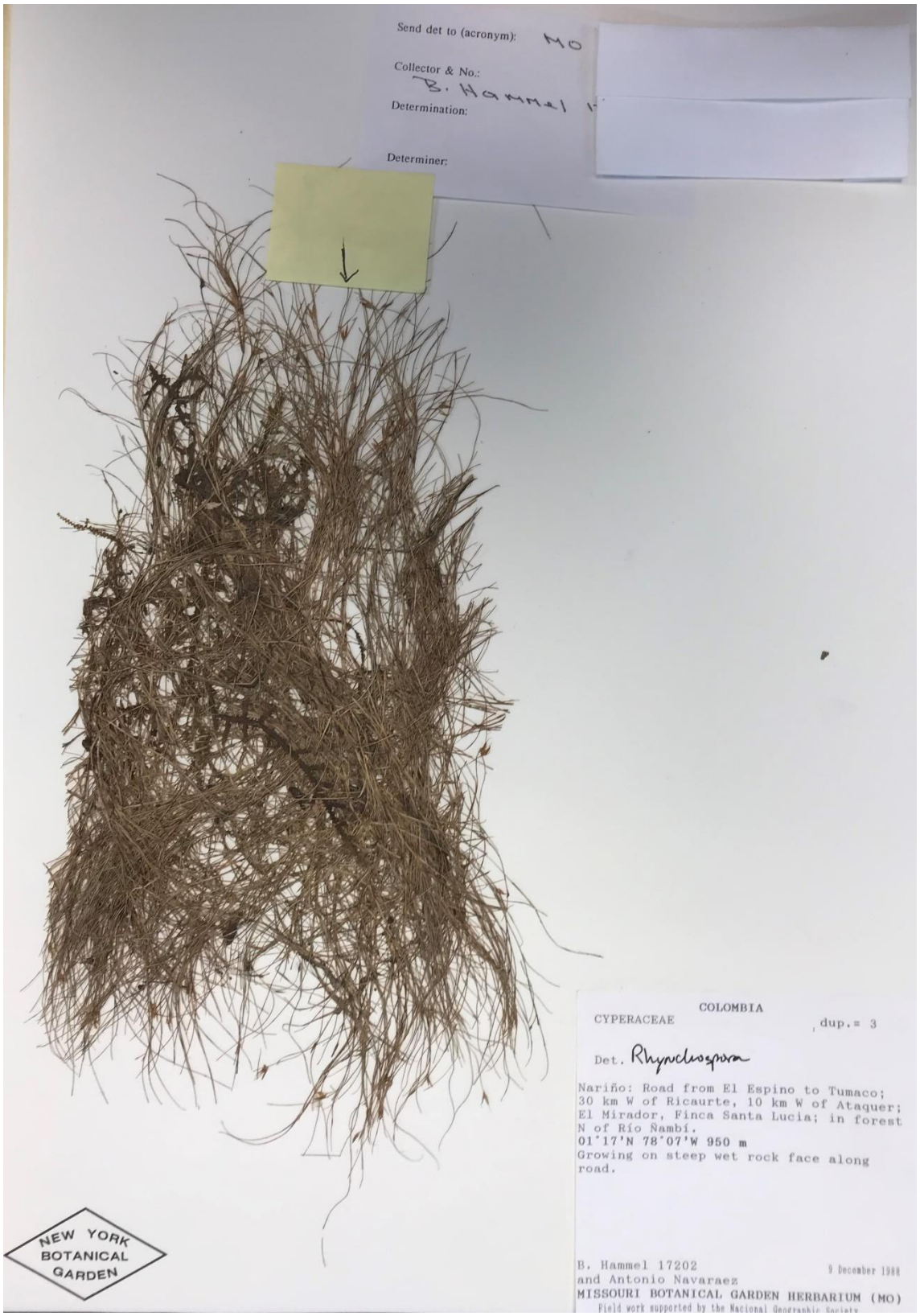

Fig. 27. *Rhynchospora sp. 4*, *B. Hammel 17202* (NY).

25. RHYNCHOSPORA SP. 5

RHYNCHOSPORA SP. 5 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BRAZIL. Minas Gerais, Diamantina, Universidade Federal Vale do Jequitinhonha e Mucuri (UFUJM), Campus JK, 25 Sep 2014, *W. W. Thomas & A. C. Galindo Costa 16395* (HOLOTYPE: JPB photo; isotype: NY).

Species very similar to *Rhynchospora emaciata*, easily distinguished by the synflorescences contracted and glumes long aristate at apex.

Perennial, rhizomes inconspicuous. Culms 25–88 × 0.04–0.2 cm. Leaves canaliculate 11.5–33 × 0.05–0.1 cm, concentrated at base forming a rosette; leaf sheath 1.4–6 cm long. Synflorescence comprising an apical corymbodium and 1–2 axillary corymbodia, all contracted and composed of partial corymbodia, and these of fascicles of spikelets; apical corymbodium 2.5–4.5 × 1.2–2.5 cm, the axillary one 1.7–2.5 × 0.8–1.6 cm. Spikelets 9–1.1 mm long, lanceoloid. Glumes persistent in mature spikelet; the basal ones brown, lanceolate, chartaceous, long-aristate at apex, margin not hyaline; the distal ones brown, lanceolate, membranaceous, aristate at apex; usually only the basal two flowers developing achenes. Anthers 3, 1.7–2.2 mm long. Achene 1–1.2 × 0.8–0.9 mm, oblong-obovoid, greyish-ivory with a faintly longitudinal dark band in the middle, the surface transversely undulate-rugose, with 9–11 lines, obtuse-truncate at apex, without a rim around the stylopodium, obtuse at base, narrowing to a stipe. Stylopodium 0.3–0.4 × 0.6–0.7 mm, triangular, truncate-concave at base, not confluent with achene, grey.

Distribution and Habitat—Endemic to Brazil. Found on humid open rocky grasslands.

Examined material—BRAZIL— **Bahia**: Abaíra, Caminho Ribeirão de Baixo, 13º15’S, 41º50’W, 30 Jul 1992, *W. Ganev 792* (HUEFS, K, NY, SPF); Datas, Morro do Coco, 3 km da cidade em direção à Diamantina, 03 Aug 1985, *J. R. Pirani et al. 8021* (NY, SPF); Rio de Contas. Pico das Almas, 13º33’S, 41º57’W, 22 Jul 1979, *S. A. Mori et al. 12484* (CEPEC, NY, US n. v.). **Distrito Federal**: Água Limpa, 13°30’009”S, 47°19’09”W, 30 Ago 2000, *C. Munhoz et al. 1853* (SP); **Goiás**: Alto Paraíso, 14°04’217”S, 47°30’336”W, 17 Jun 2000, *C. Munhoz et al. 1642* (SP); Alto Paraíso, 14°04’217”S, 47°30’336”W, 16 Ago 2000, *C. Munhoz et al. 1827* (SP). Serra dos Pirineus, Ca. 15 km (straight line) N of Corumbá de Goiás, 15 May 1973, *W. R. Anderson*

10380 (NY, US). **Minas Gerais**: Datas, 43°27’S, 18°38’W, 24 Nov 1985, *W. Thomas et al. 4890* (SPF); Diamantina, Rd. from Diamantina N to Biribiri, 10-12km S of Biribiri, 18º10’S, 43º38’W, 22 Nov 1985, *W. Thomas et al. 4837A* (NY); Jaboticatubas, km 116 ao longo da rodovia Lagoa Santa, 6 Jun 1970, *A. B. Joly et al. 153* (NY).**Tocantins**: Mateiros, Parque Estadual do Jalapão, 10°22’17”S, 46°34’58”W, 17 Jun 2002, *T. B. Cavalcanti et al. 2898* (CEN, RB); : Mateiros, Parque Estadual do Jalapão, 03 Ago 2006, J. M. Rezende *1081* (CEN).

Comments—Not as common as *Rhynchospora emaciata*, but also find in humid grasslands. The synflorescences contracted and mainly the glumes long aristate at apex make clear the recognition of this species.

Fig. 28. *Rhynchospora* sp. *5, W. W. Thomas 16395* (NY02641704).

26. RHYNCHOSPORA SP. 7

RHYNCHOSPORA SP. 7 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BRAZIL. Bahia, Abaíra. Campo do Cigano, 13º15'N, 41º55'W, 05 Feb 1992, *Stannared et al H51175* (HOLOTYPE: CEPEC; isotypes: HUEFS, K, NY, SPF).

Similar to *Rhynchospora tenuis*, differs by having the achene obovoid to obpyriform, stramineous with a faintly longitudinal dark band in the middle to completely greyish-stramineous, and stylopodium triangular sometimes tapering to a subulate tip.

Perennial, rhizomes inconspicuous. Culms 8.5–40 × 0.01–0.1 cm. Leaves canaliculate 8.5–43 × 0.02–0.1 cm, concentrated at base forming a rosette; leaf sheath 0.4–3.1 cm long. Synflorescence comprising an apical corymbodium and 1–3 axillary corymbodia, all contracted, rarely loose, and composed of partial corymbodia, and these of fascicles of spikelets; apical corymbodium 1–2.7 × 0.7–2.5 (–4) cm, the axillary one 0.6–1.8 × 0.3–2 (–3) cm. Spikelets 4.8–6.3 mm long, lanceoloid. Glumes persistent in mature spikelet; the basal ones pale brown, ovate-lanceolate, chartaceous, acute-mucronate at apex, margin not hyaline; the distal ones brown, lanceolate, membranaceous, acute-mucronate at apex; usually only the basal flower developing achene. Anthers 3, 2–2.4 mm long. Achene 0.8–1.2 × 0.6–0.8 mm, obovoid-obtrullate to obpyriform-obtrullate, stramineous with a faintly longitudinal dark band in the middle to completely greyish-stramineous, the surface transversely rugose, with 5–7 lines, acute-obtuse at apex, without a rim around the stylopodium, obtuse at base, narrowing to a medium-short stipe. Stylopodium 0.3–0.5 × 0.3–0.6 mm, triangular and sometimes tapering to a subulate tip, bilobed at base, not confluent with achene, grey to dark brown.

Distribution and Habitat— Endemic to the cerrado rocky grasslands of Brazil.

Examined material—BRAZIL— **Bahia**: Abaíra, Campo de Ouro Fino (baixo), 13º15'N, 41º54'W, 24 Jan 1992, *R. M. Harley et al.* 50796 (CEPEC, HUEFS, K n. v., NY, SPF); Rio de Contas, ca. 19 km na estrada para Pico das Almas, 27 Dec 1997, *A. M. V. de Carvalho et al. 6376* (CEPEC, NY). **Minas Gerais**: Araponga. PESB, Serra das Cabeças, 3a cabeça, 16 Jan 2001, *A. N. Caiafa 44* (NY, VIC n. v.); ca. 12 km SW of Diamantina, Serra do Espinhaço, 23 Jan 1969, *H. S. Irwin 22468* (NY, UB n. v.); 12 km by road W of Diamantina on road to Curvelo, Serra do Espinhaço, 09 Apr 1973, *W. R. Anderson 8401* (NY, UB); ca. 12 km SW of Diamantina, Serra do Espinhaço, 23 Jan

1969, *H. S. Irwin et al. 22468* (NY, UB); ca. 12 km NE of Diamantina, road to Mendanha, Serra do Espinhaço, 28 Jan 1969, *H. S. Irwin et al. 22770* (NY, UB); Diamantina, Serra do Espinhaço, ca. 8 km E. of Diamantina, road to Extração, 16 Mar 1970, *Irwin et al. 27656* (NY, UB n. v.); Carangola, Serra da Araponga, 20º43'S, 42°29'W, 25 Mar 1993, *L. S. Leoni 2154* (NY); Jaboticatubas, Serra do Cipó (along road from village of Almeida to city of Conceiçao do Mato Dentro), at km 128, or 1 km along road north of "Pálacio", 11 Mar 1969, *G. Eiten & L. T Eiten 11014* (NY); Jaboticatubas, Serra do Cipó, Fazenda Palácio, 14 Feb 1975, *G. Hatschbach & Z. Ahumada 31549* (MBM, NY); Santana do Pirapama, Serra do Cipó, acesso pela Faz. Inhame, início da trilha da Senhorinha, 27 Feb 2009, *D. C. Zappi et al. 1635* (NY, SPF); Santana do Riacho. ao longo da rodovia Belo Horizonte - Conceição do Mato Dentro, Alto do Palácio, 27 Jan 1986, H. L. Wagner et al. 9574 (NY, SPF); Serra do Cipó, km. 120 (ca. 145km N. of Belo Horizonte), 16 Feb 1968, *H. S. Irwin et al. 20286* (NY, UB); Serra do Espinhaço, at Lapinha, ca. 18km N. of Sêrro on road (MG) to Diamantina, 23 Feb 1968, *Irwin et al. 20735* (NY, UB); Serra do Espinhaço, Serra do Cipó, 19 Feb 1972, *W. R. Anderson et al. 36304* (NY, UB).

Comments—Species mostly identified as *Rhynchospora tenuis* in herbaria. It is endemic to *campos rupestres* region, where *R. tenuis* is not found.

Fig. 29. *Rhynchospora sp. 7, Stannared et al H51175* (NY00813645).

27. RHYNCHOSPORA SP. 8

RHYNCHOSPORA SP. 8 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BRAZIL. Santa Catarina, Palhoça, Pilões, 23 Feb 1956, *Reitz & Klein 2754* (HOLOTYPE: MBM; ISOTYPES: HBR n.v., NY, US).

Similar to *Rhynchospora emaciata*, differs by having shorter and narrowly ellipsoid spikelet, the achene stramineous to brown, with 10–13 lines, and stylopodium triangular, tapering to a subulate tip, confluent with achene.

Perennial, rhizomes inconspicuous. Culms 38–53 × 0.04–0.2 cm. Leaves flat 13–34 × 0.06–0.19 cm, concentrated at base forming a rosette; leaf sheath 0.5–4.8 cm long. Synflorescence comprising an apical corymbodium and 2–-3 axillary corymbodia, all loose and composed of partial corymbodia, and these of single spikelets or fascicles of spikelets; apical corymbodium 2–3.2 × 3.2–4.2 cm, the axillary one 1.3–2.1 × 2–3.2 cm. Spikelets 3–3.5 mm long, narrowly ellipsoid. Glumes caducous in mature spikelets; the basal ones stramineous, ovate-lanceolate, membranaceous, acute-mucronate at apex, margin not hyaline; the distal ones stramineous, lanceolate, membranaceous, acute at apex; usually only the basal two flowers developing achenes. Anthers 3, 0.9-2 mm long. Achene 0.8–1 × 0.8–0.9 mm, broadly-obovate, stramineous to brown, the surface transversely rugose, with 10–13 lines, obtuse at apex, without a rim around the stylopodium, acute-obtuse at base, narrowing to a short stipe. Stylopodium 0.5–0.8 × 0.4–0.8 mm, triangular, tapering to a subulate tip, concave at base, confluent with achene, stramineous to brown.

Distribution and Habitat—Endemic to the South of Brazil. Found in forest edges.

Examined material—BRAZIL—**Santa Catarina**: Palhoça, Pilões, 29 Nov 1956, *L. B. Smith & R. Klein 7984* (HBR n. v, NY, US).

Comments—One of the few species of sect. *Tenues* that is found on forest edges.

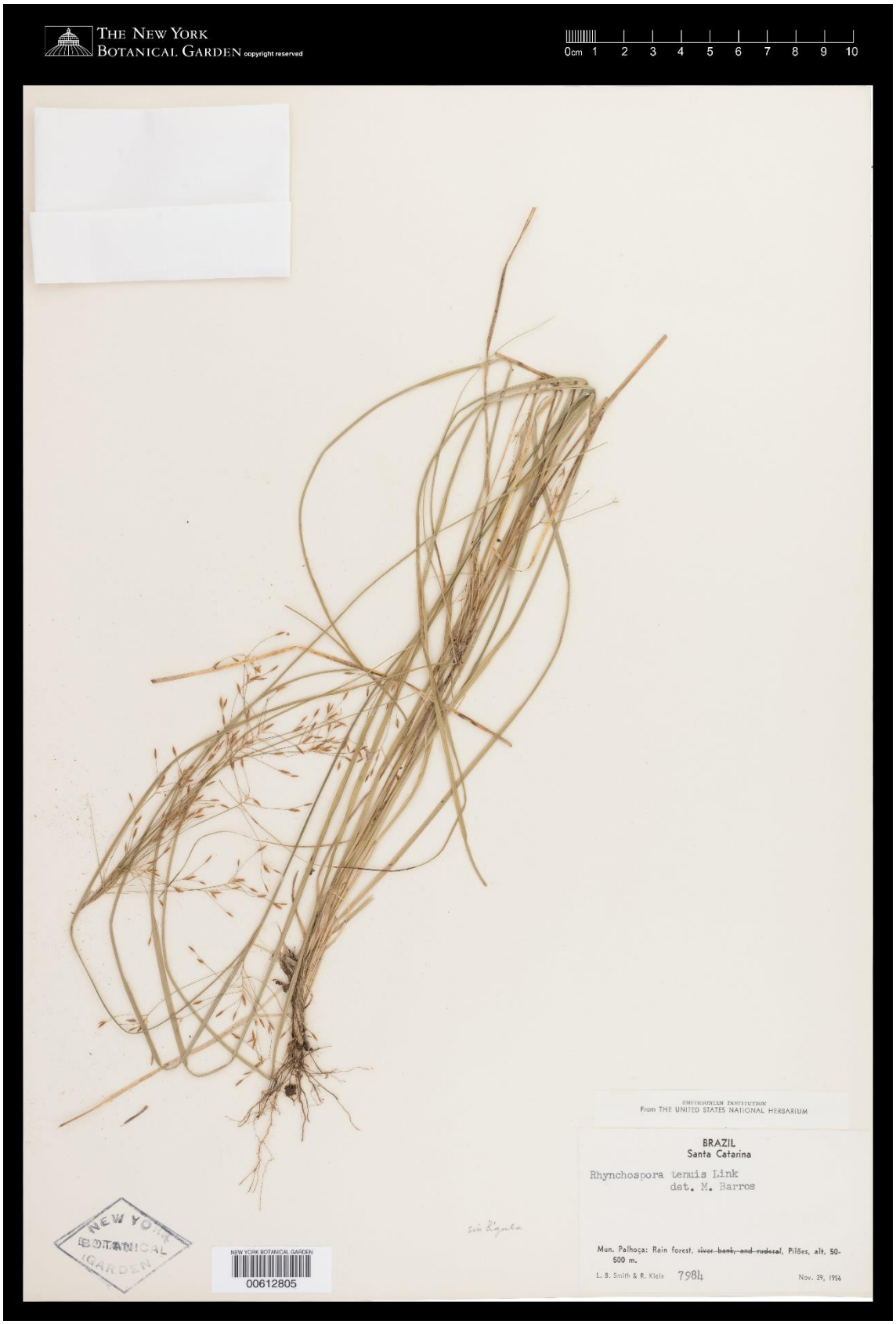

Fig. 30. *Rhynchospora sp. 8, L. B. Smith & Klein 7984* (NY00612805).

28. RHYNCHOSPORA SP. 9

RHYNCHOSPORA SP. 9 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: COLOMBIA. Vaupés, Río Kuduyari, Cerro Yapobodà, 05 Oct 1951, *R. E. Schultes & I. Cabrera 14244* (HOLOTYPE: NY; isotype: US).

Similar to *Rhynchospora emaciata*, differs by having shorter spikelets, the achene stramineous with 8–11 lines, and stylopodium confluent with achene.

Perennial, rhizomes inconspicuous. Culms 19–34 × 0.06–0.2 cm. Leaves flat 12–34 × 0.8–0.22 cm, concentrated at base forming a rosette; leaf sheath 1.4–5.8 cm long. Synflorescence comprising an apical corymbodium and 1–2 axillary corymbodia, all loose and composed of partial corymbodia, and these of single spikelets or less commonly fascicles of spikelets; apical corymbodium 2.4–4 × 2.6–5.6 cm, the axillary one 1.4–3 × 1.5–4.3 cm. Spikelets 3–4 mm long, lanceoloid. Glumes persistent in mature spikelet; the basal ones pale brown, ovate to ovate-lanceolate, membranaceous, acute to short-mucronate at apex, margin not hyaline; the distal ones pale brown, lanceolate, membranaceous, mucronate at apex; usually only the basal two flowers developing achenes. Anthers 3, 0.9-2 mm long. Achene 0.8–1 × 0.6–0.9 mm, obovate-obtrullate, stramineous, the surface transversely rugose, with 8–11 lines, obtuse-truncate at apex, without a rim around the stylopodium, acute-obtuse at base, narrowing to a short stipe. Stylopodium 0.2–0.4 × 0.6–0.8 mm, triangular, truncate-concave at base, confluent with achene, pale brown.

Distribution and Habitat—Colombia and Venezuela. Found on wet grasslands over sandstone outcrops.

Examined material—COLOMBIA—**Vaupés**: Río Vaupés, cachivera de Yurupari, 24-26 Oct 1952, *H. Garcia-Barriga 14963* (COL n. v., F).

VENEZUELA—**Amazonas**: Santa Cruz, margen del Río Atabapo, cerca de la desembocadura del Río Atacavi, 4 Sep 1960, *E. Foldats 3684* (F, VEM n. v.); Casiquiare, near Chapezon, between Boca de Casiquiare and Solano, 01º58'N, 67º03W, 09 Nov 1987, *R. Liesner & G. Carnevali 22944* (MO n. v., NY).

Comments—Leaves width and somewhat rigid sometimes ressembles *R. spruceana*, but it lacks conspicuous rhizomes, spikelets shorter and the glumes are membranaceous.

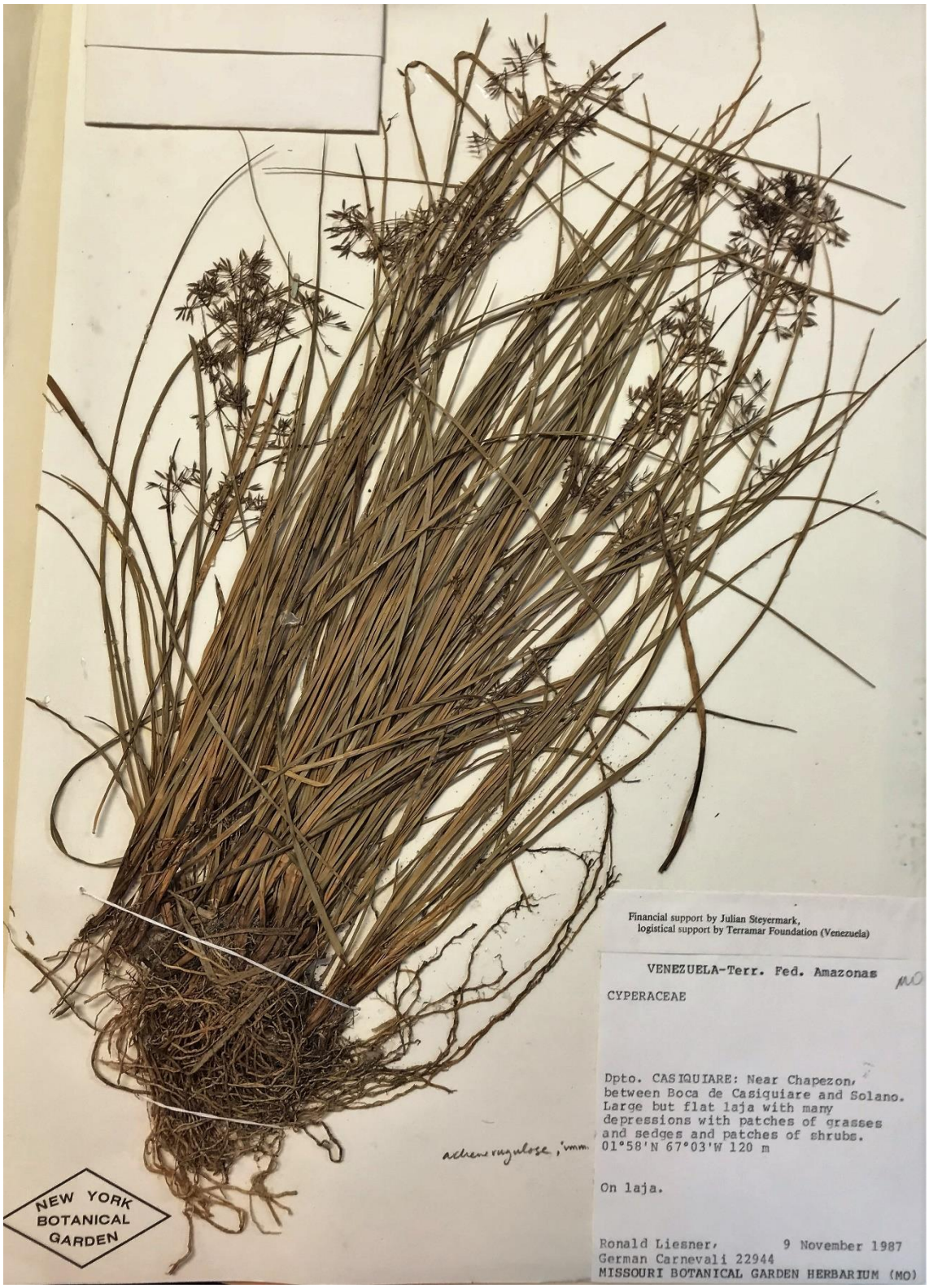

Fig. 31. *Rhynchospora sp. 9, R. Liesner & G. Carnevali 22944* (NY).

29. RHYNCHOSPORA SP. 10

RHYNCHOSPORA SP. 10 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BRAZIL. Rio de Janeiro, Nova Friburgo, Base of Pico da Caledônia, 22º19'50"S, 42º35'37"W, 27 Feb 2013, *W. W. Thomas 16078* (HOLOTYPE: NY; isotype: UFG).

Similar to *Rhynchospora tenuis*, differs by being annual, usually the basal three flowers of spikelet developing achene, having the achene obovoid-obtrullate, grayish-stramineous to pale brown, sometimes with a dark longitudinal band in the middle.

Annual. Culms 9–17 × 0.04–0.09 cm. Leaves canaliculate 5–12 × 0.05–0.12 cm, concentrated at base forming a rosette; leaf sheath 0.5–2.6 cm long. Synflorescence comprising an apical corymbodium and 2–4 axillary corymbodia, all somewhat contracted and composed of partial corymbodia, and these of fascicles of spikelets; apical corymbodium 0.7–1.8 × 0.8–2.5 cm, the axillary one 0.5–1× 0.3–1.2 cm. Spikelets 3.8–5 mm long, ovoid-lanceoloid. Glumes persistent in mature spikelet; the basal ones pale brown, ovate-lanceolate, membranaceous, acute-mucronate at apex, margin slightly hyaline; the distal ones brown, lanceolate, membranaceous, acute-mucronate at apex; usually the basal three flowers developing achene. Anthers 3, 1.2–1.5 mm long. Achene 0.9–1.1 × 0.8–1 mm, obovoid-obtrullate, grayish-stramineous to pale brown, sometimes with a dark longitudinal band in the middle, the surface transversely rugose, with 7–8 lines, truncate-acute at apex, without a rim around the stylopodium, obtuse at base, narrowing to a short stipe. Stylopodium 0.3–0.5 × 0.6–0.9 mm, triangular, tapering to a subulate tip, bilobed at base, not confluent with achene, stramineous to dark brown.

Distribution and Habitat—Endemic to Brazil. Found on humid grasslands of "campos de altitude".

Comments—Only known by the type, seems to be endemic to *campos de altitude* region.

Fig. 32. *Rhynchospora* sp. *10, W. W. Thomas 16078* (NY0297508).

30. RHYNCHOSPORA SP. 11

RHYNCHOSPORA SP. 11 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: VENEZUELA. Apure, Distrito Pedro Camejo, Laguna la Guacharaca, ca. 14km due W of the northern end of the Galeras de Cinaruco, 6º42'N, 67º27'W, 24 Feb 1979, *G. Davidse & A. C. Gonzáles 15669* (HOLOTYPE: NY; isotypes: MO n. v.).

Species similar to *Rhynchospora emaciata*, but easily distinguished by being annual, usually only the basal three flowers os spikelet developing achenes, achenes smaller, stramineous to pale brown, the stylopodium depressed-semilunate, confluent with achene.

Annual. Culms 19–47 × 0.06–0.2 cm. Leaves flat 12–34 × 0.08–0.22 cm, concentrated at base forming a rosette; leaf sheath 1–2.4 cm long. Synflorescence comprising an apical corymbodium and 2–3 axillary corymbodia, all loose (rarely somewhat contracted) and composed of partial corymbodia, and these of single spikelets; apical corymbodium (1–) 3–5.7 × (0.8–) 2–5.7 cm, the axillary one (0.7–) 1.4–4.5 × (0.7–) 1.1–4 cm. Spikelets 5–7 mm long, lanceoloid. Glumes persistent in mature spikelet; the basal ones stramineous, ovate to ovate-lanceolate, subcoriaceous and aristate at apex, margin not hyaline; the distal ones pale brown, lanceolate, membranaceous, aristate at apex; usually only the basal three flowers developing achenes. Anthers 3, 1.6 mm long. Achene 0.7–0.9 × 0.5–0.7 mm, broadly obovate, stramineous to pale brown, the surface transversely undulate-rugose, with 5–6 lines, truncate at apex, without a rim around the stylopodium, obtuse at base, narrowing to a short stipe. Stylopodium 0.1 × 0.4–0.5 mm, depressed-semilunate, truncate-concave at base, confluent with achene, pale brown.

Distribution and Habitat— North Brazil and Vezuela. Found in the beds of streams, up to the level of regularly occurring floods.

Examined material—BRAZIL—**Amazonas**: Barcelos, Rio Aracá, 25 Ago 2014, *S. M. Costa 1162* (INPA); Basin of Rio Negro, Rio Uneiuxi 5km. above mouth, 8 Nov 1971, *G. T. Prance et al. 16188* (F n. v., INPA, US). Rio Branco: Estrada Mucajai-Caracarai, campina do km 9, 10 Nov 1951, *G. A. Black & Magalhães 51-13398* (INPA, US); Santa Isabel do Rio Negro, Rio Uneiuxi, 0°37'59"S, 65º10'59"W, 3 May 2003, *I. L. Amaral 2673* (INPA). **Pará**: Mocajuba, 10-20 Apr 2009, *C. B. Lobato et al. 3656* (MG). **Roraima**: Parque Nacional do Viruá, 1°48'67"S, 61°01'57"W, 2006, *F. R. C. Costa 1648*

(INPA).

VENEZUELA—**Amazonas**: Atabapo, caño Cucurital y el rio Ventuari, 04º07'N, 66º42'W, Sep 1989, *L. Delgado 472* (NY); Atures, 4º39'N, 67º42'W, 07 Oct 1983, *F. Guanchez & G. S. Varadarajan 2498* (NY); Atures, 4º57'N, 67º43'W, 04 Nov 1984, *F. Guanchez 3212* (NY). **Apure**: Distrito Pedro Camejo, Caño La Guardia, between the Río Cinaruco and the Río Capanaparo, 6º44'N, 67º32'W, 1 Mar 1978, *G. Davidse & A. Gonzáles 14701* (MO n. v., NY, VEM n. v.). **Rios Pacimoni**: Yatua, Casiquiare, 28 Sep 1957, *B. Maguire et al. 41628* (NY, US).

Comments—The specimen from Brazil (Prance et al. 16188) have a very less developed inflorescence, the spikelets are a bit bigger, with more rigid glumes, the achene is identic to Venezuelan specimens. The specimen from Colombia have an intermediary aspect, having narrower leaves, and stylopodium a bit more rounded resembling a bit *R. spruceana*, what may confuse people because basal glumes are also subcoriaceous and this orangish color.

Fig. 33. *Rhynchospora sp. 11*, *G. Davidse & A. González 14701* (NY).

31. RHYNCHOSPORA SP. 12

RHYNCHOSPORA SP. 12 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BRAZIL. Goiás, Alto Paraíso de Goiás, ca. 27 km S. of Paraíso, 23 Mar 1968, *H. S. Irwin et al. 21698* (HOLOTYPE: UB; isotype: NY).

Similar to *Rhynchospora austrobrasiliensis*, differs by being annual, having paler glumes and achenes, the achenes broadly obovoid-obpyriform with 5-7 lines.

Annual. Culms 6.5–21.5 × 0.03–0.1 cm. Leaves flat to filiform 2.5–19 × 0.02–0.1 cm, concentrated at base forming a rosette; leaf sheath 0.4–3 cm long. Synflorescence comprising an apical corymbodium and 1–3 axillary corymbodia, all somewhat contracted and composed of partial corymbodia, and these of fascicles of spikelets or single spikelets; apical corymbodium 0.7–2.5 × 0.6–2.5 cm, the axillary one 0.5–2 × 0.3–1.9 cm. Spikelets 3.1–3.8 mm long, ovoid-lanceoloid. Glumes persistent in mature spikelet; the basal ones stramineous, ovate, membranaceous, obtuse at apex, margin slightly hyaline; the distal ones stramineous, ovate-lanceolate, membranaceous, acute at apex; usually only the basal three flowers developing achenes. Anthers 3, 0.7–1 mm long. Achene 0.7–0.9 × 0.5–0.8 mm, broadly obovoid-obpyriform, ivory to brown, sometimes with a dark longitudinal band at the middle of the achene, the surface transversely rugose, with 5–7 lines, obtuse-truncate at apex, without a rim around the stylopodium, acute-obtuse at base, narrowing to a very short stipe. Stylopodium 0.1–0.2 × 0.3–0.5 mm, shallowly triangular, faintly bilobed at base, not confluent with achene, stramineous to pale brown.

Distribution and Habitat— Brazil and Bolivia. Found in open, low, and seasonally flooded grasslands.

Examined material—BOLIVIA— Dec 1892, *O. Kuntze s. n.* (US658563); **Santa Cruz**: Nuflo de Chavez, Est. Las Madres 10 km N of Concepción, curiche by front gate (16º00’S, 62º00’W), 17 May 1986, *T. Kileen 2045* (F, NY); Velasco, aproximadamente 5 km entre San Rafael y San Miguel, 16.7312ºS, 60.7248ºW, 27 Apr 2009, *J. R. I. Wood et al. 26181* (K n. v., US, USZ n. v.).

BRAZIL—**Distrito Federal**: Pedra da Gávea, 8 Apr 1952, *L. B. Smith 6444* (R, US). **Goiás**: Cavalcante, 17 Apr 2001, *G. Pereira-Silva et al. 4931* (CEN); Presidente Kennedy, 1 Feb 1980, *T. Plowman et al. 8221* (MG, NY).**Mato Grosso**: between Jauru

& Pontes e Lacerda, 38 km SE of Pontes e Lacerda on BR174, to Cáceres, 15º27'S, 59º04'W, 30 Oct 1985, *W. Thomas et al. 4680* (INPA, MG, MO, NY, SPF, US); Comodoro, 13°44'21"S, 42°19'47"W, 21 Mar 2012, *E. C. Antunes & L. L. Antunes 102* (RB, UB); Comodoro, 13°44'39"S, 60°24'44"W, 5 Ago 2012, *E. C. Antunes & L. L. Antunes 351* (RB, UB); Vila Bela de Santíssima Trindade, Serra de Ricardo Franco, 15°S, 60°W, 22 Mar 1978, *Windish 1776* (SP); Vila Bela de Santíssima Trindade, Serra de Ricardo Franco, 15°S, 60°W, 04 Jun 1978, *Windish 1595* (SP); Vila Bela de Santíssima Trindade, Serra de Ricardo Franco, topo da cachoeria do Jatobá, 14°55'06"S, 60º04'36"W, 21 Mar 2014, *M. F. Simon et al. 2209* (CEN, NY); Serra da Pacca Nova, Mar 1917, *Rondon 1901* (RB).

Comments—Wood 26181 US have a bit smaller achene with only 4 strongly marked lines. Liman 6444 US have a bigger obovate achene and inflorescence laxer. Guillén et al. 1223 have a bigger achene as Liman 6444, but strongly undulate-rugose as Wood 26181.

Fig. 34. *Rhynchospora sp. 10, H. S. Irwin 21698* (NY00938833).

32. RHYNCHOSPORA SP. 13

RHYNCHOSPORA SP. 13 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BRAZIL. Goiás, Serra dos Pirineus, ca. 15 km (straight line) N of Corumbá de Goiás, 15 May 1973, *W. R. Anderson 10378* (HOLOTYPE: UB; isotypes: MO, NY, SPF)

Similar to *Rhynchospora elegantula*, differs by having glumes subcoriaceous, achene obpyriform, pearl to grey, the surface faintly transversely rugulose-foveolate, with 8–11 lines, the stylopodium, depressed, confluent with achene.

Perennial, rhizomes inconspicuous. Culms 9–54 × 0.02–0.09 cm. Leaves concentrated at base forming a rosette; leaf blades canaliculate 3–31 × 0.03–0.18 cm; leaf sheath 0.3–2.6 cm long. Synflorescence comprising an apical and 1–3 axillary corymbodia, the corymbodia loose and composed of partial corymbodia, and these of solitary spikelets; apical corymbodium 2–6.4 × 0.7–3.4 cm, the axillary one 1–4.4 × 0.4–2.4 cm. Spikelets 4.8–6.5 (–8) mm long, subuloid-lanceoloid; usually only the basal three flowers developing achenes. Glumes caducous in mature spikelets, the basal orange-brown, ovate-lanceolate, subcoriaceous and aristate at apex, margin hyaline; the distal ones pale brown, lanceolate, membranaceous, mucronate-aristate at apex. Anthers 3, 1.7-2.1 mm long. Achene 0.6–0.8 × 0.6–0.7 mm, obpyriform, pearl to grey, the surface faintly transversely rugulose-foveolate, with 8–11 lines, truncate at apex, without a rim around the stylopodium, obtuse at base, narrowing to a short (ca. 0.1 mm long) stipe. Stylopodium 0.1 × 0.1–0.2 mm, depressed, truncate at base, confluent with achene, brown.

Distribution and Habitat—Endemic to Brazil. Found on humid or wet rocky grasslands of cerrado.

Examined material—BRAZIL—**Distrito Federal**: Brasília, 26 Apr 1963, *J. M. Pires et al 9425* (FLOR n. v., INPA, NY, UB). **Goiás**: Alto Paraíso, 13°46’0”S, 47º30’0”W, 29 May 1994, *S. Splett 284* (UB); Cristalina, 15 Apr 1965, *E. P. Heringer 10133* (UB); Cristalina, 16°44’18”S, 47°41’57”W, *C. B. R. Munhoz et al. 7911* (UB, ASE n. v.); Serra Dourada, 11 May 1973, *W. R. Anderson 10101* (MO n. v., NY, UB); Vila Terezinha, 13°53’07”S, 47°22’16”W, 3 Jul 1978, *S. Barros 32* (HRB, MG). **Mato Grosso**: Vila Bela da Santíssima Trindade, 14°55’06”S, 60°04’36”O, 21 Mar 2014, *M. F. Simon et al. 2225* (CEN). **Minas Gerais**: Delfinópolis, 20°26’04”S, 46°38’72”W, 11

Apr 2002, *R. A. Pacheco 115* (HUFU); Diamantina, 17°54’13”S, 43°47’32”W, 28 Mar 2010, *C. B. R. Munhoz 7011* (UB); Itambé do Mato Dentro, 19º21’43”S, 43°19’55”W, *P. J. S. Silva Filho 2141* (ICN); Santana do Riacho, Serra do Cipó, 19°15’22”S, 43°33’05”W, *P. J. S. Silva Filho 2086* (ICN); São Roque de Minas, 19 Mar 1998, *A. C. Araújo et al. 1099* (SPF); São Roque de Minas, 21 Mar 1998, *A. C. Araújo et al. 1151* (SPF).

Comments—See comments on *Rhynchospora elegantula*.

Fig. 35. *Rhynchospora* sp. *13, W. R. Anderson 10101* (NY00938513).

33. RHYNCHOSPORA SP. 14

RHYNCHOSPORA SP. 14 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BRAZIL. Goiás, Cocalzinho de Goiás, Parque Estadual da Serra dos Pireneus, "ca. 700-1000 m depois da porta do Parque do lado de Cocalzinho", 15º47'56"S, 48º49'07"W, 15 May 2006, *P. G. Delprete 9769* (HOLOTYPE: UFG; isotype: NY).

Species similar to *Rhynchospora emaciata*, distinguished by the rounded achene, with surface faintly rugose and a long stipe at the base.

Perennial, rhizomes conspicuous, 0.1–0.15 cm thick. Culms 17–29 × 0.03–0.08 cm. Leaves canaliculate to filiform 6.5–21 × 0.02–0.06 cm, concentrated at base forming a rosette; leaf sheath 0.9–3 cm long. Synflorescence comprising an apical corymbodium and 1–2 axillary corymbodia, all loose and composed of partial corymbodia, and these of single spikelets; apical corymbodium 1.6–2.4 × 1.7–3.9 cm, the axillary one 0.9–2.2 × 0.8–2.2 cm. Spikelets 5.3–6.8 mm long, lanceoloid. Glumes persistent in mature spikelet; the basal ones stramineous, ovate to lanceolate, subcoriaceous, acute-aristate at apex, margin hyaline; the distal ones stramineous, lanceolate, membranaceous, acute-mucronate at apex; usually only the basal flower developing achenes. Anthers 3, 2–2.5 mm long. Achene 1–1.1 × 0.8–0.9 mm, rounded, stramineous to grey, usually with a longitudinal dark band in the middle, the surface transversely faintly rugose, with 6–7 lines, obtuse at apex, without a rim around the stylopodium, obtuse at base, narrowing to a long stipe. Stylopodium 0.4–0.5 × 0.3–0.4 mm, triangular, faintly bilobed at base, not confluent with achene, stramineous.

Distribution and Habitat—Endemic to Brazil. Found in open, low, and seasonally flooded grasslands.

Examined material—BRAZIL—**Goiás**: Cavalcante, Chapada dos Veadeiros, ca. 10 km south of Cavalcante, 9 Mar 1969, *H. S. Irwin 24128* (MO n. v., NY, UB, US); Cavalcante, Chapada dos Veadeiros, 23 Mar 1969, *H. S. Irwin 24944* (NY, UB); Serra do Caipó, 2 May 1973, *W. R. Anderson 9656* (INPA, NY). **Mato Grosso do Sul**: 19º39'37"S, 54°00'00"W, 6 Mar 2012, *S. N. Moreira et al. 493* (BHCB).

Comments— *S. N. Moreira et al. 493* have the achene with a short stype.

Fig. 36. *Rhynchospora sp. 14*, *P. G. Delprete* (Holotype, NY01145992).

34. RHYNCHOSPORA SP. 18

RHYNCHOSPORA SP. 18 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BRAZIL. Amazonas, Barcelos, Rio Aracá, Bacuquara, Campinarana. 0º09'6"N, 63º10'41"W, 3 Sep 2011, *R. C. Forzza et al. 6682* (HOLOTYPE: RB; isotypes: K, NY).

Species similar to *Rhynchospora spruceana*, distinguished by synflorescence generally comprising only one apical contracted corymbodium, glumes whitish-stramineous, the margin not hyaline, achene surface transversely rugulose with 12-15 lines.

Perennial, rhizomes inconspicuous. Culms 11–32 × 0.03–0.15 cm. Leaves flat 5–30 × 0.05–0.3 cm, concentrated at base forming a rosette; leaf sheath 0.6–2.2 cm long. Synflorescence comprising an apical corymbodium (rarely branching to an anthelodium, see F1736670, Prance et al. 14891) and rarely having one axillary corymbodium, all contract and composed of fascicles; apical corymbodium 0.7–2.4 × 0.6–1.7 cm, the axillary one (when present) 0.6–0.7 × 0.3–0.6 cm. Spikelets 4.5–6.5 mm long, lanceoloid. Glumes persistent in mature spikelet; the basal ones whitish-stramineous, ovate-lanceolate, membranaceous, aristate at apex, margin not hyaline; the distal ones whitish-stramineous, lanceolate, membranaceous, mucronate at apex; usually only the basal two flowers developing achenes. Anthers 3, 1.1–1.4 mm long. Achene 0.8–1.1 × 0.6–0.9 mm, obovate, stramineous to brown, the surface transversely rugulose with 12-15 lines, obtuse at apex, without a rim around the stylopodium, acute-obtuse at base, narrowing to a short stipe. Stylopodium 0.3–0.5 × 0.3–0.7 mm, triangular, concave at base, confluent with achene, pale brown.

Distribution and Habitat—Brazil and Venezuela, in the Amazon region. Found on white sand margin of rivers.

Examined material—BRAZIL—**Amazonas**: Barcelos, "en la ribera izquierda del Rio Aracá bajo, cerca del sitio Sauadaua", 00º13'S, 63º08'W, Jul 1985, *O. Hubber et al. 10804* (INPA, NY); Barcelos, Rio Aracá, Bacuquara, Campinarana. 0º09'6"N, 63º10'41"W, 28 Sep 2011, R. C. Forza et al. 6688 (RB, UFP n.v.); Basin of Rio Negro, Rio Cuieiras just below mouth of Rio Brancinho, 26 Sep 1971, *G. T. Prance et al. 14891* (F, INPA, NY); N margino f Rio Aracá just above Igarapé Sauadaua, 26 Jul 1985, *G. T. Prance et al. 29844* (INPA, MG, NY);Rio Cuieiras, igarapé Cachoeira, 15 Sep 1964, *W.*

Rodrigues 6047 (INPA, NY).

VENEZUELA—**Amazonas**: Dept. Atabapo, sabana ubicada em el pie oriental del Cerro Cucurito, en lar ribera izquierda (S) del medio Caño Yagua, 3º36'N, 66º34'W, 28 Jun 1979, *O. Hubber 3876* (NY, VEN); tercera sabana al pie W del Cerro Yapacana, 3º38'N, 66º52'W, 3 Jun 1978, *O. Hubber 2038* (NY, VEM n. v.); Dept. Atabapo, "sabana e laje cerca de Patacame, cerca de la margen derecha (E) del río Atabapo", 3º19'N, 67º18'W, 25 Aug 1978, *O. Hubber 2634* (NY, VEN); Dept. Atabapo, 9 Aug 1983, *R. Kral & O Hubber 70670* (NY, VEN); Dept. Atabapo, 04º07'N, 66º42W, Sep 1989, *L. Delgado 501* (NY, VEN); Dept. Atabapo, 04º07'N, 66º42W, Sep 1989, *L. Delgado 510* (NY, VEN).

Comments— Seems to be endemic to white sand margin of rivers of Amazon region.

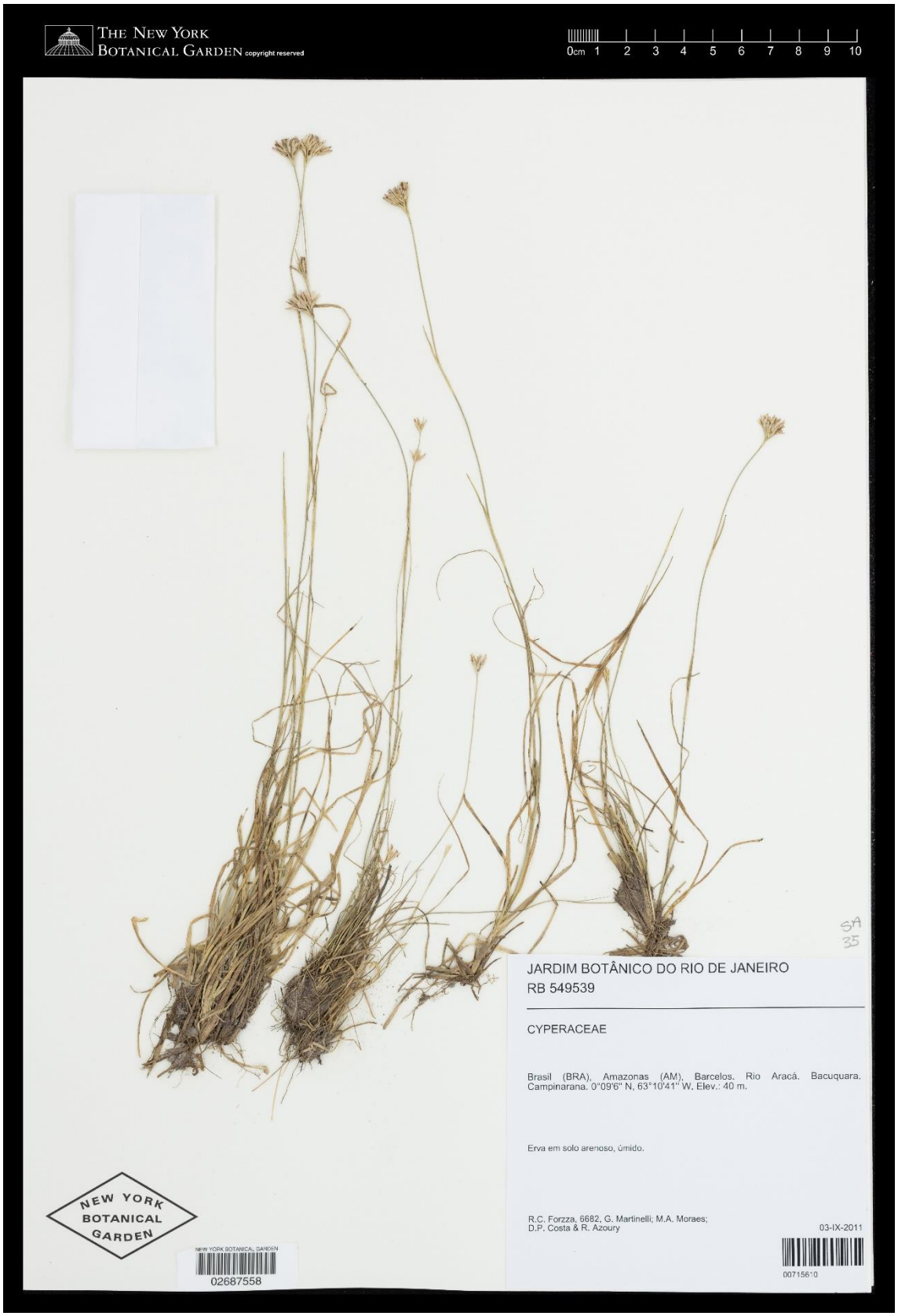

Fig. 37. *Rhynchospora sp. 18*, *R. C. Forzza 6682* (Isotype, NY02687558).

35. RHYNCHOSPORA SP. 19

RHYNCHOSPORA SP. 19 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BRAZIL. Bahia, by Rio Cumbuca ca. 3 km. S. of Mucugé, near site of small dam on road to Cascavel, Serra do Sincorá, 04 Feb 1974, *R. M. Harley et al. 15950* (HOLOTYPE: CEPEC; isotypes: IPA, NY, UEC n.v., US n.v.).

Species similar to *Rhynchospora nanuzae*, distinguished by being generally taller and having wider leaves, rhizomes inconspicuous, more developed synflorescences and bigger spikelets.

Perennial, rhizomes inconspicuous. Culms 23–73 × 0.05–0.25 cm. Leaves flat to canaliculate 7.5–63 × 0.07–0.25 cm, concentrated at base forming a rosette; leaf sheath 0.8–4.7 cm long. Synflorescence comprising an apical corymbodium and 2–4 axillary corymbodia, all loose, rarely subcontract, composed of partial corymbodia, and these of single spikelets or rarely fascicles of spikelets; apical corymbodium 2.5–15 × 2.8–9 cm, the axillary one 1.7–12.5 × 2.1–5.5 cm. Spikelets 5–9 mm long, lanceoloid. Glumes persistent in mature spikelet; the basal ones brown, ovate-lanceolate, chartaceous, acute-mucronate at apex, margin not hyaline; the distal ones brown, lanceolate, membranaceous, acute-mucronate at apex; usually only the basal two flowers developing achenes. Anthers 3, 2–2.3 mm long. Achene 0.8–1.1 × 0.7–0.9 mm, obovoid-obtrullate, greyish-stramineous to brown, the surface transversely rugose, with 6–9 lines, obtuse-truncate at apex, without a rim around the stylopodium, obtuse at base, narrowing to medium-short stipe. Stylopodium 0.3–0.6 × 0.6–9 mm, triangular, truncate-concave at base, not confluent with achene, stramineous to pale brown.

Distribution and Habitat—Brazil and Argentina. Found in open and permanently wet grasslands, near water stream or ponds.

Examined material—BRAZIL—**Bahia**: 16 km North West of Lagoinha (which is 5.5 km. S.W. of Delfino) on side road to Minas do Mimoso, Serra do Curral Feio, 41º20’W, 10º22’S, 8 Mar 1974, R. M. Harley et al. 16970 & 16978 (K n. v., NY); 19.5 km SE of Morro do Chapeu on the BA 052 road to Mundo Novo by the Rio Ferro Doido, Morro do Chapeu, 41º02’W, 11º38’S, 1 Mar 1977, R. M. Harley et al. 19217 (K n. v., NY); Alcobaça. Rod. BA 001, trecho Alcobaça/Prado, 5 Km a NW de Alcobaça, 17 Sep 1978, *S. Mori et al. 10597* (CEPEC, NY); Mucujê, 3 km ao S de Mucujê, na estrada para

Jussiape, Morro do Chapeu, 26 Jul 1979, *S. Mori et al. 12605* (CEPEC, NY); Summit of Morro do Chapeu, ca. 8 km SW of the town of Morro do Chapeu to the west of the road to Utinga, 41º12'W, 11º35'S, 30 May 1980, *R. M. Harley 22801* (K n. v., NY); Mucugê, "ca. 3 km ao S de Mucugê, na estada para Cascavel", Vale do Rio Mucugê, 14 Apr 1990, *A. M. V. de Carvalho 3064* (NY); Abaíra, Caminho Ribeirão de Baixo - quebradas, próxima a encosta da Serra do Atalho, 13°15'S, 41º50'W, 30 Jul 1992, *W. Ganev 791* (HUEFS, K n. v., NY, SP): Morro do Chapéu. 12 km NE of town of Morro do Chapéu on road to Jacobina, 11º28.601'S, 41º04.994'W, 11 Mar 2002, *W. W. Thomas et al. 12921 & 12932* (NY). **Espírito Santo**: Linhares, Reserva Florestal de Linhares, Cia Vale do Rio Doce-Floresta AS, estrada 211, 14 May 1985, *G. Martinelli 11001* (NY, RB, SI n. v.); Reserva Florestal Cia Vale do Rio Doce, Jul 1985, *M. Sobral 4058* (ICN). **Rio de Janeiro**: Cabo Frio Arraial do Cabo, Aug 1961, *A. P. Duarte 5804* (NY, RB); Estado da Guanabara, Restinga de Jacarepaguá, alagado de Sphagnum sp. situado do lado Norte da Pedra de Itaúna, 26 Aug 1969, *B. D. Sucre 5822* (NY, RB); Rio das Ostras, 7 Apr 1971, *P. L. Krieger 10466* (NY); Rio de Janeiro, estrada Rio-Santos, 03 Nov 2000, *W. Hoehne 5897* (ICN, SP n. v.)

—ARGENTINA— **Entre Rios**: Depto. Colón, A. Palmar, 18 Dec 1961, *A. Burkart & S. Crespo 22845* (NY, SI n. v.); Depto. Gualeguaychu, Médanos, 02 Feb 1973, *A. Burkart et al. 29230* (NY, SI n. v.).

Comments—There is a discjunctions between Argentina and Brazil. Specimens from Argentina are slightly different from the Brazilian ones, having synflorescences more contracted, spikelets a bit shorter. But nothing that convinced us to consider them two different species.

Fig. 38. *Rhynchospora sp. 19*, *R. M. Harley 22801* (Isotype, NY00569101).

36. RHYNCHOSPORA SP. 20

RHYNCHOSPORA SP. 20 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BOLIVIA. Santa Cruz, Velasco, Parque Noel Kampff M. Pampa La Toledo, Los Fierros, 14º36'53"S, 60º51'59"W, 16 Jun 1994, *T. Killeen & Wellens 6567* (HOLOTYPE: NY; isotypes: MO n.v., USZ n .v.).

Species similar to *Rhynchospora spruceana*, but distinguished by being taller, having inconspicuous rhizomes, and usually the basal three or more flowers of the spikelet developing achenes.

Perennial, rhizomes inconspicuous. Culms 37–66 × 0.02–0.4 cm. Leaves canaliculate 13–38 × 0.07–0.3 cm, concentrated at base forming a rosette; leaf sheath 1.5–6.4 cm long. Synflorescence comprising an apical corymbodium and 0–2 axillary corymbodia, all somewhat contracted and composed of partial corymbodia, and these of fascicles or single spikelets; apical corymbodium 4.2–7.5 × 2.4–4.6 (–8.5) cm, the axillary one 1.8–3.1 × 1.8–3.8 cm. Spikelets 7–8.5 mm long, ovoid-lanceoloid. Glumes persistent in mature spikelet; the basal ones pale brown, ovate-lanceolate, subcoriaceous, mucronate to short-aristate at apex, margin hyaline; the distal ones brown, lanceolate, membranaceous, short-aristate at apex; usually the basal three or more flowers developing achenes. Anthers 3, 2.8–4 mm long. Achene 0.9–1.1 × 0.8–1 mm, obovoid to broadly-obovoid, stramineous to brown, the surface transversely rugose, with 6–8 lines, obtuse-truncate at apex, without a rim around the stylopodium, obtuse at base, narrowing to a medium-short stipe. Stylopodium 0.2–0.4 × 0.7–0.9 mm, depressed-triangular, truncate-concave at base, not confluent with achene, stramineous to brown.

Distribution and Habitat—Endemic to Bolivia. Found in open and permanently humid grasslands, near water stream or ponds.

Examined material—BOLIVIA—**Santa Cruz**: Velasco, Parque Nacional Noel Kempff M. Campamento Los Fierros, "caminho al Tarbo", 14º36'17"S, 60º51'34"W , 6 May 1993, *Gutiérrez et al. 857* (MO, NY, USZ n. v.); Velasco, Parque Nacional Noel Kempff M. Campamento Los Fierros, Toledo, 13º36'09"S, 60º51'10"W , 1 May 1994, *Gutiérrez et al. 620B* (K n. v., USZ n. v., NY); Velasco, Parque Nacional Noel Kempff M. Serranía de Huanchaca 1. N y NE de la pista Noel Kempff, 13º54'22"S, 60º48'52"W , 8 Jun 1994, *B. Mostacedo et al. 2140* (MO, NY, USZ n. v.).

Comments—Type collections were mixed with specimens of *Rhynchospora sp.* 25, wich was separated in NY sheet. Since MO and SZU specimens were not seen, they may also have mixed material.

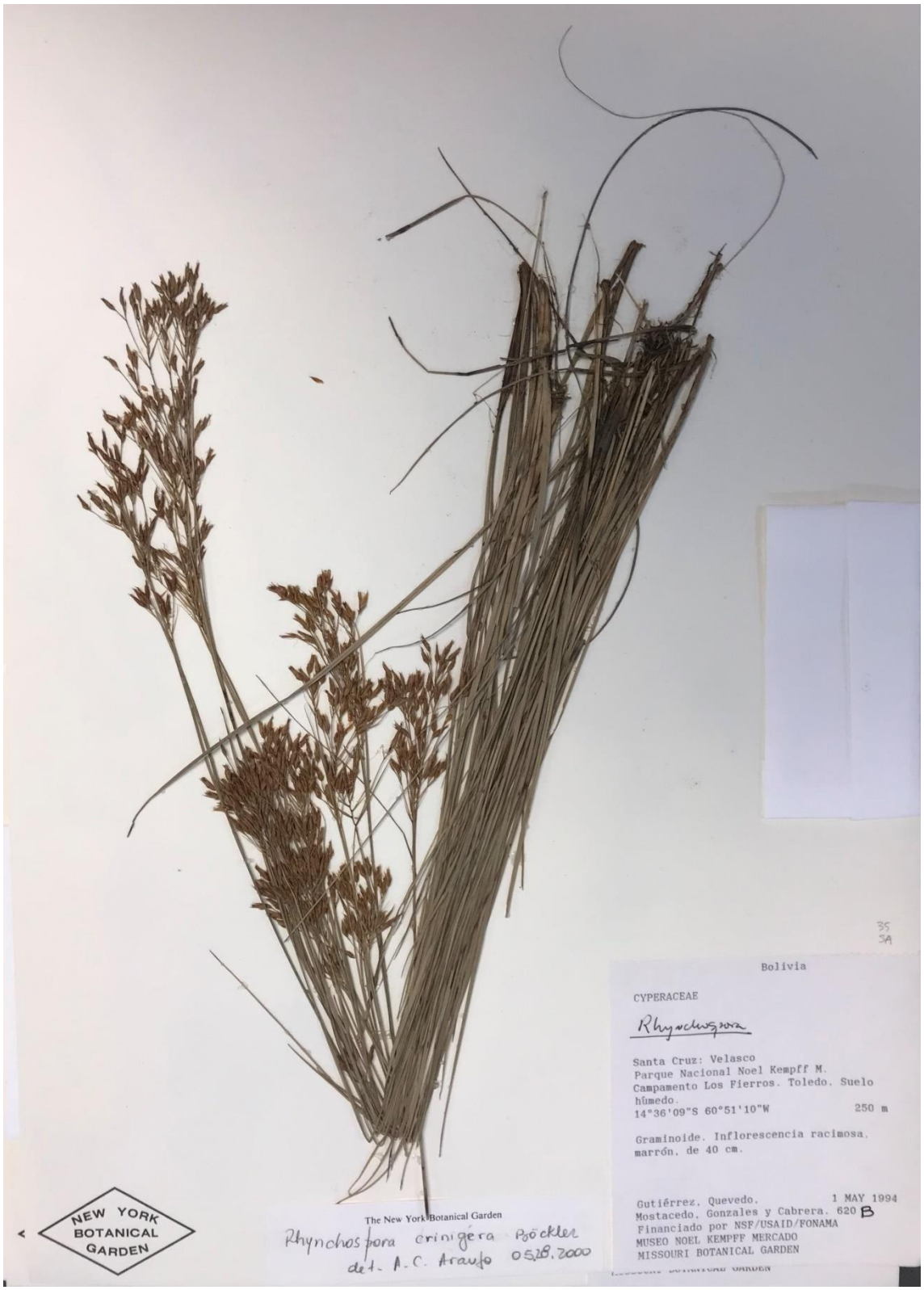

Fig. 39. *Rhynchospora sp. 20*, *Gutiérrez et al. 620B* (NY).

37. RHYNCHOSPORA SP. 21

RHYNCHOSPORA SP. 21 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BRAZIL. Bahia, Santa Luzia, "Rodovia (BA - 270) que liga Santa Luzia/Canavieiras/Una. Km 15", 7 Oct 2000, *L. A. Mattos-Silva 4269* (HOLOTYPE: HUEFS; isotypes: ALCB, CEPEC, NY).

Species similar to *Rhynchospora spruceana*, but distinguished by having inconspicuous rhizomes, narrower leaves, shorter spikelets and achenes, and a semilunate-triangular stylopodium.

Perennial, rhizomes inconspicuous. Culms 55–64 × 0.03–0.1 cm. Leaves canaliculate 3–21× 0.02–0.1 cm, concentrated at base forming a rosette; leaf sheath 0.9–4cm long. Synflorescence comprising an apical corymbodium and one axillary corymbodium, all loose and composed of partial corymbodia, and these of single spikelets; apical corymbodia 5.5–6 × 4.7–6 cm, the axillary one 3–6 × 2.7–5.5 cm. Spikelets 5–6 mm long, lanceoloid. Glumes persistent in mature spikelet; the basal ones brown, ovate-lanceolate, chartaceous, acute-mucronate to short-aristate at apex, margin slightly hyaline; the distal ones brown, lanceolate, membranaceous, acute-mucronate at apex; usually only the basal flower developing achene. Anthers 3, 1.1 mm long. Achene 0.8–0.9 × 0.6–0.8 mm, obovoid, stramineous to pale brown, the surface faintly transversely rugose, with 5–6 lines, obtuse-truncate at apex, without a rim around the stylopodium, obtuse at base, narrowing to a medium stipe. Stylopodium 0.2–0.3 × 0.6–0.7 mm, semilunate-triangular, truncate-concave at base, confluent with achene, stramineous to brown.

Distribution and Habitat—Bolivia, Brazil and Guyana. Found in open and permanently humid grasslands.

Examined material—BOLIVIA—**La Paz**: Iturralde, "Pampas del Madidi" area of the middle reaches of the Rio Madidi basin: "Campamento Malanoche" on the N shore of the Rio Enatahua (Rio Inambari according to one guide), ca. 3.5 linear km NE of the confluence of the Enatahua with the Rio Madidi, 1.5-3 km inland from camp, 12°55'25.6"S, 67º47'46.1"W, 30 May 2009, *B. M. Tork & J. Valda 616* (NY).

BRAZIL—**Bahia**: Santa Luzia, "Rodovia (BA-270) que liga Santa Luzia/Canavieiras/Una". Km 15, 15º30'5"S, 39º13'32"W, 7 Oct 2000, *L. A. Mattos-Silva*

4269 (NY, UESC n. v.).

GUYANA—Region: U. Takutu-U, Essequibo, Gunn's Strip savanna, 1 km W of village, 01º40’N, 58º38’W, 18 Feb 1994, *T. W. Henkel 4551* (US).

Comments—Species with a big disjunction between the three collections. More collections are needed to better understand this species and distribution before its publication.

Fig. 40. *Rhynchospora sp. 21*, *L. A. Mattos-Silva 4269* (Isotype, NY00612837).

38. RHYNCHOSPORA SP. 22

RHYNCHOSPORA SP. 22 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BRAZIL. Bahia, Rio de Contas, Serra das Almas, Lower NE slopes of the Pico das Almas, aprox. 41º57'W, 13º33'S, 12 Feb 1977, *R. M. Harley 19555* (HOLOTYPE: ICN; isotypes: CEPEC n.v., IPA n.v., NY, SPF n.v., UEC photo).

Similar to *Rhynchospora tenuis*, differs by being annual, synflorescences composed of paniculodia, and a smaller achene with a depressed-conical stylopodium.

Annual. Culms 6–15 × 0.03–0.1 cm. Leaves flat 3–10.5 × 0.03–0.15 cm, distributed equally along the culms; leaf sheath 0.4–1 cm long. Synflorescence comprising an apical paniculodium and 1–2 axillary paniculodia, all contracted and composed of partial paniculodia, and these of fascicles of spikelets; apical paniculodium 1–1.6 × 0.5–1.2 cm, the axillary one 0.7–1 × 0.4–0.6 cm. Spikelets 3.5–4.7 mm long, lanceoloid. Glumes persistent in mature spikelet; the basal ones pale brown, membranaceous, acute-mucronate at apex, margin not hyaline; the distal ones pale brown, lanceolate, membranaceous, acute-mucronate at apex; usually the basal four or more flowers developing achene. Anthers 3, 0.6 mm long. Achene 0.6–0.8 × 0.4–0.5 mm, broadly obovoid, stramineous with a dark gray band longitudinally in the middle to dark brown, the surface transversely rugose, with 5–6 lines, obtuse-truncate at apex, without a rim around the stylopodium, acute-obtuse at base, narrowing to a short stipe. Stylopodium 0.1 × 0.3–0.4 mm, depressed-conical, truncate-concave at base, not confluent with achene, brown.

Distribution and Habitat— Found in open, humid or wet rocky grasslands, associated with damp flushes.

Examined material—BRAZIL—Without locality, *Pohl s. n.* (US820095).

Comments—One of the few species with flat leaves and synflorescence composed of paniculodia. Phylogenetic studies support its position inside o sect. *Tenues*. Similar to *Rhynchospora* sp. 2, but with basal glumes acute-mucronate at apex, achene transversely rugose, with 5–6 lines.

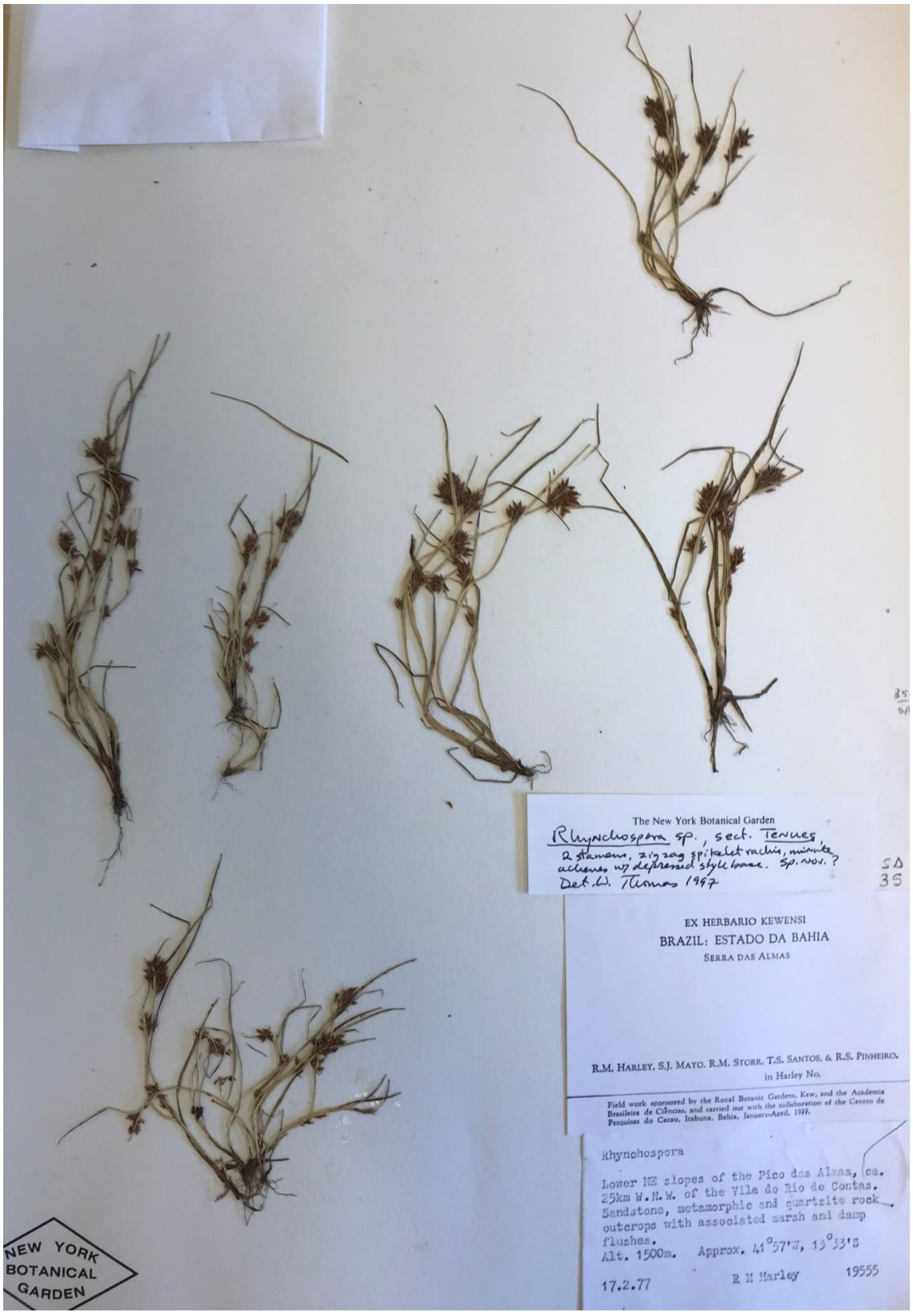

Fig. 41. *Rhynchospora sp. 22*, *R. M. Harley 19555* (NY).

39. RHYNCHOSPORA SP. 24

RHYNCHOSPORA SP. 24 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BRAZIL. Bahia, Lençóis, Serra Larga, "perto de Caeté-Açu", 19 Dec 1984, *R. M. Harley et al. CFCR 7235* (HOLOTYPE: SPF; isotype: NY).

Species similar to *Rhynchospora nanuzae*, distinguished by being generally taller, more developed synflorescences and bigger spikelets, achene also bigger and surface almost smooth.

Perennial, rhizomes short, bulbous, 0.1–0.4 cm thick. Culms 42–68 × 0.04–0.14 cm. Leaves canaliculate 17–37 × 0.02–0.1 cm, distributed equally along the culms; leaf sheath 1.1–4 cm long. Synflorescence comprising an apical corymbodium and 1–2 axillary corymbodia, all loose and composed of partial corymbodia, and these of single spikelets; apical corymbodium 3.2–6.5 × 3–8.5 cm, the axillary one 2–3.2 × 1.2–4 cm. Spikelets 5.6–8.8 mm long, fusiform to narrowly ellipsoid. Glumes persistent in mature spikelet; the basal ones stramineous-brown, lanceolate, chartaceous, short-aristate at apex, margin slightly hyaline; the distal ones brown, lanceolate, membranaceous, acute-mucronate at apex; usually only the basal flower developing achenes. Anthers 3, 3.1–3.3 mm long. Achene 1.1–1.2 × 0.9–1.1 mm, obovoid-obtrullate, greyish-stramineous, the surface almost smooth, with very discrete lines, obtuse-truncate at apex, without a rim around the stylopodium, obtuse at base, narrowing to a short stipe. Stylopodium 0.3–0.5 × 0.8–0.9 mm, triangular, truncate-concave at base, confluent with achene, dark brown.

Distribution and Habitat—Endemic to Brazil. Found in open, temporarily humid grasslands.

Examined material—BRAZIL—**Bahia**: Lençóis, Chapadinha, "rodovia em direção ao Morro do Pai Inácio", 12º28,005'S, 41º26,244'W, 26 Jan 2000, *A.C. Araújo et al. 1202* (HRB, NY, SPF); Palmeiras, Pai Inácio, S12°27'31", O41º28'17", 21 Nov 1994, *E. Melo et al. PCD 1152* (ALCB); Palmeiras, Morro do Pai Inácio, 12°27'28", 41°28'17"W, 21 Jun 1996, *M. Luceño et al. 172* (UFP); Palmeiras, Morro do Pai Inácio, 28 Apr 1997, *A. A. Conceição 545* (SPF); Palmeiras, Morro do Pai Inácio, 25 Jan 2000, *A. A. Conceição 726* (SPF); Santa Luzia, 15°30'5"S, 39°13'32"W, 7 Oct 2000, *L. A. Mattos-Silva 4269* (HUEFS).

Comments— The related species, Rhynchospora nanuzae Rocha & Luceño is generally found in drier areas of campos rupestres. Also, the spikelets are often curved in

R. nanuzae, and always straight in this species.

Fig. 42. *Rhynchospora sp. 24*, *A. C. Araújo et al. 1202* (NY02499205).

40. RHYNCHOSPORA SP. 25

RHYNCHOSPORA SP. 25 P. J. S. Silva Filho & W. W. Thomas, sp. nov.—TYPE: BOLIVIA. Santa Cruz, Velasco, Parque Nacional Noel Kempff M. Campamento Los Fierros, Toledo, 14º36'09"S, 60º51'10"W, 1 May 1994, *Gutiérrez* et *al. 620A* (HOLOTYPE: NY; isotypes: MO n. v., USZ n. v.).

Species similar to *Rhynchospora filiformis*, distinguished by the productive spikelets, where usually the basal four or more flowers develop achenes, achene also bigger and stylopodium shorter.

Perennial, rhizomes inconspicuous. Culms 43 × 0.04–0.15 cm. Leaves canaliculate 18–30 × 0.03–0.13 cm, concentrated at base forming a rosette; leaf sheath 1.7–4.2 cm long. Synflorescence comprising an apical corymbodium and one axillary corymbodium, all somewhat contracted and composed of partial corymbodia, and these of single spikelets; apical corymbodium 4.3 × 3.4 cm, the axillary one 1.9 × 2.3 cm. Spikelets 9–10 mm long, lanceoloid. Glumes persistent in mature spikelet; the basal ones pale brown, ovate-lanceolate, subcoriaceous, short-aristate at apex, margin not hyaline; the distal ones brown, lanceolate, membranaceous, mucronate-aristate at apex; usually the basal four or more flowers developing achenes. Anthers 3, no anthers, only filaments present in the material. Achene 1.4–1.8 × 1.3–1.5 mm, broadly obovoid to rounded, stramineous with a longitudinal grey band in the middle on mature achenes, the surface smooth on the middle and foveolate at borders, with no lines, obtuse-concave at apex, with a rim around the stylopodium, obtuse-truncate at base, narrowing to a medium-short stipe. Stylopodium 0.1–0.2 × 0.3–0.4 mm, depressed-triangular, truncate at base, not confluent with achene, brown.

Distribution and Habitat— Endemic to Bolivia. Found in open and permanently humid grasslands, near water stream or ponds.

Only known by the type.

Comments— Species described based on only one specimen, for that reason it lacks some measurement range. NY sheet of *Gutierrez et al. 620* was a mixture of two

vegetatively similar species new to science, so they were divided in A and B. MO and USZ sheets still need to be revised to state exactly what they are.

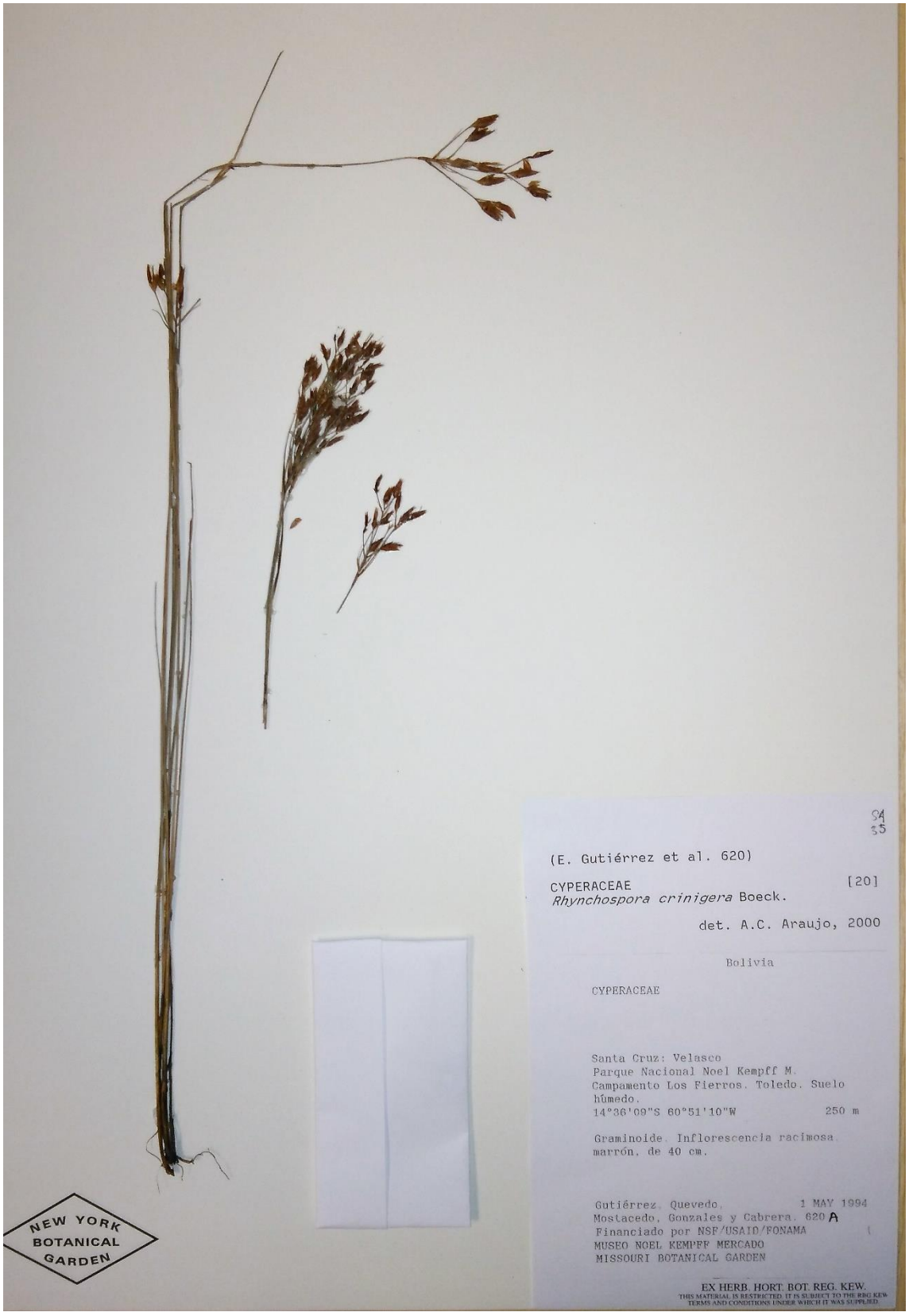

Fig. 43. *Rhynchospora* sp. *25*, *Gutiérrez et al. 620A* (NY).

41. RHYNCHOSPORA SUBNIPENSIS

RHYNCHOSPORA SUBNIPENSIS Kük., Bot. Jahrb. Syst. 75(2): 193. 1950. [Rhynchospora nipensis Kük., Repert. Spec. Nov. Regni Veg. 23: 207. 1926. *nom. nud.*].—TYPE: CUBA. Prov. Oriente, Sierra de Nipe, auf Kiefernsavanen, Oct 1914, *E. L. Ekman 3082* (LECTOTYPE (here designated): S; isolectotype: US); Rio Piedra in Pineten an grasigen Stellen, Jul 1914, *E. L. Ekman 1846* (remaining syntype: S photo, US).

Rhynchospora tenuis var. *antillana* Kük. syn. nov. Repert. Spec. Nov. Regni Veg. 23: 206. 1926.—TYPE: CUBA. Matanzas, Jaguey Grande, at Finca Juanita, 2 Aug 1923, *E. L. Ekman 16973* (LECTOTYPE (here designated): NY); Oriente; El Cobre, in collibussiccis solo auptivo prope minas, 8 Oct 1916, *E. L. Ekman 7891* (remaining sintype: US).

Rhynchospora tenuis var. *prorepens* Kük. syn. nov. Repert. Spec. Nov. Regni Veg. 23: 206. 1926. TYPE:—CUBA: Pinar del Río, Pinar del Rio, at km 12 of the highway to La Coloma, 28 Oct 1923, *E. L. Ekman 17814* (LECTOTYPE (here designated): NY); Pinar del Río, Pinelands N of Herradura, 21 Oct 1923, *E. L. Ekman 17774* (remaining syntype: US).

Perennial, rhizomes sometimes conspicuous, 0.1–0.5 cm thick. Culms 13–61 × 0.03–0.1 cm. Leaves canaliculate 6.5–59 × 0.02–0.1 cm, distributed equally along the culms; leaf sheath 0.4–3.1 cm long. Synflorescence comprising an apical and (0–)1–3 axillary corymbodia, the corymbodia generally loose, sometimes contracted, composed of corymbodia, and these of fascicles of spikelets and less commonly of single spikelets; apical corymbodium 0.7–3.8 × 0.4–5.1 cm, the axillary one 0.5–2.9 × 0.2–2.8 cm. Spikelets 3.7–5.2 mm long, lanceoloid; usually only the basal flower (rarely two or three) developing achenes. Glumes membranaceous to chartaceous, persistent in mature spikelet; the basal ones stramineous to pale brown, ovate-lanceolate, mucronate at apex, margin not hyaline; the distal ones stramineous, lanceolate, acute-mucronate at apex. Anthers 3, sometimes one or two reduced to staminodes, 1.2–1.5 mm long. Achene 0.8–1.1 × 0.6–0.9 mm, broadly obovoid to obovoid-oblong, stramineous to brown, the surface transversely rugose, with 6–9 lines, acute-truncate at apex, without a rim around the

stylopodium, obtuse at base, narrowing to a short (ca. 0.2 mm long) stipe. Stylopodium 0.4–0.8 × 0.5–0.8 mm, triangular, tapering to a subulate tip, bilobed at base, not confluent with achene, green to stramineous.

Distribution and Habitat—Endemic to Cuba. Found on dry or humid grasslands, rocky grasslands and alson found on canga soils.

Selected examined material—BAHAMAS—**Andros**: Twin Lakes region, 29 Jan 1974, *D. S. Correll & R. K. Godfrey 41300* (NY).

—CUBA— **Camagüey**: Corojo, 11 Aug 1913, *Fr. León 3967* (NY). **Cienfuegos**: SW Cieneguita, 8 Oct 1895, *R. Combs 402* (NY). **Guantánamo**: La Prenda, Oriente, 29 Dec 1920, *Bro. Hioram 4240* (NY). **Oriente**: Sierra de Nipe, prope Río Piedra, 24 Jul 1914, *E. L. Ekman 2132* (NY). **Isla de la Juventud (Isle of Pines):** Santa Fe, 27 Feb 1916, *N. L. Britton et al. 14957* (NY). **La Habana**: Sounthern slope of Cajálbana, 06 Apr 1915, *Fr. León 5044* (NY). **Matanzas:** hill west of "Tetas de Camarioca", 05 Sep 1914, *Fr. León 4638* (NY). **Pinar del Río**: San Juan y Martinez, Rio San Sebastian, 14 Nov 1923, *E. L. Ekman 18064* (NY). **Villa Clara**: Santa Clara, Sagua, 4 Sep 1903, *N. L. Britton et al. 293* (NY).

Comments—Very variable species, usually caespitose-like, forming tussocks, but sometimes emitting rhizomes. I think that depends on the soil, rhizomatous ones are found in pineland savannas, while cespitose ones are found in serpentine soils. Some examples are cespitose but also showing rhizomes, as R. K. Godfrey 41300 and W. W. Thomas 15978. Serpentine specimens are usually more compact, leafy, with coflorescences more contracted, and having thicker and paler glumes. These specimens sometimes have fewer anthers and have staminodes instead. Probably the characteristic of these soils has a strong effect on these specimens, and they may be in a route for speciation. The achene is very variable as well, but sometimes you find this variation in the same plant. There are not patterns that differentiate all of the specimens in way that we can recognize all the varieties described by Kukenthal. Kukenthal also says in the protologue of *R. subnipensis* that the achenes of it have 5-6 bristles, but the type does not have it.

Fig. 44. *Rhynchospora subnipensis* Kükenthal, *Fr. León 5044* (NY01298489).

42. RHYNCHOSPORA TENERRIMA

RHYNCHOSPORA TENERRIMA Nees ex Spreng., Syst. Veg. 4 (Curae posteriores): 26. 1827.—TYPE: WEST INDIES. "Nov. Holl." [an error for West Indies], *Kohaut s.n.*, distributed as *F. Sieber agrost. no. 116* (HOLOTYPE: AWH n. v.; isotypes: BR photo, H photo).

Schoenus setaceus P. J. Bergius, Acta Helv. Phys.- Math. 7: 130, t. 9. 1772. *Rhynchospora setacea* Boeck., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1869: 159. 1869, non Vahl, 1805. *Spermodon setaceus* (P. J. Bergius) Nees, Linnaea 9: 296. 1834, comb. nud. emend.—TYPE: SURINAME. *D. Rolander s.n.* (HOLOTYPE: C-Rottb n. v., SBT photo).

Scleria setacea Poir. in Lamarck, Encycl. 7: 4. 1806.—TYPE: PUERTO RICO. *M. Ledru s.n.* (HOLOTYPE: P).

Rhynchospora spermodon Griseb., Fl. Br. W. I. 576. 1864.—TYPE: JAMAICA. in dry pastures, *H. R. H. R. Wullschlaegel 1137* (HOLOTYPE: GOET photo).

Perennial, rhizomes inconspicuous. Culms (4–) 11–68 × 0.02–0.08 cm. Leaves canaliculate (2–) 5–32 × 0.03–0.08 cm, concentrated at base forming a rosette; leaf sheath (0.2–) 0.6–5.2 cm long. Synflorescence comprising an apical and 1–3 axillary fascicles or corymbodia, the fascicles or corymbodia contracted and composed of fascicles of spikelets; apical corymbodium or fascicle 0.5–1.6 × 0.4–1.2 cm, the axillary one 0.5–1.3 × 0.2–1 cm. Spikelets 5.3–6 mm long, ovoid-lanceoloid; usually the basal two flowers developing achene. Glumes stramineous, persistent in mature spikelet, broadly ovate to ovate-lanceolate, subcoriaceous, aristate at apex, margin not hyaline, lanceolate, chartaceous to membranaceous, acute-mucronate at apex. Anthers 2, 1.4–1.8 mm long. Achene 1.6–2.1 × 1.1–1.5 mm, rounded to broadly obovate, stramineous to brow, usually brown or gray maculated, the surface transversely undulate-rugose, faintly foveolate along margins, with 3–5 lines, emarginate at apex, with two teeth on the sides, without a rim around the stylopodium, obtuse at base, narrowing to a long (ca. 0.4 mm long) stipe. Stylopodium 0.5–0.8 × 0.5–0.9 mm, W shape, convex at base, not confluent with achene, stramineous to brown.

Distribution and Habitat—From Brazil to Mexico, and West Indies. Found on humid grasslands.

Selected examined material—BRAZIL—**Bahia**: Itajá, 19°18’16.50”S, 51°05’21.00”W, 18 Apr 2004, *A. Sciamarelli et al. 1767* (CGMS, ICN). **Goiás**: Cocalzinho de Goiás, Serra dos Pirineus, 15 May 1973, *W. R. Anderson et al. 10373* (NY). **Mato Grosso do Sul**: Pouso Frio, 29 Apr 1997, *A. C. Araújo* (ICN). **Minas Gerais**: Morro do Pilar, 19°14’05”S, 43°23’11”W, 4 Nov 2014, *Silva Filho et al. 2131* (ICN, NY). **Pará**: Rio Camará, Ilha do Marajó, Fazendo Gurupatuba, 8 Jul 1950, *G. A. Black 50-9899* (IAN). **Paraíba**: Mamgabeira-Joao Pessoa, 23 Sep 1987, *O. T. Moura 317* (NY). **Paraná**: Morretes, 25°22’51.6”S, 48°51’50.9”W, 10 May 2008, *R. Trevisan et al. 964* (ICN). **Rondônia**: Basin of rio Madeira, 18 Nov 1968, *G. T. Prance et al. 8601* (NY). **Piauí**: Piracuruca, Parque Nacional de Sete Cidades, 06 Sep 2009, *M. R. A. Mendes et. al. 470* (UFP). **Rio de Janeiro**: Rio de Janeiro, Rezende, 27 Apr 1926, *F. C. Hoehne & A. Gehrt 17606* (NY). **Roraima**: Normandia, margens do Lago Caracanã, 05 Oct 1996, *L. A. Pessoni 54* (IPA). **Sergipe**: Santa Luzia do Itanhy, RPPN Mata do Crasto, 27 Mar 2013, *L. A. Gomes et al. 1029* (NY).

—BELIZE—**Toledo District**: Along the Southern Highway 4 miles W of the Bladden Branch, 15 Mar 1987, *A. E. Brant & G. Davidse 1048* (NY).

—BOLIVIA—**El Beni**: Ballivián, Espiritu en la zona de influencia del rio Yacuma, 19 Apr 1980, *S. G. Beck 3473* (NY).

—COLOMBIA—**Chocó**: Bagadó, 06 Dec 1983, *A. M. Juncosa 1493* (MO, NY).

—CUBA— **Pinar del Río**: Hacienda San Julián, 27 Dec 1916, *Fr. León 6977* (NY).

—DOMINICAN REPUBLIC—**Santo Domingo**: Sierra Prieta, 02 Dec 1973, *A. H. Liogier 20795* (NY).

—FRENCH GUIANA— Entre Kourou et Sinnamary, 13 Aug 1982, *A. Fournet 264* (NY).

—GUADALOUPE— Les Saintes, Mar 1803, *A. Duss 3121 & 3122* (NY).

—GRENADA— Vicinity of Grand Etang, 14 Mar 1956, *A. C. Smith 10126* (NY).

—JAMAICA—**Portland Parish**: Vicinity of Port Antonio, 25 Sep 1906, *D. W. Marble 849* (NY).

—MARTINIQUE— Sur les talus de la route du Camp-Balata au Camp-Colson, Sept 1900, *A. Duss 4519693* (NY).

—MEXICO—**Chiapas:** Ocozocoautla de Espinosa. 18 - 20 km north of Ocozocoautla along road to Mal Paso, 20 Oct 1971, *D. E. Breedlove & R. F. Thorne*

21040 (NY).

—MONTSERRAT—Windward Road, near Gages, 2 Feb 1902, *J. A. Shafer 373* (NY).

—PUERTO RICO—**Cabo Rojo**: Guanajibo, 01 Mar 1962, *A. González Más 2145* (NY).

—SAINT LUCIA— Lowland, 4 Nov 1919, *J. F. Kemp 50* (NY).

—VENEZUELA— **Bolívar**: Paso de Cardozo, 27-28 Apr 1943, *E. P. Killip 37662* (NY). **Sucre**: Barbacoa, 25 Apr 1971, *M. C. Guevara 5* (NY).

Comments—Rhynchospora tenerrima var. *flexuosa* is currently a synonym of *R. flexuosa*. We were not able to check the type of *Rhynchospora tenerrima* subsp. *microcarpa* J. Raynal, so we did not consider it in this treatment.

Fig. 45. *Rhynchospora tenerrima* Nees ex Spreng., *L. A. Gomes et al. 1029* (NY02098505).

43. RHYNCHOSPORA TENUIS

RHYNCHOSPORA TENUIS Link, Schrader, and Link, Jahrb. Gewächsk. 1(3): 76. 1818. *Dichromena linkii* J. F. Macbr., Publ. Field Mus. Nat. Hist. Bot. Ser. 11: 5. 1931, nom. nov., non *Dichromena tenuis* Steud., 1855.—TYPE: BRAZIL. *Humboldt s.n.* (LECTOTYPE (here designated): HAL134381; lost holotype: B†).

Rhynchospora grosserugosa Kük., syn. nov. Bot. Jahrb. Syst. 75(3): 280. 1951. *Dichromena schiedeana* Kunth, Enum. Pl. [Kunth] 2: 282. 1837. TYPE: MEXICO. Hacienda de la Laguna, Sep 1828, C. J. W. *Schiede s. n. "802"* (LECTOTYPE (here designated): HAL0063550); Hacienda de la Laguna, 1826-1836, *C. J. W. Schiede & F. Deppe s. n. "864"* (former syntype: HAL0109882).

Rhynchospora gracilis (Spreng.) Kuntze, Revis. Gen. Pl. 3(2): 335. 1898. *Dichromena gracilis* (Spreng.) Kunth, Enum. Pl. 2: 280. 1837. *Fuirena gracilis* Spreng., Novi Provent. 46. 1819.—TYPE: BRAZIL. Rio Grande do Sul, Santana do Livramento, Cerro Palomas, 30S49'28.37", 55W20'54.13", 13 Jan 2014, *P. J. S. Silva Filho 1924* (NEOTYPE (here designated): ICN; isoneotype: NY). *Otto s.n.* (lost holotype: B†).

Rhynchospora curvula (Nees) Boeck., Linnaea 37: 596. 1873. *Spermodon curvulus* Nees in Martius, Fl. Bras. 2(1): 119. 1842.—TYPE: BRAZIL. A Campis editis prov. Minarum, *Martius s.n.* (HOLOTYPE: M n. v.).

Rhynchospora enmanuelis Luceño & Rocha, syn. nov. Hoehnea 29 (3): 197. 2002.—TYPE: BRAZIL. São Paulo, Tupã, Represa do Sete, 25 Dec 1995, *A. L. Vanzela* (HOLOTYPE: UFP; isotypes: MA n. v., UFP)

Perennial, rhizomes inconspicuous. Culms 8–58 × 0.03–0.15 cm. Leaves flat to canaliculate 8–31 × 0.03–0.13 cm, concentrated at base forming a rosette; leaf sheath 0.5–4.9 cm long. Synflorescence comprising an apical and 1–3 axillary corymbodia, the corymbodia loose to somewhat contracted, rarely contracted, composed of partial corymbodia, and these of single spikelets or fascicles of spikelets; apical corymbodium 0.7–5.7 × 0.7–9.7 cm, the axillary one 0.6–4.6 × 0.4–6.7 cm. Spikelets 3.4–5 mm long,

ovoid-lanceoloid; usually only the basal two flowers developing achenes. Glumes stramineous to pale brown, acute-mucronate at apex, persistent in mature spikelet; the basal ones ovate-lanceolate, membranaceous to chartaceous, margin not hyaline, lanceolate, membranaceous. Anthers 3, 1.2–1.7 mm long. Achene 1–1.2 × 0.7–1.2 mm, broadly obovoid to obovoid, stramineous to brown, sometimes with a dark longitudinal band at the middle of the achene, the surface transversely rugose, with 5–8 lines, obtuse at apex, without a rim around the stylopodium, obtuse at base, narrowing to a very short (ca. 0.08 mm long) stipe. Stylopodium 0.2–0.5 × 0.6–1 mm, shallowly triangular, bilobed at base, not confluent with achene, pale stramineous to dark brown.

Distribution and Habitat— From Argentina to Mexico, and Hawaii. Found on humid or seasonaly humid grasslands.

Selected examined material—ARGENTINA—**Corrientes**: 14 Feb 1980, *A. Schinini 19817* (CTES n. v., NY). **Entre Rios**: Gualeguayohú, 25 Jan 1982, *N Trocoso & Bacigalupo 3352* (CEN, SI n. v.). **Missiones**: Posadas, 16 Jan 1908, *E. L. Ekman 1306* (NY).

BELIZE— **Cayo**: 8 Apr 2016, *R. F. C. 16162* (NY, US).

BOLIVIA—**Santa Cruz:** Warnes, 21 Dec 1997, *M. H. Nee 47399* (NY).

BRAZIL—**Bahia**: Mucegê, 20 Mar 1990, *A. M. Carvalho & J. Saunders 2942* (ALCB, CEPEC). **Distrito Federal**: Brasília, 31 Jan 1966, *H. S. Irwin et al. 12168* (NY). **Espírito Santo**: Santa Teresa, Jan 1997, *M. Sobral et al. 8286* (ICN). Paraná: Guarapuava, 14 Jan 1983, *G. Hatschbach 46026* (BHCB, MBM). **Goiás**: Alto Paraíso de Goiás. Chapada dos Veadeiros, 22 Mar 1971, H. S. Irwin et al. 33008 (NY). **Mato Grosso do Sul**: Inocência, 19°34’07.0”S, 51°52’52.4”W, 21 May 2004, *A. Sciamarelli et al 1917* (CGMS). **Paraná**: Ponta Grossa, 25º13’16.”S, 50°0’39.33”W, 30 Jan 2014, *P. J. S. Silva Filho et al. 1987* (ICN). **Mato Grosso do Sul**: Dourados, 17 Feb 1975, *T. M. Pedersen 11102* (NY). **Minas Gerais**: Uberlândia, 19 Feb 1999, *M. T. C. Lemos s. n.* (HUFU). **Pará**: 1 Apr 1964, *M. Silva 260* (MG, NY). Paraíba: Areia, 17 May 1953, *J. C. M. Vasconcelos 704* (NY). **Pernambuco**: Ipouuca, 18 Mar 1996, *M. Luceño 360,6* (UFP). **Rio Grande do Sul**: São Borja, 28°43’39”S, 55°51’12”W, 8 Dec 2015, *P. J. S. Silva Filho 2192* (ICN). **Santa Catarina**: Itajaí, 26 Nov 1961, *R. M. Klein 2852* (NY). **São Paulo**: Itararé, 24°08’20”S, 49°04’37”, 12 Dec 2000, *A. P. Prata et al. 1109* (SP). **Sergipe**: Capela, 15 Jun 2007, *A. C. Silva e K. C. S. Teixeira 85* (ASE n. v., UB).

GUATEMALA—**Jutiapa**: 28 Oct 1940, *P. C. Standley 75508* (US).

HONDURAS—**Comayagua**: 24 Sep to 05 Oct 1951, *L. O. Williams 18495* (US).

MEXICO—**Chiapas**: La Trinitaria, 31 Aug 1974, *D. E. Breedlove 37012* (NY).

PARAGUAY—**Central**: Estero del Ypoá, 27 Nov 1992, *E. Zardini & L. Guerrero 33847* (NY). **San Pedro**: Alto Paraguay, 01 Nov 1959, *A. L. Woolston 1142* (NY).

URUGUAY—**Rivera**: Batovi, 8 Mar 1991, *T. M. Pedersen 15693* (NY)

Comments—We searched for holotype of *Fuirena gracilis* at B herbarium and concluded that it was lost during the World War II. The neotype designation was based on protologue information.

Fig. 46. *Rhynchospora tenuis* Link, *R. F. C. Naczi 16162* (NY02691124).

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Capítulo 3

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***Rhynchospora rheophytica* (Cyperaceae), a new species of from western Bahia, Brazil**

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ABSTRACT

A new species of *Rhynchospora*, section *Tenues*, from western Bahia, Brazil, is described, illustrated, and compared to related species.

Kew Words: Bahia, Cyperaceae, *Rhynchospora*, taxonomy

Resumo

Uma nova espécie de *Rhynchospora*, secção *Tenues*, do oeste da Bahia, Brasil, é descrita, ilustrada e comparada com espécies parentes.

The genus *Rhynchospora* Vahl is cosmopolitan with the large majority of its ca. 386 species (Buddenhagen et al., in press) found in tropical and subtropical America. The only comprehensive revision of the genus was that of Kükenthal (1949, 1950, 1951). Recent large-scale floristic treatments of the genus include Kral (2002) for North America, Thomas (1994) for Mesoamerica, Strong (2006) for the Guianas, and Koyama (1972) and Thomas (1998) for Venezuelan Guayana.

Within Brazil, recent treatments of *Rhynchospora* include Simpson (1995) for the Pico das Almas, Bahia, the Federal District by Araújo (2009), the state of Sergipe by Nunes and Prata (2013), the states of Paraíba and Pernambuco by Luceño et al. (1997), and Rocha and Luceño's (2002) treatment of *Rhynchospora* sect. *Tenues* Kük. for Brazil.

Collections made among rocks along a river bank in western Bahia, Brazil revealed a species of *Rhynchospora* (Cyperaceae) which is clearly a member of section *Tenues* but does not match any known species in the section. Species of section *Tenues* are usually small, slender plants with lax, open corymbs; the achenes lack hypogynous bristles, are usually small and turgidly biconvex, have a transversely rugose to rugulose surface, and support a depressed, persistent style base. This new species is described here and compared to three widespread species in the same section, *R. riparia* (Nees) Boeckeler, *R. emaciata* (Nees) Boeckeler, and *R. tenuis* Link (Table 1).

Observations were made from dried specimens. Figure 2 was photographed using a Nikon SMZ 800N with a DS Ri2 camera and composed

with the NIS Elements Image Stacking program (©19912014, Imaging Laboratory).

Rhynchospora rheophytica W. W. Thomas & P. J. S. Silva Filho **sp. nov.** Type:—Brazil. Bahia. Mun. Barreiras: Estrada para Brasília, BR 242; estrada no km 70 a partir da sede do município, ca. 23 km em direção à Cooperativa de Coti; cachoeira do Acaba Vida no Rio de Janeiro [11°53'40"S, 45°36'10"W]; mata de galeria. Erva frequente nas pedras a margem do rio. Folhas verdes concolores; inflorescências castanhas, 12 Jun 1992, *A.M. Amorim, A.M. de Carvalho, T.S. dos Santos, S.C. Sant'Ana & J.G. Jardim 564* (Holotype: CEPEC – 55360; Isotypes: MO, NY, US). Fig. 1, 2

This species of Rhynchospora *is unique in section* Tenues *in having very long culms and achenes that are flattened on the bottom.*

Plant in small clumps, 50–113 cm tall, apparently lax, glabrous (Fig. 1). **Culms** ± terete and slightly wrinkled longitudinally, probably upon drying, 1–1.5 mm in diam. near base; internodes ca. 8, 4–11.5 cm long, increasing in length distally; nodes not swollen, slightly darkened, occasionally sprouting new plantlets. **Leaves** basal and cauline; basal leaves no longer present; cauline leaves larger, stiff and canaliculate, diminishing in size distally, becoming flat and flexible, the lower ones (including sheath) 15–16 cm long, the sheath 3.5–4.5 cm long, the summit of the inner band (the portion of the sheath opposite the ligule) truncate, the blade 11–12.5 cm long, 1.5–2.5 mm wide, gradually tapering

distally, adaxially smooth with veins not evident, abaxially longitudinally veined. **Inflorescence** a series of corymbs (coflorescences) on lax peduncles, the basal corymbs (including the peduncle) up to 15 cm long, the distal corymbs 3–6 cm long; secondary and tertiary axes subtended by an inflorescence bract surrounding a bladeless prophyll, the inflorescence bracts 1.5–7 mm long, the bladeless prophyll ± 1 mm long, the pedicels ±1–1.5 × 0.2–0.4 mm. **Spikelets** ca. 20–40 per corymb, mostly separate and not fasciculate, roughly ellipsoidal, 5–5.5 × 2 mm, brown; the basal two glumes smaller than the rest, slightly cartilaginous, stramineous, the basal-most scale 3 × 3 mm, with the median nerve projecting out as a 0.5 mm long mucro, the second scale 2 × 3 mm, also with a 0.5 mm long mucro; remaining glumes 7–9, obscurely distichous, the largest 4 × 1.5 mm, narrowly obovate, cucullate, ferrugineous, chartaceous, the tip acuminate. **Flowers** bisexual or functionally staminate; basal 2–4 flowers of the spikelet bisexual, the next 2–3 functionally staminate; perianth bristles absent; stamens 3, the filaments 2.5–3 mm long, the anthers 1.7–1.8 mm long; stigma and style 2.5 mm long. **Achene** broadly obovate, 0.7–0.8 × 0.8–0.9 mm, orange-brown to black, rugose, with 4 or 5 (6) ridges, the base flattened and flared around the stipe; persistent style base depressed, strap-like, 0.3–0.4 × 0.8–0.9 mm (Fig. 2).

When Kükenthal (1949) described *Rhynchospora* section *Tenues*, he included 17 species; today we estimate that there are 22 species. As noted by Strong (2006), *R. riparia* has two protuberances or glands at the base of the achene. These are apparently not found on the achenes of other members of

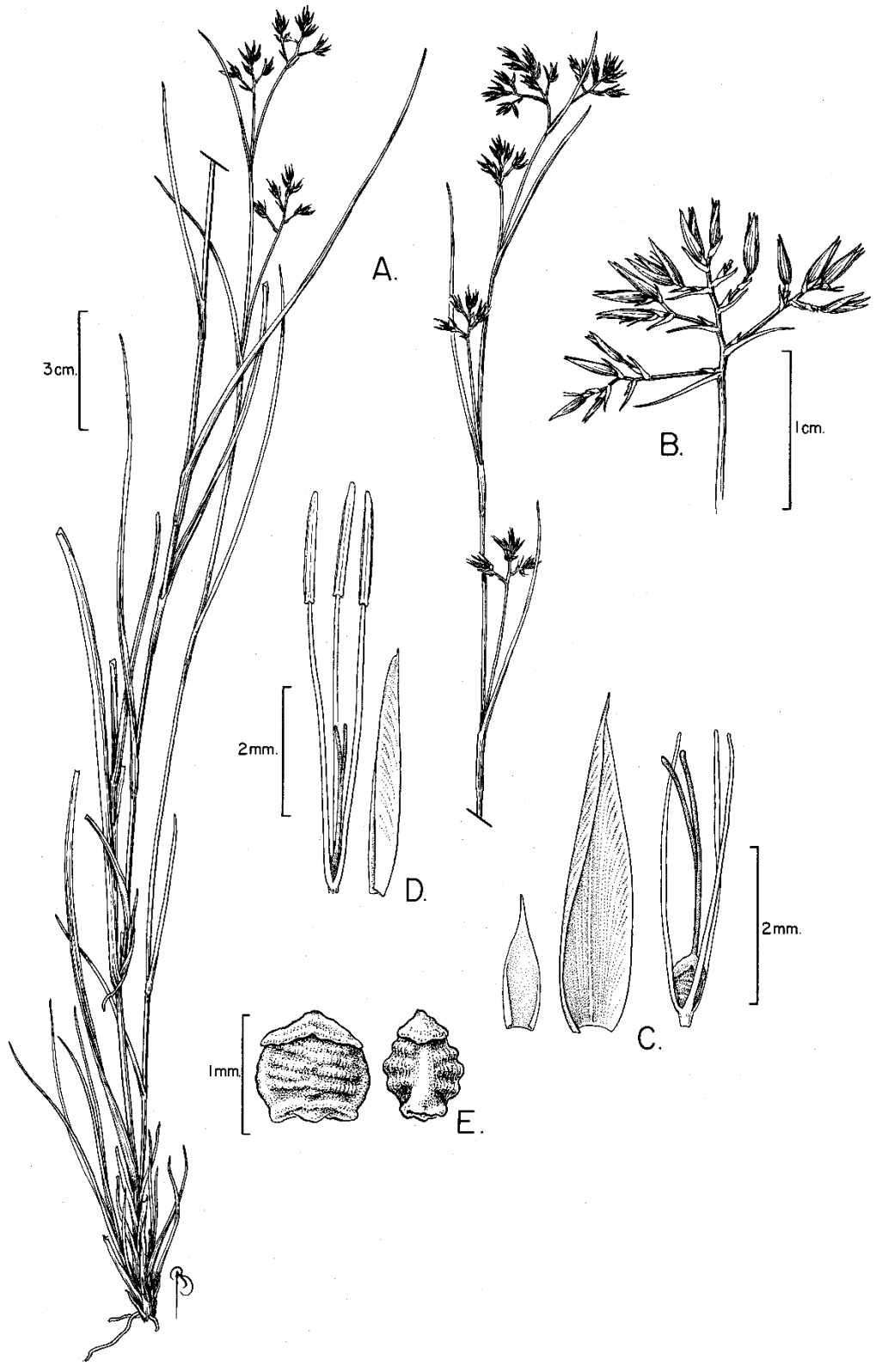

FIG. 1. *Rhynchospora rheophytica*. **A.** Plant habit. **B.** Detail of the inflorescence. **C.** Fertile spikelet with smaller basal scale, larger distal scale, and flower showing filaments, developing achene, stigma and styles. **D.** staminate flower with subtending scale and flower with developed stamens and undeveloped pistil. **E.** Achene, dorsal and lateral views. Illustration by Bobbi Angell, from *Amorim et al. 564* (NY).

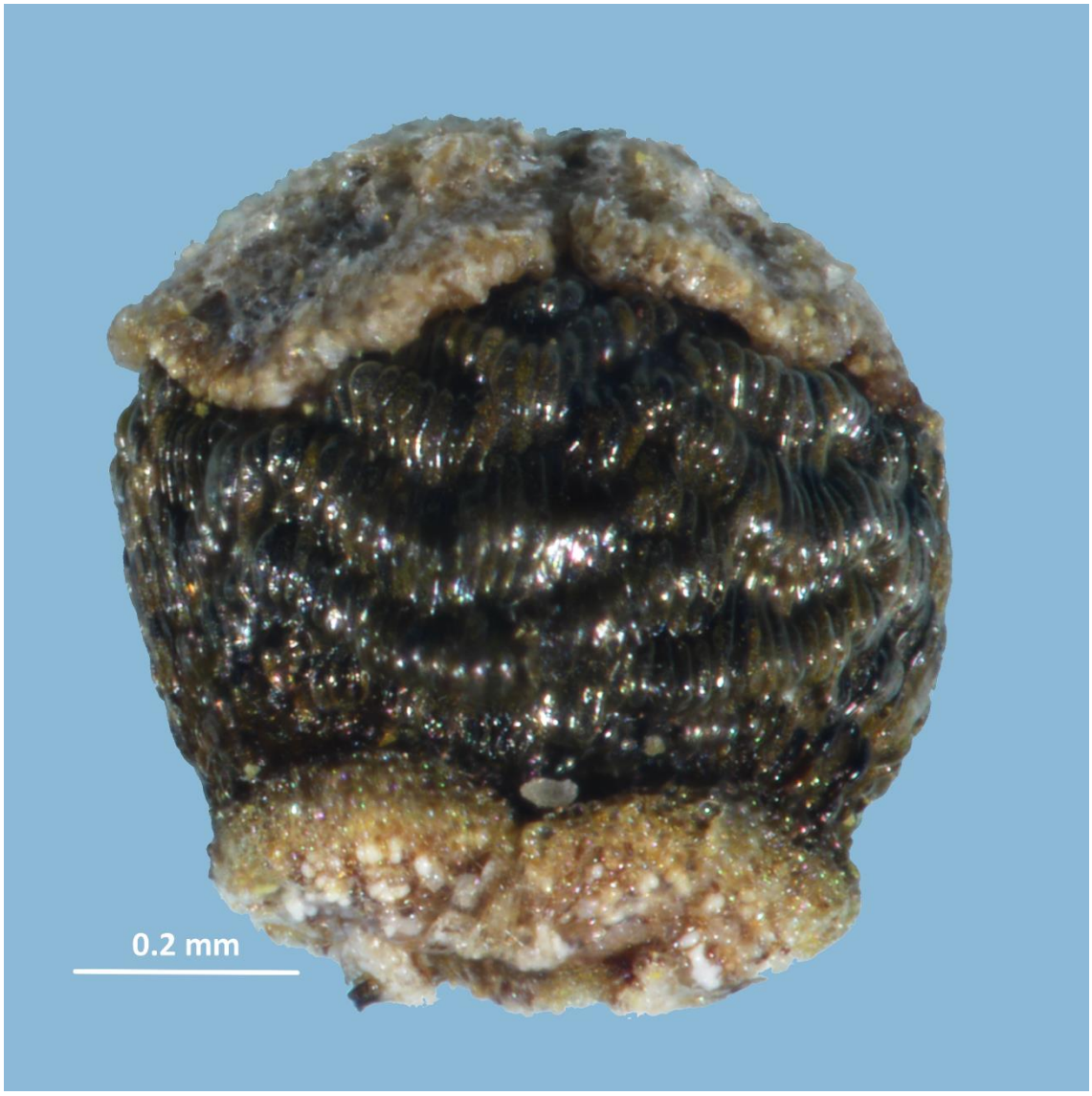

Fig. 2. Achene of *Rhynchospora rheophytica*. From *Amorim et al. 564* (NY).

sect. *Tenues*, including *R. tenuis* and *R. emaciata* (Table I). *Rhynchospora rheophytica*, however, has a flattened area around the stipe, possibly intermediate between the typical, rounded achene base found in most species and the protuberances found in *R. riparia* (Fig. 1E, 2).

Distribution and Ecology.— Only known from the type. Vegetation cover for the area (IBGE, 2004) is *cerrado*, much of it under cultivation, with areas of

seasonally deciduous forest. The locality information states that the species was found in the gallery forest among rocks along the Janeiro River near the Acaba-vida Waterfall (Fig. 3). The habitat information and the aspect of the plant suggests that it is a rheophyte, a plant that is found only in the beds of fast-flowing streams, up to the level of regularly occurring floods (Steenis, 1987).

Conservation Status.— The surrounding vegetation is dry *cerrado*, or is under cultivation, so would be unsuitable habitat for this species. There are, however, several parallel river systems north and south of the Janeiro River, so it is possible that *Rhynchospora rheophytica* will be found along one of them. It, however, is known only from a single collection, so it must be limited in its frequency and distribution. We suggest, therefore, that it deserves a conservation status of Vulnerable (IUCN, 2016).

TABLE I. Comparison of *Rhynchospora rheophytica*, *R. emaciata* (Nees) Boeckeler*, R. riparia* (Nees) Boeckeler, and *R. tenuis* Link.

	R. rheophytica	***R. emaciata***	***R. riparia***	***R. tenuis***
Plant height	47-113 cm	36-95 cm	8-24 cm	2.9-30cm
Leaf width	1.5 - 2.5 mm	0.5 – 1,6 mm	1-2 mm	0.4 – 1 mm
Coflorescences	Lax, with 14 - 71 spikelets	Lax, with 48 – 102 spikelets	Contracted, with 21 – 107 spikelets	Lax, with 14 – 70 spikelets
Spikelets	Pale brown, 6 – 6.5 mm long	Pale brown, 6 – 9 mm long	Pale brown, 3.8 – 5 mm long	Stramineous, 3.4 – 5.4 mm long
Achene base	Flattened and slightly flared around the stipe	Cuneate, gradually tapering to the stipe	With two protuberances on either side of the base	Cuneate, gradually tapering to the stipe
Persistent style base	Depressed, strap-like	Shallowly triangular	Roughly triangular, and 2-lobed	Shallowly triangular

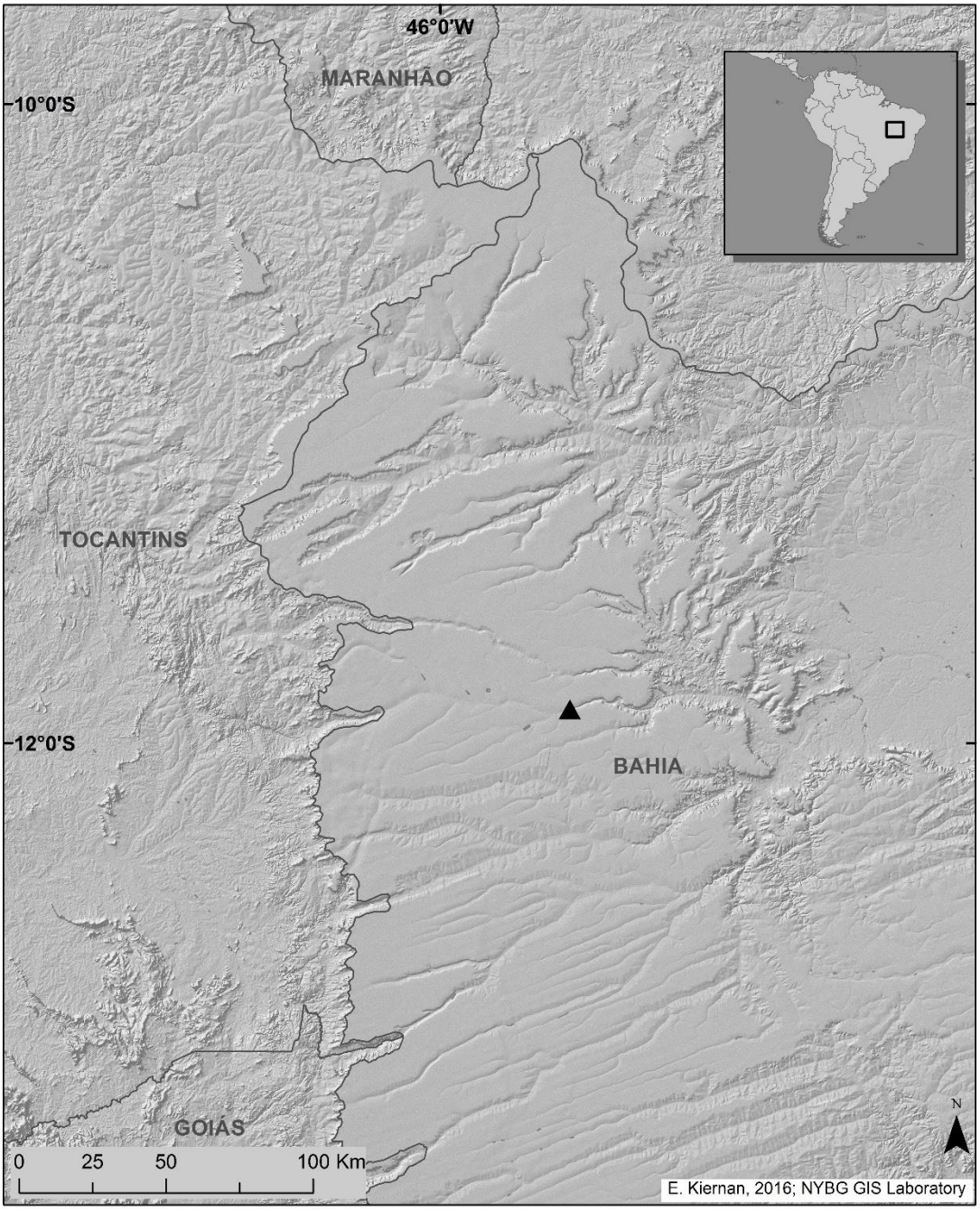

Fig. 3. Distribution map of *Rhynchospora rheophytica*.

Acknowledgments

We thank the John D. and Catherine T. MacArthur Foundation for their generous support which made possible the collection of this species. Bobbi Angel perfectly illustrated the specimen. We thank the curator of CEPEC for providing an image of the holotype. We thank the Jayne and Leonard Abess Foundation for making possible the purchase of the Nikon SMZ microscope and the focus stacking software used to prepare Fig. 2.

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Anexo I

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Revision of *Rhynchospora* (Cyperaceae) sect. *Luzuliformes*

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Abstract*—Rhynchospora* sect. *Luzuliformis* is one of the 28 sections of the genus proposed by Kükenthal, the last taxonomist to have studied the section. It has three species and two varieties, and most species are found in open areas of the southern grasslands of South America. Species were studied in the field and in herbaria, and literature was reviewed. As main results we highlight the new specific status and new name, *Rhynchospora boeckeleriana*, the designation of two neotypes and three lectotypes, and a new record for Brazil, *R. praecincta*. A full description of the four species are provided, as well as a key to distinguish the species of section *Luzuliformes*.

***Keywords*—**Sedges, new name and new status, neotype, lectotype, South America.

INTRODUCTION

In the last revision of the genus *Rhynchospora* Vahl, Kükenthal (1949, 1950, 1951) divided the genus into two subgenera and 28 sections, some already established by other taxonomists, including Kunth (1837). Boeckeler (1873), Bentham and Hooker (1883), C. B. Clarke (1900), and Gale (1944). Many were created by Kükenthal himself, including sect. *Luzuliformes* Kükenthal. In this section, Kükenthal recognized three species, *Rhynchospora crinigera* Boeckeler, *R. luzuliformis* Boeckeler (=*R. megapotamica* (Sprengel) H. Pfeiff.) and *R. praecincta* Maury. He classified *Rhynchospora luzuliformis* into three varieties: the typical variety, *R. luzuliformis* var. *spicata* Kük. in H. Pfeiff., and *R. luzuliformis* var. *pusilla* Osten.

These species occur in the grasslands of southeastern South America, being found in Argentina, southern Brazil, Paraguay, southern Bolivia and Uruguay (Kükenthal 1950). Only inhabiting open areas, from rocky grasslands to bogs (Kükenthal 1950).

These species all have problems in their circumscription and are often misidentified in herbaria. In this paper, sect. *Luzuliformes* was reviewed in order to solve these issues and thus facilitate the correct identification of these taxa. In addition, a key to the species of the section is provided, and lectotypes, neotypes and a new name are designated. Descriptions and illustrations of each of the four species are also provided.

MATERIAL AND METHODS

To analyze the circumscription of each species, describe them, and determine their distribution, we analyzed a large number of specimens from the following herbaria: BHCB, CGMS, CTES, FLOR, HAS, HBR, HUCS, HUEFS, HUFU, HURG, ICN, INPA, MBM, MG, MPUC, NY, PACA, PAMG, PEL, SMDB, UB, UFP, and US. Exception for the Herbarium of the University of Caxias do Sul (HUCS), which is not registered in Index Herbarium, all acronyms follow Thiers (2016). The original citations and types were observed mainly through the websites of JSTOR.org 2013 (http://plants.jstor.org/), the Biodiversity Heritage Library 2007 (http://www.biodiversitylibrary.org/) and Botanicus.org 2016 (http://www.botanicus.org/). Six field trips were conducted to collect in southern Brazil. The collected specimens were deposited in the herbarium ICN (Universidade Federal do Rio Grande do Sul). Before neotype designations, we contacted

all herbaria listed on "Taxonomic Literature" (Stafleu & Cowan 1985, 1986) trying to find Boeckeler and Sellow original types.

To describe the leaves, we considered only the basal ones. All measurements were based only on mature, developed structures. The measures of achene length do not include the stylopodium, which was measured separately. The terminology used in the descriptions is based on Stearn (1983), Kukkonen (1994) and Lucero and Vegetti (2012). The geographical distribution of the species was mainly obtained using data from the examined material, the *Lista de Espécies da Flora do Brasil* (Alves et al. 2016), references from monograph of Kükenthal (1949, 1950, 1951) and Tropicos.org (2016). The geographic coordinates from the exsiccatae were kept in the same way as they were written to prevent loss of information.

The illustrations of the habit and synflorescence details (Figs. 2–5) were made from photographs taken with a Nikon 5000 camera and edited in Adobe Photoshop for publication. The photographs in Fig. 1 were obtained through a stereoscopic microscope and also edited with Adobe Photoshop.

RESULTS

Rhynchospora sect. *Luzuliformes*, now includes four species: *R. boeckeleriana* Silva Filho & Boldrini, *R. crinigera*, *R. megapotamica* and *R. praecincta*. *Rhynchospora boeckeleriana* is a new name (here designated), which was previously considered to be a variety of *R. megapotamica*. Neotypes were designated for *R. boeckeleriana*, *R. luzuliformis* and *R. megapotamica*, since the original types were probably lost during World War II, and lectotypes were designated to *R. luzuliformis* var. *pusilla* and *R. praecincta*.

TAXONOMIC TREATMENT

RHYNCHOSPORA SECT. LUZULIFORMES Kükenthal. Perennial, caespitose-rhizomatous. Culms trigonous, flexuous. Leaves flat and narrow. Synflorescences formed of 2–4 paniculodia. Spikelets grouped in fascicles, fusiform to ovoid-lanceoloid, apex obtuse, all flowers hermaphroditic, most fertile. Rachilla among flowers short and rigid.

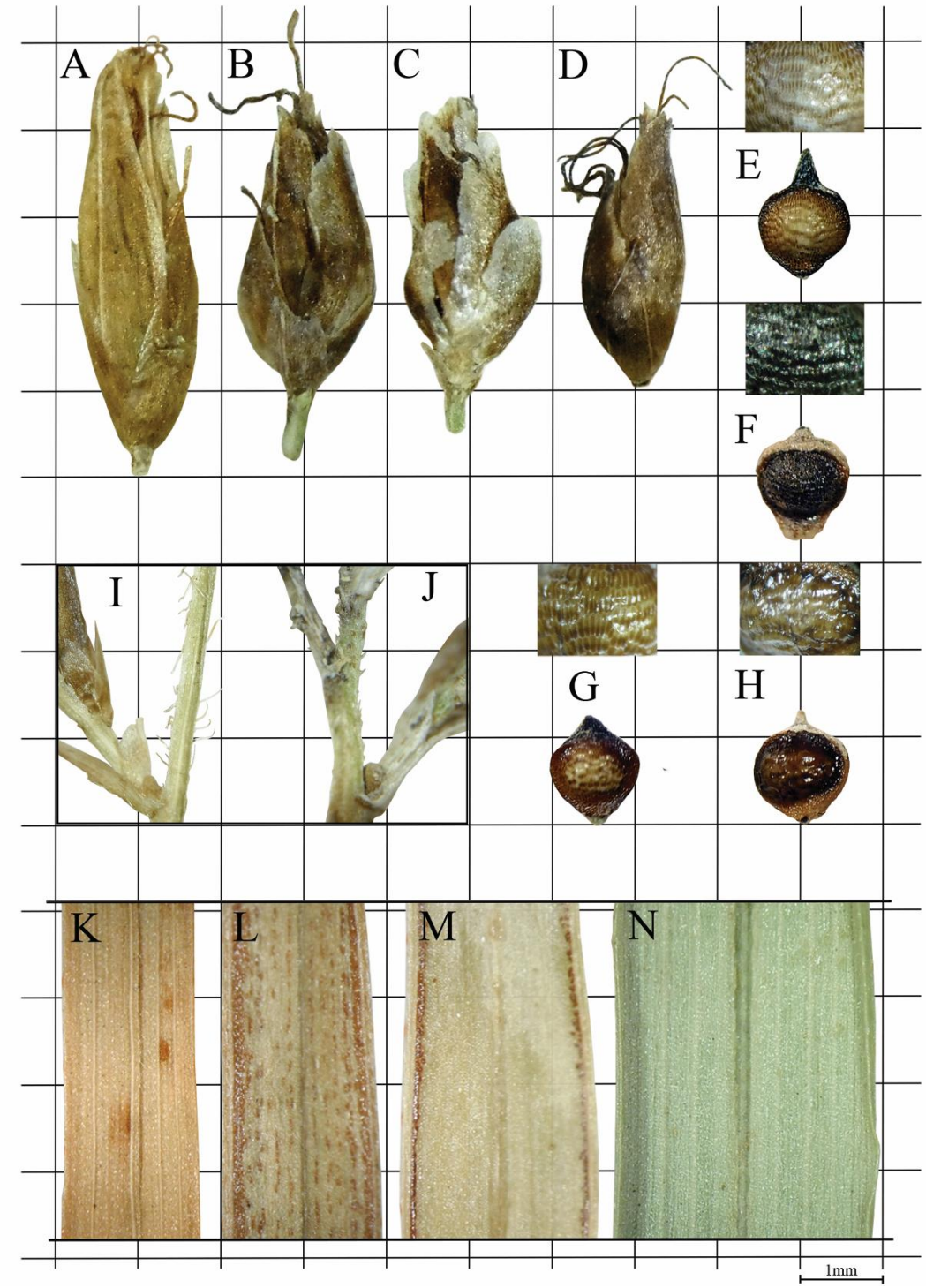

FIG. 1. Photos of the spikelets: A. *Rhynchospora crinigera* (*R. Trevisan 725*). B. *R. megapotamica* (*P. J. S. Silva Filho 1811*). C. *R. praecincta* (*P. J. S. Silva Filho 1461*). D. *R. boeckeleriana* (*R. Trevisan 765*). Photos of the achenes and detail of surfaces (surfaces do not follow the scale): E. *R. boeckeleriana* (*R. Trevisan 765*). F. *Rhynchospora crinigera* (*A. Guglieri et al. 779*). G. *R. megapotamica* (*P. J. S. Silva Filho 1880*). H. *R. praecincta* (*P. J. S. Silva Filho 1461*). Details of sinflorescence axes: I. pilosity found in axes near the spikelets of *R. crinigera* (*R. Trevisan 725*). J. scabrous axes of *R. megapotamica* (*P. J. S. Silva Filho 1811*), same pattern presented by *R. praecincta* and *R. boeckeleriana*. Abaxial surface of leaves of the species of the section *Luzuliformes*: K. *R. crinigera* (*R. Trevisan 725*). L. *R. megapotamica* (*P. J. S. Silva Filho 1811*). M. *R. praecincta* (*P. J. S. Silva Filho 1461*). N. *R. boeckeleriana* (*S. M. Hefler 249*).

Glumes membranaceous, shortly mucronate and loosely imbricate, two lowest glumes sterile, the following ones hermaphroditic. Stamens 3. Style long, deeply bifid. Hypogynous bristles absent. Achene orbicular-obovate, turgid-biconvex, transversely undulate-rugose. Stylopodium depressed, semilunate, the same width as the apex of the achene, decurrent along margins of achene (adapted from Kükenthal 1949).

KEY TO THE SPECIES OF RHYNCHOSPORA SECT. LUZULIFORMES

1. Spikelets 4–5 mm long, oblong to lanceoloid, always stramineous ..... *R. crinigera*
1. Spikelets no longer than 4 mm, generally ovoid, stramineous to brown..... 2
2. Rhizomes 6–10 mm in diameter, leaves generally with two parallel vinaceous lines along margins of abaxial leaf surface ..... *R. praecincta*
2. Rhizomes 0.8–6 mm in diameter, leaves with or without two parallel vinaceous lines along the margins of abaxial leaf surface (Fig. 1K–N), if leaves with vinaceous lines, rhizome not wider than 2.1 mm 3
3. Rhizomes 0.8–2.1 mm in diameter, elongated, leaves with two parallel vinaceous lines along the margin of abaxial leaf surface, stylopodium 0.2–0.4 mm long …..... *R. megapotamica*
3. Rhizomes 2–6 mm in diameter, short, leaves entirely green, stylopodium 0.4–0.6 mm long ..... *R. boeckeleriana*

Rhynchospora boeckeleriana Silva Filho & Boldrini nom. nov. and stat. nov. Basionym: ≡ *Rhynchospora megapotamica* var. *spicata* Kük. in H. Pfeiff. Revista Sudamer. Bot. 7: 130. 1943.—TYPE: BRAZIL. Santa Catarina. Im Sumpfen auf dem Campo der Serra do Oratorio, Feb 1890, *Ule 1611* (LECTOTYPE (here designated): HBG; lost isotype: B†).

Rhizomes 2–6 mm diameter, ligneous and short, covered by cataphylls and old sheaths often dissociated into fibers. Culms 30–77 × 0.08–0.2 cm, glabrous or scabrous apically near the spikelets, and with a longitudinal groove along its length. Leaves 17–66 × 0.15–0.5 cm, entirely green, glabrous or antrorsely scabrous along the margins and abaxially along the midvein; sheath 1–5 cm long. Synflorescence comprising a terminal paniculodium and 1-3 axillary paniculodia, all contracted to somewhat contracted and composed of partial paniculodia, and these by fascicles of spikelets; axes above second order, usually scabrous at the angles, especially the ones closest to the spikelets; apical paniculodium 2–4 (–5.5) × 1–3 cm and the axillary 1–3 × 0.6–3 cm. Spikelets 2.8–3.8 mm long, ovate to ovate-lanceoloid. Glumes ovate to lanceolate, dark brown, membranaceous, the apex obtuse, acute, or in some cases shortly bilobed, short-

mucronate, the mucron glabrous; usually only the first two flowers developing achenes. Anthers 1.3–1.5 mm long. Achene 0.8–0.9 × 0.7–1 mm, orbicular, apex obtuse, stramineous when young to brown when mature, surface transversely undulate-rugose. Stylopodium 0.4–0.6 mm long, semilunate-subulate, brown. Figures 1 (D, E, N) and 2.

Distribution and Habitat— Only known from Brazil in the states of Paraná, Santa Catarina and Rio Grande do Sul. Found in wetlands and bogs.

Etymology— The name was given in honor to the cyperologist Johann Otto Boeckeler, who noticed the new species but never validated it.

Floweringand Fruiting— September to December.

Examined material— BRAZIL. Paraná: General Carneiro, Faxinal dos Souzas, 07 December 1971, *G. Hatschbach et al 28333* (MBM); Guaíra, Parque Nacional Sete Quedas, 02 September 1981, *E. Buttura 701* (MBM); Palmas, Rio Chopim, 20 October 1966, *G. Hatschbach 15050* (MBM); Piên, Boa Vista, Pedreira, 20 October 2006, *E. F. Costa* & *Cordeiro 65* (MBM). Rio Grande do Sul: Cambará do Sul, Faxinal, December 1983, *M. Sobral* & *J. R. Stehmann 2693* (ICN); Caxias do Sul, 29º 05.085' S, 51º 02.783' W, November 2010, *P. J. S. Silva Filho et al. 1905* (ICN); Encruzilhada do Sul, estrada para Amaral Ferrador, 30º 51' 15" S, 52º 32' 20.2" W, 09 October 2008, *H. Longhi-Wagner* & *G. H. Silveira 10603* (ICN); Giruá, Granja Sobral, October 1963, *K. Hagelund 1096* (ICN); Nova Prata, Estação Experimental Fitotecnia, 15 November 1982, *J. Mattos* & *R. Frosi 31111* (HAS); Pelotas, Cascatinha, 20 November 1986, *J. R. Mattos* & *N. Mattos 32279* (FLOR); São Francisco de Paula, Lajeado Grande, RS 476, 29º 06' 33.2" S 50º 38' 22.5" W, 26 November 2010, *I. Boldrini 1659* (ICN); Soledade, BR 386, km 242, 28º 47' 32.4" S, 052º 31' 22.8" W, 20 November 2003, *S. M. Hefler et al. 249* (ICN). Santa Catarina: Água Doce, 04 December 1964, *L. B. Smith* & *R. Klein 13511* (HBR); Bom Jardim da Serra, acesso Vacas Gordas para Ubirici, 28º 19' 39.3" S, 49º 37' 18.5" W, 23 November 2006, *A. C. Araujo 1679* (ICN); Bom Retiro, BR 282, km 136, 27º 49' 29.9" S, 49º 34' 27.0" W, 29 November 2006, *R. Trevisan et al. 765* (ICN), Campo dos Padres para Bom Retiro, 17 December 1948, *R. Reitz 3493* (PACA); Caçador, Fazenda Carneiros, 21 December 1956, *L. B. Smith* & *Reitz 9007* (HBR); Catanduvas, 17-19km Oeste de Joaçaba, ca. 27º 03' S, 51º 45' W, 15 December 1964, *L. B. Smith* & *R. M. Klein 13953* (FLOR); Florianópolis, Morro da Lagoa, 14 September 1990, *M. H. Queiroz 286* (ICN); Lages, em beira de estrada no portal norte da cidade, saída para Curitiba, 27º 45.008' S, 50º 20.014' W, 21 October 2005, *R. Trevisan 397* (ICN); Lebon Régis, Rio dos Patos, 06 December 1962, *R. Klein 3400* (FLOR); Urubici, caminho entre a Pousada Rio

Canoas Refúgio de Montanhas e a Fazenda do Sr. Arno Philippe, 04 December 2006, *A. Zanin et al. 1125* (ICN), Campo dos Padres, Fazenda do Sr. Arno Philippe, 07 December 2006, *A. Zanin et al. 1274* (ICN).

***Comments*—** During the review of material from several herbaria from Rio Grande do Sul, Santa Catarina and Paraná, we noticed that *Rhynchospora megapotamica* var. *spicata* has too many different and consistent characteristics to be considered as just a variety of *R. megapotamica*. These differences include not only morphological characteristics, but also ecological aspects as habitat and distribution. Besides the characteristics mentioned in the key to species, *R. boeckeleriana* is generally more robust, the paniculodia are longer than wide, with densely aggregated, dark brown spikelets. The habitat and distribution are also different, *R. boeckeleriana* is mainly found in wetlands and bogs of the Campos de Cima da Serra region (high elevation grasslands in the southern portion of the Atlantic Rainforest), and *R. megapotamica* in dry and rocky grasslands of the Pampas. *Rhynchospora spicata* Boeckeler, the name which Kükenthal used as basionym for *R. megapotamica* var. *spicata* is a *nomen nudum.* Besides, this name was already used by Sprengel (1825) for other species with solitary spikelets, later considered as *Scleria spicata* (Spreng.) J. F. Macbride.

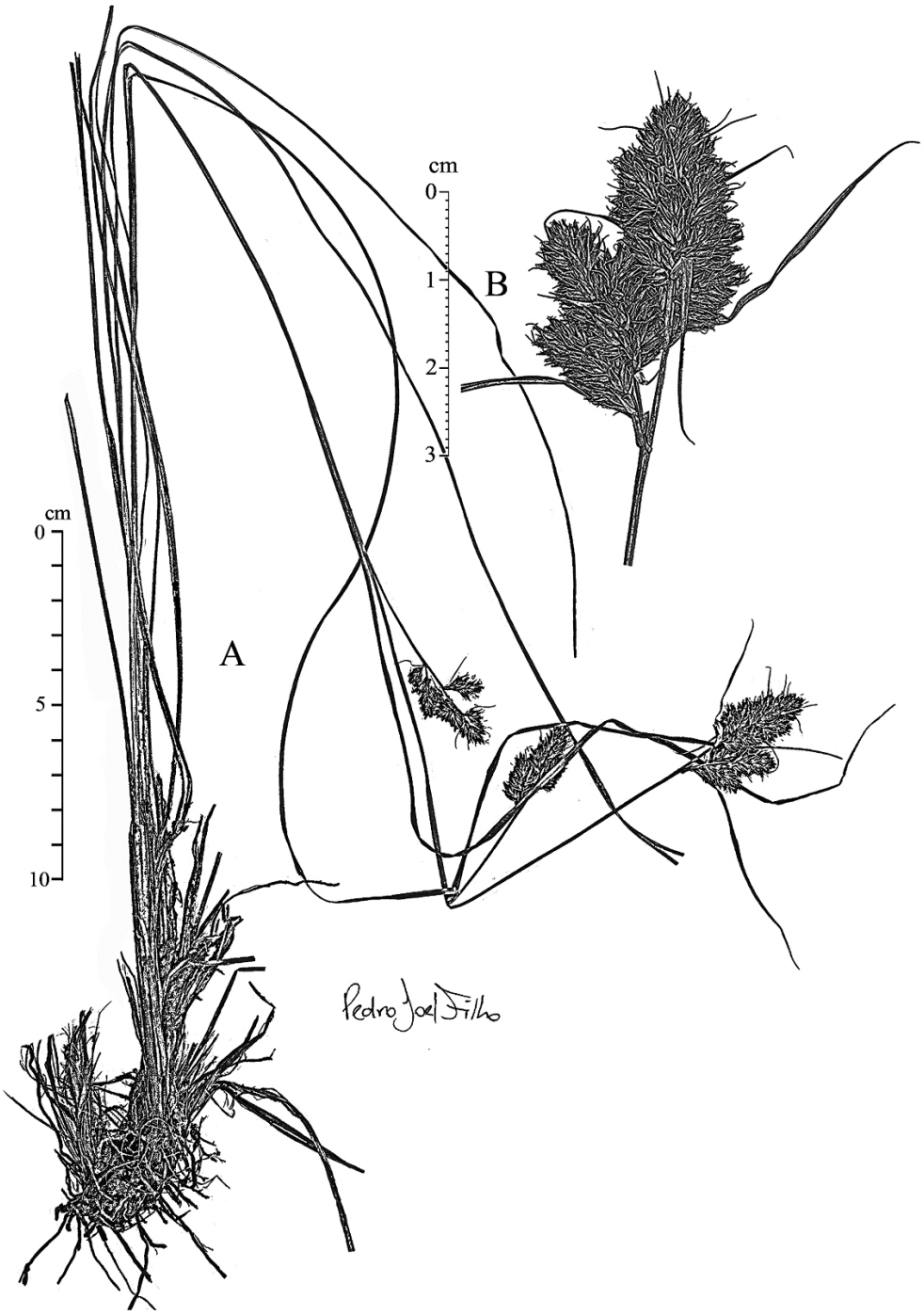

FIG. 2. *Rhynchospora boeckeleriana* Silva Filho & Boldrini. A. habit. B. synflorescence detail (*Silva Filho et al. 1905*).

RHYNCHOSPORA CRINIGERA Boeckeler. Beitr. Cyper. pt. 1, 28. 1888.—TYPE: URUGUAY. Montevideo. En los bañados de la barra del Rio Santa Lucia, 18 November 1877, *J. Arechavaleta 2522* (holotype: MVM photo).

Rhizomes 0.6–0.9 mm diameter, flexible and short, covered by cataphylls and old sheaths, sometimes dissociated into fibers. Culms 10–50 × 0.04–0.11 cm, glabrous or pilose apically near the spikelets, and with a longitudinal groove. Leaves 7–20 × 0.1–0.3 cm, entirely green, pilose, rarely glabrous or antrorsely scabrous along the margins and abaxially along the midvein; sheath 0.5–4 cm long. Synflorescence formed by a terminal paniculodium and 2–3 axillary paniculodia, all contracted (rarely open to loosely contracted) and composed of partial paniculodia, and these by fascicles of spikelets; axes above second order, usually pilose at the angles, especially the ones closest to the spikelets; apical paniculodium 0.9–2 (–2.5) × 0.8–2 cm and the axillary 0.6–1.5 × 0.6–1.5 cm. Spikelets 4–5 mm long, oblong-lanceoloid. Glumes ovate to lanceolate, stramineous, membranaceous, with a hyaline margin, the apex obtuse, acute, or in some cases shortly bilobed, short-mucronate, the mucron glabrous; usually only the first three flowers developing achenes. Anthers 2 mm long. Achene 0.8–1.1 × 0.8–1 mm, orbicular, brownish when young to black when mature, the apex obtuse, the surface transversely undulate-rugose. Stylopodium 0.2–0.4 mm long, semilunate, greyish to blackish. Figures 1(A, F, I, K) and 3.

Distribution and habitat— Brazil and Uruguay (Kükenthal 1950). Found in moist grasslands of the Atlantic Rainforest and Pampas.

Flowering/fruiting— October to December.

Examined material— BRAZIL. Paraná: Guarapuava, estrada de terra próxima à Polícia Rodoviária Federal, 27 September 2012, *E. L. Siqueira & D. S. Gonçalves 605* (FLOR); São José dos Pinhais, Rio Pequeno, 05 November 1969, G. Hatschbach 22849 (MBM); Tijucas do Sul, 15 October 1961, *G. H. Hatschbach 8510* (MBM). Rio Grande Do Sul: Bom Jesus, 28º40'16"S 50º34'32"W, 13 November 2004, *I. Boldrini et al. 1396* (ICN); Cambará do Sul, Itaimbezinho, 13 December 1972, *J. C. Lindeman s.n.* (ICN 20864); Cristal, BR 116, 27 November 2003, *I. Boldrini 1218* (ICN); Encruzilhada do Sul, BR 471, 26 November 2003, *I. Boldrini 1213* (ICN), RS 471, 30º46'0.48"S 52º35'09.0”W, 26 November 2003, *I. Boldrini et al.* 1213 (ICN); Piratini, Fazenda Santa Fé, 19 December 2005, *A. Guglieri et al. 779* (ICN); São Francisco de Paula, CPCN Pró-Mata, 04 November 2002, *F. Caporal s. n.* (MPUC 11289), estrada para Tainhas,

29º24'29,4"S 50º27'29,3"W, 28 November 2008, *R. Trevisan 1029* (ICN), RS 020, 29º24'29,0"S 50º27'29,9"W, 24 November 2006, *R. Trevisan et al. 725* (ICN); São José dos Ausentes, estrada para Bom Jesus, 28º44'35,5"S 50º05'55,3"W, 20 November 2007, *R. Trevisan 879* (ICN), Serra da Rocinha, 2 km após posto policial, 11 December 1996, *A. C. Araujo 410a* (ICN); São Lourenço do Sul, BR 116, km 167, entre o Arroio Isabel e Rio Camaquã, 02 December 1979, *T. M. Pedersen 12607* (MBM); Vacaria, Parque das Cachoeiras, 28º39'47,0" S 50º54'48,3"W, 17 November 2012, *C. Vogel-Ely & G. E. Ferreira 12* (ICN); no municipality defined, Cambará do Sul para São Francisco de Paula, February 1948, *B. Rambo 36667* (PACA); no municipality defined, Canguçu para Encruzilhada do Sul, 31º00'0,45"S, 52º41'23,3"W, 09 October 2008, *H. Longhi-Wagner & G. Silveira 10597* (ICN). Santa Catarina: Água Doce, 6 km ao sul de Horizonte (Paraná), ca. 26º38' S, 51º37' W, 04 December 1964, *L. B. Smith & R. M. Klein 13507* (HBR), 20 km a oeste de Horizonte (Paraná), 05 December 1964 *R. M. Klein 13654* (HBR); Caçador, Fazenda Esperança, 15 km a nordeste da cidade, 21 December 1956, *L. B. Smith & R. Reitz 8978* (HBR); São Joaquim, 30 January 2003, *H. Longhi-Wagner 8774a* (ICN); Urubici, Campo dos Padres, Fazenda do Sr. Arno Philippe, campo entre a casa da Fazenda e o Morro Boa Vista, 05 December 2006, *A. Zanin et al. 1227* (ICN), Morro da Igreja, 28º07'39,3"S 49º28'54,6"S, 13 December 2007, *R. Trevisan 945* (ICN); no municipality defined, Bom Jardim da Serra para São Joaquim, Serra do Oratório, 09 December 1958, *Reitz e Klein 7680* (HBR).

URUGUAY. San José: Barra de Santa Lucia, 19 December 1918, *C. Osten 14679* (MVM photo), 29 November 1929, *C. Osten 21773* (MVM photo), 10 January 1930, *C. Osten 21773b* (MVM photo), 16 January 1932, *C. Osten 21773c* (MVM photo).

***Comments*—** This is the smaller species of the section, no more than 50 cm tall and having a most herbaceous aspect than the other species of sect. *Luzuliformes*. Always found in moist grasslands, especially in the region of Campos de Cima da Serra. It differs from all other species by its longer spikelet and glumes, the glumes which are always stramineous, and leaves and inflorescence axes which are usually pilose (Fig. 1I). Practically all the material of *R. crinigera* examined was misidentified as *R. megapotamica*. We could not obtain and study the original description, but the holotype, *J. Arechavaleta 2522* (MVM), was labeled by Boeckeler as *sp. nov.* In a note written by C. Osten and attached to the specimen of *C. Osten 21773* (MVM), there is the information that *J. Arechavaleta 2522* was lent by Arechavaleta to Boeckeler, enabling the latter to described the new species. In addition to the holotype, recognition of the species was

aided by the personal note on *Osten 21773*, who also provided a key to the species of sect. *Luzuliformes*, as well as by the characters presented in Kükenthal (1950).

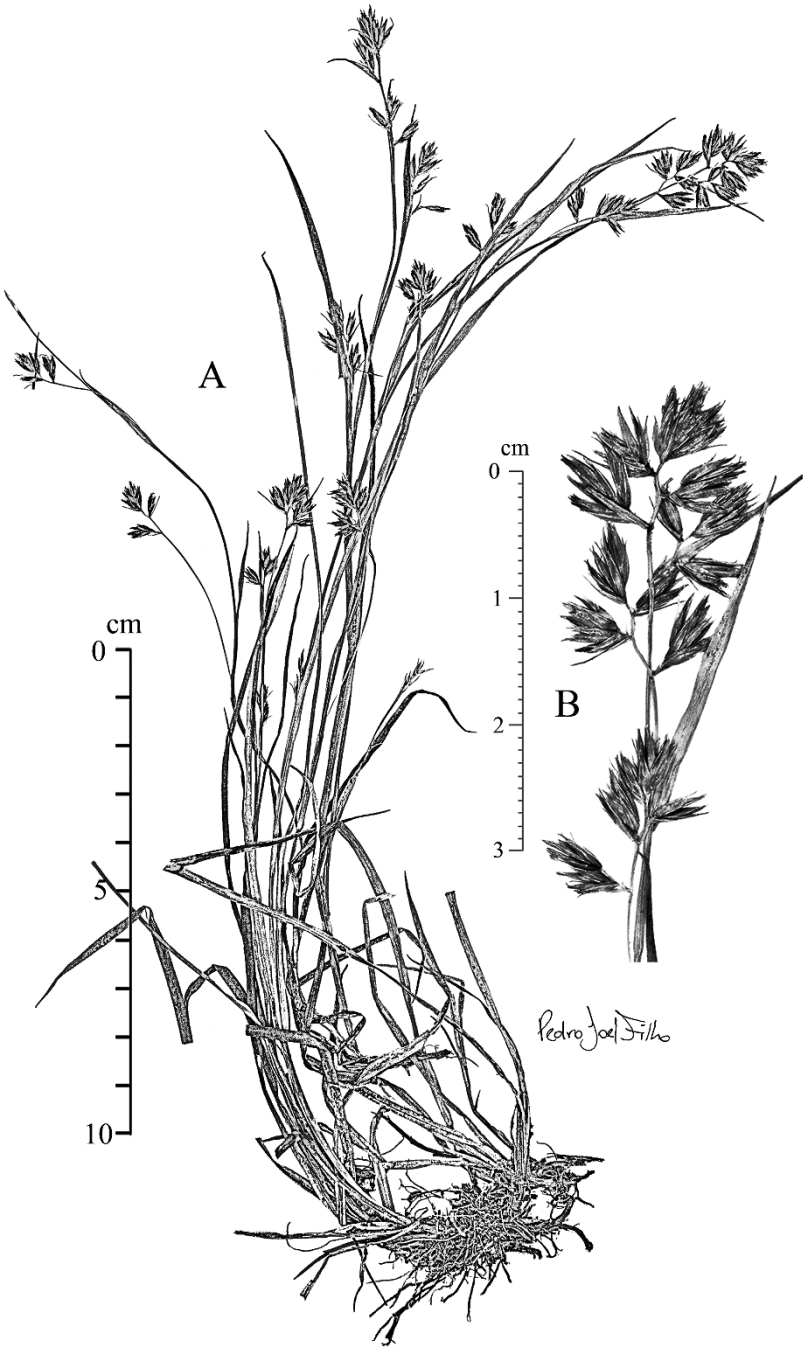

FIG. 3. *Rhynchospora crinigera* Boeckeler. A. habit. B. synflorescence (*R. Trevisan 725*).

RHYNCHOSPORA MEGAPOTAMICA (Spreng.) H. Pfeiff. Revista Sudamer. Bot. 7: 129. 1943.–-*Scirpus megapotamicus* Spreng. Tent. Suppl. 4. 1828.—TYPE: BRAZIL. Rio Grande do Sul. Rio Grande, *Sellow s. n.* (B†). NEOTYPE (here designated): BRAZIL. Rio Grande Do Sul. Pantano Grande, 30°13'44.75"S 52º21'46.08"W, 20 December 2011, *P. J. S. Silva Filho 1463* (ICN; isoneotype: NY).

Rhynchospora luzuliformis Boeckeler. Linnaea 37: 632. 1873.—TYPE: BRAZIL. *Sellow s. n.* (B†); *Boeckeler s. n.* (B†). NEOTYPE (here designated): BRAZIL. Rio Grande do Sul. Pedro Osório, 31º55'47,9"S 52º44'05,3"W, 31 October 2006, *R. Trevisan 686* (ICN).

Rhynchospora maculata Maury ex Micheli. Mém. Soc. Phys. Genève 31, pt. 1, no. 1: 146, pl. 43. 1889. TYPE: PARAGUAY. Plaine de Pirajubi, 1 September 1874, *Balansa 457* (P photo).

Rhizomes 0.8–2.1 mm diameter, flexible and elongated, covered by cataphylls and old sheaths, often dissociated into fibers. Culms 17–57 × 0.04–0.1 cm, glabrous or scabrous apically near the spikelets, and with a longitudinal groove. Leaves 11–46 × 0.08–0.3 cm, usually with two longitudinal vinaceous lines along the margin, and with punctuations scattered on the blade between the lines, most evident on the abaxial surface, especially on older leaves, the margins and abaxial midvein glabrous or antrorsely scabrous; sheath 0.5–4 cm long. Synflorescence formed of a terminal paniculodium and 1–3 axillary paniculodia, all open or rarely loosely contracted, these composed of partial paniculodia, and these of fascicles of spikelets; axes above second order usually scabrous at the angles, especially the ones closest to the spikelets; terminal paniculodium 1.8–3.5 (–4.7)× 1.2–3.7 cm and the axillary 1.2–3.5 × 1.2–3.3 cm. Spikelets 2.8–4 mm long, ovoid-lanceoloid. Glumes ovate to lanceolate, stramineous to brownish, membranaceous, with a hyaline margin, the apex obtuse, acute or, in some cases, shortly bilobed, short-mucronate, the mucron glabrous; usually only the first three flowers developing achenes. Anthers 1–2 mm long. Achene 0.8–1 × 0.8–1 mm, orbicular, stramineous when young to dark brown when mature, the apex obtuse, the surface transversely undulate-rugose. Stylopodium 0.2–0.4 mm long, semilunate, greyish to dark brown. Figures 1 (B, G, J, L) and 4.

Distribution and habitat— Argentina, Brazil, Paraguay and Uruguay. Strongly related to dry and rocky grasslands of Pampas, and rarely found in Campos de Cima da Serra (altitude grasslands of south Brazilian mountain ranges).

Flowering/fruiting— Mainly September to December, with two records outside this period, one in April and another in July.

Examined material— ARGENTINA. Chaco: Colonia Benites, October 1932, *A. G. Schulz 650* (CTES); Corrientes: Monte Caseros, Campo Gral. Avalos, Paso de la Barca, sobre el Río Miriñay, 11 September 1979, *A. Schinini et al.* (ICN 48669). Jujuy: Zapla, 09 November 1974, *A. Burkart 30400* (CTES). Missiones: Iguazú, Arroyo Aguaray, a pocos km de desembocadura en Rio Paraná, 11 September 2002, *H. Keller 1956* (ICN). Santa Fé: Reconquista, EEA Reconquista, 20 September 1985, *G. Blanchoud 2151* (CTES).

BRAZIL. Rio Grande do Sul: Aceguá, BR 473, 31º38'10,4"S; 54º08'57,9"W, 22 November 2003, *R. Trevisan et al. 208* (ICN); Alegrete, Salso, 05 October 1960, *C. W. Fischer 20* (HAS); Bagé, BR 153, 31 29'0,2"S, 54 08'1,6"W, 18 November 2006, *A. C. Araujo & I. Boldrini 1653* (ICN), BR 153, ca. 40 km S de Bagé, 10 November 1976, *T. M. Pedersen 11433* (CTES), Faculdade de Agronomia (FUNBA), 30 September 1982, *J. Mattos 25662* (HAS); Capão do Leão, BR 116, km 550, 31º51'42,8"S 52º36'03,1"W, 31 October 2006, *R. Trevisan et al. 684* (ICN); 30º21'43.63"S 53º20'23.63"W, 15 December 2011, *Silva Filho P. J. S. 1462* (ICN); Cachoeira do Sul, 25 September 1983, *D. B. Falkenberg 788* (ICN); Canoas, 06 November 1943, *Augusto 203* (MPUC); Caxias do Sul, distrito de Santa Justina, 07 September 2004, *F. Marchett 34* (HUCS); Farroupilha, 10 October 1957, *Camargo 1905* (PACA), 25 October 1958, *Camargo s.n.* (PACA 63681); Guaíba, Fazenda São Maximiniano, BR 116, km 307, 08 November 2005, *R. Trevisan 444* (ICN); Jaquirana, ponte sobre o Rio Tainhas em direção à Caxias do Sul, 06 October 2006, *A. C. Araujo et al. 1639* (ICN); Lavras do Sul, 17 October 1971, *J. C. Lindeman & B. E. Irgang* (ICN 8701); Pinheiro Machado, Coxilha Pedras Altas, 11 November 2976, *T. M. Pedersen 11438* (CTES); Piratini, gruta Iemanjá, próximo de arroio com ponte, S 31º26'58.9", W 053º07'24.2", 16 November 2003, *S. M. Hefler et al. 166* (ICN); Porto Alegre, 25 October 1945, *B. Rambo 29039* (PACA), Morro da Polícia, 01 October 1996, *H. Longhi-Wagner 3371* (ICN), Morro São Pedro, 27 September 2008, *R. Setubal & M. Grings 653* (ICN), Morro das Abertas, 14 October 1979, *J. Mariath 742* (HAS); Quaraí, Fazenda Cantagalo, 29 October 2008, *R. Setubal & I. Boldrini 720* (ICN), S30 25.140 W56 22.704, 02 November 2010, *P. J. Silva Filho & M. Grings 1038* (ICN); Rio Pardo, à 6 km do Rio Irapuá, 11 November 1980, *J. Mattos 21852* (HAS); Santa Vitória do Palmar, BR 471, 26 November 2004, *I. Boldrini 1290* (ICN), 32º54'42.40"S 52º44'14.70"W, 07 November 2012, *P. J. S. Silva Filho 1811* (ICN); Santana do

Livramento, BR 293, km 384, sentido Quaraí, entrada da Fazenda Sta. Gertrudes, 30º42'26.2"S, 055º49'03,1"W, 18 November 2003, *S. M. Hefler et al. 200* (ICN), Cerro Palomas, 15 October 1971, *J. C. Lindeman et al. s.n.* (ICN 8538); São Marcos, no km 138 da rodovia Porto Alegre para Vacaria, 13 November 1978, *J. Mattos 20343* (HAS); São Sepé, 26 September 1983, *D. B. Falkenberg 839* (ICN), cerca de 1 km do trevo para Caçapava do Sul, na rodovia Porto Alegre para Uruguaiana, 1 September 1986, *J. Mattos & N. Mattos 29871* (HAS); Uruguaiana, 30 03.384S, 56 11.418W, 01 November 2010, *P. J. S. Silva Filho & M. Grings 1838* (ICN); Viamão, Parque Estadual de Itapuã, Morro do Araçá 30º21'10,0"S 51º02'16,1"W, 22 December 2005, *R. Trevisan 572* (ICN); no municipality defined, Caibaté para São Luiz Gonzaga, 24 November 1952, *B. Rambo 53439* (PACA); no municipality defined, Amaral Ferrador para Encruzilhada do Sul, September 1985, *M. Sobral et al. 4181* (ICN); no municipality defined, Canguçu para Encruzilhada do Sul, 31º00'0,45" S, 52º41'23,3" W, 09 October 2008, *H. Longhi-Wagner & G. H. Silveira 10598* (ICN); no municipality defined, entre Bagé e Caçapava do Sul, 02 April 1985, *J. Mattos, N. Mattos & N. Silveira 28880*; no municipality defined, entre Santa Maria e São Sepé, 3 October 1971, *J. C. Lindeman et al. s.n.* (ICN 8273); no municipality defined, Granja Neugebauer para Itapoan, 27 September 1950, *B. Rambo 48856* (PACA); no municipality defined, perto de Bagé, 02 April 1985, *J. Mattos, et al. 28904* (HAS). Santa Catarina: Marcelino Ramos, Rio Uruguai, Estreito, 16 September 1994, *G. Hatschbach & J. M. Silva 61069* (FLOR); São Joaquim, July 1963, *J. Mattos 11187* (HAS).

URUGUAY: Florida, Estancia Rincón de Santa Elena, Estancia A. Gallinal, 13 November 1948, *R. Gallinal 6017* (CTES); Itapúa, Arroio San Rafael, Rutal, 15 km SE de General Delgado, 16 November 1978, *M. M. Arbo et al. 2008* (CTES).

***Comments*—** Many exsiccatae identified as *Rhynchospora megapotamica* actually are *R. boeckeleriana* or *R. crinigera*. For that reason, to determine the geographical distribution of this species, we considered only the specimens personally reviewed in this study. The type of this species was not found, it is a collection of Sellow without number, from Rio Grande do Sul, Brazil. This type probably was in B herbarium and was destroyed during World War II. The herbarium was contacted and they have not found this specimen in their collections, therefore a neotype was designated.

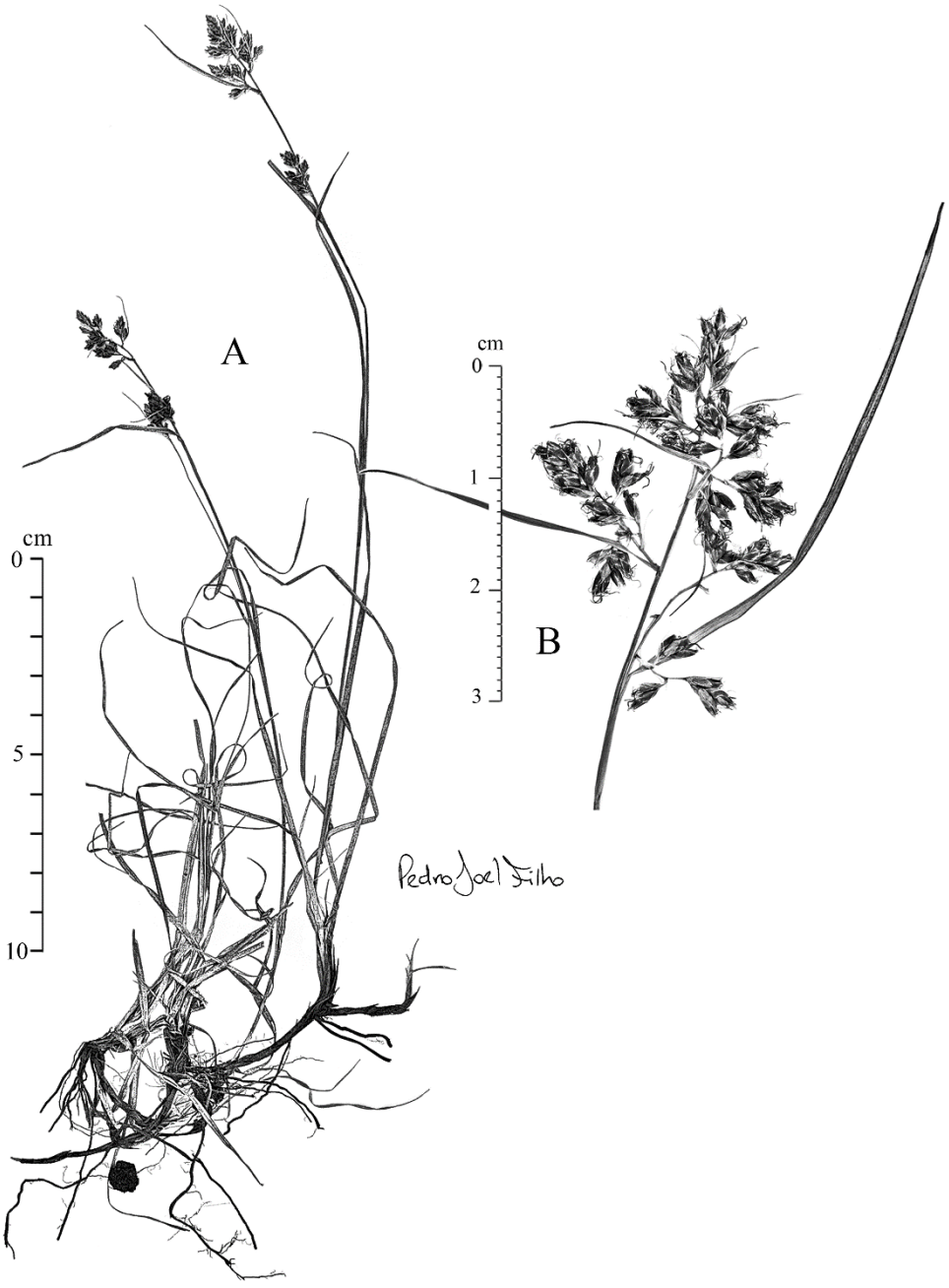

FIG. 4. *Rhynchospora megapotamica* (Spreng.) H. Pfeiff. A. habit. B. synflorescence detail (*P. J. S. Silva Filho 1463, neotype*).

RHYNCHOSPORA PRAECINCTA Maury ex Micheli. Mém. Soc. Phys. Genève 31, pt. 1, no. 1: 146, pl. 43. 1889. TYPE: PARAGUAY. *In viis*, 24 August 1874, *Balansa 453* (LECTOTYPE (here designated): P, photo). *In pascuis*, 28 Oct 1876, *Balansa 2553* (former syntype: K, photo).

Rhynchospora luzuliformis var. *pusilla* Osten syn.nov. Anales Mus. Nac. Montevideo ser. 2, 3: 219. 1931. TYPE: URUGUAY. Durazno. Cuchilla de Molles, 12 September 1899, *C. Osten 3785* (LECTOTYPE (here designated): MVM, photo). Florida. Santa Clara, 28 September 1928, *Herter* (former syntype: MVM 19265, photo).

Rhizomes 6–10 mm diameter, ligneous and short, covered by cataphylls and old sheaths often dissociated into fibers. Culms 9–35 × 0.06–0.11 cm, glabrous or scabrous apically near the spikelets, and with a longitudinal groove. Leaves 6–24 × 0.09–0.3 cm, usually with two longitudinal vinaceous lines along the margin, and sometimes with punctuations scattered on the blade between the lines, most evident on the abaxial surface, the margins and abaxial midvein glabrous or antrorsely scabrous; sheath 1–4 cm long. Synflorescence formed of a terminal paniculodium and 1–3 axillary paniculodia, all densely contracted and composed of partial paniculodia, and these composed of fascicles of spikelets; axes above second order, usually scabrous at the angles, especially the ones closest to the spikelets; apical paniculodium 0.9–2.3 × 1–2.4 cm and the axillary ones 0.5–1.6 × 0.5–1.5 cm. Spikelets 2.9–3.1 mm long, ovoid to ovoid-lanceoloid. Glumes ovate to lanceolate, stramineous, membranaceous, with evident hyaline margin, the apex obtuse, acute, or in some cases shortly bilobed, short-mucronate, the mucron glabrous; usually only the first three flowers developing achenes. Anthers 1.6–1.8 mm long. Achene 0.8–1 × 0.7–1 mm, orbicular, stramineous when young to brown when mature, the apex obtuse, the surface transversely undulate-rugose. Stylopodium 0.2–0.3 mm long, semilunate, greyish to brownish. Figures 1 (C, H, M) and 5.

Distribution and habitat— Argentina, Brazil, Paraguay and Uruguay. Found only in dry and rocky grasslands of the Pampas.

Flowering/fruiting— October to December.

Examined material— ARGENTINA. Corrientes: Concepción, 17 September 1986, *T. M. Pedersen 14582* (MBM); Empedrado: Estância Três Marias, 13 October 1982, *T. M. Pedersen 13433* (MBM); Entre Rios: Concordia, Salto Grande, 03 October 1978, *S. A. Renvoize 2886* (US); Mercedes, Ea. Dionísio, Ruta 40, 32 km SW de Colonia

Pellegrini, Colonia Uruguay, 57º 28' W, 28º 40' S, September 1999, *A. Schinini 35083* (MBM).

BRAZIL. Rio Grande do Sul: Barra do Quaraí, 14 October 1971, *J. C. Lindeman et al. s. n.* (ICN 8456), 30º 12' 14.27" S, 57º 29' 36.14" W, 17 December 2011, *P. J. S. Silva Filho 1461* (ICN); São Lourenço do Sul, Fazenda Cordilheira, 27 October 2011, *C. L. Bonilha 335* (ICN); Quaraí, Cerro do Jarau, 28 September 1984, *B. Irgang et al. s. n.* (ICN 92807); Uruguaiana, ponte sobre o Rio Ibicuí, na divisa com Itaqui, 13 November 1984, *M. Sobral 3290* (ICN).

PARAGUAY. Departamento Central: no municipality defined, próximo a Viletta, 16 November 1969, *T. M. Pedersen 9320* (MBM, US).

URUGUAY. Durazno. Cuchilla de Molles, 12 September 1899, *C. Osten 3785* (MVM, photo); Florida. Santa Clara, 28 September 1928, *Herter* (MVM 19265, photo).

Comments— *Rhynchospora praecincta* is an uncommon species, exclusively found in the Pampas where it dwells mainly in dry grasslands with shallow soils. It is recognized mainly by having short and thickened rhizomes that are densely covered with cataphylls and aged leaf sheaths often dissociated into fibers. For both *Rhynchospora praecincta* and *R. luzuliformis* var. *pusilla* lectotypes were designated.

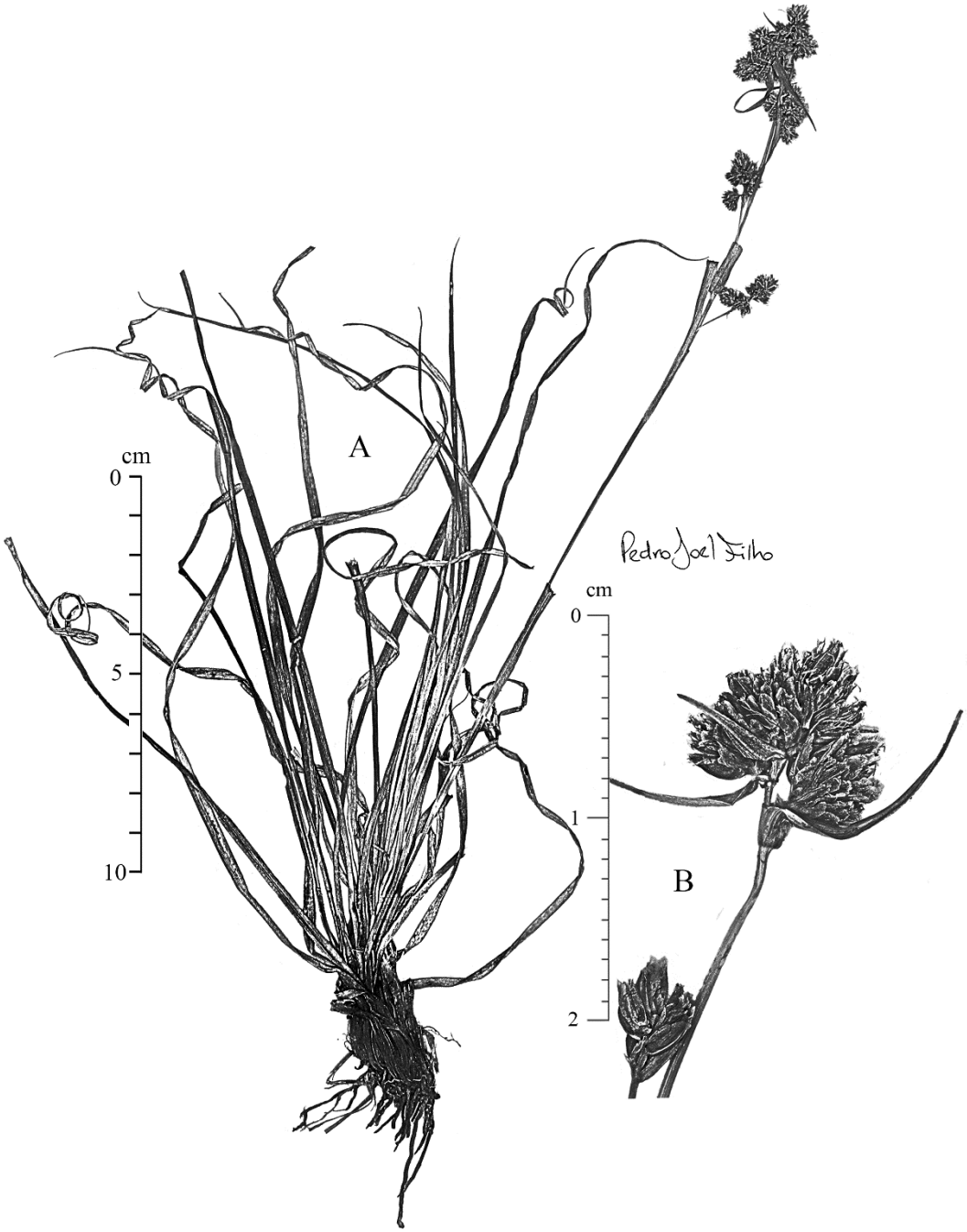

FIG. 5. *Rhynchospora praecincta* Maury *ex* Micheli. A. habit. B. synflorescence detail (*J. C. Lindeman et al. s. n.*).

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Conclusões finais

Os resultados mostraram que as seções *Laevinuces*, *Spermodontes* e *Tenues* não são monofiléticas, mas juntas formam um clado muito bem suportado, desta forma todas foram sinonimizadas em seção *Tenues*. Essa seção agora envolve 43 espécies no total, sendo 24 espécies aceitas mais 19 espécies novas. Através do conhecimento adquirido em campo, de referências bibliográficas, uma vasta revisão de herbário, esta tese apresenta uma nova chave para a seção *Tenues*, descrições e fotos de material de herbário, fotos de aquênios, e informação sobre hábitat e distribuição de todas as espécies. Cinco neótipos e quatorze lectótipos foram designados, bem como nove novas sinonimizações também foram feitas.