UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL

INSTITUTO DE BIOCIÊNCIAS

PROGRAMA DE PÓS-GRADUAÇÃO EM BOTÂNICA

ELEOCHARIS (CYPERACEAE) NA REGIÃO SUL DO BRASIL

Rafael Trevisan

Tese apresentada ao programa de Pós-Graduação em Botânica da Universidade Federal do Rio Grande do Sul, como parte dos requisitos para obtenção do título de Doutor em Ciências: Botânica.

ORIENTADORA: Profa. Dra. Ilsi Iob Boldrini

Porto Alegre – RS

2009

"...Taxonomy lays the foundations for the phylogenetic tree of life, it provides a requisite database for ecology and conservation science, and, not least, it makes accessible the vast and still largely unused benefits offered by biodiversity to humanity."

Edward O. Wilson

Dedico este trabalho a todos os taxonomistas que, mesmo sem muitos incentivos, continuam trabalhando em prol do conhecimento da Diversidade Brasileira.

AGRADECIMENTOS

À professora Ilsi Iob Boldrini pela orientação, amizade, confiança, pela alegria contagiante e por mostrar que um bom botânico deve conhecer mais do que o “seu” grupo de plantas. Sem sombra de dúvidas muito do que eu aprendi, não só de botânica, mas também da convivência profissional eu devo a essa verdadeira Mestra.

Aos meus pais, Isaltino e Cladis Trevisan pelo carinho, dedicação, confiança, “auxílio rancho” e principalmente por me apoiarem nas decisões.

Ao meu irmão Marcelo, à minha cunhada Ana Cláudia pelos almoços de Domingo e pela convivência em Porto Alegre.

Às minhas irmãs, Patrícia e Gabriela pela ajuda na digitação das informações do material examinado e na montagem das exsicatas, pela convivência, muitas vezes tempestuosa, e pelos momentos de alegria. E à Juliana B. Fernandes pela convivência em Porto Alegre.

À professora Silvia Miotto por permitir que eu saísse de “carona” nas coletas de seus alunos no início do curso quando eu não tinha suporte financeiro para o meu projeto.

À professora M. Socorro González-Elizondo pela amizade, por me encorajar a continuar trabalhando com Taxonomia e pelas valiosas sugestões e ensinamentos sobre a taxonomia do complexo gênero *Eleocharis*.

Ao amigo e estudioso de *Eleocharis*, Dr. David J. Rosen, pelas discussões, pelas fotos de tipos e pelas trocas de informações sobre a difícil tarefa de esclarecer a taxonomia do subg. *Limnochloa*.

Aos colegas Raquel Lüdtke e Ângelo Schneider, amigos verdadeiros e excelentes botânicos que tive o privilégio de conviver durante estes quatro anos, pela amizade, confiança, conversas botânicas e pelo besteirol de sempre.

À professora Hilda Longhi-Wagner pelas bibliografias emprestadas, pelas fotos e coletas de *Eleocharis* de diferentes regiões.

Aos Ciperólogos Marccus Alves e Ana Cláudia Araújo, pela gentileza em fornecer bibliografias, pelas fotos de tipos do NY e por acreditarem no meu trabalho através das oportunidades oferecidas.

Aos Drs. David Simpson e Jeremy Bruhl pelas bibliografias enviadas.

À curadora do herbário ICN, Mara Ritter e às funcionárias, Joana, Rumi e Camila, pelos auxílios constantes durante a realização deste trabalho.

Aos curadores dos herbários que gentilmente emprestaram material para o estudo.

Aos curadores e funcionários dos herbários estrangeiros que gentilmente enviaram fotos de tipos: Robert Vogt (B), Monika Steinhof (BREM), Olof Ryding (C), Gina Murrell (CGE), Emily Wood e Stephanie Zabel (GH), Angela Bond (K) e Arne Anderberg e Maria Backlund (S).

Aos funcionários do HBR, Dona Zilda, Seu Jurandir, e Daiane Martins, pela acolhida durante as visitas a Itajaí.

Ao pessoal do MBM, Dr. Gert Hatschbach, Osmar Ribas e Clarisse Polichesi pela hospitalidade durante a visita ao Museu Botânico.

Ao Prof. André Vanzela, ao doutorando Carlos R. M. da Silva e toda equipe do Labre da Universidade Estadual de Londrina pela acolhida durante minha estada em Londrina.

À professora Ana Odete Vieira, Daniel Falkenberg e Elide Pereira do Santos pela forma cordial com que me receberam nos herbários FUEL, FLOR e UPCB, respectivamente.

Ao Prof. Heinrich Hasenack e toda a equipe do Laboratório de Geoprocessamento, Centro de Ecologia/UFRGS, pelo apoio principalmente no período inicial do meu doutorado.

Ao professor Jefferson Prado pelo auxílio com algumas dúvidas nomenclaturais.

Ao pessoal da Biblioteca da Botânica, a Dilma, Ardiê e Luciano, por estarem sempre prontos para ajudar.

Aos companheiros de viagens de coleta, Ilsi Boldrini, Lilian Eggers, Raquel Lüdtke, Ângelo Schneider, Pedro Ferreira, Luciana Rogalski, Priscila Ferreira, Silvia Miotto, Guilherme Ceolin, Elisete Freitas, Verônica Thode, Sandra Muller, Giovana Vendruscolo e Seu Darcy, por tornarem as expedições menos cansativas e mais divertidas.

Aos colegas e amigos da sala 104, Raquel Lüdtke, Sonia Hefler, Liliana Essi, Pedro Ferreira e João Iganci, pelas conversas interessantes sobre vários assuntos, pelas bobagens e também por permitirem que eu espalhasse minhas coisas em vários pontos da sala.

Aos amigos, Cristiano Buzatto, Elisete Freitas, Fernando Rocha, Gabriela Silveira, Jaque Durigon, Josi Cerveira, Martin Molz, Regina Lerina, Robberson Setúbal, Rodney Schmidt, Rogério Both e Verônica Thode pelos papos descontraídos e nem por isso menos interessantes.

Às doutorandas carcinólogas Carolina Sokolowicz e Luciane Ayres Peres pela amizade de longa data, pelo carinho que sempre me trataram e pelas horas felizes compartilhadas.

Aos meus primos, Marcos Adriano e Marina Schleintvein pela amizade e pelas caronas nas viagens para Estrela Velha.

Ao Rodrigo Roland pelo auxílio na montagem de exsicatas.

Ao pessoal da Coordenação do PPG, profa. Tatiana Souza-Chies e ao Rodrigo Braga, pela solicitude sempre que precisei.

Aos professores do PPG pelos conhecimentos passados.

À Capes pela bolsa concedida.

Enfim, a todos que contribuíram de alguma forma para a realização deste trabalho.

Muito Obrigado!

SUMÁRIO

RESUMO

Eleocharis R. Br. (Cyperaceae) é um gênero cosmopolita que inclui mais de 200 espécies com alta riqueza em regiões tropicais e subtropicais da América. O gênero é reconhecido por apresentar colmos aéreos não ramificados, folhas reduzidas às bainhas, inflorescência ebracteada, constituída de uma única espigueta no ápice do colmo, e estilopódio engrossado e persistente no aquênio maduro. O presente estudo trata da revisão do gênero para o sul do Brasil e foi desenvolvido por meio de métodos tradicionais em morfologia comparativa. Os resultados obtidos são apresentados em cinco artigos independentes: **1)** o primeiro artigo apresenta a revisão taxonômica do gênero *Eleocharis* para o sul do Brasil com 44 espécies registradas; **2)** o segundo artigo traz a descrição de três novas espécies de *Eleocharis* subg. *Scirpidium*: *E. angustirostris, E. neesii* e *E. riograndensis*, incluindo também uma chave para a identificação das espécies do subgênero até então conhecidas para o Brasil; **3)** o terceiro artigo trata da descrição de cinco novas espécies de *Eleocharis* subg. *Eleocharis* ser. *Tenuissimae*: *E. angustispicula, E. densicaespitosa, E. hatschbachii, E. ramboana* e *E. urceolatoides.* Mesmo ocorrendo no Centro-Oeste do país, *E. angustispicula* e *E. hatschbachii* foram incluídas por pertencerem ao mesmo grupo. Além disso, são propostos a lectotipificação de *Eleocharis glauco-virens* e um novo sinônimo para *Eleocharis loefgreniana*. Também é apresentada uma chave preliminar para a identificação das espécies da série *Tenuissimae* ocorrentes no Brasil; **4)** o quarto artigo traz a descrição de três espécies novas: *Eleocharis pauciglumis, E. atrobrunnea* e *E. parvispicula*. A primeira pertence ao subgênero *Limnochloa* para a qual é apresentada uma chave para diferenciá-la de outras espécies similares. As outras duas espécies pertencem a *Eleocharis* subg. *Eleocharis* subser. *Ocreatae*, sendo apresentada uma chave para identificação de todas as espécies conhecidas para a subsérie no Brasil,

incluindo *E. schaffneri* que é tratada neste artigo como novo registro para o país (NE); **5)** o último artigo traz uma abordagem detalhada de *Eleocharis kleinii*, a qual foi descrita em 1966 e desde então não havia sido referida em outras publicações como um táxon confirmado para a região. Este artigo foi publicado durante a elaboração da tese.

Palavras-chave: América do Sul, Brasil, Cyperaceae, *Eleocharis*, Novo Mundo

ABSTRACT

Eleocharis R. Br. (Cyperaceae) is a worldwide genus that includes more than 200 species with a remarkable richness in tropical and subtropical America. It is recognized by having unbranched aerial culms, leaves reduced to tubular sheaths, inflorescence constituted of one spikelet on the apex of culms without involucral bracts, and the stylopodium enlarged and persistent on the mature achene. The taxonomic study of the genus *Eleocharis* for Southern Brazil was carried out using the traditional methods of comparative morphology. The results are presented in five independent articles: **1)** the first article presents a taxonomic revision of the genus *Eleocharis* for Southern Brazil, with 44 recorded species; **2)** the second article provides description of three new species of *Eleocharis* subg. *Scirpidium*: *E. angustirostris*, *E. neesii*, and *E. riograndensis*, and includes a key to identify the species of the subgenus occurring in Brazil; **3)** the third article provides description of five new species of *Eleocharis* subg. *Eleocharis* ser. *Tenuissimae*: *E. angustispicula*, *E. densicaespitosa*, *E. hatschbachii*, *E. ramboana*, and *E. urceolatoides*. Even occurring in Central-West of Brazil, *E. angustispicula* and *E. hatschbachii* were included because they belong to the same series. Furthermore, we propose the lectotypification of *Eleocharis glauco-virens* and a new synonym for *Eleocharis loefgreniana*. A preliminary key is also presented to identify the species of the series *Tenuissimae* occurring in Brazil; **4)** the fourth article offers a description of three new species: *Eleocharis pauciglumis*, *E. atrobrunnea*, and *E. parvispicula*. The first one belongs to subgenus *Limnochloa* and a key to distinguish it from other similar species is presented. The other two species belong to *Eleocharis* subg. *Eleocharis* ser. *Maculosae* subser. *Ocreatae*. It is presented a key to identify the species known to subseries in Brazil, including *E. schaffneri* which is a new record for the country (NE); **5)** the last article provides a detailed approach of *Eleocharis kleinii*, which was

described in 1966 and since then has been overlooked. This paper was published during the development of the thesis.

Key words: Brazil, Cyperaceae, *Eleocharis*, New World, South America

INTRODUÇÃO GERAL

Cyperaceae Juss. é composta por mais de 5.000 espécies, distribuídas em 104 gêneros (Goetghebeur 1998), sendo considerada a terceira maior família das monocotiledôneas. É cosmopolita, com ocorrência em diferentes habitats, preferencialmente os pouco drenados, como brejos, pântanos, margens de rios, charcos e ambientes de restinga (Dahlgren *et al*. 1985; Goetghebeur 1998; Judd *et al*. 1999).

A diversidade dessa família no Brasil aos poucos vem sendo mais bem conhecida, e de acordo com levantamento recente de Alves *et al.* (2009), a família Cyperaceae está muito bem representada no país, onde ocorrem cerca de 666 espécies, distribuídas em 42 gêneros. Este mesmo levantamento apontou que os gêneros mais abundantes no país são: *Rhynchospora* Vahl, *Cyperus* L., *Scleria* Bergius e *Eleocharis* R.Br., em ordem decrescente do número de espécies.

A família Cyperaceae figura entre as três maiores famílias das áreas campestres, juntamente com Asteraceae e Poaceae (Araújo 2003). Considerando-se que a Região Sul do Brasil apresenta extensas áreas campestres, a contribuição desta família na diversidade destes ambientes é considerável. Além disso, possui uma grande importância na composição florística e fitofisionômica nas áreas de banhados e alagados, em conjunto com várias outras espécies de macrófitas pertencentes a famílias diversas.

As duas mais recentes classificações para a família Cyperaceae, baseadas em dados morfológicos, diferem nos agrupamentos supragenéricos em tribos e destas em subfamílias. Bruhl (1995) reconheceu duas subfamílias, Cyperoideae e Caricoideae, enquanto Goetghebeur (1998) reconheceu quatro subfamílas, Cyperoideae, Caricoideae, Sclerioideae e Mapanioideae. As classificações também diferem na circunscrição das

tribos, com 12 tribos reconhecidas por Bruhl (1995) e 14 tribos delimitadas por Goetghebeur (1998).

Estudos recentes de filogenia têm apontado que nenhuma das propostas de classificações até então apresentam correlação total com as topologias das árvores obtidas, exceto para alguns agrupamentos menores (Muasya *et al.* 1998, Muasya *et al.* 2000, Simpson *et al.* 2007, Muasya *et al.* 2009a). Além disso, a filogenia aponta Cyperaceae como grupo-irmão da família Juncaceae, ambas aceitas na ordem Poales (Chase *et al.* 2005). A subfamília Mapanioideae é apontada como o grupo cuja divergência se deu mais cedo dentro da família (Muasya *et al.* 2000, Simpson *et al.* 2003).

Janssen & Bremer (2004) estimaram o tempo evolutivo para a divergência entre Cyperaceae e Juncaceae em 88 Ma antes do presente (AP), o que corresponde ao Cretáceo Médio, sendo que o aumento na diversificação da família é estimado em 76 Ma AP.

Os dados moleculares também têm causado controvérsia na aceitação de alguns gêneros, principalmente na amplitude de circunscrição. Este é o caso do gênero *Cyperus sensu stricto* que, nesta circunscrição, não aparece como um agrupamento natural (Muasya *et al.* 2002, Muasya *et al.* 2009b).

Apesar dos estudos moleculares terem avançado na família, perdura a grande dificuldade na identificação de suas espécies e, especialmente, a falta de trabalhos taxonômicos sobre as espécies que ocorrem no Brasil e sobre a potencialidade das mesmas em termos econômicos. Simpson & Inglis (2001) referiram que mais de 500 espécies de 45 gêneros, distribuídas nos cinco continentes, naturais ou introduzidas, são importantes economicamente. Algumas delas, segundo os autores, constituem na base econômica de localidades onde são nativas.

Dentre os trabalhos publicados da flora brasileira que incluíram as Cyperaceae, destaca-se o de Nees (1842), cuja área de abrangência foi todo o território nacional, apresentando 314 espécies distribuídas em 65 gêneros. Os outros artigos conhecidos são restritos a alguns estados, como o de Barros (1960), que até o momento figura como uma das principais obras para a identificação de Cyperaceae no sul do Brasil, que citou a ocorrência de 164 espécies para o estado de Santa Catarina (SC), e outras 27 para Estados vizinhos ou países limítrofes, e que possivelmente ocorram em SC. Luceño *et al.* (1997) catalogaram 136 espécies distribuídas em 22 gêneros para os estados da Paraíba e Pernambuco. Prata (2002) listou 125 espécies, pertencentes a 22 gêneros, para o estado de Roraima. Guaglianone *et al.* (2008) listaram 284 distribuídos em 29 gêneros para a Região Sul do Brasil.

Há ainda outros trabalhos que enfocaram a família Cyperaceae, em áreas mais restritas, como o de Martins *et al*. (1999), para o Parque Estadual César Vinha, no Espirito Santo, Muniz (2001), para a Ilha do Cardoso, São Paulo, e Trevisan *et al.* (2008), para o Parque Estadual de Itapuã, Rio Grande do Sul.

Além destes trabalhos, envolvendo as ciperáceas brasileiras como um todo, há também aqueles realizados com um ou dois gêneros como Muniz & Shepherd (1987), com *Scleria* Berg. para o estado de São Paulo; Araújo & Longhi-Wagner (1996), com *Cyperus* L. subg. *Anosporum* (Nees) C.B. Clarke no Rio Grande do Sul; Araújo (2001), com *Rhynchospora* sect. *Pluriflorae* Kük. no Brasil; Rocha & Luceño (2002), com o estudo taxonômico de *Rhynchospora* Vahl sect. *Tenues* para o Brasil; Alves (2003), com *Hypolytrum* Rich. para os neotrópicos; Prata (2004), com *Bulbostylis* Kunth no Brasil; Vitta (2005), com a revisão dos gêneros *Cryptangium* Schrad. ex Nees e *Lagenocarpus* Nees; Hefler (2007), com *Cyperus* L. subg. *Cyperus* na Região Sul do Brasil; Faria (1998) e Gil & Bove (2007), com estudos taxonômicos de *Eleocharis* para

São Paulo e Rio de Janeiro, respectivamente, Trevisan *et al.* (2007) e Trevisan & Boldrini (2008), com os gêneros *Kyllinga* Rottb. e *Eleocharis*, respectivamente, para o Rio Grande do Sul.

O GÊNERO *ELEOCHARIS*

Eleocharis R. Br. é um gênero cosmopolita, com aproximadamente 200 espécies concentradas, principalmente, nas regiões tropicais e subtropicais da América (Goetghebeur 1998).

As espécies de *Eleocharis* são higrófilas, ocorrendo geralmente em ambientes de borda de lagos, brejos, rios, pântanos, restingas, cachoeiras, e solos úmidos de locais abertos. A reprodução das espécies pode ser tanto vegetativa quanto sexuada, com polinização anemófila.

O gênero *Eleocharis* é caracterizado por (i) colmos aéreos simples, (ii) folhas reduzidas a bainhas, (iii) inflorescência ebracteada constituída de uma única espigueta no ápice do colmo e (iv) estilopódio engrossado e persistente no ápice do aquênio.

Segundo Svenson (1929), *Eleocharis* fazia parte do gênero *Scirpus* L., tendo sido separado deste por Robert Brown, em 1810. Essa separação foi justificada pelo fato de *Eleocharis* possuir uma inflorescência única, sem brácteas involucrais, e estilopódio persistente, endurecido, dilatado e articulado com o ovário. *Scirpus* L. *s.s.*, de acordo com Goetghebeur (1998), possui inflorescência composta, com brácteas involucrais, e estilopódio indistinto e não espessado.

A relação de *Eleocharis* com outros gêneros de Cyperaceae é algo controverso, visto que aparece associado a diferentes gêneros com baixo suporte nos clados formados (Muasya *et al.* 2000, Simpson *et al.* 2007, Muasya *et al.* 2009a). A mais recente filogenia de Cyperaceae (Muasya *et al.* 2009a) apontou *Eleocharis* como grupo irmão

de *Chillania* Roiv. Entretanto, este último é aceito em *Eleocharis* por alguns autores (Seberg 1985, Goetghebeur 1998).

Há uma grande dificuldade em estabelecer uma classificação infragenérica para *Eleocharis*, através de aspectos macromorfológicos. Em grande parte isto se deve à redução substancial nas estruturas florais e vegetativas nas espécies que compõem o gênero (Simpson 1988; Ueno *et al.* 1989; Menapace 1991; González-Elizondo & Tena-Flores 2000).

González-Elizondo & Peterson (1997) e Kukkonen (1990) realizaram um apanhado histórico sobre as classificações infragenéricas em *Eleocharis*, salientando os agrupamentos realizados e os níveis taxonômicos adotados pelos diferentes autores.

Entre algumas classificações propostas, a de Svenson (1939) dividiu o gênero em nove séries com algumas espécies *incertae sedis*. Kukkonen (1990) propôs a classificação das espécies de *Eleocharis* nos subgêneros *Eleogenus* (Nees) C.B. Clarke, *Zinserlingia* T.V. Egorova, *Scirpidium* (Nees) Kukkonen, *Limnochloa* (P. Beauv. ex T. Lestib.) Torr. e *Eleocharis* R.Br., e em 13 seções, tendo sido a seção *Eleocharis* subg. *Eleocharis* sect. *Tenuissimae* (C.B. Clarke) T. Egor. & Khoi dividida em três séries. González-Elizondo & Peterson (1997) divulgaram um sistema de classificação que dividiu o gênero *Eleocharis* nos subgêneros *Scirpidium*, *Limnochloa*, *Zinserlingia* e *Eleocharis*, os quais apresentam, conjuntamente, sete seções, oito séries e sete sub-séries, aceitando algumas das séries propostas por Svenson (1939), e descrevendo outras séries novas.

Tanto a classificação de Svenson (1939), quanto as classificações de Kukkonen (1990) e González-Elizondo & Peterson (1997), levaram em consideração apenas caracteres ligados à macromorfologia das plantas.

Estudos filogenéticos recentes demonstraram que, enquanto algumas categorias infragenéricas formam agrupamentos monofiléticos, outras são parafiléticas ou completamente artificiais (Roalson & Friar 2000, Roalson & Hinchliff 2007). Além disso, quando a morfologia é comparada com as topologias da filogenia molecular fica claro que muitos caracteres morfológicos são plesiomórficos ou tiveram múltiplas origens (González-Elizondo & Peterson 1997, Roalson & Hinchliff 2007).

Segundo González-Elizondo & Tena-Flores (2000), *Eleocharis* é um gênero amplamente distribuído, com cerca de 145 espécies conhecidas para o Novo Mundo, onde os quatro subgêneros, *sensu* González-Elizondo & Peterson (1997), estão representados. De acordo com estes autores, a maior diversidade e variabilidade morfológica, aliadas a mais ampla distribuição no gênero estão em *Eleocharis* ser. *Tenuissimae* (C.B. Clarke) Svenson (*sensu* González-Elizondo & Peterson 1997), a qual inclui complexos de espécies intimamente relacionadas, especialmente na América do Sul, indicando especiação ativa (González-Elizondo & Tena-Flores 2000).

Para o Brasil, um levantamento recente indicou a ocorrência de 65 espécies de *Eleocharis* (Alves *et al.* 2009). Entretanto não há um trabalho taxonômico de abrangência para o território brasileiro, sendo que a maioria dos trabalhos encontrados são listas de cunho regional. Exemplos destes trabalhos são o de Rambo (1959) e Bertels (1964a), para o Rio Grande do Sul, com 22 e 24 espécies e duas variedades respectivamente. Além desses, cabe destacar ainda os trabalhos de Bertels (1964b), Irgang & Gastal Jr. (1996), Gastal Jr. & Irgang (1997), Luceño *et al*. (1997), Rosa & Irgang (1998) e Martins *et al*. (1999).

Até o momento, os trabalhos taxonômicos com *Eleocharis* no Brasil são o de Barros (1960), para Santa Catarina, onde são citadas 25 espécies, Faria (1998), que estudou o gênero para o estado de São Paulo e encontrou 36 espécies e uma variedade

não típica, Gil & Bove (2007), que levantaram 19 espécies para o estado do Rio de Janeiro e Trevisan & Boldrini (2008), que levantaram 27 espécies para o Rio Grande do Sul.

Alguns trabalhos que tratam das floras de países que fazem fronteira com a Região Sul do Brasil, como o Uruguai (Marchesi 1984) e Argentina (Barros 1928, Pedersen 1968), têm contribuindo para o conhecimento das espécies do gênero ocorrentes no sul do país.

As obras que englobam o maior número de espécies com ocorrência no Rio Grande do Sul são as de Svenson (1929, 1932, 1934, 1937, 1939) e Barros (1928, 1947, 1960).

Recentemente, estudos abordando citogenética de espécies ocorrentes no Brasil vem sendo publicados (Da Silva *et al.* 2005, 2008a, 2008b), contribuindo ainda mais para esclarecer as relações de parentesco entre as espécies e a história evolutiva por trás deste gênero tão complexo e diverso.

OBJETIVOS

Tendo em vista os dados obtidos durante a revisão do gênero *Eleocharis* para o Rio Grande do Sul, as dúvidas quanto à delimitação de algumas espécies, possíveis espécies novas e as perspectivas de um estudo em uma área geográfica mais ampla, traçaram-se os seguintes objetivos para o presente trabalho:

- Realizar o levantamento do gênero *Eleocharis* para a Região Sul do Brasil.
- Ampliar a coleção de exsicatas do gênero.
- Fornecer subsídios para o reconhecimento das espécies.
- Fornecer informações de habitat e distribuição das espécies.

REFERÊNCIAS BIBLIOGRÁFICAS

ALVES, M.V. 2003. *Hypolytrum Rich. (Cyperaceae) nos Neotrópicos*. Tese de Doutorado: Universidade de São Paulo. 163p.

____; ARAÚJO, A.C.; PRATA, A.P.; VITTA, F.A.; HEFLER, S.M.; TREVISAN, R.; GIL, A.B.; MARTINS, S. & THOMAS, W.W. 2009. Diversity of Cyperaceae in Brazil. *Rodriguesia* 60(3): XXX-XXX (in press).

ARAÚJO, A.C. 2001. *Revisão de Rynchospora* sect. *Pluriflorae* Kük. *(Cyperaceae***)**. Tese de Doutorado: Universidade de São Paulo. 370p.

____. 2003. Cyperaceae nos campos sul-brasileiros. In: JARDIM, M.A.; BASTOS, M.N.; SANTOS, J.U. M. dos (eds.) *Desafios da Botânica Brasileira no novo Milênio: Inventário, Sistematização e Conservação da Diversidade Vegetal*. 54° Congresso de Botânica - Mesa Redonda. Belém: MPEG, UFRA; Embrapa, Brasil/ Museu Paraense Emílio Goeldi. Pp.127-130.

____. & LONGHI-WAGNER, H.M. 1996. Levantamento taxonômico de *Cyperus* L. subg. *Anosporum* (Nees) C.B. Clarke (Cyperaceae – Cypereae) no Rio Grande do Sul, Brasil. *Acta botanica brasilica* 10(1): 153-192.

BARROS, M. 1928. Ciperáceas Argentinas I: gênero *Heleocharis* R.Br. *Anales del Museo Nacional de Historia Natural "Bernardino Rivadavia"*, 34: 425-496.

____. 1947. Cyperaceae. In: DESCOLE, H. *Genera et Species Plantarum Argentinarum*. Tomo 4, parte 1. Pp. 1-243.

____. 1960. Las Ciperáceas del Estado de Santa Catalina. *Sellowia*, 12: 181-448.

BERTELS, A. 1964a. Ciperáceas no R. G. S. In: *Anais***...** XV Congresso Nacional de Botânica (Sociedade Botânica do Brasil, ed.) SBB, Porto Alegre. Pp. 77-90.

____. 1964b. Ciperáceas e Juncáceas nos arrozais. In: *Anais***...** XV Congresso Nacional de Botânica (Sociedade Botânica do Brasil, ed.) SBB, Porto Alegre. Pp. 251-254.

BRUHL, J. J. 1995. Sedge genera of the world: Relationships and a new classification of the Cyperaceae. *Australian Systematic Botany* 8: 125–305.

CHASE, M.W.; FAY, M.F.; DEVEY, D.S.; MAURIN, O.; RONSTED, N.; DAVIES, T.J.; PILLON, Y.; PETERSEN, G.; SEBERG, O.; TAMURA, M.N.; ASMUSSEN, C.B.; HILU, K.; BORSCH, T.; DAVIS, J.I.; STEVENSON, D.W.; PIRES, J.C.; GIVNISH, T.J.; SYTSMA, K.J.; MCPHERSON, M.A.; GRAHAM, S.W. & RAI, H.S. 2005. Multigene analyses of Monocot relationships: a summary. *Aliso* 22(1): 62-74.

DAHLGREN, R. M. T., Clifford, H. T., Yeo, P. F. 1985. *The families of the monocotyledons: structure, evolution and taxonomy*. Berlin: Springer-Verlag. 520p.

DA SILVA C. R. M., GONZÁLEZ-ELIZONDO M. S., VANZELA A. L. L. 2005. Reduction of chromosome number in *Eleocharis subarticulata* (Cyperaceae) by multiple translocation. *Botanical Journal of the Linnean Society* 149: 457 – 464.

DA SILVA, C. R. M., GONZÁLEZ-ELIZONDO, M. S., VANZELA, A. L. L. 2008a. Chromosome Reduction in *Eleocharis maculosa* (Cyperaceae). *Cytogenetic and Genome Research* 122: 175 – 180.

DA SILVA, C. R. M., GONZÁLEZ-ELIZONDO, M. S., REGO, L. N. A. A., TOREZAN, J. M. D., VANZELA, A. L. L. 2008b. Cytogenetical and cytotaxonomical analysis of some Brazilian species of *Eleocharis*. *Australian Journal of Botany* 56: 82 – 90.

FARIA, A. D. 1998. *O gênero Eleocharis R. Br. (Cyperaceae) no Estado de São Paulo*. Dissertação de Mestrado: Universidade Estadual de Campinas, Campinas. 150p.

GASTAL Jr., C. V. de S. & IRGANG, B. E. 1997. Levantamento de macrófitas aquáticas do Vale do Rio Pardo, Rio Grande do Sul. *Iheringia Sér. Botânica* 49: 3-9

GIL, A.S.B & BOVE, C.P. 2007. *Eleocharis* R. Br. (*Cyperaceae*) no Estado do Rio de Janeiro, Brasil. *Biota Neotrop***.** 7(1): http://www.biotaneotropica.org.br/v7n1/pt/abstract?Taxonomicreview+bn00507012007 ISSN 1676-0603

GOETGHEBEUR, P. 1998. Cyperaceae. In: KUBITZKI, K. (ed.). *The families and genera of vascular plant: IV. Flowering plants – monocotyledons.* Berlin: Springer-Verlag. Pp. 141-190.

GONZÁLEZ-ELIZONDO, M. S. & PETERSON, P. M. 1997. A classification of and key to the supraspecific taxa in *Eleocharis* (Cyperaceae). *Taxon,* 46: 433-449.

____. & TENA-FLORES, J. A. 2000. *Eleocharis* (Cyperaceae) in the New World. In: WILSON, K. L. & MORRISON, D. A. (eds.). *Monocots: Systematics and Evolution.* Melbourne: CSIRO. Pp. 637-641.

GUAGLIANONE, E.R. (org.) 2008. Cyperaceae. In: ZULOAGA, F.O.; MORRONE, O. & BELGRANO, M.J. (eds.) *Catalogo de las Plantas Vasculares del Cono Sur* (MSB 107). Vol. I. St. Loius: Missouri Botanical Garden Press. Pp. 302-400.

HEFLER, S.M. 2007. *Cyperus L. subgen. Cyperus (Cyperaceae) na região Sul do Brasil.* Tese de Doutorado: Universidade Federal do Rio Grande do Sul, Porto Alegre. 188p.

IRGANG, B. E. & GASTAL Jr, C. V. S. 1996. *Macrófitas aquáticas da Planície Costeira do RS*. Porto Alegre. 290 p.

JANSSEN, T. & BREMER, K. 2004. The age of major monocot groups inferred from 800+rbcL sequences. *Botanical Journal of the Linnean Society* 146: 385–398.

JUDD, W. S., CAMPBELL, C. S., KELLOGG, E. A., STEVENS, P. F. 1999. *Systematics: a phylogenetic approach.* Sinauer Associates, Inc: Massachusetts. USA. 464p.

KUKKONEN, I. 1990. On the genus *Eleocharis* (Cyperaceae) in Flora Iranica area, with revised infrageneric classification and nomenclature. *Annales Botanici Fennici* 27: 109-117.

LUCEÑO, M. & ALVES, M. V. & MENDES, A. P. 1997. Catálogo florístico y claves de identificación de las ciperáceas de los Estados de Paraíba y Pernambuco (nordeste de Brasil). *Anales del Jardín Botánico de Madrid* 55(1): 67-100.

MARCHESI, E. 1984. Cyperaceae. In: LOMBARDO, A. (ed.). *Flora Montevidensis: monocotiledóneas*. Montevideo: Intendencia Municipal de Montevideo. Tomo III. Pp. 279-342.

MARTINS, M. L. L., CARVALHO-OKANO, R. M. de, LUCEÑO, M. 1999. Cyperaceae do Parque Estadual Paulo César Vinha, Guarapi, Espírito Santo, Brasil. *Acta botanica brasilica* 13(2): 187-222.

MENAPACE, F. J. 1991. A preliminary micromorphological analysis of *Eleocharis* (Cyperaceae) achenes for systematic potencial. *Canadian Journal of Botany* 69: 1533-1541.

MUASYA, A. M., SIMPSON, D. A., CHASE, M.W. & CULHAM, A. 1998. An assessment of the suprageneric phylogeny in Cyperaceae using rbcL DNA sequences. *Plant Systematic and Evolution* 211: 257–271.

MUASYA, A.M.; BRUHL, J.J.; SIMPSON, D.A.; CULHAM, A.; CHASE, M.W. 2000. Suprageneric phylogeny of Cyperaceae: a combined analysis. In: WILSON, K. L. & MORRISON, D. A. (eds.). *Monocots: Systematics and Evolution*. Melbourne: CSIRO. Pp. 593-601.

MUASYA, A.M.; SIMPSON, D.A.; CHASE, M.W. 2002. Phylogenetic relationship in *Cyperus* L. *s.l.* (Cyperaceae) Inferred from plastid DNA sequence data. *Botanical Journal of the Linnean Society* 138: 145-153.

MUASYA, A.M.; D.A. SIMPSON; G.A. VERBOOM; P. GOETGHEBEUR; R.F. C. NACZI; M.W. CHASE & E. SMETS. 2009a. Phylogeny of Cyperaceae Based on DNA Sequence Data: Current Progress and Future Prospects. *The Botanical Review* 75(1):2–21.

MUASYA, A.M.; VRIJDAGHS, A.; SIMPSON, D.A.; CHASE, M.W.; GOETGHEBEUR, P. & SMETS, E. 2009b. What is a Genus in Cypereae: Phylogeny, Character Homology Assessment and Generic Circumscription in Cypereae. *The Botanical Review* 75(1):52–66.

MUNIZ, C. 2001. *Cyperaceae*. In: MELO, M.M.F.; BARROS, F.; CHIEA, S.A.C.; KIRIZAWA, M.; JUNG-MENDAÇOLLI, S.L.; WANDERLEY, M.G.L. (eds.). *Flora Fanerogâmica da Ilha do Cardoso*. São Paulo: Instituto de Botânica. Pp. 47-90.

____. & SHEPHERD, J. 1987. O gênero *Scleria* Berg. (Cyperaceae) no estado de São Paulo. *Revista Brasileira de Botânica* 10: 63-94.

NEES, C.G.D. 1842. Cyperaceae. In: MARTIUS, C.F.P. (ed.) *Flora Brasiliensis*. Monachii: Typographia Regia. Vol. 2. Pp. 1-226.

PEDERSEN, T.M. 1968. *Eleocharis* R. Br. In: CABRERA, A. L. (ed.). *Flora de la Provincia de Buenos Aires*. Parte I. Buenos Aires: Coleccion Cientifica del I.N.T.A. Pp. 340-355.

PRATA, A.P.N. 2002. Listagem florística das Ciperaceae do estado de Roraima, Brasil. *Hoehnea* 29(2): 93-107.

____. 2004. *O gênero Bulbostylis Kunth (Cyperaceae) no Brasil*. Tese de Doutorado: Universidade de São Paulo – Instituto de Biociências. São Paulo. 197p.

RAMBO, B. 1959. Cyperaceae Riograndenses. *Pesquisas* 3: 354-453.

ROALSON, E. H. & FRIAR, E. A. 2000. Infrageneric classification of Eleocharis (Cyperaceae) revisited: evidence from the Internal Transcribed Spacer (ITS) region of nuclear ribosomal DNA. *Systematic Botany* 25(2): 323-336.

ROALSON, E. H. & HINCHLIFF, C. 2007. Phylogenetic relationships in *Eleocharis* R.Br. (*Cyperaceae*): comparisons with classification, morphology, biogeography and physiology, In: BARBOSA, L.M. & DOS SANTOS JR, .N.A. (Orgs.) *A Botânica no Brasil: pesquisa ensino e políticas públicas*. 58º Congresso Nacional de Botânica. Sociedade Botânica do Brasil: São Paulo. Pp. 304-307.

ROCHA, E.A. & LUCEÑO, M. 2002. Estudo taxonômico de *Rhynchospora* Vahl Seção *Tenues* (Cyperaceae) no Brasil. *Hoehnea* 29(3): 189-214.

ROSA, F.F. da & IRGANG, B.E. 1998. Comunidades vegetais de um segmento da planície de inundação do Rio dos Sinos, Rio Grande do Sul, Brasil. *Iheringia Sér. Botânica* 50: 75-87.

SEBERG, O. 1985. The identity of *Chillania pusilla* Roiv. (Cyperaceae). *Systematic Botany* 10: 239-240.

SIMPSON, D. A. 1988. Some problems in *Eleocharis*. Notes on Brazilian Cyperaceae: III. *Kew Bulletin* 43(1): 127-134.

SIMPSON, D.A. & INGLIS, C.A. 2001. Cyperaceae of Economic, Ethnobotanical and Horticultural Importance: A Checklist. *Kew Bulletin* 56(2): 257-360.

SIMPSON, D.A.; FURNESS, C.A.; HODKINSON, T.R.; MUASYA, A.M. & CHASE, M.W. 2003. Phylogenetic relationships in Cyperaceae subfamily Mapanioideae inferred from pollen and plastid DNA sequence data. *American Journal of Botany* 90(7): 1071-1086.

SIMPSON, D.A., MUASYA, A.M., ALVES, M., BRUHL, J.J., DHOOGE, S., CHASE, M.W., FURNESS, C.A., GHAMKHAR, K., GOETGHEBEUR, P., HODKINSON, T.R., MARCHANT, A.D., REZNICEK, A.A., NIEUWBORG, R., ROALSON, E.H., SMETS, E., STARR, J.R., THOMAS, W.W., WILSON, K.L. & ZHANG, X. 2007. Phylogeny of Cyperaceae based on DNA sequence data - a new rbcL analysis. *Aliso* 23: 72-83.

SVENSON, H. K. 1929. Monographic Studies in the Genus *Eleocharis* I. *Rhodora* 31: 121-135, 152-163, 167-191, 199-219, 224-242.

____. 1932. Monographic Studies in the Genus *Eleocharis* II. *Rhodora* 34: 193-203, 215-227.

____. 1934. Monographic Studies in the Genus *Eleocharis* III. *Rhodora* 36: 377-389.

____. 1937. Monographic Studies in the Genus *Eleocharis* IV. *Rhodora* 39: 210-231, 236-273.

____. 1939. Monographic Studies in the Genus *Eleocharis* V. *Rhodora* 41: 1-19, 43-77, 90-110.

TREVISAN, R.; LÜDTKE, R.; BOLDRINI, I.I. 2007. O gênero *Kyllinga* Rottb. (Cyperaceae) no Rio Grande do Sul, Brasil. *Revista Brasileira de Biociências* 5(2-3): 27-36.

TREVISAN, R. & BOLDRINI. I.I. 2008. O gênero *Eleocharis* R. Br. (Cyperaceae) no Rio Grande do Sul, Brasil. *Revista Brasileira de Biociências* 6(1): 7-67.

TREVISAN, R.; FERREIRA, P.M.A. & BOLDRINI, I.I. 2008. A família Cyperaceae no Parque Estadual de Itapuã, Viamão, Rio Grande do Sul, Brasil. *Revista Brasileira de Biociências* 6(3): 217-244.

UENO, O.; SAMEJIMA, M.; KOYAMA, T. 1989. Distribution and evolution of C_4 syndrome in *Eleocharis*, a sedge group inhabiting wet and aquatic environments, based on culm anatomy and carbon isotope ratios. *Annals of Botany* 64: 425-438.

VITTA F. A. 2005. *Revisão taxonômica e estudos morfológicos e biossistemáticos em Cryptangium Schrad. ex Nees e Lagenocarpus Nees (Cyperaceae: Cryptangieae).* Tese de Doutorado: Universidade Estadual de Campinas, Campinas. 294p.

Taxonomia do gênero *Eleocharis*

APRESENTAÇÃO

Eleocharis é um dos gêneros cuja taxonomia é complicada de ser trabalhada devido à extrema redução de suas estruturas. Por conta disto, antes de entrarmos nos artigos propriamente ditos apresentamos uma breve abordagem sobre a morfologia do gênero com o objetivo de facilitar o entendimento do que vem a seguir.

Os resultados da tese estão organizados em cinco artigos independentes:

Artigo 1. **Synopsis of the genus *Eleocharis* (Cyperaceae) in Southern Brazil.** Este artigo será submetido para publicação na Revista Brasileira de Biociências.

Artigo 2. **Three new species of *Eleocharis* subg. *Scirpidium* (Cyperaceae), and a key to identify the species of the subgenus occurring in Brazil.** Este artigo será submetido para publicação na revista Novon.

Artigo 3. **Novelties in *Eleocharis* ser. *Tenuissimae* (Cyperaceae), and a key to identify the species of the series occurring in Brazil.** Este artigo será submetido para publicação na revista Systematic Botany.

Artigo 4. **Some Novelties in *Eleocharis* subg. *Limnochloa* and *Eleocharis* subg. *Eleocharis* subser. *Ocreatae* (Cyperaceae) from Brazil.** Este artigo será submetido para publicação na revista Brittonia.

Artigo 5. **Rediscovery of *Eleocharis kleinii* (Cyperaceae), an overlooked species from the highlands of South Brazil.** Este artigo foi publicado no *Journal of the Botanical Research Institute of Texas* 1(2): 1119–1124. 2007.

Todos os artigos aqui apresentados estão no formato adequado para publicação nos referidos periódicos.

As espécies novas aqui descritas não são consideradas validamente publicadas conforme *art. 30* do Código Internacional de Nomenclatura Botânica (Viena - Áustria).

ASPECTOS MORFOLÓGICOS

Nesta seção pretendemos enfatizar principalmente os aspectos morfológicos peculiares ao gênero *Eleocharis* seguindo a terminologia e conceitos adotados em trabalhos previamente publicados para o gênero (Svenson 1929, 1932, 1934, 1937, 1939; González-Elizondo 1994; Smith *et al.* 2002, Rosen *et al.* 2007, 2008; Gil & Bove 2007; e Trevisan & Boldrini 2008) e outros trabalhos com a família Cyperaceae (Kukkonen 1994, Goetghebeur 1998) e literatura clássica de terminologia botânica (Radford *et al.* 1974, Font Quer 1993).

É importante salientar que para a identificação de uma espécie de *Eleocharis* é necessária a associação de várias características morfológicas, entretanto estas características nem sempre são fáceis de detectar a campo, principalmente devido ao tamanho reduzido das estruturas.

Sistema subterrâneo e hábito

Em geral as espécies de *Eleocharis* apresentam o sistema caulinar subterrâneo de alta complexidade, de modo que sua descrição para fins taxonômicos geralmente é algo muito simplificado e dependente da percepção e meticulosidade de cada taxonomista. Talvez esse seja o motivo desta estrutura ser tão pouco usada para fins de distinção entre espécies.

Neste trabalho o sistema subterrâneo é tratado de forma simplificada, de modo que os descritores adotados são bastante generalistas, numa tentativa de facilitar o entendimento e uso do trabalho por leitores que não estão muito familiarizados com a morfologia do gênero.

As espécies são geralmente cespitosas, cespitoso-rizomatosas ou cespitoso-estoloníferas, e a presença ou ausência dessa complexidade no sistema subterrâneo está relacionada à idade das plantas. Indivíduos jovens são cespitosos e não apresentam lignificação na base, mesmo daquelas espécies com forte lignificação, quando indivíduos adultos.

Algumas espécies cespitosas apresentam crescimento vertical pronunciado, como é o caso de *Eleocharis viridans*, o qual apresenta uma lignificação na base, na qual ficam aderidos os colmos remanescentes (Figura 1A). Outras espécies, como *E. bicolor* e *E. loefgreniana*, aparentemente não apresentam formação de rizomas e nem lignificação na base da planta, o que é um forte indício de um ciclo de vida anual ou de vida curta.

Em *Eleocharis densicaespitosa* e *E. quinquangularis* os rizomas são curtos, conferindo um aspecto cespitoso com grande densidade de colmos (Figura 2A), enquanto que em *E. montana*, *E. parodii,* e *E. maculosa*, os rizomas alongados de entrenós curtos conferem um aspecto de crescimento em uma única direção, ou seja, os colmos que emergem dos entrenós do rizoma ficam alinhados no sentido de crescimento do mesmo (Figura 2B, D).

Espécies como *Eleocharis laeviglumis, E. kleinii*, *E. acutangula, E. bonariensis* e espécies afins apresentam estolhos subterrâneos com entrenós alongados (Figura 1B). Nestas espécies, geralmente os nós que brotam ficam mais distanciadas da planta-mãe, produzindo indivíduos enfileirados, que com tempo, tornam-se independentes pelo colapso dos estolhos. Nestes casos é muito comum a formação de grandes áreas cobertas por indivíduos de genótipos idênticos.

Colmos

O formato dos colmos em seção transversal é um bom caráter na distinção das espécies, principalmente naquelas robustas, onde esta característica é bem visível a olho nu. *Eleocharis acutangula* é facilmente identificada pelos colmos triangulares de ângulos agudos e faces côncavas. Nas espécies com colmos mais delgados é difícil determinar o formato dos mesmos em seção transversal quando o material está seco, pois o processo de desidratação deixa-os achatados e sulcados. Além disso, a presença de colmos ocos e septados é uma característica diagnóstica importante, principalmente porque são poucas as espécies que os apresentam, restringindo-se, no caso do sul do Brasil, a *Eleocharis interstincta*, pertencente a *Eleocharis* subg. *Limnochloa* (Figura 2C), e a algumas espécies de *Eleocharis* subser. *Truncatae* (*E. elegans, E. contracta* e *E. montana*).

De maneira geral, na literatura taxonômica de *Eleocharis* tem se usado a denominação de **capilares** para colmos com 0,1 – 0,4 mm de larg. e de **filiformes** para colmos com 0,4 – 1 mm de larg.

Folhas

No gênero *Eleocharis* as folhas são reduzidas às bainhas e, sem dúvida, é uma estrutura que auxilia na identificação das espécies, principalmente o ápice da bainha, o qual pode ter diversas variações morfológicas. A presença ou ausência de múcron dorsal (Figura 1C), ápice truncado (Figura 1D) ou oblíquo (Figura 1E) são alguns dos principais caracteres que auxiliam na identificação das espécies. Além disso, outras características como ápice hialino inflado rugoso (Figuras 1F, 2B, 2F) ou bainha tubular (Figura 1D) com o porção a apical justa ao colmo também são características de alta

relevância. O bordo da bainha pode ser mais ou menos conspícuo dependendo da coloração, com uma consistência firme ou tenra dependendo da espécie.

Inflorescência

A estrutura da inflorescência no gênero *Eleocharis* é a mais simplificada dentro da família e uniforme em todo o gênero, ou seja, constituída de uma única espigueta na extremidade do colmo (Figura 2I).

Espigueta

A unidade fundamental da inflorescência é denominada espigueta (Figura 1G), e apresenta uma série de características para a distinção das espécies, principalmente em relação à forma, ao número de flores e à disposição das glumas florais.

A espigueta é constituída de um eixo onde se inserem as glumas, sendo que cada gluma protege uma flor (exceto quando a gluma inferior é estéril). A Figura 1H traz um esquema em corte transversal da espigueta, ilustrando o seu eixo, a gluma e a flor na sua axila. Essa unidade **gluma+flor** se repete ao longo do eixo de forma dística ou espiralada, dependendo da espécie (Figura 1I).

A gluma inferior nem sempre é percebida facilmente, visto que, em algumas espécies, pode parecer como uma continuação do colmo (Figura 1G). Todavia, a mesma fornece excelentes caracteres para a diferenciação de espécies, os quais são facilmente observáveis a campo. A presença de flor na gluma inferior auxilia na identificação de algumas espécies como por exemplo, *Eleocharis bonariensis.* Além disto, a presença de gema vegetativa na axila da gluma inferior pode ser útil na identificação de algumas espécies a campo, como *E. viridans* e *E. minima*, uma vez que, com o desenvolvimento destas gemas, pode haver a formação de novos indivíduos, os quais alcançam o solo

pela flexão dos colmos e se fixam em torno da planta mãe, gerando uma população de indivíduos com o mesmo genótipo. Este modo de reprodução vegetativa em *Eleocharis* tem sido chamado de **proliferação das espiguetas** (González-Elizondo 1994, Trevisan & Boldrini 2008) (Figuras 1A, 2G).

Com o crescimento e amadurecimento dos frutos, é muito comum que as glumas florais se tornem divergentes (ex. *Eleocharis rabenii*) ou mesmo caiam com facilidade (ex. *E. bicolor*). A presença de estrias nas glumas florais está relacionada às saliências das nervuras e é um caráter diagnóstico para a determinação de algumas espécies, principalmente em *Eleocharis* subg. *Limnochloa*. O ápice das glumas florais é um bom caráter na distinção de algumas espécies. *Eleocharis bicolor*, *E. filiculmis*, *E. loefgreniana*, *E. densicaespitosa* e, mais raramente, *E. squamigera*, apresentam glumas florais com ápice emarginado, algo que não é comum no gênero.

A coloração e a consistência das glumas florais também são características muito importantes para separação de espécies.

Em algumas espécies, como em *Eleocharis urceolatoides* e *E. alveolatoides*, pode ocorrer a presença de espiguetas junto à base dos colmos. Nestes casos, o colmo onde se encontra a espigueta não se alonga e, com isso, esta fica séssil ou subséssil na base da planta. Geralmente os aquênios produzidos nestas espiguetas ficam ocultos em meio aos colmos e bainhas.

Flores

A fórmula floral de *Eleocharis* é: **P0-6(-8) A1-3 G(2-3)***. O perigônio é modificado em cerdas hipóginas (Figura 2K), as quais, quando presentes, são importantes na dispersão do aquênio, uma vez que se desprendem juntamente com este, compondo o **diásporo**. As cerdas em geral são retrorso-espinulosas, o que facilita a

adesão do diásporo a dispersores ou mesmo a outros diásporos, formando uma massa com um grande número de aquênios que se dispersa (observado em *Eleocharis montana*), aumentando as chances da espécie compor o banco de sementes do solo.

A relação entre o comprimento das cerdas e o comprimento total do aquênio auxilia na identificação de algumas espécies. Por exemplo, *Eleocharis elegans* apresenta as cerdas mais longas que o aquênio, enquanto que em *E. parodii* as cerdas são sempre mais curtas que o mesmo.

O número de estames varia de 1 a 3 e é importante na separação de espécies do subgênero *Scirpidium*. Além disso, o comprimento das anteras tem se mostrado bastante útil em alguns casos. Como o amadurecimento das flores na espigueta se dá da base para o ápice, mesmo que a base da espigueta já tenha frutos maduros, a parte superior apresenta flores em antese e isso facilita a obtenção de informações sobre os estames (Figura 2E, H).

O número de ramos do estilete é um importante caráter para a distinção das espécies em dois grupos, exceto em poucas espécies onde ambos os tipos podem ocorrer (ex. *Eleocharis montana* e *E. bicolor*). As espécies de estilete bífido, como *E. maculosa*, apresentam ovário bicarpelar, unilocular e aquênio biconvexo, enquanto as espécies com estilete trífido, como por exemplo, *E. nudipes*, apresentam o ovário tricarpelar, unilocular e aquênio trígono ou plano-convexo. É importante salientar que, mesmo sendo um caráter de interesse taxonômico, muitas vezes os ramos do estilete podem se quebrar, especialmente em materiais herborizados. Neste caso, é sempre interessante observar mais de uma flor, para ter certeza do número de ramos do estilete, antes de prosseguir nos passos da chave.

Frutos

Em *Eleocharis* a base do estilete é engrossada e permanece aderida ao ápice do aquênio maduro, e é denominada **estilopódio** (Figura 2J).

Em algumas espécies pode ocorrer uma separação entre o estilopódio e o corpo do aquênio devido ao estreitamento na porção apical do fruto, formando uma estrutura denominada **colo**. Em *Eleocharis mutata* e *E. plicarhachis* não chega a forma um colo entre o estilopódio e o corpo do aquênio, mas sim apenas um engrossamento anelar (Figura 2K).

O fruto é do tipo **aquênio** e é de extrema importância na identificação das espécies. A ornamentação da superfície dos aquênios é bastante variável e contribui significativamente na identificação das espécies. Pode variar desde liso (Figura 2J) até superfícies profundamente canceladas, com séries de células orientadas horizontalmente (Figura 2K).

A coloração dos aquênios maduros varia entre as espécies e tem sido usada na distinção entre as mesmas. Entretanto, é necessário salientar que é uma característica que depende muito da capacidade de percepção das diferentes tonalidades de cores de cada observador, de modo que nem sempre as sutilezas serão percebidas da mesma maneira por todos.

BIBLIOGRAFIA CITADA

Font Quer, P. 1993. *Diccionário de Botánica*. Barcelona: Editorial Labor, S.A. 1244p.

Gil, A. S. B & Bove, C. P. 2007. *Eleocharis* R. Br. (Cyperaceae) no Estado do Rio de Janeiro, Brasil. *Biota Neotrop.* 7(1): http://www.biotaneotropica.org.br/v7n1/pt/abstract?Taxonomicreview+bn00507012007 ISSN 1676-0603

Goetghebeur, P. 1998. Cyperaceae. In: K. Kubitzki (ed.). *The families and genera of vascular plant: IV. Flowering plants – monocotyledons*, pp. 141 – 190. Berlin: Springer-Verlag.

González-Elizondo, M. S. 1994. *Eleocharis* R. Br. (*Cyperaceae*). In: G. Davidse, M. Souza & A. O. Chater (eds), Flora Mesoamericana, Vol. 6. *Alismataceae* a *Cyperaceae*, pp. 458 – 464. Universidad Nacional Autónoma de Mexico, Mexico, D.F. - Missouri Botanical Garden, St. Louis - The Natural History Museum, London.

Kukkonen, I. 1994. Definition of descriptive terms for the Cyperaceae. *Ann. Bot. Fennici*, 31: 37-43.

Radford, A.E.; Dickison, W.C.; Massey, J.R. & Bell, C.R. (1974). *Vascular Plants Systematics.* Harper & How, New York. 891p.

Rosen, D. J.; Hatch, S. L. & Carter, R. 2007. Infraspecific taxonomy and nomenclature of *Eleocharis acutangula* (Cyperaceae). *J. Bot. Res. Inst. Texas* 1(2): 875 – 888.

_____; _____ & Carter, R. 2008. Taxonomy and nomenclature of three closely related species of *Eleocharis* subgenus *Limnochloa* (Cyperaceae). *Blumea* 53: 235 – 246.

Smith, S. G.; Bruhl, J. J.; González-Elizondo, M. S. & Menapace, F. J. 2002. *Eleocharis* R. Br. In: Flora of North America Editorial Committee (eds), Flora of North America North of Mexico, pp. 60 – 120. Vol. 23. Oxford Univ. Press, New York, USA.

Svenson, H. K. 1929. Monographic studies in the genus *Eleocharis* I. *Rhodora* 31: 121 –135, 152 – 163, 167 – 191, 199 – 219, 224 – 242.

_____ 1932. Monographic studies in the genus *Eleocharis* II. *Rhodora* 34: 193 –203, 215 – 227.

_____ 1934. Monographic studies in the genus *Eleocharis* III. *Rhodora* 36: 377 – 389.

_____ 1937. Monographic studies in the genus *Eleocharis* IV. *Rhodora* 39: 210 – 231, 236 – 273.

_____ 1939. Monographic studies in the genus *Eleocharis* V. *Rhodora* 41: 1 – 19, 43 – 77, 90 – 110.

Trevisan, R. & Boldrini, I. I. 2008. O gênero *Eleocharis* R. Br. (*Cyperaceae*) no Rio Grande do Sul, Brasil. *Rev. bras. biociênc.* 6(1): 7 – 67.

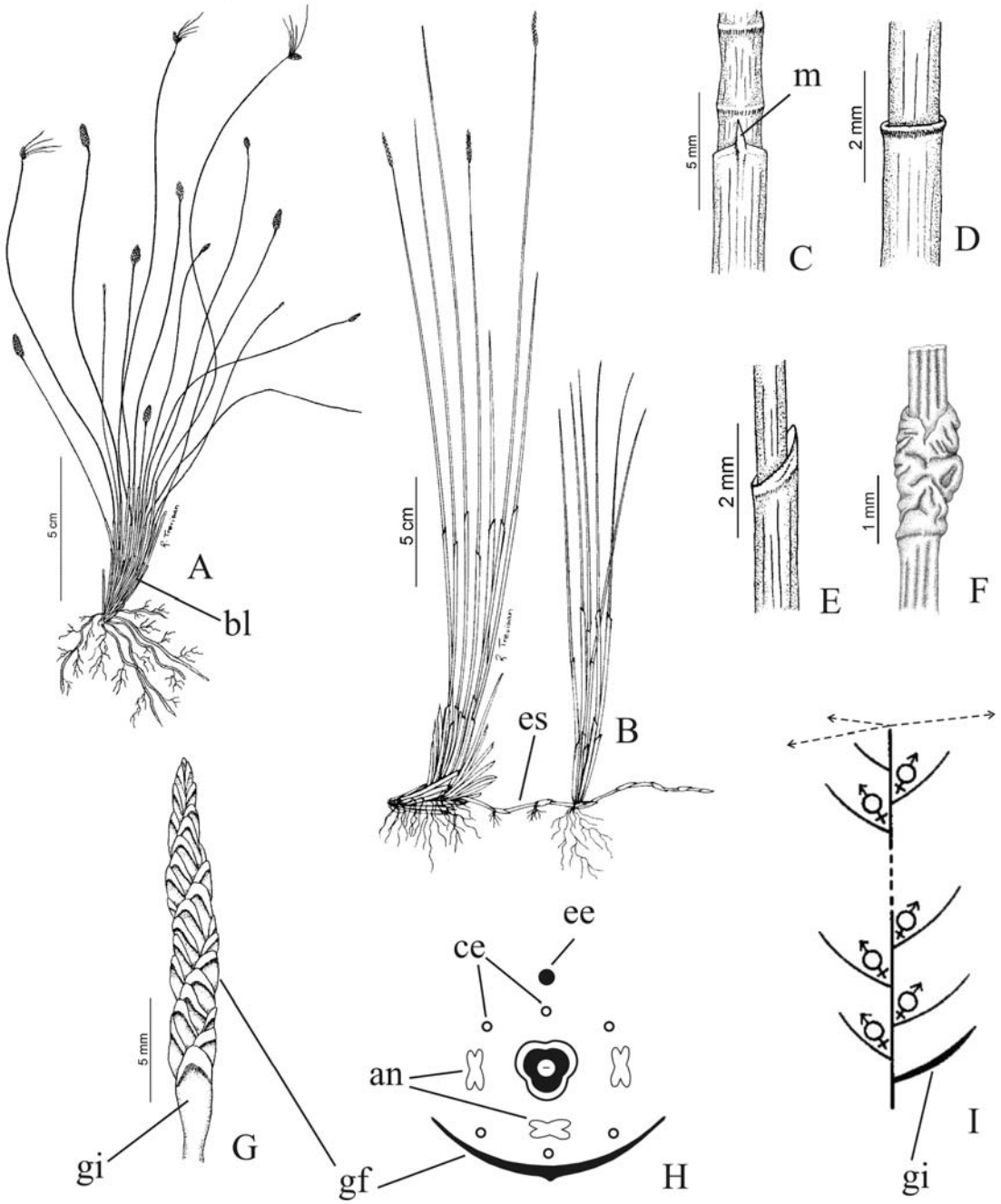

Figura 1. **A,** *Eleocharis viridans*, hábito. **B,** *E. laeviglumis*, hábito. **C,** *E. montana*, ápice da bainha mucronado. **D,** *E. montevidensis*, ápice da bainha truncado. **E,** *E. subarticulata*, ápice da bainha oblíquo. **F,** *E. atrobrunnea*, ápice da bainha inflado e rugoso. **G,** *E. laeviglumis*, espigueta. **H,** esquema da flor em *Eleocharis*. **I,** esquema da espigueta. **an:** anteras; **bl:** base lignificada; **ce:** cerdas hipóginas; **ee:** eixo da espigueta; **es:** estolho; **gf:** gluma floral; **gi:** gluma inferior; **m:** múcron dorsal.

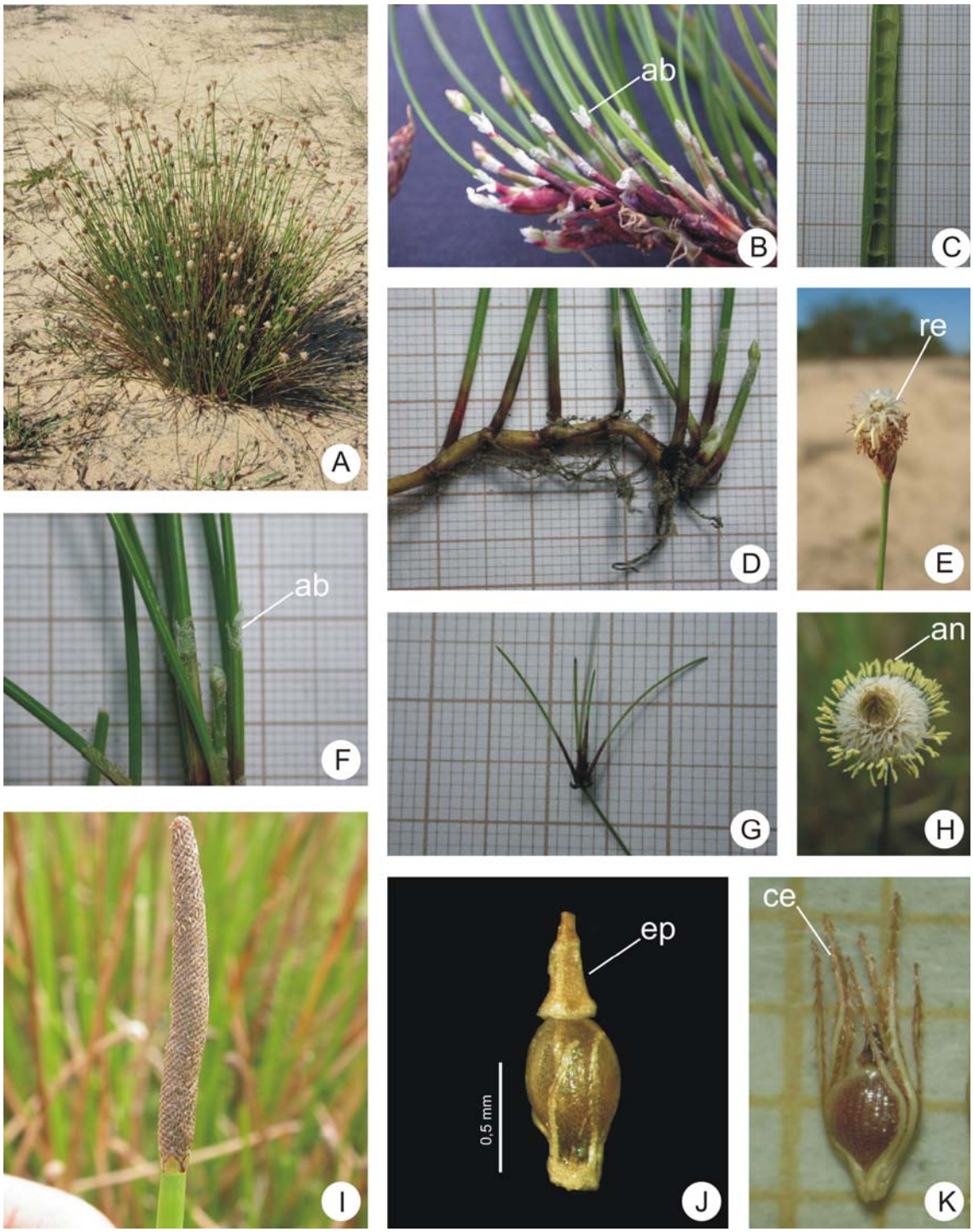

Figura 2. A, *Eleocharis densicaespitosa*, touceira densa; **B,** *E. maculosa*, rizoma; **C,** *E. interstincta*, colmo em corte longitudinal, evidenciando os septos; **D,** *E. sellowiana*, rizoma; **E,** *E. densicaespitosa*, espigueta em antese; **F,** *E. sellowiana*, ápice das bainhas; **G,** *E. minima*, espigueta proliferada; **H,** *E. nudipes*, espigueta em antese; **I,** *E. parodii*, espigueta; **J,** *E. minima*, aquênio trígono finamente reticulado; **K,** *E. plicarhachis*, aquênio biconvexo, cancelado. **ab:** ápice da bainha; **an:** anteras; **ce:** cerdas hipóginas; **ep:** estilopódio; **re:** ramos do estilete.

ARTIGO 1

Synopsis of the genus *Eleocharis* (Cyperaceae) in Southern Brazil

Este artigo será submetido para publicação na Revista Brasileira de Biociências.

Synopsis of the genus *Eleocharis* (Cyperaceae) in Southern Brazil

Rafael Trevisan[1]

Ilsi Iob Boldrini[2]

Título abreviado: **Synopsis of the genus *Eleocharis* (Cyperaceae)**

Autor para correspondência: Rafael Trevisan (rftrevisan@yahoo.com.br)

[1] Programa de Pós-Graduação em Botânica, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves, 9500, Porto Alegre, Rio Grande do Sul, 91501-970, Brazil. rftrevisan@yahoo.com.br
[2] Departamento de Botânica, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves, 9500, Porto Alegre, Rio Grande do Sul, 91501-970, Brazil.Corresponding author: ilsi.boldrini@ufrgs.br

Abstract. *Eleocharis* R. Br. (Cyperaceae) is a worldwide genus that includes about 200 species with a remarkable richness in tropical and subtropical America. It is recognised by having unbranched aerial culms, leaves reduced to tubular sheaths, inflorescence reduced to one spikelet on the apex of the culm, without involucral bracts, and stylopodium enlarged and persistent on the mature achene. The taxonomic study of the genus *Eleocharis* for Southern Brazil was carried out using the traditional methods of comparative morphology. The data were obtained through study of the literature, revision of the herbaria, and field expeditions. The genus is represented in Southern Brazil by 44 species. Descriptions and analytical key to the species are provided, as well as information about their geographic distribution and habitat. Illustrations are provided for eight species, for another ones references to published drawings are indicated.
Key words: Brazil, Cyperaceae, *Eleocharis*, New World, South America

Resumo. *Eleocharis* R. Br. (Cyperaceae) é um gênero cosmopolita que inclui cerca de 200 espécies com alta riqueza em regiões tropicais e subtropicais da América. O gênero é reconhecido por apresentar colmos aéreos não ramificados, folhas reduzidas a bainhas, inflorescência ebracteada constituída de uma única espigueta no ápice do colmo e estilopódio engrossado e persistente no aquênio maduro. O estudo taxonômico do gênero *Eleocharis* para o Sul do Brasil foi desenvolvido através de métodos tradicionais em morfologia comparativa. Os dados foram obtidos da análise de literatura, revisão de herbários e coleta de exemplares a campo. O gênero está representado no Sul do Brasil por 44 espécies. São apresentadas descrições e uma chave para a identificação das espécies, além disso, dados sobre distribuição geográfica e habitat também foram incluídos. São fornecidas ilustrações para oito espécies e para as outras são indicadas referências de ilustrações publicadas.
Palavras-chave: América do Sul, Brasil, Cyperaceae, *Eleocharis*, Novo Mundo

Introduction

Eleocharis R. Br. (Cyperaceae) is a worldwide genus that includes more than 200 species and ca. 600 published names with a remarkable richness in tropical and subtropical America (González-Elizondo & Peterson 1997; González-Elizondo & Tena-Flores 2000). Distinctive features, such as unbranched aerial culms, leaves bladeless, inflorescence constituted of one spikelet on the apex of culms without involucral bracts, and the stylopodium enlarged and persistent on the achene are uniformly found in the genus. Almost all species of *Eleocharis* are restricted to wetlands, often in muddy soils that are temporarily wet or inundated.

A comprehensive taxonomic treatment for *Eleocharis* was made by Svenson (1929, 1932, 1934, 1937, and 1939) but no recent treatment for the genus exists. Examples of regional treatments can be found in Blake (1939), Barros (1928, 1960), González-Elizondo (1994, 2001), González-Elizondo and Reznicek (1998), Faria (1998), Smith *et al.* (2002), Rosen (2006), Gil and Bove (2007), and Trevisan and Boldrini (2008).

Supraspecific classification in *Eleocharis* is difficult because relatively few macroscopic characters are provided by the comparatively simple morphology of the genus (Simpson 1988; González-Elizondo & Tena-Flores 2000). Incontestably much evolutionary convergence has occurred in most vegetative and reproductive structures (González-Elizondo & Tena-Flores 2000; Roalson & Friar 2000).

In the most recent classification proposed by González-Elizondo and Peterson (1997), based on morphological features, the genus *Eleocharis* was subdivided in four subgenera: *Limnochloa* (P. Beauv. ex T. Lestib.) Torr., *Zinserlingia* T.V. Egorova, *Scirpidium* (Nees) Kukkonen, and *Eleocharis*, each of them subdivided in sections, series and subseries.

In the New World, *Eleocharis* has more than 145 species, and four subgenera are represented (González-Elizondo & Tena-Flores 2000). In Brazil, a recent survey recorded 65 species (Alves *et al.* 2009), a number that probably will increase with the description of new taxa.

Recent phylogenetic studies have demonstrated that while some supraspecific classification units form monophyletic groups, others are paraphyletic or wholely unnatural (Roalson & Friar 2000; Roalson & Hinchliff 2007). The relatively simple morphology of the genus results in a few morphological characters that have taxonomic value, and several of them have shown a high degree of homoplasy (González-Elizondo & Peterson 1997). When morphology is compared to the current phylogenetic hypothesis, it seems clear that many morphological characters are either pleisiomorphic or have multiple origins (Roalson & Hinchliff 2007). Therefore, further studies are essential in the search for morphological features that can be mirrored in the phylogeny. It will facilitate the understanding of the relationships among the species and the evolutionary trends within the genus or subgroups.

This paper presents a taxonomic review of the *Eleocharis* for Southern Brazil including analytical key, descriptions, and data about geographic distribution and habitat of the species. Illustrations are provided for eight species, for another ones references to published drawings are indicated.

Materials and methods

About 2,300 specimens were examined from the following herbaria: BLA, CEN, FLOR, FUEL, HAS, HBR, HCB, HEPH, HUPG, HURG, IBGE, ICN, LP, MBM, MPUC, PACA, PEL, SI, SMDB, SP, UB, and UPCB. In addition, materials from herbaria with unofficial acronyms, RSPF (Universidade de Passo Fundo, RS, Brazil), HUCS (Universidade de Caxias do Sul, RS, Brazil), and CNPO (EMBRAPA Pecuária Sul, RS, Brazil), were revised. Besides,

images from several types were taken from homepages or requested to the herbaria B, BM, BREM, C, CGE, GH, K, NY, P, S, and ZT.

Field expeditions were carried out in the states of Southern Brazil (Paraná, Rio Grande do Sul, and Santa Catarina) and the collected materials were incorporated in the herbarium of the Instituto de Biociências of the Universidade Federal do Rio Grande do Sul (ICN).

The methodology to elaborate the descriptions was the following: culms length was taken since the base, near the roots, until the apex of the spikelet (when present); culms width was measured in dry material; only the upper sheath was analysed because it provides more taxonomic information; the cited number of flowers by spikelet shows the extremes found for each species; floral scales width was taken just removing the floral scale from the spikelet and taking the measurements without any kind of pre-treatment; in the key and descriptions, the achenes length includes the stylopodium.

The generic circumscription follows González-Elizondo and Peterson (1997). The terminology used in the key and descriptions follows previous taxonomic treatments for the genus (Svenson 1929, 1932, 1934, 1937, 1939; González-Elizondo 1994; Smith *et al.* 2002; Rosen *et al.* 2007, 2008; Gil and Bove 2007; and Trevisan & Boldrini 2008) and other publications as Radford *et al.* (1974), Font Quer (1993), Kukkonen (1994), and Goetghebeur (1998).

All cited specimens were seen by the author, however, as the amount of analysed material is huge, we selected up to 10 specimens for each species considering the geographical distribution in Southern Brazil and other adjacent areas. The complete list of examined material can be acquired with the first author. The index of the collections shows all the material analysed.

Taxonomic Treatment

Eleocharis R. Br., Prodromus Florae Novae Hollandiae. 224 (1810).

Type species**:** ***Eleocharis palustris*** (L.) Roem. & Schult. [designated by N.L. Britton, Bull. Dept. Agric. Jamaica 5: 10 (1907)].

Annual or perennial herbs, usually caespitose, often rhizomatous, sometimes stoloniferous; rhizomes horizontal and long or ascending, often ligneous. Culms terete, 3–5-angled or more, or strongly compressed in cross section, spongy filled with a tissue with air cavities or sometimes hollow with complete transverse septa. Leaves basal, 2 per culm, eligulate, bladeless, sometimes with a mucro or awn (tooth) at apex of the sheath. Sheaths tubular or inflated in the apical portion, with apex truncate or oblique. Inflorescences terminal, 1-spikelet, involucral bracts absent. Spikelets globose, ovoid, ellipsoid, lanceoloid or cylindric, few to many-flowered; lower scale empty, seldom flowered or sometimes bearing a vegetative shoot, in some species appearing to be a continuation of the culm or similar to the adjacent scales; floral scales spirally or rarely distichously arranged, each subtending a flower, varying the coloration from translucent white, stramineous, brown, vinaceous to almost black, smooth to striate, appressed to divergent. Flowers bisexual (rarely unisexual); perianth bristles (0–) 3 – 8, shorter than to exceeding the stylopodium, retrorsely spinulose or sometimes almost smooth; stamens 1 – 3; style 2 – 3-fid, with the base usually enlarged and persistent on the top of the achene (stylopodium), usually different in appearance from achene. Achene biconvex, plano-convex, or trigonous to subterete, sometimes with an evident separation, like a neck, between the stylopodium and the achene body, the surface vary from smooth, longitudinally rugose to deeply cancellate, white, olivaceous to black.

Key to the species of the *Eleocharis* occurring in Southern Brazil

1. Floral scales cartilaginous, or papery, with the hyaline margins clearly delimitated from the rest of the scale; achenes biconvex (clearly plano-convex or trigonous only in *E. elongata* and *E. laeviglumis*), slightly cancellate to cancellate, with 8 - 30 longitudinal rows of rectangular or polygonal cells horizontally oriented (subg. *Limnochloa*)

2. Culms hollow, septate……16. *E. interstincta*

2. Culms spongy, not septate.

3. Achenes trigonous or plano-convex, 0.7 – 1 mm wide.

4. Culms flaccid, 0.6 – 1.5 mm wide; floral scales striate and loosely imbricate; spikelets 12 – 30-flowered; achenes with 13 - 15 longitudinal rows of rectangular cells horizontally oriented; stylopodium confluent with the neck on the top of the achene ……..……..…….12. *E. elongata*

4. Culms firm, 1 - 2.2 mm wide; floral scales smooth and densely imbricate; spikelets 20 - 50-flowered; achenes with 8-12 longitudinal rows of polygonal cells horizontally oriented; stylopodium separated from the achene body by a constriction. ……19. *E. laeviglumis*

3. Achenes biconvex, rare slightly plano-convex, 1 – 2 mm wide.

5. Culms trigonous or triquetrous, with the culm faces flat or somewhat concave and sharp angles (obtuse angles in *E. plicarhachis*).

6. Floral scales smooth to slightly striate; stylopodium confluent with a hard annular thickening usually of the same texture and colour as the achene.

7. Spikelets 20 – 35-flowered; culms 1 – 1.5 mm wide; floral scales loosely imbricate; achenes cancellate, with 16 - 17 longitudinal rows of polygonal cells horizontally oriented ……..…….34. *E. plicarhachis*

7. Spikelets 60 – 110 (-160)-flowered; culms 3 – 6 mm wide; floral scales densely imbricate; achenes finely cancellate, with 25 – 30 longitudinal rows of polygonal cells horizontally oriented. .....25. *E. mutata*

6. Floral scales strongly striate; stylopodium separated from the achene by a constriction. ……..……..…..……..……1. *E. acutangula*

5. Culms terete or obscurely trigonous, with the culm faces flat to convex and obtuse angles.

8. Floral scales medially greenish to stramineous, sides brown to vinaceous; achenes finely cancellate, with 20–28 longitudinal rows of polygonal cells horizontally oriented. .....18. *E. kleinii*

8. Floral scales entirely greenish to stramineous; achenes cancellate, with 13 – 17 longitudinal rows of rectangular or polygonal cells horizontally oriented.

9. Floral scales densely imbricate; spikelet 40 – 100-flowered.

10. Culms terete, 1.8 – 2.1 mm wide. …..…….……17. *E. jelskiana*

10. Culms obscurely trigonous, with the culm faces convex and obtuse angles, 2.5 – 5 mm wide. …….……..…….30. *E. obtusetrigona*

9. Floral scales loosely imbricate; spikelet 10 – 35-flowered.

11. Floral scales striate, without submarginal band or with a thin brown submarginal line; stylopodium separated from the achene body by a constriction, 2/3 to 3/4 as wide as the achene……

……..……33. *E. pauciglumis*

11. Floral scales smooth to slightly striate, with light-brown submarginal band; stylopodium confluent with an annular

thickening at the achene apex, ca. ½ as wide as the achene.….

……34. *E. plicarhachis*

1. Floral scales membranous (rarely papery in *E. densicaespitosa* and *E. viridans*), with the hyaline margins gradual from the rest of the scale or not hyaline at all or absent; achenes subterete, slightly trigonous, trigonous, plano-convex to biconvex, if biconvex, the surface has no rows of cells horizontally oriented.

12. Lower scale fertile; achenes subterete to slightly trigonous, with 8 - 18 longitudinal rows of 20-60 rectangular cells horizontally oriented (subg. *Scirpidium*).

13. Stamens 3, anthers 1 - 1.8 mm, except in *E. neesii* with anthers 0.4 - 0.5 mm.

14. Spikelets 2.8 - 3 mm long, 8 - 10-flowered, ovoid; anthers 0.4 - 0.5 mm long.....27. *E. neesii*

14. Spikelets 3 - 13 mm long, (7-) 10 - 55-flowered, lanceoloid, rarely ovoid; anthers 1.1 – 1.8 mm long.

15. Stylopodium narrowly conical, on the top of a neck, appearing to be a continuation of the neck; floral scales hyaline to stramineous .....

…….…...2. *E. angustirostris*

15. Stylopodium conical to widely conical, separate from the achene body by a constriction; floral scales stramineous to light brown, generally with vinaceous spots.....5. *E. bonariensis*

13. Stamens 2, anthers 0.3 - 0.5 mm long.

16. Culms 1.8 - 5 cm x 0.5 – 0.7 mm, flattened when dry; spikelets 6 - 12-flowered; sheath with apex oblique, acute.....37. *E. radicans*

16. Culms 18 - 23 cm x 0.2 - 0.3 mm, capillary; spikelets 6 - 8-flowered; sheath with apex long-acuminate .....39. *E. riograndensis*

12. Lower scale sterile; achenes trigonous, plano-convex to biconvex, smooth, minutely roughened, striolate, striate, finely reticulate to reticulate (achenes with ca. 12 rows of rectangular cells horizontally oriented on de abaxial surface in *E. squamigera*) (subg. *Eleocharis*).

17. Sheaths with the dorsal mucro quite developed.

18. Culms spongy, not septate. .....31. *E. parodii*

18. Culms hollow, septate.

19. Culms 4.5 - 8 mm wide, 11 - 25 mm between the septa; achenes ca. 1.8 mm long; perianth bristles 7 - 8, exceeding the stylopodium.....11. *E. elegans*

19. Culms up to 3.5 mm wide, 0.8 – 5 mm between the septa; achenes 0.9 - 1.5 mm long; perianth bristles 4 - 7, as long as or shorter than the achenes body.

20. Culms (1 -) 1.5 – 3.5 mm wide; floral scales 2.1 – 3.2 mm long; achenes 1 - 1.5 mm long; anthers 1.2 - 1.5 mm ....23. *E. montana*

20. Culms 0.4 – 0.8 (- 1) mm wide; floral scales 1.4 – 2 mm long; achenes 0.9 – 1 mm long; anthers 0.5 mm. …….....7. *E. contracta*

17. Sheaths emucronate or with the dorsal mucro somewhat insinuating.

21. Achenes biconvex; style bifid.

22. Styles bifid and trifid in the same spikelet; achenes biconvex and trigonous mixed in the same spikelet; floral scales obtuse to emarginated; achenes yellowish white or greyish white ……..……..4. *E. bicolor*

22. Styles bifid; achenes all biconvex; floral scales acute to obtuse; achenes olivaceous, light brown, dark brown to black.

23. Sheaths tubular with the distal portion resistant, with the edges firm.…
……..…15. *E. geniculata*

23. Sheaths inflated or slightly so, with the distal portion delicate, hyaline, with the edges easily torn.

24. Sheaths with the distal portion inflated and wrinkled or becoming loose and withered on drying, generally quite distinct from the proximal portion.

25. Mature achenes clearly olivaceous or olivaceous with dark dots or lines on the sides.

26. Spikelets 6 - 8-flowered; floral scales with the sides translucent white to stramineous; achenes obovoid, slightly rugose at the distal portion, stylopodium conical, about 1/3 as wide as the achene ……..…..…….32. *E. parvispicula*

26. Spikelets (12-) 35 - 100-flowered; floral scales with the sides stramineous to vinaceous; achenes broadly obovoid, smooth at the distal portion, stylopodium hat-shaped, about 1/2 as wide as the achene ……..……..…40. *E. sellowiana*

25. Mature achenes light brown, dark brown to black.

27. Floral scales with the sides yellowish to light brown or brown; achenes light brown to dark brown. .....
……14. *E. flavescens*

27. Floral scales with the sides vinaceous to dark brown; achenes dark brown or black.

28. Achenes 0.9 - 1 x 0.7 - 0.8 mm; floral scales 2 x 1 mm, vinaceous, dark brown to almost black; spikelet 3.5 - 4 x 2 mm, 12 – 25-flowered. ……..…3. *E. atrobrunnea*

28. Achenes 1.2 – 1.7 x 0.6 – 0.9 mm long; floral scales 2.2 – 3.5 x 1 – 1.2 mm, usually dark purple to vinaceous, rarely almost black; spikelet 6 – 11 x 3 mm, 30 – 80-flowered. ……..……21. *E. maculosa*

24. Sheaths with the upper portion not or slightly inflated and not wrinkled, easily torn, usually in a continuous differentiation from the base towards the apex.

29. Culms 1.5 - 6 cm long; spikelets 1(- 3)-flowered; achenes 1 - 1.3 x 0.6 mm ……..……..……..…6. *E. capillacea*

29. Culms 5 - 25 cm long; spikelets 6 – 10-flowered; achenes 1.3 - 1.5 x 0.7 - 0.8 mm…….……..…8. *E. debilis*

21. Achenes plano-convex or trigonous; style trifid.

30. Achenes trigonous, with ca. 12 longitudinal rows of rectangular cells horizontally oriented on the abaxial surface; stylopodium separated from the achene by a constriction. …….……..41. *E. squamigera*

30. Achenes plano-convex or trigonous, smooth, striolate to reticulate, lacking the longitudinal rows of oriented cells; stylopodium confluent with the achene or separated from it by a constriction.

31. Achenes reticulate; plants caespitose-stoloniferous, with stolons herbaceous horizontally elongated.

32. Sheaths apex truncate; spikelets ovoid to lanceoloid, 60 - 170-flowered; achene 1.2 - 1.4 mm long. …….24. *E. montevidensis*

32. Sheaths apex oblique; spikelets lanceoloid, 15 - 60-flowered; achene 1.6 – 2.1 mm long. …….……42. *E. subarticulata*

31. Achenes smooth, slightly striolate to finely reticulate; plants caespitose or caespitose-rhizomatous, without horizontal elongated stolons.

33. Plants usually short, with thin non-ligneous base (usually with base somewhat ligneous in *E. niederleinii*); chasmogamous basal spikelets sometimes present; culms capillary to filiform, 0.1-0.4 mm wide.

……..

34. Styles bifid and trifid in the same spikelet; achenes biconvex and trigonous mixed in the same spikelet. …….……...……..4. *E. bicolor*

34. Styles trifid; achenes all trigonous.

35. Floral scales without hyaline margin or inconspicuous; plants caespitose-rhizomatous, with herbaceous rhizomes horizontally elongated. …….……36. *E. rabenii*

35. Floral scales with hyaline margin developed and gradual from the rest of the scale; plants caespitose without rhizomes.

36. Floral scales distichously or sub-distichously arranged. .....22. *E. minima s.l.*

36. Floral scales spirally arranged.

37. Floral scales emarginated. …… *E. loefgreniana*

37. Floral scale acute to obtuse.

38. Floral scales with the sides translucent white to stramineous.

39. Perianth bristles rudimentary or lacking; sheaths tubular, with slightly oblique apex, emucronate or with mucro somewhat insinuating, edge firm, stramineous or with red dots …….……38. *E. ramboana*

39. Perianth bristles 5 - 6, unequal, as long as or exceeding the stylopodium; sheath somewhat inflated, with oblique apex, emucronate, with delicate and inconspicuous edge. ……..……..……..26. *E. nana*

38. Floral scales with the sides dark-brown to vinaceous.

40. Spikelets 4.5 - 8 x 2 - 3 mm, ellipsoid to lanceoloid; achenes 0.9 - 1.3 mm long; anthers 1 - 1.4 mm long. ….……..…28. *E. niederleinii*

40. Spikelets 3 - 5 x 1.3 - 2.5 mm, ovoid; achenes 0.7 - 0.8 mm long; anthers 0.4 - 0.6 mm long. …….…..……43. *E. urceolatoides*

……..

33. Plant usually tall, with ligneous or robust base; basal spikelets not present; culms filiform to coarse, 0.5-2.3 mm wide, if less than 0.5 mm wide than the base is ligneous or robust.

41. Plants with ligneous short rhizomes, hardened bulbous culm-bases, with the culm-shoots recurved.

42. Culms 1 - 2 mm wide; floral scales emarginate; achenes 1 - 1.2 x 0.6 - 0.7 mm. ……..……9. *E densicaespitosa*

42. Culms 0.4 - 0.6 mm wide, floral scales acute to obtuse; achenes 0.8 x 0.5 - 0.6 mm. ……35. *E. quinquangularis*

41. Plants with robust or ligneous culm-bases, usually forming a vertical rootstock, with the culm-shoots erect.

43. Spikelets wide elliptic to globose, 5 – 10 mm wide. ……29. *E nudipes*

43. Spikelets ellipsoid, cylindrical, ovoid to lanceoloid, 2 – 3.5 mm wide.

44. Floral scales emarginate.

45. Spikelets 12 – 25-flowered; floral scales loosely imbricate; achenes 1.1 - 1.3 mm long. ……..……..…...20. *E. loefgreniana*

45. Spikelets 40 - 70-flowered; floral scales densely imbricate; achenes 0.8 - 0.9 mm long. ……..……13. *E. filiculmis*

44. Floral scales acute to obtuse, not emarginate.

46. Floral scales with hyaline margin inconspicuous or absent; culms quinquangular; sheaths with apex truncate, emucronate; spikelets not proliferous. ……..…10. *E. dunensis*

46. Floral scales with hyaline margin developed; culms quadrangular; sheaths with apex slightly oblique, emucronate or somewhat with insinuating mucro; spikelets usually proliferous…….....44. *E. viridans*

1. Eleocharis acutangula (Roxb.) Schult., *Mant.* 2: 91 (1824).

Scirpus acutangulus Roxb. Fl. Ind. 1: 216 (1820). Type: India, *Roxburgh s.n.* (lectotype BM, not seen, designated by D. J. Rosen *et al.* in J. Bot. Res. Inst. Texas 1(2): 879 [2007]).

Limnochloa acutangula (Roxb.) Nees. Contr. Bot. India 114 (1834).

Scirpus fistulosus Poir., Encycl. 6: 749 (1804). Type: Madagascar, *Poiret s.n.* (holotype P [photo!]) *nom. illeg.*

Eleocharis fistulosa (Poir.) Link., Jahrb. Gewächsk. 3: 78 (1820).

Eleocharis fistulosa (Poir.) Schult., Mant. 2: 89 (1824).

Perennial, caespitose-stoloniferous, usually with creeping or erect and ligneous rootstock. Culms 20 - 85 cm x 2 - 6 mm, triquetrous with the faces flat or concave and sharp angles, spongy, not septate. Sheaths stramineous to black at the base, apex firm, oblique, emucronate, edges firm and inconspicuous. Spikelet (15–) 22 – 36 (–45) x 3 – 5 mm, lanceoloid to cylindric, 20 - 90-flowered, not proliferous; lower scale fertile, coriaceous, oval, apex obtuse, green, appearing as a continuation of the culm, not overtopping the adjacent scales, margin

narrow hyaline; floral scales 3.5 -5 x 2 - 3 mm, cartilaginous, oval, apex obtuse, spirally arranged, densely imbricate, appressed, striate, stramineous to vinaceous, conspicuously veined, without submarginal band, hyaline margin developed and clearly delimitated from the rest of the scale; perianth bristles 5 - 7, white to light-brown, retrorse-spinulose, shorter to exceeding the stylopodium; stamens 3, anthers 1.5 – 1.9 mm, ending in a short apiculum; style trifid. Achene 2.5-3.2 x 1.3-1.9 mm, biconvex, pyriform, yellowish to light-brown, deep cancellate, with 12 - 16 longitudinal rows of polygonal cells horizontally oriented; stylopodium trapezoidal, flattened dorsiventrally, brown, separated from the achene body by a constriction, 2/3 to ¾ as wide as the achene.

DISTRIBUTION. Pantropical, in America it occurs in United States (Florida), from Mexico to Argentina, tropical Africa, Asia and Oceania (Rosen *et al.* 2007).

ARGENTINA. **Provincia de Corrientes**: Depto. Mburucuyá, Parque Nacional Mburucuyá, Estancia Santa Teresa, 25 Nov. 1997, *R. Vanni et al.* 4121 (SI).

BRAZIL. **Distrito Federal:** Planaltina, Lagoa Bonita, ca. 30 km NE from Brasília, 21 Jan. 1983, *A. E. Ramos* 194 (CEN, HEPH). **Minas Gerais:** Iturama, between Iturama and Alexandrita, 19º43'39"S, 50º13'39"W, 24 Nov. 2006, *C.R.M. Silva & A.L.L. Vanzela* 41 (ICN). **Paraná:** Araucária, Guajuvira, 08 Nov. 1959, *G. Hatschbach* 6455 (MBM, SI). Pitanga, BR 460, 24°41'40.1"S, 51°48'31.3"W, 20 Dec. 2006, *R. Trevisan et al.* 797 (ICN). **Rio Grande do Sul:** Canguçu, BR 292, 30º58'30"S, 52º39'48'W, 26 Nov. 2003, *R. Trevisan et al.* 244 (ICN). São Borja, BR 285, 16 km SW from the town, 10 Jan. 1997, *A.C. Araújo* 506 (ICN). São Francisco de Assis, farm of Joaquim Paz, 29°30'46.8"S 55°08'02.6"W, 26 Nov. 2007, *R. Trevisan* 892 (ICN). **Santa Catarina:** Campos Novos, 22km a West from Curitibanos, 05 Dec. 1956, *L.B. Smith & R. Klein* 8319 (HBR, SI). Florianópolis, Armação da Piedade, 13 Mar. 1952, *R. Reitz* 4583 (HBR).

HABITAT. The species grows in permanently flooded environments, as marshy open grasslands, edge of lakes, irrigating canals in rice cultivation, and wet roadsides.

NOTES. Illustration can be found in Rosen *et al.* (2007) and Trevisan and Boldrini (2008). This species is easily recognised by culms clearly triquetrous, with the culm faces flat or somewhat concave, and sharp angles; floral scales striate, and stylopodium clearly separated from the achene by a constriction. We are not considering infraspecific taxa for *E. acutangula*, however, Rosen *et al.* (2007) made a detailed study for the species and described two new subspecies: *E. acutangula* subsp. *breviseta* D. J. Rosen and *E. acutangula* subsp. *neotropica* D. J. Rosen. According to the authors, only *E. acutangula* subsp. *breviseta* and *E. acutangula* subsp. *acutangula* occur in southern Brazil.

2. Eleocharis angustirostris R. Trevis. & Boldrini, Novon 00: 000 (ined.). Type: Brazil, Rio Grande do Sul, mun. Osório, BR 101, km 91, 15 Oct. 2003, *I. Boldrini & R. Trevisan 1187* (holotype, ICN!).

Perennial, caespitose-stoloniferous, usually with thin and non-lignified base, stolons ca. 1 mm wide. Culms 8 - 22 cm x 0.3 - 0.6 mm, cylindric, sulcate when dried, spongy, firm, not septate. Sheaths stramineous to light brown at the base, tubular to somewhat inflated toward the apex, which is oblique, emucronate, hyaline, edges delicate and inconspicuous. Spikelets 5 - 8 x 2 mm, lanceoloid, 10 - 25-flowered, not proliferous; lower scale fertile, membranous, lanceolate to oblong, apex obtuse to acute, stramineous, about the same length as the adjacent scales, with a wide hyaline margin; floral scales 2 - 2.9 x 0.5 - 0.6 mm, membranous, lanceolate to oblong, apex acute to obtuse, spirally arranged, appressed but loosely imbricate, finely striate, keel green to stramineous, sides hyaline sometimes with some small spots vinaceous to brown, hyaline margin gradual from the rest of the scale; perianth bristles none;

stamens 3, anthers 1.2 - 1.8 mm, ending in a short apiculum; style trifid. Achene 1.3 - 1.6 x 0.4 - 0.5 mm, subterete to slightly trigonous, narrowly ellipsoid, with ca. 11 - 14 longitudinal rows of 50 - 60 rectangular cells horizontally oriented, constricted at the summit into a distinct neck, stramineous, iridescent; stylopodium narrowly conical, green to dark brown, on the top of the neck and appearing to be a continuation of it, about 1/4 as wide as the achene.

DISTRIBUTION. Known only from the type locality. It is possible that this species occurs in other areas of grasslands in the north coastland of Rio Grande do Sul.

BRAZIL. **Rio Grande do Sul**: Osório**,** BR 101, km 91, 15 Oct. 2003, *I. Boldrini & R. Trevisan* 1184, 1185, 1186, 1188 (ICN).

HABITAT. *Eleocharis angustirostris* grows in wet grasslands with grazing, in sandy soils.

NOTES. Illustration can be found in Trevisan *et al.* (vide artigo 2). *Eleocharis angustirostris* is related to *E. bonariensis* and similar to it in the general aspect, but can be distinguished by the achene narrowing at the summit into a neck, the narrow, conical stylopodium that seems to be a continuation of the neck, as well as by the pale, hyaline to stramineous floral scales (*vs*. stylopodium wide conical, separate from the achene body by a constriction, and floral scales stramineous to light brown, generally with vinaceous spots). It also differs in having the apex of the distal sheath more delicate than in *E. bonariensis* (where it can be firm or scarious but not hyaline and delicate).

3. Eleocharis atrobrunnea R. Trevis. & S. González, Brittonia 00: 000 (ined.). Type: Brazil, Rio Grande do Sul, Santo Augusto, rodovia RS-155, km 69, 4 Nov. 2003, *R. Trevisan et al.* 150 (holotype ICN!).

Perennial, caespitose, usually with thin non-ligneous base, sometimes with slender stolons with roots in the knots. Culms 4 - 9 cm x 0.4 - 0.6 mm, transversely elliptic, sulcate when dry, spongy, not septate. Sheaths vinaceous at the base, apex inflated with a hyaline wrinkled portion quite distinct from the base, emucronate, the delicate edge easily torn. Spikelets 3.5 - 4 x 2 mm, ovoid, 12 - 25-flowered, not proliferous; lower scale sterile, papery, oval, apex firm, acute to obtuse, green on the keel and dark on the sides, as long as the adjacent scales, hyaline margin narrow; floral scales 2 x 1 mm, membranous, oval, apex acute to obtuse, spirally arranged, appressed, smooth, inconspicuously veined, keel green, sides vinaceous or dark brown to almost black, hyaline margin developed on the sides and narrow at the apex, gradual from the rest of the scale; perianth bristles 7, yellow to yellowish brown, retrorse-spinulose, slightly shorter than the stylopodium; stamens 3, anthers 0.8 mm long, ending in a short apiculum; style bifid. Achene 0.9 - 1 x 0.7 - 0.8 mm, biconvex, obovoid, rounded at the apex, minutely roughened to reticulate, dark brown to black; stylopodium pyramidal depressed, green to brown, separated from the achene body by a constriction, ca. ¼ as wide as the achene, with prominent edges.

DISTRIBUTION – Known only from the type locality.

HABITAT. *Eleocharis atrobrunnea* was collected in a bog with clear water at the roadside. This poorly known species occurs in a region endangered by the advance of agriculture. At present, the natural vegetation of the northwest of Rio Grande do Sul has been replaced by monocultures of soybean, wheat and maize.

NOTES. Illustration can be found in Trevisan *et al.* (vide artigo 4). *Eleocharis atrobrunnea* is closely related with *E. flavescens* and *E. sellowiana*. However, it is different from them by the floral scales green on the keel and dark brown or vinaceous on the sides, and the achenes dark brown to black, somewhat puncticulate-reticulate and slightly rugose on the distal portion.

4. Eleocharis bicolor Chapm., Fl. South. U.S. 517 (1860). Type: United States, Florida, near Quincy, *A. W. Chapman s.n.* (holotype NY, not seen).

Eleocharis minima var. *bicolor* (Chapm.) Svenson, Rhodora 39: 219 (1937).

Annual or brief perennial, caespitose-stoloniferous, delicate stolons with long internodes, with thin non-lignified base. Culms 4 - 13 cm x 0.1 - 0.2 mm, capillary, cylindrical to quadrangular with obtuse angles, sulcate when dry, spongy, not septate. Sheaths stramineous at the base, apex oblique, emucronate, with the edge delicate, inconspicuous and hyaline. Spikelets 2.5 - 3.5 x 2 - 2.5 mm, ovoid, 8 - 15-flowered, not proliferous; lower scale sterile, membranous to papery, oval, apex obtuse to emarginate, green, shorter or as long as the adjacent scales, hyaline margin wide; floral scales 1.7 x 0.7 – 0.8 mm, membranous, oval, apex obtuse to emarginate, spirally arranged, somewhat divergent, easily falling at maturity, smooth, inconspicuously veined, keel green, sides vinaceous, hyaline margin developed at the apex and gradual from the rest of the scale; perianth bristles none or rudimentary; stamens 2, anthers 0.5 - 0.7 mm, ending in a short apiculum; style bifid or trifid mixed in the same spikelet. Achene 0.8 – 0.9 x 0.5 – 0.6 mm, biconvex or trigonous, with abaxial angle slightly salient, obovoid, truncate at the apex, smooth to finely reticulate, yellowish white or greyish white; stylopodium pyramidal or flattened dorsiventrally, green to ochraceous, confluent with the achene, as wide as the achene apex to slightly narrower. Fig. 1A-H.

DISTRIBUTION. SE of United States, Central America to Argentina (Misiones) and South of Brazil (Barros 1960; Smith *et al.* 2002; Trevisan and Boldrini 2008).

BRAZIL. **Distrito Federal:** Brasília, Road between CPAC-Sarandi, ca. 2 km from CPAC, 29 April 1985, *S. P. Almeida* 1043 (UB). Brasília, APA of São Bartolomeu, streamlet Forquilha,

DF-130, 11 Sept. 1985, *R. C. Mendonça et al.* 525 (IBGE). **Mato Grosso do Sul:** Inocência, streamlet Morgado, near the bridge, 19º51'04"S, 51º36'03"W, 13 Nov. 2004, *V. J. Pott et al.* 7328 (CGMS, ICN). **Paraná:** Clevelândia, Fazenda Sant'Ana, 29 Dec. 1956, *L. B. Smith et al.* 9564 (HBR). Curitiba, Pinhais, 18 Sept. 1966, *G. Hatschbach* 14734 (MBM). **Rio Grande do Sul:** Torres, Real beach, 16 Oct. 2003, *R. Trevisan & I. Boldrini* 23 (ICN). **Santa Catarina:** Chapecó, Fazenda Campo São Vicente, 24 km West from Campo Erê, 26 Dec. 1956, *L. B. Smith et al.* 9458 (HBR). Florianópolis, restinga of Joaquina, near avenue of the Rendeiras, 25 Jan. 2005, *T.B. Guimarães & D.B. Falkenberg* 903 (ICN).

HABITAT. Moist soils at the edges of the pools, moist grasslands.

NOTES. This species can be identified by small plants, culms capillary, floral scales easily falling at maturity, styles bifid and trifid mixed in the same spikelet, and achenes yellowish white or greyish white, biconvex or trigonous in the same spikelet.

5. Eleocharis bonariensis Nees in Hooker, J. Bot. 2: 398 (1840). Type: Argentina, Buenos Aires, *Tweedie s.n.* (holotype CGE, not seen).

Perennial, caespitose-stoloniferous, usually with thin and non-lignified base, stolons of 1 - 1.2 mm wide. Culms 5 - 50 cm x 0.2 – 1.2 mm, cylindric, sulcate when dry, spongy, firm, not septate. Sheaths stramineous, vinaceous to brown at the base, tubular, apex oblique, emucronate, hyaline, edges delicate and inconspicuous. Spikelets 3 - 13 x 1.4 - 3 mm, ovoid to lanceoloid, 7 - 55 flowered, not proliferous; lower scale fertile, membranous to papery, oval to lanceolate, apex acute to obtuse, green to stramineous, about the same length as the adjacent scales or shorter, with a wide hyaline margin; floral scales 1.8 - 3.2 x 0.8 - 1 mm, membranous, oval to lanceolate, apex acute to obtuse, spirally arranged, appressed, smooth to finely striate, keel green to yellow, sides stramineous, brown or with vinaceous spots, hyaline

margin developed and gradual from the rest of the scale; perianth bristles 0 - 3 - 4, white, smooth or retrorse-spinulose, shorter or exceeding the stylopodium; stamens 3, anthers 1.1-1.8 mm, ending in a short apiculum; style trifid. Achene (1.0) 1.3 – 1.5 x 0.4 - 0.5 mm, subterete to slightly trigonous, ellipsoid to narrowly obovoid, with 12 - 15 longitudinal rows of 40 - 60 rectangular cells horizontally oriented, obtuse at the apex, yellowish white to stramineous, shiny or iridescent; stylopodium conical to widely conical, olivaceous to brown, separated from the achene body by a constriction, ca. 1/3 as wide as the achene.

DISTRIBUTION. South of Brazil, Paraguay, Argentina, Chile and Brazil (mainly in South of the country). *E. bonariensis* is very common in Rio Grande do Sul and it becomes scarce towards of Paraná. Svenson (1939) cited *E. bonariensis* to Mexico, however, it needs further investigation.

ARGENTINA. Provincia de Corrientes, Depto. Empedrado, Estância Las Tres Marias, 18.X.1964, *T.M. Pedersen 7099*, (LP).

BRAZIL. **Paraná:** Campina Grande do Sul, a 9 km from the town, 12 Dec. 1973, *N. Imaguire* 1069 (MBM). Curitiba, Parque Barigui, 18 Oct. 1996, *C. Kozera & V.A.O. Dittrich* 264 (MBM). **Rio Grande do Sul:** Aceguá, BR 473, 31º38'10"S, 54º23'58"W, 22 Nov. 2003, *R. Trevisan et al.* 211 (ICN). Arroio do Sal, Rondinha beach, 16 Oct. 2003, *R. Trevisan & I. Boldrini* 29 (ICN). Campestre da Serra, BR 116, Rio das Antas, 03 Nov. 2003, *R. Trevisan et al.* 132 (ICN). Palmares do Sul, RST 101, km 58, 30º17'57"S, W 50º28'53"W, 22 Oct. 2003, *R. Trevisan et al.* 65 (ICN). São Francisco de Paula, RS 020, km 28, 29º24'27"S, 50º27'32"W, 28.XI.2003, *R. Trevisan et al.* 295 (ICN). **Santa Catarina:** Bom Jardim da Serra, SC 438, 28°20'37.7"S, 49°36'03.2"W, 12 Dec. 2007, *R. Trevisan* 934 (ICN). Urubici, waterfall of the Rio Avencal, 16 Oct. 2004, *G. Hatschbach et al.* 78115 (MBM).

HABITAT. *E. bonariensis* occurs in several environments such as moist grasslands, bogs, irrigating canals, edge of the streamlets, swampy soil and wet roadsides. Usually this species forms dense mats on the moist soils.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. bonariensis* is distinguished from other species by lower scale fertile, floral scales membranous, stamens 3, anthers 1.1-1.8 mm, achenes 1.3 – 1.5 x 0.4 - 0.5 mm, subterete to slightly trigonous, with 12 - 15 longitudinal rows of 40 - 60 rectangular cells, and stylopodium conical.

6. Eleocharis capillacea Kunth, Enum. Pl. 2: 139 (1837). Type: Brazil, *Sellow s.n.* (holotype B, not seen; isotype K [photo!]).

Chaetocypeus capillaceus (Kunth) Nees in Mart., Fl. Bras. 2: 93 (1842).

Perennial, caespitose-rhizomatous, with creeping rhizomes, with thin non-lignified base. Culm 1.5 - 6 cm x 0.2 mm, sulcate when dry, spongy, not septate. Sheaths vinaceous at the base, apex oblique, tubular to somewhat inflated toward the apex, not wrinkled emucronate, edges hyaline, delicate and inconspicuous. Spikelets 1.9 - 3 x 0.7 mm, lanceoloid, 1(rare 3)-flowered, with 2 scales protecting the flower, not proliferous; lower scale sterile, membranous, lanceolate, apex acute, stramineous to vinaceous, as long as the adjacent scale, wide hyaline margin; floral scale 1.9 - 3 x 0.7 mm, membranous, lanceolate, apex acute, appressed, smooth, inconspicuously veined, keel stramineous, sides stramineous to vinaceous, hyaline margin developed gradual from the rest of the scale; perianth bristles 6, yellow to light-brown, retrorse-spinulose, slightly exceeding the stylopodium; stamens 2, anthers 0.7 - 1 mm, ending in a short apiculum; style bifid. Achene 1 - 1.3 x 0.6 mm, biconvex, obovoid, smooth to minutely roughened, shiny, light brown, dark-brown or black; stylopodium

flattened dorsiventrally, small, green to ochraceous, separated from the achene body by a brief constriction, ½ as wide as the achene. Fig. 1I-N.

DISTRIBUTION. Venezuela, Paraguay, and Brazil (Svenson 1929; González-Elizondo & Reznicek 1998).

BRAZIL. **Distrito Federal:** Brasília, Reserva Ecológica do IBGE, chácara I, 15.IV.1980, *E. P. Heringer et al.* 3739 (IBGE). **Goiás:** Campos Belos, Road from Alto Paraíso to Campo Belo, km 38, 28 Nov. 1976, *G. J. Shepherd et al.* 3757 (MBM). **Maranhão:** Balsas, Agrovila Nova de Carli, 8°32'57"S, 46°37'02"W, 04 July 1998, *R. C. Oliveira et al.* 1195 (ICN). **Minas Gerais:** Conceição do Mato Dentro, near the statue of Juca, 27 April 2007, *C. R. M. Silva & A. L. L. Vanzela* 140 (ICN). **Paraná:** Campo Mourão, Parque Estadual do Lago Azul, 24º06'25.6"S, 52º18'46.1"W, 26 Feb. 2008, *M. G. Caxambu et al.* 2035 (ICN). Ponta Grossa, 05 March 1970, *G. Hatschbach & T. Koyama* 24012 (MBM). **Santa Catarina:** Chapecó, Fazenda Campo São Vicente, 24 km West from Campo Erê, 26 Dec. 1956, *L. B. Smith et al.* 9460 (HBR, SI). Mafra, 26 Jan. 1953, *R. Reitz* 5341 (HBR, PACA, SI). **São Paulo:** Mojiguaçu, Fazenda Campininha, North of Rio Mojiguaçu, 4km NW Padua Sales. 01 Aug. 1964, *G. Eiten & L.T. Eiten* 5667 (SP).

PARAGUAY. **Depto. Guairá**: Colonia Independencia, 29 March 1972, *T. M. Pedersen* 10097 (MBM).

HABITAT. This species usually grows creeping on moist soils, forming dense mats. Sometimes it can be found in shadow places.

NOTES. *E. capillacea* is characterised by short plants, sheaths delicate not wrinkled, spikelets usually 1-flowered, achenes biconvex, dark brown to black.

7. Eleocharis contracta Maury, Mem. Soc. Phys. Genève 31: 139 (1889). Type: Paraguay, *B. Balansa* 434 (holotype G?, not seen; isotype K [photo!]).

Perennial, caespitose-rhizomatous, rhizomes ligneous with short internodes. Culms 20 - 60 cm x 0.4 - 0.8 (-1) mm, terete, hollow, septate, 0.8 - 2 mm between the septa. Sheaths vinaceous at the base, apex truncate, firm, with dorsal mucro developed, edge conspicuous vinaceous to brown. Spikelets 6 - 15 x 1.8 - 3 mm, ovoid, 70 – 250-flowered, not proliferous; lower scale sterile, cartilaginous, oval, apex acute to obtuse, green, subequal the adjacent scales, with narrow hyaline margin; floral scales 1.4 - 2 x 0.7 - 1 mm, membranous, oval, apex acute to obtuse, spirally arranged, slightly divergent, smooth, inconspicuously veined, keel stramineous, sides brown, hyaline margin developed and gradual from the rest of the scale; perianth bristles 4 - 7, white to vinaceous, smooth to somewhat spinulose, shorter than the achene; stamens 1 - 2, anthers 0.5 mm, ending in a short apiculum; style bifid or trifid. Achene 0.9 - 1 x 0.5 - 0.9 mm, biconvex, plano-convex or trigonous, with abaxial angle slightly salient, obovoid, smooth to finely reticulate, olivaceous to dark-brown; stylopodium pyramidal or flattened dorsiventrally, small, ochraceous to brown, confluent with the achene or slightly separated from it by a constriction, ½ to 1/3 as wide as the achene.

DISTRIBUTION. South of Brazil, Paraguay, Argentina, and Uruguay (Barros 1928; Trevisan and Boldrini 2008).

ARGENTINA. **Provincia de Corrientes:** Depto. Santo Tomé, Estância San Francisco, 23 km NW de Governador Virasoro, 05 Dec. 1970, *A. Krapovickas et al.* 17249 (LP).

BRAZIL. **Paraná:** Tibagi, Rio Tibagi, 25º17’14”S, 49º54’25”W, 20 Jan. 2007, *C. R. M. Silva & A. L. L. Vanzela* 104 (ICN). **Rio Grande do Sul:** Santana do Livramento, 30°58'27"S, 55°19'47"W, 15 Nov. 2005, *R. Trevisan* 532 (ICN). São Francisco de Paula, BR 453, km 239,

29º15'39''S, 50º20'05''W, 28 Nov. 2003, *R. Trevisan et al.* 300 (ICN). São José dos Ausentes, Fazenda São José dos Ausentes, 22 Jan. 2002, *I. Boldrini et al.* 1227 (ICN). Tapes, 30º39'02''S, 51º30'05''W, 27 Nov. 2003, *R. Trevisan et al.* 288 (ICN). Tupanciretã, RS 392, km 16, 29°03'32''S, 53°48'26.9''W , 03 Oct. 2007, *R. Trevisan* 846 (ICN). Uruguaiana, Arroio Touro Passo, 16 Nov. 1984, *M. Sobral* 3362 (ICN). **Santa Catarina:** Bom Retiro, BR 282, km 132, 27°48'38.5''S, 49°31'09.5''W, 29 Nov. 2006, *R. Trevisan et al.* 773 (ICN). Curitibanos, towards Campos Novos, 05 Dec. 1956, *L. B. Smith & R. Klein* 8323 (HBR). HABITAT. It occurs in moist soils, usually near some stream, irrigatin canal or bog. NOTES. Illustration can be found in Trevisan and Boldrini (2008). *Eleocharis contracta* can be misidentified as *E. montana*, however, it can be differentiated from the last one by the culms 0.4 – 0.8 (- 1) mm wide, floral scales 1.4 – 2 mm long, achenes 0.9 – 1 mm long, anthers 0.5 mm (*vs*. culms (1 -) 1.5 – 3.5 mm wide, floral scales 2.1 – 3.2 mm long, achenes 1 - 1.5 mm long, anthers 1.2 - 1.5 mm).

8. Eleocharis debilis Kunth, Enum. Pl. 2: 143 (1837). Type: Brazil, Rio de Janeiro, *Sellow s.n.* (holotype B, destroyed).

Perennial, caespitose with many culms, with thin non-lignified base or slightly so. Culms 5 - 25 cm x 0.3 - 0.4 mm, sulcate when dry, spongy, not septate. Sheaths stramineous to reddish brow at the base, apex oblique, not wrinkled, slightly inflated, emucronate, with delicate, hyaline and inconspicuous edges. Spikelets 3 - 4 x 2 - 2.5 mm, ovoid, 6 – 10-flowered, not proliferous; less lower scale sterile, membranous, lanceolate, apex acute, green to stramineous, shorter than the adjacent scales, hyaline margin wide; floral scales 2 – 2.2 x 0.9 - 1 mm, membranous, oval, apex acute, spirally arranged, somewhat divergent, smooth, inconspicuously veined, keel stramineous, sides vinaceous to dark-brown, hyaline margin

narrow and gradual from the rest of the scale; perianth bristles 7 – 8, yellow to light-brown, retrorse-spinulose, unequal, as long as or exceeding the stylopodium; stamens 3, anthers 0.6 - 0.8 mm, ending in a short apiculum; style bifid. Achene 1.3 - 1.5 x 0.7 - 0.8 mm, biconvex, obovoid, smooth to minutely roughened, shiny, obtuse at the apex, dark-brown to almost black; stylopodium flattened dorsiventrally, triangular, small, green to ochraceous, separated from the achene body by a brief constriction, ½ to 1/3 as wide as the achene. Fig. 2A-F.

DISTRIBUTION. Puerto Rico, Venezuela, and Brazil (González-Elizondo and Reznicek 1996; Strong and Acevedo-Rodriguez 2005).

BRAZIL. **Bahia:** Una, 8 km West of BA-001 on road to Vila Brasil, 15º10'26"S, 39º03'34"W, 23 Jan. 2005, *W. W. Thomas et al.* 14440 (MBM). **Minas Gerais:** Santa Rita de Jacutinga, Cachoeira do Pacau, Feb. 2002, *R. Moura* 374 (ICN). **Paraná:** Guaraqueçaba, Itaqui, Rio Agua Branca, 19 Nov. 2003, *G. Hatschbach* 76710 (MBM). Jaguariaiva, Parque Estadual do Cerrado, 29 Oct. 1999, *L. von Linsingen* 39 (MBM). Morretes, Prainhas, 30 Aug. 1975, *A. Dziewa* 29 (MBM). Pinhão, 25º39'59"S, 51º40'05"W, 13 Sept. 2007, *C.R.M. Silva et al.* 193 (ICN). **Santa Catarina:** Corupá, Corrêa, 13 Jan. 1958, *R. Reitz & R. Klein* 6208 (HBR). Florianópolis, Lagoinha do Leste, 19 Dec. 1970, *R. Klein* 9188 (HBR). Governador Celso Ramos, Jordão, 19 May 1971, *R. Klein & A. Bresolin* 9448 (HBR). **São Paulo:** Itararé, Road to Bom-Sucesso de Itararé, km 9, Fazenda Santa Izabel (RIPASA), 24°08'20"S e 49°04'00”, 12 Dec. 2000, *A. P. Prata et al.* 1095 (SP).

HABITAT. It grows at the margins of streams or rivers, usually associated with stones or patches of sandy soil.

NOTES. *E. debilis* can be recognised by culms 5 - 25 cm long, sheaths delicate and not wrinkled, spikelets 6 – 10-flowered, floral scales membranous, dark and somewhat spreading, and achenes biconvex, dark brown to black.

9. Eleocharis densicaespitosa R. Trevis. & Boldrini, Syst. Bot. 00: 000 (ined.). Type: Brazil, Rio Grande do Sul, Palmares do Sul, Pontal do Anastácio, 25 Apr. 2003, *M.L. Abruzzi* 4694 (holotype HAS!).

Perennial, caespitose-rhizomatous, with ligneous short rhizomes, hardened bulbous culm-bases, with the culm-shoots recurved, and thick roots. Culms 8 - 40 cm x (0.9) 1 - 2 mm, quinquangular, irregularly sulcate when dry, spongy, not septate. Sheaths brown to purple at the base, apex oblique, emucronate or with the dorsal mucro somewhat insinuating, edge firm inconspicuous or with brown dots. Spikelets 8 - 17 (21) x 3.5 - 4.5 mm, ovoid to oblong, 40 - 70(ca. 180)-flowered, not proliferous; lower scale sterile, cartilaginous, oval, apex acute to obtuse, green, as long as or exceeding the adjacent scales, hyaline margin wide; floral scales 2.3 - 3.2 x 1.1 - 1.7 mm, membranous to papery, oval, apex emarginate, spirally arranged, appressed, smooth, inconspicuously veined, keel stramineous , sides brown to vinaceous, hyaline margin and gradual from the rest of the scale; perianth bristles none, stamens 3, anthers 1 - 1.6 mm, ending in a short apiculum; style trifid. Achene 1 - 1.2 x 0.6 - 0.7 mm, trigonous, with abaxial angle salient, obovoid, rounded at the apex, smooth, yellowish white to stramineous; stylopodium pyramidal or hemispheric, yellowish-brown to brown, separated from the achene body by a constriction, with the base somewhat incumbent on the achene apex, ca. ¾ as wide as the achene.

DISTRIBUTION. This species is known to provinces of northeastern of Argentina and coastland in Rio Grande do Sul (Brazil).

ARGENTINA. Provincia de **Corrientes:** Depto. General Paz, Santos Lugares, 11-X-1982, *T.M. Pedersen 13423* (SI).

BRAZIL. **Rio Grande do Sul**. Mostardas, Lagoa do Barro Velho, 30 Dec. 1978, *J. Waechter* 1131 (ICN). Osório, Fazenda do Arroio, 04 Jan. 1950, *B. Rambo* 45220 (PACA). Rio Grande, FURG - Campus Carreiros, 26 Aug. 1997, *A. S. Campos s.n.* (HURG 1510). São José do Norte, Estreito, Jan. 1992, *P. Tagliani s.n.* (HURG 2324). Tavares, RST 101, 31º26'41"S, 51º12'15"W, 23 Oct. 2003, *R. Trevisan et al.* 96 (ICN). Tramandaí, 14 Dec. 1984, *D. B. Falkenberg* 2038 (FLOR). Viamão, Parque Estadual de Itapuã, near Lagoa do Palácio, 30°23'55.5"S, 50°57'18.7"W, 20 Nov. 2006, *R. Trevisan et al.* 717 (ICN).

HABITAT. *Eleocharis densicaespitosa* grows in wet environments, associated to sandy banks or sandy soil near rivers and lagoons. This species usually forms dense isolated tussocks spread all over the area.

NOTES. Illustration can be found in Trevisan and Boldrini (vide artigo 3). *Eleocharis densicaespitosa* is similar to *E. quinquangularis* Boeck., from which it is differentiated by coarse culms, floral scales emarginate and larger achenes (*vs*. culms 0.4-0.6 mm wide, floral scales acute to obtuse and achenes 0.8 x 0.5-0.6 mm).

Other species with emarginated scales that could be confused with the *Eleocharis densicaespitosa* is *E. filiculmis* Kunth. However, *E. filiculmis* has perianth bristles, as was reported by González-Elizondo (1994) and Trevisan and Boldrini (2008).

10. Eleocharis dunensis Kük., Repert. Spec. Nov. Regni Veg. 12: 94 (1913). Type: Uruguay, Priapolis, depto. Maldonado, *Osten* 5716 (holotype B [photo!]).

Perennial, caespitose-rhizomatous, rhizomes ligneous, elongated and branched with short internodes, usually with ligneous rootstock. Culms 15 - 35 cm x 0.2 - 0.3 mm, quinquangular, sulcate when dry, spongy, not septate. Sheaths brown to vinaceous at the base, apex truncate, tubular, emucronate, with firm vinaceous edges. Spikelets 4 - 8 x 2 - 3 mm, ovoid, 25 - 45-

flowered, not proliferous; lower scale sterile, membranous to papery, oval, apex acute to obtuse, green, subequal or shorter than the adjacent scales, hyaline margin narrow; floral scales 1.8 – 2.1 x 0.6 - 1 mm, membranous, oval to elliptical, apex acute, spirally arranged, appressed, smooth, inconspicuously veined, keel stramineous, sides brown to dark brown, hyaline margin inconspicuous or absent; perianth bristles 0 - 3 – 5, white, smooth, shorter than the achene; stamens 3, anthers 1.1 - 1.2 mm, ending in a short apiculum; style trifid. Achene 0.7 - 1.1 x 0.5 mm, trigonous, with abaxial angle salient, obovoid, apex truncate, smooth to finely reticulate, olivaceous; stylopodium pyramidal, white to brown, separated from the achene body by a constriction, ca. ½ as wide as the achene.

DISTRIBUTION. Brazil (Rio Grande do Sul), Argentina and Uruguay.

ARGENTINA. **Provincia de Corrientes:** Depto Mburucuyá, Estância Santa Teresa, 15 Jan. 1962, *T. M. Pedersen* 6643 (ICN, LP).

BRAZIL. **Rio Grande do Sul:** Aceguá, BR 473, 31º38'10"S, 54º23'58"W, 22 Nov. 2003, *R. Trevisan et al.* 209 (ICN). Bagé, Road towards Serrilhada, 31º19'37.2"S, 54º10'56.7"W, 17 Nov. 2003, *S. M. Hefler et al.* 177 (ICN). Barra do Quaraí, Parque do Espinilho, 17 Nov. 1984, *M. Sobral* 3387 (ICN). Santa Vitória do Palmar, BR 471, S 33°30'04.4"S, 53°15'18.7"W, 26 Nov. 2004, *I. Boldrini et al.* 1282 (ICN). Uruguaiana, Nov. 1982, *M. Sobral* 3387a (ICN).

HABITAT. It occurs in wet grasslands, usually forming dense populations.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. dunensis* is easily identified by the filiform culms, tubular sheaths with apex truncate or slightly oblique, edges firm vinaceous, floral scales without hyaline margin, and achenes trigonous, smooth to finely reticulate.

11. Eleocharis elegans (Kunth) Roem. & Schult., Syst. Veg. 2: 150 (1817).

Scirpus elegans Kunth in Humb. Bonpl. & Kunth, Nov. Gen. Sp. 1: 226 (1815). Type: Peru, Trujillo, *Humboldt & Bonpland s.n.* (syntype P [photo!]).

Perennial, caespitose-rhizomatous, with creeping ligneous rhizomes, with short internodes. Culms 45 - 90 (140) cm x 4.5 - 8 mm, terete, hollow, septate, 11 - 25 mm between the septa. Sheaths vinaceous to black at the base, apex truncate, with dorsal mucro developed, with firm and vinaceous edges. Spikelets 15 - 30 x 4.5 - 5 (-7) mm, cylindrical, ca. 750-flowered, not proliferous; lower scale sterile, coriaceous, oval, apex acute, green, subequal or exceeding the adjacent scales, hyaline margin narrow or absent; floral scales 3 - 4 x 1.1 - 1.3 mm, membranous, oblong, apex acute to obtuse, spirally arranged, appressed, densely imbricate, smooth, inconspicuously veined, keel stramineous, sides stramineous to vinaceous, hyaline margin developed and gradual from the rest of the scale; perianth bristles 7 - 8, stramineous to vinaceous, retrorse-spinulose, exceeding the stylopodium; stamens 3, anthers 1.1 - 1.2, obtuse; style bifid or trifid. Achene ca. 1.8 x 0.7 – 0.8 mm, trigonous or plano-convex, with salient abaxial angle, obovoid, smooth to somewhat striate, ochraceous to yellowish brown; stylopodium pyramidal, brown, confluent with the achene or separated from it by a constriction, ½ as wide as the achene.

DISTRIBUTION. central Mexico, Central America, Colombia to northern Argentina, West Indies (Barros 1928; González-Elizondo & Reznicek 1998; Strong and Acevedo-Rodríguez 2005).

ARGENTINA. **Provincia de Entre Rios:** delta del rio Paraná, Arroyo Negro, 24.XI.1931, *A.L. Cabrera* 1965 (LP).

BRAZIL. Minas Gerais: Boa Esperança, 15 km from the town, towards Coqueiral, 23 Dec. 2007, *A. R. Silva* 631 (HCF, ICN). **Mato Grosso do Sul:** Aquidauana, Fazenda Santa Cruz, 17 July 1969, *G. Hatschbach* 21954 (UPCB). Corumbá, Porto Morrinho, 20 June 2006, *E. Barbosa & J. M. Silva* 1587 (MBM). **Paraná:** Curitiba, Capão da Imbuia, 19 Nov. 1964, *L. T. Dombrowski & Y. Saito* 981 (MBM). Foz do Iguaçu, Parque do Iguaçu, 15 Dec. 1987, *J. M. Silva* 441 (MBM). Ponta Grossa, dike Manancial Alagados, Oct. 2003, *A. Bach s.n.* (HUPG 13134). **Rio Grande do Sul:** São Gabriel, Fazenda Santa Cecília, Jan. 1944, *B. Rambo* 25698 (PACA). **Santa Catarina:** Mafra, Campo Novo, 11 Dec. 1962, *R. Klein* 3772 (FLOR, HBR). **São Paulo:** Monte Alegre do Sul, várzea of Rio Camanducaia, 25 July 1949, *M. Kuhlmann & E. Kuhn* 1861 (ICN, SP).

HABITAT. Edge of the streams, bogs and low wet grasslands.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. elegans* is easily recognised by coarse culms, 4.5 - 8 mm wide, hollow, septate, sheaths with dorsal mucro, floral scales membranous and densely imbricate.

12. Eleocharis elongata Chapm., Fl. South. U.S. 515 (1860). Type: United States, Florida, Apalachicola, *Chapman s.n.* (holotype NY [photo!]).

Perennial, caespitose-stoloniferous, with long and flaccid stolons, usually floating plants, with non-ligneous base. Culms 40 - 70 cm x 0.6 - 1.5 mm, terete, sulcate when dry, flaccid, spongy, not septate. Sheaths stramineous to vinaceous at the base, apex oblique, emucronate, edge firm, inconspicuous or with a brown ring-like in the border. Spikelets 13 - 18 x 1.8 - 2.5 mm, lanceoloid to cylindrical, 12 - 30-flowered, not proliferous; lower scale fertile, coriaceous, oval-oblong, apex acute to obtuse, green, appearing as a continuation of the culm, shorter than the adjacent scales, hyaline margin narrow; floral scales 4 – 4.5 x 1.5 - 2 mm,

papery to cartilaginous, oblong, apex acute to obtuse, spirally arranged, loosely imbricate, appressed, striate, green, conspicuously veined, with submarginal band light-brown to vinaceous, hyaline margin developed and clearly delimitated from the rest of the scale; perianth bristles 5 - 7, stramineous to light brown, retrorse-spinulose, shorter to exceeding the stylopodium; stamens 3, anthers 1.1 – 1.9 mm, ending in a short apiculum; style trifid. Achene 1.5 - 2.3 x 0.7 - 1 mm, trigonous or plano-convex, obovoid, stramineous to amber-colored, cancellate, with 13 - 15 longitudinal rows of rectangular cells oriented horizontally; constricted at the summit into a distinct neck; stylopodium pyramidal elongated, greenish to brown, confluent with the neck on the top of the achene, ca. ¼ as wide as the achene. Fig. 2G-L.

DISTRIBUTION. Southwest of United States, Central America to south Brazil (Santa Catarina).

BRAZIL. **Rio de Janeiro:** Casimiro de Abreu, district of the Barra de São João, 04 Sept. 1953, *F. Segadas-Vianna et al.* 932 (SI). Cabo Frio, Arraial do Cabo, 11 July 1953, *F. Segadas-Vianna et al.* 47 (SI). Silva Jardim, Fazenda Dilvo Perez, Vale São João, Sept. 1986, *D. Teixeira s.n.* (ICN 128060). **Santa Catarina:** Florianópolis, Rio Vermelho, 05 Oct. 1984, *M. L. Souza et al. 347* (FLOR, ICN).

UNITED STATES. **Louisiana:** Vermilion Parish, Louisiana Department of Wild Life and Fisheries, South of the Gulf Intracostal Waterway, 16.4km SW of the town of Gueydan, 21 May 2006, *D. J. Rosen et al.* 4185 (ICN).

HABITAT. Emergent plants in flooded environments, bogs, streams, and pools between dunes.

NOTES. *E. elongata* is similar to *E. laeviglumis* from which is differentiated by culms flaccid, 0.6 – 1.5 mm wide, floral scales striate and loosely imbricate, spikelets 12 – 30-flowered, achenes with 13 - 15 longitudinal rows of rectangular cells oriented horizontally,

stylopodium confluent with the neck on the top of the achene (*vs.* culms firm, 1 - 2.2 mm wide, floral scales smooth and densely imbricate, spikelets 20 - 50-flowered, achenes with 8-12 longitudinal rows of polygonal cells horizontally oriented, stylopodium separated from the achene body by a constriction). *E. elongata* is not common in southern of Brazil, where this species was collected only in Santa Catarina in lowlands.

13. Eleocharis filiculmis Kunth, Enum. Pl. 2: 144 (1837). Type: Brazil, *Schrader s.n.* (holotype GOET, not seen)

Eleocharis rothiana Boeck., Linnaea 36: 444 (1869). Type. Brazil, *coll. ingotis* (BREM [photo!]).

Perennial, caespitose, base not ligneous or slightly so. Culms 8 - 15 cm x 0.8 - 1 mm, quinquangular, sulcate when dry, spongy, not septate. Sheaths stramineous to vinaceous at the base, apex oblique, emucronate, edge firm, inconspicuous or with red dots. Spikelets 4,5 - 9 x 2.5 - 3 mm, ovoid, 40 - 70-flowered, not proliferous; lower scale sterile, cartilaginous, oval, apex obtuse, green, subequal to the adjacent scale, hyaline margin narrow; floral scales 1.7 – 1.9 x 0.8 - 1 mm, membranous, oval to obovate, apex emarginate, spirally arranged, densely imbricate, appressed, smooth, inconspicuously veined, keel stramineous, sides brown to vinaceous, hyaline margin developed and gradual from the rest of the scale; perianth bristles 6, yellow, retrorse-spinulose, shorter than the stylopodium; stamens 3, anthers 0.6 - 0.7 mm, ending in a short apiculum; style trifid. Achene 0.8 - 0.9 x 0.5 mm, trigonous, with abaxial angle salient, obovoid, apex truncate, smooth, yellow to stramineous; stylopodium pyramidal, small ochraceous, separated from the achene body by a brief constriction, 3/4 as wide as the achene.

DISTRIBUTION. Widely distributed from Mexico to South America and West Indies (Svenson, 1937; González-Elizondo, 1994).

BRAZIL. **Bahia:** Barreiras, vale of the Rio das Ondas, 4 km North of Barreiras, 05 March 1971, *H. S. Irwin et al. s.n.* (MBM 62488, NYBG 31610). **Distrito Federal:** Brasília, basin of the Rio São Bartolomeu, 12 May 1980, *E. P. Heringer et al.* 4715 (IBGE). **Minas Gerais:** Frutal, 49°03'18"S, 20°00'54"W, 23 Nov. 2006, *C. R. M. Silva & A. L. L. Vanzela* 37 (ICN). **Mato Grosso do Sul:** Paranaíba, ca. 5 km from the town, 19º42'49"S, 51º08'31"W, 24 Nov. 2006, *C. R. M. Silva & A.L.L. Vanzela* 46 (ICN). **Paraná:** Guaíra, Sete Quedas, 27 Jan. 1979, *E. Buttura s.n.* (MBM 65188). Sengés, Parque Ecológico Gruta da Barreira, 27 April 2000, *A. P. Prata et al.* 867 (SP). **Rio Grande do Sul:** Canela, Caracol, 22 Dec. 1949, *B. Lutz s.n.* (ICN 729). **Santa Catarina:** Caçador, 26º51'49"S 50º49'40"W, 20 Jan. 2007, *C. R. M. Silva & A. L. L. Vanzela* 93 (ICN). Matos Costa, 23 Feb. 1962, *R. Reitz & R. Klein* 12378 (HBR). **São Paulo:** Brotas, 22º15'54"S, 47º55'30"W, 28 April 2007, *C. R. M. Silva & A. L. L. Vanzela* 155 (ICN).

HABITAT. Bogs and wet grasslands.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. filiculmis* is similar to *E. loefgreniana* and *E. densicaespitosa*. It can be distinguished from the first one by the spikelets 40 - 70-flowered, floral scales densely imbricate, achenes 0.8 - 0.9 mm long (vs. spikelets 12 – 25-flowered, floral scales loosely imbricate, achenes1.1 - 1.3 mm long). From the second one it can be differentiated by the base of the culms not ligneous or slightly so, achenes 0.8 - 0.9 x 0.5 mm, perianth bristles developed (*vs.* hardened bulbous culm-bases, with ligneous short rhizomes, achenes 1-1.2 mm long, perianth bristles absent). *E. filiculmis* is common in Central Brazil and it becomes scarce towards of Rio Grande do Sul.

14. Eleocharis flavescens (Poir.) Urb., Symb. Antill. 4(1): 116 (1903).

Scirpus flavescens Poir. in Lamarck, Encycl. 6: 756 (1805). Type: Porto Rico, *Ledrú s.n.* (holotype P, not seen, isotype P [photo!]).

Perennial, caespitose-rhizomatous, sometimes with herbaceous elongated rhizomes, usually with short internodes, base not ligneous. Culms 4 - 20 cm x (0,4-) 0.6 – 1.1 mm, terete, sulcate when dry, spongy, not septate. Sheaths stramineous to reddish at the base, apex inflated with hyaline wrinkled portion quite distinct from the base, emucronate, the delicate edges easily torn. Spikelets 4 - 8 x 2 - 3 mm, ovoid, 20 - 60-flowered, not proliferous; lower scale sterile, cartilaginous, oval to oboval, apex acute to obtuse, green to stramineous, subequal to adjacent scales, with wide hyaline margin; floral scales 1.9 – 2.5 x 0.8 - 1 mm, membranous, oval, apex acute to obtuse, spirally arranged, appressed, smooth, inconspicuously veined, keel green to yellow, sides yellowish to light brown or brown, hyaline margin developed and gradual from the rest of the scale; perianth bristles 7 - 8, white, retrorse-spinulose, shorter or exceeding the stylopodium; stamens 3, anthers 0.9 – 1.1 mm, ending in a short apiculum; style bifid. Achene 0.9 – 1.1 x 0.5 – 0.8 mm, biconvex, obovoid, apex rounded, smooth to minutely roughened, light brown to dark brown (olivaceous when immature); stylopodium flattened dorsiventrally, depressed, whitish to olivaceous, separated from the achene body by a constriction, ½ to 1/3 as wide as the achene.

DISTRIBUTION. Southeastern of United States, south of Mexico, West Indies, northern and east of South America (González-Elizondo 1994; Smith *et al.* 2002; Trevisan and Boldrini 2008).

ARGENTINA. **Provincia de Corrientes:** Depto. Lavalle, Estancia La Pastoril, 25 Nov. 1971, *T. M. Pedersen* 10030 (LP).

BRAZIL. **Paraná:** Caiobá, towards Garatuba, 25º50'53.4"S, 48º32'50.0"W, 11 May 2008, *C. R. M. Silva et al. 373* (ICN). Guaraqueçaba, Reserva Natural Salto Morato, 10 Sept. 1999, *G. Gatti* 497 (UPCB). Paranaguá, upland of Guarany, 08 Sept. 1965, *G. Hatschbach 12734* (MBM). **Rio Grande do Sul:** Arroio do Sal, Rondinha Beach, 16 Oct. 2003, *R. Trevisan & I. Boldrini* 27 (ICN). Rio Grande, Cassino, 04 Dec. 1998, *E.N. Garcia et al.* 340 (ICN, PEL). Viamão, Parque Estadual de Itapuã, near Lagoa do Palácio, 30°24'01.0"S, 50°57'20.9"W, 20 Nov. 2006, *R. Trevisan et al.* 713 (ICN). **Santa Catarina:** Florianópolis, Rio Tavares, 11 March 1953, *R. Reitz & R. Klein* 288 (HBR). Palhoça, SC 433, km 8, between Pinheira and Praia do Sonho, 08 Feb. 2007, *R. Lüdtke* 762 (ICN). **São Paulo:** Cunha, Reserva Florestal, 12 Feb. 1981, *C.F. Muniz et al.* 237 (SP).

HABITAT. It occurs in wet grasslands, usually in drenched sandy soil.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. flavescens* is characterised by sheaths with the distal portion delicate, inflated and transversally wrinkled, floral scales membranous, with sides yellowish to light brown or brown, and achenes light brown to dark brown.

15. Eleocharis geniculata (L.) Roem. & Schult., Syst. Veg. 2: 150 (1817).

Scirpus geniculatus L., Sp. Pl. 1: 48 (1753). Type: Herb. Clifford: 21, *Scirpus* 1 (lectotype BM, designaded by Furtado in Gard. Bull. Straits Settlem. 9: 299 [1937], [photo!]).

Perennial, usually caespitose, sometimes showing herbaceous rhizomes with short internodes, not ligneous base. Culms 6 - 30 cm x 0.5 – 1.4 mm, terete, spongy, not septate. Sheaths vinaceous at the base, tubular, apex oblique, resistant, emucronate, edge firm, inconspicuous. Spikelets 3.5 - 15 x 2.3 - 4 mm, globose to ovoid, 20 - 240-flowered, not proliferous; lower scale sterile, cartilaginous, oboval, apex obtuse, green to vinaceous, subequal to the adjacent

scales, hyaline margin narrow; floral scales 1.6 - 2.2 x 1 - 1.4 mm, membranous, oval to obovate, apex obtuse, spirally arranged, appressed, smooth, inconspicuously veined, keel stramineous, sides brown to vinaceous, hyaline margin developed and gradual from the rest of the scale; perianth bristles 7 or rudimentary, yellowish, unequal, retrorse-spinulose, as long as or exceeding the stylopodium; stamens 3, anthers 0.6 mm, obtuse; style bifid. Achene 1 - 1.3 x 0.6 – 0.8 mm, biconvex, obovoid, smooth to minutely roughened, black, apex rounded; stylopodium conical depressed, stramineous, separated from the achene body by a constriction, ½ to 1/3 as wide as the achene.

DISTRIBUTION. Worldwide in tropical and subtropical regions (Svenson 1929; González-Elizondo 1994).

BRAZIL. **Mato Grosso do Sul: Corumbá**, Fazenda Nhumirim, 08 Dec. 1993, *A. C. Cervi et al.* 4211 (UPCB). **Paraná:** Caiobá, towards Guaratuba, 25º50'53.4"S, 48º32'50"W, 11 May 2008, *C.R.M. Silva et al.* 369 (ICN). Guaratuba, Ilha Bariguí, 19 Dec. 1998, *M. Borgo et al.* 334 (UPCB). Paranaguá, Pontal do Sul, Feb. 1980, *L. T. Dombrowski* 12787 (MBM). **Rio de Janeiro:** Cabo Frio, Praia do Pontal, 22º56'48"S, 42º01'54"W, 17 April 1952, *L. B. Smith et al.* 6557 (SI). **Rio Grande do Sul:** Mostardas, Lagoa Barro Velho, 30 Dec. 1978, *J. Waechter* 1127 (ICN). Santa Vitória do Palmar, Lagoa Mirim, 33°29'55.2"S, 53°26'01.4"W, 26 Nov. 2004, *I. Boldrini et al.* 1275 (ICN). Torres, Lagoa dos Quadros, 18 Jan. 1951, *B. Rambo* 49731 (ICN, PACA). **Santa Catarina:** Araranguá, Arroio do Silva, 19 Feb. 1955, *B. Rambo* 56841 (PACA). Florianópolis, Jurerê, 15 Feb. 1966, *R. Klein et al.* 6655 (FLOR, HBR).

HABITAT. It occurs in wet grasslands, in drenched sandy soil, including areas near the breaking of the waves.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. geniculata* is diagnosed by sheaths tubular with the apex firm, floral scales membranous and achenes smooth to minutely roughened, biconvex, black.

16. Eleocharis interstincta (Vahl) Roem. & Schult., Syst. Veg. 2: 149 (1817).
Scirpus interstinctus Vahl, Enum. Pl. 2: 251 (1805). Type: West Indies, *Martfelt s.n.* (holotype C [photo!])

Perennial, caespitose-stoloniferous, usually with erect and ligneous rootstock. Culms 60 - 104 cm x 4 - 8 mm, terete, hollow, septate, with septa dimorphic, membranous and cartilaginous. Sheaths vinaceous to black at the base, apex oblique, emucronate, edge firm, inconspicuous. Spikelets 20 - 46 x 5 - 8 mm, cylindrical, 60 – 120-flowered, not proliferous; lower scale sterile, coriaceous, oval, apex obtuse, green, appearing as a continuation of the culm, subequal or overtopping the adjacent floral scales, hyaline margin narrow; subigual or exceeding the adjacent scales, narrow hyaline margin; floral scales 5 - 6 x 3 – 3.2 mm, cartilaginous, oval to obovate, apex obtuse, spirally arranged, densely imbricate, appressed to slightly divergent, striate, stramineous, conspicuously veined, without submarginal band, hyaline margin developed and clearly delimitated from the rest of the scale; perianth bristles 6 - 7, white to yellow, retrorse-spinulose, subequal to exceeding the stylopodium; stamens 3, anthers 1.8 – 2.6 mm, ending in a short apiculum; style trifid. Achene 2.5 - 3 x 1.5 – 1.7 mm, biconvex, obovoid, stramineous to light-brown, cancellate, with 17 - 18 longitudinal rows of rectangular cells oriented horizontally; stylopodium triangular flattened dorsiventrally, brown, confluent with achene or separated from it by a brief constriction, ½ or 2/3 as wide as the achene.

DISTRIBUTION. South of United States to Southern Brazil and Bolivia, West Indies, and Bermuda Islands (Svenson 1929; González-Elizondo 1994).

BRAZIL. **Goiás:** Formosa, Lagoa das Pedras, Rio Canabrava, 24 March 1976, *J. E. de Paula* 696 (UB). **Paraná:** Matinhos, 25º48'28.5"S, 48º33'11.8"W, 11 May 2008, *C. R. M. Silva et al.* 374 (ICN). Paranaguá, Rio Perequê, 05 April 1957, *G. Hatschbach* 3683 (MBM). **Rio Grande do Sul:** Arroio do Sal, RS 389, km 74, 28 Jan. 2004, *R. Trevisan et al.* 330 (ICN). Torres, Faxinal, 14 Dec. 1978, *J. Waechter* 1082 (ICN). **Santa Catarina:** Florianópolis, Rio Vermelho, 14 Dec. 1984, *F.A. Silva-Filho & C. Leite* 265 (FLOR). Garopaba, 16 March 1971, *A. Bresolin* 191 (HBR). Governador Celso Ramos, Jordão, 17 Jan. 1972, *R. Klein & A. Bresolin* 10003 (HBR). Palhoça, lowland of Maciambu, near Batalhão Ambiental, 27°50'52.8"S, 48°38'0.7"W, 30 Nov. 2006, *R. Trevisan et al.* 776 (ICN). Sombrio, furnas de Sombrio, 17 Nov. 1971, *A. Schultz & M. L. Porto s.n.* (ICN 9157).

HABITAT. It occurs in as emergent plants in permanent flooded environments, such as irrigating canal, bogs, and flooded roadsides.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. interstincta* is easily identified by its culms septate, hollow, floral scales cartilaginous and striate, achenes biconvex, cancellate, with 17 - 18 longitudinal rows of rectangular cells oriented horizontally.

17. Eleocharis jelskiana Boeck., Linnaea 38: 376 (1874). Type: French Guiana, Cayenne, *Jelski s.n.* (holotype B [photo!]).

Perennial, caespitose-stoloniferous, usually with erect and ligneous rootstock. Culms 48 - 74 cm x 1.8 - 2.1 mm, terete, opaque, spongy, not septate. Sheaths stramineous to vinaceous, apex oblique, emucronate, edge firm, inconspicuous. Spikelets 25 - 37 x 3 mm, lanceoloid to cylindrical, 40 – 80-flowered, not proliferous; lower scale fertile, coriaceous, oval, apex acute

to obtuse, green, subequal or shorter than the adjacent scales, hyaline margin narrow; floral scales 3.5 - 4 x 2 mm, cartilaginous, oval, apex obtuse, spirally arranged, densely imbricate, appressed, striate, greenish to stramineous, conspicuously veined, with submarginal line light-brown or absent, hyaline margin developed and clearly delimitated from the rest of the scale; perianth bristles 6, stramineous to light-brown, retrorse-spinulose, as long as or slightly longer than the stylopodium; stamens 3, anthers 1.8 mm, obtuse; style bifid. Achene 2.3 – 2.5 x 1.2 mm, biconvex, obovoid, yellowish white to light-brown, cancellate, with ca. 13 - 14 longitudinal rows of polygonal cells oriented horizontally; stylopodium flattened dorsiventrally, elongated, brown, confluent with a short neck at the apex of achene, ca. ½ as wide as the achene. Fig. 3A-F.

DISTRIBUTION. Venezuela, Trinidad, French Guiana and Brazil (González-Elizondo & Reznicek 1998).

BRAZIL. **Paraná:** Cianorte, Fazenda Lagoa, 06 April 1966, *J.C. Lindeman & H. Haas* 938 (MBM). **Mato Grosso do Sul:** Aquidauana, Fazenda Fazendinha, pantanal, 19º29'S, 56º23'W, 07 July 1991, *S. M. Salis et al.* 454 (LP).

HABITAT. It occurs as emergent plants in permanent flooded environments.

NOTES. *E. jelskiana* was recorded in south Brasil just by a single collection from Northwest of Paraná. This species can be distinguished from the other similar species recorded in South Brazil by culms terete, not septate, floral scales cartilaginous, striate, greenish to stramineous and stylopodium separated from the achene by a constriction.

18. Eleocharis kleinii Barros, Sellowia 18: 49 (1966). Type: Brazil, Santa Catarina, Irineópolis (Valões), 10 Dec. 1962, *R. Klein* 3718a (holotype HBR!; isotype SI!).

Perennial, caespitose-stoloniferous, usually with erect and ligneous rootstock. Culms 30 - 70 cm x 1.3 - 2 mm, terete to obscurely trigonous in the distal portion, with the culm faces convex and obtuse angles, spongy, not septate. Sheaths vinaceous to dark brown, apex oblique, emucronate, edge firm, inconspicuous. Spikelets 12 - 32 x 2.5 - 4 mm, lanceoloid to cylindric, 16 - 30-flowered, not proliferous; low scale sterile, often fertile, coriaceous, oval, apex acute, green, shorter than the adjacent scales, hyaline margin narrow; floral scale 5 - 6.2 x 2 – 3.5 mm, cartilaginous, oval, apex acute, spirally arranged, loosely imbricate, appressed, striate, medially greenish to stramineous, sides brown to vinaceous, conspicuously veined, without submarginal band, hyaline margin developed and clearly delimitated from the rest of the scale; perianth bristles 6, white to yellow, retrorse-spinulose, exceeding the stylopodium; stamens 3, anthers 1.9 - 2.1 mm, ending in a short apiculum; style bifid or trifid. Achene 2.5 - 3 x 1-1.8 mm, biconvex, obovoid or pyriform, yellow, olivaceous to stramineous, finely cancellate, with 20 - 28 longitudinal rows of polygonal cells horizontally oriented; stylopodium flattened dorsiventrally, elongated, brown, separated from the achene body by a constriction, ca. ½ of as wide as the achene.

DISTRIBUTION. Brazil, endemic to the highlands of Southern Brazil (Trevisan *et al.* 2007). BRAZIL. **Paraná:** General Carneiro, Fazenda Santa Cândida, 26 Feb. 2009, *C. Bona & L.G. Peixoto* 369 (ICN). **Rio Grande do Sul:** Cambará do Sul, Faxinal, Oct. 1983, *M. Sobral & J.R.Stehmann* 2717 (FLOR, ICN, SI). Campestre da Serra, BR 116, km 70, 03 Nov. 2003, *R. Trevisan et al.* 133 (ICN). São Francisco de Paula, RS 020, 29º17'57"S, 50º20'09"W, 28 Nov. 2003, *R. Trevisan et al.* 309 (ICN). São José dos Ausentes, Silveira, Monte Negro, 28°36'59.4"S, 49°47'51.4"W, 19 Nov. 2007, *R. Trevisan* 863 (ICN). **Santa Catarina:** Bom Jardim da Serra, Serra do Rio do Rastro, SC 438, 28°24'0.7"S, 49°33'11.3"W, 11 Dec. 2007,

R. Trevisan 931 (ICN). Matos Costa, km 31, SC 302, 26°27'41"S, 51°07'32.1"W, 21 Dec. 2006, *R. Trevisan et al.* 804 (ICN).

HABITAT. It occurs as emergent plants in permanent flooded environments.

NOTES. Illustration can be found in Trevisan *et al.* (2007) and Trevisan and Boldrini (2008). *Eleocharis kleinii* can be misidentified as *E. obtusetrigona* from which is differentiated by its narrower culms, fewer flowered spikelets, loosely imbricate and conspicuously laterally brown to vinaceous floral scales, and achenes finely sculptured with more numerous longitudinal rows of epidermal cells (*vs.* culms 2.5-5 mm wide, spikelets 40 – 100-flowered, floral scales densely imbricate, stramineous, and achenes cancellate with ca. 15 longitudinal rows of epidermal cells).

Trevisan *et al.* (2007) published a note about *Eleocharis kleinii* pointing out some data on geographic distribution, collections and characterization of this species. It is important to explain that the material cited in Guaglianone *et al.* 2008 (Catalogo de las Plantas Vasculares del Cono Sur) under *E. ochrostachys* Steud. is, actually, *E. kleinii*.

19. Eleocharis laeviglumis R. Trevis. & Boldrini, Novon, 16(1): 155 (2006). Type: Brazil. Rio Grande do Sul, Santa Vitória do Palmar, BR 471, 32º45’00.1”S 52º38’951.4”W, 26 Nov. 2004, *I. Boldrini, E. N. Garcia & R. Trevisan* 1311 (holotype ICN!, isotype K! MO!).

Perennial, caespitose-stoloniferous, with elongated rhizome, erect from creeping and ligneous rootstock. Culms 30 - 65 cm x 1 – 2.2 mm, terete, firm, spongy, not septate. Sheaths stramineous to dark chestnut at the base, apex oblique, emucronate, edge firm, inconspicuous. Spikelets 10 - 23 x 2 – 3.5 mm, lanceoloid to cylindrical, 20 - 50-flowered, not proliferous; low scale fertile, coriaceous, oval, apex obtuse, green, appearing as a continuation of the culm, subequal the adjacent scales, hyaline margin narrow; floral scales 3.5 - 4 (-5) x 2 – 2.3

mm, cartilaginous, elliptic to obovate, apex obtuse, spirally arranged, densely imbricate, appressed, smooth, stramineous to yellow, inconspicuously veined, with submarginal band dark-brown to vinaceous, hyaline margin developed and clearly delimitated from the rest of the scale; perianth bristles 6 - 7, white to yellow, retrorse-spinulose, as long as or exceeding the stylopodium; stamens 3, anthers 1.3 – 1.5 mm, ending in a short apiculum; style trifid. Achene 1.8 - 2 x 0.8 - 1 mm, trigonous, with abaxial angle salient, obovoid, olivaceous to stramineous, finely cancellate, with 8-12 longitudinal rows of polygonal cells horizontally oriented; stylopodium elongated, olivaceous to brown, separated from the achene body by a constriction, 1/3 to ½ as wide as the achene.

DISTRIBUTION. Lowlands of south Brazil (Rio Grande do Sul and Santa Catarina). It is a very common species in coastland of Rio Grande do Sul.

BRAZIL. **Rio Grande do Sul:** Osório, RS 389, 29º54'20"S, 50º14'44"W, 28 Jan. 2004, *R. Trevisan et al.* 318 (ICN). Torres, 29°23'54.6"S, 49°47'15.7"W, 14 Dec.2007, *R. Trevisan* 947 (ICN). Viamão, Parque Estadual de Itapuã, near the Lagoa Negra, 30°22'49.8"S, 51°00'44.5"W, 10 Nov. 2005, *R. Trevisan* 476 (ICN). Xangri-lá, RS 389, km 26, 29º48'44"S, 50º03'42"W, 28.I.2004, *R. Trevisan et al.* 329 (ICN). **Santa Catarina:** Florianópolis, Lagoa da Chica, Campeche, 17 July 1991, *F.A. Silva-Filho* 926 (FLOR). Palhoça, Massiambú, 20 Dec. 1952, *R. Reitz* 5011 (HBR, PACA, SI).

HABITAT. It occurs as emergent plants in permanent flooded environments, forming large clonal masses.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *Eleocharis laeviglumis* is similar to *E. elongata* from which can be separated by culms firm, wider, floral scales smooth and densely imbricate, spikelets many–flowered, stylopodium separated from the achene body by a constriction (see notes under *E. elongata*).

20. Eleocharis loefgreniana Boeck., Beitr. Cyper. 2: 12 (1890). Type: Brazil, São Paulo, *Loefgren* 146 (holotype C [photo!]).

Eleocharis almensis D.A. Simpson, Kew Bull. 48: 73. (1993). Type: Brazil, Bahia, Rio de Contas, Pico das Almas, Fazenda Silvina, 23 Oct. 1988, *Harley et. al.* 25305 (holotype CEPEC, not seen, isotypes K, MBM!).

Annual or brief perennial, caespitose, base not ligneous or slightly so. Culms (5-)10 - 22 cm x (0.2-) 0.3 - 0.5 mm, quinquangular, sulcate when dry, spongy, not septate. Sheaths vinaceous at the base, apex oblique, emucronate, edge firm and inconspicuous. Spikelets 4.5 - 6 x 2 - 2.5 mm, ovoid to lanceoloid, 12 – 25-flowered, not proliferous; lower scale sterile, cartilaginous, oval, apex emarginate, green, shorter than the adjacent scales, hyaline margin narrow; floral scales 1.9 - 2.1 x 0.8 - 1 mm, membranous, oval, apex emarginate, spirally arranged, loosely imbricate, appressed, smooth, inconspicuously veined, keel stramineous to yellow, sides dark-brown to vinaceous, hyaline margin developed and gradual from the rest of the scale; perianth bristles 5 - 6, white to yellow, retrorse-spinulose, as long as or shorter than the stylopodium or achenes body; stamens 3, anthers 0.6 - 0.9 mm, ending in a short apiculum; style trifid. Achene 1.1 - 1.3 x 0.6 – 0.8 mm, trigonous, with abaxial angle salient, obovoid, apex truncate, smooth, ochraceous to stramineous; stylopodium pyramid, ochraceous to brown, separated from the achene body by a brief constriction, 2/3 to 3/4 as wide as the achene.

DISTRIBUTION. From northeast of Brazil to north of Argentina.

BRAZIL. **Distrito Federal:** Brasília, edges of the Paranoá lake, 20 March 1981, *E. P. Heringer et al.* 7664 (IBGE). **Minas Gerais:** Conceição do Mato Dentro, 27 April 2007, *C. R. M. Silva & A. L. L. Vanzela* 122 (ICN). **Paraná:** Palmas, 05 Dec. 1971, *G. Hatschbach et al.*

28241 (MBM). **Rio Grande do Sul:** São Francisco de Paula, CPCN Pró-Mata, 20 March 2004, *P.M.A. Ferreira s.n.* (MPUC 10618). São José dos Ausentes, Silveira, Monte Negro, 28°36'59.4"S, 49°47'51.4"W, 19 Nov. 2007, *R. Trevisan* 864 (ICN). **Santa Catarina:** Matos Costa, 23 Feb. 1962, *R. Reitz & R. Klein* 12378 (HBR, SI).

HABITAT. Bogs, streams margin, and wet grasslands.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. loefgreniana* is similar to *E. filiculmis* from which can be distinguished by the spikelets 12 – 25-flowered, floral scales loosely imbricate, achenes1.1 - 1.3 mm long (*vs.* spikelets 40 - 70-flowered, floral scales densely imbricate, achenes 0.8 - 0.9 mm long).

21. Eleocharis maculosa (Vahl) Roem. & Schult., Syst. Veg. 2: 154 (1817).

Scirpus maculosus Vahl, Enum. Pl. 2: 247 (1805). Type: Guadalupe, *Richard s.n.* (holotype C, not seen).

Perennial, caespitose-rhizomatous, with rhizomes herbaceous elongated, with short internodes. Culms (4-) 9 - 30 (-60) cm x 0.4-1 mm, obscurely terete, sulcate when dry, spongy, not septate. Sheaths vinaceous at the base, apex inflated with hyaline wrinkled portion quite distinct from the base, emucronate, the delicate edges easily torn. Spikelets 6 - 11 x 3 mm, ovoid, 30 – 80-flowered, not proliferous; lower scale sterile, cartilaginous, oval to oboval, apex obtuse to emarginate, green, shorter than the adjacent scales, hyaline margin narrow; floral scales 2.2 - 3.5 x 1 - 1.2 mm, membranous, oval, apex acute to obtuse, spirally arranged, appressed, smooth, inconspicuously veined, keel stramineous, sides usually dark purple to vinaceous, rarely almost black, hyaline margin developed and gradual from the rest of the scale; perianth bristles 7 - 8, light-brown, retrorse-spinulose, slightly shorter to exceeding the stylopodium; stamens 3, anthers 1 – 1.6 mm, ending in a short apiculum; style

bifid. Achene 1.2-1.7 x 0.6-0.9 mm, biconvex, obovoid, apex rounded, smooth to minutely roughened, shiny, dark-brown to black; stylopodium dorsiventrally flattened, whitish to ochraceous, separate from the achene body by a constriction, ½ as wide as the achene.

DISTRIBUTION. Central and South America (González-Elizondo 1994). It is well distributed in south of Brazil.

BRAZIL. **Minas Gerais:** Serra do Cipó, near the office of the IBAMA, 27 April 2007, *C. R. M. Silva & A. L. L. Vanzela* 139 (ICN). **Paraná:** Balsa Nova, bridge of the Arcos, 29 March 2005, *C. Kozera & R. Kersten* 2014 (MBM). Campina Grande do Sul, Alto da Serra, 14 April 1957, *G. Hatschbach & L. B. Smith* 4013 (HBR). Curitiba, Parque Barigui, 13 Dec. 1996, *V. A. O. Dittrich & C. Kozera* 288 (MBM). Jaguariaiva, road to Arapoti, 24°08'S, 49°20'W, 17 Jan. 1965, *L. B. Smith et al.* 14696 (FLOR, HBR). **Rio Grande do Sul:** Cambará do Sul, Faxinal, March 1983, *M. Sobral et al.* 5042 (ICN). Encruzilhada do Sul, RS 471, 30º49'46"S, 52º34'20”W, 26.XI.2003, *R. Trevisan et al.* 233 (ICN). Xangri-lá, RS 389, km 26, 29º48'44"S, 50º03'42"W, 28 Jan. 2004, *R. Trevisan et al.* 326 (ICN). **Santa Catarina:** Florianópolis, Rio Vermelho, 17 Jan. 1966, *R. Klein & A. Bresolin* 6515 (FLOR, HBR). Matos Costa, 26º27’41”S, 51º07’32”W, 20 Jan. 2007, *C. R. M. Silva & A. L. L. Vanzela* 85a (ICN).

HABITAT. Bogs, drenched environments, slightly wet grasslands, and edges of the swamps.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. maculosa* is characterised by sheaths with the distal portion delicate, inflated and transversally wrinkled, floral scales membranous, with sides usually dark purple to vinaceous, and achenes dark-brown to black.

22. Eleocharis minima Kunth, Enum. Pl. 2: 139 (1837). Type: Brazil, *anon*. (holotype B, not seen).

Perennial, caespitose, forming dense mats, with thin non-lignified base. Culms 3 - 12 (-20) cm x 0.1 - 0.2 mm, capillary, quadrangular, sulcate when dry, spongy, not septate. Sheaths vinaceous at the base, apex oblique, somewhat inflated, emucronate, edges delicate and inconspicuous. Spikelets 2.5 – 4.5 (6) x 1 - 2 mm, ovoid to lanceoloid, 3 - 10-flowered, often proliferating, sometimes sessile at the base of the culms; lower scale sterile, membranous, oval to elliptical, apex obtuse, greenish to vinaceous, shorter than the adjacent scales, hyaline margin wide; floral scales 1.8 – 2.5 x 0.5 – 1.2 mm, membranous, oval to lanceolate, apex acute, distichous to subdistichous, appressed, smooth, inconspicuously veined, keel green to stramineous, sides vinaceous, hyaline margin developed and gradual from the rest of the scale; perianth bristles 4 - 5, white, retrorse-spinulose, unequal, shorter than the achene; stamens 2 - 3, anthers 0.8 – 1.4 mm, ending in a short apiculum; style trifid. Achene 0.9 - 1.2 x 0.4 - 0.5 mm, trigonous, with abaxial angle salient, obovoid, smooth to finely reticulate, olivaceous to stramineous; stylopodium pyramidal, elongated, whitish to ochraceous, separated from the achene by a constriction, 1/3 as wide as the achene.

DISTRIBUTION. United States to South America, Wet Indies (González-Elizondo & Reznicek 1998; Smith *et al.* 2002). This is widely spread in South Brazil.

ARGENTINA. **Provincia de Corrientes:** Depto. Ituzaingó, Isla Apipé Grande, pto San Antonio, 19 Nov. 1976, *E. R. Guaglianone et al.* 70 (SI).

BRAZIL. **Paraná:** Tijucas do Sul, Rincão, 29 Dec. 1957, *G. Hatschbach* 4394 (MBM). **Rio Grande do Sul:** Arroio dos Ratos, Fazenda Faxinal, 04 March 1982, *K. Hagelund* 13783b (ICN). Capão da Canoa, RS 389, km 29, 16 Oct. 2003, *R. Trevisan & I. Boldrini* 30 (ICN).

Eldorado do Sul, Estação Agronômica da UFRGS, 26 Nov. 2003, *R. Trevisan et al.* 221 (ICN). Santa Vitória do Palmar, BR 471, 32°45'00.1"S, 52°38'51.4"W, 26 Nov. 2004, *I. Boldrini et al.* 1313 (ICN). São Francisco de Assis, farm of Joaquim Paz, 29°30'46.8"S, 55°08'02.6"W, 26 Nov. 2007, *R. Trevisan* 896 (ICN). São Francisco de Paula, Tainhas, 13 Dec. 1990, *H. M. Longhi-Wagner et al.* 2235 (ICN). **Santa Catarina:** Florianópolis, Pântano do Sul, 18 Jan. 1966, *R. Klein & A. Bresolin* 6601 (FLOR, ICN, HBR). São Joaquim, 28 Feb. 1966, *J. Mattos* 13395 (HAS).

HABITAT. Edge of the lakes, streamlets and bogs. This species usually grows on moist soils, forming dense mats.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. minima* is characterised by dwarf plants with capillary culms, usually with proliferous spikelets, floral scales distichous and achenes trigonous, smooth to finely reticulate, stramineous to olivaceous. *E. minima* reminds *E. baldwinii* (Torr.) Chapm. which occurs in southeast of United States, however, to solve all problems related to *E. minima* and its allied species further studies are necessary.

It is important to point out that in specimens which have a long spikelet there is a torsion in the axis of the spikelet (e. g. *Trevisan 896* [ICN]) and this suggests that the scales are polystichous, but, in fact, they are originally distichous.

23. Eleocharis montana (Kunth) Roem. & Schult., Syst. Veg. 2: 153 (1817).

Scirpus montanus Kunth in Humb., Bonpl. & Kunth, *Nov. Gen Sp*. 1: 226 (1815). Type: Colombia, *Humbold & Bompland s.n.* (holotype P, not seen).

Eleocharis nodulosa (Roth) Schult., *Mant*. 2: 87 (1824).

Perennial, caespitose-rhizomatous, rhizomes ligneous with short internodes. Culms 22 - 140 cm x (1 -) 1.5 – 3.5 mm, terete, hollow, septate, 1.5 - 5 mm between the septa. Sheaths vinaceous at the base, apex truncate, with dorsal mucro developed, edges firm, conspicuous brown. Spikelets 8 - 30 x 3 - 5 mm, ovoid to lanceoloid, 120 – 450-flowered, not proliferous; lower scale sterile, cartilaginous, oval, apex acute to obtuse, green, subequal to the adjacent scales, hyaline margin narrow; floral scales 2.1 - 3.2 x 1 - 1.5 mm, membranous, oval, apex acute to acuminate, spirally arranged, appressed to slightly divergent, smooth, inconspicuously veined, keel green to stramineous, sides brown, hyaline margin developed and gradual from the rest of the scale; perianth bristles 4 - 6, yellowish to light-brown, retrorse-spinulose, as long as or shorter than the achenes body; stamens 1 - 2, anthers 1.2 - 1.5 mm, ending in a short apiculum; style bifid or trifid. Achene 1 - 1.5 x 0.7 - 1 mm, biconvex or trigonous, with abaxial angle slightly salient, obovoid, apex obtuse, finely reticulate, olivaceous to light-brown; stylopodium pyramidal or flattened dorsiventrally, whitish to brown, confluent with the achene body or separated from it by a brief constriction, ½ as wide as the achene.

DISTRIBUTION. Southeast of United States to South America, West Indies (González-Elizondo 1994). This species is widely spread in south Brazil, and a well-represented species in collections.

ARGENTINA. Provincia de Corrientes, Depto. General Paz, 12 km E de Itá Ibaté, coast of Rio Paraná, 09 April 1972, *L. Mroginski et al.* 661 (PACA).

BRAZIL. **Distrito Federal:** Brasília, Pântano do Zoobotânico, 20 July 1965, *D. Sucre* 717 (UB). **Mato Grosso do Sul:** Naviraí, Rio Amambaí, 23 Jan. 2003, *C. Kozera* 1801 (MBM). **Paraná:** Campo Mourão, near Rio Mourão. 24°06'14.6"S, 52°19'49.5"W, 19 Dec. 2006, *R. Trevisan et al.* 790 (ICN). Jaguariaiva, mouth of the Rio das Mortes, 24°08'S, 49°16'W, 18

Jan. 1965, *L. B. Smith et al.* 14737 (HBR). Curitiba, Parque Barigui, 02 Oct. 1996, *V. A. O. Dittrich & C. Kozera* 208 (MBM). **Rio Grande do Sul:** Aceguá, BR 473, 31º38'10"S, 54º23'58"W, 22 Nov. 2003, *R. Trevisan et al.* 215 (ICN). Campestre da Serra, BR 116, km 70, 03 Nov. 2003, *R. Trevisan et al.* 134 (ICN). **Santa Catarina:** Caçador, 10 km SW from the town, 08 Feb. 1957, *L. B. Smith & R. Klein* 11017 (HBR). Florianópolis, Rio Vermelho, 28 Dec. 1984, *M.L. Souza et al.* 533 (FLOR).

HABITAT. It occurs in moist soils, usually near some stream, irrigatin canal or bog.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *Eleocharis montana* is a very common species in south Brazil and it is characterised by culms terete, hollow, septate, with (1 -) 1.5 – 3.5 mm wide, sheaths with apex truncate, mucronate, and floral scales membranous, with brown sides. See comments in *E. contracta*.

24. Eleocharis montevidensis Kunth, Enum. Pl. 2: 144 (1837). Type: Uruguay, Montevideo, *Sellow s.n.* (holotype B, herb. Kunth 3205, not seen).

Perennial, caespitose-stoloniferous, with stolons herbaceous horizontally elongated, not ligneous base. Culms 14 - 25 (-45) cm x 0.9 - 1 (-1.4) mm, terete, sulcate when dry, spongy, not septate. Sheaths vinaceous at the base, apex truncate, emucronate, edges firm, conspicuous vinaceous to brown. Spikelets 6.5 - 18 x 3 - 4 mm, ovoid to lanceoloid, 60 - 170-flowered, not proliferous; lower scale sterile, cartilaginous, oval, apex acute to obtuse, green, subequal to the adjacent floral scales, hyaline margin wide; floral scales 1 - 2 x 2.3 – 3.6 mm, membranous, oval to elliptical, apex acute to obtuse, spirally arranged, appressed, smooth, inconspicuously veined, keel stramineous, sides brown to vinaceous, with or without dark-brown submarginal band, hyaline margin developed and gradual from the rest of the scale; perianth bristles 4 - 7, yellowish to light-brown, retrorse-spinulose, as long as or shorter than

the stylopodium; stamens 3, anthers 1 - 1.4 mm, ending in a short apiculum; style trifid. Achene 1.2 - 1.4 x 0.7 - 0.9 mm, plano-convex to trigonous, obovoid, apex rounded, reticulate, olivaceous to brown; stylopodium pyramidal, whitish to brown, confluent with the achene or separated from it by a brief constriction, ca. ½ of as wide as the achene.

DISTRIBUTION. South of United States to Honduras, Brazil, Argentina and Uruguay (González-Elizondo 1994; Trevisan and Boldrini 2008). In south Brazil this species is not common, occurring only in plain coast of Rio Grande do Sul and Santa Catarina.
BRAZIL. **Rio Grande do Sul:** Cidreira, 17 Dec. 1954, *B. Rambo* 56457 (PACA). Palmares do Sul, Quintão, 02 Dec. 1996, *V. L. Caetano* 240 (ICN). Rio Grande, Cassino, 24 Sept. 1999, *E. N. Garcia* 378 (PEL). Tavares, 31º19'13"S, 51º05'10"W, 23 Oct. 2003, *R. Trevisan et al.* 90 (ICN). Tramandaí, Lagoa Tramandaí, 11. Sept. 1983, *J. R. Stehmann* 190 (ICN). **Santa Catarina:** Sombrio, 19 Oct. 1944, *R. Reitz* 808 (HBR, MBM).
URUGUAY. Depto. Colonia: Riachuelo, 16 Nov. 1936, *A. L. Cabrera* 3940 (LP). **Depto. Montevideo:** Montevideo, 26 Sept. 1937, *B. Rosengurtt* 2137 (LP).
HABITAT. Grasslands and edge of the lakes and bogs, usually with moist sandy soil.
NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. montevidensis* is characterised by sheaths with truncate apex, spikelets many-flowered, floral scales membranous, style trifid, and achenes plano-convex to trigonous, reticulate.

25. Eleocharis mutata (L.) Roem. & Schult., Syst. Veg. 2: 155 (1817).
Scirpus mutatus L., Syst. Nat. ed. 10., 2: 867 (1759). Type: Jamaica, *Browne s.n.* (lectotype LINN, herb. Linn. No. 71.2, designated by Browning *et al.* in S. African J. Bot. 63: 177 [1997] [photo!]).
Limnochloa mutata (L.) Nees, Fl. Bras. 2(1): 101 (1842).

Perennial, caespitose-stoloniferous, usually with erect and ligneous rootstock. Culms 36 - 100 cm x 3 - 6 mm, triquetrous with the culm faces flat or somewhat concave and sharp angles, surface somewhat sulcate and septate-nodulose, spongy, not septate. Sheaths black to vinaceous at the base, apex oblique, emucronate, edges inconspicuous. Spikelets 17 - 35 (62) x 3 - 5 mm, cylindrical, 60 - 110 (ca. 160)-flowered, not proliferous; lower scale sterile, coriaceous, wide ovate, apex obtuse, green, appearing as a continuation of the culm, shorter than adjacent scales, hyaline margin narrow; floral scales 3 - 4 x 2 - 2.5 mm, cartilaginous, wide obovate, apex obtuse, spirally arranged, densely imbricate, appressed to slightly divergent, smooth, stramineous, inconspicuously veined, with a thin brown submarginal line, hyaline margin developed and clearly delimitated from the rest of the scale; perianth bristles 7 - 8, whitish to reddish brown, retrorse-spinulose, as long as or longer than the stylopodium; stamens 3, anthers 1.5 - 1.8 mm, ending in a short apiculum; style trifid. Achene 1 - 1.2 x 1.8 - 2 mm, biconvex, obovoid to wide obovoid, achene apex slightly constricted at the summit into a hard annular thickening usually of the same texture and colour as the achene, stramineous, amber to yellowish brown, finely cancellate, with 25 - 30 longitudinal rows of polygonal cells oriented horizontally; stylopodium triangular, flattened dorsiventrally, brown, confluent with an annular thickening at the achene apex, ca. 1/2 as wide as the achene.

DISTRIBUTION. South of United States (Texas), Mexico, Central America, West Indies, South America, and tropical Africa (Rosen *et al.* 2008). In South Brazil it was recorded from Santa Catarina and Paraná.

BRAZIL. **Paraná:** Antonina, Rio Curitibaíba, 24 Nov. 1999, *M. Borgo et al.* 525 (UPCB). Paranaguá, Pontal do Sul, 11 Feb. 1995, *B. L. Reinert & M. R. Bornschein* 65 (MBM). **Rio de Janeiro:** Rio de Janeiro, Recreio dos Bandeirantes, 23º00'13"S, 43º20'49"W, 04 April 1952,

L. B. Smith et al. 6375 (SI). **Santa Catarina:** Florianópolis, near the Estação Ecológia Carijós, 20 April 1996, *D. B. Falkenberg* 7990 (FLOR). Tijucas, Pontal Norte, 03 Jan. 1976, *A. Reis* 38 (HBR). **São Paulo:** Bertioga, road Bertioga-São Sebastião, 02 Nov. 1983, *M. Kirizawa & A. V. G. Sousa* 1105 (SP).

HABITAT. *E. mutata* occurs in openings mangrove swamps, fresh to salty marshes, inter-dune ponds.

NOTES. Illustration can be found in Rosen *et al.* (2008). *E. mutata* can be diagnosed by its culms 3 – 6 mm wide, clearly trigonous, with the culm faces flat or somewhat concave and sharp angles, spikelets 60 – 160-flowered, floral scales smooth to slightly striate, and stylopodium confluent with a hard annular thickening.

26. Eleocharis nana Kunth, Enum. Pl. 2: 140 (1837). Type: Brazil, Rio de Janeiro, *Gaudichaud* 242 (isotype P [photo!]).

Perennial, caespitose, with thin non-lignified base. Culms 5 - 14 cm x 0.1 - 0.3 mm, obscurely quadrangular, sulcate when dry, spongy, not septate. Sheaths stramineous at the base, apex oblique, somewhat inflated, emucronate, edges delicate and inconspicuous. Spikelets 3.2 - 4 x 1.5 - 2 mm, ovoid, 6 - 12-flowered, not proliferous; lower scale sterile, membranous to papery, oval to oblong, apex obtuse, stramineous to vinaceous, as long as or shorter than the adjacent scales, hyaline margin wide; floral scales 1.5 - 1.8 x 0.8 mm, membranous, oval, apex acute to obtuse, spirally arranged, appressed to slightly divergent at maturity, smooth, inconspicuously veined, keel green to light-brown, sides translucent white to stramineous, hyaline margin developed and gradual from the rest of the scale; perianth bristles 5 – 6, shorter to exceeding the stylopodium; reddish brown, sparsely retrorse-spinulose; stamens 3, anthers 0.6 - 0.7 mm, ending in a short apiculum; style trifid. Achene 1 x 0.6 mm, trigonous,

with abaxial angle salient, obovoid, truncated at the apex, smooth to finely reticulate, yellowish white to stramineous, shiny; stylopodium pyramidal or flat with an apiculum in the center, brown, confluent with the achene body to slightly separated from it by a brief constriction, ½ to ¾ as wide as the achene, with the base somewhat incumbent on the apex of the achene. Fig. 3G-L.

DISTRIBUTION. Southern United States, Mexico, Central America, West Indies, Guyana and Brazil (González-Elizondo & Reznicek 1998). In south Brazil this species is found in coastland areas.

BRAZIL. **Paraná:** Caiobá, 06 Nov. 1947, *G. Tessmann* 2618 (HBR, MBM). Guaratuba, Brejatuba, 21 April 1960, *G. Hatschbach* 6943 (MBM). Matinhos, Parque Estadual do Rio da Onça, 19 Sept. 2003, *J. Sonehara* 214 (MBM). Paranaguá, Ilha do Mel, Praia Grande, 15 Sept. 1985, *S. M. Silva & R. M. Britez* 121 (UPCB). **Santa Catarina:** Florianópolis, Rio Canasvieras, 17 Jan. 1966, *R. Klein & A. Bresolin* 6536 (FLOR, HBR). Palhoça, Massiambú, 14 May 1953, *R. Reitz & R. Klein,* 619 (HBR, PACA). São Francisco do Sul, Vila da Glória, 08 Jan. 2006, *J. F. Berger* 735 (MBM). **São Paulo:** Boracéia, 28 Nov. 1989, *W. R. Spironelo et al.* 22356 (MBM). Cananéia, Ilha do Cardoso, ranch Santa Cruz, 19 Dec. 1991, *M. Sugiyama* 989 (SP). Jacareí, 08 May 1915, *P. Dusén* 17011 (S, SI, NY).

HABITAT. Wet grasslands, edge of bogs and inner-dune ponds, usually in sandy soil.

NOTES. *E. nana* can be identified by capillary culms, sheaths somewhat inflated, floral scales translucent white or stramineous, achenes trigonous, smooth or finely reticulate, and perianth bristles developed.

27. Eleocharis neesii R. Trevis. & Boldrini, Novon 00: 000 (ined.). Type: Brazil, Rio Grande do Sul, mun. Rio Grande, Lagoa Verde, 28 Nov. 1984, *G. Pedralli s.n.* (holotype HURG 834!).

Perennial?, caespitose-stoloniferous, usually with thin non-lignified base, stolons capillary. Culms 3 - 4 cm x 0.2 - 0.3 mm, capillary, somewhat angled, sulcate when dry, firm, spongy, not septate. Sheaths stramineous at the base, apex somewhat oblique, hyaline, inflated, emucronate, edges delicate and inconspicuous. Spikelets 2.8 - 3 x 1.7 mm, ovoid, 8 - 10-flowered, not proliferous; lower scale fertile, membranous, oval, apex acute to obtuse, stramineous, about the same length as the adjacent scales, with wide hyaline margin; floral scales 1.4 - 1.5 x 0.5 - 0.7 mm, membranous, oval, apex acute to obtuse, subdistichous, appressed, finely striated, keel stramineous, sides translucent white, hyaline margin gradual from the rest the scale; perianth bristles rudimentary or lacking; stamens 3, anthers 0.4 - 0.5 mm, ending in a short apiculum; style trifid. Achene 0.9 x 0.4 - 0.5 mm, subterete to slightly trigonous, ellipsoid, with ca. 8 longitudinal rows of 35 - 40 rectangular cells, apex rounded, stramineous, iridescent; stylopodium short pyramidal, green to dark-brown, separated from the achene body by a constriction, about 1/4 as wide as the achene.

DISTRIBUTION. Known only from type locality. It is possible that this species can occur also in other areas in south coastland of Rio Grande do Sul and Uruguay.

HABITAT. *Eleocharis neesii* grows in wet environments with sandy soil, near pools with shallow vegetation.

NOTES. Illustration can be found in Trevisan *et al.* (vide artigo 2). *Eleocharis neesii* is a small plant with capillary stolons. This species is similar to *E. radicans* from which can be

distinguished by the capillary culms and flowers with three stamens (*vs*. culms soft and flattened, usually 0.4-1 mm wide and flowers 2-stamined).

28. Eleocharis niederleinii Boeck., Beitr. Cyper. 1: 13 (1888). Type: Argentina, Rio Paraná, *Niederlein s.n.* (holotype B [photo!]).

Perennial, caespitose, usually with base somewhat ligneous. Culms (4) 6 - 30 cm x 0.2 - 0.4 mm, quadrangular, sulcate when dry, spongy, not septate. Sheaths purple at the base, rarely stramineous, apex slightly oblique, emucronate or with the dorsal mucro somewhat insinuating, edges firm, inconspicuous or with red dots. Spikelets 4.5 - 8 x 2 - 3 mm, ellipsoid or lanceoloid, 10 - 18 (23)-flowered, often proliferating; lower scale sterile, papery, oval, apex firm acute to obtuse, green, as long as or longer than adjacent scales, hyaline margin wide; floral scales 2 - 2.4 x 0.8 - 1 mm, membranous, oval, apex acute to obtuse, spirally arranged, appressed to slightly divergent, smooth, inconspicuously veined, keel greenish to stramineous, sides vinaceous to dark-brown, hyaline margin developed and gradual from the rest of the scale; perianth bristles 2 - 3 or rudimentary, sparsely white, retrorse-spinulose, shorter than the achene; stamens 3, anthers 1 - 1.4 mm , ending in a short apiculum; style trifid. Achene 0.9 – 1.3 x 0.6 – 0.7 mm, trigonous, with abaxial angle salient, obovoid, apex truncate, smooth to finely reticulate, yellowish white to stramineous; stylopodium pyramidal, trilobed, green to brown, confluent with the achene, as wide as the achene apex, with the base somewhat incumbent on the apex of the achene. Fig. 4A-G.

DISTRIBUTION. South of Brazil and northeastern of Argentina. In south of Brazil this species is widely distributed.

BRAZIL. **Paraná:** Balsa Nova, bridge of the Arcos, 19 Dec. 2005, *C. Kozera & O.P. Kozera* 2798 (MBM). Curitiba, Umbará, 06 Sept. 1979, *L. T. Dombrowski & P. Scherer Neto* 10568 (MBM). Palmas, PRT 280, 26°29'37.5"S, 52°00'35.7"W, 18 Dec. 2006, *R. Trevisan et al.* 782 (ICN). **Rio Grande do Sul:** Campestre da Serra, BR 116, km 70, 03 Nov. 2003, *R. Trevisan et al.* 135 (ICN). São Francisco de Paula, BR 453, km 239, 29º 15' 39"S 50º 20' 05"W, 28 Nov. 2003, *R. Trevisan et al.* 301 (ICN). Tupanciretã, RS 392, km 16 29°03'32"S, 53°48'26.9"W, 03 Oct. 2007, *R. Trevisan* 845 (ICN). **Santa Catarina:** Bom Jardim da Serra, Serra do Oratório, Rio Capivaras, 16 Jan. 1957, *L. B. Smith & R. Reitz* 10165 (HBR). Lages, Encruzilhada, 05 Dec. 1962, *R. Klein* 3202 (FLOR, HBR, MBM). Mafra, Campo Novo, 12 Dec. 1962, *R. Klein* 3867 (HBR). Palhoça, SC 433, km 8, road between Pinheira and Praia do Sonho, 08 Feb. 2007, *R. Lüdtke* 764 (ICN).

HABITAT. It occurs in moist grasslands, bogs and moist areas along roadsides.

NOTES. *E. niederleinii* is characterised by slender culms, spikelets 10 - 18 (23)-flowered, ellipsoid to lanceoloid, floral scales with the sides dark-brown to vinaceous, achenes 0.9 - 1.3 mm long and anthers 1 - 1.4 mm long.

29. Eleocharis nudipes (Kunth) Palla, Denkschr. Kaiserl. Akad. Wiss., Wien. Math.-Naturwiss. Kl. 79: 171 (1908).

Isolepis nudipes Kunth, Enum. Pl. 2: 206 (1837). Type: Brazil, *Sellow s.n.* (isotype P [photo!]).

Scirpidium grande Nees in Mart., Fl. Bras. 2: 97 (1842). Type: Brazil, *Sellow s.n.* (holotype B 2249, not seen).

Eleocharis grandis (Nees) Boeck., *Linnaea* 36: 453 (1869-70).

Perennial, caespitose-rhizomatous, with ligneous short rhizomes. Culms 33 - 75 cm x 0.4 – 1.9 (2.3) mm, quinquangular, sulcate when dry, spongy, not septate. Sheaths stramineous, reddish brown or dark brown at the base, apex oblique, emucronate, edges firm, inconspicuous. Spikelets 6 - 11 x 5 - 10 mm, wide elliptic to globose, 100 - 350-flowered, not proliferous; lower scale sterile, cartilaginous or membranous, oval, apex acuminate, stramineous, subequal to the adjacent scales, hyaline margin wide; floral scales 2.8 - 5 x 1 – 1.5 mm, membranous, oval, apex acute to acuminate, spirally arranged, somewhat divergent, smooth, inconspicuously veined, keel stramineous, sides stramineous to brown, hyaline margin developed and gradual from the rest of the scale; perianth bristles none; stamens 3, anthers 0.9 - 1.2 mm, ending in a short apiculum; style trifid. Achene 1 - 1.2 x 0.5 - 0.6 mm, trigonous, with abaxial angle salient, obovoid, apex truncate, smooth to slightly striolate, yellowish white to stramineous; stylopodium pyramidal, whitish to ochraceous, separated from the achene body by a brief constriction, ca. ¾ to as wide as the achene.

DISTRIBUTION. Brazil, Paraguay, Argentina and Uruguay (Trevisan and Boldrini 2008). In Brazil this species occurs from Central-Brazil towards the south, where this species is widely spread.

ARGENTINA. Provincia de Corrientes: Depto. General Paz, Swamps of Santa Lucia, 16 Sept. 1982, *T. M. Pedersen* 13410 (SI).

BRAZIL. **Mato Grosso do Sul:** Dourados, road MS 463, km 15, 22º14'10"S, 57º57'10"W, 29 Sept. 2005, *V. J. Pott & A. Pott* 8302 (HMS, ICN). **Paraná:** Balsa Nova, bridges of the Arcos, 29 Sept. 2005, *C. Kozera & A. Sanches* 2390 (MBM). Curitiba, Pinhais, 18 Sept. 1966, *G. Hatschbach* 14733 (MBM). Jaguariaiva, Joaquim Murtinho, 10 Oct. 1958, *G. Hatschbach* 5100 (MBM). Ponta Grossa, Vila Velha, 11 Oct. 1976, *L. T. Dombrowski* 6492 (MBM). **Rio Grande do Sul:** Santana do Livramento, 30°41'49"S, 55°20'29.1"W, 14 Nov. 2005, *R.*

Trevisan 506 (ICN). São Francisco de Paula, RS 020, km 28, 29º24'27"S, 50º27'32"W, 28 Nov. 2003, *R. Trevisan et al.* 294 (ICN). **Santa Catarina:** Curitibanos, Ponte Alta do Norte, 24 Oct. 1962, *R. Reitz & R. Klein* 13381 (HBR). Florianópolis, Canasvieiras, 14 Sept. 1965, *R. Klein & A. Bresolin* 6194 (FLOR, HBR).

HABITAT. This species forms robust tussocks in wet areas along roadsides, wet grasslands and swamps.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. nudipes* can be easily identified by long culms, spikelets usually globose, floral scales acuminate, divergent, and achenes trigonous without perianth bristles.

The collection *Trevisan* 1031 (ICN) is a specimen that does not match with all the features of *Eleocharis nudipes* (the spikelets are oblong (21 x 0.5 mm). Perhaps that specimen is natural hybrid between *E. densicaespitosa* x *E. nudipes* due the combination of features from both species.

30. Eleocharis obtusetrigona (Lindl. & Nees) Steud., Syn. Pl. Glumac. 2: 80. (1855).

Limnochloa obtusetrigona Lindl. & Nees in Martius, Fl. Bras. 2: 100 (1842). Type: Brazil, Bahia, *Salzmann s.n.* (holotype CGE [photo!], isotypes E, MO, P, not seen).

Eleocharis fistulosa var. *obtusetrigona* (Lindl. & Nees) Barros, Sellowia 12: 262 (1960).

Eleocharis strobilacea Pedersen, Darwiniana 12(2): 243 (1961). Type: Argentina, Corrientes, Mburucuyá, *Pedersen* 957 (holotype C, not seen).

Perennial, caespitose-stoloniferous, usually with erect and ligneous rootstock. Culms 38 - 120 cm x 2.5 - 5 mm, obscurely trigonous with the culm faces convex and obtuse angles, spongy, not septate. Sheaths stramineous to vinaceous at the base, apex oblique, emucronate, edges firm, inconspicuous. Spikelets 15 - 52 x 4 - 6 mm, lanceoloid to cylindrical, 40 – 100-

flowered, not proliferous; lower fertile, coriaceous, oval, apex acute to obtuse, green, subequal to the adjacent scales, hyaline margin narrow; floral scales 4.1 - 5.2 x 2.1 -3. 1 mm, cartilaginous, oval to obovate, apex acute to obtuse, spirally arranged, densely imbricate, appressed, striate, stramineous, conspicuously veined, without evident submarginal band, hyaline margin developed and clearly delimitated from the rest of the scale; perianth bristles 5 - 7, yellow, retrorse-spinulose, as long as or exceeding the stylopodium; stamens 3, anthers 1.8 mm, ending in a short apiculum; style bifid or trifid. Achene 2.3 - 3 x 1.4 - 1.6 mm, biconvex, obovoid to pyriform, olivaceous to light-brown, cancellate, with ca 15 longitudinal rows of rectangular cells oriented horizontally; stylopodium flattened dorsiventrally, ochraceous to brown, separated from the achene body by a constriction, ½ to 2/3 as wide as the achene.

DISTRIBUTION. United States (Texas), Mexico (Veracruz), Central America, South America (Galapagos Archipelago, Brazil, Paraguay, and Argentina) (Rosen & Hatch 2006). In south Brazil this species is widely distributed.

ARGENTINA. Provincia de Corrientes: Depto. Concepción, Carambola, 24 April 1982, *T. M. Pedersen* 13389 (ICN, SI).

BRAZIL. **Paraná:** São Mateus do Sul, 24 Oct. 1996, *F. A. Bessa* 69 (MBM). Curitiba, Bacacheri, 05 May 1976, *A. C. Cervi s.n.* (UPCB 10190). Luiziana, BR 487, km 233, 24°16'50.6"S 52°08'53.2"W, 20 Dec. 2006, *R. Trevisan et al.* 793 (ICN). **Rio Grande do Sul:** Caçapava do Sul, BR 153, 30º38'00"S, 53º23'41"W, 21 Nov. 2003, *R. Trevisan et al.* 203 (ICN). Mostardas, RST 101, km 87, 22 Oct. 2003, *R. Trevisan et al.* 77 (ICN). Santa Vitória do Palmar, BR 471, 33°09'38.7"S, 52°59'33.3"W, 26 Nov. 2004, *I. Boldrini et al.* 1291 (ICN). Torres, RS 389, 16 Oct. 2003, *R. Trevisan & I. Boldrini*, 21 (ICN). **Santa Catarina:**

Petrolândia, 27°36’41”S, 49°45’09”W, 23 Oct. 2005, *R. Trevisan* 431 (ICN). **São Paulo:** Água Branca, Parque da Água Branca, 02 June 1948, *A. B. Jolly s.n.* (ICN 151960).

HABITAT. *E. obtusetrigona* occurs as emergent plant in permanent shallow water and moist ground of a variety of freshwater wetland habitats. This species usually forms large stands of clones.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. obtusetrigona* can be identified by culms obscurely trigonous, with the culm faces convex and obtuse angles, spikelets many-flowered, floral scales cartilaginous, densely imbricate, and achenes biconvex with ca 15 longitudinal rows of rectangular cells.

31. Eleocharis parodii Barros, An. Mus. Nac. Hist. Nat. Bernardino Rivadavia 34: 480 (1928). Type: Argentina, Buenos Aires, *Parodi* 7169 (holotype BAA [photo!]).

Perennial, caespitose-rhizomatous, rhizomes subligneous with short or long internodes. Culms 20 - 50 cm x 2 - 4 mm, terete, spongy, not septate. Sheaths purple at the base, apex slightly oblique, with dorsal mucro developed, edges firm and inconspicuous. Spikelets 16 - 35 x 2.7 - 5 mm, cylindrical, 340 – 750-flowered, not proliferous, stramineous to brown; lower scale sterile, coriaceous, oval, apex acute to obtuse, green, subequal or overtopping the adjacent scales, hyaline margin narrow; floral scales 1.8 - 2.3 x 0.7 - 1 mm, membranous, oblong, apex obtuse-apiculate, spirally arranged, appressed, smooth, inconspicuously veined, keel green to stramineous, sides stramineous to brown, hyaline margin developed and gradual from the rest of the scale; perianth bristles 4 - 7, white to yellow, retrorse-spinulose, shorter than the achene; stamens 1 - 2, anthers 0.7 - 1 mm, obtuse; style trifid. Achene 0.8 - 1 x 0.5 mm, trigonous, with abaxial angle salient, orbicular to obovoid, smooth to finely reticulate, yellow

to ochraceous; stylopodium pyramidal, depressed, olivaceous to ochraceous, confluent with a short neck at the achene apex, 1/3 to 1/2 as wide as the achene.

DISTRIBUTION. Brazil, Argentina and Uruguay. In Brazil this species occurs in south region of Rio Grande do Sul.

ARGENTINA. **Provincia de Entre Rios:** Depto. Concordia, camino a Calabacilla, 22 Sept. 1978, *N. S. Troncoso et al.* 2324 (SI).

BRAZIL. **Rio Grande do Sul:** Arroio Grande, BR 116, km 629, 32°21'58.7"S, 53°11'03.7"W, 31 Oct. 2006, *R. Trevisan et al.* 693 (ICN). Barra do Quaraí, 22 Sept. 2003, *V. F. Kinupp & B. E. Irgang* 2737 (ICN). Candiota, streamlet Poacá, 21 March 1988, *P. L. Oliveira et al. s.n.* (CNPO 1464). Pedras Altas, RS 608, 31°41'45.2"S, 53°33'24.7"W, 31 Oct. 2006, *R. Trevisan et al.* 703 (ICN). Quaraí, Road to Passo da Guarda, 30°22'57.0"S, 56°21'57.5"W, 08 Dec. 2007, *R. Trevisan* 924 (ICN). Santa Vitória do Palmar, BR 471, 33°21'27.1"S, 53°10'23.1"W, 26 Nov. 2004, *I. Boldrini et al.* 1283 (ICN). Santana do Livramento, 30°44'00.1"S, 55°20'27.5"W, 14 Nov. 2005, *R. Trevisan* 516 (ICN).

URUGUAY. **Depto. Salto:** few km to the N of Arerunguá, 06 March 1991, *T. M.Pedersen* 15683 (MBM).

HABITAT. Irrigating canals, bogs in roadsides, forming robust tussocks.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. parodii* can be distinguished by its culms terete, not septate, sheaths with apex slightly oblique, mucronate, spikelets many-flowered and achenes trigonous with short perianth bristles.

32. Eleocharis parvispicula R. Trevis. & Boldrini, Brittonia 00: 000 (ined.). Type: Brazil, Paraná, Foz do Iguaçu, Parque Nacional do Iguaçu, ilhas acima das Cataratas do Iguaçu, 25º36'06"S, 54º21'40"W, 3 Oct. 2006, *Labiak et al.* 3828 (holotype MBM!).

Perennial, tussock-rhizomatous, with thin rhizomes, base non-lignified. Culms 4 - 6 cm x 0.8 - 1 mm, transversely elliptic, sulcate when dry, spongy, not septate. Sheaths stramineous at the base, apex inflated with hyaline wrinkled portion quite distinct from the base, emucronate, the delicate edges easily torn. Spikelets 3 - 3.5 x 1.5 mm, ovoid to ellipsoid, 6 - 8-flowered, not proliferous; lower scale sterile, papery, oval, apex firm, acute to obtuse, green, as long as the adjacent scales, with a wide hyaline margin; floral scales 1.9 x 0.9 mm, membranous, oval, apex acute to obtuse, spirally arranged, appressed, smooth, inconspicuously veined, keel green, sides translucent white to stramineous, hyaline margin gradual from the rest the scale; perianth bristles 7, white, retrorse-spinulose, shorter than the stylopodium; stamens 3, anthers 0.7 - 0.8 mm, ending in a short apiculum; style bifid. Achene 1.3 x 0.7 mm, biconvex, obovoid, rounded at the apex, slightly rugose at the distal portion, olivaceous; stylopodium conical, green, separated from the achene body by a constriction, about 1/3 as wide as the achene.

DISTRIBUTION. Known only from type locality, but due to the geographic nearness it is possible that this species can occur also in the province of Misiones at northeastern Argentina.
BRAZIL. **Paraná:** Foz do Iguaçu, Parque Nacional do Iguaçu, islands above Cataratas do Iguaçu, 25º36'06"S, 54º21'40"W, 3 Oct. 2006, *Labiak et al.* 3828 (MBM).
HABITAT. *E. parvispicula* grows in swamps at the margins of the Iguaçu river.
NOTES. Illustration can be found in Trevisan *et al.* (vide artigo 4). *Eleocharis parvispicula* is similar to *E. sellowiana* from which it differs by the smaller, 6-8 flowered spikelets, achenes obovoid, slightly rugose at the distal portion, stylopodium conical, about 1/3 as wide as the achene (*vs*. spikelets (12-)30-100-flowered, achenes broadly obovoid, smooth at the distal portion, and stylopodium hat-shaped, about 1/2 as wide as the achene).

33. Eleocharis pauciglumis R. Trevis. & D.J. Rosen, Brittonia 00: 000 (ined.) Type: Brazil, Santa Catarina, Garopaba, 16 Mar. 1971, *A. Bresolin* 189 (holotype HBR!).

Perennial, caespitose-stoloniferous, usually with a creeping or erect ligneous rootstock. Culms 30 - 62 cm x 1.5 - 3 mm, obscurely trigonous with the culm faces slightly convex and the angles obtuse, spongy, not septate. Sheaths vinaceous to black at the base, apex firm, oblique, emucronate, edges inconspicuous to somewhat vinaceous. Spikelets 17 - 30 x 2.8 - 3 mm, lanceoloid to cylindric, 10 - 25-flowered, not proliferous; lower scale fertile, coriaceous, oblong, apex obtuse, green, appearing as a continuation of the culm, not overtopping the adjacent floral scales, hyaline margin narrow; floral scales 4.5 - 5.1 x 2 - 2.5 mm, cartilaginous, oval-oblong, apex obtuse, spirally arranged, loosely imbricate, appressed to slightly divergent, striate, stramineous, with conspicuously veined, without submarginal band or with a thin brown submarginal band, hyaline margin developed and clearly delimitated from the rest of the scale; perianth bristles 6 - 7, white to stramineous, retrorse-spinulose, overtopping or almost equal the stylopodium; stamens 3; anthers 1.8 - 2.1 mm, ending in a short apiculum; style trifid. Achene 2.5 - 3 x 1.2 - 1.5 mm, biconvex to somewhat plano-convex, pyriform, green to stramineous, cancellate, with 13 - 15 longitudinal rows of rectangular cells oriented horizontally; stylopodium trapezoidal, flattened dorsiventrally, brown, separated from the achene body by a constriction, 2/3 to ¾ as wide as the achene.

DISTRIBUTION. Known only from coastland of the state of Santa Catarina.
BRAZIL. **Santa Catarina**: Florianópolis, Rio Vermelho, 28 Dec. 1984, *M. L. Souza & F. A. Silva-Filho* 534 (FLOR, MBM), Florianópolis, Santo Antônio de Lisboa, 19 Nov. 1969, *R. Klein* 8444 (HBR), Florianópolis, Alto Ribeirão, 20 Nov. 1969, *R. Klein & A. Bresolin* 8482

(HBR). Palhoça, road SC-433, km 8, road between Pinheira and Praia do Sonho, 8 Feb. 2007, *R. Lüdtke* 759 (ICN). Paulo Lopes, Bom Retiro, 21 Nov. 1973, *A. Bresolin* 998 (HBR).

HABITAT. *E. pauciglumis* was collected in bogs permanently flooded in coastland regions with the culms partially submerged, forming clonal masses, generally associated with sandy soil.

NOTES. Illustration can be found in Trevisan *et al.* (vide artigo 4). *E. pauciglumis* is closely related to *E. acutangula*, however it can be distinguished by the slender culms, trigonous with the culm faces flat or slightly convex and the angles rounded, spikelet 10–25-flowered, floral scales loosely imbricate, and achenes 1.2-1.5 mm wide (vs. wider, triquetrous culms with the culm faces concave and the angles acute-sharped, spikelet 20-90-flowered, floral scales closely imbricate, and achenes 1.3-1.9 mm wide).

34. Eleocharis plicarhachis (Griseb.) Svenson, Rhodora 31: 158 (1929).

Scirpus plicarhachis Griseb. Cat. Pl. Cub. 239 (1866). Type: Cuba: Pinar del Río, *Wright* 3372 (holotype GOET [photo!], isotype NY [photo!]).

Perennial, caespitose-stoloniferous, usually with erect and ligneous rootstock. Culms 37 - 75 cm x 1 - 1.5 mm, trigonous to obscurely trigonous, with the culm faces flat or convex and obtuse angles, sulcate when dry, bright, spongy, not septate. Sheaths stramineous to reddish brown at the base, apex oblique, emucronate, edges firm and inconspicuous. Spikelets 15 - 22 x 2.1 - 3 mm, lanceoloid to cylindrical, 20 - 35-flowered, not proliferous; lower scale sterile or fertile, coriaceous, oval, apex acute to obtuse, green, subequal or shorter than the adjacent scales, hyaline margin narrow; floral scales 3 - 4 x 1.5 mm, papery to cartilaginous, elliptic to oblong, apex obtuse, spirally arranged, loosely imbricate, appressed to slightly divergent, smooth to slightly striate, greenish, conspicuously veined, with light-brown submarginal

band, hyaline margin developed and clearly delimitated from the rest of the scale; perianth bristles 7, stramineous to light-brown, with brown margins, retrorse-toothed, exceeding the stylopodium; stamens 3, anthers 1.5 mm, ending in a short apiculum; style bifid. Achene 1.9 - 2 x 1 – 1.1 mm, biconvex, obovoid, achene apex slightly constricted at the summit into a hard annular thickening usually of the same texture and colour as the achenes, amber to light-brown, cancellate, with 16 - 17 longitudinal rows of polygonal cells horizontally oriented; stylopodium flattened dorsiventrally, brown, confluent with an annular thickening at the achene apex, ca. ½ as wide as the achene. Fig. 4H-M.

DISTRIBUTION. SE Mexico to Brazil and northern of Argentina (Barros 1939; González-Elizondo 1994). In south Brazil this species was recorded by a single collection from northwest of Paraná.

BRAZIL. **Distrito Federal:** Planaltina, Lagoa Bonita, 18 Aug. 1975, *J. E. Paula* 1012 (IBGE). **Paraná:** Cianorte, Fazenda Lagoa, 03 April 1966, *J. C. Lindeman & H. Haas* 868 (MBM).

HABITAT. It occurs as emergent plants in permanent flooded environments.

NOTES. *E. plicarhachis* can be diagnosed by its slender culms, spikelets 20 – 35-flowered, floral scales smooth to slightly striate, achenes biconvex, cancellate, and stylopodium confluent with an annular thickening at the achene apex.

35. Eleocharis quinquangularis Boeck., Beitr. Cyper. 1: 15 (1888). Type: Argentina, Misiones, Sierra de Santa Ana, *Niederlein s.n.* (holotype B, not seen).

Perennial, caespitose-rhizomatous, with ligneous short rhizomes, hardened bulbous culm-bases, with the culm-shoots recurved, and thick roots. Culms 13 - 30 cm x 0.4 - 0.6 mm,

quinquangular, irregularly sulcate when dry, spongy, not septate. Sheaths purple at the base, apex oblique, emucronate or with the dorsal mucro somewhat insinuating, edges firm, inconspicuous to brown. Spikelets 5 - 10 x 2.4 – 3.5 mm, ovoid to ellipsoid, 40 – 60-flowered, not proliferous; lower scale sterile, cartilaginous, oval, acuminate, green, subequal to overtopping the adjacent scales, hyaline margin wide; floral scales 1.8 – 2.8 x 1 - 1.2 mm, membranous, lanceolate, apex acute to obtuse, spirally arranged, appressed to slightly divergent, smooth, inconspicuously veined, keel yellow to stramineous, sides brown to dark-brown, hyaline margin developed and gradual from the rest of the scale; perianth bristles none; stamens 3, anthers 1 - 1.4 mm, acute; style trifid. Achene 0.8 x 0.5 – 0.6 mm, trigonous, with abaxial angle salient, obovoid, apex rounded, smooth to slightly striolate, yellowish white to stramineous; stylopodium pyramidal, whitish, separated from the achene body by a constriction, ½ to 2/3 as wide as the achene.

DISTRIBUTION. Bolivia, Paraguay, northeastern Argentina and south and central-western Brazil (Barros, 1928; Svenson, 1937; Trevisan and Boldrini, 2008). In south of Brazil this species was recorder to northwest of Rio Grande do Sul, but probably it can be found in west of Santa Catarina and Paraná.

BRAZIL. **Goiás:** Alto Paraíso de Goiás, Água Fria 1, ca 8km from Alto Paraíso to Teresina, Chapada dos Veadeiros, 14°04'21"S, 47°30'33"W, 29 Sept. 1997, *C. Munhoz et al.* 520 (ICN). **Mato Grosso do Sul:** Corumbá, Nhecolândia, Fazenda Nhumirim, 20 April 1987, *A. Pott et al.* 2616 (CPAP). Ponta Porã, Sanga Puitã, 14 Dec. 1983, *G. Hatschbach & R. Callejas* 47241 (MBM). **Rio Grande do Sul:** Santo Ângelo, Granja Piratini, 17 Feb. 1973, *K. Hagelund* 7452 (ICN).

HABITAT. Bogs and moist grasslands.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. quinquangularis* is similar to *E. densicaespitosa* from which it is differentiated by culms 0.4 - 0.6 mm wide, floral scales acute to obtuse, and achenes 0.8 x 0.5 - 0.6 mm (*vs*. culms (0.9-) 1 - 2 mm wide, floral scales emarginate and achenes 1 - 1.2 x 0.6-0.7 mm).

36. Eleocharis rabenii Boeck., Vidensk. Meddel. Dansk Naturhist. Foren. Kjobenhavn. 149 (1871). Type: Brazil, Rio de Janeiro, Nova Friburgo, *Raben s.n.* (syntype C [photo!]).

Perennial, caespitose-rhizomatous, rhizomes herbaceous horizontally elongated with short internodes. Culms 6 - 40 cm x 0.2 - 0.4 mm, quadrangular, spongy, not septate. Sheaths dark-brown to vinaceous at the base, apex slightly oblique, emucronate, edges firm, with a conspicuous vinaceous ring-like. Spikelets 2 – 3.5 x 1.5 – 2.5 mm, ovoid, 6 - 10 (-12)-flowered, not proliferous; lower scale sterile, cartilaginous, oval, apex acute, brown, shorter than the adjacent scales, hyaline margin inconspicuous; floral scales 1.3 – 1.8 x 0.6 - 1 mm, membranous, oval, apex acute, spirally arranged, somewhat divergent at maturity, smooth, inconspicuously veined, keel green to yellow, sides brown to vinaceous, hyaline margin inconspicuous or absent; perianth bristles 5 - 6, vinaceous, smooth, shorter than the achene; stamens 3, anthers 0.6 mm, ending in a short apiculum; style trifid. Achene 0.9 - 1.2 x 0.7 – 0.8 mm, trigonous, with abaxial angle salient, orbicular, apex rounded, smooth to finely reticulate, yellow to stramineous; stylopodium pyramidal, trilobed, brown, confluent with the achene, with the base somewhat decurrent on the achene angles, as wide as the achene.

DISTRIBUTION. Brazil and Uruguay (Svenson 1939; Trevisan and Boldrini 2008). It is a rare species that was collected just in South region of Brazil.

BRAZIL. **Paraná:** Colombo, Hotel Betânia, *s.d.*, *P.R.P. Andrade s.n.* (MBM 296881). Piraquara, 08 Jan. 1949, *G. Tessman s.n.* (MBM 265864). **Rio Grande do Sul:** Cambará do Sul, Itaimbezinho, March 1977, *S.C. Boechat s.n.* (ICN 42692). São Francisco de Paula, 18 Dec. 1949, *B. Rambo* 44872 (HBR, PACA). São Marcos, BR 116, km 106, 03 Nov. 2003, *R. Trevisan et al.* 130 (ICN). Vacaria, Fazenda da Ronda, 04 Jan. 1947, *B. Rambo* 30821 (PACA). **Santa Catarina:** Urubici, SC 430, Serra do Panelão, 27°53'58.6"S, 49°34'56.8"W, 12 Dec. 2007, *R. Trevisan* 942 (ICN).

HABITAT. Moist grassland, bogs, occurring also in shadow environments.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. rabenii* can be identified by its capillary culms, spikelets few-flowered, floral scales without hyaline margin, and achenes trigonous.

37. Eleocharis radicans (Poir.) Kunth, Enum. Pl. 2: 142 (1837).

Scirpus radicans Poir. Encycl. 6: 751 (1805). Type: Porto Rico Puerto Rico. *Ledrú s.n.* (holotype probably at P).

Perennial, caespitose-stoloniferous, usually with thin non-lignified base, with stolons 05-1 mm wide, elongated internodes. Culms 1.8 - 5 cm x 0.5 – 0.7 mm, flattened and sulcate when dry, spongy, not septate. Sheaths stramineous at the base, apex oblique, hyaline, emucronate, edges delicate and inconspicuous. Spikelets 2 – 3.2 x 1 - 2 mm, ovoid, 6 – 12-flowered, not proliferous; lower scale fertile, membranous, lanceolate, apex obtuse, green to stramineous, subequal to the adjacent scales, hyaline margin wide; floral scales 1.3 – 1.8 x 0.5 – 0.6 mm, membranous, oval to lanceolate, apex obtuse, subdistichous or spirally arranged, appressed to slightly divergent, finely striolate, keel hyaline, greenish to stramineous, sides hyaline to yellowish white, hyaline margin developed and gradual from the rest of the scale; perianth

bristles 3 or lacking, white, retrorse-spinulose, as long as the stylopodium; stamens 2, anthers 0.4 – 0.5 mm, ending in a short apiculum; style trifid. Achene 0.8 - 1 x 0.4 mm, subterete to slightly trigonous, ellipsoid to oblong, with ca. 8 - 10 (18) longitudinal rows of 35 - 40 rectangular cells horizontally oriented, obtuse at the apex, stramineous, iridescent; stylopodium conical, greenish to brown, separated from the achene body by a constriction, ca. 1/3 as wide as the achene.

DISTRIBUTION. United States, Mexico, Central America, West Indies, and temperate South America (Strong and Acevedo-Rodríguez 2005). This species was collected in highlands of South Brazil.

ARGENTINA. **Provincia de Misiones:** Depto. El Dorado, Puerto El Dorado, 17 Oct. 1977, *A. L. Cabrera et al.* 28842 (SI).

BRAZIL. **Paraná:** Campo Mourão, Parque Estadual do Lago Azul, below of the Salto Belo. 24º06'12"S, 52º19'55"W, 05 Oct. 2007, *M. G. Caxambu & A. R. Silva* 1720 (HCF, ICN). Londrina, Fazenda Figueira, bridge on the Rio Taquara, 21 Aug. 2003, *A. L. L. Vanzela s.n.* (FUEL 35443). **Rio Grande do Sul:** Bom Jesus, rio Socorro, 19.II.2008, *C.R. Grippa & T.B. Guimarães* 188 (ICN). Esmeralda, Rio Tigre, 22 Jan. 2008, *T. B. Guimarães & C. R. Grippa* 1262 (ICN). Giruá, Granja Sodal, Oct. 1963, *K. Hagelund* 1156 (ICN). **Santa Catarina:** Lauro Müller, descending the Serra do Rio do Rastro, SC 438, 4.6 km below of the summit, 27 April 1997, *D. B. Falkenberg* 9990 (FLOR). São Joaquim, 10 km South from the town, 28°21'S 49°56'W, 05 Jan. 1965, *L. B. Smith & R. Reitz* 14303 (FLOR, HBR). Urubici, SC 439, near the Gruta de Nossa Senhora de Lourdes, 15 Jan. 1997, *D. B. Falkenberg & G. J. Shepherd* 9205 (FLOR).

HABITAT. Wet margin of the streams, bogs, on rocks in running water.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. radicans* is characterised by dwarf plants and it can be identified by its culms soft and flattened, usually 0.4 - 1 mm wide, spikelets 6 – 12-flowered, lower scale fertile, stamens 2, anthers 0.4 – 0.5 mm long.

38. Eleocharis ramboana R. Trevis. & Boldrini, Syst. Bot. 00: 000 (ined.). Type: Brazil, Rio Grande do Sul, São José dos Ausentes, Silveira, Pousada das Araucárias, 31 Dec. 2006, *R. Trevisan* 813 (holotype ICN!).

Perennial, caespitose, usually with thin non-lignified base. Culms 6 - 19 cm x 0.1 - 0.2 mm, capillary, quadrangular, sulcate when dry, spongy, not septate. Sheaths stramineous at the base, apex tubular, slightly oblique, emucronate or with dorsal mucro somewhat insinuating, edge firm, stramineous or with red dots. Spikelets 4 - 5 x 1 - 1.8 mm, ellipsoid or lanceoloid, 10 - 15-flowered, often proliferating; lower scale sterile, papery, oval, apex firm acute to obtuse, green, as long as than adjacent scales, hyaline margin wide, floral scales 1.8 - 2.4 x 0.5 - 0.7 mm, membranous, oval, apex acute to obtuse, spirally arranged, appressed to slightly divergent, smooth, inconspicuously veined, keel green, sides translucent white to stramineous, hyaline margin developed and gradual from the rest of the scale; perianth bristles rudimentary or lacking; stamens 3, anthers 0.9 - 1.2 mm, ending in a short apiculum; style trifid. Achene 0.8 - 0.9 x 0.5 - 0.6 mm, trigonous, with abaxial angle salient, obovoid, truncate at the apex, smooth to finely reticulate, yellowish white to stramineous, iridescent; stylopodium short pyramidal or flat with central apiculum, trilobed, green to brown, confluent with the achene, as wide as the achene apex to slightly narrower, with the base somewhat incumbent on the apex of the achene.

DISTRIBUTION. This species is known from highlands of southern Brazil.

BRAZIL. **Paraná:** General Carneiro, 25 Feb. 2009, *C. Bona & L.G. Peixoto* 367 (ICN). **Rio Grande do Sul:** Derrubadas, Parque do Turvo, May 1983, *M. Sobral* 1972 (ICN). Giruá, Granja Sodal, 25 May 1966, *K. Hagelund* 4332 (ICN). Muitos Capões, BR 285, km 140, 03 Nov. 2003, *R. Trevisan et al.* 137 (ICN). Santo Ângelo, Granja Piratini, 15 Feb. 1973, *K. Hagelund* 6570 (ICN). São José dos Ausentes, Fazenda São José dos Ausentes, 22 Jan. 2002, *I. Boldrini et al.* 1234, 1235 (ICN). **Santa Catarina**. Bom Retiro, Campo dos Padres, 24 Jan. 1954, *B. Rambo* 60026 (PACA). São Bento do Sul, BR 280, 26°17'45"S, 49°23'23"W, 22 Oct. 2005, *R. Trevisan* 420 (ICN).

HABITAT. *Eleocharis ramboana* grows in wet grasslands, usually associated to basalt-originated soils.

NOTES. Illustration can be found in Trevisan and Boldrini (vide artigo 3). *E. ramboana* can be confused with *E. niederleinii* from which it can be distinguished by capillary culms, sheaths stramineous at the base, spikelet 4-5 mm long, floral scales translucent white and smaller achenes (*vs.* wider culms, 0.2-0.4 mm wide, sheaths vinaceous at the base, spikelet 4.5-8 mm long, floral scales vinaceous to dark-brown and achenes 0.9-1.3 x 0.6-0.7 mm).

Another species similar is *Eleocharis nana* from which *E. ramboana* can be differentiated by tubular sheath, with slightly oblique apex, emucronate or with dorsal mucro somewhat insinuating, edge firm, stramineous or with red dots, perianth bristles rudimentary or lacking (*vs*. sheath somewhat inflated, with oblique apex, emucronate, with delicate and inconspicuous edge, perianth bristles 5-6, as long as or exceeding the stylopodium).

39. Eleocharis riograndensis R. Trevis. & Boldrini, Novon 00: 000 (ined.) Type: Brazil, Rio Grande do Sul, mun. Cambará do Sul, 05 Feb. 1948, *B. Rambo* 366640 (holotype SI!, isotype PACA!).

Perennial?, caespitose-stoloniferous, usually with thin non-lignified base, stolons capillary. Culms 18 - 23 cm x 0.2 - 0.3 mm, capillary, somewhat angled, soft and spongy when fresh, sulcate when dry, not septate. Sheaths stramineous at the base, apex long-acuminate, hyaline, emucronate, edges delicate and inconspicuous, easily torn. Spikelets 3 - 4 x 1.7 mm, ovoid to lanceoloid, 6 - 8-flowered, not proliferous; lower scale fertile, membranous, oval, apex acute to obtuse, stramineous, about the same length as the adjacent scales, with wide hyaline margin; floral scales 1.8 - 2 x 0.5 - 0.7 mm, membranous, oval, apex acute to obtuse, spirally arranged, appressed to slightly divergent in maturity, finely striate, keel stramineous, sides stramineous to translucent white, hyaline margin gradual from the rest of the scale; perianth bristles 5 - 6, as long as or exceeding the stylopodium, stramineous, sparsely retrorse-scabrous; stamens 2, anthers 0.4 - 0.5 mm, ending in a short apiculum; style trifid. Achene 0.9 - 1 x 0.4 mm, ellipsoid to obovoid, slightly trigonous, with ca. 9 - 10 longitudinal rows of 20 - 25 rectangular cells, obtuse at the apex, stramineous, iridescent; stylopodium short pyramidal, green to dark-brown, separated from the achene body by a constriction, about 1/3 as wide as the achene.

DISTRIBUTION. Known only from type locality. It is possible that this species can occur also in other areas of grasslands in highlands of NE of Rio Grande do Sul.

BRAZIL. **Rio Grande do Sul:** mun. Cambará do Sul, 05 Feb. 1948, *B. Rambo* 366640 (PACA, SI). **Santa Catarina**: Campo Alegre, Fazenda Ernesto Scheide, 01 Feb. 1957, *L.B. Smith & R. Klein 10573* (HBR).

HABITAT. *Eleocharis riograndensis* grows in wet environments, generally forming mats.

NOTES. Illustration can be found in Trevisan *et al.* (vide artigo 2). *Eleocharis riograndensis* can be misidentified as *E. radicans*, from which it is separated by the capillary and elongate

culms (*vs*. culms flattened, wider than 0.4 mm, and usually shorter than 8 cm) and achenes with fewer rectangular cells (20 - 25 vs 30 - 50).

The main differences between *Eleocharis riograndensis* and *E. bonariensis* are in the size and number of the anthers (two anthers, 0.4 - 0.5 mm *vs*. three anthers, 1.1 - 1.8 mm), the width of the culms (0.2 - 0.3 mm *vs*. 0.4 - 1.2 mm), and the number of the flowers in the spikelets (6 - 8-flowered vs. 10 - 60-flowered).

40. Eleocharis sellowiana Kunth, Enum. Pl. 2: 149 (1837). Type: Brazil, *Sellow s.n.* (holotype B, not seen).
Eleocharis ramboi H. E. Hess, Ber. Schweiz. Bot. Ges. 67: 93 (1957). Type: Brazil, Rio Grande do Sul, *B. Rambo* 49919 (holotype ZT [photo!]).

Perennial, caespitose-rhizomatous, sometimes with herbaceous elongated rhizomes, usually with short internodes, base not ligneous. Culms (6 -) 10 - 65 cm x (0.8 -) 1 - 2 mm, obscurely terete, sulcate when dry, spongy, not septate. Sheaths stramineous or reddish brown at the base, apex inflated with hyaline wrinkled portion quite distinct from the base, emucronate, the delicate edges easily torn. Spikelets (3 -) 6 - 12 x 2 - 5 mm, ovoid to wide lanceoloid, (12-) 35 - 100-flowered, not proliferous; lower scale sterile, cartilaginous, oval to oblong, apex obtuse, green, subequal to the adjacent scale, hyaline margin wide; floral scale (1.9 -) 2.4 – 3.5 x 0.8 - 1.5 mm, membranous, oval to lanceolate, apex acute to obtuse, spirally arranged, appressed, smooth, inconspicuously veined, keel green to stramineous, sides stramineous to vinaceous, hyaline margin developed and gradual from the rest of the scale; perianth bristles 6 - 8, white, retrorse-spinulose, shorter than the achene; stamens 3, anthers 0.8 - 0.9 mm, ending in a short apiculum; style bifid. Achene 0.9 – 1.3 x 0.5 – 0.9 mm, biconvex, broadly obovoid, apex rounded, smooth, olivaceous sometimes blackened by black dots or lines; stylopodium hat-

shaped, olivaceous to ochraceous, separated the achene body by a constriction, ½ as wide as the achene.

DISTRIBUTION. Central and South America (González-Elizondo 1994). In south Brazil this species is widely distributed.

ARGENTINA. **Provincia de Misiones:** Depto. General Belgrano, Bernardo de Irigoyen, 31 Jan. 1983, *E. R. Guaglianone et al. 1140*, (SI).

BRAZIL. **Paraná:** Curitiba, Barreirinha, Chácara Nowack, 11 Jan. 1967, *J. C. Lindeman & H. Haas* 4039 (MBM). Tibagi, Rio Tibagi, 25º17.248'S, 49º54.42'W, 20 Jan. 2007, *C. R. M. Silva & A. L. L. Vanzela* 105 (ICN). **Rio Grande do Sul:** Arroio Grande, BR 116, km 629, 32°21'58.7"S, 53°11'03.7"W, 31 Oct. 2006, *R. Trevisan et al.* 697 (ICN). Caçapava do Sul, BR 153, 30º38'00"S, 53º23'41"W, 21 Nov. 2003, *R. Trevisan et al.* 201 (ICN). Palmares do Sul, RST 101, km 58, 30º17'57"S, 50º28'53"W, 22 Oct. 2003, *R. Trevisan et al.* 64 (ICN). São Francisco de Paula, RS 020, 29º17'57"S, 50º20'09"W, 28 Nov. 2003, *R. Trevisan et al.* 306 (ICN). **Santa Catarina:** Florianópolis, Rio Vermelho, 17 Jan. 1966, *R. Klein & A. Bresolin* 6525 (FLOR, HBR). Urubici, SC 430, Serra do Panelão, 27°53'58.6"S, 49°34'56.8"W, 12 Dec. 2007, *R. Trevisan* 940 (ICN). **São Paulo:** Ibitinga, road near the dike of the Rio Tietê, 21º45'13"S, 48º59'55"W, 20 July 2006, *C. R. M. Silva* 30 (ICN).

HABITAT. Moist soil, swamps, bogs, along roadsides, wet grasslands, edge of ponds and stream.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. sellowiana* has a high variability, and it can be characterised by sheaths with the distal portion delicate, inflated and transversally wrinkled, spikelets (12-) 35 - 100-flowered, floral scales membranous, with sides stramineous to vinaceous, and achenes biconvex, broadly obovoid, olivaceous sometimes blackened by black dots or lines. See comments in *E. parvispicula*.

41. Eleocharis squamigera Svenson, Rhodora 36: 389 (1934). Type: Brazil, Paraná, Jaguariaíva, *Dusén* 13276 (holotype GH, not seen, isotype NY [photo!]).

Perennial, caespitose-rhizomatous, rhizomes herbaceous elongated with short internodes. Culms 6 - 55 cm x 0.2 - 0.3 (-0.5) mm, terete, irregularly sulcate when dry, spongy, not septate. Sheaths vinaceous at the base, apex oblique, emucronate, edges delicate and inconspicuous. Spikelets 2.5 - 6 x 2 – 2.5 mm, ovoid to ellipsoid, 10 - 25 (-40)-flowered, not proliferous; lower scale sterile, membranous to papery, oval to oboval, apex obtuse, green, subequal to the adjacent scales, hyaline margin narrow; floral scales 1.2 - 1.9 x 0.8 - 1 mm, membranous, oval, apex acute to obtuse, rarely emarginate, spirally arranged, slightly divergent at maturity, smooth, inconspicuously veined, keel green to yellow, sides stramineous to brown, hyaline margin developed and gradual from the rest of the scale; perianth bristles 5 - 6, yellow, retrorse-spinulose, shorter or slightly overtopping the stylopodium; stamens 2, anthers 0.7 mm, ending in a short apiculum; style trifid. Achene 1 - 1.2 x 0.6 - 0.8 mm, trigonous, with abaxial angle salient, obovoid, apex rounded, light-brown, with ca. 12 rows of rectangular cells horizontally oriented on the abaxial surface; stylopodium pyramidal, whitish to brown, separated from the achene body by a constriction, ½ as wide as the achene.

DISTRIBUTION. Venezuela, southeast and south Brazil (González-Elizondo and Reznicek 1996). This species can be found in highlands of eastern of south Brazil.
BRAZIL. **Minas Gerais:** Ouro Branco, Serra do Ouro Branco, 20º29'18.5"S, 43º41'03.8"W, 03 Dec. 2007, *H. M. Longhi-Wagner & A. C. Araújo* 10406a (ICN). **Paraná:** Campina Grande do Sul, Estrada da Graciosa, Alto da Serra, 14 Dec. 1952, *G. Hatschbach* 2934 (LP,

MBM). São José dos Pinhais, Rio Pequeno, 05 Nov. 1969, *G. Hatschbach* 22829 (MBM). **Rio Grande do Sul:** Bom Jesus, Serra da Rocinha, 03 Feb. 1953, *B. Rambo* 53899 (HBR, PACA, SI). São José dos Ausentes, Silveira, Canyon Monte Negro, 31 Dec. 2006, *R. Trevisan et al.* 810 (ICN). **Santa Catarina:** Bom Jardim da Serra, Serra do Rio do Rastro, SC 438, 28°24'00.7"S, 49°33'11.3"W, 11 Dec. 2007, *R. Trevisan* 930 (ICN). Caçador, 15 km NE from the town, 21 Dec. 1956, *L. B. Smith & R. Reitz* 8882 (HBR). Urubici, Campo dos Padres, 10 March 2006, *A. Zanin et al.* 1043 (FLOR, ICN). **São Paulo:** Itararé, Unidade de Pesquisa e Desenvolvimento de Itararé, 24º16'06"S, 49º12'19"W, 20 Oct. 2005, *J. L. S. Tannus* 953 (HRCB, ICN).

HABITAT. Swamps, wet grasslands, bogs, edge of streamlets and ponds.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. squamigera* is diagnosed by capillary culms, spikelets 10 - 25 (-40)-flowered, floral scales membranous, achenes trigonous, with ca. 12 longitudinal rows of rectangular cells on the abaxial surface, and stylopodium separated from the achene by a constriction.

42. Eleocharis subarticulata (Nees) Boeck., Linnaea 36: 455 (1869-70).

Chaetocyperus subarticulatus Nees in Martius, Fl. Bras. 2: 96 (1842). Type: Brazil, *Sellow s.n.* (holotype B, not seen).

Eleocharis widgrenii Boeck., in Engler Bot. Jahrb. Syst. 5: 503 (1884). Type: Brazil, Minas Gerais, *Widgren s.n.* (holotype B, not seen).

Perennial, caespitose-stoloniferous, stolons herbaceous horizontally elongated. Culms 8 - 33 cm x 0.4 – 1.4 mm, obscurely terete, sulcate when dry, spongy, not septate. Sheaths vinaceous at the base, apex oblique, emucronate, edges inconspicuous or with vinaceous dots. Spikelets 6 - 12 x 1.5 - 3 mm, lanceoloid, 15 - 60-flowered, not proliferous; lower scale sterile,

cartilaginous, oval, apex obtuse, green with dark submarginal band, subequal to the adjacent scales, hyaline margin narrow; floral scales 2.1 - 3 x 0.7 – 1.3 mm, membranous, oval, apex acute, spirally arranged, appressed, smooth, inconspicuously veined, keel green to stramineous, sides brown to vinaceous, with or without submarginal dark-brown band, hyaline margin developed and gradual from the rest of the scale; perianth bristles 6 - 7, yellowish to light-brown, retrorse-spinulose, as long as or exceeding the stylopodium; stamens 3, anthers 0.5 – 0.6 mm, ending in a short apiculum; style trifid. Achene 1.6 – 2.1 x 0.6 - 0.9 mm, plano-convex to trigonous, with abaxial angle slightly salient, obovoid, apex obtuse, reticulate, olivaceous to light-brown; stylopodium pyramidal elongated, stramineous to brown, confluent with the achene body with a short neck at the achene apex, ½ to 1/3 as wide as the achene.

DISTRIBUTION. Brazil, from center of the country towards southern. This species is widely spread in south of Brazil.

BRAZIL. **Minas Gerais:** Poços de Caldas, 21°49’42”S, 46°29’51”W, 28 April 2007, *C. R. M. Silva & A. L. L. Vanzela* 147 (ICN). **Paraná:** Curitiba, Capão da Imbuia, 31 Oct. 1964, *L. T. Dombrowski & Y. Saito,* 743 (MBM). Morretes, edges of the Rio São João, 25º22'51.6"S, 48º51'50.9"W, 10 May 2008, *C. R. M. Silva et al.* 359 (ICN). Piraí do Sul, road near the town, 24º32'16.6"S, 49º57'11.2"W, 11 May 2008, *C.R.M. Silva et al.* 379 (ICN). **Rio Grande do Sul:** Cambará do Sul, Faxinal, Oct. 1983, *M. Sobral & J.R.Stehmann* 2724 (FLOR, ICN, SI). Santana do Livramento, Colony Recanto, 30°41'49.0"S, 55°20'29.1"W, 14 Nov. 2005, *R. Trevisan* 502 (ICN). São Francisco de Paula, RS 020, 29º17'57"S, 50º20'09"W, 28 Nov. 2003, *R. Trevisan et al.* 305 (ICN). **Santa Catarina:** Bom Retiro, BR 282, Km 136, 27°49'29.9"S, 49°34'27.0"W, 29 Nov. 2006, *R. Trevisan et al.* 763 (ICN). Ponte Alta, 27°24'10.7"S,

50°25'18.8"W, 11 Oct. 2006, *R. Trevisan et al.* 663 (ICN). São Joaquim, 13 km NE from the town, 17 Jan. 1957, *L. B. Smith & R. Reitz* 10257 (HBR, SI).

HABITAT. Moist soils, swamps, edge of the bogs and ponds.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. subarticulata* is characterised by its stolons, sheaths with oblique apex, spikelets lanceoloid, 15 - 60-flowered, and achenes plano-convex to trigonous, reticulate.

43. Eleocharis urceolatoides R. Trevis. & Boldrini, Syst. Bot. 00: 000 (ined.). Type: Brazil, Rio Grande do Sul, São Gabriel, assentamento Guajuviras, 28 May 2006, *R. Trevisan* 641 (holotype ICN!).

Perennial, caespitose, forming dense mats, with thin non-lignified base. Culms 4 - 9 cm x 0.1 - 0.2 mm, capillary, quadrangular, sulcate when dry, spongy, not septate. Sheaths vinaceous at the base, apex somewhat inflated, oblique, emucronate, with the edge delicate, inconspicuous and hyaline. Spikelets 3 - 5 x 1.3 - 2.5 mm, ovoid, 8 - 18-flowered, usually proliferating, often sessile at the base of the culms; lower scale sterile, membranous to papery, oval, apex acute, stramineous to vinaceous, as long as the adjacent scales, hyaline margin wide; floral scales 1.5 x 0.5 - 0.8 mm, membranous, oval, apex acute, spirally arranged, somewhat divergent, smooth, inconspicuously veined, keel green to stramineous, sides vinaceous, hyaline margin developed and gradual from the rest of the scale; perianth bristles 5 - 6, shorter than the achene, white, smooth or sparsely retrorse-scabrous; stamens 1-3, anthers 0.4 - 0.6 mm, ending in a short apiculum; style trifid. Achene 0.7 - 0.8 x 0.4 - 0.5 mm, trigonous, with abaxial angle salient, obovoid, urceolate, truncate at the apex, smooth to striate-reticulate, olivaceous to stramineous; stylopodium flat with a central apiculum, light-green to brown, confluent with the achene, as wide as the achene apex to a slightly narrower.

DISTRIBUTION. This species occurs in Paraguay and Brazil (Mato Grosso do Sul and Rio Grande do Sul). It is possible that this species can occur also in the provinces of the northeastern of Argentina.

BRAZIL. **Mato Grosso do Sul:** Corumbá, 18 March 1906, *L. M. Etchichury* 19 (SI).

PARAGUAY. **Asunción:** Trinidad, Coronel Oviedo, Oct. 1942, *Pavetti & Rojas* 10064 (SI). **Depto. Cordillera:** San Bernardino, Feb. 1915, *E. Hassler* 61 (SI).

HABITAT. The species grows in swamps and wet grasslands.

NOTES. Illustration can be found in Trevisan and Boldrini (vide artigo 3). *Eleocharis urceolatoides* can be distinguished from *E. urceolata* (Liebm.) Svenson by the smaller achenes, olivaceous to stramineous, perianth bristles developed, and stylopodium narrower than the achene (*vs.* achenes 0.8 mm long, pale gray to brownish yellow, perianth bristles lacking, and stylopodium as wide as the achene).

Other species that appears to be similar to *E. urceolatoides* is *E. barrosii* Svenson, from which can be differentiated by amphicarpic spikelets, floral scales spirally arranged, vinaceous, perianth bristles developed, and stylopodium narrower than the achene (*vs.* spikelets on the top of a developed culm, floral scales sub-distichous, light-brown, perianth bristles rudimentary or lacking, and stylopodium as wide as the achene).

44. Eleocharis viridans Kük. ex Osten, Anales Mus. Hist. Nat. Montevideo, ser. 2, 3: 175 (1931). Type: Uruguay, Canelones, *Osten* 6907 (syntype B [photo!]).

Perennial, caespitose, usually erect and ligneous rootstock. Culms 6 - 55 cm x 0.3 - 1 mm, quadrangular to irregularly sulcate when dry, spongy, not septate. Sheaths brown to purple at the base, apex slightly oblique, emucronate or with the dorsal mucro somewhat insinuating,

edges firm, with brown to vinaceous ring-like. Spikelets 6 - 13 x 2 – 3.5 mm, ellipsoid to ovoid, rarely lanceoloid (25) 30 - 60 (70)-flowered, often proliferating; lower scale sterile, cartilaginous, oval, apex acute to obtuse, green, subequal or exceeded the adjacent scales, hyaline margin wide; floral scales 2.2 – 3.5 x 1 - 2 mm, membranous to papery, oval, apex acute to obtuse, spirally arranged, appressed, smooth, inconspicuously veined, keel greenish to stramineous, sides brown to vinaceous, dark-brown to almost black, hyaline margin developed and gradual from the rest of the scale; perianth bristles 2 - 5 or lacking, white to light-brown, retrorse-spinulose, shorter than the achene; stamens 3, anthers 1.2 - 1.9 mm, ending in a short apiculum; style trifid. Achene 1 - 1.5 x 0.6 - 1 mm, trigonous, with abaxial angle salient, obovoid, apex truncate, smooth to finely reticulate, yellowish white, olivaceous to stramineous; stylopodium pyramidal, trilobed, whitish yellow to ochraceous, confluent with the achene, as wide as the achene or slightly larger, rarely slightly narrower, with the base somewhat incumbent on the achene apex.

DISTRIBUTION. South of Brazil, Paraguay, Argentina and Uruguay (Trevisan and Boldrini 2008). This species is widely distributed in south Brazil.

ARGENTINA. **Provincia de Corrientes**: Depto. Mburucuyá, Estancia Santa Teresa, 03 Jan. 1960, *T. M. Pedersen* 5324 (ICN).

BRAZIL. **Paraná:** Balsa Nova, bridge of the Arcos, 29 Sept. 2005, *C. Kozera & A. Sanches* 2350 (MBM). Matinhos, 25º48'28.5"S, 48º33'11.8"W, 11 May 2008, *C. R. M. Silva et al.* 375 (ICN). **Rio Grande do Sul:** Aceguá, BR 473, 31º38'10"S, 54º23'58"W, 22 Nov. 2003, *R. Trevisan et al.* 213 (ICN). São Francisco de Paula, RS 020, 29º17'57"S, 50º20'09"W, 28 Nov. 2003, *R. Trevisan et al.* 308 (ICN). Santa Catarina: Lages, São Jorge, 28º14'02.3"S, 50º19'43.2"W, 13 Dec. 2004, *I. I. Boldrini & L. Eggers* 1352 (ICN). Palhoça, SC 433, km 8, road between Pinheira and Praia do Sonho, 08 Feb. 2007, *R. Lüdtke* 763 (ICN).

PARAGUAY. **Depto. Paraguarí**: 15 km N from Paraguarí, Peribebuy, 01 Oct. 1967, *A. Krapovickas & C. L. Cristóbal* 13513 (LP).

URUGUAY: **Depto. Colônia:** Riachuelo,16 Nov. 1936, *A. L. Cabrera* 3926 (LP).

HABITAT. Moist soils, edge of the bogs and wet grasslands.

NOTES. Illustration can be found in Trevisan and Boldrini (2008). *E. viridans* is characterised by its culms filiforms, sheaths tubular, with apex firm, spikelets many-flowered, generally proliferous, floral scales membranous, with broad hyaline margin, and achenes trigonous, smooth to finely reticulate.

Acknowledgments

The authors are grateful to the curators of the herbaria indicated for loan of specimens; to the curators and staff of all requested herbaria for providing images of the type specimens. RT thanks Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Capes) for scholarship support.

References

Alves, M.; A. C. Araújo, A. P. Prata, F. Vitta, S. Hefler, R. Trevisan, A. B. Gil, S. Martins & W. Thomas. 2009. Diversity of Cyperaceae in Brazil. *Rodriguesia* 60(3): XXX-XXX (in press).

Barros, M. (1928). Ciperáceas Argentinas I: género *Heleocharis* R. Br. An. Mus. Nac. Hist. Nat. Bernardino Rivadavia 34: 425 – 496.

_____ (1939). Notas sobre *Heleocharis* argentinas. Darwiniana 3(3): 438 - 444.

_____ (1960). Las Ciperáceas del Estado de Santa Catalina. Sellowia 12: 181 – 448.

Blake, S. T. (1939). A monograph of the genus *Eleocharis* in Australia and New Zealand. Proc. Roy. Soc. Queensland 50: 88 – 132.

Faria, A. D. (1998). O gênero *Eleocharis* R. Br. (Cyperaceae) no Estado de São Paulo. UNICAMP. Campinas, Brazil. Unpubl. MSc. Thesis.

Font Quer, P. (1993). Diccionário de Botánica. Barcelona: Editorial Labor, S.A. 1244p.

Gil, A. S. B & Bove, C. P. (2007). *Eleocharis* R. Br. (Cyperaceae) no Estado do Rio de Janeiro, Brasil. Biota Neotrop. 7(1): http://www.biotaneotropica.org.br/v7n1/pt/abstract?Taxonomicreview+bn00507012007 ISSN 1676-0603

Goetghebeur, P. (1998). Cyperaceae. In: K. Kubitzki (ed.). The families and genera of vascular plant: IV. Flowering plants – monocotyledons, pp. 141 – 190. Berlin: Springer-Verlag.

González-Elizondo, M. S. (1994). *Eleocharis* R. Br. (Cyperaceae). In: G. Davidse, M. Souza & A. O. Chater (eds), Flora Mesoamericana, Vol. 6. *Alismataceae a Cyperaceae*, pp. 458 – 464. Universidad Nacional Autónoma de Mexico, Mexico, D.F. - Missouri Botanical Garden, St. Louis - The Natural History Museum, London.

_____ (2001). *Eleocharis* (Cyperaceae). In: W. D. Stevens, C. Ulloa Ulloa, A. Pool y O. M. Montiel (eds.), Flora de Nicaragua. Monogr. Syst. Bot. Missouri Bot. Garden 85(1): 758 – 765.

_____ & Reznicek, A. A. 1996. New *Eleocharis* (Cyperaceae) from Venezuela. Novon 6(4): 356 - 365.

_____ & _____ (1998). *Eleocharis* R. Br. In: P. E. Berry, B. K. Holst & K. Yatskievych (eds), Flora of the Venezuelan Guayana, Vol. 4. *Caesalpiniaceae – Ericaceae*, pp. 548 – 561. Missouri Botanical Garden Press, St. Louis, USA.

_____ & P. M. Peterson (1997). A classification of and key to the supraspecific taxa in *Eleocharis* (Cyperaceae). Taxon 46: 433 – 449.

_____ & J. A. Tena-Flores (2000). *Eleocharis* (Cyperaceae) in the New World. In: K. L. Wilson & D. A. Morrison (eds.), Monocots: Systematics and Evolution, pp. 637 – 643. CSIRO Publishing, Melbourne, Australia.

Guaglianone, E.R., E. Marchesi, C. Marticorena, A.C. Araújo & F. Mereles (org.) 2008. Cyperaceae. In: Zuloaga, F.O.; Morrone, O. & Belgrano, M.J. (eds.) Catalogo de las Plantas Vasculares del Cono Sur (MSB 107), pp. 302-400. Vol. I. St. Loius: Missouri Botanical Garden Press.

Kukkonen, I. (1994). Definition of descriptive terms for the Cyperaceae. Ann. Bot. Fennici, 31: 37-43.

Radford, A.E.; Dickison, W.C.; Massey, J.R. & Bell, C.R. (1974). Vascular Plants Systematics. Harper & How, New York. 891p.

Roalson, E.H. & Friar, E.A. (2000). Infrageneric classification of *Eleocharis* (Cyperaceae) revisited: evidence from the internal transcribed spacer (ITS) region of nuclear ribosomal DNA. Syst. Bot. 25: 323 – 336.

_____ & C. Hinchliff. (2007). Phylogenetic relationships in *Eleocharis* R.Br. (Cyperaceae): comparisons with classification, morphology, biogeography and physiology, In: L.M. Barbosa & N.A. dos Santos Jr. (orgs.), A Botânica no Brasil: pesquisa ensino e políticas públicas, pp. 304 – 307. 58º Congresso Nacional de Botânica, SBB, São Paulo, Brazil.

Rosen, D. J. (2006). A systematic study of select species complexes of *Eleocharis* subgenus *Limnochloa* (Cyperaceae). Ph.D. Dissertation. Texas A&M University, College Station. Unpubl. Thesis.

_____ & Hatch, S. L. (2006). New records of *Eleocharis obtusetrigona* (Cyperaceae) from Central and South America. Brittonia 58(3): 264–266.

_____; _____ & Carter, R. (2007). Infraspecific taxonomy and nomenclature of *Eleocharis acutangula* (Cyperaceae). J. Bot. Res. Inst. Texas 1(2): 875 – 888.

_____; _____ & Carter, R. (2008). Taxonomy and nomenclature of three closely related species of *Eleocharis* subgenus *Limnochloa* (Cyperaceae). Blumea 53: 235 – 246.

Simpson, D. A. (1988). Some problems in *Eleocharis*. Notes on Brazilian Cyperaceae: III. Kew Bull. 43: 127 – 134.

Smith, S. G.; Bruhl, J. J.; González-Elizondo, M. S. & Menapace, F. J. (2002). *Eleocharis* R. Br. In: Flora of North America Editorial Committee (eds), Flora of North America North of Mexico, pp. 60 – 120. Vol. 23. Oxford Univ. Press, New York, USA.

Strong, M.T. & Acevedo-Rodríguez, P. (2005). Cyperaceae. In: P. Acevedo-Rodríguez & M. T. Strong (eds.), Monocotyledons and Gymnosperms of Puerto Rico and the Virgin Islands, pp. 236 – 383. Contributions from the United States National Herbarium, vol. 52. Washington, DC, USA.

Svenson, H. K. (1929). Monographic studies in the genus *Eleocharis* I. Rhodora 31: 121 – 135, 152 – 163, 167 – 191, 199 – 219, 224 – 242.

_____ (1932). Monographic studies in the genus *Eleocharis* II. Rhodora 34: 193 –203, 215 – 227.

_____ (1934). Monographic studies in the genus *Eleocharis* III. Rhodora 36: 377 – 389.

_____ (1937). Monographic studies in the genus *Eleocharis* IV. Rhodora 39: 210 – 231, 236 – 273.

_____ (1939). Monographic studies in the genus *Eleocharis* V. Rhodora 41: 1 – 19, 43 – 77, 90 – 110.

Trevisan, R. & Boldrini, I. I. (2008). O gênero *Eleocharis* R. Br. (Cyperaceae) no Rio Grande do Sul, Brasil. Rev. bras. biociênc. 6(1): 7 – 67.

Trevisan, R.; Rosen, D. & Boldrini, I. (2007). Rediscovery of *Eleocharis kleinii* (Cyperaceae), an overlooked species from the highlands of South Brazil. J. Bot. Res. Inst. Texas 1(2): 1119 - 1124.

Figure legends

Fig. 1. *Eleocharis bicolor*. **A** habit; **B** sheath, dorsal view; **C** sheath, lateral view; **D** spikelet; **E** spikelet with achenes exposed; **F** floral scale with emarginate apex, dorsal view; **G** achene biconvex; **H** achene trigonous. *Eleocharis capillacea*. **I** habit; **J** sheath, ventral view; **K** sheath, dorsal view; **L** spikelet, with the lower scale partially covering the floral scale; **M** spikelet, lower scale view; **N** achenes with perianth bristles. **A - H** drawn from *Smith* 9564 (HBR), **I - N** drawn from *Hatschbach & Koyama* 24012 (MBM).

Fig. 2. *Eleocharis debilis*. **A** habit; **B** sheath, ventral view; **C** sheath, dorsal view; **D** spikelet; **E** floral scale, dorsal view; **F** achenes with perianth bristles. *Eleocharis elongata*. **G** habit; **H** sheath, ventral view; **I** sheath, dorsal view; **J** spikelet; **K** floral scale, dorsal view; **L** achenes trigonous with perianth bristles. **A - F** drawn from *Dziewa* 29 (MBM), **G - L** drawn from *Souza* 347 (FLOR).

Fig. 3. *Eleocharis jelskiana*. **A** habit; **B** sheath, ventral view; **C** sheath, lateral view; **D** spikelet; **E** floral scale, dorsal view; **F** achenes with perianth bristles. *Eleocharis nana*. **G** habit; **H** sheath, ventral view; **I** sheath, dorsal view; **J** spikelet; **K** floral scale, dorsal view; **L** achene with perianth bristles. **A - F** drawn from *Lindeman & Haas* 938 (MBM), **G - L** drawn from *Klein & Bresolin* 6536 (FLOR).

Fig. 4. *Eleocharis niederleinii*. **A** habit; **B** sheath, ventral view; **C** sheath with apex oblique, lateral view; **D** sheath with mucro somewhat insinuating, dorsal view; **E** spikelet; **F** floral scale, dorsal view; **G** achenes with perianth bristles. *Eleocharis plicarhachis*. **H** habit; **I** sheath, ventral view; **J** sheath, dorsal view; **K** spikelet; **L** floral scale, dorsal view; **M**

achenes with perianth bristles. **A - G** drawn from *Trevisan* 301 (ICN), **H - M** drawn from *Lindeman* 886 (MBM).

Index to Latin Names

Note: synonyms are italicised.

nodulosa (Roth) Schult.

nudipes (Kunth) Palla

obtusetrigona (Lindl. & Nees) Steud.

palustris (L.) Roem. & Schult.

parodii Barros

parvispicula R. Trevis. & Boldrini

pauciglumis R. Trevis. & D.J. Rosen

plicarhachis (Griseb.) Svenson

quinquangularis Boeck.

rabenii Boeck.

radicans (Poir.) Kunth

ramboana R. Trevis. & Boldrini

ramboi H.E. Hess

riograndensis R. Trevis. & Boldrini

rothiana Boeck.

sellowiana Kunth

squamigera Svenson

strobilacea Pedersen

subarticulata (Nees) Boeck.

urceolata (Liebm.) Svenson

urceolatoides R. Trevis. & Boldrini

viridans Kük.

widgrenii Boeck., 49

Isolepis

nudipes Kunth

Limnochloa

acutangula (Roxb.) Nees

mutata (L.) Nees

obtusetrigona Lindl. & Nees

Scirpidium

grande Nees

Scirpus

acutangulus Roxb.

elegans Kunth

fistulosus Poir.

flavescens Poir.

geniculatus L.

interstinctus Vahl

maculosus Vahl

montanus Kunth

mutatus L.

plicarhachis Griseb.

radicans Poir.

Index to Collections

List of numbered collections examined, arranged alphabetically by collectors, with the taxon they belong indicated according to the number in the treatment (e.g. = 40 is *E. sellowiana*). The herbaria in which the authors have seen these collections are indicated by the standard abbreviations.

Abreu, L.C. 344 = 42 (ICN, SP). **Abruzzi, M.L.** 778 = 30 (HAS); 1004 = 5 (HAS); 2063 = 5 (HAS); 4590 = 30 (HAS); 4694 = 9 (HAS); 4695 = 15 (HAS). **Ahumada, O.** 1159 = 23 (LP). **Almeida, S.P.** 1043 = 4 (UB). **Alves, M.** 1793 = 25 (SP); 2058 = 21 (SP); 2059 = 15 (SP). **Anderson, W.R.** 12470 = 6 (MBM). **Andrade, P.R.P.** s.n. = 36 (MBM 296881). **Aplevicz, M.R.** s.n. = 15 (HUPG 1399); s.n. = 15 (HUPG 2270). **Araújo, A.C.** 10 = 23 (ICN); 18 = 21 (ICN); 20 = 21 (ICN); 25 = 21 (ICN); 32 = 22 (ICN); 185 = 16 (HBR); 195 = 23 (HBR); 220 = 23 (HBR); 229 = 15 (HBR); 255 = 23 (ICN); 259 = 30 (ICN); 316 = 14 (HBR); 326 = 23 (HBR); 340 = 23 (HBR); 406 = 23 (ICN); 425 = 42 (ICN); 440 = 23 (ICN); 446 = 23 (ICN); 471 = 23 (ICN); 483 = 23 (ICN); 494 = 23 (ICN); 501 = 23 (ICN); 506 = 1 (ICN); 519 = 23 (ICN); 1671 = 44 (ICN); 1674 = 29 (ICN). **Arzivenco, L.** 107 = 44 (ICN); 108 = 44 (ICN); 125 = 5 (ICN); 197 = 14 (ICN); 336 = 23 (ICN); s.n. = 9 (ICN 42341); s.n. = 15 (ICN 88779); s.n. = 15 (ICN 88780); s.n. = 15 (ICN 88780); s.n. = 21 (ICN 42337); s.n. = 21 (ICN 48513); s.n. = 22 (ICN 42338); s.n. = 23 (ICN 45398); s.n. = 28 (ICN 44390); s.n. = 44 (ICN 42340).

B.L.G 97 = 1 (ICN); 107 = 40 (ICN). **Bach, A.** s.n. = 11 (HUPG 13134);s.n. = 23 (HUPG 13170); s.n. = 40 (ICN 151119). **Baptista, L.R.M.** s.n. = 21 (ICN 28203); s.n. = 23 (ICN 88708). **Barbosa, E.** 1587 = 11 (MBM). **Bassan, M.H.** 1025 = 23 (HAS). **Batista** 112 = 23 (ICN); s.n. = 5 (ICN 87853); s.n. = 5 (ICN 87854); s.n. = 5 (HCB 0493); s.n. = 5 (HCB 0496); s.n. = 23 (HCB 0112). **Bauer, D.** s.n. = 23 (ICN 132190); s.n. = 44 (ICN 132191). **Bellan, A.F.** s.n. = 44 (MPUC 7896). **Berger, J.F.** 735 = 26 (MBM). **Bertels, A.** 400 = 44 (FLOR, PEL);1042 = 23 (PACA, PEL); 1042a = 23 (PEL); 1043 = 9 (PACA, PEL, UPCB); 1066 = 44 (PEL); 1424 = 23 (PACA, PEL); 1428 = 44 (PEL); 1430 = 30 (PACA, PEL, SI, UPCB); 1430c = 40 (PEL); 1430e = 5 (PEL, UPCB); 1430f = 5 (PACA, PEL); 1431 = 40 (PEL, SI, UPCB); 1436 = 29 (PACA, PEL, UPCB); s.n. = 23 (PACA 7256, PEL 10940); s.n. = 40 (PACA 70127, PEL 10941); s.n. = 44 (PACA 70129, PEL 10947); s.n. = 44 (PACA 70092, PEL 485). **Bessa, F.A.** 69 = 30 (MBM). **Bins & Born** s.n. = 23 (ICN 35253). **Bochkermann, W.** 302 = 16 (ICN, SP). **Boechat, S.C.** s.n. = 36 (ICN 42692); s.n. = 41 (ICN 42693). **Boldrini, I.I.** 1169 = 44 (ICN); 1170 = 44 (ICN); 1172 = 44 (ICN); 1173 = 23 (ICN); 1174 = 29 (ICN); 1176 = 5 (ICN); 1179 = 5 (ICN); 1180 = 23 (ICN); 1181 = 23 (ICN); 1182 = 44 (ICN); 1183 = 44 (ICN); 1184 = 2 (ICN); 1185 = 2 (ICN); 1186 = 2 (ICN); 1187 = 2 (ICN); 1188 = 2 (ICN); 1189 = 40 (ICN); 1190 = 44 (ICN); 1191 = 40 (ICN); 1192 = 40 (ICN); 1194 = 5 (ICN); 1195 = 44 (ICN); 1202 = 5 (ICN); 1203 = 5 (ICN); 1204 = 44 (ICN); 1206 = 44 (ICN); 1207 = 5 (ICN); 1208 = 5 (ICN); 1222 = 7 (ICN); 1223 = 23 (ICN); 1224 = 42 (ICN); 1225 = 41 (ICN); 1226 = 7 (ICN); 1227 = 7 (ICN); 1228 = 7 (ICN); 1229 = 44 (ICN); 1230 = 23 (ICN); 1231 = 41 (ICN); 1232 = 40 (ICN);

1233 = 41 (ICN); 1234 = 38 (ICN); 1235 = 38 (ICN); 1239 = 40 (ICN); 1240 = 22 (ICN); 1241 = 44 (ICN); 1242 = 5 (ICN); 1246 = 40 (ICN); 1249 = 1 (ICN); 1250 = 30 (ICN); 1252 = 40 (ICN); 1253 = 40 (ICN); 1254 = 44 (ICN); 1257 = 23 (ICN); 1265 = 5 (ICN); 1266 = 5 (ICN); 1269 = 44 (ICN); 1273 = 5 (ICN); 1275 = 15 (ICN); 1276 = 40 (ICN); 1282 = 10 (ICN); 1283 = 31 (ICN); 1284 = 40 (ICN); 1285 = 23 (ICN); 1286 = 5 (ICN); 1287 = 44 (ICN); 1288 = 40 (ICN); 1289 = 5 (ICN); 1291 = 30 (ICN); 1292 = 5 (ICN); 1293 = 10 (ICN); 1294 = 1 (ICN); 1299 = 40 (ICN); 1300 = 44 (ICN); 1301 = 5 (ICN); 1303 = 40 (ICN); 1306 = 5 (ICN); 1307 = 44 (ICN); 1308 = 5 (ICN); 1309 = 40 (ICN); 1310 = 31 (ICN); 1311 = 19 (ICN); 1312 = 1 (ICN); 1313 = 22 (ICN); 1314 = 40 (ICN); 1316 = 1 (ICN); 1318 = 5 (ICN); 1341 = 44 (ICN); 1352 = 44 (ICN); 1397 = 44 (ICN); 1398 = 29 (ICN); 1444 = 5 (ICN); 1485 = 10 (ICN). **Bona, C.** 137 = 28 (ICN, UPCB); 367 = 38 (ICN); 369 = 18 (ICN). **Borgo, M.** 135 = 23 (MBM); 258 = 29 (UPCB); 334 = 15 (UPCB); 458 = 14 (UPCB); 492 = 22 (UPCB); 525 = 25 (UPCB); 551 = 15 (UPCB). **Brack, P.** 44 = 23 (ICN); 424 = 23 (ICN); 1596 = 23 (ICN); s.n. = 23 (ICN 89166); s.n. = 23 (PACA 10870). **Bresolin, A.** 180 = 15 (HBR); 189 = 33 (HBR); 191 = 16 (HBR); 242 = 15 (HBR); 998 = 33 (HBR). **Britez, R.M.** 173 = 40 (MBM, UPCB); 181 = 11 (MBM, UPCB); 2140 = 29 (MBM); s.n. = 28 (MBM 120761). **Brucker & Lüond** s.n. = 23 (MBM 77811). **Bruxel, A.** s.n. = 23 (PACA 6977). **Bueno, O.** 3571 = 5 (HAS); 3586 = 23 (HAS); 5717 = 21 (HAS). **Bueno, R.** s.n. = 29 (ICN 92628); s.n. = 44 (ICN 92627). **Burkart, A.** 25073 = 15 (SI); 28485 = 7 (SI). **Buttura, E.** 237 = 1 (MBM); s.n. = 13 (MBM 65188); s.n. = 23 (MBM 77816). **Butzke, A.** 319 = 23 (HERBARA, HUCS, MBM).

Cabrera, A.L. 1965 = 11 (LP); 3926 = 44 (LP); 3940 = 24 (LP); 3984 = 9 (LP); 4627 = 44 (LP); 19325 = 5 (LP); 27563 = 23 (SI); 28842 = 37 (SI). **Caetano, V.L.** 114 = 15 (ICN); 189 = 15 (ICN); 209 = 15 (ICN); 220 = 40 (ICN); 240 = 24 (ICN); 246 = 24 (ICN); 250 = 44 (ICN). **Camargo, O.** 35 = 44 (PACA); 46 = 29 (PACA); 140 = 23 (PACA); 141 = 23 (PACA); 702 = 23 (PACA); 819 = 23 (PACA); 856 = 5 (PACA); 990 = 23 (PACA); 1105 = 23 (PACA); 2148 = 30 (PACA); 2285 = 23 (PACA); 2333 = 5 (PACA); 2500 = 29 (PACA); 2789 = 30 (PACA); 2823 = 29 (PACA); 3046 = 29 (PACA). **Camargo, O.R.** s.n. = 5 (HAS 68940). **Camargo, R.** s.n. = 23 (ICN 131515). **Campos, A.S.** s.n. = 9 (HURG 1510). **Caporal, F.J.M.** 34 = 14 (ICN); 260 = 5 (ICN); 262 = 5 (ICN); 275 = 22 (ICN); 276 = 5 (ICN); 278 = 40 (ICN); 279 = 40 (ICN); 281 = 22 (ICN); 283 = 40 (ICN); 385 = 40 (ICN); s.n. = 22 (ICN 142588). **Carneiro, A.** s.n. = 23 (PEL 15388). **Carneiro, A.M.** 720 = 23 (ICN). **Carneiro, J.** 1260 = 23 (MBM). **Catharino, E.L.M.** 194 = 40 (SP). **Caxambu, M.G.** 1720 = 37 (HCF, ICN); 2035 = 6 (HCF, ICN). **Ceroni, Z.** s.n. = 23 (ICN 4303). **Cervi, A.C.** 2488 = 40 (UPCB); 2892 = 29 (MBM, UPCB); 3412 = 23 (MBM); 3553 = 21 (MBM, UPCB); 3623 = 15 (UPCB); 4211 = 15 (UPCB); 4273 = 21 (UPCB); s.n. = 30 (UPCB 10190). **Clayton, W.D.** 4226 = 21 (UPCB); 4266 = 21 (SP); 4740 = 15 (UPCB). **Cordeiro, J.** 1741 = 41 (MBM). **Corseuil, I.** s.n. = 23 (PACA 34465). **Costa, C.** 33 = 22 (HURG); s.n. = 24 (ICN 86374). **Coura-Neto, A.B.** 25 = 29 (FLOR). **Crisci, J.V.** 261 = 23 (LP). **Custódio-Filho, A.** 1921 = 21 (SP). **da Silva, G.P.** 2231 = 6 (CEN). **da Silva, M.A.** 976 = 6 (IBGE).

Danilericz, E. s.n. = 44 (HAS 21698). **Davidse, G.** 11349 = 23 (SP); 11072 = 21 (SI, NY); 110072 = 21 (SP). **de Lima, J.M.** s.n. = 23 (MBM 174954). **de Moraes, J.C.** 2264 = 15 (SI, ICN). **de Paula, J.E.** 696 = 16 (UB); 1008 = 16 (UB); 1012 = 34 (IBGE); 1047 = 40 (UB); 1069 = 40 (IBGE, UB); 1108 = 11 (UB); 1790 = 16 (UB). **Delgado, S.M.** 10 = 40 (UB). **Dittrich, V.A.O.** 208 = 23 (MBM); 288 = 21 (MBM,

UPCB); 290 = 23 (MBM). **Dombrowski, L.T.** 33 = 11 (MBM); 743 = 42 (MBM); 981 = 11 (MBM); 1333 = 23 (MBM); 1441 = 21 (MBM); 2051 = 29 (MBM); 2133 = 1 (MBM); 3960 = 23 (MBM); 4476 = 21 (MBM); 5021 = 11 (MBM); 5988 = 21 (MBM); 6492 = 29 (MBM); 6638 = 21 (MBM); 9131 = 29 (MBM); 9678 = 29 (MBM); 9708 = 23 (MBM); 9767 = 29 (MBM); 10053 = 1 (MBM); 10104 = 42 (MBM); 10275 = 21 (MBM); 10441 = 42 (MBM); 10568 = 28 (MBM); 11217 = 21 (MBM); 12787 = 15 (MBM); 12953 = 15 (MBM); 14179 = 21 (MBM); s.n. = 11 (MBM 174969). **Dornelles, H.H.** 6 = 30 (ICN); 7 = 23 (ICN); 69 = 23 (ICN). **Dornelles, L.** s.n. = 24 (HURG 2171). **Duarte, A.P.** 5184 = 15 (SI). **Dusén, P.** 13276 = 41 (SI); 14027 = 16 (SI); 17011 = 26 (S, SI, NY). **Dutra, R.L.** 63 = 29 (HAS). **Dziewa, A.** 29 = 8 (MBM).

E.V. s.n. = 30 (ICN 5478). **Eggers, L.** 284 = 23 (ICN). **Eiten, G.** 3229 = 11 (SP); 5667 = 6 (SP). **Etchichury, L.M.** 19 = 43 (SI).

Falkenberg, D.B. 895 = 29 (ICN); 954 = 23 (ICN); 1130 = 23 (ICN); 1351 = 23 (ICN); 2015 = 24 (FLOR); 2038 = 9 (FLOR); 2198 = 11 (ICN); 2387 = 21 (FLOR); 2457 = 23 (FLOR); 2464 = 15 (FLOR); 2765 = 5 (FLOR); 3424 = 25 (FLOR, ICN); 3471 = 42 (FLOR); 3473 = 42 (FLOR); 3966 = 21 (FLOR); 4041 = 21 (FLOR); 4166 = 21 (FLOR); 4352 = 15 (FLOR); 4894 = 15 (FLOR); 5865 = 41 (FLOR); 5980 = 23 (FLOR); 6040 = 44 (FLOR); 6041 = 44 (FLOR); 6651 = 16 (FLOR, MBM); 6769 = 12 (FLOR); 6816 = 23 (FLOR); 6880 = 42 (FLOR); 7987 = 15 (FLOR); 7989 = 15 (FLOR); 7990 = 25 (FLOR); 9205 = 37 (FLOR); 9990 = 37 (FLOR); s.n. = 9 (ICN 53613). **Ferreira, A.G.** 182 = 23 (ICN); 283 = 23 (ICN); 485 = 23 (ICN). **Ferreira, E.** s.n. = 1 (MBM 294696); s.n. = 23 (MBM 294697). **Ferreira, L.F.** 62 = 23 (MBM). **Ferreira, P.M.A.** 115 = 9 (ICN); 126 = 9 (ICN); 127 = 21 (ICN); 129 = 19 (ICN); s.n. = 20 (MPUC 10618). **Filgueiras, T.S.** 3522 = 23 (IBGE). **Fleig, M.** 865 = 1 (ICN). **Freitas, C.S.M.** s.n. = 5 (MPUC 10221); s.n. = 5 (MPUC 10222); s.n. = 40 (MPUC 10223); s.n. = 40 (MPUC 10222). **Freitas, E.** s.n. = 5 (ICN 131155); s.n. = 21 (ICN 135289); s.n. = 23 (ICN 131156); s.n. = 23 (HUNIVATES 1361, ICN 132192); s.n. = 30 (ICN 131157); s.n. = 40 (ICN 131160); s.n. = 41 (ICN 131159); s.n. = 42 (ICN 131158). **Frenzel, A.** s.n. = 8 (MBM 75894). **Friderichs, E.** s.n. = 23 (PACA 10857); s.n. = 23 (PACA 32897); s.n. = 29 (PACA 34320).

G.B.P 129 = 24 (HAS). **Gaeta, M.L.** 109 = 15 (ICN). **Garcés, L.** s.n. = 21 (ICN 89354); s.n. = 23 (ICN 89353); s.n. = 23 (ICN 89355); s.n. = 44 (ICN 89362). **Garcia, E.N.** 182 = 23 (PEL); 184 = 40 (PEL); 328 = 5 (PEL); 329 = 40 (PEL); 330 = 5 (PEL); 331 = 40 (PEL); 332 = 44 (PEL); 334 = 44 (ICN, PEL); 335 = 5 (ICN, PEL); 336 = 40 (ICN, PEL); 337 = 40 (ICN, PEL); 338 = 24 (ICN, PEL); 339 = 24 (PEL); 340 = 14 (ICN, PEL); 341 = 14 (PEL); 346 = 40 (PEL); 350 = 14 (PEL); 352 = 21 (ICN, PEL); 354 = 23 (ICN, PEL); 378 = 24 (PEL); 385 = 5 (ICN, PEL); 390 = 44 (ICN, PEL); 405 = 44 (ICN, PEL); 406 = 14 (PEL); 423 = 5 (ICN, PEL); 427 = 5 (PEL); 429 = 5 (ICN, PEL); 430 = 5 (ICN, PEL); 431 = 5 (ICN, PEL); 432 = 5 (ICN, PEL); 433 = 5 (PEL); 434 = 40 (PEL); 435 = 5 (PEL); 436 = 5 (PEL); 437 = 5 (PEL); 438 = 21 (ICN, PEL); 439 = 5 (PEL); 440 = 40 (PEL); 441 = 5 (PEL); 504 = 5 (ICN); 568 = 22 (ICN); 618 = 44 (ICN); 824 = 40 (ICN); 825 = 5 (ICN); 842 = 44 (ICN); 843 = 5 (ICN); 876 = 5 (PEL); 877 = 5 (PEL); 878 = 5 (PEL); 1016 = 9 (PEL); 1020 = 15 (PEL); 1020a = 14 (PEL). **Gatti, G.** 398 = 16 (UPCB); 497 = 40 (MBM, UPCB). **Gehrt, A.** s.n. = 13 (ICN 144312, SP). **Girardi-Deiro, A.M.** 881 = 23 (CNPO); 1112 = 5 (CNPO); s.n. = 5 (ICN 21681); s.n. = 5 (ICN 21871); s.n. = 10 (CNPO 692); s.n. = 10 (CNPO 321); s.n. = 23 (CNPO 87). **Goergem, J.** s.n. = 5 (ICN 50030); s.n. = 5 (ICN 50032); s.n. = 5 (ICN

50034); s.n. = 5 (ICN 50038); s.n. = 5 (ICN 50040); s.n. = 5 (ICN 50041); s.n. = 5 (ICN 50045); s.n. = 5 (ICN 50057); s.n. = 5 (ICN 50068); s.n. = 5 (ICN 50072); s.n. = 5 (ICN 50171); s.n. = 5 (ICN 67441); s.n. = 21 (ICN 50014); s.n. = 23 (ICN 50009); s.n. = 23 (ICN 50170); s.n. = 23 (ICN 50172); s.n. = 40 (ICN 49992); s.n. = 42 (ICN 50015). **Gomes, J.C.** 2229 = 23 (SP). **Gonçalves, I.V.** s.n. = 9 (HURG 0428). **Gonçalves, V.** 127 = 44 (ICN); 157 = 44 (ICN); 170 = 14 (ICN); 205 = 15 (ICN); 215 = 40 (ICN); s.n. = 24 (ICN 116348). **Grigal, R.** s.n. = 15 (HUPG 8851). **Grippa, C.R.** 188 = 37 (ICN); 189 = 37 (ICN). **Guaglianone, E.R.** 70 = 22 (SI); 609 = 11 (SI); 939 = 7 (SI); 988 = 23 (SI); 1140 = 40 (SI); 2081 = 23 (SI). **Guglieri, A**. 456 = 29 (ICN). **Guimarães, T.B.** 689 = 4 (ICN); 903 = 4 (ICN); 1262 = 37 (ICN); 1265 = 23 (ICN); 1266 = 42 (ICN); 1267 = 23 (ICN); 1268 = 7 (ICN); 1269 = 42 (ICN); 1270 = 23 (ICN); 1271 = 23 (ICN).

Hagelund, K. 1153 = 29 (ICN); 1156 = 37 (ICN); 4332 = 38 (ICN); 4458 = 23 (ICN); 6569 = 42 (ICN); 6570 = 38 (ICN); 6572 = 40 (ICN); 6581 = 44 (ICN); 6754 = 40 (ICN); 6767 = 1 (ICN); 6827 = 1 (ICN); 6989 = 35 (ICN); 6991 = 23 (ICN); 7364 = 23 (ICN); 7405 = 40 (ICN); 7452 = 35 (ICN); 7803 = 23 (ICN); 8720 = 44 (ICN); 9258 = 1 (ICN); 9480 = 29 (ICN); 9911 = 21 (ICN); 10531 = 29 (ICN); 10544 = 44 (ICN); 12837 = 29 (ICN); 13211 = 23 (ICN); 13696 = 29 (ICN); 13783a = 14 (ICN); 13783b = 22 (ICN); 13812 = 23 (ICN); 13877 = 23 (ICN); 14628 = 5 (ICN); 14968 = 21 (ICN); 14972 = 40 (ICN); s.n. = 22 (ICN 124990). **Hassler, E.** 61 = 43 (SI). **Hatschbach, G.** 48 = 44 (MBM); 1487 = 23 (MBM, PACA); 1851 = 1 (MBM); 2066 = 21 (MBM); 2238 = 8 (MBM); 2509 = 29 (MBM); 2521 = 23 (MBM); 2934 = 41 (LP, MBM); 3400 = 44 (HBR); 3400 = 44 (MBM); 3290 = 23 (MBM); 3683 = 16 (MBM); 3683 = 16 (SI); 3684 = 23 (MBM); 3696 = 42 (MBM); 4013 = 21 (HBR); 4013 = 21 (MBM); 4013 = 21 (MBM); 4394 = 22 (HBR); 4394 = 22 (MBM); 5100 = 29 (MBM); 5100 = 29 (MBM); 5259 = 41 (HBR, MBM, SI); 5330 = 23 (HBR); 5330 = 23 (MBM); 5330 = 23 (SI); 6455 = 1 (MBM); 6455 = 1 (SI); 6700 = 21 (MBM); 6700 = 21 (SI); 6943 = 26 (MBM); 6948 = 23 (MBM); 6973 = 40 (MBM); 7224 = 29 (MBM); 7224 = 29 (SI); 7295 = 23 (MBM); 7345 = 23 (HBR); 7345 = 23 (MBM); 7348 = 28 (MBM); 7368 = 29 (MBM); 7859 = 40 (MBM); 9270 = 11 (MBM); 9270 = 11 (SI); 9270 = 11 (UPCB); 10474 = 23 (MBM); 11760 = 11 (MBM); 12227 = 21 (MBM); 12734 = 14 (MBM); 12892 = 44 (MBM); 12892 = 44 (MBM); 12894 = 40 (MBM); 12901 = 23 (MBM); 13342 = 23 (MBM); 13700 = 21 (MBM); 13726 = 40 (MBM); 14065 = 21 (MBM); 14065 = 21 (UPCB); 14070 = 21 (MBM); 14343 = 23 (MBM); 14343 = 23 (MBM); 14453 = 23 (MBM); 14637 = 42 (MBM); 14730 = 23 (MBM); 14733 = 29 (MBM); 14733 = 29 (MBM); 14734 = 4 (MBM); 14784 = 40 (MBM); 14832 = 41 (MBM); 14884 = 40 (MBM); 14892 = 41 (MBM); 14892 = 41 (MBM); 14896 = 23 (MBM); 14979 = 28 (MBM); 14985 = 28 (MBM); 15015 = 44 (MBM); 15229 = 28 (MBM); 15417 = 29 (MBM); 18629 = 21 (MBM); 20543 = 23 (MBM); 21954 = 11 (UPCB); 22537 = 29 (MBM); 22537 = 29 (MBM); 22690 = 44 (MBM); 22822 = 42 (MBM); 22829 = 41 (MBM); 23039 = 11 (MBM); 23356 = 21 (MBM); 23992 = 16 (MBM); 23992 = 16 (UPCB); 24012 = 6 (MBM); 24024 = 40 (MBM); 24029 = 8 (LP, MBM); 24837 = 29 (MBM); 25405 = 29 (MBM); 25463 = 21 (MBM); 25463 = 21 (UPCB); 25468 = 8 (MBM); 25468 = 8 (UPCB); 25677 = 21 (MBM); 25677 = 21 (UPCB); 28241 = 20 (MBM); 28335 = 29 (MBM); 28407 = 23 (MBM); 29750 = 8 (MBM); 30662 = 11 (MBM); 30686 = 29 (MBM); 32791 = 29 (MBM); 33444 = 29 (MBM); 33448 = 23 (MBM); 33465 = 28 (MBM); 33883 = 23 (MBM); 33885 = 28 (MBM); 35183 = 23 (MBM); 38048 = 21 (MBM); 38081 = 29 (MBM); 38865 = 42 (MBM); 41439 = 11 (MBM); 43310 = 44 (MBM); 43978 = 23 (MBM); 44618 = 23 (MBM); 44984 = 8 (MBM); 46047 = 21 (MBM); 47241 = 35 (MBM); 47628 = 23 (MBM,

PACA); 47630 = 23 (MBM); 63793 = 40 (MBM); 76710 = 8 (MBM); 76805 = 23 (MBM); 78115 = 5 (MBM); 78220 = 23 (MBM). **Hefler, S.M.** 177 = 10 (ICN); 671 = 22 (ICN). **Henz, E.** s.n. = 5 (PACA 32739); s.n. = 21 (PACA 47455); s.n. = 29 (PACA 35503); s.n. = 44 (PACA 35362). **Heringer, E.P.** 3739 = 6 (IBGE); 4695 = 13 (IBGE); 4715 = 13 (IBGE); 5524 = 23 (HEPH); 6140 = 13 (IBGE); 6800 = 40 (IBGE); 7659 = 6 (IBGE); 7664 = 20 (IBGE); 11114 = 11 (UB); 14279 = 13 (IBGE, UB); 17339 = 6 (IBGE); 18390 = 6 (IBGE). **Hiltl, G.** 244 = 23 (MPUC); 1224 = 23 (HAS). **Hoehne, F.C.** = 22 (ICN 144355; SP 20513).

Imaguire, N. 66 = 21 (MBM); 1069 = 5 (MBM); 2758 = 21 (MBM). **Ir. Augusto** s.n. = 23 (PACA 33825). **Ir. G. Miguel** 15 = 23 (ICN). **Irgang, B.E.** s.n. = 5 (HURG 1328); s.n. = 5 (HURG 892); s.n. = 5 (ICN 132189); s.n. = 5 (ICN 27206); s.n. = 5 (ICN 49902); s.n. = 5 (ICN 49903); s.n. = 14 (ICN 28204); s.n. = 15 (ICN 28202); s.n. = 15 (ICN 49898); s.n. = 21 (HURG 2087); s.n. = 21 (ICN 49904); s.n. = 23 (ICN 120420); s.n. = 23 (ICN 93693); s.n. = 23 (ICN 93900); s.n. = 29 (ICN 21010); s.n. = 40 (HAS 68901, ICN 28206); s.n. = 40 (ICN 28206); s.n. = 44 (HURG 1148); s.n. = 44 (HURG 1164); s.n. = 44 (ICN 28205); s.n. = 44 (ICN 49901). **Irwin, H.S.** 5330 = 23 (UB); 5777 = 20 (UB); 5778 = 6 (UB); 8143 = 20 (UB); 8499 = 23 (UB); 8946 = 40 (UB); 10039 = 23 (UB); 10192 = 20 (UB); 11374 = 6 (UB); 19483 = 20 (UB); s.n. = 13 (MBM 62488, NYBG 31610); s.n. = 21 (MBM 62489, NYBG 31024). **Iza, O.B.** 83 = 16 (HBR).

Jarenkow, J.A. 242 = 5 (PEL); 242a = 44 (PEL); 279 = 24 (PEL); 284 = 24 (PEL); 586 = 24 (PEL); 1174 = 29 (PEL); 3885 = 23 (PEL). **Jolly, A.B.** s.n. = 1 (SI, herb. Barros 4576); s.n. = 30 (ICN 151960). **Jönsson, G.** 116a = 42 (SI). **Jörgensen, J.** 3583 = 23 (LP). **Jörgensen, P.** 449 = 1 (LP); 2625 = 9 (SI).

Kaczmarech, R. s.n. = 23 (HUPG 10958); s.n. = 41 (ICN 151115). **Kämpf, A.N.** 698 = 44 (BLA); 823 = 40 (BLA, SI); 824 = 44 (BLA); 824a = 40 (BLA); 829 = 23 (BLA); 878 = 29 (BLA); 887 = 29 (BLA); 944 = 21 (ICN); 965 = 23 (ICN); 966 = 5 (ICN); 968 = 5 (ICN); 976 = 23 (ICN); 984 = 5 (ICN); 985 = 40 (ICN). **Kersten, R.** 649 = 40 (UPCB). **Kinupp, V.** 2487 = 21 (ICN); 2487a = 44 (ICN); 2737 = 31 (ICN). **Kirizawa, M.** 1105 = 25 (SP). **Kirkbride, J.H.** 3709 = 6 (UB). **Klein, R.** 777 = 15 (HBR); 2154 = 8 (HBR, SI); 2174 = 21 (HBR); 3202 = 28 (FLOR, HBR, MBM); 3257 = 29 (FLOR, HBR); 3313 = 29 (HBR, MBM); 3334 = 29 (HBR, PACA); 3363 = 7 (HBR, SI); 3478a = 41 (HBR); 3480 = 29 (HBR); 3573 = 42 (HBR); 3611 = 29 (HBR); 3672 = 29 (FLOR, HBR); 3718a = 18 (HBR); 3770 = 42 (HBR); 3772 = 11 (FLOR, HBR); 3867 = 28 (HBR); 3868 = 23 (FLOR, HBR); 4441 = 42 (HBR); 4454 = 29 (HBR); 4457 = 29 (HBR); 4605 = 29 (HBR); 4698 = 22 (HBR); 5054 = 23 (HBR); 6059 = 25 (FLOR, ICN); 6194 = 29 (FLOR, HBR); 6449 = 15 (FLOR, HBR); 6473 = 40 (FLOR, HBR); 6515 = 21 (FLOR, HBR); 6516 = 22 (ICN); 6525 = 40 (FLOR, HBR); 6536 = 26 (FLOR, HBR); 6571 = 21 (FLOR, HBR); 6601 = 22 (FLOR, ICN, HBR); 6604 = 21 (FLOR, HBR); 6655 = 15 (FLOR, HBR); 8444 = 33 (HBR); 8482 = 33 (HBR); 8522 = 8 (HBR); 8823 = 15 (HBR); 9188 = 8 (HBR); 9443 = 8 (HBR); 9448 = 8 (HBR); 10003 = 16 (HBR); 10059 = 8 (HBR); 10251 = 15 (HBR); 10342 = 23 (HBR); 11485 = 40 (HBR). **Koyama, T.** 13720 = 11 (ICN, SP); 13783b = 6 (SP); 13838 = 16 (SP); 13851 = 6 (SP). **Kozera, C.** 264 = 5 (ICN, MBM, UPCB); 1044 = 8 (UPCB); 1055 = 15 (UPCB); 1419 = 15 (UPCB); 1605 = 23 (MBM); 1801 = 23 (MBM); 2014 = 21 (MBM); 2187 = 21 (MBM); 2350 = 44 (MBM); 2390 = 29 (MBM); 2579 = 29 (MBM); 2660 = 41 (MBM); 2798 = 28 (MBM); 2800 = 11 (MBM); 3146 = 21 (MBM); 3281 =

29 (ICN); s.n. = 41 (ICN 147704). **Krapovickas, A.** 13513 = 44 (LP); 13893 = 11 (LP); 15623 = 23 (LP); 17249 = 7 (LP). **Krieger, L.** 1012 = 23 (SP). **Kuhlmann, M.** 1861 = 11 (ICN, SP). **Kuniyoshi, Y.S.** 2869 = 15 (MBM); 4598 = 21 (MBM); 5351 = 16 (MBM); 5568 = 15 (MBM); s.n. = 21 (UPCB 47986). **Kurmmrow, R.** 141 = 5 (MBM); 185 = 21 (MBM); 2279 = 21 (FLOR, HAS); 2957 = 21 (MBM); 1038 = 21 (MBM); 1464 = 21 (MBM); 1607 = 21 (MBM); 2279 = 21 (MBM); 3254 = 21 (MBM).

Labiak, P.H. 3828 = 32 (MBM). **Lauffer** 112 = 40 (BLA); s.n. = 40 (PEL 12974). **Leff, D.** s.n. = 23 (RSPF 6379). **Leonhardt, A.** s.n. = 29 (ICN 119048). **Lerner, E.P.** s.n. = 23 (MPUC 10219); s.n. = 23 (MPUC 2940). **Lerner, M.** s.n. = 23 (MPUC 1664). **Lindeman, J.C.** 128 = 22 (MBM); 868 = 34 (MBM); 886 = 34 (MBM); 938 = 17 (MBM); 2554 = 21 (MBM); 2605 = 15 (MBM); 3681 = 23 (MBM); 3688 = 23 (MBM); 3697 = 11 (MBM); 3940 = 14 (MBM); 4030 = 1 (MBM); 4039 = 40 (MBM); 4039b = 28 (MBM); 6836 = 23 (CNPO); 6842 = 5 (CNPO); 6947 = 23 (CNPO); s.n. = 5 (HAS 68898); s.n. = 5 (ICN 21179); s.n. = 5 (ICN 21745); s.n. = 5 (ICN 28230); s.n. = 5 (ICN 8270); s.n. = 5 (ICN 8282); s.n. = 5 (ICN 8435); s.n. = 5 (ICN 8689); s.n. = 7 (HAS 68897, ICN 8473); s.n. = 7 (ICN 9045); s.n. = 21 (HAS 1029, ICN 20911); s.n. = 23 (HAS 68873, ICN 21268); s.n. = 23 (HAS 68899, ICN 8323); s.n. = 23 (HAS 68900, ICN 9467); s.n. = 23 (HAS 68942, ICN 21035); s.n. = 23 (ICN 8472); s.n. = 23 (ICN 8573); s.n. = 23 (ICN 8946); s.n. = 23 (ICN 9470); s.n. = 29 (HAS 68945, ICN 8793); s.n. = 40 (ICN 9044); s.n. = 40 (ICN 9045a); s.n. = 41 (ICN 9399); s.n. = 44 (ICN 20523); s.n. = 44 (ICN 21137); s.n. = 44 (ICN 8404); s.n. = 44 (ICN 8574). **Longhi-Wagner, H.M.** 942 = 29 (ICN); 1735 = 24 (ICN); 2070 = 24 (ICN); 2148 = 21 (ICN); 2168 = 23 (ICN); 2170 = 5 (ICN); 2184 = 44 (ICN); 2185 = 40 (ICN); 2185a = 44 (ICN); 2186 = 14 (ICN); 2187 = 44 (ICN); 2188 = 14 (ICN); 2195 = 24 (ICN); 2215 = 23 (ICN); 2235 = 22 (ICN); 2236 = 40 (ICN); 2236a = 42 (ICN); 2256 = 23 (ICN); 2259 = 42 (ICN); 2357 = 23 (ICN); 2401 = 23 (ICN); 2407 = 31 (ICN); 2488 = 29 (ICN); 2502 = 22 (ICN); 2502a = 23 (ICN); 2519 = 21 (ICN); 2522 = 14 (ICN); 3457 = 15 (ICN); 3461 = 14 (ICN); 3463 = 15 (ICN); 3563 = 22 (ICN); 3620 = 44 (ICN); 3623a = 23 (ICN); 3695 = 23 (ICN); 4025 = 10 (ICN); 5015 = 23 (ICN); 5033 = 23 (ICN); 5075 = 23 (ICN); 6146 = 40 (ICN); 7191 = 29 (ICN); 7193 = 28 (ICN); 7216a = 21 (ICN); 9305 = 5 (ICN); 9308 = 23 (ICN); 10131 = 23 (ICN); 10133 = 7 (ICN); 10406a = 41 (ICN); s.n. = 18 (ICN 129292); s.n. = 21 (ICN 111391); s.n. = 22 (ICN 111393). **Lüdtke, R.** 710 = 21 (ICN); 729 = 29 (ICN); 742 = 13 (ICN); 759 = 33 (ICN); 762 = 14 (ICN); 763 = 44 (ICN); 764 = 28 (ICN); 772 = 29 (ICN); 777 = 5 (ICN). **Lutz** s.n. = 21 (ICN 128929). **Lutz, B.** s.n. = 13 (ICN 729). **Luz, A.L.** s.n. = 42 (ICN 88157).

Machado, A.A. s.n. = 1 (MBM 304472). **Mara & Claudia** s.n. = 9 (HURG 1478); s.n. = 22 (HURG 1489). **Marinis, G.** 249 = 13 (ICN, SJRP). **Mattos, J.** 2768 = 42 (HAS); 2780 = 42 (HAS); 3608 = 23 (HAS); 4314 = 23 (HAS); 4691 = 5 (HAS); 5023 = 23 (HAS); 7457 = 41 (HAS); 9053 = 21 (HAS); 9739 = 15 (HAS); 11327 = 23 (HAS); 11373 = 23 (HAS); 11832 = 40 (HAS); 12696 = 37 (HAS); 13395 = 22 (HAS); 23017 = 23 (HAS); 24723 = 5 (HAS); 25008 = 44 (HAS); 26069 = 5 (HAS); 26070 = 23 (HAS); 29356 = 44 (HAS); 30695 = 23 (HAS); 30927 = 5 (HAS); s.n. = 5 (HAS 69229). **Mattos, J.R.** 3619 = 42 (HBR). **Mauhs, J.** s.n. = 16 (PACA 85131); s.n. = 16 (PACA 85130). **Mendaçolli, S.L.J.** 529 = 8 (ICN, SP). **Mendonça, R.C.** 378 = 40 (IBGE, SP); 395 = 23 (IBGE, SP); 486 = 6 (IBGE); 487 = 20 (IBGE); 488 = 40 (IBGE); 525 = 4 (IBGE); 547 = 13 (IBGE); 559 = 40 (IBGE); 564 = 6 (IBGE); 588 = 20 (IBGE); 590 = 40 (IBGE); 635 = 40 (SP). **Miotto, S.T.S** 516 = 44 (ICN). **Moreira, E.A.** 18 = 23 (MBM). **Moreira-Filho, H.** 424 = 15 (UPCB). **Motta, J.T.** 437 = 11 (MBM); 452 = 11

(MBM); 1454 = 40 (MBM); 2151 = 6 (MBM); 2358 = 8 (MBM). **Moura, R.S.** 374 = 8 (ICN); s.n. = 23 (HUPG 10647). **Mroginski, L.** 661 = 23 (PACA); 726 = 11 (PACA). **Müller, O.** s.n. = 23 (PACA 35507). **Munhoz, C.** 520 = 35 (ICN). **Muniz, C.F.** 237 = 14 (SP); 406 = 23 (SP); 417 = 23 (SP); 427 = 23 (SP).

Negrelle, R.R. 104 = 42 (UPCB). **Neves, M.** 172 = 5 (HAS); 213 = 21 (HAS, ICN); 312 = 23 (HAS). **Normann & Gianluppi** 527 = 29 (BLA); 544 = 29 (BLA); 650 = 29 (BLA); 699 = 22 (BLA). **Nunes, S.M.** s.n. = 23 (MPUC 10218); s.n. = 23 (MPUC 7295).

Oliveira, J.M. 39 = 5 (ICN). **Oliveira, P.L.** s.n. = 23 (CNPO 1467); s.n. = 23 (CNPO 2062); s.n. = 31 (CNPO 1464); s.n. = 40 (CNPO 1457); s.n. = 42 (CNPO 1462); s.n. = 42 (CNPO 1425); s.n. = 42 (CNPO 1426). **Oliveira, R.C.** 333 = 13 (CEN; HEPH); 354 = 23 (HEPH); 1195 = 6 (ICN). **Orth, C.** s.n. = 5 (HBR 3299, PACA 686); s.n. = 5 (PACA 2073); s.n. = 11 (HBR 3301, PACA 1048, SP 51417); s.n. = 21 (HBR 3298, PACA 711); s.n. = 22 (HBR 3302, PACA 688); s.n. = 23 (PACA 1047); s.n. = 23 (HBR 3303, PACA 2080, SP 51401); s.n. = 29 (PACA 34050); s.n. = 30 (HBR 3300, PACA 1045); s.n. = 40 (PACA 1044); s.n. = 42 (PACA 1564).

Pabst, G. 4729 = 21 (HBR); 7346a = 25 (SI). **Pavetti & Rojas** 10064 = 43 (SI). **Paz, J.** 101 = 21 (ICN); s.n. = 5 (ICN 131153); s.n. = 5 (ICN 131154). **Pedersen, T.M.** 1363 = 7 (LP); 1711 = 7 (LP); 5324 = 44 (ICN); 6643 = 10 (ICN, LP); 7099 = 5 (LP); 9668 = 11 (LP); 10030 = 14 (LP); 10031 = 44 (MBM); 10078 = 29 (MBM); 10097 = 6 (MBM); 11405 = 29 (MBM); 13389 = 30 (ICN, SI); 13410 = 29 (C, ICN, SI); 13423 = 9 (SI); 13771 = 21 (MBM); 15683 = 31 (MBM). **Pedralli, G.** s.n. = 8 (MBM 145830); s.n. = 22 (ICN 49427); s.n. = 27 (HURG 0834). **Perazzolo, M.** s.n. = 22 (HURG 1764). **Pereira Jr., J**. s.n. = 23 (HURG 1212). **Pereira, E.** 4178 = 15 (HBR); 4632 = 13 (UB); 4958 = 13 (HBR); 7859 = 23 (SI); 9749 = 11 (UPCB). **Pereira, F.B.** 8/84 = 16 (SP). **Pfadenhauer** 27 = 21 (ICN); 4 = 15 (ICN); 93 = 44 (ICN); 103 = 24 (ICN); 109 = 15 (ICN); 112 = 14 (ICN); 123 = 44 (ICN); 124 = 40 (ICN); 151 = 21 (ICN); 412 = 9 (ICN); 635 = 24 (ICN); 663 = 24 (ICN). **Pilger** 30 = 41 (SI). **Pilz, A.** s.n. = 29 (HCB 0943); s.n. = 29 (HCB 1759). **Pirani, J.R.** 3043 = 15 (SP). **Pires, J.M.** 16643 = 13 (ICN, SP). **Pivetta, J.** 626 = 23 (PACA). **Poliquesi, C.B.** 575 = 42 (MBM). **Porto, M.L.** 658 = 29 (ICN); s.n. = 21 (ICN 21848); s.n. = 21 (HAS 5196, ICN 21703). **Pott, A.** 2616 = 35 (CPAP); 3487 = 35 (CPAP); 3875 = 35 (CPAP). **Pott, V.J.** 1592 = 23 (MBM); 6513 = 29 (HMS, ICN); 7328 = 4 (CGMS, ICN); 8186 = 13 (ICN); 8302 = 29 (HMS, ICN). **Pouciano** 906 = 6 (MBM). **Prata, A.P.** 609 = 40 (MBM); 723 = 21 (SP); 840B = 13 (SP); 841 = 6 (SP); 867 = 13 (SP); 927 = 23 (SP); 1082 = 6 (SP); 1095 = 8 (SP).

Rambo, B. 717 = 40 (PACA); 1046 = 29 (PACA); 6646 = 23 (PACA); 8114 = 21 (PACA); 8917 = 23 (PACA); 8921 = 42 (PACA); 9358 = 22 (PACA); 9394 = 23 (PACA); 9623 = 42 (PACA); 9706 = 23 (PACA); 25570 = 23 (PACA); 25698 = 11 (PACA); 25700 = 7 (PACA); 25701 = 23 (PACA); 26003 = 29 (PACA); 29372 = 23 (PACA); 30821 = 36 (PACA); 30822 = 28 (SI, ICN); 31438 = 15 (PACA, SI); 31463 = 16 (PACA); 31487 = 14 (PACA); 33158 = 42 (PACA); 33160 = 23 (PACA); 33170 = 23 (PACA); 33171 = 23 (PACA); 33866 = 29 (PACA); 33982 = 29 (PACA); 34805 = 42 (PACA, SI); 34812 = 23 (PACA); 34821 = 22 (PACA); 34825 = 23 (PACA); 35290 = 42 (PACA); 36626 = 23 (ICN, PACA); 36630 = 5 (PACA); 36640 = 39 (PACA, SI); 36646 = 21 (PACA); 36648 = 42 (PACA, SI); 36649 = 42 (PACA); 36653 = 23

(PACA); 36659 = 18 (PACA); 38263 = 5 (PACA); 38264 = 23 (PACA); 38267 = 7 (HBR, PACA, SI); 38306 = 5 (PACA); 38456 = 44 (PACA); 38784 = 21 (PACA); 38808 = 1 (PACA); 38931 = 21 (PACA); 38936 = 21 (PACA); 39094 = 14 (PACA); 39094 = 40 (HBR); 39264 = 23 (PACA); 39323 = 44 (PACA); 39339 = 21 (PACA); 39345 = 23 (PACA); 39346 = 30 (PACA); 39449 = 21 (PACA); 39491 = 23 (PACA); 39518 = 21 (HBR, PACA, SI); 39519 = 40 (HBR, PACA); 39601 = 21 (PACA); 39851 = 21 (PACA); 40322 = 23 (PACA); 40992 = 23 (PACA); 43855 = 11 (PACA); 44081 = 5 (PACA); 44081a = 40 (PACA); 44106 = 5 (PACA); 44374 = 5 (PACA); 44637 = 5 (PACA); 44872 = 36 (HBR, PACA); 45220 = 9 (PACA); 46183 = 21 (HBR, PACA); 46185 = 21 (PACA); 46919 = 40 (MBM, PACA); 49731 = 15 (ICN, PACA); 51474 = 23 (PACA); 51835 = 37 (PACA); 51840 = 23 (PACA); 53094 = 23 (PACA); 53898 = 18 (HBR, PACA, SI); 53899 = 41 (HBR, PACA, SI); 54795 = 15 (PACA, SI); 55086 = 42 (HBR, PACA); 56448 = 24 (PACA); 56457 = 24 (PACA); 56458 = 15 (PACA); 56721 = 40 (HBR); 56841 = 15 (PACA); 56979 = 22 (PACA); 56983 = 5 (PACA); 57159 = 5 (PACA); 60026 = 38 (PACA); 63539 = 21 (PACA); 63539a = 44 (PACA); 71444 = 29 (PACA); s.n. = 23 (HAS 68948). **Ramos, A.E.** 194 = 1 (CEN; HEPH). **Rego, A.** s.n. = 5 (ICN 81206); s.n. = 22 (ICN 81211); s.n. = 44 (ICN 101812). **Reineck** 24 = 5 (SI). **Reinert, B.L.** 65 = 25 (MBM). **Reis, A.** 38 = 25 (HBR); 42 = 14 (HBR); 69 = 23 (HBR); 72 = 21 (HBR). **Reitz, R.** 24 = 15 (HBR, MBM, PACA); 35 = 14 (HBR, PACA); 249 = 15 (HBR); 288 = 14 (HBR); 288 = 40 (HBR); 288 = 40 (SI); 489 = 15 (HBR, PACA); 619 = 26 (HBR, PACA); 808 = 24 (HBR, MBM); 4583 = 1 (HBR); 4706 = 15 (PACA); 4784 = 33 (HBR, ICN, PACA); 5011 = 19 (HBR, PACA, SI); 5048 = 14 (HBR); 5097 = 25 (HBR); 5097 = 25 (SI); 5323 = 29 (HBR); 5341 = 6 (HBR, PACA, SI); 5479 = 29 (HBR); 5480 = 21 (HBR, PACA); 5534 = 21 (HBR); 5799 = 15 (HBR); 6010 = 21 (HBR); 6208 = 8 (HBR); 6716 = 25 (PACA); 6729 = 26 (PACA); 6747 = 21 (PACA); 6960 = 23 (HBR); 7681 = 42 (HBR); 7991 = 18 (HBR); 7991 = 18 (HBR); 1053 = 15 (HBR); 1156 = 15 (PACA); 1493 = 15 (HBR, PACA); 1780 = 16 (HBR, MBM, PACA); 2444 = 21 (HBR, MBM); 10442 = 21 (FLOR, HBR); 10503 = 21 (FLOR, HBR); 10549 = 21 (HBR); 11585 = 29 (FLOR); 11616 = 28 (FLOR, HBR); 11666 = 23 (FLOR, HBR); 11875 = 23 (FLOR, HBR); 12378 = 13 (HBR); 12378 = 20 (HBR, SI); 12799 = 29 (FLOR, HBR); 13381 = 29 (HBR); 13494 = 42 (FLOR, HBR); 13567 = 29 (HBR); 13572 = 42 (HBR); 13572 = 42 (HBR); 13679 = 40 (HBR); 13769 = 21 (HBR); 13833 = 44 (HBR); 13895 = 29 (HBR); 14105 = 40 (HBR); 14107 = 28 (HBR, ICN, MBM, PACA); 14123 = 29 (HBR); 14174 = 42 (FLOR, HBR); 14200 = 28 (HBR); 16935 = 23 (HBR); C 616 = 15 (HBR); C 984 = 8 (HBR). **Renvoize, S.A.** 3105a = 7 (SI). **Rezende, J.M.** 455 = 40 (CEN). **Ribas, O.S.** 1013 = 21 (MBM, UPCB); 6628 = 1 (MBM). **Riedel** 928 = 21 (SI). **Ritter, C. s**.n. = 29 (PACA 33405). **Roderjan, C.V.** s.n. = 16 (MBM 308727). **Rodrigues** 763 = 1 (LP). **Rodrigues, A.C.** 10 = 23 (SP). **Rodrigues, R.S.** s.n. = 44 (ICN 119470). **Romero, M.** 2234 = 40 (SI). **Rosado, L.** s.n. = 28 (HURG 1136). **Rosen, D.J.** 3845 = 16 (ICN); 3859 = 34 (ICN); 3865 = 25 (ICN, TAES); 3870 = 1 (ICN); 3923 = 25 (ICN, TAES); 3976 = 23 (ICN); 3981 = 12 (ICN); 4185 = 12 (ICN). **Rosengurtt, B.** 1256 = 23 (LP); 2137 = 24 (LP); 2199 = 31 (LP); 2465 = 24 (LP).

Sacco, J.C. 608 = 5 (HBR, MBM, PEL); 633 = 23 (HBR, PEL); 983 = 23 (HBR, PEL). **Sagadas-Vianna, F.** 47 = 12 (SI); 57 = 5 (SI); 853 = 15 (SI); 932 = 12 (SI); 2743 = 21 (SI); 3165 = 21 (SI); 3541 = 15 (SI). **Salis, S.M.** 454 = 17 (LP). **Santos, E.C.** 114 = 23 (PEL). **Santos, E.P.** 711 = 21 (MBM, UPCB). **Santos, N.M.** s.n. = 23 (HUPG 753). **Scherer, C.** s.n. = 5 (ICN 141597); s.n. = 5 (ICN 141683). **Schinini, A.** s.n. = 10 (ICN 48730). **Schultz, A.** 178 = 1 (ICN); s.n. = 16 (ICN 9157); s.n. = 30 (HAS 69617, ICN

5478); s.n. = 30 (ICN 8740). **Schulz, A.G.** 10977 = 40 (SI). **Schweigert, E.** 1016 = 23 (ICN); s.n. = 30 (ICN 128465). **Scur, L.** 563 = 21 (HUCS, MBM); 939 = 23 (HUCS, MBM); 1004 = 29 (MBM); 1005 = 23 (MBM). **Sehnem, A.** 4272 = 42 (SI). **Senna, R.M.** 445 = 23 (HAS); 446 = 23 (HAS). **Setubal, R.** 26 = 29 (ICN). **Severo, B.** s.n. = 21 (RSPF 5647). **Shepherd, G.L.** 3757 = 6 (MBM). **Silva, A.R.** 631 = 11 (HCF, ICN). **Silva, C.R.M.** 14 = 40 (ICN); 15 = 40 (ICN); 16 = 40 (ICN); 17 = 13 (ICN); 18 = 13 (ICN); 18a = 15 (ICN); 21 = 23 (ICN); 22 = 23 (ICN); 25 = 40 (ICN); 27 = 40 (ICN); 29 = 23 (ICN); 30 = 40 (ICN); 32 = 40 (ICN); 33 = 40 (ICN); 34 = 23 (ICN); 37 = 13 (ICN); 39 = 23 (ICN); 41 = 1 (ICN); 42 = 13 (ICN); 43 = 13 (ICN); 44 = 22 (ICN); 45 = 22 (ICN); 46 = 13 (ICN); 48 = 13 (ICN); 49 = 13 (ICN); 50 = 13 (ICN); 51 = 13 (ICN); 56 = 13 (ICN); 57 = 22 (ICN); 58 = 22 (ICN); 59 = 22 (ICN); 60 = 13 (ICN); 61 = 13 (ICN); 65 = 13 (ICN); 66 = 13 (ICN); 68 = 13 (ICN); 68a = 15 (ICN); 69 = 13 (ICN); 69a = 15 (ICN); 72 = 21 (ICN); 79 = 28 (ICN); 81 = 28 (ICN); 85 = 21 (ICN); 85a = 21 (ICN); 93 = 13 (ICN); 95 = 21 (ICN); 97 = 40 (ICN); 99 = 44 (ICN); 100 = 21 (ICN); 101 = 28 (ICN); 103 = 40 (ICN); 104 = 7 (ICN); 105 = 40 (ICN); 106 = 40 (ICN); 107 = 42 (ICN); 109 = 15 (ICN); 111 = 23 (ICN); 113 = 40 (ICN); 114a = 13 (ICN); 114 = 23 (ICN); 116 = 40 (ICN); 117 = 1 (ICN); 118 = 40 (ICN); 120 = 40 (ICN); 121 = 22 (ICN); 122 = 20 (ICN); 123 = 20 (ICN); 124 = 6 (ICN); 125 = 40 (ICN); 126 = 30 (ICN); 128 = 40 (ICN); 129 = 13 (ICN); 139 = 21 (ICN); 140 = 6 (ICN); 141 = 13 (ICN); 142 = 21 (ICN); 143 = 21 (ICN); 144 = 21 (ICN); 145 = 1 (ICN); 147 = 42 (ICN); 149 = 23 (ICN); 150 = 40 (ICN); 151 = 42 (ICN); 152 = 23 (ICN); 153 = 6 (ICN); 154 = 13 (ICN); 155 = 13 (ICN); 187 = 44 (ICN); 193 = 8 (ICN); 216 = 21 (ICN); 240 = 21 (ICN); 241 = 21 (ICN); 242 = 21 (ICN); 245 = 21 (ICN); 343 = 44 (ICN); 345 = 42 (ICN); 346 = 42 (ICN); 356 = 21 (ICN); 357 = 8 (ICN); 358 = 8 (ICN); 359 = 42 (ICN); 360 = 8 (ICN); 362 = 8 (ICN); 363 = 21 (ICN); 369 = 15 (ICN); 370 = 15 (ICN); 371 = 15 (ICN); 372 = 40 (ICN); 373 = 14 (ICN); 374 = 16 (ICN); 375 = 44 (ICN); 378 = 44 (ICN); 379 = 42 (ICN); 380 = 44 (ICN); s.n. = 23 (FUEL 35441); s.n. = 40 (ICN 152672); s.n. = 40 (ICN 152673). **Silva, J.M.** 441 = 11 (MBM); 916 = 21 (MBM); 1190 = 11 (MBM). **Silva, J.P.** s.n. = 23 (MPUC 1586). **Silva, S.M.** 121 = 26 (UPCB); s.n. = 1 (UPCB 30657); s.n. = 1 (FLOR 27734); s.n. = 15 (UPCB 24149). **Silva-Filho, F.A.** 97a = 1 (FLOR); 107a = 40 (FLOR); 265 = 16 (FLOR, MBM); 299 = 16 (FLOR, MBM); 921 = 21 (FLOR, SMDB); 922 = 22 (FLOR); 926 = 19 (FLOR). **Silveira, G.** 55 = 44 (ICN); 301 = 22 (ICN). **Silveira, N.** 767 = 44 (HAS); 1660 = 44 (HAS); 2318 = 21 (HAS); 5232 = 22 (HAS); 7568 = 41 (HAS); 7809 = 44 (HAS); 7811 = 23 (HAS); 10868 = 15 (HAS); 10871 = 22 (HAS). **Smith, L.B.** 5967 = 15 (SI); 6375 = 25 (SI); 6557 = 15 (SI); 6710 = 30 (SI); 7472 = 29 (HBR); 8138 = 23 (HBR); 8160 = 29 (HBR); 8264 = 44 (HBR); 8319 = 1 (HBR, SI); 8323 = 7 (HBR); 8678 = 29 (HBR); 8757 = 40 (HBR); 8882 = 41 (HBR); 8942 = 23 (HBR); 8947 = 29 (HBR); 8982 = 41 (HBR); 8990 = 42 (HBR); 9116 = 28 (HBR, SI); 9458 = 4 (HBR); 9460 = 6 (HBR, SI); 9564 = 4 (HBR); 10165 = 28 (HBR); 10257 = 42 (HBR, SI); 10322 = 42 (HBR, SI); 10449 = 5 (HBR); 10573 = 39 (HBR); 11017 = 23 (HBR); 11187 = 22 (HBR); 12598 = 23 (FLOR, HBR); 12849 = 14 (HBR); 12999 = 23 (FLOR, HBR); 13019 = 29 (HBR); 13119 = 23 (FLOR, HBR); 13119 = 23 (SP); 13376 = 23 (FLOR, HBR); 13509 = 29 (FLOR, HBR); 13673 = 41 (FLOR, HBR); 13673 = 41 (HBR); 13908 = 5 (HBR); 13911 = 23 (FLOR, HBR); 13911 = 23 (HBR); 14213 = 23 (HBR); 14245 = 23 (HBR); 14269 = 42 (HBR); 14303 = 37 (FLOR, HBR); 14303 = 37 (HBR); 14696 = 21 (FLOR, HBR); 14732 = 21 (HBR); 14737 = 23 (HBR); 15486 = 29 (HBR); 15486 = 29 (SI); 15538 = 22 (HBR); 15539 = 28 (HBR); 15608 = 29 (HBR). **Sobral, M.** 1328 = 44 (ICN); 1972 = 38 (ICN); 2577 = 28 (ICN); 2582 = 44 (ICN); 2622 = 5 (ICN); 2653 = 44 (ICN); 2696 = 5 (FLOR, ICN); 2699 = 5 (ICN); 2717 = 18 (FLOR, ICN, SI); 2717 = 18

(ICN); 2722 = 42 (ICN); 2724 = 42 (FLOR, ICN, SI); 2748 = 42 (ICN); 2749 = 5 (ICN); 2765 = 7 (ICN); 2773 = 23 (ICN); 2786 = 5 (ICN); 2788 = 42 (ICN); 2949 = 19 (ICN); 2965 = 30 (ICN); 2997 = 42 (ICN); 3141 = 22 (SI); 3145 = 9 (SI); 3255 = 40 (ICN); 3361 = 5 (ICN); 3362 = 7 (ICN); 3387 = 10 (ICN); 3387a = 10 (ICN); 3683 = 21 (ICN); 3689 = 21 (ICN, PEL); 3694 = 21 (ICN, MBM); 4188 = 5 (ICN); 4209 = 22 (ICN); 4211 = 5 (ICN); 4250 = 5 (ICN); 4344 = 23 (ICN); 4345 = 5 (ICN); 4370 = 44 (ICN); 4390 = 5 (ICN); 4455 = 5 (ICN); 4455a = 5 (ICN); 4507 = 5 (ICN); 4612 = 23 (ICN); 4612 = 40 (ICN); 4663 = 26 (ICN); 4814b = 41 (SI); 4906 = 21 (ICN); 5042 = 21 (ICN); 5054 = 21 (ICN); 5075 = 5 (ICN); 6480 = 18 (ICN). **Sonehara, J.** 214 = 26 (MBM). **Souza, D.C**. s.n. = 23 (MBM 294698). **Souza, M.L.** 362 = 26 (FLOR, ICN, MBM); 513 = 21 (FLOR, MBM); 533 = 23 (FLOR, MBM); 534 = 33 (FLOR, MBM); 534a = 25 (FLOR, ICN); 783 = 42 (FLOR); 1051 = 15 (FLOR); 1053 = 14 (FLOR); 1096 = 25 (FLOR); 1097 = 25 (FLOR, ICN, MBM); 1103 = 40 (FLOR); s.n. = 21 (FLOR 8587). **Souza, S.L.** 784 = 23 (FLOR). **Spellmeier, J.** 25 = 5 (ICN). **Spironelo, W.R.** 22356 = 26 (MBM). **Stancick, J.F.** s.n. = 26 (UPCB 31330). **Stehmann, J.R.** 190 = 24 (ICN); s.n. = 23 (MBM 145829); s.n. = 23 (ICN 63514); s.n. = 40 (MBM 145828). **Strang, H.E.** 571 = 21 (SI). **Strehl, T.** 574 = 22 (HAS, ICN); 730 = 1 (HAS, ICN); 731 = 40 (HAS, ICN). **Stützel, T.** s.n. = 21 (ICN 51517). **Sucre, D.** 262 = 6 (UB); 264 = 20 (UB); 320 = 6 (UB); 717 = 23 (UB); 723 = 23 (UB); 733 = 20 (UB); 743 = 29 (UB); 832 = 29 (UB). **Sugiyama, M.** 989 = 26 (SP).

Tagliani, P. s.n. = 9 (HURG 2203); s.n. = 9 (HURG 2324); s.n = 15 (HURG 2236). **Takeda, I.J.M.** 476 = 15 (HUPG); s.n. = 29 (HUPG 8262). **Tannus, J.L.S.** 822 = 29 (HRCB, ICN); 944 = 29 (HRCB, ICN); 953 = 41 (HRCB, ICN). **Teixeira, D**. s.n. = 12 (ICN 128060). **Tessmann, G.** s.n. = 15 (MBM 75902); s.n. = 15 (MBM 75906); s.n. = 23 (MBM 265859); s.n. = 25 (MBM 75730); s.n. = 26 (MBM 75734); s.n. = 28 (MBM 265858); s.n. = 28 (MBM 265862); s.n. = 29 (MBM 265860); s.n. = 36 (MBM 26544); s.n. = 36 (MBM 265864); s.n. = 40 (MBM 265863); s.n. = 40 (MBM 75910); s.n. = 42 (MBM 75916); 2618 = 26 (HBR, MBM). **Theissen, F.** 778 = 22 (PACA); s.n. = 23 (PACA 7432). **Thomas, W.W.** 14440 = 8 (MBM). **Trevisan, R.** 01 = 21 (ICN); 02 = 23 (ICN); 03 = 40 (ICN); 04 = 40 (ICN); 05 = 40 (ICN); 06 = 22 (ICN); 07 = 23 (ICN); 08 = 23 (ICN); 09 = 30 (ICN); 10 = 30 (ICN); 11 = 23 (ICN); 12 = 40 (ICN); 13 = 5 (ICN); 14 = 5 (ICN); 15 = 44 (ICN); 16 = 14 (ICN); 17 = 44 (ICN); 18 = 40 (ICN); 19 = 44 (ICN); 21 = 30 (ICN); 22 = 29 (ICN); 23 = 4 (ICN); 24 = 21 (ICN); 26 = 44 (ICN); 27 = 14 (ICN); 28 = 44 (ICN); 29 = 5 (ICN); 30 = 22 (ICN); 31 = 40 (ICN); 32 = 19 (ICN); 35 = 40 (ICN); 36 = 5 (ICN); 37 = 22 (ICN); 38 = 24 (ICN); 39 = 44 (ICN); 40 = 14 (ICN); 41 = 5 (ICN); 42 = 23 (ICN); 43 = 5 (ICN); 45 = 5 (ICN); 46 = 40 (ICN); 47 = 44 (ICN); 48 = 44 (ICN); 49 = 5 (ICN); 50 = 5 (ICN); 51 = 44 (ICN); 52 = 40 (ICN); 53 = 29 (ICN); 54 = 23 (ICN); 55 = 44 (ICN); 56 = 5 (ICN); 57 = 40 (ICN); 58 = 28 (ICN); 61 = 40 (ICN); 62 = 44 (ICN); 63 = 5 (ICN); 64 = 40 (ICN); 65 = 5 (ICN); 68 = 5 (ICN); 69 = 5 (ICN); 69a = 40 (ICN); 70 = 44 (ICN); 71 = 5 (ICN); 72 = 44 (ICN); 73 = 44 (ICN); 74 = 21 (ICN); 75 = 15 (ICN); 77 = 30 (ICN); 78 = 40 (ICN); 79 = 1 (ICN); 79a = 44 (ICN); 81 = 44 (ICN); 82 = 28 (ICN); 83 = 44 (ICN); 84 = 40 (ICN); 85 = 5 (ICN); 86 = 5 (ICN); 87 = 21 (ICN); 88 = 40 (ICN); 89 = 44 (ICN); 90 = 24 (ICN); 91 = 40 (ICN); 92 = 5 (ICN); 94 = 21 (ICN); 95 = 44 (ICN); 96 = 9 (ICN); 97 = 40 (ICN); 98 = 5 (ICN); 99 = 40 (ICN); 100 = 44 (ICN); 101 = 44 (ICN); 102 = 5 (ICN); 103 = 44 (ICN); 105 = 5 (ICN); 106 = 44 (ICN); 107 = 44 (ICN); 108 = 21 (ICN); 109 = 40 (ICN); 110 = 30 (ICN); 111 = 40 (ICN); 115 = 5 (ICN); 116 = 5 (ICN); 117 = 44 (ICN); 118 = 44 (ICN); 120 = 21 (ICN); 121 = 44 (ICN); 121a = 40 (ICN); 122 = 44 (ICN); 123 = 23 (ICN); 124 = 23 (ICN); 126 = 5 (ICN); 127 = 23 (ICN); 128 = 5 (ICN); 129 =

40 (ICN); 130 = 36 (ICN); 131 = 23 (ICN); 132 = 5 (ICN); 133 = 18 (ICN); 134 = 23 (ICN); 135 = 28 (ICN); 136 = 44 (ICN); 137 = 38 (ICN); 138 = 28 (ICN); 139 = 23 (ICN); 140 = 23 (ICN); 141 = 7 (ICN); 143 = 44 (ICN); 144 = 23 (ICN); 146 = 44 (ICN); 147 = 23 (ICN); 148 = 7 (ICN); 149 = 40 (ICN); 150 = 3 (ICN); 151 = 30 (ICN); 157 = 21 (ICN); 157 = 40 (ICN); 158 = 23 (ICN); 159 = 5 (ICN); 164 = 40 (ICN); 165 = 44 (ICN); 166 = 5 (ICN); 167 = 23 (ICN); 168 = 40 (ICN); 169 = 40 (ICN); 170 = 40 (ICN); 171 = 5 (ICN); 172 = 23 (ICN); 173 = 5 (ICN); 174 = 40 (ICN); 175 = 30 (ICN); 176 = 23 (ICN); 178 = 23 (ICN); 179 = 7 (ICN); 180 = 5 (ICN); 181 = 5 (ICN); 182 = 23 (ICN); 183 = 44 (ICN); 184 = 40 (ICN); 185 = 5 (ICN); 187 = 40 (ICN); 190 = 5 (ICN); 192 = 5 (ICN); 193 = 23 (ICN); 194 = 44 (ICN); 195 = 5 (ICN); 196 = 23 (ICN); 197 = 44 (ICN); 198 = 44 (ICN); 199 = 21 (ICN); 201 = 40 (ICN); 202 = 5 (ICN); 203 = 30 (ICN); 204 = 44 (ICN); 205 = 23 (ICN); 206 = 30 (ICN); 207 = 23 (ICN); 209 = 10 (ICN); 210 = 44 (ICN); 211 = 5 (ICN); 212 = 5 (ICN); 213 = 44 (ICN); 214 = 5 (ICN); 215 = 23 (ICN); 216 = 5 (ICN); 217 = 10 (ICN); 218 = 1 (ICN); 219 = 30 (ICN); 220 = 21 (ICN); 221 = 22 (ICN); 222 = 44 (ICN); 223 = 5 (ICN); 224 = 5 (ICN); 225 = 22 (ICN); 226 = 40 (ICN); 227 = 40 (ICN); 228 = 30 (ICN); 229 = 23 (ICN); 230 = 5 (ICN); 231 = 44 (ICN); 232 = 21 (ICN); 233 = 21 (ICN); 234 = 44 (ICN); 235 = 23 (ICN); 236 = 40 (ICN); 237 = 44 (ICN); 238 = 44 (ICN); 239 = 40 (ICN); 240 = 5 (ICN); 241 = 22 (ICN); 242 = 23 (ICN); 243 = 44 (ICN); 244 = 1 (ICN); 245 = 30 (ICN); 246 = 44 (ICN); 247 = 5 (ICN); 248 = 40 (ICN); 249 = 40 (ICN); 250 = 21 (ICN); 251 = 5 (ICN); 252 = 21 (ICN); 253 = 44 (ICN); 254 = 40 (ICN); 255 = 40 (ICN); 256 = 21 (ICN); 258 = 5 (ICN); 259 = 23 (ICN); 260 = 44 (ICN); 263 = 44 (ICN); 264 = 29 (ICN); 265 = 5 (ICN); 266 = 5 (ICN); 267 = 40 (ICN); 268 = 40 (ICN); 269 = 23 (ICN); 270 = 21 (ICN); 271 = 5 (ICN); 272 = 40 (ICN); 273 = 40 (ICN); 274 = 21 (ICN); 275 = 23 (ICN); 276 = 29 (ICN); 277 = 44 (ICN); 278 = 5 (ICN); 279 = 44 (ICN); 280 = 23 (ICN); 281 = 40 (ICN); 282 = 21 (ICN); 283 = 5 (ICN); 284 = 22 (ICN); 285 = 44 (ICN); 286 = 40 (ICN); 287 = 40 (ICN); 288 = 7 (ICN); 289 = 44 (ICN); 290 = 44 (ICN); 291 = 28 (ICN); 292 = 28 (ICN); 293 = 5 (ICN); 294 = 29 (ICN); 295 = 5 (ICN); 296 = 44 (ICN); 297 = 44 (ICN); 298 = 5 (ICN); 299 = 7 (ICN); 300 = 7 (ICN); 301 = 28 (ICN); 302 = 44 (ICN); 304 = 5 (ICN); 305 = 42 (ICN); 306 = 40 (ICN); 307 = 22 (ICN); 308 = 44 (ICN); 309 = 18 (ICN); 312 = 30 (ICN); 313 = 40 (ICN); 314 = 40 (ICN); 315 = 5 (ICN); 316 = 7 (ICN); 318 = 19 (ICN); 319 = 44 (ICN); 320 = 22 (ICN); 321 = 14 (ICN); 323 = 30 (ICN); 324 = 19 (ICN); 325 = 22 (ICN); 326 = 21 (ICN); 327 = 21 (ICN); 328 = 40 (ICN); 329 = 19 (ICN); 330 = 16 (ICN); 331 = 21 (ICN); 333 = 14 (ICN); 334 = 23 (ICN); 402 = 41 (ICN); 404 = 23 (ICN); 406 = 41 (ICN); 418 = 42 (ICN); 420 = 38 (ICN); 426 = 23 (ICN); 431 = 30 (ICN); 433 = 23 (ICN); 434 = 42 (ICN); 445 = 5 (ICN); 452 = 44 (ICN); 470 = 9 (ICN); 474 = 44 (ICN); 476 = 19 (ICN); 488 = 44 (ICN); 497 = 5 (ICN); 498 = 44 (ICN); 502 = 42 (ICN); 506 = 29 (ICN); 514 = 5 (ICN); 515 = 23 (ICN); 516 = 31 (ICN); 522 = 42 (ICN); 524 = 5 (ICN); 526 = 44 (ICN); 529 = 23 (ICN); 532 = 7 (ICN); 533 = 5 (ICN); 548 = 16 (ICN); 554 = 9 (ICN); 578 = 21 (ICN); 584 = 21 (ICN); 586 = 1 (ICN); 587 = 21 (ICN); 588 = 16 (ICN); 601 = 21 (ICN); 617 = 22 (ICN); 633 = 22 (ICN); 641 = 43 (ICN); 652 = 23 (ICN); 659 = 40 (ICN); 660 = 28 (ICN); 661 = 44 (ICN); 663 = 42 (ICN); 664 = 29 (ICN); 666 = 9 (ICN); 672 = 22 (ICN); 674 = 5 (ICN); 678 = 44 (ICN); 693 = 31 (ICN); 695 = 5 (ICN); 697 = 40 (ICN); 698 = 23 (ICN); 703 = 31 (ICN); 704 = 5 (ICN); 709 = 44 (ICN); 710 = 22 (ICN); 711 = 44 (ICN); 713 = 14 (ICN); 717 = 9 (ICN); 720 = 44 (ICN); 744 = 15 (ICN); 745 = 25 (ICN); 749 = 14 (ICN); 754 = 21 (ICN); 755 = 14 (ICN); 757 = 21 (ICN); 763 = 42 (ICN); 764 = 23 (ICN); 772 = 41 (ICN); 773 = 7 (ICN); 775 = 29 (ICN); 776 = 16 (ICN); 777 = 21 (ICN); 782 = 28 (ICN); 784 = 23 (ICN); 789 = 23 (ICN); 790 = 23 (ICN); 792 = 23 (ICN); 793 = 30 (ICN); 794 = 40

(ICN); 795 = 44 (ICN); 796 = 44 (ICN); 797 = 1 (ICN); 798 = 44 (ICN); 802 = 42 (ICN); 803 = 44 (ICN); 804 = 18 (ICN); 805 = 29 (ICN); 806 = 44 (ICN); 810 = 41 (ICN); 813 = 38 (ICN); 824 = 40 (ICN); 824a = 5 (ICN); 834 = 23 (ICN); 835 = 40 (ICN); 840 = 44 (ICN); 841 = 28 (ICN); 842 = 40 (ICN); 843 = 29 (ICN); 844 = 44 (ICN); 845 = 28 (ICN); 846 = 7 (ICN); 850 = 29 (ICN); 852 = 5 (ICN); 853 = 29 (ICN); 861 = 42 (ICN); 863 = 18 (ICN); 864 = 20 (ICN); 865 = 41 (ICN); 866 = 41 (ICN); 869 = 44 (ICN); 870 = 42 (ICN); 871 = 5 (ICN); 872 = 28 (ICN); 873 = 40 (ICN); 874 = 18 (ICN); 880 = 18 (ICN); 881 = 18 (ICN); 882 = 5 (ICN); 883 = 5 (ICN); 884 = 44 (ICN); 890 = 23 (ICN); 892 = 1 (ICN); 893 = 44 (ICN); 894 = 5 (ICN); 895 = 40 (ICN); 896 = 22 (ICN); 898 = 22 (ICN); 899 = 44 (ICN); 900 = 5 (ICN); 901 = 40 (ICN); 902 = 1 (ICN); 905 = 40 (ICN); 906 = 30 (ICN); 907 = 5 (ICN); 908 = 44 (ICN); 909 = 7 (ICN); 914 = 23 (ICN); 915 = 5 (ICN); 919 = 7 (ICN); 921 = 7 (ICN); 924 = 31 (ICN); 925 = 23 (ICN); 926 = 44 (ICN); 930 = 41 (ICN); 931 = 18 (ICN); 932 = 42 (ICN); 933 = 5 (ICN); 934 = 5 (ICN); 939 = 41 (ICN); 940 = 40 (ICN); 942 = 36 (ICN); 947 = 19 (ICN); 948 = 21 (ICN); 952 = 21 (ICN); 962 = 42 (ICN); 974 = 40 (ICN); 1031 = 29 (ICN). **Troncoso, N.S.** 2324 = 31 (SI).

Umgaretti, I. 568 = 5 (HAS); 715 = 44 (HAS).

Vanni, R. 4091 = 29 (SI); 4121 = 1 (SI). **Vanzela, A.L. L.** 07 = 22 (ICN); 08 = 15 (ICN); 09 = 15 (ICN); 10 = 15 (ICN); 71 = 21 (ICN); 74 = 15 (ICN); 80 = 23 (ICN); 83 = 23 (ICN); 85 = 44 (FUEL); 86 = 22 (ICN); 88 = 28 (ICN); 89 = 40 (ICN); 90 = 44 (ICN); 91 = 23 (ICN); 92 = 7 (ICN); 94 = 21 (ICN); 96 = 23 (ICN); 98 = 23 (ICN); 99a = 44 (ICN); 231 = 5 (ICN); 236 = 42 (ICN); s.n. = 23 (FUEL 35419); s.n. = 37 (FUEL 35443). **Vianna, E.** s.n. = 15 (ICN 2841); s.n. = 23 (ICN 1968). **von Linsingen, L.** 39 = 8 (MBM).

Waechter, J. 1081 = 5 (ICN); 1082 = 16 (ICN); 1082a = 30 (ICN); 1121 = 15 (ICN); 1123 = 15 (ICN); 1127 = 15 (ICN); 1131 = 9 (ICN). **Wasum, R.** 1225 = 29 (HUCS).

Yano, O. 18410 = 15 (ICN, SP).

Zakrzewski, D.P. s.n. = 21 (MBM 223032). **Zampieri, C.** 100 = 23 (FUEL). **Zanin, A.** 1036 = 42 (FLOR); 1043 = 41 (FLOR, ICN); 1098 = 41 (FLOR, ICN); 1219 = 41 (ICN); 1271 = 41 (ICN); 1383 = 36 (ICN). **Ziller, S.R.** 481 = 21 (MBM); 1692 = 42 (MBM); 1775 = 21 (MBM).

Sine col. s.n.= 7 (MPUC 7360); s.n. = 14 (MPUC 10217); s.n. = 22 (MPUC 6474); s.n. = 22 (HURG 984); s.n. = 23 (MPUC 5613); s.n. = 23 (MPUC 5611); s.n. = 23 (MPUC 7361); s.n. = 23 (MPUC 7362); s.n. = 23 (MPUC 5612); s.n. = 23 (MPUC 6468); s.n. = 23 (MPUC 6467); s.n. = 23 (MPUC 5543); s.n. = 23 (MPUC 5606); s.n. = 23 (MPUC 5607); s.n. = 23 (MPUC 5608); s.n. = 23 (MPUC 7900); s.n. = 23 (MPUC 10220); s.n. = 23 (MPUC 7888); s.n. = 23 (MPUC 7292); s.n. = 23 (MPUC 7889); s.n. = 30 (MPUC 6469); s.n. = 30 (MPUC 6497); s.n. = 30 (MPUC 5609); s.n. = 30 (MPUC 5610); s.n. = 30 (MPUC 6498); s.n. = 42 (MPUC 7293).

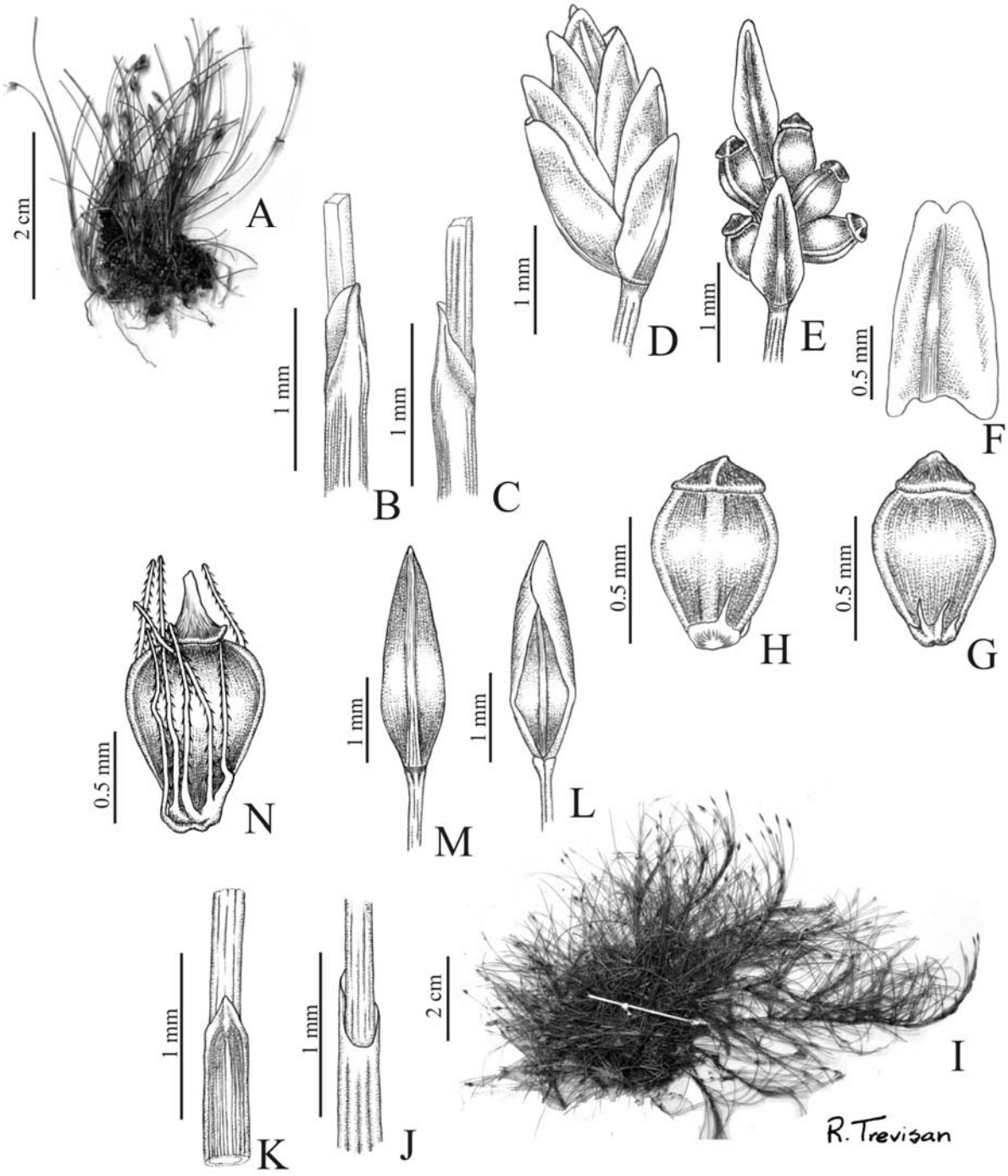
2 cm
A
1 mm
B
1 mm
C
1 mm
D
1 mm
E
0.5 mm
F
0.5 mm
H
0.5 mm
G
0.5 mm
N
1 mm
M
1 mm
L
2 cm
I
R. Trevisan
1 mm
K
1 mm
J

Figure 1

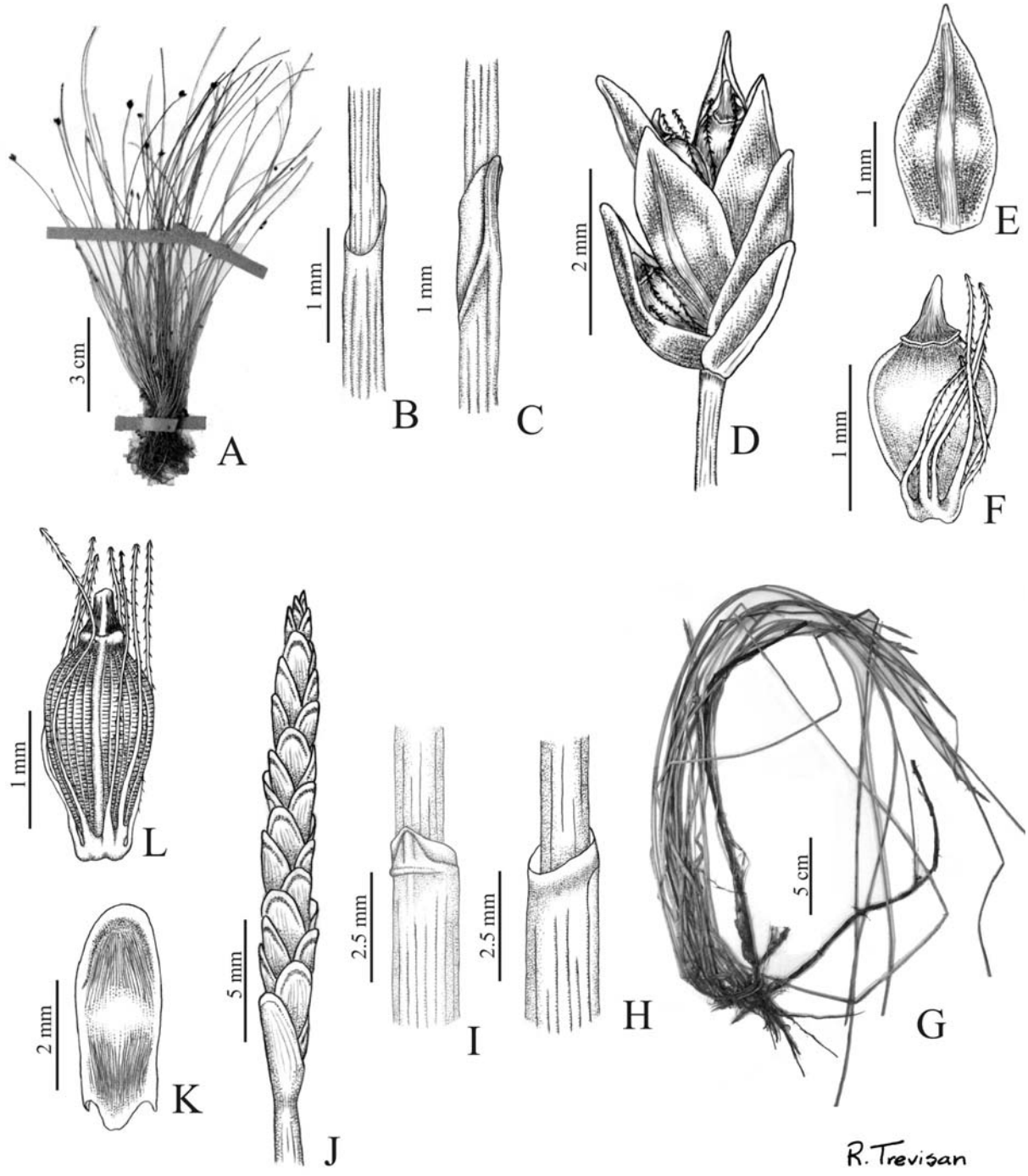
3 cm
A
1 mm
B
1 mm
C
2 mm
D
1 mm
E
1 mm
F
1 mm
L
2 mm
K
5 mm
J
2.5 mm
I
2.5 mm
H
5 cm
G
R. Trevisan

Figure 2

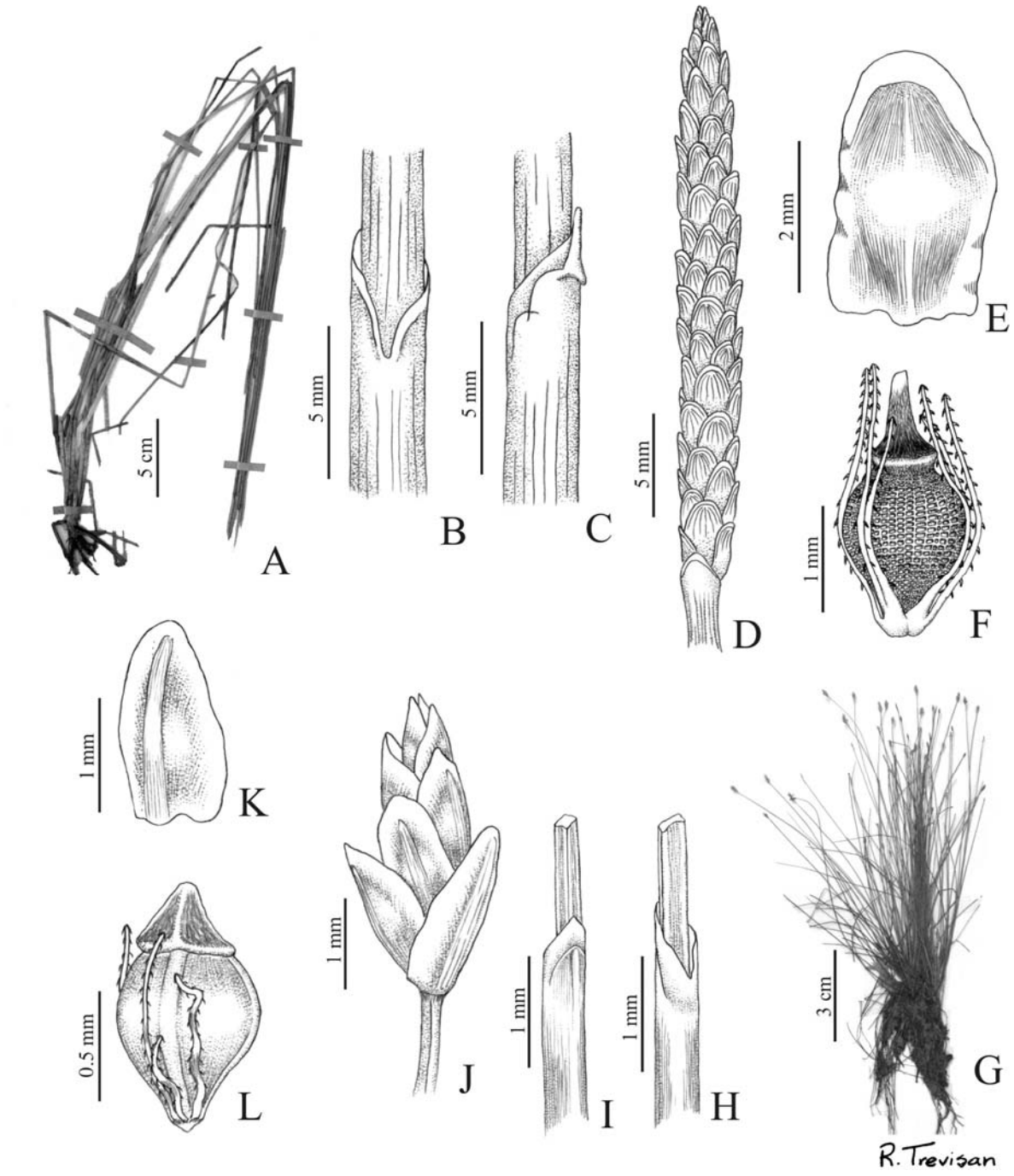
5 cm
A
5 mm
B
5 mm
C
5 mm
D
2 mm
E
1 mm
F
1 mm
K
0.5 mm
L
1 mm
J
1 mm
I
1 mm
H
3 cm
G
R. Trevisan

Figure 3

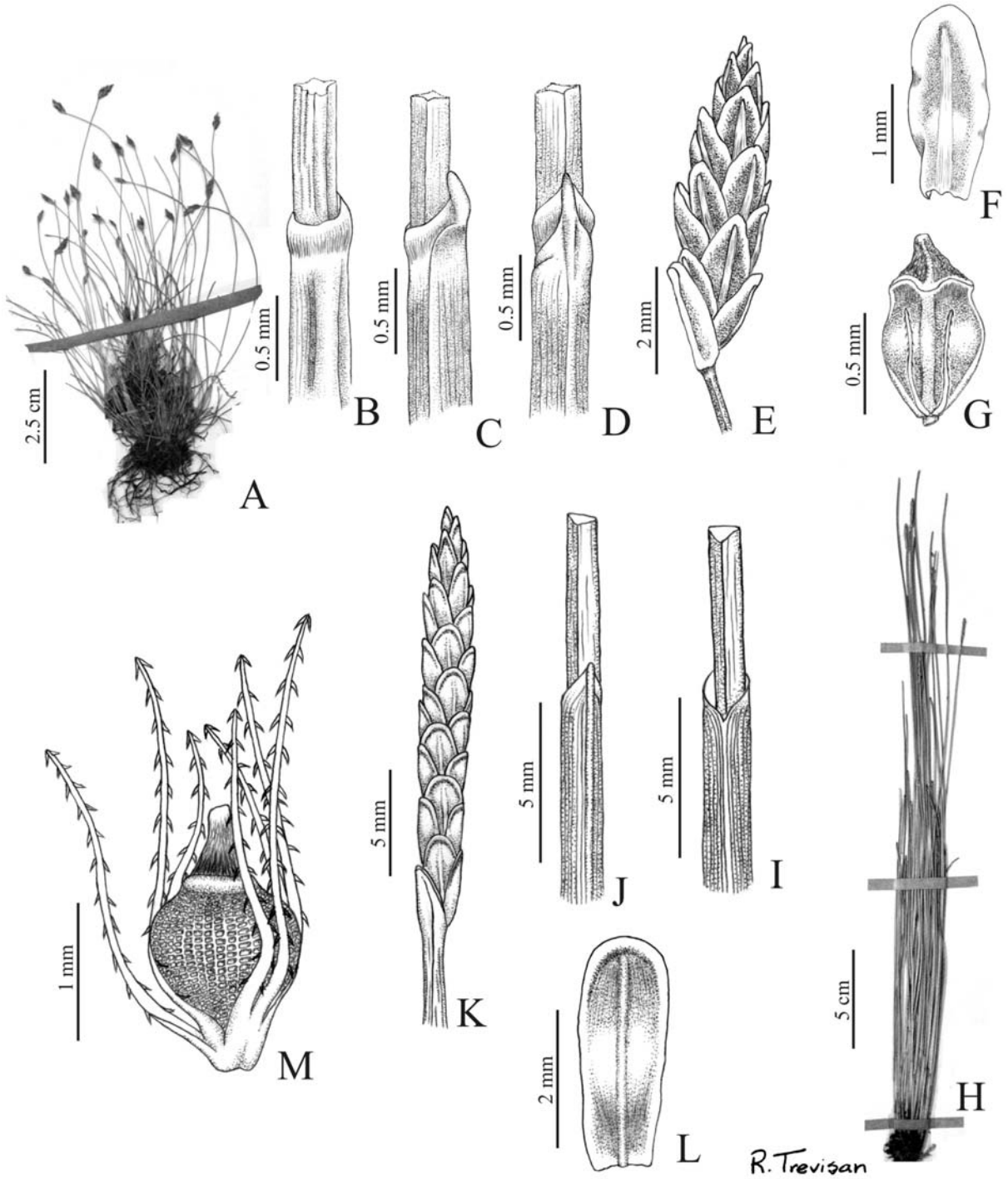
2.5 cm
A
0.5 mm
B
0.5 mm
C
0.5 mm
D
2 mm
E
1 mm
F
0.5 mm
G
5 cm
H
5 mm
I
5 mm
J
5 mm
K
2 mm
L
1 mm
M
R. Trevisan

Figure 4

ARTIGO 2

Three new species of *Eleocharis* subg. *Scirpidium* (Cyperaceae, and a key to identify the species of the subgenus occurring in Brazil

Este artigo será submetido para publicação na Novon.

Three new species of *Eleocharis* subg. *Scirpidium* (Cyperaceae), and a key to identify the species of the subgenus occurring in Brazil

Rafael Trevisan

Programa de Pós-Graduação em Botânica, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves, 9500, Porto Alegre, Rio Grande do Sul, 91501-970, Brazil. rftrevisan@yahoo.com.br

M. Socorro González-Elizondo

CIIDIR IPN Unidad Durango, Sigma 119 Fracc. 20 de Noviembre II, 34220 Durango, Dgo., Mexico. herbario_ciidir@yahoo.com.mx

Ilsi Iob Boldrini

Departamento de Botânica, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves, 9500, Porto Alegre, Rio Grande do Sul, 91501-970, Brazil. Corresponding author: ilsi.boldrini@ufrgs.br

ABSTRACT. Three new species of *Eleocharis* subg. *Scirpidium* (Nees) Kukkonen (Cyperaceae) from southern Brazil are described and illustrated here: *Eleocharis angustirostris*, *E. neesii*, and *E. riograndensis*. In addition, a key to separate the species of the subgenus *Scirpidium* occurring in Brazil is presented.

RESUMO. Três espécies novas de *Eleocharis* subg. *Scirpidium* (Nees) Kukkonen do sul do Brasil são descritas e ilustradas neste trabalho: *Eleocharis angustirostris*, *E. neesii* e

E. riograndensis. Além disso, é apresentada uma chave dicotômica para a distinção entre as espécies deste subgênero que ocorre no Brasil.

Key words: Brazil, Cyperaceae, *Eleocharis*, new species, *Scirpidium*.

Eleocharis R.Br. is a widely distributed genus of more than 200 species (González-Elizondo & Peterson, 1997) with a concentration of taxa in tropical and subtropical America (Goetghebeur, 1998). The species are generally associated with wet environments.

During the studies about the genus *Eleocharis* to Southern Brazil we found specimens of three undescribed species of *Eleocharis* subg. *Scirpidium* (Nees) Kukkonen. *Eleocharis* subg. *Scirpidium* (*Eleocharis* ser. *Aciculares* (C.B. Clarke) Svenson) is characterized by having achenes terete or very obtusely trigonous, with fragile and translucid pericarp 0.01-0.04 mm thick, sculptured with longitudinal rows of rectangular cells horizontally oriented (González-Elizondo & Peterson, 1997). It includes annual or perennial herbs, often the spikelets have the basal scale fertile, and the style is trifid.

Most of the species in this subgenus grow in areas of temperate to cold climates, from Alaska and Greenland to southern Chile and Argentina (Svenson, 1929; González-Elizondo & Tena-Flores, 2000). The subgenus is represented by ca. 15 species, from which more than 90% occurs in the New World. A centre of diversity of *Scirpidium* lies within the United States and Northern Mexico, with a secondary centre in the Andes, where at least four endemic species exist. In tropical and subtropical areas the group is restricted to high elevations (González-Elizondo & Tena-Flores, 2000).

The subg. *Scirpidium* is a distinctive and well delimited group within the genus *Eleocharis* (González-Elizondo & Peterson, 1997). However, there are some complexes of species within the subgenus in which the discontinuity among the taxa is not easily perceived. This difficulty was reported by Svenson (1939), and one of its reasons is probably the overlapping of the morphological characteristics among different species. Examples are *Eleocharis acicularis* (L.) Roem. & Schult. (in the northern hemisphere and the Andes) and *E. bonariensis* Nees (from austral South America to Mexico) in which a huge variability occurs. This high variability or polymorphism could indicate active speciation, and probably formation of cryptic species that are not detectable on a morphological basis. Therefore, this subgenus is in urgent need of a global review.

In the descriptions, the measurements of the achenes include the stylopodium.

Eleocharis angustirostris R. Trevis. & Boldrini, sp. nov. TYPE: Brazil, Rio Grande do Sul, mun. Osório, BR 101, km 91, 15 Oct. 2003, *I. Boldrini & R. Trevisan 1187* (holotype, ICN). Figure 1 A-F.

Eleocharite bonariensi Nees *affinis, sed ab ea acheniis anguste ellipticis; stylopodio angusto super collis brevis in achenio apice differt.*

Perennial, caespitose and stoloniferous, usually with thin and non-lignified base, stolons ca. 1 mm wide; culms 8--22 cm x 0.3--0.6 mm, sulcate when dried, spongy, firm, not septate; sheaths stramineous to light brown at the base, tubular to somewhat inflated toward the apex, which is oblique, emucronate, hyaline, edges delicate and inconspicuous. Spikelets 5--8 x 2 mm, lanceoloid, 10--25-flowered, not proliferous; lower scale fertile, membranous, lanceolate to oblong, apex obtuse to acute,

stramineous, about the same length as the adjacent scales, with a wide hyaline margin; floral scales 2--2.9 x 0.5--0.6 mm, membranous, lanceolate to oblong, apex acute to obtuse, spirally arranged, appressed but loosely imbricate, finely striate, keel green to stramineous, sides hyaline sometimes with some small spots vinaceous to brown, margin hyaline gradual from the rest of the scale; perianth bristles none; stamens 3, anthers 1.2--1.8 mm, ending in a short apiculum; style trifid. Achene 1.3--1.6 x 0.4--0.5 mm, subterete to slightly trigonous, narrowly ellipsoid, with ca. 11-14 longitudinal rows of 50--60 rectangular cells horizontally oriented, constricted at the summit into a distinct neck, stramineous, iridescent; stylopodium narrowly conical, green to dark brown, on the top of the neck and appearing to be a continuation of it, about 1/4 as wide as the achene.

Etymology. The epithet refers to the narrow stylopodium found in this species.

Habitat and distribution. Known only from the type locality. It is possible that this species can also occur in other areas of grasslands in the north coastland of Rio Grande do Sul. *Eleocharis angustirostris* grows in wet grasslands with grazing, in sandy soils.

Eleocharis angustirostris is related to *E. bonariensis* and similar to it in the general aspect, but can be distinguished by the achene narrowing at the summit into a neck, the narrow, conical stylopodium that seems to be a continuation of the neck, as well as by the pale, hyaline to stramineous floral scales (vs. stylopodium wide conical, separate from the achene body by a constriction, and floral scales stramineous to light brown, generally with vinaceous spots). It also differs in having the apex of the distal sheath more delicate than in *E. bonariensis* (where it can be firm or scarious but not hyaline and delicate).

Paratypes. BRAZIL. **Rio Grande do Sul**: Osório**,** BR 101, km 91, 15 Oct. 2003, *I. Boldrini & R. Trevisan, 1184, 1185, 1186, 1188* (ICN).

Eleocharis neesii R. Trevis. & Boldrini, sp. nov. TYPE: Brazil, Rio Grande do Sul, mun. Rio Grande, Lagoa Verde, 28 Nov. 1984, *G. Pedralli s.n.* (holotype, HURG 834). Figure 1 G-L.

Eleocharite radicanti (Poir.) Kunth *affinis, sed ab ea culmis capillaribus et floribus triandris differt.*

Perennial?, caespitose and stoloniferous, usually with thin non-lignified base, stolons capillary; culms 3--4 cm x 0.2--0.3 mm, capillary, somewhat angled, sulcate when dry, firm, spongy, not septate; sheaths stramineous at the base, apex somewhat oblique, hyaline, inflated, emucronate, edges delicate and inconspicuous. Spikelets 2.8--3 x 1.7 mm, ovoid, 8--10-flowered, not proliferous; lower scale fertile, membranous, oval, apex acute to obtuse, stramineous, about the same length as the adjacent scales, with wide hyaline margin; floral scales 1.4--1.5 x 0.5--0.7 mm, membranous, oval, apex acute to obtuse, subdistichous, appressed, finely striated, keel stramineous, sides translucent white, margin hyaline gradual from the rest of the scale; perianth bristles rudimentary or lacking; stamens 3, anthers 0.4--0.5 mm, ending in a short apiculum; style trifid. Achene 0.9 x 0.4--0.5 mm, ellipsoid, with ca. 8 longitudinal rows of 35--40 rectangular cells, apex rounded, stramineous, iridescent; stylopodium short pyramidal, green to dark-brown, separated from the achene body by a constriction, about 1/4 as wide as the achene.

Etymology. The epithet is a compliment to Christian Gottfried Daniel Nees von Esenbeck, who described the subgenus *Scirpidium*.

Habitat and distribution. Known only from type locality. It is possible that this species can also occur in other areas in south coastland of Rio Grande do Sul and Uruguay. *Eleocharis neesii* grows in wet environments with sandy soil, near pools with shallow vegetation.

Eleocharis neesii is a small plant with capillary stolons. This species is similar to *E. radicans* from which can be distinguished by the capillary culms and flowers with three stamens (vs. culms soft and flattened, usually 0.4-1 mm wide and flowers 2-stamined).

Eleocharis riograndensis R. Trevis. & Boldrini, sp. nov. TYPE: Brazil, Rio Grande do Sul, mun. Cambará do Sul, 05 Feb. 1948, *B. Rambo 366640* (holotype, PACA; isotype SI). Figure 1 M-Q.

Eleocharite radicanti (Poir.) Kunth affinis, sed ab ea culmis longioribus et tenuibus; vaginis apicibus longiacuminatis differt. Eleocharite bonariensi Nees similis, sed ab ea culmis angustioribus, spiculis 6--8 floribus, staminibus 2, antheris 0.4--0.5 mm longis differt.

Perennial?, caespitose and stoloniferous, usually with thin non-lignified base, stolons capillary; culms 18--23 cm x 0.2--0.3 mm, capillary, somewhat angled, soft and spongy when fresh, sulcate when dry, not septate; sheaths stramineous at the base, apex long-acuminate, hyaline, emucronate, at tip delicate and inconspicuous, easily torn. Spikelets 3--4 x 1.7 mm, ovoid to lanceoloid, 6--8-flowered, not proliferous; lower scale fertile,

membranous, oval, apex acute to obtuse, stramineous, about the same length as the adjacent scales, with wide hyaline margin; floral scales 1.8--2 x 0.5--0.7 mm, membranous, oval, apex acute to obtuse, spirally arranged, appressed to slightly divergent in maturity, finely striate, keel stramineous, sides stramineous to translucent white, margin hyaline gradual from the rest of the scale; perianth bristles 5--6, as long as or exceeding the stylopodium, stramineous, sparsely retrorso-scabrous; stamens 2, anthers 0.4--0.5 mm, ending in a short apiculum; style trifid. Achene 0.9--1 x 0.4 mm, slightly trigonous, ellipsoid to obovoid, with ca. 9--10 longitudinal rows of 20--25 rectangular cells, obtuse at the apex, stramineous, iridescent; stylopodium short pyramidal, green to dark-brown, separated from the achene body by a constriction, about 1/3 as wide as the achene.

Etymology. The epithet refers to the Brazilian State where the type was collected.

Habitat and distribution. Known only from type locality. It is possible that this species can also occur in other areas of grasslands in highlands of NE of Rio Grande do Sul. *Eleocharis riograndensis* grows in wet environments, generally forming mats.

Eleocharis riograndensis can be misidentified as *E. radicans*, from which it is distinguished by the capillary and elongate culms (vs. culms flattened, wider than 0.4 mm and usually shorter than 8 cm) and achenes with fewer rectangular cells (20--25 vs 30--50).

The main differences between *Eleocharis riograndensis* and *E. bonariensis* are in the size and number of the anthers (two anthers, 0.4--0.5 mm vs. three anthers, 1.1--1.8 mm), the width of the culms (0.2--0.3 mm vs. 0.4--1.2 mm), and the number of the flowers in the spikelets (6--8-flowered vs. 10--60-flowered).

Paratype. BRAZIL. **Santa Catarina**: Campo Alegre, Fazenda Ernesto Scheide, 01 Feb. 1957, *L.B. Smith & R. Klein 10573* (HBR).

Key to identify the species of *Eleocharis* subg. *Scirpidium* occurring in Brazil

(Achene measurements include the stylopodium)

1a. Stamens 3, anthers 1--1.8 mm, except in *E. neesii* with anthers 0.4--0.5 mm.

2a. Spikelets 2.8--4.5 mm long, 8--10-flowered, ovoid.

3a. Achenes 0.9 mm long, rows with 35--40 rectangular cells; stylopodium short pyramidal; anthers 0.4--0.5 mm long; bristles rudimentary or lacking. .....*Eleocharis neesii* R. Trevis. & Boldrini

3b. Achenes 1.5--2.4 mm long, rows with 60--70 rectangular cells; stylopodium lanceolate, falcate; anthers 1--1.2 mm long; bristles 3--4, exceeding the stylopodium. .....*Eleocharis stenocarpa* Svenson

2b. Spikelets 3--13 mm long, (7-)10--55-flowered, lanceoloid, rarely ovoid.

4a. Stylopodium narrowly conical, on the top of a neck, appearing to be a continuation of the neck; floral scales hyaline to stramineous .....
…….……...*Eleocharis angustirostris* R. Trevis. & Boldrini

4b. Stylopodium conical to widely conical, separate from the achene body by a constriction; floral scales stramineous to light brown, generally with vinaceous spots.....*Eleocharis bonariensis* Nees

1b. Stamens 2, anthers 0.3--0.5 mm long.

5a. Culms 1.8--8 cm x 0.4--1 mm, flattened; sheath with apex acute.....*Eleocharis radicans* (Poir.) Kunth

5b. Culms 18--23 cm x 0.2--0.3 mm, capillary; sheath with apex long-acuminate .....*Eleocharis riograndensis* R. Trevis. & Boldrini

The inclusion of *E. stenocarpa* is based on the report and figure presented by Faria (1998). However, it is important to point out that the measurements of the achenes presented by Faria (1998) vary from 1.5 to 2.4 mm, whereas in the description presented by Svenson (1929) the measurements vary from 1.5 to 1.8 mm.

There is another undescribed species of the subgenus *Scirpidum* related to *Eleocharis radicans* that was collected in highlands of the state of Paraná (Brazil). Due to the lack of fertile material in good condition to select a type it will be described in a forthcoming opportunity.

Acknowledgements

The authors are grateful to curators of the herbaria for loans of specimens. The first author thanks the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Capes) for scholarship support.

Literature Cited

Faria, A.D. 1998. O gênero *Eleocharis* R. Br. (Cyperaceae) no Estado de São Paulo. Mestrado em Biologia Vegetal. Unicamp, Campinas. 150 pp.

Goetghebeur, P. 1998. Cyperaceae. Pp. 141--190 in K. Kubitzki, H. Huber, P.J. Rudall, P.S. Stevens & T. Stützel (eds.). The Families and Genera of Vascular Plants, IV: Flowering plants – monocotyledons. Springer-Verlag, Berlin.

González-Elizondo, M. S. & P. M. Peterson. 1997. A classification of and key to the supraspecific taxa in *Eleocharis* (Cyperaceae). Taxon 46: 433-449.

González-Elizondo, M.S. & J.A. Tena-Flores. 2000. *Eleocharis* (Cyperaceae) in the New World. Pp. 637--643 in K. L. Wilson & D. A. Morrison (eds.). Monocots: Systematics and Evolution. CSIRO Publishing, Melbourne.

Svenson, H. K. 1929. Monographic Studies in the Genus *Eleocharis* I. Rhodora, 31: 167-191, 199-219.

Svenson, H. K. 1939. Monographic Studies in the Genus *Eleocharis* V. Rhodora, 41: 1-19.

Figure. 1. A-F, *Eleocharis angustirostris* R. Trevis. & Boldrini. - A. Habit. - B. Sheath, ventral view. - C. Sheath, dorsal view. - D. Spikelet. - E. Floral scale, dorsal view. - F. Achene. G-L, *E. neesii* R. Trevis. & Boldrini. - G. Habit. - H. Sheath, ventral view. - I. Sheath, dorsal view. - J. Spikelet. - K. Scale, dorsal view. - L. Achene. M-Q, *E. riograndensis* R. Trevis. & Boldrini. - M. Habit. - N. Sheath, lateral view. - O. Spikelet. - P. Scale, dorsal view. - Q. Achene. (All species were drawn from the holotypes).

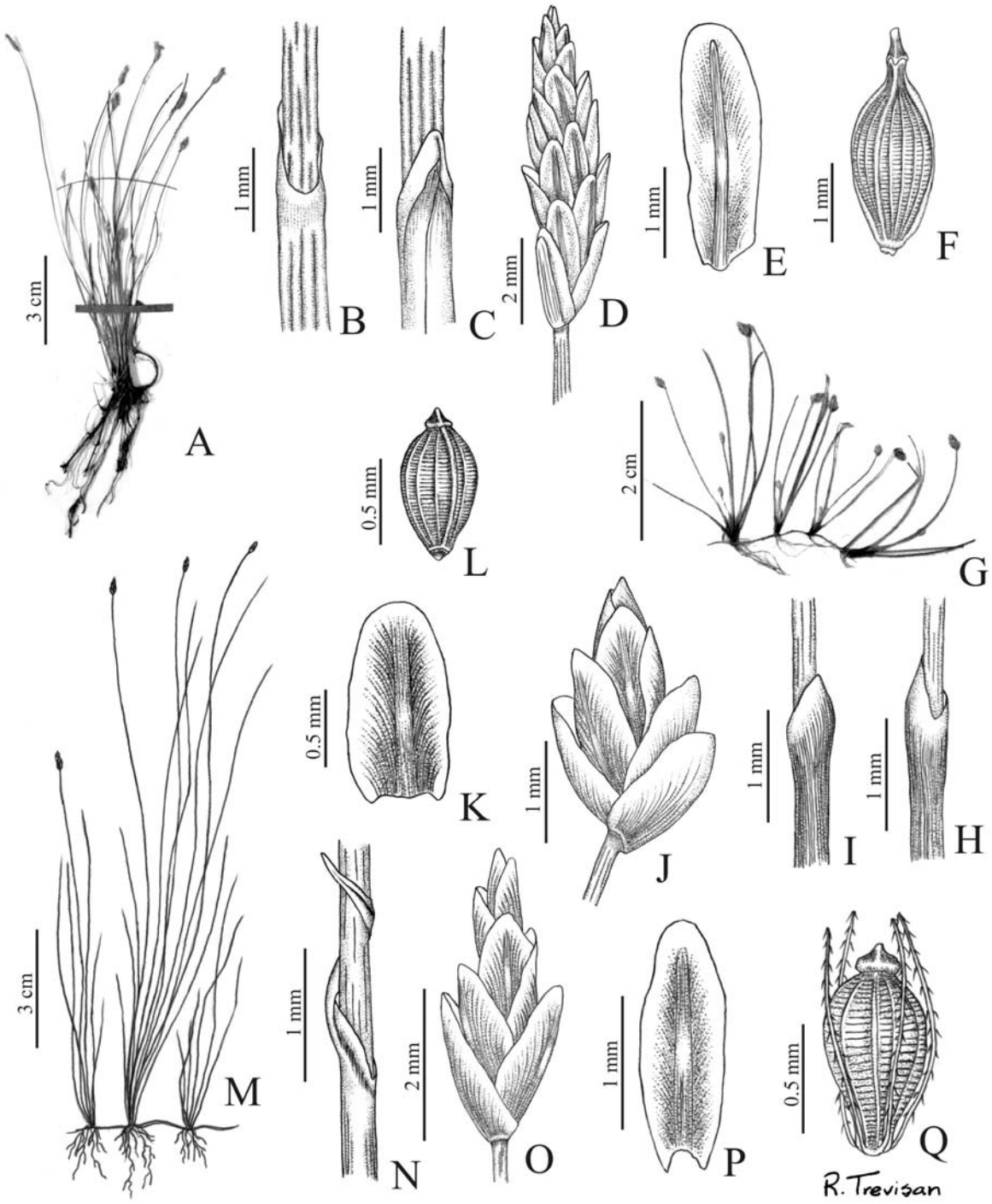
3 cm
A
1 mm
B
1 mm
C
2 mm
D
1 mm
E
1 mm
F
0.5 mm
L
2 cm
G
0.5 mm
K
1 mm
J
1 mm
I
1 mm
H
3 cm
M
1 mm
2 mm
N
O
1 mm
P
0.5 mm
Q
R. Trevisan

Figure 1

ARTIGO 3

Novelties in *Eleocharis* ser. *Tenuissimae* (Cyperaceae), and a key to identify the species of the series occurring in Brazil

---

Este artigo será submetido para publicação na Systematic Botany.

1

TREVISAN AND BOLDRINI, NEW SPECIES OF ELEOCHARIS

Novelties in *Eleocharis* ser. *Tenuissimae* (Cyperaceae), and a key to identify the species of the series occurring in Brazil

Rafael Trevisan,[1,3] and Ilsi Iob Boldrini,[2]

[1]Programa de Pós-Graduação em Botânica, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves, 9500, Porto Alegre, Rio Grande do Sul, 91501-970, Brazil

[2]Departamento de Botânica, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves, 9500, Porto Alegre, Rio Grande do Sul, 91501-970, Brazil

[3]Author for correspondence (rftrevisan@yahoo.com.br)

Abstract **-** Five new species of *Eleocharis* are described based on specimens from South America: ***Eleocharis angustispicula***, ***E. densicaespitosa***, ***E. hatschbachii***, ***E. ramboana*** and ***E. urceolatoides***. Diagnostic characters, description, detailed illustration and taxonomic comments are given. In addition, we propose the lectotypification of *Eleocharis glauco-virens* and a new synonym to *Eleocharis loefgreniana*. All those species belong to *Eleocharis* ser. *Tenuissimae* which has a pantropical distribution with some expansion in temperate areas. A preliminary key to separate the species of the series that occur in Brazil is also presented.

Resumen - Cinco nuevas especies de *Eleocharis* son descritas sobre la base de espécimens procedentes de América del Sur: *Eleocharis angustispicula, E. densicaespitosa, E. hatschbachii, E. ramboana* y *E. urceolatoides*. Caracteres diagnósticos, descripciones, ilustraciones detalladas y comentarios taxonómicos son incluidos. Además, se propone la lectotipificación de *Eleocharis glauco-virens* y un nuevo sinónimo para *Eleocharis loefgreniana*. Todas estas especies pertenecen a *Eleocharis* ser. *Tenuissimae* que tiene una distribución pantropical con cierta expansión en zonas templadas. Una clave preliminar és presentada para identificación de las especies de la serie que ocurren en Brasil.

Keywords - Brazil, new species, lectotypification, New World, synonymy, taxonomy.

Eleocharis R.Br. is a widely distributed genus of more than 200 species (González-Elizondo and Peterson 1997) with a concentration of taxa in tropical and subtropical America (Goetghebeur 1998). The species are generally associated to wet environments.

During the studies involving *Eleocharis* from Southern Brazil and Distrito Federal we found specimens of five further species of the *Eleocharis* subg. *Eleocharis* sect. *Eleocharis* ser. *Tenuissimae* (C. B. Clarke) Svenson.

Eleocharis ser. *Tenuissimae* is characterized by (1) achenes trigonous (in a few species some biconvex achenes mixed with the trigonous ones), smooth to deeply cancellate; (2) style 3-branched (styles 2-branched also present in the species having biconvex achenes mixed with the trigonous); (3) plants dwarf and capillary or more or less coarse, sometimes proliferous (González-Elizondo and Peterson 1997). The series has a pantropical distribution with some expansion in temperate areas, being represented by ca. 60 species with most part of them occurring in the New World.

According to the preliminary classification proposed by González-Elizondo and Peterson (1997) based on morphological features, *Eleocharis* ser. *Tenuissimae* can be subdivided in two subseries: *Eleocharis* subser. *Chaetariae* (C. B. Clarke) Svenson and *Eleocharis* subser. *Sulcatae* (C. B. Clarke) S. Gonzalez & P. M. Peterson.

Eleocharis subser. *Chaetariae* is characterized by (1) achenes smooth to deeply cancellate, variously coloured; (2) chasmogamous basal spikelets sometimes present (González-Elizondo and Peterson 1997). This subseries is pantropical, also occuring in temperate areas in America, with the main diversification in tropical South America.

Subseries *Chaetariae* is a quite diverse group with a complicated taxonomy. Within the subseries, it is very difficult to clearly perceive the discontinuity among the different

taxa. This difficulty is due to the great overlapping of some characteristics among different species, especially in the morphological intergrade of the achenes ornamentation (González-Elizondo and Tena-Flores 2000).

Eleocharis subser. *Sulcatae* is characterized by (1) achenes smooth or obscurely reticulate, whitish to pale-coloured; (2) basal spikelets not present (González-Elizondo and Peterson 1997). This subseries occurs in lowlands in the tropical and subtropical areas of the New World.

Plants of the subseries *Chaetariae* and *Sulcatae* intergrade morphologically, e.g., slender forms of the complex of *Eleocharis filiculmis* Kunth (*Sulcatae*) intergrade with relatively robust forms of the complex of *E. minima* Kunth (*Chaetariae*) as pointed out by Svenson (1937) and González-Elizondo and Tena-Flores (2000).

The greatest morphological variation and widest distribution in the genus is found in *Eleocharis* ser. *Tenuissimae*, which includes complexes of very closely related species, indicating active speciation (González-Elizondo and Tena-Flores 2000). An example is *Eleocharis minima* and its relative species, which comprises an intricate morphological complex that needs reviewing. There are many synonyms treated under *Eleocharis minima* that need a detailed review of their nomenclatural types in order to clearly determine all taxa involved.

A comprehensive taxonomic treatment of the series *Tenuissimae* was published by Svenson (1937, 1939) and since then several new taxa have been described (Hess 1953, 1957; Eiten 1972; Mora-Osejo 1978; González-Elizondo 1985; Simpson 1987, 1988a, 1993; Mereles 1990; Zavaro-Pérez and Pabón-Garcés 1995; González-Elizondo and

Reznicek 1996; Mereles and González-Elizondo 2003), demonstrating that this group needs a worldwide review.

Recent phylogenetic studies have demonstrated that the series *Tenuissimae* is unnatural (Roalson and Friar 2000; Roalson and Hinchliff 2007). The relatively simple morphology of the genus results in a few morphological characters that have taxonomic value and several of them have shown a high degree of homoplasy (González-Elizondo and Peterson 1997). When morphology is compared to the current phylogenetic hypothesis, it seems clear that many morphological characters are either pleisiomorphic or have multiple origins (Roalson and Hinchliff 2007). Therefore, further studies are need in the search for morphological features that can be mirrored in the phylogeny. It will facilitate the understanding of the relationships among the species and the evolutionary trends within the genus or subgroups.

In the descriptions, all the measurements of the achenes include the stylopodium.

TAXONOMIC TREATMENT

Description of the New Species

Eleocharis angustispicula R. Trevis., sp. nov. TYPE: BRAZIL, Distrito Federal: Guará, 12 km ao sul, 20 Mar 1968, *H.S. Irwin et al. 21565* (holotype: SI!).

Eleocharite nigrescenti (Nees) Steud. affinis sed ab ea spiculis angusto-ovoideis vel lanceolatoideis, 15-25 floribus et glumis apicibus acutis vel obtusis differt.

Annual, caespitose, usually with thin non-lignified base. Culms 6-12 cm x 0.3-0.4 mm, sulcate when dry, spongy, not septate. Sheaths stramineous to vinaceous at the base, apex hyaline, oblique, emucronate, with delicate inconspicuous edges. Spikelets 4.5-6 x 1.3-2 mm, narrow-ovoid to lanceoloid, 15-25-flowered, not proliferous; lower

scale sterile, papery to membranous, oval to lanceolate, apex acute, stramineous, as long as the adjacent scales, hyaline margin wide; floral scales 1.5-1.7 x 0.7 mm, membranous, oval to lanceolate, apex acute, spirally arranged, appressed, loosely imbricate, smooth, inconspicuously veined, keel stramineous, sides vinaceous, hyaline margin developed and gradual from the rest of the scale; perianth bristles rudimentary or lacking; stamens 2-3, anthers 0.4 mm, ending in a short apiculum; style trifid. Achene 0.6-0.7 x 0.4 mm, trigonous, with abaxial angle slightly marked, obovoid, rounded at the apex, slightly punctuated to reticulate, yellowish white, iridescent; stylopodium short pyramidal, light-brown, separate from the achene body by a brief constriction, ca. 1/2 as wide as the achene.

Distribution and Habitat – (Fig. 1 A-F). That species is known only from Distrito Federal. The species grows in open wet grasslands.

Etymology - The specific epithet refers to the narrow-ovoid to lanceoloid spikelets found in this species.

Additional material examined - BRAZIL, Distrito Federal: Brasília, Água Limpa, divisa com Cristo Redentor (Jardim Botânico de Brasília) e o IBGE, 15º55'47"S 47º54'22"W, 28 Mar 2000, *C. Munhoz et al. 1007* (IBGE).

Observations - *Eleocharis angustispicula* is included in *Eleocharis* subser. *Chaetariae*. Plant size and achene shape and size are similar to those found in *E. nigrescens* (Nees) Steud., another species placed within the *Chaetariae* group. The new species can be distinguished from *E. nigrescens* by the spikelets narrow-ovoid to lanceoloid, 10-25-flowered; floral scales loosely imbricate, with apex acute to obtuse (*vs*. spikelets wide-ovoid, 20-70-flowered; floral scales densely imbricate, with apex emarginate). *Eleocharis nigrescens* is widely distributed in lowlands, occurring in

neotropics and tropical Africa and Madagascar (Svenson 1937; Simpson 1988b; González-Elizondo 1994).

Eleocharis densicaespitosa R. Trevis. & Boldrini, sp. nov. TYPE: BRAZIL, Rio Grande do Sul: Palmares do Sul, Pontal do Anastácio, 25 April 2003, *M.L. Abruzzi 4694* (holotype: HAS!).

Eleocharite quinquangulari Boeck. affinis sed ab ea culmis latioribus; glumis emarginatis et acheniis majoribus differt.

Perennial, caespitose-rhizomatous, with ligneous short rhizomes, hardened bulbous culm-bases, with the culm-shoots recurved, and thick roots. Culms 8-40 cm x (0.9)1-2 mm, quinquangular, irregularly sulcate when dry, spongy, not septate. Sheaths brown to purple at the base, apex oblique, emucronate to slightly protruding mucro, edge firm inconspicuous or with brown dots. Spikelets 8-17 (21) x 3.5-4.5 mm, ovoid to oblong, 40-70(ca. 180)-flowered, not proliferous; lowerscale sterile, cartilaginous, oval, apex acute to obtuse, green, as long as or exceeding the adjacent scales, hyaline margin wide; floral scales 2.3-3.2 x 1.1-1.7 mm, membranous to papery, oval, apex emarginate, spirally arranged, appressed, smooth, inconspicuously veined, keel stramineous , sides brown to vinaceous, hyaline margin and gradual from the rest of the scale; perianth bristles none, stamens 3, anthers 1-1.6 mm, ending in a short apiculum; style trifid. Achene 1-1.2 x 0.6-0.7 mm, trigonous, with abaxial angle salient, obovoid, rounded at the apex, smooth, yellowish white to stramineous; stylopodium pyramidal or hemispheric, yellowish-brown to brown, separated from the achene body by a constriction, with the base somewhat incumbent on the achene apex, ca. ¾ as wide as the achene.

Distribution and Habitat – (Fig. 1 G-L). This species is known to provinces of northeastern of Argentina and coastland in Rio Grande do Sul (Brazil). *Eleocharis densicaespitosa* grows in wet environments, associated to sandy banks or sandy soil near rivers and lagoons.

Etymology - The specific epithet refers to the general aspect of the plant in the field. The tussocks are usually isolated with the culms densely congregate.

Additional material examined - ARGENTINA. Provincia del Chaco: Las Palmas, Feb 1917, *P. Jörgensen 2625* (SI); Provincia de Corrientes: Depto. General Paz, Santos Lugares, 11 Oct 1982, *T.M. Pedersen 13423* (SI); Provincia de Entre Rios: Gualeguaychú, dunas do rio Uruguai, Dec 1936, *A.L. Cabrera 3984* (LP).

BRAZIL. Rio Grande do Sul: Capão da Canoa, 15 Dec 2005, *R. Trevisan 554* (ICN); Cidreira, 02 Jan 1976, *L. Arzivenco s.n.* (ICN 42341); Mostardas, Lagoa do Barro Velho, 30 Dec 1978, *J. Waechter 1131* (ICN); Osório, Fazenda do Arroio, 04 Jan 1950, *B. Rambo 45220* (PACA); Rio Grande, Domingos Petrolini, 05 Oct 1982, *I.V. Gonçalves s.n.* (HURG 0428), FURG - Campus Carreiros, 16 Aug 1997, *Mara & Claudia s.n.* (HURG 1478); FURG - Campus Carreiros, 26 Aug 1997, *A.S. Campos s.n.* (HURG 1510), Ilha dos Marinheiros, 20 Jan 1954, *A. Bertels 1043* (PACA, PEL, UPCB); São José do Norte, Estreito, Jan 1992, *P. Tagliani s.n.* (HURG 2324), São José do Norte, *s.d.*, *P. Tagliani s.n.* (HURG 2203); Tavares, Laguna dos Patos, 22 Feb 2004, *E.N. Garcia & E.J.E. Silva 1016* (PEL), RST 101, 31º26'41"S 51º12'15"W, 23 Oct 2003, *R. Trevisan et al. 96* (ICN); Tramandaí, 4 km ao norte da cidade, Feb 1978, *Pfadenhauer 412* (ICN), CECLIMAR, 07 April 1983, *D.B. Falkenberg s.n.* (ICN 53613), CECLIMAR, 14 Dec 1984, *D.B. Falkenberg 2038* (FLOR); Viamão, Itapuã, 05 Jan 1984, *M. Sobral 3145* (SI), Parque Estadual de Itapuã, Praia de Fora, 30°23'10"S

51°01'14"W, 23 Oct 2006, *R. Trevisan et al. 666* (ICN), Parque Estadual de Itapuã, próximo à Lagoa do Palácio, 30°23'55"S 50°57'18"W, 20 Nov 2006, *R. Trevisan et al. 717* (ICN), Viamão, Parque Estadual de Itapuã, próximo à Lagoa Negra 30°22'44"S 51°00'01"W, 10 Nov 2005, *R. Trevisan 470* (ICN), Parque Estadual de Itapuã, 30º22'54"S 50°59'59"W, 15 Dec 2005, *P.M.A. Ferreira 126* (ICN), Parque Estadual de Itapuã, 30º23'00"S 51°01'06"W, 15 Dec 2005, *P.M.A. Ferreira 115* (ICN).

Observations - *Eleocharis densicaespitosa* can be placed in *Eleocharis* subser. *Sulcatae*. This new species is similar to *Eleocharis quinquangularis* Boeck., from which it is differentiated by coarse culms, floral scales emarginate and larger achenes (*vs*. culms 0.4-0.6 mm wide, floral scales acute to obtuse and achenes 0.8 x 0.5-0.6 mm). *E. quinquangularis* occurs in Bolivia, Paraguay, northeastern of Argentina and south and central-west of Brazil (Barros 1928; Svenson 1937; Trevisan and Boldrini 2008). Other species with emarginate scales that could be confused with *E. densicaespitosa* is *E. filiculmis* Kunth. However, *E. filiculmis* has achenes with perianth bristles, as was reported by González-Elizondo (1994) and Trevisan and Boldrini (2008). *E. filiculmis* is widely distributed from Mexico to South America and West Indies (Svenson 1937; González-Elizondo 1994). Moreover, *E. densicaespitosa* can be misinterpreted as *E. balansaiana* Boeck., but in the original description Boeckeler (1879) made a strong point that the latter has no emarginate scales at all. This is an important feature to conclude that both species are really different. *E. balansaiana* was described to Paraguay. An illustration presented by Barros (1928: 460) under the name *E. sulcata* Nees ex Boeck. (a synonym of *E. filiculmis*) is in fact *E. densicaespitosa*. The specimen used by Barros (1928) to prepare the drawing was collected by *Hauman* in Entre Rios, Argentina.

Eleocharis hatschbachii R. Trevis., sp. nov. TYPE: BRAZIL, Mato Grosso do Sul: Corumbá, Passo da Lontra, 18 May 2002, *G. Hatschbach et al. 73128* (holotype: MBM!).

Eleocharite minaro Boeck. affinis sed ab ea vaginis apicibus inflatis, hyalinis et fragilibus differt. *Eleocharite glaucovirenti* Boeck. similis sed ab ea spiculis plurifloribus, 10-20 floribus; antheris 1.7 mm longis, longioribus; stylopodio a strictura segregato ab achenio apice differt.

Perennial, caespitose, usually with ligneous vertical caudex. Culms 7-35 cm x 0.5-0.7 mm, irregularly sulcate when dry, spongy, not septate. Sheaths brown to vinaceous at the base, apex somewhat inflated, oblique, emucronate, edge hyaline inconspicuous easily torn. Spikelets 5.5-9 x 2-2.2 mm, lanceoloid, 10-20-flowered, often proliferous; lower scale sterile, cartilaginous, oval, apex obtuse to emarginate, green, as long as or shorter than the adjacent scales, hyaline margin wide; floral scales 2,7-2.9 x 1 mm, membranous to papery, oval to lanceolate, apex obtuse or emarginate, spirally arranged, appressed, smooth, inconspicuously veined, keel green to stramineous, sides stramineous, light-brown to vinaceous, hyaline margin developed and gradual from the rest of the scale; perianth bristles 6, white, retrorse-spinulose, unequal, shorter than the achene; stamens 3, anthers 1.7 mm, ending in a short apiculum; style trifid. Achene 1-1.4 x 0.5-0.6 mm, trigonous, with abaxial angle salient, obovoid, rounded at the apex, slightly reticulate, yellowish brown to olivaceous with black lines; stylopodium pyramidal, yellowish brown to light-brown, separate from the achene by a constriction, 2/3 to 3/4 as wide as the achene.

Distribution and Habitat – (Fig. 2 A-F). This species is known from northeastern of Argentina and Pantanal biome in Mato Grosso do Sul (Brazil). *Eleocharis hatschbachii* grows in wet environments, associated to sandy soil near rivers and lagoons in plain reliefs.

Etymology - The epithet of *Eleocharis hatschbachii* is a compliment to Gert Hatschbach who collected the type material and is an important Brazilian Botanist that has collected several specimens from Brazilian flora.

Additional material examined - ARGENTINA. Corrientes: Depto. San Martin, Colonia C. Pellegrini, Estero del Miriñay, 22 Feb 1976, *A. Krapovickas et al. 29519* (MBM).

BRAZIL. Mato Grosso do Sul: Corumbá, Fazenda Nhumirim, sub-região da Nhecolândia, Pantanal, 18º59'S 56º39'W, 90 m.s.m., 14 April 1998, *V.J. Pott & A. Pott 3364* (CPAP, ICN); Miranda, 90 km W da cidade em direção a Corumbá, 21 Jul 1977, *P.H. Gibbs et al. 5381* (MBM).

Observations - *Eleocharis hatschbachii* is a coarse and long-culmed species, with big achenes which are typical features of the *Sulcatae* group. This species can be misidentified as *E. minarum* Boeck., *E. glauco-virens* Boeck. or *E. viridans* Kük. However, the new species can be distinguished from *E. viridans* and *E. minarum* by the sheaths somewhat inflated with delicate edges (*vs.* tubular sheaths with firm edges). *E. viridans* occurs in south Brazil, Paraguay, Argentina and Uruguay (Svenson 1937; Trevisan and Boldrini 2008). *E. minarum* was described to the state of Minas Gerais (Brazil) and was cited to Paraguay (Mereles 1988). *E. hatschbachii* has spikelets many-flowered, 10-20-flowered; anthers 1.7 mm long and stylopodium separated from the achene by a constriction, whereas *E. glauco-virens* has spikelets few-flowered, 5-12-

flowered; anthers 0.4 mm long and stylopodium confluent with the achene, with prominent ring-like basal margin.

Eleocharis ramboana R. Trevis. & Boldrini, sp. nov. TYPE: BRAZIL, Rio Grande do Sul, São José dos Ausentes, Silveira, Pousada das Araucárias, 31 Dec 2006, *R. Trevisan 813* (holotype: ICN!).

Eleocharite niederleinii Boeck. affinis sed ab ea culmis capillaribus, vaginis basis stramineis; spiculis albidis vel stramineis, 4-5 mm longis et acheniis minoribus differt.

Perennial, caespitose, usually with thin non-lignified base. Culms 6-19 cm x 0.1-0.2 mm, capillary, quadrangular, sulcate when dry, spongy, not septate. Sheaths stramineous at the base, apex tubular, slightly oblique, emucronate or with mucro somewhat insinuating, edge firm, stramineous or with red dots. Spikelets 4-5 x 1-1.8 mm, ellipsoid or lanceoloid, 10-15-flowered, often proliferating; lower scale sterile, papery, oval, apex firm acute to obtuse, green, as long as than adjacent scales, hyaline margin wide, floral scales 1.8-2.4 x 0.5-0.7 mm, membranous, oval, apex acute to obtuse, spirally arranged, appressed to slightly divergent, smooth, inconspicuously veined, keel green, sides translucent white to stramineous, hyaline margin developed and gradual from the rest of the scale; perianth bristles 2, rudimentary or lacking; stamens 3, anthers 0.9-1.2 mm, ending in a short apiculum; style trifid. Achene 0.8-0.9 x 0.5-0.6 mm, trigonous, with abaxial angle salient, obovoid, truncate at the apex, smooth to finely reticulate, yellowish white to stramineous, iridescent; stylopodium short pyramidal or flat with central apiculum, trilobed, green to brown, confluent with the achene, as wide as the achene apex to slightly narrower, with the base somewhat incumbent on the apex of the achene.

Distribution and Habitat – (Fig. 2 G-L). This species is known from highlands of southern Brazil. *Eleocharis ramboana* grows in wet grasslands, usually associated to basalt-originated soils.

Etymology - The epithet of *Eleocharis ramboana* is a compliment to Balduino Rambo who was an important Brazilian Botanist that published several studies about the flora of Rio Grande do Sul and made one of the most important biological collections of southern Brazil.

Additional material examined - BRAZIL. Rio Grande do Sul: Derrubadas, Parque do Turvo, V-1983, *M. Sobral 1972* (ICN); Giruá, Granja Sodal, 25 May 1966, *K. Hagelund 4332* (ICN); Muitos Capões, BR 285, km 140, 03 Nov 2003, *R. Trevisan et al. 137* (ICN); Santo Ângelo, Granja Piratini, 15 Feb 1973, *K. Hagelund 6570* (ICN); São José dos Ausentes, Fazenda São José dos Ausentes, 22 Jan 2002, *I. Boldrini et al. 1234, 1235* (ICN). Santa Catarina. Bom Retiro, Campo dos Padres, 24 Jan 1954, *B. Rambo 60026* (PACA); São Bento do Sul, BR 280, 26°17’45”S 49°23’23”W, 22 Oct 2005, *R. Trevisan 420* (ICN).

Observations -. *Eleocharis ramboana* can be placed within the subseries *Chaetariae*. This species is small, with capillary culms and proliferous spikelets but the sheaths are tubular with firm apex, which are characteristics of some species of the *Sulcatae* group. *E. ramboana* can be confused with *E. niederleinii* Boeck. from which it can be distinguished by sheaths stramineous at the base; spikelet 4-5 mm long, floral scales translucent white and smaller achenes (*vs.* sheaths vinaceous at the base; spikelet 4.5-8 mm long, floral scales vinaceous to dark-brown and achenes 0.9-1.3 x 0.6-0.7 mm). *E. niederleinii* occurs in southern Brazil and northeastern of Argentina. Another species similar to the new species is *E. nana* Kunth from which it can be differentiated

by tubular sheath, with slightly oblique apex, emucronate or with mucro somewhat insinuating, edge firm, stramineous or with red dots; perianth bristles rudimentary or lacking (*vs*. sheath somewhat inflated, with oblique apex, emucronate, with delicate and inconspicuous edge; perianth bristles 5-6, as long as or exceeding the stylopodium).

Eleocharis urceolatoides R. Trevis. & Boldrini, sp. nov. TYPE: BRAZIL, Rio Grande do Sul, São Gabriel, assentamento Guajuviras, 28 May 2006, *R. Trevisan 641* (holotype: ICN!).

Eleocharis urceolata (Liebm.) Svenson affinis sed ab ea acheniis minoribus, olivaceis vel estramineis; setis hypoginis evolutis; stylopodio angustiore quam achenio differt. *Eleocharite barrosii* Svenson similis sed ab ea spiculis basi culmis praesentibus; glumis spiratim dispositis, lateribus vinaceis; setis hypoginis evolutis; stylopodio angustiore quam achenio differt.

Perennial, caespitose, forming dense mats, with thin non-lignified base. Culms 4-9 cm x 0.1-0.2 mm, capillary, quadrangular, sulcate when dry, spongy, not septate. Sheaths vinaceous at the base, apex somewhat inflated, oblique, emucronate, with the edge delicate, inconspicuous and hyaline. Spikelets 3-5 x 1.3-2.5 mm, ovoid, 8-18-flowered, usually proliferating, often sessile at the base of the culms; lower scale sterile, membranous to papery, oval, apex acute, stramineous to vinaceous, as long as the adjacent scales, hyaline margin wide; floral scales 1.5 x 0.5-0.8 mm, membranous, oval, apex acute, spirally arranged, somewhat divergent, smooth, inconspicuously veined, keel green to stramineous, sides vinaceous, hyaline margin developed and gradual from the rest of the scale; perianth bristles 5-6, shorter than the achene, white, smooth or sparsely retrorse-scabrose; stamens 1-3, anthers 0.4-0.6 mm, ending in a short apiculum;

style trifid. Achene 0.7-0.8 x 0.4-0.5 mm, trigonous, with abaxial angle salient, obovoid, urceolate, truncate at the apex, smooth to striate-reticulate, olivaceous to stramineous; stylopodium flat with a central apiculum, light-green to brown, confluent with the achene, as wide as the achene apex to a slightly narrower.

Distribution and Habitat – (Fig. 2 M-R). The new species occurs in Paraguay and Brazil (Mato Grosso do Sul and Rio Grande do Sul). It is possible that this species can occur also in the provinces of the northeastern of Argentina. The species grows in swamps and wet grasslands.

Etymology - The epithet refers to *Eleocharis urceolata* (Liebm.) Svenson, which is very similar to the new species.

Additional material examined - BRAZIL. Mato Grosso do Sul: Corumbá, 18 Mar 1906, *L.M. Etchichury 19* (SI).

PARAGUAY. Asunción: Trinidad, Coronel Oviedo, Oct 1942, *Pavetti & Rojas 10064* (SI); Depto. Cordillera: San Bernardino, Feb 1915, *E. Hassler 61* (SI).

Observations - *Eleocharis urceolatoides* can be placed in *Eleocharis* subser. *Chaetariae*. The general aspects of the plant reminds of that in *E. urceolata,* another species positioned in the *Chaetariae* group. The new species can be distinguished from *E. urceolata* by the smaller achenes, olivaceous to stramineous; perianth bristles developed, and stylopodium narrower than the achene (*vs.* achenes 0.8 mm long, pale gray to brownish yellow; perianth bristles lacking, and stylopodium as wide as the achene). *E. urceolata* occurs in Mexico and Nicaragua (Svenson 1937; González-Elizondo 1994, 2001). Other species that appears to be similar to *E. urceolatoides* is *E. barrosii* Svenson, from which can be differentiated by amphicarpic spikelets; floral scales spirally arranged, vinaceous; perianth bristles developed, and stylopodium

narrower than the achene (*vs.* spikelets on the top of a developed culm; floral scales sub-distichous, light-brown; perianth bristles rudimentary or lacking, and stylopodium as wide as the achene). *Eleocharis barrosii* was described to northeastern Argentina.

Lectotypification

Eleocharis glauco-virens Boeck., *Cyp. Nov.* 1: 13. 1888. – Type: [BRAZIL], "Brasilia, prov. Rio de Janeiro, herb. *Glaziou 15686*" (lectotype (designated here): C, photo!; isolectotype: K, photo!).

The protologue of *Eleocharis glauco-virens* cited two collections for this species: "*Herb. Glaziou no. 15686, Brasilia, in prov. Rio de Janeiro; in prov. Santa Catharina leg. E.Ule*".

The collection of *Ule s.n.* from Santa Catarina, cited in the protologue, was not located and probably will never be. No other collection of *E. glauco-virens* is known to southern of Brazil.

The lectotype collected in Rio de Janeiro is preserved at C herbarium. The sheet presents, however, two different species. The material that fits in Boeckeler's description is the right side of the sheet, and the material in the left side is *Eleocharis loefgreniana* Boeck., which was identified by Svenson as *Eleocharis filiculmis* (according to Svenson's label on the sheet).

New Synonymy

Eleocharis loefgreniana Boeck., *Cyp. Nov.* 2: 12. 1890. – Type: Brazil, São Paulo, *Loefgren* 146 (holotype: C, photo!).

Eleocharis almensis D.A. Simpson, *Kew Bull.* 48:73. 1993. Type: Brazil. Bahia: Rio de Contas, Pico das Almas, Fazenda Silvina, 23 Oct. 1988, *Harley et. al. 25305* (holotype: CEPEC; isotype: K, MBM!). **syn. nov.**

We studied the types and the original descriptions of both names and we did not find features that allow us to keep them as different taxa. The shape of the sheaths, spikelets, floral scales, achenes and number of the flowers are the same. We found some differences in the length of the achenes and the width of the culms, but we believe that this few differences are parts of the natural variability of the species.

In the original description of *Eleocharis almensis*, Simpson (1993) compared the new species with *E. filiculmis*, however the comparison with *E. loefgreniana* was not presented.

Preliminary key to the species of Eleocharis ser. Tenuissimae in Brazil

1. Plants usually short, with thin non-ligneous base; achenes smooth to deeply cancellate; chasmogamous basal spikelets sometimes present; culms capillary to filiform, 0.1-0.5 mm wide (up to 0.7 mm wide in *E. bahiensis* and *E. braunii*). [subser. *Chaetariae*]
2. Achenes cancellate to subcancellate.
    3. Achenes 2-2.6 mm long….. *Eleocharis alveolatoides* S. González & Reznicek
    3. Achenes 0.7-1.2 mm long.
        4. Spikelets 1-flowered, usually the spikelet on the tip of the culm bearing a male flower and the spikelets at the base of the culms with bisexual or female flowers…….. *Eleocharis chamaegyne* L.T. Eiten
        4. Spikelets 3 to many-flowered.

5. Stylopodium confluent with the achene apex.

6. Plants with long stolons; achenes 0.8 mm long; stylopodium low-pyramidal. …….....……*Eleocharis glauca* Boeck.

6. Plants caespitose, not stoloniferous; achenes 0.9-1.4 mm; stylopodium pyramidal-acuminate. ……..…..……*Eleocharis retroflexa* (Poir.) Urb.

5. Stylopodium separated from the achene apex by a constriction.

7. Floral scales obtuse to emarginate, spirally arranged; perianth bristles none. ..... *Eleocharis bahiensis* D.A. Simpson

7. Floral scales acute, subdisctichous; perianth bristles equaling the achene. ……..…… *Eleocharis subfoliata* C.B. Clarke

2. Achenes smooth to slightly reticulate.

8. Styles bifid and trifid in the same spikelet; achenes biconvex and trigonous mixed in the same spikelet; floral scales obtuse to emarginate……

…….……... *Eleocharis bicolor* Chapman

8. Styles trifid; achenes all trigonous; floral scales acute, obtuse or emarginate.

9. Floral scales distichously or sub-distichously arranged.

10. Achenes shining white; sometimes with slender, elongated rhizomes. ..... *Eleocharis amazonica* C. B. Clarke

10. Achenes stramineous to olivaceous; caespitose, not rhizomatous .....*Eleocharis minima* Kunth *s.l.*

9. Floral scales spirally arranged.

11. Floral scales with the sides translucent white to stramineous.

12. Perianth bristles rudimentary or lacking. ……..

…… *Eleocharis ramboana* R. Trevis. & Boldrini

12. Perianth bristles 5-8, unequal, as long as or exceeding the stylopodium.
    13. Culms 0.5-0.7 mm wide; spikelets with more than 20 flowers; perianth bristles yellowish white ……
    ……*Eleocharis braunii* H. Hess
    13. Culms 0.1-0.3 mm wide; spikelets 5-12-flowered; perianth bristles reddish brown. ……..…..*Eleocharis nana* Kunth

11. Floral scales with the sides light-brown, purple-brown, dark-brown, to vinaceous (seldom in *E. nigrescens* the floral scales can be yellowish brown).
    14. Achenes rounded at the apex; stylopodium separate from the achene body by a constriction, 1/3 to 1/2 as wide as the achene.
        15. Spikelets narrow-ovoid, lanceoloid, oblong to oblong-lanceoloid.
            16. Spikelets 10-25-flowered; floral scales loosely imbricate, with apex acute to obtuse. …. *Eleocharis angustispicula* R. Trevis.
            16. Spikelets up to 60-flowered; floral scales densely imbricate, with apex obtuse to emarginated. … *Eleocharis morroi* D.A. Simpson
        15. Spikelets ovoid to wide-ovoid. …….……
        ……*Eleocharis nigrescens* (Nees) Kunth
    14. Achenes truncate at the apex; stylopodium confluent with the achene, as wide as the achene apex to slightly narrower.
        17. Spikelets ellipsoid to lanceoloid; achenes 0.9-1.3 mm long; anthers 1-1.4 mm long. …….*Eleocharis niederleinii* Boeck.

17. Spikelets ovoid; achenes 0.6-0.8 mm long; anthers 0.4-0.6 mm long.
    18. Spikelets 8-18-flowered; floral scales acute; perianth bristles 5-6, shorter than the achene. …..…..*Eleocharis urceolatoides* R. Trevis. & Boldrini
    18. Spikelets up to 60-flowered; floral scales obtuse to emarginate; perianth bristles rudimentary or lacking. ……..*Eleocharis setifolia* (A. Rich.) A. Raynal

1. Plant usually tall, with ligneous or robust base; achenes smooth or obscurely reticulate; basal spikelets not present; culms filiform to coarse, 0.5-2.5 mm wide, if less than 0.5 mm wide than the base is ligneous or robust. [subser. *Sulcatae*]
    19. Plants with ligneous short rhizomes, hardened bulbous culm-bases, with the culm-shoots recurved.
        20. Culms 1-2 mm wide; floral scales emarginate; achenes 1-1.2 x 0.6-0.7 mm. …….*Eleocharis densicaespitosa* R. Trevis. & Boldrini
        20. Culms 0.4-0.6 mm wide; floral scales acute to obtuse; achenes 0.8 x 0.5-0.6 mm. ……. *Eleocharis quinquangularis* Boeck.
    19. Plants caespitose, with robust or ligneous culm-bases, usually forming a caudex, with the culm-shoots erect.
        21. Spikelets obovoid, wide-ovoid to globose.
            22. Spikelets wide-ovoid to globose; perianth bristles none …… …… *Eleocharis nudipes* (Kunth) Palla
            22. Spikelets obovoid; perianth bristles 5, not exceeding the stylopodium. …….*Eleocharis pachystyla* (C. Wright) C.B. Clarke

21. Spikelets ellipsoid, cylindrical, ovoid to lanceoloid.
    23. Floral scales emarginate.
        24. Spikelets 10-25-flowered; floral scales loosely imbricate; achenes1-1.4 mm long.
            25. Culms 0.5-0.7 mm wide; achenes slightly reticulate; spikelets usually proliferous. …….*Eleocharis hatschbachii* R. Trevis.
            25. Culms 0.2-0.5 mm wide; achenes smooth; spikelets not proliferous ……..…….....*Eleocharis loefgreniana* Boeck.
        24. Spikelets 30-70-flowered; floral scales densely imbricate; achenes 0.5-0.9 mm long.
            26. Achenes smooth; perianth bristles 6, shorter than the achene. ……..……..*Eleocharis filiculmis* Kunth
            26. Achenes longitudinally rugose; perianth bristles none. ……..*Eleocharis rugosa* D.A. Simpson
    23. Floral scales acuminate, acute to obtuse, not emarginate.
        27. Sheaths with the apex truncate to slightly oblique, the edges firm, conspicuous.
            28. Floral scales without hyaline margin; culms quinquangular; sheaths with apex truncate, emucronate; spikelets not proliferous. ……..…….*Eleocharis dunensis* Kük.
            28. Floral scales with hyaline margin conspicuous; culms quadrangular; sheaths with apex slightly oblique, emucronate or somewhat with insinuating mucro; spikelets usually

proliferous…….. *Eleocharis viridans* Kük. and *E. minarum* Boeck. (see comments below)

27. Sheaths with apex clearly oblique, with the edges delicate, hialine, inconspicuous.

29. Spikelets 10-20-flowered; anthers 1.7 mm long; stylopodium separated from the achene by a constriction……. …….. *Eleocharis hatschbachii* R. Trevis.

29. Spikelets 5-12-flowered; anthers 0.4 mm long; stylopodium confluent with the achene, with prominent ring-like basal margin. ……*Eleocharis glauco-virens* Boeck.

This preliminary key is an attempt to facilitate the identification of the species of the intricate series *Tenuissimae* recorded to Brazil until now. Obviously, there are several undescribed and/or misinterpreted and badly known species that need a reviewing (e.g. *Eleocharis emarginata* (Nees) Klotzch ex Boeck.).

Barros (1960) cited *Eleocharis barrosii* Svenson to southern Brazil, however the material studied by Barros was not correctly identified. Therefore, the occurrence of this species was not confirmed to the country yet.

Comparing the descriptions and materials of *Eleocharis minarum* and *E. viridans* we did not find features that allow us to clearly separate both species as different taxa. In the descriptions of *E. minarum*, Boeckeler (1890) and Svenson (1939) pointed out that spikelets are 6-15-flowered, but the type material has spikelets with more than 20 flowers. The original description of *E. minarum* was based on a material without mature achenes, so, it is hard to conclude if the *E. minarum* and *E. viridans* are the same taxon.

ACKNOWLEDGMENTS - The authors are grateful to the curators of the herbaria indicated for loan of specimens; to P.M. Ferreira for the critical review of the manuscript; and to Dr. Olof Ryding (from C herbarium) for providing images of the type of *Eleocharis glauco-virens*. RT thanks the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Capes) for scholarship support.

LITERATURE CITED

Barros, M. 1928. Ciperáceas Argentinas I: género *Heleocharis* R.Br. *Anales del Museo Nacional de Historia Natural Bernardino Rivadavia* 34: 425-496.

Boeckeler, O. 1879. Mittheilung über Cyperaceen. *Flora* 62(10): 158-160.

Boeckeler, O. 1890. *Beiträge zur Kenntniss der Cyperaceen*. Varel a.d. Jade (Germany: Breitschädel & Vogt. Heft II. 43p.

Eiten, L. T. 1972. Name change for *Eleocharis pygmaea* (Süss.) L.T. Eite. *Phytologia* 22(5): 423.

Goetghebeur, P. 1998. Cyperaceae. Pp. 141-190 in *The Families and Genera of Vascular Plants, vol IV, Flowering plants – monocotyledons,* eds. K. Kubitzki, H. Huber, P.J. Rudall, P.S. Stevens and T. Stützel. Berlin: Springer-Verlag.

González Elizondo, M. S. 1985. Tres nuevas especies Mexicanas de Cyperaceae. *Phytologia* 57(6): 381-385.

González-Elizondo, M. S. 1994. *Eleocharis* R. Br. (Cyperaceae). Pp. 458-464 in *Flora Mesoamericana* vol. 6, eds. G. Davidse, M. Souza and A. O. Chater. Mexico, D.F.:Universidad Nacional Autónoma de Mexico, St. Louis: Missouri Botanical Garden, London: The Natural History Museum.

González Elizondo, M. S. and A. A. Reznicek. 1996. New *Eleocharis* (Cyperaceae) from Venezuela. *Novon* 6(4): 356-365.

González Elizondo, M. S. and P. M. Peterson. 1997. A classification of and key to the supraspecific taxa in *Eleocharis* (Cyperaceae). *Taxon* 46: 433-449.

González Elizondo, M. S. and J. A Tena-Flores. 2000. *Eleocharis* (Cyperaceae) in the New World. Pp. 637-643, in *Monocots: Systematics and Evolution*, eds. K. L. Wilson and D. A. Morrison. Melbourne: CSIRO Publishing.

González Elizondo, M. S. 2001. *Eleocharis* (Cyperaceae). Pp. 758-765, in *Flora de Nicaragua*, eds. W. D. Stevens, C. Ulloa Ulloa, A. Pool and O. M. Montiel. Saint Louis: Missouri Botanical Garden Press.

Hess, H. 1953. Über die Gattungen *Heleocharis* und *Carex* aus Angola und dem unteren Kongo. *Bericht der Schweizerischen Botanischen Gesellschaft* 63: 317–359.

Hess, H. 1957. Beiträge zur Kenntnis der Gattung *Heleocharis* in Brasilien. *Bericht der Schweizerischen Botanischen Gesellschaft* 67: 91-94.

Mereles, F. & M. S. González-Elizondo. 2003. *Eleocharis canindeyuensis* F. Mereles & S. González (Cyperaceae), una nueva espécie para la flora del Paraguay. *Candollea* 58(1): 75-78.

Mereles, F. 1988. Tres Ciperáceas del género *Eleocharis*, nuevas para la flora del Paraguay. *Candollea* 43: 415-416.

Mereles, F. 1990. *Eleocharis occidentalis* Mereles, spec. nov., una nueva especie en el género *Eleocharis* R. Br. (Cyperaceae-Scirpeae). *Candollea* 45: 653-655.

Mora-Osejo, L. E. 1978. Nueva Cyperaceae de la laguna de Tota, Boyacá, Colômbia. *Caldasia* 12(58): 277-281.

Roalson, E.H. & E. A. Friar. 2000. Infrageneric classification of *Eleocharis* (Cyperaceae) revisited: evidence from the internal transcribed spacer (ITS) region of nuclear ribosomal DNA. *Systematic Botany* 25: 323-336.

Roalson, E. H. & C. Hinchliff. 2007. Phylogenetic relationships in *Eleocharis* R.Br. (Cyperaceae): comparisons with classification, morphology, biogeography and physiology. Pp. 304-307, in *A Botânica no Brasil: pesquisa ensino e políticas públicas*, org. L. M. Barbosa and N. A. dos Santos Jr. São Paulo: Sociedade Botânica do Brasil, 58º Congresso Nacional de Botânica.

Simpson, D. A. 1987. New Species of *Cyperus* and *Eleocharis* from Bahia: Notes on Brazilian Cyperaceae II. *Kew Bulletin* 42(4): 897-901.

Simpson, D. A. 1988a. Some problems in *Eleocharis*. Notes on Brazilian Cyperaceae: III. *Kew Bulletin* 43(1): 127-134.

Simpson, D.A. 1988b. A re-appraisal of *Eleocharis setifolia* & *E. nigrescens* (Cyperaceae). *Kew Bulletin* 43(3): 423-430.

Simpson, D. A. 1993. New species and a new combination in Cyperaceae from Brazil. Notes on Brazilian Cyperaceae: VI. *Kew Bulletin* 48(4): 699-713.

Svenson, H. K. 1937. Monographic studies in the genus *Eleocharis* IV. *Rhodora* 39: 210-231, 236-273.

Svenson, H. K. 1939. Monographic studies in the genus *Eleocharis* V. *Rhodora* 41: 43-77, 90-110.

Trevisan, R. & I.I. Boldrini. 2008. O gênero *Eleocharis* R. Br. (Cyperaceae) no Rio Grande do Sul, Brasil. *Revista Brasileira de Biociências* 6(1): 7-67.

Zavaro-Pérez, C. A. & G. Pabón-Garcés. 1995. De Eleocharitibus cubensibus notulae (in floram novam cubensem studia intendentia). *Fontqueria* 47: 269-272.

Figure Legends

FIG. 1. *Eleocharis angustispicula*. A. Habit. B-C. Sheath, ventral and dorsal view. D. Spikelet. E. Scale, dorsal view. F. Achene with rudimentary perianth bristles. *E. densicaespitosa.* G. Habit. H-I. Sheath, ventral and dorsal view. J. Spikelet. K. Scale, dorsal view. L. Achene. (All species were drawn from the holotypes).

FIG. 2. *Eleocharis hatschbachii*. A. Habit. B-C. Sheath, lateral and dorsal view. D. Spikelet. E. Scale, dorsal view. F. Achene. *E. ramboana.* G. Habit. H-I. Sheath, lateral and dorsal view. J. Spikelet. K. Scale, lateral view. L. Achene. *E. urceolatoides.* M. Habit. N-O. Sheath, ventral and dorsal view. P. Spikelet. Q. Scale, dorsal view. R. Achene with perianth bristles. (All species were drawn from the holotypes).

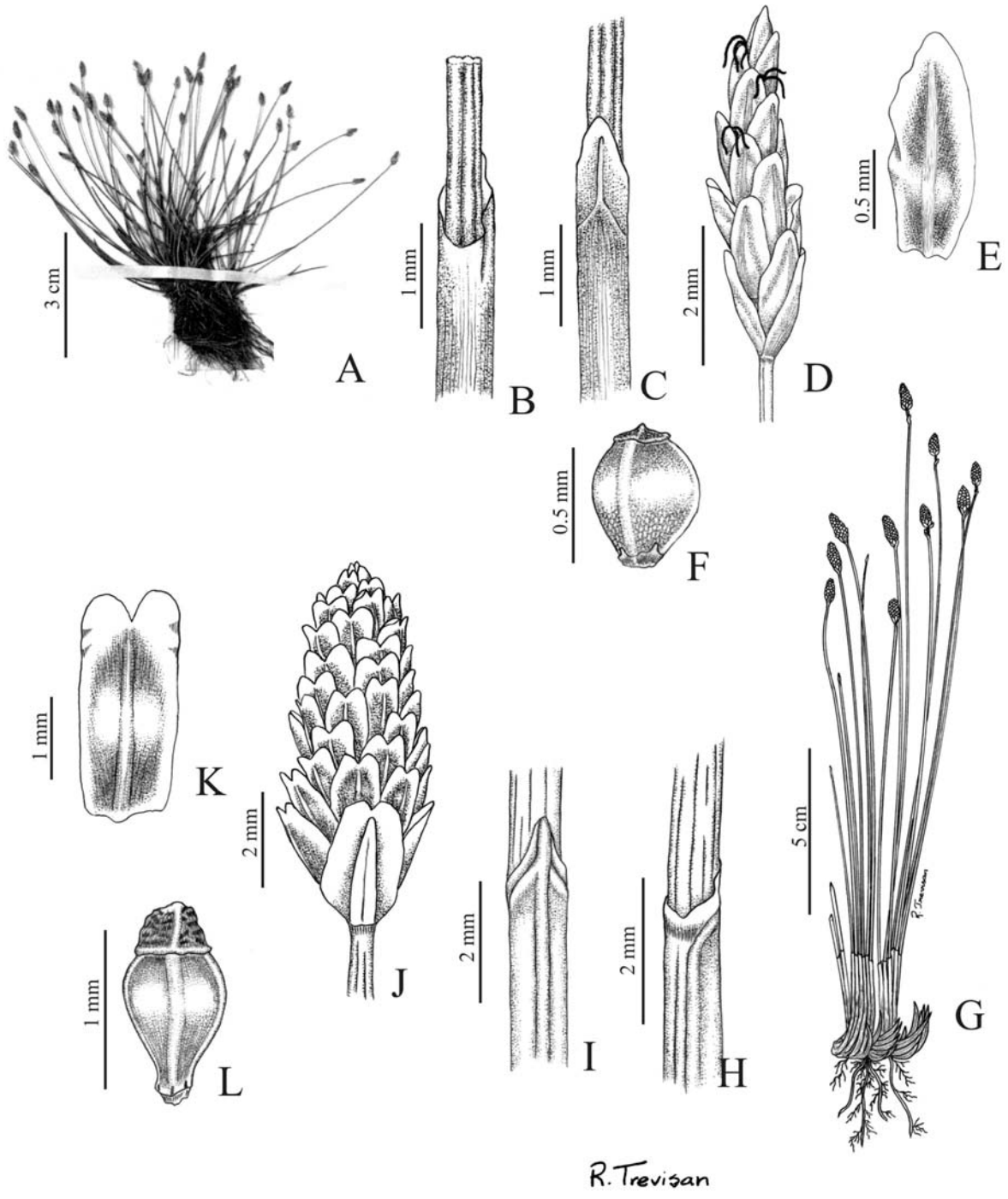
3 cm
A
1 mm
B
1 mm
C
2 mm
D
0.5 mm
E
0.5 mm
F
5 cm
G
2 mm
H
2 mm
I
2 mm
J
1 mm
K
1 mm
L
R. Trevisan

Figure 1

1

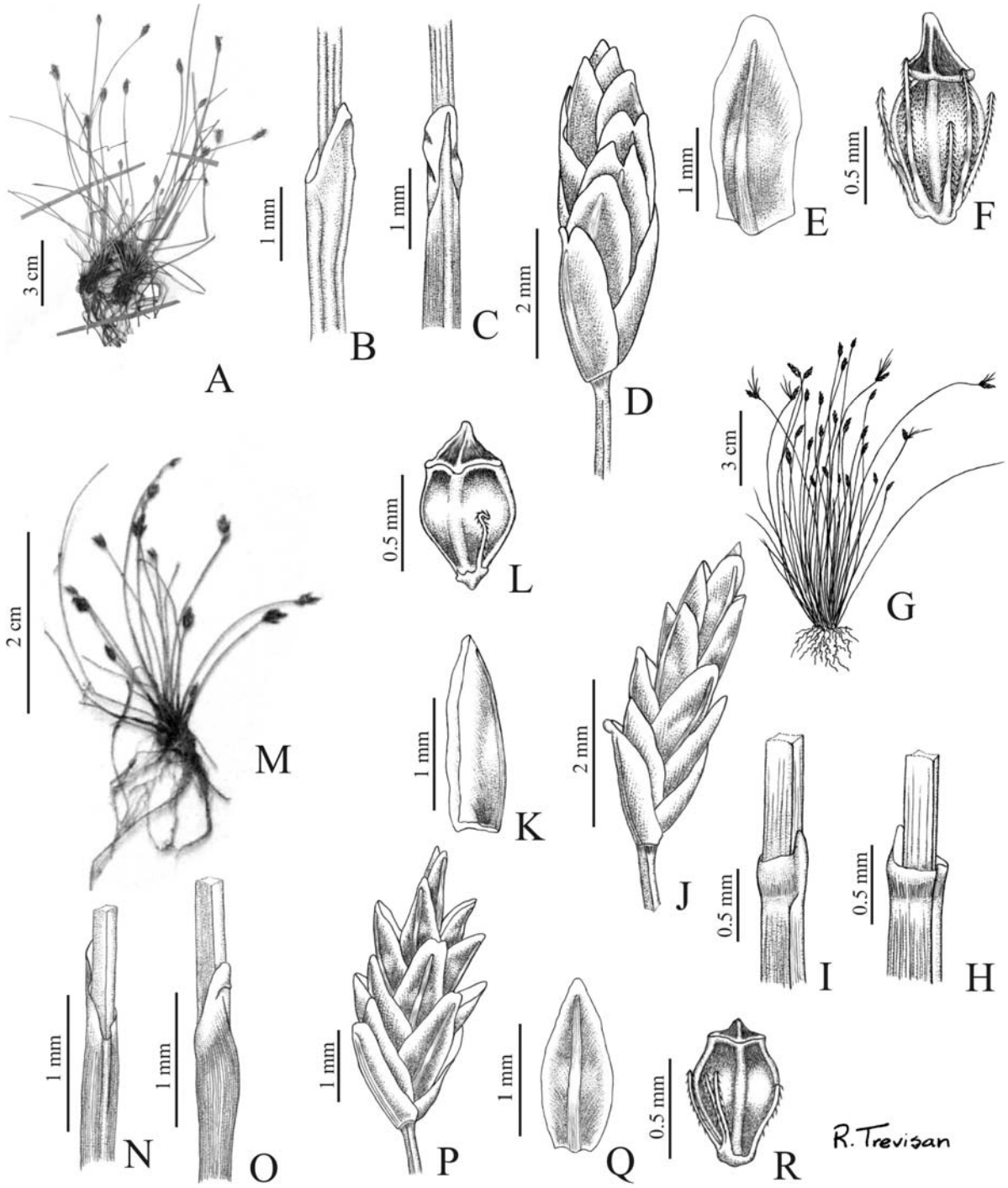
3 cm
A
1 mm
B
1 mm
C
2 mm
D
1 mm
E
0.5 mm
F
3 cm
G
0.5 mm
L
2 cm
M
1 mm
K
2 mm
J
0.5 mm
I
0.5 mm
H
1 mm
N
1 mm
O
1 mm
P
1 mm
Q
0.5 mm
R
R. Trevisan

Figure 2

1

ARTIGO 4

Some novelties in *Eleocharis* subg. *Limnochloa* and *Eleocharis* subg. *Eleocharis* subser. *Ocreatae* (Cyperaceae) from Brazil

Este artigo será submetido para publicação na Brittonia.

Some Novelties in Eleocharis subg. Limnochloa and Eleocharis subg. Eleocharis subser. Ocreatae (Cyperaceae) from Brazil

RAFAEL TREVISAN[1], M. SOCORRO GONZÁLEZ-ELIZONDO[2], DAVID J. ROSEN[3], AND ILSI IOB BOLDRINI[4]

[1]Programa de Pós-Graduação em Botânica, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves, 9500, Porto Alegre, Rio Grande do Sul, 91501-970, Brazil; rftrevisan@yahoo.com.br

[2]CIIDIR IPN Unidad Durango, Sigma 119 Fracc. 20 de Noviembre II, 34220, Durango, Dgo., Mexico; herbario_ciidir@yahoo.com.mx

[3]Department of Biology, Lee College, Baytown, TX 77522-0818, U.S.A. drosen@lee.edu

[4]Departamento de Botânica, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves, 9500, Porto Alegre, Rio Grande do Sul, 91501-970, Brazil; ilsi.boldrini@ufrgs.br

Abstract. Trevisan, R. (Programa de Pós-Graduação em Botânica, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves, 9500, Porto Alegre, Rio Grande do Sul, 91501-970, Brazil; e-mail: rftrevisan@yahoo.com.br), M.S. González-Elizondo (CIIDIR IPN Unidad Durango, Sigma 119 Fracc. 20 de Noviembre II, 34220, Durango, Dgo., Mexico), D.J. Rosen (Department of Biology, Lee College, Baytown, TX 77522-0818, U.S.A.) & I.I. Boldrini (Departamento de Botânica, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves, 9500, Porto Alegre, Rio Grande do Sul, 91501-970, Brazil). Some Novelties in Eleocharis subg. Limnochloa and Eleocharis subg. Eleocharis subser. Ocreatae (Cyperaceae)

from Brazil. Brittonia 00: 000-000. Three new species are described for Southern Brazil: **Eleocharis pauciglumis**, a member of Eleocharis subg. Limnochloa, similar to E. acutangula; **Eleocharis atrobrunnea** and **E. parvispicula**, which belong to Eleocharis subg. Eleocharis sect. Eleogenus and are similar to Eleocharis flavescens and E. sellowiana. Morphological descriptions, illustrations, data on habitat, and a key to differentiate them from similar species are presented. In addition, Eleocharis shaffneri is recorded for the Northeastern Brazil. It is the first record to the country and a description for this species is also presented.

Key words: Brazil, Cyperaceae, Eleocharis, Eleogenus, Limnochloa, South America.

Eleocharis R. Br. is a worldwide genus that includes more than 200 species with a remarkable richness in tropical and subtropical America (González-Elizondo & Tena-Flores, 2000). Distinctive features, such as unbranched aerial culms, leaves reduced to tubular sheaths, inflorescence constituted of one spikelet on the apex of culms without involucral bracts, and the stylopodium enlarged and persistent on the achene are uniformly found in the genus. Almost all species of *Eleocharis* are restricted to wetlands, often in muddy soils that are temporarily wet or inundated.

A worlwide taxonomic revision for *Eleocharis* was published by Svenson (1929, 1932, 1934, 1937, 1939) but no recent treatment for the genus exists. Examples of regional treatments can be found in Blake (1939), Barros (1928, 1960), González-Elizondo (1994, 2001), González-Elizondo and Reznicek (1998), Smith et al. (2002), Rosen (2006), Gil and Bove (2007), and Trevisan and Boldrini (2008).

In the New World, *Eleocharis* has more than 145 species, and the four subgenera are represented: *Limnochloa* (P. Beauv. ex T. Lestib.) Torr., *Zinserlingia* T.V. Egorova, *Scirpidium* (Nees) Kukkonen, and *Eleocharis* (González-Elizondo & Tena-Flores, 2000). In Brazil, a recent survey recorded 65 species (Alves et al., 2009) which belong to three subgenera except *Zinserlingia*. This number of the species will probably increase with the description of new taxa.

A group of *Eleocharis* that deserves special attention is *Eleocharis* subg. *Eleocharis* sect. *Eleogenus* (Nees) Benth. & Hook. f. ser. *Maculosae* Svenson, which is the largest series in the section *Eleogenus*, with about 15 species (González-Elizondo & Peterson, 1997). The series *Maculosae* is represented by two subseries, *Ocreatae* (C. B. Clarke) Svenson and *Rigidae* Svenson.

Subseries *Ocreatae* is characterized by (1) distal sheath membranous, delicate, hyaline, often wrinkled and inflated at the apex; (2) style 2-branched, and (3) achenes biconvex, olivaceous, brown, or purple to black (González-Elizondo & Peterson, 1997).

Another group that has been studied recently is *Eleocharis* subg. *Limnochloa* (P. Beauv. ex T. Lestib.) Torr. sect. *Limnochloa* (P. Beauv. ex T. Lestib.) Benth. & Hook. f., including the description of new taxa (González-Elizondo & Reznicek, 1996; Roalson, 1999; Trevisan & Boldrini, 2006; Rosen & Hatch, 2007; Rosen et al., 2007).

Eleocharis subg. *Limnochloa* comprises over 35 species occurring in seasonally wet to permanently flooded habitats mainly from tropical regions (Rosen et al., 2007). It is distinguished from other *Eleocharis* subgenera by a combination of the following morphological characteristics: (1) lower scale appears to be a continuation of the culm; (2) cartilaginous, un-keeled (rarely obscurely-keeled), many-veined floral scales with a distinct hyaline margin; (3) culms that are often as thick as the cylindrical spikelet, and (4) biconvex (rarely trigonous) achenes usually with epidermis of large, conspicuous polygonal cells (Svenson, 1929; González-Elizondo & Peterson, 1997).

In this paper are described three new species of *Eleocharis*. Two of them, *E. atrobrunnea* and *E. parvispicula*, belong to *Eleocharis* subg. *Eleocharis* sect. *Eleogenus* ser. *Maculosae* subser. *Ocreatae*. The other, *Eleocharis pauciglumis*, belongs to *Eleocharis* subg. *Limnochloa*. Keys to differentiate them from similar species are presented. Additionally, a new record of *Eleocharis schaffneri*, which belongs to subseries Ocreatae, to Northeastern Brazil is denoted.

Novelties in the Ocreatae group

NEW SPECIES

Eleocharis atrobrunnea R. Trevis. & S. González, **sp. nov.** Type: Brazil. Rio Grande do Sul: Santo Augusto, rodovia RS-155, km 69, 4 Nov 2003, *Trevisan et al. 150* (Holotype: ICN). Fig. 1A-F.

Eleocharite sellowiana Kunth affinis sed ab ea culmis tenuibus; spiculis vinaceis vel atrobrunneis, 12-25 floribus; acheniis atrobunneis vel nigriscentibus differt. *Eleocharite flavescenti* (Poir.) Urb. similis sed ab ea spiculis atrobrunneis et acheniis atrobrunneis vel nigriscentibus differt.

Perennial herbs, caespitose, usually with thin non-ligneous base, sometimes with slender stolons with roots in the knots. Culms 4-9 cm x 0.4-0.6 mm, transversely elliptic, sulcate when dry, spongy, not septate. Sheaths vinaceous at the base, apex inflated with a hyaline wrinkled portion quite distinct from the base, emucronate, the delicate edge easily torn. Spikelets 3.5-4 x 2 mm, ovoid, 12-25-flowered, not proliferous; lower scale sterile, papery, oval, apex firm, acute to obtuse, green on the keel and dark on the sides, as long as the adjacent scales, hyaline margin narrow; floral scales 2 x 1 mm, membranous, oval, apex acute to obtuse, spirally arranged, appressed, smooth, inconspicuously veined, keel green, sides vinaceous, dark brown to almost black, hyaline margin developed on the sides and narrow at the apex, gradual from the rest of the scale; perianth bristles 7, yellow to yellowish brown, retrorse-spinulose, slightly shorter than the stylopodium; stamens 3, anthers 0.8 mm long, ending in a short apiculum; style bifid. Achene 0.9-1 x 0.7-0.8 mm, biconvex, obovoid, rounded at the apex, minutely roughened to reticulate and slightly rugose on the distal portion,

dark brown to black; stylopodium pyramidal depressed, green to brown, separated from the achene body by a constriction, ca. ¼ as wide as the achene, with prominent edges.

Distribution and Ecology – Known only from the type locality. *Eleocharis atrobrunnea* was collected in a bog with clear water at the roadside. This poorly known species occurs in a region endangered by the advance of agriculture. At present, the natural vegetation of the northwest of Rio Grande do Sul has been replaced by monocultures of soybean, wheat and maize. In that region the roadsides have an important role in maintenance of the regional species diversity.

Phenology – Flowering and fruiting at spring and summer.

Etymology – The epithet refers to the dark brown color of the spikelets.

Eleocharis atrobrunnea is closely related with *E. flavescens* and *E. sellowiana*. However, it is different from them by the floral scales green on the keel and dark brown or vinaceous on the sides, and the achenes dark brown to black, somewhat puncticulate-reticulate and slightly rugose on the distal portion.

Eleocharis parvispicula R. Trevis. & Boldrini, **sp. nov.** Type: Brazil. Paraná: Foz do Iguaçu, Parque Nacional do Iguaçu, ilhas acima das Cataratas do Iguaçu, 25º36'06"S, 54º21'40"W, 3 Oct 2006, *Labiak et al. 3828* (Holotype: MBM, isotype: UPCB). (Fig. 1G-K)

Eleocharite sellowiana Kunth affinis sed ab ea spiculis minoribus, 3-3.5 mm longis, paucifloribus, glumis albidis vel stramineis et acheniis parum rugosis in supra parte differt.

Perennial herbs, tussock-rhizomatous, with thin rhizomes, base non-lignified. Culms 4-6 cm x 0.8-1 mm, transversely elliptic, sulcate when dry, spongy, not septate. Sheaths stramineous at

the base, apex inflated with hyaline wrinkled portion quite distinct from the base, emucronate, the delicate edges easily torn. Spikelets 3-3.5 x 1.5 mm, ovoid to ellipsoid, 6-8-flowered, not proliferous; lower scale sterile, papery, oval, apex firm, acute to obtuse, green, as long as the adjacent scales, with a wide hyaline margin; floral scales 1.9 x 0.9 mm, membranous, oval, apex acute to obtuse, spirally arranged, apressed, smooth, inconspicuously veined, keel green, sides translucent white to stramineous, margin hyaline gradual from the rest the scale; perianth bristles 7, white, retrorse-spinulose, shorter than the stylopodium; stamens 3, anthers 0.7-0.8 mm, ending in a short apiculum; style bifid. Achene 1.3 x 0.7 mm, biconvex, obovoid, rounded at the apex, slightly rugose at the distal portion, olivaceous; stylopodium conical, green, separated from the achene body by a constriction, ca. of 1/3 as wide as the achene.

Distribution and Ecology – Known only from type locality, but due to the geographic nearness it is possible that this species can occur also in the province of Misiones at Northeastern Argentina. *Eleocharis parvispicula* grows in swamps at the margins of the Iguaçu river.

Phenology – Flowering and fruiting in October and presumably in summer.

Etymology – The epithet refers to the small spikelets.

Eleocharis parvispicula is similar to *E. sellowiana* from which it differs by the smaller, 6-8 flowered spikelets, achenes obovoid, slightly rugose at the distal portion, stylopodium conical, about 1/3 as wide as the achene (vs. spikelets (12-)30-100-flowered; achenes broadly obovoid, smooth at the distal portion, and stylopodium hat-shaped, about 1/2 as wide as the achene).

This new species resembles *Eleocharis rojasiana* Mereles, described from Venezuela (Mereles, 2004), due to the similarities in the general habit. However, *Eleocharis rojasiana* has culms 0.1-0.2 mm wide; sheath apex somewhat inflated and not wrinkled; stamens 1;

achenes 0.9-1 x 0.8 mm, broadly obovoid with rounded base, smooth at the distal portion, and stylopodium hat-shaped, about ½ to 2/3 as wide as the achene.

NEW RECORD

Eleocharis schaffneri Boeck., *Bot. Jahrb. Syst.* 7: 274. 1886.

Annual or short-perennial herbs, caespitose, usually with thin non-ligneous base. Culms 20-35 cm x 1-1.2 mm, cylindric or elliptic, sulcate when dry, spongy, not septate. Sheaths stramineous or reddish at the base, apex hyaline not inflated or slightly so, not wrinkled and continuous from the base, emucronate, the delicate edge easily torn. Spikelets 3-7 x 2.5-3 mm, ovoid, 40-80-flowered, not proliferous; lower scale sterile, papery, oval to oblong, apex obtuse, green, almost equal to the adjacent scales, with wide hyaline margin; floral scales 1.8 x 0.5-0.6 mm, membranous, oval to lanceolate, apex acute to obtuse, spirally arranged, somewhat spreading, easily falling at maturity, smooth, inconspicuously veined, keel stramineous to green, sides brown to vinaceous, margin hyaline gradual from the rest of the scale; perianth bristles 7-8, white, retrorse-spinulose to almost smooth, shorter than the stylopodium; stamens 2, anthers 0.4-0.5 mm, ending in a short apiculum; style bifid. Achene 0.7-0.8 x 0.4-0.5 mm, biconvex, obovoid, apex rounded, smooth, olivaceous sometimes blackened by black dots or lines; stylopodium hat-shaped, olivaceous to yellowish brown, separate from the achene body by a constriction, ½ as wide as the achene.

Distribution and Ecology – From Mexico, Costa Rica (González-Elizondo, 1994), Guatemala, Nicaragua (González-Elizondo, 2001), and NE Brazil. *Eleocharis schaffneri* occurs in swamps in the Agreste region or coastland.

Specimens examined. BRAZIL. PARAÍBA: Esperança, 14 Sep 1958, *Moraes 1915* (SI).

SERGIPE: Aracajú, 9 Oct 2005, *Koczicki 511* (MBM).

Eleocharis schaffneri belongs to *Eleocharis* sect. *Eleogenus* ser. *Maculosae* subser. *Ocreatae* and is recorded for the first time from Brazil. This species is similar to *Eleocharis sellowiana* from which is distinguished by the smaller achenes, scales, and anthers, and by sheaths not wrinkled and not inflated or slightly so.

KEY TO THE SPECIES OF *ELEOCHARIS* SUBG. *ELEOCHARIS* SECT. *ELEOGENUS* SER. *MACULOSAE* SUBSER. *OCREATAE* IN BRAZIL

(Obs.: Achene measurements include the stylopodium)

1. Distal leaf sheaths membranous or scarious, with the upper portion inflated and transversally wrinkled or becoming loose and withered on drying, generally quite distinct from the lower portion.
    2. Mature achenes clearly olivaceous or olivaceous with dark dots or lines on the sides.
        3. Spikelet 6-8-flowered; floral scales translucent white to stramineous; achenes obovoid, slightly rugose at the distal portion, stylopodium conical, about 1/3 as wide as the achene body ……..…*E. parvispicula* R. Trevis. & Boldrini
        3’. Spikelet (12-)30-100-flowered; floral scales stramineous to vinaceous; achenes broadly obovoid, smooth at the distal portion, stylopodium hat-shaped, about 1/2 as wide as the achene body ……..…. *E. sellowiana* Kunth
    2’. Mature achenes light brown, dark brown to black.
        4. Floral scales yellowish to light brown or brown; achenes light brown to dark brown. ……..……*E. flavescens* (Poir.) Urb.
        4’. Floral scales vinaceous to dark brown; achenes dark brown or black.
            5. Achenes 0.9-1 x 0.7-0.8 mm; floral scales 2 x 1 mm, vinaceous, dark brown to almost black; spikelet 3.5-4 x 2 mm, 12-25-flowered. …….. ……. *E. atrobrunnea* R. Trevis. & S. González

5’. Achenes 1.2–1.7 x 0.6–0.9 mm long; floral scales 2.2–3.5 x 1–1.2 mm, usually dark purple to vinaceous, rarely almost black; spikelet 6–11 x 3 mm, 30–80-flowered. ……. *E. maculosa* (Vahl) Roem. & Schult.

1’. Distal leaf sheaths hyaline, usually translucent, with the upper portion not or slightly inflated, not wrinkled, easily torn, sometimes prolonged into a long point, generally in a continuous differentiation from the base towards the apex.

6. Mature achenes olivaceous, often with dark dots or lines on the sides.

7. Culms 0.3-0.5 mm wide; achenes 0.8-1.3 mm long; floral scales 2.3-2.5 x 0.9-1 mm; anthers 1.2 mm long. ……..…..…..*E. olivaceonux* D.A. Simpson

7’. Culms 1-1.2 mm wide; achenes 0.7-0.8 mm long; floral scales 1.8 x 0.5-0.6 mm; anthers 0.4-0.5 mm long. ……..…… *E. schaffneri* Boeck.

6’. Mature achenes dark brown to black.

8. Culms 1.5-6 cmm long; spikelets 1-3-flowered; achenes 1-1.3 x 0.6 mm ……..……..……..……...……*E. capillacea* Kunth

8’. Culms 5-25 cm long; spikelets 6-15-flowered; achenes 1.3-1.5 x 0.7-0.8 mm……..……..……..…… *E. debilis* Kunth

A novelty from the subgenus Limnochloa

Eleocharis pauciglumis R. Trevis. & D.J. Rosen, **sp. nov.** Type: Brazil. Santa Catarina: Garopaba, 16 Mar 1971, *Bresolin 189* (Holotype: HBR). (Fig. 1 L-Q)

Eleocharite acutangula (Roxb.) Schult. affinis sed ab ea culmis tenuibus, trigonis, angulis rotundatis et lateribus plano-convexis; spiculis paucifloribus, 10-25 floribus; glumis laxe imbricatis, late expositis; acheniis angustioribus differt.

Perennial herbs, caespitose-stoloniferous, usually with a creeping and ligneous rootstock. Culms 30-62 cm x 1.5-3 mm, trigonous with the culm faces slightly convex and the angles rounded spongy, not septate. Sheaths vinaceous to black at the base, apex firm, oblique, papery, dorsal mucro absent, edge inconspicuous to somewhat vinaceous. Spikelets 17-30 x 2.8-3 mm, lanceoloid to cylindric, 10-25-flowered, not proliferous; lower scale fertile, coriaceous, oblong, apex obtuse, green, appearing as a continuation of the culm, not overtopping the adjacent floral scales, margin hyaline narrow; floral scales 4.5-5.1 x 2-2.5 mm, cartilaginous, oval-oblong, apex obtuse, spirally arranged, loosely imbricate, apressed to slightly divergent, striate, stramineous, with conspicuously veined, without submarginal band or with a brown submarginal line, margin hyaline developed and clearly delimitated from the rest of the scale; perianth bristles 6-7, white to stramineous, retrorse-spinulose, overtopping or almost equal the stylopodium; stamens 3; anthers 1.8-2.1 mm, ending in a short apiculum; style trifid. Achene 2.5-3 x 1.2-1.5 mm, biconvex to somewhat plano-convex, pyriform, green to stramineous, cancelate, with 13-15 longitudinal rows of rectangular cells oriented horizontally; stylopodium trapezoidal, flattened dorsiventrally, brown, separated from the achene body by a constriction, 2/3 to 3/4 as wide as the achene.

Distribution and Ecology – Known only from coastland of the state of Santa Catarina. *Eleocharis pauciglumis* was collected in bogs permanently flooded in coastland regions with the culms partially submerged, forming clonal masses, generally associated with sandy soil.

Phenology – Flowering and fruiting in summer and fall.

Etymology – The epithet refers to the spikelets with few scales.

Additional specimens examined. BRAZIL. SANTA CATARINA: Florianópolis, Rio Vermelho, 28 Dec 1984, *Souza & Silva-Filho 534* (FLOR, MBM), Santo Antônio de

Lisboa, 19 Nov 1969, *Klein 8444* (HBR), Alto Ribeirão, 20 Nov 1969, *Klein & Bresolin 8482* (HBR); Palhoça, rodovia SC-433, km 8, estrada entre praia da Pinheira e praia do Sonho, 8 Feb 2007, *Lüdtke 759* (ICN); Paulo Lopes, Bom Retiro, 21 Nov 1973, *Bresolin 998* (HBR).

Eleocharis pauciglumis is closely related to *E. acutangula*, however it can be distinguished by the slender culms, trigonous with the culm faces flat or slightly convex and the angles rounded; spikelet 10–25-flowered; floral scales loosely imbricate; achenes 1.2-1.5 mm wide (vs. wider, triquetrous culms with the culm faces concave and the angles acute-winged; spikelet 20-90-flowered; floral scales closely imbricate; achenes 1.3-1.9 mm wide).

Despite of the overlapping of some characteristics between *Eleocharis pauciglumis* and *E. acutangula*, the combination of all these subtle features push the specimens of *E. pauciglumis* away from being just a variant of *E. acutangula* or of another species of the subgenus *Limnochloa*.

KEY TO DIFFERENTIATE *ELEOCHARIS PAUCIGLUMIS* FROM SIMILAR SPECIES OCCURING IN SOUTHERN BRAZIL

1. Floral scales with finely cellular-lineate veins (conspicuously raised veins usually not clearly discernable at 20x); achene apex slightly constricted at the summit into a hard annular thickening usually of the same texture and color as the achene. ..... *E. mutata* (L.) Roem & Schult.

1’. Floral scales coarsely many-veined (conspicuously raised veins clearly discernable at 20x); achene apex weakly to markedly constricted to a short neck between the achene body and the stylopodium.

2. Perianth bristles almost 2-times achene length; mature achenes olivaceous to light brown with 20–28 longitudinal rows of slightly transversely elongated polygonal cells.

3. Culms 1.3–2 mm wide, obtusely trigonous distally; upper sheath apex narrowly acuminate and extended into a soft awn; perianth bristles relatively fine; achene surface finely sculptured to nearly smooth; floral scales medially greenish to stramineous, laterally dark reddish. …… *E. kleinii* Barros

3’. Culms 2–4 mm wide, terete to obscurely 3-angled; upper sheath apex acute, not extended into a soft awn; perianth bristles relatively coarse; achene surface coarsely sculptured; floral scales medially greenish to stramineous with a subapical dark brownish splotch, laterally stramineous. ..... *E. liesneri* S. González & Reznicek

2’. Perianth bristles less than 2-times achene length; mature achenes stramineous, dark green splotched with amber or rarely entirely amber with 11–18 longitudinal rows of deep concave transversely polygonal cells (at least the most centrally located).

4. Culms triquetrous distally, the culm faces concave and the angles acute-winged…….…… *E. acutangula* (Roxb.) Schult.

4’. Culms obscurely 3-angled distally or trigonous with the culm faces flat or slightly convex and the angles rounded.

5. Exposed portion of floral scales longer than wide; spikelet 10–25-flowered; achenes 1.2-1.5 mm wide. … *E. pauciglumis* R. Trevis. & D.J. Rosen

5’. Exposed portion of floral scales about as long as wide; spikelet 40–100-flowered; achenes 1.4-1.6 mm wide. … *E. obtusetrigona* (Lindl. & Nees) Steud.

Acknowledgments

The authors are grateful to the curators of the herbaria indicated for loan of specimens. The first author thanks the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Capes) for scholarship support.

Literature Cited

Alves, M.; A. C. Araújo, A. P. Prata, F. Vitta, S. Hefler, R. Trevisan, A. B. Gil, S. Martins & W. Thomas. 2009. Diversity of Cyperaceae in Brazil. *Rodriguesia* 60(3): XXX-XXX (in press).

Barros, M. 1928. Ciperáceas Argentinas I: género *Heleocharis* R.Br. *Anales del Museo Nacional de Historia Natural "Bernardino Rivadavia"* 34: 425-496.

_____. 1960. Las Ciperáceas del Estado de Santa Catalina. Sellowia 12: 181 – 448.

Blake, S. T. 1939. A monograph of the genus *Eleocharis* in Australia and New Zealand. Proceedings of the Royal Society of Queensland 50: 88 – 132.

Gil, A. S. B & C. P. Bove. 2007. *Eleocharis* R. Br. (Cyperaceae) no Estado do Rio de Janeiro, Brasil. Biota Neotropica 7(1): http://www.biotaneotropica.org.br/v7n1/pt/abstract? Taxonomicreview+bn00507012007 ISSN 1676-0603

González-Elizondo, M. S. 1994. *Eleocharis* R. Br. (Cyperaceae). Pp. 458 – 464. *In:* G. Davidse, M. Souza & A. O. Chater (eds). Flora Mesoamericana, Vol. 6. Alismataceae a Cyperaceae. Universidad Nacional Autónoma de Mexico, Mexico, D.F. - Missouri Botanical Garden, St. Louis - The Natural History Museum, London.

_____. 2001. *Eleocharis* (Cyperaceae) in: Stevens, W. D., C. Ulloa Ulloa, A. Pool y O. M. Montiel (eds.). Flora de Nicaragua. Monogr. Syst. Bot. Missouri Bot. Garden 85(1): 758-765.

_____ & A. A. Reznicek. 1996. New *Eleocharis* (Cyperaceae) from Venezuela. Novon 6(4): 356-365.

_____ & _____. 1998. *Eleocharis* R. Br. Pp. 548–561. *In:* P. E. Berry, B. K. Holst & K. Yatskievych (eds). Flora of the Venezuelan Guayana, Vol. 4. Caesalpiniaceae – Ericaceae. Missouri Botanical Garden Press, St. Louis.

_____ & P. M. Peterson. 1997. A classification of and key to the supraspecific taxa in *Eleocharis* (Cyperaceae). Taxon 46: 433 – 449.

_____ & J. A. Tena-Flores. 2000. *Eleocharis* (Cyperaceae) in the New World. Pp. 637 – 643. *In:* K. L. Wilson & D. A. Morrison (eds.), Monocots: Systematics and Evolution. CSIRO Publishing, Melbourne.

Mereles, M. F. 2004. Una nueva especie de *Eleocharis* (Cyperaceae) para Venezuela. Novon 14(2): 193-195.

Roalson, E. H. 1999. *Eleocharis yecorensis* (Cyperaceae), a new species of spike-sedge from México. Aliso 18: 57–60.

Rosen, D. J. 2006. A systematic study of select species complexes of *Eleocharis* subgenus *Limnochloa* (Cyperaceae). Ph.D. Dissertation. Texas A&M University, College Station.

_____ & S. L. Hatch. 2007. A new species of *Eleocharis* subgen. *Limnochloa* (Cyperaceae) from Bolivia. Brittonia 59(4): 377–379.

_____; _____ & R. Carter. 2007. Infraspecific taxonomy and nomenclature of *Eleocharis acutangula* (Cyperaceae). Journal of the Botanical Research Institute of Texas 1(2): 875 – 888.

Smith, S. G., J. J. Bruhl, M. S. González-Elizondo & F. J. Menapace. 2002. *Eleocharis* R. Br. In: Flora of North America Editorial Committee, eds. Flora of North America North of Mexico, Vol. 23. Oxford Univ. Press, New York. Pp. 60 – 120.

Svenson, H. K. 1929. Monographic studies in the genus *Eleocharis* I. Rhodora 31: 121 –135, 152 – 163, 167 – 191, 199 – 219, 224 – 242.

Svenson, H. K. 1932. Monographic studies in the genus *Eleocharis* II. Rhodora 34: 193 – 203, 215 – 227.

Svenson, H. K. 1934. Monographic studies in the genus *Eleocharis* III. Rhodora 36: 377 – 389.

Svenson, H. K. 1937. Monographic studies in the genus *Eleocharis* IV. Rhodora 39: 210 – 231, 236 – 273.

Svenson, H. K. 1939. Monographic studies in the genus *Eleocharis* V. Rhodora 41: 1 – 19, 43 – 77, 90 – 110.

Trevisan, R. & I. I. Boldrini. 2006. A New Species of *Eleocharis* R. Brown (Cyperaceae) from Southern Brazil. Novon 16(1): 155–157.

_____ & _____. 2008. O gênero *Eleocharis* R. Br. (Cyperaceae) no Rio Grande do Sul, Brasil. Revista Brasileira de Biociências 6(1): 7-67.

FIG. 1. *Eleocharis atrobrunnea*. **A.** Habit. **B.** Sheath, ventral view. **C.** Sheath, dorsal view. **D.** Spikelet. **E.** Scale, dorsal view. **F.** Achene. *E. parvispicula*. **G.** Habit. **H.** Sheath, ventral view. **I.** Spikelet. **J.** Scale, dorsal view. **K.** Achene. *E. pauciglumis*. **L.** Habit. **M.** Sheath, ventral view. **N.** Sheath, dorsal view. **O.** Spikelet. **P.** Scale, dorsal view. **Q.** Achene. (All species were drawn from the holotypes).

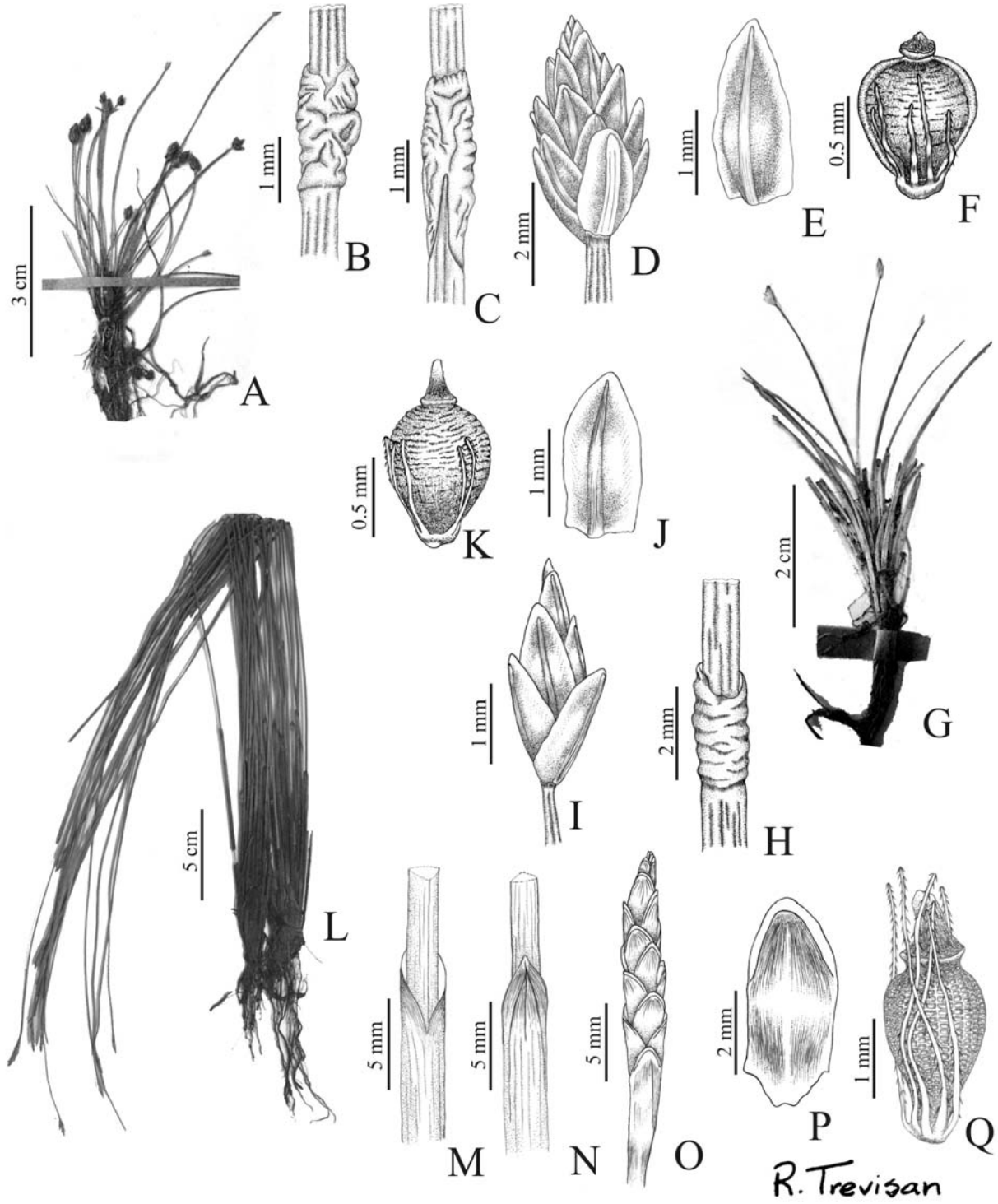
3 cm
A
1 mm
B
1 mm
C
2 mm
D
1 mm
E
0.5 mm
F
2 cm
G
2 mm
H
1 mm
I
1 mm
J
0.5 mm
K
5 cm
L
5 mm
M
5 mm
N
5 mm
O
2 mm
P
1 mm
Q
R. Trevisan

Fig. 1.

REDISCOVERY OF *ELEOCHARIS KLEINII* (CYPERACEAE), AN OVERLOOKED SPECIES FROM THE HIGHLANDS OF SOUTH BRAZIL

R. Trevisan

Programa de Pós-Graduação em Botânica
Universidade Federal do Rio Grande do Sul
Av. Bento Gonçalves 9500
Porto Alegre, Rio Grande do Sul, 91501-970, BRASIL
rftrevisan@yahoo.com.br

D.J. Rosen

S.M. Tracy Herbarium
Department of Ecosystem Science & Management
Texas A&M University
College Station, Texas 77843-2126, U.S.A.

I.I. Boldrini

Departamento de Botânica
Universidade Federal do Rio Grande do Sul
Av. Bento Gonçalves 9500
Porto Alegre, Rio Grande do Sul, 91501-970, BRASIL
ilsi.boldrini@ufrgs.br

ABSTRACT

Dr. Manuel Barros described *Eleocharis kleinii* in 1966 based on only one collection from Santa Catarina state, Brazil. The species is closely related to *E. liesneri* differing in features of the culms, floral scales, perianth bristles, and achene surface sculpturing. An expanded description, notes on ecology and conservation status, additional and recent specimen citations from Santa Catarina and Rio Grande do Sul states, a key to distinguish *E. kleinii* from the similar species, and illustration are presented.

RESUMO

Dr. Manoel Barros descreveu *Eleocharis kleinii* em 1966 tendo como base um único material coletado no estado de Santa Catarina, Brasil. *E. kleinii* é semelhante à *E. liesneri* diferindo desta pelas características do escapo, glumas, cerdas perigoniais e ornamentação da superfície do aquênio. Este trabalho consiste de uma descrição ampliada da espécie, notas ecológicas e status de conservação, citação de materiais recentemente coletados nos estados de Santa Catarina e Rio Grande do Sul, uma chave dicotômica para distinguir *E. kleinii* de espécies semelhantes e ilustrações.

Eleocharis R. Br. is a worldwide genus that includes ca. 200 species with a remarkable richness in tropical and subtropical America (González-Elizondo & Tena-Flores 2000). Distinctive features, such as unbranched aerial culms, leaves reduced to tubular sheaths, an inflorescence constituted of one spikelet on the apex of culms without involucral bracts, and the stylopodium enlarged and persistent on the achene are uniformly found in this genus. Almost all species of *Eleocharis* are restricted to wetlands, often in muddy soils that are temporarily wet or inundated. The genus has not been treated comprehensively since the seminal work of Svenson (1929, 1932, 1934, 1937, 1939). Others (Blake 1939; Barros 1947, 1960; González-Elizondo 1994; Faria 1998; González-Elizondo & Reznicek 1998; Smith et al. 2002; Gil 2007; Trevisan 2005) have provided more regional treatments.

Trevisan and Boldrini (2005) published records of *Eleocharis ochrostachys* Steud. from Rio Grande do Sul and Santa Catarina States, Brazil. However, additional study of the specimens cited, including comparison to types of *E. ochrostachys*, led us to consider that these collections possibly represented an undescribed species of *Eleocharis*. Recent correspondence with Drs. Rosa Guaglianone (SI) and Socorro González-Elizondo (CIIDIR) has brought to our attention that one of the specimens studied by the first author (*Klein 3718a*) while visiting Herbário Barbosa Rodrigues (HBR) in September, 2006, is the holotype of a poorly known species from the highlands of South Brazil, *Eleocharis kleinii* Barros. The holotype bears no annotation as either *E. kleinii*, or as a type, hence our earlier opinion that it was an undescribed species. We fond no reference to this species in checklists or floristic treatments since the protologue, although it is to be included in the forthcoming *Catalogo de la Flora del Cono Sur* (pers. comm. Drs. Rosa Guaglianone and Socorro González-Elizondo).

The protologue of *Eleocharis kleinii* provides only a brief description based on a single specimen from Santa Catarina state with no illustration. The purpose of this manuscript is to improve the knowledge of *E. kleinii* by providing an expanded description, ecological information and conservation status, additional specimen citations, a key to distinguish *E. kleinii* from the similar species, and illustration.

Eleocharis kleinii Barros, Sellowia 18:49. 1966. (**Fig. 1 a–e**). TYPE: BRAZIL: Santa Catarina, Irineópolis (=Valões), 10 Dec 1962, *R.M. Klein 3718a* (HOLOTYPE: HBR!; ISOTYPE: SI!).

Perennial herb; roots coarse, fibrous, mostly drab-brown; rhizomes elongated, 2–3 mm thick, dark maroon, the scales 1.2–1.5 cm long. **Culms** obtusely trigonous distally, terete proximally, 30–70 cm × 1.3–2 mm, soft, internally spongy with incomplete transverse septa, smooth to finely longitudinally striate, light green (grayish green when dry). **Leaves** 2, reduced to sheaths, membranous, loose, friable, proximally venose, upper sheath 7–18 cm, apex narrowly acuminate and extended into a soft awn, proximally dark maroon, becoming chestnut to tawny distally. **Spikelets** cylindric, acute, 12–32 × 2.5–4 mm, two times wider than culms, 16- to 30-flowered; proximal scale empty (rarely with a flower), amplexicaulous and appearing as a continuation of the culm; remaining fertile floral scales conspicuously arranged in 4 spiraled rows, weakly imbricate, somewhat appressed to loose at maturity, ovate, 5–6.2 × 2–3.5 mm, medially cartilaginous, marginally and distally translucent hyaline-erose, central area slightly round-keeled, apex acute, abaxiall veins slightly raised to cellular-lineate (the centrally located veins sometimes reddish), only mid-vein distinguishable in adaxial view, medially greenish to stramineous, laterally reddish. **Flowers** with 6 perianth bristles, slender distally, becoming slightly coarser proximally, sub-equal, exceeding the stylopodium, densely retrorsely spinulose to below the middle with fine spinules, white to yellowish white; stamens 3; anthers 1.9–2.1 mm long, yellow to stramineous; style bifid or trifid. **Achenes** biconvex, obovoid to obpyriform, 2–2.2 mm × 1.3–1.4 (1.9) mm, with 20–28 longitudinal rows of slightly transversely elongated polygonal cells, finely sculptured to nearly smooth at 20×, dull buff yellow maturing to olivaceous, apex constricted to a distinct neck. **Stylopodium** triangularly elongate, dorsoventrally compressed with a thickened basal rim, somewhat curvate, 0.7–1.5 × 0.5–0.6 mm, dark brown.

Distribution.—South America: Brazil (Rio Grande do Sul and Santa Catarina states). Endemic to the highlands of South Brazil, this species has been endangered by the silviculture of *Pinus* species. Some wetlands have been dried to cultivate this exotic species on a large scale. The species fits in category of Vulnerable in level D (UICN 2001).

Habitat.—The species grows in permanently flooded environments in highlands of South Brazil. The plants generally have culms partially submerged, forming clonal masses (Fig. 2). *Eleocharis kleinii* occurs above 30º latitude S, between 500–1400 m above sea. These high regions are the coldest in South Brazil, with an average temperature of ca. 17ºC and winter occurrences of frost or snow (Boldrini 1997). The pluviometry is 1500 to 2000 mm a year with rains distributed throughout the year (Moreno 1961).

Other Specimens Examined. **BRAZIL. Rio Grande do Sul:** Cambará do Sul, Faxinal, Dec 1983, *M. Sobral & J. R. Stehmann 2717* (FLOR, ICN), Cambará do Sul, Feb 1948, *B. Rambo 36659* (PACA); Campestre da Serra, BR 116, km 70, 03 Nov 2003, *Trevisan, R. Lüdtke, M. Vignoli-Silva & L. Mentz 133* (ICN); São Francisco de Paula, 1996, *H.M. Longhi-Wagner* (ICN 129292); São Francisco de Paula, 29º17'57" S 50º20'08.8" W, 28 Nov 2003, *Trevisan & Boldrini 309* (ICN, MO, TAES); São José dos Ausentes, Serra da Rocinha, 03 Feb 1953, *B. Rambo* 53898 (HBR, PACA). **Santa Catarina:** Bom Jardim da Serra, desfiladeiro do Funi, Feb 1989, *M. Sobral et al. 6480* (ICN); Bom Jardim da Serra, Serra do Oratório, 15 Dec 1958, *R. Reitz & R. Klein* 7991 (HBR); Matos Costa, SC 302, km 31, 26º27'41" S 51º07'32,1" W, 21 Dec 2006, *R. Trevisan 804* (ICN).

Barros (1966) correctly placed *Eleocharis kleinii* in subgen. *Limnochloa* (P. Beauv. ex Lestib.) Torr. This species is included in this subgenus on the basis of the following features: indurate floral scales with a distinct hyaline margin; proximal scale appearing as a continuation of the culm; achenes ornamented with longitudinal rows of polygonal cells (González-Elizondo & Peterson 1997). Barros (1966) indicated that *E. kleinii* was very close to *E. elongata* Chapm., sharing with it slender culms and aquatic habitat. However, we believe that *E. kleinii* is most closely related to *E. liesneri* S. González & Reznicek (Fig. 1 f–g), another species from the highlands of South America (González-Elizondo & Reznicek 1998; Rosen 2006). *Eleocharis kleinii* differs from *E. liesneri*

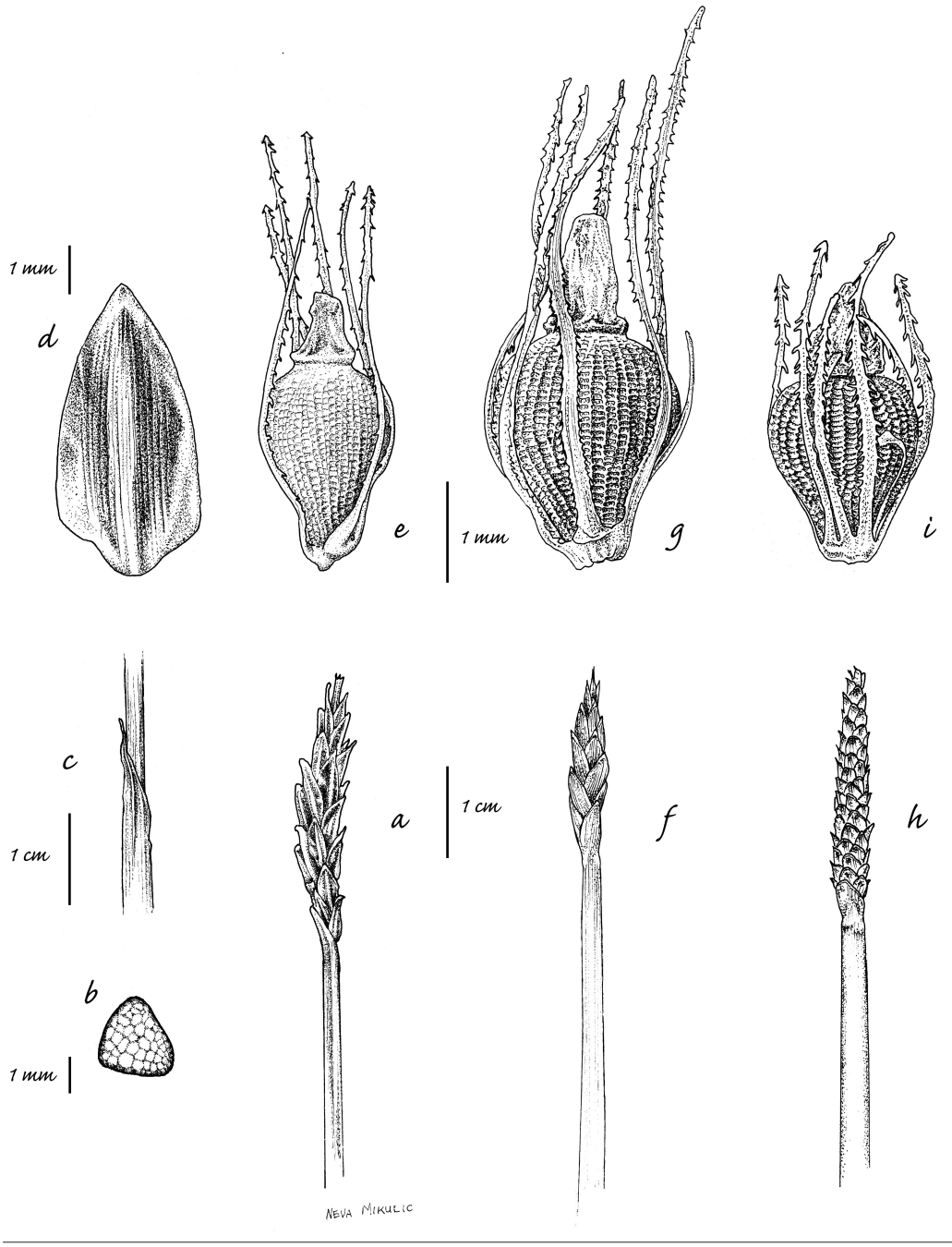

Fig. 1. *Eleocharis kleinii* Barros. **a.** Detail of spikelet and distal end of culm. **b.** Cross section at distal end of culm. **c.** Detail of upper leaf sheath apex. **d.** Fertile floral scale. **e.** Detail of achene. *Eleocharis liesneri* S. González & Reznicek. **f.** Detail of spikelet and distal end of culm. **g.** Detail of achene. *Eleocharis obtusetrigona* (Lindl. & Nees) Steud. **h.** Detail of spikelet and distal end of culm. **i.** Detail of achene. Drawn by Neva Mikulicz.

Fig. 2. Habitat of *Eleocharis kleinii* Barros. Photograph taken in Santa Catarina state, Matos Costa, SC 302, km 31, 26º27'41" S 51º07'32,1" W in 21 Dec 2006. Land clearing in the background of the picture is in preparation for potato cultivation.

in its obtusely trigonous culms, narrowly acuminate leaf sheaths extended into a soft awn, floral scales medially greenish to stramineous and laterally dark reddish, finely sculptured to nearly smooth achenes, and less coarse perianth bristles. *Eleocharis kleinii* also appears to be closely related to *E. obtusetrigona* (Lindl. & Nees) Steud. (Fig. 1 h–i), differing in its shorter and narrower culms, narrowly acuminate leaf sheath apex, fewer flowered spikelets, longer, less imbricate and conspicuously laterally reddish floral scales, relatively longer and less coarse perianth bristles, and achenes that are finely sculptured to nearly smooth with more numerous longitudinal rows of epidermal cells. The occurrence in *E. kleinii* of floral scales with medially greenish to stramineous and laterally reddish coloration is unique among currently known New World species of subg. *Limnochloa*. The following key will help distinguish between these three taxa.

KEY TO SEPARATE *E. KLEINII*, *E. LIESNERI*, AND *E. OBTUSETRIGONA*

1. Exposed portion of floral scales longer than wide; spikelet 12–30-flowered; perianth bristles over 2-times achene length; mature achenes olivaceous to light brown with 20–28 longitudinal rows of slightly transversely elongated polygonal cells.
   2. Culms 1.3–2 mm wide, obtusely trigonous distally; upper sheath apex narrowly acuminate and extended into a soft awn; perianth bristles relatively fine; achene surface finely sculptured to nearly smooth; floral scales medially greenish to stramineous, laterally dark reddish **E. kleinii**
   2. Culms 2–4 mm wide, terete (obscurely 3-angled); upper sheath apex acute, not extended into a soft awn; perianth bristles relatively coarse; achene surface coarsely sculptured; floral scales medially greenish to stramineous with a subapical dark brownish splotch, laterally stramineous **E. liesneri**
1. Exposed portion of floral scales about as long as wide; spikelet 40–100-flowered; perianth bristles less

than 2-times achene length; mature achenes dark green splotched with amber or rarely entirely amber with 11–18 longitudinal rows of transversely reniform (at least the most centrally located) polygonal cells
E. obtusetrigona

Faria (1998) cited *Eleocharis laxiflora* (Thwaites) H. Pfeiff. (a currently accepted synonym of *E. ochrostachys*) from São Paulo state, however, the description and illustrations are close to *E. kleinii* and perhaps those materials studied belong instead to this species. The superficial resemblance of *E. kleinii* to the Old World *E. ochrostachys* is due to the occurrence in both species of spikelets wider than the slender culms and weakly imbricate floral scales. *Eleocharis kleinii* differs markedly from *E. ochrostachys* in the nature of the constriction between the stylopodium and achene. In *E. kleinii*, the stylopodium is well diferentiated from the achene apex, which is markedly constricted to a short neck. In *E. ochrostachys*, the stylopodium arises from the central sunken region of an annular thickening at the achene apex. *Eleocharis ochrostachys* also differs from *E. kleinii* in having usually distally terete to weakly-angled culms, acute leaf sheaths, and red-maculate floral scales with wider marginally and apically translucent hyaline-erose regions.

ACKNOWLEDGMENTS

The authors are grateful to curators of the herbaria indicated for loan of specimens. The first author thanks the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Capes) for scholarship support. Special thanks to Neva Mikulicz for preparing the illustration and to Drs. Rosa Guaglianone and Socorro González-Elizondo for their help and suggestions.

REFERENCES

Barros, M. 1947. *Cyperaceae*. In: H. Descole, ed. Genera et Species Plantarum Argentinarum 4(1):1–243.

Barros, M. 1960. Las Ciperáceas del Estado de Santa Catalina. Sellowia 12:181–448.

Barros, M. 1966. Uma nova Ciperácea em Santa Catarina. Sellowia 18:49.

Blake, S.T. 1939. A monograph of the genus *Eleocharis* in Australia and New Zealand. Proc. Roy. Soc. Queensland 50:88–132.

Boldrini, I.I. 1997. Campos do Rio Grande do Sul: Caracterização Fisionômica e Problemática Ocupacional. Bol. Inst. Biociências: Ecologia 56:1–33.

Faria, A.D. 1998. O gênero *Eleocharis* R. Br. (Cyperaceae) no Estado de São Paulo. Dissertação de Mestrado. Universidade Estadual de Campinas, São Paulo.

Gil, A.S.B and C.P. Bove. 2007. *Eleocharis* R. Br. (Cyperaceae) no Estado do Rio de Janeiro, Brasil. Biota Neotrop. 7(1): http://www.biotaneotropica.org.br/v7n1/pt/abstract? Taxonomicreview+bn00507012007 ISSN 1676-0603.

González-Elizondo, M.S. and A.A. Reznicek. 1998. *Eleocharis* R. Br. In: P.E. Berry, B.K. Holst, and K. Yatskievych, eds. Flora of the Venezuelan Guayana, Vol. 4. *Caesalpiniaceae–Ericaceae*. Missouri Botanical Garden Press, St. Louis. Pp. 548–561.

González-Elizondo, M.S. 1994. *Eleocharis* R. Br. (Cyperaceae). In: G. Davidse, M. Souza, and A.O. Chater, eds. Flora Mesoamericana, Vol. 6. *Alismataceae* a Cyperaceae. Universidad Nacional Autónoma de Mexico, Mexico, D.F.; Missouri Botanical Garden, St. Louis; The Natural History Museum, London. Pp. 458–464.

González-Elizondo, M.S. and P.M. Peterson. 1997. A classification of and key to the supraspecific taxa in *Eleocharis* (Cyperaceae). Taxon 46:433–449.

González-Elizondo, M.S. and J.A. Tena-Flores. 2000. *Eleocharis* (Cyperaceae) in the New World. In: K.L. Wilson and D.A. Morrison, eds. Monocots: Systematics and Evolution. CSIRO Publishing, Melbourne. Pp. 637–643

Moreno, J.A. 1961. Clima do Rio Grande do Sul. Boletim Geográfico do RS, Secretaria da Agricultura, Porto Alegre, Ano 6. v.11, 134p.

Rosen, D.J. 2006. New and disjunct records of *Eleocharis liesneri* (Cyperaceae) from South America. Sida 22: 781–786.

Smith, S.G., J.J. Bruhl, M.S.González-Elizondo, and F.J. Menapace. 2002. *Eleocharis* R. Br. In: Flora of North America Editorial Committee, eds. Flora of North America North of Mexico, Vol. 23. Oxford Univ. Press, New York. Pp. 60–120.

Svenson, H.K. 1929. Monographic studies in the genus *Eleocharis* I. Rhodora 31:121–135, 152–163, 167–191, 199–219, 224–242.

Svenson, H.K. 1932. Monographic studies in the genus *Eleocharis* II. Rhodora 34:193 –203, 215–227.

Svenson, H.K. 1934. Monographic studies in the genus *Eleocharis* III. Rhodora 36:377–389.

Svenson, H.K. 1937. Monographic studies in the genus *Eleocharis* IV. Rhodora 39:210–231, 236–273.

Svenson, H.K. 1939. Monographic studies in the genus *Eleocharis* V. Rhodora 41:1–19, 43–77, 90–110.

Trevisan, R. 2005. O gênero *Eleocharis* R. Br. (Cyperaceae) no Rio Grande do Sul, Brasil. Dissertação de Mestrado: Universidade Federal do Rio Grande do Sul.

Trevisan, R. and I.I. Boldrini. 2005. *Eleocharis ochrostachys* Steud. (Cyperaceae), nova ocorrênia para os Estados do Rio Grande do Sul e Santa Catarina, Brasil. Acta Bot. Brasilica 19:695–699.

UICN. 2001. Categorías y Criterios de la Lista Roja de la UICN: Versión 3.1. Comisión de Supervivencia de Especies de la UICN. UICN, Gland, Suiza y Cambridge, Reino Unido.

CONSIDERAÇÕES FINAIS

Ao longo de seis anos (Mestrado + Doutorado) estudando o gênero *Eleocharis*, foi possível constatar algumas peculiaridades sobre a taxonomia do gênero que são importantes de serem destacadas.

Embora tenhamos buscado outros caracteres para trabalhar a taxonomia, não podemos negar que, em *Eleocharis*, a identificação das espécies é altamente dependente da presença de frutos maduros nas espiguetas e isto muitas vezes é um fator limitante quando os exemplares são coletados com espiguetas muito jovens.

Eleocharis é um gênero bastante diverso no Brasil, com estimativa inicial de 63 espécies. Todavia, com a intensificação das coletas e a revisão de um número maior de exemplares, foi possível descobrir 11 espécies novas e uma nova ocorrência, aumentando para 75 o número de espécies no Brasil. A partir disso fica claro que a diversidade do gênero está subestimada e provavelmente vai aumentar à medida que os estudos com o gênero forem sendo feitos para outras regiões do país, podendo ultrapassar 80 espécies.

Entretanto, para completar a revisão do gênero para o Brasil, algumas etapas precisam ser vencidas: (i) intensificar coletas em regiões do país pobremente conhecidas, incluindo coleta de material para possíveis estudos moleculares; (ii) ter acesso aos materiais depositados no exterior, incluindo os tipos nomenclaturais e os materiais estudados para a elaboração da *Flora Brasiliensis* publicada no século XIX; (iii) e conseguir financiamento para um trabalho como este.

Acreditamos que algumas espécies de *Eleocharis* se prestariam muito bem para estudos evolutivos, principalmente por apresentarem expressiva reprodução sexuada e

assexuada concomitante. Além disso, são espécies fáceis de cultivar em casa de vegetação.

Algo que já observamos a campo e também em plantas mantidas em cultivo, é que em algumas espécies da ser. *Tenuissimae* os indivíduos produzem espiguetas com flores desenvolvidas, entretanto, antes mesmo da formação dos frutos, estas espiguetas definham e acabam proliferando, não produzindo aquênios maduros. Muitas vezes, nestes casos, a correta identificação do material fica comprometida. Segundo pesquisadores da Universidade de Londrina, algumas plantas proliferadas mantidas em cultivo por mais de dois anos não produziram aquênios maduros. Nestas espécies, o processo que faz com que a haja sobrepujança da reprodução vegetativa em detrimento da reprodução sexuada ainda não é compreendido, ainda mais após a planta ter gasto grande quantidade de energia na produção de espiguetas e flores. Geralmente, a espigueta já está em antese quando na axila da gluma inferior inicia-se a proliferação. Não se sabe se a falta de fecundação desencadeia o processo de proliferação ou se o processo de proliferação bloqueia a produção de frutos. Em todas as espiguetas prolíferas observadas não foi constatada a presença de aquênios maduros.

Em *Eleocharis* os cromossomos são holocêntricos, e é muito comum a quebra e fusão de cromossomos com conseqüente alteração no número e tamanho dos mesmos. Neste sentido, estudar a evolução cromossômica no gênero e as conseqüências nos modos de reprodução das espécies é algo interessante e que poderia ajudar a entender os processos evolutivos em outras espécies com este tipo de cromossomo ou mesmo naquelas que apresentam cromossomos com centrômero bem definido.

Outro projeto interessante a ser desenvolvido é a revisão de *Eleocharis minima* e espécies afins em toda a América, na busca de uma melhor delimitação das espécies. Entretanto um projeto como este exigiria a colaboração de ciperólogos de outros países

americanos, principalmente para a coleta de material para possíveis estudos moleculares.

Eleocharis apresenta uma grande importância ecológica nos ecossistemas em que as espécies ocorrem. Pode-se dizer que as áreas úmidas estão grandemente ameaçadas tanto pela poluição das águas, quanto pelas secas devido às grandes alterações climáticas atuais.

Em suma, as possibilidades de estudos com *Eleocharis* são infinitas nas mais diferentes áreas, tanto em taxonomia quanto em evolução, citogenética ou ecologia.

Livros Grátis

(http://www.livrosgratis.com.br)

Milhares de Livros para Download:

Baixar livros de Literatura
Baixar livros de Literatura de Cordel
Baixar livros de Literatura Infantil
Baixar livros de Matemática
Baixar livros de Medicina
Baixar livros de Medicina Veterinária
Baixar livros de Meio Ambiente
Baixar livros de Meteorologia
Baixar Monografias e TCC
Baixar livros Multidisciplinar
Baixar livros de Música
Baixar livros de Psicologia
Baixar livros de Química
Baixar livros de Saúde Coletiva
Baixar livros de Serviço Social
Baixar livros de Sociologia
Baixar livros de Teologia
Baixar livros de Trabalho
Baixar livros de Turismo