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Considerations on the genus *Schizachyrium* (Poaceae–Andropogoneae) in Central America and West Indies, and confirmation of the occurrence of *S. glaziovii*

CASSIANO A. DORNELES WELKER[1] & MYRIAM CAROLINA PEICHOTO[2]
[1]*Universidade Federal do Rio Grande do Sul, Programa de Pós-Graduação em Botânica, Av. Bento Gonçalves 9500, Porto Alegre, Rio Grande do Sul, 91501-970, Brazil. E-mail: cassiano_welker@yahoo.com.br*
[2]*Instituto de Botánica del Nordeste, Facultad de Ciencias Agrarias (UNNE), Sargento Cabral 2131, Corrientes, 3400, Argentina. E-mail: mcpeichoto@agr.unne.edu.ar*

Abstract

Schizachyrium (Poaceae–Andropogoneae) includes ca. 60 species, 10 of them previously cited for Central America and 13 for West Indies. The confirmation of the occurrence of *Schizachyrium glaziovii* in these regions is reported here, expanding its northern limit of distribution to Guatemala and Belize. The species was previously accepted only for South America. We provide a description of the species, a distribution map, and a key to distinguish it from *S. microstachyum* and *S. condensatum*, species whose circumscriptions are confused in floras of Central America and West Indies. Taxonomic comments, illustrations of the type materials and images of the three species are also provided. A revised synonymy of *S. glaziovii* is presented and a lectotype for *Andropogon condensatus* subsp. *elongatus* (a synonym of *Schizachyrium glaziovii*) is designated here.

Key words: Gramineae, lectotypification, Mesoamerica, *Schizachyrium condensatum*, *Schizachyrium microstachyum*

Resumen

Schizachyrium (Poaceae–Andropogoneae) incluye cerca de 60 especies, 10 de las cuales fueron previamente citadas para América Central y 13 especies para las Indias Occidentales. En este trabajo se reporta la presencia de *Schizachyrium glaziovii* para esa región, expandiendo su límite Norte hasta Guatemala y Bélice. Esta especie fue previamente aceptada solamente para Sudamérica. Se proporciona la descripción de la especie, el mapa de distribución y una clave para distinguirla de *S. microstachyum* y *S. condensatum*, especies cuyas circunscripciones son muy confusas en las floras de América Central e Indias Occidentales. También se incluyen comentarios taxonómicos, ilustraciones del material tipo y fotografías de las tres especies. Se presenta la sinonimia revisada de *S. glaziovii* y se designa aquí el lectotipo de *Andropogon condensatus* subsp. *elongatus* (sinónimo de *Schizachyrium glaziovii*).

Palabras clave: Gramineae, lectotipificación, Mesoamérica, *Schizachyrium condensatum*, *Schizachyrium microstachyum*

Introduction

Schizachyrium Nees (1829: 331) (Poaceae–Andropogoneae) includes ca. 60 species from tropical and subtropical regions of the world (Clayton & Renvoize 1986). The genus is represented in America by ca. 30 species, distributed from Canada to Argentina and Uruguay (Filgueiras 2003). Ten species have been cited for Central America: eight of them for Guatemala, six for Belize, Costa Rica, Honduras, and Nicaragua, five for Panama, and four for El Salvador (Manrique 1994, Pohl 1994, Filgueiras 2003). Thirteen species have been cited for West Indies (Hitchcock 1936, Filgueiras 2003) (Table 1).

The species of *Schizachyrium* have been divided into two morphological groups, based on inflorescence traits (Peichoto *et al.* 2008). The first group includes taxa with straight rachis internodes and pedicels, and sparsely branched inflorescences with one to a few racemes. The other group includes taxa with flexuous rachis internodes and pedicels at maturity, and highly branched inflorescences, like *S. condensatum* (Kunth 1816: 188) Nees (1829: 333) and related species. A molecular phylogeny of *Schizachyrium* is being performed in order to test the monophyly of the genus and

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TABLE 1. Occurrence of the *Schizachyrium* species in Central America and West Indies.*

	Central America							**West Indies** (including all island nations)
	Belize	**Costa Rica**	**El Salvador**	**Guatemala**	**Honduras**	**Nicaragua**	**Panama**	
	(a,b,c)	(a,b,c,d)	(a,b,c)	(a,b,c,e)	(a,b,c,f)	(a,b,c,g)	(a,b,c,h)	(a,b,i)
Schizachyrium brevifolium (Swartz 1788: 26) Nees ex Büse (1854: 359)	X	X	X	X	X	X	X	X
S. cirratum (Hackel 1885: 119) Wooton & Standley (1912: 30)				X				
S. condensatum (Kunth 1816: 188) Nees (1829: 333)**	X	X	X	X	X	X	X	X
S. cubense (Hackel 1885: 121) Nash (1912: 109)								X
S. gaumeri Nash (1912: 102)	X							
S. gracile (Sprengel 1824: 284) Nash (1903: 60)								X
S. malacostachyum (Presl 1830: 337) Nash (1912: 102)		X		X		X		X
S. microstachyum (Desvaux ex Hamilton 1825: 8) Rosengurtt *et al.* (1968: 35)	X	X	X	X	X	X	X	X
S. multinervosum Nash (1912: 109)								X
S. parvifolium (Hitchcock 1936: 391) Borhidi & Catasús Guerra (1980: 258)								X
S. reedii (Hitchcock & Ekman 1936: 390) Borhidi & Catasús Guerra (1980: 258)								X
S. salzmannii (Trinius ex Steudel 1854: 361) Nash (1912: 104)					X			X
S. sanguineum (Retzius 1783: 25) Alston (1931: 334)	X	X	X	X	X	X	X	X
S. semitectum (Swallen 1950: 427) Reeder (1984: 252)				X				X
S. tenerum Nees (1829: 336)	X	X		X	X	X	X	X
Number of species	**6**	**6**	**4**	**8**	**6**	**6**	**5**	**13**

Source: (a) Pohl 1994; (b) Filgueiras 2003; (c) Manrique 1994; (d) Morales 2003; (e) Swallen 1955 (under *Andropogon* L.); (f) Nelson Sutherland 2008; (g) Pohl 2001; (h) D'Arcy 1987; (i) Hitchcock 1936 (under *Andropogon*).

*In addition to the species listed in the table, we confirm in this paper the occurrence of *Schizachyrium glaziovii* in all countries of Central America and in West Indies (in Trinidad and Tobago). None of the references cited in the table accepted the taxon (neither as *S. glaziovii* nor *Andropogon condensatus* subsp. *elongatus* nor other combinations of this basionym).

**The distribution of *S. condensatum* in Central America and West Indies needs to be revised, since all materials identified as belonging to this species that we have examined so far are incorrectly identified and correspond to *S. microstachyum* or *S. glaziovii.*

of these two morphological groups of species (Peichoto *et al.* in prep.). No molecular phylogeny of the genus is currently available. Türpe (1984) accepted *S. condensatum* in a broad sense, considering as its synonyms almost all South American taxa belonging to the second morphological group. However, based on morphometric analyses Peichoto *et al.* (2008) demonstrated that those species are independent taxa. This circumscription has been adopted in recent works on *Schizachyrium* (Peichoto 2010, Welker & Longhi-Wagner 2012a, 2012b).

There is great confusion about the circumscriptions of the morphologically similar species *Schizachyrium condensatum*, *S. microstachyum* (Desvaux ex Hamilton 1825: 8) Rosengurtt *et al.* (1968: 35), and *S. glaziovii* Peichoto (2010: 314) in floras of Central America and West Indies. *Schizachyrium condensatum* is widely cited for these regions (Manrique 1994, Filgueiras 2003, Nelson Sutherland 2008); however, the specimens are often incorrectly identified and correspond to *S. microstachyum* or *S. glaziovii*. *Schizachyrium microstachyum* subsp. *elongatum* (Hackel 1883: 297) Rosengurtt *et al.* (1968: 37) was considered a synonym of *S. microstachyum* in several floras of Central America (Pohl 1994, Pohl 2001, Morales 2003, Nelson Sutherland 2008). On the other hand, Manrique (1994) listed *S. microstachyum* and *Andropogon condensatus* subsp. *elongatus* Hackel (1883: 297) (the basionym of *Schizachyrium microstachyum* subsp. *elongatum*) as synonyms of *S. condensatum*. Based on morphometric analyses, Peichoto *et al.* (2008) demonstrated that *S. microstachyum* subsp. *elongatum* is distinct from *S. condensatum* and *S. microstachyum,* and the name *S. glaziovii* was proposed for that taxon at the species level (Peichoto 2010).

In the original description of *S. glaziovii*, the species is cited only for South America (Peichoto 2010). However, during taxonomic revision of the genus *Schizachyrium* in America, the occurrence of *S. glaziovii* in Central America and West Indies was confirmed. Although the name *S. microstachyum* subsp. *elongatum* was included by some authors in the synonymy of other species of *Schizachyrium*, that taxon was not accepted in any flora of Central America and West Indies, neither as *S. glaziovii* nor *S. microstachyum* subsp. *elongatum*. This paper confirms the occurrence of *S. glaziovii* in Central America and West Indies and provides a description of the species based on specimens from those regions, a distribution map of the species in Central America, West Indies and South America, and the revised synonymy of *S. glaziovii*. A key to distinguish *S. glaziovii* from the morphologically similar species *S. microstachyum* and *S. condensatum*, illustrations of the type materials and images of the three species are also provided. A lectotype for *Andropogon condensatus* subsp. *elongatus* (a synonym of *Schizachyrium glaziovii*) is also designated here.

Taxonomic treatment

Schizachyrium glaziovii Peichoto (2010: 314). (Figs. 1D–G, 2C–D).

Type:—BRAZIL. Rio de Janeiro: Rio de Janeiro, *Glaziou 2739* (holoype P!, isotypes C!, K!, W!).

Andropogon condensatus subsp. *elongatus* Hackel (1883: 297)
Andropogon condensatus var. *elongatus* (Hack.) Hackel (1889: 388)
Andropogon paniculatus var. *elongatus* (Hack.) Hackel (1906: 417)
Schizachyrium condensatum subvar. *elongatum* (Hack.) Roberty (1960: 229)
Schizachyrium microstachyum subsp. *elongatum* (Hack.) Rosengurtt *et al.* (1968: 37)
Lectotype **(designated here):**—BRAZIL. Rio de Janeiro: Rio de Janeiro, *Glaziou 2739* (P!, isolectotypes C!, K!, W!).

Perennial, caespitose, (40–)50–180 cm high. Leaf sheaths glabrous; blades glabrous, 8–35 cm × 3–6 mm; ligule membranous, 0.8–2 mm long. Inflorescence panicle-like, narrowly oblong, (20–)25–45(–60) cm long, highly branched, with 40–150 racemes, each raceme protected by a spatheole. Spatheole open, 20–25(–28) mm long. Peduncle of each raceme 3–10 mm long, included within the spatheole. Racemes differentiated into nodes and internodes, disarticulating at the nodes; spikelets paired at each node of the rachis, one sessile and one pedicelled, both falling off together with a rachis internode at maturity. Rachis internodes and pedicels flexuous at maturity. Rachis internode (4–)4.5–5.5(–6) mm long. Sessile spikelet: lower glume chartaceous, two-keeled, 4.5–5.5 mm long; upper glume chartaceous, one-keeled, 4.5–6 mm long; lower lemma hyaline, 3–4.5 mm long; upper lemma hyaline, bifid, 3–4.5 mm long, with an awn 12–17 mm long. Caryopsis 2.5–3 mm long. Pedicellate spikelet: lower glume 1–2 mm long, with an awn 1–2.5 mm long.

Geographic distribution:—*Schizachyrium glaziovii* is widely distributed in South America (from Colombia and Venezuela to Argentina and Uruguay), Central America (from Guatemala and Belize to Panama) and West Indies (in Trinidad and Tobago) (Fig. 3).

Habitat:—The species inhabits primarily dry grasslands, less commonly wet grasslands and disturbed areas, such as roadsides.

Phenology:—Flowering and fruiting mainly from December to March.

FIGURE 1. Illustrations of the type materials of *Schizachyrium glaziovii* and morphologically similar species in Central America and West Indies. A–C. *Schizachyrium condensatum* (*Humboldt & Bonpland s.n.*, P). A. inflorescence. B. raceme with the spatheole. C. pair of spikelets and rachis internode. D–G. *Schizachyrium glaziovii* (*Glaziou 2739*, P). D. inflorescence. E. raceme with the spatheole. F. open spatheole with the peduncle included within it. G. pair of spikelets and rachis internode. H–K. *Schizachyrium microstachyum* (*Desvaux 8*, P). H. inflorescence. I. raceme with the spatheole. J. convolute spatheole with the superior portion of the peduncle exserted at maturity. K. pair of spikelets and rachis internode. Illustrations by Liliana Gómez.

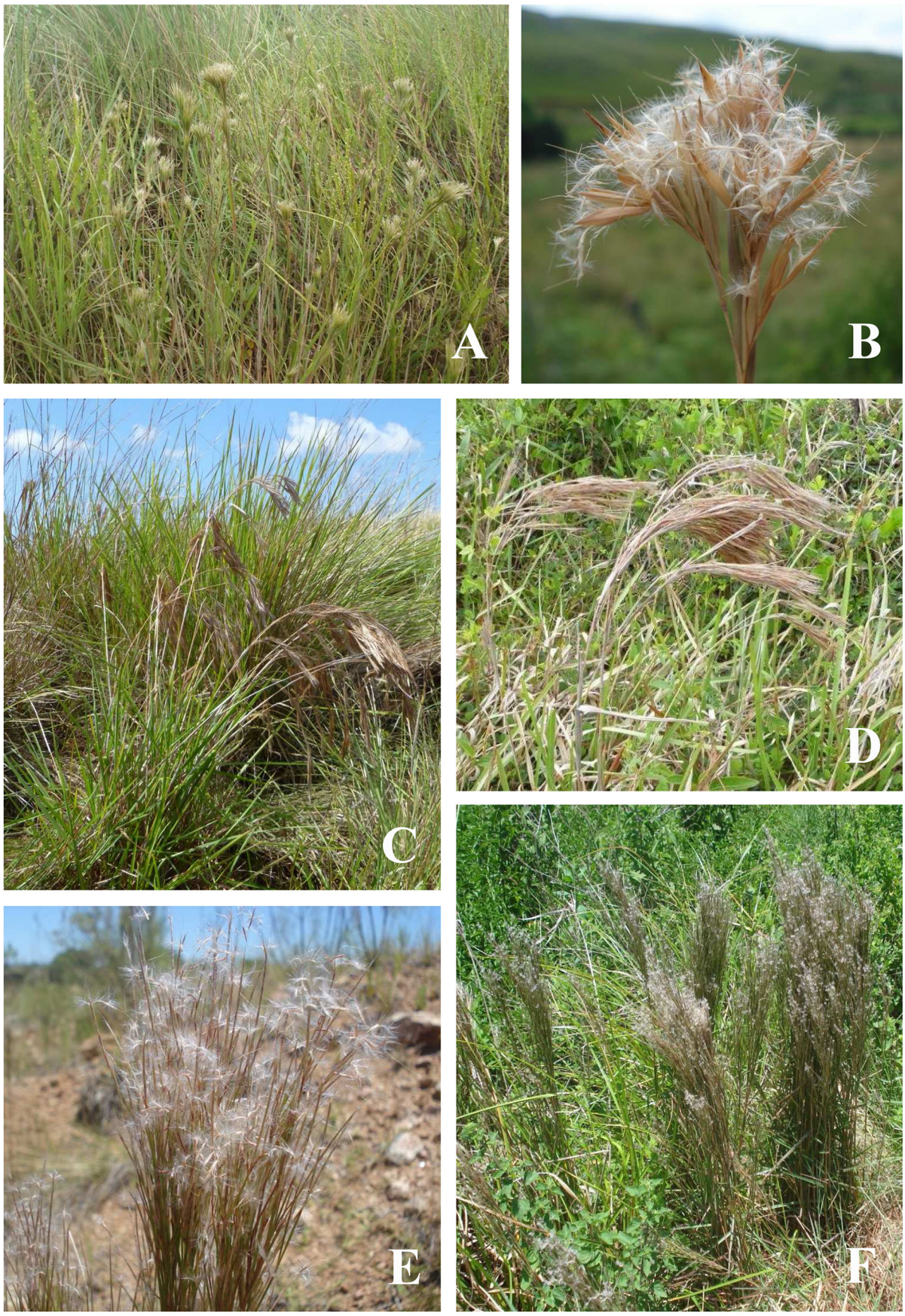

FIGURE 2. Photos of *Schizachyrium glaziovii* and morphologically similar species in the field. A–B. *Schizachyrium condensatum* (*Longhi-Wagner & Welker 10757*, ICN – Brazil). A. habit. B. inflorescence. C–D. *Schizachyrium glaziovii* (*Longhi-Wagner & Welker 10577*, ICN – Brazil). C. habit. D. inflorescence. E–F. *Schizachyrium microstachyum* (*Welker 203*, ICN – Brazil). E. inflorescence. F. habit. Photo credit: H.M. Longhi-Wagner (A–D), C.A.D. Welker (E, F).

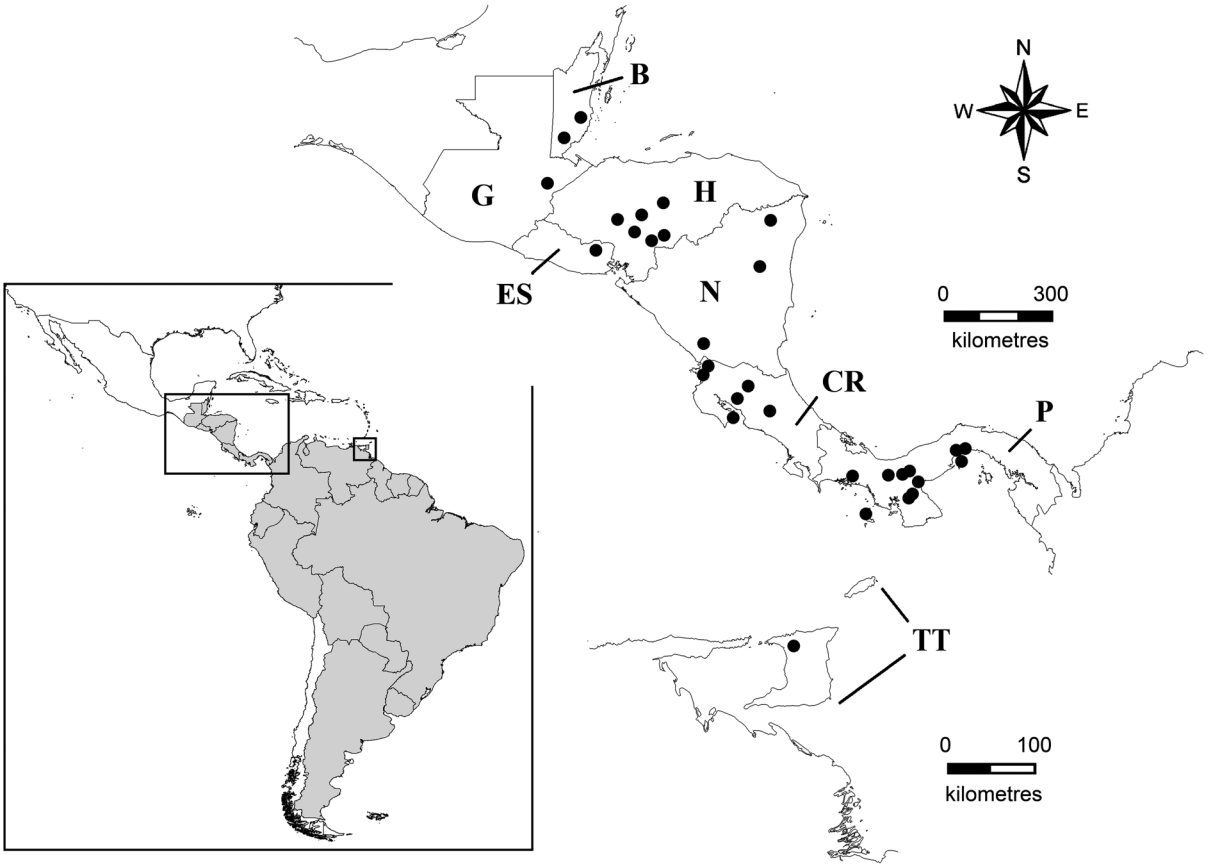

FIGURE 3. Distribution map of *Schizachyrium glaziovii* in Central America, West Indies and South America. Countries with solid fill (inset) represent the occurrence of the species. Dots indicate the locations of specimens examined from Central America and West Indies. Countries: Belize (B), Costa Rica (CR), El Salvador (ES), Guatemala (G), Honduras (H), Nicaragua (N), Panama (P), Trinidad and Tobago (TT).

Observations:—In the most recent revision of *Schizachyrium* for South America, Peichoto (2010) erroneously treated *Andropogon condensatus* subsp. *elongatus* (and other combinations based on this basionym) as synonyms of *Schizachyrium spicatum* (Sprengel 1824: 254) Herter (1940: 135). This error was caused by a misinterpretation of Hackel (1883: 297), who had considered *Deyeuxia spicata* Sprengel (1824: 254) (the basionym of *Schizachyrium spicatum*) as a synonym of *Andropogon condensatus* subsp. *elongatus*. However, when describing *Schizachyrium glaziovii* as a new species in that paper, Peichoto (2010) commented that the herbarium specimens previously determined and/or cited as *S. microstachyum* subsp. *elongatum* correspond to *S. glaziovii*. We are here correcting this mistake, including the name *Andropogon condensatus* subsp. *elongatus* and other combinations of this basionym (*A. condensatus* var. *elongatus*, *A. paniculatus* var. *elongatus*, *Schizachyrium condensatum* subvar. *elongatum*, and *S. microstachyum* subsp. *elongatum*) in the synonymy of *S. glaziovii*.

Schizachyrium glaziovii differs from *S. microstachyum* mainly by the narrowly oblong inflorescences (Figs. 1D, 2D) and open spatheoles, which are longer than the respective peduncles (the peduncles remain included within the spatheoles at maturity) (Fig. 1E–F). On the other hand, *S. microstachyum* has wide inflorescences that are generally open (Figs. 1H, 2E), and strongly convolute spatheoles, which are slightly shorter than the respective peduncles (the superior portion of the peduncles are exserted at maturity) (Fig. 1I–J). Moreover, the inflorescences of *S. glaziovii* are generally pendulous (Figs. 2C–D), whereas in *S. microstachyum* they are erect (Figs. 2E–F). This character is easily observable in the field, but difficult to observe in herbarium materials (Welker & Longhi-Wagner 2012b). *Schizachyrium microstachyum* is the most common species of the genus in America, occurring from Mexico to Argentina and Uruguay (Filgueiras 2003, Peichoto 2010).

Schizachyrium condensatum differs from *S. glaziovii* and *S. microstachyum* mainly by the corymb-like inflorescences, generally strongly congested (Figs. 1A, 2B). The other two species have panicle-like inflorescences, varying in shape from open to narrowly oblong (Figs. 2D–E). Furthermore, *S. condensatum* has shorter spatheoles and awn of the sessile spikelet than the other two species. *Schizachyrium condensatum* occurs in South America, from Colombia

to Argentina and Uruguay (Peichoto 2010). The species is also cited for Mexico, Central America, and West Indies (Manrique 1994, Filgueiras 2003), but its occurrence in these regions needs to be revised. All herbarium specimens from these regions previously identified as *S. condensatum* that we have examined so far were incorrectly identified and correspond to *S. microstachyum* or *S. glaziovii*. Additional investigation is required to determine the distribution of *S. condensatum* in America. Type materials and reference to specimens examined of *S. condensatum* and *S. microstachyum* are listed in the Appendix.

Material examined:—BELIZE. Stann Creek: Sapodilla Lagoon, 8 March 2003, *Woo & Farruggia 756* (MO). Toledo: along the Southern Highway, 6 km W of the Bladden Branch, 15 March 1987, *Brant & Davidse 1035* (MO). COSTA RICA. Alajuela: Santa Maria National Park, near park headquarters, 26 January 1978, *Liesner 4570* (MO). Guanacaste: La Cruz, Santa Rosa National Park, Cuenca de Santa Elena, Península de Santa Elena, 22 January 2003, *Rodríguez et al. 7663* (MO); Santa Rosa National Park, North edge of the park, 1 February 1978, *Liesner 4826* (MO). Puntarenas: Gulfo de Nicoya, Isla Tolinga, 6 February 1984, *Khan et al. 832* (MO); road to Monteverde and Santa Elena, a few km before Santa Elena, 28 January 1998, *Clark & Reiners 1586* (MO). San José: Cantón de Aserri, Cuenca del Pirris-Damas, Fila Bustamante, Alto Glória, 24 January 1999, *Morales 6766* (MO). EL SALVADOR. Morazán: Perquín, Rio Sapo, 25 January 2000, *Monterrosa et al. 50* (MO). GUATEMALA. Zacapa: 13 km E of El Lobo, 9 February 1970, *Harmon & Fuentes 1847* (MO). HONDURAS. Comayagua: 8 km SE of Siguatepeque, 25 May 1972, *Burch 6204* (MO). El Paraíso: Las Casitas, 25 October 1951, *Swallen 11098* (MO); road to Danlí, km 78, 1 November 1951, *Swallen 11232* (MO). Francisco Morazán: region of Las Mesas, 15 October 1951, *Swallen 10750* (MO); Valle de San Pedro, 35 km SE of Tegucigalpa, 12 October 1983, *Quintana 77* (MO). Olancho: Jutiapa Forest Camp, near Salamá, 22 December 1978, *Pohl & Gabel 13760* (MO). NICARAGUA. Rivas: Isla Ometepe, 8 February 1984, *Robleto 161* (MO). Zelaya: near Tala Has and Puente Mango (over Río Kisalaya), 18 April 1978, *Davidse 1979* (MO); vicinity of junction of road to Alamikamba with road between El Empalme and Limbaika, 24 February 1979, *Stevens et al. 12813* (MO). PANAMA. Chiriquí: 17 km NE of San Felix on road to Cerro Colorado copper mines, 18–19 March 1974, *Nee 10697* (MO). Coclé: Aguadulce, 5 January 1970, *McDaniel & Cooke 12755* (MO). Herrera: 16 km S of Ocú, 21 January 1966, *Tyson et al. 2851*, *2852* (MO). Panamá: along the Corozal road, near Panama City, 13 December 1923, *Standley 26804* (MO); Panama City, 21 February 1981, *Concepcion & Isos 70* (MO); Taboga Island, 24 January 1935, *Allen 112* (GH, MO). Veraguas: trail between Cañazas and the foot of the Cordillera Central, headwaters of Río Cañazas, 8 February 1937, *Allen 152* (MO); Coiba National Park, 2 April 2004, *Ibáñez & Rodríguez 2863* (MO); San José, 1 March 1984, *Carrasquilla 1940* (MO); 18 km S of Santa Fe, vicinity of San José on Santiago-Santa Fe road, 18 November 1973, *Nee 8168* (MO). TRINIDAD AND TOBAGO. Trinidad: St. Joseph savanna, 24 March 1920, *Britton et al. 980* (GH).

Additional material examined:—A large number of specimens from different countries from South America was also examined. These herbarium specimens are listed in Peichoto (2010) and Welker & Longhi-Wagner (2012b).

Key to distinguish Schizachyrium glaziovii from morphologically similar species from Central America and West Indies

1. Inflorescence corymb-like, congested to subcongested (Fig. 2B); spatheole 11–18(–20) mm long; awn of the sessile spikelet 7–10(–11) mm long ..... *S. condensatum*
- Inflorescence panicle-like, open to narrowly oblong (Figs. 2D–E); spatheole (18–)20–28 mm long; awn of the sessile spikelet 11–17 mm long 2
2. Inflorescence wide, open to subcontracted (Fig. 2E); spatheole strongly convolute; peduncle 15–30 mm long, with the superior portion exserted at maturity (Figs. 1I–J); lower glume of the sessile spikelet 3.5–4.3(–4.5) mm long ..... *S. microstachyum*
- Inflorescence elongate, narrowly oblong (Fig. 2D); spatheole open; peduncle 3–10 mm long, included within the spatheole at maturity (Figs. 1E–F); lower glume of the sessile spikelet 4.5–5.5 mm long..... *S. glaziovii*

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Appendix

Additional material examined

Schizachyrium condensatum (Kunth) Nees (Figs. 1A–C, 2A–B).

Type:—COLOMBIA. Tolima, regni novogranatensis, prope Ibague & Valle de Carabajal, October, *Humboldt & Bonpland s.n.* (holotype P!, isotype US! [fragm. ex P]).

Schizachyrium microstachyum (Desv. ex Ham.) Roseng., B.R. Arrill. & Izag. (Figs. 1H–K, 2E–F).

Type:—WEST INDIES. *Desvaux 8* (holotype P!, isotype US! [fragm. ex P]).

A large number of specimens of *Schizachyrium condensatum* and *S. microstachyum* from different countries was also examined. These herbarium specimens are listed in Peichoto (2010) and Welker & Longhi-Wagner (2012b).