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Short communication

First record of *Isachne ligulata* (Poaceae: Micraioideae) in Brazil and a key for the Brazilian species of the genus

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ABSTRACT

While performing a taxonomic revision of the Neotropical species of *Isachne,* analysis of herbarium collections revealed the occurrence of *Isachne ligulata* in Brazil. We provide a description and the first illustration of *I. ligulata*, along with comments on its ecology, distribution and morphological affinities with related South American species. We also provide an identification key for the Brazilian species of the genus.

Keywords: distribution, grasses, Isachneae, Neotropics, South America

Isachne R. Br. includes ca. 100 species (Veldkamp 2016), and is the largest and the most widespread genus of the subfamily Micraioideae. The genus has its greatest diversity in tropical and temperate Asia (Judziewicz 1990), but also occurs in Africa, the Americas, Pacific Islands and Australia (Clayton *et al*. 2006). Thirteen species are recorded for the Neotropics (Rodrigues *et al*. 2016), and are distributed from southern Mexico to Bolivia and southeastern Brazil (Renvoize 1987). Despite the extensive area of occurrence of the genus *Isachne* in the Neotropics, most of the species are restricted to Mesoamerica, the Antilles and northern South America.

Historically, *Isachne* was placed in the subfamily Panicoideae, and considered as a distinct genus or as a section of *Panicum* L., mainly because of the apparent similarity of the spikelets in the members of these two genera. Surprisingly, recent phylogenetic studies resolved *Isachne* (tribe Isachneae Benth.) as belonging to a clade that also included the tribes Micraireae Pilg. and Eriachneae Eck-Boorsb., within the resurrected and emended subfamily Micraioideae (Duvall *et al*. 2007; Sánchez-Ken *et al*. 2007). Currently, *Isachne* is included in tribe Isachneae and is artificially divided into two sections according to the degree of similarity of the anthecia. *Isachne* sect. *Isachne* includes the species with heteromorphic anthecia (i.e., anthecia very dissimilar or completely different in texture and pilosity), whereas *Isachne* sect. *Albentes* V. Prakash & S.K. Jain includes the species with homomorphic anthecia (i.e., anthecia similar or almost similar in texture and pilosity) (Iskandar & Veldkamp 2004; Veldkamp 2016).

Isachne comprises annual or perennial plants, usually with trailing or climbing culms, which may vary from being short and delicate to long, robust, rigid, thick and very branched (Renvoize 1987). The genus can be recognized by the spikelets disarticulating above the subequal glumes; the anthecia frequently homomorphic (less often heteromorphic); mostly coriaceous to subcoriaceous; the lower staminate, pistillate or bisexual; the upper bisexual

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or pistillate (Hitchcock 1920; Clayton & Renvoize 1986).

Species of *Isachne* predominantly inhabit localities with damp or muddy soils, such as swamps, along streams, brooks, headwaters, rivers, edges of lakes, waterfalls, etc., usually associated with flooded grasslands or riparian vegetation (Longhi-Wagner 2012; Longhi-Wagner & Welker 2014).

Longhi-Wagner (2012) drew attention for the urgent need of a revision for the Brazilian species of *Isachne*. Two years later, Longhi-Wagner & Welker (2014) provided a compilation of the genus in Brazil and described a new species. Currently, four species are recorded for Brazil: *Isachne goiasensis* Renvoize, *I. hirtiglumis* Longhi-Wagner & Welker, *I. polygonoides* (Lam.) Döll and *I. salzmannii* (Trin. ex Steud.) Renvoize (Filgueiras & Rodrigues 2015).

We conducted studies at BHCB, HUEFS, IAC, IBGE, INPA, OUPR, R, RB, SP, SPF, UB, UEC and VIC (herbaria acronyms according to Thiers 2016), and consulted the Reflora Virtual Herbarium (available at http://reflora.jbrj.gov.br/reflora/herbarioVirtual/) and the virtual collections from K, MO, NY, P and US. As a result, the first record of *I. ligulata* Swallen in Brazil is confirmed. Additionally, the first illustration of the species and further comments on its ecology, conservation, distribution and morphological affinities with related species occurring in South America are provided. A key for the Brazilian species of *Isachne* is also presented.

Isachne ligulata Swallen, Caldasia 2(8): 305. 1943.

Type: COLOMBIA. Department of Cauca: [Cauca Valley], Cuatro Esquinas, 5/VI/1922, FW Pennell & EP Killip 6343 (holotype US-1140437; image!).

Fig. 1.

Perennials, climbing or leaning plants, 1.5-3.5(-4) m long; culms robust, branched, re-branching at the top, glabrous; nodes glabrous. Sheaths pubescent to densely pilose towards the apex, trichomes tuberculate, dehiscent in old sheaths, margins densely ciliate; ligule 2-3 mm long, ciliate; leaf blades linear-lanceolate, 3-15 × 0.3-1.5 cm, apex acute, base obtuse to rounded, not amplexicaul, scabrous-pubescent to scabrous-pilose, margins scabrous. Panicles 5-15 cm long, primary branches usually spreading, secondary branches divergent, axillary glands conspicuous; pedicels inconspicuously scabrous, glandular bands absent. Spikelets solitary, elliptic-globose to oblong, 1.8-2.3 mm long, anthecia homomorphic; glumes subequal, 0.1-0.3 mm shorter than the lower anthecium, lower glume 7-9-nerved, upper glume 9-11-nerved, both pubescent at the apex; lower anthecium bisexual, pistillate or staminate, oblong-elliptic to elliptic, 1.8-2.3 mm long, subequal or ca. 0.5 mm longer than the upper anthecium, apex rounded to subacute, coriaceous, stramineous, lemma and palea with minutely appressed and sparse bicellular trichomes; upper anthecium bisexual, oblong-elliptic, 1.3-1.5 mm long, coriaceous, callus pilose, lemma and palea with minutely appressed-sparse bicellular trichomes, nearly glabrous. Caryopsis oblong, blackish, 0.2 × 0.1 mm.

Flowering in January, March, April, June, and from August to November. In the Guyana highlands, according to Judziewicz (1990), the species flowers from September through February.

Material examined: BRAZIL. Amazonas: Santa Isabel do Rio Negro, Parque Nacional do Pico da Neblina, 0°47'14"N, 66°01'26"W, 22/IX/2012, RC Forzza *et al*. 7275 (RB, SP).

Additional material examined: COLOMBIA. Cundinamarca: Salto de Tequendama, 1-3/X/1938, J Cuatrecasas 165 [paratype] (P; image). PERU. Pasco: Prov. Oxapampa, 5/III/1986, H van der Werff *et al*. 8405 (US; image). VENEZUELA. Bolívar: Sarvén-tepuí, slopes and talus forest, 13/I/1953, JJ Wurdack 34138 (RB).

Distribution and ecology: *Isachne ligulata* is an endemic South American species reported from mountainous areas of the Amazon Basin and the Guiana Shield, at altitudes ranging 1700-2500 m. It was originally described from Colombia but later its distribution was found to extend to Guyana, Peru and Venezuela (Swallen & García-Barriga 1943; Renvoize 1987; Zuloaga & Morrone 2003). Individuals are found along forest edges, especially along streams (Judziewicz 1990), and are sometimes associated with shrubby vegetation.

This is the first record of *I. ligulata* for Brazil, 73 years after its original description (Swallen & García-Barriga 1943). In Brazil this species is known only from the region of Santa Isabel do Rio Negro, in the state of Amazonas, in Pico da Neblina National Park, near the border with Venezuela. The long span of time between the original description and the discovery of the species in the Brazilian Amazon is probably due to the difficulty of accessing the area where it is found and there having been few studies undertaken there, most of them focused on woody rather than herbaceous species, and are conducted in relatively limited and isolated locations (BFG 2015).

Conservation: In Brazil, *I. ligulata* has only been recorded from a conservation unit, the Pico da Neblina National Park. The lack of information about the species' distribution and population size are barriers to assessing the conservation status of this species in Brazil, and so according to IUCN criteria, it should be considered as data deficient (IUCN 2015).

Morphological affinities: As commonly occurs with other species of *Isachne*, the culms in *I. ligulata* rebranch at the tips and produce one inflorescence branch per node (Fig. 1).

Specimens currently accepted under the circumscription of *I. ligulata* used to be primarily identified as *I. arundinacea* Griseb., a species recorded for Mexico, Mesoamerica, and northern and northwestern South America (Zuloaga & Morrone 2003; Clayton *et al*. 2006).

Isachne arundinacea has been traditionally circumscribed as having longer leaf blades, glabrous sheaths, ascending panicles, often with secondary branches and pedicels

Figure 1. *Isachne ligulata*. A: apex of the culm with flowering branches; B: apex of the leaf-sheath and base of leaf blade; C: apex of the leaf-sheath, ligular region and base of leaf blade; D: detail of the adaxial surface of leaf blade; E: spikelet, lateral view; F: anthecia (note the pilosity at the rachilla between the upper and the lower anthecia); G: lower anthecium, lemma view; H: lower anthecium, palea view; I: upper anthecium, lemma view; J: upper anthecium, palea view. [Based on: A - JJ Wurdack 34138 (RB); B-J - RC Forzza *et al*. 7275 (SP)]. Illustration by Rodrigo S. Rodrigues.

appressed to the spreading primary branches; the pedicels are extremely short, and the spikelets are 1.4-1.8 mm long, globose, and clustered at the branch tips. Micromorphological characters of the leaf blade and spikelets also support *I. ligulata* and *I. arundinacea* as distinct species (RS Rodrigues & TS Filgueiras unpubl. res.).

The morphology of the spikelets of *I. ligulata* closely resembles that of *I. rigens* Trin., another Meso- and South American species not yet recorded for Brazil, but which has a similar habit and distribution (Zuloaga & Morrone 2003; Clayton *et al*. 2006). *Isachne rigens*, however, can be distinguished by the more delicate culms, panicle size, spikelets regularly or loosely distributed along the branches, and pedicels usually inserted directly on the primary branches.

The morphological distinctions between *I. ligulata* and other species that occur in Brazil are highlighted in the following dichotomous key.

Key to the Brazilian species of Isachne

1. Culms 100-400 cm long, somewhat lignified, robust 2
2. Leaf-sheaths glabrous; panicles 18-27(-30) cm long, flexible; pedicelar bands present; upper anthecium conspicuously appressed-pilose, hemispheric to sub-hemispheric ..... *I. goiasensis*
2'. Leaf-sheaths pubescent to densely pilose towards the apex; panicles 5-15 cm long, rigid; pedicelar bands absent; upper anthecium inconspicuously appressed-pubescent to nearly glabrous, oblong-ellipsoid ..... *I. ligulata*
1'. Culms 10-90 cm long, herbaceous, slender 3
3. Glumes entirely hirsute; anthecia homomorphic, similar in texture and pilosity ..... *I. hirtiglumis*
3'. Glumes glabrous or the upper 1/4 glabrescent to sparsely pubescent; anthecia heteromorphic, dissimilar in texture and pilosity 4
4. Leaf-sheaths glabrous; leaf blades linear-lanceolate, base slightly attenuate, not amplexicaul; lemma of the lower anthecium conspicuously sulcate on the back towards the base ..... *I. salzmannii*
4'. Leaf-sheaths pubescent to hirsute; leaf blades lanceolate, base cordate to subcordate, amplexicaul; lemma of the lower anthecium not sulcate ..... *I. polygonoides*

Additional remarks: Zuloaga & Morrone (2003) cited "Caldas" as the department of Colombia where the type was collected. However, the label of the holotype at the US herbarium bears the printed information: "Department of El Cauca, Cauca Valley", therefore "Caldas" and "Cauca" are two distinct Departments in Colombia. The same wrong information is recorded in the databank of Tropicos (2016).

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