

NAMING HYBRIDS IN THE *ANDROPOGON LATERALIS* COMPLEX (POACEAE, ANDROPOGONEAE) AFTER MULTIVARIATE ANALYSES

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Abstract. Nagahama, N.; A. M. Anton, M. I. Hidalgo & G. A. Norrmann. 2012. Naming hybrids in the *Andropogon lateralis* complex (Poaceae, Andropogoneae) after multivariate analyses. *Darwiniana* 50(1): 114-123.

The *Andropogon lateralis* complex is constituted by 13 taxonomic entities: seven species and six class inter-specific hybrids distributed in Central and South America. Natural hybrids within this group are quite common due to lack of inter-specific barriers. These hybrids have been collected in the last two centuries and, in most cases, have caught the attention of taxonomists, who formally described several as new taxa. Therefore, taxonomic entities based on them have been validly published. In southern South America, among the ten taxonomic entities in the *A. lateralis* complex, five are natural hybrids and at least three possess legitimate names (*A. × coloratus*, *A. × lindmanii*, and *A. × subtilior*). Based on morphometric analyses and previous studies we propose that other two natural hybrids deserve taxonomic names. These entities are *Andropogon × velutinus* (*A. bicornis* × *A. glaziovii*, = *Andropogon* sp 1 according to Zanin, 2001) and *Andropogon × catarinensis* (*A. bicornis* × *A. arenarius*). Taxonomic treatments of *A. × velutinus* and *A. × catarinensis* are presented.

Keywords. Andropogoneae; inter-specific hybrids; morphometry; multivariate analysis; taxonomy.

Resumen. Nagahama, N.; A. M. Anton, M. I. Hidalgo & G. A. Norrmann. 2012. Nombres válidos para híbridos del complejo *Andropogon lateralis* (Poaceae, Andropogoneae) sobre la base de análisis multivariados. *Darwiniana* 50(1): 114-123.

El complejo *Andropogon lateralis* está constituido por alrededor de 13 entidades taxonómicas: siete especies y seis híbridos inter-específicos distribuidos en Centro y Sudamérica. Los híbridos naturales en este grupo son frecuentes debido a la ausencia de barreras reproductivas entre las especies. Estos híbridos han sido recolectados en los últimos dos siglos y, en la mayoría de los casos, han llamado la atención de los taxónomos, quienes han descrito a varias de estas combinaciones formalmente como nuevos taxones. Por lo tanto, las entidades taxonómicas basadas en combinaciones híbridas han sido válidamente publicadas. De las diez entidades taxonómicas que integran el complejo *A. lateralis* en el Cono Sur de Sudamérica, cinco corresponden a híbridos naturales y tres de estos poseen nombres legítimos (*A. × coloratus*, *A. × lindmanii* y *A. × subtilior*). Sobre la base de análisis morfométricos y estudios previos, proponemos que los dos híbridos naturales restantes también merecen nombres taxonómicamente válidos. Estas entidades son *Andropogon × velutinus* (*A. bicornis* × *A. glaziovii*, = *Andropogon* sp 1 de acuerdo a Zanin, 2001) y *Andropogon × catarinensis* (*A. bicornis* × *A. arenarius*). En este trabajo se presentan los tratamientos taxonómicos de *Andropogon × velutinus* y *Andropogon × catarinensis*.

Palabras clave. Análisis multivariado; Andropogoneae; híbridos interespecíficos; morfometría; taxonomía.

INTRODUCTION

The *Andropogon lateralis* Nees complex in southern South America (Argentina, Bolivia,

Brazil, Paraguay and Uruguay) is represented by the following species: *A. arenarius* Hack., *A. bicornis* L., *A. glaziovii* Hack., *A. hypogynus* Hack., *A. lateralis* Nees, and the hybrids *A. ×*

coloratus (Hack.) (pro. sp.), *A. × lindmanii* (Hack.) (pro. sp.), *A. × subtilior* (Hack.) Norrmann, *A. arenarius × A. bicornis* and *A. bicornis × A. glaziovii*. The first two hybrids have variable degrees of fertility, and the others are completely sterile (Norrmann, 2009). The complex is considered to be a natural group of alohexaploid species ($2n = 6x = 60$), in which anther size and the number of pollen grains in the fertile sessile spikelets are strongly reduced compared with those of pedicellate spikelets. This discriminant character “dimorphism of anthers” defines the complex (Campbell, 1983; Campbell & Windisch, 1986).

Within this complex, natural inter-specific hybrids have been reported, where populations of different species live in sympatry. Three hybrid combinations were reported by Campbell & Windisch (1986) and two more by Norrmann (2009). Of the ten taxa that the complex comprises in southern South America, five are legitimate species and the others are inter-specific hybrids, of which three have taxonomically valid names: *A. × coloratus*, *A. × lindmanii* and *A. × subtilior* (Norrmann, 2009).

During the treatment of inter-specific hybrids within the complex, one of the authors of this work proposed taxonomic names for most hybrids (Norrmann, 2009). Therefore, natural hybrids between *A. hypogynus* and *A. lateralis* were added to the already existing entity *A. × coloratus*; in the same way natural hybrids between *A. arenarius* and *A. lateralis* were included in *A. × lindmanii*, and those between *A. bicornis* and *A. lateralis* in *A. × subtilior*.

Since then, different analyses were performed on these hybrids, including inflorescence typology and morphometric analyses, confirming the consistency of these entities (Nagahama, 2012). Therefore, we propose that both unnamed natural hybrids remaining in Norrmann (2009) treatment also deserve a name. The aims of this study are to: (1) analyze hybrid combinations based on characters of the inflorescences, (2) propose taxonomic names of two hybrid combinations as in other cases within the complex and (3) present the taxonomic treatment of *A. arenarius × A. bicornis* and *A. bicornis × A. glaziovii*.

MATERIALS AND METHODS

Plant material

We analyzed the following taxa: *A. arenarius*, *A. bicornis*, *A. glaziovii*, *A. bicornis × A. glaziovii* and *A. arenarius × A. bicornis*. We used the living collection of *Andropogon* species and hybrids held at IBONE, Corrientes, Argentina. Additionally, collection trips were undertaken since April 2007 to 2010, covering north-eastern Argentina (Corrientes, Chaco, Formosa, Misiones, Santa Fe), Brazil (Rio Grande do Sul, Santa Catarina), and Paraguay (Fig. 1). To identify a specimen as a natural hybrid, putative parents should be present at the field collection sites. Each field collection from natural populations included live individuals and synflorescences. Plants were transplanted to clay pots at the experimental garden of the Instituto de Botánica del Nordeste (IBONE), Corrientes, Argentina, where individuals from each species and hybrid combination were cultivated. Vouchers were deposited at the CORD herbarium and other voucher specimens from CTES, CORD, MI, VI were analyzed. More details of species and hybrids can be found in Norrmann (2009) and Nagahama (2012).

Morphometric analysis

Eighteen quantitative characters (see Table 1) of 130 specimens (species and hybrids) were analyzed on the basis of the correlation matrix through Principal Components Analysis (PCA) using the Pearson correlation coefficient (Michener & Sokal, 1957) and the data matrix (data not show) was standardized by character using PCORD program v. 4.25 (McCune & Mefford, 1999). We excluded from the analysis both the first pair of spikelets (due to its variability) and the terminal sessile spikelet (because of the truncation) of each floriferous branch (Nagahama, 2012). To reduce the experimental error, we considered the variability of the spikelets within the same plant. To do this, 10 pairs of spikelets were measured per plant and average values were used for morphometric analyses. Also, floriferous branches were selected from different branches of each plant and in turn, this methodology was carried out in at least 22 up

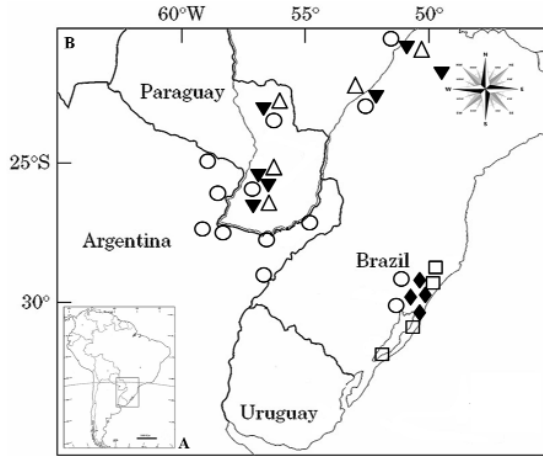


Fig. 1. Geographical distribution of studied populations of *Andropogon*. *A. arenarius* (□), *A. bicornis* (○), *A. glaziovii* (△), *A. x velutinus* (▼) and *A. x catarinensis* (◆).

to 30 individuals per entity of different populations, depending on availability of material.

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<http://www.ojs.darwin.edu.ar/index.php/darwiniana/about/editorialPolicies#custom-0>.

RESULTS

Specimens of *A. bicornis*, *A. glaziovii* and their hybrids formed three well defined groups, with the hybrids positioned between *A. bicornis* and *A. glaziovii* groups (Fig. 2). The first component explains 54.2 %, the second 20.3 %, and the third 6.7 % of the total variance. The variables that contribute most to the first component (and their eigen values) are length of hairs on articulated rachis internodes (-0.30), length of hairs on pedicel (-0.30), pedicellate spikelet width (-0.29), pedicellate spikelet length (0.28), length of articulated rachis internodes (-0.28), pedicel length (-0.28) and pedicel width (0.28), while the length of first

Table 1. Morphological characters analyzed.

Pedicel length
Pedicellate spikelet length
Sessile spikelet length
Length of hairs on pedicel
Awn length
Pedicellate spikelet width
Sessile spikelet width
Length of articulated rachis internodes
Length of hairs on articulated rachis internodes
Pedicel width
Synflorescence length
Number of internodes of the main axis of synflorescence
Number of branches on the main axis of synflorescence
Length of first branch on the main axis of synflorescence
Number of internodes of the first branch
Number of branches on the first branch
Length of second branch on the main axis of synflorescence
Number of internodes of the second branch

branch on the main axis of synflorescence (-0.44), number of branches on the first branch (-0.40), number of branches on the main axis of synflorescence (-0.38) and synflorescence length (-0.37) contributes to the second component.

Figure 3 shows specimens of *A. arenarius*, *A. bicornis* and their hybrids. The hybrids are positioned between the parental species. The first component explains 65.9 %, the second 11.9 %, and the third 5.9 % of the total variance. The variables number of internodes of the second branch (-0.28), length of second branch on the main axis of synflorescence (-0.27), number of branches on the first branch (-0.27), number of internodes of the first branch (-0.27), length of first branch on the main axis of synflorescence (-0.27), number of internodes of the main axis of synflorescence (-0.27), pedicel width (-0.27) and number of branch-

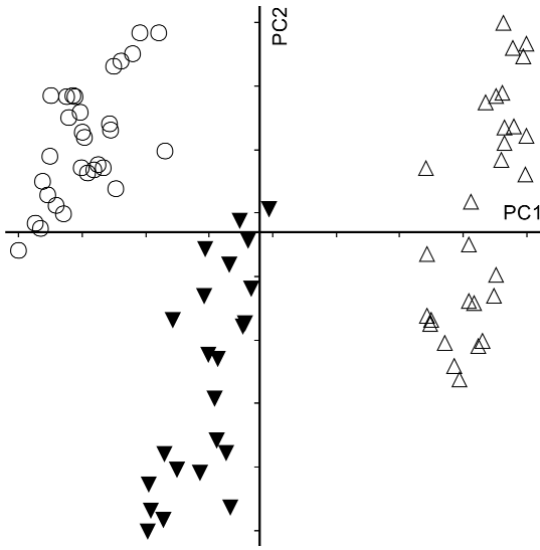


Fig. 2. PCA analyses. Plot of 82 specimens on the first two principal components. *Andropogon bicornis* (○), *A. glaziovii* (△) and *A. × velutinus* (▼). PC1= 54.2%, PC2= 20.3%.

es on the main axis of synflorescence (0.26) contribute more to the first component. On the other hand, the variables that contribute most to the second component are length of hairs on articulated rachis internodes (0.49), sessile spikelet length (-0.41), pedicel length (-0.38), length of articulated rachis internodes (-0.30) and sessile spikelet width (-0.28).

When analyzing two species together with their corresponding hybrid combination (Figs. 2 and 3), there were three well-defined groups, indicating that the hybrids have stable morphotypes and that these are identifiable in the sympatric areas of the parental species.

DISCUSSION AND CONCLUSIONS

Among the five inter-specific natural hybrids recognized up to date in the *A. lateralis* complex, three were described in the past at species level: *A. × coloratus*, *A. × lindmanii* and *A. × subtilior*. Nowadays these hybrids are considered as legitimate taxonomic entities, as they are morphologically distinct from their parental species, being useful to have them formally named (Norrmann, 2009). However the hybrid combinations *A. bicornis* × *A. glaziovii* and *A. arenarius* × *A. bicornis*

did not receive names in the past, likely because they were not collected at all during the lifetime of E. Hackel.

Most hybrid combinations in *A. lateralis* complex are sterile due to complete failure to form embryo sacs (*A. × subtilior*, *A. arenarius* × *A. bicornis* and *A. bicornis* × *A. glaziovii*; Norrmann, 2009). In both cases analyzed in this study (sterile inter-specific hybrids), the analysis by PCA showed three defined groups (Figs. 2 and 3) due to the absence of backcrossing, enabling the identification of hybrids which present stable morphotypes. Those morphotypes presented differences in both inflorescence typology (Nagahama, 2012) and morphometric analysis of inflorescences, allowing us to recognize these specimens into the complex by classical means. In addition, hybrid individuals generally flower together and live together. Considering all these facts, these hybrids could be considered as ‘good species’ in the classical topological taxonomic sense (Cronquist, 1981) and they deserve to be classified and formally named as other hybrids in the complex.

TAXONOMIC TREATMENT

Andropogon x velutinus Norrmann & Nagahama, nothosp. nov. (= *A. bicornis* × *A. glaziovii*). TYPE: Paraguay, Depto. Concepción, 38 km E de Concepción por ruta 5, 20-IV-1995, *G. A. Norrmann 219* (holotype CORD!; isotype CTES). Fig. 4.

Plants perennial, caespitose, culms 120 - 220 cm tall, nodes 17-27, glabrous; floral stem robust, cylindrical. Leaf sheaths generally longer than the internodes, velvety rarely glabrous; blades 26-74 × 0.3- 0.6 cm, not basally constricted, linear, usually conduplicate, pubescent on both surfaces, rarely glabrous, margins scabrous towards the apex, acute apex; ligule 0.5-1 mm long, membranous-ciliate. Inflorescence a false panicle, 120.1-220 cm long, corymbosus, highly branched, especially in the upper nodes, composed of both terminal and axillary inflorescence units, these units 3-4.1 cm long, with 2, rarely 3 racemes, equal or subequal in length, conjugate or subdigitate, exerted or partially enclosed by the spatheole; peduncle of the inflorescence unit 1.6-6 cm long; spatheoles 2-5.5

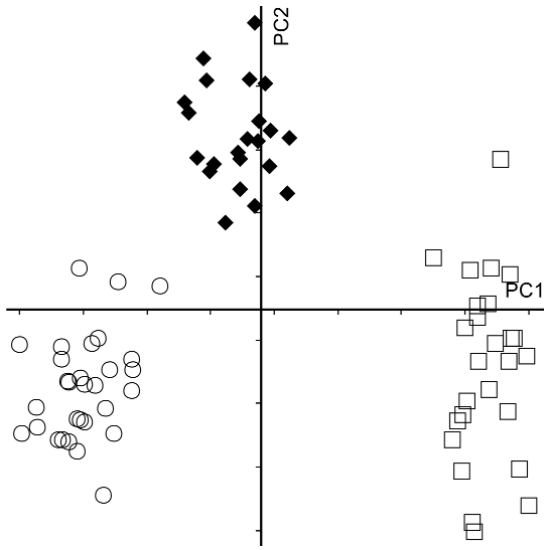


Fig. 3. PCA analysis. Plot of 78 specimens on the first two principal components. *Andropogon arenarius* (□), *A. bicornis* (○) and *A. x catarinensis* (◆). PC1= 65.9%, PC2= 11.9%.

cm long. Pedicels and rachis internodes linear, subequal in length, pedicels 1.6 -2.8 mm long, internodes from 1.9-3 mm long, both with hairs 5.3-8.2 mm long. Sessile spikelets perfect, 3-4.1 × 0.8-1 mm, linear-lanceolated, generally awned, callus shortly pubescent, hairs 1-1.5 mm long. Lower glume 3-4 × 0.5-0.7 mm, slightly concave, lanceolate, chartaceous, margins glabrous, 2-nerved, acute apex; upper glume 2.6-3.1 × 0.7-1 mm, chartaceous, margins glabrous, 3 -nerved, the lateral nerves tenuous, acute apex. Lower lemma 1.8- 2 × 0.5-0.7 mm, bicrenate, lanceolate, hyaline, glabrous, 0 - 3-nerved, acuminate apex; palea absent; upper lemma 1-2 × 0.1-0.6 mm, hyaline, glabrous on the margins, 1-nerved, acute apex, awned, awn 5-9 mm long; palea 0.6-0.9 × 0.2-0.5 mm, hyaline, glabrous , 0-nerved, erose apex. Lodicules 2, 0.4 mm long, glabrous. Stamens 3, anthers 0.5-0.8 mm long, yellow. Cariopsis not developed or undeveloped 0.9 - 1.9 × 0.3-0.5 mm. Pedicellate spikelets usually reduced, 0.5-1 × 0.05 mm long. Pedicelled spikelet of the penultimate pair developed, male, 3-4.5 × 0.1-0.2 mm long, lanceolate, awnless, with 3 stamens, anthers 1-1.5 mm long. Lower glume 2.8-4 × 0.5-1 mm, sub-chartaceous, glabrous on the margins, 5- nerved, acute apex; upper glume 2-3.3 × 0.8-1 mm, chartaceous, glabrous, 3- nerved, acute apex; lower

lemma 2-3 × 0.6-1 mm, hyaline, 3-nerved; palea absent; upper lemma 1.9-2.7 × 0.5-0.7 mm, hyaline, 1- nerved; palea 0.6-0.8 × 0.1-0.2 mm long, hyaline, glabrous, 0-nerved, erose apex. Lodicules 2, 0.5 mm long, glabrous, anthers 1.1-1.5 mm long.

Distribution and habitat. *Andropogon x velutinus* grows in west-central and southeastern Brazil, and Paraguay, forming small but dense populations in confined sympatric areas -swamps-among populations of the parental species (*A. bicornis* and *A. glaziovii*). Parental species *A. bicornis* grows from the southern United States to northern Argentina and *A. glaziovii* is restricted to Paraguay, Bolivia and west-central and southeastern Brazil (Goiás, Mato Grosso do Sul, Mina Gerais and São Paulo).

Observations. *Andropogon x velutinus* (= *Andropogon* sp 1 according to Zanin, 2001) is a sterile alohexaploid (2n = 6x = 60).

Representative examined material

Andropogon bicornis L.

ARGENTINA. **Chaco.** Depto. 1° de Mayo, Colonia Benítez, borde de estero, 20-IV-1965, *Schulz 15022* (CTES); 17-IV-1964, *Schulz 13841* (CTES). **Corrientes.** Depto. Bella Vista, 15 km N de Bella Vista, 16-V-1983, *Norrman & Quarín 89* (CTES); Depto. Capital, 18 km SE de Corrientes, Ruta 5, 25-III-1982, *Norrman 51* (CTES, LIL); Riachuelo, 7-IV-1974, *Quarín 2344* (CTES); Campus Universitario, 20-III-1998, *Schinini 34389* (CTES); Mansión de Invierno, 20-IV-1972, *Carnevali 3044* (CTES); ruta 12 y Arroyo Riachuelo, 1-III-1995, *Schinini 29131* (CTES). Depto. General Alvear, ruta 14 y Río Aguapey, 17-V-1983, *Norrman & Quarín 91* (CTES, BAA, US). Depto. Itatí, ruta 12, 47 km. E de Itatí, 26-II-1977, *Ahumada 775* (CTES); Puerto Corazón, 5 km. N de ruta 12, 17-II-1983, *Schinini & Carnevali 23268* (CTES). Depto. Ituzaingó, ruta 12 y ruta 38, al costado del camino, 24-VI-1990, *Schinini 26868* (CTES); desembocadura del Arroyo Garapé en el Río Paraná, 24-IV-1975, *Schinini 11093* (CTES); Isla Apipé Grande, Puerto San Antonio, 10-XII-1973,

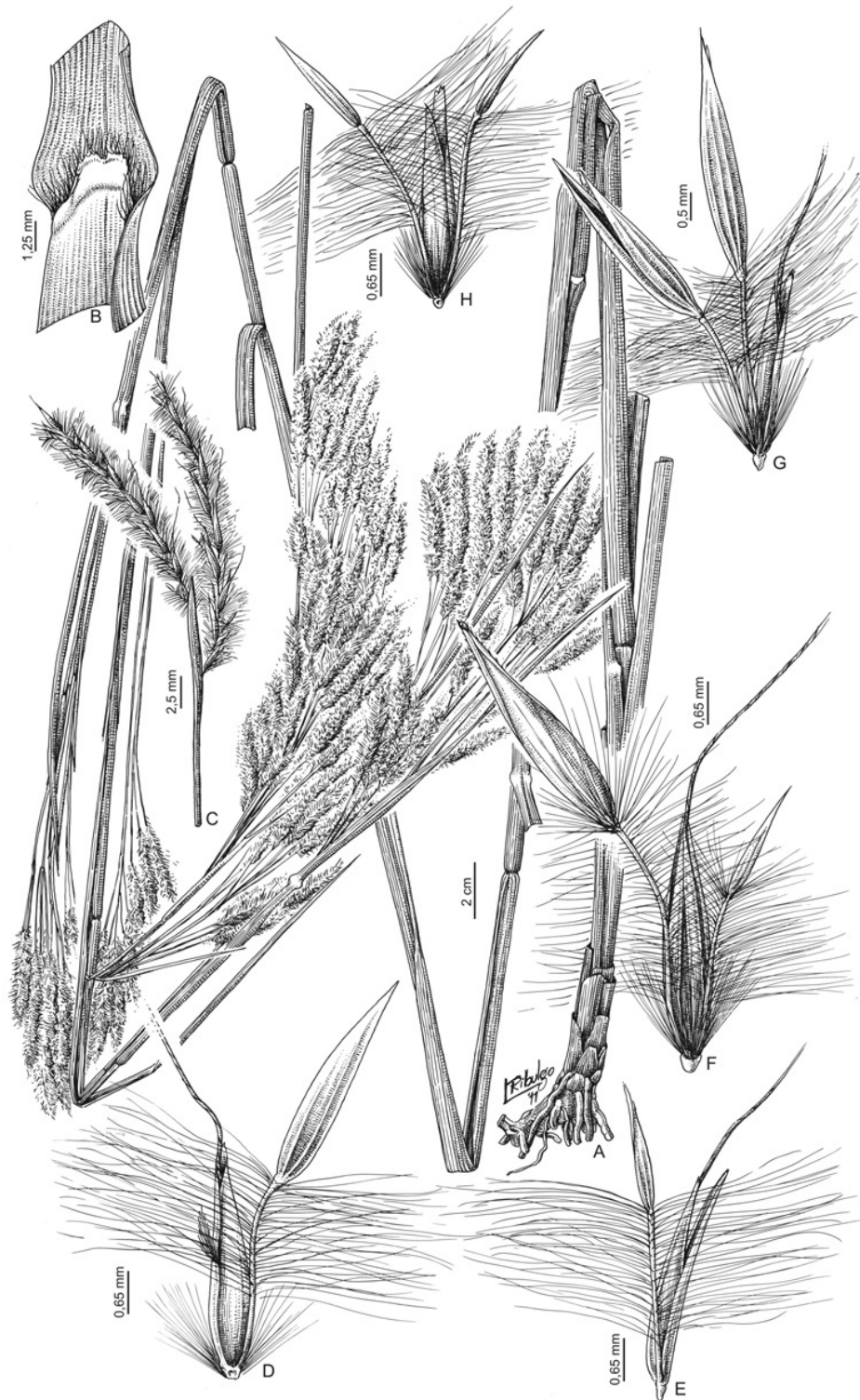


Fig. 4. *Andropogon* × *velutinus*. **A**, habit. **B**, ligule. **C**, unit of inflorescence. **D-E**, different types (middle or proximal) of spikelets. **F-H**, different types of distal pairs of spikelets. De Nagahama & Norrmann 49 (CORD).

Krapovickas 24122 (CTES); 9 km. de ruta 12, camino a San Carlos, 11-IV-1974, *Krapovickas 24869* (CTES). Depto. San Cosme, ruta 6, 4,5 km. S de ruta 12, en cañada, 23-II-1983, *Carnevali 6025* (CTES). Depto. Santo Tomé, Laguna la Luna, Galarza, en embalsado, VII-1995, *Schinini 6596* (CTES); Garruchos, costa del Río Uruguay, 12-IV-1974, *Krapovickas 25091* (CTES); Estancia Timbó, Arroyo Ciriaco y ruta 40, 27-II-1983, *Schinini 23463* (CTES). Depto. San Roque, ruta 123, 15 km. W de 9 de Julio, 17-V-1983, *Norrman & Quarín 90* (CTES). **Formosa**. Depto. Bermejo, Puerto Bermejo, 2-III-1901, *Kermes 634* (CTES). Depto. Pilcomayo, estero Isla Leona, ruta 86, 22-III-1979, *Piccinini & Petetin 3674* (CTES). Depto. San Pedro, ruta 20 y Arroyo Piray Guazú, 21-III-1997, *Tressens 5704* (CTES). Depto. Monte Carlo, Monte Carlo, 22-V-1951, *Montes 15388* (SI, BAA). **Misiones**. Depto. Capital, Posadas, 11-VI-1912, *Ekman 549, 550* (CORD). Depto. San Pedro, 21-III-1997, *Tressens 5704* (CTES). Depto. El Dorado, ruta provincial 17, Pozo Azul, 27-V-2002, *Keller 1832* (CTES).

BRAZIL. **Amazonas**. Estrada Manaus, Porto Velho, Castanho Tupana, 7-VII-1972, *Silva 184* (CTES). **Minas Gerais**. Ouro Preto, 22-I-1984, *Schinini & Ferrucci 24590* (CTES). **Paraná**. Region of villaje of Prata, Sandy cerrado, 11-II-1974, *Anderson, W. 10784* (CTES); Piraquara, sine data, *Dombrowski 10505* (CTES). **Rio Grande do Sul**. Igrejinha, estrada Taquara, Gramado, 7-IV-1971, *Valls 11486* (CTES); Ijuí, km. 346 da BR 285, 24-VII-1973, *Valls 2682* (CTES); Torres, colonia Sao Pedro, 28-III-1970, *Valls 1102* (CTES).

PARAGUAY. **Alto Paraná**. Estancia Santa Elena, 5 km. N de Hernandarias, III-1995, *Schinini & Caballero 27414* (CTES). **Asunción**. Jardín Botánico, en terrenos modificados, 17-III-1973, *Schinini 6230* (CTES). **Canindeyú**. Jejui-mí, 26-III-1996, *Jiménez & Marín 71* (CTES); Lagunita, pastizal, 26-III-1996, *Jiménez & Marín 43* (CTES). **Central**. Ipacaraí, en camino a Patiño, 27-II-1985, *Mereles 226* (CTES); ruta 2 y Arroyo Mboiy, 2-III-1975, *Schinini 10945* (CTES). **Cordillera**. Cordillera de Altos, Cerro Tobatí, 9-III-1984, *Schinini 24050* (CTES).

Misiones. Santiago, Estancia La Soledad, 21-IV-1961, *Pedersen 5941* (CTES). **Paraguari**. Pirayú, en esteros, II-1983, *Mereles 234* (CTES). **Presidente Hayes**. Ruta Trans, Chaco, km. 120, 25-IV-1989, *Mereles 3019* (CTES); Estancia Maroma, 90 km. E de Pozo Colorado, 23-III-1995, *Mereles 5931* (CTES).

Andropogon glaziovii Hack.

BRAZIL. **Goiás**. 70 km. SE de Jataí, 12-IV-1988, *Valls 11712* (CTES); 39 km. SW de Gacu, 12-IV-1988, *Valls 11720* (CTES). **Mato Grosso do Sul**. 5 km W de Ribas ao Rio Pardo, 14-IV-1988, *Valls 11765* (CTES); Campo Grande, *Norrman 311* (CTES).

PARAGUAY. **Amambay**. Parque Nacional Cerro Corá, ruta 5, 18-IV-1995, *Norrman 163* (CTES). **Concepción**. Ruta 5, 32 km noreste de Concepción, 20-IV-1995, *Norrman 196, a, b, c, d* (CTES). Misiones. 2 km E de San Juan Bautista por ruta 1, 21-IV-1995, *Norrman 217, a, b, c, d* (CTES); 2,1 km E de San Juan Bautista por ruta 1, 16-IV-2009, *Nagahama 87, 88, 89, i, ii, iii, iv* (CTES). **San Pedro**. Ayo. Ipané y ruta 3, 20-IV-1995, *Norrman 203, a, b, c, d, e* (CTES).

Andropogon × velutinus Norrmann & Nagahama (= *A. bicornis* × *A. glaziovii*)

PARAGUAY. **Concepción**. 38 km E de Concepción por ruta 5, 20-IV-1995, *Norrman 199, a, b, c, d, e* (CTES). **Misiones**. 2 km E de San Juan Bautista por ruta 1, 21-IV-1995, *Norrman 218, 219, 222 a, b, c, d, e* (CTES).

BRAZIL. **São Paulo**. Auriflama, SP 310, km 570, 27-XII-1984, *Campbell 4704* (SP); Pereira Barreto, 31-XII-1984, *Campbell 4705* (SP); 27-XII-1984, *Campbell 4706* (SP).

Andropogon x catarinensis Norrmann & Nagahama, nothosp. nov. (= *A. arenarius* × *A. bicornis*). TYPE: Brazil, Estado de Santa Catarina, Itapirubá, 22-II-2008, *N. Nagahama & G. A. Norrmann 49* (holotype CORD!; isotype CTES). Fig. 5.

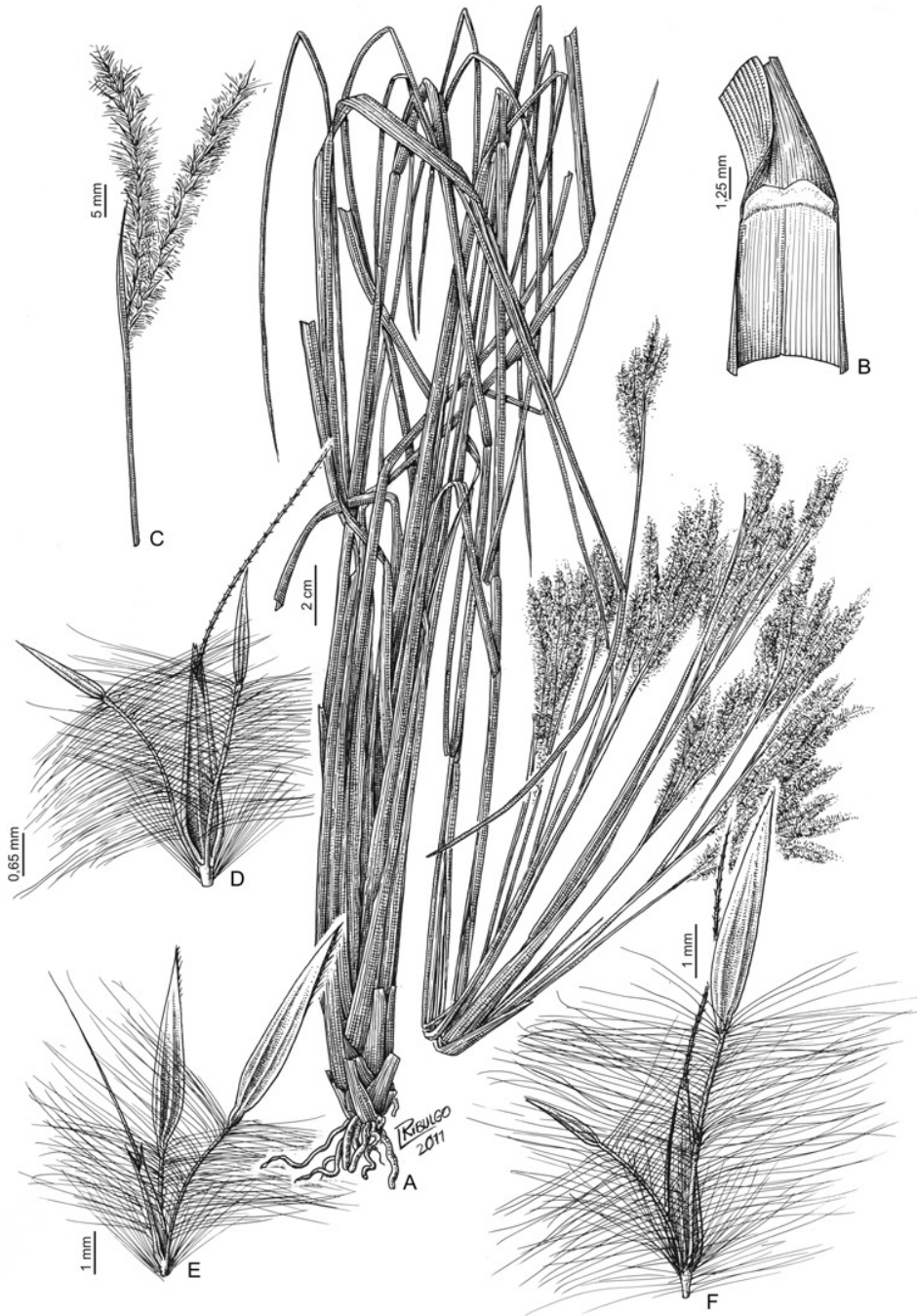


Fig. 5. *Andropogon* × *catarinensis*. **A**, habit. **B**, ligule. **C**, unit of inflorescence. **D-G**, different types of distal pairs of spikelets. De Norrmann 219 (CORD).

Plants perennial, caespitose, culms 91 - 115 cm tall, nodes 9-18, glabrous. Leaf sheaths shorter and/or longer than the internodes,

glabrous; blades 10-60 × 0.2-0.5 cm, base straight, linear, conduplicate or flat, glabrous on both surfaces or scabrous-pubescent on

adaxial surface, apex acute or subobtusate; ligule 1-1.4 mm long, membranous ciliate. Inflorescences dense, 90.2-114.7 cm long, sub-congested, sub-corymbose, highly branched, composed of both terminal and axillary inflorescence units, these units 2.8 - 4.8 cm long, with 2-3 (-4) racemes, equal or subequal in length, partially enclosed by the spatheole, with intense hairiness; peduncle of the inflorescence unit 3.1-7.2 cm long; spatheoles 4.3-8 cm long. Pedicels and rachis internodes 2.1-3 mm long, both with hairs 8-11 mm long. Sessile spikelets perfect, 2.1 - 3.4 mm, awned, callus hairy. Lower glume 2-3.4 × 0.6-0.8 mm, slightly concave, lanceolate, chartaceous, glabrous on the margins, 2 - 3 nerved, acute apex; upper glume (2.1-) 3-4 × 0.7-0.9 mm, sub-chartaceous, ciliate on the upper half of the margins, 3-nerved, the lateral nerves tenuous, acute apex. Lower lemma 1.8-2.9 × 0.4-0.6 mm, bicrenate, hyaline or hyaline vinaceous, ciliate on the upper half of the margins, 0-2- nerved; palea absent; upper lemma 1 - 1.8 × 0.2-0.4 mm, lanceolate, hyaline or hyaline vinaceous, glabrous on the margins, 0-1-nerved, briefly bifid apex, awned, awn 1.6-4.5 mm long; palea 0.4-1 × 0.2-0.4 mm, hyaline, glabrous, 0-nerved, truncate or irregularly dentate apex. Lodicules 2, 0.5 mm long, glabrous. Stamens 3, anthers 0.8 mm long. Cariopsis not developed or undeveloped 0.7-1.6 × 0.2-0.5 mm. Pedicellate spikelets usually reduced, 1.3-2.4 × 0.05 mm long, lanceolate.

Distribution and habitat. One of the parental species, *A. bicornis*, lives in disturbed areas from Argentina to south EEUU. Therefore, the area occupied by *A. × catarinensis* is closely linked to the more restricted distribution limits of the other parental species, *A. arenarius*, occurring along the coastal dunes of southern Brazil (Santa Catarina, São Paulo, and Rio Grande do Sul) and Uruguay. Such geographical restriction is likely probably related to the sterility of the *A. × catarinensis* individuals, being found only in the sympatric areas of the parental species, where the F1 is formed.

Observations. *Andropogon × catarinensis* is a sterile alohexaploid (2n = 6x = 60).

Representative examined material

Andropogon bicornis L.

Refer to the examined material of *Andropogon × velutinus*.

Andropogon arenarius Hack.

BRAZIL. **Rio Grande do Sul.** Osorio, praia Atlântida, 02-II-1974, *Valls 1468* (CTES); Osorio, em campo de dunas móveis, 10-IX-1972, *Valls 2146* (CTES); Torres, beira da Praia, próximo ao Morro do Farol, 28-III-1970, *Valls 1116* (CTES); Capão da Canoa, III-1992, *Norrman 104* (CTES, BAA). **Santa Catarina.** Itapirubá, 22-II-2008, *Nagahama & Norrmann 29, 30, 31, 32, 23, i, ii, iii, iv, v* (CORD); 02-I-1994, *Norrman 139* (CTES); Laguna, en dunas, 02-I-1994, *Norrman 224* (CTES).

Andropogon × catarinensis Norrmann & Nagahama (= *A. arenarius* × *A. bicornis*)

BRAZIL. **Santa Catarina.** Itapirubá, 22-II-2008, *Nagahama & Norrmann 48, 49, 50, 58, 67, i, ii, iii, iv* (CORD); *Norrman 331, 332* (CTES).

Key to the new named hybrids of *Andropogon lateralis* complex in this study

1. Inflorescences scarcely branched, main axis with 7-15 internodes and 4-9 branches. First branch on the main axis of synflorescence 12.4-22 cm long, with 2-4 internodes and 1-5 branches. Second branch on the main axis of synflorescence 8.1-13.6 cm long, with 2-3 internodes *A. arenarius*
1. Inflorescences profusely branched, main axis with 15-28 internodes and 14-71 branches. First branch on the main axis of synflorescence 22.3-61.2 cm long, with 5-11 internodes and 9-49 branches. Second branch on the main axis of synflorescence 18-47.9 cm long, with 4-10 internodes 2
- 2(1). Articulate rachis internodes 2.2-3 mm long. Sessile spikelet 0.3-0.4 mm lat. Pedicel less than 0.1 mm lat., with hairs 5-10 mm long 3
2. Length of articulated rachis internodes 1.4-2.1 mm long. Sessile spikelet 0.4-0.7 mm lat. Pedicel 0.15-0.3 mm lat., with hairs 2.2-5 mm long 4
- 3(2). Synflorescence 90.2-114.7 cm long. Second branch on the main axis of synflorescence with 4-6 internodes. Hairs on articulate rachis internodes 9-12 mm long. Pedicel 2.4-3 mm long. Upper lemma of the sessile spikelet awned, awn 1.1-4.8 mm long *A. × catarinensis*

3. Synflorescence 122.4-180 cm long. Second branch on the main axis of synflorescence with 6-10 internodes. Hairs on articulate rachis internodes 7-8.6 mm long. Pedicel 3-4.5 mm long. Upper lemma of the sessile spikelet awnless *A. bicornis* 4(2). Main axis of synflorescence with 37-71 branches. First branch on the main axis of synflorescence with 34-49 branches. Second branch on the main axis of synflorescence with 8-10 internodes. Articulate rachis internodes 1.8-2.2 mm long., with hairs 4.9-6 mm long. Pedicel 2.5-3 × 0.1-0.2 mm, with hairs 4.5-5.1 mm long. Pedicellate spikelet 1-2.3 × 0.1-0.2 mm *A. × velutinus* 4. Main axis of synflorescence with 19-36 branches. First branch on the main axis of synflorescence with 10-32 branches. Second branch on the main axis of synflorescence with 4-6 internodes. Articulate rachis internodes 1.4-1.8 mm long., with hairs 2.7-3.4 mm long. Pedicel 1.5-2.5 × 0.2-0.3 mm, with hairs 2.2-3.1 mm long. Pedicellate spikelet 2.5-4.1 × 0.2-0.7 mm *A. glaziovii*

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