Taxonomic and Geographic Notes on the Hybanthus lanatus (A. st.-Hil.) Baill. Complex (Violaceae)

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Source: Candollea, 66(2) : 367-375

Published By: The Conservatory and Botanical Garden of the City of Geneva (CJBG)

URL: https://doi.org/10.15553/c2011v662a14

Taxonomic and geographic notes on the Hybanthus lanatus (A. St.-Hil.) Baill. complex (Violaceae)

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Abstract

PAULA-SOUZA, J. DE, J. R. PIRANI & C. DELFINI FELICIANO (2011). Taxonomic and geographic notes on the Hybanthus lanatus (A. St.-Hil.) Baill. complex (Violaceae). *Candollea* 66: 367-375. In English, English and French abstracts.

Recent taxonomical studies on South American *Hybanthus* s.l. attest the occurrence of *Hybanthus lanatus* (A. St.-Hil.) Baill. *(Violaceae)* in Argentina, altough this species has been previously reported as endemic to the Cerrado of the Brazilian Plateau. This species presents large morphological variations within its distribution range. It is part of *Hybanthus lanatus* complex which includes 5 other species phylogenetically closely related (*Hybanthus poaya* (A. St.-Hil.) Baill., *Hybanthus strigoides* Taub., *Hybanthus velutinus* Schulze-Menz and two other undescribed species). *Hybanthus velutinus* Schulze-Menz had been recorded in Argentina in the 1950's, but this occurrence is based on an incorrect identification of specimens collected in San Ignacio, in the very same area where *Hybanthus lanatus* has been recorded. The disjunct distribution of *Hybanthus lanatus* between the Brazilian Plateau and the area of San Ignacio in Argentina, further supported by similar cases in other plant groups, suggests a dispersal model rather than a «dry forest refuge» model event. Descriptions, comments on the geographical distributions and illustrations of *Hybanthus lanatus* and *Hybanthus velutinus*, are provided in order to eliminate future confusion between these two species.

Key-words

VIOLACEAE – Hybanthus – Cerrado – Argentina – Distribution – Taxonomy

Résumé

PAULA-SOUZA, J. DE, J. R. PIRANI & C. DELFINI FELICIANO (2011). Notes taxonomiques et géographiques sur le complexe Hybanthus lanatus (A. St.-Hil.) Baill. (Violaceae). *Candollea* 66: 367-375. En anglais, résumés anglais et français.

Des études taxonomiques récentes sur les *Hybanthus* s.l. sud-américains ont attesté la présence d'*Hybanthus lanatus* (A. St.-Hil.) Baill. *(Violaceae)* en Argentine, bien que cette espèce ait été rapportée comme endémique dans le Cerrado du Plateau brésilien. Cette espèce présente une morphologie très variable dans sa distribution géographique. Elle fait partie du complexe *Hybanthus lanatus* qui inclut 6 espèces phylogénétiquement très proches (*Hybanthus lanatus*, *Hybanthus poaya* (A. St.-Hil.) Baill., *Hybanthus strigoides* Taub., *Hybanthus velutinus* Schulze-Menz et deux autres espèces non-décrites). *Hybanthus velutinus* Schulze-Menz a été signalée en Argentine dans les années 1950, mais cette présence est basée sur une identification incorrecte de specimens récoltés à San Ignacio, dans la même aire où *Hybanthus lanatus* a été observée. La distribution disjointe d'*Hybanthus lanatus* entre le Plateau brésilien et la région de San Ignacio, à l'instar d'autres groupes de plantes, indique plus un phénomène de type «dispersion» qu'un phénomène de type «refuge de forêts sèches». Les descriptions et commentaires relatifs aux distributions géographiques d'*Hybanthus lanatus* et *Hybanthus velutinus* ainsi que leurs illustrations sont présentés dans le but d'éliminer toute future confusion entre ces deux espèces.

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Received on January 28 2010. Accepted on August 29, 2011. Edited by P. Bungener

Introduction

Hybanthus s.l. is a genus of approximately 150 species distributed in the tropics, with highest diversity in Latin America. It includes a wide range of life-forms, from herbs to arborescent species (rarely lianescent, Bennett, 1972), and has been traditionally well characterized by its saccate-gibbose and strongly zygomorphic flowers (Hekking, 1988). However, recent phylogenetic studies (Feng, 2005, Paula-Souza, 2009) have indicated that *Hybanthus* s.l. is highly polyphyletic, and drastic changes are expected in the circumscription of this genus in a near future.

The Cerrado of the Brazilian Plateau houses a group of very peculiar species of *Hybanthus* s.l., morphologically characterized by a well-developed root-system with a high potential of bud production (probably xylopodiferous), corresponding to a life-form that is typical of species adapted to the edaphic and climatic conditions and seasonal fires of this Brazilian biome (Hayashi & Appezzato-da-Glória, 2007). This is a taxonomically very problematic group, including *H. lanatus* (A. St.-Hil.) Baill, *H. strigoides* Taub., *H. velutinus* Schulze-Menz, *H. poaya* (A. St.-Hil.) Baill, and two undescribed species. Phylogenetic studies carried on recently (Paula-Souza, 2009) indicate that all these species are grouped together in a strongly supported clade, corroborating previous conclusions based on morphological data and broadening the circumscription of the *"Hybanthus lanatus complex"*.

Within this complex, *H. lanatus* is the most widely distributed species and shows the largest morphological variability, followed by *H. poaya*. The remaining three species of this complex (*H. strigoides* and the two unnamed species) are narrowly endemic to central Brazil, whilst *H. velutinus* does not occur in the core area of the Brazilian Cerrado, but rather in scattered spots of the southernmost limits of this biome in São Paulo and Paraná states in Brazil, and in peripherical areas in Rio Grande do Sul state (Brazil) and Paraguay.

Sparre (1950) recorded a few collections of *H. velutinus* from San Ignacio, Misiones Province in Argentina, but our recent taxonomical study of South American species of *Hybanthus* s.l. has pointed to misidentification of the specimens referred by this author. Instead of *H. velutinus*, *H. lanatus* is the species growing in San Ignacio, this being the first and noteworthy record of this species for the Argentinean flora, considering the geographical disjunction that it represents.

Materials and methods

The study was based on bibliographical research, as well as examination of collections in the following herbaria: ALCB, ASE, B, BHCB, BM, BR, CEN, CEPEC, CESJ, CPAP, CTES, CVRD, E, EAC, EAN, ESA, FCAB, FUEL, G, GFJP, GOET, GUA, HB, HBG, HBR, HEPH, HMS, HRCB, HUEFS, HUFU, HURG, IAC, IAN, IBGE, ICN, INPA, IPA, JPB, K, L, LINN, M, MA, MAC, MEXU, MBM, MBML, MG, MO, NY, OUPR, P, PACA, PEL, R, RB, SI, SJRP, SMDB, S, SP, SPF, SPSF, TEPB, UB, UEC, UFG, UFP, UPCB, US, VIC, W, and WU.

Results

1. *Hybanthus lanatus* (A. St.-Hil.) Baill., Traité Bot. Méd. Phan. 2: 841 1884 (Fig. 1).

≡ *Ionidium lanatum* A. St.-Hil. in Mém. Mus. Hist. Nat. 11: 482. 1824.

≡ *Solea lanata* (A. St.-Hil.) Spreng., Syst. Veg. Cur. Post.: 97. 1827.

Typus: Brazil. Minas Gerais: «pâturages herbeux pr. Tejuco dans le District des diamants, campos», 1817, *St. Hilaire Catal. B1 no. 2080* (holo-: P!).

= *Ionidium lacteum* S. Moore in Trans. Linn. Soc. 4: 307. 1895, **syn. nov.**

Typus: Brazil: «Matto Grosso, in campis ad Serra da Chapada alt. circa 1800 ped.» s.d., *S. Moore 187* (holo-: BM!).

Herbs with a well developed underground system reaching ca. 70 cm, 15-20 cm tall, simple or branched at ground level; internodes 5-18 mm. *Leaves* alternate; stipules 3.5-6 × ca. 0.5-1 mm, margin entire; leaves subsessile; blade 15-36 × (5.5-)7-15 mm, oblong, ovate, elliptic, obovate to oblanceolate, less frequently lanceolate or suborbicular, apex acute to obtuse or less frequently rounded, apiculate, margin entire or irregularly serrate at the apex, base acute to attenuate, tomentose to densely villous, less frequently pubescent, hairs all stellate or frequently simple with sparse or rare stellate hairs. *Flowers* deep violet, blue, light blue, lilac, white, greenish or yellowish, usually with a yellow spot at the base of the anterior petal, solitary, axillary; floral pedicel 11-21 mm, tomentose to villous; bracteoles ca. 1-1.5 × ca. 0.5 mm; sepals equal, 5-8(-10) × 1.5-3 mm, lanceolate to ovate, frequently subfalcate, margin entire, base truncate, tomentose to villous; posterior petals 5.5-8 × ca. 1-3 mm, ovate or oblong, subfalcate; lateral petals 10.5-16.3 × 2-5(-12) mm, spatulate to oblong, frequently constricted at the central portion, falcate, rarely clawed, tomentose to villous at apex; anterior petal 16-18.5 mm long, clawed, blade 13-22 mm wide, oblate, deltoid, transversely oblong or elliptic, or widely transversely rhombic, apex truncate, emarginate or obtuse, tomentose to villous; filaments 1-2 mm, connective appendages white, ca. 0.5 mm long, nectariferous appendages noduliform, frequently much reduced, inserted on the filaments usually near the base of the anthers, subglabrous to villous; style 3-4 mm, glabrous or rarely tomentose at the base, straight or less frequently subsigmoid, ovary 2-2.5 mm, villous. *Capsule* 8.5-10 × 6-7.5 mm, ellipsoid to ovoid; seeds ca. 3 × 2-2.5 mm.

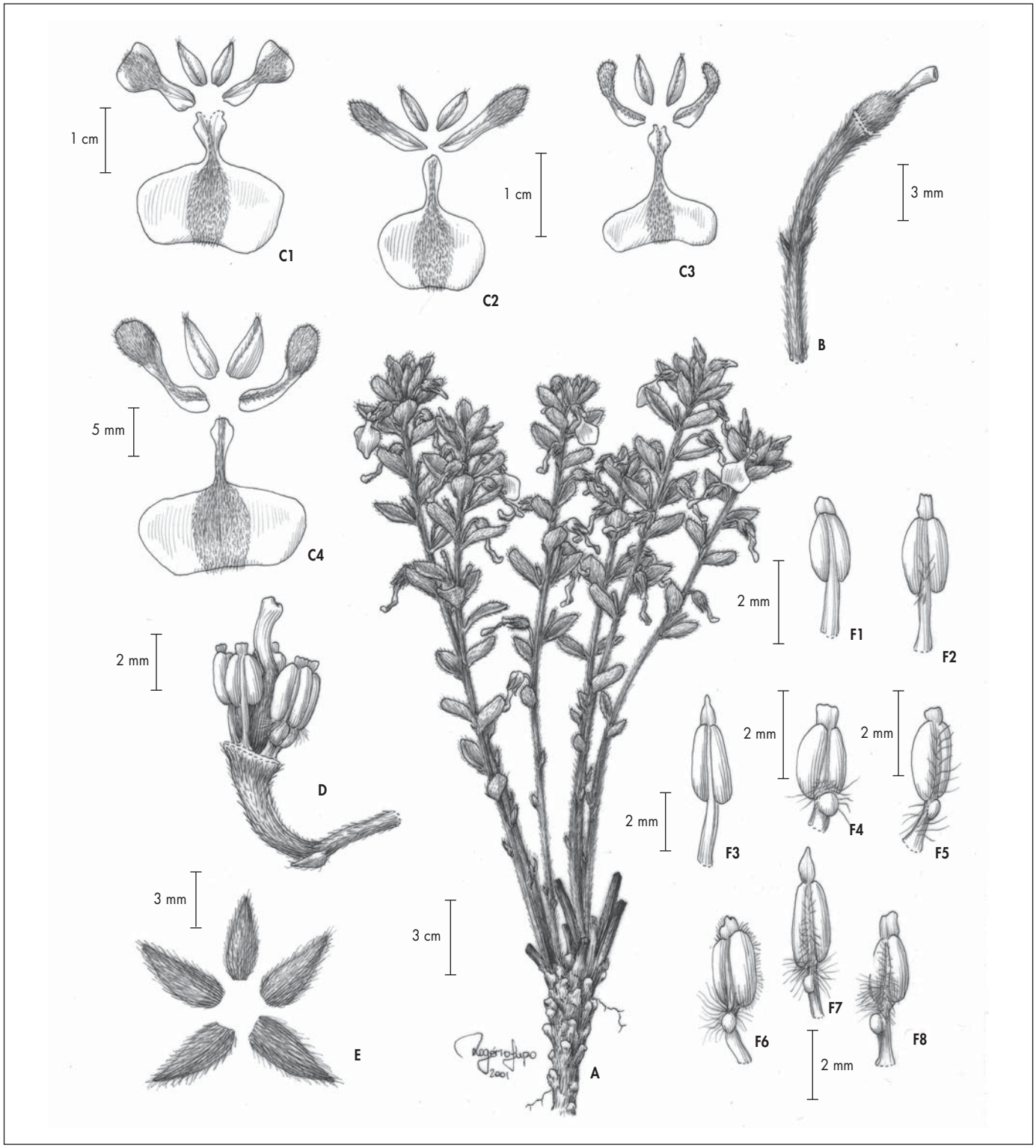

Fig. 1. – *Hybanthus lanatus* (A. St.-Hil.) Baill. **A.** Habit; **B.** Gynoecium, floral pedicel and bracteoles; **C.** Morphological variability of the corolla; **D.** Androecium and gynoecium; **E.** Calyx; **F1-F3.** Morphological variability of the anterior stamens; **F4-F8.** Morphological variability of the posterior stamens.

[**A:** *Souza & al. 3541* (ESA); **B, C4:** *Mendonça & al. 3097* (IBGE); **C1, E:** *Mello-Barreto 9488* (BHCB); **C2:** *Irwin & Soderstrom 6727* (UB); **C3, F1:** *Irwin & Soderstrom 6285* (UB); **D:** *Filgueiras & al. 3129* (IBGE); **F2:** *Cesar 630* (UB); **F3, F7:** *Fonseca & al. 1298* (IBGE); **F4:** *Fonseca 1574* (IBGE); **F5:** *Harley & al. 10850* (UB); **F6:** *Irwin & al. 9910* (UB); **F8:** *Silva & Oliveira 2408* (IBGE)].

Among the species of *H. lanatus* complex, the most widely distributed and most morphologically variable is *H. lanatus* (as here circumscribed), showing a very diverse range of variation in leaf shape and size and indument-type. A closer analysis of the type of *Ionidium lacteum* S. Moore showed that the sepals are not semipinnatifid-pectinate as the author described, but inconspicuously sub-entire, a feature that could easily be erroneously interpreted as Moore refered due to the dense hairs covering the sepals. Therefore, this name is considered here as a synonym of *H. lanatus*.

Distribution and habitat. – The species occurs in cerrados, grasslands and «campos rupestres» of the Brazilian Plateau from Tocantins to Mato Grosso do Sul, also reaching Espinhaço Range in Minas Gerais and probably ecotonal cerrado/caatinga areas in Ceará and Bahia. In Argentina it is only known from a restricted area in San Ignacio, Misiones province. (Fig. 2).

Selected specimens examined. – **Argentina. Misiones:** San Ignacio, Teyucuaré, sabanas, 13.II.1945, *Burkart 15292* (SI). s.d., *Giambiagio s.n.* (SI 17125); Parque Provincial Teyú Cuaré, campos, 27°16'S 55°33'W, 150 m, 19.IX.2000, *Múlgura de Romero & al. 2065* (MO).

Brazil. Bahia(?): Retiro pr. Pago Contendas, in deserto flum. S. Francisco, s.d., *Saint-Hilaire 589* (P). **Ceará:** Sandy campos, Cachoeira, II.1839, *Gardner 2397-a* (K). **Distrito Federal:** Brasília, rod. Brasília-Planaltina de Goiás (DF-128), km 7, próximo à Estação Ecológica de Águas Emendadas, cerrado recentemente queimado, 15°34'52''S 47°40'36''W, 29.VII.2000, *Souza & al. 3541* (ESA). **Goiás:** Campinaçu, região da Fazenda Praia Grande cruzando o Córrego Praia Grande (margem esquerda); ca. 6 km após o córrego, pastagem recém queimada em região de antiga mata seca, 430 m, s.d., *Walter & al. 2676* (CEN, ESA); Corumbá de Goiás, Serra do Bicame, estrada para Pirenópolis, campo sobre terreno rochoso, 01.VIII.1984, *Pereira & al. 1093* (IBGE); Formosa, 19.X.1965, *Duarte 9379* (RB), 20.X.1961, *Heringer 10703* (UB); Jataí, estrada de Jataí para Serranópolis, a 20 km do Ribeirão Ariranha, 18.X.1972, *Rizzo 8474* (ESA, UFG); Niquelândia, Morro do Cristo, cerrado queimado há 30 dias, 12°27'08''S 48°27'26''W, 19.IX.1996, *Fonseca 1199* (IBGE); Pirenópolis, estrada para o Parque Estadual dos Pireneus, cerrado queimado recentemente, 14.X.2006, *Paula-Souza & al. 6615* (ESA). **Goiás/Tocantins:** Between Cavalcante & Conceição, s.d., *Burchell 8118* (BR, K). **Minas Gerais:** Abadia dos Dourados, arid upland campo N. d'Abadia, V.1840, *s.coll. 4091* (K); Gouveia, Serra do Espinhaço, rodovia para Barão do Guaçuí, campo limpo de altitude, recém queimado, 1300 m, 24.X.1999, *Hatschbach & al. 69629* (CTES, MBM); Itacambira, cerrado, 1300 m, 17°00.572''S 43°20.266''W, 13.XI.2001, *Tozzi & Alencar 2001-478* (UEC); Montes Claros, Serra do Catuny, Brejo das Almas, 1000 m, campo com cascalho, 10.XI.1938, *Markgraf & al. 3230* (R, RB); Sacramento, PARNA Serra da Canastra, próximo à guarita de Sacramento, campo limpo, um mês após a queimada, 19.VIII.1994, *Nakajima & al. 413* (ESA, HUFU); Salgado, Brasilia in herbidis umbrosis, s.d., *Martius s.n.* (M); Santana do Riacho, Serra do Cipó, ao lado da Pensão Chapéu de Sol, cerrado, 06.VII.2001, *Souza & al. 3583* (ESA); Sopa, près de Biribiry, *Glaziou 18871* (K, P); Unaí, entre Unaí e Chupador, campo recém queimado, 26.X.1961, *Duarte 6378* (HB, RB). **Mato Grosso:** Chapada dos Guimarães, Sta. Anna da Chapada, 20.IX.1902, *Robert 547* (BM, K); Itiquira, ca. 23 km Leste de Itiquira na estrada MT-299 a Alto Araguaia, cerrado queimado, 550 m, 17°14' 12''S 53°47'50''W, 17.IX.1995, *Pott & al. 7376* (CPAP). **Mato Grosso do Sul:** Campo Grande, 10.IX.1936, *Archer & Gehrt 164* (SP). **Tocantins:** Natividade, Serra de Natividade, XII.1839, *Gardner 3196* (K).

2. *Hybanthus velutinus* Schulze-Menz in Notizbl. Bot. Gart. Berlin-Dahlem 12: 111. 1934 (Fig. 3).

Lectotypus (designated by Seo & al., 2010): «In regione fluminis Yhú», X.1905, *Hassler 9514* (G [G76156!]; iso-: BM!, G [G76155!, G76157!, G76157a!, G76158!, G76158a!], P!, W!).

Herbs usually with a well developed underground system, 15-30 cm tall, simple or branched at ground level; internodes 3-26 mm. *Leaves* alternate; stipule 5-7 × ca. 0.5 mm, margin entire; leaves sessile to subsessile; blade 17-33 × 6-12.5 mm, oblanceolate, elliptic to lanceolate, apex acute to obtuse or rounded, margin entire, sub-entire or serrate, or less frequently sharp-toothed, base acute to attenuate, tomentose to villous or woolly, hairs all stellate or frequently simple with some sparse stellate hairs. *Flowers* white, solitary, axillary; floral pedicel 9-18(-29) mm; bracteoles ca. 2 × ca. 0.5 mm; sepals equal, 8-9.5 × 3.5-8 mm, lanceolate to ovate, margin fimbriate, base truncate to rounded or cordate, villous; posterior petals 6.5-9 × 2-3.5 mm, oblong to lanceolate; lateral petals 14-20 × 8.5-17 mm, clawed or less frequently spathulate, falcate, villous; anterior petal 13-17 mm long, clawed, blade 11-25 mm wide, transversely oblong or less frequently subsquare, apex truncate to emarginate, villous; filaments ca. 1-1.5 mm, connective appendages white, ca. 0.5 mm long, frequently asymmetric, nectariferous appendages noduliform, sometimes much reduced and inconspicuous, inserted on the filaments, villous; style 3-3.7 mm, glabrous, straight, ovary ca. 2.5 mm, villous. *Capsule* 9-10.5 × 6-7.5 mm, ellipsoid to ovoid; seeds ca. 3 × ca. 2 mm.

Hybanthus velutinus shows some variability regarding the indument, and as observed in *H. lanatus*, sometimes the leaves and stems are covered only by simple hairs, or scattered few-branched stellate hairs. However, stellate hairs are always found on the sepals or petals. Furthermore, the subterraneous system of this species is considerably less developed than in

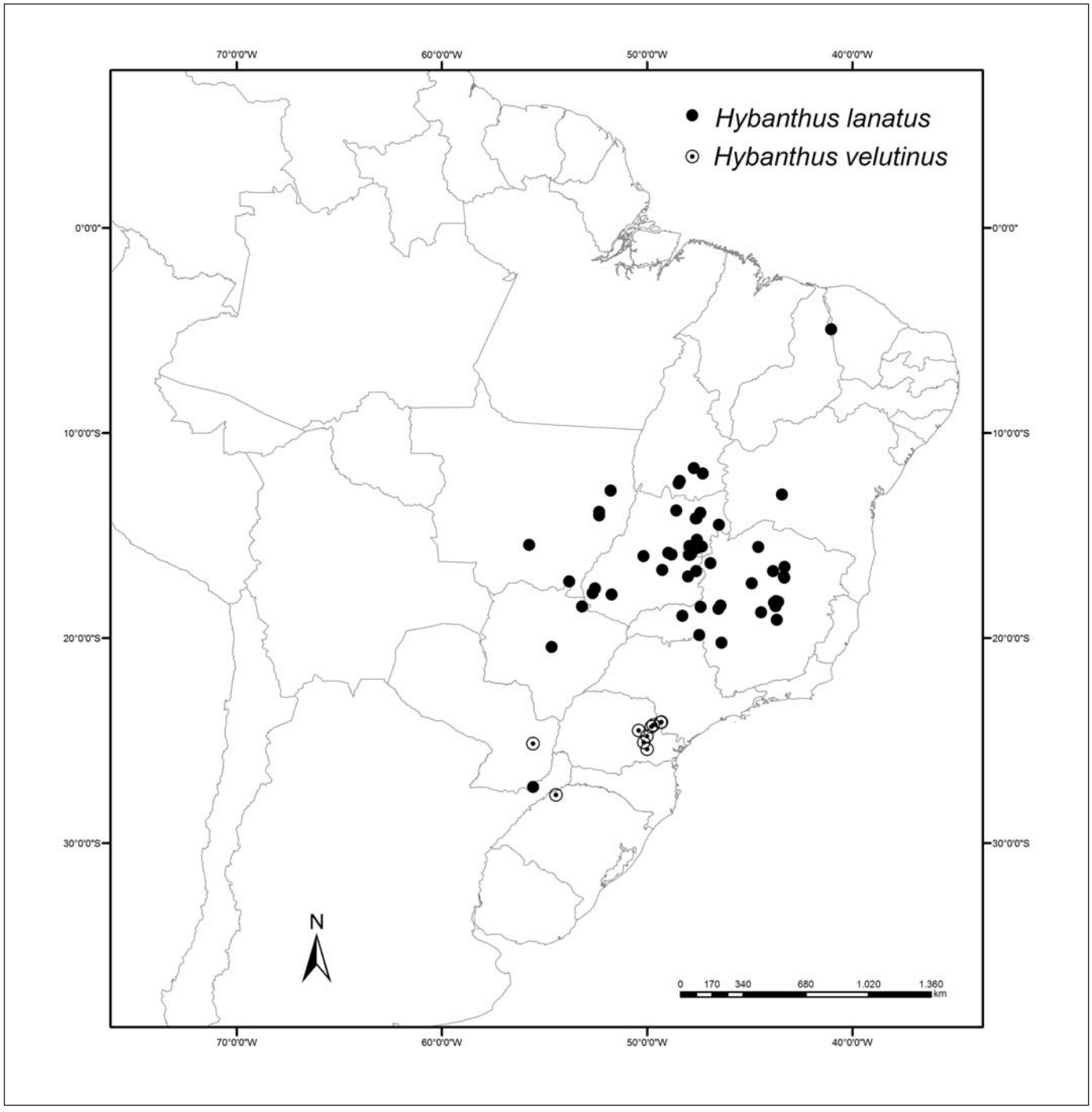

Fig. 2. – Geographical distribution of *Hybanthus lanatus* (A. St.-Hil.) Baill. and *H. velutinus* Schulze-Menz.

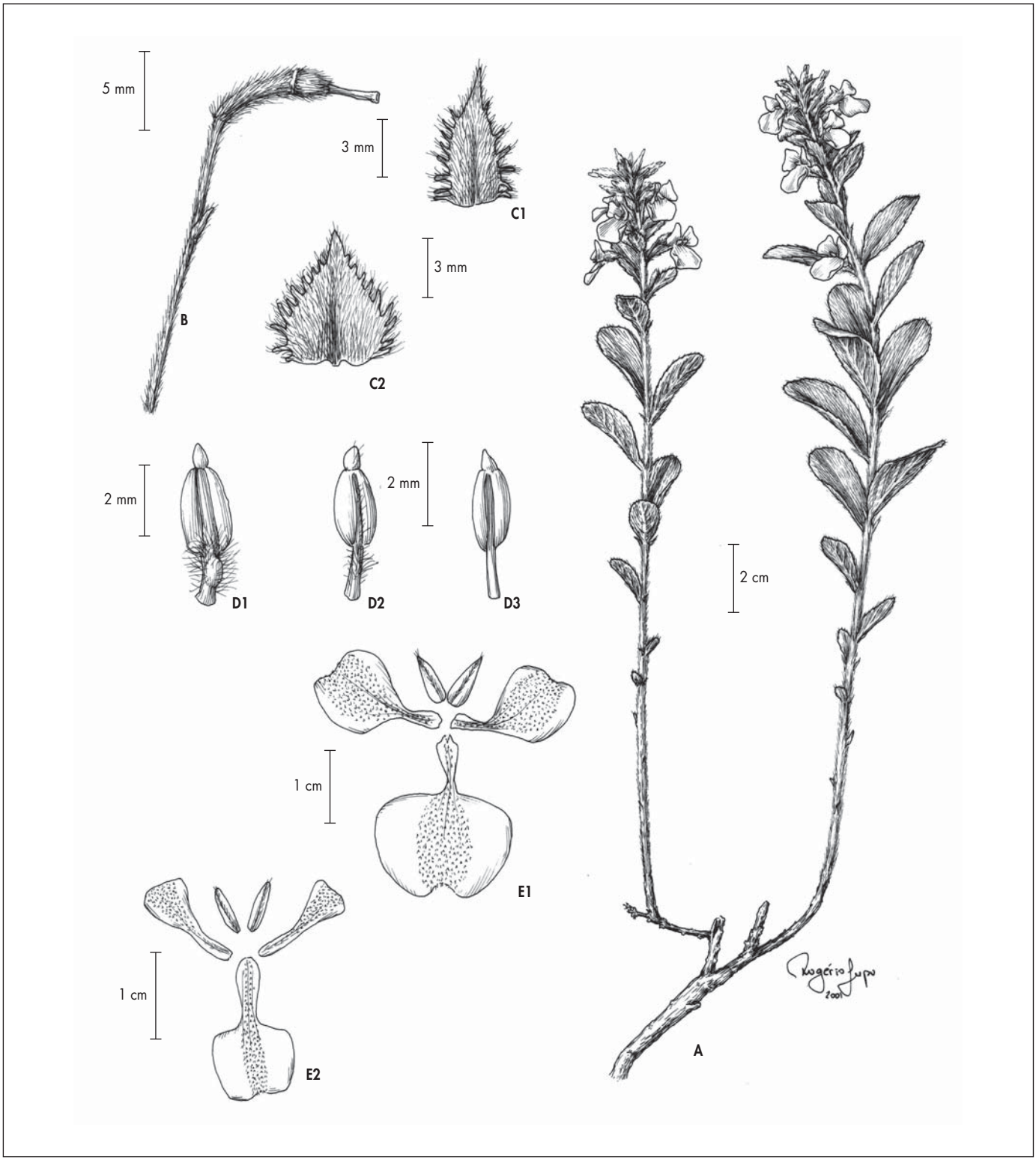

Fig. 3. – *Hybanthus velutinus* Schulze-Menz. **A.** Habit; **B.** Gynoecium, floral pedicel and bracteoles; **C1-C2.** Morphological variability of the sepals; **D1-D2.** Morphological variability of the anterior stamens; **D3.** Posterior stamen; **E1-E2.** Morphological variability of the corolla.

[**A, D1.** *Hatschbach 59430* (ESA); **B.** *Dombrowski 6627* (MBM); **C1.** *Hatschbach 45485* (MBM); **C2, E1.** *Hatschbach 37073* (ESA); **D2, D3.** *Dombrowski 676* (PEL); **E2:** *Hatschbach 17099* (MBM)].

H. lanatus, and sometimes the xylopodiferous-like structure bearing buds is not even formed in *H. velutinus*, which may be a reflect of the habitat less subject to fires than the localities where the other species of *H. lanatus* complex thrive in the central Brazil Cerrado.

Distribution and habitat. – Hybanthus velutinus is found in Paraguay and Brazil, in grasslands and fragments at the southernmost limits of Cerrado in southern São Paulo and northeastern Paraná. Its occurrence in Argentina, although very likely, is still to be confirmed (Fig. 2).

Selected specimens examined. – **Brazil. Paraná:** Castro, na rodovia entre Castro e Itararé, Parque Florestal de Caxambú, no campo, 30.XI.1984, *Mattos 26914* (HAS); Jaguariaíva, BR 151, entrada da Fazenda 3 Ledes II, a ca. 1 km E do pedágio, campo graminoso em beira de estrada, 24.33310°S 49.79395°W, 26.9.2007, *Paula-Souza & al. 8736* (SPF); Palmeira, campo arenoso, seco, 25.X.1976, *Dombrowski 6627* (MBM); Ponta Grossa, Parque Vila Velha, campo limpo, 22.IX.1982; *Hatschbach 45485* (MBM); Tibagi, Três Pontões, campo limpo, 12.X.1959, *Hatschbach 6377* (HBR, MBM). **Rio Grande do Sul:** Tucunduva, s.d., *Weir 378* (BM, K). **São Paulo:** Itararé, 9km de Itararé para Bom Sucesso de Itararé, beira de estrada, 13.XI.2003, *Paula-Souza & al. 3645* (ESA).

Discussion

1. *On the occurrence of H. velutinus in Argentina.*

Hybanthus velutinus is readily distinguished from *H. lanatus* for its much larger and frimbriate sepals (more details in table 1), and the specimen *Múlgura de Romero & al. 2065* (MO), collected in Teyucuaré, San Ignacio, Argentina, undoubtedly corresponds to the latter species. That specimen was collected exactly at the same locality as the couple of samples referred by Sparre (1950) as *H. velutinus*, but this author did not describe the calyx for the collections he mentioned. The morphology of the anthers' connective appendages, which Sparre (1950) used to distinguish this species from *H. calceolaria* (L.) Oken, is similar to most species within the *H. lanatus* complex, and in both *H. velutinus* and *H. lanatus* they are hyaline and much reduced when compared to the large, orange-brown connective appendages of *H. calceolaria* and most of the remaining species of the genus. A careful analysis of the specimens listed by Sparre (1950) as *H. velutinus* (*Giambiagio s.n.* [SI] and *Burkart 15292* [SI]) confirmed their identification as *H. lanatus*. Thus, the occurrence of *H. velutinus* in Argentina is highly questionable, since no further record of this species there was registered from our extensive search among over 3500 herbarium specimens.

Though, even if not yet recorded, the occurrence of *H. velutinus* in Misiones is still probable, as it occurs in adjacent localities of Paraguay (where the type specimen was collected), and Brazil (Fig. 2). Similar patterns of distribution are found in a large number of species in other plant groups, whose occurrence in Argentina has also been recently first recorded (Peralta, 2001; Ponce, 2001; Peter, 2004; Calviño & Martínez, 2007; Vega & Dematteis, 2008). The distributions of these species can be referred as to the Misiones Nucleus, as designed by Prado & Gibbs (1993) and Pennington & al. (2003), a roughly triangular area whose sides correspond to the Brazilian-Bolivian border in Puerto Suárez-Corumbá, Resistencia-Corrientes in Argentina and the upper Uruguay River valley in Misiones (Argentina) and Santa Catarina (Brazil). *Hybanthus velutinus* has been more frequently recorded for areas that do not exactly correspond to the Misiones Nucleus (southern São Paulo and northeastern Paraná states), but always in areas that should be considered as peripheral and transitional of Cerrado. Its distribution through Paraguay (Fig. 2) strongly suggests that the possibility of its occurrence in Misiones or northeastern Corrientes Provinces should not be fully discarded.

2. *On the distribution of H. lanatus, its occurrence in Argentina and considerations on the nature of the San Ignacio flora.*

As referred above, the area where *Hybanthus lanatus* was first recorded in Argentina belongs to the Misiones Nucleus, one of the distribution «nuclei» or concentrations of the Tropical Seasonal Forests Region (Prado, 2000) or Seasonally Dry Tropical Forests (SDTF, Pennington & al., 2003). Although the relationships between Cerrado and SDTF are extremely complex, both growing in areas of low precipitation and high seasonality, each of these tropical forests shows very particular edaphic characteristics (Gentry, 1995; Pennington

Table 1. – Diagnostic features between *Hybanthus lanatus* (A. St.-Hil.) Baill. and *Hybanthus velutinus* Schulze-Menz.

Features	*H. lanatus*	*H. velutinus*
Margin of sepals	Entire	Fimbriate
Size of sepals	5-8(-10) × 1.5-3 mm	8-9.5 × 3.5-8 mm
Width of lateral petals	2-5(-12) mm	8.5-17 mm
Geographical distribution	Cerrados of the Brazilian Plateau (core area)	Southern Brazil and adjacent areas of Paraguay

& al., 2000, 2003): Cerrado vegetation grows on poorer, dystrophic soils, with high levels of aluminum, whilst SDTF occupies areas with limestone and other soils having a moderate to high pH and nutrient levels, and are much less subject to fires that are very frequent in the Cerrado areas. For this reason, Cerrado and SDTF are considered distinct phytogeographic units (Gentry, 1995; Pennington & al., 2000, 2003; Prado, 2000), the latter comprising a number of sub-units, one of which is the Misiones Nucleus.

The discovery of *H. lanatus* in Argentina stimulates some interesting discussions on the distribution pattern of this species and the nature of the vegetation in San Ignacio. The hypothesis of the islands of dry forests in southern South America as evidences of a former, wider Cerrado vegetation during the Holocene (Behling, 1998; Ledru & al., 1998) is highly controversial (Mayle, 2004), if we consider that the Cerrado and SDTF are best defined by edaphic factors rather than climatic ones or seasonality, as discussed above. The San Ignacio area where *H. lanatus* is found is characterized by well-drained soils, with low pH and nutrient levels (Biganzoli & Múlgura de Romero, 2004), and is floristically similar to the Cerrado vegetation. In fact, the Teyucuaré region (in San Ignacio) has been considered an impoverished Cerrado, due to the affinities of its vascular flora and fauna to Cabrera & Wilink's (1973) Cerrado Province (Chébez, 1996). Thus, in the San Ignacio region, the concept of an impoverished Cerrado island in a SDTF can be better explained through migrations and long distance dispersal events, as proposed by Mayle (2004) than by the "dry forest refuge" hypothesis. The floristic elements found in this area could have reached their current distribution by land, through the Sierra de Amambay in Paraguay and low altitude mountain ranges in southern Brazil (Biganzoli & Múlgura de Romero, 2004), or even by water, through the Paraná River drainage system that reaches San Ignacio, coming north from central Brazil. Being so, the impoverishment of the San Ignacio cerrado could be a result of poor dispersal capacity of some elements from the core Cerrado, rather than due to area reduction caused by gradually warmer and wetter climates in this region after the glacial period.

The current known distribution of *Hybanthus lanatus* supports such hypothesis, with further evidences from other plant groups (e.g. *Ditassa acerosa* Mart., Ezcurra & Múlgura de Romero, 2001). Unlike *H. velutinus,* the widely distributed *H. lanatus* was until recently considered endemic to the Brazilian Cerrado, and both the location and the very restricted distribution of this species in Argentina suggest an event of dispersal from the Brazilian Plateau southwards to Misiones. Although the potential for long-distance dispersal of the propagules of *Hybanthus* is considered poor when compared to other Violaceae genera, in which hydrochory and anemochory play a major role in their distribution patterns (e.g. *Corynostylis* Mart. & Zucc., *Anchietea* A. St.-Hil., and *Agatea* A. Gray, Paula-Souza, 2009), the ability to cross astonishing distances exists for this genus, as observed by Wofford & al. (2004), and this fact most likely explains the occurrence of *H. lanatus* in Argentina.

Acknowledgements

The authors are grateful to Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), Universidade de São Paulo, Myndel Botanica Foundation, and International Association for Plant Taxonomy (IAPT) for financing visits to foreign herbaria. The authors also would like to thank the curators of the consulted herbaria for making their collections available either during personnal visits or by providing loans of specimens, and to Dr. Norma Deginani for sending images from herbarium SI.

References

Behling, H. (1998). Late Quaternary vegetational and climatic changes in Brazil. *Rev. Palaeobot. Palynol*. 99: 143-156.

Bennett, E. M. (1972). A Revision of the Australian Species of Hybanthus Jacquin (Violaceae). *Nuytsia* 1: 218-241.

Biganzoli, F. & M. E. Múlgura de Romero (2004). Inventario Florístico del Parque Provincial Teyú Cuaré y alrededores (Misiones, Argentina). *Darwiniana*. 42: 1-24.

Cabrera, A. L. & A. Willink (1973). *Biogeografía de América Latina.* Monograph 13. OEA. Washington DC.

Calviño, C. I. & S. G. Martínez (2007). Nuevas citas para Argentina y Uruguay, y notas sobre Eryngium sect. Panniculata (Apiaceae). *Darwiniana* 45: 68-76.

Chébez, J. C. (1996). Misiones Ñú. Campos Misioneros, algo más que el confín de la selva. *Nuestras aves* 14: 4-16.

Ezcurra, C. & E. M. Múlgura de Romero (2001). Sobre la presencia de Ditassa acerosa (Asclepiadaceae) en la Argentina. *Hickenia* 3: 95-97.

Feng, M. (2005). *Floral morphogenesis and molecular systematics of the family Violaceae*. Ph.D. Dissertation, Department of Biological Sciences, Ohio University. Athens.

Gentry, A. H. (1995). Diversity and floristic composition of neotropical dry forests. *In:* Bullock, S. H., H. A. Mooney & Medina, E. (ed.), *Seasonally dry tropical forests:* 146-194. Cambridge University Press.

Hayashi, A. H. & B. Appezzato-da-Glória (2007). Anatomy of the underground system in Vernonia grandiflora Less. and V. brevifolia Less. (Asteraceae). *Braz. Arch. Biol. Technol.* 50: 979-988.

Hekking, W. H. A. (1988). Violaceae – Part 1 (Rinorea and Rinoreocarpus). *Fl. Neotrop. Monogr.* 46. New York Botanical Garden.

Ledru, M. P., M. L. Salgado-Labouriau & M. L. Lorscheitten (1998). Vegetation dynamics in southern and central Brazil during the last 10.000 yr. B.P. *Rev. Palaeobot. Palynol*. 99: 131-142.

Mayle, F. E. (2004). Assessment of the Neotropical dry forest refugia hypothesis in the light of palaeoecological data and vegetation model simulations. *J. Quatern. Sci.* 19: 713-720.

Paula-Souza, J. (2009). *Estudos Filogenéticos em Violaceae com ênfase na Tribo Violeae e Revisão Taxonômica dos Gêneros Lianescentes de Violaceae na Região Neotropical.* Ph.D. Dissertation, Instituto de Biociências, Universidade de São Paulo. São Paulo.

Pennington, R. T., M. Lavin, D. E. Prado, C. A. Pendry, S. K. Pell, & C. A. Butterworth (2003). Historical climate change and speciation: Neotropical seasonally dry forest plants show patterns of both Tertiary and Quaternary diversification. *Philos. Trans., Ser. B* 359: 515-538.

Pennington, R. T., D. E. Prado & Pendry, C. A. (2000). Neotropical seasonally dry forests and Quaternary vegetation changes. *J. Biogeogr.* 27: 261-273.

Peralta, P. (2001). Clidemia (Melastomataceae) una nueva cita para la flora argentina. *Hickenia* 3: 115-117.

Peter, G. (2004). The genus Isostigma (Asteraceae, Heliantheae) in Argentina: Two new records and notes on distribution. *Darwiniana* 42: 207-215.

Ponce, M. M. (2001). Additions and corrections to the pteridophyte flora of northeastern Argentina. *Amer. Fern J.* 91: 70-72.

Prado, D. E. (2000). Seasonally dry forests from tropical south america: from forgotten ecosystems to a new pyhytogeographic unit. *Edinburgh J. Bot.* 57: 437-461.

Prado, D. E. & P. E. Gibbs (1993). Patterns of species distributions in the dry seasonal forests of South America. *Ann. Miss. Bot. Gard.* 80: 902-927.

Seo, M. C., A. M. Sanso & C. C. Xifreda (2010). Lectotypifications in Hybanthus Jacq. (Violaceae) of the native flora of Argentina and Paraguay. *Candollea* 64: 279-282.

Sparre, B. (1950). Estudios sobre las Violaceas Argentinas I. Los Generos Hybanthus y Anchietea. *Lilloa* 23: 515-574.

Vega, A. J. & M. Dematteis (2008). Eupatorium rufescens y Vernonia oligactoides (Asteraceae), nuevas citas para la flora Argentina. *Bonplandia* 17: 83-89.

Wofford, B. E., J. Paula-Souza, A. S. Weakley & T. E. Govus (2004). The Rediscovery of the South American Hybanthus parviflorus (Violaceae) in North America. *Sida* 21: 1209-1214.