



# *Hippeastrum angustifolium* Pax (Amaryllidaceae): first record for a biodiversity hotspot in the Mato Grosso do Sul, Brazil

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## Abstract

*Hippeastrum angustifolium* Pax a bulbous perennial in the family Amaryllidaceae, occurs in Argentina, Paraguay, and south-southeastern Brazil in the Pampa and Atlantic Forest domains. In this work, we present the first record of this species for the Cerrado domain in the state of Mato Grosso do Sul, Brazil. We also comment on its biology and ecology.

## Key words

Bulbous herbs; Cerrado; distribution; South America; wetlands.

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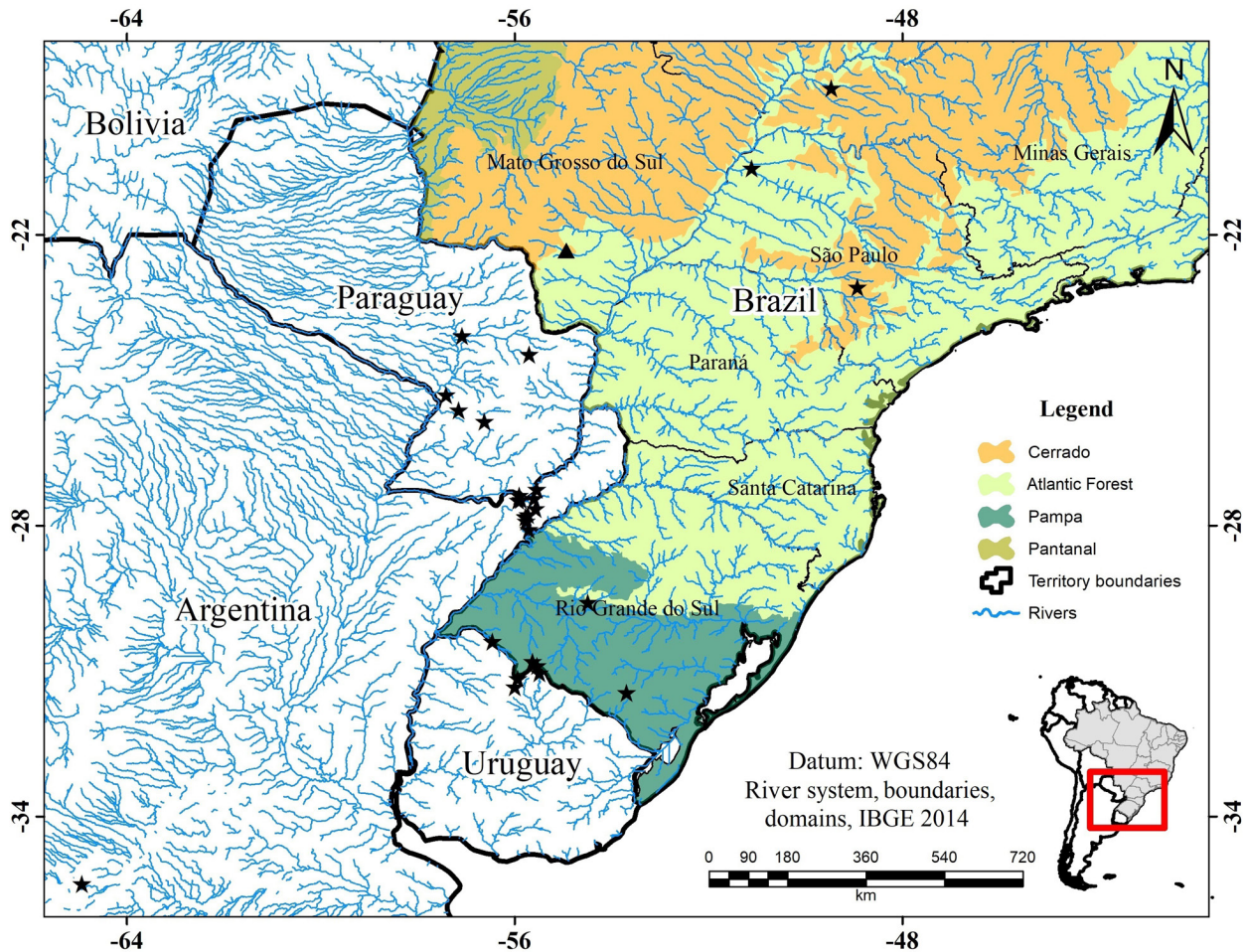
## Introduction

The family Amaryllidaceae J.St.-Hil. is distributed worldwide and its taxonomy is complex (Oliveira 2012). In Brazil, 18 genera are recognized, comprising 135 native species (Dutilh and Oliveira 2015a). Amaryllidoideae Burnett is distributed from temperate to tropical areas; South America, South Africa, and the Mediterranean region are the 3 main centers of diversity (Arroyo and Cutler 1984, Meerow 2004). This subfamily consists of bulbous herbs, with strap-shaped leaves, umbellate inflorescences, bisexual flowers, inferior ovaries, and capsule-shaped fruits (Meerow 2004).

According to APG IV (2016), Amaryllidoideae is 1 of 3 subfamilies of Amaryllidaceae and is part of the clade Hippeastroide. This clade includes the tribe Hippeastreae Herb. ex Sweet, with 7 genera, including the genus

*Hippeastrum* Herb., which presents the greatest species richness in this group (Meerow and Snijman 1998, Meerow et al. 2000). *Hippeastrum* has about 50 species throughout North and South America (Meerow 2004). In Brazil, *Hippeastrum* is a major genus and many species are native, occurring throughout the country; species are epiphytes or terrestrial in grasslands, forests, caatinga, marshes, and near the sea (Dutilh 1989, Schultz 1990, Dutilh 2005a). Plants of the genus are popularly known as amaryllis and lilies and have great economic importance worldwide because many are used as ornamentals or have pharmacological potential (Dutilh 2005a).

*Hippeastrum angustifolium* Pax is 1 of the 34 species of *Hippeastrum* known from Brazil. It is distributed through Argentina, Paraguay and south-southeastern Brazil, in the states of Rio Grande do Sul and São Paulo,



**Figure 1.** Geographic distribution of *H. angustifolium* in South America. ★ = previously known occurrences; ▲ = first species record in the Cerrado of Mato Grosso do Sul, Brazil.

in the Pampa and Atlantic Forest domains, respectively (Dutilh and Oliveira 2015b). This species is widely marketed as an ornamental plant by collectors of bulbous plants around the world (Dutilh 2005b), but little is known about this species distribution in Brazil because many natural populations are disappearing and citations in lists of local floras are scarce (Dutilh 2005a, Dutilh et al. 2013). In this work, we present the first record of *H. angustifolium* for the Cerrado domain in the state of Mato Grosso do Sul, Brazil, along with comments about its biology and ecology.

## Methods

The species was collected during the “Aquatic Communities Monitoring Program” in the areas around the São Fernando Sugarcane Mill, Dourados, Mato Grosso do Sul (Fig. 1).

Here, typical Cerrado phytophysiognomies predominate, Submontane Semi-deciduous Forest and Atlantic Forest formations interspersed (IBGE 2012). The climate is Cfa according to the Koeppen climate classification system, with a warm summer, average annual temperature between 20 and 22 °C and an annual rainfall between 1600 and 1900 mm (Alvares et al. 2013).

The collected specimen was deposited in the Herbarium of the Federal University of Mato Grosso do Sul, Campo Grande (CGMS).

The geographic distribution map (Fig. 1) was prepared using the available information in the SpeciesLink (<http://www.splink.org.br>) and Global Biodiversity Information Facility (<http://www.gbif.org>) databases, as well as unpublished data from Julie Henriette Antoinette Dutilh (pers. comm.). When the geographic coordinates of collection sites were not explicit, for mapping purposes, we used the most specific locality (hence, the nearest town). Records for which a set of coordinates could not be derived from the data are recorded in (Table 1) but not mapped.

## Results

**New records.** Brazil: Mato Grosso do Sul. Dourados, wetland next to MS-379 road, near São Fernando Sugarcane Mill (22°19'41" S, 054°56'14" W), 7-X-2016, (*B. Bueno*, CGMS 57124). Dourados, wetland next to MS-379 road, near junction with MS-463 road (22°15'32" S, 054°52'41" W), 7-X-2016, (*B. Bueno*, no voucher specimen collected).

The specimens were collected in a *vereda* (a typical wetland of the Cerrado, with water table above the sur-

**Table 1.** List of *H. angustifolium* available, including the data for each sample. Asterisks (\*) indicate geographic coordinates determined by authors. MBM = Herbário do Museu Botânico Municipal, SI and AS = Instituto de Botânica Darwinion, MO = Missouri Botanical Garden, C = University of Copenhagen, F = Field Museum, B = Botanischer Garten und Botanisches Museum Berlin-Dahlem, MACN = Museo Argentino de Ciencias Naturales, CGMS = Herbário da Fundação Universidade Federal de Mato Grosso do Sul, HDCF = Herbário do Departamento de Ciências Florestais, UEC = Herbário da Universidade Estadual de Campinas, BHCB = Herbário da Universidade Federal de Minas Gerais, ESA = Herbário da Escola Superior de Agricultura Luiz de Queiroz, S = Swedish Museum of Natural History, NY = The New York Botanical Garden, SPF = Universidade de São Paulo, SP = Instituto de Botânica, U = Naturalis Biodiversity Center, K = Royal Botanic Gardens Kew, BM = British Museum of Natural History, MVJB = Museo y Jardín Botánico, MVM = Museo Nacional de Historia Natural, MVFQ = Universidad de la República.

| Locality                                 | Latitude    | Longitude    | Date        | Herbarium number                 | Collector/Collection number                   |
|--|-------------|--------------|-------------|----------------------------------|---|
| Argentina, Misiones, Apóstoles           | 27°49'00" S | 055°46'00" W | 21-IX-2004  | MBM 322847                       | M.E.M. Romero 3797 et al.                     |
| Argentina, Misiones, Ruta Provincial 1   | 27°49'23" S | 055°46'12" W | 21-IX-2004  | SI 145417; SI 145418             | M.E.M. Romero s/n°                            |
| Argentina, Misiones, Posadas             | 27°28'48" S | 055°55'12" W | 15-X-2000   | SI 19106                         | F.O. Zuloaga 7145                             |
| Argentina, Corrientes, Santo Tomé        | 28°04'59" S | 055°42'00" W | 22-X-1996   | SI 1408; MO 2188178              | O. Morrone 1822                               |
| Argentina, Misiones, Apóstoles*          | 27°54'53" S | 055°45'18" W | 13-X-1977   | SI                               | A.L. Cabrera 28761                            |
| Argentina, Misiones, Gral Guemes         | 27°39'00" S | 055°33'36" W | 12-X-1977   | SI 67351                         | A.L. Cabrera 28626                            |
| Argentina, Misiones*                     | 27°15'29" S | 055°32'05" W | 25-X-1959   | C                                | T.M. Pedersen 5230                            |
| Argentina, Misiones, Posadas             | 27°22'59" S | 055°54'00" W | XII-1950    | SI 19106; MO 2452834             | R.A. Spegazzini 1                             |
| Argentina, Misiones, Candelaria          | 27°26'24" S | 055°35'24" W | 1907        | SI 10037                         | A. de Llamas 26616                            |
| Argentina, La Pampa, Ruta Provincial 11* | 35°23'12" S | 064°55'14" W | 27-X-1886   | F                                | G. Niederlein 1893                            |
| Argentina                                |             |              | 27-X-1886   | B 9971                           | G. Niederlein 1893                            |
| Argentina, Misiones*                     | 27°27'47" S | 055°51'50" W | 13-X-1886   | MACN 16771                       | G. Niederlein 655                             |
| Argentina, Misiones, Apóstoles           | 27°46'48" S | 055°43'12" W |             | SI 67350                         | A.L. Cabrera s/n°                             |
| Argentina                                |             |              |             | MO 3029368                       | G. Niederlein 1893                            |
| Brazil, MS, Dourados                     | 22°19'41" S | 054°56'14" W | 7-X-2016    | CGMS 57124                       | B. Bueno s/n°                                 |
| Brazil, RS, Mata                         | 29°34'59" S | 054°29'07" W | 13-X-2009   | HDCF 6517                        | K.P. Soares s/n°                              |
| Brazil, SP, Avaré                        | 23°05'24" S | 048°55'12" W | 23-X-2001   | UEC 170541                       | J.H.A. Dutilh s/n°                            |
| Brazil, RS, Quaraí                       | 30°23'15" S | 056°27'5" W  | 5-XI-1995   | UEC 77762; BHCB 31158            | J.R. Stehmann 1986 et al.                     |
| Brazil, RS, Candiota                     | 31°26'56" S | 053°40'55" W | 5-XI-1995   | UEC 77238                        | J.R. Stehmann 1987 et al.                     |
| Brazil, RS, Santana do Livramento        | 30°53'26" S | 055°31'58" W | 3-XI-1995   | ESA 39648; UEC 77752; BHCB 31329 | J.R. Stehmann 2004 et al.                     |
| Brazil, MG, Ituiutaba*                   | 18°58'41" S | 049°27'45" W | 3-X-1944    | S                                | A. Macedo 513                                 |
| Brazil, RS, Santana do Livramento*       | 30°48'11" S | 055°37'33" W | 13-XI-1936  | MO 3029316; NY 886273            | W.A. Archer 4435; J.H.A. Dutilh s/n°          |
| Brazil, SP, Andradina*                   | 20°37'47" S | 051°05'59" W | 21-X-1936   | SPF 72966; SP 36534              | F.C. Hoehne s/n°; F.C. Hoehne & A. Gehrt 1938 |
| Paraguay, San Pedro*                     | 24°05'26" S | 057°4'33" W  | 12-XII-1956 | U 1065423                        | A.L. Woolston 732                             |
| Paraguay, Gaurá, Itapé*                  | 25°51'05" S | 056°36'49" W | IX-1931     | S                                | P. Jorgensen 4540                             |
| Paraguay, Canindeyú, Curuguaty           | 24°28'14" S | 055°41'35" W | IX-1898     | AS 34146                         | E. Hassler 4591                               |
| Paraguay                                 |             |              | 27-IX-1874  | K                                | B. Balansa 529                                |
| Paraguay, Paraguari*                     | 25°37'11" S | 57°9'00" W   |             | MO 2492272                       | E. Hassler 4591                               |
| Paraguay, Central, Areguá*               | 25°18'20" S | 57°24'33" W  |             | BM 526566                        | E. Hassler b.1864; d.1937; Hassl. 4591        |
| Uruguay, Rivera, Ruta 27*                | 31°2'31" S  | 55°29'11" W  |             | MVJB 38317                       | C. Brussa 1292                                |
| Uruguay, Tacuarembó                      | 31°19'37" S | 55°59'15" W  | XI-1898     | SI 179273; MVM                   | J. Arechavaleta 3993c; M.B. Berro 5957        |
| Uruguay, Rivera, Tranqueras              | 31°9'24" S  | 55°55'55" W  |             | MVFQ 621; MVM                    | J. Arechavaleta 3998                          |

face, abundant organic matter, and many filiform species of Poaceae and Cyperaceae; Moreira et al. 2015). The *Vereda* is located within an area of cultivated pasture (*Urochloa* spp.) surrounded by sugarcane. Two natural populations of *H. angustifolium* were recorded in 2 separate wetlands, about 9 km apart.

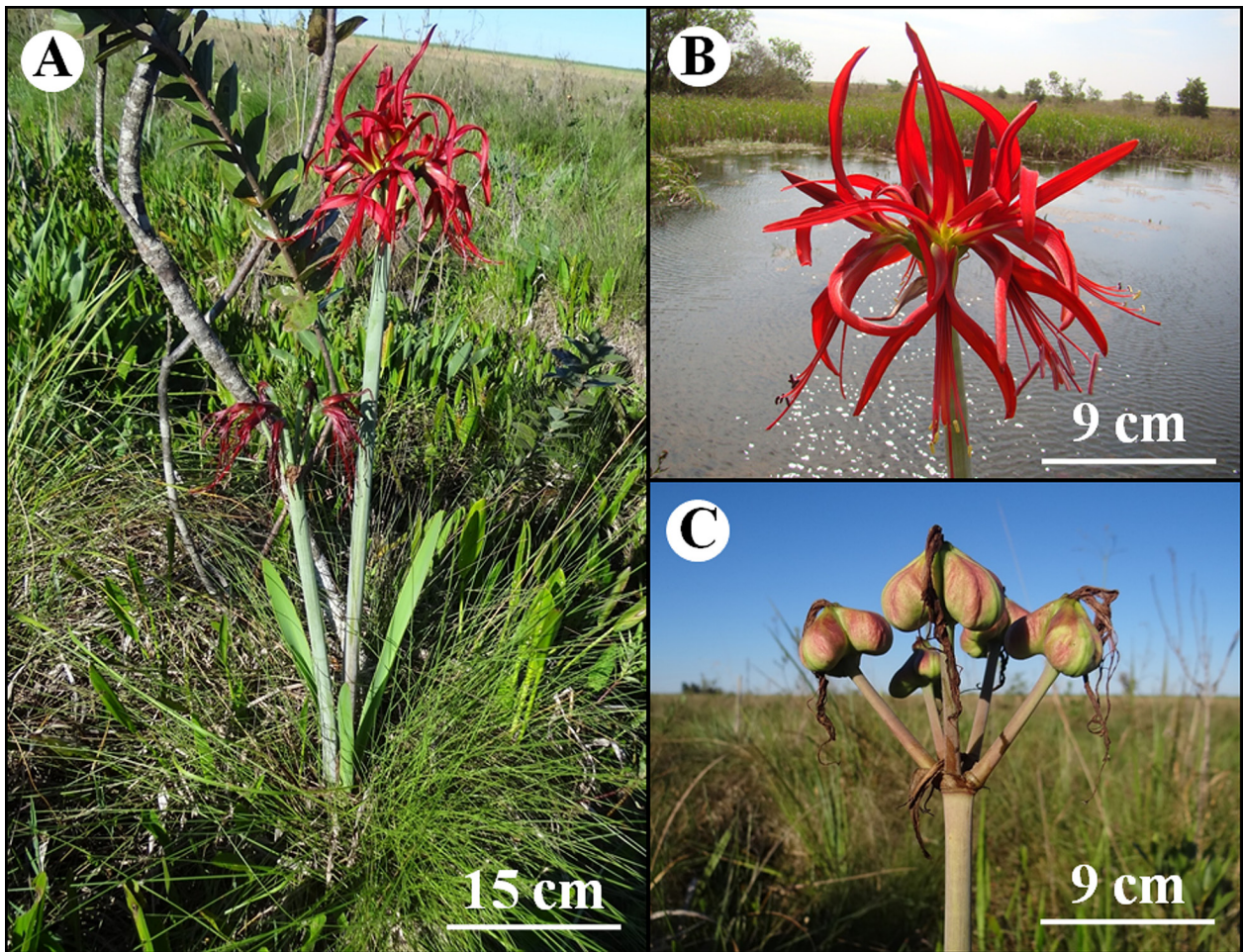
**Identification.** *Hippeastrum* individuals with flowers and fruits were collected for their identification in laboratory. The flowers were analyzed with stereomicroscope and flower features were identified according to the identification key for *Hippeastrum* species (Dutilh 2005a). According to Dutilh (2005a), the flower features required to identify species are: a) 3 lower tepals wrapping the filaments base, b) thick corona of fimbriae and c) stamens

and style longly exerted (Fig. 2B). *Hippeastrum angustifolium* is characterized as a bulbous herb with annual green leaves and long erect hollow scape that can sustain up to twelve dark red and green-tinged flowers, which give rise to fruit containing semi-discoïd and flattened seeds (Dutilh 2005a). It is a terrestrial plant that usually occurs in wet open grasslands (Dutilh and Oliveira 2015b) and its pollination is certainly performed by birds and seed dispersion by wind (Piratelli 1997, Oliveira 2012, Fig. 2).

## Discussion

The Cerrado is a global biodiversity hotspot with over 4800 plant and vertebrate species found nowhere else,





**Figure 2.** General appearance of *H. angustifolium* from Dourados, Mato Grosso do Sul, Brazil. **A.** Habit. **B.** Inflorescence. **C.** Fruit.

but public protected areas cover only 7.5% of the area this biome and deforestation threatens about 480 endemic plant species (Strassburg et al. 2017). The *vereda* wetlands are important in maintaining animal and plant diversity (Moreira et al. 2015), but, unfortunately, the *vereda* subsystem is one of the most vulnerable in Brazil because it is under high anthropogenic pressure and has little capacity for regeneration (Carvalho 1991).

Since 2011, *H. angustifolium* has been recorded in the surveys of the São Fernando Mill. The 2 natural populations recorded are located inside private rural properties, but the specimens were collected only in the mill area because we did not have authorization to collect them in the other area. All specimens recorded in the last 5 years were observed blooming in September and October, and their flowers were visited by hummingbirds, bees, and butterflies (Berinaldo Bueno, pers. obs.). The closest known occurrence where this species was previously documented is in São Paulo state, Brazil (*J.H.A. Dutilh, UEC 170541*), about 520 km northwest from our record.

The species is classified as Vulnerable in Brazil, but is not protected (Dutilh et al. 2013). It is considered extirpated in the state of São Paulo (SNA 2016). In the states of São Paulo and Minas Gerais, records of *H. angustifolium* were mainly made in the 1930s and 1940s,

respectively (Table 1). In both states, plant records were in specific habitats (Fig. 1) and its occurrence is unlikely nowadays, as the habitats needed by this species have drastically changed in the last several decades due to expansion of agriculture, natural resource extraction, and infrastructure projects (MMA 2008). Based on the data available to us, this species is restricted in some habitats in south-southeastern in South America and the its populations seem to be very scarce (Fig. 1), which makes them more susceptible to several threats. According to Dutilh et al. (2013), *H. angustifolium* is rapidly disappearing due to dam construction, opening of drainage channels, and agricultural and urban expansion on wetlands. In the southern region of Brazil, for example, flooded areas, previously considered unhealthy and unproductive, were drained for growing rice. Agrochemicals, applied on rice crops, cause soil and water contamination and put the flora in jeopardy (Carvalho and Ozório 2007). The generation time of *H. angustifolium* is a limiting factor that hinders the recovery of populations because it is at least 3–4 years (CNCFlora 2017).

Thus, habitat preservation is very important for survival of *H. angustifolium*. Because this species is still Data Deficient (MMA 2008), new studies on its reproductive biology and ecology are needed.

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## Authors' Contributions

BB collected the data. SNM and VJP identified the species. BB, SNM and VJP wrote the text and produced the map.

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