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# Unpredicted occurrence of *Aglae caerulea* in the Pantanal wetland biome and its implications (Apidae: Euglossini)

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**Abstract** – An unpredicted occurrence of the cleptoparasitic orchid bee *Aglae caerulea* is announced for the Pantanal wetland biome in midwest Brazil, cataloged in a gallery forest in the Serra das Araras Ecological Station, southwestern Mato Grosso. A single female was cataloged outside the polygons where surveys were recently proposed for new orchid bee inventories in the Neotropical realm. The female found in habitat preoccupied by its hostess *Eulaema nigrata* is presumed representative to confirm that *A. caerulea* occurs in sympatry with their host in this wetland. Two recent points of occurrence in the Amazon rainforest of Mato Grosso were included here to update the *Aglae* distribution map. Following a meticulous literature review, several previous records from tropical moist forests in Panama and spanning from the Caribbean Sea to the Cerrado in central Bolivia and Brazil were used to complete the present record points of *A. caerulea* in the neotropics. The results demonstrate another distributional gap in euglossines and suggest the need for additional studies to find *Aglae* in southern Pantanal and farther afield.

**neotropics / Hymenoptera / orchid bees / gallery forest / Cerrado**

Neotropical orchid bees include the pollen-collecting genera *Eufriesea* Cockerell, *Euglossa* Latreille, and *Eulaema* Lepeletier, and two parasitic genera, *Exaerete* Hoffmannsegg and *Aglae* Lepeletier de Saint-Fargeau and Audinet-Serville (Michener 2007). The latter is monotypic and represented by *Aglae caerulea* Lepeletier de Saint-Fargeau and Audinet-Serville (body size 20–28 mm), which emerge from the nests of *Eulaema nigrata* Lepeletier (Myers 1935) (body size 18–31 mm), on which they depend for shelter and provisions for larvae.

Euglossine males are attracted to chemical baits, whereas the females have only been sighted and collected by entomologists when visiting blossoms or netted mid-flight (Dressler 1982), or with the help of trap-nests (Garófalo et al. 1993).

Moure (1967) and Cameron (2004) identified *A. caerulea* as endemic to the Amazon basin (see Morato 2001), however, Anjos-Silva et al. (2006), Silva

et al. (2013), and Martins et al. (2016) reported occurrences for the Cerrado domain. More recently, our team has collected *A. caerulea* in two study areas in the northern Mato Grosso Amazon, in Cotriguaçu (Schorn de Souza 2014) and Novo Mundo (Figueiredo 2015).

I report here an unpredicted occurrence of *A. caerulea* on the northern border of the Pantanal wetland, in southwestern Mato Grosso. Several biogeographical implications of this are discussed, and additional studies suggested for testing the distribution limits in southern Pantanal and farther afield.

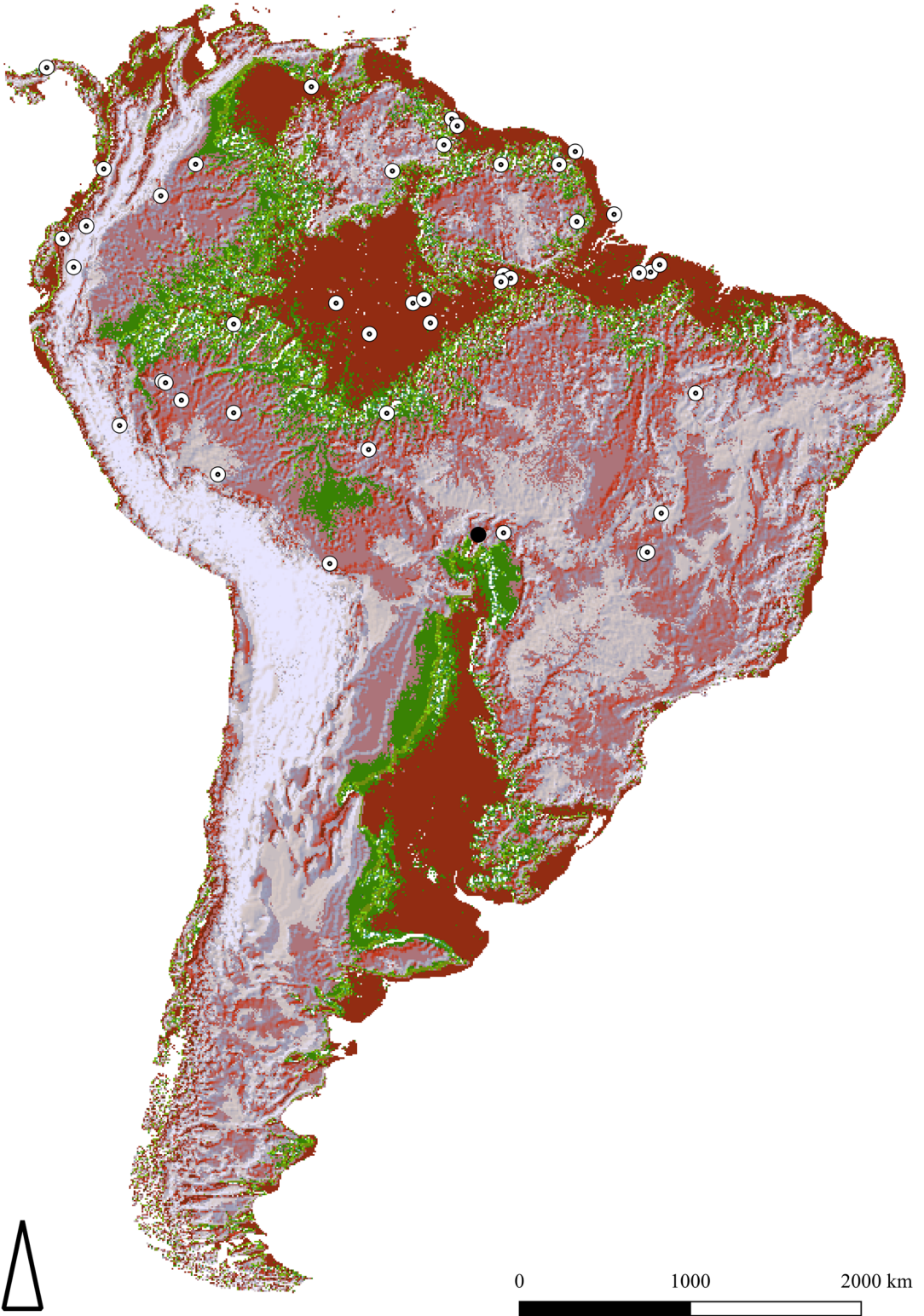
## 1. MATERIAL AND METHODS

### 1.1. Study area

The study was conducted in the Serra das Araras Ecological Station, a permanently protected 28,700-ha area of parallel mountain ranges running from the northwest to the southeast (NE-SE), 50-km-long and 8-km-wide (elevation from 230 to 900m), located in the Porto Estrela municipality, southwestern Mato Grosso (Figure 1,

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◀ **Figure 1** Distribution of the 70 occurrences for *Aglae caerulea* in the Neotropics, from 10°N in northern Venezuela (Aragua) and 8°N Panama to 17°S in central Bolivia (Cochabamba) and 16°S in central Brazil (Mato Grosso and Goiás). Circles refer to the previous *A. caerulea*'s known records. Arrow refers to the newest record (this study) in the Serra das Araras Ecological Station, at the northern border of the Pantanal wetland biome, Porto Estrela municipality, Mato Grosso, Brazil.

black circle). The ecological station is controlled by the ICMBio Instituto Chico Mendes de Conservação da Biodiversidade of Brazil. The gallery forest studied is composed of trees with a height of ca. 5–10 m and is situated at the margins of the Salobra stream, in an upstream basin area ca. 20 km west of the Pantanal floodplain (EJ Anjos-Silva personal observation).

**1.2. Specimen collection**

Throughout the field study period, insects were netted daily for 7 days from 27 April to 3 May 2017. Entomological nets, McPhail traps, and 2-L plastic bottles were used to collect wild bees and wasps in four different canopies along four ecological trails at the same time at this ecological station (unpubl. data). One female was collected near the headquarters of the ecological station (15° 39.00' S–57° 12.00' W; elevation 230 m), in an entomological net, sacrificed in ethyl acetate and deposited (voucher EJASC 77.000) at the Neotropical Bees and Wasps Laboratory at UNEMAT, University of Mato

Grosso State, Brazil. The expeditions had been granted permission to collect insects under ICMBio SisBio license numbers 12.778 and 53.717 in the name of EJAS.

**1.3. Species occurrences**

Curiously, following a meticulous literature review, I noted that we (Anjos-Silva et al. 2006; Silva et al. 2013) had previously disregarded some studies: Beebe (1951), Bonilla-Gómez and Nates-Parra (1992), González (1996), Bembé (2002), Hentrich et al. (2007), and Abrahamczyk et al. (2011a, b). Further collection sites were also obtained from Martins et al. (2016), the GBIF Global Biodiversity Information Facility ([www.gbif.org](http://www.gbif.org)), the Discover Life Bee Species Guide and World Checklist (Ascher and Pickering 2018) (<http://www.discoverlife.org>), and CRIA's Species Link ([www.splink.org.br](http://www.splink.org.br)).

**2. RESULTS**

The female *A. caerulea* was observed in the gallery forest, landing only once on the leaf bush of an undetermined species of Fabaceae, viz. on 1 May 2017 in a trail near the headquarters of the ecological station (Figure 1). At about 10:15 a.m., the female approached the bush leaf and landed on it for approximately 10 s before being collected.

This finding of *A. caerulea* in the northern Pantanal border region has several biogeographical implications: (a) this record represents a very distinctive biota to consider in future search expeditions for this species,

**Table 1.** Köppen-Geiger climate zones and associated geographic distribution pattern for the parasitic orchid bee *Aglae caerulea* and its *Eulaema nigrita* hostess in the Neotropics. Three other *Eulaema* species (cf. Oliveira 2007; Ascher and Pickering 2018) *E. bombiformis* (Packard 1869), *E. cingulata* (Fabricius 1804), and *E. meriana* (Olivier 1789) occur in sympatry with *E. nigrita* nest parasites at least from 10° N to 15° S in the neotropics encompassing the Amazon and Atlantic rainforest to Cerrado biomes.

Euglossini species	Biomes and Köppen-Geiger climate types <sup>1</sup>						
	Tropical rainforest			Atlantic rainforest			Tropical savannah
	Af	Am	Aw	Af	Am	Aw	Aw
<i>Aglae caerulea</i>	*	*	*	?	?	?	* <sup>2</sup>
<i>Eulaema nigrita</i>	*	*	*	*	*	*	*
<i>Eulaema bombiformis</i>	*	*	*	*	*	*	*
<i>Eulaema cingulata</i>	*	*	*	*	*	*	*
<i>Eulaema meriana</i>	*	*	*	?	*	*	*

<sup>1</sup> Köppen-Geiger climate classifications follow Peel et al. (2007). *Af*, tropical rainforest climate; *Am*, tropical monsoon climate; *Aw*, tropical wet and dry or savannah climate. \* = presence of species. ? = species not cataloged until today

<sup>2</sup> This study

(b) new data cataloging presence in habitats not indicated in any studies, through sampling or species distribution modeling, (c) the possibility that *A. caerulea* is able to explore different plant species as food and shelter resources in the wetland biome, (d) expansion of the species distribution limits forming a “new” suitable area, (e) it corroborates the hypothesis that the species is as locally rare in floodplains as it is elsewhere, and (f) it confirms that this parasitic species occurs in sympatry with its hostess *E. nigrita* in the Pantanal biome.

Although our result is based on a singleton, it is considered representative to confirm that this parasitic species lives not only in sympatry with its hostess *E. nigrita* but also in the Pantanal and of sufficient size to encourage new expeditions to find *Aglae* in southern Pantanal and farther afield.

It is necessary to highlight three issues: (a) the climate of the areas where *A. caerulea* has been cataloged in the Amazon varies from tropical rainforest climate (Af) to tropical monsoon climate (Am), according to the Köppen-Geiger classification (cf. Peel et al. 2007, Table I), (b) using distribution modeling, Silva et al. (2013) indicated the region stretching from north Espírito Santo to north Bahia as a potentially suitable area for *A. caerulea*, and (c) the Aw category corresponds to the climate of the Pantanal (Table I).

The present study reveals another distributional gap in euglossine “rainforest-dependent species,” but demonstrates that new experiments are needed to confirm whether *A. caerulea* uses gallery forests to cross the Cerrado ecocline toward the Amazon and to reach Atlantic rainforest habitats. This hypothesis requires testing to determine whether or not the absence of this cleptoparasitic species in rainforest fragments of Brazil’s Atlantic coast is a technical artifact.

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## AUTHOR CONTRIBUTION

EJAS conceived, designed, and performed this research and interpretation of the data and wrote the paper. The author read and approved the final manuscript.

## COMPLIANCE WITH ETHICAL STANDARDS

**Conflict of interest** The author declares that there are no conflicts of interest.

**Note scientifique: occurrence imprévue D' *aglae caerulea* dans les zones humides du Pantanal et ses implications (Apidae: Euglossini)**

**Les néotropiques / Hymenoptera / abeilles à orchidée / forêt galerie / cerrado**

**Wissenschaftliche Notiz: Unvorhergesehenes Vorkommen von *Aglae caerulea* im Pantanal Sumpfbereich und seine Implikationen (Apidae: Euglossini)**

**Neotropen / Hymenoptera / Prachtbienen / Galeriewald / Cerrado**

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