

New genus and subgenus of South American long-horned bees (Apidae, Eucerini)

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Abstract

As part of a broader treatment of Eucerini systematics, a new genus and a new subgenus are described to accommodate previously described species. *Savannychapis* **gen. n.** is described to accommodate *Gaesischia interrupta* Urban 1989, originally described as a species of *Gaesischia* (*Gaesischiana*) Michener *et al.* 1955, and *Gaesischia* (*Gaesischioides*) **subgen. n.** to accommodate *Gaesischia hyptidis* (Ducke 1910), previously included in *Gaesischia* *s. str.* Michener *et al.* 1955 and *G. (Agaesischia)* Moure & Michener 1955. These new taxa are only known in the South American dry diagonal, a set of open vegetation biomes of central-eastern South America.

Key words: Brazilian savanna, Caatinga, Cerrado, Eucerinae, *Gaesischia*, *Gaesischioides*, *Savannychapis*

Introduction

Bees in the apid tribe Eucerini, especially those lineages occurring in the New World, have had their taxonomy intensely studied during the last 70 years. However, the morphological homogeneity of the entire tribe has hindered comprehension of their phylogenetic relationships or even the limits of supraspecific groups (Michener 2007; Moure & Michener 1955). The description of eucerine diversity and delimitation of genera (e.g., LaBerge 1956a, 1956b, 1961, 2001; Urban 1967a, 1967c, 1967d, 1968a, 1968b, 1970, 1971, 1972, 1973, 1974a, 1974b, 1989a, 1989b) have recently been complemented by the use of molecular data for phylogenetic and taxonomic studies (Dorchin *et al.* 2018a, 2018b; Freitas *et al.* 2018, 2019; Freitas & Silveira 2017; Wright *et al.* 2020).

Thanks to the use of molecular data in the last few years, many advances in understanding the relationships among Eucerini lineages were achieved (Dorchin *et al.* 2018a, 2018b; Freitas *et al.* 2018, 2019; Freitas & Silveira 2017). However, a lack of full taxonomic and geographic coverage has hindered a better assessment of the classification of long-horned bees.

After the formalization of Eucerinae as an apid subfamily (Bossert *et al.* 2019), a study focusing on the phylogenetic relationships within this subfamily further established a broad phylogenetic hypothesis for the group and redefined boundaries among the included tribes (Freitas *et al.* 2021). This study is currently being used as a foundation for a more comprehensive investigation of the phylogenetic relationships of tribe Eucerini. It aims at filling gaps in taxon sampling to provide an extended phylogenetic hypothesis for the tribe (Freitas *et al.* in prep.). These studies suggest that a few rearrangements in the classification of the tribe are desirable. To make new names available for this work currently in preparation, here I describe a new genus (*Savannychapis* **gen. n.**) and a new subgenus (*Gaesischia* (*Gaesischioides*) **subgen. n.**) to accommodate two species already interpreted as distinctive among the remaining *Gaesischia* species (Moure & Michener 1955; Urban 1989c, 2003), and which were never formalized as separate taxa.

Material and methods

The specimens examined in this study belong to the following entomological collections: (a) Coleção Entomológica “Padre Jesus Santiago Moure” of the Department of Zoology—Universidade Federal do Paraná, Curitiba, Brazil (DZUP); (b) Coleção Entomológica “Prof. J.M.F. Camargo”, Universidade de São Paulo, Ribeirão Preto, Brazil (RPSP); and (c) “Coleção de Insetos-Hymenoptera” of “Centro de Coleções Taxonômicas”, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil (IHY-UFGM). Terminology refereeing to morphological structures follows Urban (1967), Silveira *et al.* (2002), and Michener (2007). Metasomal terga and sterna were called T1, T2 etc, and S1, S2 etc, respectively.

Taxonomy

Eucerini Latreille

Gaesischia (*Gaesischioides*) Freitas New subgenus

Type species: *Eucera hyptidis* Ducke 1910 [p. 93]

Diagnosis: *Gaesischia* (*Gaesischioides*) *hyptidis* has five segmented maxillary palpi as in *Gaesischia s. str.* and *G. (Gaesischiana)*, different from *G. (Gaesischiopsis)*, which have four segmented maxillary palpi; the pilosity is predominantly pale in both sexes, in the remaining subgenera it is variable. Males: clypeus yellow; labrum black, generally with a small yellow/whitish area on its disc (Fig. 1-f); the sixth metasomal sternum with subapical carinae running parallel to posterior margin, broadly interrupted by the median line, and with a tuft of hairs on the disc (Fig. 1-e), these characters, in combination with those shared by both sexes, form a unique combination among the subgenera of *Gaesischia*. Females: clypeus black with a yellow triangular area on its apex (Fig. 1-b), which differentiates it from the remaining species of *Gaesischia* with five maxillary palpomeres and a yellow apical band on the clypeus.

Etymology: The subgenus name is a free combination of the generic name (*Gaesischia*) and the Latin suffix -oides, which means resemblance or likeness.

Included species: *Gaesischia* (*Gaesischioides*) *hyptidis* (Ducke 1910).

Distribution: The species was described by Ducke (1910) and redescribed by Urban (1968) based on specimens from the state of Ceará, Brazil. There are also records from the states of Sergipe and Rio Grande do Norte, suggesting that this species is associated with the Caatinga in northeastern Brazil.

Comments: *Gaesischia hyptidis*, as highlighted in previous treatments of *Gaesischia* taxonomy, is a distinct species (Moure & Michener 1955). It was firstly positioned in the subgenus *G. (Agaesischia)* together with *G. patellicornis*, but with a caveat that this was a tentative decision (Moure & Michener 1955). It was later transferred to *Gaesischia s. str.* (Laberge 1958; Urban 1968a) but still retained under *G. (Agaesischia)* in Moure’s Catalog for Neotropical bee species (Urban *et al.* 2012). According to the results of Freitas *et al.* (in prep.), it is recovered as the sister lineage of the clade containing *Gaesischia s. str.* + *G. (Gaesischiopsis)*, or as sister to *G. (Gaesischiopsis)*, highlighting its distinctiveness, as already noticed by Moure & Michener (1955), when speculating on the possible proximity of *G. hyptidis* and *G. (Gaesischiopsis)*. The easiness of identifying both males and females of *G. hyptidis* using the two identification keys available in the comprehensive reviews of *Gaesischia* conducted by Urban (1968, 1989c) reinforces the distinctiveness of this species.

Savannychapis Freitas New genus

Type species: *Gaesischia interrupta* Urban 1989c [p. 90]

Diagnosis: The genus *Savannychapis* is easily recognizable among the remaining Neotropical genera closely related to *Gaesischia* (*Dasyhalonia* Michener, LaBerge and Moure, *Florilegus* Robertson, *Gaesochira* Moure and Michener, *Hamatothrix* Urban, *Micronychapis* Moure and Michener, *Pachysvastra* Moure and Michener, *Platysvastra*

Moure, *Santiago* Urban, and *Svastrina* Moure and Michener) by (i) the maxillary palpi with three palpomeres (Fig. 2-e); by the (ii) sixth sternum of males with a posterolateral carinae on each side of the median line, approaching, but neither attaining the apex of the sternum nor each other near the median line (Fig. 2-f); (iii) T6 without lateral parts elevated or forming teeth. Among Neotropical Eucerini, the only other genus with the combination of three or fewer palpomeres and carinae on S6 in some of its species is *Melissoptila* Holmberg; however, the presence of elevations or teeth on the laterals parts of T6 is a diagnostic character for that genus together to the number of maxillary palpomeres, while *Savannychapis* lacks elevations on lateral parts of T6.

Etymology: The name is a free combination of savanna in reference to the Cerrado (Brazilian savanna), where the type species seems to be endemic, plus the suffix *-nychapis* regarding its sister genus *Micronychapis*.

Included species: *Savannychapis interrupta* (Urban 1989) **comb. n.**

Distribution: This species seems to have a broad distribution in the domain of Cerrado (Brazilian savanna), with records in the Brazilian states of Bahia, Mato Grosso, and Minas Gerais.

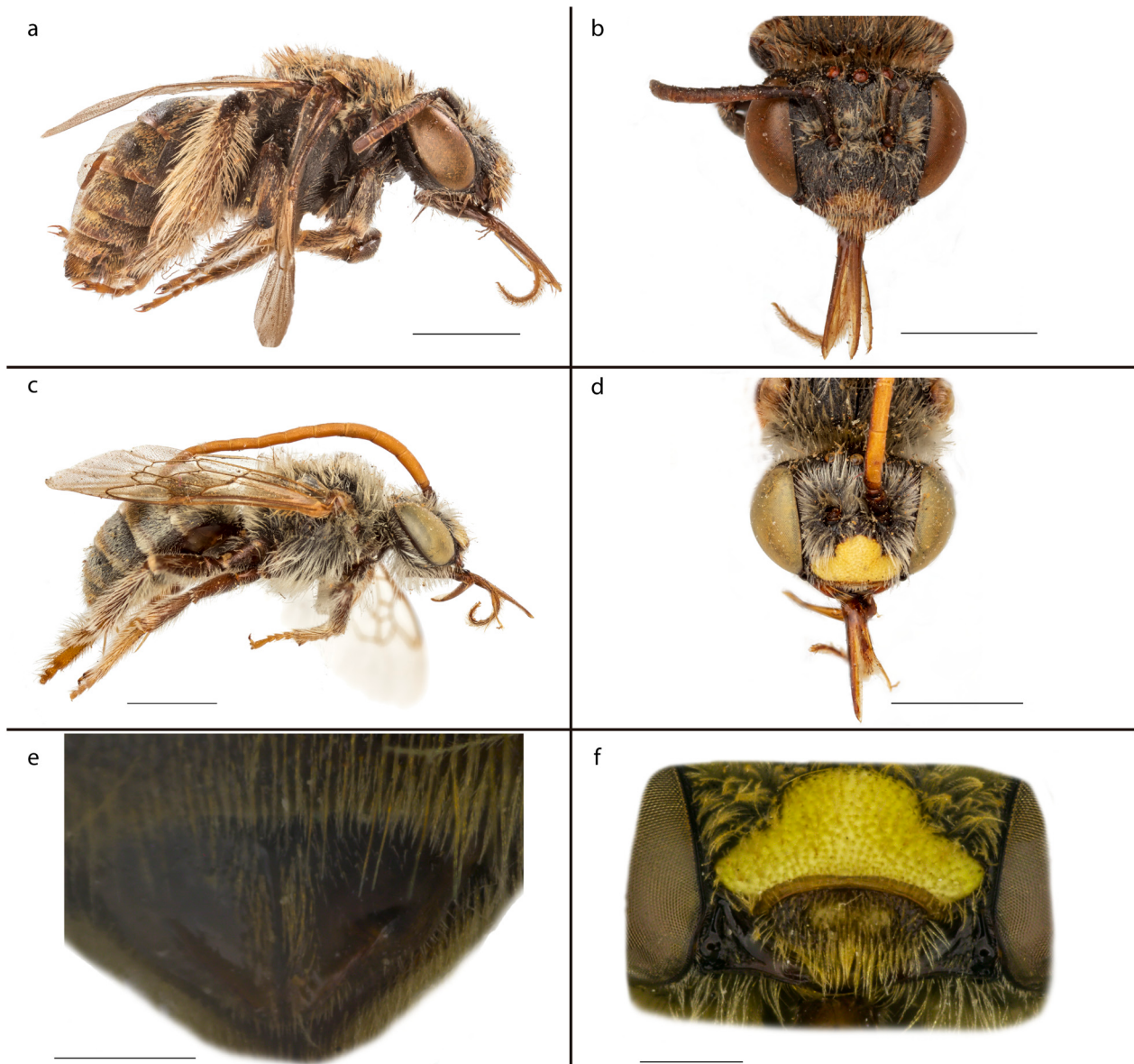


FIGURE 1. *Gaesischia* (*Gaesischioides*) *hyptidis* (Ducke 1910): Female in **a**) lateral and **b**) frontal views. Male in **c**) lateral view, **d**) frontal view, **e**) sixtieth sterna (S6), and **f**) labrum. Specimens from Ceará, Brazil, studied by Danuncia Urban (DZUP) and used as references to confirm the identity of the vouchers used in the phylogenetic study subsidizing the proposal of this new taxon. Scale bars = 2 mm.

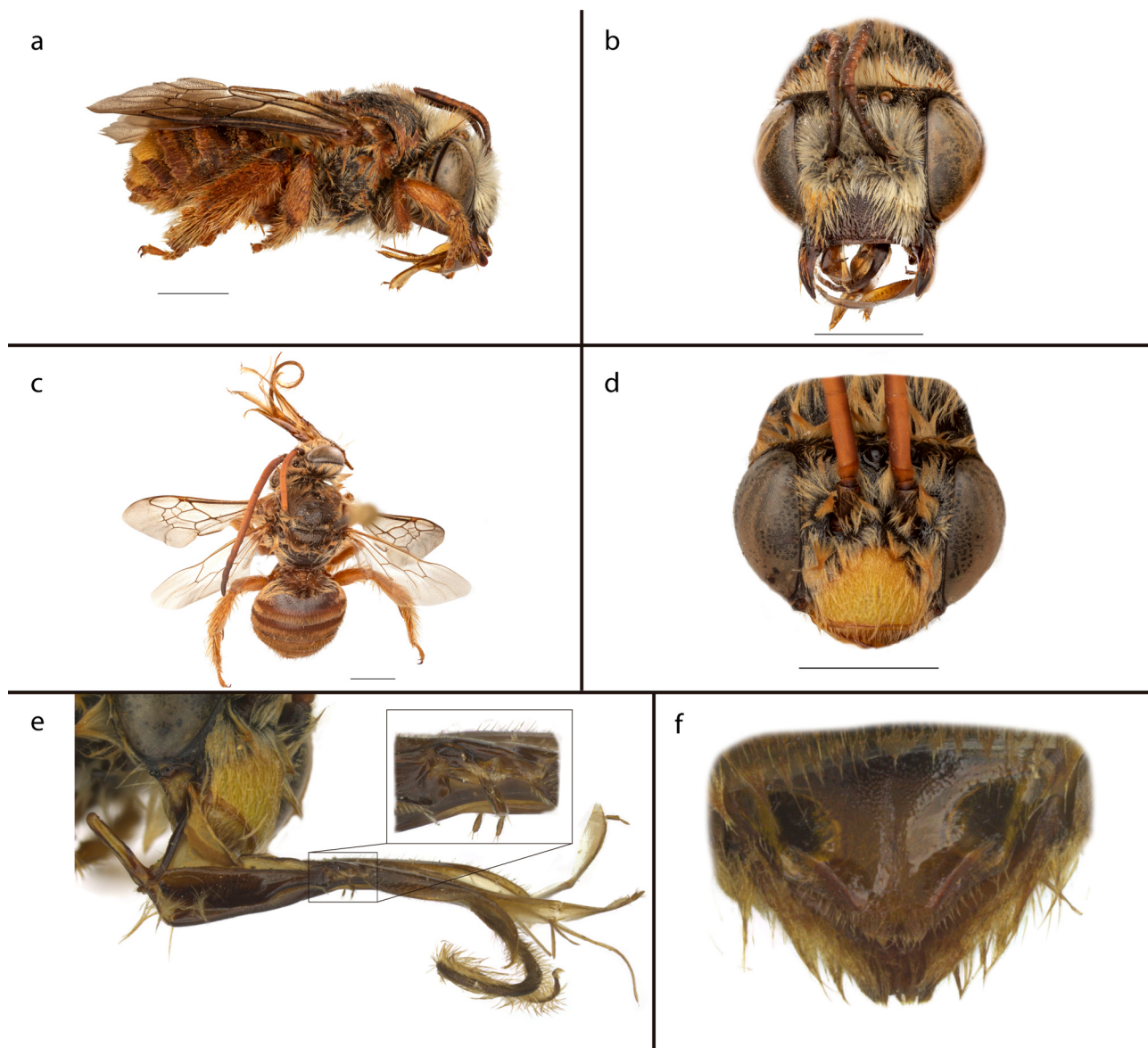


FIGURE 2. *Savannychapis interrupta* (Urban 1989): Female (Paratypus) in **a**) lateral and **b**) frontal views; specimen from Bahia, Brazil. Male in **d**) dorsal and **e**) frontal views; specimen from Mato Grosso, Brazil. **g**) detail of the three-segmented maxillary palpi, and **h**) sterna of male, to highlight the structure of S6 with two apicolateral carinae, not converging near the midline, and with basolateral depressions. Both specimens were studied by Dr. Danuncia Urban (DZUP) and used to confirm the identity of the vouchers included in the phylogenetic study subsidizing the proposal of the new genus. Scale bars = 2 mm.

Discussion

Eucerini is a group with a highly homogeneous external morphology (Michener 2007; Moure & Michener 1955), and there are not many informative characters to delimit supraspecific groups or even to recognize groups of genera. *Gaesischia* is one of these eucerine genera without informative characters, and this is why species resembling the general morphology of the lineage, but lacking particular diagnostic characters, sometimes are tentatively positioned among the subgenera of *Gaesischia*.

In the results of Freitas *et al.* (in prep.) *Savannychapis* is unambiguously recovered as sister to *Micronychapis*, both monotypic and probably endemic to the Cerrado (Brazilian savanna), with the divergence between them estimated to have occurred during late Miocene (~10-6 Mya). *Micronychapis* is one of the most distinctive genera among Neotropical Eucerini. It has peculiar tarsal claws, internal and external rami almost the same size, and maxil-

lary palpi with five palpomeres. Its males have pygidial plate bilobed ending in two upturned points, mid and hind legs thickened with robust tibial spurs, and S6 without carinae or lamellae. Females have elevated/lamelliform parts on lateral T6, forming a tooth on each side; and a bilobed S6. *Savannychapis*, differently, lacks distinctive characters and as highlighted before, has only three maxillary palpomeres and carinae on S6. The two genera share the robust body size, and males with thick antennae, its diameter slightly shorter than interantennal distance.

On the other hand, *Gaesischia hyptidis* was recovered in two alternative positions among the remaining subgenera of *Gaesischia*; in analysis using the Multispecies Coalescent model, it appeared as sister to *Gaesischia s. str.* + *G. (Gaesischiopsis)*, while in the results of concatenation (multiple loci concatenated and analyzed through maximum likelihood), it was sister to *G. (Gaesischiopsis)*. This instability was one of the reasons for proposing a new subgenus to accommodate *G. hyptidis* instead of just including it in one of the remaining subgenera.

Future studies on eucerine morphology, considering the recent advances in its classification, should provide new synapomorphies for the clades recognized and subsidize the proposition of precise identification keys to genera and subgenera.

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