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# A new ant-mimetic species of *Metopiellus* (Staphylinidae: Pselaphinae) from the Northern Colombian Amazon

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## Running head

new species of *Metopiellus* from the Colombian Amazon

## ABSTRACT

The genus *Metopiellus* (Staphylinidae: Pselaphinae) is confirmed in Colombia. A new ant-mimetic species of *Metopiellus*, *Metopiellus guanano* sp. nov., is described from the northern Amazon. Major diagnostic characters and ecological data are given. A new symbiotic association (rove beetle and fungus-growing ants) is hypothesized for the genus *Apterostigma* (Formicidae: Myrmicinae) and recorded for the first time for the country.

**Key Words:** *Apterostigma*, Colombian Amazon, *Metopiellus*, Myrmecomorph, Staphylinidae.

## Introduction

Sackchoowong et al., (2008) state Pselaphinae beetles are ubiquitous, diverse, and poorly explored in the Tropics. Thirty-nine Pselaphinae tribes evidence myrmecophily of which some are comprised primarily or exclusively of myrmecophiles, such as Arnyliini, Attapseniini, Clavigerini, Coliilodionini, Ctenistini, Metopiasini, Tiracerini, and Tmesiphotini Parker 2016. The Neotropical genus *Metopiellus* Raffray 1908 of the tribe Metopiasini, is constituted by four species, *Metopiellus aglenus* Reitter 1885, *Metopiellus hirtus* Reitter 1885, and *Metopiellus painensis* Asenjo et al. 2017 are described from Brazil and, *Metopiellus silvaticus* Bruch 1933 in Argentina. In this paper, we describe a new species of *Metopiellus* from the Northern Colombian Amazon from Mitu and Villa Fatima counties in the Department of Vaupes. This record of *Metopiellus* is a confirmation of the genus for the country.

## Material and method

Samples were examined using a Leica wild m3c. Z-stepped micrographs were captured using a Leica MC170 HD camera with a Leica 10450528 adapter (0.5x) camera mounted on a Leica M205 A microscope with a 1x objective. Dissections on the apical segments of the abdomen were made under a Motic SMZ-168 (max magnification of 80x) microscope and cleared in a 10% KOH solution placed in a double boiler for three minutes. Morphological character terminology, including foveation and nomenclature/initials, follows Chandler (2001) and Asenjo et al., (2019). Final plates were edited using Adobe Illustrator CS6 (Adobe Systems Inc., California, U.S.A.).

Measurements symbols:

BL body length (from the margin of antennal tubercle of the head to posterior margin of tergite VIII).

BW body width (maximum width of elytra).

EL elytral length (maximum).

EW elytral width (maximum).

HL head length (from anterior margin of antennal tubercle of the head to posterior margin of the head disc).

HW head width (maximum).

NW neck width (minimum).

PL pronotum length (maximum).

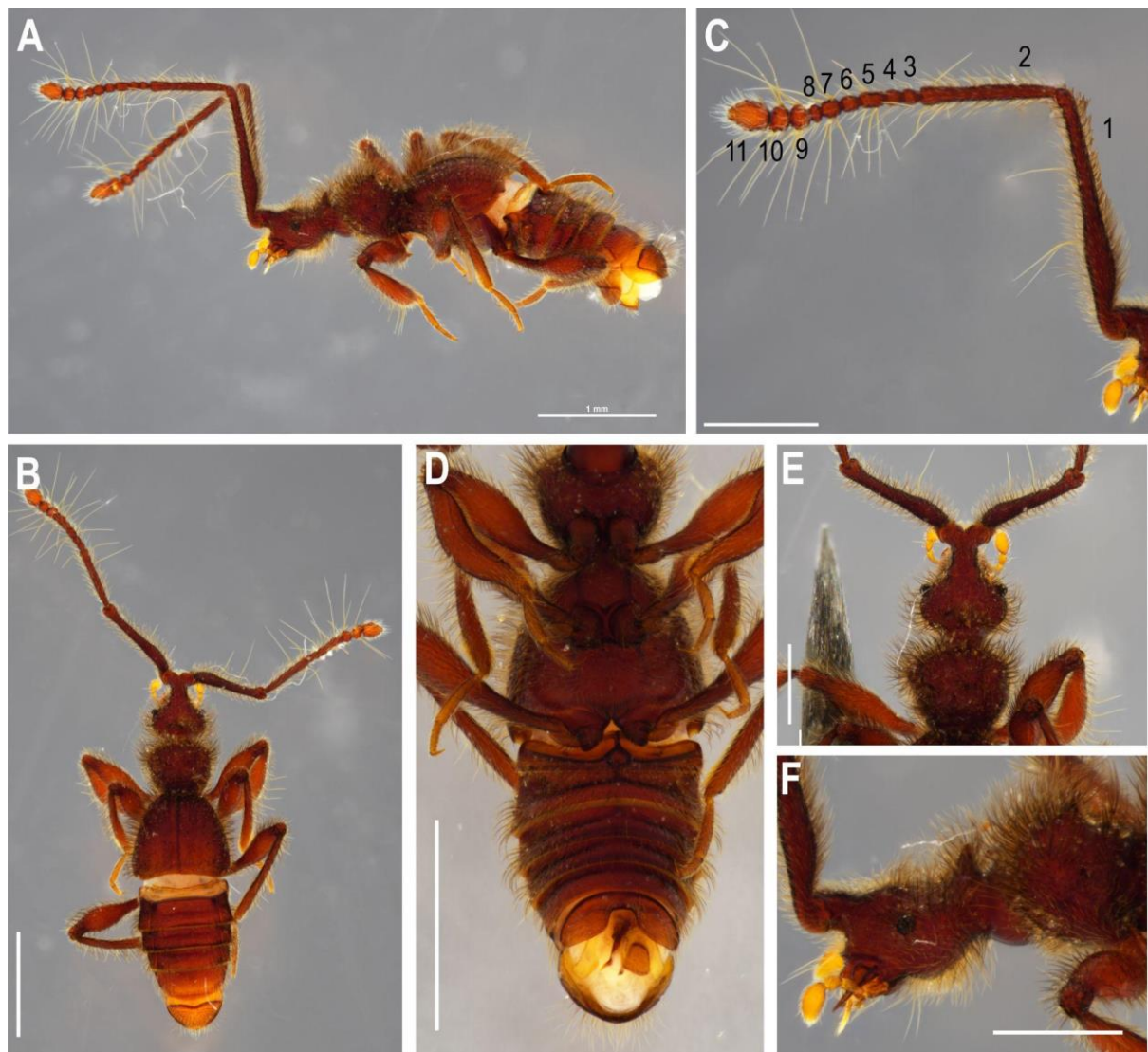
PW pronotum width (maximum, without the spines).

## Repositories

Collections are referred to by the following acronyms:

ICN Instituto de Ciencias Naturales de la Universidad Nacional de Colombia, Bogotá, Colombia.

## Results



**FIGURE 1.** ♂ *Metopiellus guanano* new species, holotype, A, habitus, left lateral view; B, habitus, dorsal view; C, left antenna, lateral view; D, habitus, ventral view; E, head and pronotum, dorsal view; F, head and pronotum, left lateral view. Scale bars: 1 mm (A,B,D); 0.5 mm (C,E,F).



**FIGURE 2.** ♂ *Metopiellus guanano* new species, holotype, A, segment VIII (T8, tergum VIII and S8, sternum VIII), lateral view; B, tergum VIII (T8); C, sternum VIII (S8); D, aedeagus, ventral view; E, aedeagus, lateral view; F, aedeagus, dorsal view. Scale bars: 0.5 mm (A); 0.2 mm (B-F).

***Metopiellus guanano* sp. nov.**

**Fig. 1-3**

**Type material** (1 ♂, 1 ♀).

**Holotype** : COLOMBIA • 1 ♂; Vaupés department, Mitú, kilómetro 16 carretera vía Mitú-Monfort, Cucura. 1°08'41.6"N 70°08'06.6"W. 10 Aug. 2019, Winkler 48 h. Col. Fernandez Lab. ICN 099808



**Paratype** Colombia • 1♀: Vaupés department, Villa Fatima, Pie de Cerro Tipiaca, 1°01'30.0"N 69°58'37.2"W. 19 March. 2020, Winkler 40 h. Lote VW01. Col. Fernandez Lab. ICN 099807

**Diagnosis.** *Metopiellus guanano* sp. nov. presents a significant number of autapomorphic characters such as: the presence of a prominent horn-like spine coming out of the vertexal region of the head, the presence of 4 distinct pronotal spines, 2 deep elytral sulci and contiguous metacoxae, as well as the shape of the aedeagus (Fig. 2D-F) and thick pilosity covering its entire body (Fig. 1).

**Description.** Holotype male, Body, mouthparts, antennae, and tarsi reddish light-brown (Figs. 1-2). Measurements. BL (2.54 mm), BW (0.7 mm), EL (0.66 mm), EW (0.35 mm), HL (0.4 mm), HW (0.38 mm), NW (0.18 mm), PL (0.35 mm), PW (0.44 mm).

**Head** (Figs. 1E-F): pyriform (HL: 0.4 mm; HW: 0.38), anterior region distinctly narrower, raised at antennal tubercle. Antennal tubercle foveated and coarse. Posterior margin of head abruptly narrowed and with posterior-lateral angles rounded. Neck almost  $\frac{2}{3}$  width of head, and lateral margins slightly obtuse (Figs. 1E). Head with two vertexal foveae [VF] (Figs. 1E) near the posterior margin. Medial spine protruding from Vertex, between the vertexal foveae, similar to the ones present on the pronotum. Vertex longitudinally impressed with sulcus running from anterior margin of antennal tubercle to the vertexal fovea, branching out at the position of the eyes; sulcus narrow. Ventral surface of the head with long thin gular sulcus, interrupted at posterior third by two large gular foveae [GF]. Head covered in thick curved setae. Compound eyes small and slightly protruding laterally, ommatidia number 12 (Figs. 1F). Antennae (Figs. 1C) about  $\frac{3}{4}$  body length, scape almost half antennal length, last three antennomeres abruptly widened, scape length (all lengths without peduncle) 1.2 mm, width 0.15 mm, pedicel shorter than scape (length 0.59 mm: width 0.07), antennomeres 3 - 4, and 6 - 7 about as long as wide, antennomeres 5 much longer than wide: 3 (length 0.07 mm: width 0.07 mm), 4 (length 0.06 mm: width 0.07 mm), 5 (length 0.11 mm: width 0.06 mm), 6 (length 0.08 mm: width 0.07 mm), 7 (length 0.08 mm: width 0.07 mm); antennomere 8 wider than long (length 0.04 mm: width 0.08 mm), antennomere 9 subcircular (length 0.08 mm: width 0.10 mm), antennomere 10 almost subquadrate (length 0.09 mm: width 0.11 mm), antennomere 11 longitudinally oval with pointed apex (length 0.19 mm: width 0.13 ); all antennomeres with coarse integument and covered by long setae as well as thick sub erect pilosity.

**Thorax** (Figs. 1B,D-F): pronotum trapezoidal in dorsal view (PL: 0.35; PW: 0.44) widest anteriorly, stair shaped in profile. Two rounded protuberances on the medial region of anterior half, acuminate with two spines. Two smaller spines produced laterally on each side of the two rounded protuberances of the medial region of the anterior half of the pronotum. Posterior half well below height of anterior half, demarcated by a deep sulcus which connects with two deep lateral antebasal foveae. Pronotum coarse, covered in thick curved setae. Pronotum anterior margin slightly convex and basal margin straight. Prosternum with lateral procoxal fovea. Mesoventrite with prepectal fovea and lateral mesosternal fovea. Metaventrte with lateral mesocoxal foveae, lateral metasternal fovea and median metasternal fovea. Region of metaventrte in articulation with metacoxae form triangular protuberance, inwardly convex. "Waist" between pronotum and elytra strongly produced, with dark coarsely reticulated integument.

**Elytra:** subquadrate (EL: 0.66; EW: 0.35), sides gradually broadening apically (Fig. 1A-B). Posterior margins convex, humeri without small longitudinal carina. Elytron is uniformly rounded. No conspicuous basal elytral foveae (possibly replaced by sulci). Apicolateral margin of elytra slightly notched.

**Legs** (Figs. 1A,D): legs long and robust. Femora thickened at apical half. Tibiae slightly curved and slightly shorter than femora, all tibiae thickened at apex. Protibiae in its internal face carinate and without microsetae on the posterior and mesial region, carinae lined with thick curved setae. Tarsi 3-

segmented, first tarsomeres very short, last 2 tarsomeres longer, tarsomere 2 longer than segment 3; all tarsi with single claw and thick accessory seta. Pro Coxae conical and prominent, mesocoxae globular-conical, less prominent than procoxae, metacoxae transverse, region that articulates with meta-trochanter conical. Procoxae, mesocoxae and metacoxae contiguous.

**Abdomen** (Figs. 2A-C): slightly margined, with five visible tergites (morphological tergites IV–VIII), tergite VIII with a rounded apex. Tergites and sternites IV–VII fused and bordered by prominent carina. Sternite III visible as a small transverse plate between metacoxae with long transversal sulcus (Fig. 1D). Sternum IX divided longitudinally (Figs. 1D, 2B).

**Aedeagus**: (Figs. 2D-F). symmetric with median lobe slightly bulbous at base, elongate and narrow, curved at apex.

**Female** with characters of head, pronotum, and elytra as are described for males. Abdominal sternum VIII with posterior margin rounded and without small prolongation (Fig. 3A,B).

**Habitat and ecological notes.** The specimens were collected through Winkler sampling in primary forest in the northern Colombian Amazon. The sampled localities correspond to areas with a relative humidity of 84% and an average temperature of 28° C, in both locations the vegetation was characteristic of a humid tropical forest. The processes that determine the diversity and floristic composition of the forests are not well known (Cano & Stevenson 2008). The sampling in Cucúra was carried out at no more than 20 m from a body of water, the area had been slightly intervened by eliminating plants from the understory and the terrain was humid due to recent rains, it is an area of primary forest, the predominant vegetation is arboreal with little presence of small plants.

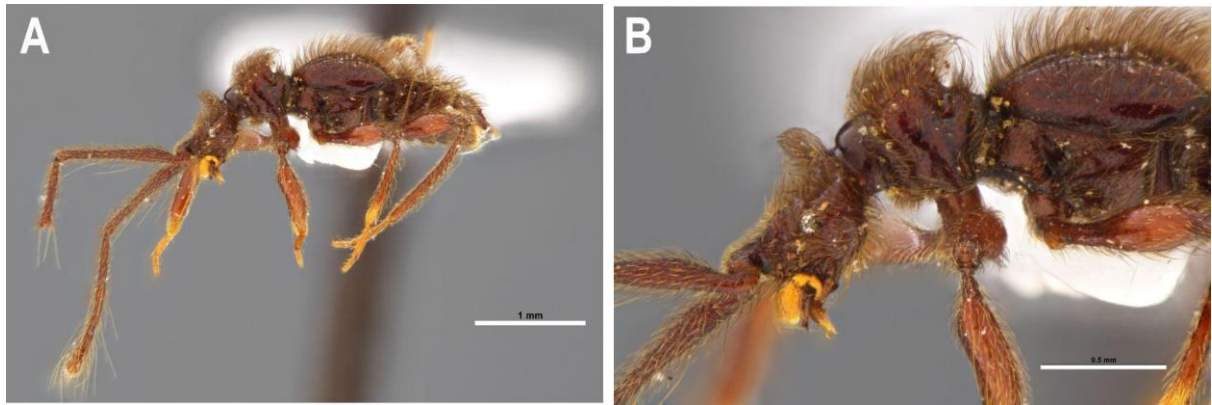
The sampling in Villa Fátima was carried out in a submontane primary forest, the collection area was mostly pristine, the predominant vegetation is arboreal, little understory vegetation was observed, this may be due to the superficiality of the first granite layer of the hill (Tepui) (Gröger 2000).

*Apterostigma pilosum* complex samples were abundant in the same sampling method in the holotype and paratype localities. It is important to highlight this new species' morphological similarity and possible obligate synoekete behavior with regards to the *Apterostigma pilosum* complex collected samples.

**Etymology.** This ant-mimetic rove beetle new species is named after the indigenous communities located at the type localities. The Guanano people inhabit the Vaupés River region of Colombia, from the Santa Cruz area below Mitú to Ibacaba in the lower Vaupés on the border of Brazil (Stenzel 2007).

**Distribution.** *Metopiellus guanano* sp. nov. is known from the holotype and paratype localities, Counties of Mitu and Villa Fatima, Department of Vaupes, Colombia (Fig. 4).

**Comments.** The new species belongs to *Metopiellus*, based on the third antennal segment being much shorter than the second (Fig. 1C); the posterior coxae contiguous or nearly so; and the mesial face of the protibia being carinate and open at its base and apex (Fig. 1D). However, the new species appears to be highly automorphic, presenting sides of the spinose protrusion on the pronotum as well as a medial protrusion on the dorsum of the pronotum.



**Figure 3.** ♀ *Metopiellus guanano* new species, paratype ,A, habitus, left lateral view; B, head and pronotum, left lateral view. Scale bars: 1 mm (A); 0.5 mm (B).



**Figure 4.** Geographic distribution of *Metopiellus guanano* sp. nov. The larger filled black star denotes the type locality

## Discussion

Colombia has recorded approximately 769 beetle species from 230 Staphylinidae genera (Armbrecht et al. 2019). The list of ant-rove beetles with a known association includes the tribes Osoriinae, Paederinae, Staphilininae, Staphylinidae, and Tachyphorinae, being reported in association with *Brachymyrmex*, *Strumigenys*, *Pheidole* and, *Solenopsis geminata* nests from dry forests of southwestern Colombia (García y Chacón de Ulloa 2005; García-Cárdenas et al. 2001). Newton et al. (2005) recorded *Metopiellus* for the country, then Sissa and Navarrete (2016) documented the genus in a study of the composition and structure of rove beetles in the department of Boyacá. Nevertheless, none of these works named or described the species reported, so they were considered dubious records. Here we provide the first confirmed record of the Metopiasini tribe, with the first official record of the genus *Metopiellus* Raffray (1908) for the country.

There are few reports of associations between beetles and Fungus-growing ants. Navarrete-Heredia (2001) reports ten Pselaphinae species associated with *Atta* and *Acromyrmex*, of which *Attapsenius* (*Attapseniini*) is an obligate guest of *Atta sexdens* fungus galleries (Park 1942). On the ant-camptosome associations' synthesis, Agrain et al. 2015, report the genus *Atta*, specifically the species *Atta texana* (Buckley 1860) and *Atta mexicana* (Smith 1858), as ant-host of Cryptocephalinae beetles. These authors also noted that fungus-growing ants nests could provide food to their beetle guests. Shepard (2020) records *Cercyon* sp. (Coleoptera: Hydrophilidae: Cercyon Leach), associated with *Atta colombica* Guérin-Meneville 1844 in Crique Aimara in French Guiana. Finally, the present report constitutes the first record of mimetics from a Staphylinidae in the genus *Apterostigma* and the first record of this association (leaf-cutting ants and rove beetle symbiosis) in Colombia.

The examined specimens suggest *Metopiellus guanano* sp. nov. as a true myrmecomorph. According to McIver & Stonedahl (1993), myrmecomorphic insects display morphological modifications that enhance mimicry. Pselaphinae beetles possess very specialized myrmecomorphic body plans and are even called "Ant-loving" beetles. *Metopiellus guanano* sp. nov. demonstrates many modifications that help to mimic the *Apterostigma* sp. to an impressive degree. Specifically, the thick pilosity covering its body, resembling that of the *Apterostigma pilosum* complex, the reddish-brown color, and the conspicuous mesosomal constriction, which is typical of *Apterostigma* ants. (Lattke 1997). Personal observations, and the overlapping presence of the two species in consecutive sampling trips, provide possible evidence for a myrmecophilous relationship, but further study is required to verify this association.

This new report provides further evidence for the myrmecophilous status of the genus *Metopiellus*. The only previous report of myrmecophily for the genus was that of *M. aglenus* Reitter 1885 in its original description, where it was reported in association with *Hylomyrma reitteri* (Mayr 1887). The species *M. silvaticus* Bruch (1933) was also collected in an unconfirmed association with ants, But this association has yet to be confirmed (Asenjo et al. 2017). In the Neotropics, the only Pselaphinae species with a known myrmecophilous relationship is *Jubogaster towai* (Coleoptera: Staphylinidae: Pselaphinae: Trogastrini), which establishes a relationship with *Pheidole xanthogaster* Wilson (Parker and Maruyama 2013). In addition, these authors noted that the largest Pselaphinae species are myrmecophiles and termitophiles. Nevertheless, this new report expands the myrmecophile size range to include small species such as *M. guanano* sp. nov.

## Key to the species of *Metopiellus* (Based on Asenjo et al., 2017)

1. Head with a horn-like spine protruding from the vertexal region; mesonotum with 2 acuminate bolbus projections . . . . . *Metopiellus guanano* sp. nov.
- Head simple, lacking any horn-like spine protrusion; mesonotum simple, without spines or projections . . . . . 2
2. Head similar in width to pronotum; eyes absent . . . . . *Metopiellus aglenus* (Reitter) -
- Head narrower than pronotum; eyes small or almost absent . . . . . 3 3.



Pedicle almost one half of the length of scape; length of antennomere 5 longer than length of antennomere 3 and 4 together ..... *Metopiellus painensis* (Asenjo et al.).  
 - Pedicle less than half length of scape; length of antennomere 5 shorter than length of antennomere 3 and 4 together ..... 4  
 4. Antennomere 8 transverse; eyes small ..... *Metopiellus hirtus* (Reitter)  
 - Antennomere 8 obconical; eyes almost absent ..... *Metopiellus silvaticus* (Bruch)

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