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Research Article

New Species of *Exomalopsis* and Its Associated Cleptoparasite *Nomada* from Colombia with Description of the Nest (Hymenoptera: Apoidea: Anthophila: Apidae)

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We describe two new species of bees from Colombia; one is a species of *Exomalopsis* found nesting in the city of Medellin, Colombia, (the host) and its cleptoparasitic bee, a species of the genus *Nomada*. In addition, we provide information on the nest architecture of the new species and provide data on occupancy by both the host bee and its cleptoparasite. We present an updated list of the species of *Exomalopsis* and *Nomada* of Colombia and taxonomic keys to the species of *Exomalopsis*.

1. Introduction

Exomalopsis Spinola (Apinae: Exomalopsini) encompasses nearly 90 described species in four subgenera according to Michener [1]. The genus is only known from the Western Hemisphere and most of its diversity if found in the Neotropical and Nearctic regions. Timberlake [2] reviewed the species of the genus in the broader sense in the United States and later revised the species of North America [3]; more recently, Silveira [4] revised the phylogenetic relationships and classification of the tribe Exomalopsini and later described new species and designated lectotypes for previously described species of South America [5].

Nests of *Exomalopsis* are communal; the nests and nesting behavior of some species have been described (i.e., [6] on *E. solani*, Raw [7, 8] on *E. globosa* and *E. similis*, Rozen and Snelling [9] on *E. nitens*, and Zucchi [10] on *E. auropilosa*, but the nesting biology of most of the species remains unknown. Rozen [11] compared the nesting biology of several genera in the tribe Exomalopsini, including 12 species of *Exomalopsis* sensu lato, four of them in the nominal subgenera: *E. auropilosa*, *E. globosa*, *E. similis*, and *E. fulvofasciata*.

In terms of the diversity of the genus in Colombia, there are currently four described species of *Exomalopsis* that are currently known (three in the subgenus *Exomalopsis* (*E. auropilosa*, *E. digressa*, and *E. similis*) and one in the subgenus *Phanomalopsis* (*E. snowi*)) in addition to an undetermined number of undescribed species according to Smith-Pardo [12], Smith-Pardo and Vélez-Ruiz [13], and Vélez-Ruiz [14].

In this paper, we describe a new species of bee in the genus *Exomalopsis*, subgenus *Exomalopsis* (host), and a new species of bee in the genus *Nomada*, a cleptoparasitic of the former. In addition, we present the description of the nest, provide some data on its occupancy, and provide a taxonomic key to the species of *Exomalopsis* currently known for Colombia.

2. Materials and Methods

One nest was found, dissected, and described; all bees were collected inside or coming to the nest. It was located in the area around the Melitological and Apicultural Research Laboratory (LIMA) of the Universidad Nacional de Colombia (coordinates: 6°16′49″N 75°34′45.55″W, elevation: 1529 m),

located at the Ecoparque Cerro el Volador (El Volador hill, Ecological Park) in Medellin, Colombia.

The nest was located in the apiary grounds in between several well-established honey bee hives (*Apis mellifera scutellata*) at a distance of only 35 cm from the nearest bee hive, making the dissection of the *Exomalopsis* nest particularly complicated and requiring protecting gear used in apiculture with Africanized honey bee; in addition to protecting clothes, we had to continuously use a smoker to control the aggressive behavior of the honey bees. For the excavation of the nest, we used shovels, chisels, a rock hammer, forceps (for extraction of the cells), and plaster of Paris (to trace the channels leading to cells). The nests were excavated following the technique proposed by Norden et al. [6]. Two people spent a total of 6 hours dissecting the entire nest.

Morphological terminology generally follows that of Silveira [5], Almeida and Silveira [15], and Michener [1], with some sculpturing terms adapted from Harris [16] and with the following abbreviations employed in the description: F—flagellomere; OD—ocellar diameter (based on the median ocellus); S—metasomal sternum; T—metasomal tergum. Photomicrographs were prepared using a Nikon SMZ 1500 with a Nikon digital camera DS-Fi1. The material is deposited in the following institutions: Museo Entomologico Francisco Luis Gallego (MEFLG), Medellin, Colombia, the Snow Entomological Collection (SEMC), University of Kansas, KS, USA, the American Museum of Natural History (AMNH), NY, USA, and the Entomology Collection of the California Academy of Sciences (CAS), CA, USA.

Samples of pollen were collected from the corbicula of returning foraging females of *Exomalopsis* and from the interior of the cells with larvae or pupae of the host bee; the samples were prepared following the method of Erdtman [17], observed using a Unico light microscope, and the identification to family of the pollen types was done using the palynological atlas for the area by Velásquez [18].

3. Results

3.1. Nest

3.1.1. Architecture. The nest was found in the ground with a slope of 30°, the soil cover was mostly grass, and it is classified as alluvial soil. There was a single entrance to the nest, surrounded by a small tumulus of mostly clay and organic matter (mostly dead leaves and seeds of eucalyptus trees from nearby) as in Figure 1.

Internally, the nest entrance leads to a main channel of around 19–17 mm of diameter, which turned narrower after the commencement of the branching of channels leading to cells, which started branching of the main channel at a depth of approximately 80 cm (20–30 cm into the horizon B) and extended down to almost the end of the main channel at 120 cm depth (interface between horizons B and C (Figure 2, arrow)); all along its length, the main channel had a distinctive gray clay lining, which was more evident in the O and A soil horizons.

We found a total of 34 cells, as close as 15 cm and as far as 30 cm of the main channel. Most of the cells led to the main channel by a single channel which in general had not more than 11 mm in diameter and with a lining that resembled more the soil surrounding it (less contrasting), although there was still some gray clay. For some of the cells dissected, we were not able to find the channel that led to the main one, and all of these cells were closed and with immature stages present (Figure 3).

There were also some cells with different stages of larval development connected by the same channel; however, most of the cells apparently had their own connecting branch to the main channel. Each individual cell was surrounded by sandy soil, without any particular lining, different to the soil surrounding them; we also found pupae stages in cells that were sealed; the dimensions for each cell were as follows: diameter 8-9 mm and length (depth) 12–14 mm. A diagram representing the finding on the architecture of the dissected nest is presented in Figure 2.

3.1.2. Nest Population. In total, we collected 43 adults of *Exomalopsis* (28 females and 15 males) and 20 adults of *Nomada* (14 females and 6 males), most of the adults were collected in the nest or near the entrance, although some (8 *Exomalopsis* and 2 *Nomada*) were collected while trying to land on the nest entrance. The population of immature bees associated with the collected cells (34) was distributed as follows: 24 cells had different stages of immature *Exomalopsis* and 10 had immature stages of *Nomada*. We saw the adults of both the host and the cleptoparasite bees interact freely at the interior of the nest. There were no signs of aggressive behavior from the host to the cleptoparasite, and at times, they were standing next to each other at the entrance; cleptoparasite exited and entered the nest without any impediment by the host bees when they were standing at the nest's entrance.

3.2. Bees

3.2.1. Taxonomy

Genus *Exomalopsis* Spinola

Exomalopsis Spinola, 1853: 89 [19].

Exomalopsis aburraensis. sp.nov

Figures 4-5.

Diagnosis. The new species belongs to the subgenus *Exomalopsis* and as such differs from species in other subgenera by the T1 of the female with or without premarginal depressed area cover which has punctuations and in the case of the male because of the presence of spine-like process on each side of S6. This species can also be recognized by the setae of the head, which is mainly whitish and the thorax, ferruginous; the terga in both sexes have bands of apical erected, branched, ferruginous, and densely distributed setae.

Female (Figure 4) Holotype. Body length 8 mm; forewing length 7.5 mm Head width 3 mm; head wider than long; compound eyes 2.5 times longer than wide; ocellocular distance 2 times OD; interocellar distance about 3 times

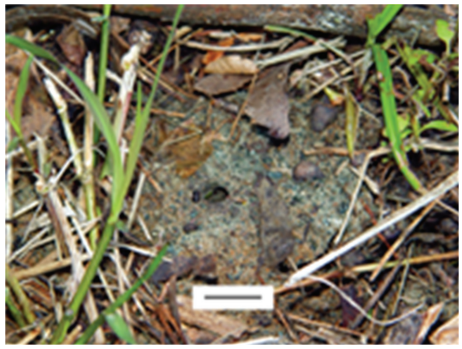

Figure 1: Nest entrance of *Exomalopsis aburraensis* sp.nov. (Scale 20 mm.)

Figure 2: Channel of the entrance in nest of *Exomalopsis aburraensis* sp.nov. (Scale 100 cm = 1 m, division at 50 cm.)

median ocelloccipital distance; ocelloccipital distance one third of the interocellar distance; distance of integumental punctures less than a puncture diameter; mandible edentate; malar area length very short near to base of compound eye; clypeus 1.3 times wider than long; supraclypeal area plane; frontal line occupying one third of the frons, not reaching the middle ocellus; distance between subantennal sulci 4 times diameter antennal suture; scape 5 times longer than wide; pedicel circular, narrower than F1; genal area broadest dorsally.

Thorax. Posterior legs with abundant plumose setae from tibiae to basitarsus; basitibial plate mostly rounded, with a carinate fringe; forewing with three submarginal cells; stigma two times as long as marginal cell length.

Color of head, mesosoma, and metasoma black. Wing veins brown-yellowish, wing membranes transparent. Integument of the mesoscutum and mesoscutellum with abundant punctures separated by a distance less than its diameter.

Pubescence of the head mainly whitish, except for a ferruginous, large patch of dense, minutely branched setae on the vertex. Labrum with dense long setae, the middle ones 3 times OD; clypeus with sparse shorter setae (2 OD); paraocular area with a dense group of short setae (1 OD or less); frons with long (2 OD) and dense minutely branched setae, longest setae (3 OD) on vertex and along preoccipital ridge; ocellar area with sparse, long setae (2 OD); gena with short (1 OD) setae, longer on lower part. Mesosoma with long (about 2 OD), ferruginous and sometimes bright yellow, dense branched setae; mesoscutum and mesoscutellum with dark yellow setae; metanotum cover by dense group of long (>2 OD) ferruginous straight setae that surrounds the scutellum; propodeum cover with abundant setae; posterior tibiae setae predominantly black with some groups of white setae. T1–T4 with short (1 OD), erected, ferruginous, branched, dense setae that in T1-T2 covering the apex and the sides of each tergite (being more abundant in T2) and in T3-T4 cover completely the segment. T5 cover by a dense group of long (about 2 OD), black, branched setae. S2–S5 with long and sparse ferruginous setae at the apical margin.

Figure 3: Closed cell of *Exomalopsis aburraensis* sp.nov. containing a pupae (scale = 10 mm).

Male (Figure 5). Body length 6 mm; forewing length 5.8 mm. head width 2.4 mm; wider than long; compound eyes 2.5 times longer than their wide; ocellocular distance 3 times OD; interocellar distance about 1.5 times median ocelloccipital distance; ocelloccipital distance two thirds of the interocellar distance; distance of integumental punctures less than punctures diameter; mandible edentate; malar area length very short near to base of compound eye; clypeus trapezoid, almost 2 times wider than long; supraclypeal area plane; distance between subantennal sulci 2 times diameter antennal suture; scape 4 times wider than long; pedicel circular, narrower than F1; genal area parallel to the posterior edge of the compound eye.

Thorax. Posterior legs with few dense plumose setae from tibiae to basitarsus; basitibial plate mostly rounded, with a carinate fringe; forewing with three submarginal cells; stigma two times as long as marginal cell length.

Color of head, mesosoma, and metasoma black. Wing veins brown-yellowish, wing membranes transparent. Integument of the mesoscutum and mesoscutellum with abundant punctures separated by a distance less than its diameter.

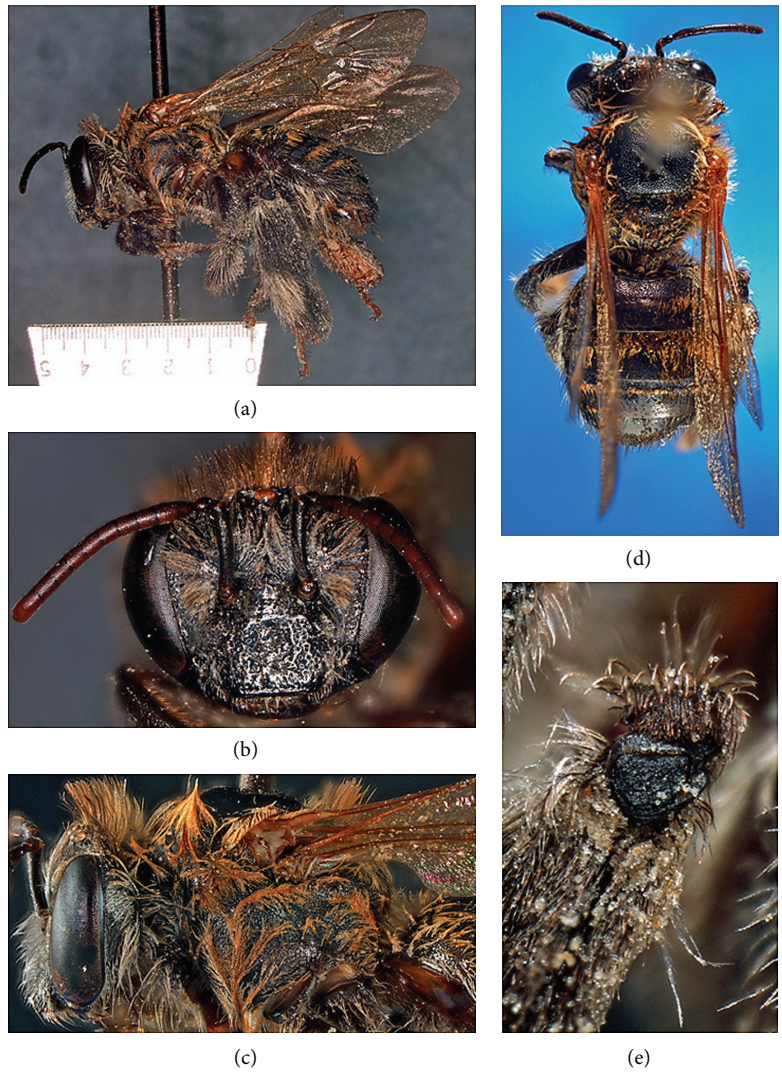

FIGURE 4: Photographs of the female (holotype) of *Exomalopsis aburraensis* sp.nov.: (a) habitus, lateral view (scale; each division equals to 1 mm, total 5 mm = 0.5 cm); (b) frontal view of the head (face); (c) lateral view of head and mesosoma (thorax + propodeum: pro-, meso-, and metapleura); (d) habitus, dorsal view; (e) close view of the metatibial plate.

Dense pubescence on the head whitish, except for a ferruginous, large patch of dense, minutely branched setae on the vertex. Labrum with dense long setae (2 times OD); clypeus cover by longer dense group of setae (3 OD); paraocular area and frons cover by a dense group of long minutely branched setae (about 3 OD); vertex and preoccipital ridge with long (2 OD) and dense minutely branched setae; ocellar area without setae; gena with long (2 OD) setae, longer on lower part. Mesosoma particularly on mesoscutum and mesoscutellum with short (>1 OD), ferruginous, dense branched setae; metanotum cover by dense group of long (>2 OD) ferruginous straight setae that surrounds the scutellum; propodeum with sparse short setae (>1 OD); posterior tibiae setae predominantly black with some groups of white setae. T1 with erected, dark yellow short setae (>1 OD) on the lateral sides; T2–T5 with narrow and dense, apical band of erected, dark yellow short setae (>1 OD); S2–S5 with long and sparse whitish setae at the apical margin; S6 rounded with an elevated area at each side in which apex has a black carina that ends in a pointed spine. Genitalia and associated sterna are presented in Figures 5(d)–5(f).

Type Material

Holotype. ♀ Colombia, Antioquia, Medellín, Cerro el Volador, Laboratorio de Investigaciones Melitológicas y Apícolas LIMA, 6°16′49″N 75°34′45.55″W September 1st of 2008, A.H. Smith-Pardo. Deposited in Museo Entomologico "Francisco Luis Gallego" (MEFLG) at Universidad Nacional de Colombia, Medellin.

Paratypes. Same as the holotype: 22♀ 12♂(MEFLG, AMNH, SEMC, CAS), some the original specimen were destroyed in transit to the USA from Colombia and therefore are not included.

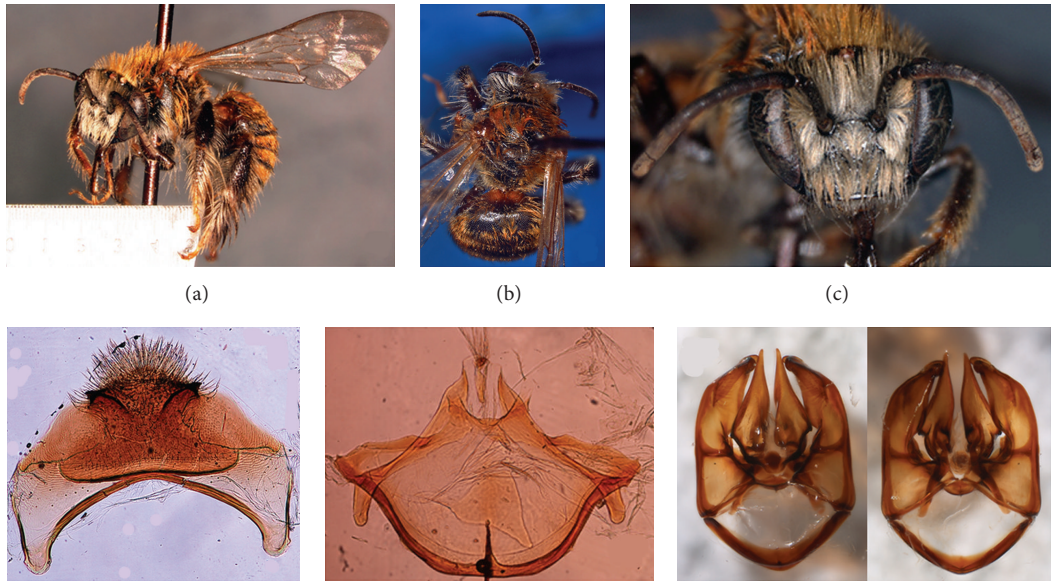

Figure 5: Male of *Exomalopsis aburraensis* sp.nov.: (a) habitus, lateral view (scale 5 mm = 0.5 cm, each division = 1 mm); (b) habitus, dorsal view (last three metasomal segments not visible); (c) frontal view of the head (face), (d) last visible metasomal sternite (S6); metasomal sternites 7 (S7) and 8 (S8), both internal and closely associated with the genital capsule; (f) genital capsule (left ventral view, right dorsal view).

Etymology. The species epithet refers to the *Aburra Valley* in the Departament of Antioquia which encompasses the Volador hill where this species was collected.

Genus *Nomada* Scopoli

Nomada Scopoli, 1770: 44 [20].

Nomada medellinenses sp.nov

Figures 6-7.

Diagnosis. This species resembles *Nomada advena* [21] (the only identified species known to occur in Colombia according to Moure et al. [22]) in the overall appearance. *N. medellinensis* differs from *N. advena* and other undetermined species from Colombia (seven morph species according to Smith-Pardo [23]) by the overall coloration patterns in the pro-, meso-, and metasoma in both females and males and by the shape of the male genital capsule and hidden sclerites. It differs from *N. advena* in particular in the following characters (compared with images of the holotype provided by the BMNH): supraclypeal area completely brown; face mostly brown, yellow maculae restricted to the central portion of clypeus and a band as wide as mid ocellus extending from the anterior tentorial pit to the paraocular margin at the level of the antennal insertion; scape and inter-ocellar spaces with setae twice as long as OD; mesoscutellum, side of propodeum, and metacoxae dark brown (all yellow in *N. advena*); metasoma with yellow band on T1 half the width of metafemur (half or more in *N. advena*), band on T2 as narrow as that on T1 and complete (incomplete and broad in *N. advena*).

Female (Figure 6) Holotype. Body length 9.5 mm; fore wing length 7 mm. head width 3.5 mm, almost 2 times wider than long; compound eyes 2.5 times longer than wide; distance ocellocular 2.5 times OD; integument shiny; scattered punctures on the face, distance integumental punctures on the frons and vertex less than punctures diameter; mandible edentate; malar area length increases from the condyle to the acetabulum; clypeus 2 times wider than long; anterior tentorial pits 2 times face punctures diameter, rounded and black; distance between subantennal sulci at the base 1.5 times antennal suture diameter; scape narrower at the base, 3.5 times longer than wide; pedicel trapezoid wider at the base; F1 as long as F2; genal area parallel sided.

Thorax. Medial and posterior legs with a group of spines occupying 3âĄĎ4 of the tibia margin; posterior leg with a row of 4 to 5 spines at tibial apical margin; integument of the mesoscutum and mesoscutellum shiny, with few punctures and setae; parapsidal lines on the scutum evident; propodeal triangle hairless, with abundant small close punctures on the integument.

Abdomen. Integument shiny; all terga with dense small contiguous punctures separated by a distance less than a half of its diameter (inconspicuous character because all terga are covered by dense setae).

Color of head, mesosoma, and metasoma mainly black. Face with yellow markings on the paraocular area; scape, pedicel and F1 light brown; rest of the flagellomeres dark brown to black. Pronotal collar, pronotal lobe, and metanotum yellow; scutellum completely yellow or black with some yellow coloration. Wing veins dark brown, wing membranes

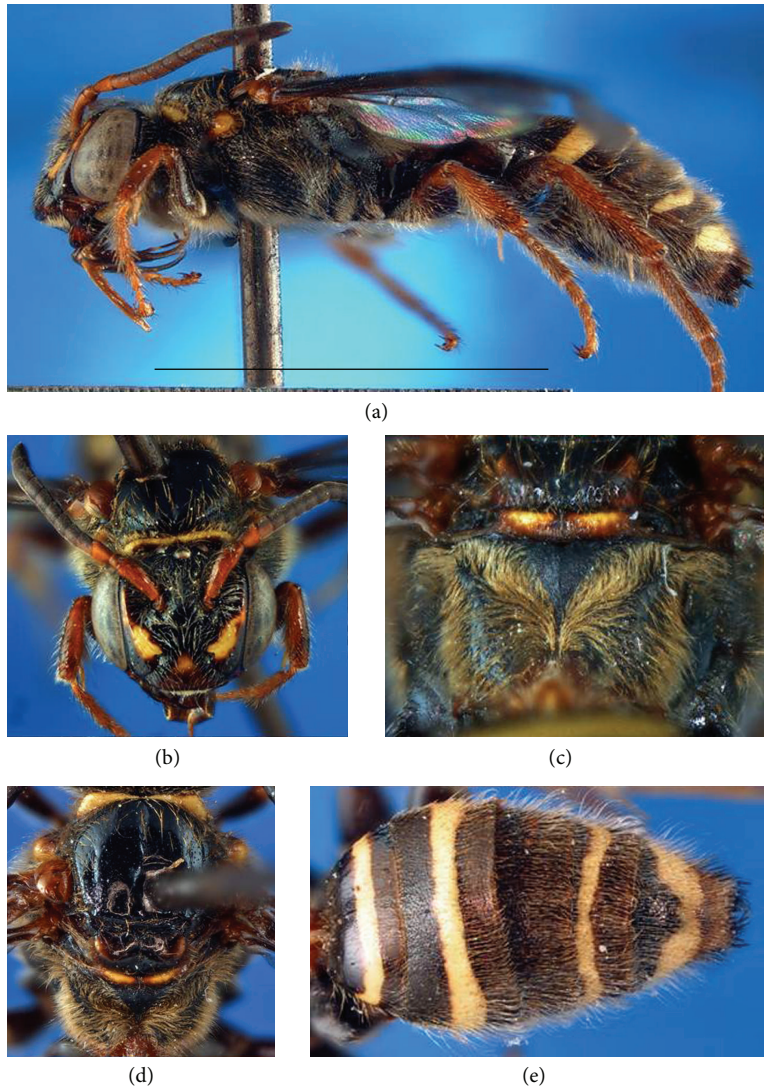

Figure 6: Female (holotype) of *Nomada medellinenses* sp.nov.: (a) habitus, lateral view (scale 5 mm); (b) frontal view of the head (face) and mesosoma (pronotum, mesoscutum, mesoscutellum, and tegulae visible); (c) posterior view of the propodeum showing shape and pubescence of propodeal triangle; (d) dorsal view of mesosoma (thorax + propodeum); (e) dorsal view of the metasomal (T1–T5).

brownish. T1, T2, and T4 with a medial yellow band; T3 with a band thinner than those on the other terga; T5 completely yellow. On dorsal view coxa, trochanter and femur of three legs dark-brown or black; on ventral view coxa and trochanter completely black, femur mixed with black and brown; tibiae, basitarsus and tarsus brown or ferruginous.

Pubescence of the head mainly whitish. Labrum with dense short setae (1 OD); clypeus with sparse shorter setae (1 OD); paraocular area with a dense group of longer setae (1.5 OD); frons with long (2 OD); longest setae (2.5 OD) on vertex and along the scape; genal area cover by a dense group of short setae (1–1.5 OD), being more dense lower part. Scutum, scutellum and metanotum with scarce ferruginous setae (2 OD); mesopleura cover by a dense group of white setae (1.5 OD); lateral portions of the propodeum cover with dense yellowish-whitish short setae (<1 OD). Metasoma on dorsal view completely cover by erected, dark-yellow seta that increases its longitude to the apex (T1 setae <1 OD until T5 2 OD). On ventral view from the frontal coxa to the apex of the abdomen—S5—(except for the pigidial plate) completely covered by a dense group of whitish long setae (1.5 OD).

Male (Figure 7). Body length 7.5 mm; forewing length 6.3 mm. Head width 2.2 mm, almost as long as wide; compound eyes almost 2 times longer than wide; distance ocellocular 2 times OD; integument shiny; punctures on the face very dense (including the paraocular area, supraclypeal area, frons, and vertex), with a distance between integumental less than punctures diameter; mandible edentate; malar area length increases from the condyle to the acetabulum; clypeus 2 times wider than long; anterior tentorial pits 2 times face punctures diameter, rounded and black; distance between subantennal sulci at the base 1.5 times antennal suture diameter; scape narrower at the base, 3 times longer than wide; pedicel trapezoid wider at the base; F1 as long as F2; genal area parallel sided.

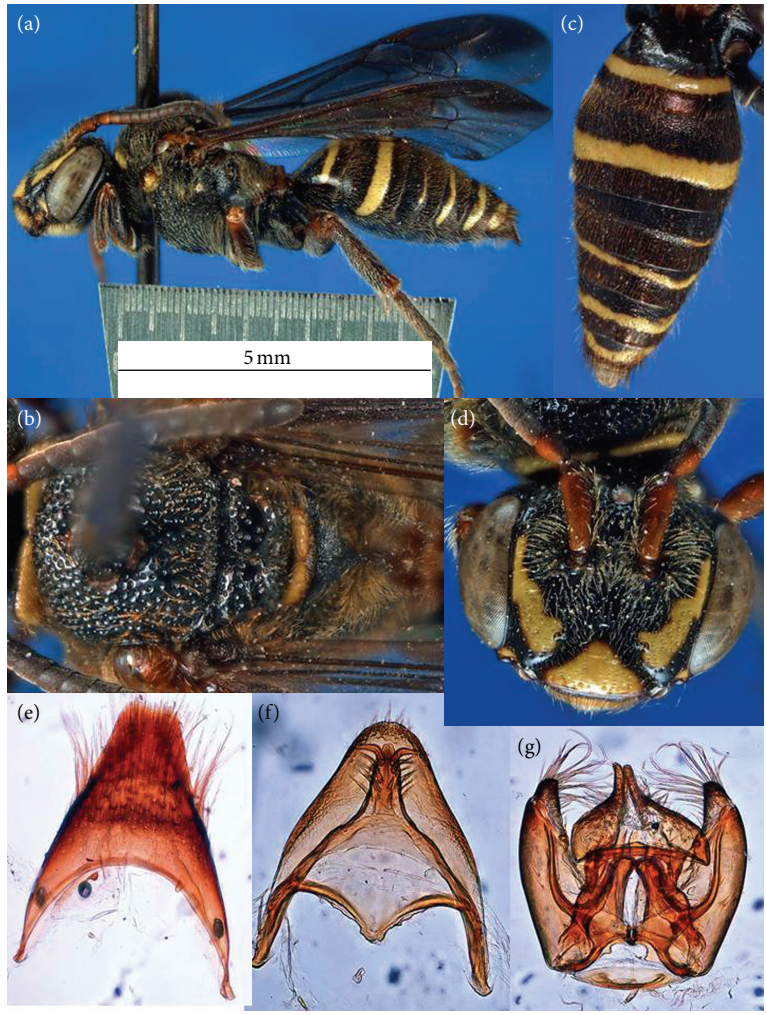

Figure 7: Male of *Nomada medellinenses* sp.nov.: (a) habitus, lateral view (scale 5 mm); (b) dorsal view of the mesosoma (thorax + propodeum); (c) dorsal view of the metasoma showing banding pattern; (d) frontal view of the head (face); (e) last visible metasomal segment (T6) showing pygidial plate; (f) metasomal sternites S7 + S8 (internal); (g) genital capsule (mostly dorsal view, although some ventral characters also visible).

Thorax. Integument of the scutum and scutellum shiny; punctures on the scutum abundant and very close between them; punctures on the scutellum separated by a distance less than its diameter (in both cases the integument looks like rugous); propodeal triangle opaque and hairless.

Abdomen. Integument shiny; proximal portion of each tergite (above yellow band) with dense small contiguous punctures separated by a distance less than a half of its diameter.

Color of head, mesosoma, and metasoma mainly black. Face with yellow markings on the paraocular area, clypeus, and at the base of the mandible; scape, pedicel, and F1 light brown; rest of the flagellomeres dark brown to black. Pronotal collar, pronotal lobe, and metanotum yellow; scutellum varies between completely yellow or black. Wing veins dark brown, wing membranes brownish. On dorsal view coxa, trochanter and femur of three legs dark-brown or black; on ventral view, coxa and trochanter completely black, femur mixed with black and brown; tibiae, basitarsus, and tarsus brown or ferruginous. T1 and T2 with a thick medial yellow band; T3 without medial yellow band or with an inconspicuous one; T4 and T5 with a medial yellow band but thicker than those in T1 and T2.

Sparse pubescence on the head whitish, except for a few ferruginous group of scarce erected setae on the vertex. Labrum covered by dense short setae (<1 OD); clypeus with sparse shorter setae (1 OD); paraocular area with a dense group of branched, long setae (1.5 OD); frons with scarce long setae (2 OD); setae on vertex long, erected, and scarce (1.5 OD); genal area with scarce erected, short setae (1 OD). Scutum, scutellum, and metanotum with scarce ferruginous setae (no longer than 1.5 OD); mesopleura with scarce white setae (1.5 OD); lateral portions of the propodeum cover with dense yellowish-whitish short setae (<1 OD). Metasoma on dorsal view with erected, dark-yellow setae on the apex of each tergite, that increase their longitude to the apex of the abdomen (T1 setae <1 OD until T5 1.5 OD). Hidden sclerites S7-S8 and genital capsule as in Figure 7.

Type Material

Holotype. ♀ *Colombia, Antioquia, Medellín, Cerro el Volador, Laboratorio de Investigaciones Melitologicas y Apicolas LIMA* (6°16′49″N 75°34′45.55″W September 1st of 2008, A.H. Smith-Pardo. Deposited in Museo Entomologico "Francisco Luis Gallego" (MEFLG) at Universidad Nacional de Colombia, Medellin.

Paratypes. Same as the holotype: 1♀ 1♂ (AMNH, SEMC), and 5 ♀ some of them were partially destroyed in transit to the USA from Colombia.

Etymology. The species epithet refers to the Municipality of Medellín where the city of the same name is located and where the species was collected.

4. Key to Species of *Exomalopsis* of Colombia

(Modified from Timberlake [3]. Characters apply to both sexes.)

(1) T1 of female with premarginal line depressed, forming transverse sulcus, and marginal zone between dorsolateral convexities smooth and shining, comprising no more than two-thirds of dorsal surface of tergum; pterostigma about two-thirds as long as marginal cell; S6 of male entirely planar … *Exomalopsis (Phanomalopsis) snowi* Cockerell.
T1 of female with premarginal line not depressed; pterostigma approximately as long as marginal cell; S6 of male with median elevated area that broadens toward apex of sternum, forming carina or spine at each side … 2 *Exomalopsis (Exomalopsis)* spp.

(2) Pubescence of the thorax and legs ochreous, yellow, or golden (in some cases pubescence of thorax white) … 3.
Pubescence of the thorax and legs ferruginous … *E. aburraensis* sp.nov.

(3) Pubescence of the thorax and abdomen white or ochreous … 4.
Pubescence of the thorax and abdominal bands yellow or golden, with some black pubescence on outer side of the hind tibiae … *E. auropilosa* Spinola.

(4) Hind tibiae rather strongly swollen, thickest before apex, and fringed behind with short dark pubescence; male with narrow bands on the abdomen; wings dusky subhyaline, darker at apex … *E. digressa* Timberlake.
Hind tibiae moderately swollen, with long pubescence fringing posterior margin toward apex; male with white apressed bands of setae on the abdomen; wings dusky subhyaline, no darker at apex … *E. similis* Cresson.

5. Discussion

E. aburraensis sp.nov. nests in a sloping ground with clay-like soil as looks common in most *Exomalopsis* nests. Rozen and Snelling [9] and Rozen [11] found 6 entrances to the nest of *E. nitens* and *E. sidae,* respectively. *E. aburraensis* nest had only one entrance in which all individuals used to access to the nest. On *E. nitens,* the entrances did not have tumuli, but in *E. aburraensis* nest as in most of *Exomalopsis* species, tumuli are present on the nest entrance. *E. aburraensis* nest was connected by a main channel which is common in most *Exomalopsis* [9]. The characteristic of having only one entrance and a big number of cells shows that the bees *E. aburraensis* on this particular nest are communal, which means they share the activities on the nest [1, 24, 25]. Other bees of the genus that shows a cooperative work are *E. globosa* and *E. similis* [7]. In *E. nitens* cells were arranged in series of two or only one per channel. In *E. aburraensis*, cells were arranged singly.

Rozen [11] mentioned that Zucchi [10] recorded the biggest number of females found in a nest of *Exomalopsis* (*E. auropilosa,* 884 in total), but we found the biggest number of males ever recorded for any *Exomalopsis* species (15 in total). We did not find any evidence of previous generations on the nest (empty old cells) which means that possibly the nest was recently established.

All species of the genus *Nomada* Scopoli are cleptoparasites of other bees (Andrenidae, Halictidae, Collectidae, Melittidae, and some Apidae), having the nests of *Andrena* Fabricius as the most common host [24, 26, 27]. However, some authors mention that bees from genus *Nomada* are cleptoparasites of *Exomalopsis* [24, 26], but few papers establish that relationship, because this specific cleptoparasitic bees are not specialized on *Exomalopsis* [28]. Raw [8] mentioned that *Nomada cubensis* and *N. pilipes* are potential cleptoparasites of *Exomalopsis* due to the presence of adults near to the nests, but he never recovered immature occupying cells into the nest. Some cuckoo bees of the genera *Hypochrotaenia*, *Paranomada*, *Triopasites*, *Melanomada*, and *Hesperonomada* were reported by Rozen [11] as the cleptoparasites of different species of *Exomalopsis*.

The proportion of cleptoparasitic bees into a nest of *Exomalopsis* is not the same, as it varies depending on the species; for example, *Paranomada velutina* is the parasite of *E. solani*, and its rate of parasitism is close to the 50% of the cells of the host's nest [29], while *P. nitida* parasite of *E. solidaginis* presented a low rate of parasitism on the cells of its host [11]. Besides, Rozen [11] found a high density of *Melanomada sidaefloris* parasiting cells on the nest of *E. sidae* (close to 1 : 1 proportion). In this case, *Nomada medellinensis* had a low population density in comparison with the number of individuals of *E. aburraensis*, which can be explained because there were no, signs of aggressive behavior between species, and that makes more plausible that the cleptoparasitic bee was unnoticed by *E. aburraensis* individuals. Something similar was reported by Rozen [30] between E. and its cleptoparasite *Brachynomada scotti*; both species apparently coexist without any aggressive behavior.

Melanomada sp. cleptoparasite of *E. nitens* was registered by Rozen and Snelling [9] waiting for the correct moment to enter to the nest. In this case, *E. nitens* detected in some cases the intruder's eggs and tried to destroy them by digging to the egg with their mandibles or filling the cell with soil.

We suspect that *Nomada medellinensis* bees are using some distinctive odor of *E. aburraensis* to survive and interact freely inside of the nest.

Pollen samples taken from inside the nest and some of the adults of *Exomalopsis* indicate the presence of plants that belong to the families: Rubiaceae, Melastomataceae, Asteraceae and Anacardiaceae, used as food source for the colony. Raw [7] found the most common species of plants visited as source of pollen for *E. globosa* and *E. similis* are *Mimosa pudica* (Mimosaceae) and *Borrerialaevis* (Rubiaceae), followed by some Papilionaceae, Compositae, and Acanthaceae. This supports the idea of *Exomalopsis* as a polylectic group of bees.

E. aburraensis sp.nov. belongs to the subgenus *Exomalopis*. Both females and males have a characteristic pubescence of the thorax and legs ferruginous, having this as a unique character for the species that have been described from Colombia. Silveira [31] reviewed the phylogenetic relationships and classification of the tribe Exomalopsini and addressed the lack of taxonomical knowledge particularly in the *Exomalopsis* subgenus. Even though such paper was published more than 10 years ago, until today, that is the most recent study about the phylogenetic relationships of the group. Both subgenera *Phanomalopsis* and *Exomalopsis* are consistent groups inside of the tribe, but due to a big number of plesiomorphies, the former subgenus is hard to separate from the rest [31]. This aspect does not represent a difficulty to separate *Exomalopsis* from Colombia because *E. snowi* is the only species described from the country that belongs to the subgenus *Phanomalopsis*. Further analysis should be made to propose a new phylogenetic hypothesis at genus and subgenera levels. Until now, *E. aburraensis* sp.nov. looks restricted to the clay-like soil present at the *Aburra Valley* in the Departament of Antioquia, Colombia.

Although *Nomada* is a morphological diverse genus of bees, different authors consider subgenera or species groups trying to solve the differences between the species [32, 33]. *Nomada medellinenses* sp.nov. is easy to separate from the previous species described from Colombia, because of the particular pattern of coloration. Due to its cleptoparasitic habits and a possible specificity for its host *E. aburraensis*, this species of *Nomada* could be found principally associated with the host nests. Collection of more specimens in surrounded areas where the host nest was found will help to have more information about the host-parasite specificity between this new species.

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