



HOLOTIPUS ARTICLE



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# A New Species of the genus Augochloropsis Cockerell 1897 (Halictidae, Augochlorini) from Northeast Brazil, and a key to species from the Bahia State

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UNIVERSIDADE FEDERAL DA BAHIA, CAMPUS ONDINA, INSTITUTO DE BIOLOGIA, DEPARTAMENTO DE ZOOLOGIA, LABORATÓRIO DE BIONOMIA, BIOGEOGRAFIA E SISTEMÁTICA DE INSETOS, SALVADOR-BA, BRAZIL; HTTPS://ORCID.ORG/0000-0001-7477-2191. CONTACT EMAIL: RICARDOSM@UFBA.BR.

#### Abstract.

Augochloropsis, with 150 species, is the most speciose Augochlorini genus. This taxon displays a wide spectrum of social behavior ranging from solitary to primitively eusocial. In the present study Augochloropsis beatrice sp. nov. from Bahia, northeast Brazil, is described and a key to the species occurring in Bahia is provided, together with their distribution.

# Introduction

Besides the genus Apis Linnaeus, 1758 (Apidae), Halictidae are the most numerous bees in the world, in terms of number of individuals (Michener 2007) and the family contains the most speciose bee genus in the world, Lasioglossum Curtis, 1833 (Ayala-Barajas 2020). In the Neotropical region, Augochlorini, which are characterized by a generally shiny metallic color, are one of the most representative tribes, with all genera occurring in South America. *Augochloropsis* is the most diverse genus, with approximately 150 species, about 75 of these widespread across Brazil in different regions of the country (Silveira et al. 2002; Moure 2012). However, this genus is understudied and remains poorly known (Silveira et al. 2002; Michener 2007).

Bees of this genus are notable pollinators by vibration, which is method of pollination, important for the reproduction of certain flowering plants, particularly plants of economic interest. The social behavior of Augochloropsis ranges from solitary to primitively



**RICARDO SANTOS MAGALHÃES** 

### Keywords: Augochloropsis, Bees, Halictidae, Neotropical, Systematics, Taxonomy.

eusocial (Coelho 2002; Nunes-Silva et al. 2010). The genus presents well documented difficulties for specific identification. The last species described was Augochloropsis isabelae Engel from Peru (Engel 2008) and a complete revision of the genus is not viable due to the taxonomic complexity and the large number of specimens deposited in different national and international institutions (Santos 2014).

According to Silveira (2002) and Moure (2012), five species are confirmed to occur in the state of Bahia, Brazil: Augochloropsis calypso (Smith, 1879), A. toralis (Vachal, 1904), A. berenice (Smith, 1879), A. cupreola (Cockerell, 1900) and A. crassigena Moure, 1943.

> Figure 1. Female of *Augochloropsis beatrice* **sp. nov.** Scale bar = 0.5 mm.

# **Material and Methods**

Bees were examined under a stereomicroscope and photographed with the aid of a Leica M165 stereomicroscope coupled with a Leica DFC295 digital camera, with the Leica Application Suite V4.1 Interactive Measurements, Montage Software. The species were diagnosed and described based on the morphological characters. The examined material was previously identified from the BIOSIS reference collection by Dr. Favízia Freitas de Oliveira and photographs of type specimens through highresolution photographs.

The identification key was made based on the descriptions of other species from Bahia State. Repository institutions of the specimens are the Hymenoptera Reference Collection of the Laboratory of Bionomy, Biogeography and Insect Systematics (**BIOSIS**) and the Federal University of Bahia (**MHNBA-MZUFBA**) Salvador, BA.

All measurements were made in millimeters (mm), mid ocelus distance (OD), and Puncture diameter (PD). The abbreviations T1, T2, etc. denote the metasomal terga and S1, S2, etc. denote the metasomal sterna.

# Results

Tribe Augochlorini Beebe, 1925

Genus Augochloropsis Cockerell, 1897

Augochloropsis beatrice sp. nov. (Figs. 1-2, 6)

Holotype: female HOLÓTIPO MHNBA-MZUFBA 550 // Brasil, Bahia, Cachoeira Grande, 16/01/2007 11:35–12:05h, *Stryphnodendron pulcherrimum*, Monteiro D. & Florence C.

Paratype: male MHNBA-MZUFBA 451 // Brasil, Bahia, Pacangê, 14/01/2007, 10:30–11:00, Stryphnodendron pulcherrimum, Monteiro D. & Florence C.; male MHNBA-MZUFBA 549 // Brasil, Bahia, Cachoeira Grande, 16/01/2007, 11:35–12:05h, Stryphnodendron pulcherrimum, Monteiro D & Florence C.; male MHNBA-MZUFBA 098 // Brasil, Bahia, Pacangê, 06/01/2007, 10:00–10:30h, *Strvphnodendron pulcherrimum*, Monteiro D. & Florence C.; female MHNBA-MZUFBA 332 // Brasil, Bahia, Cachoeira Grande, 11/01/2007, 10:20–10:50h, Stryphnodendron pulcherrimum, Monteiro D. & Florence C.; female MHNBA-MZUFBA // 29, Brasil, Bahia, Cachoeira Grande, 30/12/2006, 10:30-11:00h, Stryphnodendron pulcherrimum, Monteiro D. & Florence C.; female MHNBA-MZUFBA 518 // Brasil, Bahia, Cachoeira Grande, 16/01/2007,

08:45–09:15h, Stryphnodendron pulcherrimum, Monteiro D. & Florence C.; female MHNBA-MZUFBA 56 // Brasil, Bahia, Cachoeira Grande, 11:00–11:30h, Stryphnodendron pulcherrimum, Monteiro D. & Florence C.; female MHNBA-MZUFBA 55 // Brasil, Bahia, Cachoeira Grande, 05/01/2006, 11:00-11:30, Stryphnodendron pulcherrimum, Monteiro D. & Florence C.; female MHNBA-MZUFBA 517 // Brasil, Bahia, Cachoeira Grande, 16/01/2007, 04:45–09:45, Stryphnodendron pulcherrimum, Monteiro D. & Florence C.

Diagnosis: *Augochloropsis beatrice* **sp. nov.** can be recognized by its metallic green color with a square black area on the middle of mesothorax and the dark fuscous metallic metasoma. Punctures are sparse on the middle of the mesothorax and dense and confluent on the sides. The basal area of the propodeum is densely striated with smooth and polished edges. The pubescence is yellowish, while legs and vibrissae are fulvous.

Description. Female: Pubescence on legs pale yellowish; wings grizzled, apical vibrissae fulvous; clypeus with a semilunar black spot near the base and a black square area on the middle of the mesothorax. Tegulae with brown spot on the apex; basal area of the propodeum densely plicate in the middle and smooth and polished at the edges. Marginal area of the propodeum smooth and polished on the middle, weakly and sparsely punctured on the sides (2DP). Metepisternum narrow and angled, forming an irregular pentagon when seen laterally. Metasoma dark and fuscous; vibrissae yellowish, short and sparse; apex of the abdomen with pale vellow setae. Mandibles black with a bluish-green spot near the base. Ocelli pale yellowish. Middle of the mesothorax with sparse punctures on the black square area and confluent punctures on the sides. The punctures in the metasoma weakly, smooth and sparse, equally punctured in T1 and T2.

Total body length: 10–10.5 mm, head length: 2.3 mm, mesosoma: 2.7 mm, metasoma: 5.5 mm, wing length: 6.5 mm. Eye distance: 9 OD, lateral ocellus distance: 2 OD, eye width: 3 OD, intertegular distance: 10-12 OD. Clypeus fairly imbricated separated by 1–1.5 PD. Distance between antennal sockets: 2.2 OD.

Male: As for the female, except for secondary sexual characters and for: total body length: 9.7 mm, head length: 2.2 mm, mesosoma: 2.5 mm, metasoma: 5.0 mm, wing length: 6.2 mm, eye distance 9 OD, eye width: 2 OD, clypeus width: 3 OD, lateral ocellus distance: 1.5 OD. Intertegular distance about 10–11 OD frontal line emerging from the clypeus apex in the line of antennal sockets ending at 30D of the mid ocellus.

Male genital capsule (Fig. 3): basal area of gonocostylus with some setae; volsella short, with transverse ridge and depression below notch. Gonobase with narrow or membranous ventral bridge; dorsal lobes strongly projecting over gonocoxites. Ventral gonostylus complex, apically a seta-bearing lobe continued basally as a broad lobe bearing small setae on the ventral surface, strong setae on the apical edge, and with medial extension bearing a more or less well-defined long thin process. Apical median angle prolonged ventrally. Both margins of gonocoxyte converging diagonally towards gonobase. Ventral gonostylus apically bearing a row of strong, flattened, regular setae. Penis valve with very high crest, small ventral keel and pronounced darkly pigmented dorsal crest, apical to dorsal.

Remarks. In my research, another species, Augochloropsis notophops, appears to be very similar to Augochloropsis *beatrice* **sp nov**. in its description, with some differences that will be compared in these notes. *Augochloropsis notophops* is described having a "dark purple" square on the thorax and A. beatrice is described with a black square on the thorax. The abdomen is described in *A. notophops* as having a totally green color, and differs from *A. beatrice* which is described as having a completely black abdomen. The tegulae are described in A. notophops as having a totally green color different from A.beatrice which is described as having a coppery color. The wings in A. notophops are described as having "dusky" wings and A. beatrice is described as having hyaline wings. The vibrissae are described in A. notophops being "pale orange" and differ from *A. beatrice* which are described as having a strong orange colouring.

Etymology: The specific epithet is in honor of my longtime friend and partner Beatrice Tertuliano de Lima.

# Augochloropsis berenice (Smith, 1879) (Figs. 4, 8)

Female: Size: 8-9 mm. Body green with blackishblue abdomen; abdomen duller than thorax, T2–T6 more blackish than T1. Pubescence pale white on the thorax; pale from the 2/3 of the apical terga to the abdominal apex. Punctation large and sparse on the middle of the mesoscutum; basal area of propodeum slightly wrinkly and slightly reticulated; mesoscutellum with extremely dense punctures with microreticulated spaces between. Process of labrum bilobed.

Total body length: 8 mm, head length: 2.0 mm, mesosoma: 2.5 mm, metasoma: 3.5 mm, wing length: 6 mm. Eye distance: 9.2 OD, lateral ocellus distance: 2.1 OD, eye width: 3 OD, Intertegular distance: 9.5-10 OD. Clypeus fairly imbricated separated by 1.5-2 PD. Distance between antennal sockets: 2 OD.

Male: As for the female, except for punctation. Head very closely punctured, clypeus coarsely so; flagellum fulvous towards the apex beneath. Thorax more strongly punctured than head; scutellum with larger deep punctures; base of the metathorax longitudinally finely rugulose, with a smooth shiny area surrounding the striated one; apex truncate. Abdomen finely punctured.

Examined material: female MHNBA-MZUFBA // Brasil, Bahia, Barra do Tijuípe, Fazenda Natura, 12/11/2013, Souza, C. Q.; female MHNBA-BIOSIS // Brasil, Bahia, Barra do Tijuípe, Fazenda Natura, 10/11/2013, Souza, A. A. B.; female MHNBA-MZUFBA 05199 // Brasil, Bahia, Ilhéus, 24° 49'2499S, 83°84'030W, E. L. Siqueira.

### Augochloropsis calypso (Smith, 1879) (Figs. 4, 10)

Female: Body size: 8-9 mm. Process of labrum bipartite; mandible with a green spot near the base. Abdomen, or majority of the venter, green; flagellum apex testaceous; tegulae with brown spot near apex; wings hyaline. Pubescence pale white on the thorax; tergites pale yellow on the apex, with more highlighted yellow apical vibrissae. Punctation small and sparse on the mesoscutum; basal area of propodeum microreticulated and with marked grooves.

Total body length: 8 mm, head length: 2 mm, mesosoma: 2.5 mm, metasoma: 3.5 mm, wing length: 6 mm. Eye distance: 10 OD, lateral ocellus distance: 3 OD, eye width: 4 OD, intertegular distance: 9 OD. Clypeus fairly imbricated separated by 1 PD. Distance between antennal sockets: 2.1 OD.

Examined material: female MHNBA-MZUFBA 03262 // Brasil, Bahia, Ilhéus, 24°49'3670S 83°85'053W, 15/02/2009, R. B. Martins; female MHNBA-MZUFBA 04681 // Brasil, Bahia, Salvador, UFBA-campus Ondina, 09/03/2010, T. Mahlmann; female MHNBA-MZUFBA 05381 // Brasil, Sergipe, Areia Branca, Pov, 29/01/2014, F. M. Fontes.

### Augochloropsis crassigena Moure, 1943 (Figs. 4, 9)

Female. Body size: 8.5-9 mm; clypeus with a semilunar spot at apex; mandibles ferruginous with a green spot near base. Body green with weak golden sheen, tegulae with a brown spot near the apex. Pubescence pale yellow on the terga, with whitish apical vibrissae. Punctation strong on the clypeus,







Figure 2. Male of *Augochloropsis beatrice* **sp. nov.** Scale bar = 0.5 mm.

Figure 3. Male genital capsule of *Augochloropsis beatrice* **sp. nov.** dorsal and ventral view. Scale bar = 0.5 mm.



Figure 4. A-F females of *Augochloropsis calypso*, *A. crassigena*, *A. cupreola*, *A. berenice*, *A. melanochaeta*, *A. smithiana*. Scale bar = 500 μm/0.5mm.









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small and sparse on the mesoscutum, and stronger on the mesoscutellum; spaces between punctures smooth; basal area of the propodeum with shallow grooves, slightly microreticulated.

Total body length: 8.5 mm, head length: 2.2 mm, mesosoma: 2.5 mm, metasoma: 3.8 mm, wing length: 6-6.2 mm. Eye distance: 8 OD, lateral ocellus distance: 1.4 OD, eye width: 3 OD, Intertegular distance: 8 OD. Distance between antennal sockets: 1.8 OD.

Examined material: MHNBA-MZUFBA 05384 // Brasil, Ceará, Areia Branca, Pov, 10°47'25.7"S 37°2'57"W, 06/02/2014, A. L. Santos; female MHNBA-MZUFBA 002139 // Brasil, Bahia, Guanambi, Fazenda do Sr. Vadinho, 20/02/2010 a 23/10/2010, F. F. Oliveira, S. lua, L.N.; female MHNBA-MZUFBA 003100 // Brasil, Ceará, Limoeiro do Norte, 20/05/2008, S. V. Rodriguez & equipe; female MHNBA-BIOSIS // Brasil, Bahia, Barreiras, Bairro Morada Nobre, 12/12/2008, 07:40 am, 21/12/2012. T. Mahlmann; female MHNBA-MZUFBA // Brasil, Bahia, Salvador, UFBA Campus Ondina, 13°00'09"S 38°30'30'.0W, 21/12/2012, Silveira M & equipe; female MHNBA-MZUFBA 02202 // Brasil, Bahia, Ibiraba, 10°48'S 42°50'W, 20/06/2000, Viana, B. F. Col.; female MHNBA-MZUFBA 2108 // Brasil, Bahia, Feira de Santana, Campus UEFS, 12°12'10"S 38°58'15"W, 07/04/2008, 13:00 h.

# Augochloropsis cupreola (Cockerell, 1900) (Figs. 4-5)

Body size: 8-9 mm; margin before clypeus with a semilunar black spot, sometimes bordered with red or crimson; abdominal apex blackened or brownish. Thorax green with golden brightness and abdomen coppery; T1: coppery; T2: reddish T3-T6: crimson. Pubescence yellowish on the legs and in the apical vibrissae. Punctation very dense on metathorax and basal area of propodeum microreticulated; wrinkled and without grooves.

Total body length: 8.5 mm, head length: 2.0 mm; mesosoma: 2.5 mm, metasoma: 4 mm; wing length: 6.3 mm; eye distance: 8 OD; lateral ocellus distance: 1.7 OD; eye width: 2.5-3 OD; intertegular distance: 9-9.5 OD; distance between antennal sockets: 1.5-1.7 OD.

Examined material: female MHNBA-BIOSIS // Brasil, Bahia, Lençóis, Trilha Ribeirão do Meio. 31/05/2005, 07:00 am, Ane, Cris & Flávio.

#### Augochloropsis toralis (Vachal, 1904)

Body size: 8-8.5 mm; body green with golden sheen, abdomen coppery/reddish; edge of clypeus and labrum vellowish; apex of mandible reddish. Pubescence pale fulvous. Punctation dense and sparse on the middle of mesoscutellum, with smooth bright spaces between them.

This species was not examined, and was not found on the BIOSIS/MHNBA collection.

#### Augochloropsis melanochaeta Moure, 1950 (Figs. 4, 11)

Female. body size: 9-9.5 mm, Color: entirely green with golden sheen in the terga; clypeus with black spot in the apex with crimson reflections around it; hair: quite yellowish on the apical vibrissae; punctation: very dense and marked; with tiny microreticulated spaces and basal area of propodeum with poorly defined carinas and microreticulated spaces.

Total body length: 9 mm, head length: 2.0 mm, mesosoma: 2.6 mm, metasoma: 4.2 mm, wing length: 6.5 mm, Eye distance: 8.2 OD, lateral ocellus distance: 2 OD, eye width: 3 OD, Intertegular distance: 10 OD. Distance between antennal sockets: 1.6 OD.

Male as described for female except for the color and punctation. Color is brighter and more gold; the basitarsus is whitish. Punctation is slightly denser and deeper than the females.

Examined material: female MHNBA-BIOSIS// Brasil, Bahia, Ilhéus, 24° 49'3771S, 83°85'455W, R. B. Martines Col.

### Augochloropsis smithiana Cockrell, 1900 (Figs. 4, 7)

Female. Body size: approximately 12-12.5 mm. Body entirely green with strong golden sheen on the tergites starting from T2; pubescence pale, whitish on the apical vibrissae; tegulae with a brown spot near apex. Punctation small and sparse, with polished spaces on the mesoscutum; basal area of propodeum slightly carinated and wrinkled in the middle with microreticulated appearance. Total body length: 12-12.02 mm; head length: 2.5 mm; mesosoma: 3.5 mm; metasoma: 5.8-6.0 mm; wing length: 7.2 mm; eve distance: 9 OD; lateral ocellus distance: 2.5 OD; eve width: 3-3.2 OD; intertegular distance: 10 OD. Distance between antennal sockets: 2 OD.

Male as for the female, except for the punctation, denser than the female on the base of metathorax and scutellum; base of metathorax longitudinally plicate and scutellum with very small close punctures.

Examined material: female MHNBA-BIOSIS // Brasil, Bahia, Palmeiras, Morro do Pai Inácio, 29/04/2003, F. F. de Oliveira.

#### Distribution records: Fig. 12

#### Key to species of Augochloropsis of Bahia (females)

The key below is applicable only to females, as many species in this genus are known only by the female type.

1a. Large-sized bees (over 11 mm), with head and thorax green, and abdomen with strong golden sheen .... Augochloropsis smithiana

1b. Medium-sized bees (between 7 and 10 mm)

2a. Head, thorax and abdomen uniformly green, with or without golden sheen ...

2b. Thorax green; terga with coppery, reddish or 

3a. Thorax green; tergites mostly coppery or reddish ... 6

3b. Thorax green; tergites dark ......7

4a. Apical vibrissae yellow ...

4b. Body green with strong golden sheen; pubescence pale; apical vibrissae whitish; terga with blackened bristles starting from T3; mesoscutellum with small and sparse punctures ...... Augochloropsis crassigena

5a. Body uniformly green; pale yellowish hair in all terga; apical vibrissae from T1-T4 vellow; mandibles with a green spot near the base; process of labrum bipartite; small and sparse punctures on the mesoscutellum; basal area of propodeum with apparent grooves .. .. Augochloropsis calvpso

5b. Body uniformly green; pubescence and apical vibrissae from T1-T4 yellowish; mandibles with a green spot and crimson reflections at apex; mesoscutellum with dense and marked punctures; basal area of propodeum wrinkled with very weak grooves ..... . Augochloropsis melanochaeta

6a. Body green with golden sheen; terga coppery and brownish or blackened at apex; punctation of mesothorax entirely dense, without polished or smooth spaces; apical vibrissae from T1-T3 whitish; basal edge of clypeus with semilunar black spot ...... ... Augochloropsis cupreola

6b. Body green with golden sheen; terga with coppery or reddish tones; edge of clypeus and labrum vellowish; apex of mandibles reddish pale hair; punctures on the mesoscutellum dense and sparse on the middle and smooth and brilliant spaces in between. ... Augochloropsis toralis

7a Mesothorax uniformly green; terga bluish-black; pubescence and vibrissae pale white; basal area of propodeum smooth and polished .... .... Augochloropsis berenice

7b Mesothorax with a black square area on the middle and green at sides; terga fuscous blackened; pubescence and vibrissae fulvous; basal area of propodeum strongly plicate ..... .. Augochloropsis beatrice sp. nov.

Discussion

.... 5

Seven species of Augochloropsis were found to occur in Bahia, one of them, A. crassigena occuring in 3 biomes, i.e., Atlantic Forest, Cerrado and Caatinga (biome classification following IBGE 2004) and with a large geographic distribution, widespread across northeastern Brazil. A. calypso occurs in Atlantic Forest and between Cerrado and Caatinga Biomes. A. *cupreola* appears to be restricted to the Cerrado biome. A. berenice, A. melanochaeta and A. beatrice sp. nov. appear to be restricted to the Atlantic forest biome. I did not find records of any of these species in the Amazon Forest, despite the known presence of many species of the genus in this biome. The specimens of Augochloropsis melanochaeta Moure, 1950 and A. smithiana (Cockerell, 1900) were previously collected in the state of Bahia, identified and registered in the BIOSIS reference collection, and included as new records. A more complete biogeographical analysis would be necessary to understand the distribution of these species.

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Front cover image

*Augochloropsis metallica metallica* (Fabricius, 1793); USGS Native Bee Inventory and Monitoring Program, 12201 Sunrise Valley Drive Reston, VA 20192, USA.

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