

# Orchid Bees of the Great Metropolitan Area of Costa Rica (Hymenoptera: Apidae: Euglossini)

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## Abstract

We generally perceive urban areas as sites of very low biodiversity, contaminated and with little potential for ecological research. This is because, for a long time, we were taught in schools from a young age that this is a characteristic of these ecosystems. However, recent studies aimed at generating inventories of urban species revealed that in the Metropolitan Area of Costa Rica there are at least 674 species of Hymenoptera, of which 19 are orchid bees (Apidae: Apinae: Euglossini), two of them from the genus *Eufriesea*, 10 from the genus *Euglossa*, 5 from the genus *Eulaema*, and 2 from the genus *Exaerete*. These species have very specific environmental requirements that make them indicators of good environmental health, thus breaking this myth of urban areas; this could be because all species share a very similar metallic green coloration, which could be interpreted by those unfamiliar with their taxonomy as a single species. This article presents an identification key for these species, as well as brief details on the state of knowledge about them.

**Keywords:** Urban Biodiversity, Costa Rica, Hymenoptera, Orchid Bees, Euglossini, Environmental Indicators, Urban Ecosystems, Species Inventory, Metallic Green Coloration, Species Identification

## Original Research Article

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## INTRODUCTION

Urban entomology focuses its research on insects that thrive in human infrastructure (Rust et al., 2024). Decades ago, educators commonly introduced the idea that urban environments had extremely poor diversity, and many of us grew up with this idea. However, a rapid biodiversity survey conducted in 2024 revealed that in the Greater Metropolitan Area (GAM) of Costa Rica alone, there are at least 674 species of the Hymenoptera order (Sánchez-Ocampo 2024). These lists, as further studies are conducted, will increase the number of species on this list, demonstrating that insects are much more resilient than we think. Taking the above as a reference, I would like to highlight in this article the species of the Euglossini tribe (Hymenoptera: Apidae: Apinae), which have a distribution restricted to the American continent, with at least a third of the species recorded to date concentrated between Costa Rica and Panama (Roubik and Hanson 2004). It includes 258 accepted species, associated with more than 40 plant families, some of which are strictly dependent on diseases for pollination (Dressler, 1982; Roubik and Hanson, 2004; Viana et al., 2021;

Moure and Melo 2023), making them practically indispensable for the ecosystem.

Therefore, their presence in urban ecosystems is a good sign, as it indicates that human impact has not been extreme enough to displace them. However, it is vital to consider establishing biological monitoring and more in-depth population studies.

This article provides an identification key for the 19 species reported in the study by Sánchez-Ocampo (2024) for the GAM of Costa Rica, in order to contribute to future ecological projects that use orchid bees as biological indicators in that site.

## METHODOLOGY

### Abbreviations

MNCR-A: National Museum of Costa Rica, Arthropod Heritage Collection.

BBSL: Agricultural Research Service, Bee Biology and Systematics Laboratory collection.

SEMC: Snow Entomological Museum Collection

Identification Key

Taking as a reference the bee species of the Euglossini tribe reported in Sánchez-Ocampo (2024) (Table 1), a

dichotomous key was developed. For this purpose, the Orchid Bee Identification Book by Roubik and Hanson (2004) and a detailed review of the specimens of these species in the MNCR-A collection were used.

Table 1. Euglossini species reported for the GAM

| Species                                  | Boucher specimen |
|--|------------------|
| <i>Eufriesea concava</i>                 | MNCR-A 1008036   |
| <i>Eufriesea pallida</i>                 | MNCR-A 4336844   |
| <i>Euglossa (Euglossa) deceptrix</i>     | BBSL 6725        |
| <i>Euglossa (Euglossa) dilemma</i>       | SEMC 152106      |
| <i>Euglossa (Euglossa) townsendi</i>     | MNCR-A 1015959   |
| <i>Euglossa (Euglossa) tridentata</i>    | MNCR-A 4011384   |
| <i>Euglossa (Euglossa) variabilis</i>    | MNCR-A 4262821   |
| <i>Euglossa (Euglossa) viridissima</i>   | MNCR-A 3931166   |
| <i>Euglossa (Glossura) imperialis</i>    | MNCR-A 1008051   |
| <i>Euglossa (Glossura) ignita</i>        | MNCR-A 4353804   |
| <i>Euglossa (Glossurella) bursigera</i>  | MNCR-A 4361266   |
| <i>Euglossa (Glossurella) sapphirina</i> | MNCR-A 4334053   |
| <i>Eulaema (Apeulaema) cingulata</i>     | MNCR-A 5002352   |
| <i>Eulaema (Apeulaema) polychroma</i>    | MNCR-A 3832020   |
| <i>Eulaema (Apeulaema) speciosa</i>      | MNCR-A 5002213   |
| <i>Eulaema (Eulaema) luteola</i>         | MNCR-A 1008049   |
| <i>Eulaema (Eulaema) meriana</i>         | MNCR-A 4353796   |
| <i>Exaerete frontalis</i>                | MNCR-A 5002463   |
| <i>Exaerete smaragdina</i>               | MNCR-A 979403    |

Ejemplares Revisados

La clave se elaboró utilizando como referencia los siguientes ejemplares depositados en la colección del MNCR:

- Eufriesea concava*: MNCR-A 1739362, MNCR-A 4270202.
- Eufriesea pallida*: MNCR-A 4336844.
- Euglossa (Euglossa) deceptrix*: 2 Miscellaneous specimen without code.
- Euglossa (Euglossa) townsendi*: MNCR-A 4272556, MNCR-A 4272554.
- Euglossa (Euglossa) tridentata*: MNCR-A 4222029, MNCR-A 4222044.
- Euglossa (Euglossa) variabilis*: MNCR-A 4290625, MNCR-A 4290665.
- Euglossa (Euglossa) viridissima*: MNCR-A 4270200, MNCR-A 4270201.
- Euglossa (Glossura) imperialis*: MNCR-A 2349940, MNCR-A 3780312.
- Euglossa (Glossura) ignita*: MNCR-A 4222037.
- Euglossa (Glossurella) bursigera*: MNCR-A 709751, MNCR-A 4272094.
- Euglossa (Glossurella) sapphirina*: MNCR-A 5002689, 5002663.
- Eulaema (Apeulaema) cingulata*: MNCR-A 3358926.
- Eulaema (Apeulaema) polychroma*: MNCR-A 4261805,

- MNCR-A 4334051.
- Eulaema (Apeulaema) speciosa*: MNCR-A 4170451, MNCR-A 4250341.
- Eulaema (Eulaema) luteola*: MNCR-A 3560286, MNCR-A 4239790, MNCR-A 4171752.
- Eulaema (Eulaema) meriana*: MNCR-A 4290645
- Exaerete frontalis*: MNCR-A 4285369, MNCR-A 4288261.
- Exaerete smaragdina*: MNCR-A 1686607, MNCR-A 1199169, MNCR-A 4200908

RESULTS

Identification Key for Euglossini Species of the GAM

- 1 Hind tibiae longer than wide, individuals metallic green in color, body more than 2 cm long\_\_\_\_\_2 (Genus *Exaerete*)
- 1’ Hind tibiae wider than long, individuals metallic or opaque in color, variable sizes from 1 cm to more than 3 cm long\_\_\_\_\_3
- 2 Hind tibia with a very pronounced curvature, body more than 20mm long \_\_\_\_\_*Exaerete frontalis*
- 2’ Hind tibia slightly curvature, body length less than 20mm\_\_\_\_\_ *Exaerete smaragdina*
- 3 Hind tibia is triangular in shape with the distal angle rounded

like a lobe, body with very little hairiness, integument of very bright metallic green, blue and purple colors\_\_\_\_\_ 4 (Genus *Euglossa*)

3' Hind tibia is not triangular in shape, body with dense hairiness over the entire surface, dark colors with yellow bands or sections on the abdomen\_\_\_\_\_ 13

4 Body length less than 1 cm, metallic blue or blue-green coloration \_\_\_\_\_ 5

4' Body length more than 1 cm, variable coloration \_\_\_\_\_ 6

5 Paraocular line present \_\_\_\_\_ *Euglossa sapphirina*

5' Paraocular line absent \_\_\_\_\_ *Euglossa townsendi*

6 Body length more than 1.5 cm, sternites II with two diagonal notches, clypeus protrudes dorsally the same length as the distance between the upper margin of the sternites and the posterior edge of the head \_\_\_\_\_ 7

6' Body length less than 1.5 cm, no diagonal notches on sternites II, and dorsally the clypeus protrudes a length shorter than the measurement between the antennae and the posterior edge of the head \_\_\_\_\_ 8

7 Body completely metallic green, no other shades \_\_\_\_\_ *Euglossa imperialis*

7' Metallic green body, with golden shades on the abdomen\_\_\_\_\_ *Euglossa ignita*

8 Mandible with two teeth\_\_\_\_\_ 9

8' Mandible with three teeth\_\_\_\_\_ 10

9 Distal tuft forms a 90° angle, body uniformly blue-green\_\_\_\_\_ *Euglossa variabilis*

9' Distal tuft forms a smaller angle than 90°, body green with golden tones on the abdomen\_\_\_\_\_ *Euglossa deceptrix*

10 Scutellum has a very marked medial groove\_\_\_\_\_ 11

10' Scutellum does not have a medial groove\_\_\_\_\_ *Euglossa bursigera*

11 Sternite II with a large hairy pad\_\_\_\_\_ 12

11' Sternite II without a large hairy pad\_\_\_\_\_ *Euglossa tridentata*

12 The three teeth of the mandible are equidistant\_\_\_\_\_ *Euglossa dilemma*

12' The medial tooth of the mandible is closer than the external tooth\_\_\_\_\_ *Euglossa viridissima*

13 Face with metallic colorations\_\_\_\_\_ 13 (Genus *Eufriessea*)

13' Face opaque black or dark brown\_\_\_\_\_ 14 (Genus *Eulaema*)

14 Abdomen with greenish iridescence on the first abdominal segment\_\_\_\_\_ *Eufriessea concava*

14' Abdomen without iridescence on the first abdominal segment\_\_\_\_\_ *Eufriessea pallida*

15 Body length greater than 20 mm\_\_\_\_\_ 16

15' Body length equal to or less than 20 mm\_\_\_\_\_ 17

16 Completely yellow abdominal bands\_\_\_\_\_ *Eulaema luteola*

16' Yellow abdominal bands on the first 3 segments and orange on the terminal segments\_\_\_\_\_ *Eulaema meriana*

16 Abdomen with a black band on the second segment\_\_\_\_\_ *Eulaema cingulata*

16' Abdomen with uniform yellow coloration, except on the first abdominal segment\_\_\_\_\_ 18

18 First abdominal segment with iridescent hues greenish\_\_\_\_\_ *Eulaema speciosa*

18' First abdominal segment opaque without iridescent tones\_\_\_\_\_ *Eulaema polychroma*

## DISCUSSION

It is very important to keep in mind that orchid bees are quite similar, so it is not good to assume an identification without having captured specimens and examining them well, especially with species of the genus *Euglossa*, since all the species reported for the GAM have a predominantly metallic green coloration of a very similar tone, so it is very easy to assign them an erroneous identification. On the other hand, it is important to highlight the importance of conducting further studies on the functionality of this group as bioindicators in urban areas. Previous work has found that the species *Exaerete smaragdina* and *Exaerete frontalis* are often found in areas with less intense urbanization (dos Santos et al., 2025). Given that this study did not consider the specific distribution of the species, it would be beneficial to implement a methodology in the future that involves the same non-scientific population. This will not only provide access to points other than public roads, where traps are often at risk of being stolen or damaged, but also begin to create a culture of observation and documentation among the non-scientific public.

Some platforms, such as INaturalist, have achieved this community involvement in recording biodiversity through photographs; however, in taxonomic terms, some species are impossible to distinguish using these means, making collection ultimately essential.

## CONCLUSIONS

- A. It is essential to identify specimens of the *Euglossa* genus from urban GAM using keys and guides such as the one in this article, since the species share the same color pattern and have very similar dimensions.
- B. Identification is very important for conservation studies, since unlike studies to evaluate biodiversity, where specimens can be left with only a number, for the study of the biology of urban bees.

Orchid bees represent a very promising potential for use as bioindicators of human pressure on wildlife, due to their sensitivity to stress caused by urban areas.



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