

## ***Euglossa samperi* n. sp., a new species of orchid bee from the Ecuadorian Andes (Hymenoptera: Apidae)**

SANTIAGO RAMÍREZ

*Museum of Comparative Zoology and Department of Organismic and Evolutionary Biology, Harvard University, 26 Oxford st. Cambridge, MA 02138. E-mail: sramirez@oeb.harvard.edu*

### **Abstract**

A new species of orchid bee in the genus *Euglossa* is here described. *Euglossa samperi* n. sp. Ramírez occurs on the Pacific foothills of the Ecuadorian Andes. Based on morphological characters, this new taxon is assigned to the subgenus *Glossurella*, one of the most species-rich, yet poorly known groups of orchid bees.

**Key words:** Orchid bee, Euglossini, Ecuador, Esmeraldas, Chocó, endemism, *Glossurella*, bursigera species group, *Euglossa*, genitalia

### **Introduction**

Orchid bees pollinate ca ~700 spp. of Neotropical orchids (Williams 1983, Ramirez *et al.* 2002), and, as a result, a considerable body of research has focused on these charismatic animals during the past 150 years (Roubik & Hanson 2004). Male bees collect fragrances (sesquiterpenes and derivative compounds) from orchid flowers and other sources and store them in specialized pockets located in their hind legs. In the process, these males pollinate orchid flowers (Roubik & Hanson 2004). During courtship, hovering males present their fragrance bouquets to females by transferring samples from their hind legs to small hair patches on their middle tibiae, which they then ventilate by pressing against a rapidly oscillating jugal comb—a set of short blades anchored to the wing base (Bembé 2004, Eltz *et al.* 2003, Eltz *et al.* 2005).

Most of the currently known orchid bee taxa were described between 1960 and 1985, soon after the discovery of chemicals baits that readily attract male bees (Dodson *et al.* 1969). However, a number of new species have also been described recently (*e.g.* Oliveira & Nemesio 2003, Roubik 2004, Ramírez 2005, Anjos-Silva & Rebelo 2006, Oliveira 2006, Rasmussen & Skov 2006, Parra-H *et al.* in press). These new discoveries come from

poorly sampled geographical areas of South America or correspond to formerly overlooked sibling species (e.g. Roubik 2004, Oliveira 2006).

Of the five genera that compose orchid bees, *Euglossa* Latreille 1802 is the most species-rich. With more than 110 described species to date, *Euglossa* contains considerable morphological uniformity among its members. Nonetheless, a subgeneric classification has been proposed by Moure (1989) and Dressler (1978a, 1982) (see Ramírez *et al.* 2002 for summary). In this article I describe an additional new species of *Euglossa* from low elevation Andean forests of northwest South America, an area that remains poorly studied but has undergone sustained deforestation during the past 2,000 years (Merchant *et al.* 2004).

### Material and methods

A total of 14 specimens of *Euglossa samperi* n. sp. were examined for the present work. These specimens were collected as part of an ongoing project on the molecular phylogeny of the tribe Euglossini. The species is described from males only because the bees were collected using traps baited with chemicals (see Roubik & Hanson 2004 for methods).

Integument coloration was characterized by eye under a microscope lit with an optic fiber High Intensity Illuminator (Fiber-Lite, series 180, Dolan-Jenner Industries, Inc). Anatomical terminology follows Michener (2000). Drawings and body measurements were made using a *camera lucida* mounted on a Leica MZ75 dissecting microscope. Photographs were made with a digital camera (JVC, ref. KYF75U) mounted on a MZ16 Leica microscope and further processed with Auto-Montage software (Syncroscopy 2002). All measurements, unless otherwise indicated, were taken from all 14 individuals. Locality maps were produced with the software package ArcGIS version 9.1 (ESRI 2004).

### Species description

#### *Euglossa (Glossurella) samperi*, n. sp. Ramírez

Males only, females unknown.

*Diagnosis.* Males of *E. samperi* n. sp. are separated from other members of *Glossurella* by having three midtibial tufts, except from those of *E. paisa* Ramírez 2005, which also have three midtibial tufts. Males of *E. samperi* n. sp. are separated from those of *E. paisa* by the presence of complete white paraocular markings on the face, and green integument with bronze hues throughout; males of *E. paisa* lack white paraocular markings and have blue integument.

*Dimensions.* Total body length 12.85 mm (11.2–12.9); head width 4.51 mm (4.40–4.60); intertegular span 3.48 mm (3.17–3.80); abdominal width 4.60 mm

(4.40–4.85).

*Head.* Clypeus green (dark brown in few specimens) with bronze hues on apical end; medial and lateral keels dark brown; white paraocular markings complete, wider below, tapering upward; area above and on sides of antennal socket bronze (Fig. 3); frons and vertex green. Tongue exceeding body length by ~4 mm ( $n=3$ ); head length 2.52 mm (2.30–2.75); protuberant clypeus (Figs. 1, 2); head width 4.51 mm (4.40–4.60); upper interantennal distance 1.08 mm (1.00–1.17); clypeus length 1.36 mm (1.27–1.40); clypeocular distance 0.81 mm (0.70–0.85).

*Mesosoma.* Mesepisternum bronze with green hues; mesoscutum and scutellum light green with bronze hues. Intertegular span 3.48 mm (3.17–3.80); scutellum rounded with shallow medial depression on posterior margin (Fig. 2). Midtibia straight on inner surface, curved on outer surface (Figs. 4, 5); velvet area curved, almost reaching anterior end. Three hair tufts at base of midtibia; basal tuft (I) circular, middle tuft (II) elongate, apical tuft (III) larger than I and II, longer than wide, tapering apically (Fig. 5). Hind tibia green with light golden hues, triangular, concave at apical margin, polished on posterior 2/3, with little punctation on anterior 1/3 (Fig. 1). Wing venation dark maroon; membrane light maroon, translucent (Fig. 1). Jugal comb at base of hind wing with 13–15 blades.

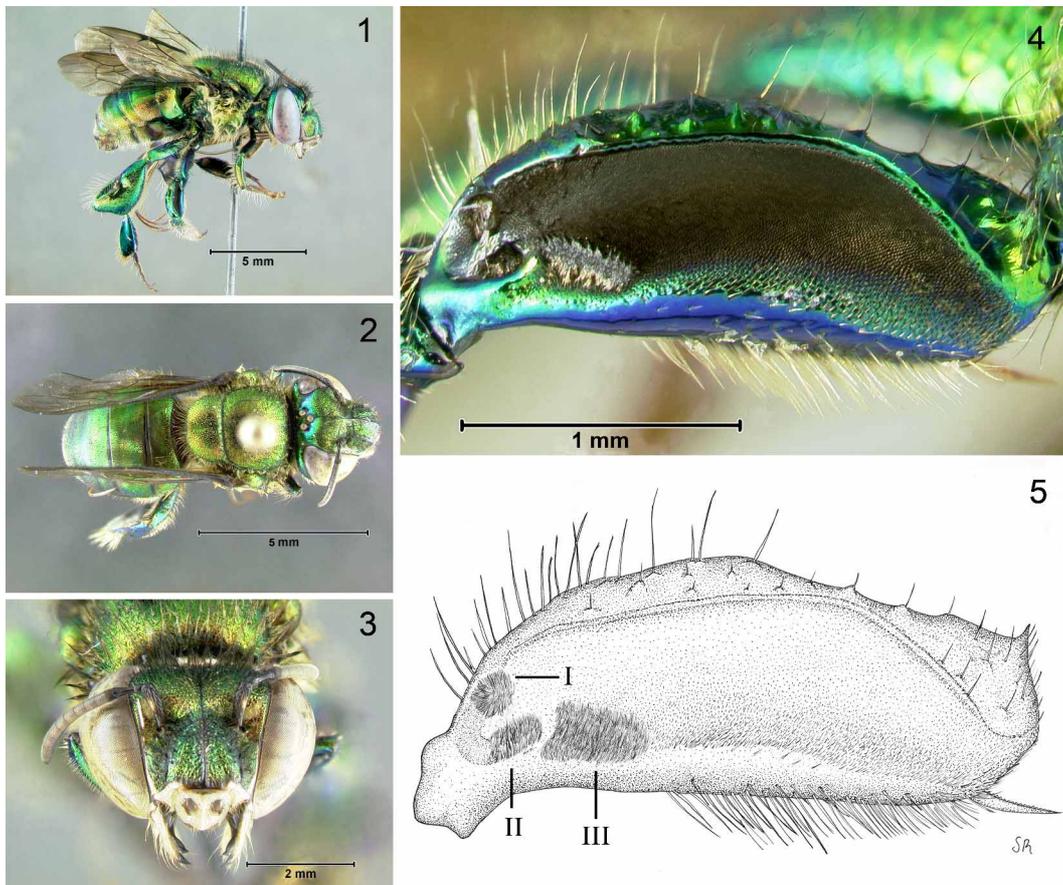
*Metasoma.* Terga dark green with golden hues; sterna bronze red; metasomal width 4.60 mm (4.40–4.85). Semicircular depressions on sternum 2 well defined, filled by unbranched yellow setae.

*Pilosity.* Long (~0.8 mm), sparse, unbranched, black setae on vertex; long (~1 mm), branched yellow setae on genal area; sparse, short (~0.5 mm), branched, yellow setae on mesoscutum and scutellum, denser, short (~0.5 mm), unbranched, black setae on mesoscutum and scutellum; fore-, mid- and hind legs fringed with long (~0.7 mm), both branched and unbranched yellow setae. Metasomal terga covered with short (~0.1 mm), black setae; metasomal sterna fringed with yellow, sparse, unbranched setae (~0.3 mm).

*Punctation.* Clypeus and frons covered with dense, coarse punctures; mesoscutum and scutellum coarsely punctate; mesepisternum with sparse shallow punctures; metasomal terga 1–4 with fine, small punctures in medial area, increasing in size and decreasing in density toward sides; terga 5–6 with sparser, coarser punctures.

*Genitalia and hidden metasomal sterna.* Line drawings of sterna 7 and 8 and the genital capsule of both *E. samperi* **n. sp.** and *E. paisa* Ramírez (its putative closest relative, see discussion) are provided for comparison in figures 6–11. Sternum 7 of *E. samperi* **n. sp.** with pronounced lobes (Fig. 9), narrower, longer than in *E. paisa* (Fig. 6). Sternum 8 of *E. samperi* **n. sp.** with curved apical process and blunt spiculum (Fig. 10), unlike *E. paisa* (Fig. 7). Gonocoxite lobes of genitalia rounded (Fig. 11), larger than in *E. paisa* (Fig. 8). Dorsal bridge of penis valves curved (Fig. 11).

*Variation.* All measurements examined varied by less than 5%. Head width was the least variable (1.92 %), and head length the most variable (4.79%). Integumental coloration showed no substantial variation.

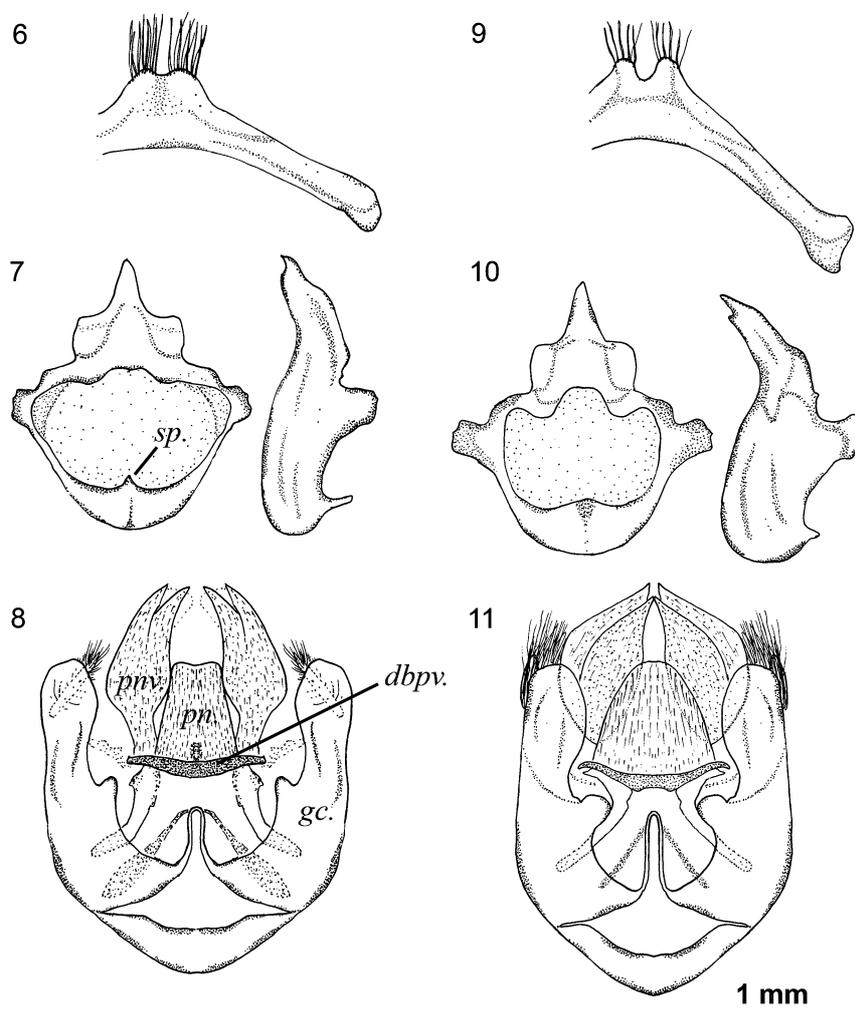


**FIGURES 1–5.** *Euglossa samperi* n. sp.: lateral profile (1), upper view (2), frontal view (3), and middle tibia (4) of paratype with its corresponding line drawing (5).

*Etymology.* The epithet *samperi* n. sp. honors Cristián Samper, who, together with his wife Adriana Casas, has devoted considerable effort to promote the study of Neotropical diversity.

*Holotype.* ECUADOR: Esmeraldas, Bilsa Biological Station 00° 21' N 79° 44' W, 500 m, April 8, 2005, *leg.* Santiago Ramírez *ex.* Cineole (SR1906), deposited in the entomological collections of the Pontificia Universidad Católica del Ecuador, Quito (Museo QCAZ).

*Paratypes.* ECUADOR: Esmeraldas, Bilsa Biological Station 00° 21' N 79° 44' W, 500 m, April 8–9, 2005, *leg.* Santiago Ramírez *ex.* Cineole (13 Individuals coded SR1526, SR1908, SR1911, SR1914, SR2000–2002, SR2004, SR2006–2012). Paratypes will be deposited in the Museum of Comparative Zoology (Harvard University), National Museum of Natural History, Washington, D.C., and the Division of Entomology, Natural History Museum, Kansas University.



**FIGURES 6–11.** Hidden male sterna 7 (6), 8 (7) and genitalia capsule (8) of *Euglossa paisa* Ramirez (2005) and *Euglossa samperi* n. sp. (Figs. 9–11) (*dbpv.*: dorsal bridge of penis valves, *gc.*: gonocoxite, *pn.*: penis, *pnv.*: penis valves, *sp.*: spiculum).

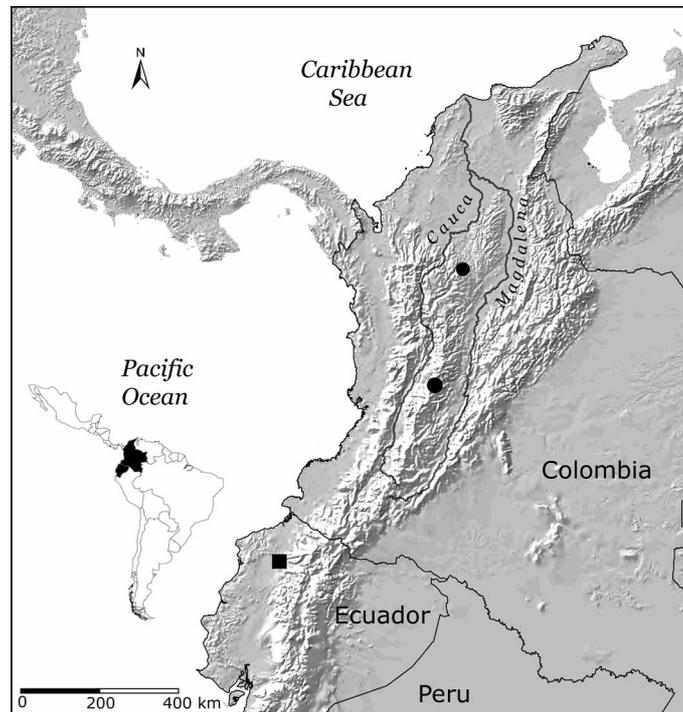
## Discussion

*Euglossa samperi* n. sp. is a morphologically distinct species easily differentiated from other members of *Euglossa*. Among the species of *Euglossa*, it most closely resembles *E. paisa* Ramirez 2005. These two species are similar in external morphology, body size, and number of midtibial tufts (three). They differ in coloration of the integument (blue in *E. paisa*), white paraocular markings (absent in *E. paisa*), tongue length (shorter in *E. paisa*), and various genitalic characters (Figs. 8, 11). When Ramirez (2005) described *E. paisa*, *E.*

*samperi* **n. sp.** was still unknown, and it was therefore proposed that *E. paisa* was most similar to *E. oleolucens* Dressler (1978b). However, based on the present work, it is clear that *E. paisa* and *E. samperi* **n. sp.** are more similar to each other than either species is to *E. oleolucens*.

*Euglossa samperi* **n. sp.** may be restricted to mid-elevation forests of the Pacific slopes of the Andean cordillera. Although individuals of *E. samperi* were only found in the cloud forests of the Mache-Chindul mountains at 500 m elevation (Fig. 12), other orchid bees collected at the same site were more typical of those found at higher elevations (> 800 m) elsewhere in the Neotropical Region (e.g. *Eufriesea chrysopyga*, *Euglossa championi*, *E. dressleri*, *E. heterosticta*, *E. villosiventris*, *Eulaema polychroma* and *E. speciosa*). This unusual faunal assemblage for 500 m elevation (see Ramírez *et al.* 2002) may be explained by the distinct climate regime and forest composition of this area. Mache-Chindul is characterized by cool temperatures, near constant cloudiness, and dense populations of epiphytes (Ramírez, pers. obs.), conditions more typical of higher elevations. Thus, it is possible that *E. samperi* **n. sp.** occurs at higher altitudes in the Andean cordillera.

The two species that most closely resemble *E. samperi* (*E. paisa* and *E. oleolucens*) are also restricted to montane forests. Robust phylogenetic analyses of these species in relation to lowland rain forest taxa may shed new light on the origin and diversification of the highly diverse, endemic Andean biota.



**FIGURES 12.** Map of the Andean region showing collection localities of *Euglossa samperi* **n. sp.** ● and its close relative *Euglossa paisa* Ramírez (2005) ■.

## Acknowledgements

I thank Beth Pringle and Naomi Pierce for providing useful comments on the manuscript. Gary Alpert allowed me to use his digital photography equipment for the Auto-Montage work. This research was supported by grants from the Putnam Expedition Fund (Museum of Comparative Zoology), the Colombia Biodiversa Fund (Fundación Alejandro Escobar), the David Rockefeller Center for Latin American Studies (Harvard) and DDIG-NSF (DEB # 0608409). Staff from the Fundación Jatun Sacha (Ecuador) kindly assisted with logistics during field work at Bilsa Biological Station.

## References

- Anjos-Silva, E.J.D. & Rebelo, J.M.M. (2006) A new species of *Exaerete* Hoffmannsegg (Hymenoptera: Apidae: Euglossini) from Brazil. *Zootaxa*, 1105, 27–35.
- Bembé, B. (2004). Revision der *Euglossa cordata*-Gruppe und untersuchungen zur funktionsmorphologie und faunistik der Euglossini (Hymenoptera, Apidae). Dissertation zur Erlangung des Doktorgrades an der Fakultät für Biologie der Ludwig-Maximilians-Universität München. München. 177 pp.
- Dodson, C.H., Dressler, R.L., Hills, H.G., Adams, R.M. & Williams, N.H. (1969) Biologically Active Compounds in Orchid Fragrances. *Science*, 164, 1243–1249.
- Dressler, R.L. (1978a) An infrageneric classification of *Euglossa*, with notes on some features of special taxonomic importance (Hymenoptera; Apidae). *Revista de Biología Tropical*, 26, 187–198.
- Dressler, R.L. (1978b) New species of orchid bees from Mexico and Central America. *Revista de Biología Tropical*, 26, 167–185.
- Dressler, R.L. (1982) New species of *Euglossa*. III. The *bursigera* species group (Hymenoptera: Apidae). *Revista Biología Tropical*, 30, 131–140.
- Eltz, T., Roubik, D.W. & Whitten, M.W. (2003) Fragrances, male display and mating behaviour of *Euglossa hemichlora*: a flight cage experiment. *Physiological Entomology*, 28, 251–260.
- Eltz, T., Sager, A. & Lunau, K. (2005) Juggling with volatiles: exposure of perfumes by displaying male orchid bees. *Journal of Comparative Physiology a-Neuroethology Sensory Neural and Behavioral Physiology*, 191, 575–581.
- ESRI (2004) ArcGIS. Version 9.1 [computer program]. Redlands, CA. ESRI Inc. (USA).
- Latreille, P.A. (1802) *Histoire Naturelle des Fourmis*. Paris, 445 pp.
- Marchant, R., Behling, H., Berrio, J.C., Hooghiemstra, H., van Geel, B., van der Hammen, T., Herrera, L., Melief, B., van Reenen, G. & Wille, M. (2004) Vegetation disturbance and human population in Colombia - a regional reconstruction. *Antiquity*, 78, 828–838.
- Moure, J.S. (1989) *Glossuropoda*, novo subgênero de *Euglossa*, e duas espécies novas da Amazônia, do mesmo subgênero (Apidae-Hymenoptera). *Memórias do Instituto Oswaldo Cruz*, 84, 387–389.
- Oliveira, M.L.d. (2006) Três novas espécies de abelhas da Amazônia pertencentes ao gênero *Eulaema* (Hymenoptera: Apidae: Euglossini). *Acta Amazonica*, 36, 121–128.
- Oliveira, M.L.d. and Nemésio, A. (2003) *Exaerete lepeletieri* (Hymenoptera: Apidae: Apini: Euglossina): a new cleptoparasitic bee from Amazonia. *Lundiana*, 4, 117–120.
- Parra-H, A. Ospina-Torres, R. Ramírez, S. (In press) *Euglossa natesi* n. sp., a new species of orchid bee from the Chocó region of Colombia and Ecuador (Hymenoptera: Apidae). *Zootaxa*
- Ramírez, S. (2005) *Euglossa paisa*, a new species of orchid bee from the Colombian Andes

- (Hymenoptera: Apidae). *Zootaxa*, 1065, 51–60.
- Ramírez, S., Dressler, R.L. and Ospina, M. (2002) Orchid bees (Hymenoptera: Apidae: Euglossini) from the Neotropical Region: A species checklist with notes on their biology. *Biota Colombiana*, 3, 7–118.
- Rasmussen, C. and Skov, C. (2006) Description of a new species of *Euglossa* (Hymenoptera: Apidae: Euglossini) with notes on comparative biology. *Zootaxa*, 1210, 53–67.
- Roubik, D.W. (2004) Sibling species of *Glossura* and *Glossuropoda* in the Amazon Region (Hymenoptera: Apidae: Euglossini). *Journal of Kansas Entomological Society*, 77, 235–253.
- Syncroscopy (2002) (a division of Synoptics Inc.). AUTO-MONTAGE. Version 4.0 [computer program]. Frederick, Maryland: SYNOPTICS Inc (USA).