

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/328440459>

A Preliminary Checklist of the Orchid Bees (Hymenoptera: Apidae: Euglossini) of Ecuador

Article in *Psyche A Journal of Entomology* · October 2018

DOI: 10.1155/2018/2678632

CITATIONS

0

READS

6

3 authors, including:



Sebastian Padron

Universidad del Azuay (UDA)

9 PUBLICATIONS 0 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Researches of taxonomy of different groups of Insects [View project](#)

Review Article

A Preliminary Checklist of the Orchid Bees (Hymenoptera: Apidae: Euglossini) of Ecuador

Pablo S. Padrón ^{1,2}, David W. Roubik,³ and Ruben P. Picón¹

¹Laboratorio de Entomología, Escuela de Biología, Ecología y Gestión, Universidad del Azuay, Cuenca, Ecuador

²Museo Ecuatoriano de Ciencias Naturales del Instituto Nacional de Biodiversidad, Sección invertebrados, Quito, Ecuador

³Smithsonian Tropical Research Institute, Ancón, Balboa, Panama

Correspondence should be addressed to Pablo S. Padrón; sebastianpadronm@yahoo.com

Academic Editor: Guya K. Maniania

Copyright © 2018 Pablo S. Padrón et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

A checklist of Euglossini in Ecuador is given, including all currently described, valid species collected until 2018. The list has been assembled from museum records, fieldwork cited herein, and literature. The former species lists are nearly doubled here, with 1 *Aglae*, 23 *Eufriesea*, 68 *Euglossa*, 18 *Eulaema*, and 5 *Exaerete*, 115 in total with >50 new records for the country. Distribution and collection data are included, and some doubtful species are discussed. The Amazon region is the most species rich area but not necessarily a natural pattern, perhaps due to uneven sampling effort across the country. Southern Ecuador is relatively little sampled.

1. Introduction

Orchid bees are a conspicuous and a fascinating group of Neotropical bees, in which males have noteworthy behavior related to gathering aromatic compounds from orchids and other sources [1]. The bees increasingly are objects of study in different fields such as ecology [2, 3], chemical ecology [4–8], conservation [9–11], evolution [12], and taxonomy [13–17]. Such research contributes to an understanding of general bee biology and how neotropical ecosystems function.

More than 252 species have been described, and many synonymized, since early descriptions by Linnaeus (1758) under the genus name *Apis* [18]. Several species lists have been published at regional levels [18–21] and the country level, Brazil [19, 21–28], Peru [19, 29, 30], Panama [19, 31, 32], Bolivia [33], Colombia [19, 34], Mexico [35], Nicaragua [36], Honduras [37], and Venezuela [19].

Ecuador is well known as a megadiverse country with an outstanding diversity of organisms and ecosystems and considered important for conservation proposes, e.g., the Tumbes-Choco-Magdalena region and the tropical Andes [38, 39]. At the same time, from the species records examined here and from biogeographic analyses of other apidologists, e.g., [13, 40], it is clear that the NW of Ecuador is quite similar to Central America, while Amazonian Eastern Ecuador and

the Andes have some different species. Additionally, among the well-studied Ecuadorian palms, although most species are Andean compared to other regions, 60% of them are from adjacent lowlands; i.e., they are not Andean endemics [41].

Here we update the taxonomic base of knowledge on Ecuadorian euglossines. Only two publications had reported, in general, species for Ecuador. Ramírez et al. [19] report 62 species and Moure et al. [18] report 63. Recent articles treat the taxonomy of the orchid bees of Ecuador, mainly focusing on the description of new species, *Euglossa samperi* [42]; *Euglossa natesi* [43]; *Euglossa williamsi* [44], *Euglossa celiae*, and *Euglossa subandina* [45]. As part of our continuing study of euglossines in Ecuador and elsewhere, while not listing unnamed species here (as for Meliponini, see [46], or Euglossini, [47]) we attempt to bring euglossine taxonomy up to date, particularly in western South America, and include limited discussion of taxonomic problems.

2. Methods

2.1. Material Examined. All material examined from museums came from the following institutions:

INABIO: Instituto Nacional de Biodiversidad, Quito-Ecuador.

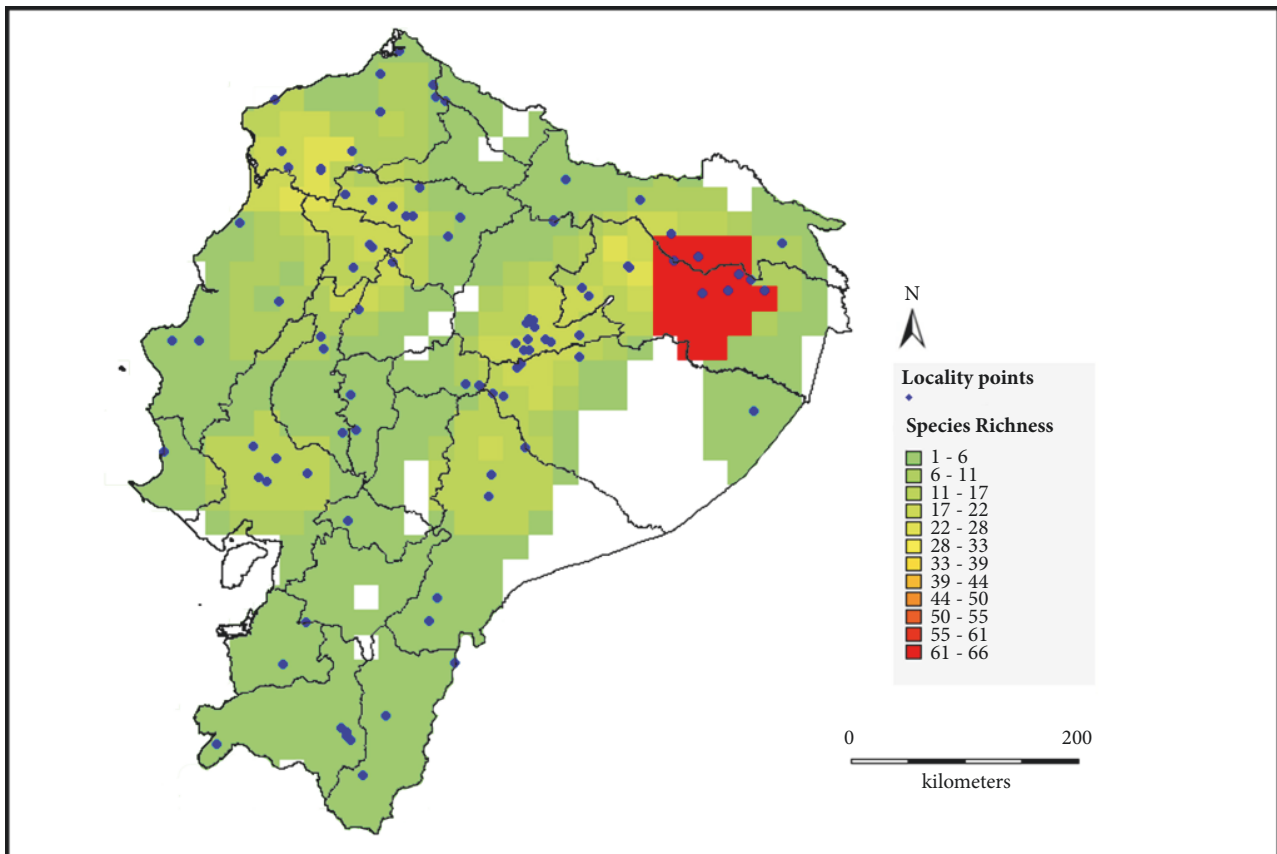


FIGURE 1: Species richness pattern observed for the Euglossini tribe in Ecuador based in 2332 collecting records.

MZUA: Museo de Zoología de la Universidad del Azuay, Cuenca- Ecuador.

NMNH: National Museum of Natural History, Smithsonian Institution, Washington DC - USA.

QCAZ: Museo de Zoología de la Pontificia Universidad Católica del Ecuador, Quito-Ecuador.

STRI: Smithsonian Tropical Research Institute (DW Roubik collection), Balboa, Panama.

Additional data came from the following institutions:

AMNH: American Museum of Natural History, New York, USA.

DZUP: Departamento de Zoología, Universidad Federal do Paraná, Curitiba, Brasil.

FLMNH: Florida Museum of Natural history, Gainesville, USA.

ZSM: Zoologische Staatssammlung Munchen, Munchen, Germany.

2.2. Field Work. Several locations in the country had been visited in most of the provinces of Ecuador during the last decades, mainly by DW Roubik and also by PS Padrón and RB Picón (Figure 1). Orchid bees were collected in bait traps or collected using hand nets at baiting stations,

using chemical attractants such as cineole, eugenol, skatole, vanillin, PDMB (p-dimethoxybenzene), methyl salicylate, and methyl cinnamate, during the day at different periods between 08,00 and 17,00 h.

The species list is presented by subgenus and species following the systematic arrangement proposed by Moure et al. [18], so it does not include the recently named subgenus of *Euglossa*, *Alloglossura*, which will be subject to further evaluation [17], nor a proposed name *Hybomelissa* for the *Exaerete* group containing *E. frontalis* [48]. The species determinations were based upon comparative study of type and other material at NMNH and in the collections of DW Roubik and RL Dressler, at STRI and at the Florida Museum of Natural History, particularly collections made by DW Roubik from French Guiana, Panama, Costa Rica, and Ecuador. Diagnostic reference photographs also were consulted for euglossines of French Guiana (Discover Life, https://www.discoverlife.org/mp/20p?see=I_DWR, and the NMNH euglossine types, https://biogeodb.stri.si.edu/bioinformatics/roubik_bees/). We attempt to treat determinations made by others as likely correct, unless we had additional information, and acknowledge that some of the above cited reference material, or identifications, may be erroneous.

2.3. Species Richness. A total of 2322 distribution records were georeferenced, localities were plotted using DIVA-GIS 7.5 [49], and the species richness was calculated.

3. Results

The preliminary checklist presented here contains 115 species distributed among the genera, 1 species in *Aglae*, 68 species in *Euglossa*, 23 in *Eufriesea*, 18 species in *Eulaema*, and 5 species in *Exaerete*. The list is arranged by genera and subgenera (when formally designated), and species are listed alphabetically, with specimen label information or the literature references. For each label or collection, available information included types, number of specimens, province, locality, elevation, latitude, longitude, date of collection, collector, museum, and reference.

Checklist of Orchid Bees from Ecuador

Tribe Euglossini Latreille, 1802

Genus *Aglae* Lepeletier & Serville (1825)

(1) *Aglae coerulea* Lepeletier & Serville, 1825

Records: 1, Napo, Portoyacu, 700 m, D. Velastegui, INABIO; 1, Pastaza, QCAZ; 1, Pastaza, Villano Taranguro, 342 m, 1 22.6670 S, 77 22 91 O, 35345, J. Naranjo, QCAZ; 1, Esmeraldas, Rio Cananda, 400 m, 0 28 45, 77°11 51 O, QCAZ; 1, Napo, Avila Viejo, 750, QCAZ; Esmeraldas, Choco Region, [50]; 1, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

Genus *Eufriesea* Cockerell (1908)

(2) *Eufriesea buchwaldi* (Friese, 1923)

Records: [18].

(3) *Eufriesea auripes* (Gribodo, 1882)

Records: 1, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(4) *Eufriesea chrysopyga* (Mocsáry, 1898)

Records: [18]; 1, QCAZ; 17, Orellana, Yasuní, QCAZ; 1, Orellana, Est. Río Huiririma, 220 m, 0 38 LS 75 54 LW, QCAZ; 1, 500 m, QCAZ; 1, Morona Santiago, Wapula, 1380 m, -2.126813, -78.089803, 26/XII/2016, S. Padrón, P. Picón, C. Maldonado, J. Falcón, MZUA.

(5) *Eufriesea combinata* (Mocsáry, 1897)

Records: Morona Santiago, Res. Biologica El Quimi, 1671 m, McPhail trap, Julio 2017, A. Suárez-Torres, INABIO.

(6) *Eufriesea concava* (Friese, 1899)

Records: Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(7) *Eufriesea duckei* (Friese, 1923)

Records: Guayas, Balzapamba-Guayaquil, [13, 19].

(8) *Eufriesea excellens* (Friese, 1925)

Records: Holotype, Guayas, Guayaquil, [13, 19]; Guayas, Guayaquil, [18, 51].

(9) *Eufriesea fragrocara* (Kimsey, 1977)

Records: Napo, (Río Apungora), September, [13]; 6, Orellana, Yasuní, QCAZ; [18, 19]; Napo, 1°24'S; 77°43'W, [52]; 1, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(10) *Eufriesea longipennis* (Friese, 1925)

Records: Guayas, Guayaquil, [18].

(11) *Eufriesea lucida* (Kimsey, 1977)

Records: Napo, "El meme allure", Junio, [13, 18, 19].

(12) *Eufriesea lucifera* Kimsey, 1977

Records: Pichincha, Santo Domingo, [13, 19]; Pichincha, [18].

(13) *Eufriesea magrettii* (Friese, 1899); synonym *Eufriesea andina* Friese, 1925

Records: 2, Zamora Chinchipe, Tundayme, 1281 m, 11 Oct 2016, F. Tobar, MEPN 9953, MH Yanouch, salicilato, INABIO.

(14) *Eufriesea mussitans* (Fabricius, 1787)

Records: Bolivar, Balzapamba, [18, 53].

(15) *Eufriesea nigrescens* (Friese, 1923)

Records: Lectotype, Bolivar, Balzapamba, AMNH, [13]; Bolivar, Balsapamba (Balzapamba), [18, 19, 51].

(16) *Eufriesea ornata* (Mocsáry, 1896)

Records: 2, Orellana, Yasuní, QCAZ; 1, Pastaza, Puyo, QCAZ; 1, Pastaza, Puyo, 250m, QCAZ; [18, 19]; 1, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(17) *Eufriesea opulenta* (Mocsáry, 1908)

Records: 1, Orellana, Yasuní, Julio 2017, D.W. Roubik, STRI.

(18) *Eufriesea pretiosa* (Friese, 1903)

Records: Holotype, Tungurahua, Santa Inez, Ecuador, AMNH, [13]; Tungurahua, Santa Inez, [13]; Tungurahua, Santa Inez, [19, 54]; Tungurahua, Santa Ines, [18, 51].

(19) *Eufriesea pulchra* (Smith, 1854)

Records: Pastaza, Puyo km 35 to Tena, 960 m, 29/02/1980, N.H. Williams NMNH; 57, Orellana, Yasuní, 280m, QCAZ; [19, 55]; 6, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(20) *Eufriesea purpurata* (Mocsáry, 1896)

Records: 2, Napo, Limoncocha (forest), 25/07/1971, D. L. Pearson, NMNH; 6, Orellana, Yasuní, 250 m, QCAZ; 6, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(21) *Eufriesea superba* (Hoffmannsegg, 1817)

Records: Los Ríos, Palenque Station, April, [13, 19]; Los Rios, [18, 56].

(22) *Eufriesea surinamensis* (Linnaeus, 1758)

Records: 1, Guayas, Guayaquil, 43010, C. Dodson, NMNH; 2, Guayas, Guayaquil, NMNH; 14, Guayas, Guayaquil, 18/03/1960, G. Frymire, NMNH; 14, Guayas, la Lolita, 10/02/1960, G. Frymire, NMNH; 4, Los Ríos, Quevedo, 22010, C. Dodson, NMNH; Los Ríos, Montalvo, 28/02/1968, G. Frymire NMNH; Los Ríos, Vic. Quebrada, march abril 1955, E. N. O'Rourke, NMNH; Guayas, Guayaquil, [13]; 1, 500 m, QCAZ; [18, 19].

(23) *Eufriesea theresiae* (Mocsáry, 1908)

Records: [19]; Zamora, Río Zamora, [18, 51].

(24) *Eufriesea venezolana* (Schrottky, 1913)

Records: Los Ríos, Palenque River, [13, 18]; Guayas, Guayaquil, [13].

Genus Euglossa Latreille (1802)

Subgenus Euglossa Latreille, 1802

(25) *Euglossa amazonica* Dressler, 1982

Records: 3, Orellana, Yasuní, QCAZ; 2, Orellana, Coca, 700 m, 79 02 27 W 00 18 21 S, QCAZ; 2, Morona Santiago, Chiwasa, LW 79 05 LN 00 05 18, QCAZ; 1, Morona Santiago, San Juan Bosco, 1050 m, -3,119898, -78,527502, II/2016, H. Garzón, MZUA; 1, Morona Santiago, Wapula, 1380 m, -2,126813, -78,089803, 25/XII/2016, S. Padrón, P. Picón, C. Maldonado, J. Falcón, MZUA; 42, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(26) *Euglossa analis* Westwood, 1840

Records: 4, QCAZ; 63, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(27) *Euglossa avicula*, Dressler, 1982

Records: Napo, [19]; 4, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(28) *Euglossa auricollis* Friese, 1923

Records: [18].

(29) *Euglossa auriventris* Friese, 1925

Records: Syntype, Guayas, Guayaquil, [19, 53]; Guayas, Guayaquil, [18, 51].

(30) *Euglossa bidentata* Dressler, 1982

Records: 9, Esmeraldas, 300 m, LW 79 16 10 LN 00 17 00, QCAZ; 6, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(31) *Euglossa championi* Cheesman, 1929

Records: [19]; 1, Cañar, Ocaña, 600 m, II-I-06, S. Padrón, MZUA; [57].

(32) *Euglossa charapensis* Cockerell, 1917

Records: West of Ecuador, [58]; 1, 1601 m, QCAZ; [19]; 1, Loja, Malacatos, 1450 m, -4,224100, -79,262287, 31/XII/2016, P. Picón, S. Padrón, MZUA; 1, Morona Santiago, Wapula, 1360 m, -2,125181, -78,088571, 18/V/2017, S. Padrón, MZUA.

(33) *Euglossa chlorina* Dressler, 1982

Records: 1, Pichincha, 2000 m, 79 00 00 W 00 25 25 S, QCAZ; 1, Pichincha, Patricia Pilar, QCAZ; 1, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(34) *Euglossa cognata* Moure, 1970

Records: 6, QCAZ; 2, Napo, Yuturi Lodge, Río Napo, 359 m, 79 12 W 00 28 N, QCAZ; [19]; Orellana, Yasuní, [59]; Napo, [59]; Alto Tambo, [18, 59]; 15, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(35) *Euglossa cordata* (Linnaeus, 1758)

Records: [18].

(36) *Euglossa cybelia* Moure, 1968

Records: [19].

(37) *Euglossa deceptrix* Moure, 1968

Records: Ibarra (?), 1897, leg. W. F. H. Rosenberg, [60]; 1, El Oro, Piñas, 960 m, 26.2.-2.3.1982, leg. N. H. Williams, det. R. L. Dressler, [60]; 2, Lita, 17.8.1987, leg. det. R. L. Dressler, [60]; 1, Paramba, 3.1897, leg. F. H. Rosenberg, det. Bembé (Eg. cordata, det. Friese) [60]; 1, ZSM, [60]; Esmeraldas, Bilsa Biological Reserve ("Bilsa" hereafter), 0°20,816' N 79°42,659' W, [47]; 1, QCAZ; 4, Esmeraldas, Mache-Chindul Ecological Reserve, August to December 2014, [47].

(38) *Euglossa despecta* Moure, 1968

Records: 1, Esmeraldas, Pitzara, QCAZ; 8, Esmeraldas, Mache-Chindul Ecological Reserve, August to December 2014, [47]; 14, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(39) *Euglossa dissimula* Dressler, 1978

Records: 12, Esmeraldas, Mache-Chindul Ecological Reserve, August to December 2014, [47].

(40) *Euglossa dressleri* Moure, 1968

Records: [19]; 18, Esmeraldas, Mache-Chindul Ecological Reserve, August to December 2014, [49].

(41) *Euglossa gaianii* Dressler, 1982

Records: 1, Guayas, San Joaquin, QCAZ.

(42) *Euglossa gibbosa* Dressler, 1982

Records: 1, Holotype, Pichincha, Santo Domingo, 20/07/1967, R. L. Dressler, NMNH; 1, Allotype, Pichincha, Santo Domingo, 20/07/1967, R. L. Dressler, NMNH; 1, Pichincha, Palenque, QCAZ; 2, Pichincha, Santo Domingo - Quevedo, 220 m, 0 38 LS 75 54 LW, QCAZ; 3, Pichincha, Patricia Pilar, 389 m, 79 12 W 00 28 N, QCAZ; 2, Los Ríos, Río Palenque, 218 m, 75 52 W 00 36 S, QCAZ; 1, Esmeraldas, Tonsupa, 517 m, 01 28.434 S 77 31.868 W; QCAZ; Santo Domingo, [59]; Pichincha, [18]; Santo Domingo, [18]; 1, Manabí, Jama Coaque, 300 m, -0,107904, -80,122931, 02/XII/2016, P. Picón, S. Padrón, MZUA; [49]; 2, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(43) *Euglossa hansonii* Moure, 1965

Records: 2, Pichincha, Santo Domingo, [61]; 15, Esmeraldas, Mache-Chindul Ecological Reserve, [61]; 21 Aug. 1967, [62]; 3 Jan. 1970, H. A. Hespenheide (Dressler coll.), [62]; 2, Pichincha, Santo Domingo, 22/07/1967, R. L. Dressler, NMNH; 15, Esmeraldas, Bilsa Biological Reserve ("Bilsa" hereafter), 0°20,816' N 79°42,659' W, [47].

(44) *Euglossa hemichlora* Cockerell, 1917

Records: 1, Holotype, Paramba, Ecuador; NMNH, [53]; 3, Pichincha, Santo Domingo, 20/07/1967, R. L. Dressler, NMNH; 4 Feb. 1971, H. Kennedy (Dressler coll. and to be distributed, [62]; 13, Pichincha, Santo Domingo, det. Bembé (*Eg. heterosticta*, det. R. L. Dressler), DZUP, [60]; 14, Pichincha, Santo Domingo, 20.-22.7.1967, leg. R. L. Dressler det. Bembé, DZUP, [60]; Pichincha, Santo Domingo, 22/07/67, R. L. Dressler, [63]; Pichincha, Santo Domingo, [18, 45]; 1, Loja, Cabeza de Toro, 309 m, -80,30235, -4,294143, 26/VIII/2017, J. Falcón, J. Fajardo, P. Picón, S. Padrón, MZUA; 1, Guayas, Guayaquil Espol, 100 m, -2,14829, -79,965824, 16/XI/2016, P. Picón, S. Padrón, MZUA; 19, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(45) *Euglossa heterosticta* Moure, 1968

Records: 1, QCAZ; 14, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(46) *Euglossa ioprosopa* Dressler, 1982

Records: 2, Orellana, Yasuní, QCAZ; 1, Morona Santiago, Macas, 620 m, QCAZ; 2, Napo, Coca, 750 m, QCAZ;

1, Morona Santiago, Chiwasa, 77 50 00 W 0 55 0 S, QCAZ; [64]; leg. Dressler, [18, 51]; 14, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(47) *Euglossa iopyrrha* Dressler, 1982

Records: 13, Orellana, Yasuní, 100 m, 79 26 6 W 1 6 42 S, QCAZ. 1, Orellana, Yasuní, 640 m, QCAZ; 1, Orellana, Yasuní, Km 34, QCAZ; leg. Dressler, [51]; 12, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(48) *Euglossa maculilabris* Moure, 1968

Records: 16/08/1972, E. W. Stiles, NMNH; 16, Esmeraldas, Mache-Chindul Ecological Reserve, NMNH.

(49) *Euglossa magnipes* Dressler, 1982

Records: 1, QCAZ; 2, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(50) *Euglossa milenae* Bembé, 2007

Records: 1, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ; 24, Esmeraldas, Mache-Chindul Ecological Reserve, August to December 2014; [18, 19].

(51) *Euglossa mixta* Friese, 1899

Records: 4, Esmeraldas, Mache-Chindul Ecological Reserve, 15/08/1967, R. L. Dressler, NMNH; 1, 250m, QCAZ; 141, Orellana, Yasuní, 500 m, 76 30 W 00 38 S, QCAZ; 8, Napo, Loreto Cotapino, QCAZ; 2, Napo,

Talag, 500 m, 76 30 W 00 38 S, QCAZ; 1, Guayas, Km 26 C. Cabanilla, QCAZ; 1, Orellana, Yasuní, QCAZ; 2, Napo, Yuturi Lodge, Río Napo, QCAZ; [18]; 1, Morona Santiago, Cordillera del Cóndor, 1850 m, 078971 - 9597359, 18/III/06, S. Padrón, MZUA; 37, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(52) *Euglossa modestior* Dressler, 1982

Records: 1, Morona Santiago, Chiwasa, QCAZ; 1, Tena, Shushufindi, Yasuní, QCAZ; 1, Napo, Archidona, QCAZ; 5, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(53) *Euglossa mourei* Dressler, 1982

Records: 1, D. Roubik, NMNH; 3 males, Napo, Río San Miguel, NMNH; 27/04/1988, D. Roubik, NMNH; 2, Napo, Tena Shushufindi, QCAZ; 1, Orellana, Coca, QCAZ; 4, Orellana, Yasuní, QCAZ; Napo, [18]; 1, Morona Santiago, Wapula, 1380 m, -2,126813, -78,089803, 26/XII/2016, S. Padrón, P. Picón, C. Maldonado, J. Falcón, MZUA; 28, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(54) *Euglossa nigropilosa* Moure, 1965

Records: Bolivar, Balzapamba, NMNH; 20/07/1967, R. L. Dressler, NMNH; Tungurahua, 700 - 1400 m, NMNH; Tungurahua, Topo, 700 -1400 m, NMNH; 1, Tungurahua, Río Verde, 600 m, 78 27 18 W 00 50 24, QCAZ; 1, Cotopaxi, Las Pampas, 250 m, 00 56 S 75 24 W, QCAZ; 1, Pichincha, 250 m, 00 56 S 75 24 W, QCAZ; Bolivar, Balzapamba, 16/01/1960, C. Jativa, NMNH; Tungurahua, 700 - 1400 m, Dr. C. H. Dodson, [65]; Tungurahua, [18]; 1, Morona Santiago, El Paraíso, 1630 m, -3,299298, -78,589826, 05/XII/2015, S. Padrón, MZUA; 1, Morona Santiago, Wapula, -2,126813, -78,089803, 26/XII/2016, S. Padrón, P. Picón, C. Maldonado, J. Falcón, MZUA; 1, Morona Santiago, Wapula, 1380m, -2,126813, -78,089803, 26/XII/2016, S. Padrón, P. Picón, C. Maldonado, J. Falcón, MZUA.

(55) *Euglossa platymera* Dressler, 1982

Records: 1, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(56) *Euglossa pleosticta* Dressler, 1982

Records: 2, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(57) *Euglossa retroviridis* Dressler, 1982

Records: 2, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(58) *Euglossa securigera* Dressler, 1982

Records: 2, QCAZ; [19]; 1, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(59) *Euglossa tridentata* Moure, 1970

Records: 4, Pichincha, Santo Domingo, 20/07/1967, R. L. Dressler, NMNH; 1, 250 m, QCAZ; 1, Pichincha, Patricia Pilar, QCAZ; 4, Pichincha, Santo Domingo, [18, 19]; 1, Loja, Cabeza de Toro, 309 m, -80,30235, -4,294143, 26/VIII/2017, J. Falcón, J. Fajardo, P. Picón,

S. Padrón, MZUA; 2, Manabí, Jama Coaque, 300 m, -0,107904, -80,122931, 02/XII/2016, P. Picón, S. Padrón, MZUA.

(60) *Euglossa variabilis* Friese, 1899

Records: 1, Paramba, NMNH; April 1998, D. W. Roubik, [66]; 7, Pichincha, Santo Domingo, DZUP, [60]; Guayas, 1, Guayaquil, leg. Buchwald, (Eg. cordata, det. Alfken 1904), det. Dressler, [60]; 1, El Oro, 16 km SSE Buenavista, 16.4.1989, leg. Dressler, Whitten and Williams, det. Bembé, [60]; 1, Los Rios, Río Palengue Station, 5.4.1972, leg. C. H. Dodson, MC, det. Bembé, [60].

Subgenus Euglossella Moure, 1967

(61) *Euglossa apiformis* Schrottky, 1911

Records: Zamora, 5-7/III/1982, N. H. Williams 89 [handwritten on the underside], [45]; Zamora Chinchipe, [18].

(62) *Euglossa bigibba* Dressler, 1982

Records: 1, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ; 1, Orellana, Yasuní, March 2018, D.W. Roubik.

(63) *Euglossa cyanura* Cockerell, 1917

Records: [18]; 2, Esmeraldas, Mache-Chindul Ecological Reserve, August to December 2014, [47].

(64) *Euglossa granti* Cheesman, 1929

Records: 1, Imbabura, Lita, 320 m, QCAZ; 16 Aug. 1972, Dressler, 1982; 13-27 April 1998, D. Roubik; coll. No 33.

(65) *Euglossa perfulgens* Moure, 1967

Records: 1, Orellana, Yasuní, 220 m, 0 38 LS 75 54 LW, QCAZ.

(66) *Euglossa singularis* Mocsáry, 1899

Records: 1, 250 m, QCAZ; [19]; Morona Santiago, [18]; Napo, [18]; Pastaza, [18]; Zamora Chinchipe, [18]

(67) *Euglossa viridis* (Perty, 1833)

Records: 13-27 April 1998, D. Roubik, Roubik, 2004; 1, QCAZ; [18]; 2, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

Subgenus Glossura Cockerell, 1917

(68) *Euglossa allosticta* Moure, 1969

Records: 12, Orellana, Yasuní, 750 m, QCAZ; 1, Orellana, Yasuní, QCAZ; 1, Esmeraldas, Pitzara, QCAZ; [19]; Eastern Ecuador, [59]; 1, Manabí, Jama Coaque, 300 m, -0,107904, -80,122931, 02/XII/2016, P. Picón, S. Padrón, MZUA; 32, Esmeraldas, Mache-Chindul Ecological Reserve, August to December 2014, Botsch, et al., 2017; 2, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(69) *Euglossa asarophora* Moure & Sakagami, 1969

Records: [19]; Esmeraldas, [67]; 14, Esmeraldas, Mache-Chindul Ecological Reserve, August to December 2014, [47].

(70) *Euglossa flammea* Moure, 1969

Records: 1, Imbabura, Lita, INABIO; [19, 20]; 28, Esmeraldas, Mache-Chindul Ecological Reserve, August to December 2014, [47].

(71) *Euglossa ignita* Smith, 187

Records: 31, Orellana, Yasuní, QCAZ; 3, Napo Tena, Shushufindi, Yasuní, 09 47 56.7 W 66 36 10.7 W, QCAZ; 136, Orellana, Yasuní, QCAZ; 1, Orellana, Yasuní, QCAZ; 1, Morona Santiago, Chiwasa, QCAZ; 1, Napo, Tena, Misahualli, QCAZ; 1, Napo, Loreto, QCAZ; 2, Napo, Yuturi Lodge, Río Napo, QCAZ; 1, Napo, Jatun Sacha, 270 m, 0 32 54 S 76 21 18 W, QCAZ; 1, Napo, Taracoa, QCAZ; 1, Napo, Coca, QCAZ; 3, Napo, Limoncocha, 16/08/1972, E. W. Stiles, NMNH; [18]; 12, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(72) *Euglossa imperialis* Cockerell, 1922

Records: 1, Napo, Misahualli, 29132, Joseph J Anderson, NMNH; Napo, P. Santa Cecilia, 25-31/03/1969, P. Spangler, NMNH; 1, Napo, Taracoa, QCAZ; 201, Napo, Yasuní, 250 m, QCAZ; 16, Orellana, Yasuní, 250 m, QCAZ; 1, Orellana, Yasuní, 250 m, QCAZ; 1, Napo, Yasuní, QCAZ; 4, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(73) *Euglossa lugubris* Roubik, 2004

Records: 3, Napo, Yasuní National Park, leg. Roubik, [51]; Napo, [18]; 1, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(74) *Euglossa natesi* Parra, Ospina-Torres & Ramírez, 2006

Records: 1, Paratype, Esmeraldas, km 17 Lita-Alto Tambo, 730 m, 19/05/1976, J. Cohen, NMNH; Esmeraldas, [18].

(75) *Euglossa occidentalis* Roubik, 2004

Records: 1, Holotype, Napo, Yasuní National park, 13-27 April 1998, D. Roubik, QCAZ, [68]; 12, Paratypes, Orellana, Parque Nacional Yasuní, Sept. 2001, E. Báus D. Roubik, QCAZ, [68]; 3, Paratypes, Napo, Yasuní National park, 13-27 April 1998, D. Roubik, QCAZ, [68]; 16, Paratypes, Orellana, PUCE SC Yasuní, 250m, 76°24'19" W 00°40'32 S, 18- 23 Feb. 2001, D. Roubik & E. Báus, QCAZ, [68]; Orellana, Parque Nacional Yasuní, nov. 1998, E. Báus D. Roubik, QCAZ, [68]; Orellana, Shushufindi Yasuní, 500 m, 76°30'W 00°38' S, 3 Aug. 1999, F. Palomeque, QCAZ, [68]; 2, Paratypes, Orellana, Loreto Cotapino, 640 m, 22 May 1999, F. Palomeque, QCAZ, Donoso, et al., 2009; Napo, Talag, 600 m, W 77°54' S01°03', 12 Jun 99, H. Zumárraga, QCAZ, [68]; 2, Paratypes, Orellana, Parque Nacional Yasuní, dic. 2001, E. Báus D. Roubik, QCAZ, [68]; 17, Paratypes, Orellana, Parque Nacional Yasuní, dic. 2002, E. Báus D. Roubik, QCAZ, [68]; Orellana, E.C. Yasuní, 250 m, 00°40'S 76°23'W, 20 Nov 1999, L. Torres, [66]; Paratype, Orellana, Yasuní Universidad Estación, 36923, D. Roubik, NMNH; 18

Jan. 1990, [43]; 1, Orellana, Yasuní, 250 m, QCAZ; Napo, [18]; 15, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(76) *Euglossa orellana* Roubik, 2004

Records: 1, Holotype, Napo, Yasuní National Park, 13-27 April 1998, D. Roubik, QCAZ, [68]; 132, Paratypes, Orellana, Yasuní National Park, 13-27 April 1998, D. Roubik, QCAZ, [68]; 7, Paratypes, Orellana, Tena Shushufindi Yasuní, 500 m, 76°30' W 00°38'S, 03 Aug. 1999, F. Palomeque, QCAZ, [68]; Napo, Tena Misahualli Jatun Sacha, 550 m, 77°30'W 01°03'S, 23 Oct. 1999, P. Carrera, QCAZ, [68]; 5, Paratypes, Napo, E.C. Yasuní, 250 m, LW78°58' LS00 56, 22 Apr. 1998, F. Palomeque, QCAZ, [68]; 2, Paratypes, Napo, Loreto, 9 Aug. 1991, D. Roubik, QCAZ, [68]; 189, Paratypes, Orellana, PUCE SC Yasuní, 250 m, 76°24'19" W 00°40'32 S, 18-23 Feb. 2001, D. Roubik and E. Baus, QCAZ, [68]; Pichincha-Napo, Taracoa S. Abedravo, 18-V-84, QCAZ, [68]; 2, Paratypes, Napo, Yuturi Lodge Río Napo, 0°32'54"S 76°2'18" W, 270 m, 20 Mar. 1999, R. Brooks, QCAZ, [68]; 108, Paratypes, Orellana, Parque Nacional Yasuní, dic. 2002, E. Baus D. Roubik, QCAZ, [68]; 49, Paratypes, Orellana, Parque Nacional Yasuní, Sept. 2001, E. Baus D. Roubik, QCAZ, [68]; 47, Paratypes, Orellana, Yasuní Nat. Park Catholic Univ. Station, Aug 7-17 2004, D. Roubik, QCAZ, [68]; 5, Paratypes, Orellana, Yasuní Universidad Estación, 27/04/1988, D. Roubik, NMNH; 100, Paratypes, Orellana, Yasuní, QCAZ; Pastaza, Tewaeno 32km sw of Tzapino, 19/05/1976, J. Cohen, NMNH; Napo, Yasuní National Park, [18]; 2, Morona Santiago, Wapula, 1380 m, -2,126813, -78,089803, 26/XII/2016, S. Padrón, P. Picón, C. Maldonado, J. Falcón, MZUA; 1, Morona Santiago, Wapula, 1360 m, -2,126813, -78,089803, 03/VI/2016, C. Maldonado, S. Padrón, MZUA; 14, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(77) *Euglossa rufipes* Rasmussen & Skov, 2006

Records: Napo, [18]; Pastaza, [18]. Río Hollín, D. W. Roubik, 2018, QCAZ.

(78) *Euglossa tiputini* Roubik, 2004

Records: 1, Holotype, Orellana, Yasuní National Park, [19]; 2, Paratypes, Napo, Hacienda Ila, D. Velastigui, [19]; Paratypes, Napo, Hacienda Ila, 12-26-68, D. Velastegui, QCAZ, [68]; Napo, Talag, 400 m, 28 Dic. 1993, O. Torres, QCAZ, [66]; Napo, Yasuní National Park, [18].

(79) *Euglossa viridifrons* Dressler, 1982

Records: Paramba, 13-27 April 1998, D. Roubik, QCAZ, [66]; 1, Napo, Limoncocha, Feb. Apr. (1998, 2001), D. Roubik, [66]; Napo, [18]; 2, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

Subgenus Glossurella Dressler, 1982

(80) *Euglossa augaspis* Dressler, 1982

Records: 4, Esmeraldas, 20 m, LW 78 59 39 LN 00 47 30, QCAZ; 1, Morona Santiago, Wapula, 1380 m, -2,126813, -78,089803, 26/II/2016, S. Padrón, P. Picón, C. Maldonado, J. Falcón, MZUA; 11, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(81) *Euglossa moratoi* Nemésio & Engel 2012

Records: 1, QCAZ; 6, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(82) *Euglossa dodsoni* Moure, 1965

Records: [19]; 1, Manabí, Jama Coaque, 300 m, -0,107904, -80,122931, 02/XII/2016, P. Picón, S. Padrón, MZUA; 65, Esmeraldas, Mache-Chindul Ecological Reserve, August to December 2014, [47].

(83) *Euglossa fuscifrons* Dressler, 1982

Records: 1, Holotype, Napo, Vera Cruz, 03/II/1969, D. Velastegui, NMNH, Dressler 1982; 2, Orellana, Loreto Cotapino, 220 m, 0 38 LS 75 54 LW, QCAZ; 1, Napo, Talac, 938 m, 77 69 LW 0128 LS, QCAZ; [19, 51]; Napo, [18]; 1, Morona Santiago, Wapula, 1380 m, -2,126813, -78,089803, 26/XII/2016, S. Padrón, P. Picón, C. Maldonado, J. Falcón, MZUA; Napo, Río Hollín, 14.I.2012, [17]; 31, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(84) *Euglossa gorgonensis* Cheesman, 1929

Records: Esmeraldas, Mache-Chindul Ecological Reserve, [59]; 1, Manabí, Jama Coaque, 300 m, -0,107904, -80,122931, 02/XII/2016, P. Picón, S. Padrón, MZUA.

(85) *Euglossa laevicincta* Dressler, 1982

Records: 1, Holotype, Pichincha, Santo Domingo, [51]; 6, Orellana, Yasuní, QCAZ; leg. Dodson, [51].

(86) *Euglossa macrorhyncha* Dressler, 1982

Records: 1, Holotype, Pichincha, Santo Domingo, 22/07/1967, R. L. Dressler, NMNH; 1, Allotype, Pichincha, Santo Domingo, 15/08/1967, NMNH; 20/07/1967, R. L. Dressler, NMNH; Pichincha, Santo Domingo, NMNH; Pichincha, [18]; 1, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(87) *Euglossa prasina* Dressler, 1982

Records: 2, Orellana, Yasuní, QCAZ; 1, Orellana, Loreto Cotapino, QCAZ; Napo, [18]; 6, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(88) *Euglossa samperi* Ramírez, 2006

Records: 1, Holotype, Esmeraldas, Bilsa Biological Station, 500 m, 00° 21' N 79° 44' W, leg. Santiago Ramírez, QCAZ, [19]; 13, Paratypes, Esmeraldas, Bilsa Biological Station, 500 m, 00° 21' N 79° 44' W, leg. Santiago Ramírez, [42]; Donoso, et al., 2009; Esmeraldas, Bilsa Biological Station, 00°21'N 79°44'W, 500 m [18].

(89) *Euglossa turbinifex* Dressler, 1978

Records: 1, Pichincha, Santo Domingo, 6 Aug. 1968, C. Dodson (Dressler coll.); 2, Pichincha, Santo Domingo, 16 - 18 Feb. 1969, N. H. Williarns (Dressler coll.), [69]; 1, Pichincha, Santo Domingo, emerged from a nest collected by C. Dodson, no date (Dressler coll.), [19, 69].

(90) *Euglossa williamsi* Hinojosa-Díaz & Engel, 2011

Records: 1, Holotype, Napo, September 1987, Dressler, Wille, Whitten, Williams, FLMNH, [44]; December 26, 1968, [66]; Napo, [18].

Subgenus Glossuropoda Moure, 1989

(91) *Euglossa intersecta* Latreille, 1817

Records: 53, QCAZ; 88, Orellana, Yasuní, QCAZ; 5, Napo, Tena Misahualli Jatun Sacha, 640 m, QCAZ; 71, Orellana, Yasuní, 804 m, QCAZ; 3, Sucumbios, Cuyabeno, 350 m, QCAZ; 4, Orellana, Estación Chiruisla, QCAZ; 36, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(92) *Euglossa rugilabris* Moure, 1967

Records: 12, Orellana, Yasuní National Park, Feb., Apr. (1998, 2001), D. Roubik, [66]; Orellana, Yasuní National Park, 13-27 April 1998, Roubik, NMNH; 2, QCAZ; 12, Orellana, Yasuní National Park, [18, 70]; 14, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

Genus Eulaema Lepeletier (1841)

Subgenus Apaulaema Moure, 1950 [71]

(93) *Eulaema boliviensis* Friese, 1898

Records: 1, Quito to Napo, [18, 19, 72].

(94) *Eulaema cingulata* (Fabricius, 1804); synonym *pseudocingulata* Oliveira 2000

Records: 1, Sucumbíos, Río Aguatico, 550 m, 77 30 W 01 03 S, QCAZ; 1, Pichincha, Palmitopamba, QCAZ; 1, Pichincha, Playa Rica, QCAZ; 5, Pichincha, Santo Domingo, QCAZ; 2, Esmeraldas, Castel novo, 00 56 S 75 24 W, QCAZ; 2, Los Ríos, CCRP, 550 m, QCAZ; 2, Napo, Coca, 00 56 S 75 24 W, QCAZ; 1, Los Ríos, Palenque, QCAZ; 1, Pichincha, San Miguel de los Bancos, 218 m, 75 52 W 00 36 S, QCAZ; 1, Los Ríos, Quevedo, 00 56 S 75 24 W, QCAZ; 10, Orellana, Yasuní, 00 56 S 75 24 W, QCAZ; 1, Napo, Misahualli, 250 m, 00 56 S 75 24 W, QCAZ; 2, Cotopaxi, Gausaganda La Mana, 250 m, 00 56 S 75 24 W, QCAZ; 1, Cotopaxi, Otonga, QCAZ; 1, Los Ríos, San Carlos, QCAZ; 1, Esmeraldas, Durango, QCAZ; 1, Carchi, Via a Lumbaquí Tulcan, 250 m, 00 56 S 75 24 W, QCAZ; 1, Pichincha, Santo Domingo, [19]; Pichincha, Santo Domingo, [59]; Orellana, Yasuní, [59]; Loja, Vilcabamba, (nov), [18, 51]; Bolivar, Balzapamba, [72]; Pichincha, Nanegalito- Reserva Inti Llacta, 1800 m, [73].

(95) *Eulaema marcii* Nemésio, A. (2009); synonym *cingulata*?

Records: 12, Orellana, 300 m, 75 11 W 00 59 S, QCAZ; 1, Pichincha, Tinalandia, 08 52 31 S 72 46 55 W, QCAZ; 2, Pichincha, Pedro Vicente Maldonado, QCAZ; 1, Napo, El Reventador, QCAZ; 1, Esmeraldas, Zapallo, QCAZ; 2, Pichincha, Puerto Quito, QCAZ; 1, Loja, Valladolid, QCAZ; 1, Cotopaxi, Otonga, QCAZ; 1, Orellana, Yasuní, QCAZ; 1, Sucumbíos, Shushufindi, QCAZ; 1, Esmeraldas, Río Canande, QCAZ; 1, Morona Santiago, El Paraiso, 1630m, -3,299298, -78,589826, 11/VI/2015, S. Padrón, MZUA; 1, Morona Santiago, Wapula, 1380m, -2,126813, -78.089803, 26/XII/2016, S. Padrón, P. Picón, C. Maldonado, J. Falcón, MZUA; 4, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(96) *Eulaema mocsaryi* (Friese, 1899)

Records: 95, Orellana, Yasuní, QCAZ; 1, Orellana, Coca, QCAZ; 20, Orellana, Yasuní, QCAZ; [18, 19]; Pichincha, Nanegalito- Reserva Inti Llacta, 1800 m, [73]; 6, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(97) *Eulaema napensis* Oliveira, 2006

Records: 1, Holotype, Napo, Jumandi, [74]; 1, Napo, Jumandi, [71]; 1, Orellana, Archidona, Jumandi, [51]; 7, 640 m, QCAZ; [18]; 1, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(98) *Eulaema nigrifacies* Friese, 1898

Records: Napo, [53]; Pichincha, Quito, [18, 75].

(99) *Eulaema nigrita* Lepeletier, 1841

Records: 1, Pichincha, Niebli, 250 m, QCAZ; [76].

(100) *Eulaema peruviana* (Friese, 1903)

Records: 2, Orellana, Nuevo Rocafuerte, 250 m, 00 56 S 75 24 W, QCAZ; [18, 19]; 2, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(101) *Eulaema polychroma* (Mocsáry, 1899)

Records: 28, Guayas, Valdivia, 17/04/1960, C. Dodson, NMNH; 2, Manabí, Mt. Chiriste, 19/01/1960, G. P. Frayning, NMNH; Manabí, Portoviejo, 25051, Pedro Alcivar, NMNH; Guayas, Nobol 5.5 km N, 30 m, 12/01/1978, Wayne N Mathis, NMNH; Guayas, Guayaquil, 28/03/1960, L. Jativa, NMNH; 1, Pichincha, Jerusalem, 270 m, QCAZ; 1, Pichincha, Palmeras, QCAZ; 1, Pichincha, Cumbaya El arbolito, QCAZ; 1, Pichincha, Guallabamba, QCAZ; 1, Pichincha, Santo Domingo, QCAZ; 1, El Oro, Piñas, 600 m, 22/VII/04, S. Padrón, MZUA; [18, 19].

(102) *Eulaema speciosa* (Mocsáry, 1897)

Records: Pichincha, Santo Domingo, 25 de Julio 1967, R. L. Dressler, NMNH; 1, Morona Santiago, Macas, QCAZ; 1, Pichincha, San Miguel de los Bancos, QCAZ; 1, Pichincha, Mindo, QCAZ; 1, Pichincha, Puerto Quito, QCAZ; 1, Esmeraldas, Durango, QCAZ; 6, Napo, Avila Viejo, 10 09 07 S 63 55 41 W, QCAZ; 1, Sucumbios, Reventador, QCAZ; [18, 19].

Subgenus *Eulaema* Lepeletier, 1841(103) *Eulaema bombiformis* (Packard, 1869)

Records: 1, Holotype, Quito to Napo, [72]; Balzapamba, [53]; Quito to Napo, [69]; Quito to Napo, [75]; 3, Orellana, Yasuní, QCAZ; 1, Orellana, Est. Río Huiririma, 1000 m, 77 23 W 00 15 N, QCAZ; 1, Esmeraldas, Reserva Río Canande, 17.00 S 39.36 W, QCAZ; 1, Orellana, Chiruisla, QCAZ; 2, Pastaza, Villano K10, 631 m, 79 1 LW LS 00 5, QCAZ; 2, Sucumbios, Cuyabeno, 350 m, QCAZ; 1, Napo, Pozo Daimi, 2578 m, 78 25 W 00 17 S, QCAZ; 1, Carchi, Via a Lumbaquí Tulcan, QCAZ; 2, Orellana, Loreto Cotapino, 220 m, QCAZ; 18, Yasuní, 220 m, QCAZ; [19]; Pichincha-Napo, (probably en route to Napo river), [18, 51]; 2, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(104) *Eulaema bomboides* (Friese, 1923)

Records: 1, Pichincha, Santo Domingo, Dressler, [77]; 1, Los Ríos, Río Palenque Station, Dressler, [19, 77]; Bolívar, Balsapampa (Balzapampa), [51]; Bolívar, Balsapampa, [18].

(105) *Eulaema chocoana* Ospina-Torres & Sandino-Franco, 1997

Records: Esmeraldas, [78]; 1, 700 m, QCAZ.

(106) *Eulaema leucopyga* Friese, 1898

Records: 1, Carchi, El Placer, 500 m, 76 30 W 00 38 S, QCAZ; 1, Pichincha, Endesa, 610 m, 77 48 W 00 54 S, QCAZ; 1, Pichincha, San Miguel de los Bancos, 1500 m, 78 17 42 W 01 23 54 S, QCAZ; 1, Pichincha, Santo Domingo, QCAZ; 4, Esmeraldas, Río Canandé, 250 m, 00 56 S 75 24 W, QCAZ; [18, 19].

(107) *Eulaema meriana* (Olivier, 1789)

Records: 13, Napo, Limoncocha, 14/06/1977, D. L. Vincent, NMNH; Napo, Lago Agrio 2 km N, 26 de Septiembre 1975, A. Langley, NMNH; Pastaza, Puyo, 8 de febrero 1976, Spangler, et al., NMNH; Napo, Limoncocha, 16/08/1972, E. W. Stiles, NMNH; Dressler, 1979; 1, Napo, Tarapa, QCAZ; 1, Campanacocha, QCAZ; 1, Esmeraldas, QCAZ; 86, Orellana, Yasuní, QCAZ; 1, Napo, Yuturi Lodge, Río Napo, QCAZ; 5, Napo, Loreto, QCAZ; 1, Esmeraldas, Quinde, QCAZ; 1, Pichincha, Pedro Vicente Maldonado, QCAZ; 1, Los Ríos, Quevedo, QCAZ; 1, Sucumbios, Cuyabeno, QCAZ; 1, Pastaza, Loracachi, QCAZ; 1, Los Ríos, San Carlos, QCAZ; 1, Napo, Lago Agrio, QCAZ; 45, Napo, 600 m, 1° 02' 8" S 77° 40' W, QCAZ; 1, Orellana, Est. Río Huiririma, 500 m, QCAZ; 1, Pastaza, Via Tena Puyo, 1800 m, QCAZ; 33, QCAZ; [18, 19]; Pichincha, Nanegalito- Reserva Inti Llacta, 1800 m, [73]; 1, Azuay, Sarayunga, 530 m, -3,315218, -79,582313, 10/XI/2016, P. Picón, S. Padrón, MZUA; 1, Morona Santiago, San Juan Bosco, 1050 m, -3,119898, -78,527502, II/2016, H. Garzón, MZUA; 4, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(108) *Eulaema parapolyzona* Oliveira, 2006

Records: Napo, Limoncocha (forest), 16/07/1971, D.L. Pearson, NMNH; 2, Napo, Limoncocha, 16/08/1972, E.W. Stiles, NMNH; 2, Orellana, Yasuní, 100 m, 02 14 49 S 79 39 37 W, QCAZ; 1, Orellana, Coca, 250 m, QCAZ; Napo, [18]; 2, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(109) *Eulaema tenuifasciata* (Friese, 1925)

Records: Napo, Limoncocha, 15 de Junio 1977, P. J. Spangler D. R. Givens, NMNH; 1, Napo, Tena Talag, 269 m, 76 11 S 00 01 S, QCAZ; 1, Napo, Coca Palmoriente, QCAZ; 1, Morona Santiago, Macas, 1000 m, 77 23 W 00 15 N, QCAZ.

(110) *Eulaema sororia* Dressler & Ospina-Torres, 1997

Records: 1, Holotype, Esmeraldas, Oeste de Lita, 14-18 Agosto 1987, [19, 79]; Esmeraldas, Oeste de Lita, 14-18 Agosto 1987, Dressler, Hills, Whitten, Williams, Leg. KU, [80]; Esmeraldas, [18].

Genus *Exaerete* Hoffmannsegg (1817)(111) *Exaerete dentata* (Linnaeus, 1758)

Records: 2, Guayas, Guayaquil, NMNH; 1, A. Cartwright Donor, NMNH; San Rafael, 100 m oeste, F. Campos, NMNH; 1, Purchased Kny Scheerer Co NY, NMNH; [18, 19]; 2, [80].

(112) *Exaerete frontalis* (Guérin, 1844)

Records: 1, Cotopaxi, Guasanda, La Maná, 500 m, QCAZ; 1, Orellana, Coca, QCAZ; 1, Napo, Tena Shushufindi, 500 m, QCAZ; 1, Napo, Archidona, QCAZ; 1, Pichincha, P. V. Maldonado Río Pizar, 280 m, QCAZ; 1, Esmeraldas, Borbon, 25 m, 78 58 W 1 4 N, QCAZ; 8, Orellana, Yasuní, 250 m, QCAZ; Los Ríos, Río Palenque Biological Station Quevedo, 14/03/1979, Joseph J. Anderson, NMNH; 1, Napo, Limoncocha, 16/08/1972, E. W. Stiles, NMNH; [18, 19, 59]; 1, Morona Santiago, Wapula, 1380 m, -2.126813, -78.089803, 26/XII/2016, S. Padrón, P. Picón, C. Maldonado, J. Falcón, MZUA; 1, Morona Santiago, San Juan Bosco, 1500 m, -3,119898, -78,527502, 18/VIII/2016, S. Padrón, H. Garzón, MZUA; 1, Manabí, Jama Coaque, 300 m, -0,107904, -80,122931, 02/XII/2016, P. Picón, S. Padrón, MZUA; 6, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

(113) *Exaerete lepeletieri* Oliveira & Nemésio, 2003

Records: 1, Napo, Limoncocha (Yard), 26165, D.L. Pearson, NMNH; 1, Pichincha, Santo Domingo, QCAZ.

(114) *Exaerete smaragdina* (Guérin, 1844)

Records: 1, Tena, Shushufindi, Yasuní, 500 m, QCAZ; 1, Guayas, Guayaquil, QCAZ; 2, Napo, Tena Talag, 750 m, QCAZ; 3, Pichincha, Santo Domingo, QCAZ; 1, Esmeraldas, km 6 Lita San Lorenzo, QCAZ; 1, Pichincha, Puerto Quito, QCAZ; 1, Loja, Malacatos, QCAZ; 1, Los Ríos, San Carlos, 100 m, 79 26 6 W

TABLE 1: New species records added for Ecuador.

Genus	Species
<i>Euglossa</i>	<i>amazonica</i> Dressler, 1982
	<i>analys</i> Westwood, 1840
	<i>avicula</i> , Dressler, 1982
	<i>bidentata</i> Dressler, 1982
	<i>championi</i> Cheesman, 1929
	<i>charapensis</i> Cockerell, 1917
	<i>chlorina</i> Dressler, 1982
	<i>cybelia</i> Moure, 1968
	<i>deceptrix</i> Moure, 1968
	<i>despecta</i> Moure, 1968
	<i>dissimula</i> Dressler, 1978
	<i>dressleri</i> Moure, 1968
	<i>gaianni</i> Dressler, 1982
	<i>hansoni</i> Moure, 1965
	<i>heterosticta</i> Moure, 1968
	<i>iopyrrha</i> Dressler, 1982
	<i>maculilabris</i> Moure, 1968
	<i>magnipes</i> Dressler, 1982
	<i>modestior</i> Dressler, 1982
	<i>platymera</i> Dressler, 1982
	<i>pleosticta</i> Dressler, 1982
	<i>retroviridis</i> Dressler, 1982
	<i>securigera</i> Dressler, 1982
	<i>variabilis</i> Friese, 1899
	<i>bigibba</i> Dressler, 1982
	<i>granti</i> Cheesman, 1929
	<i>perfulgens</i> Moure, 1967
	<i>singularis</i> Mocsáry, 1899
	<i>allosticta</i> Moure, 1969
	<i>asarophora</i> Moure & Sakagami, 1969
	<i>flammea</i> Moure, 1969
	<i>imperialis</i> Cockerell, 1922
	<i>augaspis</i> Dressler, 1982
	<i>moratoi</i> Nemésio & Engel, 2012
	<i>dodsoni</i> Moure, 1965
	<i>gorgonensis</i> Cheesman, 1929
	<i>laevicincta</i> Dressler, 1982
	<i>turbinifex</i> Dressler, 1978
	<i>intersecta</i> Latreille, 1817
<i>Eulaema</i>	<i>nigrita</i> Lepeletier, 1841
	<i>chocoana</i> Ospina-Torres & Sandino-Franco, 1997
	<i>marcii</i> Nemésio (2009)
<i>Eufriesea</i>	<i>tenuifasciata</i> (Friese, 1925)
	<i>auripes</i> (Gribodo, 1882)
	<i>combinata</i> (Mocsáry, 1897)
	<i>concava</i> (Friese, 1899)
	<i>duckei</i> (Friese, 1923)
	<i>magretti</i> (Friese, 1905)
	<i>opulenta</i> (Mocsáry, 1908)
	<i>pulchra</i> (Smith, 1854)
	<i>purpurata</i> (Mocsáry, 1896)
	<i>venezolana</i> (Schrottky, 1913)
<i>Exaerete</i>	<i>trochanterica</i> (Friese, 1900)
	<i>lepeletieri</i> Oliveira & Nemésio, 2003

1 6 42 S, QCAZ; 1, Orellana, Loreto Cotapino, 640 m, QCAZ; 1, Los Ríos, Palenque, QCAZ; 1, El Oro, Buenaventura, Piñas, 620 m, S. Padrón, QCAZ; 1, Napo, Avila Viejo, 750 m, QCAZ; 1, Napo, Archidona, 77 50 00 W 0 55 0 S, QCAZ; 26, Orellana, Yasuní, 250 m, QCAZ; 1, Pichincha, Santo Domingo, QCAZ; 1, Los Ríos, Quevedo, 4 de abril/1960, C. Dosdson, NMNH; 1, Esmeraldas, San Lorenzo, 24/03/1979, Jos. J. Anderson, NMNH; 1, Los Ríos, Río Palenque Biological Station 40 km Quevedo, 14/03/1979, J. Anderson, NMNH; Pastaza, Puyo (22 km W), 28373, D. R. Givens, NMNH; Pastaza, Santa Clara, 30/06/1976, P. M. Turner, NMNH; [19]; Orellana, Yasuní, [18, 59, 80]; 4, Loja, Malacatos - Ceibopamba, 1500 m, -4,167369, -79,300962, 02/III/2017, P. Picón, S. Padrón, MZUA; 1, Loja, Malacatos, -4,198158, -79,262703, 03/XI/2016, P. Picón, S. Padrón, MZUA.

(115) *Exaerete trochanterica* (Friese, 1900)

Records: [19]; 1, Orellana, Yasuní, Julio 2017, D.W. Roubik, QCAZ.

4. Discussion

With 115 species reported for Ecuador, our results almost double the number known from previous work [19] (62) and [18] (63 species). In a medium elevation area of north central Peru [81] there may be similar species richness, but as we suggest below, the highest species diversity occurs, as in many groups, in NE Ecuador.

In Ecuador, the genus *Euglossa* is the most diverse, with 68 species, followed by *Eufriesea* 23, *Eulaema* 18, *Exaerete* 5, and *Aglae* 1 species. Fifty-two new species records are added for the country, compared to the most recent species list, in [18]. The new species records are distributed in four genera. Thirty-nine new species records are added for the genus *Euglossa*, 4 new species records for *Eulaema*, 9 new species records for *Eufriesea*, and 2 new species records for *Exaerete* (Table 1). There are at least 10 more undescribed species.

Finally, for the monotypic genus *Aglae*, here we added new distribution records for its conspicuous species *A. coerulea* Lepeletier & Seville, 1825, in Napo, Pastaza, and Esmeraldas Provinces, extending its known distribution to the Eastern Andes in Ecuador. Previously it was reported for Ecuador by [50] from the Chocó Region in western Ecuador.

Our results show a clear richness pattern (Figure 1), with a concentration of species in the Amazon region. As noted by previous authors [13, 19, 40, 66] the northwest is similar to Mesoamerica and Panama. The Andean and inter-Andean region, between the Cordillera Occidental and Oriental, may hold endemic euglossines, but the overall similarity to Peru and Colombia does not permit such a view at present. The lower to medium elevation Andes region may, like the palms [41], hold the most species. For now, most Ecuadorian euglossines have been found east of the Andes, in the lowlands. This is perhaps the result of more intensive sampling there, especially at the Estación Biológica Yasuní. It is also clear that some areas are poorly sampled, especially the southern part of Ecuador. In those areas, such as the

Cordillera del Condor, Cerro Plateado, Zapotillo, and Zumba Regions, more new species records for the country will likely be found, as is now the case in Yasuní forest, in the northeast.

Any single reported collection should, for the time being, be viewed with some skepticism and needing replication and confirmation. The single recorded specimens that differ from the gender of the designated holotype, for example, the male of *Eufriesea combinata* or *Eufriesea theresiae* [51], require further field work to validate. We see a need to emphasize that some species are quite difficult to identify and distinguish, likely due to mimicry, and phylogenetically close relatives that first separated by climate changes during glaciations, either on both sides of the Andes or in higher elevation areas, compared to lowlands. There are reasonably cryptic sibling or close relatives. For example, *Euglossa chalybeata* and *E. piliventris*, previously thought to be native to Ecuador, have yet to be found there, but in their place *Euglossa orellana*, *E. occidentalis*, and *E. lugubris* were described [65]. Similarly, Kimsey [13] pointed out the synonymy of *Eufriesea andina* with its senior synonym, *Ef. magretti*, and the color polymorphism of the males in both this species and *Ef. venezolana*, which had confused previous taxonomic work. We find also very slight differentiation between two *Eulaema* and subgenus *Apeulaema*, although some of the reported males in Ecuador may in fact match those of French Guiana—the type area for *Eulaema cingulata*—and we have examined two from Eastern Ecuador that are different, one indistinguishable externally from *Eulaema* of Panama, which is now tentatively given the name *Eulaema marci*, but which was described from Eastern Brazil. Further study of genitalic details would repay the effort.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Acknowledgments

The authors would like to thank the Universidad del Azuay and its Research Funding Program 2016–2017 for the support to the fieldwork and the museum visits of Pablo S. Padrón and Ruben P. Picón. Pablo S. Padrón wishes to thank Cristina Lalama for help databasing museum specimens and also José Falcón and Henry Garzón for help during fieldwork. The authors are also grateful to Albaro Barragán, Brian Harris, and Santiago Villamarín for allowing them to examine specimens from the collections under their care at the QCAZ, NMNH, and INABIO, respectively. Finally they want to thank Ministerio del Ambiente del Ecuador for the Collecting Permits.

References

- [1] D. W. Roubik and J. T. Knudsen, “An embellishment that became a mutualism: Inquiries on male bee tibial bouquets and fragrance-producing orchids in Panama and oceanic islands (Apidae: Apinae, Euglossini; Orchidaceae: Epidendroideae),” *Flora*, vol. 232, pp. 117–127, 2017.

- [2] D. W. Roubik and J. D. Ackerman, "Long-term ecology of euglossine orchid-bees (Apidae: Euglossini) in Panama," *Oecologia*, vol. 73, no. 3, pp. 321–333, 1987.
- [3] C. Rasmussen, "Diversity and abundance of orchid bees (Hymenoptera: Apidae, Euglossini) in a tropical rainforest succession," *Neotropical Entomology*, vol. 38, no. 1, pp. 66–73, 2009.
- [4] M. R. Santiago, "Age structure of male *Euglossa imperialis* (Hymenoptera: Apidae: Euglossini) at nectar and chemical sources in Panama," *Journal of Tropical Ecology*, vol. 4, no. 3, pp. 303–306, 1988.
- [5] F. P. Schiestl and D. W. Roubik, "Odor compound detection in male euglossine bees," *Journal of Chemical Ecology*, vol. 29, no. 1, pp. 253–257, 2003.
- [6] T. Eltz, D. W. Roubik, and K. Lunau, "Experience-dependent choices ensure species-specific fragrance accumulation in male orchid bees," *Behavioral Ecology and Sociobiology*, vol. 59, no. 1, pp. 149–156, 2005.
- [7] R. B. Singer, A. J. Marsaioli, A. Flach et al., "The ecology and chemistry of pollination in Brazilian orchids: recent advances," *Floriculture, Ornamental and Plant Biotechnology*, vol. 4, pp. 569–582, 2006.
- [8] T. Pokorný, M. Hannibal, J. J. G. Quezada-Euán et al., "Acquisition of species-specific perfume blends: Influence of habitat-dependent compound availability on odour choices of male orchid bees (*Euglossa* spp.)," *Oecologia*, vol. 172, no. 2, pp. 417–425, 2013.
- [9] R. O. Souza, M. A. Del Lama, M. Cervini et al., "Conservation genetics of neotropical pollinators revisited: Microsatellite analysis suggests that diploid males are rare in orchid bees," *Evolution*, vol. 64, no. 11, pp. 3318–3326, 2010.
- [10] J. D. Ackerman and D. W. Roubik, "Can extinction risk help explain plant-pollinator specificity among euglossine bee pollinated plants?" *Oikos*, vol. 121, no. 11, pp. 1821–1827, 2012.
- [11] A. Nemésio, "Are orchid bees at risk? First comparative survey suggests declining populations of forest-dependent species," *Brazilian Journal of Biology*, vol. 73, no. 2, pp. 367–374, 2013.
- [12] A. C. Martins, G. A. R. Melo, and S. S. Renner, "The corbiculate bees arose from New World oil-collecting bees: Implications for the origin of pollen baskets," *Molecular Phylogenetics and Evolution*, vol. 80, no. 1, pp. 88–94, 2014.
- [13] L. S. Kimsey, *Systematics of bees of the genus Eufriesea (Hymenoptera, Apidae)*, University of California Press, 1982.
- [14] E. J. Dos Anjos-Silva, "Occurrence of *Eulaema* (Apeulaema) pseudocingulata oliveira (Hymenoptera: Apidae: Euglossini) in the Platina Basin, Mato Grosso State, Brazil," *Neotropical Entomology*, vol. 36, no. 3, pp. 484–486, 2007.
- [15] S. R. Ramírez, D. W. Roubik, C. Skov, and N. E. Pierce, "Phylogeny, diversification patterns and historical biogeography of euglossine orchid bees (Hymenoptera: Apidae)," *Biological Journal of the Linnean Society*, vol. 100, no. 3, pp. 552–572, 2010.
- [16] M. L. de Oliveira, "Taxonomic notes on Exaerete (Hymenoptera: Apidae: Euglossina), with the description of a new species," *Biota Neotropica*, vol. 11, no. 1, pp. 131–132, 2011.
- [17] R. R. Ferrari, A. Nemésio, and F. A. Silveira, "Phylogeny of the orchid-bee genus *Euglossa* Latreille (Hymenoptera: Apidae), with emphasis on the subgenera *E.* (*Glossura*) Cockerell and *E.* (*Glossuropoda*) Moure," *Zoologischer Anzeiger*, vol. 267, pp. 82–100, 2017.
- [18] M. Moure and L. R. R. Faria Jr, "Euglossini Latreille," in *Catalogue of Bees (Hymenoptera, Apoidea) in the Neotropical Region*, J. S. Moure, D. Urban, and G. A. R. Melo, Eds., vol. 1802, 2018, <http://www.moure.cria.org.br/catalogue>.
- [19] S. Ramírez, R. L. Dressler, and M. Ospina, "Abejas euglossinas (Hymenoptera: Apidae) de la Región Neotropical: Listado de especies con notas sobre su biología," *Biota Colombiana*, vol. 3, no. 1, pp. 7–118, 2002.
- [20] D. W. Roubik and P. E. Hanson, *Orchid bees of tropical America: biology and field guide*, Instituto Nacional de Biodiversidad (INABIO), 2004.
- [21] A. Nemésio and F. A. Silveira, "Diversity and distribution of orchid bees (Hymenoptera: Apidae) with a revised checklist of species," *Neotropical Entomology*, vol. 36, no. 6, pp. 874–888, 2007.
- [22] J. S. Moure, "A check-list of the known euglossine bees (Hymenoptera, Apidae)," *Atlas do Simpósio sobre a Biota Amazônica*, vol. 5, pp. 395–415, 1967.
- [23] S. H. Sofia, A. M. Santos, and C. R. Silva, "Euglossine bees (Hymenoptera, Apidae) in a remnant of Atlantic Forest in Paraná State, Brazil," *Iheringia. Série Zoologia*, vol. 94, no. 2, pp. 217–222, 2004.
- [24] A. Nemésio and E. F. Morato, "The orchid-bee fauna (Hymenoptera: Apidae) of Acre state (northwestern Brazil) and a re-evaluation of euglossine bait-trapping," *Lundiana*, vol. 7, no. 1, pp. 59–64, 2006.
- [25] S. C. Buys, A. C. Schmitt, M. F. Silva, R. C. Soares, C. L. Rodrigues, and C. A. Antunes, "Inventário de abelhas Euglossini (Hymenoptera, Apidae) da Estação Biológica de Santa Lúcia (Santa Teresa, ES, sudeste do Brasil), com uma lista das espécies da tribo que ocorrem no Estado do Espírito Santo," *Acta Biológica Paranaense*, vol. 42, no. 1–4, 2013.
- [26] D. C. Giangarelli, W. M. D. Aguiar, and S. H. Sofia, "Orchid bee (Hymenoptera: Apidae: Euglossini) assemblages from three different threatened phytophysiognomies of the subtropical Brazilian Atlantic Forest," *Apidologie*, vol. 46, no. 1, pp. 71–83, 2015.
- [27] R. Oliveira, C. E. Pinto, and C. Schlindwein, "Two common species dominate the species-rich Euglossine bee fauna of an Atlantic Rainforest remnant in Pernambuco, Brazil," *Brazilian Journal of Biology*, vol. 75, no. 4, pp. S1–S8, 2015.
- [28] D. Storck-Tonon, E. F. Morato, A. W. F. de Melo, and M. L. de Oliveira, "Orchid bees of forest fragments in Southwestern Amazonia," *Biota Neotropica*, vol. 13, no. 1, pp. 133–141, 2013.
- [29] D. L. Pearson and R. L. Dressler, "Two-year study of male orchid bee (hymenoptera: Apidae: Euglossini) attraction to chemical baits in lowland south-eastern Perú," *Journal of Tropical Ecology*, vol. 1, no. 1, pp. 37–54, 1985.
- [30] R. S. Niemack, D. J. Bennett, I. Hinojosa-Díaz, and C. S. Chaboo, "A contribution to the knowledge of the orchid bee fauna of the Los Amigos Biological Station, Madre de Dios, Peru (Hymenoptera: Apidae: Euglossini)," *Check List*, vol. 8, no. 2, pp. 215–217, 2012.
- [31] R. E. Ricklefs, R. M. Adams, and R. L. Dressler, "Species Diversity of *Euglossa* in Panama," *Ecology*, vol. 50, no. 4, pp. 713–716, 1969.
- [32] J. D. Ackerman, "Diversity and seasonality of male euglossine bees (Hymenoptera: Apidae) in central Panama," *Ecology*, vol. 64, no. 2, pp. 274–283, 1983.
- [33] R. Perger, "The highest known euglossine bee community from a garden in the Bolivian Andes (Hymenoptera, Apidae, Euglossini)," *Journal of Hymenoptera Research*, vol. 45, pp. 65–73, 2015.

- [34] M. A. Bonilla-Gómez and G. Nates-Parra, "Abejas euglosinas de Colombia (Hymenoptera: Apidae) I. Claves ilustradas," *Caldasia*, vol. 17, no. 1, pp. 149–172, 1992.
- [35] J. S. Moure, "A key to the parasitic euglossine bees and a new species of Exaerete from Mexico (Hymenoptera-Apoidea)," *Revista de Biología Tropical*, vol. 12, no. 1, pp. 15–18, 1964.
- [36] I. A. Hinojosa-Díaz and M. S. Engel, "A checklist of the orchid bees of Nicaragua (Hymenoptera: Apidae: Euglossini)," *Journal of the Kansas Entomological Society*, vol. 85, no. 2, pp. 135–144, 2012.
- [37] K. W. McCravy, J. V. Dyke, T. J. Creedy, and D. W. Roubik, "Orchid Bees (Hymenoptera: Apidae: Euglossini) of Cusuco National Park, State of Cortés, Honduras," *Florida Entomologist*, vol. 99, no. 4, pp. 765–768, 2016.
- [38] N. Myers, R. A. Mittermeyer, C. G. Mittermeyer, G. A. B. da Fonseca, and J. Kent, "Biodiversity hotspots for conservation priorities," *Nature*, vol. 403, no. 6772, pp. 853–858, 2000.
- [39] C. G. Mittermeier, N. Myers, and G. Robles, *Hotspots: Earth's biologically richest and most endangered terrestrial ecoregions*, CEMEX, SA, Agrupación Sierra Madre, SC, 2000.
- [40] J. M. F. De Camargo, "Historical biogeography of the Meliponini (Hymenoptera, Apidae, Apinae) of the Neotropical region," in *Pot-honey: a legacy of stingless bees*, P. Vit, S. R. M. Pedro, and D. W. Roubik, Eds., pp. 19–34, Springer, New York, NY, USA, 2013.
- [41] R. Valencia, R. Mont, H. Navarrete, and R. Montúfar, *Palmas ecuatorianas: biología y uso sostenible*, Publicaciones del Herbario QCA, Quito, Ecuador, 2013.
- [42] S. Ramírez, "Euglossa samperi n. sp., a new species of orchid bee from the Ecuadorian Andes (Hymenoptera: Apidae)," *Zootaxa*, no. 1272, pp. 61–68, 2006.
- [43] A. Parra-H, R. Ospina-Torres, and S. Ramírez, "Euglossa natesi n. sp., a new species of orchid bee from the Chocó region of Colombia and Ecuador (Hymenoptera: Apidae)," *Zootaxa*, no. 1298, pp. 29–36, 2006.
- [44] I. A. Hinojosa-Díaz and M. S. Engel, "Euglossa williamsi, a new species of orchid bee from the Amazon Basin of Ecuador and Peru, with notes on its taxonomic association and biogeography (Hymenoptera, Apidae)," *ZooKeys*, vol. 159, pp. 49–63, 2011.
- [45] I. A. Hinojosa-Díaz and M. S. Engel, "Revision of the orchid bee subgenus Euglossella (Hymenoptera, Apidae), Part I, the decorata species group," *ZooKeys*, vol. 140, pp. 27–69, 2011.
- [46] D. W. Roubik, "100 Species of meliponines (Apidae: Meliponini) in a parcel of Western Amazonian forest at Yasuní Biosphere Reserve, Ecuador," in *Pot-pollen in stingless bee melittology*, P. Vit, S. R. M. Pedro, and D. W. Roubik, Eds., pp. 189–206, Springer Nature, Cham, Switzerland, 2018.
- [47] J. C. Botsch, S. T. Walter, J. Karubian, N. González, E. K. Dobbs, and B. J. Brosi, "Impacts of forest fragmentation on orchid bee (Hymenoptera: Apidae: Euglossini) communities in the Chocó biodiversity hotspot of northwest Ecuador," *Journal of Insect Conservation*, vol. 21, no. 4, pp. 633–643, 2017.
- [48] M. S. Engel, "A new species of the cleptoparasitic orchid bee genus Exaerete from northern Venezuela (Hymenoptera: Apidae)," *Entomologist's Monthly Magazine*, vol. 154, no. 3, pp. 161–175, 2018.
- [49] R. J. Hijmans, L. Guarino, C. Bussink et al., *DIVA-GIS. 7.5. A geographic information system for the analysis of species distribution data*, 2018, <http://www.diva-gis.org>.
- [50] D. P. Silva, A. J. C. Aguiar, G. A. R. Melo, E. J. Anjos-Silva, and P. De Marco Jr., "Amazonian species within the Cerrado savanna: New records and potential distribution for Aglae caerulea (Apidae: Euglossini)," *Apidologie*, vol. 44, no. 6, pp. 673–683, 2013.
- [51] A. Nemésio, "Description of the male Eufriesea theresiae (Mocsáry, 1908) (Hymenoptera: Apidae: Euglossina), with illustration of the holotype and comments on its geographic distribution, including a new record for the state of Pará, northern Brazil," *Zootaxa*, no. 2762, pp. 63–68, 2011.
- [52] M. S. Souza, T. J. Izzo, and E. J. Anjos-Silva, "Expanding the area of distribution of Eufriesea fragrocara Kimsey (Hymenoptera, Apidae) in the Brazilian Amazon Forest," *Scientific Electronic Archives*, vol. 8, no. 1, pp. 43–46, 2015.
- [53] L. S. Kimsey and R. L. Dressler, "Synonymic species list of Euglossini," *The Pan-Pacific Entomologist*, vol. 62, no. 3, pp. 229–236, 1986.
- [54] V. H. González and R. Ospina-Torres, "Eufriesea nigrescens y E. pretiosa (Hymenoptera: Apidae: Euglossini): un caso de oportunismo o simbiosis?" *Caldasia*, vol. 22, no. 2, pp. 357–359, 2000.
- [55] E. J. dos Anjos-Silva, "Eufriesea pulchra smith (Hymenoptera: Apidae: Euglossini): Extended geographic distribution and filling gaps in Mato Grosso state, Brazil," *Neotropical Entomology*, vol. 39, no. 1, pp. 133–136, 2010.
- [56] P. Milet-Pinheiro, J. B. F. Silva, D. M. A. F. Navarro, I. C. S. Machado, and G. Gerlach, "Notes on pollination ecology and floral scent chemistry of the rare neotropical orchid Catasetum galeritum Rchb.f.," *Plant Species Biology*, vol. 33, no. 2, pp. 158–163, 2018.
- [57] S. S. Suni and B. J. Brosi, "Population genetics of orchid bees in a fragmented tropical landscape," *Conservation Genetics*, vol. 13, no. 2, pp. 323–332, 2012.
- [58] T. D. A. Cockerell, "Some euglossine bees," *The Canadian Entomologist*, vol. 49, no. 4, pp. 144–146, 1917.
- [59] C. W. Dick, D. W. Roubik, K. F. Gruber, and E. Bermingham, "Long-distance gene flow and cross-Andean dispersal of lowland rainforest bees (Apidae: Euglossini) revealed by comparative mitochondrial DNA phylogeography," *Molecular Ecology*, vol. 13, no. 12, pp. 3775–3785, 2004.
- [60] B. Bembé, *Revision der Euglossa cordata-gruppe und untersuchungen zur funktionsmorphologie und faunistik der Euglossini (Hymenoptera, Apidae)* [Doctoral, thesis], 2005.
- [61] R. L. Dressler, "Una Sievekingia nueva de Colombia," *Orquideologia*, vol. 11, pp. 215–221, 1976.
- [62] R. L. Dressler, "New species of Euglossa. IV. The cordata and purpurea species groups (Hymenoptera: Apidae)," *Revista de Biología Tropical*, vol. 30, no. 2, pp. 141–150, 1982.
- [63] A. Parra-H and G. Nates-Parra, "First record of Eufriesea bare Gonzalez & Gaiani and notes on the distribution of three species of orchid bees pertaining to the genus Euglossa Latreille (Apidae: Euglossini) in Colombia," *Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales*, vol. 31, no. 120, pp. 415–423, 2007.
- [64] A. Nemésio, S. C. Augusto, and E. A. B. Almeida, "Euglossa decorata Smith (Hymenoptera: Apidae) in central Brazil - Biogeographic implications," *Lundiana*, vol. 8, no. 1, pp. 57–61, 2007.
- [65] T. J. Otero, "Biología de Euglossa nigropilosa Moure (Apidae: Euglossinae) I: características de nidificación en la Reserva Natural de Planada," *Boletín Museo Entomología Universidad del Valle*, vol. 4, no. 1, pp. 1–19, 1996.
- [66] D. W. Roubik, "Sibling species of Glossura and Glossuropoda in the Amazon region (Hymenoptera: Apidae: Euglossini),"

- Journal of the Kansas Entomological Society*, vol. 77, no. 3, pp. 235–253, 2004.
- [67] C. Rasmussen and C. Skov, “Description of a new species of *Euglossa* (Hymenoptera: Apidae: Euglossini) with notes on comparative biology,” *Zootaxa*, no. 1210, pp. 53–67, 2006.
 - [68] D. A. Donoso, F. Salazar, F. Maza, R. E. Cárdenas, and O. Dangles, “Diversity and distribution of type specimens deposited in the invertebrate section of the museum of zoology QCAZ, Quito, Ecuador,” *Annales de la Société Entomologique de France*, vol. 45, no. 4, pp. 437–454, 2009.
 - [69] R. L. Dressler, “*Eulaema bombiformis*, *E. meriana*, and Mullerian Mimicry in Related Species (Hymenoptera: Apidae),” *Biotropica*, vol. 11, no. 2, pp. 144–151, 1979.
 - [70] S. Ramírez, “Reporte final del proyecto,” *Diversidad y Evolución de las Abejas de las Orquídeas y sus Plantas Hospederas en Colombia*, Department of Organismic and Evolutionary Biology and Museum of Comparative Zoology. Harvard University, 2006, <http://www.faae.org.co/colombiabiodiversa/informes/SantiagoRamirez>.
 - [71] G. A. R. Melo, “Notes on the systematics of the orchid-bee genus *Eulaema* (Hymenoptera, Apidae),” *Revista Brasileira de Entomologia*, vol. 58, no. 3, pp. 235–240, 2014.
 - [72] M. L. Oliveira, “Catálogo comentado das espécies de abelhas do gênero *Eulaema* Lepeletier, (Hymenoptera: Apidae),” *Lundiana*, vol. 8, no. 2, pp. 113–136, 1841.
 - [73] J. Hayes, *Abejas silvestres (Himenóptera: Apoidea) en la neblina: Análisis de la diversidad, interacciones, y potencial para miel en un remanente de bosque nublado*, 2015.
 - [74] M. L. Oliveira, “Três novas espécies de abelhas da Amazônia pertencentes ao gênero *Eulaema* (Hymenoptera: Apidae: Euglossini),” *Acta Amazonica*, vol. 36, no. 1, pp. 121–127, 2006.
 - [75] J. S. Moure, “As espécies do gênero *Eulaema* Lepeletier, 1841 (Hymenoptera, Apidae, Euglossinae),” *Acta Biológica Paranaense*, vol. 29, 2000.
 - [76] C. A. Garófalo, E. Camillo, and J. C. Serrano, “Reproductive aspects of *Meloetyphlus fuscatus* a meloid beetle cleptoparasite of the bee *Eulaema nigrata* (Hymenoptera, Apidae, Euglossini),” *Apidologie*, vol. 42, no. 3, pp. 337–348, 2011.
 - [77] R. Ospina-Torres, “Revisión de la morfología genital masculina de *Eulaema* (Hymenoptera: Apidae),” *Revista de Biología Tropical*, vol. 46, no. 3, pp. 749–762, 1998.
 - [78] R. Ospina-Torres and J. C. Sandino-Franco, “*Eulaema chocoana*, nueva especie de abeja euglosina de la costa pacífica colombiana,” *Caldasia*, vol. 19, no. 1-2, pp. 165–174, 1997.
 - [79] R. L. Dressler and R. Ospina-Torres, “Una nueva especie de *Eulaema* (Hymenoptera: Apidae) del Choco,” *Caldasia*, vol. 19, no. 1-2, pp. 95–100, 1997.
 - [80] L. S. Kimsey, “An illustrated key to the genus *Exaerete* with descriptions of male genitalia and biology (Hymenoptera: Euglossini, Apidae),” *Journal of the Kansas Entomological Society*, vol. 52, no. 4, pp. 735–746, 1979.
 - [81] A. Nemésio and C. Rasmussen, “Sampling a biodiversity hotspot: The orchid-bee fauna (hymenoptera: Apidae) of tarapoto, northeastern peru, the richest and most diverse site of the neotropics,” *Brazilian Journal of Biology*, vol. 74, no. 3, pp. 33–44, 2014.

