Journal *of* Melittology
Bee Biology, Ecology, Evolution, & Systematics *The latest buzz in bee biology*
No. 43, pp. 1–26 11 December 2014

A new paracolletine bee from Colombia (Hymenoptera: Colletidae), with an updated checklist of the tropical Andean bee fauna

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Abstract. A new species of the paracolletine genus *Lonchopria* Vachal, ***Lonchopria* (*Biglossa*) *comforti*** Gonzalez & Engel, new species, from high elevations in the Central Andes of Colombia is described and figured. A preliminary key to the species of the *Lonchopria* subgenus *Biglossa* Friese is presented. Recent records of bees occurring at elevations above 2500 m in Colombia and other Andean countries are also summarized.

INTRODUCTION

The South American Andean bee fauna remains among the least known in the world. Many areas in this region are largely unexplored and material deposited in collections and available for study is scarce. Gonzalez & Engel (2004) reviewed for the first time the biology, diversity, biogeography, and distribution of the assemblage of bees occurring at high elevations in the Andes from Venezuela to Peru. While recording about 131 species in 33 genera from five extant bee families, Gonzalez & Engel (2004) demonstrated the uniqueness of this fauna, which parallels the Andean flora

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ISSN 2325-4467

in its origins and distribution. They also stressed the importance of continuing its taxonomic exploration not only to increase our understanding of the biogeography of neotropical bees, but also to promote their conservation and sustainable use given that moderate elevations of the Andes are the center of agriculture in all Andean countries. Since that review, a number of genera and species have been documented from this region, albeit not all occurring at high elevations, but certainly revealing the richness and diversity of bees along the range of the Andes (*e.g.*, Ascher *et al*., 2006; Celis *et al*., 2014; Engel, 2007, 2009a, 2010a, 2010b; Engel *et al*., 2006; Engel & Gonzalez, 2009; Gonçalves & Engel, 2010; Gonzalez, 2004, 2006; Gonzalez & Engel, 2011, in press; Gonzalez & Ruz 2007; Gonzalez *et al*., 2013a; Smith-Pardo & Gonzalez, 2009).

The purpose of this paper is two-fold. First, to describe a new species of Paracolletini in the genus *Lonchopria* Vachal from the Andes of Colombia, and second, to summarize recent records in the literature on the diversity of the tropical Andean bee fauna. The 17 nominal species of this South American genus occur from the state of Paraná in Brazil, Chile and Argentina, through the Andes of Bolivia, Peru, and Colombia, where it appears to be particularly diverse (Michener, 1989, 2007). The species described herein belongs to the subgenus *Biglossa* Friese, the largest (nine species) of the five subgenera recognized in *Lonchopria* (Table 1); it represents the second species of *Lonchopria* known from Colombia (Gonzalez & Engel, in press). We also provide a preliminary key to the species of the subgenus *Biglossa*.

MATERIAL AND METHODS

Material presented here is deposited in the Museo Entomológico Francisco Luis Gallego, Universidad Nacional de Colombia, Medellín, Colombia (MEFLG) and Division of Entomology, University of Kansas Natural History Museum, Lawrence, Kansas (SEMC). The description is provided in the belief that such accounts refine our hypotheses of specific diversity and taxonomic circumscriptions, and elaborate on the pattern and combination of traits that ultimately provide the foundations for understanding general phenomena among bees (Grimaldi & Engel, 2007; Engel, 2011; Gonzalez *et al*., 2013b). Morphological terminology follows that of Engel (2001) and Michener (2007), except that the projections from the inner metatibial spur are herein called branches, instead of teeth, and torulus is used instead of antennal socket (*vide* Engel, 2009b). The format for the description generally follows that used by Gonzalez & Florez (2011) and Gonzalez & Engel (in press). The abbreviations F, S, and T, are used for antennal flagellomere, and metasomal sternum and tergum, respectively. Total body length was estimated by measuring the combined lengths of the head, mesosoma (from the clypeus to the propodeum, in lateral profile), and metasoma, and adding the values. Forewing length was measured from the outer border of the tegula to the tip of the forewing. Intertegular distance was the shortest distance between the inner margins of the tegulae. Photomicrographs were prepared using a Canon EOS 7D digital camera attached to an Infinity K-2 long-distance microscopic lens, and were assembled with CombineZM software™. Final figures were processed with Adobe® Photoshop® 7.0. Measurements were made with an ocular micrometer attached to an Olympus SZX-12 stereomicroscope. To facilitate comparisons, in the appendix we summarize new records of Andean bees following the format of Gonzalez & Engel (2004). As in that work, species were coded as "restricted" when found only at high elevations (> 2500 m), "widespread" when found from lowlands to highlands, and

"transient" when collected at high elevations even though they clearly belong to other elevations and ecosystems. For an overview of the topography, vegetation, and geological history of the Andean region see Gonzalez & Engel (2004) and references therein.

SYSTEMATICS

Genus *Lonchopria* Vachal
Subgenus *Biglossa* Friese
Lonchopria* (*Biglossa*) *comforti Gonzalez & Engel, new species
ZooBank: urn:lsid:zoobank.org:act:60420568-D290-44AD-938C-AC193F47A9AE
(Figs. 1–18)

Diagnosis: The female of this species can be recognized by the following combination of characters: clypeus largely asetose and impunctate except on depressed, mediobasal area (Figs. 3, 5); integument dark brown to black with weak metallic bluish or greenish highlights on face and mesoscutum (Figs. 5, 6); mesoscutum imbricate with punctures separated by at least a puncture width (Fig. 6); and metasomal terga with sparse basal and apical yellowish fasciae (Figs. 1, 2, 8). The male can be recognized by the following combination of characters: clypeus with punctate, depressed median area occupying about basal two-thirds of clypeal length (Fig. 11); legs unmodified, not swollen nor with tooth or projections; malar area linear; head, mesosoma (excluding legs), and metasomal terga with distinct bluish or greenish highlights (Figs. 9, 10); and metasomal terga with distinct apical yellowish fasciae. The female of *L. comforti* resembles that of a presently unnamed species of *Lonchopria* from Norte de Santander, Colombia (Gonzalez & Engel, in press), both with the clypeus largely asetose and impunctate except on depressed, mediobasal area, and the body pubescence dark brown to black. It differs from that species in the larger depressed median area of the clypeus (occupying about basal two-thirds of clypeal length in *L. comforti*; basal half of clypeus in the unnamed species); head and mesosoma with weak metallic bluish or greenish highlights, sometimes on the metasomal terga (absent in the unnamed species); metasomal terga with sparse basal and apical yellowish fasciae (absent in the unnamed species); and metasomal terga dull and strongly imbricate (metasomal terga shinier and weakly imbricate in the unnamed species). Additionally, *L. comforti* is known from the Central cordillera while the unnamed species occurs from the Eastern cordillera, near the border with Venezuela (Gonzalez & Engel, in press).

Description: ♀: Body length 11.7 mm (10.5–12.7, $\bar{x}$ = 11.2, n = 13); forewing length 8.2 mm (8.2–8.8, $\bar{x}$ = 8.5, n = 10); head width 3.6 mm (3.4–3.8, $\bar{x}$ = 3.6, n = 13), length 2.9 mm (2.6–2.9, $\bar{x}$ = 2.8, n = 13). Head 1.2 times wider than long; inner orbits of compound eyes slightly converging below (Fig. 5); intertorular distance about twice as long as median ocellar diameter, 0.7 times of torulorbital distance; torulus diameter about as wide as median ocellar diameter; ocellocular distance 2.5 times median ocellar diameter, about twice as long as ocelloccipital distance; interocellar distance 0.9 times length of ocellocular distance, 2.2 times median ocellar diameter; compound eye about three times longer than broad; gena widest medially, 0.9 times narrower than compound eye in profile; mandible not apically expanded, with small preapical tooth (Fig. 4); clypeus protuberant in profile, disc convex with distinct median depression on basal two-thirds (Figs. 3, 5); scape 5.7 times longer than broad; pedicel about as long as broad,

Table 1. Classification of *Lonchopria* Vachal (*sensu* Michener, 1989, 2007). Floral records taken from the literature and museum specimens (*vide* Gonzalez & Engel, in press).

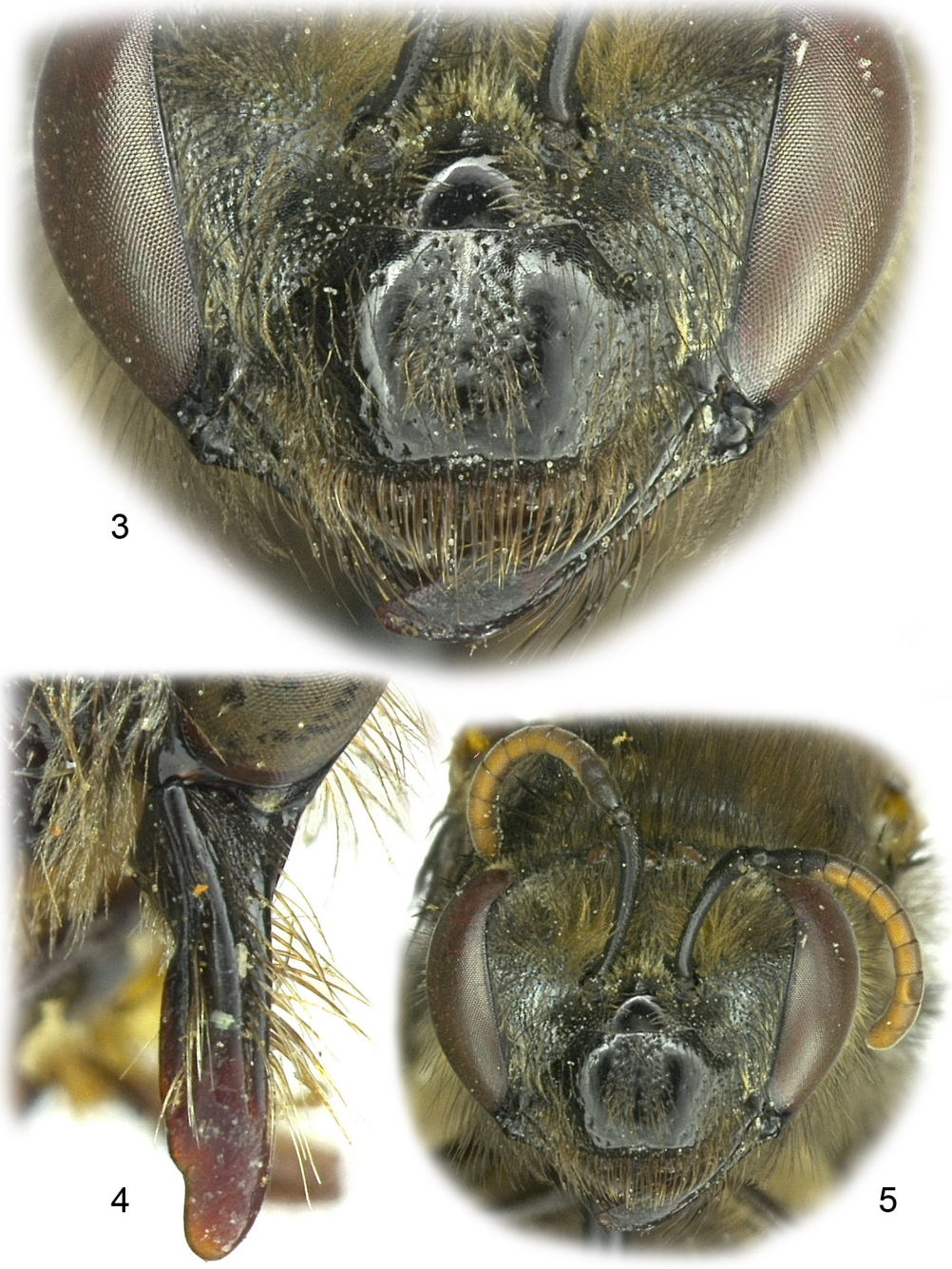
Taxon	Sexes	Elevation	Distribution	Floral records
Genus *Lonchopria* Vachal				
Subgenus *Biglossa* Friese				
L. aenea (Friese)	♀♂	—	Argentina (Salta, Tucumán)	—
L. alopex Cockerell	♂	—	Bolivia (La Paz)	—
L. chalybaea (Friese)	♀♂	850–1450 m	Argentina (Catamarca, Mendoza, Salta, Tucumán)	ASTERACEAE: *Baccharis marginalis* var. *coerulescens*, *B. serrulata*, *B. salicifolia*, *Cyclolepis genistoides*, *Heterothalamus spartioides*, *Parchenium hysterophorus*. SOLANACEAE: *Lycium gracile*, *L. chilense*, *L. longiflorum*, *Physalis viscosa*, *Solanum elaeagnifolium*, *S. atriplicifolium*. TAMARICACEAE: *Tamarix africana*.
L. comforti, n. sp.	♀♂	2459–2505 m	Colombia (Antioquia)	ASTERACEAE: *Ageratina tinifolia*. CLUSIACEAE: *Clusia gutifera*. MELASTOMATACEAE: *Tibouchina lepidota*. SOLANACEAE: *Solanum tuberosum*.
L. sp. (Gonzalez & Engel, in press)	♀	2640 m	Colombia (Norte de Santander)	—
L. deceptrix (Moure)	♀♂	1450 m	Argentina (Catamarca, Tucumán)	—
L. inca Cockerell	♂	2389 m	Peru (Lima)	—
L. longicornis Michener	♀♂	1450 m	Argentina (Catamarca)	ASTERACEAE: *Baccharis* sp. SOLANACEAE: *Solanum* sp.
L. nivosa (Vachal)	♀♂	500–1000 m	Argentina (Salta, Tucumán)	—
L. robertsi Michener	♀♂	2300 m	Argentina (Catamarca, Chubut, Tucumán)	FABACEAE: *Prosopis nigra*. ZYGOPHYLLACEAE: *Bulnesia retama*, *Larrea divaricata*, *L. cuneifolia*.

Table 1. Continued.

Taxon	Sexes	Elevation	Distribution	Floral records
Subgenus *Biglossa* Friese				
L. thoracica (Friese)	♀♂	350 m	Argentina (Mendoza, Salta, Tucumán)	ASTERACEAE: *Baccharis serrulata*, *B. salicifolia*, *B. subulata*, *Bidens leucantha*, *Heterothalamus spartioides*, *Senecio pinnatus*. FABACEAE: *Acacia furcata*, *Prosopis alpataco*, *P. campestris*, *Glycyrrhiza atragalina*, *Medicago sativa*. RANUNCULACEAE: *Clematis hilarii*. SOLANACEAE: *Lycium gracile*, *L. chilense*, *L. argentinum*, *Physalis viscosa*, *Physalis* sp., *Solanum elaeagnifolium*, *S. atriplicifolium*. ZYGOPHYLLACEAE: *Bulnesia retama*, *Larrea divaricata*.
Subgenus *Ctenosibyne* Moure				
L. cingulata Moure	♀♂	934 m	Brazil (Paraná, São Paulo)	—
Subgenus *Lonchoprella* Michener				
L. annectens Michener	♀♂	—	Argentina (Catamarca, Santiago del Estero)	FABACEAE: *Prosopis alba*, *Zucagnia* sp.
Subgenus *Lonchopria s.str*.				
L. luteipes (Friese)	♀	—	Chile (Santiago)	—
L. rufitorax Ruiz	♀	—	Chile (Chiloe, Concepción)	—
L. similis (Friese)	♀♂	—	Chile (Arauco, Atacama, Cauquenes, Coquimbo, Concepción)	CACTACEAE: *Echinopsis chiloensis litoralis*.
L. zonalis (Reed)	♀♂	520 m	Chile (Concepción, Coquimbo, Santiago, Valparaíso)	ROSACEAE: *Eriobotrya japonica*, *Quillaja saponaria*.
Subgenus *Porterapis* Michener				
L. porteri Ruiz	♀♂	—	Chile (Coquimbo)	LORANTHACEAE: *Tristerix corymbosus* (as *Phrygilanthus tetrandrus*).

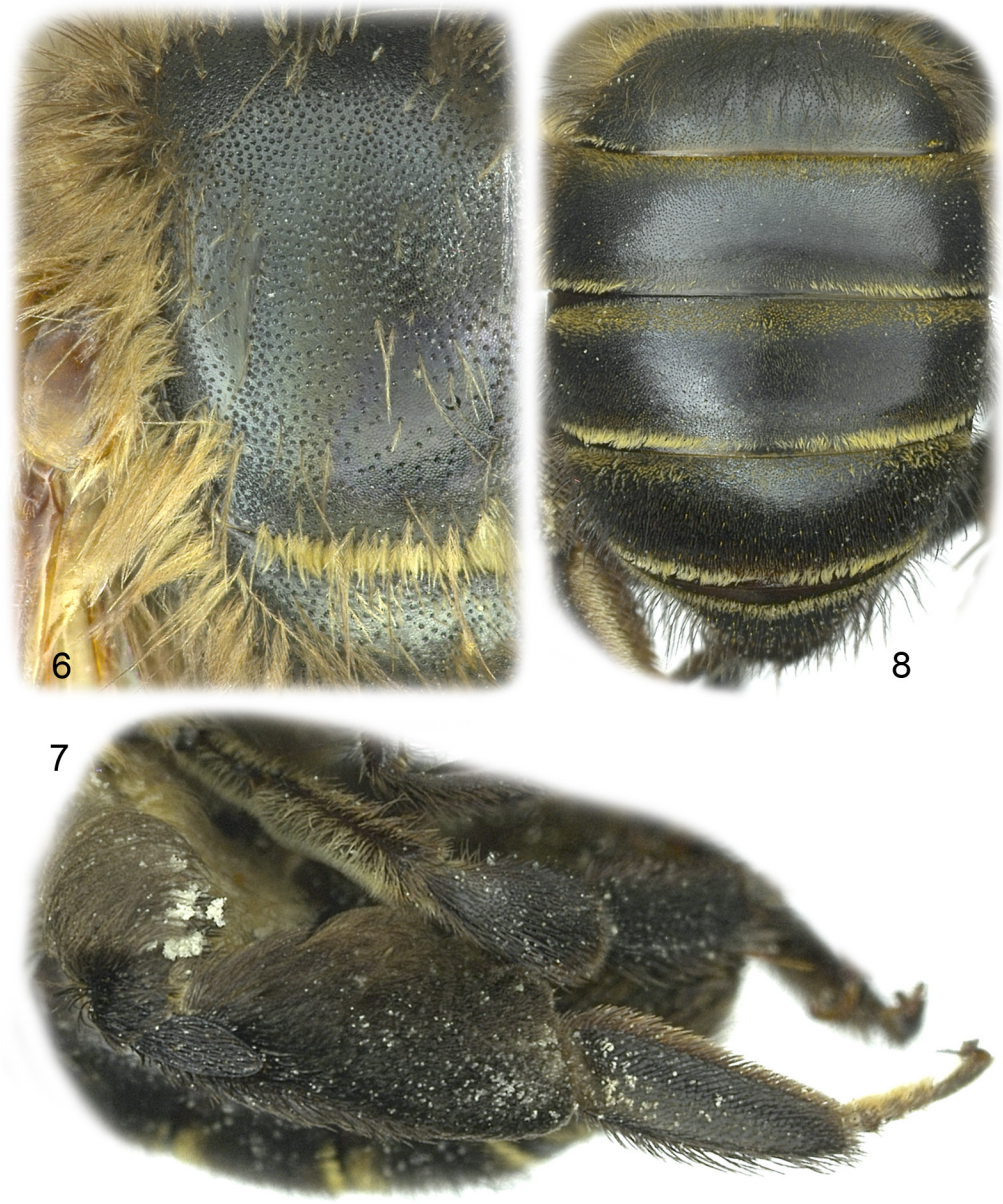
Figures 1–2. Female holotype of *Lonchopria* (*Biglossa*) *comforti*, new species. **1.** Lateral habitus. **2.** Dorsal habitus.

0.6 times length of first flagellomere; first flagellomere 1.3 times longer than broad, 1.5 times longer than second; second flagellomere broader than long, slightly shorter than third, remaining flagellomeres progressively increasing in length, apical flagellomere longest. Intertegular distance 2.5 mm (2.5–2.7, $\bar{x} = 2.6$, $n = 13$). Protibial spur with apical portion of rachis long, about as long as malus length, with distinct row of eight elongate branches, not including apical portion of rachis (7–9 branches in some paratypes); inner metatibial spur with distinct row of nine elongate branches, not including apical portion of rachis (10 branches in some paratypes).



Figures 3–5. Female holotype of *Lonchopria* (*Biglossa*) *comforti*, new species (except paratype in figure 4). **3.** Lower three-quarters of head detailing clypeal structure and sculpturing. **4.** Outer surface of mandible. **5.** Full facial view.

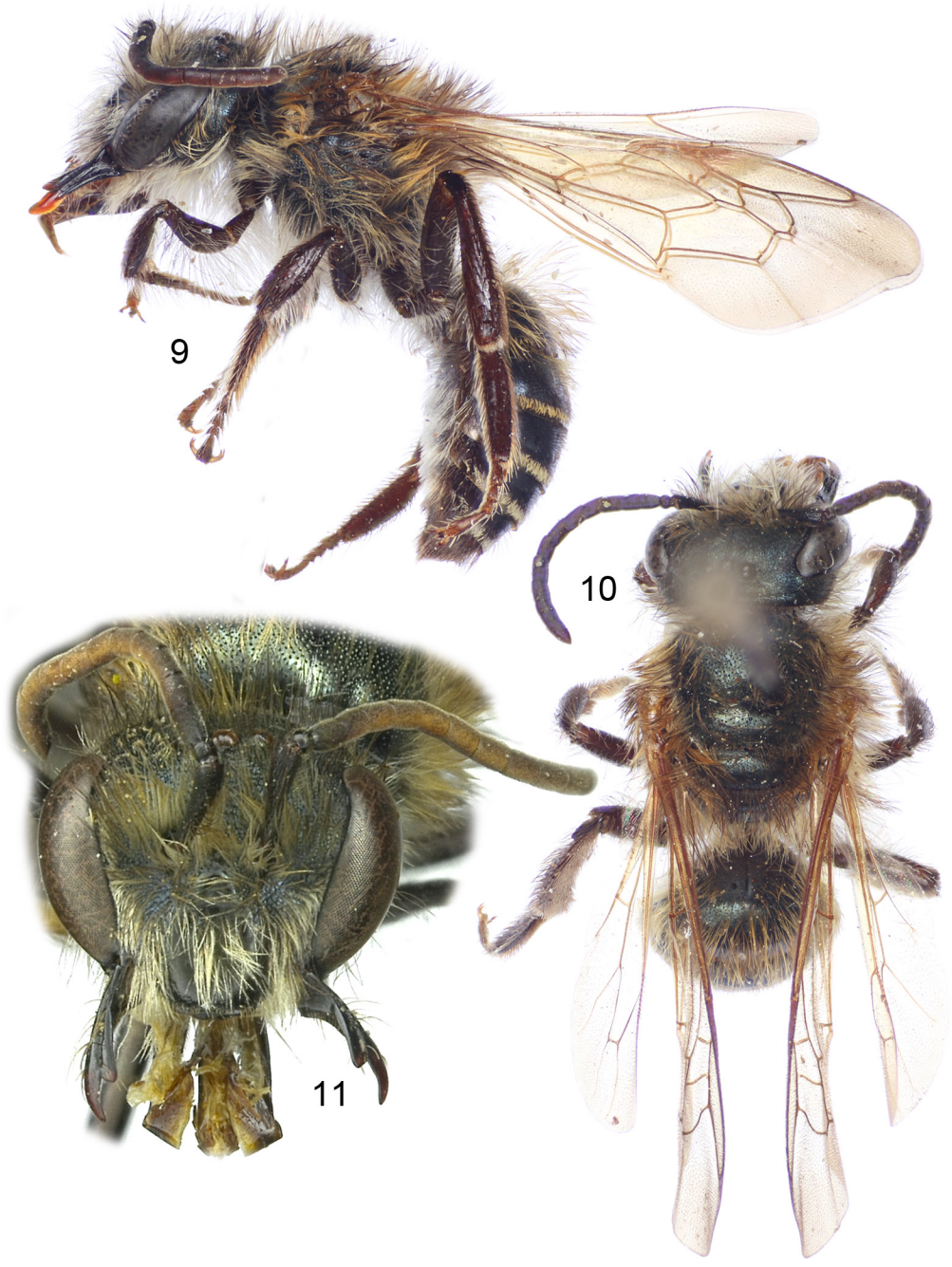
Color black, except as follows: F3–10 ventrally yellowish; apex of mandible, pro- and mesofemora, distitarsi, and discs of metasomal sterna dark reddish brown; frons, vertex, and mesoscutum with weak metallic bluish or greenish highlights. Tegula brownish; wing membranes translucent orange, veins and pterostigma dark orange.



Figures 6–8. Female holotype of *Lonchopria* (*Biglossa*) *comforti*, new species (except paratype in figure 6). **6.** Left half of mesoscutum and mesoscutellum. **7.** Metatibia and metabasitarsus. **8.** Detail of metasomal terga.

Head and mesosoma with mainly yellowish to light reddish brown setae mixed with dark brown to black setae on frons, vertex, mesoscutum, and pleura dorsally; legs with dark brown to gray setae except coxae and femora of all legs with yellowish setae. Metasoma with dark brown setae except distal margins of T1–T4 and basal areas of T2–T5 with yellowish fasciae.

Clypeus largely impunctate, smooth, and shining, except lateral areas and mid-basal depression imbricate, with punctures separated by a puncture width or less;



Figures 9–11. Male paratype of *Lonchopria* (*Biglossa*) *comforti*, new species. **9.** Lateral habitus. **10.** Dorsal habitus. **11.** Facial view.

supraclypeal area impunctate, smooth, and shining on center, otherwise with small contiguous punctures; subantennal area impuctate, weakly imbricate to nearly smooth and shining; paraocular area weakly imbricate with punctures separated by 1–2 times a puncture width; frons imbricate with punctures contiguous and forming rows above

Figures 12–18. Male paratype of *Lonchopria* (*Biglossa*) *comforti*, new species. **12.** Outer surface of mandible. **13.** Left half of metasomal sternum seven. **14.** Right half of sternum eight. **15.** Lateral view of sternum eight. **16.** Genital capsule, ventral view. **17.** Genitalia, lateral view. **18.** Genitalia, dorsal view.

antennal toruli, punctures sparser (1–2 times a puncture width) below median ocellus; vertex weakly imbricate with punctures separated by less a puncture width or less, sparser behind ocelli; gena imbricate with punctures separated by 1–2 times a punc-

ture width; postgena weakly imbricate with punctures sparser than on gena. Mesoscutum imbricate with punctures separated by 1–2 times a puncture width anteriorly, along lateral and posterior borders, and on central disc, otherwise punctures considerably more sparse (Fig. 6); mesoscutellum imbricate with punctures separated by 1–2 times a puncture width, sparser on disc; metanotum imbricate with punctures smaller and shallower than those on mesoscutum, separated by about a puncture width or less. Pleura imbricate with punctures separated by a puncture width or less; metepisternum transversely striate near wing base. Propodeum with basal area strongly and finely imbricate and impunctate, lateral and posterior surfaces strongly imbricate with punctures separated by 1–2 times a puncture width or less. Metasoma finely imbricate with small punctures separated by 2–4 times a puncture width on T1, those on T2–T4 smaller and denser, T5 with larger punctures than on T1, separated by 2–4 times a puncture width basally, much closer distall; sterna with punctures separated by a puncture width or less.

♂: As described for the female, except for usual secondary sexual characteristics and the following: Body length 8.5–9.7 mm ($\bar{x}$ = 9.1, n = 6); forewing length 7.1–7.8 mm ($\bar{x}$ = 7.4, n = 5); head width 3.0–3.3 mm ($\bar{x}$ = 3.2, n = 6), length 2.4–2.7 mm ($\bar{x}$ = 2.6, n = 6). Inner orbits of compound eyes converging below (Fig. 11); intertorular distance 2.4 times median ocellar diameter, about as long as torulorbital distance; ocellocular distance 2.9 times median ocellar diameter, 1.9 times ocelloccipital distance; interocellar distance 0.8 times length of ocellocular distance; compound eye 2.4 times longer than broad; mandible apically expanded, with large preapical tooth (Fig. 12); frontal line carinate, extending from median ocellus to supraclypeal area, abruptly ending at that point as small tooth (better seen in profile) (Fig. 11); scape 8.0 times longer than broad; flagellum in repose reaching mesoscutellum, first flagellomere 1.6 times longer than broad, 1.2 times longer than second; second flagellomere 1.3 times longer than broad, about as long as third. Intertegular distance 2.0–2.2 mm ($\bar{x}$ = 2.2, n = 6). Protibial spur with apical portion of rachis long, 0.6 times length of malus, with distinct row of 10–13 elongate branches (not including apical portion of rachis); inner metatibial spur ciliate.

Color as in female but with legs largely dark reddish brown and with more conspicuous metallic bluish or greenish highlights on head, mesosoma, and metasomal terga (Figs. 10, 11).

Pubescence paler, longer, and sparser than in female. Metasoma with denser and longer apical fasciae on T2–T5.

Integument with sculpturing as described for the female, except frons strongly imbricate and with denser punctures, and mesoscutum and mesoscutellum weakly imbricate to nearly smooth. Genital capsule and associated hidden sterna as in Figs. 13–18.

Holotype: ♀, Colombia: Antioquia, Envigado, San Sebastian, Papa [*Solanum tuberosum* L. variety Diacol capiro]-Bosque. Trans. Papa ppal. En: Jama 11:30am. 2459 m.s.n.m., 06°08′04.6″N, 075°32′17″W, 19°C, 65%HR, Enero 22, 2010. Col. Sepúlveda-Cano, P., Osorio, N. (MEFLG).

Paratypes: 1♀, with same data as holotype (MEFLG); 1♀, with same data as holotype except collected at 10:00am (SEMC); 3♀♀, with same data as holotype except collected 21 January 2010 and at 12:00 m. and 3:30am, and 18 January 2010 at 11:30am, respectively (MEFLG); 1♀, Colombia: Antioquia, Envigado, Las Palmas, Cultivo-Bosque. Trans. Borde. En: Jama 9:00am. 2505 m.s.n.m., 06°09′07.3″N, 075°30′48.4″W, 20°C, 59%HR, Agosto 28, 2009. Col. Sepúlveda-Cano, P. (MEFLG); 1♀, Colombia: Antioquia, Envigado, Loma del Escobero, Papa [*Solanum tuberosum* L. variety Dia-

col capiro]-Bosque. Trans. Papa ppal. En: Jama 12:00 m. 2459 m.s.n.m., 06°07′03″N, 075°32′16″W, 19°C, 65%HR, Enero 22, 2010. Col. Sepúlveda-Cano, P., Osorio, N. (MEFLG); 1♀, with data as on previous female except 20 January 2010 (MEFLG); 1♀, with data as on previous female except collected 21 January 2010 and at 9:00am (SEMC); 1♀, Antioquia, 25 km S, Medellin, 21 January 1984, James H. Cane (SEMC); 2♀♀, Antioquia, Retiro, En: *Gutifera* [Clusiaceae], Febrero de 1975, Col: A. Molina (MEFLG); 2♂♂, Antioquia, Rionegro, En: *Eupatorium tinifolium* [*Ageratina tinifolia* (Kunth) R.M.King & H. Rob], Julio de 1975, Col: J. Cano (MEFLG); 1♂, Antioquia, Rionegro, En: *Eupatorium tinifolium* [*Ageratina tinifolia* (Kunth) R.M.King & H. Rob], Julio de 1975, Col: R. Añez (MEFLG); 1♂, Antioquia, Rionegro, En: *Tibouchina lepidota* [*Tibouchina lepidota* (Bonpl.) Baillon], Julio de 1975, Col: R. Añez (MEFLG); 2♂♂, Antioquia, Rionegro, En: *Eupatorium tinifolium* [*Ageratina tinifolia* (Kunth) R.M.King & H. Rob], Julio de 1975, Col: J. Cano (SEMC); 1♀, Caldas, Pensilvania, VI-25-1978, J.H. Cane (SEMC).

COMMENTS: Unlike the holotype, some female paratypes have lighter body pubescence and the integument largely dark reddish brown with more metallic bluish or greenish highlights on the head, mesosoma, and metasomal terga.

This species has been collected between 2000 and 2500 m elevation in the Central Andes of Colombia. It appears to be present year-round, as specimens have been captured from January through August.

ETYMOLOGY: This species honors Mr. Mark Douglas Comfort (6 August 1962–24 November 2014). Doug was a courageous, resilient, smart, kind, and gifted man, who was a lifelong musician and songwriter. He was a committed member of the St. Elizabeth Ann Seton Catholic Church in Salina, Kansas, who strongly advocated for healthy, purposeful, and active living. Doug is survived by his wife Louise and two sons, Kane and Lucas, his father Dave, and siblings Mike, Mitch, Jeff, and Julie. "Uncle Doug" is sorely missed.

Key to Species of *Biglossa*

Females

We were not able to examine the female of *L. thoracica* (Friese); *L. alopex* Cockerell and *L. inca* Cockerell are known only from the male. Thus, these species are not included in the key.

1. Clypeus punctate throughout or nearly so, without distinct mediobasal depressed area 2
—. Clypeus largely asetose and impunctate except on depressed, mediobasal area (Fig. 3) 4
2(1). Mesoscutum imbricate between punctures; terga with weak metallic green or blue highlights (Argentina) ..... *L. chalybaea* (Friese)
—. Mesoscutum smooth and shiny between punctures; terga without weak metallic green or blue highlights 3
3(2). Base of T1 imbricate, with punctures at most slightly larger than those on second and third terga; body pubescence largely whitish, T1–T5 each with complete (transverse across tergal width) white apical fasciae (Argentina) .... *L. longicornis* Michener
—. Base of T1 smooth and shiny with punctures distinctly larger than those on second and third terga; body pubescence largely dark brown to black, distal margin of T2, and discs of T3 and T4 medially with yellow fasciae (Argentina) ..... *L. nivosa* (Vachal)

4(1). Mesoscutum imbricate between punctures (sometimes with large impunctate areas on disc) (Fig. 6) 5
—. Mesoscutum largely smooth and shiny between punctures 6
5(4). Mesoscutum, mesoscutellum, and T1 with reddish setae; head and mesosoma dark brown to black, without metallic bluish or greenish highlights (Argentina) ..... *L. aenea* (Friese)
—. Mesoscutum, mesoscutellum, and T1 with dark brown or black setae; head and mesosoma with weak metallic bluish or greenish highlights, sometimes on metasomal terga (Colombia) ..... *L. comforti*, n. sp.
6(4). Body pubescence pale, whitish to yellowish; terga densely covered by fasciae, integument barely visible; clypeus with depressed median area with punctures contiguous (Argentina) ..... *L. robertsi* Michener
—. Body pubescence dark brown to black; terga without fasciae, sparsely covered by erect, mostly-simple setae, integument largely visible; clypeus with depressed median area with punctures scattered [Colombia: Norte de Santander (Gonzalez & Engel, in press)] ..... *Lonchopria* sp.

Males

The Bolivian species *L. alopex* is known only from the male. It is not included in this key but, based on the original description, it might run to *L. deceptrix* (Moure) from Argentina. The male of the undescribed species from Norte de Santander, Colombia, is unknown (Gonzalez & Engel, in press).

1. Clypeus punctate throughout 2
—. Clypeus largely asetose and impunctate, except basally 4
2(1). Metafemur distinctly swollen; metatibia with distinct carina projecting into a tooth near apex on anterior margin; clypeus dull, coarsely and densely punctate, densely covered by relatively short, minutely-branched setae (integument obscured); clypeus with distinct preapical ridge swollen laterally; terga metallic bluish to greenish (Argentina) ..... *L. chalybaea* (Friese)
—. Metafemur and metatibia unmodified, not swollen or with carina; clypeus shinier, with sparser punctures, with longer branched setae, without swollen preapical ridge; terga black, without metallic highlights 3
3(2). Clypeal margin laterally projecting into a tooth; sculpturing of T1 notoriously different from that of second and third terga, strongly imbricate, with punctures sparser and larger than the contiguously punctate second and third terga (Argentina) ..... *L. nivosa* (Vachal)
—. Clypeal margin straight; sculpturing of T1 similar to that of second and third terga, strongly imbricate with minute, very sparse punctures (Peru) ... . *L. inca* Cockerell
4(1). Terga with metallic bluish or greenish highlights 5
—. Terga dark brown to black, without metallic bluish or greenish highlights ... 7
5(4). Head and mesosoma (excluding legs) with metallic bluish or greenish highlights as on terga; clypeus with noticeably depressed, punctate, median area occupying about basal two-thirds of clypeal length (Colombia) .... *L. comforti*, n. sp.
—. Head and mesosoma dark brown to black, without metallic bluish or greenish highlights; clypeus with median area punctate, not depressed or scarce-

ly depressed, occupying basal half of clypeus (Argentina) 6
6(5). Malar area linear; metabasitarsus narrow, about half width of metatibia (Argentina) ..... *L. deceptrix* (Moure)
—. Malar area longer, about half width of F1; metabasitarsus broad, about two-thirds of metatibia width (Argentina) ..... *L. aenea* (Friese)
7(4). F1 long, distinctly longer than broad, about 1.8 times longer than broad (Argentina) ..... *L. longicornis* Michener
—. F1 short, about as long as broad or slightly longer 8
8(7). Mandible with small median teeth, thus appearing tridentate; terga without apical fasciae (Argentina) ..... *L. thoracica* (Friese)
—. Mandible without small median teeth; T1–T5 with apical fasciae (Argentina) .. .. *L. robertsi* Michener

DISCUSSION

As in many groups of bees (Gonzalez *et al*., 2013b), a significant amount of work remains to be done in the species-level taxonomy of *Lonchopria*. For example, based on the material we examined at SEMC, several other new species from Argentina, Chile, and Peru were recognized during this study. However, we chose not to include them here until a comprehensive treatment of the group is undertaken and more material is examined from those countries where the genus is most diverse. The preliminary key to the species presented here would allow the recognition of almost all named species of *Biglossa*. To date, the only available key is that of Moure (1949) for the three Argentinean species he separated in *Biglossidia* Moure, and that Michener (1989) synonymized under *Biglossa*.

During the last decade, at least 27 species and six genera from the high elevations in the tropical Andes have been documented in the literature. That is, a total of 158 identified species and 39 genera are today known from high elevations of the Andes from Venezuela through Peru (Appendix). Apidae and Halictidae remain as the most diverse families, together accounting for nearly half of the total species. The most diverse genera are *Neocorynura* Schrottky (18 species), *Augochlora* Smith (16 species), *Anthidium* Fabricius (16 species), *Chilicola* Spinola (15 species), and *Bombus* Latreille (14 species). Although *Augochlora* is a species-rich lineage, there has been no modern revision of the group and several of the species established by Vachal may prove to be synonyms, thereby considerably reducing its purported diversity in the Andes. Indeed, many of the genera are in need of a modern consideration of species hypotheses as in the case of *Lonchopria*. Although some genera, such as *Neocorynura* and *Bombus*, appear to be equally diverse across the tropical Andean region, others seem to be more diverse in particular areas or habitats. For example, *Anthidium* are highly diverse in ecoregions on the western flank of the Andes of Peru and Ecuador, namely the Central Andean dry puna, Sechura Desert, and the Central Andean puna (Gonzalez & Griswold, 2013). A number of halictine genera occur in elevations close to the 2500 m mark set as "high elevations". For example, species of *Ischnomelissa* Engel (Engel, 2013), *Chlerogas* Vachal (Engel, 2009a, 2010a; Engel & Gonzalez, 2009; Engel *et al*., 2006), *Caenaugochlora* Michener (Gonçalves & Engel, 2010), and *Chlerogella* (Engel, 2010b; Engel & Rasmussen, 2013) sometimes meet and exceed 2400 m and it is possible that some of those species, or new species closely related, may eventually be discovered at or above 2500 m. Therefore, a greater diversity is expected at higher elevations as more habitats and locations are sampled across the Andean region.

The highest reaches of the Andes are ripe for research, with a continually growing fauna of unique composition. The biology and status of these species are in need of considerable study, and some endemic groups may be susceptible to the influences of human-mediated climate change given that there is a fixed, upper-elevational limit to which they and their associated flora can escape. As their 'island' peaks become augmented from rising temperatures and environmental degradation, entire ecosystems not represented further down the slopes may disappear. This makes it imperative that efforts be undertaken now to survey the highest regions of the Andes and grants us the opportunity to understand this rich bee fauna before it is eroded or even lost.

ACKNOWLEDGEMENTS

We are grateful to two anonymous reviewers for their constructive comments. Partial support was provided by US National Science Foundation grant DBI-1057366 (to M.S.E.), as well as the Engel Illustration Fund of the University of Kansas College of Liberal Arts & Sciences. This is a contribution of the Division of Entomology, University of Kansas Natural History Museum.

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APPENDIX

Checklist of High-Elevation, Andean Bees

Below is an updated checklist of bees at high elevations (over 2500 m) in the Andean region. The original checklist was provided in Gonzalez & Engel (2004).

Annotations in the table are as follow: Sociality (Soc.): SC = eusocial; Sm = semisocial; C = communal; S = solitary; P = cleptoparasitic. Geographic distribution (Geogr. distr.): Venezuela (Ve), Colombia (Co), Ecuador (Ec), Peru (Pe). Elevational distribution (Elev. distr.): R = restricted to high elevations (> 2500 m); W = widespread, found from lowlands to highlands; T = transient, collected at high elevations even though they clearly belong to other elevations and ecosystems; ? = insufficient information available.

Taxa	Soc.	Elevation [m]	Geogr. distr.	Elev. distr.	References
ANDRENIDAE					
Protandrenini					
Incasarus garciai Gonzalez, Rasmussen & Engel	S	2750	Pe	R	Gonzalez *et al*. (2013a)
Liphanthus cuscoensis Gonzalez, Rasmussen, & Engel	S	4167	Pe	R	Gonzalez *et al*. (2014)
Protandrena bachue Gonzalez & Ruz	S	2830–3380	Co	R	Gonzalez & Ruz (2007)
Protandrena rangeli Gonzalez & Ruz	S	2600–2830	Co	R	Gonzalez & Ruz (2007)
Protandrena guarnensis Gonzalez & Ruz	S	2000–2575	Co	R	Gonzalez & Ruz (2007)
Protandrena wayruronga Gonzalez & Ruz	S	3150–3400	Ec, Co?	R	Gonzalez & Ruz (2007)

Appendix. Continued.

Taxa	Soc.	Elevation [m]	Geogr. distr.	Elev. distr.	References
APIDAE					
Anthophorini					
Anthophora andicola Schrottky	S	2500–4000	Pe	R	Gonzalez & Engel (2004)
Anthophora arequipensis Brèthes	S	2400–3300	Ec, Pe	R	Gonzalez & Engel (2004)
Anthophora paranensis Holmberg	S	590–2500	Pe	W	Gonzalez & Engel (2004)
Anthophora pilifrons Packard	S	1800–3300	Ec, Pe	R	Gonzalez & Engel (2004)
Anthophora versicolor Friese	S	2400–3000	Pe	R	Gonzalez & Engel (2004)
Anthophora walteri Gonzalez	S	2700–2720	Co	R	Gonzalez & Chavez (2004)
Apini					
Apis mellifera Linneaus	SC	0–3400	Ve, Co, Ec, Pe	W	Gonzalez & Engel (2004)
Bombini					
Bombus atratus Franklin	SC	150–3500	Co	W	Liévano & Ospina (1984), Gonzalez & Engel (2004)
Bombus baeri Vachal	SC	1900–4200	Pe	R	Chavarría (1996)
Bombus butteli Friese	SC	1370–3200	Ec, Pe	R	Chavarría (1996)
Bombus coccineus Friese	SC	2000–4200	Ec, Pe	R	Chavarría (1996)
Bombus ecuadorius Meunier	SC	1300–3500	Ec, Pe	R	Chavarría (1996)
Bombus funebris Smith	SC	2000–4750	Co, Ec, Pe	R	Liévano & Ospina (1984), Chavarría (1996), Gonzalez & Engel (2004)
Bombus handlirschi Friese	SC	2000–3480	Pe	R	Chavarría (1996)
Bombus hortulanus Friese		2100–3300	Co	R	Liévano & Ospina (1984), Gonzalez & Engel (2004)
Bombus opifex Smith	SC	0–3900	Ec, Pe	W	Chavarría (1996)
Bombus pullatus Franklin	SC	18–3500	Co	W	Liévano & Ospina (1984), Gonzalez & Engel (2004)

Appendix. Continued.

Taxa	Soc.	Elevation [m]	Geogr. distr.	Elev. distr.	References
APIDAE, continued					
Bombini, continued					
Bombus robustus Smith	SC	750–3700	Ve, Co, Ec, Pe	W	Liévano & Ospina (1984), Chavarría (1996), Gonzalez & Engel (2004)
Bombus rohweri (Frison)	SC	2300–3300	Co, Ve	R	Chavarría (1996)
Bombus rubicundus Smith	SC	2000–3690	Ve, Co, Ec, Pe	R	Chavarría (1996)
Bombus volucelloides Gribodo	SC	1000–3000	Ve, Co, Ec, Pe	W	Chavarría (1996)
Epeolini					
Doeringiella hebes Roig-Alsina	P	2800	Pe	?	Roig-Alsina (1989)
Eucerini					
Alloscirtetica oliveirae Urban	S	3700–3800	Pe	R	Urban (1977)
Alloscirtetica weyrauchi Michener, LaBerge & Moure	S	3100	Pe	R	Urban (1971)
Thygater aethiops (Smith)	S	1400–3400	Co	R	Urban (1967), Gonzalez & Engel (2004)
Thygater dispar (Smith)	S	1900–3460	Ec, Pe	R	Urban (1967)
Thygater melanotrichia Urban	S	2800	Pe	R	Urban (1967)
Euglossini					
Euglossa ioprosopa Dressler	?	2560	Co	T	Parra-H & Nates-Parra (2007)
Eulaema bombiformis (Packard)	C	2–2560	Co	T	Bonilla (1990)
Eulaema boliviensis (Friese)	C	3900	Ve	?	Gonzalez & Engel (2004)
Eulaema cingulata (Fabricius)	C	100–2800	Co	T	Bonilla (1990), Gonzalez & Engel (2004)
Eulaema nigrita Lepeletier de Saint Fargeau	C	20–2560	Co	T	Bonilla (1990)
Eulaema polychroma (Mocsáry)	C	450–3400	Co, Ec, Pe, Ve	T	Gonzalez & Engel (2004)
Eulaema polyzona (Mocsáry)	C	2560	Co	T	Bonilla (1990)
Meliponini					
Geotrigona aff. *subgrisea* (Cockerell) *s.str.*	SC	~1320–3450	Co	R	Gonzalez & Sepúlveda (2007)
Melipona nigrescens Friese	SC	1200–3400	Co	R	Gonzalez & Engel (2004)

Appendix. Continued.

Taxa	Soc.	Elevation [m]	Geogr. distr.	Elev. distr.	References
APIDAE, continued					
Meliponini, continued					
Parapartamona brevipilosa (Schwarz)	SC	1500–3400	Co	R	Gonzalez & Nates-Parra (1999), Gonzalez & Engel (2004)
Parapartamona caliensis (Schwarz)	SC	1800–2640	Co	R	Gonzalez & Nates-Parra (1999), Gonzalez & Engel (2004)
Parapartamona imberbis Moure	SC	1400–2400	Co	R	Gonzalez & Nates-Parra (1999)
Parapartamona zonata (Smith)	SC	2500	Ec, Pe	R	Coloma-Roman (1986)
Paratrigona eutaeniata Camargo & Moure	SC	1320–3450	Co	R	Nates-Parra *et al*. (1999), Gonzalez & Vélez (2007), Gonzalez & Engel (2004)
Partamona peckolti Friese	SC	1200–2850	Co	W	Gonzalez & Engel (2004)
Scaptotrigona cf. *limae* Brèthes	SC	1400–2600	Co	W	Gonzalez & Engel (2004)
Trigona amalthea (Olivier)	SC	0–2640	Co, Ec	W	Coloma-Roman (1986)
Trigona fulviventris Guérin-Méneville	SC	0–3450	Co	W	Gonzalez & Engel (2004)
Trigona silvestriana (Vachal)	SC	2500	Ec	W	Coloma-Roman (1986)
Tapinotaspidini					
Chalepogenus rasmusseni Roig-Alsina	S	2770	Pe	R	Roig-Alsina (1999)
Xylocopini					
Xylocopa fimbriata Fabricius	S	4–2600	Co, Ec, Pe	W	Hurd (1978), Cruz (1996)
Xylocopa frontalis (Olivier)	S	0–2500	Co, Ec, Pe	W	Hurd (1978), Cruz (1996)
Xylocopa lachnea Moure	S	4–2600	Co, Ec, Pe	W	Hurd (1978), Gonzalez & Engel (2004)
Xylocopa viridigastra Lepeletier de Saint Fargeau	S	10–4000	Ec, Pe	W	Hurd (1978)
COLLETIDAE					
Colletinae					
Colletes mimincus Cockerell	S	2801	Pe	?	Moure & Urban (2002)
Colletes rubicola Benoist	S	2600–2760	Ec	R	Moure & Urban (2002)

Appendix. Continued.

Taxa	Soc.	Elevation [m]	Geogr. distr.	Elev. distr.	References
COLLETIDAE, continued					
Colletinae, continued					
Lonchopria comforti Gonzalez & Engel	S	2000–2500	Co	R	Herein
Lonchopria sp.	S	2640	Co	R	Gonzalez & Engel (in press)
Diphaglossinae					
Cadegualina andina (Friese)	S	2000–2900	Ec, Ve, Co	R	Urban & Moure (2001), Gonzalez & Michener (2004)
Cadegualina sericata (Friese)	S	2800–2950	Co	R	Gonzalez & Michener (2004)
Caupolicana egregia Friese	S	2500	Pe	?	Urban & Moure (2001)
Caupolicana niveofasciata Friese	S	2430–3155	Ec	R	Urban & Moure (2001)
Hylaeinae					
Hylaeus benoisti Michener	S	2850	Ec	R	Michener (2000)
Hylaeus expansus (Vachal)	S	3300	Pe	?	Urban & Moure (2002)
Xeromelissinae					
Chilicola aequatoriensis Benoist	S	1900–2700	Ec, Pe, Ve, Co	R	Michener (2002)
Chilicola benoistiana Michener	S	2654	Co	R	Michener (2002)
Chilicola bigibbosa Michener	S	3460	Pe	R	Michener (2002)
Chilicola bochica Gonzalez	S	2600	Co	R	Gonzalez & Giraldo (2009)
Chilicola brzoskai Michener	S	2500	Ec	R	Michener (2002)
Chilicola colombiana Michener	S	1630–2972	Co	R	Michener (2002)
Chilicola deborahae Gonzalez	S	3170–3600	Co	R	Gonzalez & Giraldo (2009)
Chilicola espeleticola Michener	S	3710–4300	Ve	R	Michener (2002)
Chilicola gibbosa Michener	S	2500	Co	?	Michener (2002)
Chilicola involuta Michener	S	3150–3200	Ec	R	Michener (2002)
Chilicola paramo Gonzalez & Michener	S	3400–3600	Co	R	Gonzalez & Michener (2004)
Chilicola paramoides Gonzalez	S	2600–3350	Co	R	Gonzalez & Giraldo (2009)
Chilicola quitensis Benoist	S	2850	Ec	R	Michener (2002)
Chilicola simplex Michener	S	2907	Ec	R	Michener (2002)

Appendix. Continued.

Taxa	Soc.	Elevation [m]	Geogr. distr.	Elev. distr.	References
COLLETIDAE, continued					
Xeromelissinae, continued					
Chilicola styliventris (Friese)	S	2300–3800	Ec, Pe	R	Michener (2002)
HALICTIDAE					
Augochlorini					
Augochlora atricreis (Vachal)	?	3000	Pe	R?	Moure & Hurd (1987)
Augochlora bogotensis (Vachal)	?	2600	Co	R?	Moure & Hurd (1987)
Augochlora cylix (Vachal)	?	~3000	Pe	?	Moure & Hurd (1987)
Augochlora dorsualis (Vachal)	?	2600	Co	?	Moure & Hurd (1987)
Augochlora ectasis (Vachal)	?	2600	Co	?	Moure & Hurd (1987)
Augochlora esox (Vachal)	?	2600	Co	?	Moure & Hurd (1987)
Augochlora foxiana Cockerell	?	815–2600	Co	W	Moure & Hurd (1987)
Augochlora jugalis (Vachal)	?	3000	Pe	?	Moure & Hurd (1987)
Augochlora laenifrons (Vachal)	?	2600	Co	?	Moure & Hurd (1987)
Augochlora leptis (Vachal)	?	900–3000	Ec, Pe	W	Moure & Hurd (1987)
Augochlora myrrhites (Vachal)	?	2600	Co	?	Moure & Hurd (1987)
Augochlora pachytes (Vachal)	?	~500–3000	Pe	W	Moure & Hurd (1987)
Augochlora patruelis (Vachal)	?	~3000	Pe	?	Moure & Hurd (1987)
Augochlora phoenicis (Vachal)	?	~2000–3300	Pe	?	Moure & Hurd (1987)
Augochlora punctibasis (Vachal)	?	~3000	Pe	?	Moure & Hurd (1987)
Augochlora repandirostris (Vachal)	?	815–2600(?)	Bolivia to Co	W	Moure & Hurd (1987)
Augochloropsis cyclis (Vachal)	?	~3000	Pe	?	Moure & Hurd (1987)
Augochloropsis holmbergi (Schrottky)	?	~3000	Pe	?	Moure & Hurd (1987)
Augochloropsis varians (Vachal)	?	500–3000	Pe	W	Moure & Hurd (1987)
Ischnomelissa rhina Brooks & Engel	?	2300–2600	Ec	R	Brooks & Engel (1998)
Caenaugochlora silvicola Engel	?	2700	Ec	R	Engel (2007)
Neocorynura aymara Smith-Pardo & Gonzalez	?	2800-4000	Pe	?	Smith-Pardo & Gonzalez (2009)
Neocorynura cicur (Vachal)	?	3300	Pe	?	Moure & Hurd (1987)
Neocorynura iguaquensis Smith-Pardo & Gonzalez	Sm?	2150–3000	Co	R	Gonzalez *et al*. (2006)

Appendix. Continued.

Taxa	Soc.	Elevation [m]	Geogr. distr.	Elev. distr.	References
HALICTIDAE, continued					
Augochlorini, continued					
Neocorynura joannisi (Vachal)	?	2300–2800	Ve, Co, Ec, Pe	R	Engel (1996), Smith-Pardo & Gonzalez (2009)
Neocorynura lasipion (Vachal)	?	3300	Pe	?	Moure & Hurd (1987)
Neocorynura marginans (Vachal)	?	~2000–3300	Pe	?	Moure & Hurd (1987)
Neocorynura micheneri (Eickwort)	?	2400–3500	Ec	?	Smith-Pardo & Gonzalez (2009)
Neocorynura muiscae Smith-Pardo & Gonzalez	Sm?	2850	Co	R	Gonzalez *et al*. (2006)
Neocorynura nossax (Vachal)	?	~2000–3300	Pe	?	Moure & Hurd (1987)
Neocorynura notoplex (Vachal)	?	3300	Pe	?	Moure & Hurd (1987)
Neocorynura papallactensis Engel	?	3200	Ec	R	Engel (1999)
Neocorynura pseudobaccha (Cockerell)	?	500–3000	Pe	W	Moure & Hurd (1987)
Neocorynura puruhana Smith-Pardo & Gonzalez	?	2789	Ec	?	Smith-Pardo & Gonzalez, (2009)
Neocorynura riverai (Vachal)	?	3300	Pe	?	Moure & Hurd (1987)
Neocorynura sequax (Vachal)	?	3300	Pe	?	Moure & Hurd (1987)
Neocorynura stilborhin (Vachal)	?	500–3000	Pe	W	Moure & Hurd (1987)
Neocorynura triacontas (Vachal)	?	~2000–3300	Pe	?	Moure & Hurd (1987)
Neocorynura tungurahuana Smith-Pardo & Gonzalez	?	2600	Ec	?	Smith-Pardo & Gonzalez (2009)
Neocorynurella viridis Engel & Klein	?	2600	Ve	?	Engel & Klein (1997), Smith-Pardo & Gonzalez (2009)
Neocorynurella seeleyi Engel & Klein	?	2800–4300	Co, Ve	R	Engel & Klein (1997), Smith-Pardo & Gonzalez (2009)
Neocorynurella cosmetor (Vachal)	?	~2300–2700	Co, Ve	R	Moure & Hurd (1987), Engel (2000), Smith-Pardo & Gonzalez (2009)
Pseudaugochlora crawfordi (Vachal)	?	~3000	Pe	?	Moure & Hurd (1987)
Pseudaugochlora praepotens (Vachal)	?	~3000	Pe	?	Moure & Hurd (1987)

Appendix. Continued.

Taxa	Soc.	Elevation [m]	Geogr. distr.	Elev. distr.	References
HALICTIDAE, continued					
Caenohalictini					
Caenohalictus alexandrei Celis, Cure, & Aguilar-Benavides[1]	?	2580–2780	Co	R	Celis *et al*. (2014)
Caenohalictus columbus (Vachal)	?	2600(?)	Co	?	Moure & Hurd (1987)
Caenohalictus cuprellus (Vachal)	?	~2000–3300	Pe	?	Moure & Hurd (1987)
Caenohalictus eberhardorum Michener	?	1800–2900	Co	R	Moure & Hurd (1987), Gonzalez & Engel (2004)
Caenohalictus ecuadorensis (Cameron)	?	2740	Ec	?	Moure & Hurd (1987)
Caenohalictus lindigi (Vachal)	?	2600(?)	Co	?	Moure & Hurd (1987)
Caenohalictus notares (Vachal)	?	~2700	Ec	?	Moure & Hurd (1987)
Caenohalictus obnuptus (Vachal)	?	~2000–3300	Pe	?	Moure & Hurd (1987)
Caenohalictus riveti (Vachal)	?	~2700	Ec	?	Moure & Hurd (1987)
Caenohalictus robertsi Packer	?	4000	Ec	R	Packer (1993)
Caenohalictus sabanaensis Celis, Cure, & Aguilar-Benavides	?	2580–2780	Co	R	Celis *et al*. (2014)
Gastrohalictini					
Lasioglossum santafensis Gonzalez & Rasmussen	?	~2500–2600	Co	?	Gonzalez (2006), Gonzalez *et al*. (2010)
Halictini					
Sphecodes bogotensis Meyer	P	~2500–2600	Co	?	Moure & Hurd (1987)
MEGACHILIDAE					
Anthidiini					
Anthidium alsinai Urban	S	3900	Pe	R	Urban (2001)
Anthidium cuzcoense Schrottky	S	2400–3500	Pe	R	Gonzalez & Griswold (2013)
Anthidium danunciae Gonzalez & Griswold	S	3200	Pe	R	Gonzalez & Griswold (2013)
Anthidium deceptum Smith	S	300–3500	Pe	W	Gonzalez & Griswold (2013)
Anthidium funereum Schletterer	S	1500–4200	Pe, Ec	R	Gonzalez & Griswold (2013)
Anthidium igori Urban	S	2800–3200	Pe	R	Gonzalez & Griswold (2013)
Anthidium luizae Urban	S	3400	Pe	R	Urban (2001)

Appendix. Continued.

Taxa	Soc.	Elevation [m]	Geogr. distr.	Elev. distr.	References
MEGACHILIDAE, continued					
Anthidiini, continued					
Anthidium masunariae Urban	S	3500–4100	Pe	R	Gonzalez & Griswold (2013)
Anthidium nigerrimum Schrottky	S	3500–4400	Pe	R	Gonzalez & Griswold (2013)
Anthidium peruvianum Schrottky	S	2400–4000	Pe	R	Gonzalez & Engel (2004), Gonzalez & Griswold (2013)
Anthidium rafaeli Urban	S	2800–3400	Pe	R	Gonzalez & Griswold (2013)
Anthidium rozeni Urban	S	2800	Pe	R	Urban (2001)
Anthidium rubripes Friese	S	400–4200	Pe	W	Gonzalez & Griswold (2013)
Anthidium tarsoi Urban	S	2800	Pe	R	Urban (2001)
Anthidium vigintiduopunctatum Friese	S	0–3100	Pe, Ec	W	Gonzalez & Griswold (2013)
Anthidium weyrauchi Schwarz	S	3052	Pe	R	Gonzalez & Griswold (2013)
Megachilini					
Megachile amparo Gonzalez	S	2600–3000	Co	R	Gonzalez (2006)
Megachile eumelanotricha Moure	S	3900–4700	Pe	R	Moure (1956)
Megachile remigata Vachal	S	3000	Pe	?	Raw (2002)
Megachile spp.	S	2500–3000	Ec, Pe	?	Gonzalez & Engel (2004)
Coelioxys spp.	P	2700	Co	?	Gonzalez & Engel (2004)

[1] Note that this species is likely a junior synonym of *Caenohalictus cuprellus* (Vachal), a species that has been misidentified widely in the recent literature.

Journal of Melittology

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The *Journal of Melittology* was established at the University of Kansas through the efforts of Michael S. Engel, Victor H. Gonzalez, Ismael A. Hinojosa-Díaz, and Charles D. Michener in 2013 and each article is published as its own number, with issues appearing online as soon as they are ready. Papers are composed using Microsoft Word® and Adobe InDesign® in Lawrence, Kansas, USA.

Journal of Melittology is registered in ZooBank (www.zoobank.org), and archived at the University of Kansas and in Portico (www.portico.org).

http://journals.ku.edu/melittology
ISSN 2325-4467