

TRABAJOS ORIGINALES

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Correspondencia:

*Corresponding author

Victor H. Gonzalez: victorgonzab@gmail.com
Division of Entomology, Natural History Museum,
1501 Crestline Drive – Suite 140, University of
Kansas, Lawrence, Kansas 66045, USA.

Mabel Alvarado: malvaradog@unmsm.edu.pe
Universidad Nacional Mayor de San Marcos, Museo
de Historia Natural, Departamento de Entomología.
Av. Arenales 1256 Jesús María, Lima 14, Perú.

Claus Rasmussen: claus.rasmussen@bios.au.dk
Department of Bioscience, Aarhus University, Ole
Worms Allé 1, DK-8000 Aarhus C, Denmark.

Otros datos de los autores / biografía:

ORCID Víctor H. Gonzalez: 0000-0002-4146-1634
ORCID Mabel Alvarado: 0000-0001-8135-9223
ORCID Claus Rasmussen: 0000-0003-1529-6548

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Una especie nueva de *Andinopanurgus* (Hymenoptera: Andrenidae) de las grandes alturas del sur de Perú

Victor H. Gonzalez^{1,*}, Mabel Alvarado², Claus Rasmussen³

1. Division of Entomology, Natural History Museum, University of Kansas, USA.
2. Universidad Nacional Mayor de San Marcos, Museo de Historia Natural, Departamento de Entomología, Perú.
3. Department of Bioscience, Aarhus University, Denmark.

Abstract

We describe and figure a distinctive new species of the bee genus *Andinopanurgus* Gonzalez and Engel (Andrenidae, Protandrenini) from Apurímac and Cusco in southern Peru. *Andinopanurgus vargasllosai* Gonzalez and Alvarado, n. sp., occurs at elevations above 4000 m in the Central Andes and is the second species of this genus in Peru. The new species possesses terga with semi-translucent distal margins, a unique feature among *Andinopanurgus*, and it combines morphological features of the two species groups previously recognized in the genus. To facilitate its recognition, we provide an updated key to species of *Andinopanurgus*.

Resumen

Describimos e ilustramos una especie nueva del género *Andinopanurgus* Gonzalez y Engel (Andrenidae, Protandrenini) procedentes de Apurímac y Cusco, al sur de Perú. *Andinopanurgus vargasllosai* Gonzalez y Alvarado, n. sp., se encuentra en alturas superiores a los 4000 m en los Andes centrales y es la segunda especie del género registrada para el Perú. La especie nueva posee tergos metasomales con las márgenes distales semi-translúcidas, una característica única dentro de *Andinopanurgus*, y combina características morfológicas de los dos grupos de especies hasta ahora reconocidos en el género. Con el fin de facilitar la identificación, presentamos una clave actualizada para las especies de *Andinopanurgus*.

Introduction

Andinopanurgus Gonzalez and Engel, initially described as a subgenus of *Protandrena* Cockerell, consists of seven species occurring at mid- and high elevations (1100 – 3400 m) in the Andes from the Venezuela to Peru. Limited information is available on the biology of *Andinopanurgus*. Scattered observations suggest that species nest in the ground and are polylectic, visiting a wide range of exotic, cultivated and native plants (Gonzalez & Ruz 2007, Gonzalez & Engel 2011, Gonzalez et al. 2013). Some species, such as *A. bachue* and *A. rangeli*, are common in both managed and unmanaged gardens in Bogotá, Colombia, thus showing their ability to adapt to urban environments (V.H. Gonzalez, unpublished data). At least one species, *A. guarnensis*, exhibits buzzing behavior on flowers of cultivated potatoes to release their pollen (Gonzalez et al. 2013).

Gonzalez and Engel (2011) recognized two species groups within *Andinopanurgus* based on certain male features. In the *bachue* species group, which contains most of the species, the first antennal flagellomere is distinctly longer than the second flagellomere, the clypeus is maculated with yellow or cream, the fifth sternum bears stout spines midapically, and the seventh tergum is medially emarginate on its distal margin. In the other species group (*guarnensis* group), which consists of *A. guarnensis* and *A. femoralis*, the first antennal flagellomere is about as long as the second, the clypeus is black, the fifth sternum bears normal branched setae midapically, and the distal margin of the seventh tergum is straight, not medially emarginated.

Herein, we describe a new species from Peru that exhibits morphological features of the two species groups previously recognized by Gonzalez and Engel (2011). For example, the male has a yellow clypeus and the first antennal flagellomere is longer than the second, as in the *bachue* species group. However, the fifth sternum lacks stout spines on its midapical margin and the apical margin of the seventh tergum is straight, as in the *guarnensis* species group. Thus, the new species bridges the morphological gap between these two species groups. To facilitate the recognition of the new species, we also provide an updated key to all species of the genus.

Material and methods

Morphological terminology follows that of Engel (2001) and Michener (2007). To describe and measure body features, we used an ocular micrometer on an Olympus SZX-12 stereomicroscope. We prepared photomicrographs using a Nikon D1x digital camera attached to an Infinity K-2 long-distance microscopic lens, and assembled series of images at different focal depths with the Zerene Stacker™ software package. We used the abbreviations F, S, T, OD, and PW for antennal flagellomere, metasomal sternum and tergum, ocellar diameter and puncture width, respectively. Measurements of the female paratype are in parentheses. The material discussed is in the Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Perú (MUSM), and the

Snow Entomological Collection, Division of Entomology, University of Kansas Natural History Museum, Lawrence, Kansas, USA (SEMC).

Systematics

TRIBE PROTANDRENINI ROBERTSON, 1904

GENUS *ANDINOPANURGUS* GONZALEZ AND ENGEL, 2011

Andinopanurgus vargasllosai Gonzalez and Alvarado,
n. sp.

(Figs. 1, 2)

Diagnosis. Both sexes of *A. vargasllosai* (Fig. 1a, 2b, c) are easily separated from all other species of *Andinopanurgus* by their small body size (4.5–5.1 mm in body length) and T1–T4 with apical margins semi-translucent. It resembles *A. femoralis* in its small body size and metatibia with scopal setae whitish, but in that Peruvian species the apical margins of T1–T4 are brown, F1 is about as long as F2, and the mesoscutum and mesoscutellum are shiny, weakly imbricate between punctures (Fig. 1f). In *A. vargasllosai*, F1 is longer than F2 and the mesoscutum and mesoscutellum are duller, finely punctate (Fig. 1e). Furthermore, the male of *A. vargasllosai* can be recognized by the combination of the following features: clypeus yellow (Fig. 2a), F1 longer than F2, S5 with normal setae on midapical margin, and T7 with apical margin straight.

Description. Holotype. ♀. Total body length 4.84 mm (5.05); forewing length, as measured from apex of humeral sclerite, 3.79 mm (3.58); head width 1.28 mm. Head 1.1× wider than long; inner orbits of compound eyes slightly converging below (Fig. 1a); intertorular distance 2.4× OD, 0.8× length of torulorobital distance; torulus diameter equal to OD; ocellular distance 2.8× OD, 2.3× greater than ocellocipital distance; interocellar distance 2.0× OD; compound eye 1.8× longer than wide; clypeus 2.4× broader than long, projecting about 0.3× compound eye width in lateral view; gena 0.8× width of compound eye in profile; supraclypeal area gently convex in profile, slightly more elevated than clypeus; inner subantennal sulcus about 0.7× length of outer subantennal sulcus; facial fovea about 3.7× longer than broad, 0.7× length of scape; scape 3.0× longer than broad, antennal flagellum unmodified, slightly shorter than head width; pedicel 0.6× length of F1, about as long as broad, F1 1.9× longer than broad, about 2.2× longer than F2 and F3 individually, remaining flagellomeres about as long as broad, except last flagellomere longer than broad. Forewing prestigma about twice as long as broad (prestigma width measured to its margin); pterostigma 4.4× longer than broad. Mesosoma about as wide as head width; mesoscutum 1.5× wider than long, 2.4× longer than mesoscutellum, 4.2× longer than metanotum; propodeum with basal part about 0.9× mesoscutellum length in dorsal view; protibial spur with apical portion of rachis long, about as long as malus, with four elongate branches (not including apical portion of rachis); mesotibial spur straight, with coarse branches, 0.8× mesobasitarsus length; metatibial spurs about the same length, curved apically; pre-

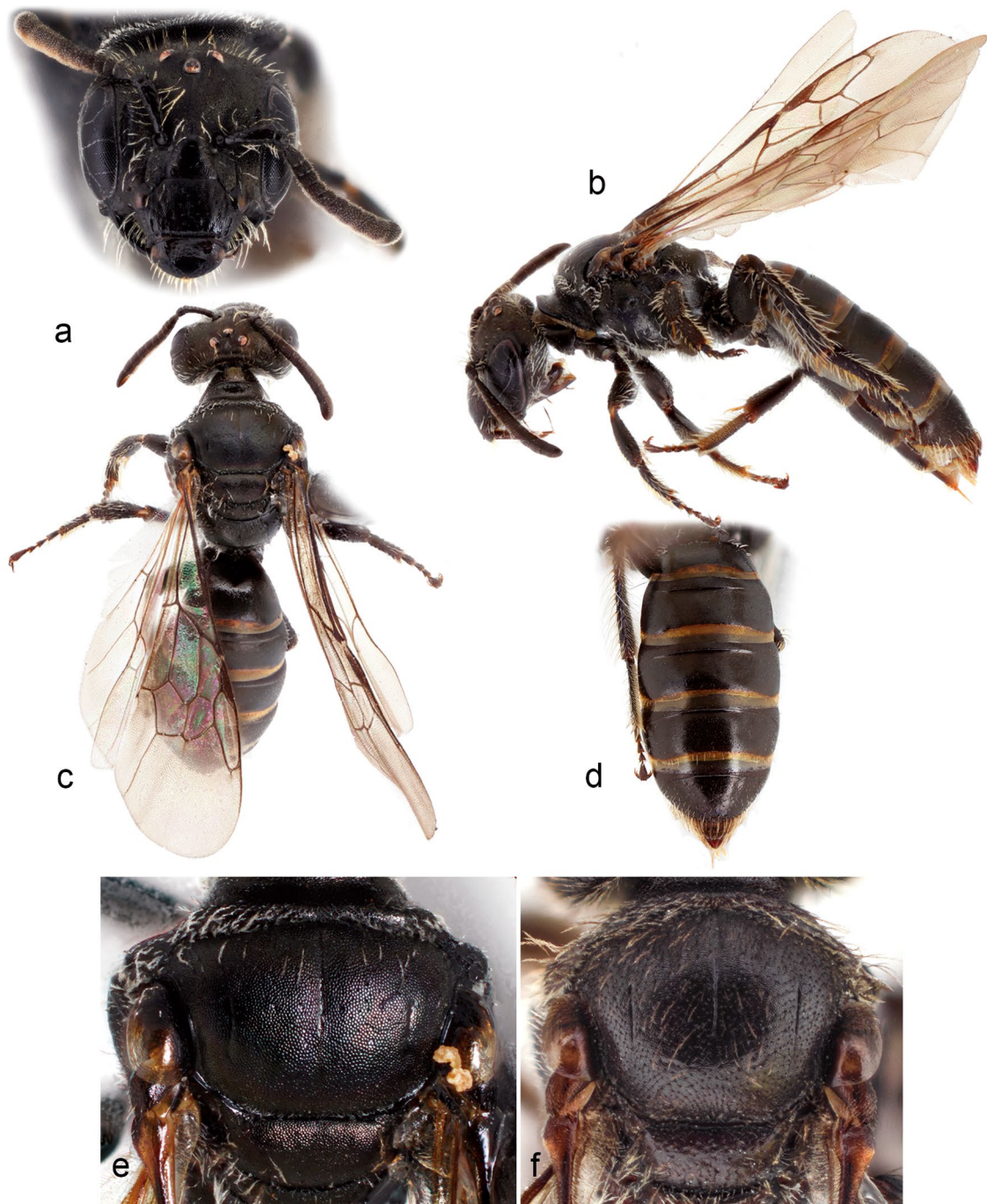


Figure 1. Female holotype of *Andinopanurgus vargasillosai* Gonzalez and Alvarado, n. sp. except figure f, which corresponds to a female paratype of *A. femoralis* (Gonzalez and Engel). **a**, facial view; **b**, lateral habitus; **c**, dorsal habitus; **d**, dorsal view of metasoma; **e**, **f**, dorsal view of mesoscutum and mesoscutellum.

tarsal claws with inner ramus slightly shorter than the outer. Lateral fovea of T2 4.0× longer than broad.

Color black, except ventral surfaces of F3–F10 and outer surfaces of pro- and mesotibiae basally with yellow maculations, and apical margins of T1–T5 and S2–S5 semi-translucent (Figs. 1b–d). Tegula semi-translucent brownish; wing membranes brownish, veins and pterostigma dark brown.

Pubescence in general whitish and sparse. Head with long (2.0× OD), semierect, minutely branched setae; sca-

pe with long, scattered, minutely-branched setae, about twice as long as maximum scape diameter, pedicel with minutely-branched setae as long as its maximum diameter. Pronotum with short (0.3–0.5× OD), dense, minutely-branched setae along dorsal margin and pronotal lobe posteriorly; mesoscutum, mesoscutellum, and metanotum with sparse, long (1.1× OD), erect, minutely-branched setae arising among short (0.1–0.2× OD), denser (especially on lateral margins), simple setae; mesepisternum and lateral and posterior areas of propodeum with sparse, long (1.0× OD), erect, minutely-branched setae.

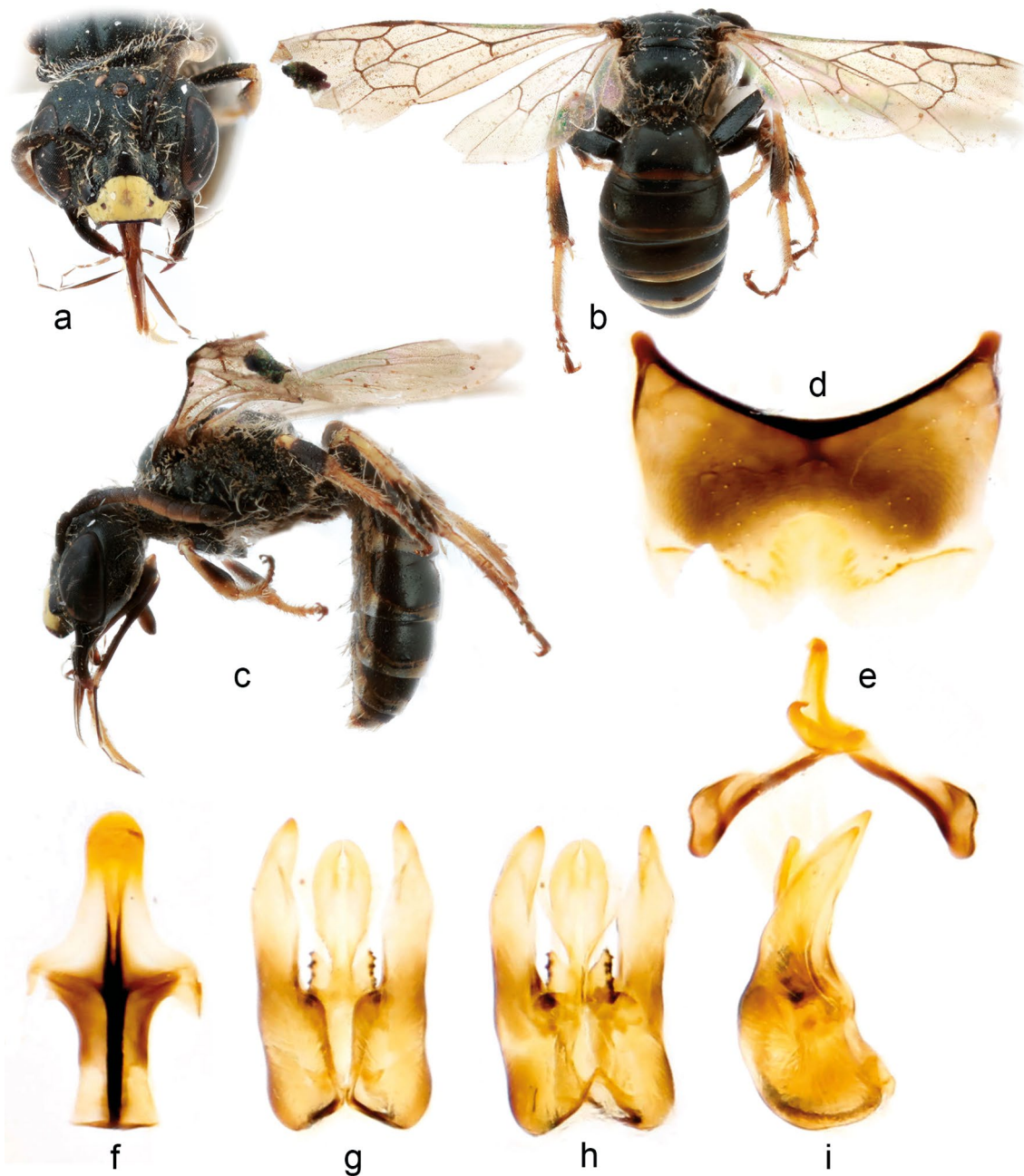


Figure 2. Male paratype of *Andinopanurgus vargaslosai* Gonzalez and Alvarado, n. sp. **a**, facial view; **b**, posterior view of mesosoma and metasoma; **c**, lateral habitus; **d**, ventral view of sixth sternum; **e**, ventral view of seventh sternum (note that the left apical lobe was broken during dissection and it appears in front of the right lobe); **f**, ventral view of eighth sternum; **g-i**, genital capsule in dorsal, ventral, and profile views.

Metasomal terga with minute ($\leq 0.2 \times OD$), semierect, sparse, simple setae on discs, pre-marginally and laterally with denser, longer, minutely branched setae ($\sim 1.0 \times OD$); T5 with setae longer, darker, and denser than on other terga; sterna with denser and longer setae than on terga, particularly on distal sterna.

Outer surface of mandible and basal area of labrum smooth and shiny, impunctate; clypeus with fine and contiguous punctures among, large, scattered setiferous punctures; supraclypeal area with fine and contiguous punctures on distal third, punctures becoming faint basally,

thus integument appearing smooth and shiny at low magnifications; subantennal area and remainder of face with fine, contiguous punctures or alveoli, coarser than on clypeus; gena strongly imbricate with faint punctures. Mesoscutum, mesoscutellum, and metanotum with fine, contiguous punctures or alveoli (Fig. 1e); mesepisternum strongly imbricate with large, scattered ($2-3 \times PW$), faint setiferous punctures; metepisternum strongly imbricate with few striae near wing base. Propodeum strongly imbricate with fine and weak striae basally, lateral and posterior surfaces with faint, scattered punctures. Metasomal terga and sterna shiny, weakly imbricate with

minute, scattered punctures on discs, punctures coarser and denser on apical terga and sterna; distal margins of terga weakly imbricate, impunctate.

♂. As for the female except for yellow integumental markings on clypeus, apices of femora, outer surfaces of tibiae, basitarsi (Figs. 2a–c), and the following: Total body length 4.68 mm; forewing length 3.68 mm; head width 1.50 mm. Head 1.2× wider than long (Fig. 2a); intertorular distance 2.0× OD, about as long as torulorobital distance; torulus diameter 0.8× OD; ocellocular distance 2.1× greater than ocellocipital distance; interocellar distance 1.5× OD; compound eye 2.3× longer than wide; gena about as wide as compound eye in profile; supra-clypeal area, as seen in profile, on the same level with clypeus; facial fovea 5.0× longer than broad, 0.3× length of scape; scape 2.1× longer than broad; F1 1.6× longer than broad, about 1.6× longer than F2 and F3 individually. Pterostigma 3.8× longer than broad. Mesosoma narrower than head width; mesoscutum 1.4× wider than long, 3.6× longer than mesoscutellum, 6.3× longer than metanotum; protibial spur with apical portion of rachis with a row of about 10 elongate branches (not including apical portion of rachis). Lateral fovea of T2 more ovoid and shallower than that of the female, 2.5× longer than broad. T7 with distal margin straight or nearly so; S5 unmodified, without stout spines on midapical margin; S6–S8, and genital capsule as in Figs. 2d–i.

Holotype. ♀, Perú: AP [Apurímac], Mina Las Bambas, Sector Saqrapiña, 14°4'37.24"S, 72°18'33"W, 4265 m, 24.iv–03.v.2017 [24 abr–3 may 2017], L. Figueroa (MUSM).

Paratypes. One female with the same data as the holotype deposited at SEMC, and one male deposited at MUSM with the following label data: CU [Cusco], Espinar, Qbda. Chaisamayo, 14°59'46.15"S, 71°16'25.93W, 4167 m, 16–17.iii.2011 [16–17 mar 2011], Pastizal, M. Alvarado.

Etymology. This species honors the Peruvian writer, politician, journalist, and 2010 Nobel laureate Jorge Mario Pedro Vargas Llosa.

Comments. *Andinopanurgus vargasllosai* n. sp. occurs in Puna grasslands. Specimens of both sexes were captured in areas where Las Bambas copper mine has restoration programs for the endemic and rarely collected shrub *Nototriche armeriifolia* A.W. Hill (Malvaceae) (Chanco et al. 2006). Thus, it would be interesting to know if this bee is a potential visitor or pollinator of *N. armeriifolia*, although some species of *Nototriche* Turcz. appear to be pollinated by beetles and butterflies (Arroyo et al. 1982, García-Franco & Arroyo 1995).

The new species combines morphological features of the two currently recognized species groups in *Andinopanurgus*, the *bachue* and *guarnensis* groups. Thus, *A. vargasllosai* n. sp. bridges the morphological gap between these two species groups and it cannot be assigned to either one. The new species might represent an additional species group within *Andinopanurgus*.

Key to species of *Andinopanurgus*

Males

1. Clypeus without cream or yellow maculations; F1 short, about as long as F2; face and disc of mesoscutum weakly shiny; S5 without spines on midapical margin, with fringe of normal, minutely-branched setae; T7 with distal margin straight, not medially emarginate. **2**
 - Clypeus with cream or yellow maculations; F1 distinctly longer than F2; face and disc of mesoscutum duller; S5 with or without distinctly stout, short spines on midapical margin; T7 with distal margin variable, straight or with V-shaped median emargination. **3**
 - 2(1). S7 with apical lobes narrow, parallel-sided, retrorse section of apex comma-shaped; gonostylus slender in profile, slightly tapering towards apex, basally strongly protuberant on medial margin in dorsal view (Colombia: Antioquia)
 - A. guarnensis* (Gonzalez & Ruz)
 - S7 with apical lobes not parallel-sided, much broader apically (apex about twice as broad as base), retrorse section of apex not comma-shaped; gonostylus more robust in profile, about same width across its length, basally not protuberant on medial margin in dorsal view (Peru). *A. femoralis* (Gonzalez & Engel)
 - 3(1). T1–T4 each with semi-translucent apical margin; S5 without spines on midapical margin, with fringe of normal, minutely-branched setae; T7 with distal margin straight, not medially emarginated (Peru).
 - A. vargasllosai* Gonzalez and Alvarado, n. sp.
 - T1–T4 with apical margins brown to black; S5 with distinctly stout, short spines on midapical margin; T7 with V-shaped median emargination on distal margin (Venezuela to Ecuador). **4**
 - 4(3). Antennal flagellum weakly or strongly crenulate on posterior surface; S5 with more than four spines on midapical margin; larger bees (body length 7.9–11.8 mm). **6**
 - Antennal flagellum unmodified, not crenulate on posterior surface; S5 with a row of four spines on midapical margin; small bees (body length 5.7–6.8 mm). **5**
 - 5(4). Small bees (head width 1.6–1.7 mm; body length 5.7–6.1 mm) (Colombia: Boyacá, Cundinamarca).
 - A. rangeli* (Gonzalez & Ruz)
 - Larger bees (head width 1.8 mm; body length 6.8 mm) (Venezuela).
 - A. maximina* (Gonzalez & Ruz)
 - 6(4). Antennal flagellum strongly crenulate on posterior surface, with deep concavity between flagellomeres; mandible not distinctly broad apically; posterior hypostomal carina unmodified, without a tooth; protibial spur with apex of rachis very short (less than one-third of malus length), with less than five elongate branches (not including apical portion of rachis); S3–S5 with distal margins distinctly convex; S5 with midapical row of spines medially projecting. **7**
 - Antennal flagellum weakly crenulate on posterior surface, without deep concavity between flagellomeres; mandible distinctly broad apically; posterior hypostomal carina with strong tooth; protibial spur with apex long, about three-fourths of malus length, with a distinct row of 10 elongate branches (not including apical portion of rachis); S3–S4 with distal margins gently convex; S5 with midapical row of spines straight, not medially projecting (Ecuador: Napo). *A. amyae* (Gonzalez & Engel)
 - 7(6). F8 and F9 crenulate; S5 midapical row of spines of unequal sizes, distal two spines distinctly longer (Ecuador: Quito, Napo).
 - A. wayruronga* (Gonzalez & Ruz)
 - F8 and F9 unmodified, not crenulate; S5 with midapical row of spines of about same size, without two distinctly long spines distally (Colombia: Boyacá, Cundinamarca).
 - A. bachue* (Gonzalez & Ruz)

Females

Note that the females of *A. amyae* and *A. wayruronga* are unknown. However, given that the male of these species have crenulate antennal flagella they likely should run to *A. bachue* in the key.

1. Antennal flagellum unmodified, not crenulate. **2**
- Antennal flagellum modified, weakly crenulate on posterior surface of F1–F5 (Colombia: Boyacá, Cundinamarca).
A. bachue (Gonzalez & Ruz)
- 2(1). F1 about as long as F2; discs of mesoscutum and mesoscutellum shiny, weakly imbricate between punctures. **3**
- F1 distinctly longer than F2; discs of mesoscutum and mesoscutellum dull, finely punctate to strongly imbricate between punctures. **4**
- 3(2). Mesofemur with posterior surface and metafemur with anterior and posterior surfaces distinctly depressed (Peru).
A. femoralis (Gonzalez & Engel)
- Meso- and metafemora unmodified, not distinctly depressed (Colombia: Antioquia). *A. guarnensis* (Gonzalez & Ruz)
- 4(2). T1–T4 each with semi-translucent apical margin (Figs. 1b–d); metatibia with whitish scopal setae (Peru).
A. vargasillosai Gonzalez and Alvarado, **n. sp.**
- T1–T4 with apical margins brown to black; metatibia with dark brown to black scopal setae (Colombia, Venezuela). **5**
- 5(4). Small bees (head width 1.6–1.8 mm; body length 5.6–6.3 mm) (Colombia: Boyacá, Cundinamarca).
A. rangeli (Gonzalez & Ruz)
- Larger bees (head width 1.9–2.1 mm; body length 7.8 mm) (Venezuela). *A. maximina* (Gonzalez & Ruz)

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Competing interests:

The authors have declared that no competing interests exist.

Author contributions:

VHG: recognized novelty of the species and wrote the manuscript; MA: collected specimens, prepared photographs, and contributed in the revision and discussion of manuscript; CR: prepared photographs, and contributed in the revision and discussion of manuscript.

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Ethics and legal statement:

Material proceeded from museums and no specific permits were required.