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Articles

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El subgénero *Chalepochile* en la Argentina (Hymenoptera:
Megachilidae: *Megachile*)

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Resumen: El subgénero *Chalepochile* Gonzalez & Engel de *Megachile* Latreille se conocía sólo de machos de dos especies. En esta contribución se describe la hembra de *M. ardua* Mitchell, especie tipo de *Chalepochile*, como también una especie nueva basada en ambos sexos. La nueva especie *M. .Chalepochile. bilineata* se distribuye en las provincias de Córdoba, La Rioja y Mendoza, en la Argentina. Se discuten las relaciones filogenéticas del subgénero *Chalepochile* a la luz de los caracteres de las hembras.

Palabras clave: Abejas cortadoras de hojas, Argentina, Especie nueva, Taxonomía.

Abstract: The subgenus *Chalepochile* Gonzalez & Engel of *Megachile* Latreille was known only from males of two species. In this contribution the female of *M. ardua* Mitchell, type species of *Chalepochile*, is described, as well as a new species based on both sexes. The new species *M. .Chalepochile. bilineata* occurs in the provinces of Córdoba, La Rioja and Mendoza in Argentina. The phylogenetic relationships of the subgenus *Chalepochile* are discussed in the light of characters of the females.

Keywords: Argentina, Leaf-cutter bees, New species, Taxonomy.

INTRODUCTION

The subgenus *Megachile* (*Chalepochile*) was proposed by Gonzalez & Engel to include two South American species known only from the male sex (Gonzalez et al., 2018). These species had been previously assigned to either the subgenus *Ptilosaroides* Mitchell (Schlindwein, 1998), *Ptilosarus* Mitchell (Raw, 2002, 2007; Silveira et al. 2002), or *Rhyssomegachile* Mitchell (Moure et al., 2007; Moure & Melo, 2022). All these subgenera, together with *Neochelynia* Schrottky and *Zonomegachile* Mitchell, form a group of closely related Neotropical subgenera (Gonzalez et al., 2018; Gonzalez et al., 2019). The morphological distinctiveness of *Chalepochile* among all these subgenera is hampered by the lack of knowledge of the female sex, because females bear important features used for characterizing subgenera. The subgenus *Chalepochile* has been recently synonymized under *Rhyssomegachile* (Moure & Melo, 2022).

The purpose of the present contribution is to describe for the first time the female of *Megachile ardua* Mitchell, type species of *Chalepochile*, and to describe a new species from central western Argentina, based on both sexes. All this new information is used to expand the phylogenetic analysis

of Gonzalez et al. (2018), based on adult morphology, to test the validity and phylogenetic position of *Chalepochile*.

MATERIAL AND METHODS

The specimens studied are deposited in the Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina (MACN). The maximum diameter of the median ocellus (MOD) is used as a reference to express the length of the pubescence and other structures. The metasomal terga (T) and sterna (S) are identified with Arabic numerals. PD stands for puncture diameter.

The phylogenetic analysis of Gonzalez et al. (2018) is expanded to include the female of *M. ardua* and the new species described below. Their data matrix is modified by the addition of the new taxa, but no new characters are added. Parsimony analysis was performed with the program TNT (Goloboff et al., 2003). Characters were treated as nonadditive and equally weighted. The algorithm Implicit Enumeration, which gives exact solutions, was used for the search of most parsimonious trees. In the descriptions below, some features are followed by a pair of numbers in parentheses separated by a comma. The first number corresponds to the number in the list of characters used by Gonzalez et al. (2018) while the second corresponds to the character state here attributed to the added taxa. Inapplicable character states are indicated by a question mark. The trees obtained with TNT were submitted to the program WinClada (Nixon, 2002) for delayed character optimization and printing.

RESULTS

Phylogenetic analysis

The phylogenetic analysis produced two equally parsimonious trees (tree length 145), the strict consensus of which is shown in Figure 1. The topology of the two trees only differs in the position of the species within the subgenus *Rhysomegachile*. The new species *M. bilineata* clusters with *M. ardua* and *M. tacanensis*, justifying its inclusion in the subgenus *Chalepochile*. All the characters that support *Chalepochile* are female characters (Fig. 1). The relationships of *Chalepochile* in the cladogram are similar to those obtained by Gonzalez et al. (2018), but the clade sister to this subgenus is better resolved.

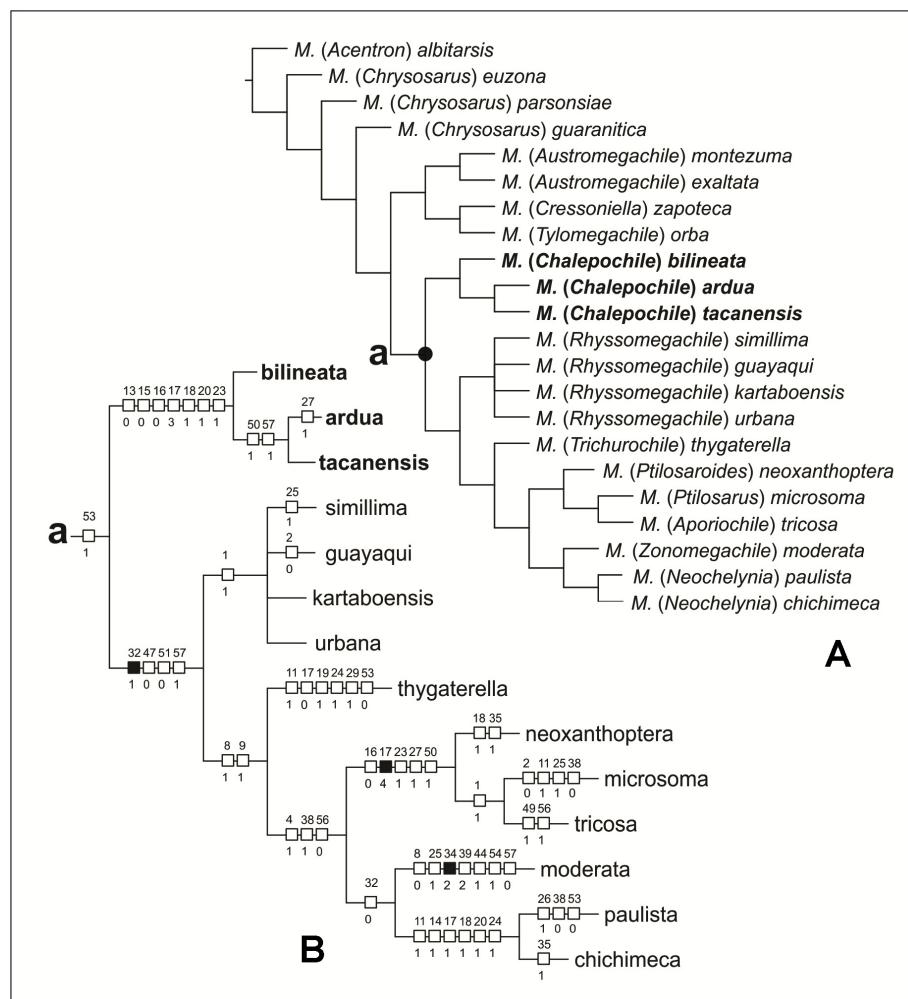


Fig. 1.

Relationships of *Chalepochile* to other subgenera of *Megachile* based on female and male characters. A. Consensus of the two most parsimonious trees. B. Detail of the clade (a) that includes *Chalepochile*, showing character optimization. Only characters common to the two trees are plotted (black squares, unique characters; white squares, homoplasious characters).

Megachile (Chalepochile) Gonzalez & Engel

Megachile (Chalepochile) Gonzalez & Engel, in Gonzalez et al., 2018: 23. Type species: *Megachile ardua* Mitchell, 1930.

The subgenus *Chalepochile* was proposed to include two closely related and very similar species: *Megachile ardua* Mitchell, and *M. tacanensis* Moure, the latter having been described as a subspecies of *M. ardua* (Moure, 1948). Since the original diagnosis of the subgenus was exclusively based on the male sex, it is appropriate to expand the diagnosis based on characteristics of the female.

Females of *Chalepochile* can be recognized by their mandibles with four teeth, the fourth being truncate, incised, and with cutting edges in the second and third interspaces (incomplete and complete cutting edge respectively) (Fig. 2); by the lack of a preoccipital carina; by the scutum with small, nearly coalescent punctures; by the presence of a scuto-scutellar band of pale hairs; by the metanotum slanting to rear; by the forewing darkened along the costal margin; by the ovoid metasoma;

by the T6 with stiff, semierect hairs interspersed with the appressed pubescence; by the S6 evenly setose and without a bare apical lip; and by the metasomal sterna with lateral apical fasciae under the scopa.

The inclusion of the new species *M. bilineata* and the female *M. ardua* in the phylogenetic analysis corroborates the relationships found by Gonzalez et al. (2018). The placement of *Chalepochile* as a synonym of *Rhyssomegachile* (Moure & Melo, 2022) is not supported. *Chalepochile* can be distinguished from *Rhyssomegachile* by the lack of a preoccipital carina, the metanotum slanting to rear, the presence of a scuto-scutellar band of short, plumose hairs, the male clypeus densely covered with hairs on its entire surface, and the presence of a longitudinal patch of short hairs on the inner surface of the male hind femur. *Rhyssomegachile* has a distinct preoccipital carina, at least behind the gena, the metanotum is vertical, there is no scuto-scutellar band, and no specialized patch of hairs on the male hind femur.

Females of *M. ardua* and *M. bilineata* will run to *Cressoniella* in the keys presented by Michener (2007) and Gonzalez et al. (2018) for the subgenera of *Megachile* of the Western Hemisphere. They differ from *Cressoniella* in the presence of sternal lateral apical fasciae under the scopa, the slanting to rear metanotum, and the evenly setose S6. Species of *Cressoniella* lack sternal fasciae under the scopa, have a vertical metanotum, and have a distinct bare preapical area on the disc of S6.

Key to species of *Chalepochile*

(Females of *M. tacanensis* unknown)

1. T1 of both sexes with distinct yellow apical band. Wings dusky. Female scopal hairs capitate. Male T6 without pale appressed pubescence, only sparse, erect setae present. (Western Argentina). *M. bilineata*

1'. T1 of both sexes with brownish hairs not forming distinct apical band (Fig. 3). Wings yellowish brown. Female scopal hairs sharply pointed. Male T6 with both appressed pale pubescence and sparse erect setae. 2

2. Appressed pubescence of T4-T5 of male bright yellow, densely covering and hiding integument; short setae densely branched and decumbent. Apical bands of female T4-T5 bright yellow. (Brazil, Paraguay, eastern Argentina and eastern Bolivia). *M. ardua*

2'. Appressed pubescence of T4-T5 of male whitish to pale yellowish, sparsely covering and allowing to see integument; short setae minutely branched, semierect. Female unknown. (Western Argentina and Bolivia). *M. tacanensis*

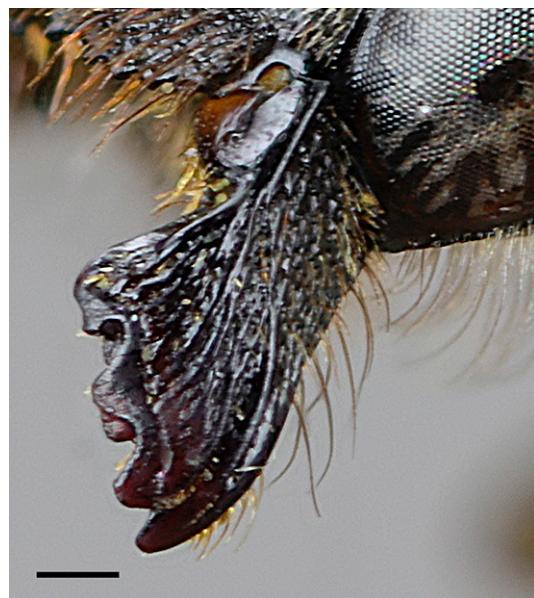


Fig. 2.
Megachile ardua Mitchell. Female mandible. Scale bar = 0,2 mm.



Fig. 3.
Megachile ardua Mitchell, female. A. lateral view. B. dorsal view. Scale bars = 1 mm.

Megachile (Chalepochile) ardua Mitchell (Figs. 2, 3)

Megachile ardua Mitchell, 1930: 268 (Holotype male, Brazil, Mato Grosso, Chapada dos Guimarães, Academy of Natural Sciences, Philadelphia).

Megachile (Chalepochile) ardua: Gonzalez, Griswold & Engel, 2018: 23-27, Figs. 5C, 11, 12.

Diagnosis. Females are characterized by the bright yellow apical metasomal terga (broad yellow apical bands on T4 and T5, and yellow pubescence on T6), contrasting with the dark basal terga. This pattern is similar to that of *M. (Ptilosaroides) neoxanthoptera* Cockerell, from which it is distinguished by the scuto-scutellar band with white hairs, and the setose T6, with abundant stiff, semierect hairs.

Description. Female. Total length 9.0 – 10.3 mm; length of forewing 6.8-7.6 mm. Color. Integument black; legs black (21, 0), except yellowish brown claws and pale yellowish spurs. Tegula dark brown; wings yellowish brown, forewing infuscate on costal margin (23, 1); veins and pterostigma yellowish brown. **Pubescence.** Head with black hairs on

clypeus, supraclypeal area, lower paraocular area, and antennal scape; intermixed black and yellowish hairs on frons, and yellowish erect hairs and appressed pubescence on vertex and gena. Pronotal collar with narrow band of whitish hairs, not reaching posterolateral angles; remainder of pronotum with black hairs. Scutum with two strata of yellowish hairs, one of short, semierect hairs 0.2-0.6x MOD, and another one of long, erect hairs 1.0-1.3x MOD (17, 3); disc of scutellum with similar pubescence, but erect hairs longer, 1.1-1.8x MOD; scuto-scutellar band present (18, 1), of short (0.15-0.25x MOD), dense, plumose whitish hairs; scutellum convex (19, 0). Metanotum with erect black hairs, 0.9-1.6x MOD, with minute branches, not hiding integument. Pleurae and propodeum with black hairs above and whitish hairs below in variable proportions. Legs with pubescence mostly whitish, except brownish on inner surface of basitarsi, and black on base of forecoxa. Basitarsus of foreleg with simple setae (22, 0). Metasoma with distinct yellow apical bands on T4 and T5, narrow on T4, broad on T5 (27, 1). T1-T3 with pale brownish hairs on their discs, and with poorly defined, narrow apical bands of brownish hairs (25, 0). Most of T6 with appressed pale yellowish pubescence, except hairs brown at apex (in one specimen brown hairs occupying apical third of T6); T6 with long (1.1-1.3x MOD), semierect yellowish hairs interspersed with appressed pubescence (28, 0). Scopa yellowish, except hairs mostly dark brown on S6. Disc of S6 evenly covered with setae (30, 0); apical fringe reaching margin of sternum (31, 0). S2-S3 without entire white apical fasciae under scopa (29, 0), but S3-S5 with lateral yellowish apical fasciae under scopa. *Sculpture.* Clypeus and supraclypeal area with dense, small punctures separated by 0.2-0.5 PD, sparser medially. Punctures on frons, vertex and scutum small, nearly coalescent (16, 0); punctures on scutellum smaller than on scutum; punctures of mesopleuron small on hypoepimeral area (similar to those of scutum), becoming larger downward; punctures on lower part of mesopleuron 2.0-2.5x as large as those of scutum and separated by shiny interspaces 0.5-1.0 PD. Discs of terga with dense, minute punctures (half as large as those of scutum). *Morphology.* Clypeus weakly convex (3, 0); apex denticulate, with median denticle larger than lateral ones. Mandible with four teeth; first and second teeth of similar size (7, 0); fourth tooth truncate, incised (8, 2); premarginal carina separated from margin of mandible (9, 0); second interspace with cutting edge present (10, 1), incomplete (11, 0), and third interspace with complete cutting edge (12, 1); outer ridge not joining acetabular carina (4, 0); upper acetabular groove with apical tuft (5, 1); outer premarginal impressed fimbria reduced (6, 0); inner surface without distinct secondary fimbria (13, 0). First and second maxillary segments short, 2.0x and 2.8x as long as wide, respectively (14, 0; 15, 0). Hypostomal carina fading anteriorly, not reaching base of mandible. Inner margin of eyes subparallel, upper interocular distance 1.09x lower interocular distance. Distance from lateral ocellus to posterior margin of head 1.8x MOD. Maximum width of gena in lateral view 0.8x maximum width of eye. Proportions of scape, pedicel and first three flagellomeres 4.3:1.1:1:1.2; first flagellomere as

long as its apical width. Preoccipital margin angulate, but not carinate (1, 0) (2, ?). Metanotum slanting to rear, not hidden by scutellum (20, 1). Metasomal terga without distinct premarginal lines (26, 0); T2 and T3 with shallow postgradular groove (24, 0).

Male. A detailed description of the male is provided by Gonzalez et al. (2018).

Distribution. Argentina, provinces of Buenos Aires, Corrientes, and Misiones; Bolivia, department of Santa Cruz; Brazil, states of Mato Grosso, Rio Grande do Sul, and Santa Catarina; Paraguay, departments of Caaguazú, Guairá, and San Pedro.

Material studied. Argentina. Buenos Aires: 2 females, Pdo. San Pedro, Vuelta de Obligado, 12-13-XII-2013, C. & A. Roig (MACN); 1 male, Punta Indio, 24-II-2012, A. Sanguinetti (MACN); 1 female, San Antonio de Areco, 26-XII-2008, sobre *Carduus acanthoides*, J.P. Torretta (MACN); 1 female, San Antonio de Areco, 28-XII-2008, sobre *Asclepias mellodora*, J.P. Torretta (MACN). Corrientes: 2 females, Parque Nacional Mburucuyá, 17-X-2009, N. Veiga (MACN); 1 male, Parque Nacional Mburucuyá, VII-VIII-2009, N. Veiga (MACN). Misiones: 1 M, 1-X-1910, Jörgensen (MACN). Brazil. Santa Catarina: 3 males, Nova Teutonia, 8-10-XI-1932, F. Plaumann (MACN).

Megachile (Chalepochile) bilineata n. sp. (Fig. 4)

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Diagnosis. This species is distinguished by the unusual pattern of yellow apical bands on the metasoma. Both sexes have yellow bands on T1 and T4, contrasting with the dark pubescence of other terga; the male also has yellow pubescence basally on T4. The wings are dusky, not yellowish brown as in related species. The metanotum is covered with short pale plumose hairs, much as in species of the subgenus *Neochelynbia*. Females are further distinguished by the capitate hairs of the scopa and the hind tibiae and basitarsi. The male lacks pale appressed pubescence on T6, unlike the related *M. ardua* and *M. tacanensis*.

Female holotype. Total length 9.5 mm; length of forewing 6.5 mm. Color. Integument black, except yellowish brown claws and pale yellowish spurs on all legs (21, 0). Tegula dark brown; wings dusky, forewing infuscate on costal margin (23, 1); veins and pterostigma brown. Pubescence. Head with black hairs on clypeus and supraclypeal area; paraocular area and frons with intermixed black and white hairs, vertex with short, appressed, whitish hairs directed anteriorly and scattered long, erect hairs; gena with white hairs. Pronotal collar with band of yellow hairs reaching pronotal lobes; remainder of pronotum with black hairs. Scutum and scutellum with yellowish hairs of two types: semierect, abundant, short hairs 0.2-0.3x MOD, and erect, sparse, long hairs, 0.5-0.8x MOD (17, 3); disc of scutellum with similar pubescence, but erect hairs longer, 1.6-1.8x MOD; scuto-scutellar band present (18, 1), of short, dense whitish hairs; scutellum convex (19, 0). Metanotum with dense, yellowish hairs with short branches, hiding integument; hairs 0.7-1.0x MOD. Pleurae and propodeum with white hairs. Legs

with pubescence mostly whitish, except brownish on inner surface of basitarsi. Basitarsus of foreleg with simple setae (22, 0). Metasoma with distinct yellow apical bands on T1 and T4 (27, 0). Discs of T2-T6 with greyish hairs on their discs, conspicuous only in certain lights; T2, T3, and T5 without apical bands (25, 0); T5 and T6 with abundant, stiff, semierect hairs 0.6-1.2x MOD (28, 0). Hairs of scopa white, capitate on S2-S5, black, with pointed apices on S6. Disc of S6 evenly covered with setae (30, 0); apical fringe reaching margin of sternum (31, 0). S2-S4 with short, lateral white apical fasciae under scopa (29, 0), that on S2 rudimentary. Sculpture. Clypeus and supraclypeal area with dense, small punctures separated by 0.2-0.5 PD, sparser medially. Punctures on frons, vertex and scutum small, nearly coalescent (16, 0); punctures on scutellum smaller than on scutum, separated by 0.2-0.5 PD; punctures of mesopleuron small on hypoepimeral area, becoming larger downward; punctures on lower part of mesopleuron 2.0-2.5x as large as those of scutum and separated by shiny interspaces 0.5-1.0 PD. Discs of terga with dense, minute punctures. Morphology. Clypeus weakly convex (3, 0); apex denticulate, with median denticle larger than lateral ones. Mandible entirely similar to that of *M. ardua* (see above). First and second maxillary segments short, 1.7x and 2.1x as long as wide, respectively (14, 0; 15, 0). Hypostomal carina fading anteriorly, not reaching base of mandible. Inner margin of eyes subparallel, upper interocular distance 1.06x lower interocular distance. Distance from lateral ocellus to posterior margin of head 1.6x MOD. Maximum width of gena in lateral view 0.8x maximum width of eye. Proportions of scape, pedicel and first three flagellomeres 4.7:1.4:1:1.1:1.4; first flagellomere 0.8x as long as its apical width. Preoccipital margin angulate, but not carinate (1, 0) (2, ?). Metanotum slanting to rear, not hidden by scutellum (20, 1). Metasomal terga without distinct premarginal lines (26, 0); T2 and T3 with shallow postgradular groove (24, 0).

Male. Total length 8.0 mm; length of forewing 5.8 mm. Color. Black, except yellowish claws and tibial spurs, reddish brown underside of tibiae and femora, and dark reddish brown tegula. Wings as in female. Pubescence. White on head, mesosoma, legs, and metasomal sterna. T1 and T4 with yellow apical band; T4 also with short, plumose, appressed yellow hairs on disc. T2, T3, and T5 with greyish hairs as in female; T6 with sparse erect setae, without appressed pubescence (50, 0). Clypeus entirely covered with long hairs (32, 0). Underside of head, prosternum, coxa (41, 0), trochanter, and base of femur of foreleg, with dense, finely branched, long hairs, up to 2.5-3.0x MOD, with woolly appearance. Metanotum with finely branched hairs similar to those of female, but longer (1.0-1.5x MOD) and sparser, only partially hiding integument. Middle tarsus with fringe of long hairs, those of basitarsus up to 5x MOD. Sculpture. Punctuation similar to that of female. Morphology. Mandible tridentate (35, 0), without ventral process (36, 0; 37, ?). Proportions of scape, pedicel and first three flagellomeres 4.75:1.25:1:2.75:3.0 (33, 1); first flagellomere as long as 0.6x its apical width. Hypostomal area unmodified (34, 0). Coxal spine and stiff setae on forecoxa absent (38,

0; 39, ?; 40, ?; 42, 0). Foretibia unmodified (43, 0). Forebasitarsus unmodified (44, 0), slender, 3.7x as long as its apical width, without lateral fringe. Middle tibia without protuberances on inner surface (45, 0); tibial spur present (46, 0). Hind femur with specialized, longitudinal patch of short hairs on inner dorsolateral surface (47, 1). Preapical carina of T6 medially emarginate (48, 0); disc of T6 without longitudinal median ridge or protuberance (49, 0). Apical margin of T6 bilobate, with lateral tooth (51, 1; 52, 0). Gradulus of T7 carinate (53, 1); preapical carina of T7 medially truncate (54, 0). Dorsal lobe of gonocoxite present (55, 1), small (56, 1). Gonostylus as long as penis valves (57, 0), without apical lobes (58, 0).

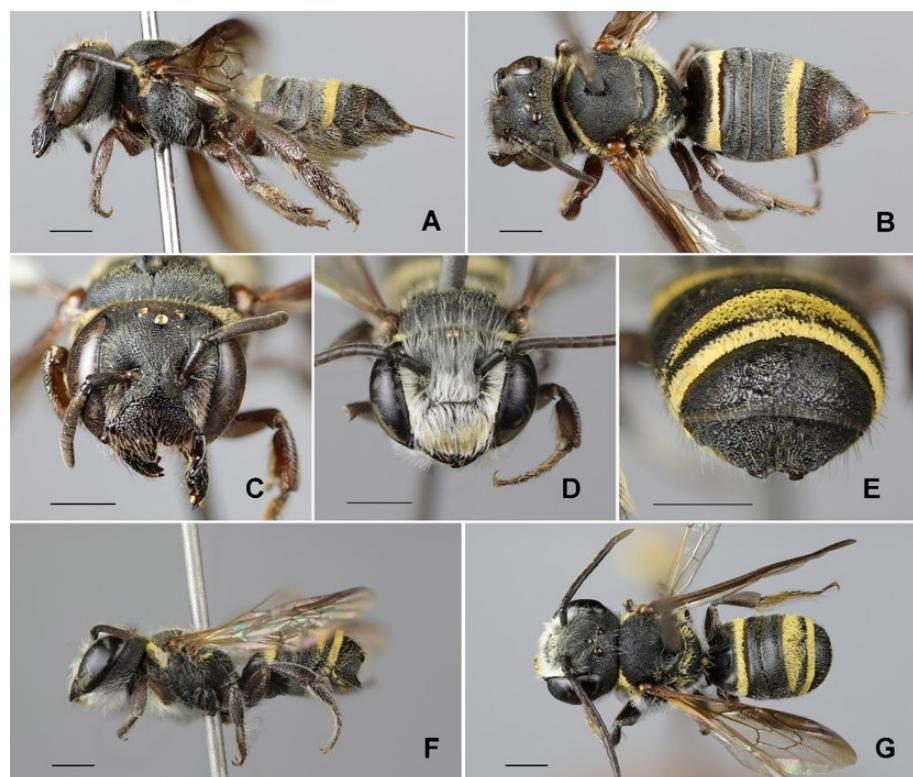


Fig. 4.

Megachile bilineata n. sp. A. female, lateral view. B. female, dorsal view. C. female, face. D. male, face. E. male, caudal view of metasomal terga. F. male, lateral view. G. male, dorsal view. Scale bars = 1 mm.

Distribution. Argentina, provinces of Córdoba, La Rioja, and Mendoza.

Etymology. The species name refers to the two tergal apical bands on the metasoma.

Material studied. Holotype female, Argentina, Córdoba, Chancaní, X-1991, J. Genise, J. Farina & P. Hazeldine (MACN). Paratypes: 1 female, Argentina, Mendoza, Villavicencio, sitio V2, 1225 m, 32,53075°S 68,947806°W, 13-XI-2006, Diego Vázquez (MACN); 1 male, Argentina, La Rioja, Valle de Huaco, RN 75, km 50, 29°15'41.86"S 67°04'34.36"W, ex *Zucagnia punctata*, 30-X-2011, Roig Alsina, González V. & Compagnucci (MACN).

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