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New Neotropical cleptoparasites in the genus *Austrostelis* (Hymenoptera: Megachilidae: Anthidiini)

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Abstract. Three new species of cleptoparasites of the rare genus *Austrostelis* Michener & Griswold are described. *Austrostelis mexicana* Griswold, new species, and *A. costaricensis* Griswold, new species, represent a northern extension of the genus into Mesoamerica while *A. bicolor* Griswold, new species, from Venezuela adds to our limited knowledge for northern South America. A key to the species from Mesoamerica and northern South America is provided.

INTRODUCTION

Cleptoparasites are often rare in collections due, in part, to the frequent focus on flowering plants by melittologists while in the field. Female cleptoparasites are rarely found on flowers, having no need to visit them except to nectar. The Neotropical *Austrostelis* Michener & Griswold, is such a rare cleptoparasite. Originally recognized as the *Hoplostelis aliena* species group within the newly recognized genus *Hoplostelis* Dominique (Griswold & Michener, 1988), it was later recognized as a distinctive genus, *Austrostelis* (Michener & Griswold, 1988). Despite the great difference in body shape, these two genera form a monophyletic clade of cleptoparasites, one of only ten such clades in the long-tongued bees (Litman *et al.*, 2013).

Though widely distributed in the Neotropics (Michener, 2007), of the nine species recognized in a revision of *Austrostelis* (Parizotto *et al.*, 2018), four are known only from the holotype, and none have been recorded from Mesoamerica. Little is known about their host associations. The only confirmed host is *Epanthidium tigrinum* (Schrottky) (Zanella & Ferreira, 2005) although *A. iheringi* (Schrottky) was reared from completely parasitized anthidiine nests that did not discriminate among nests of *E. tigrinum*, *Hypanthidioides* (*Dicranthidium*) *seabrai* Urban, and *H. (Saranthidium) musciformis* (Schrottky) (Cordiero *et al.*, 2015).

The presence of an unnamed *Austrostelis* in Mesoamerica was noted in the early 1990s (Michener & Griswold, 1994) but was not described because it was represented by a single female. Several other undescribed cleptoparasitic Anthidiini, often known

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from unique individuals, have similarly awaited additional material. That has not been forthcoming over the last thirty years. This study describes those undescribed species of *Austrostelis* from Mesoamerica and northern South America, supplementing the work of Parizotto *et al.* (2018), in the hope that documentation will encourage discovery of additional material. All species with this northern distribution differ from more southerly congeners in the entirely light color of the metasoma.

MATERIAL AND METHODS

Morphological terminology follows that of Michener (2007) as does the classification of Anthidiini. Abbreviations F, S, and T are used for antennal flagellomere, metasomal sternum and metasomal tergum, respectively. Photomicrographs were taken using a Keyence® VHX-500F Digital Imaging System. Lengths were taken using an ocular micrometer on a Leica MZ12 stereomicroscope rounded to the nearest tenth of a millimeter. Total body length was estimated by measuring the combined length of head and mesosoma (from the clypeus to the propodeum, in profile), then adding the length of the metasoma. Forewing length was measured from the posterior border of the tegula to the tip of the forewing.

Placement of *A. flava* in the key to species is based on the images of the holotype in Parizotto *et al.* (2018). Material studied is deposited in the following collections: USDA-ARS Pollinating Insects Research Unit, Logan, Utah, USA (BBSL); National Collection of Insects, Department of Zoology, Universidad Nacional Autónoma de México, México City, Mexico (CNIN); El Colegio de la Frontera Sur, San Cristobal de las Casas, Chiapas, Mexico (ECOSUR); Florida State Collection of Arthropods, Florida State University, Gainesville, Florida, USA (FSCA); Museo de Zoología, Universidad de Costa Rica, San José, Costa Rica (MZUCR); and Snow Entomological Museum, University of Kansas, Lawrence, Kansas, USA (SEMC).

SYSTEMATICS

Key to species of *Austrostelis* of Mesoamerica and northern South America

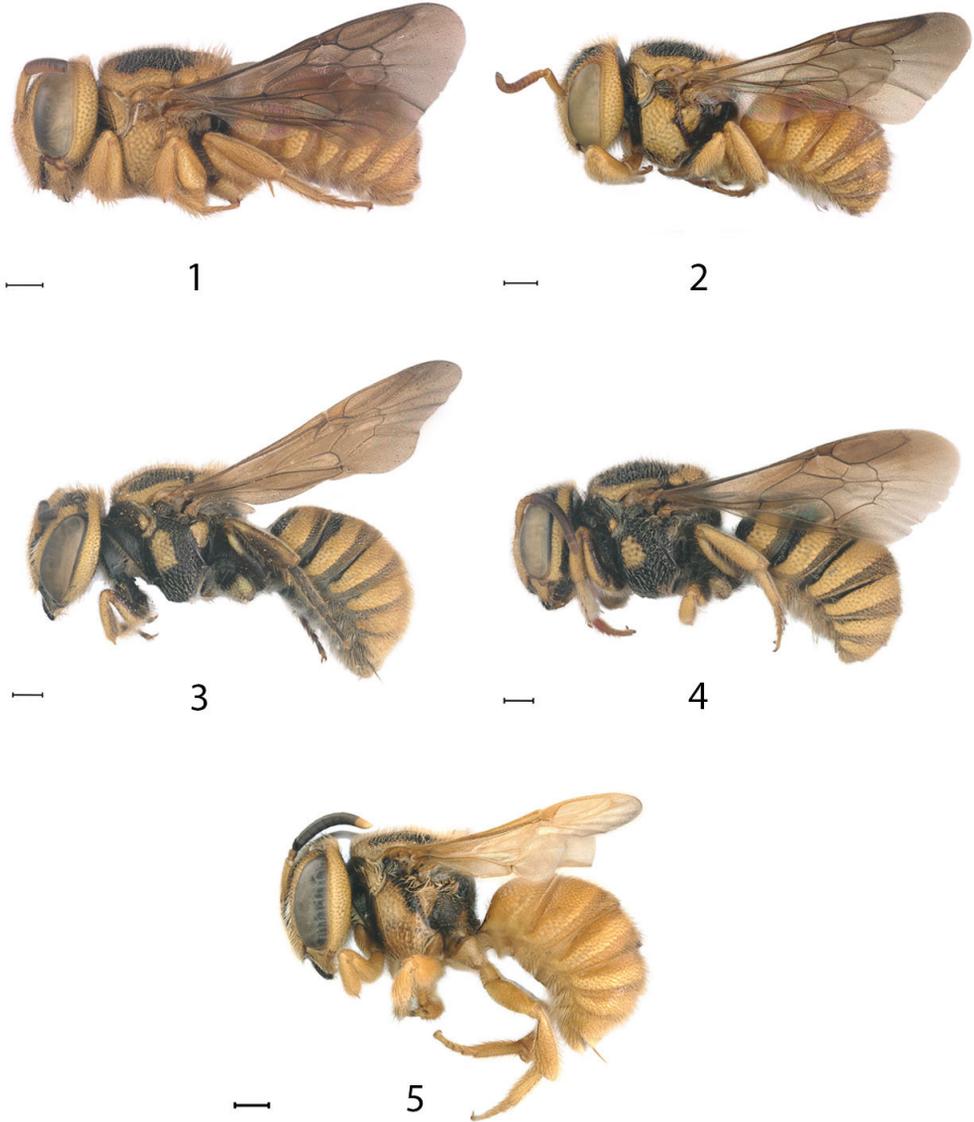
1. Marginal cell light yellow in contrast to dark tip of forewing; apical one or two flagellomeres light in contrast to black preceding segments*A. costaricensis*, n. sp.
- Marginal cell as smoky or more so than dark tip of forewing; apical flagellomeres dark similar to preceding flagellomeres.....2
- 2(1). Labrum not reaching end of hypostomal carina, galea exposed; F2 light.....*A. bicolor*, n. sp.
- Labrum reaching end of hypostomal carina, galea hidden; F2 dark 3
- 3(2). F2–F4 black; T2 black basally *A. mexicana*, n. sp.
- F2–F4 light colored; T2 reddish basally..... *A. flava* (Friese)

Austrostelis bicolor Griswold, new species

ZooBank: urn:lsid:zoobank.org:act:5124A795-5944-4EBA-B6A8-AC55E7D6BB04

(Figs. 1, 2, 6, 7, 11, 12, 16, 17, 21)

DIAGNOSIS: This species differs from other northern species by the more angulate axillae (Figs. 11, 12), short labrum, T2 with coarser punctation and broader impunctate margin (Figs. 16, 17), and absence of submedial, longitudinal stripes on the scutum (Figs. 11, 12). From the potentially co-occurring *A. flava* (Friese) it differs in tergal punctation finer and impunctate tergal margins narrower.



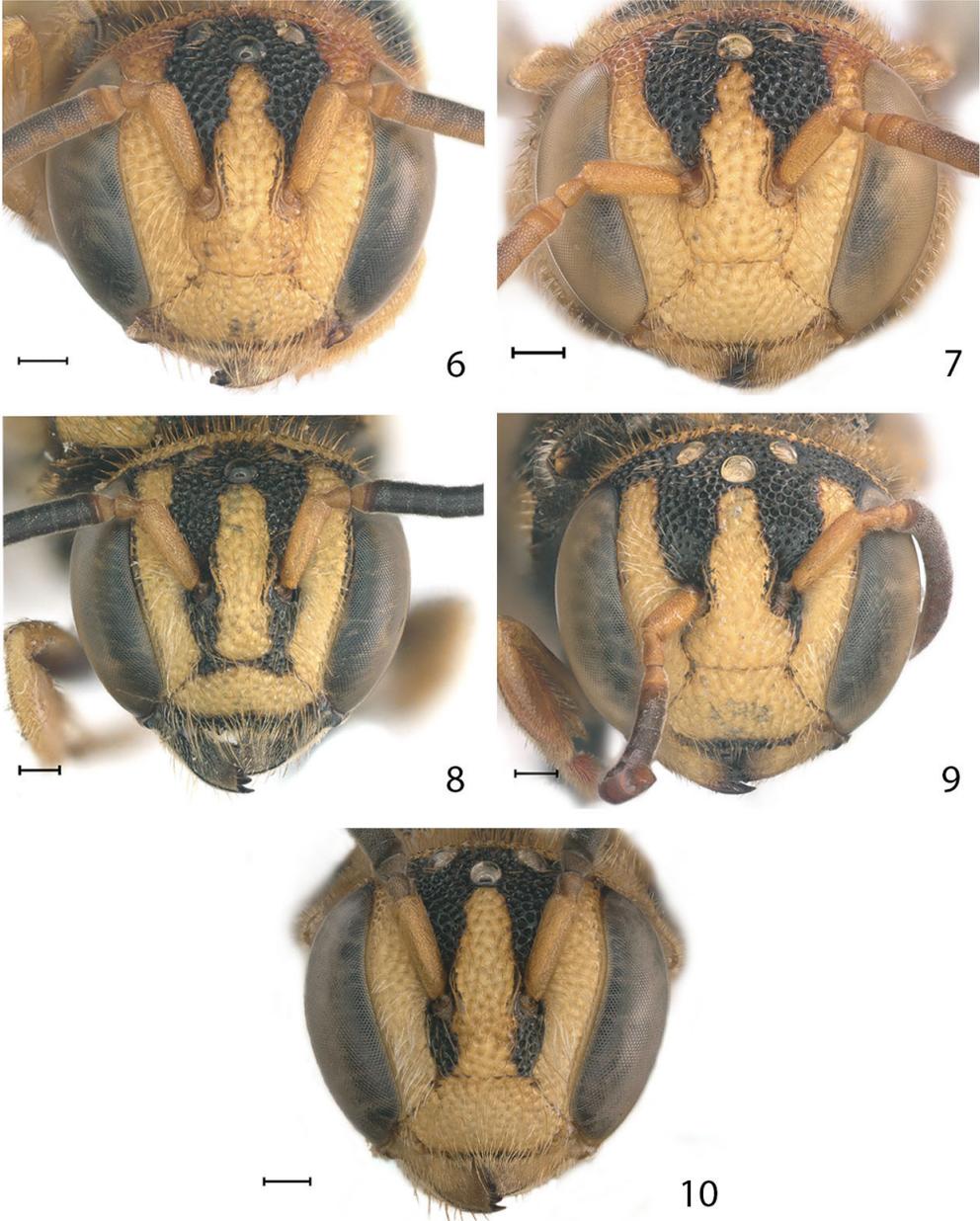
Figures 1–5. *Austrostelis* lateral habitus. 1. *A. bicolor* female holotype. 2. *A. bicolor* male paratype (BBSLID116102). 3. *A. mexicana* female holotype. 4. *A. mexicana* male paratype (BBSLID116107). 5. *A. costaricensis* female holotype. Scale bar = 0.5 mm.

DESCRIPTION: Female. Body length, 5.6 mm; intertegular distance, 1.58 mm. Body with black marks limited to head and mesosoma, metasoma dorsally orange with yellow markings (Fig. 1). Forewing smoky apically including marginal cell, stigma and veins surrounding marginal cell dark brown (Fig. 1). Labrum short, not reaching full length of fossa, mouthparts in repose exposed apically. Mandible 4-toothed, third tooth weak, obtuse, gap dorsal to it deeper than one ventral to it. Clypeus with moderate, nearly contiguous punctures. Subantennal suture convex (Fig. 6). Juxtantennal carinae with even flare. Flagellum dark except F1, F2 yellow; penultimate segment slightly longer than broad. Pronotal collar lacking narrow groove laterally. Scutum polished; punctation dense, not contiguous; punctures regular (Fig. 11). Scutellum with apical margin very broadly, evenly convex, carinate except medially; laterally, at margin with axilla, exceeding the axillar length. Axilla angulate laterally (Fig. 11). Mesepisternum with punctation dense, punctures medially no larger than those on scutum laterally. Metapleuron with puncture row along anterior margin, disc without punctures on ventral half, posterior margin distinctly angulate near middle. Forewing unicolored, venation dark; marginal cell darkly cloudy in contrast to surrounding areas (Fig. 1). T2 with lateral margin in dorsal view slightly convex; punctation of subapical band slightly smaller than on disc, not fine; apical impunctate margin moderately wide (Fig. 16). T3–T6 with rather dense, subappressed white pubescence. T6 with small preapical pit medially, with very fine indistinct transverse preapical striae.

Male. Body length, 5.3 mm; intertegular distance, 1.52 mm. As female except: Mandible apically reduced, 3-toothed. Labrum with apical margin truncate, not angled medially. Additional flagellomere. T2 shape as in female but punctation medially less dense, less coarsely punctate, only slightly finer than on disc (Fig. 17). T7 apical margin slightly convex with hint of emargination medially. S2 short, disc flat, apical zone translucent, concolorous (Fig. 21). S3 apical margin slightly incurved on middle two-thirds, laterally slightly angled anteriorly, fringe on margin dense, straight medially becoming long laterally, curled toward midline. S4, S5 with similarly configured fringes but shorter. S5, S6 with small apicolateral slightly acute angle

TYPE MATERIAL: Holotype female: "Venezuela Merida Los Araques 13km W Lagunillas 18-VII-1991 L.Stange & C.Porter" (HOLO103). Paratypes: same data, 1 female, 7 males. Holotype deposited in FSDA, paratypes in FSDA and BBSL.

COMMENTS: This is the first record of *Austrostelis* from Venezuela. It runs to couplet 5, *A. flava*, in Parizotto *et al.* (2018) but differs as indicated in the diagnosis. It is worth noting that both species from northern South America, this species and *A. flava* from Colombia, have a pale metasoma unlike the largely dark metasomal coloration in all known species from more southerly parts of South America. A single male from the type locality has the basal zone of T2 black. This specimen is also larger than the other specimens and may not be conspecific, so is not included here. The markings, body size and shape of *A. bicolor* are virtually identical with *Hypanthidium magdalena* Urban of adjacent northern Colombia.



Figures 6–10. *Austrostelis* frontal view. 6. *A. bicolor* female holotype. 7. *A. bicolor* male paratype (BBSLID116102). 8. *A. mexicana* female holotype. 9. *A. mexicana* male paratype (BBSLID116107). 10. *A. costaricensis* female holotype. Scale bar = 0.25 mm.

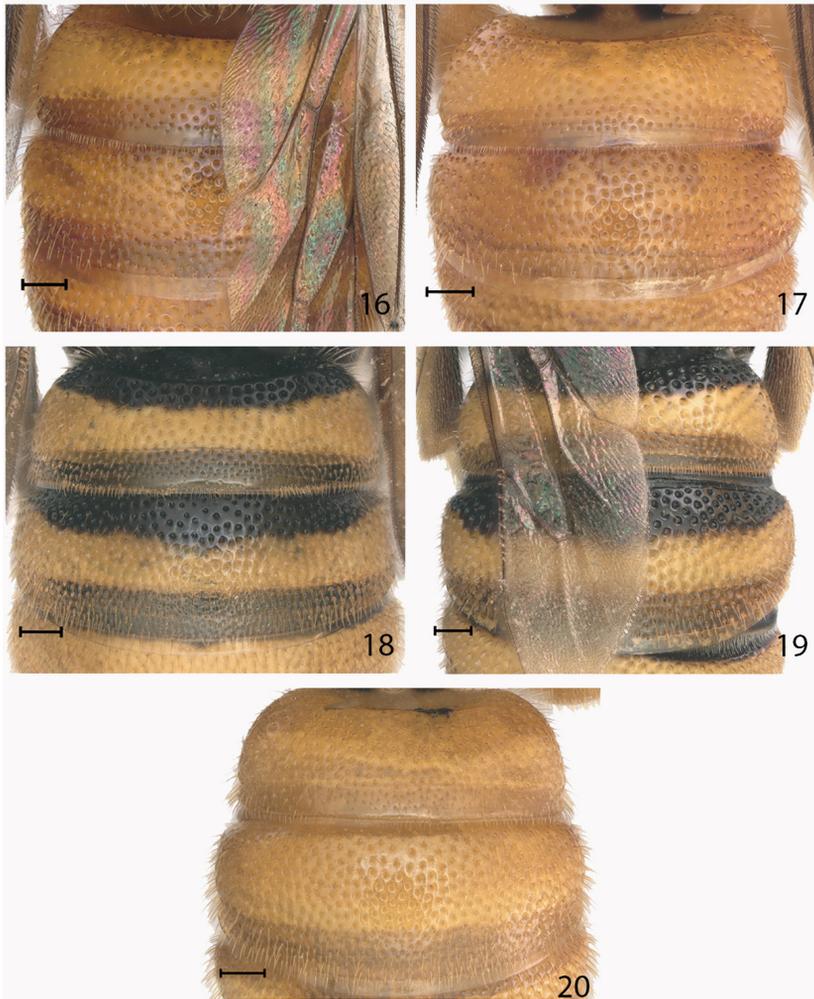


Figures 11–15. *Austrostelis mesosoma* dorsal view. **11.** *A. bicolor* female holotype. **12.** *A. bicolor* male paratype (BBSLID116102). **13.** *A. mexicana* female holotype. **14.** *A. mexicana* male paratype (BBSLID116107). **15.** *A. costaricensis* female paratype. Scale bar = 0.25 mm.

Austrostelis costaricensis Griswold, new species

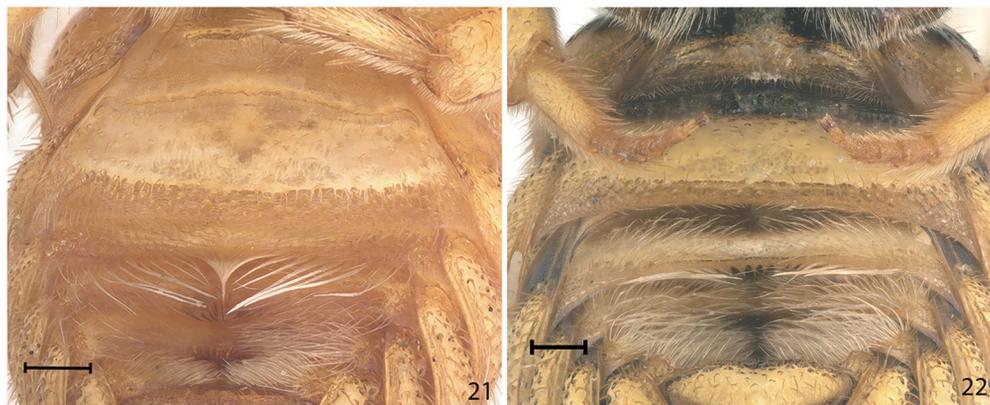
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(Figs. 5, 10, 15, 20)

DIAGNOSIS: Unique among known *Austrostelis* in the bicolored wings with yellow veins and dark tips and the entirely yellow and reddish metasoma (Fig. 5). Presumably this would apply to males since markings do not differ significantly between sexes in *Austrostelis*. Additionally, it differs from *A. mexicana* and *A. bicolor* in F10 white, F9 no longer than broad instead of longer than broad and subantennal suture nearly straight (Fig. 10).



Figures 16–20. *Austrostelis* metasoma T1 and T2. 16. *A. bicolor* female holotype. 17. *A. bicolor* male paratype (BBSLID116102). 18. *A. mexicana* female holotype. 19. *A. mexicana* male paratype (BBSLID116107). 20. *A. costaricensis* female holotype. Scale bar = 0.25 mm.

DESCRIPTION: Female. Body length, 5.6 mm; intertegular distance, 1.50 mm. Body with black marks limited to head and mesosoma, metasoma dorsally largely orange with yellow markings (Figs. 5, 10, 15). Forewing bicolored, smoky apically, yellow in marginal cell, stigma yellow, veins surrounding marginal cell light (Fig. 5). Labrum long, extending full length of fossa, completely covering mouthparts in repose. Mandible 4-toothed, third tooth weak, obtuse, gap dorsal to it no deeper than one ventral to it. Clypeus with moderate, nearly contiguous punctures. Subantennal suture nearly straight (Fig. 10). Juxtantennal carinae with convex flare dorsally. Flagellum black except dark red on F1, white on F10 (Fig. 5) and sometimes F9; penultimate segment no longer than broad. Pronotal collar extending medially as narrow groove nearly to the level of the parapsidal suture. Scutum polished; punctation dense but not contiguous, punctures regular (Fig. 15). Scutellum with apical margin very broadly, evenly convex, carinate except medially; laterally, at margin with axilla, exceeding the



Figures 21, 22. *Austrostelis* male S2–S5. 21. *A. bicolor* male paratype (BBSLID116102). 22. *A. mexicana* male paratype (BBSLID116107). Scale = 0.25 mm.

axillar length. Axilla broadly rounded laterally, not angulate (Fig. 15). Mesepisternum with punctation dense, punctures medially larger than those on scutum laterally. Metapleuron with puncture row along anterior margin, disc without punctures on ventral half, posterior margin distinctly angulate near middle. T2 with lateral margin in dorsal view strongly convex; punctation of subapical band slightly smaller than on disc, not fine; apical impunctate margin narrow (Fig. 20). T3–T6 with rather dense, suberect golden pubescence. T6 with small preapical pit medially, without transverse preapical striae.

Male: unknown.

ETYMOLOGY: Name recognizes the country of origin of this species.

DISTRIBUTION: Costa Rica.

TYPE MATERIAL: Holotype female: “COSTA RICA, San José Ciudad Colón, 800m VI–VII 1990 col. Luis Fournier”. Paratype female: “COSTA RICA Guanacaste Maritza Biol.Sta. Volcan Orosi, 12-II-1995 F.D. Parker” (HOLO102). Holotype deposited in Museo de Zoología, Universidad de Costa Rica (MZUCR); paratype in BBSL.

COMMENTS: *Austrostelis costaricensis* runs to couplet 3 in Parizotto *et al.* (2018), where it agrees with *A. appendiculata*, known only from Brazil, in the entirely yellow mandible but the mesepisternum lacks the black discal spot. The markings and body size of *A. costaricensis* make it almost impossible to distinguish visually from the co-occurring *Hypanthidioides (Saranthidium) panamensis* (Cockerell).

Austrostelis mexicana Griswold, new species

ZooBank: urn:lsid:zoobank.org:act:045BA3C6-8A9D-4B95-BE45-B56C92C72214
(Figs. 3, 4, 8, 9, 13, 14, 18, 19, 22)

DIAGNOSIS: The combination of rounded axillae (Figs. 13, 14); black basal and apical bands on the terga (Figs. 18, 19); and frons, vertex, and scutum (Figs. 13, 14) with punctation confluent, is distinctive. In addition, the female mandible is largely black (Fig. 8).

DESCRIPTION: Female. Body length, 7.1 mm; intertegular distance, 1.70 mm. Body black with yellow markings on head, mesosoma, and extensively on metasoma dorsally (Figs. 3, 8, 13). Forewing smoky apically, yellowish smoky in marginal cell, stigma dark amber, veins surrounding marginal cell dark. Labrum long, extending full

length of fossa, completely covering mouthparts in repose. Mandible 4-toothed, third tooth weak, strongly obtuse, gap dorsal to it no deeper than one ventral to it.

Clypeus with coarse, contiguous punctures. Subantennal suture weakly convex. Juxtantennal carina with convex flare dorsally. Flagellum black except yellow on F1, brown on distal half of F10; penultimate segment longer than broad. Pronotal collar extending medially as narrow groove nearly to the level of the parapsidal suture. Scutum with surface shiny but not polished; punctation contiguous, punctures irregular. Scutellum with apical margin very broadly, evenly convex, carinate except medially; laterally, at margin with axilla, exceeding the axillar length. Axilla slightly rounded laterally, not angulate (Fig. 13). Mesepisternum with punctation dense, punctures medially no larger than those on scutum laterally. Metapleuron with row of punctures along anterior margin, disc without punctures on ventral half; posterior margin distinctly angulate near middle. Forewing unicolored, venation dark; marginal cell darkly cloudy in contrast to surrounding areas (Fig. 3). T2 with lateral margin in dorsal view only slightly convex; subapical band finely, densely punctate, much finer than on disc, apical impunctate margin narrow (Fig. 18). T3–T6 with rather dense, suberect golden pubescence. T6 with small preapical pit medially, without transverse preapical striae.

Male. Body length, 7.1 mm; intertegular distance, 1.82 mm. As female except: Mandible apically reduced, 3-toothed, mostly yellow (Fig. 9). Labrum with apical margin angled medially. Additional flagellomere. T2 shape as in female but punctation of subapical zone more coarsely punctate, only slightly finer than on disc (Fig. 19). T7 apical margin slightly convex with hint of emargination medially. S2 short, disc raised into rounded transverse ridge, apical zone translucent, not pigmented (Fig. 22). S3 apical margin distinctly incurved on middle two-thirds, laterally distinctly angled anteriorly, fringe on margin dense, straight medially becoming long laterally, curled toward midline. S4, S5 with similarly configured but shorter fringes. S5, S6 with small apicolateral acute angle.

ETYMOLOGY: Name recognizes the country of origin of this species.

DISTRIBUTION: Central to southern Mexico.

TYPE MATERIAL: Holotype female: “Mex[ico]. Chis. Acacovaqua.15°15.37 N. 032°23 26 W 2005/VII/11 M.Rincón, R.Ayala, R. Vandame, M.Guzman” (HOLO101). Paratype males: MEXICO: 1 male, San Luis Potosi Tlamaya (nr. Xilitla) 900 m alt., 24 Aug. 1988, D. Yanega on *Hyptis*; 1 male, Veracruz, Loma Ventura, El Mirador, 1170 m, 24-09-06, 19 1234.3N 96 54 08.3W En *Bidens pilosa*, M. Bonet, 0000006158. Holotype deposited in ECOSUR; paratypes in SEMC and CNIN.

COMMENTS: The female runs to couplet 5 in Parizotto *et al.* (2018), where it fails both sets of characters: scape and F1 are reddish but scutellum is largely yellow as are T3–T6. In the key to males (Parizotto *et al.*, 2018), the male runs to *A. flava* in couplet 5. The inclusion of images of the holotype of *A. flava* in Parizotto *et al.* (2018) suggests that *A. mexicana* differs in narrower impunctate tergal margins and T2 with basal third black.

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I wish to recognize Charles Michener who did much to increase my understanding of Anthidiini, and who, while we worked together on systematics of Western Hemisphere Anthidiini, shared the recognition of the distinctive nature of the San Luis Potosi specimen. Thanks to Taylor Hawkes for the images and to the curators who provided material: Remy Vandame (ECOSUR), Ismael Hinojosa-Díaz (CNIN), Paul

Hanson (MZUCR), Lionel Stange (FSDA), and Charles Michener (SEMC).

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