Journal *of* Melittology
Bee Biology, Ecology, Evolution, & Systematics *The latest buzz in bee biology*
No. 87, pp. 1–15 8 August 2019

A new genus of augochlorine bees from northern Venezuela (Hymenoptera: Halictidae)

Michael S. Engel[1]

Abstract. A new genus and species of the bee tribe Augochlorini (Halictinae) is described and figured from northern Venezuela. ***Trichommation osculans*** Engel, new genus and species, is a member of the *Megaloptidia*-group of genera as evidenced by the narrow and elongate mouthparts and sharply pointed galeal apex. The genus is most similar to *Megommation* Moure and *Megaloptidia* Cockerell, particularly in the enlarged ocelli present only in these genera among those in the group. Aside from intermingling traits of both of these genera, *Trichommation* is further distinct from both owing to the presence of ocular setae, a pectinate inner metatibial spur, and basal rugae on the basal area of the propodeum. Emendations to the key to genera of the *Megaloptidia* group are provided to allow for the identification of *Trichommation*.

INTRODUCTION

The genera encompassing the *Megaloptidia*-genus group in the New World bee tribe Augochlorini include a variety of bees with diverse biologies ranging from cleptoparasitism to crepuscular/nocturnal foraging (Engel, 2000; Michener, 2007; Gonçalves, 2016). Traditionally, this group has included the genera *Megaloptidia* Cockerell, *Megommation* Moure, *Ariphanarthra* Moure, *Micrommation* Moure, *Megaloptina* Eickwort, *Stilbochlora* Engel *et al*., and *Cleptommation* Engel *et al*. (Eickwort, 1969; Engel, 2000). The last three of these were originally established as subgenera within an expanded *Megommation* (*e.g*., Eickwort, 1969; Engel *et al*., 1997; Engel, 2000; Michener, 2007), but owing to their rather dissimilar morphologies and biologies (Silveira *et al*., 2002; Engel, 2013) and the fact that *Megommation s.l*. as so defined was not monophyletic (Gonçalves, 2016) these have since been recognized as individual genera (*e.g*.,

[1] Division of Entomology, Natural History Museum, and Department of Ecology & Evolutionary Biology, 1501 Crestline Drive – Suite 140, University of Kansas, Lawrence, Kansas 66045-4415, USA (msengel@ku.edu).
[2] Division of Invertebrate Zoology, American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024-5192, USA
doi: http://dx.doi.org/10.17161/jom.v0i87.11673

ISSN 2325-4467

Silveira *et al*., 2002; Engel, 2013; Gonçalves, 2016). Although not advised, an alternative system could subsume each of these small groups as subgenera within *Megaloptidia*.

The genus group has been recovered as monophyletic in the most recent phylogenetic analyses of the tribe (*e.g*., Gonçalves, 2016). Engel (2000) recovered *Pseudaugochlora* Michener as the extant sister group to the clade, while the recent analysis by Gonçalves (2016) also suggested *Augochlorodes* Moure might be intercalary between *Pseudaugochlora* and the *Megaloptidia* group. Indeed, Gonçalves (2016) proposed expanding the group to include *Pseudaugochlora* and *Augochlorodes*, rather than as closely related but distinct. I prefer to maintain the narrower confines of the *Megaloptidia*-genus group as it is a well-defined, easily recognized clade, particularly noteworthy for the narrowed and elongate prementum combined with the absence of defined lateral teeth on the labral distal process. Inclusion of *Pseudaugochlora* and *Augochlorodes* renders it difficult to circumscribe the unit, particularly with the latter genus. Moreover, Gonçalves (2016) noted that his more broadly defined grouping was poorly supported in all of his analyses and it therefore seems prudent to retain the more cohesive *Megaloptidia*-genus group as circumscribed by Eickwort (1969) and Engel (2000), noting that *Pseudaugochlora* and *Augochlorodes* are likely the closest extant relatives (another option would be to collectively refer to them as the infratribe Megaloptidiiti with three generic groups included, analogous to the system used in Engel, 2000). The only other genus in which the mouthparts are narrowed, analogous to those of the *Megaloptidia* group, is *Chlerogelloides* Engel *et al*., which encompasses three rather peculiar species from French Guiana, Amazonian Brazil, and the eastern side of the Andes and Amazon Basin of Ecuador and Peru (Engel *et al*., 1997; Engel & Brooks, 1999; Oliveira *et al*., 2012). The development of narrowed mouthparts in *Chlerogelloides*, however, is independently derived and the genus is more closely related to *Chlerogella* Michener and *Ischnomelissa* Engel (Engel, 2000; Gonçalves, 2016).

The genera of the *Megaloptidia* group are all typically rather poor in species diversity. Presently, *Ariphanarthra*, *Micrommation*, and *Stilbochlora* are each monotypic (Moure, 1951, 1969; Engel *et al*., 1997), although for the last of these genera there are several further species known from collections (pers. obs.). *Megaloptidia* has three species (Engel & Brooks, 1998), *Megommation* two species (Gonçalves & Santos, 2010), *Cleptommation* four species (Engel, 2013), and *Megaloptina* has at least two species (Eickwort, 1969; Engel, 2000). Of particular interest are the crepuscular habits of *Megaloptidia* and *Megommation*, both of which have enlarged ocelli for dim-light foraging but which have each evolved such a life history independently, as well as from the more widely known nocturnal genus *Megalopta* Smith (Engel, 2000; Gonçalves, 2016).

Herein is described a new genus of Augochlorini belonging to the *Megaloptidia* group (Fig. 1), possessing the greatly narrowed and elongate prementum, sharply pointed galeal apex, and lacking labral lateral teeth as in other genera of the clade. Among this group, the genus is superficially most similar to *Megaloptidia* and *Megommation* owing to the enlarged ocelli, either representing another independent origin of dim-light foraging within the clade or more likely perhaps related to one of these genera. Like *Megommation*, the new genus lacks the enlargement of compound eyes and could be related to this genus. Refinement of its phylogenetic position relative to *Megommation* awaits the discovery of the male which remains unknown for the new genus. The genus and its sole species are described here in order to bring them to the attention of melittologists in the hopes of learning more about its biology. Augmented couplets to the existing key to augochlorine genera are provided in order to permit proper identification of the new genus.

Figures 1–2. Holotype female of *Trichommation osculans*, new genus and species. **1.** Lateral habitus. **2.** Lateral detail of head and mesosoma.

MATERIAL AND METHODS

The format for the generic description is analogous to those used elsewhere for Augochlorini (Engel, 2000, 2007; Engel *et al*., 1997). Morphological terminology follows that of Eickwort (1969), Engel (2000, 2001), and Michener (2007), with the terms

for metatibial spur and protibial calcar morphologies taken from Engel (2009) and Engel *et al*. (2017), respectively. Morphological features were studied and measured with an Olympus SZX12 stereomicroscope, and images prepared with a Canon 7D digital camera. Comparative material of all genera of the *Megaloptidia* group were examined from the collections of the Division of Entomology, University of Kansas Natural History Museum, Lawrence, Kansas and the Division of Invertebrate Zoology, American Museum of Natural History, New York, New York.

SYSTEMATICS

Tribe Augochlorini Beebe

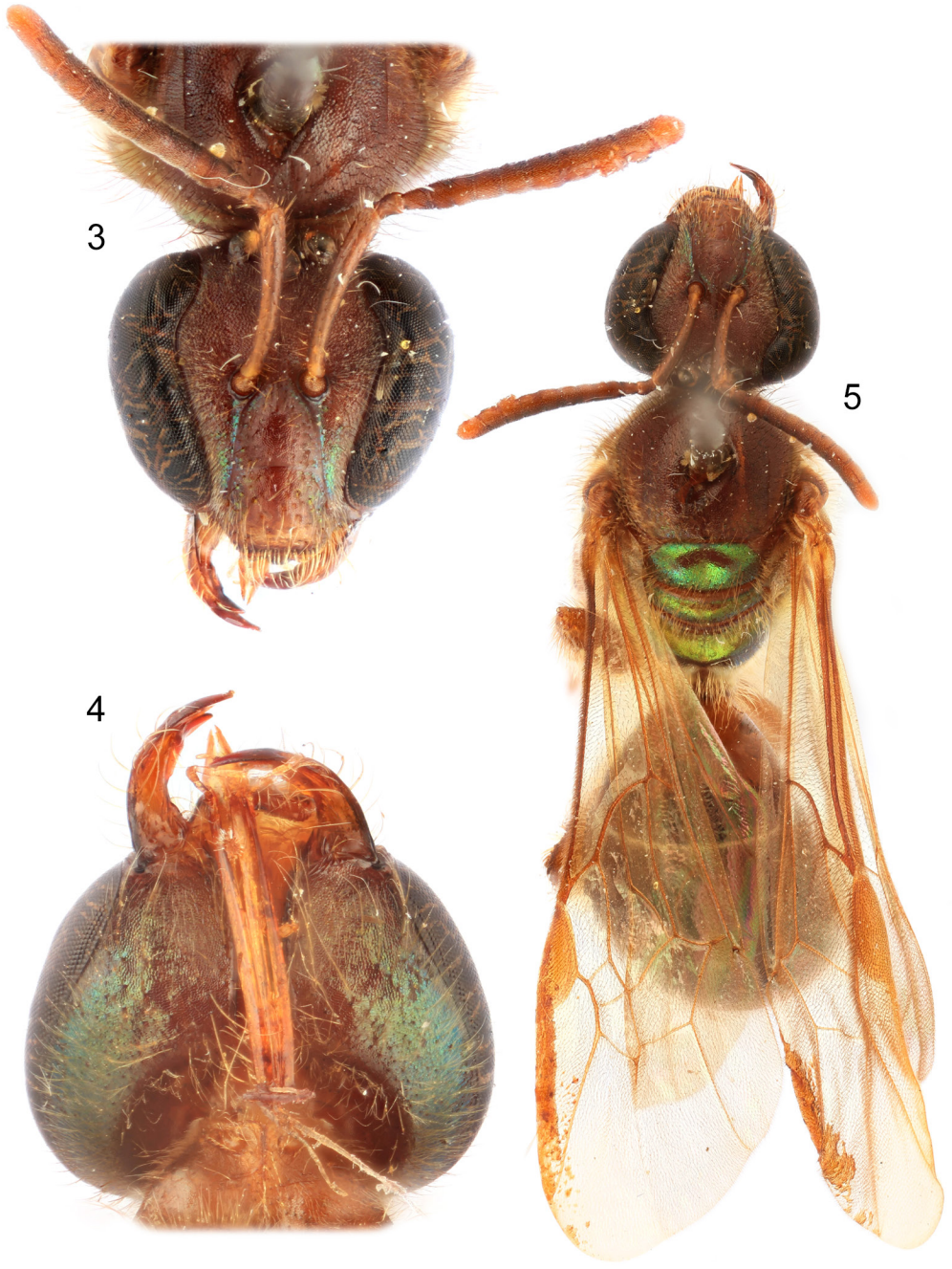
Trichommation Engel, new genus

ZooBank: urn:lsid:zoobank.org:act:1EC370C1-806C-49C9-939D-65DE8CD215D2

TYPE SPECIES: *Trichommation osculans* Engel, new species.

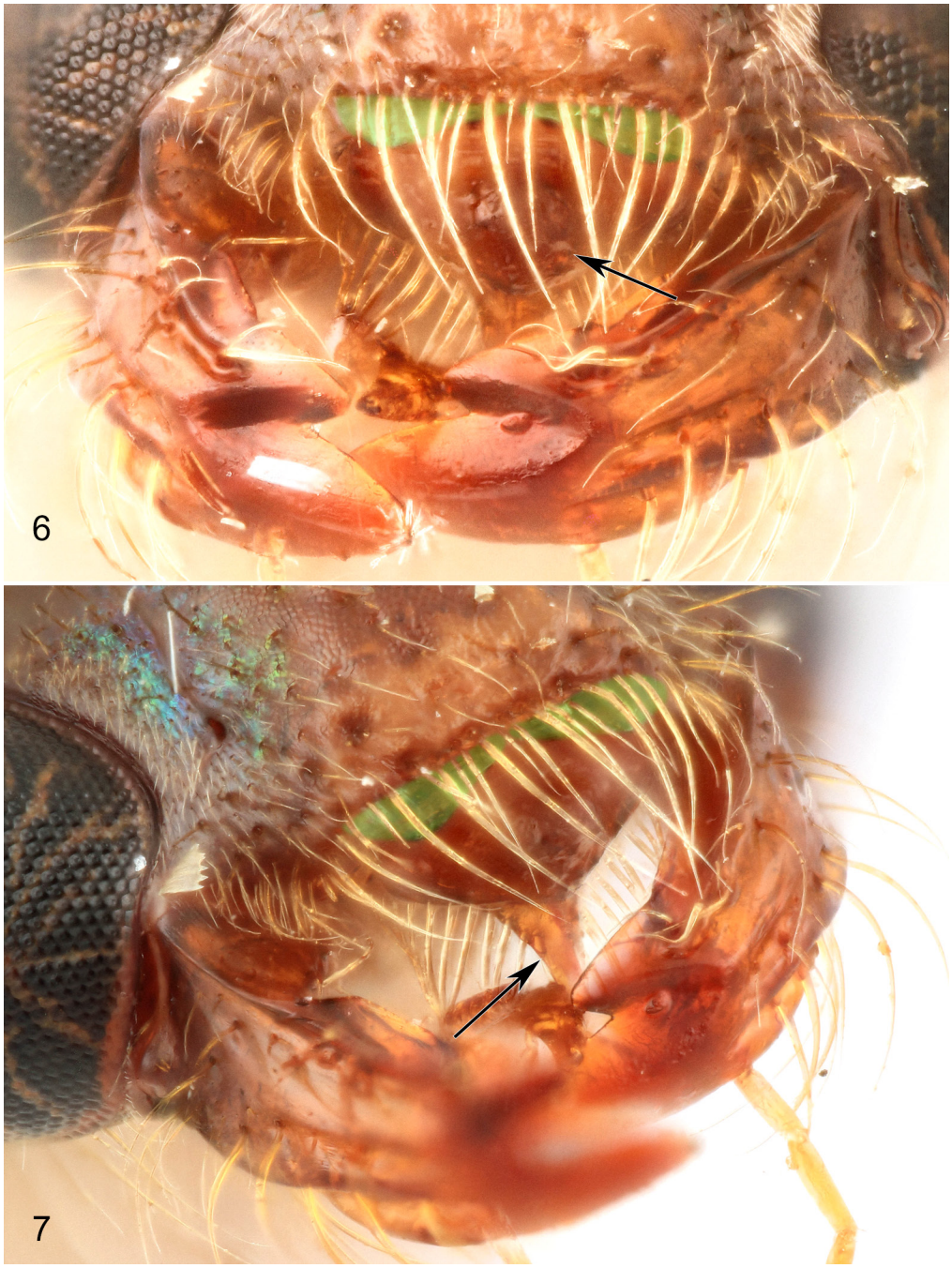
DIAGNOSIS: *Trichommation* is unique among genera in the *Megaloptidia*-genus group for the possession of distinct ocular setae (most genera have minute setae, but these are about as long as a single ommatidial diameter, or often less, while in the new genus these setae are more than twice the ommatidial diameter, and often thrice or more). The new genus is most similar to *Megommation* and *Megaloptidia*, but differs from both in the pectinate inner metatibial spur (serrate in the former two genera), presence of basal rugae on the basal area of the propodeum (entirely coriarious without other sculpturing in the former two genera), and smaller body size (just under 10 mm in the new genus, while the former two genera are over 11 mm, and frequently 12–15 mm). Apart from the aforementioned traits, the combination of the following further discriminates the genus from others: ocelli enlarged; compound eyes not enlarged, with upper tangent not exceeding level of vertex; labral distal process narrowly triangular, narrower than basal area; labral basal area suborbicular; hypostomal ridge lamellate; probasitarsal brush present; and metabasitibial plate with all borders well defined.

DESCRIPTION: ♀: Mandible short (length from anterior articulation to apex subequal to lower interorbital distance: versus well surpassing it as in *Cleptommation*), with acute subapical tooth. Labrum with distal process narrowly triangular, lateral teeth absent (Fig. 7); basal elevation suborbicular, slightly protuberant, with apical surface flattened (Fig. 6). Prementum greatly narrowed and elongate (Fig. 4). Galeal apex acutely pointed (Figs. 4, 8). Hypostomal ridge lamellate, particularly strongly so posteriorly (Fig. 8); anterior angle rounded. Malar space linear, base of mandible abutting lower tangent of compound eye (Figs. 2, 3). Epistomal sulcus forming orthogonal angle (Fig. 3). Ocelli greatly enlarged (Figs. 2, 3); ocellar furrow absent; compound eyes not greatly enlarged, upper tangent not exceeding level of vertex in facial view (Fig. 3); compound eyes with distinct ocular setae (Fig. 9), individual setae longer than ommatidial diameter. Vertex not expanded or ridged posterior to ocelli, short (subequal to ocellar diameter), without ocellar furrow. Antennal flagellum with 10 flagellomeres. Preoccipital ridge rounded. Pronotal lateral angle obtuse, not projected, lateral ridge rounded, dorsal ridge not carinate. Mesoscutum broadly rounded anteriorly; mesoscutal lip low and rounded. Tegula oval. Probasitarsal brush absent. Scopa formed of long, plumose setae on metafemur, setae uniformly golden yellow (Figs. 1, 14); inner ridge of metatibia with long, branched setae blending to simple setae on outer surface; inner surface of metatibia with dense simple setae. Metabasitibial plate distinct



Figures 3–5. Holotype female of *Trichommation osculans*, new genus and species. **3.** Facial view. **4.** Ventral view of head. **5.** Dorsal habitus.

on anterior and posterior borders (Fig. 15), apex acutely rounded. Inner metatibial spur pectinate (Fig. 16), fewer than 10 branches, branches not densely packed together. Forewing with marginal cell apex acute. Hind wing with distal hamuli irregularly spaced (2-1-2). Basal area of propodeum slightly shorter than mesoscutellum, surface

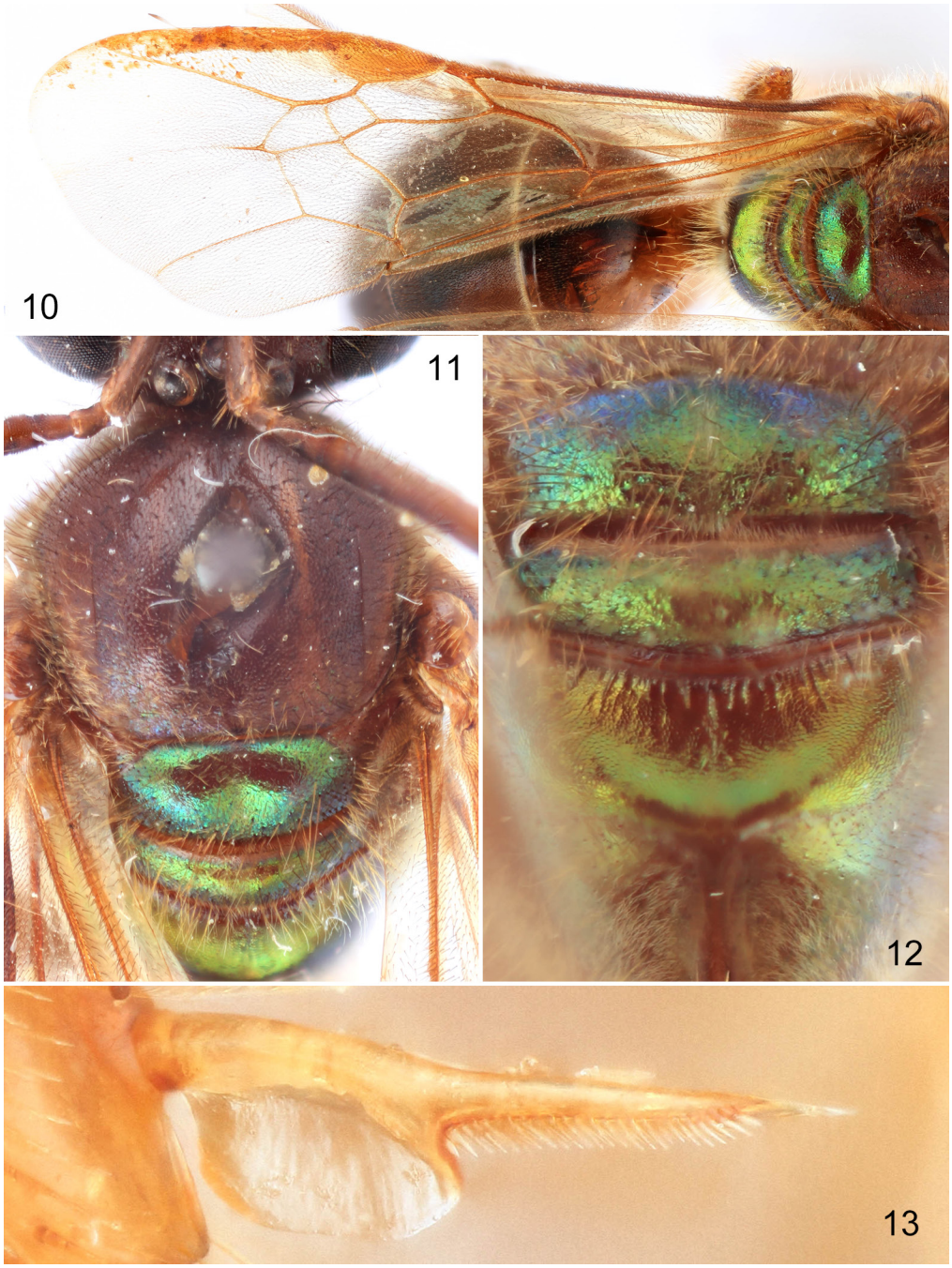


Figures 6–7. Labral and clypeal details from holotype female of *Trichommation osculans*, new genus and species (clypeal angles of marginal area highlighted in green). **6.** Direct view of clypeal apex and labral basal area. **7.** Oblique view of clypeal apex and narrow labral distal process.

coriarious (*sensu* Harris, 1979), with short, basal rugae (Fig. 12), border between basal area and posterior surface broadly rounded; propodeal pit narrow, slit-like. Metasoma unmodified.

Figures 8–9. Head details of *Trichommation osculans*, new genus and species. **8.** Lateral oblique view of labiomaxillary complex and hypostomal lamella (arrow points to posterior enlargement of lamella). **9.** Detail of compound eye showing fine ocular setae.

Etymology: The new genus-group name is a combination of the Greek words *trichós* (genitive singular of *thrix*, meaning, "hair") and *ommation* (diminutive of *ómma*, meaning, "eye"), and is a reference to the setose compound eyes, distinctive among the



Figures 10–13. Details of holotype female of *Trichommation osculans*, new genus and species. **10.** Forewing. **11.** Detail of mesoscutum, mesoscutellum, and metanotum. **12.** Detail of mesoscutellum, metanotum, and basal area of propodeum. **13.** Detail of protibial calcar.

Megaloptidia-group of genera. The name also refers to the general similarity between this new taxon and the genus *Megommation* Moure. The gender of the name is neuter.

Figures 14–17. Details of holotype female of *Trichommation osculans*, new genus and species, and *Megommation insigne* (Smith). **14.** Hind leg of *T. osculans*. **15.** Metabasitibial plate of *T. osculans*. **16.** Inner and outer metatibial spurs of *T. osculans*. **17.** Hind leg of *M. insigne*.

Trichommation osculans Engel, new species
ZooBank: urn:lsid:zoobank.org:act:1CEA7AB0-6226-4F26-8DB6-3F40A0795241
(Figs. 1–16)

Diagnosis: As for the genus (*vide supra*).

Description: ♀: Total body length 9.5 mm; forewing length 7.9 mm. Head slightly wider than long, length 2.07 mm, width 2.33 mm. Upper interorbital distance 1.07 mm; lower interorbital distance 0.93 mm. Compound eyes with fine, white ocular setae, individual setae much longer than an individual ommatidial diameter (Fig. 9). Intertegular distance 1.83 mm; mesoscutellum weakly bigibbous. Protibial calcar of strigilis with primary velum somewhat rectangular, with inner margin (long border)

straight except rounded proximally and apically, apical margin largely bordered by sclerotized thickening from rachis; malus elongate, straight, longer than velum, inner margin minutely ciliate (Fig. 13); inner metatibial spur pectinate, with five branches (Fig. 16), not including apical portion of rachis. Forewing (Fig. 10) with basal vein distad 1cu-a by two times vein width; first submarginal cell slightly longer than combined lengths of second and third submarginal cells; second submarginal nearly quadrate, anterior border along Rs only slightly shorter than posterior border, anterior border about as long as anterior border of third submarginal cell along same vein (*i.e.*, 3Rs and 4Rs nearly equal); posterior border of third submarginal cell slightly less than twice length of anterior border; 1rs-m confluent with 1m-cu; 2rs-m faintly arched, distad 2m-cu by six times vein width; hind wing with distal hamuli arranged 2-1-2.

Clypeus and supraclypeal area with coarse, shallow punctures separated by less than a puncture width or more, integument between punctures coriarious; face with small, contiguous, irregular punctures giving integument a roughened appearance, such punctures becoming weaker on lower face and blending to coriarious integument, similarly blending to imbricate-coriarious integument in ocellocular area and on vertex; gena and postgena coriarious. Pronotum finely coriarious to imbricate. Mesoscutum with small contiguous punctures, punctures slightly more spaced outside parapsidal lines, punctures weaker and more separated posteriorly; tegula faintly coriarious anteriorly with scattered minute punctures, posteriorly smooth and impunctate; mesoscutellum with faint small punctures in anterior third, punctures contiguous medially, elsewhere separated by a puncture width or more, blending to imbricate and coriarious integument posteriorly; metanotum minutely nodulose; pleura with coarse, small, weak punctures separated by less than a puncture width, such punctures becoming weaker and more drawn out ventrally, integument between finely and weakly coriarious; lateral and posterior surfaces of propodeum imbricate to coriarious, basal area of propodeum coriarious, with short basal rugae. Metasomal terga and sterna imbricate.

Mandible dark brown near base, otherwise largely reddish brown; labiomaxillary complex amber brown, with yellow palpi; labrum reddish brown; clypeal apex light reddish brown (almost fulvous), remainder of clypeus, supraclypeal area, face, and vertex reddish brown, with metallic green and blue reflections on lower face, margins of supraclypeal area and clypeus around subantennal sulci and lateral borders of epistomal sulcus; scape largely reddish brown except lighter on ventral surface; pedicel and flagellum reddish brown to brown except somewhat lighter ventrally and apically on flagellum, particularly so by apical flagellomere; gena and postgena reddish brown with strong metallic green to green-blue highlights, particularly on gena. Pronotum as described for gena; propleuron light reddish brown; mesoscutum largely reddish brown with scattered metallic highlights along borders (Fig. 11); tegula as on mesoscutum without highlights; mesoscutellum and metanotum metallic green, with golden to brassy highlights, particularly on metanotum (Figs. 10, 11); pleura metallic green with golden to brassy highlights (Fig. 2); propodeum metallic green with golden and brassy highlights (Fig. 12). Wing membranes like light parchment (Figs. 1, 5); veins largely amber colored except darker on C and Sc+R and lighter on R and Rs beyond tangent with submarginal cells (Fig. 10). Legs largely light reddish-orange brown to light amber brown (Figs. 1, 14); pro- and mesotibial spurs yellow, outer metatibial spur yellow, inner metatibial spur amber. Metasoma dark reddish brown to dark brown on apical terga and sterna (Fig. 1).

Pubescence generally amber to golden yellow (Figs. 1, 2) except largely fuscous on terga II–VI and sterna V–VI; scopal setae distinctly golden yellow (Figs. 1, 14).

Figures 18–20. Female of *Megommation insigne* (Smith). **18.** Lateral view of head. **19.** Facial view. **20.** Basal area of propodeum.

♂: *Latet*.

Holotype: ♀ (Figs. 1, 5), Venezuela, [Aragua: Parque Nacional Henri Pittier, Rancho Grande Biological Station], Pico Periquito [approximately 10°20′26′′N, 67°42′03′′W], 16 Aug 1967, R.W. Poole; deposited in the Division of Entomology, University of Kansas Natural History Museum, Lawrence, Kansas.

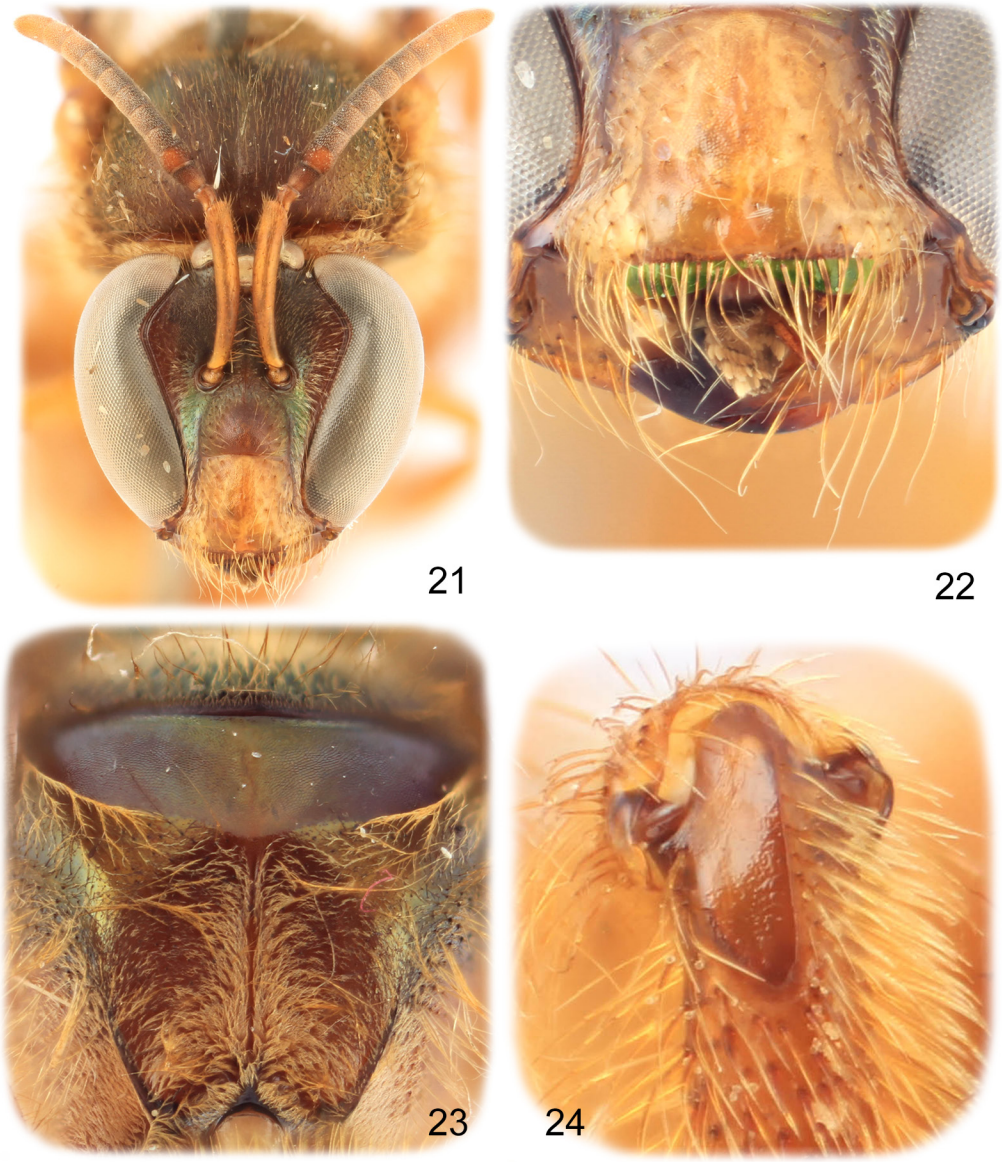
Etymology: The specific epithet refers to the word *osculant*, meaning "intermediate between two taxa", and derived from the Latin word *ōsculāns*, itself meaning, "kissing". The name refers to the intermingling of features of *Megommation* and *Megaloptidia* in this taxon.

COMMENT: Pico Periquito is situated inside Aragua along the border with Carabobo, and due north of Mariara, and is a well-known locality for bird watching. Further exploration for crepuscular and matinal bees in the area would be fruitful, ideally leading to the discovery of the yet-unknown male for this species.

Modified Couplets to Key to Augochlorine Genera
(modified from Engel, 2000)

The following couplets pertaining to the *Megaloptidia*-group of genera (Engel, 2000) are reproduced here with some emendations and an additional couplet to accommodate *Trichommation*.

1. Prementum greatly narrowed and elongate, length seven or more times greater than width 2
—. Prementum not greatly narrowed or elongate, length less than seven times width 9
2. Maxillary palpi not elongate, extending posteriorly to base of prementum at most 3
—. Maxillary palpi greatly elongate, extending posteriorly to posterior border of mesosoma or beyond ..... *Ariphanarthra* Moure
3. Pronotal dorsal surface not inflated; epistomal sulcus variable, but never forming a deep projection extending into clypeus; basal area of propodeum variable 4
—. Pronotal dorsal surface inflated; epistomal sulcus forming a narrow, deep projection extending into clypeus, nearly reaching clypeal apex; basal area of propodeum elongate, as long as mesoscutellum and metanotum combined ..... *Chlerogelloides* Engel *et al*.
4. Ocelli greatly enlarged ..... 4′
—. Ocelli not enlarged 6
4′. Compound eyes without ocular setae; inner metatibial spur serrate; basal area of propodeum coriarious, without striae or rugae (Figs. 20, 23) 5
—. Compound eyes with fine, ocular setae (Fig. 9); inner metatibial spur pectinate (Fig. 16); basal area of propodeum coriarious with short, basal rugae (Fig. 12) ..... *Trichommation*, n. gen.
5. Compound eyes greatly enlarged, projecting above vertex in frontal view (Fig. 21); clypeal apex relatively straight; marginal cell apex feebly truncate and appendiculate; metabasitibial plate not truncate, longer than wide, with anterior and posterior borders defined (Fig. 24) ..... *Megaloptidia* Cockerell
—. Compound eyes not greatly enlarged, vertex projecting above upper tangent of compound eyes (Fig. 19); clypeal apex concave; marginal cell apex acute; metabasitibial plate short, truncate, largely obscured by overhanging setae, with posterior border defined, anterior border obsolescent .... *Megommation* Moure
6. Metabasitibial plate with anterior border obsolescent or all borders faint; inner metatibial spur variable 7
—. Metabasitibial plate with all borders well developed; inner metatibial spur serrate ..... *Micrommation* Moure
7. Scopa present; mandible unmodified, short with weak subapical tooth; inner metatibial spur pectinate 8



Figures 21–24. Female of *Megaloptidia nocturna* (Friese). **21.** Facial view. **22.** Detail of clypeal apex (clypeal angles of marginal area highlighted green). **23.** Basal area and posterior surface of propodeum. **24.** Metabasitibial plate.

—. Scopa absent; mandible long and slender; inner metatibial spur serrate .... *Cleptommation* Engel *et al*.

8. Metabasitibial plate short and rounded, borders not defined; basal area of propodeum coriarious or imbricate, without striae or rugae .... *Megaloptina* Eickwort

—. Metabasitibial plate of normal length, narrowly rounded, posterior border well developed; basal area of propodeum smooth and shining with basal striae ..... *Stilbochlora* Engel *et al*.

DISCUSSION

At first glance, the holotype of *Trichommation osculans* brings to mind the genera *Megaloptidia* or *Megommation* owing to the aforementioned enlarged ocelli and greatly narrowed gena. However, the presence of distinct ocular setae, a pectinate inner metatibial spur, and basal rugae on the propodeal basal area immediately distinguishes *Trichommation* from both of these genera. The ocular setae of *Trichommation* are quite fine when compared to those of *Caenaugochlora* Michener, but are nonetheless present and distinctly longer than multiple ommatidial diameters (Fig. 9). Unlike *Megaloptidia* and *Megommation*, which have serrate inner metatibial spurs, *Trichommation* has a distinctly pectinate spur with long branches (Fig. 16). Enigmatically, Gonçalves & Santos (2010) listed *Megommation* as having a pectinate spur. I have not seen the species they described as *Megommation amazonicum* Gonçalves & Santos, but the type species of the genus, *M. insigne* (Smith), has a clearly simple spur, as noted by previous authors (*e.g.*, Moure, 1943; Eickwort, 1969; Engel, 2000; Michener, 2007). While the basal area of the propodeum in each of these genera is coriarious, *Megommation* and *Megaloptidia* lack striae or rugae of any kind (Figs. 20, 23), while short basal rugae are distinct in *Trichommation* (Fig. 12). Furthermore, *Trichommation* is noticeably smaller than *Megommation* or *Megaloptidia*, the latter two frequently over 12 mm in length [12–15 mm in length in all except *Megaloptidia contradicta* (Cockerell), which is about 11.3 mm in the male holotype: Engel & Brooks, 1998], and the former under 10 mm. The protibial calcar of *Trichommation* (Fig. 13) is similar in morphology to that of *Megommation*, *Megaloptidia*, *Micrommation*, *Stilbochlora*, and *Megaloptina*, while differing greatly from that of *Megalopta* whereby the malus is distinctly pectinate.

Interestingly, the genus intermingles various features of *Megommation* and *Megaloptidia*. The compound eyes of *Megommation* and *Trichommation* are similar in that the vertex projects above the upper tangent of the compound eyes (Figs. 3, 19), while in *Megaloptidia* the situation is reversed, with the compound eyes projecting above the vertex (Fig. 21) (Engel & Brooks, 1998). Like *M. insigne*, the hypostomal carina is lamellate (Figs. 8, 18), particularly so posteriorly, while it is strongly carinate in *Megaloptidia*. In *Megommation* and *Megaloptina* the clypeal angles of the beveled marginal area (= clypeal teeth of the marginal area, *sensu* Eickwort, 1969) are broadly triangular, each about as long as wide, and the margin between is distinctly, broadly, and deeply concave, particularly so in the latter genus. In *Cleptommation* the angles are weakly triangular and the margin between is comparatively straight to faintly concave. In *Stilbochlora* the angles are quite small, triangular, and widely separated, with the wide margin between them straight. The angles in *Trichommation* most closely resemble those of *Megaloptidia*, whereby the angles are short, broad (not triangular in overall form), and arch continuously to a shallow medial indentation (Figs. 6, 7, 22). The metabasitibial plate in *Megommation* is short, truncate, and anteriorly obsolescent, while in both *Trichommation* and *Megaloptidia* the plate is longer than wide, forming a rounded rectangle or elongate rectellipse, with clearly demarcated borders anteriorly and posteriorly (Figs. 15, 24). The labral distal process is narrowly triangular in *Trichommation* (Fig. 7) and *Megaloptidia*, while in *Megommation* it is broadly triangular, nearly as wide as the basal area. In *Megommation* the outer surface of the metatibia has a distinct line of black setae (Fig. 17), either running the entire length of the metatibia or more restricted apically, while in *Trichommation* the setae are golden yellow (Fig. 14). In *Megaloptidia* the metatibial setae range from amber to black (Engel & Brooks, 1998). Given this intermingling of features in *T. osculans* it will be quite revealing what

impact it has on phylogenetic estimates within the *Megaloptidia*-genus group once the male is eventually discovered.

ACKNOWLEDGEMENTS

I am thankful to two anonymous reviewers for their comments on the manuscript, and to Kellie K. Magill Engel, Jennifer C. Thomas, and the late Charles D. Michener for assistance. This is a contribution of the Division of Entomology, University of Kansas Natural History Museum.

REFERENCES

Eickwort, G.C. 1969. A comparative morphological study and generic revision of the augochlorine bees (Hymenoptera: Halictidae). *University of Kansas Science Bulletin* 48(13): 325–524.

Engel, M.S. 2000. Classification of the bee tribe Augochlorini (Hymenoptera: Halictidae). *Bulletin of the American Museum of Natural History* 250: 1–89.

Engel, M.S. 2001. A monograph of the Baltic amber bees and evolution of the Apoidea (Hymenoptera). *Bulletin of the American Museum of Natural History* 259: 1–192.

Engel, M.S. 2007. Two new augochlorine bees from Ecuador (Hymenoptera: Halictidae). *Acta Entomologica Slovenica* 15(1): 21–29.

Engel, M.S. 2009. Revision of the bee genus *Chlerogella* (Hymenoptera, Halictidae), Part I: Central American species. *ZooKeys* 23: 47–75.

Engel, M.S. 2013. Revision of the cleptoparasitic bee genus *Cleptommation* (Hymenoptera: Halictidae). *Journal of Melittology* 22: 1–26.

Engel, M.S., & R.W. Brooks. 1998. The nocturnal bee genus *Megaloptidia* (Hymenoptera: Halictidae). *Journal of Hymenoptera Research* 7(1): 1–14.

Engel, M.S., & R.W. Brooks. 1999. A new *Chlerogelloides* from French Guiana, with comments on the genus (Hymenoptera: Halictidae). *Journal of the Kansas Entomological Society* 72(2): 160–166.

Engel, M.S., R.W. Brooks, & D. Yanega. 1997. New genera and subgenera of augochlorine bees (Hymenoptera: Halictidae). *Scientific Papers, Natural History Museum, University of Kansas* 5: 1–21.

Engel, M.S., A.S. Alqarni, & M.A. Shebl. 2017. Discovery of the bee tribe Tarsaliini in Arabia (Hymenoptera: Apidae), with the description of a new species. *American Museum Novitates* 3877: 1–28.

Gonçalves, R.B. 2016. A molecular and morphological phylogeny of the extant Augochlorini (Hymenoptera, Apoidea) with comments on implications for biogeography. *Systematic Entomology* 41(2): 430–440.

Gonçalves, R.B., & L.M. Santos. 2010. Notes and new species of the halictine genus *Megommation* Moure (Hymenoptera, Apidae, Augochlorini). *Zootaxa* 2685: 57–64.

Harris, R.A. 1979. A glossary of surface sculpturing. *Occasional Papers in Entomology* 28: 1–31.

Michener, C.D. 2007. *The Bees of the World* [2nd Edition]. Johns Hopkins University Press; Baltimore, MD; xvi+[i]+953 pp., +20 pls.

Moure, J.S. 1943. Notas sôbre abelhas da coleção Zikán (Hym. Apoidea). *Revista de Entomologia* 14(3): 447–484.

Moure, J.S. 1951. *Ariphanarthra*, um novo gênero de Halictidae (Hymenopt.-Apoidea). *Dusenia* 2(2): 137–140.

Moure, J.S. 1969. *Micrommation*, novo gênero de Halictidae do Paraná (Hym. Apoidea). *Atas da Sociedade de Biologia do Rio de Janeiro* 12(5–6): 247–249.

Oliveira, F.F., de, M.S. Engel, & T. Mahlmann. 2012. A new *Chlerogelloides* from northeastern Brazil and French Guiana, with a key to the species (Hymenoptera, Halictidae). *ZooKeys* 185: 41–53.

Silveira, F.A., G.A.R. Melo, & E.A.B. Almeida. 2002. *Abelhas Brasileiras: Sistemática e Identificação*. Editora IDMAR; Belo Horizonte, Brazil; 253 pp.

ZooBank: urn:lsid:zoobank.org:pub:64341535-B13B-4A89-9DF7-89D06924ECFA

Journal of Melittology

A Journal of Bee Biology, Ecology, Evolution, & Systematics

The *Journal of Melittology* is an international, open access journal that seeks to rapidly disseminate the results of research conducted on bees (Apoidea: Anthophila) in their broadest sense. Our mission is to promote the understanding and conservation of wild and managed bees and to facilitate communication and collaboration among researchers and the public worldwide. The *Journal* covers all aspects of bee research including but not limited to: anatomy, behavioral ecology, biodiversity, biogeography, chemical ecology, comparative morphology, conservation, cultural aspects, cytogenetics, ecology, ethnobiology, history, identification (keys), invasion ecology, management, melittopalynology, molecular ecology, neurobiology, occurrence data, paleontology, parasitism, phenology, phylogeny, physiology, pollination biology, sociobiology, systematics, and taxonomy.

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