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Three new species of the genus *Caenaugochlora* from Central America and Colombia (Hymenoptera: Halictidae)

Michael S. Engel[1,2]

Abstract. Three distinctive new species of the augochlorine bee genus *Caenaugochlora* Michener (Halictinae: Augochlorini) are described and figured as ***Caenaugochlora* (*Caenaugochlora*) *leoi*** Engel, new species, from Costa Rica, ***C.* (*C.*) *hestia*** Engel, new species, from Panama, and ***C.* (*C.*) *gonzalezi*** Engel, new species, from Colombia. The new species are distinguished from among their congeners and the diversity of *Caenaugochlora* tabulated. In addition, a third subgenus is established within the genus and a revised key to the subgenera proposed. ***Metaugochlora*** Engel, new subgenus, is based on two species described earlier from the Andes of Ecuador and that exhibit traits intermediate between *Caenaugochlora s.str*. and *Ctenaugochlora* Eickwort. It is possible that these groups would be more suitably treated as individual genera in the future and as our knowledge of the total diversity is refined.

INTRODUCTION

There are several generic groups within the New World tribe Augochlorini that are in need of revision, and one of these is the genus *Caenaugochlora* Michener (Michener, 1954, 2007). The genus comprises a rather heterogeneous assortment of 28 species (Table 1) (Engel, 2000; Michener, 2007; Moure, 2007; Gonçalves & Engel, 2010), inclusive of three described herein, and at one time also encompassed those in *Pseudaugochlora* Michener, the latter of which putatively are unrelated (Engel, 2000). Eickwort (1969), when removing the species of *Pseudaugochlora*, established two subgenera, differentiating them on the setation of the compound eyes and forms of the female metabasitibial plate, inner metatibial spur, and male sterna. Despite the removal of *Pseudaugochlora*,

[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 (mengel@amnh.org).

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questions remain regarding its relationship to other genera and even its monophyly (Engel, 2014). Once known from a handful of species, several genera have expanded greatly during the last decade and several of the new lineages found possess character combinations that close the seeming disparity between groups such as *Chlerogella* Michener, *Ischnomelissa* Engel, *Ctenaugochlora* Eickwort, and *Caenaugochlora s.str*. (*e.g*., Engel, 1997a, 1997b, 2009a, 2010a, 2014; Engel & Gonçalves, 2010; Gonçalves & Engel, 2010), raising questions about taxon circumscription, classification, and phylogeny. Indeed, as more new taxa are discovered, it is less clear whether *Caenaugochlora s.l*. should be maintained as a valid grouping or be segregated into multiple genera. It is possible that it would be more meaningful to recognize each of the subgenera as individual genera, and even to further divide *Caenaugochlora s.str*., a step that is initiated below. Ultimately, a more permanent solution awaits a comprehensive treatment of the species, as there remain several undescribed and many incompletely known (*e.g*., from a single sex), and an eventual phylogeny encompassing as much of the diversity as is permissible, combining morphology, DNA sequences, and other forms of data (*e.g*., Engel, 2011).

Descriptions matter, and in the above context it is from the documentation of these new species and their unique amalgamation of traits that we derive our understanding of relationship and other phenomena (Grimaldi & Engel, 2007). Accordingly, the discovery of three quite distinctive new species of *Caenaugochlora* further contributes to a growing body of knowledge concerning the diversity of the group, ultimately aiding species-level revisionary efforts and more current hypotheses of taxon circumscription (Gonzalez *et al*., 2013). These new species are described here to bring them to the awareness of melittologists who are encouraged to seek additional material and data on their biology. Only one species, *Caenaugochlora* (*Caenaugochlora*) *costaricensis* (Friese), has been studied in detail for its nesting biology and semisocial behavior (Michener & Kerfoot, 1967). Some species are not difficult to locate, such as *C*. (*C*.) *gemella* (Cockerell), and so it is hoped that regional efforts will be made to locate nests of other species and gradually build a comparative framework for understanding nesting and biological diversity within the group, along with a characterization of the immature stages. Such efforts may discover biological traits that corroborate or refute hypotheses established otherwise only from features of the external morphology (Engel, 2011). The opportunity is taken also to remove two species from an already polymorphic and putatively paraphyletic *Caenaugochlora s.str*.

MATERIAL AND METHODS

All of the material discussed reposes in the Division of Entomology, University of Kansas Natural History Museum (Biodiversity Institute), Lawrence, Kansas. For the descriptions, morphological terminology follows that of Eickwort (1969), Engel (2000, 2001, 2009b), and Michener (2007), while the format is adapted from that used elsewhere in *Caenaugochlora* (*e.g*., Engel, 1995a, 2007, 2009a, 2014; Engel & Gonçalves, 2010), as well as more broadly among augochlorine bees (*e.g*., Engel, 1995b, 1997b, 2003, 2010a, 2010b, 2013a, 2013b; Engel & Brooks, 2002; Engel *et al*., 1997, 2014; Brooks & Engel, 1998, 1999; Oliveira *et al*., 2012). Measurements were taken with an ocular micrometer on an Olympus SZX-12 stereomicroscope. Photographs were taken with a Canon EOS 7D digital camera mounted to an Infinity K-2 microscopic lens and illuminated with a Xenon-flash mechanism. The concept of *Caenaugochlora* employed here is that of Eickwort (1969), Engel (2000), and Michener (2007).

Table 1. Species and distribution of *Caenaugochlora* Michener (updated and expanded from Gonçalves & Engel, 2010).

Species	Mexico	Guatemala	Honduras	Costa Rica	Panama	Colombia	Venezuela	Ecuador
Caenaugochlora Michener								
Caenaugochlora s.str. Michener								
C. aequilanx (Vachal)	X							
C. chaetops (Vachal)	X							
C. cupriventris (Vachal)	X							
C. flagrans (Vachal)	X							
C. fulgur (Vachal)	X							
C. inermis (Vachal)	X							
C. tonsilis (Vachal)	X		X					
C. amatitlana (Cockerell)		X	X					
C. gemmella (Cockerell)		X		X				
C. wilmattae (Cockerell)		X	X					
C. cyanella Engel			X					
C. costaricensis (Friese)				X				
C. leoi n. sp.				X				
C. elisabethae Engel				X	X			
C. hestia n. sp.					X			
C. macswaini Michener					X			
C. jeffreyi Engel						X		
C. gonzalezi n. sp.						X		
C. elpidia Engel							X	
C. pantochlora Engel							X	
C. silvicola Engel								X
Metaugochlora n. subgen.								
C. bennetti Gonçalves & Engel								X
C. quichua Gonçalves & Engel								X
Ctenaugochlora Eickwort								
C. donnae Engel				X				
C. perviridis Engel & Gonçalves				X				
C. beethoveni Engel				X				
C. algeri Engel				X	X			
C. perpectinata (Michener)				X	X			

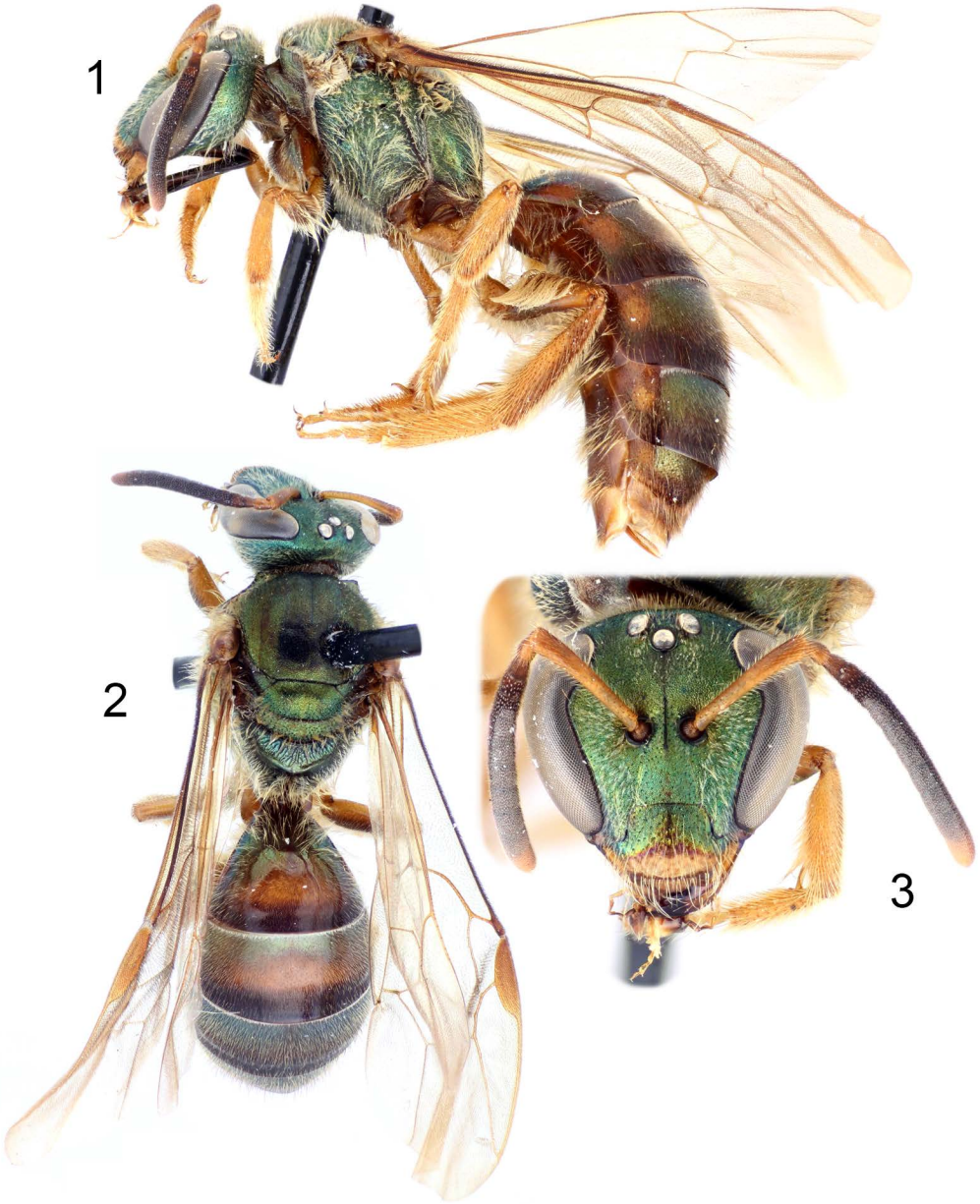
SYSTEMATICS

Genus *Caenaugochlora* Michener
Subgenus *Caenaugochlora* Michener
Caenaugochlora* (*Caenaugochlora*) *leoi Engel, new species
ZooBank: urn:lsid:zoobank.org:act:1DCEAE8C-92F3-43C8-AF24-E3462851D324
(Figs. 1–4)

DIAGNOSIS: The new species can be identified by the combination of a metallic green head and mesosoma with yellow legs (Figs. 1–2); the broad yellow apical margin on the clypeus (Fig. 3); the yellow scape, pedicel, and apicalmost flagellomere (Fig. 3); the equal upper and lower interorbital distances, the angled pterostigmal margin inside the marginal cell; and the pattern of sculpture on the pleura and basal area of the propodeum (Fig. 4) (*vide* Description, *infra*).

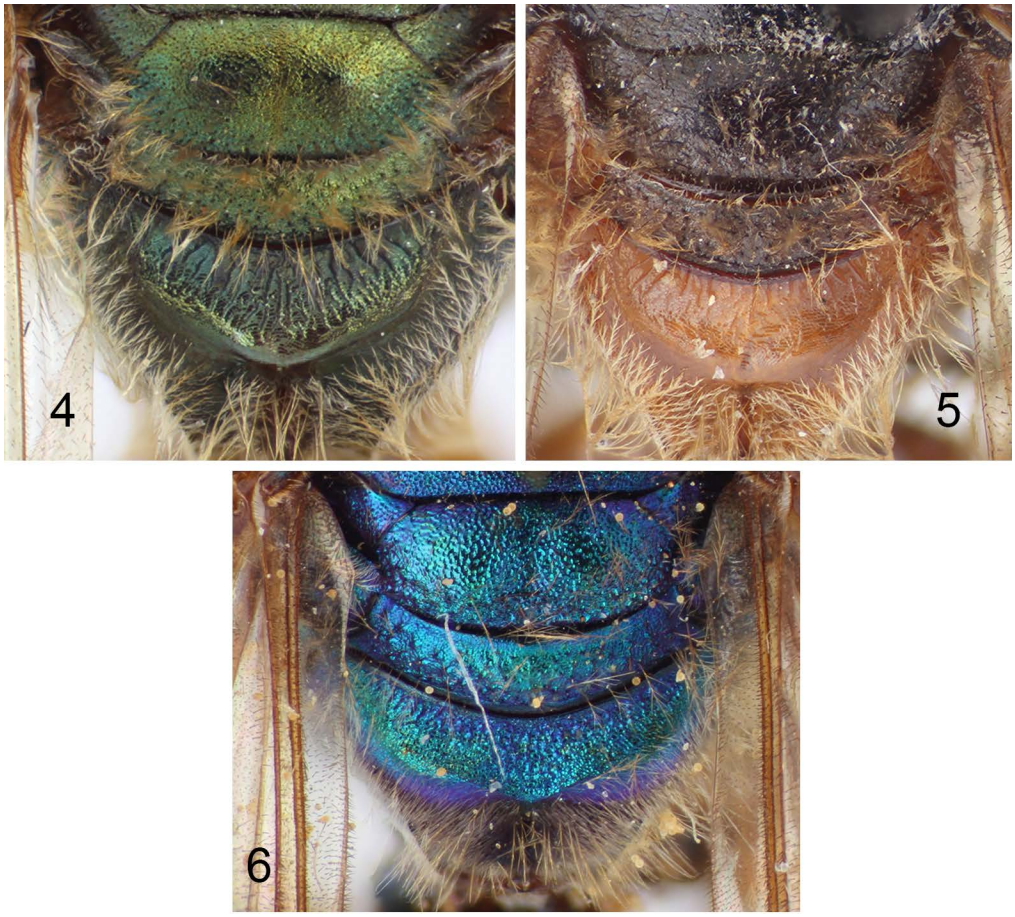
DESCRIPTION: ♀: Total body length 11.2 mm; forewing length 7.9 mm. Head slightly wider than long, length 2.5 mm, width 2.7 mm. Mandible with distinct subapical tooth. Labrum with basal area transverse, surface with low transversely ovoid elevation, basally blending into remainder of surface. Malar space linear. Clypeus and supraclypeal area relatively low in profile, surfaces rather flat. Upper interorbital distance 1.3 mm; lower interorbital distance 1.3 mm. Compound eyes with fine, white ocular setae, individual setae much longer than an individual ommatidial diameter. Preoccipital ridge angled above, not carinate, laterally rounded. Pronotal lateral angle slightly obtuse, dorsal ridge carinate, lateral ridge angled, not carinate. Mesoscutum with anterior border broadly rounded, with narrow, anterior-facing surface low, not projecting over pronotum; intertegular distance 2.2 mm. Inner metatibial spur pectinate, with seven long branches, not including apical portion of rachis, branches progressively shorter toward apex of spur, rachis thickened around basal branches; metabasitibial plate broadly triangular, with rimmed anterior and posterior borders, apex narrowly rounded. Forewing with basal vein distad 1cu-a by three times vein width; pterostigmal margin inside marginal cell angled, with longer, relatively straight posterior border and shorter anterior border; marginal cell elongate; first submarginal cell about as long as combined lengths of second and third submarginal cells; second submarginal cell slightly narrowed anteriorly, anterior border along Rs about as a long as anterior border of third submarginal cell along same vein; 1rs-m almost confluent with 1m-cu, former slightly offset distally; apex of second submarginal cell at tangent with pterostigmal apex; 2rs-m gently arched, distad 2m-cu by eight times vein width; hind wing with distal hamuli arranged 3-1-1-3. Metasomal terga not depressed; sterna unmodified.

Clypeus with coarse, shallow punctures separated by less than a puncture width in yellow area, slightly more widely spaced in green area, integument between punctures strongly imbricate, almost granulose in appearance; supraclypeal area strongly imbricate, almost granulose, with small punctures separated by two or more times a puncture width, more widely spaced centrally; face strongly imbricate, with small, densely scattered punctures below level of antennal toruli, such punctures contiguous at and above level of toruli, giving integument a minutely roughened texture, such integument blending through ocellocular area to strongly imbricate, almost finely granulose vertex, vertex strongly imbricate with scattered punctures; gena as on vertex except anteriorly near compound eye imbrication less strong and punctures more defined, posteriorly imbrication stronger and punctures sparse to absent; postgena



Figures 1–3. Holotype female of *Caenaugochlora* (*Caenaugochlora*) *leoi*, new species. **1.** Lateral habitus. **2.** Dorsal habitus. **3.** Facial view.

impunctate and longitudinally striate. Pronotum finely imbricate. Mesoscutum imbricate, with small contiguous punctures in lateral thirds, such punctures becoming shallower and gradually more widely spaced in middle third and particularly toward midline, around median line punctures faint and separated by more than a puncture width, posteriorly punctures separated by about a puncture width; mesoscutellum strongly imbricate with small punctures separated by about a puncture width laterally and posteriorly, otherwise punctures sparse and faint; metanotum coarsely imbricate,



Figures 4–6. Dorsal views of the mesoscutella, metanota, and propodea of the female holotypes of the species treated here. **4.** *Caenaugochlora* (*Caenaugochlora*) *leoi*, new species. **5.** *C.* (*C.*) *hestia*, new species. **6.** *C.* (*C.*) *gonzalezi*, new species.

appearing slightly nodulose around setae; pleura coarsely imbricate and granulose, surface appearing roughened anteriorly, with sparse, coarse, exceedingly faint, shallow punctures, such faint punctures apparently progressively disappearing posteriorly, mesepisternal border with metepisternum less imbricate and with scattered minute punctures; metepisternum largely smooth to finely imbricate and shining, with scattered minute punctures; lateral surface of propodeum strongly imbricate with scattered coarse, shallow punctures; posterior surface more weakly imbricate than lateral surfaces, with scattered coarse punctures; basal area of propodeum imbricate, with irregular striate rugae, such rugae extending most of surface but not reaching apical margin (Fig. 4), apical margin rounded and more finely imbricate than surface between rugae. Metasomal terga imbricate except more finely imbricate apical margins and dorsal-facing surface of first tergum, anterior-facing surface of first tergum smooth and shining; sterna largely finely imbricate with scattered, postgradular punctures.

Mandible largely yellow with dark reddish brown apex; labiomaxillary complex dark brown, with palpi largely yellow except basal palpomeres dark brown; labrum yellow; clypeus with apical third yellow, remainder of clypeus and head metallic green with golden highlights, some coppery highlights at transition between yellow

and green coloration on clypeus; scape and pedicel yellow (Fig. 3); flagellum dark brown except slightly lighter first flagellomere and apicalmost flagellomere yellow (Fig. 3). Mesosoma metallic green with golden or coppery highlights (Figs. 1, 2), such highlights most noticeable on nota, in places with more olivaceous appearance, disc of mesoscutum darker with less prominent highlights; tegula semi-translucent yellow; wing membranes hyaline, with faint tinge of parchment color, veins yellow to yellow brown except Sc+R dark brown; legs yellow with slightly darker areas on outer borders of metafemur and metatibia and under surface of mesofemur, procoxa slightly darker with strong metallic green and golden highlights, under surface of metafemur in basal half darker with some metallic highlights. Metasoma generally light brown to brown with strong metallic olivaceous green-golden highlights on discs, laterally metallic coloration faint and color lighter brown, broad apical margins dark brown with no or faint metallic highlights; sterna brown with at most faint metallic golden highlights.

Pubescence nowhere obscuring integumental surfaces, color golden except tinged slightly darkly golden on mesoscutum and apically on metasomal terga; otherwise pubescence as typical for genus.

♂: Unknown.

Holotype: ♀, Costa Rica: San José, km 117 Pan-Am Hwy [Pan-American Highway], 19 km N San Isidro, 1800 m, 9°28′0′′ N, 83°42′30′′ W, 20–25 Jun [June] 1997, S & J Peck, CR1P97 023, ex: flight intercept trap; deposited in the Division of Entomology, University of Kansas Natural History Museum, Lawrence, Kansas.

Paratype: 1♀, same data and repository as holotype.

Etymology: The specific epithet honors young Leo Hughes Engel (born 31 July 2014), beloved nephew.

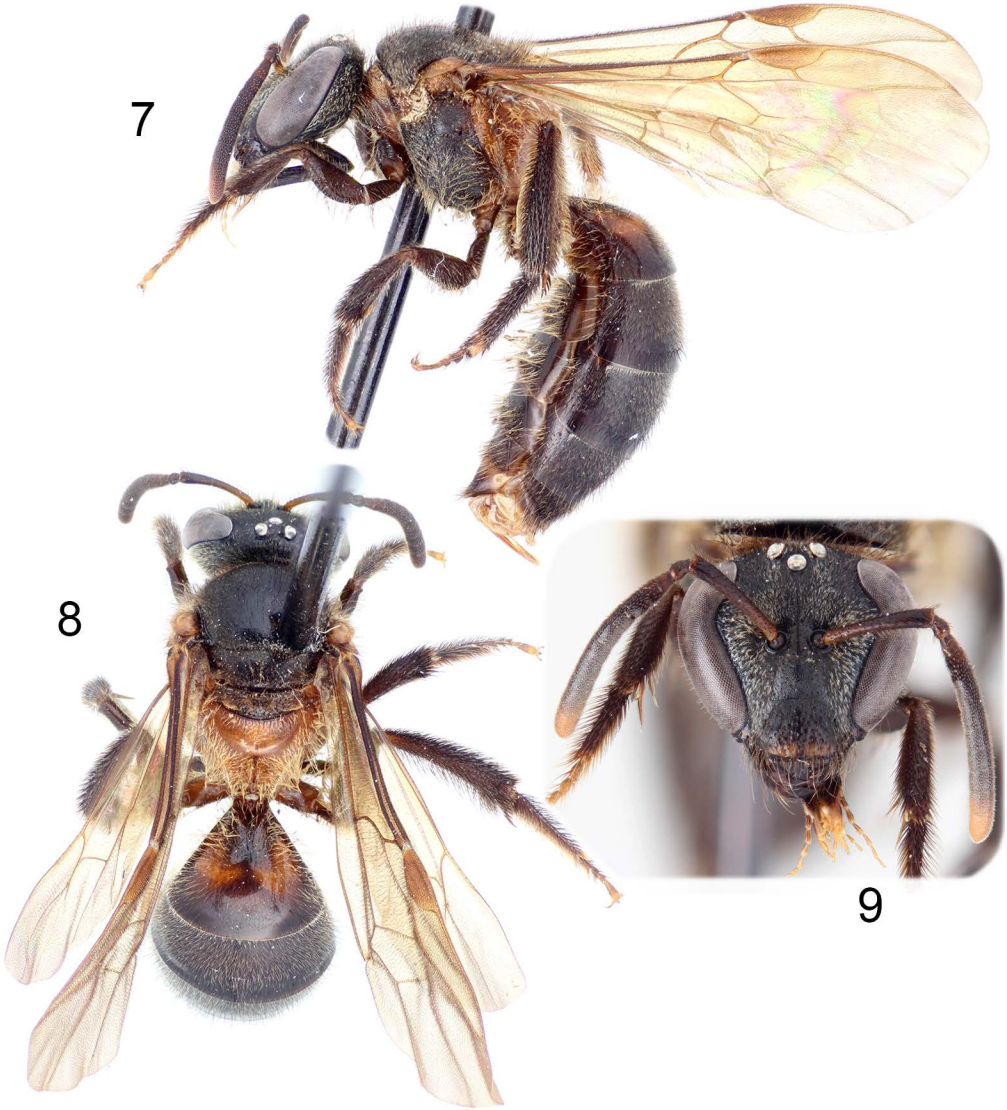
Caenaugochlora* (*Caenaugochlora*) *hestia Engel, new species

ZooBank: urn:lsid:zoobank.org:act:BD9AE87D-F9F1-45E1-AAA4-44434A6F4CF5

(Figs. 5, 7–9)

Diagnosis: The new species at first glance is superficially reminiscent of *C.* (*Ctenaugochlora*) *perpectinata* (Michener), differing from that species by the usual subgeneric distinctions in addition to the coloration of the metapleuron and propodeum, as well as details of integumental sculpturing (*vide* Michener, 1954; Engel & Gonçalves, 2010). The new species may be recognized by the combination of its pattern of coloration lacking metallic highlights (Figs. 7–9), the generally black setae of the leg contrasting with the yellow setae of the metafemoral scopa; sculpture of the basal area of the propodeum (Fig. 5), and the coarsely imbricate mesepisternum contrasting with the more finely sculptured mesoscutal disc.

Description: ♀: Total body length 9.6 mm; forewing length 7.4 mm. Head slightly wider than long, length 2.1 mm, width 2.4 mm. Mandible with distinct subapical tooth. Labrum with basal area transverse, with low orbicular elevation, elevation basally blending into remainder of surface. Malar space linear. Clypeus and supraclypeal area not strongly produced in profile. Upper interorbital distance 1.2 mm; lower interorbital distance 1.0 mm. Compound eyes with sparse minute setae, individual setae not longer than ommatidial diameter. Preoccipital ridge angled above, not carinate, laterally rounded. Pronotal lateral angle slightly obtuse, dorsal ridge carinate, lateral ridge angled, not carinate. Mesoscutum with anterior border broadly rounded, with narrow, anterior-facing surface not projecting over pronotum; intertegular distance 1.8



Figures 7–9. Holotype female of *Caenaugochlora* (*Caenaugochlora*) *hestia*, new species. **7.** Lateral habitus. **8.** Dorsal habitus. **9.** Facial view.

mm. Inner metatibial spur pectinate, with six branches, not including apical portion of rachis, branches progressively shorter toward apex of spur, rachis thickened around basal branches; metabasitibial plate narrowly triangular, with rimmed anterior and posterior borders, apex narrowly rounded. Forewing with basal vein distad 1cu-a by three times vein width; pterostigmal margin inside marginal cell continuously arched; marginal cell elongate; first submarginal cell longer than combined lengths of second and third submarginal cells; second submarginal cell slightly narrowed anteriorly, anterior border along Rs shorter than anterior border of third submarginal cell along same vein; 1rs-m confluent with 1m-cu; apex of second submarginal cell at tangent with pterostigmal apex; 2rs-m gently arched, distad 2m-cu by six times vein width;

hind wing with distal hamuli arranged 3-1-3. Metasomal terga not depressed; sterna unmodified.

Clypeus with coarse, shallow punctures separated by less than a puncture width, integument between punctures imbricate; supraclypeal area imbricate and impunctate or with exceedingly faint, coarse punctures along borders; face coarsely imbricate, appearing almost granulose, similar integument on vertex, imbricate pattern becoming broader on gena; postgena impunctate and longitudinally striate. Pronotum finely imbricate. Mesoscutum with lateral thirds consisting of contiguous, ill-defined punctures giving roughened texture, such integument blending on inner side of parapsidal lines to shallow, more well-defined and separated punctures and then to a largely impunctate and faintly imbricate medial third, with sparse minute punctures medially; mesoscutellum faintly imbricate with small to minute punctures, such punctures separated by more than twice a puncture width over much of surface except more closely spaced posteriorly and laterally; metanotum imbricate, appearing slightly nodulose around setae; mesepisternum coarsely imbricate, appearing roughened, impunctate; metepisternum smooth with scattered minute punctures; lateral and posterior surfaces of propodeum faintly imbricate to smooth with sparse, shallow punctures; basal area of propodeum imbricate, with irregular, radiating basal rugae, rugae extending from one half to two thirds of surface, not reaching apical margin, apical margin rounded and faintly imbricate (Fig. 5). Metasomal terga finely imbricate, more finely so on apical margins, anterior-facing surface of first tergum largely smooth and shining; sterna finely imbricate with scattered coarse punctures.

Mandible dark brown; labiomaxillary complex dark brown, with palpi yellow; labrum dark brown; clypeal apex with narrow band of yellowish brown, remainder of clypeus and head black; scape dark brown except basally light brown; pedicel dark brown; flagellum dark brown except yellowish on ventral of penultimate flagellomere and entirely yellow on apical flagellomere (Fig. 9). Mesosoma black except as follows: pronotum yellow brown (Fig. 7) except brown anterior to pronotal lobe; metepisternum and propodeum yellow brown (Figs. 7, 8); tegula semi-translucent yellow; wing membranes hyaline, with faint parchment color, venation yellow brown to brown except Sc+R dark brown; legs dark brown except promediotarsus and distitarsi yellow, upper surfaces of meso- and metafemora yellow brown. Metasoma dark brown except anterior-facing surface of first tergum largely light brown except with large dark brown medial area (Fig. 8), and pregradular area of sterna lighter brown.

Pubescence of head generally fuscous except face below ocelli with short, subappressed, branched setae not obscuring integument (Fig. 9), setae of gena yellow; pronotum with largely yellow, shorter setae, particularly on surface of dorsal ridge and bordering pronotal lobe (Fig. 7), along with more sparse, longer, erect, fuscous setae largely along dorsal ridge; setae of mesosomal nota intermixing typically erect, long, fuscous setae that become progressively longer, more branched, and more numerous from mesoscutum to metanotum, with shorter, lighter or even pale yellow setae that are more scarce and typically along margins; pleura with largely, long, branched yellow setae, with some long, erect, fuscous setae intermixed mostly on upper mesepisternum; lateral and posterior surfaces of propodeum with long, branched, yellow setae (Fig. 8); legs with largely fuscous to black setae except lighter on distal pro- and mesotarsomeres, coxae, trochanters, mesofemoral brush, and metafemoral scopa, penicillus composed of yellow setae; first metasomal tergum with, long, sparse yellow setae predominant on disc, replaced with more numerous, shorter, simpler, finer, less erect, pale yellow setae more posteriorly, such setae dominant on remaining terga and

becoming progressively more fuscous on succeeding segments such that those of sixth tergum largely dark fuscous; sternal setae elongate, branched, and yellow (Fig. 7) although becoming progressively more fuscous on fourth through sixth sterna.

♂: Unknown.

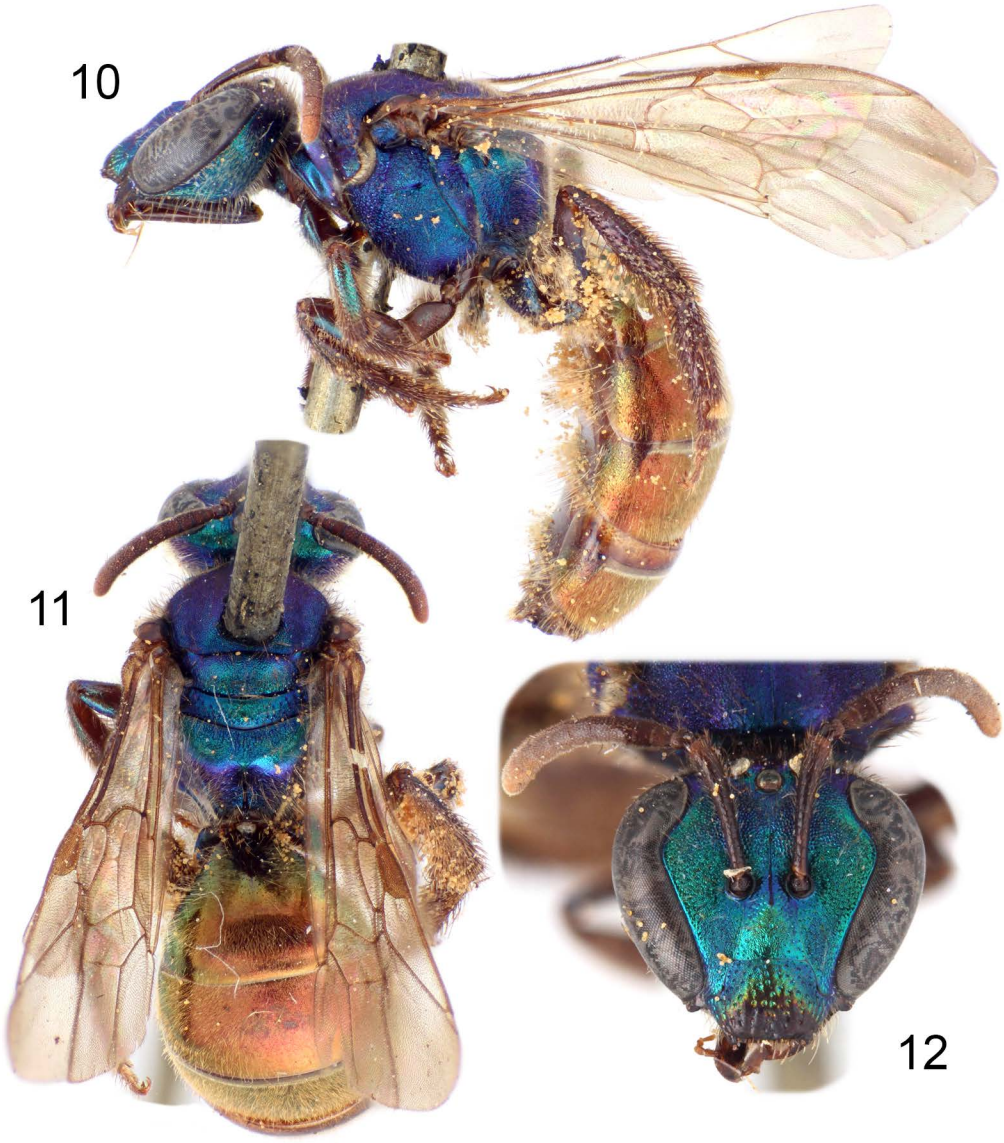
HOLOTYPE: ♀, Panama: Chiriquí Prov. [Province], La Fortuna, "Cont. Divide Trail" [Continental Divide Trail], 8°46′ N, 82° 12′ W, 1100 m, 23-v–9-vi 1995, J. Ashe, R. Brooks, #157, ex: flight intercept trap; deposited in the Division of Entomology, University of Kansas Natural History Museum, Lawrence, Kansas.

ETYMOLOGY: The specific epithet is from Hestia, Olympian goddess of hearth and fire. The name is a reference to the appearance of the yellow brown propodeum against the otherwise largely black body, and reminding the viewer of the glow of a fire against a dark hearth.

Caenaugochlora* (*Caenaugochlora*) *gonzalezi Engel, new species
ZooBank: urn:lsid:zoobank.org:act:658C307F-9751-42A5-A632-E86868BE3E12
(Figs. 6, 10–12)

DIAGNOSIS: *Caenaugochlora gonzalezi* is one of the more distinctive species in the genus, with the deep metallic blue-green-purple coloration of the head and mesosoma (Figs. 10–12) contrasting strongly with the otherwise brighter metallic bronzy-red metasoma (Figs. 10, 11), and lacking long ocular setae (an uncommon trait in the subgenus). In addition to the contrasting body coloration and ocular setation, the pattern of sculpturing on the pleura, mesoscutum, and basal area of propodeum (*vide* Description, *infra*), tergal setation, and apically-yellowed flagellum serve to characterize the species. The species could easily be confused with those of the genus *Neocorynura* Schrottky, but lacks the distinctive features of that genus such as the broadly obtuse epistomal angle, carinate preoccipital ridge, carinate pronotal lateral ridge, and narrowed propodeum with lateral carinae scarcely divergent.

DESCRIPTION: ♀: Total body length 8.7 mm; forewing length 5.8 mm. Head slightly wider than long, length 2.0 mm, width 2.3 mm. Mandible with distinct subapical tooth. Labrum with basal area transverse, low orbicular elevation basally blending into remainder of surface. Malar space linear. Clypeus and supraclypeal area not strongly produced in profile. Upper interorbital distance 1.2 mm; lower interorbital distance 1.0 mm. Compound eyes with fine, white ocular setae, individual setae longer than ommatidial diameter. Preoccipital ridge strongly angled, not carinate. Pronotal lateral angle almost orthogonal, dorsal ridge carinate, lateral ridge sharply angled, not carinate. Mesoscutum with anterior border broadly rounded, with well-defined, anterior-facing surface very slightly projecting over pronotum; intertegular distance 1.7 mm. Inner metatibial spur pectinate, with four branches, not including apical portion of rachis, branches progressively shorter toward apex of spur, rachis slightly thickened around basal two branches; metabasitibial plate low, narrowly triangular, poorly differentiated but with equally developed and distinct anterior and posterior borders, apex narrowly rounded. Forewing with basal vein distad 1cu-a by two times vein width; pterostigmal margin inside marginal cell continuously arched; marginal cell elongate; first submarginal cell longer than combined lengths of second and third submarginal cells; second submarginal cell slightly narrowed anteriorly, anterior border along Rs about as long as anterior border of third submarginal cell along same vein; 1rs-m confluent with 1m-cu; apex of second submarginal cell at tangent with pterostigmal apex; 2rs-m gently arched, distad 2m-cu by seven times vein width;



Figures 10–12. Holotype female of *Caenaugochlora* (*Caenaugochlora*) *gonzalezi*, new species. **10.** Lateral habitus. **11.** Dorsal habitus. **12.** Facial view.

hind wing with distal hamuli arranged 3-1-1-2. Metasomal terga not depressed; sterna unmodified.

Clypeus with coarse, shallow punctures separated by a puncture width or less, integument between punctures imbricate; supraclypeal area with small, scattered punctures, integument otherwise coarsely imbricate; face below antennal toruli coarsely imbricate with scattered small punctures, such punctures becoming contiguous on frons, such integument extending through ocellocular area; vertex coarsely imbricate, with scattered punctures; gena finely imbricate with small punctures separated about a puncture width, ventrally along border with postgena becoming longitudinally stri-

ate; postgena impunctate and longitudinally striate along outer portions, blending to imbricate in area bordering hypostomal fossa. Pronotum finely imbricate. Mesoscutum strongly imbricate, with small contiguous punctures in lateral thirds and along posterior border, such punctures becoming more spaced and shallower in medial third; mesoscutellum with coarse, contiguous punctures; metanotum imbricate, with scattered, short rugae giving a nodulose appearance; mesepisternum with coarse, irregular, contiguous punctures giving surface a strongly roughened appearance, punctures becoming progressively smaller posteriorly; metepisternum longitudinally striate rugose in upper half, ventrally imbricate; lateral surface of propodeum imbricate with scattered, weak punctures; posterior surface of propodeum faintly imbricate with scattered, minute punctures; basal area of propodeum strongly imbricate, appearing almost granular, with weak, irregular, basal rugae, rugae not extending beyond midlength, apical margin rounded and strongly imbricate. Metasomal terga finely imbricate with minute punctures, more faintly imbricate and sparsely punctate on apical margins, first tergum smoother than succeeding terga, particularly anterior-facing surface smooth and largely impunctate; sterna finely imbricate with scattered course punctures.

Mandible dark brown; labiomaxillary complex dark brown, with yellow palpi; labrum dark brown; apical half of clypeus black, remainder deep metallic green with metallic golden or bronze highlights at transition between color regions (Fig. 12); remainder of face deep metallic green with blue highlights (Fig. 12), vertex with growing blue and purple highlights; gena metallic green with faint blue highlights; scape and pedicel dark brown; flagellum dark brown blending gradually to yellow brown in apical 3–4 flagellomeres. Mesosoma deep metallic blue with areas of prominent metallic green or purple (Fig. 10), mesoscutum predominantly purple with metallic blue or green highlights (Fig. 11); tegula semi-translucent yellow, with metallic blue highlights anteriorly and along inner border; wing membranes hyaline, with faint parchment coloration; veins yellow brown except Sc+R darker; legs dark brown with areas of metallic green and blue highlights. Metasomal terga brilliant metallic red coppery-golden, with metallic green highlights laterally on first tergum, sixth tergum with metallic purple highlights; sterna deep reddish brown.

Pubescence generally sparse and pale golden to gold fuscous, those of pleura and metafemoral scopa yellow; metasomal terga with numerous, fine, short, subappressed, posterolaterally-directed, golden setae, except such setae sparse on disc of anterior-facing surface of first tergum; gradular vibrissae composed of dense, minute, white setae, typically obscured by overlapping posterior margin of preceding tergum; sternal setae generally yellow and elongate, shorter and more fuscous on fifth and sixth sterna.

♂: Unknown.

HOLOTYPE: ♀, Colombia: Dept. Magdalena [Departamento del Magdalena], Onaca, 2500 ft. [*ca*. 762 m], Dec. [December]; deposited in the Division of Entomology, University of Kansas Natural History Museum, Lawrence, Kansas.

ETYMOLOGY: The specific epithet honors Dr. Victor H. Gonzalez, dear colleague and a leading melittologist who has made particularly important contributions to our knowledge of the Colombian and Andean fauna.

Metaugochlora Engel, new subgenus

ZooBank: urn:lsid:zoobank.org:act:830D604F-7863-4259-A898-C2DD1E1FCAFC

Type species: *Caenaugochlora* (*Caenaugochlora*) *bennetti* Gonçalves & Engel, 2010.

Diagnosis: Compound eyes setose (usually setose in *Caenaugochlora s.str.*, only minute setae present in *Ctenaugochlora*); preoccipital ridge carinate (sharply angled in *Caenaugochlora s.str.* except *C. macswaini* Michener and *C. elpidia* Engel; carinate in *Ctenaugochlora*); female metabasitibial plate with strong anterior and posterior borders (as in *Caenaugochlora s.str.*, anterior border obsolescent in *Ctenaugochlora*); female inner metatibial spur pectinate, with less than 10 long branches (as in *Caenaugochlora s.str.*, densely pectinate with more than 10 long branches in *Ctenaugochlora*); striae of basal area of propodeum not reaching apical margin (as in *Caenaugochlora s.str.*, striae reach the apical margin in *Ctenaugochlora*); male metasomal sternum IV with long, lateral, postgradular projections bearing elongate setae at their apices (such projections absent in *Caenaugochlora s.str.* and *Ctenaugochlora*); male genitalia with parapenial lobe broad (narrow elsewhere in genus).

Etymology: The subgeneric name is a combination of the Greek *meta*, meaning, "between" or "among" and implying change, and *Augochlora*, type genus of the tribe. The gender of the name is feminine.

Included species: *Caenaugochlora* (*Metaugochlora*) *bennetti* Gonçalves & Engel and *C.* (*M.*) *quichua* Gonçalves & Engel, both from the Andes of Ecuador.

Comments: Although the author previously hesitated to remove these species from *Caenaugochlora s.str.* (Gonçalves & Engel, 2010), it no longer seems as though such an overly conservative decision was well founded. A new key to the subgenera of *Caenaugochlora* is here provided.

Key to Subgenera of *Caenaugochlora*
(modified from Michener, 2007)

1. Female metabasitibial plate well rimmed on all borders; female inner metatibial spur pecticate, with less than 10 well separated branches; compound eyes typically distinctly setose, ocular setae longer than an ommatidial diameter; striae of basal area of propodeum not reaching apical margin; male metasomal sternum IV often with distinctive setal patch apicomedially and raised on blunt tubercles 2
—. Female metabasitibial plate obsolescent anteriorly; female inner metatibial spur densely pecticate, with more than 10 tightly packed branches; compound eyes with only minute, scattered setae; striae of basal area of propodeum reaching apical margin; male metasomal sternum IV with V-shaped setal patch bordering median depression ..... *Ctenaugochlora* Eickwort
2(1). Preoccipital ridge sharply angled, not carinate; male metasomal sternum IV without lateral projections; male parapenial lobe narrow .... *Caenaugochlora* Michener *s.str.*
—. Preoccipital ridge carinate; male metasomal sternum IV with long, lateral projections bearing apical setae; male parapenial lobe broad .... *Metaugochlora* n. subgen.

DISCUSSION

Although *Caenaugochlora* are relatively diverse and widespread (Table 1), most of the species are rarely encountered and there is little biological data available. Aside from the aforementioned account of the social and nesting biology of *C. costaricensis*

(Friese) by Michener & Kerfoot (1967: as a species of *Pseudaugochloropsis* Schrottky), only scant data are available, such as observations of nectar feeding and buzzing behavior at flowers of *Witheringia* L'Hér. (Solanaceae) (Bohs, 2000) and scattered floral records (*e.g.*, Moure & Hurd, 1987; Moure, 2007; Meléndez-Ramirez *et al.*, 2002). Individuals are at times encountered at flowers of Cucurbitaceae, although they apparently are not oligolectic, and this may permit the capture of additional material or perhaps the location of nearby nesting sites. The genus is more extensively established across South America than previously surmised (*e.g.*, Engel & Gonçalves, 2010; Engel, 2014; Gonçalves & Engel, 2010), and there is every reason to believe that numerous other species remain to be documented in the Andean region. With the discovery and description of these species there should be a more accessible means for their identification, permitting melittologists in neotropical countries to identify material, and thereby hopefully locate nests and undertake future investigations into their biology. Discovery of the nesting biology, immature stages, and floral ecology across a greater diversity of genera and species of Augochlorini should remain one of the goals for future initiatives.

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