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Revision of the brachycistidine genus *Colocistis* Krombein, 1942 (Hymenoptera, Tiphiiidae)

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Abstract

Twelve species of the brachycistidine genus *Colocistis* Krombein, 1942 are reviewed and two new species, *Colocistis chemsaki* and *C. oaxacana*, are described from Baja California and Oaxaca, Mexico respectively. A key to the species and species distribution maps are provided.

Keywords

Oaxaca, Baja California, Mexico

Introduction

In 1917 Bradley recognized the relationship of males of several species he considered members of the genus *Brachycistis*. He placed these in what he named the *castanea* group. Malloch (1926) arranged the species of *Brachycistis* into groups according to structural criteria, proposed the *brevis* group consisting of three species and provided a key to the groups. Krombein (1942) described the male of a new species, *pilosa*, near the *castanea* group but because of its small compound eyes, small ocelli and black coloration he placed it in a new genus, *Colocistis*. In his nomenclatorial review of the brachycistidine genera, Wasbauer (1966) transferred all four of the species in the *castanea* group as well as two in the *brevis* group to *Colocistis*. In this work he also provided a key which separat-

ed *Colocistis* from the other male brachycistidine genera known at that time. The latest generic key was provided by Kimsey and Wasbauer (2006). Kimsey (2006) synonymized the female-based genus, *Aglyptacros* Mickel & Krombein (1942) with *Colocistis*. Ironically, the type of the genus *Colocistis*, *pilosa* Krombein is only known from the holotype specimen and the species may very well be extinct, as the type was collected in the vicinity of the City of San Diego, which is now highly urbanized.

The genus *Colocistis* occurs from southern Idaho and northern California south to Oaxaca, Mexico and east to Nebraska and eastern Texas.

Materials and methods

Type repositories and specimens studied below are indicated by the following acronyms: ANSP – Philadelphia Academy of Sciences, Pennsylvania, USA; BME – Bohart Museum of Entomology, University of California, Davis, USA; CAS – California Academy of Sciences, San Francisco, USA; CDFCA – California State Arthropod Collection, California Department of Food and Agriculture, Sacramento; CUIC – Cornell University Insect Collection, Ithaca, New York, USA; EMEC – Essig Museum, University of California, Berkeley, USA; KSBS – University of Kansas, Lawrence, USA; LACM – Los Angeles County Museum of Natural History, California, USA; MCZ – Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA; UCRC – Entomological Research Museum, University of California, Riverside, USA, and USNM – U.S. National Museum, Washington, D.C., USA.

Morphological terminology follows that used by Wasbauer (1966) is further illustrated in Figs 1, 10 and 14. The following acronyms are used in the descriptions below: LID = *lower interocular distance*, the narrowest distance between the eye margins across the face; OOL = *ocellocular length*, the distance between the hind ocellus and the nearest eye margin, and UID = *upper interocular distance*, the distance between the dorsal eye margins across the face.

Taxonomy

Colocistis Krombein

<http://species-id.net/wiki/Colocistis>

Colocistis Krombein, 1942 (April):65. Type species: *Colocistis pilosa* Krombein 1942:66. Original designation.

Aglyptacros Mickel & Krombein, 1942 (November):669. Type species: *Glyptommetopa eureka* Banks 1912. Original designation. Synonymized by Kimsey 2006.

Diagnosis. The genus *Colocistis* exhibits a number of unique traits in both sexes. Features in the female, include the ventrally angulate occipital carina, the ventrally angulate mid-

and hindtrochanters, hindcoxal carina on both the inner, ventral margin and dorsobasal surface. Because a number of these features, including the angulate occipital carina and hindcoxal carina are shared with males of *Colocistis* and the distributions of the two genera coincide *Aglyptacros* was made the junior synonym of *Colocistis* (Kimsey 2006).

Description. Male Body length 5–16 mm.

Head. Compound eyes and ocelli enlarged (except quite small in *chemsaki* and *pilosissima*); gular carina either not elevated or elevated gradually at level of posterior mandibular condyle, not suddenly produced apically, clypeal length versus width ratio not exceeding 0.35; maxillary and labial palpi not reduced, maxillary palpi six-segmented, exceeding posterior border of gular orifice by half length of palpus; labial palpi four-segmented.

Mesosoma. Fore wing with costa extending beyond stigma for a distance not over half length of stigma; forewing with two discoidal cells and two or three submarginal cells, second submarginal cell completely or almost completely underlying first submarginal cell, first transverse cubital vein arising at or before basal third of second submarginal cell (Fig. 14); hind wing with cubitus arcuately curved, longer than first transverse cubital vein and meeting it at an angle of less than 135 degrees; hind wing with jugal lobe shorter than submedial cell; forecoxa with admesal stridulatory area; hindcoxa with longitudinal carina on inner margin.

Metasoma. Sternum II without basal longitudinal carina (one species with transverse carina); digitus of genitalia without process extending distad of articulum; volsellar plate without spines or teeth, but with flexible hairs on mesal surface.

Description. Female Body length 5–12 mm.

Head. Mandible broadest subapically, with two distinct apical teeth, inner margin with large, obtuse tooth at broadest point, obtuse tooth obscured by scutate bristles, inner margin below tooth with three small teeth, outer carina obsolescent, ventral carina distinct, sharp; maxillary palp 5-segmented; occipital carina well-developed, angulate ventrolaterally, forming straight line ventrally, often subtended by secondary carina; vertex with submedial impressions, lateral setose groove represented by row of large punctures or foveae.

Mesosoma. Propleural ventral margin strongly elevated, with sharp, transverse carina; hindcoxa with longitudinal carina on inner margin; hindtibial calcar slightly curved and acute apically.

Metasoma. Sternum I with transverse subbasal carina well-developed and protruding, subtended by medial pit, and with two foveae basad; tergum I with well-developed lateral ridge.

Distribution. *Colocistis* species are found in southeastern California, southern Nevada, southern Arizona, southern Colorado, western Texas and as far south as Oaxaca, Mexico.

Key to species of *Colocistis*

- 1 Wingless, metasoma 6-segmented; females 2
- Winged, metasoma 7-segmented; males..... 5

- 2 Gular carina strongly elevated or angulate on either side of midline, meeting occipital carina (as in Fig. 11); meso-metapleural suture obsolescent; metasomal sternum I with medial, longitudinal sulcus present on basal third **3**
- Gular carina linear or crenulate, not elevated or angulate on either side of midline, interrupted medially occipital carina incomplete laterally, not meeting gular carina (as in Fig. 12); meso-metapleural suture present, distinct; metasomal sternum I with medial, longitudinal sulcus present on more than half of length **4**
- 3 Gular carina interrupted medially, with strongly developed submedial tooth or angle, meeting occipital carina at distinct angle (Fig. 11); transverse carina posterior to gular carina medially interrupted, without curved angles or lobes; meso-metapleural suture absent or only faintly visible in certain views.....
..... **segredientata Mickel & Krombein**
- Gular carina not interrupted medially, strongly developed submedial rounded lobe (Fig. 10); gular carina meeting occipital carina in even curve; transverse carina posterior to gular carina with two low, rounded prominences behind lobes of gular carina; meso-metapleural suture faint but distinct..... **eureka (Banks)**
- 4 Gular carina extending laterally considerably beyond where occipital carina would terminate if present (Fig. 12); vertex foveae linear, consisting of row of contiguous pits; metasomal sternum I medial, longitudinal sulcus extending complete length of sternum, sulcus narrow and deep anteriorly, broad and shallow posteriorly **sulcata Mickel & Krombein**
- Gular carina not extending laterally beyond where occipital carina would terminate if present; vertex foveae short, elliptical; metasomal sternum I medial, longitudinal sulcus same width throughout, deeper anteriorly than posteriorly **paxillata Mickel & Krombein**
- 5 Forewing with two submarginal cells (as in Fig. 13); hindcoxal carina low and indistinct **6**
- Forewing with three submarginal cells (as in Fig. 14); hindcoxal carina prominent **8**
- 6 Gular carina elevated anteriorly (as in Fig. 9) **eremi (Bradley)**
- Gular carina not elevated anteriorly, nearly linear **7**
- 7 OOL 1 ocellar diameter or less; vertex not visible behind ocelli in full frontal view (Fig. 1); gonostylar apical margin evenly curved to acute apex (Fig. 49) **brevis (Cresson)**
- OOL 2 ocellar diameters or more; vertex clearly visible behind ocelli in front view (Fig. 3); gonostylar apical margin truncate or slightly emarginate (Fig. 51)..... **chemsaki sp. n.**
- 8 Metasomal sternum II basally slightly raised and separated from posterior part by transverse declivity (as in Figs 19, 22) **9**
- Metasomal sternum II without raised area basally (as in Fig. 20)..... **10**
- 9 Head and body black; ocelli small, diameter of lateral ocellus 0.5× OOL (Fig. 7); clypeus with median tubercle (Fig. 7); aedeagus in lateral view evenly curved, simple at apex (Fig. 55) **pilosa Krombein**

- Head and body castaneus; ocelli enlarged, diameter of lateral ocellus at least 0.7× OOL (Fig. 4); clypeus without median tubercle (Fig. 4); aedeagus in lateral view suddenly decurved, apex with a dorsally projecting process (Fig. 52) ***crassa* (Bradley)**
- 10 Clypeus with a projecting tubercle, plainly visible above mandibles in full lateral view, area between tubercle and apex appearing beveled (Fig. 8); genitalia in lateral view with gonostyli straight or slightly concave at apex; aedeagus decurved before apex (Fig. 56) ***thermarum* (Bradley)**
- Clypeus somewhat flattened and depressed, not visible above mandibles in full lateral view, apex not beveled; genitalia in lateral view with gonostylus strongly excavate at apex; aedeagus not decurved before apex (as in Figs 50, 54) **11**
- 11 Integument of head, mesosoma and first metasomal segment lighter in color than remainder of metasoma; head in full frontal view (Fig. 6) with vertex arched far above ocelli; genitalia in lateral view (Fig. 54) with apex of gonostylus nearly straight ***oaxacana* sp. n.**
- Integument of entire body concolorous; head in full frontal view with vertex arched only slightly, if at all, above ocelli (Fig. 2); genitalia in lateral view (Fig. 50) with apex of gonostylus strongly excavate ***castanea* (Cresson)**

***Colocistis brevis* (Cresson)**

http://species-id.net/wiki/Colocistis_brevis

Figures 1, 33, 41, 49

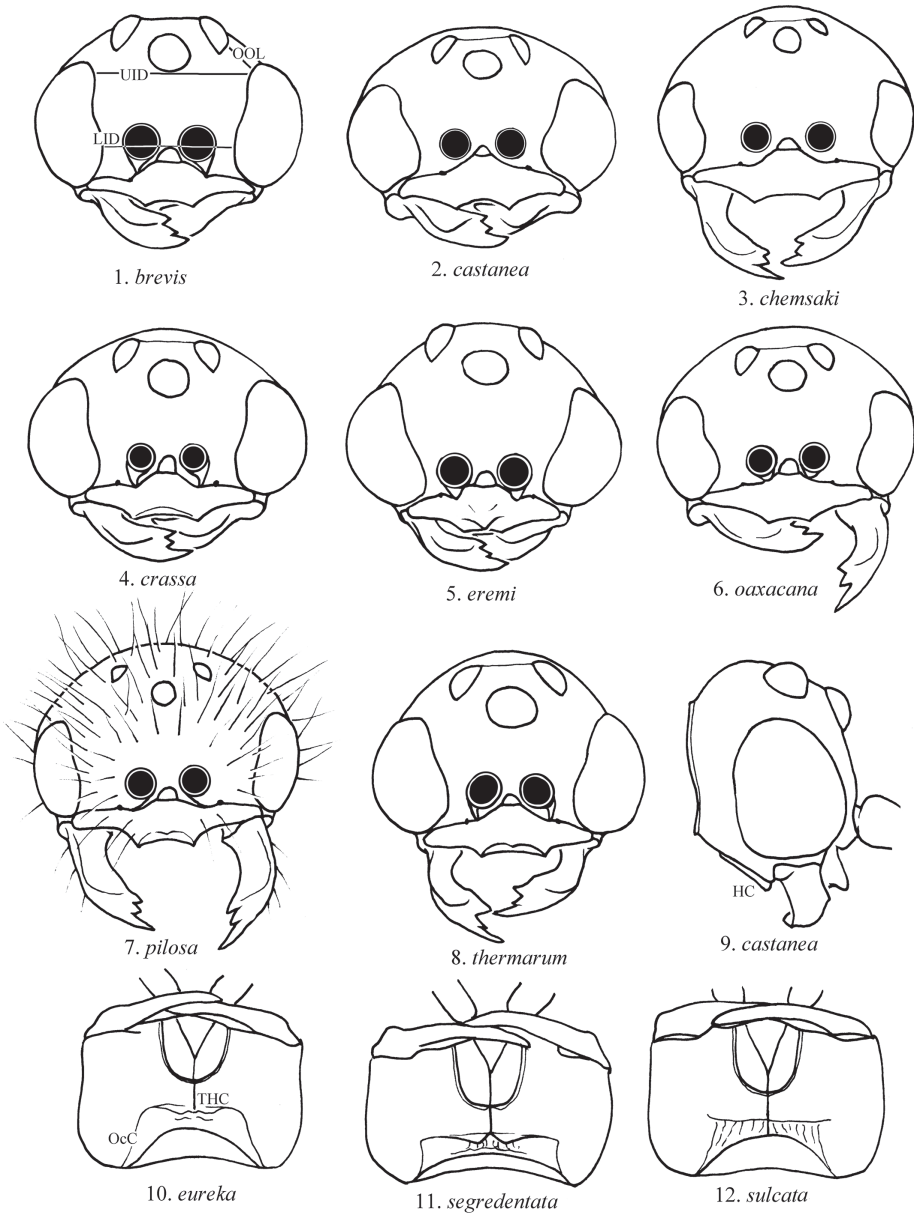
Brachycistis brevis Fox, 1899:285. Holotype male; USA: California (ANSP).

Diagnosis. This is one of three species in *Colocistis*, with two submarginal cells, including *eremi* and *chemsaki*, and one of two (*eremi*) with the costal vein not extending beyond the stigma. It can be distinguished from *eremi* by the hypostomal carina not elevated anteriorly (strongly elevated in *eremi*) and the aedeagus in lateral view slightly decurved (not decurved in *eremi*).

Description. Male.

Body length. 5–11 mm.

Head (Fig. 1). Compound eyes enlarged, extending laterally far beyond temples, inner margins somewhat emarginate; ocelli enlarged, diameter of lateral ocellus at least 0.7× OOL; vertex with impressed line between lateral ocelli absent or reduced to a row of punctures; postvertex not visible behind ocelli in frontal view; lateral ocelli separated from vertex by 0.5 or less one ocellar diameter in frontal view; clypeus raised medially and visible above mandibles in lateral view, apex not bounded laterally by strong teeth; gular carina gradually elevated anteriorly.; LID 0.8× UID; flagellomere I length 2.3–2.5× breadth; flagellomere II length 2.5× breadth; flagellomere IX length 5.5–6.0× breadth; occipital carina strong, complete ventrally, with strong carina extending from foramen magnum to hypostomal carina medially; mandible narrowest submedially.



Figures 1–12. 1–8 Front view of male head. 9 Lateral view of male head 10–12 Ventral view of female head. Abbreviations: LID = least interocular distance, OcC = occipital carina; OOL = ocellocular distance, THC = transverse hypostomal carina, UID = upper interocular distance.

Mesosoma. Pronotal punctures deep, contiguous; forefemur without stout spines; foretibia without spines except apically; basitarsus with three spines on outer surface; tibial spur as long as basitarsus; hindcoxal longitudinal dorsal carina basally angulate; mesopleural punctures contiguous; scutellum not strongly elevated above level of pro-

podeum; scutal and scutellar punctures 1–4 puncture diameters apart; postscutellum densely punctate; propodeum dorsal surface densely irregularly rugose, with irregular longitudinal submedial and sublateral carinae, posterior surface transversely, densely ridged, with large, dense punctures laterally; lateral surface impunctate ventrally becoming densely punctate dorsally; forewing with two submarginal cells, costa not extending along wing margin beyond stigma.

Metasoma. Tergum I without transverse carina; sternum II without raised area anteriorly.

Genitalia (Figs 42, 50). Gonostylus evenly curved to tip, aedeagus slightly de-curved in lateral view.

Color. Head and body concolorous castaneous; vestiture brown.

Female unknown.

Distribution (Fig. 33). USA: **Arizona**: Maricopa, Pima, Yuma counties; **California**: Imperial, Inyo, Riverside, San Bernardino, San Diego counties; **Nevada**: Lincoln, Nye counties; **Texas**: El Paso County; Mexico: **Baja California, Baja California Sur, Sonora**; 990 males were examined including the type (BME, EMEC, KSBS, LACM).

***Colocistis castanea* (Cresson)**

http://species-id.net/wiki/Colocistis_castanea

Figures 2, 9, 14, 15, 17, 20, 34, 42, 50

Brachycistis castanea Cresson, 1865a:388. Holotype male; USA: California (ANSP).

Brachycistis stygia Bradley, 1917:276. Holotype male; USA: Arizona, Nogales (CUIC).

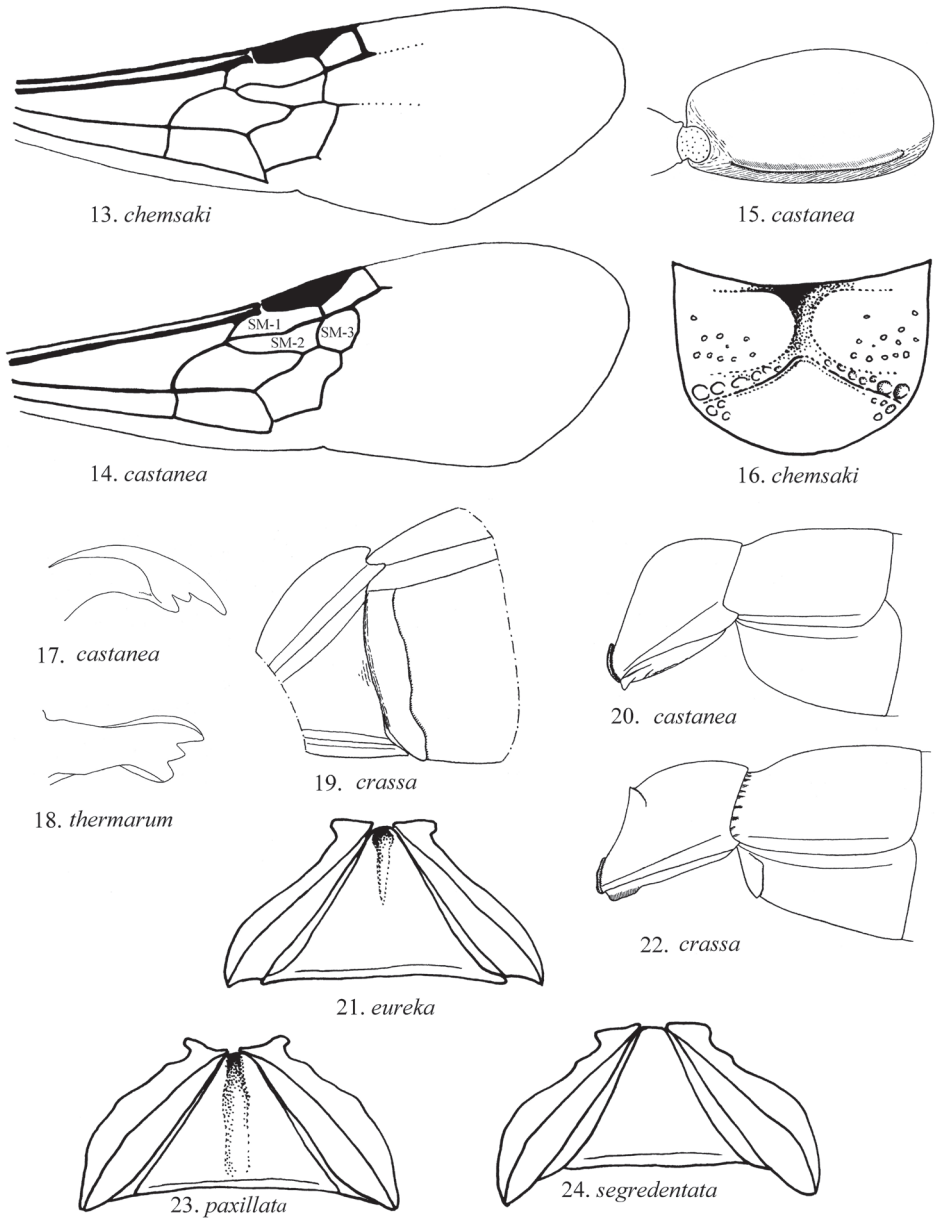
New synonymy.

Diagnosis. The simple second metasomal sternum distinguishes *castanea*, *oaxacana* and *thermarum* from other species of *Colocistis*. *Colocistis castanea* and *oaxacana* share a flattened clypeus in profile (elevated and tuberculate in *thermarum*). The concolorous body color and unmodified vertex will distinguish *castanea* from *oaxacana*. No structural features, only color could be found to distinguish *stygia* from *castanea*.

Description. Male.

Body length. 10–15 mm.

Head (Fig. 2). Head: compound eyes enlarged, extending laterally far beyond temples, inner margins somewhat emarginated; ocelli enlarged, diameter of lateral ocellus at least 0.7× OOL, removed from vertex by 0.5 or less one ocellar diameter in frontal view; impressed line present between lateral ocelli posteriorly; clypeus nearly flat, not visible above mandibles in lateral view, without projecting tubercle, apex not margined by strong teeth; antennal socket rim only slightly thickened ventrolaterally; LID 0.7× UID; flagellomere I length 2.3–2.5× breadth; flagellomere II length 2.5–2.6× breadth; flagellomere IX length 4.5–5.0× breadth; occipital carina strong but incomplete ventrally; mandible narrowest submedially, tapering apically toward ventroapical tooth (Fig. 17).



Figures 13–24. **13, 14** Male forewing. **15** Ventral view of male hindcoxa **16** Dorsal view of male propodeum **17** dorsal view of male mandible **18** lateral view of mandible **19** Ventral view of male metasomal sterna I-II **20, 22** Lateral view of male metasomal segments I and II **21, 23, 24** Ventral view of female metasomal sternum I. Abbreviations: SM-1, 2, 3 = submarginal cells 1–3.

Mesosoma. Pronotal punctures deep, contiguous, shoulders well developed, not produced laterally; forefemur without stout spines; foretibia without spines except apically; basitarsus with row of three spines on outer surface; tibial spur 0.9× length of

basitarsus; hindcoxa with longitudinal carina on ventral surface (Fig. 15), longitudinal dorsal carina not tooth-like; scutal, scutellar and mesopleural punctures large, separated by 1–3 puncture diameters; scutellum elevated above level of propodeum, with polished impunctate area medially; postscutellum densely punctate; propodeum dorsal surface coarsely rugose, with irregular, shallow, longitudinal medial groove, posterior surface separated from dorsal by transverse ridge, posterior surface polished, nearly impunctate, lateral surface dorsally with contiguous punctures becoming sparsely punctate to impunctate ventrally; forewing with 3 submarginal cells; costa continuing along wing margin beyond stigma.

Metasoma. Tergum I without transverse carina (Fig. 20); sternum II without raised area basally.

Genitalia (Figs 42, 49). Gonostylar apex arcuately excavate in lateral view; aedeagus not decurved before apex.

Color. Head and body concolorous castaneous to black; vestiture light brown. Female unknown.

Distribution (Fig. 34). USA: **Arizona**: Cochise and Pima counties; **California**: Riverside, San Bernardino counties; **Nevada**: Clark County; **New Mexico**: Dona Ana, Eddy counties; **Texas**: Brewster, Culberson, Dimmit, Hudspeth, Maverick counties; MEXICO: **Baja California**, **Baja California Sur**, **Chihuahua**, **Coahuila**, **Sinaloa**, **Sonora**; 1727 males were examined (BME, CDFA, EMEC, LACM, UCRC).

***Colocistis chemsaki* Kimsey & Wasbauer, sp. n.**

<http://zoobank.org/DFA21F30-24D2-4BEA-8DD7-A3174EB2CD29>

http://species-id.net/wiki/Colocistis_chemsaki

Figures 3, 13, 16, 37, 43, 51

Holotype male. Mexico: Baja California Sur, La Paz, 21/ix.1967, J. A. Chemsak, on flowers during day (EMEC).

Paratypes. 1 male, 15 mi w La Paz, Michelbacher and Ross; 1 male, Santo (“San”) Domingo, Michelbacher and Ross (BME, CAS).

Diagnosis. This is one of three species, including *eremi* and *brevis*, with only two forewing submarginal cells. Unlike *eremi* the gular carina is simple, and unlike *brevis* the aedeagus is not decurved. This species shares several features with *pilosa*. The ocelli are small, about the size of the pedicel, whereas they are much larger than the pedicel in other *Colocistis*, and the eyes closely follow the head margins as opposed to bulging laterally. Unique features include the antenna darker than the rest of the body, whereas they are the same color in the other species, and the propodeum in *chemsaki* has two large elevated, ovoid areas on either side of the midline of the dorsal surface.

Description. Male.

Body length. 7–8 mm.

Head (Fig. 3). Compound eyes slightly enlarged, barely extending laterally beyond temples, inner margins somewhat emarginated; ocelli small, diameter subequal

to pedicel length; of lateral ocellus at least $0.7\times$ OOL, removed from vertex by 0.5 or less an ocellar diameter in frontal view; impressed line present between lateral ocelli posteriorly; clypeus nearly flat, not visible above mandibles in lateral view, without projecting tubercle, apex not margined by strong teeth; antennal socket rim only slightly thickened ventrolaterally; LID $0.9\times$ UID; flagellomere I length $2.3\times$ breadth; flagellomere II length $2.8\times$ breadth; flagellomere IX length $4.2\times$ breadth; occipital carina strong but incomplete ventromedially; mandible narrowest submedially, tapering apically toward ventroapical tooth.

Mesosoma. Pronotum nearly vertical anteriorly, punctures deep, contiguous close, shoulders well-developed, not produced laterally; foretibia without spines except apically; basitarsus with row of three spines on outer surface; tibial spur $0.9\times$ length of basitarsus; hindcoxal longitudinal dorsal carina elevated, angulate basally; mesonotal and mesopleural punctures deep, $0.5\text{--}1.0$ puncture diameter apart; scutellum elevated above level of propodeum, with polished impunctate area medially; postscutellum densely punctate; propodeum nearly impunctate, dorsal surface with shallow medial, longitudinal groove, dorsal surface separated from posterior surface by transverse ridge, ridge interrupted medially, lateral surface with punctures $1\text{--}2$ puncture diameters apart; forewing with 3 submarginal cells; costa continuing along wing margin beyond stigma.

Metasoma. Tergum I without transverse carina; sternum II without raised area basally.

Genitalia (Figs 43, 51). Gonostylar apex arcuately excavate in lateral view; aedeagus not decurved before apex.

Color. Head and body concolorous castaneous to black; vestiture brown.

Female unknown.

Distribution (Fig. 37).

Etymology. The species is named after the collector, John Chemsak.

***Colocistis crassa* (Bradley)**

http://species-id.net/wiki/Colocistis_crassa

Figures 4, 19, 22, 35, 44, 52

Brachycistis crassa Bradley, 1917:277. Holotype males; USA: California, Fresno County, Coalinga (CUIC).*

Diagnosis. *Colocistis crassa* and *pilosa* share a distinctive modification of metasomal sternum II, which has the basal area elevated and separated from the rest of the sternum by a transverse declivity. These two species can be separated by the castaneous body color in *crassa* (black in *pilosa*), clypeus with a well-developed medial tubercle (no tubercle in *pilosa*) and large compound eyes and ocelli (small in *pilosa*).

Description. Male.

Body length. 9–16 mm.

Head (Fig. 4). Compound eyes enlarged, extending well beyond temples; ocelli enlarged, diameter of lateral ocellus at least $0.7\times$ OOL; impressed line present between lateral ocelli; antennal socket rim thickened and carinate ventrolaterally; clypeus with median tubercle, visible above mandible in lateral view, apex not bounded laterally by strong teeth; gular carina not raised; LID $0.7\times$ UID; flagellomere I length $3.2\text{--}3.3\times$ breadth; flagellomere II length $2.7\text{--}2.8\times$ breadth; flagellomere IX length $5.7\text{--}5.8\times$ breadth; occipital carina strong, incomplete ventrally; hypostomal carina not raised; mandible narrowest submedially, tapering apically toward ventroapical tooth.

Mesosoma. Pronotum nearly vertical anteriorly, punctures separated by $0.5\text{--}1.0$ puncture diameters, shoulders well developed, not produced laterally; forefemur without stout spines; foretibia without spines except apically; basitarsus with two spines on outer surface; tibial spur $0.9\times$ length of basitarsus; hindcoxal longitudinal dorsal carina forming obtuse angle basally; scutal and mesopleural punctures $1\text{--}2$ puncture diameters apart; scutellum somewhat curved above level of propodeum, coarsely punctured with large, polished impunctate area medially; postscutellar punctures $1\text{--}2$ puncture diameters apart; propodeum with long dorsal surface, nearly impunctate, with wide medial, longitudinal trough, reaching carina separating dorsal from posterior surfaces, posterior surface with shallow punctures, $0.5\text{--}1.0$ puncture diameters apart, lateral surface punctures $0.5\text{--}1.0$ puncture diameters apart dorsally, nearly impunctate ventrally; forewing with 3 submarginal cells; costa extending along wing margin beyond stigma.

Metasoma. Tergum I with transverse carina at apex of frontal declivity (Fig. 22); sternum II with anterior portion slightly raised and separated from remainder of sternum by a transverse declivity (Figs 19, 22).

Genitalia (Figs 44, 52). Gonostylar apex somewhat excavate in lateral view; aedeagus abruptly decurved in lateral view, apex with dorsally projecting process.

Color. Head and body unicolorous, castaneous; vestiture pale brown.

Female unknown.

Distribution (Fig. 35). USA: **Arizona:** Cochise, Coconino, Gila, Graham, Maricopa, Pima, Pinal, Santa Cruz, Yuma counties; **California:** Alpine, Fresno, Imperial, Inyo, Kern, Kings, Lassen, Los Angeles, Madera, Merced, Mono, Monterey, Riverside, San Benito, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Santa Clara, Sonoma, Stanislaus, Tuolumne, Tulare, Ventura counties; **Idaho:** Ada, Elmore, Owyhee counties; **Kansas:** Stanton County; **Nevada:** Churchill, Esmeralda, Eureka, Humboldt, Lincoln, Nye, Pershing, Washoe counties; **New Mexico:** Dona Ana, Eddy, Hidalgo, Luna, Quay counties; **Texas:** Alpine, Brewster, Culberson, El Paso, Jeff Davis counties; **Utah:** Ogden County; Mexico: **Baja California, Baja California Sur, Chihuahua, San Luis Potosi, Sinaloa, Sonora;** 1250 males were examined (BME, CAS, CDFA, EMEC, KSBS, LACM, MCZ).

***Colocistis eremi* (Bradley)**

http://species-id.net/wiki/Colocistis_eremi

Figures 5, 36, 45, 53

Brachycistis eremi Bradley, 1917:279. Holotype male; USA: California, Imperial County, Calexico (CUIC).

Diagnosis. Only *brevis* and *eremi* have two submarginal cells and the costal vein not extending beyond the stigma. *Colocistis eremi* can be distinguished from *brevis* by the strongly elevated hypostomal carina and the aedeagus straight in lateral view as discussed under *brevis*.

Description. Male.

Body length. 5–12 mm.

Head (Fig. 5). Compound eyes enlarged, extending laterally far beyond temples; ocelli enlarged, diameter of lateral ocellus at least $0.7\times$ OOL; lateral ocellus removed from vertex by 0.5 or less one ocellar diameter; impressed line between lateral ocelli absent or reduced to row of punctures; clypeus raised medially and visible above mandibles in lateral view, apex not bounded laterally by strong teeth; gular carina raised anteriorly; LID $0.6\times$ UID; flagellomere I length $2.7\text{--}2.8\times$ breadth; flagellomere II length $3\times$ breadth; flagellomere IX length $3.6\text{--}3.7\times$ breadth; occipital carina strong, complete ventrally; mandible narrowest submedially, tapering apically toward ventroapical tooth.

Mesosoma. Pronotal punctures shallow, $0.5\text{--}1.0$ puncture diameters apart, shoulders well-developed, not produced laterally; forefemur without stout spines; foretibia without spines except apically; basitarsus with two spines on outer surface; tibial spur subequal to length of basitarsus; hindcoxa with longitudinal dorsal carina basally tooth-like; scutal punctures $1\text{--}2$ puncture diameters apart; mesopleural punctures nearly contiguous; scutellum slightly elevated above level of propodeum, punctures $1\text{--}3$ puncture diameters apart; postscutellum impunctate medially, densely punctate laterally; propodeum dorsal surface with longitudinal sublateral carinae, shallowly rugose, without transverse carina separating dorsal from posterior surface, posterior surface punctures deep, $1\text{--}3$ puncture diameters apart, lateral surface punctures $0.5\text{--}1.0$ puncture diameters apart dorsally, impunctate ventrally; forewing with two submarginal cells, costa not extending along wing margin beyond stigma.

Metasoma. Tergum I without transverse carina; sternum II without raised area anteriorly.

Genitalia (Figs 45, 53) in lateral view with gonostylus broadly curved to nearly straight at tip, aedeagus not decurved.

Color: Head and body unicolorous castaneous; vestiture pale brown.

Female unknown.

Distribution (Fig. 36): USA: **Arizona:** Coconino, Maricopa, Pima, Pinal, Yuma counties; **California:** Imperial, Inyo, Riverside, San Bernardino, San Diego Counties; Nevada: Lincoln, Nye counties; Mexico: **Baja California, Baja California Sur, Sonora;** 518 males were examined (BME, EMEC, KSBS, LACM).

***Colocistis eureka* (Mickel & Krombein)**

http://species-id.net/wiki/Colocistis_eureka

Figures 10, 21, 39

Glyptomtopa eureka Banks, 1912:202. Holotype female; USA: Arizona, Palmerlee (MCZ).

Diagnosis. *Colocistis eureka* shares the strongly elevated gular carina with *segredentata*. However, in *eureka* the carina is strongly biangular or bidentate versus medially uninterrupted and the meso- metapleural sulcus is faint but distinct, versus absent or incomplete in *segredentata*.

Male unknown.

Description. Female.

Body length. 9.5–10.0 mm.

Head. Wider than long in anterior view; vertex with lateral foveae consisting of row of large, shallow punctures; occipital carina (Fig. 10) meeting transverse carina at obtuse angle, transverse carina irregular, notched medially between submedial teeth, subtended by irregular rugae toward occiput.

Mesosoma. Pronotal disk 0.4× as long as broad in dorsal view, nearly impunctate, with several scattered punctures; propleura densely punctured; foretibia with two spines laterally; basitarsus with two spines on outer surface; tibial spur 0.9× length of basitarsus; hindcoxa ventral carina extending 0.5 length of coxa, dorsal longitudinal carina broadly elevated basally.

Metasoma. Sternum I without medial groove (Fig. 21).

Color. Reddish brown; vestiture whitish to pale yellow.

Distribution (Fig. 39). USA: Arizona, Cochise County: Palmerlee; Santa Cruz County: Atascosa Mountain; two specimens were seen (BME, UCRC).

***Colocistis oaxacana* Kimsey & Wasbauer, sp. n.**

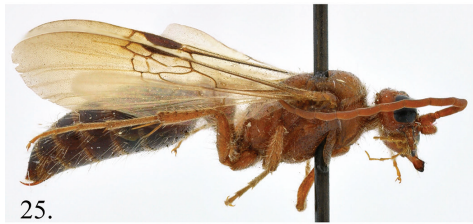
<http://zoobank.org/669E891B-4329-4EAD-B707-715EB06358EA>

http://species-id.net/wiki/Colocistis_oaxacana

Figures 6, 25, 26, 37, 46, 54

Diagnosis. Two unique features distinguish *oaxacana* from other species of *Colocistis*, the bicolored body and strongly elevated vertex. This species most closely resembles *castanea* but, in addition, to differences in the coloration and the elevated vertex, can be distinguished by the gonostylar apex strait or slightly curved but not excavate as in *castanea*.

Type material. Holotype male: Mexico: Oaxaca, 23 mi. south Matias Romero, iv/5/1962, F. D. Parker & L.A. Stange (BME). Paratypes (30 males): 6 males: same data as holotype; 4 males: iv/6/1962; 1 male, iv/8/1962; 1 male, iv/22/1962; 10 males: Tequisistlan, iv/6/1962, F. D. Parker & L.A. Stange; 4 males: 1 mi sw Tehuantepec, iv/5/53, E. I. Schlinger; 2 males: Ixtepec, iv/23/1962, F. D. Parker & L.A. Stange;



25.

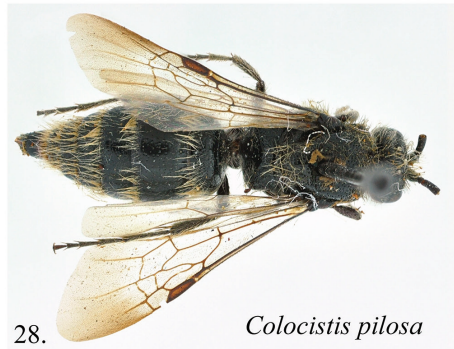


27.



26.

Colocistis oaxacana



28.

Colocistis pilosa



29.



31.



30.

Colocistis paxillata



32.

Colocistis segredentata

Figures 25–32. 25–28. Males. 29–32 Females. 25, 27, 29, 31 Lateral view 26, 28, 30, 32 Dorsal view 25–30 are images of the holotypes.

1 male: 10 mi ne Juchitan, iv/15/1953, E. I. Schlinger; 2 males: Chiapas, 28 mi w Cintalapa (BME, EMEC).

Description. Male (Figs 25, 26).



Figures 33–36. Distribution maps of *Colocistis* species.

Body length. 9–11 mm.

Head (Fig. 6). Compound eyes enlarged, extending well beyond temples; ocelli enlarged, diameter of lateral ocellus at least $0.7\times$ OOL; lateral ocelli removed from vertex by nearly one ocellar diameter in frontal view; impressed line present between lateral ocelli; clypeus slightly convex but without projecting tubercle in lateral view, apex not



Figures 37–40. Distribution maps *Colocistis* species.

bounded laterally by strong teeth; antennal socket rim only slightly thickened ventrolaterally; LID $0.8 \times$ UID; flagellomeres I-II length $2.7\text{--}2.8 \times$ breadth; flagellomere IX length $5.2\text{--}5.5 \times$ breadth; occipital carina strong but incomplete ventrally, without ca-

rina extending from foramen magnum to hypostomal carina medially; gular carina not raised; mandible narrowest submedially, tapering apically toward ventroapical tooth.

Mesosoma. Pronotum nearly vertical anteriorly, sloping posteriorly, punctures shallow and sparse medially, laterally deep and close, shoulders well developed, not produced laterally; forefemur without stout spines; foretibia without spines except apically; basitarsus with two spines on outer surface; tibial spur 0.9× length of basitarsus; hindcoxal longitudinal dorsal carina not tooth-like; scutal and mesopleural punctures separated by 0.5–1.0 puncture diameter; scutellum not arched dorsally above level of propodeum, punctures large, 0.5–1.0 puncture diameters apart, with polished impunctate area posteromedially; postscutellum impunctate medially; propodeum nearly impunctate, dorsal surface with shallow V-shaped trough medially, forming obtuse angle with posterior surface, separated from posterior surface by medially interrupted transverse carina, lateral surface with scattered punctures, 2–5 puncture diameters apart; forewing with 3 submarginal cells, costa extending long wing margin beyond stigma.

Metasoma. Tergum I without transverse carina; sternum I with narrow longitudinal medial groove extending most of length; sternum II without raised anterior portion.

Genitalia (Figs 46, 54). Gonostylus not excavate ventrally before apex and apical margin straight not excavate in lateral view; aedeagus broadest subapically and submedially, not decurved before apex in lateral view, apex simple.

Color. Head and mesosoma castaneous, metasoma darker, often nearly black; vestiture pale brown to black.

Female unknown.

Distribution (Fig. 37)

Etymology. The species is named after the collection locality, the state of Oaxaca, Mexico.

Discussion. *Colocistis oaxacana* is the southernmost species in the genus. The others are only recorded from as far south as Sinaloa, Mexico.

***Colocistis paxillata* (Mickel & Krombein)**

http://species-id.net/wiki/Colocistis_paxillata

Figures 23, 29, 30

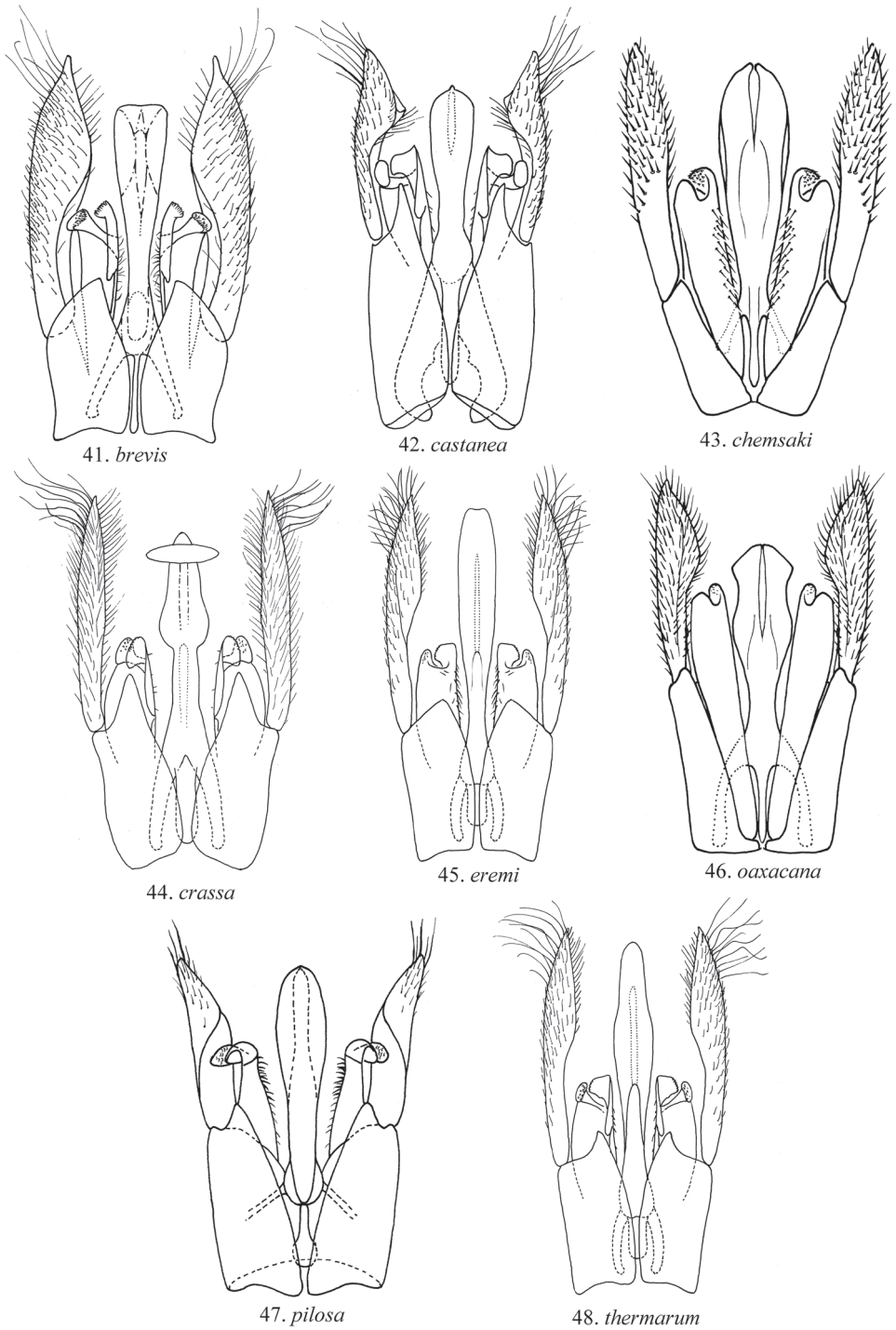
Aglyptacros paxillata Mickel & Krombein, 1942:673. Holotype female; USA: Colorado, La Junta (USNM).

Diagnosis. In *paxillata* and *sulcata* the gular carina is not elevated or angulate and does not meet the occipital carina. *Colocistis paxillata* can be distinguished from *sulcata* by the sulcus on metasomal sternum I extending the same width for the length of the sternum.

Male unknown.

Description. Female (Figs 29, 30).

Body length. 10.5 mm.



Figures 41–48. Ventral view of male genital capsule.

Head. 1.3× as wide as long (along midline) in anterior view; vertex with lateral foveae small, circular; occipital carina ending before hypostomal carina medially; transverse carina short and irregular on either side of midline.

Mesosoma. Pronotal disk 0.5× as long as broad in dorsal view, 1.8× as long as scutum; punctures 2–3 puncture diameters apart; propleura heavily punctured; forefemur without stout spines; foretibia without spines except apically; basitarsus with row of three spines on outer surface; tibial spur 0.9× length of basitarsus; hindcoxa ventral carina about half length of coxa, dorsal carina broadly lobate dorsally.

Metasoma. Sternum I with medial groove parallel-sided, extending to apical margin of sternum (Fig. 23).

Color. Reddish brown; vestiture pale yellow.

Distribution. USA: Colorado, Otero County; only the holotype female was seen.

***Colocistis pilosa* Krombein**

http://species-id.net/wiki/Colocistis_pilosa

Figures 7, 27, 28, 37, 47, 55

Colocistis pilosa Krombein, 1942:66. Holotype male; USA: California, San Diego County, San Diego, June 22, 1890 (USNM).

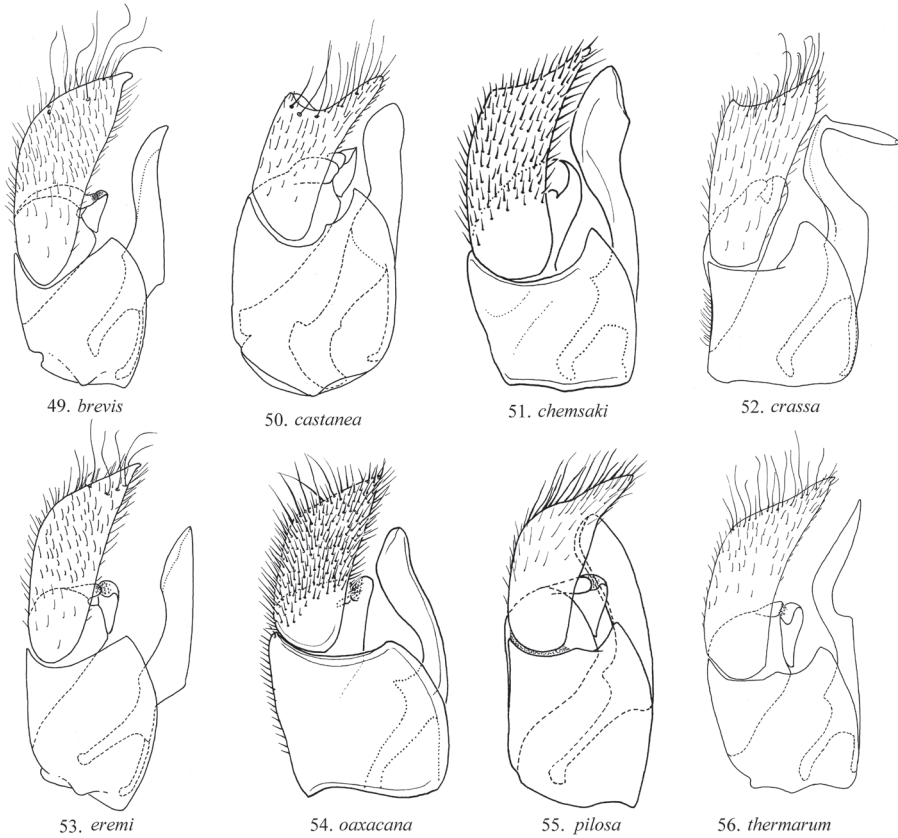
Diagnosis. *Colocistis pilosa* is only one of two species, including some specimens of *castanea*, with black body coloration. However, it shares with *crassa* the distinctive modification of metasomal sternum II, with the basal area elevated and separated from the rest of the sternum by a transverse declivity. These two species can be separated by the clypeus without a medial tubercle in *pilosa* (well-developed in *castanea*) and small compound eyes and ocelli (large in *castanea*), and long, dense, whitish pubescence.

Description. Male (Figs 27, 28).

Body length 11–12 mm.

Head (Fig. 7). Compound eyes not enlarged, barely extending beyond temples, inner margins slightly evenly curved; ocelli small, diameter of lateral ocellus 0.5× OOL; without impressed line between lateral ocelli; antennal socket rim slightly thickened ventrolaterally; clypeus with median tubercle visible in lateral view, apex bounded laterally by strong teeth; gular carina not raised; LID 0.85× UID; flagellomere I length 2.4× breadth; flagellomeres II–X missing; occipital carina strong but incomplete ventrally, with carina extending from foramen magnum to hypostomal carina medially; mandible narrowest submedially.

Mesosoma. Pronotum nearly vertical anteriorly, sloping posteriorly, punctures deep, largely contiguous, shoulders well-developed, not produced laterally; forefemur without stout spines; foretibia without spines, except apically; basitarsus with three spines on outer surface; tibial spur 0.9× length of basitarsus; hindcoxa without longitudinal dorsal carina tooth-like basally; mesonotal and mesopleural punctures contiguous; scutellum strongly arched dorsally much above level of propodeum, punctures 0.5–1.5 puncture diameters apart, with small, polished impunctate area medially; postscutellum punctures large, con-



Figures 49–56. Lateral view of male genital capsule.

tiguous; propodeum dorsal surface coarsely rugulose, separated from posterior face by distinct carina, posterior face punctures contiguous laterally, becoming more widely separated toward midline, except for small dorsomedial impunctate area, punctures becoming small toward petiole, laterally punctures 0.5 puncture diameter apart to contiguous; forewing with 3 submarginal cells, costa extending along wing margin beyond stigma.

Metasoma. Tergum I without transverse carina; sternum II with anterior portion slightly raised and separated from remainder of sternum by transverse declivity.

Genitalia (Figs 47, 55). Gonostylus slightly emarginate ventrally before tip in lateral view; aedeagus evenly curved, simple at apex in lateral view.

Color. Head and body unicolorous, black, with extensive long, erect pale, yellowish setae, setae more than half as long as eye height.

Female unknown.

Distribution (Fig. 37).

Discussion. *Colocistis pilosa* may be extinct; no specimens have been seen since the type was collected. The San Diego region where the type was collected has become increasingly urbanized since 1942 and is now highly urbanized with commercial and residential developments.

***Colocistis segredientata* (Mickel & Krombein)**

http://species-id.net/wiki/Colocistis_segredientata

Figures 11, 24, 31, 32, 38

Aglyptacros segredientata Mickel & Krombein, 1942:671. Holotype female; USA: Arizona, Benson (MCZ).

Diagnosis. This might be the female of *castanea*. It shares a number of characteristics with *eureka* as discussed under that species. *Colocistis castanea* can be distinguished by the meso- metapleural suture absent or faint and incomplete and the medially interrupted transverse carina posterior to the gular carina.

Male unknown.

Description. Female (Figs 31, 32).

Body length 7.0–10.5 mm.

Head. Wider than long in anterior view; vertex with lateral foveae consisting of row of large, deep punctures; occipital carina meeting hypostomal carina at a right angle, hypostomal carina forming sharp angle on either side of midline; transverse carina short, irregular (Fig. 11).

Mesosoma. Pronotal disk 0.4× as long as broad in dorsal view; punctures widely separated, 2–10 puncture diameters apart; propleura coarsely rugosopunctate; forefemur without stout spines; foretibia without spines except apically; basitarsus with row of three spines on outer surface; tibial spur 0.9–1.0× as long as basitarsus; hindcoxa ventral, longitudinal carina extending half length of coxa; dorsal longitudinal carina broadly elevated and lobe-like basally.

Metasoma. Sternum I with medial groove short, not extending much beyond base of sternum, or absent (Fig. 24).

Color. Reddish brown; vestiture whitish to pale yellow.

Distribution (Fig. 38). USA: Arizona, Cochise County; California: Imperial, Inyo counties; Nevada: Nye County; 35 specimens were examined (BME, CDFA, UCRC).

***Colocistis sulcata* (Mickel & Krombein)**

http://species-id.net/wiki/Colocistis_sulcata

Figures 12, 39

Aglyptacros sulcata Mickel & Krombein, 1942:674. Holotype female; USA: Texas, Valentine (KSBS).

Diagnosis. *Colocistis sulcata* most closely resembles *paxillata* based on the incomplete occipital carina and simple gular carina. It can be distinguished from *paxillata* by the gular carina extending laterally beyond where the occipital carina would join if extended and metasomal sternum I medial longitudinal trough narrow and deep anteriorly, becoming broad and shallow posteriorly; parallel-sided in *paxillata*.

Male unknown.

Description. Female.

Body length. 7–12 mm.

Head. Twice as wide as long in anterior view; vertex with lateral fovea a row of circular punctures; occipital carina meeting transverse carina at nearly right angle, transverse carina extending laterally further than occipital carina (Fig. 12).

Mesosoma. Notal punctures deep, scattered, 1–5 puncture diameters apart; pronotal disk 0.5× as long as broad in dorsal view, punctures 3–5 puncture diameters apart; propleura coarsely rugosopunctate; forefemur without stout spines; foretibia without spines except apically; basitarsus with row of three spines on outer surface; tibial spur as long as basitarsus; hindcoxa ventral carina extending half length of coxa; dorsal longitudinal carina broadly elevated and lobe-like basally; meso-metapleural suture at most indicated by faint indentation.

Metasoma. Sternum I with medial groove narrowest anteriorly, broadened posteriorly, extending length of sternum.

Color. Reddish brown; vestiture whitish to pale yellow.

Distribution (Fig. 39). USA: Arizona: Cochise County; Texas: Jeff Davis, Presidio counties; 4 specimens were examined (BME, EMEC).

***Colocistis thermarum* (Bradley)**

http://species-id.net/wiki/Colocistis_thermarum

Figures 8, 18, 30, 40, 48, 56

Brachycistis thermarum Bradley, 1917:274. Holotype male; USA: Arizona, Hot Springs (CUIC).

Diagnosis. This is one of three species, including *castanea* and *oaxacana*, which have three submarginal cells and the second metasomal sternum simple. It can be distinguished from both by the tuberculate clypeus.

Description. Male.

Body length. 8–15 mm.

Head (Fig. 8). Compound eyes enlarged, extending well beyond temples; ocelli enlarged, diameter of lateral ocellus at least 0.7× OOL; impressed line present between lateral ocelli; antennal socket rim only slightly thickened ventrolaterally; clypeus with median tubercle visible above mandible in lateral view, apex not bounded laterally by strong teeth; gular carina not raised; LID 0.7× UID; flagellomeres I–II length 2.3–2.4× breadth; flagellomere IX length 5× breadth; occipital carina strong but, complete ventrally; hypostomal carina not raised; mandible narrowest submedially, apically broad and teeth subequal in length.

Mesosoma. Pronotum nearly vertical anteriorly, punctures deep, 0.5 puncture diameter apart to contiguous, shoulders well-developed, not produced laterally; forefemur without stout spines; foretibia without spines except apically; basitarsus with two spines on outer surface; tibial spur 0.9× length of basitarsus; hindcoxa without basally

tooth-like longitudinal dorsal carina; scutal punctures 0.5–2.0 puncture diameters apart; mesopleural punctures contiguous; scutellum flattened dorsally nearly planar with level of propodeum, punctures 0.5–1.0 puncture diameters apart, with small, polished impunctate area medially; postscutellum densely punctate; propodeal dorsal surface separated from posterior and lateral surfaces by carina, dorsal surface with longitudinal medial trough, surface shallowly rugose, posterior surface nearly impunctate, lateral surface densely punctate dorsally, impunctate ventrally; forewing with 3 submarginal cells; costa extending along wing beyond stigma.

Metasoma. Tergum I without transverse carina; sternum II without raised area basally.

Genitalia (Figs 48, 56). gonostylar apex nearly straight in lateral view; aedeagus abruptly decurved before apex, without dorsally projecting process.

Color. Head and body unicolorous, castaneous; vestiture whitish to pale yellow.

Female unknown.

Distribution (Fig. 40): USA: **Arizona**: Cochise, Maricopa, Pima, Pinal, Yuma counties; **California**: Imperial, Inyo, Riverside counties; **Texas**: Culberson, Dimmit, Jeff Davis counties; MEXICO: **Baja California, Baja California Sur, Sonora**; 370 males were examined (BME, CAS, CDFA, EMEC).

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References

- Banks N (1912) New Scolioidea. *The Canadian Entomologist* 44:197–203. doi: 10.4039/Ent44197-7
- Bradley JC (1917) Contributions toward a monograph of the Mutillidae and their allies of America north of Mexico. IV. A review of the Myrmosidae. *Transactions of the American Entomological Society* 43: 247–290.
- Cresson ET (1865) Descriptions of some new species of *Mutilla* from California. *Proceedings of the Entomological Society of Philadelphia* 4: 385–390.
- Fox WJ (1899) The North American Mutillidae. *Transactions of the American Entomological Society* 25: 219–300.
- Kimsey LS (2006) Competing taxonomies: reexamination of the female-based genera of Brachycistidinae (Hymenoptera: Tiphidae). *Zootaxa* 1121: 21–34.
- Kimsey LS, Wasbauer MS (2006) Phylogeny and checklist of the nocturnal tiphids of the Western Hemisphere (Hymenoptera: Tiphidae: Brachycistidinae). *Journal of Hymenoptera Research* 15: 9–25.
- Krombein KV (1942) A new genus and species of Brachycistidinae. *Proceedings of the Entomological Society of Washington* 44: 67–68. doi: 10.2307/2420897

- Malloch JR (1926) Systematic notes on and descriptions of North American wasps of the subfamily Brachycistidinae. *Proceedings of the United States National Museum* 68: 1–28, 4 pls.
- Mickel CE Krombein KV (1942) *Glyptommetopa* Ashmead and related genera in the Brachycistidinae, with descriptions of new genera and species (Hymenoptera: Tiphidae). *American Midland Naturalist* 28(3): 648–679.
- Wasbauer MS (1966) Revision of the male wasps of the genus *Brachycistis* in American north of Mexico (Hymenoptera: Tiphidae). *University of California Publications in Entomology* 43: 1–96.
- Wasbauer MS (1968) New genera of male Brachycistidinae with a redescription of *Brachycistellus* Baker and a key to North American genera (Hymenoptera: Tiphidae). *The Pan-Pacific Entomologist* 44(3): 184–197.