Western North American Naturalist 84(3), © 2024, pp. 269–319

Review of the parasitoid wasp genus *Cratichneumon* Thomson (Hymenoptera: Ichneumonidae) from Arizona's Sky Islands, with descriptions of eleven new species

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ABSTRACT.—We review the parasitoid wasp genus *Cratichneumon* Thomson (Hymenoptera: Ichneumonidae: Ichneumoninae) from the Madrean Archipelago of southeastern Arizona and describe 11 new species: *C. antichromus* Claridge & Helcoski sp. nov., *C. arussatus* Claridge & Helcoski sp. nov., *C. elongatus* Claridge & Helcoski sp. nov., *C. fossorius* Claridge & Helcoski sp. nov., *C. igniferus* Claridge & Helcoski sp. nov., *C. luteus* Claridge & Helcoski sp. nov., *C. permagnus* Claridge & Helcoski sp. nov., *C. scabriculus* Claridge & Helcoski sp. nov., *C. symmixtus* Claridge & Helcoski sp. nov., *C. tetragonops* Claridge & Helcoski sp. nov., and *C. warneri* Claridge & Helcoski sp. nov. *Cratichneumon russatus* (Cresson, 1877) syn. nov. is proposed as a junior synonym of *C. astutus* (Holmgren, 1868). New distribution records are presented for *C. arizonensis* (Viereck, 1905), *C. astutus* (Holmgren, 1868), and *C. flaschkai* Heinrich, 1973, extending their range far into the Sierra Madre Occidental in Mexico. Despite the present advances, there are still significant unresolved questions. For instance, the females of 3 species remain unidentified, no biological information is known for any of the species, and our knowledge of the distribution of all species is undoubtedly highly fragmentary. The discovery of so many unknown *Cratichneumon* species in Arizona highlights the paucity of our knowledge of Ichneumoninae in western North America.

RESUMEN.—Aquí revisamos el género *Cratichneumon* Thomson (Hymenoptera: Ichneumonidae: Ichneumoninae) del archipiélago Madrense del sureste de Arizona y describen once nuevas especies: *C. antichromus* Claridge & Helcoski sp. nov., *C. arussatus* Claridge & Helcoski sp. nov., *C. elongatus* Claridge & Helcoski sp. nov., *C. fossorius* Claridge & Helcoski sp. nov., *C. igniferus* Claridge & Helcoski sp. nov., *C. luteus* Claridge & Helcoski sp. nov., *C. permagnus* Claridge & Helcoski sp. nov., *C. scabriculus* Claridge & Helcoski sp. nov., *C. symmixtus* Claridge & Helcoski sp. nov., *C. tetragonops* Claridge & Helcoski sp. nov., y *C. warneri* Claridge & Helcoski sp. nov. También, *C. russatus* (Cresson, 1877) se propone como sinónimo junior de *C. astutus* (Holmgren, 1868). Se presentan nuevos registros de distribución para *C. arizonensis* (Viereck, 1905), *C. astutus* (Holmgren, 1868), y *C. flaschkai* Heinrich, 1973, extendiendo su área de distribución hasta la Sierra Madre Occidental en México. A pesar de los avances actuales, todavía existen importantes preguntas sin resolver. Por ejemplo, las hembras de tres especies siguen sin identificar, no se conoce información biológica de ninguna de las especies y nuestro conocimiento sobre la distribución de todas las espécies es sin duda sumamente fragmentario. El descubrimiento de tantos de especies desconocido de *Cratichneumon* en Arizona destaca la escasez de nuestro conocimiento de Ichneumoninae en el oeste de América del Norte.

Cratichneumon Thomson is a large genus of ichneumonid wasps (Hymenoptera: Ichneumonidae) in the subfamily Ichneumoninae that are endoparasitoids of various families of micro- and macrolepidopterans (Yu et al. 2016). There are around 129 species that occur worldwide, except for the Australasian region, but the genus is most diverse in the Nearctic, with 66 described species (Yu et al. 2016). In North America, *Cratichneumon* is one of the most diverse ichneumonine genera, with the majority of species concentrated in the eastern United States and Canada (Heinrich 1961b, Yu et al. 2016). As with most ichneumonines, much less is known of the species in western North America, apart from a few original, outdated descriptions from the 19th or early 20th century (e.g., Cresson 1877, Holmgren 1868, Viereck 1905, 1906). Overall, the western *Cratichneumon* fauna of the United States and Canada appears less diverse both at the local and regional levels, even including undescribed species (B. Claridge

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personal observation). The major exception, however, is the Madrean Sky Islands region.

Although the lowlands of southeastern Arizona, southwestern New Mexico, and adjacent areas in Mexico are primarily dominated by the Sonoran and Chihuahua deserts, the region's greatest biodiversity is found in the high-altitude Madrean Archipelago, or Madrean Sky Islands, which are visible as peaks rising from the desert (Heald 1951, Meyer et al. 2015). At the base of the sky islands, low-altitude desert scrub and grassland give rise to higher-altitude pine-oak woodlands, chaparrals, pine forests, and mixed conifer forests (McLaughlin 1994). The shift in dominant vegetation type results in a repeated spatial arrangement of isolated, montane habitat surrounded by relatively less diverse lowlands, resembling an inland archipelago (Heald 1951). According to the World Wildlife Fund's classification, the Madrean Archipelago forms the northernmost extension of the Sierra Madre Occidental pine-oak ecoregion (Olson et al. 2001), but it is also widely considered to be a transition zone between the southern Rocky Mountains and the Sierra Madre Occidental biotas (Brown et al. 1979, Brown 1994, Bezy and Cole 2014), as well as between the Nearctic and Neotropical biogeographic regions (Halffter 1964, 1976, 1987). One result of this complex geography is high species richness, particularly of arthropods (Moore et al. 2013, Meyer et al. 2015).

The present study is a review of the largely unknown *Cratichneumon* species from this region which only occur on the sky islands or otherwise more mesic sites such as sheltered canyons, including those on the Mogollon Rim. Although only 2 *Cratichneumon* species were previously known from Arizona, we discovered 11 new and striking species. The study was initiated when a number of new species were first discovered among V-flight intercept trap (VFIT) by-catch collected by William Warner, inventor of the VFITs (Warner 2017). Additional specimens were subsequently found among material recently donated by Michael Irwin, as well as specimens at the Entomology Museum of Utah State University and several other institutions.

Full taxonomic treatments are provided for the 11 new species and 3 previously described species, including diagnoses, descriptions, specimen images, and distribution maps. In addition to the species key and other identification resources presented here, an interactive filterable gallery, including a larger set of Nearctic *Cratichneumon* species, can be accessed at https://ichsofna.org.

Methods

We examined 1117 specimens from the following collections: Hasbrouck Insect Collection, Arizona State University, Phoenix, Arizona, USA (ASUHIC); California Academy of Sciences, San Francisco, California, USA (CAS); Canadian National Collection of Insects, Agriculture Canada, Ottawa, Ontario, Canada (CNCI); Essig Museum of Entomology, University of California, Berkeley, California, USA (EMEC); Entomology Museum of Utah State University, Logan, Utah, USA (EMUS); and the Walnut Canyon National Monument collection (WACA) housed in the Museum of Northern Arizona, Flagstaff, Arizona, USA. The study area corresponds to the sky islands as delimited by Moore et al. (2013). The Chiricahua, Huachuca, Patagonia, Pinaleño, Whetstone, and Patagonia Mountains, the Mogollon Rim, and Walnut Canyon National Monument were well-sampled, primarily via either Malaise traps or VFITs, while material for the remainder of the mountains included in the Madrean Archipelago was either entirely lacking or only poorly represented. A small amount of material composed of hand-collected specimens was also available from the Sierra Madre Occidental. Collection data are only presented for primary type specimens, while data for all specimens are available in tab-delimited format using Darwin Core terms (Supplementary Material 1; open-access repository Zenodo [https://doi.org/10.5281/zenodo.10672204]).

For species delimitation and discovery, we first sorted the specimens to species based on characters typically used to delimit *Cratichneumon* and other ichneumonine species, including size, color, surface sculpture, and other structural characters such as the presence of propodeal apophyses and the dimensions of various external body parts (Heinrich 1961b, 1977). We then identified the species or established that they were undescribed using the keys and descriptions of Heinrich (1961b), Heinrich (1977), original descriptions of *Cratichneumon* species from surrounding areas (Cameron 1885, 1904, Cresson 1864, 1874, 1877, Schulz 1906), and comparison with determined material at EMUS and type images when necessary.

Morphological terminology primarily follows Bennett et al. (2019). Surface sculpture terminology follows Harris (1979). "T1," "T2," and so forth refer to the corresponding metasomal tergites and "MS1" refers to the first metasomal segment. The "median field" of the supraclypeal area refers to the medial, usually convex area of the supraclypeal area that, if well developed, is delimited ventrally by the epistomal suture, dorsally by the transverse ridge ventral to the antennal insertions, and laterally by weak vertical impressions (Heinrich 1961a). References to yellow or yellowish-white banding on the tibiae follow the use of "annulus" in Heinrich (1961a) in which both the base and apex must be distinctly darker in color than the central area of the tibia, although the basal darkened area is sometimes restricted to 0.1× the tibial length. It is not considered banding when the yellow or yellowish-white area extends to the base of the tibia. *Cratichneumon* species are sexually dimorphic, and thus, each sex is described in full. No separate sections on biology are provided as no biological information, including hosts attacked, is known for any of the species.

Specimen images were taken with a Canon 1200D body, a Canon EF-S 60-mm macro lens for habitus images, and a Venus Optics Laowa 25-mm Ultra-Macro lens for higher-magnification images. Image stacking was performed with Helicon Focus 7 and further processed in the web-based photo editor Photopea (photopea.com). Figures were assembled in LibreOffice Draw 5.4.4.2. Distribution maps were generated in QGIS 3.10 (QGIS Development Team 2023).

RESULTS

Diagnosis of Nearctic *Cratichneumon* Thomson

Heinrich (1977) noted the heterogenous and problematic nature of *Cratichneumon*, especially when comparing species from disparate biogeographical regions. A critical analysis of *Cratichneumon* using phylogenomic evidence is therefore much needed and will likely necessitate taxonomic changes and alter the diagnosis. However, this is outside the scope of the current work, and the following diagnosis generally conforms to that of Heinrich (1961b) and Heinrich (1977), with several notable exceptions.

Cratichneumon species in the Nearctic are diagnosed by the following combination of characters: (1) clypeus flat (except weakly convex in *C. elongatus* sp. nov. and concave in the males of several eastern species); (2) postpetiole smooth to granulate, sometimes weakly rugulose and usually without dense punctation (except usually punctate-rugulose in *C. warneri* sp. nov. females); (3) female oxypygous with ovipositor not significantly projecting past metasomal apex (except slightly projecting past apex in *C. elongatus* sp. nov.); (4) gastrocoelus shallow; (5) thyridium narrower than interthyridial width; and (6), male thyridium set back from anterior margin of T2 (Heinrich 1961b, Heinrich 1977). *Cratichneumon* is most similar to *Aoplus* Tischbein, *Crypteffigies* Heinrich, *Homotherus* Förster, and *Platylabops* Heinrich. However, *Aoplus* and *Homotherus* have a wide thyridium (wider than interthyridial width), and the ovipositor of *Crypteffigies* significantly projects past the metasomal apex. *Platylabops* can be separated from all species of *Cratichneumon* (besides *C. elongatus*) by the convex clypeus and the lack of propodeal apophyses in all species (dentate in *C. elgonatus*). For additional identification resources for Nearctic ichneumonine genera, see the website https://ichsofna.org.

KEY TO *CRATICHNEUMON* FEMALES OF THE SKY ISLANDS OF SOUTHEASTERN ARIZONA, INCLUDING TWO UNASSOCIATED FEMALES (FEMALES OF *LUTEUS*, *PERMAGNUS*, AND *SYMMIXTUS* ARE UNKNOWN)

1. Metasoma mostly or entirely black or dark iridescent blue (Figs. 3A, 11G) 2

— Metasoma mostly or entirely light to dark brownish red (e.g., Figs. 1G, 5F) 3

2. Metasoma dark iridescent blue (Fig. 11G) . . . . . *C. flaschkai* Heinrich

— Metasoma black (Fig. 3A). . . *C. arizonensis* (Viereck)

3. Mesosoma entirely black (Fig. 1D) or at most with scutellum and propodeum dark brownish red. Mesonotum smooth with scattered, coarse punctures (Fig. 1D) . . . . . *C. antichromus* Claridge & Helcoski, new species

— Mesosoma mostly to entirely light red to brownish red (e.g., Figs. 5B, 19B), or if predominantly black, then scutellum and postscutellum yellowish white (Fig. 15D). Mesonotum smooth to granulate and moderately to densely punctate (e.g., Figs. 5D, 13D) 4

4. Hind tibia with yellowish-white to yellow banding (e.g., Figs. 9A, 22A) or head predominantly yellow anteriorly (Fig. 19C). 5

— Hind tibia either uniformly colored or at most darker apically (e.g., Figs. 5A, 7A) and head brownish red anteriorly (e.g., Figs. 5C, 13C) 9

5. Propodeal apophyses dentate (Fig. 9E). Clypeus weakly convex (Fig. 9C). Head narrowed ventrally in anterior view (Fig. 9C) . . . . . *C. elongatus* Claridge & Helcoski, new species

— Propodeal apophyses varying from absent to lamellate (Figs. 15E, 19E, 22E). Clypeus flat (Figs. 15C, 19C, 22C). Head parallel-sided in anterior view (Figs. 15C, 19C, 22C) 6

6. Mesosoma usually with extensive black areas (occasionally predominantly brownish red), MS1 entirely brownish red, and the following areas always yellowish white: dorsal margin of pronotum, subalar ridge, scutellum, and postscutellum (Fig. 15A). Propodeal apophyses lamellate (Fig. 15E) . . . . . *C. igniferus* Claridge & Helcoski, new species

— Mesosoma predominantly brownish red, posterior margin of MS1 yellow, or without the above combination of yellowish-white areas (Figs. 19A, 22A, 24A) 7

7. Hind coxa with scopa (Fig. 26B) . . . . . *Cratichneumon* female A

— Hind coxa without scopa (Figs. 19H, 22G) 8

8. Anterior of head (Fig. 19C) and posterior margin of MS1 yellow (Fig. 19F). Mesopleuron brownish red with anteroventral yellow mark (Fig. 19B) . . . . . *C. scabriculus* Claridge & Helcoski, new species

— Anterior of head (Fig. 22C) and posterior margin of MS1 brownish red (Fig. 22F). Mesopleuron entirely brownish red with posterior margin occasionally black (Fig. 22B) . . . . . *C. tetragonops* Claridge & Helcoski, new species

9. Metasoma impunctate or nearly so (Fig. 13F). Propodeal apophyses lamellate (Fig. 13E) . . . . . *C. fossorius* Claridge & Helcoski, new species

— Metasoma with moderate to dense punctation (Figs. 5F, 7F, 24F). Propodeal apophyses absent (Figs. 5E, 7E, 24E) 10

10. Postpetiole smooth and densely punctate or punctate-rugulose (Fig. 24F). Hind coxa with medium-sized scopa (Fig. 24G) . . . . . *C. warneri* Claridge & Helcoski, new species

— Postpetiole granulate with at most a few scattered punctures (Figs. 5F, 7F). Hind coxa with small scopa (Fig. 7G) or scopa entirely absent (Fig. 5G) . . 11

11. Hind coxa with scopa (Fig. 7G) . . . . . *C. astutus* Holmgren

— Hind coxa without scopa (Fig. 5G) 12

12. Areola length and width approximately equal. Scutellum punctate-rugulose (Fig. 5D) . . . . . *C. arussatus* Claridge & Helcoski, new species

— Areola length approximately 1.8× width. Scutellum sparsely punctate . . . . . *Cratichneumon* female B

KEY TO *CRATICHNEUMON* MALES OF THE SKY ISLANDS OF SOUTHEASTERN ARIZONA

1. Metasoma mostly or entirely black or dark iridescent blue (Figs. 4A, 12A) 2

— Metasoma yellow or brownish red with black banding (Figs. 2A, 21E) 3

— Metasoma mostly or entirely light to dark brownish red without black banding (Figs. 6A, 14A) 7

2. Metasoma dark iridescent blue (Fig. 12A). Body length 15.9–18.2 mm . . . . . *C. flaschkai* Heinrich

— Metasoma predominantly black (Fig. 4A). Body length 7.3–8.2 mm . . . . . *C. arizonensis* Viereck

3. Flagellum without yellowish-white banding (Figs. 2A, 17A, 25A) 4

— Flagellum with yellowish-white banding (Figs. 20A, 21A) 6

4. Overall color more extensively yellow (mesopleuron, ventral division of metapleuron and hind coxa primarily yellow) (Fig. 17B) . . . . . *C. luteus* Claridge & Helcoski, new species

— Color more extensively black (mesopleuron, ventral division of metapleuron and hind coxa primarily black), except for mesopleuron occasionally primarily yellow (Figs. 2B, 25B) 5

5. Hind tibia with yellow banding (basal 0.1 dark brown to black, basal 0.1–0.5 yellow, and apical 0.5 dark brown to black) (Fig. 25A). T2 smooth to weakly granulate and densely punctate (Fig. 25F) . . . . . *C. warneri* Claridge & Helcoski, new species

— Hind tibia without yellow banding (tibia with basal 0.5 yellow and apical 0.5 dark brown to black) (Fig. 2A). T2 smooth with fine to moderate-sized punctation (Fig. 2F) . . . . . *C. antichromus* Claridge & Helcoski, new species

6. Mesopleuron black and yellow (Fig. 20B). T2 length approximately 1.25× width of posterior margin . . . . . *C. scabriculus* Claridge & Helcoski, new species

— Mesopleuron predominantly brownish red with limited black and yellow areas (Fig. 21B). T2 length approximately 1.0× width of posterior margin . . . . . *C. symmixtus* Claridge & Helcoski, new species

7. Mesosoma primarily black or at least with significant black areas (Fig. 14B, 16B) 8

— Mesosoma mostly to entirely brownish red or light brownish red (Figs. 10B, 18B, 23B) 9

8. Flagellum without banding (Fig. 14A). Head primarily black (Fig. 14C). Mesosoma uniformly black (Fig. 14B). Metasoma impunctate or nearly so (Fig. 14F) . . . . . *C. fossorius* Claridge & Helcoski, new species

— Flagellum with yellowish-white banding (Fig. 16F). Head yellowish white (Fig. 16C). Mesosoma predominantly black to brownish red with yellowish-

white markings (Fig. 16B). Metasoma with at least fine, shallow punctures on T2 (Fig. 16F) . . . . . *C. igniferus* Claridge & Helcoski, new species

9. Propodeal apophyses dentate (Figs. 10E, 18E) 10

— Propodeal apophyses absent (Figs. 6E, 8E, 23E) . . . 11

10. Flagellum without banding (Fig. 10A). Head ventrally tapering in anterior view (Fig. 10C). Clypeus weakly convex (Fig. 10C) . . . . . *C. elongatus* Claridge & Helcoski, new species

— Flagellum with yellowish-white banding on flagellomeres 11–22 (Fig. 18A). Head parallel-sided in anterior view (Fig 18C). Clypeus flat (Fig. 18C) . . . . *C. permagnus* Claridge & Helcoski, new species

11. Hind tibia with yellow banding (Fig. 23A). Flagellum with complete yellow banding on flagellomeres 13–20 (Fig. 23A) . . . . . *C. tetragonops* Claridge & Helcoski, new species

— Hind tibia brownish red or at most with apex darkened (Figs. 6A, 8A). Flagellum with banding varying from entirely absent to incomplete from flagellomeres 14/15–16/19 to complete from 11–17 (Figs. 6A, 8A). 12

12. Flagellum with yellowish-white banding varying from incomplete on flagellomeres 14/15–16/19 to complete from flagellomeres 11–17 may be complete or incomplete but always present (Fig 6A). Flagellomeres 7/8–16/18 with small to medium-sized, dark brown tyloids. Mesonotum smooth to weakly granulate and densely punctate except medioposterior region longitudinally punctate-rugulose (Fig. 6D) . . . . . *C. arussatus* Claridge & Helcoski, new species

— Flagellum without banding (Fig. 8A). Flagellomeres 4/5–13/15 with small to medium-sized, dark brown tyloids. Mesonotum smooth with sparse to moderately dense punctation with at most a few punctures confluent forming longitudinal rugulae medioposteriorly (Fig. 8D) . . . . . *C. astutus* Holmgren

Taxonomic Treatments

Cratichneumon antichromus Claridge & Helcoski, new species

(Figs. 1–2, 29)

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DIAGNOSIS.—*Cratichneumon antichromus* females can be identified based on their distinct color pattern, particularly the absence of yellow or yellowish-white areas on the black mesosoma and the entirely brownish-red metasoma. Additionally, the smooth mesonotum with scattered, coarse punctures further sets female *C. antichromus* apart from congeners. The overall yellow and black color with a banded metasoma renders the males similar to a number of other species. Males are diagnosed by the following combination of characters: flagellum without banding; hind tibia without banding (basally yellow and apically dark brown to black); mesonotum smooth with fine to moderate-sized punctation; postpetiole and T2 smooth; and T2 with fine to moderate-sized punctation. *Cratichneumon antichromus* males are most similar to *C. luteus* and *C. warneri*, but the latter species are readily differentiated by the differences in color (e.g., greater extent of yellow areas in *C. luteus* and the brownish-red metasomal apex and basally dark brown to black hind tibia in *C. warneri* males) and the denser, coarser punctation in both species, particularly on the mesonotum and T2.

DESCRIPTION, FEMALE.—(Fig. 1). Body length: 9.3–9.9 mm; forewing length: 6.6–7.0 mm.

Color. Predominantly black head and mesosoma with a brownish-red metasoma. Head primarily black with occasional brownish-red markings on the medial paraocular area. Mesosoma black except following areas dark brownish-red in 10% of specimens: scutellum, subalar ridge, tegula, postscutellum, and propodeum. Fore and middle legs black except tibiae ventrally dark brownish red and tarsi varying from brownish red to dark brownish red. Hind leg: coxa black, trochanter and trochantellus black to dark brownish red; femur and tibia brownish red to dark brownish red; tarsus black to dark brownish red. Wing membrane clear. Pterostigma light brown to reddish brown. Metasoma brownish red.

Head. Clypeus smooth and dorsal 0.4 coarsely punctate, ventral margin varying from coarsely punctate to impuncate; flat in lateral view. Supraclypeal area smooth and coarsely punctate. Dorsal margin of median field with small, blunt, median tubercle. Gena smooth and sparsely, coarsely punctate. Supra-antennal area smooth and coarsely punctate. Vertex smooth and coarsely punctate. Antenna filiform (only weakly flattened and slightly wider subapically) with short flagellomeres (flagellomere 1 length and width equal) and 36–38 flagellomeres.

Mesosoma. Pronotum smooth and coarsely punctate dorsally becoming rugulose ventrally. Mesonotum smooth and sparsely, coarsely punctate. Scutellum smooth with a few scattered, coarse punctures. Mesopleuron smooth and varying from entirely coarsely, longitudinally punctate-rugulose to coarsely punctate with ventral 0.5 longitudinally punctate-rugulose. Speculum

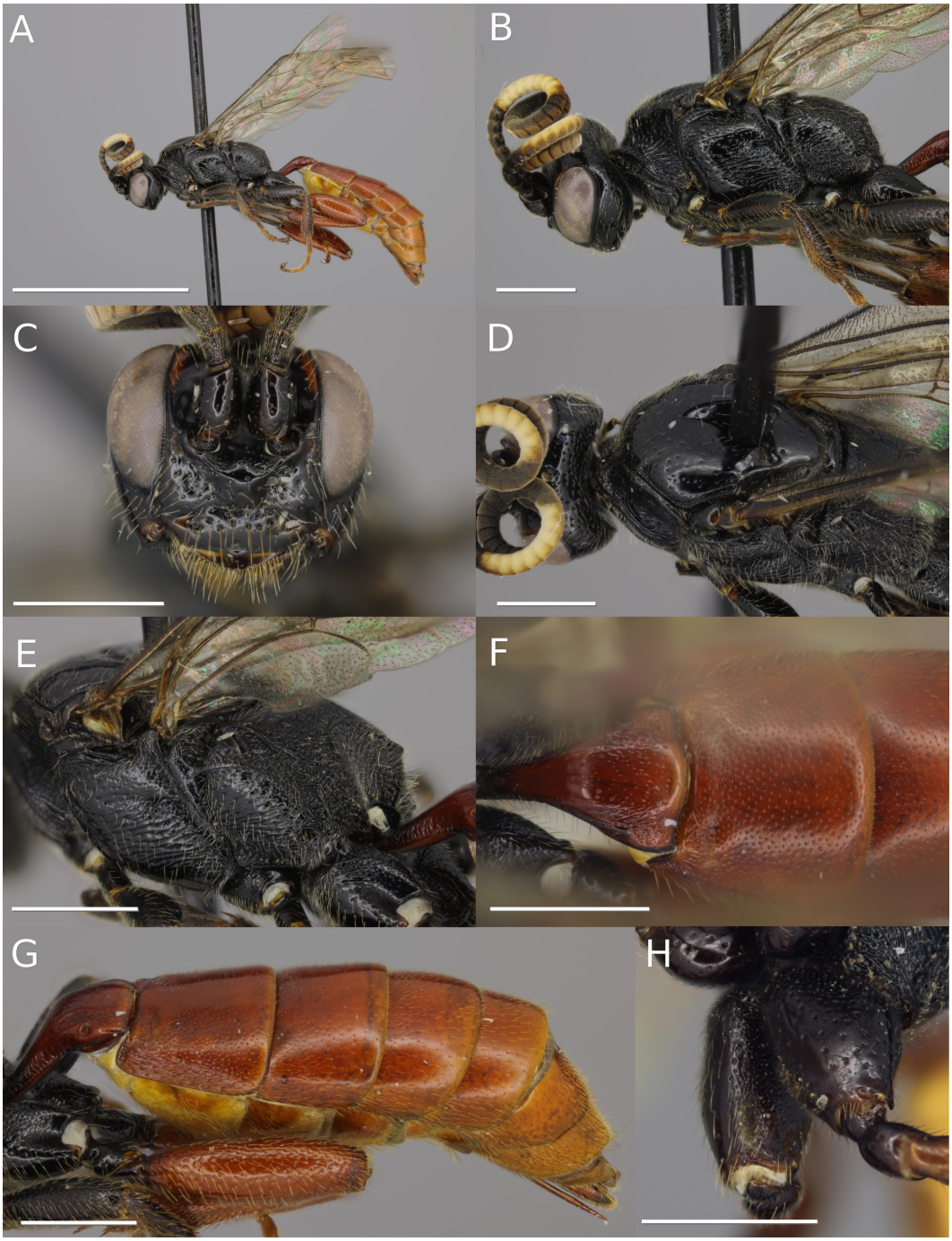

Fig. 1. *Cratichneumon antichromus* sp. nov., female holotype. ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsolateral view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsal view. ***G*,** Metasoma, dorsolateral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*G*). *Cratichneumon antichromus* sp. nov., female paratype (EMUSENT00006380). ***H*,** Hind coxa, ventral view. Scale bar: 1.0 mm (*H*).

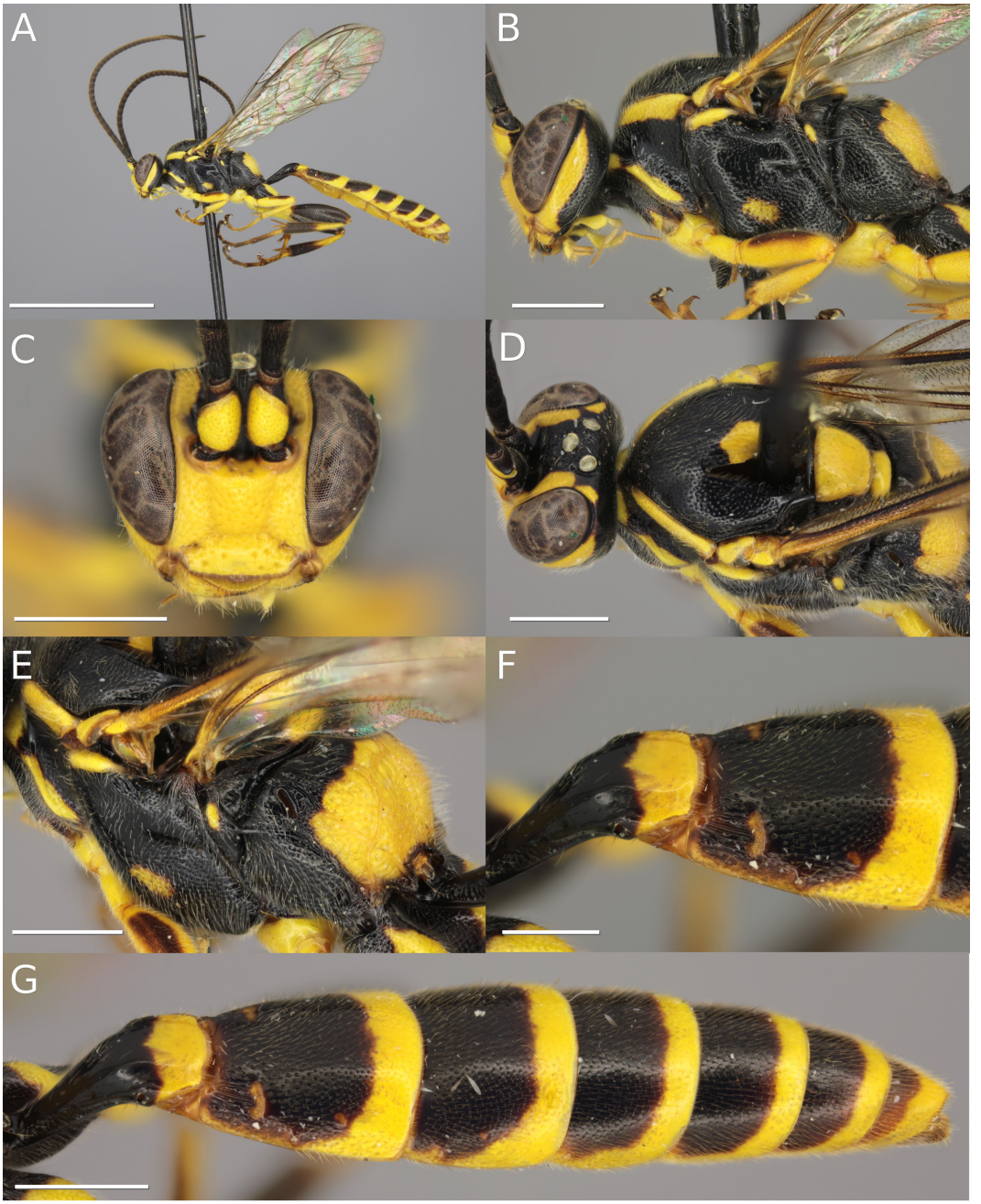

Fig. 2. *Cratichneumon antichromus* sp. nov., male paratype (EMUSENT00005014). ***A*****,** Habitus. ***B*****,** Mesosoma, lateral view. ***C*****,** Head, anterior view. ***D,*** Mesosoma, dorsal view. ***E*****,** Propodeum, dorsolateral view. ***F*****,** T1–2, dorsolateral view. ***G,*** Metasoma, dorsolateral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*G*).

smooth and finely punctate. Metapleuron smooth and coarsely punctate-rugulose. Propodeum punctate-rugulose except areola varying from smooth to finely rugulose. Propodeal apophyses absent. Areola length approximately equal to width. Hind coxa with small scopa.

Metasoma. Postpetiole varying from nearly smooth to weakly granulate and finely punctate laterally. T2 smooth with sparse, fine to moderate-sized punctation. T3–7 smooth with fine, shallow, sparse punctation becoming smoother and impunctate posteriorly.

DESCRIPTION, MALE.—(Fig. 2). Body length: 9.4–12.3 mm; forewing length: 6.5–8.0 mm.

Color. Predominantly black with extensive yellow markings and metasoma yellow and black banded. Mandible yellow except dark brown apex. Clypeus and supraclypeal area yellow. Gena yellow anteriorly and black posteriorly. Supra-antennal area black except paraocular area broadly yellow. Remainder of paraocular area yellow except posterodorsal corner black. Vertex and occiput black. Prosternum black. Pronotum primarily black with ventral margin varying from entirely yellow to yellow with a small central black area and dorsal margin yellow except anterior 0.1 black. Mesonotum black except a small, central yellow mark. Scutellum, postscutellum, tegula, and subalar ridge yellowish. Mesopleuron varying from entirely black to black with large, central yellow spot. Ventral division of metapleuron black. Propodeum yellow except anterior 0.2–0.4 black. Fore and middle legs yellow except variable splotchy brown to dark brown marks on femora dorsally and tarsus becoming light brown to brown apically. Hind leg: coxa black except variable yellow, dorsoapical mark; trochanter and trochantellus yellow; femur black to dark brown; tibia with basal 0.5–0.6 yellow and apical 0.4–0.5 dark brown to black; tarsus dark brown except tarsomere 1 usually yellowish basally. Wing membrane clear. Pterostigma yellowish to light brown. Metasoma: MS1 black except posterior margin yellow; T2 color highly variable with 90% of specimens with T2 predominantly yellow with anterior 0.2–0.6 black except lateral margin and 10% of specimens with T2 black except posterior 0.3 yellow (one exceptional specimen with T2 entirely yellow except small submedial dark brown spots at anterior 0.3); T3–7 with anterior 0.5–0.8 black except yellow lateral margins and posterior 0.2–0.5 yellow.

Head. Clypeus smooth with dorsal 0.5 sparsely, coarsely punctate and ventral margin with a few scattered, coarse punctures; flat in lateral view. Supraclypeal area smooth with moderately dense punctation. Dorsal margin of median field with median tubercle varying from absent to small and blunt. Gena smooth with moderately dense punctation. Supra-antennal area smooth to weakly granulate with moderately dense punctation. Vertex smooth and finely punctate. Antenna with 36–39 flagellomeres. Flagellomeres 6/8–21/22 with small, black tyloids; 0–5 tyloids spanning length of flagellomeres.

Mesosoma. Pronotum smooth and dorsally with moderately dense punctation becoming rugulose ventrally. Mesonotum smooth with fine to moderate-sized punctation. Scutellum smooth and finely, sparsely punctate. Mesopleuron smooth with dorsal 0.4 with moderately dense punctation and ventral 0.6 densely punctate with some punctures confluent forming longitudinal rugulae. Speculum smooth and finely punctate. Ventral division of metapleuron smooth with moderately dense punctate. Propodeum punctate-rugulose except areola smooth. Propodeal apophyses absent. Areola width slightly greater than length.

Metasoma. Postpetiole smooth and occasionally with fine, shallow punctures laterally. T2 smooth with fine to moderate-sized punctation. T3–7 smooth and finely, indistinctly punctate becoming smooth and impunctate posteriorly.

MATERIAL EXAMINED.—*Holotype*. ♀; USA; Arizona; Cochise Co.; Chiracahua Mts.; 18.iv.1981; B. & C. Dasch; trap; EMUSENT 00005901.

DISTRIBUTION.—Only known from the Chiricahua, Huachuca, and Sierra Ancha Mountains (Fig. 29).

ETYMOLOGY.—Derived from the Greek *anti* (against or opposite to) and *khrōma* (color) in reference to the contrasting, bicolored pattern in both sexes. Adjective.

Cratichneumon arizonensis (Viereck)

(Figs. 3–4, 28)

Ichneumon (*Eurylabus*) *arizonensis* Viereck, 1905:195. Holotype: ♀ [University of Kansas, Lawrence, Kansas, USA]. Holotype not examined.

DIAGNOSIS.—*Cratichneumon arizonensis* males and females are primarily black, similar to a number of other species particularly in the eastern Nearctic. Females are distinguished from similarly colored species by a combination of the following characters: hind coxa with a small

scopa; areola longer than wide; and mesopleuron with coarse longitudinal rugosity. Males are diagnosed by a combination of the following characters: tyloids medium sized; wing membrane clear; mesopleuron with coarse longitudinal rugosity; and ventral division of metapleuron finely punctate-rugulose. Also, *C. arizonensis* is not known to co-occur with any other predominantly black *Cratichneumon* species north of Mexico, excluding *C. flaschkai*, which has a dark iridescent blue metasoma.

DESCRIPTION, FEMALE.—(Fig. 3). Body length: 9.0–13.5 mm; forewing length: 6.0–9.6 mm.

Color. Predominantly black with yellowish-white markings. Head primarily black to dark brown except paraocular area yellowish white dorsally, medially, and ventrally. Antenna black except flagellomeres 7/9–15/16 with yellowish-white banding. Mesosoma black except following areas yellowish white: dorsal margin of pronotum; scutellum, subalar ridge; postscutellum (90% of specimens). Fore and middle legs: coxae, trochanters, trochantelli, and femora primarily black to dark brown; tibiae primarily yellowish white with variable black to dark brown area ventrally and apical 0.2–0.4 black; tarsi varying from dark brown to yellowish white, darkening apically to tarsomere 5. Hind leg: coxa, trochanter, trochantellus, and femur black to dark brown; tibia primarily black except basal 0.1–0.5 yellowish white; tarsus black to dark brown. Wing membrane clear. Pterostigma light brown to dark brown. Metasoma black.

Head. Clypeus smooth and moderately to densely, coarsely punctate; flat in lateral view. Supraclypeal area smooth and densely, coarsely, punctate-rugulose. Dorsal margin of median field without distinct tubercle. Gena smooth and coarsely punctate-rugulose. Supra-antennal area smooth and coarsely, densely punctate. Vertex smooth and coarsely, densely punctate. Antenna filiform (only weakly flattened subapically) with short flagellomeres (flagellomere 6/7 length and width equal) and 31–35 flagellomeres.

Mesosoma. Pronotum smooth and varying from predominantly finely punctate dorsally and rugulose ventrally to predominantly rugulose and finely punctate dorsally. Mesonotum smooth and densely, coarsely punctate, posteromedially with some punctures confluent forming longitudinal rugulae. Scutellum smooth and finely punctate. Mesopleuron smooth and coarsely, longitudinally punctate-rugulose. Speculum smooth varying from densely, finely, punctate to punctate-rugulose. Metapleuron smooth and varying from coarsely punctate-rugulose to coarsely rugulose. Propodeum irregularly rugulose. Propodeal apophyses absent. Areola length greater than width. Hind coxa with small scopa.

Metasoma. Postpetiole varying from granulate to nearly smooth and weakly longitudinally rugulose with a few scattered punctures. T2 granulate and densely, coarsely punctate. T3–7 weakly granulate and finely punctate becoming smoother posteriorly.

DESCRIPTION, MALE.—(Fig. 4). Body length: 7.3–8.2 mm; forewing length: 5.0–9.0 mm.

Color. Predominantly black with highly variable yellowish-white markings. Head primarily yellowish white except apical 0.5 of mandible; supra-antennal area, vertex, and gena black except yellowish-white paraocular area. Antenna black except yellowish-white banding varying from flagellomeres 15–17 yellowish white mediodorsally to flagellomeres 14–22 entirely yellowish white. Prosternum varying from entirely black to anterior 0.5 black and posterior 0.5 yellowish white. Pronotum primarily black with ventral margin varying from black to yellowish white and dorsal margin yellowish white. Mesonotum entirely black except occasional small yellowish-white marks posterolaterally. Scutellum, postscutellum, tegula, and subalar ridge yellowish white. Mesopleuron varying from entirely black to primarily black with variable yellowish-white areas along anterior, dorsal, and posterior margins and variable yellowish-white marks on ventral 0.5. Ventral division of metapleuron black. Propodeum entirely black with the third lateral area yellowish white in 90% of specimens, occasionally petiolar area yellowish white and connecting to marks on third lateral area. Fore and middle legs: coxae primarily yellowish white with basal 0.2 varying from yellowish white to black; trochanters yellowish white; trochantelli basally yellowish white and apically black to dark brown; femora yellowish white anteriorly and dark brown to black posteriorly; tibiae primarily yellowish white with variable black to dark brown area ventrally; tarsi varying from light brown to yellowish white, darkening apically to tarsomere 5. Hind leg: coxa black except yellowish-white dorsoapical area; trochanter, trochantellus, and femur black to dark brown; tibia basally yellowish white, apically black to dark brown; tarsus black to dark brown. Wing membrane clear. Pterostigma

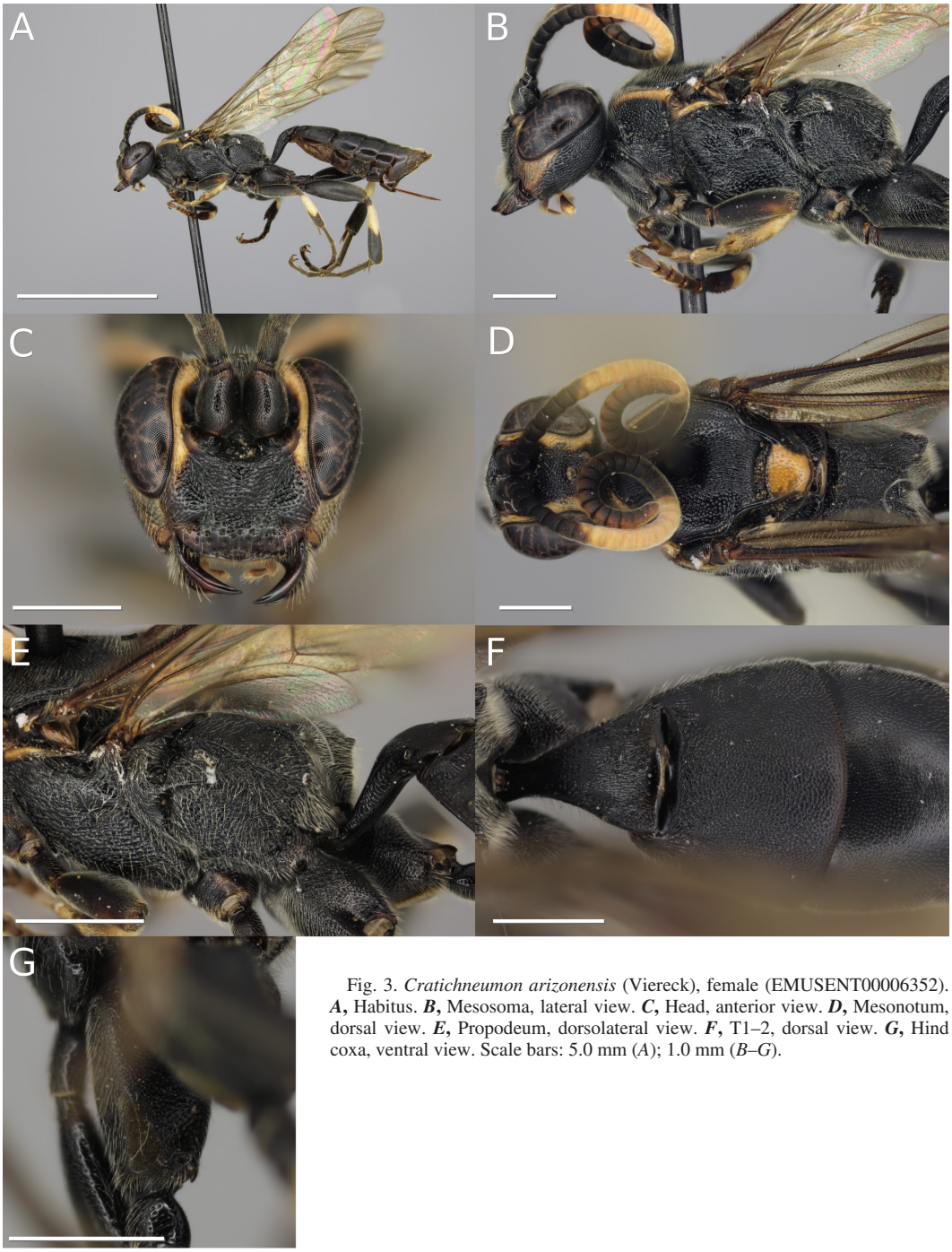

Fig. 3. *Cratichneumon arizonensis* (Viereck), female (EMUSENT00006352). ***A***, Habitus. ***B***, Mesosoma, lateral view. ***C***, Head, anterior view. ***D***, Mesonotum, dorsal view. ***E***, Propodeum, dorsolateral view. ***F***, T1–2, dorsal view. ***G***, Hind coxa, ventral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*G*).

light to dark brown. Metasoma black except posterior margin of postpetiole yellowish white in 90% of specimens.

Head. Clypeus smooth and sparsely, coarsely punctate; flat in lateral view. Supraclypeal area smooth and varying from moderately to densely, coarsely punctate (25% of specimens with paraocular areas puncate-rugulose). Dorsal margin of median field without distinct tubercle. Gena smooth with sparse to moderate-sized punctation. Supra-antennal area smooth and coarsely, densely punctate. Vertex smooth and

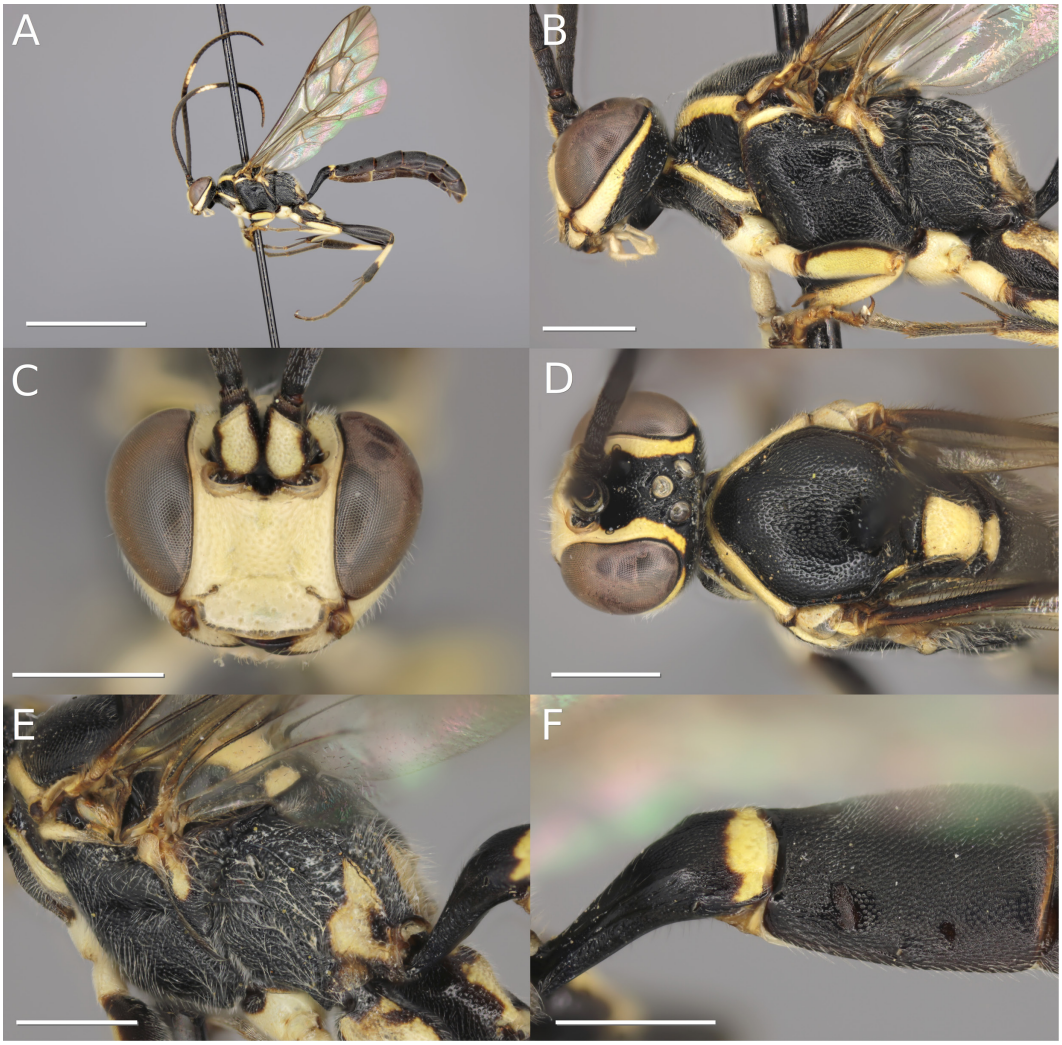

Fig. 4. *Cratichneumon arizonensis* (Viereck), male (EMUSENT00006268). ***A*,** Habitus. B. Mesosoma, lateral view. ***C*,** Head anterior view. ***D*,** Mesonotum, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsolateral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B–F*).

coarsely, densely punctate. Antenna with 34–38 flagellomeres. Flagellomeres 6/7–15/17 with long, brown tyloids; 2–5 tyloids spanning length of flagellomere.

Mesosoma. Pronotum smooth and varying from predominantly finely punctate dorsally and rugulose ventrally to predominantly rugulose and finely punctate dorsally. Mesonotum smooth and densely, coarsely punctate, centrally with some punctures confluent forming longitudinal rugulae. Scutellum smooth and finely punctate varying from sparse to moderately dense. Mesopleuron smooth and varying from predominantly longitudinally rugulose and densely punctate dorsally to predominantly sparsely, finely punctate and longitudinally rugulose ventrally. Speculum smooth with fine, sparse to moderately dense punctation. Metapleuron smooth and punctate-rugulose. Propodeum rugulose except first and second lateral areas varying between rugulose and punctate-rugulose. Propodeal apophyses absent. Areola length and width approximately equal.

Metasoma. Postpetiole granulate and impunctate except for a few scattered punctures. T2–3 weakly granulate and densely, coarsely punctate.

T4–7 weakly granulate and punctuate becoming smoother and impunctate posteriorly.

Material examined.—See Supplementary Material 1.

Distribution.—From the Mogollon Rim (including Walnut Canyon and Pinos Altos in New Mexico) throughout the Madrean Archipelago (recorded from the Chiricahua, Huachuca, Santa Catalina Mountains) and the Sierra Madre Occidental as far south as El Salto, Durango, Mexico (Fig. 28).

Cratichneumon arussatus Claridge & Helcoski, new species

(Figs. 5–6, 28)

urn:lsid:zoobank.org:act:87C4CF34-5AFA-4EA5-A3C9-C1696A907BE2

Diagnosis.—*Cratichneumon arussatus* females are similar to other primarily brownish-red females, particularly those with which they co-occur in Arizona, but are readily distinguished by the following combination of characters: propodeal apophyses absent; hind tibia entirely brownish red; scopa absent; scutellum punctate-rugulose; mesonotum longitudinally punctate-rugulose posteromedially; and T2 with dense, shallow punctation. Females are most similar to *C. astutus* but are easily distinguished due to the absence of the scopa and coarser surface sculpture on the mesosoma. Males are predominantly brownish red and diagnosed by the following combination of characters: flagellum with yellowish-white banding varying from flagellomeres 14/15–16/19 yellowish white dorsally to complete banding on flagellomeres 11–17; propodeal apophyses absent; hind tibia without banding; and mesonotum with medioposterior longitudinally punctate-rugulose. As in females, *C. astutus* males are the most similar to those of *C. arussatus*. However, the latter are easily differentiated from the former by the complete to incomplete yellowish-white banding on at least 2 flagellomeres (without any trace of flagellar banding in *C. astutus*) and the coarser mesosomal surface sculpture.

Description, female.—(Fig. 5). Body length: 6.4–10.1 mm; forewing length: 4.9–6.5 mm.

Color. Predominantly brownish red to light brownish red except flagellomeres 7–12 with incomplete yellowish-white banding, flagellomeres 13–28 dark brown to black, and fore and mid legs lighter with yellowish tibiae. Wing membrane clear. Pterostigma light to dark brown.

Head. Clypeus smooth and sparsely, coarsely punctate; flat in lateral view. Supraclypeal area smooth and moderately to densely punctate with some punctures confluent forming transverse rugulae. Dorsal margin of median field with a small, blunt, median tubercle. Gena smooth with moderately dense punctation dorsally becoming sparser ventrally. Supra-antennal area smooth to weakly granulate with moderately dense punctation. Vertex smooth to weakly granulate with moderately dense punctation. Antenna filiform (only moderately flattened and wider subapically) with short flagellomeres (flagellomere 6/7 length and width equal) and 28–29 flagellomeres.

Mesosoma. Pronotum smooth and densely punctate dorsally becoming rugulose ventrally. Mesonotum smooth and densely punctate with medioposterior punctures confluent forming longitudinal rugulae. Scutellum punctate-rugulose. Mesopleuron smooth and longitudinally punctate-rugulose. Speculum smooth and finely punctate to punctate-rugulose. Ventral division of metapleuron longitudinally punctate-rugulose. Propodeum primarily irregularly rugulose except first and second lateral areas and dorsal 0.5 of petiolar area punctate-rugulose. Propodeal apophyses absent. Areola length and width approximately equal. Hind coxa without scopa.

Metasoma. Postpetiole granulate and varying from impunctate to with few scattered punctures. T2 granulate with dense, shallow punctation becoming obsolete posteriorly. T3–7 granulate and impunctate becoming smooth posteriorly.

Description, male.—(Fig. 6). Body length 6.4–10.4 mm; fore wing length 4.7–7.6 mm.

Color. Predominantly brownish red except head primarily yellow and flagellum with incomplete to complete yellowish-white banding. Head yellow anteriorly becoming brownish red posteriorly except mandibular apex dark brown. Antenna: scape and pedicel yellowish ventrally becoming brownish red dorsally and flagellum light brownish red ventrally and dark brown dorsally except yellowish-white banding varying from flagellomeres 14/15–16/19 yellow dorsally to complete yellowish-white banding from flagellomeres 11–17 (80% of specimens with incomplete banding). Mesosoma brownish red except following areas yellow or partially yellowish: posterior of prosternum, ventral margin of pronotum, posterior of dorsal margin of pronotum, subalar ridge, tegula, anteroventral region of mesopleuron, scutellum, postscutel-

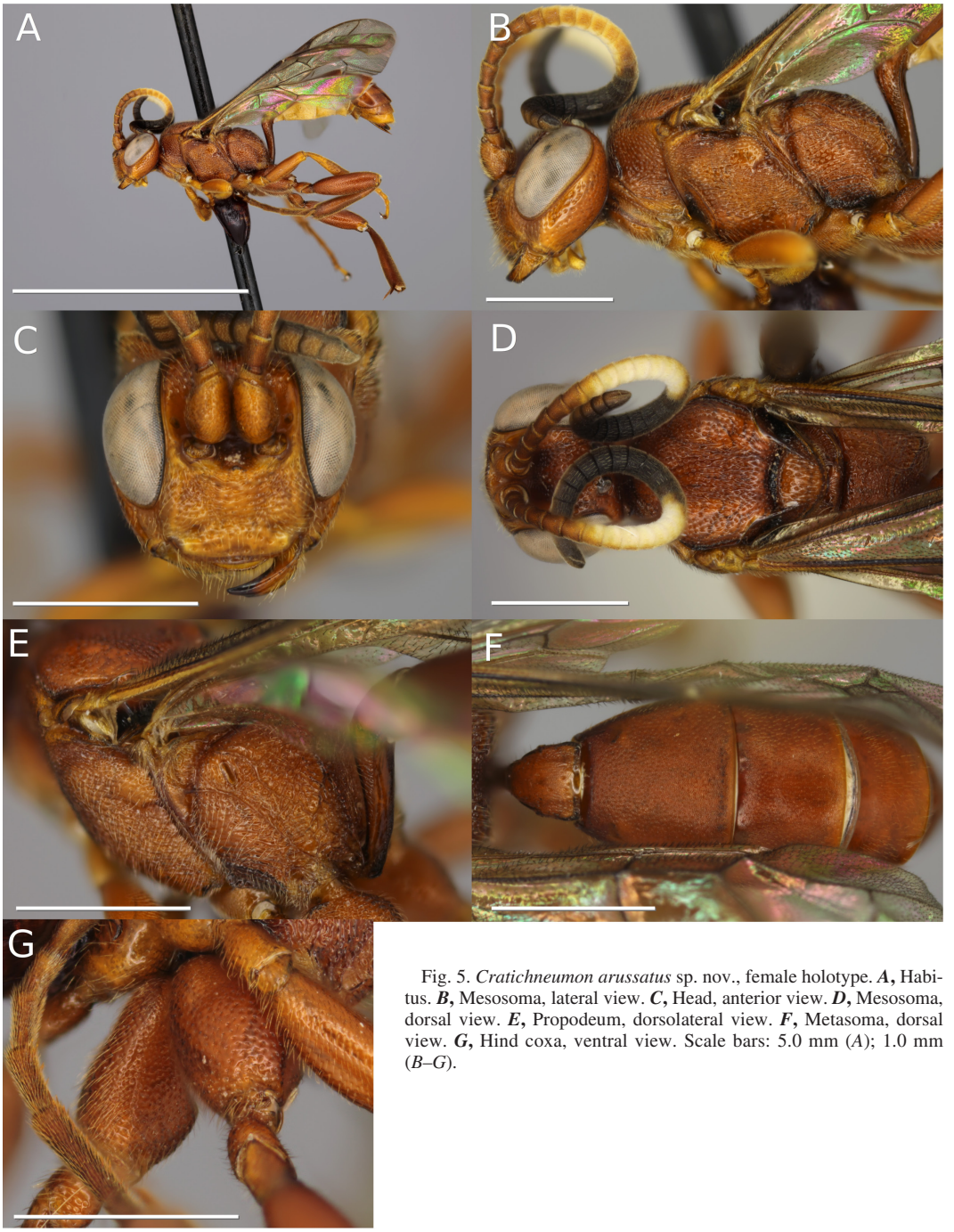

Fig. 5. *Cratichneumon arussatus* sp. nov., female holotype. ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** Metasoma, dorsal view. ***G*,** Hind coxa, ventral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*G*).

lum, and posterior of propodeum (these areas highly variable in extent and hue). Fore and middle legs varying from brownish red with some yellowish areas to predominantly yellow with some brownish-red areas (especially the femora). Hind leg varying from brownish red to dark brownish red. Wing membrane clear. Pterostigma light to dark brown. Metasoma brownish red.

Head. Clypeus smooth and sparsely, coarsely punctate; flat in lateral view. Supraclypeal area smooth and densely punctate medially becoming

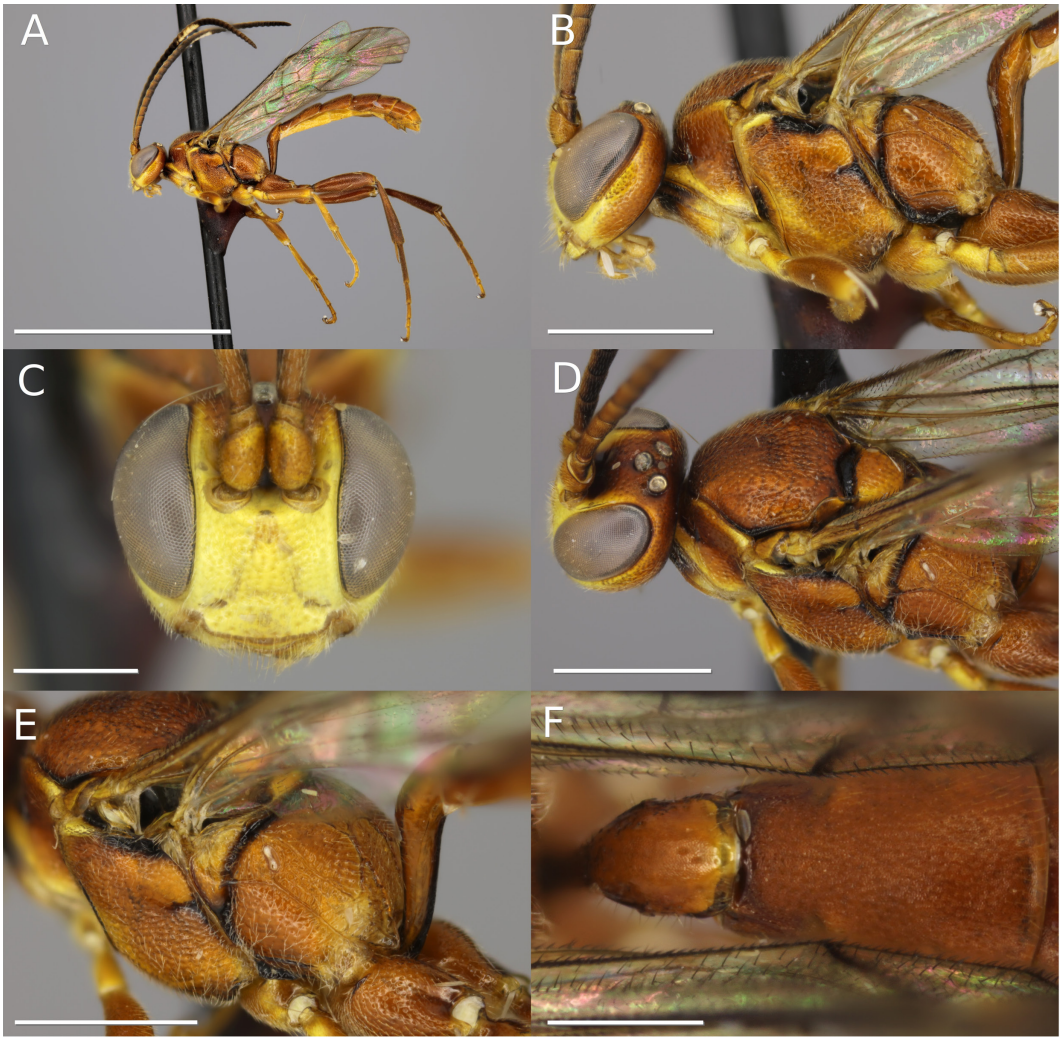

Fig. 6. *Cratichneumon arussatus* sp. nov., male paratype (EMUSENT00006553). ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsal view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*, *D*, *E*, *F*); 0.5 mm (*C*).

sparser and finer laterally. Dorsal margin of median field with median tubercle varying from absent to small and blunt. Gena smooth and moderately to finely punctate. Supraantennal area granulate with moderately dense punctation. Vertex smooth and finely punctate. Antenna with 32–37 flagellomeres. Flagellomeres 7/8–16/18 with small to medium-sized, dark brown tyloids; no tyloids spanning length of flagellomere.

Mesosoma. Pronotum smooth with fine, sparse to moderately dense punctation and rugulose ventrally. Mesonotum smooth to weakly granulate and densely punctate with medioposterior longitudinally punctate-rugulose. Scutellum smooth and moderately to densely punctate. Mesopleuron densely punctate with some punctures confluent forming longitudinal rugulae, dorsal 0.3 with punctures less dense. Speculum smooth with sparse to moderately dense punctation. Ventral division of metapleuron smooth and varying from moderately to densely punctate. Propodeum smooth and rugulose except pleural area and second lateral area punctate-rugulose. Propodeal apophyses absent. Areola width greater than length.

Metasoma. Postpetiole granulate and impunctate. T2 granulate and densely, shallowly punctate with punctation coarser and denser anteriorly becoming finer and sparser posteriorly. T3–7 weakly granulate and finely punctate becoming smooth and impunctate posteriorly.

MATERIAL EXAMINED.—*Holotype*. ♀; USA; Arizona; Santa Cruz Co.; Patagonia Mts., Harshaw Rd.; 31.44897 −110.72950; 1580 m; 15.vi.2022; M.E. Irwin, G.R. Ballmer; EMUSE NT00006449.

DISTRIBUTION.—North from the Mogollon rim in Walnut Canyon, throughout the Madrean Archipelago (Chiricahua, Huachuca, Patagonia, Pinaleño, and Whetstone Mountains) and the Sierra Madre Occidental as far south as Durango, Mexico (Fig. 28).

ETYMOLOGY.—Derived from the combination of the Greek prefix *a*, which connotes a sense of negation, and *russatus*, a newly proposed junior synonym of *Cratichneumon astutus*, due to their striking similarity. Noun in apposition.

Cratichneumon astutus Holmgren, new combination

(Figs. 7–8, 30)

Ichneumon astutus Holmgren, 1868: 394. Holotype: ♂ [Naturhistoriska riksmuseet, Stockholm, Stockholm]. Images of type examined.

Ichneumon russatus Cresson, 1877: 183. Holotype: ♀ [Entomology Collection at Academy of Natural Sciences, Drexel University, Philadelphia, Pennsylvania, USA]. Images of type examined. New synonym.

Ichneumon (*Barichneumon*) *citrinifascialis* Viereck, 1905: 297. Holotype: ♂ [Snow Entomology Museum, University of Kansas, Lawrence, Kansas, USA]. Type not examined. Synonymized under *russatus* by Townes (1944).

DIAGNOSIS.—*Cratichneumon astutus* females are predominantly brownish red with limited black areas around the mesosomal sutures and are diagnosed by the following combination of characters: flagellum filiform; tibiae without banding (tibiae uniformly brownish red or at most darker apically); hind coxa with small to medium-sized scopa; propodeal apophyses absent; and postpetiole granulate and impunctate. *Cratichneumon astutus* females are most similar to *C. arussatus* in color, size, and habitus but can be readily differentiated by the presence of a scopa on the hind coxa (scopa absent in *C. arussatus*) and the finer sculpture on the mesonotum without a significant degree of longitudinal rugosity (longitudinally punctate-rugulose posteromedially in *C. arussatus*). *Cratichneumon astutus* males are similar to other primarily brownish-red males but are diagnosed by the following combination of characters: flagellum without banding; hind tibia without banding; propodeal apophyses absent; and mesonotum with sparse to moderately dense punctation with at most a few punctures confluent forming longitudinal rugulae medioposteriorly. *Cratichneumon astutus* males are most similar to *C. arussatus* although can be readily distinguished by the lack of flagellar banding (at least 2 flagellomeres partially yellowish white in *C. arussatus*) and the finer mesosomal surface sculpture.

DESCRIPTION, FEMALE.—(Fig. 7). Body length: 6.7–8.8 mm; forewing length: 4.7–5.9 mm.

Color. Predominantly brownish red to light brownish red except: variable black markings on the occiput, prosternum, pronotum, and ventral and anterior margins of the mesopleuron, metapleuron, and petiole; auxillary troughs of the mesonotum and metanotum black; flagellum with flagellomeres 1–6 dark brown to black, yellowish-white banding on flagellomeres 7–13, and flagellomeres 14–27 dark brown to black. Wing membrane clear. Pterostigma brown to dark brown.

Head. Clypeus smooth and sparsely, coarsely punctate; flat in lateral view. Supraclypeal area smooth to weakly granulate and moderately to densely punctate with some punctures confluent forming transverse rugulae. Dorsal margin of median field with median tubercle varying from absent to small and blunt. Gena smooth and densely punctate to weakly rugulose becoming sparser ventrally. Supra-antennal area granulate with moderately dense to dense punctation. Vertex smooth to weakly granulate with moderately dense punctation. Antenna filiform (only weakly flattened and wider subapically) with medium length flagellomeres (flagellomeres 5/6 length and width equal) and 27–28 flagellomeres.

Mesosoma. Pronotum smooth and densely punctate dorsally with some punctures forming longitudinal rugulae becoming rugulose ventrally. Mesonotum smooth to weakly granulate and moderately to densely punctate with some medioposterior punctures confluent forming longitudinal rugulae. Scutellum smooth and moderately to sparsely punctate. Mesopleuron smooth and longitudinally punctate-rugulose. Speculum smooth with sparse to moderately dense punctation. Ventral division of metapleuron smooth and longitudinally punctate-rugulose. Propodeum smooth and irregularly rugulose. Propodeal apophyses absent. Hind coxa with small scopa.

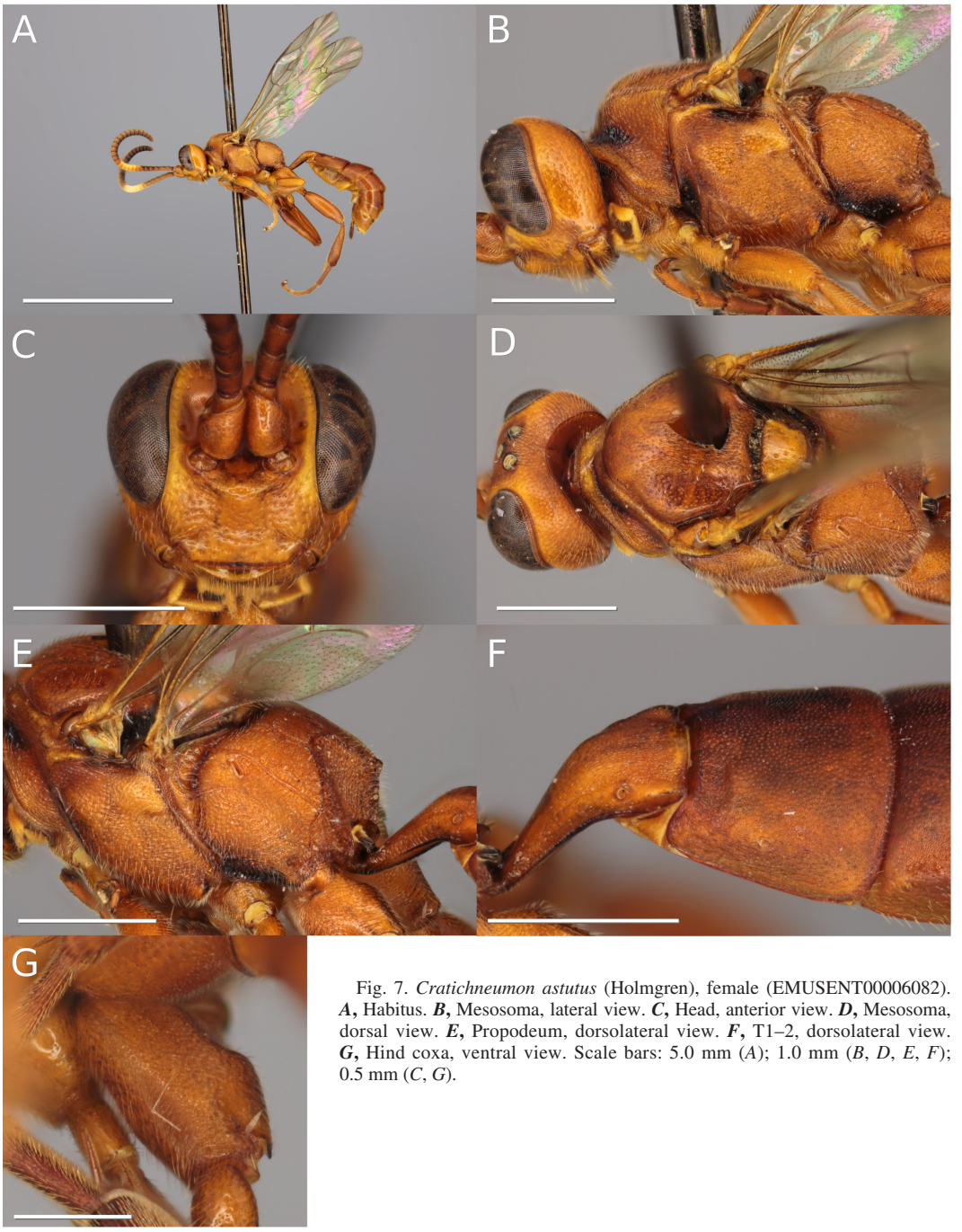

Fig. 7. *Cratichneumon astutus* (Holmgren), female (EMUSENT00006082). ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsolateral view. ***G*,** Hind coxa, ventral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*, *D*, *E*, *F*); 0.5 mm (*C*, *G*).

Metasoma. Postpetiole coarsely granulate and impunctate. T2 granulate with dense, shallow punctation becoming less punctate posteriorly. T3 weakly granulate with moderately dense punctation becoming sparser posteriorly. T4–7 weakly granulate to smooth and sparsely punctate becoming smoother and impunctate posteriorly.

Description, male.—(Fig 8). Body length: 6.4–10.2 mm; forewing length: 4.0–6.5 mm.

Color. Primarily light brownish red with variable yellow and black markings. Head primarily yellow except mandibular apex dark brown to black, and medial portion of supra-antennal area, vertex beyond paraocular area, and occiput black

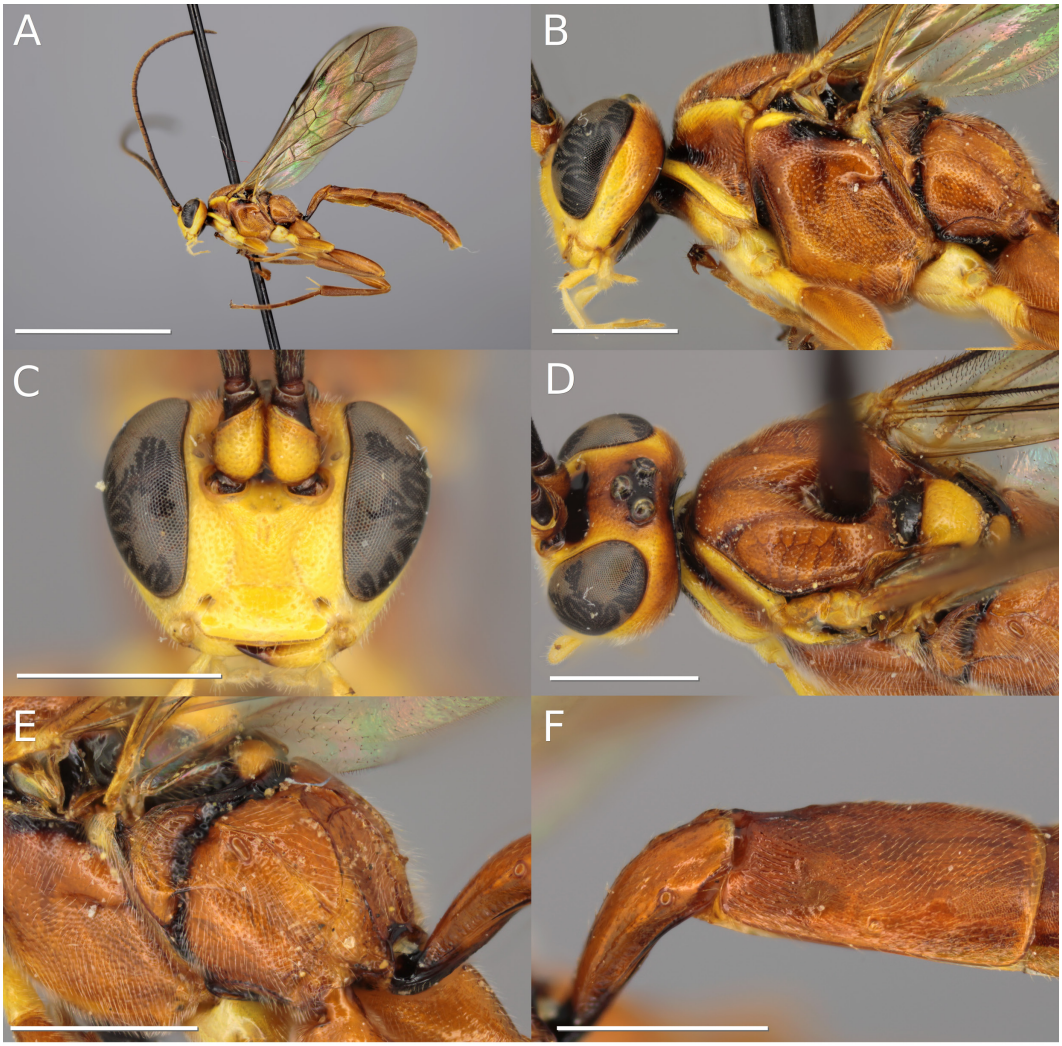

Fig. 8. *Cratichneumon astutus* (Holmgren), male (EMUSENT00005437). ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsolateral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B–F*).

to dark brownish red. Antenna: scape yellow ventrally and dark brown to black dorsally; pedicel dark brownish red to black; flagellum light brownish red ventrally and dark brown to black dorsally. Pronotum ventrally black with dorsal 0.1–0.2 light brownish red with ventral and dorsal margins yellow. Prosternum anteriorly black and posteriorly yellow. Mesonotum predominantly brownish red with posterior 0.1–0.2 black with variable anterior and lateral black margins. Scutellum, postscutellum, tegula, and subalar ridge yellow. Mesopleuron varying from brownish red to dorsally light brownish red becoming yellow ventrally with variable dorsal, posterior, and anterior margins black. Ventral division of metapleuron primarily light brownish red becoming yellow anteriorly with variable anterior and ventral margins black. Propodeum primarily light brownish red becoming yellowish posteriorly. Fore and middle legs: coxae, trochanters, and trochantelli yellow; femora primarily light brownish red with yellowish apex; tibiae and tarsi varying from yellowish to light brownish red. Hind leg: coxa light brownish red except variable black ventromedial mark; trochanter and trochantelli light brownish red;

femur light brownish red; tibia light brownish red darkening apically; tarsus brownish red to dark brown. Wing membrane clear. Pterostigma brown to dark brown. MS1 primarily light brownish red with anterior margin black; T2–7 brownish red.

Head. Clypeus smooth and sparsely to moderately punctate; flat in lateral view. Supraclypeal area smooth with fine, sparse to moderately dense punctation. Dorsal margin of median field without distinct tubercle. Gena smooth and finely sparsely punctate. Supra-antennal area smooth to weakly granulate with sparse to moderately dense punctation. Vertex smooth and finely punctate. Antenna with 32–39 flagellomeres. Flagellomeres 4/5–13/15 with small to medium-sized dark brown tyloids; no tyloids spanning length of flagellomere.

Mesosoma. Pronotum smooth with fine sparse to moderately dense punctures (20% of specimens rugulose ventrally). Mesonotum smooth with spare to moderately dense punctation with at most a few punctures confluent forming longitudinal rugulae medioposteriorly. Scutellum smooth and finely, sparsely punctate. Mesopleuron smooth and moderately to densely punctate (20% of specimens with occasional punctures confluent forming occasional longitudinal rugulae). Speculum smooth and finely punctate. Ventral division of metapleuron smooth with moderately dense punctation. Propodeum smooth and punctate-rugulose. Propodeal apophyses absent.

Metasoma. Postpetiole smooth to weakly granulate and impunctate. T2 smooth to weakly granulate and shallowly, densely punctate. T3–7 granulate and shallowly, densely punctate becoming smoother and impunctate posteriorly.

Material examined.—See Supplementary Material 1.

Distribution.—Widespread in western North America as far north as Vancouver Island in Canada (Cresson 1877) and as far south as El Salto, Durango, in the Sierra Madre Occidental (Fig. 27).

Comments.—As suggested by Townes (1961), we treat *C. russatus* (Cresson, 1877) as a new synonym of *C. astutus* (Holmgren, 1868). Images of both the male type of *C. russatus* and the female type of *C. astutus* were examined. The sex association is based on male and female specimens (EMUS) sorted to *C. russatus* by Henry Townes. Given the overlap in collecting events and general congruence in color and surface sculpture, we are confident in the sex association and therefore the synonymization. Curiously, Cresson (1877) treats *Ichneumon russatus* as a described species from "Cress. Proc. Cal. Acad. 1877." This publication is apparently nonexistent, rendering Cresson (1877) published in the Transactions of the American Entomological Society as the first description, which Cresson (1879), Carlson (1979), and Yu et al. (2016) subsequently treated as the original description as well.

Cratichneumon elongatus Claridge & Helcoski, new species

(Figs. 9–10, 29)
urn:lsid:zoobank.org:act:89453D76-3502-409B-855C-FBBBC16C35BD

Diagnosis.—Both sexes of *Cratichneumon elongatus* are easily recognized among congeners by the overall light brownish-red color, ventrally tapering head, weakly convex clypeus, dentate propodeal apophyses, and female areola which is distinctly longer than wide. The lithe, partially elongated habitus and shape of the head and clypeus renders *C. elongatus* a highly unusual species in *Cratichneumon*.

Description, female.—(Fig. 9). Body length: 8.2–9.5 mm; forewing length: 6.0–7.2 mm.

Color. Predominantly light brownish red to brownish red with limited yellow and black markings. Head brownish red except mandibular apex dark brown and paraocular area narrowly yellow except posteriorly. Mesosoma brownish red except ventral margin of pronotum, posterodorsal corner of pronotum, and subalar ridge yellowish. Fore and middle legs light brownish red to brownish red except coxae occasionally yellowish. Hind leg brownish red except apical 0.3–0.4 of femur varying from brownish red to black; tibia with basal 0.3 brownish red, 0.3–0.6 yellow, and apical 0.4 dark brown. Wing membrane clear. Pterostigma dark brown. Metasoma brownish red.

Head. Clypeus smooth and densely punctate; clypeus weakly convex in lateral view. Supraclypeal area smooth and varying from densely punctate to punctate-rugulose. Dorsal margin of median field with small, blunt median tubercle. Gena smooth varying from having moderately dense punctation to punctate-rugulose. Supra-antennal area punctate-rugulose. Vertex granulate and punctate-rugulose. Antenna filiform (only weakly flattened and wider subapically) with medium-length flagellomeres (flagellomere 14 length and width equal) and 29 flagellomeres.

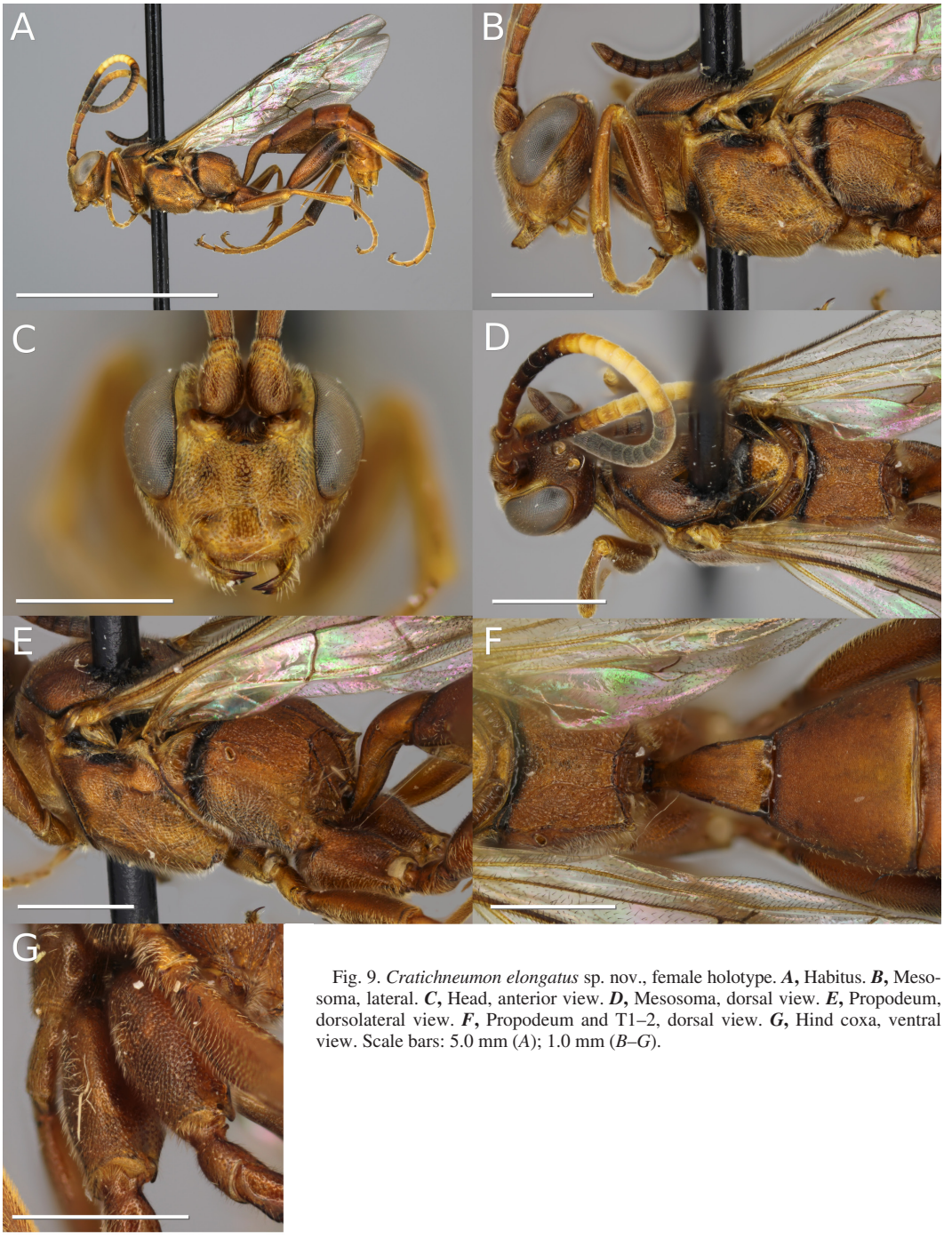

Fig. 9. *Cratichneumon elongatus* sp. nov., female holotype. ***A*,** Habitus. ***B*,** Mesosoma, lateral. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** Propodeum and T1–2, dorsal view. ***G*,** Hind coxa, ventral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*G*).

Mesosoma. Pronotum smooth and rugulose. Mesonotum granulate medially becoming smooth laterally and densely punctate medially becoming sparser laterally, posterior 0.5 longitudinally punctate-rugulose. Scutellum smooth and densely punctate. Mesopleuron smooth and longitudinally punctate-rugulose. Speculum smooth and finely, densely punctate. Ventral division of metapleuron punctate-rugulose. Propodeum irregularly rugulose. Propodeal apophyses dentate. Areola length greater than width. Hind coxa without scopa.

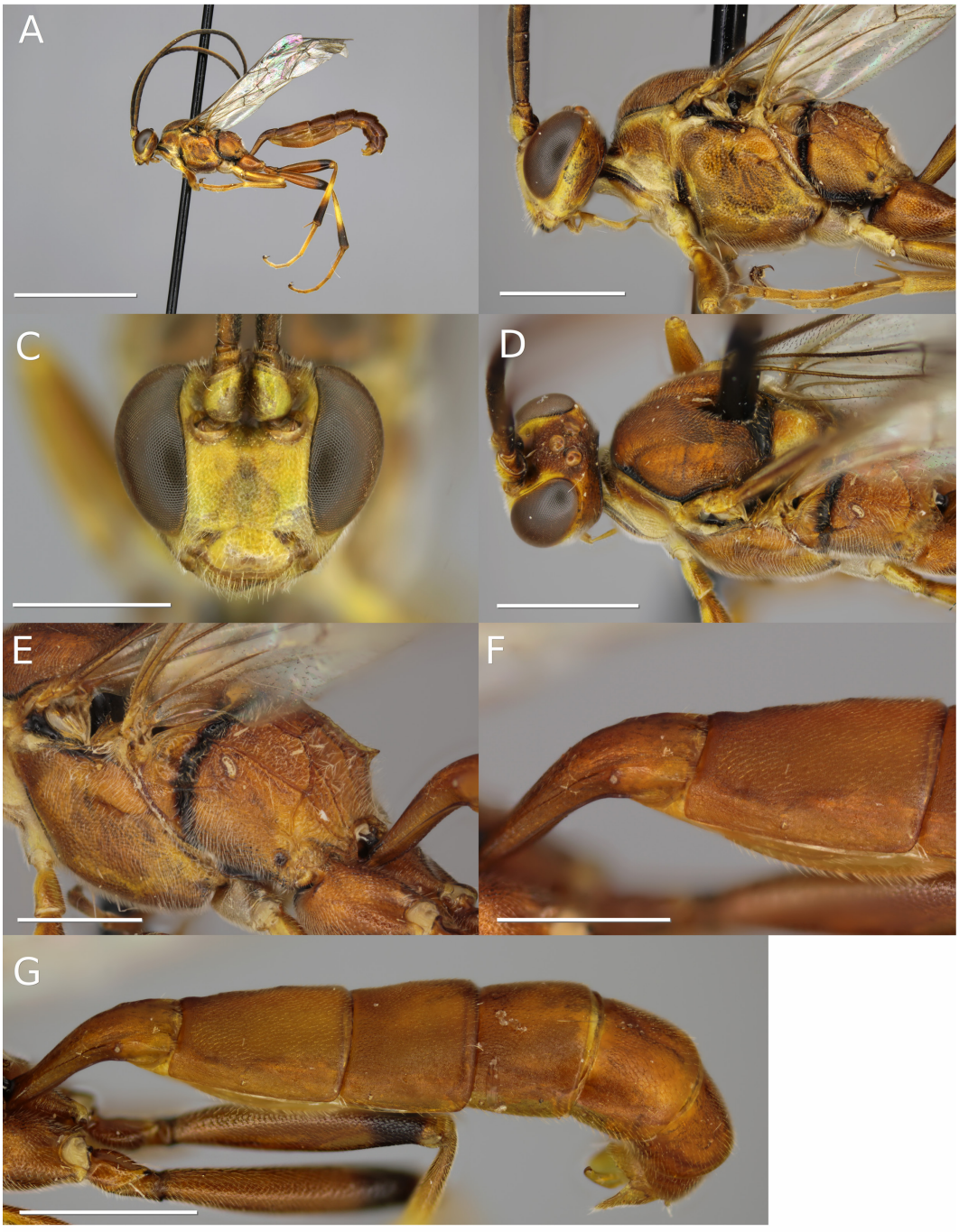

Fig. 10. *Cratichneumon elongatus* sp. nov., male paratype (EMUSENT00005657). ***A*****,** Habitus. ***B*****,** Mesosoma, lateral view. ***C*****,** Head, anterior view. ***D*****,** Mesosoma, dorsal view. ***E*****,** Propodeum, dorsolateral view. ***F*****,** T1–2, dorsolateral view. ***G*****,** Metasoma, dorsolateral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*G*).

Metasoma. Postpetiole granulate and weakly longitudinally rugulose. T2 granulate with shallow, nearly indistinct punctation. T3–7 granulate becoming smooth posteriorly.

DESCRIPTION, MALE.—(Fig. 10). Body length: 8.6–10.6 mm; forewing length: 6.6–7.8 mm.

Color. Light brownish red to brownish red with extensive yellowish white to yellow areas and limited black markings. Head with mandible (except dark brown apex), supraclypeal area, ventral 0.2–0.4 of gena, and medial paraocular area yellowish white to yellow, remainder brownish red. Mesosoma brownish red except pronotum anteriorly dark brown to black and following areas yellow: dorsal and ventral margins of pronotum, variable posterior area of prosternum, tegula, subalar ridge, scutellum laterally and posteriorly, and postscutellum. Fore and middle legs: coxae, trochanters and trochantelli yellow; femora and tibiae brownish red to yellowish, lighter anteriorly; tarsi brownish red. Hind leg brownish red except: apical 0.3–0.4 of femur varying from dark brown to black; tibia predominantly brownish red with basal 0.3–0.6 yellow and apical 0.4 varying from dark brown to black. Wing membrane clear. Pterostigma dark brown. Metasoma brownish red.

Head. Clypeus smooth and densely, finely punctate; weakly convex in lateral view. Supraclypeal area smooth and densely, finely punctate. Dorsal margin of median field with median tubercle varying from absent to small and blunt. Gena smooth and weakly punctate-rugulose. Supra-antennal area punctate-rugulose. Vertex smooth and weakly rugulose. Antenna with 34–36 flagellomeres. Flagellomeres 7/8–20/22 with medium-sized, brown tyloids; 7–9 tyloids spanning length of flagellomere.

Mesosoma. Pronotum smooth and predominantly rugulose except dorsal 0.3 punctate-rugulose. Mesonotum granulate and densely, shallowly punctate. Scutellum smooth and densely, finely punctate. Mesopleuron smooth and densely punctate with some punctures confluent forming longitudinal rugulae. Speculum smooth and finely punctate. Ventral division of metapleuron punctate-rugulose. Propodeum irregularly rugulose. Propodeal apophyses dentate. Areola length and width approximately equal to length greater than width.

Metasoma. Postpetiole granulate with weak longitudinal rugulae laterally in 30% of specimens. T2 granulate with faint, nearly indistinct punctation. T3–7 granulate becoming smooth posteriorly.

MATERIAL EXAMINED.—*Holotype.* ♀; USA; Arizona; Cochise Co.; Huachuca Mts., 0.8 rd mi SW Reef; 31.4238 −110.2991; 4–24.vii.2019; W.B. Warner; VFIT; EMUSENT00006433.

DISTRIBUTION.—North from the Mogollon Rim in Walnut Canyon and likely throughout the Madrean Archipelago but only recorded here from the Chiricahua, Huachuca, and Sierra Ancha Mountains (Fig. 29).

ETYMOLOGY.—Derived from the Latin *elongatus* in reference to the elongated, lithe habitus. Adjective.

Cratichneumon flaschkai Heinrich

Figs. 11–12, 28

Cratichneumon flaschkai Heinrich, 1973: 463. Holotype: ♀ [Zoological Staatssammlung, Munich, Germany]. Images of holotype examined.

DIAGNOSIS.—*Cratichneumon flaschkai* is easily recognized among congeners by its large size (body length 15.9–18.2 mm), dark metallic blue metasoma, and the dentate propodeal apophyses.

DESCRIPTION, FEMALE.—(Fig. 11). Body length: 16.7 mm; forewing length: 13.1 mm.

Color. Predominantly black with limited yellowish-white markings on the head and mesosoma, metasoma dark iridescent blue. Head black except mandible with dark brown apex, medial and dorsal paraocular area extensively yellowish white and posteroventral paraocular area narrowly yellowish white with a small ventral extension. Antennae black except flagellomeres 9–18 with yellowish-white banding. Mesosoma black except propodeum weakly dark iridescent blue dorsally and following areas yellowish white: dorsal margin of pronotum, subalar ridge, scutellum, and postscutellum. Fore and middle legs black except fore tibia yellowish white except black at base and apex, middle tibia black with basal 0.1–0.6 yellowish white (longer dorsally). Hind leg black except basal 0.2–0.5 of tibia yellowish white. Wing membrane clear. Pterostigma dark brown to black. Metasoma dark iridescent blue.

Head. Clypeus smooth and coarsely punctate, sparser ventrally except at ventral margin; flat in lateral view. Dorsal margin of median field without distinct tubercle. Supraclypeal area smooth and punctate medially and laterally punctate-rugulose. Gena smooth and punctate ventrally becoming punctate-rugulose dorsally. Supra-antennal area weakly granulate and densely punctate. Vertex smooth to weakly

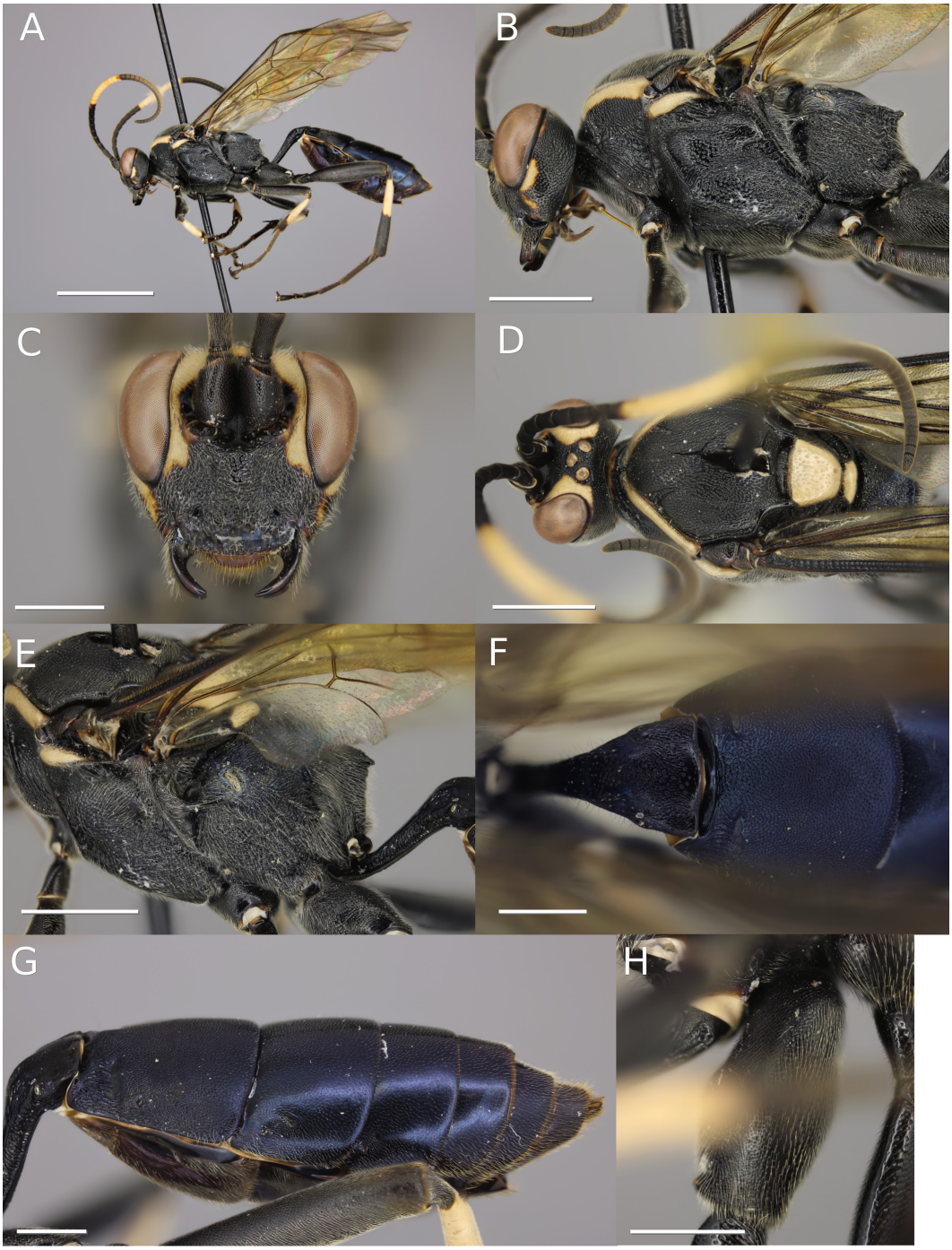

Fig. 11. *Cratichneumon flaschkai* Heinrich, female (EMUSENT00006252). ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsal view. ***G*,** Metasoma, lateral view. ***H*,** Hind coxa, ventral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*H*).

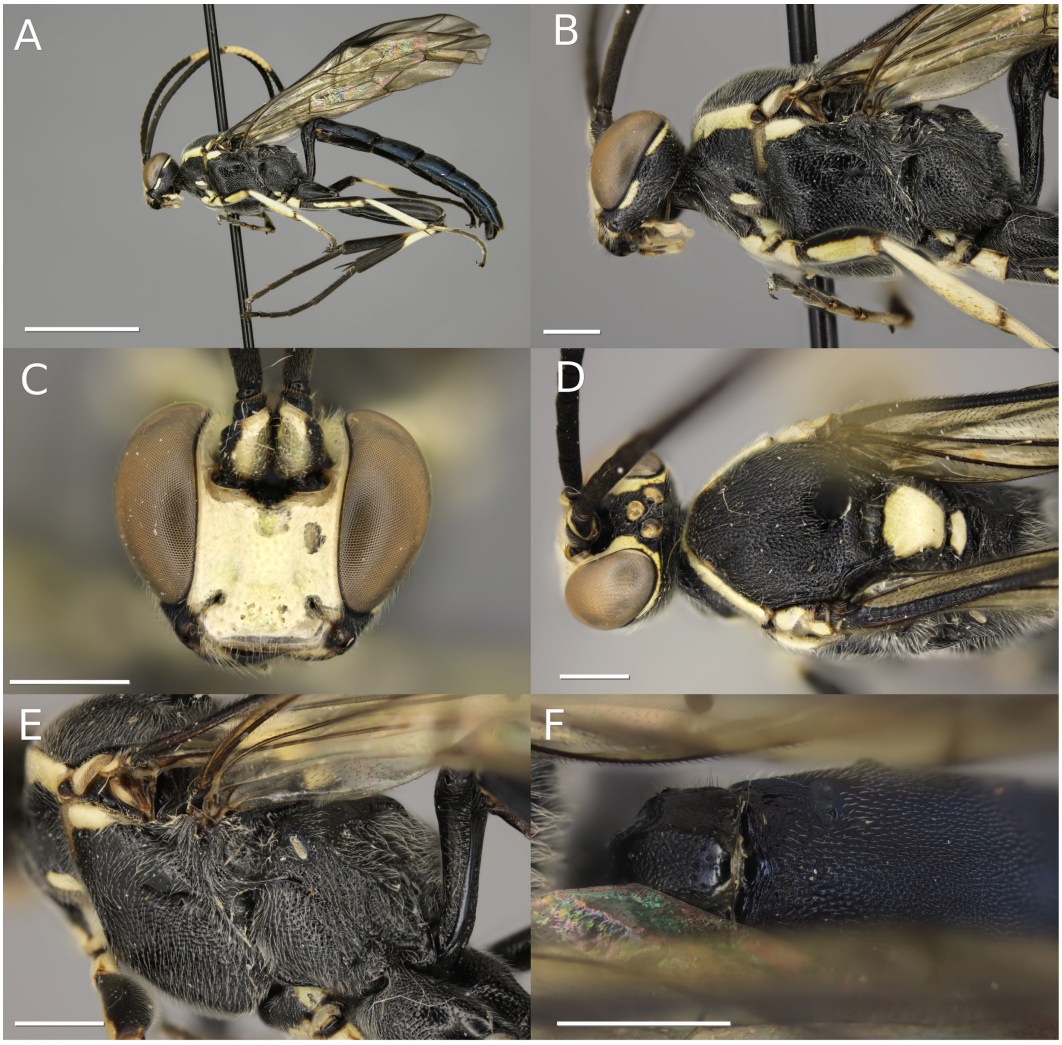

Fig. 12. *Cratichneumon flaschkai* Heinrich, male (EMUSENT00006499). ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsal view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*F*).

granulate and finely punctate-rugulose, smoother medially. Antenna filiform (moderately flattened but not significantly wider subapically) with medium-length flagellomeres (flagellomere 10 length and width equal) and 42 flagellomeres.

Mesosoma. Pronotum smooth with dorsal 0.4 densely punctate and ventral 0.6 rugulose. Mesonotum smooth medially becoming weakly granulate sublaterally and coarsely, densely punctate medially with some medial punctures confluent forming longitudinal rugulae. Scutellum smooth and finely, sparsely punctate. Mesopleuron smooth and predominantly punctate-rugulose with rugosity absent anterodorsally. Speculum smooth and weakly punctate-rugulose. Ventral division of metapleuron smooth and rugulose-punctate. Propodeum irregularly rugulose except first lateral area weakly punctate-rugulose. Propodeal apophyses dentate. Areola length approximately equal to width. Hind coxa without scopa.

Metasoma. Postpetiole granulate and sparsely, shallowly punctate with punctures denser medially. T2 very weakly granulate bordering on smooth and densely, finely punctate anteriorly becoming finer and sparser posteriorly.

T3–7 predominantly smooth and impunctate except T3 with sparse, fine, nearly indistinct punctures.

DESCRIPTION, MALE.—(Fig. 12). Body length: 15.9–18.2 mm; forewing length: 11.5–12.6 mm.

Color. Predominantly black with extensive yellowish-white areas particularly on the head and legs and metasoma predominantly dark iridescent blue. Head predominantly yellow to yellowish white with following areas black: mandible (except yellowish white basally), malar space, gena (except narrowly yellowish white along posterior paraocular area), supra-antennal area (except widely yellowish white along medial paraocular area) and vertex. Antenna black except yellowish-white banding on flagellomeres 16/18–23/26. Mesosoma black except propodeum weakly dark iridescent blue dorsally and following areas yellow to yellowish white: anterior 0.2 and posterior 0.2 of ventral margin of pronotum, dorsal margin of pronotum, small submarginal ventral spot on pronotum, subalar ridge, tegulum, scutellum, and post-scutellum. Fore and middle legs: coxae black basally and yellow to yellowish white apically; trochanters brownish yellow to yellowish white except basally and apically with variable black areas; trochantelli dark brown to black; femora primarily dark brown to black with anterior face yellow except at base; tibiae yellow to yellowish white except variable black area ventero-apically; tarsi black except tarsomeres 1–2 partially yellowish white dorsally. Hind leg black except basal 0.2–0.5 of hind tibia yellow to yellowish white. Wing membrane clear. Pterostigma dark brown to black. Metasoma dark iridescent blue.

Head. Clypeus smooth with sparse to moderately dense, coarse punctation, sparser ventrally except at ventral margin; flat in lateral view. Supraclypeal area smooth to very weakly granulate with moderately dense punctation on median field and fine punctation laterally. Dorsal margin of median field without distinct tubercle. Gena smooth and punctate-rugulose. Supra-antennal area smooth to weakly granulate with dense, shallow punctation. Vertex smooth and finely punctate to finely punctate-rugulose. Antenna with 41–45 flagellomeres. Flagellomeres 6–17/18 with medium-sized, black tyloids with 2–4 spanning entire length of the flagellomere.

Mesosoma. Pronotum smooth with dorsal 0.4 with fine to moderate-sized punctation and ventral 0.6 rugulose. Mesonotum smooth and densely punctate, medially more dense with some punctures confluent forming longitudinal rugulae. Scutellum smooth and finely punctate. Mesopleuron smooth with moderately dense to dense punctation with area immediately ventral to speculum longitudinally rugulose. Speculum smooth and densely, finely punctate. Ventral division of metapleuron varying from rugulose to dorsal 0.5 smooth with ventral 0.5 rugulose. Propodeum smooth and irregularly rugulose except first lateral area weakly punctate-rugulose. Propodeal apophyses lamellate to dentate. Areola width greater than length.

Metasoma. Postpetiole granulate with at most a few scattered punctures. T2 granulate with anterior 0.1 largely impunctate and the remainder densely punctate becoming sparser posteriorly. T3 granulate and anterior 0.5 finely, densely punctate becoming sparser posteriorly. T4–7 weakly granulate and shallowly punctate with granulation and punctation becoming obsolete posteriorly.

DISTRIBUTION.—Present from Boulder, Colorado, in the north, throughout Arizona (Mogollon Rim and Madrean Sky Islands), and in the Sierra Madre Occidental as far south as Durango, Mexico (Fig. 28).

Cratichneumon fossorius Claridge & Helcoski, new species

(Figs. 13–14, 28)

urn:lsid:zoobank.org:act:9FA60B76-4F3C-4A3A-B567-DD6FB3A37011

DIAGNOSIS.—Despite the sexual dimorphism and dichromatism, *C. fossorius* males and females can be readily distinguished from congeners by the lamellate propodeal apophyses and granulate and impunctate to nearly impuncate metasoma. Additionally, both sexes are unusual among *Cratichneumon* species in that both sexes have a medium-sized, blunt, median tubercle on the dorsal margin of the median field, which, when present (as in *Cratichneumon igniferus*), is considerably smaller. Females are further distinguished by the bristle-shaped flagellum which is rare in *Cratichneumon*. The male color pattern is also unique.

DESCRIPTION, FEMALE.—(Fig. 13). Body length: 10.8–12.3 mm; forewing length: 7.3–8.5 mm.

Color. Brownish red except for a few black and yellowish areas. Head brownish red except median section of paraocular area yellowish and mandibular apex dark brown to black. Antenna:

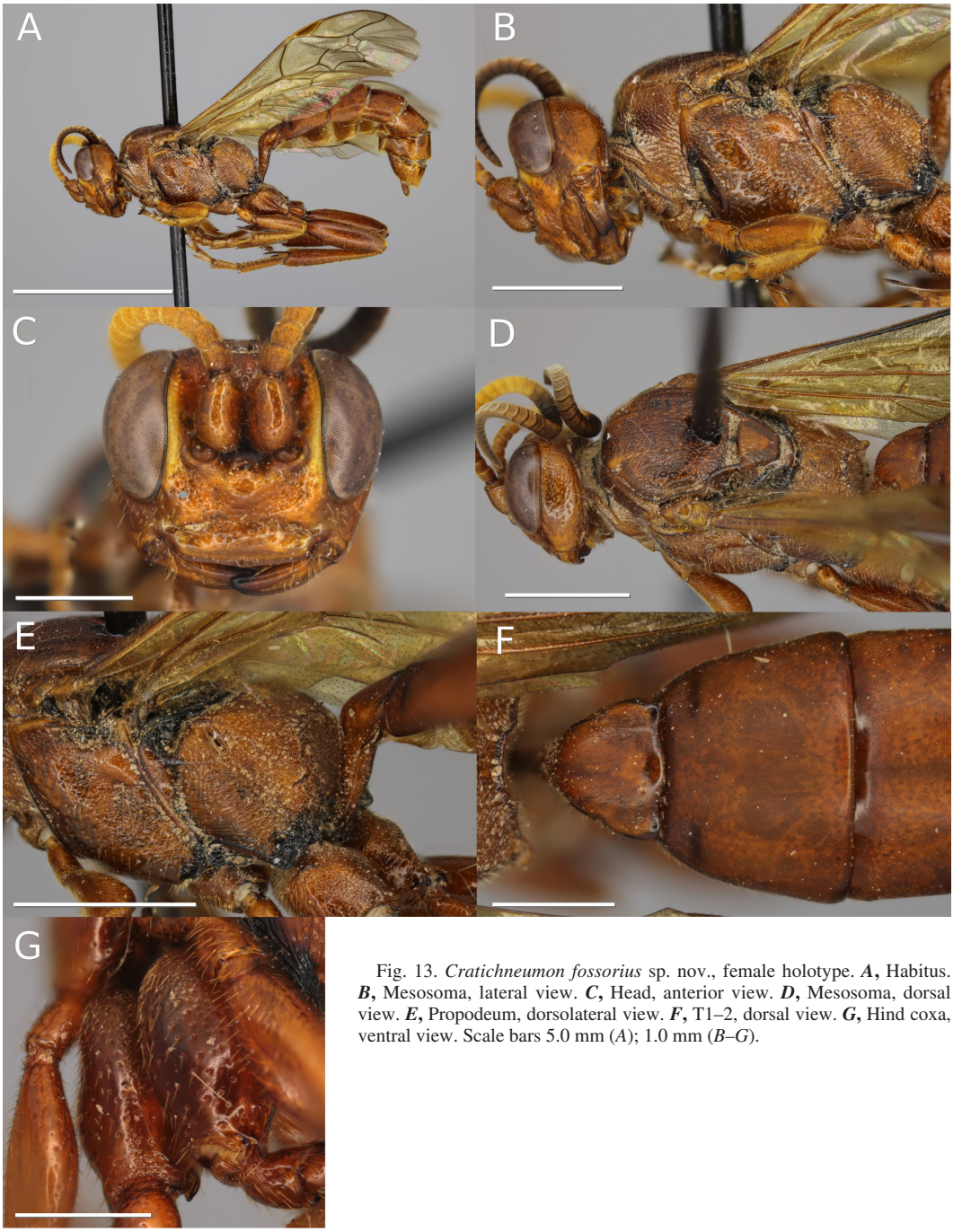

Fig. 13. *Cratichneumon fossorius* sp. nov., female holotype. ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsal view. ***G*,** Hind coxa, ventral view. Scale bars 5.0 mm (*A*); 1.0 mm (*B–G*).

scape and pedicel brownish red; flagellomeres 1–5/6 brownish red, 5/6–14/15 with yellow banding and 15/16–40/41 dark brown, lighter ventrally. Mesosoma brownish red except following areas black to dark brown: dorsal margin of pronotum, small medial area at anterior margin of mesonotum, majority of epicnemum except brownish-red posterior margin, extreme venteroposterior margin of mesopleuron, metanotum excluding brownish-red postscutellum, ventral division of metapleuron, and ventral margin of posterior face of propodeum. Wing

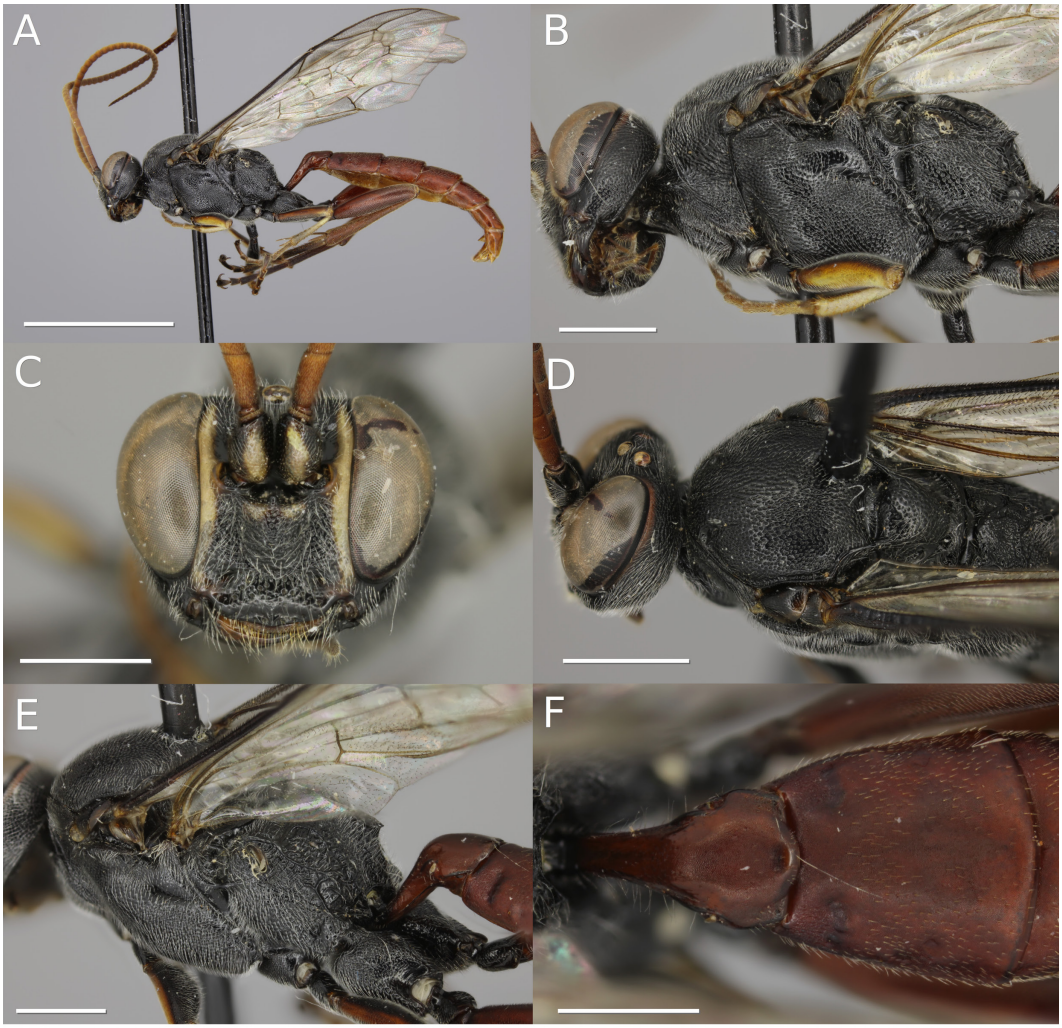

Fig. 14. *Cratichneumon fossorius* sp. nov., male paratype (EMUSENT00004547). ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsal view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*F*).

membrane clear. Pterostigma light brown to brown. Metasoma brownish red.

Head. Clypeus smooth and coarsely punctate at dorsal margin; flat in lateral view except ventral margin flattened and slightly upturned. Supraclypeal area smooth and moderately to coarsely punctate. Dorsal margin of median field with medium-sized, blunt median tubercle. Gena smooth and sparsely punctate ventrally becoming denser dorsally. Supra-antennal area smooth and densely, coarsely punctate medially becoming sparser laterally. Vertex smooth and densely punctate with some posterior punctures confluent forming transverse rugulae. Antenna weakly bristle-shaped (subapically flattened and widened and apically narrowed) with short flagellomeres (flagellomere 1 length and width equal) and 40–42 flagellomeres.

Mesosoma. Pronotum smooth and densely punctate dorsally, transversely rugulose ventrally. Mesonotum smooth with moderately dense punctation. Scutellum smooth with moderately dense punctation. Mesopleuron smooth and sparsely, coarsely punctate except anterodorsal corner longitudinally rugulose-punctate and posterior 0.4–0.6 longitudinally rugulose-punctate. Speculum smooth and finely punctate. Ventral division of metapleuron longitudinally punctate-

rugulose. Propodeum irregularly punctate-rugulose. Propodeal apophyses lamellate. Areola length and width approximately equal. Hind coxa without scopa.

Metasoma. Granulate and nearly impunctate except postpetiole with a few shallow, scattered punctures and T2 nearly entirely impunctate with faint, nearly indistinct punctures.

DESCRIPTION, MALE.—(Fig. 14). Body length: 10.3–14.4 mm; forewing length: 7.3–10.2 mm.

Color. Head and mesosoma predominantly black and metasoma brownish red. Head primarily black except: clypeus usually with lateral yellowish-white marks that connect to yellowish-white area along median section of paraocular area, median field varying from entirely yellowish white to dorsal margin with lateral yellowish-white marks, dorsal and lateral sections of paraocular area narrowly brownish red. Antenna: scape black except yellowish-white area ventrally; pedicel black; flagellum reddish brown, lighter ventrally. Mesosoma black without any yellowish-white markings. Fore leg: coxa, trochanter, and trochantellus black; femur anteriorly brownish yellow to light brown and black posteriorly; tibia anteriorly yellow white and black posteriorly; tarsus dark reddish brown except tarsomere 1 yellowish anteriorly. Middle leg patterned similarly to fore leg except femur anteriorly dark brownish red and tarsus varying from brown to black. Hind leg: coxa and trochanter black; trochantellus, femur and tibia dark brownish red; tarsus black except basal 0.1–0.2 dark brownish red. Wing membrane clear. Pterostigma dark brown to black. Metasoma brownish red.

Head. Clypeus smooth with ventral 0.5 sparsely punctate and dorsal 0.5 with coarse, moderately dense punctation; medial 0.3 with ventral margin flattened and slightly upturned. Supraclypeal area smooth and densely punctate laterally becoming transversely punctate-rugulose medially. Dorsal margin of median field with medium-sized, blunt median tubercle. Gena smooth and densely, finely punctate. Supraantennal area weakly granulate and densely punctate-rugulose. Vertex smooth and transversely punctate-rugulose. Antenna with 44–46 flagellomeres. Flagellomeres 5/6–12/14 with small, oval-shaped, brown tyloids; no tyloids spanning length of flagellomere.

Mesosoma. Pronotum smooth and punctate-rugulose dorsally becoming rugulose ventrally. Mesonotum smooth and densely, coarsely punctate with some confluent punctures forming longitudinal rugulae. Scutellum smooth and moderately to densely punctate. Mesopleuron smooth and densely, coarsely punctate with many with punctures confluent forming longitudinal rugulae. Speculum varying from predominantly smooth to densely, finely punctate. Ventral division of metapleuron longitudinally punctate-rugulose. Propodeum varying from punctate-rugulose to rugulose. Propodeal apophyses lamellate. Areola varying from width and length equal to width slightly greater than length.

Metasoma. Postpetiole granulate and impunctate or nearly so. T2 granulate and impuncate or nearly so. T3–7 granulate and impunctate becoming smooth posteriorly.

MATERIAL EXAMINED.—*Holotype.* ♀; USA; Arizona; Cochise Co.; Huachuca Mts., 0.8 rd mi SW Reef; 31.4238 −110.2991; 4–24.vii.2019; W.B. Warner; VFIT; EMUSENT00005558.

DISTRIBUTION.—From Walnut Canyon on the Mogollon rim, the Madrean Sky Islands (Chiricahua, Huachuca, and Pinaleño Mountains and Sierra Ancha), and as far south as Durango, Mexico, in the Sierra Madre Occidental (Fig. 28).

ETYMOLOGY.—Derived from the Latin adjective *fossōrius*, meaning to fit for digging or delving, in reference to the females that have short, robust legs likely adapted for accessing underground hosts (Gauld and Fitton 1987) as well as stout, conical spines also probably associated with digging (Mathou et al. 2023). The fossorial habit of the females is further evidenced by the severe wear on the mandibles of many female specimens, so much so that in one specimen the mandibles are widely separated medially. Adjective.

Cratichneumon igniferus Claridge & Helcoski, new species

(Figs. 15–16, 28)
urn:lsid:zoobank.org:act:7FD7D16F-99EA-47F5-BBF0-D101C53EFDA2

DIAGNOSIS.—Both males and females of *Cratichneumon igniferus* are instantly recognizable based on its unique and striking coloration with extensive black, brownish-red, and yellowish-white areas and the lamellate to weakly dentate propodeal apophyses.

DESCRIPTION, FEMALE.—(Fig. 15). Body length: 12.7–16.5 mm; forewing length: 9.0–11.6 mm.

Color. Usually brownish red and black with extensive yellowish-white markings, though

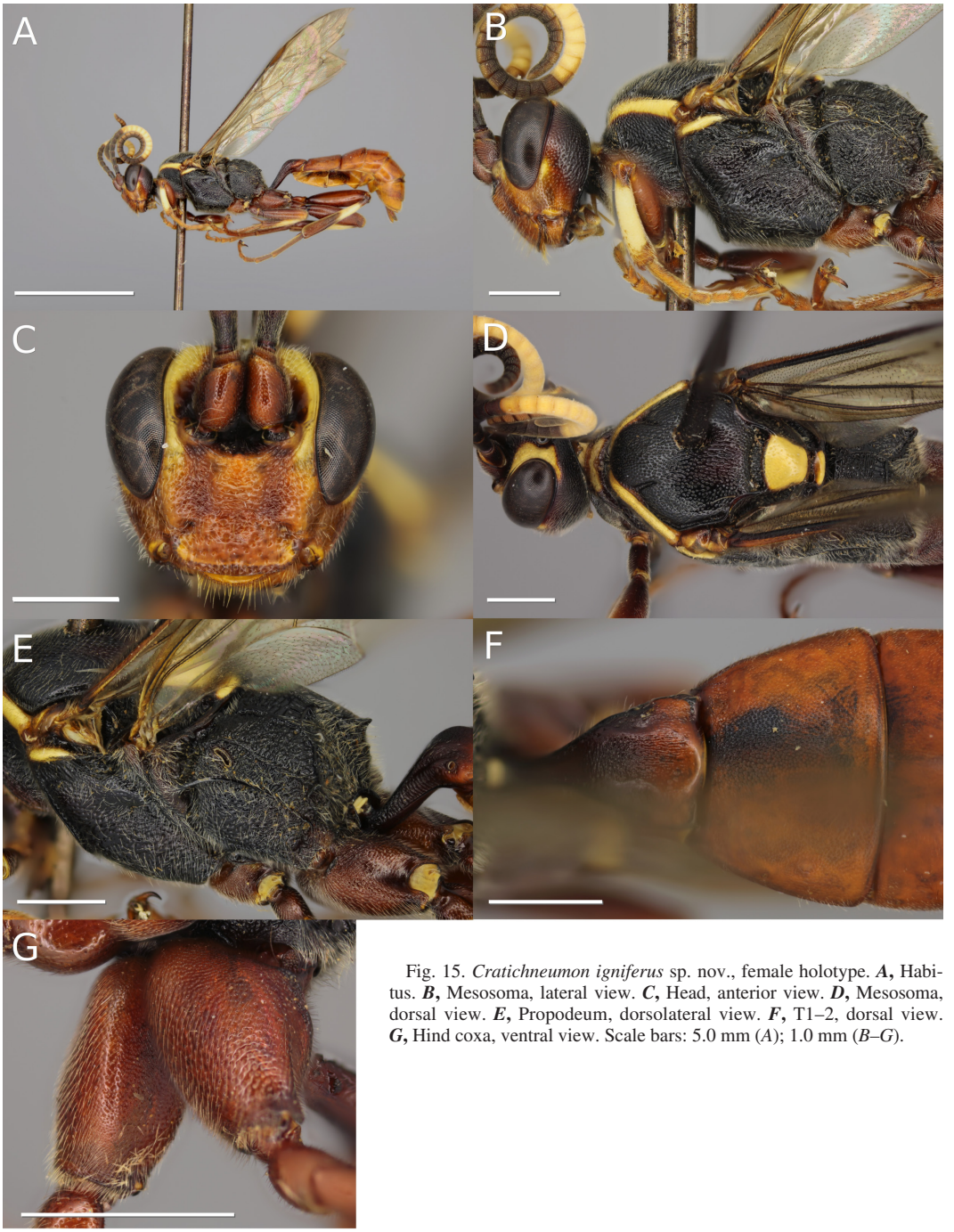

Fig. 15. *Cratichneumon igniferus* sp. nov., female holotype. ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsal view. ***G*,** Hind coxa, ventral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*G*).

the mesosoma varies from predominantly black to brownish red. Head varying from predominantly brownish red to brownish red anteriorly and posteriorly dark brownish red to black except mandibular apex dark brown and paraocular area primarily yellowish white except lighter color absent to weak ventrally and venterolaterally. Antenna: scape and pedicel brownish red to dark brownish red; flagellum dark brown to black except flagellomeres 8–18 with yellow to yellowish-white banding. Mesosoma varying from brownish red to nearly

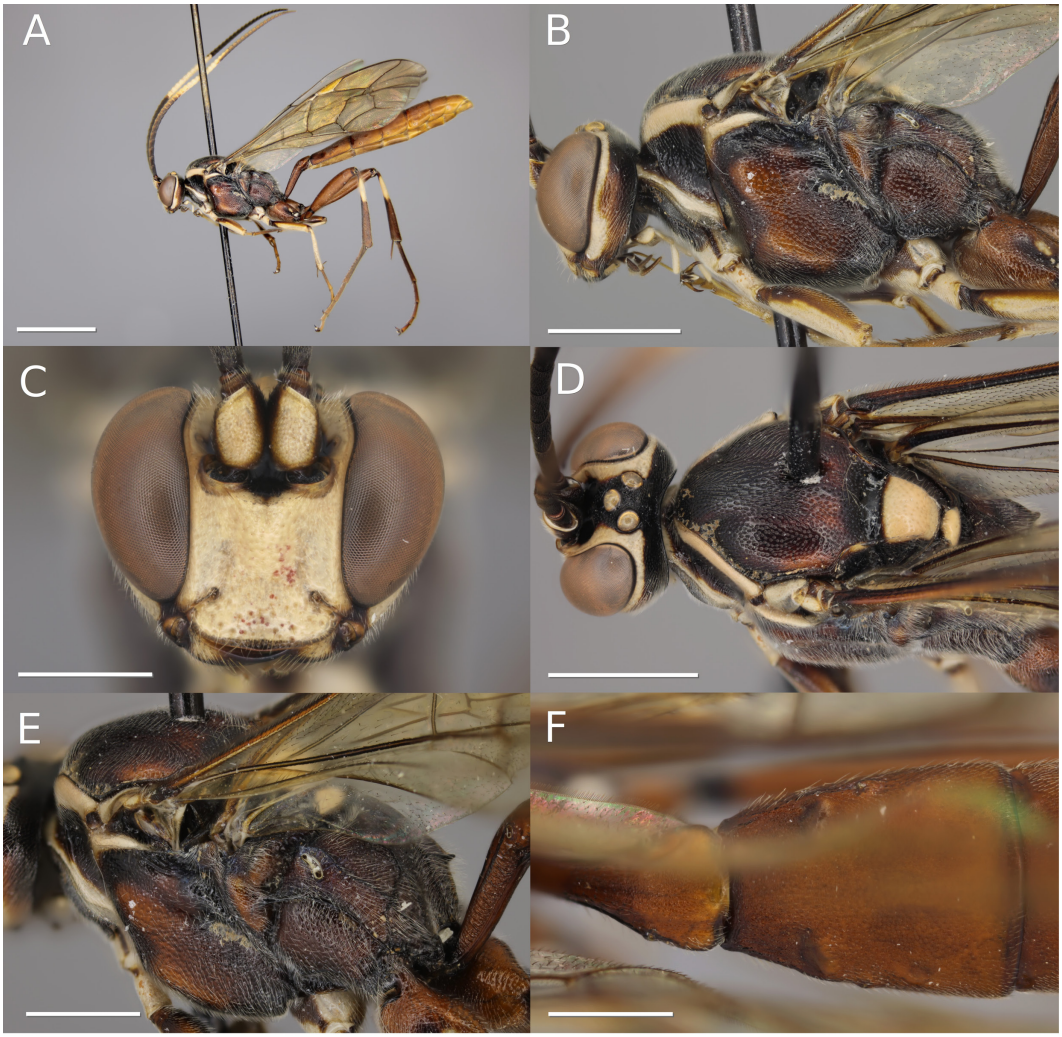

Fig. 16. *Cratichneumon igniferus* sp. nov., male paratype (EMUSENT00005571). ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsal view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*F*).

entirely black except following areas yellowish white: median 0.3 of ventral margin of pronotum, dorsal margin of pronotum, subalar ridge, scutellum and postscutellum. Fore and middle legs brownish red except tibiae yellowish white except base and apical 0.1–0.4 brownish red. Hind leg primarily brownish red except apex of coxa varying from brownish red to dark brown, basal 0.2–0.5 of tibia yellowish white, apical 0.4 of tibia and tarsus varying from brownish red to dark brownish red. Wing membrane clear. Pterostigma light brown to brown. Metasoma predominantly brownish red with T1 occasionally dark brown to black anteriorly.

Head. Clypeus smooth with moderately dense punctation; flat in lateral view. Supraclypeal area smooth and punctate-rugulose. Dorsal margin of median field with small, blunt median tubercle. Gena smooth and densely, finely punctate-rugulose. Supra-antennal weakly granulate and densely, finely, shallowly punctate to punctate-rugulose. Vertex smooth and moderately to densely punctate. Antenna filiform (subapically flattened but not significantly widened and only weakly narrowed apically)

with medium length flagellomeres (flagellomere 8/9 length and width equal) and 38–40 flagellomeres.

Mesosoma. Pronotum smooth with dorsal 0.2–0.4 punctate and ventral 0.8–0.6 punctate-rugulose. Mesonotum smooth and densely punctate with medioposterior punctures confluent forming longitudinal rugulae. Scutellum smooth with moderately dense punctation. Mesopleuron smooth and longitudinally punctate-rugulose. Speculum smooth and longitudinally punctate-rugulose. Ventral division of metapleuron smooth and punctate-rugulose. Propodeum punctate-rugulose. Propodeal apophyses lamellate. Areola length greater than width. Hind coxa without scopa.

Metasoma. Postpetiole smooth and predominantly impunctate except for a few scattered punctures and longitudinally rugulose in 50% of specimens. T2 granulate with dense, fine, shallow punctation. T3–7 granulate and finely punctate becoming smooth and impunctate posteriorly.

DESCRIPTION, MALE.—(Fig. 16). Body length: 10.1–17.2 mm; forewing length: 7.8–11.1 mm.

Color. Tricolored with extensive black, yellowish-white and brownish-red areas. Head predominantly yellowish white except following areas black: mandible (except small basal yellowish-white mark), malar space, remainder of head posterior to paraocular area. Antenna: scape and pedicel yellowish white ventrally and dark brown to black dorsally; flagellum brown ventrally and dark brown to black dorsally except flagellomeres 14/15–22/23 with yellowish-white banding. Mesosoma predominantly black except following areas yellowish white: ventral and dorsal margins of pronotum, subalar ridge, tegula, scutellum and postscutellum. Fore leg: coxa basally black and apically yellowish white; trochanter yellowish white; trochantellus dark brown to black; femur dark brown to black except large ventral yellowish-white area from basal 0.1–0.2 to apex; tibia yellowish white except variable ventero-apical dark brown to black area; tarsus varying from yellowish white to dark brown. Middle leg similarly colored as fore leg but with larger dark brown to black areas on coxa, femur, and tibia. Hind leg: coxa varying from dark brownish red to black; trochanter and trochantellus dark brown to black; femur varying from brownish red with base and apex ventrally dark brown to predominantly black and centrally dark brownish red; tibia with basal 0.1 varying from brownish red to black, basal 0.2–0.4 yellowish white, and apical 0.6 varying from dark brownish red to black; tarsus varying from dark brownish red to black. Wing membrane clear. Pterostigma light brown to brown. Metasoma with MS1 dark brownish red to black and T2–T7 brownish red.

Head. Clypeus smooth with sparse to moderately dense punctation; flat in lateral view. Supraclypeal area smooth with moderately dense punctation. Dorsal margin of median field without distinct tubercle. Gena smooth and moderately to densely punctate with some punctures confluent forming rugulae. Supra-antennal area weakly granulate and moderately, shallowly punctate. Vertex smooth with moderately dense punctation. Antenna with 39–44 flagellomeres. Flagellomeres 6/7–17/19 with medium-sized to large, black tyloids (except light brown on yellowish-white flagellomeres); 2–7 tyloids spanning length of flagellomere.

Mesosoma. Pronotum smooth with moderately dense punctation. Mesonotum smooth and densely, finely punctate. Scutellum smooth and moderately, finely punctate. Mesopleuron smooth and densely punctate with some punctures forming longitudinal rugulae medioposteriorly. Speculum smooth with sparse to moderately dense punctation. Metapleuron smooth and densely, coarsely punctate with ventral division becoming punctate-rugulose. Propodeum smooth and punctate-rugulose. Propodeal apophyses varying from lamellate to weakly dentate. Areola width and length approximately equal.

Metasoma. Postpetiole smooth and varying from entirely impunctate to impunctate except for a few scattered punctures. T2 granulate with dense, fine, shallow punctation. T3–7 granulate and finely punctate becoming smooth and impunctate posteriorly.

MATERIAL EXAMINED.—*Holotype.* ♀; USA; Arizona; Cochise Co.; Portal; 12.viii.1974; H. & M. Townes; EMUSENT00005110.

DISTRIBUTION.—North from the Mogollon Rim, throughout the Madrean Sky Islands (Chiricahua, Huachuca, Pinaleño, and Santa Rita Mountains) and south as far as Durango, Mexico, in the Sierra Madre Occidental (Fig. 28).

ETYMOLOGY.—Derived from the Latin *ignis* (fire) and *ferre* (to bear) in reference to the coloration of both sexes (and in particular the female) that is reminiscent of the coals of a campfire flaring up and burning. Adjective.

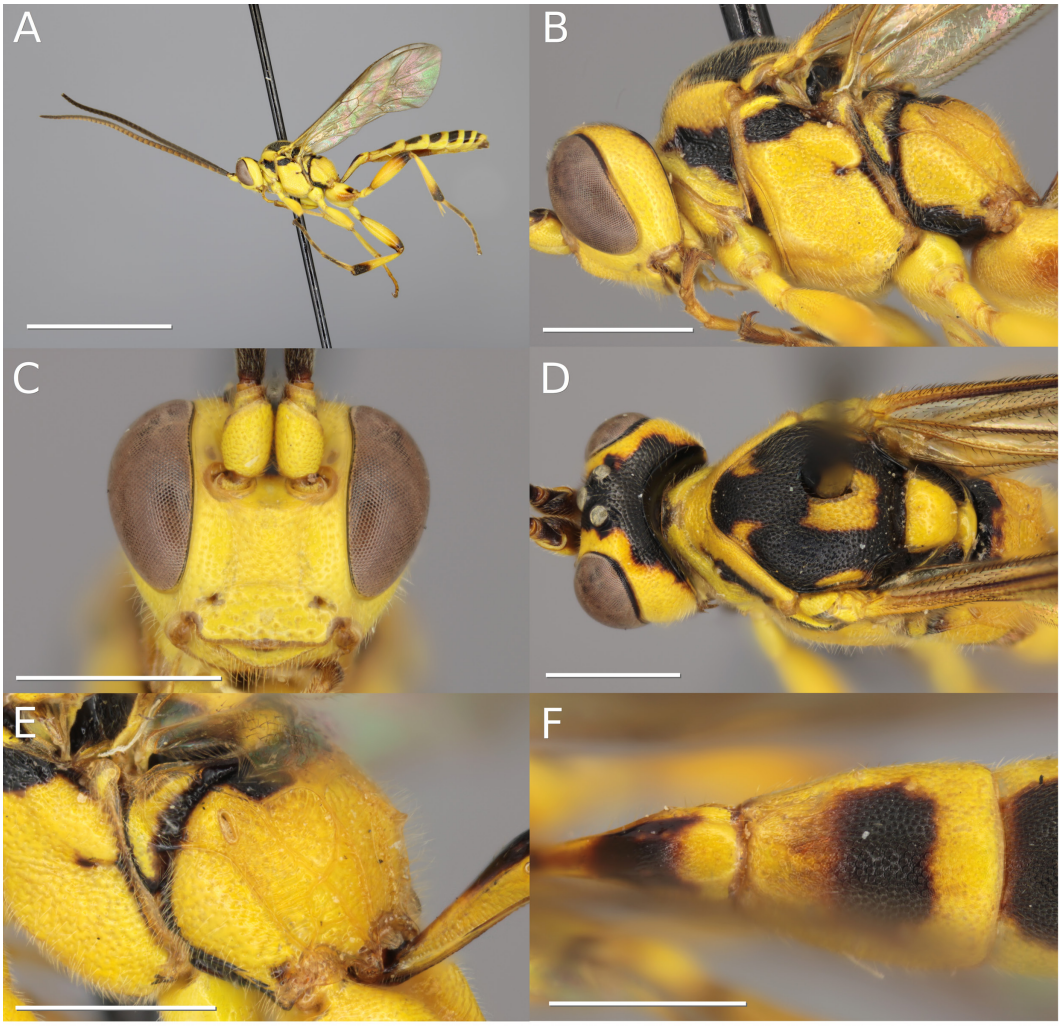

Fig. 17. *Cratichneumon luteus* sp. nov., male holotype. ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsal view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B–F*).

Cratichneumon luteus Claridge & Helcoski, new species

(Figs. 17, 28)

urn:lsid:zoobank.org:act:660F01AE-8737-4B11-AD18-CF0EF3CC1E38

DIAGNOSIS.—*Cratichneumon luteus* males are small to medium-sized with yellow and black coloration including with a banded metasoma. They can be distinguished by the following combination of characters: antenna without yellowish-white banding; more extensive yellow color than other co-occurring species (including a primarily yellow ventral division of the metapleuron and yellowish pterostigma); ventral division of the metasoma moderately punctate (without rugosity); and T2 smooth to weakly granulate and densely, coarsely punctate. This species is similar to co-occurring males (particularly *C. antichromus*, *C. scabriculus*, and *C. warneri*) though can easily be distinguished based on color. *Cratichneumon luteus* females are unknown.

DESCRIPTION, MALE.—(Fig. 17). Body length: 8.6–9.6 mm; forewing length: 5.7–6.3 mm.

Color. Predominantly yellow with variable black areas and a banded metasoma. Head primarily yellow except following areas black: mandibular apex, vertex medially, posterior 0.5 of gena, and occiput. Pronotum yellow except

for central area black. Prosternum yellow. Mesonotum black except posterior yellow spot. Scutellum, postscutellum, tegula, and subalar ridge yellow. Mesopleuron primarily yellow with black dorsal margin and ventral, anterior, and posterior margins varying from entirely yellow to black. Speculum varying from entirely black to nearly entirely yellow. Ventral division of metapleuron varying from primarily black to primarily yellow with anterior margin black. Propodeum predominantly yellow except anterior 0.1–0.3 black. Fore and middle legs: coxae, trochanters, and trochantelli yellow; femora, tibiae, and tarsi varying from yellow to light reddish brown. Hind leg: coxa basally yellow and dorsally black to brownish red, varying ventrally from black to light brownish red; trochanter yellow; trochantellus varying from yellow to brownish red; femur basally yellow to brownish red becoming dark reddish brown to black apically; tibia basally yellow, apically black to dark brown; tarsus varying from yellow to brownish-red to black. Wing membrane clear. Pterostigma yellowish. MS1 black except yellow posterior margin; T2 yellow with variable-sized brownish to black central area; T3–7 predominantly black except lateral and posterior margins yellow.

Head. Clypeus smooth and sparsely, coarsely punctate; flat in lateral view. Supraclypeal area smooth with punctation varying from sparse to moderately dense (median field in 25% of specimens puncate-rugulose). Dorsal margin of median field with median tubercle varying from absent to small and blunt. Gena smooth with sparse to moderately dense punctation. Supraantennal area granulate with sparse to moderately dense punctation. Vertex granulate and moderately to densely punctate. Antenna with 32–33 flagellomeres. Flagellomeres 8/10–14/15 with small, black tyloids; no tyloids spanning length of flagellomere.

Mesosoma. Pronotum smooth with moderately dense punctation dorsally becoming punctate-rugulose ventrally. Mesonotum granulate and densely, coarsely punctate, medioposteriorly with some punctures confluent forming longitudinal rugulae. Scutellum smooth with sparse to moderately dense punctation. Mesopleuron smooth and densely punctate-rugulose. Speculum smooth with sparse to moderately dense punctation. Ventral division of metapleuron smooth with moderately dense punctation. Propodeum rugulose. Propodeal apophyses absent. Areola width greater than length to approximately equal.

Metasoma. Postpetiole varying from entirely smooth to very weakly granulate, weakly striate in 25% of specimens. T2 granulate and densely, coarsely punctate. T3–7 weakly granulate and finely punctuate becoming smoother and impunctate posteriorly.

FEMALE.—Unknown.

MATERIAL EXAMINED.—*Holotype.* ♂; USA; Arizona; Cochise Co.; Portal; 21.ix.1987; H. & M. Townes; EMUSENT00005679.

DISTRIBUTION.—Known from the Chiricahua Mountains in southeastern Arizona and La Cuidad, Durango, Mexico, in the Sierra Madre Occidental (Fig. 28) and likely throughout the intervening areas.

ETYMOLOGY.—Derived from the Latin *luteus* for saffron-yellow in reference to the striking yellow color of the male. Adjective.

Cratichneumon permagnus Claridge & Helcoski, new species

(Figs. 18, 29)
urn:lsid:zoobank.org:act:FE217078-0EF8-4D4B-BDDF-932A4DA10D25

DIAGNOSIS.—*Cratichneumon permagnus* is immediately recognizable by the large size (body length 16.3 mm), dentate propodeal apophyses, yellowish-white banding on flagellomeres 11–22, and overall light reddish-brown color. Chromatically, it is most similar to some specimens of *Cratichneumon tetragonops*, although the latter species is considerably smaller (body length 8.6–12.5 mm) and lacks the dentate propodeal apophyses.

DESCRIPTION, MALE.—(Fig. 18). Body length: 16.3 mm; forewing length: 11.8 mm.

Color. Light brownish red with limited yellowish-white areas. Head with mandibles (except dark brown apex), clypeus, supraclypeal area, and paraocular area yellowish white; remainder light brownish red. Antenna: scape yellowish white ventrally becoming brown dorsally; pedicel yellowish white ventrally becoming dark brown dorsally; flagellum with flagellomeres 1–10 light brownish red ventrally and dark brown dorsally, flagellomeres 11–22 with yellowish-white banding, and remainder dark brown. Mesosoma light brownish red except following areas yellowish white: dorsal and ventral margins of pronotum, prosternum, apex of scutellum, postscutellum, subalar ridge, and tegula. Fore and middle legs: coxae, trochanters

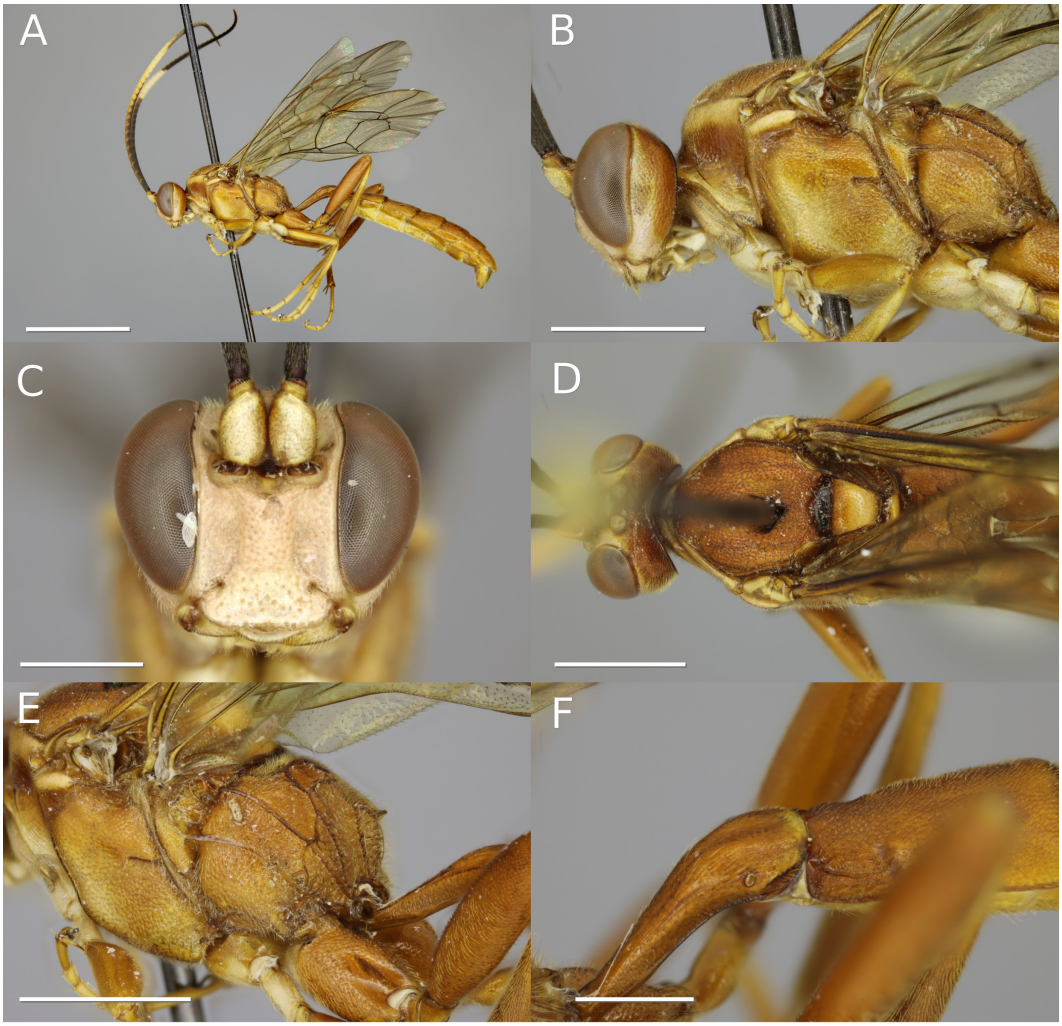

Fig. 18. *Cratichneumon permagnus* sp. nov., male holotpye. ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsolateral view. Scale bars: 5.0 mm (*A*); 2.0 mm (*B*, *D*, *E*); 1.0 mm (*C*, *F*).

and trochantelli yellowish white; femora light brownish red posteriorly, lighter anteriorly; tibiae yellowish; tarsi yellowish white. Hind leg: coxa brownish red; trochanter and trochantellus light brownish red; femur brownish red; tibia brownish red except basal 0.3 yellowish; tarsus yellowish white except tarsomere 5 light brownish. Wing membrane clear. Pterostigma brownish red. Metasoma light brownish red.

Head. Clypeus smooth with moderately dense punctation; flat in lateral view. Supraclypeal area smooth with moderately dense punctation. Dorsal margin of median field without distinct tubercle. Gena smooth and densely, finely punctate. Supra-antennal area weakly granulate and densely, finely, shallowly punctate. Vertex smooth and densely, finely, shallowly punctate. Antenna with 43 flagellomeres. Flagellomeres 6–20 with large, dark brown tyloids; 6 tyloids spanning length of flagellomere.

Mesosoma. Pronotum smooth with dorsal 0.6 punctate becoming sparser ventrally, ventral 0.4 largely impunctate. Mesonotum smooth and densely punctate. Scutellum smooth and sparsely, finely punctate. Mesopleuron smooth and densely punctate with some punctures confluent forming longitudinal rugulae, punctation sparser subdorsally. Speculum smooth and

Table 1. Diagnostic characters differentiating *Cratichneumon scabriculus* sp. nov. and *Cratichneumon symmixtus* sp. nov.

Species	Body length (mm)	Tyloids	Areola	T2 length
C. scabriculus	9.9–12.9	present on flagellomeres 5/6–13/14	width and length approximately equal to length > width	1.25× width of posterior margin of T2
C. symmixtus	6.3	present on flagellomeres 5–10	width > length	1.0× width of posterior margin of T2

weakly punctate-rugulose. Ventral division of metapleuron smooth and densely punctate. Propodeum smooth and weakly rugulose. Propodeal apophyses dentate. Areola width slightly greater than length.

Metasoma. Postpetiole granulate and impunctate. T2–3 granulate with dense, fine, shallow punctation. T4–7 granulate and finely punctate becoming smoother and impunctate posteriorly.

Female.—Unknown.

Material examined.—*Holotype.* ♂; USA; Arizona; Cochise Co.; 12 km S Sierra Vista, Ramsey Cyn.; [31.4476, −110.6035]; 1700 m; 15.vi.1986; B. Brown; EMUSENT00006568.

Distribution.—Only known from type locality (Fig. 29).

Etymology.—Derived from the Latin *permagnus* meaning very great or large in reference to the large size of the species compared to other members of the same genus. Adjective.

Comments.—The female of *C. permagnus* is unknown but could presumably be easily associated with the male based on the size, dentate propodeal apophyses, and similarities in color and/or surface sculpture.

Cratichneumon scabriculus Claridge & Helcoski, new species

(Figs. 19–20, 29)

urn:lsid:zoobank.org:act:29C8C942-D9F6-4465-B886-95FB1AFD6304

Diagnosis.—Females of *Cratichneumon scabriculus* are primarily brownish red with significant yellow areas particularly on the anterior of the head, anteroventral corner of the mesopleuron, and posterior margin of MS1. In addition to the aforementioned color characters, females are diagnosed by the following combination of characters: flagellum filiform; propodeal apophyses absent; scopa absent; and T2 granulate with dense, fine, shallow punctation becoming sparser posteriorly. The undescribed *Cratichneumon* female A and *Cratichneumon* female B are very similar to *C. scabriculus* but can be separated out by the above characters. See the comments regarding female A and B for more details. Similar to many other species, *C. scabriculus* males are primarily yellow and black with a banded metasoma and apically brownish-red metasoma. They can be separated from congeners by the following combination of characters: flagellum with yellow banding; flagellomeres 5/6–13/14 with small, dark brown tyloids; hind tibia without banding (basally yellow and apically dark brown to black); mesopleuron densely punctate-rugulose; propodeal apophyses absent; areola longer than wide; T2 anteriorly granulate and shallowly, densely punctate; and T2 length 1.25× width of posterior margin. The most similar co-occurring species in both color and structure is *Cratichneumon symmixtus*. The two are readily distinguishable based on the more extensive brownish-red areas including the majority of the metasoma in *C. symmixtus*, the denser and coarser punctation on T2 in *C. scabriculus*, and the characters in Table 1.

Description, female.—(Fig 19). Body length: 8.0 mm; forewing length: 5.6 mm.

Color. Predominantly light brownish red with extensive yellow and limited dark brown areas. Head yellow except mandibular apex dark brownish red and medial area of supra-antennal area and posterodorsal area of head brownish red. Antenna: scape and pedicel yellow ventrally and dark brown posteriorly; flagellum brown except flagellomeres 6–18 with yellow banding. Mesosoma primarily brownish red except pronotum centrally dark brown; ventral surface of mesopleuron, metapleuron, and propodeum dark brown; the following areas yellow: ventral and dorsal margins of pronotum, central mark on mesonotum, scutellum, postscutellum, subalar ridge, tegula, large anteroventral mark on mesopleuron, and yellowish areas near the propodeal apophyses. Fore and middle legs yellowish except coxae, trochanters, and trochantellus

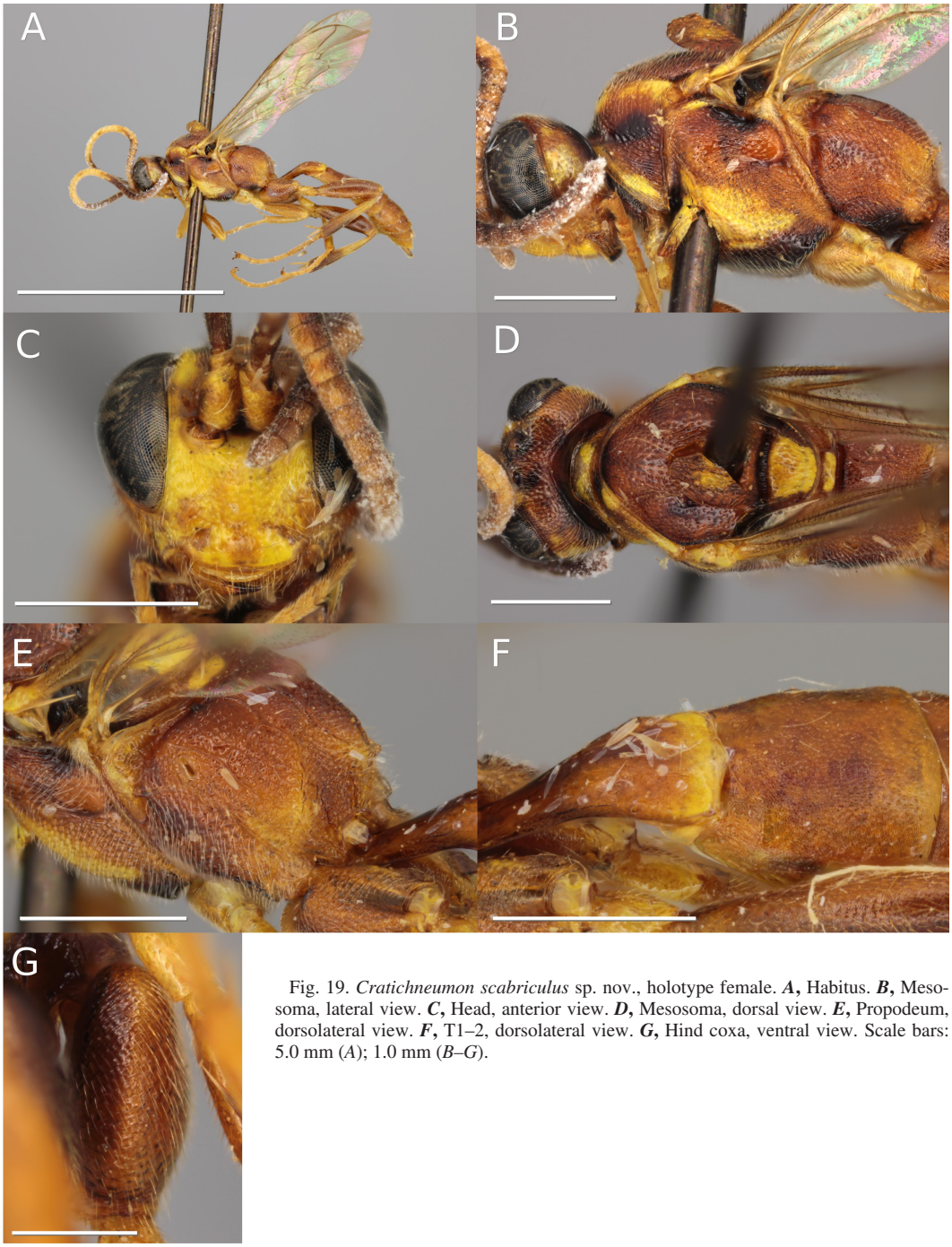

Fig. 19. *Cratichneumon scabriculus* sp. nov., holotype female. ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsolateral view. ***G*,** Hind coxa, ventral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*G*).

yellowish white. Hind leg: coxa brownish red except dark brown medioventrally; trochanter and trochantellus yellowish white; femur brownish red; tibia with basal 0.5 yellow and apical 0.5 dark brown; tarsus light brownish red. Wing membrane clear. Pterostigma yellow. Metasoma light brownish red except posterior margin of T1 yellow.

Head. Clypeus smooth and sparsely, coarsely punctate; flat in lateral view. Supraclypeal area smooth with moderately dense punctation. Dorsal margin of median field without distinct

Fig. 20. *Cratichneumon scabriculus* sp. nov., paratype male (EMUSENT00005711). ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsolateral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*F*).

tubercle. Gena smooth with moderately dense punctation. Supra-antennal area weakly granulate and coarsely punctate with some punctures confluent forming longitudinal rugulae. Antenna filiform (only weakly flattened and wider subapically) with medium length flagellomeres (flagellomere 9 length and width equal) and 32 flagellomeres.

Mesosoma. Pronotum smooth and punctate dorsally becoming rugulose ventrally. Mesonotum smooth with moderately dense punctation with some medioposterior punctures confluent forming longitudinal rugulae. Scutellum smooth and longitudinally rugulose-punctate. Mesopleuron smooth and coarsely punctate-rugulose. Speculum smooth and densely punctate. Ventral division of metapleuron smooth and coarsely punctate-rugulose. Propodeum smooth and punctate-rugulose except first lateral area with moderately dense punctation and areola weakly rugulose. Propodeal apophyses absent. Areola length greater than width. Hind coxa without scopa.

Metasoma. Postpetiole coarsely granulate and impunctate. T2 granulate with dense, fine shallow punctation becoming sparser posteriorly. T3–7 weakly granulate and finely, sparsely punctate becoming smoother and impunctate posteriorly.

DESCRIPTION, MALE.—(Fig. 20). Body length: 9.9–12.9 mm; forewing length: 6.5–7.8 mm.

Color. With extensive black and yellow areas. Metasoma black and yellow banded with yellow portions becoming brownish red posteriorly. Head yellow except mandibular apex dark brown and the following areas black to dark brown: median portion of supra-antennal area, vertex (excluding paraocular area), and posterodorsal region of gena. Antenna: scape yellow ventrally becoming brown to black dorsally; pedicel dark brown; flagellum dark brown ventrally becoming black dorsally except flagellomeres 13/14–19/20 with yellow banding. Prosternum yellow except basal 0.3 black to dark brown. Pronotum black to dark brown except ventral margin and dorsal margin. Mesonotum black except moderate-sized central yellow mark. Scutellum, postscutellum, tegula, and subalar ridge yellow. Mesopleuron yellow except dorsal 0.3 and ventral surface black to dark brown. Dorsal division of metapleuron yellow. Metapostnotum yellow anterolaterally. Ventral division of metapleuron black to dark brown except posterior 0.1–0.2 yellow. Anterior 0.5–0.6 of propodeum black to dark brown and posterior 0.4–0.5 yellow (yellow area more extensive on second pleural area). Fore and middle legs predominantly yellow except femora brownish yellow to light brown. Hind leg: coxa black to dark brown except dorsal surface with variably sized yellow mark; trochanter and trochantellus yellow; femur brown to black except yellowish at base and apex; tibia with basal 0.5–0.6 yellow and apical 0.4–0.5 dark brown to black; tarsus yellow. Wing membrane clear. Pterostigma light to dark brown. MS1 black except posterior margin yellow and lateral face varying from black to partially yellow apically. T2–7 predominantly black with lateral and posterior margins yellow becoming brown to brownish red at more apical tergites and black area becoming smaller at more apical tergites.

Head. Clypeus smooth with sparse to moderately dense punctation; flat in lateral view. Supraclypeal area smooth to weakly granulate laterally and densely punctate medially becoming sparser laterally. Dorsal margin of median field with tubercle varying from absent to small and blunt. Gena smooth and moderately to densely punctate. Supra-antennal area smooth to weakly granulate and punctate-rugulose. Vertex smooth and densely punctate. Antenna with 33–34 flagellomeres. Flagellomeres 5/6–13/14 with small, dark brown tyloids; no tyloids spanning length of flagellomere.

Mesosoma. Pronotum smooth with moderately dense punctation dorsally becoming rugulose ventrally. Mesonotum smooth and densely, coarsely punctate with some punctures medially confluent forming longitudinal rugulae. Scutellum smooth with moderately dense punctation. Mesopleuron smooth and densely punctate-rugulose. Speculum smooth and varying from with moderately dense punctation to punctate-rugulose. Ventral division of metapleuron smooth and varying from with moderately dense punctation to punctate-rugulose. Propodeum smooth and irregularly rugulose except pleural area, first lateral area and second lateral area punctuate-rugulose. Propodeal apophyses absent Areola length greater than width.

Metasoma. Postpetiole smooth and impunctate. T2 anteriorly granulate and shallowly, densely punctate. T3–7 weakly granulate and densely, shallowly punctate, becoming smoother posteriorly.

MATERIAL EXAMINED.—*Holotype.* ♀; USA; Arizona; Cochise Co.; 5 mi W Portal; 5400 ft; 29.viii.1965; EMUSENT00005727.

DISTRIBUTION.—Only known from the Chiricahua and Huachuca Mountains in southeastern Arizona (Fig. 29).

ETYMOLOGY.—Derived from the Latin *scaber* (rough, scabby) due to the overall coarse surface sculpture. Adjective.

Cratichneumon symmixtus Claridge & Helcoski, new species

(Figs. 21, 29)
urn:lsid:zoobank.org:act:691376C1-30CE-4F60-9793-04BE19D19344

DIAGNOSIS.—*Cratichneumon symmixtus* is a small species and most similar to *C. scabriculus* in the overall color and the coarse mesosomal sculpture. For differentiating males, refer to the above diagnosis of *C. scabriculus*. Females of *C. symmixtus* are unknown.

DESCRIPTION, MALE.—(Fig. 21). Body length: 6.3 mm; forewing length: 4.7 mm.

Color. Tricolored with extensive yellow, black, and brownish-red areas. Head predominantly yellow except mandibular apex dark brown, supra-antennal area black medially, vertex black and gena becoming black posteriorly (entire paraocular area yellow). Antenna: scape and pedicel yellowish ventrally becoming

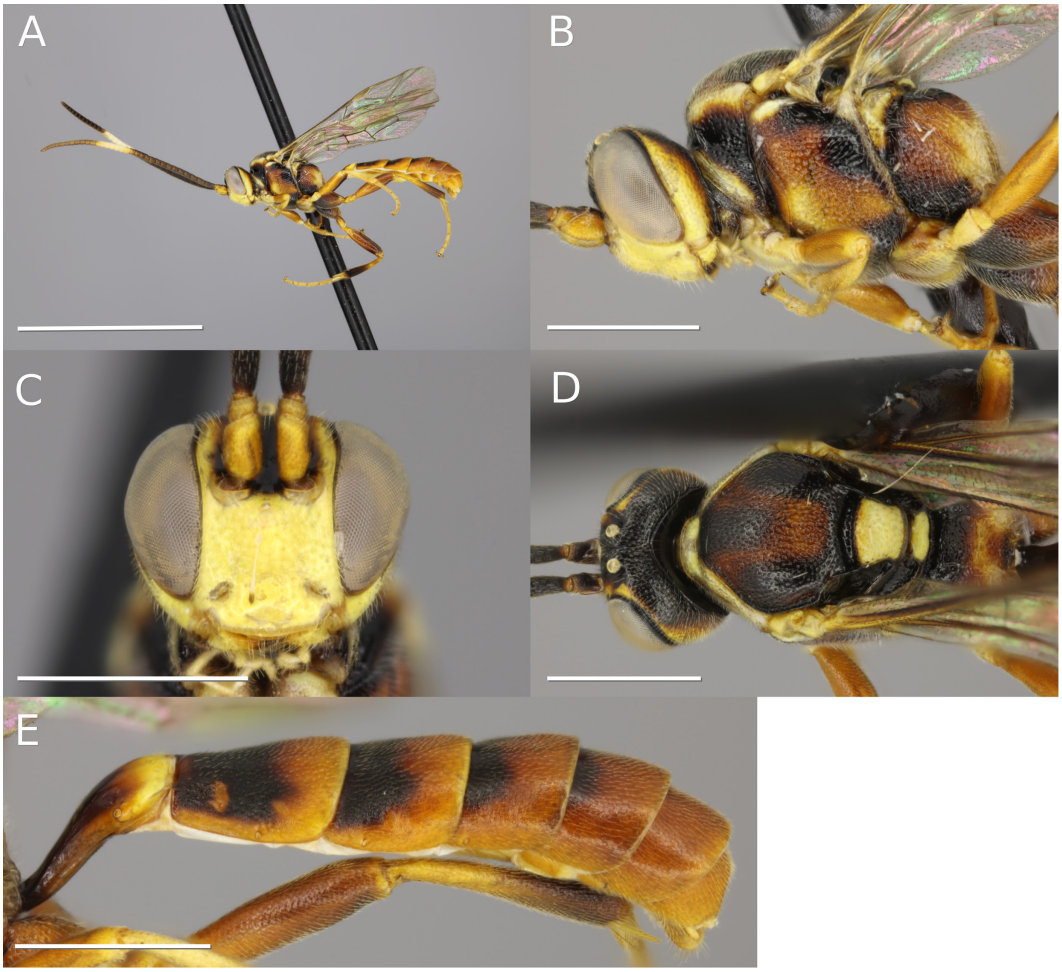

Fig. 21. *Cratichneumon symmixtus* sp. nov., holotype male. ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Metasoma, lateral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B–E*).

brownish red dorsally; flagellum dark brown ventrally becoming black dorsally except flagellomeres 15–20 with yellow banding. Prosternum dark brown except small posterior, yellowish mark. Pronotum dark brown except ventral margin and posterior 0.9 of dorsal margin yellowish white. Mesonotum black except brownish red U-shaped mark. Scutellum, postscutellum, subalar ridge, and tegula yellowish white. Mesopleuron predominantly brownish red except black posterodorsally and ventrally and yellowish anteromedially. Ventral division of metapleuron black anteriorly becoming brownish red posteriorly. Propodeum black anteriorly becoming brownish red and then yellowish white posteriorly except petiolar area brownish red becoming dark brown at posterior margin. Fore and middle legs predominantly yellowish except femora brownish except at apices. Hind leg: coxa black anteroventrally becoming apically brownish red; trochanter and trochantellus brownish yellow; femur yellowish brown basally becoming brownish red apically; tibia with basal 0.4 brownish yellow and apical 0.6 dark brownish red to dark brown; tarsus yellow. MS1 dark brown except posterior margin yellow. T2 with anterior 0.6 black (excluding brownish-red lateral margins) and posterior 0.4 brownish red becoming yellowish posteriorly. T3 with anterior 0.5 black (excluding brownish-red lateral margins) and posterior 0.5 brownish red becoming yellowish posteriorly. T4 with anterior 0.3 black (excluding brownish-red lateral margins) and remainder brownish red. T5 with anterior

0.1 black (excluding brownish-red lateral margins) and remainder brownish red. T6–7 brownish red.

Head. Clypeus smooth with dorsal 0.5 sparsely, coarsely punctate; flat in lateral view. Supraclypeal area smooth to very finely granulate with moderately dense punctation. Dorsal margin of median field without distinct tubercle. Gena smooth with moderately dense punctation ventrally becoming weakly rugulose dorsally. Supra-antennal area weakly granulate with moderately dense punctation. Vertex smooth and finely punctate. Antenna with 32 flagellomeres. Flagellomeres 10–15 with small, dark brown tyloids; no tyloids spanning length of flagellomere.

Mesosoma. Pronotum smooth and sparsely punctate dorsally and rugulose ventrally. Mesonotum smooth laterally becoming weakly granulate medially with moderately dense punctation with some punctures confluent forming longitudinal rugulae medioposteriorly. Scutellum smooth and finely punctate. Mesopleuron coarsely rugulose-punctate except rugosity weaker anterodorsally. Speculum smooth with moderately dense punctation. Ventral division of metapleuron coarsely punctate-rugulose. Propodeum smooth and rugulose except pleural areas and second lateral area punctate-rugulose. Propodeal apophyses absent. Areola width greater than length.

Metasoma. Postpetiole granulate and impunctate except for a few scattered punctures at posterior margin. T2 granulate with moderately dense, fine, shallow punctation. T3–7 granulate with shallow, nearly indistinct punctation becoming smoother posteriorly.

FEMALE.—Unknown.

MATERIAL EXAMINED.—*Holotype*. ♂; USA; Arizona; Graham Co.; Pinaleño Mts., Ash Cr., nr Pima; 32.7668 −109.8668; 1370 m; 07–12.vi.2015; M.E. Irwin; EMUSENT00005933.

DISTRIBUTION.—Only known from the type locality in the Pinaleño Mountains in southeastern Arizona (Fig. 29).

ETYMOLOGY.—Derived from the Greek *symmiktos*, meaning commingled, in reference to the complex overall color pattern that is especially evident on the mesosoma. Adjective.

COMMENTS.—*Cratichneumon* female B may represent the female to *C. symmixtus*; however, further evidence is needed to confirm the association. See the comments regarding *Cratichneumon* female B for more details.

Cratichneumon tetragonops Claridge & Helcoski, new species

(Figs. 22–23, 29)

urn:lsid:zoobank.org:act:58818826-2AA3-4BA3-AC00-B8A91E78D824

DIAGNOSIS.—*Cratichneumon tetragonops* males and females are readily distinguished among congeners by the overall brownish-red color with yellowish-white banding on the flagellum and hind and middle tibiae. The more robust, subquadrate head in both sexes is also highly distinctive.

DESCRIPTION, FEMALE.—(Fig. 22). Body length: 9.3–11.2 mm; forewing length: 7.0–7.5 mm.

Color. Brownish red with very occasional yellow and black regions. Head entirely brownish red with mandibular apex dark brown to black except in 20% of specimens with paraocular area and mandibular base yellow. Antenna: scape brownish red; pedicel dark brownish red to black; flagellum with flagellomeres 1–5 dark brownish red to black, 6–16 with yellowish-white banding, and 17–36 dark brown to black. Pronotum and prosternum brownish red. Mesonotum brownish red with variable black margins. Scutellum yellow, postscutellum light brownish red in 80% of specimens and yellow in 20%, tegula and subalar ridge brownish red in 80% of specimens and yellow in 20%. Mesopleuron brownish red with occasional posterior black margins.Ventral division of metapleuron brownish red. Propodeum brownish red with lateral anterior 0.1–0.2 region yellow in 20% of specimens. Fore and middle legs: varying from entirely brownish red in 80% of specimens to dorsally light brownish red and ventrally yellow in 20% of specimens. Hind leg entirely brownish red except variable yellow band on basal region of tibia. Wing membrane clear. Pterostigma light to dark brown. Metasoma brownish red.

Head. Clypeus smooth to weakly granulate with dorsal 0.5 moderately punctuate and ventral margin sparsely punctate; flat in lateral view. Supraclypeal area smooth and densely, finely punctate. Dorsal margin of median field without distinct tubercle. Gena granulate and densely punctate. Supra-antennal area and vertex smooth and finely, densely punctate. Antenna filiform (only weakly flattened and wider subapically) with medium-length flagellomeres (flagellomere 5/6 length and width equal) and 36–38 flagellomeres.

Mesosoma. Pronotum smooth with fine, moderately dense punctation becoming ventrally

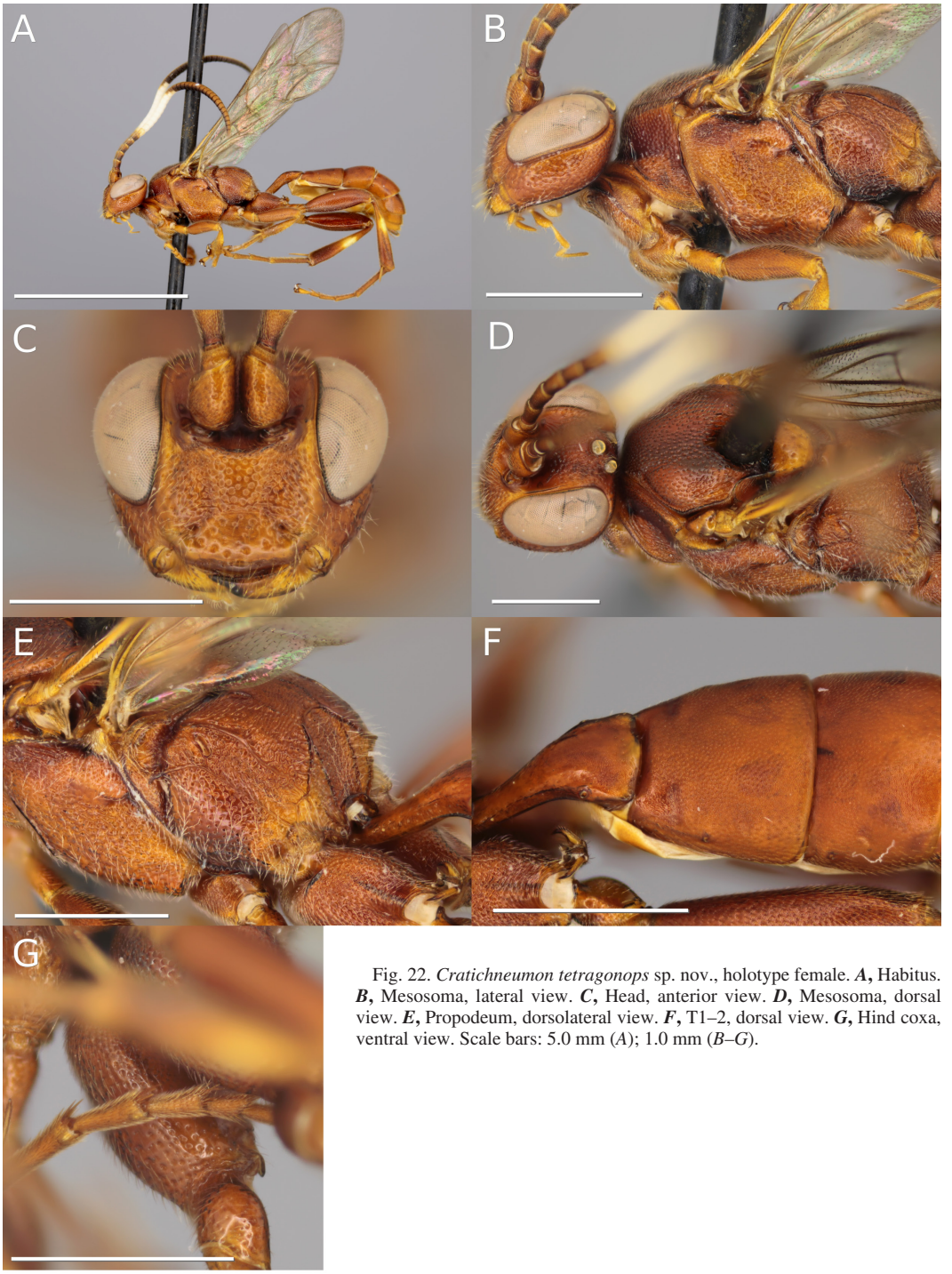

Fig. 22. *Cratichneumon tetragonops* sp. nov., holotype female. ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsal view. ***G*,** Hind coxa, ventral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*G*).

punctate-rugulose. Mesonotum granulate and densely punctate with some punctures forming lateral rugulae. Scutellum smooth with fine, sparse to moderately dense punctation. Mesopleuron and speculum smooth and densely punctate-rugulose. Ventral division of metapleuron smooth and moderately densely punctate-rugulose. Propodeum smooth and densely punctate-rugulose. Propodeal apophyses absent. Areola length greater than width. Hind coxa without scopa.

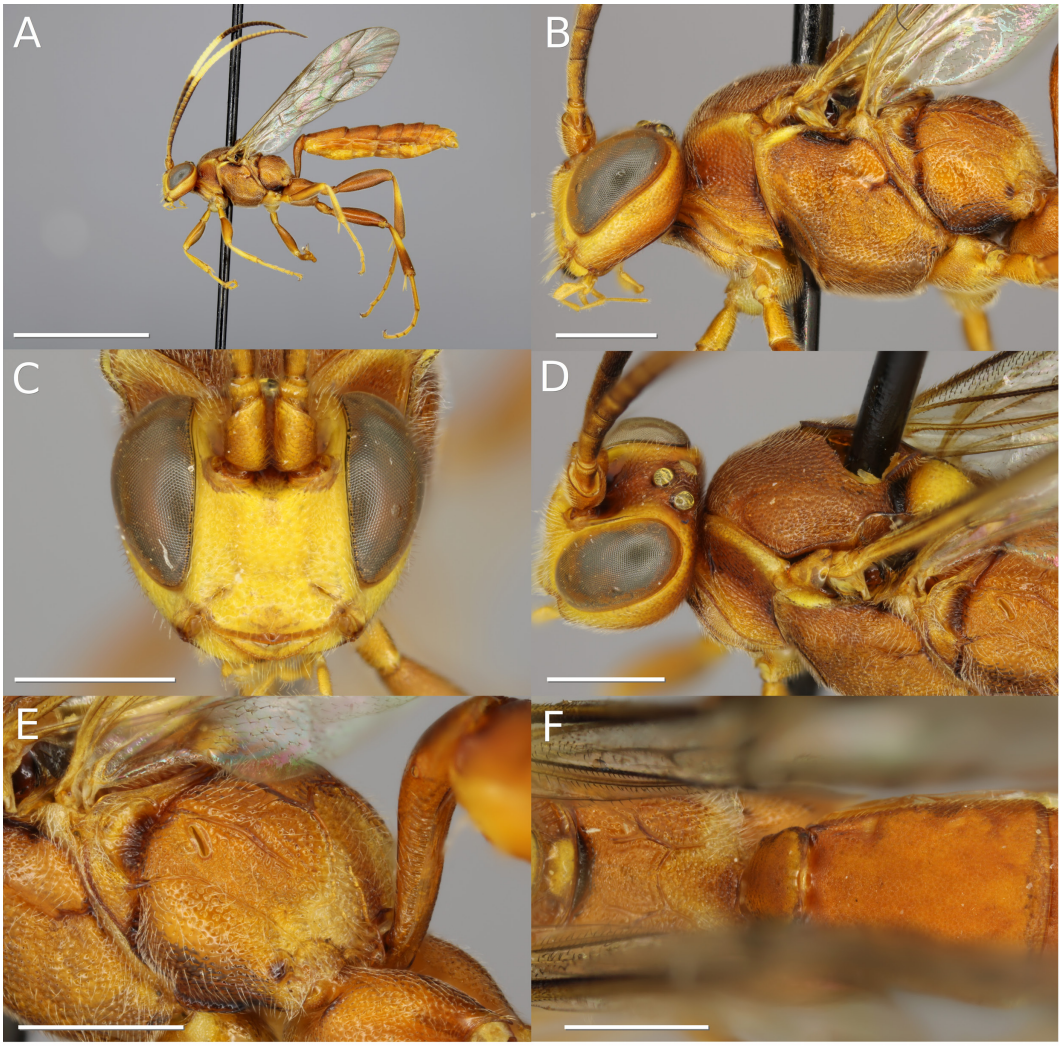

Fig. 23. *Cratichneumon tetragonops* sp. nov., paratype male (EMUSENT00004585). ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsolateral view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsal view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B–F*).

Metasoma. Postpetiole weakly granulate with moderately dense punctation. T2–7 granulate and densely, shallowly punctate becoming smoother and impunctate posteriorly.

DESCRIPTION, MALE.—(Fig. 23). Body length: 8.6–12.5 mm; forewing length: 6.1–8.0 mm.

Color. Light brownish red with minor yellow and black regions. Head light brownish red except clypeus, supraclypeal area, and paraocular area yellow and mandibular apex dark brown to black. Antenna: scape light brownish red; pedicel dark brown to black; flagellum with flagellomeres 1–12 dark brown, 13–20 with yellow banding, and 21–36 light brownish red to dark brown. Pronotum light brownish red with variable ventral and dorsal margins yellow and variable black spot on posteroventral margin. Prosternum light brownish red, lightening ventrally with ventral 0.4–0.6 yellow. Mesonotum light brownish red with variable black margins. Scutellum, postscutellum, tegula, and subalar ridge yellow. Mesopleuron light brownish red with variable black margins. Ventral division of metapleuron light brownish red with variable ventral and anterior margins black. Propodeum light brownish red becoming lighter anteriorly

with lateral anterior 0.1–0.2 region yellow. Fore and middle legs: varying from entirely light brownish red in 60% of specimens to dorsally light brownish red and ventrally yellow in 40% of specimens. Hind leg: coxa, trochanter, trochantelli, and femur light brownish red; tibia with basal 0.4–0.6 yellowish white, apically light brownish red; tarsomeres light brownish red. Wing membrane clear. Pterostigma light brown to brown. Metasoma light brownish red.

Head. Clypeus smooth, dorsal 0.5 with moderately dense punctation becoming sparser ventrally; flat in lateral view. Supraclypeal area smooth with fine, moderately dense to dense punctation. Dorsal margin of median field without distinct tubercle. Gena granulate and densely punctate. Supra-antennal area and vertex smooth and finely, densely punctate. Antenna with 36–38 flagellomeres. Flagellomeres 5/8–16/18 with small to medium-sized, dark brown tyloids; 0–2 tyloids spanning length of flagellomere.

Mesosoma. Pronotum smooth with fine, moderately dense punctation becoming punctate-rugulose ventrally. Mesonotum granulate and densely punctate. Scutellum smooth with fine, sparse to moderately dense punctation. Mesopleuron smooth and densely punctate-rugulose. Speculum smooth with fine, sparse to moderately dense punctation. Ventral division of metapleuron smooth with moderately dense punctation becoming punctate-rugulose ventrally. Propodeum smooth and punctate-rugulose. Propodeal apophyses absent. Areola length and width approximately equal to length slightly greater than width.

Metasoma. Postpetiole weakly granulate with moderately dense punctation. T2–7 granulate and densely, shallowly punctate becoming smoother and impunctate posteriorly.

MATERIAL EXAMINED.—*Holotype*. ♀; USA; Arizona; Graham Co.; Pinaleño Mts., round the Mtn camps; 32.7638 −109.8683; 1370 m; 7–12.vi.2015; M.E. Irwin; Mal in small dry wash; EMUSENT00006561.

DISTRIBUTION.—From the Walnut Canyon and "nr. Alpine" on the Mogollon Rim and throughout the Madrean Archipelago (Chiricahua, Huachuca, Patagonia, and Pinaleño Mountains and the Sierra Ancha) (Fig. 29).

ETYMOLOGY.—Derived from the Greek *tetragōnos*, meaning square, and *ōps*, for face, in reference to the square-shaped head. Noun in apposition.

Cratichneumon warneri Claridge & Helcoski, new species

(Figs. 24–25, 28)
urn:lsid:zoobank.org:act:D84F8E13-53B6-4428-AD3B-1A874CE82E83

DIAGNOSIS.—Females of *C. warneri* are reddish brown and most similar to the co-occurring *C. arussatus* and *C. tetragonops*. However, *C. warneri* females are diagnosed by a combination of the following characters: hind tibia without banding; hind coxa with medium-sized scopa; scutellum with sparse to moderately dense punctation; postpetiole punctate-rugulose; and T2 with coarser, more defined punctation than *C. arussatus* or *C. tetragonops*. Smaller specimens of *C. warneri* can be especially similar to *C. arussatus*; however, the clearest character separating the two is that *C. warneri* females lack any rugosity on the scutellum (scutellum always punctate-rugulose in *C. arussatus*). Males are primarily black and yellow, including a banded metasoma, and are diagnosed by the following combination of characters: flagellar banding absent; hind tibia with yellow banding; ventral division of metapleuron predominantly black; and T2 weakly granulate and densely punctate. *Cratichneumon warneri* males are similar to those of *C. antichromus* but are easily separated based on differences in color and the coarser punctation on T2 and mesonotum.

DESCRIPTION, FEMALE.—(Fig. 24). Body length: 8.5–12.4 mm; forewing length: 6.0–7.3 mm.

Color. Predominantly brownish red to light brownish red except flagellomeres 7/8–14/15 with incomplete yellowish-white banding, flagellomeres 14/15–30/32 dark brown to black, and paraocular area yellow medially, and fore and mid legs lighter with yellowish tibiae. Wing membrane clear. Pterostigma yellowish to dark brown.

Head. Clypeus smooth and sparsely punctate; flat in lateral view. Supraclypeal area smooth with moderately dense punctation. Dorsal margin of median field with small, blunt, median tubercle. Gena smooth and moderately to densely punctate dorsally becoming sparser ventrally. Supra-antennal area smooth and densely punctate. Vertex smooth and densely punctate. Antenna filiform (only moderately flattened and wider subapically) with short flagellomeres (flagellomere 7/8 length and width equal) and 30–32 flagellomeres.

Mesosoma. Pronotum smooth and densely punctate dorsally becoming rugulose ventrally.

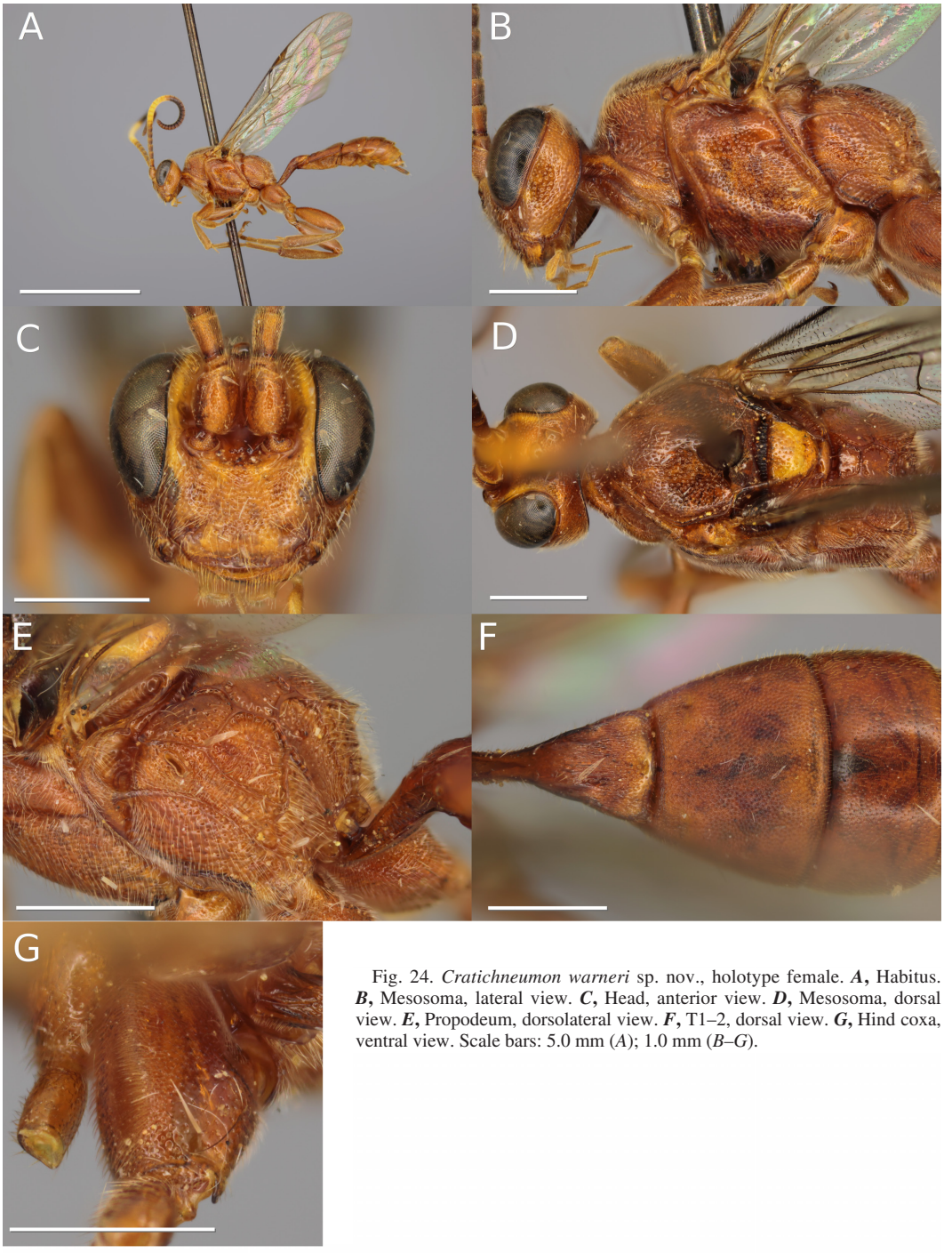

Fig. 24. *Cratichneumon warneri* sp. nov., holotype female. ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsal view. ***G*,** Hind coxa, ventral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*G*).

Mesonotum smooth with moderately dense to dense punctation. Scutellum smooth with sparse to moderately dense punctation. Mesopleuron smooth and longitudinally punctate-rugulose. Speculum smooth and finely punctate to punctate-rugulose. Ventral division of metapleuron smooth and longitudinally punctate-rugulose. Propodeum smooth and primarily irregularly rugulose except first and second lateral areas punctate-rugulose. Propodeal apophyses absent.

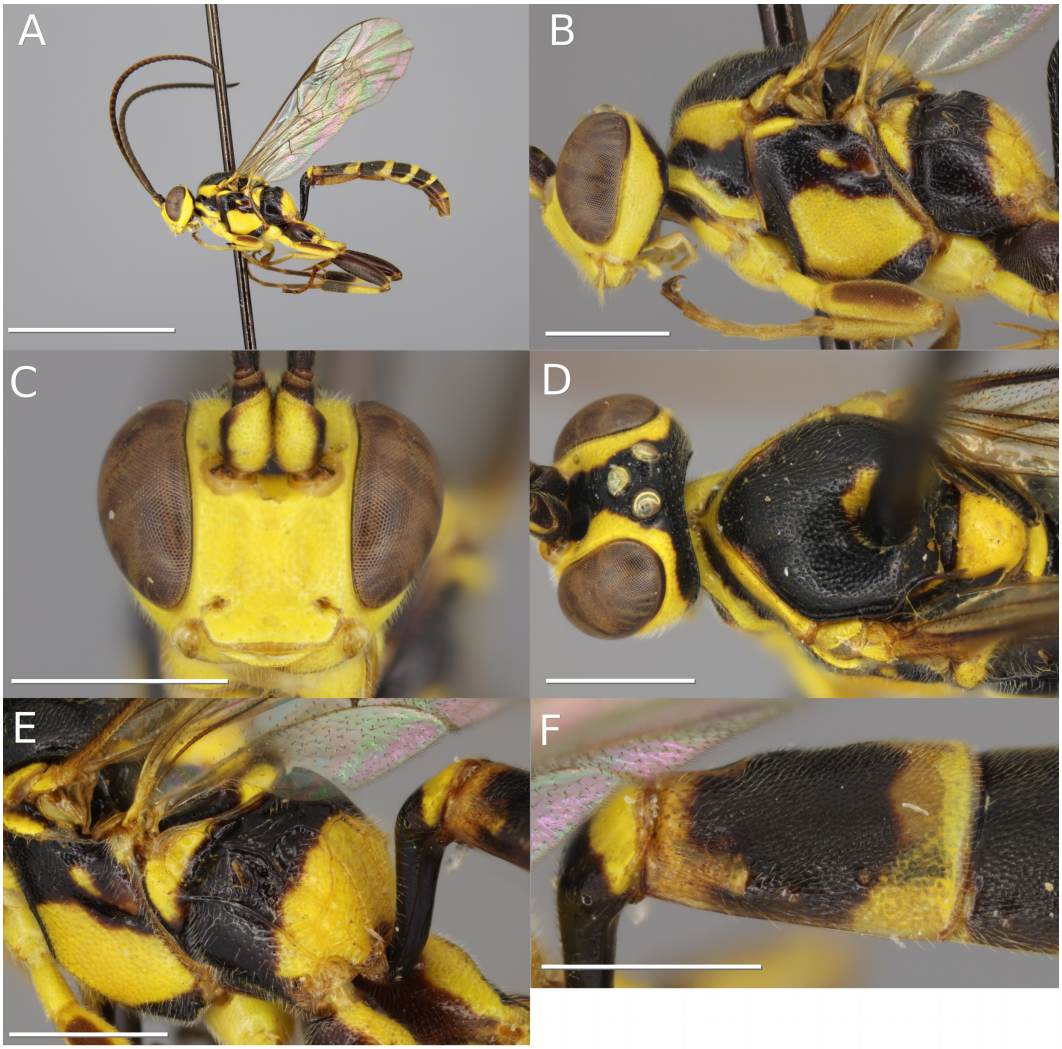

Fig. 25. *Cratichneumon warneri* sp. nov., paratype male (EMUSENT00005746). ***A*,** Habitus. ***B*,** Mesosoma, lateral view. ***C*,** Head, anterior view. ***D*,** Mesosoma, dorsal view. ***E*,** Propodeum, dorsolateral view. ***F*,** T1–2, dorsolateral view. Scale bars: 5.0 mm (*A*); 1.0 mm (*B*–*F*).

Areola unusually small and length and width approximately equal. Hind coxa with medium-sized scopa.

Metasoma. Postpetiole smooth and densely punctate to weakly punctate-rugulose. T2 smooth to weakly granulate with dense punctation. T3 smooth to weakly granulate with sparse to moderately dense punctation becoming sparser posteriorly. T4–7 smooth to weakly granulate and sparsely punctate becoming smooth and impunctate posteriorly.

Description, male.—(Fig. 25). Body length: 6.7–9.5 mm; forewing length: 5.5–7.3 mm.

Color. Black and yellow including a banded metasoma. Head yellow except mandibular apex dark brown and the following areas black: medial portion of supra-antennal area and vertex excluding paraocular area. Antenna: scape yellow ventrally and dark brown to black dorsally; pedicel dark brown to black; flagellum brown ventrally and dark brown to black dorsally. Pronotum black with ventral and dorsal margins yellow. Prosternum varying from predominantly black and apically yellow to predominantly yellow and basally black. Mesonotum black with a yellow central mark. Scutellum, postscutellum,

tegula, and subalar ridge yellow. Mesopleuron varying from predominantly black with large yellow spot on ventral 0.6 to predominantly yellow with black area on dorsal 0.3 with yellow speculum. Ventral division of metapleuron black except posterior 0.2 yellow. Propodeum with anterior 0.4–0.5 black and posterior 0.5–0.6 yellow. Fore and middle legs: yellow except large splotchy brown to dark brown marks on femora dorsally and tarsus becoming light brown to brown apically. Hind leg: coxa black except variable yellow, dorso-apical mark; trochanter and trochantellus yellow; femur dark brown to black; tibia dark brown to black except basal 0.1–0.5 yellow; tarsus dark brown to black except base of tarsomeres 1–3 light brownish. Wing membrane clear. Pterostigma light brown to black. MS1 black except posterior margin yellow. T2 black except anterior margin, gastrocoelus, and posterior 0.2 yellow. T3–6 black except posterior margins yellow (yellow area becoming narrower posteriorly). T6 varying from black to reddish brown. T7 reddish brown.

Head. Clypeus smooth with moderately dense to dense punctation; flat in lateral view. Supraclypeal area smooth and densely punctate. Gena smooth with moderately dense to dense punctation. Supra-antennal area smooth to weakly granulate with moderately dense punctation. Vertex smooth to weakly granulate and finely punctate. Antenna with 30–35 flagellomeres. Flagellomeres 8/9–19 with small to medium-sized black tyloids; 0–8 tyloids spanning length of flagellomere.

Mesosoma. Pronotum smooth with fine, sparse to moderately dense punctation dorsally becoming rugulose ventrally. Mesonotum smooth and moderately to densely punctate. Scutellum smooth and finely, sparsely punctate. Mesopleuron smooth with dorsal 0.4 densely punctate and ventral 0.6 densely punctate with some punctures confluent forming longitudinal rugulae. Speculum smooth and finely punctate. Ventral division of metapleuron smooth with moderately dense punctation. Propodeum with area anterior to posterior transverse carinae punctate-rugulose except impunctate areola, irregularly rugulose posterior to posterior transverse carinae. Propodeal apophyses absent. Areola width greater than length.

Metasoma. Postpetiole smooth and varying from impunctate with moderately dense punctation (20% of specimens with weak longitudinal striation). T2 smooth to weakly granulate and densely punctate. T3–7 weakly granulate and densely punctate becoming smooth and impunctate posteriorly.

MATERIAL EXAMINED.—*Holotype.* ♀; USA; Arizona; Cochise Co.; SWRS, 5 mi W Portal; 5400 ft; 12.vi.1965; EMUSENT00006143.

DISTRIBUTION.—North from the Mogollon Rim, throughout the Madrean Archipelago (Chiricahua, Huachuca, Patagonia, Pinaleño, and Whetstone Mountains), and south in the Sierra Madre Occidental as far as Durango, Mexico (Fig. 28).

ETYMOLOGY.—Named in honor of the coleopterist William B. Warner whose collecting efforts greatly contributed to the current study.

COMMENTS.—The densely punctate to weakly punctate-rugulose postpetiole of *C. warneri* is exceptional in *Cratichneumon*. The lack of dense punctation on the postpetiole is one of the key characters used to separate *Cratichneumon* from similar genera such as *Barichneumon* and *Melanichneumon* (Heinrich 1961a), since there is no apparent analog among species in the eastern Nearctic. However, we are confident in the placement of the female in *Cratichneumon* based on the lack of a median tubercle on the anterior margin of the propodeum, the shallow gastrocoelus, the well-developed thyridum, and the association with the male. Also, in *C. warneri* the postpetiole punctation is not as coarse as is typical in *Barichneumon*, *Melanichneumon*, and similar genera. Given the large number of *Cratichneumon* species (Yu et al. 2016) and the lability of morphology in Ichneumoninae (Tschopp et al. 2013, Santos et al. 2021), such exceptions to the traditional diagnosis are not surprising.

Cratichneumon female A

(Fig. 26A, B)

COMMENTS.—Female A is similar to *C. scabriculus* and female B except the scopa on the hind coxa is present (absent in *C. scabriculus* and female B), and the head and mesopleuron are brownish red without yellow areas as in *C. scabriculus*. The presence of a scopa in particular strongly suggests that female A is not simply a color morph of *C. scabriculus*. The development of the scopa is nearly always consistent within a given species, though there are rare exceptions, such as in *Protichneumon grandis* (Brullé), in which it varies from small to absent (Heinrich 1961a). Label data: USA; Arizona; Cochise Co.; Huachuca Mtns. 0.8 rd mi

Fig. 26. *Cratichneumon* female A (EMUSENT00006261). ***A*,** Habitus. ***B*,** Hind coxa, ventral view. *Cratichneumon* female B (EMUSENT00005948). ***C*,** Habitus. Scale bars: 5.0 mm (*A*, *C*); 0.5 mm (*B*).

SW Reef; 31.4238 −110.2991; 06–21.vii.2019; W.B. Warner; VFIT; EMUSENT00006261.

Cratichneumon female B

(Fig. 26C)

Comments.—Female B is most similar to *C. scabriculus* and female A. However, it is predominantly brownish red and lacks the distinctive yellow areas of *C. scabriculus* including on the anterior of the head, large anteroventral area of the mesopleuron, and hind tibial banding. Female B differs from female A by the lack of a scopa, the head which narrows slightly ventrally, and the narrower gena. It is also considerably smaller than either species. Due to the similarity in size and the coarse surface sculpture on the mesosoma, female A may represent the female of *C. symmixtus*. However, this association is uncertain as female A and *C. symmixtus* are only represented by singletons from different mountain ranges. Label data: USA; Arizona; Cochise Co.; Huachuca Mts. 0.5 mi W Hwy.; 5100 ft; viii.1993; N. McFarland; EMUSENT 00005948.

Discussion

Fourteen species of *Cratichneumon*, including the 11 newly described species, are now recorded from Arizona. *Cratichneumon* is the most diverse genus of Ichneumoninae in the Madrean Archipelago, both in terms of described and undescribed species (Claridge personal observation). Additionally, 8 species have been documented in the Sierra Madre Occidental in Mexico, which likely represents a significant portion of the *Cratichneumon* fauna in the area. Although we were able to confidently delimit

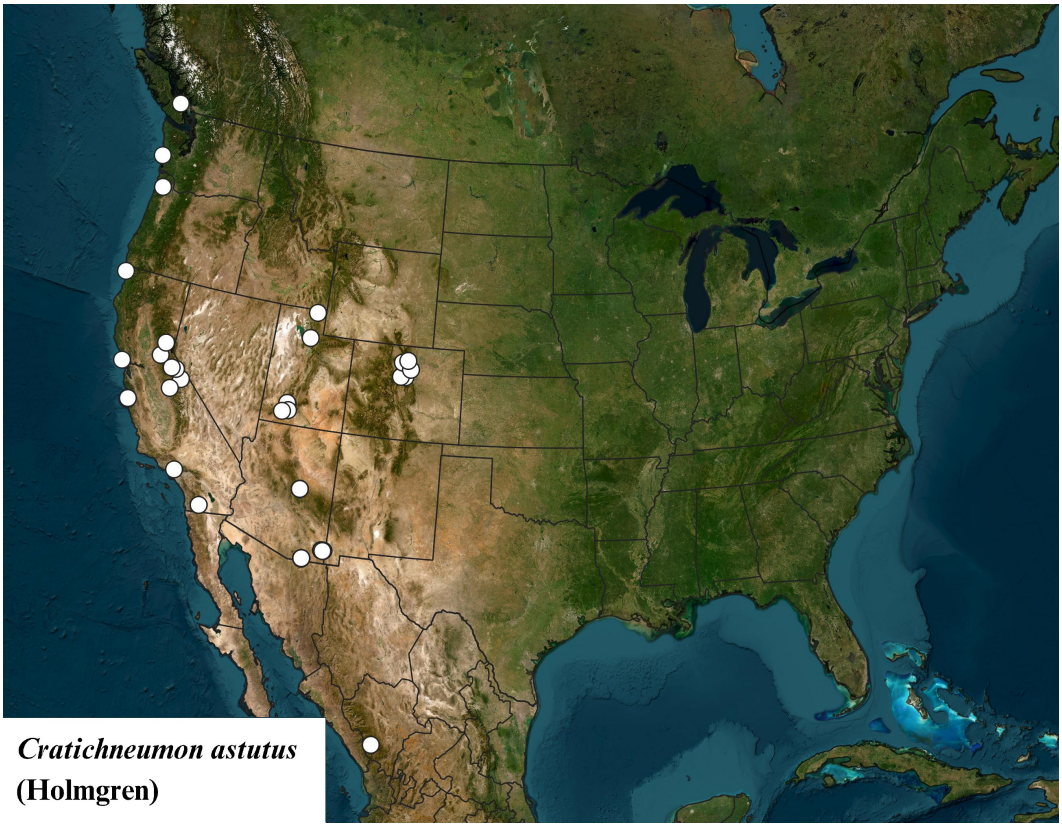

Fig. 27. Distribution of *Cratichneumon astutus* Holmgren.

and describe 11 new species, the females of *C. luteus*, *C. permagnus*, and *C. symmixtus* remain unknown. Also, an additional 2 female specimens, each likely representing separate species, were discovered, though they were unable to be associated and thus left undescribed. Despite the progress made here, the presence of 2 species represented by singleton males suggests that additional species may yet be discovered with increased collecting effort and/or a more extensive survey of existing collections. Furthermore, essentially no biological information, including any hosts, is known for any of the species.

Although peripheral to the study, the collecting methods that yielded the majority of the specimens examined are noteworthy. First, despite being designed to collect Coleoptera (Warner 2017), VFITs appear effective at collecting ichneumonids and possibly other Hymenoptera, as evidenced by the extensive material collected by Bill Warner. It is possible that the V-shaped design more readily directs intercepted wasps toward the collecting fluid compared to similar flight intercept traps. Regardless, the by-catch material donated by Bill Warner and Michael Irwin from VFITs and malaise traps, respectively, was instrumental to the current study and emphasizes the importance of processing and sharing by-catch in entomological research (Spears and Ramirez 2015).

In terms of the number of described species, these findings represent the most significant advance in North American ichneumonine taxonomy in over 4 decades (Heinrich 1977) and highlight the paucity of our knowledge of ichneumonid biodiversity more generally, even in the United States, a country with robust scientific resources. For Ichneumoninae alone, there are at least tens, if not hundreds, of undescribed species in western North America (Claridge personal observation). Further taxonomic research on Ichneumoninae would greatly benefit from additional collecting and the use of molecular data to aid in sex associations.

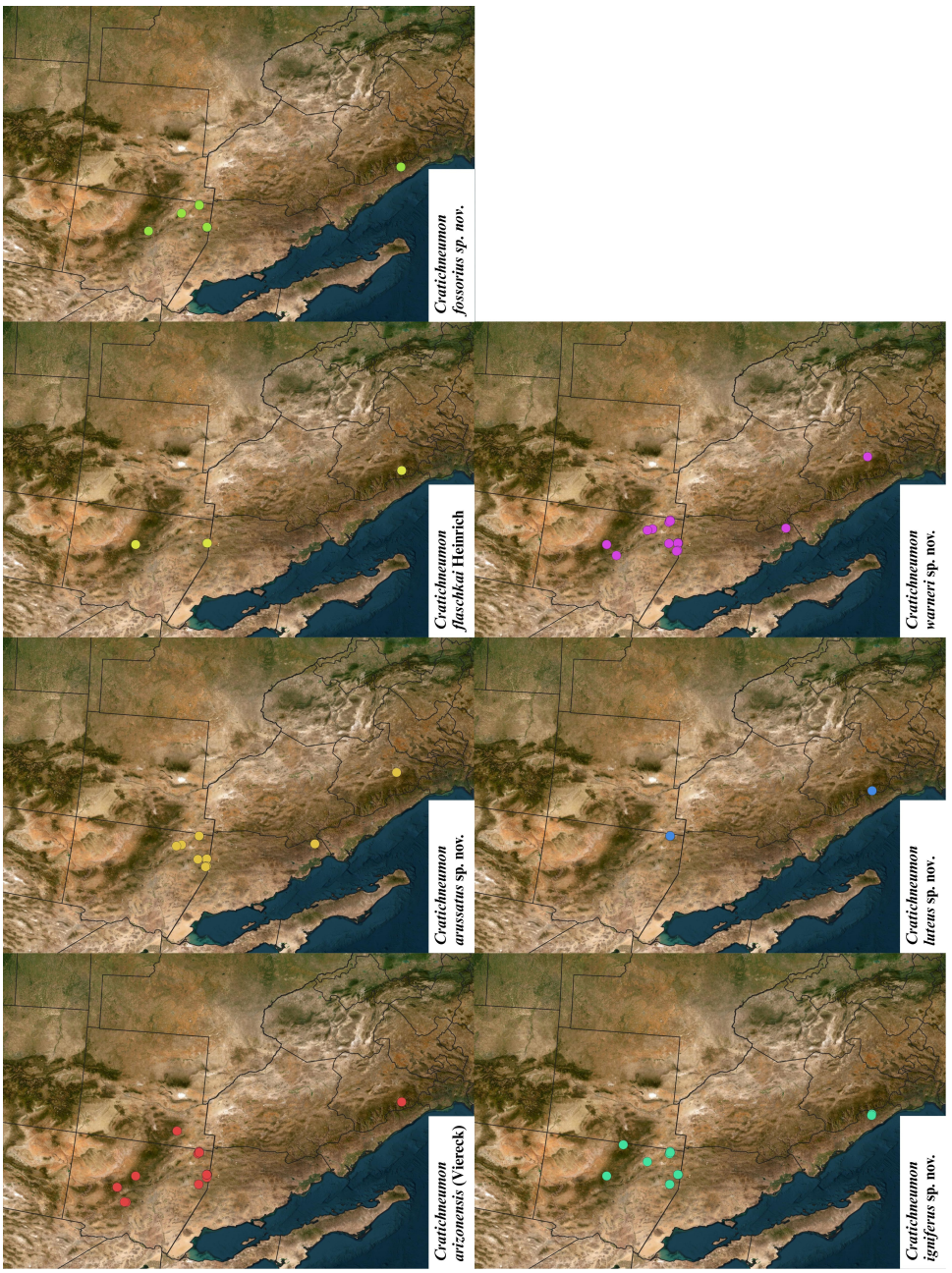

Fig. 28. Distribution of *Cratichneumon arizonensis* (Viereck), *Cratichneumon arussatus* sp. nov., *Cratichneumon flaschkai* Heinrich, *Cratichneumon fossorius* sp. nov., *Cratichneumon igniferous* sp. nov., *Cratichneumon luteus* sp. nov., and *Cratichneumon warneri* sp. nov.

Fig. 29. Distribution of *Cratichneumon antichromus* sp. nov., *Cratichneumon elongatus* sp. nov., *Cratichneumon permagnus* sp. nov., *Cratichneumon scabriculus* sp. nov., *Cratichneumon symmixtus* sp. nov., and *Cratichneumon tetragonops* sp. nov.

Supplementary Material

One online-only supplementary file accompanies this article (https://scholarsarchive.byu.edu/wnan/vol84/iss3/1).

Supplementary Material 1. Collection data for specimens examined (tab-delimited file).

Acknowledgments

We thank William Warner (ASUHIC), Michael Irwin (INHS), Andrew Bennett (CNCI), Chris Grinter (CASC), Peter Oboyski (EMEC), and Signe Valentinsson (MNA) for their specimen donations or loans. We are grateful to Hege Vårdal (Swedish Museum of Natural History), Stefan Schmidt (Bavarian State Collection of Zoology), Helena Onody (Zoology Museum of the University of São Paulo), and Jason Weintraub (Entomology Collection at the Academy of Natural Sciences, Drexel University) for providing images or loans of type specimens. We thank Olivia Claridge for assistance with assembling the distribution figures. Finally, we thank the editorial team at the *Western North American Naturalist* for their support covering publication fees. Collection visits to the California Academy of Sciences and the Essig Museum by BRC were funded by the Graduate Student Research Award from the Society of Systematic Biologists.

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Received 6 December 2023
Revised 17 February 2024
Accepted 22 February 2024
Published online 1 August 2024