



## A review of the Nearctic *Odontomachus* (Hymenoptera: Formicidae: Ponerinae) with a treatment of the males

JOE A. MACGOWN<sup>1,5</sup>, BRENDON BOUDINOT<sup>2</sup>, MARK DEYRUP<sup>3</sup> & D. MAGDALENA SORGER<sup>4</sup>

<sup>1</sup>Mississippi Entomological Museum, Mississippi State, MS

<sup>2</sup>University of California Davis, Davis, CA

<sup>3</sup>Archbold Biological Station, Lake Placid, FL

<sup>4</sup>North Carolina State University, Raleigh, NC

<sup>5</sup>Corresponding author. E-mail: [jmacgown@entomology.msstate.edu](mailto:jmacgown@entomology.msstate.edu)

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### Abstract

The ant genus *Odontomachus* Latreille in the United States is reviewed. Six species are treated: *O. brunneus* (Patton), *O. clarus* Roger, *O. desertorum* Wheeler **stat. nov.**, *O. relictus* Deyrup and Cover, *O. ruginodis* M.R. Smith, and *O. haematodus* (Linnaeus), a new record for North America. The spread of *O. haematodus* is documented, and its identity is clarified. The genus is diagnosed for species in the Nearctic region for all castes, and worker- and male-based keys are presented. The workers and males of all six species are described and figured, including the first male descriptions for *O. haematodus* and *O. desertorum*. This represents the first study of species-level variation in *Odontomachus* male genitalia, and one of the first of such studies of the Ponerinae for any biogeographic region. A discussion of the utility of the male sex for *Odontomachus* taxonomy is provided.

**Key words:** taxonomy, trap-jaw ants, alien species, invasive, identification, keys, genitalia

### Introduction

Trap-jaw ants in the genus *Odontomachus* Latreille (Hymenoptera: Formicidae: Ponerinae) are large, conspicuous ants that can be recognized by the peculiar shape of the head, long linear mandibles, large tapering petiole, and obvious sting. The highly specialized head morphology constitutes a trap-jaw mechanism that the ants use primarily for catching prey (Patek et al. 2006). Males are more generalized and may be recognized in the Nearctic

region by the spiniform terminal abdominal tergum, elliptical propodeal spiracle, absence of distinct notauli, and presence of the jugal lobes at the posterior base of the hindwing. Based on the discovery of the male of *O. desertorum* Wheeler **stat. nov.** and a reassessment of worker morphology, we revive this name from synonymy with *O. clarus* and elevate the name to species. Thus, of the 67 species occurring worldwide (Bolton 2014), five valid species have been reported from the United States: *O. brunneus* (Patton), *O. clarus* Roger, *O. desertorum*, *O. relictus* Deyrup and Cover, and *O. ruginodis* M.R. Smith. Furthermore, we document the first published records and spread in the United States of a species introduced from South America, *O. haematodus* (Linnaeus). In light of the elevation of *O. desertorum* and this new record, the worker-based key of Deyrup and Cover (2004) is updated and a new male-based key to Nearctic *Odontomachus* species is provided for all six species. This work represents the first species-level study of the male genitalia of *Odontomachus*, one of the first such studies of the Ponerinae of any biogeographic region.

Our understanding of the species boundaries of *Odontomachus* in the United States has undergone drastic change since 1939 when M.R. Smith published his study on the *Odontomachus* of the United States (M.R. Smith 1939). At that time, Smith (1939) recognized only one US species, *O. haematoda* Linnaeus, with three western subspecies, *O. h. clarus* (Louisiana and Texas), *O. h. coninodis* Wheeler (Arizona), and *O. h. desertorum* Wheeler (Arizona), and one eastern subspecies, *O. h. insularis* Guérin-Méneville, which was only reported from Florida and Georgia. Little had changed by 1950 when Creighton's tome "The Ants of North America" was published as he basically followed Smith's treatment of the group (Smith 1939). In 1964, Wilson reported *O. ruginodis* from the Florida Keys. When Brown (1976) revised the genus, he elevated *O. clarus* to species level and synonymized all other western subspecies with that name. Brown recognized only one species in the Southeast, *O. brunneus*, and synonymized all previous records from the southeastern US with *O. brunneus*, a supposedly widespread tropical species, and *O. insularis* was removed from the North American fauna. In 1979, when the Catalog of Hymenoptera North of Mexico was published, D.R. Smith (1979) recognized four US species, *O. clarus*, *O. coninodis*, *O. desertorum*, and *O. insularis*. Although the catalog closely followed the treatment of the genus by Creighton (1950), it was a matter of not having the information from Brown (1976) available in time for printing and editing the catalog. Nevertheless, this created a confusing situation for anybody trying to identify *Odontomachus* species in the US. Specimens of eastern species are still labeled as *O. insularis* in some collections. This confusion was mostly clarified by Deyrup *et al.* (1985) in their treatment of southeastern *Odontomachus*. Deyrup *et al.* (1985) followed Brown (1976) in the recognition of *O. clarus* as the only western species, but determined that there were actually three species in Florida: *O. brunneus*, *O. clarus*, and *O. ruginodis*, reviving the third species from synonymy. Deyrup and Cover (2004) later discovered that the species previously considered to be *O. clarus* from Florida was actually a distinct, allopatric species, which they described as *O. relictus*. We have determined that another species, *O. haematodus*, native to South America, has recently become established along the Gulf Coast. No reliable records of this species occurring in other regions of North America were found. *Odontomachus haematodus* has actually been in the southeastern region since at least the 1950's, but has been identified as *O. bauri* Emery, *O. brunneus*, *O. ruginodis*, and probably *O. insularis* until recently, when its true identity was realized. Thus, at present, we recognize six species occurring in the US, including *O. desertorum*. We revive *O. desertorum* from synonymy and elevate it to species based on worker and male morphology, distribution, and habitat preference.

*Odontomachus desertorum* was described by Wheeler (1915) as a subspecies of *O. haematodus*, and was treated as such by M.R. Smith (1939) and Creighton (1950) until the name was synonymized with *O. clarus* by Brown (1976). Brown merely noted that *O. desertorum* is large and richly colored and did not provide justification for his synonymy. Here, workers and males of *O. desertorum* were found to be well outside of the bounds of variation observed in *O. clarus*, being not only larger, but also having sculptured propleurae, a shorter pronotal cervical lobe, longer scapes, and a distinct petiolar form. Male *O. desertorum* are separable from *O. clarus* at a glance due to their yellow-brown coloration and distinct petiolar sternum morphology (see Fig. 10 in the key). Smith (1939) previously noted that the two species may occur within a few miles of one another, strongly suggesting that their distinct morphologies as observed here are maintained by reproductive isolation. Finally, *O. clarus* and *O. desertorum* display different habitat preferences, with *O. clarus* having a widespread distribution in dry forested habitats in Texas, mountainous Arizona, central Louisiana, and central Mexico, while *O. desertorum* is restricted to the Sonoran Desert of Arizona and Mexico.

In the US, *Odontomachus* nests are located in the soil, under rocks, in leaf litter, in rotting logs, in mulch, and in standing dead trees or dead parts of trees with nests observed in trees as high as 2.0 m above ground level. Most native species in the United States are found in natural habitats with sandy soils, although the introduced species *O. haematodus* and *O. ruginodis* may be found in both urban and natural habitats. Soil type for *O. haematodus* is less important as it often nests in rotting wood, leaf litter, under mulch, or in tree cavities instead of in the soil. Typically nocturnal, members of this carnivorous genus may be occasionally observed during the day as they forage for prey with their mandibles held open at a 180° angle. The mandibles of a worker are spring-loaded and can be snapped rapidly together on prey or forcibly closed against a surface or other organism to propel itself off the ground backwards or upwards, leading prior authorities to call *Odontomachus* “leaping ants” (Patton 1894). In a study of a related species, *O. bauri* Emery, workers were measured jumping upward as a defensive movement from 1.0–6.0 cm, but in escape jumps, which were in horizontal trajectories, distances covered were from 5.0–40 cm (Patek *et al.* 2006). The comparative biology of *Odontomachus* and three other trap-jaw lineages of ants was recently reviewed by Larabee and Suarez (2014). *Odontomachus* species can inflict a painful sting; however, native species found in the US are not typically aggressive and do not usually sting humans unless handled. This is not the case for *O. haematodus*, which aggressively defends its nest by immediately stinging intruders, and may thus be considered a notable, potentially invasive species.

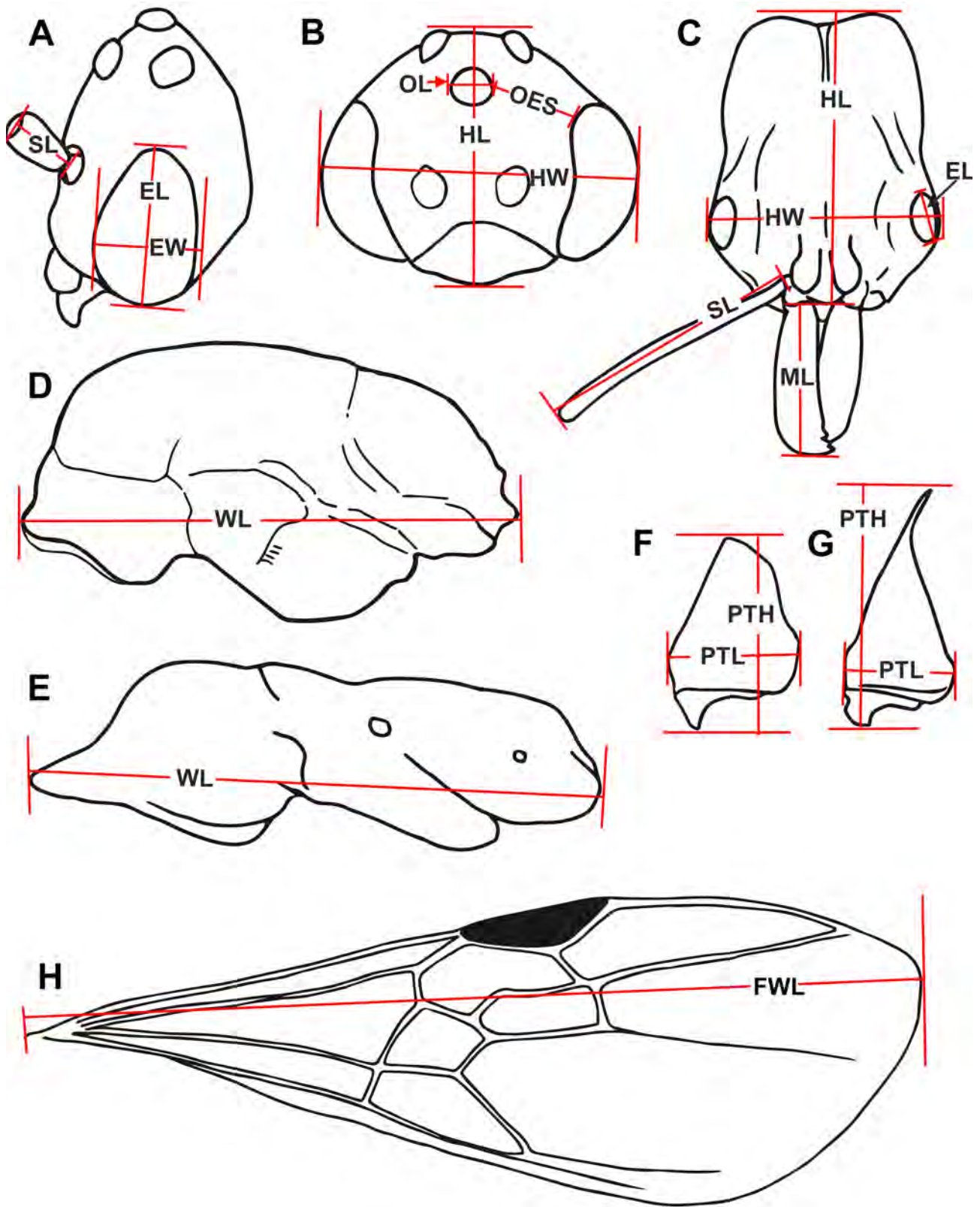
## Materials and methods

Material was collected for this study by members of the Mississippi Entomological Museum (MEM), Mark Deyrup (Archbold Biological Station, FL, ABS), John T. Longino (University of Utah, UT, JTLC), Philip S. Ward (University of California, Davis, CA, PSWC) and various other private collectors in the region (see acknowledgments). Additional specimens were examined from the University of Auburn Collection (AUEM), University of Georgia Collection of Arthropods (UGCA), the Louisiana State Arthropod Museum (LSAM), University of Texas at El Paso (UTEP), the Smithsonian National Collection (USNM), the Los Angeles County Museum of Natural History (LACM), the R.M. Bohart Museum of Entomology at University of California, Davis (UCDC), the Utah Museum of Natural History (UMNM), the Harvard Museum of Comparative Zoology (MCZC), University of Michigan Museum of Zoology (UMMZ), and the Department of Entomology at the University of Illinois at Urbana-Champaign. Voucher specimens of all species from this study are stored in the MEM and ABS collections. Locality data of *O. desertorum* (from Mexico and the US) and *O. haematodus* specimens from the US are given (see Appendix 1), but specific data are not supplied for other US species.

Genitalia were dissected and examined in 95% ethanol and genitalic sclerites were slide-mounted for imaging. Male genitalic terminology follows Boudinot (2013), with particular additions for unique structures of *Odontomachus* (see Diagnosis section below). Photomicrographs were captured using two different imaging systems. For most images, a Leica DFC 495 digital camera mounted on a Leica Z16 Microscope with motorized z-stepping was used, and image stacks were merged using Leica Application Suite V 4.1.0 with Montage Module. For some images, a JVC KY-F7U digital camera mounted on a Leica MZ 16A microscope with motorized z-stepping was used; these image stacks were merged using Auto-Montage Pro v. 5.02 or Zerene Stacker 1.0. All images were edited in Photoshop CS5. Measurements were made either using a reticule placed in a 10X eyepiece of a Leica MZ16 stereomicroscope at a magnification of 10–100X, or with a dual-axis Autometrics digital stage micrometer situated beneath a Wild Heerbrug stereomicroscope at a magnification of 25–50X. All measurements given are in millimeters; indices are not provided as they were found to be uninformative in most cases.

Measurements (also see Fig. 1)

EL	Eye Length. Maximum length of eye in lateral view.
EW	Eye Width. Maximum width of eye in lateral view (not measured for workers).
FWL	Forewing Length. Maximum length of forewing (when present).
HL	Head Length. Maximum length of head, excluding mandibles, measured from anterior margin of clypeus to occipital carina in full-face view.



**FIGURE 1.** Measurements of *Odontomachus* species. (A) Head of male approximately in profile: eye length (EL), eye width (EW), and scape length (SL). (B) Head of male in full-face view: head width (HW), head length (HL), median ocellar length (OL), and distance between lateral ocellus and edge of compound eye (OES). (C) Head of worker in full-face view: EL, HL, HW, scape length (SL), and mandibular length (ML). (D) Mesosoma of male in profile view showing Weber's length (WL). (E) Mesosoma of worker in profile view showing WL. (F) Petiole of male in profile view: petiole height (PTH) and petiole length (PTL). (G) Petiole of worker in profile view: PTH and PTL. (H) Forewing of male showing forewing length (FWL).

HW	Head Width. Maximum width of head including eyes in full-face view.
ML	Mandible Length. Measured from posterior margin of clypeus to apex of mandible in dorsal view (not measured for males).
OL	Ocellar length. Maximum length of median ocellus.
OES	Ocellar Eye Space. Minimum distance from lateral ocellus to compound eye (only measured in males)
PTH	Petiole Height. Maximum height of petiole from base (including subpetiolar process) to an imaginary line tangential to the apex as measured in profile view.
PTL	Petiole Length. Maximum length of petiole in profile view.
SL	Scape Length. Maximum length of scape excluding basal constriction.
WL	Weber's Length. Mesosomal length, measured from anterior edge of pronotum to posterior corner of metapleuron in profile view. Note that this is an atypical definition of Weber's Length, because it includes the anteriormost projection of the pronotum, which is often hidden by the head capsule in lateral view.

## Diagnosis

### Diagnosis of Nearctic *Odontomachus*

(Figs. 12–25)

*Workers* can be recognized by the following characteristics: Body large (TL 7.0–9.5 mm; WL 2.44–3.48 mm); head uniquely shaped (Fig. 1C), longer than wide in full-face view; occipital carina V-shaped; supra-ocular ridge present, prominent; strong, longitudinal median furrow present on frons and vertex, extending from anterior apex of occipital carina; mandibles long, linear, and inserted in the middle of the anterior margin of head (as seen in full-face view), with tips abruptly turned inward, with 2 or 3 teeth present apically in a vertical series and with denticles present along inner border; palpal formula 4, 3; antennae 12-merous, scape long, almost reaching posterior border of head. Petiole large, conical to subconical; height of node much greater than axial length of petiole, node often with apical spine on node, and with prominent anteroventral subpetiolar process present. Gaster elongate, somewhat oval shaped, with prominent sting. Tibial spur formula 2(1s,1p), 2(1s,1p); Meso- and metatibia each with a small, simple spur anterior to a large, pectinate spur.

*Queens* may be recognized by the characters indicated above for workers, with the following differences: Slightly larger; ocelli present; with fully developed wings which have the ancestral-formicid venational pattern: Marginal cell 1, submarginal cells 1 and 2, discal cell 1, and subdiscal cell 1 closed; hindwing jugal lobe present; thoracic region of mesosoma with associated enlargement for flight muscles.

*Males* are slender in appearance with approximately oval heads that are wider than long in full-face view; antennae 13-merous, scape very short, and funiculus extremely long; compound eyes large, bulging; ocelli large; mandibles reduced, usually lacking teeth; palpal formula 5, 3; tibial spur formula as in worker and queen; subpetiolar process long, subtriangular or truncate; gaster elongate, lacking sculpture; pre- and postsclerites of gastral segment II with weak cinctus; abdominal tergum VIII produced as long sharp spine overhanging genitalia; abdominal sternum IX apically strap-shaped, long and narrow; pygostyles present, digitate. Wings fully developed, with venation and form similar to that indicated for queen (Fig. 1H), and with jugal lobe present. Genitalia with the following characteristics: Abdominal sternum IX with anterior margin approximately linear, lateral margins of disc subparallel, and with long tongue-like posterior lobe. Cupula well-developed, long; basimere length usually greater than height in profile view and ventroapically separated from telomere by membrane; telomere variably wedge-shaped; cuspis long and dorsoventrally elongated, dorsoventral height approximately one-third length; digitus with abruptly thickened apical club, dorsoventral height of digitus about equal to that of cuspis; valvura arcuate, anterior apex directed anterodorsally (VU in Fig. 25G); valviceps subrectangular (VU in Fig. 25G), with ventral margin sinuate, serrate, and produced anteriorly (cranially, AVP in Fig. 25G) and posteriorly (caudally, AP in Fig. 25G); valviceps with dorsolateral carina that curves ventrally near valviceps apex and juts laterally (DLC in Fig. 25G), producing a lamina that extends apically along the lateral apodeme (SAL in Fig. 25G); valviceps with ectal (lateral) diagonal sclerotization extending posterodorsally from near valvura base to apicodorsal lobe of valviceps (DS in Fig. 25G).

## Discussion of male utility in *Odontomachus* taxonomy

While our knowledge of male ants has been increasing at the regional and generic level, our species-level knowledge of male ants is still in its infancy. Literature in which males are treated at the species level and in which synthetic keys are provided are historically rare and taxonomically restricted, but have been published at a rapid rate recently (*e.g.*, Yoshimura & Fisher 2012; Boudinot & Fisher 2013; Boudinot *et al.* 2013; Yoshimura & Fisher 2014). As more male ants are associated with workers, and as more focus has been directed on male ants, the general presumption that males are too morphologically stable (Wheeler 1910) for taxonomy has changed. The present study confirms the findings of prior works relying on male *Odontomachus* for alpha taxonomy (Deyrup *et al.* 1985; Deyrup and Cover 2004), and expands on the utility of males for the genus.

The taxonomy of Nearctic *Odontomachus* species, as indicated in the Introduction section, has undergone considerable shifting at both the specific and subspecific levels. Both of the recent Nearctic *Odontomachus* species descriptions have been supported by male characters (Deyrup *et al.* 1985; Deyrup and Cover 2004). During the present study a spectrum of taxonomically informative variation was found for both genitalic and non-genitalic characters. With respect to non-genitalic characters, the most informative variation displayed by Nearctic *Odontomachus* was in ocellar development, petiole structure, and—surprisingly—color. Sculpture was found to be variable both among and within species, with the mesoscutum and propodeum displaying the most meaningful variation. Except for ocellar proportions, seemingly all non-genitalic morphometrics scale isometrically, with the majority of Nearctic species' measurements on the same line of isometry (results not shown). Workers are quite uniform in proportion for the Nearctic region as well. Absolute measurements are thus more informative than indices for Nearctic *Odontomachus*, however morphometrics for *Odontomachus* may prove to be more valuable in regions with greater species diversity; the genitalia have yet to be assessed quantitatively. Although wing venation was not found to be informative for Nearctic *Odontomachus*, wing venation should not be ignored in the study of males.

While male *Odontomachus* were found to be identifiable without reference to genitalia, several genitalic characters were found to be valuable for parsing species boundaries. The most informative genitalic elements were found to be the ninth abdominal sternum, telomere, and valviceps, which varied most conspicuously among species; the cupula, basimere, and volsellae are only subtly differentiated among species. To understand variation of the ninth sternum, two taxon-specific characters need to be defined: (1) The disc of the ninth sternum is comprised of the broad anterior area which is posteriorly delimited by the strong medial inflexions (shoulders), and punctuated anteromedially by the spiculum, a spiniform apodeme upon which muscles attach (Boudinot 2013). (2) The posterior lobe of the ninth sternum is a posterior tongue-like flat process that extends caudally, and its length is determined by the anterolateral (basolateral) inflection points. Both the disc and the posterior lobe were found to vary informatively in shape and proportion, with some species being easily recognizable by these sternal characters. The telomere varied more subtly than the valviceps and ninth sternum, a fact that may be compounded by examination method (*e.g.*, slide mounting). Variation of the valviceps was predominantly observed with respect to proportions of the various areas and structures defined in the diagnosis above. These structures are of interest, as, at least among Nearctic Ponerinae, the dorsolateral carina and subapical lamina of the valviceps are unique, with all other Nearctic ponerines lacking these two structures, and for also being present in Oriental *Odontomachus* (illustrated in Ogata 1987).

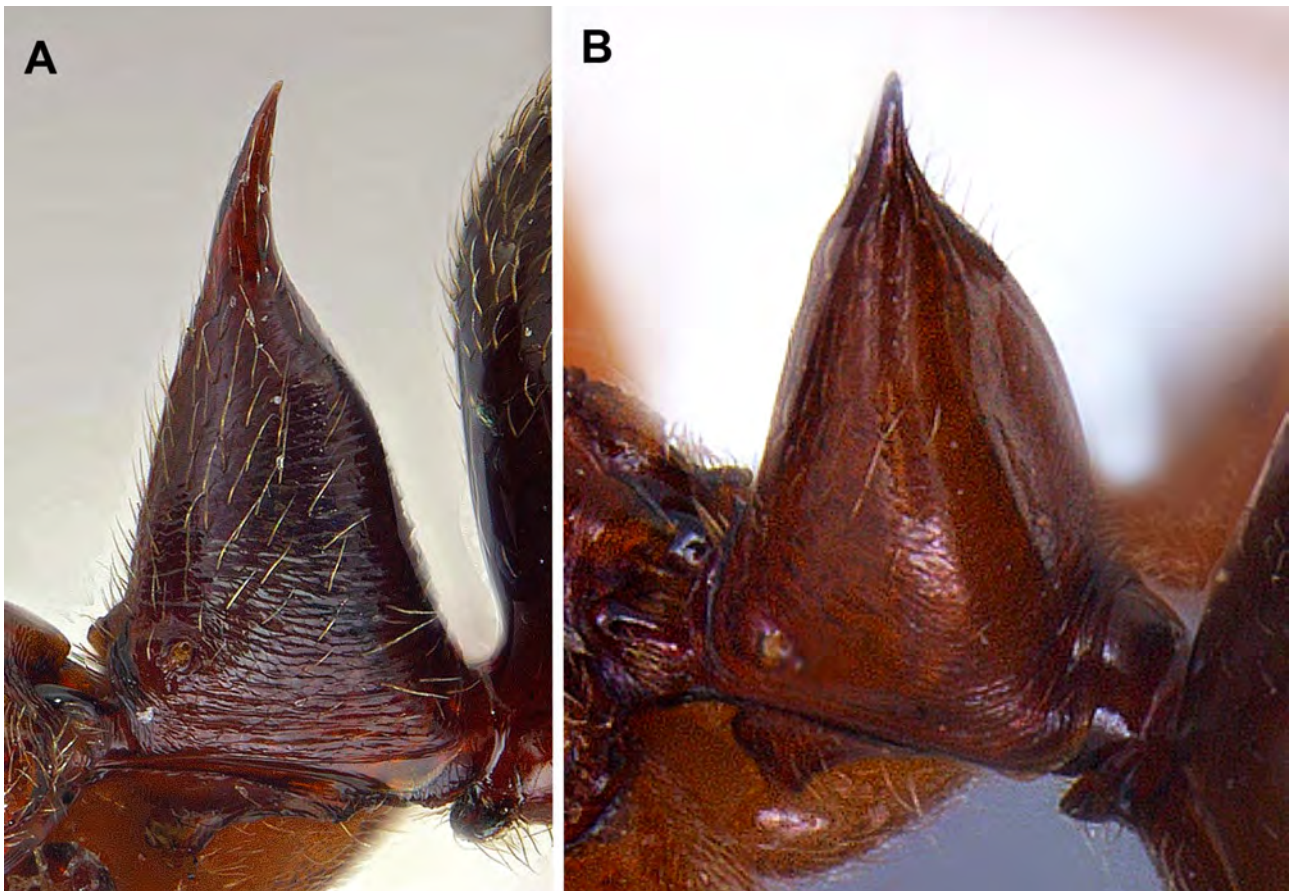
Future work on *Odontomachus* will decidedly benefit from emphasizing males, as they are not only abundant in collections (*pers. obs.*) but are also now more easily associable with the female castes using COI barcoding and other molecular methods. Undoubtedly more male-based characters of alpha-taxonomic value will be discovered for *Odontomachus* and other ponerine and non-ponerine genera. For *Odontomachus* in particular, future research on males of the genus may contribute to the resolution of the phylogenetic position of *Anochetus*, which may be either sister to or nested within *Odontomachus* (Schmidt 2013).

## Identification keys

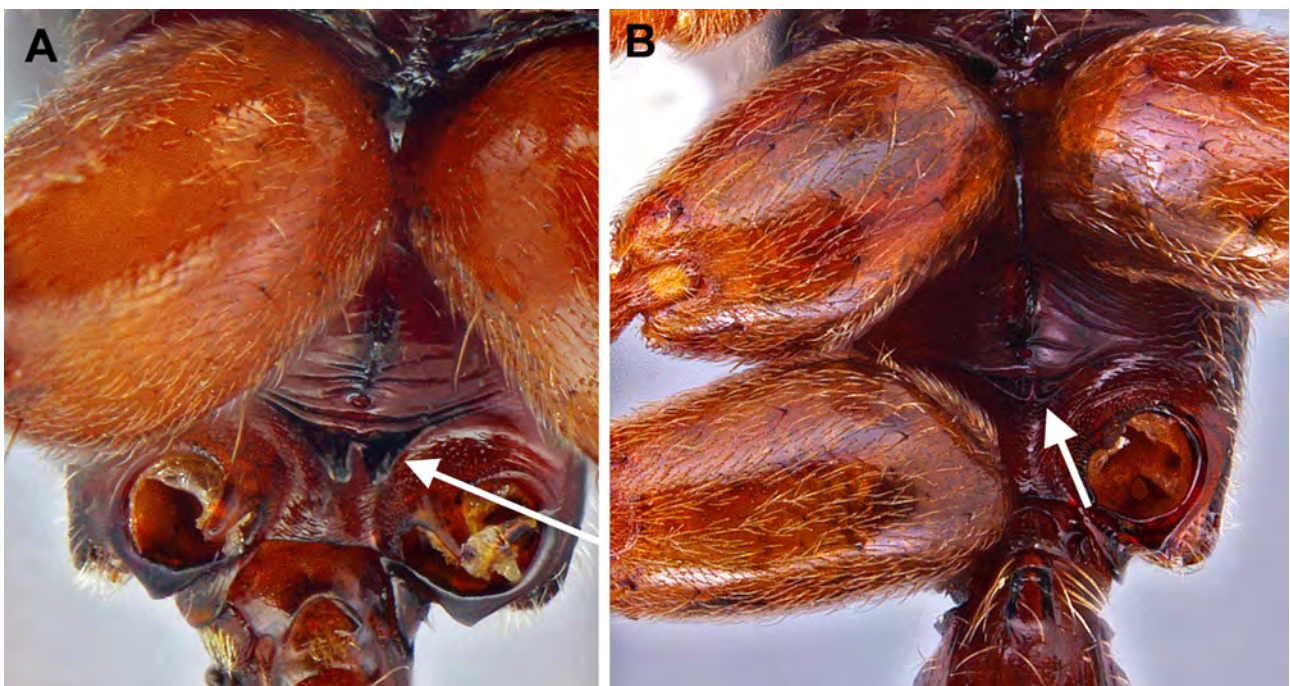
The keys presented below are for the identification of all North American species of *Odontomachus* north of Mexico.

**Key to workers and queens**

- 1 Petiole with conspicuous transverse striae (Fig. 2A) ..... 2  
 - Petiole smooth, lacking transverse striae, or with at most, only a few feeble striae basally (Fig. 2B) ..... 3

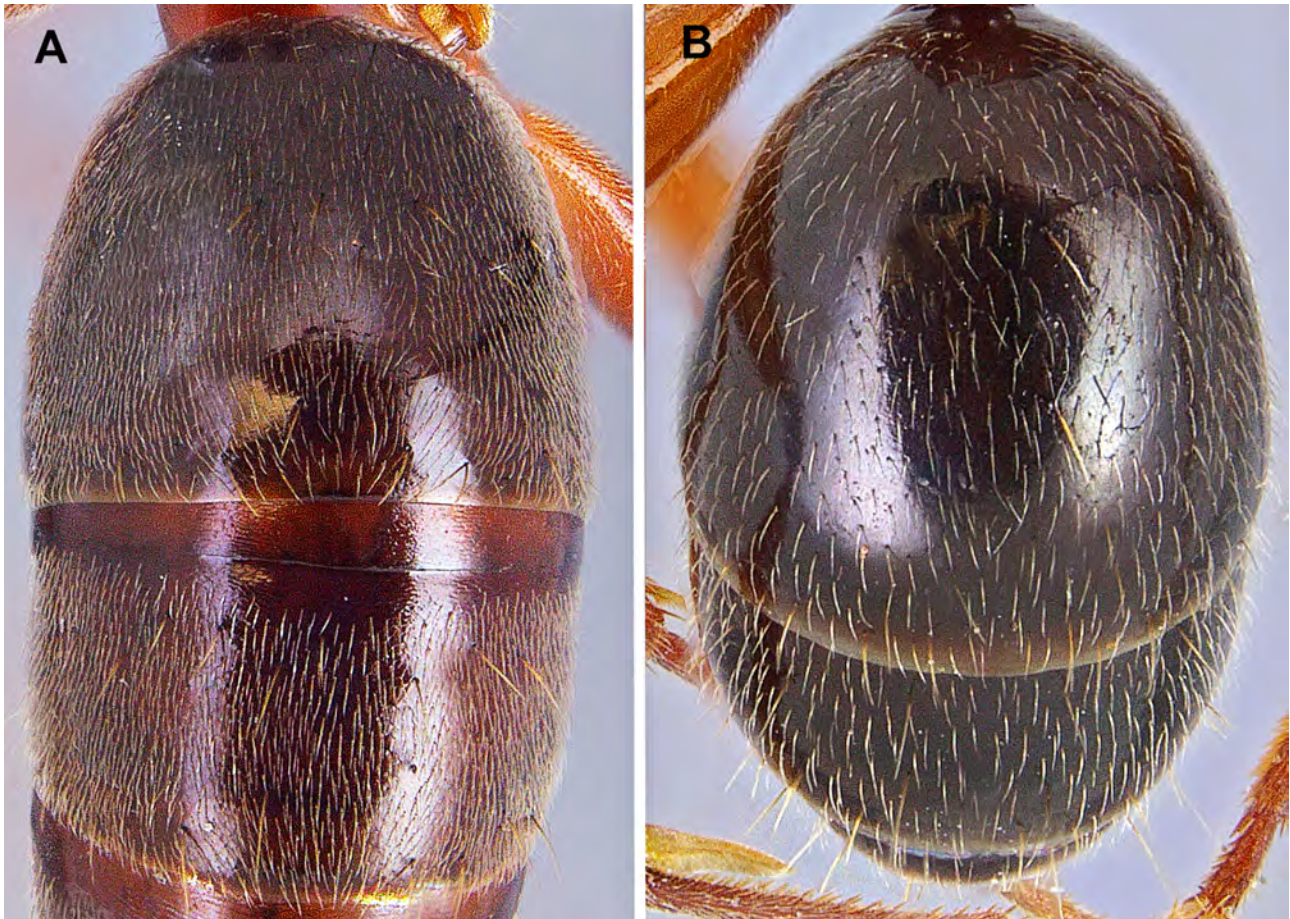


**FIGURE 2.** Worker petioles, profile view: (A) *O. ruginodis* and (B) *O. clarus*.



**FIGURE 3.** Worker metasterna, anteroventral oblique view: (A) *O. haematodus* with both hindcoxae removed, arrow indicating elongate metasternal processes and (B) *O. ruginodis* with one hindcoxa removed, arrow indicating cleft ridge.

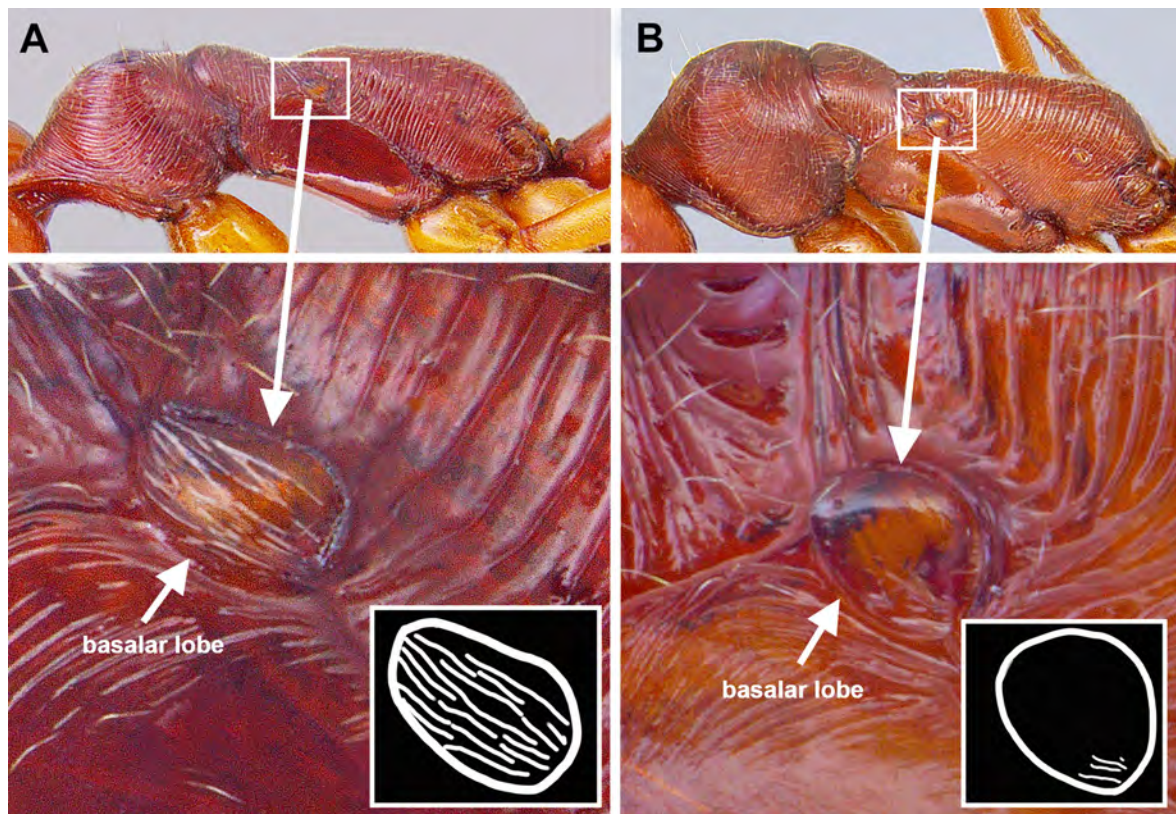
- 2 Large, HL usually greater than 2.5 mm, WL usually greater than 3.0 mm; transverse striae on petiolar node conspicuous anteriorly, laterally, and posterobasally, but reduced or lacking on remainder of posterior region; metasternum with paired, elongate, slender, spiniform processes present (Fig. 3A) (it may be necessary to remove one hind leg including coxa to see this character) (Gulf Coast) ..... *O. haematodus* (L.)
- Smaller, HL usually less than 2.5 mm, WL usually less than 2.75 mm; petiole with coarser striae on the posterior side, finer striae basally on the sides and front; metasternum with notched ridge, but not projecting as elongate spiniform processes (Fig. 3B) (peninsular FL) ..... *O. ruginodis* M. R. Smith
- 3 Pubescence on first tergite of gaster extremely fine and dense, spaces between hairs less than 1/3 as wide as length of hairs (Fig. 4A) (GA to MS) ..... *O. brunneus* (Patton)
- Pubescence on first tergite of gaster sparse, spaces between hairs at least 1/2 as wide as length of hairs (Fig. 4B) ..... 4



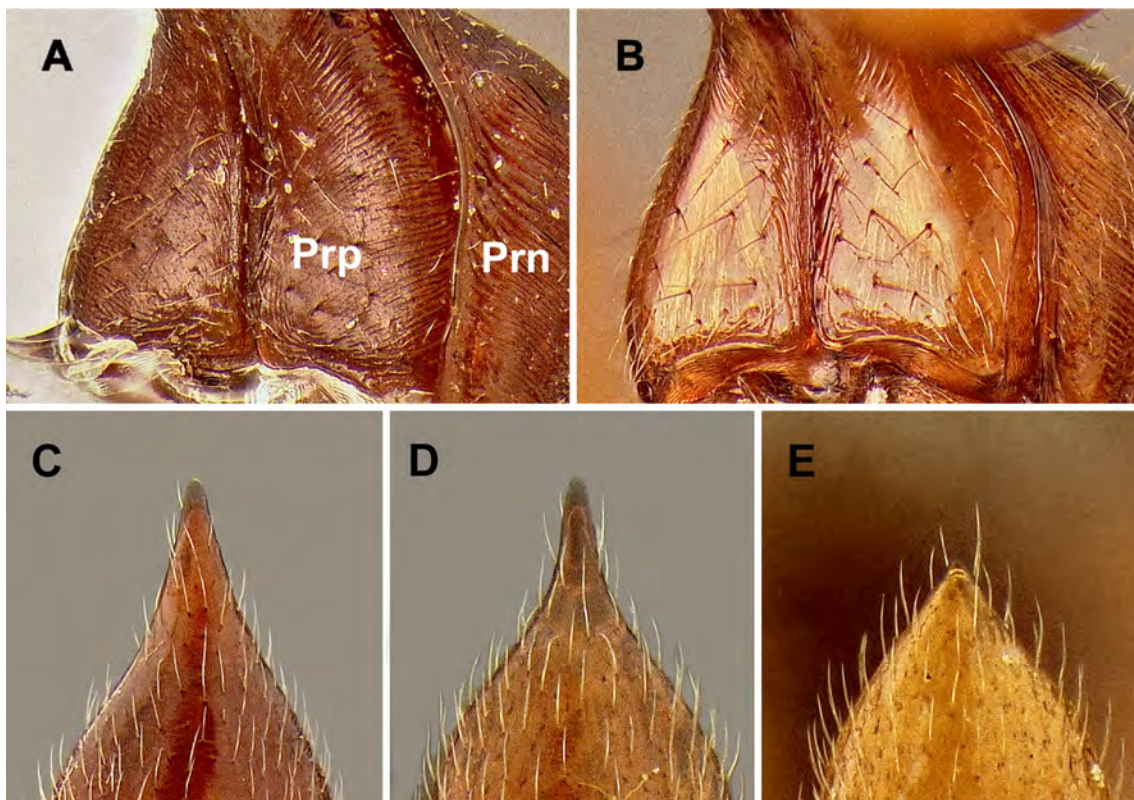
**FIGURE 4.** First gastral tergites of workers, dorsal view: (A) *O. brunneus* and (B) *O. clarus*.

- 4 Basalar lobe striate, ovate in shape (Fig. 5A) (endemic to sand ridges of south-central peninsular FL) ..... *O. relictus* Deyrup and Cover
- Basalar lobe mostly smooth, spheroid (Fig. 5B) (west of the Mississippi River) ..... 5
- 5 Large, HL > 2.5 mm, WL > 3.0 mm; propleurae almost entirely striate or otherwise roughened (Fig. 6A); cervical lobe of pronotum wider than long in dorsal view with width measured from the posterior inflection points; scapes long (SL/HW = 1.11–1.15); dorsomedian process of petiole in anterior view spiniform, long, thick at base, and poorly differentiated from rest of node (Fig. 6C) (Sonoran Desert, AZ, Mexico) ..... *O. desertorum* Wheeler
- Smaller, HL ≤ 2.2 mm, WL ≤ 2.8 mm; propleurae almost entirely smooth and shining, with sculpture restricted to portions of lateral margins (Fig. 6B); cervical lobe of pronotum longer than wide in dorsal view with width measured from the posterior inflection points; scapes shorter (SL/HW = 0.99–1.07); dorsomedian process of petiole in anterior view either stoutly conical or spiniform, short, narrow at base, and strongly differentiated from rest of node (Fig. 6D, E) (LA, SW US, and north and central Mexico) ..... *O. clarus* Roger





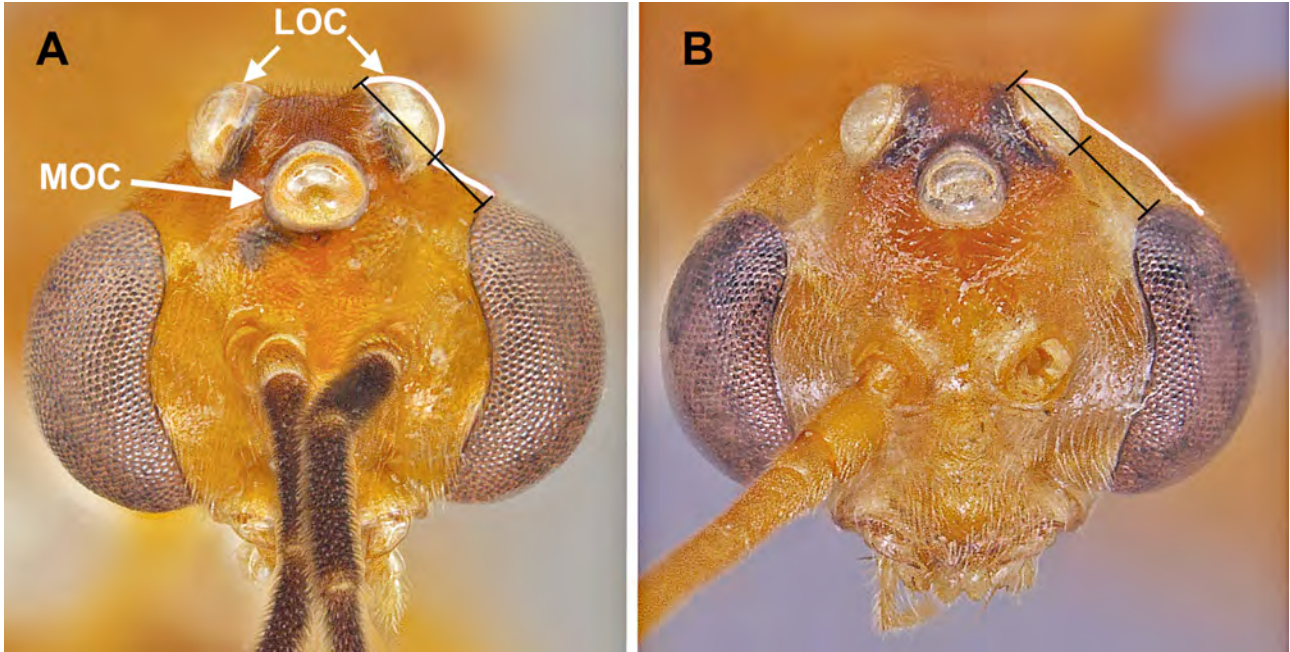
**FIGURE 5.** Worker basalar lobes: (A) *O. relictus*, basalar lobe ovate, with striae (inset at bottom right with simple diagram showing strial pattern of basalar lobe) and (B) *O. clarus*, basalar lobe spheroid, mostly smooth (inset with simple diagram showing general lack of sculpture of basalar lobe).



**FIGURE 6.** Worker propleurae (prp) and pronota (prn), ventrolateral oblique view: (A) *O. desertorum*, note striations on propleurae, and (B) *O. clarus*, note the smooth propleurae; and worker petiolar nodes, anterior view: (C) *O. desertorum* and (D, E) *O. clarus*.

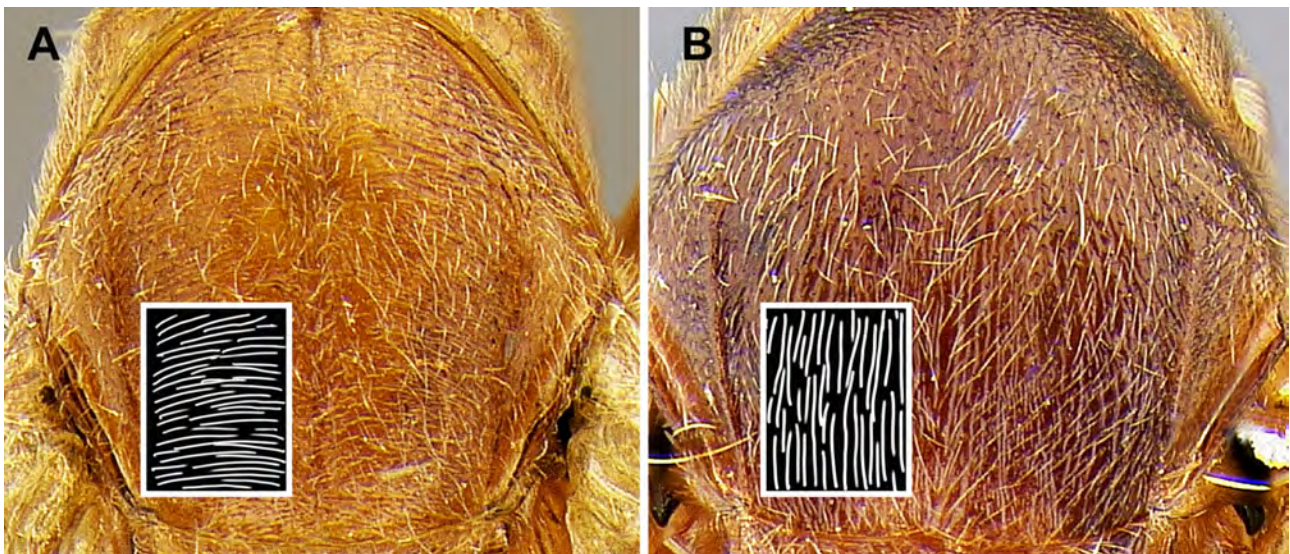
**Key to Males**

- 1 Ocelli large, maximum diameter of each ocellus greater than distance between lateral ocellus and compound eye ( $OL \geq 0.22$  mm;  $OES \leq 0.16$  mm); lateral ocelli conspicuously projecting beyond posterior border of head in full-face view (Fig. 7A) . . . 2
- Ocelli smaller, maximum diameter of each ocellus less than or equal to distance between lateral ocellus and compound eye ( $OL \leq 0.20$  mm;  $OES \geq 0.20$  mm); lateral ocelli indistinctly projecting beyond posterior border of head in full-face view (Fig. 7B) . . . . . 3



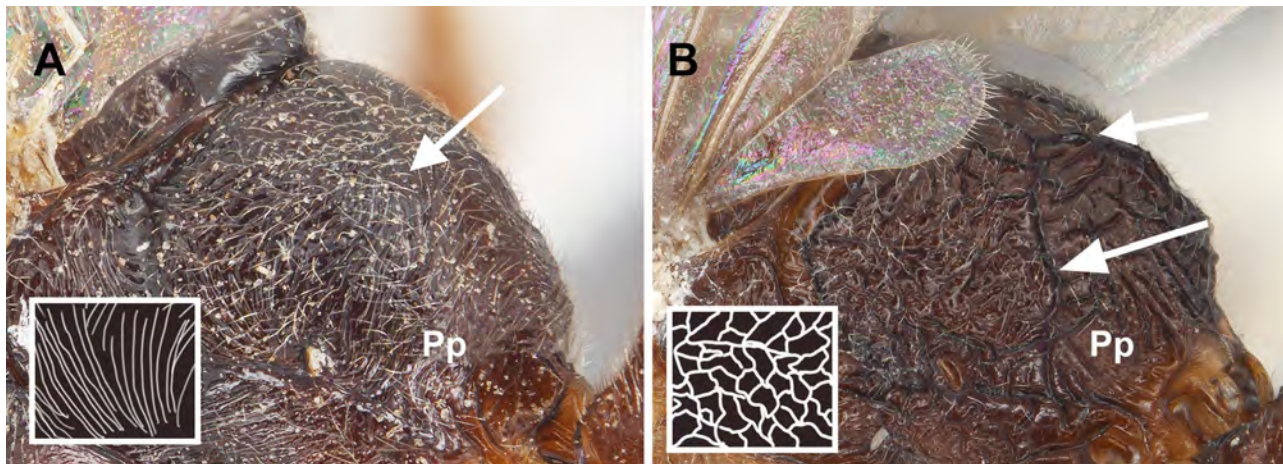
**FIGURE 7.** Male heads, full-face view: (A) *O. brunneus* and (B) *O. haematodus*. LOC = lateral ocelli, MOC = median ocellus.

- 2 Body entirely yellow; scape and pedicel yellow, funiculi distal to pedicel brown; mesoscutum transversely striate (Fig. 8A); clypeus (excluding supraclypeal area) about as long as broad . . . . . *O. brunneus* (Patton)
- Body light brown to dark brown; entire antenna yellow; mesoscutum predominantly longitudinally striate (Fig. 8B); clypeus (excluding supraclypeal area) distinctly longer than broad . . . . . *O. relictus* Deyrup and Cover



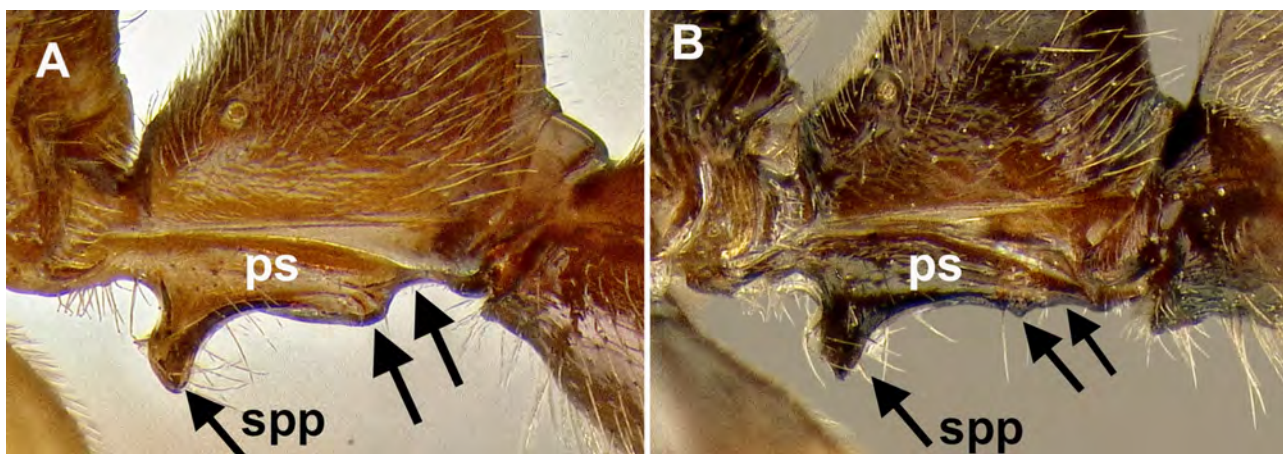
**FIGURE 8.** Male mesoscuta, dorsal view: (A) *O. brunneus* (inset shows transverse striae) and (B) *O. relictus* (inset shows longitudinal striae).

- 3 Propodeum finely striate (Fig. 9A); posterior face of propodeum rarely offset from dorsal and lateral faces by distinct carina (Fig. 9A); antennae brown or infuscated, at least apically . . . . . 4
- Propodeum coarsely rugose (Fig. 9B); posterior face of propodeum always offset from dorsal and lateral faces by distinct, arcing carina (Fig. 9B); antennae entirely yellow . . . . . 5



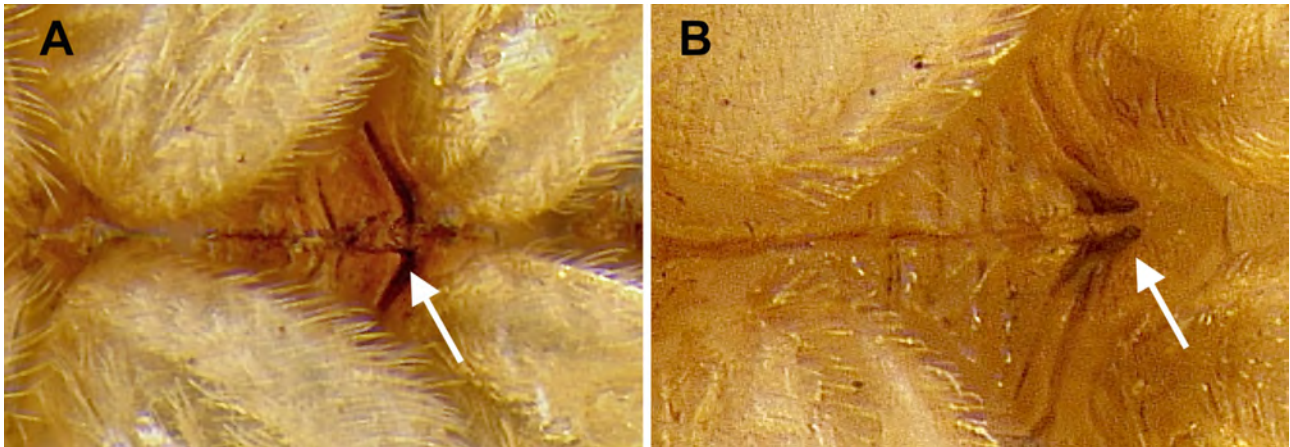
**FIGURE 9.** Male propodea (Pp), oblique view: (A) *O. clarus* (rectangular inset shows striate sculpture, arrow indicates lack of obvious propodeal carina) and (B) *O. ruginodis* (rectangular inset shows reticulated sculpture, arrows point to propodeal carina).

- 4 Large (WL 2.61–3.06); petiolar sternum with conspicuous process near the posterior margin, distinctly angular in profile view; petiolar sternum near posterior margin mostly glabrous (lacking setae); anterior subpetiolar process digitate apically (Fig. 10A); body entirely light brown, appendages honey yellow . . . . . *O. desertorum* Wheeler
- Smaller (WL 2.39–2.65); petiolar sternum without process near posterior margin; petiolar sternum near posterior margin with paired setae; anterior subpetiolar process triangular apically (Fig. 10B); body entirely dark brown to black, appendages lighter brown. . . . . *O. clarus* Roger



**FIGURE 10.** Male petiolar sterna (ps), profile view: (A) *O. desertorum*, left arrow indicates subrectangular subpetiolar process (spp), middle arrow indicates the angular posterior process of the petiolar sternum, and right arrow points to the depressed region behind the posterior angled process; and (B) *O. clarus*, left arrow indicates triangular subpetiolar process, middle arrow points to tubercles with setae, and right arrow indicates the lack of angular posterior process and accompanying shallow depression.

- 5 Propodeum dark brown; lateral face of petiolar node conspicuously striate, with striae extending up posterior face of node nearly to petiolar apex; metasternum with short, broad, lip-like processes anterior to metacoxae (Fig. 11A) . . . . . *O. ruginodis* M.R. Smith
- Body entirely yellow; lateral face of petiolar node rugulose, without conspicuous striae, posterior face of node with at most one stria; metasternum with elongate, narrow, spine-like processes anterior to metacoxae (Fig. 11B) . . . . . *O. haematodus* (Linnaeus)



**FIGURE 11.** Male metasterna, anteroventral oblique view, with arrow indicating sternal processes: (A) *O. ruginodis* and (B) *O. haematodus*.

### Species account

#### *Odontomachus brunneus* (Patton, 1894)

(Figs. 4, 7, 8, 12, 13, 24, 25, 26)

*Atta brunnea* Patton 1894: 618 (worker) Georgia, USA.

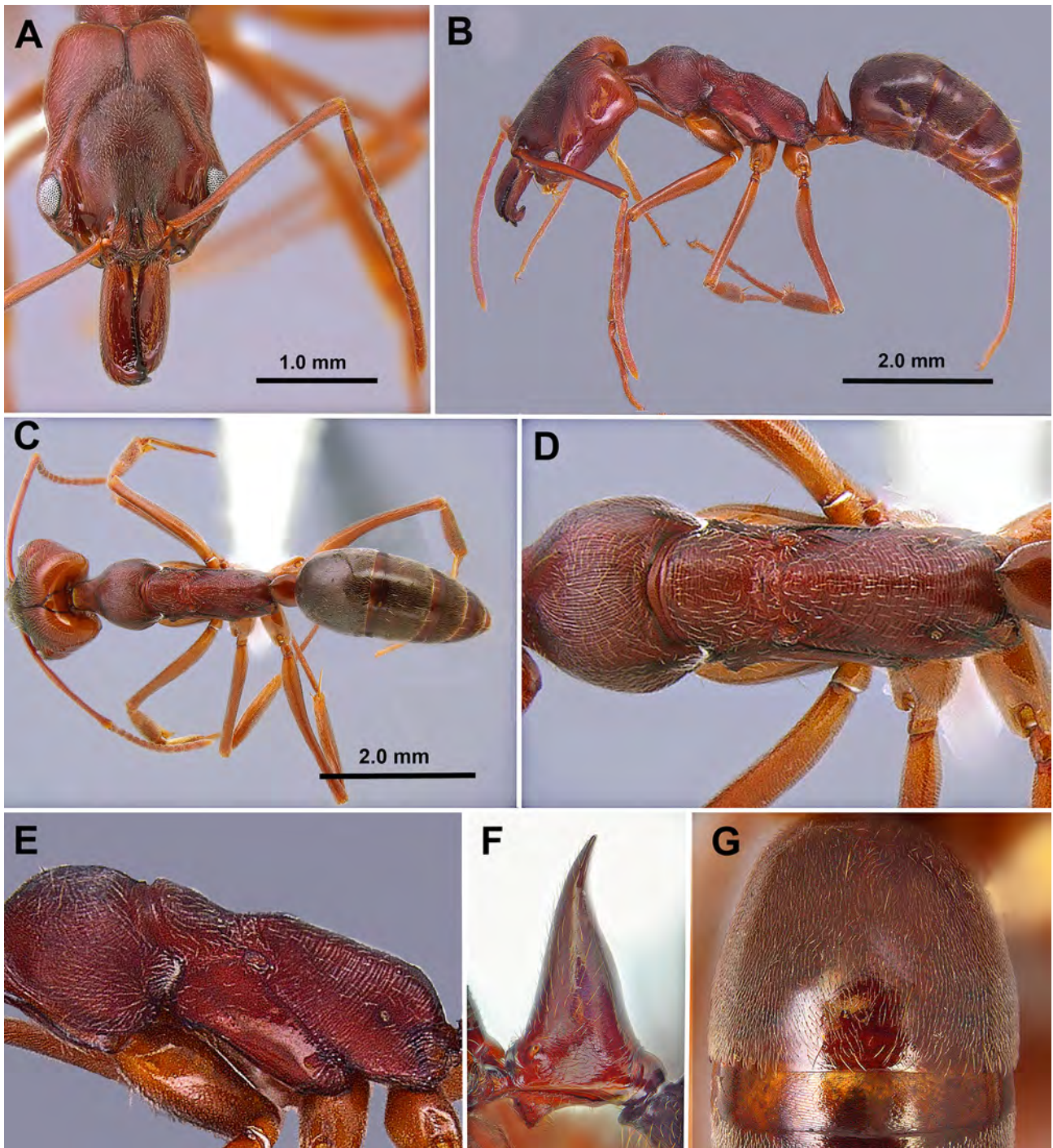
*Odontomachus brunneus* (Patton, 1894); Emery, 1895: 268 (as junior synonym of *Odontomachus insularis* Guérin-Méneville, 1844); Brown, 1976: 103, 139 (as senior synonym of *O. fuscus*); Deyrup, Trager & Carlin, 1985: 191 (male).

*Odontomachus fuscus* Stitz, 1925:115; Brown, 1976: 103, 139 (unresolved junior homonym of *Odontomachus fuscus* Stitz, 1916: 372).

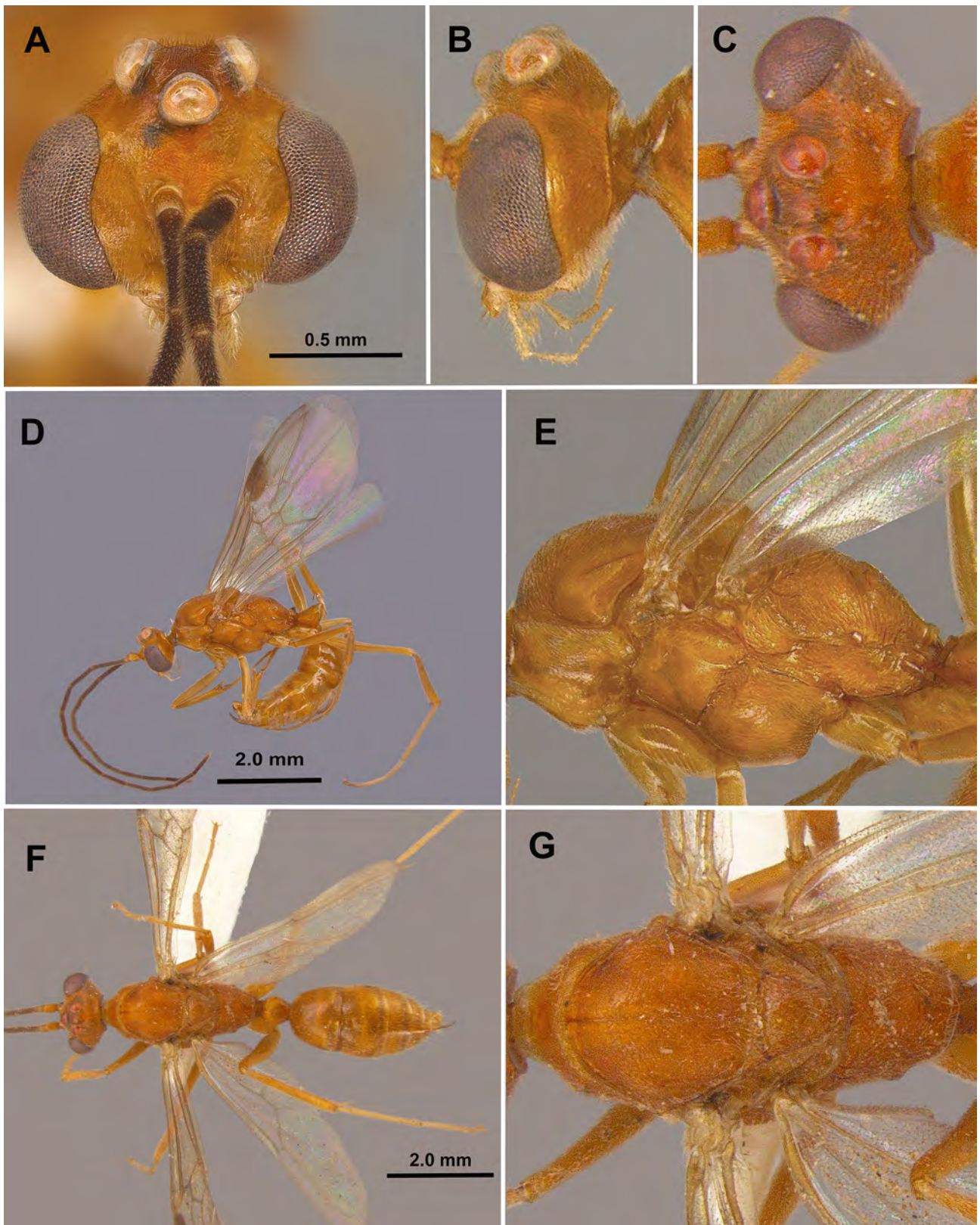
**Diagnosis.** Workers of this species are distinguished from others in our region by the much finer and denser pubescence on the first gastral tergite. Males are yellow-colored and most easily confused with those of *O. haematodus*; those of *O. brunneus* are clearly separated by the following characters: 1) ocelli larger, projecting beyond the posterior border of the head; 2) metasternal processes short, not elongate and spine-like; 3) posterior face of propodeum not offset from dorsal and lateral faces by distinct carina, and by numerous genitalic characters (see Figs. 24, 25). Male *O. brunneus* are further separated from other US species by the transverse mesoscutal striae, and by the anteroposteriorly slender mesosoma. Genitalia of *O. brunneus* are most similar to those of *O. ruginodis* and *O. clarus*, but are distinguished from these two species by the following characters (see Figs. 24, 25): abdominal sternum IX narrower and longer than *O. clarus*, and broader than *O. ruginodis*; telomere apex broadly rounded, posterodorsal margin nearly linear (apex narrower and posterodorsal margin sinuate in *O. clarus* and *O. ruginodis*); valviceps apicodorsal lobe broad (narrow in *O. clarus*), subapical lamina narrow (broad *O. clarus* and *O. ruginodis*). *Odontomachus brunneus* has the proportionally shortest (dorsoventral) valviceps of the Nearctic species.

**Description.** Worker: HL 2.10–2.44, HW 1.58–1.92, SL 1.84–2.10, EL 0.34–0.42, ML 1.16–1.36, WL 2.44–3.00, PTH 0.96–1.20, PTL 0.48–0.52 (n=10). Entire body generally shiny except where obscured by dense pubescence; head, mesosoma, and petiole dark reddish-brown to dark brown; gaster darker brown; scape and legs brown. Head with fine, longitudinal striae covering much of the head in full-face view, striae beginning from frontal lobes and diverging toward posterior corners of head, fading at corners and sides; sides and underside of head lacking sculpture; dorsally with numerous, fine, appressed pubescence and scattered elongate, erect setae present. Pronotum with sub-circular, concentric striae that become longitudinal near rear margin; pubescence appressed, abundant; 5–8 elongate, erect setae present. Mesonotum and propodeum with deep transverse striae; propleuron, mesopleuron, and basalar lobe lacking sculpture; pubescence abundant dorsally, appressed. Metasternum lacking paired, elongate, spiniform processes between hind coxae. Petiole widest at base, gradually tapering apically to a short spine directed rearward; mostly lacking striae with only faint striae present near base;

subpetiolar process rounded triangular; appressed pubescence present anteriorly and laterally, but mostly absent posteriorly. Gaster mostly shiny beneath pubescence, lacking striae or other strong sculpture, but with fine coriaceous sculpture (seen at high magnification); fine, appressed pubescence dense, spaces between hairs less than 1/3 the length of a hair, often overlapping one another; scattered erect, elongate setae present.



**FIGURE 12.** *Odontomachus brunneus*, worker: (A) head in full-face view, (B) lateral habitus, (C) dorsal habitus, (D) mesosoma in dorsal view, (E) mesosoma in lateral view, (F) petiole in lateral view, and (G) first gastral tergite in dorsal view showing pubescence.



**FIGURE 13.** *Odontomachus brunneus*, male: (A) head in full-face view, (B) head in lateral view, (C) head in dorsal view, (D) lateral habitus, (E) mesosoma in lateral view, (F) dorsal habitus, and (G) mesosoma in dorsal view.

Male: HL 1.00–1.08, HW 1.24–1.34, SL 0.18–0.22, EL 0.68–0.76, EW 0.40–0.44, OL 0.24, OES 0.16, WL 2.52–2.76, PTH 0.72–0.88, PTL 0.46–0.54, FWL 5.10–5.65 (n=5). Head, mesosoma, and petiole generally shiny except where obscured by dense pubescence; head, meso- and metasoma, legs, scape and pedicel yellow to

yellowish-brown, remainder of funiculus brown. Head and mesosoma with abundant fine, white pubescence except on anepisternum where pubescence is mostly absent. Eyes extremely large, maximum diameter of each eye at least 70% of the length of the head in full-face view. Ocelli large, the length of each ocellus wider than distance between lateral ocellus and eye margin; in full-face view, lateral ocelli protrude beyond posterior border of head. Mesosoma: pronotum lacking sculpture; mesoscutum with fine transversely arcuate striae anteriorly, striae becoming longitudinal posteriorly; mesoscutellum raised and convex, lacking sculpture; propodeum with weak to moderately strong transverse striae laterally, and especially posterodorsally; mesopleuron mostly lacking striae. Petiole bluntly rounded apically, with rounded triangular subpetiolar process anteriorly; densely pubescent anteriorly and laterally, but reduced pubescence posteriorly. Disc of abdominal sternum IX trapezoidal, breadth slightly greater than length; posterior lobe length approximately twice maximum lobe width, basal half narrowed. Telomeral apex broadly rounded; telomere length distinctly greater than height; valviceps ventral apex strongly produced, narrow; valviceps apical margin broadly concave; vertical portion of dorsolateral carina and lateral margin of subapical lamina meeting at an angle; apicodorsal lobe of valviceps broad; subapical lamina narrow.

**Queen:** No specimens measured, but similar to workers in color and general appearance except slightly larger, with mesosoma developed for wings.

**Distribution (Fig. 26).** USA. Alabama: Baldwin and Houston Counties. Florida: Alachua, Baker, Bay, Bradford, Broward, Citrus, Clay, Collier, Columbia, Dade, De Soto, Duval, Franklin, Gadsden, Gilchrist, Glades, Hamilton, Hendry, Hernando, Highlands, Hillsborough, Indian River, Jackson, Jefferson, Lake, Lee, Leon, Levy, Liberty, Madison, Marion, Martin, Monroe, Nassau, Okeechobee, Orange, Osceola, Palm Beach, Pasco, Polk, Putnam, Sarasota, St. Lucie, Sumter, Taylor, Volusia, Wakulla, and Walton Counties. Georgia: Chatham, Clinch, Dougherty, Glynn, Lowndes, and Ware Counties. Mississippi: Harrison County. According to Deyrup and Cover (2004), the occurrence of this species in the Caribbean region and Central and South America is unclear due to historical misidentifications and nomenclatural changes. Distributional information from Deyrup and Cover (2004) and examination of specimens from the ABS, MEM, UGA, USNM, and personal collections of Dan Sutor and Doug Booher.

**Discussion.** *Odontomachus brunneus* appears to be restricted to the southeastern US. Previous records of *O. brunneus* from the Caribbean, and Central and South America (Brown 1976) all appear to be of *O. ruginodis*. The situation was clarified by Deyrup *et al.* (1985) who recognized the distinction between *O. ruginodis* and *O. brunneus* and revived the former from synonymy with the latter. Brown's statement (1976) that *O. brunneus* is well adapted to "marginal habitats is consistent with the ecology of *O. ruginodis*, whereas *O. brunneus* in the Southeast is generally found in undisturbed natural habitats.

In the US, *O. brunneus* occurs in a wide variety of natural habitats including flatwoods, mesic forests, pine savannas, swamp forests, oak-pine scrub, upland scrub, sandhills, bayheads, edges of seasonal ponds, and elevated tussocks. Nests of *O. brunneus* have been found in leaf litter, rotting logs, at tree bases, and in open to partially covered sandy areas. Nest architecture has been explored and discussed by Cerquera and Tschinkel (2010). Workers occasionally forage during the day, but are more active at night. Upon colony disturbance, workers are not aggressive, but instead quickly retreat or vacate the nest. This is in sharp contrast to the aggressive defensive stinging behavior of *O. haematodus*. Alates have been collected from May through December. This broad time frame for alate activity contrasts sharply with the early summer activity of *O. haematodus*.

### ***Odontomachus clarus* Roger, 1861**

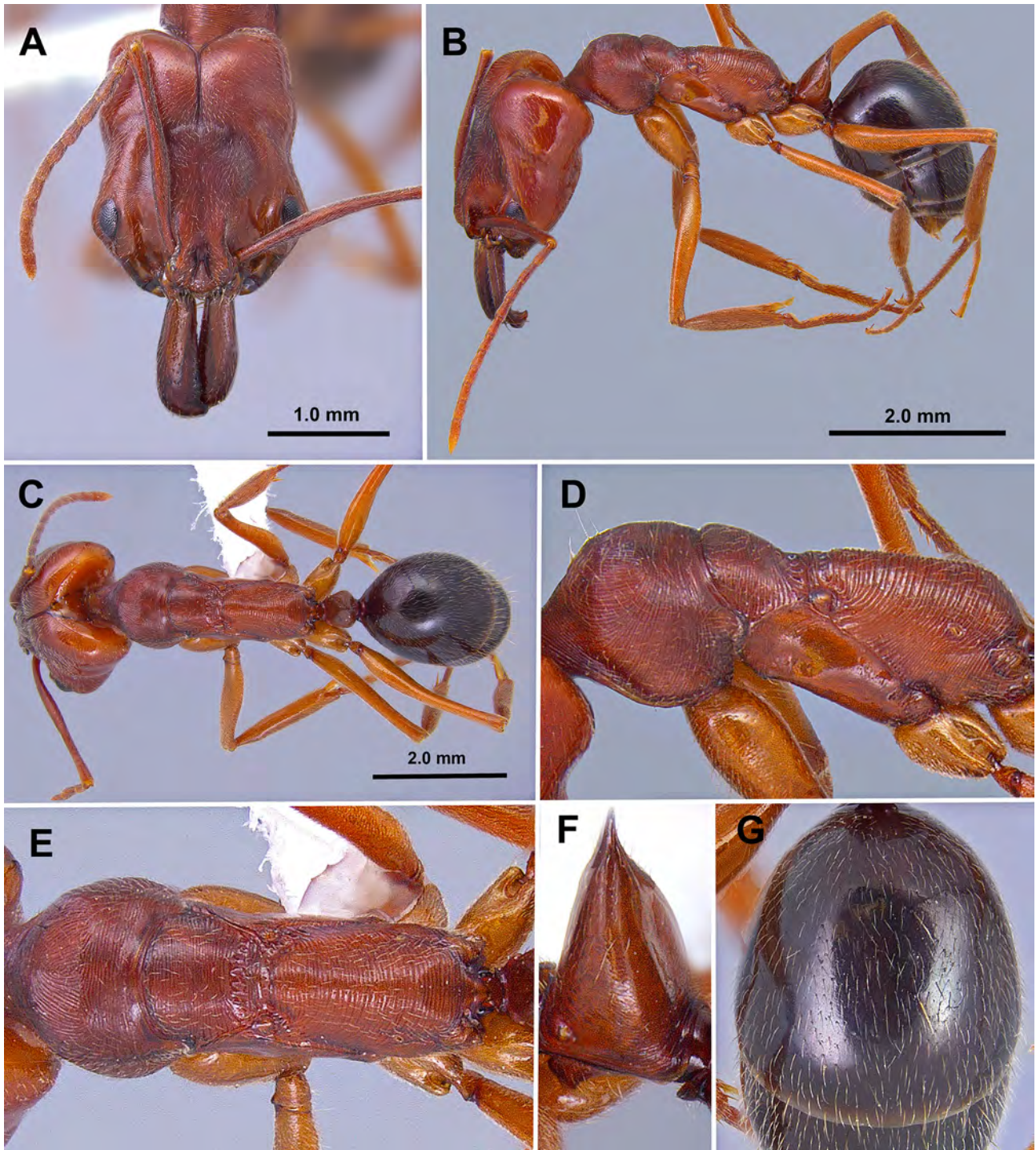
(Figs. 2, 4, 5, 6, 9, 10, 14, 15, 24, 25, 26)

*Odontomachus clarus* Roger, 1861: 26 (worker) Texas, USA; Patton, 1894: 618 (male); Wheeler, 1908: 407 (queen); Petralia & Vinson, 1980: 381 (larva). Subspecies of *O. haematodus*: Emery, 1911: 115; Wheeler, 1914: 40; Smith, 1939: 129. Revived status as species: Taylor & Wilson, 1962: 142; Brown, 1976: 136.

*Odontomachus texana* Buckley, 1867: 355. Junior synonym of *O. insularis*: Emery, 1895: 268; of *O. clarus*: Wheeler, 1902: 26.

*Odontomachus haematodus* subsp. *coninodis* Wheeler, 1915: 391; Brown, 1976: 103. Junior synonym of *O. clarus*: Brown, 1976: 103.

*Odontomachus haemataoda* subsp. *clarionensis* Wheeler, 1934: 141. Junior synonym of *O. clarus*: Taylor & Wilson, 1962: 142.

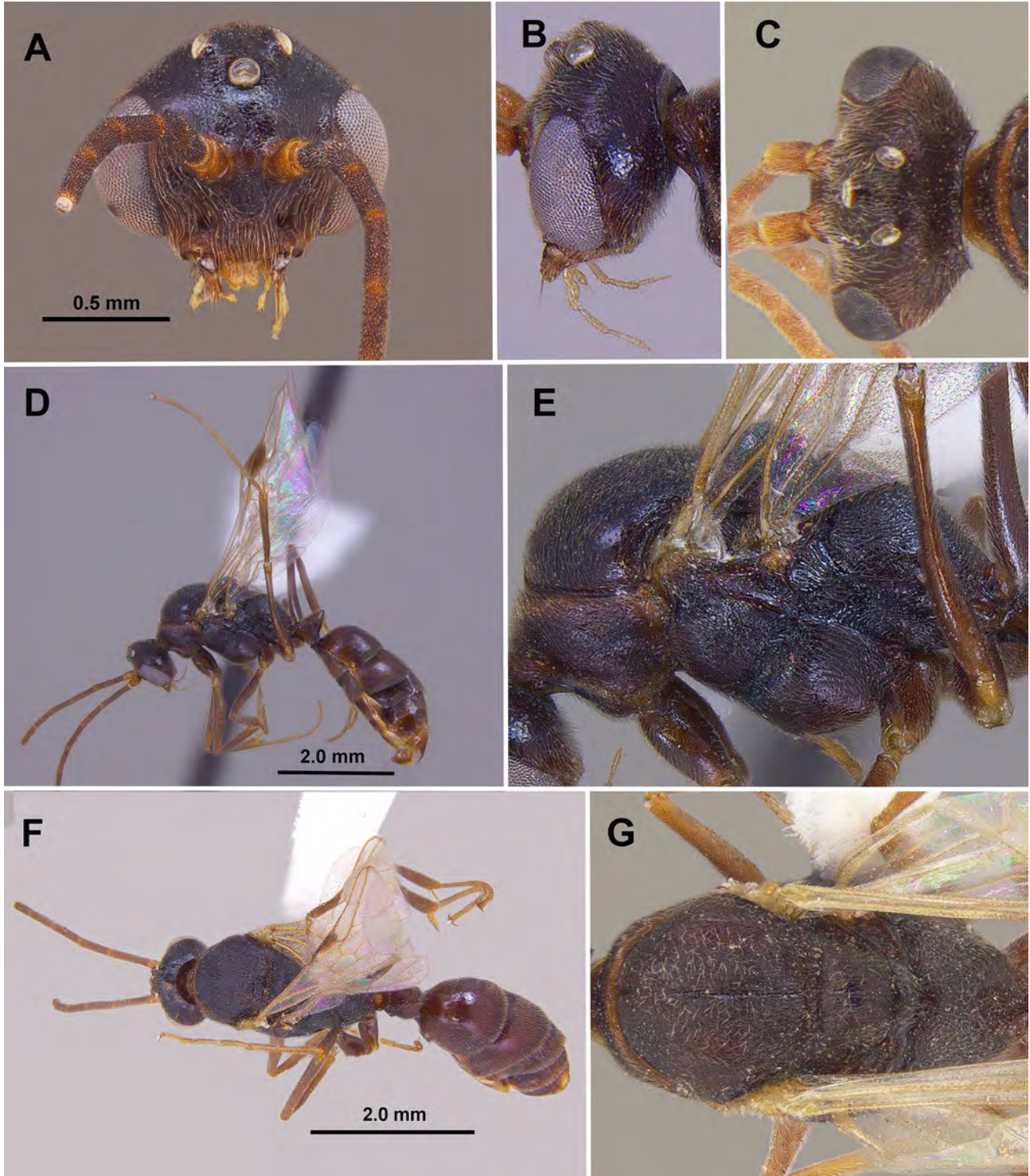


**FIGURE 14.** *Odontomachus clarus*, worker: (A) head in full-face view, (B) lateral habitus, (C) dorsal habitus, (D) mesosoma in lateral view, (E) mesosoma in dorsal view, (F) petiole in lateral view, and (G) first gastral tergite in dorsal view showing pubescence.

**Diagnosis.** Workers of *O. clarus* are most similar to *O. relictus* and *O. desertorum*, but are distinguished from *O. relictus* by their smooth basilar lobes (striate in *O. relictus*), and from *O. desertorum* by the following: Size smaller (HL < 2.2 mm, WL < 2.8 mm); dorsomedian petiolar process nub-like or well-differentiated; propleurae almost entirely smooth and polished-looking; pronotal cervical lobe longer than broad; and antennal scapes relatively shorter (SL/HW = 0.99–1.07 vs. 1.11–1.15). *Odontomachus clarus* is further differentiated from *O. relictus* by geography: *O. clarus* only occurs west of the Mississippi river; whereas, *O. relictus* only occurs east of the Mississippi river. Males are uniquely identifiable among the Nearctic fauna by, at minimum, the following



combination of characters: 1) dark brown coloration; 2) ocelli small, weakly bulging past posterior head margin; 3) mesoscutum longitudinally striate (striae may be posterolaterally divergent); 4) posterior margin of petiolar sternum lacking an angular process, but with paired setae on tubercles; and 5) propodeum finely striate. The ninth abdominal sternum of *O. clarus* is unique, having a short, broad apical portion of abdominal sternum IX (Fig. 24B). The genitalia are otherwise most similar to those of *O. desertorum*, differing primarily in having a more strongly sclerotized digitus and anteroventral process shorter, sharply triangular, and not upturned.



**FIGURE 15.** *Odontomachus clarus*, male: (A) head in full-face view, (B) head in lateral view, (C) head in dorsal view, (D) lateral habitus, (E) mesosoma in lateral view, (F) dorsal habitus, and (G) mesosoma in dorsal view.

**Description.** Worker: HL 1.92–2.32, HW 1.57–1.90, SL 1.68–1.90, EL 0.31–0.36, ML 1.06–1.30, WL 2.43–2.83, PTH 0.81–1.10, PTL 0.42–0.48 (n=7). Entire body generally shiny except where obscured by dense pubescence; head, mesosoma, and petiole reddish-brown, legs yellowish-brown to orangish-brown, and gaster blackish. Head with fine, longitudinal striae covering much of the head in full-face view, striae beginning from frontal lobes and diverging toward posterior corners of head, fading at corners and sides; sides and underside of head lacking sculpture; with numerous, fine, appressed pubescence and scattered elongate, erect setae present dorsally. Pronotum with circular, slightly concentric striae that become transverse near rear margin; appressed pubescence abundant; 5–6 elongate, erect setae present. Mesonotum and propodeum with deep transverse striae; propleuron, mesopleuron, and basalar lobe lacking sculpture; abundant pubescence present dorsally. Metasternum lacking paired elongate, spiniform processes between hind coxae. Petiole widest at base, either gradually tapering apically to a short spiniform spine or stoutly conical (see Figs. 6D, E and 14F); mostly lacking striae with only faint striae present near base; subpetiolar process rounded triangular; appressed pubescence present anteriorly and laterally, but mostly absent posteriorly. Gaster mostly shiny beneath pubescence, lacking striae or other strong sculpture, but with fine coriaceous sculpture (seen at high magnification); slightly coarse, appressed pubescence somewhat sparse, hairs separated by at least 1/2 of their length; scattered erect, elongate setae present.

Male: HL 0.91–0.97, HW 1.18–1.30, SL 0.17–0.25, EL 0.62–0.64, EW 0.35–0.37, OL 0.12–0.14, OES 0.25–0.26, PTH 0.66–0.73, WL 2.39–2.65, PTL 0.40–0.59, FWL 4.56–4.97 (n=3). Body generally shiny except where obscured by dense pubescence; head and mesosoma brownish-black, petiole and gaster dark reddish-brown to brownish-black, legs and antennae reddish-brown. Head and body with abundant semi erect, whitish pubescence. Eyes extremely large, maximum diameter of each eye at least 70% of the length of the head in full-face view. Ocelli small, the length of each ocellus about half the distance between lateral ocellus and eye margin; in full-face view, lateral ocelli do not noticeably protrude beyond posterior border of head. Mesosoma: pronotum lacking sculpture; mesoscutum with fine transversely arcuate striae anteriorly, striae becoming longitudinal posteriorly; mesoscutellum raised and convex, with longitudinal striae; propodeum and mesopleuron with weak to slightly strong longitudinal striae. Petiole bluntly rounded apically, with apically acute to apically rounded triangular subpetiolar process present anteriorly; densely pubescent anteriorly and laterally, with reduced pubescence posteriorly; petiolar sternum lacking angular process near posterior margin, but with paired setae on small tubercles. Abdominal sternum IX disc subrectangular, breadth almost twice length; posterior lobe length less than twice maximum width, basal half barely narrowed. Telomer apex narrowly rounded; telomere length distinctly greater than height; valviceps ventral apex strongly produced and very narrow; apical margin of valviceps linear until abruptly curving posteriorly at apicoventral process; anteroventral process of valviceps sharply triangular, and not upturned; vertical portion of dorsolateral carina and lateral margin of subapical lamina curving into one another; apicodorsal lobe of valviceps narrow and dorsally elongate; subapical lamina broad.

Queen: No specimens measured, but similar to workers in color and general appearance except slightly larger, with mesosoma developed for wings.

**Distribution (Fig. 26).** **Mexico.** Chihuahua, Coahuila, Hidalgo, Nuevo Leon, and Clarión Island. **USA.** Arizona: Cochise, Pima, Santa Cruz, and Yavapai Counties. New Mexico: McKinley County. Texas: Bastrop, Bexar, Bosque, Brewster, Brown, Denton, Jeff Davis, and Travis Counties. Louisiana: Natchitoches Parish. Distributional information from AntWeb (2013), Anonymous (2013), Brown (1976), Adams *et al.* (2010), Deyrup and Cover (2004), and examination of specimens from ABS, JTLC, LACM, LSAM, MEM, UCDC, UGA, and UTEP.

**Discussion.** *Odontomachus clarus* has had four specific synonyms until the present paper. While the Buckley name may be safely ignored as superfluous and *O. desertorum* is here recognized as a valid species, the species-status of the other two names stands to be reassessed. *Odontomachus clarus* is variable across its range, with a broad longitudinal gradient from Texas and Louisiana South to Hidalgo, Mexico, and a very narrow shift from Texas into the mountains of Arizona. The US-Mexico cline is manifested in a North-to-South trend of increasing intensity of gastral sculpturation, erection of gastral pubescence, and anteroposterior compression of the petiolar node. The Mexican High Plateau population is otherwise identical to those of the Great and South Central Plains. The montane Arizonan populations, located in the Chiricahua, Huachua, and Santa Rita Mountains, as well as the Colorado Plateau Transition Zone, have previously been provided with the subspecific name *O. clarus coninodis* (Wheeler 1915) due to their nub-like dorsomedian petiolar process (see Fig. 6E). Upon careful examination of material across the range of *O. clarus* it is clear that this is the only distinguishing character for these populations,

and that the conical dorsomedian petiolar process merely represents a foreshortening of the process as the rest of the petiole is otherwise unmodified. Moreover, males attributable to “coninodis are inseparable from those of *O. clarus* except for reduced size. These observations strongly suggest that the name *O. clarus coninodis* should remain in synonymy with *O. clarus*. It would still be valuable to conduct a sampling transect from Texas through the southeastern Arizona mountains to detect intergradation of petiolar node form as Brown (1976) suggested.

Finally, the status of the name *O. clarus clarionensis* remains to be absolutely determined. The name was provided by Wheeler (1934) for an insular population on Clarión Island (about 700 km WSW from the tip of Baja) of what he considered to be *O. haematodus*. Wheeler erected the subspecies based on the larger size, broader head, and smoother posterolateral head corners than compared to *O. haematoda* (an artificial assembly not recognized as such at the time). Taylor and Wilson (1962) synonymized the subspecies with *O. clarus* without discussion, and the population has been noted as “typical for *O. clarus* by Brown (1976). Examination of one of the cotypes at the MCZ does not reveal any salient distinctions of the Clarión Island population from mainland *O. clarus*. The synonymy is thus tentatively confirmed here; however, it would be valuable to sequence genetic material of the Clarión Island population of *O. clarus* to compare to material from across the species’ range.

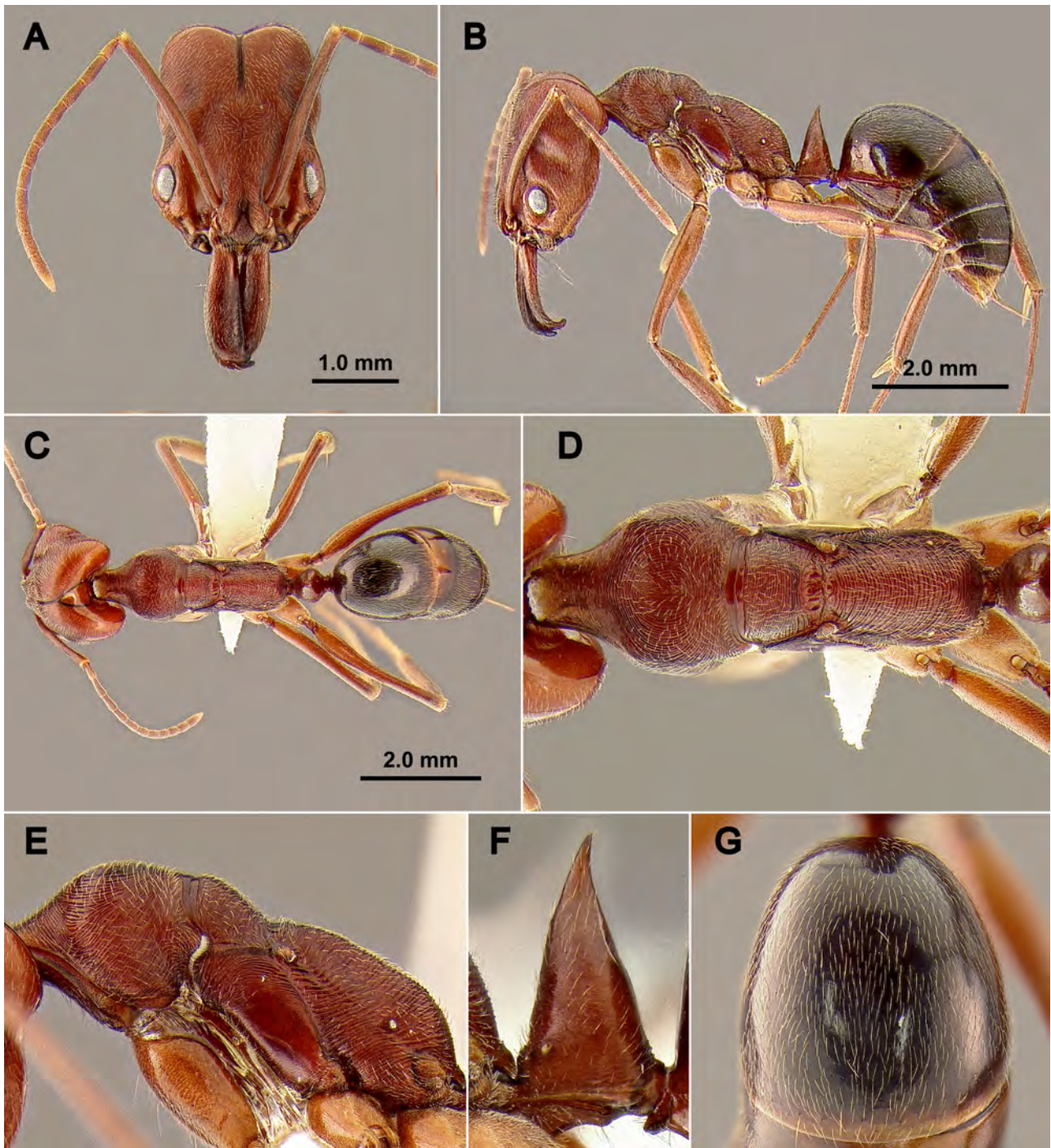
The first report of *Odontomachus clarus* from Louisiana was based on specimens collected in Provencal in Natchitoches Parish (Smith 1939). Unfortunately, we were unable to locate Smith’s specimens to verify this record. Subsequent authorities implicitly questioned this disjunct record: Brown (1976) omitted it entirely from his lengthy monograph, and this record was later omitted by Deyrup and Cover (2004). Smith’s efforts were later vindicated, however, as specimens of *O. clarus* were collected nesting under large rocks in sandy soil in the Kisatchie National Forest in Natchitoches Parish just 20 km SW of where Smith reported this species (Adams *et al.* 2010). Similarly, in Texas, nesting sites are typically in dry sites. In Arizona, its nesting habits appear more flexible, as it has been collected under rocks and grass tussocks in dry to mesic habitats (Deyrup and Cover 2004). These differences in nest site selection may yet reveal whether the “coninodis populations represent a distinct species, although this seems unlikely. Regardless of the results of increased sampling and molecular work on the Arizona populations, the Louisiana populations of *O. clarus* would certainly retain that specific epithet as the type series was collected from Texas.

### ***Odontomachus desertorum* Wheeler, 1915 STAT. NOV.**

(Figs. 6, 10, 16, 17, 24, 25, 26)

*Odontomachus haematoda desertorum* Wheeler, 1915: 391 Lectotype worker (here designated): United States, Arizona: Tucson, 24 November 1910 (W.M. Wheeler) [MCZC, MCZT\_20523] (examined). Junior synonym of *O. clarus*: Brown, 1976: 103. See also: Smith, 1939. **New Status.**

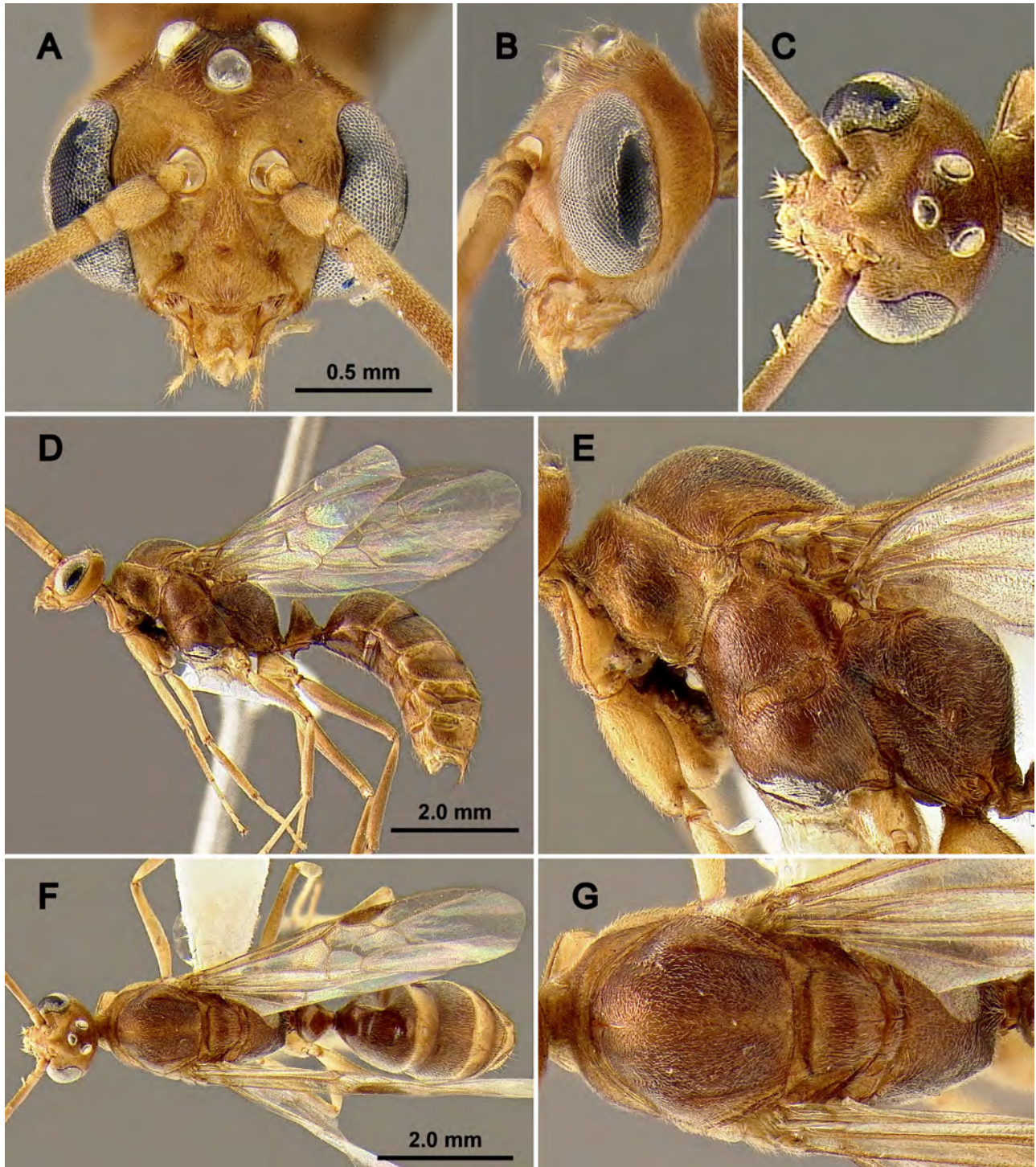
**Diagnosis.** Workers of *Odontomachus desertorum* can be separated from the introduced species *O. haematodus* and *O. ruginodis* by the smooth, mostly unsculptured petiole (striate in *O. haematodus* and *O. ruginodis*); from *O. brunneus* by coarse and somewhat sparse gastral pubescence (densely pubescent in *O. brunneus*); and from *O. relictus* by the smooth basilar lobes (striate in *O. relictus*). Additionally, *O. desertorum* can be separated from these species by geography as it is restricted to the Sonoran Desert region of the southwestern US and northwestern Mexico; whereas, all of the aforementioned species are only known to occur east of the Mississippi River in the US. Workers of *O. desertorum* are most similar to those of *O. clarus* (also a western species), with workers of both species being similar in coloration, having coarse gastric pubescence and a smooth petiole and basilar lobe, but may be differentiated from *O. clarus* by the much larger size (WL 3.41–3.57 compared to WL 2.43–2.83 for *O. clarus*), stout, poorly differentiated dorsomedian petiolar spine (Fig. 6C) (may be nublke or well differentiated in *O. clarus*), the entirely striate propleurae (Fig. 6A), pronotal cervical lobes which are wider than long, and by the relatively longer scapes (SL/HW = 1.11–1.15 vs. 0.99–1.07). Males are uniquely identifiable among US species by the following character combination: 1) generally large size (WL 2.61–3.06); 2) ocelli relatively large and bulging beyond posterior border of head; 3) body light golden brown and appendages honey yellow; 4) propodeum finely striate; and 5) petiolar sternum posteriorly glabrous and with a distinct angular process near the posterior margin. The genitalia of *O. desertorum* are most similar to *O. clarus* from which they differ mainly by the narrower posterior ninth sternal lobe (Fig. 24C), the less strongly-sclerotized digitus, and by the longer, slightly upturned, anteroventral valviceps process with rounded apex (Fig. 25I).



**FIGURE 16.** *Odontomachus desertorum*, worker: (A) head in full-face view, (B) lateral habitus, (C) dorsal habitus, (D) mesosoma in dorsal view, (E) mesosoma in lateral view, (F) petiole in lateral view, and (G) first gastral tergite in dorsal view showing pubescence.

**Description.** Worker: HL 2.59–2.74, HW 2.00–2.17, SL 2.30–2.40, EL 0.46–0.49, ML 1.45–1.57, WL 3.41–3.57, PTH 1.33–1.35, PTL 0.59–0.60 (n=2). Entire body generally shiny except where obscured by dense pubescence; head, mesosoma, and petiole deep red, legs and antennae ferruginous, nearly orange, and gaster piceous black. Head with fine, longitudinal striae covering much of the head in full-face view, striae beginning on frontal lobes and clypeus and diverging toward posterior corners of head, fading at corners and sides; sides and underside of head smooth with fine piligerous punctures; head with fine appressed pubescence and with sparse, variable setae present on postgenal bridge and in ocellar triangle. Pronotum with circular, concentric striae which are transverse along rear margin; appressed pubescence abundant; 0–4 elongate erect setae present. Mesonotum and propodeum with transverse striae, striae coarser on propodeum; propleuron entirely striate; mesopleuron striate

in dorsal fifth and near mesocoxae; basalar lobe smooth; pubescence abundant on mesonotum and propodeum. Metasternum lacking paired elongate, spiniform processes between hind coxae. Petiole in profile view widest at base and tapering gradually toward posterodorsally-directed spine; petiole, in anterior view, with dorsomedian process thick at base, long, and poorly differentiated; node mostly smooth and shining, with weak striae present near base; subpetiolar process rounded, triangular; appressed pubescence present anteriorly and laterally, but mostly absent posteriorly. Gaster mostly smooth and shining, although faintly coriaceous dorsomedially; fine appressed pubescence somewhat sparse, hairs separated by somewhat less than one hair length; scattered standing setae present.



**FIGURE 17.** *Odontomachus desertorum*, male (note: prothorax damaged and genitalia dissected out): (A) head in full-face view, (B) head in lateral view, (C) head in dorsal view, (D) lateral habitus, (E) mesosoma in lateral view, (F) dorsal habitus, and (G) mesosoma in dorsal view.

**Male:** HL 0.97–1.06, HW 1.34–1.37, SL 0.23–0.25, EL 0.69–0.75, EW 0.43–0.44, OL 0.18; OES 0.21–0.26, WL 2.61–3.06, PTH 0.87–0.94, PTL 0.54–0.82, FWL 5.32–5.64 (n=2). Body generally shiny except where obscured by dense pubescence; head and appendages honey yellow, mesosoma and metasoma light golden brown. Head and body with dense pubescence of variable stature. Eyes extremely large, maximum diameter of each eye at least 70% of head length in full-face view. Ocelli relatively large but not hypertrophied, the length of each ocellus slightly more than half the distance between lateral ocellus and eye margin; in full-face view, lateral ocelli protrude beyond posterior margin of head. Mesosoma: pronotum coriaceous to granulose; mesoscutum covered with weakly rugose striae which are transversely arcuate anteriorly and becoming longitudinal posteriorly; mesoscutellum raised and convex, with longitudinal striae; mesopleuron roughened by dense, weak sculpture; propodeum finely striate. Petiole bluntly rounded apically, with digitate subpetiolar process; densely pubescent anteriorly and laterally, with reduced pubescence posteriorly. Abdominal sternum IX disc trapezoidal, breadth about twice length; posterior lobe length almost three times maximum width, basal half barely narrowed. Telomerapex narrowly rounded; telomere length distinctly greater than height; valviceps ventral apex strongly produced and very narrow; apical margin of valviceps linear before weakly and abruptly curving posteriorly at apicoventral process; anteroventral process of valviceps slightly elongated, with a rounded, slightly upturned apex; vertical portion of dorsolateral carina and lateral margin of subapical lamina curving into one another; apicodorsal lobe of valviceps narrow and elongated; subapical lamina broad.

**Distribution (Fig. 26, Appendix 1).** Sonoran Desert. **USA.** **Arizona:** Maricopa and Pima Counties. **Mexico.** Sonora. Distributional information from specimens examined from LACM, MCZC, and UCDC.

**Discussion.** *Odontomachus desertorum* is restricted to the Sonoran Desert; its range in Arizona is surrounded by that of *O. clarus* to the north, east, and south. When first described as a subspecies of *O. haematodus* (“haematoda”) by Wheeler (1915), the coloration and petiolar node form were used to characterize the taxon, a character set scarcely improved by M.R. Smith (1939) who noted the larger size and well-developed lateral ocellar pits of *O. desertorum*. Creighton (1950) repeated this diagnosis in his derivative key to the North American *Odontomachus*. Brown (1976) synonymized *O. haematodus desertorum* with *O. clarus*, but unfortunately did not provide support for this action. Based on the discovery and examination of the male of *O. desertorum* and a reassessment of worker variation for names attributable to *O. clarus*, it is here determined that *O. desertorum* should be revived from synonymy and elevated to species. While no sympatric material of *O. desertorum* and *O. clarus* were examined during this study, M.R. Smith (1939) indicated that the two species may occur within a few miles of one another, supporting recognition of *O. desertorum* as a valid species.

New worker-based characters for separating *O. desertorum* from *O. clarus* are the former’s longer antennal scapes (see diagnosis), shorter cervical pronotal lobe (which contacts the occiput when the head is reflexed), and entirely or almost entirely striate propleurae (which forms the longitudinally divided area beneath the pronotum and above the procoxae, and is technically the proepisterna) (Fig. 6A). The male of *O. desertorum* is conspicuously different from that of *O. clarus* in terms of coloration and with respect to the petiolar sternum, which is strongly angled in *O. desertorum* (Fig. 10A) and nearly flat in *O. clarus* (Fig. 10B). Genitalic differences between the two species are indicated in the diagnosis above. The ocelli of male *O. desertorum* are also slightly larger than *O. clarus*; this may reflect a more light-restricted flight timing or perhaps size-based allometry. Until further males are collected and phenological data are recorded and collated, it is too early to infer temporal isolation of diel flight times between the two species. Beyond worker and male morphology, little is known about the biology of *O. desertorum*. Whereas *O. clarus* is usually collected in woodland habitats, *O. desertorum* seems to prefer open desert/desert-scrub habitats. Smith (1939) noted that *O. desertorum* may be common but infrequently collected due to nocturnal or matinal foraging times. Material provided by Stefan Cover (MCZ) suggest that this may indeed be true, as the label data indicate that the workers were collected while “nocturnal[ly] foraging.

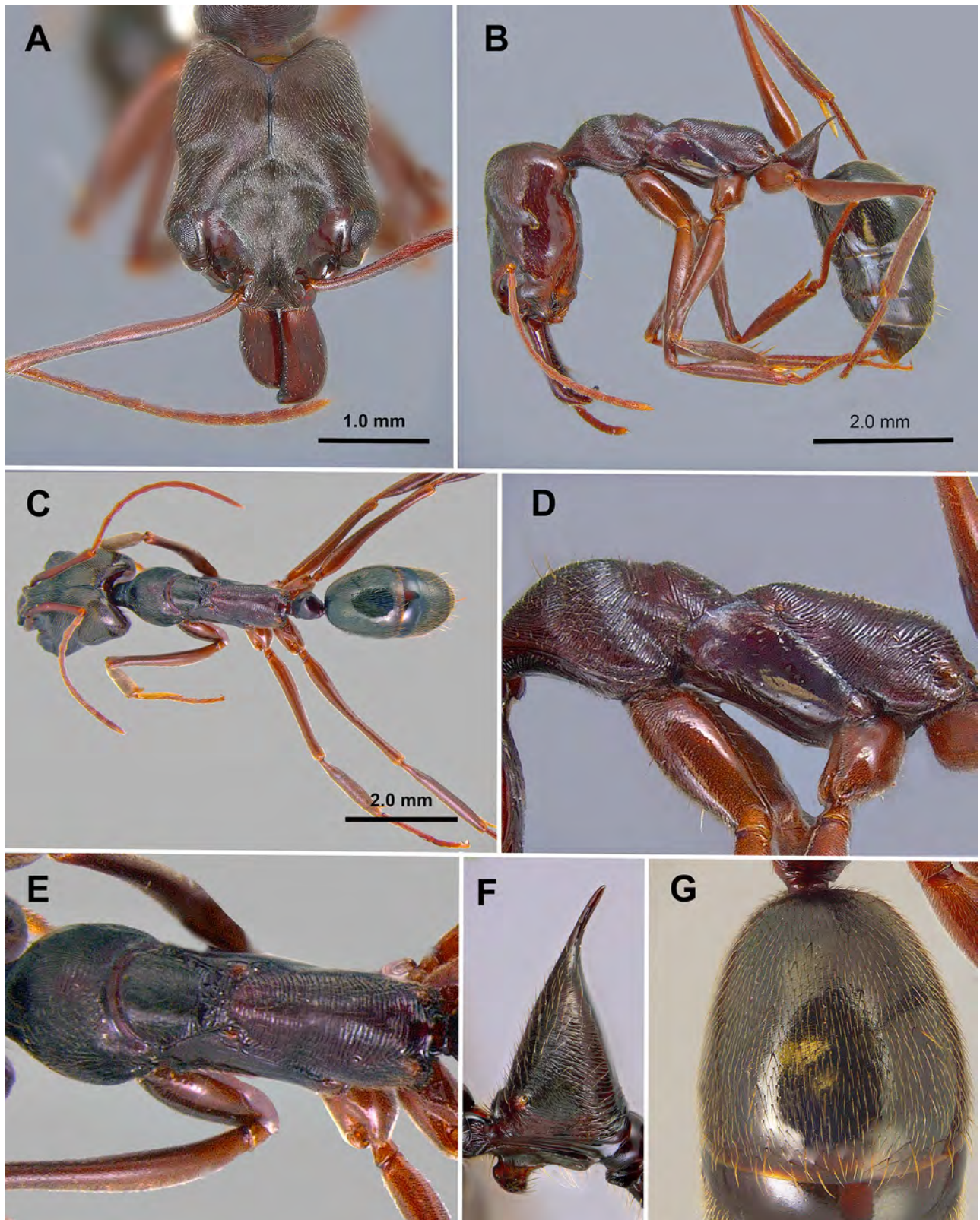
### ***Odontomachus haematodus* (Linnaeus, 1758)**

(Figs. 3, 11, 18, 19, 24, 25, 26)

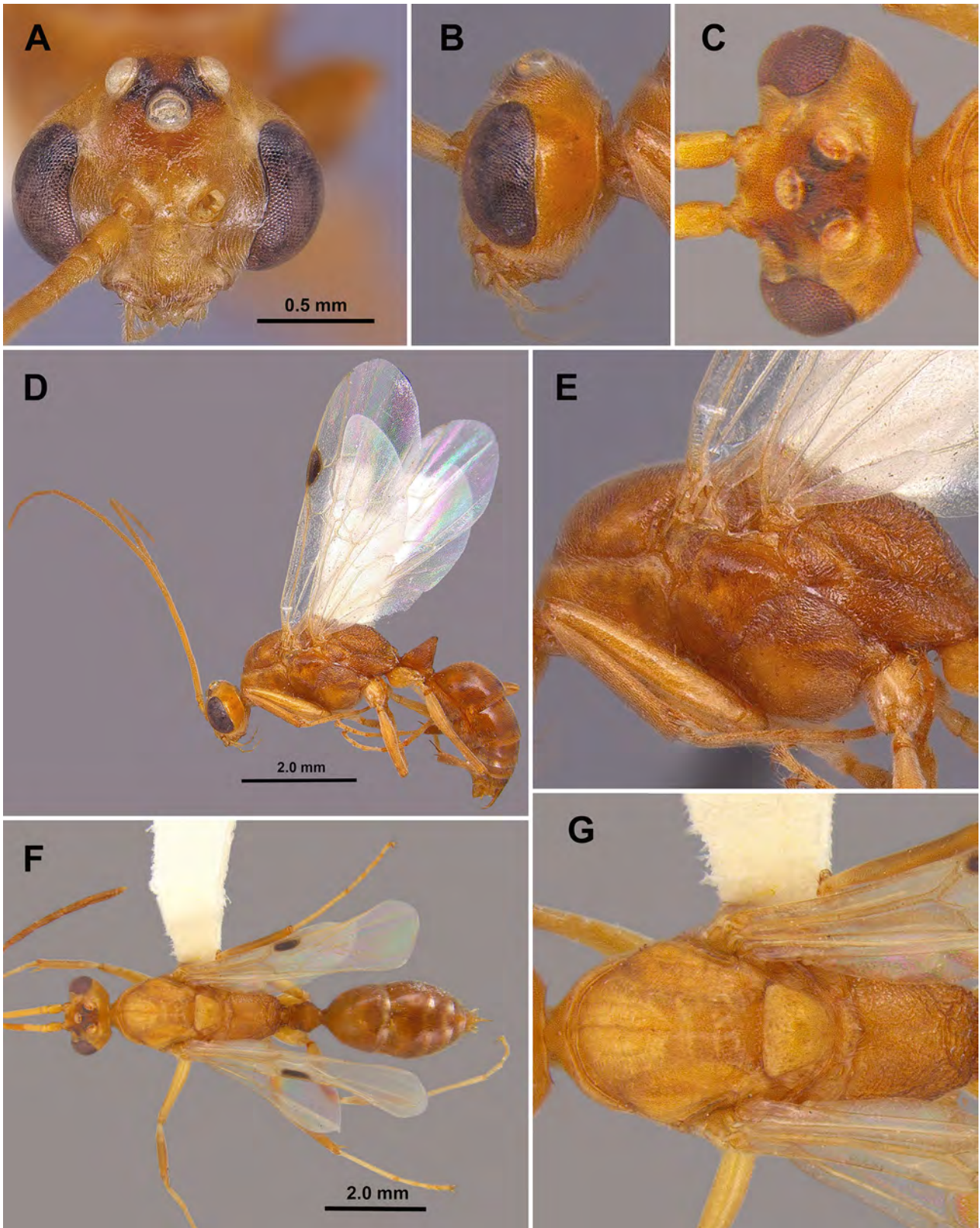
*Formica haematoda* Linnaeus, 1758: 582 (queen) “America Meridionali; Emery, 1899: 5 (larva); Wheeler & Wheeler, 1952: 646 (larva). Combination in *Odontomachus*: Latreille, 1804: 179.

*Formica maxillosa* DeGeer, 1773: 601. Junior synonym of *O. haematodus*: Retzius, 1783: 75; Olivier, 1792: 502; Latreille, 1802: 192.

*Odontomachus hirsutiusculus* Smith, F., 1858: 78. Junior synonym of *O. haematodus*: Roger, 1861: 24; Brown, 1976: 104.  
*Odontomachus haematoda* var. *pallipes* Crawley, 1916: 368. Junior synonym of *O. haematodus*: Brown, 1976: 104.  
*Odontomachus haematodus* r. *pubescens* var. *beuneipes* Emery, 1893: 91. Unavailable name; material referred to *O. haematodus*: Brown, 1976: 104.



**FIGURE 18.** *Odontomachus haematodus*, worker: (A) head in full-face view, (B) lateral habitus, (C) dorsal habitus, (D) mesosoma in dorsal view, (E) mesosoma in lateral view, (F) petiole in lateral view, and (G) first gastral tergite in dorsal view showing pubescence.



**FIGURE 19.** *Odontomachus haematodus*, male: (A) head in full-face view, (B) lateral habitus, (C) dorsal habitus, (D) body in lateral view, (E) mesosoma in lateral view, (F) body in dorsal view, and (G) mesosoma in dorsal view.

**Diagnosis.** Workers in the Nearctic region are identified by their unique large size, dark color, lightly shagreened gastral dorsum, and presence of elongate metasternal processes between the hind coxae (Fig. 3), a character unique for the Nearctic fauna. The yellow colored males are most similar to *O. brunneus*, but can be separated by the following: 1) ocelli small, weakly bulging past posterior head margin; 2) posterior propodeal face offset dorsally



and laterally by distinct carina; 3) metasternal processes long and narrow; and by numerous genitalic characters. Genitalia of *O. haematodus* are unique among Nearctic species, with the telomere distinctly taller than long. The ninth abdominal sternum is most similar to that of *O. ruginodis*, having similarly proportioned discs and strongly constricted posterior lobes, but *O. haematodus* has a broader posterior lobe apex.

**Description.** Worker: HL 2.32–2.75, HW 1.88–2.16, SL 2.16–2.48, EL 0.44–0.54, ML 1.38–1.56, WL 3.04–3.48, PTH 1.22–1.38, PTL 0.54–0.60 (n=10). Entire body generally shiny except where dulled by dense pubescence; concolorous dark reddish-brown to blackish. Head with fine, longitudinal striae covering much of the head in full-face view, striae beginning from frontal lobes and diverging toward posterior corners of head, fading at corners and sides; sides and underside of head lacking sculpture; with numerous, fine, appressed pubescence and scattered elongate, erect setae present (dorsally). Pronotum with somewhat circular concentric striae that become longitudinal near rear margin; appressed pubescence abundant; 5–8 elongate, erect setae present. Mesonotum and propodeum with deep transverse striae; propleuron, mesopleuron, and basalar lobe lacking sculpture; abundant pubescence present dorsally. Metasternum with paired narrowed, elongate, spiniform processes between hind coxae (Fig. 3A). Petiole widest at base, gradually tapering apically to a long spine directed rearward; transverse striae completely surrounding petiole except upper dorso-posteriorly where striae are faint or lacking; subpetiolar process somewhat anvil shaped; appressed pubescence present anteriorly and laterally, but mostly absent posteriorly. Gaster mostly shiny beneath pubescence, lacking striae or other strong sculpture, but weakly shagreened (seen at high magnification); fine, appressed pubescence moderately dense, spaces between hairs usually less than 1/2 the length of a hair; scattered erect, elongate setae present.

Male: HL 1.00–1.12, HW 1.20–1.30, SL 0.18–0.20, EL 0.62–0.68, EW 0.36–0.40, OL 0.18–0.20, OES 0.20–0.22, WL 2.68–2.83, PTH 0.90–0.94, PTL 0.50–0.56, FWL 4.70–5.45 (n=5). Body generally shiny except where obscured by dense pubescence; head, meso- and metasoma yellowish-orange, antenna and legs pale yellowish-orange. Head and body with abundant fine, white pubescence except on anepisternum, where it is mostly absent. Eyes extremely large, maximum diameter of each eye at least 70% of the length of the head in full-face view. Ocelli small to average in size, the length of each ocellus slightly less to approximately the same as the distance between lateral ocellus and eye margin; in full-face view, lateral ocelli do not protrude beyond posterior border of head. Mesosoma: pronotum with faint transverse striae, especially laterally, but mostly appearing to lack sculpture; mesoscutum with faint transversely arcuate striae anteriorly, striae becoming transverse posteriorly; mesoscutellum raised and convex, lacking sculpture; propodeum evenly rounded without obvious declivous face, with strong rugoreticulation; mesopleuron mostly lacking striae or with very faint longitudinal striae. Petiole bluntly rounded apically, with rounded triangular subpetiolar process anteriorly; densely pubescent anteriorly and laterally, but reduced pubescence posteriorly. Abdominal sternum IX disc subrectangular, breadth about twice length; posterior lobe length about twice maximum lobe width, basal half strongly narrowed. Telomeral apex very narrowly rounded, nearly angular; telomere length distinctly shorter than height; valviceps apex weakly produced, broad; apical margin of valviceps linear; vertical portion of dorsolateral carina and lateral margin of subapical lamina meeting at an angle; apicodorsal lobe of valviceps narrow, somewhat short; subapical lamina broad.

Queen: HL 2.48–2.55, HW 2.14–2.00, SL 2.35–2.36, EL 0.52–0.55, ML 1.56–1.58, OL 0.12–0.13, WL 3.56–3.60, PTH 1.28–1.62, PTL 0.58–0.66, FWL 6.5 (n=2 except for FWL for which only one individual had wings). Similar to workers in color and general appearance except with mesosoma developed for wings and with wings present in alate specimens.

**Distribution (Fig. 26, Appendix 1):** Due to misidentifications, the worldwide distribution of this species is not clearly understood at this time. However, based on recent examination of numerous specimens from the US, the distributional records for this species from this country given here (Appendix 1) can be considered reliable. Additionally, specimens from Brazil, British Guiana, and Peru were identified as *O. haematodus* by MacGown [LSAM, UGCA, and UMMZ]. Brown (1976) reported this species' distribution as continental South America from Orinoco Delta to Tucuma, Argentina. McGlynn (1999) reported *O. haematodus* as being introduced to Hawaii; however, these records have not been verified, nor is this species thought to have been established in that state. Krushelnycky *et al.* (2005) did not include *O. haematodus* in their recent list of ant species from Hawaii. In the US we have verified records of established populations of this species only from the Gulf Coast region, specifically from: Alabama: Baldwin, Escambia, and Mobile Counties. Florida: Escambia County. Louisiana: Orleans Parish. Mississippi: Greene and Jackson Counties. Distributional information for US specimens from AntWeb (2013) (Florida record), and examination of specimens in AUEM, MEM and USNM.

**Discussion.** *Odontomachus haematodus* is native to South America. The earliest record in the US we found was of three specimens collected on 1 June 1956 from Mobile, Alabama. These specimens were borrowed from the USNM and examined by MacGown. Earliest MEM records are from 2000 from Baldwin County, Alabama, by which time this species had become locally abundant. Until recently, specimens of this species from the Gulf Coast were identified as *O. insularis*, *O. brunneus*, and/or *O. ruginodis*. However, after examination of workers and males of all three species, it became clear that this now-common Gulf Coast species is *O. haematodus*.

This species has been collected in a variety of habitats along the Gulf Coast including bottomland forests, pine forests, in a mixed forest at the edge of estuary, at the edge of a pitcher plant bog, fore dunes, shell midden, pine savanna, sandhill, and in residential areas. In non-urban areas, nests have been discovered in the soil, in leaf litter, in rotting logs and stumps, at tree bases, in dead parts of standing live trees (colonies observed in tree cavities at least 2.0 m from ground level); in urban areas nests have been discovered under mulch, debris, under roots of ornamental grass bushes, in building foundations, and under PVC pipes. Colonies range in size from less than a hundred workers to several thousand with some colonies polygynous. Similar to other members of the genus, workers are typically nocturnal, but may also forage during the day. In areas in the Gulf Coast where this species occurs, populations may be extremely abundant, especially in parts of Baldwin and Mobile Counties, Alabama; and Jackson County, Mississippi. Large populations have also been observed at the Audubon Zoo in New Orleans, Louisiana (Pers. Comm. Fred Larabee and Andy Saurez). Compared to other US species, *O. haematodus* is an aggressive stinger. Upon placing one's hand in leaf litter where a nest is located, workers may immediately sting. The sting is painful, but not long lasting (MacGown, personal observation). Homeowner's in southern Mississippi have complained of bites and stings received from this species (MacGown, unpublished data). One homeowner stated, "[the] ants would latch on with their mandibles and sting repeatedly, lashing out with their abdomens. One ant can sting 4–5 times before you realize it. They are very aggressive." Alate males and queens have been collected from late June through early August.

It is clear from collecting records that the abundance of *O. haematodus* along the Gulf Coast is a recent phenomenon, and it is also clear that this species is continuing to spread. This suggests that *O. haematodus* spent around 50 years in North America before some threshold condition allowed it to form such large populations that they became conspicuous. This kind of history would not be unique to *O. haematodus*. *Camponotus planatus*, for example was restricted to a small area of tropical Florida for many decades, arriving some time before 1910 (Deyrup et al. 2000). This species is now common in some sites (including some natural habitats) in central peninsular Florida (Deyrup 2014, unpublished data) and has even been recorded in Mississippi (MacGown 2010). It is always possible, however, that the 1956 collection of *O. haematodus* represents an independent failed introduction.

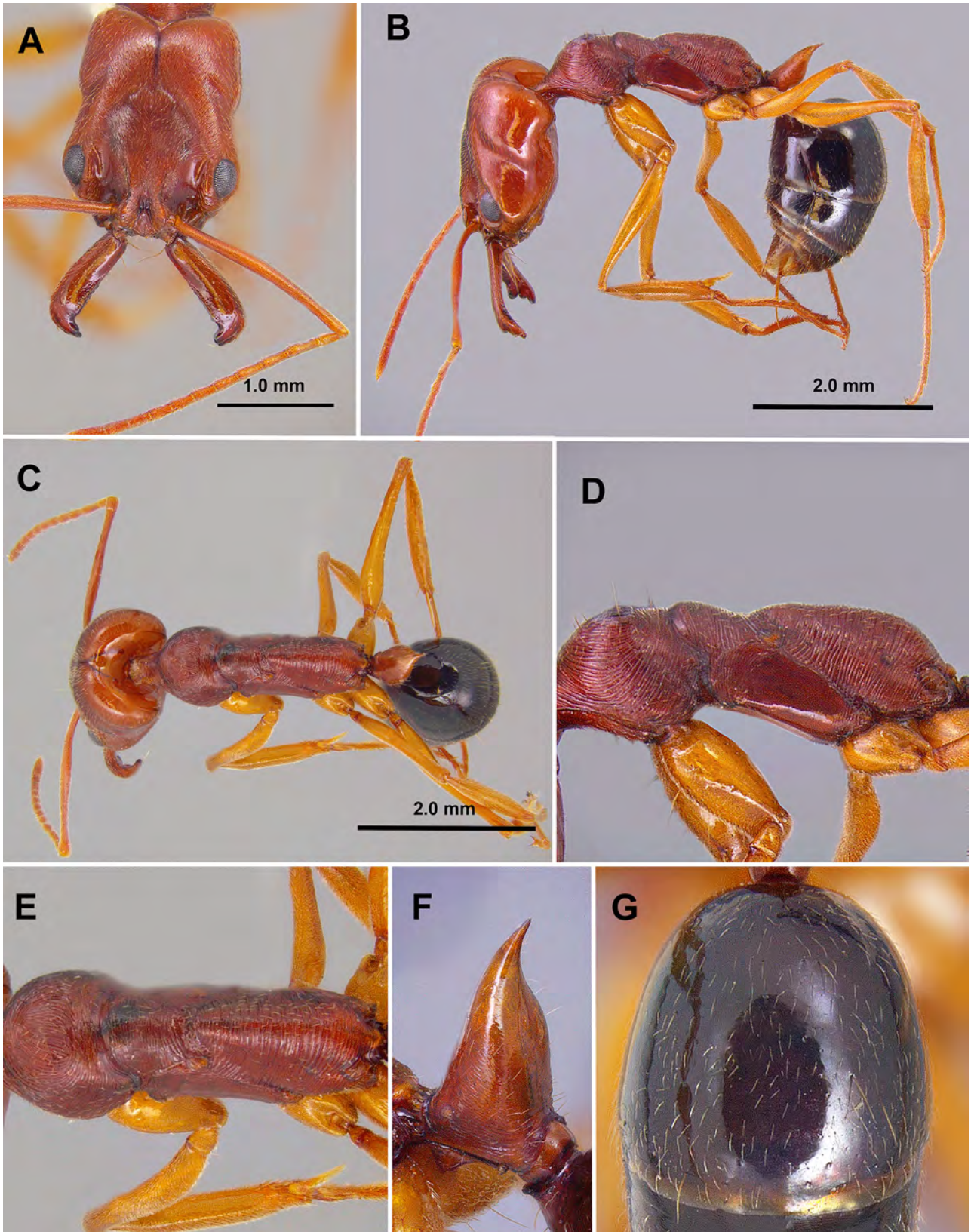
### ***Odontomachus relictus* Deyrup and Cover, 2004**

(Figs. 5, 8, 20, 21, 24, 25, 26)

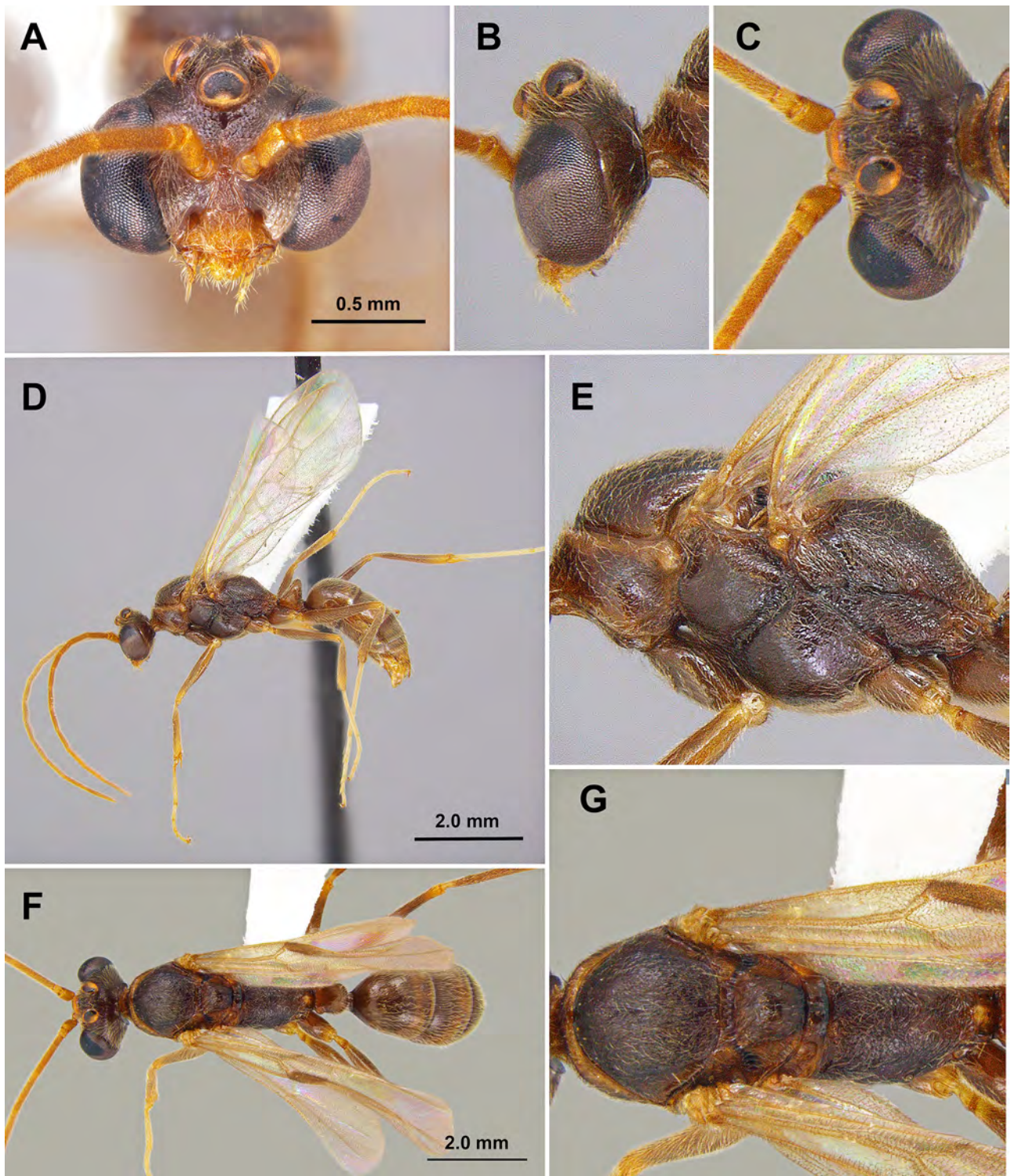
*Odontomachus relictus* Deyrup & Cover, 2004: 137 (worker, queen, and male) Florida, USA.

**Diagnosis.** Very similar to *O. clarus*, but endemic to Florida; *O. relictus* has never been reported from west of the Mississippi river. Workers are most similar to *O. clarus*, but may be separated by the striate basalar lobes (Fig. 5A). Workers are further separated from other Nearctic species by the following combination: 1) gastric pubescence sparse; 2) basalar lobes striate; and 3) petiolar node lacking conspicuous, transverse striae. Males are uniquely identified by the following combination: 1) body and head dark brown, antennae yellowish-brown; 2) very large, strongly bulging ocelli, and 3) longitudinally striate mesoscutum. The ninth abdominal sternum is unique, having a very short disc relative to length. Genitalia of *O. relictus* are most similar to those of *O. clarus*, but are distinguished by the following character combination: 1) telomere apex very narrowly rounded; 2) penisvalvar apicodorsal lobe broader; 3) apicoventral penisvalvar process shorter, broader (see Fig. 25).

**Description.** Worker: HL 2.00–2.06, HW 1.68–1.80, SL 1.94, EL 0.30–0.40, ML 1.20, WL 2.67–2.68, PTH 0.90, PTL 0.44–0.52 (one MEM specimen measured, other measurements from Deyrup and Cover 2004). Entire body generally shiny except where dulled by dense pubescence; head, mesosoma, and petiole reddish-brown, legs



**FIGURE 20.** *Odontomachus relictus*, worker: (A) head in full-face view, (B) lateral habitus, (C) dorsal habitus, (D) mesosoma in dorsal view, (E) mesosoma in lateral view, (F) petiole in lateral view, and (G) first gastral tergite in dorsal view showing pubescence.



**FIGURE 21.** *Odontomachus relictus*, male: (A) head in full-face view, (B) head in lateral view, (C) head in dorsal view, (D) lateral habitus, (E) mesosoma in lateral view, (F) dorsal habitus, and (G) mesosoma in dorsal view.

yellowish-brown, and gaster blackish. Head with fine, longitudinal striae covering much of the head in full-face view, striae beginning from frontal lobes and diverging toward posterior corners of head, fading at corners and sides; sides and underside of head lacking sculpture; with numerous, fine, appressed pubescence and scattered elongate erect setae present dorsally. Pronotum with somewhat circular concentric striae that become longitudinal posteriorly, then transverse at posterior margin; appressed pubescence abundant; 5–6 elongate, erect setae present. Mesonotum and propodeum with deep transverse striae; with abundant pubescence present dorsally. Propleuron

mostly lacking sculpture, smooth and shiny; mesopleuron with longitudinal striae at dorsal and ventral margins, otherwise smooth and shiny; pubescence mostly lacking. Basalar lobe with coarse striate sculpture. Metasternum lacking paired elongate, spiniform processes between hind coxae. Petiole widest at base, gradually tapering apically to a short spine directed rearward; mostly lacking striae with only faint striae present near base; subpetiolar process rounded triangular; appressed pubescence present anteriorly and laterally, but mostly absent posteriorly. Gaster mostly shiny beneath pubescence, lacking striae or other strong sculpture, but with fine coriaceous sculpture (seen at high magnification); fine, appressed pubescence sparse, spaces between hairs more than the length of a hair; scattered erect, elongate setae present.

**Male:** HL 0.98–1.07, HW 1.30–1.45, SL 0.22–0.24, EL 0.76, EW 0.50, OL 0.22–0.23, OES 0.13, WL 2.43–2.50, PTH 0.64–0.70, PTL 0.44–0.47, FWL 4.95–5.00 (two MEM specimens measured, other measurements from Deyrup and Cover 2004). Body generally shiny except where obscured by dense pubescence; head and mesosoma brownish-black, petiole and gaster dark reddish-brown to brownish-black, femora and tibiae dark brown, tarsi pale yellowish-brown, and antennae yellowish-brown and contrasting with the dark head. Head, meso- and metasoma with abundant whitish subdecumbent pubescence. Eyes extremely large, maximum diameter of each eye at least 70% of the length of the head in full-face view. Ocelli large, length of each ocellus greater than distance between lateral ocellus and eye margin; in full-face view, lateral ocelli protrude beyond posterior border of head. Mesosoma: pronotum lacking sculpture; mesoscutum with fine transversely arcuate striae anteriorly, striae becoming longitudinal posteriorly; mesoscutellum convex, shiny, with longitudinal striae; propodeum long and low without a declivous posterior face, with fine striae in concentric ovals medially, transversely bisinuate posteriorly, and longitudinal laterally. Mesopleuron with weak to slightly strong transverse striae. Petiole bluntly rounded apically, with rounded triangular subpetiolar process anteriorly; densely pubescent anteriorly and laterally, with reduced pubescence posteriorly. Abdominal sternum IX disc very short, breadth almost three times length; posterior lobe length about twice width. Telomer apex very narrowly rounded, almost angular; telomere length distinctly greater than height; valvices ventral apex weakly produced, narrow; valvices apical margin linear to weakly concave; apicodorsal lobe of valvices somewhat narrow and short; vertical portion of dorsolateral carina and lateral margin of subapical lamina curving into one another.

**Queen:** HL 2.15, HW 1.77, EL 0.27, ML 1.20, PTL 0.52, WL 2.75 (measurements from Deyrup and Cover 2004, one individual measured). Structure and color similar to worker, but with presence of ocelli and expanded mesosoma (for flight); pronotum with transverse striae; and mesonotum with longitudinal striae.

**Distribution (Fig. 26):** Described from Highlands, Polk, Orange, and Citrus Counties in south-central peninsular Florida (Deyrup and Cover 2004).

**Discussion.** *Odontomachus relictus* is endemic to sand ridges in central Florida. It was described from the Lake Wales Ridge, including an outlier site previously thought to be part of the Orlando Ridge, and the Southern Brooksville Ridge, although the latter may be a distinctive allopatric population that deserves taxonomic recognition (Sorger, unpublished genetic data).

Little is known about the habitat requirements and nest structure of *O. relictus*. This species has been observed to nest in the ground at the base of oak bushes and is often found in places with at least some leaf litter cover. Due to specific habitat preferences or microclimatological needs, *O. relictus* may be threatened by human development and disturbance. This species is predominately nocturnal. Male flight activity peaks conspicuously during July through October, apparently correlated with moonlight (see Deyrup *et al.* 1985, where *O. relictus* is identified as *O. clarus*).

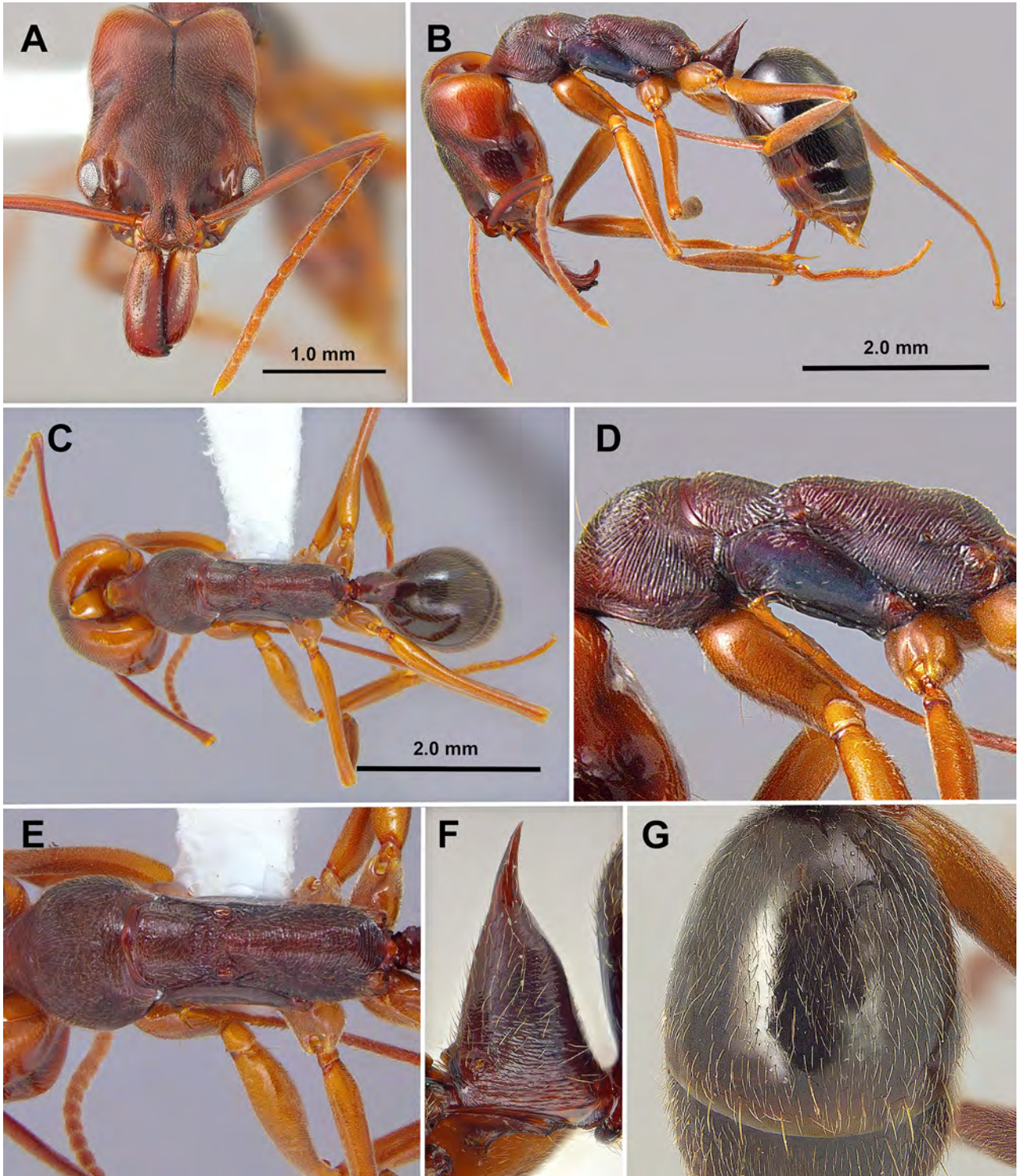
### ***Odontomachus ruginodis* M. R. Smith, 1937**

(Figs. 2, 3, 7, 9, 11, 22–26)

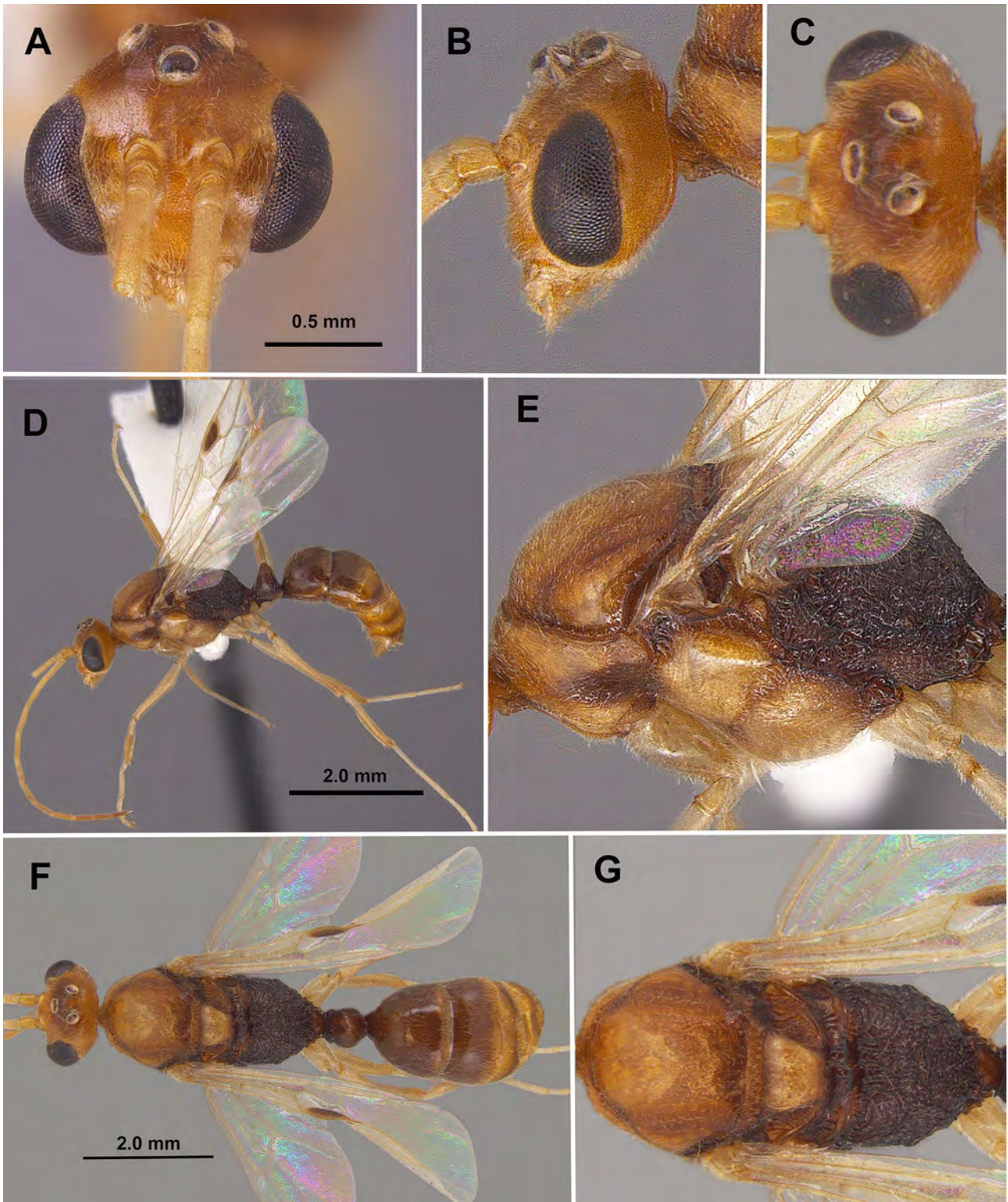
*Odontomachus haematodus* var. *ruginodis* Smith, 1937: 828 (worker and queen), Bahamas. [First available use of *Odontomachus haematodes insularis ruginodis* Wheeler, 1905: 82, unavailable name.] Deyrup, Trager & Carlin, 1985: 192 (male). Raised to species: Wilson, 1964: 4. Junior synonym of *O. brunneus*: Brown, 1976: 103. Revived from synonymy: Deyrup, Trager & Carlin, 1985: 192.

**Diagnosis.** Workers may be identified by the unique following character combination: 1) body small, somewhat tricolored orangish, reddish-brown, and blackish; 2) petiolar node with conspicuous transverse striae; and 3)

metasternal ridge notched, with short, rounded triangular teeth (not elongate as in *O. haematodus*). Males are uniquely identified by the following character combination: 1) ocelli small, weakly projecting beyond posterior head margin; 2) metasternal processes short; 3) mesoscutum smooth to weakly longitudinally striate; 4) propodeum coarsely rugose; and 5) petiolar node conspicuously striate. Abdominal sternum IX is most similar to that of *O. haematodus*, but the apex of the posterior lobe is narrower (see Fig. 24). Genitalia are most similar to *O. clarus* but are differentiated by the following characters: telomerapex broader, more evenly rounded; telomerapex posterodorsal margin less concave; valviceps apicodorsal lobe and ventroapical process broader (Fig. 25).



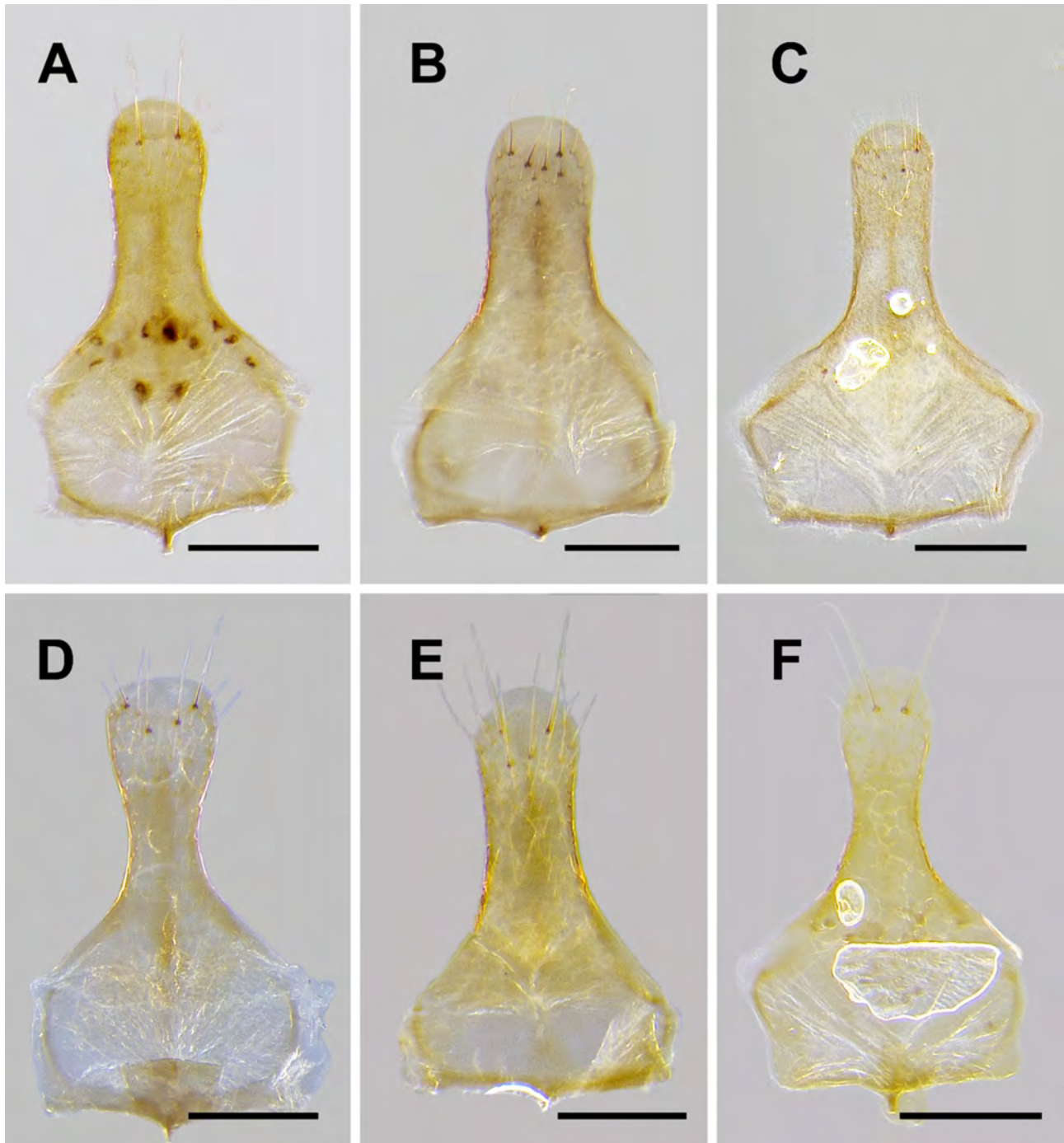
**FIGURE 22.** *Odontomachus ruginodis*, worker: (A) head in full-face view, (B) lateral habitus, (C) dorsal habitus, (D) mesosoma in dorsal view, (E) mesosoma in lateral view, (F) petiole in lateral view, and (G) first gastral tergite in dorsal view showing pubescence.



**FIGURE 23.** *Odontomachus ruginodis*, male: (A) head in full-face view, (B) head in lateral view, (C) head in dorsal view, (D) lateral habitus, (E) mesosoma in lateral view, (F) dorsal habitus, and (G) mesosoma in dorsal view.

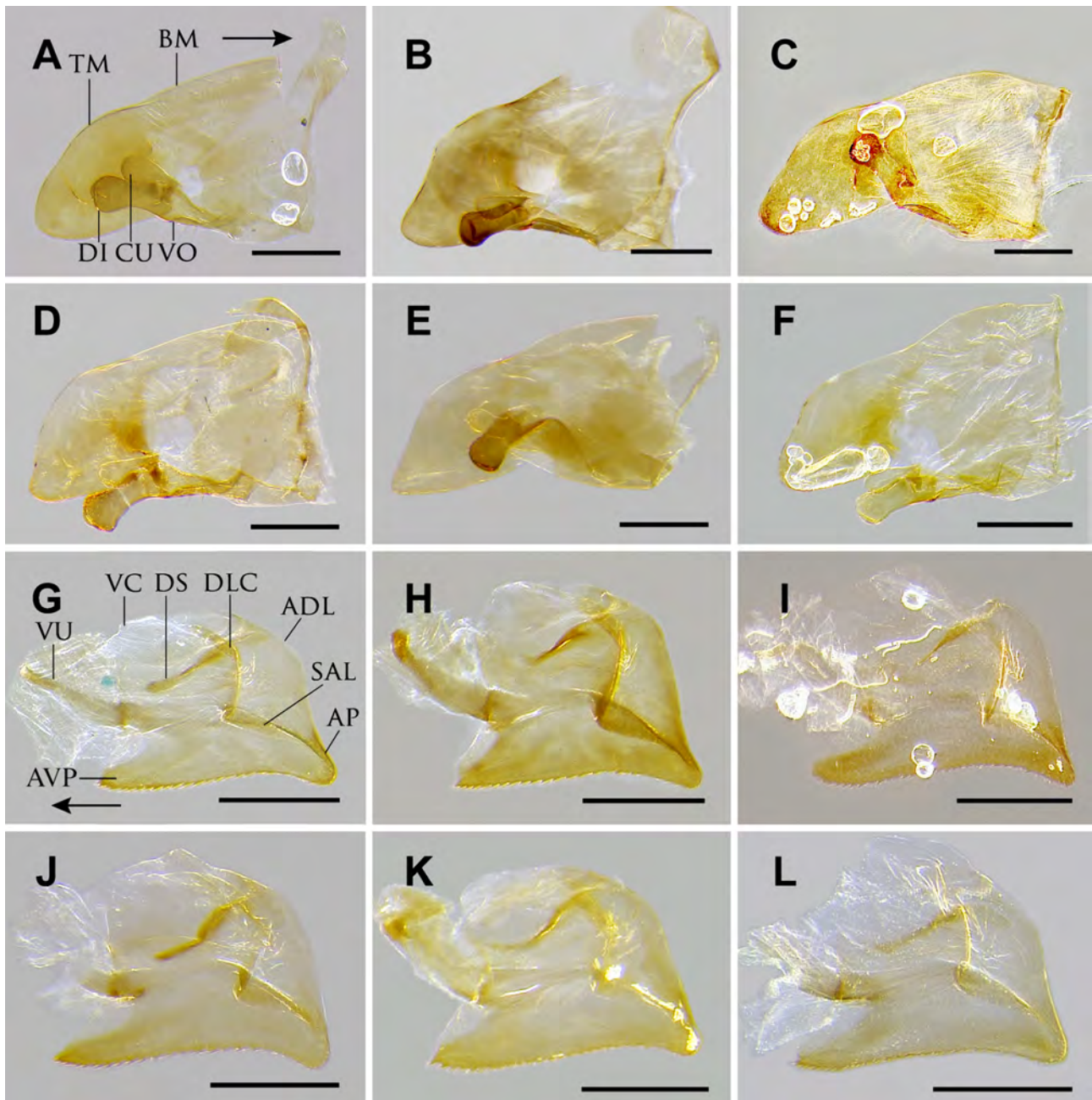
**Description.** Worker: HL 2.00–2.18, HW 1.58–1.76, SL 1.78–1.90, EL 0.33–0.38, ML 1.16–1.20, WL 2.50–2.60, PTH 0.88–1.04, PTL 0.44–0.46 (n=5). Entire body generally shiny except where dulled by dense pubescence; head including mandibles and antennae and legs orangish-brown to reddish-brown, mesosoma and waist darker reddish-brown, and gaster brownish-black. Head with fine, longitudinal striae covering much of the head in full-face view, striae beginning from frontal lobes and diverging toward posterior corners of head, fading at corners and sides; sides and underside of head lacking sculpture; with numerous, fine, appressed pubescence and

scattered elongate, erect setae present dorsally. Pronotum with somewhat circular concentric striae that become transverse near rear margin; appressed pubescence abundant; 6–10 elongate, erect setae present. Mesonotum and propodeum with deep transverse striae; propleuron, mesopleuron, and basalar lobe lacking sculpture; abundant pubescence present dorsally. Metasternum with ridge that can be bilobed or cleft, but lobes not extending out as elongate, spiniform processes (Fig. 3B). Petiole widest at base, gradually tapering apically to a short spine directed rearward; with transverse striae present and obvious of all surfaces; subpetiolar process somewhat anvil shaped; appressed pubescence present anteriorly and laterally, but mostly absent posteriorly. Gaster mostly shiny beneath pubescence, lacking striae or other strong sculpture, but with fine coriaceous sculpture (seen at high magnification); slightly coarse, appressed pubescence somewhat sparse, spaces between hairs more than 1/2 the length of a single hair; scattered erect, elongate setae present.



**FIGURE 24.** Male *Odontomachus* abdominal sternum IX, mesal view; all scale bars 0.2 mm. (A) *Odontomachus brunneus*; (B) *O. clarus*; (C) *O. desertorum*; (D) *O. haematodus*; (E) *O. relictus*; (F) *O. ruginodis*.





**FIGURE 25.** Male *Odontomachus* genitalic sclerites, left-hand side; arrows indicate anterior; all scale bars 0.2 mm. (A–F) Paramere and volsella, medial view; (G–L) penisvalva, lateral view. (A, G) *Odontomachus brunneus*; (B, H) *O. clarus*; (C, I) *O. desertorum*; (D, J) *O. haematodus*; (E, K) *O. relictus*; (F, L) *O. ruginodis*. Abbreviations: ADL = apicodorsal lobe; AP = apicoventral process; AVP = anteroventral process; BM = basimere; CU = cuspis; DI = digitus; DLC = dorsolateral carina; DS = diagonal sclerotization; SAL = subapical lamina; TM = telomere; VC = valviceps; VO = volsella; VU = valvura.

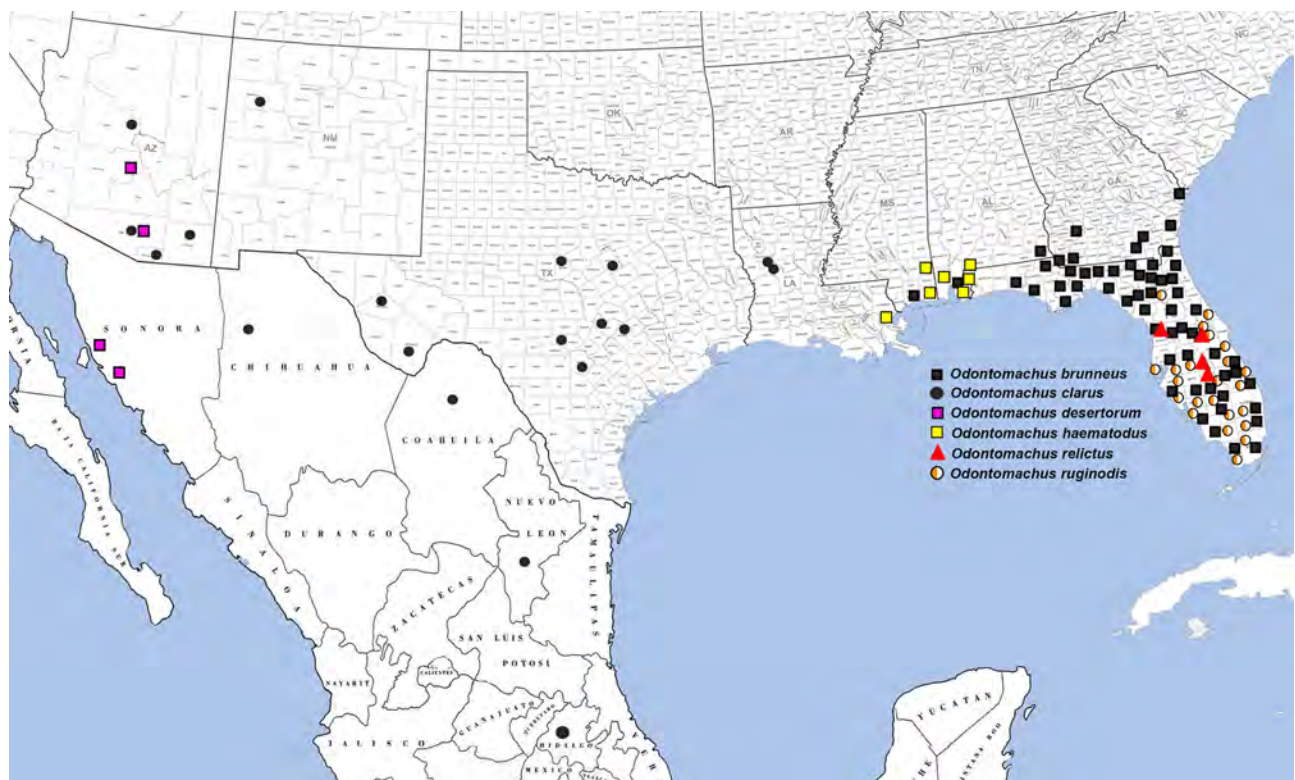
**Male:** HL 0.88–0.96, HW 1.10–1.20, SL 0.15–0.18, EL 0.58–0.64, EW 0.32–0.38, OL 0.15–0.18, OES 0.22–0.23, WL 2.28–2.50, PTH 0.72–0.76, PTL 0.42–0.48; FWL 4.08–4.60 (n=5). Head, mesosoma, and petiole generally shiny except where obscured by dense pubescence; head and mesosoma yellowish-brown with a darker brown infuscation on pronotum, propodeum dark brown, gaster yellowish-brown to darker brown, antennae and legs pale yellowish-brown. Head, meso- and metasoma with abundant fine, white pubescence except on anepisternum where pubescence is mostly absent. Eyes relatively large, maximum diameter of each eye 50–60% of the length of the head in full-face view. Ocelli relatively small, length of each ocellus less than distance between lateral ocellus and eye margin; in full-face view, lateral ocelli only protrude slightly beyond posterior border of head. Mesosoma: pronotum lacking sculpture; mesoscutum feebly shining, lacking obvious sculpture;

mesoscutellum raised and rounded, with longitudinal striae; propodeum with distinct declivous face in profile, strongly rugoreticulate; mesopleuron mostly lacking striae. Petiole bluntly rounded apically, with triangular subpetiolar process anteriorly; densely pubescent anteriorly and laterally, but reduced pubescence posteriorly. Abdominal sternum IX disc breadth about twice length; posterior lobe length about twice maximum lobe width, basal half strongly narrowed. Telomerap apex narrowly to somewhat broadly rounded; telomere length distinctly greater than height; valvices ventral apex weakly produced, broad; valvices apical margin broadly concave; vertical portion of dorsolateral carina and lateral margin of subapical lamina meeting at an angle; apicodorsal lobe of valvices somewhat broad, short; subapical lamina broad.

**Queen:** HL 2.18–2.20, HW 1.82–1.88, SL 1.90–2.02, EL 0.40–0.46, ML 1.10–1.30, OL 0.12, WL, 2.94–3.06, PTH 1.14–1.24, PTL 0.52–0.56, FWL 6.00–6.25 (n=2). Similar to workers in color and general appearance except slightly larger, alate, and with mesosoma developed for wings.

**Distribution (Fig. 26):** In the US, this species is known only from peninsular Florida, where it is abundant in the Keys and the southern Peninsula, found sporadically in the central and northern Peninsula: Alachua, Brevard, Broward, Charlotte, Collier, Dade, Glades, Hendrey, Highlands, Hillsborough, Indian River, Lee, Manatee, Martin, Monroe, Orange, Polk, Sarasota, St. Lucie, and Volusia Counties (Deyrup and Cover 2004). The species has been reported from the West Indies (Deyrup & Cover 2004), and is apparently widespread in Central and South America (based on specimens examined from UMN, UCDC, and UGCA).

**Discussion.** The status of *Odontomachus ruginodis* as an exotic species is unclear. The Florida populations may be recent arrivals from Antillean populations, as evidenced by the frequent collection in disturbed areas, such as near homes, rather than in natural habitats. Indeed, Puerto Rican populations of *O. ruginodis* show a preference for forests that are at least 25 years old (Osorio-Pérez *et al.* 2007), and males of Nearctic *O. ruginodis* more-closely resemble those of the Antilles rather than of the mainland Neotropics. During the past 20 years, this species appears to have been steadily expanding its range northward in Florida. Males have been collected from early May through June.



**FIGURE 26.** Map of the southern United States (by county) and northern Mexico (by state) showing the known occurrences of *Odontomachus brunneus* (black square), *O. clarus* (black circle), *O. desertorum* (magenta square), *O. haematodus* (yellow square), *O. relictus* (red triangle), and *O. ruginodis* (orange and white circle).

## Acknowledgments

We extend our gratitude to two anonymous reviewers for constructive comments that greatly improved the manuscript; and to John Longino for encouraging expansion of this work. Reviewer 1 and Stefan Cover are particularly thanked for prompting BEB to examine the *O. clarus* complex in greater detail. For valuable loans of material, we thank Rick Hoebeke (University of Georgia), Doug Booher (University of California, Los Angeles), Victoria Bayless (Louisiana State University), Andy Suarez (University of Illinois at Urbana-Champaign), William MacKay (University of Texas, El Paso), John Longino (University of Utah), Giar-Ann Kung (LACM), and Stefan Cover and Jignasha Rana (MCZ) ; for collections of specimens, we thank Heath Richter (Mobile, AL), Dan Suiter (GA), Lloyd Davis (FL), Archie Nelson (Jackson Co., MS), Fred Larabee (University of Illinois at Urbana-Champaign), and others. Thanks to Barry Bolton and the AntCat community (<http://www.AntCat.org/>) community for taxonomic catalog resources. This article is approved for publication as Journal Article No. J- 12474 of the Mississippi Agricultural and Forestry Experiment Station. This research was supported in part by the National Institute of Food and Agriculture, United States Department of Agriculture, under Project No. MIS-012040 and the USDA-ARS Areawide Management of Imported Fire Ant Project (Richard L. Brown, Principal Investigator).

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#### APPENDIX 1. Specimen records of *O. desertorum* and *O. haematodus* examined.

***Odontomachus desertorum*. United States: Arizona:** *Maricopa Co.*, Mesa nr. McDowell & Val Vista, 33.46833 -111.75667, 22 June 2005, J. Weser, desert backyard, under bushes, foraging under bushes (2 workers, 2 males) [MCZC]; *Pima Co.*, Tuscon, Near University of Arizona, 32.23210 -110.95538, 1 August 1951(1 male) [LACM]. **Mexico: Sonora:** R. Yaqui, Hwy 15, 27.366667 N -110.166667 W, +/- 3km, 10 m elevation 7.viii.1985 Ginter Ekis coll. (1male) [UCDC]; 9 km NNE Punta Narragansett, Isla Tiburón, 28 deg 57' N 112 deg 13' W, 5 m elev. 15.xii.1997 P.S. Ward#13465-2, ex spider middens under stone, Sonoran desert (3 workers) [UCDC]

***Odontomachus haematodus*. United States: Alabama:** *Baldwin Co.*: Bay Minette, 14 June 2003, J. Forster (2 workers) [AUEM]; Blakeley Park, 30°43'55"N 87°55'08"W, 7 Aug. 2013, J.A. MacGown, nest in oak-magnolia litter (1 worker) [MEM]; same date except, 30°43'57"N 87°54'46"W, 7 Aug. 2013, J.A. MacGown, nest in litter at base of pine tree in mixed pine hardwood forest (1 dealate queen, 39 workers) [MEM], same data except, 30°44'50"N 87°55'23"W, 8 Aug. 2013, at peanut butter bait on *Quercus* sp. in bottomland forest (1 worker) [MEM]; Bon Secour NWR, H. Richter (1 worker) [MEM], same data except, 30°13'43"N 87°49'51"W, 21 June 2001, J.A. MacGown, blacklight and MV lamp in foredunes (1 male) [MEM], same data except, 30°13'43"N 87°49'51"W, 29 March 2007, J.A. MacGown, J.G. Hill, in foredunes (12 workers) [MEM], same data except, 30°13'43"N 87°49'51"W, 3 April 2005, J.A. MacGown, under rotting log under scrub oak tree in foredunes (1 worker) [MEM], same data except, 30°14'10"N 87°49'49"W, J.A. MacGown, J.G. Hill, in hind dunes (1 worker) [MEM], same data except, 30°14'48"N 87°49'45"W, 3 April 2005, J.A. MacGown (8 workers) [MEM]; Byrnes Lake, 11 Oct. 2001, J.McCredie (1 worker) [MEM]; Daphne, Village Point Park, 12 June 2012, H. Richter (4 workers) [MEM]; Weeks Bay NERR, 30°24'58"N 87°49'10"W, 4 Aug. 2000, R.L. Brown, blacklight/boxtrap in pitcher plant bog, William H. Cross Expedition (2 males) [MEM], same data except, 3 Aug. 2000, T.L. Schiefer, blacklight trap in mixed forest near estuary, W.H. Cross Expedition (5 males) [MEM]; Weeks Bay NERR, 30°25'03"N 87°49'50"W, 1 Aug. 2000, D.M. Pollock, blacklight trap in mixed forest near estuary, W.H. Cross Expedition (1 male) [MEM], same data except, 1 Aug. 2000, J.A. MacGown, blacklight trap in mixed forest near estuary, W.H. Cross Expedition (1 male) [MEM], same data except, 1 Aug. 2000, T.L. Schiefer, blacklight trap in mixed forest near estuary, W.H. Cross Expedition (5 males) [MEM], same data except, 4 Aug. 2000, 4 Aug. 2000, J.A. MacGown, blacklight trap in mixed forest near estuary, W.H. Cross Expedition (1 male) [MEM], same data except, 4 Aug. 2000, R.L. Brown, at tree seep in mixed forest near estuary, W.H. Cross Expedition (4 workers) [MEM], same data except, 4 Aug. 2000, T.L. Schiefer, blacklight trap in mixed forest near estuary, W.H. Cross Expedition (1 male) [MEM], same data except, 5 Aug. 2000, T.L. Schiefer, blacklight trap in mixed forest near estuary, W.H. Cross Expedition (3 males) [MEM], same data except, 6 Aug. 2000, T.L. Schiefer, blacklight trap in mixed forest near estuary, W.H. Cross Expedition (1 male) [MEM], same data except, 1-8 Aug. 2000, J.A. MacGown, B. Smith, pitfall traps in mixed forest near estuary, W.H. Cross Expedition, (54 workers) [MEM], same data except, 20 June 2001, J.A. MacGown, blacklight trap in mixed forest near estuary, W.H. Cross Expedition (3 males) [MEM], same data except, 20 June 2001, T.L. Schiefer blacklight & M.V. lamp in mixed forest near estuary, W.H. Cross Expedition (6 males) [MEM], same data except, 23 June 2001, J.A. MacGown, blacklight trap in mixed forest near estuary, W.H. Cross Expedition (3 males) [MEM], same data except, 23 June 2001, J.A. MacGown, on mushroom on tree in mixed forest near estuary, W.H. Cross Expedition (2 workers) [MEM], same data except, 25 June 2001, T.L. Schiefer, blacklight trap in mixed forest near estuary, W.H. Cross Expedition (1 male) [MEM], same data except, 21-25 June 2001, J.A. MacGown, pitfall traps in mixed forest near estuary, W.H. Cross Expedition, (2 workers) [MEM], same data except, 6 April 2003, R.L. Brown, bottomland marsh (7 workers) [MEM], same data except, 2 April 2005, J.A. MacGown, under rotting log in mixed forest near estuary (1 dealate queen, 43 workers) [MEM], same data except, 2 April 2005 (25 workers) [MEM], J.A. MacGown, under rotting log in mixed forest near estuary (1 dealate queen, 43 workers) [MEM], same data except, 3 April 2005, R.L. Brown, under bark of *Pinus* sp. stump in mixed forest near estuary (2 workers) [MEM]; Weeks Bay NERR, 30°25'08"N 87°49'05"W, 13 April 2013, Jaeger, colony in tree hole at edge of parking log and pitcher plant bog (4 workers) [MEM]; Weeks Bay NERR, 30°25'08"N 87°49'50"W, 13 April 2013, C. Jaeger, colony under PVC piping at dormitory at edge of mixed estuarine forest (3 workers) [MEM]; no locality data, May, R. Wingard, ex lawn (1worker) [AUEM], no locality data, June, R. Wingard, ex lawn (1worker) [AUEM], no locality data, summer, E. Benson (1 worker) [AUEM]. *Escambia Co.*: 1.25 mi NW of Atmore, 31°01'52"N 87°30'42"W, 1-22 July 2013, A. Van Hoogmoaed, Lindgren Funnel trap with ethanol/Alpha pinene UHR Lure (1 dealate queen, 1 alate

queen, 1 male) [MEM]. *Mobile Co.*: Mobile, 1 June 1956 [no collector information] (3 workers) [USNM]; Mobile, 22 March 2003, T. Toliver (2 workers) [AUEM]; Mobile, 20 May 1974, E.C. Ward, (2 workers) [AUEM]; Mobile, July 2007, C. Hesselein, (2 workers) [AUEM]; Mobile, 13 June 2003, J. Forster (4 workers) [AUEM]; Mobile, 30°34'39"N 88°12'09"W, 9 July 2013, G. Kalb, colony in rotted pecan stump in yard in residential neighborhood (3 workers) [MEM]; Mobile, 30°42'43"N 88°07'44"W, 12 June-2 July 2013, A. Van Hoogmoaed, Lindgren funnel trap (1 alate queen) [MEM]; Prichard, Chickasobogue Park, 28 June 2012, H. Richter, base of dead pine tree (2 workers) [MEM]; Theodore, 20 June 2012, Richter, nest at base of tree (1 worker) [MEM]. **Florida:** *Escambia Co.*: Perdido Bay Golf Club, N30 19.553' W087 25.584, 11 Nov. 2005, L.R. Davis, Jr., in litter at base of pine tree (1 worker, 1 male) [Lloyd Davis private collection]. **Louisiana:** *Orleans Parish*: New Orleans, Audubon Zoo, 25 Sept. 2009, F. Larabee (1 worker) [MEM]. **Mississippi:** *Greene Co.*: Deaton Preserve, 31°00'04"N 88°42'08"W, 12 May 2006, J.A. MacGown, J.G. Hill, nest in soil and wood at base of thin-leaved *Quercus* sp. (30 workers) [MEM]. *Jackson Co.*: 2 mi NNE Call Town, 30°31'27"N 88°32'34"W, 20 June-25 July 2006, D.W. Haynes, Lindgren funnel trap baited with Typosan (1 worker) [MEM]; 3 km W Moss Point, 30°24'43"N 88°33'58"W, 29 Oct. 2009, J. Benigno (17 workers) [MEM]; Forts Lake Rd. X I-10, 88.41645 N 30.52996W, 12 Sept. 2007, S. Chandler (3 workers) [MEM]; Grand Bay Savanna, 30°25'39"N 88°25'30"W, 1 May 2004, J.G. Hill, coastal savannah (2 workers) [MEM]; Grand Bay Savanna, 30°22'07"N 88°26'21"W, 1 May 2004, J.A. MacGown, in soil on shell midden (2 workers) [MEM]; Moss Point, 30°27'04"N 88°32'52"W, 1 Oct. 2013, A. Nelson, colony in leaf litter at base of pecan tree in residential neighborhood (3 workers) [MEM]; Moss Point, T6S R5W Sec. 6, 14 Dec. 2002, J.G. Hill (3 workers) [MEM]; Moss Point, 19 May 2010, C. Whittington, (1 worker) [MEM]; Pascagoula, 30°31'13"N 88°32'31"W, 9 Sept. 2013, S. Jones, in yard in residential neighborhood (1 worker) [MEM]; Pascagoula, 30°21'35"N 88°31'07"W, 22 Sept. 2000, M. Riggins (5 workers) [MEM]; [locality unknown], 3 Nov. 2008, S. Pendleton (6 workers) [MEM]; 1.5 mi NE Escatawpa, 30°27'23"N 88°31'21"W, 27 April-16 May 2006, D.W. Haynes, Lindgren funnel trap baited with Typosan (1 alate queen) [MEM].