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Description of a new species of *Myrmecina* (Hymenoptera: Formicidae: Myrmicinae) from the southeastern United States

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ABSTRACT

Myrmecina davisoni sp. nov. (Hymenoptera: Formicidae: Myrmicinae) is described from Alabama, USA based on specimens from a mixed colony that included one *M. davisoni* queen with workers and several *Myrmecina americana* Emery workers without a queen, suggesting that *M. davisoni* may be parasitic. Photographs of the worker and queen are provided and an identification key separating this species from the two other described North American species, *M. americana* and *Myrmecina cooperi* Deyrup, is given.

Keywords. New species, southeastern United States, ants, Myrmicinae, cryptic, parasitic, trap nests.

INTRODUCTION

The genus *Myrmecina* (Hymenoptera: Formicidae: Myrmicinae) includes 105 species worldwide (Bolton 2023). Only three *Myrmecina* species are currently recognized in North America: *M. americana* Emery, a widespread species ranging from southern Canada to Baja California (Fisher & Cover 2007); *M. cooperi* Deyrup, a rarely collected species only known from Alabama and Florida (Deyrup 2015); and *M. harrisoni* Brown, which occurs in Mexico (Brown 1967). Fisher & Cover (2007) gave brief mention of a rarely collected and undescribed species of *Myrmecina* that is found in nests of *M. americana*. Deyrup (2015) referred to this undescribed species in his manuscript, included lateral habitus and full-face view drawings of the worker caste, and even included it in his key to species of *Myrmecina* in North America north of Mexico, but he did not give it a name. In an unpublished study of ant trap nest efficacy in Alabama, Paul Davison (University of North Alabama) and I discovered a mixed colony of *M. americana* and another species of *Myrmecina* that matched the illustrations and information given by Deyrup (2015). In this paper, I describe the worker and queen castes of this new species of *Myrmecina* as *M. davisoni* sp. nov.

MATERIAL AND METHODS

Specimens were collected in a plaster “trap nest” (Fig. 1) that was buried just below the surface of the leaf litter beneath an oak tree in Wildwood Park in Florence, Lauderdale County, Alabama (34.804N, 87.695W). The plaster trap nest, designed by Paul Davison, was one of many that were placed in woodland habitats as part of collaborative study with Davison comparing occupancy rates of ants in plaster trap nests vs wooden trap nests (study results in progress). Each plaster trap nest was formed in two pieces by pouring a mixture of DAP® Plaster of Paris and water into ice cube trays with elliptical shaped depressions and leveled flat on top. After the plaster pieces were dried, cavities were drilled in each half and an “entrance hole” of ca. 2.0 mm was drilled into one of the halves. The halves were then positioned together with a cable tie forming a cylinder approximately 4.0 cm in length and 1.7 cm in width (at middle), and with a cavity diameter of ca. 9.5 mm and cavity volume of ca. 1.16 ml.

The trap was placed in the ground on 3 September 2016, and a colony of unidentified ants with a queen was observed occupying the trap on 15 October 2016. The trap was again observed on 14 December 2016 and found to be vacant. The trap was checked for occupancy on 27 April 2017 and was

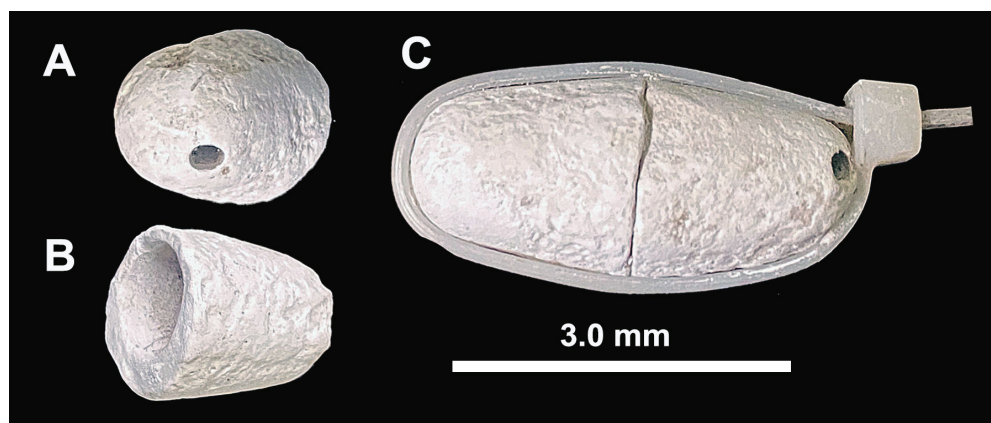


Figure 1. Plaster trap nests: (A) view of one half of a trap nest showing drilled entrance hole, (B) view of one half of trap nest showing the cavity space (both halves of trap nest have similar cavities), and (C) two halves of a trap nest tied together with cable tie.

occupied by a colony, which was collected for study.

Photomicrographs were captured using a Leica DFC 495 digital camera mounted on a Leica Z16 Microscope with motorized Z-stepping, and image stacks were merged using Leica Application Suite V 4.1.0 with Montage Module. All images were edited in Photoshop CS6. Measurements were made using a reticule placed in a 10X eyepiece of a Leica MZ16 stereomicroscope at a magnification of 10–100X. All measurements are given in millimeters. Measurements taken as follows:

AntL-I: Maximum length of scape (first antennomere) measured without condyle and neck.

AntL-II–XII: Length of funiculus (antennomeres 2–12).

Ant-X–XII: Length of club (antennomeres 10–12).

AntL-XII: Length of apical antennomere.

EL: Eye length. Maximum length of eye, measured in lateral view

GL: Maximum length of gaster measured in profile (this may vary, and was only used as part of the approximate total length measurement)

HW: Head width. Maximum width of head including eyes in full-face view.

HL: Head length. Maximum length of head along midline in full-face view, measured medially from the anteriormost part of the head (anterior edge of clypeus) to the uppermost point of posterior margin.

MDL: Mandible length. Maximum length of mandible measured in full-face view from posterior margin of clypeus to apex.

MesL: Mesosoma length. Maximum length of mesosoma in lateral view measured from farthest point on anterior face of pronotum, excluding the neck, to posteroventral corner of mesosoma.

PrW: Pronotum width. Maximum width of pronotum in dorsal view.

PW: Petiole width. Maximum width of abdominal segment II (petiole) in dorsal view.

PL: Petiole length. Maximum length of abdominal segment II (petiole) in dorsal view, measuring only the length of the petiolar posttergite.

PPW: Petiole width. Maximum width of abdominal segment III (postpetiole) in dorsal view.

PPL: Petiole length. Maximum length of abdominal segment III (postpetiole) in dorsal view, measuring only the length of the petiolar posttergite.

FFeL: Fore femur length.

MFeL: Mid femur length.

HFeL: Hind femur length.

WstL: Waist length. Measurement of waist in lateral view (used as part of the approximate total length measurement).

TL: $HL + MesL + WstL + GL$

The holotype and two paratypes were deposited in the Mississippi Entomological Museum (MEM).

RESULTS

The trap nest contained 16 workers of *M. americana*, one queen of *M. davisoni*, seven workers of *M. davisoni*, and 14 larvae and 11 eggs of either

M. americana or *M. davisoni*. Unfortunately, six of the *M. davisoni* workers had been pulled out for study and misplaced, and these specimens were not available to measure at the time when this manuscript was being written.

Key to the species of *Myrmecina* in the southeastern United States

Key to United States species of *Myrmecina* based on workers, modified from Deyrup (2015).

- 1 Head, mesosoma, and waist shiny, with reduced parallel carinae, interrugal rugoreticulation lacking; propodeal spine blunt, pre-propodeal spine lacking (Fig. 2A) *Myrmecina davisoni* MacGown sp. nov.
- Head, mesosoma, and waist with strong sculpture, conspicuous parallel carinae present with rugoreticulation in between carinae; propodeal spine acute, small triangular pre-propodeal spine present (Fig. 2B) 2

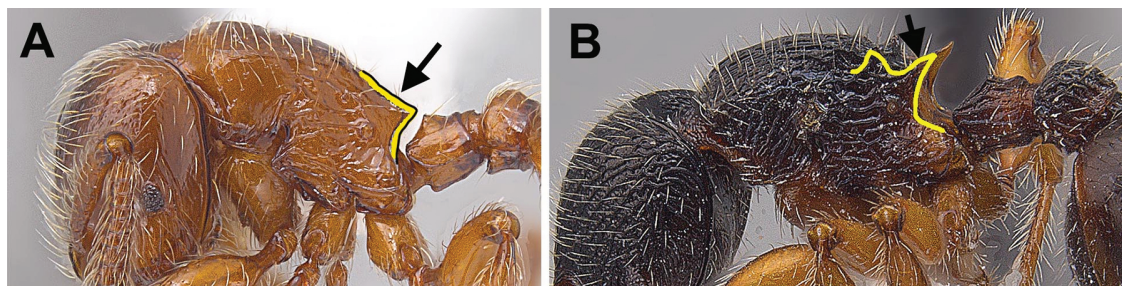


Figure 2. (A) *Myrmecina davisoni* sp. nov. showing the overall lack of sculpture and single blunt propodeal spine and (B) *M. americana* showing the coarse sculpture and acute propodeal spine with small pre-spinelike process.

- 2 Total length 2 mm or less; postpetiole with a distinct ventral process that is directed anteriorly (Fig. 3A); color dark reddish brown *Myrmecina cooperi* Deyrup
- Total length greater than 2.0 mm; postpetiole concave below, lacking a conspicuous process (Fig. 3B); color reddish brown to blackish brown *Myrmecina americana* Emery

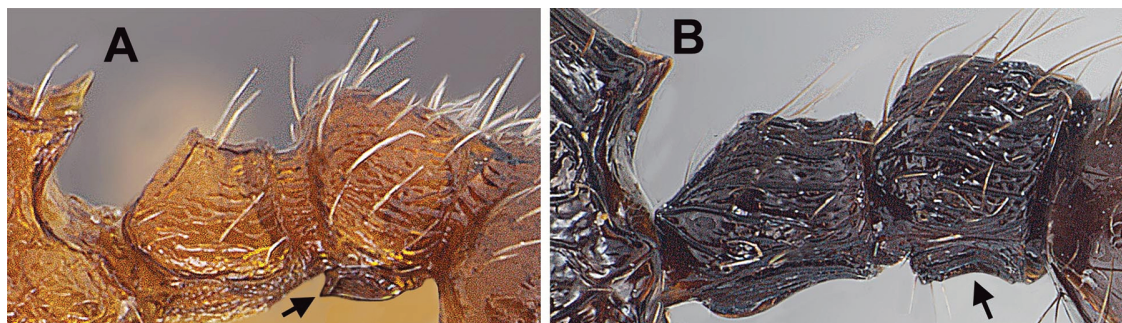


Figure 3. (A) *Myrmecina cooperi* with arrow pointing to anteriorly directed ventral postpetiolar process and (B) *M. americana* with arrow pointing to ventral area of postpetiole showing concavity; forward projecting process lacking.

Taxonomy

Myrmecina davisoni MacGown sp. nov.

(Figures 2A, 4A, 5, 6)

urn:lsid:zoobank.org:act:F8859812-73F8-

4D21-B2C8-452DA577843C

Holotype worker — [United States] ALA., Lauderdale, Wildwood Park, Florence, 34.80911 -87.69828, 27 Apr 2017, P. G. Davison & T. I. Heinkel, Plot 2, Colony in artificial plaster cavity under leaf litter beneath oak trees (Holotype deposited in MEM). Specimen code MEM 455,106.

Paratype worker — Same data as holotype except with unique specimen code: MEM 455,107.

Paratype dealate queen — Same data as holotype except with unique specimen code: MEM 455,108.

Holotype measurements: HW 0.62, HL 0.66, EL 0.08, AntL-I 0.51, AntL-II–XII 0.81, AntL-X–XII 0.41, AntL-XII 0.26, MDL 0.37, PrW 0.41, MesL 0.76, PW 0.18, PL 0.20, PPW 0.22, PPL 0.20, FFeL 0.51, MFeL 0.51, HFeL 0.52.

Additional paratype measurements (one worker): HW 0.63, HL 0.66, EL 0.07, AntL-I 0.50, AntL-II–XII 0.88, AntL-X–XII 0.45, AntL-XII 0.26, MDL 0.38, PrW 0.43, MesL 0.78, PW 0.20, PL 0.20, PPW 0.23, PPL 0.19, FFeL 0.52, MFeL 0.51, HFeL 0.52; (*one dealate queen*): HW 0.90, HL 0.91, EL 0.16, AntL-I 0.60, AntL-II–XII 0.93, AntL-X–XII 0.50, AntL-XII 0.31, MDL 0.44, PrW 0.79, MesL 0.78, PW 0.25, PL 0.22, PPW 0.34, PPL 0.20, FFeL 0.69, MFeL 0.68, HFeL 0.71.

Diagnosis (worker) — The genus *Myrmecina* can be separated from other myrmicine genera in North America by the distinctive ridge located on the side of head that extends from the mandibles to the posterior corners of the head and by the low rounded shape of the petiole (in lateral view), which lacks a distinct node. Workers of *Myrmecina davisoni* are small (TL \approx 2.70 mm), shiny reddish brown, have reduced carinae and other sculpture, lack a small pre-propodeal process found in many *Myrmecina* species, and possess a distinct ventral process on the postpetiole that projects anteriorly (Fig. 4A). *Myrmecina davisoni* is easily differentiated from the other North American species, *M. americana*, *M. cooperi*, and *M. harrisoni*, by its lack of sculpture

on the entire body, which gives it a shiny, glossy appearance. *Myrmecina americana* also differs from *M. davisoni* by lacking a forward projecting process on the venter of the postpetiole and being concave instead (Fig. 4B).

Description of Holotype worker — (Figures 2A, 4A, 5A–D): Small (TL approximately 2.72 mm). Entire body reddish brown except gastral tergites I and II, which are dark brown. Head, mesosoma, waist, and appendages shiny with reduced sculpture in the form of weak carinae on head and mesosoma; gaster finely shagreened. Head, mesosomal dorsum, waist dorsum, gaster, antennae, and legs with abundant, long, semierect, curved, whitish setae.

Head in full face view slightly longer than wide, rounded rectangular; posterior corners of head slightly rounded, posterior margin concave; sides of head with a strong ridge extending from mandibles to the posterior corners of the head; several low, carina present between antennal fossae extending longitudinally from level of antennal insertions toward posterior edge of head, most not reaching edge, several similar carina present on side of head beneath eye and encircling eye; strong sculpture such as rugoreticulation not present on head, but fine micro reticulation present; numerous, semi erect, curved, whitish setae of approximately the same length present across entire head with those along edges curved anteriorly, setae on face curving inward toward midline, setae on clypeal edge curving anteriorly and toward midline of clypeus, setae closest to clypeus longer than others on head; eyes located on sides of head near mid-point, small, with 15 facets: clypeus broadly rounded with a median tooth; antennal fossae covering antennal insertions; antennae with 12 antennomeres, scape (antennomere I) long, angled near base, slightly narrowed basally then widening; antennomeres II–IX each slightly wider than long, antennomere II and IX approximately the same size, antennomeres III–VIII slightly smaller than II or IX and subequal to one another, antennomeres X–XII each successively larger and forming a club with apical antennomere (XII) slightly longer than X–XI; scape with numerous semi erect, whitish setae, all curving toward apex; funiculus with numerous semi erect, curved, whitish setae directed apically with those on apical flagellomere being denser and shorter than elsewhere on funiculus; mandible long,

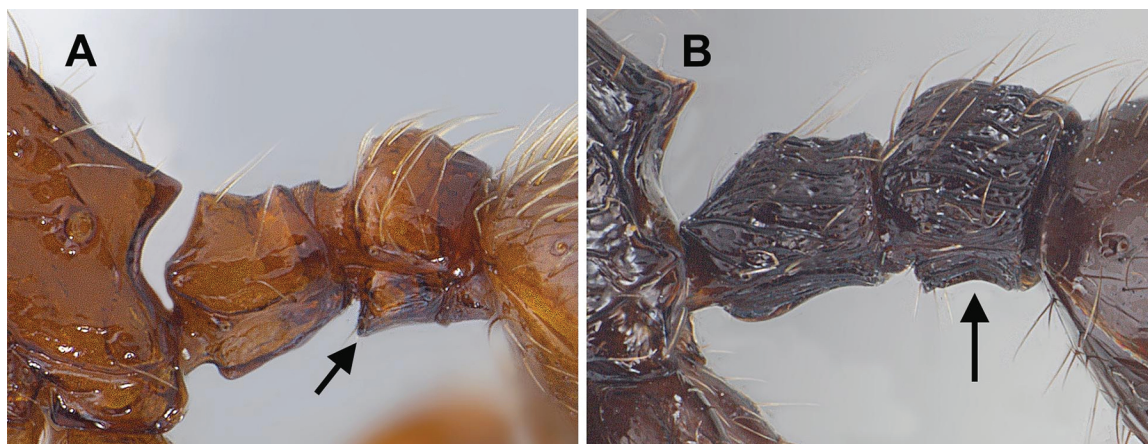


Figure 4. (A) Lateral view of the posterior region of propodeum and the waist of *Myrmecina davisoni* sp. nov. Note the overall lack of sculpture, blunt propodeal process projected posteriorly, and anteriorly directed ventral postpetiolar process and (B) lateral view of the posterior region of propodeum and the waist of *M. americana* showing strong sculpture, acute propodeal spine projected slightly upward, and venter of postpetiole concave, lacking a forward projecting process.

curved, somewhat scoop-shaped, teeth along margin reduced, slightly serrate, and apical tooth elongate.

Mesosoma entire, in dorsal view widest at humeral area and narrowing to propodeum; promesonotal and metanotal sutures weakly impressed, only obvious on lower mesopleural region; entire mesosoma smooth and shiny, lacking notable sculpture except for several irregular raised carinae on mesopleuron and metapleuron; six irregular, longitudinal carinae on dorsum of mesonotum and propodeum; and strong carinae encircling the entire mesosoma in lateral view and in dorsal view from humeral area to and surrounding propodeal teeth; interspaces smooth; mesosomal dorsum with numerous semi erect, curved, whitish setae; propodeal spines triangular, lacking a smaller anterior spine (often present in *Myrmecina* species); propodeal spiracle circular. Waist smooth, shiny, lacking sculpture; petiole about as wide as long, somewhat barrel shaped, with a low, raised triangular process dorsally, with a few erect, whitish setae dorsally; postpetiole slightly wider than long, with a strong ventral process projecting anteriorly, dorsum with numerous erect, curved, whitish setae. Legs shiny, with numerous semi-erect, whitish setae; fore, mid, and hind femur subequal, basal region of each femur narrowed then widened.

Gaster weakly shagreened, with numerous, semi erect, curved, whitish setae of approximately the same length present.

Description of Paratype Dealate Queen — (Figs. 6A–D): Larger than worker (TL 3.97 mm). Head except cheeks, mesosomal dorsum, waist dorsum, and first two tergites and sternites of gaster dark brown; the rest of the body and appendages a lighter reddish brown. Head, mesosoma, waist, and appendages shiny with reduced sculpture in the form of weak carinae on head and mesosoma; gaster finely shagreened. Head, mesosomal dorsum, waist dorsum, gaster, antennae, and legs with abundant, long, semierect, curved, whitish setae.

Head in full face view about as wide as long, widest posteriorly; posterior corners of head slightly rounded, posterior margin concave; sides of head with a strong ridge extending from mandibles to the posterior corners of the head; numerous low, raised sharp edged carina present between antennal fossae extending longitudinally from level of antennal insertions toward posterior edge of head, reaching posterior corners, but most not extending past ocelli; several similar carina present on side of head beneath eye and encircling eye; strong sculpture such as rugoreticulation not present on head, but fine micro

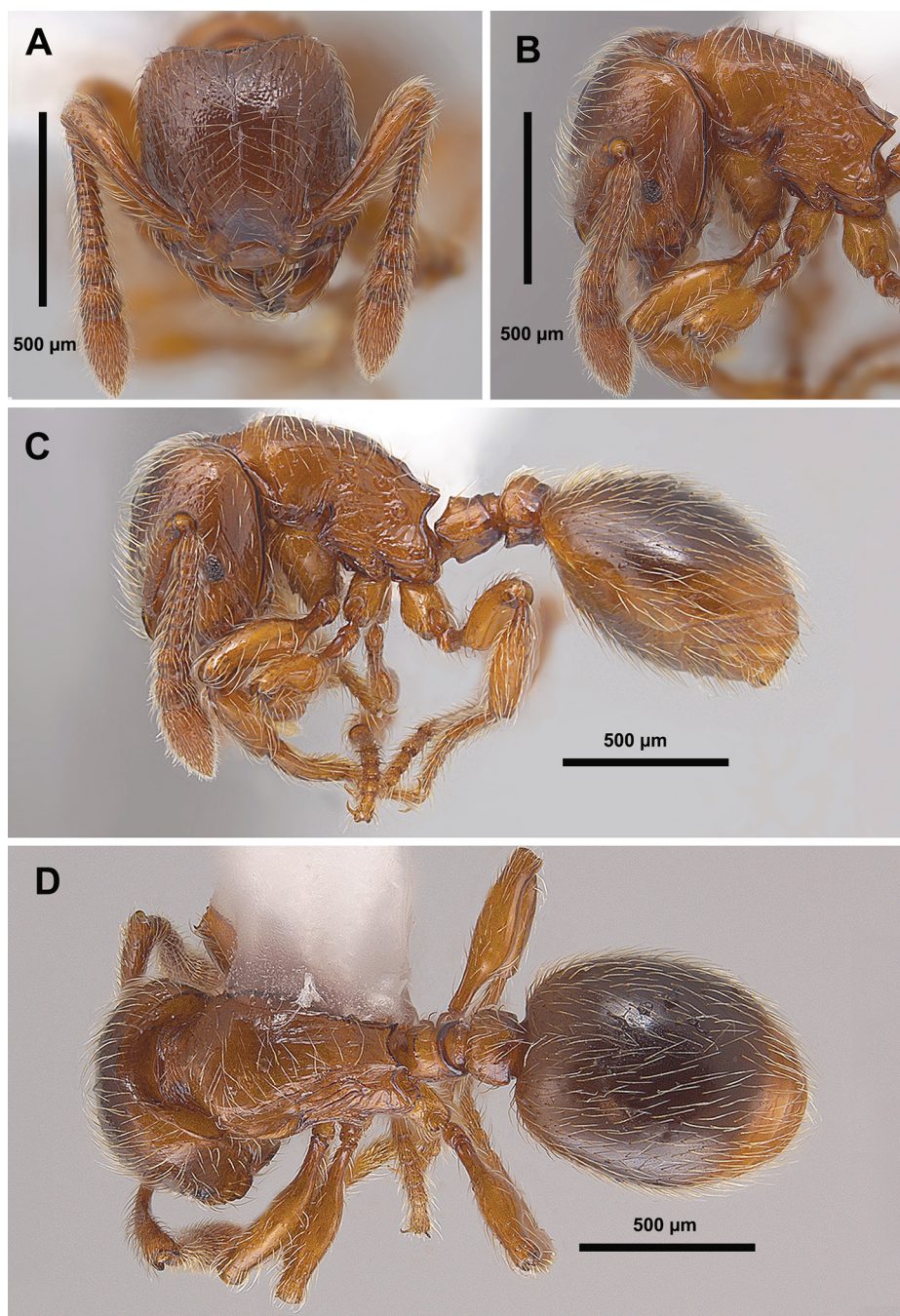


Figure 5. *Myrmecina davisoni* sp. nov., holotype worker (A) full-face view of the head, (B) lateral view of head and mesosoma, (C) lateral habitus, and (D) dorsal habitus.

reticulation present; numerous, semi erect, curved, whitish setae of approximately the same length present across entire head with those along edges curved anteriorly, setae on face curving inward toward midline, setae on clypeal edge curving anteriorly and toward midline of clypeus, setae closest to clypeus longer than others on head; eyes located on sides of head near mid-point, large, with 100+ facets: three ocelli present; clypeus broadly rounded with a median tooth; antennal fossae covering antennal insertions; antennae with 12 antennomeres, scape (antennomere I) long, angled near base, slightly narrowed basally then widening; antennomeres II–IX each slightly wider than long, antennomere II and IX approximately the same size, antennomeres III–VIII slightly smaller than II or IX and subequal to one another, antennomeres X–XII each successively larger and forming a club with apical antennomere (XII) slightly longer than X–XI; scape with numerous semi erect, whitish setae, all curving toward apex; funiculus with numerous whitish, semi erect, curved setae directed apically with those on apical flagellomere being denser and shorter than elsewhere on funiculus; mandible long, curved, somewhat scoop-shaped, teeth along margin reduced, slightly serrate, and apical tooth elongate.

Mesosoma ovate in dorsal view, widest at wing bases then narrowing to propodeum; mesoscutellum positioned above metanotum, together distinctly raised above dorsal surface of propodeum (in lateral view); entire mesosoma shiny, irregular raised carinae present on pronotum, anterior edges of mesopleuron, metapleuron, and a few short longitudinal carinae at scutellar sulcus; in lateral view strong a carina SS encircling the entire mesosoma ventrally to and surrounding propodeal teeth; interspaces smooth; mesosomal dorsum with numerous semi erect, strongly curved, whitish setae. pronotum not visible in dorsal view, asymmetrically hexagonal in lateral view; propodeal spines triangular, lacking a smaller anterior spine; propodeal spiracle circular. Waist smooth, shiny, lacking sculpture; petiole about as wide as long, somewhat barrel shaped, with low, raised triangular process dorsally, with a few erect, whitish setae dorsally; postpetiole slightly wider than long, with a strong ventral process projecting anteriorly, dorsum with numerous erect, curved, whitish setae. Legs shiny, with numerous semi-erect,

whitish setae; fore, mid, and hind femur subequal, basal region of each femur narrowed then widened. Gaster weakly shagreened, with numerous, semi erect, curved, whitish setae of approximately the same length present.

Etymology —This species is named in honor of Paul Davison, naturalist and professor of biology at the University of North Alabama. Paul's enthusiasm and passion for nature and education is unquenchable.

DISCUSSION

Fisher & Cover (2007) reported that *M. davisoni* (listed as *M. sp.*) was found in colonies of *M. americana*. The present discovery of a mixed colony of *M. americana* workers without a queen and *M. davisoni* with a queen and workers gives further credibility that *M. davisoni* is parasitic on *M. americana*.

Although *M. americana* is widespread in North America and workers are often collected using soil and leaf litter methods (e.g., Berlese funnels, Winkler sacks, sifting), colonies are rarely found. Due in part to the infrequency in which colonies are found, the biology of most species of *Myrmecina* has not been studied in depth. Masuko (1994) observed and reported on the biology of two Japanese species, *M. nipponica* Wheeler and *M. flava* Terayama, and wrote that they were specialized predators of oribatid mites (Oribatida: Oribatidae). Masuko (1994) noted the jaws of the workers were serrate and scoop-shaped, modifications which allowed them to partially peel open the hardened exterior of oribatid mites, and the heads of the larvae were elongate allowing them to be able reach into the interior of partially shelled mites to feed. The biology of *Myrmecina* species found in North America has not been studied. However, because the mandibles and other morphological structures are similar to Japanese species, it seems likely that they also have similar prey selection and feeding behavior. Deyrup (2017) noted that on two occasions he found middens of oribatid mites in colonies of *M. americana*, which strengthens the likelihood that *M. americana* preys on these mites.

In recent years, increased soil and litter sampling and the use of extraction methods have helped to provide a more comprehensive picture of ant diversity and density. These methods are especially

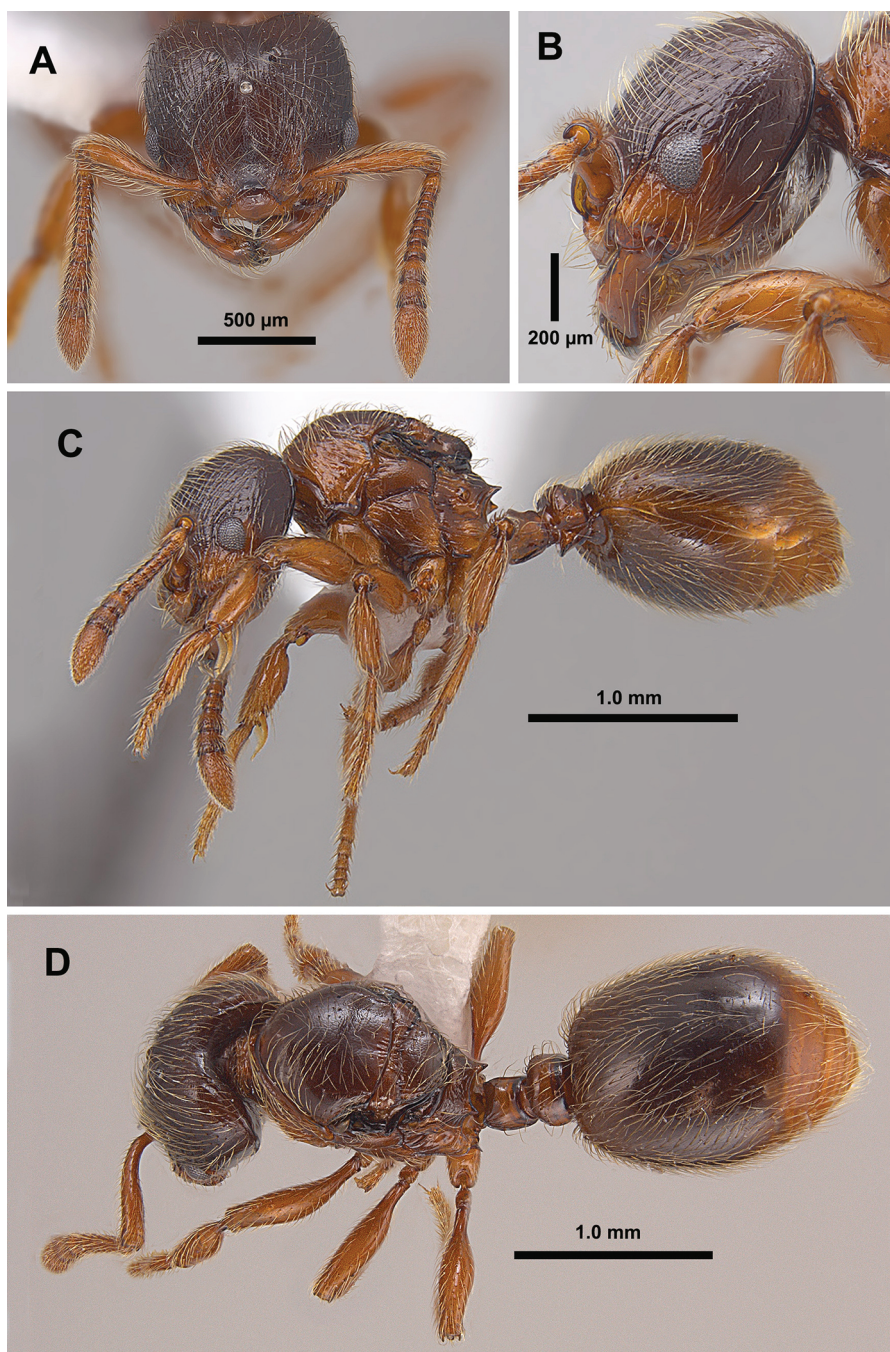


Figure 6. *Myrmecina davisoni* sp. nov., paratype queen (A) full-face view of the head, (B) lateral view of head and mesosoma, (C) lateral habitus, and (D) dorsal habitus.

helpful in locating individuals of minute, cryptic hypogeic ants and other organisms. However, the knowledge garnered from litter sampling techniques is limited because it does not provide insight into ant colony structure and behavior. The use of artificial trap nests such as those used in this study and others (Booher et al. 2017) may provide an invaluable tool in researching colony structure of cavity inhabiting hypogeic ants, including species that may be parasitic.

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