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## Central American ants of the genus *Megalomyrmex* Forel (Hymenoptera: Formicidae): six new species and keys to workers and males

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## ABSTRACT

*Megalomyrmex* Forel is a distinctive lineage of Neotropical ants, some of which are specialized parasites or predators of the fungus-growing ants Attini. Here we review and key the Central American fauna. Six new species are described from both female castes: *M. brandaoi* sp. n., *M. fungiraptor* sp. n., *M. longinoi* sp. n., *M. milenae* sp. n., *M. megadrifti* sp. n. and *M. osadrifti* sp. n. A worker-based key to all Central American species is presented, and all species are illustrated. *Megalomyrmex drifti* Kempf is redescribed and the first descriptions of queens for *M. miri* Brandão and *M. foreli* Emery are provided. New biological information, several new geographic records, and a discussion of the species-group schema of Brandão (1990) are presented. The male sex of *Megalomyrmex* is diagnosed at the genus-level and keyed to species for the Central American fauna, where known. The male of each species treated in the key is diagnosed, described, or redescribed. Males are known for fourteen out of twenty total Central American *Megalomyrmex* species. A distinct but unasociated male is described and keyed (*M. male* 01). The males of *M. miri* Brandão and *M. wettereri* Brandão are described for the first time, and the distinctness of these two species is confirmed. One potential synapomorphy of *Megalomyrmex* present in males and workers is the presence of a carina which posteriorly delimits the basalmost region of the petiolar dorsum.

**Key words:** Attini, ergatoid, genitalia, Mesoamerica, Myrmicinae, revision, social parasite, taxonomy

## INTRODUCTION

The Neotropical ant genus *Megalomyrmex* Forel is diverse in form and behavior. Several species tend to be sternorrhynchans or are predacious (Brandão 1990); others are associates of fungus-growing Attini, having lestoproct (thief ant), agro-predatory (garden usurper), or xenobiotic (cohabitating guest ant) relationships with their hosts (Adams 2008; Adams, Shah *et al.* 2012). The 44 species of *Megalomyrmex* are separated into four species groups (Brandão 1990) which are characterized by morphology and behavior. The genus was last revised by Longino (2010) for the species of Central America, and before that on a global scale by Brandão (1990, 2003). New material and new discoveries inspire this update and refinement in our understanding of the Central American fauna. Here we describe six new species; provide worker- and male-based keys; describe or redescribe males and ergatoid queens; and provide a diagnosis for the male sex of the genus.

Whereas workers of *Megalomyrmex* are relatively distinct in habitus, having been likened to “*Solenopsis* with *Pheidole antennae*” (Longino 2010), the males are morphologically heterogeneous. The males of several species resemble generalized myrmecines, while those of certain morphogroups bear convergent derived similarities with other taxa, such as *Aphaenogaster honduriana* Mann and the *A. phalangium* complex. We found that males of *Megalomyrmex* have one unique character in the context of Central American myrmecines: the basalmost area of the petiolar dorsum is delimited posteriorly by an arcing carina (or pair of sinuate carinae). Many ponerine genera have a similar carina, but given the widespread absence of a basipetiolar carina in the Myrmecinae, presence in the Ponerinae may be considered convergent. We follow the precedent of Borowiec & Longino (2011) for describing the unassociated males of new species without formally naming them, in light of general critique of parallel taxonomic systems (Ward & Summich 2012).

The new species described herein are attributed to the *leoninus*-, *pusillus*-, and *silvestrii*-groups. *Megalomyrmex milenae* sp. n. is attributed to the *leoninus*-group, while four new species are described in the *pusillus*-group: *M. brandaoi* sp. n., *M. longinoi* sp. n., *M. megadrifti* sp. n., and *M. osadrifti* sp. n. Species of the *leoninus*-group contain the largest ants of the genus and are known to be predatory and to tend sternorrhynchans (Brandão 1990). The *pusillus*-group contains the smallest *Megalomyrmex* species; almost nothing is known about them except that these species may be collected in tropical wet forest leaf litter, and may nest in twigs or logs on the ground (Brandão 2003). The *silvestrii*-group is the most well-studied of the four current species groups (Adams *et al.* 2000, 2008; Adams & Longino 2007; Adams 2012; Adams, Shah *et al.* 2012) and contains species which are social parasites of fungus-growing ants, consuming both the fungus and host brood (Adams & Longino 2007). Within this species group is the well-defined *symmetochus* complex, comprised of *M. symmetochus* Wheeler, *M. fungiraptor* sp. n., and *M. adamsae* Longino. *Megalomyrmex adamsae* is a parasite of *Trachymyrmex* (Adams, Shah *et al.* 2012) while *M. symmetochus* is a parasite of *Sericomyrmex* species (Longino 2010); the exact host of *M. fungiraptor* is unknown.

## MATERIALS AND METHODS

The majority of specimens examined in this study were generated from the Arthropods of La Selva (ALAS) and Leaf Litter Arthropods of Meso-America (LLAMA) inventories. Point-mounted specimens were examined using two different microscopes: a Leica EZ4 (max magnification 35x) and a Leica M80 (max magnification 60x). All specimens examined, including the holotypes and paratypes, have a unique specimen identifier label (*e.g.* CASENT#, JTLC#, or INBIOCRI#) mounted on the pin, which links the specimen to the digital database AntWeb.org (AntWeb 2013). This database is progressively updated with specimen records; additionally, images of the holotypes are deposited therein. Dissections were carried out in ethanol-filled watch-glasses with size 5 forceps and mounted on slides following Boudinot & Fisher (2013). Dry specimens were boiled in water for about 2 minutes prior to dissection. Z-stepped micrographs were captured using a Leica DFC450 camera mounted on a Leica Z16 APO microscope with a 2x objective, and montaged via the program Leica Applications Suite version 3.8 (LAS v3.8, Leica Microsystems, Germany). These montages were edited in Photoshop CS5 (Adobe Systems Inc., California, U.S.A.) and plates were composed using Adobe Illustrator CS6 (Adobe Systems Inc., California, U.S.A.). Note that measurements for all castes not receiving a description are presented prior to the geographic range subsection in their respective species accounts.

## Measurements and indices

Measurements were taken using a digital dual-axis stage micrometer mounted on a Leica M80 microscope following Longino (2010), with the addition of the eye index (EI) and of the oculomandibular distance (OMD) and index (OMI). The OMD and OMI are not reported for males, as the malar area is reduced and proved uninformative. Dimensions were recorded in mm to three significant digits but were accurate to the nearest 0.01 mm and thus are reported to two significant digits after rounding.

- HL *Head length*. Maximum length of head in full-face view from anterior margin of clypeus to posterior margin of head (including occipital carina, if visible; excluding ocelli if protruding beyond posterior margin).
- HW *Head width*. Maximum width of head in full-face view, including eyes if they protrude beyond margins of head.
- SL *Scape length*. Maximum length of scape in dorsal view from apex to basal flange, not including basal condyle and neck.
- EL *Eye length*. Maximum length of compound eye in lateral view.
- ML *Mesosoma length*. In lateral view, diagonal distance from basal inflection of the anterior pronotal flange (“neck”) to the posteriormost extension of the propodeal lobes.
- OMD *Oculomandibular distance*. In lateral view, the minimum distance between the anterior margin of the compound eye and the lateral clypeal margin.
- OMI *Oculomandibular index*.  $100 \times \text{OMD} / \text{EL}$ .
- CI *Cephalic index*.  $100 \times \text{HW} / \text{HL}$ .
- SI *Scape index*.  $100 \times \text{SL} / \text{HL}$ .
- EI *Eye index*.  $100 \times \text{EL} / \text{HW}$ .

## Terminology

*Head*. To increase descriptive precision in this and future studies, and to accurately reflect the homology of head capsule elements, we carefully apply the following cranial terminology (figs. 1–3). The *frons* is the area posterior to the anterior tentorial pits, and which is delimited laterally by the medial margin of the compound eyes, and posteriorly by the anterior margin of the median ocellus (an educated guess for the median ocellus location will have to be made for workers). The *vertex* is the cranial region between the anterior margin of the median ocellus and the occipital carina, and which is delimited laterally by a line drawn from the medial margin of the compound eye to the occipital carina. The *gena* is the lateral area of the head capsule ventral to the medial margin of the compound eye and is ventrally delimited by an imaginary line from the apex of the occipital carina to the hypostomal margin. The gena is further divided into the anterior *malar area*—between the anterior eye margin and the mandibular insertion—and the *temple*, which is the area posterad the compound eye. The *occiput* is the area surrounding the raised *postocciput* and is delimited by the occipital carina. Although the region of the occiput ventrad of the postocciput is called the postgena, the occiput is not anteroventrally closed by the occipital carina in many ants and the use of postgena is thus ambiguous. These head regions are distinct in queens and males, but the posterior frons and anterior vertexal margins are ambiguous in workers which lack ocelli, although in this case without reference to reproductives the vertex can be assumed to begin at slightly before midlength between the posterior compound eye margins and posterior margin of the head.

Confusion exists in the literature about the ventral sclerotization of the Formicidae head capsule. Gauld & Bolton (1988) state that the ventral surface is formed by the fusion of the genae forming a genal bridge, while others suggest the structure is the subgenal bridge (Gotwald 1969; Ronquist *et al.* 1999; Vilhelmsen 2009, 2011; Serna & Mackay 2010). Until the homology of this region among ants and other Apocrita is explicitly clarified, we use *postgenal bridge* in deference to broader studies of hymenopteran cranial morphology (Rasnitsyn 1988; Ronquist *et al.* 1999; Mikó *et al.* 2007; Vilhelmsen 2009, 2011). It should be noted that Serna & Mackay (2010) erroneously labeled the *postgenal suture* (the ventromedian longitudinal cranial suture) as the “genal bridge”, and their interpretation of tripartite bridge composition contradicts the more general interpretations for the Formicidae (Gauld & Bolton 1988; Rasnitsyn 1988; Ronquist *et al.* 1999).

*Full-face view* is achieved when the head capsule is oriented such that the anterior clypeal margin and posterior cranial margin are in the same plane of focus, regardless of whether the posterior margin is composed of the occipital carina or vertex. We define the *head dorsum* as the portion of the head capsule visible in full-face view, which is an arbitrary combination of the frons, vertex, and gena. For the antenna, we use the following terms: *scape* for the first antennomere; *funiculus* for the antennomeres distad the scape (i.e. antennomeres 2–11 or 2–13); and *pedicel* for the second antennomere.

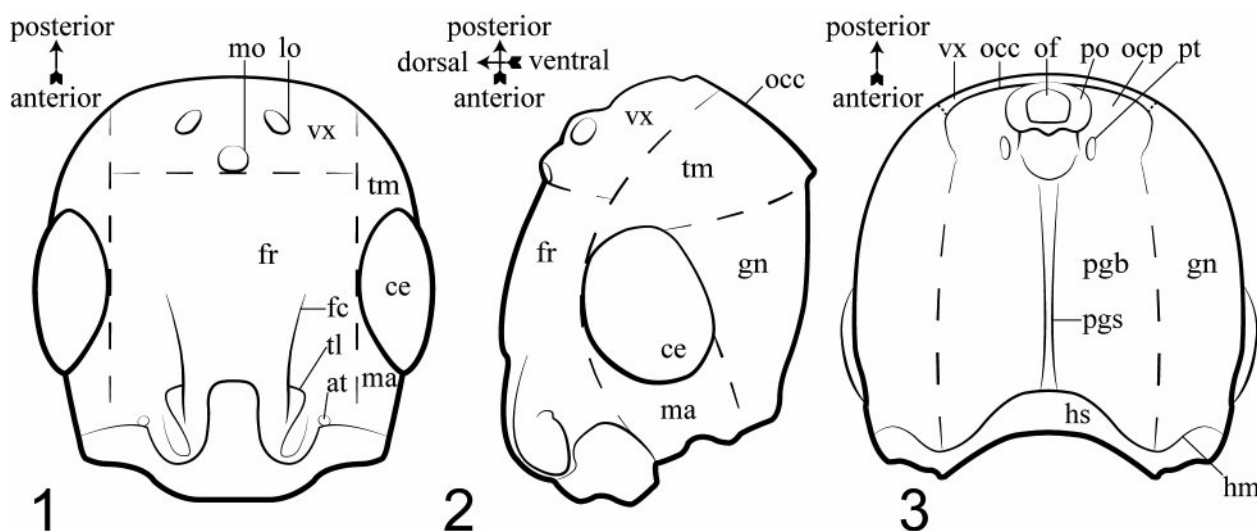
*Mesosoma*. We use *anapleural suture* (Gibson 1993) rather than the “oblique mesopleural furrow” of Yoshimura & Fisher (2009). The *notaulus* (pl. *notauli*) is the longitudinal paramedian line which extends posteriorly from the anterior margin of the mesoscutum; although it is present internally in alates (as the median line of the first mesopleuro-mesonotal muscle), it may not be visibly impressed externally, a state which for our purposes we term absent. We use *foraminal carina* (Longino 2010; = epipetiolar carina of Brandão 1990) for the carina which arcs across the posterior face of the propodeum, uniting the propodeal lobes dorsally. In cases where the foraminal carina is obsolescent medially, we state that the carina is “incomplete”. Additionally, we consider the foraminal carina to be absent or incomplete in species which do not have the propodeal lobes united by a single carina even if the posterior face of the propodeum has transverse carinae between or dorsad the propodeal lobes.

*Wings*. For wing venation, we follow Yoshimura & Fisher (2012) with the exception of the anterobasal cell of the forewing which we call the *costal cell*, rather than costal+subcostal (figs. 4 & 5; Boudinot & Fisher 2013).

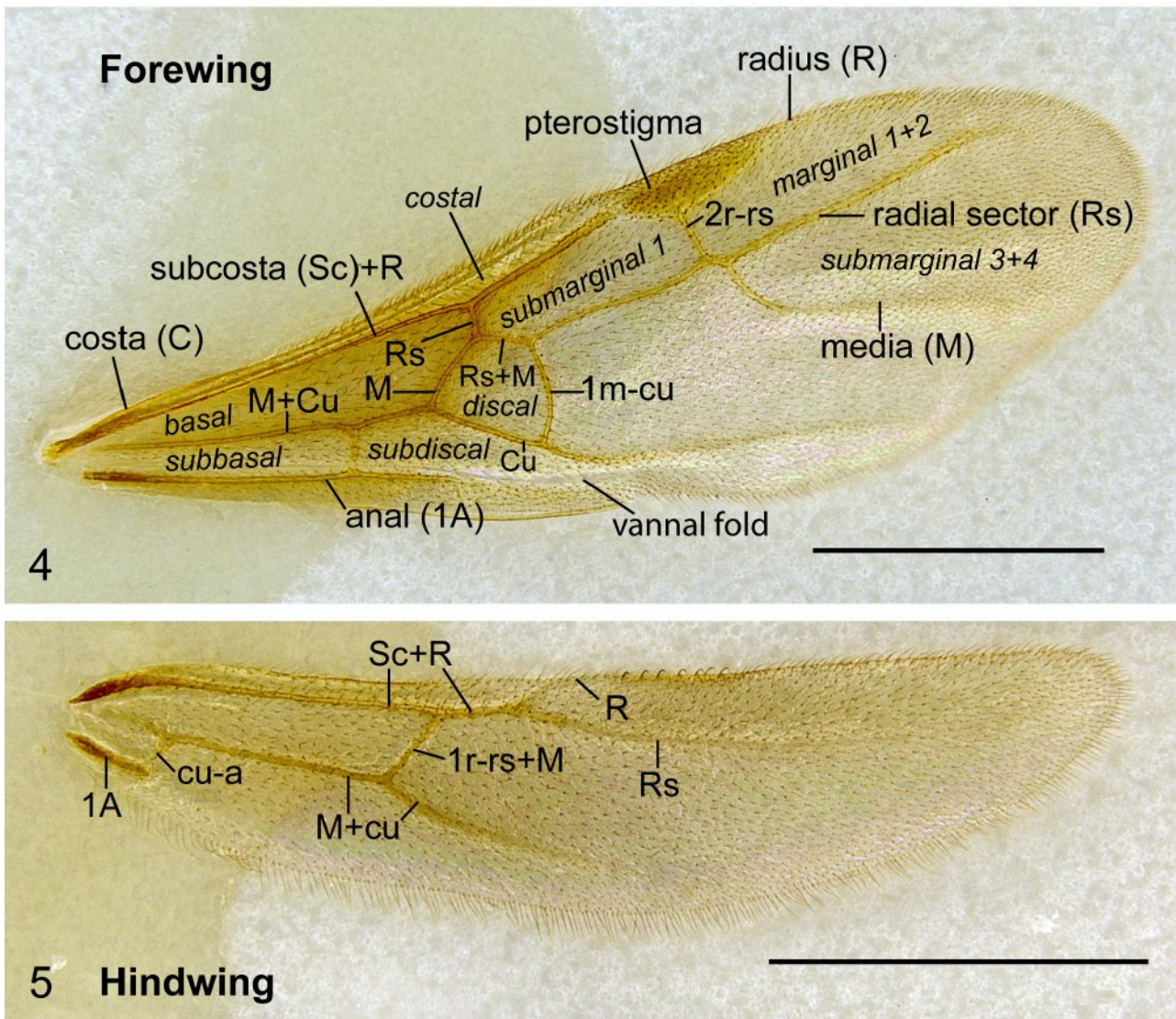
*Metasoma*. Sting apparatus terminology follows Kugler (1978); specifically we describe the *aculeus*, which is composed of the *lancet* (= first valvulae) and the *sting shaft* (= fused second valvulae). Sting apparatus were dissected for one to five specimens of six *Megalomyrmex* species (*M. foreli*, *M. fungiraptor*, *M. longinoi*, *M. milenae*, *M. miri*, *M. silvestrii*). The term *basipetiolar carina* is coined herein for a carina, or pair of carinae, which delimit the basalmost portion of the petiolar dorsum. Although the term “gaster” refers to different tagmata across the ant subfamilies (Keller 2011), for *Megalomyrmex* we refer to the abdominal segments IV–VIII (after the postpetiole) as the *gaster*. We use *pygostyles* for the finger-like appendages of abdominal tergum X in males, rather than “cerci”, due to conflicting use of the term cerci between non-hymenopterous and hymenopterous insects (Yoshimura & Fisher 2007).

*Genitalia*. Genitalic terminology follows Boudinot (2013). A summary of the terms is as follows: the *parameres* are the lateral-most valves, each of which is divided into a basal *basimere* and distal *telomere* (fig. 192); medial to the parameres are the *volsellae*, each of which are produced apically into the lateral *cuspis* and medial *digitus* (fig. 206); the sclerites of the aedeagus are the *penisvalvae*, which are divided into the *valvura* and *valviceps* (fig. 220), or the anterior apodeme and posterior blade.

*Sculpture and setational stature*. For terms relating to sculpture we follow Harris (1979) and Longino (2010); we follow Wilson (1955) for setational stature.



**FIGURES 1–3.** Head capsule anatomy (diagrams based on *Megalomyrmex longinoi* sp. n.). Abbreviations: *at*, anterior tentorial pit; *ce*, compound eye; *fc*, frontal carina; *fr*, frons; *gn*, gena; *hm*, hypostomal margin; *hs*, hypostoma; *lo*, lateral ocellus; *ma*, malar area; *mo*, median ocellus; *occ*, occipital carina; *ocp*, occiput; *of*, occipital foramen; *po*, postocciput; *pgb*, postgenal bridge; *pgs*, postgenal suture; *pt*, posterior tentorial pit; *tl*, torular lobe; *tm*, temple; *vx*, vertex. **1.** Full-face view. **2.** Profile of head capsule oriented in full-face view. **3.** Oblique ventral view.



**FIGURES 4–5.** Wing venation of *Megalomyrmex adamsae* queen (CASENT0629669); cell names are indicated in *italics*. Scale bars are 1 mm. **4.** Forewing. **5.** Hindwing.

## Repositories

Collections are referred to by the following acronyms, which follow the Insect and Spider Collections of the World website (<http://hbs.bishopmuseum.org/codens/>, Evenhuis 2012) and/or the Registry of Biological Repositories (<http://www.biorepositories.org/>, Registry of Biological Repositories 2013):

BMNH	The Natural History Museum, London, U.K.
CASC	California Academy of Sciences, San Francisco, California, U.S.A.
INBC	Instituto Nacional de Biodiversidad, Costa Rica.
JTLC	John T. Longino personal collection, University of Utah, Salt Lake City, Utah, U.S.A.
LACM	Los Angeles County Museum of Natural History, Los Angeles, CA, U.S.A.
MCSN	Museo Civico de Storia Naturale “Giacomo Doria”, Genoa, Italy.
MCZ	Museum of Comparative Zoology, Cambridge, MA, USA.
MZSP	Museu de Zoologia da Universidade de São Paulo, Brazil.
UCD	Bohart Museum of Entomology, University of California, Davis, CA, U.S.A.
USNM	National Museum of Natural History, Washington, DC, USA.

## TAXONOMIC SYNOPSIS, RELATIONSHIPS, AND BIOLOGY

### Synopsis of the genus *Megalomyrmex* Forel, 1885

*Megalomyrmex* Forel, 1885: 371. Type-species: *Megalomyrmex leoninus* Forel, by monotypy. [Type species not *Formica bituberculata* Fabricius, unjustified subsequent designation by Wheeler, W.M. 1911: 167.]

*Megalomyrmex* in Myrmicinae: Dalla Torre, 1893: 71.

*Megalomyrmex* in Myrmicinae, Myrmicini: Emery, 1895: 769; Forel, 1899: 57; Ashmead, 1905: 383; Wheeler, W.M. 1910: 139.

*Megalomyrmex* in Myrmicinae, Pheidolini: Kusnezov, 1952: 10 (in key).

*Megalomyrmex* in Myrmicinae, *Megalomyrmex* genus group: Ettershank, 1966: 81; in *Solenopsis* genus group: Bolton, 1987: 271; Brandão, 1990: 412.

*Megalomyrmex* in Myrmicinae, Megalomyrmecini: Dlussky & Fedoseeva, 1988: 80.

*Megalomyrmex* in Myrmicinae, Solenopsidini: Emery, 1914: 41 [subtribe Monomoriini]; Forel, 1917: 243; Emery, 1922: 189; Wheeler, W.M. 1922: 663; Kusnezov, 1957: 268; Kusnezov, 1962: 160; Kusnezov, 1964: 61; Hölldobler & Wilson, 1990: 16; Jaffe, 1993: 10; Bolton, 1994: 106.

*Wheelerimyrmex* Mann, 1922: 29 [as subgenus of *Megalomyrmex*]. Type-species: *Megalomyrmex silvestrii*, by original designation. Junior synonym of *Megalomyrmex*: Ettershank, 1966: 101; Brandão, 1990: 415.

*Cepobroticus* Wheeler, W.M. 1925: 168 [as subgenus of *Megalomyrmex*]. Type-species: *Megalomyrmex (Cepobroticus) symmetochus*, by monotypy. Junior synonym of *Megalomyrmex*: Ettershank, 1966: 101; Brandão, 1990: 415.

### Synopsis of Central American species

The list provided below covers only species known from Central America. Species are organized according to Brandão's (1990) species-group schema, with the species described by Longino (2010) newly included (although see "Species groups and complexes" section below). The sexes and castes known for each species are indicated in brackets: w = worker, q = queen, m = male.

#### *leoninus*-group

*Megalomyrmex foreli* Emery, 1890 [w, q, m]

= *Megalomyrmex latreillei* Emery, 1890

*Megalomyrmex milenae* **Boudinot, Sumnicht & Adams sp. n.** [w, q, m]

#### *modestus*-group

*Megalomyrmex modestus* Emery, 1896 [w, q, m]

*Megalomyrmex wallacei* Mann, 1916 [w, q, m]

#### *pusillus*-group

*Megalomyrmex brandaoi* **Boudinot, Sumnicht & Adams sp. n.** [w, q, m]

*Megalomyrmex drifti* Kempf, 1961 [w, q]

*Megalomyrmex incisus* M. R. Smith, 1947 [w, q, m]

*Megalomyrmex longinoi* **Boudinot, Sumnicht & Adams sp. n.** [w, q]

*Megalomyrmex megadrifti* **Boudinot, Sumnicht & Adams sp. n.** [w, q, m]

*Megalomyrmex miri* Brandão, 1990 [w, q, m]

*Megalomyrmex osadrifti* **Boudinot, Sumnicht & Adams sp. n.** [w, q]

#### *silvestrii*-group

*Megalomyrmex adamsae* Longino, 2010 [w, q, m]

*Megalomyrmex fungiraptor* **Boudinot, Sumnicht & Adams sp. n.** [w, q]

*Megalomyrmex mondabora* Brandão, 1990 [w, q, m]

*Megalomyrmex mondaboroides* Longino, 2010 [w, q, m]

*Megalomyrmex nocarina* Longino, 2010 [w]

*Megalomyrmex reina* Longino, 2010 [q]

*Megalomyrmex silvestrii* Wheeler, 1909 [w, q, m]



= *Megalomyrmex brasiliensis* Borgmeier, 1930  
= *Megalomyrmex langi* Wheeler, 1925  
= *Megalomyrmex misionensis* Santschi, 1936  
= *Megalomyrmex sjostedti* Wheeler, 1925  
= *Megalomyrmex wheeleri* Weber, 1940  
*Megalomyrmex symmetochus* Wheeler, 1925 [w, q, m]  
*Megalomyrmex wettereri* Brandão, 2003 [w, q, m]  
*Megalomyrmex* male 01 [m]

## Species groups and complexes

Species groups of *Megalomyrmex* were formally established by Brandão (1990) based on worker morphology and behavior of 31 species. We examined the workers and males (where known) of all 20 described Central American *Megalomyrmex* species and found that the morphological characters proposed by Brandão (2010) no longer consistently separate the species attributed to each group. Although no action is taken to delimit new species groups, we question the reciprocal monophyly of the *leoninus*- and *modestus*-groups, and of the *pusillus*- and *silvestrii*-groups, and propose a series of natural groups based on worker and male morphology.

Of Brandão's (1990) characters used to diagnose species of the *leoninus*- and *modestus*-groups, only body size and pedicel length effectively separate the Central American species (*leoninus*-group ML > 2 mm, pedicel < 2 x antennomere 3 length; *modestus*-group ML < 2 mm, pedicel ≥ 2 x antennomere 3 length). Other characters with potential discriminatory power for the two groups either overlapped or were falsified, including the following: eye size, antennal club antennomere count, degree of promesonotal suture depression, foraminal carina completion, shape of femoral apices, and sting form. Examination of the males revealed no unequivocal distinguishing characters for either of these species groups. *Megalomyrmex wallacei* has a mosaic of distinct characters which are shared with either *M. foreli* or *M. modestus*. Whereas *M. wallacei* and *M. foreli* have an elevated occipital carina, *M. milenae* does not, although all three have an apically flattened third antennomere and lack crossvein 1m-cu. *Megalomyrmex wallacei* also shares other characters with *M. modestus*, such as the strong development of the petiolar and postpetiolar nodes and the strongly arched medial face of the telomere. The situation is further complicated as *M. foreli* and *M. modestus* both have distinctly produced, angular metasternal processes (figs. 114 & 144) while *M. milenae* and *M. wallacei* do not (figs. 135 & 175). Thus we observe no clear manner in which to divide the groups; we do, however, hypothesize that these two groups are closely related, given their unique, shared mandibular dentition composed of large, subequal, and robustly triangular teeth.

Regarding the *pusillus*- and *silvestrii*-groups, all of the morphological characters used to diagnose these groups overlapped. Despite this overlap, several complexes are identifiable. Following Longino (2010), we use the oldest available specific epithet for the complex name. We discuss five complexes for non-*leoninus* and non-*modestus* group species: the *drifti*, *miri*, *mondabora*, *silvestrii* and *symmetochus* complexes. Two species, *M. incisus* and *M. longinoi*, remain unlinked to any Central American complex.

The *miri* and *symmetochus* complexes are morphologically similar. The *symmetochus* complex is composed of *M. adamsae*, *M. fungiraptor*, and *M. symmetochus*, while the *miri* complex is composed of *M. miri* and *M. wettereri*. Placement of *M. miri* in a complex with *M. wettereri* contradicts its placement in the *pusillus*-group, but *M. miri* shares several morphological characters and behavioral traits with *M. wettereri* (Longino 2010; this study). The *symmetochus* and *miri* complexes are united by three distinguishing characters: (1) "symmetochus-type" mandibular dentition composed of 4–7 subequal basal teeth subtending the two larger apical teeth; (2) postpetiolar sternum longitudinally bulging, anteriorly toothed, and transversely costate; (3) funiculus stout, becoming strongly incrassate, with a poorly distinguished apical club, and apical antennomere stoutly conical. The *miri* and *symmetochus* complexes are distinguished from one another by several characters: species of the *miri* complex have reduced compound eyes, the clypeus extends narrowly between the frontal lobes, and the postpetiole is *silvestrii*-like, with the posterior face curving evenly to the posterior margin, whereas the *symmetochus* complex species have large eyes, a broader posterior clypeal portion, and a postpetiole which is variably anteroposteriorly compressed and with a distinct posterior face and posterior base. Males of the *symmetochus* complex are also unique among *Megalomyrmex* species, having long antennal scapes and large ocelli.

The *drifti* complex is composed of species which we have delimited from within the previously conceived *M. drifti* (Kempf 1970; Brandão 1990; Longino 2010). Thanks to intense collecting in Central America, we recognize four species in the *drifti* complex: *M. brandaoi*, *M. drifti*, *M. megadrifti*, and *M. osadrifti*. These species have an anteriorly truncate first gastric tergum, clypeus weakly longitudinally bicarinate, occipital carina obscured by the vertex in full-face view, and smooth dorsal mandibular faces. The known males of the *drifti* complex are nearly identical to those of *M. wettereri* (but only superficially similar to *M. miri*).

Two complexes—the *silvestrii* and *mondabora* complexes—share “*silvestrii*-type” mandibular dentition, where numerous small subequal denticles subtend two larger apical teeth. The *silvestrii* complex is composed of *M. silvestrii*, *M. reina*, *M. nocarina*, while the *mondabora* complex is composed of *M. mondabora*, *M. mondaboroides*, and *M. male 01*. Three distinct, shared male characters were observed in *M. mondabora*, *M. mondaboroides*, and *M. male 01*: (1) an elongated spiculum (the anteromedial apodeme of abdominal sternum IX); (2) less concave anterolateral margins of abdominal sternum IX; and (3) an exceptionally long and narrow submarginal cell 1+2 of the forewing.

Finally, among the Central American fauna we are left with *M. incisus* and *M. longinoi*. The two species are very dissimilar, although they share unique mandibular form and dentition, being composed of an enlarged second or third basal tooth (depending on presence of the more-basal denticles) and larger apical and subapical teeth, with the intercalary denticles of varying sizes. *Megalomyrmex longinoi* is clearly related to *M. cuatiara* Brandão based on several characters, including eye size, placement, scape length, and general body form, but is otherwise unique with respect to sculpturation among all *Megalomyrmex* species. *Megalomyrmex incisus* has several unique characters and lacks any apparent shared traits with other complexes we examined.

Brandão (1990) indicated that queen form was useful for species-group delimitation and made special note of the large ergatoid queens in the *leoninus*-group. It was later discovered that *M. drifti* and *M. incisus*, members of the *pusillus*-group, facultatively utilize the same reproductive strategy (Brandão 2003; Longino 2010), suggesting this reproductive strategy may differ between populations as is true in many other ant species (Peeters 2012). We add *M. wallacei* to the list of *Megalomyrmex* species with facultative ergatoid queens via a nest series from La Selva, Costa Rica. This is the second species reported in the *modestus*-group, in addition to *M. goeldi* Forel, for which this reproductive strategy is known (Brandão 2003). The queen of *M. wallacei* was originally described by Mann (1916) as dealate, which was implicitly confirmed by Brandão (1990, 2003). Additionally, we observed the first ergatoid queen in the *silvestrii*-group. A *M. silvestrii* ergatoid was found with an alate-condition mesosoma and ocelli but without functional wing bases, and with the mesosoma sloping similar to the worker (figs. 163 & 164). If the alate condition is plesiomorphic for *Megalomyrmex* then it seems that ergatoid queens have evolved several times within the genus.

## DIAGNOSIS OF THE MALE OF *MEGALOMYRMEX* FOREL, 1885

Males of *Megalomyrmex* are morphologically heterogeneous; some species resemble “generalized myrmicines” whereas others resemble the strange attenuated males of Neotropical *Aphaenogaster*. The generalized males may be confused most easily with those of New World native *Monomorium*, but the reduced petiolar and postpetiolar nodes of *Megalomyrmex* males, relative to workers, is sufficient to separate the two genera. However, separation of *Megalomyrmex* males from those of *Aphaenogaster* deserves special mention, due to the remarkable convergence in body form (even including a kinked and distally swollen metabasitarsus in one case). Males of *Megalomyrmex* may be separated from those of *Aphaenogaster* by the following characters: (1) absence of an anterior mesonotal bulge (present in *A. honduriana*); (2) region of head capsule posterior to ocelli never produced into an elongated and flared collar (present in the *A. phalangium* complex); (3) absence of an anterobasal metacoxal bulge; (4) presence of the foraminal carina (if developed); (5) presence of the basipetiolar carina. The diagnosis provided below is derived from examination of the males of the following taxa: *M. adamsae*, *M. brandaoi*, *M. foreli*, *M. incisus*, *M. megadrifti*, *M. miri*, *M. milenae*, *M. modestus*, *M. mondabora*, *M. mondaboroides*, *M. silvestrii*, *M. symmetochus*, *M. wallacei*, *M. wettereri*, and *M. male 01*. Among the Central American Myrmicinae, characters which are unique for *Megalomyrmex* are indicated in italics. Workers of the genus have been diagnosed by Bolton (2003).

1. Antenna with 11, or more often 13 antennomeres.
2. Funiculus of antenna as long as, or more often longer than mesosoma.
3. Antennomeres often kinked (distinctly bent or curved).
4. Pedicel cylindrical or subcylindrical, never swollen.
5. Palpal formula 4,3; 3,3; or 3,2.
6. Mandibles worker-like, with distinct basal and masticatory margins and with three to numerous teeth.
7. Head proportional for body size (i.e. head length about one half mesosoma length, HL/ML = 0.47–0.62).
8. Occipital carina and vertex never markedly elongated and flared as a collar.
9. Notauli absent or weakly indicated by short diagonal sulcus with transverse carinae.
10. Metacoxa without an anterobasal bulge.
11. Metasternum with or without a spine-like process.
12. Tibial spur formula 1s–b, 1s–b.
13. Ventral margin of tarsal claws smooth, without teeth.
14. Foraminal carina usually present and well-developed, may be absent.
15. *Propodeal foramen with a strong foraminal carina*, several arcing carinae of equal strength, or no distinct carinae.
16. Pterostigma present, well-developed.
17. Forewing: submarginal cell 1 closed.
18. Forewing: marginal cell 1+2 open (i.e. apical abscissae of R and Rs not fusing at apex of wing).
19. Hindwing: claval region narrow.
20. Petiole and postpetiole nodiform; nodes reduced in height relative to workers and queens.
21. *Basalmost area of petiolar dorsum delimited posteriorly by a transversely arcing carina or two lateromedian, sinuate carinae* (i.e. *basipetiolar carina present*).
22. Postpetiole with narrow posterior attachment (i.e. helcium of first gastric tergum narrow).
23. Gastral shoulder present (i.e. first gastric sternum with a transverse angle laterad the helcium).
24. Pygostyles present.
25. Telomere tall in the sagittal plane; not dorsoventrally flattened. Body predominantly shining: pronotum, mesoscutum, mesopleuron and lateral face of propodeum never areolate, foveolate, foveate, or scabrous; these surfaces without lamellae, carinae, denticles, or spines.

#### Notes/Comments

1. Specimens may (very infrequently) differ in antennomere count from left to right antenna due to variable suturation.
3. One of various antennomeres of the funiculus is always kinked in the *silvestrii*-group, excluding *M. wettereri*. Both *M. wallacei* and *M. foreli* have the third antennomere apically flattened and kinked. The fourth antennomere of *M. mondabora*, *M. mondaboroides*, and *M. male 01* is kinked. The function, if any, of the kinked antennomeres of male *Megalomyrmex* and other genera (e.g. *Basiceros* and *Aphaenogaster*) is unknown.
11. This is character six in Bolton's (2003) diagnosis of the solenopsidine tribe group, which he classifies as not having a metasternal process, with the exceptions of *M. latreillei* (= *M. foreli*) and *Vollenhovia pertinax* Smith. We observed presence of a metasternal process, in addition to *M. foreli*, in the male and both castes of female of *M. leoninus* and *M. modestus*.
12. The tibial spur formula follows Bolton (2003), in this case indicating that the meso- and metatibia have one simple to barbate spur each.
14. The foraminal carina has various states of development and is effectively absent in *M. drifti* and *M. foreli*. We predict that the male of *M. nocarina* will not have a foraminal carina.
21. The basipetiolar carina is present in all sexes and castes of *Megalomyrmex*; it is weakly developed in the male of *M. modestus*. A similar carina is present on the males of several ponerine lineages, but this must be considered homoplasious.
23. This is the twelfth character in Bolton's (2003) diagnosis of the Solenopsidini.
26. Prior to the discovery of *M. longinoi*, no *Megalomyrmex* species were known to have costate sculpture. If the male of *M. longinoi* has similar sculpture to the worker, then this would be an exception to this character.

**KEYS TO CENTRAL AMERICAN *MEGALOMYRMEX* SPECIES**

**Worker-based key to Central American species**

Notes: *Megalomyrmex reina* is not keyed as this species is only known from queens, however the worker is likely to have similar mandibular dentition, as well as the large petiolar and postpetiolar processes (see figs. 159–160). Species of the *drifti* complex are separated by subtle characters, and thus are difficult to identify; morphometrics are often necessary for a confident determination. Alate queens do not consistently key out.

- 1 Mandible with five robust, approximately equal-sized and equally-spaced triangular teeth (fig. 6); large species (ML > 1.0 mm) ..... 2
- Mandible with variable dentition: with 3–11 distinct teeth or denticles subtending two larger apical teeth, often varying in size (figs. 7 & 8); if with three roughly evenly-spaced triangular teeth (fig. 7), then teeth varying in size, and body small (ML < 1.0 mm) ..... 5



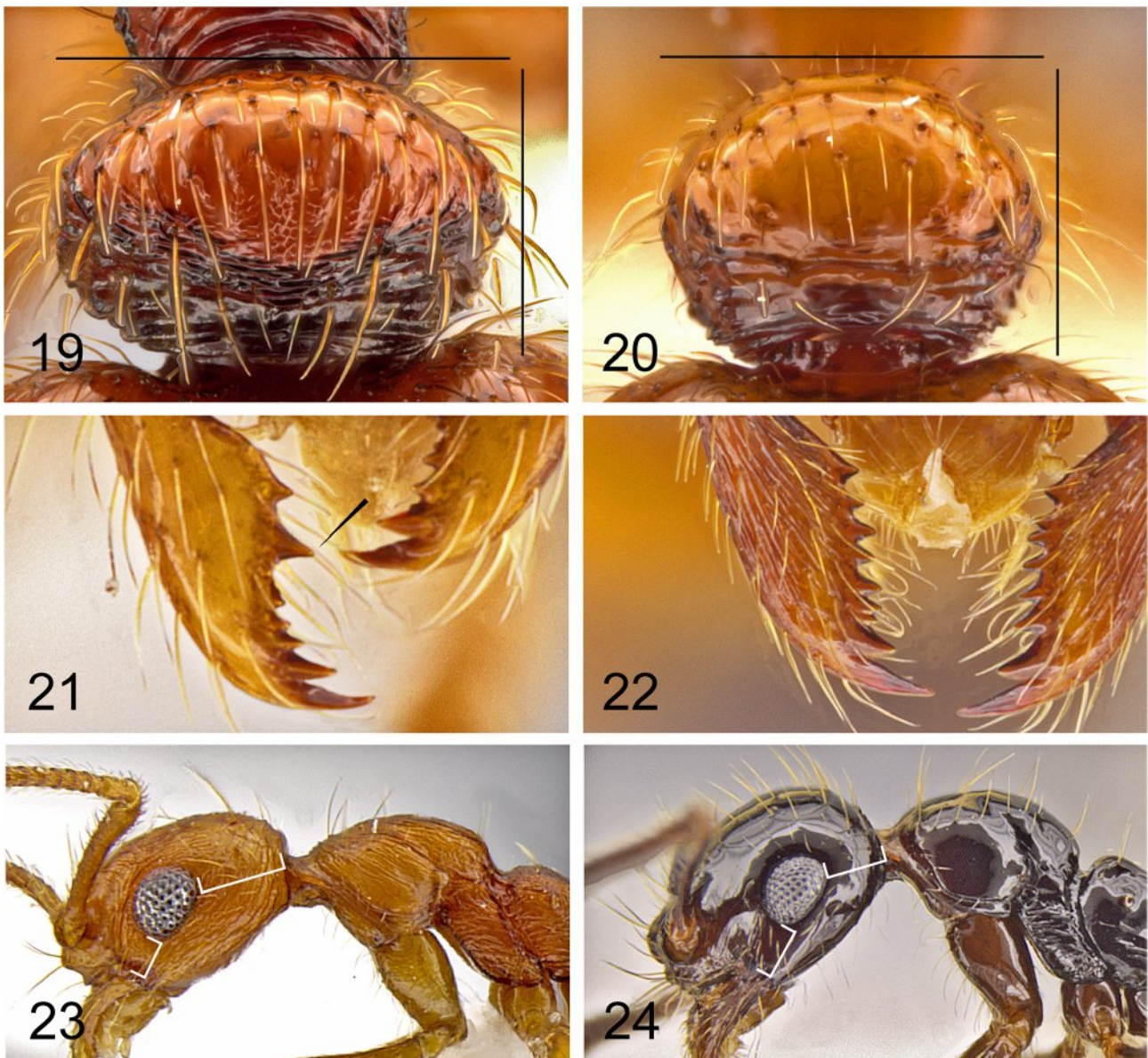
**FIGURES 6–12.** 6–8: Worker mandibles, dorsal view; 9 & 10: worker petioles, lateral view; 11 & 12: worker compound eyes, posterolateral view; black arrows indicate ocular setae. 6. *M. wallacei* (INBIOCRI002280168). 7. *M. brandaoi* holotype (CASENT0630943). 8. *M. silvestrii* (CASENT0629673). 9. *M. milenae* holotype (CASENT0630042). 10. *M. foreli* (CASENT0613262). 11. *M. wallacei* (IBIOCRI002280168). 12. *M. milenae* holotype (CASENT0630042).

- 2 Petiolar node narrow, distinct from long, narrow petiolar peduncle (fig. 9). Eye small or large (EL < 0.25 mm, or > 0.30 mm). Propodeum with or without hairy tubercles where dorsal and posterior faces meet . . . . . 3
- Petiolar node broad, indistinct from short, broad petiolar peduncle (fig. 10). Eye large (EL > 0.30). Propodeum without hairy tubercles where dorsal and posterior faces meet . . . . . 4
- 3 Dorsal face of mandible coarsely striate. Occipital carina obscured by vertex in full-face view. Ocular setae present (best seen against a dark background, fig. 11). Costa Rica to Venezuela. . . . . *M. modestus* Emery
- Dorsal face of mandible smooth; only interrupted by coarse piligerous puncta. Occipital carina visible in full-face view. Ocular setae absent (fig. 12). Costa Rica south to Andean region . . . . . *M. foreli* Emery
- 4 Postpetiolar node robustly globose; anterodorsal and posterodorsal faces convex in profile view (fig. 13). Ocular setae present (best seen against a dark background). Frons with numerous longitudinal, often sinuate carinulae in addition to concentric carinulae around antennal insertions. Costa Rica to Colombia, Guyana, and Amazonian Brazil . . . . . *M. wallacei* Mann
- Postpetiolar node not globose; anterodorsal face convex, posterodorsal face concave in profile view (fig. 14). Ocular setae absent. Frons without longitudinal carinulae in addition to concentric carinulae around antennal insertions. Panama . . . . . *M. milenae* new species
- 5 Disc of katepisternum with distinct longitudinal carinulae which completely traverse the disc; rugose or not (fig. 15) . . . . . 6
- Disc of katepisternum without distinct longitudinal carinulae; smooth and shining, sometimes with rugosity along posterior margin of disc, or in a portion of the basal half, but this never extending across the width of the disc (fig. 16) . . . . . 11

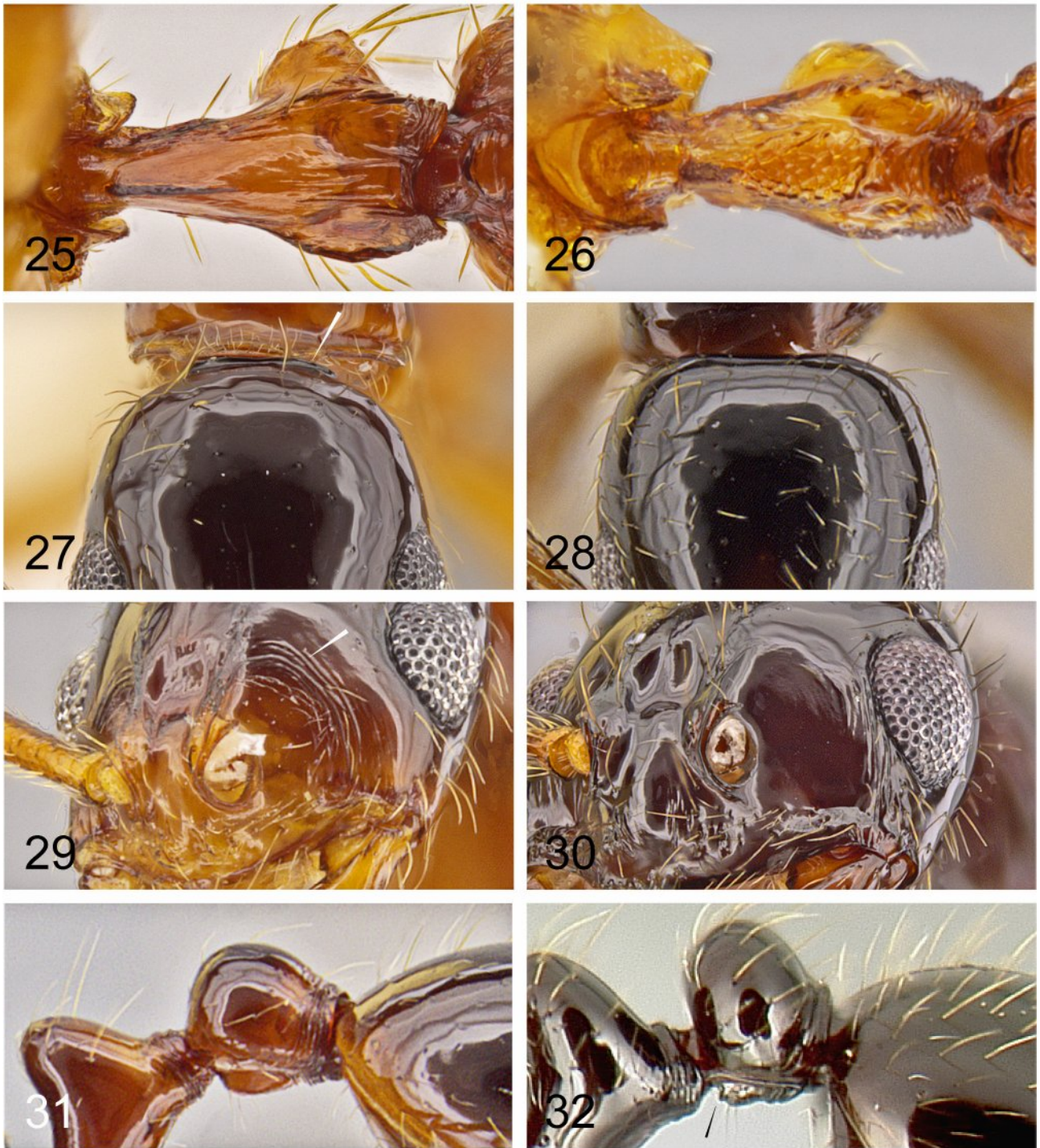


**FIGURES 13–18.** 13 & 14: Worker postpetioles, lateral view; 15 & 16: worker katepisterna, lateral view; 17 & 18: worker mesobasitarsi, dorsal (outer) view; numbers indicate tarsomere identity, starting with 1 at basitarsus; pretarsus (tarsomere 5) out of frame. 13. *M. wallacei* (CASENT0630042). 14. *M. milenae* holotype (CASENT0630042). 15. *M. incisus* (JTL000014345). 16. *M. wettereri* (IBIOCRI001233214). 17. *M. fungiraptor* holotype (CASENT0629661). 18. *M. adamsae* (CASENT0629688).

- 6 Meso- and metabasitarsi strongly anteroposteriorly compressed, extremely thin in dorsal view (fig. 17)..... 7  
 - Meso- and metabasitarsi tubular (fig. 18) ..... 8  
 7 Postpetiole width about twice the height in posterior view (fig. 19). Posterior face of postpetiole with fine areolate sculpturation in addition to transverse carinulae (fig. 19). Postpetiolar process in profile view long, fang-like. Malar area covered by longitudinal carinulae. Nicaragua and Costa Rica ..... *M. fungiraptor* new species  
 - Postpetiole width slightly greater than height in posterior view (fig. 20). Posterior face of postpetiole smooth and shining in addition to transverse carinulae (fig. 20). Postpetiolar process in profile view short, stout. Malar area largely smooth, not completely covered with longitudinal carinulae. Costa Rica, Panama, and Peru. .... *M. symmetochus* Wheeler  
 8 Second or third mandibular tooth from basal margin larger than other basal teeth (fig. 21). Dorsal face of propodeum sloping smoothly to posterior face ..... 9  
 - Second or third mandibular tooth from basal margin subequal in length to other basal teeth (fig. 22). Dorsal face of propodeum meeting posterior face at an angle ..... 10  
 9 Head capsule, promesonotum, petiole and postpetiole covered with rugulose or costate sculpturation (fig. 23). Eye distinctly in anterior half of head, excluding mandibles (fig. 23). Antennae relatively long (SI > 115). Panama . . . *M. longinoi* new species  
 - Head capsule, promesonotum, petiole and postpetiole smooth and shining (fig. 24). Eye placed about midlength of head, excluding mandibles (fig. 24). Antennae relatively short (SI < 105). Southern Mexico south to Central Brazil and Peru. .... *M. incisus* M.R. Smith



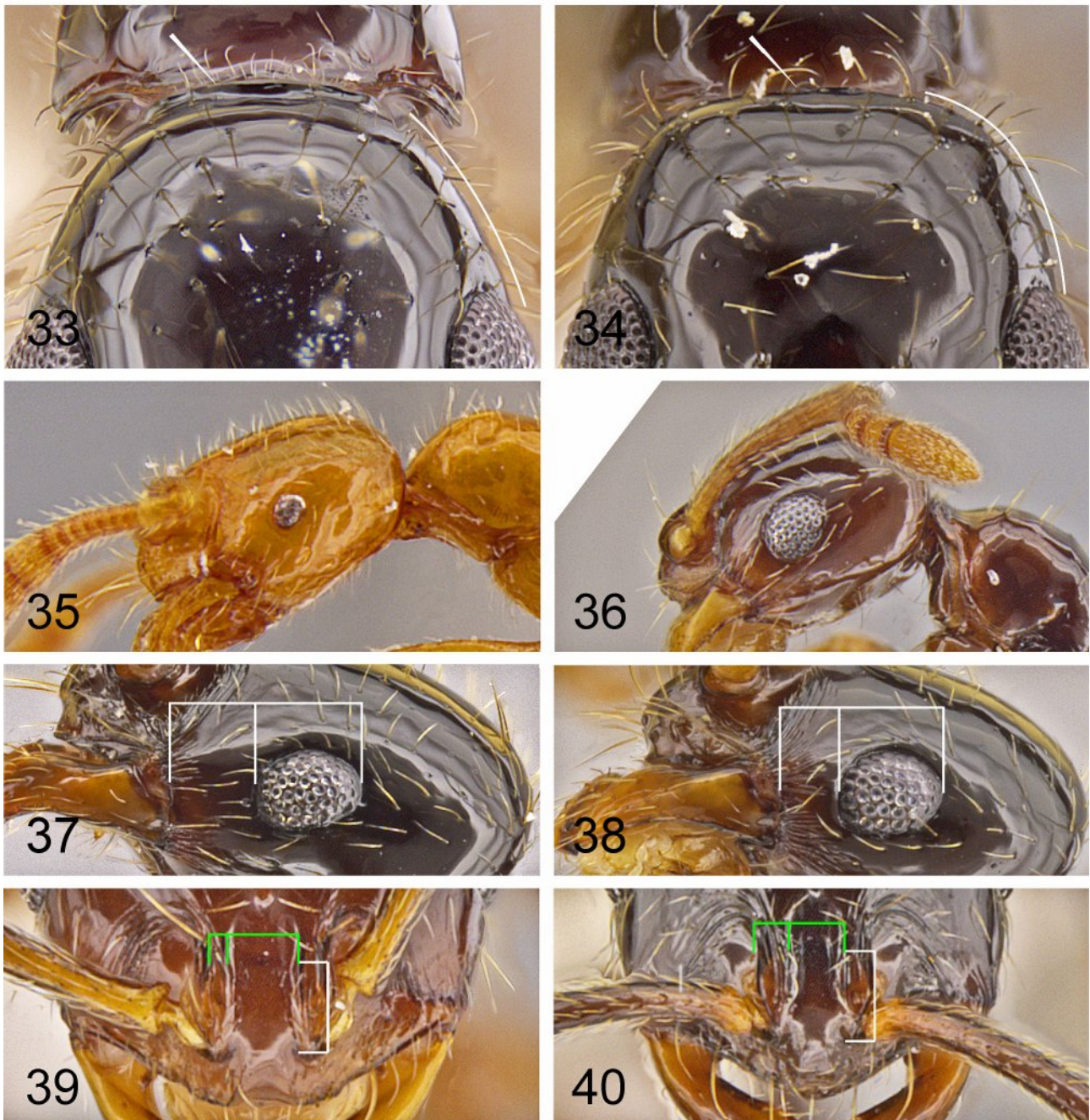
**FIGURES 19–24.** 19 & 20: Worker postpetioles, posterior view; transverse black line indicates maximum postpetiolar width, longitudinal black line indicates maximum postpetiolar height. 21 & 22: worker mandibles, dorsal view; black arrow indicates enlarged subbasal tooth; 23 & 24: worker heads and mesosomata, profile view; brackets indicate minimum lengths of malar area and temple. 19. *M. fungiraptor* holotype (CASENT0629661). 20. *M. symmetochus* (JTLC000015328). 21. *M. longinoi* holotype (CASENT0619091); arrow indicates enlarged subbasal tooth. 22. *M. adamsae* (CASENT0629668). 23. *M. longinoi* holotype (CASENT0619091). 24. *M. incisus* (JTLC000014345).



**FIGURES 25–32.** 25 & 26: Worker petioles, ventrolateral oblique view; 27 & 28: posterior halves of worker head capsules, full-face view; white arrow indicates occipital carina; 29 & 30: worker frons, anterolateral oblique; white arrow indicates complete concentric carinulae; 31 & 32: worker postpetioles, profile view; black arrow indicates denticle on postpetiolar sternum. 25. *M. adamsae* (CASENT0629668). 26. *M. miri* (CASENT0631003). 27. *M. silvestrii* (CASENT0629673). 28. *M. drifti* (CASENT0630914). 29. *M. silvestrii* (CASENT0629673). 30. *M. mondabora* (CASENT0613272). 31. *M. silvestrii* (CASENT0629673). 32. *M. noarina* (INB0003678142).

- 10 Eye large (EL > 0.20 mm), with greater than six ommatidia at maximum diameter. Malar space with at least three strong carinulae extending from lateral margin of mandible to compound eye. Ventrolateral faces of petiole smooth and shining (fig. 25). Larger (ML > 1.0 mm). Panama . . . . . *M. adamsae* Longino
- Eye miniscule (EL < 0.10 mm), with at most four ommatidia in maximum diameter. Malar space without carinulae. Ventrolateral faces of petiole scabrous (fig. 26). Smaller (ML < 1.0 mm). Costa Rica and Panama . . . . . *M. miri* Brandão
- 11 Occipital carina visible in full-face view, even if just slightly (fig. 27). Ocular setae present or absent . . . . . 12

- Occipital carina completely obscured in full-face view (fig. 28). Ocular setae present ..... 15
- 12 Antennal insertion encircled by concentric carinulae extending from posterior clypeal margin to frontal carina (fig. 29) and/or scapes, in repose, distinctly exceeding posterior margin of head (SI > 95) ..... 13
- Antennal insertion not encircled by concentric carinulae; carinulae extend posteriorly from posterior clypeal margin reaching or passing compound eye medially (fig. 30) and scapes, in repose, barely or not exceeding posterior margin of head (SI < 89).  
..... 14



**FIGURES 33–40.** 33 & 40: Posterior halves of worker head capsules, full-face view; white arrow indicates occipital carina, white line indicates curvature of temple. 35 & 36: worker head capsules, haphazard lateral view; 37 & 38: worker head capsules, slight anteriorly oblique lateral view, maximizing malar space; white brackets indicate relative lengths of eye and malar space; 39 & 40: worker head capsules, full-face view; green top brackets indicate width of clypeus between antennal insertions relative to length, length indicated by side white brackets. 33. *M. mondabora* (CASENT0613272). 34. *M. mondaboroides* (INB000362234). 35. *M. wettereri* (INBIOCRI001233214). 36. *M. brandaoi* holotype (CASENT0630943). 37. *M. megadrifti* holotype (CASENT0630930). 38. *M. drifti* (CASENT0630918). 39. *M. brandaoi* holotype (CASENT0630943). 40. *M. megadrifti* holotype (CASENT0630930).



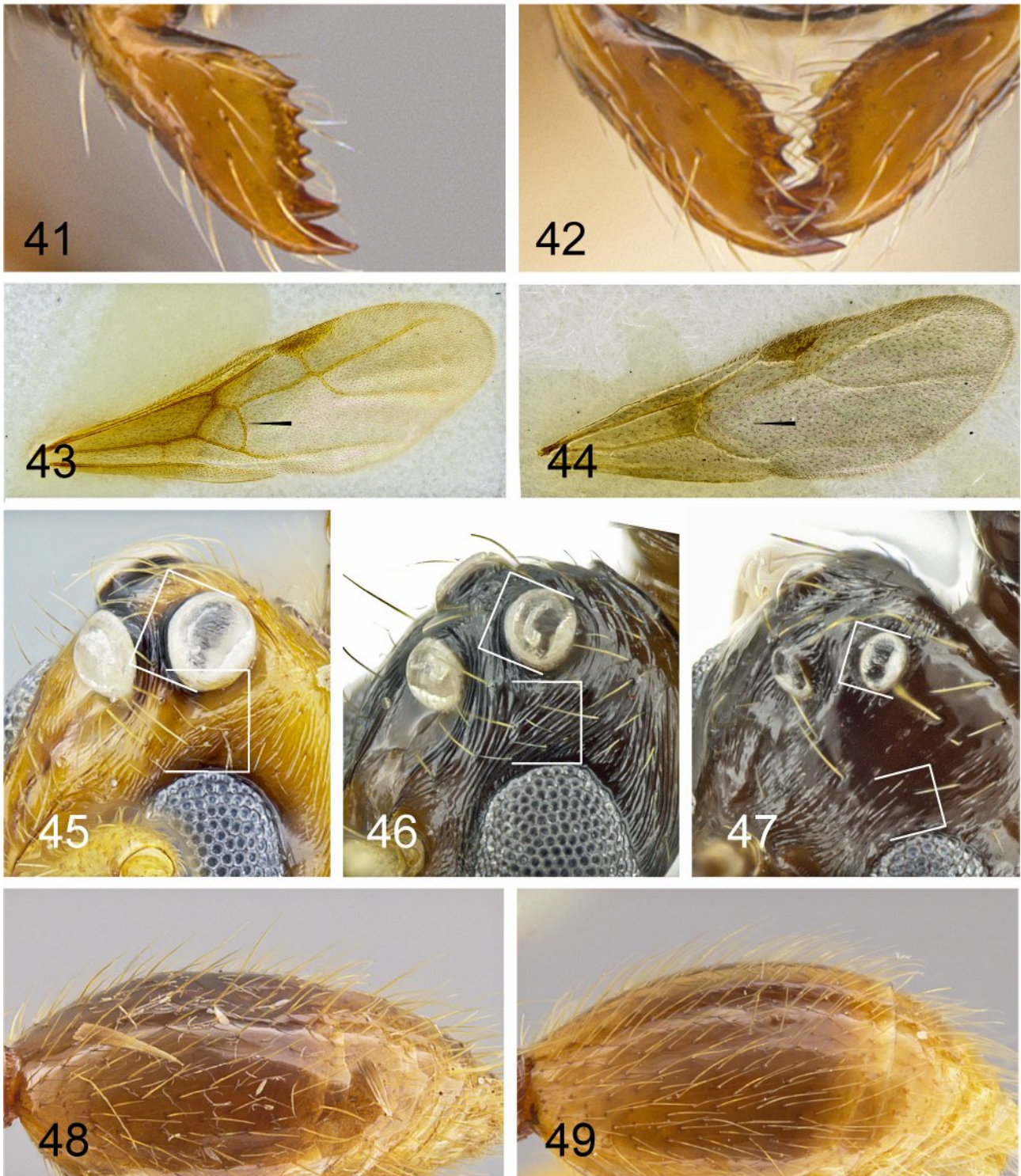
- 13 Postpetiole globose and sternum smoothly bulging (fig. 31). Masticatory margin of mandible with 12 or more miniscule denticles subtending apical two. Foraminal carina present, complete. Scape relatively long (SI > 110). Southern Mexico to northern Argentina; widespread in mainland South America . . . . . *M. silvestrii* Wheeler
- Postpetiole anteriorly compressed and sternum dentate anteriorly (fig. 32). Masticatory margin of mandible with 7–10 teeth subtending apical two. Foraminal carina present or absent. Scape relatively short (SI < 105). Costa Rica, Panama . . . . . *M. nocarina* Longino
- 14 Occipital carina strongly produced (fig. 33). Temple, in full-face view, evenly and shallowly curved in full-face view (fig. 33). Apical antennomere subequal in length to the preceding two antennomeres. Scape relatively long (SI > 120). Costa Rica. . . . . *M. mondabora* Brandão
- Occipital carina relatively weak (fig. 34). Temple, in full-face view, with strongly rounded angle between posterior and lateral margins (fig. 34). Apical antennomere longer than preceding two antennomeres. Scape relatively short (SI < 114). Costa Rica, Panama, Peru . . . . . *M. mondaboroides* Longino
- 15 Eyes miniscule, with at most five ommatidia at maximum diameter (fig. 35). Eye distant from lateral margin of clypeus (OMI > 125, fig. 35). Pedicel about as long as the following three antennomeres. Costa Rica and Panama . . . . . *M. wettereri* Brandão
- Eyes larger, with at least seven ommatidia in maximum diameter (fig. 36). Eye relatively closer to lateral margin of clypeus (OMI < 100, fig. 36). Pedicel about as long as the following two antennomeres . . . . . 16
- 16 Eyes relatively distant from lateral margin of clypeus (OMI ≥ 61, fig. 37). Dorsal and posterior faces of propodeum meeting at a narrowly rounded or pointed angle, with or without a distinct pointed tubercle. Posterior face of propodeum often with concentric carinulae around foraminal carina. Basal and masticatory margins of mandible distinct . . . . . 17
- Eyes relatively close to lateral margin of clypeus (OMI < 59, fig. 38). Dorsal and posterior faces of propodeum meeting at a broad curve or narrowly rounded angle, without a distinct pointed tubercle. Posterior face of propodeum without concentric carinulae around foraminal carina. Basal and masticatory margins of mandible distinct or indistinct . . . . . 18
- 17 Setae, especially on first gastric tergum, very coarse. First gastric tergum with few (< 5) short appressed setae. Portion of clypeus between antennal insertions comparatively broad (fig. 39). Foraminal carina incomplete. Costa Rica . . . . . *M. brandaoi* new species
- Setae less coarse. First gastric tergum with numerous (> 10) short appressed setae. Portion of clypeus between antennal insertions comparatively narrow (fig. 40). Foraminal carina complete to incomplete. Southern Mexico to Costa Rica; South America; presumably present in Panama . . . . . *M. megadrifti* new species
- 18 Mandible with distinct basal and masticatory margins; margins meet at an angle with or without a denticle (fig. 41). Propodeum rounded dorsolaterally. Scapes longer (SI > 86). Costa Rica . . . . . *M. osadrifti* new species
- Mandible with indistinct basal and masticatory margins; margins curve into another and may have minute denticles (fig. 42). Propodeum distinctly marginate dorsolaterally. Scapes shorter (SI < 84). Honduras south to South America; range in South America undetermined. . . . . *M. drifti* Kempf

### Male-based key to Central American species

Notes: Males of five Central American species remain unknown: *Megalomyrmex longinoi*, *M. osadrifti*, *M. fungiraptor*, *M. nocarina*, and *M. reina*. It is predicted that *M. fungiraptor* males will run to couplet 3 based on the conformity of male and female wing venation and the similarity of *M. fungiraptor* females to those of *M. adamsae* and *M. symmetochus*; it is also predicted that the undescribed *drifti* complex males will run to “*M. megadrifti*” in couplet 7.

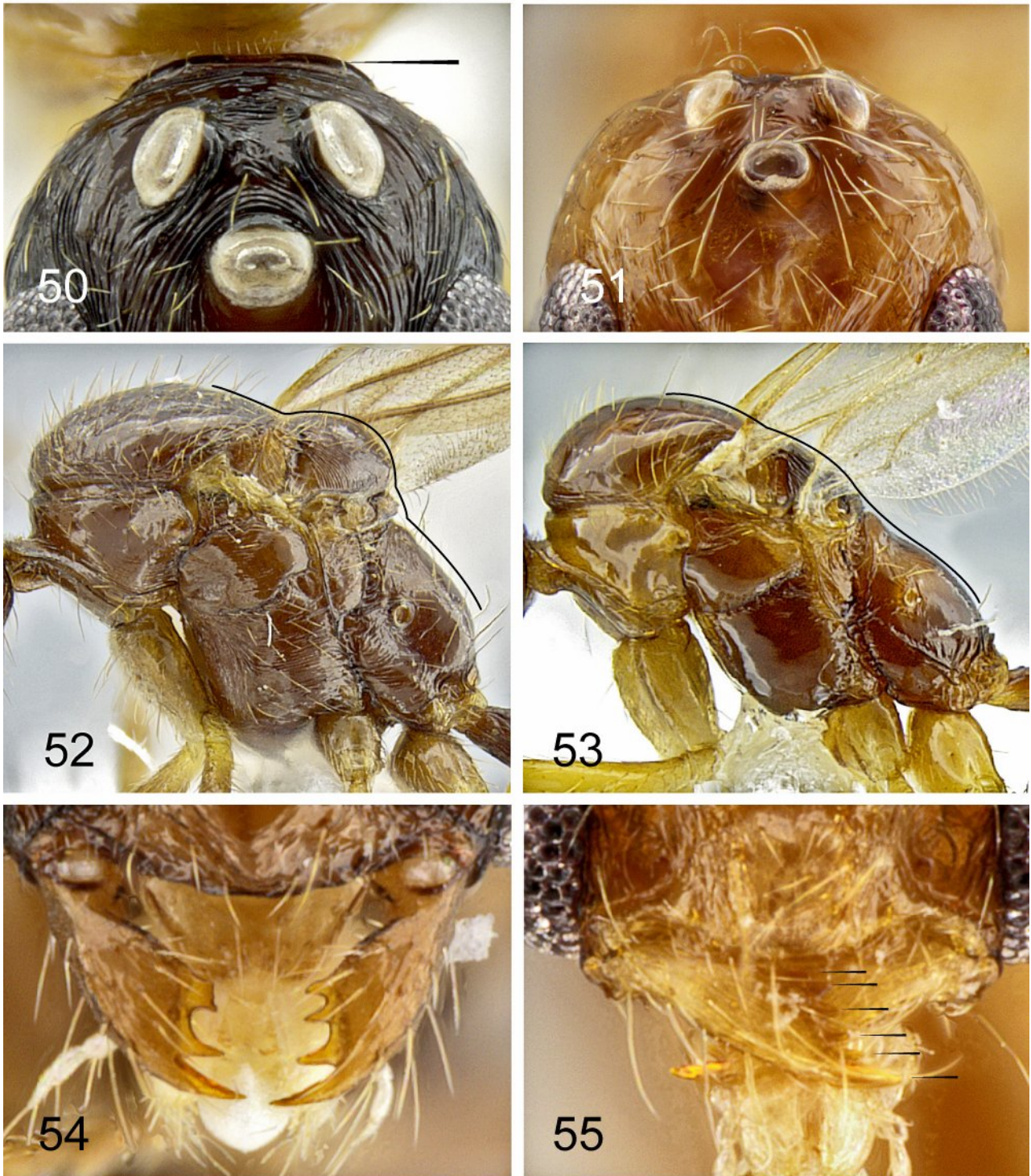
- 1 Forewing crossvein 1m-cu present (fig. 43) . . . . . 2
- Forewing crossvein 1m-cu absent (fig. 44) . . . . . 9
- 2 Dorsal face of mandible coarsely striate. Minimum distance between compound eye and lateral ocellus less than one lateral ocellus length (fig. 45) and/or scape length greater than that of antennomeres 2–4. . . . . 3
- Dorsal face of mandible mostly smooth. Minimum distance between compound eye and lateral ocellus greater than one lateral ocellus length (figs. 46 & 47) and scape length less than that of antennomeres 2–4. . . . . 4
- 3 Setae on gastric tergum I coarse, stiff, somewhat dilute (fig. 48). Ventral face of petiole with two longitudinal carinulae flanking median longitudinal carinula. Panama . . . . . *M. adamsae* Longino
- Setae on gastric tergum I fine, flexuous, relatively dense (fig. 49). Ventral face of petiole with at least four carinulae flanking median carinula. Nicaragua to Panama . . . . . *M. symmetochus* Wheeler
- 4 Occipital carina visible in full-face view (fig. 50) . . . . . 5
- Occipital carina obscured by vertex in full-face view, well below level of ocellar region (fig. 51) . . . . . 6
- 5 Mesosoma robust. Mesoscutellum strongly bulging in profile view (fig. 52). Costa Rica to Venezuela . . . . . *M. modestus* Emery
- Mesosoma gracile. Mesoscutellum weakly bulging in profile view (fig. 53). Southern Mexico to northern Argentina . . . . . *M. silvestrii* Wheeler
- 6 Masticatory margin of mandible with three or four large, widely-spaced teeth (fig. 54). Scape short: about three times longer than the pedicel. . . . . 7
- Masticatory margin of mandible with six or more small, close-set teeth (fig. 55). Scape long: four to five times longer than the pedicel. Pale brown . . . . . 8

- 7 First gastric tergum with numerous (> 10) short appressed setae in addition to long suberect to erect setae. Strongly shining black. Mexico south to Brazil. .... *M. megadrifti* new species
- First gastric tergum with sparse (< 5) or without short appressed setae in addition to long suberect to erect setae. Red-brown. Costa Rica, Ecuador. .... *M. brandaoi* new species



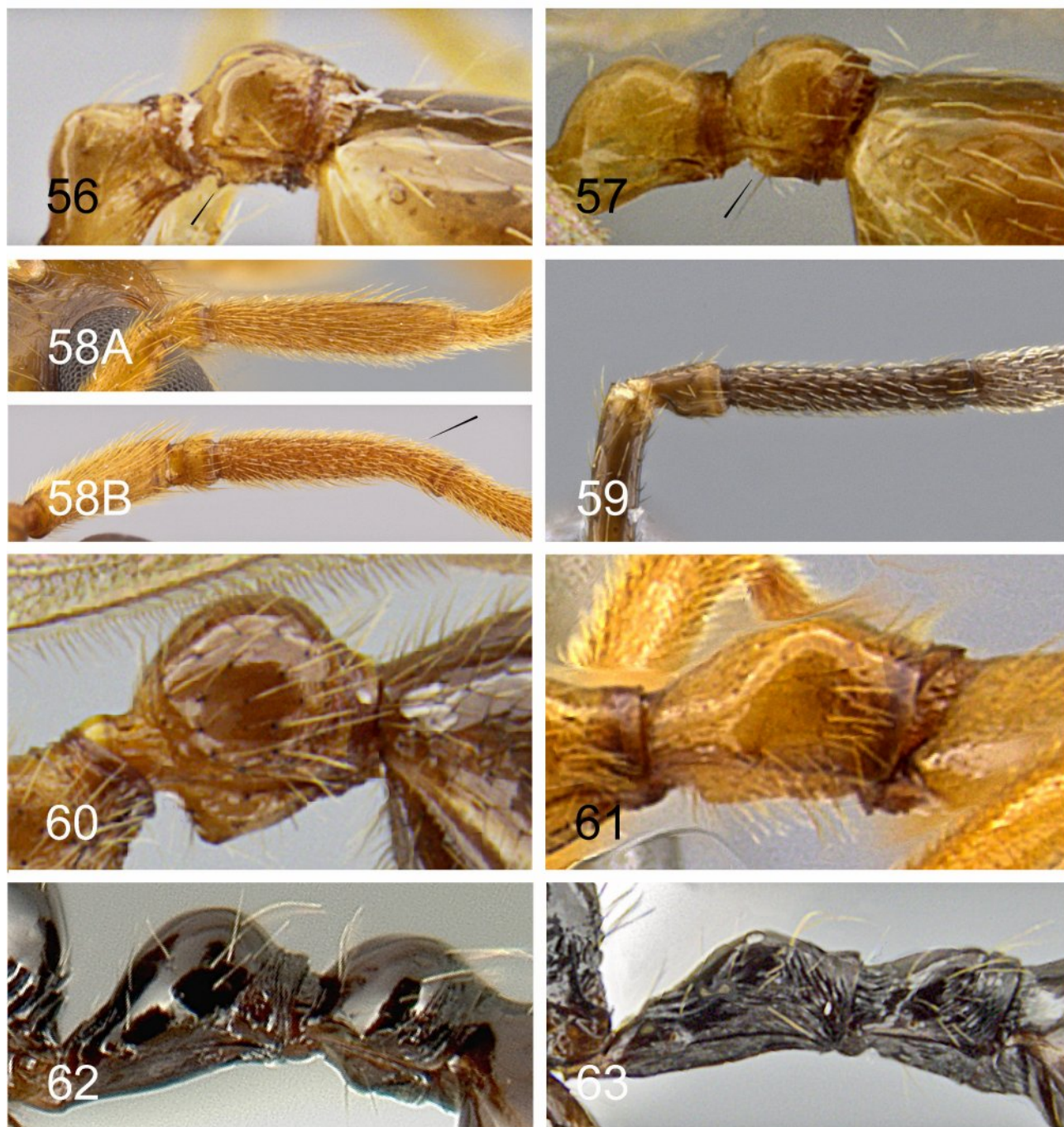
**FIGURES 41–49.** 41 & 42: Worker mandibles, dorsal view; 43 & 44: forewings, dorsal view; 45–47: male heads, anterodorsal oblique view; white brackets indicate maximum length of lateral ocellus; 48 & 49: male metasomata without petioles or postpetioles, profile view. 41. *M. osadrifti* holotype (CASENT0630909). 42. *M. drifti* (CASENT0630914). 43. *M. adamsae* queen (CASENT0629668). 44. *M. mondaboroides* male (CASENT0629670). 45. *M. symmetochus* (CASENT0619480). 46. *M. silvestrii* (CASENT0611418). 47. *M. brandaoi* (JTLC000002912). 48. *M. adamsae* (CASENT0631057). 49. *M. symmetochus* (CASENT0619480).

- 8 Postpetiole with anteroventral denticle in profile view (fig. 56). Ventral surface of petiole with rough sculpturation. All setae on scape appressed. Costa Rica and Panama ..... *M. miri* Brandão
- Postpetiole without anteroventral denticle in profile view (fig. 57). Ventral surface of petiole smooth and shining. Setae on scape appressed to subdecumbent. Costa Rica and Panama ..... *M. wettereri* Brandão
- 9 Occipital carina distinctly visible in full-face view (fig. 50) ..... 10
- Occipital carina obscured by vertex in full-face view (fig. 51) ..... 13



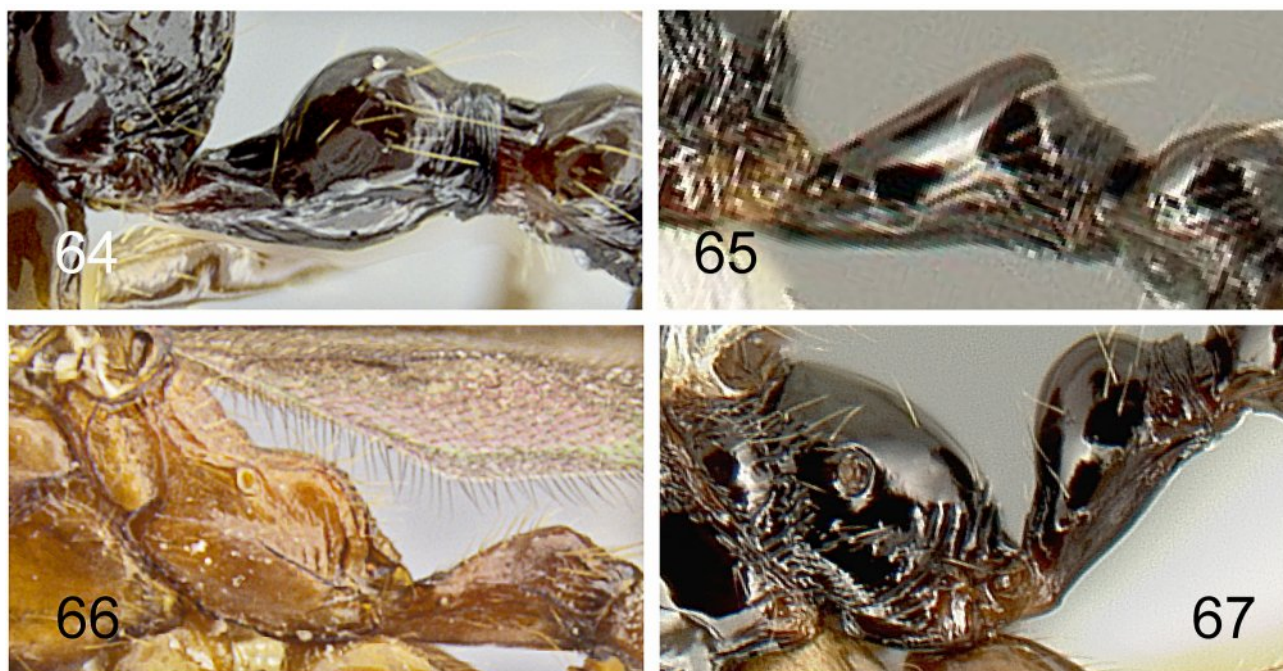
**FIGURES 50–55.** 50 & 51: Posterior halves of male heads, full-face view; 52 & 53: male mesosomata in profile view; 54 & 55: male mandibles, anterodorsal view; arrows indicate teeth of *M. wettereri*. 50. *M. silvestrii* (CASENT0611418). 51. *M. wettereri* (CASENT0630040). 52. *M. modestus* (INBIOCRI002280196). 53. *M. silvestrii* (CASENT0611418). 54. *M. brandaoi* (CASENT0630028). 55. *M. wettereri* (CASENT0630040).

- 10 Third antennomere apically flattened and/or bent (fig. 58). Submarginal cell 1+2 of forewing broad: less than or equal to four times as long as broad ..... 11
- Third antennomere cylindrical, not apically bent (fig. 59). Submarginal cell 1+2 of forewing very narrow: five or more times as long as broad ..... 12
- 11 Postpetiole globose: postpetiolar node and sternum strongly convex in profile view (fig. 60). Masticatory margin of mandible with six teeth; the subapical tooth about one third the length of the apical tooth. Palpal formula 3,2. Costa Rica, Panama, Colombia, Guyana, Amazonian Brazil ..... *M. wallacei* Mann
- Postpetiole not globose: postpetiolar node and sternum weakly convex in profile view (fig. 61). Masticatory margin of mandible with five teeth; the subapical tooth about half the length of the apical tooth. Palpal formula 3,3. Costa Rica south to Andean regions of Colombia, Ecuador, and northern Peru ..... *M. foreli* Emery

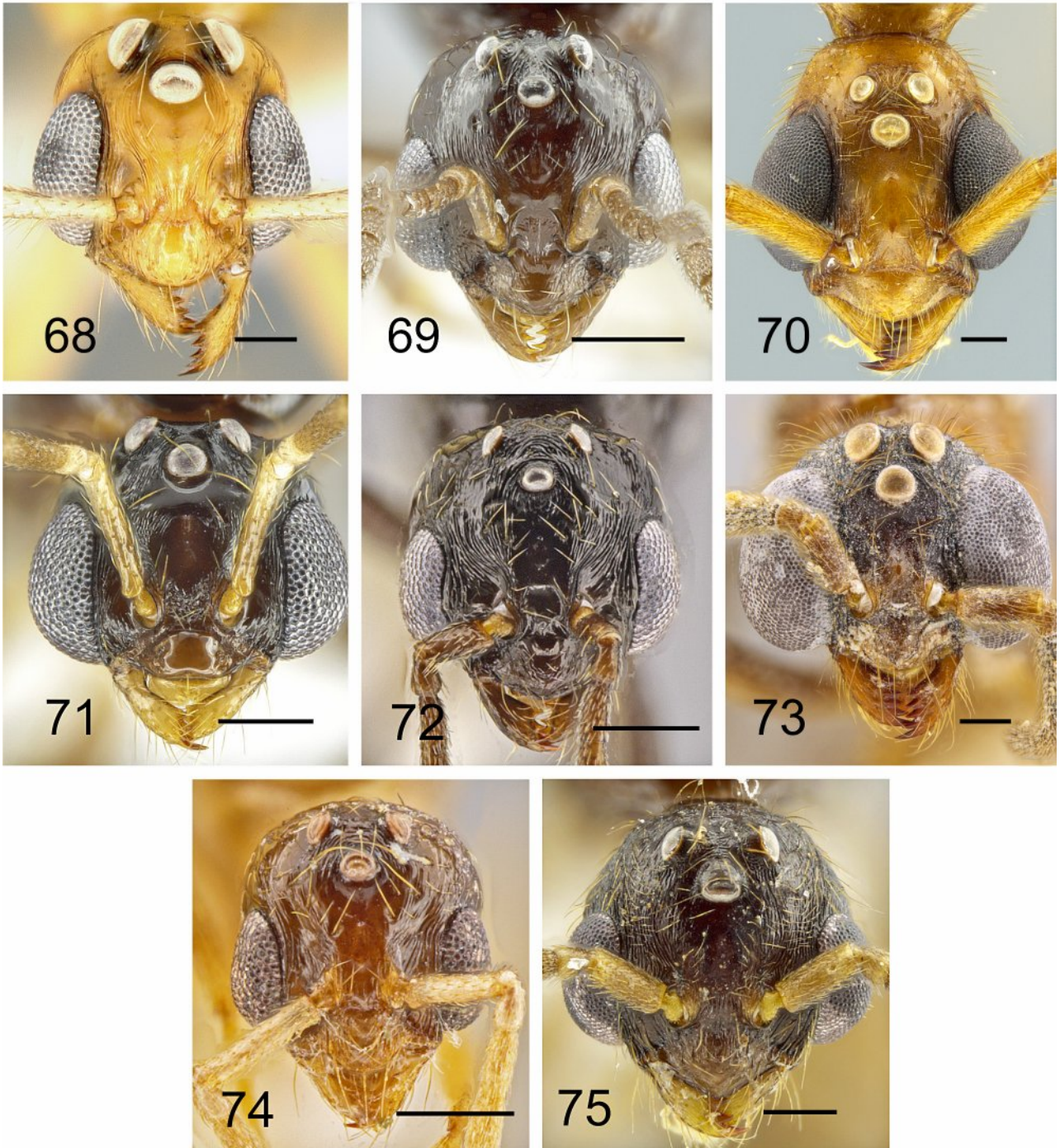


**FIGURES 56–63.** 56 & 57: Male postpetioles, profile view; 58 & 59: male left antennae; black arrow indicates flattened kink; 60 & 61: male postpetioles, profile view; 62 & 63: male petioles and postpetioles, profile view. 56. *M. miri* (CASENT0630868). 57. *M. wettereri* (CASENT0630040). 58A. *M. foreli* (CASENT0615189), mediadorsal view. 58B. *M. foreli* ventral view. 59. *M.* male 01 (CASENT0630020). 60. *M. wallacei* (CASENT0630041). 61. *M. foreli* (CASENT0615189). 62. *M. mondabora* (JTL000001520). 63. *M.* male 01 (CASENT0630020).

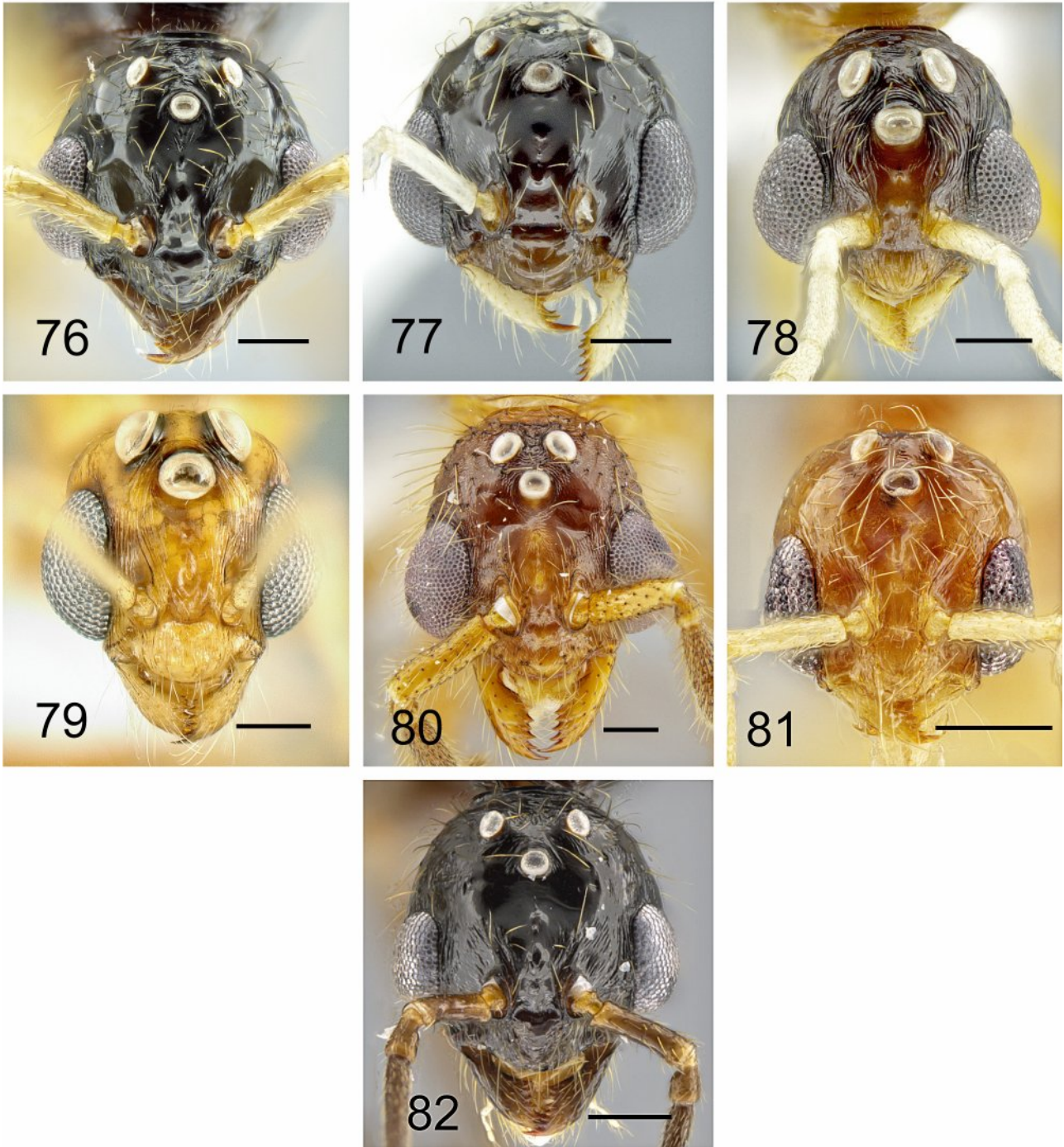
- 12 Petiolar node bulbous and with a distinct posterior face in profile view (fig. 62). Postpetiolar node distinct and strongly convex in profile view (fig. 62). Femora and at least first three antennomeres white; tibiae pale brown. Costa Rica ..... *M. mondabora* Brandão
- Petiolar node angular and without a distinct posterior face (fig. 63). Postpetiolar node indistinct, almost linear in profile view (fig. 63). Femora, first three antennomeres, and tibiae dark brown. Chiapas, Mexico ..... *M. male 01*
- 13 Antenna with eleven antennomeres. Anterodorsal margin of petiole concave (fig. 64). Metabasitarsus bent about midlength and swollen apically. Southern Mexico south to Peru, Venezuela, and central Brazil; absent in Costa Rica. .... *M. incisus* Smith
- Antenna with thirteen antennomeres. Anterodorsal margin of petiole linear (fig. 65). Metabasitarsus tubular; neither bent nor swollen apically ..... 14
- 14 Antenna brown to honey-colored. Large (ML > 2.25 mm). Compound eyes giant, taking up most of the head (fig. 73), separated across the frons by less than one eye width in full-face view. Lateral ocellus less than one lateral ocellus length from compound eye. Dorsal face of propodeum depressed in profile view (fig. 66). Panama ..... *M. milenae* new species
- Antenna white. Small (ML < 1.5 mm). Compound eyes smaller, not taking up most of the head (Fig. 77), separated across the frons by more than twice one eye width in full-face view. Lateral ocellus about three lateral ocellus lengths from compound eye. Dorsal face of propodeum convex in profile view (fig. 67). Costa Rica and Panama. .... *M. mondaboroides* Longino



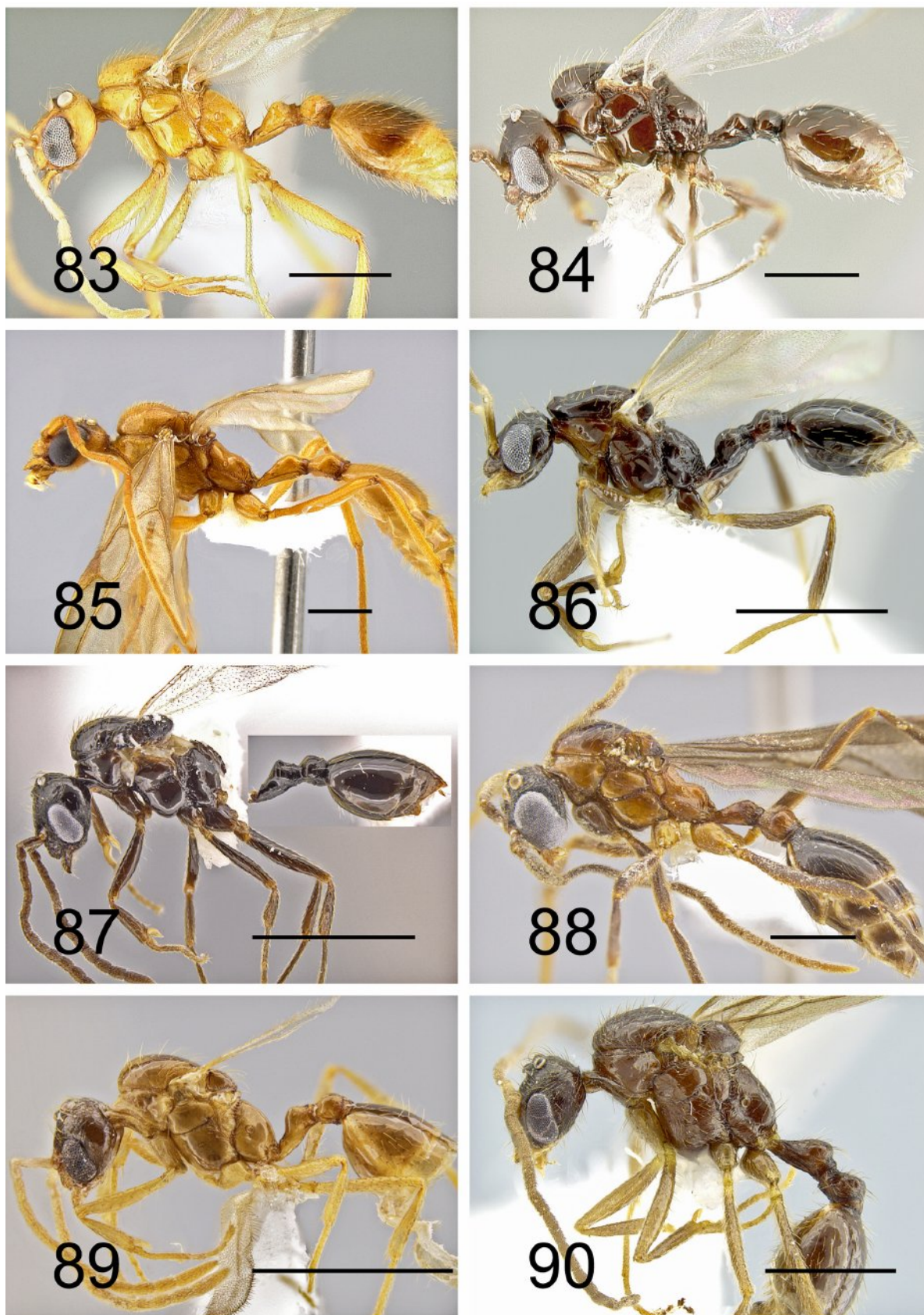
**FIGURES 64–67.** 64 & 65. Male petioles, profile view; 66 & 67: male propodea, profile view. 64. *M. incisus* (CASENT0614216). 65. *M. mondaboroides* (CASENT0613247). 66. *M. milenae* (CASENT0630869). 67. *M. mondabora* (JTL000001520).



**FIGURES 68–75.** *Megalomyrmex* males in full-face view; all scale bars 0.2 mm. **68.** *M. adamsae* (CASENT0613259, image from AntWeb). **69.** *M. brandaoi* (JTLC000002912). **70.** *M. foreli* (CASENT0615189). **71.** *M. incisus* (CASENT0614216). **72.** *M. megadrifti* (CASENT0630906). **73.** *M. milenae* (CASENT0630869). **74.** *M. miri* (CASENT0630868). **75.** *M. modestus* (INBIOCRI002280196).

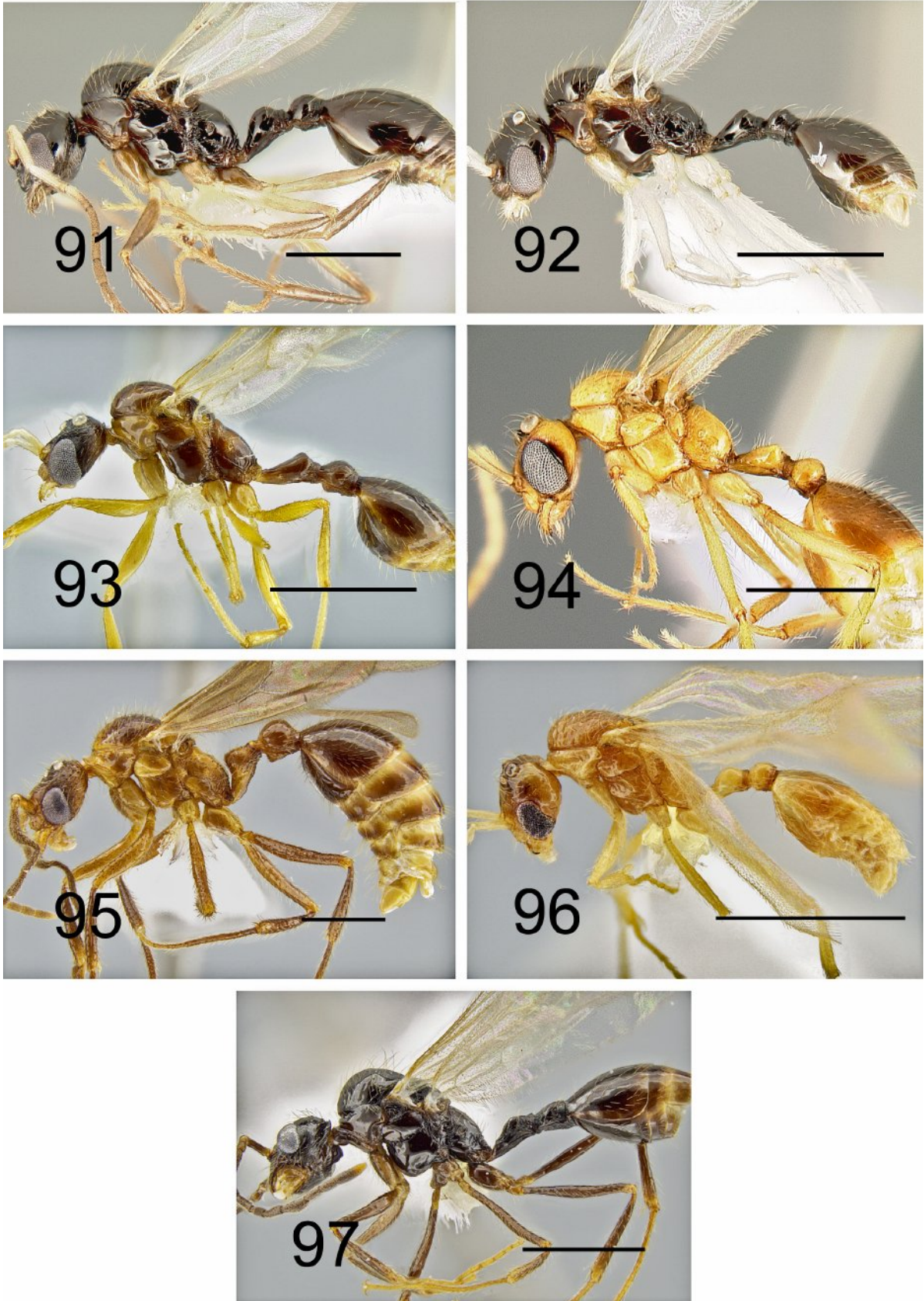


**FIGURES 76–82.** *Megalomyrmex* males in full-face view; all scale bars 0.2 mm. **76.** *M. mondabora* (JTLC000001520). **77.** *M. mondaboroides* (CASENT0613247). **78.** *M. silvestrii* (CASENT0611418). **79.** *M. symmetochus* (CASENT0613260, image from AntWeb). **80.** *M. wallacei* (CASENT0630041). **81.** *M. wettereri* (CASENT0630040). **82.** *M.* male 01 (CASENT0630020).



**FIGURES 83–90.** *Megalomyrmex* males in profile view; all scale bars 1.0 mm. **83.** *M. adamsae* (CASENT0613259, image from AntWeb). **84.** *M. brandaoi* (CASENT000002912, image from AntWeb). **85.** *M. foreli* (CASENT0615189). **86.** *M. incisus* (CASENT0614216). **87.** *M. megadrifti* (CASENT0630906); note: composite image, head, mesosoma, and metasoma to same scale (specimen damaged). **88.** *M. milenae* (CASENT0630869). **89.** *M. miri* (CASENT0630868). **90.** *M. modestus* (INBIOCRI002280196).





**FIGURES 91–97.** *Megalomyrmex* males in profile view; all scale bars 1.0 mm. **91.** *M. mondabora* (CASENT000001520, image from AntWeb). **92.** *M. mondaboroides* (CASENT0613247, image from AntWeb). **93.** *M. silvestrii* (CASENT0611418). **94.** *M. symmetochus* (CASENT0613260, image from AntWeb). **95.** *M. wallacei* (CASENT0630041). **96.** *M. wettereri* (CASENT0630040). **97.** *M.* male 01 (CASENT0630020).

## SPECIES ACCOUNTS

### *Megalomyrmex adamsae* Longino, 2010

(Figs. 4, 18, 22, 25, 43, 48, 68, 83, 98–101, 178, 193, 208, 223, 238, 243, 244)

*Megalomyrmex adamsae* Longino, 2010: 41, figs. 3B, 3D, 7A–H. Holotype worker, paratype workers, queens and male: PANAMA, Panamá: Pipeline Rd., 4E heading N, 9.16000°N 79.74490°W, ±20 m, 50 m, 29 Sep 1999 (R. Adams#RMMA990929-01) [MCZ, CAS, USNM] (holotype worker and paratype male examined, MCZ).

*Measurements.* Worker (holotype from Longino 2010): HW 0.85, HL 0.90, SL 0.89, EL 0.26, ML 1.29, CI 94, SI 99

Worker (n=2, plus 6 from Longino 2010): HW 0.82–0.90, HL 0.88–0.96, SL 0.85–0.92, OMD 0.19–0.20, EL 0.24–0.27, ML 1.29–1.39, CI 93–98, SI 96–100, EI 29–30, OMI 73–79.

Queen (n=1, plus 3 from Longino 2010): HW 0.94–1.02, HL 0.93–0.95, SL 0.91–0.95, OMD 0.16, EL 0.34, ML 1.53–1.58, CI 101–108, SI 92–96, EI 36, OMI 47.

**Geographic range.** Panama; sea-level to 100 m elevation.

**Diagnosis. Worker** Uniquely identified among Central American *Megalomyrmex* by the following combination: (1) katepisternum costate in dorsal third; (2) dorsal surface of mandible striate; (3) mandible usually with 6 teeth, basal teeth decreasing in size towards basal tooth; (4) meso- and metabasitarsi tubular; (5) occipital carina not visible in full-face view. **Queen** Similarly identifiable as worker except most of katepisternum smooth, alate. **Male** Recognized by the following: (1) scapes relatively long (SI > 80); (2) crossvein 1m-cu present; (3) postpetiolar sternum weakly convex; (4) setae on gastric tergum I coarse and relatively sparse.

**Description. Male Measurements** (n=4, plus 1 from Longino 2010): HW 0.74–0.90, HL 0.72–0.89, SL 0.65–0.77, EL 0.42–0.53, ML 1.22–1.64, CI 101, SI 85, EI 56–60.

*Head* Antenna with 13 antennomeres; antennomere 3 apically kinked; apical antennomeres not forming a club; scape length greater than eye length. Scape yellowish-white; pedicel and antennomere 3 white; antennomeres 4–13 grading to honey yellow. Palpal formula 4,3. Mandible triangular, masticatory margin with 5 teeth; apical tooth largest; basal teeth decreasing in size from apical tooth. Dorsal face of mandible roughly striate. Minimum distance between lateral ocellus and compound eye less than to slightly more than one lateral ocellus length. Occipital carina not visible in full-face view. *Mesosoma* Mesosoma somewhat attenuate. Notauli absent. Parapsidal lines weak. Meso- and metabasitarsus not anteroposteriorly flattened. Metabasitarsus neither kinked nor swollen apically. Forewing crossvein 1m-cu present; submarginal cell 1 length about four times width; terminal abscissa of M branching from Rs distad 2r-rs. Pterostigma well-developed; longer posterad 2r-rs than anterad. *Metasoma* Ventrolateral longitudinal carina of petiole present. Postpetiolar helcium subcircular. Postpetiolar spiracle placed about midlength on lateral tergal margin on a lateral process. Sternum of postpetiole with a weak convexity in profile view. Postpetiolar tergum convex; not bilobed. *Genitalia* Abdominal sternum IX about as long as broad at base, triangular: lateral margins bulging about midlength and tapering to apex. Telomere short, triangular with narrowly rounded, angular apex; dorsal margin weakly concave, ventral margin weakly convex; dorsomedial dentiform process absent; medial face subrectangular; ventral margin without sclerotized denticle. Apical margin of cuspis slightly linear, tapering; apicodorsal angle more angular than apicoventral angle. Digitus stem narrow; apical blade broad, tapering strongly to apex; ventral margin weakly arched, becoming linear subapically; ventral margin not obscuring apicodorsal angle of cuspis. Valviceps about half as tall as long, subrectangular; apical (posterior) margin truncate; ventral margin weakly convex; penisvalvar teeth in anterior half truncate, posterior half acute; teeth close-set.

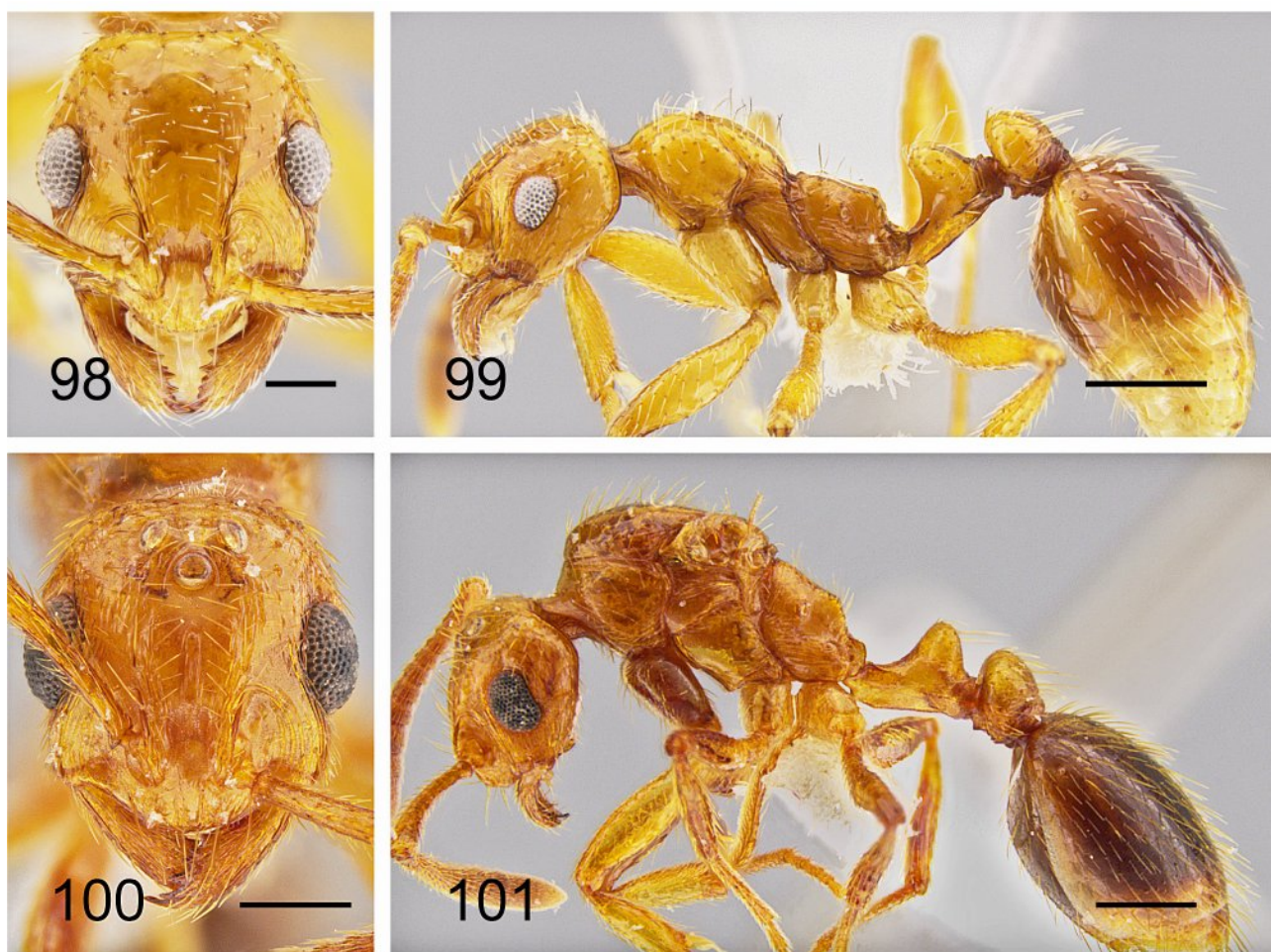
**Comments.** The worker is distinguished from *M. fungiraptor*, in addition to having tubular basitarsi, by the following: (1) mandibles orange (vs. burgundy); (2) anterior margin of clypeus flattened, vertical, meeting dorsal face at an angle (vs. rounded); (3) scapes longer (SI 96–99 vs. 91–93); (4) macrosetae on funiculus appressed (vs. appressed to decumbent); (5) setae on temples, in full-face view, appressed to subdecumbent (vs. subdecumbent to suberect); (6) subpetiolar process stout; (7) postpetiolar helcium with crossribbing; (8) setae on body, but especially on first gastric tergum, more dilute; (9) setae stouter. For a list of characters separating males of *M. adamsae* from those of *M. symmetochus* see the “Comments” section of the latter species account. Generally, however, smaller males have less convex postpetiolar sterna, and more strongly bulging anterodorsal petiolar faces. At least one new

species of the *symmetochus* complex with terete basitarsi and coarse setae were examined at the MCZ from Brazil and Guyana.

**Biology.** *Megalomyrmex adamsae* is an obligate xenobiont or guest ant social parasite, consuming fungus garden and host brood of fungus-growing ants (Adams, Shah *et al.* 2012). They are associates of at least two sympatric *Trachymyrmex* sister species, *T. zeteki* and *T. cf. zeteki* in Panama (Adams, Jones *et al.* 2012; Adams, Shah *et al.* 2012; T. Schultz pers. comm.) which nest in creek embankments (Fernández-Marín *et al.* 2004). Parasite queens infiltrate newly founded colonies with few or no workers and a small garden (fig. 239). Remarkably, aggression between the queens subsides not long after infiltration and the host queen exhibits an obvious submissive posture (fig. 240; <http://www.youtube.com/watch?v=cweqMCZcMXk>). Male and female reproductives are produced at the start of the rainy season in Panama and 1–3 young queens are found in incipient host colonies from May to August. Reproductives were collected—in large numbers from one collection event, presumably from a flight—in September at Fort Clayton in Panama by R. Kimsey.

**Male material examined.** PANAMA, Panamá: Pipeline Rd., 5E heading N, 9°9'36N 79°44'41.64W, 50 m, 29 Sep 1999 (*R.M.M. Adams*#RMMA990929-06); Fort Clayton, 22 Sep 1981 (*R.B. Kimsey*).

**Female material examined.** PANAMA, Panamá: Pipeline Rd., 5E heading N, 9°9'36N 79°44'41.64W, 50 m, 29 Sep 1999 (*R.M.M. Adams*#RMMA990929-06); Parq. Nac. Soberanía, Pipeline Road, 9.16318°N 79.74450°W, 94 m, 30 Sep 1999 (*R.M.M. Adams*# RMMA990930-19); Fort Clayton, 22 Sep 1981 (*R.B. Kimsey*).



**FIGURES 98–101.** *Megalomyrmex adamsae* Longino worker (CASENT0630965) and queen (CASENT0629669); full-face view scale bars 0.2 mm, profile scale bars 0.5 mm. **98.** Worker, head in full-face view. **99.** Worker, profile view. **100.** Queen, head in full-face view. **101.** Queen, profile view.

***Megalomyrmex brandaoi* Boudinot, Sumnicht & Adams sp. n.**

(Figs. 7, 36, 39, 47, 54, 69, 84, 102–105, 179, 194, 209, 224, 238)

**Type material.** *Holotype worker.* COSTA RICA, Heredia: 10 km SE La Virgen, 10.33333°N 84.08333°W ±2 km, 500 m, 9 Nov 2002, wet forest, nest in dead stick in litter (J. Longino#JTL4856) [CASENT0630943, MCZ].

*Paratype worker:* (9) Same collection as holotype. [CASENT0630939, BMNH; CASENT0630940, CASC; CASENT0630941, INBC; CASENT0630942, LACM; JTLC000003329, JTLC; CASENT0630944, MCSN; CASENT0630945, MZSP; CASENT0630946, UCD; CASENT0630947, USNM].

*Paratype queens:* (2) Same collection as holotype [JTLC000003329, JTLC; CASENT0630948, MCZ]

*Paratype males:* (3) Same collection as holotype [JTLC000002912, INBC; CASENT0630949, MCZ; CASENT0630950, MZSP].

**Geographic range.** Costa Rica, Ecuador; sea-level to 500 m elevation.

**Diagnosis. Worker** Uniquely identified among Central American *Megalomyrmex* by the following combination of characters: (1) disc of katepisternum smooth and shining; (2) occipital carina not visible in full-face view; (3) first gastric tergum with at most 4 short appressed setae; (4) setae coarse; (5) foraminal carina absent.

**Queen** Identifiable similarly to worker, alate. **Male** Differing from all known Central American *Megalomyrmex* by the following combination: (1) lateral ocellus greater than three of its lengths from the compound eye; (2) pedicel swollen (*i.e.* with convex sides); (3) antenna without any kinked antennomeres; (4) scape short (SI 30); (5) eyes short, relative to head length (EI 28). Among the Central American species examined, *M. brandaoi* has the smallest genitalia, and most reduced penisvalvar dentition.

**Description. Worker Measurements** (holotype): HW 0.52, HL 0.58, SL 0.50, OMD 0.09, EL 0.15, ML 0.71, CI 89, SI 85, EI 29, OMI 62.

*Measurements* (n=6): HW 0.49–0.54, HL 0.55–0.60, SL 0.47–0.52, OMD 0.09–0.10, EL 0.13–0.16, MK 0.67–0.76, CI 88–90, SI 85–88, EI 27–31, OMI 60–72.

*Head* Palpal formula 3,2. Basal and masticatory margins of mandible distinct, demarked by an angle with a small tooth. Mandible with 5–6 teeth; apical two teeth largest; apical tooth slightly less than twice as long as subapical; 3–4 basal teeth small, widely-spaced. Dorsal surface of mandible smooth and shining, interrupted by weak piligerous punctae. Clypeus truncate in profile view, with median seta often raised on a small tubercle. Clypeal carinae present, often weak; diverging anteriorly. Clypeus, between antennal insertions, broader than maximum diameter of scape. Antennal fossa encircled by 2–3 complete carinulae. Malar area roughened in anterior half, smooth posteriorly. Compound eye with 1–5 ocular setae. Occipital carina short, distinct; obscured by vertex in full-face view; extending anteroventrally less than one eighth distance to hypostomal margin. *Mesosoma* Katepisternum and promesonotum smooth and shining; propodeum smooth and shining excluding 3 wide-set metapleural carinulae. Metapleural carinulae do not reach meso-metapleural suture. Propodeum with dorsal and posterior faces meeting at a blunt angle; propodeum dorsolaterally marginate only at angle; dorsal margin concave in profile view. Foraminal carina absent. Meso- and metabasitarsi tubular. *Metasoma* Petiole and postpetiole predominantly smooth and shining, except for fine carinulae or rugae around posterior bases, the anterior petiolar base, and the ventrolateral longitudinal carina of petiole. Subpetiolar process a truncate denticle. Postpetiolar sternum finely bidentate anteriorly. Lancets of sting apparatus weakly spatulate. *Setation* Coarse; head dorsum with long, somewhat dense subdecumbent to suberect setae and medium appressed setae which are most abundant on gena; setae on scape appressed to subdecumbent; promesonotum with about 16 erect setae on each lateral half, most setae very long, about 5 or 6 shorter; first gastric tergum with dense, long, subdecumbent to suberect setae, with 0–4 very sparse short appressed setae. Head, meso- and metasoma burnt caramel brown, mandibles, antennae, and legs deep honey yellow.

**Queen Measurements** (n=1): HW 0.59, HL 0.62, SL 0.53, OMD 0.09, EL 0.20, ML 0.88, CI 95, SI 85, EI 33, OMI 44.

Similar to worker, but with alate-condition mesosoma, coarser sculpturation, and more numerous setae on mesosoma. Wing venation as in male.

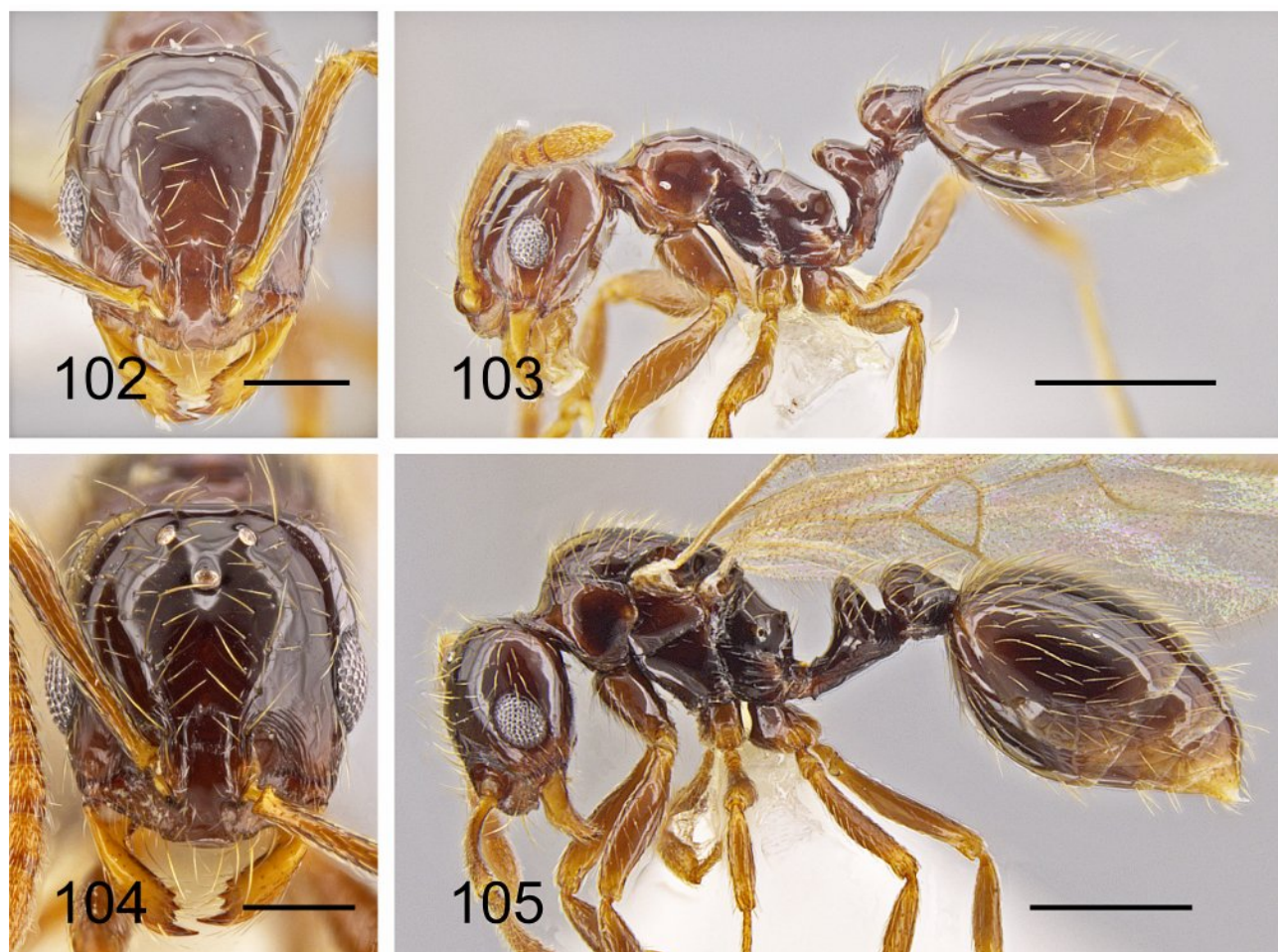
**Male Measurements** (n=2): HW 0.55–0.56, HL 0.52–0.54, SL 0.16, EL 0.28–0.29, ML 0.86–0.89, CI 104–107, SI 30, EI 51.

*Head* Antennae with 13 antennomeres, none of which are kinked; not forming a club; scape length shorter than eye length; entire antenna brown. Palpal formula 3,2. Mandible subfalcate; masticatory margin with four triangular teeth, decreasing in size from apical tooth. Dorsal surface of mandible roughened and weakly striate. Minimum

distance between lateral ocellus and compound eye distinctly greater than two lateral ocellus lengths. Compound eye with few, sparse ocular setae. Occipital carina not visible in full-face view. *Mesosoma* *Mesosoma* robust. Notauli weakly indicated by indistinct sulci with transverse carinulae. Parapsidal lines weak. Foraminal carina absent. Metasternum without a process. Basitarsi tubular. Pterostigma well-developed. Forewing crossvein 1m-cu present; submarginal cell 1 length about twice width; terminal abscissa of M branching from Rs+M at 2r-rs. *Metasoma* Basipetiolar carina arc-shaped. Ventrolateral longitudinal carina of petiole present. Petiolar spiracle in anterior third. Petiolar and postpetiolar posterior margins without distinct girdling carinae. Postpetiolar helcium approximately circular. Postpetiolar spiracle placed at about the first one third of the lateral tergal margin. Sternum of postpetiole concave with a weak median bulge in profile view. Postpetiolar tergum shallowly but evenly convex; apex at midlength; not bilobed. *Genitalia* Abdominal sternum IX lateral margins tapering to base of apical triangle, which is produced ventrally somewhat; apical triangle neither keeled nor with a distinct degree of sclerotization; apical process narrowly triangular, pointed. Telomere short, triangular, bluntly rounded; medial dentiform process absent; medial face of telomere not arched; ventral margin without sclerotized denticles. Cuspis apicodorsally and apicoventrally produced; apical margin concave. Digitus thin; dorsal margin parabolic, ventral margin unevenly arched, with basal half more strongly arched than the nearly linear posterior half; ventral margin slightly obscuring posteroapical angle of cuspis. Valvices height subequal to length, ovate; basal half of dorsal margin slightly flattened, while the distal half curved continuously through the apical margin to the ventral margin; ventral margin weakly convex; penisvalvar teeth miniscule.

**Etymology.** Named after Dr. Roberto Brandão for his valuable contributions to the taxonomy of this genus.

**Comments.** *Megalomyrmex brandaoi* is strikingly setose. Although other *Megalomyrmex* species have far more setation—such as the *mondabora* complex and the *leoninus* group—*M. brandaoi* is easily distinguished from other *drifti* complex species by its fiercely hirsute facies.



**FIGURES 102–105.** *Megalomyrmex brandaoi* sp. n. holotype worker (CASENT0630943) and paratype queen (CASENT063094); full-face view scale bars 0.2 mm, profile scale bars 0.5 mm. **102.** Worker, head in full-face view. **103.** Worker, profile view. **104.** Queen, head in full-face view. **105.** Queen, profile view.

The following characters are unique to *M. brandaoi* among species of the *drifti* complex: (1) setae coarse; (2) first gastric tergum with at most four short, appressed setae, though usually without; (3) portion of clypeus between antennal insertions wider than maximum width of scape; (4) antennal club shorter than combined length of antennomeres 2–9; (5) metanotal sulcus shallow (vs. deeply incised). Supporting characters for the separation of *M. brandaoi* from *drifti* complex species include: (1) mandible with five comparatively large, almost evenly-spaced teeth (vs. variable, often with small denticles); (2) basal and masticatory margins distinct; (3) the three longitudinal carinae crossing metapleural gland bulla wide-set (vs. dense); (4) foraminal carina absent.

Note that figure 4B of Longino (2010) is the petiole to this species.

**Biology.** The only known collections of this species are from the Barva Transect in Costa Rica. The type series was nesting in a dead stick in leaf litter, while other partial colonies or strays have been collected via Winkler. Males have been collected via malaise and Winkler sifting; the latter probably due to leaf litter nesting.

**Additional male material examined.** COSTA RICA, Guanacaste: Miravalles E of Bagaces, 23 Jul 1996 (*S. O'Keefe*); Heredia: 10 km SE La Virgen, 10.33333°N 84.08333°W ±2 km, 500 m, 9 Nov 2002, wet forest, nest in dead stick in litter (*J. Longino*#JTL4856); 11 km ESE La Virgen, 10.35°N 84.05°W, 300 m, 15 Feb 2004, montane wet forest, ex malaise trap (*ALAS*#*ALAS/03/malaise*). ECUADOR, Napo: Guagua Sumaco, 45 along Hollin-Loreto Road, 14–20 Jul 1989 (*M. & J. Wasbauer & H. Real*).

**Additional female material examined.** COSTA RICA, Guanacaste: Miravalles E of Bagaces, 23 Jul 1996 (*S. O'Keefe*); Heredia: 10 km SE La Virgen, 10.33333°N 84.08333°W ±2 km, 500 m, 9 Nov 2002, wet forest, nest in dead stick in litter (*J. Longino*#JTL4856); P.N. Braulio Carrillo, 10°20'N 84°02'W, 500 m, 20 Apr 2007 (*TEAM-OET*#AMI-3-W-136-08).

### *Megalomyrmex drifti* Kempf, 1961

(Figs. 28, 38, 42, 106–109, 238)

*Megalomyrmex drifti* Kempf, 1961: 504, figs. 9–11. Holotype worker, paratype workers, queen: SURINAM, Dirkshoop [MZSP] (examined). Brandão 1990: 448, description of male. See also: Kempf 1970: 362–363, figs. 9–12; and Longino 2010: 44.

**Geographic range.** Tropical South America, north through Central America to Honduras; sea-level to 1000 m elevation.

**Diagnosis. Worker** Uniquely identified among Central American *Megalomyrmex* by the following combination: (1) basal and masticatory margins indistinct; (2) small (ML < 1.0 mm); (3) disc of katapisternum smooth and shining; (4) occipital carina obscured by vertex in full-face view; (5) eye normally-developed and relatively close to lateral clypeal margin (EL > 0.10 mm, OMI < 60); (6) scape relatively short (SI < 85). **Queen** Similarly identifiable as worker, alate. (**Male** Unknown, see comments section below.)

**Description. Worker Measurements** (holotype, from Brandão 1990): HW 0.45, HL 0.60, SL 0.38, ML 0.60, CI 75, SI 63. (Kempf 1961: HL 0.51, SL 0.37, EL 0.11, ML 0.61, SI 73.)

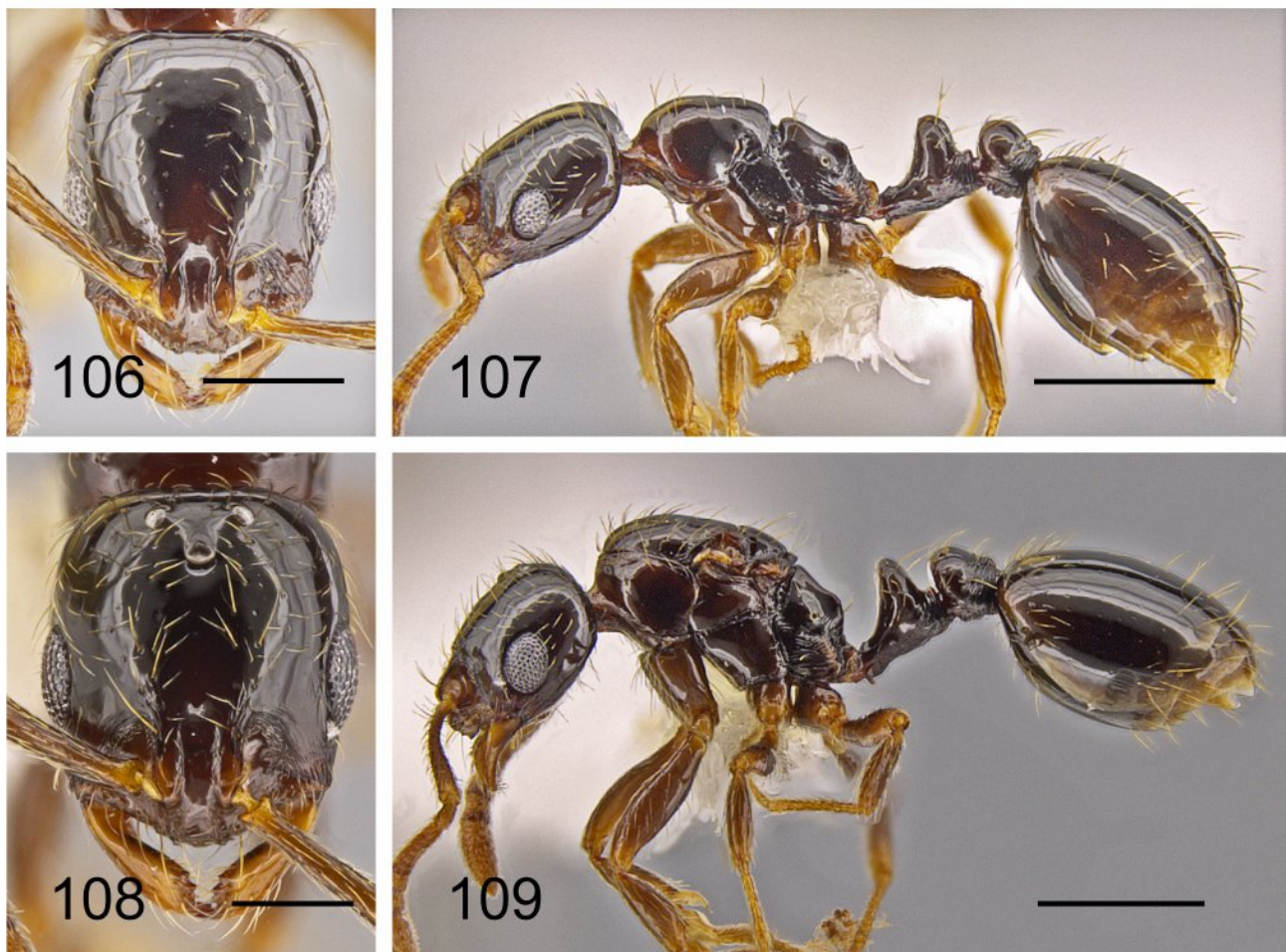
**Measurements** (n=9): HW 0.43–0.48, HL 0.52–0.56, SL 0.41–0.45, OMD 0.06–0.08, EL 0.12–0.15, ML 0.63–0.72, CI 84–88, SI 78–82, EI 29–32, OMI 43–57.

**Head** Palpal formula 3,2. Basal and masticatory margins of mandible indistinct, curving evenly from basal to masticatory margin. Mandible with 4–7 teeth; apical two teeth largest; apical tooth slightly less than twice as long as subapical; 2–5 very small basal teeth. Dorsal surface of mandible smooth and shining, interrupted by weak piligerous punctae. Clypeus truncate in profile view, with median seta often raised on a small tubercle. Clypeal carinae present, distinct to weak; diverging anteriorly. Clypeus, between antennal insertions, narrower than maximum diameter of scape. Antennal fossa encircled by 2–4 complete carinulae. Malar area roughened in anterior half, smooth posteriorly. Compound eye with about 2–7 ocular setae. Compound eye relatively close to lateral clypeal margin (OMI < 60). Scape relatively short (SI < 85). Occipital carina short, distinct; obscured by vertex in full-face view; extending anteroventrally less than one eighth length of postgenal bridge. *Mesosoma* Katapisternum and promesonotum smooth and shining, propodeum smooth and shining except for 4 close-set metapleural carinulae. Metapleural carinulae not reaching meso-metapleural suture. Metanotal depression a deep incision. Propodeum with dorsal and posterior faces meeting at a bluntly rounded, raised angle; propodeum dorsolaterally marginate; dorsal margin concave in profile view. Propodeal foramen complete to weak dorsomedially. Meso- and

metabasitarsi tubular. *Metasoma* Petiole and postpetiole predominantly smooth and shining, except for occasional weak roughness posteroventrally on the petiole, and concentric girdling carinulae on posterior bases of petiole and postpetiole. Posterior petiolar base distinct from posterodorsal petiolar face. Subpetiolar process a small, distinct, posteriorly-pointed denticle. Postpetiolar sternum weakly bidentate anteriorly. Lancets of sting apparatus flattened, about three times as thick as metasomal seta. *Setation* Fine; head dorsum with somewhat dense medium to long subdecumbent to erect setae, in addition to somewhat denser short appressed to subdecumbent setae; scape with appressed setae, sometimes with decumbent to subdecumbent setae; promesonotum with about 11–12 setae on each lateral half, about 3–5 longest setae; first gastric tergum with somewhat more dilute long suberect setae, and with at least 10, but more often greater than 20 short appressed setae. Head, meso- and metasoma shining black to dark brown, sometimes pale brown; legs, antennae, and mandibles yellow-brown.

**Queen Measurements** (n=2): HW 0.53–0.55, HL 0.60–0.61, SL 0.48, OMD 0.07, EL 0.19, ML 0.87, CI 89–90, SI 80–81, EI 35–36, OMI 37–38.

Similar to worker, but with alate-condition mesosoma, coarser sculpturation, and more mesosomal setation. Wing venation not observed.



**FIGURES 106–109.** *Megalomyrmex drifti* Kempf worker (CASENT0630914) and queen (CASENT0624999); full-face view scale bars 0.2 mm, profile scale bars 0.5 mm. **106.** Worker, head in full-face view. **107.** Worker, profile view. **108.** Queen, head in full-face view. **109.** Queen, profile view.

**Comments.** Kempf (1970) stated that *Megalomyrmex drifti* displayed a strong morphocline across South America; Brandão (1990) and later Longino (2010) concurred. From the Central American material available to us, we found morphological, geographic, and genetic (unpubl. data) evidence for three new species previously attributed to *M. drifti*. Our newly restricted *M. drifti* is found in sympatry with two new *drifti* complex species, *M. megadrifti* and *M. osadrifti*. Although only collected in parapatry with *M. drifti*, *M. brandaoi* is remarkably distinct. Previously, Brandão (1990) suggested that the observed morphocline could be caused by high population viscosity due to the production of ergatoid gynes; to our knowledge, ergatoid queens have only been reported from

an unknown *drifti* complex species from Rio Palenque, Ecuador, and Bocaiuva, PR, Brazil (Brandão 1990). It remains to be determined how many *drifti* complex species are present in South America. As well, the male of *M. drifti* has previously been described (Brandão 1990); it is not known to which *drifti* complex species these described males belong.

For notes specifically separating *M. drifti* from the other *drifti* complex species, see the “Comments” sections of the respective species accounts. In short, *M. drifti* is distinct among Central American *drifti* complex species via the following combination of characters: (1) basal and masticatory margins of mandible indistinctly demarcated; (2) small (ML < 0.75 mm); (3) propodeum dorsolaterally marginate; (4) malar space relatively short (OMI < 60); (5) scapes relatively short (SI < 85). Relative to *M. megadrifti*, *M. drifti* is much less variable intra- and interpopulationally across its Central American range.

**Biology.** *Megalomyrmex drifti* is a small leaf-litter nesting species which have been collected in twigs and leaves (Longino 2010; T. McGlynn pers. comm.) as well as in many leaf litter sifting collections (Brandão 1990; Kempf 1970; Longino 2010; herein). These observations, although attributed to *M. drifti*, likely apply to or are of other species in the *drifti* complex *Megalomyrmex drifti*, as we have newly delimited it, is known in Central America from sea-level to mid-elevation (750 m) wet forests.

**Male material examined.** NICARAGUA, Matagalpa: RN Cerro Musún, 12.9546°N 85.2304°W, ±20 m, 615 m, 2–4 May 2011, wet forest, ex. malaise trap (LLAMA#Ma-D-01-3-01).

**Female material examined.** COLOMBIA, Magdalena: Parque Nacional Natural Tayrona, Pueblito limite Sur, 26 January 1978, 210–360 m, berlese (*C. Kugler*); Meta: Quebrada Susamuko, 23 km NW Villavicencio, 5 March 1972, 1000 m, forest litter (*S. & J. Peck*#B-234). COSTA RICA, Heredia: Est. Biol. La Selva, 10°26'N 84°01'W, 100 m, 1993 (*J.T. Longino*#B/12/093); Puntarenas: 13 km SSW Pto. Jimenez, 8.40667°N 83.3283°N ±200 m, 130 m, 10 Mar 2008, tropical rainforest, ex sifted leaf litter (*J.T. Longino*#JTL6209-29). ECUADOR, Pichincha: Domingo, Rio Palenque Sta., 23 May 1975, 215 m, forest, (*J. Peck*); (unknown province): Volcan Cotopaxi, NNE Latacunga, 23 June 1975, 350 m, paramo moss and shrub litter (*S. & J. Peck*#B-305). HONDURAS, Gracias a Dios: Las Marias, 15.71901°N 84.87844°W ±20 m, 380 m, 10 Jun 2010, tropical rainforest, ex sifted leaf litter (LLAMA#Wm-C-07-2-03); Las Marias, 15.71200°N 84.86305°W ±25 m, 100 m, 9 Jun 2010 (LLAMA#Wm-C-07-1-02). NICARAGUA, Matagalpa: R.N. Cerro Musún, 12.9607°N 85.2333°W ±10 m, 750 m, 1 May 2011, tropical wet forest, ex sifted leaf litter (LLAMA#Wa-D-01-1-01); R.N. Cerro Musún, 12.9609°N 85.2328°W ±10 m, 750 m, 1 May 2011, tropical wet forest, ex sifted leaf litter (LLAMA#Wa-D-01-1-13); Región Autónoma Atlántico Norte: P.N. Cerro Saslaya, 13.76878°N 84.98426°W ±10 m, 360 m, 7 May 2011, mature wet forest, ex sifted leaf litter (LLAMA#Wa-D-02-1-20); Región Autónoma Atlántico Sur: 13 km WNW Rama, 12.19470°N 84.3365°W ±100 m, 190 m, 18 Apr 2011, 2° forest, ex sifted leaf litter (*J.T. Longino*#JTL7322-s). PANAMA, Panamá: Cerro Azul, 22 June 1976, 610 m, forest floor leaf litter (*A. Newton*). SURINAME, Saramacca: Dirkshoop, “X 1959 11-DIIId-5” (*I.V.D. Drift*).

### ***Megalomyrmex foreli* Emery, 1890**

(Figs. 9, 58, 61, 70, 85, 110–114, 180, 195, 210, 225, 238, 245–247)

*Megalomyrmex foreli* Emery, 1890: 46, pl. 5, fig. 3. Lectotype worker (designated by Brandão 1990: 434): COSTA RICA, Jimenez (near Guapiles, Prov. Limón) [MCSN] (not examined). Forel, 1899: 58, description of male. See also: Brandão, 1990: 434; 2003: 152, and Longino 2010: 45 and fig. 2B.

*Measurements* (lectotype from Brandão 1990): HW 1.73, HL 1.97, SL 2.42, ML 2.85.

*Worker* (n=9, plus 40 from Brandão 1990 in parentheses): HW 1.40–1.61 (1.50–1.86), HL 1.67–1.87 (1.50–1.86), SL 1.90 – 2.24 (1.98–2.58) OMD 0.44–0.47, EL 0.35–0.43, ML 2.30–2.71 (2.28–3.09), CI 83–86, SI 113–123, EI 25–28, OMI 102–127.

**Geographic range.** Costa Rica south to Andean regions of Colombia, Ecuador, and northern Peru; 450–1200 m elevation.

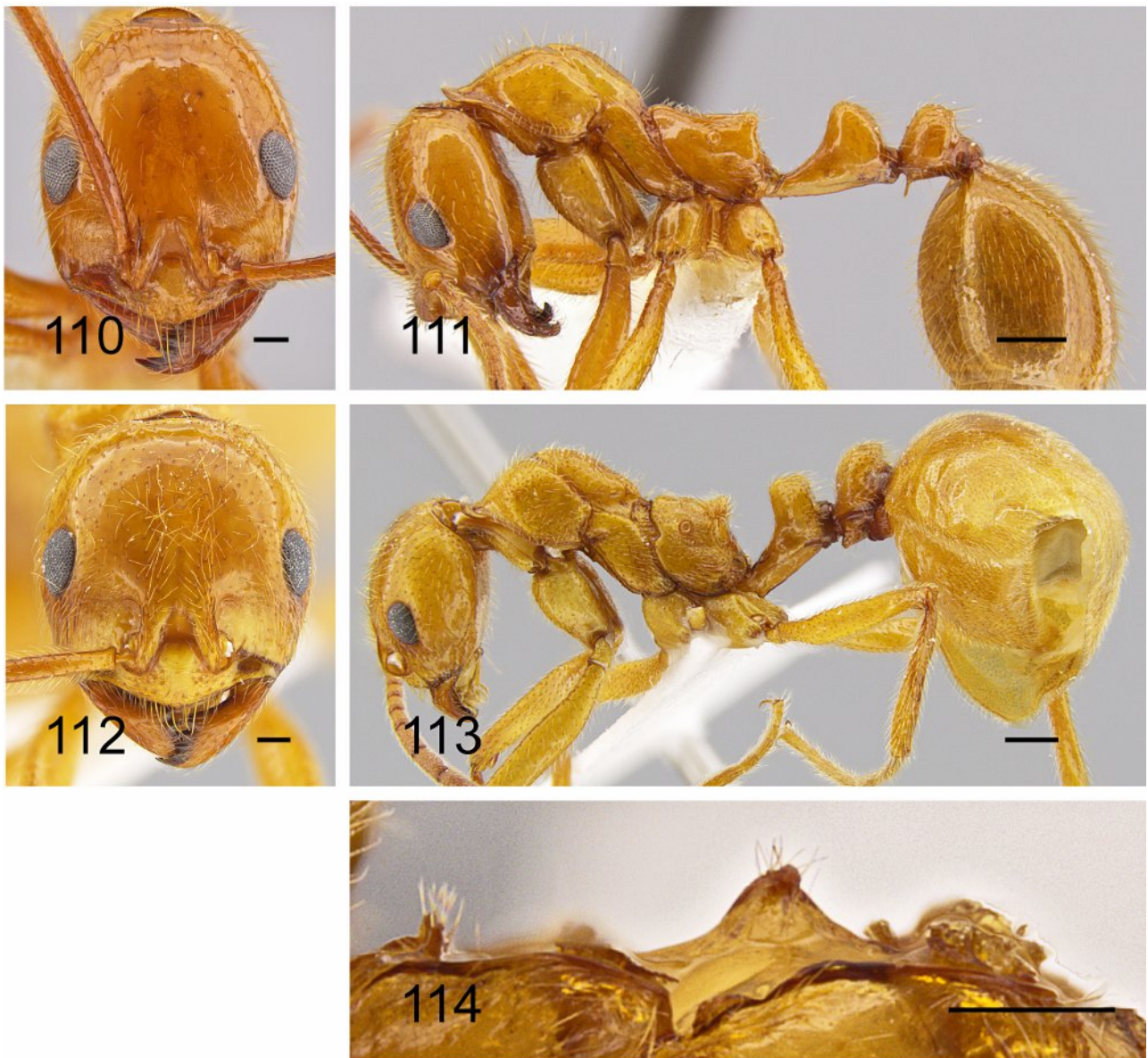
**Diagnosis. Worker** Uniquely identified among Central American *Megalomyrmex* species by (1) mandible with 5 robust, equally-spaced, subequal teeth; (2) anterior margin of clypeus recessed beneath bulging median portion. Identification supported by the following characters: (1) mesosternum with pair of pointed triangular processes; (2) metasternum with strong triangular process; (3) propodeal corners often produced as setose



tubercles; (4) postpetiole often with long, thin pencil-like process. **Queen** Similarly identifiable as worker, but with much larger gaster, ergatoid. **Male** Differs from all other Central American *Megalomyrmex* males by the following combination: (1) very large (ML > 2.0 mm); (2) head longer than broad (CI ~98); (3) ventral margin of valviceps crescent-shaped, with anterobasal angle almost abutting base of valvura. Note that (1) and (2) are sufficient to identify *M. foreli* males.

**Description. Ergatoid queen** *Measurements* (n=2): HW 1.73–1.75, HL 1.87–1.89, SL 2.16–2.20, OMD 0.45–0.48, EL 0.43–0.45, ML 2.74–2.89, CI 92–93, SI 115–116, EI 25–26, OMI 100–113.

Ergatoid; similar to the worker, including palpal formula of 4,3, but differing as follows: median ocellus present; foraminal carina incomplete, with 3–4 concentric incomplete carinae; metanotum distinct; propodeal tubercles more pronounced; petiolar spiracles distinctly raised on bosses; petiolar node subquadrate, with sloping parabolic anterior face and vertical posterior face forming 90° angle with dorsal face; postpetiole wider, compressed anteroposteriorly; postpetiolar sternum very short, with strong tubercle-like anteroventrally-directed process; setation finer, denser, shorter.



**FIGURES 110–114.** *Megalomyrmex foreli* Emery worker and ergatoid queen (CASENT0630874); full-face view and metasternal profile scale bars 0.2 mm, profile view scale bars 0.5 mm. Note: terminal segments of queen dissected out. **110.** Worker, head in full-face view (JTLC000003356). **111.** Worker, profile view (JTLC000003356). **112.** Queen, head in full-face view. **113.** Queen, profile view. **114.** Ventral surface of mesosoma, worker in inverted profile view, anterior to left (CASENT0613262).

**Male Measurements** (n=3): HW 1.27–1.43, HL 1.30–1.44, SL 0.57–0.64, EL 0.77–0.79, ML 2.54–2.85, CI 98–99, SI 44–45, EI 55–61.

**Head** Antennae with 13 antennomeres; antennomere 4 kinked near base; no other kinks and without club. Entire antenna orange-yellow. Palpal formula 3,3. Mandible triangular; masticatory margin with 5 triangular teeth; apical tooth largest, basal four teeth subequal. Dorsal face of mandible roughened and with striations. Minimum distance between lateral ocellus and compound eye slightly greater than one lateral ocellus length. Compound eye glabrous. Occipital carina visible in full-face view. *Mesosoma* Mesosoma attenuate. Notauli absent. Parapsidal lines distinct. Foraminal carina absent, but at least two carinae are present arcing over foramen. Metasternum with a distinct fang-like process. Basitarsi tubular. Pterostigma well-developed, somewhat narrow and elongate. Forewing crossvein 1m-cu absent; submarginal cell 1 length about four times width; terminal abscissa of M absent. *Metasoma* Basipetiolar carina composed of two sinuate carinae which are parallel for the posterior third of their length. Ventrolateral longitudinal carina of petiole present. Petiolar spiracle just posterad anterior third. Petiolar and postpetiolar posterior margins without girdling carinae. Postpetiolar helcium weakly elliptical in the horizontal plane. Postpetiolar spiracle placed at about midlength of lateral margin. Sternum of postpetiole with an anterior bulge which slopes gently to the posterior margin. Postpetiolar tergum weakly convex with apex distinctly in posterior half of postpetiole. **Genitalia** Abdominal sternum IX slightly longer than broad; lateral margins tapering to rounded apex; apex not heavily sclerotized, nor produced ventrally. Telomere triangular in profile view, with apex rounded; dorsal and ventral margins linear; without medial dentiform process; medial face of telomere sclerotized, subrectangular; ventral margin without sclerotized denticles. Cuspis with apicodorsal and apicoventral margins strongly rounded, apical margin almost without linear portion. Digitus broad; apex rounded but angular; dorsal margin angular, with a linear basal portion meeting a weakly convex distal portion at approximately 90°, this angle is rounded; ventral margin shallowly arched; ventral margin concealing apicodorsal angle of cuspis. Valvaceps less than half as tall as long; dorsal margin linear, sloping posteroventrally to short, rounded apex; ventral margin convex, broadest anterad midlength; penisvalvar teeth short, truncate, and close-set.

**Comments.** We consider *Megalomyrmex foreli* to be a geographically variable species, following Brandão (1990, 2003) and Longino (2010). Variation observed in Central America—predominantly from Costa Rican material—reveals a mosaic of forms which vary in propodeum shape, subpostpetiolar process development, and form of the basipetiolar carina. This latter character varies from sinuate and paired, to arcing and complete. A parallel geographic mosaic of forms is observed in the species of the strictly ergatoid-queen producing *Aphaenogaster phalangium* complex (Longino & Cover 2004). To our knowledge, ergatoid queens of *M. foreli* have only been collected in Costa Rica (Peeters 2012) but are assumed to be the only reproductive strategy of the species (Brandão 1990). Importantly, none of the geographic variants of Central American *M. foreli* have been collected in sympatry. The queen description is based on specimens from Heredia province, Costa Rica.

Among Central American *leoninus*- and *modestus*-group species only *Megalomyrmex foreli* and *M. milenae* have glabrous compound eyes. This state was observed for *M. foreli* for all castes. In Costa Rican worker specimens (RMMA110323-01), the sting apparatus lancets were observed to be slightly longer than the sting shaft, broad, with dorsal and ventral margins approximately parallel until weakly spatulate apex. The sting shaft was as long as the lancets and much thinner, coming to a finely rounded point apically.

**Biology.** *Megalomyrmex foreli* can be baited with tuna (Brandão 2003) and Keebler Pecan Sandies and has been observed collecting small worms, consuming large insects, and tending Margarodidae in the field (fig. 241; Longino 2010). Colonies can be large (> 500 individuals), nesting in diffuse soil at the base of trees with an inconspicuous nest entrance (fig. 242) (RMMA pers. obs.) or small (~100 individuals) nesting in the stems of *Calathea* spp. (Marantaceae) approximately 1 m above ground (Jones *et al.* 1991). Pyrroline and pyrrolidine alkaloids have been detected in the venom of *M. foreli* and are dispensed through the large flattened and weakly spatulate sting (Jones *et al.* 1991) possibly through oblique gaster-tip dragging (fig. 243). Additional natural history of this species has been reported in Longino (2010).

**Male material examined.** COSTA RICA, Heredia: 10 km SE La Virgen, 10.33333°N 84.08333°W, 500 m, 25 Mar 2011 (*R.M.M. Adams*#RMMA110323-05); Puntarenas: 5 km S San Vito, 8.78333°N 82.96667°W, 1200 m, 26 Aug 2010, montane wet forest, ex. pan trap (*M. Pollet & A. De Braekeleer*#12786).

**Female material examined.** COSTA RICA, Guanacaste: 9 km NE Sta. Elena, 10°23'N 84°47'W, 650 m, 2 Mar 1998 (*J.T. Longino*#JTL3877). Heredia: 10 km SE La Virgen, 10°20'N 84°05'W, 500 m, 10 Nov 2002, wet forest, nest in ground & liana stem (*J. Longino*#JTL4874); near El Ceibo station, Waterline trail, 10 km SE La

Virgen, 10°20'N 84°05'W, 450–550 m, 23 Mar 2011 (*R.M.M. Adams*#RMMA110323-01 & RMMA110323-05); Puntarenas: Osa Peninsula, Corcovado, Los Planes, 7 Jun 1982 (*J.T. Longino*). Wilson Botanical Garden, 8.7833 82.96667 ±200 m, 1200 m, 22 Mar 1990, moist forest, nocturnal foragers (*J. Longino*#JTL2612).

***Megalomyrmex fungiraptor* Boudinot, Sumnicht & Adams sp. n.**

(Figs. 17, 19, 115–118, 238)

**Type material.** *Holotype worker* NICARAGUA, Región Autónoma del Atlántico Norte: PN Cerro Saslaya, 13.77036°N 84.98102°W ±100 m, 320 m, 9 May 2011, tropical wet forest at bait (*LLAMA*#Ba-D-02-1-05-01) [CASENT0629661, MCZ].

*Paratype workers*: (9) same data as holotype (CASENT0629666, BMNH; CASENT0629662, CAS; CASENT0629664, INBC; CASENT0629256, JTLC; CASENT0629663, LACM; CASENT0629665, MCSN; CASENT0629667, MZSP; CASENT0629660, UCD; CASENT0629781, USNM).

**Geographic range.** Nicaragua to Costa Rica; 50–310 m elevation.

**Diagnosis. Worker** Uniquely identified by the combination of two characters: (1) meso- and metabasitarsi strongly compressed; (2) postpetiole about twice as wide as tall. Identification supported by the following: (1) katepisternum costate; (2) dorsal face of mandible striate; (3) dorsal and posterior faces of propodeum meeting at a blunt angle; (4) subpostpetiolar process strong, long, fang-like. **Queen** Similarly identifiable as worker, alate.

**Description. Worker Measurements** (holotype): HW 0.85, HL 0.90, SL 0.84, OMD 0.18, EL 0.26, ML 1.25, CI 94, SI 96, EI 30, OMI 68.

*Measurements* (n=7): HW 0.81–0.87, HL 0.84–0.94, SL 0.79–0.87, OMD 0.17–0.20, EL 0.25–0.27, ML 1.25–1.36, CI 92–94, SI 90–93, EI 30–32, OMI 67–74.

*Head* Palpal formula 3,2. Basal and masticatory margins of mandibles distinct. Mandible with 6–8 teeth: apical tooth largest; tooth size decreasing towards basal margin. Dorsal surface of mandible coarsely striate. Clypeus convex in profile. Frontal carina with 2–3 proximal parallel carinulae extending posteriorly to about anterior margin of compound eye. Antennal fossa surrounded by 1–2 fragmented carinulae. Malar area with coarse carinulae. Compound eye with medium-long ocular setae. Occipital carina thin; not visible in full-face view; extending on ventral surface about one third distance to hypostomal margin. *Mesosoma* Katepisternum, anepisternum, and lower lateral sides of propodeum with longitudinal rugae. Metapleural carinulae reaching meso-metapleural suture. Dorsal face of propodeum meeting posterior face at a blunt angle. Posterior face of propodeum with 1–3 transverse carinulae. Foraminal carina entire. Meso- and metabasitarsi anteroposteriorly compressed. Posterior base of petiole and posterior face of postpetiole with several pronounced transverse carinae. *Metasoma* Ventral keel of petiole a low translucent flange, forming a short angular tooth anteriorly. Keel splitting into two small subparallel carinulae posteriorly in ventral view. Postpetiolar sternum produced as a long, sharp, anteriorly projecting tooth. Lancets of sting apparatus longer than sting shaft, narrow, broadening to truncate apex; sting shaft apically spatulate. *Setation* Uniformly dense, suberect to subdecumbent coarse setae present on: femora, tibiae, scape, head, mandible, mesosoma, and first gastric tergum. Most of cuticle smooth and shining although face, dorsal surface of head, clypeus, promesonotum, dorsal petiole and dorsal postpetiole with uniformly distributed piligerous punctae tilted such that one side of each puncta is raised above the other. General body and appendage color deep orange; mandibles dark brown; first gastric tergum with a wide black band wrapped wrapped around the posterior two thirds.

**Queen Measurements** (n=3): HW 0.93–0.95, HL 0.96–0.94, SL 0.84–0.87, EL 0.34–0.35, ML 1.52–1.59, CI 102–103, SI 90–92, EI 37.

Similar to worker; differing by having an alate-condition mesosoma, with coarser sculpturation, and denser setation. Forewing with pterostigma; crossvein 1m-cu present; submarginal cell 1 between four and five times longer than width; apical abscissa of M branching from Rs+M basad 2r-rs, becoming spectral around where it curves apicad.

**Male** Unknown.

**Etymology.** Stems are from Latin, meaning “fungus thief.” The specific epithet is a noun in apposition, and thus invariant.

**Comments.** *Megalomyrmex fungiraptor* is the most robust species in the *symmetochus* complex and has been collected in sympatry with *M. symmetochus* in Nicaragua and Honduras. The new species is unambiguously a

member of the broad *symmetochus* complex, and specifically within the narrow *symmetochus* complex (refer to “Species groups and complexes” section). Sister-species relationships remain unclear among species of the narrow *symmetochus* complex; in terms of gross morphology, *M. fungiraptor* shares several characteristics which distinguish *M. adamsae* from *M. symmetochus* and vice versa. The most compelling character uniting *M. fungiraptor* to *M. symmetochus* is the anteroposterior compression of the basitarsi—a unique trait, at least within the Central American *Megalomyrmex* fauna. At least one character, beyond body size, is shared between *Megalomyrmex fungiraptor* and *M. adamsae*: the meeting between dorsal and posterior faces of the propodeum is angular. For a discussion of separating *M. fungiraptor* from *M. adamsae*, see the “Comments” section of the latter species.

This new species is immediately distinguishable from *M. adamsae* by the anteroposteriorly flattened meso- and metabasitarsi (fig. 17). It is distinct from *M. symmetochus* by the following: (1) posterior face of postpetiole subopaque, roughened by fine rugulose sculpture (vs. smooth and shining above carinae); (2) sternal process of postpetiole projecting anteroventrally as a long fang-like process in profile (vs. short); (3) dorsal margins of petiole and postpetiole weakly convex in posterior view (vs. strongly convex); (4) postpetiole relatively broader; (5) anterior and posterior faces of postpetiole parallel in profile view (vs. posterior face evenly sloping to base); (6) petiolar node relatively narrow; (7) foraminal carina entire (vs. medially obsolescent); (8) setae on antennomeres 3–8 decumbent (vs. appressed); (9) head dorsum and temple roughened by fine, sometimes weak, carinulae extending from piligerous punctures (vs. smooth and shining between piligerous punctures); (10) setae stouter and less erect.



**FIGURES 115–118.** *Megalomyrmex fungiraptor* sp. n. holotype worker (CASENT0629661) and paratype queen (JTLCO00005544); scale bar of face-views 0.2 mm, all others 0.5 mm. **115.** Worker, head in full-face view. **116.** Worker, profile view. **117.** Queen, head in full-face view. **118.** Queen, profile view.

**Biology.** The natural history of this species is unknown but the numerous unique shared morphological characters of the narrow *symmetochus* complex strongly suggest that *M. fungiraptor* are guest ants like *M. symmetochus* and *M. adamsae*, the former associating with *Sericomyrmex* species and that latter with *Trachymyrmex* species (Longino 2010; Adams, Shah *et al.* 2012). Although *Sericomyrmex aztecus* was collected at

the same baiting station (using Keebler Pecan Sandies) as the type series of *M. fungiraptor*, suggesting it a likely host, other Attini were collected at baits in the same locale, including *Trachymyrmex cornetzi* (host of *M. wettereri*), *Cyphomyrmex rimosus* sensu lato (host to *M. mondabora*), and *C. costatus* (host to *M. mondaboroides* and *M. silvestrii*). *Sericomyrmex amabilis*—the host of *M. symmetochus*—build tunnels in the leaf litter, and the *Megalomyrmex* are often found in the tunnels. If this is also true for the *M. fungiraptor* host, this might explain why they were able to be baited and do not always remain subterranean. Alternatively, this species may be a facultative social parasite like *M. silvestrii* and may nest and forage independent of their host colony. The only known queens were collected at a blacklight at the La Selva Biological Station in Costa Rica.

Wheeler (1925) reported that *Sericomyrmex* groom the tarsi of their *M. symmetochus* guests. Future work could examine possible function of the unique compressed basitarsi of *M. fungiraptor* and *M. symmetochus*.

**Additional female material examined.** COSTA RICA, Heredia: La Selva Biol. Sta. 10°26'N 84°01'W, 50 m, lowland wet rainforest ex light trap, 1 Sep 2003 (*H.A. Hespeneheide*); Est. Biol. La Selva, 10°26'N 84°01'W, 50–150 m, Jul 1993 (*R.V. Vargas/INBio-OET*). NICARAGUA, Región Autónoma del Atlántico Norte: PN Cerro Saslaya, 13.77036°N 84.98102°W ±100 m, 320 m, 9 May 2011, tropical wet forest at bait (*LLAMA#Ba-D-02-1-05-01*); PN Cerro Saslaya, 13.7703°N 84.98075°W ±30 m, 310 m, 9 May 2011, tropical wet forest, in soil and leaf litter (*M.M. Prebus#MMP0309*).

### ***Megalomyrmex incisus* M.R. Smith, 1947**

(Figs. 15, 24, 71, 86, 119–122, 181, 196, 211, 226, 239, 248)

*Megalomyrmex incisus* Smith, M.R. 1947: 102. Holotype worker: PANAMA, Panamá: Barro Colorado Island, Jul–Oct 1943 (Zetek) [USNM] (not examined). Brandão, 1990: 451, description of male. Brandão, 2003: 157, description of queen. See also Longino 2010: 45–46 and fig. 4A.

*Measurements* (worker: mean of 3 paratypes from Brandão 1990): HW 0.66, HL 0.67, SL 0.62, ML 0.94.

*Worker* (n=7, plus 20 from Brandão 1990 in parentheses): HW 0.68–0.70 (0.65–0.87), HL 0.66–0.71 (0.63–0.86), SL 0.65–0.70 (0.63–0.78), OMD 0.14–0.16, EL 0.20–0.22, ML 0.94–1.02 (0.98–1.18), CI 98–105, SI 96–99, EI 29–32, OMI 66–74.

**Geographic range.** Southern Mexico south to Peru, Venezuela, and central Brazil; absent in Costa Rica. Sea-level to 1000 m elevation.

**Diagnosis. Worker** Uniquely identified among Central American *Megalomyrmex* by the following combination of characters: (1) second or third basal mandibular tooth largest; (2) clypeus, between antennal insertions wider than maximum scape width; (3) eyes placed about midlength of head; (4) katapisternum costate. Additionally, the petiolar shape is unique, with a robust wedge-shaped node for which anterior face is steeper than posterior face. **Queen** Ergatoid queens are identifiable similarly to workers but with larger gaster. **Male** Uniquely identified among Central American *Megalomyrmex* species by the 11-merous antenna, and the kinked and apically swollen metabasitarsus.

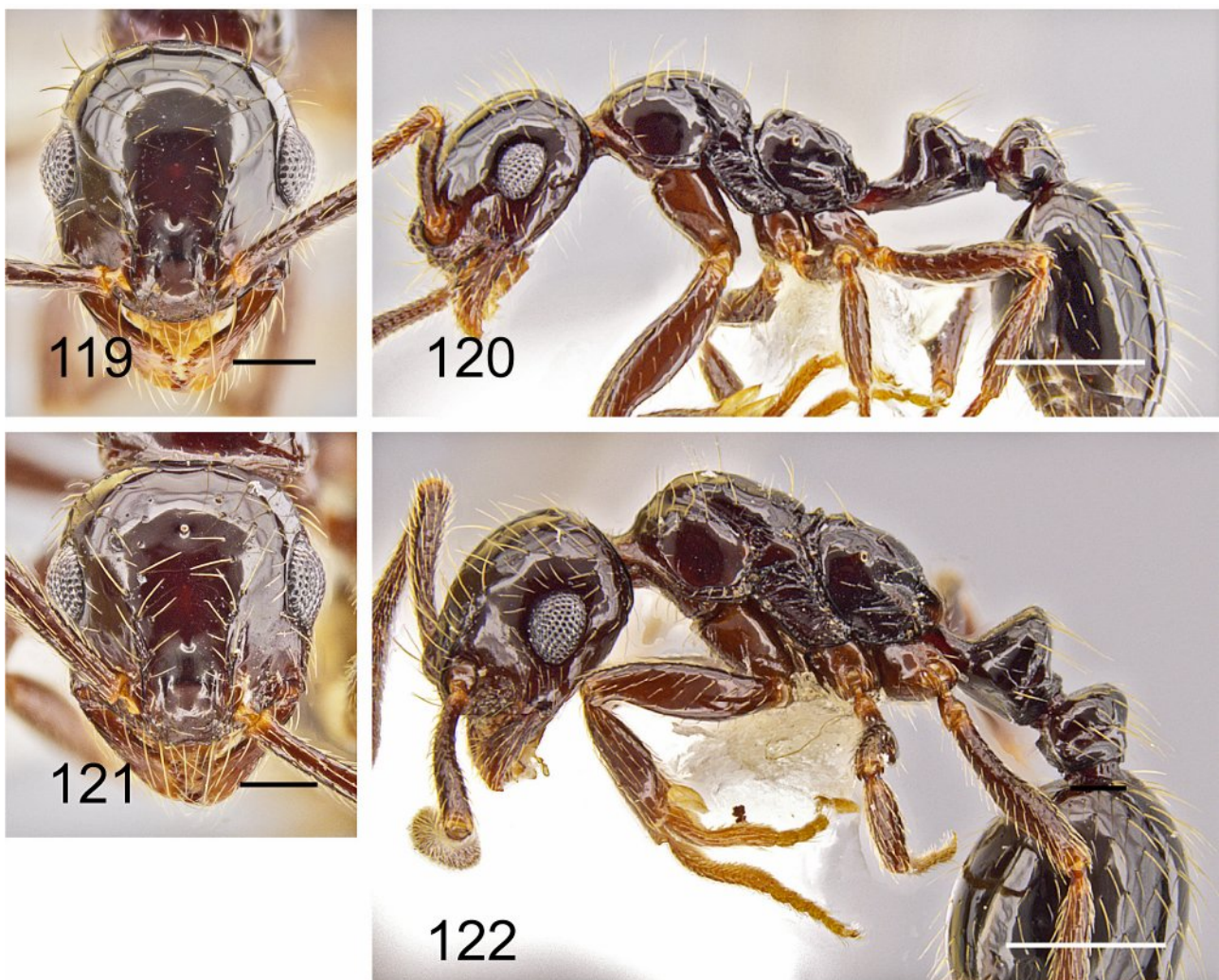
**Description. Ergatoid queen** *Measurements* (n=3): HW 0.76–0.78, HL 0.76–0.80, SL 0.70–0.74, OMD 0.15–0.16, EL 0.24–0.26, ML 1.06–1.16, CI 97–10, SI 90–83, EI 32–33, OMI 61–66.

Similar to worker, but with alate-condition mesosoma, all three (minute) ocelli, wider petiole and postpetiole, and slightly coarser sculpturation.

**Male** *Measurements* (n=2): HW 0.67–0.70, HL 0.57–0.59, SL 0.32–0.34, EL 0.35–0.36, ML 1.10–1.18, CI 117–119, SI 56–58, EI 51–52.

**Head** Antennae with 11 antennomeres; antennomere 5 sigmoid; antennomeres 6 and 7 evenly curved, curve of 6 stronger than 7; antennomeres 8–11 distinctly clavate: shorter and broader than preceding antennomeres; scape length subequal to eye length. Basal half of scape infuscated; pedicel white; antennomeres 3–7 infuscated; 8–11 yellowed. Mandible strap-shaped, with basal and ectal margins subparallel; masticatory margin with four teeth, apical tooth about four times as long as subapical tooth; basal three teeth subequal in size. Dorsal face of mandible smooth and shining. Minimum distance between lateral ocellus and compound eye about two lateral ocellus lengths. Compound eye glabrous. Occipital carina not visible in full-face view. **Mesosoma** Mesosoma somewhat attenuate: propodeum elongated. Notauli absent. Parapsidal lines weak. Foraminal carina present, strong; with concentric dorsal carinula. Basitarsi not anteroposteriorly flattened; metabasitarsus kinked just basad midlength

with dorsal portion swollen. Pterostigma well-developed. Forewing crossvein 1m-cu absent; submarginal cell length four to five times width; terminal abscissa of M branches from Rs+M distad 2r-rs. *Metasoma* Basipetiole carina a very obtuse triangle. Ventrolateral longitudinal carina of petiole absent. Petiolar spiracle in anterior third. Petiolar and postpetiolar posterior margins without girdling carinae. Postpetiolar helcium subcircular. Postpetiolar spiracle placed near one third the length of the lateral tergal margin. Sternum of postpetiole with an anterior convexity in profile view. Postpetiolar tergum shallowly convex, weakly bilobed. *Genitalia* Abdominal sternum IX longer than broad, tapering to apex; apex not produced ventrally or distinctly sclerotized. Telomere triangular with a narrow and acutely rounded apex; dorsal margin concave, ventral margin convex; medial dentiform process absent; medial face subrectangular; ventral margin without sclerotized denticles. Cuspis apicodorsally and apicoventrally rounded; apical margin linear. Digitus broadened at midlength; dorsal margin strongly arched, ventral margin weakly arched; apex narrowly rounded; ventral margin slightly obscuring apicodorsal angle of cuspis. Valvaceps height somewhat greater than half its length, ovate; dorsal margin produced dorsally in basal half, with apical half convex and sloping gently to meet the ventral margin which continues to the apex; ventral margin weakly convex but produced ventrally in the basal half; penisvalvar teeth miniscule, triangular, relatively wide-set.



**FIGURES 119–122.** *Megalomyrmex incisus* M.R. Smith worker (JTL000014345) and ergatoid queen (CASENT0601730); full-face view scale bars 0.2 mm, profile view scale bars 0.5 mm. **119.** Worker, head in full-face view. **120.** Worker, profile view. **121.** Queen, head in full-face view. **122.** Queen, profile view.

**Comments.** The 11-merous antenna of the *Megalomyrmex incisus* male is unique at least within the named Central American representatives of the genus. *Megalomyrmex* male 01 (see below) from Mexico has the penultimate antennomere elongated and partially divided by a lateromedian suture, although this is likely a developmental aberration. It remains to be determined if the 11-merous state is consistent throughout the entire range of *M. incisus*. Workers, queens, and males of *M. incisus* have glabrous compound eyes.

We report an intense orange form of this species from Ecuador and Venezuela (fig. 248). Despite the striking coloration, which is similar to that of *M. longinoi*, the Ecuadorian workers are otherwise only slightly distinct from specimens from the Colombian and Central American populations. Male *M. incisus* specimens examined from Ecuador are markedly different from the Central American material; these specimens have a longer petiole with a less robust node, a more compact postpetiolar node, coarser setae, and a median clypeal bulge. Additionally, a distinct new species from Brazil, otherwise identifiable as *M. incisus*, was examined at the MCZ. The elevational range provided in the “Geographic range” has been supplemented by data from Longino (2010).

**Biology.** At least in Central America, *M. incisus* is a lowland species, having been collected from about sea-level to 870 m. Full colonies are rarely collected for this species. However, in March 2006, a single colony was collected with 10 ergatoid queens, 66 workers, 1 male and brood in a mushy wet log in Ecuador (fig. 244), and on 3 May 2013 a full colony with alate males, one ergatoid queen and about two-to-three dozen workers was collected in a folded leaf on the ground in a second growth rainforest in Gamboa, Panama (BEB000836-2, below). Gaster flagging behavior was often observed in the laboratory, prompted by minor disturbance. Many workers and all ergatoids were covered in unidentified mites in both Ecuadorian and Panamanian colonies. A winged female was collected by W.L. and D. E. Brown, 23–27 June 1971, Rancho Grande, 1100m, Estado Aragua, Venezuela. From the material available to us, only ergatoid queens were found in Central America and Ecuador.

**Male material examined.** ECUADOR, Morona Santiago: Miazal, 50 km SE Macas, 300 m, 4–7 Jan 1933, malaise trap (*M. & J. Wasbauer*). GUATEMALA, Petén: 13km NW Machaquilá, 16.44554°N 89.55000°W ±150 m, 400 m, 27 May 2009, tropical moist forest, ex sifted litter (LLAMA#Wa-B-06-1-20, Wm-B-06-1-02). PANAMA, Panamá: Barro Colorado, 7 May 1980 (*H. Wolda*).

**Female material examined.** COLOMBIA, Amazonas: Leticia, El Zafie, 4°13'S 69°56'W, 150 m, 2–4 Oct 2007, ex sifted leaf litter (*L.E. Franco & S. Florica*#FF 2-4XII2007-12). ECUADOR, Pichincha: Unión del Toachi Station, 00°79'75.7"S 78°57'05.8"W, 820 m, 11 Mar 2006, hand collected (*R.M.M. Adams & J.M. Vieira*#RMMA060311-15). GUATEMALA, Izabal: 5 km NW Morales, 15.50966°N 88.86268°W ±36 m, 160 m, 18 May 2009, 2° lowland rainforest, ex sifted leaf litter (LLAMA#Wm-B-04-1-07); 5 km NW Morales, 15.51214°N 88.86620°W ±58, 215 m, 18 May 2009, 2° lowland rainforest, ex sifted leaf litter (LLAMA#Wm-B-04-1-10); 5 km NW Morales, 15.51351°N 88.86647°W ±26 m, 245 m, 17 May 2009, 2° lowland rainforest, ex sifted leaf litter (LLAMA#Wm-B-04-1-01); 5 km NW Morales, 15.51065°N 88.86086°W ±50 m, 195 m, 17 May 2009, 2° lowland rainforest, ex sifted leaf litter (LLAMA#Wa-B-04-1-27); Petén: 13 km NW Machaquilá, 16.4454°N 89.54998°W ±50 m, 400 m, 27 May 2009, tropical rainforest, ex sifted leaf litter (LLAMA#Wa-B-06-1-20); 13 km NW Machaquilá, 16.44173°N 89.53527°W ±25 m, 390 m, 28 May 2009, tropical moist forest, ex sifted leaf litter (LLAMA#Wm-B-06-1-05). HONDURAS, Atlántida: 2 km SSW Tela, 15.76416°N 87.45657°W ±20 m, 30 m, 15 Jun 2010, 2° tropical rainforest, ex sifted leaf litter (LLAMA#Wa-C-08-1-22); 10 km SSW Tela 15.69479°N 87.47707°W ±20 m, 720 m, 17 Jun 2010, tropical wet forest, ex sifted leaf litter (LLAMA#Wm-C-08-1-10); Comayagua: P.N. Cerro Azul Meambar, 14.87238°N 87.90332°W ±20 m, 870 m, 22 May 2010, montane rainforest, ex sifted leaf litter (LLAMA#Wm-C-04-1-08). MEXICO, Chiapas: 9 km SE Salto de Agua, 17°31'N 92°18'W, 50 m, 14 Jul 2007 (R.S. Anderson#RSA2007-011); 8 km SE Salto de Agua, 17.51615°N 92.30164°W ±300m, 100 m, 14 Jun 2008, 2° wet forest, ex sifted leaf litter (LLAMA#Wm-A-08-2); Lago Metzabok, 17.12566°N 91.63088°W, 570 m, 5 Jun 2008, lowland wet forest, ex sifted leaf litter (LLAMA#Wa-A-06-1-02); Nahá, 16.98023°N 95.58610°W ±300 m, 860 m, 12 Jun 2008, mesophil forest, ex sifted leaf litter (*M.G. Branstetter*#857). PANAMA, Panamá: Barro Colorado Island, 12–18 Jun 1985 (*H. Wolda*); P.N. Soberanía, Gamboa, 9.11693°N 79.69530°W ±50 m, 3 May 2013, second growth rainforest, nest in folded leaf on ground (*J. Shik & B. Boudinot*#BEB000836-2). VENEZUELA, Aragua: 1.6 km SSW Cumboto, 13.38872°N 67.79769°W, 150 m, 15 Aug 2008, riparian dry forest, ex sifted leaf litter (*J.T. Longino*#6468-s); Rancho Grande, 15 km N Maracay, 19–27 Feb 1971, berlese, ex forest litter (*S.B. Peck*#BS-12093P#B-194).

### ***Megalomyrmex longinoi* Boudinot, Sumnicht & Adams sp. n.**

(Figs. 21, 23, 123–126, 239)

**Type material.** *Holotype worker* PANAMA, Panamá: Canal Zone, Gigante Peninsula, 9.11131°N 79.84818°W, ±150 m, 110 m, seasonally wet secondary forest ex sifted leaf litter, 1–15 June 2011 (*T.P. Sumnicht*#TPS LIA-4RDN1) [CASENT0619091, MCZ].

*Paratype workers*: (9) same data as holotype (CASENT0619092, BMNH; CASENT0619093, CAS; CASENT0619094, INBC; CASENT0619095, JTLC; CASENT0619096, LACM; CASENT0619097, MCSN; CASENT0619098, MZSP; CASENT0619099, UCD; CASENT0629782, USNM).

*Paratype queens*: (7) same data as holotype (CASENT0619100, CAS; CASENT0619101, INBC; CASENT0619105, MCZ; CASENT0619102, MCSN; CASENT0619103, MZSP; CASENT0619104, USNM).

**Geographic range.** Panama; sea-level to 150 m elevation.

**Diagnosis. Worker** Unique among the described *Megalomyrmex* for the presence of rugulose or costate sculpture covering the head, mesosoma, petiole and postpetiole. Identification supported by the following combination of characters: (1) mandible subfalcate; (2) basal mandibular teeth variable, but with basal or subbasal tooth largest; (3) eyes relatively close to lateral clypeal margin (OMI < 60); (4) scapes relatively long (SI > 115).

**Queen** Uniquely identified by the sculpturation described for the worker, alate.

**Description. Worker** *Measurements* (holotype): HW 0.54, HL 0.63, SL 0.77, OMD 0.10, EL 0.19, ML 0.80, CI 86, SI 122, EI 36, OMI 52.

*Measurements* (n=10): HW 0.51–0.54, HL 0.57–0.63, SL 0.71–0.78, OMD 0.09–0.10, EL 0.17–0.20, ML 0.74–0.80, CI 85–89, SI 120–125, EI 33–37, OMI 46–56.

*Head* Palpal formula 3,2. Mandible subfalcate, with 7–9 teeth: apical and subapical always largest; second or third tooth from base also large; remaining teeth small and of variable size, and basal tooth present or absent. Dorsal surface of mandible smooth and shining. Basal half of mandibular basal margin with minute denticle. Clypeus with transverse rugae which branch posteriorly at the median portion. Sculpture of head dorsum finely foveate with thin, extensive rugae spanning the vertex, surrounding the eyes, and extending from the frontal carinae leaving a shining patch in the center of the frons. Compound eyes glabrous. Occipital carina thin and barely visible in full-face view; angled medially on postgenal bridge and fading less than one fourth distance to hypostomal margin. *Mesosoma* Mesosoma with numerous rugulae and carinulae; pronotum with transverse rugulae which curve posterolaterally along the lateral faces; rugulae on mesonotum more longitudinal. Mesopleuron and lateral portions of propodeum foveate. Posterodorsal face of propodeum with transverse carinulae throughout, becoming more rugulose as they extend onto lateral faces. Foraminal carina entire. Meso- and metabasitarsi not anteroposteriorly compressed. *Metasoma* Anterior faces of petiole and postpetiole smooth and shining; posterodorsal margin of petiole with transverse arcing costulae. Ventral margin of petiole gently convex in profile; ventral surface with numerous transverse carinulae. Postpetiolar sternum with a weak anterior convexity. Lancets of sting apparatus slightly longer than sting shaft, broadening apically, subspatulate; sting shaft very slightly broadened after midlength, but parallel to pointed apex. *Setation* Head with sparse, long subdecumbent to suberect setae; promesonotal dorsum with four consecutive pairs of conspicuous suberect setae; similar pair on apex of propodeum pointing anteriorly; petiolar node with three pairs of setae along a single transverse axis, two long pairs towards the apex, and a shorter pair towards the base; gaster smooth and shining with sparse, long subdecumbent setae. General body and appendage color pale to deep golden yellow.

**Queen** *Measurements* (n=5): HW 0.56–0.62, HL 0.64–0.68, SL 0.76–0.77, OMD 0.08–0.09, EL 0.24–0.25, ML 0.93–1.00, CI 90–92, SI 113–119, EI 40–42, OMI 32–37.

General shape, sculpture, dentition, and pilosity similar to worker; mesoscutum with two anterolateral shining patches devoid of sculpture.

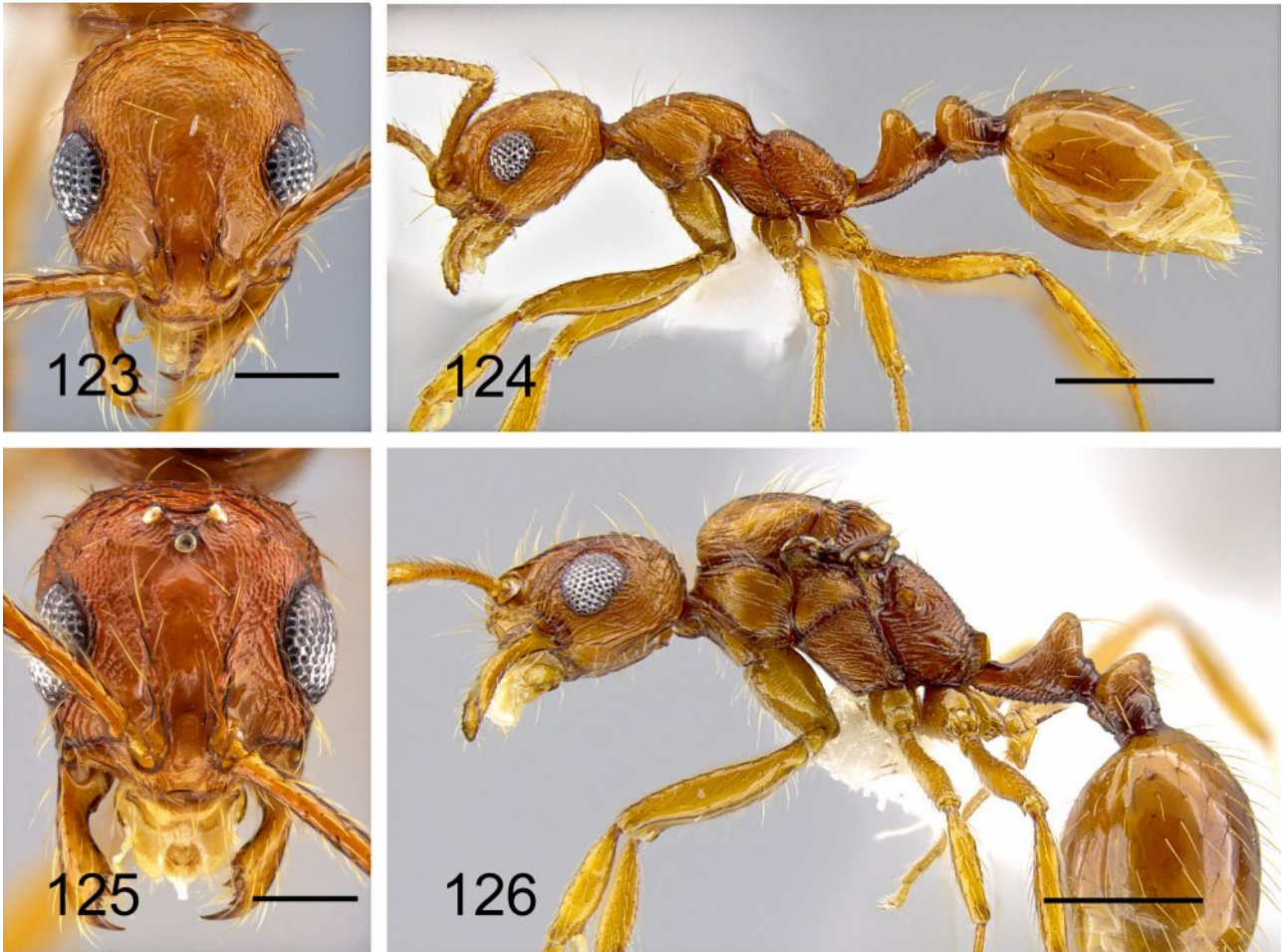
**Male** Unknown.

**Etymology.** Named after Dr. John T. Longino for his invaluable advising and insight.

**Comments.** This species is very similar to *M. cuatiara* Brandão, but is unique within the genus for the rough sculpturation of the entire head and mesosoma. In addition to sculpturation, the following characters distinguish *M. longinoi* from *M. cuatiara* (micrograph of *M. cuatiara* paratype examined, CASENT0902333, as well as workers in the MCZ collection): (1) medial margin of mandibular base distinctly dentate (vs. indistinctly dentate); (2) setae on scape appressed to decumbent (vs. subdecumbent to suberect); (3) Metanotum strongly impressed (vs. shallowly to not impressed); (4) posterior face of promesonotum steep, almost vertical, distinct from promesonotal dorsum (vs. promesonotum curving evenly and shallowly through metanotum); (5) dorsal face of propodeum very short (vs. dorsal face of propodeum long); (6) red-orange (vs. yellow).

**Biology.** This species is known from three independent collections; two were Panamanian leaf litter samples in the secondary forest of Gigante Peninsula, part of the Barro Colorado Natural Monument. One of these samples contained two workers, while the other contained numerous workers, larvae, pupae, and four dealate queens and was likely a polygynous colony nesting in the leaf litter. The third sample was collected off of Pipeline Road in the Soberanía National Park in Panama and was a colony (two dealate queens, >70 workers, and brood) nesting in a log.





**FIGURES 123–126.** *Megalomyrmex longinoi* sp. n. holotype worker (CASENT0619091) and paratype queen (CASENT0619100); face-view scale bars 0.2 mm, profile view scale bars 0.5 mm. **123.** Worker, head in full-face view. **124.** Worker, profile view. **125.** Queen, head in full-face view. **126.** Queen, profile view.

**Additional female material examined.** PANAMA, Panamá: Canal Zone, Gigante Peninsula, 9.11131°N 79.84818°W, ±150m, 110m elevation, seasonally wet secondary forest ex sifted leaf litter, 1–15 June 2011 (*T.P. Sumnicht*#TPS LIA-4RDN1 & TPS LIA-4RCN1); Parq. Nac. Soberanía, Pipeline Road, 9°09'41.96"N 79°45'08.797"W, 88 m, 25 Jun 2010 (*R.M.M. Adams*#RMMA100625-01).

***Megalomyrmex megadrifti* Boudinot, Sumnicht & Adams sp. n.**

(Figs. 37, 40, 72, 87, 127–130, 182, 197, 212, 227, 239)

**Type material.** *Holotype worker* NICARAGUA, Jinotega: P.N. Cerro Saslaya, 12.772°N -84.9977°W ±20 m, 710 m, 8 May 2011, montane wet forest, ex sifted leaf litter (*LLAMA*#Wm-D-02-1-09) [CASENT0630930, MCZ].

*Paratype worker*: (1) same data as holotype [CASENT0630931, MZSP].

*Paratype queen*: (1) same data as holotype [CASENT0630932, MCZ].

**Geographic range.** Southern Mexico to Costa Rica; South American distribution to be clarified but known from Colombia and Argentina. Sea-level to 1520 m elevation.

**Diagnosis. Worker** Uniquely identified among Central American *Megalomyrmex* by the following character combination: (1) katapisternum smooth and shining; (2) 5–7 small, sharp, subequal teeth subtending large apical 2; (3) propodeum often dentate where dorsal and posterior faces meet; (4) occipital carina not visible in full-face view. **Queen** Similarly identifiable as worker, alate. **Male** Differs from all Central American *Megalomyrmex* by the following combination of characters: (1) crossvein 1m-cu present; (2) occipital carina not visible in full-face view; (3) scape about three times longer than pedicel; (4) first gastric tergum with numerous short appressed setae.

**Description. Worker** *Measurements* (holotype): HW 0.56, HL 0.68, SL 0.62, OMD 0.12, EL 0.15, ML 0.92, CI 82, SI 92, EI 27, OMI 76.

*Measurements* (n=23): HW 0.52–0.63, HL 0.60–0.72, SL 0.55–0.70, OMD 0.10–0.13, EL 0.14–0.18, ML 0.81–0.99, CI 82–89, SI 89–97, EI 25–30, OMI 65–91.

*Head* Palpal formula 3,2. Basal and masticatory margins of mandible distinct, demarcated by an angle with a small tooth. Mandible with 4–6 teeth; apical tooth largest, almost three times as long as subbasal tooth; subbasal tooth slightly larger than basal teeth; basal teeth subequal, variably placed. Dorsal surface of mandible smooth and shining, interrupted by weak piligerous punctae. Clypeus truncate in profile view. Clypeal carinae present, weak to indistinct; diverging anteriorly. Clypeus between antennal insertions narrower than maximum width of scape. Antennal fossa encircled by 2–4 complete carinulae. Malar area with or without fine carinulae in anterior half; smooth and shining posteriorly. Compound eye with several ocular setae. Compound eye relatively distant from lateral clypeal margin (OMI > 60). Scape relatively long (SI ≥ 89). Occipital carina strong, short; obscured by vertex in full-face view; extending anteroventrally less than one eighth the length of the postgenal bridge. *Mesosoma* Katepisternum and promesonotum smooth and shining; propodeum smooth and shining, excluding close-set 3–4 metapleural carinulae and concentric carinulae around complete foraminal carina. Metapleural carinulae do not reach meso-metapleural suture. Metanotum deeply and narrowly or broadly incised. Propodeum with dorsal and posterior faces meeting at a blunt to denticulate angle; propodeum not to weakly marginate dorsolaterally; dorsal margin weakly concave to linear in profile view. Meso- and metabasitarsi tubular. *Metasoma* Petiole and postpetiole predominantly smooth and shining, except for girdling carinulae at posterior bases. Subpetiolar process a weak to strong, short angular flange. Postpetiolar sternum variable: bidentate, with a single process, or with two ridges. Lancets of sting apparatus flattened, narrow, weakly spatulate. *Setation* Fine; head dorsum with long, somewhat dense subdecumbent to suberect setae and medium appressed setae which are most abundant on gena; setae on scape almost entirely appressed; promesonotum with about 12–14 setae on each lateral half, most setae long; first gastric tergum with somewhat more dilute suberect to subdecumbent setae, in addition to numerous short, appressed setae. Head, meso- and metasoma shining black to light brown; mandibles, antennae and legs dark brown.

**Queen** *Measurements* (n=8): HW 0.58–0.65, HL 0.64–0.72, SL 0.57–0.65, OMD 0.09–0.11, EL 0.19–0.21, ML 0.96–1.08, CI 90–94, SI 89–93, OMI 45–53.

Similar to worker, differing mainly in having an alate-condition mesosoma.

**Male** *Measurements* (n=2): HW 0.56–0.60, HL 0.55–0.58, SL 0.17, OMD 0.02, EL 0.29–0.31, ML 0.90–0.99, CI 101–104, SI 30–31, EI 51–52.

*Head* Antenna with 13 antennomeres, antennomeres 6 and 7 weakly curved; not forming a club; scape length much shorter than head length; entire antenna brown, scapes shining black. Palpal formula 3,2. Mandible subfalcate; masticatory margin with 4–5 sharp, somewhat long triangular teeth, decreasing in size from apical tooth. Dorsal surface of mandible weakly roughened, but otherwise smooth and shining. Minimum distance between lateral ocellus and compound eye distinctly greater than three lateral ocellus lengths. Compound eye with few, sparse ocular setae. Occipital obscured by vertex in full-face view. *Mesosoma* Mesosoma robust. Notauli absent. Parapsidal lines very weakly indicated. Foraminal carina incomplete. Metasternum without a triangular process. Basitarsi tubular. Pterostigma well-developed. Forewing crossvein 1m-cu present; submarginal cell 1 length about twice width; terminal abscissa of M branching from where 2r-rs meets Rs, becoming spectral where M curves apicad. *Metasoma* Basipetiolar carina parabolic. Ventrolateral longitudinal suture of petiole present. Petiolar spiracle in anterior third. Petiolar and postpetiolar terga with girdling carinae along posterior base. Postpetiolar helcium approximately circular. Postpetiolar spiracle placed about the first third of the lateral tergum margin. Sternum of postpetiole concave in profile view with a very weak anterior bulge. Postpetiolar tergum shallowly but evenly convex, with apex about midlength; not bilobed. *Genitalia* Abdominal sternum IX lateral margins tapering to apex; apex neither keeled nor with a distinct degree of sclerotization; apical process indistinct. Telomere short, triangular, blunted apically; medial dentiform process absent; medial face of telomere subquadrangular; ventral margin without sclerotized denticles. Cuspis broadly lobate apicodorsally; concave apicomediaally. Digitus broad basally, with a broad apicodorsal lobe which is distinct from the thin digitiform apical portion; ventral margin a skewed parabola; ventral margin obscuring apicodorsal portion of cuspis. Valviceps height less than length, somewhat wedge-shaped; dorsal margin meeting ventral margin at a rounded angle apicodorsally; ventral margin unevenly and weakly convex; penisvalvar teeth much shorter than broad, finely pointed.

**Etymology.** The specific epithet refers to the size of this new species relative to the very similar *Megalomyrmex drifti*. The epithet is a noun in apposition and thus invariant.

**Comments.** From the pithy description and morphometrics provided by Kempf (1970), it is highly likely that this new species is his larger, longer scaped “Southeastern Brazilian” form. *Megalomyrmex megadrifti* and *M. drifti* were found in sympatry in Las Marias, Honduras, and P.N. Cerro Saslaya, Nicaragua. We collected the two species in narrow sympatry near Rama, Nicaragua. Preliminary COI data indicate a deep split between at least these two species (BOLD 2013). *Megalomyrmex megadrifti* was also collected in sympatry with *M. brandaoi* on the Barva Transect, Costa Rica. We examined a male from Argentina (UCDC), and the holotype worker of *M. drifti* was examined (MCZ).

*Megalomyrmex megadrifti* can always be separated from *M. drifti*, at least for Central American populations, by the quantitative characters of body size (ML), and relative scape (SI) and malar space length (OMI). The new species is considerably larger than *M. drifti* in all three metrics. No overlap was observed in these traits among all measured individuals, including sympatric and allopatric populations (ML > 0.80 vs. < 0.75; SI > 87 vs. < 85; OMI > 62 vs. < 59).



**FIGURES 127–130.** *Megalomyrmex megadrifti* sp. n. holotype worker (CASENT0630930) and non-type queen (CASENT0611359); full-face view scale bars 0.2 mm, profile scale bars 0.5 mm. **127.** Worker, head in full-face view. **128.** Worker, profile view. **129.** Queen, head in full-face view. **130.** Queen, profile view.

The most critical qualitative character which separated *M. drifti* from *M. megadrifti* is the distinctness of the basal and masticatory mandibular margins for the new species. This character can, however, be tricky to interpret without direct comparison between specimens of both species when *M. drifti* has basal denticles at midlength of the curve between the margins, or when *M. megadrifti* lacks a basal denticle at the angle. Beyond mandibular form, other qualitative characters can be useful for distinguishing the two species. *Megalomyrmex megadrifti* may often

be recognized by (1) the presence of small, pointed tubercles where the dorsal and posterior propodeal faces meet, (2) rugulae cover the posteroventral fourth of the katapisternum, (3) median, longitudinal clypeal sulcus shallow, (4) the promesonotum is strongly convex, and (5) when the posterior face of the propodeum has distinct (or indistinct) concentric carinulae around the foraminal carina. A medium-sized, mid-elevation specimen displaying all five of these qualitative characters was chosen as the holotype.

The most notable distinctions between the male of *M. megadrifti* and *M. brandaoi* are related to volsellar form (figs. 206 & 209). These differences are as follows, from the perspective of *M. megadrifti*: (1) cuspis with apicoventral angle less produced; (2) base of digitus broader; (3) apicodorsal lobe of digitus broad, distinct from apical portion (vs. narrower and indistinct from apical portion); (4) apical portion of digitus narrow, digitiform.

**Biology.** This species has broad geographic and elevational ranges and occurs in a variety of habitats. In Central America it occurs from Chiapas to Costa Rica, from sea-level to 1520 m, in rainforests and in cloud forests. Along its Central American range, *M. megadrifti* has been collected almost exclusively via leaf litter sifting. In Nicaragua a male was collected in early May via malaise trap. It is likely that this species is a twig or leaf-litter nester, as queens, workers, and males have been collected together in Winkler samples.

**Male material examined.** COSTA RICA, Heredia: P.N. Braulio Carrillo, 10°20'N 84°02'W, 150–180 m, 26 Julio 2007 (*TEAM-OET#AMI-2-W-148*). NICARAGUA, Matagalpa: RN Cerro Musún, 12.9546°N 85.2304°W, ±20 m, 615 m, 2–4 May 2011, wet forest, ex. malaise trap (*LLAMA#Ma-D-01-3-01*) (CASENT0630906).

**Female material examined.** ARGENTINA, Formosa: 25 km N Formosa, Estancia Guaycolec, 25°59'S 58°12'W, 185 m, 26 Feb–10 Mar 1999 (*S.L. Heydon & J.M. Ledford*). BELIZE, Cayo: Caves Branch, 4–14 August 1972, high canopy forest, Berlese (*S. & J. Peck#B-248*); Stann Creek: Hummingbird Gap, 45 km NW Stann Creek, 19 August 1972, 450 m, forest (*S. & J. Peck#B-246*). COLOMBIA, Meta: 12 km NW Villavicencio, Quebrada Susumuko, 5 Mar 1972, berlese, ex forest litter (*S.B. Peck & J. Kukalova-Peck#FMHD#72-148*). COSTA RICA, Heredia: Finca La Selva, 14–17 January 1973, rainforest (*W.L. Brown*); Finca La Selva, 14–17 January 1973, rainforest (*C. Kugler*); 7 km SW Pto. Viejo, 10.40389 -84.03944 ±500 m, 160 m, 26 Jul 2007, mature wet forest, ex sifted leaf litter (*TEAM#AMI-2-W-148-01*); Puntarenas: P.N. Braulio Carrillo, 10°20'N 84°02'W, 150–180 m, 26 Julio 2007 (*TEAM-OET#AMI-2-W-148*); 4.5 km S Monteverde, 10.26594°N 84.80425°W ±20 m, 1230 m, 27 Dec 2010, cloud forest, ex sifted leaf litter (*J.T. Longino#JTL7231-s*). GUATEMALA, El Progreso: 3.7 km SW Morazán, 14°54'N 90°09'W, 460 m (*M.G. Branstetter#MGB626.11*); 12 km N San Augustin Acasaguastlan, 1200 m, 3 Jun 1991, oak/pine forest litter (*R.S. Anderson#RSA1991-049*); Izabal: 5 km NW Morales, 15.51341°N 88.86616°W ±27 m, 245 m, 17 May 2009, 2° lowland rainforest, ex sifted leaf litter (*LLAMA#Wm-B-04-1-02*); 5 km NW Morales, 15.51416°N 88.86504°W ±50 m, 250 m, 17 May 2009, 2° lowland tropical rainforest, ex sifted leaf litter (*LLAMA#Wa-B-04-2-30*); 5 km NW Morales, 15.51387°N 88.86557°W ±50 m, 250 m, 17 May 2009, 2° lowland tropical rainforest, ex sifted leaf litter (*LLAMA#Wa-B-04-2-17*); Petén: 13 km NW Machaquilá, 16.4416°N -89.5345°W ±50 m, 390 m, 28 May 2009, tropical moist forest, ex sifted leaf litter (*LLAMA#Wa-B-06-2-29*); Parq. Nac. Tikal, 17.2403°N 89.6212°W ±50 m, 270 m, 22 May 2009, tropical moist forest, ex sifted leaf litter (*LLAMA#Wa-B-05-2-20*). HONDURAS, Atlántida: 12 km SW La Ceiba, 15.69449°N -86.86316°W ±20 m, 200 m, 19 Jun 2010, tropical rainforest, ex sifted leaf litter (*LLAMA#Wa-C-09-1-30*); 2 km SSW Tela, 15.76479°N 87.45683°W ±20 m, 30 m, 15 Jun 2010, 2° tropical forest, ex sifted leaf litter (*LLAMA#Wa-C-08-1-07*); 8 km SSW Tela, 15.70961°N 87.46828°W ±20 m, 360 m, 17 Jun 2010, tropical rainforest, ex sifted leaf litter (*LLAMA#Wm-C-08-2-07*); Comayagua: P.N. Cerro Azul Meambar, 14.87314°N 87.90297 ±30 m, 890 m, 22 May 2010, montane rainforest, ex sifted leaf litter (*LLAMA#Wm-C-04-1-07*); P.N. Cerro Azul Meambar, 14.86993°N 87.90479°W ±110 m, 770 m, 21 May 2010, montane rainforest, ex sifted leaf litter (*LLAMA#Wm-C-04-2-01*); Cortés: P.N. Cusuco, 15.4869°N 88.2341°W ±20 m, 1330 m, 30 May 2010, mesophyll forest, ex sifted leaf litter (*LLAMA#Wa-C-06-1-29*); Gracias a Dios: Las Marias, 15.71901°N 84.87844°W ±20 m, 380 m, tropical rainforest, ex sifted leaf litter (*LLAMA#Wm-C-07-2-03*); Olancho: 9 km N Catacamas, 14.93646°N 85.90488°W ±5 m, 1340 m, 10–13 May 2010, disturbed hardwood forest, ex malaise trap (*LLAMA#Ma-C-02-2-01*); 14 km WSW Catacamas, 14.79972°N 86.01415°W ±210 m, 600 m, 13 May 2009, tropical moist forest, ex sifted leaf litter (*J.T. Longino#JTL6537-s*). MEXICO, Chiapas: 2 km SE Custepec, 15.72094°N 92.95077°W, 1520 m, 17 May 2008, mesophil forest, ex sifted litter (*LLAMA#Wa-A-02-1-27*); 2 km SE Custepec, 15.72099°N 92.95054°W, 520 m, 17 May 2008, mesophil forest, ex sifted leaf litter (*LLAMA#Wm-A-02-1*); 6 km SW Ocosingo, 1400 m, 16 Sep 1992, wet oak/pine forest (*R.S. Anderson#RSA1992-105*); Lago Metzabok, 17.12704°N 91.63000°W, 570 m, 5 Jun 2008, lowland wet forest, ex sifted leaf litter (*LLAMA#Wa-A-06-1-38*); Nahá, 16°58'N 91°35'W, 950 m, 14 Jul 2007

(*J.T. Longino*#6047-s); 8 km SE Salto de Agua, 17.51465°N 92.29516°W, 70 m, 14 Jun 2008, 2° wet forest, ex sifted litter (*LLAMA*#Wa-A-08-1-11); Palenque Ruins, 4 July 1949 (*C.J. Goodnight*); San Luis Potosí: El Salto, 6 July 1969, berlesate (*S. & J. Peck*#B-166); Playón de la Gloria, 16.14818°N 90.89660°W ±26 m, 180 m, 24 Jun 2008, mature wet forest, ex malaise trap (*LLAMA*#Ma-A-09-2-01); Playón de la Gloria, 16.15979°N 90.90158°W, 160 m, 24 Jun 2008, mature wet forest, ex sifted leaf litter (*LLAMA*#Wa-A-09-1-12); 8 km SE Salto de Agua, 17.51456°N 92.29516°W, 70 m, 14 Jun 2008, 2° wet forest, ex sifted leaf litter (*LLAMA*#Wa-A-08-1-11); 8 km SE Salto de Agua, 17.51615°N 92.30164°W ±300 m, 100 m, ex sifted leaf litter (*LLAMA*#Wm-A-08-2); 2.5 km S Nuevo San Juan Chamula, 16°07'N 91°27'W, 750 m, 22 Jul 2007 (*R.S. Anderson*#RSA2007-028); Tamaulipas: 21 mi E Tulq., 8 Jun 1983, Berlese, tropical deciduous litter (*S.B. Peck*#FHMD#83-611); Veracruz: Cordoba Paraje Nueve, Nacimiento, 7 August 1969, tropical evergreen forest, Berlese (*S. & J. Peck*#176). NICARAGUA, Jinotega: P.N. Cerro Saslaya, 13.7706°N 85.0252°W ±30 m, 1140 m, 14 May 2011, montane wet forest, ex sifted leaf litter (*LLAMA*#Wm-D-03-2-10); Región Autónoma del Atlántico Norte: P.N. Cerro Saslaya, 13.7736°N 84.9842°W ±20 m, 420 m, 8 May 2011, disturbed tropical wet forest, ex sifted leaf litter (*LLAMA*#Wm-D-02-1-03).

***Megalomyrmex milenae* Boudinot, Sumnicht & Adams sp. n.**

(Figs. 10, 12, 14, 66, 73, 88, 131–135, 183, 198, 213, 228, 239)

**Type material.** *Holotype worker*: PANAMA, Panamá: Pipeline Road, La Seda, 9.16°N 79.7449°W, 73 m, 27 May 2011 (*R. Adams*#RMMA110527-01) [CASENT0630042, MCZ].

*Paratype workers*: (5) same data as holotype [CASENT0630983, BMNH; CASENT0630984, CAS; CASENT0630985, INBC; CASENT0630992, JTLC; CASENT0630993, MZSP; CASENT0630994, USNM]; (3) same data as holotype except #RMMA1100527-02 [CASENT0631008, LACM; CASENT0631009, MCSN; CASENT0631010, UCD].

*Paratype queen*: (1) same data as holotype [CASENT0630043, MCZ].

*Paratype males*: (3) same data as holotype except #RMMA1100527-02 [CASENT0631011, MCZ; CASENT0631012, INBC; CASENT0630869, MZSP].

**Geographic range.** Panama; sea-level to 100 m elevation.

**Diagnosis.** **Worker** Uniquely identified among Central American *Megalomyrmex* by the following combination of characters: (1) masticatory margin of mandible with 5 robust, equally-spaced, subequal triangular teeth; (2) eye large (EL > 0.30 mm); (3) compound eye without ocular setae; (3) mesosternum without triangular processes. **Queen** Similarly identifiable to worker, but with much larger gaster, ergatoid. **Male** Unique among Central American *Megalomyrmex* for the hypertrophied compound eyes. Otherwise separated by the following combination: (1) forewing 1m-cu present; (2) wings infuscated; (3) propodeum distinctly depressed; (4) large (ML > 2.0 mm).

**Description.** **Worker** *Measurements* (holotype): HW 1.26, HL 1.51, SL 1.93, OMD 0.38, EL 0.36, ML 2.17, CI 84, SI 128, EI 29, OMI 106.

*Measurements* (n=10): HW 1.26–1.38, HL 1.51–1.62, SL 1.93–2.05, OMD 0.37–0.42, EL 0.35–0.38, ML 2.17–2.37, CI 83–86, SI 125–128, EI 26–29, OMI 99–123.

**Head** Palpal formula 4,3. Basal and masticatory margins of mandible distinct. Mandible with 5 robust teeth: apical tooth largest; basal four teeth subequal in size. Dorsal surface of mandible predominantly smooth except for setigerous punctures and striae near the masticatory margin. Clypeus convex in profile. Frons smooth and shining, with 2–4 weak, rounded carinae diverging from the posterior margin of the clypeus to the frontal carina. Antennal fossa with incomplete concentric carinulae. Malar area smooth and shining with setigerous punctures. Occipital carina short; visible in full-face view; curving abruptly onto postgenal bridge about 1/10 distance to hypostomal margin. Antennal club of three antennomeres. *Mesosoma* Mesopleuron smooth and shining; anepisternum separated from katepisternum by broad anterior fossa. Propodeum with distinct dorsal and posterior faces meeting at blunt, weakly produced angles; propodeum longitudinally depressed. Posterior face of propodeum with approximately 8 weak transverse carinulae. Foraminal carina entire. Mesosternal processes are rounded protuberances. Femoral apices rounded. Meso- and metabasitarsi circular to ovate in cross-section. *Metasoma* Anterodorsal face of petiole weakly concave, rising steeply to petiolar node apex. Posterior base of petiole smooth and posterior face of postpetiole with faint carinulae. Petiolar sternum with an anteroventral lamina. Postpetiolar

sternum convex, without angular processes. Lancets of sting apparatus shorter than sting shaft, broad, slightly spatulate; sting shaft lancets, thin to pointed apex. *Setation* Subdecumbent to erect, somewhat dilute setae of variable length present on head, mesosoma, and metasoma; subdecumbent setae on scape of even length; setae on tibiae and tarsi decumbent to appressed. Lancets of sting apparatus slightly broadened at apex. Most of cuticle smooth and shining, except for piligerous punctures, and for short, shining, transverse carinulae along the midline of the ventral surface of the head. Head and antennae reddish-orange; mesosoma, petiole, and postpetiole orange-brown; gaster dark brown to black.

**Ergatoid queen** *Measurements* (n=1): HW 1.40, HL 1.54, SL 1.84, OMD 0.35, EL 0.39, ML 2.34, CI 90.7, SI 120, EI 28, OMI 89.

Ergatoid. Similar to worker, except: postpetiolar sternum with a short, stout, anteroventrally-directed triangular process; sculpturation coarser, especially setigerous puncta which are elongate in the malar region, and on the petiole and postpetiole; setae on head and mesosoma coarse and dense; setae coarse, decumbent, and very dense on first gastric tergum.

**Male** *Measurements* (n=3): HW 1.29–1.31, HL 1.01–1.02, SL 0.39–0.41, EL 0.76, ML 2.14–2.17, CI 128–129, SI 38–40, EI 58–59.

*Head* Antenna with 13 antennomeres, third antennomere apically kinked, and fourth antennomere curved; not forming club; scape length about half eye length (SL ~ 0.5 EL). Antenna brown, becoming light golden near apex. Palpal formula 4,3. Mandible triangular; masticatory margin with five teeth; apical tooth about twice as long as basal teeth; basal four teeth subequal in size. Compound eye glabrous. Occipital carina not visible in full-face view. *Mesosoma* Mesosoma attenuate; propodeum distinctly depressed. Notauli absent. Parapsidal lines distinct. Foraminal carina incomplete, but with 2–3 internal complete concentric carinae. Meso- and metabasitarsi tubular. Metabasitarsus neither kinked nor apically swollen. Pterostigma present, narrow and elongate. Forewing crossvein 1m-cu absent; submarginal cell 1 length about four times width; terminal abscissa of M branching from about midlength of Rs+M, becoming spectral after curving anterad, extending almost to apical margin. *Metasoma* Basipetiole carina arc-shaped. Ventrolateral longitudinal carina of petiole present. Petiolar spiracle in anterior fifth of segment. Posterior margin of petiole and postpetiole without girdling carinae. Postpetiolar helcium approximately circular. Postpetiolar spiracle about midlength of lateral tergal margin. Sternum of petiole weakly bulging in anterior two thirds of sclerite. Postpetiolar tergum parabolic; apex slightly posterad midlength. *Genitalia* Abdominal sternum IX about as broad as long; basolateral margins concave, forming “shoulders” basad the concave apicolateral margins, which form the acute apical lobe; apical lobe not strongly sclerotized or produced ventrally. Telomere short, triangular, bluntly rounded apically; medial dentiform process absent; medial face subquadrate; ventral margin without sclerotized denticles. Cuspis without an apicodorsal lobe; apical margin convex. Digitus somewhat broad; dorsal margin with a rounded angle posteroapically, ventral margin evenly curving until it becomes subapically linear; apex narrowly rounded; ventral margin obscuring apicodorsal angle of cuspis. Valvaceps height somewhat more than half the length, subquadrangular; dorsal margin curving to linear apex; ventral margin sinuate, distinct at apex from dorsal margin; penisvalvar teeth close-set, long and narrow basally grading to fine and triangular apically.

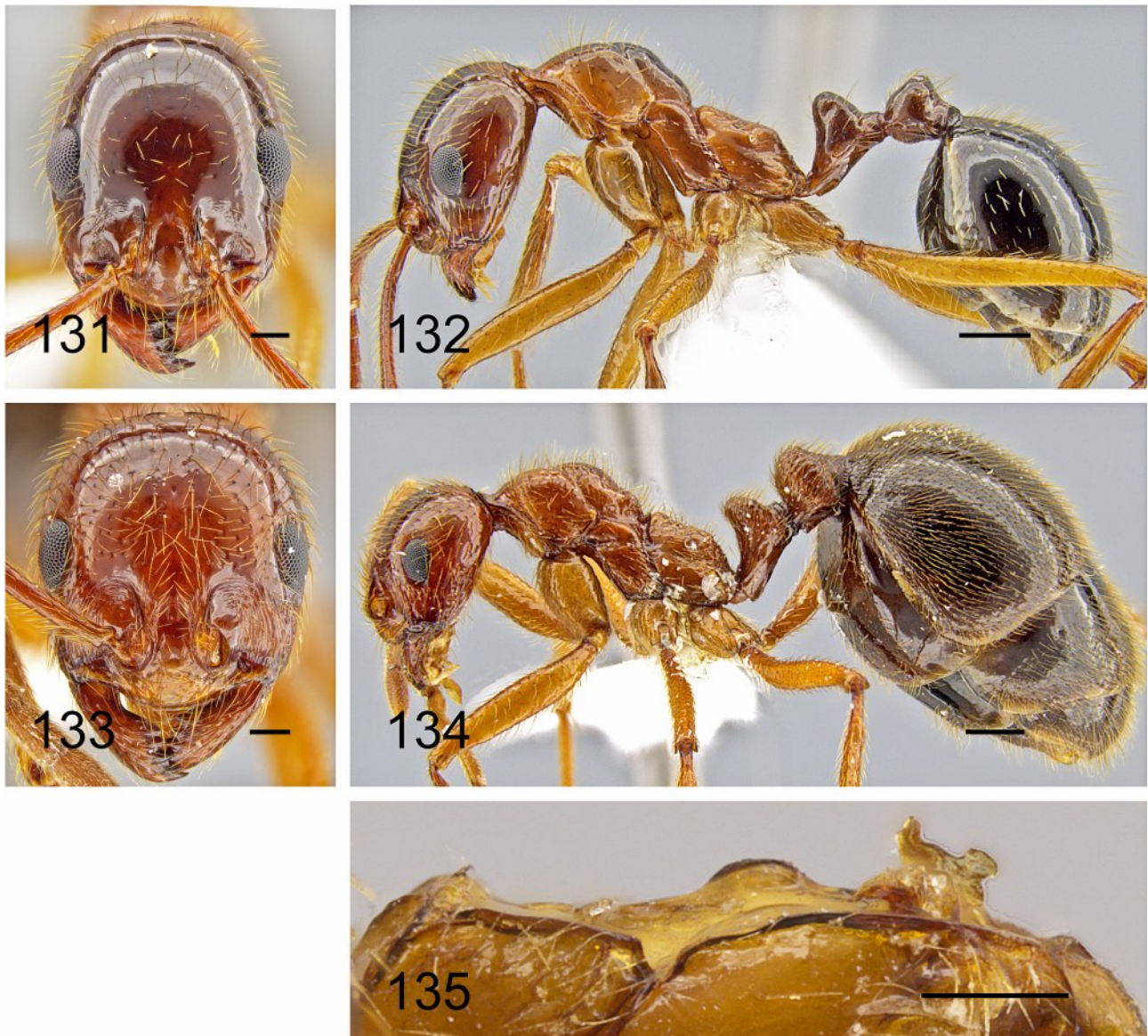
**Etymology.** This species is named after Milena Elise Adams Antonova, daughter of R. M. M. Adams.

**Comments.** Males and both castes of females have glabrous eyes. The males have the largest compound eyes known for any Central American *Megalomyrmex* species. Flight phenology for this species is unknown.

In Central America, workers of *M. milenae* may most easily be confused with *M. foreli*, but differ as follows: (1) clypeus not produced anterodorsally in profile view; (2) mesosternal processes bulging, rounded (not denticulate); (3) petiole without a narrowed peduncle; (4) postpetiolar sternum without a pointed process; (5) first gastric tergum with long, relatively dilute setation. Further, *M. milenae* workers are separated from all *leoninus*- and *modestus*-group species by the following combination of characters: (1) dorsal face of mandible smooth; (2) anterior margin of clypeus without median denticle; (3) petiole without narrowed peduncle; (4) petiole with laminar tooth; (5) postpetiole rounded, without tooth; (6) femoral apices rounded.

Similarly to workers, males of *M. milenae* are most similar to *M. foreli*, but differ in the following: (1) occipital carina not visible in full-face view; (2) ocelli subequal in size; (3) compound eyes gigantic (4) minimum distance between lateral ocellus and compound eye less than one lateral ocellus length (vs. about two and a half); (5) wings infuscated (vs. hyaline) (6) propodeum distinctly depressed; (7) postpetiole shorter, more globose; (8) smaller (ML ~2.15 vs. ML ~2.75); (9) CI greater (CI 128–129 vs. CI 98–99).

*Megalomyrmex milenae* workers are most similar to those of the South American *M. cupecuara*, but can be separated by the following (*M. cupecuara* holotype examined, MCZ; measurements of *M. cupecuara* from Brandão 1990): (1) eyes larger, maximum diameter about three times longer than maximum supraclypeal area breadth (no measurements of *M. cupecuara* available, but maximum eye length about 1.5–2 times supraclypeal area breadth); (2) shape short, SI 125–128 (vs. SI 136–138); (3) dorsal mesonotal face short, about one-third length of posterior face (vs. long, subequal to length of posterior face); (4) dorsal and posterior faces of propodeum meeting at rounded angle laterally (vs. propodeum weakly tuberculate); (5) petiolar peduncle comparatively; (6) anterior face of postpetiolar node flattened (vs. anterior face of postpetiolar node strongly convex); (7) postpetiolar sternum rounded (vs. with weak denticle); (8) gastric setae somewhat sparse with single layer (vs. denser, bilayered).



**FIGURES 131–135.** *Megalomyrmex milenae* sp. n. worker and paratype queen (CASENT0630043); full-face view scale bars 0.2 mm, profile view scale bars 0.5 mm. **131.** Holotype worker, head in full-face view (CASENT0630042). **132.** Holotype worker, profile view (CASENT0630042). **133.** Queen, head in full-face view. **134.** Queen, profile view. **135.** Ventral surface of worker mesosoma, inverted profile view with anterior to left (CASENT0631021).

**Biology.** Three colonies were baited with Keebler Pecan Sandies and excavated from the embankment of the La Seda creek off of Pipeline Road in Panama, two each with a single ergatoid queen. Worker numbers were estimated to be around ~187 in one colony and 273 workers and 9 males in the queenless subcolony. In 2013, several more colonies were collected, all of which were monogynous, and with worker numbers ranging from 25 to

462. The smallest colony had likely just migrated from its natal nest and was found in loose leaf litter. In larger colonies, the nest entrance is similar to that of *M. foreli* (fig. 242) as an inconspicuous hole in the soil.

**Additional male material examined.** PANAMA, Panamá: Parq. Nac. Soberanía, 9°09.309'N 79°44.125'W, 73 m, 27 May 2011 (R.M.M. Adams#RMMA110527-02).

**Additional female material examined.** PANAMA, Panamá: Parq. Nac. Soberanía, 9°09.360'N 79°44.115'W, 69 m, 5 May 2011 (R.M.M. Adams#RMMA110505-01); Parq. Nac. Soberanía, 9°09.309'N 79°44.125'W, 73 m, 27 May 2011 (R.M.M. Adams#RMMA110527-02); Parq. Nac. Soberanía, 9°09.309'N 79°44.125'W, 73 m, 27 May 2011 (R.M.M. Adams#RMMA110527-02).

### *Megalomyrmex miri* Brandão, 1990

(Figs. 26, 56, 74, 89, 136–139, 184, 199, 214, 229, 239)

*Megalomyrmex miri* Brandão, 1990: 452, figs. 117 and 118. Holotype worker: COSTA RICA, Limón, Zent [USNM] (micrographs examined).

*Measurements* (holotype from Brandão 1990): HW 0.48, HL 0.50, SL 0.48, ML 0.75, CI 96, SI 96.

*Worker* (n=3; plus 1 in parentheses from Brandão 1990): HW 0.43–0.46 (0.48), HL 0.49–0.54 (0.55), SL 0.45–0.49 (0.50), OMD 0.12, EL 0.04–0.05, ML 0.69–0.77 (0.78), CI 84–86 (87), SI 90–91 (91), EI 10–12, OMI 230–294.

**Geographic range.** Costa Rica and Panama; sea-level to 400 m elevation.

**Diagnosis. Worker** Distinguished by the following: (1) miniscule eyes, with at most four ommatidia at greatest diameter; (2) disc of katapisternum costate. See distinctions from *M. wettereri* below for more characters.

**Queen** Alate; distinguished by the following: (1) ventral petiolar faces rugose; (2) dorsal and posterior propodeal faces meeting at a distinct angle. **Male** Recognizable as follows: (1) forewing 1m-cu present; (2) occipital carina not visible in full-face view; (3) petiolar and postpetiolar sterna scabrous; (4) scapes distinctly shorter than head width.

**Description. Queen** *Measurements* (n=1): HW 0.55, HL 0.59, SL 0.53, OMD 0.09, EL 0.18, ML 0.93, CI 93, SI 90, EI 32, OMI 51.

Differs from worker as follows: eye proportionally larger; ocelli present; mesosoma with alate condition, disc of katapisternum smooth; petiole and postpetiole more robust.

**Male** *Measurements* (n=1): HW 0.46, HL 0.48, SL 0.25, EL 0.24, ML 0.88, CI 95, SI 52.

*Head* Antenna with 13 antennomeres, none of which are kinked, nor forming a club; scape length greater than eye length. Antenna pale yellow grading to honey yellow apically. Mandible triangular; masticatory margin with five teeth; apical tooth largest, about four times as long as basal teeth; basal four teeth equal in size and evenly spaced. Dorsal face of mandible densely and finely striate. Minimum distance between lateral ocellus and compound eye about four lateral ocellus lengths. Compound eye with extremely sparse, short ocular setae. Occipital carina not visible in full-face view. *Mesosoma* Mesosoma not attenuate. Notauli absent. Parapsidal lines distinct. Foraminal carina incomplete; posterior face of propodeum smooth. Basitarsi tubular. Pterostigma well-developed. Forewing with crossvein 1m-cu; submarginal cell 1 length about four times width; terminal abscissa of M branching from Rs+M near 2r-rs, becoming spectral near its base, becoming absent well before apical margin. *Metasoma* Basipetiolar carina arc-shaped. Ventrolateral carina of petiole indistinct. Petiolar spiracle in anterior fourth of petiole. Petiolar and postpetiolar posterior margins without distinct girdling carinae. Postpetiolar helcium circular. Postpetiolar spiracle anterad midlength lateral margin of tergum. Sternum of postpetiole with an acute anterior denticle. Postpetiolar tergum strongly convex. *Genitalia* Abdominal sternum IX tapering to long acute triangular lobe at apex; apical lobe not heavily sclerotized or produced ventrally. Telomere triangular with blunt apex; dorsal margin concave, ventral margin linear; medial dentiform process absent; medial face distinctly sclerotized, subquadrate, very weakly arched. Cuspis produces apicodorsally; apical margin sinuate. Digitus apical portion very thin (thinner than digitus stem); dorsal margin strongly and narrowly explanate posteroapically; ventral margin evenly curved; ventral margin obscuring posterodorsal angle of cuspis. Valviceps height just subequal to length, ovate; dorsal margin curving sharply to ventral margin at apex; ventral margin weakly convex basally; penisvalvar teeth distinctly separated, longest near base.

**Comments.** No palpal formula is provided in the male description as the mouthparts of the only known



specimen are retracted into the head capsule, although it is predicted to be 3,2 as observed in workers. The HL measurement of the holotype reported in Brandão (1990; CI = 96 vs. 90–91) is proportionally low relative to the paratype and the new ranges presented above. As only micrographs of the holotype specimen were examined we cannot test this measurement in the present work.

The distinctness of *Megalomyrmex miri* from *M. wettereri*, previously questioned by Longino (2010), is here confirmed via study of the worker and male castes. Characters which separate the workers of *M. miri* from *M. wettereri* are as follows: (1) smaller (HL 0.49–0.55 vs. 0.58–0.59); (2) scape longer (SI 90–96 vs. 84–85); (3) setae on scape appressed (vs. decumbent to subdecumbent); (4) katapisternum longitudinally costate (vs. smooth); (5) petiolar peduncle with a dorsolateral longitudinal carina extending about one-fifth the length of the node (vs. without); (6) posterior face of petiolar node meeting posterior petiolar collar at a distinct angle (vs. smoothly curving through petiolar collar to posterior petiolar margin); (7) petiolar sternum almost completely rugose (vs. smooth and “polished”); (8) first gastric tergum with long, relatively dilute decumbent to subdecumbent setae interspersed with shorter appressed setae; (9) setae on legs appressed (vs. subdecumbent to decumbent); (10) head with distinct appressed and subdecumbent setae (vs. setae grading from decumbent to subdecumbent). Queens share with workers at least characters 2, 3, 5, 6, 7, 8, 9, 10.

Males of *M. miri* may be separated from those of *M. wettereri* by the following gross morphology: (1) scape setae completely appressed (vs. appressed to decumbent); (2) setae on legs, excluding ventral faces, completely appressed (vs. appressed to subdecumbent); (3) petiolar and postpetiolar nodes stronger, taller; (4) petiolar sternum rugose; (5) postpetiolar sternum anteriorly dentate in profile view (vs. rounded). In addition to gross morphology, several genitalic characters separate the two closely related species: (1) dorsal margin of telomere concave; (2) apical segment of digitus thinner than digitus stem, linear; (3) apicodorsal margin of cuspis obscured by digitus stem; (4) apical margin of cuspis emarginate; (5) penisvalvar teeth distinctly separated; (6) ventral margin of penisvalva convex; (7) penisvalva shorter. Morphometrically, males of *M. miri* and *M. wettereri* differ only slightly. A larger sample size for the respective species may yield further discriminatory characters.



**FIGURES 136–139.** *Megalomyrmex miri* Brandão worker (CASENT0631003) and queen (CASENT0630875); full-face view scale bars 0.2 mm; profile view scale bar 0.5 mm. **136.** Worker, head in full-face view. **137.** Worker, profile view. **138.** Queen, head in full-face view. **139.** Queen, profile view.

Additional characters or character states observed in *M. miri* workers which were previously unreported are as follows: Palpal formula 3,2; 2–4 ommatidia at greatest diameter of compound eye (vs. 5); compound eye glabrous; metanotal sulcus with crossribbing carinae; subpetiolar process rounded with a minutely serrate margin to “double dentate”; lancets of sting apparatus longer than sting shaft, narrow, broadening very slightly to rounded apex; sting shaft narrow to apex.

**Biology.** In May 2010, a large colony of *Megalomyrmex miri* was found cohabiting with *Myrmicocrypta ednaella* Mann (J. Sosa-Calvo det.) confirming *M. miri* as a guest ant and social parasite. The host colony had ~108 workers and a single queen, while the *M. miri* colony had ~144 workers, four queens, and two males. This is the first record of a *Megalomyrmex* species parasitizing *Myrmicocrypta*. Few behavioral observations were possible but amiable interactions between host and parasites were most common. Gaster flagging by *M. miri* workers was observed on occasion. Attempts were made to introduce this species into *Cyphomyrmex longiscapus* Weber colonies (host of *M. wettereri*) with marginal success.

**Male material examined.** PANAMA, Panamá: El Llano forest, 9°16'46.40"N 78°57'41.40"W, 365 m, 21 May 2010 (*R.M.M. Adams*#RMMA100521-02).

**Female material examined.** PANAMA, Panamá: El Llano forest, 9°16'46.40"N 78°57'41.40"W, 365 m, 21 May 2010 (*R.M.M. Adams*#RMMA100521-02).

### ***Megalomyrmex modestus* Emery, 1896**

(Figs. 52, 75, 90, 140–144, 185, 200, 215, 230, 240)

*Megalomyrmex modestus* Emery, 1896: 94. Lectotype worker (designated by Brandão 1990: 425): COSTA RICA: Suerre [near Jimenez, Limón Prov.] [MCSN] (not examined). Brandão, 1990: 426: description of queen, male. See also Longino 2010: 46–47.

*Measurements* (lectotype from Brandão 1990): HW 0.90, HL 1.08, SL 1.10, ML 1.40, CI 83, SI 102.

*Worker* (n=6): HW 0.91–1.03, HL 1.08–1.19, SL 1.12–1.23, OMI 0.23–0.28, EL 0.19–0.22, ML 1.46–1.65, CI 84–88, SI 103–105, EI 20–21, OMI 118–138.

*Alate queen* (n=1): HW 1.47, HL 1.49, SL 1.53, OMD 0.29, EL 0.39, ML 2.66, CI 98, SI 102, EI 26, OMI 75.

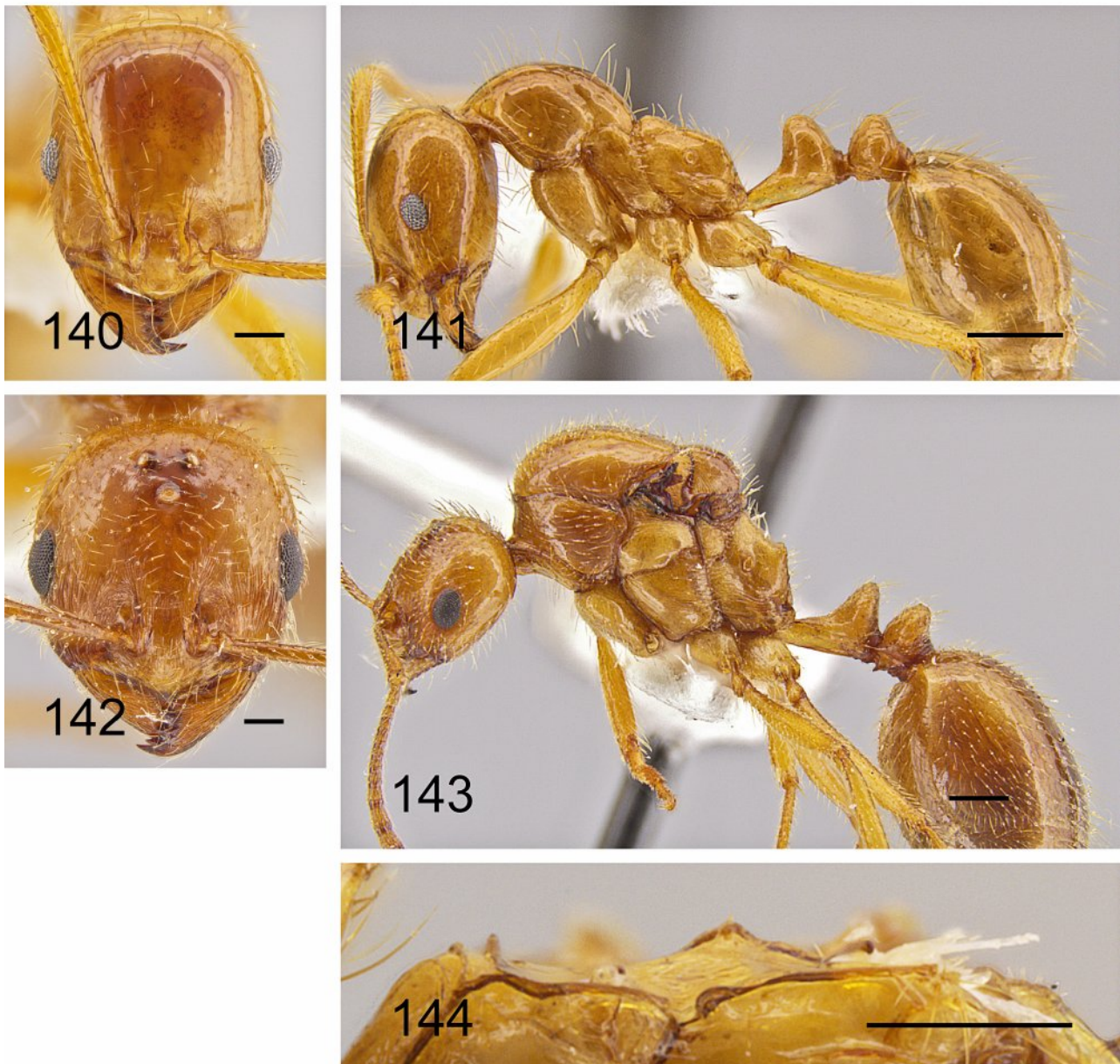
**Geographic range.** Costa Rica, Panama, Colombia, Venezuela; sea-level to 940 m elevation.

**Diagnosis. Worker** Uniquely identified among Central American *Megalomyrmex* by the following combination: (1) mandible with 5 robust, equally-spaced, subequal triangular teeth; (2) eye small (EL < 0.25); (3) dorsal face of mandible striate; (4) clypeus with triangular median process; (5) disc of katapisternum roughened in ventral half by striations and weak carinulae; (6) petiolar peduncle long and thin. **Queen** Similarly identifiable as worker, but alate, with larger eyes, and less-robust petiolar and postpetiolar nodes. **Male** Uniquely identified among Central American *Megalomyrmex* by either of the following: (1) postpetiolar helcium laterally compressed; (2) telomere with a dorsomedian dentiform process. Otherwise recognized by the following combination: (1) forewing 1m-cu present; (2) scape length less than antennomeres 2–4; (3) occipital carina visible in full-face view; (4) mesosoma robust.

**Description. Male** *Measurements* (n=2): HW 0.87–0.89, HL 0.83, SL 0.27, EL 0.43–0.45, ML 1.60–1.64, CI 105–107, SI 33, EI 49–51.

*Head* Antenna with 13 antennomeres, none of which are kinked, nor forming a club; scape length shorter than eye length. Entire antenna brown, except apex of terminal antennomere which is pale. Palpal formula 4,3. Mandible subfalcate; masticatory margin with three triangular teeth; apical tooth about twice the length of the subbasal tooth; subbasal tooth subequal in size to basal tooth from which it is separated by a short diastema. Dorsal face of mandible striate, at least at midlength. Minimum distance between lateral ocellus and compound eye about three lateral ocellus lengths. Compound eyes with dense, short ocular setae. Occipital carina visible in full-face view. *Mesosoma* Mesosoma robust. Notauli absent. Parapsidal lines weak. Foraminal carina present. Metasternum with a triangular process. Basitarsi tubular. Pterostigma elongated apically. Forewing crossvein 1m-cu present; submarginal cell 1 one fourth as wide as long; terminal abscissa of M branches from Rs at or just basad 2r-rs. *Metasoma* Basipetiolar carina arc-shaped; weak; most distinct laterally, obsolescent medially. Ventrolateral longitudinal carina of petiole present. Petiolar spiracle in anterior fourth. Posterior margin of petiole with distinct girdling carinae; postpetiole without. Postpetiolar helcium strongly compressed laterally. Postpetiolar spiracle

placed about midlength of the lateral tergal margin. Sternum of postpetiole produced anteriorly; this process angular, sloping gently to posterior margin. *Genitalia* Abdominal sternum IX lateral margins subparallel, arching apically to posterior margin which is ventromedially produced as a relatively strongly sclerotized apical triangle; this triangle is keeled ventrally and produced apically; lateral faces of this apical triangle concave. Telomere triangular, elongate, with apex acutely angled; telomere with medially-directed dentiform process (hence “shouldered”); medial face of telomere sclerotized, arched; ventral margin with two anteriorly-directed sclerotized denticles. Cuspis with posterodorsal process; apical margin weakly convex. Digitus narrow; dorsal margin explanate, with posterodorsal margin subangular; ventral margin parabolic; apex triangular; ventral margin slightly obscuring apex of cuspal posterodorsal process. Valviceps about half as tall as long, subrectangular; dorsal margin curving smoothly through apical margin to meet the sclerotized ventral margin; basal two thirds of ventral margin linear; penisvalvar teeth short, truncate, close-set.



**FIGURES 140–144.** *Megalomyrmex modestus* Emery worker and queen (INBIOCRI002280179); full-face view and metasternal profile scale bars 0.2 mm; profile view scale bar 0.5 mm. **140.** Worker, head in full-face view (IBIOCRI001281465). **141.** Worker, profile view (IBIOCRI001281465). **142.** Queen, head in full-face view. **143.** Queen, profile view. **144.** Ventral surface of worker mesosoma, inverted profile view with anterior to left (CASENT0631022).

**Comments.** Workers, alate queens, and males of *Megalomyrmex modestus* have relatively dense, short ocular setae. *Megalomyrmex modestus* workers are set off from the Central American *leoninus*- and *modestus*-group species by several traits unique in this two groups: (1) body comparatively small (ML 1.40–1.65 vs. ML 1.83–2.71); (2) eyes relatively small (EI 20–21 vs. EI 25–33); (3) dorsal mandibular face striate (vs. smooth); (4) anterior clypeal margin strongly angulate medially (vs. weakly dentate or convex); (5) antennal club distinctly broader than preceding antennomeres of funiculus (vs. subequal in width to preceding antennomeres); (6) gastral shoulders strong (vs. weak or indistinct); petiolar peduncle long and thin (vs. comparatively shorter and stout); and body completely pale yellow (vs. head and mesosoma orange and/or gaster black). However, given these distinct characters, it is notable that *M. modestus* shares with *M. wallacei* (another *modestus* group species) a notch between the basalmost and basal mandibular margins.

**Biology.** Large polygynous colonies (>2000 workers) have been collected nesting in or under logs and in diffuse soil at the base of trees. Longino (2010) reported a colony ~ 20 cm deep soil on a creek embankment. In a Costa Rican population where *Apocephalus* phorid flies (B. Brown det.) were seen attacking workers, individuals walked around with their gasters tucked under their bodies. It is difficult to bait this species with Keebler Pecan Sandies as they are mainly subterranean and nocturnal; if the bait is placed on top of a soil nest they will emerge and bury the cookies. Colonies construct soil galleries on the side and at the base of trees when tending immature white flies (Aleyrodoidea: Aleyrodidae). *Megalomyrmex modestus* was the most frequently collected *Megalomyrmex* species during Malaise trapping in La Selva, Costa Rica, with well over fifty specimens recovered.

**Male material examined.** COSTA RICA, Alajuela: Casa Eladio, Rio Peñas Blancas, 10.31667°N 84.7167°W, 800 m, 27 Apr 1988, tropical wet forest, nest on stream bank in soil (*J.T. Longino*#JTL2019); El Aleman, Rio Peñas Blancas, 10.3°N 84.75°W, 940 m, 18 May 1991, wet forest, search in recent treefall (*J.T. Longino*#JTL2890-s); Cartago: Turrialba, 600 m, 17 Jul 1965 (*H.G. Real*); Heredia: 11 km ESE La Virgen, 10.35°N 84.05°W, 300 m, 15 Feb 2004, montane wet forest, ex. malaise trap (*ALAS*#ALAS/03/malaise/). PANAMA, Darien: Cana Pine Tr., 7 Jun 1996 (*A.R. Gillogly*#960607).

**Female material examined.** COSTA RICA, Alajuela: Rio Peñas Blancas, 10°19N 84°43°W, 800 m, 2 Mar 2004 (*J.T. Longino*#JTL5278-s); Rio Peñas Blancas, 10°19N 84°43°W, 800 m, 10 May 1999 (*J.T. Longino*#JTL2529-s); Casa Eladio, Rio Peñas Blancas, 10.31667°N 84.7167°W, 800 m, 27 Apr 1988, tropical wet forest, nest on stream bank in soil (*J.T. Longino*#JTL2019); Heredia: La Selva, nr. Sarapio, 9.279556°N 89.9615°W, 93 m, 20 Mar 2011 (*J. Larsen*#JTL110320-03).

### ***Megalomyrmex mondabora* Brandão, 1990**

(Figs. 30, 33, 62, 67, 76, 91, 145–148, 186, 201, 216, 231, 240)

*Megalomyrmex mondabora* Brandão, 1990: 442, figs. 95, 96. Holotype worker: COSTA RICA, Cartago: Turrialba, 18–22 Jan 1973 (*W. L. Brown Jr.*) [MCZC] (not examined). See also Longino (2010): 47 and fig. 8.

*Measurements* (holotype from Longino 2010): HW 0.74, HL 0.88, SL 1.08, EL 0.23, ML 1.34, SI 123, CI 85.

*Worker* (n=5, plus 10 from Longino 2010): HW 0.74–0.88, HL 0.86–0.96, SL 1.08–1.21, OMD 0.12–0.13, EL 0.26–0.30, ML 1.31–1.50, CI 85–93, SI 121–128, EI 33–35, OMI 40–47.

*Queen* (n=3 from Longino 2010): HW 0.94–0.97, HL 1.00–1.01, SL 1.15–1.17, EL 0.33, ML 1.60–1.65, CI 95–96, SI 114–118.

**Geographic range.** Honduras, Costa Rica, and Panama; 300–1170 m elevation.

**Diagnosis. Worker** Uniquely identifiable among Central American *Megalomyrmex* as follows (1) 8–10 small, subequal teeth subtending apical 2; (2) foraminal carina complete; (3) antennal fossa not encircled by carinulae; (4) scapes relatively long (SI > 115). **Queen** Similarly identifiable as worker, alate. **Male** Recognizable by the following three characters: (1) forewing submarginal cell 1 about eight times as long as width; (2) antenna infuscated at least basally; (3) petiolar and postpetiolar nodes bulbous.

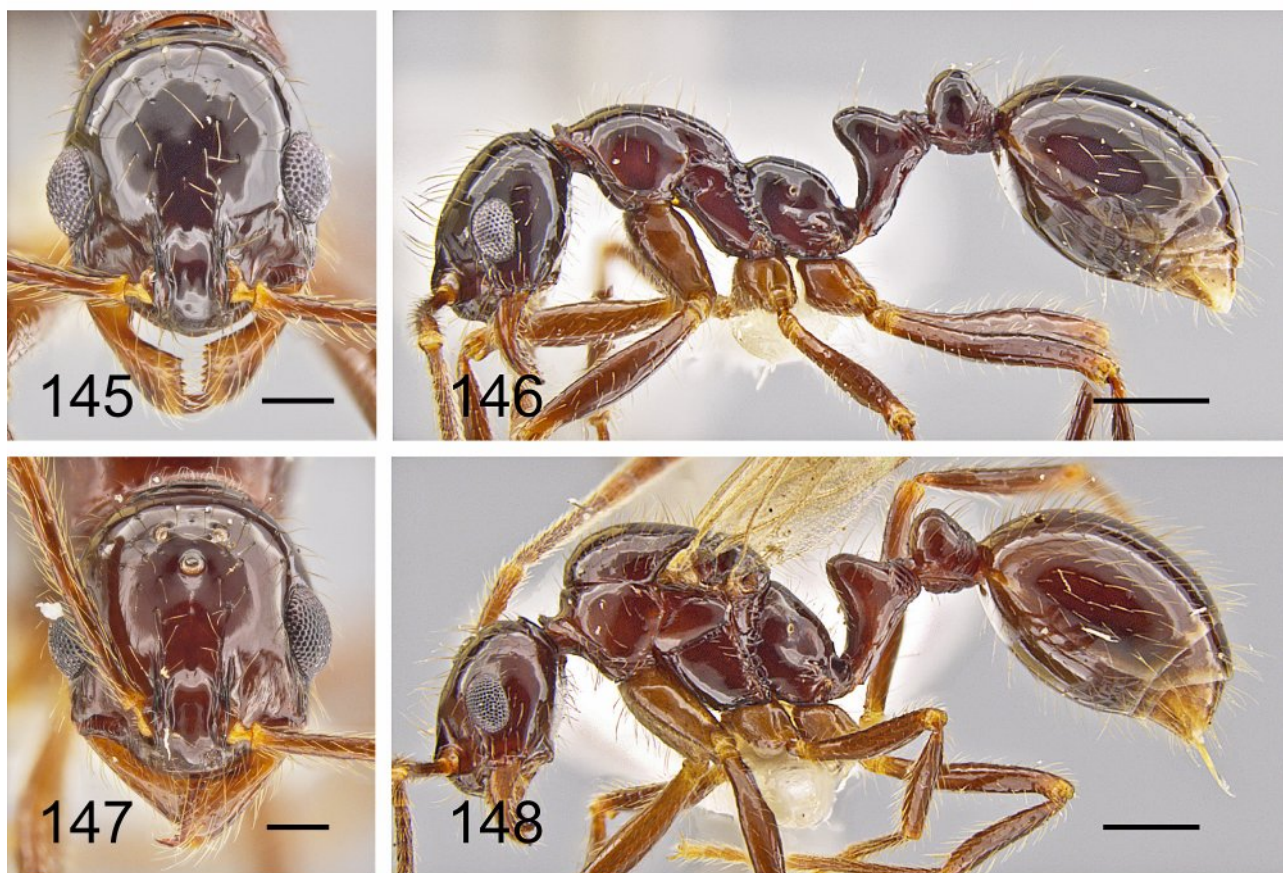
**Description. Male** *Measurements* (n=2 from Longino 2010): HW 0.81–0.92, HL 0.75–0.84, SL 0.34–0.40, EL 0.36–0.41, ML 1.38–1.55, CI 45, SI 46–48, EI 44–45.

*Head* Antenna with 13 antennomeres; antennomere 4 apically kinked; no other antennomeres kinked, nor forming club; scape length subequal to eye length. Antenna infuscated from basad midlength to apex. Palpal formula 4,3. Mandible subfalcate; masticatory margin with 7 teeth; apical tooth more than twice length of

subapical tooth; basal teeth somewhat irregular in size and spacing. Dorsal face of mandible smooth and shining, with weak piligerous punctae. Minimum distance between lateral ocellus and compound eye about four lateral ocellus lengths. Compound eye glabrous. Occipital carina visible in full-face view. *Mesosoma* Mesosoma somewhat attenuate: propodeum elongated. Notauli absent. Parapsidal lines distinct. Foraminal carina present; with concentric carina dorsad. Basitarsi tubular. Pterostigma present, narrow and elongate. Forewing without crossvein 1m-cu; submarginal cell 1 about eight times longer than wide; terminal abscissa of M may be weak, not sclerotized, not joined to Rs, or basally sclerotized and branching from Rs slightly distad 2r-rs. *Metasoma* Basipetiole carina arc-shaped. Ventrolateral longitudinal carina of petiole present. Petiolar spiracle in anterior fourth. Posterior margin of petiole with girdling carinae; postpetiole without. Postpetiolar helcium approximately circular. Postpetiolar spiracle placed at about midlength of lateral tergal margin. Sternum of postpetiole bulging at about midlength in profile. Postpetiolar tergum asymmetrically convex; apex posterad midlength. *Genitalia* Abdominal sternum IX tapering to obtusely triangular apex; apical lobe not sclerotized or produced ventrally. Telomere short, triangular, with acute apex; without medial process; medial face not heavily sclerotized nor arched. Cuspis projecting apicodorsally; apical margin slanting anteroventrally. Digitus narrow to very narrow; apex bluntly rounded; dorsal margin slightly more arched than ventral margin; ventral margin not obscuring posterodorsal angle of cuspis. Valviceps about half as tall as long, subovate; dorsal margin shallowly sloping to apical margin; ventral margin weakly convex; penisvalvar teeth narrow and close-set.

**Comments.** The male of *M. mondabora* differs from *M. mondaboroides* by the following: (1) antenna infuscated; (2) occipital carina not visible in full-face view; (3) frontal and occipital carina strong. Differing from all other Central American *Megalomyrmex* by the following combination of characters: small (ML < 2.0 mm), crossvein 1m-cu and apical abscissa of M absent.

The compound eyes of *Megalomyrmex mondabora* females (queen, worker) and males are glabrous, whereas workers of *Megalomyrmex mondaboroides* have very sparse ocular setae and males' eyes are glabrous.



**FIGURES 145–148.** *Megalomyrmex mondabora* Brandão worker (CASENT0630976) and queen (INBIOCRI001280862); full-face view scale bars 0.2 mm, profile scale bars 0.5 mm. **145.** Worker, head, full-face view. **146.** Worker, profile view. **147.** Queen, head in full-face view. **148.** Queen, profile view.

**Biology.** This thief ant species is found in a separate chamber from the main fungal galleries within the nest structure of yeast-growing *Cyphomyrmex cornutus* Kempf (Adams & Longino 2007), although a single queen was once collected by RMMA with a young *C. rimosus* Spinola colony in February 2003.

**Male material examined.** COSTA RICA, Guanacaste: Est. Paitilla, Guanacaste Cons. Area, 10.983°N 85.433°W, 700 m, 11 Feb 1995, wet forest, ex suspended carton nest of accreted soil (*J.T. Longino*#3651); Heredia: 10 km SE La Virgen, 10.3333°N 84.0667°W, 500 m, 19 Jun 2012, mature wet forest, ex carton nest (*J.T. Longino*#4676); near El Ceibo station, Waterline trail, 10 km SE La Virgen, 10°20'N 84°05'W, 450–550 m, 25 Jun 2005 (*R.M.M. Adams*#RMMA050625-01). HONDURAS, Comayagua: PN Cerro Azul Meambar, 14.8693°N 87.8979°W ±100 m, 1170 m, 22 May 2010, ridgetop cloud forest, beating vegetation (*LLAMA*#Go-C-04-3-04).

**Female material examined.** COSTA RICA, Alajuela: Rio Peñas Blancas, 10°19'N 84°43'W, 800 m, 26–28 Apr 1997 (*J.T. Longino*#JTL1584); Guanacaste: Est. Paitilla, Guanacaste Cons. Area, 10.983°N 85.433°W, 700 m, 11 Feb 1995, wet forest, ex suspended carton nest of accreted soil (*J.T. Longino*#JTL3651); Heredia: 10 km SE La Virgen, 10.3333°N 84.0667°W, 500 m, 19 Jun 2012, mature wet forest, ex carton nest (*J.T. Longino*#JTL4676); P.N. Braulio Carrillo, 10°21'N 84°04'W, 300 m, 21 Mar 2006 (*TEAM-OET*#AMI-4-W-070-02).

### ***Megalomyrmex mondaboroides* Longino, 2010**

(Figs. 34, 44, 65, 77, 92, 149–152, 187, 202, 217, 232, 241, 249)

*Megalomyrmex mondaboroides* Longino, 2010: 49, 50, fig. 9. Holotype worker, paratype workers, males, queen. PANAMA, Panamá: El Llano, 9.27956°N 78.96150°W, 300 m, 30 Mar 2001 (*H. Fernandez-Marin*#HF010330-50) [MCZ] (not examined).

*Measurements* (holotype from Longino 2010): HW 0.72, HL 0.78, SL 0.85, EL 0.23, ML 1.18, CI 92, SI 109.

*Worker* (n=1, plus 6 from Longino 2010): HW 0.61–0.72, HL 0.64–0.79, SL 0.68–0.87, OMD 0.12, EL 0.19–0.27, ML 0.89–1.18, CI 91–94, SI 106–114, EI 38, OMI 45.

*Queen* (n=1 from Longino 2010): HW 0.81, HL 0.85, SL 0.87, EL 0.32, ML 1.29, CI 96, SI 103, EI 39.

**Geographic range.** Costa Rica, Panama, Peru; sea-level to 300 m elevation.

**Diagnosis. Worker** Uniquely identifiable among Central American *Megalomyrmex* as follows: (1) 8–10 small, subequal denticles subtending large apical two; (2) katapisternum smooth and shining; (3) antennal insertion not encircled by carinulae; (4) scape relatively short (SI < 114). **Queen** Similarly identifiable as worker, alate. **Male** Identifiable by the following two characters: (1) forewing submarginal cell 1 about eight times as long as wide; (2) entire antenna white. Identification supported by the following: (1) forewing 1m-cu present; (2) occipital carina not visible in full-face view.

**Description. Male** *Measurements* (n=2 from Longino 2010): HW 0.72–0.75, HL 0.64–0.66, SL 0.29–0.33, EL 0.35–0.36, ML 1.16–1.17, CI 113–114, SI 46–51, EI 48–49.

*Head* Antenna with 13 antennomeres; antennomere 3 apically kinked; not forming club; scape length less than eye length. Antenna entirely white. Palpal formula 4,3 or 3,3. Mandible triangular; masticatory margin with 10–12 teeth; apical and subapical teeth largest; basalmost tooth offset from juncture of masticatory and basal margins. Dorsal face of mandible smooth and shining, with weak piligerous punctae. Minimum distance between lateral ocellus and compound eye greater than two lateral ocellus lengths. Compound eye glabrous. Occipital carina not visible in full-face view. *Mesosoma* Mesosoma somewhat attenuate. Notauli absent. Parapsidal lines distinct. Basitarsi tubular. Pterostigma well-developed. Forewing crossvein 1m-cu absent; submarginal cell 1 about one eighth as wide as long; terminal abscissa of M branches distad 2r-rs. *Metasoma* Basipetiole carina almost cordate, with rounded posterolateral corners and with posterior margin linear. Ventrolateral longitudinal carina of petiole present. Petiole spiracle in anterior third. Posterior margins of petiole and postpetiole with girdling carinae. Postpetiole helcium subcircular. Sternum of postpetiole weakly convex in profile view. Postpetiole tergum distinctly nodiform, with steeper anterior face and sloping posterior face; apex anterad midlength. *Genitalia* Abdominal sternum IX broader than long; lateral margins concave, curving abruptly to posterior margin; posterior margin with acute triangular lobe which is about as long as wide at base. Telomere short and bluntly triangular; dorsal margin concave and ventral margin convex; median dentiform process absent; median face not arched; ventral margin without sclerotized denticles. Apical margin of cuspis convex; without apicodorsal process. Digitus narrow basally, rapidly becoming broad; dorsal margin explanate apicodorsally and subapically; ventral margin

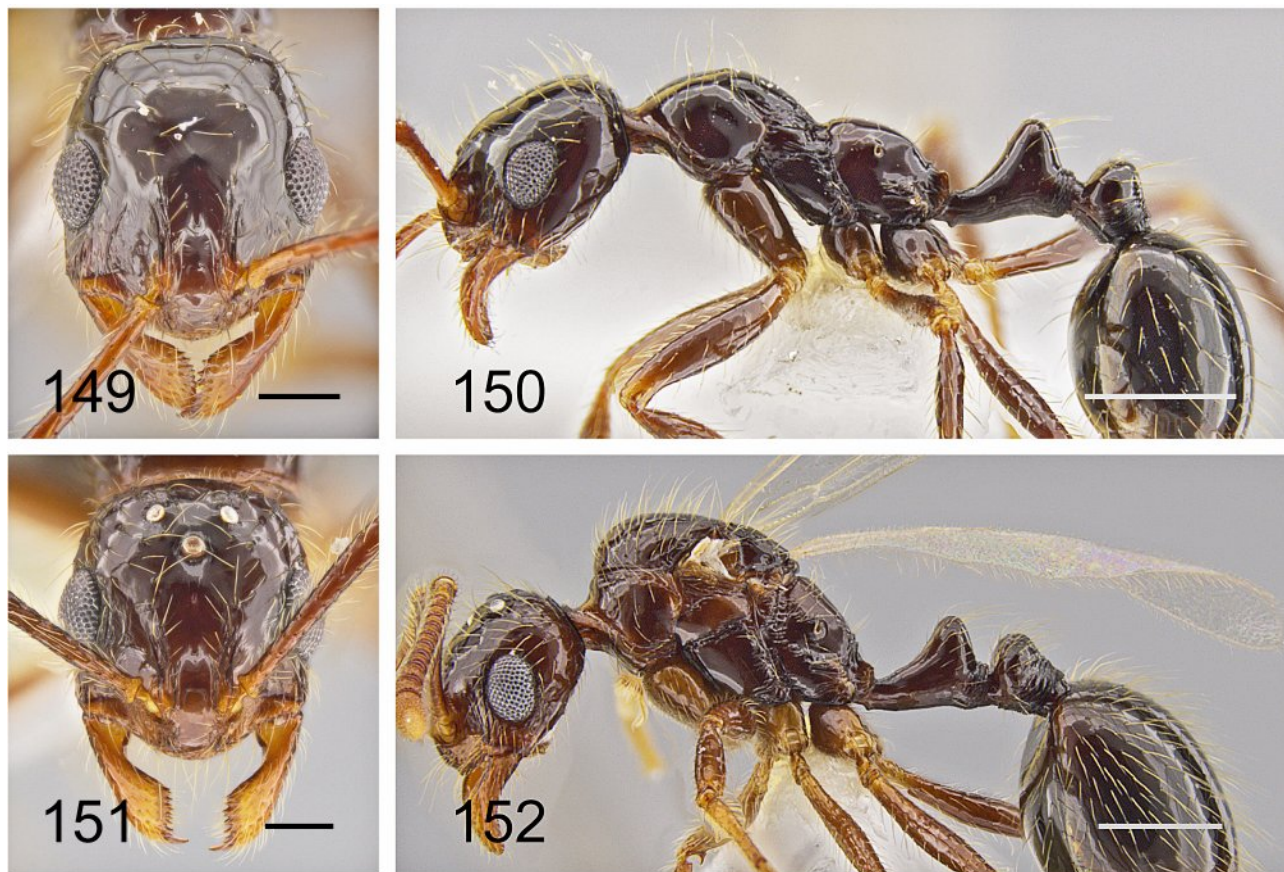
strongly convex and grading to linear apically; apex triangular; ventral margin only slightly obscuring apicodorsal angle of cuspis. Valviceps less than half as tall as long, subrectangular; dorsal margin linear, curving somewhat abruptly to apex and continuing evenly through ventral margin; ventral margin linear; penisvalvar teeth short and close-set.

**Comments.** The male of *M. mondaboroides* differs from *M. mondabora* and *M. male 01* by the following: (1) antenna entirely white; (2) occipital carina not visible in full-face view; (3) frontal and occipital carina weak. Differing from all other Central American *Megalomyrmex* by the following combination of characters: small (ML < 2.0 mm, HW < 1.0 mm), crossvein 1m-cu and apical abscissa of M absent.

Workers of *Megalomyrmex mondaboroides* were observed to have very sparse or no ocular setae, while the male's compound eyes were glabrous.

**Biology.** Recently studied in the laboratory, this thief ant species nests separately from their *Cyphomyrmex costatus* Mann host colony (fig. 245) and periodically conducts raids. During raids, the *C. costatus* workers remain still, hide in the fungal substrate, or flee. The raid is led by *M. mondaboroides* scouts where several workers follow each other to the garden then quickly graze on the fungus garden and take brood back to their nest. With access to a small host subcolony and brood supplements from *Sericomyrmex*, *Trachymyrmex*, and *Acromyrmex*, a *M. mondaboroides* colony can live for at least 2 ½ years in the laboratory. Remarkably this species is also associated with *Apterostigma goniodes* Lattke. In 2001, three queens and ~30 workers were found at the bottom of the host cavity and then continued to nest beside and not within the host garden in the laboratory. Although clearly associated with the fungus-growing ants, it is possible this species forages outside the nest, as two workers have been collected in sifted leaf litter (Costa Rica, Longino 2010; Peru, this study).

**Male material examined.** PANAMA, Panamá: El Llano, 9.27956°N 78.9615°W, 300 m, 30 Mar 2001, (*H. Fernández-Marín*#HF010330-50).



**FIGURES 149–152.** *Megalomyrmex mondaboroides* Longino worker (INB0003622334) and queen (CASENT0631025); full-face view scale bars 0.2 mm, profile scale bars 0.5 mm. **149.** Worker, head in full-face view. **150.** Worker, profile view. **151.** Queen, head in full-face view. **152.** Queen, profile view.

**Female material examined.** COSTA RICA, Heredia: Est. Biol. La Selva, 10°26'N 83°59'W, 40–125 m, 14 Jun 2004 (*TEAM-OET#AMI-1-010-07*). PANAMA, Panamá: Barro Colorado Island, January 1960 (*W.L. Brown & E.S. McCluskey#M-80*). PERU, Madre de Dios: Tambopata Research Center, -13.13993°N -69.62118°W ±100 m, 300 m, 19 Oct 2000, mixed *terra firme* forest, ex sifted leaf litter (*D. Feener#TRC-S11-R2C06*).

**Biology.** Nothing is known of this new species beyond the collection data.

### *Megalomyrmex nocarina* Longino, 2010

(Fig. 32, 153, 154, 241)

*Megalomyrmex nocarina* Longino, 2010: 52, fig. 10. Holotype worker: COSTA RICA, Heredia: Estación Biológica La Selva, 10°26'N 83°59'W, 40–125 m, 16 Sep 2005 (Proyecto TEAM AMI-1-W-044-03) [MCZ] (not examined).

*Measurements* (holotype from Longino 2010): HW 0.70, HL 0.83, SL 0.82, EL 0.23, ML 1.22, CI 84, SI 99.

*Worker* (n=7, plus 9 from Longino 2010): HW 0.66–0.72, HL 0.80–0.88, SL 0.78–0.90, OMD 0.09–0.11, EL 0.22–0.27, ML 1.16–1.34, CI 81–85, SI 97–103, EI 34–38, OMI 34–45.

**Geographic range.** Costa Rica, Panama; sea-level to 1200 m.

**Diagnosis. Worker** Uniquely identifiable among Central American *Megalomyrmex* by the following combination of characters: (1) mandible with 7–10 minute denticles subtending two large apical teeth; (2) katepisternum smooth and shining; (3) occipital carina visible in full-face view; (4) foraminal carina usually absent; (5) postpetiole extremely robust, weakly compressed anteroposteriorly; (6) postpetiolar sternum bulging, minutely dentate anteriorly. (**Queen** and **male** unknown.)

**Comments.** *Megalomyrmex nocarina* species is newly recorded from Panama. Ironically, specimens from Panama have a foraminal carina, contradicting the namesake diagnostic character state. The species is additionally separated from other species in the *mondabora* complex by its long, thin, posterior clypeal portion. Since Longino (2010) little more has been learned about this species and reproductives have yet to be collected.

**Biology.** Nothing is known of this new species beyond the collection data.

**Female material examined.** COSTA RICA, Alajuela: Rio Peñas Blancas, 10°19'N 84°43'W, 800 m, 26–28 Apr 1987, wet forest, ex sifted leaf litter (*J.T. Longino#JTL1579-s*); Guanacaste: 8 km S Santa Cecilia, 10°59'N 86°26'W, 650 m, 24 Jan 1991, wet forest, ex sifted leaf litter (*J.T. Longino#JTL2789-s*); Heredia: 16 km N Vol. Barba, 10°16'N 84°05'W, 1020 m, 4–14 Jul 1986, wet forest, litter sample (*J.T. Longino#1340-s*); Est. Biol. La Selva, 10°26'N 83°59'W, 40–125 m, 3 Feb 2005 (*TEAM#AMI-W-024-01*); Est. Biol. La Selva, 10°26'N 83°59'W, 40–125 m, 16 Sep 2005 (*TEAM#AMI-W-046-04*); Est. Biol. La Selva, 10°26'N 83°59'W, 40–125 m, 6 Dec 2005 (*TEAM#AMI-W-057-03*); La Selva Biol. Sta., 10.41639°N 84.02000°W ±500 m, 50 m, 15 Sep 2001, mature wet forest, ex sifted leaf litter (*TEAM#AMI-1-W-044-03*). PANAMA, Chiriquí: Finca Hartmann, 2 km N Sta. Clara, 15 km NW Hato del Volcan, 8.84478°N -82.76075°W, ± 1 km, 1200 m, 20 May 1977 (*S. Peck & J. Kukulova-Peck#FMNH-INS0000101732*).



**FIGURES 153–154.** *Megalomyrmex nocarina* Longino worker (CASENT0629677); full-face view scale bars 0.2 mm, profile scale bars 0.5 mm. **153.** Head, full-face view. **154.** Profile view.



***Megalomyrmex osadrifti* Boudinot, Sumnicht & Adams sp. n.**

(Figs. 41, 155–158, 241)

**Type material.** *Holotype worker* COSTA RICA, Puntarenas: 13 km SSW Pto. Jimenez, 8.40667°N 83.3283°W ±200 m, 130 m, 10 Mar 2008, tropical rainforest, ex sifted leaf litter (*J.T. Longino*#JTL6209-49) [CASENT0630909, MCZ].

*Paratype workers*: (3) same data as holotype [CASENT0630907, BMNH; CASENT0630908, MZSP; CASENT0630910, USNM].

*Paratype queen*: (1) same data as holotype except #JTL6209-26 [CASENT0630911, MCZ].

**Geographic range.** Osa Peninsula of Costa Rica; sea-level to 300 m elevation.

**Diagnosis.** **Worker** Uniquely identified among Central American *Megalomyrmex* as follows: (1) katepisternum smooth and shining; (2) mandibular teeth, excluding apical two, small and fine; (3) occipital carina not visible in full-face view; (4) eyes of normal development and relatively close to anterolateral corner of clypeus ( $EL > 0.12$  mm,  $OMI < 60$ ); (5) scapes relatively long ( $SI > 90$ ); (6) dorsal and posterior faces of propodeum meeting at broad curve. **Queen** Similarly identifiable as worker, but with less robust petiolar and postpetiolar nodes, alate.

**Description.** **Worker** *Measurements* (holotype): HW 0.50, HL 0.58, SL 0.53, OMD 0.08, EL 0.16, ML 0.77, CI 85, SI 91, EI 33, OMI 49.

*Measurements* (n=5): HW 0.48–0.52, HL 0.56–0.61, SL 0.50–0.57, OMD 0.06–0.09, EL 0.15–0.16, ML 0.73–0.80, CI 83–86, SI 87–93, EI 31–33, OMI 40–57.



**FIGURES 155–158.** *Megalomyrmex osadrifti* sp. n. holotype worker (CASENT0630909) and paratype queen (CASENT0630911); full-face view scale bars 0.2 mm, profile scale bars 0.5 mm. **155.** Worker, head in full-face view. **156.** Worker, profile view. **157.** Queen, head in full-face view. **158.** Queen, profile view.

*Head* Palpal formula 3,2. Basal and masticatory margins of mandible distinct, demarcated by an angle with a small tooth. Mandible with 5–6 teeth; apical two teeth largest, apical tooth slightly longer than subapical; 3–4 basal teeth small, evenly spaced or sometimes crowded somewhat anteriorly, away from basal tooth. Dorsal surface of mandible smooth and shining, interrupted by weak piligerous punctae. Clypeus truncate in profile view, with median seta often raised on a small tubercle. Clypeal carinae present, weak, and parallel until near anterior edge of clypeus. Clypeus, between antennal insertions, narrower than maximum width of scape. Antennal fossa surrounded by 2–3 complete carinulae. Malar area roughened in anterior half, smooth posteriorly. Compound eye with several ocular setae. Compound eye relatively close to lateral clypeal margin (OMI < 40). Scapes relatively long (SI > 90). Occipital carina short, distinct; obscured by vertex in full-face view; extending anteroventrally less than one eighth length of postgenal bridge. *Mesosoma* Katepisternum, promesonotum, and propodeum smooth and shining, excluding 3–4 close-set metapleural carinulae. Metapleural carinulae not reaching meso-metapleural suture. Metanotum deeply incised. Foraminal carina incomplete dorsomedially. Meso- and metabasitarsi tubular. *Metasoma* Petiole and postpetiole predominantly smooth and shining, except for girdling carinulae around posterior bases. Subpetiolar process a broad, truncate denticle in profile view. Postpetiolar sternum weakly dentate anteriorly. Lancets of sting apparatus flattened, narrow, broadening apically. *Setation* Fine; head dorsum with somewhat dilute longer suberect to erect setae in addition to short appressed to decumbent setae; scape with appressed to suberect setae; promesonotum with about 12 setae on each lateral half, about half of these setae long; first gastric tergum with somewhat dilute long subdecumbent to suberect setae in addition to numerous short appressed setae. Head, meso- and metasoma black to dark red-brown; mandibles, antennae, and legs yellow-brown.

**Queen** *Measurements* (n=2): HW 0.58–0.59, HL 0.65, SL 0.57–0.60, OMD 0.08, EL 0.20–0.21, ML 0.95–0.99, CI 0.90, SI 0.89–0.91, OMI 0.38–0.39.

Similar to worker; differing by presence of an alate-condition mesosoma, stronger sculpturation and more pronounced propodeal angle.

**Male** Unknown.

**Etymology.** This species is morphologically similar to *M. drifti* and the Osa Peninsula of Costa Rica is the type locality.

**Comments.** *Megalomyrmex osadrifti* is known from the Puntarenas province of Costa Rica in sympatry with *M. drifti*. Separating *M. osadrifti* from *M. drifti* is relatively easy; in addition to having distinct basal and masticatory mandibular margins, *M. osadrifti* has a well-rounded propodeum and relatively long scapes, whereas *M. drifti* has a dorsolaterally marginate and more angular propodeum. Furthermore, *M. osadrifti* is often larger (ML usually > 0.70 mm, vs. ML usually < 0.70 mm). This new species is separated from *M. megadrifti* by the propodeum shape and the relatively short malar space (OMI < 60). It is possible that this new species corresponds with the “Peruvian variant” described by Kempf (1970), although we have not examined these specimens. The type series of this species was collected by the Tropical Rainforests field program of the Evergreen State College (Olympia, Washington, U.S.A) along a 200 m Winkler transect.

**Biology.** Nothing is known of this new species beyond the collection data.

**Female material examined.** COSTA RICA, Puntarenas: Osa, Rancho Quemado, 8°42'N 83°33'W, 2–300 m, 15 Dec 1990, wet forest, sifted leaf litter (*J.T. Longino*#2760-s); 13 km SSW Pto. Jimenez, 8.40667°N 83.32833°W ±200 m, 130 m, 10 Mar 2008 (*J.T. Longino*#JTL6209-13 & JTL6209-26).

### ***Megalomyrmex reina* Longino, 2010**

(Figs. 159, 160, 242)

*Megalomyrmex reina* Longino, 2010: 53–54, fig. 11. Holotype queen: COSTA RICA, Alajuela: Rio Peñas Blancas, 10°19'N 84°43'W, 800 m, 2 Mar 2004 (*J.T. Longino*#5278-s) [MCZ] (not examined).

*Measurements* (queen: n=2 from Longino 2010, including holotype): HW 0.83–0.85, SL 0.93, HL 0.87, EL 0.28–0.29, ML 1.52–1.58, CI 96–98, SI 106, EI 33–34.

**Geographic range.** Costa Rica; 800 m elevation.

**Diagnosis. Queen** With unique petiolar and postpetiolar morphology: petiolar sternum robustly flanged; postpetiolar sternum with a strong, long median thorn-like process; alate. (**Worker** and **male** unknown.)

**Comments.** Workers and males are as yet unknown for this enigmatic species. We postulate that workers will have similar mandibular dentition and the unique petiolar and postpetiolar morphology of the queen as indicated in Longino (2010).



**FIGURES 159–160.** *Megalomyrmex reina* Longino holotype queen (JTLC000005356, image from AntWeb); full-face view scale bars 0.2 mm, profile scale bars 0.5 mm. Modified from Longino 2010, with permission. **159.** Head in full-face view. **160.** Profile view.

### *Megalomyrmex silvestrii* Wheeler, 1909

(Figs. 8, 27, 29, 31, 46, 50, 53, 78, 93, 161–166, 188, 203, 218, 233, 242)

*Megalomyrmex silvestrii* Wheeler, 1909: 235. Holotype worker: MEXICO, Veracruz: Cordoba [MCZ] (not examined). Senior synonym of *brasiliensis*, *langi*, *misionensis*, *sjostedti*, *wheeleri*: Kempf & Brown, 1968: 97. Full synonymy in Kempf & Brown, 1968. See also: Brandão, 1990: 443; Longino, 2010: 54.

*Measurements* (holotype from Brandão 1990): HW 0.70, HL 0.83, SL 0.94, ML 1.35, CI 84, SI 113.

*Worker* (n=17, plus 30 in parentheses from Brandão 1990): HW 0.60–0.75 (0.60–0.73), HL 0.75–0.94 (0.71–0.88), SL 0.89–1.07 (0.83–1.08), OMD 0.12–0.17, EL 0.18–0.24, ML (1.08–1.45), CI 77–81, SI 110–121, EI 30–33, OMI 60–79.

*Queen* (n=3): HW 0.80–0.86, HL 0.87–0.98, SL 0.97–1.10, OMD 0.15–0.17, EL 0.28–0.31, ML 0.43–1.60, CI 88–91, SI 110–113, EI 35–37, OMI 48–56.

**Geographic range.** Mexico to northern Argentina; widespread in mainland Neotropics. Sea-level to 1100 m elevation.

**Diagnosis. Worker** Unique among Central American *Megalomyrmex* for the mandibular dentition consisting of two large apical teeth subtended by greater than twelve miniscule, equal-sized denticles. Identification confirmed by the following combination of characters: (1) katapisternum smooth and shining; (2) occipital carina visible in full-face view; (3) postpetiolar node robustly globose, attenuated posteriorly; (4) postpetiolar sternum strongly and smoothly bulging; (5) anterior margin of clypeus recessed. **Queen** Identifiable similarly to worker, alate or ergatoid. **Male** Differs from all other Central American *Megalomyrmex* by the specific combination of following characters: (1) crossvein 1m-cu present; (2) scape length shorter than eye length; (3) postpetiole with a ventral bulge; (4) mesosoma gracile.

**Description. Alate queen** *Measurements* (n=3): HW 0.80–0.86, HL 0.87–0.98, SL 0.97–1.10, OMD 0.15–0.17, EL 0.28–0.31, ML 1.43–1.60, CI 88–91, SI 110–113, EI 35–37, OMI 48–56.

**Ergatoid queen** *Measurements* (n=1): HW 0.70, HL 0.83, SL 0.94, OMD 0.13, EL 0.24, ML 1.20, CI 84, SI 112, EI 35, OMI 54.

Similar to worker and alate queen. Differing from worker by having a reduced alate-condition mesosoma, ocelli, and larger compound eyes. Differing from alate queen by having less voluminous and more slanted mesosoma, relatively smaller ocelli and a narrower head.

**Male** *Measurements* (n=2): HW 0.64–0.78, HL 0.61–0.74, SL 0.23–0.29, EL 0.33–0.40, ML 1.06–1.37, CI 103–108, SI 39–40, EI 46–51.

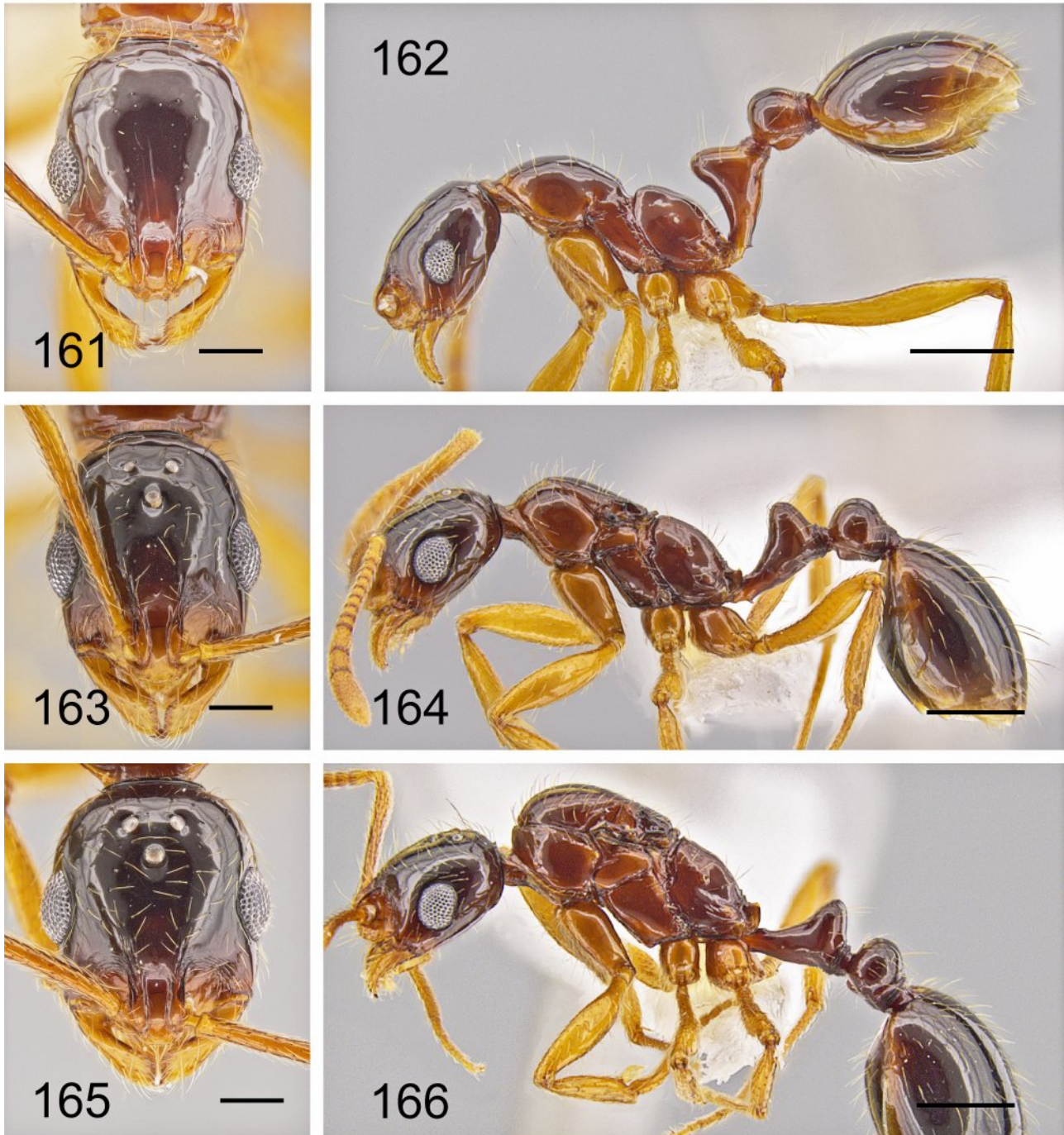
*Head* Antenna with 13 antennomeres; antennomere 3 apically kinked; apical antennomeres not clavate; scape length shorter than eye length. Antennae white, grading into honey yellow apically. Palpal formula 4,2. Mandible triangular; masticatory margin with 8 teeth; apical tooth about twice length of subapical tooth which is about twice length of the remaining basal teeth; 6 basal teeth small, subequal. Dorsal face of mandible smooth and shining, with weak piligerous punctae. Minimum distance between lateral ocellus and compound eye somewhat greater than one lateral ocellus length or about three lateral ocellus lengths in. Occipital carina visible in full-face view. *Mesosoma* Mesosoma attenuate. Notauli absent. Parapsidal lines distinct or weak. Basitarsi tubular. Pterostigma narrow, elongate. Forewing with crossvein 1m-cu; submarginal cell 1 about one third to one fourth as wide as long; terminal abscissa of M branches from Rs+M basad 2r-rs. *Metasoma* Basipetiole carina with distinct lateral and posterior margins or arc-shaped. Ventrolateral longitudinal carina of petiole present. Petiole spiracle placed in anterior fourth. Petiole and postpetiole with girdling carinae or these carinae weak. Postpetiole helcium somewhat elliptical in the horizontal plane. Postpetiole spiracle placed at about midlength of lateral tergal margin or near anterior third. Sternum of postpetiole strongly bulging in anterior half, and sloping posteriorly. Postpetiole tergum convex, with apex posterad midlength. *Genitalia* Abdominal sternum IX lateral margins weakly convex, curving to base of apical triangular lobe; triangular lobe about as long as broad at the base. Telomere short, triangular, acute apex angular; dorsal and ventral margins convex; medial dentiform process absent; medial face weakly crescentiform; ventral margin without sclerotized denticles. Cuspis with weak apicodorsal process; apical margin linear, meeting ventral margin at a narrowly rounded angle. Digitus narrowing subbasally, becoming apicodorsally explanate; explanate apicodorsal margin distinct from relatively narrow apical portion; ventral margin weakly arched; apex bluntly rounded; ventral margin not obscuring apicodorsal angle of cuspis. Valvaceps about half as tall as long, ovate; dorsal margin linear to slightly convex, curving evenly through the apex to the ventral margin; basal half of ventral margin linear to slightly convex; penisvalvar teeth about as long as wide to longer than wide, close-set.

**Comments.** Males of *Megalomyrmex silvestrii* from Nicaragua to southern Mexico were observed to be large and dark, whereas a single specimen from La Selva Biological Station was smaller and paler. Further characters which distinguish the large, dark form from the small, pale form are as follows: (1) lateral ocellus distant from compound eye by slightly more than one lateral ocellus length (vs. about three lateral ocellus lengths); (2) parapsidal line distinct (vs. indistinct); (3) basipetiole carina with distinct lateral and posterior margins (vs. arc-shaped); (4) postpetiole spiracle about midlength of lateral tergal margin (vs. near anterior third); (5) petiole and postpetiole with distinct girdling carinae (vs. weak). This small, pale male could be a representative of a cryptic species of *M. silvestrii*, a situation which would not be too surprising given the numerous synonyms attributed to this species. COI barcode data is in accord with a cryptic species hypothesis (BOLD 2013), although we were unable to discern any morphologically distinct clusters via examination of workers from La Selva and the rest of Central America.

Across the Central American range of *M. silvestrii* workers and queens varied in the erectness of tibial and scape setae, the form of the propodeum, and size and shape of the postpetiole. We could find no pattern of variation indicative of distinct species within *M. silvestrii*. Otherwise, workers and queens were observed to have sparse, short ocular setae. The lancets of the venom apparatus of a worker from Honduras were broad to the apex, which was slightly curved and broadly rounded. The sting shaft subtly widened at the apex, but was not spatulate. An ergatoid queen, along with fully alate queens, were collected in La Ceiba, Honduras (figs. 163 & 164). This queen has a more strongly-slanted mesosomal dorsum, while forewing bases are nub-like and the hindwings are not developed.

**Biology.** Weber (1940) reported three collections of *M. silvestrii* (then reported as *M. wheeleri*; *M. wheeleri* synonymized with *M. silvestrii* by Kempf & Brown 1968) in nests of *Cyphomyrmex costatus* on Barro Colorado Island, Panama. In one nest he found a dealate queen. In a second nest he found a dealate queen and a worker. In a third nest he found three dealate queens and 55 workers. However, Brown (in Kempf & Brown 1968) reported finding four nests, two from Barro Colorado Island, one from Cerro Campana, Panama, and one from Santa Teresa, Brazil, that "were nesting independently of other ants so far as he could tell." Brown's two Barro Colorado nests were "inside a small clod of soil in the leaf litter," and "in a small piece of rotten wood, 10 mm deep and 15 mm wide, also contained many termites." J.L.M. Diniz collected isolated nests of *M. silvestrii* in Betim, Mato Grosso, Brazil (reported in Brandão 1990), and free-living colonies have been collected on Pipeline Road and Barro Colorado Island, Panama. In 1999 a colony was kept for several months in the laboratory and fed *Drosophila* and

honey (RMMA pers. obs.) suggesting predatory tendencies. Kempf and Brown (1968) suggested that the species is "not so much a parasite as it is a mass-foraging predator that specializes in raiding, and sometimes occupying, the nests of small Attini." This raiding behavior, similar to *M. mondaboroides*, was observed in a captive colony with *C. costatus* (RMMA pers. obs.), firmly classifying this species as a facultative thief ant (Kempf and Brown 1968; Adams *et al.* 2012).



**FIGURES 161–166.** *Megalomyrmex silvestrii* Wheeler worker (CASENT0629673), ergatoid queen (CASENT0625330), and alate queen (CASENT0625314); full-face view scale bars 0.2 mm, profile scale bars 0.5 mm. **161.** Worker, head in full-face view. **162.** Worker, profile view. **163.** Ergatoid queen, head in full-face view. **164.** Ergatoid queen, profile view. **165.** Alate queen, head in full-face view. **166.** Alate queen, profile view.

**Male material examined.** COSTA RICA, Heredia: 11 km ESE La Virgen, 10.35°N 84.05°W, 300 m, 15 Feb 2004, montane wet forest, ex. malaise trap (*ALAS#L/01/040*). GUATEMALA, Izabal: 5 km NW Morales, 15.51065°N 88.8609°W ±30 m, 180 m, 18 May 2009, 2° lowland forest, ex sifted leaf litter (*LLAMA#Wm-B-04-1-05*); Petén: Parc. Nac. Tikal, 17.2443°N 89.622°W ±6 m, 270 m, 22–25 May 2009, tropical moist forest, malaise trap (*LLAMA#Ma-B-05-2-02*); Parc. Nac. Tikal, 17.2443°N 89.622°W ±6 m, 270 m, 22–25 May 2009, tropical moist forest, pan trap (*LLAMA#Ft-B-05-2-02*); Cerro Cahuí, 17.0004°N 89.7035°W ±5 m, 140 m, 22–25 May 2009, tropical moist forest, malaise trap (*LLAMA#Ma-B-05-1-02*). MEXICO, Chiapas: Lago Metzabok, 17.124°N 91.6381°W ±10 m, 570 m, 5–8 Jun 2008, lowland wet forest, malaise trap (*LLAMA#Ma-A-06-2-02*). NICARAGUA, Región Autónoma del Atlántico Sur: RN Kakha Creek, 12.6725°N 83.7157°W ±20 m, 30 m, 6–10 Jun 2011, 2° lowland rainforest, malaise trap (*LLAMA#Ma-D-07-2-02*). PANAMA, Panamá: Barro Colorado, 14 May 1980, 18 May 1980, 11 Aug 1980, 4 Jun 1980 (*H. Wolda*).

**Female material examined.** COSTA RICA, Heredia: La Selva Biol. Sta. 10.41639°N 84.0200°W ±500 m, 50 m, 13 Jun 2000 (*TEAM#AMI-1-W-010-08*), 1 Sep 2000 (*TEAM#AMI-1-W-014-012*), 11 Jun 2002 (*TEAM#AMI-1-W-079-02*), 23 Nov 2002 (*TEAM#AMI-1-W-108-07*); La Selva Biol. Sta., 10°26'N 84°01'W, 50–150 m, 2004 (*TEAM-OET#WF/01/18*); Limón: Res. Biol. Hitoy-Cerere, 9°40'N 83°02'W, 500 m, 30 Aug 1985, wet forest, ex sifted leaf litter (*J.T. Longino#970-s*). GUATEMALA, Izabal: 5 km NW Morales, 15.51351°N 88.86647°W ±26 m, 245 m, 17 May 2009, 2° lowland rainforest, ex sifted leaf litter (*LLAMA#Wm-B-04-1-01*); 5 km NW Morales, 15.51021°N 88.86173°W ±30 m, 180 m, 18 May 2009, 2° lowland rainforest, ex sifted leaf litter (*LLAMA#Wm-B-04-1-05*); 5 km NW Morales, 15.51443°N 88.86455°W ±50 m, 250 m, 17 May 2009, 2° lowland rainforest, ex sifted leaf litter (*LLAMA#Wa-B-04-2-42*); 5 km NW Morales, 15.51394°N 88.86544°W ±50 m, 250 m, 17 May 2009, 2° lowland rainforest, ex sifted leaf litter (*LLAMA#Wa-B-04-2-20*); Zacapa: 8.5 km NE Tucultán, 15°04'N 89°41'W, 1100 m, 6 Jul 2007 (*M.G. Branstetter#617-5*). HONDURAS, Atlántida: 12 km SW La Ceiba, 15.69449°N 86.86334°W ±20 m, 200 m, 19 Jun 2010, tropical rainforest, ex sifted leaf litter (*LLAMA#Wa-C-09-1-26*); 12 km SW La Ceiba, 15.6108°N 86.86079°W ±20 m, 280 m, 19 Jun 2010, tropical rainforest, ex sifted leaf litter (*LLAMA#Wa-C-09-2-23*); 2 km SSW Tela, 15.76433°N 87.45664°W ±20 m, 30 m, 15 Jun 2010, 2° tropical rainforest, ex sifted leaf litter (*LLAMA#Wa-C-08-1-18*); 2 km SSW Tela 15.76570°N 87.45567°W ±70 m, 20 m, 16 Jun 2010, old cacao plantation, at bait (*LLAMA#Ba-C-08-3-03-16*); 7 km SSE Tela, 15.72801°N 87.44949°W ±70 m, 130 m, 16 Jun 2010, tropical rainforest, at bait (*LLAMA#Ba-C-08-1-05-12*); Comayagua: P.N. Cerro Azul Meambar, 14.86993°N 87.90479°W ±110 m, 770 m, 21 May 2010, montane rainforest, ex sifted leaf litter (*LLAMA#Wm-C-04-2-01*); P.N. Cerro Azul Meambar, 14.87314°N 87.90297°W ±30 m, 890 m, 22 May 2010, montane rainforest, ex sifted leaf litter (*LLAMA#Wm-C-04-1-07*); Gracias a Dios: Las Marias, 15.69077°N 84.84038°W ±100 m, 40 m, 9 Jun 2010, tropical rainforest, at bait (*LLAMA#Ba-C-07-1-05-15*). MEXICO, Chiapas: Lago Metzabok, 17.12562°N 91.63090°W, 570 m, lowland wet forest, ex sifted leaf litter (*LLAMA#Wa-A-06-1-01*); 8 km SE Salto de Agua, 17.51615°N 82.30164°W ±300 m, 100 m, 14 Jun 2008, 2° wet forest, ex sifted leaf litter (*LLAMA#Wm-A-08-2*); 8 km SE Salto de Agua, 17.51465°N 82.29516°W, 70 m, 41 Jun 2008, 2° wet forest, ex sifted leaf litter (*LLAMA#Wa-A-08-1-11*). NICARAGUA, Chontales: 2.5 km NE Santo Domingo, 12.27641°N 85.06350°W ±100 m, 730 m, 21 Apr 2011, wet forest, ex sifted leaf litter (*J.T. Longino#JTL7365-s*); Región Autónoma del Atlántico Norte: P.N. Cerro Saslaya, 13.76949°N 84.97815°W ±100 m, 290 m, 9 May 2011, tropical wet forest, at bait (*LLAMA#Ba-D-02-2-03-01*); P.N. Cerro Saslaya, 13.76880°N 84.98422°W ±10 m, 360 m, mature wet forest, ex sifted leaf litter (*LLAMA#Wa-D-02-1-19*); Región Autónoma del Atlántico Sur: P.N. Kakha Creek, 12.67260°N 83.71553°W ±10 m, 30 m, 6 Jun 2011, 2° lowland rainforest, ex sifted leaf litter (*LLAMA#Wa-D-07-1-34*); P.N. Kakha Creek, 12.67274°N 83.71541°W ±10 m, 30 m, 6 Jun 2011 (*LLAMA#Wa-D-07-1-38*); Matagalpa: 3 km N Rio Blanco, 12.95458°N 85.23037°W ±50 m, 610 m, 4 May 2011, house clearing, at bait (*J.T. Longino#JTL7486.1*); R.N. Cerro Musún, 12.96075°N 85.23248°W ±10 m, 750 m, 1 May 2011, tropical wet forest, ex sifted leaf litter (*LLAMA#Wa-D-01-1-28*). PANAMA, Changuinola: Corriente Grande, 2 Apr 1980 (*H. Wolda*); Panamá: Canal Zone, Barro Colorado Island, 9°9.794'N 79°50.292'W, 72 m, Jun 2010 (*A. Kay#MsilJun2010*). VENEZUELA, Aragua: Ocumares de la Costa, 10.46009°N 67.77643°W, 70 m, 13 Aug 2008, 2° dry forest, ex sifted leaf litter (*J.T. Longino#6449-s*); Ocumares de la Costa, 10.46097°N 67.77406°W, 20 m, 13 Aug 2008, cacao plantation, ex sifted leaf litter (*J.T. Longino#6450-s*).

## ***Megalomyrmex symmetochus* Wheeler, 1925**

(Figs. 20, 45, 49, 79, 94, 167–170, 189, 204, 219, 234, 242, 250)

*Megalomyrmex symmetochus* Wheeler, W.M. 1925: 168, fig. 5. Lectotype worker (designated by Brandão, 1990: 445): PANAMA, Panamá: Barro Colorado Island, July 1924 (Wheeler) [MCZ] (lectotype examined, USNM workers from type series examined). Wheeler, 1925: 168, description of queen, male. Wheeler, G. & Wheeler, J., 1955: 126, description of larva. See also: Brandão, 1990: 445, and Longino 2010: 55–56 and figs. 3A, D.

*Measurements* (holotype from Brandão 1990): HW 0.73, HL 0.80, SL 0.78, ML 1.15.

*Worker* (n=13, plus 35 from Longino 2010): HW 0.60–0.84, HL 0.75–0.89, SL 0.69–0.84, OMD 0.15–0.19, EL 0.19–0.25, ML 1.03–1.31, CI 88–95, SI 90–96, EI 27–28, OMI 76–84.

*Queen* (n=5, dealate): HW 0.89–0.93, HL 0.86–0.91, SL 0.79–0.84, OMD 0.15–0.16, EL 0.32, ML 1.37–1.49, CI 102–103, SI 90–92, EI 34–35, OMI 46–50.

**Geographic range.** Nicaragua, Costa Rica, Panama, Peru; sea-level to 1070 m elevation.

**Diagnosis. Worker** Uniquely identified by the following two characters: (1) meso- and metabasitarsi extremely anteroposteriorly compressed; (2) postpetiole only slightly wider than tall in posterior view. Otherwise recognizable by the following combination: (1) disc of katapisternum costate; (2) dorsal face of mandible coarsely striate; (3) eye not reduced; (4) malar space largely smooth, not covered with longitudinal carinulae. **Queen** Identifiable similarly to worker, alate. **Male** Recognizable by the following combination: (1) scape long, about as long as head width (SI > 75); (2) crossvein 1m-cu present; (3) postpetiolar sternum distinctly bulging; (4) first gastric tergum setae fine, dense.

**Description. Male Measurements** (n=20): HW 0.68–0.85, HL 0.69–0.84, SL 0.55–0.75, EL 0.37–0.48, ML 1.15–1.50, CI 96–108, SI 78–90, EI 52–59.

*Head* Antenna with 13 antennomeres; antennomere 3 kinked apically; no other antennomeres kinked; not forming a club; scape length distinctly greater than eye length. Entire antenna honey yellow. Palpal formula 3,2. Mandible triangular; masticatory margin with 6–7 teeth; apical tooth more than twice length of subbasal tooth, which may be notched apically; basal teeth decreasing in size from apical tooth. Dorsal face of mandible densely and finely striate. Minimum distance between lateral ocellus and compound eye dimorphic: less than or somewhat greater than one lateral ocellus length. Compound eye with obvious medium-long ocular setae. Occipital carina not visible in full-face view. *Mesosoma* Mesosoma attenuate. Notauli absent. Parapsidal lines weak. Foraminal carina present, may be weak; with about four transverse carinulae dorsad, these may also be weak. Basitarsi weakly flattened anteroposteriorly; metabasitarsus neither kinked nor swollen apically. Forewing crossvein 1m-cu present; submarginal cell 1 about one fourth as wide as long; with terminal abscissa of M branching from Rs distad 2rs-rs. *Metasoma* Basipetiolar carina arc-shaped. Ventrolateral carina of petiole present. Petiolar spiracle in anterior third. Posterior margin of petiole and postpetiole without girdling carinae; postpetiole but with transverse carinae on posterior face. Postpetiolar helcium subcircular. Postpetiolar spiracle placed between anterior third and midlength of tergal lateral margin, on a lateral bulge. Sternum of postpetiole with a blunt triangular process in the anterior half, which slopes strongly to just anterad posterior margin in profile view. Postpetiolar tergum convex, with apex slightly posterad midlength. *Genitalia* Abdominal sternum IX about as long as broad at base; triangular: lateral margins emarginate about midlength and tapering to apex. Telomere short, triangular with rounded apex; dorsal margin concave, ventral margin convex; medial dentiform process absent; medial face subrectangular; ventral margin without sclerotized denticles. Apical margin of cuspis slightly convex; without apicodorsal process. Digitus narrowing subbasally, broadening near apicodorsal bend; dorsal margin somewhat evenly arched to having three linear segments separated by abrupt curves; ventral margin strongly arched, flattened subapically; apex rounded; ventral margin not obscuring apicodorsal angle of cuspis. Valviceps about half as tall as long, ovate; dorsal margin bulging medially, projecting apicodorsally over the apex to rounding evenly through the valviceps apex to the ventral margin; ventral margin weakly sinuate; penisvalvar teeth truncate and close-set.

**Comments.** The males of *M. symmetochus* and *M. adamsae* are quite similar morphologically. *Megalomyrmex* males differ consistently from *M. adamsae* by the following: (1) postpetiolar sternum with a strong, often subrectangular swelling (vs. weakly convex); (2) setae on first gastric tergum comparatively fine and more dense; (3) clypeal setae numerous; (4) ventral face of petiole with several (~3–6 on each lateral side), slightly divergent longitudinal, infrequently curved carinulae (vs. a single median longitudinal carinula flanked by two slightly divergent longitudinal carinulae); (5) digitus broader, more linear apically; (6) penisvalvar apex truncate (vs.

rounded). Although other characters of the petiole and postpetiole show some potential for separating the two species, these characters are either too subtle to observe without direct comparison, or overlap in variation. Geographic variation was also observed; males of *M. symmetochus* from Costa Rica and Nicaragua have longer setae on most body surfaces, including the scapes, legs, and wings, and have less robust petioles and postpetioles than males from Panama. Specifically, regarding the petiole and postpetiole, the nodes and anterodorsal faces are less produced and/or convex.

The worker of *Megalomyrmex symmetochus* differs from those of *Megalomyrmex adamsae* and *fungiraptor* by the following: (1) smaller (HW 0.69–0.72); (2) without distinct dorsal and posterior faces of the propodeum in profile; (3) malar area and posterior face of propodeum without arcing carinae; (4) petiole stout; node at 90° angle to peduncle; anterior and posterior faces with approximately the same slope; (5) anterior face of scape smooth and shining; (6) setae long, fine, and suberect to subdecumbent on first gastric tergum. Additional characters separate this species individually from each of the others. Workers and queens were observed to have ocular setae.

We confirm the range extension of *Megalomyrmex symmetochus* to Costa Rica and Nicaragua by collections of all castes and sexes, while a single male was examined from Peru (specimen at CASC). The worker of *M. symmetochus* was observed to vary intrapopulationally in the intensity of scape, mandible, and propodeal sculpturation, as well as in the form of the propodeum in profile view. Within the Panamanian population the propodeal profile varied from low, with indistinct posterior and dorsal faces, to higher with distinct faces. Some Panamanian individuals had largely smooth anterior scape and lateral mandibular faces; this variant form includes specimens of the type series. Other individuals within the population displayed a gradient from smooth to rough mandibular and scape sculpture, with the single known Costa Rican worker having a more extreme form of this roughened sculpture, especially on the scape. Additionally, this Costa Rican worker has a thinner postpetiole, with a posterior face which slopes evenly to the posterior base, and a longer scape (SI 96 vs. 91–92; other morphometric distinctions indicated in parentheses in measurements data). The evenly sloping postpetiole form was also observed in queens from Costa Rica and Nicaragua.

Intranidal size dimorphism was observed in our sample of males from Panama, having a large and a small class. Mesosoma, eye, and head length scaled linearly, thus any of these metrics may be used to divide the groups cleanly (ML 1.15–1.25 vs. 1.34–1.50; EL 0.37–0.41 vs. 0.45–0.48; HL 0.69–0.72 vs. 0.80–0.84). Besides gross size, the only other distinct external character which distinguishes the groups is the distance between the lateral ocellus and the compound eye. This distance is greater than one maximum lateral ocellus length in the small class, whereas the distance is less than one maximum lateral ocellus length in the large class. With respect to the genitalia, only the form of the telomere and the digitus showed qualitative differences between the classes, although these differences seem to grade as size increases within groups; no clear break was observed in these characters. The apex of the telomere of the larger males in lateral view was more pointed, whereas that of the smaller males was more blunted. In medial view, the digitus was very narrow in the smallest males and broadened allometrically with increase of overall body size, although the base or stem of the digitus did not allometrically broaden. Thus a large male would have a relatively narrow basal shaft compared to the exaggerated anteroposterior breadth of the hook (the mediolateral breadth did not increase allometrically). The cause or function of this dimorphism is unknown. Speculative causes may be environmental, such as the quality and/or quantity of nutrition, or perhaps related to colony developmental stage or age. In any case, observational and molecular data are much needed.

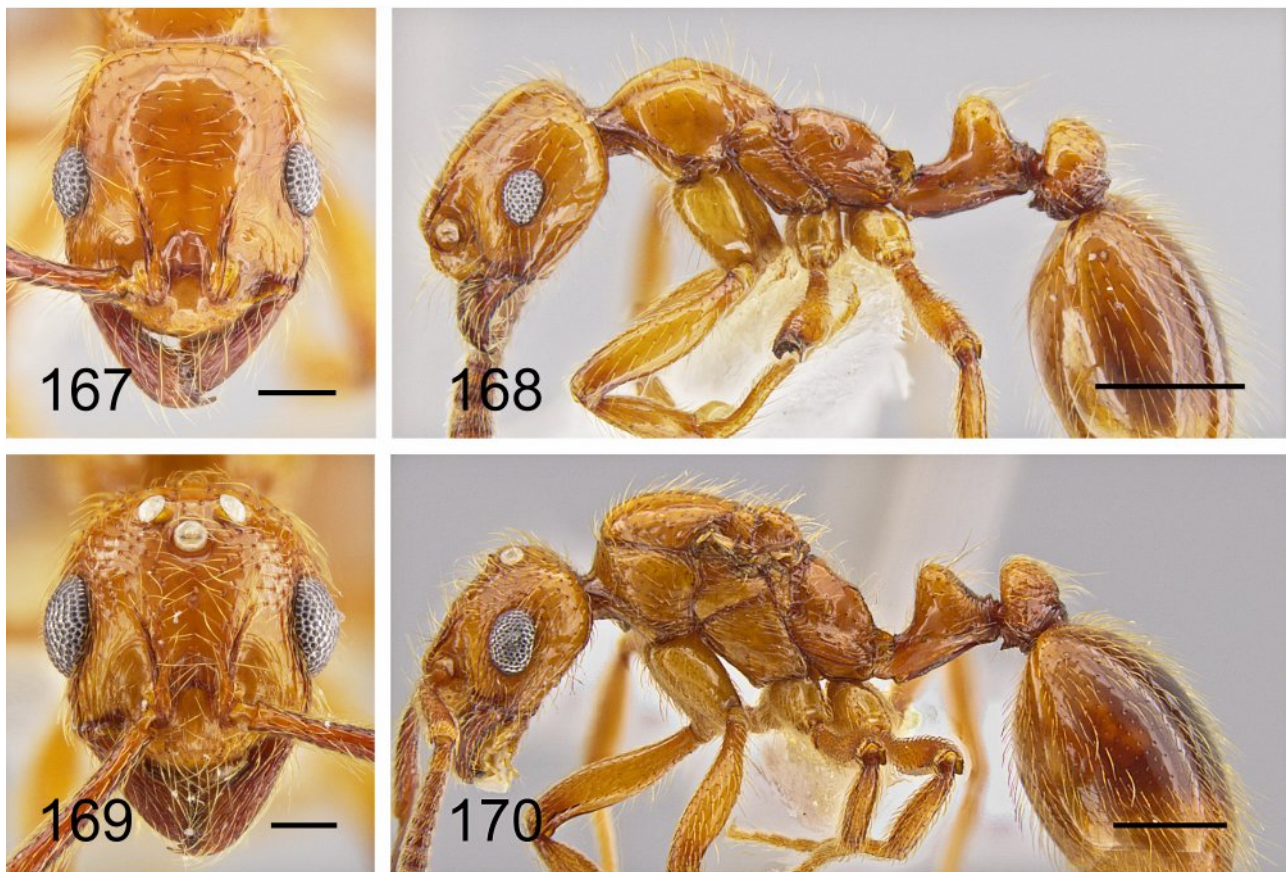
**Biology.** Many colonies of this guest ant social parasite have been collected and observed extensively from 1999 to 2012. This species constructs several cavities throughout the *Sericomyrmex amabilis* fungus garden where they house the queen and brood. Hundreds of parasite workers can be found within a single host colony and in every garden chamber. Parasites can be seen moving from chamber to chamber because the host constructs tunnels in the leaf litter. Most interactions between the two species are amiable (Wheeler 1925) but aggression is sometimes observed in the field and laboratory during the start of the rainy season when the two species are producing sexuals (Adams *et al.* 2013). Like the guest ant parasite *M. adamsae*, *M. symmetochus* workers chew the wings off some of the host female reproductives (fig. 246; Adams *et al.* 2012). *Sericomyrmex amabilis* can effectively kill parasite workers by removing legs and antennae with their strong mandibles, giving this host species the ability to reduce fitness impact by the parasite by “culling” the parasite worker population. Young parasitized host colonies have been collected, although none have been found at the foundress stage.

Kaspari *et al.* (2001) surveyed for alates on Barro Colorado Island, Panama, and found that *M. symmetochus*



peak in alate production in the month of May. Thus future collections in June to August may yield newly infiltrated young host colonies, as has been found in other *Megalomyrmex* species during these months in Panama. Reproductives in Nicaragua (Parque Nacional Cerro Saslaya) were collected by M. Prebus over the course of six days during May in lowland wet forest at 280 m and in montane forest at 1070 m. Notably, the only reproductives of *M. fungiraptor* have been collected during September (at La Selva Biological Station, Costa Rica) suggesting possible temporal reproductive isolation between the two species via differing flight phenologies.

**Male material examined.** NICARAGUA, Región Autónoma del Atlántico Norte: Parq. Nac. Saslaya, 13.77054°N 84.9786°W ±1 km, 290 m, 7–10 May 2011, wet forest, search (*J.T. Longino*#7515-s); P.N. Cerro Saslaya, 13.76912°N 85.02421°W ±30 m, 1070 m, montane wet forest, at mercury vapor lamp (*M.M. Prebus*#MMP0318); P.N. Cerro Saslaya, 13.77016°N 84.97810°W ±30 m, 280 m, tropical wet forest, at mercury vapor lamp (*M.M. Prebus*, 6 May 2011 #MMP0303, 7 May 2011 #MMP0305, 9 May 2011 #MMP0311). PANAMA, Panamá: Barro Colorado, 11 Aug 1980 and 12–18 Jun 1985 (*H. Wolda*); Barro Colorado Island, 2 May 1975 (*C. Toft & S. Levings*); Fort Clayton, 27 Oct 1981 (*R.B. Kimsey*); Parq. Nac. Soberanía, Pipeline Road, 9°9'36.00"N 79°44'41.64"W, 86 m, 29 Jul 2005 (*R.M.M. Adams*#RMMA050729-12b); Parq. Nac. Soberanía, Camino de Plantación, 9°09.786'N 79°44.732'W, 93 m, 4 May 2011 (*R.M.M. Adams*#RMMA110504-03); Parq. Nac. Soberanía, Camino de Plantación, 9°4.605'N 79°39.574'W, 105 m, 10 Jun 2010 (*R.M.M. Adams*#RMMA100610-03); 9°4.705'N 79°39.594'W, 1 May 2011 (*R.M.M. Adams*#RMMA110529-01). PERU: Yurac, 67 mi E of Tingo Maria, 4 Oct 1954 (*E.L. Schlinger & E.S. Ross*).



**FIGURES 167–170.** *Megalomyrmex symmetochus* Wheeler worker (JTLC000015328) and queen (INB0003692962); full-face view scale bars 0.2 mm, profile scale bars 0.5 mm. **167.** Worker, head in full-face view. **168.** Worker, profile view. **169.** Queen, head in full-face view. **170.** Queen, profile view.

**Female material examined.** COSTA RICA, Heredia: La Selva Biol. Sta., 10.4333°N 84.0167°W, 50 m, 4 Aug 1992, lab clearing blacklight (*J.T. Longino*#3319-s); 11 km ESE La Virgen, 10.35° 84.05°W, 300 m, montane wet forest, ex sifted leaf litter (*ALAS*#WF/01/21); La Selva Biol. Sta., 10.43433°N 84.0137°W ±20 m, 50 m, 18 Jun 1993, lowland rainforest, at blacklight (*ALAS*#L/01/044); La Selva Biol. Sta., 10.43433°N 84.0137°W ±20 m, 50

m, 18 Aug 1993, lowland rainforest, at blacklight (ALAS#L/01/060); **Puntarenas**: 15 km SSW Pto. Jimenez, 8.407665°N 83.32801°W ±30 m, 170 m, 7 Mar 2010, mature wet forest, ex sifted leaf litter (J.T. Longino#6901-48); NICARAGUA: **Región Autónoma del Atlántico Norte**: Parq. Nac. Saslaya, 13.77054°N 84.9786°W ±1 km, 290 m, 7–10 May 2011, wet forest, search (J.T. Longino#7515-s); PN Cerro Saslaya, 13.77016°N 84.97810°W ±30 m, 280 m, tropical wet forest, at mercury vapor lamp (M.M. Prebus, 6 May 2011 #MMP0303, 7 May 2011 #MMP0305). PANAMA, **Colón**: Mt. Hope, Canal Zone, 8 July 1924 [mounted with *Trachymyrmex*] (W.M. Wheeler#616); **Panamá**: Barro Colorado, 9 Jun 1980, 23 Jul 1980, 11 Aug 1980, 12–18 Jun 1985 (H. Wolda); Barro Colorado Island, 30 May 1981 (R.B. & LS Kimsey); Barro Colorado Island, 9°9'N 79°51'W, 1991 (M. Kaspari); Barro Colorado Island, 9°9'N 79°51'W, 6 Apr 1994 (J. Pickering#2417); Parq. Nac. Soberanía, Pipeline Road, 9°9'36.00"N 79°44'41.64"W, 86 m, 29 Jul 2005 (R.M.M. Adams#RMMA050729); Parq. Nac. Soberanía, Camino de Plantación, 9°09.786'N 79°44.732'W, 93 m, 4 May 2011 (R.M.M. Adams#RMMA110504-03; also 11 May 2011, A. Illum#A110511-05); Parq. Nac. Soberanía, Camino de Plantación, 9°4.605'N 79°39.574'W, 105 m, 10 Jun 2010 (R.M.M. Adams#RMMA100610-03). PERU, **Tambopata**: Cuzco Amazonica, 15 km NE Puerto Moldonado, 23 Jun 1989, 200 m, terra firme forest, nest at base of large tree in clay, in *Sericomyrmex* colony (S.P. Cover & J.E. Tobin#09-42b).

### ***Megalomyrmex wallacei* Mann, 1916**

(Figs. 11, 13, 60, 80, 95, 171–175, 189, 205, 220, 235, 242, 251)

*Megalomyrmex wallacei* Mann, 1916: 445, plate 3, fig. 28. Lectotype queen (designated by Brandão 1990: 426): BRAZIL, Rondônia: Porto Velho [MCZ] (not examined). Paralectotype worker: same data [MZSP] (not examined). Brandão, 2003: 150, description of male. See also: Brandão, 1990: 426, and Longino 2010: 56.

**Measurements** (n=8; 30 from Brandão 1990 in parentheses): HW 1.04–1.15 (0.98–1.03), HL 1.26–1.44 (1.13–1.18), SL 1.48–1.71 (1.50–1.58), OMI 0.27–0.30, EL 0.33–0.38, ML 1.83–2.06 (1.78–1.85), CI 80–83, SI 116–119, EI 31–33, OMI 80–89.

**Geographic range.** Costa Rica, Panama, Colombia, Guyana, Brazil (Amazonas, Pará, Rondônia, Tocantins); sea-level to 100 m elevation.

**Diagnosis. Worker** Uniquely identified among Central American *Megalomyrmex* by the following combination: (1) mandible with 5 robust, evenly-spaced, subequal triangular teeth; (2) postpetiolar tergum robustly globose, anterior and posterior and anterior faces with about same curvature; (3) postpetiolar sternum strongly and smoothly bulging, without a denticle. **Queen** Similarly identifiable as worker, but with larger gaster, ergatoid. **Male** Recognizable by the minimum presence of the following characters: (1) third antennomere apically flattened and bent; (2) petiolar and postpetiolar nodes strongly globose; (3) postpetiolar sternum strongly and smoothly bulging. Additionally, the blackened piligerous punctae are unique among Central American *Megalomyrmex*.

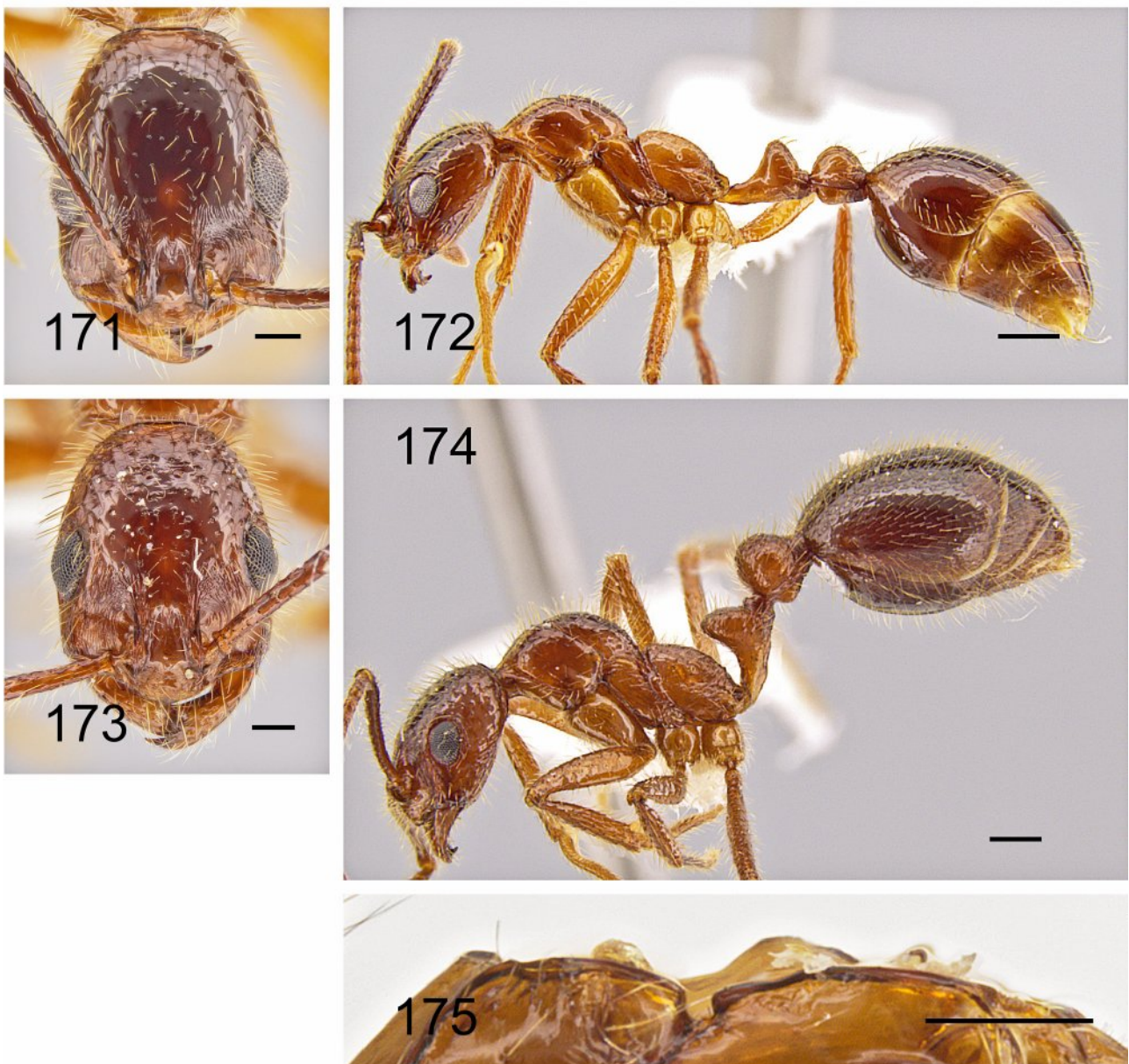
**Description. Ergatoid queen** **Measurements** (n=1): HW 1.11, HL 1.37, SL 1.55, OMD 0.32, EL 0.36, ML 2.00, CI 81, SI 113, EI 32, OMI 90.

Similar to worker, but differing as follows: all sculpturation rougher and more pronounced; setae stouter and denser on all body surfaces; setal punctures slightly raised, giving the cuticle a less-even shine; promesonotal suture distinct and deeply impressed; petiolar node anteroposteriorly thinner; postpetiolar larger, more globose, with a patch of proprioceptor setae on the anterior face; lateral ocelli present, median ocellus absent.

**Male Measurements** (n=5): HW 0.98–1.04, HL 1.02–1.07, SL 0.45–0.47, EL 0.46–0.49, ML 1.85–2.02, CI 96–99, SI 43–46, EI 46–47.

**Head** Antenna with 13 antennomeres; antennomere 3 apically flattened and kinked; antennomeres 4 and 6 basally kinked; apical antennomeres not forming a club; scape slightly shorter than eye length. Antenna yellow-brown to brown. Palpal formula 3,3, although the apical maxillary palpomere is divided into a thicker basal half and thinner distal half with a suture of variable development. Mandible triangular; masticatory margin with 5–6 teeth; apical tooth more than three times as long as subapical tooth; basal teeth approximately equal in size. Dorsal margin of mandible smooth and shining, with piligerous punctae. Minimum distance between lateral ocellus and compound eye about four times one lateral ocellus length. Compound eye with long ocular setae. Occipital carina visible in full-face view. **Mesosoma** Mesosoma attenuate. Notauli absent. Parapsidal lines weak. Foraminal carina complete; entire posterior face of propodeum covered with distinct, concentric carinae. Basitarsi tubular.

Pterostigma reduced. Forewing crossvein 1m-cu absent; submarginal cell 1 about one fourth to one fifth as wide as long; terminal abscissa of M absent. *Metasoma* Basipetiole carina arc-shaped, truncate apically. Ventrolateral carina of petiole absent. Petiolar spiracle just posterad anterior third. Posterior margin of postpetiole with weak to indistinct girdling carinae; postpetiole without girdling carinae. Postpetiolar helcium circular to subcircular. Postpetiolar spiracle placed slightly anterad midlength of postpetiolar lateral tergal margin; not bulging. Sternum of postpetiole convex, bluntly triangular anteroventrally. Postpetiolar tergum globose. *Genitalia* Abdominal sternum IX broader than long, with obtuse triangular lobe at apex; apical lobe not sclerotized or produced ventrally. Telomere triangular with bluntly rounded apex; dorsal and ventral margins only slightly convex; medial dentiform process absent; medial face and very strongly arched. Cuspis without apicodorsal process. Digitus extremely broad; dorsal margin explanate, strongly arching; ventral margin very weakly curved; ventral margin obscuring posterodorsal angle of cuspis. Valviceps about half as tall as long, subrectangular; dorsal margin sloping steeply to the truncate apex; ventral margin distinctly convex, broadest about midlength; penisvalvar teeth elongate.



**FIGURES 171–175.** *Megalomyrmex wallacei* Mann worker and ergatoid queen (CASENT0630962); full-face view and metasternal profile scale bars 0.2 mm; profile view scale bar 0.5 mm. **171.** Worker, head in full-face view (CASENT0630979). **172.** Worker, profile view (CASENT0630979). **173.** Queen, head in full-face view. **174.** Queen, profile view. **175.** Ventral surface of worker mesosoma, inverted profile view with anterior to left (CASENT0631024).

**Comments.** The ergatoid queen of *Megalomyrmex wallacei* may be successfully identified using the worker key presented above. The male is unique among Central American *leoninus*- and *modestus*-group males as follows: (1) posterior face of propodeum completely covered in evenly arcing concentric carinae; (2) ventrolateral carina of petiole absent; (3) postpetiolar tergum strongly and evenly convex; (4) postpetiolar sternum strongly and angularly bulging; (5) piligerous punctures on body blackened.

Unreported characters we observed in the Costa Rican and Panamanian material of *M. wallacei* are: presence of very long ocular setae (longest of any Central American species); postpetiole bulging laterally such that the spiracles are directed ventrally (unique among Central American species of the *leoninus*- and *modestus*-groups) lancets of sting apparatus subequal in length to sting shaft, narrow to apex; sting shaft narrow to pointed apex. Future taxonomic work on *Megalomyrmex* should directly compare South American to Central American material. In addition to differences in sculpturation, and possibly in the shape of the pronotum, Central American specimens are generally larger in all metrics than the South American specimens from Brandão (1990). The elevational range provided in “Geographic range” section supplemented by data from Longino (2010).

**Biology.** In August 2005, colonies of *M. wallacei* were collected at La Selva Biological Station by baiting foraging workers with Keebler Pecan Sandies (n=11). In one observation, a few individuals were capable of clearing a bait station monopolized by hundreds of *Pheidole* workers in a matter of minutes by dispensing their volatile alkaloid-based venom via erratic behaviors such as bucking, gaster flagging, and side-swipe stinging, where the gaster comes from the side rather than tucked under the ant. Colony size ranged from ~50 to 366 females, 0 to 21 males and ~100 to 250 brood. The number of females includes workers and ~3 to 6 ergatoid queens (fig. 247). Most colonies nested in the leaf litter in twigs, between leaves, within old palm leaf petioles, or between the bark and heartwood of a log. On occasion, a colony would nest in the leaves caught at the base of a short palm 10 to 20 cm above ground. Workers quickly flee with brood and move nesting sites following perturbation. Colonies were collected by C. R. F. Brandão with single alate queens near Manaus, Brazil with similar nesting habits (Brandão 2003).

**Male material examined.** COSTA RICA, Heredia: La Selva Biol. Sta., 10.4201°N 84.002°W, 50 m, 15 Apr – 2 May 1993, Malaise (ALAS#M/02/081); La Selva Biol. Sta., near Sarapiquí, 10°25'35.04"N 84°01'32.88"W, 93 m, 19 Aug 2003 (R.M.M. Adams#RMMA030819-06 and RMMA030819-08; also 4 Jul 2005, R.M.M. Adams#RMMA050704-03 & RMMA050704-04).

**Female material examined.** COSTA RICA, Heredia: La Selva Biol. Sta., near Sarapiquí, 10°25'35.04"N 84°01'32.88"W, 93 m, 19 Aug 2003 (R.M.M. Adams#RMMA030819-06 and RMMA030819-08; also 4 Jul 2005, R.M.M. Adams#RMMA050704-03; also 10 Jul 2005, R.M.M. Adams#RMMA050710-02; also 13 Jul 2005, R.M.M. Adams#RMMA050713-02).

### ***Megalomyrmex wettereri* Brandão, 2003**

(Figs. 16, 35, 51, 55, 57, 81, 96, 176, 177, 191, 206, 221, 236, 242, 252, 253)

*Megalomyrmex wettereri* Brandão, 2003: 155, figs. 1–4. Holotype worker: COSTA RICA, Heredia: La Selva, 10°26'N 84°01'W, 50–150 m, 2 Mar 1993 (Wetterer) [MCZ] (paratypes examined). Paratype queen: PANAMA, Darién: km 7 of El Llano Carti Suitupo Road, Panama, 7 Jun 1998 (U. Mueller#980607-01) [MZSP] (not examined). See also: Adams *et al.* 2000: 549–554 (as *Megalomyrmex* sp. n.), and Longino 2010: 57.

*Measurements* (n=3, plus 1 from Longino 2010): HW 0.50–0.52, HL 0.58–0.59, SL 0.49–0.50, OMD 0.12–0.13, EL 0.07–0.08, ML 0.082–0.83, CI 0.87–0.89, SI 0.84–0.85, EI 0.14–0.16, OMI 154–176.

**Geographic range.** Costa Rica and Panama; sea-level to 365 m elevation.

**Diagnosis.** **Worker** Uniquely identified by (1) strongly reduced eyes, with at most 5 ocelli at maximum diameter; (2) katepisternum smooth. **Queen** Presumably identifiable similarly as worker (see comments section below). **Male** Identified by the following combination: (1) forewing 1m-cu present; (2) occipital carina obscured by vertex in full-face view; (3) scape about four to five times longer than pedicel; (4) petiolar sternum smooth and shining.

**Description.** **Male** *Measurements* (n=3): HW 0.46–0.50, HL 0.47–0.52, SL 0.23–0.25, EL 0.24–0.26, ML 0.88–0.89, CI 96–99, SI 47–51, EI 52–53.

*Head* Antenna with 13 antennomeres; no antennomeres kinked, although apical antennomeres may shrivel asymmetrically when dried; apical antennomeres not forming a club; scape length slightly less than eye length.

Entire antenna pale yellow-brown. Palpal formula 3,2. Mandible triangular; masticatory margin with 5–6 teeth; apical tooth about three times as long as subapical tooth; basal teeth approximately equal in length. Dorsal face of mandible finely and densely striate. Minimum distance between lateral ocellus and compound eye about 4 to 5 times one lateral ocellus length. Compound eye with sparse short ocular setae. Occipital carina not visible in full-face view. *Mesosoma* Mesosoma robust. Notauli absent. Parapsidal lines weak to indistinct. Foraminal carina complete; posterior face of propodeum without additional distinct carinae or carinulae. Basitarsi tubular. Pterostigma well-developed. Forewing crossvein 1m-cu present; submarginal cell 1 about one fourth as wide as long; terminal abscissa of M present, branching slightly distad 2rs-rs. *Metasoma* Basipetiole carina a shallow arch. Ventrolateral carina of petiole present, weak. Petiolar spiracle in anterior fifth. Posterior margin of petiole and postpetiole without girdling carinae. Postpetiolar helcium subcircular. Postpetiolar spiracle slightly anterad midlength of tergal lateral margin; without a lateral bulge. Sternum of postpetiole weakly bulging. Postpetiolar tergum convex. *Genitalia* Abdominal sternum IX tapering to long acute triangular lobe at apex; apical lobe not sclerotized or produced ventrally. Telomere short, evenly rounded apically; medial dentiform process absent; medial face weakly crescentiform; ventral margin without sclerotized denticles. Cuspis with distinct apicodorsal process; incised between apicodorsal process and convex apical margin. Digitus narrowed subbasally, broadening to apicodorsal bend; dorsal margin produced dorsoapically, as arched as ventral margin; ventral margin not obscuring posterodorsal angle of cuspis. Valvaceps height somewhat more than half length, wedge-shaped; dorsal margin rounding evenly through apical margin to ventral margin; anterior two thirds of ventral margin almost linear, very weakly convex; penisvalvar teeth close-set, longest near base.

**Comments.** We confirm the palpal count 3,2 for the worker of *M. wettereri*. For a discussion of characters which separate *M. wettereri* workers from those of *M. miri* refer to the “Comments” section of the latter species. We were unable to examine a queen of *M. wettereri*, but predict that the ventrolateral faces of the petiole will be smooth and shining, as in the worker, allowing the queen to be separated from *M. miri*.

**Biology.** This species has been described as a guest ant or an agro-predator, depending on its host choice. It has been collected cohabiting with *Trachymyrmex cornetzi* by Jim Wetterer in 1993 in Costa Rica and from numerous usurped *Cyphomyrmex longiscapus* colonies in Panama (Adams *et al.* 2000; Brandão 2003; Longino 2010). When *M. wettereri* takes over a *Cyphomyrmex* colony the *M. wettereri* workers fill the typically open auricle with soil (fig. 248) allowing them to maintain the garden free of the fungus-growing host workers and stealing most of the fungus garden (fig. 249). Single queens have been collected within usurped gardens suggesting that they are able to infiltrate a colony without the help of workers (Adams *et al.* 2000; RMMA unpubl. data), but larger colonies with >60 workers and up to three queens are typical. An unmistakable behavior exhibited by *M. wettereri* during host colony infiltration and colony disturbance is gaster flagging (<http://youtu.be/Wb8tSLHwcUA>). This behavior is seen in many other *Megalomyrmex* but is most frequently observed and very obvious in this species.

**Male material examined.** PANAMA, Panamá: El Llano Forest, 9°16'46.40" N 78°57'41.40" W, 365m, 30 Mar 2001 (R.M.M. Adams#RMMA010330-01); Parq. Nac. Soberanía, 9°09.778'N 79°44.712'W, 86 m, 8 Aug 2005 (R.M.M. Adams#RMMA050808-02).



**FIGURES 176–177.** *Megalomyrmex wettereri* Brandão worker (INBIOCRI001233214); full-face view scale bars 0.2 mm, profile scale bars 0.5 mm **176.** Head in full-face view. **177.** Profile view.

**Female material examined.** COSTA RICA, Heredia: La Selva Biological Station, 10.43333°N 84.01667°W ±2 km, 50 m, 2 Mar 1993, nr. lab clearing (*J. Wetterer*#LS001483); La Selva Biological Station, 10.43333°N 84.01667°W ±2 km, 50 m, 30 Jul 2010, (*J. Wetterer*#JW93030201).

### ***Megalomyrmex* male 01**

(Figs. 59, 63, 82, 97, 192, 207, 222, 237, 242)

**Geographic range.** Chiapas, Mexico; 980 m elevation.

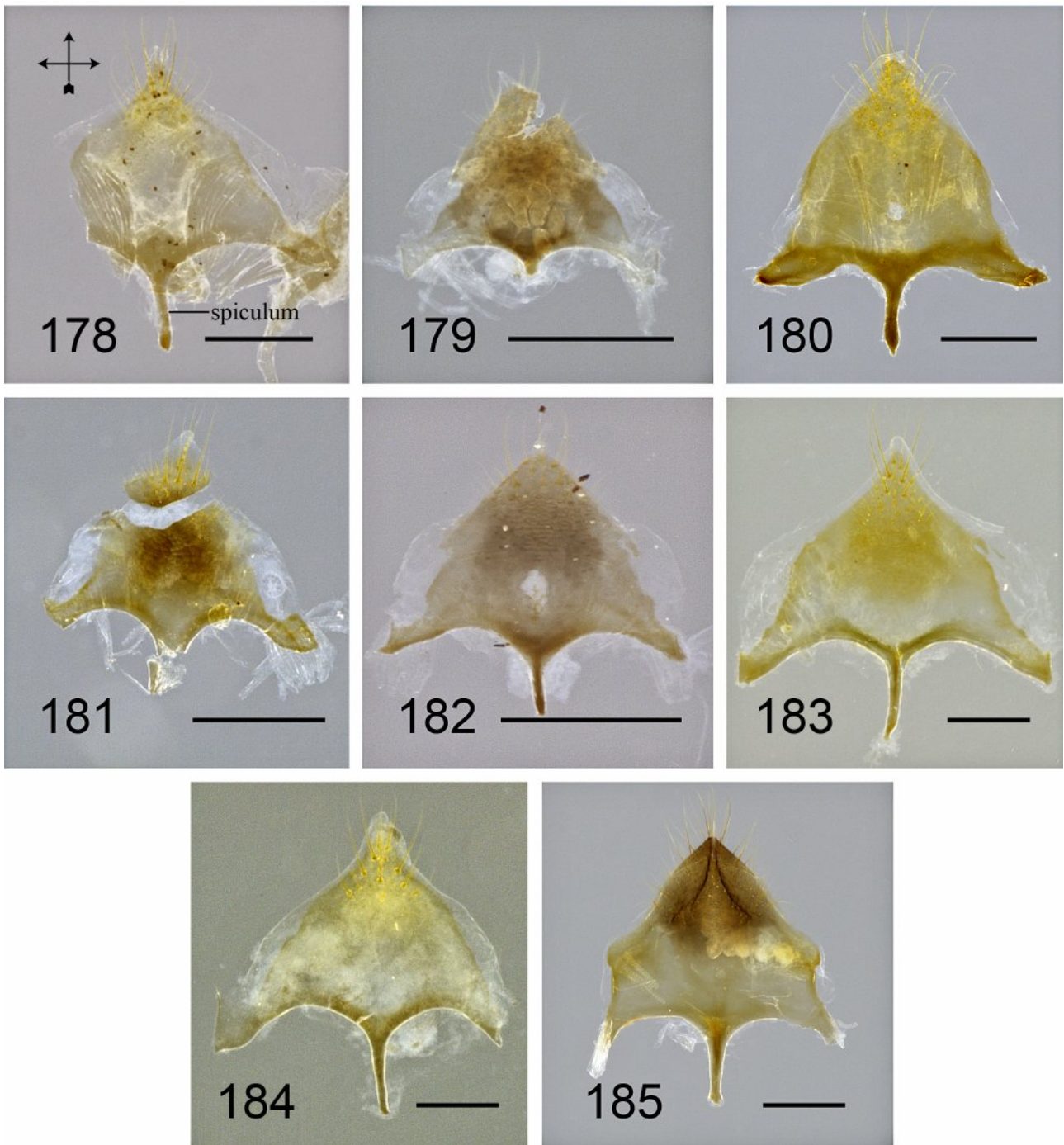
**Diagnosis. Male** Uniquely identified by the following combination: (1) submarginal cell 1 about eight times longer than wide; (2) petiolar and postpetiolar nodes weak; (3) petiolar node without distinct posterior face; (4) tibiae dark brown.

**Description. Male** *Measurements* (n=1): HW 0.73, HL 0.72, SL 0.29, EL 0.33, ML 1.34, CI 101, SI 40, EI 45. *Head* Antenna with 11 or 12 antennomeres; antennomere 3 not apically kinked; base of antennomeres 4 and 6 kinked; apical antennomeres not forming a club; scape shorter than eye length. Antenna brown, except for yellow apex of the terminal antennomere. Palpal formula 4,3. Mandible triangular; masticatory margin with 6 teeth; apical tooth about three times as long as subapical tooth; basal teeth variably shaped and size, but generally small. Dorsal face of mandible smooth and shining, interrupted by piligerous punctae. Minimum distance between lateral ocellus and compound eye about five lateral ocellus lengths. Compound eye glabrous. Occipital carina visible in full-face view. *Mesosoma* Mesosoma somewhat attenuate. Notauli absent. Parapsidal lines indistinct. Foraminal carina incomplete; posterior face of propodeum with 6 or 7 concentric carinulae. Basitarsi tubular. Pterostigma well-developed, elongate. Forewing without crossvein 1m-cu; submarginal cell 1 about one eighth as wide as long; terminal abscissa of M present only as a miniscule appendix near where 2r-rs meets Rs+M; terminal abscissa of M branching from Rs+M after 2r-rs. *Metasoma* Basipetiolar carina present as a semi-circle. Ventrolateral carina of petiole present, distinctly raised. Petiolar spiracle placed in anterior fourth. Posterior margin of petiole and postpetiole without girdling carinae. Postpetiolar helcium circular. Postpetiolar spiracle slightly anterad midlength of tergal lateral margin; weakly bulging. Sternum of postpetiole linear. Postpetiolar tergum flattened; bilobed in dorsal view. *Genitalia* Abdominal sternum IX lateral margins weakly convex, curving into base of apical triangular lobe; triangular lobe longer than wide at the base, acute, not produced ventrally nor distinctly sclerotized. Telomere short, triangular, bluntly rounded apically; medial dentiform process absent; medial face weakly crescentiform; ventral margin without sclerotized denticles. Cuspis apicodorsally produced; apex linear. Digitus base narrow, broadening apically, becoming narrow evenly near apex; dorsal margin evenly and strongly arched, ventral margin weakly and unevenly parabolic; apex rounded; ventral margin not obscuring apicodorsal angle of cuspis. Valviceps height about half the length, subrectangular; dorsal margin linear, curving abruptly at apex through the arched apical margin to meet the ventral margin; ventral margin weakly convex; penisvalvar teeth miniscule, triangular.

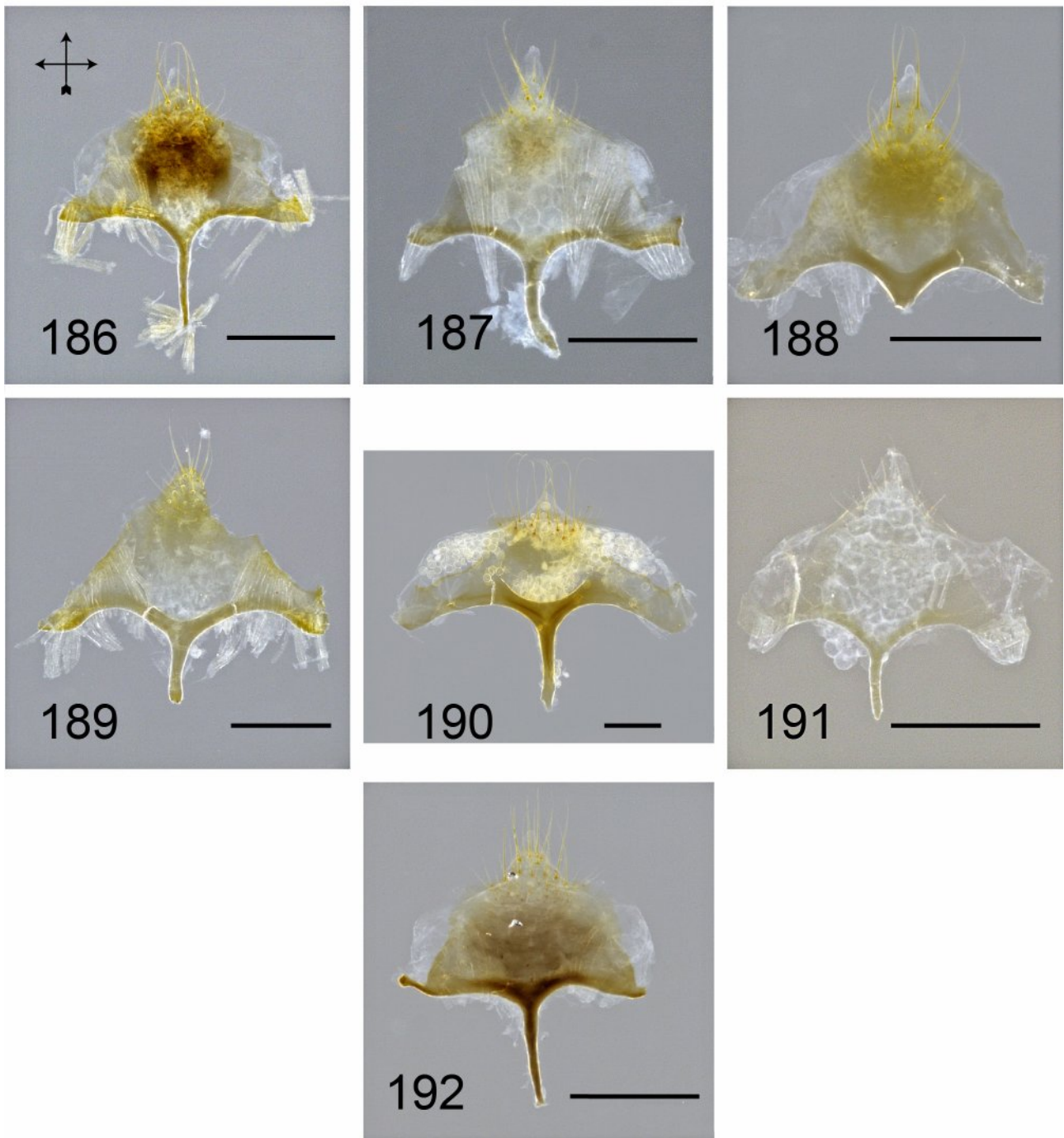
**Comments.** The male described here is almost certainly a new species. It shows the greatest morphological similarity with *Megalomyrmex mondabora*. This morphospecies is distinguished by a narrower head (CI 101 vs. ~110), rougher sculpturation, darker color of body and legs, as well as distinct petiole and postpetiolar shapes. Whereas *M. mondabora* has a bulging postpetiolar sternum and bulbous petiolar and postpetiolar nodes, *M.* male 01 has an approximately linear postpetiolar sternum and much reduced nodes. With respect to the genitalia, *M.* male 01 has a blunter and taller telomere, an apicodorsal cuspal lobe, and a broader digitus.

**Biology.** Mostly unknown, however this single male was collected in June of 2008 via Malaise trap at 900 m in Nahá, Chiapas, suggesting that males fly at this time of year.

**Male material examined.** MEXICO, Chiapas: Nahá, 16.9634°N 91.5934°W ±5 m, 980 m, 9–13 Jun 2008, mesophil forest, malaise trap (*LLAMA*#Ma-A-07-1-01) (CASENT0630020).

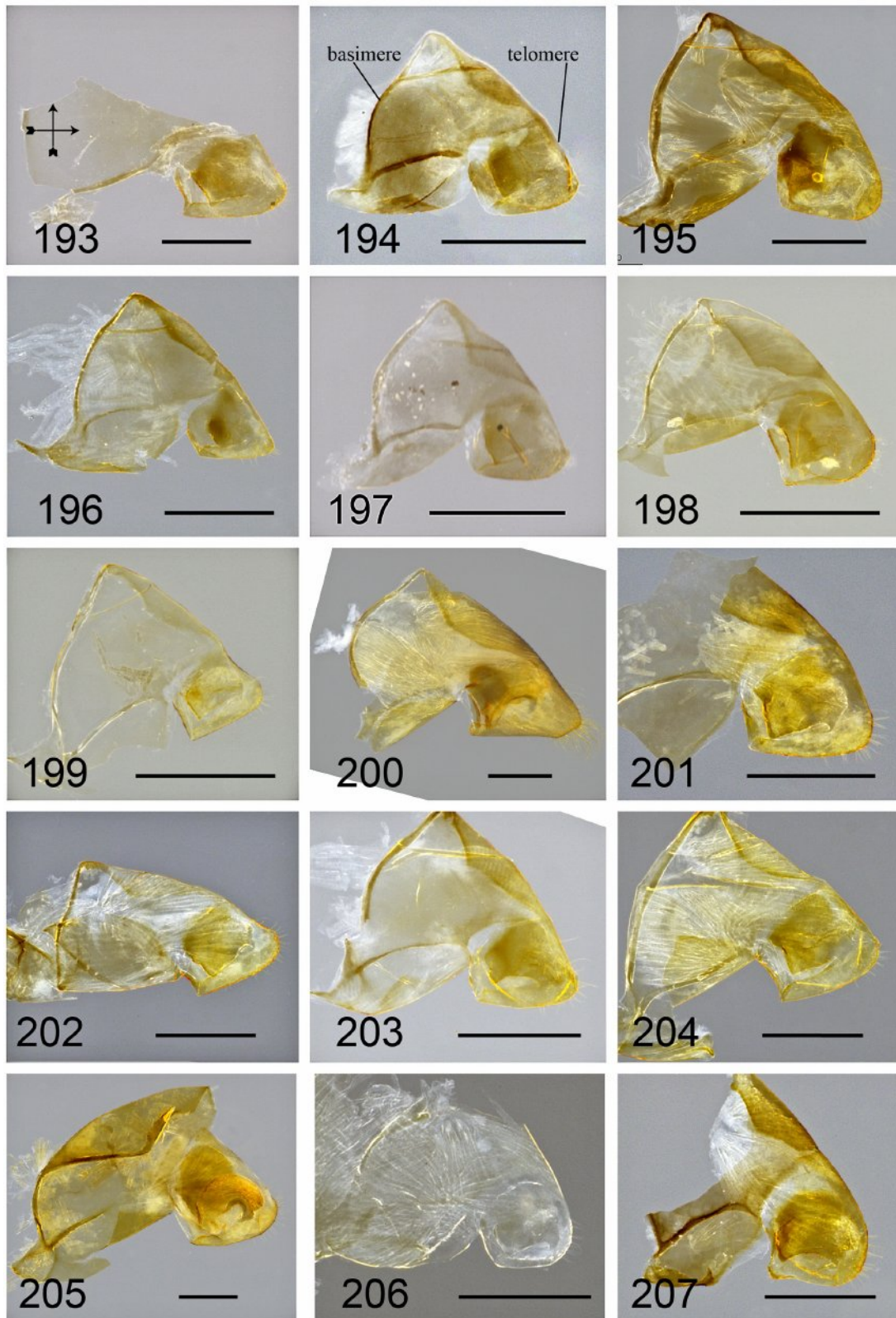


**FIGURES 178–185.** *Megalomyrmex* male abdominal sterna IX, ectal view; scale bars 0.2 mm. Longitudinal arrow pointing from anterior to posterior. **178.** *M. adamsae* (CASENT0631056). **179.** *M. brandaoi* (CASENT0630028). **180.** *M. foreli* (CASENT0615189). **181.** *M. incisus* (CASENT0630026). **182.** *M. megadrifti* (CASENT0630906). **183.** *M. milenae* (CASENT0630869). **184.** *M. miri* (CASENT0630868). **185.** *M. modestus* (CASENT0630038).

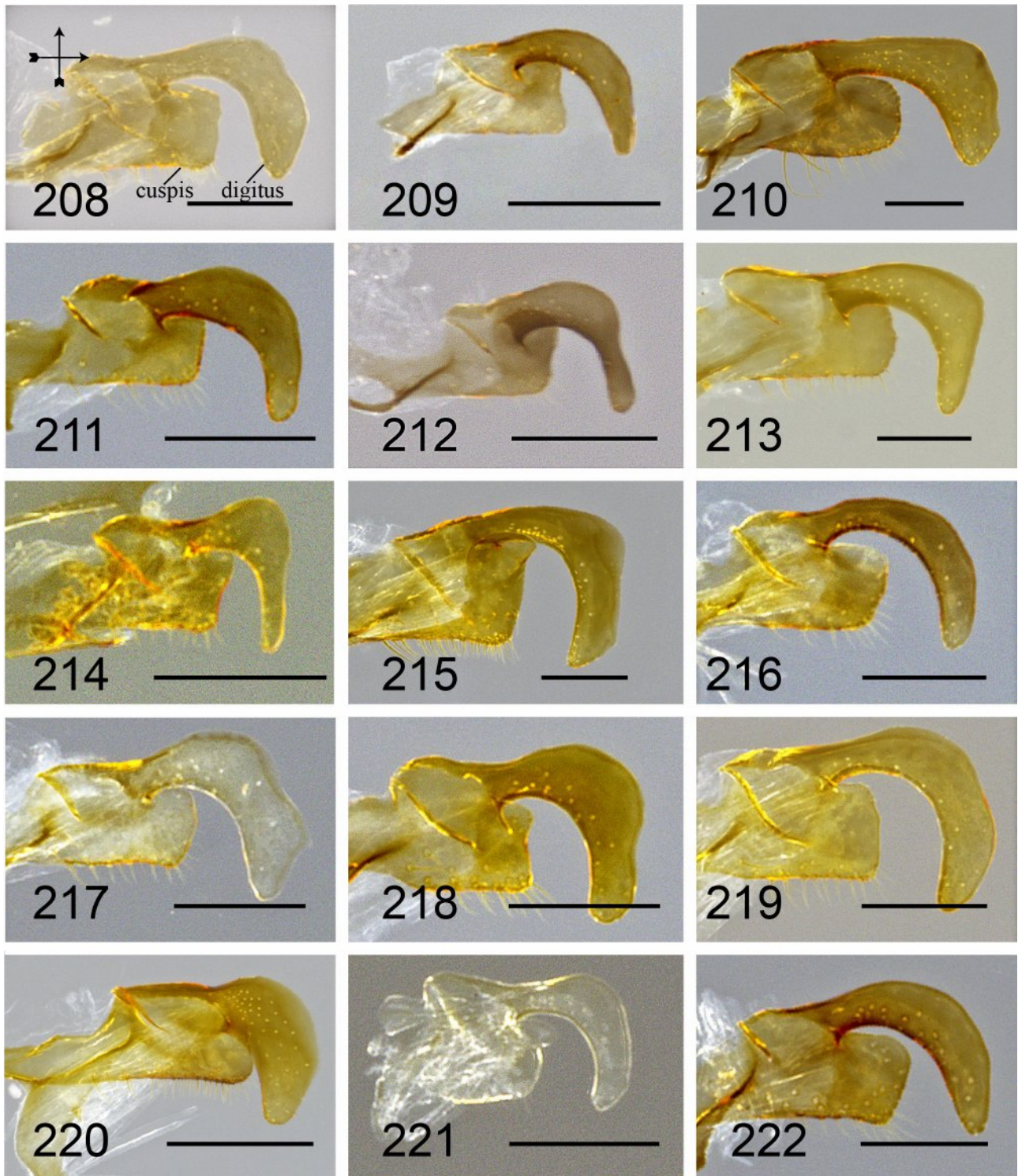


**FIGURES 186–192.** *Megalomyrmex* male abdominal sterna IX, ectal view; scale bars 0.2 mm. Longitudinal arrow pointing from anterior to posterior. **186.** *M. mondabora* (CASENT0630030). **187.** *M. mondaboroides* (CASENT0630046). **188.** *M. silvestrii* (CASENT0630027). **189.** *M. symmetochus* (CASENT0630031). **190.** *M. wallacei* (CASENT0630035). **191.** *M. wettereri* (CASENT0630037). **192.** *M.* male 01 (CASENT0630020).

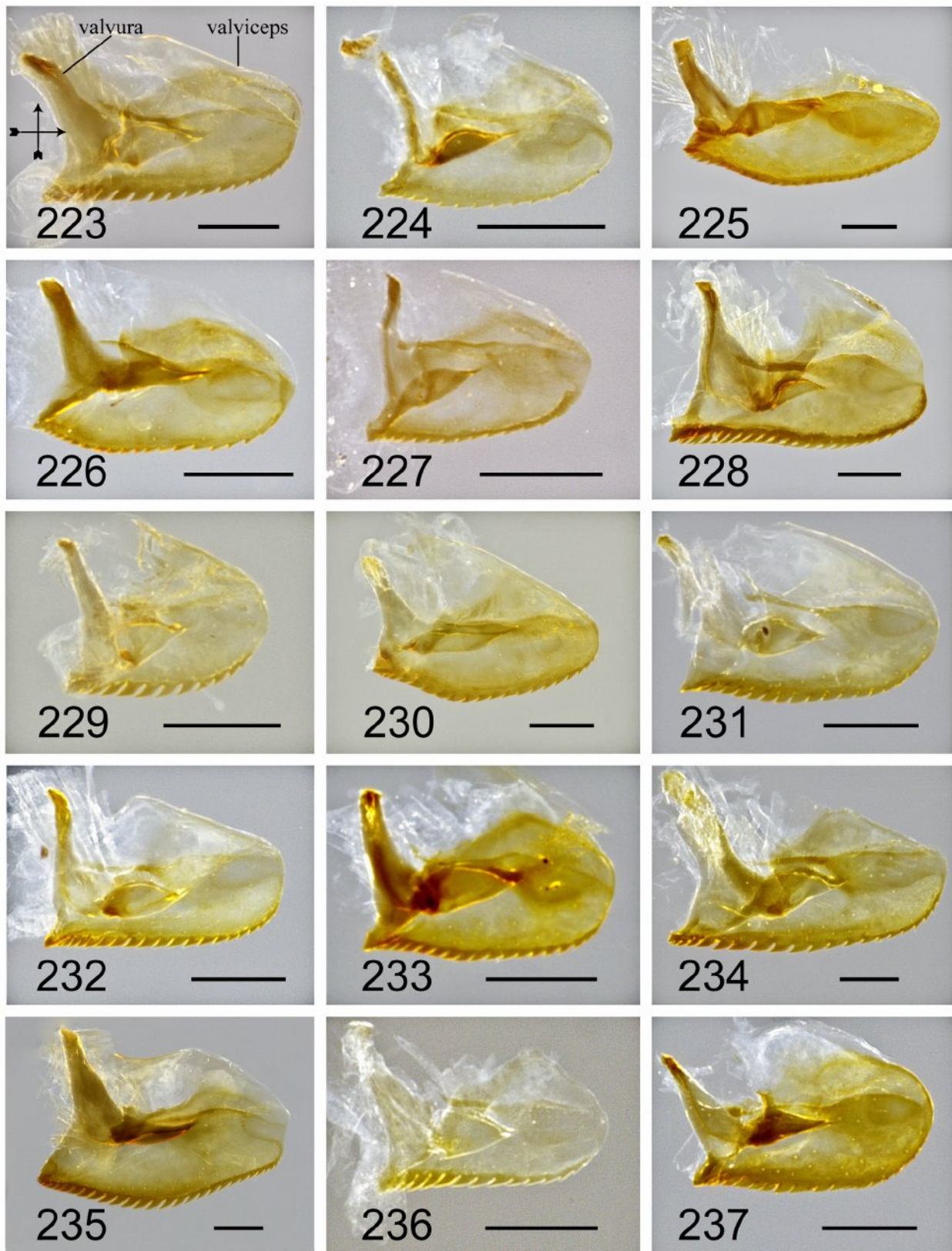




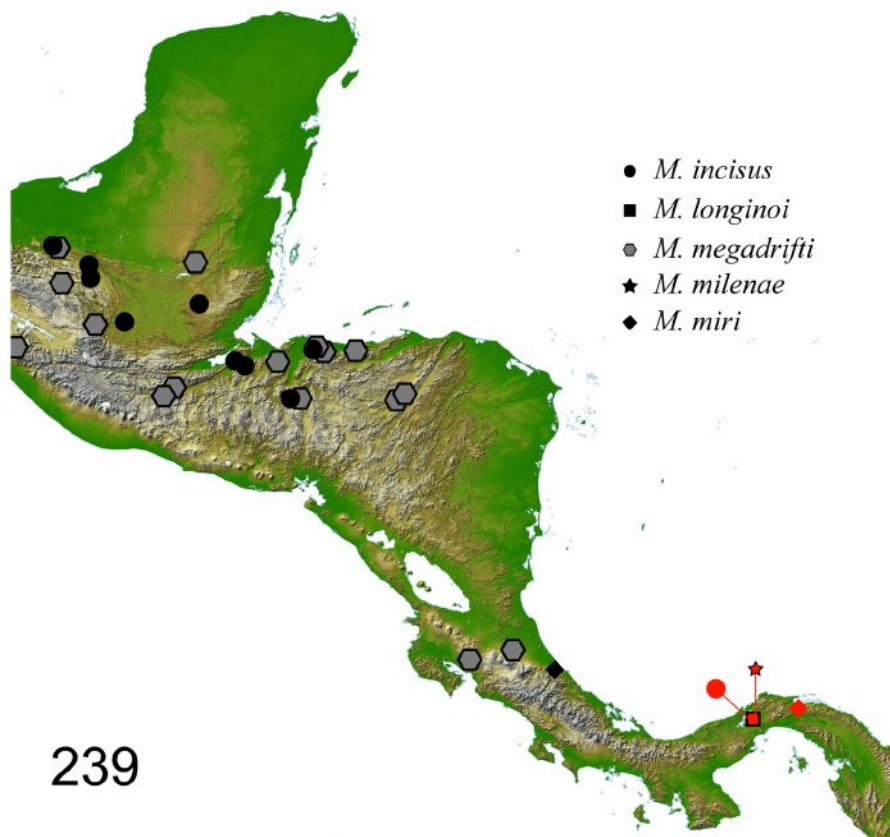
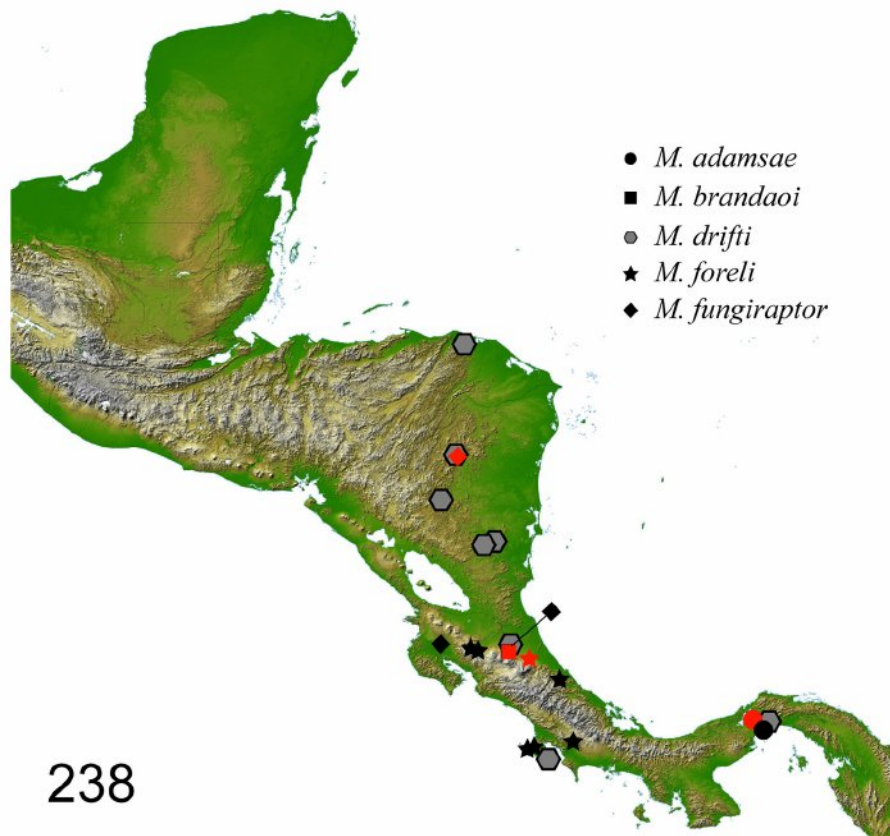
**FIGURES 193–207.** *Megalomyrmex* male parameres, mesal view; scale bars 0.2 mm. Longitudinal arrow pointing from ventral to dorsal, transverse arrow from anterior to posterior. **193.** *M. adamsae* (CASENT0631056). **194.** *M. brandaoi* (CASENT0630028). **195.** *M. foreli* (CASENT0615189). **196.** *M. incisus* (CASENT0630026). **197.** *M. megadrifti* (CASENT0630906). **198.** *M. milenae* (CASENT0630869). **199.** *M. miri* (CASENT0630868). **200.** *M. modestus* (CASENT0630038). **201.** *M. mondabora* (CASENT0630030). **202.** *M. mondaboroides* (CASENT0630046). **203.** *M. silvestrii* (CASENT0630027). **204.** *M. symmetochus* (CASENT0630031). **205.** *M. wallacei* (CASENT0630029). **206.** *M. wettereri* (CASENT0630037). **207.** *M. male 01* (CASENT0630020).



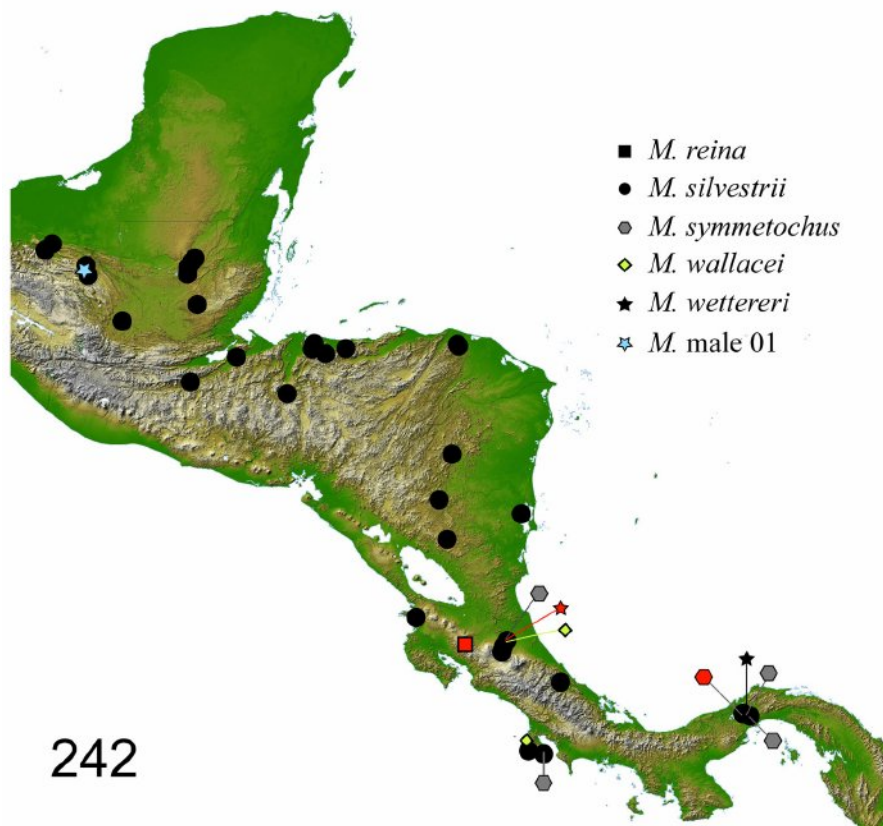
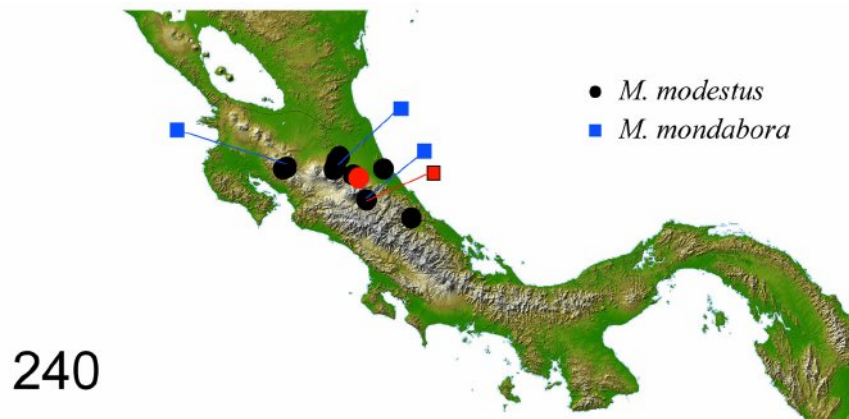
**FIGURES 208–222.** *Megalomyrmex* male volsellae, all medial views except fig. 163 which is lateral; scale bars 0.1 mm. Longitudinal arrow pointing from ventral to dorsal, transverse arrow from anterior to posterior. **208.** *M. adamsae* (CASENT0631056). **209.** *M. brandaoi* (CASENT0630028). **210.** *M. foreli* (CASENT0615189). **211.** *M. incisus* (CASENT0630026). **212.** *M. megadrifti* (CASENT0630906). **213.** *M. milenae* (CASENT0630869). **214.** *M. miri* (CASENT0630868). **215.** *M. modestus* (CASENT0630038). **216.** *M. mondabora* (CASENT0630030). **217.** *M. mondaboroides* (CASENT0630046). **218.** *M. silvestrii* (CASENT0630027). **219.** *M. symmetochus* (CASENT0630031). **220.** *M. wallacei* (CASENT0630029). **221.** *M. wettereri* (CASENT0630037). **222.** *M. male 01* (CASENT0630020).



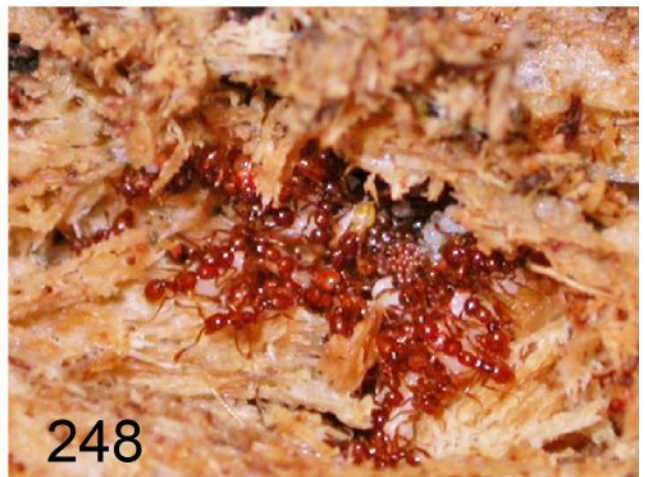
**FIGURES 223–237.** *Megalomyrmex* male penisvalvae, lateral view; scale bars 0.1 mm. Longitudinal arrow pointing from ventral to dorsal, transverse arrow from anterior to posterior. **223.** *M. adamsae* (CASENT0631056) **224.** *M. brandaoi* (CASENT0630028). **225.** *M. foreli* (CASENT0615189). **226.** *M. incisus* (CASENT0630026). **227.** *M. megadrifti* (CASENT0630906). **228.** *M. milenae* (CASENT0630869). **229.** *M. miri* (CASENT0630868). **230.** *M. modestus* (CASENT0630038). **231.** *M. mondabora* (CASENT0630030). **232.** *M. mondaboroides* (CASENT0630046). **233.** *M. silvestrii* (CASENT0630027). **234.** *M. symmetochus* (CASENT0630031). **235.** *M. wallacei* (CASENT0630029). **236.** *M. wettereri* (CASENT0630037). **237.** *M. male 01* (CASENT0630020).



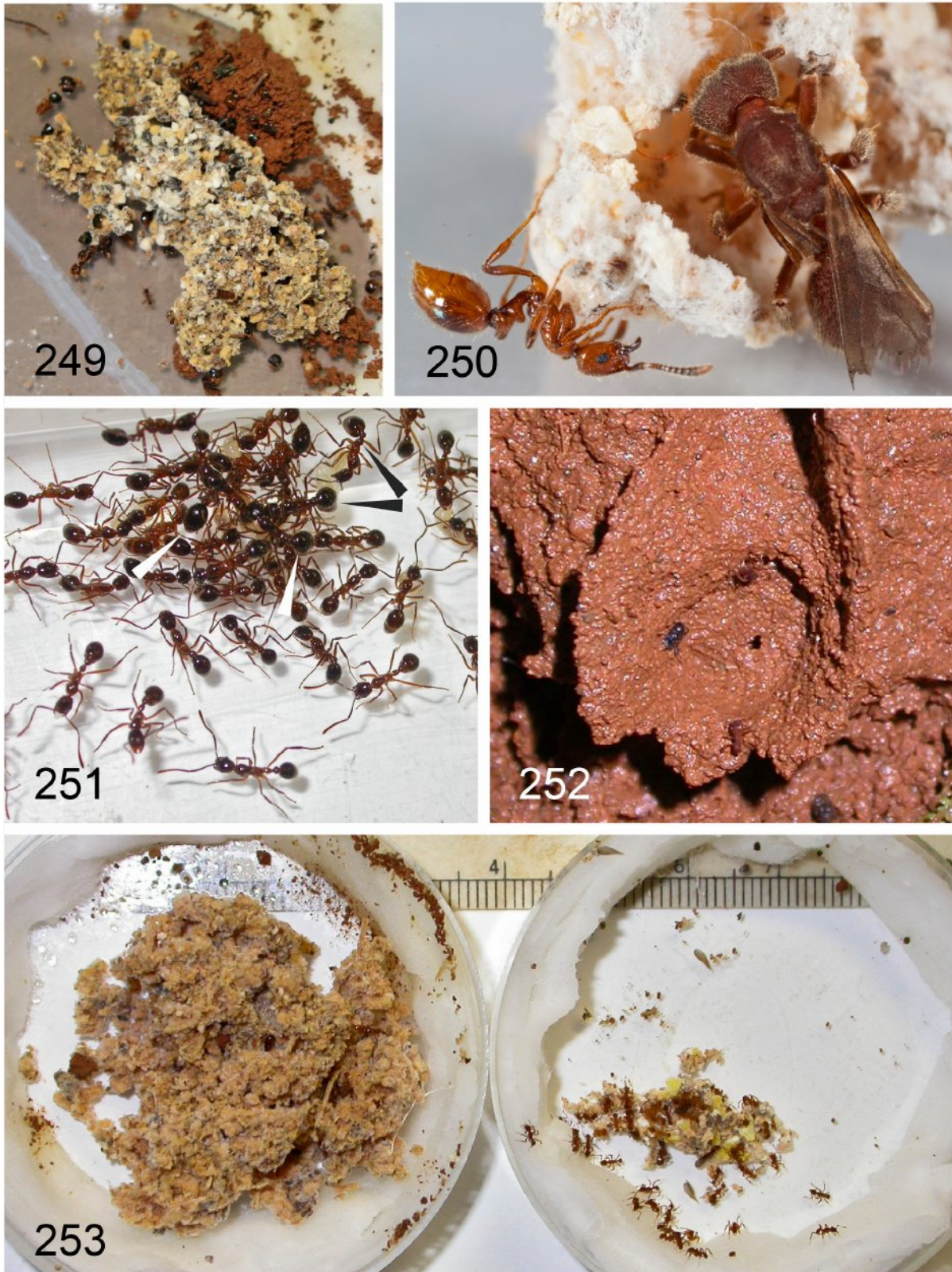
**FIGURES 238–239.** Distribution maps of Central American *Megalomyrmex* species; type localities indicated with red for the respective symbols. **238.** *M. adamsae*, *M. brandaoi* sp. n., *M. drifti*, *M. foreli*, and *M. fungiraptor* sp. n. **239.** *M. incisus*, *M. longinoi* sp. n., *M. megadrifti* sp. n., *M. milenae* sp. n., and *M. miri*.



**FIGURES 240–242.** Distribution maps of Central American *Megalomyrmex* species; type localities indicated with red for the respective symbols. **240.** *M. modestus*, *M. mondabora*; note that specimens of *M. modestus* from Panama have unreferencable locale names, and thus are not mapped. **241.** *M. mondaboroides*, *M. nocarina*, and *M. osadrifti* sp. n. **242.** *M. reina*, *M. silvestrii*, *M. symmetochus*, *M. wallacei*, *M. wettereri*, and *M. male 01*.



**FIGURES 243–248.** *Megalomyrmex* natural history observations. **243.** *M. adamsae* in host *Trachymyrmex zeteki* garden; ruler in metric. **244.** Host *Trachymyrmex zeteki* queen in submissive posture faced with a *M. adamsae* queen (right). **245.** *M. foreli* tending sternorrhynchan scale insects in soil gallery on side of a liana. **246.** Nest entrance of *M. foreli* colony. **247.** Gaster-tip dragging by *M. foreli* worker. **248.** *M. incisus* nest in split log, Ecuador.



**FIGURES 249–253.** *Megalomyrmex* natural history observations. **249.** Nest partitioning of *M. mondaboroides* in host colony of *Cyphomyrmex costatus*; *M. mondaboroides* nest in red dirt clump on upper right, next to host fungus garden. **250.** Wings of virgin *Sericomyrmex amabilis* queen (right) clipped by *M. symmetochus* guest ant (lower left) (photo by J. Liberti). **251.** *M. wallacei* lab colony with four ergatoid queens indicated by two white and two black arrows. **252.** Sealed nest entrance auricle of *Cyphomyrmex longiscapus* (two workers pictured) after nest usurpation by *M. wettereri*. Small black hole is the reduced entrance. **253.** Garden (left) stolen by a *M. wettereri* colony from the *C. longiscapus* colony in right dish; several *C. longiscapus* workers visible in right dish on remnants of their fungus garden; ruler in metric.

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