ABSTRACT

Title of Document: SYSTEMATICS OF THE CRYPTIC FUNGUS-FARMING ANT GENUS *Myrmicocrypta* FR. SMITH, WITH THE DESCRIPTION OF A NEW GENUS AND SPECIES OF FUNGUS-FARMING ANTS (HYMENOPTERA: MYRMICINAE).

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Fungus-farming ants (Hymenoptera: Formicidae) have become model systems for exploring questions regarding the evolution of symbiosis. However, robust phylogenetic studies of both the ants and their cultivars are needed to address whether or not the attine ant symbiosis is a result of strict or diffuse coevolution.

Chapter One, deals with the relationships of the species within the ant genus *Myrmicocrypta*, and their fungal cultivars. Analyses conducted, recovered the genus as monophyletic and the sister group of *Mycocepurus*. In addition, the species *M. tuberculata* was recovered as the sister to the rest of *Myrmicocrypta*. The time-calibrated phylogeny recovered the age of stem-group *Myrmicocrypta* plus its sister group as 35.16 Ma, whereas the inferred age for the crown-group *Myrmicocrypta* was recovered at 30.05 Ma.

Chapter Two, represents the first species-level taxonomic revision of the fungus-farming ant genus *Myrmicocrypta*. *Myrmicocrypta* is distributed in the New World tropics from Mexico to northern Argentina, and, as far as it is known, absent in the Caribbean and in the fossil record. Sixty-five species are recognized, of which 37 are described as new species. The revision includes a taxonomic key to the species of *Myrmicocrypta* based on the worker caste. When possible, descriptions and photographs of the reproductive forms (i.e., queens and males), geographic distribution, and notes on natural history are presented.

Finally, Chapter Three, deals with the description of *Cyatta abscondita,* a new genus and species of fungus-farming ant from Brazil, based on morphological study of more than 20 workers, two dealate gynes, one male, and two larvae. Ecological field data are summarized, including natural history, nest architecture, and foraging behavior. Phylogenetic analyses of DNA sequence data from four nuclear genes indicate that *C. abscondita* is the distant sister taxon of the genus *Kalathomyrmex*, and that together they comprise the sister group of the remaining neoattine ants, an informal clade that includes the conspicuous and well-known leaf-cutter ants. Morphologically, *C. abscondita* shares very few obvious character states with *Kalathomyrmex.* It does, however, possess a number of striking morphological features unique within the fungus-farming tribe Attini. It also shares morphological character states with taxa that span the ancestral node of the Attini. The morphology, behavior, and other biological characters of *C. abscondita* are potentially informative about plesiomorphic character states within the fungus-farming ants and about the early evolution of ant agriculture.

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By

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Dedication

To

Maria del Carmen, Humberto, and Diego

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Chapter 1: Phylogeny and evolution of the cryptic non-leaf-cutting fungus-farming ant genus *Myrmicocrypta* Fr. Smith (Hymenoptera: Formicidae) inferred from molecular data.

1.1. Introduction

Agriculture (i.e., the habitual planting of an immobile cultivar in or on particular substrates, the improvement of the conditions for the crop by the farmer, the harvesting of the crop for food, and the nutritional dependence by the farmer on the crop; (Mueller et al., 2005b; Schultz et al., 2005)) is known to have evolved in only four animal groups: humans, bark beetles, termites, and ants. While agriculture seems to have arisen multiple times in humans ~10000–11000 years ago (Cavalli-Sforza, 2001; Cavalli-Sforza et al., 1996; Diamond, 1997, 1998; Hölldobler and Wilson, 2010; Schultz *et al.*, 2005), in ants this behavior arose a single time, ~50–56 million years ago during the Eocene climatic optimum, in the most recent common ancestor of the *Atta* genus-group within the tribe Attini *sensu lato* (Mueller *et al.*, 2005b; Schultz and Brady, 2008; Ward et al., 2014).

Fungus-farming ants (Formicidae: Myrmicinae: Attini) comprise a group of ~250 exclusively New World species (in 15 known genera) that rely exclusively on the basidiomycete fungi (Agaricales: Leucocoprineae and Pterulaceae) they cultivate for food. In return the ants provide the cultivar with nourishment, proliferation, and protection from competing and pathogenic microbes through behavioral, chemical, and biological control (Quinlan and Cherrett, 1977; Currie and Stuart, 2001; Currie et

al., 1999c; Fernandez-Marin et al., 2009). In addition to the ants and their cultivars, the attine agricultural symbiosis also include an ascomycete fungal crop disease (*Escovopsis*) that is found only in attine fungus gardens (Currie, 2001a; Currie and Stuart, 2001; Currie et al., 2003a; Currie et al., 1999b; Reynolds and Currie, 2004) and that is putatively controlled by antibiotics produced by symbiotic actinomycete bacteria (*Pseudonocardia* and *Amycolatopsis*) growing on the ants' integuments (Currie *et al.*, 1999c; Kost et al., 2007; Mueller et al., 2008; Sen et al., 2009; Wilkinson, 1999). However, Sen *et al.* (2009)) and Mueller et al. (2010) have suggested that (i) secretions from the *Pseudonocardia* and *Amycolatopsis* suppress the fungi cultivated by the ants, (ii) isolates of the *Pseudonocardia* and *Amycolatopsis* showed non-specific action against *Escovopsis*, and (iii) the presence of *Pseudonocardia* on the ant's integument is explained by the continuous colonization from the environment as part of a large microbial community (acquisition model) rather than the *Pseudonocardia* being transmitted vertically (coevolution-codivergence model. There has been controversy regarding both models (Cafaro et al., 2011; Mattoso et al., 2011; Mueller *et al.*, 2008; Mueller *et al.*, 2010; Sen *et al.*, 2009; Caldera and Currie, 2012), but new studies seem to reconcile both views (Andersen et al., 2013; Scheuring and Yu, 2012).

So dependent are the ants on this symbiosis that virgin queens upon leaving their birth nests carry within their infrabuccal pockets a pellet of the original (natal) nest mycelium, which is then used in the foundation of a new colony (Fernandez-Marin et al., 2004; Mintzer and Vinson, 1985; Mueller *et al.*, 2008; Mueller and Rabeling, 2008; Quinlan and Cherrett, 1978; Seal and Tschinkel, 2007; Huber, 1905;

Von Ihering, 1898; Weber, 1972b). In a similar fashion, ant queens are thought to carry the *Pseudonocardia* bacteria from their original nests, thus assuring at least some vertical transmission (Currie *et al.* (1999c); Mueller (2002); Wilkinson (1999). But see Mueller *et al.* (2010); Sen *et al.* (2009)). In spite of this strong association between the attine ants and their mutualists, inter- and intra- specific host-switching has been documented for cultivars, *Escovopsis*, and *Pseudonocardia* (Cafaro and Currie, 2005b; Gerardo et al., 2004; Gerardo and Caldera, 2007; Gerardo et al., 2006a; Gerardo et al., 2006b; Green et al., 2002; Mikheyev et al., 2006; Mikheyev et al., 2007b; Poulsen and Boomsma, 2005; Poulsen et al., 2005). It has been suggested that sharing of cultivar lineages occurs through garden thefts (Adams et al., 2000b) and/or by acquisition of free-living fungi, the latter in the more lower fungus-farming ants (Green *et al.*, 2002; Mikheyev *et al.*, 2006; Mueller et al., 1998b; Vo et al., 2009).

Attine agriculture has been divided into five distinct agricultural systems, characterized by unique associations of ant, cultivar, and crop-disease lineages: (i) lower agriculture (G3), (ii) coral-fungus agriculture (G2, G4), (iii) yeast agriculture (G3), (iv) generalized higher agriculture (G1), and (v) leaf-cutter agriculture (G1) (Schultz and Brady, 2008). Each agricultural system is characterized by morphologically and phylogenetically distinct attine cultivar groups (clades and grades) associated with phylogenetically distinct subsets (clades and grades) of fungus-farming ants (Mueller, 2002). Within the fungus-farming ants, the most well-known group is the one containing the conspicuous, highly derived, leafcutter species (representing approximately 20% of fungus-farming ant diversity), which use fresh

(live) plant material as a substrate for growing their fungal crop, making them important agricultural pests in the tropics. In contrast, the less derived, non-leafcutting fungus-farming ants do not collect fresh plant material but rather use insect frass and other organic detritus on which to grow their fungal cultivars. These less conspicuous, much more poorly known, groups hold the keys for understanding deeper attine evolution. Of these "lower attines," the genus *Myrmicocrypta* is arguably one of the most important for understanding the origin and early evolution of agriculture in ants (Fernandez-Marin et al., 2005; Mueller *et al.*, 2005b; Schultz, 2007; Schultz and Brady, 2008; Schultz and Meier, 1995b).

1.1.1. The fungus-farming ant genus *Myrmicocrypta*

Myrmicocrypta, one of the most poorly known fungus-farming ant genera (Price et al., 2003; Schultz and Brady, 2008; Schultz and Meier, 1995b; Wetterer et al., 1998), is currently regarded as relatively "primitive" for the *Atta* genus group, i.e., to retain many character states considered plesiomorphic for the group, including characters of wing venation (Kusnezov, 1962; Kusnezov, 1961, 1963); male antennae (Kusnezov, 1961); degree of queen/worker polymorphism (Wheeler, 1910); monomorphism of the worker caste (Emery, 1912; Wheeler, 1910); larval morphology, including the form of the galea in some species and straight (rather than curved) body profile (Schultz and Meier, 1995b); position on the integument of mutualistic *Pseudonocardia* Henssen (Actinomycetes) bacterial symbionts (Currie *et al.*, 1999c); and the use, by the nest-founding queen, of her shed

forewing as a platform for the incipient garden (Fernandez-Marin *et al.*, 2004). Based on these characters, some authors have identified *Myrmicocrypta* as the "most primitive" member of the Attini (Emery, 1912; Emery, 1913; Kusnezov, 1955; Schultz and Meier, 1995b; Wheeler, 1910), or have even concluded that it is paraphyletic with respect to the remainder of the tribe (Schultz and Meier, 1995b). More recent molecular phylogenetic analyses, including those of nuclear genes, however, have found it to be monophyletic (Schultz and Brady, 2008; Sosa-Calvo et al., 2013).

The ant genus *Myrmicocrypta* (Formicidae: Myrmicinae: Attini) was established by Fr. Smith (1860) based on an alate gyne collected in São Paulo, Brazil. Currently the genus comprises 31 described species and subspecies (Bolton, 1995; Bolton et al., 2006; Sosa-Calvo and Schultz, 2010), but this number will certainly rise (see Chapter 2), distributed in the Neotropics from Mexico through Northern Argentina (Fernández and Sendoya, 2004; Kempf, 1972). Except for the Republic of Trinidad and Tobago, which is a biotic extension of the mainland, the genus is unknown in the Caribbean (Weber, 1968; Weber, 1958b, a; Wheeler, 1922; Wilson, 1988) or from Dominican Amber (Wilson, 1988); see Kempf (1972) Fernández and Sendoya (2004); Bolton *et al.* (2006) for distributional information.

Colonies of most *Myrmicocrypta* species are small, consisting of as few as 100 individuals (Murakami and Higashi, 1997; Price *et al.*, 2003; Weber, 1945), several hundred individuals (Murakami et al. (2000); Weber (1945); JSC personal communication) or up to ~1600 individuals (e.g. *Myrmicocrypta buenzlii* as reported by Weber (1966)), with a single mated queen per colony (Villesen et al., 1999;

Villesen et al., 2002; Weber, 1972a; Weber, 1979). Nests of *Myrmicocrypta* are most commonly found underground, but at least two species are known to nest in cavities in rotten logs. The nest entrance of the colonies found on the forest floor usually consists of a small mound of soil around an inconspicuous entrance hole (Fernandez-Marin *et al.*, 2005; Weber, 1968; Weber, 1945, 1946, 1947, 1969). Underground colonies vary in the depth at which the fungal chamber is located, usually from ~2 cm to ~100 cm from the surface. Nests usually consist of a single, spherical chamber that contains the fungal cultivar, which is usually found suspended from the ceiling of the chamber by rootlets or by the use of the queen's forewing as platform at the colony founding (Fernandez-Marin *et al.*, 2004). Nests in rotten wood have irregularly shaped chambers and the fungal cultivar does not seem to be suspended from the ceiling of the chamber (Hölldobler and Wilson, 1990; Mann, 1916; Murakami and Higashi, 1997; Murakami *et al.*, 2000; Pagnocca et al., 2010; Weber, 1941b; Weber, 1968; Weber, 1945, 1947, 1969); JSC and TRS personal observation), and, contrary to the ground-nesting species, which have to excavate their chambers, the wood nesting species are thought to used abandoned galleries produced by wood-boring insects, especially beetles. Workers are cryptic foragers in the leaf litter and thus rarely hand-collected in the field.

Myrmicocrypta species reportedly use a wide variety of organic matter as substrates for their fungus gardens, including arthropod frass, wood pellets, insect corpses, seeds, flower parts, dry leaves, and other plant debris (Hölldobler and Wilson, 1990; Leal and Oliveira, 1998; Mueller *et al.*, 2005b; Murakami and Higashi, 1997; Weber, 1968; Weber, 1941b, 1945, 1946, 1947, 1966, 1969; Wheeler, 1922).

The only thorough study to date dealing with *Myrmicocrypta* biology (Murakami and Higashi, 1997) reports that *M. ednaella* Mann garden substrate consists mainly of wood chips and occasional insect corpses and that adult workers feed primarily upon plant nectar and sap, which they share with other workers via trophallaxis. Leal and Oliveira (2000) studied the foraging ecology of attine ants in a Neotropical savanna, estimating the seasonal use of Cerrado vegetation as fungal substrate by fungus-growing ants in Brazil. Their results show that, during the rainy season, *Myrmicocrypta* ants used flowers or fruits whenever these resources were found close to their nest, but when these resources are scarce, during the dry season, the ants switch to different substrates, preferring seeds, insect frass (from defoliating caterpillars and wood-boring beetles) or dead insects (Leal and Oliveira, 2000; Leal and Oliveira, 1998; Leal et al., 2011). Recently, Pagnocca *et al.* (2010) surveyed yeasts associated with the fungal cultivar of *Myrmicocrypta camargoi* (Sosa-Calvo and Schultz, 2010) finding 39 yeast strains, of which 36 were identified as basidiomycete yeasts and three were ascomycetes. Out of the 36 basidiomycete strains, 34 strains were identified as a single new morpho-type, *Trichosporon chiarelli*.

The aim of this study is to infer the phylogenetic relationships of the species in the poorly known ant genus *Myrmicocrypta,* and to infer the relationships of *Myrmicocrypta* to other basally diverging attine species, especially those belonging to the informal 'Paleoattini' group, to inform the early evolutionary history of the ant-cultivar symbiosis, and to provide the basis for a taxonomic revision of the genus.

1.2. Materials and Methods

1.2.1. Ants

Specimens of *Myrmicocrypta* were selected to represent a complete phylogenetic sample of the genus; thus, sampling densely the *Myrmicocrypta* morphospace (Figure 1.1). Initially, 112 specimens belonging to *Myrmicocrypta* (the ingroup) and 84 taxa (the outgroup, spanning both attine and non-attine species) were included to assess the phylogeny of *Myrmicocrypta* (Figure 1.2).

The outgroup taxa were based on previous studies that have dealt with morphology (Schultz and Meier, 1995b), molecular data (Schultz and Brady, 2008; Sosa-Calvo *et al.*, 2013), or a combination of both (Wetterer *et al.*, 1998). The phylogenetic position of *Myrmicocrypta* within the *Atta* genus group was tested by adding new taxa to the alignment of Schultz and Brady (2008). In a second analysis, the number of taxa was reduced to include only the genera in the Paleoattini (i.e., *Apterostigma* Mayr, *Mycocepurus* Forel, and *Myrmicocrypta* Fr. Smith).

Voucher specimens for all extractions (listed in Table 1.1) have been deposited in the insect collection of the Smithsonian Institution's National Museum of Natural History.

1.2.1.1. *Collection of molecular data*

Fragments from six protein-coding genes were employed in phylogenetic analysis in this study: five nuclear genes, *elongation factor 1-alpha F1* (*EF1α-F1*), *elongation factor 1-alpha F2* (*EF1αF2*), *wingless* (*wg*), *long-wavelength rhodopsin* (*LW Rh*), and *Topoisomerase I* (*TOPI*), and the mitochondrial marker *cytochrome oxidase I* (*COI*). Primers used to generate the sequence data are listed in Table 1.2. It was necessary to divide gene regions larger than 1kb in amplified sequence length into at least two overlapping fragments for amplification and sequencing, thus: *EF1α-F1* four fragments, *wg* two fragments, *TOPI* two fragments. Gene fragments *EF1α-F1*, *wg*, and *LW Rh* each contains an intragenic region (intron). All of these gene fragments have been successfully used in multiple studies of ant phylogenetics (Brady, 2003; Brady et al., 2006; Cardoso et al., 2013; Cardoso et al., 2014; Cristiano et al., 2013; Jansen and Savolainen, 2010; Ward et al., 2010, 2014; Ward and Sumnicht, 2012; Branstetter, 2012; Mehdiabadi et al., 2012).

Extraction of whole ant genomic DNA was performed using the Qiagen DNeasy Tissue Kit (Qiagen U.S.A., Valencia, CA) following the manufacturer's protocols. The Qiagen protocol requires cell lysis with Proteinase K digestion (performed in a 24 h period in this study) followed by several steps of DNA binding and purification in mini-column centrifuge tubes. The extracted DNA was eluted from the mini-column in two steps of 50 µL of nuclease-free water each (differing from the Qiagen procedure which calls for 200 µL of AE buffer). At this point, the

eluate (~90 µL) was transfer into clean, sterile, and properly labeled tubes and stored at –20 ºC.

DNA was extracted primarily from adult workers and, depending on availability, adult queens and males. DNA was extracted destructively or non-destructively depending on the number of specimens available. DNA was destructively sampled from individuals that were subsets of nest series (by nest series meaning entire or partial colonies in which multiple developmental stages are observed). In such cases, the whole ant was dried for 30 minutes on a kimwipe (KimTech), then the specimen was placed in a 1.5 mL tube with a new, or previously sterilized, stainless steel bead, and the ant was finely pulverized at 25.0 Hertz for about 30 seconds using a Qiagen TissueLyser RETSCH MM200 (Qiagen U.S.A., Valencia, CA) for rapid cell and tissue disruption. DNA was non-destructively extracted from individuals that were unique or from very limited nest series and/or those individuals that were required for future morphological study. Such individuals were in some cases alcohol-preserved and in other cases pinned. Non-destructive DNA extractions followed normal extraction procedures except that the specimens were left intact and were not grinded prior to cell lysis. During non-destructive extraction procedure, the entire individual was first dried for 30 minutes, then placed directly into a tube with Proteinase K and ATL buffer and gently mixed for 24 h in water bath at 55 ºC. After the 24 h cell lysis process, the complete ant was removed and stored in a vial in 95% ethanol for subsequent cleaning and mounting. The voucher specimens were then cleaned using several washes of soapy water and vinegar or ethyl acetate before point-mounting.

DNA sequences were amplified by conducting polymerase chain reaction (PCR) runs in 25 µL solutions containing 1 µL of template DNA, 1 µL of each primer (forward and reverse), 12.2 µL of H_2O, 5 µL of 5x buffer, 2 µL of dNTPs, 2.5 µL of $MgCl_2$, and 0.3 µL of Taq polymerase (Promega, Maddison, WI) or in 20 µL solutions containing 1 µL of template, 0.8 µL of each primer, 5.4 µL of H_2O, and 10 µL of PCR Master Mix (1.5 mM $MgCl_2$, 0.2 mM of dNTPs, and 1 unit of Taq polymerase) (Promega, Maddison, WI). If the initial PCR amplification failed, then a re-amplification (re-PCR) was implemented using the same volumes as in the original PCR, and in order to increase the likelihood of success, these reactions were done with either one or both primer set being downstream of the original forward or reverse primer obtaining significant better results.

Polymerase Chain Reaction (PCR) amplifications for all genes, except for *LW Rh*, were performed in a thermal cycler set to run the following program: 1 min denaturation at 95 ºC; 34 cycles of 30 s denaturation at 95 ºC, 1 min annealing at 45–60 ºC (depending on primer set), and 1.5 min extension at 72 ºC; 1.5 min final extension at 72 ºC; and unlimited hold at 4–10 ºC. For *LW Rh*, a Touchdown (TD) PCR program was used. This program is same as the program detailed above except that the cycling portion of the program is modified so that for five cycles the annealing temperature is higher (55 ºC) and then the temperature is dropped 0.5 ºC every fifth cycle until reaching the lower temperature (45 ºC) (Korbie and Mattick, 2008). Visualization of PCR products was performed in Ethidium-bromide stained agarose gel (50 mL of 1.5% TBE gel—Tris/Borate/EDTA—and 1 µL of Ethidium

bromide) by running 5 µL of product mixed with 1.5 µL of 6X loading dye and were run for ~30 minutes at 100 volts.

PCR product was then purified by adding 3µL of the enzymatic cleanup reagent ExoSAP-IT® (Affymetrix Inc., Santa Clara, CA; exonuclease I and shrimp alkaline phosphatase), previously diluted in nuclease-free water (9:1), into the remaining 15–20 µL of PCR product; then the solution was run in a thermal cycler for 30 min at 37 ºC, for enzyme to remove unincorporated nucleotides and primers, followed by 15 min at 80 ºC, for enzyme inactivation. The primers employed, in both amplification and sequencing, are listed in Table 1.1. Sequencing reactions used 1 µL of the cleaned PCR product.

Bi-directional sequencing reactions were performed at the Laboratory for Analytical Biology (LAB) of the Smithsonian Institution on an ABI 3100 automated sequencer using ABI BigDye Terminator v3.1 Cycle Sequencing kit (Applied Biosystems Inc., Foster City, CA, U.S.A.). Purified PCR products were primed for sequencing using the same primers as those used during amplification. Sequence data were assembled and edited using the program Sequencher v.4.10.1 (Gene Codes Corp., Ann Arbor, MI, U.S.A.). All new sequences will be deposited in GenBank.

1.2.1.2. *Alignment and phylogenetics*

Initially, all genes were aligned using the program MAFFT v.7 (Katoh et al., 2009; Katoh et al., 2002; Katoh and Standley, 2013; Katoh and Toh, 2010) as implemented in Geneious v.6.1.6 (Biomatters Ltd., Auckland, New Zealand). Non-

coding regions were removed from the outgroup taxa in order to maximize the number of informative sites for the ingroup taxa. Translation to amino acids in MacClade v.4.08 OS X (Maddison and Maddison, 2005) was performed for all genes to make sure nucleotide sequences were not out of frame.

Alignment was performed again on non-coding regions alone using the online version of the program MAFFT v.7 (Katoh *et al.*, 2009; Katoh *et al.*, 2002; Katoh and Standley, 2013; Katoh and Toh, 2010) maintained by the Computational Biology Research Center of the National Institute of Advanced Industrial Science and Technology (AIST, Japan: http://mafft.cbrc.jp/alignment/server/). The alignment was performed using the AUTO strategy, which, depending on the dataset, selects the most appropriate strategy, and the *scoring matrix for nucleotide sequences* was set to 1PAM/ K=2, which is suggested for closely related DNA sequences. For other parameters (*gap opening penalty* and *offset value*) the default settings were used (*1.53* and *0.0*, respectively). Alignment of non-coding regions was performed under the iterative refinement method (*FFT-NS-i*), in which an alignment is obtained first by conducting progressive alignment, then is subjected to an iterative refinement process ((Berger and Munson, 1991; Gotoh, 1993; Katoh *et al.*, 2009; Katoh *et al.*, 2002; Katoh and Standley, 2013; Katoh and Toh, 2010)) that is repeated until either considerable improvement in the weighted sum of pairs (WSP, Gotoh (1995)) is achieved or 1000 iterations (cycles) are reached.

The MAFFT alignment was then submitted to the guide-tree based alignment GUIDANCE web-server (Penn et al. (2010a); http://guidance.tau.ac.il/) with the GUIDANCE algorithm chosen for assessing confidence values to the alignment

(Penn et al., 2010b; Privman et al., 2012). The GUIDANCE algorithm uses a bootstrapped guide tree (100), compares the alignments produced, and computes a confidence score for each position in the alignment. This confidence score is then used to determine what positions in the variable non-coding regions should be excluded (masked) from further analyses. I used an arbitrary, somewhat rigorous, 95% bootstrap value as cutoff to identify sites that were poorly aligned. Then, the alignment was inspected by eye using MacClade v.4.08 OS X (Maddison and Maddison, 2005) searching for sites that seemed poorly aligned (in addition to those sites previously identified by the GUIDANCE algorithm) and, when observed, such sites were also excluded from further analyses.

A concatenated alignment and partitioned strategy was employed to conduct tree inference by using maximum likelihood and Bayesian frameworks. Gene fragments were concatenated in Geneious v.6.1.6 OS X (Biomatters Ltd., Auckland, New Zealand) and inspected by hand in MacClade v.4.08 OS X (Maddison and Maddison, 2005). Partitions were established by two approaches: (i) a user-chosen (subjective) partition scheme and (ii) a program-chosen (objective) partition scheme search.

In the user-chosen (subjective) approach, the concatenated alignment was partitioned in the following schemes: (i) 'partition1,' entire alignment (no subsets); (ii) 'partition5,' which includes 1st and 2nd positions of *COI*, 3rd position of *COI*, introns as a single partition, and 1st and 2nd codon positions of nuclear genes, and 3rd codon position of nuclear genes; (iii) 'partition7,' which consisted of all genes separated and the three introns combined into a single subset (*COI*, *EF1α–F1*, *EF1α–F2*, *LWRh*,

TOP1, *wg*, introns); (iv) 'partition9,' similar to partition scheme 'partition7,' except that each intron formed a separate subset; and (v) 'partition16,' in which each nuclear gene was divided into codon positions 1+2 and codon position 3, each intron fragment formed a separate subset, and *COI* was divided, so each codon position was a separate subset (see Table 1.3). The most appropriate evolutionary model was selected, for each data partition, by using the Akaike Information Crtiterion Corrected (AICc) (Posada and Buckley, 2004) calculated with jModelTest v2.1.4 (Darriba et al., 2012; Posada, 2008, 2009), information summarized in Table 1.3.

In the program-chosen (objective) search, partition schemes were identified by using the program PartitionFinder v1.1.1 (Lanfear *et al.*, 2012) to identify the partition scheme and substitution model that best fit the data, and in this way to avoid over-parameterization, which has been shown to cause strong bias in posterior probability estimation (Lemmon and Moriarty, 2004). PartitionFinder takes into consideration all possible subsets of the data, creating partition schemes that could contain, for example, similar codon positions from different nuclear genes with similar rates and patterns of substitution. In order to do this, all possible partitions for the data to be analyzed are specified as subsets. PartitionFinder then estimates a NJ tree using PhyML 3.0 (Guindon et al., 2010) unless a user tree is given, selects the best substitution model for each subset, calculates the log likelihood for each subset, compares the sum of the log likelihood of the subsets that are used to form a particular partition scheme, and finally selects the partition scheme using AIC, AICc, or BIC. Searches in PartitionFinder were performed using the *"Models of Evolution PartitionFinder*" parameter set as ("*all*") thus identifying models for nucleotide

sequences and comparing 56 models of evolution per subset. Partition schemes were compared by setting the parameter "*model_selection=BIC*," which tends to be more rigorous, penalizing extra parameters (Abdo et al., 2005). Due to the relatively large size of this dataset, the parameter "*Search*" was set to the "*greedy*" algorithm, which performs heuristic searches to find the best partition scheme. Rather than the default NJ tree, a tree resulting from the Bayesian analysis (MrBayes v3.2.2; Ronquist et al. (2012); Ronquist and Huelsenbeck (2003)) of the 'Partition16' (see above) was given to PartitionFinder as "*user_tree_topology*." The 21 predefined data blocks indicating positions 1, 2, and 3 for each gene and non-coding regions (for *EF1aF1*, *wg*, *LW Rh*) were analyzed under the conditions above, resulting in the identification of 10 partition schemes ('10PS') in PartitionFinder (Table 1.4) and are the partitions employed in both Bayesian and Maximum Likelihood analyses. When the model identified by PartitionFinder was not implemented in MrBayes, the next, most complex model available was used. Other searches were conducted for reduced datasets, including removing the introns and/or the mitochondrial marker, resulting in '6PS' (no introns and no COI), '7PS' (no COI), and '9PS' (no introns) (see Table 1.4).

PartitionFinder was also used to identify the best partition scheme under the two approaches listed above (the user-chosen and the program-chosen). Two runs of PartitionFinder were conducted using the '*user*' scheme search, the *BIC* model selection, and selecting '*all*' for models of evolution, one of the two runs was given the tree estimated using the Bayesian analysis of the 'partition16' scheme (see above), and the second run was performed allowing PartitionFinder to estimate the tree using

BioNJ (Gascuel, 1997). In both cases, the partition scheme found by PartitionFinder (i.e., '10PS') was chosen and all analyses described below used this scheme.

Bayesian analyses were performed on the '10PS' dataset using the program MrBayes v.3.2.2 (Ronquist and Huelsenbeck, 2003; Ronquist *et al.*, 2012) with the following settings maintained equal across runs: *nucmodel= 4by4*, *nchains= 8* (seven heated and one cold; temperature parameter set at 0.05), and *nruns= 2*. Branch length priors were shortened as follow: *prset applyto= (all), brlenspr= unconstrained:exponential* (*100*) to avoid known problems with branch-length estimation (Marshall, 2010; Marshall et al., 2006). Parameters *samplefreq*, *ngen*, and *burn-in* varied according to run. All parameters except topology and tree length were unlinked across data subsets by using the command *prset applyto= (all), ratepr= variable*. Burn-in and stationarity were assessed by comparing the mean and variance of log likelihoods, both by eye and by using the Bayes Factor comparison in Tracer v1.5 (Rambaut and Drummond, 2007a); by examination of the PSRF values (should be close to 1.00); by examination of ESS values (should be >200); and by examination of the split frequencies diagnostic (should be close to 0.00). Based on this information, burn-in was set at 1 million generations. Clade support was assessed by combining the post-burn-in trees in MrBayes and used to generate a 50% majority-rule consensus tree with posterior probabilities (PPs) in PAUP* v4.0a128 (Swofford, 2003) or in FigTree v1.2.3 (Rambaut, 2009).

Maximum likelihood (ML) tree inference was performed using the program Garli 2.0 (Zwickl, 2006, 2011), using parallel processing. The partition strategy ('10PS') used in the Bayesian analysis was used in the ML analysis, and each subset

was assigned the model suggested by PartitionFinder. Unconstrained ML best-tree analyses consisted of 200 replicate searches and were conducted using default settings with the exception of *linkmodels= 0*; *subsetspecificrates= 1*; *topoweight= 0.01*; *brlenweight= 0.002*; and *modweight*= modified according to the number of partitions as 0.0005 x (number of subsets + 1) (as suggested by the author). Branch support was estimated by conducting 1000 bootstraps pseudoreplicates differing from default settings as follows: *genthreshfortopoterm=10000*; *scorethreshforterm= 0.10*; *startoptprec= 0.5*; *minoptprec= 0.01*; *brlenweight= 0.002*; *numberofprecreductions= 1*; *topoweight= 0.01*; *treerejectionthreshold= 20.0*; and *modweight=0.0005 x* (*number of subsets + 1*). These settings increase the speed of the analysis by reducing the rigorousness of each bootstrap run.

Additional tree searches were implemented to test the importance of using different datasets. First, two datasets were analyzed in MrBayes v3.2.2 (Ronquist et al., 2012) and Garli (Zwickl 2006). One dataset did not include *COI* and the other did not include *COI* and intronic regions. These strategies were implemented to overcome possible noise (oversaturation on *COI* and poorly aligned regions in the introns) (Branstetter 2012). Both reduced datasets were analysed in MrBayes and Garli using the same conditions as above. Both datasets were partitioned based on results from PartitionFinder.

Single-gene analyses were performed under Bayesian inference in MrBayes v3.2.2 (Ronquist and Huelsenbeck, 2003; Ronquist *et al.*, 2012) in order to assess the possibility of gene tree conflict and to compare clade support by each gene. Each run consisted 10 million generations with a burn-in of 0.5 million generations (except for

wg in which case, run consisted of 20 million generations with a burn-in of 1 million generations). Partitions for each of these genes were identified by PartitionFinder v1.1.1 (Lanfear *et al.*, 2012) and summarized in Table 1.5. Summary of performance of each gene is presented in Table 1.8, and 50% majority-rule consensus trees for each gene are present in Figure 1.5.

Model testing in jModeltest and PartitionFinder and phylogenetic and divergence analyses were conducted using the Smithsonian Hydra High Performance Computing Cluster (Herndon, VA), the Smithsonian NMNH LAB Topaz Computer Cluster (Washington, DC) and the CIPRES Science Gateway (Miller et al. (2010); http://www.phylo.org/).

1.2.1.3. *Divergence dating*

Divergence dates were inferred using a Bayesian relaxed clock uncorrelated lognormal approach (Drummond et al., 2006) as implemented in the program BEAST v1.7.5 (Drummond and Rambaut, 2007; Drummond et al., 2012) with BEAGLE v1.0 (Ayres et al., 2012). Data partitioning and models of nucleotide substitution were determined using PartitionFinder v.1.1.1 (Lanfear *et al.*, 2012), as in MrBayes analyses described above. A fossil and a secondary date previously estimated by (Schultz and Brady, 2008) were used as calibration points and are described below. BEAST XML files were generated using the complementary program BEAUti v1.7.4 (part of the program BEAST). Substitution models were unlinked, clock and tree models were linked among partitions, and tree prior was set as Yule process (Heled

and Drummond, 2012). The results combine two runs of 1 billion generation each. Burn-in, convergence, and mixing were assessed by examining time series plots and ESS values (>200) in Tracer v1.5 (Rambaut and Drummond, 2007a). Based on this information, burn-in was set at 500 million generations for each run. Topology and divergence times were visualized using FigTree v1.2.3 (Rambaut, 2009).

Since *Myrmicocrypta* is not known from the fossil record, nodes were calibrated using two *Apterostigma* species known from Dominican amber and a secondary date from a previous study (Schultz and Brady, 2008). These dates were assigned a lognormal and normal prior distribution respectively.

Calibration point 1. Apterostigma pilosum-stem-group. Lognormal prior, 39–30–15 (mean 2.7, SD 0.3, zero offset 15.0). The only fossils known, to date, for the Paleoattini are two species belonging to the genus *Apterostigma* (A. *eowilsoni* and A. *electropilosum*) both described by Schultz (2007) from Dominican amber inclusions. The age of Dominican amber has been estimated to be 23–30 MY (lower Miocene to mid Oligocene) by Grimaldi (1995); 15–20 MY (lower Miocene to early middle Miocene) by Iturralde-Vinent and MacPhee (1996) and Grimaldi and Engel (personal communication); 25 MY (Oligocene to Miocene) by Poinar and Poinar (1999); and 16–19 MY (early Miocene) by Lapolla et al. (2013). Since there has been some discrepancy on the dates of the age (see Poinar (2010)), I used 15 MY as a conservative estimate, as did Schultz and Brady (2008).

Root node calibration. Paleoattini. Normal prior, 49–45–41 (mean 45.0, SD 2.5). Schultz and Brady (2008) studied the relationships of the members of the tribe Attini and inferred dates of major splits within the tribe using three fossils, and information from a previous study of all ants, which used 41 calibration points (Brady *et al.*, 2006). Based on their results, I have calibrated the node of the Paleoattini as 45 MY.

1.2.1.4. *Ancestral state estimation*

Ant taxa were assigned single states in three characters, including:

(i) Nesting behavior= 0: underground, 1: in rotten log, and 2: under leaves;

(ii) Fungal cultivar group= 0: group B, 1: group D, 2: group E, 3: group F, 4: group G, 5: group H, 6: group G1, 7: group G2 and, 8: group G4 (information from Mehdiabadi *et al.* (2012); Villesen et al. (2004));

(iii) General agricultural systems= 0: G1, 1: G2, 2: G4, 3: G3 clade1, 4: G3 clade2 (information from Chapela et al. (1994); Schultz and Brady (2008); Villesen *et al.* (2004)).

Species for which information was not available received "unknown" (i.e., "?") state assignments. Species and character-state assignments are listed in Table 1.6. Optimization of character evolution was performed on the Bayesian phylogram obtained with the '10PS' partition scheme of the genus *Myrmicocrypta* and outgroups, under maximum likelihood ancestral-state estimation using the one parameter Markov k-state 1 parameter model (Mk1-est; Lewis (2001)) included in the

StochChar v.1.1 package (Maddison and Maddison, 2006) as part of the program Mesquite v.2.75 (Maddison and Maddison, 2011).

1.2.2. Fungi

Fungal DNA was extracted by placing a small piece of alcohol-preserved tissue (dry and gently squeezed for ~1 minute) in approximately 200 μL of 10% Chelex® 100 Resin (Bio-Rad, Hercules CA) solution. Samples were incubated in a programmable thermal cycler for 1.5 h at 60 ºC and heated for 15 min at 99 ºC. The program was paused at 1 h and samples were mixed by vortexing for 30 s. DNA was then centrifuged at 13000 rpm for 2 minutes. To prevent PCR inhibition from the Chelex beads, the supernatant was removed and placed in new vials and stored at -20 ºC until needed. Tweezers were flamed-sterilized between samples to prevent cross-contamination.

Amplification and sequencing of the internal transcribed spacer (ITS) region followed the methods of Mueller *et al.* (1998b). Primers used for ITS amplification are listed in Table 1.1. In addition, ITS was amplified and sequenced for the first time directly from the ant DNA extraction with at least 50% success. In these cases amplification and sequencing of the ITS gene fragment was conducted as described above.

1.2.2.1. *Alignment and phylogenetics*

DNA sequences of the *Myrmicocrypta* fungal cultivar were incorporated into a large alignment (>440 sequences) of fungal cultivars and free-living Leucocoprineae amassed during the past 10 years by the AntLab at the National Museum of Natural History. The ITS alignment consisted of 1246 aligned nucleotide sites, including indels. The alignment was modeled using the Akaike Information Criterion (AIC) (Posada and Buckley, 2004) as implemented in jModelTest v2.1.4 (Darriba *et al.*, 2012; Posada, 2008, 2009) as a single partition set, resulting in the GTR+I+G nucleotide substitution model.

Bayesian analysis was conducted using MrBayes 3.2.2 (Ronquist and Huelsenbeck, 2003; Ronquist *et al.*, 2012) with *nucmodel= 4by4*, *nruns= 2*, *nchains= 8*, and *samplefreq= 1000* and consisted of 20 million generations with a burn-in of 10 million generations. Known problems with branch-length estimation in MrBayes (Brown et al., 2010; Marshall, 2010; Marshall *et al.*, 2006; Spinks and Shaffer, 2009; Ward *et al.*, 2014) were addressed by setting *brlenspr= unconstrained:Exp(100)*. Burn-in, convergence, and stationarity were assessed using Tracer v1.5 (Rambaut and Drummond, 2007a), by examining PSRF values and '*.stat*' output files in MrBayes, and by using Bayes factor comparisons of harmonic-mean marginal likelihoods of pairs of runs with standard error estimated using 1000 bootstrap pseudoreplicates in Tracer 1.5 (Rambaut and Drummond, 2007a), which employs the weighted likelihood bootstrap estimator of Newton and Raftery (1994) as modified by Suchard et al. (2001).

1.3. Results

1.3.1. Molecular data

After the exclusion of ambiguously aligned regions, the concatenated dataset for all six genes consisted of 5481 bp (including introns: 1470 bp for *EF1aF1*, 1022 bp for *wg*, 547 bp for *LW Rh*, 517 bp for *EF1aF2*, 883 bp for *TOP1*, 1042 bp for *COI*) (Table 1.3). The entire dataset produced 1585 parsimony informative sites (PIS) for all taxa and 1339 PIS for ingroup only taxa, with most signal derived from third codon positions (74% sites for all taxa and 58% sites for ingroup only taxa). Of these 1585 PIS for all taxa, exonic regions of nuclear genes and mitochondrial gene produced 684 and 520 PIS, respectively; whereas for the 1339 PIS for the ingroup only taxa 462 and 495 PIS were produced by nuclear and mitochondrial regions, respectively.

Included non-coding regions (introns) provided the analyses with 176 PIS within the ingroup and exhibit considerable variability (15–37% variable sites (VS)). Of the six gene fragments employed, the mitochondrial gene *COI* is the most variable of the protein-coding genes at all codon positions in all-taxon and ingroup-only datasets (Table 1.3), with 3rd positions the most variable (98% and 96%, respectively). With the exception of 3rd position of *COI*, no other gene fragment departed significantly from base composition homogeneity across taxa.

PartitionFinder analyses comparing the user-selected partitions (Table 1.3) and the best partition scheme obtained by PartitionFinder (Lanfear *et al.*, 2012)

always selected the '10PS' scheme as the best partition scheme given the data. Analyses were conducted by (i) giving PartitionFinder a starting tree (i.e., using the tree from 'Part16') and (ii) by allowing PartitionFinder to estimate a NJ tree.

1.3.2. Ant phylogeny based on concatenated data

Maximum likelihood (ML) and Bayesian phylogenetic analyses of the concatenated 6-gene dataset under partition scheme '10PS' yielded similar topologies (Figure 1.3, Bayesian reconstruction, with support from both analyses indicated). Regardless of partitioning scheme employed, all ML and Bayesian analyses resulted in nearly identical topologies, with minor changes in branch lengths and topology at weakly supported nodes. Analyses in which *COI* was removed differed mostly with regard to support for a sister-group relationship between *Myrmicocrypta JSC042* and *M. uncinata*; whereas in analyses in which *COI* was included, *M. JSC042* rendered *M. uncinata* paraphyletic.

The description of relationships below refers to the '10PS' analyses unless otherwise noted. In all analyses conducted (including those with different partition schemes) strong support was found for the monophyly of the genus *Myrmicocrypta* (Bayesian posterior probability [BPP]/ML bootstraps: 1.00/100) and for a sister-group relationship between *Myrmicocrypta* and the genus *Mycocepurus*. These relationships have been proposed before (Schultz and Brady, 2008; Sosa-Calvo *et al.*, 2013; Ward *et al.*, 2014). The species *Apterostigma megacephala*, recently described (Lattke, 1999) from four workers, is for the first time here included in a molecular analysis

and its position as the sister taxon to the rest of *Apterostigma* was recovered with high support (1.00/100), a position hypothesized by Lattke (1999) and Schultz (2007).

Within *Myrmicocrypta* the species *M. tuberculata* was recovered in all analyses as the sister taxon to the rest of *Myrmicocrypta* with strong support (1.00/100). The next node down (N3) includes the clade containing *M. JSC019*, *M. JSC019a*, and *M. boliviana* as the sister clade to the rest of *Myrmicocrypta*, with high support (1.00/99). Most of the deep nodes within *Myrmicocrypta* are strongly supported (N5: 1.00/91; N8: 1.00/99; N13: 1.00/91; N15: 1.00/93; N16: 1.00/99; N17: 1.00/100); with few nodes presenting moderate to weak support (N6: 0.99/69; N7: 1.00/70; N9: 1.00/85; N10: 0.99/67; N11: 1.00/88; N12: 0.96/68) (Figure 1.2).

The recently described species *M. bucki*, *M. camargoi*, and *M. erectapilosa* (Sosa-Calvo and Schultz, 2010), which are characterized by having erect simple to spatulate hairs, depart from the ancestral scale-like hairs character state present in most species of *Myrmicocrypta.* It was expected that the condition of erect hairs had appeared a single time in *Myrmicocrypta*, i.e., that the species with erect simple hairs would form a monophyletic group. Instead, ancestral-state estimation under maximum likelihood in Mesquite v.2.75 (Maddison and Maddison, 2011) suggests that this condition has independently appeared at least seven times in *Myrmicocrypta*, once in the clade including *M. JSC026* and *M. JSC027*; once in *JSC-028*; once in the branch leading to *M. bucki*; once in the branch leading to *M. camargoi*; once in branch leading to *M. erectapilosa*; once in the branch leading to *M. JSC023*; and once in the common ancestor of *M. JSC046* and *M. JSC048*. In addition, new species with

erect simple hairs are described in Chapter 2, some of which may not belong to any of the groups listed above.

1.3.3. Ant divergence dating

The time-calibrated phylogeny derived from the BEAST analysis (Figure 1.4) recovered the age of stem-group *Myrmicocrypta* plus its sister group (*Mycocepurus*) as 35.16 Ma (HPD 22.69–45.91). The inferred age of 35 Ma for *Myrmicocrypta* + *Mycocepurus* is somewhat younger than estimates from recent studies which are in the range of 37–40 Ma (Schultz and Brady, 2008; Ward *et al.*, 2014), although the 95% posterior density values overlap with those estimates in Ward *et al.* (2014). The root of the tree in Figure 1.4, the origin of the informal group the 'Paleoattini' (Kusnezov, 1963), was recovered at an inferred age of 43.69 Ma, which is very close to the dates recovered for this clade by Schultz and Brady (2008) and Ward *et al.* (2014).

The inferred age for the crown-group *Myrmicocrypta* was recovered at 30.05 Ma [95% highest posterior density (HPD) 19.03–41.1 Ma], which contrasts with the younger date obtained in the study by Schultz and Brady (2008). However, it is important to point out that their sample size is smaller than the one presented here.

1.3.4. Ant ancestral state estimation

Several characters and character states were estimated under the Markov k-state 1 parameter model (Lewis, 2001) in Mesquite 2.75. For nesting behavior, the likelihood that the most common ancestor of *Myrmicocrypta* nested underground was estimated as 0.99980337, whereas the switch to nesting in rotten log by the species *M. JSC001* and *M. spinosa*, is reconstructed as having occurred once in the common ancestor of these two sister species (0.98850742) (see Figure 1.2; taxa in blue). Within fungus-farming ants, five agricultural systems have been identified (Schultz and Brady, 2008). *Myrmicocrypta* species are considered lower agriculturists. Lower agriculture has been divided into two clades (Clade 1 and 2). Based on ancestral character-state reconstruction, the most recent common ancestor of *Myrmicocrypta* practiced Clade 2 lower agriculture (0.96588926). Switches to clade 1 have occurred multiple times, once in the most recent common ancestor of *Myrmicocrypta JSC001* and *M. ednaella* (N8: 0.98917789) and the species *M. camargoi*, *M. JSC039*, *M. JSC046*, and *M. uncinata*. The rest of *Myrmicocrypta* species for which fungal association data were available cultivate fungi in Clade 2. Based on the study by Mehdiabadi *et al.* (2012), both Clades 1 and 2 can be divided into several, more finely delimited "subclades," i.e., fungal species or species groups. I conducted ancestral character-state analyses using these subclades, but none could be assigned to the most recent common ancestor of *Myrmicocrypta* with high probability. However, the likelihood that one of those subclades was associated with the most recent common ancestor of particular ant clades was: 0.90583126 for group E (N9); 0.98779005 for

group D (N11); and 0.90001469 for group B (N10). Several non-closely related species within *Myrmicocrypta* have switched to the same fungal cultivar subclade (Figure 1.2, red and purple boxes). In one case the same species, *Myrmicocrypta JSC048*, cultures two subclades of fungi.

1.4. Discussion

1.4.1. Origin and evolution of *Myrmicocrypta*

Molecular systematics has made great progress in recovering the evolutionary history of different groups of animals, including ants (Ward et al., 2010; 2005; 2014; Schultz and Brady 2008; Brady et al., 2006; Moreau et al., 2006 among many others). Here, I present, for the first time, the molecular phylogeny of the cryptic fungus-farming ant genus *Myrmicocrypta*, reconstructing the relationships of its species, estimating the origin of the genus, and reconstructing patterns association with fungal cultivars.

Recently (Schultz and Brady, 2008; Ward *et al.*, 2014) the origin of the fungus-farming ants has been estimated at ~50–56 Ma, during a period of warm global temperatures known as the Eocene Climatic Optimum (Graham, 2011; Zachos et al., 2001). The time-calibrated phylogeny of *Myrmicocrypta* (Figure 1.4) supports an origin of the stem-group *Myrmicocrypta* (plus its sister group, *Mycocepurus*) at the late Eocene (35 Ma, CI= 23–46), whereas for crown-group *Myrmicocrypta* the origin

is estimated to be in the early-mid Oligocene (30 Ma, CI= 19–41), a transition period between the Eocene and the mid-Miocene climatic optimums, in which it has been hypothesized that the rates of extinction/establishment of species were faster, several ecosystems appeared, including lowland Neotropical rain forest and deciduous forest, and many lineages underwent adaptive radiations (Graham, 2011). Lineage through time plots, performed in BEAST, show an increase in the diversification of *Myrmicocrypta*, with the majority of the species appearing from 15 Ma to present, which coincides with the Mid-Miocene Climatic Optimum (15–17 Ma), a period of global warmth where ecosystems like Caatingas and Cerrado appeared (Graham, 2011), now restricted mostly to Brazil, but small fragments are found in Paraguay, and Bolivia. In addition, the formation of the Drake Passage (~32 Ma), the gradual uplift of the Andes from South to North (~10–20 Ma), and the Humboldt Current contributed to aridification, especially along the coast, and contributed to the diversification of lineages in drier environments. Furthermore, the evolution of Neotropical flora (Antonelli et al., 2009; Graham, 2011; Graham et al., 2001; Gregory-Wodzicki, 2000), and the formation of the Amazon wetland, fomented the evolutionary explosion of species we see today (Antoine et al., 2006; Graham, 2009; Hoorn, 2006; Hoorn et al., 1995).

1.4.2. Relationships within the fungus-farming ant genera

The results from the concatenated four-gene and six-gene datasets (Figures 1.2 and 1.3) support the position of *Myrmicocrypta* within the informal clade

"Paleoattini," which includes also the genera *Apterostigma* and *Mycocepurus*, the latter considered the sister group of *Myrmicocrypta* (Figure 1.3). This result is not surprising, since historically the genus *Myrmicocrypta* has been grouped within the Paleoattini based on morphological characters of the worker and wing venation (Emery 1913; Kusnezov 1963) and previous molecular analyses have corroborated this finding (Schultz and Brady 2008; Sosa-Calvo et al., 2013; Rabeling et al., 2011; Ward et al., 2014). Morphologically, the Paleoattini genera share (i) the presence of a fenestrae (clear spot) on the forewing of queens (this fenestrae, as far as it is known, it is absent from the males and from any other genus in ants) (Emery 1913; 1922; Fernandez-Marin et al., 2005), (ii) antennal funicular segment I (pedicel) in males, much shorter (~ 2x shorter) than funicular segment II (Sosa-Calvo and Schultz, 2010); and the presence of *Pseudonocardia* on basisternum II under the forelegs (Currie et al., 1999).

1.4.3. The ant genus *Myrmicocrypta*

The phylogeny presented here (Figure 1.3) should be considered tentative, and hopefully it will facilitate future research into the evolution of fungus-farming behavior in ants. Although the sample used in the phylogenetic analyses is relatively large (100 taxa for the ingroup alone, encompassing 40 putative species), it is far from complete. Several known species were not included in the analyses because their DNA was unusable due to specimen age or preservation or because the species was only known from the type specimen (e.g., many that were described in the late

1800s or early 1900s). Regardless of these shortcomings, this represents the first attempt to untangle relationships within the genus.

The relationships of the species of *Myrmicocrypta* presented here accord with the relationships obtained by Schultz and Brady (2008). However, the sample in the present study is larger. In the study by Schultz and Brady (2008) the branches leading to the three paleoattine genera and the branch leading to *Kalathomyrmex* tend to be long. Recent discoveries, one a new genus, *Cyatta,* the other a bizarre species, *Apterostigma megacephala,* break the long-branches leading to *Kalathomyrmex* and *Apterostigma,* respectively (Sosa-Calvo et al., 2013; Schultz and Sosa-Calvo, submitted). Here, the branch subtending *Myrmicocrypta* is only slightly shortened by the addition of new taxa. The still-long branch subtending *Myrmicocrypta* could indicate that more undescribed species remain to be discovered or that all early-diverging species are now extinct.

One interesting result is the recovery of the species *Myrmicocrypta tuberculata* Weber as the sister taxon to the rest of the species in the genus. This species was described from several workers collected in Bolivia. Several specimens, including nest material, were later collected from the Amazonian forests of Ecuador and Colombia. This species is interesting because it is the only species in the genus in which the integuments of the workers, queens, and males are covered with crypts (i.e., small pits) (Figure 1.6). It has been shown (Currie et al., 2006) that certain species of fungus-farming ants evolved cuticular crypts, which are supported by exocrine glands, to host and rear antibiotic-producing bacteria used by the ants to protect their cultivar gardens from the detrimental action of parasitic fungi in the

genus *Escovopsis*. Based on the dating analyses of the genus, *Myrmicocrypta tuberculata* represents the earliest diverging lineage in which the crypts appear in the fungus-farming ant symbiosis. A new case has been identified in an undescribed, younger, species belonging to the *Apterostigma auriculatum* species group in which the crypts are connected via a duct cell to the corresponding gland cell underneath the crypt. In this new species, the ants seem to be hosting a new symbiont, a black yeast (order Chaetothryriales) with unknown function (Schultz and Sosa-Calvo, in preparation).

A main character for distinguishing the members of *Myrmicocrypta* from other genera in the fungus-farming ants is the presence of scale-like or squamate hairs (Bolton, 1994; Hölldobler and Wilson, 1990). However, species belonging to *Myrmicocrypta* have been recently described that lack this character state and instead have erect simple or spatulate hairs (Sosa-Calvo and Schultz, 2010). Ancestral character-state analyses suggest that squamate or scale-like hairs are the ancestral condition in *Myrmicocrypta,* whereas the presence of erect simple or spatulate hairs is a derived condition appearing multiple times in the genus. Another deviation from the rule in *Myrmicocrypta* is the switch from underground nesting to rotten-wood nesting. This seems to have evolved a single time in the ancestor of the species *M. spinosa* and *M. JSC001*. The ability to occupy possibly abandoned pre-existing galleries in rotten wood (probably carved by wood-boring beetles) have allowed these two species to spread throughout the Amazonian and Guiana Shield forests of South America. Of course, these galleries in rotten wood represent a less isolated environment for their cultivated fungi than underground chambers. Some

Myrmicocrypta colonies have been observed to share a fungal cultivar with an unrelated species, *Cyphomyrmex faunulus*, also nesting in the same rotten wood (JSC personal observation). This behavior, *parabiosis*, has also been observed between *Apterostigma urichii* and *C. faunulus* (Sanhudo et al., 2008), and it has been suggested as a mechanism to replace or regain cultivar gardens after a loss by pathogens or by agro-predators (e.g., *Megalomyrmex* species; Adams et al. (2000a); Adams *et al.* (2000b)).

1.4.4. Fungal cultivars associated with *Myrmicocrypta*

Since fungus-farming ants depend on their cultivated gardens for food, it has long been assumed that both the ants and the fungus evolved by strict coevolution (Weber, 1972b) and this view has been typically supported by the habit of sexually mature queens, prior to departing the maternal nest, to store a nucleus of fungal mycelium within their infrabuccal pockets. After mating, the foundress queen searches and identifies a suitable location for its new nest, in which the queen regurgitates the fungal pellet and uses it to start its own garden (Huber, 1905; Mehdiabadi and Schultz, 2010). However, recent studies have shown that lower attines occasionally acquire/recruit new fungi from free-living sources (i.e., horizontal transmission) (Chapela *et al.*, 1994; Hinkle et al., 1994a; Mueller *et al.*, 1998b; Vo *et al.*, 2009). *Myrmicocrypta* is known to practice lower (G3) leucocprinaceous agriculture (Chapela *et al.*, 1994), which has been divided into two distantly related clades (Clades 1 and 2). Recently, Mehdiabadi *et al.* (2012) tested the symbiont

fidelity in species of *Cyphomyrmex wheeleri* species group showing that species of ants are exclusively associated with a single 'species' of fungal cultivar for long periods of time, suggesting ant-fungus coevolution, and that shifts to new cultivars were associated with speciation events in the ants.

Although I was not able to obtain fungal sequences for all the species used in this study, the few available sequences indicate that: (i) species of *Myrmicocrypta* are associated with the Clade 1 and Clade 2 fungal groups; (ii) ancestral-state reconstruction of the fungal 'species' available in this study suggest that the most recent common ancestor of *Myrmicocrypta* cultivated Clade 2 fungi and that switches to Clade 1 fungi have occurred multiple times; and (iii) most species of *Myrmicocrypta* seem to grow fungi in at least five cultivar subclades (identified by Mehdiabadi *et al.* (2012)). In a single case in which sequences of the fungal cultivar were obtained for the specimens used in the ant phylogeny, it was observed that *M. JSC048* grow fungi from two subclades (E and H, figure 1.2). The specimens were collected in Cerrado habitat in Brasilia and Uberlandia, Brazil, with both fungal cultivars occurring in both localities.

Table 1.1. List of specimens, extraction codes, collection codes, voucher specimen depository, collection data, and collector(s). USNM= United States National Collection at Smithsonian Institution-National Museum of Natural History.

	Ext. code	Col Code	Depository	Locality	Collector
egacephala	504	JSC090213-01	USNM	Parauapebas, BA, Brazil (2009)	J. Sosa-Calvo
uriculatum	44	UGM951208-01	USNM	Gamboa, Panama (1995)	UG Mueller
orotheae	303	TRS960416-09	USNM	Paramakatoi, Guyana (1996)	TR Schultz
entigerum	369	UGM980613-01	USNM	Gamboa, Panama (1998)	UG Mueller
ollare	444	APT3/SIANTDB3568	USNM	La Selva, Costa Rica (1991)	TR Schultz
anni	45	TRS960429-06	USNM	Barro Colorado Isl, Panama (1996)	TR Schultz
onioides	367	UGM980607-29	USNM	El Llano, Panama (1998)	UG Mueller
rdus	316	UGM960120-02	USNM	Gamboa, Panama (1996)	UG Mueller
nithi	410	TRS030323-09	USNM	Chaco, Argentina (2003)	TR Schultz
tuberculata	1278	JR071014-LS02	USNM	Amacayacu, Amazonas, Colombia (2007)	J. Rodriguez
tuberculata	525	AL030618-07	USNM	Tiputini, Ecuador (2003)	A. Little
JSC-020	527	JSC041006-12	USNM	Puerto Maldonado, Peru (2004)	J. Sosa-Calvo
JSC-019a	1291	JSC071010-LS07	USNM	Amacayacu, Amazonas, Colombia (2007)	J. Sosa-Calvo
boliviana	1295	JSC120731-01	USNM	Puerto Maldonado, Peru (2012)	J. Sosa-Calvo
JSC-019	1250	JSC061010-LS07	USNM	Acarai Mts, Guyana (2006)	J. Sosa-Calvo
JSC-019	1205	JSC041004-10	USNM	Puerto Maldonado, Peru (2004)	J. Sosa-Calvo
JSC-019	526	JSC041006-14	USNM	Puerto Maldonado, Peru (2004)	J. Sosa-Calvo
JSC-024	1285	RJGF 00075	USNM	Puerto Maldonado, Peru (2012)	RJ Guerrero
longinoda	1230	ANTC30372	USNM	Rondonia, Brazil (2012)	R. Feitosa & R. da Silva
longinoda	1239	M3155	USNM	Putumayo, Colombia (2002)	R. Cobete
longinoda	1284	JSC120731-02	USNM	Puerto Maldonado, Peru (2012)	J. Sosa-Calvo
unidentata	1176	JSL020925-01-LS09	USNM	nr Bartica, Guyana (2002)	JS LaPolla
unidentata	1253	JSC061010-LS04	USNM	Acarai Mts, Guyana (2006)	J. Sosa-Calvo
unidentata	1279	RMF120731-LS01	USNM	Puerto Maldonado, Peru (2012)	RM Feitosa
JSC-026	1188	CR040603	USNM	Manaus, Brazil (2004)	C. Rabeling
JSC-027	1171	JSL021105-01-LS19	USNM	Iwokrama Forest Reserve, Guyana (2002)	JS LaPolla
JSC-027	1320	AJ120927-01	USNM	Reserva Ducke, Manaus, Brazil (2012)	A. Jesovnik
JSC-030	1144	Wm-B-04-2-02-A	USNM	Izabal, Guatemala (2009)	LLAMA
ednaella	1203	RMMA100528-06	USNM	El Llano, Panama (2010)	RMM Adams
ednaella	1204	RMMA100521-02	USNM	El Llano, Panama (2010)	RMM Adams
JSC-029	1164	CMO-PNNT-Bosque6.2	USNM	Risaralda, Colombia (2012)	CM Ortiz
JSC-028	1114	MGB870-A	USNM	Chiapas, Mexico (2008)	MG Branstetter
JSC-028	1140	Wm-A-09-1-all	USNM	Chiapas, Mexico (2008)	LLAMA
bucki	516	JSC051119-09	USNM	Puerto Maldonado, Peru (2005)	J. Sosa-Calvo
JSC-025	1231	ANTC30373	USNM	Rondonia, Brazil	R. Feitosa & R. da Silva
JSC-025	1255	JSC041006-02	USNM	Puerto Maldonado, Peru (2004)	J. Sosa-Calvo
occipitalis	1183	CJM020606-01-LS16	USNM	Gamboa, Panama (2002)	CJ Marshall
occipitalis	519	TRS041006-03	USNM	Puerto Maldonado, Peru (2004)	TR Schultz
occipitalis	1257	JSC041006-16	USNM	Puerto Maldonado, Peru (2004)	J. Sosa-Calvo
occipitalis	517	TRS041006-01	USNM	Puerto Maldonado, Peru (2004)	TR Schultz
spinosa	1224	TRS061007-WS07	USNM	Acarai Mts, Guyana (2006)	TR Schultz
spinosa	1199	AGH030610-01	USNM	Yasuni Park, Ecuador (2003)	AG Himler
spinosa	531	CC030609-03	USNM	La Selva, Ecuador (2003)	C. Currie
JSC-001	1186	AGH030615-09	USNM	Napo, Tiputini, Ecuador (2003)	AG Himler
JSC-001	1190	SV030615-01	USNM	Napo, Tiputini, Ecuador (2003)	S. Villamarin
JSC-001	1292	JR071010-LS03	USNM	Amacayacu, Amazonas, Colombia (2007)	J. Rodriguez
JSC-001	1293	JR071010-LS06	USNM	Amacayacu, Amazonas, Colombia (2007)	J. Rodriguez
JSC-001	1259	TRS050730-18	USNM	French Guiana (2005)	TR Schultz
JSC-001	1260	TRS050720-10	USNM	French Guiana (2005)	TR Schultz
JSC-001	1014	JSC051031-01	USNM	Lely Mts., Suriname (2005)	J. Sosa-Calvo
JSC-001	1275	JSC060309-25	USNM	Raleighvallen, Suriname (2006)	J. Sosa-Calvo
JSC-001	521	JSC051102-24	USNM	Nassau Mts., Suriname (2005)	J. Sosa-Calvo
JSC-001	28	TRS960410-14	USNM	Iwokrama Forest Reserve, Guyana (1996)	TR Schultz
JSC-001	523	JSC051105-09	USNM	Nassau Mts., Suriname (2005)	J. Sosa-Calvo
camargoi	408	SIANTDB2655	USNM	Botucatu, Sao Paulo (2002)	RS Camargo
erectopilosa	1252	JSC041006-06	USNM	Puerto Maldonado, Peru (2004)	J. Sosa-Calvo
erectopilosa	1272	JSC051124-02-LS06	USNM	Puerto Maldonado, Peru (2005)	J. Sosa-Calvo
JSC-017	518	JSC041009-22	USNM	Puerto Maldonado, Peru (2004)	J. Sosa-Calvo
JSC-021	1197	TRS921111-05	USNM	Morne Bleu, Trinidad (1992)	TR Schultz & J. Wetterer
JSC-023	1268	ANTC30374	USNM	Amalfi, Antioquia, Colombia (1999)	E. Vergara & F. Serna
JSC-008	314	UGM960125-12	USNM	Gamboa, Panama (1996)	UG Mueller
JSC-008	1200	TRS960424-10	USNM	Gamboa, Panama (1996)	TR Schultz
JSC-008	528	UGM960125-12	USNM	Gamboa, Panama (1996)	UG Mueller
urichi	1232	ANTC30375	USNM	Santa Fe de Antioquia, Colombia (2000)	E. Vergara & F. Serna

urichi	1267	ANTC30376	USNM	San Carlos, Antioquia, Colombia (2007)	E. Vergara & C. Gomez
urichi	1213	CR080813-01	USNM	Venezuela (2008)	C. Rabeling
urichi	1126	JTL6450-s	USNM	Aragua, Venezuela (2008)	JT Longino
urichi	9	UGM950118-01	USNM	Simla Biological Station, Trinidad (1995)	UG Mueller
urichi	1207	UGM950110-13	USNM	Las Cuevas, Trinidad (1995)	UG Mueller & SA Rehner
urichi	1266	ANTC30377	USNM	Santafe de Antioquia, Colombia (2000)	E. Vergara & F. Serna
ca ednaella	1242	M1494	USNM	PNN Gorgona, Cauca, Colombia (2001)	H. Torres
ca ednaella	1154	Ba-A-07-4-01-08	USNM	Chiapas, Mexico (2008)	LLAMA
ca ednaella	1229	HF010328-50	USNM	El Llano, Panama (2001)	H. Fernandez
ca ednaella	1166	CMO120317-Bosque8.1	USNM	Risaralda, Colombia (2012)	CM Ortiz
ca ednaella	440	UGM960121-02	USNM	Gamboa, Panama (1996)	UG Mueller
ca ednaella	530	UGM960110-02	USNM	Gamboa, Panama (1996)	UG Mueller
ca ednaella	1227	NMG031216	USNM	Panama (2003)	NM Gerardo
ca ednaella	1150	Wa-A-09-2-34	USNM	Chiapas, Mexico (2008)	LLAMA
ca ednaella	1192	UGM060818	USNM	La Ceiba, Honduras (2006)	UG Mueller
JSC-033	1044	JSC060303-01	USNM	Bakhuis Mts., Sipaliwini, Suriname (2006)	J. Sosa-Calvo
JSC-033	1181	JSC061030-01	USNM	Kamoa Mts., Upper Essequibo, Guyana (2006)	J. Sosa-Calvo
JSC-034	1216	CR040615-08	USNM	Loreto, Peru (2004)	C. Rabeling
JSC-038	1215	CR040618-15	USNM	Loreto, Peru (2004)	C. Rabeling
JSC-036	1225	SES090205-04	USNM	Belem, Para, Brazil (2009)	CT Lopes & SE Solomon
JSC-037	1174	TRS021012-04	USNM	Mt. Ayanganna, Guyana (2002)	TR Schultz et al.
JSC-037	1248	UGM021012-04	USNM	Mt. Ayanganna, Guyana (2002)	UG Mueller
JSC-039	1157	AJ111129-04	USNM	Upper Takutu-Upper Essequibo, Guyana (2011)	A. Jesovnik
buenzlii	327	TRS960416-03	USNM	Paramakatoi, Guyana (1996)	TR Schultz & UG Mueller
JSC-041	1160	JSC111126-10	USNM	Upper Takutu-Upper Essequibo, Guyana (2011)	J. Sosa-Calvo
JSC-041	1173	UGM050721-04	USNM	Montjoly, French Guiana (2005)	UG Mueller
uncinata	1202	AW0063	USNM	Central Aregua, Paraguay (1995)	A. Wild
JSC-042	1069	TRS080923-15	USNM	Uberlandia, Minas Gerais, Brazil (2008)	TR Schultz
uncinata	1222	CR060929-09	USNM	Rio Claro, Sao Paulo, Brazil (2006)	C. Rabeling
uncinata	529	TRS030331-01b	USNM	Misiones, Argentina (2003)	TR Schultz et al.
uncinata	1156	JSC111009-11	USNM	Santa Catarina, Brazil (2011)	J. Sosa-Calvo & TR Schultz
uncinata	1287	CR120328-03	USNM	Argentina (2012)	C. Rabeling
uncinata	1288	CR120328-01	USNM	Argentina (2012)	C. Rabeling
JSC-046	1072	JSC081028-01	USNM	São Felix do Tocantins, Tocantins, Brazil (2008)	J. Sosa-Calvo
JSC-047	520	JSC090223-24	USNM	Brasilia DF, Brazil (2009)	J. Sosa-Calvo & TR Schultz
JSC-049	1218	CR060813-02	USNM	Alter do Chao, Para, Brazil (2006)	C. Rabeling
JSC-049	1219	CR060813-03	USNM	Alter do Chao, Para, Brazil (2006)	C. Rabeling
JSC-050	1169	JSC081027-21	USNM	São Felix do Tocantins, Tocantins, Brazil (2008)	J. Sosa-Calvo
JSC-050	522	JSC090126-13	USNM	Alter do Chao, Para, Brazil (2009)	J. Sosa-Calvo
JSC-048	1066	JSC080924-05	USNM	Uberlandia, Minas Gerais, Brazil (2008)	J. Sosa-Calvo
JSC-048	1286	JSC080921-25	USNM	Uberlandia, Minas Gerais, Brazil (2008)	J. Sosa-Calvo
JSC-048	1070	JSC100417-04	USNM	Brasilia DF, Brazil (2010)	J. Sosa-Calvo
JSC-048	1214	CR070721-06	USNM	IBGE, Brasilia DF, Brazil (2007)	C. Rabeling

Table 1.2. Primers used for sequencing mitochondrial (*cytochrome oxidase I –**COI***) and nuclear (*elongation factor 1a F1 copy–**EF1aF1***; *elongation factor 1a F2 copy–**EF1aF2***; *long-wavelength rhodopsin–**LW Rh***; *Topoisomerase I–**TOP1***; and *wingless–**wg***) gene fragments in ants and the nuclear ribosomal internal transcribed spacer (ITS) region in the fungi.

Gene Region	Primer	Sequence 5' to 3'	Source
ANTS			
COI	LCO1490	GGT CAA CAA ATC ATA AAG ATA TTG G	Folmer et al. (1994)
	HCO2198	TAA ACT TCA GGG TGA CCA AAA AAT CA	Folmer *et al.* (1994)
	CI13	ATA ATT TTT TTT ATA GTT ATA CC	Hasegawa et al. (2002)
	CI14	AT TTC TTT TTT TCC TCT TTC	Hasegawa *et al.* (2002)
	Jerry	CAA CAY TTA TTT TGA TTT TTT GG	Simon et al. (1994)
	Ben3R	GC WAC WAC RTA ATA KGT ATC ATG	Brady et al. (2000)
	MycoGeorge	ATA CCT CGT CGA TAT TCT GA	Rabeling et al. (2011)
	Pat	ATC CAT TAC ATA TAA TCT GCC ATA	Simon *et al.* (1994)
EF1a-F1	M3 F1-383F	CAT ATW AAC ATT GTS GTS ATY GG	Schultz and Brady (2008)
	10R F1-1887R	ACG GCS ACK GTT TGW CKC ATG TC	Schultz and Brady (2008)
	for2 F1-494F	AAG GAG GCT CAG GAG ATG GG	Schultz and Brady (2008)
	rev1 F1-1044R	CGT CTT ACC ATC GGC ATT GCC	Schultz and Brady (2008)
	U377 F1-792F	TT GGC GTG AAG CAG CTG ATC G	Schultz and Brady (2008)
	TRS1R F1-1189R	ACC TGG TTT YAA GAT RCC GGT	Schultz and Brady (2008)
	U52.1 F1-1109F	CCG CTT CAG GAT GTC TAT AA	Schultz and Brady (2008)
	L53 F1-1551R	CCG CGT CTC AGT TCY TTC AC	Schultz and Brady (2008)
	TRS4F F1-1424F	GCG CCK GCG GCT CTC ACC ACC GAG G	Brady *et al.* (2006)
	TRS9R F1-1829R	GGA AGG CCT CGA CGC ACA TMG G	Brady *et al.* (2006)
EF1a-F2	515F	GGT TCC TTC AAR TAY GCY TGG GT	Ward pers. Comm.
	1371R	CC RAT CTT RTA YAC GTC CTGC	Ward pers. Comm.
	557F	GAA CGT GAA CGT GGT ATY ACS AT	Brady *et al.* (2006)
	1118R	TTAC CTG AAG GGG AAG ACG RAG	Brady *et al.* (2006)
LW Rh	LR134F	ACM GTR GTD GAC AAA GTK CCA CC	Ward pers. Comm.
	LR143F	GAC AAA GTK CCA CCR GAR ATG CT	Ward and Downie (2005)
	LR639ER	YTTAC CG RTT CCA TCC RAA CA	Ward and Downie (2005)
TOP1	TP1293EF	TKCAG G TGG GAR GAR GAR AAG AA	Ward and Sumnicht (2012)
	TP2266ER3	GTYAC C TAA RAA RTC RAA BAC RAC	Ward and Sumnicht (2012)
	TP1339F	GAR CAY AAR GGA CCK GTR TTY GCA CC	Ward and Sumnicht (2012)
	TP2192R	GA RCA RCA RCC YAC DGT RTC HGC YTG	Ward and Sumnicht (2012)
	TP1901F2	CY AAT GTY ACD TGG CTH GCR TCH TGG AC	Ward and Sumnicht (2012)
Wg	Wg254F	CGA GAG ACC GCK TTY RTC TAY GC	Ward pers. Comm.
	Wg1038R	CA CTT NAC YTC RCA RCA CCA RTG	Ward pers. Comm.
	Wg290F	GCW GTR ACT CAC AGY ATC GC	Ward pers. Comm.
	wg645R	CG RTC CTT BAG RTT RTC GCC	Ward pers. Comm.
	Wg503F	CT CTC TCR TTA CAG CAC GT	Schultz and Brady (2008)
	Wg524EF	GCA GCA CGT TTC YTC VGA RAT GCG	Ward pers. Comm.
	Wg578F	TGC ACN GTG AAR ACY TGC TGG ATG CG	Ward and Downie (2005)
	wg1032R	AC YTC GCA GCA CCA RTG GAA	Abouheif and Wray (2002)
FUNGI			
ITS	ITS1	TCC GTA GGT GAA CCT GCG G	White et al. (1990)
	ITS5	GGA AGT AAA AGT CGT AAC AAG G	White *et al.* (1990)
	5.8SF	TCG ATG AAG AAC GCA GC	Vilgalys and Hester (1990)
	5.8SR	CGC TGC GTT CTT CAT CG	Vilgalys and Hester (1990)
	ITS4	TCC TCC GCT TAT TGA TAT GC	White *et al.* (1990)

Table 1.3. Sequence characteristics, user-selected partitions, and models chosen for each data partition. Models of evolution suggested by jModelTest v2.1.4.

		All taxa			Ingroup only			Model		User-selected Partitions				
ent	No. sites	VS	% VS	PIS	VS	% VS	PIS	AICc	BIC	Part1	Part5	Part7	Part9	Part16
	1507	414	27	272	360	24	229	TrN+I+G	K80+G					
intron)	1075	416	39	179	213	20	136	TrN+I+G	TrNef+I+G			x	x	
ı Pos 1+2	716	34	5	16	29	4	13	TrN+I	TrN+I					x
ı Pos 3	359	233	65	163	184	51	123	HKY+G	HKY+G					x
n (exc 90%)	395	142	36	90	142	36	90	HKY+G	TPM1uf+G				x	x
	1048	287	27	180	237	23	134	TrN+G	TrNef+G					
intron)	703	168	24	105	118	17	59	TrNef+G	TrNef+G			x	x	
1+2	468	24	5	7	14	3	2	K80	K80					x
3	235	144	61	98	104	44	57	JC	HKY+G					x
90%)	319	119	37	75	119	37	75	HKY	HKY				x	x
	549	133	24	98	98	18	68	HKY+G	K80+G					
	458	120	26	87	85	19	57	K80+G	HKY+G			x	x	
os 1+2	305	48	16	32	36	12	25	K80+I	K80+I+G					x
os 3	153	72	47	55	49	32	32	TrNef+I	HKY+I					x
(exc 90%)	89	11	12	11	13	15	11	TIM2ef+I	K80+G				x	x
ı	517	138	27	99	94	18	58	TrNef+G	TrNef+G			x	x	
ı Pos 1+2	344	18	5	12	15	4	8	JC+I	JC+I					x
ı Pos 3	173	120	69	87	79	46	50	K80+G	TrNef+G					x
	883	283	32	214	210	24	153	TrN+I+G	TrN+G			x	x	
os 1+2	588	66	11	41	42	7	25	TrN+G	TrN+G					x
os 3	295	217	74	173	168	57	128	K80	HKY+G					x
	1042	576	55	520	543	52	495	TIM2+I+G	TIM2+I+G			x	x	
; 1	347	162	47	137	144	41	123	GTR+I+G	GTR+I+G					x
; 2	347	74	21	50	65	19	43	TIM3+I+G	TIM3+I+G					x
; 1+2	694	236	34	109	209	30	166	TIM3+I+G	TIM3+I+G		x			
; 3	348	340	98	333	334	96	329	TIM2+G	TIM2+I+G		x			x
c 90%)	803	274	34	176	274	34	176	TPM3uf+I+G	HKY+I+G		x	x		
: Introns)	5546	207	37	1585	178	32	1339	GTR+I+G	GTR+I+G	x				
	3635	975	27	684	171	47	462	TrN+I+G	TrN+I+G					
Pos 1+2	2421	190	8	109	136	6	73	TIM3+I+G	TIM3+I+G		x			
Pos 3	1214	785	65	575	583	48	389	TIM2+G	TPM2uf+G		x			

Abbreviations: VS= variable sites; %VS= percentage of variables sites; PIS= parsimony informative sites; exc 90%= refers to exclusion of ambiguously aligned sites according to Guidance algorithm.; PartN= partitions including the number of gene fragments used, selected based on the information given.

Table 1.4. The ten partition schemes (ps) and best models identified by PartitionFinder v1.1.1 ((Lanfear *et al.*, 2012)). The Bayesian models are adaptations from the models used in ML. Other partitions schemes used are modifications of the large '10PS' scheme, thus: '6PS' (no introns, no *COI*); '7PS' (no *COI*); and '9PS' (no introns).

		ML	Bayesian
Subset	**Gene fragment block**	**Best model**	**Best Model***
ps1	*EF1aF1*pos3, *TOP1*pos3	TIM+G	GTR+G
ps2	*EF1aF1*pos1, *EF1aF2*pos1	TrN+I	GTR+I
ps3	*EF1aF1*pos2, *wg*pos1, *wg*pos2	K80	K80
ps4	*EF1aF1* Intron, *wg* Intron	K81uf+G	GTR+G
ps5	*EF1aF2*pos3, *LW Rh*pos3, *wg*pos3	TrNef+G	SYM+G
ps6	*LW Rh* Intron, *LW Rh*pos1, *LW Rh*pos2, *TOP1*pos1	K80+I+G	K80+I+G
ps7	E*F1aF2*pos2, *TOP1*pos2	F81+I+G	HKY+I+G
ps8	*COI*pos1	GTR+I+G	GTR+I+G
ps9	*COI*pos2	GTR+I+G	GTR+I+G
ps10	*COI*pos3	GTR+I+G	GTR+I+G

Table 1.5. The partition schemes for each gene identified by PartitionFinder v1.1.1 ((Lanfear *et al.*, 2012)) and used in Bayesian analyses.

			Bayesian
Gene Fragment	**Subset**	**Subset Partitions**	**Best Model***
EF1aF1	1	*EF1aF1*pos1	TrN+I
	2	*EF1aF1*pos2	JC
	3	*EF1aF1*pos3	TIM+G
	4	*EF1aF1* intron	TIM+G
wg	1	*wg*pos12	GTR
	2	*wg*pos3	GTR+G
	3	*wg* intron	GTR+I
LW Rh	1	*LWRh*pos12+*LWRh* Intron	K80+I+G
	2	*LWRh*pos3	TrNef+G
EF1aF2	1	*EF1aF2*pos12	K81+I
	2	*EF1aF2*pos3	TrNef+G
TOP1	1	*TOP1*pos12	TrN+I
	2	*TOP1*pos3	HKY+G
COI	1	*COI*pos1	GTR+I+G
	2	*COI*pos2	GTR+I+G
	3	*COI*pos3	GTR+I+G

Table 1.6. Taxa, characters, and character states used in the ancestral state estimation in Mesquite v2.75 ((Maddison and Maddison, 2011)).

Taxa	A	B	C	Source
504 Apterostigma megacephala	0	6	0	
044 Apterostigma auriculatum	1	0	3	Schultz and Brady (2008)
045 Apterostigma manni	0	8	2	Villesen *et al.* (2004)
367 Apterostigma goniodes	0	8	2	Villesen *et al.* (2004)
444 Apterostigma collare	2	7	1	Schultz and Brady (2008)
303 Apterostigma dorotheae	0	7	1	Villesen *et al.* (2004)
369 Apterostigma dentigerum	2	7	1	Villesen *et al.* (2004)
316 Mycocepurus tardus	0	0	3	Schultz and Brady (2008)
410 Mycocepurus smithii	0	4	3	Schultz and Brady (2008)
1278 Myrmicocrypta tuberculata	0	?	?	
525 Myrmicocrypta tuberculata	0	5	4	
1250 Myrmicocrypta JSC019	0	?	?	
1205 Myrmicocrypta JSC019	0	?	?	
526 Myrmicocrypta JSC019	0	?	?	
527 Myrmicocrypta JSC020	0	?	?	
1291 Myrmicocrypta JSC019a	0	?	?	
1295 Myrmicocrypta boliviana	0	?	?	
1285 Myrmicocrypta JSC024	?	?	?	
1176 Myrmicocrypta unidentata	0	?	?	
1253 Myrmicocrypta unidentata	0	?	?	
1279 Myrmicocrypta unidentata	0	?	?	
1230 Myrmicocrypta longinoda	0	?	?	
1239 Myrmicocrypta longinoda	0	?	?	
1284 Myrmicocrypta longinoda	0	?	?	
1188 Myrmicocrypta JSC026	?	?	?	
1171 Myrmicocrypta JSC027	0	?	?	
1320 Myrmicocrypta JSC027	0	0	3	
1144 Myrmicocrypta JSC030	0	?	?	
1203 Myrmicocrypta ednaella	0	0	3	
1204 Myrmicocrypta ednaella	0	0	3	
1164 Myrmicocrypta JSC029	?	?	?	
1114 Myrmicocrypta JSC028	0	?	?	
1140 Myrmicocrypta JSC028	0	?	?	
516 Myrmicocrypta bucki	0	?	?	
1231 Myrmicocrypta JSC025	?	?	?	
1255 Myrmicocrypta JSC025	?	?	?	
1183 Myrmicocrypta occipitalis	0	?	?	
519 Myrmicocrypta occipitalis	0	1	3	
1257 Myrmicocrypta occipitalis	0	1	3	
517 Myrmicocrypta occipitalis	0	1	3	
1224 Myrmicocrypta spinosa	1	?	?	
1199 Myrmicocrypta spinosa	1	?	?	
531 Myrmicocrypta spinosa	1	?	?	
1186 Myrmicocrypta JSC001	1	?	?	
1190 Myrmicocrypta JSC001	1	?	?	
1292 Myrmicocrypta JSC001	1	?	?	
1293 Myrmicocrypta JSC001	1	?	?	
1259 Myrmicocrypta JSC001	1	1	3	
1260 Myrmicocrypta JSC001	1	?	?	
1014 Myrmicocrypta JSC001	1	1	3	
1275 Myrmicocrypta JSC001	1	1	3	
521 Myrmicocrypta JSC001	1	1	3	
028 Myrmicocrypta JSC001	1	1	3	Schultz and Brady (2008)
523 Myrmicocrypta JSC001	1	1	3	
408 Myrmicocrypta camargoi	0	0	3	
1252 Myrmicocrypta erectapilosa	?	?	?	
1272 Myrmicocrypta erectapilosa	?	?	?	
518 Myrmicocrypta JSC017	0	?	?	

1197 Myrmicocrypta JSC021	0	5	4	
1268 Myrmicocrypta JSC023	?	?	?	
1200 Myrmicocrypta JSC008	0	?	?	
314 Myrmicocrypta JSC008	0	2	4	Schultz and Brady (2008)
528 Myrmicocrypta JSC008	0	2	4	
1232 Myrmicocrypta urichi	0	?	?	
1267 Myrmicocrypta urichi	0	?	?	
009 Myrmicocrypta urichi	0	2	4	Schultz and Brady (2008)
1207 Myrmicocrypta urichi	0	2	4	
1126 Myrmicocrypta urichi	0	?	?	
1213 Myrmicocrypta urichi	0	?	?	
1266 Myrmicocrypta ca ednaella	0	?	?	
1242 Myrmicocrypta ca ednaella	0	?	?	
1154 Myrmicocrypta ca ednaella	0	?	?	
1229 Myrmicocrypta ca ednaella	0	?	?	
1166 Myrmicocrypta ca ednaella	0	?	?	
1227 Myrmicocrypta ca ednaella	0	?	?	
440 Myrmicocrypta ca ednaella	0	2	4	Schultz and Brady (2008)
530 Myrmicocrypta ca ednaella	0	2	4	Schultz and Brady (2008)
1150 Myrmicocrypta ca ednaella	0	?	?	
1192 Myrmicocrypta ca ednaella	0	?	?	
1044 Myrmicocrypta JSC033	0	?	?	
1181 Myrmicocrypta JSC033	0	2	4	
1216 Myrmicocrypta JSC034	0	?	?	
1215 Myrmicocrypta JSC038	0	2	4	
1225 Myrmicocrypta JSC036	?	?	?	
1174 Myrmicocrypta JSC037	0	?	?	
1248 Myrmicocrypta JSC037	0	2	4	
1157 Myrmicocrypta JSC039	0	0	3	
327 Myrmicocrypta buenzlii	0	3	4	Schultz and Brady (2008)
1160 Myrmicocrypta JSC041	0	?	?	
1173 Myrmicocrypta JSC041	0	?	?	
1202 Myrmicocrypta uncinata	0	?	?	
1069 Myrmicocrypta JSC042	0	?	?	
1222 Myrmicocrypta uncinata	0	?	?	
529 Myrmicocrypta uncinata	0	?	?	
1156 Myrmicocrypta uncinata	0	?	?	
1287 Myrmicocrypta uncinata	0	0	3	
1288 Myrmicocrypta uncinata	0	0	3	
1072 Myrmicocrypta JSC046	0	0	3	
520 Myrmicocrypta JSC047	0	2	4	
1218 Myrmicocrypta JSC049	0	?	?	
1219 Myrmicocrypta JSC049	0	?	?	
1169 Myrmicocrypta JSC050	0	2	4	
522 Myrmicocrypta JSC050	0	2	4	
1066 Myrmicocrypta JSC048	0	5	4	
1286 Myrmicocrypta JSC048	0	2	4	
1070 Myrmicocrypta JSC048	0	2	4	
1214 Myrmicocrypta JSC048	0	5	4	

Characters: (**A)** *Nest*: 0=underground, 1=rotten wood, 2= under leaves. (**B)** *Fungal Cultivar* (refers to finely defined groups): 0= group B, 1= group D, 2= group E, 3= group F, 4= group G, 5= group H, 6= group G1, 7= group G2 and, 8= G4 [From Mehdiabadi *et al.* (2012)]. (**C)** *Fungal Cultivar* 2 (refers to major groups): 0= G1, 1= G2, 2= G4, 3= G3 clade1, 4= G3 clade2 [From Villesen *et al.* (2004); Chapela *et al.* (1994); Schultz and Brady (2008)].

Table 1.7. Summary of Bayesian analyses.

Partition Name	Subsets	Run	Chains	Generations[a]	Burn-in[a]	TL	Marginal likelihood
Full dataset							
'10PS'	10	1	8	20	1	2.86	-45220.786 ± 0.361
'10PS'	10	2	8	20	1	2.86	-45220.803 ± 0.330
'10PS'	10	3	8	20	1	2.86	-45220.846 ± 0.321
'10PS'	10	4	8	20	1	2.86	-45220.864 ± 0.346
'16Part'	16	1	8	20	1	3.38	-53105.496 ± 0.408
'16Part'	16	2	8	20	1	3.38	-53104.775 ± 0.381
No COI & introns							
'6PS'	6	1	8	20	1	2.03	-15952.668 ± 0.336
'6PS'	6	2	8	20	1	2.05	-15950.961 ± 0.343
No COI							
'7PS'	7	1	8	20	1	1.63	-18651.660 ± 0.104
'7PS'	7	2	8	20	1	1.99	-18653.927 ± 0.095
No introns							
'9PS'	9	1	8	20	1	3.13	-41089.042 ± 0.332
'9PS'	9	2	8	20	1	3.13	-41089.451 ± 0.290
Individual genes							
EF1aF1	4	1	8	10	0.5	0.85	-6442.567 ± 0.506
EF1aF1	4	2	8	10	0.5	0.85	-6443.539 ± 0.500
EF1aF2	2	1	8	10	0.5	1.49	-2433.916 ± 0.501
EF1aF2	2	2	8	10	0.5	1.49	-2433.818 ± 0.527
wg	3	1	8	20	1	1.32	-4206.051 ± 0.514
wg	3	2	8	20	1	1.31	-4206.777 ± 0.600
LW Rh	2	1	8	10	0.5	1.90	-2417.433 ± 0.439
LW Rh	2	1	8	10	0.5	1.91	-2418.068 ± 0.465
TOP1	2	1	8	10	0.5	1.01	-4377.264 ± 0.446
TOP1	2	1	8	10	0.5	1.01	-4378.818 ± 0.539
COI	3	1	8	10	0.5	6.13	-24941.606 ± 0.687
COI	3	1	8	10	0.5	6.13	-24939.565 ± 0.683

Values for the branch length pri

or (**λ**) was set to 100; temperature for all independent runs was set to 0.05; burn-in was set after run completion in TRACER; the estimated marginal likelihood was calculated, for each run, in TRACER (see text for description). [a] in million of years.

Table 1.8. Support values for nodes inferred from single genes and other concatenated datasets. For the single gene analyses the support values are Bayesian posterior probability (BPPs). For the concatenated analyses the number are in the form of BPPs/Maximum Likelihood bootstraps. Concatenated analyses refer to three partition schemes from PartitionFinder (Lanfear et al., 2012). '6PS' all genes excluding *COI* and introns; '7PS' all genes excluding *COI*; '9PS' all genes excluding introns.

			Single genes						Concatenated		
Node	**Description**	**No. genes**	***EF1aF1***	***EF1aF2***	***wg***	***LW Rh***	***TOP1***	***COI***	**'6PS'**	**'7PS'**	**'9PS'**
N1	*Myrmicocrypta* + sister (*Mycocepurus*)	6	96	95	100	100	100	100	100/100	100/100	100/100
N2	Crown *Myrmicocrypta*	6	100	100	100	100	100	100	100/100	100/100	100/100
N3	*M. boliviana+JSC019* Clade + rest of *Myrmicocrypta*	4	100	100	—	100	—	99	100/99	100/100	100/99
N4	*M. JSC019* + *M. boliviana* Clade	2	—	—	—	100	—	100	100/100	100/100	100/100
N5	*M. unidentata* and *longinoda* Clade + rest of *Myrmicocrypta*	2	96	—	—	—	—	96	100/84	100/89	100/91
N6	*M. JSC024 +longinoda-unidentata* Clade	1	—	—	—	—	—	100	100/78	100/68	100/81
N7	*M. ednaella-JSC001 + camargoi-uncinata* Clades	1	—	—	—	—	97	96	98/58	100/59	100/72
N8	*M. ednaella* + M. *JSC001* Clades	3	—	—	—	94	98	97	100/92	100/93	100/98
N9	*M. camargoi + uncinata*	1	—	—	61	—	—	—	88//61	100/75	100/81
N10	*M. ednaella* group	1	—	—	—	—	99	—	91/58	51/54	100/69
N11	*M. JSC001* group	1	—	—	—	—	86	—	100/96	100/91	100/93
N12	*M. camargoi + erectopilosa* Clade	1	—	—	—	—	94	—	—/—	94/—	94/61
N13	*M. urichi* + *M. uncinata* Clade	1	—	—	—	—	—	97	100/89	100/73	100/98
N14	*M. urichi* Group	5	99	—	75	100	100	100	100/100	100/100	100/100
N15	*M. buenzlii* + *M. uncinata* Clades	3	—	—	93	—	90	99	99/81	100/94	98/71
N16	*M. buenzlii* Group	3	—	—	100	—	93	100	100/90	100/96	100/99
N17	*M. uncinata* Group	5	100	—	95	75	58	97	100/99	100/100	100/100

Table 1.9. Divergence time estimates and 95% highest posterior density (HPD) output from BEAST given in millions of year ago (Ma).

Node	**Description**	**Age**	**95% HPD (Ma)**
N1	*Myrmicocrypta* + sister (*Mycocepurus*)	35.16	22.69–45.91
N2	Crown *Myrmicocrypta*	30.05	19.03–41.1
N3	*Myrmicocrypta boliviana+JSC019* Clade + rest of *Myrmicocrypta*	26.82	16.4–37.49
N4	*M. JSC019* + *M. boliviana* Clade	14.01	3.54–26.72
N5	*M. unidentata* and *longinoda* Clade +rest of *Myrmicocrypta*	24.59	14.5–34.49
N6	*M. JSC024 +longinoda-unidentata* Clade	15.22	3.64–27.27
N7	*M. ednaella-JSC001 + camargoi-uncinata* Clades	22.56	13.78–32.5
N8	*M. ednaella* + M. *JSC001* Clades	19.05	10.4–28.22
N9	*M. camargoi + uncinata*	20.35	11.59–29.75
N10	*M. ednaella* group	13.72	4.26–22.86
N11	*M. JSC001* group	15.74	8.39–23.86
N12	*M. camargoi + erectopilosa* Clade	14.58	5.64–23.92
N13	*M. urichi* + *M. uncinata* Clade	18.39	10.62–27.44
N14	*M. urichi* Group	14.29	7.05–22.67
N15	*M. buenzlii* + *M. uncinata* Clades	16.07	8.88–24.31
N16	*M. buenzlii* Group	12.65	5.85–20.07
N17	*M. uncinata* Group	13.28	6.66–20.61

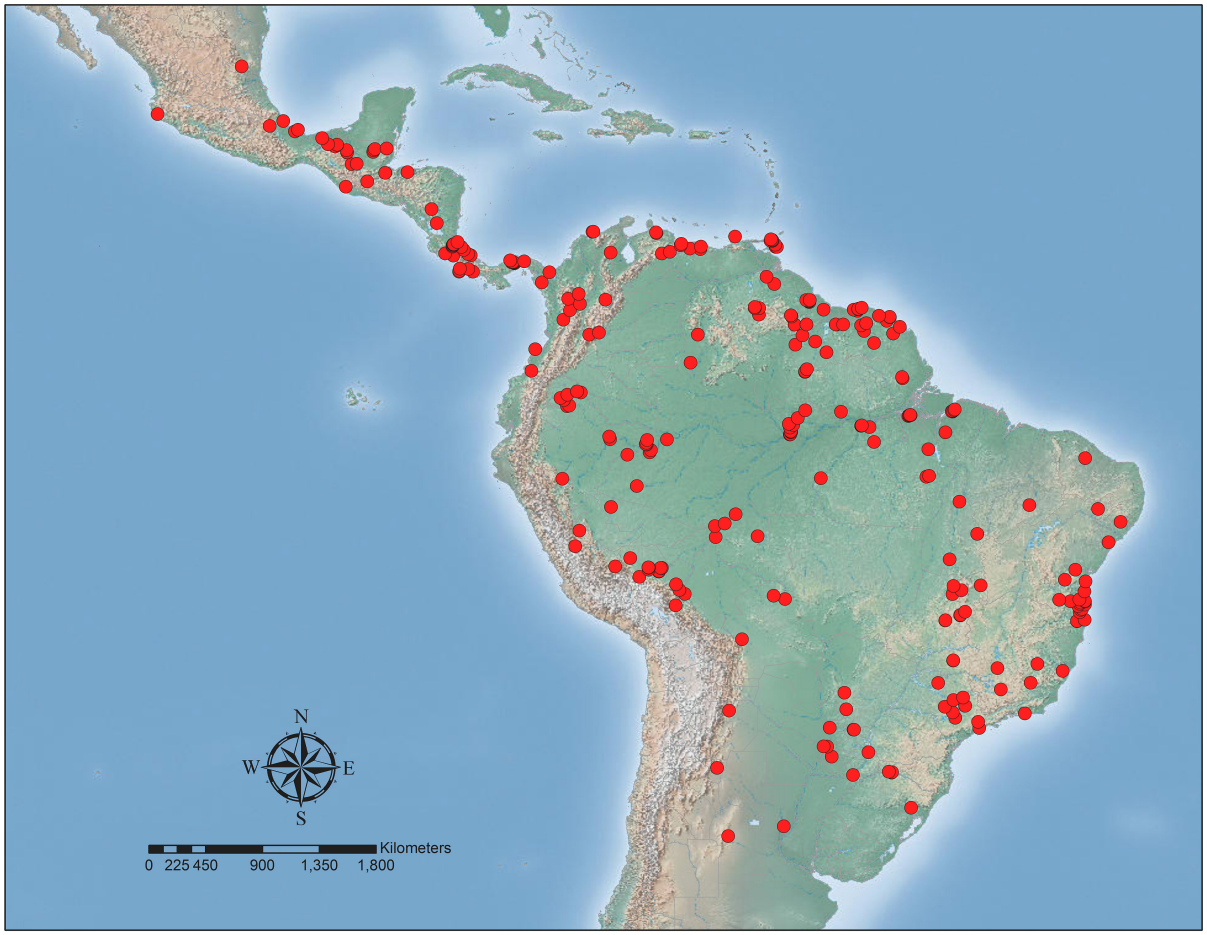


Figure 1.1. Distribution map of *Myrmicocrypta.*

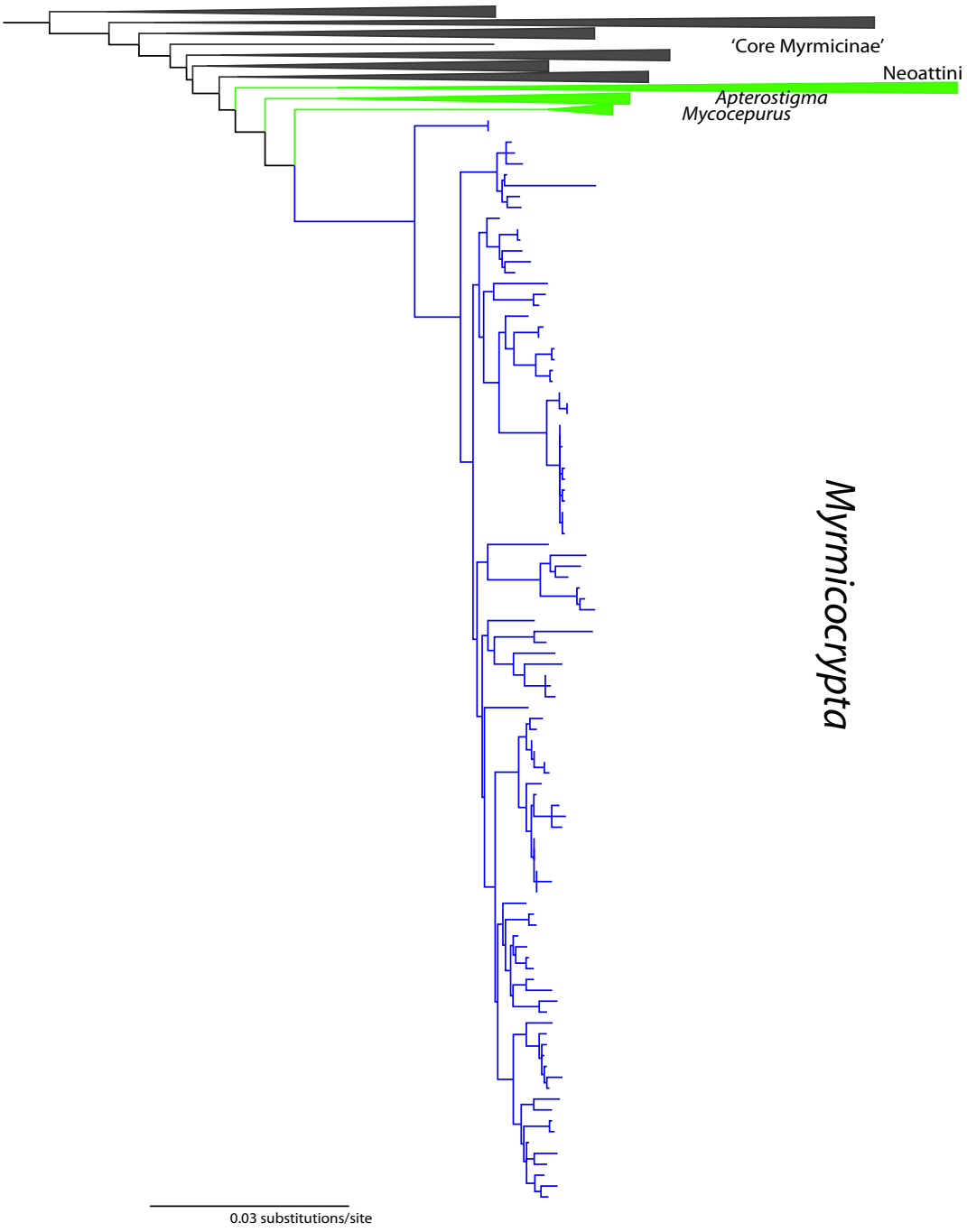


Figure 1.2. Fungus-farming phylogeny based on Schultz and Brady (2008), including four nuclear genes. The position of the genus *Myrmicocrypta* (blue) within the 'Paleoattini' (in addition to *Apterostigma* and *Mycocepurus*) and the rest of fungus-farming groups (green).

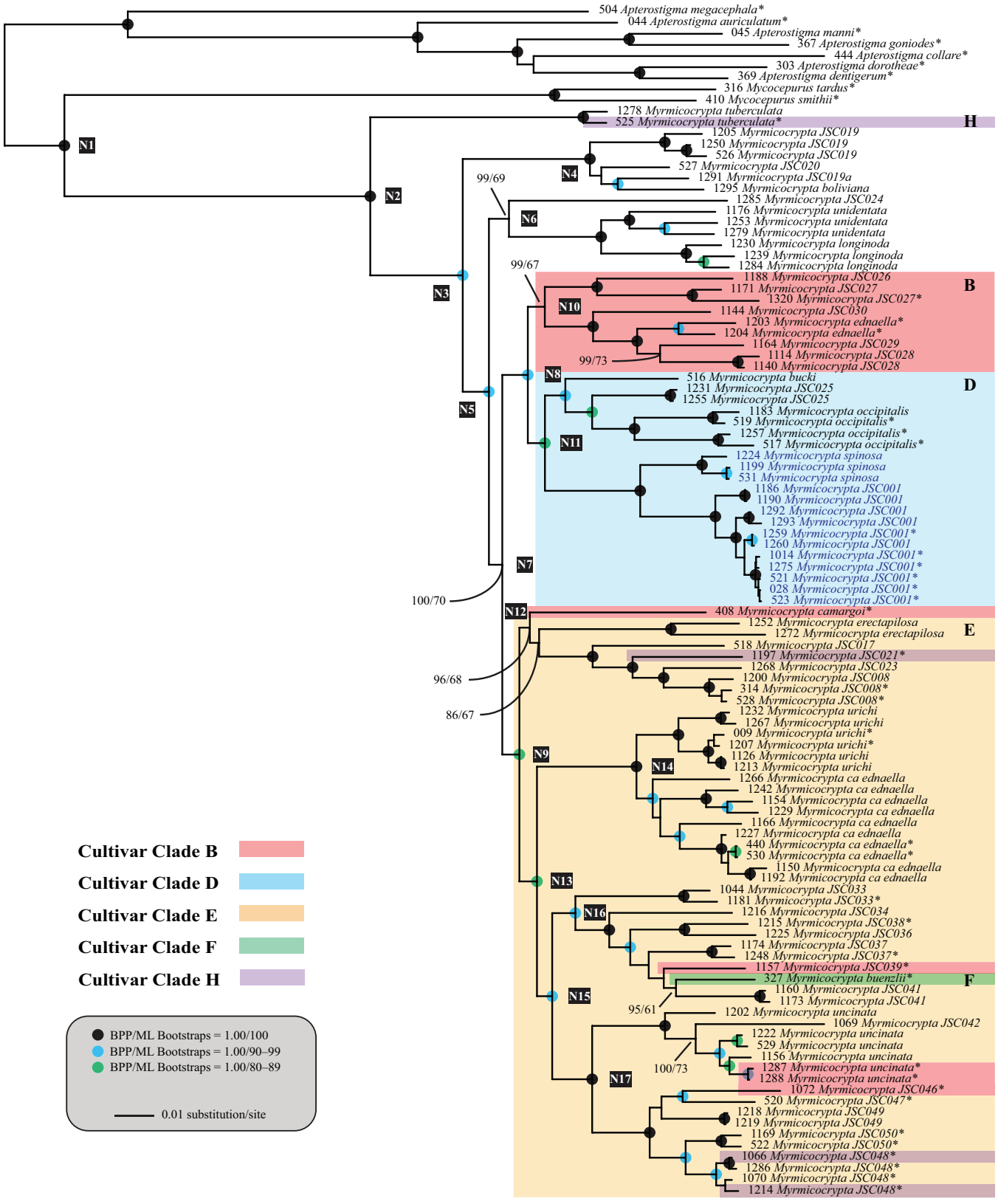


Figure 1.3. Bayesian-generated phylogeny of the fungus-farming ant genus *Myrmicocrypta* and outgroup species. Coloured boxes indicate ancestral-state fungal associations of ants as reconstructed under the maximum likelihood Mk-1 (est) Markov k-state 1 parameter model as part of the package StoChar in Mesquite v2.75. The cultivar clades (colored boxes)

correspond to those identified by Mehdiabadi et al., (2012) based on ITS sequences of >440 fungal taxa, including free-living and ant-associated fungi. The proportional likelihoods under the Markov k-state model that each cultivar clade arose in the most recent common ancestor of the corresponding ant clade was: N9=0.90583126; N10=0.900001469; N11=0.98779005; and N13=0.97355163. Colored circles indicate Bayesian posterior probabilities (BPP)/Maximum Likelihood Bootstraps (ML Bootstraps) as follows: black circles 1.00/100; blue circles 1.00/90–99; green circles 1.00/80–89. Other support values are given directly on the tree. Node labels N1–N17 correspond to nodes used in Tables 1.8 and 1.9. Asterisk symbol (*) after species name indicates taxa from which fungal cultivar was obtained either from collected garden or directly from the ant DNA extraction; unknown state assignments were given to non-asterisk taxa. Taxa in blue refer to species that nest in rotten logs (ancestral-state estimation 0.98850742), all other species within *Myrmicocrypta* are known to nest underground (ancestral-state estimation N2=0.99980337).

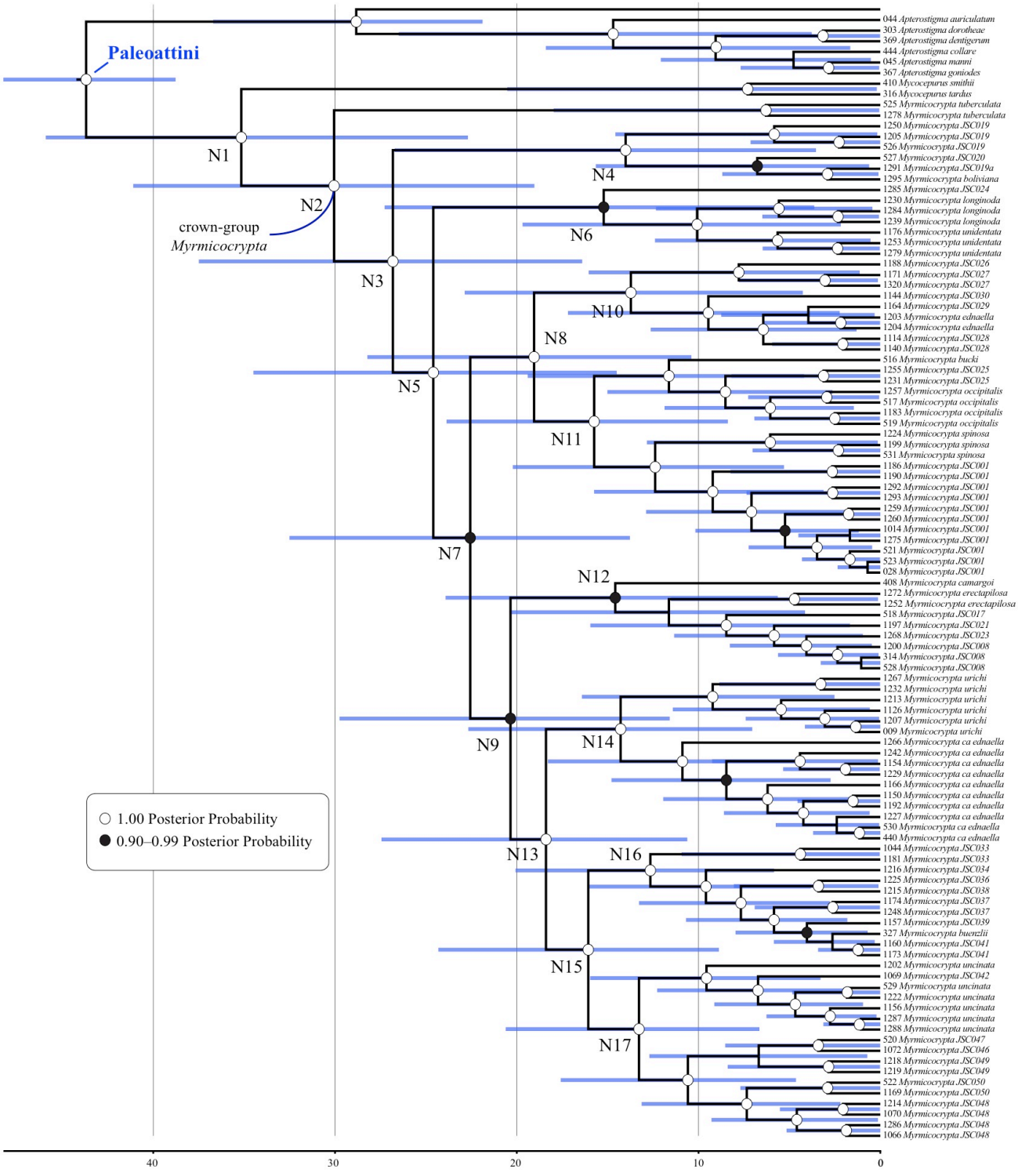
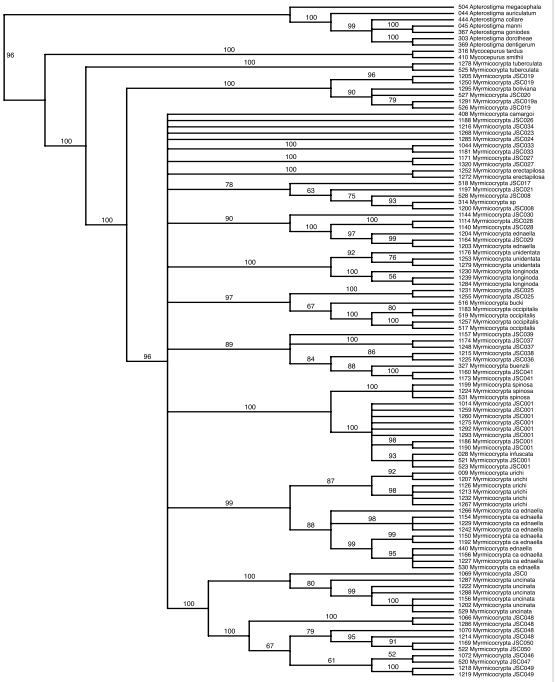


Figure 1.4. Time-calibrated phylogeny of *Myrmicocrypta*, inferred from a BEAST analysis. Blue bars depict the 95% HPD (highest probability density). Open circles correspond to posterior probability values of 1.00; closed circles correspond to posterior probability values of 0.90–0.99.

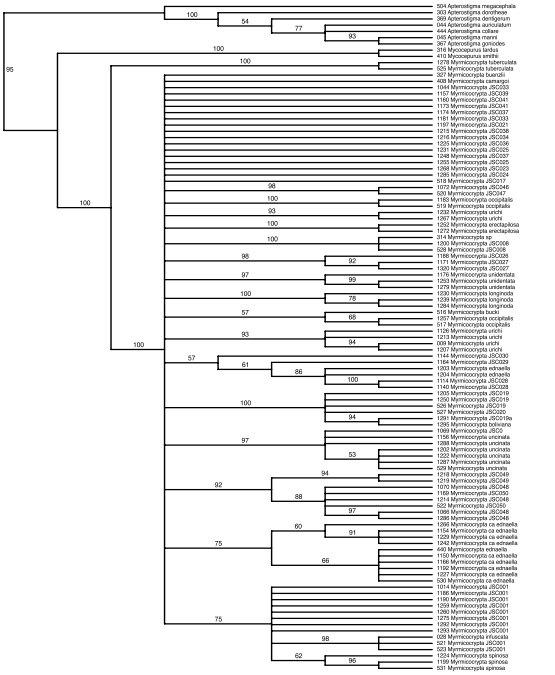
A

Majority-rule consensus tree



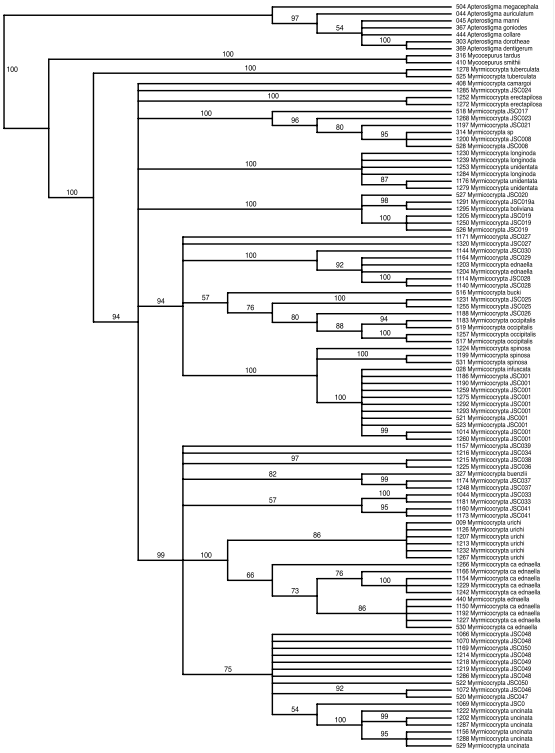
B

Majority-rule consensus tree



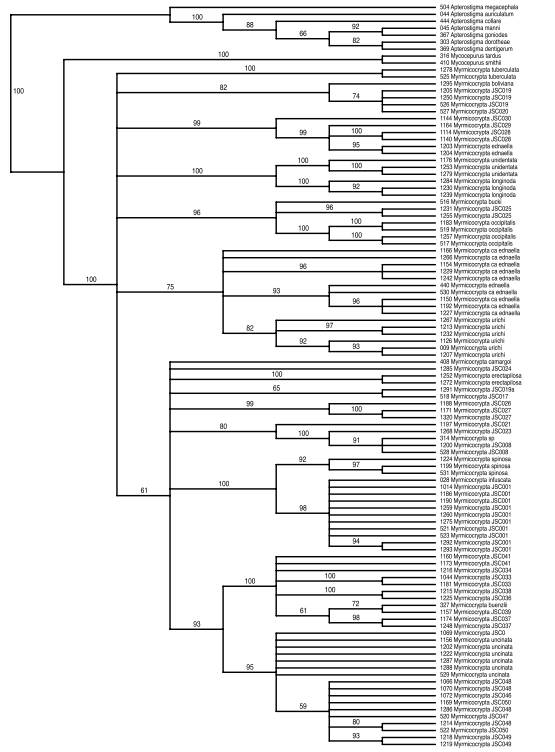
C

Majority-rule consensus tree



D

Majority-rule consensus tree



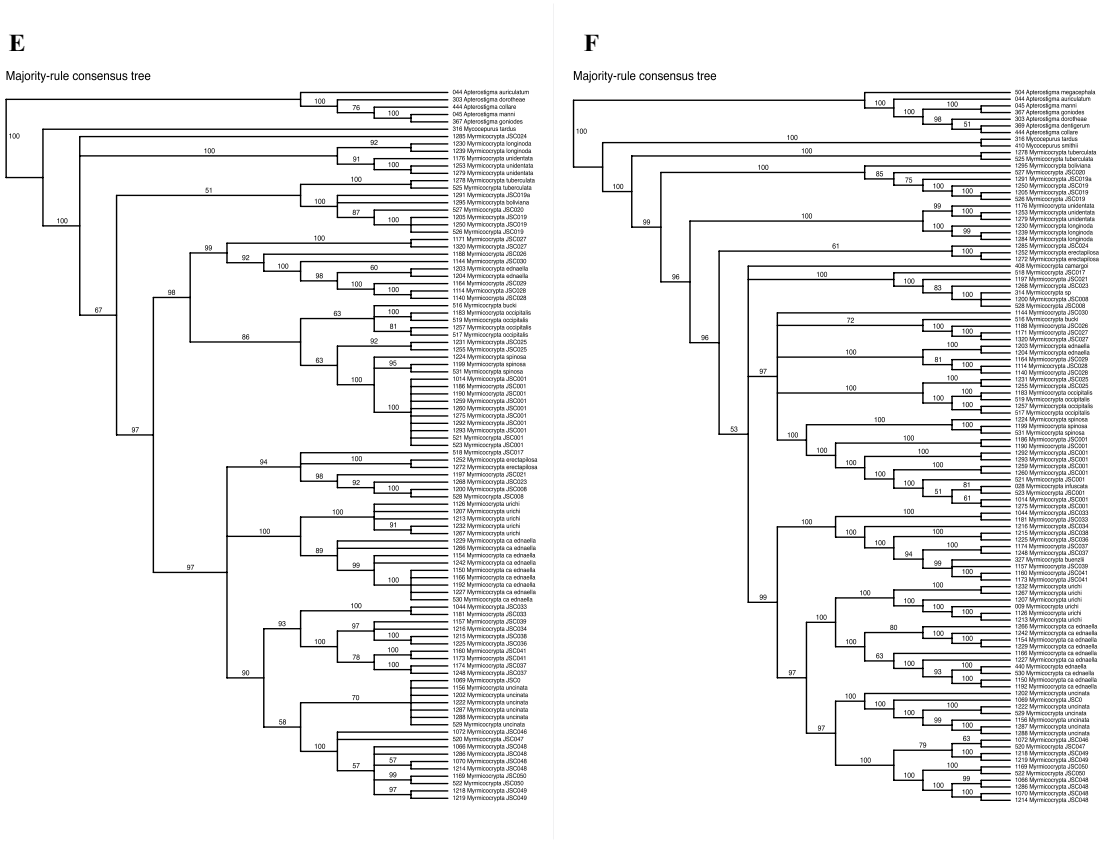


Figure 1.5. Majority-rule consensus tree of each gene used in this study, *EF1aF1* (A), *EF1aF2* (B), *LW Rh* (C), *wg* (D), *TOP1* (E), and *COI* (F).

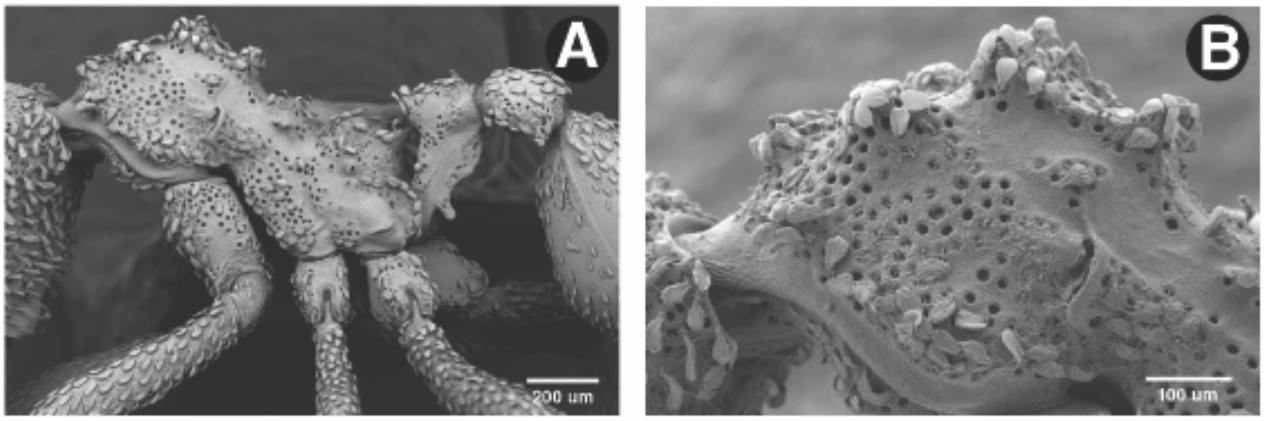


Figure 1.6. *Myrmicocrypta tuberculata* showing the presence of the crypts. A) Lateral view of mesosoma, petiole, and postpetiole. B) Lateral view of promesonotum.

Chapter 2: Taxonomic revision of the Neotropical fungus-farming ant genus *Myrmicocrypta* Fr. Smith (Hymenoptera: Formicidae: Myrmicinae).

2.1. Introduction

The non-leaf-cutting fungus-farming ant genus *Myrmicocrypta* (Formicidae, Myrmicinae, Attini) was established by Fr. Smith (1860) based on an alate queen collected by HW Bates in São Paulo [de Olivença], Brazil (see Kempf (1961)). Until now, the genus *Myrmicocrypta* has never been taxonomically revised. Previous taxonomic actions in *Myrmicocrypta* were mostly at the genus level and consisted solely of a junior synonym (*Glyptomyrmex*, Emery (1894), the transfer of nine species to the attine genera *Mycetophylax*, *Kalathomyrmex*, *Paramycetophylax*, and *Trachymyrmex* (Bolton, 1995; Weber, 1958b; Santschi, 1929, 1922; Emery, 1922; Emery, 1913; Bolton, 2013; Bolton *et al.*, 2006), and the transfer from the genus *Apterostigma* of the species *Myrmicocrypta uncinata* (Emery, 1894). This lack of taxonomic work has left the genus with a number of poorly delimited species, making it difficult to properly identify its species (MacKay and Vinson, 1989). In addition, earlier taxonomists described species based on the reproductive castes (i.e., queens or males) without direct association with the worker caste. This constitutes a serious problem, because (i) ant taxonomy relies mostly on the worker caste; (ii) reproductives are not as commonly collected as workers; and (iii) association of

males, queens, and workers is possible when collecting entire colonies and these can be kept under laboratory conditions.

Currently the genus comprises 31 described species and subspecies (Bolton, 1995; Bolton, 2013; Bolton *et al.*, 2006; Sosa-Calvo and Schultz, 2010) distributed in the Neotropics from Mexico through northern Argentina (Kempf, 1972; Fernández and Sendoya, 2004). The genus remains unknown both in the Caribbean (Weber, 1968; Bolton *et al.*, 2006; Fernández and Sendoya, 2004; Wilson, 1988; Wheeler, 1922; Weber, 1958b) and in the fossil record (Wilson, 1988) (Figure 2.1).

The genus *Myrmicocrypta* is one of 16 genera (including *Pseudoatta*) within the monophyletic ant tribe Attini (Schultz and Meier, 1995a; Schultz and Brady, 2008; Mueller et al., 2001; Wetterer *et al.*, 1998). Like all other attine ants, members of *Myrmicocrypta*, as far as their biologies are known, cultivate fungi in the tribe Leucocoprineae (Agaricales) upon which they depend for food (Garling, 1979; Hölldobler and Wilson, 1990; Mueller et al., 2005a; Schultz *et al.*, 2005; Wilson, 1971). The tribe Attini *s.s.* is informally divided into two major groups or clades, the Paleoattini and the Neoattini (Kusnezov, 1961, 1963; Schultz and Brady, 2008). The genus *Myrmicocrypta* belongs to the Paleoattini, which also includes the genera *Apterostigma* Mayr and *Mycocepurus* Forel. Members of the paleoattine group share (i) the presence of a fenestra on the forewing of queens, but absent in males, as far as is known unique in ants (Emery, 1913; Emery, 1922; Fernández-Marin et al., 2005); (ii) antennal scapes in the male short, shorter than the sum of funicular segments I–III; (iii) funicular segment I in the antenna of males shorter than funicular segment II; and (iv) petiole pedunculate, as opposed to sessile in the Neoattini.

Until recently, the only putative synapomorphy of the genus was the presence of squamate hairs (Smith, 1860). Recently, Sosa-Calvo and Schultz (2010) proposed six putative morphological synapomorphies for the genus, five of the worker caste and one of the male, including: (i) base of antennal scapes bilobed at the junction of the antennal condyle, (ii) mid-portion of clypeus, anterior to the frontal lobes, produced into a pair of blunt to acuminate frontoclypeal teeth, (iii) area of propleuron adjacent to the inferior pronotal angle bearing a tooth, tubercle, or carina, (iv) postpetiole with latero-posterior margins usually confluent with the antero-lateral margins of the gaster, (v) body of most species typically covered with appressed to suberect squamate or spatulate hairs, reversed to erect or simple hairs in some species, and (vi) propodeal spines extremely long and thin in the males.

This study represents the first comprehensive taxonomic revision of this large and previously neglected fungus-farming ant genus. High-resolution digital images of workers, queens, and males accompany the descriptions of new species and redescriptions of previously known species. In addition, new collection records, geographic distribution maps, and natural histories of the species are provided when possible. A stable taxonomic foundation for *Myrmicocrypta* will facilitate further research on the biology and natural history of these ants, and contribute to our general understanding of the evolution of fungus-farming behavior in ants.

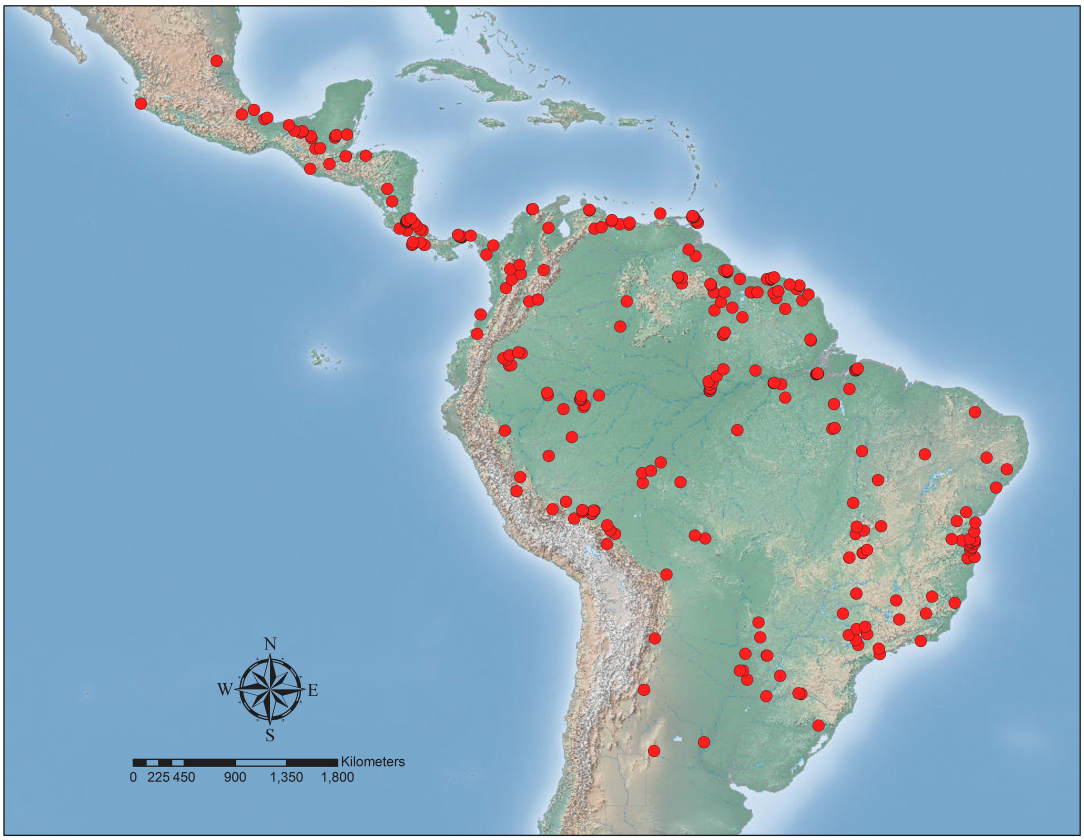


Figure 2.1. Distribution map of *Myrmicocrypta.*

2.2. Materials and Methods

2.2.1. Species delimitation

I employ the view that species are aggregates of interbreeding or potentially interbreeding populations connected by gene flow, that is, the Biological Species Concept (Mayr 1942; Coyne and Orr 2004). Support for reproductive isolation is a result of finding either morphological or genetic discontinuities (or both) that are

maintained in sympatry among closely related taxa. Species described should be viewed as hypotheses that may be tested with the acquisition of additional data.

2.2.2. Depositories of material

The specimens examined were borrowed from and/or have been deposited in the following institutions. The collection acronyms follow those listed by Brandão (2000):

AMNH American Museum of Natural History, Central Park West at 79th Street, New York, NY, U. S. A.

BLME Coleção Entomológica, Bacci Laboratory of Molecular Evolution, São Paulo State University (UNESP), Rio Claro, São Paulo, Brazil.

BMNH The Natural History Museum, London, UK.

CPDC Centro de Pesquisas do Cacau, Comissão Executia do Plano de Lavoura Cacaueira (CEPLAC), Itabuna, Bahia, Brazil.

CRC C. Rabeling Collection, Cambridge, MA, U. S. A.

CUIC Cornell University Insect Collection, College of Agriculture and Life Sciences, Cornell University, Ithaca, NY, U. S. A.

DZUP Coleção Entomológica "Pe. Jesus Santiago Moure", Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, Paraná, Brazil.

IAvHC Instituto "Alexander von Humboldt," Coleccion de Entomologia, Villa de Leyva, Boyacá, Colombia.

ICN Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá DC, Colombia.

IMLA Fundación e Instituto Miguel Lillo, Universidad Nacional de Tucumán, Miguel Lillo, Tucumán, Argentina

INBio Instituto Nacional de Biodiversidad, San José, Costa Rica.

INPA Instituto Nacional de Pesquisas da Amazônia, Manaus, Amazonas, Brazil.

JTLC John T. Longino, personal collection, University of Utah, Salt Lake City, UT, U. S. A.

KOUC Michael Kaspari Collection, Oklahoma University, Department of Zoology, Norman, OK, U. S. A.

LACM Los Angeles County Museum of Natural History, 900 Exposition Boulevard, Los Angeles, CA, U. S. A.

MBC–UFU Museu de Biodiversidade do Cerrado, Universidade Federal de Uberlândia, Uberlândia, Minas Gerais, Brazil.

MCSN Museo Civico di Storia Naturale "Giacomo Doria," Genoa, Italy.

MCZC Museum of Comparative Zoology, Harvard University, Cambridge, MA, U. S. A.

MHNG Musée d'Histoire Naturelle, Geneva, Switzerland

MIZA Museo del Instituto de Zoologia Agricola "Francisco Fernández Yépes," Facultad de Agronomía, Universidad Central de Venezuela, Maracay, Venezuela.

MPEG Museu Paraense "Emílio Goeldi," Belém, Pará, Brazil.

MUSM Museo de Historia Natural "Javier Prado," Universidad Nacional Mayor

de San Marcos, Lima, Perú.

MZSP Museu de Zoologia da Universidade de São Paulo, São Paulo, São Paulo, Brazil.

NHMB Naturhistorisches Museum, Basel, Switzerland.

NHMW Naturhistorisches Museum Wien, Vienna, Austria.

SMNK Staatliches Museum fuer Naturkunde Karlsruhe, Germany.

UCDC The Bohart Museum of Entomology, University of California, Davis, CA, U. S. A.

UNAB Museo Entomológico, Facultad de Agronomía, Universidad Nacional de Colombia, Bogotá, DC, Colombia.

UGEC University of Guyana, Entomological Collection, Georgetown, Guyana.

USNM United States National Museum of Natural History, Washington, DC, U. S. A.

UTEP University of Texas at El Paso, El Paso, TX, U. S. A.

2.2.3. Standard morphological measurements and specimen preparation

All measurements were taken to the nearest 0.001 mm and, unless otherwise noted, are in millimeters. Composite images were generated at the USNM Ant Lab using a JVC KY–F75U digital camera mounted on a Leica Z16 APO steromicroscope attached to a Dell Optiplex GX620 computer. Composite images were assembled using Auto-Montage Pro® (Version 5.03.0061 BETA) software (Synoptics Ltd.). Wings of males and queens were removed from the left side of the specimen, placed

on microscope slides with Euparal mounting medium, and covered with a square coverglass. The slides were labeled with the name of the species, the sex, country, and locality of collection, and the unique USNMENT number of the specimen to which the wings belong. All images were cropped and edited using Photoshop CS5.1® (Version 12.1 x64) (Adobe Inc.).

The measurements, indices, abbreviations, and morphological terminology utilized throughout follow Gauld and Bolton (1988); Sosa-Calvo and Schultz (2010); Serna and Mackay (2010); Rabeling et al. (2007a); Klingenberg and Brandão (2009), and literature cited therein, with modifications where noted. The following abbreviations are used in the description: w = worker, dq = dealate queen, m = male.

Anatomical abbreviations are as follows (see Figure 2.2):

EL Eye Length: in full-face view, the maximum diameter of the eye measured from the dorsal margin to the ventral margin. This measurement was usually taken from the left eye.

FLD Frontal Lobe Distance: in full-face view, the maximum horizontal distance between the outer borders of the frontal lobes.

GL Gaster Length: in profile, the length of the gaster from the anteriormost point of first gastral segment (fourth abdominal segment) to the posteriormost point of the last segment.

HL Head Length: in full-face view, the maximum vertical distance from the

posteriormost margin of the head to the midpoint of the anterior clypeal margin (clypeal apron), excluding the mandibles.

HFL Hind Femur Length: in most appropriate view, the maximum length of the hind femur.

HTL Hind Tarsomere I Length: in most appropriate view, the maximum length of the hind tarsomere I.

HW Head Width: in full-face view, the maximum horizontal width of the cephalic capsule excluding the eyes.

ML Mandible Length: in full-face view, the maximum diagonal-line distance from the base of the external mandibular insertion to the apical tooth. When mandibles were closed, the mandible on top was measured. When mandibles were open, then the left mandible was measured.

MSLI Median Clypeal Seta Length I: in full-face view, the maximum length of the unpaired median clypeal seta from its point of origin on the clypeal apron to the tip (apex) of the seta.

MSLII Median Clypeal Seta Length II: in full-face view, the maximum length of the unpaired median clypeal seta from the point where it surpasses the anterior margin of clypeal apron to the tip (apex) of the seta.

PL Petiole Length: in lateral view, the straight-line distance from the posteriormost margin of the petiole to the posteriormost margin of the metapleural lobe.

PPL Postpetiole Length: in lateral view, the maximum length of the postpetiole.

PPW Postpetiole Width: in dorsal view, the maximum horizontal width of the postpetiole.

SL Scape Length: in full-face view, the maximum length of the scape excluding the basal condyle.

TL Total Length: HL+ML+WL+PL+PPL+GL.

WL Weber's Length: in lateral view, the diagonal length of the alitrunk as measured from the anteriormost dorsal extent of the pronotum to the posteriormost ventral angle of the propodeum.

CI Cephalic Index: (HW/HL)*100.

FLI Frontal Lobes Index: (FLD/HW)*100.

MI Mandibular Index: (ML/HL)*100.

MSI Median Seta Index: (MSL/HL)*100.

OI Ocular Index: (EL/HW)*100.

PPI Postpetiole Index: (PPW/PPL)*100.

RFLDI Relative Frontal Lobe Distance Index I: (FLD/HL)*100.

RFLDII Relative Frontal Lobe Distance Index II: (FLD/HW)*100.

SI Scape Index: (SL/HW)*100.

Latitude and longitude coordinates were converted to decimal degrees when needed by using the Earth Point Web Site (http://www.earthpoint.us/Convert.aspx). In cases where coordinates were not documented on the specimen label, the coordinates were estimated using Google Earth v7.0 (http://www.google.com/earth/index.html) and are presented within brackets. The

distribution maps of the species of *Myrmicocrypta* were generated using the software ArcGIS v10.1 (Esri, Redlands, CA).

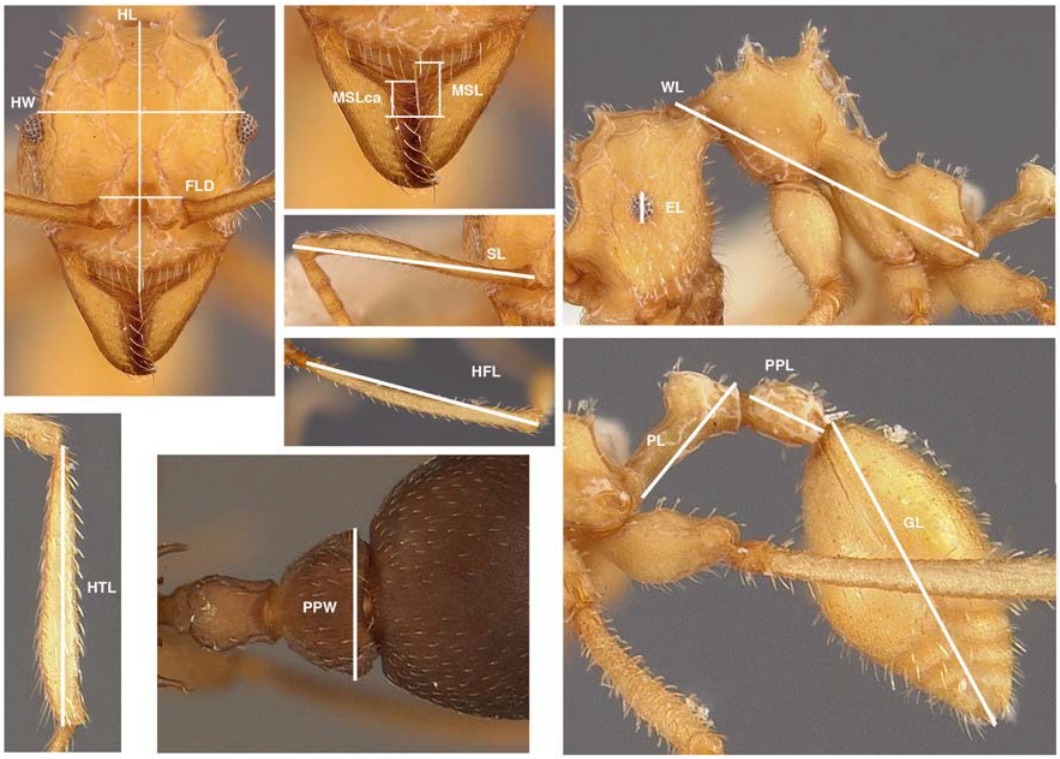


Figure 2.2. Standard measurements used in this study

2.3. Taxonomic history of the genus *Myrmicocrypta*

The genus *Myrmicocrypta* was created by Fr. Smith (1860) based on an alate gyne collected in São Paulo, Brazil. Mayr (1865): 24) briefly defined the genus, citing the characters: wings of gynes with short hairs, with submarginal cell closed, lacking stigma, and lacking discal cell; and frontal lobes very reduced in workers and gynes. Forel (1885) created the genus *Glyptomyrmex*, based on a single male collected in Orizaba, Mexico, noting its resemblance to males in the genera *Apterostigma* Mayr

and *Cyphomyrmex* Mayr. Mayr (1887) described the species *Apterostigma uncinatum*, based on a single worker collected in St. Catharina, Brazil. After examining the type specimen and additional specimens (workers, gyne, and male) collected in Asuncion, Paraguay, Emery (1890): 70) transferred *A. uncinatum* to *Glyptomyrmex*. Referring to the description by Fr. Smith (1860) and reexamining the gyne, Emery (1894): 224) synonomized the genus *Glyptomyrmex* with *Myrmicocrypta* and synonomized *G. uncinatum* with *M. squamosa.* Subsequently, Forel (1911): 295) revived *uncinata* as a variety of *M. squamosa.* Weber (1958b): 262) synonymyzed the species *M. corniculata* Emery, under *M. collaris* Emery, arguing that the differences seen in wing venation and cephalic area were not significant. In the same publication, Weber synonymized *M. buenzlii* Borgmeier under *M. squamosa*, after examining workers from São Paulo deposited in the Forel collection and identified as *M. squamosa*. Later, Kempf (1961): 517) reinstated *M. buenzlii* from synonymy arguing that the identity of the specimens deposited in the Forel collection were just a mere guess, due to the assumption that the type locality was São Paulo. As evidence, Kempf suggested that the specimens collected by HW Bates, and labeled "St. Paul, Brazil," refer to São Paulo de Olivença, in the state of Amazonas (northern Brazil); whereas the specimens deposited in Forel's Collection were collected by Luederwaldt in Ipiranga, São Paulo state (southern Brazil). Kempf points out "Inasmuch as the original description of *squamosa*, a female, is worthless for all practical recognition, it follows that Forel's identification of the specimens from southern Brazil as belonging to the same species is merely a guess." As a result, the taxonomy of *Myrmicocrypta* comprises a series of isolated descriptions with

poorly defined species boundaries and with no available resources for species identification.

Some, but not all, previous researchers have suggested that members of *Myrmicocrypta* possess the most plesiomorphic characters within the Attini *s. s.*, i.e., that *Myrmicocrypta* species may be morphologically little diverged from the ancestral attine and that the genus may occupy a phylogenetic position near the root of the attine tree. Wheeler (1910) was the first to propose that *Myrmicocrypta* is the "most primitive" attine genus, based on low degree of worker/queen polymorphism and on the monomorphic worker caste. Emery (1912) produced the first phylogenetic diagram for the fungus-farming ants, dividing it into two clades, one containing (*Apterostigma* + *Myrmicocrypta*) and the other containing (*Cyphomyrmex* + the rest of the attines). A year later, Emery added *Mycocepurus* Forel to the clade containing *Myrmicocrypta* and *Apterostigma*, based on the relative smaller size of the antennal pedicel in the males (Emery, 1913), and subsequently reinforced this grouping (Emery, 1922): 332) as perhaps a more primitive lineage. In the same publication, Emery (1922): 335–337) presents a diagnosis for *Myrmicocrypta* based on the worker, queen, and male; and presents a synopsis of the geographic distribution of the species of *Myrmicocrypta* known at that time. Kusnezov (1955): 23) also hypothesized that the genera *Myrmicocrypta* + *Apterostigma* + *Mycocepurus* were “primitive” based on nest architecture, number of individuals per colony, fungal substrate, worker monomorphism, and defense behavior. He subsequently grouped the three genera together under the informal group Paleoatiini (Kusnezov, 1961). The phylogeny of Schultz and Meier (1995a), based solely on morphological characters of

larvae, reconstructs *Myrmicocrypta* as paraphyletic with regard to both the remaining Paleoattini (*Mycocepurus* + *Apterostigma*) and the Neoattini. Emery (1913) identified for the first time a clear spot (fenestra) near the margin of the forewing of the queens of *Myrmicocrypta*. This fenestra, which is missing from the wings of males, has been proposed as synapomorphic for the paleoattines (Fernández-Marin *et al.*, 2005; Schultz, 2007; Sosa-Calvo and Schultz, 2010; Sosa-Calvo *et al.*, 2013). Emery (1913) also suggests that, morphologically, the males of *Myrmicocrypta* are more variable than workers and queens, which tend to be more uniform in their morphology. In addition, Emery (1913) points out the difficulty of associating males with other castes in *Myrmicocrypta*.

The larval stage of *Myrmicocrypta* was first described by Wheeler (1948) based on the larvae of three species, including *M. guianensis*, *M. spinosa*, and *M. urichi*; and characters of the larvae were used in a phylogenetic analysis of the tribe (Schultz and Meier 1995).

2.4. Natural history of *Myrmicocrypta*

Workers are cryptic foragers in the leaf litter and thus rarely hand-collected in the field. *Myrmicocrypta* species reportedly use a wide variety of organic matter as substrates for their fungus gardens, including arthropod frass, wood pellets, insect corpses, seeds, flower parts, dry leaves, and other plant debris (Hölldobler and Wilson, 1990; Leal and Oliveira, 2000; Mueller *et al.*, 2005b; Murakami and Higashi, 1997; Sosa-Calvo and Schultz, 2010; Weber, 1941a; Weber, 1968; Weber, 1945,

1947, 1966, 1969). The most thorough study of *Myrmicocrypta* biology (Murakami and Higashi, 1997) reports that (i) individuals of *M. ednaella* Mann grow their cultivar gardens on a substrate consisting primarly of small pieces of wood; (ii) both queen and larvae feed solely on mycelium, whereas older workers depend more on nectar and/or sap, and are rarely seen feeding on mycelium; and (iii) brood care is almost non-existent, possibly due to the fact that the larvae of attine ants are embedded in their cultivar gardens and can feed on the mycelium without aid of nestmates.

Like many lower attine ants, and differing from the higher (leaf-cutter) attine ants, queens of *Myrmicocrypta* are single mated and worker-to-worker relatedness has been estimated to be very close to 0.75 (Murakami *et al.*, 2000; Villesen *et al.*, 1999).

A new species of basidiomycetous yeast, *Trichosporon chiarellii* (Basidiomycota: Trichosporonales), was recently isolated and described from a colony of *Myrmicocrypta camargoi* (Pagnocca *et al.*, 2010). Species belonging to this genus are found in both the soil and water, and some species are known to be opportunistic pathogens. A few species have been found in the guts of beetles (Fuentefria et al., 2008; Middelhoven et al., 2004). Parasitism by *Megalomyrmex sp* and *Gnamptogenys hartmanni* on colonies of *Myrmicocrypta* from Panama and Argentina has been recently discovered (R Adams; C Rabeling; personal communication). Individuals of *Myrmicocrypta*, as well as other attine species, are known to place their cultivated fungi on the integuments on their larvae and pupae (Armitage et al., 2012) and it has recently been shown that fungal hyphae are capable

of penetrating the cuticule of the larvae, suggesting exchange of nutrients (Ortiz et al., 2012). Pupae of *M. guianensis* were reported to be naked whereas the larva was reported to be covered with a fungal coat (Weber, 1946), cited by Wheeler (1948)).

As in other genera of fungus-farming ants, a filamentous actinomycete bacterium, *Pseudonocardia* can be found growing in particular areas of the integument of *Myrmicocrypta* species, used by the ants to control the pathogenic effects of the specialized garden-parasite *Escovopsis* (Hypocreales). In paleoattines, which include the genus *Myrmicocrypta*, the *Pseudonocardia* bacterium is concentrated in an area under the forelegs (Currie et al., 1999a). It has also been reported that the ants possess cuticular structures (crypts) for the rearing and nourishment of antibiotic-producing bacteria (Currie et al., 2006). Althought such crypts were reported initially in *Cyphomyrmex* (Currie *et al.*, 2006), similar crypts are reported here for the first time in *Myrmicocrypta tuberculata* Weber (Figure 2.3), and have also been discovered in a new species in the *Apterostigma auriculatum* species group, in the latter case apparently serving to nourish a novel microbial symbiont (Sosa-Calvo and Schultz in preparation).

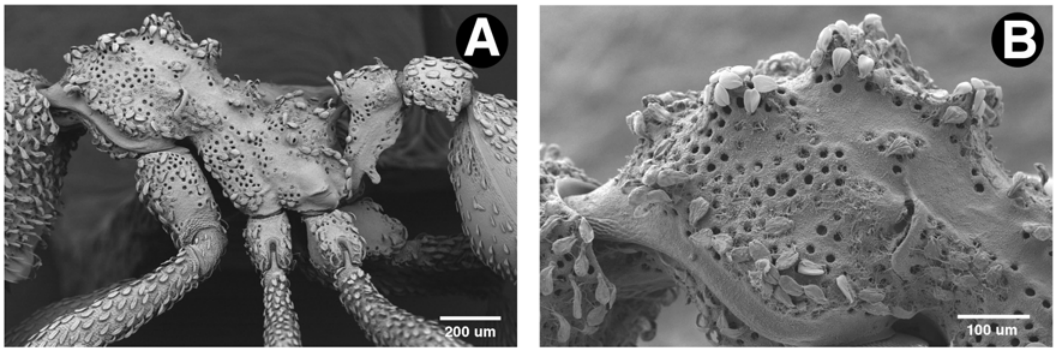


Figure 2.3. SEM of worker of *Myrmicocrypta tuberculata*. (A) Mesosoma, petiole and postpetiole. (B) Promesonotum.

2.4.1. Nest architecture

Most members of the genus *Myrmicocrypta* construct their colonies underground 5 cm to 1 m from the surface. The exception to this, as far as it is known, are the species *Myrmicocrypta spinosa* and *Myrmicocrypta JSC–001,* both of which nest in rotten logs. Underground colonies usually consist of a single, spherical chamber containing the entire colony, i.e., the fungal garden, brood, queen, workers, and, on occasion, alates (i.e., winged reproductives, both males and unmated queens). The dimensions of the chamber vary, possibly correlated with age, younger colonies having smaller chambers and older colonies having relatively large chambers. Some species, e.g., *Myrmicocrypta ednaella* Mann (1922), have been observed nesting underneath stones, with the fungus garden attached to and hanging from the underside of the stone, and *Myrmicocrypta urichi* have been located nesting under coconuts (Weber, 1937).

Most *Myrmicocrypta* nest entrances are inconspicuous holes in the ground no more than 1 mm in diameter. Weber (1937) reports that the species *Myrmicocrypta guianensis* constructs a crater out of sandy soil (~8 cm in diameter), with a funnel opening in the form of a turret ~1.8 cm high and 3.5 cm in diameter. Colonies of *Myrmicocrypta foreli* were encountered under a log about 7.5 cm from the surface (Mann, 1916).

Nest chambers of the species that inhabit rotten logs are usually irregular in shape and rarely these colonies have been found in parabiosis with other fungus-farming

ants that also nest in rotten logs, e.g., *Cyphomyrmex faunulus* (personal observation) or a species of the genus *Apterostigma.* A single observation of parabiosis, a form of symbiosis in which two or more species share the same nest and sometimes the same pheromone trails, but keep their broods separate (Hölldobler and Wilson, 1990), was reported to occur between the rotten-log-nesting fungus-farming ant species *Cyphomyrmex faunulus* and *Apterostigma urichii* by Sanhudo *et al.* (2008). Outside the Attini, parabiosis has been observed in several genera belonging to different subfamilies (e.g., *Crematogaster limata* and *Dolichoderus debilis*, Forel (1898); *Camponotus femoratus* and *Crematogaster levior* Vantaux et al. (2007)).

2.4.2. Diagnosis of the genus *Myrmicocrypta*

Myrmicocrypta Fr. Smith

Myrmicocrypta Fr. Smith (1860): 73). Type-species: *Myrmicocrypta squamosa* Fr. Smith (1860): 74) by monotypy.

Junior synonymy of *Myrmicocrypta*.

Glyptomyrmex, Forel (1885): 365). Type-species: *Glyptomyrmex dilaceratum,* by monotypy.

Glyptomyrmex as junior synonym of *Myrmicocrypta* Emery (1894): 224).

Several putative morphological synapomorphies for the genus have been identified and listed in Sosa-Calvo and Schultz (2010), including:

WORKER:

1) In full-face view, antennal scapes bilobed at the base at the junction of the antennal condyle.
2) Posterior lateral margins of the clypeus, anterior to the frontal lobes, produced into a pair of blunt to acuminate frontoclypeal teeth.
3) Area of propleuron adjacent to the inferior pronotal angle bearing a tooth, tubercle, or carina.
4) Postpetiole with lateral margins usually confluent with the anterior lateral margins of the gaster.
5) Body of most species typically covered with appressed to suberect squamate or spatulate hairs; however, species with erect and simple hairs also present.

MALE:

1) Propodeal spines extremely long and thin.

Diagnosis (worker). Monomorphic. In full-face view, cephalic margin convex, interrupted medially by a concavity and sometimes by blunt tubercles but never by spines. Eyes of variable size, flat, convex, hemispherical, or globose. Lacking ventral subocular prominence. Antennal scapes long, usually surpassing occipital corners and bilobed at base of junction of antennal condyle. Clypeal apron always present as smooth to weakly sculptured shining strip, anterior to clypeus; posterior portion of clypeal apron extending between frontal lobes or interrupted anteriorly. Posterior lateral margins of clypeus, anterior to frontal lobes, produced into a pair of blunt to acuminate frontoclypeal teeth. Frontal lobes vestigial to weakly expanded (triangular or convex), barely covering antennal sockets. Lateral corners of hypostoma with

acute hypostomal teeth (hypostomal teeth rounded or absent in *Apterostigma* and *Mycocepurus*). Area of propleuron adjacent to inferior pronotal angle bearing a tooth, tubercle, carina, or otherwise sculptured and bearing erect hairs (sculpture and hairs absent in *Mycocepurus* and sculpture absent in *Apterostigma*). Promesonotum usually with spines or tubercles, rarely reduced to low ridges or carinae (as in *Apterostigma*), anteriorly with three pairs of spines or tubercles, but never with a crown of well-differentiated spines (as in *Mycocepurus*). Petiole with long peduncle and well-defined petiolar node lacking spines but sometimes with posterior carina (petiolar node weakly defined in *Apterostigma* and armed with two pairs of spines in *Mycocepurus*). Postpetiole, in dorsal view, trapezoidal, subquadrate, or dome-like with or without posterior margin emarginate, lateral margins usually confluent with anterior lateral margins of gaster. First gastral segment somewhat longer than wide; in dorsal view, its anterior and posterior margins straight, the lateral margins convex and anteriorly carinate. Sting present, protruding, and visible; frequently large. Body of most species covered with appressed to suberect squamate or spoon-shaped hairs, some species with erect simple hairs.

Type species: *Myrmicocrypta squamosa* Fr. Smith.

2.5. Results

2.5.1. Synoptic list of the species of *Myrmicocrypta*

Myrmicocrypta boliviana Weber 1938

Myrmicocrypta buenzlii Borgmeier 1934

Myrmicocrypta bucki Sosa-Calvo and Schultz 2010

Myrmicocrypta camargoi Sosa-Calvo and Schultz 2010

Myrmicocrypta collaris Emery 1913

Myrmicocrypta corniculata Emery 1913, **Revived from synonymy**

Myrmicocrypta dilacerata (Forel 1885)

= *Myrmicocrypta dilacerata* r. *cornuta* Forel 1899 **New synonym**

Myrmicocrypta ednaella Mann 1922

Myrmicocrypta ca ednaella **New species**

Myrmicocrypta elizabethae Weber 1937

Myrmicocrypta erectapilosa Sosa-Calvo and Schultz 2010

Myrmicocrypta foreli Mann 1916

Myrmicocrypta godmani Forel 1899

Myrmicocrypta guianensis Weber 1937

Myrmicocrypta longinoda Weber 1938

Myrmicocrypta occipitalis Weber 1938

= *Myrmicocrypta microphthalma* Borgmeier 1948 **New synonym**

Myrmicocrypta oglobini Santschi 1936

Myrmicocrypta peruviana (Emery 1913), **New status**

Myrmicocrypta rudiscapa Emery 1913

Myrmicocrypta spinosa Weber 1937

= *Myrmicocrypta infuscata* Weber 1946 **New synonym**

Myrmicocrypta squamosa Fr Smith 1860

Myrmicocrypta subnitida Forel 1899

Myrmicocrypta surianensis (Wheeler 1925), **New status**

Myrmicocrypta triangulata Forel 1912

Myrmicocrypta tuberculata Weber 1938

Myrmicocrypta uncinata (Mayr 1887), **New status**

= *Myrmicocrypta bruchi* Santschi 1936 **New synonym**

Myrmicocrypta unidentata Weber 1937

Myrmicocrypta urichi Weber 1937

Myrmicocrypta weyrauchi Borgmeier 1948

Myrmicocrypta JSC–001 **New species**

Myrmicocrypta JSC–003 **New species**

Myrmicocrypta JSC–005 **New species**

Myrmicocrypta JSC–006 **New species**

Myrmicocrypta JSC–008 **New species**

Myrmicocrypta JSC–009 **New species**

Myrmicocrypta JSC–017 **New species**

Myrmicocrypta JSC–019 **New species**

Myrmicocrypta JSC–019a **New species**

Myrmicocrypta JSC–019b **New species**

Myrmicocrypta JSC–020 **New species**

Myrmicocrypta JSC–021 **New species**

Myrmicocrypta JSC–022 **New species**

Myrmicocrypta JSC–022a **New species**

Myrmicocrypta JSC–022b **New species**

Myrmicocrypta JSC–022x **New species**

Myrmicocrypta JSC–022y **New species**

Myrmicocrypta JSC–023 **New species**

Myrmicocrypta JSC–024 **New species**

Myrmicocrypta JSC–025 **New species**

Myrmicocrypta JSC–026 **New species**

Myrmicocrypta JSC–027 **New species**

Myrmicocrypta JSC–028 **New species**

Myrmicocrypta JSC–029 **New species**

Myrmicocrypta JSC–030 **New species**

Myrmicocrypta JSC–033 **New species**

Myrmicocrypta JSC–034 **New species**

Myrmicocrypta JSC–037 **New species**

Myrmicocrypta JSC–039 **New species**

Myrmicocrypta JSC–042 **New species**

Myrmicocrypta JSC–046 **New species**

Myrmicocrypta JSC–047 **New species**

Myrmicocrypta JSC–048 **New species**

Myrmicocrypta JSC–049 **New species**

Myrmicocrypta JSC–050 **New species**

Myrmicocrypta JSC–051 **New species**

2.5.2. Key to the species of *Myrmicocrypta* based on workers

1. Integument covered with cuticular crypts (i.e., small but conspicuous pits) … *M. tuberculata*

–. Integument lacking cuticular crypts; integument smooth or granulate … 2

2(1). Body covered with scale-like or squamate hairs, lacking any erect simple hairs … 3

–. Body covered with erect, simple hairs. If scale-like or squamate hairs are present, then at least a pair of erect hairs on dorsum of head, frontal lobes, or antennal scapes … 35

3(2). Frontal lobes vestigial, parallel, not expanded to very weakly expanded laterally … 4

–. Frontal lobes conspicuously expanded laterally, either convex or triangular … 17

4(3). In lateral view, hypostomal teeth short to very reduced, inconspicuous… 8

–. In lateral view, hypostomal teeth long, very conspicuous … 5

5(4). Large individuals (WL 1.18–1.19). In full-face view, base of antennal scape with serrate carina … *M. JSC–051*

–. Relatively smaller individuals (WL 0.93–1.05). In full-face view, base of antennal scape lacking a serrate carina … 6

6(5). In lateral view, propleural tubercles long and conspicuous. In full-face view, antennal scape scabrous … *M. JSC–029*

–. In lateral view, propleural tubercles vestigial, reduced to carinae. In full-face view, antennal scapes finely reticulate … 7

7(6). In lateral view, lateral mesonotal tubercles slightly larger than anterior mesonotals … *M. JSC–017*

–. In lateral view, lateral mesonotal tubercles as long as anterior mesonotals … *M. JSC–021*

8(4). In lateral view, propleural tubercles tooth-like, conspicuous … 9

–. In lateral view, propleural tubercles reduced to carinae or angle, not tooth-like … 12

9(8). In full-face view, frontal carinae present, strongly marked; extending posteriorly to reach cephalic margin … 10

–. In full-face view, frontal carinae vestigial to absent; not reaching the cephalic margin … 11

10(9). Eyes large (EL 0.13, OI 20–22), convex, with 8–9 ommatidia in longest row, 33–41 ommatidia total. Unpaired median seta mid-sized (MSL 0.10–0.14, MSI 13–17). In lateral view, anterior pronotal tubercles tooth-like … *M. JSC–042*

–. Eyes small (EL 0.07–0.09, OI 11–17), convex, with 3–4 ommatidia in longest row, 10–12 ommatidia total. Unpaired clypeal seta short, stout (MSL 0.06–0.08, MSI 8–12). In lateral view, anterior pronotal tubercles absent or present as shallow carinae … *M. ednaella*

11(9). In full-face view, dorsum of head rugulose. Dorsum of head covered with spoon-shaped hairs. Eyes flattened. In lateral view, propodeal spines short. Lateral pronotal tubercles tooth-like … *M. JSC–033*

–. In full-face view, dorsum of head smooth, lacking rugae. Dorsum of head covered with broad, scale-like appressed hairs. Eyes globose. In lateral view, propodeal spines long. Lateral pronotal tubercles absent … *M. JSC–034*

12(8). In lateral view, outer portion of mid and hind tarsomeres with suberect simple hairs … *M. JSC–039*

–. In lateral view, outer portion of mid and hind tarsomeres with appressed simple hairs … 13

13(12). In full-face view, dorsum of head rugulose. In lateral view, ventral portion of petiole with a thick, irregular carina or ventral anterior process … 14

–. In full-face view, dorsum of head lacking rugae. In lateral view, ventral portion of petiole lacking a thick carinae or ventral anterior process… *M. elizabethae*

14(13). In full-face view, unpaired median seta long (MSL 0.11–0.13) … *M. JSC–037*

–. In full-face view, unpaired median seta short (MSL 0.06–0.09) … 15

15(14). In lateral view, propodeal spines long, almost as long as length of the eye … *M. foreli* (JSC–036 and *JSC–038*)

–. In lateral view, propodeal spines short, almost half the length of the eye … 16

16(15). Smaller individuals (HL 0.64–0.65, HW 0.51–0.52). Area between mesonotal and metanotal grooves with a pair of tubercles, of which the posterior one is the largest. In lateral view, node of petiole subquadrate …

M. guianensis

–. Larger individuals (HL 0.71–0.79, HW 0.58–0.65). Area between mesonotal and metanotal grooves with a pair of tubercles of same size. In lateral view, node of petiole rounded anteriorly … *M. buenzlii*

17(3). In full-face view, frontal carinae reduced to vestigial, masked by rugosities on dorsum of head… 18

–. In full-face view, frontal carinae strongly marked… 24

18(17). In dorsal view, disc of postpetiole longer than - or as long as - wide (PPL 0.24–0.29, PPW 0.24–0.28, PPI 93–100) … *M. longinoda*

–. In dorsal view, disc of postpetiole wider than long (PPL 0.15–0.24, PPW 0.22–0.29, PPI 105–200) … 19

19(18). Smaller individuals (WL 0.71–0.77, SL 0.50–0.58, HFL 0.54–0.61). Eyes small (EL 0.06–0.09, OI 12–18), convex, with 3–5 ommatidia in longest row (~8–15 ommatidia total) … *M. unidentata*

–. Larger individuals (WL 0.80–0.90, SL 0.61–0.71, HFL 0.63–0.81). Eyes large (EL 0.09–0.12, OI 15–20), convex, with 6–8 ommatidia in longest row (21–42 ommatidia total) … 20

20(19). In lateral view, area between mesonotal and metanotal grooves low, lacking pronounced tubercles … *M. urichi*

–. In lateral view, area between mesonotal and metanotal grooves with small but conspicuous small tooth-like tubercles … 21

21(20). In lateral view, anterior propodeal tubercle present, small but conspicuous … 22

–. In lateral view, lacking anterior propodeal tubercle … 23

22(21). In lateral view, anterior ventral process of petiole present, tooth-like. In dorsal view, disc of postpetiole finely reticulate … *M. JSC–020*

–. In lateral view, petiole lacking anterior ventral process. In dorsal view, disc of postpetiole smooth … *M. boliviana*

23(21). In lateral view, propleural tubercle tooth-like, small. In full-face view, dorsum of head with small pimple-like projections. In full-face view, frontal carina (line) present, posterior to frontal lobes … *M. JSC–019a*

–. In lateral view, propleural tubercle vestigial, a carina present instead. In full-face view, dorsum of head rugulose. In full-face view, frontal carina (line) posterior to frontal lobes absent … *M. JSC–019*

24(17). In lateral view, anterior pronotal tubercles tooth-like … 25

–. In lateral view, anterior pronotal tubercles absent or carina-like … 31

25(24). In dorsal view, humeral tubercles long, needle-like … 26

–. In dorsal view, humeral tubercles tooth-like to triangular, but not needle-like … 28

26(25). In full-face view, frontal lobes triangular, weakly expanded laterally. In full-face view, antennal scapes with suberect, spoon-shaped hairs. In full-face view, clypeal apron wide … 27

–. In full-face view, frontal lobes triangular widely expanded laterally. In full-face view, antennal scapes covered with appressed spoon-shaped hairs. In full-face view, clypeal apron narrow … *M. weyrauchi*

27(26). In dorsal view, lateral pronotal tubercles massive, long, and needle-like … *M. JSC–003*

–. In dorsal view, lateral pronotal tubercles short, shorter than humeral tubercles … *M. occipitalis*

28(25). In dorsal view, humeral tubercles reduced to tumosities. In lateral view, hypostomal teeth reduced, very small, inconspicuous. In full-face view, sides of head convex, giving head a rounded shape … *JSC–019b*

–. In dorsal view, humeral tubercles tooth-like. In lateral view, hypostomal teeth large, conspicuous. In full-face view, sides of head straight, giving head a subquadrate shape … 29

29(28). Antennal scapes longer (SL > 70). Postpetiole longer (PPL > 0.20) … 30

–. Antennal scapes shorter (SL < 70). Postpetiole shorter (PPL < 0.20) … *M. JSC–030*

30(29). Eyes larger (EL > 0.11), with 8–10 ommatidia in longest row (42–53 ommatidia total). Dorsum of promesonotum with appressed squamate hairs … *M. JSC–001*

–. Eyes smaller (EL < 0.11), with 4–6 ommatidia in longest row (12–23 ommatidia total). Dorsum of promesonotum glabrous (lacking appressed squamate hairs) … *M. spinosa*

31(24). In full-face view, frontal lobes triangular. In lateral view, lateral mesonotal tubercles larger than any other tubercle in promosonotum … *M. JSC–008*

–. In full-face view, frontal lobes convex. In lateral view, lateral mesonotal tubercles as long as other tubercle in promesonotum … 32

32(31). Eyes small (EL < 0.09, OI 9–12), with 3–5 ommatidia in longest row (6–14 ommatidia total) … 33

–. Eyes large (EL >0.09, OI 15–20), with 5–8 ommatidia in longest row (18–38 ommatidia total) … 34

33(32). In lateral view, occipital collar bidentate with large tubercles. In lateral view, hypostomal teeth reduced, small. In full-face view, unpaired clypeal median seta short (MSL 0.07–0.08, MSI 10–12). Smaller individuals (HL

0.61–0.65, WL 0.75–0.81) … *M. JSC–024*

–. In lateral view, occipital collar reduced, upper tubercle tooth-like. In lateral view, hypostomal teeth large, conspicuous. In full-face view, unpaired median seta large (MSL 0.10–0.13, MSI 13–17). Larger individuals (HL 0.75–0.82, WL 0.95–1.05) … *M. JSC–025*

34(32). In full-face view, unpaired median seta long (MSL 0.10–0.15, MSI 12–18) … *M. uncinata*

–. In full-face view, unpaired media seta short, stout (MSL 0.04–0.08, MSI 6–10) … *M. ca ednaella*

35(2). Body covered entirely with erect simple hairs … 36

–. Body covered with appressed to semi-erect spoon-shaped hairs, with erect simple hairs restricted to head, antennal scapes, or frontal lobes … 40

36(35). In full-face view, frontal lobes reduced, parallel, failing to covered antennal insertions … 37

–. In full-face view, frontal lobes laterally expanded, convex to triangular, weakly covering antennal insertions … 38

37(36). In lateral view, hypostomal teeth vestigial. In full-face view, dorsum of head with small pimple-like tubercles. Hind femur and tibia large (HFL 0.70–0.81, HTL 0.54–0.60) … *M. JSC–005*

–. In lateral view, hypostomal teeth large and curving at tip. In full-face view, dorsum of head rugulose. Hind femur and tibia short (HFL 0.64–0.72, HTL 0.42–0.48) … *M. bucki*

38(36). In full-face view, hairs on antennal funicular segments long, erect, and simple … *M. JSC–006*

–. In full-face view, hairs on antennal funicular segments short and appressed … 39

39(38). Larger individuals (HL 0.88, HW 0.69, WL 1.11, TL 4.15, HFL 0.87, HTL 0.63). In full-face view, unpaired median seta relatively thick, long (MSL 0.09, MSI 11), four to five appressed simple hairs on each side of the median seta reaching anterior margin of clypeal apron … *M. JSC–022b*

–. Smaller individuals (HL 0.66–0.71, HW 0.57–0.63, WL 0.84–0.91, TL 3.22–3.33, HFL 0.63–0.68, HTL 0.48–0.49). In full-face view, unpaired clypeal seta long (MSL 0.14–0.17, MSI 21–23), with three pairs of simple, long, slender, appressed hairs surpassing the clypeal apron … *M. erectapilosa*

40(35). Larger individuals (WL > 1.04) … 41

–. Smaller individuals (WL < 1.04) … 45

41(40). Eyes small (EL 0.08–0.09, OI 10–12), with 3–5 ommatidia in longest row (6–12 ommatidia in total) … *M. JSC–022x*

–. Eyes large (EL 0.11–0.14, OI 14–23), with 7–9 ommatidia in longest row (35–48 in total) … 42

42(41). Antennal scapes covered with erect simple hairs or suberect, spoon-shaped hairs in addition to erect simple hairs … 43

–. Antennal scapes covered with short, appressed, spoon-shaped hairs … 44

43(42). In lateral view, frontal lobes protruding forward. In lateral view, lateral mesonotal tubercles larger than any other tubercle on mesosoma. Legs long (HFL > 1.25, HTL > 1.00) … *M. camargoi*

–. In lateral view, frontal lobes not protruding. In lateral view, lateral mesonotal tubercles as large as any other tubercles on mesosoma. Legs short (HFL < 1.25, HTL <1.00) … *M. JSC–009*

44(42). In lateral view, occipital collar with upper tubercle large, larger than lower tubercle. In lateral view, hypostomal teeth large, conspicuous. In lateral view, propleural tubercle present, tooth-like … *M. JSC–047*

–. In lateral view, occipital collar with upper and lower tubercles of equal size. In lateral view, hypostomal teeth vestigial. In lateral view, propleuron with irregular carina, lacking a tubercle … *M. JSC–046*

45(40). Individuals with small eyes (EL < 0.08), with 2–5 ommatidia in longest row (5–17 ommatidia in total). Outer margin of mid and hind tarsomere I with erect/suberect simple hairs … 46

–. Individuals with large eyes (EL > 0.09), with 6–10 ommatidia in longest row (22–52 ommatidia in total). Outer margin of mid and hind tarsomere I with appressed hairs … 51

46(45). In full-face view, posterior margin of clypeus not extending between frontal lobes … 47

–. In full-face view, posterior margin of clypeus extending between frontal lobes … *M. JSC–022y*

47(46). In lateral view, hypostomal teeth present, conspicuous … 48

–. In lateral view, hypostomal teeth vestigial, inconspicuous … *M. surianensis*

48(47). In lateral view, propleuron with a carina or angulate, lacking a tubercle … 49

–. In lateral view, propleuron with a conspicuous tubercle … 50

49(48). In lateral view, petiolar node subquadrate … *M. JSC–027*

–. In lateral view, anterior margin of petiolar node rounded, with small tooth … *M. JSC–022a*

50(48). In lateral view, occipital collar with long upper and lower tubercles, rounded at tip. In full-face view, hairs on antennal scape suberect and simple. In full-face view, frontal carinae strongly impressed, contrasting with any rugosity on dorsum of head … *M. JSC–028*

–. In lateral view, occipital collar with small angulate tubercles, acute. In full-face view, hairs on antennal scape erect and simple. In full-face view, frontal carinae weakly impressed not contrasting with any other rugosity on dorsum of head … *M. JSC–026*

51(45). In full-face view, frontal lobes triangular (FLD > 0.21). In lateral view, fore coxae rugose … *M. JSC–023*

–. In full-face view, frontal lobes reduced, convex or parallel (FLD < 0.21). In lateral view, forecoxa smooth … 52

52(51). In full-face view, frontal lobes weakly convex, anterior portion separated by posterior portion of clypeus … 53

–. In full-face view, frontal lobes parallel, anterior portion close together … 54

53(52). In dorsal view, humeral tubercles long, triangular. In lateral view, hypostomal teeth reduced, inconspicuous … *M. JSC–049*

–. In dorsal view, humeral tubercles short, tooth-like. In lateral view,

hypostomal teeth long, conspicuous … *M. JSC–022*

54(53). In lateral view, lateral pronotal tubercles acute and large … *M. JSC–048*

–. In lateral view, lateral pronotal tubercles blunt, carinae-like, not acute … *M. JSC–050*

2.5.3. Species of *Myrmicocrypta*

Myrmicocrypta boliviana Weber, 1938

(Figure 2.4)

Myrmicocrypta boliviana Weber (1938): 161) (w). 2 syntype workers, **BOLIVIA:** Beni; Rurrenabaque [211m; 14° 26′ 32″ S 67° 31′ 42″ W]; x.1921; (*WM Mann*); Mulford Biol. Exp. [USNM, MCZ] [examined]. The lectotype, here designated, is a worker with unique identifier number [USNMENT No. 00755354] deposited at USNM.

Diagnosis. *Worker*: cephalic corners rounded, lacking tubercles; frontal carinae vestigial; frontal lobes expanded laterally, convex to triangular; clypeal median seta short; tubercles on mesosoma almost completely eroded; petiole lacking ventral process. *Queen*: as in worker with modifications expected of the caste. *Male*: cephalic corners with acute tubercles; hypostomal teeth reduced, rounded at tip.

Measurements. *Workers*. EL 0.09–0.10, FLD 0.20–0.23, GL 0.64–0.74, HFL 0.63–0.68, HL 0.61–0.68, HTL 0.47–0.51, HW 0.52–0.58, ML 0.38–0.46, MSL 0.05–0.06, MSLca 0.02–0.03, OI 16–19, PL 0.29–0.35, PPL 0.19–0.21, PPW 0.23–0.26, SL 0.61–0.66, TL 2.99–3.26, WL 0.80–0.90, CI 77–87, MI 57–68, MSI 7–9, MSLI 43–63, PPI 114–132, RFLDI 31–35, RFLDII 38–45, SI 115–121 (n=9).

Description: *Worker*: Head subquadrate, slightly longer than broad (HL 0.61–0.68, HW 0.52–0.55, CI 83–87); cephalic margin almost straight, interrupted medially by weakly impressed emargination; cephalic corners evenly rounded, lacking tubercles; in full-face view, sides of head slightly convex; in full-face view, frontal carinae vestigial; postero-ventral angles of the head (collar) produced on each side as a pair of tubercles, top one somewhat more acute than lower tubercle. Masticatory (inner) margin of mandibles with 6–7 irregular teeth; outer margin of mandibles weakly sinuate; dorsum of mandibles finely striate-punctate; unpaired median seta short, stout (MSL 0.05–0.06, MSLca 0.02–0.03), originating proximal to posterior margin of clypeal apron; clypeal apron with anterior margin evenly convex, dorsum translucid and wrinkled; fronto-clypeal teeth present anterior to antennal insertions; in lateral view, fronto-clypeal teeth acuminate, covered with narrow spoon-shaped hairs; frontal lobes of moderate size (FLD 0.22, RFLDI 33–34, RFLDII 39–40) laterally expanded with triangular to convex outer margins. Eyes of moderate size with 6 ommatidia in longest row (21–23 total), situated distinctly back of the midline of head and posterior to frontal lobes; antennal scape finely reticulate, covered with narrow, spoon-shaped hairs, becoming increasingly narrow (to almost simple) toward apex of

scape; antennal scape exceeding occipital angles by a distance equal to about twice their distal diameter; funicular segments 2–9 about as broad as long; hypostomal teeth present (0.04), slightly shorther than median clypeal seta.

Mesosoma: Pronotum lacking distinct tubercles, the sites of the usual tubercles being indicated by roughenings and spoon-shaped hairs; lateral pronotal tubercles angled, better seen in dorsal view, giving promesonotum a square appearance; propleuron angulate, lacking tubercle; mesonotal tubercles also eroded, anterior mesonotal tubercles low but distinct; declivous surface of mesonotum with a single pair of tubercles. [This is true for one of the syntype specimens (MCZC); the other has two small tubercles in this point (USNM). Weber points out: "the usual anterior [median] pair being represented by a single squamate hair." The specimen at USNM has the median mesonotal tubercle very small, vestigial.] Basal and declivous surfaces of propodeum bordered on each side by thin carinae; basal surface as long as declivity; propodeal spines weak but acute; propleuron with a small but conspicuous tubercle or angle.

Metasoma: Petiole distinctly pedunculate, lacking anterior ventral process, but with a slight ventral convexity medially [very weak]; ventral margin of petiole with a pair of weak carinae that extend to posterior margin of petiole, best seen in ventral view; in lateral view, anterior margin of petiolar node rounded; in dorsal view, dorsum of petiolar node rounded; in lateral view, posterior margin of petiolar node with small tooth-like carinae; in dorsal view, postpetiole twice (or slightly less) as broad as

petiole; postpetiole broader than long (PPI 114–117); sides of postpetiole broadly convex; posterior margin moderately emarginate medially; dorsum of postpetiole covered with appressed squamate hairs; gastral segment I long-ovate, tergite finely reticulate and covered with spoon-shaped hairs.

Pilosity of moderately abundant squamate hairs, which become narrow-squamate (spoon-shaped) on the appendages, the latter bearing a fine, appressed pubescence. Yellowish-brown.

Other material examined. Measurements. WORKER. EL 0.09–0.10, FLD 0.20–0.28, GL 0.64–0.74, HFL 0.63–0.68, HL 0.61–0.67, HTL 0.47–0.51, HW 0.52–0.55, ML 0.38–0.42, MSL 0.05–0.06, MSLca 0.02–0.03, OI 17–19, PL 0.31–0.35, PPL 0.19–0.20, PPW 0.23–0.26, SL 0.61–0.64, TL 2.99–3.22, WL 0.80–0.88, CI 77–85, MI 57–66, MSLI 43–63, PPI 117–132, RFLDI 31–44, RFLDII 36–52, SI 116–121 (n=7).

Queen. Resembling the worker, but with modifications appropriate for the caste. *Head:* In full-face view, thin ocular carinae extending to occipital corners; antennal scapes strongly reticulate, with marked rugae at basal anterior margin; unpaired median seta short (MSL 0.06, MSLca 0.03), thick; ocelli small, rounded (anterior ocellus 0.03 mm, maximum diameter).

Mesosoma: Pronotal tubercles small, humeral (inferior lateral pronotals) angulate, with narrow base; lateral pronotal tubercles, in dorsal view, angulate to blunt, with wide bases; anterior pronotals absent; propleuron with blunt tubercle. Mesonotum, in dorsal view, longer than wide; very narrow anteriorly and rounded; in lateral view, somewhat flat; medially with a pair of weak longitudinal carinae covered with spoon-shaped hairs; anterior portion with short median line; parapsidial lines present; transcutal articulation present; scutellum wider than long; axillae convex laterally; lateral margin of scutellum carinate; posterior margin of scutellum weakly bidentate. Lateral portions of propodeum with thin carinae that connect anterior margin of propodeum and propodeal spiracles; base and declivity of propodeum laterally carinate (similar to the worker); propodeal spines long.

Metasoma: Petiole, in lateral view, appearing subquadrate; in dorsal view, node of petiole rounded, surrounded by thin carina. In dorsal view, postpetiole trapezoidal; lateral margin widely convex; posterior margin concave medially; base of gaster finely rugo-reticulate; gastral tergite I strongly reticulate.

Measurements. QUEEN. EL 0.13, FLD 0.23, GL 0.98, HFL 0.76, HL 0.74, HTL 0.56, HW 0.63, ML 0.45, MSL 0.06, MSLca 0.03, OI 21, PL 0.48, PPL 0.24, PPW 0.36, SL 0.70, TL 3.95, WL 1.08, CI 86, MI 61, MSLI 44, PPI 150, RFLDI 31, RFLDII 36, SI 110 (n=1).

Male. Unknown

Comments. This species resembles *Myrmicocrypta JSC–020*. See comments under *Myrmicocrypta JSC–020*.

Material examined. BOLIVIA: *Departamento de La Paz*; Tumupasa; [506m; 14.1500° S 67.9167° W]; xii.1921; (*WM Mann*); Mulford Biol. Exp. **PERU: *Madre de Dios*;** 15 Km NE Puerto Maldonado, Cuzco Amazonico; 200m; [12.6000º S 69.1833º W]; 23.vi.1989; (*SP Cover* & *JE Tobin*); CA-421; Terra Firme forest, plot IU22, clay soil at base of large tree.

Myrmicocrypta buenzlii Borgmeier, 1934

(Figure 2.5)

Myrmicocrypta buenzlii Borgmeier (1934): 104) (w.). 2w, **SURINAME:** Paramaribo; Paramaribo; [4m; 5º 49’ 23.52” N 55º 10’ 03.75” W]; (*GH Bünzli*). (Holotype, IBUS [Not examined]) (Paratype, MZSP [examined]).

Taxonomic history:

Junior synonym of *Myrmicocrypta squamosa* Weber (1958b): 262).

Revived from synonymy by Kempf (1961): 517).

Diagnosis. This species is very similar to *M. foreli* Mann (1916) and *M. guianensis* Weber (1937). *Worker.* Slightly larger individuals (TL 3.49–3.86, WL 0.90–1.03); frontal lobes vestigial, very weakly expanded laterally; hypostomal teeth conspicuous; pronotum with lateral and humeral tubercles small; propleural tooth present; propodeal spines long; antero-ventral process of petiole small, tooth-like (in

some specimens present as a carinae); anterior margin of petiolar node rounded. *Queen.* Frontal lobes weakly expanded, convex; posterior margin of scutellum wide and with a pair of tumosities; propodeal spines triangular; base and declivous of propodeum with lateral carinae; petiolar node subquadrate. *Male.* Cephalic corners rounded to slightly angulate; frontal carinae present; area behind lateral occelli with a very inconspicuous tumosity; long propodeal spines; petiolar node subquadrate; lacking ventral process of petiole.

Description. Worker. *Head.* In full-face view, excluding mandibles, longer than broad (HL 0.71–0.79, HW 0.58–0.65, CI 76–85); anteriorly slightly narrowed; cephalic corners subangular; posterior cephalic margin straight. Anterior margin of clypeal apron broadly convex; median seta stout, short (MSL 0.07–0.09, MSI 9–12); body of clypeus with low fronto-clypeal teeth. Mandibles long, triangular (ML 0.44–0.53, MI 57–68), pointed, with 7–8 teeth. (Note: Borgmeier mentions 6 teeth. The paratype examined has 7 and other specimens examined have 7–8 teeth.) Frontal lobes short, weakly expanded laterally, widely convex (FLD 0.13–0.15). In full-face view, frontal carinae extending backwards and surrounding median impression at eye level. Eyes of medium size (EL 0.09–0.11; OI 15–18), strongly convex, situated slightly above the middle of the sides of the head (6–8 ommatidia in longest row, 22–37 ommatidia total). Postorbital carinae indistinct. Antennal scape robust, long (SL 0.62–0.74, SI 108–119), surpassing cephalic corner by 1/4 of its length. Hypostomal teeth conspicuous, triangular.

Mesosoma. Anterior pronotal tubercles low, vestigial; humeral tubercles small, triangular; lateral pronotal tubercles irregular; dorsum of pronotum, posterior to anterior pronotals, slightly concave; propleuron with small tubercle. Anterior mesonotal tubercles larger than other mesonotal tubercles. Metanotal constriction deep. Basal face of propodeum as long as its declivity; propodeal spines present, long; in dorsal view, lateral margins of the basal face diverging backwards.

Metasoma. In lateral view, peduncle of petiole longer than petiolar node; ventral process of petiole with minute tubercle. In lateral and dorsal views, anterior margin of petiolar node rounded; in dorsal view, node of petiole slightly longer than wide; in lateral view, posterior portion of petiolar node flat. Disc of postpetiole wider than long (PPL 0.18–0.22, PPW 0.24–0.30, PPI 125–149); in dorsal view, trapezoidal; posterior margin of postpetiole marginate medially. In lateral view, postpetiole slightly convex dorsally. In lateral view, dorsum of gaster convex. Base of gaster truncate.

Integument densely granulate-punctate and dull; mandibles reticulate-punctate with coarse punctures close to the apical margin.

Hairs whitish, short, moderately abundant on the head, petiole, gaster, and postpetiole; sparse on the thorax, antennal scapes, and legs.

Color yellow-red.

Material examined. Measurements. WORKER. EL 0.09–0.11, FLD 0.13–0.15, GL 0.79–0.94, HFL 0.74–0.83, HL 0.71–0.79, HTL 0.52–0.60, HW 0.58–0.65, ML 0.44–0.53, MSL 0.07–0.09, MSLca 0.05–0.06, OI 15–18, PL 0.33–0.46, PPL 0.18–0.22, PPW 0.24–0.30, SL 0.62–0.74, TL 3.49–3.86, WL 0.93–1.03, CI 76–85, MI 57–68, MSI 9–12, PPI 125–149, RFLDI 16–21, RFLDII 19–25, SI 108–119 (n=15).

Queen. Resembling the worker with modifications expected for the caste and with the following differences:

Head. In full-face view, frontal lobes expanded laterally, convex; frontal carinae strongly marked; cephalic corners rounded; hypostomal teeth small, acute.

Mesosoma. Anterior pronotal tubercles reduced to carinae. Mesoscutum with anterior median carinae; antero-lateral margin of mesoscutum marginate; dorsum of mesoscutum with longitudinal median rugae; parapsidal lines present. Scutellum wider than long; posterior margin of scutellum wide and with a pair of tumosities.

Metasoma. In lateral view, petiolar node subquadrate; anterior ventral process of petiole carinate. In lateral view, dorsum of postpetiole convex; in dorsal view, disc of postpetiole dome-like.

Material examined. Measurements. QUEEN. EL 0.16, FLD 0.17, GL 1.06–1.10, HFL 0.81–0.85, HL 0.80–0.84, HTL 0.59, HW 0.68–0.69, ML 0.52–0.53, MSL 0.09,

MSLca 0.05–0.07, OI 23, PL 0.49–0.55, PPL 0.20–0.22, PPW 0.46, SL 0.73–0.75, TL 4.21–4.39, WL 1.14–1.15, CI 82–85, MI 63–65, MSI 10–12, PPI 206–231, RFLDI 20–21, RFLDII 24, SI 107–109 (n=2).

Male. *Head.* Excluding eyes, triangular; cephalic corners rounded or slightly angulate; cephalic margin, behind each posterior ocellus, with small carinae, lacking tubercles; frontal lobes reduced, widely separated; frontal carinae present, slightly raised at each side of median ocellus; mandibles triangular; outer margin of mandibles convex, inner margin with 7–8 distinct teeth; dorsum of mandibles strongly reticulate-punctate; second and third funicular joints taken together longer than antennal scapes; clypeal apron short, wrinkled; anterior margin slightly triangular; unpaired median seta long and thick; posterior margin of body of clypeus (close to antennal insertions) emarginate due to deep longitudinal groove (easily seen in full-face and lateral view); hypostomal teeth present, wide at base with acute tip; occipital collar lacking.

Mesosoma. In dorsal view, pronotum with small lateral and humeral tubercles, lacking anterior pronotals; dorsum of pronotum smooth. Mesoscutum as in the queen, with more pronounced latero-anterior emarginations; in lateral view, mid-anterior portion high and somewhat angulate (in some males, more pronounced, resembling tubercles); mesoscutum with paired (parallel) median longitudinal carinae; area between carinae smooth; parapsidal lines present, sinuous; postero-lateral margin of mesoscutum produced into thick tubercles; posterior margin of mesoscutum convex.

Scutellum with axillae triangular and pointing posteriorly; posterior margin of scutellum bidentate; dorsum of scutellum rugulose. Basal face of propodeum with thin lateral carinae; propodeal spines long, wide at base, constricted medially, and rounded and slightly expanded apically, rounded at tip.

Metasoma. Petiole pedunculate, thick; ventral process of petiole absent; petiolar node subquadrate, distinct. In lateral view, postpetiole globose; in dorsal view, dome-like; posterior margin of postpetiole sinuous to medially emarginate. In lateral view, gaster convex dorsally.

Legs long and slender. Body color ferruginous to dark brown; antennae, madibles, and legs yellowish-brown; pilosity short, restricted to rugosities in head, mesosoma, and anterior portion of forecoxa, dorsum, katepisternum, postpetiole, and gaster. Body smooth except for rugae on dorsum of scutellum and dense reticulations on dorsum of disc of postpetiole and gaster. Wings slightly brownish.

Material examined. Measurements. MALE. EL 0.29–0.35, FLD 0.16–0.19, GL 1.18–1.42, HFL 1.03–1.26, HL 0.74–0.83, HTL 0.89–1.28, HW 0.64–0.74, ML 0.41–0.47, MSL 0.07–0.11, MSLca 0.04–0.09, OI 46–48, PL 0.55–0.71, PPL 0.22–0.23, PPW 0.36–0.43, SL 0.29–0.33, TL 4.27–5.08, WL 1.15–1.43, CI 86–89, MI 54–57, MSI 10–15, PPI 158–193, RFLDI 21–25, RFLDII 25–28, SI 45–47 (n=3).

Comments. Borgmeier described this species based on two workers collected in a coffee plantation in Paramaribo, Suriname. Borgmeier deposited the holotype at the Institute of Plant Biology in Rio de Janeiro, Brazil, under specimen identifier N. 7639. Borgmeier deposited the paratype in his personal collection, now housed at MZSP. Unfortunatelly, I was not able to examine the holotype, so the redescription presented here is based on the paratype specimen as well as on other material from Suriname, Guyana, and French Guiana.

This species is very close to *M. guianensis* and *M. foreli*. There is character variation across the geographic distribution of the species as described here, which could indicate that it is a complex of species. These variations include:

i. Some specimens from Trinidad seem to have slightly smaller hypostomal teeth, smaller propodeal spines, and somethat more eroded pronotal sculpture. Most specimens from Trinidad have a thin to curtain-like longitudinal ventral strip on the petiole rather than the minute ventral tooth present in the paratype. However, two worker specimens from Toco in Trinidad, presumably belonging to same nest, vary in this character, one posessing a relatively long ventral petiolar process, the other possessing a strip.

ii. The specimens from French Guiana resemble those from Suriname, but they seem to lack the ventral process of the petiole and have somewhat smaller hind femurs and hind tibiae.

iii. The Venezuelan specimens possess a small ventral petiolar process and/or a small strip replacing the tooth.

iv. The specimen from Brazil has short propodeal spines and a very deep metanotal groove that seems deeper than the one present in the 'typical' form of *M. buenzlii*.

Material examined. GUYANA: ***Potaro-Siparuni;*** Paramakatoi; [970m; 4.716667º N 59.7º W]; 16.iv.1996; (*TR Schultz* & *UG Mueller*); nest series; savannah; TRS960416–03 [22w, 9m, USNM]. Same data as previous entry, but TRS960416–05 [9w, 2aq, 2m, USNM]. Same data as previous entry, but 17.iv.1996; TRS960417–07 [4w, 1m, USNM]. ***Upper Takutu-Upper Essequibo;*** Annai; [95m; 3.9500º N 59.1333º W]; 12.iv.1996; (*TR Schultz* & *UG Mueller*); nest series; TRS960412–14 [4w, 1m, USNM]. Same data as previous entry, but TRS960412–05 [1w, USNM]. Same data as previous entry, but TRS960412–06 [2w, USNM]. Same data as previous entry, but TRS960412–09 [2w, USNM]. **SURINAME:** ***Commewijne;*** Meerzorg; [0m; 5.9167º N 54.9167º W]; 8.iii.1961; (*EO Wilson*) [1w, MCZ]. ***Paramaribo;*** Paramaribo; [1m; 5.8333º N 55.1667º W]; (*GH Bünzli*); coffee plantation [1w, MZSP]. Same locality as previous entry [3w, LACM; 6w, MZC, 3w, USNM]. Paramaribo; Cultuurtuin; [11m; 5° 50' 50" N 55° 9' 35" W]; 13.x.1939; (*DC Geijskes*) [6w, USNM]. ***Saramacca;*** Dirkshoop; [9m; 5.7833º N 55.4833º W]; v.1959; (*Ivd Drift*) [2w, MZSP]. ***Wanica;*** Lelydorp; [8m; 5.7000º N 55.2333º W]; 27.iv.1938; (*DC Geijskes*); in *Atta cephalotes* nest [3w, MZSP]. **TRINIDAD:** Mayaro Bay; [50m; 10.25º N 61.050º W]; 6.xii.1934; (*NA Weber*); NAW025 [3w, MCZ]. ***Saint George;*** Maracas Valley, near M. Falls; 275m; [10° 41' 12" N 61° 24' 40" W]; 23.iii.1935; (*NA Weber*); rocky soil; nest series; NAW069 and NAW073

[3w, LACM; 1w, MCZ]. ***Tunapuna-Piarco;*** Morne La Croix, NW slope, Km 20 Arima-Blanchisseuse Rd; 244m; [10.75º N 61.3166667º W]; 7.iv.1935; (*NA Weber*); nest series; clay; NAW105 [3w, MCZ]. Same locality and data as previous entry, but NAW106 [2w, MCZ].

Myrmicocrypta bucki Sosa-Calvo & Schultz, 2010

(Figure 2.6)

Myrmicocrypta bucki Sosa-Calvo and Schultz (2010): 192), figs 23–26 (w.). 1w, HOLOTYPE, **PERU:** Madre de Dios; Puerto Maldonado; Centro de Investigacion y Capacitacion Rio Los Amigos (CICRA), Otorongo Trail; 276m; 12º 33' 42.28' S 70º 05" 32.64' W; 19.xi.2005; (*J Sosa-Calvo*); nest series; forest; JSC051119–09. Holotype deposited in MUSM [USNMENTNo. 00537326] [examined].

Measurements. WORKER. EL 0.05–0.07, FLD 0.11–0.14, GL 0.72–0.83, HFL 0.64–0.72, HL 0.72–0.77, HTL 0.42–0.48, HW 0.62–0.67, ML 0.45–0.54, MSL 0.13–0.16, MSLca 0.09–0.13, OI 7–11, PL 0.31–0.36, PPL 0.16–0.19, PPW 0.24–0.28, SL 0.66–0.72, TL 3.28–3.65, WL 0.91–1.01, CI 85–88, MI 63–71, MSI 17–21, MSLI 74–86, PPI 136–167, RFLDI 15–18, RFLDII 17–21, SI 101–108 (n=11).

Diagnosis. Frontal lobes vestigial, failing to cover antennal insertions; hypostomal teeth long; vertexal carina present; humeral and lateral pronotal spines acute; dorsum

of pronotum smooth and glabrous; propodeal spines long and acute; petiole subquadrate.

Description. Worker. *Head*: in full-face view, and excluding mandibles, longer than broad (HL 0.72–0.76, HW 0.62–0.67, CI 85–88); cephalic corners convex anteriorly, slightly angulate posteriorly; cephalic margin widely convex, interrupted medially by two low carinate tubercles in vertexal area; integument matte and strongly rugose to scabrous. In lateral view, occipital "collar" (neck) reduced to two low, blunt tubercles. Mandibles triangular, long (ML 0.45–0.54, MI 63–71); inner margin of mandibles 6–8-toothed decreasing in size from apex to base; outer margin of mandibles sinuous; dorsal surface of mandibles striolate. In full-face view, anterior margin of clypeal apron convex and medially slightly angulate, hyaline, and transversely weakly striate; clypeal apron thin; unpaired clypeal seta long (MSL 0.13–0.16, MSI 17–21), thick, with 5–6 simple appressed hairs on each side of median seta; body of clypeus with pair of blunt frontoclypeal teeth covered with simple, curved hairs; posterior portion of clypeus very narrowly extending between frontal lobes. in full-face view, frontal lobes strongly reduced, parallel, failing to cover antennal insertions. Frontal carinae obsolete or vestigial. Eyes very small (EL 0.05–0.07, OI 7–11), convex, with 3–4 ommatidia in longest row (7–10 ommatidia total); eyes above middle of head. Antennal scape reticulate and long (SL 0.66–0.72, SI 101–109); antennal scape wider near its apex than at rest of its length; anterior edge of antennal scape minutely denticulate; in full-face view anterior and posterior

edges of antennal scape bearing suberect to erect hairs. In lateral view, hypostomal teeth long, and somewhat curved.

Mesosoma. Integument of mesosoma minutely puncate. Dorsum of pronotum smooth and glabrous with small, triangular humeral tubercles; lateral tubercles slightly longer than humeral, acute, dentiform, longer and more discrete than other mesosomal tubercles; lacking anterior pronotal tubercles or spines; propleuron broadly obtusely angulate. Lateral and anterior mesonotal tubercles reduced to carinae, low. Area between mesonotal and metanotal grooves with two pairs of low tumosities; metanotal groove with single median longitudinal carina that extends from posterior portion of mesonotum through anterior portion of propodeum. Propodeum anteriorly carinate, lacking anterior spines or tubercles; posterior propodeal spines long and acute; dorsum and declivous of propodeum with lateral carinae extending to propodeal lobes; base of propodeum flat, in profile subequal to declivity of propodeum.

Metasoma. Petiole pedunculate; in lateral view, node of petiole with pair of small anterior tubercles and pair of convex posterior carinae; in lateral view, node subquadrate, in dorsal view slightly longer than broad. In dorsal view, disc of postpetiole broader than long (PPL 0.16–0.19, PPW 0.24–0.28, PPI 136–167); anterior margin of postpetiole straight, sides widely convex, posterior margin medially emarginate; latero-posterior corners with inferior angle. Gastral tergite I punctulate-reticulate; in dorsal view, base of tergite at junction with postpetiole

convex, slightly carinate laterally; pilosity on gastral tergite I consisting of widely separated, extremely narrowly spatulate hairs, all curved at tips and directed backwards.

Individuals brown ferruginous; pilosity restricted to wrinkles, tubercles, spines, carinae, appendages, antennal scapes, and gaster, absent elsewhere. Legs and antennal scapes strongly reticulate.

Queen. Unknown.

Male. Unknown.

Comments. *Myrmicocrypta bucki* is similar in size and habitus to *M. erectapilosa* but differs from it by having simple, curved hairs (simple but entirely erect in *M. erectapilosa*); frontoclypeal teeth blunt (large and acute in *M. erectapilosa*); hypostomal teeth long (short and triangular in *M. erectapilosa*); frontal lobes narrow, exposing part of the antennal condyles (triangular in *M. erectapilosa*); vertexal carinae forming a pair of tubercles on cephalic margin in full-face view (these tubercles absent in *M. erectapilosa*); humeral and lateral tubercles acute (reduced in *M. erectapilosa*); node of petiole subquadrate in profile (rounded in *M. erectapilosa*). *M. bucki* can be separated from any other *Myrmicocrypta* species by the presence of simple, semi-erect hairs.

Material examined. BRAZIL: ***Amapa;*** Serra do Navio; [159m; 0.895833º N 52.001944º W] [no date] (*Silverstone*); stomach content *Phyllobates pictus* [4w, LACM]. ***Amazonas;*** Manaus; Headquarters of Empresa Brasilaira de Pesquisa Agropecuaria (EMBRAPA), 28Km AM010; 40–50 m; 2º 53’ S 59º 59’ W; 9.v.2003; (*C. Rabeling* & *M. Verhaagh*) CR030509 [2w, USNM]. ***Para;*** Melgaço; Caxiuanã, ECFPn; 1º 44’ 0.96” S 51º 30’ 37.97” W; 21–23.iv.2002; (*AY Harada*, *EP Fagundes*, & *C Renato*) [3w, MPEG]. **PERU:** ***Madre de Dios;*** Centro de Investigación y Capacitación Río Los Amigos (CICRA), Otorongo Trail; 276m; 12º 33' 42.28' S 70º 05" 32.64' W; 19.xi.2005; (*J Sosa-Calvo*); nest series; forest; JSC051119–09 [1w, MUSM; 14w, USNM]. Same locality information as previous entry, but JSC051119–01 [1w, USNM].

Myrmicocrypta camargoi Sosa-Calvo & Schultz, 2010

(Figure 2.7–2.8)

Myrmicocrypta camargoi Sosa-Calvo and Schultz (2010): 184–189), figs 1–15 (w.q.m). 1w, HOLOTYPE, **BRAZIL:** São Paulo; Botacatu; 825m; 23º 15’ S 48º 15’ W; 29.xi.2002; (*RS Camargo*); nest series; pasture. Holotype deposited in MZSP [USNMENTNo. 00412647] [examined].

Measurements. WORKER. EL 0.11–0.12, FLD 0.28–0.34, GL 0.97–1.13, HFL 1.43–1.60, HL 0.95–1.02, HTL 1.03–1.23, HW 0.74–0.80, ML 0.58–0.69, MSL 0.16–0.18, MSLca 0.11–0.13, OI 14–16, PL 0.38–0.42, PPL 0.21–0.23, PPW 0.26–0.29, SL

1.10–1.19, TL 4.49–4.89, WL 1.33–1.46, CI 76–81, MI 60–71, MSI 16–19, MSLI 62–74, PPI 112–126, RFLDI 30–34, RFLDII 38–44, SI 147–154 (n=10).

Diagnosis. Large individuals (TL 4.49–4.89, WL 1.33–1.46); body covered with erect hairs; frontal lobes, in full-face view, convex laterally and, in profile, strongly protruding; antennal scapes covered with simple, sub-erect hairs; lateral mesonotal spines very long and knobbed at apex, with some spatulate hairs.

Description. Worker. *Head:* in full-face view and excluding mandibles, longer than wide (HL 0.94–1.02, HW 0.72–0.80, CI 76–81); cephalic corners anteriorly convex, posteriorly angulate; dorsum of head with erect, spatulate hairs restricted to carinae; sculpture on head restricted to discrete carinae, areas in between smooth, minutely punctate; in full-face view, frontal carinae branching posteriorly into fully developed median vertexal carinae and continuing laterally to connect with carina arising in area of eye, possibly preocular carina; denticles occur at junctions of carinae, and in lateral view, forming projections of almost similar size and shape; in lateral view, frontal carinae posteriorly branching into projections of almost similar size and shape. In lateral view, occiput drawn out postero-laterally into an enlarged bilobed "neck" or "collar" that extends backwards, covering antero-lateral portions of pronotum. Mandibles long (ML 0.58–0.69, MI 60–71), masticatory margin 8–10-toothed, increasing uniformly from base to apex; dorsum of mandibles rugulose-strigulate. Anterior margin of clypeal apron hyaline, shining, and imbricate, with distinct median angle; unpaired clypeal seta long, thick (MSL 0.16–0.18, MSI 16–19), arising from

posterior margin of clypeal apron, with 5–7 simple, appressed hairs on each side of unpaired clypeal seta, extending pass clypeal margin. Body of clypeus with frontoclypeal teeth acute, covered with suberect simple hairs; posterior portion of clypeus extending between frontal lobes. In full-face view, frontal lobes evenly rounded, expanded laterally (FLD 0.28–0.34), barely covering antennal insertions; in lateral view, frontal lobes strongly protruding. Eyes globose, large (EL 0.11–0.12, OI 14–16) with 7–8 ommatidia in longest row (35–48 in total); eyes located posterior to middle of head at level above frontal lobes. Antennal scapes very long (SL 1.10–1.19, SI 147–154), thin, reticulate, slightly thickened at apex and covered with short simple erect hairs. In lateral view, hypostomal teeth long, acute.

Mesosoma. Anterior pronotal tubercles low, tooth-like; humeral tubercles triangular, larger than anterior pronotals; lateral pronotal tubercles long, robust, directed forward; dorsum of pronotum smooth; in lateral view, propleuron lacking distinct tubercles, instead bearing roughenings and erect, spatulate hairs. In lateral view, lateral mesonotal tubercles large, largest of body; anterior mesonotal tubercles small, tooth-like; area between mesonotal and metanotal groove with two pairs of tubercles, anterior pair as large as or larger than posterior pair. Metanotal groove deep and conspicuous, usually lacking median longitudinal carina, but some with weakly impressed median longitudinal carina. In lateral view, base of propodeum flat and slightly longer than declivity; both laterally carinate; propodeal spines reduced to tubercles. Base of forecoxa with a conspicuous and lamellate carina.

Metasoma. In lateral view, peduncle of petiole lacking ventral process; in dorsal view, node of petiole rounded anteriorly, longer than wide, and in lateral view, anteriorly rounded and posteriorly straight. In dorsal view, postpetiole wider than long (PPL 0.21–0.23, PPW 0.26–0.29, PPI 115–126); posterior margin weakly emarginate; postero-lateral postpetiolar processes absent. Dorsum of gastral segment I finely reticulate and covered with short, erect, spatulate hairs; very subtle longitudinal sculpturing visible anteriorly; anterior margin straight, anterior lateral carinae absent. Hind legs long (HFL 1.43–1.60, HTL 1.03–1.23), covered with short stout pitlosity; tibiae covered with short simple suberect hairs.

Individuals yellow to ferruginous; pilosity restricted mainly to tubercles and carinae, suberect spoon-shaped or spatulate; antennal scapes and tibiae with simple, erect hairs.

Queen. As the worker with modifications expected for the caste and with the following differences:

Head. Masticatory (inner) margin of mandibles 11-toothed.

Mesosoma. Anterior pronotal tubercles long, connected by rugae. Mesoscutum with median pair of longitudinal raised carinae, extending through entire length of mesoscutum, developed anteriorly into blunt triangular denticles; median line present as low carina on anterior half of mesoscutum; parapsidal lines present, conspicuous; parascutal lobes prominent. Scutellum without lateral projections and ending

posteriorly as two prominent dorsoventrally extended, laterally compressed, distally rounded processes; base and declivity of propodeum laterally carinate, carinae continuing downward to join propodeal lobes; propodeal teeth short, triangular.

Metasoma. In dorsal view, postpetiole wider than long (PPL 0.38–0.39, PPW 0.67–0.73, PPI 175–186), with pronounced posterolateral corners, posteriorly emarginate.

Head and body dark ferrugineous; gaster yellowish to light ferrugineous; wings smoky. Pilosity as in worker.

Measurements. QUEEN. EL 0.22–0.25, FLD 0.42–0.43, GL 2.15–2.22, HFL 1.55–1.99, HL 1.20–1.24, HTL 1.52–1.57, HW 1.05–1.13, ML 0.80–0.85, MSL 0.22–0.24, MSLca 0.15–0.17, OI 19–24, PL 0.67–0.72, PPL 0.38–0.39, PPW 0.67–0.73, SL 1.44, TL 7.42–7.51, WL 2.13–2.22, CI 85–94, MI 67–69, MSI 18–19, MSLI 67–69, PPI 175–186, RFLDI 34–36, RFLDII 38–40, SI 127–137 (n=2).

Male. *Head:* in full-face view, triangular, wider posteriorly and laterally angulate, cephalic margin interrupted laterally by pair of tubercles and medially (behind posterior ocelli) by pair of denticulate tubercles mounted on posterior extensions of vertexal carinae; frontal carinae extending posterad to intersect with vertexal carinae, not continuing laterad; low tubercles present at point of intersection; median carina extending between frontal lobes to anterior margin of median ocellus, more pronounced anteriorly, weaker posteriorly. Dorsum of mandibles punctate;

masticatory margin with 8–9 teeth gradually decreasing in size toward base; outer margin of manibles convex. Anterior margin of clypeal apron convex, shining, and imbricate; 3–4 pairs of lateral clypeal hairs barely exceeding anterior clypeal margin on each side of unpaired median seta (MSL 0.09–0.16, MSI 10–17); body of clypeus with median carina arising posterior to hyaline border at socket of median clypeal seta, extending posterad and dividing into two carinae; posterior border of clypeus carinate. Antennae 13-segmented; antennal scapes barely surpassing cephalic margin, shorter than funicular segments I-III combined; funicular segment II > 2x longer than funicular segment I (antennal pedicel). In lateral view, posterior margin of head concave; with a median longitudinal carina that originates at occipital carina and extends to level of vertexal tubercles. In lateral view, occipital collar present laterally, short, and in lateral view, quadrate. In lateral view, hypostomal teeth large and rounded at tip.

Mesosoma. Humeral and lateral pronotal tubercles short and angulate; anterior pronotal tubercles absent, replaced by a transverse carina that connects lateral spines; propleuron obtusely angulate bearing simple hairs. Mesoscutum and scutellum similar to those of gyne, axillary concavities less pronounced; propodeal spines long and dorsolaterally compressed, in lateral view appearing somewhat expanded apically, in dorsal view appearing apically blunt, but in dorsolateral (edge-on) view appearing linear; base of propodeum with a pair of lateral carinae (Rio de Janeiro specimens; carinae absent in Espiritu Santo specimens), declivity with a pair of lamellate carinae (Rio de Janeiro specimens; carinae lower in Espiritu Santo specimens).

Metasoma. Petiole pedunculate; in profile, node of petiole low and evenly convex; petiole with dorso-lateral carinae that extend along entire length of petiole, petiolar node with single median (Espiritu Santo specimens) or a few longitudinal carinae (Rio de Janeiro specimens); petiole with a pair of ventral lateral longitudinal carinae extending its entire length; node of petiole longer than wide. In dorsal view, disc of postpetiole wider than long (PPL 0.27–0.33, PPW 0.46–0.53, PPI 150–196). Gastral tergite I finely reticulate.

Individuals ferruginous in color; antennae and legs testaceous; pilosity on antennal scape simple and appressed; head and mesosoma with hook-like hairs mostly on carinae and tubercles; legs with simple appressed or decumbent hairs; abdominal tergite IV with very short simple appressed hairs.

Measurements. MALE. EL 0.37–0.40, FLD 0.25–0.29, GL 1.64–1.86, HFL 1.57–1.59, HL 0.90–0.94, HTL 1.40–1.48, HW 0.77–0.83, ML 0.48–0.58, MSL 0.09–0.16, MSLca 0.05–0.11, OI 47–51, PL 0.64–0.73, PPL 0.27–0.33, PPW 0.46–0.53, SL 0.48–0.54, TL 5.96–6.34, WL 1.90–1.98, CI 82–92, MI 53–62, MSI 10–17, MSLI 59–67, PPI 150–196, RFLDI 27–32, RFLDII 30–35, SI 58–70 (n=4).

Comments. The individuals from Minas Gerais differ slightly from the type series by the presence of a small antero-ventral petiolar process and the area between the

mesonotal and metanotal grooves with the anterior pair of spines long, whereas the posterior pair of spines very reduced.

The nest of *Myrmicocrypta camargoi* is reported to occur underground as deep as ~1m from the surface (Pagnocca *et al.*, 2010). A new species of anamorphic basidiomycetous yeast, *Trichosporon chiarelli*, has been described from the nests of this species (Pagnocca *et al.*, 2010).

Material examined. BRAZIL: ***Espirito Santo;*** Santa Teresa; [708m; 19.9167º S 40.6000º W]; xi.1928; (*O Conde*) [2m, MZSP]. ***Goias;*** Jatai; Faz. Aceiro; [584m; 13.8333º S 46.4333º W]; 30.x.1962; Exp. Dep. Zool.; cerrado [1dq, MZSP] "Sao Paulo, Botucatu; 5 x 1991; (BH Dietz)" (MZSP). ***Minas Gerais;*** Bom Despacho; [725m; 19.7167º S 45.2500º W]; vi–ix.2000; (*LS Ramos* & *CGS Marinho*) [3w, CEPEC]. ***Rio de Janeiro;*** Floresta da Tijuca; [907m; 22.949167º S 43.299444º W]; iv.1966; (*M Alvarenga*) [2m, MZSP]. ***São Paulo;*** Botacatu; 825m; 23º 15' S 48º 15' W; 29.xi.2002; (*RS Camargo*); nest series; pasture [5w, MZSP; 5w, USNM]. Same locality as previous entry, but 5.x.1991; (*BH Dietz*) [1aq, MZSP]. Same locality as previous entry, but 13.vii.1987; (*LC Forti*); pasture [1w, MZSP]. Same locality as previous entry, but 29.xi.2002; (*RS Camargo*) [3w, CEPEC].

Myrmicocrypta collaris Emery, 1913

(Figure 2.9)

Myrmicocrypta collaris Emery (1913): 252), figs 2–3 (q.). 1aq, HOLOTYPE,

PERU: Vilcanota; [1905m; 12º 28’ 44.03” S 72º 29’ 12.56” W] (*Staudinger*). Holotype deposited in MSNG [USNMENTNo. 00445577] [examined].

Measurements. QUEEN. EL 0.16, FLD 0.22, GL 1.25, HFL 1.02, HL 0.89, HTL n/a, HW 0.78, ML 0.61, MSL 0.13, MSLca 0.10, OI 21, PL 0.52, PPL 0.28, PPW 0.49, SL 0.85, TL 4.90, WL 1.35, CI 88, MI 69, MSI 15, MSLI 77, PPI 175, RFLDI 25, RFLDII 28, SI 109 (n=1).

Diagnosis. Frontal lobes weakly expanded, weakly convex; unpaired median seta long; pronotal tubercles low; small, tooth-like, antero-ventral process of petiole; fenestra on forewing half-moon-shaped, large.

Description. Alate queen. *Head.* In full-face view, and excluding mandibles, longer than wide (HL 0.89, HW 0.78, CI 88); cephalic corner anteriorly convex, posteriorly weakly angulate; posterior cephalic margin almost straight, interrupted medially by weak median emargination; low vertexal tubercles present. In lateral view, collar with upper tubercle larger than lower one, visible in dorsal view. In full-face view, mandibles triangular, long (ML 0.61, MI 69); inner margin of mandibles 8-toothed; outer margin of mandibles sinuous. Anterior margin of clypeal apron convex; unpaired clypeal seta long, thick (MSL 0.13, MSI 15); 4–5 short, appressed, flattened hairs at each side of clypeal seta; in lateral view, frontoclypeal teeth triangular; posterior portion of clypeus weakly extending between frontal lobes. In full-face view, frontal lobes weakly expanded laterally (FLD 0.22), widely convex; frontal

carinae feebly impressed; dorsum of head rugulose. Eyes large, convex (EL 0.16, OI 21). Antennal scapes long (SL 0.85, SI 109), finely reticulate; hairs on antennal scape thinly flattened, appressed. In lateral view, hypostomal teeth large, triangular.

Mesosoma. Pronotum with short humeral and lateral tubercles; anterior pronotal tubercles vestigial. In dorsal view, mesoscutum anteriorly with median line present; parapsidal lines present. Posterior margin of scutellum bidentate. In lateral view, propodeal spines acute, triangular; base and declivity of propodeum with lateral carina.

Metasoma. In lateral view, petiole subquadrate; antero-ventral process of petiole small; ventral margin of petiole with thin carinae; disc of petiole with lateral carinae, lacking setae or sculpture, smooth. Disc of postpetiole wider than long (PPL 0.28, PPW 0.49, PPI 175); anterior margin of postpetiole straight to convex; posterior margin of postpetiole medially emarginate; disc of postpetiole laterally rugulose. Base of gaster with some longitudinal striae; gastral tergite I finely reticulate.

Forewing with large fenestra, half-moon-shaped. Color ferruginous, legs slightly lighter.

Male. Unknown.

Worker. Unknown.

Comments. See comments under *M. corniculata.*

Material examined. PERU: Vilcanota; [1905m; 12º 28’ 44.03” S 72º 29’ 12.56” W] (*Staudinger*) [1aq, MSNG].

Myrmicocrypta corniculata Emery, 1913 **revived from synonymy**

(Figure 2.10)

Myrmicocrypta corniculata Emery (1913): 253), figs 2 (q.). 1aq, HOLOTYPE, **PERU**: [Departamento de Pasco?]; [Puerto?] Pachitea; [249m; 9.933197º S 75.033493º W]; (*Staudinger*). Holotype deposited in MSNG [USNMENTNo. 00445576] [examined].

Measurements. QUEEN. EL 0.17, FLD 0.20, GL n/a, HFL 0.95, HL 0.86, HTL n/a, HW 0.80, ML 0.56, MSL 0.15, MSLca 0.11, OI 21, PL n/a, PPL 0.27, PPW 0.52, SL 0.78, TL n/a, WL 1.28, CI 93, MI 65, MSI 17, MSLI 73, PPI 193, RFLDI 23, RFLDII 25, SI 98 (n=1).

Diagnosis. Frontal lobes weakly expanded, almost straight; unpaired median seta long; posterior portion of clypeus failing to extend between frontal lobes; leading edge of antennal scape serrate; humeral tubercles triangular, larger than lateral pronotal tubercles; tooth-like antero-ventral process of petiole present; fenestra on forewing small; pilosity on head and mesosoma somewhat suberect.

Description. Alate queen. *Head.* In full-face view, and excluding mandibles, slightly longer than wide (HL 0.86, HW 0.80, CI 93), subquadrate; cephalic corner convex; posterior cephalic margin almost straight, interrupted medially by weak emargination; vertexal tubercles low, inconspicuous. In lateral view, collar with upper tubercle larger than lower one, visible in dorsal view. In full-face view, mandibles triangular, long (ML 0.56, MI 65); inner margin of mandibles 8-toothed; outer margin of mandibles evenly convex. Anterior margin of clypeal apron convex; unpaired clypeal seta long, thick (MSL 0.15, MSI 17); 5–6 short, appressed, stout hairs at each side of clypeal seta; in lateral view, frontoclypeal teeth triangular; posterior portion of clypeus failing to extend between frontal lobes. In full-face view, frontal lobes weakly expanded laterally (FLD 0.20), straight; frontal carinae feebly impressed; dorsum of head rugulose. Eyes large, convex (EL 0.17, OI 21). Antennal scapes long (SL 0.78, SI 98), finely reticulate; leading edge of anternnal scape serrate; hairs on antennal scape thinly flattened, appressed. In lateral view, hypostomal teeth short, triangular.

Mesosoma. Anterior pronotal tubercles vestigial; humeral tubercles triangular, larger than lateral tubercles. In dorsal view, mesoscutum anteriorly with median line present; parapsidal lines present; dorsum of mesoscutum rugose. Posterior margin of scutellum bidentate. In lateral view, propodeal spines acute, triangular; base and declivity of propodeum with lateral carina.

Metasoma. In lateral view, petiole subquadrate; antero-ventral process of petiole tooth-like; disc of petiole smooth. Disc of postpetiole wider than long (PPL 0.27, PPW 0.52, PPI 193); anterior margin of postpetiole straight to convex; postero-inferior margin of postpetiole acute; posterior margin of postpetiole medially emarginate. Base of gaster lacking longitudinal striae; gastral tergite I finely reticulate.

Forewing with small fenestra. Color of head and mesosoma dark brown, gaster slightly lighter; legs yellowish. Pilosity on head and dorsum of mesosoma consisting of suberect, spoon-shaped hairs.

Male. Unknown.

Worker. Unknown.

Comments. This species was synonymized under *M. collaris* by Weber (1958b), who argued that the differences in "wing and occipital area are not significant." However, *M. corniculata* differs from *M. collaris* in the presence of erect simple hairs on the dorsum of the frontal lobes, the shape of the frontal lobes, the pronotum with more developed lateral and humeral tubercles, the small fenestra in the forewing (large and moon-shaped in *M. collaris*), wing venation, and base of gaster with longitudinal striae.

Material examined. PERU: ***[Departamento de Pasco?];*** [Puerto?] Pachitea; [249m; 9.933197º S 75.033493º W]; (*Staudinger*). [1aq, MSNG].

Myrmicocrypta dilacerata (Forel, 1885)

(Figure 2.11)

Glyptomyrmex dilaceratum Forel (1885): 365) (m.). **MEXICO**: Veracruz; Orizaba; [1215m; 18.8500º N 97.100º W] (*M Saussure*). [MHNG, USNMENTNo. 00758398] [examined].Combination in *Myrmicocrypta*: Forel (1899): 38.

Myrmicocrypta dilacerata r. *cornuta* Forel (1899): 38) (m.). **MEXICO**: Jalisco; San Blas; [201m; 19.700º N 105.0833º W]; (*Schumann*). [not examined] **NEW SYNONYM**

Measurements. MALE. EL 0.34–0.36, FLD 0.23–0.25, GL 1.21–1.48, HFL 1.17–1.28, HL 0.79–0.87, HTL 0.98–1.09, HW 0.69–0.73, ML 0.39–0.41, MSL 0.07–0.09, MSLca 0.03–0.05, OI 50–51, PL 0.63–0.72, PPL 0.21–0.26, PPW 0.40–0.45, SL 0.39–0.44, TL 4.74–5.13, WL 1.43–1.48, CI 82–88, MI 48–51, MSI 8–11, MSLI 40–67, PPI 171–191, RFLDI 26–30, RFLDII 32–35, SI 54–61 (n=3).

Diagnosis. Cephalic corners with low, blunt tubercles; frontal carinae present, extending at level of median ocellus; vertex deeply excavated, concave.

Description. Male. *Head*: Excluding eyes, triangular; cephalic corners with small, blunt tubercles; cephalic margin, behind lateral ocelli, tuberculate, appearing higher than cephalic corners; frontal lobes reduced, slightly convex, and widely separated (FLD 0.23); frontal carinae impressed, extending posteriorly and forming a low tumosity at level of mid ocellus; ocular carinae present, reaching tubercles of cephalic corners; eyes large (EL 0.34); in lateral view, vertex excavated (concave), shiny; occiput drawn into a blunt tubercle; mandibules triangular with straight to broadly convex outer margin and 9 distinct teeth; dorsum of mandible densely reticulate; in lateral view, clypeus angulate; in oblique view, clypeus subqueadrate and with thin lateral carinae; clypeal apron wide, anterior margin convex; unpaired median seta short and thick (MSL 0.09, MSI 11); hypostomal teeth long, rounded at tip. "Antennae long, 13-segmented; antennal scape short. The second funicular segment as long as a little more than twice the first and barely longer than the following." (From Forel's description. Antennae missing in specimen examined.)

Mesosoma. Pronotum with anterior tubercles vestigial, present as carinae; humeral tubercles present, blunt at tip; lateral pronotal tubercles present, with massive base and rounded at tip; propleuron with minute angle. Mesoscutum with pair of antero-lateral emarginations (notauli); mid portion of mesoscutum with a pair of parallel carianae that extend all mesoscutum length; in lateral view, anterior margin of mesoscutum high rounded; parapsidal lines present; posterior margin of mesoscutum with tooth-like lateral projections; axillae triangular and with raised carinae, tooth-like, directed posteriorly; posterior margin of scutellum with a pair of thick teeth,

which tips direct downwards; base of propodeum, in lateral view, slightly shorther than propodeal declivity; in dosal view, propodeum wider at ortigin of propodeal spines; in lateral view, side of propodeum with strong carinae connecting anterior margin of propodeum with propodeal spiracle; base and declivity of propodeum with very thin lateral carinae; propodeal spines present long and thin apically, broad at base.

Metasoma. In lateral view, petiole pedunculate, with vestigial ventral process; in lateral view, node of petiole low, rounded anteriorly; in dorsal view, node of petiole rounded anteriorly, wider than long. Postpetiole broader than long (PPL 0.21, PPW 0.40–0.46, PPI 155–193); in dorsal view, disc of postpetiole slightly trapezoidal; posterior margin of postpetiole medially emarginate. Gaster, in lateral view, somewhat convex dorsally; gastral tergite I finely reticulate. Legs long and slender.

Body opaque, finely granulate. Gastral tergite I finely reticula-granulate. Lacking erect hairs; short very narrow spoon-shaped hairs present on tubercles; first gastral tergite with simple appressed hairs. Body dark brown, legs slightly lighter, tarsal segments and mandibles yellowish. Wings smoky, finely hairy.

Comments. This species is only known from the male described by Forel and three other males later identified by Forel (1899) as belonging to this species, two from Mexico and one from Panama. I have examined the type specimen from the Forel collection, which is, unfortunately, in poor condition. I have seen photographs of the

specimen from Teapa, Tabasco, Mexico (on AntWeb), which resembles the type specimen from Orizaba. The main difference I am able to discern is the lack of a ventral process on the petiole and the somewhat larger pronotal tubercles in the specimen from Teapa. Unfortunately, I was not able to locate the specimen from Panama.

The male of the *M. dilacerata* r. *cornuta* is synonymyzed here under *M. dilacerata* because the differences listed by Forel are consistent with within-species variation. Those differences include: (i) slightly larger size than *M. dilacerata*; (ii) the pronotal tubercles smaller than in *M. dilacerata*; (iii) the tubercles on the cephalic corners higher than in *M. dilacerata*. Until the type of *M. dilacerata* r. *cornuta* can be located and studied it should be considered a junior synonym of *M. dilacerata*.

Material examined. MEXICO: *Tabasco*; Teapa; [95m; 17.5500º N 92.9500º W]; March; (*HH Smith*) [1m, BMNH]. ***Veracruz***; Tuxtlas, 10Km NNW Sontecomapan; 200m; 18.583333º N 95.083333º W; 20.iii.1985; (*PS Ward*) PSW7335–7 [1m, UCDC]. **COSTA RICA: *San Jose***; San Jose; [1380m; 9º 37’ 32.63” N 84º 00’ 39.58” W]; 1940; (*H Schmidt*) [1m, MZSP].

Myrmicocrypta ednaella Mann, 1922

(Figure 2.12–2.13)

Myrmicocrypta ednaella Mann (1922): 46) (w, q). 16 cotype workers and 3 queens;

HONDURAS: Departamento de Atlantida; Lombardia; [685m; 15.5667º N

87.2833º W]; ii–iii.1920; (*WM Mann*). (USNM) [examined]. The lectotype, here designated, is a worker with unique identifier number [USNMENT No. 00758311] deposited at USNM.

Diagnosis. Eyes small, convex (3–4 ommatidia in longest row, 10–12 ommatidia total; EL 0.07–0.09, OI 11–17); frontal lobes weakly developed (FLD 0.18–0.20); lateral margins convex; frons strongly impressed medially between well-developed frontal carinae; posterior portion of head (close to vertex) with three smaller impressions, the outer two of which are bordered by fine carinae; these impressions lacking hairs, except for the impression on the frons; metanotal groove deep; node of petiole, in profile, rounded; ventral margin of petiole with small process; hairs on tarsal segments suberect.

Description. Worker. *Head:* in full-face view and excluding mandibles, slightly longer than broad (HL 0.65–0.76, HW 0.51–0.64, CI 78–86), slightly narrow anteriorly; cephalic margin almost straight, interrupted medially by shallow emargination; cephalic corners anteriorly rounded, posteriorly subangulate, lacking tubercles; in full-face view, sides of head slightly convex; in full-face view, frons strongly impressed at middle between frontal carinae; posterior portion of head, close to posterior cephalic margin, with three small impressions, of which outer two bordered by thin carinae, and middle one forming the cephalic margin emargination by elevated carinae, appearing as small tubercles. Mandibles triangular, long (ML 0.38–0.50, MI 58–67); masticatory margin with 5–7 irregular teeth; outer margin

straight, slightly convex; dorsum of mandibles reticulate-striolate. In full-face view, anterior margin of clyeal apron broadly convex; mid portion of clypeus (body of clypeus) elevated and marginate at sides; in oblique view, fronto-clypeal tubercles triangular, carinate, covered with spoon-shaped hairs; unpaired clypeal seta mid-sized, stout (MSL 0.06–0.08, MSI 8–12), originating proximal to posterior margin of clypeal apron and with 3–5 narrow spoon-shaped hairs on each side of median seta; dorsum of clypeal apron shining and weakly wrinkled. Frontal lobes of moderate size (FLD 0.18–0.21), slightly expanded laterally, and broadly convex; frontal carinae parallel to nearly eye level, then curved and bordering frontal impression, extending toward corners of cephalic margin. Eyes small (EL 0.07–0.09, OI 12–17), convex, with 3–4 ommatidia in longest row (7–11 ommatidia total), situated at middle of sides of head; in full-face view, preocular carinae fine but distinct, extending to cephalic corners. In lateral view, postero-ventral angles of head (collar) produced on each side as pair of tubercles. Antennal scape long (SL 0.60–0.69, SI 106–118), somewhat stout, slightly surpassing cephalic corner; anterior margin (leading edge) of antennal scape minutely spiculate, dorsum finely reticulate, covered with narrow spoon-shaped hairs, becoming narrower towards apex. In lateral view, hypostomal teeth triangular, slightly shorter than - or as long as - eye length.

Mesosoma. Pronotum, in profile, dorsally flattened; anterior pronotal tubercles low and blunt, covered with spoon-shaped hairs; inferior lateral pronotal (humeral) tubercles triangular, larger than anterior pronotals; lateral pronotal tubercles triangular, with wide bases, and with fine carina that connects, anteriorly, with

anterior pronotal tubercles, and posteriorly, with the lateropronotal mesopleural suture (better seen in profile; *sensu* Serna and Mackay 2010); propleural tubercle tooth-like, blunt. In lateral view, lateral and anterior mesonotal tubercles low, blunt, carinate, connected by a fine carina that extends past the mesonotal constriction to connect with vestigial median mesonotal tubercles; posterior mesonotal tubercle vestigial, almost as developed as median tubercle; metanotal (mesoëpinotal of Mann 1922) constriction strong, deep. In lateral view, basal face of propodeum flat, subquadrate, somewhat longer than broad, as long as declivity; both surfaces with thin lateral margins carinate; propodeum with short triangular spines, in dorsal view, diverging from median line.

Metasoma. In lateral view, antero-ventral portion of petiolar peduncle with very small, inconspicuous process; in profile, node anteriorly rounded, flattened dorsally; in dorsal view, node of petiole longer than broad, rounded anteriorly and concave posteriorly. In dorsal view, disc of postpetiole dome-shaped, anterior margin widely convex, sides convex, posterior margin medially emarginate; disc of postpetiole wider than long (PPL 0.16–0.21, PPW 0.24–0.28, PPI 129–150). Base of gaster striate; remainder of gastral tergite I shining, smooth on the sides, finely rugulose medially; gastral tergite I covered with suberect spoon-shaped hairs. Outer margin of hind tarsomere I with decumbent, sparse, narrowly spoon-shaped hairs on upper half; inner margin of hind tarsomere I with decumbent, more dense, flattened hairs.

Body densely granulose and opaque. Hairs on head and body short and spoon-shaped; moderately abundant and regularly arranged on head, postpetiole, and gaster; sparse and limited to carinae of the mesosoma and petiole; anterior margin of pronotum with very few hairs; legs with abundant, strongly-curved, appressed, squamiform hairs.

Measurements. WORKER. EL 0.07–0.09, FLD 0.18–0.23, GL 0.65–0.83, HFL 0.69–0.77, HL 0.65–0.75, HTL 0.47–0.51, HW 0.51–0.64, ML 0.38–0.50, MSL 0.06–0.08, MSLca 0.03–0.05, OI 11–17, PL 0.31–0.41, PPL 0.16–0.21, PPW 0.24–0.28, SL 0.60–0.69, TL 3.01–3.63, WL 0.84–0.99, CI 78–86, MI 59–67, MSI 11–17, MSLI 45–67, PPI 129–150, RFLDI 24–31, RFLDII 30–38, SI 106–118 (n=21).

Queen. Resembling the worker with modifications appropriate for the caste and with the following differences:

Mesosoma. Mesoscutum irregularly margined at sides and with a pair of parallel ridges on median surface; parapsidal lines present; dorsum of mesonotum weakly rugose; postero-lateral margin of mesonotum rounded. Scutellum, in dorsal view, wider than long; axillae, in dorsal view, triangular, covered with spoon-shaped hairs; posterior margin of scutellum bidentate; propodeal spines larger than in workers.

Metasoma. Petiole in lateral view slightly subquadrate; ventral process of petiole small; ventral margin of petiole sinuate.

Sculpture similar to that of the worker except that occipital region of head and thorax bear irregular striae.

Measurements. QUEEN. EL 0.13–0.20, FLD 0.23–0.27, GL 1.04–1.34, HFL 0.89–0.99, HL 0.83–0.94, HTL 0.60–0.72, HW 0.71–0.84, ML 0.49–0.58, MSL 0.07–0.09, MSLca 0.03–0.05, OI 18–24, PL 0.50–0.73, PPL 0.23–0.30, PPW 0.23–0.30, SL 0.73–0.85, TL 4.29–5.27, WL 1.19–1.38, CI 85–89, MI 59–62, MSI 8–10, MSLI 45–58, PPI 174–178, RFLDI 27–30, RFLDII 32–35, SI 101–104 (n=4).

Male. Unknown.

Comments. I have examined several specimens of the cotype series of Mann (1922) (Cat No. 24465, deposited at the USNM), which includes seven workers and two dealate queens. In addition, there are also two pins in the USNM collection with individuals collected at the same locality by Mann and labeled as cotypes; however, the Catalogue number given by Mann in his publication is not recorded on the label of those specimens. I have given them USNMENT numbers: 1 pin: 2w, 1dq [USNM, USNMENT No. 00758310]; 1 pin: 1w [USNM, USNMENT No. 00758308]. In addition, there is a pin deposited in the LACM collection [LACMENT181985] bearing three workers, also labeled ‘cotype’ and also not labeled with the Catalogue number given by Mann. Finally, there is a pin deposited in the MCZ collection, with three workers also labeled as ‘cotype’ with number ‘4–6 21129’ [3w, MCZ,

USNMENT No. 00758309]. I have selected as the lectotype one of the specimens (worker) from the series Cat No. 24465, deposited in the USNM.

The type series described by Mann (1922) consists of specimens from several colonies collected underneath stones. Mann (1922): 48) describes the fungus garden as "pendulous, hanging from the underside of the stones into little pockets, which evidently are excavated by the ants." The gardens collected by Mann were small, not bigger than - and looking like - a thimble. The specimens from the south of Colombia were collected from the stomach contents of the harlequin poison dart frog *Oophaga* (=*Dendrobates) histrioniocus* (Berthold). Some colonies of *M. ednaella* collected in El Llano in Panama were parasitized by the ant species *Megalomyrmex wettereri* Brandão (RMM Adams, personal communication).

Material examined. COLOMBIA: *Cauca*; PNN Gorgona El Roble; 130m; 2º 58' N 78º 11' W; 6–9.iii.2001; (*H Torres*); winkler; M.1494 [1w, IAvHC]. ***Nariño;*** La Guayacana; [108m; 1.4333º N 78.4500º W]; (*PA Silverstone*); stomach content M3 *Dendrobates histrionicus*; PAS44.66 [6w, LACM]. **COSTA RICA: *Heredia;*** La Selva; [84m; 10.422º N 84.015º W]; 9.ii.1974; leaf litter; Berlesse; cacao plantation; (*Talbot & VanDevender*); CP#6929 [1w, LACM]. La Selva; 50–150m; 10º 26' N 84º 01' W; 14.vi.1999; (*INBio-OET*); bosque secundario [3w, INBio]. PN Braulio Carrillo; 300m; 10º 21' N 84º 04' W; 21.iii.2006; (*TEAM-OET*); AMI–4–W–070–02 [1w, INBio]. 11 Km ESE La Virgen; 300m; 10º 21' N 84º 03' W; 7.xi.2003; (*JT Longino*); JTL5228 [1w, INBio]. La Selva; 50m; 10º 26' N 83º 59' W; 2.iii.1987; (*DM Olson*) [1w, UCDC]. ***Limon*;** Hamburg Farm; [50 m; 10.25º N 83.45º W]; (*F*

Nevermann) [1w, MZSP]. Sector Cerro Cocori, Fca. de E. Rojas; 150m; 10.6º N 83.71667º W; (*E Rojas*) [2w, INBio]. Zent; [31m; 10.0333333º N 83.2833333º W]; iii.1924; (*WM Mann*) [1w, USNM]. **HONDURAS: *Departamento de Atlantida*;** Lombardia; [685m; 15.5667º N 87.2833º W]; (*WM Mann*) [10w, 3dq, USNM; 3w, MCZ; 3w, LACM]. **PANAMA: *Colon Province*;** San Lorenzo Forest; [14m]; 9º 17' N 79º 58' W; 30.ix.2004; (*Dejean, Orivel, Corbara, Aberlenc, Leponce*); winkler [3w, CEPEC]. San Lorenzo Forest; I.B.I.S.C.A.; [14m]; 9º 17' N 79º 58' W; 23.x–2.xi.2004; FL-IlC0 [1w, 2 aq, CEPEC]. Canal Zone; Gamboa; [27m; 9.1167º N 79.7000º W]; 22.xii.1995; (*UG Mueller*); nest series; UGM951222–01 [3w, 1dq, USNM]. Canal Zone; 3 Km NW Gamboa; 40m; 9º 08' N 79º 43' W; 10.xii.1983; (*PS Ward*); sifted litter (leaf mold rotten wood); rainforest; PSW6391–32 [3w, UCDC].

Myrmicocrypta ca ednaella **sp. nov.**

(Figure 2.14–2.15)

HOLOTYPE. 1w, PANAMA: Colon Province; Pipeline Rd., Km 6 (Soberania Park); [40m; 9º 08' N 79º 43' W]; 3.v.1996; (*UG Mueller*); nest series; UGM960503–01 [USNM, USNMENT No. 00443342].

PARATYPE. 6w, same information as holotype [USNM, USNMENT Nos. 00443344–00443346, 00443350]; **1w,** same information as holotype [USNM, USNMENT No. 00443351].

Measurements. WORKER. EL 0.11 (0.09–0.11), FLD 0.18 (0.17–0.20), GL 0.73 (0.69–0.77), HFL 0.75 (0.70–0.78), HL 0.69 (0.67–0.73), HTL 0.53 (0.49–0.55), HW 0.55 (0.54–0.58), ML 0.41 (0.38–0.46), MSL 0.06 (0.05–0.06), MSLca 0.03 (0.02–0.03), OI 19 (18–17), PL 0.39 (0.31–0.40), PPL 0.18 (0.17–0.19), PPW 0.24 (0.23–0.26), SL 0.65 (0.60–0.66), TL 3.28 (3.05–3.44), WL 0.89 (0.83–0.93), CI 79 (78–81), MI 60 (57–63), MSI 9 (8), MSLI 44 (33–50), PPI 137 (129–144), RFLDI 26 (25–28), RFLDII 33 (32–35), SI 119 (107–117) (n=8).

Diagnosis. Eyes large, globose (5–8 ommatidia in longest row, ~18–33 ommatidia total; EL 0.09–0.12, OI 17–20); frons impressed medially between well-developed frontal carinae; posterior portion of head (close to vertex) with three smaller impressions, the outer two of which are bordered by fine carinae; these impressions lacking hairs, except for the impression in the frons; metanotal groove shallow; hairs on hind tarsomere I appressed, with apical half of outer margin of tarsomere glabrous.

Description. Worker. *Head:* in full-face view and excluding mandibles, slightly longer than broad (HL 0.66–0.79, HW 0.52–0.65, CI 75–84); cephalic margin interrupted medially by shallow emargination; cephalic corners angulate, lacking tubercles but with conspicuous carina; in full-face view, sides of head somewhat straight; in full-face view, frons impressed at middle between frontal carinae; posterior portion of head, close to posterior cephalic margin, with three small impressions, of which outer two bordered by thin carinae, and middle one forming median cephalic margin emargination, carinae appearing as small tubercles (similar to

M. ednaella). Mandibles long (ML 0.38–0.48, MI 55–63); masticatory (inner) margin 6–8-toothed; outer margin straight, slightly convex; dorsum of mandibles reticulate-striolate. In full-face view, anterior border of clypeal apron broadly convex (slightly sinuous), mid-portion of clypeus (body of clypeus) elevated and marginate at sides; in oblique view, fronto-clypeal tubercles triangular, carinate, covered with spoon-shaped hairs; unpaired clypeal seta mid-sized, stout (MSL 0.04–0.08, MSI 6–10), originating proximal to posterior margin of clypeal apron and with 4–5 simple hairs on each side of median seta; dorsum of clypeal apron shining and weakly wrinkled. In full-face view, frontal lobes of moderate size (FLD 0.17–0.23), slightly expanded laterally, broadly convex; frontal carinae posterior to frontal lobes slightly pinched, extending parallel (nearly diverging) to nearly eye level, then curved and bordering frontal impression, extending toward cephalic margin and corners. Eyes large (EL 0.09–0.12, OI 17–20) with 5–8 ommatidia in longest row (18–33 ommatidia total), convex, globose, situated at middle of sides of head; in full-face view, postorbital carinae fine but distinct, failing to extend to cephalic corners. In lateral view, postero-ventral angles of head (collar) produced on each side as pair of tubercles. Antennal scape long (SL 0.60–0.75, SI 107–128) somewhat stout, slightly surpassing the cephalic corner; dorsum of antennal scape finely reticulate, covered with appressed, narrow, spoon-shaped hairs, becoming narrower towards apex. In lateral view, hypostomal teeth long, about half size of eye length; triangular.

Mesosoma. Anterior pronotal tubercles low and blunt, covered with spoon-shaped hairs; inferior lateral pronotal (humeral) tubercles angulate, slightly larger than

anterior pronotals; lateral pronotal tubercles widely angulate, with wide base, and with very fine carinae that do not connect with lateropronotal mesopleural suture (differing from *M. ednaella*; better seen in profile; *sensu* Serna and Mackay 2010); propleuron obtusely angulate or with low tubercle (differing from *M. ednaella*). Lateral and anterior mesonotal tubercles low (lateral slightly larger than anterior), blunt, carinate, connected laterally (forming a square area). Area between mesonotal and metanotal grooves with small posterior mesonotal tubercle, low, missing median tubercle. Metanotal constriction conspicuous, shallow (shallower than in *M. ednaella*); lateral carinae extending from base of posterior mesonotal tubercles to groove. In lateral view, basal face of propodeum flat, quadrate, and as long as the declivity; both surfaces with thin lateral carinae; propodeum with long spines; in dorsal view, propodeal spines slightly diverging from median line.

Metasoma. In lateral view, peduncle of petiole with long, conspicuous, antero-ventral process; in lateral view, node anteriorly rounded, flat posteriorly, ending in postero-lateral carinae; in dorsal view, node of petiole longer than broad, rounded anteriorly and straight posteriorly. In dorsal view, somewhat dome-shaped; anterior margin widely convex to straight; sides convex; posterior margin medially emarginate; postpetiole wider than long (PPL 0.16–0.21, PPW 0.22–0.30, PPI 123–154). Base of gater with very short striae; rest of gastral tergite I shining, smooth on sides, finely rugulose medially; gastral tergite I covered with suberect spoon-shaped hairs. Outer margin of proximal half portion of hind tarsomere I with decumbent spoon-shaped

hairs; inner margin of hind tarsomere I with decumbent, more dense flattened hairs; outer margin of apical half portion of tarsomere I shining and lacking hairs.

Body densely granulose and opaque. Hairs on head and body short and spoon-shaped; moderately abundant and regularly arranged on head, postpetiole, and gaster; sparse and limited to carinae of mesosoma and petiole; legs with abundant, strongly-curved, appressed squamiform (spoon-shaped) hairs.

Other material examined. Measurements. WORKER. EL 0.09–0.12, FLD 0.17–0.23, GL 0.66–0.89, HFL 0.68–0.87, HL 0.66–0.79, HTL 0.48–0.59, HW 0.52–0.65, ML 0.38–0.48, MSL 0.04–0.08, MSLca 0.01–0.04, OI 17–20, PL 0.33–0.44, PPL 0.16–0.21, PPW 0.22–0.30, SL 0.61–0.75, TL 3.11–3.72, WL 0.85–1.04, CI 75–84, MI 55–62, MSI 7–10, MSLI 29–57, PPI 126–154, RFLDI 24–30, RFLDII 29–39, SI 112–128 (n=40).

Queen. Unknown.

Male. Unknown.

Comments. This species resembles in all aspects, and is sympatric to, *Myrmicocrypta ednaella* Mann, also widely distributed in Central America. The main characters to distinguish the two species are the size of the eyes, being slightly smaller in *M. ednaella* (EL 0.07–0.09, OI 11–17) and the reduced number of ommatidia (3–4 ommatidia in longest row, 10–12 ommatidia in total), whereas *M. ca ednaella*

consistently possesses slightly larger eyes (EL 0.09–0.12, OI 17–20) and a higher number of ommatidia (5–8 ommatidia in longest row, ~18–33 ommatidia total). Other characters that can be used to separate the two species include: (i) hairs on each side of unpaired clypeal seta simple in *M. ca ednaella n.sp.* (sometimes there can also be narrow spoon-shaped hairs present, see discussion below), whereas specimens belonging to *M. ednaella* have spoon-shaped hairs on each side of the unpaired median seta; (ii) in *M. ca ednaella n. sp.,* hairs on proximal portion of tarsomere I of hind legs spoon-shaped, wider than the hairs present in the same position in *M. ednaella*, which tend to be more narrowly spoon-shaped; (iii) hairs on antennal scapes more appressed and more flattened in *M. ca ednaella sp n.* than in *M. ednaella*, in the latter the antennal scapes covered with narrower, decumbent hairs.

This species, as defined here, has a broad geographic distribution (from Tamaulipas (Mexico) in the north to Cauca (Colombia) in the south). I have observed morphological variation across the entire distribution, which could indicate that this a complex of cryptic species.

Specimens from lowland Guatemala (<450 m) and Mexico (<250 m) resemble those from Panama, differing however from the type series by having a short ventral petiolar process (some specimens), the petiole more subquadrate, and gaster darker colored compared with the rest of the body. The specimens from Nicaragua (450 m elevation) resemble those from lowland Guatemala and Mexico but are more uniform in color (reddish). Some of the specimens from Costa Rica (Carara) with a more parallel raised frontal carinae and somewhat larger humeral tubercles. Specimens from Corcovado (also in Costa Rica) with frontal carinae as in the type series, but

with somewhat larger humeral tubercles. Specimens from Barro Colorado (UGM960214–17), which belong to a nest series, show variation in the depth of the metanotal groove and workers have vestigial anterior pronotal tubercles.

Specimens from higher elevations (>450 m) have the metanotal groove very shallow to almost eroded, the propodeum and the mid-mesonotal area appearing almost continuous. Some specimens from lowland Mexico have shallow and others deep metanotal grooves. Specimens from higher elevations in Mexico differ from the type series by having slightly larger, triangular humeral tubercles and more globose eyes. Specimens from Colombia (high elevation) are slightly larger than the type series.

The species *M. subnitida, M. triangulata, M. dilacerata,* and *M. godmani,* all described based on males, could be synonyms of this species. Alternatively, the variation described for the workers may correlate with each of the species based on males. However, I cannot directly associate *M. ca ednaella*, described here, with any of these males. Collections of entire colonies, including males, are required to finally associate workers with species currently known only from males.

Material examined. BELIZE: *Cayo District*; 9Km S Belmopan; [59m; 17.2500º N 88.7667º W]; 20.viii.1972; (*S&J Peck*); berlesse; leaf-litter under carrion; forest [1m, MCZ]. **COLOMBIA: *Cauca*;** Isla Gorgona; [231m; 2.9675º N 78.180278º W]; 12.xii.1989; (*M Baena*); GF–P114; pitfall trap [1w, UTEP]. PNN Gorgona El Roble; 130m; 2º 58’ N 78º 11’ W; 6–9.iii.2001; (*H Torres*); winkler; M1494 [2w, IAvHC]. ***Choco*;** Goleta, La Playona; 3m; [8.45º N 77.1667º W]; iv.2000; (*M Figueroa*) [1w,

UNAB]. **COSTA RICA: *Heredia*;** Estación Biológica La Selva; 40–125m; 10º 26’ N 83º 59’ W; 23.ix.2004; (*Proyecto TEAM*); AMI–2–W–017–08 [1w, JTLC]. Same data as previous entry, but 05.ix.2007; AMI–1–W–152–10 [1w, JTLC]. Same as previous entry, but AMI–1–W–151–08 [1w, JTLC]. PN Braulio Carrillo; 180m; 10º 24’ N 84º 02’ W; 24.x.2006; (*TEAM-OET*); AMI–2–W–105–01 [1w, JTLC]. 16 Km SSE La Virgen; 1050–1150m; 10º 16’ N 84º 05’ W; 23.ii.2001; (*ALAS*); 11–WF–01–22 [1w, JTLC]. Same data as previous entry, but 22.iii.2001; 11–WF–03º30 [1w, JTLC]. ***Limon;*** Puerto Viejo; [76m; 9.6500º N 82.7667º W]; 29.i.1979; (*C Andrews*); CA#132 [1w, 1aq, MCZ]. ***Puntarenas*;** Reserva Biologica Carara; 30m; 9º 47’ N 84º 36’ W; 23.vii.1985; (*PS Ward*); PSW7581–8; stray; ground; forest [1w, UCDC]. Parque Nacional Corcovado; <100m; 8º 29’ N 83º 36’ W; 18.xii.1990; (*JT Longino*); winkler; leaf-litter; wet forest; JTL12769–5 [1w, JTLC]. 3Km N Ciudad Neily; 210m; 8º 41’ N 82º 57’ W; 31.vii.1985; (*PS Ward*); winkler; leaf-litter; 2º forest; PSW7771–12 [1w, UCDC]. **GUATEMALA: *El Progreso*;** 3.7Km SW Morazán; 460m; 14.9051º N 90.153617º W; 7.vii.2007; (*JT Longino*); tropical dry forest; winkler sample; JTL6022–s [1w, JTLC]. ***Izabal;*** 5Km NW Morales; 250m; 15.5137176º N 88.865852º W; 17.v.2009; (*LLAMA*); 2º lowland forest; Wa–B–04–2–10; Wa–B–04–2–38 [2w, JTLC]. Same data as previous entry, but 210m; 15.51161º N 88.86439º W; Wm–B–04–1–03 [1w, JTLC]. Same data as previous entry, but 18.v.2009; 170m; 15.5103º N 88.86326º W; Wm–B–04–2–02 [1w, JTLC]. Same data as previous entry, but 160m; 15.50966º N 88.86268º W; Wm–B–04–1–07 [1w, JTLC]. ***Peten;*** Parque Nacional Tikal; 270m; 17.21405º N 89.61253º W; 22.v.2009; (*LLAMA*); tropical moist forest; Wm–B–05–2–04; Wa–B–05–2–19; Wa–B–05–2–28;

Wm–B–05–2–03 [4w, JTLC]. Same as previous entry, but 325m; 17.13202º N 89.68206º W; Wm–B–05–2–07 [1w, JTLC]. Cerro Cahuí; 290m; 17.00266º N 89.7187º W; 21.v.2009; (*LLAMA*); Wx–B–05–1–01 [1w, JTLC]. **NICARAGUA: *Matagalpa*;** Pancasan; 450m; 12º 56' N 85º 34' W; 18.vi.1992; (*TR Schultz*); TRS 920618–10 [5w, USNM]. Same data as previous entry, but TRS920618–14 [1w, USNM]. Isla de Diamante; 9–10.x.1994; (*JP Caldwell*)l JPC8808 [6w, CEPEC; 5w, MZSP]. **MEXICO: *Chiapas*;** 8.8 Km SE Salto de Agua; 50m; 17º 30' N 92º 17' W; 14.vii.2007; (*MG Branstetter*); MGB 648–B [1w, JTLC]. 9 Km SE Salto de Agua; 50m; 17º 31' N 92º 18' W; 14.vii.2007; (*RS Anderson*); RSA2007–011 [1w, JTLC]. Najá; 950m; 16º 58' N 91º 35' W; 14.vii.2007; (*J Luna-Cozar*) [1w, JTLC]. Najá; 950m; 16º 58' N 91º 35' W; 14.vii.2007; (*MG Branstetter*); MGB653–6 [1w, JTLC]. 12 Km NW Flor de Cafe; 520m; 16º 08' N 91º 16' W; 22.vii.2007; (*JT Longino*); JTL 6103–s [1w, JTLC]. Lago Metzabok; 570m; 17.12704º N 91.63000º W; 05.vi.2008; (*LLAMA*); Wa–A–06–1–38; winkler; leaf-litter; lowland wet forest [1w, JTLC]. Nahá; 950m; 16.97444º N 91.58702º W; 12.vi.2008; (*DJ Cox*); DJC0169 [1w, JTLC]. Playon de la Gloria; 160m; 16.15929º N 90.90155º W; 26.vi.2008; (*LLAMA*); Wm–A–09–1–all [1w, JTLC]. ***Tabasco*;** 10 Km N Cardenas; [10m; 17.9833º N 93.3667º W]; 28.v.1988; (*W Mackay*); pitfall trap; open area; WM10526 [1w, UTEP]. ***Tamaulipas*;** 10 Km W El Encino; 200m; 23.08º N 99.10º W; 19–20.vii.1979; (*PS Ward*); hand collected, ground; stray worker; rainforest; PSW3739–5 [1w, UCDC]. ***Veracruz*;** Veracruz; [0m; 19.200º N 96.1333º W]; 22.vi.1953; (*CJ Goodnight*); berlesse [2w, MCZ]. **PANAMA: *Colon Province*;** San Lorenzo Forest; I.B.I.S.C.A.; [14m]; 9º 17' N 79º 58'W; 17.x.2003; FL-C1A28a [2w, CEPEC]. San Lorenzo

Forest; I.B.I.S.C.A.; [14m]; 9º 17’ N 79º 58’W; 12–23.ix.2004; FL-C2C0 [1w, CEPEC]. Canal Zone; Gamboa, pond area; [40m; 9º 08’N 79º 43’W]; 25.i.1996; (*JJ Boomsma*) [3w, USNM]. Gamboa, Pipeline Rd, Km ~6 (Soberania Park); [40m; 9º 08’N 79º 43’W]; 18.viii.2003; (*J Sosa-Calvo*); winkler; leaf-litter; JSC030818–01–LS08 [1w, USNM]. Gamboa, Pipeline Rd, Km 6 (Soberania Park); [40m; 9º 08’ N 79º 43’ W]; 5.ii.1996; (*UG Mueller*); nest series; UGM960205–01 [2w, USNM]. Canal Zone; Gamboa; [27m; 9.1167º N 79.7000º W]; 21.i.1996; (*UG Mueller*); nest series; UGM960121–01 [2w, 1dq, USNM]. Tule; 16.viii.1996; (*UG Mueller*); nest series; UGM960816–02 [2w, 3aq, USNM]. Gamboa; [27m; 9.1167º N 79.7000º W]; 21.i.1996; (*UG Mueller*); nest series; UGM960121–02 [2w, 3aq, USNM]. Canal Zone, Barro Colorado Island; [79m; 9.1636º N 79.8378º W]; 1938; (*N Weber*) [17w, 2dq, MCZ]. Canal Zone, Barro Colorado Island; [79m; 9.1636º N 79.8378º W]; 28.iv.1958; (*N Weber*) [8w, MCZ]. Canal Zone, Barro Colorado Island NM; 50ha plot., LASH project; 50m; 9º 09’ N 79º 51’ W; vi–vii.2002; (*ME Kaspari*) [6w, MKOU]. Canal Zone, Barro Colorado Island; [79m; 9.1636º N 79.8378º W]; 14.ii.1996; (*UG Mueller*); nest series; UGM960214–17 [3w, 1dq, USNM]. Canal Zone, Barro Colorado Island; [79m; 9.1636º N 79.8378º W]; iv–v.1942; (*J Zetek*); JZ4953 [1w, USNM].

Myrmicocrypta elizabethae Weber, 1937

(Figure 2.16–2.17)

Myrmicocrypta elizabethae Weber (1937): 383) (dg). 1dg, HOLOTYPE, **GUYANA**: Forest Settlement [Penal Settlement], R. Mazaruni; [10m; 6.39733º N 58.67808º

W]; 5.ix.1935; NAW349.1; (*NA Weber*) (MCZ) [examined]. [USNMENTNo. 00755497].

Diagnosis. *Worker.* Eyes large (EL 0.09–0.12, OI 15–19) with 7–8 ommatidia in longest row (26–40 ommatidia total); clypeal apron broadly convex, almost straight; frontal lobes vestigial, parallel; frontal carinae vestigial; head, in full-face view, wider anteriorly than posteriorly; long unpaired median seta; hypostomal teeth small; mesosoma smooth; node of petiole rounded; postpetiole, in dorsal view, convex anteriorly; hairs on head and body broadly spatulate and appressed.

Description. Worker. *Head*: in full-face view and excluding mandibles, longer than broad (HL 0.68–0.80, HW 0.55–0.68, CI 79–84), narrowed posteriorly at level of cephalic corners; cephalic margin transverse, with vestigial median emargination; postero-ventral angles of head (collar) smooth and lacking tubercles; in full-face view, cephalic corners rounded; sides convex; clypeal apron narrow, anterior margin of clypeal apron broadly convex, almost straight; unpaired median seta long (MSL 0.11–0.14, MSI 14–18); fronto-clypeal teeth small and acute; hypostomal teeth small, rounded; mandibles triangular, thick, long (ML 0.39–0.48, MI 57–62), with convex outer margin, inner (masticatory) margin 6–8 toothed; dorsum of mandibles finely reticulate-punctate; eyes large (EL 0.09–0.12, OI 15–19), with 7–8 ommatidia in longest row (26–40 ommatidia total), situated posterior to midline of head at a level above frontal lobes; frontal lobes vestigial, parallel; frontal lobes slightly separated; frontal carinae vestigial; antennal scapes long (SL 0.70–0.83, SI 120–130).

Mesosoma. Anterior pronotal tubercles absent; humeral pronotal tubercle small, triangular; lateral pronotal tubercles conspicuous, blunt; dorsum of pronotum somewhat flattened; propleural tooth vestigial; lateral mesonotal tubercles reduced to tumuliform carinae; anterior mesonotal tubercles vestigial; median and posterior mesonotal tubercles fused into a single small tubercle; metanotal groove deep; anterior portion of propodeum lacking tubercles; basal face of propodeum smooth and, in lateral view, flat; basal face of propodeum larger than propodeal declivity; propodeal spines short, triangular; basal and declivous faces of propodeum lacking lateral carinae.

Metasoma. Petiole distinctly pedunculate, long; in lateral view, anterior portion of node rounded; node of petiole rounded; ventral margin of petiole lacking ventral process; ventral carinae of petiole vestigial. Postpetiole, in lateral view, ovoid; in dorsal view, disc of postpetiole bell-shaped (anterior margin rounded, posterior margin angulate, slightly wider than anterior margin). In dorsal view, disc of postpetiole slightly wider than long (PPL 0.17–0.21, PPW 0.20–0.25, PPI 114–129); posterior dorsal margin of postpetiole weakly emarginate medially. In lateral view, gaster dorsally convex; in dorsal view, gaster long-ovate (longer than wide); gastral tergite I reticulate. Legs long and slender (HTL 0.54–0.66, HFL 0.62–0.94).

Body opaque, finely granulose, smooth; tubercles low; mandibles striate-punctate; gastral tergite I finely reticulate.

Pilosity of moderately abundant squamate hairs, which become narrow-squamate on scape and legs; hairs on proximal portion of tarsomere I narrowly squamate, distal portion of segment with scarce appressed simple hairs; funicular segments covered with appressed pubescence. Brownish-yellow.

Material examined. Measurements. WORKER. EL 0.09–0.12, FLD 0.10–0.13, GL 0.65–0.83, HFL 0.62–0.95, HL 0.68–0.80, HTL 0.54–0.66, HW 0.55–0.68, ML 0.39–0.48, MSL 0.11–0.14, MSLca 0.09–0.11, OI 15–19, PL 0.35–0.43, PPL 0.17–0.21, PPW 0.20–0.25, SL 0.70–0.82, TL 3.15–3.74, WL 0.89–1.04, CI 79–84, MI 57–62, MSLI 14–18, PPI 114–129, RFLDI 15–17, RFLDII 18–21, SI 120–130 (n=12).

Queen. Resembling the worker with modifications expected for the caste with the following differences:

Head. Frontal carinae weakly impressed.

Mesosoma. Lateral pronotal tubercles tumuliform; sides of pronotum concave; median carinae of mesoscutum present; latero-posterior margin of mesoscutum convex; parapsidal lines present; mesoscutum, dorsally, with a pair of longitudinal raised carinae; dorsum of mesoscutum lacking rugae; scutellum wider than long; posterior margin of scutellum bidentate, dorsally with median carinae; in lateral view, basal portion of propodeum as long as declivous; propodeal spines triangular, thick; declivity of propodeum with thin lateral carinae.

Metasoma. In lateral view, margin of petiole with thin lateral carinae; ventral margin of petiole with thin paired carinae; postpetiole, in dorsal view, wider than long (PPL 0.28, PPW 0.50, 179–180), dome-like; disc of postpetiole rugose; anterior margin broadly convex; postero-lateral margin angulate; posterior margin of petiole medially emarginate; basigastral costulae short but sharply developed and distinct; gastral tergite I densely and finely reticulate; anterior margin of gastral segment I straight.

Body ferruginous to reddish-brown, darker than worker; legs and antennae slightly lighter.

Measurements. QUEEN. EL 0.16, FLD 0.15–0.16, GL 1.13–1.34, HFL 0.97–1.00, HL 0.85–0.88, HTL 0.64–0.68, HW 0.74, ML 0.50–0.54, MSL 0.15, MSLca 0.11, OI 21, PL 0.55, PPL 0.28, PPW 0.50, SL 0.82–0.85, TL 4.50–4.83, WL 1.20–1.25, CI 84–87, MI 59–61, MSLI 17, PPI 179–180, RFLDI 17–19, RFLDII 21, SI 111–115 (n=2).

Male. Unknown.

Comments. Weber (1937) established this species from a single dealate queen that he collected in primary forest. This species resembles *Myrmicocrypta JSC–019* but differs from it on the reduced frontal lobes, the long unpaired median clypeal seta, the vestigial occipital collar, and the reduced hypostomal teeth.

Material examined. GUYANA: ***Cuyuni-Mazaruni;*** Forest Settlement [Penal Settlement], R. Mazaruni; [10m; 6.39733º N 58.67808º W]; 5.ix.1935; NAW349.1; (*NA Weber*) [1dq, MCZ]. ***Potaro-Siparuni;*** Iwokrama Forest Reseach Center; Whitewater Camp; 60m; 4º 43.89' N 58º 50.992' W; 5.xi.2002; (*JS LaPolla* et al.); 1º forest; leaf-litter sample; JSL021105–01–LS01 to 20 [12w, 1dq, USNM].

Myrmicocrypta erectapilosa Sosa-Calvo & Schultz, 2010

(Figure 2.18–2.19)

Myrmicocrypta erectapilosa Sosa-Calvo and Schultz (2010): 189), figs 16–22 (w.q).

1w, HOLOTYPE, **BRAZIL**: Amazonas; Manaus; BR 174 Km 45 EEST 51; [85m; 2.590782º S 60.030700º W]; 13.ix.1991; (*AY Harada & AG Bandeira*). Holotype deposited in INPA [USNMENTNo. 00537304] [examined].

Measurements. WORKER. EL 0.05–0.06, FLD 0.21–0.24, GL 0.70–0.78, HFL 0.63–0.68, HL 0.66–0.71, HTL 0.48–0.49, HW 0.57–0.63, ML 0.44–0.47, MSL 0.14–0.17, MSLca 0.10–0.13, OI 8–10, PL 0.29–0.36, PPL 0.15–0.16, PPW 0.24–0.26, SL 0.60–0.65, TL 3.22–3.33, WL 0.84–0.91, CI 86–89, MI 63–69, MSI 21–23, MSLI 68–81, PPI 153–176, RFLDI 30–34, RFLDII 35–38, SI 103–107 (n=4).

Diagnosis. Body covered with erect simple hairs; hypostomal teeth short, triangular, and acute; sculpture on mesosoma reduced; frontal lobes triangular and partially covering the antennal insertions.

Description. Worker. *Head:* in full-face view and excluding mandibles longer than wide (HL0.67–0.71, HW 0.57–0.63, CI 86–89); cephalic margin with shallow median concavity, cephalic corners evenly convex, lacking sharp angles, spines, or tubercles.

Head covered mainly with erect and suberect hairs; integument evenly reticulate-rugose. In lateral view, occiput not extended into a "neck" or "collar," at most with very low tooth-like tumosities. Mandibles triangular, long (ML 0.44–0.47, MI 63–69); masticatory margin of mandible 6–8-toothed increasing in size towards apex; outer margin weakly sinuous; dorsal surface of mandibles striate. Clypeal apron thin, shining, and with shallow transverse striae; anterior margin evenly convex; unpaired clypeal seta long (MSL 0.14–0.17, MSI 21–23), with five pairs of simple, long, slender, appressed hairs that originate on posterior margin of clypeal apron and overhang mandibles; in lateral view, body of clypeus produced medially into pair of prominent frontoclypeal teeth triangular and covered with simple erect hairs; in oblique view, body of clypeus subquadrate, medially with triangular tubercles, and with thin carina laterally; posterior portion of clypeus extending between frontal lobes. Frontal lobes, in full-face view, triangular and partially covering antennal insertions; frontal carinae vestigial, past level of eyes merging with abundant scabrous sculpture. Eyes reduced (EL 0.05–0.06, OI 8–10), with 3–4 ommatidia in longest row (6–10 ommatidia total). Antennal scape long (SL 0.60–0.65, SI 103–107), slightly wider at midpoint; hairs on antennal scape simple long, leading edge of antennal scape erect. In lateral view, hypostomal teeth short, triangular, and acute; hypostoma glabrous, smooth, and shiny.

Mesosoma. Pronotal humeral and lateral spines reduced to eroded tubercles occurring at intersections of carinae; anterior pronotal spines absent; dorsum of pronotum with median longitudinal carina arising at anterior pronotal margin and extending posteriorly at least to level of lateral pronotal spines; dorsum of pronotum sometimes with low wrinkles; propleuron with one or two very small tubercles, each bearing simple hair. Mesonotal tubercles reduced to carinae. Anterior propodeal spines absent; posterior portion of propodeum with short, blunt teeth; base of propodeum, in profile, flat and as long as declivity of propodeum; declivity of propodeum with a very reduced but conspicuous lamella on each side.

Metasoma. In lateral view, petiole pedunculate; lacking or with vestigial antero-ventral process; ventral margin of petiole with pair of closely approximated longitudinal carinae; in lateral view, node of petiole rounded; in dorsal view ellipsoidal and with longitudinal carina. In lateral view, postpetiole slightly longer than high, dorsally convex; in dorsal view, disc of postpetiole wider than long (PPL 0.15–0.16, PPW 0.24–0.26, PPI 153–176); in dorsal view, posterior margin of postpetiole slightly emarginate; latero-inferior processes acute. In lateral view, base of gastral tergite I at junction with postpetiole ventrally evenly convex and smooth; in dorsal view, base of gastral tergite I at junction with postpetiole with transverse carina with lateral corners; laterally a few short carinae extend posterad from these corners. Dorsum of gastral tergite I punctulate-reticulate.

Individuals uniformly brown ferruginous; antennal scapes, head, and mesosoma covered with simple, erect hairs restricted mainly to carinae or tubercles; hairs on gastral tergite I curving at tip.

Queen. As the worker with modifications expected for the caste and with the following differences:
Head: frontal carina extending posterad to almost level of mid-ocellus and splitting into two low carinae, vertexal ones being more conspicuous. In lateral view, occipital collar (neck) moderately developed laterally, with both upper and lower extensions small and blunt, lower one slightly larger than upper tubercle. In lateral view, frontoclypeal teeth long. Antennal scape rugose; leading edge of antennal scape serrate.

Mesosoma. Dorsum of pronotum conspicuously rugose. Mesoscutum overall rugose; antero-median longitudinal carina present, extending ~1/3 length of mesoscutum; dorsum of mesoscutum with pair of longitudinal low carinae; parapsidal lines conspicuous and extending nearly to anterior margin of mesoscutum. Scutellum posteriorly bidentate, dorsally rugose; propodeum with pair of short denticles;

declivity of propodeum with a conspicuous lamella on each side. In lateral view, sides of pronotum, mesopleuron, metapleuron, and sides of propodeum rugulose.

Metasoma. In lateral view, antero-ventral process of petiole tooth-like. Disc of postpetiole wider than long (PPL 0.19–0.22, PPW 0.40–0.50, PPI 183–247), with projecting posterior latero-inferior corners. Gastral tergite I densely reticulate, basally with widely spaced, short costulae and with conspicuous antero-lateral carinae, as in worker.

Body color dark yellow or light brown; pilosity as in worker.

Measurements. QUEEN. EL 0.11–0.12, FLD 0.27–0.29, GL 1.05–1.13, HFL 0.77–0.85, HL 0.76–0.81, HTL 0.55–0.59, HW 0.69–0.71, ML 0.50–0.53, MSL 0.17–0.20, MSLca 0.13–0.15, OI 15–17, PL 0.40–0.46, PPL 0.19–0.22, PPW 0.40–0.50, SL 0.68–0.75, TL 4.11–4.24, WL 1.13–1.19, CI 88–92, MI 63–68, MSI 21–26, MSLI 73–79, PPI 183–240, RFLDI 35–38, RFLDII 38–42, SI 96–106 (n=5).

Male. Unknown.

Comments. See comments under *Myrmicocrypta bucki*.

Material examined. BRAZIL: ***Amazonas***; Manaus; BR 174 Km 45 EEST 51; [85m; 2.590782º S 60.030700º W]; 13.ix.1991; (*AY Harada* & *AG Bandeira*) [2w, 1dq, INPA]. Manaus; Dimona Camp, RS 2018; [95m; 2.33792º S 60.10812º W]; 21.x.1993; (*AB Casimiro*); plot C-5 [1w, CEPEC]. **PERU:** ***Madre de Dios;*** Puerto Maldonado; Los Amigos (CICRA); 292m; 12º 33' 42.18" S 70º 06' 13.26" W; 21–24.xi.2005; (*J Sosa-Calvo*); leaf-litter sample; JSC051121–02–LS06 [8w, USNM].

Myrmicocrypta foreli Mann, 1916

(Figure 2.20–2.21)

Myrmicocrypta foreli Mann (1916): 457), pl. 4, figs. 32–34 (w.q.). 25w, 1dq,

BRAZIL: Rondonia; Madeira-Mamoré Railroad Camp 41 (~306 Km S from Porto Velho); [131m; 10.407196º S 65.329353º W]; vii–xii.1911; (*WM Mann & F Baker*). (USNM, MCZ, LACM) [examined]. The lectotype, here designated, is a worker with unique identifier number [USNMENT No. 00755241] deposited at USNM.

Diagnosis. *Worker*. Medium sized individuals (TL 3.05–3.39, WL 0.82–0.89); frontal lobes vestigial, parallel, appearing as raised carinae; unpaired median seta of clypeal apron small and stout; anterior pronotal tubercles vestigial; propodeal spines long; ventral margin of petiole keeled. *Queen*. Frontal lobes vestigial, parallel; head wider at posterior margin than anterior margin; small hypostomal teeth; propodeal spines long; base of propodeum with thick lateral carinae; ventral margin of petiole keeled; disc of petiole concave.

Description. Worker. *Head*: In full-face view, excluding mandibles, longer than broad (HL 0.66–0.73, HW 0.53–0.57, CI 78–81), with slightly convex sides and concave cephalic margin medially slightly concave; occipital posterior corners (collar) drawn out into thick blunt tubercles. Anterior margin of clypeal apron broadly convex (slightly sinuous); clypeal apron with stout, short (MSL 0.06–0.07, MSI 9–11), unpaired median seta. Frontal lobes reduced (FLD 0.09–0.13), appearing as a

continuation of the frontal carinae somewhat elevated at insertion of antenna1 scape, and anteriorly extending outward reaching base of fronto-clypeal teeth; posteriorly very slightly diverging towards cephalic margin, becoming much weaker at a little less than half the distance from base of scape to cephalic margin. Antenna1 scape long (SL 0.62–0.69, SI 115–124), curved, thickened at tip, surpassing cephalic margin by about one fourth their length. Eyes of medium size (EL 0.10–0.12, OI 18–22) with 6–8 ommatidia in longest row (24–32 ommatidia total), located at the middle of sides of head. Mandibles long (ML 0.41–0.47, MI 62–68) and rather slender, masticatory margin with 6–8 short teeth, of which preapical and apical teeth larger than rest; outer margin of mandibles somewhat sinuous.

Mesosoma. In dorsal view, median portion (between lateral pronotal tubercles) of pronotum slightly concave; humeral tubercle small, angulate, carinae-like; anterior tubercles vestigial reduced to carinae that connect postero-laterally with base of lateral pronotal tubercles; anterior pronotal tubercles absent or vestigial (replaced by squamate hairs); lateral pronotal tubercles blunt with massive base and, in dorsal view, giving pronotum a square appearance; propleuron with angulate carina and covered with squamate hairs; anterior portion of mesonotum with lateral and anterior tubercles join together by parallel tuberculate carinae; anterior mesonotal tubercles slightly larger than lateral tubercles; mesonotal constriction strong, steep; median and posterior mesonotal tubercles present between mesonotal and metanotal constriction. Propodeum with subequal base and declivity, the latter steep; anterior portion of propodeum with raised carina, appearing as irregular denticle; in lateral view, lateral

margin of base of propodeum with thin carina, connecting at base of propodeal spines; propodeal spines with wide base, acute, and about half as long as declivity.

Metasoma. Petiole elongate; in lateral view, node rounded. Ventral margin of petiole keeled, angulate anteriorly, and diverging posteriorly into two thin carinae. In dorsal view, disc of postpetiole twice as broad as disc of petiole; disc of postpetiole broader than long, sides evenly convex, posterior margin marginated medially. Gaster elongate, gastral tergite I longer than broad; base of gaster weakly striate, gastral tergite I finely reticulate-punctate. Legs long and stout.

Body and legs subopaque, except the gaster, in which sides of first gastral tergite is shining. Head with minute rugae arranged in more or less circular patterns closest to cephalic margin. Mandibles longitudinally striate, sublucid.
Body, antennae, and legs with thick, short, curved, decumbent, glistening hairs.
Color light ferruginous, yellowish, the masticatory margin of mandible darker.

Material examined. Measurements. WORKER. EL 0.10–0.12, FLD 0.09–0.13, GL 0.68–0.86, HFL 0.68–0.76, HL 0.66–0.73, HTL 0.46–0.53, HW 0.53–0.58, ML 0.41–0.48, MSL 0.06–0.08, MSLca 0.04–0.05, OI 18–22, PL 0.30–0.39, PPL 0.17–0.21, PPW 0.23–0.26, SL 0.62–0.68, TL 3.05–3.39, WL 0.82–0.89, CI 78–81, MI 62–68, MSI 9–11, PPI 115–141, RFLDI 14–18, RFLDII 17–23, SI 115–124 (n=17).

Queen. Dealate. As the worker with modifications expected for the caste and with the following differences:

Head. In full-face view, wider at posterior margin than anteriory; rugae on dorsum of head strongly marked; cephalic corners rounded; cephalic margin medially concave; hypostomal teeth small, acute.

Mesosoma. Pronotum with humeral and lateral tubercles of similar size, blunt; anterior pronotal tubercles absent, replaced by rugae that connect base of humeral and lateral tubercles; dorsum of pronotum covered with abundant spoon-shaped hairs. Mesoscutum, in lateral view, slightly rounded above, with a longitudinal pair of irregular rugae at sides and middle; anterior portion of mesoscutum with median carinae; parapsidal lines present, conspicuous; margin of mesoscutum lacking tubercles or projections. Scutellum wider than long; axillae, in dorsal view, triangular; in lateral view, slightly elevated and acute posteriorly; posterior margin of scutellum bidentate; propodeum with a pair of long, strong spines; base of propodeum shorter than declivity; base of propodeum laterally carinate; declivity of propodeum laterally thinly carinate.

Metasoma. In dorsal view, node of petiole concave; disc of postpetiole wider than long, rugose; base of gaster with 6 very short, but strong striae, rest of gastral tergite I minute and densely striate-reticulate.

Ferruginuous in color.

Measurements. QUEEN. EL 0.18, FLD 0.12, GL 1.02, HFL 0.83, HL 0.78, HTL 0.57, HW 0.66, ML 0.46, MSL 0.07, MSLca 0.05, OI 28, PL 0.52, PPL 0.24, PPW 0.46, SL 0.74, TL 4.09, WL 1.08, CI 85, MI 59, MSI 9, MSLI 64, PPI 196, RFLDI 16, RFLDII 19, SI 112 (n=1).

Male. Unknown.

Comments. This species was described by WM Mann (Mann, 1916) from several workers and a dealate queen collected at camp 41 during the construction of the Madeira-Mamoré Railroad (also known as the "Devil's Railroad") in the state of Rondonia. Mann (1916) reports that the colony was found under a log, approximately 7.5 cm from the surface of the ground. The nest consisted of a single chamber containing the small fungal garden. The colony from Loreto, Peru, also consisted of a single chamber, which contained workers and 1 dealate queen, and was located 3 cm below the surface. The single chamber was roughly spherical (3cm wide x 3 cm high).

The queen is very similar to the queen of *M. squamosa* Fr. Smith, but differs from it mainly in the shape of the frontal lobes, the overall shape of the head, and the ventral keel on the petiole.

The individual from Putumayo, Colombia, is very similar to the type series of *M. foreli*; however, it is slightly smaller than the individuals in the type series. The eyes

are slightly smaller with 19 ommatidia total. The measurements for the Colombian individual are: EL 0.09, FLD 0.11, GL 0.61, HFL 0.61, HL 0.61, HTL 0.42, HW 0.50, ML 0.37, MSL 0.08, MSLca 0.05, OI 13, PL 0.28, PPL 0.16, PPW 0.21, SL 0.58, TL 2.80, WL 0.77, CI 81, MI 60, MSI 13, PPI 130, RFLDI 17, RFLDII 21, SI 116 (n=1).

Material examined. **BRAZIL: *Rondonia***; Madeira–Mamoré Railroad, Camp 41; (*WM Mann* & *F Baker*); nest series [25w, 1dg, USNM, LACM, MCZ]. **COLOMBIA: *Putumayo***; PNN La Paya, Cabaña La Paya; 330m; 0º 2'S 75º 12' W; 1–15.xii.2001; (*E Lozano*); pitfall; M2802 [1w, IAvH]. **PERU: *Loreto***; ACTS Field Station; [118m]; 3.2489º S 72.90908º W; 18.vi.2004; (*C Rabeling*); nest series; CR040618–15 [1w, USNM].

Myrmicocrypta godmani Forel, 1899

Myrmicocrypta godmani Forel (1899): 39) (m.). **NICARAGUA**: Chontales; [109m; 11.939472º N 85.189404º W]; (*Janson*). [not examined].

Worker. Unknown.

Queen. Unknown.

Comments. I was not able to locate the type specimen for this species. Based on the description by Forel (1899), this species is very similar to *M. dilacerata* and *M. subnitida*. Forel points out the following characters to differentiate this species from

dilacerata and *subnitida*: (i) the shape of the head similar to that of *subnitida*; (ii) the tubercles on the pronotum arranged similarly to those of *subnitida*, but propodeal spines more robust; (iii) the petiole with a conspicuous petiolar node as in *dilacerata* (differing from *subnitida*).

This species differs from both *dilacerata* and *subnitida* in the absence of tubercles behind the lateral ocelli, and the lack of tubercles on the cephalic corner. This species also seems to differ from *dilacerata* and *subnitida* by the pilosity. The hairs are slightly shorter than in *subnitida*. At the end of the description, Forel seems troubled by establishing this as a new species. He argues that althought this species is different from *dilacerata* in shape, it resembles *dilacerata* in color, body sculpture, and pilosity.

Since I was not able to study the male of this species, I have decided to maintain this species as valid until the type specimen can be studied. Only then will it be safe to make a decision about whether this species is valid or is a junior synonym of *dilacerata*.

Myrmicocrypta guianensis Weber, 1937

(Figure 2.22–2.23)

Myrmicocrypta guianensis Weber (1937): 385) (w.q.). 4w, 1dq, **GUYANA**: East Berbice Corentyne Region; Oronoque River; [193m; 2º 45’ N 57º 25’ 60” W]; 24.vii.1936; NAW591.1; (*NA Weber*). (MCZ, LACM) [examined]. The lectotype, here designated, is a worker with unique identifier number [USNMENT No.

00755195] deposited at MCZ.

Diagnosis. This species is very similar to *M. foreli* Mann (1916). *Worker*. Medium sized individuals (TL 2.98–3.06, WL 0.81–0.82); frontal lobes vestigial, parallel, appearing as raised carinae; unpaired median seta of clypeal apron small and stout; anterior pronotal tubercles vestigial; propodeal spines long; antero-ventral process of petiole tooth-like; in lateral view, node of petiole subquadrate. *Queen*. Frontal lobes vestigial, parallel; head wider at posterior margin than anterior margin; small hypostomal teeth; sides of mesosoma strongly rugulose, except for sides of pronotum; propodeal spines long; base of propodeum with thick lateral carinae; antero-ventral process of petiole tooth-like, extending with a thin, sinuous ventral carina; disc of petiole concave.

Description. Worker. *Head:* in full-face view, excluding mandibles, longer than broad (HL 0.64–0.65, HW 0.51–0.52, CI 78–82), with slightly convex sides and cephalic margin medially slightly concave; occipital posterior corners (collar) drawn out into thick blunt tubercles. Anterior margin of clypeal apron broadly convex; clypeal apron with stout, short (MSL 0.07, MSI 10–11), unpaired median seta. Frontal lobes reduced (FLD 0.11–0.12), appearing as a continuation of the frontal carinae somewhat elevated at insertion of antenna1 scape, and anteriorly extending outward reaching base of fronto-clypeal teeth; posteriorly very slightly diverging towards cephalic margin, becoming much weaker at a little less than half the distance from base of scape to cephalic margin. Antenna1 scape long (SL 0.61, SI 116–121),

curved, thickened towards apex, surpassing cephalic margin by about one fourth their length. Eyes of medium size (EL 0.09, OI 18) with 6 ommatidia in longest row (20–21 ommatidia total), located at the middle of sides of head. Mandibles long (ML 0.39–0.42, MI 61–65) and rather slender, masticatory margin with 7 short teeth, of which preapical and apical teeth larger than rest; outer margin of mandibles somewhat sinuous. Hypostomal teeth very small, really hard to see in profile.

Mesosoma. In dorsal view, median portion (in between lateral pronotal tubercles) of pronotum slightly concave; humeral tubercle small, angulate, carinae-like; anterior tubercles vestigial reduced to carinae that connect postero-laterally with base of lateral pronotal tubercles; anterior pronotal tubercles absent or vestigial (replaced by squamate hairs); lateral pronotal tubercles blunt with massive base and, in dorsal view, giving pronotum a somewhat square appearance; propleuron with angulate carina and covered with squamate hairs; anterior margin of forecoxa with small tubercles with spoon-shaped hairs; anterior portion of mesonotum with lateral and anterior tubercles join together by parallel tuberculate carinae; anterior mesonotal tubercles slightly larger than lateral tubercles; mesonotal constriction not as strong as metanotal constriction (groove); median and posterior mesonotal tubercles present between mesonotal and metanotal constriction; posterior mesonotal tubercles slightly larger than median tubercles. Propodeum with subequal base and declivity, the latter steep; anterior portion of propodeum with raised carina, appearing as irregular denticle; in lateral view, lateral margin of base of propodeum with thin carina, connecting at base of propodeal spines; propodeal spines with wide base, acute, and

about half as long as declivity.

Metasoma. Petiole elongate; in lateral view, node subquadrate. Antero-ventral margin of petiole toothed, with thin carina that extends posteriorly splitting into two parallel carinae. In dorsal view, node of petiole slightly longer than wide; anterior margin of node of petiole convex; disc of postpetiole twice as broad as disc of petiole; disc of postpetiole broader than long (PPL 0.17–0.18, PPW 0.23–0.25, PPI 140–141), sides evenly convex, posterior margin marginated medially. Gaster elongate, gastral tergite I longer than broad; base of gaster weakly striate, gastral tergite I finely reticulate-punctate. Legs long and stout.

Body and legs subopaque, except the gaster, in which sides of first gastral tergite is shining. Head with minute rugae arranged in more or less circular patterns closest to cephalic margin. Mandibles longitudinally striate, sublucid.
Head, mesosoma, waist segments, and gaster with spoon-shaped hairs; antennae and legs with narrow, short, decumbent, glistening hairs.
Color light ferruginous, yellowish, the masticatory margin of mandible darker.

Material examined. Measurements. WORKER. EL 0.09, FLD 0.11–0.12, GL 0.63–0.68, HFL 0.66–0.68, HL 0.39–0.42, HTL 0.46–0.47, HW 0.51–0.52, ML 0.39–0.42, MSL 0.07, MSLca 0.05, OI 18, PL 0.29–0.36, PPL 0.17–0.18, PPW 0.23–0.25, SL 0.61, TL 2.98–3.06, WL 0.81–0.82, CI 78–82, MI 61–65, MSI 10–11, PPI 140–141, RFLDI 17–19, RFLDII 22–23, SI 116–121 (n=2).

Queen. Dealate. As the worker with modifications expected for the caste and with the following differences:

Head. In full-face view, wider at posterior margin than anteriory; rugae on dorsum of head strongly marked; cephalic corners rounded; cephalic margin medially concave; hypostomal teeth small, acute.

Mesosoma. Pronotum with lateral tubercles slightly larger than humeral tubercles, blunt; anterior pronotal tubercles absent, replaced by rugae that connect base of humeral and lateral tubercles; dorsum of pronotum covered with abundant spoon-shaped hairs and rugae. In lateral view, sides of mesosoma strongly rugose, whereas sides of pronotum smooth. Mesoscutum, in lateral view, slightly rounded above, with a longitudinal pair of irregular rugae at sides and middle; anterior portion of mesoscutum with median carinae; parapsidal lines present, conspicuous; margin of mesoscutum lacking tubercles or projections. Axillae, in dorsal view, triangular; in lateral view, slightly elevated and acute posteriorly; posterior margin of scutellum bidentate; propodeum with a pair of long, strong spines; base of propodeum slightly shorter than declivity; base of propodeum laterally carinate; declivity of propodeum thinly carinate laterally.

Metasoma. In dorsal view, node of petiole concave, slightly longer than wide; disc of postpetiole wider than long (PPL 0.26, PPW 0.47, PPI 178), rugose; base of gaster

with some very short, but strong striae, rest of gastral tergite I minute and densely striate-reticulate.

Body light brown, legs and antennae yellowish, gaster ferruginous.

Measurements. QUEEN. EL 0.17, FLD 0.15, GL 1.00, HFL 0.83, HL 0.79, HTL 0.57, HW 0.67, ML 0.49, MSL 0.09, MSLca 0.05, OI 25, PL 0.50, PPL 0.26, PPW 0.47, SL 0.73, TL 4.18, WL 1.14, CI 85, MI 62, MSI 11, MSLI 54, PPI 178, RFLDI 19, RFLDII 23, SI 109 (n=1).

Male. Unknown.

Comments. This species was described by Weber (1937) based on four workers and a dealate queen that he collected in Eastern Guyana near the junction of the Oronoque River and the New River in the disputed area between Guyana and Suriname in the Courantyne basin. Weber (1937) collected this species in sandy soil, where the ants formed a small crater (8 cm in diameter) surrounding a small turret (1.8 cm high and 3.5 cm in diameter). The garden chamber was located underground about 11 cm from the surface, and contained a fungal garden 1.5 cm in diameter, sessile, and lacking gongylidia. In addition, Weber (1946) reports that pupae of this species were naked whereas the larvae were covered with mycelium.

Morphologically, this species resembles *Myrmicocrypta foreli* from Brazil but it can be distinguished mainly by the shape of the petiolar node and the presence of an antero-ventral process of petiole.

Material examined. **GUYANA:** ***East Berbice-Corentyne Region*;** Oronoque River; [193m; 2º 45' N 57º 25' 60" W]; 24.vii.1936; NAW591.1; (*NA Weber*); nest series [1w, 1dq, MCZ; 1w, LACM].

Myrmicocrypta longinoda Weber, 1938

(Figure 2.24)

Myrmicocrypta longinoda Weber (1938): 158) (w.). **BRAZIL:** Rondonia; União; Rio Madeira; [226 m; 10.3333333º S 62.3333333º W]; Mulford Biol. Expedition 1921–1922; (*WM Mann*) [examined]. The lectotype, here designated, is a worker on lower point with unique identifier number [USNMENT No. 00755363] deposited at USNM.

Measurements. WORKER. EL 0.06–0.09, FLD 0.19–0.25, GL 0.62–0.79, HFL 0.65–0.68, HL 0.61–0.73, HTL 0.42–0.51, HW 0.49–0.56, ML 0.34–0.41, MSL 0.04–0.07, MSLca 0.02–0.03, OI 11–15, PL 0.27–0.39, PPL 0.21–0.29, PPW 0.24–0.26, SL 0.58–0.65, TL 2.69–3.39, WL 0.73–0.86, CI 76–85, MI 55–62, MSI 6–10, MSLI 38–57, PPI 93–100, RFLDI 31–36, RFLDII 38–44, SI 102–123 (n=28).

Diagnosis. Frontal lobes expanded laterally, convex; eyes small, globose (3–5 ommatidia in longest row); frontal carinae vestigial to absent; occipital collar bidentate; propleural tubercle present, long; in dorsal view, postpetiole slightly longer than- or as long as- wide.

Description. Worker. *Head*, excluding mandibles, longer than broad (HL 0.61–0.73, HW 0.49–0.56, CI 76–85); sides of head broadly convex; cephalic margin weakly emarginate medially; vertexal portion of head lacking pair of small tubercles; cephalic corner rounded; in full-face view, dorsum of head weakly rugose; in full-face view, frontal carinae rudimentary; inferior angles of occiput (collar) bidentate, prominent; clypeal apron slightly broad, anterior margin of clypeal apron weakly sinuous to broadly convex; unpaired clypeal seta short (MSL 0.04–0.07, MSI 6–10), with 4 narrow spoon-shaped appressed hairs on each side of median seta; fronto-clypeal teeth short, acute, conspicuous; in oblique view, median portion of clypeus slightly concave; in lateral view, hypostomal teeth short, triangular. Mandibles triangular, long (ML 0.34–0.41, MI 56–62), with convex outer margin; inner (masticatory) margin 6–7-toothed; dorsum of mandibles finely reticulate-punctate; eyes small (EL 0.06–0.09, OI 11–15), with 3–4 ommatidia in longest row (8–12 ommatidia total), situated posterior to midline of head at a level above frontal lobes; frontal lobes laterally expanded, triangular (FLD 0.19–0.25); frontal lobes slightly separated, posterior portion of clypeus extending between frontal lobes; antennal scapes long (SL 0.58–0.65, SI 102–123), thick, reticulate, and covered with scarce appressed narrow spoon-shaped hairs.

Mesosoma. Dorsum of pronotum smooth to weakly rugulose, anterior pronotal tubercles very small; humeral tubercle triangular; in lateral view, lateral pronotal tumosities present with some irregular carinae; in dorsal view, lateral pronotal tubercles carinate, rounded; propleural tooth long, acute; sides of pronotum smooth; lateral and anterior mesonotal present as low tubercles, lateral tubercles carinate, larger than anterior mesonotals; lateral mesonotals tooth-like, acute; in dorsal view, lateral and mesonotal tubercles forming squared area; area between meso and metanotal grooves, with small tubercle, sometimes with a vestigial second tubercle; metanotal groove deeper than mesonotal groove; anterior portion of propodeum angulate; in lateral view, basal face of propodeum flat; basal face of propodeum as long as propodeal declivity; propodeal spines small, acute; basal and declivous faces of propodeum with thin lateral carinae.

Metasoma. Petiole distinctly pedunculate, long (PL 0.27–0.39); in lateral view, anterior margin of petiolar node rounded; in dorsal view, node of petiole rounded; in lateral view, ventro-anterior process of petiole toothed; in lateral view, ventral margin of petiole weakly sinuous, and with thin ventral carinae. Postpetiole, in lateral view, anteriorly convex and flattened dorsally; in dorsal view, disc of postpetiole, rectangular, with anterior margin rounded at the corners and lateral margins sinuous to straight. In dorsal view, disc of postpetiole longer than- or as long as- wide (PPL 0.24–0.29, PPW 0.24–0.28, PPI 93–100); in dorsal view, posterior margin of postpetiole weakly emarginate medially. In lateral view, gaster tergite I widely

convex; in dorsal view, gaster long-ovate (longer than wide); gastral tergite I reticulate, with sides shiny; gastral tergite I with scarce spoon-shaped hairs. Legs long and slender.

Body opaque, rugulose; tubercles low. Pilosity of moderately abundant squamate hairs, which become narrow-squamate on antennal scape and legs. Brownish-yellow.

Queen. Unknown.

Male. Unknown.

Comments. This species is easily recognized by the relatively long postpetiole. The specimens from Bolivia differ slightly from those of the type series from Brazil by having a more conspicuous frontal carina. Some specimens from Peru differ slightly from those of the type series by having the disc of postpetiole slightly wider than long, rather than longer than wide, a relatively smaller propleural tubercle, and petiole with an antero-ventral process.

This species resembles *M. boliviana*, *M. unidentata*, and *M. JSC–024*.

Other material examined. BOLIVIA: ***Departamento de La Paz***; Isiamas [Ixiamas]; [357m; 13.75º S 68.15º W]; xii. Mulford Biological Expedition 1921–1922; (*WM Mann*) [4w, USNM]. **BRAZIL:** ***Amapa;*** Serra do Navio; [86m; 0.9833º N 52.0500º W]; no date; (*Silverstone*); stomach contents *Phyllobates pictus*; LACM42302 [1w, LACM]. ***Amazonas***: Balbina; [30m; 1.917222º S 59.473611º W]; 1992–1994; (*M*

Queiroz) [1w, CEPEC]. Manaus; [39m; 3.1º S 60.0166667º W]; viii.1962; (*K Lenko*); #4129 [8w, MZSP]. Manaus; Reserva Ducke; [57m]; 2.9385833º S 59.9628º W; 4.xii.1990; (*FD Apolinario*); in termite nest; APO041290 [2w, USNM]. Same data as previous entry, but 6.viii.1990; (*FD Apolinario*); Cerrado, in termite nest [2w, USNM]. Same data as previous entry, but 10.viii.1992; (*TR Schultz & J D'Arc*); nest series; forest; along road; TRS920810–15 [12w, USNM]. Manaus; Dimona station; INPA, 100 ha plot; 130m; 2.34121º S 60.09414º W; 16.i.2009; (*J Sosa-Calvo*); JSC090116–LS01, LS08, LS10 [6w, USNM]. ***Para;*** Belem; Parque Ambiental do Utinga; [42m; 1.42104º S 48.42958º W]; 5.viii.1962; (*PF Darlington*) [1w, MCZ]. Serra Norte de Carajas; km 9 prox Igar Azul; [716m; 6.108056º S 50.304444º W]; vii–viii.1985; (*Brandão & Benson*) [1w, LACM]. Parauapebas; Floresta Nacional de Carajaas; 659m; 6.03291º S 50.11639º W; 05.iv.2010; (*TR Schultz, J Sosa-Calvo, CT Lopes*); winkler; TRS100405–LS07 [1w, USNM]. ***Rondônia***; Porto Velho; [86m; 8.7667º S 63.9000º W]; (*R Feitosa & R Silva*) [1w, USNM]. União; Rio Madeira; [226 m; 10.3333333º S 62.3333333º W]; Mulford Biol. Expedition 1921–1922; (*WM Mann*) [9w, USNM, MZSP]. Girau? Rio Madeira; [174m; 9.4333333º S 64.6833333º W]; Mulford Biol. Expedition 1921–1922; (*WM Mann*) [4w, USNM]. **COLOMBIA:** ***Putumayo;*** PNN La Paya; Cabaña La Paya; [330m; 0.0333333º S 75.2º W]; (*E Lozano*); M3155 [1w, IAvHC]. **GUYANA:** ***Upper Takutu-Upper Essequibo*****;** Acarai Mts., nr Romeo's Camp; 264m; 1.3889º N 58.9461167º W; 7.x.2006; (*J Sosa-Calvo*); 1º forest; leaf-litter; TRS061007–LS07 [1w, USNM]. **PERU:** ***Madre de Dios***; Puerto Maldonado; Cuzco Amazonico; 15 Km NE; 200m; 13.vi.1989; (*SP Cover & JE Tobin*); CA–150 [6w, MCZ]. Puerto Maldonado; RN Tambopata; Sachavacayoc

Centre, Condenado Trail; 194m; 12.85286º S 69.36720º W; 23.vii.2012; (*RJ Guerrero*) [1m, 1q, USNM]. Same locality and data as previous entry, but 31.vii.2012; (*J Sosa-Calvo*); JSC120731–02 [1w, USNM]. **VENEZUELA: *Amazonas;*** Expedicion Tapirapecó, Camp Base; 200m; 2.0166667º N 67.1166667º W; 31.i.1989; (*JT Lattke*); JTL1233 [2w, MIZA].

Myrmicocrypta occipitalis Weber, 1938

(Figure 2.25–2.26)

Myrmicocrypta occipitalis Weber (1938): 159) (w.m.). 7w, 4m, syntypes, **BOLIVIA**: Departamento de La Paz; Tumupasa; [506m; 14.1500º S 67.9167º W] (*WM Mann*) (USNM, MCZ) [examined]. The lectotype, here designated, is a worker (top specimen) with unique identifier number [USNMENT No. 00755201] deposited at USNM.

Myrmicocrypta microphthalma Borgmeier (1948): 202), figs. 27, 28 (w.q.). 11w, 2dq, syntypes, **PERU**: Provincia de Chanchamayo; Valle Chanchamayo; 800m; [11.054386° S 75.329036° W]; 1.viii.1939; (*W Weyrauchi*); (No. 30) (MZSP) [examined] **NEW SYNONYM**

Diagnosis. Eyes small (EL 0.06–0.09, OI 10–14) with 3–4 ommatidia in longest row (9–15 ommatidia total); clypeal apron expanded; frontal lobes weakly expanded, convex to triangular; frontal carinae present; head, in full-face view, rounded and posteriorly angulate; mandibles long; humeral spines long and directed horizontally; long propodeal spines.

Description. Worker. *Head*: in full-face view and excluding mandibles, longer than broad (HL 0.80–0.91, HW 0.61–0.74, CI 76–83), narrowed posteriorly at level of cephalic corners; cephalic margin transverse, with median pair of tubercles; postero-ventral angles of head (collar) drawn out on each side in two large blunt tubercles; in full-face view, cephalic corners rounded with slightly inferior tubercle; sides convex. Clypeal apron widely expanded, dorsally wrinkled; anterior margin of clypeal apron evenly convex; unpaired median seta long (MSL 0.09–0.15, MSLI 10–17), originating at mid portion of clypeal apron. Fronto-clypeal teeth blunt; in oblique view, sides of clypeus thinly carinate. Mandibles narrow, long (ML 0.47–0.58, MI 56–65), with sinuate outer margin; inner (masticatory) margin of mandible 6–8-toothed; dorsum of mandibles basally reticulate, apically smooth and shinning. Eyes small (EL 0.06–0.09, OI 10–14), with 3–4 ommatidia in longest row (9–15 ommatidia total), situated posterior to midline of head at a level above frontal lobes. Frontal lobes weakly expanded (FLD 0.20–0.26, RFLDI 24–31), convex to weakly angular (triangular); frontal lobes slightly separated; frontal carinae short, continued backwards as indistinct ridges enclosing a circular, depressed area. Antennal scapes long (SL 0.70–0.83, SI 106–128), reticulate, and narrow. In lateral view, hypostomal teeth triangular.

Mesosoma. Anterior pronotal tubercles distinct; humeral pronotal tubercle long and projecting laterally; lateral pronotal tubercles acute with wide base. In lateral view, mesonotum with flateral and anterior tubercles acute, triangular. Area between

mesonotal and metanotal grooves with two pairs of acute small tubercles. Metanotal groove deep; propodeum produced anteriorly as a small tubercle and posteriorly, produced as a moderately to large developed propodeal spines, slender and acute. Basal and declivous face of propodeum with thin lateral carinae.

Metasoma. Petiole distinctly pedunculate with anterior portion of node angled, viewed in profile; node of petiole small, flattened dorsally; ventral margin without tooth. Postpetiole, in dorsal view, slightly over twice as broad as petiole, distinctly broader than long (PPL 0.17–0.20, PPW 0.23–0.28, PPI 123–153), with sides and anterior margin, as seen from above, evenly convex; angulate posteriorly, posterior dorsal margin emarginate medially. Gaster, in lateral view, dorsally flattened; in dorsal view, gaster long-ovate (longer than wide). Legs long and slender (HTL 0.59–0.73, HFL 0.75–1.00).

Body opaque, finely granulose, tubercles of head connected by irregular wrinkles; mandibles striate-punctate; gastral tergite I finely reticulate.
Pilosity of moderately abundant squamate hairs, which become narrow-squamate on scape and legs; hairs on tarsi simple, decumbent and short; funicular segments covered with appressed pubescence. Brownish-yellow.

Material examined. Measurements. WORKER. EL 0.06–0.09, FLD 0.20–0.25, GL 0.74–0.94, HFL 0.75–0.96, HL 0.80–0.91, HTL 0.59–0.73, HW 0.61–0.74, ML 0.47–0.58, MSL 0.09–0.15, MSLca 0.05–0.11, OI 10–14, PL 0.28–0.45, PPL 0.17–0.20,

PPW 0.23–0.28, SL 0.70–0.83, TL 3.12–4.05, WL 0.96–1.08, CI 76–83, MI 56–65, MSLI 56–83, PPI 123–153, RFLDI 24–31, RFLDII 29–40, SI 106–128 (n=37).

Queen. Resembling the worker with modifications expected for the caste with the following differences:

Head. Head longer than wide, subquadrate; tubercles on cephalic margin better developed than in worker; frontal carinae strongly impressed.

Mesosoma. Pronotal tubercles connected by weakly impressed rugae; anterior and antero-lateral margin of mesoscutum weakly concave producing anterior portion on mesoscutum bilobed; median carinae present; latero-posterior margin of mesoscutum tooth-like; parapsidal lines present; mesoscutum, dorsally, with a pair of longitudinal keels; dorsum of mesoscutum rugose to scabrous; scutellum wider than long; axillae triangular and with raised carinae; posterior margin of scutellum bidentate; in lateral view, basal portion of propodeum shorter than declivous; propodeal spines long and thin; dorsum of mesoma with erect short spatulate hairs.

Metasoma. In lateral view, anterior and posterior margin of petiolar node with raised carinae, appearing like teeth; postpetiole, in dorsal view, wider than long, trapezoidal; anterior margin slightly concave, sides straight; postero-lateral margin tooth-like; posterior margin of petiole medially emarginate; gastral tergite I densely and finely reticulate.

Body ferruginous to reddish-brown, darker than worker; legs and antennae slightly lighter.

Measurements. QUEEN. EL 0.20–0.22, FLD 0.29–0.31, GL 1.42–1.57, HFL 1.29–1.30, HL 1.10–1.14, HTL 0.90–0.93, HW 0.94–0.96, ML 0.64–0.68, MSL 0.13–0.15, MSLca 0.10–0.11, OI 22–24, PL 0.62–0.71, PPL 0.24–0.30, PPW 0.57–0.61, SL 0.99–1.03, TL 5.64–5.90, WL 1.54–1.58, CI 84–86, MI 56–61, MSLI 71–79, PPI 192–245, RFLDI 26–27, RFLDII 31–33, SI 103–109 (n=4).

Male. *Head.* Excluding eyes, triangular; cephalic corners with small tubercles; cephalic margin produced, behind of each posterior ocellus, as an acute tubercle; frontal lobes small vertical, widely separated; frontal carinae present, forming small tubercle on each side of median ocellus; mandibules triangular with slightly convex outer margin and 7–8 distinct teeth; second and third funicular joints taken together longer than antennal scapes; clypeal apron wide and anterior margin convex; unpaired median seta long and thick; hypostomal teeth large, blunt.

Mesosoma. Pronotum with lateral and humeral tubercles present; humeral tubercles the largest; anterior pronotal tubercles absent, instead a raised carinae present before promesoscutal line. Mesoscutum like in the queen, with longitudinal keel more pronounced, in lateral view, giving dorsum of mesoscutum a convex appearance, and

less rugulose; scutellum like in queen, axillae triangular and with raised carinae; propodeal spines long, very slender and acute, curved backwards towards apices.

Metasoma. Petiole pedunculate, without ventro–median tooth; node rounded dorsally. Postpetiole broader than long; anterior margin convex; sides evenly convex anteriorly, shallowly emarginate posteriorly at each side and in the middle. Gaster, in lateral view, somewhat convex dorsally. Legs long and slender.

Body opaque and rugose on head and thorax, mandibles, antennal scapes, and gastral tergite I finely reticulate-punctate. Pilosity confined to sparse, simple hairs which are recurved on sculpturing, and a fine appressed pubescence on appendages.
Body color brown, appendages paler, mandibles yellowish brown. Wings weakly smokey.

Measurements. MALE. EL 0.35–0.38, FLD 0.20–0.23, GL 1.38–1.63, HFL 1.34–1.38, HL 0.85–0.88, HTL 1.00–1.15, HW 0.79–0.81, ML 0.44–0.49, MSL 0.11–0.17, MSLca 0.05–0.08, OI 42–48, PL 0.55–0.63, PPL 0.24–0.27, PPW 0.45–0.46, SL 0.35–0.37, TL 5.05–5.41, WL 1.51–1.60, CI 92–93, MI 52–57, MSLI 50–67, PPI 168–189, RFLDI 24–27, RFLDII 26–29, SI 44–46 (n=4).

Comments. This species is similar to *Myrmicocrypta JSC–003*, *M. JSC–025*, and *M. weyrauchi*. *Myrmicocrypta occipitalis* differs from *M. JSC–003* mainly in the overall size, by having smaller lateral pronotal spines, and by having larger propodeal spines.

Myrmicocrypta occipitalis differs from *M. JSC–025* in the presence of conspicuous frontal carinae, the wide clypeal apron, the conspicuous occipital collar, the presence of small triangular anterior pronotal tubercles, and the shape of the head. *Myrmicocrypta occipitalis* can be distinguished from *M. weyrauchi* by the reduced frontal lobes and the larger size.

Individuals of *Myrmicocrypta occipitalis* nest underground. A colony collected at Los Amigos, Peru was located approximately 5–6 cm from surface. The sole chamber was large, approximately 12–15 cm in diameter and contained >1000 individuals and lots of garden. A colony of *Myrmicocrypta occipitalis* collected in Ecuador was found to host members of the agropredator ant *Megalomyrmex* sp.

Material examined. BOLIVIA: ***Departamento de La Paz;*** Tumupasa; [506m; 14.1500º S 67.9167º W]; xii.1921; Mulford Biological Expedition 1921–1922; (*WM Mann*) [3w, 2m, MCZ; 4w, 2m, USNM]. **BRAZIL:** ***Amazonas;*** Benjamin Constant; Project BioBrasil/GEF/UNEP; [65m; 4.3744º S 70.0297º W]; (*R Zanetti* & *N Dias*) [2w, CEPEC]. Manaus; Reserva Ducke; [50–110m; 3º 05' S 60º 00' W]; 9.vi.1971; (*WL Brown* & *DE Brown*); rotten log; rainforest [6w, MCZ]. ***Bahia;*** Canavieiras; [0m; 13.5500º S 38.9667º W]; 09.x.1998; (*JCS Carmo* & *JRM Santos*) [1w, CEPEC]. Eunápolis, Juerana; [180m; 16.378º S 39.58º W]; 07.viii.2006; (*JRM Santos*) [2w, CEPEC]. Ilheus; CEPEC; [10m; 47.8º S 39º W]; i–iv.1996; (*AC Moreira*) [3w, CEPEC]. Same locality as previous, but 1986 and 1987; (*JH Delabie*) [3w, 1dq, CEPEC]. Area Zoologica, Km 22 of Ilheus, CEPEC; [10m; 47.8º S 39º W]; x.1986; (*JH Delabie*) [2w, CEPEC]. Itacare, RPPN Pedra do Sabia; [42m; 14.259304º S

39.045558º W]; 21.vii.2006; (*B Jahyny*) [3w, CEPEC]. Itororó; [279m]; 14º 57’ 31” S 40º 02’ 33” W; 08.viii.2000; (*JRM dos Santos*) [2w, CEPEC]. Santa Cruz Cabrália; [0m; 16.2833º S 39.0333º W]; 08.viii.2006; (*JRM Santos* & *JCS Carmo*) [1w, CEPEC]. São José de Buerarema; [148m]; 15º 03’ 06” S 39º 18’ 48” W; 14.ix.2000; (*JRM dos Santos*) [2w, CEPEC]. Una; Betania; [4m]; 15º 30’ 02” S 39º 13’ 14” W; 21.x.1999; (*JRM dos Santos*) [3w, CEPEC]. ***Goias;*** Campinaçu; Serra da Mesa; [499m]; 13º 52’ S 48º 23’ W; 18.ii–2.iii.1996; (*Silvestre, Brandão, & Yamamoto*) [1w, MZSP]. ***Pará;*** Belem; Utinga; 37m; 01.42498º S 48.42607º W; 9.viii.1962; (*PF Darlington*) [1w, MCZ]. Melgaço; Caxiuanã, ECFPn; [39m]; 1º 44’ 9.01” S 51º 29’ 15.44” W; 27.i.2003; (*AY Harada* et al.); winkler [11w, MPEG]. Parauapebas; 672m; 06.03406º S 50.11626º W; 05.iv.2010; (*TR Schultz, J Sosa-Calvo, & CT Lopes*); leaf-litter sample; TRS100404–LS03 [3w, USNM]. Tailândia; Faz. Santa Marta; [47m; 2.946944º S 48.952778º W]; 13–14.v.2003; (*AM Elizabeth*) [3w, CEPEC]. ***Santa Catarina;*** Chapecó; [301m; 27.0833º S 52.9833º W]; v.1957; (*F Plaumann*) [1w, MZSP]. ***Sergipe;*** Areia Branca; E. E. da Serra de Itabaiana; [54m]; 10º 45’ 54” S 37º 19’ 57.4” W; 19–25.v.2003; (*RR Silva, BH Dietz, & LS Ferreira*); winkler [3w, MZSP]. ***São Paulo;*** Praia Grande; PE Serra do Mar; Núcleo Pilões-Cubatão; [477m]; 23º 58’ 31” S 46º 32’ 24” W; 26–27.v.2001; (*AA Tavares & RR Silva*); winkler [2w, MZSP]. **COSTA RICA:** ***Provincia de Heredia;*** PN Braulio Carrillo; 500m; 10º 20’ N 84º 02’ W; 18.x.2005; (*TEAM–OET*); AMI–3–W–053–03 [1w, INBio]. 11 Km SE La Virgen; 450–550m; 10º 20’ N 84º 04’ W; 13.iv.2003; (*INBio–OET–ALAS*); transect; 05/B/BH/086 [1w, INBio]. ***Provincia de Limón;*** Valle de la Estrella; [63m; 09° 44' 24" N 82° 58' 00" W]; iv.1924; (*WM Mann*) [1w, USNM]. ***Provincia de***

Puntarenas; Llorona; Corcovado National Park; 100m; [8.55º N 83.583333º W]; 11–12.v.1979; (*PS Ward*); Ex. Rotten log; lowland rainforest; PSW3351 [1w, 1m, UCDC]. Osa; Rancho Quemado; 2–300m; 8º 42’ N 83º 33’ W; 15.xii.1990; (*JT Longino*); leaf-litter sample; wet forest; JTL2760–s [1w, JTLC]. **ECUADOR: *Napo;*** Tiputini Biodiversity Station; Chorongo Trail; [213m]; 0º 38.295’ S 76º 8.959’ W; 15.vi.2003; (*NM Gerardo*); nest series; with *Megalomyrmex* sp.; NMG030615–01 [1w, USNM]. **GUYANA: *Upper Takutu-Upper Essequibo;*** nr Kamoa River, nr Kamoa River camp; 394m; 1º 32.786’ N 58º 49.929’ W; 22.x.2008; (*J Sosa-Calvo & TR Schultz*); leaf litter sample; 1º forest; TRS061022–LS02 [1w, USNM]. **PANAMA: *Panama Province;*** Gamboa, Pipeline Rd., 2.5 Km past Rio Frijoles; 72m; [9.151865º N 79.734075º W]; 6–8.vi.2002; (*CJ Marshall*); litter sample; CJM020606–01–LS16 [2w, USNM]. Same data as previous entry, but CJM020606–01–LS18 [1w, USNM]. Barro Colorado Island; 50m; [9.15º N 79.85º W]; vii–viii.1942; (*J Zetek*); 4975; LotNo. 42 II986 [6w, MZSP]. Same data as previous entry, but iv–v.1942; 4953; LotNo. 42 I5209 [2w, USNM]. Barro Colorado Island, 50 Ha plot, LASH Project; 50m; 9º 09’ N 79º 51’ W; vi–vii.2002; (*ME Kaspari*) [1w, MEKOU]. **PERU: *Madre de Dios;*** Cuzco Amazonico; 15 Km NE Puerto Maldonado, Tambopata; 200m; [12.585064º S 69.242329º W]; 13.vi.1989; (*SP Cover & JE Tobin*); CA–124 [5w, 1dq, MCZ]. Puerto Maldonado; Estación Biológica Los Amigos CICRA; 274m; 12º 43.142’ S 70º 06.053’ W; 06.x.2004; (*TR Schultz & J Sosa-Calvo*); nest series underground; TRS041006–01 [20w, 10aq, 1dq, USNM]. Same data as previous entry, but TRS041006–03 [9w, 1dq, USNM]. Same data as previous entry, but JSC041006–16 [2w, USNM]. ***Provincia de Chanchamayo;***

Valle Chanchamayo; 800m; [11.054386° S 75.329036° W]; 1.viii.1939; (*W Weyrauchi*); (No. 30) [cotype series *M. microphthalma*; 8w, 1dq, MZSP]. Same data and locality as previous entry, but 1.ii.1939 [cotype series *M. microphthalma*; 3w, 1dq, MZSP]. **VENEZUELA:** ***Bolivar;*** El Bochinche Reserva Forestal Imataca, Km 80; 180m; [7.597957º N 61.140226º W]; 19.v.1985 [2w, 1m, MIZA].

Myrmicocrypta ogloblini Santschi, 1936

(Figure 2.27)

Myrmicocrypta oglobini Santschi (1936): 411) (q). HOLOTYPE, 1q, **ARGENTINA**: Misiones; Estación Experimental Loreto; [95 m; 27.3167º S 55.5333º W]; 1.viii.1933; (*AA Ogloblin*) [Holotype, NHMB, USNMENTNo. 00758327] [examined].

Measurements. QUEEN. EL 0.17, FLD 0.28, GL 1.14, HFL 0.88, HL 0.86, HTL 0.66, HW 0.68, ML 0.50, MSL 0.06, MSLca 0.01, OI 24, PL 0.51, PPL 0.28, PPW 0.38, SL 0.83, TL 4.49, WL 1.20, CI 78, MI 58, MSI 7, MSLI 22, PPI 149, RFLDI 33, RFLDII 42, SI 122 (n=1).

Diagnosis. Frontal lobes expanded laterally, triangular; head subquadrate; unpaired median seta of clypeal apron short; propodeal spines present, long; ventral process of petiole tooth-like, short.

Description. Dealate queen. *Head*: in full-face view, head longer than broad (HL 0.86, HW 0.68, CI 78), cephalic corners angulate; posterior cephalic margin medially

somewhat deeply indented; vertexal margin with small pair of tubercles, posterior to lateral ocelli, and raised carina; frontal carina developed, delineated with spoon-shaped hairs; frons shallowly depressed; in lateral view, frontal lobes projecting forward; in full-face view, frontal lobes expanded laterally, triangular (FLD 0.28), densely convered with spoon-shaped hairs; clypeal apron convex anteriorly, with short stout unpaired median seta (MSL 0.06, MSI 7); fronto-clypeal teeth bidentate; in oblique view, clypeus medially concave, and with thin lateral carinae; mandibles triangular 6–7-toothed, decreasing gradually from apex to base; antennal scape long (SL 0.83, SI 122) finely reticulate and densely covered with spoon-shaped hairs; eyes round (EL 0.17, OI 24); occiput drawn into a blunt collar. Hypostomal teeth short, triangular.

Mesosoma: dorsum of pronotum smooth; anterior pronotal tubercles small; humeral tubercles present, triangular; lateral pronotal tubercles present, with massive base and with irregular carinae; propleuron angled, perhaps with small tubercle (hard to see); posterior margin of scutellum bidentate; katepisternum and anepisternum weakly rugose; anterior portion of propodeum with small, inconspicuous tooth; propodeal spines present, long; base of propodeum shorter than declivous of propodeum; both with lateral thin carinae.

Metasoma: propodeum pedunculate; in lateral view, node of petiole subquadrate; ventral margin of petiolar peduncle with small tooth-like anterior process; ventral margin of petiole sinuous; in dorsal view, node of petiole rounded; in dorsal view, postpetiole wider than long (PPL 0.28, PPW 0.38, PPI 149); in dorsal view,

postpetiole trapezoid; anterior portion of postpetiole straight; in dorsal view, sides of postpetiole weakly rugose, medially concave and smooth; in dorsal view, postero-inferior corners of postpetiole angulate; posterior margin of postpetiole emarginate medially; basigarster lacking costulae, gastral tergite I reticulate-punctate.

Worker. Unknown.

Male. Unknown.

Comments. This species was described based on a single dealate queen. It differs from *Myrmicocrypta squamosa* and *M. uncinata* mainly in the laterally expanded frontal lobes and overall size. This species resembles *M. boliviana* in the form of the frontal lobes, the short, stout, unpaired median clypeal seta, and somewhat in the shape of mesoscutum; however, *M. ogloblini* differs from *M. boliviana* by the larger pronotal tubercles, the presence of a ventral process of the petiole, and the rather angulate cephalic corners.

Material examined. Known only from the type locality.

Myrmicocrypta peruviana (Emery, 1913) **NEW STATUS**

(Figure 2.28)

Myrmicocrypta triangulata var. *peruviana* Emery (1913): 254) (m.). **PERU**:

Vilcanota; [no other information given]; (*Staudinger*) [MSNG, USNMENTNo. 00445574] [examined].

Measurements. MALE. EL 0.34–0.39, FLD 0.20, GL 1.33–1.41, HFL 1.36–1.41, HL 0.81–0.86, HTL 1.28–1.33, HW 0.76–0.83, ML 0.44–0.46, MSL 0.14–0.15, MSLca 0.10–0.12, OI 44–47, PL 0.59–0.65, PPL 0.33, PPW 0.48–0.50, SL 0.37–0.39, TL 5.06–5.29, WL 1.50–1.64, CI 94–97, MI 53–54, MSI 17, MSLI 71–80, PPI 144–152, RFLDI 23–24, RFLDII 24–26, SI 47–49 (n=2).

Diagnosis. In full-face view, cephalic corners obtusely angulate; tubercles behind lateral ocelli, low, triangular, tooth-like; lateral tubercles vestigial; humeral tubercles triangular; node of petiole rounded; antero-ventral process of petiole tooth-like; long flattened to simple subdecumbent pilosity.

Description. Male. *Head*: in full-face view, posterior margin of head with small pair of tubercles behind lateral ocelli; cephalic corners weakly angulate; frontal carinae inconspiculous, extending posteriorly lacking low tubercle at level of median ocellus, carinae continuing posteriorly to connect with lateral ocelli; in lateral view, vertex weakly excavated (concave), dull; occiput drawn into right tubercle. In full-face view, frontal lobes parallel; in lateral view, frontal lobes triangular, projecting forward. In lateral view, clypeus rounded; in oblique view, body of clypeus triangular, with lateral thin carinae; posterior portion of clypeus rugulose. Clypeal apron wide; anterior margin convex; unpaired median seta relatively long (MSL 0.14–0.15, MSI 17). Mandibles triangular, with 8 teeth on masticatory margin; outer margin of mandibles convex; dorsum of mandibles reticulate. In lateral view, hypostomal teeth

short, acute. Antennal scape short (SL 0.37–0.39, SI 47–49), thick, and reticulate; covered with appressed simple hairs.

Mesosoma. In dorsal view, pronotum short; lacking anterior pronotal tubercles; lateral pronotal tubercles small, vestigial; humeral pronotal tubercles present, triangular; propleuron angulate, but lacking tubercle. In lateral view, anterior portion of mesoscutum angulate; anterior margin of mesoscutum concave laterally; mesoscutum with pair of parallel high carinae; parapsidal lines conspicuous, sinuous; posterior margin of mesoscutum with pair of large, lateral rounded tubercles, directed upwards; posterior margin of mesoscutum evenly convex. Scutellum wider than long; axillae high, tuberculate with tips directed posteriorly; posterior margin of scutellum bidentate; dorsum of scutellum rugulose. In lateral view, base of propodeum shorter than declivous; propodeal spines long and blunt at tip; lateral margin of declivity of propodeum with thin carinae.

Metasoma. In lateral view, petiole pedunculate; antero-ventral process of petiole tooth-like; in lateral view, node of petiole low, rounded anteriorly; in dorsal view, node of petiole rounded anteriorly, wider than long. Postpetiole broader than long (PPL 0.33, PPW 0.48–0.50, PPI 144–152); in dorsal view, disc of postpetiole finely reticulate, trapezoidal; lateral margins of postpetiole widely convex; posterior margin of postpetiole medially emarginate. Gaster, in lateral view, somewhat convex dorsally; gastral tergite I finely reticulate. Legs long and slender.

Body dull, finely granulate and overall rugulose. Gastral tergite I finely reticulate. Pilosity consisting of very narrow to simple subdecumbent hairs; hairs on gastral tergite I shorter than rest of body, simple, and appressed. Body dark ferruginous, legs, antennae, and mandibles brown-yellowish. Wings brownish, finely hairy.

Worker. Unknown.

Queen. Unknown.

Comment. Emery (1913) differentiated this species from *Myrmicocrypta triangulata* based on reduced tubercles on the cephalic margin. In addition to this character, *M. peruviana*, known only from the male, differs from the male of *M. triangulata* in the reduced postero-lateral mesoscutal tubercles and in the presence of an antero-ventral process of the petiole, and somewhat in the form of the pilosity.

Material examined. PERU: (no locality information) (*Staudinger*) [1m, AMNH].

Myrmicocrypta rudiscapa Emery, 1913

(Figure 2.29)

Myrmicocrypta rudiscapa Emery (1913): 253), figs 2–4 (q.). 1aq, HOLOTYPE, **BOLIVIA**: Departamento de La Paz; Mapiri; [557m; 15º 15’ 0” S 68º 10’ 0” W]; (*Staudinger*). Holotype deposited in MSNG [USNMENTNo. 00445600] [examined].

Measurements. QUEEN. EL 0.16, FLD 0.21, GL n/a, HFL 1.00, HL 0.91, HTL n/a, HW 0.78, ML 0.56, MSL 0.12, MSLca 0.08, OI 21, PL n/a, PPL 0.34, PPW 0.51, SL 0.83, TL n/a, WL 1.44, CI 86, MI 62, MSI 13, MSLI 67, PPI 150, RFLDI 23, RFLDII 27, SI 106 (n=1).

Diagnosis. Frontal lobes weakly expanded, almost straight; unpaired median seta long; posterior portion of clypeus extending between frontal lobes; leading edge of antennal scape with narrow serrated carina; humeral and lateral tubercles triangular, equal in size; lacking antero-ventral process of petiole; fenestra on forewing small; pilosity on head and mesosoma somewhat suberect.

Description. Alate queen. *Head.* In full-face view, and excluding mandibles, slightly longer than wide (HL 0.91, HW 0.78, CI 86), subquadrate; cephalic corner convex; posterior cephalic margin almost straight, interrupted medially by weakly impressed median emargination; vertexal tubercles low, inconspicuous. In lateral view, collar bidentate. In full-face view, mandibles triangular, long (ML 0.56, MI 62); inner margin of mandibles 6-toothed (hard to count due to position of type specimen on point); outer margin of mandibles evenly convex. Anterior margin of clypeal apron convex; unpaired clypeal seta median-sized, thick (MSL 0.12, MSI 13); 5–6 short, appressed, thinly flattened hairs at each side of clypeal seta; in lateral view, frontoclypeal teeth low; posterior portion of clypeus extending between frontal lobes. In full-face view, frontal lobes weakly expanded laterally (FLD 0.21), weakly convex, almost straight; frontal carinae strongly impressed, continuing posteriad to

cephalic margin, splitting into a pair of carinae, one directed to vertexal area, another to cephalic corner. Eyes large, convex (EL 0.16, OI 21). Antennal scapes long (SL 0.83, SI 106), finely reticulate and with conspicuous rugae; leading edge of antennal scape with conspicuous serrated carina; hairs on antennal scape flattened, decumbent. In lateral view, hypostomal teeth short, triangular.

Mesosoma. Anterior pronotal tubercles vestigial; dorsum of pronotum rugulose; humeral tubercles triangular; lateral tubercles triangular. In dorsal view, mesoscutum anteriorly with median line present; antero-lateral margin of mesoscutum concave; parapsidal lines present; dorsum of mesoscutum rugose. Posterior margin of scutellum bidentate. In lateral view, propodeal spines acute, triangular.

Metasoma. In lateral view, petiole subquadrate; antero-ventral process of petiole reduced to low tumosity; disc of petiole smooth; in dorsal view, rounded. Disc of postpetiole wider than long (PPL 0.34, PPW 0.51, PPI 150); in dorsal view, disc of postpetiole somewhat heart-shaped; anterior margin of postpetiole widely convex; sides of postpetiole convex; postero-inferior margin of postpetiole rounded; posterior margin of postpetiole medially emarginate. Base of gaster lacking longitudinal striae; gastral tergite I finely reticulate.

Forewing with small fenestra. Color ferruginous; legs yellowish. Pilosity on head and dorsum of mesosoma consisting of suberect, spoon-shaped hairs.

Male. Unknown.

Worker. Unknown.

Comments. This species was described by Emery (1913) based on a single alate queen. The main character used by Emery to differenciate this species from any other species in *Myrmicocrypta* was the presence of a serrated carinae on the leading edge of the antennal scape. In that character, *Myrmicocrypta rudiscapa* resembles the species *M. JSC–022a, M. JSC–022b, M. JSC–029,* and *M. JSC–051*. However, the specimens from Colombia (*M. JSC–51*, five workers) are larger than the queen of *M. rudiscapa*. *Myrmicocrypta rudiscapa* differ from *M. JSC–022a* by the shape of the frontal lobes, the pilosity on the antennal scapes, and the postpetiole having latero-inferior projections. *Myrmicocrypta rudiscapa* differ from *M. JSC–-022b* by the shape of the head, the shape of the frontal lobes, pilosity on the antennal scape, and shape of petiolar node. *Myrmicocrypta rudiscapa* differ from *M. JSC–0229* by the length of the clypeal seta, the shape of the petiolar node, and petiolar process.

Material examined. BOLIVIA: ***Departamento de La Paz;*** Mapiri; [557m; 15º 15’ 0” S 68º 10’ 0” W]; (*Staudinger*) [1aq, MSNG].

Myrmicocrypta spinosa Weber, 1937

(Figure 2.30–2.31)

Myrmicocrypta spinosa Weber (1937): 382). 15w, cotypes, **GUYANA**: 22.5 mi W Kartabo Pt., between Mazaruni & Cuyuni Rivers; [28m; 6.367684º N 58.703212º

W]; 8.ix.1935; (*NA Weber*); in rotten log; nest series; NAW353 (MCZ) (MCZ25056) [examined]. 2w, same data (USNM) [USNMENTNo. 00755388]; 1w, same data, but 7.ix.1935; NAW358. (USNM52936). The lectotype, here designated, is a worker with unique identifier number [USNMENT No. 00755380] deposited at MZC.

Myrmicocrypta infuscata Weber (1946): 131). Holotype worker, **GUYANA**: Mazaruni River, Forest Settlement [prison]; [73m; 6.325792º N 58.644346º W]; viii.1935; (*NA Weber*) (MCZ) [USNMENTNo. 00755335] [examined]. **NEW SYNONYM.**

Diagnosis: *Worker*: medium-sized individuals (TL 3.66–4.48, WL 0.96–1.25); eyes small, convex (4–6 ommatidia in longest row, ~12–23 ommatidia total; EL 0.06–0.11, OI 9–16); frontal carina conspicuous surrounding frons; frontal lobes somewhat triangular; cephalic corners angulate; dorsum of pronotum lacking appressed squamate hairs.

Description. Worker. *Head:* in full-face view and excluding mandibles, slightly longer than broad (HL 0.74–0.97, HW 0.60–0.83, CI 77–86); in full-face view, cephalic corners with blunt tubercles; cephalic margin broadly concave, interrupted medially by two tubercles, formed from irregular carinae crossing dorsal surface anterior to cephalic corners; in full-face view, sides of head weakly convex, parallel. Mandibles triangular (ML 0.44–0.59, MI 57–68), masticatory margin with 7–9 irregular teeth; outer margin slightly sinuous; dorsum of mandibles finely areolate-

striolate. Anterior border of clyeal apron convex; dorsunm of clypeal apron wide, shinning, and finely wrinkled; mid portion of clypeus (body of clypeus) raised as blunt teeth (fronto-clypeal teeth) underneath antennal insertions; in oblique view, fronto-clypeal tubercles triangular, carinate, covered with spoon-shaped hairs; unpaired clypeal seta mid-sized, stout (MSL 0.05–0.09, MSLI 7–12), originating close to posterior margin of clypeal apron and with 5–7 spoon-shaped hairs on each side. Frontal lobes of moderate size (FLD 0.21–0.28), slightly expanded laterally, and broadly convex (almost triangular); frontal carinae, posterior to frontal lobes extending parallel (nearly diverging) to each other, nearly at eye level; frontal carina developed posteriorly as irregular carinae enclosing frontal area, posteriorly extending weakly to mid tubercles and laterally to cephalic corners. Eyes small (EL 0.06–0.11, OI 9–16) with 4–6 ommatidia in longest row (12–23 ommatidia total), globose, situated slightly above midline of head; in full-face view, preocular carina finely impressed. In lateral view, postero-ventral angles of the head (collar) produced on each side as a pair of conspicuous blunt tubercles. Antennal scape long (SL 0.72–0.91, SI 108–121), thick; dorsum of antennal scape finely reticulate, covered with decumbent to appressed spoon-shaped hairs, narrowing towards apex. Hypostomal teeth acute, large (~1/4 length of eye).

Mesosoma. Pronotum, in dorsal view, with anterior and humeral tubercles tooth-like, acute and short, lateral pronotals thick, larger than previous tubercles; portion anterior to anterior pronotal tubercles somewhat triangular (see comments below); dorsum of pronotum smooth to rugulose, lacking any pilosity, appressed broadly squamate hairs

restricted to tubercles; propleural tubercle small but conspicuous, covered with wide squamate hairs; lateral mesonotal tubercles large, larger than any tubercle on mesonotum; in dorsal view, tubercles slightly diverging from median line; in some specimens, promesonotal suture visible, vestigial; anterior mesonotal tubercles acute, less massive than lateral mesonotals; declivous of mesonotum concave; median and posterior mesonotals present, the former shorter than the latter; in lateral view almost forming a right angle; metanotal groove present, deep; anterior margin of propodeum lacking tubercles, rounded or angulate; basal and declivous surface of propodeum laterally with thin carinae that meet posteriorly on acute teeth; in lateral view, area between mid and hind coxae lacking small tooth.

Metasoma. Petiole pedunculate; in lateral view, node of petiole subquadrate; anterior margin angulate, dorsal margin flat to slightly concave; petiole lacking antero-ventral process; ventral margin of petiole with two parallel thin carinae that extend to posterior margin; in dorsal view, node of petiole almost as wide as long; posterior margin of petiole straight. Postpetiole wider than long (PPL 0.20–0.31, PPW 0.26–0.36, PPI 107–132); in lateral view, postpetiole subquadrate, dorsally broadly convex; in dorsal view, anterior margin convex, lateral margin broadly convex with inferior postero-lateral angles rounded, posterior margin of postpetiole emarginate medially; postero-lateral margin carved; dorsum of postpetiole covered with appressed wide squamate hairs. Gastral tergite I anteriorly and posteriorly broadly convex, distinctly longer than broad; tergite finely punctate, lateral margins smooth and shining. Legs long and slender (HTL 0.58–0.78, HFL 0.86–1.10).

Head and thorax opaque and shagreened, sparcely rugulose. Hairs of body squamate, sparce; most aboundant on carinae, tubercles, dorsum of postpetiole, and gastral tergite I, legs, and antennal scapes. Color of body yellowish to dark ferruginous, some specimens with head and gaster darker than rest of body.

Measurements. *Workers.* EL 0.06–0.11, FLD 0.21–0.28, GL 0.74–1.03, HFL 0.86–1.10, HL 0.74–0.97, HTL 0.58–0.78, HW 0.60–0.83, ML 0.44–0.59, MSL 0.05–0.09, MSLca 0.01–0.04, OI 9–16, PL 0.31–0.49, PPL 0.20–0.31, PPW 0.26–0.36, SL 0.72–0.91, TL 3.44–4.57, WL 0.96–1.25, CI 77–86, MI 57–68, MSI 7–12, MSLI 22–63, PPI 107–132, RFLDI 27–31, RFLDII 33–38, SI 108–121 (n=33).

Queen. Dealate. As in the worker with modifications expected for caste and with the following differences:

Head. Dorsum of head rugulose.

Mesosoma. Dorsum of pronotum rugose; sides of pronotum smooth and glabrous. In dorsal view, mesoscutum with pair of parallel raised carinae extending through entire length of mesoscutum; median line present, conspicuous. Parapsidial lines conspicuous. Dorsum of mesoscutum rugulose. Posterior margin of mesoscutum with small teeth that project lacterally. Axillae triangular, with raised carinae. Scutellum larger than broad; lacking lateral projections, posteriorly bidentate; dorsum rugose.

Base and declivity of propodeum laterally carinate; propodeal spines present, acute. Anapleural sulcus present, deep, anepisternum rugulose and katepisternum rugose.

Metasoma. In dorsal view, petiole weakly rugose. In dorsal view, postpetiole trapezoidal, wider than long (PPL 0.36, PPW 0.58, PPI 161), posterior margin widely concave medially; dorsum of postpetiole rugulose. Gastral tergite I strongly reticulate.

Body (head, mesosoma, coxae, waist segments, and gaster) covered with spoon-shaped hairs.

Measurements. QUEEN. EL 0.22, FLD 0.32, GL 1.53, HFL 1.30, HL 1.05, HTL 0.93, HW 0.91, ML 0.65, MSL 0.09, MSLca 0.03, OI 25, PL 0.63, PPL 0.36, PPW 0.58, SL 1.01, TL 5.71, WL 1.49, CI 87, MI 62, MSI 9, MSLI 38, PPI 161, RFLDI 31, RFLDII 35, SI 111 (n=1).

Male. Unknown.

Comments. Weber (1937): 383) states that this species is "described from two colonies taken from the same [rotten] log September 8, 1935, by myself about 23 miles west of Kartabu Point, British Guyana. Under the rotted bark about six feet above the ground was one colony and a few feet along the log was the other colony at a height of 8 feet." Copies of Weber's field books, which are deposited at the MZC, list these colonies as collections NAW353 and NAW354. Close examination of

specimens from both colonies, show several remarkable differences, among them the size of the eyes.

At first glance, I considered these specimens, along with *Myrmicocrypta infuscata* Weber (1946), also from Guyana, to be the same species. The type specimen of *M. infuscata* was also collected by Weber in 1935 "in the vicinity of the Forest Settlement, Mazaruni River." After examinating the holotype of *M. infuscata* and Weber's description of this species (Weber, (1946): 131–132), I have concluded that this species should be considered a junior synonym of *Myrmicocrypta spinosa* Weber. Weber separated the two species based on the single worker of *M. infuscata* beeing slightly larger and darker in color. The measurements he pointed out were: eye diameter= 0.09 (*infuscata*) vs. 0.08 (*spinosa*); antennal scape length= 0.9 (*infuscata*) vs. 0.8 (*spinosa*); postpetiole slightly larger in *infuscata* than in *spinosa.* He reported that both of these specimens have the same length of the mesosoma (WL). I compared the single specimen of *M. infuscata* and the workers from NAW353 with the workers from colony NAW354, and I believe these are two different species. Members of colonies NAW354 differ from individuals belonging to *M. spinosa* (including *M. infuscata*) in: (i) eyes large with 8–10 ommatidia in longest row (27–49 ommatidia total), whereas eyes of *M. spinosa* small with 4–6 ommatidia in longest row (12–23 ommatidia total); (ii) dorsum of pronotum with appressed broadly squamate hairs, whereas *M. spinosa* lacks hairs on dorsum of pronotum; and (iii) dorsum of pronotum anteriorly lacking angulate carinae, anterior to anterior pronotal tubercles, whereas *M. spinosa* has this angulate carina, which can be weak in some specimens.

The specimens from Venezuela are slightly larger than those of the type series. They also differ in the presence of a low angular carina anterior to the anterior (median) pronotal tubercles; the frontal lobes, in full-face view, are more separated than in the type series; and the promesonotal suture is weakly impressed. I have seen three specimens collected by F. Plaumann, in Guaragi, Paraná, Brazil [MZSP, USNMENTNo. 00755431] that seem to agree with the description of *M. spinosa*, however, these specimens can be distinguished from *M. spinosa* mainly by the long hypostomal teeth, the presence of anterior propodeal tubercles, the shape of the node of the petiole, and the pilosity somewhat semi-erect.

Material examined. BRAZIL: *Amazonas*; Manaus; Reserva Ducke; [120m; 2.92861º S 59.94611º W]; 9.vi.1971; (*WL & DE Brown*); rainforest, rotten log [4w, MCZ]. Ig Marianil; Rio Branco Rd., 24 km NE of Manaus M-86; [45m; 3º 06' 23.07" S 60º 01' 35.15' W]; 26.viii.1962; (*WL Brown*) [9w, MCZ]. ***Pará;*** Melgação, Caxiuaná, ECFPn, VI Transecto (3.00); [49m]; 1º 46' 53.58 S 51º 35' 31.10" W; 18–20.i.2004; (*AY Harada, EP Fagundes, CED Sanhudo, Joca*); Winkler sample 3 [1w, MPEG]. **ECUADOR: *Orellana*;** Yasuni National Park; Yasuni Danta Trail (across Rio Napo from La Selva Lodge location); [211m; 1.037516º S 75.761781º W]; 10.vi.2003; (*AG Himler*); nest series; under log bark; AGH030610–01 [3w, USNM]. La Selva, Main Trail; [279m]; 0º 29.851' S 76º 22.483’ W; 9.vi.2003; (*CR Currie*); nest series; in log; CC030609–03 [2w, USNM]. **GUYANA: *Cuyuni-Mazaruni;*** 22.5 mi W Kartabo Pt., between Mazaruni & Cuyuni Rivers; [28m; 6.367684º N 58.703212º W]; 7.ix.1935; (*NA Weber*); in rotten log; nest series; NAW358 [1w,

USNM]. 22.5 mi W Kartabo Pt., between Mazaruni & Cuyuni Rivers; [28m; 6.367684º N 58.703212º W]; 8.ix.1935; (*NA Weber*); in rotten log; nest series; NAW353 [14w, MCZ; 2, USNM]. Mazaruni River, Forest Settlement [prison]; [73m; 6.325792º N 58.644346º W]; viii.1935; (*NA Weber*) [1w, MCZ]. Same data as previous entry, but viii-ix; NAW302 [1dq, MCZ]. ***Upper Takutu-Upper Essequibo;*** Acarai Mts., nr Romeo's Camp; 282m; 1º 23.307' N 58º 56.774' W; 7.x.2006; (*TR Schultz & J Sosa-Calvo*); 1º forest; rotten wood; winkler sample; TRS061007–WS07 [3w, USNM]. Acarai Mts., nr Romeo's Camp; 285m; 1º 23.17' N 58º 56.791' W; 10.x.2006; (*R Shoni, TR Schultz & J Sosa-Calvo*); 1º forest; rotten wood; winkler sample; JSC061010–WS07 [2w, USNM]. Nr. Kamoa River; nr Kamoa River Camp; 394m; 1º 32.786' N 58º 49.929' W; 22.x.2006; (*Felix, TR Schultz & J Sosa-Calvo*); 1º forest; leaf-litter; winkler sample; TRS061022–LS05 [1w, USNM]. **SURINAME: *Sipaliwini;*** Nassau Mts; 514m; 4º 49’ 13” N 54º 35’ 20” W; 04.xi.2005; (*J Sosa-Calvo*); nest series; rotten log; JSC051104–14 [1w, USNM]. **VENEZUELA: *Bolivar*;** Cumbre S. Amarawai Tepui; 900m; 05º 26' N 62º 15' W; 09.v.1986; (*JT Lattke*); JTL812 [7w, MIZA].

Myrmicocrypta squamosa Fr Smith, 1860

(Figure 2.32)

Myrmicocrypta squamosa Smith (1860): 74) (aq.). HOLOTYPE, 1aq, **BRAZIL**: Amazonas; São Paulo [de Olivença]; 71m; 3º 27’ 0” S 68º 47’ 60” W; (*HW Bates*) [Holotype, BMNH, 1014881] [examined].

Measurements. QUEEN. EL 0.18, FLD 0.18, GL 1.18, HFL 0.93, HL 0.86, HTL 0.60, HW 0.73, ML 0.54, MSL 0.09, MSLca 0.05, OI 24, PL 0.60, PPL 0.27, PPW 0.50, SL 0.74, TL 4.64, WL 1.20, CI 85, MI 62, MSI 10, MSLI 54, PPI 203, RFLDI 21, RFLDII 24, SI 101 (n=1).

Diagnosis. Frontal lobes reduced, convex; small hypostomal teeth; vertexal portion of head with pair of small tubercles, behind posterior ocelli; dorsum of head rugulose; humeral and lateral pronotal tubercles prominent; in dorsal view, disc of postpetiole dome-like.

Description. Queen. *Head:* in full-face view, head longer than broad (HL 0.86, HW 0.73, CI 85), cephalic corners convex; posterior occipital margin medially emarginate, vertexal margin with small pair of tubercles, posterior to lateral ocelli; frontal carina weakly developed but conspicuous; frons shallowly depressed; frontal lobes slightly convex (FLD 0.18), very closed together; clypeal apron convex anteriorly; fronto-clypeal teeth low, blunt; in oblique view, clypeus quadrate, with thin lateral carinae; unpaired median seta of clypeus median in size (MSL 0.09, MSI 10); mandibles triangular; outer margin of mandibles slightly sinuous; inner margin 7-toothed; antennal scape long (SL 0.74, SI 101) finely reticulate and covered with spoon-shaped hairs; eyes round (EL 0.18, OI 24); occiput drawn into a blunt collar; hypostomal teeth short, triangular.

Mesosoma: dorsum of pronotum weakly rugose; anterior pronotal tubercles vestigial; humeral tubercles present, triangular; lateral pronotal tubercles present, larger than humeral and slightly directed upwards; propleuron angled; scutellum with axillae triangular; posterior margin of scutellum bidentate; katepisternum and anepisternum rugose; propodeum bi-spinose; base of propodeum shorter than declivous of propodeum; both with lateral thin carinae.

Metasoma: propodeum pedunculate; in lateral view, subquadrate; ventral margin of petiole with thin carina; in dorsal view, node of petiole roundedin dorsal view, postpetiole wider than long; in dorsal view, anterior portion of postperiole convex, giving postpetiole a dome-like appearance; dorsum of postpetiole rugulose, medially concave; in dorsal view, postero-inferior corners of postpetiole acute; posterior margin of postpetiole emarginate medially; basigarster with short costulae, rest of gastral tergite I reticulate.

Comments. There is a lot of confusion regarding this species, which was described based on a single alate queen by Fr. Smith (1860), from specimens collected in "Sao Paulo." Weber (1958: 262), synonymized the species *M. buenzlii* with *squamosa* after studying material from the Forel collection, identified as *squamosa,* collected in Ipiranga, São Paulo. Later, Kempf (1961:517) revived from synonymy *M. buenzlii* arguing that the "identity of the original *squamosa* rests exclusively upon the assumption that São Paulo city is the type locality." Kempf (1961) explains that the specimen described as *squamosa* by Smith, was collected by Henry W. Bates in São

Paulo de Olivença, in the Amazon; contrary to the specimens identified as *squamosa* in the Forel collection, and suggests that "inasmuch as the original description of *M. squamosa*, a female, is worthless for all practical recognition, it follows that Forel's identification of the specimens from southern Brazil as belonging to the same species is merely a guess."

I have studied the specimens from the Forel collection as well as other specimens deposited in the MZSP. Comparison of these specimens suggests that they belong to *M. uncinata* Mayr, described from Santa Catarina, Brazil. I have further determined that *M. bruchi* from Argentina belongs to *uncinata*. I have studied both workers and queens, compared the queens of *uncinata* and *oglobini* with the queen of *squamosa* and and I find no morphological characters that set them apart.

The queen of *M. squamosa* can be distinguished from the queen of *M. bruchi* (here synonymized under *uncinata*) by the presence of long propodeal spines (short in *uncinata*), short unpaired median clypeal seta (long in *uncinata*), shape of pilosity, and postero-lateral margin of postpetiole angulate (rounded in *uncinata*). The queen of *squamosa* differs from the queen of *oglobini* mainly in the shape of the head and the shape of the frontal lobes.

Material examined. Known only from the type.

Myrmicocrypta subnitida Forel, 1899

(Figure 2.33)

Myrmicocrypta subnitida Forel (1899): 39) (m.). **PANAMA:** [Chiriqui Province;] Bugaba; [350m; 8.4833º N 82.6167º W]; (*Champion*) [MHNG, USNMENTNo. 00755502] [examined].

Measurements. MALE. EL 0.33, FLD 0.19, GL 1.24, HFL 1.31, HL 0.80, HTL 1.10, HW 0.69, ML 0.44, MSL n/a, MSLca n/a, OI 48, PL 0.63, PPL 0.25, PPW 0.41, SL 0.37, TL 4.80, WL 1.44, CI 86, MI 55, MSI n/a, MSLI n/a, PPI 163, RFLDI 24, RFLDII 28, SI 54 (n=1).

Diagnosis. Cephalic corners almost rounded; pronotum with small but acute humeral and lateral pronotal tubercles; anterior margin of mesoscutum sharp, biggibose; petiole lacking a node.

[Note: The specimen from MHNG collection is mounted with the head facing the point, making it very difficult to see the characters of the head in full-face view, including number of teeth in the mandible, measuring the unpaired median seta, shape of clypeal apron, and shape of clypeus in oblique view. However, pictures of another male, from the same collection and deposited in the BMNH collection were studied from AntWeb.org. The description presented here is based on both specimens and Forel's original description].

Description. Male. *Head*: in full-face view, cephalic corners almost rounded, with very thin carinae; lateral ocelli each with short, very sharp teeth; in lateral view, vertex weakly excavated (concave), smooth; occiputal carinae present, lateral portions of occiput drawn into a sharp angle; in full-face view, frontal lobes reduced, slightly convex; frontal carinae present extending posteriorly forming a low tubercle at level of median ocellus, the carinae continuing posteriorly to connect with lateral ocelli; in lateral view, clypeus obtusely angled; in full-face view, mandibles triangular, outer margin slightly sinuous; inner margin with 8 teeth; dorsum of mandibles reticulate; unpaired median seta present, long and thin; clypeal apron broadly convex; in lateral view, hypostomal teeth long and thin; antennal scape short (SL 0.37, SI 54), thick, and reticulate; covered with appressed simple hairs.

Mesosoma: in dorsal view, dorsum of pronotum smooth, lacking anterior pronotal tubercles; lateral and humeral tubercles present, small and triangular, humeral tubercles slightly smaller and more acute than lateral tubercles; thin carina present close to promesonotoal suture. Anterior portion of mesoscutum, in lateral view, high, forming a sharp angle; in dorsal view, antero-lateral margin of mesoscutum concave; anterior portion bilobate; in dorsal view, mesoscutum appearing somewhat triangular; dorsum of mesoscutum with a pair of raise carinae parallel to each other and higher at posterior portion of mesoscutum; in lateral view, mesoscutum appearing flat; parapsidal lines present, conspicuous; in dorsal view, postero-lateral margin of mesoscutum extended laterally like a pair of rounded tubercles. In dorsal view, scutellum wider than long; in lateral view, axillae elevated and pointing posteriorly,

acute; posterior margin of scutelum bidentate, tubercles slightly curving downwards; dorsum of scutellum rugose. In lateral view, base of propodeum as long as declivity of propodeum, both laterally carinate; propodeal spines, long and thin.

Metasoma: in lateral view, petiole pedunculate lacking ventral process and lacking a distinctive petiolar node; in dorsal view, petiolar node elongate, slightly cylindrical. In dorsal view, postpetiole trapezoidal, broader than long (PPL 0.25, PPW 0.41, PPI 163); lateral margins straight; disc of postpetiole finely reticulate; posterior margin of postpetiole medially emarginate. Gastral tergite I finely reticulate, slightly lustrous. Legs long and slender (HTL 1.10, HFL 1.31).

Body dull, finely granulate and overall rugulose. Gastral tergite I finely reticulate. Pilosity consisting mostly of simple appressend hairs; hairs on gastral tergite I shorter than rest of body. Body ferruginous (reddish in color), legs, antennae, and mandibles slightly lighter. Wings yellowish, finely hairy.

Worker. Unknown.

Queen. Unknown.

Comments. This species resembles the males of *Myrmicocrypta occipitalis* originally described from specimens collected in Bolivia. The range of *Myrmicocrypta occipitalis* is extended in this revision to include specimens in Costa Rica and Panama. However, *Myrmicocrypta subnitida* differs from the males of

Myrmicocrypta occipitalis by the following characters: (i) cephalic corners almost rounded in *subnitida*, angled in *occipitalis*; (ii) humeral spines short and acute in *subnitida*, long and needle-like in *occipitalis*; (iii) anterior pronotal tubercles lacking in *subnitida*, present and tooth-like in *occipitalis*; (iv) petiole lacking a node in *subnitida*, node conspicuous in *occipitalis*.

Material examined. PANAMA: [***Chiriqui Province;***] Bugaba; [350m; 8.4833º N 82.6167º W]; (*Champion*) [1m, BMNH; 1m, MHNG].

Myrmicocrypta surianensis (Wheeler, 1925) **NEW STATUS**

(Figure 2.34)

Myrmicocrypta foreli var. *surianensis* Wheeler (1925): 45) (w.). 8 syntypes workers.

BOLIVIA: Suriani (*N Holmgren*) [Locality not found]. [MZC, USNMENTNo. 00755379]. The lectotype, here designated, is a worker (bottom specimen) with unique identifier number [USNMENT No. 00755379] deposited at MZC. **NEW STATUS**. [examined].

Measurements. WORKER. EL 0.08, FLD 0.17, GL 0.75–0.84, HFL 0.72, HL 0.74, HTL 0.51–0.54, HW 0.63, ML 0.44–0.49, MSL 0.11–0.15, MSLca 0.07–0.11, OI 12–13, PL 0.35–0.39, PPL 0.22, PPW 0.27–0.28, SL 0.64–0.68, TL 3.50–3.54, WL 0.86–0.91, CI 85–86, MI 60–66, MSI 14–20, MSLI 69–80, PPI 121–126, RFLDI 22–23, RFLDII 26–27, SI 103–108 (n=3).

Diagnosis. Frontal lobes slightly expanded laterally, convex; eyes small (5 ommatidia longest row); hypostomal teeth vestigial; unpaired median seta long; in lateral view, dorsum of head with short simple erect hairs constrasting with cephalic ground pilosity; node of petiole rounded; antero-ventral process of petiole present, tooth-like.

Description. Worker. *Head.* In full-face view, excluding mandibles, longer than wide (HL 0.74, HW 0.63, CI 85–86); sides of head broadly convex, almost straight; cephalic corners slightly angulate; posterior cephalic margin emarginate medially; in full-face view, dorsum of head rugose; in lateral view, dorsum of head with short simple erect hairs contrasting with cephalic ground pilosity; in full-face view, frontal carinae weakly impressed; in lateral view, frontal carinae distinct; occiput drawn into a bidentate collar; anterior margin of clypeal apron broadly convex; unpaired clypeal seta long (MSL 0.17, MSI 14–20) with 5–6 appressed narrowly flattened hairs on each side of median seta; in lateral view, fronto-clypeal teeth acute, conspicuous; in oblique view, clypeus triangular, posterior margin, in front of antennal insertions, produced into acute fronto-clypeal teeth; lateral margin of clypeal apron weakly carinate. Mandibles triangular, long (ML 0.44–49, MI 60–66), with convex outer margin; inner (masticatory) margin 6–7-toothed; dorsum of mandibles reticulate; eyes small (EL 0.08, OI 12–13), convex, with 5 ommatidia in longest row (13–17 ommatidia total), situated posterior to midline of head at a level above frontal lobes; frontal lobes weakly expanded, convex, (FLD 0.17); frontal lobes slightly separated, posterior margin of clypeus extending between frontal lobes, posterior margin of

clypeus convex, medially close together; antennal scapes long (SL 0.64–68, SI 103–108), reticulate; leading each of antennal scape with thin serrated carinae; antennal scapes covered with suberect elongate spoon-shaped hairs. Hypostomal teeth vestigial.

Mesosoma. Dorsum of pronotum smooth, anterior pronotal tubercles vestigial to absent; in dorsal view, humeral tubercle small, triangular; in dorsal view, lateral pronotal tubercles as rounded carinae; in lateral view, lateral pronotal tubercles angled, acute and with some irregular carinae; propleural vestigial, carinate; sides of pronotum smooth; lateral and anterior mesonotal present as low carinate tubercles, connected by thin lateral carinae, anterior mesonotals slightly larger than lateral mesonotals; in lateral view, lateral mesonotals with a single erect simple hair; iarea between meso and metanotal grooves, with very small tubercles; metanotal groove slightly deeper than mesonotal groove, and with longitudinal median carinae; anterior portion of propodeum angulate; in lateral view, basal face of propodeum flat; basal face of propodeum slightly longer than propodeal declivity; propodeal spines triangular, acute; basal and declivous faces of propodeum with thin lateral carinae.

Metasoma. Petiole distinctly pedunculate, long (PL 0.35–0.39); in lateral view, anterior margin of petiolar node rounded; in dorsal view, node of petiole rounded; in lateral view, ventro-anterior process of petiole toothed; in lateral view, ventral margin of petiole weakly sinuous, and with thin ventral carinae; in dorsal view, node of petiole slightly longer than wide; posterior margin of petiole with thin carinae.

Postpetiole, in lateral view, convex dorsally; in dorsal view, disc of postpetiole, dome-like, with postero-inferior margin angled; sides of postpetiole convex; in dorsal view, disc of postpetiole longer than- or as long as- wide (PPL 0.22, PPW 0.27–0.28, PPI 121–126); in dorsal view, posterior margin of postpetiole weakly emarginate medially. In lateral view, gaster tergite I widely convex; in dorsal view, gaster long-ovate (longer than wide); gastral tergite I reticulate; gastral tergite I with suberect spoon-shaped hairs.

Body dull, light-brown. Pilosity of moderately abundant short, spoon-shaped and more or less hooked or only moderately arched curved hairs. Hairs on antennal scapes and legs suberect, narrow squamate.

Queen. Unknown.

Male. Unknown.

Comments. This species differs from *Myrmicocrypta foreli* by the presence of erect simple hairs on the dorsum of the head, the length of the unpaired clypeal seta, the size of the eyes, and the rounded petiolar node.

Material examined. Known only from the type series.

Myrmicocrypta triangulata Forel, 1912

(Figure 2.35)

Myrmicocrypta triangulata Forel (1912): 190) (m.). **GUATEMALA**: Retalhuleu; Retalhuleu; [241m; 14.5333º N 91.6833º W]; *(Stoll*). [MHNG, USNMENTNo.00758397] [examined].

Measurements. MALE. EL 0.36–0.39, FLD 0.25–0.26, GL 1.61–1.66, HFL 1.40–1.50, HL 0.90–0.96, HTL 1.21–1.30, HW 0.83–0.90, ML 0.50–0.53, MSL 0.13, MSLca 0.09, OI 43–44, PL 0.67–0.77, PPL 0.30, PPW 0.46–0.54, SL 0.39–0.41, TL 5.76–5.81, WL 1.65–1.73, CI 92–94, MI 52–58, MSI 15, MSLI 65, PPI 156–180, RFLDI 27–28, RFLDII 29–30, SI 45–47 (n=2).

Diagnosis. In full-face view, cephalic margin tuberculate; tubercles behind lateral ocelli present; occipital collar with blunt tubercle; propleuron with long tubercle; pronotum with small lateral and humeral tubercles small, tooth-like; postero-lateral margin of mesoscutum with blunt lateral projections; petiole with conspicuous node.

Description: Male. *Head*: Forel described it as "with the mandibles closed, the head forms, from one cephalic angle to another, and those at the end of the mandibles an exact isosceles triangle longer on the sides than its base, which consists of the posterior margin of the head." In full-face view, posterior margin of head with a pair of tubercles behind lateral ocelli, forming three concavities in cephalic margin; frontal carinae present, extending posteriorly forming a low tubercle at level of median ocellus, the carinae continuing posteriorly to connect with lateral ocelli; in lateral view, vertex excavated (concave), shiny; occiput drawn into a blunt tubercle; in full-

face view, frontal lobes parallel; in lateral view, frontal lobes appearing as triangular, projecting forward; in lateral view, clypeus rounded; in oblique view, clypeus with anterior portion slightly concave, surrounded by thin carinae; posterior portion of clypeus rugulose; clypeal apron wide; anterior margin convex; unpaired median seta relatively long (MSL 0.13, MSI 15); mandibles triangular, with 8 teeth on masticatory margin; outer margin of mandibles convex; dorsum of mandibles reticulate; hypostomal teeth long, rounded at tip; antennal scape short (SL 0.39, SI 47), thick, and reticulate; covered with appressed simple hairs.

Mesosoma. In dorsal view, pronotum short; in lateral view, abruptly angulate; lacking anterior pronotal tubercles; lateral and humeral pronotal tubercles present, triangular (humeral larger than lateral tubercles); propleuron with acute tubercle. Anterior portion of mesoscutum separated from rest of mesoscutum by grooves (notauli) converging close to median line; anterior portion of mesoscutum bilobulate; mesoscutum with pair of parallel high carinae; parapsidal lines present, conspicuous; posterior margin of mesoscutum with pair of large, lateral rounded tubercles; posterior margin of mesoscutum evenly convex. Scutellum wider than long; axillae high, tuberculate with tips directed posteriorly; posterior margin of scutellum bidentate; dorsum of scutellum rugulose. In lateral view, base of propodeum slightly shorter than declivous; propodeal spines long and blunt at tip; lateral margin of declivity of propodeum with thin carinae.

Metasoma. In lateral view, petiole pedunculate, lacking ventral process; in lateral view, node of petiole low, rounded anteriorly; in dorsal view, node of petiole rounded anteriorly, wider than long. Postpetiole broader than long (PPL 0.30, PPW 0.46, PPI 156); in dorsal view, disc of postpetiole finely reticulate and slightly trapezoidal; lateral margins of postpetiole widely convex; posterior margin of postpetiole medially emarginate; Gaster, in lateral view, somewhat convex dorsally; gastral tergite I finely reticulate. Legs long and slender.

Body dull, finely granulate and overall rugulose. Gastral tergite I finely reticulate. Pilosity consisting of very narrow to simple appressed hairs; hairs on gastral tergite I shorter than rest of body. Head and mesosoma dark gray-brownish, petiole, postpetiole, and gaster ferruginous (reddish in color), legs, antennae, and mandibles brown-yellowish. Wings brownish, finely hairy.

Worker. Unknown.

Queen. Unknown.

Comments. The male of *M. triangulata* resembles the male of *M. dilacerata* in the concavity of the vertex, the angulate cephalic corners, and the shape of the petiole. However, *M. triangulata* differs from *M. dilacerata* in the smaller pronotal tubercles, the presence of a long propleural tubercle, and the relatively long clypeal seta.

Material examined. GUATEMALA: ***Retalhuleu;*** Retalhuleu; [241m; 14.5333 N 91.6833 W]; *(Stoll*). [1m, MHNG]. **MEXICO:** ***Veracruz;*** Santiago de Tuxtlas; Las Hamacas, 17 Km N of Santiago de Tuxtlas; [266m; 18.4667º N 95.3000º W]; 26–28.viii.1953; (*EO Wilson*); tropical evergreen forest; EOW307 [1m, MCZ].

Myrmicocrypta tuberculata Weber, 1938

(Figure 2.36–2.38)

Myrmicocrypta tuberculata Weber (1938): 159) (w). 7 cotype workers; **BOLIVIA**: Departamento de La Paz; Ixiamas; [357m; 13.7500º S 68.1500º W]; xii.1921; (*WM Mann*); Mulford Expedition. (USNM) [examined]. The lectotype, here designated, is a worker (bottom specimen) with unique identifier number [USNMENT No. 00755455] deposited at USNM.

Diagnosis. Body completely covered with crypts; frontal lobes reduced, parallel, and rounded anteriorly; hypostomal teeth long and acute; body covered with squamate hairs; pronotum with three pair of tubercles (anterior, humeral, and lateral); mesonotum with three pairs of tubercles (lateral, anterior, and posterior); propodeum with long propodeal spines; node of petiole triangular, in lateral view; ventral process of petiole with anterior margin acute and extending back to posterior margin of petiole.

Description. Worker. *Head*: in full-face view and excluding mandibles, longer than wide (HL 0.79–0.90, HW 0.59–0.71, CI 73–80); cephalic corners anteriorly weakly convex, posteriorly somewhat angulate; cephalic margin medially concave and with pair of tubercles on vertexal area. In lateral view, cephalic collar present, bilobed. Mandibles long, triangular (ML 0.42–0.48, MI 51–55); inner margin of mandibles 6–8-toothed, decreasing in size toward base; outer margin of mandibles slightly sinuous; dorsum of mandibles reticulate. In full-face view, clypeal apron wide, with anterior margin convex, dorsum weakly rugulose; unpaired clypeal seta mid-sized (MSL 0.06–0.07, MSI 7–8), stout, originating slightly before edge of posterior margin of clypeal apron and anterior margin of body of clypeus; 6–7 appressed simple hairs on each side of the median seta reaching the anterior margin of clypeal apron; body of clypeus, in oblique view, bilobed underneath the antennal insertions (frontoclypeal teeth), with median constriction; frontoclypeal teeth present as thick tubercles. Eyes small (EL 0.08–0.11, OI 13–17), with 5–7 ommatidia in longest row (12–23 ommatidia in total); eyes surrounded by ocular carina. In full-face view, frontal lobes thick, straight, barely covering antennal insertions, anteriorly rounded, and very close together (FLD 0.16–0.20) with posterior portion of clypeus (finger of clypeus) narrowly extending between frontal lobes and forming a deep groove. In full-face view, frontal carinae present, extending backwards, branching off at mid length to form vertexal carinae; secondary carinae extending toward cephalic corners; carinae raised at midlength forming small tubercles, largest tubercle at vertexal area. Supraocular tubercle present, blunt. Antennal scape long (SL 0.75–0.88, SI 121–135), finely reticulate; antennal scape covered with appressed narrowly spoon-shaped hairs,

becoming simple (or almost simple) towards apex of scape. In lateral view, hypostomal teeth large, acute.

Mesosoma: pronotum with long humeral tubercles, acute; anterior pronotal tubercles long, acute, and directed forward; lateral tubercles massive, blunt, and low; in dorsal view, lateral tubercles angulate; propleuron lacking tubercles, at most carinate. In lateral view, lateral mesonotal tubercles blunt, conspicuous; anterior mesonotal tubercles acute, with narrower base than lateral mesonotals. Area between mesonotal and metanotal grooves with two pairs of small tubercles (anterior pair usually smaller or vestigial). In lateral view, metanotal groove deep. Anterior portion of propodeum angulate, lacking pair of tubercles; propodeal spines long and acute; lateral mnrgin of base of propodeum with raised carinae; declivous of propodeum lacking lateral carina.

Metasoma: in lateral view, petiole pedunculate; ventral margin of petiole with thick, curtain-like carinae and with tooth-like anterior process. In lateral view, ventral margin of petiole sinuous. In lateral view, petiolar node triangular; anterior margin of petiolar node straight, posterior margin flat; in dorsal view, petiolar node straight. In lateral view, postpetiole slightly convex both dorsally and ventrally; in dorsal view, postpetiole wider than long (PPL 0.20–0.25, PPW 0.28–0.38, PPI 126–154); posterior margin of postpetiole medially concave; in dorsal view, postero-inferior margin angulate; dorsum of postpetiole covered with appressed spoon-shaped hairs. Base of gaster costulae large and dense; gastral tergite I densely reticulate and covered with

scale-like hairs; lateral margin of gastral segment I with narrower hairs; sides of gastral segment I smooth and shinny. Outer margin of tarsomere I with narrow spoon-shaped proximal to the base. Inner margin with decumbent single hairs.

Body color yellowish to ferruginous. Integument covered almost entirely with crypts, except for area surrounding median line, which is smooth; legs and antennae. Pilosity consisting of appressed squamate hairs.

Measurements. WORKER. EL 0.08–0.11, FLD 0.16–0.20, GL 0.79–0.97, HFL 0.94–1.08, HL 0.79–0.90, HTL 0.64–0.77, HW 0.59–0.71, ML 0.42–0.48, MSL 0.06–0.07, MSLca 0.02–0.03, OI 13–17, PL 0.36–0.48, PPL 0.20–0.25, PPW 0.28–0.38, SL 0.75–0.88, TL 3.60–4.18, WL 1.00–1.20, CI 74–80, MI 51–55, MSI 8–7, MSLI 33–40, PPI 126–154, RFLDI 19–22, RFLDII 24–29, SI 121–135 (n=18).

Queen. Dealate. Resembling the worker, but with modifications proper of the caste.

Mesosoma: Parapsidial lines short. Scutellum lacking lateral projections, posteriorly bidentate. In lateral view, base and declivity of propodeum laterally carinate. In lateral view, anapleural sulcus deep, dividing mesopleuron into anepisternum and katepisternum.

Metasoma: petiole as in worker, with anterior margin, in dorsal view, medially concave and laterally produced into two small angles (short tubercles). In dorsal view,

postpetiole trapezoidal, anterior margin broadly concave; posterior margin of postpetiole concave medially. Base of gaster medially produced into shallow groove, more pronounced than in worker; gastral tergite I strongly reticulate.

Body covered by crypts as in worker. Body color dark ferruginuous.

Measurements. QUEEN. EL 0.21, FLD 0.22, GL 1.56, HFL 1.18, HL 1.03, HTL 0.88, HW 0.81, ML 0.54, MSL 0.07, MSLca 0.03, OI 26, PL 0.69, PPL 0.30, PPW 0.64, SL 0.96, TL 5.58, WL 1.48, CI 79, MI 52, MSI 7, MSLI 36, PPI 215, RFLDI 21, RFLDII 27, SI 118 (n=1).

Male. *Head:* mandibles broadly triangular; masticatory margin of mandibles with 6–8 teeth; apical tooth largest decreasing in size towards base; dorsum of mandibles densely reticulate. In full-face view, clypeal apron wide, anterior margin broadly convex; unpaired clypeal seta mid-sized (MSL 0.07–0.09, MSI 10–13), originating proximal to posterior margin of clypeal apron, and extending past anterior margin of clypeal apron (MSLca 0.03–0.05) over basal tooth. In full-face view, frontal lobes thick, weakly expanded (FLD 0.15–0.17). Antennal scapes short (SL 0.29–0.37, SI 50–62), slightly surpassing cephalic margin and finely reticulate; in full-face view, antennal scapes slightly thicker at base than apex; antennal funicular segment II long, twice as long as funicular segment I (pedicel). Eyes large (EL 0.30–0.33, OI 49–56). In lateral view, area behind posterior ocelli with pair of tooth-like tubercles (in some specimens, vestigial to absent); in full-face view, cephalic corners angulate or with

small tubercle; in profile, vertex concave, with a median longitudinal carina that originates at cephalic carina and extends to level of vertexal tubercles; in lateral view, cephalic collar subquadrate. In lateral view, hypostomal tooth small, broadly triangular.

Mesosoma: pronotum with three pair of tubercles present, anterior pronotal the largest. In lateral view, mesoscutum shield-like, almost flat dorsally; in dorsal view, notauli strongly impressed; in dorsal view, mid portion of mesoscutum with pair of carinae extending posteriorly; postero-lateral margin of mesoscutum produced into triangular lobe. Scutellum wider than long; axillae produced into posterior tubercles (larger than those of the queen); scutoscutellar sulcus deep; posterior margin of scutellum bidentate. In lateral view, base and declivity of propodeum with thin lateral carina; propodeal spines long; anapleural sulcus deep and with transverse rugae.

Metasoma: petiole pedunculate; in profile, node rounded or slightly subquadrate; antero-ventral process of petiole vestigial or lacking. In dorsal view, postpetiole trapezoidal; disc of postpetiole finely reticulate; disc of postpetiole wider than long (PPL 0.18–0.20, PPW 0.33–0.36, PPI 161–203); posterior margin widely concave medially. Base of gaster finely reticulate, rest of gastral tergite I smooth and shinny.

Measurements. MALE. EL 0.30–0.33, FLD 0.15–0.17, GL 1.14–1.34, HFL 1.07–18, HL 0.69–0.74, HTL 0.84–0.95, HW 0.56–0.61, ML 0.35–0.37, MSL 0.07–0.09, MSLca 0.03–0.05, OI 49–56, PL 0.45–0.54, PPL 0.18–0.20, PPW 0.33–0.36, SL

0.29–0.37, TL 4.12–4.56, WL 1.25–1.37, CI 77–85, MI 48–51, MSI 10–13, MSLI 43–55, PPI 161–203, RFLDI 20–23, RFLDII 24–27, SI 0.29–0.37 (n=5).

Comments. This species is easily distinguished from any other species of *Myrmicocrypta* by the presence of crypts in the integument and the presence of long anterior pronotal tubercles on the worker, queen, and male.

Some variations have been observed within individuals of this species, including: (i) small hypostomal teeth on a specimen from Ecuador, and (ii) gastral segment of the males almost entire smooth and shinny in the male from Peru, differing slightly from the specimens from Brazil.

Material examined. BOLIVIA: ***Departamento de La Paz*****;** Ixiamas; [357m; 13.7500º S 68.1500º W]; xii.1921; (*WM Mann*); Mulford Expedition [2w, MCZ; 15w, 1dq, USNM]. **BRAZIL:** ***Amazonas*****;** Estirão do Equador; R. Javari; [91m; 4º 31' 53.71" S 71º 37' 03.34" W]; ix.1979; (*Alvarenga*) [5m, MZSP]. **COLOMBIA:** ***Amazonas*****;** 7 Km N Leticia; [96m; 4.216667º S 69.933333º W]; 10–25.ii.1972; (*S & J Peck*); B–230 [1w, MIZA]. Leticia; PNN Amacayacu; [200–300m; 3.483333º S 70.2º W]; 14.x.2007; (*J Rodriguez, J Sosa-Calvo, TR Schultz, S Johnson*); winkler; leaf-litter; JR071014–LS02 [1w, USNM]. **ECUADOR*****: Orellana;*** Tiputini Biodiversity Station; Maquisapa Trail; [213m]; 0º 38.295' S 76º 8.959' W; 18.vi.2003; (*A Little*); nest series; in ground under log; AL030618–07 [2w, USNM]. **PERU:** ***Departamento de Cusco;*** Quince Mil; 750m; [13.2289º S 70.7600º W]; ix.1962; (*L Pena*) [1m, MCZ].

Myrmicocrypta uncinata (Mayr, 1887) **NEW STATUS**

(Figure 2.39–2.41)

Apterostigma uncinatum Mayr (1887): 554) (w.). **BRAZIL**: Santa Catharina [not examined]. Emery (1890): 70) (q, m.). Combination in *Glyptomyrmex*: Emery (1890): 70); in *Myrmicocrypta*: Forel (1911): 296).

Myrmicocrypta bruchi Santschi (1936): 409), figs. 13–14 (w, q.) 2 workers and 1 dealate queen. **ARGENTINA**: Cordoba; Alta Gracia; [515m; 31.6667º S 64.4333º W]; (*C Bruch*) [NHMB, 00758167, 00755204] [examined] **NEW SYNONYMY**

Measurements. WORKER. EL 0.09–0.12, FLD 0.20–0.24, GL 0.82–1.02, HFL 0.78–0.89), HL 0.75–0.85, HTL 0.55–0.66, HW 0.61–0.70, ML 0.46–0.55, MSL 0.08–0.16, MSLca 0.05–0.12, OI 15–18, PL 0.37–0.49, PPL 0.20–0.25, PPW 0.26–0.32, SL 0.71–0.81, TL 3.60–4.16, WL 0.94–1.09, CI 78–84, MI 58–65, MSI 11–19, MSLI 60–77, PPI 116–147, RFLDI 24–30, RFLDII 29–37, SI 114–125 (n=24).

Diagnosis. *Worker*: long, thick, unpaired median seta; frontal lobes weakly expanded laterally, convex; frontoclypeal teeth acute; propleuron teeth large; ventral process of petiole present, tooth-like. *Queen*: as the worker with modifications of the caste;

marginal cell short. *Male*: pronotum with small teeth; propleuron with small acute tubercle; marginal cell short.

Description. Worker. *Head*: in full-face view, excluding mandibles, longer than wide (HL 0.75–0.83, HW 0.61–0.70, CI 78–84); sides of head broadly convex; cephalic corners slightly angulate; posterior cephalic margin emarginate medially; in full-face view, dorsum of head rugose; in full-face view, frontal carinae present, extending at level of eyes; anterior margin of clypeal apron broadly convex; unpaired clypeal seta long (MSL 0.10–0.15, MSI 12–18) with 5–6 appressed narrowly flattened hairs on each side of median seta; fronto-clypeal teeth acute, conspicuous; in oblique view, median portion of clypeus concave, posterior margin, in front of antennal insertions, produced into acute fronto-clypeal teeth; lateral margin of clypeal apron weakly carinate. Mandibles triangular, long (ML 0.46–0.55, MI 58–63), with slightly sinuous outer margin; inner (masticatory) margin 6–8-toothed; dorsum of mandibles reticulo-strigate; eyes median in size (EL 0.09–0.12, OI 15–18), globose, with 5–8 ommatidia in longest row (21–38 ommatidia total), situated posterior to midline of head at a level above frontal lobes; frontal lobes weakly expanded, slightly convex, (FLD 0.20–0.24); frontal lobes slightly separated, posterior margin of clypeus extending between frontal lobes, posterior margin of clypeus convex; antennal scapes long (SL 0.73–0.80, SI 114–122), reticulate, and covered with appressed elongate spoon-shaped hairs. Hypostomal teeth present, triangular.

Mesosoma. Dorsum of pronotum smooth to weakly rugulose, anterior pronotal tubercles vestigial (at most carina-like); in dorsal view, humeral tubercle small, triangular; in dorsal view, lateral pronotal tubercles angled, giving an subquadrate appearance; in lateral view, lateral pronotal tubercles angled, acute and with some irregular carinae; propleural tooth present; sides of pronotum smooth; lateral and anterior mesonotal present as low tubercles, connected by thin lateral carinae, anterior mesonotals slightly larger than lateral mesonotals; in dorsal view, lateral and mesonotal tubercles forming squared area; area between meso and metanotal grooves, with very small tubercles; metanotal groove slightly deeper than mesonotal groove; anterior portion of propodeum angulate; in lateral view, basal face of propodeum flat to slightly concave; basal face of propodeum as long as propodeal declivity, or slightly longer; propodeal spines small and carinate or slightly longer, acute; basal and declivous faces of propodeum with thin lateral carinae.

Metasoma. Petiole distinctly pedunculate, long (PL 0.37–0.49); in lateral view, anterior margin of petiolar node rounded; in dorsal view, node of petiole rounded; in lateral view, ventro-anterior process of petiole toothed; in lateral view, ventral margin of petiole weakly sinuous, and with thin ventral carinae; in dorsal view, node of petiole slightly longer than wide; posterior margin of petiole with thin carinae. Postpetiole, in lateral view, flattened dorsally; in dorsal view, disc of postpetiole, rounded, with postero-inferior margin angled; sides of postpetiole convex; in dorsal view, disc of postpetiole longer than- or as long as- wide (PPL 0.20–0.25, PPW 0.26–0.32, PPI 116–147); in dorsal view, posterior margin of postpetiole weakly

emarginate medially. In lateral view, gaster tergite I widely convex; in dorsal view, gaster long-ovate (longer than wide); gastral tergite I reticulate; gastral tergite I with spoon-shaped hairs. Legs long and slender.

Body dull, brownish to ferruginous. Pilosity of moderately abundant short, flattened and more or less hooked or only moderately arched curved hairs. Hairs on antennal scapes and legs narrow squamate.

Queen. Resembling the worker with modifications expected for the caste and with the following differences:

Head. Clypeal apron broad; unpaired clypeal seta long and thin.

Mesosoma. Humeral and lateral pronotal tubercles present, small; posterior margin of scutellum with small pair of tubercles; propodeal tubercles small; base and declivity of propodeum carinate laterally. Forewing with short marginal cell.

Measurements. QUEEN. EL 0.15–0.18, FLD 0.18–0.25, GL 1.15–1.34, HFL 0.89–0.97, HL 0.87–0.94, HTL 0.63–0.69, HW 0.72–0.80, ML 0.51–0.57, MSL 0.09–0.17, MSLca 0.05–0.11, OI 20–24, PL 0.46–0.62, PPL 0.26–0.31, PPW 0.40–0.51, SL 0.79–0.88, TL 4.65–4.95, WL 1.22–1.27, CI 82–88, MI 58–66, MSI 10–18, MSLI 60–65, PPI 144–193, RFLDI 20–27, RFLDII 24–32, SI 105–112 (n=7).

Male. *Head.* Excluding eyes, triangular; ocular carinae extending backwards to cephalic corners; cephalic margin, behind of each posterior ocellus, with small tubercles; vertex shallowly concave; frontal lobes small, parallel, and widely separated (FLD 0.20–0.23); frontal carinae impressed, extending backwards and meeting with a carinae that extends from lateral ocelli and forming a small tubercle at level of mid ocellus; mandibules triangular with convex outer margin and 7 distinct teeth; second and third funicular joints taken together longer than antennal scapes; antennal scapes long (SL 0.37–0.39, SI 51–53), thinner toward apex; clypeal apron wide, anterior margin convex; unpaired median seta long and thick (MSL 0.10–0.13, MSI 13–15); in lateral view, body of clypeus obtusely angled; in oblique view, anterior face of body of clypeus reticulate; margin of body of clypeus demarcated by thin carina; postero-dorsal margin of body of clypeus with conspicuous groove and longitudinal rugae; hypostomal teeth short, triangular.

Mesosoma. Pronotum lacking anterior tumosities; humeral tubercles present, triangular, smaller than lateral pronotal tubercles; lateral pronotal tubercles acute; dorsum of pronotum rugulose; in lateral view, propleuron with pyramidal tubercle. In lateral view, anterior portion of mesoscutum on straight angle; in dorsal view, antero-lateral margins of mesoscutum concave; lateral margin of mesoscutum sinuous; postero-lateral margin of mesoscutum tuberculate, directed upwards; in dorsal view, dorsum of mesoscutum with parallel raised carinae that extends entire length of mesoscutum; parapsidal lines present, short; dorsum of mesoscutum rugulose; scutellum wider than long; in dorsal view, axillae triangular, in lateral view, axillae

tuberculate pointing backwards; posterior margin of scutellum, bidentate; in lateral view, posterior tubercles of scutellum thick and rounded at tip; dorsum of scutellum rugulose; propodeal spines long, thick at base, slender and rounded at tip, diverging posteriorly. Declivity of propodeum as long as- or longer than- base of propodeum, both with lateral carinae.

Metasoma. Petiole pedunculate, with anterior ventral process; in lateral view, node of petiole low, rounded anteriorly; in dorsal view, node of petiole rounded, almost as wide as long. In lateral view, dorsum of postpetiole, convex; postpetiole broader than long (PPL 0.25, PPW 0.36, PPI 144–145); disc of postpetiole dome-like; posterior margin of petiole, in dorsal view, shallowly emarginate medially; disc of postpetiole reticulate and longitudinal rugae. Gaster, in lateral view, convex dorsally; gastral tergite I finely reticulate. Legs long and slender.

Body opaque and somewhat rugose on head and thorax; mandibles, antennal scapes, and gastral tergite I reticulate. Pilosity confined to sparse, hairs that are narrowly flattened medially and thin and simple towards the apex, which are recurved on sculpturing, and simple short fine appressed pubescence on appendages.
Body color brown, appendages paler, mandibles yellowish brown. Wings slightly smokey.

Measurements. MALE. EL 0.30–0.33, FLD 0.20–0.23, GL 1.30–1.33, HFL 1.14–1.19, HL 0.79–0.82, HTL 1.00–1.05, HW 0.73–0.74, ML 0.45–0.48, MSL 0.10–0.13,

MSLca 0.07–0.09, OI 41–45, PL 0.62–0.63, PPL 0.25, PPW 0.36, SL 0.37–0.39, TL 4.82–4.92, WL 1.37–1.46, CI 90–93, MI 55–61, MSI 13–15, MSLI 67–68, PPI 144–145, RFLDI 25–28, RFLDII 27–30, SI 51–53 (n=2).

Comments. This species was described by Mayr (1887) from Santa Catharina in southern Brazil. Unfortunately, there is no additional locality information regarding this (these) specimen(s). I have seen a worker from Asuncion, Paraguay, collected by Emery and identified as *Myrmicocrypta uncinata* by Mayr. The specimen is deposited in the NHMW collection. This specimen is in agreement with the original description by Mayr (1887): 554). The specimens of *Myrmicocrypta bruchi* were described by Santschi (1936) based on two workers and a dealate queen from Alta Gracia, Cordoba, Argentina. Santschi described this species as being slightly larger than *uncinata* and lacking propodeal spines. I have studied a series (presumably a nest series) from Tucuman, Argentina. In this series, there are specimens with both long and short propodeal spines. In addition, some specimens of this series have the base of the propodeum slightly longer than the declivity of the propodeum, whereas in other specimens both the base and declivity of propodeum are very close in length. Specimens from São Paulo, Brazil, identified as *Myrmicocrytpa squamosa uncinata* by Forel differ slightly from the type series of *bruchi* and the specimen of *uncinata* from Paraguay by having slightly larger anterior mesonotal tubercles.

Regarding whether or not this species is *M. squamosa* described by Fr. Smith (1860), Kempf (1961) argues that the association of the workers from Ipiranga, São Paulo, as *squamosa* by Forel is due to the fact that the locality is São Paulo. However,

Kempf (1961) points out that the type of *M. squamosa* was collected by HW Bates in São Paulo de Olivença, a small town in the state of Amazonas, near the border with Colombia. It is true however, that *Myrmicocrypta uncinata* as defined here seems very closed to *Myrmicocrypta squamosa*. Comparison of the queens of *squamosa* with those of *uncinata* and *bruchi* suggests that they differ in the shape of the frontal lobes, the long propodeal spines in *squamosa*, and the length of the median clypeal seta.

Nests of this species are located underground, ~12cm from surface. The sole chamber is rounded, and the garden is usually grown from rootlets at the ceiling on the chamber.

Material examined. ARGENTINA: ***Provincia de Misiones;*** Parque Provincial Salto Encantado, Guard Station; 191m; 25º 42.162' S 54º 26.093º W; 31.iii.2003; (*TR Schultz*); nest series; TRS030331–01B [5w, 3aq, USNM]. ***Provincia de Santa Fe***; Naré; [19m; 30.9667º S 60.4667º W]; x.1957; (*N Kusnezov*) No. 10652 [1aq, IMLA]. ***Provincia de Salta***; Agua Blancas; [562m; 22.7333º S 64.3667º W]; (*N Kusnezov*) No.3024 [3w, USNM]. ***Provincia de Tucumán***; San Miguel de Tucumán; [430m; 26.8167º S 65.2167º W]; 25.ii.1953; (*N Kusnezov*) No.9163 [3w, LACM; 3w, MCZ; 28w, USNM]. Same as previous entry but 23.xii.1958; (*N Kusnezov*) No.10652 [1dq, IMLA]. San Miguel de Tucumán; [464m; 26.808285º S 65.217590º W]; (*N Kusnezov*) [2w, 1m, LACM; 2w, 1aq, 2m, MCZ]. **BRAZIL**: ***Rio Grande do Sul***; Pareci Novo; [92m; 29.6500º S 51.4000º W]; 21.iv.1926; (*B Rambo SJ*) [2w, 1dq, MZSP]. ***Santa Catarina***; Guatambu; Fazenda Don Guilherme; 517m; 27.14701º S

52.78491º W; (*J Sosa-Calvo*); JSC111004–04 [1aq, USNM]. Guatambu; Camping ground; 544m; 27.12622º S 52.76244º W; (*J Sosa-Calvo*); JSC111007–07 [1aq, USNM]. Guatambu; Fazenda Don Guilherme; 498m; 27.14757º S 52.78270º W; (*J Sosa-Calvo*); nest series; JSC111009–11 [3w, 1aq, USNM]. ***São Paulo***; São Paulo; [637m; 23.5333º S 46.6167º W]; (*Luederwaldt*) [1w, MZSP]. Ipiranga; [609m; 21.8000º S 47.7000º W]; 16.vi.1918; (*H Luederwaldt*) [1w, 1m, MZSP]. Ipiranga; [609m; 21.8000º S 47.7000º W]; 16.vi.1918; (*Ihering*) [3w, MHNG]. Rio Claro, Campus da UNESP; [612m]; 22.396º S 47.542º W; 29.ix.2006; (*C Rabeling*); nest entrance; soil nest; CR060929–09 [1w, USNM]. Same as previous entry, but 05.x.2006; CR061005–11 [1w, USNM]. **PARAGUAY**: no locality information [MHNG]. ***Departamento Canindeyu***; Res. Nat. Bosque Mbaracayu-Jejuimi; 264m; 24.1º S 55.5º W; 2.v.1996; (*A Wild*); AW0137 [2w, UCDC]. Same data as previous entry, but 11.vi.1996; AW0179, AW0201 [3w, LACM; 9w, UCDC]. Same data as previous entry, but 12.iii.1997; AW0491 [3w, UCDC]. Same locality as previous entry, but 24.1º S 55.4666667º W; 19–30.vi.1996; (*AC Costa*) [1m, UCDC]. ***Departamento Central***; Areguá; 164m; 25.3º S 57.3833333º W; 1.x.1995; (*A Wild*); AW0063 [2w, 2aq, LACM; 6w, 2aq,1m UCDC]. Asunción; [104m; 25.2821972º S 57.6351º W]; 1890; (*Emery*); [1w, NHMW]. ***Departamento Paraguari***; Ybycui; Parque Nacional Ybycui; 121m; 26.0166667º S 57.05º W; 1-2.x.1994; (*B Garcete*); AW0403 [1m, UCDC]. ***Departamento Presidente Hayes***; Monte Lindo; [45m; 23.9500º S 57.2000º W]; 16.xi.1993; (*B Garcete*); leaf-litter sample; AW0502 [1w, LACM; 1w, UCDC]. Same data as previous entry, 16.ix.1993; AW0476 [2w, UCDC].

Myrmicocrypta unidentata Weber, 1937

(Figure 2.42)

Myrmicocrypta unidentata Weber (1937): 384) (w). HOLOTYPE, **GUYANA**: Mazaruni River, Forest Settlement [prison]; [73m; 6.325792º N 58.644346º W]; 23.viii.1935; (*NA Weber*); NAW314. (MCZC) [MCZ35362, USNMENTNo. 00755348] [examined].

Diagnosis: *Worker*: small individuals (TL 2.81–3.08, WL 0.71–0.77), eyes small (EL 0.06–0.09, OI 12–18), convex with 3–5 ommatidia in longest row (~8–15 ommatidia total); frontal carina inconspicuous; frontal lobes somewhat expanded laterally, convex; cephalic corners convex; small propleuron tooth; portion between mesonotal and metanotal grooves high, appearing as single tooth; metanotal groove deep.

Measurements. WORKER. EL 0.06–0.09, FLD 0.18–0.22, GL 0.61–0.79, HFL 0.54–0.61, HL 0.60–0.64, HTL 0.36–0.44, HW 0.49–0.55, ML 0.32–0.41, MSL 0.04–0.06, MSLca 0.02–0.03, OI 12–18, PL 0.29–0.35, PPL 0.20–0.23, PPW 0.22–0.26, SL 0.50–0.58, TL 2.81–3.08, WL 0.71–0.77, CI 78–87, MI 52–64, MSI 6–9, MSLI 38–67, PPI 105–121, RFLDI 28–35, RFLDII 34–45, SI 98–115 (n=22).

Description: *Worker*: Head, in full-face view and excluding mandibles, slightly longer than broad (HL 0.60–0.64, HW 0.49–0.55, CI 78–87). In full-face view, cephalic margin straight to broaly convex, with very shallow (inconspicuous) median emargination; cephalic corners convex; dorsum of head rugulose; in full-face view, sides of head weakly convex; in full-face view, frontal carinae vestigial, frons shallowly concave medially. Mandibles triangular (ML 0.32–0.41, MI 56–64); inner (masticatory) margin with 6–7 irregular teeth; outer margin straight, slightly convex; dorsum of mandibles finely areolate-striolate. Anterior border of clyeal apron convex (slightly triangular), mid portion of clypeus (body of clypeus) raised as acute teeth (fronto-clypeal teeth); in oblique view, fronto-clypeal tubercles acuminate, carinate, covered with spoon-shaped hairs; clypeal unpaired median seta short, stout (MSL 0.04–0.06, MSI 6–9), originating proximal to posterior margin of clypeal apron and with 4–5 simple hairs on each side of median seta; dorsum of clypeal apron shinning and weakly wrinkled. Frontal lobes of moderate size (FLD 0.18–0.22), slightly expanded laterally, and broadly convex; posterior margin of clypeus extending between frontal lobes. Frontal carinae, posterior to frontal lobes extending parallel (nearly diverging) to each other, nearly at eye level, frontal carina not extending to cephalic margin. Eyes small (EL 0.06–0.09, OI 12–18) with 3–5 ommatidia in longest row (8–15 ommatidia total), convex, situated slightly above midline of head; in full-face view, postorbital carinae lacking; postero-ventral angles of the head (collar) produced on each side as a pair of blunt tubercles. Antennal scape (SL 0.50–0.58, SI 98–115) thickening towards apex; dorsum of antennal scape finely reticulate, covered

with sparce appressed narrow spoon-shaped hairs, becoming narrower towards apex. Hypostomal teeth present, triangular.

Mesosoma. In profile, dorsum of pronotum anteriorly flattened; anterior pronotal tubercles vestigial; humeral tubercles vestigial; lateral pronotal tubercles blunt with irregular carinae; in profile, dorsum of promesonotum flattened; propleural tubercle small but conspicuous; lateral and anterior mesonotal tubercles low (tumuliform), in profile anterior tubercle slightly larger than lateral, blunt, carinate, connected laterally (forming a square area); mid portion of mesonotum with single stout and pointed tubercle between the mesonotal and metanotal grooves (median tubercle absent); metanotal groove deeper than mesonotal groove; in lateral view, basal surface of propodeum carinate laterally, produced behind as small but distinct teeth; basal surface flat, quadrate, and as long as the declivity; propodeal declivity lacking lateral carinae.

Metasoma. Petiole pedunculate (PL 0.29–0.35) with antero-ventral process (lacking on holotype); in profile, ventral margin of petiole sinuous, with a pair of parallel carinae that originate at anterior portion of petiole, diverging backwards toward posterior margin; in profile, node rising smoothly and convexly to posterior descending dorsal surface; in dorsal view, node of petiole as long as broad, rounded anteriorly and straight posteriorly but with shallow median concavity; dorsal and ventral margins of postpetiole, in lateral view, evenly convex; postpetiole slightly shorter than petiole; in dorsal view, postpetiole subquadrate to trapezoidal, postpetiole

wider than long (PPL 0.20–0.23, PPW 0.22–0.26, PPI 105–121); posterior margin of postpetiole weakly emarginate medially; lateral margins of postpetiole broadly convex (almost straight). First gastral segment slightly longer than wide; first gastral tergite finely reticulate, covered with appressed spoon-shaped hairs.

Head with abundant narrow squamate hairs; mesosomal tubercles with sparse squamate hairs; postpetiole and first gastral tergite with spoon-shaped hairs; antennal scapes and legs with abundant, but not obscuring integument, narrow squamate. Body pale ferruginous, slightly darker on head, mandibles darker (brown).

Queen. Unknown.

Male. Unknown.

Comments. This species was described by NA Weber (1937) from a single worker he collected "in a virgin greenheart forest (*Nectandra rodei* Schomb.) near the Forest Settlement, Mazaruni River, British Guiana [Guyana]." There is another specimen deposited in the MZC collected on 18 June 1936 by NA Weber (collection number 461), in Oko River, Cuyuni River tributary, that is labeled as 'Paratype.' However, based on Weber's field notes, it seems to me that the collection number 461 is a mistake, since this collection number refers to specimens collected by Weber in Port of Spain, Trinidad on 3 June 1936, whereas the specimens collected in Oko River on 18 June 1936 should have received the collection number 480. This specimen differs slightly from the holotype specimen by having seven rather than six teeth on the

mandible and by having a small yet conspicuous ventral process on the anterior portion of the petiole.

The specimens from Venezuela differ slightly from the type and from the Guyana specimens by the (i) presence of triangular inferior pronotal (humeral) tubercles, whereas the specimens from Guyana lack humeral tubercles; (ii) cephalic margin with a pair of raised median carinae, similar to tubercles, whereas the cephalic margin is straight and lacks tubercles in the type and other Guyana specimens; (iii) fronto-clypeal tubercles somewhat less acute; (iv) overall appearing more sculptured than the type and the specimens from Guyana. The specimens from Brazil, Colombia, and Peru differ from the holotype and other Guyana specimens by the presence of small but conspicuous humeral tubercles.

This species is very similar to *Myrmicocrypta boliviana* Weber (1938), differing from it mainly in the size of the eyes (slightly larger in *M. boliviana* than in *M. unidentata*), the length of antennal scape (slightly larger in *M. boliviana* than in *M. unidentata*), and the overall worker body size, larger in *M. boliviana* (WL 0.80–0.90), smaller in *M. unidentata* (WL 0.71–0.77).

Material examined. BRAZIL: *Pará*; Benfica; [191m; 6.7650º S 70.9364º W]; 13.viii.1962; (*WL Brown*); B-170; [2w, MCZ]. Melgaço; Caxiuanã, ECFPn; [48m]; 1º 43’ 29.42” S 51º 25’ 47.23” W; 19–21.vii.2007; (*AY Harada* et al) [1w, MPEG]. Same data as previous entry, but 21–23.i.2007 [1w, MPEG]. Same data as previous entry, but 1º 42’ 23.81” S 51º 27’ 32.72” W; 25–27.vii.2006 [1w, MPEG]. Same data as previous entry, but 1º 46’ 53.58” S 51º 35’ 31.10” W; 22–24.iv.2006 [1w, MPEG].

Posto Trombetas; [87m; 1.484444º S 56.399167º W]; 01.viii.1992; (*JD Majer*); 4552; [2w, CEPEC]. **COLOMBIA: *Putumayo*;** PNN La Paya, Cabaña La Paya, Chagra; 320m; 0º 7' S 74º 56' W; 30.iv–1.v.2002; (*R Cobete*); winkler; M3154 **[**2w, IAvHC]. **GUYANA: *Cuyuni–Mazaruni*;** Calm Water Creek, along Essequibo River nr Bartica; [656m]; 6º 28.06' N 58º 37.16' W; 24.ix.2002; (*JS LaPolla*); litter sample; 1º forest; JSL020925–01–LS09 [2w, USNM]. Oko River, Cuyuni River tributary; [54m; 6.466667º N 58.866667º W]; 18.vi.1936; (*NA Weber*); NAW461 [1w, MCZC]. ***Potaro-Sipurini*;** Paramakatoi; PK-Kato Trail; [970m; 4.7167º N 59.7000º W]; 15.iv.1996; (*TR Schultz* & *UG Mueller*); nest series; soil; TRS960415–08 [3w, USNM]. same data, TRS960415–07 [3w, USNM]. ***Upper Takutu-Upper Essequibo;*** Kanuku Mountains; Moco-Moco Falls; 224m; 3º 17.297' N 59º 38.376' W; 20.x.2002; (*TR Schultz, JS LaPolla, C Marshall, R Williams*); winkler; leaf-litter; 2º forest; JSL021020–01–LS06 [1w, USNM]. nr. Kamoa River; Kamoa R. Camp; 293m; 1º 23.171º N 58º 56.804º W; 10.x.2006; (*J Sosa-Calvo, TR Schultz*); winkler; leaf-litter; 1º forest; JSC061010–LS04 [1w, USNM]. Same data as previous entry, but 314m; 1º 23.137º N 58º 56.787º W; JSC061010–LS06 [1w, USNM]. nr. Kamoa River; Kamoa R. Camp; 394m; 1º 32.786' N 58º 49.929' W; 22.x.2006; (*J Sosa-Calvo, TR Schultz*); winkler; leaf litter; 1º forest; TRS061022–LS01 [3w, USNM]. **PERU: *Madre de Dios*;** Puerto Maldonado; Sachavacayoc Centre; 194m; 12.85286º S 69.36720º W; 19–31.vii.2012; (*R Feitosa*); winkler [1w, USNM]. **VENEZUELA: *Amazonas;*** Expedicion Tapirapeco; Camp Base; 200m; 2º 1' N 67º 7' W; 31.i.1989; (*J Lattke*); JL1233 [2w, MIZA].

Myrmicocrypta urichi Weber, 1937

(Figure 2.43–2.44)

Myrmicocrypta urichi Weber (1937): 379), figs 2–3 (w.q.m.). 9 cotype workers, 1 cotype queen, 1 cotype male. **TRINIDAD**: Rio Claro–Mayaro; Mayaro Bay; [0m; 10.25º N 60.9666667º W]; (*NA Weber*); nest series under coconuts. [Examined]. The lectotype, here designated, is a worker (top point) with unique identifier number [USNMENT No. 00758572] deposited at MZC.

Measurements. WORKER. EL 0.09–0.11, FLD 0.17–0.20, GL 0.70–0.91, HFL 0.67–0.78, HL 0.71–0.78, HTL 0.46–0.56, HW 0.54–0.61, ML 0.40–0.48, MSL 0.05–0.07, MSLca 0.02–0.03, OI 15–18, PL 0.30–0.42, PPL 0.15–0.20, PPW 0.25–0.29, SL 0.60–0.71, TL 3.15–3.68, WL 0.84–0.96, CI 76–83, MI 54–68, MSI 7–10, MSLI 36–56, PPI 130–200, RFLDI 23–28, RFLDII 29–35, SI 106–121 (n=18).

Diagnosis. Frontal lobes weakly expanded laterally, convex; propodeal spines short; antero-ventral process of petiole tooth-like; anterior margin of petiole rounded.

Description. Worker. *Head.* In full-face view, excluding mandibles, longer than wide (HL 0.68–0.78, HW 0.54–0.59, CI 76–83); sides of head broadly convex, almost straight; cephalic corners angulate; posterior cephalic margin straight, weakly emarginate medially; in full-face view, dorsum of head rugose; in full-face view, frontal carinae weakly impressed; occiput drawn into a bidentate collar; anterior margin of clypeal apron broadly convex; unpaired clypeal seta short (MSL 0.05–0.07,

MSI 7–10) with 5–6 appressed narrowly flattened hairs on each side of median seta; in lateral view, fronto-clypeal teeth reduced; in oblique view, clypeus triangular, posterior margin, in front of antennal insertions, produced into carinate fronto-clypeal teeth; lateral margin of body of clypeus weakly carinate. Mandibles triangular, long (ML 0.40–48, MI 54–68), with slightly sinuous outer margin; inner (masticatory) margin 7–8-toothed; dorsum of mandibles reticulate; eyes small (EL 0.09–0.11, OI 15–18), convex, with 5–7 ommatidia in longest row (13–30 ommatidia total), situated posterior to midline of head at a level above frontal lobes; frontal lobes weakly expanded, convex, (FLD 0.17–0.20); frontal lobes slightly separated, posterior margin of clypeus extending between frontal lobes, posterior margin of clypeus convex, medially close together; antennal scapes long (SL 0.60–0.71, SI 106–121), reticulate; antennal scapes covered with suberect elongate spoon-shaped hairs. Hypostomal teeth small, triangular.

Mesosoma. Dorsum of pronotum smooth, anterior pronotal tubercles vestigial to absent, covered with spoon-shaped hairs; in dorsal view, humeral tubercle small, triangular; in dorsal view, lateral pronotal tubercles as rounded carinae; in lateral view, lateral pronotal tubercles as low tumosities; propleuron angulate, carinate; sides of pronotum smooth; lateral and anterior mesonotal present as low carinate tubercles, connected by thin lateral carinae, anterior mesonotals slightly larger than lateral mesonotals; area between meso and metanotal grooves, with very small tubercles; metanotal groove shallow almost as deep as mesonotal groove; anterior portion of propodeum angulate; in lateral view, basal face of propodeum flat; basal face of

propodeum as long as propodeal declivity; propodeal spines short triangular, acute; basal and declivous faces of propodeum with thin lateral carinae.

Metasoma. Petiole distinctly pedunculate, long (PL 0.30–0.42); in lateral view, anterior margin of petiolar node rounded; in dorsal view, node of petiole rounded; in lateral view, antero-ventral process of petiole toothed; in lateral view, ventral margin of petiole weakly sinuous, and with thin ventral carinae; posterior margin of petiole with thin carinae. Postpetiole, in lateral view, convex dorsally; in dorsal view, disc of postpetiole, dome-like, with postero-inferior margin angled; sides of postpetiole convex; in dorsal view, disc of postpetiole wider than long (PPL 0.15–0.20, PPW 0.25–0.29, PPI 130–200); in dorsal view, posterior margin of postpetiole weakly emarginate medially. In lateral view, gaster tergite I widely convex; in dorsal view, gaster long-ovate (longer than wide); gastral tergite I reticulate; gastral tergite I with appressed spoon-shaped hairs.

Body dull, light-brown to dark brown. Pilosity of moderately abundant short, narrow spoon-shaped on dorsum of head, less abundant on thorax where confined largely to projections; dorsum of petiole and postpetiole with spoon-shaped hairs. Hairs on antennal scapes and legs appressed, narrow squamate.

Queen. Dealate. As the worker with modifications expected for the caste and with the following differences:

Mesosoma. Dorsum of pronotum rugose; dorsum of mesoscutum rugose; parapsidal lines present; scutellum wider than long; posterior margin of scutellum bidentate. Propodeal spines short but well-developed.

Metasoma. In dorsal view, postpetiole dome-like; posterior margin of postpetiole medially emarginate; latero-posterior margin of postpetiole emarginate. Base of gaster with short longitudinal striae, rest of gastral segmernt I reticulate.
Darker in color than the worker.

Measurements. QUEEN. EL 0.16, FLD 0.21, GL 1.22, HFL 0.85, HL 0.84, HTL 0.60, HW 0.71, ML 0.47, MSL 0.06, MSLca 0.03, OI 22, PL 0.55, PPL 0.23, PPW 0.49, SL 0.71, TL 4.45, WL 1.13, CI 84, MI 56, MSI 7, MSLI 44, PPI 209, RFLDI 25, RFLDII 30, SI 100 (n=1).

Male. *Head*. Excluding mandibles, slightly longer than wide; cephalic corners angulate; cephalic margin with three concavities; posterior ocelli behind with a pair of low tubercles; vertexal portion of head transversely and deeply excised short neck. Anterior margin of clypeal apron convex; median clypeal seta thick (MSL 0.07, MSI 10). Mandibles triangular (ML 0.39, MI 51), inner margin of mandible 7-toothed; dorsum of mandible reticulate. Eyes large (EL 0.33, OI 50), hemispherical. Frontal lobes straight (FLD 0.22), as vertical carinae, not covering antennal insertions. Frontal carinae present, forming a small tumosity at level of median ocellus. Antennal scapes short (SL 0.33, SI 50), sub-cylindrical. Hypostomal teeth triangular.

Mesosoma. Pronotum lacking anterior pronotal tubercles; humeral tubercles triangular; lateral pronotal tubercles pyramidal, with wide base. Mesoscutum with a pair of longitudinal median carinae and carinae on margins; anterior portion of mesoscutum laterally concave; in lateral view, anterior margin of mesoscutum angulate; posterior margin of mesoscutum with lateral tubercles. In lateral view, axillae raised, triangular; in dorsal view, dorsum of scutellum rugulose; posterior margin of scutellum bidentate. Propodeal spines long.

Metasoma. Petiole pedunculate; node of petiole present; first gastral tergite slightly wider than long.

Head and thorax opaque, dark brown; antennae, mandible, legs yellowish; pilosity of scarce short and recurved white hairs.

Measurements. MALE. EL 0.33–0.34, FLD 0.22, GL 1.39–1.58, HFL 1.08–1.29, HL 0.76–0.86, HTL 1.00–1.18, HW 0.66–0.77, ML 0.39–0.42, MSL 0.07–0.09, MSLca 0.03–0.05, OI 45–50, PL 0.55–0.69, PPL 0.22–0.26, PPW 0.44–0.48 SL 0.33–0.39, TL 4.70–5.35, WL 1.38–1.54, CI 86–89, MI 49–51, MSI 10, MSLI 45–54, PPI 184–197, RFLDI 25–29, RFLDII 28–33, SI 50 (n=2).

Comments. This species is very similar to *Myrmicocrypta buenzlii* but differs from it by the expanded frontal lobes, the small propodeal spines, and the large antero-ventral process of the petiole.

This species is widely distributed from Trinidad and Tobago to western Colombia from 0m to 1750m elevation. Observed variation includes:

i. Some specimens from Trinidad are bicolored, with the head slightly darker than the rest of the body.

ii. Specimens from Magdalena, Colombia, are darker in color, with slightly longer propodeal tubercles than those of the Trinidad specimens, and with the gaster brown-reddish.

iii. Specimens from Antioquia, Colombia, differ from the type series from Trinidad by the presence of slightly larger propodeal spines.

iv. Specimens from Sanare, Venezuela, are slightly larger than the type series from Trinidad. The males resemble in all aspects the male from Trinidad except for the presence of anterior pronotal tubercles and the size.

Weber (1945) discusses the biology and nest architecture of this species. The nest entrance consists of a crater of ~2–5cm diameter with a small hole in the center. The chamber is located no more than 5cm from the surface. The fungus garden is usually suspended from the chamber's roof by rootlets. Colonies contain no more than a 200 individuals.

Material examined. COLOMBIA: ***Antioquia***; Santa Fe de Antioquia, Finca Cotove UN; 600m; 6.5613889º N 75.8316667º W; 6.x.2000; (*E Vergara* & *F Serna*); Forest,

hand collection [8w, UNAB]. Same as previous entry but 24.xi.2003; (*F Yepes*); nest series [3w, UNAB]. San Carlos, Corregimiento Puerto Garzón; [1009m; 6.190648º N 74.994004º W]; 5.i.2007; (*E Vergara* & *F Serna*) [1w, UNAB]. ***Magdalena***: PNN Tayrona Pueblito; 225m; 11.3333333º N 74.0333333º W; 5–7.ix.2000; (*R Henriquez*); M657; Winkler [3w, IAvHC]. Bahia de Gairaca, PNN Tayrona ca 20km NE Santa Marta; [33m; 11.317010º N 74.106300º W]; vi.1985; (*HG Mueller*); pitfall [3dq, UCDC]. ***Meta***; Transecto Sumapaz; 1540m; [4 ºN 74.3333º W]; 29.vii.1981; (*T van der Hammen* et al.) [1w, UCDC]. Villavicencio; [500m; 4.1533333º N 73.635º W]; 17.xii.1975; (*W* & *E Mackay*) [1dq, UTEP]. ***Santander***; Municipio Pinchote, Vda El Bosque, Fca Santa Marta; 1720m; 6.4868056º N 73.1846389º W; 25.ii.2004; (*J Henao*); café con sombra; pitfall [4w, IAvHC]. **TRINIDAD:** ***Rio Claro–Mayaro***; Nariva Swamp; [8m; 10.4166667º N 61.0833333º W]; 25.vi.1935; (*NA Weber*); nest series (NAW212, NAW213) [23w, 2dq, MCZ; 4w, USNM; 1w, LACM] . Same as previous entry, but NAW214.1 [1w, MCZ]. Mayaro Bay; [8m; 10.25º N 60.9666667º W]; 25.xi.1934; (*NA Weber*); (NAW008) [4w, MCZ]. ***Tunapuna–Piarco***; Simla Biological Station; [176m; 10.6836111º N 61.2833333º W]; 17.i.1995; (*UG Mueller*); nest series; UGM950117–04 [6w, USNM]. Same as previous entry but UGM950115–01 [5w, USNM]. Same as previous entry but 7.i.1995; UGM950107–02 [5w, USNM]. Same as previous entry but 18.i.1995; UGM950118–01 [11w, 1aq, 4m, USNM]. ***San Juan–Laventille***; Las Cuevas [Reserve?]; [94m; 10.7833333º N 61.3833333º W]; 10.i.1995; (*UG Mueller*); nest series; UGM950110–13 [9w, 2aq, USNM]. **VENEZUELA:** ***Aragua***; Valle Santa Maria, PNH Pittier, 4.8 km SW Cumboto; 850m; 10.3666667º N 67.8266667º W; 03.ix.2003; (*E Rodriguez* et al.)

[5w, MIZA]. Same data as previous but, 4.5km SO Cumboto; 860m; 05.viii.2003 [3w, MIZA]. Ocumares de la Costa; 20m; 10.46097º N 67.77406º W; 13.viii.2008; (*JT Longino*); JTL6450-e [2w, JTLC]. El Castaño; [641m; 10.121797º N 67.165642º W]; 1.xi.1983; (*E Doreste*) [1dq, MIZA]. ***Cojedes***; Carretera Manrique, La Sierra; 300m; [9.895898º N 68.590000º W]; 5.xi.1983; (*F Fernandez*) [4w, MIZA]. ***Falcon***; 4km NO Macuquita, Sierra de S. Luis; 900m; [11.278212º N 69.573517º W]; 25.vi.1983; (*JE Lattke*) [1w, MIZA]. Serrania de San Luis; 1120m; [11.223775º N 69.549958º W]; 19.viii.1993; (*A Mayhé*) [3w, USNM]. ***Lara***; Sanare; 1300m; [9.7839º N 69.1611º W]; 6.xii.1985; (*JE Lattke & WL Brown*) [1w, USNM]. Same as previous, but Posada El Sauce; 1330m; soil; lawnedge [7w, 7m, MCZ). ***Miranda***; Padron, Est. Exp. de Caucagua, ca R Tuy & R Cuira; [60m; 10.274798º N 66.373951º W]; 16.iii.1982; (*CRF Brandão* et al.) [1w, MZSP]. Parque Nacional Guatopo; 1750m; [10.083333º N 66.416667º W]; 13.iii.1982; (*CRF Brandão* et al.) [2w, MZSP]. ***Nueva Esparta***; Isla Margarita; abajo la toma de agua del Valle; [124m; 10.986944º N 63.935556º W]; 4.vii.1936; (*P Hummelinck*) [2w, MCZ]. ***Zulia***; El Tucuco; 500m; [9º 50’ 44.37” N 72º 48’ 44.22” W]; 6.ix.1984; (*J Lattke*); JL562 [2w, USNM].

Myrmicocrypta weyrauchi Borgmeier, 1948

(Figure 2.45–2.46)

Myrmicocrypta weyrauchi Borgmeier (1948): 204), figs. 29, 30 (w.q.). 11w, 1 dq, syntypes, **PERU:** Provincia de Chanchamayo; Valle Chanchamayo; 800m; [11.054386° S 75.329036° W]; 1.viii.1939; (*W Weyrauchi*) (No. 28) (MZSP)

[examined]. The lectotype, here designated, is a worker (top specimen) with unique identifier number [USNMENT No. 00755536] deposited at MZSP.

Diagnosis. Very similar in general habitus to *M. occipitalis*. *Worker*. Frontal lobes expanded laterally, triangular, with anterior margin slightly concave; frontoclypeal teeth acute, long; hypostomal teeth short; antero-ventral margin of petiole with small process; in lateral view, anterior margin of node of petiole rounded; hairs on hind tarsi appressed. *Queen.* Smaller than the queen of *M. occipitalis*; lateral pronotal spines short, pointing upwards; mesoscutum lacking lateral projections; propodeal spines short; ventral process of petiole present.

Description. Worker. *Head*: in full-face view and excluding mandibles, longer than broad (HL 0.68–0.78, HW 0.51–0.59, CI 73–78); posterior cephalic margin interrupted medially by pair of tubercles; cephalic corners rounded, posteriorly tuberculate (angulate); postero-ventral angles of head (collar) drawn out on each side in two large blunt tubercles; anterior margin of clypeal apron convex, apron not as expanded as in *M. occipitalis*; unpaired clypeal seta mid-sized (MSL 0.06–0.11, MSLI 8–14); frontoclypeal teeth, in lateral and oblique view, acute. Mandibles triangular, long (ML 0.39–0.45, MI 55–61), with convex outer margin; inner (masticatory) margin of mandibles 7–9-toothed. Eyes slightly larger than those of *M. occipitalis* (EL 0.08–0.10, OI 15–17); with 5–6 ommatidia in longest row (14–26 ommatidia total); situated posterior to midline of head above frontal lobes level. In full-face view, frontal lobes expanded laterally, triangular, with anterior margin with small concavity; frontal lobes slightly separated. Frontal carinae conspicuous,

continuing backwards as indistinct ridges enclosing a circular, depressed area. Antennal scapes long (SL 0.65–0.74, SI 122–136). In lateral view, hypostomal teeth small, triangular.

Mesosoma. Anterior pronotal tubercles tooth-like; humeral pronotal tubercle long, needle-like, and projecting laterally; lateral pronotal tubercles acute with wide base. In lateral view, propleuron with small triangular tubercle. Lateral mesonotal tubercles triangular; anterior mesonotal tubercles, small, triangular. Area between mesonotal– and metanotal– grooves with two pairs of small tooth-like tubercles. Metanotal groove deep, concave. Propodeum produced anteriorly as small tubercle and posteriorly, produced as moderately to long, slender, and acute propodeal spines. Basal and declivous face of propodeum with thin lateral carinae; in lateral view, propodeal inferior lobe rounded.

Metasoma. Petiole pedunculate; in lateral view, anterior portion of petiolar node rounded, dorsal margin flat; posterior margin of petiole with small tooth-like carinae; in lateral view, petiole with small antero-ventral process; ventral margin of petiole sinuate; postpetiole wider than long (PPL 0.14–0.18, PPW 0.18–0.23, PPI 114–140), with anterior margin straight; posterior margin emarginate medially. Gaster, in lateral view, dorsally flattened; in dorsal view, gaster long-ovate (longer than wide). Gastral tergite I reticulate. Legs long and slender (HTL 0.55–0.64, 0.72–0.86). Hairs on hind tarsomere I appressed.

Body pale brownish-yellowish; hairs finely scale-like and much scarce than in *M. occipitalis*.

Material examined. Measurements. WORKER. EL 0.08–0.10, FLD 0.21–0.26, GL 0.69–0.89, HFL 0.72–0.86, HL 0.68–0.78, HTL 0.55–0.64, HW 0.51–0.59, ML 0.39–0.45, MSL 0.08–0.11, MSLca 0.05–0.09, OI 15–17, PL 0.26–0.36, PPL 0.14–0.18, PPW 0.18–0.23, SL 0.65–0.74, TL 3.13–3.47, WL 0.85–0.97, CI 73–78, MI 55–61, MSLI 11–14, PPI 114–140, RFLDI 30–34, RFLDII 41–45, SI 122–136 (n=10).

Queen. Dealate. Resembling the worker, with modifications expected for the caste with the following differences.

Head. Dorsum of head with frontal and vertexal carinae and carinae on cephalic corners more conspicuous than in worker, raised, better seen in lateral view.

Mesosoma. Median carina of mesoscutum strongly impressed; mesoscutum with two weak central carinae, slightly raised anteriorly, somewhat angulate, when seen in lateral view; in dorsal view, mesoscutum lacking lateral projections; parapsidal lines weakly impressed. Scutellum, in dorsal view, broadly triangular, wider than longer; posterior margin bidentate. In lateral view, propodeal lobes rounded; dorsum of mesoscutum and scutellum wrinkled; anepisterum, katepisternum, and sides of propodeum wrinkled; dorsal and declivous face of propodeum smooth.

Metasoma. Petiole as in the worker, with ventral process more developed. Gastral tergite I finely reticulate; covered with spoon-shaped hairs.

Measurements. QUEEN. EL 0.17–0.18, FLD 0.29–0.30, GL 1.06, HFL 0.92–0.93, HL 0.83–0.84, HTL 0.70–0.71, HW 0.63–0.66, ML 0.47–0.48, MSL 0.09–0.10, MSLca 0.06–0.08, OI 25–29, PL 0.44–0.47, PPL 0.17–0.21, PPW 0.32, SL 0.80, TL 4.13–4.24, WL 1.16–1.19, CI 75–79, MI 56–57, MSLI 11–12, PPI 196, RFLDI 35, RFLDII 45–46, SI 121–128 (n=2).

Male. *Head.* Excluding eyes, triangular; cephalic corners with small tubercles; cephalic margin produced, behind of each posterior ocellus, as an acute pyramidal tubercle. Frontal lobes small, weakly expanded, widely separated (FLD 0.22). Frontal carinae present, forming small tubercle on each side of median ocellus. Mandibles triangular with convex outer margin and 8–9 distinct teeth; dorsum of mandibles strongly reticulate. Clypeal apron widely convex; unpaired clypeal seta mid-sized (MSL 0.08, MSI 10), and thin; in oblique view, body of clypeus rounded medially, carinate laterally, and with median raised carina. Antennal scape short (SL 0.41–0.43, SI 65–68), strongly reticulate; second and third funicular joints taken together slightly shorter than antennal scapes (antennal scapes shorter than the length of funicular segments I–III). in lateral view, occipital area (behind vertexal tubercles) concave and with median carina. Hypostomal teeth short, blunt.

Mesosoma. Pronotum with lateral and humeral tubercles present; anterior pronotal tubercles either present or with a raised carinae present before promesoscutal line and connecting with each lateral tubercle; inferior pronotal carinae as in the worker and queen; propleural margin angulate. Mesoscutum like in the queen, with pair of longitudinal carinae more pronounced, in lateral view, dorsum of mesoscutum flat; scutellum like in queen, axillae triangular; propodeal spines with wide base, long, very slender, and rounded at tip.

Metasoma. Peduncle of petiole with antero-ventral tooth, and with ventral margin sinuous; in lateral view, node anteriorly angulate, and dorsally flattened. Postpetiole broader than long (PPL 0.20–0.22, PPW 0.30–0.31, PPI 139–157); shape of postpetiole as in the worker and queen. Gaster, in lateral view, somewhat convex dorsally; gastral tergite I finely areolate. Legs long and slender.

Body opaque and weakly rugose on head and thorax, mandibles, antennal scapes, and gastral tergite I finely reticulate-punctate. Pilosity confined to sparse, simple hairs which are recurved on sculpturing, and a fine appressed pubescence on appendages. Body color brown, appendages paler, mandibles yellowish brown. Wings somewhat smoky.

Measurements. MALE. EL 0.32, FLD 0.22, GL 1.10–1.16, HFL 1.09–1.10, HL 0.75–0.76, HTL 1.01–1.05, HW 0.63–0.64, ML 0.37–0.38, MSL 0.08, MSLca 0.07, OI 50–51, PL 0.55, PPL 0.20–0.22, PPW 0.30–0.31, SL 0.41–0.43, TL 4.33–4.35, WL 1.32,

CI 83–85, MI 49–50, MSLI 10, PPI 139–157, RFLDI 29, RFLDII 34–35, SI 65–68 (n=2).

Comments. This species is very similar to *Myrmicocrypta occipitalis*, but differs from it mainly by (i) the frontal lobes expanded, triangular, and with a shallow anterior concavity; (ii) the presence of a ventral process of the petiole; (iii) the small hypostomal teeth; and (iv) appressed hairs on the tarsomeres. The queen and male of *M. weyrauchi* are significantly smaller than the queen and male of *M. occipitalis*.

Material examined. BRAZIL: *Acre*; Porto Walter; [198m]; 8º 15' 31.2" S 72º 46' 37.1" W]; 05.ii–17.iv.1997; (*J Caldwell*); 12738; in *Bufo typhonius* [3w, CEPEC]. ***Pará;*** Melgaço, Caxiuanã, ECFPn II; [39m]; 1º 44' 9.01" S 51º 29' 15.44" W; 26–28.iv.2007; (*AY Harada* et al.); Winkler [1w, MPEG]. **PERU: *Provincia de Chanchamayo;*** Valle Chanchamayo; 800m; [11.054386° S 75.329036° W]; 1.vi.1939; (*W Weyrauchi*) (No. 322) [6w, 1aq, 3m, USNM]. Same as previous entry, but 1.viii.1939 (No. 28) [type series; 10w, 1dq, MZSP]. ***Madre de Dios;*** Cuzco Amazónico; 15 Km NE of Puerto Maldonado; 200m; [12.585064º S 69.242329º W]; vi.1989; (*SP Cover* & *JE Tobin*) [1w, MCZ].

Myrmicocrypta JSC–001 **sp. nov.**

(Figure 2.47–2.48)

HOLOTYPE: 1w, GUYANA: Potaro-Sipurini; Dicymbe Forest; 717m; 5º 17.76' N 59º 54.63' W; 6.x.2002; (*TR Schultz*, *JS LaPolla*, *C Marshall*, *R Williams*); nest series; Dycimbie forest; log; TRS021006–02; (UGEC) [USNMENTNo. 00412814].

Paratypes: 16w, same data as holotype; (USNM) [USNMENTNo. 00412807–08, 00412810–12, 00412816–19, 00412822, 00412824, 00413609, 00413624, 00445003–04, 00758292]. 427w, same data as holotype; (USNM) [Ethanol vials, USNMENTNo. 00414773–78, 00414780–81, 00415309–12, 00521887]. 1dq, same data as holotype; (USNM) [USNMENTNo. 00444993]. 7m, same data as holotype; (USNM) [USNMENTNo. 00412809, 00412811, 00412815, 00412821, 00413608, 00413624, 00445004]

Measurements. Holotype (Paratypes). WORKER. EL 0.13 (0.13–0.14), FLD 0.27 (0.26–0.29), GL 0.97 (0.96–1.04), HFL 0.90 (1.02–1.17), HL 0.94 (0.91–0.98), HTL 0.75 (0.74–0.79), HW 0.79 (0.77–0.82), ML 0.61 (0.58–0.70), MSL 0.09 (0.09–0.11), MSLca 0.05 (0.04–0.06), OI 12 (11–14), PL 0.50 (0.40–0.59), PPL 0.36 (0.31–0.38), PPW 0.34 (0.31–0.38), SL 0.91 (0.88–0.94), TL 4.63 (4.46–4.75), WL 1.24 (1.18–1.30), CI 84 (83–87), MI 65 (61–74), MSLI 50 (40–53), PPI 95 (95–109), RFLDI 29 (29–31), RFLDII 34 (33–37), SI 116 (109–119) (n=17).

Diagnosis. *Worker*: median sized individuals (TL 3.82–4.88, WL 1.01–1.27), eyes relatively large, convex (7–10 ommatidia in longest row, ~27–54 ommatidia total; EL 0.11–0.15, OI 14–18); frontal carina conspicuous surrounding frons; frontal lobes

somewhat triangular; cephalic corners angulate; dorsum of pronotum with appressed squamate hairs.

Description. Worker. *Head:* in full-face view and excluding mandibles, slightly longer than broad (HL 0.81–0.98, HW 0.69–0.82, CI 80–88); in full-face view, cephalic corners with blunt tubercles; cephalic margin broadly concave, interrupted medially by pair of tubercles, formed from irregular carinae crossing dorsal surface anterior to cephalic corners; in full-face view, sides of head straight. In full-face view, mandibles triangular, large (ML 0.50–0.63, MI 60–67); inner (masticatory) margin of mandibles with 7–9 irregular teeth, outer margin slightly sinuous; dorsum of mandibles finely areolate-striolate. Anterior border of clypeal apron convex; dorsum of clypeal apron shinning and finely wrinkled; mid portion of clypeus (body of clypeus) rugulose and raised as blunt teeth (fronto-clypeal teeth) underneath antennal insertions; in oblique view, fronto-clypeal tubercles triangular, carinate; in oblique view, sides of clypeus with thin carinae; unpaired clypeal seta mid-sized, stout (MSL 0.07–0.11, MSI 9–14), and with ~6–7 narrow spoon-shaped hairs on each side; in full-face view, posterior margin of clypeus extending between frontal lobes. Frontal lobes of moderate size (FLD 0.24–0.29), slightly expanded laterally, triangular. Frontal carinae extending posteriorly as irregular carinae enclosing frontal area, posteriorly extending weakly to mid tubercles and laterally to cephalic corners. Eyes mid-sized (EL 0.11–0.15, OI 14–17) with 8–10 ommatidia in longest row (42–53 ommatidia total), convex, situated slightly above midline of head; in full-face view, postorbital (preocular) carinae weakly impressed; postero-ventral angles of head

(collar) produced on each side as pair of conspicuous blunt tubercles. Antennal scape long (SL 0.76–0.94, SI 108–121), thick; dorsum of antennal scape finely reticulate, covered with appressed spoon-shaped hairs, narrowing towards apex. In profile, hypostomal teeth acute, large (~1/2 length of eye).

Mesosoma. In dorsal view, pronotum with anterior and humeral tubercles tooth-like, acute and short, lateral pronotals thick, larger than previous tubercles; in dorsal view, dorsum of pronotum smooth, with appressed spoon-shaped hairs; in lateral view, propleuron with small, blunt tubercle; lateral mesonotal tubercles large, larger than any tubercle on mesonotum; in dorsal view, tubercles slightly diverging from median line; anterior mesonotal tubercles low rounded at tip, less massive than lateral mesonotals; area between mesonotal and metanotal grooves with conspicuous tubercle, acute, and carinate; metanotal groove deep; anterior margin of propodeum lacking tubercles, rounded or angulate; basal surface of propodeum laterally with thin carinae that end on long propodeal teeth. In lateral view, area between mid and hind coxae with small but conspicuous tooth.

Metasoma. In lateral view, petiole pedunculate; in lateral view, node of petiole subquadrate; anterior margin angulate, dorsal margin flat; petiole with small, inconspicuous, antero-ventral process; ventral margin of petiole with two parallel thin carinae that extend to posterior margin; in dorsal view, node of petiole longer than wide; posterior margin of petiole straight. Postpetiole variable, longer than wide or slightly wider than long (PPL 0.29–0.38, PPW 0.30–0.37, PPI 95–110); in lateral view, postpetiole longer than high, subquadrate, anteriorly rounded, dorsally broadly

convex; in dorsal view, anterior margin convex, lateral margin broadly convex with postero-lateral angles rounded, posterior margin of postpetiole emarginate medially; postero-lateral margin carved; dorsum of postpetiole covered with appressed squamate hairs. Gastral tergite I with antero-lateral margin convex; gastral tergite I distinctly longer than broad; tergite surface finely punctate, lateral margins smooth and shining. Legs long and slender (HTL 0.65–0.79, HFL 0.94–1.17).

Head and thorax opaque and shagreened, smooth. Hairs of body squamate, sparce; most abundant on carinae, tubercles, dorsum of postpetiole, gastral tergite I, legs, and antennal scapes. Color of body yellowish to dark ferruginous, some specimens with head and gaster darker than rest of body.

Other material examined. Measurements. Worker. EL 0.11–0.15, FLD 0.24–0.28, GL 0.83–0.99, HFL 0.94–1.13, HL 0.81–0.96, HTL 0.65–0.79, HW 0.69–0.80, ML 0.50–0.60, MSL 0.07–0.09, MSLca 0.03–0.05, OI 14–18, PL 0.34–0.52, PPL 0.29–0.35, PPW 0.30–0.36, SL 0.76–0.93, TL 3.82–4.57, WL 1.01–1.26, CI 80–88, MI 60–67, MSLI 33–70, MSI 9–13, PPI 96–110, RFLDI 27–31, RFLDII 33–38, SI 108–121 (n=20).

Queen. As in the worker with modifications expected for caste and with the following differences:

Head. Dorsum of head rugulose.

Mesosoma. Dorsum of pronotum rugose; sides of pronotum smooth and glabrous. In dorsal view, mesoscutum with pair of parallel raised carinae extending through entire length of mesoscutum; median line present, conspicuous. Parapsidial lines conspicuous. Dorsum of mesoscutum rugulose. Posterior margin of mesoscutum with small teeth that project lacterally. Axillae triangular, with raised carinae. Scutellum larger than broad; lacking lateral projections, posteriorly bidentate; dorsum rugose. Base and declivity of propodeum laterally carinate; propodeal spines present, acute; anapleural sulcus present, deep, anepisternum rugulose and katepisternum rugose.

Metasoma. In dorsal view, petiole weakly rugose. In dorsal view, postpetiole trapezoidal, wider than long (PPL 0.42–0.46, PPW 0.58–0.66, PPI 132–156), posterior margin widely concave medially; dorsum of postpetiole rugulose. Gastral tergite I strongly reticulate.

Body (head, mesosoma, coxae, waist segments, and base of gaster) covered with spoon-shaped hairs.

Measurements. QUEEN. EL 0.22–0.25, FLD 0.32–0.36, GL 1.44–1.71, HFL 1.30–1.41, HL 1.08–1.14, HTL 0.91–1.00, HW 0.94–1.06, ML 0.63–0.69, MSL 0.09–0.11, MSLca 0.03–0.05, OI 24–25, PL 0.65–0.82, PPL 0.42–0.46, PPW 0.58–0.66, SL 1.02–1.07, TL 5.87–6.47, WL 1.61–1.73, CI 86–94, MI 56–62, MSLI 38–54, MSI 8–10, PPI 132–156, RFLDI 29–34, RFLDII 32–36, SI 96–109 (n=6).

Male. *Head:* In full-face view, mandibles broadly triangular; masticatory margin of mandibles with 9–12 teeth; apical and subapical teeth largest decreasing in size towards base; dorsum of mandibles densely reticulate. Anterior margin of clypeal apron broadly convex; dorsum strigulate; unpaired median seta present, thick almost flattened medially (MSL 0.08–0.10, MSI 10–12); in lateral view, clypeus obtusely angulate; in oblique view, dorsally convex, sides carinate. Antennal scapes short (SL 0.40–0.44, SI 45–53), finely reticulate; in full-face view, antennal scapes slightly thicker at base than apex; antennal funicular segment II long (0.32–0.34), longer than funicular segment I (pedicel) (0.11–0.13). In lateral view, frontal lobes projecting forward and, in full-face view, broadly separated (FLD 0.25–0.30). In full-face view, frontal carina present, forming a pair of tubercles at level of median ocellus; median carina present, originating between frontal lobes and extending to anterior margin of median coellus; a pair of carinae connecting posterior margin of median ocellus with pair of tubercles; cephalic margin, between lateral ocelli concave; low tooth behind each lateral ocellus; cephalic corner with pair of low tubercles, angulate; in profile, vertex weakly concave, with a median longitudinal carina that originates at cephalic carina and extends to level of vertexal tubercles. In lateral view, cephalic collar present. Hypostomal teeth conspicuous, rounded at tip.

Mesosoma. Pronotum with humeral and lateral tubercles triangular, lacking anterior tubercles; in dorsal view, carina connecting base of lateral pronotal tubercles. In dorsal view, notauli as deep grooves isolating anterior portion of mesoscutum; in

lateral view, anterior portion of mesoscutum obtusely angulate; mid portion of mesoscutum with pair of parallel carinae; parasscutal lobe (postero-lateral margin) present, triangular, and expanding laterally; parapsidal lines conspicuous. Axillae produced into posterior pyramidal tubercles (larger than those of queen). Scutellum with posterior margin bidentate; scutellum broader than long. Base and declivity of propodeum with thin (almost inconspicuous) lateral carina; propodeal lobes subquadrate; propodeal spines long, with thick base. Anapleural sulcus deep and lacking transverse rugae; in lateral view, area between mid and hind coxae with small but conspicuous tooth; lateral margin of propodeum with small tooth on top of propodeal spiracle.

Metasoma: petiole pedunculate; in profile, node of petiole rounded; ventral margin of petiole lacking ventral process. Postpetiole, in dorsal view, trapezoidal, broader than long (PPL 0.31–0.38, PPW 0.40–0.63, PPI 128–164); posterior margin broadly concave medially; dorsum of postpetiole rugulose gastral tergite I finely reticulate, as long as wide, covered with minute appressed simple hairs.

Measurements. MALE. EL 0.38–0.41, FLD 0.25–0.30, GL 1.54–1.69, HFL 1.52–1.66, HL 0.88–0.99, HTL 1.20–1.42, HW 0.79–0.93, ML 0.49–0.57, MSL 0.08–0.10, MSLca 0.04–0.06, OI 43–49, PL 0.63–0.86, PPL 0.31–0.38, PPW 0.40–0.63, SL 0.40–0.44, TL 5.60–6.24, WL 1.67–1.95, CI 88–95, MI 55–59, MSI 10–12, MSLI 43–60, PPI 128–173, RFLDI 28–31, RFLDII 30–34, SI 45–53 (n=9).

Comments. This species resembles *Myrmicocrypta spinosa* Weber in general habitus, but it can be distinguished by the larger eyes, the larger postpetiole, and the presence of appressed squamate hairs on the dorsum of anterior portion of pronotum. These two species occur in sympatry across their distributions, and sometimes can be collected nesting in the same rotten log. When describing *Myrmicocrypta spinosa* as a new species, Weber pointed out that two colonies were found nesting in the same log. The colonies were assigned the numbers 353 and 354 by Weber. The colony used to describe *M. spinosa* was 353; however, Weber considered individuals of colony numbered 354 to belong to the same species. Close examination of individuals from both colonies, suggest that in fact the two belong to two different species, *M. spinosa* and *M. JSC–001* (described here). Later, Weber (1946) described the species *Myrmicocrypta infuscata* also from Guyana and based on a single worker. Weber's differentiated M. infuscata from M. spinosa by the slightly larger size of the eyes (EL 0.09 in *M. infuscata* compared with EL 0.08 in *M. spinosa*), the length of the antennal scape (larger in *infuscata* than in *spinosa*), and the length of the postpetiole (slightly larger in *infuscata* than in *spinosa*). I have examined the series of *M. spinosa* and the holotype of *M. infuscata*, and have synonymized *infuscata* with *spinosa*. Although, *Myrmicocrypta JSC-001* is very similar to *spinosa*, the morphological character states listed above are sufficient to separate the two species. Their separation is also supported by molecular data.

Myrmicocrypta JSC–001 nests in rotten logs in rainforests. The fungus garden usually occupies an irregular space in the rotten log, in cavities possibly created by other insects. Colonies tend to be large, with almost 500 adult individuals. Parabiosis

between *M. JSC-001* and *Cyphomyrmex faunulus* Wheeler (1925) has been observed in a colony in Guyana (personal observation). Parabiosis between attine species has been observed previously between *Cyphomyrmex faunulus* and *Apterostigma urichii* Forel by Sanhudo et al. (2008).

Material examined. BRAZIL: *Amazonas*; Ig Marianil; Rio Branco Rd., 24 km NE of Manaus M–11; [45m; 3º 06' 23.07" S 60º 01' 35.15' W]; 22.viii.1962; (*WL Brown*) [2w, 1dq, MCZ]. Manaus; [45m; 3º 06' 23.07" S 60º 01' 35.15" W]; 24.viii.1962; (*K Lenko*); KL4524 [3w, MZSP]. ***Pará;*** Belem; Reserva Guamá; [9m; 1º 28' 08.25" S 48º 26' 57.76" W]; 6.xii.1986; APEG No.486 [5w, 1m, MZSP]. Belem; APEG; [2m; 1º 27' 18.07" S 48º 30' 08.52" W]; 14.vii.1969; (*N Rosa*); NR1038 [3w, MZSP]. Jacareacanga; [177m; 6º 12' 23.77" S 57º 49' 28.11" W]; x.1959; (*M Alvarenga*) [5w, MZSP]. Melgação; Caxiuaná, ECFPn, IV Transecto (9 400); [12m]; 1º 45' 15.98" S 51º 31' 20.66" W; 19–21.i.2004; (*AY Harada, EP Fagundes, CED Sanhudo, Joca*); Winkler [1w, MPEG]. Santarém; Faz. Taperinha; [80m; 2º 34' 30" S 54º 21' 50" W]; ii.1968; Exp. Perm. Amaz. [2w, MZSP]. Benfica; [20m; 1º 18' 52.96" S 48º 17' 36.88" W]; 13.viii.1962; (*WL Brown*); B–178 [5w, MCZ]. **COLOMBIA:** ***Amazonas;*** Leticia; PNN Amacayacu; 80m; 3º 47.547' S 70º 17.359' W; 10.x.2007; (*J Rodriguez, TR Schultz, & J Sosa-Calvo*); winkler; rotten wood; JR071010–LS03, LS06 [2w, USNM]. **ECUADOR: *Orellana;*** Tiputini Biodiversity Station; [220m; 0.638063º S 76.149834º W]; 15.ii.1998; (*CR Currie*); nest series; CRC980215–01 [5w, 3aq, USNM]. Same data as previous entry, but 16.ii.1998; CRC980216–01 [8w, 1aq, USNM]. Same data as previous, but Chorongo Trail; [300m]; 0º 38.295' S 76º

8.959’ W; 15.vi.2003; (*AG Himler*); nest series, under bromeliad on fallen tree; AGH030615–09 [3w, USNM]. Same data as previous, but Maquisapa Trail; [300m]; 0º 38.295’ S 76º 8.959’ W; 18.vi.2003; (*AG Himler*); nest series in log; AGH030618–09 [3w, USNM]. Same data as previous, but Chorongo Trail; [300m]; 0º 38.295’ S 76º 8.959’ W; 15.vi.2003; (*A Little*); nest series in rotten log; AL030615–01 [3w, USNM]. 3w, Same data as previous, but Chorongo Trail; [300m]; 0º 38.295’ S 76º 8.959’ W; 15.vi.2003; (*S Villamarin*); nest series; SV030615–01 [3w, USNM]. Yasuni National Park; Yasuni Danta Trail (across Rio Napo from La Selva Lodge location); [1.083333º S 75.916667º W]; 10.vi.2003; (*S Villamarin*); nest series; SV030610–06 [3w, USNM]. Tiputini Biodiversity Station; [0.638333º S 76.15º W]; 1.i.1994–30.vii.2002; (*T Erwin*); canopy fogging; tropical rainforest; lot2046, t5 st7, 260–4580 [1m, USNM]. **FRENCH GUIANA:** ***Department de la Guyane;*** Paracou; [43m; 5º 15’ N 52º 55’ W]; xi.1996; (*B Corbara, A Dejean, & J Orivel*) [14w, 2dq, 2m, CEPEC; 6w, 1m, MZSP]. Petit–Saut; [19m; 5° 20' 60” N 53° 40' 60” W]; 02–28.xi.2001; (*S Lacau & G Fleck*) [11w, CEPEC]. Petit Sant Basse Vie; [6m]; 5.207925vi–vii.2000; (*S Durou, J Delabie, A Dejean, & A Gibernau*) [3w, CEPEC]. Amazone Nature Lodge; 295m; 4º 33.426’ N 52º 12.349’ W; 20.vii.2005; (*TR Schultz*); nest in rotten log; TRS050720–10 [1w, USNM]. Nourages Field Station; 147m; 04º 05.301’ N 52º 40.631’ W; 30.vii.2005; (*TR Schultz*); nest in rotten log; TRS050730–18 [1w, USNM]. Same locality as previous entry, but 120m; 04º 05.265’ N 52º 40.605’ W; 05.viii.2005; (*TR Schultz*); nest in rotten log; TRS050805–04 [1w, USNM]. **GUYANA:** ***Cuyuni-Mazaruni;*** 22.5 mi W of Kartabo Pt; [28m; 6.38333º N 58.68333º W]; 8.ix.1935; (*NA Weber*); nest series; NAW354 [14w, MCZ; 2w,

LACM]. Kartabo; [6.38333º N 58.68333º W]; vii–viii.1920; (*WM Wheeler*) [13w, 1dq, MCZ; 4w, AMNH; 8w, LACM; 3w, USNM]. ***East Berbice-Corentyne;*** Bartica District; [15m; 5.7833º N 57.6333º W]; 28.vii.1920; (*WM Wheeler*) [5w, USNM]. ***Potaro-Siparuni;*** Iwokrama; Malali, Essequibo River; [60m; 4º 43.89' N 58º 50.99' W]; 10.iv.1996; (*TR Schultz* & *UG Mueller*); forest; TRS960410–14, 18 [5w, USNM]. Iwokrama; Kurupakari Base Camp; [60m; 4º 43.89' N 58º 50.99' W]; 11.iv.1996; (*TR Schultz* & *UG Mueller*); forest; TRS960411–06 [1w, USNM]. ***Upper Takutu-Upper Essequibo;*** Acarai Mts; Romeo's Camp; 282m; 1º 23.194' N 58º 56.76' W; 9.x.2009; (*TR Schultz, J Sosa-Calvo, CJ Marshall, R Williams*); nest series; 1º forest, rotten log; TRS061006–05 [2w, 1dq, USNM]. Same data as previous entry, but TRS061006–04 [5w, USNM]. Same data as previous entry, but TRS061009–06 [1w, 1dq, USNM]. Same data as previous entry, but TRS061009–09 [4w, USNM]. Acarai Mts; nr. Romeo's Camp; 277m; 1º 23.334' N 58º 56.764' W; 7.x.2006; (*TR Schultz*); 1º forest; rotten wood; winkler; TRS061007–WS06 [3w, USNM]. Same locality as previous entry, but 282m; 1º 23.307' N 58º 56.774' W; 7.x.2006; (*J Sosa-Calvo*); 1º forest; rotten wood; winkler; TRS061007–WS08 [2w, USNM]. Same locality as previous entry, but 272m; 1º 23.211' N 58º 56.813' W; 08.x.2006; (*J Sosa-Calvo*); nest in rotten wood; JSC061008–07 [1w, USNM]. Same locality and data as previous entry, but JSC061008–26 [1w, USNM]. Same locality and data as previous entry, but JSC061008–35 [1w, USNM]. Same locality and data as previous entry, but JSC061008–37 [1w, USNM]. Acarai Mts; New Romeo's Camp; 620m; 1º 21.126' N 58º 57.415' W; 15.x.2006; (*J Sosa-Calvo*); nest in rotten log; JSC061015–01 and 02 [2w, 1m, USNM]. **PERU:** ***Departamento de San Martin;*** Davidcillo; 30Km NNE

Tarapoto; 220m; 6º 15’ S 76º 15’ W; 21.viii.1986; (*PS Ward*); rainforest; winkler, wood; PSW8684–4 [1w, UCDC]. **SURINAME:** ***Sipaliwini;*** Lely Mts; 658m; 04º 16’ 03.1” N 54º 44’ 45.2” W; 31.x.2005; (*J Sosa-Calvo*); nest in rotten log; JSC051031–01 [1w, USNM]. Nassau Mts; 514m; 4º 49’ 13” N 54º 35’ 20” W; 02.xi.2005; (*J Sosa-Calvo*); nest in rotten log; JSC051102–11 [2w, USNM]. Same locality and data as previous entry, but JSC051102–12 [2w, USNM]. Same locality and data as previous entry, but JSC051102–14 [2w, USNM]. Same locality and data as previous entry, but JSC051102–24 [1w, USNM]. Same locality and data as previous entry, but JSC051102–26 [1w, USNM]. Same locality and data as previous entry, but 04.xi.2005; JSC051104–01 [2w, USNM]. Same locality and data as previous entry, but JSC051104–11 [1w, USNM]. Same locality and data as previous entry, but 05.xi.2005; JSC051105–05 [3w, 1dq, USNM]. Same locality and data as previous entry, but JSC051105–09 [1w, USNM]. Bahkuis Mts; 249m; 04º 43’ 14.8” N 56º 43’ 33.5” W; 09.iii.2006; (*J Sosa-Calvo*); nest in rotten log; JSC060309–07 [1w, USNM]. Same locality and data as previous entry, but JSC060309–25 [1w, USNM]. **VENEZUELA:** ***Bolivar;*** Talud S. Amarawai Tepui; 700m; 05º 26’ N 62º 15’ W; 09.v.1996; (*JT Lattke*); JTL856 [7w, MIZA]. Same locality and data as previous entry, but 05º 26’ N 65º 15.5’ W; JTL803 [6w, MIZA]. Rio Akanan, ca. Amarawai Tepui; 470m; [5º 54’ N 62º 13’ W]; 02.v.1986; (*JT Lattke*); JTL761 [5w, MIZA]. Same locality as previous entry, but 700m; 04.v.1986; JTL776 [6w, MIZA]. Same locality as previous entry, but 470m; 04.v.1986; JTL780 [1w, 7aq, MIZA]. Campamento Rio Grande; 250m; 8º 07’ N 61º 42’ W; 14.viii.1986; (*JT Lattke*); JTL940 [3w, CUIC]. Auyantepui, Cañon del Diablo; Isla Raton; 600m; [5.900278º N

62.541389º W]; 02.ix.1994; (*JT Lattke*); JTL1533 [7w, MIZA]. Isla Raton cerca al Salto Angel; 600m; [5.9675º N 62.535556º W]; 02.ix.1994; (*JT Lattke*); JTL1534 [7w, MIZA].

Myrmicocrypta JSC–003 **sp. nov.**

(Figure 2.49)

HOLOTYPE: 1w, ECUADOR: Napo; Tiputini Biological Station; [220m]; 00° 38' 18" S 76° 08' 58" W; 18.ii.1998; (*CR Currie*); nest series; CRC980218–03 [USNM, USNMENTNo. 00442620].

PARATYPES. 21w, same locality and data as holotype [USNM, USNMENTNo. 00442614–15, 00442619, 00442621–26, 00442628–37, 00442642, 00442920].

Measurements. WORKER. EL 0.09 (0.07–0.09), FLD 0.27 (0.24–0.28), GL 0.88 (0.81–0.98), HFL 1.06 (1.00–1.12), HL 0.94 (0.89–1.03), HTL 0.75 (0.72–0.81), HW 0.79 (0.74–0.85), ML 0.60 (0.57–0.65), MSL 0.12 (0.09–0.14), MSLca 0.08 (0.05–0.10), OI 11 (9–12), PL 0.42 (0.38–0.48), PPL 0.20 (0.20–0.24), PPW 0.28 (0.28–0.32), SL 0.86 (0.81–0.93), TL 4.21 (3.97–4.52), WL 1.16 (1.11–1.24), CI 83 (80–

85), MI 63 (59–69), MSLI 150 (130–175), PPI 139 (129–149), RFLDI 28 (26–29), RFLDII 34 (31–35), SI 110 (107–114) (n=22).

Diagnosis. Relatively large individuals (WL 1.11–1.24, TL 3.97–4.52); eyes small (EL 0.07–0.09, OI 9–12) with 4–5 ommatidia in longest row (11–16 ommatidia total); frontal lobes triangular, slightly expanded laterally; head somewhat rounded; hypostomal teeth large; lateral pronotal tubercles very large.

Description. Worker. *Head:* in full-face view and excluding mandibles, longer than broad (HL 0.89–1.03, HW 0.74–0.85, CI 80–85), narrowed posteriorly at level of cephalic corners and anteriorly at level of frontal lobes; cephalic margin transverse, with median pair of tubercles; postero-ventral angles of head (collar) drawn out on each side in two large blunt tubercles; in full-face view, cephalic corners rounded anteriorly, angulate posteriorly; sides of head convex. Mandibles narrow, long (ML 0.57–0.65, MI 59–69), with sinuate outer margin; inner (masticatory) margin of mandible 6–8-toothed; dorsum of mandibles basally reticulate, apically smooth and shinning. Clypeal apron wide, dorsally wrinkled; anterior margin of clypeal apron evenly convex; unpaired median seta long (MSL 0.09–0.14, MSI 9–14), originating at posterior margin of clypeal apron and anterior margin of clypeus. Fronto-clypeal teeth blunt, obtusely angulate; in oblique view, sides of clypeus thinly carinate; in full-face view, posterior margin of clypeus extending between frontal lobes. Eyes small (EL 0.07–0.09, OI 9–12), convex, with 4–5 ommatidia in longest row (11–16 ommatidia total), situated posterior to midline of head at a level above frontal lobes. Frontal

lobes weakly expanded (FLD 0.24–0.28, RFLDI 26–29), weakly triangular; frontal lobes slightly separated. Frontal carinae conspicuous, extending backwards and weakly enclosing a circular, depressed area. Antennal scapes long (SL 0.81–0.93, SI 107–114), reticulate, and narrow. In lateral view, hypostomal teeth long, triangular.

Mesosoma. Anterior pronotal tubercles distinct, low, tooth-like; humeral pronotal tubercle long and projecting laterally; lateral pronotal tubercles long, longer than any tubercle in the pronotum, acute, and with wide base; propleuron at most obtusely angulate. In lateral view, mesonotum with lateral and anterior tubercles acute, triangular. Area between mesonotal and metanotal grooves with two pairs of acute tubercles. In lateral view, metanotal groove deep, concave. In lateral view, propodeum produced anteriorly as a acute, triangular, small tubercle; propodeal spines long, slender, and diverging from median line and posteriorly. Basal and declivous face of propodeum with thin lateral carinae; in lateral view, base of propodeum shorter than declivous of propodeum.

Metasoma. In lateral view, petiole distinctly pedunculate with anterior portion of node angled, with small tooth-like tubercle; node of petiole longer than wide; posterior portion of petiole with thin rounded lateral carina; in lateral view, peduncle of petiole lacking antero-ventral process; ventral margin of petiole peduncle sinuous, concave posteriorly, with thin carina that splits in two at concavity. Postpetiole, in dorsal view, slightly over twice as broad as petiole, distinctly broader than long (PPL 0.20–0.24, PPW 0.28–0.32, PPI 125–149), with sides, as seen from above, evenly

convex; angulate posteriorly, posterior dorsal margin emarginate medially. Gaster, in lateral view, dorsally flattened; in dorsal view, anterior margin of gaster convex; gaster long-ovate (longer than wide). Legs long and slender (HTL 0.72–0.81, HFL 1.00–1.12).

Body opaque, finely granulose; outer portions of frontal carinae rugulose; mandibles reticulate basally, smooth and shinning apically; gastral tergite I finely reticulate. Pilosity of moderately abundant squamate hairs, which become narrow-squamate on scape and legs; hairs on tarsi narrowly flattened, decumbent, and short. Body color brownish-yellow.

Queen. Unknown.

Male. Unknown.

Comments. *Myrmicocrypta JSC–003* resembles *M. JSC–025*, *M. weyrauchi*, and *M. occipitalis,* but can easily be distinguished from all of them by the larger size (WL 1.11–1.24) and the large lateral pronotal tubercles.

Material examined. Known only from the type series.

Myrmicocrypta JSC–005 **sp. nov.**

(Figure 2.50)

HOLOTYPE: 1w, BRAZIL: Bahia; Ilheus; Aguas de Olivença; 09.x.1998; [51m; 14º 56’ 09.49” S 39º 01’ 27.19” W]; Cacau; (*JRM Santos*) [CEPEC, USNMENTNo. 00758246].

PARATYPE. 15w, same data and locality as holotype, [2w, USNM, USNMENTNo. 00755516], [3w, MZSP, USNMENTNo. 00750879], [3w, MZSP, USNMENTNo. 00755469], [3w, CEPEC, USNMENTNo. 00755457], [4w, CEPEC, USNMENTNo. 00693899].

Measurements. WORKER. EL 0.07 (0.07–0.08), FLD 0.13 (0.13–0.16), GL 0.8 (0.69–0.80), HFL 0.80 (0.70–0.81), HL 0.75 (0.69–0.81), HTL 0.59 (0.54–0.60), HW 0.64 (0.58–0.69), ML 0.44 (0.41–0.47), MSL 0.15 (0.13–0.16), MSLca 0.11 (0.08–0.11), PL 0.40 (0.34–0.42), PPL 0.19 (0.18–0.23), PPW 0.24 (0.23–0.27), SL 0.74 (0.63–0.74), TL 3.56 (3.30–3.75), WL 0.97 (0.91–1.06), CI 86 (82–89), MI 58 (55–62), MSI 20 (17–21), MSLI 141 (124–152), OI 11 (11–13), PPI 125 (111–140), RFLDI 18 (18–22), RFLDII 21 (21–25), SI 115 (102–115) (n=16).

Diagnosis. Median sized specimens (WL 0.91–1.06, TL 3.30–3.75); in full-face view, frontal lobes parallel; dorsum of head with pimple-like tubercles from where simple hairs originate; unpaired median seta very long (MSLI 124–152); hypostomal teeth vestigial; eyes small (EL 0.07–0.08, 4–5 ommatidia in longest row); in lateral view, petiolar node rounded; ventral process of petiole reduced, vestigial.

Description. Worker. *Head:* in full-face view, excluding mandibles longer than wide (HL 0.69–0.81, HW 0.58–0.69, CI 82–89); in full-face view, cephalic corners rounded, posterior margin of cephalic corners lacking tubercles; in full-face view, cephalic margin weakly concave medially, with inconspicuous tubercles; in lateral view, dorsum of head with erect/suberect simple hairs; in full-face view, sides of the head broadly convex; in full-face view, dorsum of head covered with pimple-like tubercles from which hairs originate. Inner margin of mandibles with 6–7 teeth, decreasing in size toward base; dorsum of mandibles striolate; outer margin of mandibles conve. In full-face view, anterior margin of clypeal apron broadly convex; clypeal apron hyaline and, dorsally, smooth and shinning; unpaired median seta long (MSL 0.13–0.16, MSI 17–21), originating before the posterior margin of clypeal apron and extending past anterior margin of clypeal apron; in full-face view, 5–6 decumbent to appressed simple hairs on each side of median seta, surpassing anterior margin of clypeal apron; body of clypeus, perpendicular to clypeal apron, shield-like; in profile, frontoclypeal teeth vestigial, carina instead tubercles underneath antennal insertions; in oblique view, lateral margin of clypeus with ruga; median portion of body of clypeus wrinkled; clypeus covered with subdecumbent simple hairs. Eyes small (EL 0.07–0.08, OI 11–13), globose, with 4–5 ommatidia in longest row, and 10–14 ommatidia in total; eyes situated in the upper half of head. In full-face view, frontal lobes parallel (FLD 0.13–0.17), failing to cover antennal insertions; in full-face view, posterior margin of clypeus (finger of the clypeus) narrowly extending between frontal lobes, posteriorly expanded into a deep pit; in lateral view, frontal lobes with simple suberect hairs. In full-face view, frontal carina absent. Occiput

drawn out posterolaterally into bilobed collar, upper tubercle tooth-like, lower tubercule obtusely angulate. Antennal scape thin, long (SL 0.63–0.74, SI 102–115), strongly reticulate in its entire length, apically smooth; antennal scape with sparse erect/suberect simple hairs. Vertex smooth and glabrous. In lateral view, hypostomal teeth vestigial.

Mesosoma. In dorsal view, humeral pronotal tubercles vestigial; lateral pronotal tubercles, in dorsal view, conspicuous, larger than humeral tubercles, with massive base; in dorsal view base of lateral pronotal tubercles with pimple-like tubercles; in fronto-dorsal view, lateral pronotal tubercles directed; anterior pronotal tubercles absent; in dorsal view, dorsum of pronotum flat and smooth; propleuron with small triangular tubercle. In dorsal view, lateral mesonotal anteriorly connected by thin carina; lateral mesonotal tubercles low, blunt; anterior mesonotal tubercles either low and blunt or small, tooth-like, covered with erect/suberect simple hairs. Area between mesonotal and metanotal groove lacking tubercles, at most pimple-like tubercles; metanotal groove deep, concave; in lateral view, anterior propodeal tubercles low, pimple-like from which erect simple hair arise; propodeal tubercles small, tooth-like; in lateral view, dorsum of propodeum as long as declivity of propodeum; in lateral view, propodeum with erect/suberect thinly flattened hairs; in dorsal view, dorsum of propodeum and declivity smooth and lacking lateral carinae.

Metasoma. In lateral view, petiole pedunculate with vestigial to small antero-ventral process; ventral margin of peduncle with a pair of very thin carina that extend parallel

to each other towards posterior margin of petiole; in lateral view, ventral margin sinuate; node of petiole, in lateral view, low, rounded. In dorsal view, disc of postpetiole, wider than long (PPL 0.17–0.24, PPW 0.23–0.29, PPI 108–146); in lateral view postpetiole subquadrate and slightly convex dorsally; disc of postpetiole smooth; posterior margin of postpetiole medially emarginate and postero-inferior margin of postpetiole rounded. Anterior margin of gaster rounded; gastral tergite I areolate.

Individuals yellowish to ferruginous. Head and mesosoma with erect simple hairs; metasoma covered with subdecumbent narrowly thin flattened hairs; pilosity on antennal scape with scarse simple erect/suberect hairs.

Other material examined. Measurements. WORKER. EL 0.07, FLD 0.15–0.17, GL 0.72–0.83, HFL 0.73–0.83, HL 0.71–0.80, HTL 0.51–0.61, HW 0.60–0.68, ML 0.43–0.48, MSL 0.13–0.15, MSLca 0.10–0.11, PL 0.38–0.43, PPL 0.17–0.24, PPW 0.25–0.29, SL 0.67–0.74, TL 3.38–3.78, WL 0.94–1.06, CI 83–87, MI 58–62, MSI 17–19, MSLI 131–140, OI 11–12, PPI 108–146, RFLDI 19–21, RFLDII 22–25, SI 105–113 (n=6).

Queen. Unknown.

Male. Unknown.

Comments. This species resembles the species *M. bucki* Sosa-Calvo & Schultz from Peru and Brazil in general habitus, but it can be distinguished from it by the: (i) vestigial hypostomal teeth; (ii) dorsum of head covered with pimple-like tubercles, each associated with a seta; (iii) presence of a tubercle on the propleuron; and (iv) node of petiole, in lateral view, rounded.

Material examined. BRAZIL: *Bahia*; Ilheus; Olivença; [0m]; 14º 58' 8.85" S 39º 0.01' 48" W; 16.xi.1998; (*JRM dos Santos*) [3w, CEPEC, USNMENT No.00755588]. Una; [4m]; 15º 11' 04" S 39º 0.00' 56" W; 24.viii.1998; (*JRM dos Santos*); A45 [2w, CEPEC, USNMENTNo. 00755513]; same data as previous entry [1w, CEPEC, USNMENTNo. 00693894].

Myrmicocrypta JSC–006 **sp. nov.**

(Figure 2.51)

HOLOTYPE: 1w, PERU: Madre de Dios; Cuzco Amazonico; 15 Km NE of Puerto Maldonado; [199m; 12º 35' 16.39" S 69º 09' 19.98" W]; vi.1989; (*S.P. Cover & J.E. Tobin*); JT271 (CA792) [MCZ, USNMENTNo. 00537313].

PARATYPE. 3w, same data as holotype, [1w, USNM, USNMENTNo. 00758208], [2w, MZC, USNMENTNo. 00755467].

Measurements. WORKER. EL 0.07 (0.06–0.08), FLD 0.26 (0.25–0.27), GL 0.92 (0.91–0.97), HFL 0.90 (0.90–0.95), HL 0.88 (0.90–0.94), HTL 0.63 (0.64–0.69), HW

0.78 (0.79–0.86), ML 0.57 (0.58–0.60), MSI 16 (14–15), MSL 0.14 (0.13–0.14), MSLca 0.11 (0.09–0.10), PL 0.43 (0.38–0.45), PPI 132 (132–155), PPL 0.22 (0.20–0.22), PPW 0.30 (0.30–0.32), OI 8 (8–9), RFLDI 29 (28–30), RFLDII 29 (24–27), SL 0.81 (0.83–0.85), TL 4.13 (4.18–4.29), WL 1.11 (1.11–1.19), CI 89 (88–92), MI 65 (64–65), MSLI 76 (65–71), SI 104 (99–105) (n=4).

Diagnosis. Funicular segments of antennae with suberect simple hairs (all other *Myrmicocrypta* species with appressed hairs) in addition to very short appressed pilosity; frontal lobes laterally expanded, triangular; dorsum of head with abundant erect/suberect simple hairs, vertex glabrous (*sens. str.*); small eyes; large propleural tubercle; large individuals (WL 1.11–1.19, TL 4.13–4.29).

Description. Worker. *Head:* in full-face view, excluding mandibles, longer than wide (HL 0.88–0.94, HW 0.78–0.86, CI 88–92); in full-face view, cephalic corners rounded; cephalic margin shallowly concave medially (almost straight), with a pair of low, blunt carina; in lateral view, dorsum of head covered with erect/suberect simple; in full-face view, sides of the head straight; dorsum of head rugulose. Inner margin of mandibles with 7–8 teeth, decreasing in size toward base; dorsum of mandibles striolate; outer margin of mandibles convex. Anterior margin of clypeal apron broadly convex; clypeal apron hyaline and with weakly impressed rugae; unpaired median seta long (MSL 0.13–0.14, MSI 14–16), thick, originating before posterior margin of clypeal apron; 8–9 long appressed (with respect to clypeal apron, erect with respect to body of clypeus) simple hairs on each side of median seta and surpassing anterior

margin of clypeal apron; body of clypeus, perpendicular to clypeal apron, shield-like; in lateral view, frontoclypeal teeth reduced to carinae underneath antennal insertions; in oblique view, margins of clypeus with thin carina; median portion of body of clypeus rugose; clypeus covered with simple hairs. Eyes very reduced (EL 0.06–0.08, OI 8–9), with 4 ommatidia in longest row, 9–11 ommatidia in total; eyes situated in upper half of head. In full-face view, frontal lobes slightly expanded laterally, triangular (FLD 0.25–0.27), barely covering antennal insertions, with posterior margin of clypeus (finger of clypeus) interrupted anteriorly by proximity of frontal lobes, posteriorly expanded into a deep pit; frontal lobes covered with simple suberect/subdecumbent hairs; dorsum of frontal lobes weakly rugose. In full-face view, frontal carina weakly impressed, obscured by rugae on frons. Occiput drawn out posterolaterally into a conspicuous bituberculate collar, both tubercles large and blunt at tip. Antennal scape long (SL 81–85, SI 99–105), strongly reticulate-rugose, apically smooth and shinny; anterior margin of antennal scape (leading edge of scape) scabrous; in full-face view, antennal scape covered with erect/suberect simple hairs; funicular segments with suberect simple hairs. Vertex glabrous. In lateral view, hypostomal teeth large, triangular, reticulate, and shinny.

Mesosoma. In dorsal view, humeral tubercles tooth-like, subtriangular, and covered with narrow flattened hairs; lateral pronotal tubercles slightly larger than humeral tubercles, blunt, with massive base; in dorsal view, obtusely angled; in fronto-dorsal view, lateral pronotal tubercles directed laterally, covered with narrow flattened suberect hairs; anterior pronotal tubercles vestigial to absent, replaced by appressed

narrow flattened hairs; anterior dorsum of pronotum mostly glabrous; propleural tubercle large, blunt at tip. Lateral mesonotal tubercles low, covered with simple and narrowly flattened erect/suberect hairs; anterior mesonotal tubercles smaller than lateral mesonotals, with subdecumbent narrowly flattened hairs; both lateral and anterior mesonotal connected by thin lateral carina, area within lacking hairs, smooth; area between mesonotal and metanotal grooves with single carina-like tubercle; metanotal groove deep (some specimens with short median longitudinal carina). In lateral view, anterior propodeal tubercles absent, anterior margin of propodeum rounded (convex); propodeum with pair of long acute teeth; dorsum and declivous of propodeum with thin lateral carinae; propodeal declivity slightly shorter than dorsum (base) of propodeum; dorsum of base and declivous of propodeum smooth.

Metasoma. In lateral view, petiole pedunculate with inconspicuous (vestigial) antero-ventral process; ventral margin of peduncle with a pair of thin carina that extend parallel to each other towards the posterior margin of petiole; in lateral view, ventral margin sinuate; node of petiole, in lateral view, subquadrate; posterior margin of petiolar node with low obtusely angled carinae; dorsum of petiolar node smooth and lacking hairs, narrow spoon-shaped hairs restricted to lateral carina. In dorsal view, postpetiole trapezoidal, wider than long (PPL 0.20–0.23, PPW 0.30–0.32, PPI 131–155); in lateral view, slightly convex dorsally; latero-dorsal portions covered with long decumbent narrow spoon-shaped hairs; in dorsal view, lateral portions of postpetiole weakly rugose, median portion of dorsum smooth; in dorsal view, posterior margin of postpetiole medially emarginate; postero-inferior margin of

postpetiole with obtusely angulate corners. Gastral tergite I finely and densely reticulate, covered with subdecumbent narrow spoon-shaped hairs that curved medially, all directed posterad. Outer margin of basitarsi of hindlegs with erect/suberect simple hairs.

Body dull, light-brown to yellowish. Pilosity of abundant erect/suberect simple hairs on head, antennal scape, and legs; pilosity on mesosoma consisting of erect/suberect narrowly flattened hairs; pilosity on waist segments and gaster decumbent consisting of narrow spoon-shaped hairs.

Other material examined. Measurements. WORKER. EL 0.07, FLD 0.26, GL 0.93, HFL 0.91, HL 0.89, HTL 0.63, HW 0.8, ML 0.56, MSI n/a, MSL n/a, MSLca n/a, PL 0.44, PPI 131, PPL 0.23, PPW 0.30, OI 8, RFLDI 30, RFLDII 29, SL 0.81, TL 4.21, WL 1.15, CI 90, MI 63, MSLI n/a, SI 101 (n=1)

Queen. Unknown.

Male. Unknown.

Comments. The presence of erect/suberect simple hairs on antennal funicular segments is unique within *Myrmicocrypta*. This species resembles *Myrmicocrypta erectapilosa* in the presence of erect simple hairs on the body and the triangular frontal lobes.

Other material examined. **BRAZIL:** ***Acre***; Porto Walter; [198m]; 08º 15' 31.2" S 72º 46' 37.1" W; 05.ii.–17.iv.1997; (*J Caldwell*), 13331; Collected in *Epipedobates* sp1. [1w, CEPEC].

Myrmicocrypta JSC–008 **sp. nov.**

(Figure 2.52–2.53)

HOLOTYPE: 1w, PANAMA: Colon; Pipeline Rd., Km 6; Soberania National Park; [101m; 9° 4′ 27.47″ N 79° 39′ 35.3″ W]; 24.iv.1996; (*TR Schultz* & *UG Mueller*); nest series; soil; TRS960424–10 [USNM, USNMENTNo. 00755248]

PARATYPE. 5w, 4aq, same locality and data as holotype [USNM, USNMENTNo. 00307413–15]. **4w,** same locality as holotype, but 25.i.1996; (*UG Mueller*); nest series; UGM960125–12 [USNM, USNMENTNo. 00442853, 00755277, 00442852, 00443716]. **4w,** same as previous entry, but UGM960125–07 [USNM, USNMENTNo. 00443718, 00443720, 00442838–39]. **1w,** same locality as holotype, but 24.iv.1996; (*TR Schultz* & *UG Mueller*); TRS960424–16 [USNM, USNMENTNo. 00307391].

Measurements. WORKER. Holotype (Paratypes). EL 0.07 (0.10–0.12), FLD 0.24 (0.22–0.26), GL 0.88 (0.70–0.83), HFL 0.83 (0.76–0.85), HL 0.72 (0.65–0.75), HTL 0.59 (0.53–0.60), HW 0.58 (0.54–0.60), ML 0.46 (0.44–0.49), MSL 0.10 (0.10–0.13),

MSLca 0.08 (0.07–0.09), PL 0.41 (0.35–0.44), PPL 0.20 (0.19–0.23), PPW 0.26 (0.25–0.29), SL 0.69 (0.66–0.74), TL 3.67 (3.27–3.67), WL 1.00 (0.93–1.03), CI 80 (77–84), MI 63 (63–67), MSI 14 (13–18), MSLI 80 (67–81), OI 13 (18–21), PPI 129 (129–139), RFLDI 33 (31–35), RFLDII 41 (38–45), SI 119 (117–128) (n=13).

Diagnosis. Body brown (castaneous), legs lighter in color than rest of body; in full-face view, frontal lobes triangular, slightly expanding laterally and in lateral view, angle of frontal lobes slightly raised; hypostomal teeth triangular, short, and acute; body mostly covered with narrow spoon-shaped hairs; vertexal area with some suberect narrow spoon-shaped hairs; in lateral view, frontoclypeal teeth small, blunt; lateral mesonotal tubercles larger than any other tubercle on mesosoma; metanotal groove shallow; propodeum with short propodeal spines; petiole with antero-ventral process tooth-like, small.

Description. Worker. *Head*: in full-face view and excluding mandibles, longer than wide (HL 0.65–0.74, HW 0.54–0.60, CI 77–86); cephalic corners rounded anteriorly, posteriorly angulate, with small tubercle; cephalic margin medially emarginate and with pair of short tubercles; in lateral view, with at least pair of suberect narrow flattened hairs. Inner margin of mandibles with 7–8 teeth, decreasing in size toward base; dorsum of mandibles reticulate; outer margin of mandibles sinuate. In full-face view, anterior margin of clypeal apron broadly convex, dorsally weakly rugulose; unpaired clypeal seta mid-sized (MSL 0.09–0.13, MSI 13–18), originating slightly before de edge of posterior margin of clypeal apron and anterior margin of body of

clypeus; four to six appressed simple hairs on each side of the median seta reaching anterior margin of clypeal apron; frontoclypeal teeth short, blunt; in oblique view, lateral margins of body of clypeus with thin carina; in oblique view, body of clypeus medially slightly concave. Eyes convex, mid-sized (EL 0.07–0.12, OI 13–21), with 6–8 ommatidia in longest row (25–47 ommatidia in total). In full-face view, frontal lobes triangular (with acute lateral margin) (FLD 0.18–0.26), barely covering antennal insertions, with posterior margin of clypeus (finger of the clypeus) extending between frontal lobes and forming a deep groove. In full-face view, frontal carinae weakly impressed, extending posteriorly forming vertexal carinae; dorsum of head rugose. Antennal scape long (SL 0.66–0.74, SI 115–128), finely reticulate, covered with decumbent narrow spoon-shaped hairs, directed towards; hairs at apex of scape simple and appressed. Cephalic collar bilobed, of almost equal size. Vertex smooth. Hypostomal teeth short, acute.

Mesosoma: humeral tubercles triangular and prominent; anterior pronotal tubercles present, small and acute; lateral tubercles small, blunt, and low; pronotal tubercles covered with spoon-shaped hairs; dorsal portion of pronotum smooth; in dorsal view, anterior tubercles with carina extending posteriorly to meet anterior portion of lateral tubercles; in lateral view, propleuron with small obtusely angulate tubercle. Lateral mesonotal tubercles long, longer than any other tubercle on mesosoma, and rounded at tip; in fronto-dorsal view, lateral mesonotal tubercle straight, directed upwards; anterior mesonotal tubercles acute, tooth-like, with narrower base than lateral mesonotals; area between mesonotal and metanotal groove with two pairs of small

tooth-like tubercles; mesonotal groove present, smooth; metanotal groove shallowly concave; anterior portion of propodeum angulate or with small anterior pronotal pair of tubercles; propodeal spines short; dorsum (base) of propodeum and declivity of propodeum straight; median portion of mesonotum and propodeum smooth; base and declivity of propodeum with thin lateral carinae. area between mid and hind coxae with short carinatet tubercle.

Metasoma: in profile, petiole pedunculate; antero-ventral portion of petiole with small tooth-like process; ventral margin of petiole sinuate to straight; with a pair of shallow carinae originating at ventral process and diverging posteriorly; in lateral view, node of petiole subquadrate; in dorsal view, lateral margins of petiolar node with spoon-shaped hairs, dorsum of petiole smooth and glabrous; in lateral view, node of petiole straight dorsally. Postpetiole, in dorsal view, wider than long (PPL 0.19–0.21, PPW 0.25–0.29, PPI 129–151); in profile, dorsally widely convex, ventrally flat or slightly concave; in dorsal view, anterior margin of postpetiole straight, posterior margin medially emarginate; in dorsal view, postpetiole trapezoidal in shape; postero-inferior portion of postpetiole obtusely to rightly angulate; dorsum of postpetiole covered with narrow spoon-shaped hairs. Base of gaster finely strigate, rest of gastral tergite I areolate; gastral tergite I covered with spoon-shaped hairs; inner margin of hind tarsomeres covered with simple decumbent hairs. Outer margin of basitarsi proximally with narrow spoon-shaped hairs and strongly reticulate, distally with simple appressed hairs.

Other material examined. Measurements. WORKER. EL 0.10–0.12, FLD 0.18–0.25, GL 0.70–0.75, HFL 0.78–0.85, HL 0.69–0.74, HTL 0.53–0.59, HW 0.56–0.59, ML 0.43–0.49, MSL 0.09–0.13, MSLca 0.07–0.09, OI 17–21, PL 0.32–0.41, PPL 0.19–0.21, PPW 0.26–0.28, SL 0.68–0.73, TL 3.36–3.56, WL 0.93–1.00, CI 79–86, MI 59–67, MSI 13–18, MSLI 65–79, PPI 127–151, RFLDI 25–34, RFLDII 31–42, SI 115–124 (n=6).

Queen. Resembling the worker with modifications expected for the caste and with the following differences:

Mesosoma: dorsum and sides of pronotum rugulose. In lateral view, pronotum elongate. Lateral margins of pronotum slightly compressed medially. In lateral view, anterior portion of mesoscutum angulate; median line slightly raised; parapsidal lines present, sharply marked, extending almost to anterior portion of mesoscutum; dorsum of mesoscutum rugose medially; in dorsal view, posterior margin of mesoscutum obtusely angulate. Axillae large, posteriorly with small tubercle; posterior margin of scutellum bidentate; dorsum of scutellum rugulose. Base and declivity of propodeum laterally carinate. Anapleural sulcus present, deep and wide, anepisternum and katepisternum rugulose covered with short spoon-shaped hairs. Inferior margin of metapleura (between mid and hind coxae) with a short tubercle.

Measurements. QUEEN. EL 0.15–0.18, FLD 0.23–0.30, GL 1.10–1.32, HFL 0.93–1.01, HL 0.81–0.88, HTL 0.62–0.70, HW 0.68–0.74, ML 0.51–0.59, MSL 0.11–0.14,

MSLca 0.07–0.10, OI 22–24, PL 0.55–0.63, PPL 0.25–0.30, PPW 0.41–0.48, SL 0.79–0.84, TL 4.49–4.93, WL 1.20–1.32, CI 82–85, MI 61–68, MSI 13–16, MSLI 58–75, PPI 145–190, RFLDI 27–35, RFLDII 32–42, SI 110–117 (n=7).

Male. Unknown.

Comments. This species can be differentiated from any other species of *Myrmicocrypta* by the frontal lobes triangular and expanded laterally, the large unpaired clypeal seta, the relative large eyes, the mesonotal tubercles larger than any other tubercles, and the presence of an antero-ventral process on the peduncle of the petiole.

Variations within this species include:

i. Individuals from El Llano, Panama, differ from the type series by the convex rather than triangular frontal lobes.
ii. Individuals from Barro Colorado Island (BCI) have the metanotal groove somewhat deeper than individuals from Pipeline Rd and El Llano.

Material examined. PANAMA: *Colon;* Pipeline Rd., Km14; [134m; 9º 11’ 03.83” N 79º 45’ 54.03” W]; 27.xii.1995; (*UG Mueller*); nest series; UGM951227–01 [2w, 1dq, USNM]. Barro Colorado NM; 50ha plot; LASH Project; 50m; 9º 09’ N 79º 51’ W; vi–vii.2002; (*ME Kaspari*) [2w, KOUC]. **Darien*;*** El Llano; [30m; 9° 13′ 27.1″ N 78° 57′ 57.4″ W]; 7.i.1996; (*UG Mueller*); nest series; UGM960107–14 [2w, 1dq, USNM].

Myrmicocrypta JSC–009 **sp. nov.**

(Figure 2.54)

HOLOTYPE: 1w, BRAZIL: Goias; Anapolis; [1026m; 16º 19’ 20.83” S 48º 57’ 19.82” W]; 11.i.1966; (*WW Kempf*); (4182) [MZSP, USNMENT No.00758245].

PARATYPE. 5w, same data and locality as holotype, [2w, USNM, USNMENT No.00750880], [3w, MZSP, USNMENTNo. 00755498].

Measurements. WORKER. EL 0.13 (0.13), FLD 0.24 (0.24–0.25), GL 0.95 (0.91–0.96), HFL 1.05 (0.96–1.03), HL 0.97 (0.93–0.97), HTL 0.76 (0.75–0.76), HW 0.85 (0.80–0.84), ML 0.65 (0.56–0.59), MSL 0.13 (0.13–0.15), MSLca 0.09 (0.10–0.11), OI 16 (16), PL 0.43 (0.41–0.48), PPL 0.25 (0.21–0.23), PPW 0.33 (0.31–0.32), SL 0.91 (0.85–0.91), TL 4.43 (4.23–4.39), WL 1.18 (1.18–1.22), CI 88 (85–87), MI 67 (59–63), MSI 13 (14–15), MSLI 74 (75–80), PPI 132 (138–148), RFLDI 25 (26–27), RFLDII 29 (30–31), SI 107 (106–110) (n=6)

Diagnosis. Large specimens (WL 1.18–1.24, TL 4.23–4.51); cephalic margin medially interrupted by deep groove; dorsum of head with erect/suberect simple hairs in addition to short spoon-shape ground pilosity; eyes large (EL 0.12–0.13, OI 14–16) with 8–9 ommatidia in longest row; occiput drawn out postero-laterally into a single toothed collar; frontal lobes weakly expanded laterally, almost parallel; posterior margin of cephalic corners with small tubercle.

Description. Worker. *Head;* in full-face view and excluding mandibles, longer than wide (HL 0.93–1.00, HW 0.80–0.86, CI 85–88); in full-face view, cephalic corners rounded, posterior margin of cephalic corner with small tubercle; in full-face view, cephalic margin concave medially, with pair of low, blunt carina; in lateral view, dorsum of head with erect/suberect simple hairs in addition to, more abundant, short spoon-shaped ground pilosity; in full-face view, sides of the head straight, slightly convex; in full-face view, dorsum of head rugulose to scabrous. Inner (masticatory) margin of mandibles with 7–8 teeth, decreasing in size toward base; dorsum of mandibles striolate; outer margin of mandibles sinuate. Unpaired median seta long (MSL 0.13–0.15, MSI 13–15); in full-face view, 5 decumbent to appressed spoon-shaped hairs on each side of median seta and not surpassing anterior margin of clypeal apron; anterior margin of clypeal apron broadly convex; clypeal apron hyaline and, dorsally, weakly rugulose. In oblique view, body of clypeus, perpendicular to clypeal apron, shield-like, medially concave and lateral margin with thin carinae; in profile, frontoclypeal teeth acute, underneath antennal insertions; median portion of body of clypeus rugose; clypeus covered with subdecumbent spoon-shaped hairs. Eyes large (EL 0.12–0.13, OI 14–16), globose, with 8–9 ommatidia in longest row, and 35–52 ommatidia in total (see comments section); eyes situated in the upper half of head. In full-face view, frontal lobes, separated, almost parallel (FLD 0.24–0.26), barely covering antennal insertions and with posterior margin of clypeus (finger of the clypeus) extending backwards between frontal lobes, posteriorly expanded into a deep pit; in lateral view, frontal lobes with simple suberect hairs; dorsum of frontal

lobes weakly rugose. In full-face view, frontal carina slightly raised, weakly obscured by rugae on frons, continuing to meet vertexal tubercles; small ocellus present; vertex weakly separated into two lobes, lacking hairs and rugulose; occiput drawn out posterolaterally into a conspicuous single tubercle (neck or collar), lacking lower tubercle. Antennal scape long (SL 85–0.91, SI 104–110), strongly reticulate in its entire length, apically smooth; leading edge (anterior margin) of antennal scape, basally with scabrous carina, reduced to thin carina apically; anterior margin of antennal scape (leading edge of scape) scabrous; in full-face view, anterior and posterior margins of antennal scape with sparse subdecumbent spoon-shaped hairs, dorsum of antennal scape with suberect simple hairs, ventral portion of antennal scape with decumbent spoon-shaped hairs. In lateral view, hypostomal teeth large, acute, weakly reticulate, and shinny.

Mesosoma. In dorsal view, humeral pronotal tubercles tooth-like, subtriangular, and covered with spoon-shaped hairs; lateral pronotal tubercles slightly larger than humeral tubercles, with massive base and connected to humeral tubercles and anterior pronotal tubercles by conspicuous carinae; in fronto-dorsal view, lateral pronotal tubercles directed upwards, carinate, and covered with spoon-shaped decumbent hairs; anterior pronotal tubercles low, blunt, with decumbent spoon-shaped hairs; in dorsal view, dorsum of pronotum glabrous; propleuron obtusely angulate, carinate, and with subdecumbent spoon-shaped hairs; mesonotum somewhat higher than pronotum; single promesonotal tubercle present, small but conspicuous; lateral mesonotals tubercles long, blunt at tip, suberect narrow spoon-shaped hairs; anterior

mesonotals long and acute, with subdecumbent narrowly flattened hairs; both lateral and anterior mesonotal connected by thin lateral carina, area within lacking hairs, smooth; mesonotal declivity with median and lateral carinae; median and posterior mesonotal tubercles present, tooth-like, posterior mesonotals slightly larger than median mesonotals, covered with decumbent spoon-shaped hairs; in dorsal view, mesonotal spiracle produced into a triangular tubercle; sides of mesonotum with raised carina; metanotal groove deep with median longitudinal carina; lateral margin of metanotal groove carinate; in lateral view, anterior propodeal tubercles replaced by low, blunt carina; propodeal spines long, with subdecumbet long narrow spoon-shaped hairs that curve at the tip; dorsum (base) of propodeum with lateral carinae that extends from anterior margin of propodeum to propodeal teeth; declivity of propodeum with thin carina extending at point of intersection with propodeal lobes; propodeal declivity as long as dorsum (base) of propodeum; in lateral view, antero-lateral portion of propodeum, with conspicuous carina; dorsum (basal) of- and declivity of- propodeum smooth, lacking hairs (except for hairs present on propodeal spine, and carinae); in lateral view, anterior face of the forecoxa bearing small tubercles and subdecumbent spoon-shaped hairs curving medially; lateral portion of forecoxa weakly rugose lacking hairs.

Metasoma. In lateral view, petiole pedunculate lacking ventral process; ventral margin of peduncle with pair of thin carina that extend parallel to each other towards posterior margin of petiole; in lateral view, ventral margin sinuate; node of petiole, in lateral view, subquadrate; anterior margin of petiolar node with angled carina from

which decumbent spoon-shaped hairs arise; posterior margin of petiolar node with tooth-like carinae; in dorsal view, dorsum of petiole rounded, carinate laterally covered with decumbent spoon-shaped hairs; disc of petiolar node smooth and lacking hairs, narrow spoon-shaped hairs restricted to lateral carina; disc of postpetiole, in dorsal view, hexagonal, wider than long (PPL 0.21–0.25, PPW 0.31–0.33, PPI 132–148); in lateral view postpetiole subquadrate (~1.2x longer than high) and slightly convex dorsally; in dorsal view, lateral portions of postpetiole weakly rugose, median portion of dorsum smooth; posterior margin of postpetiole medially emarginate and postero-inferior margin of postpetiole with short ventral triangular extensions; in lateral view, posterior margin of postpetiole carved. Gastral tergite I finely and densely reticulate, covered with subdecumbent spoon-shaped hairs that curved medially, all directed posterad; gastral sternite I strongly reticulate, covered with decumbent narrowly spoon-shaped hairs.

Other material examined. Measurements. WORKER. EL 0.12–0.13, FLD 0.26, GL 0.93–0.97, HFL 1.00–1.05, HL 0.97–1.00, HTL 0.74–0.76, HW 0.84–0.86, ML 0.59–0.63, MSL 0.15, MSLca 0.11, OI 14–15, PL 0.41–0.48, PPL 0.23–0.24, PPW 0.32–0.33, SL 0.89–0.91, TL 4.33–4.51, WL 1.20–1.24, CI 86–88, MI 59–63, MSI 15, MSLI 73, PPI 137–140, RFLDI 26–27, RFLDII 30–31, SI 104–108 (n=3).

Queen. Unknown.

Male. Unknown.

Comments. The paratype series resemble the holotype individual with some small differences in size. Some specimens included in the "other material examined" section, although from the same locality, differ from the type series in the ocellus more inconspicuous and (when present) hard to see and the promesonotal tubercle absent. The paratype series and the specimens in "other material examined" section differ from the holotype in the number of ommatidia (8–9 ommatidia in longest row, ~35–44 ommatidia in total), number of mandibular teeth (6–8), and the distance (length) by which the unpaired median seta surpasses the anterior border of the clypeal apron (0.10–0.11 mm).

Other material examined. Same as holotype, but 17.i.1969, (*WW Kempf*) (5457) [3w, MZSP].

Myrmicocrypta JSC–017 **sp. nov.**

(Figure 2.55)

HOLOTYPE: 1w, PERU: Madre de Dios; Puerto Maldonado; Estación Biológica Los Amigos; ~635m on Huangana Trail; 277m; 12º 34' 08.4" S 70º 06' 03.1" W; 09.x.2004; (*J Sosa-Calvo*); nest series; underground; JSC041009–22 [MUSM, USNMENTNo. 00758633].

PARATYPE. 5w, same locality and data as holotype. [USNM, USNMENTNo. 00755252, 00758630–32, 00758634].

Measurements. EL 0.11 (0.11), FLD 0.15 (0.14–0.16), GL 0.79 (0.76–0.80), HFL 0.83 (0.80–0.84), HL 0.76 (0.74–0.76), HTL 0.59 (0.57–0.60), HW 0.61 (0.59–0.61), ML 0.52 (0.49–0.55), MSL 0.11 (0.09–0.11), MSLca 0.09 (0.07–0.08), OI 18 (17–18), PL 0.42 (0.40–0.43), PPL 0.21 (0.20–0.24), PPW 0.29 (0.27–0.30), SL 0.73 (0.71–0.74), TL 3.70 (3.62–3.71), WL 1.00 (0.96–1.01), CI 80 (80–82), MI 68 (64–73), MSI 15 (12–15), MSLI 76 (73–75), PPI 138 (117–148), RFLDI 19 (19–21), RFLDII 24 (24–26), SI 120 (118–123) (n=5).

Diagnosis. Hypostomal teeth reduced, acute; dorsum of head with spoon-shaped hairs; unpaired median seta relatively long (MSL 0.09–0.11, MSI 12–15); frontal lobes reduced, parallel; occipital collar bidentate; humeral tubercles present, triangular; anterior pronotal tubercles tooth-like; ventral margin of peduncle of petiole with a short anterior, ventral process, with a single thin carina extending backwards, splitting into two such carina at mid portion of ventral margin.

Description. Worker. *Head*: in full-face view, head longer than wide (HL 0.64–0.76, HW 0.50–0.61, CI 77–82); margins of head almost straight; cephalic corners rounded, with pimple-like tubercles anteriorly, posteriorly slightly angulate; cephalic margin almost straight, medially weakly emarginate. Anterior margin of clypeal apron convex, dorsally weakly rugulose; unpaired median seta long (MSL 0.09–0.11, MSI 12–15), originating slightly before de edge of posterior margin of clypeal apron and anterior margin of body of clypeus; five to six appressed narrowly spoon-shaped hairs

on each side of the median seta reaching anterior margin of clypeal apron. Inner (masticatory) margin of mandibles with 7–8 teeth, decreasing in size toward base; dorsum of mandibles reticulate-strigulate; outer margin of mandibles weakly sinuous. Body of clypeus, perpendicular to clypeal apron, shield-like medially slightly concave; in profile, frontoclypeal teeth acute and conspicuous, underneath antennal insertions; in oblique view, lateral margins of clypeus with thin carina. Eyes convex, moderately small (EL 0.07–0.11, OI 15–18), with 5–6 ommatidia in longest row (12–30ommatidia in total). In full-face view, frontal lobes reduced, parallel (FLD 0.13–0.16), barely covering antennal insertions; with posterior margin of clypeus (finger of the clypeus) narrowly extending between frontal lobes and forming a deep groove. In full-face view, frontal carinae vestigial not extending back eye level; vertexal area with a pair of low tubercles; in lateral view, dorsum of head with spoon-shaped hairs, all directed anteriorly and lacking erect hairs. Dorsum of frontal lobes with narrow spoon-shaped hairs. In full-face view, base of antennal scapes bilobed; antennal scape long (SL 0.61–0.74, SI 118–124), strongly reticulate, with appressed narrow spoon-shaped hairs. In lateral view, cephalic collar bidentate; vertex smooth. Hypostomal teeth reduced, acute.

Mesosoma. In dorsal view, humeral tubercles triangular, slightly larger than anterior pronotals; anterior pronotal tubercles low, tooth-like; in dorsal view, lateral pronotal tubercles obtusely angulate; in lateral view, lateral pronotal low. Dorsum and sides of pronotum glabrous, with hairs only on tubercles; in dorsal view, inferior pronotal area swollen, with low tubercles, and with spoon-shaped hairs. Propleuron angulate.

Lateral mesonotal tubercles long (slightly longer than any other tubercle). Anterior mesonotal tubercles blunt, slightly shorter than lateral mesonotals. Area between mesonotal and metanotal groove with two pairs of small tooth-like tubercles. Metanotal groove deep, smooth. In lateral view, propodeum at same level as mid portion of mesosoma; anterior propodeal tubercles low or absent (just as an angle); propodeal spines reduced to tooth-like carinae; dorsal margin of propodeum as long as or longer than declivity of propodeum. In lateral view, basal face and declivous with thin lateral carinae. In lateral view, small tubercle or carina between mid and hind coxae.

Metasoma. Petiole pedunculate, with small ventro-anterior process; thin carinae originate at base of tooth, and extends backwards, splitting into two carinae at midlength and diverging towards posterior margin of petiole; in lateral view, ventral margin of petiole sinuous. In lateral view, anterior margin of petiolar node rounded, with low pimple-like tubercles; posterior margin of petiolar node, laterally carinate (shape of petiolar node, in lateral view, subquadrate). Postpetiole, in dorsal view, wider than long (PPL 0.19–0.24, PPW 0.24–0.30, PPI 117–148); in dorsal view, anterior margin of postpetiole rounded; sides of postpetiole convex; postero-inferior margin of postpetiole rounded to angulate. Posterior margin of postpetiole medially emarginate. Dorsum of postpetiole smooth, covered with spoon-shaped hairs. Basigastral area with few narrowly impressed costulae, rest of gastral tergite I finely reticulate; dorsum of gastral tergite I with spoon-shaped hairs. Legs short and slender (HTL 0.50–0.60, HFL0.70–0.84).

Head and thorax opaque and shagreened; smooth. Hairs of body narrow spoon-shaped hairs, sparce; most abundant on carinae, tubercles, dorsum of postpetiole and gastral tergite I, and legs. Hairs on antennal scapes narrower. Color of body ferruginous.

Queen. Unknown

Male. Unknown.

Comments. The single excavated nest of this species consisted of a small, spherical chamber, located ~3cm from the surface. The diameter of the chamber was ~2.5cm. The colony was small with few workers and small fungal garden.

Material examined. PERU: ***Madre de Dios***; Puerto Maldonado; Estación Biológica Los Amigos; ~225m on Huangana Trail; 277m; 12º 34' 08.4" S 70º 06' 03.1" W; 08.x.2004; (*J Sosa-Calvo*); JSC041008–13 [1w, USNM].

Myrmicocrypta JSC–019 **sp. nov.**

(Figure 2.56)

HOLOTYPE: 1w, PERU: Madre de Dios; Puerto Maldonado; Centro Sachavacayoc; 234m; 12.81870º S 69.36395º W; 03.viii.2012; (*J Sosa-Calvo*); nest series; JSC120803–01 [MUSM, USNMENTNo. 00758559]

PARATYPE. 3w, 1dq, same locality data as holotype. [USNM, USNMENTNo. 00755266, 00758560–62]

Measurements. WORKER. EL 0.11 (0.10–0.11), FLD 0.23 (0.23–0.24), GL 0.75 (0.70–0.73), HFL 0.79 (0.79–0.81), HL 0.73 (0.71–0.75), HTL 0.59 (0.56–0.58), HW 0.60 (0.58–0.62), ML 0.43 (0.42–0.45), MSL 0.06 (0.05–0.06), MSLca 0.03 (0.03), OI 19 (16–18), PL 0.39 (0.30–0.38), PPL 0.21 (0.20–0.21), PPW 0.25 (0.24–0.26), SL 0.70 (0.69–0.71), TL 3.41 (3.29–3.33), WL 0.90 (0.88–0.90), CI 83 (81–85), MI 59 (60–62), MSI 8 (7–8), MSLI 50 (44–63), PPI 117 (120–130), RFLDI 32 (31–34), RFLDII 38 (37–41), SI 116 (114–120) (n=4).

Diagnosis. *Worker.* Eyes large (EL 0.09–0.12, OI 15–20) with 6–8 ommatidia in longest row (22–42 ommatidia total); clypeal apron convex; frontal lobes laterally expanded, triangular; frontal carinae weakly impressed; head, in full-face view, subquadrate; short and stout unpaired median seta; hypostomal teeth small; mesosoma smooth; long propodeal spines; postpetiole, in dorsal view, bell-like; hairs on head and body spoon-shaped and appressed.

Description. Worker. *Head*, in full-face view and excluding mandibles, longer than broad (HL 0.63–0.76, HW 0.50–0.65, CI 80–87); sides of head broadly convex to straight; cephalic margin transverse, with vestigial median emargination; cephalic corner rounded anteriorly, slightly angulate posteriorly; postero-ventral angles of head (collar) present, superior tubercle acute, inferior tubercle blunt; clypeal apron

narrow, anterior margin of clypeal apron broadly convex, almost straight; unpaired median seta short and stout (MSL 0.05–0.06, MSI 6–8), with 4 simple appressed hairs on each side of median seta; fronto-clypeal teeth acute, conspicuous; in lateral view, hypostomal teeth short, triangular. Mandibles triangular, long (ML 0.36–0.45, MI 57–62), with sinuous outer margin; inner (masticatory) margin 6–7-toothed; dorsum of mandibles finely reticulate-punctate; eyes large (EL 0.09–0.12, OI 15–20), with 6–8 ommatidia in longest row (22–42 ommatidia total), situated posterior to midline of head at a level above frontal lobes; frontal lobes laterally expanded, triangular to convex; frontal lobes slightly separated; antennal scapes long (SL 0.59–0.74, SI 106–121), thin, reticulate, and covered with scarse appressed narrow spoon-shaped hairs.

Mesosoma. Pronotum smooth, anterior pronotal tubercles present, small and blunt at tip; humeral pronotal tubercle triangular, larger than lateral; in dorsal view, lateral pronotal tubercles small, blunt, appearing smaller than humeral tubercles and giving pronotum a square shape anteriorly; propleural tubercle present, short and blunt; lateral and anterior mesonotal present as low tubercles, slightly raised and connected laterally by carinae; in dorsal view, appearing as a squared area; area between meso and metanotal grooves, with a couple of small tubercles, of which the anterior one (median mesonotal) smaller than posterior mesonotal or absent; metanotal groove deep, slightly deeper than mesonotal groove; anterior portion of propodeum lacking tubercles; basal face of propodeum smooth and, in lateral view, flat; basal face of propodeum as long as propodeal declivity; propodeal spines long; basal and declivous faces of propodeum lacking lateral carinae.

Metasoma. Petiole distinctly pedunculate, long (PL 0.30–0.39); in lateral view, anterior margin of petiolar node rounded; in dorsal view, node of petiole rounded; ventral margin of petiole lacking antero-ventral process; in lateral view, ventral margin of petiole weakly sinuous, almost straight and lacking ventral carinae or vestigial. Postpetiole, in lateral view, convex dorsally; in dorsal view, disc of postpetiole, smooth, bell-shaped (anterior margin rounded, posterior margin angulate, slightly wider than anterior margin). In dorsal view, disc of postpetiole slightly wider than long (PPL 0.19–0.24, PPW 0.22–0.28, PPI 110–133); in dorsal view, posterior margin of postpetiole emarginate medially. In lateral view, gaster dorsally convex; in dorsal view, gaster long-ovate (longer than wide); gastral tergite I reticulate, with sides shiny; gastral tergite I with scarce appressed spoon-shaped hairs; epipygium strongly reticulate, posterior margin concave to notched. Legs long and slender. Body opaque, finely granulose, smooth; tubercles low. Pilosity of moderately abundant squamate or spoon-shaped hairs, which become narrow-squamate on scape and legs; hairs on tarsi proximal portion of tarsomere I narrow squamate, distal portion of segment with scarce appressed simple hairs; funicular segments covered with appressed pubescence. Brownish-yellow.

Other material examined. EL 0.09–0.12, FLD 0.21–0.24, GL 0.60–0.77, HFL 0.67–0.87, HL 0.63–0.75, HTL 0.48–0.63, HW 0.50–0.65, ML 0.36–0.44, MSL 0.05, MSLca 0.02–0.03, OI 15–20, PL 0.31–0.39, PPL 0.19–0.24, PPW 0.22–0.28, SL

0.59–0.74, TL 2.84–3.49, WL 0.75–0.95, CI 80–87, MI 57–60, MSI 6–8, MSLI 47–67, PPI 110–133, RFLDI 30–34, RFLDII 37–42, SI 106–120 (n=16).

Queen. Resembling the worker with modifications expected for the caste and with the following differences:

Head. Frontal carinae weakly impressed expending backward to level of mid ocellus; Ocelli small; head wider at posterior margin than anteriorly; hypostomal teeth larger than in the worker, triangular.

Mesosoma. Pronotum as in the worker; sides of pronotum concave; median carinae of mesoscutum present; latero-posterior margin of mesoscutum convex; parapsidal lines present, sinuous; mesoscutum, dorsally, with a pair of longitudinal raised carinae, covered with spoon-shaped hairs; dorsum of mesoscutum smooth; scutellum wider than long; posterior margin of scutellum bidentate, dorsally with median carinae; in lateral view, basal portion of propodeum shorter than propodeal declivous; propodeal spines long; lateral margin of basal and declivity faces of propodeum with thin lateral carinae.

Metasoma. In lateral view, petiolar node subquadrate; ventral margin of petiole with thin paired carinae; postpetiole, in dorsal view, wider than long (PPL 0.25–0.27, PPW 0.42–0.45, PPI 164–167), trapezoidal; disc of postpetiole smooth; anterior margin somewhat concave; postero-lateral margin angulate; posterior margin of petiole

medially emarginate; gastral tergite I densely and finely reticulate, lacking basigastral costulae.

Body ferruginous, darker than the worker.

Measurements. QUEEN. EL 0.16, FLD 0.23–0.28, GL 1.06–1.10, HFL 0.96, HL 0.85–0.86, HTL 0.68–0.70, HW 0.74–0.77, ML 0.46–0.48, MSL 0.05–0.07, MSLca 0.03, OI 21, PL 0.54–0.55, PPL 0.25–0.27, PPW 0.42–0.45, SL 0.77–0.79, TL 4.33–4.46, WL 1.16–1.19, CI 87–89, MI 54–55, MSI 6–8, MSLI 50–63, PPI 164–167, RFLDI 31–33, RFLDII 36–37, SI 102–104 (n=2).

Male. *Head.* Excluding eyes, triangular; cephalic corners with small tubercles; cephalic margin, behind of each posterior ocellus, lacking tubercles; frontal lobes small, slightly expanding laterally, convex, and widely separated (FLD 0.21–0.24); frontal carinae weakly impressed; mandibules triangular with convex outer margin and 7 distinct teeth; second and third funicular joints taken together as long as antennal scapes; antennal scapes long (SL 0.40–0.41, SI 57–59), thinner toward apex; clypeal apron wide, anterior margin convex; unpaired median seta short and thick (MSL 0.07–0.08, MSI 9–10); hypostomal teeth short, triangular.

Mesosoma. Pronotum with anterior tumosities; humeral tubercles present, triangular; lateral pronotal tubercles blunt, smaller than humeral; dorsum of pronotum smooth; in lateral view, anterior margin of pronotum somewhat concave; propleuron with

pyramidal tubercle. Mesoscutum like in the queen, with longitudinal cariane more pronounced, in lateral view, giving dorsum of mesoscutum a convex appearance; scutellum like in queen, axillae triangular and with raised carinae; propodeal spines long, thick at base, slender and acute at tip, curved backwards towards apices.

Metasoma. Petiole pedunculate, without ventral process; in lateral view, node of petiole low, rounded anteriorly; in dorsal view, node of petiole rounded, almost as wide as long. Postpetiole broader than long (PPL 0.24–0.26, PPW 0.40–0.46, PPI 155–193); disc of postpetiole trapezoidal; posterior margin of petiole, in dorsal view, shallowly emarginate medially; sides of disc of postpetiole reticulate, median portion weakjly impressed, almost smooth. Gaster, in lateral view, somewhat convex dorsally; gastral tergite I finely reticulate. Legs long and slender.

Body opaque and somewhat rugose on head and thorax; mandibles, antennal scapes, and gastral tergite I finely reticulate-punctate. Pilosity confined to sparse, simple hairs which are recurved on sculpturing, and a fine appressed pubescence on appendages. Body color brown, appendages paler, mandibles yellowish brown. Wings slightly smokey.

Measurements. MALE. EL 0.33–0.35, FLD 0.21–0.24, GL 1.32–1.34, HFL 1.04–1.07, HL 0.79, HTL 1.04–1.05, HW 0.69–0.70, ML 0.37–0.40, MSL 0.07–0.08, MSLca 0.03–0.04, OI 46–50, PL 0.57–0.64, PPL 0.24–0.26, PPW 0.40–0.46, SL

0.40–0.41, TL 4.65–4.79, WL 1.34–1.38, CI 88–89, MI 46–51, MSI 9–10, MSLI 34–55, PPI 155–193, RFLDI 27–30, RFLDII 30–34, SI 57–59 (n=2).

Comments. This species has been collected in Amazonian and Guiana Shield forest, mostly in leaf-litter samples. The colony of the type series, from Peru, consisted of an underground subspherical chamber (H= 4cm, W= 3.5cm, D=1.5cm) located ~3 cm from the surfcace. The nest entrance consisted of an inconspicuous round hole in the ground.

This species seems to be closely related to and resembles *Myrmicocrypta JSC–019b* from Bahia and Minas Gerais, Brazil. The individuals belonging to *M. JSC–019b* have stronger impressed frontal carinae encompassing the frons and extending to the vertexal area. Lateral carinae join the frontal carinae to form two enclosed areas close to the cephalic margin, these carinae originating from weakly impressed ocular carinae. In addition, these specimens have a small ventro-anterior process of the petiole, which is absent in the type series.

This species is very similar to *M. elizabethae* but differs mostly in the shape of the frontal lobes (expanded laterally in *M. JSC–019*, parallel in *M. elizabethae*) and in the length of the unpaired clypeal median seta (short and stout in *M. JSC–019*, long and thin in *M. elizabethae*).

Material examined. BOLIVIA: ***Santa Cruz***; Aserradero Moira; 180m; 14º 34’ S 61º 12’ W; 27.xi.1993; (*PS Ward*); tropical forest; sifted litter; PSW12174–19 [2w, UCDC]. **BRAZIL:** ***Amazonas***; ZF3, Km 41; [111m]; 2º 25’S 59º 48’ W; 20.ix.1996;

(*AC Mercedes* et al.) [2w, USNM]. Manaus; Reserva Ducke; 95m; 2º 55’ 56.7” S 59º 58’ 19.6” W; 27.ix.2012; (*A Jesovnik*); nest series; AJ120927–03 [2w, USNM]. ***Pará***; Melgaço; Caxiuanã; ECFPn; [12m]; 1º 44’ 0.96” S 51º 30’ 37.97” W; 27.x.2003; (*AY Harada* et al.) [2w, MPEG]. **GUYANA: *Cuyuni-Mazaruni***; Calm Water Creek, along Essequibo River nr. Bartica; 20m; 6º 28.06’ N 58º 37.16’ W; 24.ix.2002; (*JS LaPolla*); 1º forest; litter sample; JSL020925–01–LS09 [1w, USNM]. ***Potaro-Siparuni***; Paramakatoi; PK-Katio Trail; [970m; 4° 43′ 0″ N 59° 42′ 0″ W]; 15.iv.1996; (*TR Schultz* & *UG Mueller*); nest series; TRS960415–06 [8w, 1m, USNM]. Same data as previous, but 14.iv.1996; TRS960414–11 [3w, USNM]. ***Upper Takutu-Upper Essequibo***; Acarai Mts., nr Romeo’s Camp; 263m; 1º 23.136’ N 58º 56.772’ W; 10.x.2006; (*TR Schultz* & *J Sosa-Calvo*); 1º forest; leaf-litter sample; JSC061010–LS07 [2w, USNM]. **PERU: *Madre de Dios***; Estación Pakitza-Manu; 9–28.ii.1992; (*R Camora* & *D Quintero*) [2w, CEPEC]. across River from Cocha Cashu; [332m; 11.888157º S 71.407599º W]; 19.x.1999; (*DW Davidson*); sifted litter; [1w, LACM]. Puerto Maldonado; Estación Biológica Los Amigos; Mirador Trail; 291m; 12º 33’ 17.39” S 70º 06’ 26.69” W; 04.x.2004; (*J Sosa-Calvo*); JSC041004–10 [2w, USNM]. Same as previous entry, but 04.x.2004; (*J Sosa-Calvo*); JSC041006–14 [1w, USNM]. Same as previous entry, but 24.xi.2005; (*J Sosa-Calvo*); winkler; JSC051124–02–LS06 [1w, USNM]. Puerto Maldonado; Centro Sachavacayoc; 234m; 12.81870º S 69.36395º W; 31.vii.2012; (*J Sosa-Calvo*); Winkler; JSC120731–LS01 [1dq, USNM]. Same as previous entry, but Condenado Trail; 26–29.vii.2012; (*AntCourse*) [1m, USNM]. Puerto Maldonado; Centro Sachavacayoc; 183m; 12.85127º S 69.37370º W; 29.vii.2012; (*A Jesovnik*); AJ120729–01 [1dq, USNM].

Myrmicocrypta JSC–019a **sp. nov.**

(Figure 2.57)

HOLOTYPE: 1w, COLOMBIA: Amazonas; Leticia; PNN Amacayacu; 80m; 3º 47.547' S 70º 17.350' W; 10.x.2007; (*J Sosa-Calvo, TR Schultz, J Rodriguez*); leaf-litter sample; JSC071010–LS07 [ICN, USNMENTNo. 00758654]

PARATYPE. 1 w, same locality and data as holotype. [USNM, USNMENTNo. 00758661].

Measurements. WORKER. EL 0.10 (0.10), FLD 0.22 (0.21), GL 0.67 (0.73), HFL 0.66 (0.69), HL 0.65 (0.68), HTL 0.49 (0.48), HW 0.58 (0.58), ML 0.41 (0.44), MSL 0.03 (0.05), MSLca 0.01 (0.02), OI 17 (17), PL 0.31 (0.32), PPL 0.21 (0.22), PPW 0.25 (0.26), SL 0.64 (0.64), TL 3.09 (3.21), WL 0.83 (0.83), CI 88 (85), MI 63 (65), MSI 5 (7), MSLI 40 (43), PPI 119 (121), RFLDI 34 (31), RFLDII 38 (37), SI 111 (111) (n=2).

Diagnosis. *Worker.* Clypeal apron convex; frontal lobes laterally expanded, triangular to convex; frontal carinae weakly impressed; in full-face view, area immediately posterior to frontal lobes weakly protruding forward (also seen in lateral view) and with conspicuous median line; cephalic corners rounded; short and stout unpaired

median seta; hypostomal teeth small; tubercles on mesosoma low, attenuate; propodeal spines short; antero-ventral process of petiole small, inconspicuous.

Description. Worker. *Head*, excluding mandibles, longer than broad (HL 0.65–0.69, HW 0.56–0.59, CI 83–88); sides of head broadly convex; cephalic margin with median emargination; cephalic corner rounded; postero-ventral angles of head (collar) present, superior tubercle acute, inferior tubercle blunt; clypeal apron narrow, anterior margin of clypeal apron broadly convex, almost straight; unpaired median seta short and stout (MSL 0.03–0.05, MSI 5–7), with 4–5 short narrowly spoon-shaped appressed hairs on each side of median seta; fronto-clypeal teeth obtusely angulate to small, conspicuous, tubercles. Mandibles triangular (ML 0.41–0.45, MI 63–68), with sinuous outer margin; inner (masticatory) margin 5–7-toothed; dorsum of mandibles finely reticulate-punctate; eyes large (EL 0.10–0.11, OI 17–19), with 7–8 ommatidia in longest row (27–36 ommatidia total), situated posterior to midline of head at a level above frontal lobes. Frontal lobes expanded laterally, triangular to convex; frontal lobes slightly separated, posterior margin of clypeus extending between frontal lobes; area posterior to frontal lobes slightly protruding forward (appearing somewhat swollen); median line present between frontal carinae. Antennal scapes long (SL 0.64–0.66, SI 111–116), thin, reticulate, and convered with scarse appressed narrow spoon-shaped hairs. In lateral view, hypostomal teeth short, triangular.

Mesosoma. Dorsum of pronotum overall smooth; anterior pronotal tubercles vestigial; humeral pronotal tumosities present; in dorsal view, lateral pronotal tubercles reduced

to carinae, obtusely angulate; propleural tubercle short, blunt; lateral mesonotal tubercles reduced to carinae; anterior mesonotal tubercles low, tooth-like; lateral carinae connecting lateral and mesonotal tubercles; in dorsal view, appearing as squared area; area between meso and metanotal grooves, with a couple of small tubercles, of which anterior one (median mesonotal) smaller than posterior mesonotal or absent; metanotal groove deep, slightly deeper than mesonotal groove; anterior portion of propodeum lacking tubercles, at most angulate; basal face of propodeum smooth and, in lateral view, flat; basal face of propodeum smooth; propodeal spines short; basal and declivous faces of propodeum lacking lateral carinae.

Metasoma. Petiole distinctly pedunculate, long (PL 0.31–0.35); in lateral view, anterior margin of petiolar node rounded; in dorsal view, node of petiole rounded; ventral margin of petiole with minute antero-ventral process; in lateral view, ventral margin of petiole weakly sinuous, almost straight and lacking ventral carinae or vestigial. Postpetiole, in lateral view, widely convex dorsally; in dorsal view, disc of postpetiole, smooth; in dorsal view, disc of postpetiole trapezoidal, anterior margin straight, sides convex, and posterior margin slightly angulate; posterior margin of postpetiole slightly wider than anterior margin. In dorsal view, disc of postpetiole slightly wider than long (PPL 0.21–0.23, PPW 0.25–0.26, PPI 107–121); in dorsal view, posterior margin of postpetiole weakly emarginate medially. In lateral view, gaster dorsally convex; in dorsal view, gaster long-ovate (longer than wide); gastral tergite I reticulate, with sides shiny; gastral tergite I with scarce appressed spoon-

shaped hairs; epipygium strongly reticulate. Legs long and slender (HTL 0.48–0.53, HFL 0.66–0.76).

Body opaque, finely granulose, smooth; tubercles attenuate. Pilosity of moderately abundant squamate or spoon-shaped hairs, which become narrow-squamate on scape and legs; hairs on tarsi proximal portion of tarsomere I narrow squamate, distal portion of segment with scarce appressed simple hairs; funicular segments covered with appressed pubescence. Ferruginous.

Other material examined. EL 0.11, FLD 0.20–0.21, GL 0.70–0.73, HFL 0.71–0.76, HL 0.66–0.69, HTL 0.50–0.53, HW 0.56–0.59, ML 0.44–0.45, MSL 0.03–0.05, MSLca 0.01–0.02, OI 19, PL 0.31–0.35, PPL 0.22–0.23, PPW 0.25–0.26, SL 0.64–0.66, TL 3.23–3.29, WL 0.85–0.89, CI 83–85, MI 65–68, MSI 5–7, MSLI 40–50, PPI 107–118, RFLDI 30–31, RFLDII 36, SI 113–116 (n=3).

Queen. Unknown.

Male. Unknown.

Comments. This species resembles *Myrmicocrypta JSC–019* and *M. JSC–019b* but it can be distinguisheded from both species by the area immediately posterioir to frontal lobes weakly swollen and protruding slightly forward in lateral view; the presence of a conspicuous frontal median line; and the propodeal spines short.

The specimens from Ecuador tend to be bicolored, with the head and gaster darker than the rest of the body. One of the specimens from Ecuador also has a more developed antero-ventral process of the petiole.

Material examined. COLOMBIA: ***Putumayo;*** PNN La Paya, Cabaña La Paya; 330m; 0º 2’ S 75º 12º W; 31.viii–3.ix.2002; (*A Morales*); pitfall; M3330 [1w, IAvHC]. **ECUADOR:** ***Orellana;*** Tiputini Biodiversity Station; [213m; 0.638333º S 76.15º W]; 10.ii–3.iii.2003; (*KT Ryder Wilkie*); winkler; rainforest [2w, USNM].

Myrmicocrypta JSC–019b **sp. nov.**

(Figure 2.58)

HOLOTYPE: 1w, BRAZIL: Bahia; Una, A59–Betania; [118m]; 15º30’02” S 39º13’14” W; 21.x.1999; (*JRM dos Santos*) [top worker, CEPEC, USNMENTNo. 00920691].

PARATYPE. 1 w, same locality and data as holotype. [CEPEC, USNMENTNo. 00920691]. **3w,** Bahia; Una, A44; [112m]; 15º14’01.5” S 39º11’04” W; 21.iii.2000; (*JRM dos Santos*) [CEPEC, MZSP, USNM, USNMENTNo. 00755321].

Measurements. WORKER. EL 0.10 (0.11), FLD 0.22 (0.22–0.23), GL 0.81 (0.73–0.76), HFL 0.82 (0.83–0.87), HL 0.75 (0.74–0.76), HTL 0.59 (0.60–0.61), HW 0.60 (0.59–0.63), ML 0.46 (0.44–0.46), MSL 0.05 (0.04–0.05), MSLca 0.02 (0.01–0.02), OI 17 (17–19), PL 0.38 (0.30–0.37), PPL 0.23 (0.23–0.24), PPW 0.26 (0.24–0.26),

SL 0.71 (0.71–0.75), TL 3.56 (3.37–3.55), WL 0.93 (0.91–0.97), CI 80 (79–82), MI 61 (59–62), MSI 7 (5–7), MSLI 38 (33–43), PPI 110 (104–113), RFLDI 29 (29–30), RFLDII 36 (37), SI 119 (118–122) (n=5).

Diagnosis. *Worker.* Eyes large (EL 0.10–0.12, OI 16–19) with 6–8 ommatidia in longest row (21–32 ommatidia total); clypeal apron convex; frontal lobes laterally expanded, triangular to convex; frontal carinae strongly impressed circumscribing frons, splitting into two posterior carinae, one of which extends towards vertexal area and another extends towards cephalic corners, circumbscribing two areas before cephalic margin; ocular carinae present; hypostomal teeth vestigial; long propodeal spines; antero-ventral process of petiole present, small, tooth-like.

Description. Worker. *Head*, in full-face view and excluding mandibles, longer than broad (HL 0.73–0.81, HW 0.58–0.68, CI 77–84); sides of head broadly convex to straight; cephalic margin transverse, with median emargination; cephalic corners rounded anteriorly, slightly angulate posteriorly. Postero-ventral angles of head (collar) present, superior tubercle larger than inferior tubercle and rounded at tip. Clypeal apron narrow; anterior margin of clypeal apron broadly convex; unpaired median seta short and stout (MSL 0.04–0.05, MSI 5–7), with 4–5 simple appressed hairs on each side of median seta; fronto-clypeal teeth acute, conspicuous. Mandibles triangular, long (ML 0.42–0.49, MI 55–64), with sinuous outer margin; inner (masticatory) margin 6–7-toothed; dorsum of mandibles finely reticulate-punctate. Eyes large (EL 0.10–0.12, OI 16–19), convex, with 6–8 ommatidia in longest row

(21–32 ommatidia total), situated posterior to midline of head at a level above frontal lobes. Frontal lobes laterally expanded, triangular to convex; frontal lobes slightly separated by posterior margin of clypeus extending between frontal lobes. Frontal carinae strongly impressed circumscribing frons, splitting into two posterior carinae, one of which extends towards vertexal area and another extends towards cephalic corners, circumbscribing two areas before cephalic margin; ocular carinae present. Antennal scapes long (SL 0.66–0.76, SI 109–122), thin, reticulate, and covered with scarse appressed narrow spoon-shaped hairs. In lateral view, hypostomal teeth inconspicuous, triangular.

Mesosoma. Anterior pronotal tubercles very small, as pair of tumosities; humeral pronotal tubercle triangular, smaller than lateral tubercles; in dorsal view, lateral pronotal tubercles obtusely angulate, giving pronotum square shape anteriorly; propleural tubercle short and blunt; lateral and anterior mesonotal present as low tubercles, slightly raised and connected laterally by carinae; more conspicuous than pronotal tubercles; in dorsal view, appearing as a squared area; area between mesonotal and metanotal grooves, with a couple of small tubercles, of which the anterior one (median mesonotal) is smaller than posterior mesonotal or absent; metanotal groove deep, concave, slightly deeper than mesonotal groove; anterior portion of propodeum lacking tubercles, at most angulate; basal face of propodeum smooth and, in lateral view, somewhat concave to flat; basal face of propodeum shorter than propodeal declivity; propodeal spines long; basal and declivous faces of propodeum with thin lateral carinae.

Metasoma. Petiole distinctly pedunculate, long (PL 0.30–0.40); in lateral view, anterior margin of petiolar node rounded; in dorsal view, node of petiole rounded; ventral margin of petiole with small antero-ventral process; in lateral view, ventral margin of petiole weakly sinuous, almost straight; ventral margin of petiole with thin parallel carinae. Postpetiole, in lateral view, dorsally flat; in dorsal view, disc of postpetiole, smooth, subquadrate. In dorsal view, disc of postpetiole slightly wider than long (PPL 0.20–0.25, PPW 0.24–0.28, PPI 104–132); in dorsal view, posterior margin of postpetiole weakly emarginate medially. In lateral view, gaster dorsally convex; in dorsal view, gaster long-ovate (longer than wide); gastral tergite I reticulate, with sides shiny; gastral tergite I with scarce appressed spoon-shaped hairs. Legs long and slender (HTL 0.56–0.63, HFL 0.78–0.88).

Body opaque, finely granulose; tubercles low. Pilosity of moderately abundant squamate or spoon-shaped hairs, which become narrow-squamate on scape and legs; hairs on tarsi proximal portion of tarsomere I narrow squamate, distal portion of segment with scarce appressed simple hairs; funicular segments covered with appressed pubescence. Brown-yellowish.

Other material examined. WORKER. EL 0.10–0.12, FLD 0.22–0.24, GL 0.71–0.89, HFL 0.78–0.88, HL 0.73–0.81, HTL 0.56–0.63, HW 0.58–0.68, ML 0.42–0.49, MSL 0.04–0.05, MSLca 0.01–0.02, OI 16–18, PL 0.31–0.40, PPL 0.20–0.25, PPW

0.25–0.28, SL 0.66–0.76, TL 3.30–3.79, WL 0.91–1.00, CI 77–84, MI 55–64, MSI 5–7, MSLI 25–50, PPI 104–132, RFLDI 29–31, RFLDII 35–40, SI 109–121 (n=18).

Queen. Unknown.

Male. Unknown.

Comments. This species resembles *Myrmicocrypta JSC–019* and *M. JSC–019a* in overall habitus; however, it can be differentiated from those species by the strongly impressed frontal carinae, the reduced hypostomal teeth, and the presence of a small but conspicuous antero-ventral process of the petiole.

Material examined. BRAZIL: *Bahia*; Eunapolis; Juerana-etapa 2; [185m; 16.371967º S 39.582489º W]; 22.i.2007; (*IC Nascimento*) [1w, CEPEC]. Itabuna; Ferradas; [45m]; 14º 49’ 33” S 39º 24’ 16” W; 21.ix.2000; (*JRM dos Santos*) [1w, CEPEC]. Mascote; [54m;] 15° 33' 49” S 39° 18' 34” W; 18.vi.1999; (*JRM dos Santos*) [3w, CEPEC]. Santa Cruz Cabrália; [0m; 16° 16' 60” S 39° 1' 60” W]; 03.xi.2006; (*JRM Santos*) [1w, CEPEC]. Same data as previous entry but, 48º 29’ 75” S 81º 94’ 5.33” W; 15.i.2007; (*IC Nascimento*) [1w, CEPEC]. São José da Vitoria; [180m]; 15° 08.65’ S 39° 23.36′ W; 28.v.2003; (*JRM Santos*); Mata-Alto; Winkler [1w, CEPEC]. A63; [173m]; 15º 44.04’ S 39º 23.04’ W; 11.xi.1999; (*JRM dos Santos*) [2w, CEPEC]. Vitória da Conquista; [969m; 14° 50' 60” S 40° 51' 0 W]; 29.i.1994; (*IC Nascimento*) [6w, CEPEC]. ***Minas Gerais;*** Ipaba; [281m]; 19º 25’ S 42º 24’ W; 15–17.ix.2006; (*DL Braga*) [1w, CEPEC]. Lavras; [937m; 21° 13' 60” S

45° 0' 0" W]; vi–xii.2002; (*MS Santos* & *NS Dias*) [3w, CEPEC]. Viçosa; [648m; 20° 45′ 14″ S 42° 52′ 55″ W]; 1997–1998; (*SM Soares*); [1w, CEPEC].

Myrmicocrypta JSC–020 **sp. nov.**

HOLOTYPE: 1w, PERU: Madre de Dios; Puerto Maldonado; Estación Biológica Los Amigos; Mirador Trail; 291m; 12º 33' 17.39" S 70º 06' 26.69" W; 06.x.2004; (*J Sosa-Calvo*); JSC041006–12 [MUSM, USNMENTNo. 00758649].

PARATYPE. 1w, BRAZIL: Para; Melgaço; Caxiuanã ECFPn; [39m]; 1º 44' 9.01" S 51º 29' 15.44" W; 2–4.x.2005; (*AY Harada* et al.); winkler [1w, MPEG, USNMENTNo. 00758656].

Measurements. *Workers*. EL 0.08, FLD 0.17, GL 0.58–0.61, HFL 0.56, HL 0.58, HTL 0.38–0.39, HW 0.46–0.49, ML 0.36–0.37, MSL 0.05, MSLca 0.02–0.03, OI 16–17, PL 0.29–0.31, PPL 0.20–0.21, PPW 0.21–0.22, SL 0.52–0.53, TL 2.73–2.80, WL 0.71–0.73, CI 80–85, MI 63–64, MSI 8, MSLI 43–57, PPI 98–106, RFLDI 29–30, RFLDII 35–36, SI 106–114 (n=2).

Diagnosis. *Worker*: small individuals (WL 0.71–0.73, TL 2.73–2.80); cephalic corners rounded, lacking tubercles; frontal carina vestigial; frontal lobes weakly expanded laterally, convex; clypeal median seta short; tubercles on mesosoma almost completely eroded; petiole with antero-ventral process.

Description: *Worker*: Head subquadrate, slightly longer than broad (HL 0.58, HW 0.46–0.49, CI 80–85); cephalic margin almost straight, interrupted medially by weakly impressed emargination; cephalic corners evenly rounded, lacking tubercles; in full-face view, sides of head slightly convex; in full-face view, frontal carinae vestigial, dorsum of head rugose; postero-ventral angles of the head (collar) produced on each side as a pair of tubercles, top one somewhat more acute than lower tubercle. Masticatory (inner) margin of mandibles with 5–6 irregular teeth; outer margin of mandibles convex/straight; dorsum of mandibles finely striate-punctate; unpaired median seta short, stout (MSL 0.05, MSLca 0.02–0.03), originating proximal to posterior margin of clypeal apron; clypeal apron with anterior margin evenly convex, dorsum translucid and wrinkled; fronto-clypeal teeth present anterior to antennal insertions; in lateral view, fronto-clypeal teeth acuminate, covered with narrow spoon-shaped hairs; frontal lobes of moderate size (FLD 0.17, RFLDI 29–30, RFLDII 35–36) laterally expanded with convex outer margins. Eyes small with 4–5 ommatidia in longest row (13–16 ommatidia in total), situated distinctly back of the midline of head and posterior to frontal lobes; antennal scape finely reticulate, covered with narrow spoon-shaped hairs, getting narrower (to almost simple) at apex of scape; hypostomal teeth present, small, triangular.

Mesosoma: Pronotum lacking anterior tubercles; humeral tubercles triangular; lateral pronotal tubercles angulate, better seen in dorsal view, giving promesonotum a square appearance; propleuron tuberculate; mesonotal tubercles eroded; anterior mesonotal

tubercles low but distinct; area between mesonotal and metanotal groove with a conspicuous tubercle; declivous surface of propodeum bordered on each side by thin carinae; basal surface as long as declivity; anterior portion of propodeum with tooth-like tubercle; propodeal spines long and acute.

Metasoma: Petiole distinctly pedunculate; in lateral view, peduncle of petiole with antero-ventral process, and with a slight ventral convexity medially; ventral margin of petiole with a pair of weak carina that extends to posterior margin of petiole, best seen in ventral view; in lateral view, anterior margin of petiolar node rounded; in dorsal view, dorsum of petiolar node rounded; in lateral view, posterior margin of petiolar node with small tooth-like carinae; in dorsal view, postpetiole twice (or slightly less) as broad as petiole; disc of postpetiole as long broad or slightly broader (PPL 0.20–0.21, PPW 0.21–0.22; PPI 98–106); sides of postpetiole broadly convex; posterior margin moderately emarginate medially; dorsum of postpetiole covered with appressed squamate hairs; gastral segment I long-ovate, tergite finely reticulate and covered with spoon-shaped hairs.

Pilosity of moderately abundant squamate hairs, which become narrow-squamate (spoon-shaped) on the appendages, the latter bearing a fine, appressed pubescence. Yellowish-brown.

Queen. Unknown.

Male. Unknown.

Comments. This species resembles *Myrmicocrypta boliviana* in general habitus, but can be separated from that species by the: (i) smaller size; (ii) presence of an antero-ventral process of the petiole; and (iii) disc of postpetiole as long as broad, or slightly broader.

Material examined. Known only from the type localities.

Myrmicocrypta JSC–021 **sp. nov.**

(Figure 2.59)

HOLOTYPE: 1w, TRINIDAD: Saint George; Morne Bleu; Arima–Blanchicheusse Rd, nr Textel Radar Station; 545m; [10.716667º N 61.283333º W]; 11.xi.1992; (*TR Schultz & J Wetterer*); nest series; 1º Forest; soil; TRS921111–05 [USNM, USNMENTNo. 00412794].

PARATYPE. 9w, 2m, same locality data as holotype [USNM, USNMENTNo. 00412780, 00412792, 00412795–97, 00755310]. **5w,** same locality data as holotype [Ethanol, Vial USNMENTNo. 00414840].

Measurements. WORKER. EL 0.11 (0.09–0.11), FLD 0.17 (0.16–0.21), GL 0.79 (0.71–0.88), HFL 0.84 (0.77–0.87), HL 0.77 (0.73–0.81), HTL 0.60 (0.56–0.61), HW 0.59 (0.55–0.64), ML 0.53 (0.47–0.55), MSL 0.10 (0.09–0.11), MSLca 0.07 (0.05–

0.07), OI 18 (16–18), PL 0.42 (0.35–0.44), PPL 0.20 (0.18–0.21), PPW 0.26 (0.22–0.26), SL 0.74 (0.64–0.75), TL 3.71 (3.41–3.90), WL 1.00 (0.93–1.05), CI 76 (76–79), MI 69 (64–71), MSI 13 (12–14), MSLI 67 (57–67), PPI 132 (115–140), RFLDI 21 (21–30), RFLDII 28 (27–39), SI 126 (115–130) (n=8).

Diagnosis. Hypostomal teeth small, triangular; dorsum of head with spoon-shaped hairs (lacking erect hairs); unpaired seta of clypeal apron mid-sized (MSL 0.09–0.11, MSI 13–15); frontal lobes reduced, weakly convex, almost parallel; humeral tubercles small, triangular; propleuron carinate; propodeal spines short, carinate (more like corners); dorsum (basal portion of propodeum) larger than its declivity; ventral margin of peduncle of petiole with a short anterior, ventral process, with a single thin carina extending backwards, splitting into two such carina at mid portion of ventral margin.

Description. Worker. *Head*: in full-face view and excluding mandibles, longer than wide (HL 72–81, HW 0.55–0.64, CI 76–80); margins of head almost straight; vertexal area with a pair of low tubercles, posterior margin medially slightly emarginate; cephalic corners anteriorly rounded, posteriorly angulate; in lateral view, dorsum of head with spoon-shaped hairs, lacking erect hairs. Dorsum of frontal lobes with narrow spoon-shaped hairs. Anterior margin of clypeal apron broadly convex, dorsally weakly rugulose; unpaired clypeal seta mid-sized (MSL 0.09–0.11, MSI 12–14), originating slightly before edge of posterior margin of clypeal apron and anterior margin of body of clypeus; five to eight appressed narrowly spoon-shaped hairs on

each side of the median seta reaching anterior margin of clypeal apron. Mandibles long (ML 0.47–0.56, MI 64–75), triangular; inner margin of mandibles 6–8-toothed, decreasing in size toward base; dorsum of mandibles reticulate; outer margin of mandibles sinuous. Body of clypeus, perpendicular to clypeal apron, shield-like, with some rugae and medially slightly concave; in profile, frontoclypeal teeth acute and conspicuous, underneath antennal insertions; in oblique view, lateral margins of clypeus with thin carina; posterior portion of clypeus extending between frontal lobes. Eyes convex, moderately mid-sized, with 6–9 ommatidia in longest row (24–36 ommatidia in total). In full-face view, frontal lobes reduced, weakly convex almost parallel (FLD 0.16–0.21), barely covering antennal insertions; with posterior margin of clypeus (finger of the clypeus) narrowly extending between frontal lobes and forming a deep groove. In full-face view, frontal carinae short extending at eye level. In full-face view, base of antennal scapes bilobed; antennal scape strongly reticulate, with scarse, appressed very narrow spoon-shaped hairs. In lateral view, cephalic collar bidentate, tubercles small. Vertex smooth. Hypostomal teeth triangular.

Mesosoma. Anterior pronotal tubercles vestigial or very reduced (as carina); humeral tubercles small, triangular, larger than anterior tubercles; lateral pronotal tubercles, low; in dorsal view, angulate; in lateral view carinate, low, and forming straight angle; dorsum and sides of pronotum mostly glabrous, with hairs restricted to tubercles; propleuron carinate, obtusely angulate. Promesonotal suture weakly marked dorsally. Lateral and anterior mesonotal tubercles low; anterior tubercles tooth-like, whereas lateral mesonotal tubercles carinate; both tubercles joint by lateral

thin lateral carinae; area between mesonotal and metanotal grooves witth two pairs of small tooth-like tubercles; metanotal groove shallow to concavely deep. Anterior portion of propodeum with tooth-like tubercles or angulate; propodeal spines short, triangular; base and declivous faces of propodeum with thin lateral carinae; dorsal margin of propodeum longer than- or as long as- declivity of propodeum; small tubercle (carina) between mid and hind coxae.

Metasoma. Ventral margin of petiole with tooth-like antero-ventral process; thin carinae originate at base of tooth and extending backwards, splitting into two carinae at midlength and diverging towards posterior margin of petiole. In lateral view, anterior margin of petiolar node rounded; in lateral view, dorsum of petiolar node straight; in dorsal view, petiolar node longer than wide; dorsum of petiolar node smooth; posterior margin of petiolar node, laterally. In dorsal view, postpetiole wider than long (PPL 0.18–0.21, PPW 0.22–0.27, PPI 115–140); in dorsal view, anterior margin of postpetiole convex; sides of postpetiole broadly convex; postero-inferior margin of postpetiole obtusely angulate to tooth-like; in dorsal view, posterior margin of postpetiole medially emarginate; disc of postpetiole smooth, covered with spoon-shaped hairs. Base of gaster lacking costulae, rest of gastral tergite I areolate; anterior portion of gaster, laterally, rounded.

Body yellowish to light brownish, smooth; head, tubercles, petiole, postpetiole, femur, tibia, and gaster covered with spoon-shaped hairs; hairs on antennal scape and legs dense, appressed, and very narrow and elongate.

Other material examined. Measurements. WORKER. EL 0.10–0.11, FLD 0.17–0.18, GL 0.78–0.83, HFL 0.80–0.86, HL 0.72–0.76, HTL 0.59–0.61, HW 0.58–0.61, ML 0.51–0.56, MSL 0.10, MSLca 0.06, OI 17–20, PL 0.33–0.38, PPL 0.19–0.20, PPW 0.25–0.27, SL 0.71–0.75, TL 3.52–3.65, WL 0.94–0.97, CI 79–80, MI 70–75, MSI 13–14, MSLI 60, PPI 132–139, RFLDI 24, RFLDII 30, SI 121–124 (n=4).

Queen. Resembling the worker with modifications expected for the caste and with the following differences:

Head: dorsum of head rugulose.

Mesosoma: dorsum and sides of pronotum weakly rugulose. Mesoscutum with long median line; parapsidal lines long, slightly rised, and extending to anterior margin of mesoscutum; dorsum of mesoscutum rugose. Posterior margin of scutellum bidentate.

Metasoma: in dorsal view, postpetiole with postero-inferior triangular projections. Base of gaster with short striae.

Measurements. QUEEN. EL 0.15–0.16, FLD 0.20–0.21, GL 1.15–1.20, HFL 0.89–0.93, HL 0.81–0.83, HTL 0.65–0.66, HW 0.67–0.69, ML 0.58–0.60, MSL 0.12–0.13, MSLca 0.07–0.08, OI 22–23, PL 0.53–0.59, PPL 0.24–0.26, PPW 0.45–0.46, SL

0.75–0.81, TL 4.52–4.56, WL 1.13–1.18, CI 82–84, MI 71–73, MSI 15, MSLI 61–67, PPI 176–184, RFLDI 24–26, RFLDII 29–31, SI 110–120 (n=3).

Male. *Head.* Cephalic corners broadly convex; cephalic margin, behind of each posterior ocellus, with small, carina-like, tumosities or tooth. In lateral view, vertex shallowly concave; vertex with thin carinae originating at base of cephalic tubercles and extending to occipital carina. Frontal lobes small, parallel, and broadly separated (FLD 0.18–0.19). Frontal carinae impressed, extending backwards and meeting with carinae that extends from lateral ocelli and meeting at level of mid ocellus. Mandibules triangular with weakly sinuous outer margin; inner margin of mandibles with 8–9 distinct teeth; dorsum of mandibles finely reticulate. Antennal scapes short (SL 0.35–0.40, SI 50–55), finely reticulate, and with short simple appressed hairs; second and third funicular segments taken together longer than antennal scapes. Anterior margin of clypeal apron convex; unpaired clypeal seta mid-sized and thick (MSL 0.10–0.12, MSI 13–15); in lateral view, body of clypeus obtusely angled; margin of body of clypeus demarcated by thin carina. Hypostomal teeth short, triangular.

Mesosoma. Pronotum lacking anterior tumosities or carinae; humeral tubercles present, triangular, slightly larger than lateral pronotal tubercles; lateral pronotal tubercles irregular, at most angulate, with carina extending towards mid-line; dorsum and sides of pronotum smooth; in lateral view, propleuron obtusely angulate. In lateral view, anterior portion of mesoscutum raised as pair of tubercles; in lateral

view, mesoscutum flat or slightly concave dorsally; in dorsal view, antero-lateral margins of mesoscutum concave; lateral margin of mesoscutum sinuous; postero-lateral margin of mesoscutum tuberculate, directed upwards; in dorsal view, dorsum of mesoscutum with parallel pair of raised carinae that extend entire length of mesoscutum; parapsidal lines present; dorsum of mesoscutum weakly rugulose. Scutellum wider than long; in dorsal view, axillae triangular, in lateral view, axillae tooth-like pointing backwards; posterior margin of scutellum, bidentate; in lateral view, posterior tubercles of scutellum thick and rounded at tip; dorsum of scutellum with median longitudinal carina and lateral rugae. Propodeal spines long, thick at base, slender and rounded at tip, diverging posteriorly; declivity of propodeum slightly longer than base of propodeum, both with thin lateral carinae.

Metasoma. Petiole pedunculate, long (PL 0.59–0.65), with small (vestigial) antero-ventral process; in lateral view, node of petiole inconspicuous, anterior portion rounded; in dorsal view, node of petiole slightly longer than wide; disc of petiole smooth, with lateral thin carinae. In lateral view, dorsum of postpetiole, convex; in dorsal view, postpetiole broader than long (PPL 0.20–0.21, PPW 0.36–0.38, PPI 173–180); in dorsal view, anterior margin of postpetiole convex; sides of postpetiole somewhat convex; posterior margin of petiole, in dorsal view, medially emarginate; disc of postpetiole finely reticulate. Gaster, in lateral view, convex dorsally; gastral tergite I finely reticulate and lustrous. Legs long and slender.

Body opaque; mandibles, antennal scapes, disc of postpetiole, and gastral tergite I reticulate. Pilosity confined to sparse, hairs that are narrowly flattened medially and thin and simple towards the apex, which recurved on sculpture, and simple short fine appressed pubescence on appendages.

Body color dark brown to reddish, appendages slightly paler. Wings yellowish.

Measurements. MALE. EL 0.33–0.35, FLD 0.18–0.19, GL 1.19–1.49, HFL 1.00–1.30, HL 0.77–0.80, HTL 1.11–1.13, HW 0.69–0.74, ML 0.44–0.46, MSL 0.10–0.12, MSLca 0.07–0.08, OI 47–51, PL 0.59–0.65, PPL 0.20–0.21, PPW 0.36–0.38, SL 0.35–0.40, TL 4.55–4.90, WL 1.32–1.34, CI 88–94, MI 56–60, MSI 13–15, MSLI 61–71, PPI 173–186, RFLDI 23–24, RFLDII 25–27, SI 50–55 (n=4).

Comments. This species resembles *M. JSC-017* from Peru and *M. buenzlii,* known from French Guiana, Suriname, Guyana, and Trinidad. It differs from both species by the slightly larger distance between the frontal lobes, the shape of the petiole, and the shape of the occipital collar.

Variations observed in individuals of this species include:

i) Within the same nest, I have seen individuals with a shallow metanotal groove (almost absent) and individuals with a more pronounced, concave, and somewhat deeper metanotal groove.

ii) Within the same nest, I have seen individuals that lack the anterior propodeal tubercles and others that have a small tooth-like tubercle.

iii) In the specimens from Guyana (TRS960415–10), the postero-inferior margin of the postpetiole forms a nearly right angle (almost like a tooth) unlike the margin in the type series from Trinidad, which is obtusely angulate.

iv) Males have very reduced to tooth-like tubercles behind the lateral ocelli. This variation can be observed in the males from the type series from Trinidad.

The nest from Trinidad was collected in a steep embankment. The nest entrance consisted of a small turret of about 1 cm long. The sole chamber was spherical (~2 cm in diameter) and approximately 2.5 cm from the surface (record from TR Schultz's field notebook).

Material examined. GUYANA: ***Potaro-Siparuni***; Paramakatoi; PK–Katio Trail; [970m; 4° 43′ 0″ N 59° 42′ 0″ W]; 15.iv.1996; (*TR Schultz* & *UG Mueller*); nest series; soil; TRS960415–10 [12w, 6aq, 2m, USNM].

Myrmicocrypta JSC–022 **sp. nov.**

(Figure 2.60)

HOLOTYPE: 1w, GUYANA: Upper Takutu-Upper Essequibo; Acarai Mountains, nr Romeo's Camp; 273m; 1º 23.122' N 58º 56.761' W; 10.x.2006; (*TR Schultz* & *J Sosa-Calvo*); 1º forest swamp; leaf-litter; Winkler sample; JSC061010–LS08 [USNM, UNSMENTNo.00694880]

PARATYPE. 1w, same data as holotype [USNM, cryovial, USNMENTNo. 00525271]. Same as previous entry, but 282m; 1º 23.225' N 58º 56.776' W; 7.x.2006; (*TR Schultz & J Sosa-Calvo*); 1º forest swamp; leaf-litter; Winkler sample; TRS061007–LS01 [1w, USNM]. Same as previous entry, but 300m; 1º 23.244' N 58º 56.783' W; 7.x.2006; (*TR Schultz & J Sosa-Calvo*); 1º forest swamp; leaf-litter; Winkler sample; TRS061007–LS05 [1w, USNM].

Measurements. EL 0.11 (0.11–0.12), FLD 0.20 (0.19), GL 0.79 (0.79), HFL 0.89 (0.88–0.90), HL 0.77 (0.76–0.78), HTL 0.60 (0.59–0.60), HW 0.61 (0.60–0.65), ML 0.51 (0.50–0.51), MSL 0.10 (0.09–0.10), MSLca 0.07 (0.07–0.08), OI 17 (17–20), PL 0.37 (0.39–0.43), PPL 0.24 (0.21–0.23), PPW 0.30 (0.30), SL 0.76 (0.73–0.74), TL 3.73 (3.72), WL 1.04 (1.03–1.04), CI 80 (79–84), MI 66 (66), MSI 13 (12–13), MSLI 73 (75–80), PPI 128 (135–141), RFLDI 26 (25), RFLDII 32 (29–32), SI 124 (113–121) (n=3).

Diagnosis: hypostomal teeth small, but acute; dorsum of head with erect simple hairs contrasting with narrow spoon-shaped ground pilosity; clypeal unpaired seta relatively long; frontal lobes weakly expanded laterally, convex; hairs on antennal scape short, narrowly flattened and appressed; anterior pronotal tubercles small or reduced to carinae; propodeal spines short, carinate (more like corners); petiole with tooth-like ventral process.

Description. Worker. *Head*: in full-face view, head longer than wide (HL 0.71–0.78, HW 0.57–0.65, CI 77–84); unpaired median seta relatively long (MSL 0.09–0.10, MSI 12–14), originating slightly before de edge of posterior margin of clypeal apron and anterior margin of of clypeus; five to six appressed narrowly spoon-shaped hairs on each side of the median seta reaching anterior margin of clypeal apron; anterior margin of clypeal apron broadly convex, dorsally weakly rugulose; inner margin of mandibles with 7–9 teeth; dorsum of mandibles reticulate; outer margin of mandibles sinuate. Body of clypeus, perpendicular to clypeal apron, shield-like; in profile, frontoclypeal teeth acute and conspicuous, underneath antennal insertions; in oblique view, lateral margins of clypeus with thin carina. Eyes convex, moderately small, with 6–8 ommatidia in longest row (28–40 ommatidia in total). In full-face view, frontal lobes barely expanding laterally, broadly convex (FLD 0.18–0.20), barely covering antennal insertions. In full-face view, frontal carinae weakly impressed, extending backwards forming vertexal carinae medially and lacking secondary carinae extending toward cephalic corners; posterior dorsum of head rugose. In full-face view, cephalic corners angulate, ending in a small tubercle; cephalic margin medially weakly emarginate; in lateral view, dorsum of head with at least 3 pairs of erect simple hairs in addition to appressed spoon-shaped ground pilosity. Dorsum of frontal lobes with erect simple to flattened hairs; in full-face view, base of antennal scapes bilobed; antennal scape strongly reticulate, with scarse, appressed simple or very narrow spoon-shaped hairs; cephalic collar, in profile, bidentate (in 1006 specimen, lower one larger than the top one, need to check the other specimens); vertex smooth. Hypostomal teeth triangular, small.

Mesosoma. Anterior pronotal tubercles small, carina-like; humeral tubercles triangular, larger than anterior pronotals; in dorsal virew, lateral pronotal tubercles triangular; in lateral view, lateral pronotals with wide base and acute tip; dorsum of pronotum in its majority glabrous, with hairs restricted to tubercles; propleuron angulate, lacking tubercle. Lateral mesonotal tubercles low with wide base, carinate, and with a suberect to erect narrow spoon-shaped hair; anterior mesonotal tubercles, triangular, tooth-like. Area between meso and metanotal grooves with with two pairs of vestigial blunt tubercles. Metanotal groove deep, concave. Anterior propodeal tubercles low, tooth-like; propodeal spines short, triangular. In lateral view, small tubercle between mid and hind coxae.

Metasoma. In lateral view, antero-ventral portion of petiole with tooth-like process; a couple of thin carinae originate at base of tooth and extends entire length of petiole diverging towards posterior margin of petiole. In lateral view, ventral margin of petiole sinuate. In lateral view, anterior margin of petiolar node rounded, dorsal portion appearing flattened. Postpetiole, in dorsal view, wider than long (PPL 0.20–0.24, PPW 0.28–0.30, PPI 128–141); in dorsal view, postero-lateral margin of postpetiole inferiorly produced as triangular extensions; in dorsal view, posterior margin of postpetiole medially emarginate. Gastral tergite I finerly reticulate, with or without costulae on basigastral area; antero-lateral margin of gastral segment I carinate; sides of gastral tergite I smooth and shinny.

Head and thorax opaque. Dorsum of head weakly rugose, dorsum of mesosoma smooth. Hairs on body consisting mostly of appressed spoon-shaped hairs, some in tubercles more narrow, and dorsum of head and frontal lobes with suberect/erect simple hairs. Hairs on antennal scapes simple to narrow flattened and appressed. Color of body pale brown to reddish.

Other material examined. Measurements. Worker. EL 0.09–0.11, FLD 0.18–0.19, GL 0.64–0.81, HFL 0.78–0.83, HL 0.71–0.74, HTL 0.55–0.55, HW 0.57–0.59, ML 0.45–0.47, MSL 0.09–0.10, MSLca 0.05–0.07, OI 16–20, PL 0.35–0.42, PPL 0.20–0.23, PPW 0.28–0.30, SL 0.68–0.71, TL 3.40–3.56, WL 0.93–0.99, CI 77–83, MI 62–65, MSI 12–14, MSLI 57–79, PPI 129–142, RFLDI 25–26, RFLDII 30–33, SI 117–125 (n=6).

Queen. Unknown.

Male. Unknown.

Comments. The worker of this species resembles those of of *M. JSC–022a, JSC–022b, JSC–022x,* and *JSC–022y* in the presence of erect simple hairs on the dorsum of the head. However, this species differs from all of them in the antennal scape lacking erect simple hairs and the size of the eyes.

The specimens from Suriname differ slightly in the lateral pronotal tubercles being slightly more rounded than angulate in dorsal view. The specimens from Brazil

differ from the specimens from Guyana and Suriname mostly in the presence of short costulae on the base of gaster.

Material examined. BRAZIL: ***Para;*** Melgaço, Caxiuanã, ECFPn; [44m]; 1º 42' 23.81" S 51º 27' 32.72" W; 15–17.i.2004; (*AY Harada* et al.) [3w, MPEG]. Same as previous entry, but 1º 44' 9.01" S 51º 29' 15.44" W; 26–28.i.2007; (*AY Harada* et al.) [1w, MPEG]. Same as previous entry, but 1º 46' 53.58" S 51º 35' 31.10" W; 27–29.i.2006; (*AY Harada* et al.) [1w, MPEG]. **SURINAME:** ***Brokopondo District;*** Poeroe man; Kemisa; [43m; 4.67º N 54.95º W] ix.1959; 2-XXIa-10; (*Ivd Drift*) [1w, MZSP].

Myrmicocrypta JSC–022a **sp. nov.**

(Figure 2.61)

HOLOTYPE: 1w, GUYANA: Iwokrama Forest Reserve; Whitewater Camp; 60m; 4º 43.89' N 58º 50.992' W; 5.xi.2002; (*JS LaPolla* et al.); 1º forest; litter sample; JSL021105–01–LS19 [USNM, USNMENTNo. 00412261].

PARATYPE. 1w, same data as holotype [USNM, USNMENTNo. 00412260].

Measurements. EL 0.06 (0.06), FLD 0.20 (0.20), GL 0.79 (0.75), HFL 0.76 (0.74), HL 0.76 (0.75), HTL 0.52 (0.50), HW 0.64 (0.63), ML 0.47 (0.50), MSL 0.10 (0.12), MSLca 0.07 (0.09), OI 9 (9), PL 0.42 (0.41), PPL 0.19 (0.18), PPW 0.26 (0.26), SL

0.68 (0.70), TL 3.57 (3.53), WL 0.94 (0.94), CI 84 (84), MI 62 (67), MSI 13 (16), MSLI 73 (72), PPI 137 (150), RFLDI 27 (27), RFLDII 32 (32), SI 106 (111) (n=2).

Diagnosis: hypostomal teeth small, but acute; head with simple erect/suberect hairs contrasting with flattened cephalic ground pilosity; frontal lobes weakly expanded, convex and anteriorly close together; eyes small with 3–4 ommatidia in longest row (5–8 ommatidia total); antennal scape with simple erect/suberect hairs; ventral process of petiole lacking or with an inconspicuous tooth.

Description. Worker. *Head*: in full-face view, longer than wide (HL 0.71–0.76, HW 0.56–0.66, CI 80–86); unpaired median seta relatively long (MSL 0.09–0.12, MSI 12–17), originating at– or slightly close to– edge of posterior margin of clypeal apron and anterior margin of clypeus; five to six appressed narrowly spoon-shaped hairs on each side of the median seta reaching anterior margin of clypeal apron; anterior margin of clypeal apron broadly convex, dorsally weakly rugulose; inner margin of mandibles with 6–8 teeth; dorsum of mandibles reticulate; outer margin of mandibles somewhat sinuous. Body of clypeus, perpendicular to clypeal apron, shield-like; in profile, frontoclypeal teeth conspicuous, blunt or acute underneath antennal insertions; in oblique view, lateral margins of clypeus with thin carina. Eyes small, with 3–4 ommatidia in longest row (5–8 ommatidia in total). In full-face view, frontal lobes barely expanded laterally, broadly convex (FLD 0.17–0.23), barely covering antennal insertions; frontal lobes very closely together anteriorly. In full-face view, frontal carinae weakly impressed, blending with rugae on dorsum of head. In full-face

view, cephalic corners somewhat angulate; cephalic margin almost straight, medially weakly emarginate; in full-face view, vertexal area with pair of small tubercles; in lateral view, dorsum of head with erect simple hairs in addition to appressed flattened ground pilosity. Dorsum of frontal lobes with erect simple to flattened hairs; in full-face view, base of antennal scapes bilobed; antennal scape strongly reticulate, with scarce, erect/suberect simple hairs, some curved at tip; leading edge of antennal scape with thin crenulate carina. In profile, cephalic collar, occipital collar, bidentate formed by small, blunt tubercles; vertex smooth. Hypostomal teeth triangular.

Mesosoma. Anterior pronotal tubercles reduced to carina; humeral tubercles triangular, larger than anterior pronotals; in dorsal view, lateral pronotal tubercles triangular; in lateral view, lateral pronotals with wide base and acute tip; dorsum of pronotum in its majority glabrous, with hairs restricted to tubercles; propleuron angulate to tuberculate. Lateral mesonotal tubercles low with wide base, carinate, and with a suberect to erect narrow spoon-shaped hair; anterior mesonotal tubercles, triangular, tooth-like. Area between meso and metanotal grooves with two pairs of small blunt tubercles, posterior pair slightly larger than anterior one. Metanotal groove deep, concave. Anterior propodeum angulate, with small triangular carina-like tubercle; propodeal spines short, triangular. In lateral view, lacking small tubercle between mid and hind coxae.

Metasoma. In lateral view, antero-ventral portion of petiole lacking a ventral process or with minute inconspicuous tooth; paired thin carinae extending ventral length of

petiole diverging towards posterior margin of petiole. In lateral view, ventral margin of petiole sinuate to slightly concave. In lateral view, anterior margin of petiolar node rounded with pair of small tubercles; dorsum of petiolar node with posterior lateral carinae. Postpetiole, in dorsal view, wider than long (PPL 0.16–0.19, PPW 0.22–0.26, PPI 132–159); in dorsal view, postero-lateral margin of postpetiole inferiorly produced as small triangular extensions; in dorsal view, posterior margin of postpetiole medially emarginate. Gastral tergite I finely reticulate; antero-lateral margin of gastral segment I carinate.

Head and thorax opaque. Dorsum of head rugose, dorsum of mesosoma smooth. Hairs on body consisting mostly of subdecumbent spoon-shaped hairs, some hairs in tubercles narrower, and dorsum of head, frontal lobes, and body of clypeus with suberect/erect simple hairs. Antennal scape with simple to narrow flattened and suberect/erect hairs. Hairs on gastral segment I with narrow spoon-shaped decumbent hairs. Color of body pale brown to yellowish.

Other material examined. Measurements. WORKER. EL 0.05–0.07, FLD 0.17–0.23, GL 0.71–0.86, HFL 0.71–0.79, HL 0.71–0.76, HTL 0.49–0.53, HW 0.56–0.67, ML 0.45–0.54, MSL 0.09–0.12, MSLca 0.07–0.09, OI 9–11, PL 0.33–0.43, PPL 0.17–0.19, PPW 0.23–0.26, SL 0.68–0.74, TL 3.27–3.64, WL 0.86–0.99, CI 80–86, MI 61–72, MSI 12–17, MSLI 71–87, PPI 132–159, RFLDI 24–31, RFLDII 29–36, SI 110–122 (n=9).

Queen. Unknown.

Male. Unknown.

Comments. This species resembles *M. JSC–022a, JSC–022b, JSC–022x,* and *JSC–022y* in the presence of erect simple hairs on the dorsum of head. However, this species differs from *JSC–022* in the presence of erect simple hairs on the antennal scapes and in the small eyes. *Myrmicocrypta JSC–022a* differs from *M. JSC–022b* and *JSC–022y* in the frontal lobes closely approximated anteriorly, whereas in *M. JSC–022b* and *M. JSC–022y* the posterior margin of the clypeus extends between the frontal lobes. *Myrmicocrypta JSC–022a* differs from *M. JSC–022x* in the frontal lobes convex rather than straight; the hypostomal teeth relatively short rather than long in *M. JSC–022x*; and the posterior cephalic margin weakly emarginate, rather than deep and strongly emarginate in *M. JSC–022x*.

Variations within this species include: (i) specimens from Acre, Brazil, with thin, narrow, almost needle-like hypostomal teeth; (ii) the specimen (M1154) from Amacayacu, Colombia, with subdecumbent hairs rather than erect/suberect hairs on the antennal scape; (iii) the specimens from Venezuela with a reduced occipital collar; (iv) the specimens from Brazil, Colombia, Ecuador, and French Guiana with the tubercle on the propleuron more conspicuous; (v) the specimens from Venezuela with smaller tubercles in the area between the mesonotal and metanotal grooves; (vi) the specimen (M715) from Amacayacu, Colombia, with a differently shaped petiole;

(vii) the specimen (M715) from Amacayacu, Colombia, with the antero-ventral margin of petiole with a minute tooth or the antero-ventral process of petiole lacking.

In addition, the specimens from Colombia are relatively smaller: GL 0.63–0.64, HFL 0.61–0.63, HL 0.66, HTL 0.40–0.41, SL 0.58–0.62, TL 3.07–3.10, WL 0.83–0.85, SI 100–110 (n=2).

Individuals of this species have been collected from stomach contents of poison dart frogs in the genus *Epipedobates* Myers and *Dendrobates leucomelas* Steindachner.

Material examined. BRAZIL: ***Acre;*** Porto Walter; [210m]; 8º 15’ 31.2” S 72º 46’ 37.1” W; 05.ii–17.iv.1997; (*J Caldwell*); 13172; *Epipedobates* sp [6w, CEPEC]. ***Amazonas;*** Balbina; [30m; 1° 55′ 2″ S 59° 28′ 25″ W]; 1992–1994; (*M Queiroz*) [1w, CEPEC]. ***Para;*** Tailândia; Faz. Santa Marta; [47m; 2° 56′ 49″ S 48° 57′ 10″ W]; 13–14.v.2003; (*AM Elizabeth*) [1w, CEPEC]. **COLOMBIA:** ***Amazonas;*** Leticia; PNN Amacayacú, Matamata; 150m; 3º 41’ S 70º 15’ W; 11–13.x.2000; (*A Parente*); M1154; Winkler [1w, IAvH]. Same data as previous entry, but 17–19.vi.2000; (*A Parente*); M715; Winkler [1w, IAvH]. **ECUADOR:** ***Orellana;*** Tiputini Biodiversity Station; [213m; 0° 38′ 18″ S 76° 9′ 0″ W]; 9.ii–8.iii.2002; (*K Ryder Wilkie* & *A Mertl*); 2605542; HC-litter, tropical rainforest [1w, USNM]. **FRENCH GUIANA:** ***Departement de la Guyane;*** Petit Saut; [19m]; 4° 59’ N 53° 08’ W; vii.2000; (*S Durou* & *A Dejean*) [2w, CEPEC]. Paracou [Field Station]; [41m; 5.274390º N 52.923662º W]; xi.1996; (*B Corbara*, *A Dejean* & *J Orivel*) [3w, CEPEC].

VENEZUELA: Amazonas; Cerro Yo-Pacana [Parque Nacional Cerro Yapacana?]; [136m; 4° 0′ 31″ N 66° 35′ 14″ W]; stomach contents (M35) *Dendrobates leucomelas* [3w, LACM].

Myrmicocrypta JSC–022b **sp. nov.**

(Figure 2.62)

HOLOTYPE: 1w, BRAZIL: Bahia; Camacã; [236m]; 15º 17.52’ S 39º 29.39’ W; 29.vi.2003; (*JRM Santos*); Mata-Alto; Winkler [CEPEC, USNMENTNo. 00755488].

Measurements. EL 0.07, FLD 0.24, GL 0.91, HFL 0.87, HL 0.88, HTL 0.63, HW 0.69, ML 0.53, MSL 0.09, MSLca 0.04, OI 11, PL 0.49, PPL 0.24, PPW 0.26, SL 0.83, TL 4.15, WL 1.11, CI 79, MI 60, MSI 11, MSLI 43, PPI 112, RFLDI 28, RFLDII 36, SI 121 (n=1).

Diagnosis: relatively large individuals (WL 1.11, TL 4.15); hypostomal teeth long, triangular; dorsum of head with simple erect/suberect hairs in addition to subdecumbent narrow spoon-shaped hairs; frontal lobes weakly expanded laterally, convex and with posterior margin of clypeus extending between frontal lobes; occipital collar bituberculate; anterior pronotal tubercles absent; lateral pronotal tubercles reduced.

Description. Worker. *Head*: in full-face view, longer than wide (HL 0.88, HW 0.69, CI 79); unpaired median seta relatively thick, long (MSL 0.09, MSI 11), originating at edge of posterior margin of clypeal apron and anterior margin of clypeus; four to five appressed simple hairs on each side of the median seta reaching anterior margin of clypeal apron; anterior margin of clypeal apron sinuous to convex, dorsally weakly rugulose; inner margin of mandibles with 7 teeth; dorsum of mandibles reticulate; outer margin of mandibles sinuous. Body of clypeus, perpendicular to clypeal apron, shield-like; in profile, frontoclypeal teeth conspicuous, blunt, underneath antennal insertions; in oblique view, lateral margins of clypeus with thin carina. Eyes small (EL 0.07, OI 11), with 4 ommatidia in longest row (9 ommatidia in total). In full-face view, frontal lobes barely expanded laterally, convex (FLD 0.24), barely covering antennal insertions; posterior margin of clypeus extending between frontal lobes. In full-face view, frontal carinae weakly impressed, extending backwards pass eye level; frons weakly emarginate. In full-face view, cephalic corners weakly angulate; cephalic margin medially emarginate; in full-face view, vertexal area with pair of small tubercles; in lateral view, dorsum of head with erect simple hairs in addition to subdecumbent narrow spoon-shaped hairs. In full-face view, base of antennal scapes bilobed; antennal scape strongly reticulate with some rugae basally and with scarce, erect/suberect simple hairs, some curved at tip; leading edge of antennal scape with thin crenulate carina. In profile, occipital collar, bituberculate, upper tubercle long. Hypostomal teeth long, triangular.

Mesosoma. Anterior pronotal tubercles absent; humeral tubercles small, triangular; in dorsal view, lateral pronotal tubercles obtuse to convex; in lateral view, lateral pronotals low, blunt, with irregular carinae; dorsum of pronotum in its majority glabrous, with hairs restricted to tubercles; propleuron angulate. Lateral mesonotal tubercles blunt with wide base; anterior mesonotal tubercles, triangular, tooth-like, slightly shorther than lateral mesonotal tubercles. Area between meso and metanotal grooves with two pairs of small blunt tubercles, posterior pair slightly larger, and more conspicuous, than anterior tubercle. Metanotal groove deep, concave. Anterior propodeum angulate, with small triangular carina-like tubercle; propodeal spines short, triangular; declivous of propodeum with thin lateral carina. In lateral view, lacking small tubercle between mid and hind coxae.

Metasoma. In lateral view, antero-ventral portion of petiole lacking ventral process, but with minute swelling; vestigial paired thin carinae extending ventral length of petiole diverging towards posterior margin of petiole. In lateral view, ventral margin of petiole straight. In lateral view, anterior margin of petiolar node rounded with pair of small tubercles; dorsum of petiolar node with posterior low lateral carinae; in dorsal view, node of petiole cylindrical, longer than wide. Postpetiole, in dorsal view, wider than long (PPL 0.24, PPW 0.26, PPI 112); in dorsal view, posterior margin of postpetiole sinuous, lacking median emargination. Gastral tergite I finely reticulate.

Head and thorax opaque. Dorsum of head weakly rugolose, dorsum of mesosoma smooth. Hairs on body consisting mostly of erect/suberect flattened hairs, some hairs

on anterior portion of pronotum hook-liked; dorsum of head, frontal lobes, and body of clypeus with suberect/erect simple hairs. Antennal scape with simple suberect/erect hairs. Hairs on gastral segment I with narrow spoon-shaped decumbent hairs. Color of body light reddish.

Queen. Unknown.

Male. Unknown.

Comments. Although this species is known from a single individual, I believe there is enough morphological evidence to consider it a valid species. *Myrmicocrypta JSC–022b* differs: (i) from *M. JSC–022* by the presence of erect/suberect simple hairs on the antennal segments (simple and appressed in *M. JSC–022*); (ii) from *M. JSC–022a* by the posterior margin of the clypeus extending between the frontal lobes, the shape of the petiole, and the larger size (posterior margin of clypeus not extending between the frontal lobes, petiole subquadrate, and smaller size in *M. JSC–022a*); (iii) from *M. JSC–022x* by the smaller hypostomal teeth, by having convex, laterally expanded frontal lobes, and by the shape of the petiole (large hypostomal teeth, reduced, straight frontal lobes, and the somewhat subquadrate petiolar node in *M. JSC–022x*); (iv) from *M. JSC–022y* by the smaller hypostomal teeth, by a tubercle on the propleuron absent, and by the long cylindrical petiolar node (large hypostomal teeth, large tubercle in the propleura, and short petiolar node in *M. JSC–022y*).

Material examined. Known only from the type specimen.

Myrmicocrypta JSC–022x **sp. nov.**

(Figure 2.63)

HOLOTYPE: 1w, BRAZIL: Bahia; Santa Cruz Cabrália; [0m; 16° 16' 60 S 39° 1' 60 W]; 09.viii.2006; (*JCS Carmo* & *JRM Santos*); Sucupira-A [CEPEC, USNMENTNo. 00755490]. [top specimen]

PARATYPE. 12w, same data as holotype [4w, MZSP, USNMENTNo. 00755209; **3w,** USNM, USNMENTNo. 00755191; **5w,** CEPEC, USNMENTNo. 00755490, 00755175].

Measurements. EL 0.09 (0.08–0.09), FLD 0.18 (0.17–0.20), GL 0.90 (0.86–0.93), HFL 0.85 (0.83–0.88), HL 0.88 (0.83–0.91), HTL 0.61 (0.59–0.61), HW 0.77 (0.73–0.78), ML 0.60 (0.56–0.68), MSL 0.13 (0.12–0.14), MSLca 0.09 (0.09–0.11), OI 11 (10–12), PL 0.43 (0.35–0.45), PPL 0.23 (0.21–0.23), PPW 0.28 (0.27–0.29), SL 0.79 (0.75–0.80), TL 4.11 (3.93–4.21), WL 1.08 (1.07–1.12), CI 87 (83–88), MI 68 (66–77), MSI 14 (13–16), MSLI 74 (72–81), PPI 126 (123–134), RFLDI 21 (20–23), RFLDII 24 (23–27), SI 102 (102–107) (n=13).

Diagnosis: relatively large individuals (WL 1.02–1.18, TL 3.85–4.21); hypostomal teeth large, acute; dorsum of head with simple erect/suberect hairs contrasting with narrow spoon-shaped cephalic ground pilosity; frontal lobes feeble, almost straight;

eyes small with 3–4 ommatidia in longest row (6–10 ommatidia total); antennal scape with simple erect/suberect hairs; occipital collar blunt, at most with upper tubercle (not bidentate); ventral process of petiole tooth-like.

Description. Worker. *Head*: in full-face view, longer than wide (HL 0.82–0.91, HW 0.71–0.81, CI 83–89); unpaired median seta relatively long (MSL 0.11–0.14, MSI 13–16), originating slightly before edge of posterior margin of clypeal apron and anterior margin of clypeus; four to five appressed narrowly spoon-shaped to simple hairs on each side of the median seta reaching anterior margin of clypeal apron; anterior margin of clypeal apron broadly convex, dorsally weakly rugulose; inner margin of mandibles with 7–9 teeth; dorsum of mandibles reticulate-costulate; outer margin of mandibles somewhat sinuous. Body of clypeus, perpendicular to clypeal apron, shield-like; in profile, frontoclypeal teeth conspicuous, blunt or acute underneath antennal insertions; in oblique view, lateral margins of clypeus with thin carina. Eyes small, with 3–5 ommatidia in longest row (6–12 ommatidia in total). In full-face view, frontal lobes feeble, almost straight (FLD 0.17–0.21), barely covering antennal insertions; frontal lobes closely together anteriorly. In full-face view, frontal carinae weakly impressed, extending posteriorly circumscribing frons and continuing posteriorly to vertexal tooth-like tubercles. In full-face view, cephalic corners weakly angulate to convex; cephalic margin almost straight, medially weakly emarginate; in full-face view, vertexal area with pair of small tubercles; in lateral view, dorsum of head with erect simple hairs in addition to decumbent spoon-shaped ground pilosity. Dorsum of frontal lobes with erect simple hairs; in full-face view, base of antennal

scapes bilobed; antennal scape strongly reticulate and with some rugae (more concentrated close to its base) with scarce, erect/suberect simple hairs, some curved at tip. In profile, occipital collar vestigial, at most with upper tubercle small; vertex weakly rugulose. Hypostomal teeth large, acute.

Mesosoma. Anterior pronotal tubercles vestigial, reduced to low carina; humeral tubercles long, triangular; in dorsal view, lateral pronotal tubercles triangular with broad base; in lateral view, lateral pronotals with wide base and acute tip and with irregular carinae; dorsum of pronotum in its majority glabrous, with hairs restricted to tubercles; propleuron angulate to weakly tuberculate. Lateral mesonotal tubercles triangular, slightly smaller than anterior mesonotal tubercles; in lateral view, lateral mesonotal tubercles somewhat pointing forward; anterior mesonotal tubercles, triangular, large and acute, larger than lateral mesonotal tubercles. Area between meso and metanotal grooves with two pairs of tubercles, posterior pair larger than anterior tubercles. Metanotal groove deep, concave. Anterior propodeum angulate, carinate; propodeal spines long, triangular; base and declivous of propodeum with lateral thin carina. In lateral view, lacking small tubercle between mid and hind coxae.

Metasoma. In lateral view, antero-ventral portion of petiole with ventral tooth-like process; paired thin carinae extending ventral length of petiole diverging towards posterior margin of petiole. In lateral view, ventral margin of petiole sinuate to slightly straight. In lateral view, anterior margin of petiolar node rounded and with

lateral thin carinae; in lateral view, posterior margin of petiolar node with somewhat short triangular carina (giving a subquadrate appearance); in dorsal view, node of petiole somewhat rounded. Postpetiole, in dorsal view, wider than long (PPL 0.20–0.24, PPW 0.27–0.34, PPI 122–151); in dorsal view, postero-lateral margin of postpetiole inferiorly angulate; in dorsal view, posterior margin of postpetiole medially emarginate. Gastral tergite I finely reticulate; anterior margin of gastral segment I straight.

Head and thorax opaque. Dorsum of head rugose, dorsum of mesosoma smooth. Hairs on body consisting mostly of subdecumbent spoon-shaped hairs, some hairs in tubercles narrower, and dorsum of head, frontal lobes, and body of clypeus with suberect/erect simple hairs. Antennal scape with simple to narrow flattened and suberect/erect hairs.

Hairs on gastral segment I with narrow spoon-shaped decumbent hairs. Color of body yellowish to ferruginous.

Other material examined. Measurements. WORKER. EL 0.07–0.09, FLD 0.18–0.21, GL 0.83–1.07, HFL 0.80–0.93, HL 0.82–0.91, HTL 0.53–0.62, HW 0.71–0.81, ML 0.58–0.65, MSL 0.11–0.13, MSLca 0.08–0.11, OI 9–11, PL 0.35–0.47, PPL 0.20–0.24, PPW 0.28–0.34, SL 0.75–0.83, TL 3.85–4.36, WL 1.02–1.18, CI 86–89, MI 67–75, MSI 13–15, MSLI 71–80, PPI 122–151, RFLDI 21–24, RFLDII 24–27, SI 102–108 (n=9).

Queen. Unknown.

Male. Unknown.

Comments. See comments under *JSC–022b*.

Material examined. BRAZIL: ***Alagoas;*** Quebrângulo-wc; [408m]; 09º 19' S 36º 28' W; 28.vii.1999; (*JRM Santos*) [3w, CEPEC]. ***Minas Gerais;*** Uberlandia; Fazenda Experimental Panga; 794m; 19.18314º S 48.40343º W; 20.x.2012; (*A Jesovnik*); nest series; underground; AJ121020–01 [2w, USNM]. ***Sergipe;*** Areia Branca, EE da Serra de Itabaiana; [183m]; 10º 45’ 54” S 37º 19’ 57.4” W; 19–25.v.2003; (*RR Silva, BH Dietz, & LS Ferreira*) [3w, MZSP]. ***Tocantins;*** Peixes; Fazenda Galileia; [245m]; 11º 58’ 44” S 48º 39’ 33” W; 30.ix-03.x.2001; (*Alburquerque & Silva*); gallery forest [3w, MZSP].

Myrmicocrypta JSC–022y **sp. nov.**

(Figure 2.64)

HOLOTYPE: 1w, PANAMA: Darien; Cana; 1050m; 7° 43' N 77° 43' W; 25.viii.1987; (*DM Olson*); DMO771 [UCDC, USNMENTNo. 00755192].

PARATYPE. 1w, PANAMA: Colón Province; San Lorenzo Forest; [21m; 9º 17’ N 79º 58’ W]; 2.v.2005; W13092; T145–47; IBISCA. [CEPEC, USNMENTNo. 00758619].

Measurements. EL 0.07 (0.08), FLD 0.22 (0.22), GL 0.85 (0.80), HFL 0.83 (0.76), HL 0.81 (0.79), HTL 0.59 (0.54), HW 0.67 (0.65), ML 0.60 (0.53), MSL (0.08), MSLca (0.04), OI 10 (12), PL 0.46 (0.39), PPL 0.20 (0.20), PPW 0.28 (0.28), SL 0.79 (0.73), TL 3.93 (3.70), WL 1.02 (0.99), CI 82 (83), MI 73 (67), MSI (10), MSLI (50), PPI 142 (136), RFLDI 27 (28), RFLDII 33 (35), SI 117 (112) (n=2).

Diagnosis. Hypostomal teeth long and acute; dorsum of head with simple erect/suberect hairs contrasting with narrow spoon-shaped cephalic ground pilosity; frontal lobes weakly expanded laterally, convex; posterior margin of clypeus extending between frontal lobes; occipital collar bi-tuberculate, lower tubercle larger; propleuron with prominent tubercle; node of petiole rounded.

Description. Worker. *Head*: in full-face view, longer than wide (HL 0.79–0.81, HW 0.65–0.67, CI 82–83); unpaired median seta relatively long (MSL 0.08, MSI 10), originating slightly before edge of posterior margin of clypeal apron and anterior margin of clypeus (median seta missing in holotype individual); five to six appressed narrowly spoon-shaped to simple hairs on each side of the median seta reaching anterior margin of clypeal apron; clypeal apron broad; anterior margin of clypeal apron broadly convex, dorsally weakly rugulose; inner margin of mandibles with 6–8 teeth; dorsum of mandibles reticulate-costulate; outer margin of mandibles sinuous. Body of clypeus, perpendicular to clypeal apron, shield-like; in profile, frontoclypeal teeth conspicuous, acute underneath antennal insertions; in oblique view, lateral

margins of clypeus with thin carina. Eyes small, with 4 ommatidia in longest row (9 ommatidia in total). In full-face view, frontal lobes weakly expanded laterally, convex (FLD 0.22), barely covering antennal insertions; posterior margin of clypeus extending between frontal. In full-face view, frontal carinae impressed, extending posteriorly circumscribing frons and continuing posteriorly to vertexal area, forming pair of raised carinae. In full-face view, cephalic corners angulate; cephalic margin straight, median emargination shallow, almost absent; in lateral view, dorsum of head with erect simple hairs in addition to decumbent flattened ground pilosity. Dorsum of frontal lobes with erect simple hairs; in full-face view, base of antennal scapes bilobed; antennal scape strongly reticulate, with some rugae at base with scarce, erect/suberect simple hairs, some curved at tip. In profile, occipital collar bidentate, both tubercles large (lower tubercle somewhat larger than upper tubercle); vertex smooth Hypostomal teeth large, acute.

Mesosoma. Anterior pronotal tubercles vestigial, reduced to low carina, making anterior portion of pronotum angulate; humeral tubercles short, triangular; in dorsal view, lateral pronotal tubercles triangular with broad base; in lateral view, lateral pronotals with wide base and acute tip; dorsum of pronotum in its majority glabrous, with hairs restricted to tubercles; propleuron with large tubercle. Lateral mesonotal tubercles triangular, with wide base; anterior mesonotal tubercles, tooth-like, with narrow base. Area between meso and metanotal grooves with two pairs of tooth-like tubercles, posterior pair slightly larger than anterior tubercles. Metanotal groove somewhat deep, concave. Anterior propodeum angulate, carinate; propodeal spines

long, triangular; declivous of propodeum with lateral thin carina. In lateral view, area between mid and hind coxae with small tubercle.

Metasoma. In lateral view, antero-ventral portion of petiole with small inconspicuous ventral process; paired thin carinae extending ventral length of petiole diverging towards posterior margin of petiole. In lateral view, ventral margin of petiole. In lateral view, petiolar node rounded; in dorsal view, node of petiole somewhat rounded. Postpetiole, in dorsal view, trapezoidal, wider than long (PPL 0.20, PPW 0.28, PPI 136–142); in dorsal view, postero-lateral margin of postpetiole inferiorly angulate; in dorsal view, posterior margin of postpetiole medially emarginate; dorsum of postpetiole smooth. Anterior margin of gastral tergite I rounded laterally; gastral tergite I finely reticulate; latero-posterior portion of gastral tergite I smooth and shiny.

Head and thorax opaque. Dorsum of head rugose, dorsum of mesosoma smooth. Hairs on body consisting mostly of subdecumbent spoon-shaped hairs, some hairs in tubercles narrower, and dorsum of head, frontal lobes, and body of clypeus with suberect/erect simple hairs. Antennal scape with simple to narrow flattened and suberect/erect hairs.

Hairs on gastral segment I with narrow spoon-shaped subdecumbent hairs. Color of body brownish.

Queen. Unknown.

Male. Unknown.

Comments. See comments under *JSC–022b*.

Material examined. Known only from thye type locality.

Myrmicocrypta JSC–023 **sp. nov.**

(Figure 2.65)

HOLOTYPE: 1w, COLOMBIA: Antioquia; Amalfi; [1716m; 6º 54’ 38” N 75º 4’ 48” W]; 19.xii.1999; (*E Vergara* & *F Serna*) [ICN, USNMENTNo. 00758216].

PARATYPE. 1w, same locality data as holotype [USNM, USNMENTNo. 00755280].

Measurements. WORKER. EL 0.11 (0.11), FLD 0.25 (0.24), GL 0.93 (0.88), HFL 0.85 (0.86), HL 0.79 (0.77), HTL 0.60 (0.59), HW 0.66 (0.62), ML 0.51 (0.50), MSL 0.12 (0.13), MSLca 0.08 (0.09), OI 17 (18), PL 0.46 (0.45), PPL 0.22 (0.21), PPW 0.32 (0.32), SL 0.75 (0.72), TL 3.94 (3.94), WL 1.04 (1.02), CI 83 (81), MI 65 (65), MSI 15 (16), MSLI 67 (74), PPI 144 (151), RFLDI 32 (31), RFLDII 38 (39), SI 114 (116) (n=2).

Diagnosis. Frontal lobes expanded laterally, triangular, and covered with erect simple hairs, some of which curve at the tip; dorsum of head with long erect simple hairs in addition to narrow subdecumbent spoon-shaped hairs; unpaired clypeal seta mid-

sized (MSL 0.11, MSI 14); antennal scapes lacking erect simple hairs; humeral tubercles triangular; pronotal neck smooth and glabrous, separated from rest of pronotum by raised carinae that connects the humeral tubercles and passing through anterior pronotal tubercles; peduncle of petiole thick, with small antero-ventral process.

Description. Worker. *Head*: in full-face view and excluding mandibles, head longer than wide (HL 0.77–0.79, HW 0.62–0.66, CI 81–83); cephalic corners rounded, posteriorly slightly angulate; in full-face view, cephalic margin medially emarginate; dorsum of head rugose. Inner margin of mandibles 8-toothed, decreasing in size toward base; dorsum of mandibles reticulate; outer margin of mandibles convex. Anterior margin of clypeal apron broadly convex, slightly angulate medially, dorsally weakly rugulose; unpaired clypeal seta mid-sized (MSL 0.12–0.13, MSI 15–16), originating before the posterior margin of the posterior margin of clypeal apron; five to six long decumbent narrowly spoon-shaped hairs on each side of unpaired clypeal seta reaching anterior margin of clypeal apron. Body of clypeus, perpendicular to clypeal apron, shield-like medially slightly concave; in lateral view, frontoclypeal teeth acute and conspicuous, underneath antennal insertions; in fronto-anterior view, lateral margins of clypeus with thin carina; median portion of body of clypeus concave, with upper portion produced into two large, tubercles; body of clypeus rugose. Eyes mid-sized, convex, with 6–7 ommatidia in longest row (30–31ommatidia in total). In full-face view, frontal lobes expanded laterally, triangular (FLD 0.24–0.25)**,** barely covering antennal insertions; posterior margin of clypeus

(finger of the clypeus) extending between frontal lobes and forming a deep groove; frontal lobes covered with erect hairs simple to very narrowly expanded hairs. In full-face view, frontal carinae raised extending back to vertexal area; vertexal area with a pair of low tubercles. In lateral view, dorsum of head with erect simple hairs contrasting with narrowly decumbent spoon-shaped ground pilosity. Antennal scape long (SL 0.72–0.75, SI 114–116), strongly reticulate, and covered with decumbent, narrow flattened hairs. In lateral view, cephalic collar bidentate, top tooth slightly larger than bottom tooth. Vertex rugose. Hypostomal teeth acute.

Mesosoma. In dorsal and lateral views, pronotal neck differentiated (isolated) from rest of pronotum by raised carinae that extends from inferior pronotal process, extending anteriorly to base of humeral tubercles and connecting anterior tubercles anteromedially; area anterior to carina smooth, glabrous, and lighter in color than rest of pronotum (area posterior to carina wrinkled, with hairs on tubercles, and darker in color). In dorsal view, humeral tubercles triangular; anterior pronotal tubercles low, carina-like, formed by meeting of transverse carina connecting humeral tubercles and diagonal carina connecting lateral pronotal tubecles; lateral pronotal tubercles low, formed by irregular carinae, and with small acute tooth; in dorsal view, lateral pronotal tubercles carinate, slightly rounded, and with pimples; posterior portion of pronotum slightly concave. Propleuron with thick blunt tubercle. Lateral mesonotal tubercles high (larger than any other tubercle in the mesonotum) with some (3–4) long erect flattened hairs, accompanied of subdecumbent narrow spoon-shaped hairs (most common at base of tubercle); anterior mesonotal tubercles triangular, low with

wider base and lower than lateral mesonotals; tip of tubercle with single long erect flattened hair. Area between mesonotal and metanotal groove with two pairs of tubercles, posterior tubercle slightly larger. In dorsal view, both mesonotal and metanotal groove with single median longitudinal (paratype) or without (holotype). Metanotal groove shallow. Anterior propodeal tubercles low, carinate; propodeal spines short and acute, tooth-like; dorsal margin (base) of propodeum slightly longer than its declivity. In lateral view, anterior face of forecoxa with pimple-like tubercles; lateral face of forecoxa rugose.

Metasoma. In lateral view, peduncle of petiole thick; antero-ventral process of petiole long and acute (smaller in paratype); a pair of thin carinae originate at base of tooth, extending entire length of ventral petiolar margin, diverging towards the posterior margin of petiole. In lateral view, node of petiole subquadrate; in dorsal view, node of petiole slightly longer than wide; posterior margin of petiolar node with angled carinae. Postpetiole, in lateral view, subquadrate; dorsally and laterally rugose. In dorsal view, medially with a shallow groove (covered with debris in holotype). In dorsal view, disc of postpetiole wider than long (PPL 0.21–0.22, PPW 0.32, PPI 144–151). In dorsal view, postero-inferior margin of postpetiole with short triangular extensions; in dorsal view, posterior margin of postpetiole medially slightly emarginate; in dorsal view, postpetiole covered with narrow spoon-shaped hairs. Dorsum of gastral tergite I finely reticulate.

Individuals bicolored, body light ferruginous and gaster dark brown; legs yellowish. Erect simple hairs present on dorsum of head and mesosoma, in addition to decumbent narrow spoon-shaped hairs; hairs on petiole, postpetiole, and gaster consisting of transparent narrow spoon-shaped hairs; pilosity on antennal scapes decumbent narrow flattened hairs.

Queen. Unknown.

Male. Unknown.

Comments. This species is can be distinguished from any other species in the genus by the presence of erect, simple hairs on the dorsum of the head and promesonotum; the antennal scape covered with appressed simple hairs; the long hypostomal teeth; and the anterior portion of the pronotum smooth, differing from the rest of the pronotum, which is rugose.

Material examined. Known only from the type series.

Myrmicocrypta JSC–024 **sp. nov.**

(Figure 2.66)

HOLOTYPE: 1w, BRAZIL: Pará; Melgaço; Caxiuanã ECFPn; Transect II (6–900); [12m]; 1.7358361º S 51.4876222º W; 26–28.iv.2005; (*AY Harada* et al.); leaf-litter sample [MPEG, USNMENTNo. 00758566]

PARATYPE. 1w, same locality data as holotype, but Transect V (2–300); [12m]; 1.7248389º S 51.4297861º W; 26–28.iv.2004; (*AY Harada* et al.); leaf-litter sample [USNM, USNMENTNo. 00755514]. **1w,** same locality data as holotype, but Transect IV (1–200); [12m]; 1.7544389º S 51.5224056º W; 22–24.x.2005; (*AY Harada* et al.); leaf-litter sample [MZSP, USNMENTNo. 00755509].

Measurements. WORKER. EL 0.08 (0.07), FLD 0.23 (0.22), GL 0.69 (0.63–0.64), HFL 0.69 (0.63–0.67), HL 0.65 (0.61–0.65), HTL 0.53 (0.46–0.48), HW 0.49 (0.48–0.49), ML 0.37 (0.36), MSL 0.07 (0.07), MSLca 0.05 (0.04–0.05), OI 16 (14), PL 0.32 (0.29–0.36), PPL 0.18 (0.16–0.17), PPW 0.20 (0.19–0.20), SL 0.63 (0.59), TL 3.02 (2.87–2.90), WL 0.81 (0.75–0.79), CI 75 (75–77), MI 57 (56–58), MSI 10 (10–11), MSLI 70 (60–70), PPI 111 (120–123), RFLDI 35 (35), RFLDII 47 (46), SI 128 (121–123) (n=3).

Diagnosis. Eyes small (EL 0.07–0.08, OI 14–16) with 3–5 ommatidia in longest row (8–14 ommatidia total); clypeal apron convex; frontal lobes laterally expanded, triangular; frontal carinae impressed; vertexal tubercles present; median size unpaired clypeal seta; hypostomal teeth small, triangular; occipital collar bidentate; short propodeal spines; postpetiole, in dorsal view, subquadrate.

Description. Worker. *Head*, excluding mandibles, longer than broad (HL 0.61–0.71, HW 0.48–0.52, CI 71–77); sides of head broadly convex; cephalic margin transverse, medially emarginate; vertexal portion of head with pair of small tubercles; cephalic

corner angulate; in full-face view, dorsum of head rugose; frontal carinae present, masked by rugae on dorsum of head; postero-ventral angles of head (collar) present, bidentate; clypeal apron narrow, anterior margin of clypeal apron broadly convex; unpaired clypeal seta median in size (MSL 0.07–0.08, MSI 10–12), with 4 narrow spoon-shaped appressed hairs on each side of median seta; fronto-clypeal teeth acute, conspicuous; in oblique view, median portion of clypeus concave; in lateral view, hypostomal teeth short, triangular. Mandibles triangular, long (ML 0.37–0.40, MI 53–58), with convex outer margin; inner (masticatory) margin 7–8-toothed; dorsum of mandibles finely reticulate-punctate; eyes large (EL 0.07–0.08, OI 14–16), with 3–5 ommatidia in longest row (8–14 ommatidia total), situated posterior to midline of head at a level above frontal lobes; frontal lobes laterally expanded, triangular; frontal lobes slightly separated, posterior portion of clypeus extending between frontal lobes; antennal scapes long (SL 0.59–0.65, SI 121–131), thick, reticulate, and convered with scarce appressed narrow spoon-shaped hairs.

Mesosoma. Dorsum of pronotum rugulose, anterior pronotal tubercles present, small; humeral pronotal tubercle triangular, larger than lateral tubercles; in lateral view, lateral pronotal tumosities present with irregular carinae; in dorsal view, lateral pronotal tubercles carinate; propleuron angulate; sides of pronotum rugulose; lateral and anterior mesonotal present as low tubercles, lateral tubercles carinate, larger than anterior mesonotals; lateral mesonotals tooth-like, acute; in dorsal view, appearing as a squared area; area between meso and metanotal grooves, with a couple of small tubercles, of which the anterior one (median mesonotal) is smaller than posterior

mesonotal; metanotal groove deep, slightly deeper than mesonotal groove; anterior portion of propodeum angulate; in lateral view, basal face of propodeum flat; basal face of propodeum shorter than propodeal declivity; propodeal spines short; basal and declivous faces of propodeum with thin lateral carinae.

Metasoma. Petiole distinctly pedunculate, long (PL 0.29–0.39); in lateral view, anterior margin of petiolar node rounded; in dorsal view, node of petiole rounded; ventral margin of petiole with tooth ventral process; in lateral view, ventral margin of petiole weakly sinuous, and with ventral thin carinae. Postpetiole, in lateral view, convex dorsally; in dorsal view, disc of postpetiole, subquadrate. In dorsal view, disc of postpetiole slightly wider than long (PPL 0.16–0.19, PPW 0.19–0.22, PPI 111–124); in dorsal view, posterior margin of postpetiole weakly emarginate medially. In lateral view, gaster dorsally convex; in dorsal view, gaster long-ovate (longer than wide); gastral tergite I reticulate, with sides shiny; gastral tergite I with scarce spoon-shaped hairs. Legs long and slender.

Body opaque, rugulose; tubercles low. Pilosity of moderately abundant spoon-shaped hairs, which become narrow-squamate on scape and legs. Brownish-yellow.

Queen. Unknown.

Male. Unknown.

Other material examined. Measurements. WORKER. EL 0.07–0.08, FLD 0.24–0.25, GL 0.66–0.74, HFL 0.67–0.71, HL 0.65–0.71, HTL 0.50–0.52, HW 0.49–0.52, ML 0.37–0.40, MSL 0.07–0.08, MSLca 0.05–0.06, OI 14–16, PL 0.35–0.39, PPL 0.17–0.19, PPW 0.20–0.22, SL 0.62–0.65, TL 3.04–3.24, WL 0.82–0.86, CI 71–77, MI 53–58, MSI 10–12, MSLI 58–75, PPI 114–124, RFLDI 34–38, RFLDII 47–49, SI 121–131 (n=5).

Comments. This species is very similar to *Myrmicocrypta longinoda* but differs in the size of the eyes (smaller in *M. longinoda*) and the size of the postpetiole (larger or as long as wide in *M. longinoda*).

Material examined. BRAZIL: ***Amazonas***; EMBRAPA; Amazonia Occidental, 30Km N Manaus; [99m]; 2.892794º S 59.973997º W; 04.ix.2006; (*C Rabeling*). CR060904–14 [1w, USNM]. Manaus; BR174 Km45-EEST, INPA; 8.v.1991; (*AY Harada* & *AG Bandeira*) [1w, INPA]. ***Pará***; Novo Repartimento, Faz. Arataú; [184m; 4.1513889º S 50.1633333º W]; 19.vi–12.viii.2003; (*AM Elizabeth*) [1w, CEPEC]. **ECUADOR:** ***Provincia de Sucumbios***; Cuyabeno; [236m; 0.2666667º S 75.8833333º W]; 12.x–05.xi.1994; (*JP Caldwell*) [2w, CEPEC]. **GUYANA:** ***Upper Takutu-Upper Essequibo***; Acarai Mts. nr Romeo's Camp; 300m; 1.3839667º S 58.9465333º W; 10.x.2006; (*TR Schultz* & *J Sosa-Calvo*); 1º forest, Winkler; JSC061010–LS10 [1w, USNM]. **PERU:** ***Madre de Dios***; Puerto Maldonado; Sachavacayoc Centre; 237m; 12.84962º S 69.37350º W; 18–29.vii.2012; (*RJG Feitosa*); Winkler2; RJGF00075 [1w, USNM].

Myrmicocrypta JSC–025 **sp. nov.**

(Figure 2.67)

HOLOTYPE: 1w, PERU: Madre de Dios; Los Amigos Biological Station (CICRA), Trompetero (6) Trail; 270m; 12.569167º S 70.100111º W; 06.x.2004; (*J Sosa-Calvo*, *TR Schultz*, & *CJ Marshall*); leaf-litter sample; JSC041006–LS02 [USNM, USNMENTNo. 00755317].

PARATYPES. 12w, same data as holotype [USNM, USNMENTNo. 00755298, 00758517–19, 00755287, 00758641–46]. **23w,** same data as holotype [in alcohol, USNM, USNMENTNo. 00521904].

Measurements. WORKER. EL 0.07 (0.06–0.08), FLD 0.20 (0.20–0.21), GL 0.72 (0.71–0.79), HFL 0.80 (0.72–0.86), HL 0.75 (0.75–0.82), HTL 0.57 (0.50–0.59), HW 0.64 (0.61–0.68), ML 0.54 (0.51–0.58), MSL 0.11 (0.11–0.13), MSLca 0.09 (0.09–0.11), OI 10 (9–12), PL 0.35 (0.30–0.39), PPL 0.20 (0.19–0.21), PPW 0.27 (0.26–0.28), SL 0.69 (0.63–0.75), TL 3.54 (3.16–3.76), WL 0.97 (0.95–1.05), CI 85 (82–87), MI 71 (64–72), MSLI 114 (115–146), PPI 133 (130–145), RFLDI 27 (25–28), RFLDII 32 (30–33), SI 109 (103–113) (n=12).

Diagnosis. *Worker*: eyes small, convex (3–4 ommatidia in longest row, 6–13 ommatidia total; EL 0.06–0.09, OI 9–12); frontal lobes weakly developed (FLD 0.19–

0.22), convex; unpaired median seta long (MSL 0.10–0.13, MSI 13–17); dorsum of head rugose; anterior pronotal tubercles vestigial; long lateral and humeral pronotal tubercles; long propodeal spines; peduncle of petiole thick.

Description. Worker. *Head*: in full-face view and excluding mandibles, longer than wide (HL 0.74–0.83, HW 0.61–0.71, CI 82–89); in full-face view, cephalic corners rounded, angulate posteriorly; cephalic margin almost straight, weakly emarginate medially, with small pair of tumosities; sides of head widely convex; in lateral view, dorsum of head lacking erect simple hairs; in full-face view, dorsum of head rugulose. Masticatory margin of mandibles 7–9-toothed decreasing in size toward base; outer margin of mandibles sinuate; dorsum of mandibles basally reticulate, apically smooth and shinning. Anterior margin of clypeal apron widely convex; clypeal apron narrow; unpaired median seta thick, mid-sized (MSL 0.10–0.13, MSI 13–17) originating before the posterior margin of clypeal apron; in full-face view, and at each side of median seta, clypeal apron with 5–6 appressed spoon-shaped hairs that curve apically at anterior margin of clypeal apron. In oblique view, fronto-clypeal tubercles low, carinate; lateral margin of body of clypeus carinate; body of clypeus rugose, covered with flattened subdecumbent hairs; in lateral view, frontoclypeal teeth obtusely carinate; posterior margin of clypeus narrowly extending between frontal lobes. In dorsal view, frontal carinae absent or obscured by frontal rugosities. Frontal lobes weakly expanded, convex laterally (FLD 0.19–0.22). Eyes small (EL 0.06–0.09, OI 9–12) with 3–4 ommatidia in longest row (6–13 ommatidia total), convex, placed at upper half of head. Antennal scape long (SL 0.63–0.75, SI 100–

113); antennal scape thin, finely reticulate and rugulose, covered with decumbent narrow spoon-shaped hairs. In lateral view, postero-ventral angles of the head (collar) produced, on each side, with a small upper tubercle. Vertex smooth. In lateral view, hypostomal teeth elongate, triangular.

Mesosoma. Anterior pronotal tubercles absent or reduced to low carina; anterior portion of pronotum covered with spoon-shaped hairs; in dorsal view, humeral and lateral pronotal tubercles triangular; in lateral view, lateral pronotal tubercles triangular with irregular carinae; in dorsal and lateral view, dorsum of pronotum flat, lacking pilosity. In lateral view, propleuron with obtusely angulate carina. In dorsal view, promesonotal line weakly present. Anterior mesonotal tubercles triangular to blunt at tip, with narrower base and slightly larger than lateral mesonotal tubercles. Area between meso– and metanotal– grooves with two pairs of small tubercles; metapleural groove deeply concave, with weakly impressed longitudinal carina. Anterior portion of propodeum lacking tubercles, at most angulate, carinate; propodeal spines long, triangular, slightly diverging from median line; base and declivity of propodeum with thin lateral carinae; small tubercle present on inferio-anterior portion of propodeum between mid and hind coxae.

Metasoma. In lateral view, peduncle of petiole thick, lacking antero-ventral process; node of petiole, in lateral view, subquadrate; ventral margin of petiolar peduncle convex and with thin pair of carinae that run parallel to each other reaching posterior margin. In dorsal view, node of petiole as long as wide; posterior portion of petiolar

node with thin triangular carinate. In dorsal view, postpetiole dome-like, with anterior margin rounded; lateral margin convex; posterior margin medially emarginate; postpetiole wider than long (PPL 0.18–0.22, PPW 0.24–0.30, PPI 120–148); in dorsal view, postero-inferior margin of postpetiole laterally extending, blunt at tip. Gaster, basally, reticulate; rest of gastral tergite finely reticulate; anterior margin of gastral tergite I rounded; gastral tergite I longer than broad; broadly convex laterally; gastral tergite I covered with decumbent spoon-shaped hairs; sides of gastral tergite I smooth and shinning.

Outer margin of hind tarsomere I with appressed sparse simple hairs; inner margin of hind tarsomere I with decumbent more dense simple hairs; 1/3 of hind tarsomere I reticulate, rest of tarsomere smooth and shinning.

Body opaque; light brown to yellowish in color. Hairs on dorsum of head consisting mostly of narrow spoon-shaped hairs; appressed flattened hairs on lateral margin of head (underneath the eyes); spoon-shaped pilosity on mesosoma restricted to tubercles and carinae; pilosity on legs consisting of appressed to decumbent narrowly flattened hairs; inferior sides of pronotum with long flattened appressed hairs; decumbent, narrowly spoon-shaped hairs present on antennal scapes.

Other material examined. Measurements. WORKER. EL 0.06–0.09, FLD 0.19–0.22, GL 0.74–0.85, HFL 0.76–0.86, HL 0.74–0.83, HTL 0.54–0.60, HW 0.63–0.71, ML 0.47–0.58, MSL 0.10–0.13, MSLca 0.08–0.11, OI 9–12, PL 0.29–0.41, PPL

0.18–0.22, PPW 0.24–0.30, SL 0.68–0.75, TL 3.44–3.87, WL 0.93–1.04, CI 82–89, MI 61–73, MSI 13–16, PPI 120–148, RFLDI 24–28, RFLDII 28–34, SI 100–111 (n=15).

Queen. Unknown.

Male. Unknown.

Comments. This species resembles *Myrmicocrypta occipitalis* Weber, *M. weyrauchi* Borgmeier, and *M. JSC–003*. However, it can be distinguished from all of them by: (i) the shape of the head; (ii) the absence of frontal carinae; (iii) the narrow clypeal apron; (iv) the reduced occipital collar; and (v) the absence of anterior pronotal tubercles.

Material examined. BRAZIL: *Amazonas*; Benjamin Constant; Project BioBrasil/GEF/UNEP; [65m; 4.3744º S 70.0297º W]; (*R Zanetti* & *N Dias*) [1w, CEPEC]. Manaus, Rs2108; [92m; 3.1º S 60.016667º W]; 20.x.1993; (*AB Casimiro*) [1w, CEPEC]. ***Pará;*** Belem; Utinga Forest Preserve; 45m; 1.41739º S 48.42876º W; 3.ii.2009; (*J Sosa-Calvo* & *CT Lopes*); winkler sample; rainforest; JSC090203–LS05 [1w, USNM]. Benfica; [191m; 6.7650º S 70.9364º W]; 13.viii.1962; (*PF Darlington*); B–166 [5w, MCZ]. Marituba; [25m]; 1º 22’ S 48º 20’ W; 21.x.2004; (*JRM Santos*); Mata; Pitfall [1w, CEPEC]. ***Rondonia;*** Porto Velho; Area Abunã; [113m; 9º 36’ 29.7” S 65º 22’ 40.7” W]; 08–21.ix.2010; (*RM Feitosa* & *RR Silva*) [1w, USNM]. **FRENCH GUIANA: *Department de la Guyane;*** Maripassoula;

[92m; 3.6333º S 54.0333º W]; 21–23.vi.2000; (*Delabie* et al.) [2w, CEPEC]. **PERU:** ***Madre de Dios*;** across River from Cocha Cashu; 11.888157º S 71.407599º W; 19.x.1999; (*DW Davidson*); Ex sifted litter [3w, LACM]. Los Amigos Biological Station (CICRA), 1st Mirador (10) Trail; 291m; 12º 33' 17.39" S 70º 06' 26.69" W; 04.x.2004; (*J Sosa-Calvo*); stray [1w, USNM]. **SURINAME:** no data (*Geijskes*) [2w, MZSP]. ***Sipaliwini;*** Anapaike; [84m; 3.4167º N 54.0333º W]; 8–29.xi.1963; (*B Malkin*) [2w, MZSP].

Myrmicocrypta JSC–026 **sp. nov.**

(Figure 2.68)

HOLOTYPE: 1w, BRAZIL: Amazonas; EMBRAPA Amazonia Occidental, 30km, N Manaus; [99m]; 2.892794º S 59.973997º W; 04.vi.2003; (*C Rabeling & M Verhaag*); Pilz Präp 34; hand collecting; (MZSP) [USNMENTNo. 00758436].

PARATYPES. 7w, same data as holotype [1w, SMNK, USNMENTNo. 00755304]; [1w, MZSP, USNMENTNo. 00758434]; [5w, USNM, USNMENTNo. 00755258, 00758433, 00758435, 00758437, 00758438].

Measurements. WORKER. EL 0.07 (0.05–0.07), FLD 0.16 (0.16–0.17), GL 0.75 (0.63–0.75), HFL 0.63 (0.61–0.64), HL 0.65 (0.63–0.68), HTL 0.44 (0.44–0.47), HW 0.56 (0.55–0.58), ML 0.43 (0.40–0.45), MSL 0.11 (0.11–0.13), MSLca 0.08 (0.08–0.09), OI 12 (9–12), PL 0.33 (0.29–0.35), PPL 0.16 (0.16–0.17), PPW 0.21 (0.23–0.24), SL 0.63 (0.62–0.68), TL 3.13 (2.95–3.26), WL 0.82 (0.81–0.86), CI 85 (81–

88), MI 65 (63–66), MSLI 142 (129–142), PPI 136 (146–148), RFLDI 24 (24–26), RFLDII 28 (29–31), SI 112 (111–117) (n=8).

Diagnosis. *Worker*: eyes small, convex (3–4 ommatidia in longest row, 5–8 ommatidia total; EL 0.05–0.07, OI 9–12); frontal lobes weakly developed (FLD 0.16–0.17), convex; unpaired median seta long (MSL 0.11–0.13), extending pass second tooth from base of mandible; head, in dorsal view, rugulose with somewhat conspicuous frontal carinae and, in lateral view, dorsum of head with erect hairs; hairs on antennal scapes subdecumbent and simple; frons strongly impressed medially between well-developed frontal carinae.

Description. Worker. *Head*: in full-face view and excluding mandibles, longer than wide (HL 0.63–0.68, HW 0.55–0.58, CI 81–88); in full-face view, cephalic corners rounded; cephalic margin weakly emarginate medially; sides of head widely convex; in lateral view, dorsum of head with simple erect hairs in addition to some short appressed flattened hairs; in full-face view, dorsum of head rugulose to scabrous; in lateral view, sides of head with appressed flattened hairs; ventral margin of head with appressed spoon-shaped hairs; unpaired median seta thick, long (MSL 0.11–0.13, MSI 16–19) originating before the posterior margin of clypeal; in full-face view, 5–6 decumbent to appressed spoon-shaped hairs on each side of the median seta and vaguely surpassing anterior margin of clypeal apron. Mandibles long (ML 0.40–0.45, MI 63–65); mandibles 6–8-toothed decreasing in size toward base; dorsum of mandibles striolate. In oblique view, fronto-clypeal tubercles pyramidal, carinate

laterally, covered simple hairs; in lateral view, frontoclypeal teeth acute. Frontal lobes weakly expanded, convex laterally; tin full-face view, frontal lobes very closed together anteriorly and covered with simple erect hairs (better seen in lateral view). Eyes small (EL 0.05–0.07, OI 9–12) with 3–4 ommatidia in longest row (5–8 ommatidia total), convex, placed at upper half of head. Preocular carina absent. In lateral view, postero-ventral angles of the head (collar) produced on each side as pair of small tubercles. Antennal scape (SL 0.62–0.68, SI 111–117) long, exceeding occipital corner by one-fourth its length; anterior margin (leading edge), especially at base, minutely spiculated; covered with simple hairs. In lateral view, hypostomal teeth short, triangular.

Mesosoma: Pronotum, in lateral view, almost flattened dorsally; humeral pronotal tubercles triangular; lateral pronotal tubercles blunt, wide at base, and with irregular fine carinae that connects with vestigial anterior pronotal tubercles; propleuron, in lateral view, with angular carina; promesonotal line absent; lateral and anterior mesonotal tubercles low; median and posterior mesonotal tubercles small; metapleural groove deeply concave; anterior portion of propodeum lacking tubercles, at most angulate; propodeal spines short, triangular; base and declivity of propodeum with thin lateral carinae.

Metasoma: Ventral process of petiole with a minute, very inconspicuous tooth; petiole, in lateral view, subquadrate; ventral margin of petiolar peduncle with pair of thin carinae that run parallel to each other, from inconspicuous tooth (anteriorly) to

posterior margin of petiole; node of petiole, in dorsal view, longer than wide. Postpetiole, in dorsal view, trapezoidal; anterior and lateral margins straight; posterior margin medially marginated; postpetiole wider than long (PPL 0.16–0.17, PPW 0.21–0.24, PPI 136–148). Gaster, basally, reticulate; rest of gastral tergite finely reticulate; gastral tergite I covered with decumbent narrow spoon-shaped hairs; gastral tergite I longer than wide, sides broadly convex.

Outer margin of hind tarsomere I with decumbent sparse simple hairs that curve medially; inner margin of hind tarsomere I with decumbent more dense simple hairs.

Body opaque; yellowish in color. Hairs on head mostly simple erect with some appressed flattened hairs on the ventral and lateral (underneath the eyes) margins of head; mesosoma with hairs mostly on tubercles and carinae; few simple hairs, mostly on lateral mesonotal tubercles, rest with medially flattened hairs that curve apically; inferior sides of pronotum with long flattened appressed hairs; simple erect hairs present on antennal scapes; legs with simple to very narrow flattened subdecumbent.

Queen. Unknown.

Male. Unknown.

Comments: this species can be easily distinguished from other species of *Myrmicocrypta* by the combination of the following characters: (i) erect simple hairs on the dorsum of the head; (ii) long unpaired median seta on the clypeal apron; (iii)

frontal lobes convex and weakly expanded laterally; (iv) very small eyes; and (v) rugulose dorsum of head.

Material examined. Known only from type series.

Myrmicocrypta JSC–027 **sp. nov.**

(Figure 2.69–2.70)

HOLOTYPE: 1w, BRAZIL: Amazonas; Manaus; Reserva Ducke; 95m; 2º 55' 57.0" S 59º 58' 19.2" W; 27.ix.2012; (*A Jesovnik*); nest series; underground; AJ120927–01 [MZSP, USNMENTNo. 00755261].

PARATYPES. 3w, 1dq, same data as holotype [USNM, USNMENTNo. 00755259, 00755260, 00755262]

Measurements. Holotype (Paratypes). WORKER. EL 0.05 (0.05–0.06), FLD 0.23 (0.20–0.22), GL 0.77 (0.74–0.77), HFL 0.73 (0.72–0.73), HL 0.74 (0.72–0.74), HTL 0.52 (0.48–0.51), HW 0.63 (0.60–0.61), ML 0.48 (0.45–0.47), MSL 0.12 (0.11), MSLca 0.09 (0.08–0.09), OI 8 (8–10), PL 0.42 (0.39–0.41), PPL 0.17 (0.16–0.18), PPW 0.24 (0.24–0.25), SL 0.68 (0.68–0.69), TL 3.53 (3.42–3.47), WL 0.96 (0.93–0.94), CI 85 (82–84), MI 65 (62–65), MSI 16 (15–16), MSLI 129 (131–142), PPI 147 (136–158), RFLDI 31 (28–30), RFLDII 36 (34–35), SI 109 (111–115) (n=4).

Diagnosis. This species is very similar in size (slightly larger) and general appearance to *JSC–26*, but *JSC–027* differs from *M. JSC–026* by: (i) being slightly larger (WL 0.90–0.98) than JSC–026 (WL 0.81–0.88); (ii) having frontal lobes slightly more developed (FLD 0.20–0.22, RFLDII 31–36); (iii) lateral pronotal tubercles larger and acute; (iv) base (dorsum) of propodeum as large as declivity of propodeum (dorsum of propodeum larger than declivity in *JSC–26*); (v) hairs on body of clypeus narrow spatulate (differing from *JSC–26* in which hairs on body of clypeus are simple); (vi) hairs on gastral tergite I narrowly spoon-shaped hairs, whereas hairs on gastral tergite I of *JSC–026* spoon-shaped hairs.

Description. Worker. *Head:* In full-face view and excluding mandibles, longer than wide (HL 0.71–0.76, HW 0.60–0.66, CI 82–87); in full-face view, cephalic corners angulate. Cephalic margin lacking a pair of median vertexal tubercles, median emargination weak. In lateral view, dorsum of head with erect simple hairs in addition to short spoon-shaped ground pilosity. In full-face view, sides of the head broadly convex. Occiput drawn out posterolaterally into a bituberculate neck or collar; tubercles low, anterior one blunt and rounded; posterior one produced into an acute angle. Dorsum of head strongly rugose. Mandibles relatively large (ML 0.45–0.49, MI 62–67); inner margin of mandibles 6–7-toothed, decreasing in size toward base; dorsum of mandibles reticulate; outer margin of mandibles straight. In full-face view, anterior margin of clypeal apron broadly convex, dorsally weakly rugulose; unpaired clypeal seta long (MSL 0.10–0.12, MSI 13–16); 5–8 long decumbent flattened hairs on each side of unpaired seta and reaching anterior margin; body of

clypeus, perpendicular to clypeal apron, shield-like medially straight; in profile, frontoclypeal teeth conspicuous, triangular; in oblique view, lateral margin of clypeus with thin carina; frontoclypeal teeth covered with flattened hairs. In full-face view, frontal lobes expanded laterally, convex (FLD 0.20–0.23), barely covering antennal insertions; posterior margin of clypeus (finger of the clypeus) interrupted anteriorly by proximity of frontal lobes, posteriorly expanded into a deep pit; frontal lobes covered with simple erect hairs (or very narrowly flattened hairs); dorsum of frontal lobes rugose. Eyes very reduced (EL 0.05–0.07, OI 8–10), with 2–3 ommatidia in longest row, 5–7ommatidia in total; eyes situated in the upper half of head. In full-face view, frontal carina inconspicuous being masked by rugae on dorsum of head (scabrous). Vertex smooth, lacking any rugae. Antennal scape long (SL 0.66–0.71, SI 105–115), strongly reticulate; anterior margin of antennal scape (leading edge of scape) scabrous; in full-face view, hairs on antennal scape sparsely subdecumbent very narrowly flattened (almost simple) and curving medially. In lateral view, hypostomal teeth short, triangular.

Mesosoma. In dorsal view, pronotum with humeral tubercles angulate, subtriangular, and covered with spoon-shaped hairs; lateral pronotal tubercles larger than any other tubercle in promesonotum, triangular; anterior pronotal tubercles vestigial, no visible in dorsal view; in lateral view, appearing like a couple of short carinae with spoon-shaped hairs; in lateral view, dorsum of pronotum flat; anterior dorsum of pronotum smooth and mostly glabrous, with spoon-shaped hairs on place of anterior pronotals, base of lateral pronotals, and humeral tubercles only; area between lateral pronotals

and lateral mesonotals lacking hairs; propleuron with large angled carina covered with narrow spoon-shaped hairs. Lateral mesonotals low, carinate with couple narrowly flattened erect hairs; anterior mesonotal tubercles small, triangular with subdecumbent narrow spoon-shaped hairs, but slightly larger than lateral mesonotals; both lateral mesonotal and anterior mesonotal connected by thin lateral carina, area with few decumbent spoon-shaped hairs and smooth. Area between mesonotal and metanotal grooves appearing as a single tubercle, sometimes anterior small tubercle present, vestigial. Metanotal groove deep (scooped out), deeper than mesonotal groove, lacking median longitudinal carina. In lateral view, anterior propodeal tubercles low, carinate; propodeum with a pair of teeth, triangular and acute; base and declivous face of propodeum with thin lateral carinae; propodeal declivity slightly longer than dorsum of propodeum; dorsum (basal) portion and declivity of propodeum smooth.

Metasoma. In lateral view, petiole pedunculate lacking vento-anterior process; ventral margin of peduncle with a pair of thin carina that extend parallel to each other towards posterior margin of petiole; node of petiole, in lateral view, subquadrate; anterior margin of petiolar node with angulate carina from which subdecumbent long spoon-shaped hairs arise; posterior margin of petiolar node with low convex carinae; dorsum of petiolar node smooth and lacking hairs, spoon-shaped hairs restricted to lateral carina; ventral margin of petiole, in profile, almost straight. In dorsal view, postpetiole trapezoidal, wider than long (PPL 0.16–0.18, PPW 0.24–0.26, PPI 136–158); disc of postpetiole covered with decumbent spoon-shaped hairs curving at tips;

in lateral view, dorsum of postpetiole with median sulcus; in dorsal view, posterior margin of postpetiole medially emarginate and postero-inferior margin of postpetiole with short ventral triangular triangular. Base of gaster strigate-reticulate; rest of gastral tergite I finely and densely reticulate, covered with subdecumbent spoon-shaped hairs that curved medially, all directed posterad; gastral sternite I strongly reticulate, covered with decumbent spoon-shaped hairs.

Outer margin of basitarsi of hindlegs with scarce subdecumbent to decumbent hairs curving medially towards the apex. Inner margin of basitarsi of hindlegs with more abundant straight decumbent simple hairs and with abundant pubescense distally. Body opaque; yellowish to light brownish in color. Dorsum of head with some simple erect hairs in addition to short decumbent cephalic ground. Pilosity on mesosoma mostly on tubercles and carinae; few simple hairs, mostly on lateral mesonotal tubercles, rest with medially flattened hairs that curve apically; simple erect hairs present on antennal scapes; legs with simple to very narrow flattened subdecumbent hairs.

Other material examined. Measurements. WORKER. EL 0.05–0.07, FLD 0.20–0.22, GL 0.71–0.78, HFL 0.71–0.78, HL 0.71–0.76, HTL 0.46–0.53, HW 0.61–0.66, ML 0.46–0.49, MSL 0.10–0.11, MSLca 0.07–0.08, OI 8–10, PL 0.36–0.39, PPL 0.18, PPW 0.25–0.26, SL 0.66–0.71, TL 3.35–3.54, WL 0.90–0.98, CI 84–87, MI 63–67, MSI 13–15, MSLI 133–160, PPI 139–148, RFLDI 26–31, RFLDII 31–36, SI 105–112 (n=4).

Queen. Dealate. Resembling the worker with modifications proper of the caste and the following differences:

Head. Antennal scapes striate.

Mesosoma. Dorsum of pronotum rugose; lateral pronotal tubercles triangulat, large; sides of pronotum smooth. In lateral view, mesoscutum broadly convex; median mesocutal line conspicuous; dorsum of mesoscutum rugulose; parapsidal lines conspicuous, sinuous; margin of mesoscutum lacking lateral projections. Axillae rounded posteriorly. Scutellum wider than long; posterior margin of scutellum weakly bidentate; dorsum of scutellum rugulose.

Metasoma. Dorsum of postpetiole rugulose; sides of postpetiole convex; disc of postpetiole wider than long (PPL 0.24, PPW 0.48, PPI 199).

Measurements. QUEEN. EL 0.15, FLD 0.27, GL 1.30, HFL 0.98, HL 0.93, HTL 0.68, HW 0.83, ML 0.57, MSL 0.11, MSLca 0.09, OI 18, PL 0.61, PPL 0.24, PPW 0.48, SL 0.87, TL 5.01, WL 1.37, CI 89, MI 62, MSI 12, MSLI 131, PPI 199, RFLDI 29, RFLDII 32, SI 105 (n=1).

Male. Unknown.

Comments. In full-face view, the antennal scape is strongly scabrous, with the leading edge weakly serrate. Antennal scapes with rugae were previously described in *M. rudiscapa* Emery. In addition, in his description Emery (1913) distinguished *M. rudiscapa* from *M. collaris* and *M. corniculata* based on the "presence of a narrow, serrated crest on the leading edge of the antennal scape" (translated from Emery (1913), p 253–254).

The edge of the antennal scape of the queen of *M. corniculata* is also serrated, but the leading edge of the antennal scape lacks the "serrated crest" described by Emery (1913) in M. rudiscapa. Although the worker caste has not yet been described for either *M. rudiscapa* or *M. corniculata*, the queen of *M. JSC–027* can be distinguished from the queens of both of these species in (i) the presence of erect hairs on the antennal scapes; (ii) the frontal lobes convex and slightly more expanded laterally; (iii) the presence of erect simple hairs on dorsum of head; and (iv) the clypeal apron thin, thinner than the clypeal aprons of *M. rudiscapa* and *M. corniculata*.

Variations among individuals placed in this species include: (i) the disc of the postpetiole weakly rugulose in the specimen from Colombia. This differs from the type series, in which at least the median portion of the postpetiole, in dorsal view, is smooth and glabrous; and (ii) more developed propleural tubercles in the specimen from Colombia than in the type series.

Material examined. COLOMBIA: ***Amazonas;*** Leticia; PNN Amacayacu; Mata-Mata River; 81m; 3º 48.379' S 70º 14.940' W; 14.x.2007; (*J Rodriguez, J Sosa-Calvo, TR Schultz*); leaf-litter sample; JR071014–LS02 [1w, ICN]. **GUYANA:**

Potaro-Siparuni; Iwokrama Forest Reserve; Whitewater Camp; 60m; 4º 43.89' N 58º 50.99' W]; 05.xi.2002; (*JS LaPolla*); leaf-litter sample; JSL021105–01–LS19 [3w, USNM].

Myrmicocrypta JSC–028 **sp. nov.**

(Figure 2.71)

HOLOTYPE: 1w, MEXICO: Chiapas; Playón de la Gloria; 160m; 16.15929º N 90.90155º W; 26.vi.2008; (*LLAMA Project*); mature wet forest; maxi-winkler; leaf-litter; Wm–A–09–1–all–A [USNM, USNMENTNo. 00758241].

PARATYPES. 1w, MEXICO: Chiapas; 8Km SE Salto de Agua; 100m; 17.51466º N 92.29878º W; 16.vi.2008; (*LLAMA Project*); 2º wet forest; maxi-winkler; leaf-litter; MGB870–A [USNM, USNMENTNo. 00758242]. **1w**, Chiapas; 21Km SW Salto de Agua; 180m; 17.38542º N 92.42802º W; 15.vi.2008; (*LLAMA Project*); 2º wet forest; baiting; Ba–A–08–3–01–19 [USNM, USNMENTNo. 00758243].

Measurements. Holotype (Paratypes). WORKER. EL 0.07 (0.06), FLD 0.19 (0.20–0.21), GL 0.70 (0.79), HFL 0.76 (0.79–0.80), HL 0.73 (0.76–0.79), HTL 0.55 (0.58), HW 0.61 (0.61–0.63), ML 0.45 (0.48–0.50), MSL 0.07 (0.08–0.09), MSLca 0.03 (0.03–0.04), OI 11 (10), PL 0.39 (0.39–0.41), PPL 0.18 (0.19–0.19), PPW 0.27 (0.24–0.26), SL 0.71 (0.74–0.76), TL 3.38 (3.58–3.69), WL 0.95 (0.97–1.03), CI 84 (80–81), MI 62 (62–63), MSLI 45 (45–42), PPI 155 (130–151), RFLDI 26 (26–28), RFLDII 31 (32–35), SI 116 (120) (n=3).

Diagnosis. Eyes small, convex (3 ommatidia in longest row, 8 ommatidia total; EL 0.06–0.07, OI 10–11); frontal lobes weakly developed (FLD 0.19–0.21); hairs on antennal scapes subdecumbent and thinly flattened or simple; hairs on dorsum of head with subdecumbent simple to thinly flattened hairs; tubercles in collar well-developed, especially upper tubercle; frons strongly impressed medially between well-developed frontal carinae; posterior portion of head (close to vertex) with three smaller impressions, the outer two of which are bordered by fine carinae; these impressions lacking hairs, except for the impression in the frons; metanotal groove deep; node of petiole, in profile, rounded; ventral margin of petiole with small process.

Description. Worker. *Head:* This species resembles member of the species *Myrmicocrypta ednaella*, but differ from it by having the following characters states: outer margin of mandibles sinuous; [masticatory margin of mandible with 6-7 teeth]. In oblique view, fronto-clypeal teeth tubercles blunt, carinate, covered with thinly flattened to simple subdecumbent hairs. Frontal lobes covered with simple subdecumbent hairs. Eyes small (EL 0.07, OI 11) with 3 ommatidia in longest row (8 ommatidia total), convex, placed at upper half of head. Preocular carina absent, a ruga can be present instead, but not reaching cephalic corners; postero-ventral angles of the head (collar) produced on each side as a pair of well-developed tubercles, upper tubercle rounded at the tip; dorsum of head with subdecumbent thinly flattened to simple hairs; integument in dorsum of head rugulose; antennal scape (SL 0.71, SI

116), anterior margin (leading edge), especially at base, minutely spiculated; covered with thinly flattened to simple hairs.

Mesosoma. Lateral pronotal tubercles lacking fine carinae that connects with anterior pronotal tubercles or with lateropronotal mesopleural suture; propleural tubercle present, tooth-like, large (in dorsal view, this tubercles can be seen sticking out); promesonotal line present; lateral tubercles low, triangular; anterior mesonotal tubercles tooth-like, with narrower base than lateral tubercles; median and posterior mesonotal tubercles small; anterior portion of propodeum with low tubercles; propodeal spines long slightly diverging from median line.

Metasoma. Ventral process of petiole absent or with a minute, very inconspicuous tooth; postpetiole, in dorsal view, trapezoidal; anterior and lateral margins straight; posterior margin medially marginated; postpetiole wider than long (PPW 0.27, PPL 0.18, PPI 155); gaster, basally, strigate; rest of gastral tergite I shining, smooth on the sides, finely reticulate medially; gastral tergite I covered with suberect narrow spoon-shaped hairs; sides of gaster convex.

Outer margin of hind tarsomere I with decumbent sparse simple hairs that curve medially; inner margin of hind tarsomere I with decumbent more dense flattened hairs.

Body densely granulose and opaque. Hairs on head mostly thinly flattened to simple and with some appressed-decumbent narrowly spoon-shaped hairs; body with short and spoon-shaped hairs confined to tubercles and carinae. Legs with abundant strongly-curved appressed narrowly spoon-shaped hairs.

Queen. Unknown.

Male. Unknown.

Comments. This species resembles *Myrmicocrypta ednaella* but can easily be separated from that species by the presence of very thin flattened to simple hairs on the dorsum of the head and the antennal scapes, whereas the hairs in those locations on *M. ednaella* are narrow and spoon-shaped.

Material examined. Only known from the type series.

Myrmicocrypta JSC–029 **sp. nov.**

(Figure 2.72)

HOLOTYPE: 1w, COLOMBIA: Risaralda; Parque Nacional Natural Tatamá, Reserva Natural Montezuma; 1662m; [5.062778° N 76.175° W]; 13–14.iii.2012; (*Collected by*); primary forest; core6; [ICN, USNMENTNo. 00758239].

PARATYPES. 1w, same data as holotype, but 14–15.iii.2012 [USNM, USNMENTNo. 00758240].

Measurements. WORKER. EL 0.07 (0.08), FLD 0.18 (0.20), GL 0.85 (1.07), HFL 0.83, HL 0.81 (0.84), HTL 0.54 (0.55), HW 0.66 (0.69), ML 0.51 (0.53), MSL 0.08 (0.09), MSLca 0.04 (0.03), OI 10 (12), PL 0.46, PPL 0.21 (0.22), PPW 0.28 (0.30), SL 0.76 (0.77), TL 3.88 (4.15), WL 1.04, CI 82, MI 62 (64), MSLI 46 (38), PPI 130 (135), RFLDI 22 (23), RFLDII 26 (28), SI 115 (112) (n=2).

Diagnosis. Eyes small, convex (4–5 ommatidia in longest row, 9–11 ommatidia total; EL 0.07–0.08, OI 10–12); frontal lobes parallel (FLD 0.18–0.20); hairs on antennal scapes subdecumbent and thinly flattened; hypostomal teeth long, longer than maximum diameter of eye; in full-face view, cephalic corners and sides of head convex; propleural teeth reduced to carina or small tubercles; tubercles in collar well-developed, especially upper tubercle; frons strongly impressed medially between well-developed frontal carinae; posterior portion of head (close to vertex) with three smaller impressions, the outer two of which are bordered by fine carinae; these impressions lacking hairs, except for the impression in the frons; metanotal groove deep, with median carinae; anterior pronotal tubercles vestigial; propodeal spines long; antero-ventral process of petiole present, long.

Description. Worker. This species resembles the members of the species *Myrmicocrypta ednaella* and *M. JSC–028*, but differ from them by having the

following combination of characters and character states: outer margin of mandibles sinuous. In oblique view, fronto-clypeal teeth tubercles blunt, carinate, covered with long narrow spoon-shaped hairs. Frontal lobes parallel covered with narrowly flattened hairs. Preocular carina absent, a ruga can be present instead, but not reaching cephalic corners; postero-ventral angles of the head (collar) produced on each side as a pair of low tubercles, upper tubercle acute at the tip; dorsum of head with subdecumbent narrowly spoon-shaped hairs; integument in dorsum of head rugulose; antennal scape large (SL 0.76–0.77, SI 112–115), strongly reticulate-rugose and with anterior margin (leading edge) minutely spiculated; antennal scapes covered with narrowly flattened hairs. In full-face view, cephalic corners rounded, cephalic margin interrupted medially by weak constriction; sides of head broadly convex.

Mesosoma. Anterior pronotal tubercles vestigial with spoon-shaped hairs; in dorsal view, dorsum of pronotum with very weak but conspicuous irregular rugae that runs medially; humeral tubercles small, subtriangular; connected to base of lateral pronotal tubercles by thin carina (more conspicuous in paratype); lateral pronotal tubercles with massive base, irregular at the tip (with several carinae); in dorsal view, somewhat triangular; in fronto-dorsal view, blunt at the tip, carinate, and directed laterally; promesonotal line weakly impressed; lateropronotal mesopleural suture long, curving mesad and weakly continuing to form the promesonotal suture (this condition is shared with *M. JSC–28*); propleuron produced into a angle or small tooth, covered with appressed spoon-shaped hairs; median mesonotal vestigial and posterior mesonotal tubercles low, acute (tooth-like); metanotal groove deeper than mesonotal

groove; both grooves with an unpaired longitudinal median carina. Metanotal groove median carina originating on mid portion of transverse carina connecting posterior mesonotals and extends to transverse carina connecting anterior porpodeal tubercles; anterior propodeal tubercles present, low; propodeal spines present, long, acute, and with very wide base; declivity of propodeum with a thin lateral carina that connects to propodeal lobes; dorsum and declivity of propodeum, in dorsal view, smooth; in lateral view, declivity larger than base of propodeum.

Metasoma. Ventral process of petiole present, tooth-like; ventral margin of peduncle with a pair of thin carina that extend parallel to each other towards the posterior margin of petiole; postpetiole, in dorsal view, subquadrate; anterior margin straight; lateral margins broadly convex; posterior margin medially marginated; postpetiole wider than long (PPW 0.28–0.30, PPL 0.21–0.22, PPI 130–135); gaster, basally, areolate; rest of gastral tergite I reticulate, and shining; sides of gastral tergite I smooth and shining, finely reticulate medially; gastral tergite I covered with narrow spoon-shaped hairs that direct backwards; sides of gaster convex.

Body rugulose and opaque; hairs on head mostly narrowly spoon-shaped; body with short and spoon-shaped hairs confined to tubercles and carinae. Legs covered with abundant curved, appressed, and narrowly spoon-shaped hairs.

Queen. Unknown.

Male. Unknown.

Comments. This species resembles both *Myrmicocrypta ednaella* and *M. JSC–028* in the impression on the frons, the reduced eyes, the low tubercles on the mesosoma, and the shape of the petiolar node in lateral view. It differs from both of those species in the shape of the frontal lobes (parallel in *M. JSC–029*, but broadly convex in *M. ednaella* and *M. JSC–028*) and the shape of the cephalic corners (rounded in *M. JSC–029*, but more angulate in *M. ednaella* and *M. JSC–028*).

Material examined. Known only from type series.

Myrmicocrypta JSC–030 **sp. nov.**

(Figure 2.73)

HOLOTYPE: 1w, GUATEMALA: Izabal; 5km NW Morales; 170m; 15.5103º N 88.86326º W; 18.v.2009; (*LLAMA Project*); 2º lowland rainforest; maxi-winkler; leaf-litter; Wm–B–04–2–02–A [USNM, USNMENTNo. 00758238].

Measurements. WORKER. EL 0.08, FLD 0.21, GL 0.69, HFL 0.78, HL 0.75, HTL 0.53, HW 0.61, ML 0.44, MSL 0.08, MSLca 0.04, OI 13, PL 0.40, PPL 0.19, PPW 0.26, SL 0.64, TL 3.42, WL 0.95, CI 82, MI 58, MSLI 50, PPI 138, RFLDI 28, RFLDII 34, SI 105 (n=1).

Diagnosis. Eyes small, convex (4 ommatidia in longest row, 12 ommatidia total; EL 0.08, OI 13); frontal lobes weakly developed (FLD 0.21), convex; antennal scapes somewhat thick and covered with short narrow spoon-shaped; cephalic corners angulate, supra-ocular carina present; anterior pronotal tubercles small, tooth-like; frons strongly impressed medially between well-developed frontal carinae; in dorsal view, anterior margin of pospteriole convex; metanotal groove deep; ventral margin of petiole with small process.

Description. Worker. This species resembles members of the species *Myrmicocrypta ednaella*, but differ from it by having the following characters states: cephalic corners angulate; supra-ocular carina present; preocular carina absent; postero-ventral angles of the head (collar) produced on each side as a pair of well-developed tubercles, lower tubercle larger than upper tubercle; integument in dorsum of head smooth; antennal scape long (SL 0.64, SI 105) and thick; anterior margin (leading edge), especially at base, minutely spiculated; covered with narrow spoon-shaped hairs.

Mesosoma. Pronotum smooth; anterior and humeral tubercles small, tooth-like; lateral pronotial tubercles larger than other tubercles on pronotum; propleural tubercle present, low, carina-like; promesonotal line weakly impressed, but conspicuous; lateral tubercles low, triangular; anterior mesonotal tubercles tooth-like, with narrower base than lateral tubercles; median mesonotal tubercles small; posterior mesonotal tubercles tooth-like, larger than median mesonotals; anterior portion of

propodeum with low tubercles; propodeal spines slightly longer than anterior propodeals and slightly diverging from median line; propodeal declivity appearing larger than base of propodeum; lateral margins of base and declivity of propodeum with thin carinae.

Metasoma. Ventral process of petiole absent; postpetiole, in dorsal view, dome-like; anterior and lateral margins convex; postpetiole wider than long (PPW 0.26, PPL 0.19, PPI 138); gaster, basally, densely reticulate; gastral tergite I smooth on the sides, finely reticulate medially; gastral tergite I covered with spoon-shaped hairs; sides of gaster convex; gastral tergite I longer than wide.

Body opaque. Hairs on head mostly short spoon-shaped; body with short and spoon-shaped hairs confined to tubercles and carinae.

Queen. Unknown.

Male. Unknown.

Comments. This species is described based on a single worker collected in Guatemala. Morphologically, this species resembles *M. ednaella* from which it can be distinguisheded by the presence of anterior pronotal tubercles (absent or vestigial in *M. ednaella*), the presence of a supra-ocular carinae (absent in *M. ednaella*), the presence of anterior propodeal tubercles (lacking in *M. ednaella*), and the declivity longer than the basal face of the propodeum (in *M. ednaella* both are subequal in

length, or the basal face is slightly longer than the declivity). This species also resembles somewhat the species *M. spinosa* from South America. However, it differs from that species in size; the length of the unpaired median seta; the presence of a promesonotal line; and the presence of anterior propodeal tubercles.

Material examined. Known only from the type specimen.

Myrmicocrypta JSC–033 **sp. nov.**

(Figure 2.74–2.75)

HOLOTYPE: 1w, SURINAME: Sipaliwini; Raleigh Vallen Nature Preserve; [56m]; 4º 44' N 56º 14' W; 30.i.2006; (*J Sosa-Calvo*); nest series; JSC060130–01 [USNM, USNMENTNo. 00758546]

PARATYPES. 2w, 1dq, same locality data as holotype. [USNM, USNMENTNo. 00758229; 00758547]

Measurements. WORKER. EL 0.09 (0.08–0.10), FLD 0.13 (0.13–0.14), GL 0.68 (0.67–0.75), HFL 0.65 (0.67–0.71), HL 0.67 (0.68–0.76), HTL 0.44 (0.45–0.51), HW 0.55 (0.57–0.62), ML 0.42 (0.44–0.49), MSL 0.09 (0.09), MSLca 0.07 (0.06–0.07), OI 17 (14–16), PL 0.34 (0.34–0.40), PPL 0.19 (0.18–0.20), PPW 0.24 (0.23–0.28), SL 0.59 (0.62–0.68), TL 3.13 (3.16–3.54), WL 0.83 (0.86–0.96), CI 82 (82–84), MI

62 (61–70), MSI 14 (11–14), MSLI 71 (71–79), PPI 128 (129–142), RFLDI 20 (18–20), RFLDII 24 (22–23), SI 106 (109–112) (n=3).

Diagnosis. Small flattened eyes; median sized unpaired median clypeal seta; reduced frontal lobes; lack of anterior pronotal tubercles; propleuron with distinct tubercle; presence of ventral process of petiole; and the presence of suberect simple hairs on tarsal tarsomere II–V.

Description. Worker. *Head*: in full-face view, longer than wide (HL 0.67, HW 0.55, CI 82). In full-face view, cephalic corners convex; cephalic margin straight, slightly (almost inconspicuously) emarginate medially, lacking tubercles. In full-face view, sides of the head somewhat straight. Eyes small (EL 0.09, OI 17), flattened, with 3–4 ommatidia in longest row, 7-12 ommatidia in total; situated in the upper half of head. In full-face view, frontal lobes reduced, weakly convex (almost parallel), failing to cover antennal insertions; frontal lobes, dorsally, with spoon-shaped hairs. Frontal carinae vestigial past level of eyes merging with rugulose sculpture. Dorsum of head weakly rugulose; vertex smooth. Mandibles triangular; inner margin with 6–8 teeth; dorsum of mandibles finely reticulate, with several short simple appressed hairs. In full-face view, anterior margin of clypeal apron convex, dorsally with weakly impressed rugae; unpaired median seta median in size (MSL 0.09), originating at mid portion of clypeal apron; posterior margin of body of clypeus, close to antennal insertions, produced into a pair of short tubercles. Antennal scape long (SL 0.59–

0.68, SI 109–112), finely reticulate; antennal scapes covered with narrow decumbent spoon-shaped hairs. Hypostomal teeth short, triangular.

Mesosoma: anterior pronotal tubercles vestigial to absent, some squamate hairs; dorsum of pronotum smooth; humeral tubercles reduced, very small triangular projections; propleuron with a small tubercle covered with squamate hairs; in dorsal view, lateral pronotal tumusities present, with irregular carinae; in profile, lateral pronotal tubercles with massive base, blunt at tip; covered with abundant squamate hairs. In dorsal view, lateral mesonotals as rounded carina; in profile, lateral mesonotals low present as a raised carina, covered with squamate hairs; anterior mesonotals, in profile, as obtuse carina covered with squamate hairs; in dorsal view, lateral and anterior mesonotal tubercles jointed together by thin lateral carina forming quadrate area, area between smooth; mesonotal groove smooth; area between mesonotal and metanotal grooves appearing as a small tubercle (in few samples, with very low median and posterior mesonotal tubercles) with squamate hair at tip. Metanotal groove slightly deeper than mesonotal, smooth. Anterior propodeal tubercles absent, convex; propodeal spines present, well-developed; each with a squamate hair close to the tip. In lateral view, basal face of propodeum slightly convex; declivity of propodeum convex, with thin lateral carina that increases in size towards propodeal lobes; basal face and declivity of propodeum, smooth.

Metasoma: petiole pedunculate with ventral process tooth-like or carinate that extends to mid portion of length of ventral margin of peduncle; from mid portion to posterior

margin of ventral margin of petiole splitting into pair of carinae, parallel to each other; in lateral view, anterior margin of petiolar node evenly rounded with squamate hairs; in dorsal view, disc of petiole almost rounded, smooth; in lateral view, posterior margin of petiolar node with low raised carina that forms two low tubercles, each with squamate hair. Postpetiole, in lateral view, dorsally convex; disc of postpetiole covered with scale-like shaped hairs; wider than long (PPL 0.18–0.20, PPW 0.23–0.28, PPI 128–142); in dorsal view, bell-shaped, lacking lateral posterior projections; posterior margin of postpetiole, in dorsal view, medially emarginate. Base of gaster with thin short lateral carinae; dorsum of gastral tergite I finely reticulate, lateral margins smooth and shinny; gastral tergite with squamate hairs. Tarsal segments with suberect hairs; outer margin of basitarsus smooth and shinny, with a distal pair of suberect hairs.

Queen. Dealate. As the worker with modifications expected for the caste and with the following differences:

Mesosoma. Dorsum of pronotum rugulose; humeral and lateral tubercles pronounced; propleuron tuberculate. Katepisternum rugulose; scutellum bidentate posteriorly; propodeal spines long, acute; base of propodeum shorter than declivous of propodeum; base and declivous face of propodeum with lateral thin carinae.

Metasoma. In lateral view, anterior ventral process of petiole carinate. In lateral view, dorsum of postpetiole convex; in dorsal view, disc of postpetiole convex anteriorly,

rugose. Anterior corner of gaster flattened; base of gaster costulate, rest of gastral tergite reticulate.

Measurements. QUEEN. EL 0.18, FLD 0.17, GL 1.11, HFL 0.85, HL 0.85, HTL 0.59, HW 0.77, ML 0.50, MSL 0.10, MSLca 0.07, OI 23, PL 0.54, PPL 0.25, PPW 0.33, SL 0.75, TL 4.46, WL 1.21, CI 91, MI 59, MSI 12, MSLI 73, PPI 132, RFLDI 20, RFLDII 24, SI 97 (n=1).

Male. Unknonwn.

Comments. This species resembles *M. unidentata* but differs from it mainly by: (i) the frontal lobes completely reduced (expanded in *M. unidentata*); (ii) the ventral process of the petiole present as a curtain that extends almost the entire length of the petiole (*M. unidentata* lacks a ventral process of any kind); (iii) the postpetiole, in dorsal view, appearing almost rounded, with a strong convex anterior margin (subquadrate and long in *M. unidentata*). This species resembles *M. JSC–034*, *M. JSC–037*, and *M. foreli*: (i) the reduced weakly expanded frontal lobes (except for *M. foreli*, in which the frontal lobes are parallel); (ii) the smooth dorsum of the pronotum and the reduced anterior pronotal tubercles; and (iii) the acute triangular propodeal spines. This species differs from *M. JSC–034*, *M. JSC–037*, and *M. foreli* in having small eyes, with 3–4 ommatidia in the longest row, and flattened rather than convex or globose.

Other material examined. SURINAME: ***Sipaliwini District***; Bahkuis Mts., 155m; 4º 43’ 48.7” N 56º 46’ 4.8” W; 03.iii.2006; JSC060303–01; (*J Sosa-Calvo*) [1w, USNM].

Myrmicocrypta JSC–034 **sp. nov.**

(Figure 2.76)

HOLOTYPE: 1w, ECUADOR: Napo; Tiputini Biol. Station; [213m; 0° 38′ 18″ S 76° 9′ 0″ W]; 17.ii.1998; (*CR Currie*); nest series; CRC980217–10 [USNM, USNMENTNo. 00442591]

PARATYPES. 8 w, same data as holotype. [USNM, USNMENTNo. 00442579, 00442581–84, 00442586, 00442899]

Measurements. WORKER. EL 0.09 (0.09–0.10), FLD 0.13 (0.13–0.14), GL 0.86 (0.76–0.82), HFL 0.80 (0.78–0.82), HL 0.73 (0.73–0.75), HTL 0.59 (0.55–0.60), HW 0.59 (0.60–0.63), ML 0.45 (0.46–0.50), MSL 0.08 (0.07–0.09), MSLca 0.06 (0.05–0.06), OI 16 (14–16), PL 0.42 (0.37–0.44), PPL 0.17 (0.17–0.20), PPW 0.26 (0.25–0.28), SL 0.68 (0.66–0.71), TL 3.58 (3.45–3.68), WL 0.94 (0.93–1.00), CI 82 (81–86), MI 62 (62–67), MSI 11 (10–12), MSLI 75 (58–75), PPI 153 (139–162), RFLDI 18 (17–19), RFLDII 22 (21–23), SI 114 (110–117) (n=9).

Diagnosis. Dorsum of head smooth, lacking rugosities; antennal scape densely covered with scale-like hairs, difficult to see integument; hairs on body widely squamate, appressed; hypostomal collar vestigial; basal face of propodeum larger than declivity of propodeum; long propodeal spines.

Description. Worker. *Head*: in full-face view, longer than wide (HL 0.73–0.75, HW 0.59–0.63, CI 81–86). In full-face view, cephalic corners convex; cephalic margin slightly (almost inconspicuously) emarginate medially, lacking tubercles. In full-face view, sides of the head widely convex, almost straight. Mandibles triangular (ML 0.450.50, MI 62–67); inner margin with 6–7 teeth; dorsum of mandibles finely reticulate. In full-face view, anterior margin of clypeal apron convex; unpaired median seta present, median in size (MSL 0.07–0.09, MSI 10-12). Body of the clypeus, in lateral view, straight; upper portion of body of clypeus, in profiile, with thin carina obtusely angulate underneath antennal insertions; body of clypeus, in oblique view, triangular with lateral carina. Frontal lobes, in full-face view, reduced (vestigial), weakly convex and failing to cover antennal insertions (FLD 0.13); area between frontal lobes very closed together, anteriorly. Frontal carinae, in dorsal view, absent; in lateral view, weakly impressed, extending at past eye level. Eyes small with 4–6 ommatidia in longest row, 11-22 ommatidia in total; eyes situated in the upper half of head. Antennal scape long (SL 0.66–0.71, SI 109-110); finely reticulate; covered with narrow decumbent spoon-shaped hairs. Dorsum of head (frons) smooth, with few rugae on vertexal area. Malar space (gena) and ventral gena smooth, lacking

tumosities or tubercles, and covered with squamate hairs. Vertex smooth. Hypostomal teeth small, triangular.

Mesosoma: anterior pronotal tubercles vestigial to absent; humeral tubercles very small; in dorsal view, lateral pronotal angulate; in profile, lateral pronotals with large base and in a right angle; dorsum of pronotum flat and smooth; propleuron with small, but conspicuous tubercle. In dorsal view, lateral mesonotals reduced, vestigial; in profile, lateral mesonotals low, carinate, appearing as a continuation of pronotum (convex anteriorly). Anterior mesonotals slightly larger than lateral mesonotals. Mesonotal groove smooth; small pair of tubercles between mesonotal and metanotal groove; metanotal groove slightly deeper than mesonotal groove. Anterior propodeal obtusely angulate; propodeal spines present, well-developed triangular with relatively wide base; each with squamate hairs (at least three of them). In lateral view, basal face of propodeum flat, slightly larger than declivity of propodeum; dorsum of propodeum; in dorsal view, dorsum of basal face and declivity of propodeum smooth.

Metasoma: petiole pedunculate with a tooth-like ventral process and with concave carina that extends to mid portion of length of peduncle; from this point splitting into a pair of thin carina that extend parallel to each other, towards the posterior margin of petiole; in lateral view, anterior margin of petiolar node evenly rounded; in dorsal view, anterior margin of disc of petiole rounded; disc of petiole smooth; in lateral view, posterior margin of petiolar node with low raised carina, forming a low tubercle on each side. In dorsal view, disc of postpetiole smooth; in lateral view, subquadrate.

In dorsal view, postpetiole wider than long (PPL 0.17–0.20, PPW 0.25–0.28, PPI 132–162); in dorsal view, anterior margin convex; lateral margin convex, posteriorly laterally angulate; posterior margin of postpetiole, in dorsal view, medially emarginate; disc of postpetiole covered with squamate hairs. Gastral tergite I finely reticulate and shinning; gastral tergite I larger than wide; gastral sternite smooth and shinny. Tarsal tarsomeres lacking suberect simple hairs.

Body yellowish to brown-yellowish, smooth; head, tubercles, petiole, postpetiole, femur, tibia, and gaster covered with broadly spatulate appressed; hairs on antennal scape dense and slightly narrower (spoon-shaped).

Other material examined. WORKER. EL 0.08–0.10, FLD 0.12–0.13, GL 0.66–0.80, HFL 0.70–0.80, HL 0.63–0.73, HTL 0.51–0.57, HW 0.51–0.60, ML 0.40–0.48, MSL 0.07–0.08, MSLca 0.05, OI 15–17, PL 0.33–0.41, PPL 0.17–0.19, PPW 0.24–0.26, SL 0.62–0.68, TL 3.07–3.48, WL 0.84–0.95, CI 81–85, MI 63–66, MSI 10–12, MSLI 67–73, PPI 132–154, RFLDI 18–19, RFLDII 21–23, SI 112–122 (n=4).

Queen. Unknown.

Male. Unknown.

Comments. This species resembles *JSC–033* but differs from it mainly in: (i) the dorsum of the head smooth, lacking strong rugae (in *JSC–033,* the frons is scabrous); (ii) the eyes, in full-face view, convex (in *JSC–033*, the eyes flattened in full-face

view); (iii) the hairs on the head and body wider (squamate) than those in *JSC–033*; (iv) the propodeal spines somewhat larger than in *JSC–033*.

This species nests underground. A small colony collected in Loreto, Peru, consisted of a single, small, round chamber (H= 1.5cm, W= 1.5cm) and contained 3 workers and 1 dealate queen (Rabeling pers. comm.)

Other material examined. COLOMBIA: ***Amazonas***; Leticia; Parque Nacional Natural Amacayacu; 80m; 03º 47.547' S 70º 17.350' W; 10.x.2007; (*J Sosa-Calvo, TR Schultz, & J Rodriguez*); leaf-litter sample; JSC071010–LS04 [1w, USNM]. **PERU:** ***Loreto***; Loreto Explorama Lodge; 55km NE Iquitos; [103m]; 3.4434º S 72.8498º W; 15.vi.2004; (*C Rabeling*); nest series; CR040615–08 [1w, USNM]. RMMA040617–02.

Myrmicocrypta JSC–037 **sp. nov.**

(Figure 2.77–2.78)

HOLOTYPE: 1w, GUYANA: Cuyuni-Mazaruni; Mount Ayanganna; Falls Camp; 1134m; 5º 22.332' N 59º 57.563' W; 12.x.2002; (*TR Schultz*, *J LaPolla*, *C Marshall*, *R Williams*); nest series; TRS021012–04 [USNM, USNMENTNo. 00444549]

PARATYPES. 8w, same data as holotype [USNM, USNMENT No. 00755286, 00444788, 00444786, 00444552, 00758550–53]. Several workers deposited in ethanol [vial USNMENTNo. 00417485].

Measurements. WORKER. EL 0.11 (0.11–0.12), FLD 0.17 (0.17–0.19), GL 0.86 (0.88–0.93), HFL 0.91 (0.91–0.98), HL 0.79 (0.82–0.83), HTL 0.63 (0.63–0.67), HW 0.63 (0.64–0.68), ML 0.53 (0.53–0.55), MSL 0.11 (0.09–0.13), MSLca 0.07 (0.06–0.09), OI 17 (16–18), PL 0.43 (0.41–0.45), PPL 0.21 (0.21–0.24), PPW 0.26 (0.26–0.28), SL 0.79 (0.79–0.91), TL 3.86 (3.91–4.03), WL 1.04 (1.04–1.09), CI 81 (78–83), MI 67 (63–67), MSI 13 (10–16), MSLI 69 (62–72), PPI 124 (120–127), RFLDI 21 (20–23), RFLDII 26 (25–29), SI 124 (120–135) (n=9).

Diagnosis. Eyes relatively large and globose; frontal lobes reduced, slightly convex; long propodeal spines; dorsum of postpetiole reticulate.

Description. Worker. *Head*: Head, in full-face view, longer than wide (HL 0.75–0.83, HW 0.60–0.68, CI 76–83). In full-face view, cephalic corners convex; posterior cephalic margin widely convex slightly emarginate medially, lacking tubercles; lateral cephalic margin sides convex. Mandibles triangular; outer margin sinuate; inner margin with 7–8 teeth; dorsum of mandibles finely reticulate and with several short simple appressed hairs. In full-face view, anterior margin of clypeal apron convex, slightly angulate medially; dorsum of clypeal apron longitudinally wrinkled; unpaired median seta long (MSL 0.11–0.13, MSI 10–18), originating at mid portion of clypeal apron. Clypeus, in lateral view, straight; upper portion of clypeus, in profiile, with thin carina forming pair of tubercles (fronto-clypeal) underneath antennal insertions; in oblique view, clypeus with thin conspicuous lateral carinae;

medially with mid rugae that splits and directs backwards to base of fronto-clypeal teeth; area between fronto-clypeal tubercles shallowly concave and with a horizontal carina connecting the bases of the frontoclypeal teeth; body of clypeus with abundant narrow spoon-shaped hairs; posterior margin of body of the clypeus convex, not running between frontal lobes. Frontal lobes, in full-face view, parallel, thick, failing to cover antennal insertions; frontal carinae present, running at eye level, masked posteriorly by rugae on frons; dorsum and ventral portions of head strongly rugose; frons impressed; vertex with pair of enclosed glabrous areas on each side of median vertexal emargination; occiput, in lateral view, drawn out posterolaterally into a small neck or collar, weakly bidentate. Eyes situated in the upper half of head; globose, large (EL 0.10–0.12, OI 16–19) with 7 ommatidia in longest row (28–37 ommatidia in total). Antennal scape long (SL 0.72–0.91, SI 118-128); finely reticulate; covered with narrow and elongate decumbent spoon-shaped hairs; these hairs getting narrower towards the apex of scape; apex of scape smooth, with appressed simple hairs. Hypostomal teeth small, triangular.

Mesosoma: anterior pronotal tubercles vestigial to absent (more like a very low carina), covered with several appressed spoon-shaped hairs; dorsum of pronotum (behind anterior pronotal and between lateral pronotal tubercles) weakly rugulose; pronotal neck smooth; humeral tubercles low, triangular; in dorsal view, lateral pronotal tubercles thick and conspicuous; irregular margin, consisting of carinae; in profile, lateral pronotal tubercles with massive base, blunt at tip; in fronto-dorsal view, lateral pronotal tubercles blunt at tip, low and formed by, at least, two carinae;

area between lateral pronotal tubercles slightly concave. Propleuron with small obtuse tubercle. In dorsal view, a ruga present anterior to promesonotal tubercles, appearing as a promesonotal suture; in lateral view, promesonotals low present as a raised carina lower than anterior mesonotals; dorsally visible as carina. In lateral view, anterior mesonotals as triangular carina, forming small tubercle; in dorsal view promesonotal and anterior mesonotal tubercles jointed together by a thin lateral carina, forming a squared area, with smooth dorsum. Mesonotal groove smooth with thin lateral carina (some specimens with median carinae present). Area between mesonotal and metanotal grooves with a pair of low tubercles, of which posterior pair largest; metanotal groove appearing deeper than mesonotal groove. Katepisternum rugose. Anterior portion of propodeum lacking tubercles, at most anterior margin angled; propodeal spines present; in dorsal view, diverging from central plane; in lateral view, dorsum of propodeum straight; in profile, dorsum of propodeum and declivity of propodeum with a thin carina; dorsum and declivity of propodeum, in dorsal view, smooth; dorsum of propodeum as long as its declivity; posterior portion of side of propodeum rugose.

Metasoma: petiole pedunculate with thin curtain-like ventral process that extends to mid portion of length of peduncle, from this point a pair of thin carina originate extending, parallel to each other, towards the posterior margin of petiole; in profile, posterior ventral margin of petiole slightly concave; in lateral view, anterior margin of petiolar node rounded, straight dorsally; in dorsal view, disc of petiole rounded, with lateral carinae; disc of petiole smooth; in lateral view, posterior margin of

petiolar node with low raised carina that forms two low tubercles. In dorsal view, disc of postpetiole reticulo-rugose; in lateral view, dorsally convex; in dorsal view, postpetiole wider than long, bell-shaped; lateral margins of postpetiole slightly convex; posterior margin of postpetiole, in dorsal view, medially emarginate. Gastral tergite and sternite I strongly reticulate.

Pilosity on head, mesosoma, and metasoma spoon-shaped; pilosity on antennal scapes and legs consisting of scarcely and elongate narrow spoon-shaped hairs. Body color brownish to yellowish-brown, lighter in color on mandibles, legs, and antennal segments.

Other material examined. Measurements. WORKER. EL 0.10–0.12, FLD 0.16–0.17, GL 0.80–0.90, HFL 0.81–0.93, HL 0.75–0.82, HTL 0.58–0.66, HW 0.60–0.66, ML 0.50–0.54, MSL 0.11–0.13, MSLca 0.08–0.11, OI 17–19, PL 0.36–0.44, PPL 0.20–0.21, PPW 0.24–0.27, SL 0.72–0.81, TL 3.56–3.93, WL 0.95–1.05, CI 76–81, MI 66–67, MSI 14–18, MSLI 71–80, PPI 118–126, RFLDI 19–30, RFLDII 24–37, SI 118–128 (n=7).

Queen. Dealate. As the worker with modifications expected for the caste and with the following differences:

Head. Posterior cephalic margin emargination more conspicuous than in worker; fronto-clypeal teeth more pronounced, sharper; ocular carinae present; antennal bicolored.

Mesosoma. Dorsum of pronotum as in worker; lateral pronotal tubercles pronounced; propleuron with low rounded tubercle. Katepisternum and anepisternum rugulose; scutum with pair of parallel longitudinal raised carinae; parapsidal lines long, extending to anterior portion of scutum; scutellum bidentate posteriorly; in lateral view, strong carinae connecting propodeal spiracle with anterior portion of propodeum; propodeal spines long, acute; base of propodeum slightly shorter than its declivous; base and declivous face of propodeum with lateral thin carinae; declivous face of propodeum rugose.

Metasoma. In lateral view, anterior ventral process of petiole carinate. In lateral view, dorsum of postpetiole convex; in dorsal view, disc of postpetiole convex anteriorly, rugose. Anterior corner of gaster flattened; base of gaster with short costulae, rest of gastral tergite reticulate.

Measurements. QUEEN. EL 0.20, FLD 0.22, GL 1.27–1.30, HFL 1.09–1.10, HL 0.91–0.93, HTL 0.75, HW 0.80–0.84, ML 0.60–0.61, MSL 0.10–12, MSLca 0.06–0.07, OI 24–25, PL 0.61–0.66, PPL 0.30–0.31, PPW 0.48–0.51, SL 0.91–0.93, TL 5.05–5.20, WL 1.35–1.40, CI 86–92, MI 64–67, MSI 11–13, MSLI 60–61, PPI 162–164, RFLDI 24, RFLDII 24–25, SI 111–114 (n=2).

Male. Unknown.

Comments. Nests of this species were collected underground, in wet, sandy soil, near a creek in a cloud forest. Nest entrances have a conspicuous turret formed of gray sand pellets (TR Schultz, field notes). The garden chamber was located ~2cm below the surface (dimensions of the chamber: H= 4cm; W= 4cm; D= 6cm), and the garden appeared to be planted on pieces of long grass common near the creek (TR Schultz, field notes).

This species is easily recognized by: the cephalic corners rounded; the long, thick unpaired median clypeal seta; the antennal pilosity; and the strongly reticulate disc of the postpetiole. The queen of this species has the antennae bicolored, with the antennal scapes dark brown in most of their length and the apical portion of the antennal scape and the funicular segments yellowish. The pilosity present on the antennal scapes, head, and legs tends to be dark and spatulate.

Material examined. GUYANA: ***Cuyuni-Mazaruni***; Mt Ayanganna; Cloud Forest; 1300m; 5º 22.483' N 59º 57.969' W; 13.x.2002; (*TR Schultz*, *J LaPolla*, *C Marshall*, *R Williams*); nest series; UGM021013–03 [2w, 1dq, USNM]. Same data as previous entry, but (*UG Mueller*); nest series; UGM021013–02 [2w, USNM]. Mt Ayanganna; Falls Camp; 1134 m; 5º 22.332' N 59º 57.563' W; 13.x.2002; (*UG Mueller*); nest series; 1º Forest; UGM021013–05 [2w, 1dq, USNM]. Same data as previous, but

14.x.2002; (*TR Schultz*, *J LaPolla*, *C Marshall*, *UG* Mueller, *R Williams*); 1º forest stream bank; TRS021014–03B [1w, USNM].

Myrmicocrypta JSC–039 **sp. nov.**

(Figure 2.79–2.80)

HOLOTYPE: 1w, BRAZIL: Amazonas; Manaus; Reserva Ducke; 95m; 2.932417º S 59.972111º W; 26.ix.2012; (*A Jesovnik*); AJ120926–04; nest series. [MZSP, USNMENTNo. 00758169]

PARATYPES. 3w, 1dq same locality data as holotype. [USNM, USNMENTNo. 00758170, 00758538, 00758556]

Measurements. WORKER. EL 0.07 (0.07–0.09), FLD 0.15 (0.14–0.15), GL 0.75 (0.75–0.79), HFL 0.75 (0.73–0.76), HL 0.73 (0.70–0.75), HTL 0.54 (0.52–0.54), HW 0.59 (0.60–0.64), ML 0.46 (0.44–0.50), MSL 0.11 (0.11–0.12), MSLca 0.09 (0.08–0.09), OI 12 (11–14), PL 0.35 (0.34–0.40), PPL 0.19 (0.19–0.20), PPW 0.24 (0.25–0.26), SL 0.68 (0.66–0.69), TL 3.40 (3.37–3.59), WL 0.93 (0.91–0.97), CI 81 (85–86), MI 63 (62–66), MSI 15 (16), MSLI 76 (71–78), PPI 132 (132–134), RFLDI 20 (20–21), RFLDII 25 (24–25), SI 132 (132–134) (n=4).

Diagnosis. Small rounded eyes; median sized unpaired median clypeal seta; reduced frontal lobes; lacking frontal carinae; anterior pronotal tubercles small; ventral process of petiole carinate; presence of suberect simple hairs on tarsal segment.

Description. Worker. *Head*: in full-face view, longer than wide (HL 0.70–0.80, HW 0.59–0.64, CI 80–86). In full-face view, cephalic corners convex; posterior cephalic margin straight, slightly (almost inconspicuously) emarginate medially, lacking tubercles. In full-face view, sides of the head somewhat straight. Eyes small (EL 0.07–0.09, OI 11–14), convex, with 4–5 ommatidia in longest row, 12–18 ommatidia in total; situated in the upper half of head. In full-face view, frontal lobes reduced, weakly convex (almost parallel), failing to cover antennal insertions. Frontal carinae vestigial past level of eyes merging with weakly impressed rugose sculpture. Dorsum of head weakly rugulose almost smooth; vertex smooth. Mandibles triangular; inner margin with 6–8 teeth; dorsum of mandibles finely reticulate, with several short simple appressed hairs. In full-face view, anterior margin of clypeal apron convex, dorsally with weakly impressed rugae; unpaired median seta median in size (MSL 0.11–0.13, MSI 15–17), originating at mid portion of clypeal apron; posterior margin of body of clypeus, close to antennal insertions, convex, carinate. Antennal scape long (SL 0.66–0.75, SI 107–117), finely reticulate; antennal scapes scarcely covered with narrow decumbent spoon-shaped hairs. Hypostomal teeth short, triangular.

Mesosoma: anterior pronotal tubercles vestigial; dorsum of pronotum smooth; humeral tubercles reduced, very small triangular projections; propleuron angled

covered with squamate hairs; in dorsal view, lateral pronotal tumosities present, with irregular carinae; in profile, lateral pronotal tubercles with massive base, carinate, and spiculate; covered with abundant squamate hairs. In dorsal view, lateral mesonotals as low carina; in profile, lateral mesonotals low present as a raised carina, covered with squamate hairs; anterior mesonotals, in profile, as obtuse carina covered with squamate hairs; in dorsal view, lateral and anterior mesonotal tubercles jointed together by thin lateral carina forming quadrate area, area between smooth; mesonotal groove smooth; area between mesonotal and metanotal grooves appearing as a pair of small tubercles with squamate hair at tip. Metanotal groove slightly deeper than mesonotal groove, smooth. Anterior propodeal tubercles present; propodeal spines present, well-developed; each with a squamate hair close to the tip. In lateral view, basal face of propodeum straight, with lateral thin carinae; declivity of propodeum convex, lacking lateral carinae; basal face and declivity of propodeum, smooth.

Metasoma: petiole pedunculate with ventral process carinate that extends to mid portion of length of ventral margin of peduncle; from mid portion to posterior margin of ventral margin of petiole splitting into pair of carinae, parallel to each other; in lateral view, anterior margin of petiolar node evenly rounded with squamate hairs; in dorsal view, disc of petiole almost rounded, smooth; in lateral view, posterior margin of petiolar node with low raised carina that forms two low tubercles, each with squamate hair. Postpetiole, in lateral view, dorsally convex; disc of postpetiole, smooth, covered with spoon-shaped hairs; wider than long (PPL 0.19–0.22, PPW 0.24–0.27, PPI 121–139); in dorsal view, trapezoidal, lacking lateral posterior

projections; posterior margin of postpetiole, in dorsal view, medially emarginate; sides of postpetiole convex. Base of gaster with thin short lateral carinae; dorsum of gastral tergite I finely reticulate, lateral margins smooth and shinny; gastral tergite with squamate hairs. Tarsal segments with suberect hairs; outer margin of basitarsus smooth and shinny, with a distal pair of suberect hairs.

Other material examined. Measurements. WORKER. EL 0.08–0.09, FLD 0.13–0.15, GL 0.80–0.84, HFL 0.73–0.83, HL 0.75–0.80, HTL 0.57–0.60, HW 0.61–0.64, ML 0.47–0.54, MSL 0.11–0.13, MSLca 0.08–0.10, OI 13–14, PL 0.37–0.38, PPL 0.19–0.22, PPW 0.25–0.27, SL 0.70–0.75, TL 3.56–3.77, WL 0.94–1.00, CI 80–82, MI 61–70, MSI 15–17, MSLI 67–75, PPI 121–139, RFLDI 17–19, RFLDII 22–23, SI 115–117 (n=3).

Queen. Dealate. Resembling the worker with modifications expected for the caste and with the following differences:

Mesosoma. Dorsum of pronotum rugulose; humeral and lateral tubercles pronounced; propleuron angled, lacking a tubercle. Katepisternum rugulose; dorsum of scutum rugose; scutellum bidentate posteriorly; propodeal spines long, acute; base of propodeum slightly shorter than declivous of propodeum; base and declivous face of propodeum with lateral thin carinae.

Metasoma. In lateral view, anterior ventral process of petiole carinate. In lateral view, dorsum of postpetiole convex; in dorsal view, disc of postpetiole convex anteriorly, rugose. Anterior corner of gaster flattened; base of gaster costulate, rest of gastral tergite reticulate.

Measurements. QUEEN. EL 0.17, FLD 0.20, GL 1.30, HFL 0.98, HL 0.91, HTL 0.66, HW 0.79, ML 0.55, MSL 0.13, MSLca 0.09, OI 22, PL 0.65, PPL 0.28, PPW 0.38, SL 0.82, TL 4.96, WL 1.27, CI 86, MI 60, MSI 14, MSLI 68, PPI 139, RFLDI 22, RFLDII 25, SI 104 (n=1).

Male. Unknown.

Comments. This species is very similar to *M. JSC–033*, but differs in the eyes convex rather than flattened; worker and queen with the small propleural process angulate rather than tuberculate; the larger, more conspicuous hypostomal teeth in the queen; and the presence of simple subdecumbent hairs on the tarsal segments.

The nest of this species was found serendipitously while digging for a nest of *Sericomyrmex*. The nest was located underground ~5cm from the surface. The sole chamber was large and spherical in shape (H= 3cm, W= 4cm, D= 3.5cm). This species was collected in forest dominated by *Chlorocardium* sp., i.e., greenheart forest.

Material examined. GUYANA: ***Upper Takutu-Upper Essequibo*****;** Apoteri Village; Conservation Interantional Concession, Essequibo River; 80m; 3.51331º N 58.23476º W; 29.xi.2011; (*A Jesovnik*); nest series; green heart forest (*Chlorocardium* sp); AJ111129–04 [3w, USNM].

Myrmicocrypta JSC–042 **sp. nov.**

(Figure 2.81–2.82)

HOLOTYPE: 1w, BRAZIL: Minas Gerais; Uberlândia; Fazenda Experimental do Panga; 796m; 19º 10.283' S 48º 23.766' W; 23.ix.2008; (*TR Schultz*); nest series; Cerrado *sensu stricto*; TRS080923–15 [MZSP, USNMENTNo. 00758168]

PARATYPES. 2w, 1dq, same as data as holotype [USNM, USNMENTNo. 00758557–58, 00920692].

Measurements. WORKER. EL 0.13 (0.13), FLD 0.15 (0.14–0.15), GL 0.83 (0.77–0.83), HFL 0.88 (0.82–0.90), HL 0.80 (0.74–0.82), HTL 0.63 (0.60–0.64), HW 0.63 (0.58–0.62), ML 0.52 (0.47–0.51), MSL 0.14 (0.10–0.13), MSLca 0.10 (0.06–0.10), OI 20 (21–22), PL 0.42 (0.39–0.45), PPL 0.20 (0.20–0.21), PPW 0.26 (0.25–0.26), SL 0.77 (0.71–0.79), TL 3.75 (3.50–3.83), WL 0.97 (0.93–1.00), CI 78 (76–78), MI 65 (63–64), MSI 17 (13–16), MSLI 71 (60–75), PPI 126 (123–124), RFLDI 19 (17–20), RFLDII 24 (22–25), SI 123 (123–126) (n=3).

Diagnosis. Eyes large, rounded; median sized unpaired median clypeal seta; reduced frontal lobes; bases of frontal lobes complete, cup-like; frontal carinae present; lacking erect simple hairs; pilosity on body spoon-shaped; ventral process of petiole present, convex.

Description. Worker. *Head*: in full-face view, longer than wide (HL 0.74–0.82, HW 0.58–0.64, CI 76–79). In full-face view, cephalic corners convex, slightly angled posteriorly; posterior cephalic margin emarginate medially; vertexal portion of head with small tubercles. Occiput drawn laterally into a bidentate collar. In full-face view, sides of the head somewhat straight. Eyes large (EL 0.13, OI 20–22), convex, with 8–9 ommatidia in longest row, 33–41 ommatidia in total; situated in the upper half of head. In full-face view, frontal lobes reduced, weakly convex (almost parallel) laterally, failing to cover antennal insertions. Frontal carinae present surpassing level of eyes merging with rugose sculpture on frons. Dorsum of head weakly rugulose almost smooth; vertex smooth. Mandibles triangular (ML 0.47–0.52, MI 63–65); inner margin with 6–8 teeth; outer margin weakly sinuous; dorsum of mandibles finely reticulate, with several short simple appressed hairs. In full-face view, anterior margin of clypeal apron convex, dorsally with weakly impressed rugae; unpaired median seta median in size (MSL 0.10–0.14, MSI 13–17), originating at mid portion of clypeal apron; posterior margin of body of clypeus, close to antennal insertions, produced into a pair of carinate teeth. Antennal scape long (SL 0.71–0.79, SI 123–126), finely reticulate; antennal scapes scarcely covered with narrow decumbent

spoon-shaped hairs; base of antennal scape cup-like, no bilobed. Hypostomal teeth short, triangular.

Mesosoma: anterior pronotal tubercles small, triangular; dorsum of pronotum smooth; humeral tubercles small, traingular; propleuron with small tubercle; in dorsal view, lateral pronotal tumosities present, with irregular carinae; in profile, lateral pronotal tubercles with massive base, carinate, and spiculate; covered with abundant squamate hairs; in dorsal view, inferior portion of pronotum pimple-like. In dorsal view, lateral mesonotals as small carina; in profile, anterior mesonotals larger than lateral mesonotals, triangular; in dorsal view, lateral and anterior mesonotal tubercles jointed together by thin lateral carina forming quadrate, smooth, area; mesonotal groove smooth; area between mesonotal and metanotal grooves appearing as a pair of small; mesonotal spiracles tuberculate. Metanotal groove deep, slightly deeper than mesonotal groove, smooth. Anterior propodeal tubercles present, small; small tooth present on anterior inferior portion of propodeum; propodeal spines present, carina-like. In lateral view, basal face of propodeum straight, larger than declivous face of propodeum; lateral thin carinae on base of propodeum with median small tooth; declivity of propodeum convex, with lateral carinae; basal face and declivity of propodeum, smooth; area between mid and hind coxae with small tubercle.

Metasoma: petiole pedunculate with tooth-like blunt ventral process, with thin, parallel, carinae extending from this point to posterior portion of petiole; in lateral view, anterior margin of petiolar node evenly rounded with squamate hairs; in dorsal

view, disc of petiole longer than wide, almost smooth; in lateral view, posterior margin of petiolar node with low raised carina that forms two low tubercles, each with squamate hair. Postpetiole, in lateral view, dorsally convex; disc of postpetiole, weakly rugulose, covered with spoon-shaped hairs; wider than long (PPL 0.20–0.21, PPW 0.25–0.26, PPI 123–126); in dorsal view, trapezoidal, lacking lateral posterior projections; posterior margin of postpetiole, in dorsal view, medially emarginate; sides of postpetiole straight. Base of gaster with thin short lateral carinae; dorsum of gastral tergite I finely reticulate, lateral margins smooth and shinny; gastral tergite with squamate hairs. Tarsal segments with subdecumbent hairs; outer margin of basitarsus smooth and shinny, with a distal pair of suberect hairs.

Individuals yellowish-brown. Head, mesosoma, and metasoma covered with spoon-shaped hairs; pilosity on antennal scape with scarce short spoon-shaped hairs.

Other material examined. Measurements. WORKER. EL 0.13, FLD 0.15, GL 0.86, HFL 0.82, HL 0.81, HTL 0.60, HW 0.64, ML 0.50, MSL 0.12, MSLca 0.08, OI 21, PL 0.42, PPL 0.21, PPW 0.27, SL 0.79, TL 3.84, WL 1.02, CI 79, MI 62, MSI 15, MSLI 67, PPI 126, RFLDI 19, RFLDII 24, SI 122 (n=1).

Queen. Dealate. As the worker with modifications expected for the caste and with the following differences:

Mesosoma. Dorsum of pronotum rugulose; anterior propnotal tubercles vestigial; parapsidal lines long, reaching anterior margin of scutum. Katepisternum rugulose; dorsum of scutum rugose; scutellum bidentate posteriorly; propodeal spines short, traingular; base of propodeum as long as declivous of propodeum; base and declivous face of propodeum with lateral thin carinae.

Metasoma. In lateral view, anterior ventral process of petiole tooth-like, extending posteriorly as a carinae. In lateral view, dorsum of postpetiole convex; in dorsal view, disc of postpetiole convex laterally, rugose. Anterior corner of gaster flattened; base of gaster costulate, rest of gastral tergite reticulate.

Measurements. QUEEN. EL 0.17, FLD 0.17, GL 1.18, HFL 1.00, HL 0.95, HTL 0.73, HW 0.75, ML 0.58, MSL 0.15, MSLca 0.10, OI 23, PL 0.63, PPL 0.29, PPW 0.47, SL 0.89, TL 4.90, WL 1.28, CI 80, MI 61, MSI 15, MSLI 68, PPI 163, RFLDI 18, RFLDII 23, SI 119 (n=1).

Male. Unknown.

Comments. This species resembles *M. JSC–047, M. JSC–049,* and *M. JSC–050* in general habitus, including somewhat in the shape of the frontal lobes; however, this species can be easily separated from the others by the lack of erect simple hairs. *Myrmicocrypta JSC–042* differs from any other species of *Myrmicocrypta* by the base

of the antennal scapes cup-like to weakly bilobate, whereas the base of antennal scape in *Myrmicocrypta* is bilobate.

Material examined. BRAZIL: ***DF;*** Tabatinga; Fazenda Cooperbrás; 2003–2004; (*FGV Schmidt*) [1w, CEPEC].

Myrmicocrypta JSC–046 **sp. nov.**

(Figure 2.83–2.84)

HOLOTYPE: 1w, BRAZIL: Tocantins; São Felix do Tocantins; 357m; 10.16241º S 46.68114º W; 28.x.2008; (*J Sosa-Calvo*); nest series; Jalapão; JSC081028–14 [MZSP, USNMENTNo. 00758331].

PARATYPES. 3w, 1dq, same as data as holotype [3w, 1dq, USNM, USNMENTNo. 00758328–30].

Measurements. WORKER. EL 0.13 (0.13–0.14), FLD 0.20 (0.20), GL 1.00 (0.83–1.02), HFL 0.93 (0.89–0.91), HL 0.81 (0.79–0.81), HTL 0.69 (0.68–0.69), HW 0.61 (0.60–0.63), ML 0.46 (0.49–0.50), MSL 0.15 (0.13–0.17), MSLca 0.12 (0.09–0.11), OI 22 (21–23), PL 0.48 (0.38–0.45), PPL 0.21 (0.20–0.21), PPW 0.25 (0.24–0.26), SL 0.83 (0.79–0.81), TL 4.03 (3.80–4.01), WL 1.08 (1.04–1.05), CI 75 (76–77), MI 57 (60–63), MSI 19 (16–21), MSLI 76 (68–74), PPI 119 (119–122), RFLDI 24 (25–26), RFLDII 32 (33), SI 135 (130–131) (n=4).

Diagnosis. Eyes large, rounded; long unpaired median clypeal seta; frontal lobes convex, expanded laterally; suberect simple hairs on dorsum of head; hypostomal teeth short; ventral process of petiole present, tooth-like.

Description. Worker. *Head*: in full-face view, longer than wide (HL 0.79–0.81, HW 0.60–0.63, CI 75–77). In full-face view, cephalic corners convex, slightly angled posteriorly; posterior cephalic margin emarginate medially; vertexal portion of head with small tubercles; a simple suberect hair originating from each tubercle. Occiput drawn laterally into bidentate collar. In full-face view, sides of the head somewhat straight. Eyes large (EL 0.13–0.14, OI 21–23), convex, with 8–9 ommatidia in longest row, 39–45 ommatidia in total; situated in the upper half of head. In full-face view, frontal lobes convex, expanded laterally (FLD 0.20), failing to cover antennal insertions. Frontal carinae present surpassing level of eyes merging with rugose sculpture on frons. Dorsum of head rugose; vertex smooth. Mandibles triangular (ML 0.46–0.50, MI 57–63); inner margin with 7–8 teeth; outer margin convex; dorsum of mandibles finely reticulate, with several short simple appressed hairs. In full-face view, anterior margin of clypeal apron convex, dorsally with weakly impressed rugae; unpaired median seta long in size (MSL 0.13–0.17, MSI 16–21), originating at mid portion of clypeal apron; posterior margin of body of clypeus, close to antennal insertions, produced into a pair of carinate teeth. Antennal scape long (SL 0.79–0.83, SI 130–135), finely reticulate; antennal scapes scarcely covered with very narrow decumbent spoon-shaped hairs; base of antennal scape bilobed. Hypostomal teeth short, blunt at tip.

Mesosoma: anterior pronotal tubercles small, traingular; dorsum of pronotum smooth; humeral tubercles small, triangular; propleuron with small blunt tubercle; in dorsal view, lateral pronotal tumosities present, pimple-like, with irregular carinae; in profile, lateral pronotal tubercles with massive base, carinate, and spiculate; covered with abundant squamate hairs; in dorsal view, inferior portion of pronotum pimple-like. In dorsal view, lateral mesonotals as small carina; in profile, anterior mesonotals as long as lateral mesonotals; mesonotal groove smooth; area between mesonotal and metanotal grooves appearing as a pair of small tumosities; mesonotal spiracles as small tubercle. Metanotal groove deep, slightly deeper than mesonotal groove, smooth. Anterior propodeal tubercles present, small; propodeal spines present, small, carina-like. In lateral view, basal face of propodeum straight, as long as declivous face of propodeum; declivity of propodeum straight, with thin, almost inconspicuous, lateral carinae; basal face and declivity of propodeum, smooth; area between mid and hind coxae with small tubercle.

Metasoma: petiole pedunculate with tooth-like ventral process, with thin, parallel, carinae extending from this point to posterior portion of petiole; in lateral view, ventral margin of petiole concave; anterior margin of petiolar node evenly rounded with squamate hairs; in dorsal view, disc of petiole longer than wide, smooth. Postpetiole, in lateral view, dorsally convex; disc of postpetiole, smooth; wider than long (PPL 0.20–0.21, PPW 0.24–0.26, PPI 119–122); in dorsal view, trapezoidal, lacking lateral posterior projections; posterior margin of postpetiole, in dorsal view,

medially emarginate; sides of postpetiole straight. Base of gaster with thin short lateral carinae; dorsum of gastral tergite I finely reticulate; gastral tergite with squamate hairs. Tarsal segments with appressed simple hairs.

Individuals reddish-brown. Head, mesosoma, and metasoma covered with spoon-shaped hairs; pilosity on antennal scape with scarce, consisting of short narrowly flattened hairs. Dorsum of head with erect to suberect simple hairs that contrast with the spoon-shaped ground pilosity.

Queen. Dealate. Resembling the worker with modifications expected for the caste and with the following differences:

Dorsum and sides of pronotum rugose; katepisternum and anepisternum rugose; parapsidal lines raised; median portion of mesoscutum rugose; posterior margin of scutellum bidentate; dorsum of scutellum rugose; dorsum of postpetiole rugose; base of gaster costulate, rest of gastral tergite I finely reticulate.

Measurements. QUEEN. EL 0.18, FLD 0.25, GL 1.25, HFL 1.00, HL 0.93, HTL 0.75, HW 0.75, ML 0.52, MSL 0.12, MSLca 0.06, OI 24, PL 0.59, PPL 0.26, PPW 0.41, SL 0.93, TL 4.86, WL 1.32, CI 81, MI 56, MSI 13, MSLI 50, PPI 163, RFLDI 27, RFLDII 34, SI 124 (n=1).

Male. Unknown.

Comments. The single nest chamber of this species was found underground ~20cm from the surface. The chamber was large and subspherical (H= 8.5cm, W= 10cm). The ceiling consisted of a great number of rootlets from which the fungal garden was suspended and somewhat contained by the rootlets.

Material examined. Known only from the type locality.

Myrmicocrypta JSC–047 **sp. nov.**

(Figure 2.85–2.86)

HOLOTYPE: 1w, BRAZIL: DF; Brasilia; Fazenda Experimental Agua Limpa; 1109m; 15.95257º S 47.90118º W; 23.ii.2009; (*J Sosa-Calvo*); nest series; Cerrado *sensu stricto*; JSC090223–24 [MZSP, USNMENTNo. 00758346].

PARATYPES. 4w, same data as holotype [1w, MZSP, USNMENTNo. 00758344; 3w, 1dq, USNM, USNMENTNo. 00758335, 00758343, 00758345].

Measurements. WORKER. EL 0.14 (0.13), FLD 0.15 (0.14–0.15), GL 0.90 (0.89–0.98), HFL 0.96 (0.91–0.95), HL 0.83 (0.83–0.84), HTL 0.71 (0.68–0.72), HW 0.64 (0.63–0.66), ML 0.50 (0.50–0.53), MSL 0.15 (0.16–0.17), MSLca 0.10 (0.11–0.12), OI 22 (20), PL 0.44 (0.39–0.46), PPL 0.25 (0.23–0.25), PPW 0.27 (0.28), SL 0.84 (0.82–0.86), TL 3.98 (3.93–4.04), WL 1.06 (1.04–1.09), CI 77 (76–80), MI 61 (60–

63), MSI 18 (19–20), MSLI 68 (71–72), PPI 107 (111–121), RFLDI 18 (17–18), RFLDII 24 (22–24), SI 131 (129–131) (n=5).

Diagnosis. Eyes large, rounded; median sized unpaired median clypeal seta; reduced frontal lobes, weakly expanded very closed anteriorly; dorsum of frontal lobes with few erect short simple hairs; bases of antennal scapes weakly bi-lobated; frontal carinae present; dorsum of head with a pair of erect very narrow hairs; pilosity on body spoon-shaped; ventral process of petiole present.

Description. Worker. *Head*: in full-face view, longer than wide (HL 0.83–0.84, HW 0.63–0.66, CI 76–80). In full-face view, cephalic corners convex, slightly angled posteriorly; posterior cephalic margin emarginate medially; vertexal portion of head with small tubercles. Occiput drawn laterally into a bidentate collar, upper tubercle longer. In full-face view, sides of the head somewhat straight. Eyes large (EL 0.13–0.14, OI 20–22), convex, with 8–9 ommatidia in longest row, 38–44 ommatidia in total; situated in the upper half of head. In full-face view, frontal lobes reduced, weakly convex (almost parallel) laterally, failing to cover antennal insertions, converging anteriorly. Frontal carinae present surpassing level of eyes merging with rugose sculpture on frons. Dorsum of head rugose; vertex weakly rugose. Mandibles triangular (ML 0.50–0.53, MI 60–63); inner margin with 8–9 teeth; outer margin convex; dorsum of mandibles finely reticulate, with several short simple appressed hairs. In full-face view, anterior margin of clypeal apron convex, dorsally with weakly impressed rugae; unpaired median seta median in size (MSL 0.15–0.17, MSI

18–20), originating at mid portion of clypeal apron; posterior margin of body of clypeus, close to antennal insertions, produced into a pair of carinate teeth; in oblique view, clypeus trapezoidal, rugose; lateral portion of body of clypeus carinate. Antennal scape long (SL 0.82–0.86, SI 129–131), finely reticulate; antennal scapes scarcely covered with narrow decumbent spoon-shaped hairs; base of antennal scape weakly bilobed. Hypostomal teeth small, rounded at tip.

Mesosoma: anterior pronotal tubercles tooth-like, traingular; dorsum of pronotum smooth; humeral tubercles small, traingular; propleuron with small triangular tubercle; in dorsal view, lateral pronotal tumosities present, with irregular carinae; in profile, lateral pronotal tubercles with massive base, carinate, and pimple-like; covered with abundant squamate hairs; in dorsal view, inferior portion of pronotum pimple-like. In lateral view, lateral mesonotals tooth-like, triangular; in dorsal view, lateral mesonotals as carina; in profile, anterior mesonotals slightly larger than lateral mesonotals, triangular; in dorsal view, lateral and anterior mesonotal tubercles jointed together by thin lateral carina forming quadrate, smooth, area; mesonotal groove smooth; area between mesonotal and metanotal grooves appearing as a pair of small tubercles; mesonotal spiracles tuberculate. Metanotal groove shallow. Anterior propodeal tubercles present, small; propodeal spines present. In lateral view, basal face of propodeum straight, larger than declivous face of propodeum; lateral thin carinae on base of propodeum with median small tooth; declivity of propodeum with lateral carinae; basal face and declivity of propodeum, smooth; area between mid and hind coxae with small tubercle.

Metasoma: petiole pedunculate with tooth-like blunt ventral process, with thin, parallel, carinae extending from this point to posterior portion of petiole; in lateral view, ventral margin of petiole sinuous; in lateral view, anterior margin of petiolar node evenly rounded with squamate hairs; in dorsal view, disc of petiole longer than wide, margin demarcated with carinae. Postpetiole, in lateral view, dorsally convex; disc of postpetiole, weakly rugulose, covered with spoon-shaped hairs; wider than long (PPL 0.23–0.25, PPW 0.27–0.28, PPI 114–120); in dorsal view, trapezoidal, lacking lateral posterior projections; posterior margin of postpetiole, in dorsal view, medially emarginate; sides of postpetiole straight. Base of gaster with thin short lateral carinae; dorsum of gastral tergite I finely reticulate; gastral tergite with squamate hairs. Outer margin of tarsal segments with appressed hairs; outer margin of basitarsus reticulate and shinny, lacking a distal pair of suberect hairs.

Individuals yellowish-brown. Head, mesosoma, and metasoma covered with spoon-shaped hairs; pilosity on antennal scape with scarce short narrow spoon-shaped hairs.

Queen. Dealate. Resembling the worker with modifications expected for the caste and with the following differences:

Mesosoma. Dorsum of pronotum rugulose; anterior propnotal tubercles small; parapsidal lines long; katepisternum rugulose; dorsum of scutum rugose; scutellum bidentate posteriorly; propodeal spines short, triangular; base of propodeum as long

as declivous of propodeum; base and declivous face of propodeum with lateral thin carinae.

Metasoma. In lateral view, anterior ventral process of petiole long tooth-like, extending posteriorly as carinae. In lateral view, dorsum of postpetiole convex; in dorsal view, disc of postpetiole convex laterally, rugose (PPL 0.32, PPW 0.48, PPI 150). Anterior corner of gaster flattened; base of gaster costulate, rest of gastral tergite reticulate.

Measurements. QUEEN. EL 0.17, FLD 0.19, GL 1.28, HFL 1.02, HL 0.96, HTL 0.75, HW 0.79, ML 0.75, MSL 0.16, MSLca 0.11, OI 21, PL 0.59, PPL 0.32, PPW 0.48, SL 0.89, TL 5.23, WL 1.34, CI 82, MI 78, MSI 17, MSLI 71, PPI 151, RFLDI 20, RFLDII 24, SI 113 (n=1).

Male. Unknown.

Comments. This species is very similar to *Myrmicocrypta JSC–042*, but differs from it by the erect, very narrow hairs on the dorsum of the head; the frontal lobes closely approximated anteriorly; and the base of the antennal scapes slightly bilobed. This species resembles *Myrmicocrypta JSC–046,* but differs from it mostly in the shape of the frontal lobes and in the less sculptured integument.

Nest series of this species have been collected in Cerrado *sensu stricto* in Brasilia, Brazil. The nest was located underground at the edge of a service road. The nest

entrance consisted on an irregular hole at the base of a small hill. The single chamber was located ~26 cm from the surface. The fungal garden was contained in a large, roughly spherical chamber (H= 7.6cm, W= 7.6cm, D= 7.6cm). Workers were seen foraging mostly at night around 20:00 and 23:15 hours.

Material examined. Known only from the type series.

Myrmicocrypta JSC–048 **sp. nov.**

(Figure 2.87–2.88)

HOLOTYPE: 1w, BRAZIL: Minas Gerais; Uberlândia; Estação Experimental Panga; 810m; 19.17595º S 48.3974833º W; 24.ix.2008; (*J Sosa-Calvo*); Cerrado *sensu stricto*; nest series; JSC080924–01 [MZSP, USNMENTNo. 00758611].

PARATYPE. 9w, 1dq, same locality and data as holotype. [8w, USNM, USNMENTNo. 00758609–10, 00758612–617; 1w, MZSP, USNMENTNo. 00758539; 1dq, MZSP, USNMENTNo. 00758540].

Measurements. WORKER. EL 0.12 (0.11–0.12), FLD 0.15 (0.13–0.15), GL 0.89 (0.75–0.88), HFL 0.89 (0.75–0.89), HL 0.81 (0.70–0.79), HTL 0.65 (0.54–0.65), HW 0.64 (0.56–0.64), ML 0.51 (0.44–0.50), MSL 0.14 (0.10–0.15), MSLca 0.11 (0.08–0.11), OI 18 (18–19), PL 0.43 (0.36–0.44), PPL 0.22 (0.19–0.21), PPW 0.27 (0.24–0.27), SL 0.80 (0.71–0.79), TL 3.87 (3.35–3.84), WL 1.00 (0.88–1.02), CI 79 (78–

81), MI 63 (60–64), MSI 17 (13–18), MSLI 81 (68–80), PPI 121 (117–128), RFLDI 18 (17–19), RFLDII 23 (21–24), SI 124 (122–129) (n=10).

Diagnosis. *Worker*: base of antennal scape slightly bilobed to cup-like; frontal lobes slightly convex anteriorly; hypostomal teeth vestigial, almost absent; dorsum of head and frontal lobes with erect simple hairs; propleuron tuberculate; sides of postpetiole with small pimple-like tubercles. *Queen*: hypostomal teeth small, triangular; mesoscutum rugose, lacking longitudinal raised carinae; parapsidal lines slightly raised; pilosity on mesoscutum sub-erect spoon-shaped; disc of postpetiole rugose. *Male*: cephalic corners carinate; pair of acute tubercles behind lateral ocelli; hypostomal teeth present; anterior portion of mesoscutum tuberculate; latero-posterior margin of mesoscutum with triangular tubercles extending laterally; node of petiole rounded; ventral process of petiole present, tooth-like.

Description. Worker. *Head*: in full-face view, longer than wide (HL 0.70–0.84, HW 0.56–0.68, CI 76–82). In full-face view, cephalic corners convex anteriorly, angulate posteriorly; posterior cephalic strainght, slightly interrupted by very small pimple-like carinae; in lateral view, dorsum of head with at least two pairs of erect hairs, constracting with ground pilosity on cephalic dorsum, vertexal pair longer than anterior pair. Occiput drawn laterally into a bilobed collar, upper tubercle slightly larger than lower tubercle. In full-face view, sides of the head widely convex. Eyes large (EL 0.10–0.14, OI 17–22), convex, with 7–10 ommatidia in longest row, 29–52 ommatidia in total; situated in the upper half of head. In full-face view, frontal lobes

reduced (FLD 0.13–0.17), weakly convex (almost parallel) laterally, failing to cover antennal insertions. Frontal carinae vestigial, at most extanding at eye level. Dorsum of head pimple-like (pustulose); vertex smooth. Mandibles triangular (ML 0.43–0.53, MI 56–64); inner margin with 6–9 teeth; outer margin straight; dorsum of mandibles subtrigulate, with several short simple appressed hairs. In full-face view, anterior margin of clypeal apron convex, dorsally with weakly impressed rugae; unpaired median seta median in size (MSL 0.10–0.15, MSI 12–19); clypeal apron with ~5 simple appressed hairs on each side of unpaired clypeal seta; posterior margin of body of clypeus, close to antennal insertions, produced into a pair of carinate teeth; in oblique view, clypeus trapezoidal, with mid rugae; lateral portion of body of clypeus with very thin carinae. Antennal scape long (SL 0.71–0.80, SI 116–129), finely reticulate; antennal scapes scarsely covered with narrow decumbent spoon-shaped hairs; base of antennal scape cup-like or weakly bilobed; length of 2nd and 3rd funicular segments equal or 3rd funicular segment slightly larger than 2nd. Hypostomal teeth vestigial, very small and rounded at tip.

Mesosoma: anterior pronotal tubercles small, tooth-like; dorsum of pronotum smooth; humeral tubercles larger than anterior pronotal tubercles, triangular; propleuron with large, conspicuous triangular tubercle; in dorsal view, lateral pronotal tubercles present, fromed by small tubercles from where spoon-shaped hairs originate; in profile, lateral pronotal tubercles with massive base, carinate, and pimple-like; in dorso-frontal view, lateral pronotal tubercle carinate pointing upwards; covered with spoon-shaped hairs; in dorsal view, inferior portion of pronotum with small pimple-

like tubercles. In lateral view, lateral mesonotal tubercles long, blunt at tip; in dorso-lateral view, lateral mesonotal tubercles pointing upwards; in profile, anterior mesonotals slightly smaller than lateral mesonotals, triangular; in dorsal view, lateral and anterior mesonotal tubercles either jointed together by thin lateral carina or lacking such carinae, forming quadrate, smooth, area; mesonotal groove smooth; area between mesonotal and metanotal grooves with pair of tubercles of equal size or posterior tubercles slightly larger. Metanotal groove concave. Anterior propodeal tubercles present, small; propodeal spines long, acute. In lateral view, basal face of propodeum flat, as long as- or slightly shorter than- declivity of propodeum; both base and declivous of propodeum with small lateral tumosities; in dorsal view, basal face and declivity of propodeum, smooth; area between mid and hind coxae with small tubercle.

Metasoma: petiole pedunculate with tooth-like ventral process, either lacking or with thin, parallel, carinae extending from this point to posterior portion of petiole; in lateral view, ventral margin of petiole sinuous; in lateral view, anterior margin of petiolar node rounded with small pimple-like tubercles; in dorsal view, disc of petiole longer than wide, margin demarcated with carinae and pimple-like tumosities. Postpetiole, in lateral view, dorsally subquadrate; disc of postpetiole smooth, covered with spoon-shaped hairs; wider than long (PPL 0.16–0.23, PPW 0.24–0.30, PPI 115–171); in dorsal view, slightly longer posteriorly than anteriorly; posterior margin of postpetiole, in dorsal view, medially emarginate; sides of postpetiole straight; postero-lateral margin convex, shallowly emarginate. Base of gaster finely

substrigulate, rest of dorsum of gastral tergite I finely reticulate, latero-posterior portions of gastera tergite I smooth and shiny; gastral tergite with squamate hairs. Outer margin of hind tarsal segments with appressed hairs; outer margin of basitarsus reticulate and shinny, lacking a distal pair of suberect hairs.

Individuals light ferruginous to dark brown, legs yellowish. Head, mesosoma, and metasoma covered with transparent spoon-shaped hairs restricted to tubercles or rugae; pilosity on antennal scape consisting of long narrow spoon-shaped hairs; legs (excluding tarsal segments) with appressed spoon-shaped hairs. Approximately 1/3 of outer margin of tarsomere I reticulate, rest (2/3) of outer margin of tarsomere smooth and shinny.

Other material examined. Measurements. WORKER. EL 0.10–0.14, FLD 0.13–0.17, GL 0.78–0.94, HFL 0.73–0.88, HL 0.75–0.84, HTL 0.56–0.69, HW 0.59–0.68, ML 0.43–0.53, MSL 0.10–0.15, MSLca 0.07–0.11, OI 12–19, PL 0.38–0.47, PPL 0.16–0.23, PPW 0.24–0.31, SL 0.72–0.80, TL 3.48–4.04, WL 0.93–1.08, CI 76–82, MI 56–64, MSI 12–19, MSLI 67–84, PPI 115–148, RFLDI 16–21, RFLDII 21–28, SI 116–126 (n=26).

Queen. Resembling the worker with modifications expected for the caste and with the following differences:

Head: frontal lobes very closed together; antennal scape reticulate and rugulose; hypostomal teeth small, triangular; dorsum of head rugose.

Mesosoma. Dorsum and sides of pronotum rugose; lateral pronotal tubercles large, multituberculate. In lateral view, mesoscutum flattened; dorsum of mesoscutum rugose, lacking longitudinal carinae, covered with suberect narrowly flattened and spoon-shaped hairs; parapsidal lines present, raised; latero-posterior margin of mesoscutum convex. Scutellum wider than long; posterior margin of scutellum bidentate, dorsally with median carinae; dorsum of scutellum rugulose; in lateral view, posterior tubercles of scutellum triangular. Sides of mesosoma rugose. In lateral view, basal portion of propodeum shorter than propodeal declivous; propodeal spines short, triangular; lateral margin of basal and declivity faces of propodeum with thin lateral carinae.

Metasoma. In lateral view, anterior portion of petiole convex, petiolar node subquadrate; in dorsal view, disc of petiole somewhat rounded, with very shallowly impressed rugae. Postpetiole, in dorsal view, wider than long (PPL 0.23–0.31; PPW 0.39–0.49; PPI 142–170), trapezoidal; disc of postpetiole rugose; sides of postpetiole convex; postero-lateral margin obtusely angulate; in dorsal view, posterior margin of petiole medially emarginate; latero-posterior portions of postpetiole weakly carved. Base of gaster striate, rest of gastral tergite I densely and finely reticulate.

Measurements. QUEEN. EL 0.15–0.17, FLD 0.17–0.21, GL 1.12–1.24, HFL 0.88–0.99, HL 0.87–0.94, HTL 0.64–0.68, HW 0.73–0.78, ML 0.53–0.57, MSL 0.15–0.17, MSLca 0.11–0.13, OI 20–23, PL 0.50–0.64, PPL 0.23–0.31, PPW 0.39–0.49, SL 0.82–0.90, TL 4.44–4.89, WL 1.18–1.27, CI 82–85, MI 59–63, MSI 16–19, MSLI 67–76, PPI 142–170, RFLDI 19–23, RFLDII 22–28, SI 110–117 (n=5).

Male. *Head.* Excluding eyes, triangular; ocular carinae extending backwards to cephalic corners; cephalic corners angulate by raised carinae; cephalic margin, behind of each posterior ocellus, with triangular tubercles. In lateral view, vertex shallowly concave; vertex with thin carinae originating at base of cephalic tubercles and extending to occipital carina. Frontal lobes small, parallel, and broadly separated (FLD 0.21). Frontal carinae impressed, extending backwards and meeting with carinae that extends from lateral ocelli and forming a small tubercle at level of mid ocellus. Mandibules triangular with convex outer margin and 6–8 distinct teeth; dorsum of mandibles finely reticulate. Antennal scapes short (SL 0.36–0.38, SI 47–50), narrower toward apex, finely reticulate, and with short simple appressed hairs; second and third funicular segments taken together longer than antennal scapes. Clypeal apron wide, anterior margin convex; unpaired median seta long and thick (MSL 0.10–0.12, MSI 12–14); in lateral view, body of clypeus obtusely angled; in oblique view, anterior face of body of clypeus reticulate; margin of body of clypeus demarcated by thin carina; postero-dorsal margin of body of clypeus with conspicuous groove and longitudinal rugae; hypostomal teeth short, blunt.

Mesosoma. Pronotum with very small anterior tumosities or carinae; humeral tubercles present, triangular, slightly larger than lateral pronotal tubercles; lateral pronotal tubercles angulate; dorsum of pronotum smooth; in lateral view, propleuron with small tubercle or angulate. In lateral view, anterior portion of mesoscutum raised as pair of tubercles; in dorsal view, antero-lateral margins of mesoscutum concave; lateral margin of mesoscutum sinuous; postero-lateral margin of mesoscutum tuberculate, directed laterally; in dorsal view, dorsum of mesoscutum with parallel pair of raised carinae that extend entire length of mesoscutum; parapsidal lines present, extending to anterior margin; dorsum of mesoscutum weakly rugulose; scutellum wider than long; in dorsal view, axillae triangular, in lateral view, axillae tuberculate pointing backwards; posterior margin of scutellum, bidentate; in lateral view, posterior tubercles of scutellum thick and rounded at tip; dorsum of scutellum with median longitudinal carina and lateral rugae; propodeal spines long, thick at base, slender and rounded at tip, diverging posteriorly. Declivity of propodeum as long as base of propodeum, both with thin lateral carinae.

Metasoma. Petiole pedunculate, with anterior tooth-like ventral process; in lateral view, node of petiole rounded anteriorly; in dorsal view, node of petiole cylindrical, weakly rugose. In lateral view, dorsum of postpetiole, convex; postpetiole broader than long (PPL 0.25–0.28, PPW 0.38–0.42, PPI 145–151); disc of postpetiole trapezoidal; posterior margin of petiole, in dorsal view, lacking median emargination; disc of postpetiole reticulate. Gaster, in lateral view, convex dorsally; gastral tergite I finely reticulate and lustrous. Legs long and slender.

Body opaque and somewhat rugose on head and thorax; mandibles, antennal scapes, and gastral tergite I reticulate. Pilosity confined to sparse, hairs that are narrowly flattened medially and thin and simple towards the apex, which are recurved on sculpturing, and simple short fine appressed pubescence on appendages.
Body color black to reddish, appendages slightly paler. Wings yellowish.

Measurements. MALE. EL 0.34–0.36, FLD 0.21, GL 1.30–1.44, HFL 1.21–1.26, HL 0.82–0.87, HTL 1.07–1.18, HW 0.74–0.79, ML 0.44–0.48, MSL 0.10–0.12, MSLca 0.07–0.09, OI 46–48, PL 0.60–0.72, PPL 0.25–0.28, PPW 0.38–0.42, SL 0.36–0.38, TL 4.90–5.15, WL 1.46–1.52, CI 89–93, MI 52–57, MSI 12–14, MSLI 65–73, PPI 145–151, RFLDI 25–26, RFLDII 27–29, SI 47–50 (n=3).

Comments. This species shares with *Myrmicocrypta JSC–047* the presence of a cup-like or weakly bilobed base of the antennal scape, the third segment of the antennal funiculus slightly longer than the second segment, and the hairs on hind tarsomere I narrowly flattened and subdecumbent. This species differs from *M. JSC–047* in the smaller tubercles on the occipital collar, the smaller ventral process of the petiole, and the larger propodeal spines.

This species differs from *M. JSC–046, JSC–049,* and *JSC–050* by the bases of the antennal scapes cup-like to slightly bilobed rather than bilobed, and by the third segment of the antennal funiculus slightly longer than the second segment rather than the second and third segments of the same size (*JSC–049, JSC–050*). However, *M.*

JSC–046 shares this condition with *JSC-048* but differs from that species in the frontal lobes convex rather than straight.

Specimens from Agua Limpa, Brasilia, differ slightly from the typical form by having slightly larger propodeal spines and larger ventral process of petiole. The specimens from Tabatinga have the upper tubercle of the occipital collar acute, the tubercle of the posterior cephalic corner slightly larger, and the mesosomal tubercles more carinate. The specimens from Paraguay resemble those of the type series; however, the frontal lobes are more closely approximated anteriorly and the hypostomal teeth are very small and vestigial.

Nests of this species are found underground in Cerrado habitat. The nest consists of a single rounded chamber ~ 30cm from the surface.

Material examined. BOLIVIA: *Santa Cruz*; Las Gamas; PN Noel Kempff Mercado; 700m; 14.8º S 60.3833333º W; 2.xii.1993; (*PS Ward*); PSW12250–16 [3w, UCDC]. 10Km NW Terevinto; 380m; 17.6666667º S 63.45º W; 10.xii.1993; (*PS Ward*); PSW12328–6 [3w, UCDC]. **BRAZIL: *Bahia***; Itatim; [241m; 12.711944º S 39.697778º W]; 21.iv.1996; (*GM Santos*) [1dq, CEPEC]. Maracás, Fazenda Maria Inacia-Mata Cipo; [1004m; 13.4333333º S 40.45º W]; 24–29.xi.1990; (*Brandão, Diniz, & Oliveira*) [1w, MZSP]. ***DF*;** Brasilia; Fazenda Experimental Agua Limpa; 1099m; 15.95242º S 47.90129º W; 17.iv.2010. (*J Sosa-Calvo*); Cerrado *sensu stricto*; nest series; JSC100417–01 [2w, 1dq, USNM]. Same as previous entry, but Cerrado *sensu stricto*; nest series JSC100417–04 [1w, USNM]. Same as previous entry, but 1161m; 15.96622º S 47.88811º W; 24.x.2011; (*TR Schultz & J Sosa-Calvo*); Cerrado

sensu stricto; nest series; TRS111024–01 [4w, 1m, USNM]. Estação RECOR do IBGE, 30Km S of Brasilia; [1102m]; 15.94422º S 47.87611º W; 21.vii.2007; (*C Rabeling*); Cerrado *sensu stricto*; nest series; CR070721–06 [1w, USNM]. Same as previous entry, but 18.vii.2007; (*C Rabeling*); nest series; CR070718–03 [1w, USNM]. Tabatinga; Fazenda Cooperbrás; [861m; 15.707331º S 47.556867º W]; 2003–2004; (*FGV Schmidt*) [2w, CEPEC]. ***Goias*;** Anapolis; [916m; 16.3333333º S 48.9666667º W]; 17.i.1969; (*W Kempf*) [3w, MZSP]. Niquelandia; [652m; 14.45º S 48.45º W]; 18–30.v.1996; (*Silvestre, Silva & Brandão*) [3w, MZSP]. São Jorge; 999m; 14.17597º S 47.81552º W; 2008; (*UG Mueller*). ***Mato Grosso do Sul*;** Jardim; [258m; 21.4666667º S 56.15º W]; i.1962; (*R Mueller*) [1w, MZSP]. ***Minas Gerais*;** Uberlandia; Estação Experimental Panga; 795m; 19.17529º S 48.39719º W; 21.ix.2008; (*J Sosa-Calvo*); Cerrado *sensu stricto*; nest series; JSC080921–02 [1w, 1dq, USNM]. Same as previous entry, but stray; JSC080921–25 [1w, USNM]. Same as previous entry, but 810m; 19.17595º S 48.3974833º W; 24.ix.2008; (*J Sosa-Calvo*); Cerrado *sensu stricto*; nest series; JSC080924–05 [1w, 1dq, USNM]. Same as previous entry, but Cerrado *sensu stricto*; nest series; JSC080924–02 [1w, USNM]. Same as previous entry, but 19.1672222º S 48.3936111º W; 1.x.2002; (*CT Lopes*) [1w, CEPEC]. ***Pernambuco*;** Tapera; [418m; 8.4º S 38.0833333º W]; (*B Pickel*) [5w, 2m, MZSP]. ***Piauí*;** Canto do Buriti; [251m; 8.1166667º S 42.9666667º W]; 18–22.xi.1991; (*CRF Brandão*) [3w, MZSP]. ***São Paulo*;** Agudos; [608m; 22.4666667º S 49º W]; 13.xii.1955; (*W Kempf*) [3w, MZSP; 3w, USNM]. Boa Esperança do Sul, Fazenda Itaquerê; [524m; 21.9833333º S 48.3833333º W]; 25.i.1964; (*K Lenko*) [4w, MZSP]. Botucatú; [636m; 22.8666667º S 48.4333333º W]; 14.vii.2001; (*AA*

Moreira) [3w, 3aq, CEPEC]. Mirassol; [459m; 20.7666667º S 49.4666667º W]; 15.iv.1976; (*Diniz*) [5w, MZSP]. Rio Claro; [608m; 22.4º S 47.55º W]; 16.viii.2001; (*AA Moreira*) [3w, 2m, CEPEC]. ***Tocantins*;** Palmeirante; [178m]; 7.8736944º S 47.9520556º W; 10–15.xii.2001; (*Alburquerque* & *Silva*); winkler sample; Cerradão [1w, MZSP]. **PARAGUAY: *Amambay*;** Parque Nacional Cerro Corá; [288m]; 22.65º S 56.0166667º W; 13.v.1997; (*A Wild*); AW0564 [2w, UCDC].

Myrmicocrypta JSC–049 **sp. nov.**

(Figure 2.89)

HOLOTYPE: 1w, BRAZIL: Pará; Alter do Chao; [25m]; 02.48382º S 54.95919º W; 13.viii.2006; (*C Rabeling*); nest series; CR060813–02 [MZSP, USNMENTNo. 00758596].

PARATYPES. 2w, same locality and data as holotype [USNM, USNMENTNo. 00758358, 00758595]. **1w,** same locality as holotype, but CR060813–03 [USNM, USNMENTNo. 00758359]. **2w,** same locality as holotype, but CR060813–11 [USNMENTNo. 00758360, 00758594].

Measurements. WORKER. EL 0.13 (0.11–0.13), FLD 0.16 (0.14–0.16), GL 0.88 (0.84–0.88), HFL 0.83 (0.81–0.87), HL 0.80 (0.78–0.79), HTL 0.62 (0.62–0.65), HW 0.60 (0.58–0.60), ML 0.49 (0.47–0.49), MSL 0.13 (0.11–0.15), MSLca 0.09 (0.07–0.11), OI 22 (19–23), PL 0.42 (0.39–0.43), PPL 0.20 (0.20), PPW 0.28 (0.24–0.27), SL 0.81 (0.79–0.81), TL 3.74 (3.63–3.74), WL 0.96 (0.96–0.98), CI 74 (74–77), MI 61 (60–62), MSI 16 (14–18), MSLI 74 (65–73), PPI 140 (128–133), RFLDI 20 (18–20), RFLDII 27 (24–27), SI 137 (133–138) (n=6).

Diagnosis. Frontal lobes almost parallel, slightly convex; base of antennal scapes bilobed; in full-face view, cephalic corners slightly angulate; hypostomal teeth small; occipital collar with sharp upper tubercle, lower tubercle small, angulate; 2nd funicular segment of antennae as long as 3rd funicular segment; ventral process of petiole present, small.

Description. Worker. *Head*: in full-face view, longer than wide (HL 0.78–0.80, HW 0.58–0.60, CI 74–77). In full-face view, cephalic corners convex anteriorly, angulate posteriorly; posterior cephalic margin emarginate medially; vertexal portion of head with small tubercles. Occiput drawn laterally into a bidentate collar, upper tubercle small, triangular. In full-face view, sides of the head somewhat convex. Eyes large (EL 0.11–0.13, OI 19–23), convex, with 8–9 ommatidia in longest row, 35–49 ommatidia in total; situated in the upper half of head. In full-face view, frontal lobes reduced, weakly convex (almost parallel) laterally, failing to cover antennal insertions. Frontal carinae present surpassing level of eyes merging with rugose

sculpture on frons. Dorsum of head rugose; vertex smooth. Mandibles triangular (ML 0.47–0.49, MI 60–62); inner margin with 7–9 teeth; outer margin weakly sinuous; dorsum of mandibles finely reticulate-costate, with several short simple appressed hairs. In full-face view, anterior margin of clypeal apron convex, dorsally with weakly impressed rugae; unpaired median seta median in size (MSL 0.11–0.15, MSI 14–18), originating at mid portion of clypeal apron; posterior margin of body of clypeus, close to antennal insertions, produced into a pair of carinate teeth; in oblique view, clypeus trapezoidal, with mid rugae; lateral portion of body of clypeus with thin carinae. Antennal scape long (SL 0.78–0.81, SI 133–138), finely reticulate; antennal scapes scarcely covered with narrow decumbent spoon-shaped hairs; base of antennal scape bilobed; length of 2nd and 3rd funicular segments equal. Hypostomal teeth small, rounded at tip.

Mesosoma: anterior pronotal tubercles small, carinate, connecting with lateral pronotal tubercles; dorsum of pronotum smooth; humeral tubercles small, triangular; propleuron with small blunt tubercle; in dorsal view, lateral pronotal tumosities present, with irregular carinae; in profile, lateral pronotal tubercles with massive base, carinate, and pimple-like; covered with abundant squamate hairs; in dorsal view, inferior portion of pronotum pimple-like. In lateral view, lateral mesonotals tooth-like, triangular; in dorsal view, lateral mesonotals as carina; in profile, anterior mesonotals slightly larger than lateral mesonotals, triangular; in dorsal view, lateral and anterior mesonotal tubercles jointed together by thin lateral carina forming quadrate, smooth, area; mesonotal groove smooth; area between mesonotal and

metanotal grooves appearing as a pair of small tubercles, posterior tubercles slightly larger. Metanotal groove shallowly concave. Anterior propodeal tubercles present, small; propodeal spines present, triangular. In lateral view, basal face of propodeum slightly concave, shorter than declivity of propodeum; base and declivous of propodeumj with thin lateral carinae; in dorsal view, basal face and declivity of propodeum, smooth; area between mid and hind coxae with small tubercle.

Metasoma: petiole pedunculate with tooth-like blunt ventral process, with thin, parallel, carinae extending from this point to posterior portion of petiole; in lateral view, ventral margin of petiole sinuous; in lateral view, anterior margin of petiolar node evenly rounded with squamate hairs; in dorsal view, disc of petiole longer than wide, margin demarcated with carinae. Postpetiole, in lateral view, dorsally convex; disc of postpetiole, weakly rugulose, covered with spoon-shaped hairs; wider than long (PPL 0.20, PPW 0.24–0.28, PPI 128–140); in dorsal view, trapezoidal, lacking lateral posterior projections; posterior margin of postpetiole, in dorsal view, medially emarginate; sides of postpetiole weakly convex. Base of gaster with thin short lateral carinae; dorsum of gastral tergite I finely reticulate; gastral tergite with squamate hairs. Outer margin of tarsal segments with appressed hairs; outer margin of basitarsus reticulate and shinny, lacking a distal pair of suberect hairs.

Individuals yellowish-brown. Head, mesosoma, and metasoma covered with spoon-shaped hairs; pilosity on antennal scape with scarse short narrow spoon-shaped hairs.

Queen. Unknown.

Male. Unknown.

Comments. The nests of this species were collected in sandy loam soil in patches of dry Amazonian forest and moist tropical lowland Amazonian forest.

Material examined. Known only from the type series.

Myrmicocrypta JSC–050 **sp. nov.**

(Figure 2.90–2.91)

HOLOTYPE: 1w, BRAZIL: Tocantins; São Felix do Tocantins; 357m; 10.16241º S 46.68114º W; 28.x.2008; (*J Sosa-Calvo*); nest series; JSC081028–14 [MZSP, USNMENTNo. 00758365].

PARATYPE. 6w, 1dq, same locality and data as holotype. [5w, USNM, USNMENTNo. 00758361, 00758597–600; 1w, 1dq, MZSP, USNMENTNo. 00758368].

Measurements. WORKER. EL 0.10 (0.09–0.11), FLD 0.13 (0.13–0.15), GL 0.77 (0.74–0.81), HFL 0.75 (0.72–0.78), HL 0.74 (0.71–0.76), HTL 0.55 (0.53–0.60), HW 0.57 (0.56–0.60), ML 0.45 (0.43–0.47), MSL 0.13 (0.12–0.14), MSLca 0.11 (0.10–0.11), OI 17 (16–18), PL 0.41 (0.38–0.41), PPL 0.20 (0.17–0.20), PPW 0.24 (0.22–

0.26), SL 0.73 (0.68–0.77), TL 3.48 (3.29–3.60), WL 0.91 (0.85–0.97), CI 77 (78–81), MI 61 (58–61), MSI 17 (16–19), MSLI 84 (71–89), PPI 122 (122–131), RFLDI 18 (16–20), RFLDII 23 (21–25), SI 127 (121–128) (n=7).

Diagnosis. Relatively smaller specimens (HL 0.71–0.76, HFL 0.71–0.79, HTL 0.53–0.60). Hypostomal teeth vestigial, very small and rounded at tip; 2nd funicular segment of antennae as long as 3rd funicular segment; ventral process of petiole present, small.

Description. Worker. *Head*: in full-face view, longer than wide (HL 0.71–0.76, HW 0.54–0.61, CI 76–81). In full-face view, cephalic corners convex anteriorly, angulate posteriorly; posterior cephalic margin emarginate medially; vertexal portion of head with small raised carinae, almost as tubercles; in lateral view, dorsum of head with at least a pair of erect hairs, constracting with ground pilosity on cephalic dorsum. Occiput drawn laterally into a bilobed collar, both tubercles small, blunt. In full-face view, sides of the head somewhat convex. Eyes large (EL 0.09–0.11, OI 16–19), convex, with 6–8 ommatidia in longest row, 22–39 ommatidia in total; situated in the upper half of head. In full-face view, frontal lobes reduced (FLD 0.13–0.15), weakly convex (almost parallel) laterally, failing to cover antennal insertions. Frontal carinae present surpassing level of eyes merging with rugose sculpture on frons. Dorsum of head rugose; vertex smooth. Mandibles triangular (ML 0.41–0.48, MI 57–63); inner margin with 6–8 teeth; outer margin weakly sinuous; dorsum of mandibles finely reticulate-costate, with several short simple appressed hairs. In full-face view,

anterior margin of clypeal apron convex, dorsally with weakly impressed rugae; unpaired median seta median in size (MSL 0.11–0.14, MSI 15–19), originating at mid portion of clypeal apron; posterior margin of body of clypeus, close to antennal insertions, produced into a pair of carinate teeth; in oblique view, clypeus trapezoidal, with mid rugae; lateral portion of body of clypeus with very thin carinae. Antennal scape long (SL 0.68–0.75, SI 119–130), finely reticulate; antennal scapes scarcely covered with narrow decumbent spoon-shaped hairs; base of antennal scape bilobed; length of 2nd and 3rd funicular segments equal. Hypostomal teeth vestigial, very small and rounded at tip.

Mesosoma: anterior pronotal tubercles tooth-like; dorsum of pronotum smooth; humeral tubercles larger than anterior pronotal tubercles, triangular; propleuron with small blunt tubercle; in dorsal view, lateral pronotal tumosities present, with irregular carinae; in profile, lateral pronotal tubercles with massive base, carinate, and pimple-like; in dorso-frontal view, lateral pronotal tubercle pointing upwards; covered with abundant spoon-shaped hairs; in dorsal view, inferior portion of pronotum with small pimple-like tubercles. In lateral view, lateral mesonotals tooth-like, triangular; in dorsal view, lateral mesonotals as carina; in profile, anterior mesonotals slightly larger than lateral mesonotals, triangular; in dorsal view, lateral and anterior mesonotal tubercles either jointed together by thin lateral carina or lacking lateral carinae, forming quadrate, smooth, area; mesonotal groove smooth; area between mesonotal and metanotal grooves appearing as a pair of very small tubercles, posterior tubercles slightly larger. Metanotal groove shallowly concave. Anterior

propodeal tubercles present, small or angulate; propodeal spines present, triangular. In lateral view, basal face of propodeum flat, as long as declivity of propodeum; at most, base of propodeum with thin lateral carinae; in dorsal view, basal face and declivity of propodeum, smooth; area between mid and hind coxae with small tubercle.

Metasoma: petiole pedunculate with tooth-like blunt ventral process, with thin, parallel, carinae extending from this point to posterior portion of petiole; in lateral view, ventral margin of petiole concave medially; in lateral view, anterior margin of petiolar node in obtuse angle with squamate hairs; in dorsal view, disc of petiole longer than wide, margin demarcated with carinae. Postpetiole, in lateral view, dorsally convex; disc of postpetiole, weakly rugulose, covered with spoon-shaped hairs; wider than long (PPL 0.17–0.21, PPW 0.22–0.28, PPI 113–135); in dorsal view, trapezoidal, lacking lateral posterior projections; posterior margin of postpetiole, in dorsal view, medially emarginate; sides of postpetiole weakly convex. Dorsum of gastral tergite I finely reticulate; gastral tergite with squamate hairs. Outer margin of tarsal segments with appressed hairs; outer margin of basitarsus reticulate and shinny, lacking a distal pair of suberect hairs.

Individuals light ferruginous, legs yellowish. Head, mesosoma, and metasoma covered with transparent spoon-shaped hairs; pilosity on antennal scape and legs (excluding tarsal segments) consisting of long narrow spoon-shaped hairs.

Approximately 1/3 of outer margin of tarsomere I reticulate, rest (2/3) of outer margin of tarsomere smooth and shinny.

Other material examined. Measurements. WORKER. EL 0.09–0.11, FLD 0.13–0.14, GL 0.74–0.93, HFL 0.70–0.79, HL 0.71–0.76, HTL 0.53–0.57, HW 0.54–0.61, ML 0.41–0.48, MSL 0.11–0.14, MSLca 0.09–0.11, OI 16–19, PL 0.35–0.45, PPL 0.18–0.21, PPW 0.22–0.28, SL 0.69–0.75, TL 3.29–3.77, WL 0.86–0.99, CI 76–81, MI 57–63, MSI 15–19, MSLI 68–84, PPI 113–135, RFLDI 17–19, RFLDII 22–24, SI 119–130 (n=14).

Queen. Resembling the worker with modifications expected for the caste and with the following differences:

Mesosoma. Dorsum and sides of pronotum rugose; lateral pronotal tubercles large. In lateral view, mesoscutum flattened; dorsum of mesoscutum with pair of longitudinal raised carinae covered with suberect spoon-shaped hairs; dorsum of mesoscutum rugulose; parapsidal lines present; latero-posterior margin of mesoscutum convex. Scutellum wider than long; posterior margin of scutellum bidentate, dorsally with median carinae; dorsum of scutellum rugulose. Sides of mesosoma rugulose. In lateral view, basal portion of propodeum shorter than propodeal declivous; propodeal spines short, triangular; lateral margin of basal and declivity faces of propodeum with thin lateral carinae.

Metasoma. In lateral view, petiolar node subquadrate; ventral margin of petiole with thin paired carinae; in dorsal view, disc of petiole with very shallowly impressed rugae; postpetiole, in dorsal view, wider than long (PPL 0.25, PPW 0.42, 169), dome-like; disc of postpetiole rugose; sides of postpetiole convex; postero-lateral margin angulate; in dorsal view, posterior margin of petiole medially emarginate; latero-posterior portions of postpetiole carved. Base of gaster striate, rest of gastral tergite I densely and finely reticulate.

Body ferruginous, darker than the worker.

Measurements. QUEEN. EL 0.15, FLD 0.17, GL 1.20, HFL 0.88, HL 0.86, HTL 0.62, HW 0.72, ML 0.53, MSL 0.15, MSLca 0.11, OI 21, PL 0.60, PPL 0.25, PPW 0.42, SL 0.83, TL 4.59, WL 1.15, CI 84, MI 61, MSI 18, MSLI 70, PPI 169, RFLDI 19, RFLDII 23, SI 114 (n=1).

Male: unknown.

Comments. This species is very similar to *M. JSC–049* but differs from that species in its slightly smaller size and in its vestigial hypostomal teeth; in *JSC–049* the hypostomal teeth are small but conspicuous. Variations observed in this species include: the specimens from Pará, Brazil, have larger anterior pronotal tubercles, slightly differing from the specimens from Tocantins, Brazil. In one worker from nest series JSC090127–02 (Pará), there are two median clypeal setae rather than the single

seta on the clypeal apron typical for the genus. Furthermore, in some specimens from Pará, the petiole is subquadrate, rather than slightly convex posteriorly. In other specimens, the anterior margin of the petiole is slightly rounded rather than angulate.

Colonies of this species were encountered mostly in sandy soil in Pará and Tocantins, Brazil. The nest entrances of some nests, especially those from Pará, consist of a small hole in the ground surrounded by a ring of small pieces of soil. The single chamber was located from eight to 40 cm from the surface. The roughly spherical chamber was usually 5–9 cm high, 5–8 cm wide, and 6.35–7 cm deep. The fungal garden was suspended from the ceiling by rootlets. In one colony, JSC090126–18, several workers of *Gnamptogenys sp* were found in the fungal garden, but it was not clear whether or not this species was interacting with the colony of *Myrmicocrypta JSC–050* as a predator. Some species of *Gnamptogenys*, including *G. hartmani* Wheeler, have been observed to attack fungus-growing ants in the genera *Trachymyrmex* and *Sericomyrmex* (Adams et al., 2013; Dijkstra and Boomsma, 2003).

Other material examined. BRAZIL: *Pará*; Alter do Chao; 23m; 2.46457º S 54.92902º W; 26.i.2009; (*J Sosa-Calvo*); nest series; sandy soil; JSC090126–13 [4w, USNM]. Same as previous entry but, 39m; 2.45660º S 54.92332º W; 26.i.2009; (*J Sosa-Calvo*); nest series; sandy soil; JSC090126–17 [1w, USNM]. Same as previous entry but, 46m; 2.46079º S 54.92595º W; 26.i.2009; (*J Sosa-Calvo*); nest series; sandy soil; JSC090126–18 [1w, USNM]. Same as previous entry but, 39m; 2.46075º S 54.92599º W; 27.i.2009; (*J Sosa-Calvo*); nest series; sandy soil; JSC090127–02

[2w, USNM]. Same as previous entry but, JSC090127–07 [4w, USNM]. Same as previous entry but, 38m; 2.46082º S 54.92598º W; 29.i.2009; (*J Sosa-Calvo*); nest series; JSC090129–04 [1w, USNM]. ***Tocantins*;** São Felix do Tocantins; 357m; 10.16237º S 46.68055º W; 28.x.2008; (*J Sosa-Calvo*); nest series; JSC081028–03 [3w, USNM]. Same as previous entry but, 362m; 10.16305º S 46.67900º W; 27.x.2008; (*J Sosa-Calvo*); nest series; sandy soil; JSC081027–21 [5w, USNM].

Myrmicocrypta JSC–051 **sp. nov.**

(Figure 2.92)

HOLOTYPE: 1w, COLOMBIA: Antioquia; Municipio Tamesis; Vda. San Nicolas, Fca. San Nicolas; 1590m; 5.7371944º N 75.7083889º W; 20.viii.2003; (*J Henao*); pitfall [IAvH, USNMENTNo. 00758579].

PARATYPE. 4w, same locality and data as holotype. [IAvH, USNMENTNo. 00758575–76; USNM, USNMENTNo. 00758577–78].

Measurements. WORKER. EL 0.10 (0.09–0.11), FLD 0.20 (0.18–0.20), GL 0.94 (0.91–0.99), HFL 1.09 (1.05–1.09), HL 0.91 (0.89–0.90), HTL 0.80 (0.76–0.79), HW 0.76 (0.72–0.75), ML 0.57 (0.53–0.56), MSL 0.09 (0.07–0.09), MSLca 0.03 (0.03–0.04), OI 13 (13–15), PL 0.44 (0.45–0.47), PPL 0.21 (0.21), PPW 0.30 (0.28–0.29), SL 0.99 (0.91–0.99), TL 4.25 (4.23–4.27), WL 1.18 (1.18–1.19), CI 83 (81–84), MI

62 (59–62), MSI 10 (8–10), MSLI 29 (36–46), PPI 144 (130–135), RFLDI 22 (20–22), RFLDII 26 (25–27), SI 130 (126–136) (n=5).

Diagnosis. Relatively large specimens (TL 4.23–4.27, WL 1.18–1.19); frontal lobes vestigial, barely expanding laterally, parallel; leading edge of antennal scape serrate; basal portion of antennal scape carinate; small eyes; long hypostomal teeth, triangular; large propleural tubercle; large lateral mesonotal tubercles; large propodeal spines.

Description. Worker. *Head*: excluding mandibles, slightly longer than broad (CI 81–84); in full-face view, cephalic corners angulate; cephalic margin straight to widely convex, medially with a pair of small tubercles, formed by raised vertexal carinae; in full-face view, sides of head slightly convex; mandibles triangular (ML 0.53–0.57, MI 59–62), masticatory margin with 7–8 irregular teeth, outer margin slightly sinuous, almost straight; dorsum of mandibles finely areolate-striolate, apical portion of mandible shiny; anterior border of clyeal apron convex; dorsum of clypeal apron shinning and finely wrinkled; mid portion of clypeus (body of clypeus) flattened anteriorly, raised as blunt teeth (fronto-clypeal teeth) posteriorly, underneath antennal insertions; in oblique view, fronto-clypeal tubercles triangular, carinate laterally; clypeal unpaired median seta mid-sized, stout (MSL 0.07–0.09, MSI 9–10), with ~7 very narrow spoon-shaped hairs on each side; frontal lobes of moderate size (FLD 0.18–0.20), vestigial, barely expanded laterally, and parallel; frontal carinae, posterior to frontal lobes extending parallel (nearly diverging) to each other, nearly at eye level;

frontal carina developed posteriorly as irregular carinae enclosing frontal area, posteriorly extending weakly to mid tubercles and laterally to cephalic corners; eyes small (EL 0.09–0.11, OI 13–15) with 4–5 ommatidia in longest row (16–20 ommatidia total), convex, situated slightly above midline of head; in full-face view, postorbital (preocular) finely impressed; postero-ventral angles of the head (collar) produced on each side as a pair of conspicuous blunt tubercles; antennal scape long (SL 0.91–0.99, SI 126–136) thin; dorsum of antennal scape finely reticulate, covered with decumbent very narrow spoon-shaped hairs, to simple hairs towards apex; hypostomal teeth acute, large, conspicuous in lateral view.

Mesosoma. Pronotum, in dorsal view, with vestigial anterior tubercles, reduced to carinae; humeral tubercles triangular, acute and short; lateral pronotal tubercles thick, pointing upwards, larger than humeral tubercles; in dorsal view, dorsum of pronotum smooth; lacking any pilosity, narrow spoon-shaped hairs restricted to tubercles; propleural tubercle large, covered with very narrow squamate hairs; in lateral view and dorsal view, promesonotal line (suture) weakly impressed; lateral mesonotal tubercles large, larger than any tubercle on mesonotum; in dorsal view, tubercles slightly diverging from median line; anterior mesonotal tubercles triangular, acute, less massive than lateral mesonotals; declivous of mesonotum concave; median and posterior mesonotals present, the former slightly shorter than the latter; metanotal groove present, deep; anterior margin of propodeum angulate; basal and declivous surface of propodeum laterally with thin, irregular carinae that meet posteriorly on

acute teeth (propodeal tubercles missing in some specimens); in lateral view, area between mid and hind coxae with small tooth.

Metasoma. Petiole pedunculate; in lateral view, node of petiole rounded; petiole lacking ventral process or with vestigial tooth; ventral margin of petiole slightly sinuous; ventral margin of petiole with two parallel thin carinae that extend to posterior margin; postpetiole wider than long (PPL 0.21–0.22, PPW 0.28–0.30, PPI 130–144); in lateral view, dorsally broadly convex; in dorsal view, anterior margin convex, lateral margin broadly convex with postero-lateral angles rounded, posterior margin of postpetiole emarginate medially; postero-lateral margin carved; dorsum of postpetiole covered with decumbent spoon-shaped hairs. In lateral view, gastral tergite I almost flat; gastral tergite I distinctly longer than broad; tergite finely punctate, lateral margins smooth and shining. Legs long and slender (HTL 0.76–0.80, HFL1.05–1.09).

Head and thorax opaque and shagreened, sparcely rugulose. Hairs of body narrow spoon-shaped hairs, sparce; most aboundant on carinae, tubercles, dorsum of postpetiole and gastral tergite I, legs. Hairs on antennal scapes narrower. Color of body ferruginous.

Queen. Unknown.

Male. Unknown.

Comments. This species resembles *Myrmicocrypta spinosa* and *M. JSC–001* in general habitus, but differs from both species in: (i) the frontal lobes are vestigial and parallel, rather than triangular or convex as in *spinosa* and *JSC–001*; (ii) the antennal scapes are covered with subdecumbent/suberect, very narrow, spoon-shaped hairs, whereas in *spinosa* and *JSC–001* the hairs on the antennal scapes are spoon-shaped and appressed; (iii) the base of the antennal scape are carinate, whereas the base of the antennal scapes in *spinosa* and *JSC–001* lack carinae.

This species resembles the queen of *Myrmicocrypta rudiscapa* Emery described from Bolivia in the shape of the frontal lobes and in the well-developed frontal carinae; somewhat in the shape of the postpetiole; and in the pilosity of the antennal scapes. However, this species differs from the queen of *M. rudiscapa* in the presence of a carina at the base of the antennal scape and in the lack of serrate carinae on the leading margin of the antennal scape. For now, I am maintaining these as two separate species until entire colonies can be obtained and workers and queens can be associated.

Material examined. Known only from the type series.

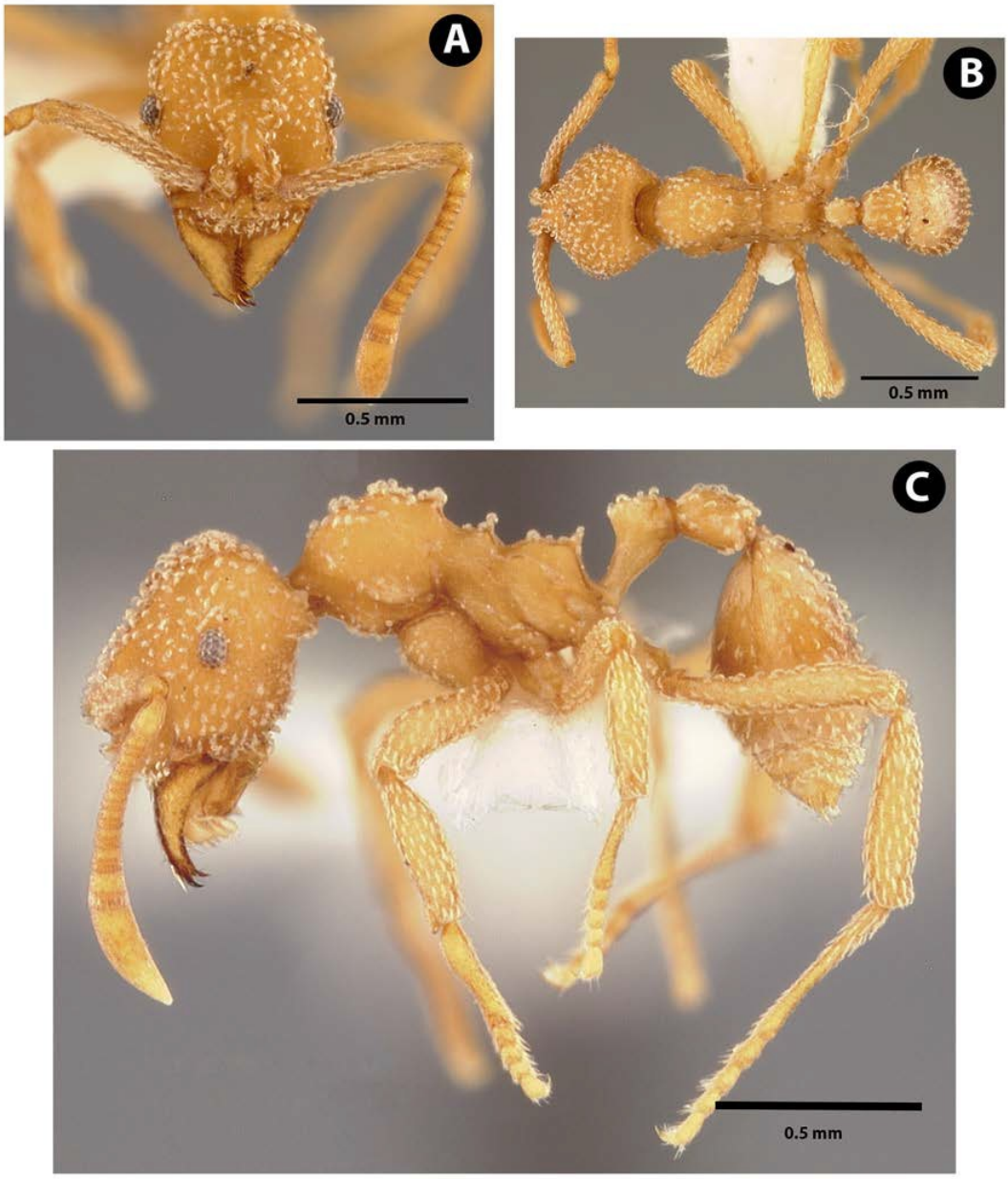


Figure. 2.4. Worker of *Myrmicocrypta boliviana*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

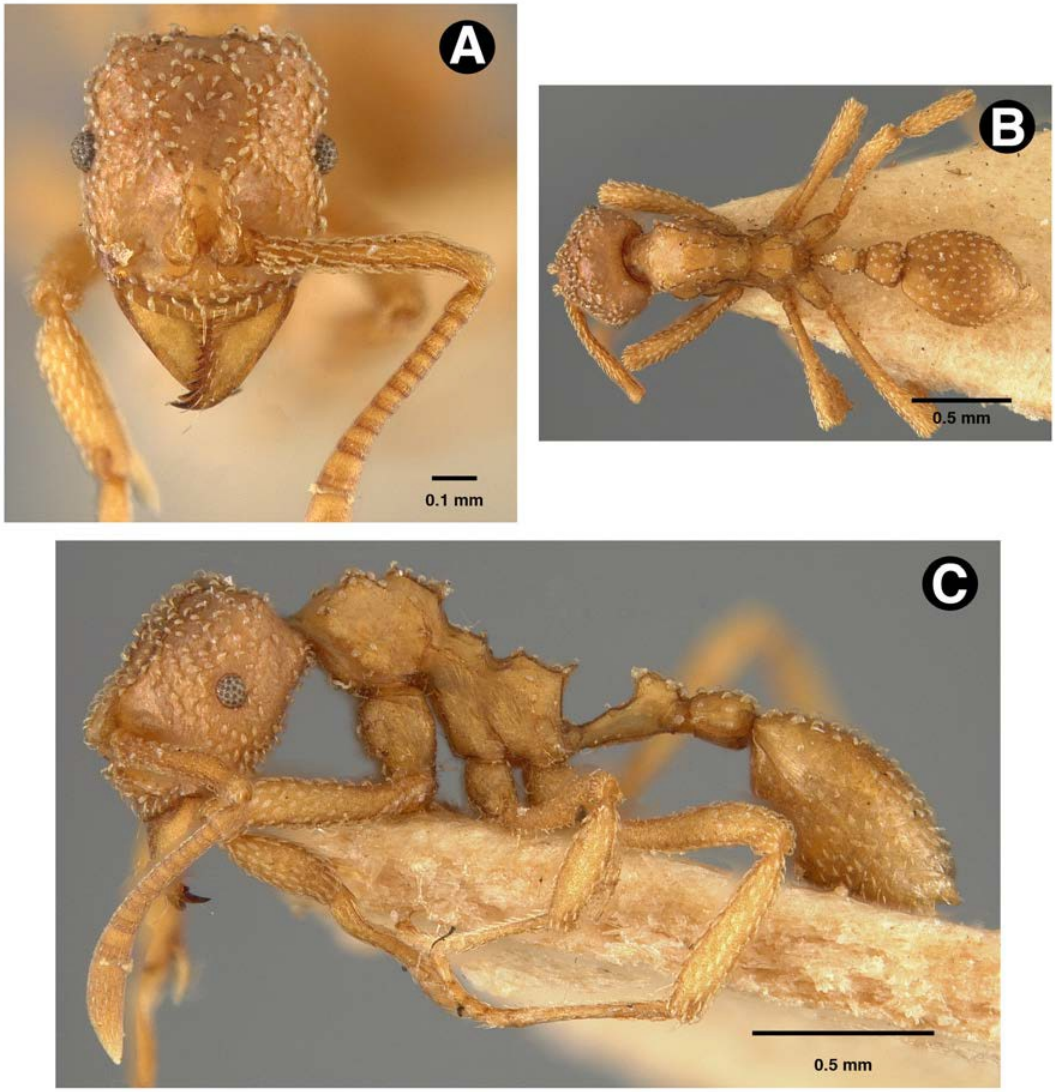


Figure. 2.5. Worker of *Myrmicocrypta buenzlii*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

Figure. 2.6. Worker of *Myrmicocrypta bucki*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

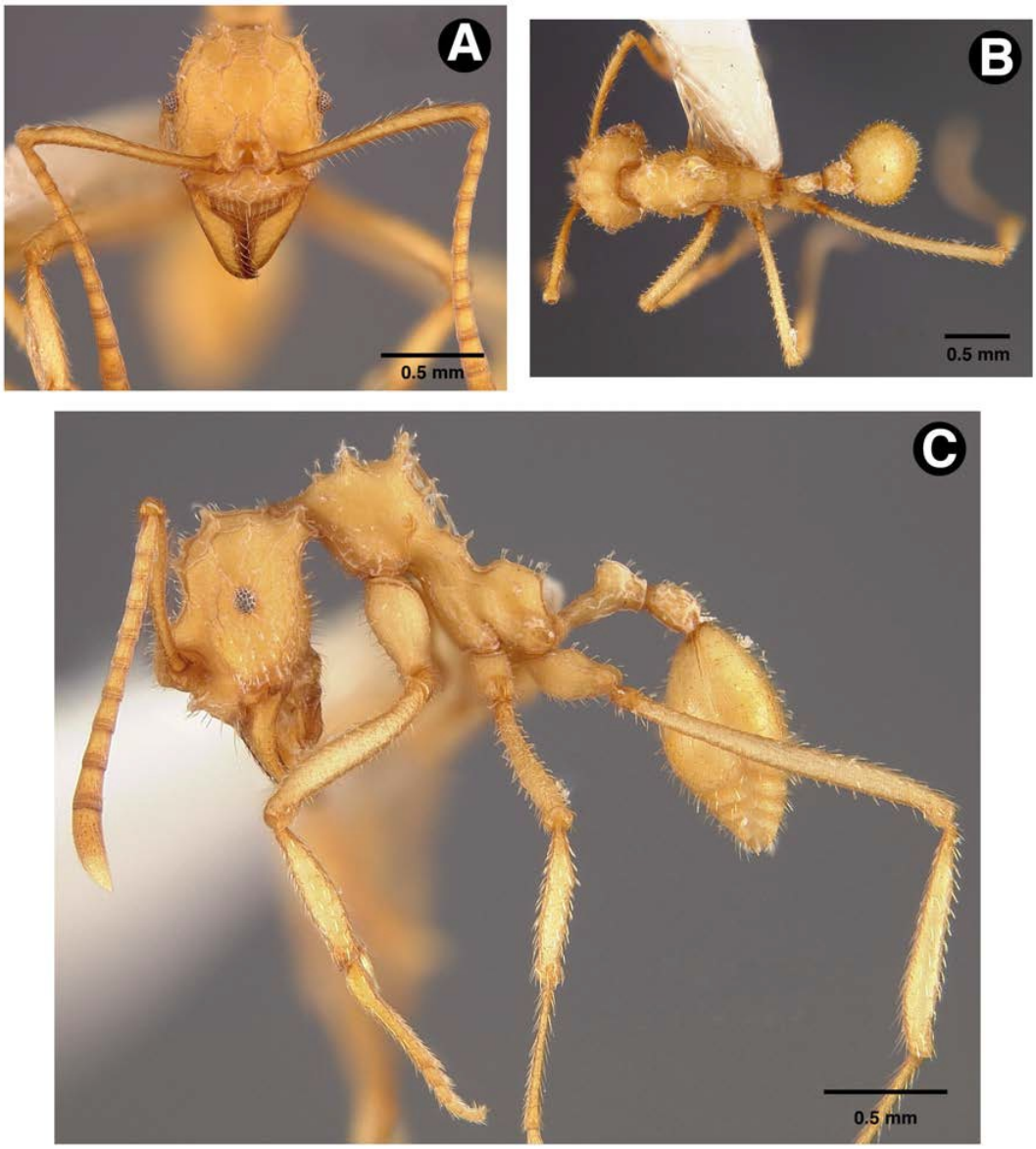


Figure. 2.7. Worker of *Myrmicocrypta camargoi*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

Figure. 2.8. Dealate queen (A, C, E) and male (B, D, F) of *Myrmicocrypta camargoi*. (A, B) Full-face view. (C, D) Lateral view. (E, F) Dorsal view.

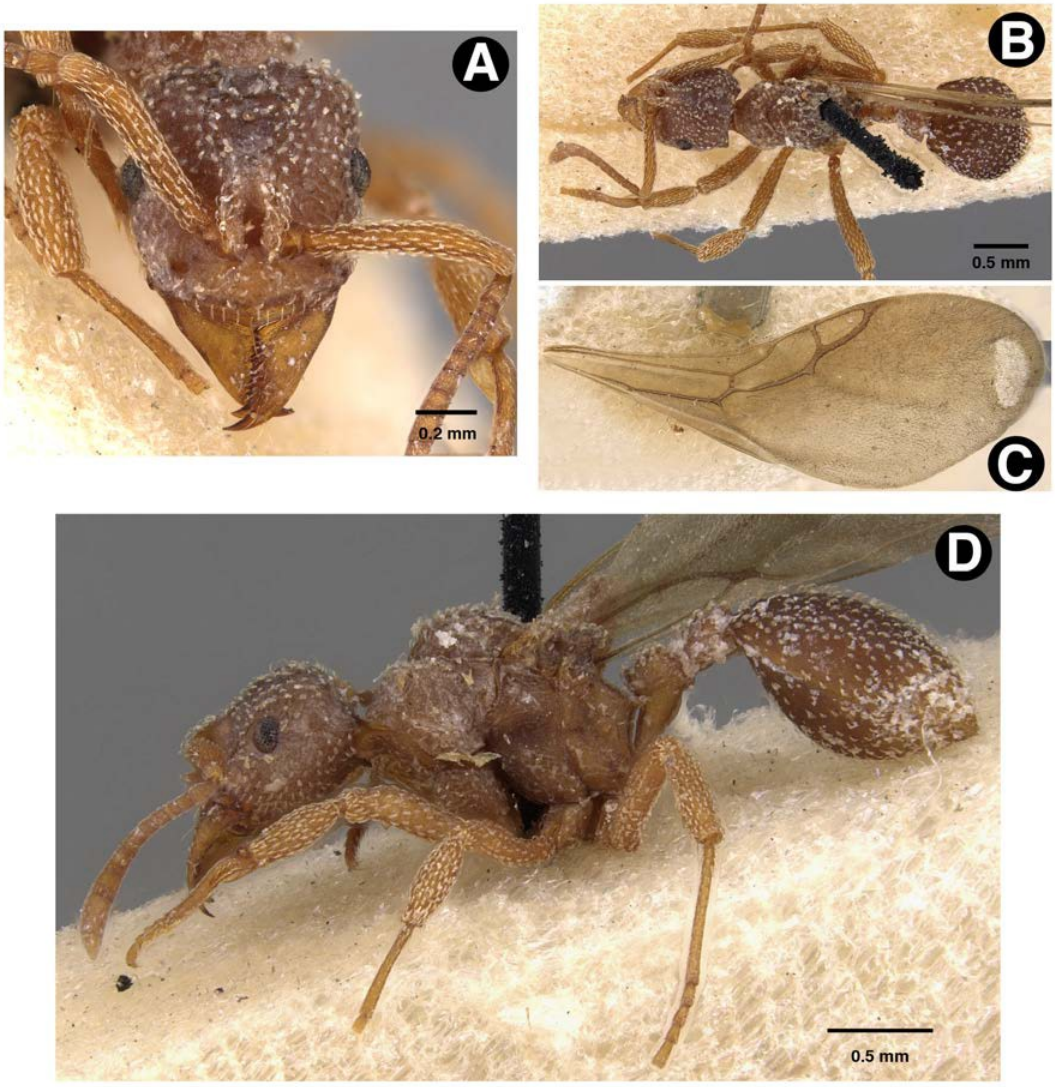


Figure. 2.9. Holotype queen of *Myrmicocrypta collaris*. (A) Full-face view. (B) Dorsal view. (C) Fore wing. (D) Lateral view. (Photographs from AntWeb.org)

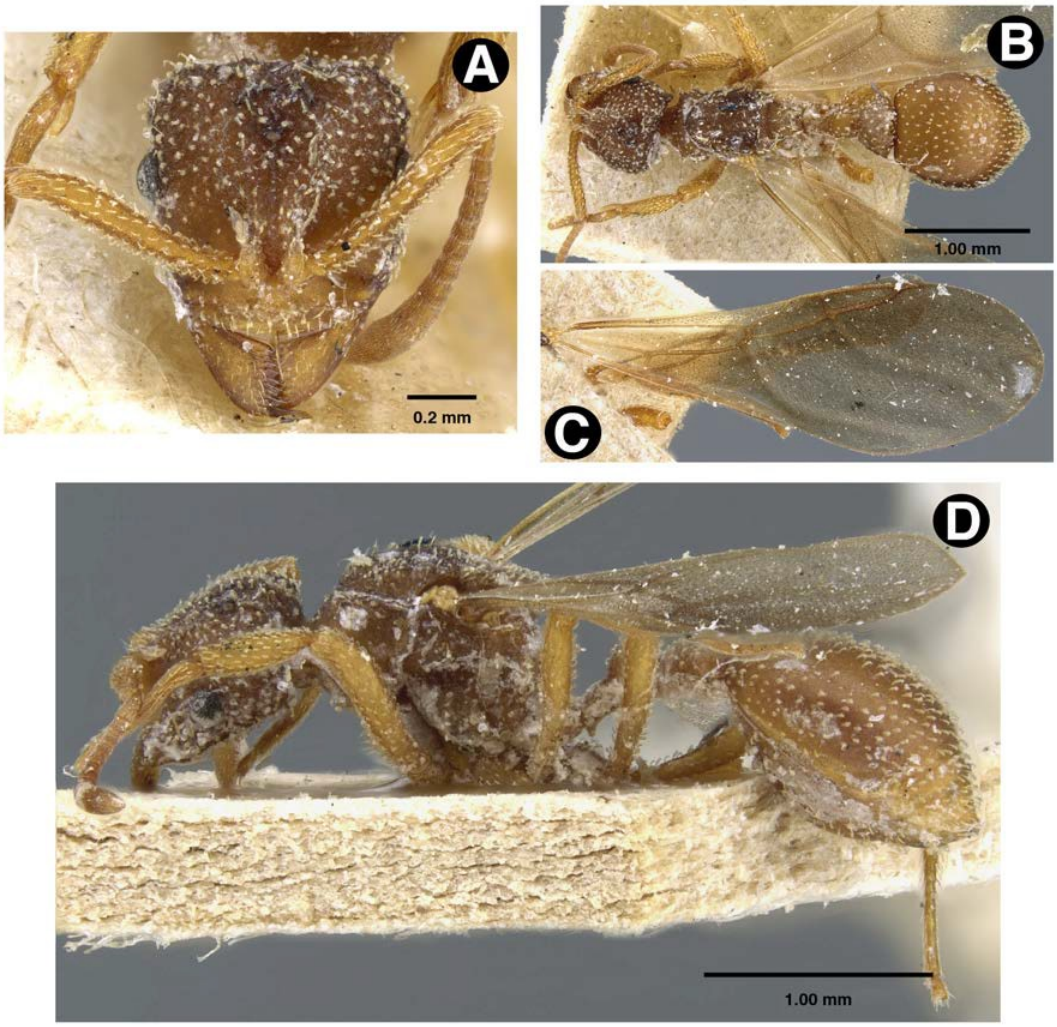


Figure. 2.10. Holotype queen of *Myrmicocrypta corniculata*. (A) Full-face view. (B) Dorsal view. (C) Fore wing. (D) Lateral view. (Photographs from AntWeb.org)

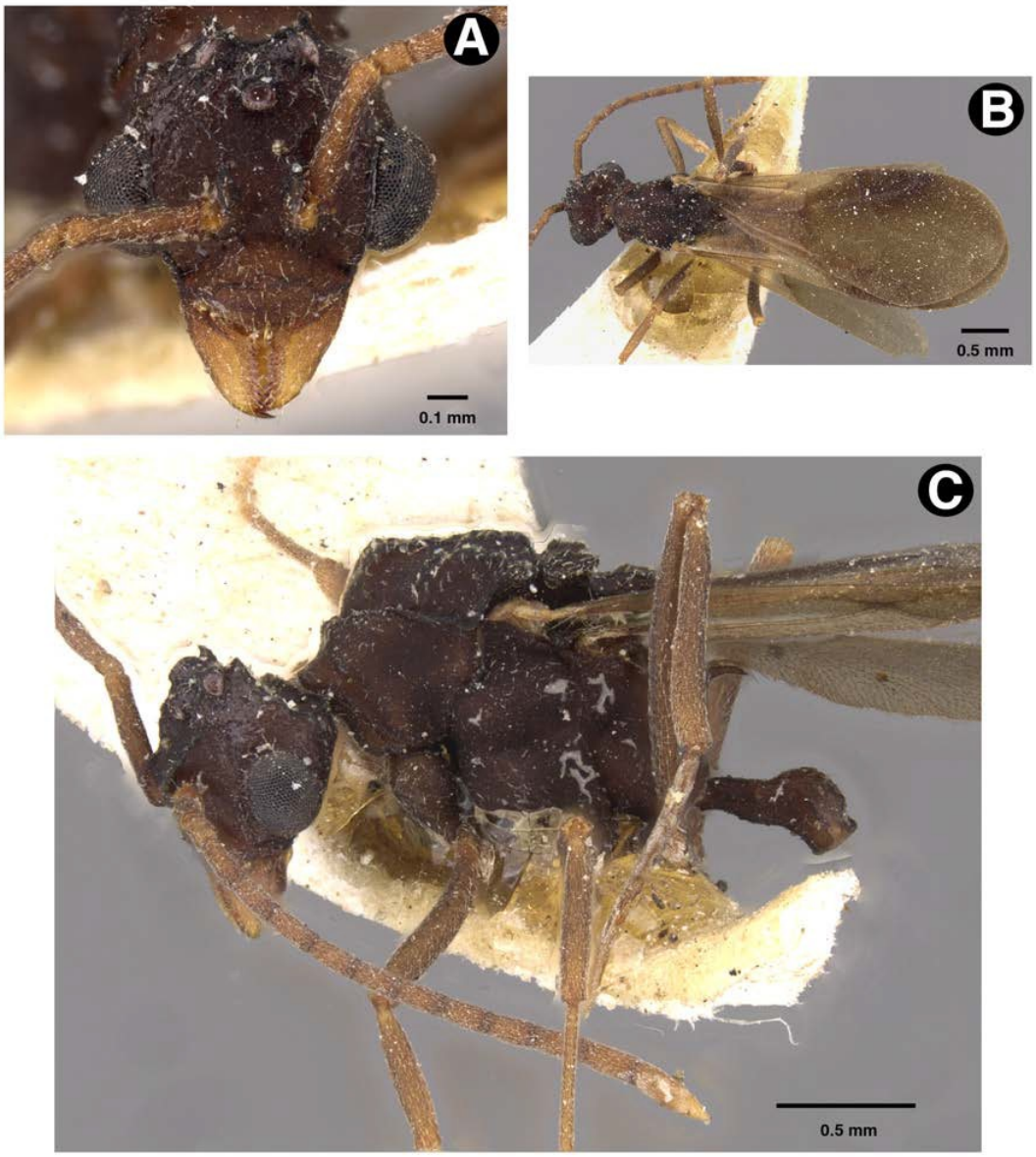


Figure. 2.11. Male of *Myrmicocrypta dilacerata*. (A) Full-face view. (B) Dorsal view. (C) Lateral view. (Photographs from AntWeb.org)

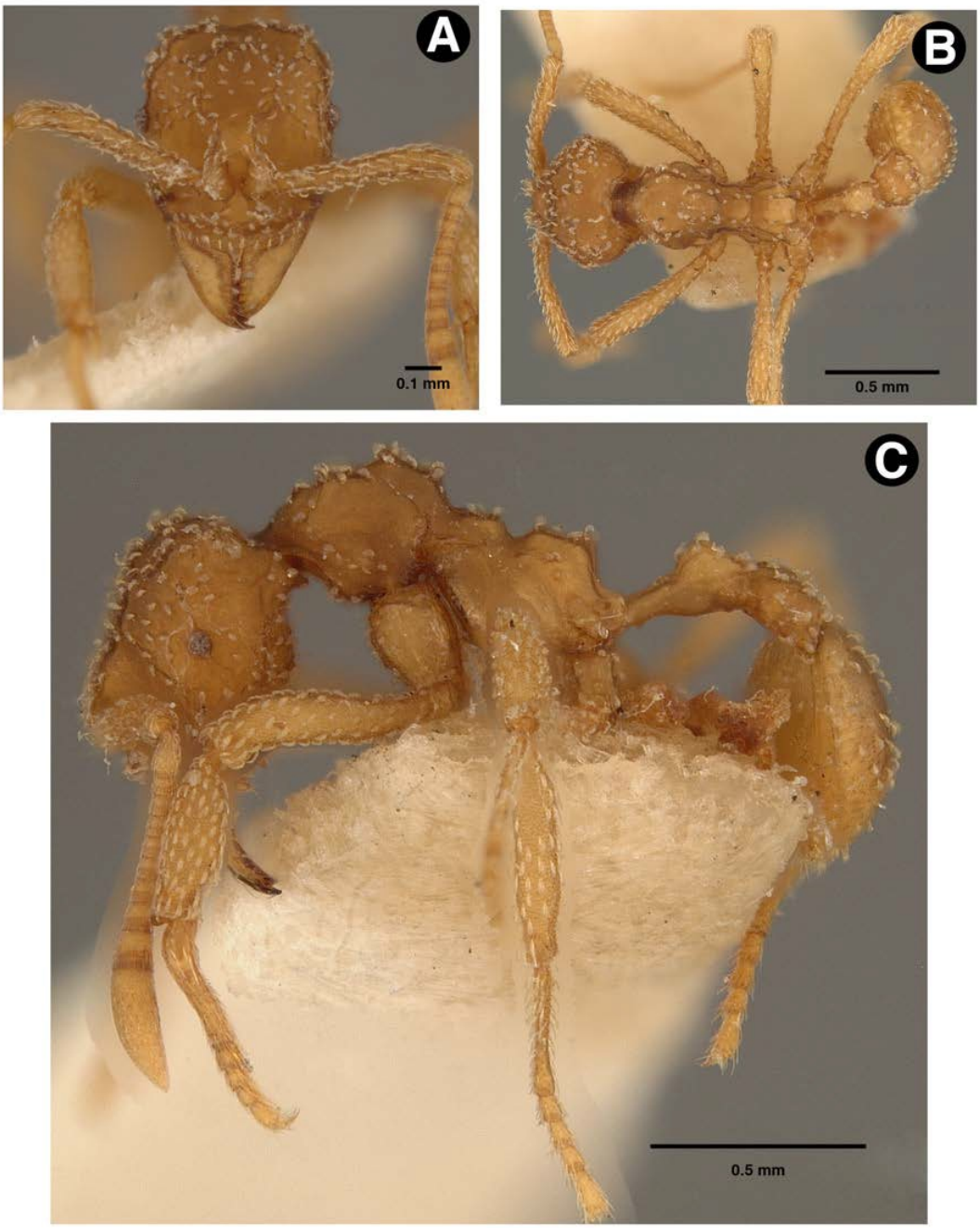


Figure. 2.12. Worker of *Myrmicocrypta ednaella*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

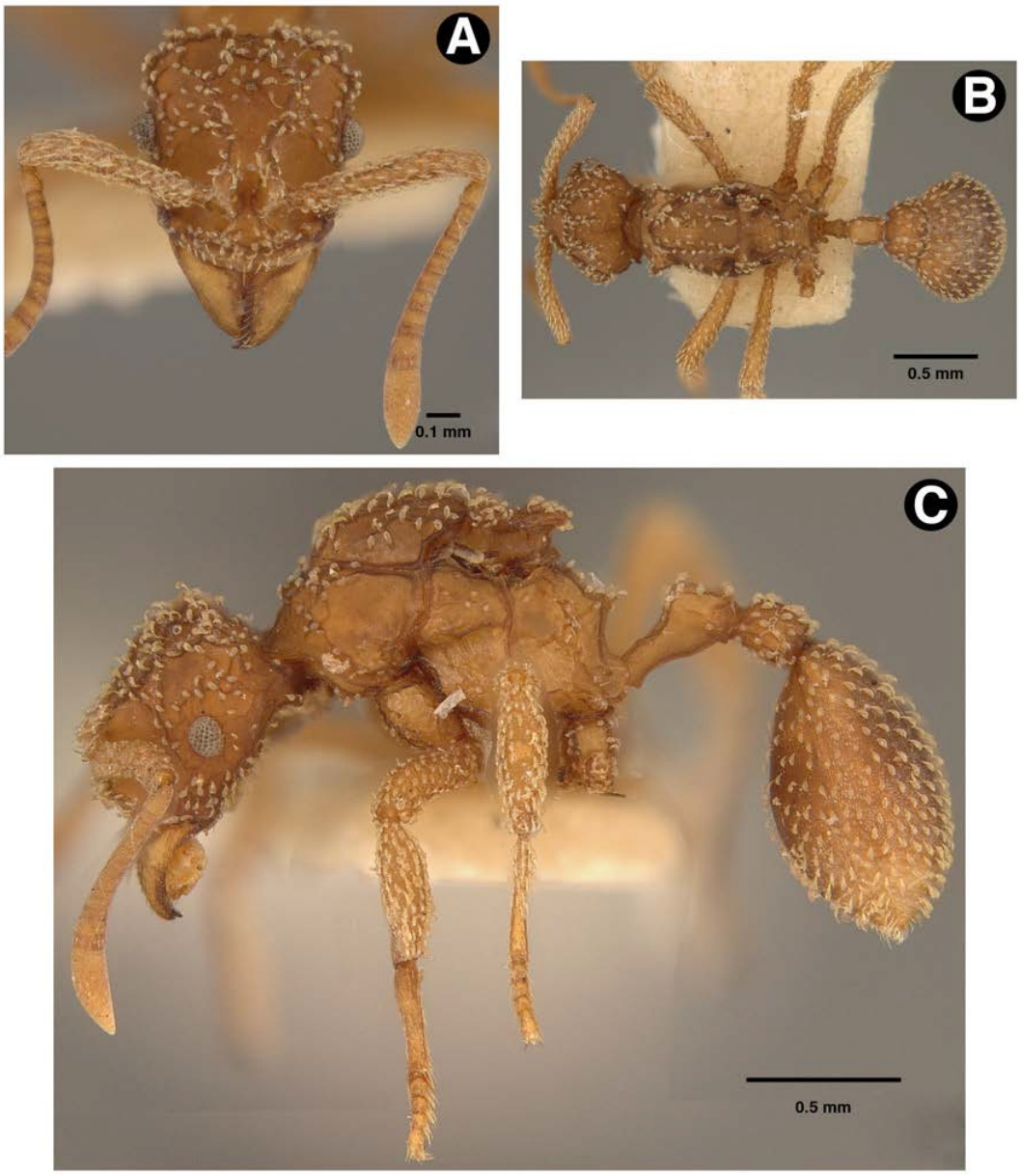


Figure. 2.13. Dealate queen of *Myrmicocrypta ednaella*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

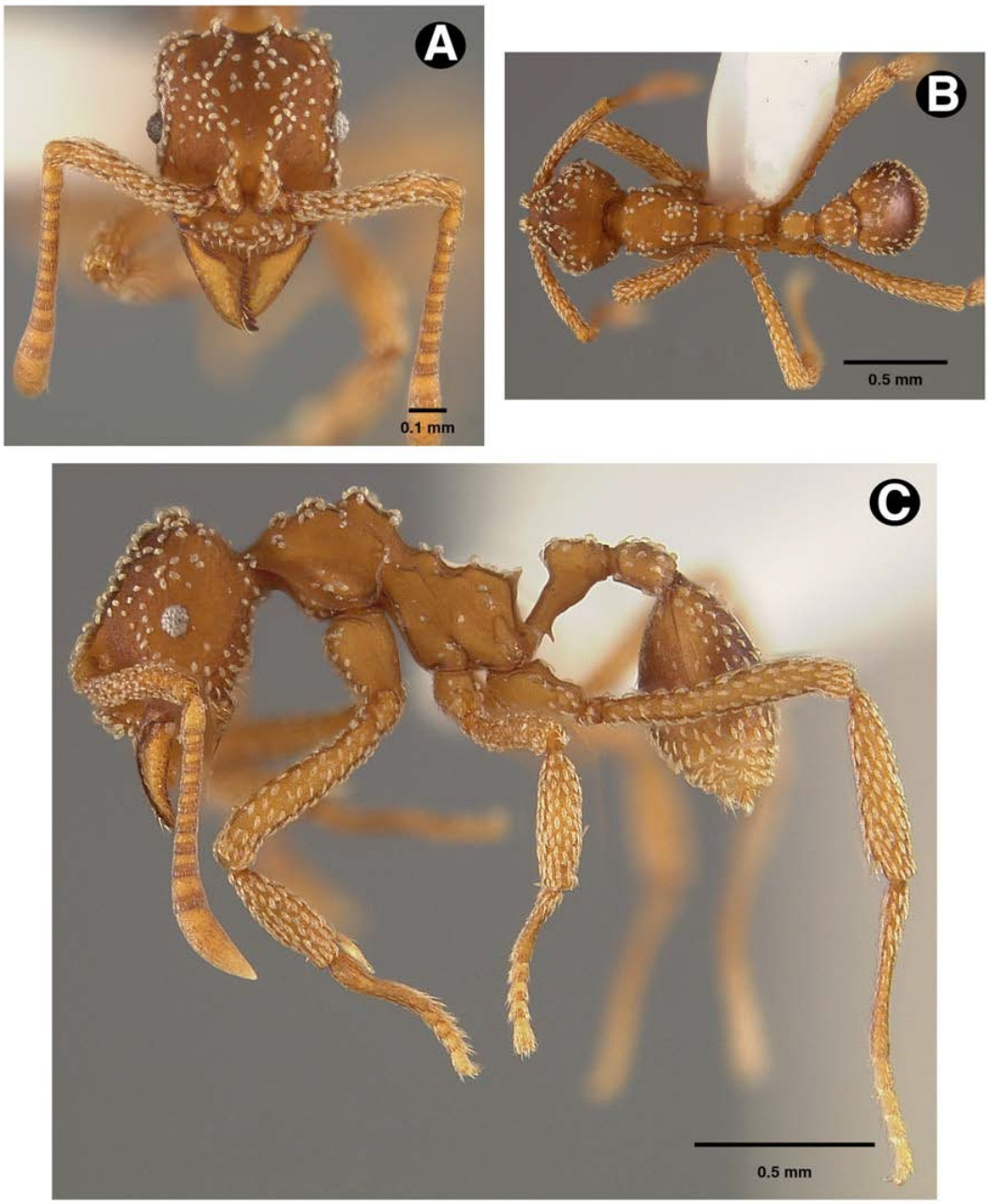


Figure. 2.14. Holotype worker of *Myrmicocrypta* ca *ednaella* **sp. nov.** (A) Full-face view. (B) Dorsal view. (C) Lateral view.

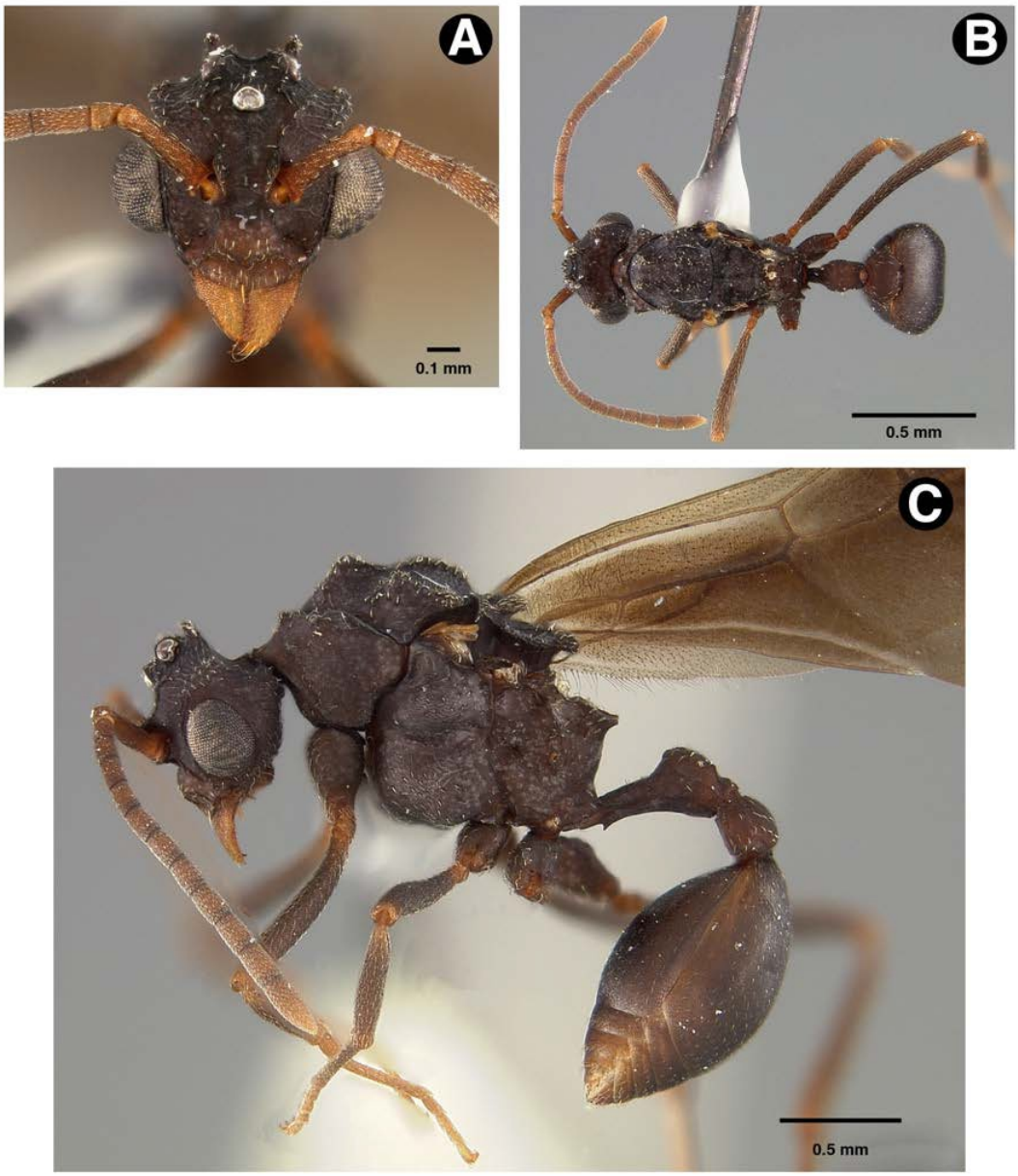


Figure. 2.15. Male of *Myrmicocrypta* ca *ednaella* **sp. nov.** (A) Full-face view. (B) Dorsal view. (C) Lateral view. (Note: propodeal spines broken)

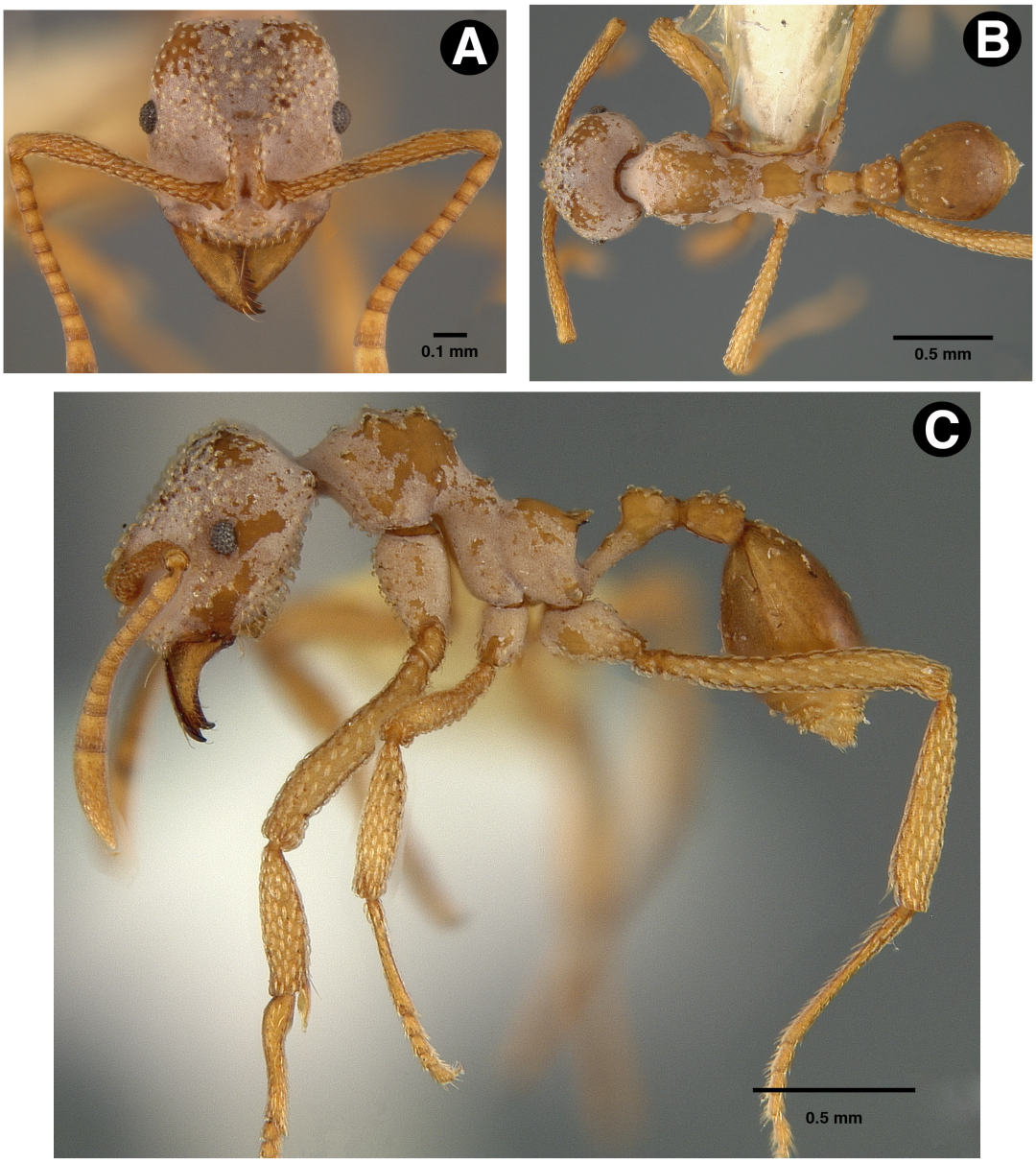


Figure. 2.16. Worker of *Myrmicocrypta elizabethae*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

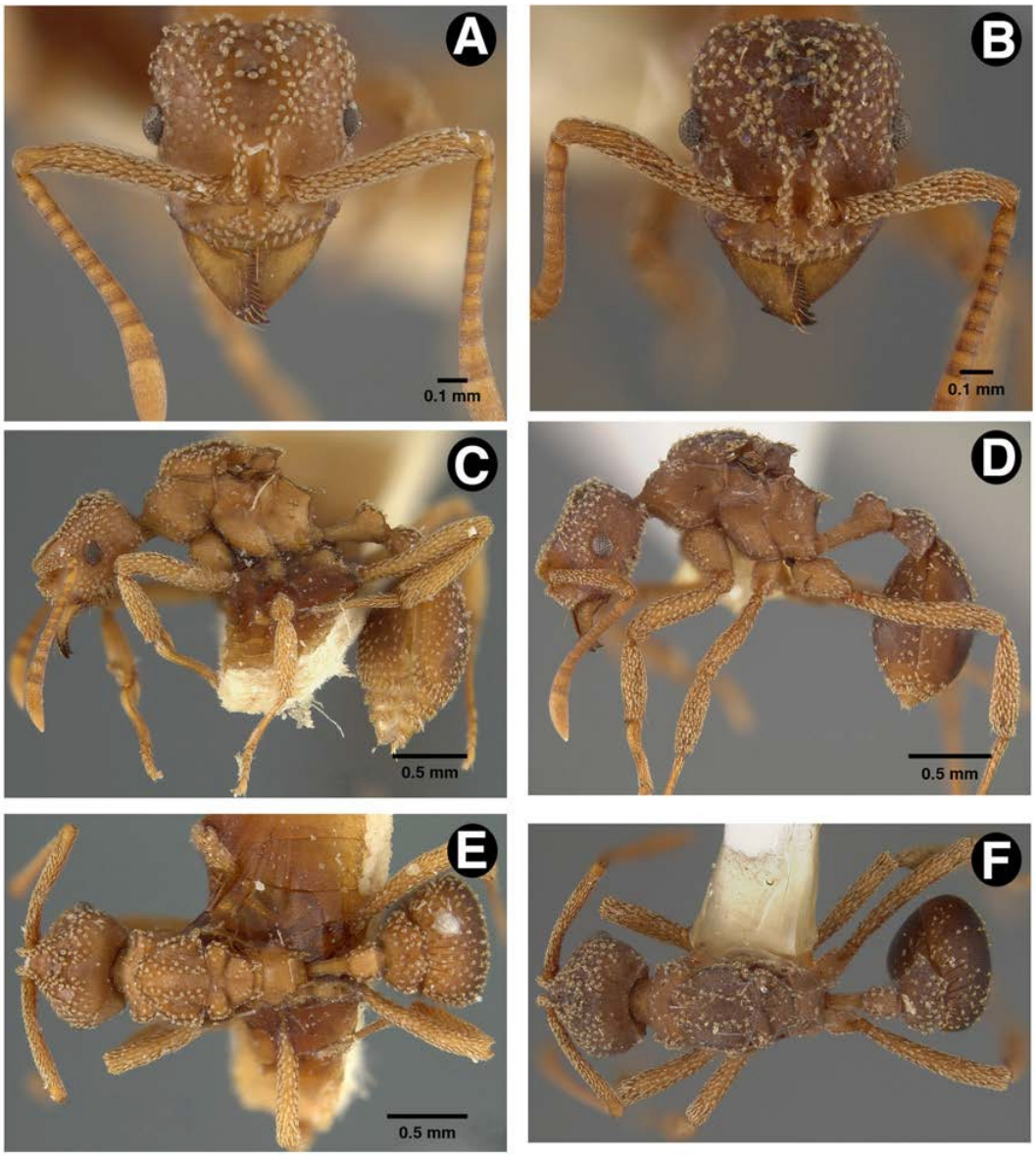


Figure. 2.17. Holotype dealate queen of *Myrmicocrypta elizabethae* (A, C, E). (A, B) Full-face view. (C, D) Lateral view. (E, F) Dorsal view.

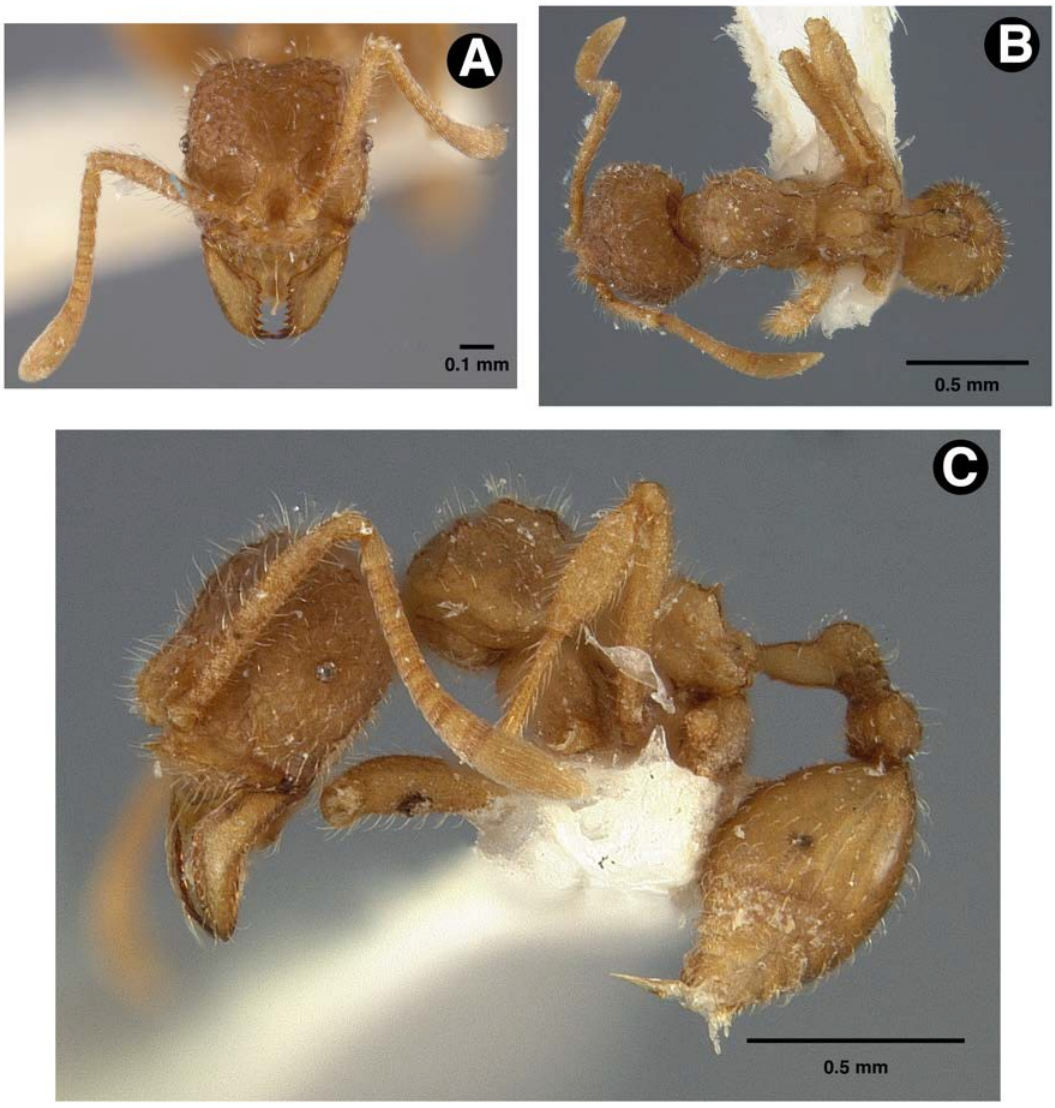


Figure. 2.18. Paratype worker of *Myrmicocrypta erectapilosa*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

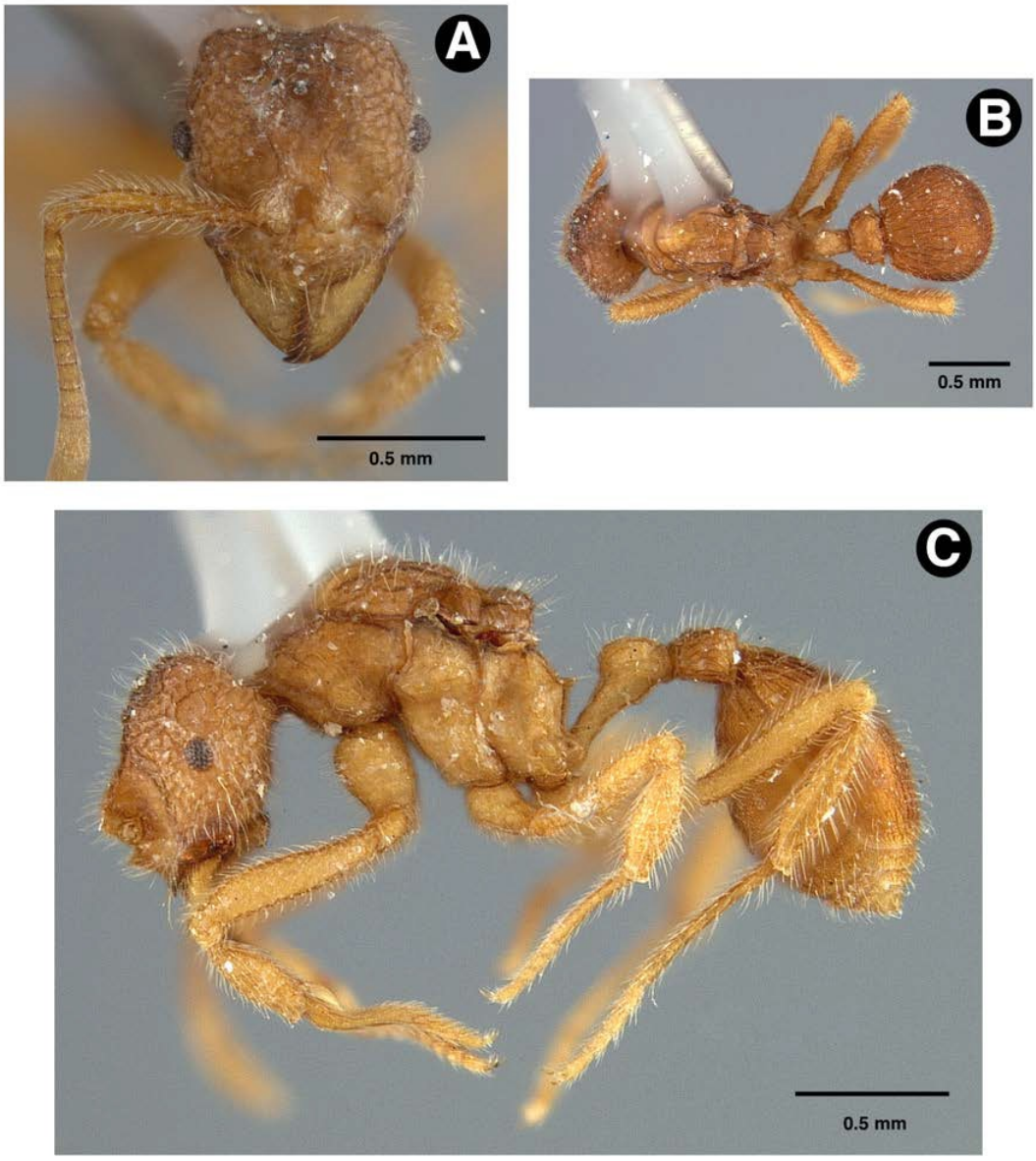


Figure. 2.19. Paratype dealate queen of *Myrmicocrypta erectapilosa*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

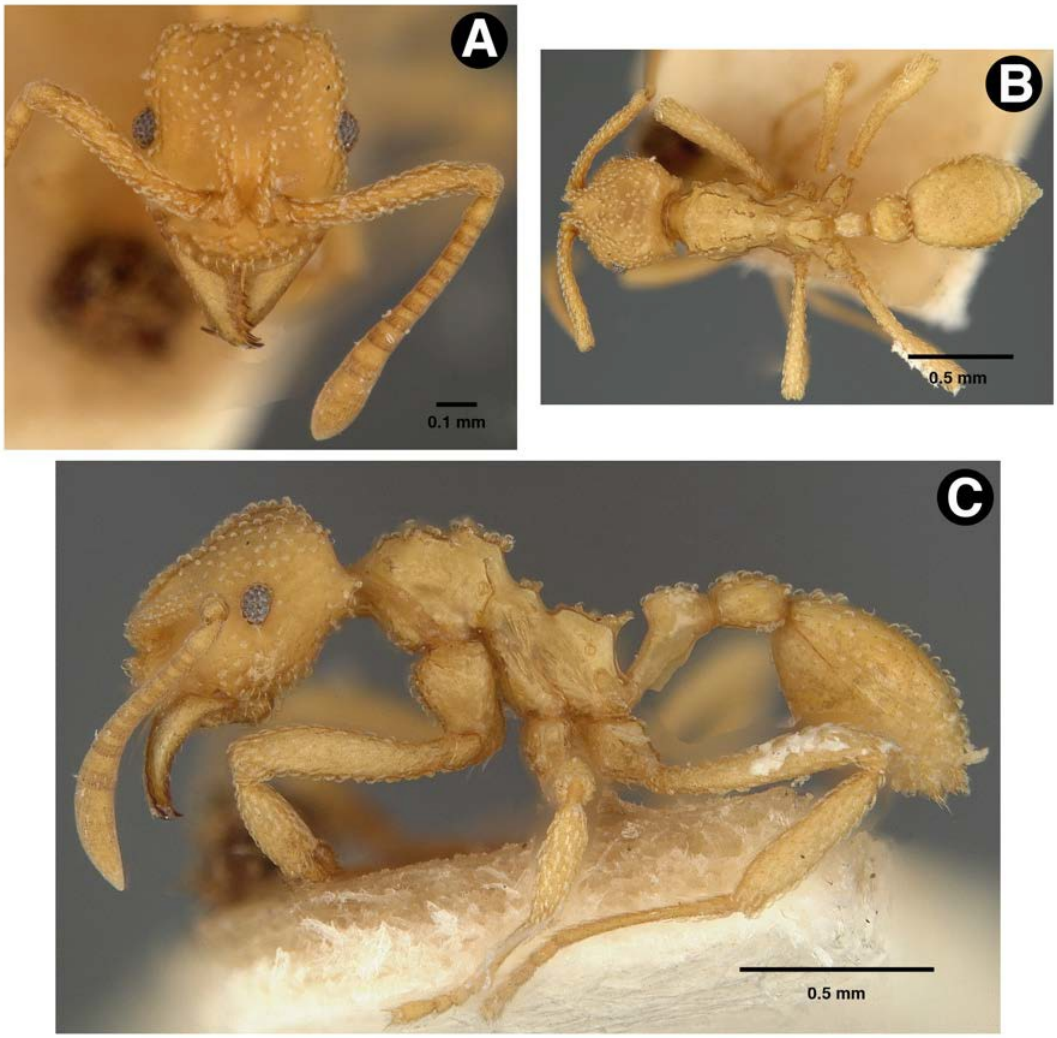


Figure. 2.20. Worker of *Myrmicocrypta foreli*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

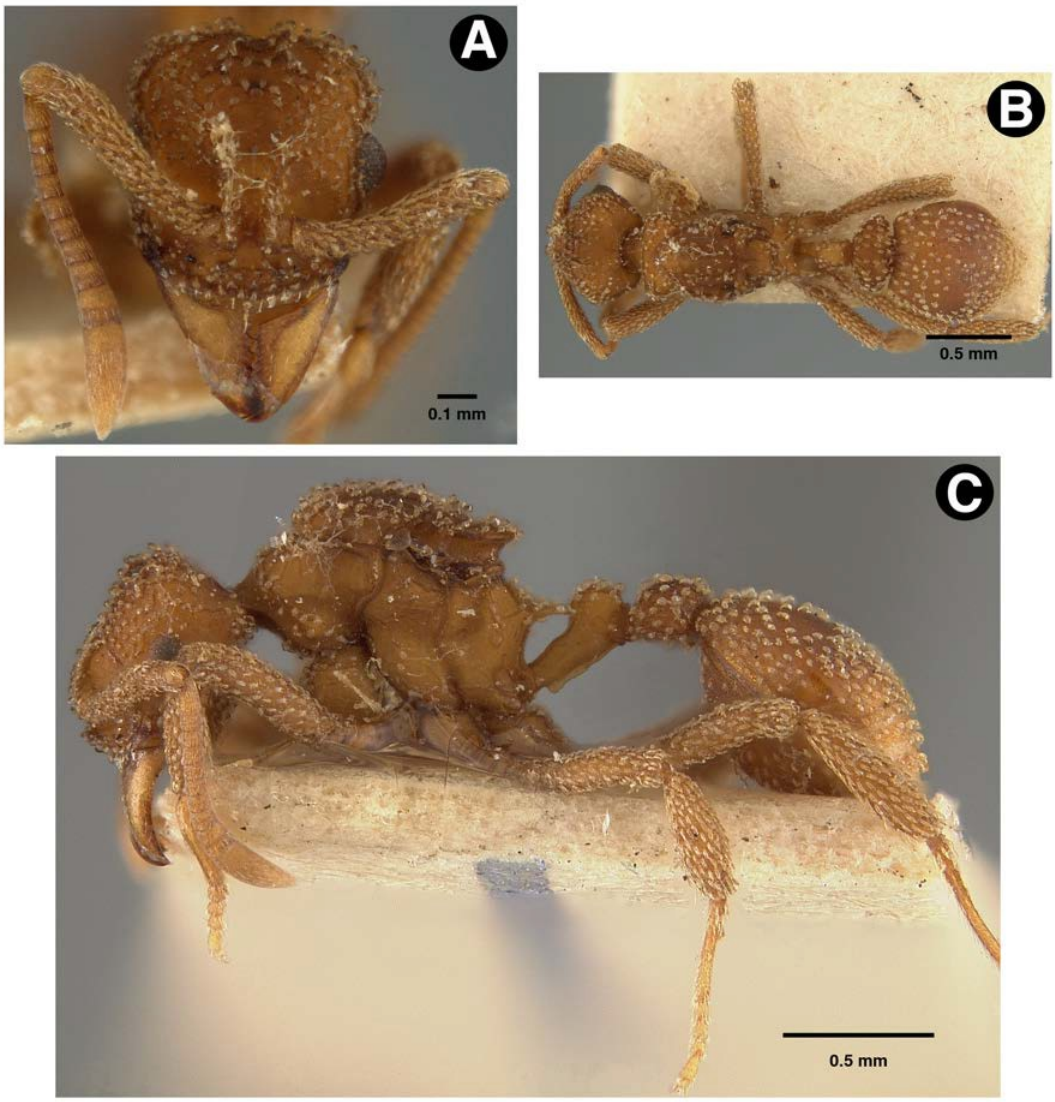


Figure. 2.21. Dealate queen of *Myrmicocrypta foreli*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

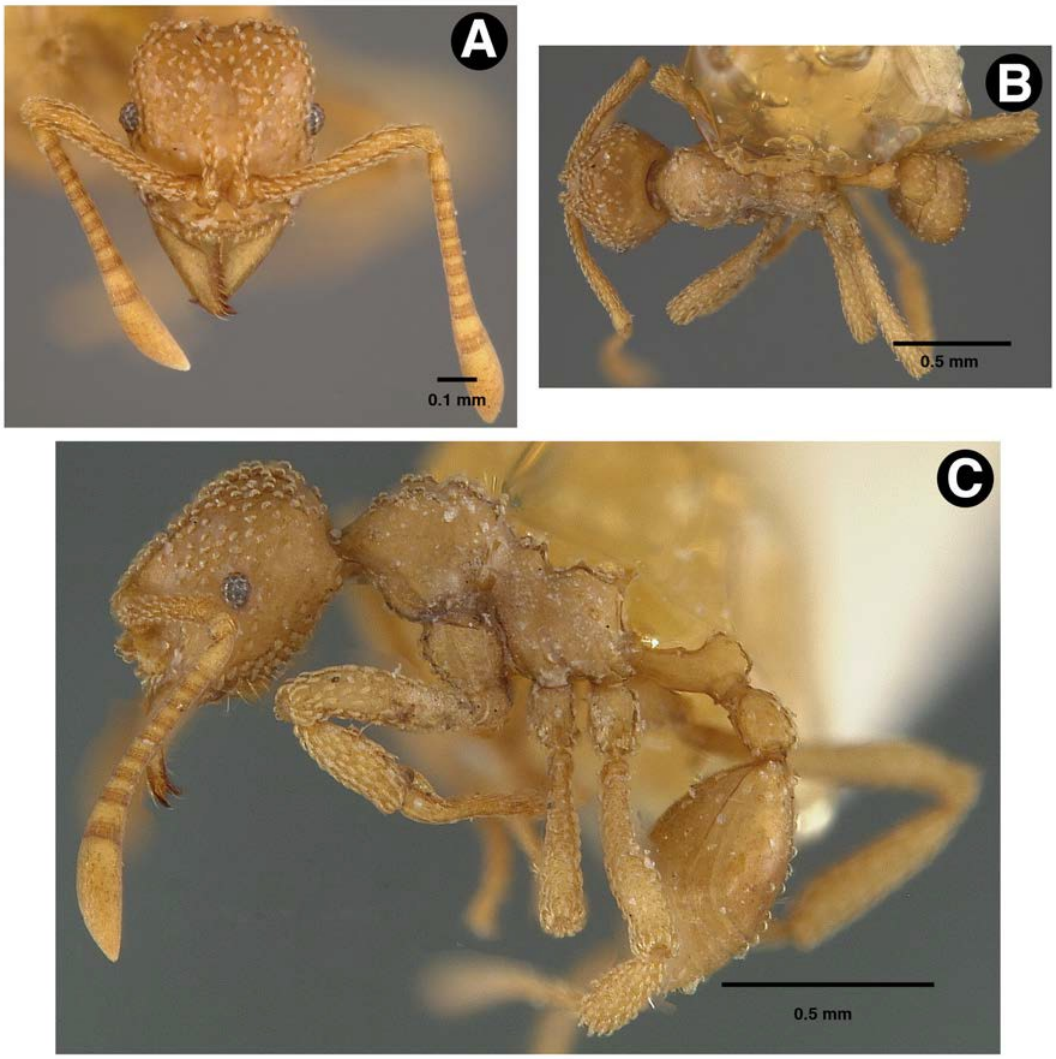


Figure. 2.22. Worker of *Myrmicocrypta guianensis*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

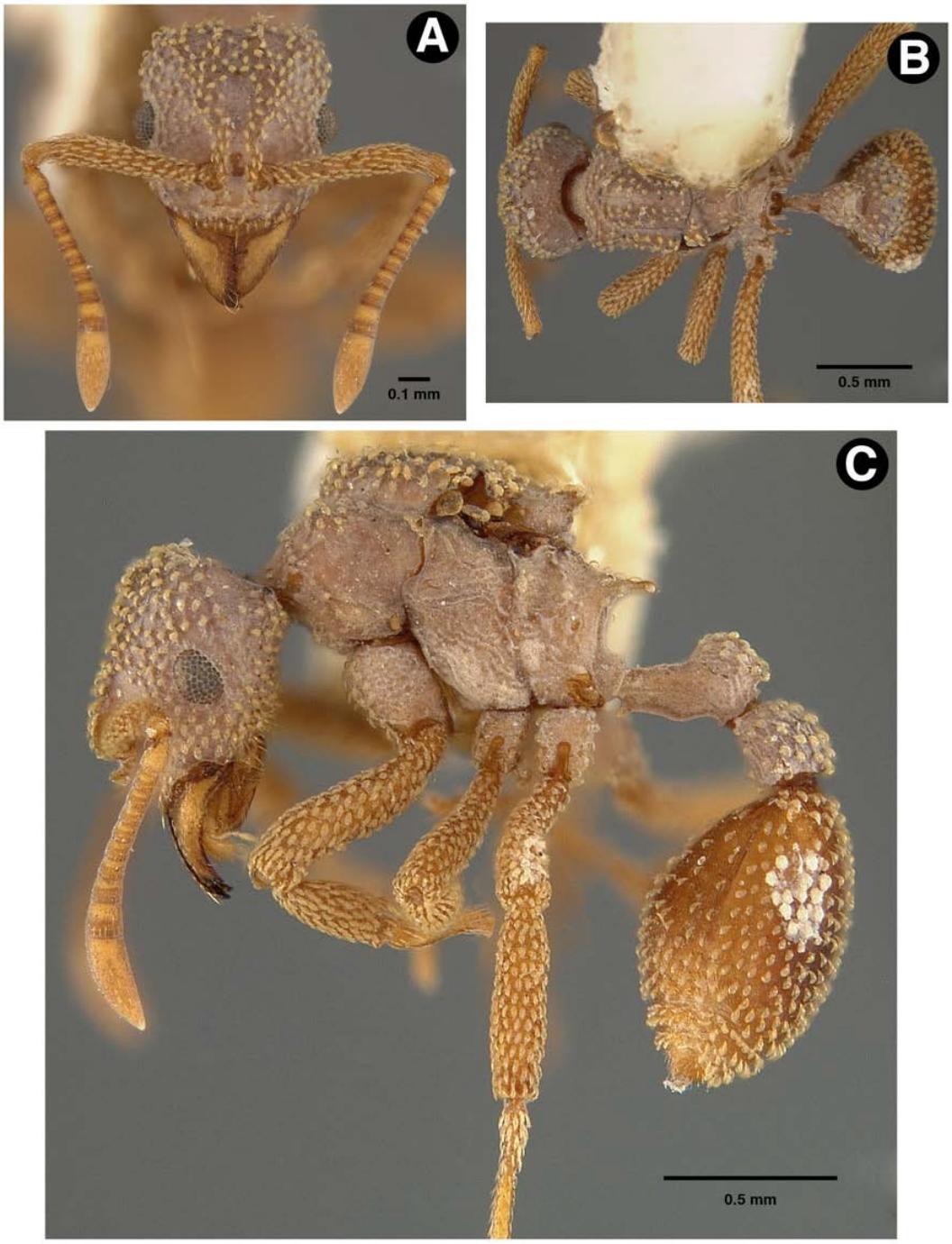


Figure. 2.23. Dealate queen of *Myrmicocrypta guianensis*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

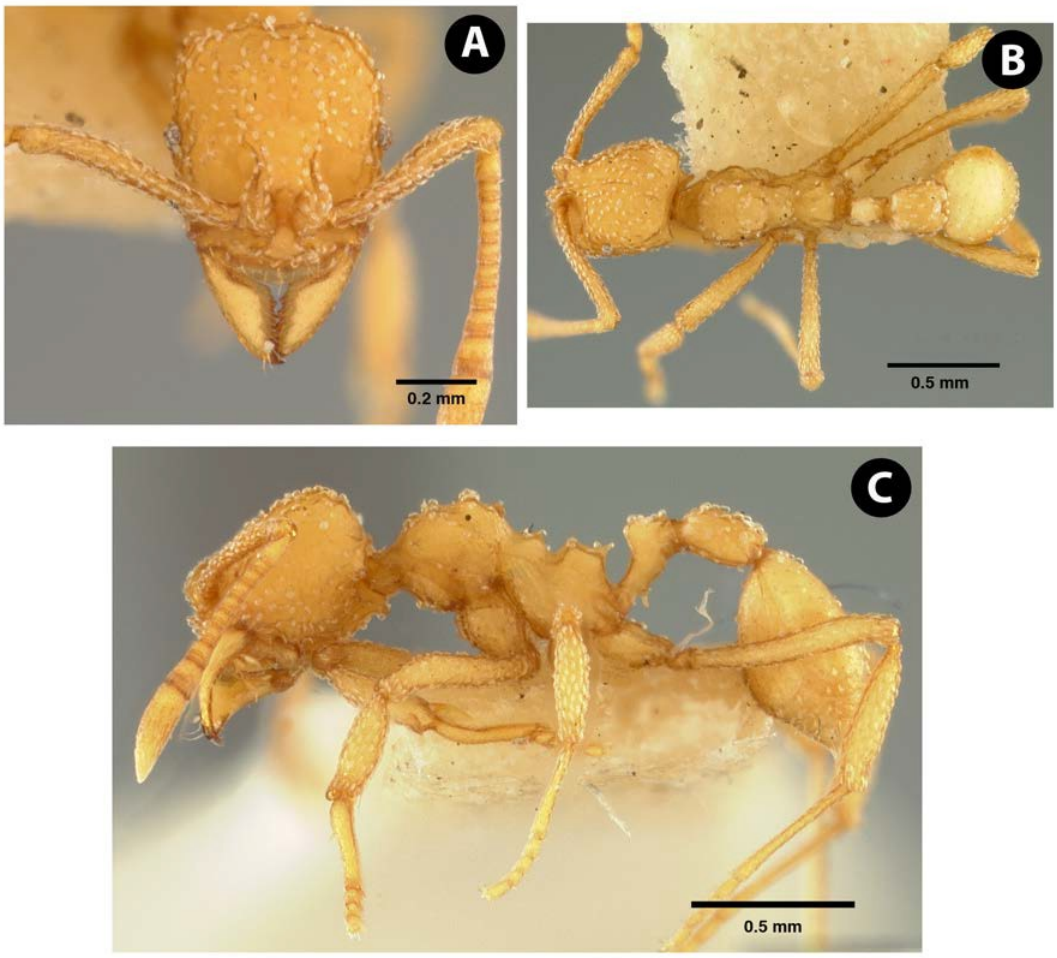


Figure. 2.24. Holotype worker of *Myrmicocrypta longinoda*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

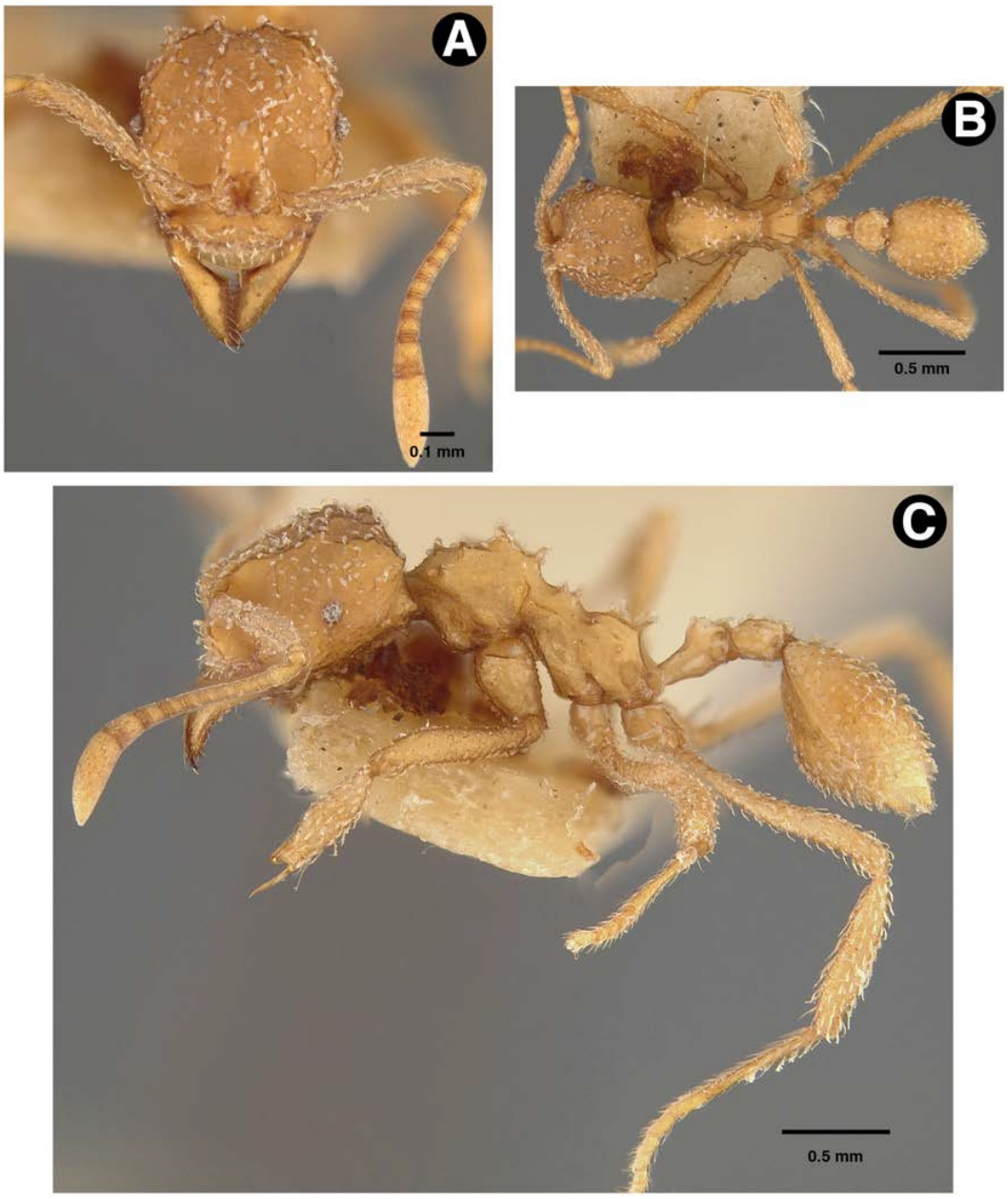


Figure. 2.25. Worker of *Myrmicocrypta boliviana*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

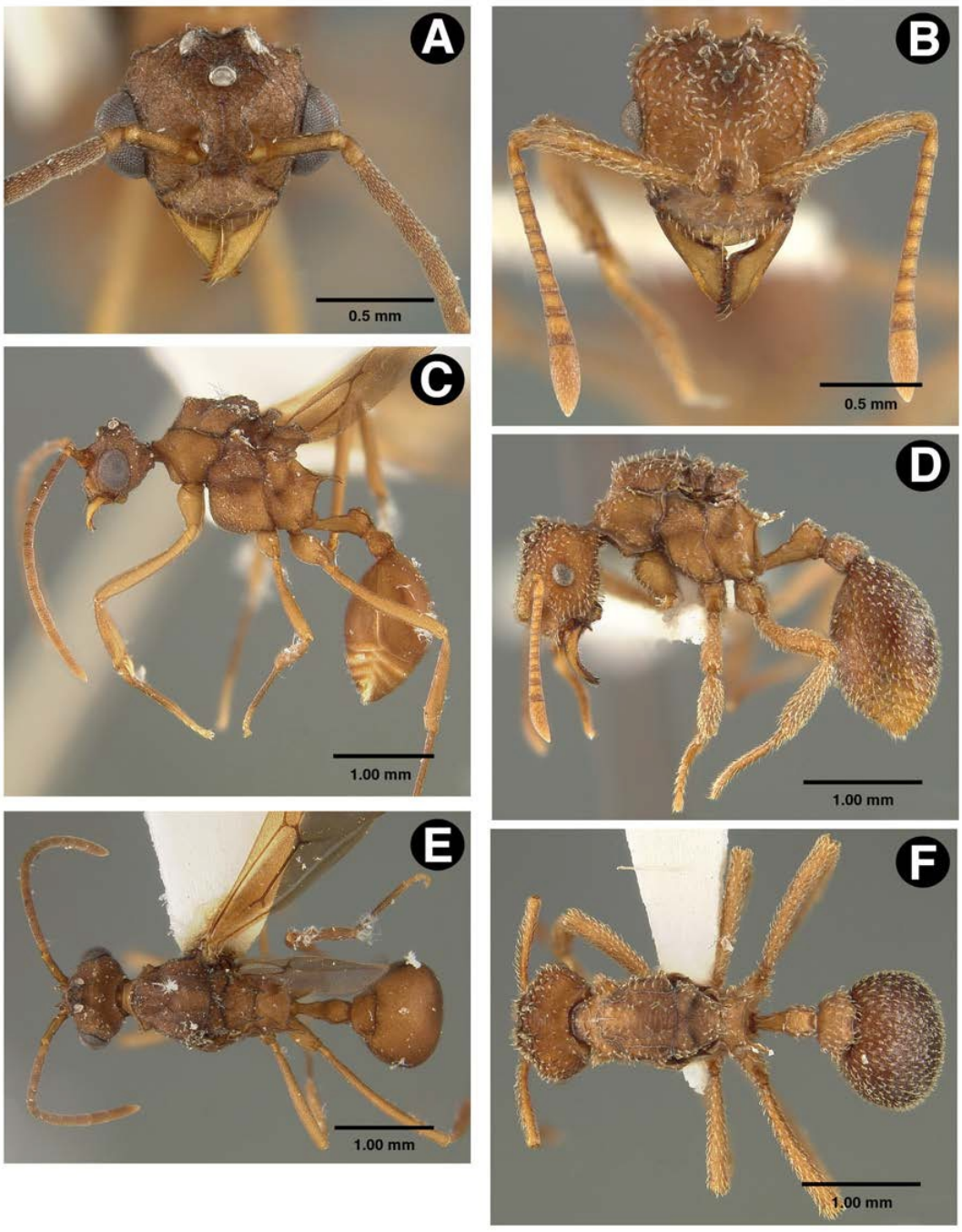


Figure. 2.26. Male (A, C, E) and dealate queen (B, D, F) of *Myrmicocrypta occipitalis*. (A, B) Full-face view. (C, D) Lateral view. (E, F) Dorsal view.

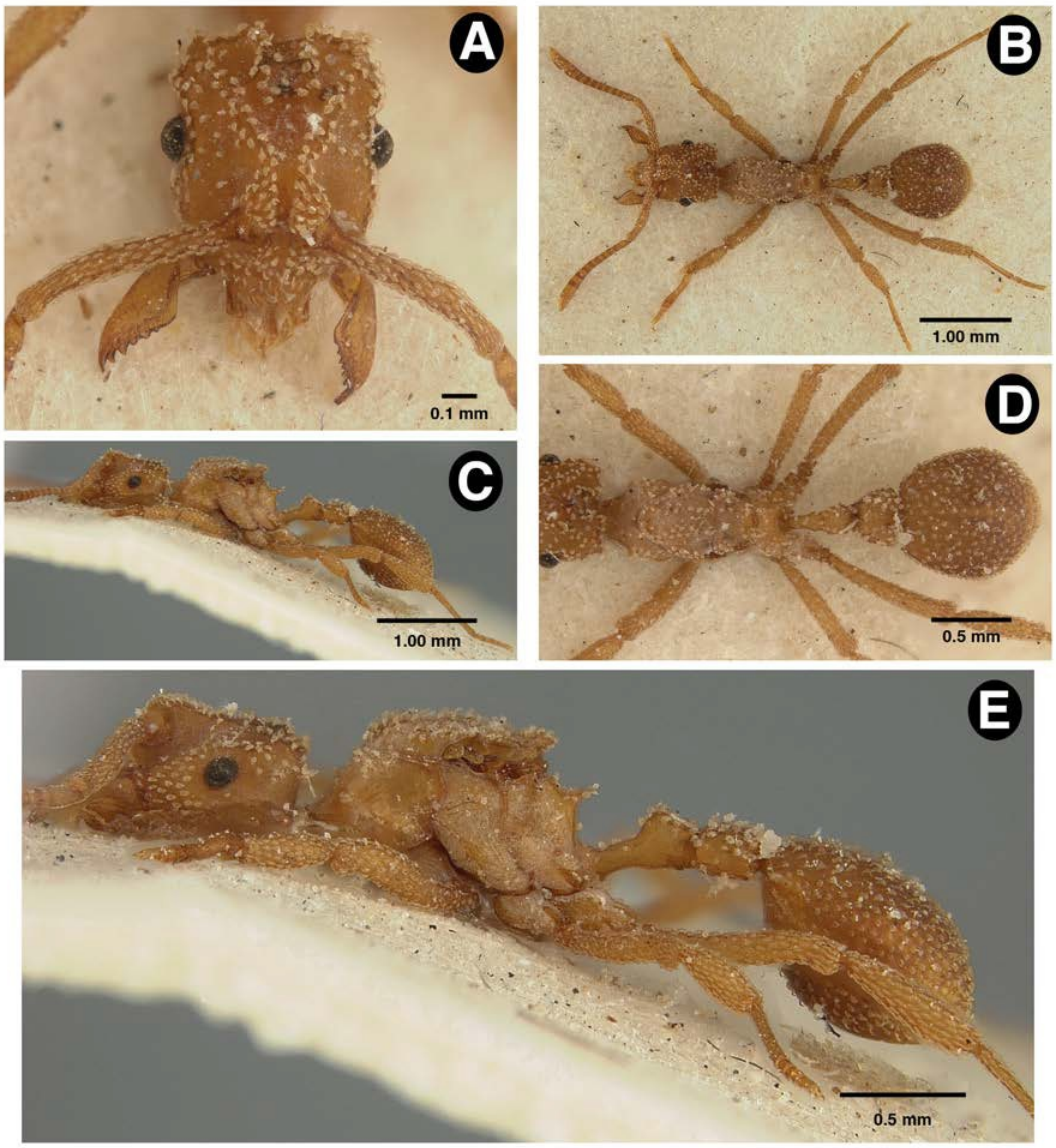


Figure. 2.27. Holotype dealate queen of *Myrmicocrypta oglobini*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

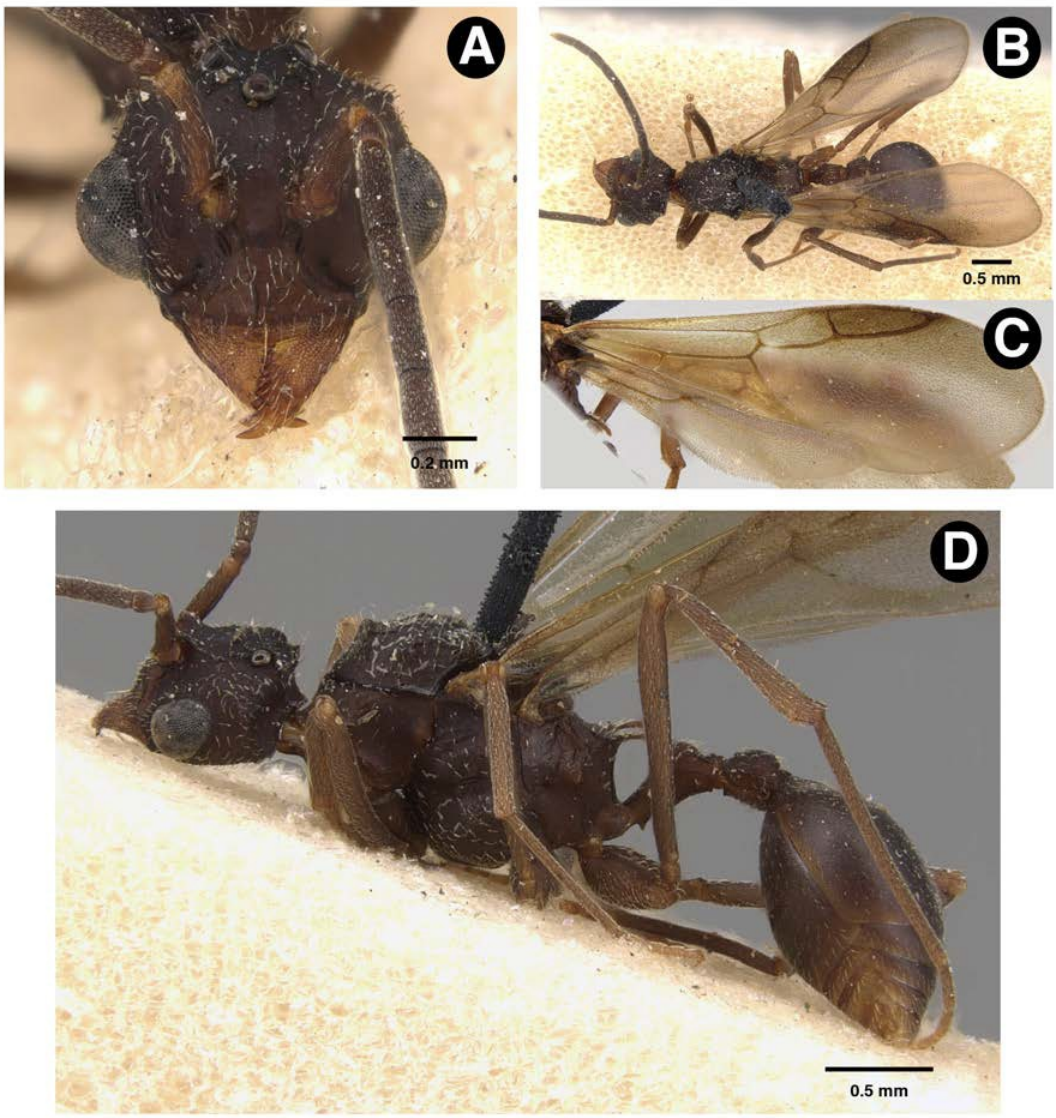


Figure. 2.28. Holotype male of *Myrmicocrypta peruviana*. (A) Full-face view. (B) Dorsal view. (C) Fore wing. (D) Lateral view. (Photographs from AntWeb.org)

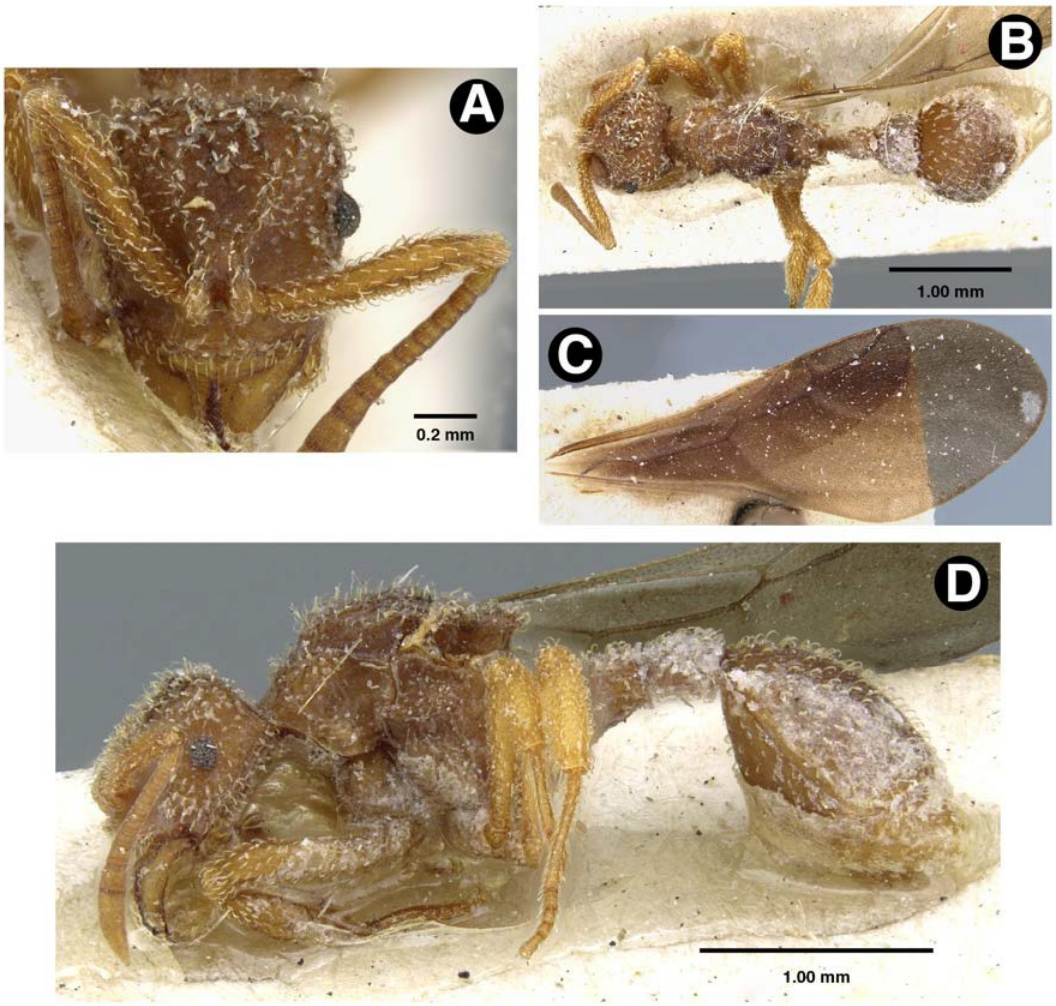


Figure. 2.29. Holotype queen of *Myrmicocrypta rudiscapa*. (A) Full-face view. (B) Dorsal view. (C) Fore wing. (D) Lateral view. (Photographs from AntWeb.org)

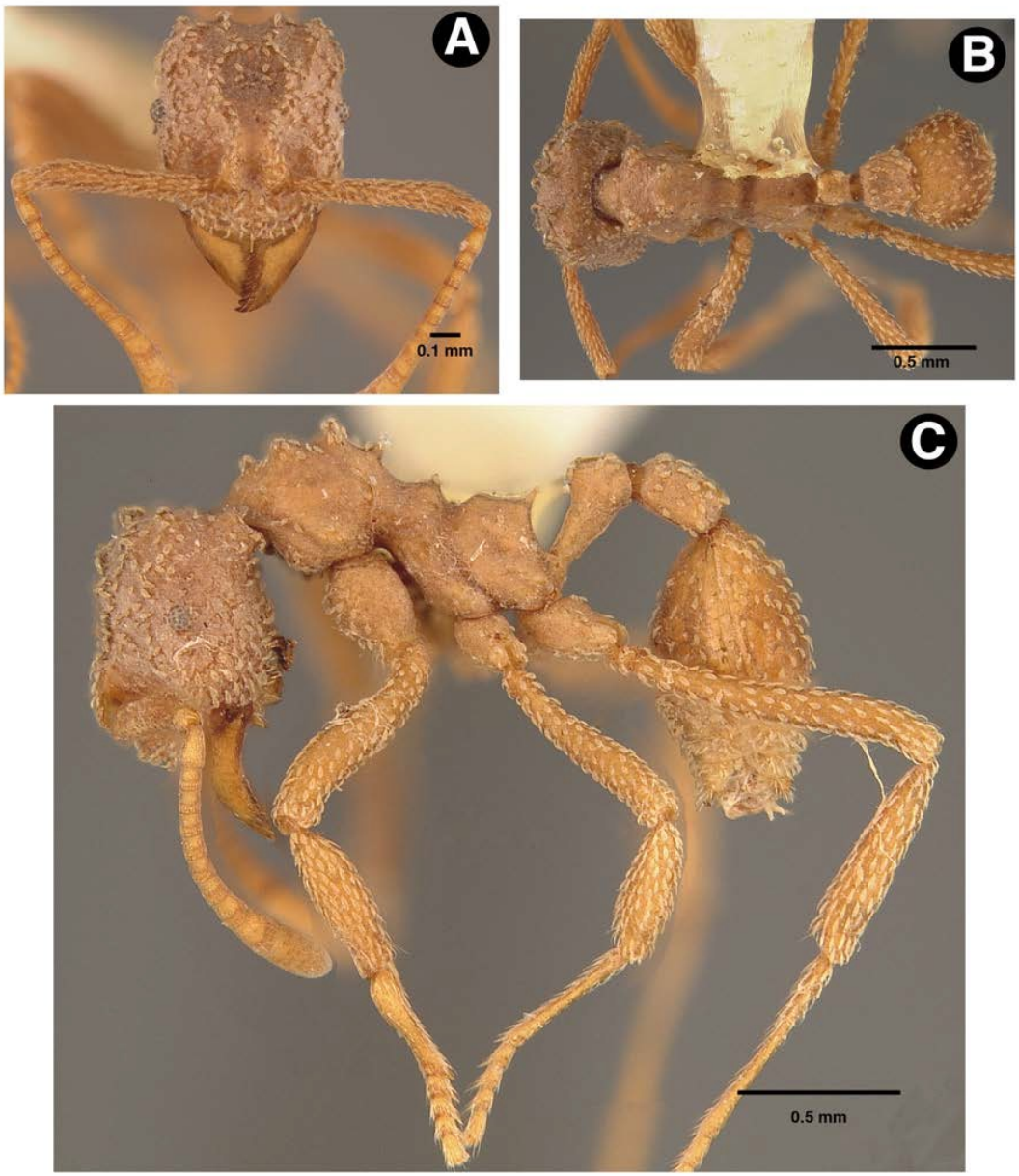


Figure. 2.30. Worker of *Myrmicocrypta spinosa*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

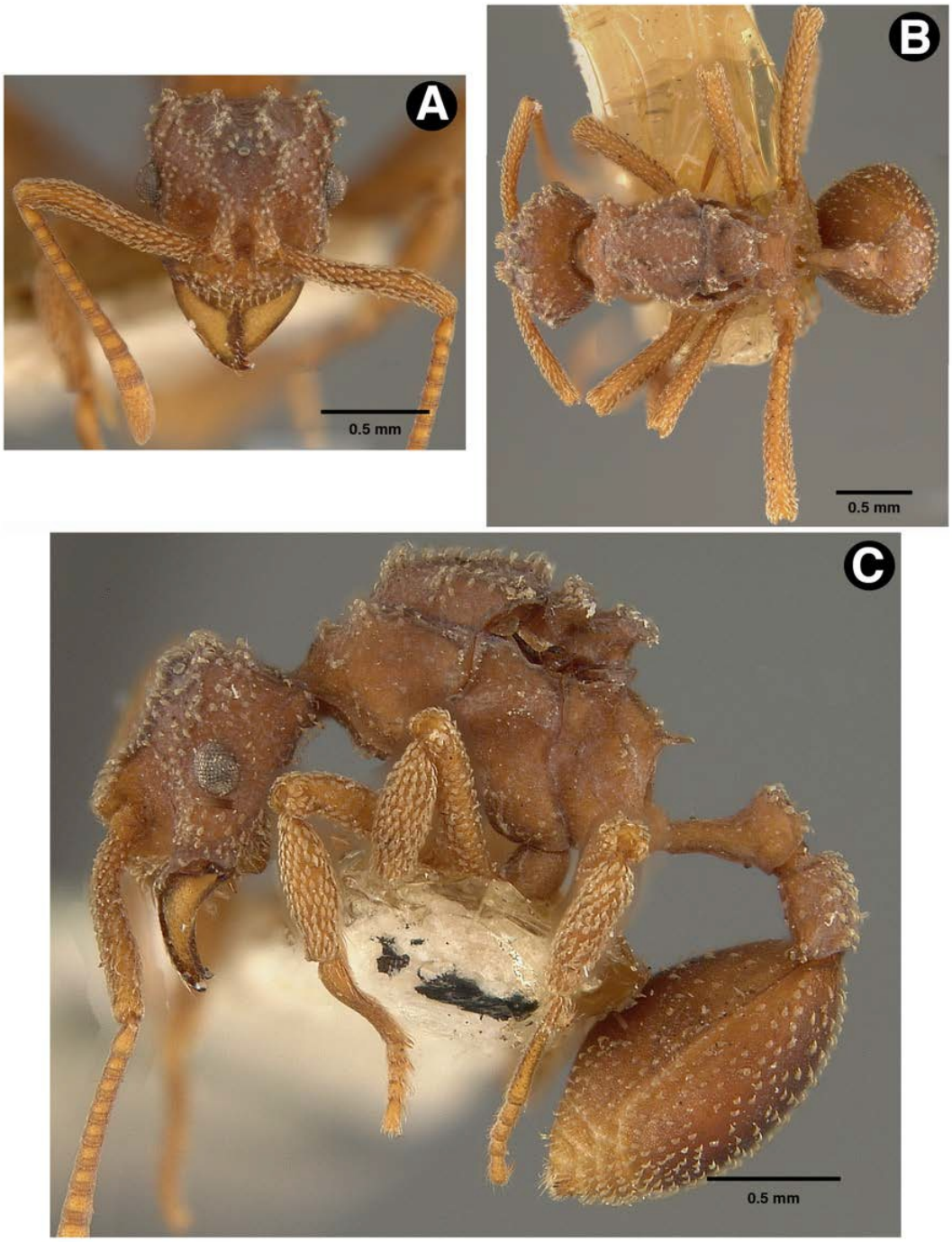


Figure. 2.31. Dealate queen of *Myrmicocrypta spinosa*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

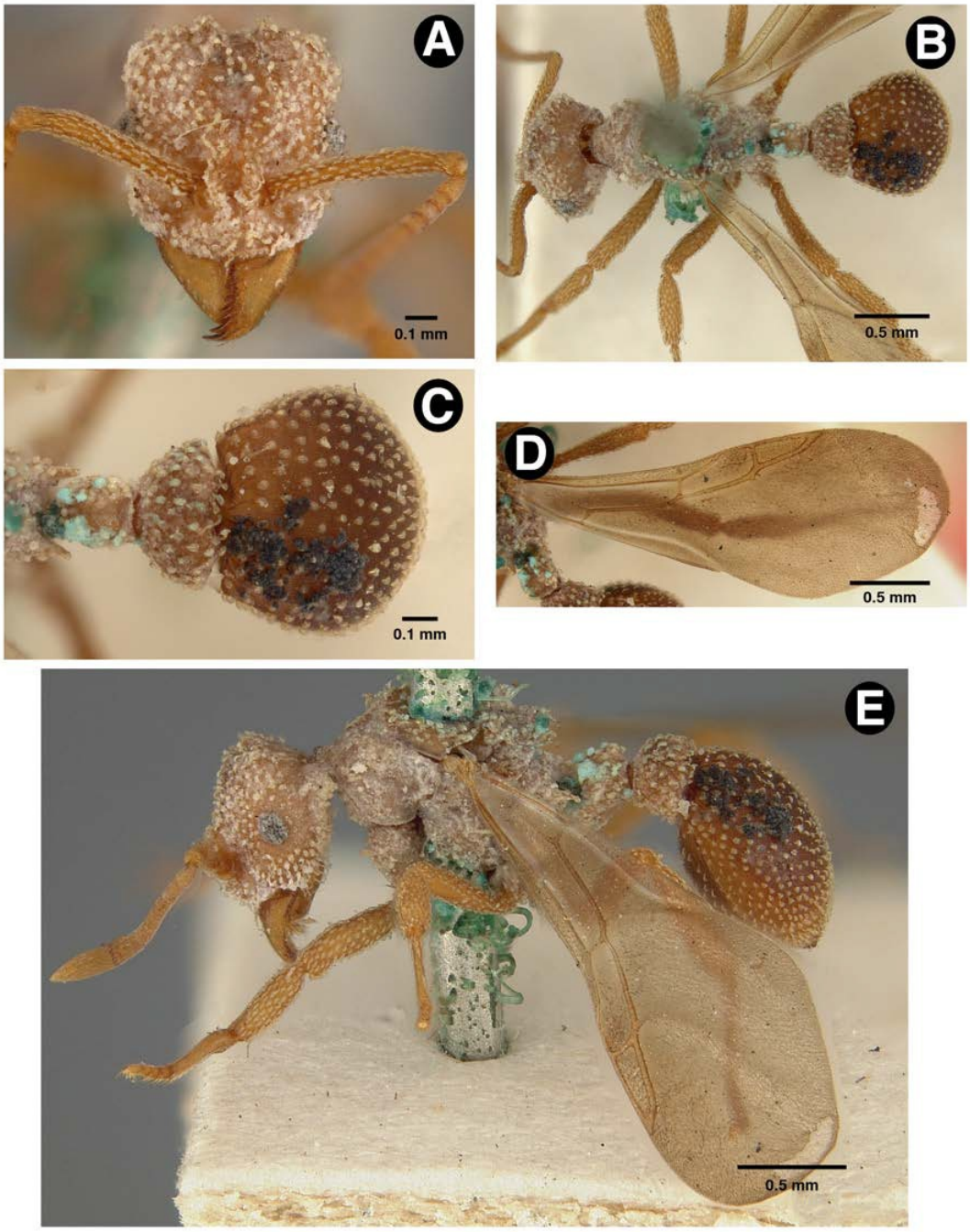


Figure. 2.32. Holotype worker of *Myrmicocrypta squamosa*. (A) Full-face view. (B) Dorsal view. (C) Gaster, dorsal view. (D) Fore wing. (E) Lateral view.

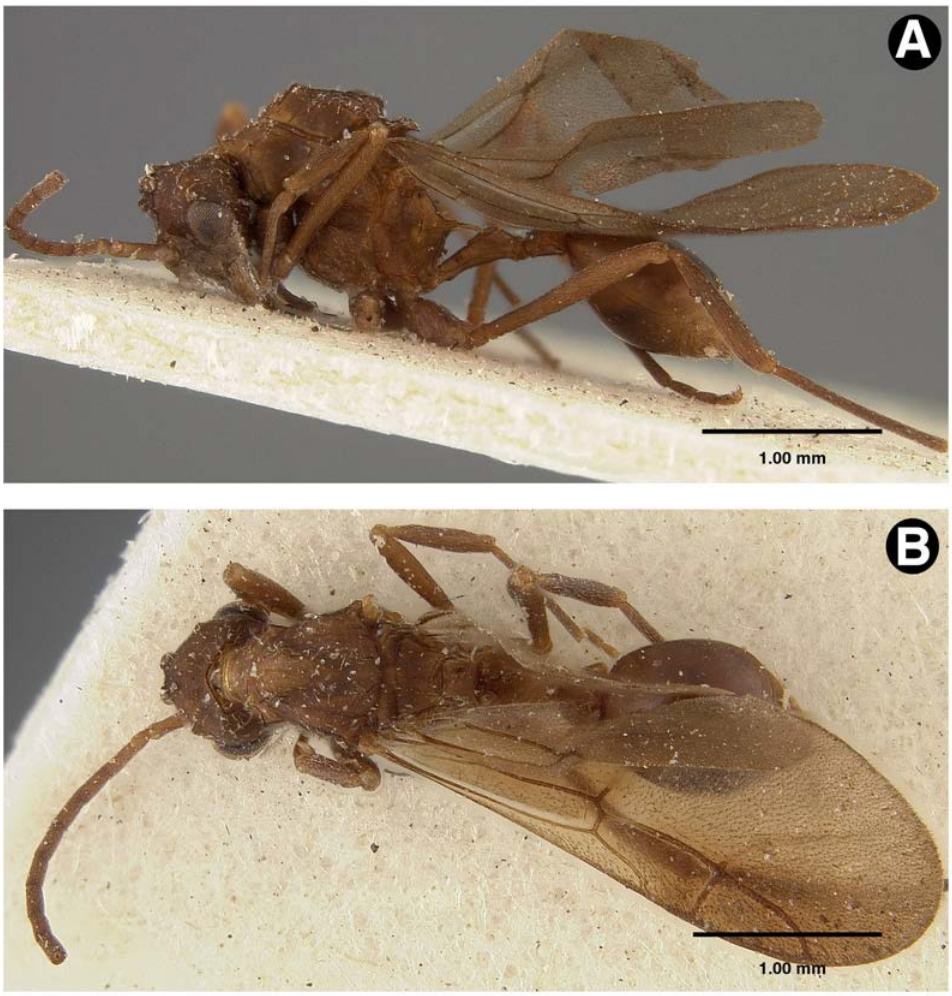


Figure. 2.33. Male of *Myrmicocrypta subnitida*. (A) Lateral view. (B) Dorsal view.

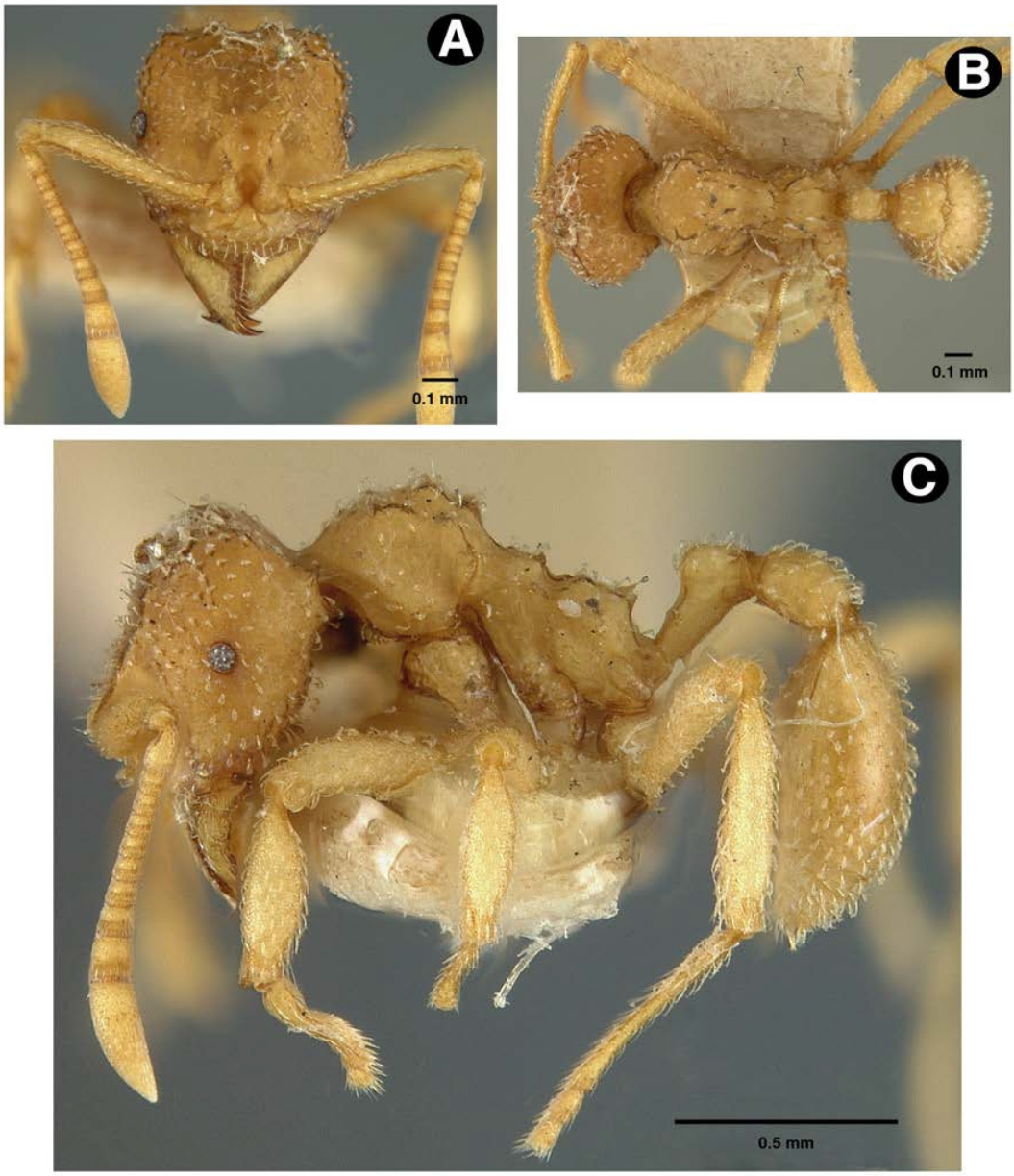


Figure. 2.34. Worker of *Myrmicocrypta surianensis*. (A) Full-face view. (B) Dorsal view. (C) Lateral view. (Photographs by E. Okonski)

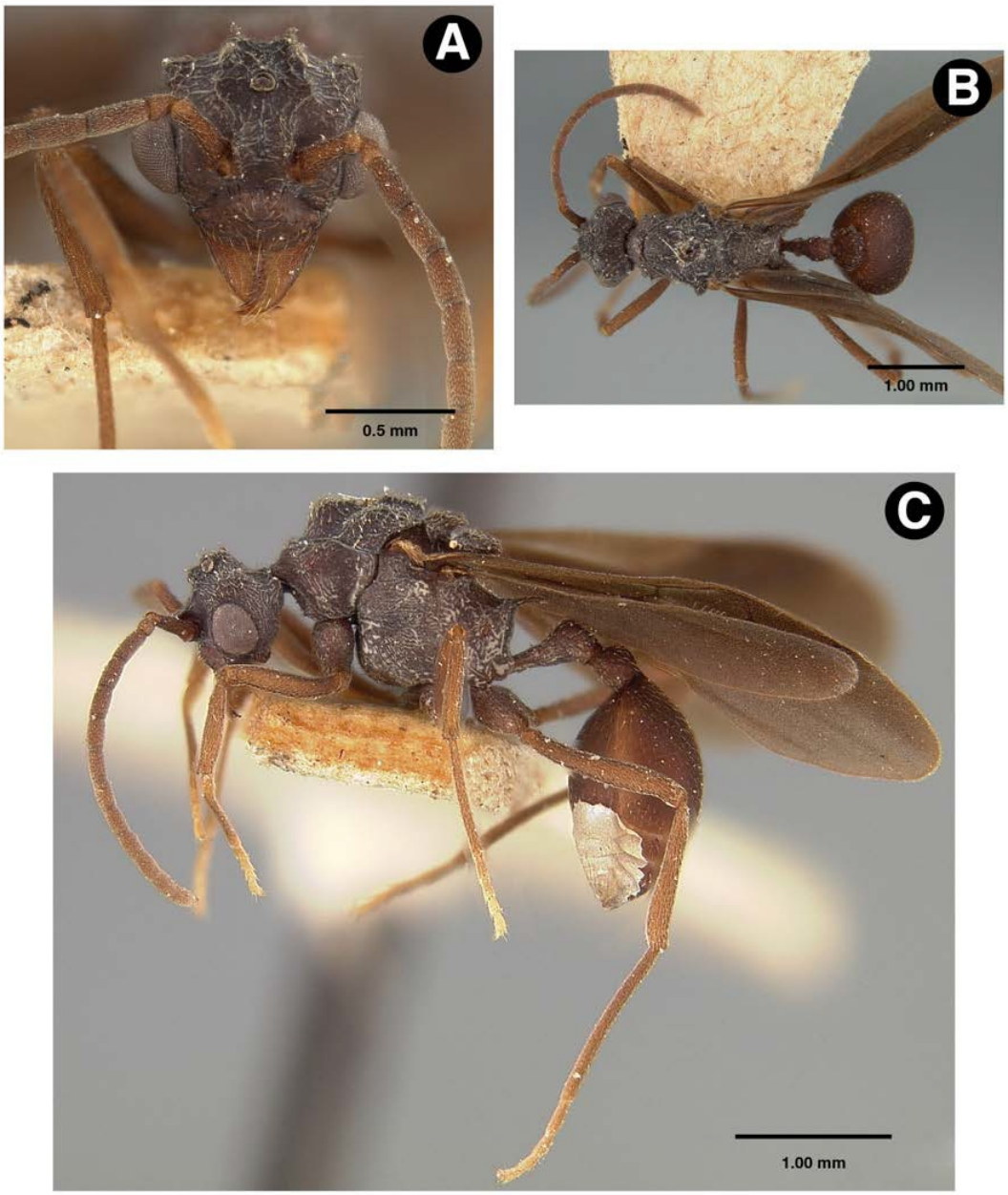


Figure. 2.35. Male of *Myrmicocrypta triangulata*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

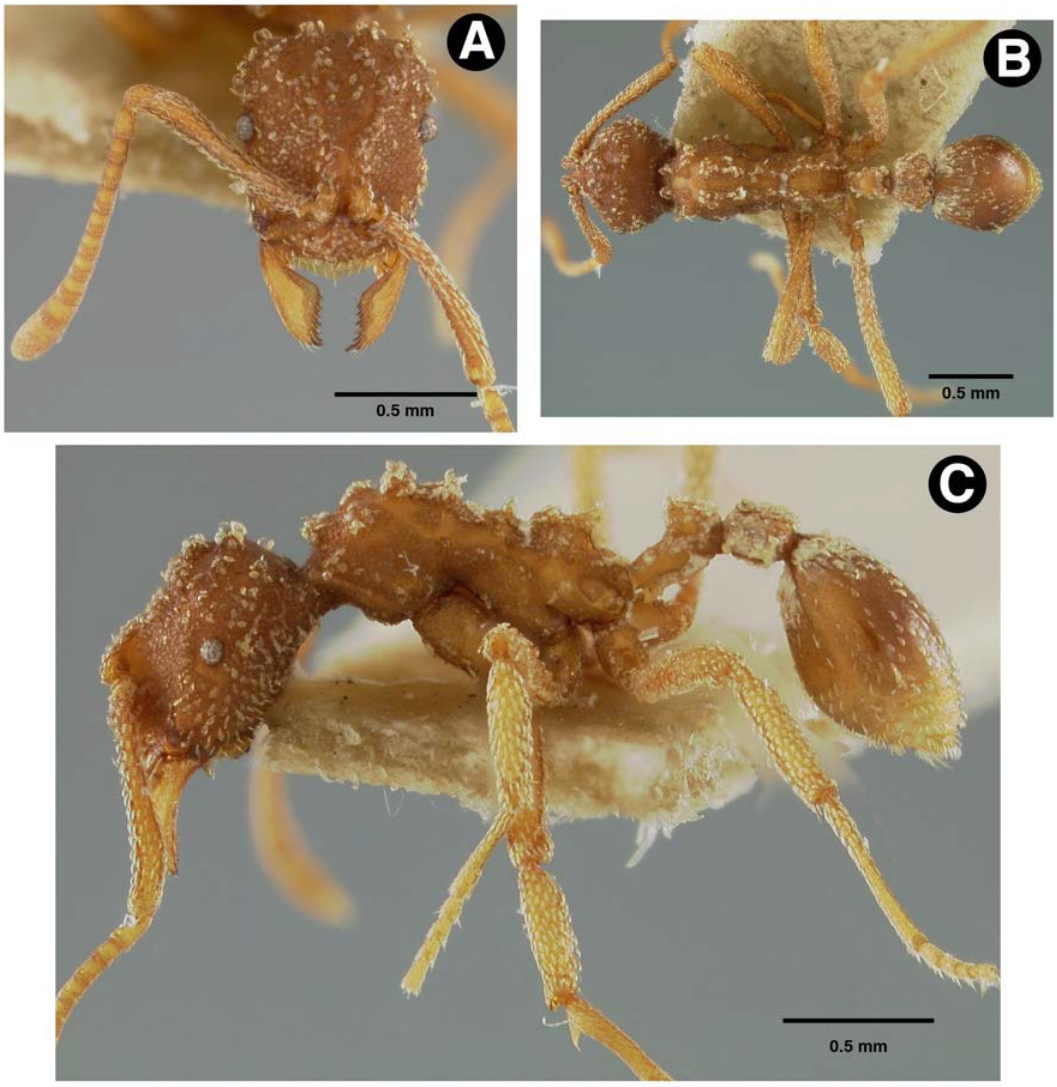


Figure. 2.36. Worker of *Myrmicocrypta tuberculata*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

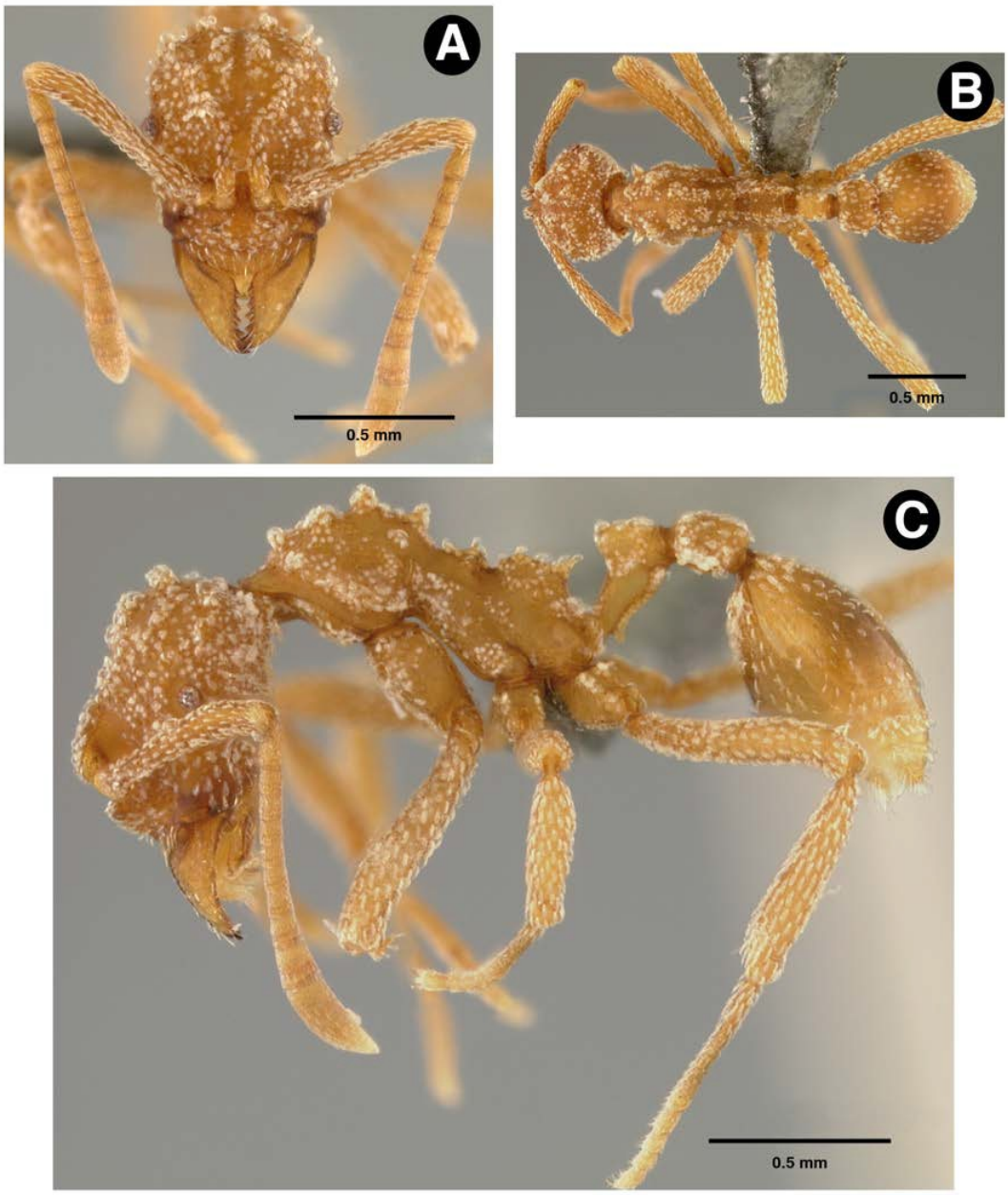


Figure. 2.37. Worker of *Myrmicocrypta tuberculata*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

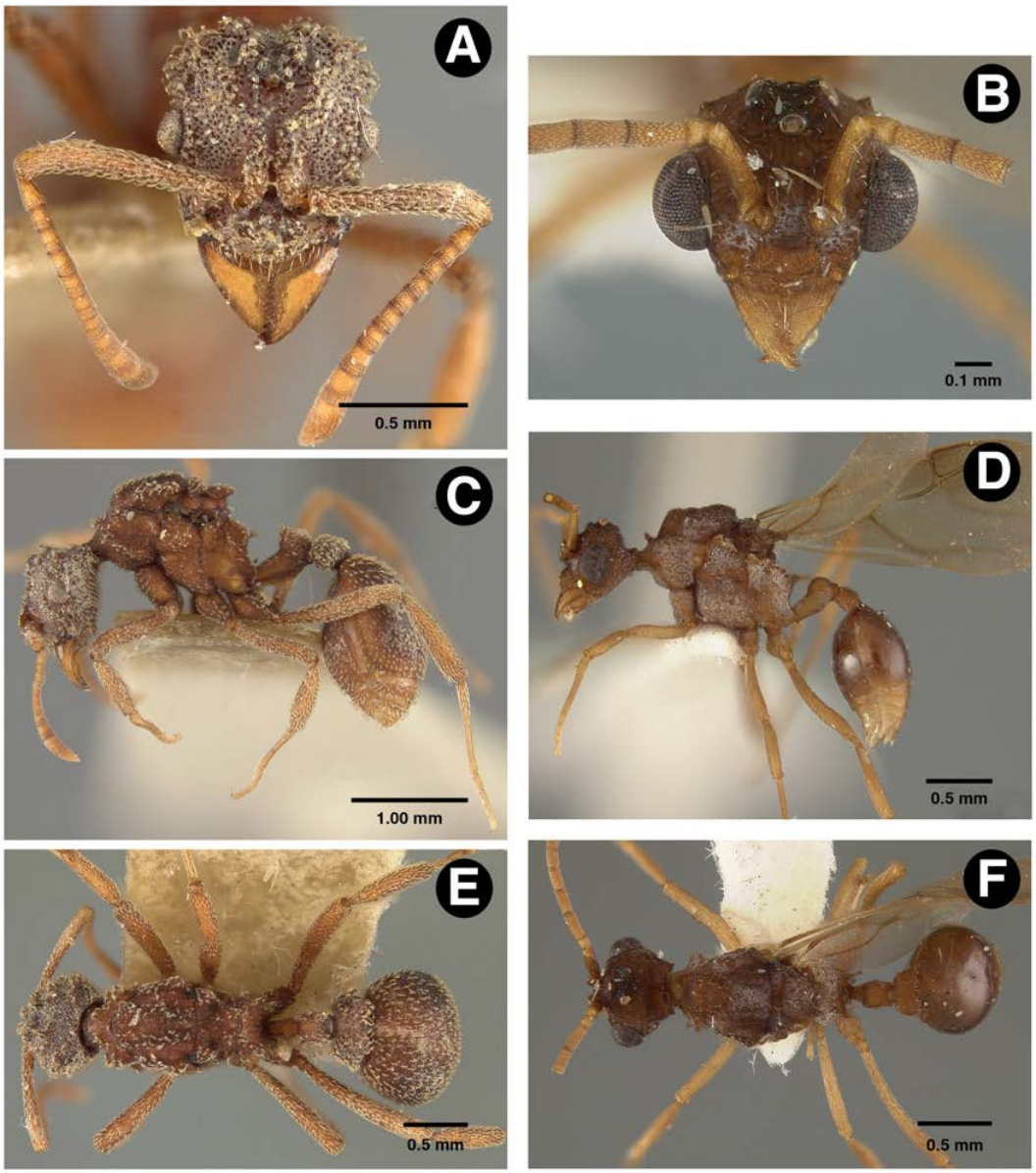


Figure. 2.38. Dealate queen (A, C, E) and male (B, D, F) of *Myrmicocrypta tuberculata*. (A, B) Full-face view. (C, D) Lateral view. (E, F) Dorsal view.

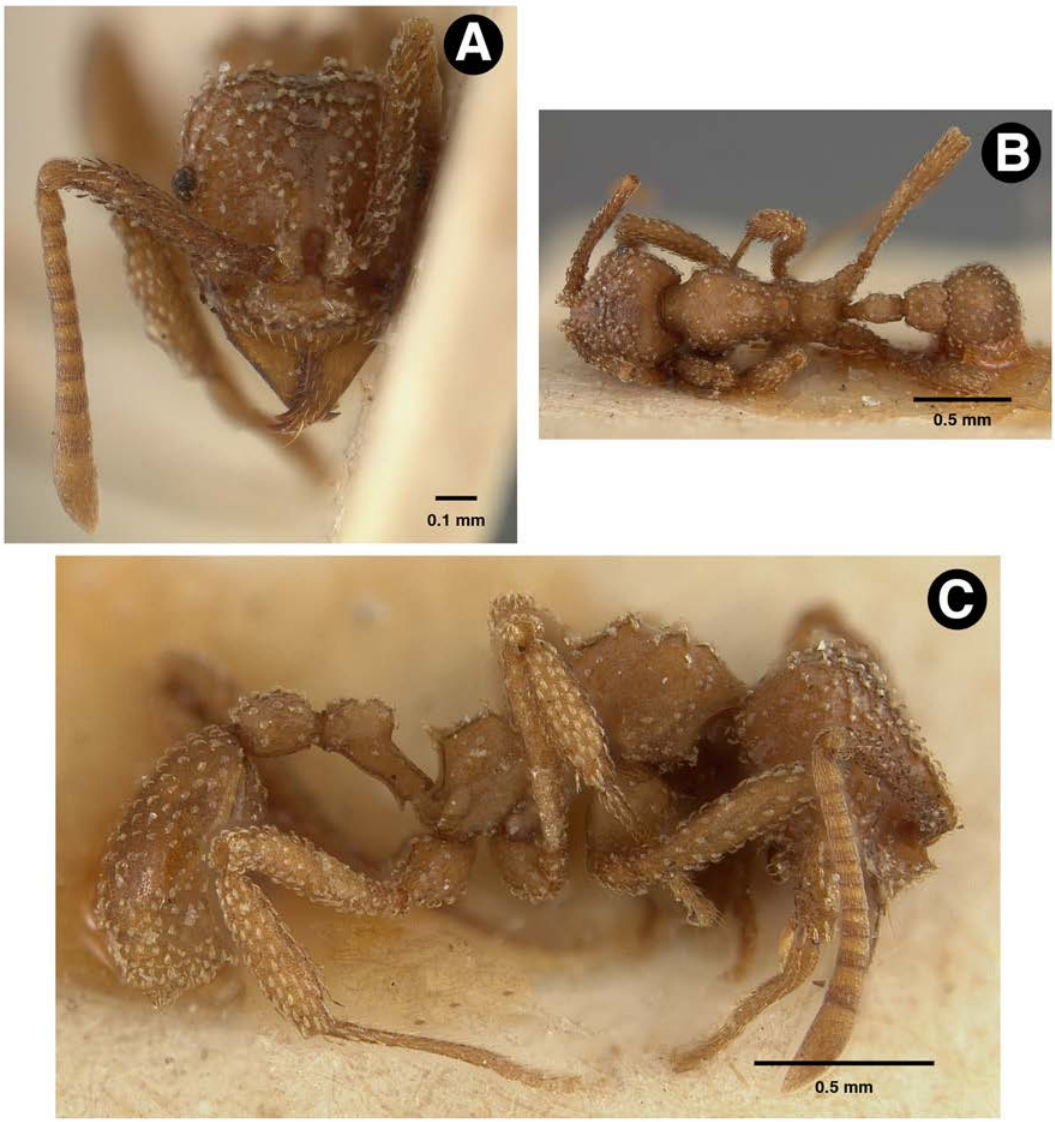


Figure. 2.39. Worker of *Myrmicocrypta uncinata*. (A) Full-face view. (B) Dorsal view. (C) Lateral view. (From Paraguay, Mayr)

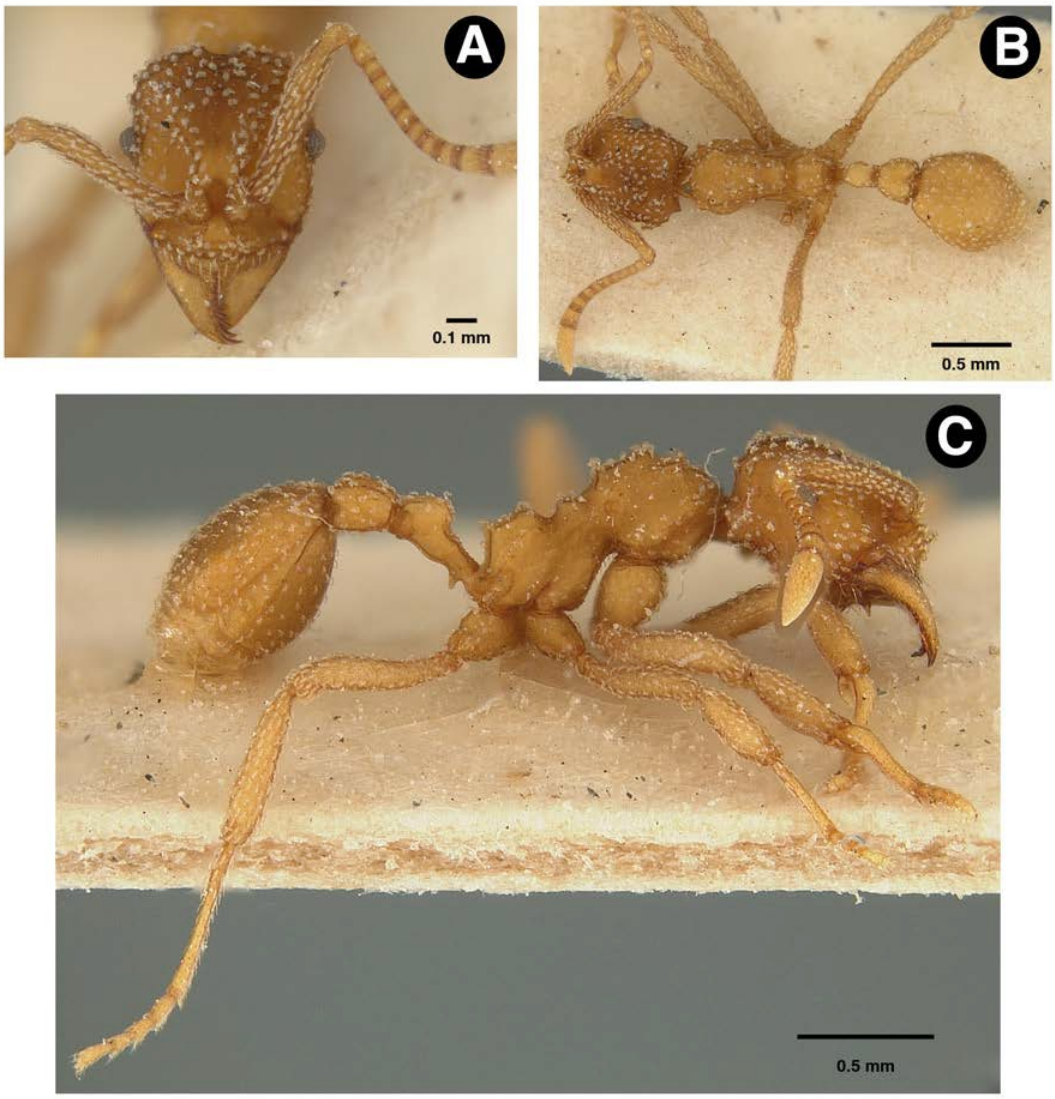


Figure. 2.40. Worker of *Myrmicocrypta uncinata*. (A) Full-face view. (B) Dorsal view. (C) Lateral view. (Note: cotype worker of *Myrmicocrypta bruchi*)

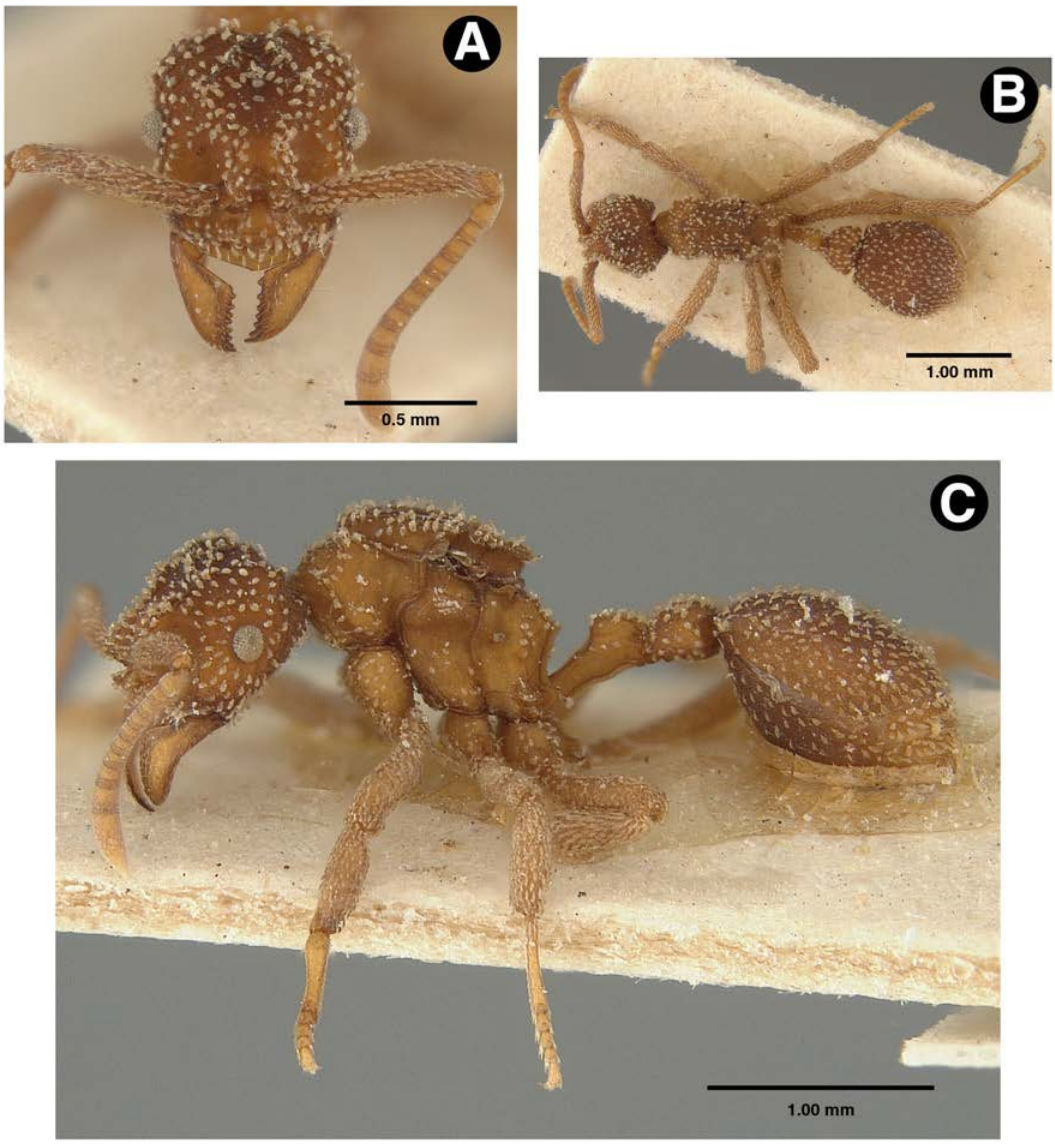


Figure. 2.41. Dealate queen of *Myrmicocrypta uncinata*. (A) Full-face view. (B) Dorsal view. (C) Lateral view. (Note: cotype specimen of *Myrmicocrypta bruchi*)

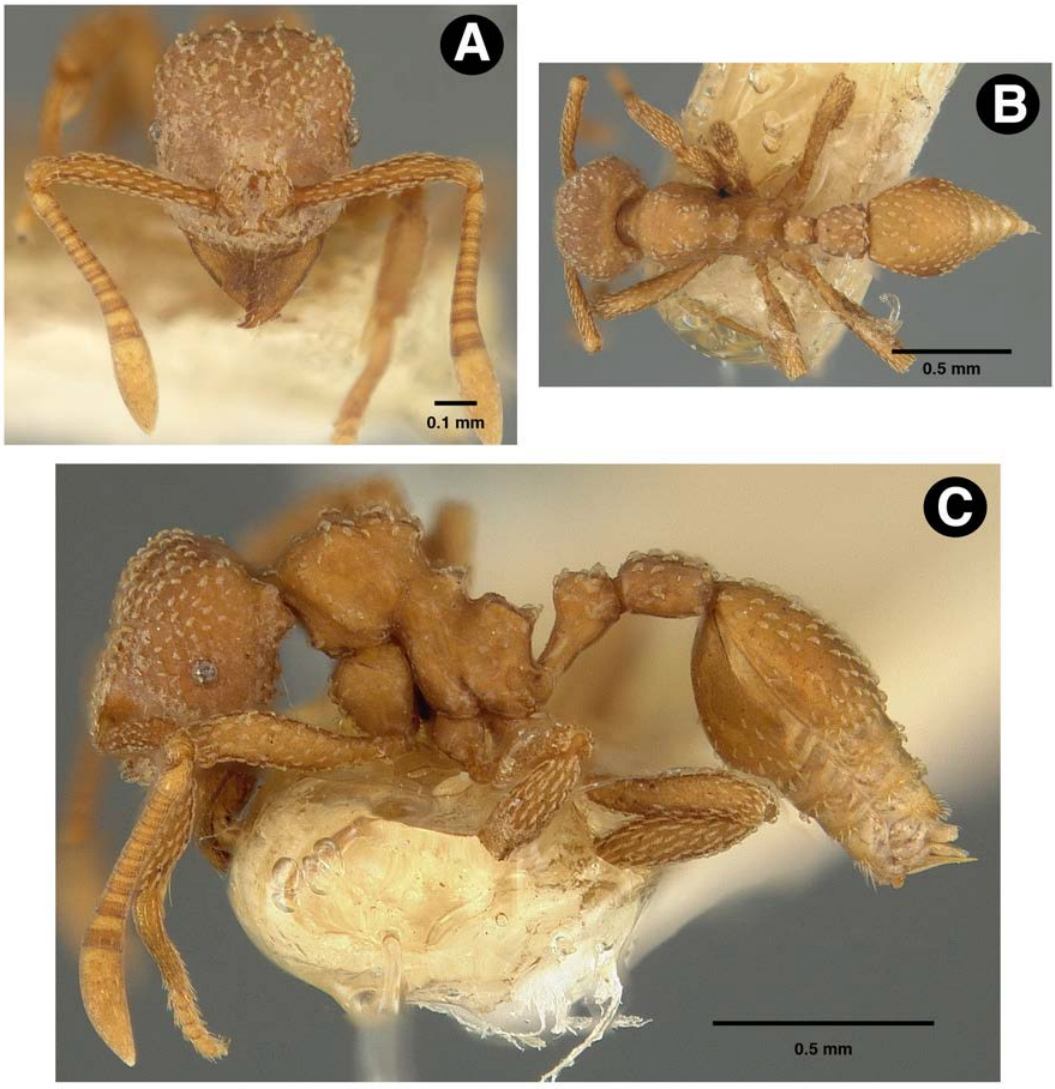


Figure. 2.42. Worker of *Myrmicocrypta unidentata*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

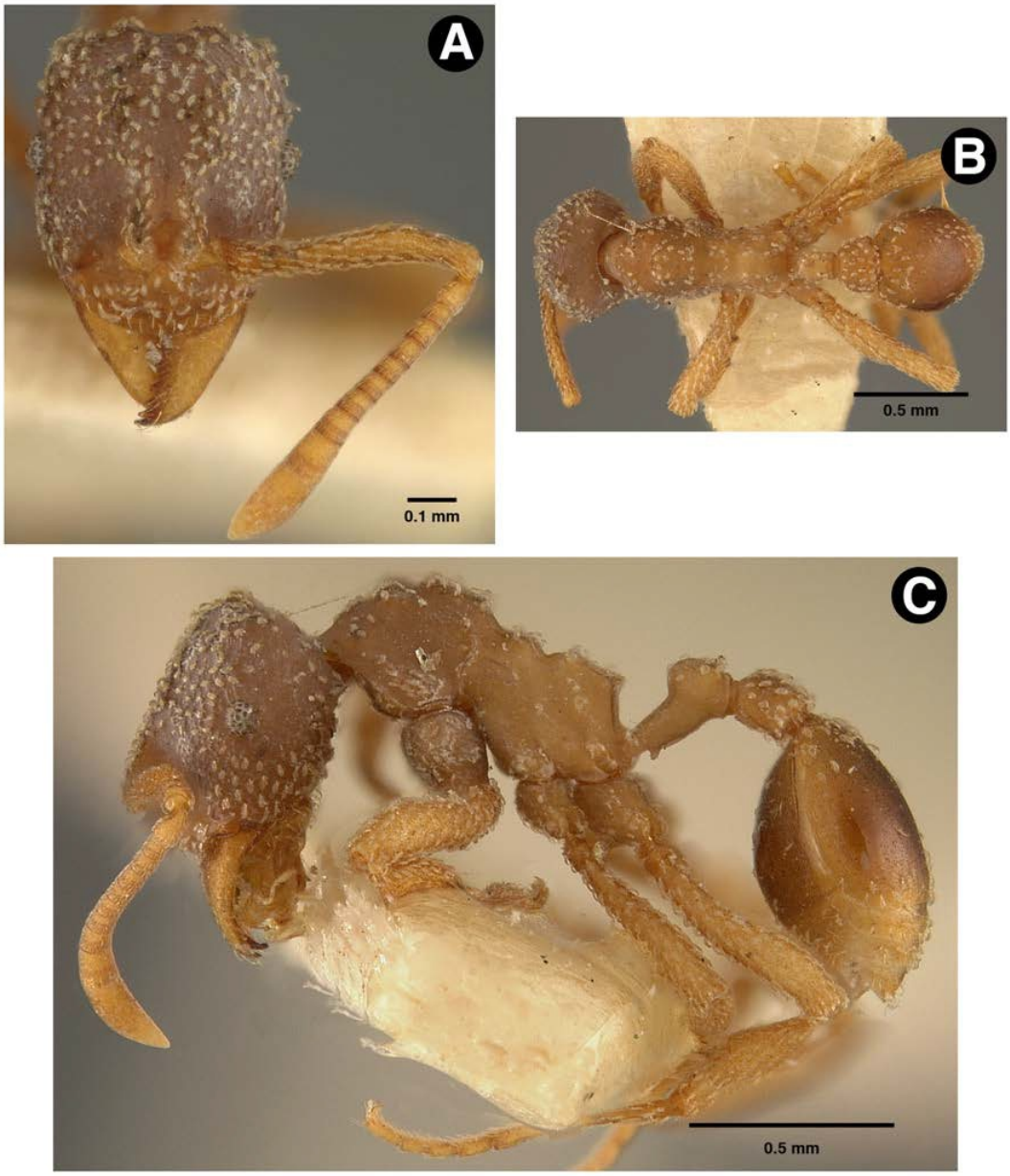


Figure. 2.43. Worker of *Myrmicocrypta urichi*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

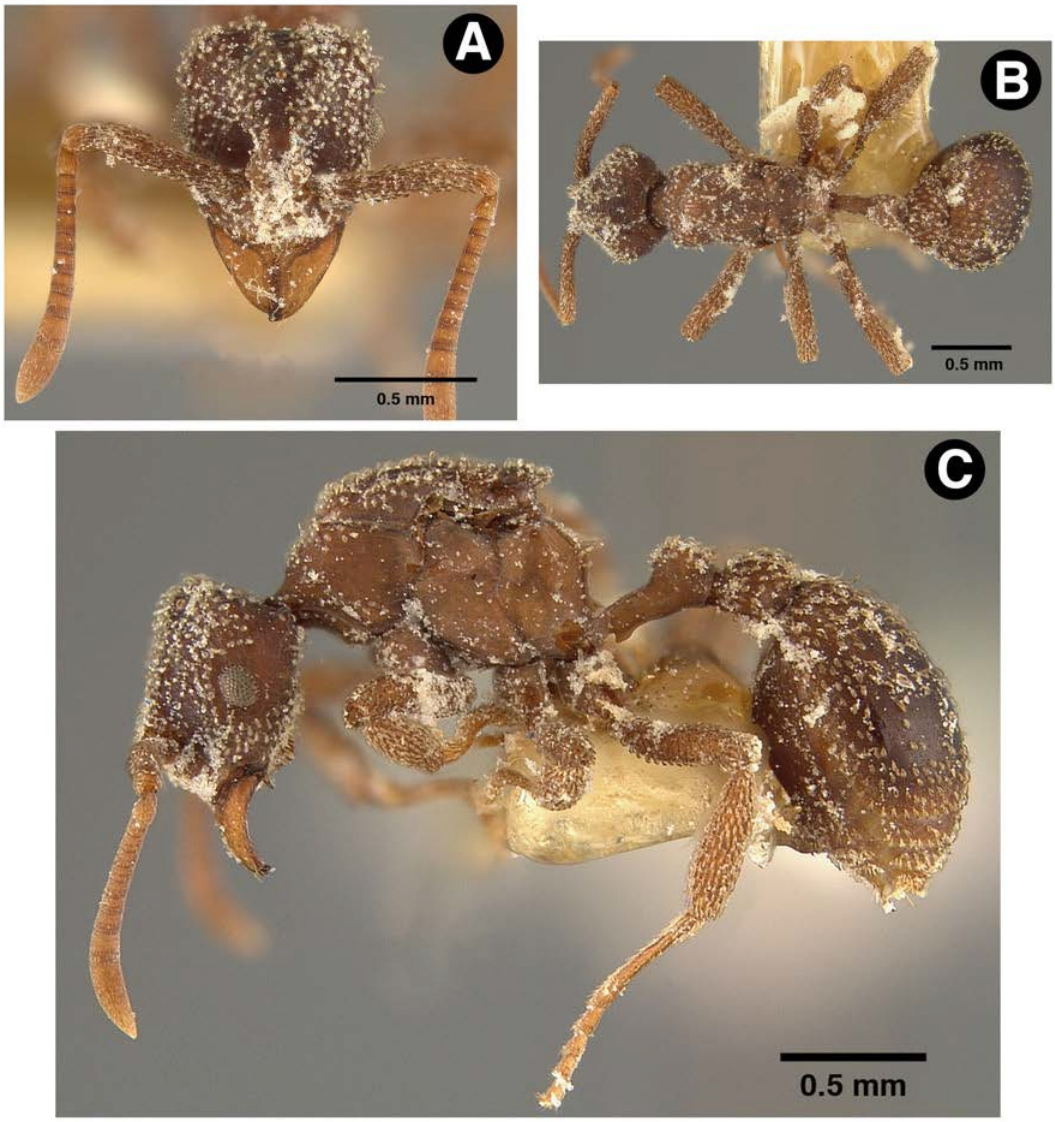


Figure. 2.44. Dealate queen of *Myrmicocrypta urichi*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

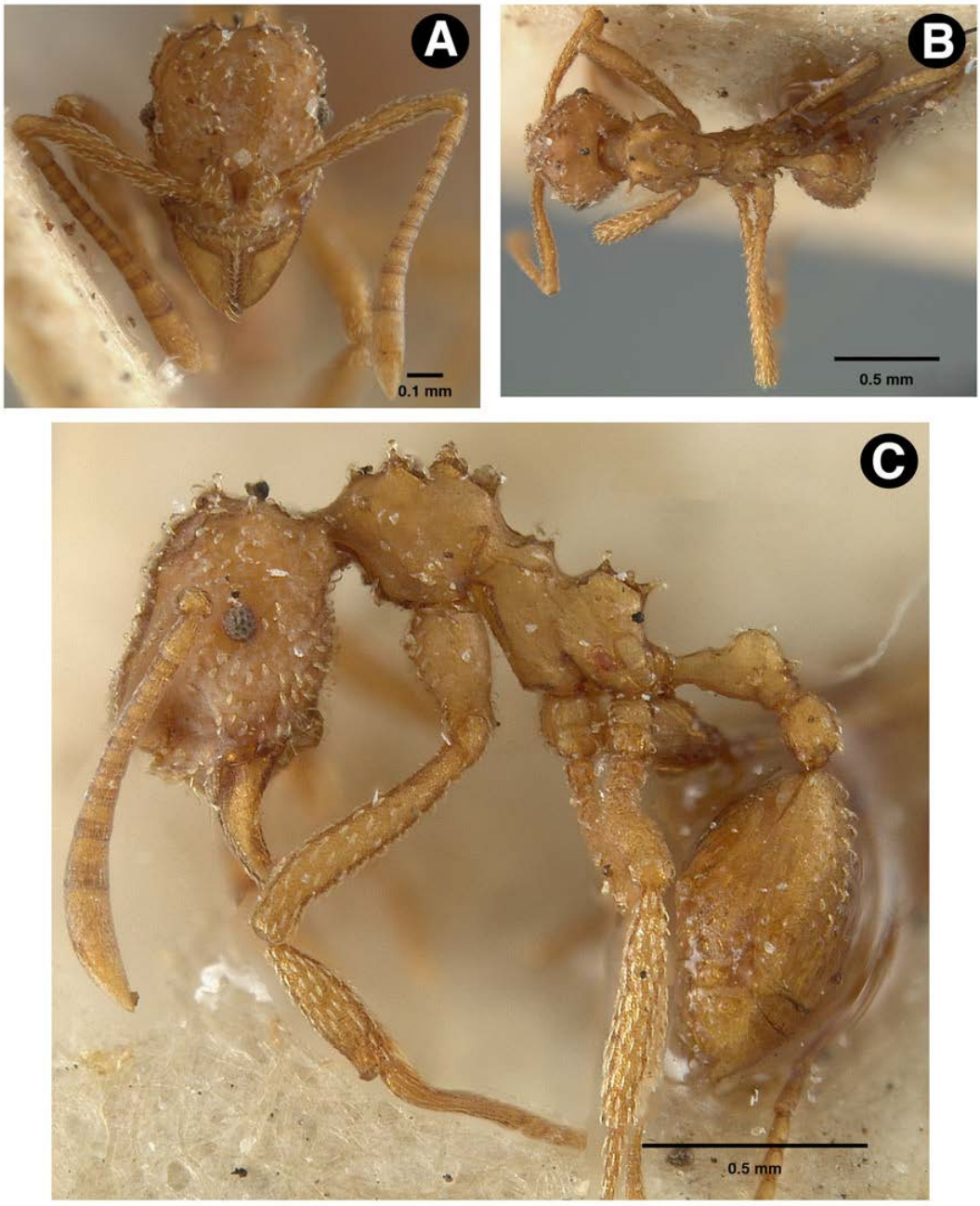


Figure. 2.45. Worker of *Myrmicocrypta weyrauchi*. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

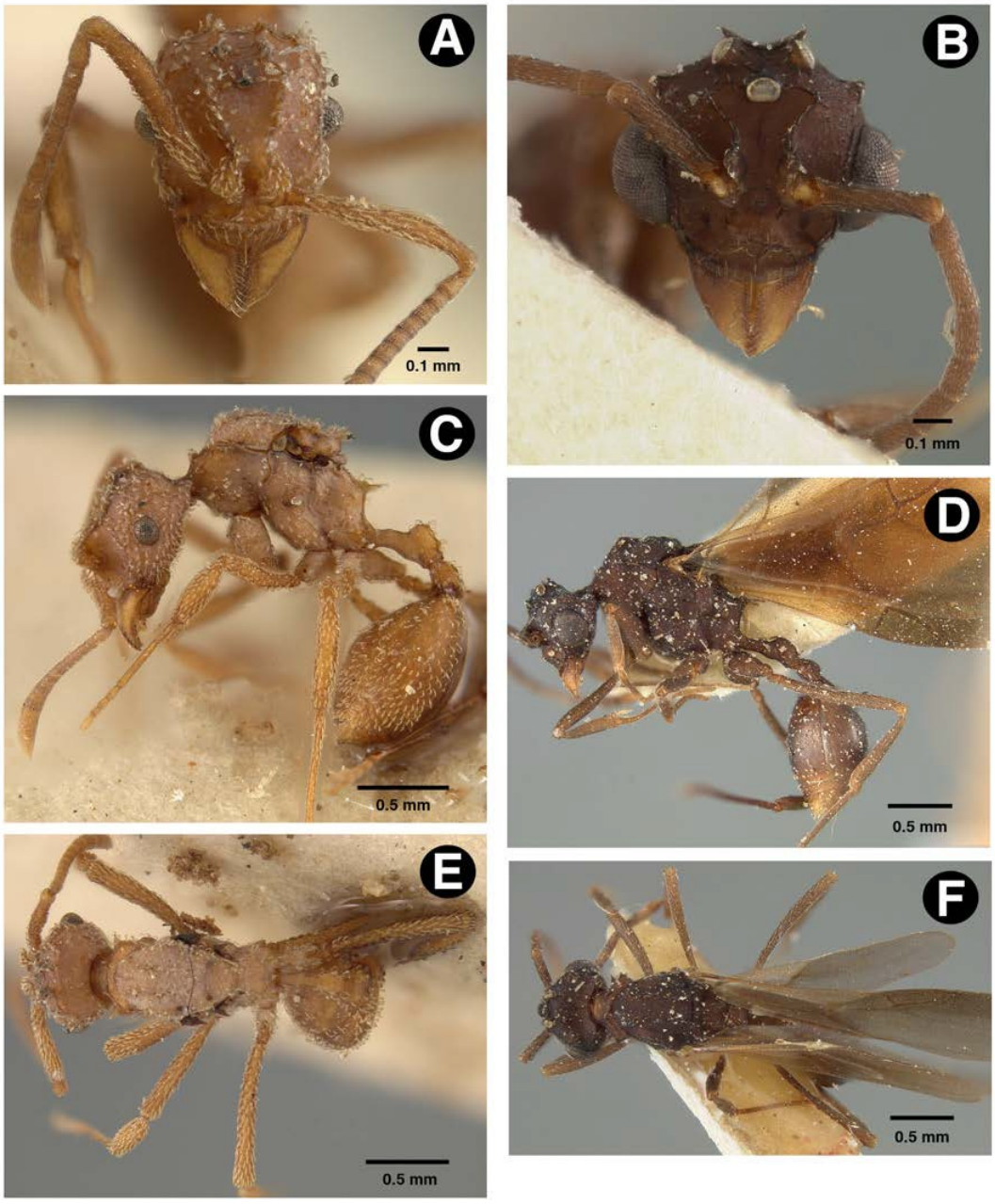


Figure. 2.46. Dealate queen (A, C, E) and male (B, D, F) of *Myrmicocrypta camargoi*. (A, B) Full-face view. (C, D) Lateral view. (E, F) Dorsal view.

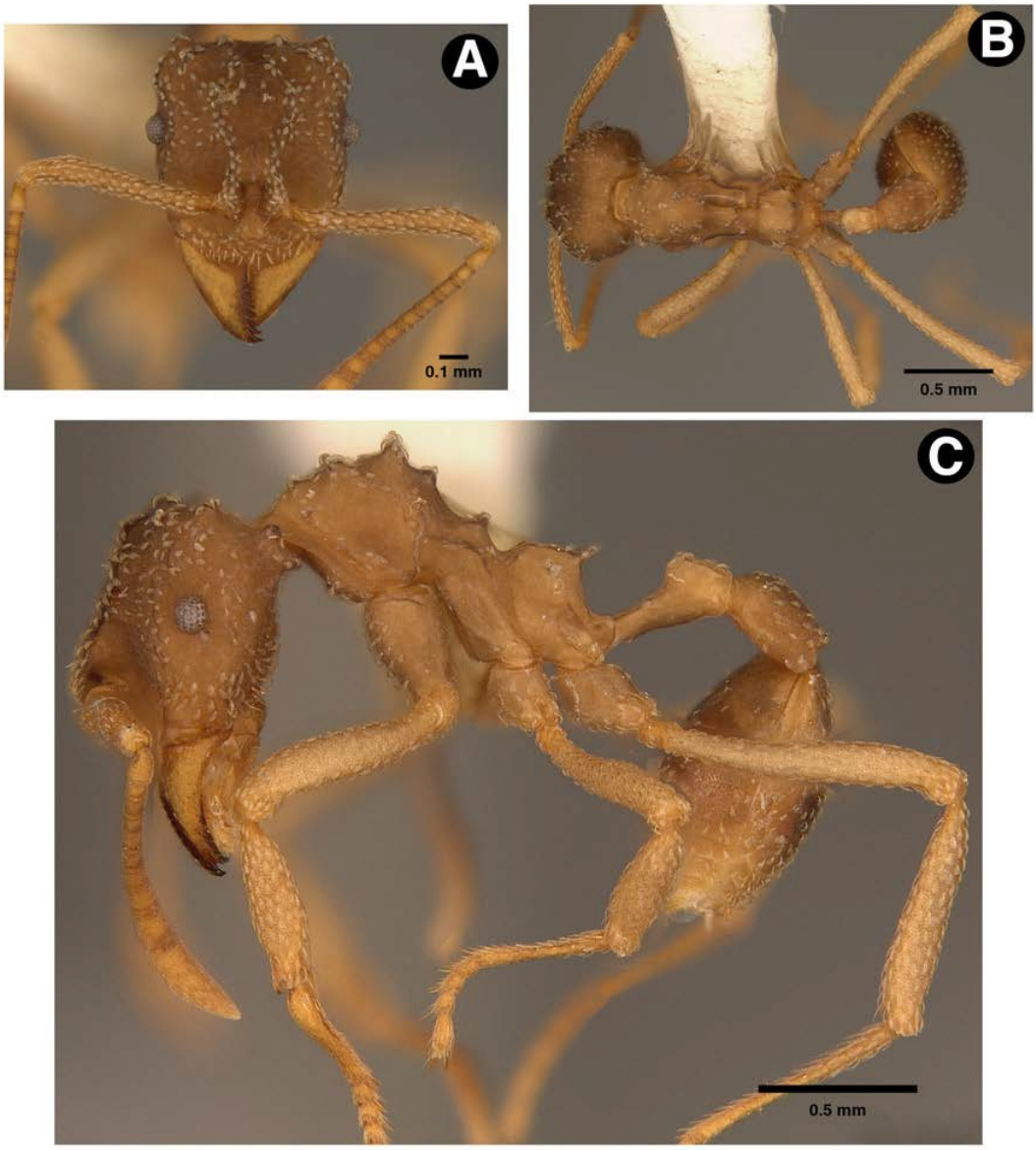


Figure. 2.47. Holotype worker of *Myrmicocrypta JSC–001* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

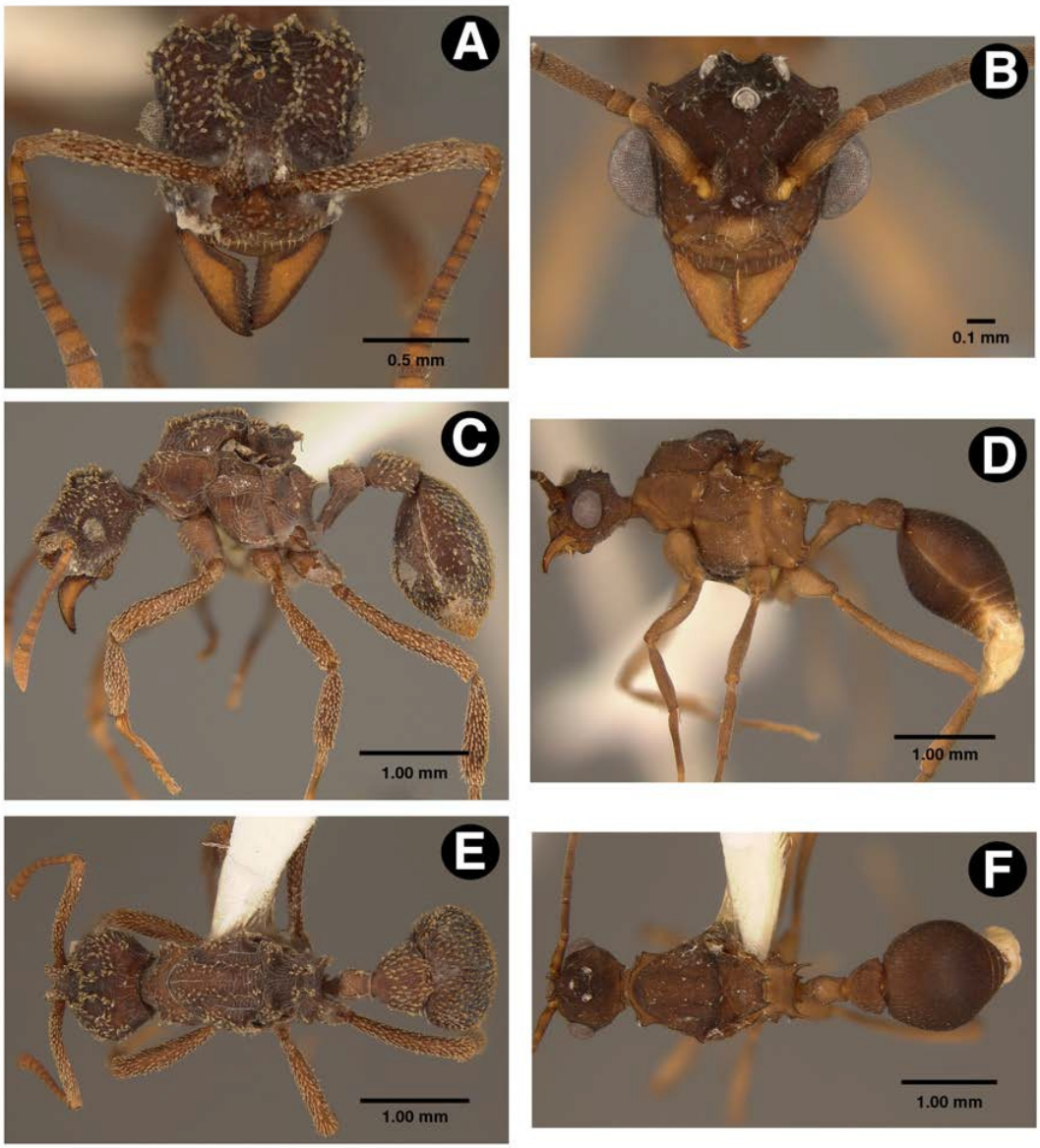


Figure. 2.48. Dealate queen (A, C, E) and male (B, D, F) of *Myrmicocrypta JSC–001* **sp. nov.** (A, B) Full-face view. (C, D) Lateral view. (E, F) Dorsal view.

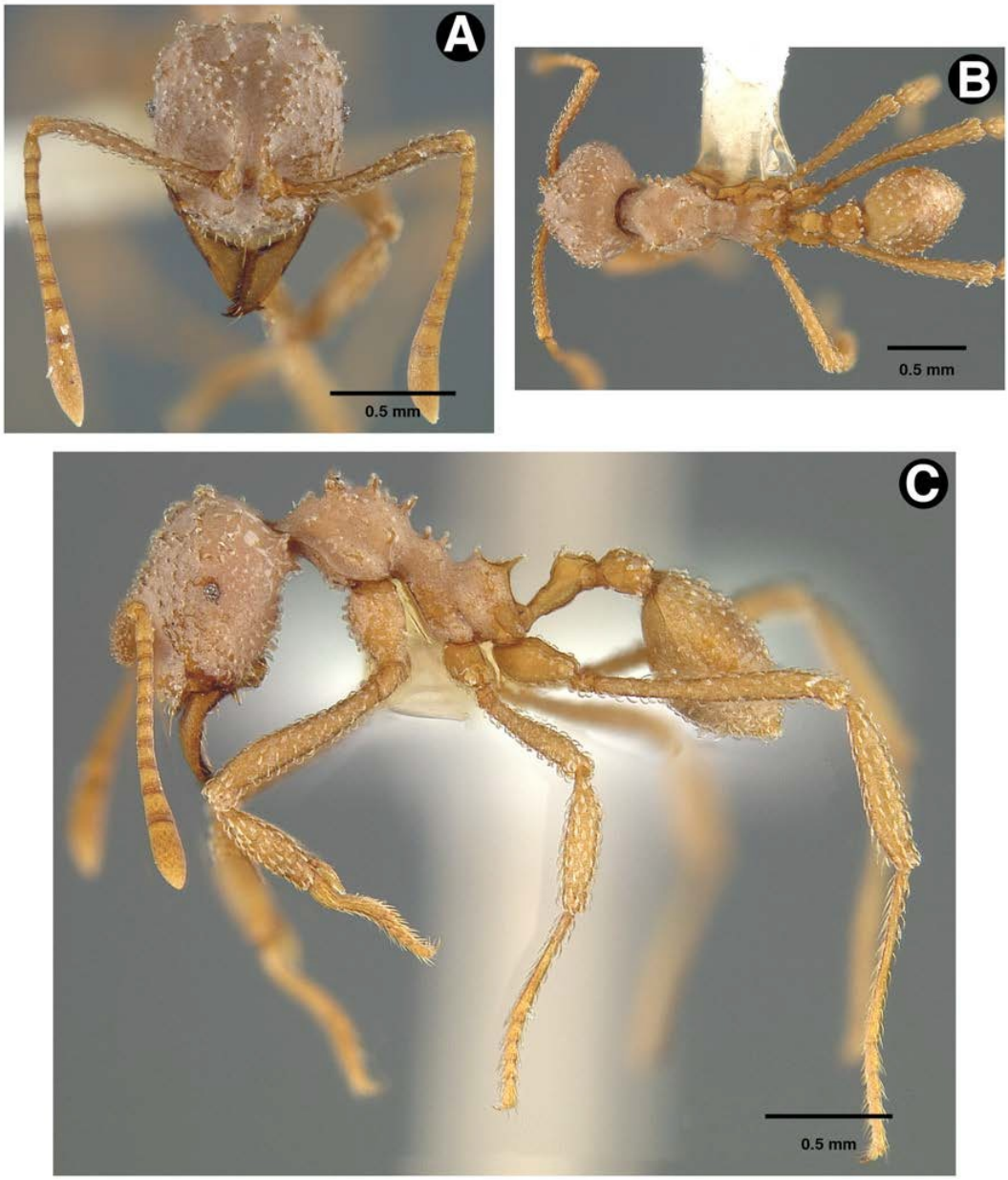


Figure. 2.49. Holotype worker of *Myrmicocrypta JSC–003* **sp. nov.** (A) Full-face view. (B) Dorsal view. (C) Lateral view.

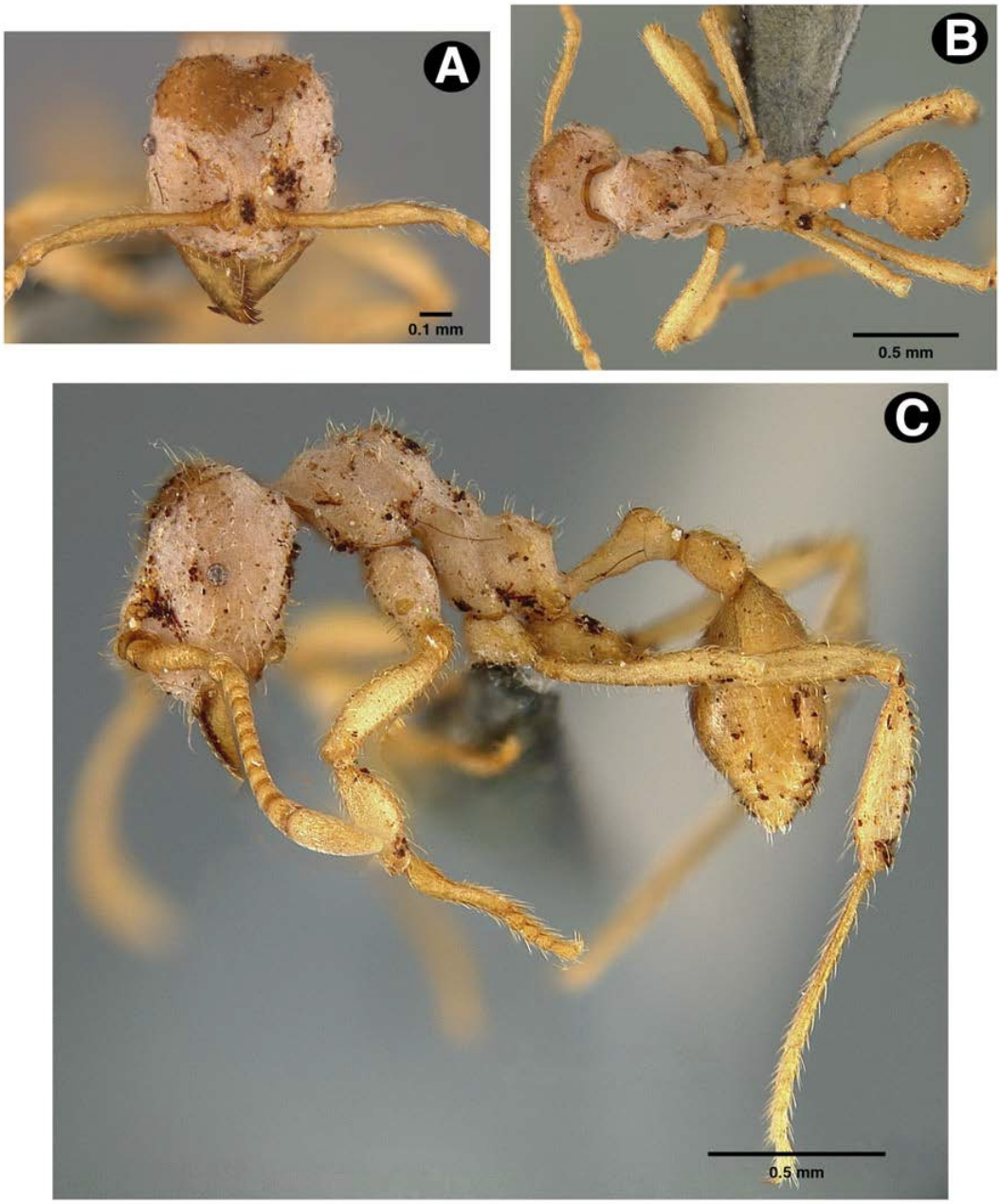


Figure. 2.50. Holotype worker of *Myrmicocrypta JSC–005* **sp. nov.** (A) Full-face view. (B) Dorsal view. (C) Lateral view.

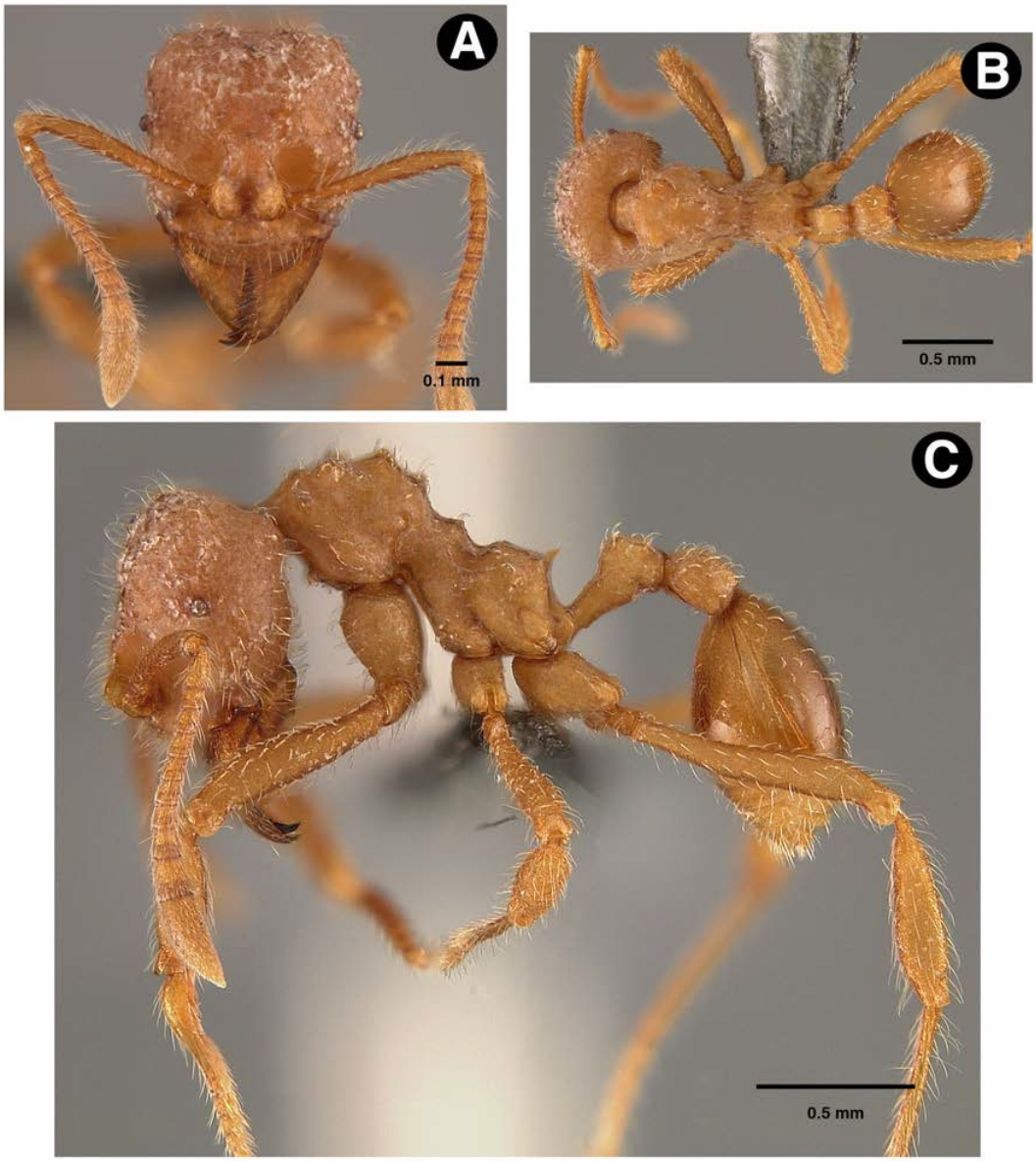


Figure. 2.51. Holotype worker of *Myrmicocrypta JSC–006* **sp. nov.** (A) Full-face view. (B) Dorsal view. (C) Lateral view.

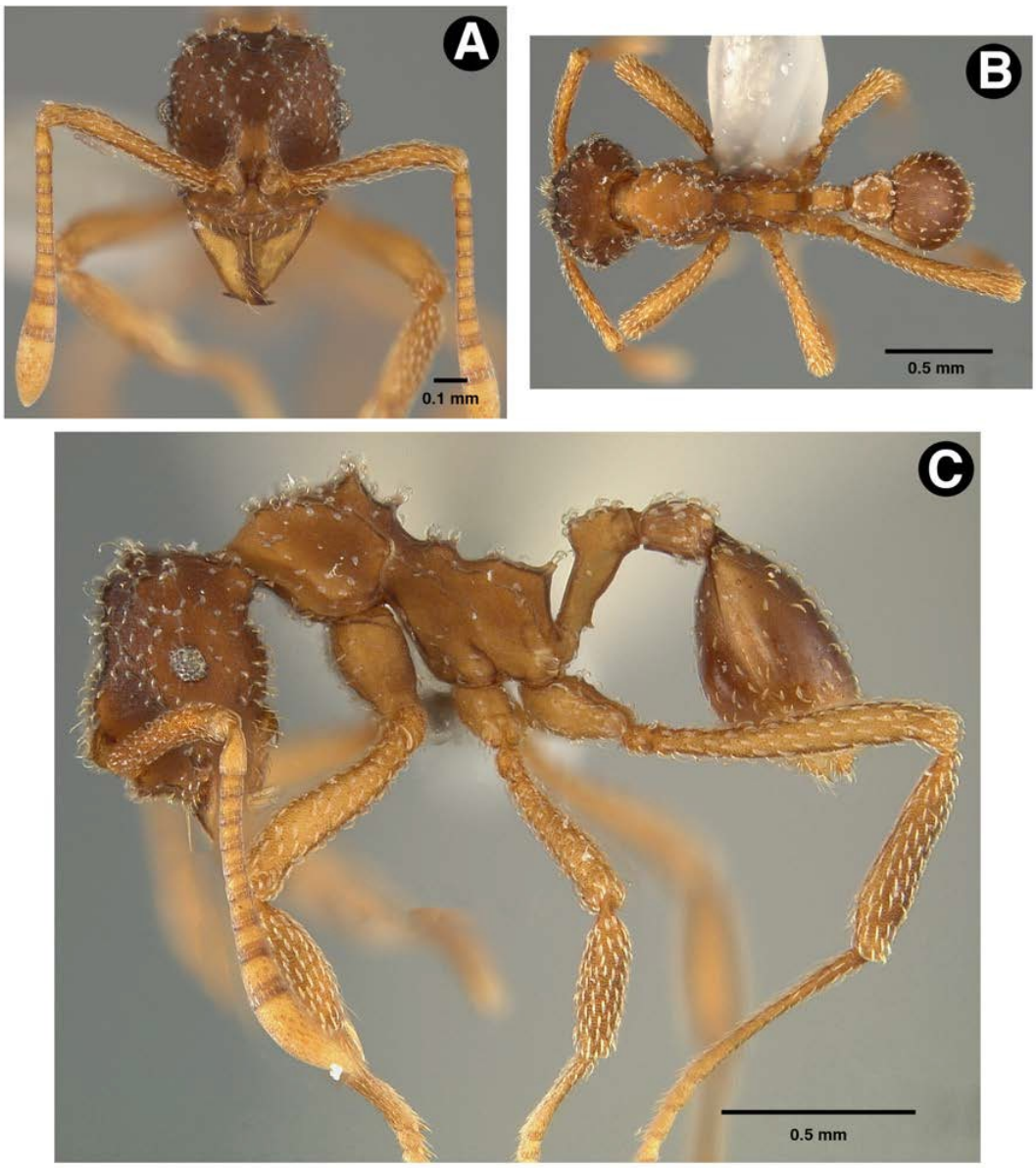


Figure. 2.52. Holotype worker of *Myrmicocrypta JSC–008* **sp. nov.** (A) Full-face view. (B) Dorsal view. (C) Lateral view.

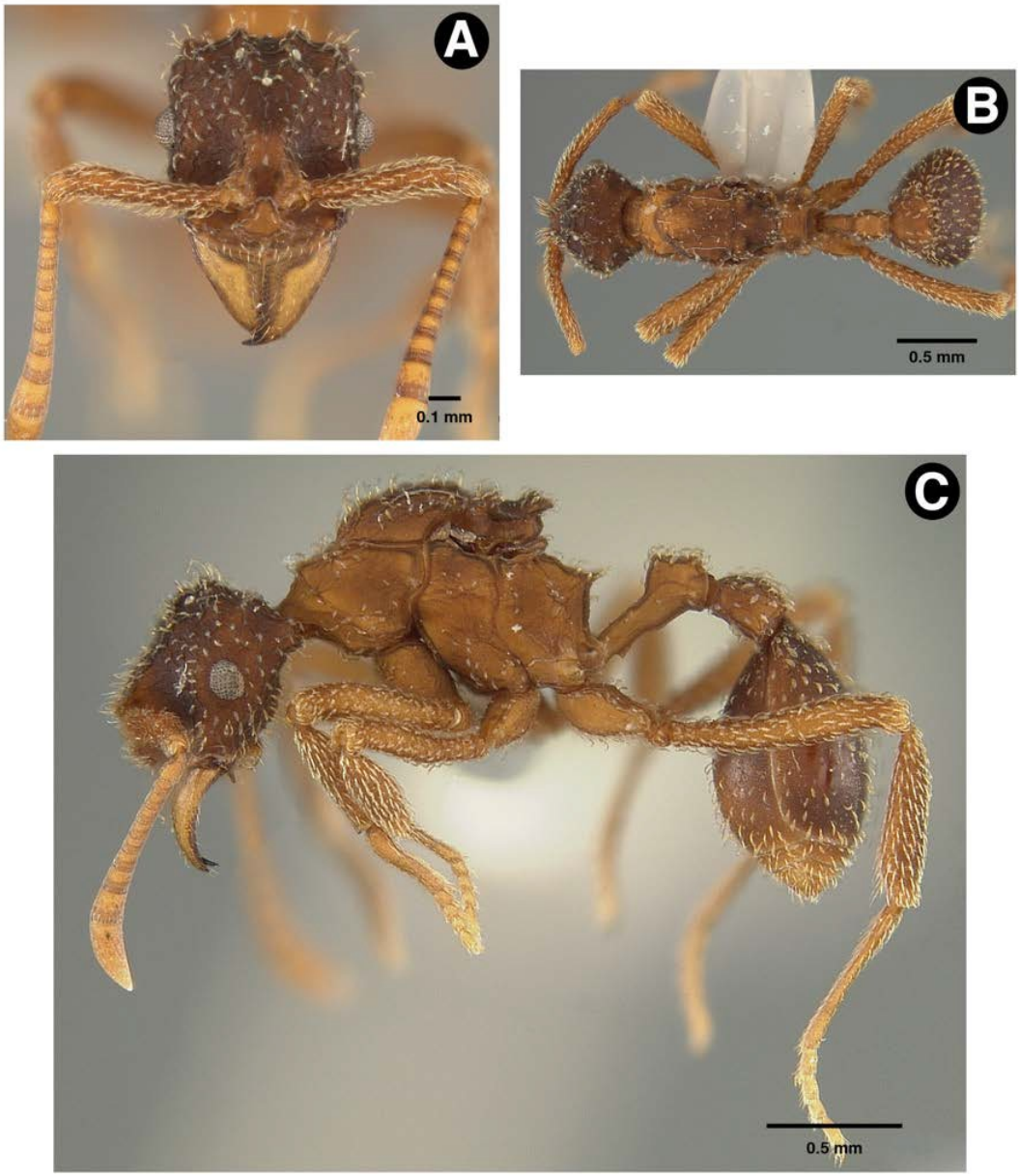


Figure. 2.53. Holotype worker of *Myrmicocrypta JSC–008* **sp. nov.** (A) Full-face view. (B) Dorsal view. (C) Lateral view.

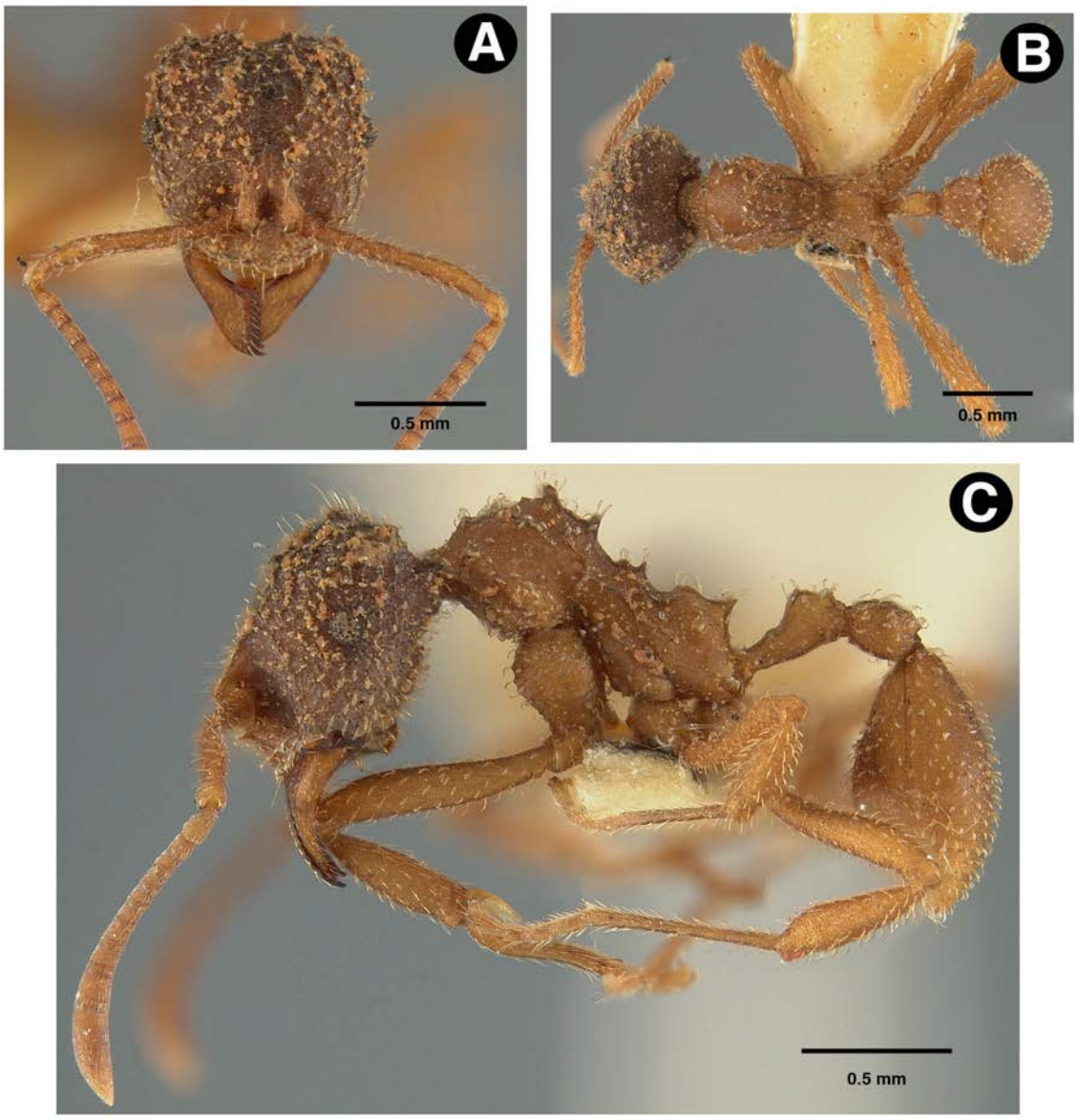


Figure 2.54. Holotype worker of *Myrmicocrypta JSC–009* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view. (Photographs by E. Okonski)

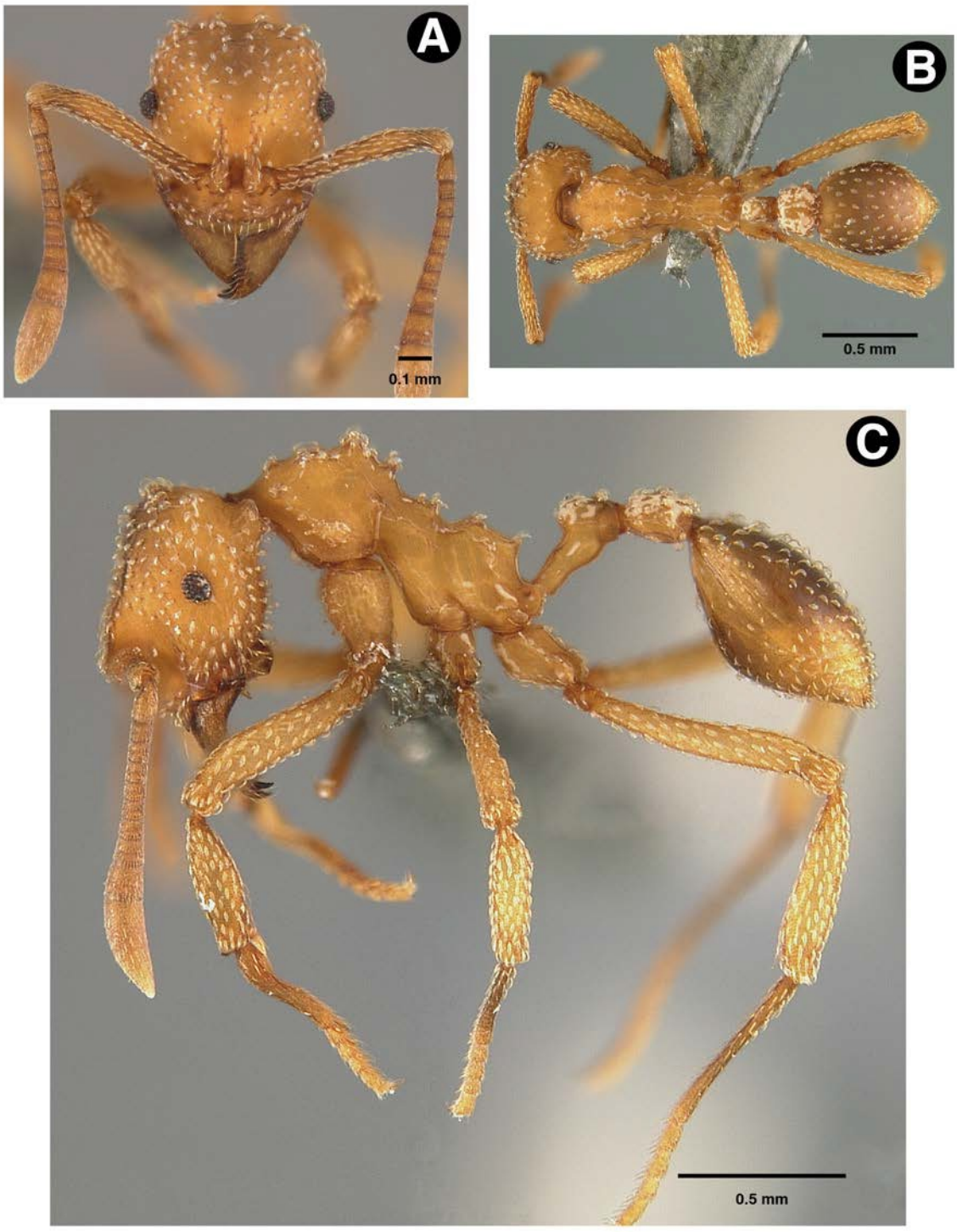


Figure 2.55. Holotype worker of *Myrmicocrypta JSC–017* **sp. nov**.
(A) Full-face view. (B) Dorsal view. (C) Lateral view.

Figure 2.56. Holotype worker of *Myrmicocrypta JSC–019* **sp. nov**.
(A) Full-face view. (B) Dorsal view. (C) Lateral view.

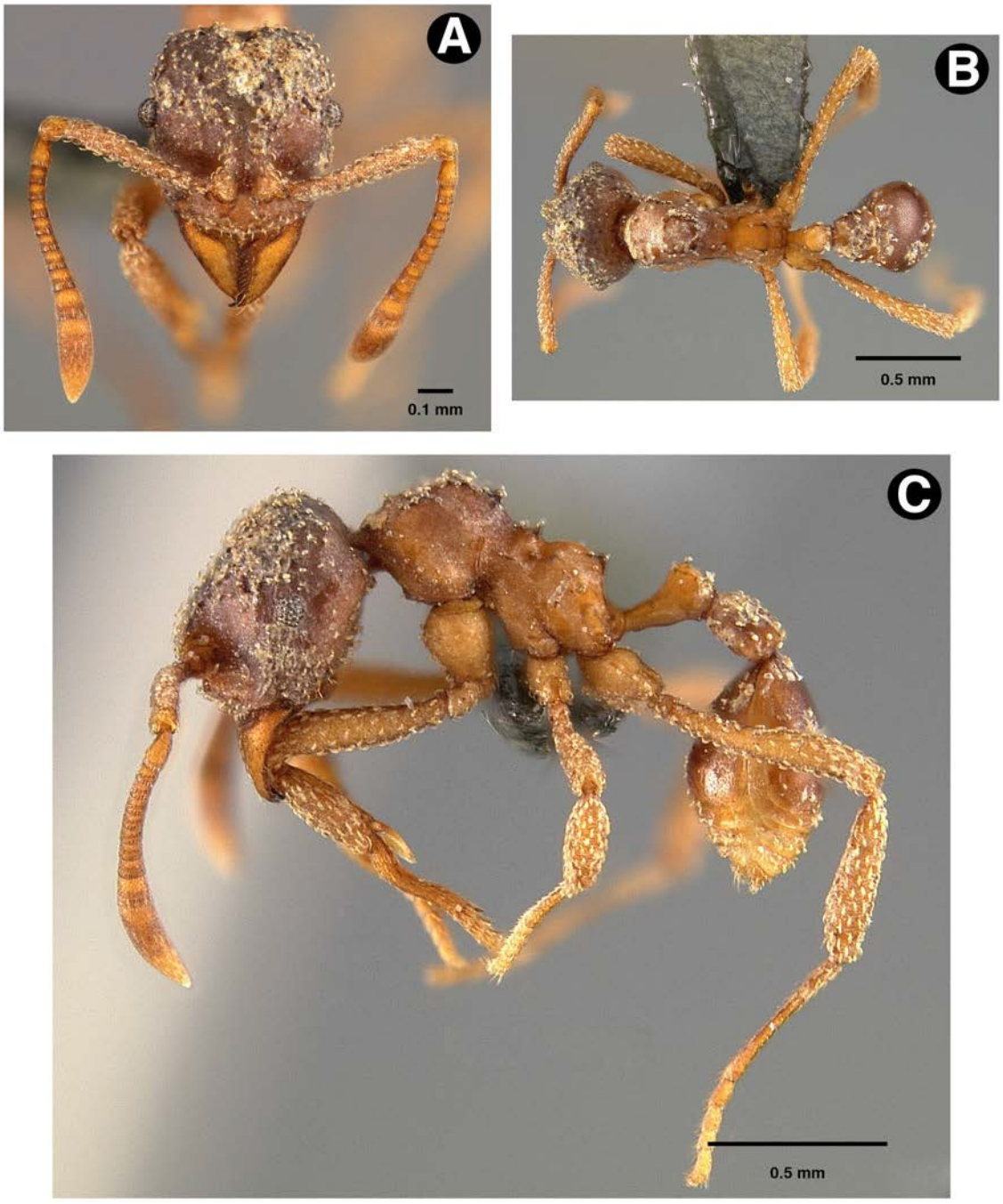


Figure 2.57. Holotype worker of *Myrmicocrypta JSC–019a* **sp. nov**.
(A) Full-face view. (B) Dorsal view. (C) Lateral view.

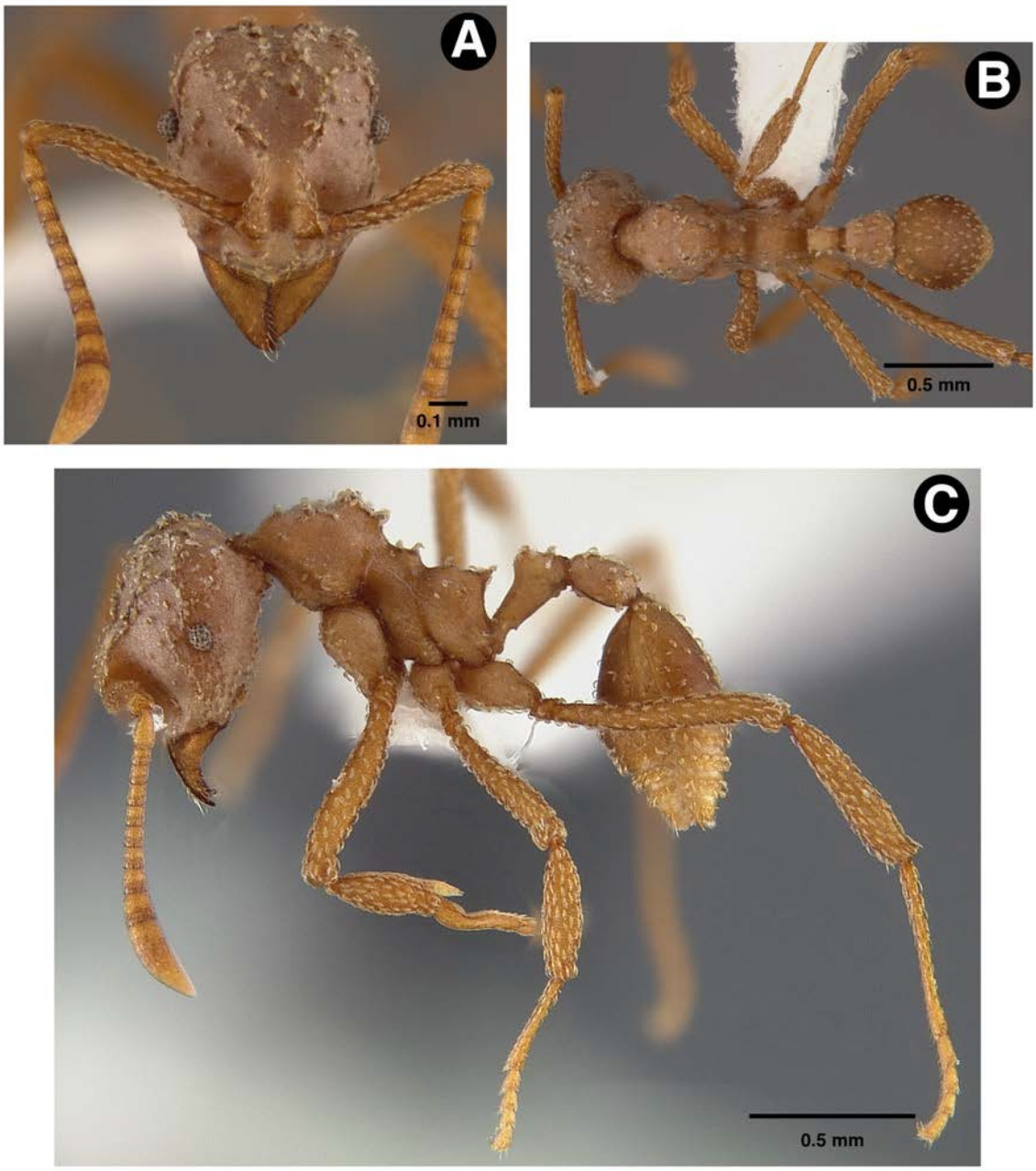


Figure 2.58. Holotype worker of *Myrmicocrypta JSC–019b* **sp. nov**.
(A) Full-face view. (B) Dorsal view. (C) Lateral view.

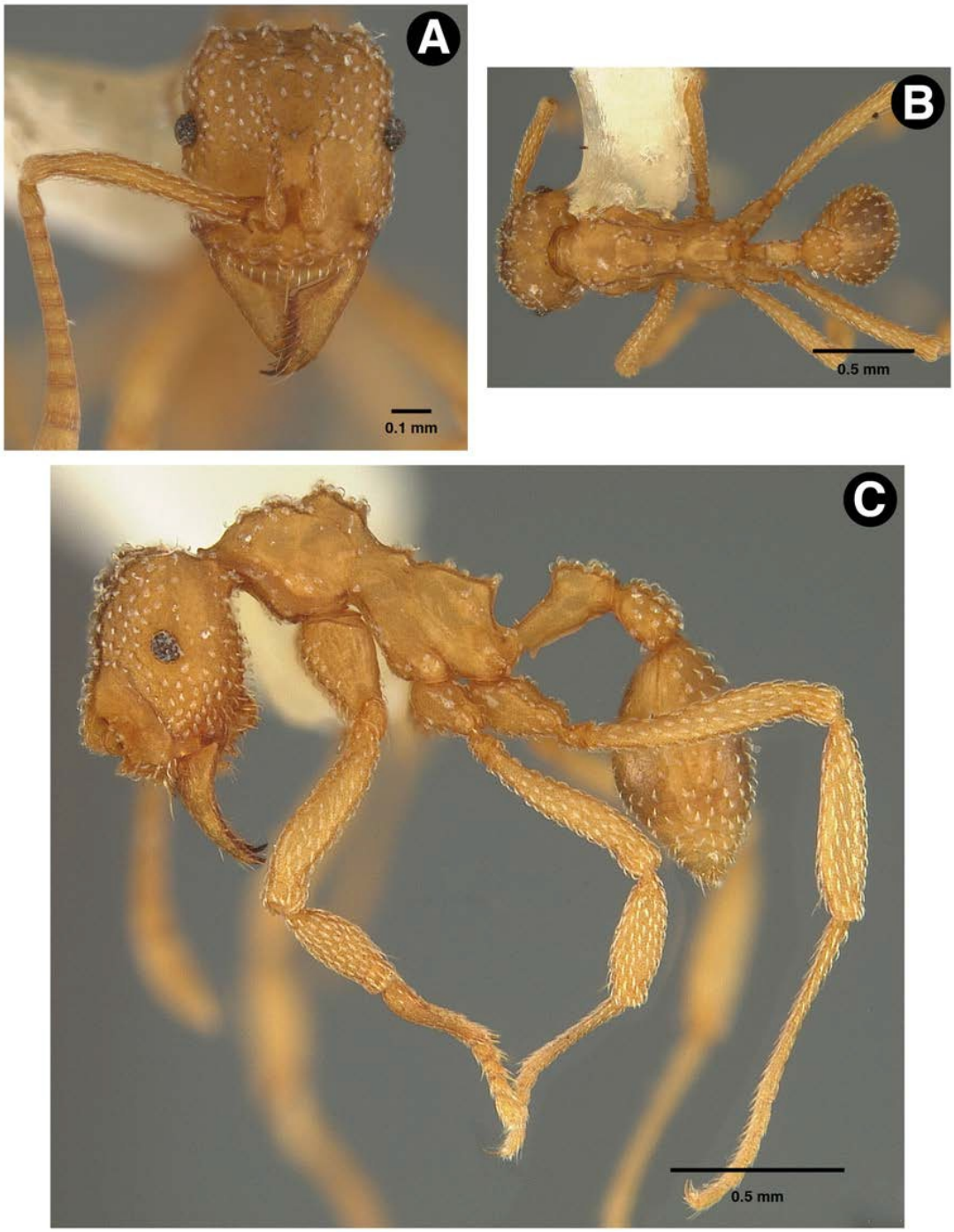


Figure 2.482 Holotype worker of *Myrmicocrypta JSC–021* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

Figure 2.60. Holotype worker of *Myrmicocrypta JSC–022* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

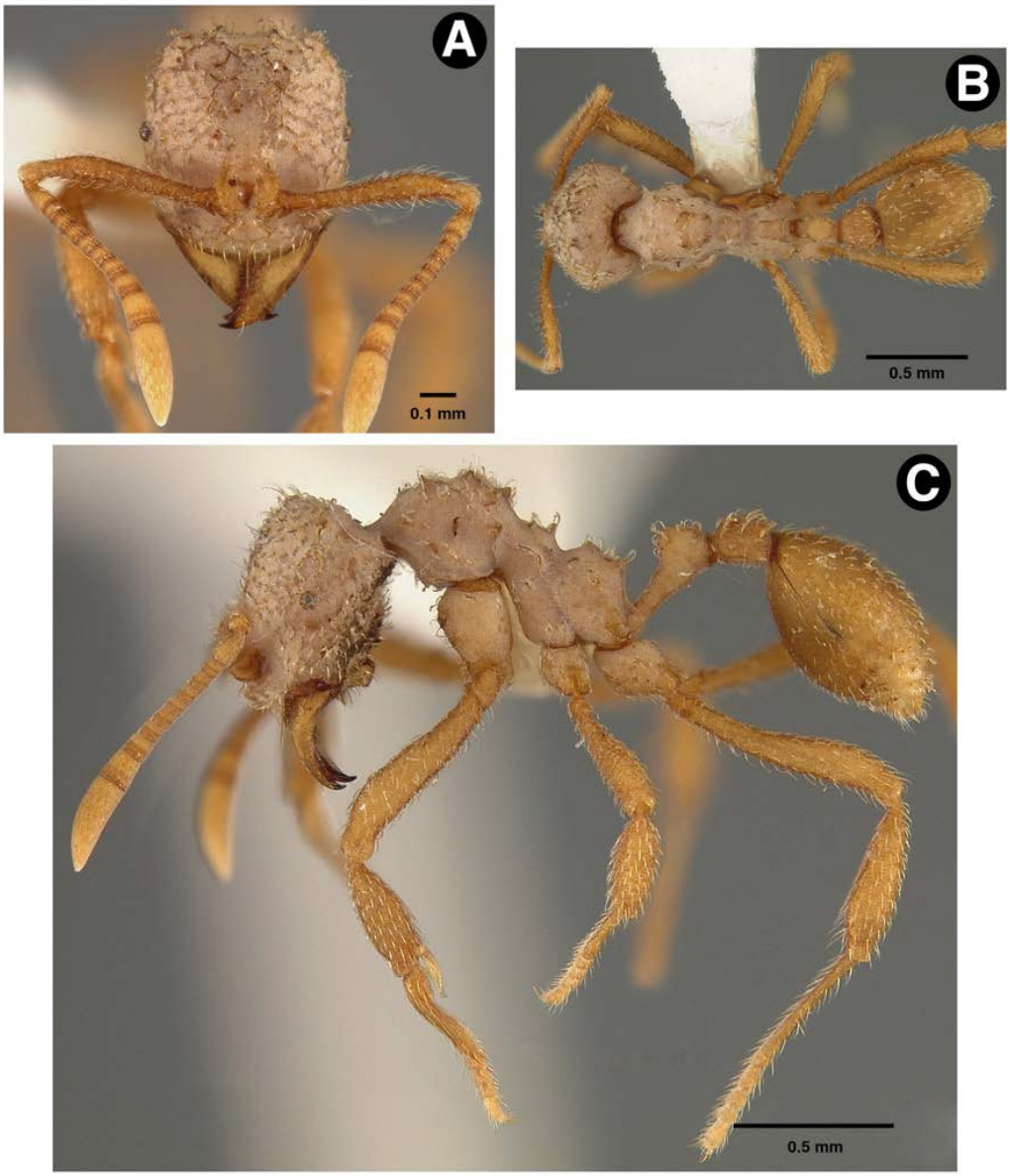


Figure 2.61. Holotype worker of *Myrmicocrypta JSC–022a* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

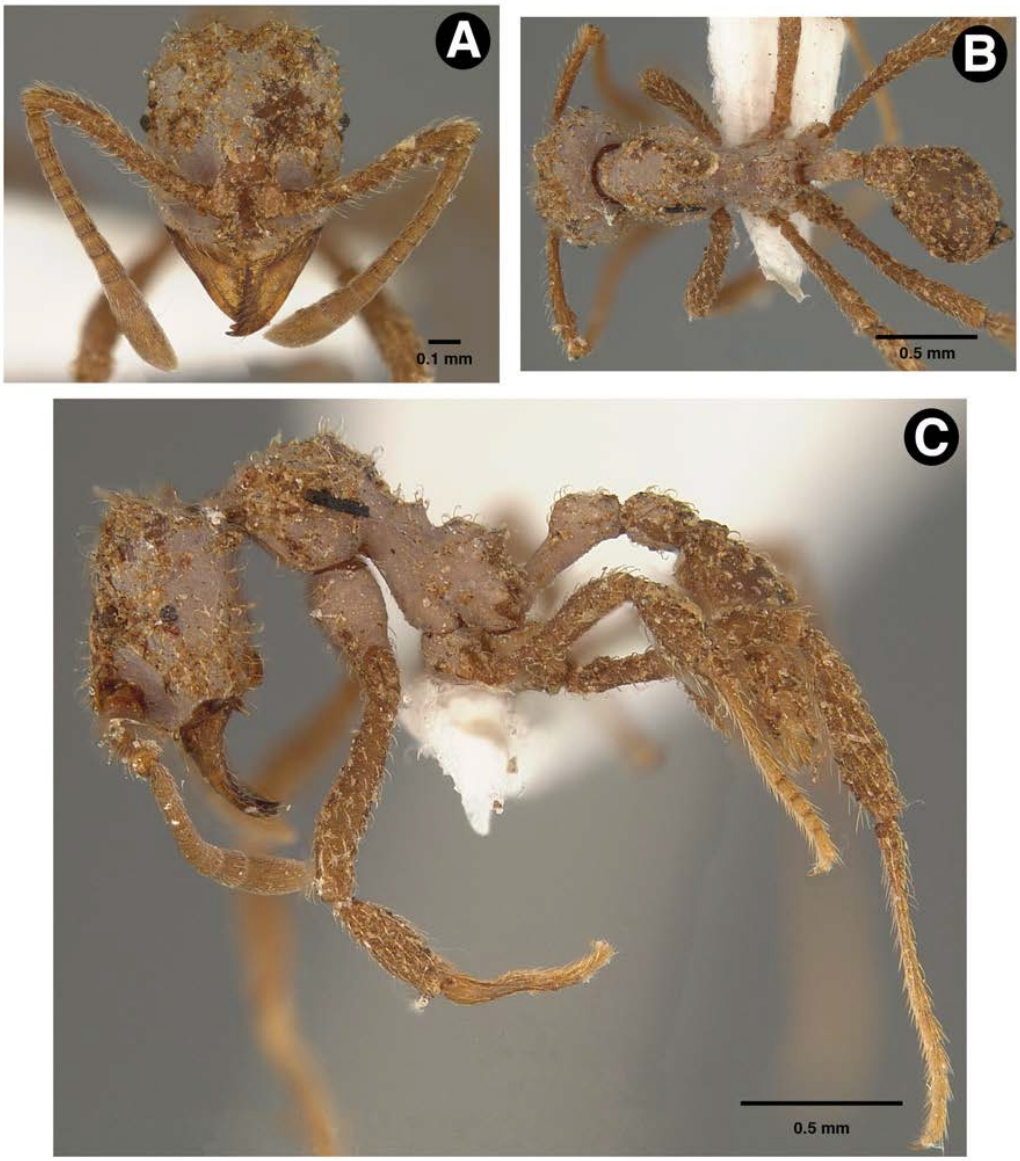


Figure 2.62. Holotype worker of *Myrmicocrypta JSC–022b* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

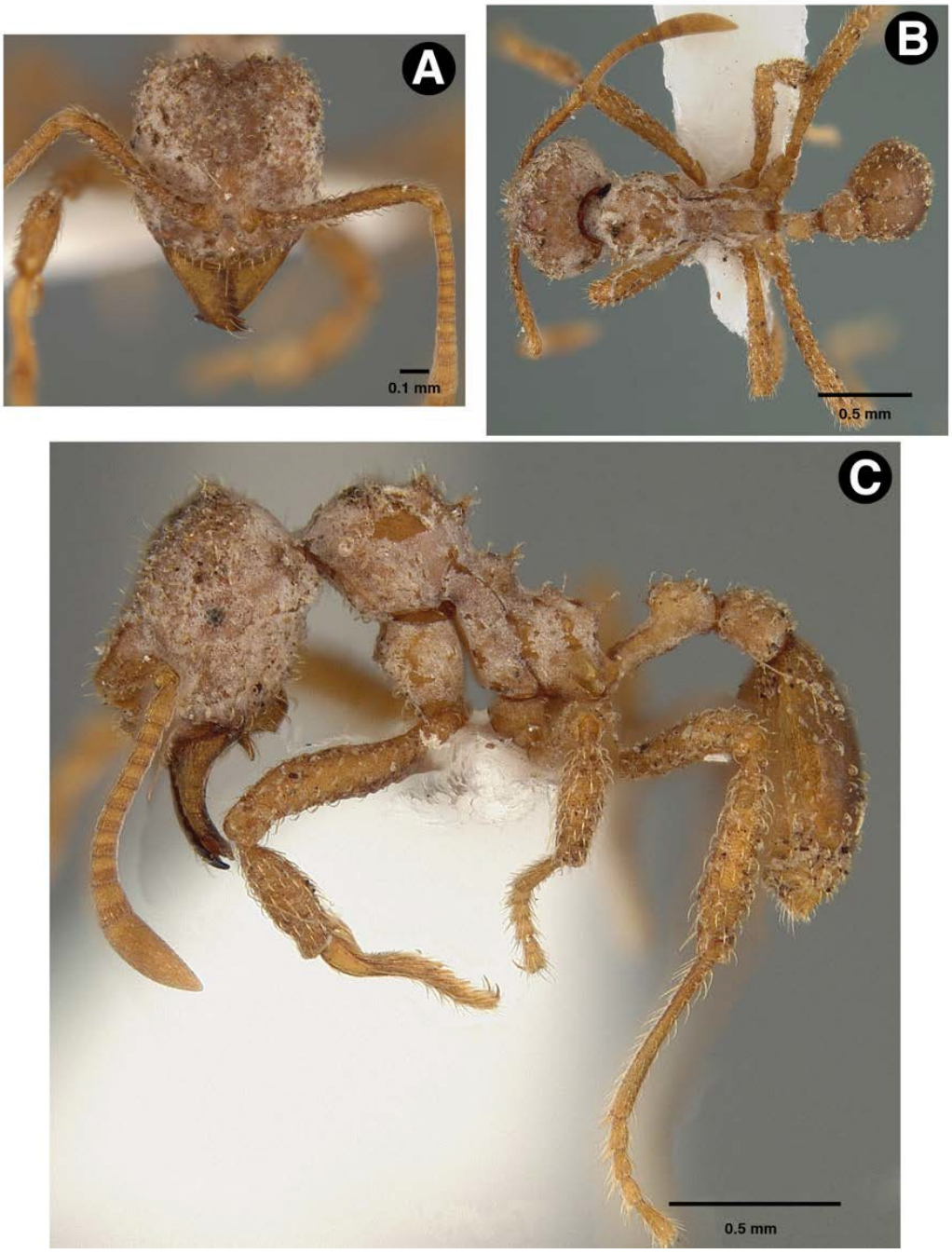


Figure 2.63. Holotype worker of *Myrmicocrypta JSC–022x* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

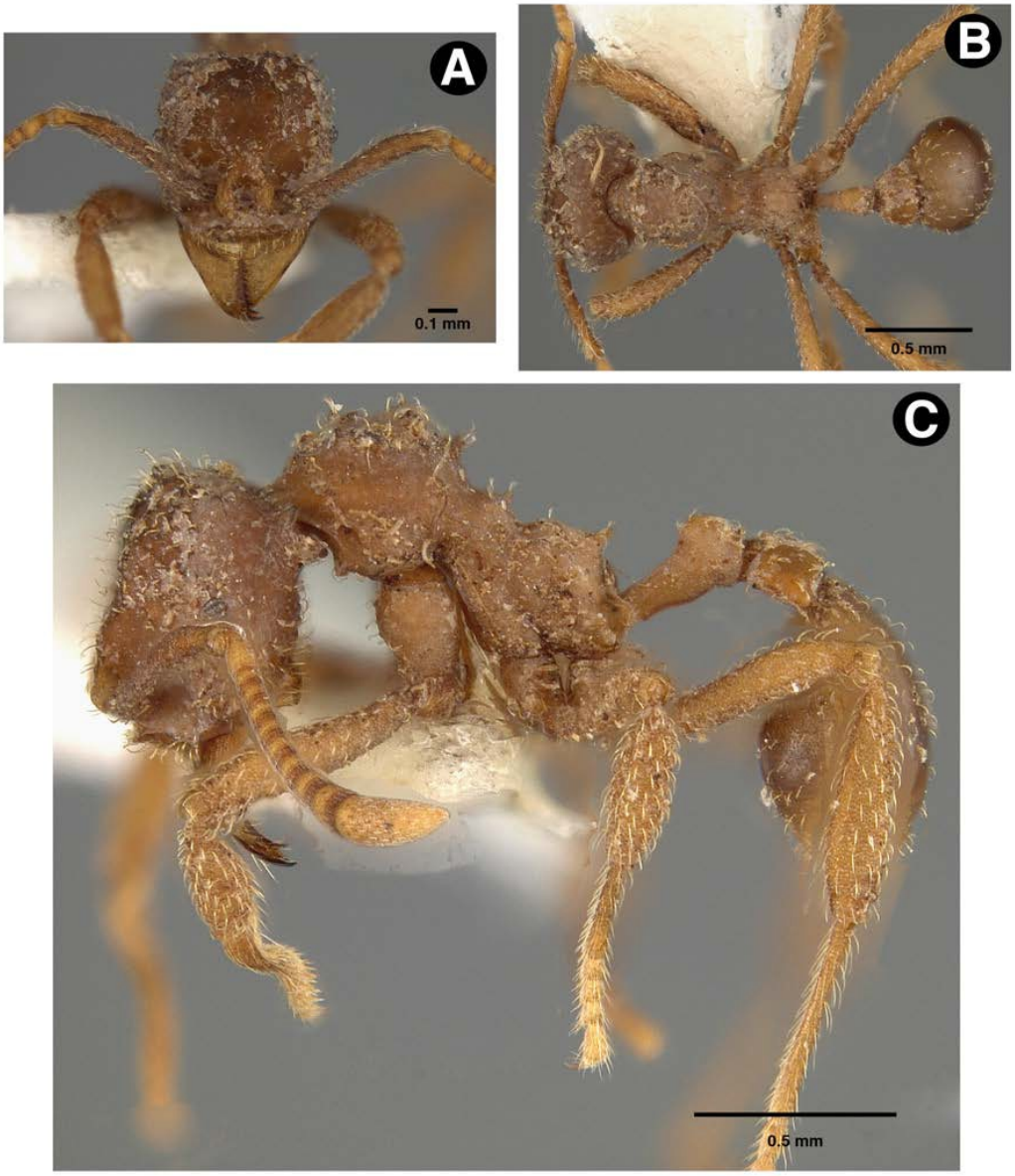


Figure 2.64. Holotype worker of *Myrmicocrypta JSC–022y* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

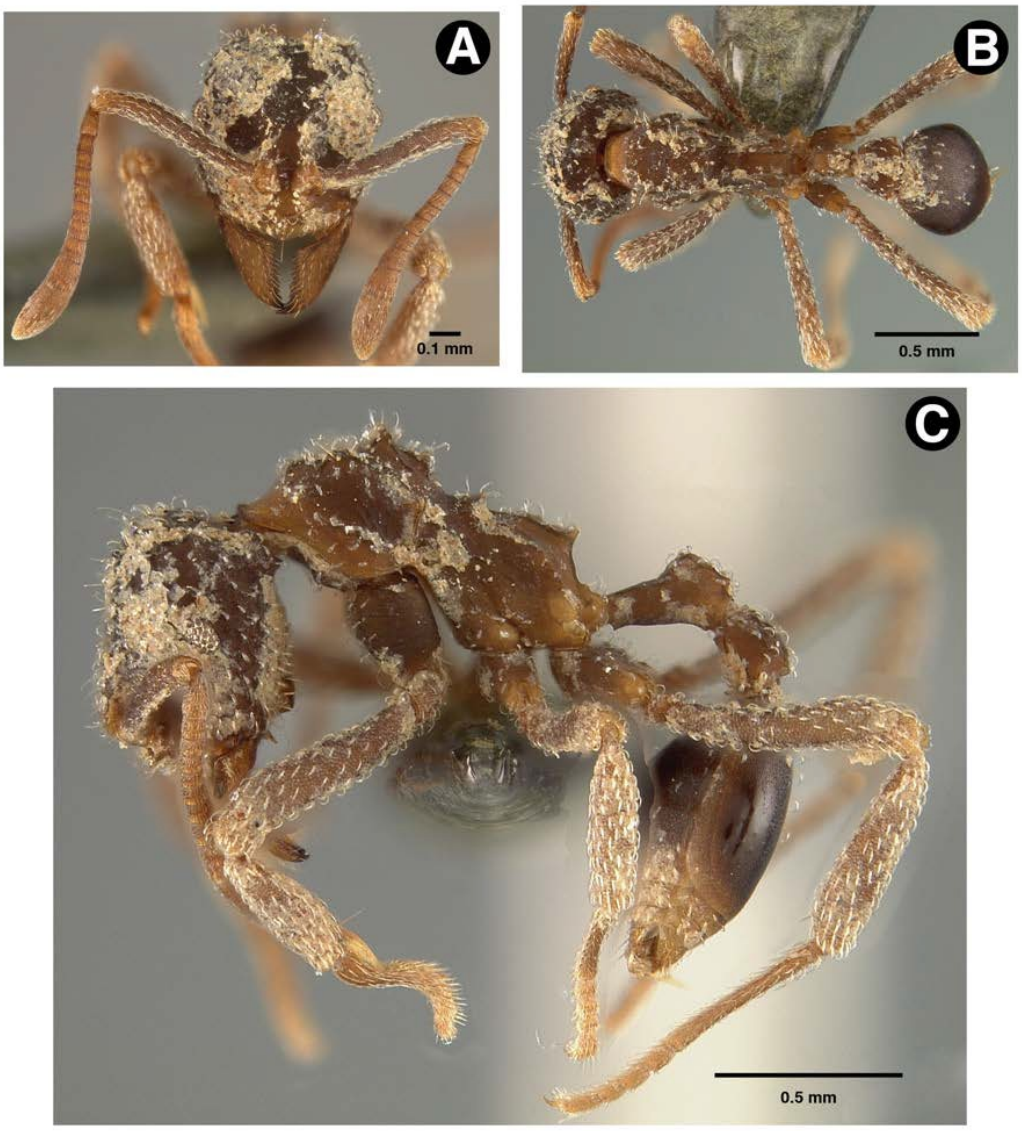


Figure 2.65. Holotype worker of *Myrmicocrypta JSC–023* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

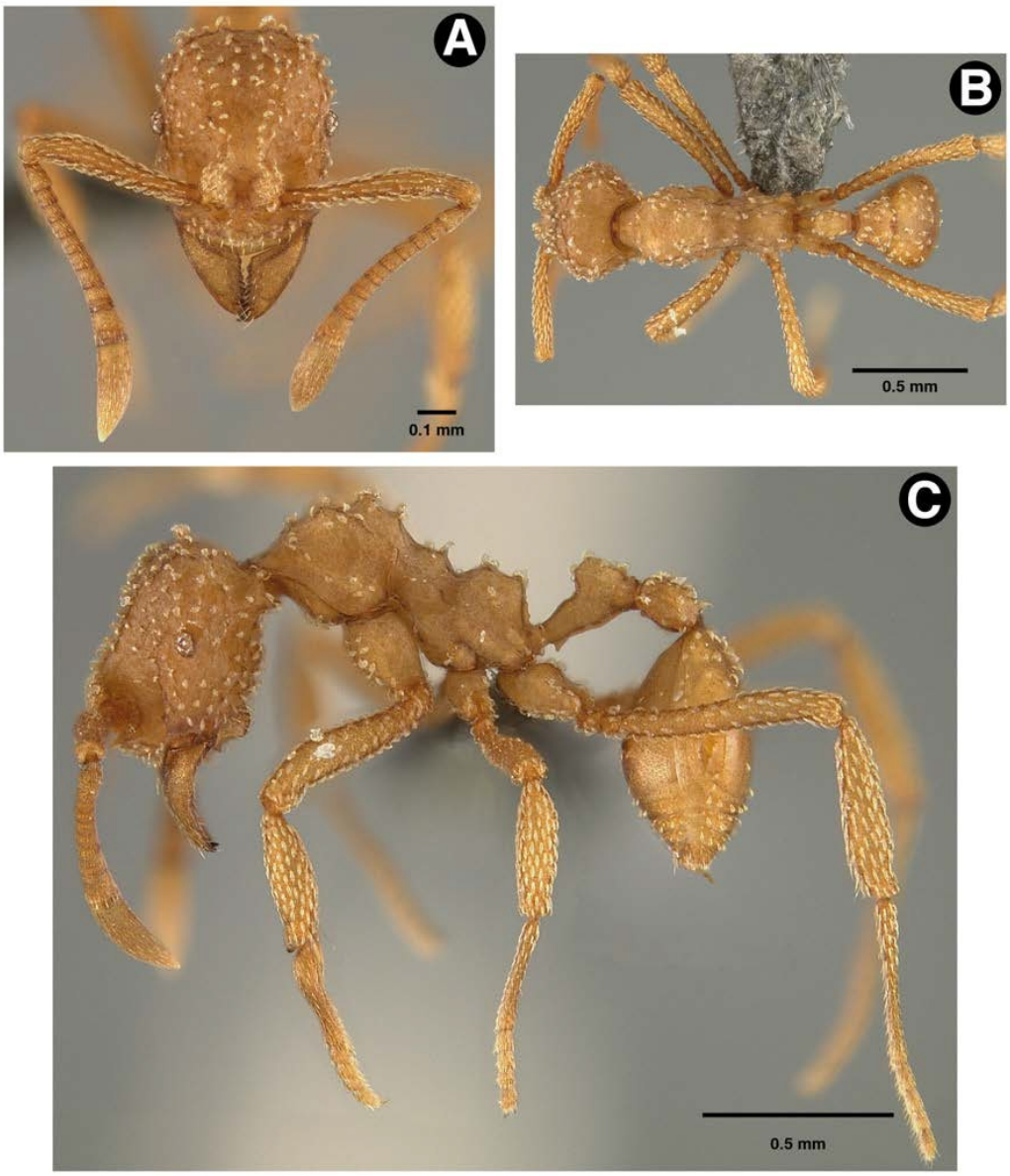


Figure 2.66. Holotype worker of *Myrmicocrypta JSC–024* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

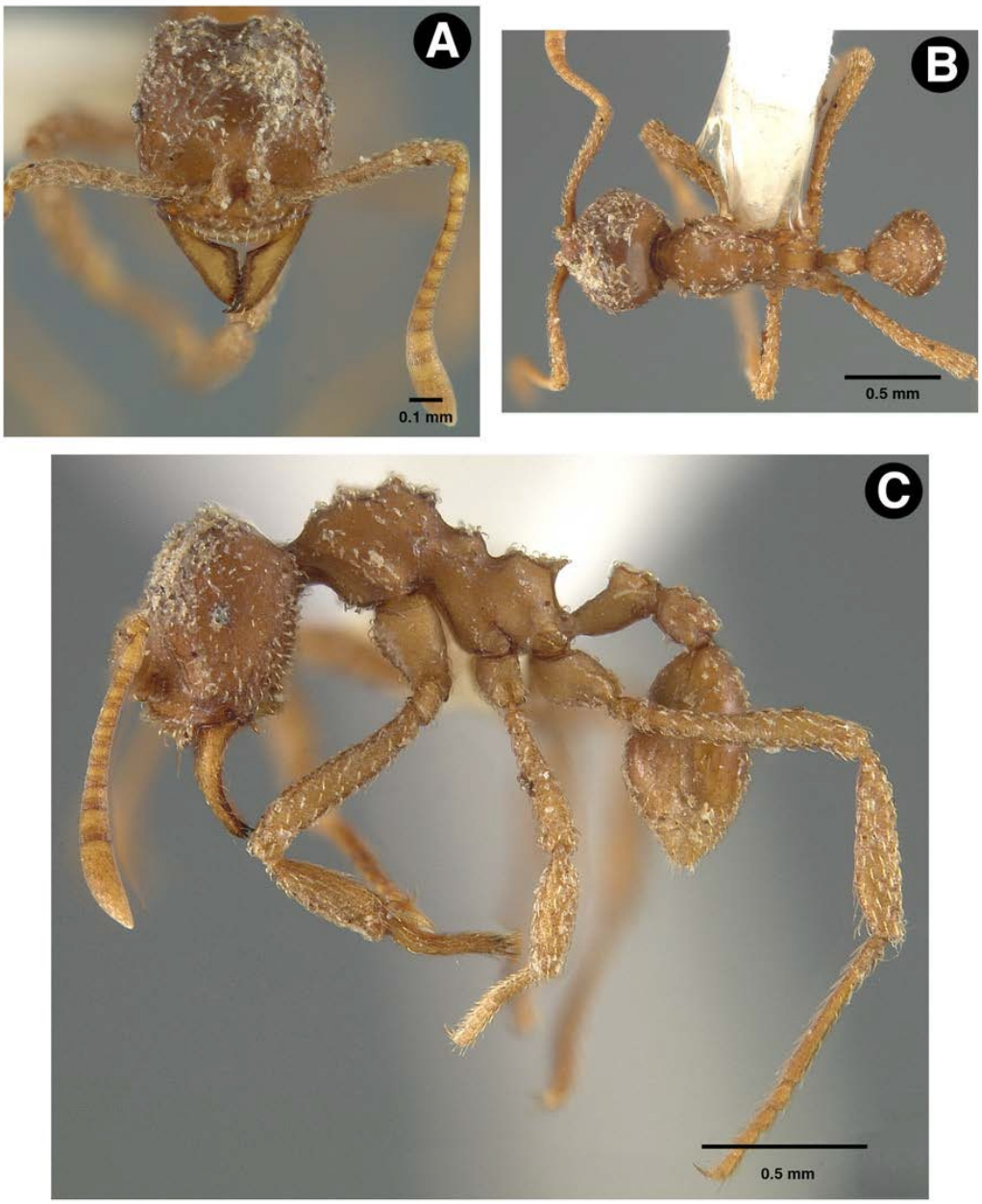


Figure 2.67. Holotype worker of *Myrmicocrypta JSC–025* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

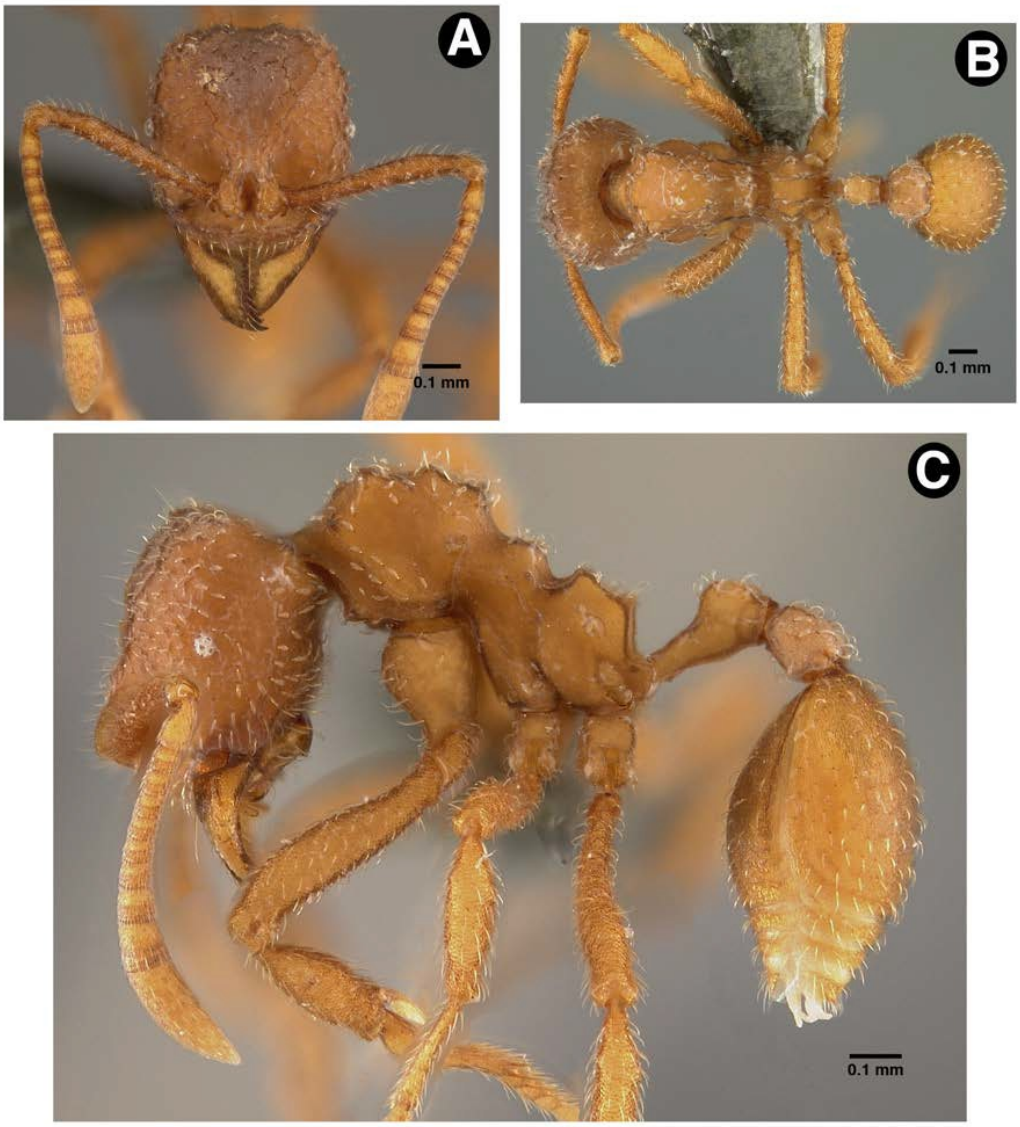


Figure 2.68. Holotype worker of *Myrmicocrypta JSC–026* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

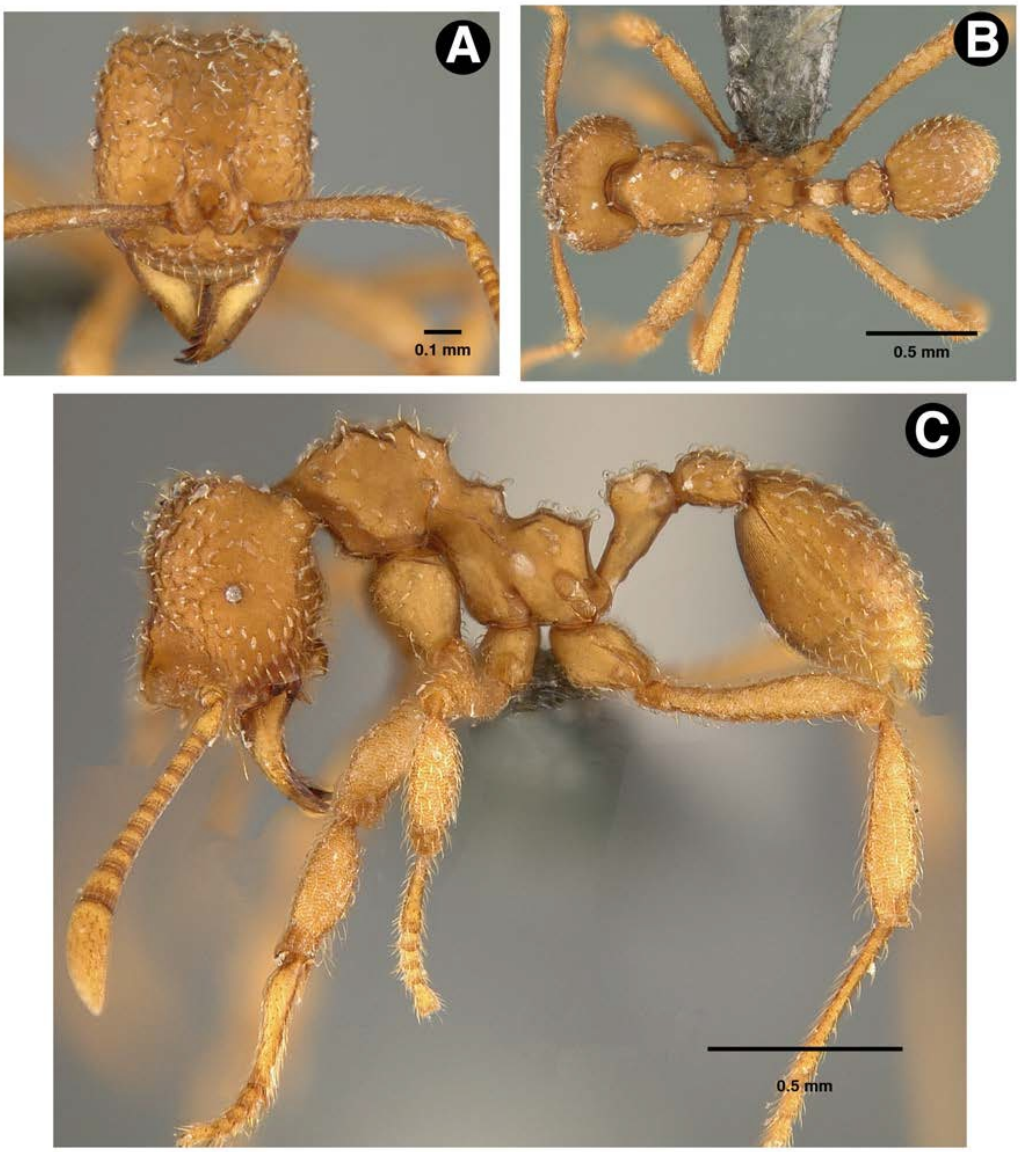


Figure 2.69. Holotype worker of *Myrmicocrypta JSC–027* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

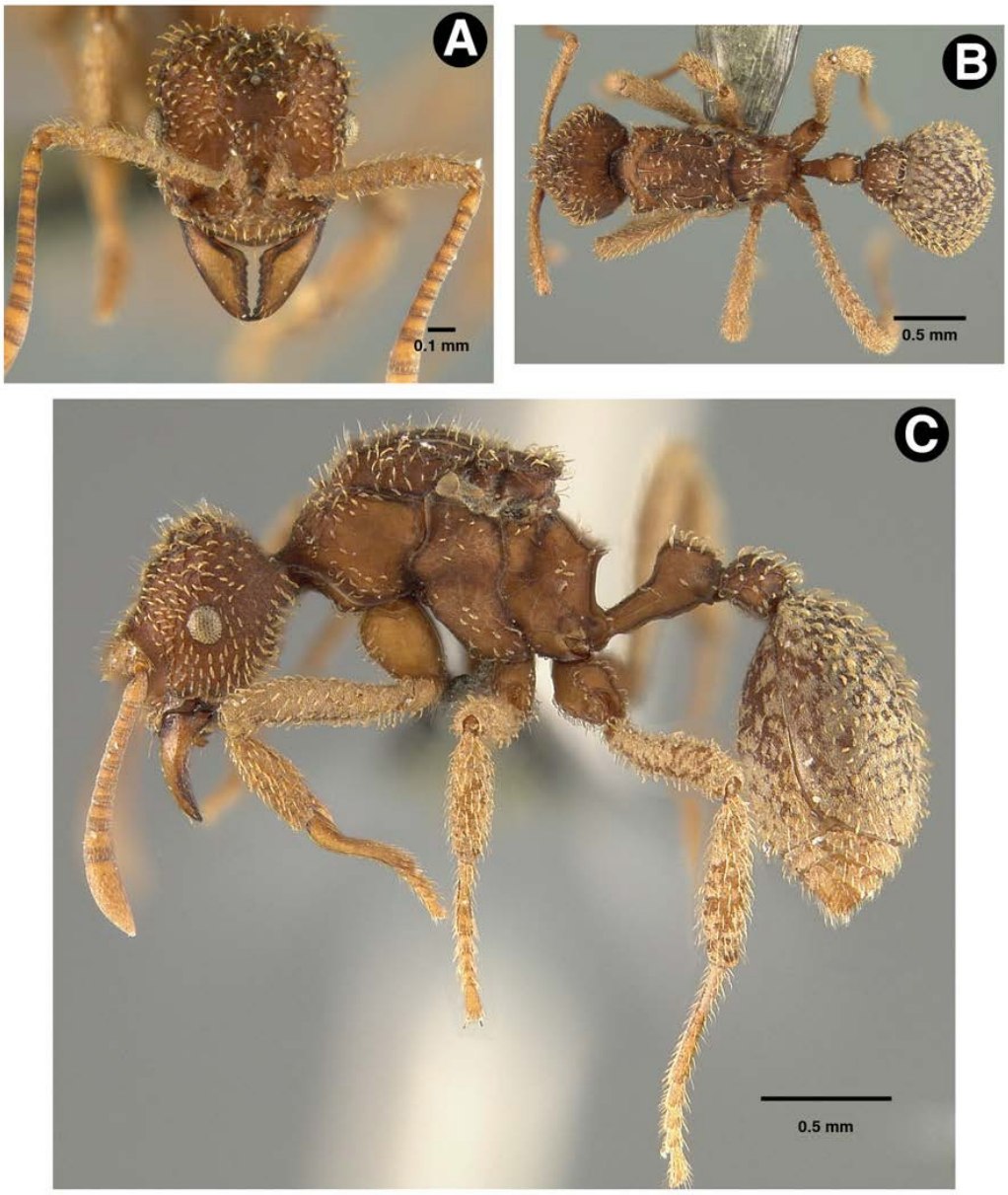


Figure 2.70. Paratype queen of *Myrmicocrypta JSC–027* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

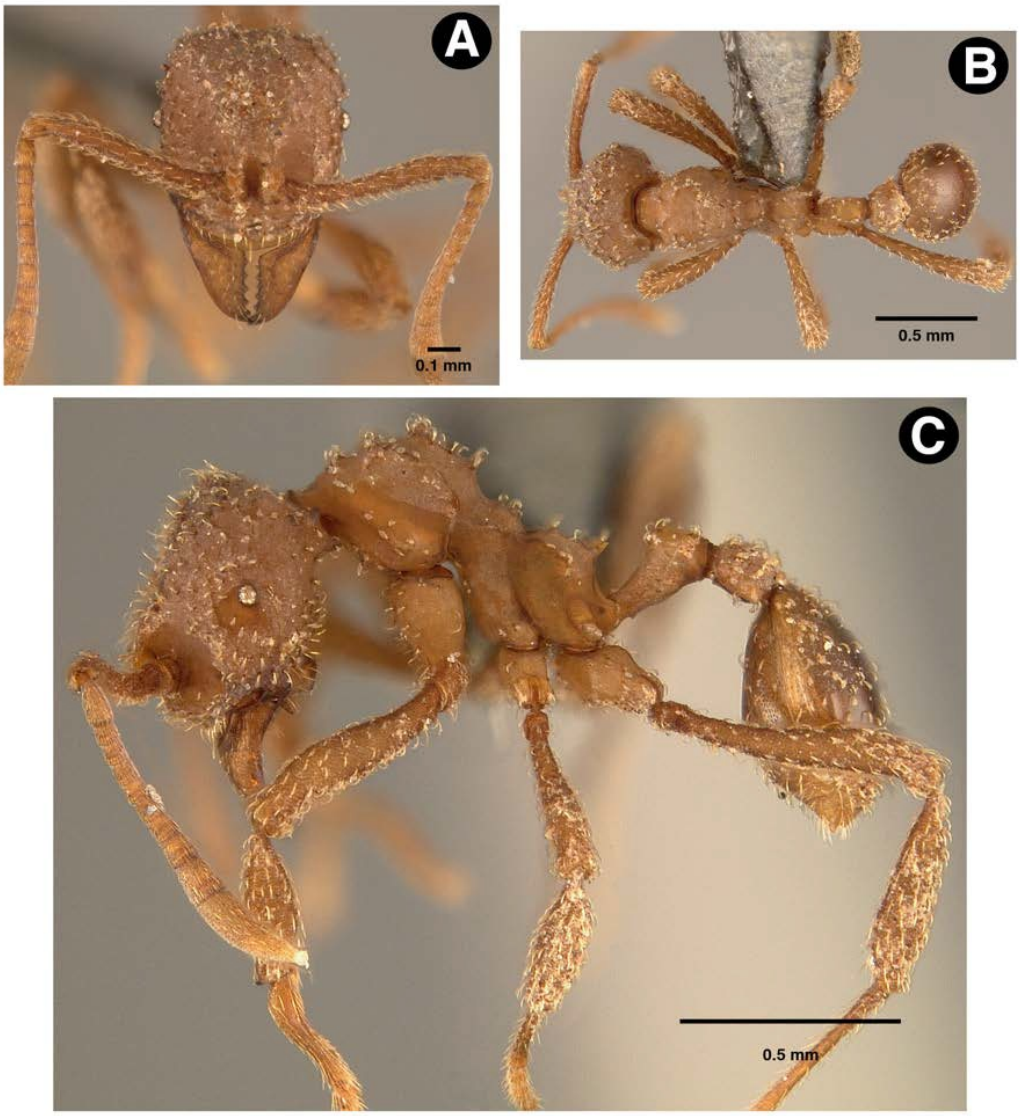


Figure 2.71. Holotype worker of *Myrmicocrypta JSC–028* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

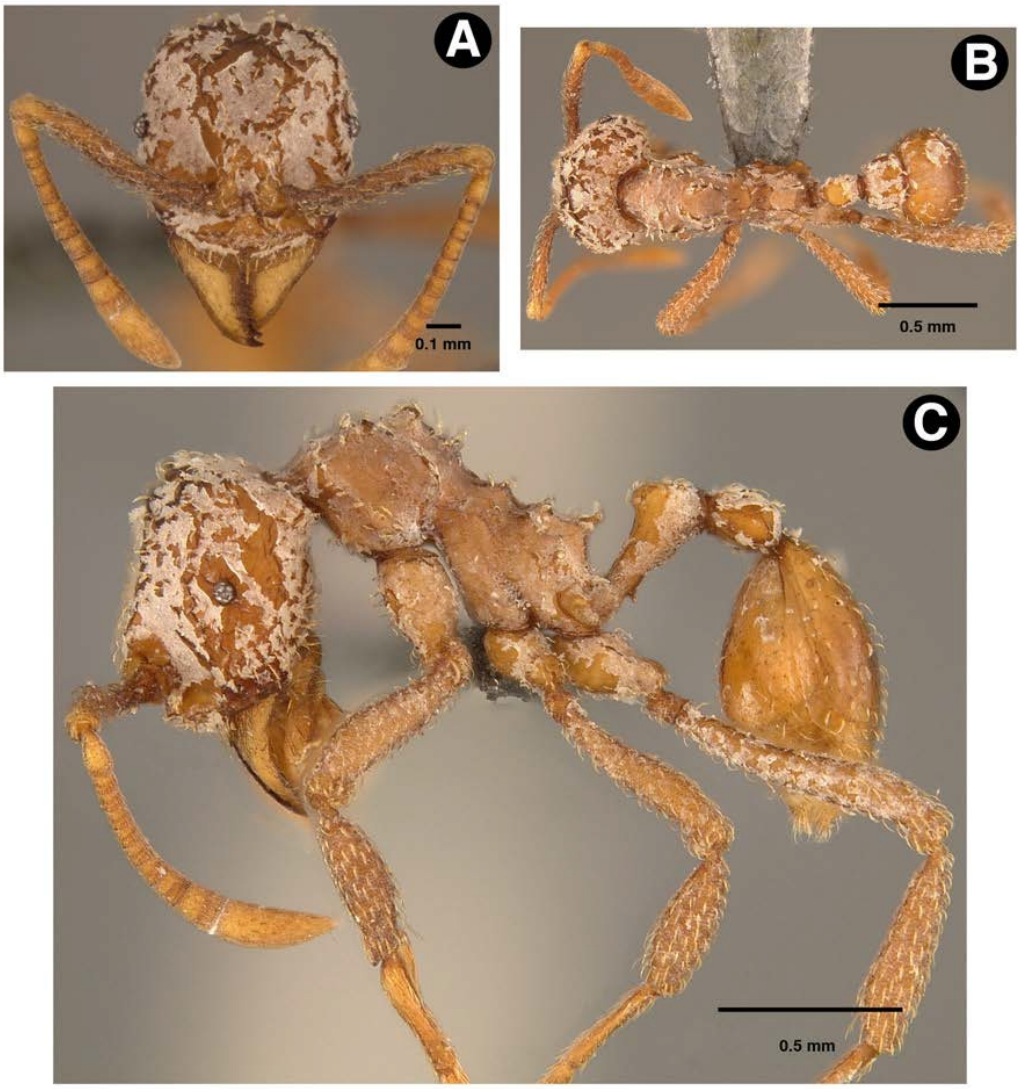


Figure 2.72. Holotype worker of *Myrmicocrypta JSC–029* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

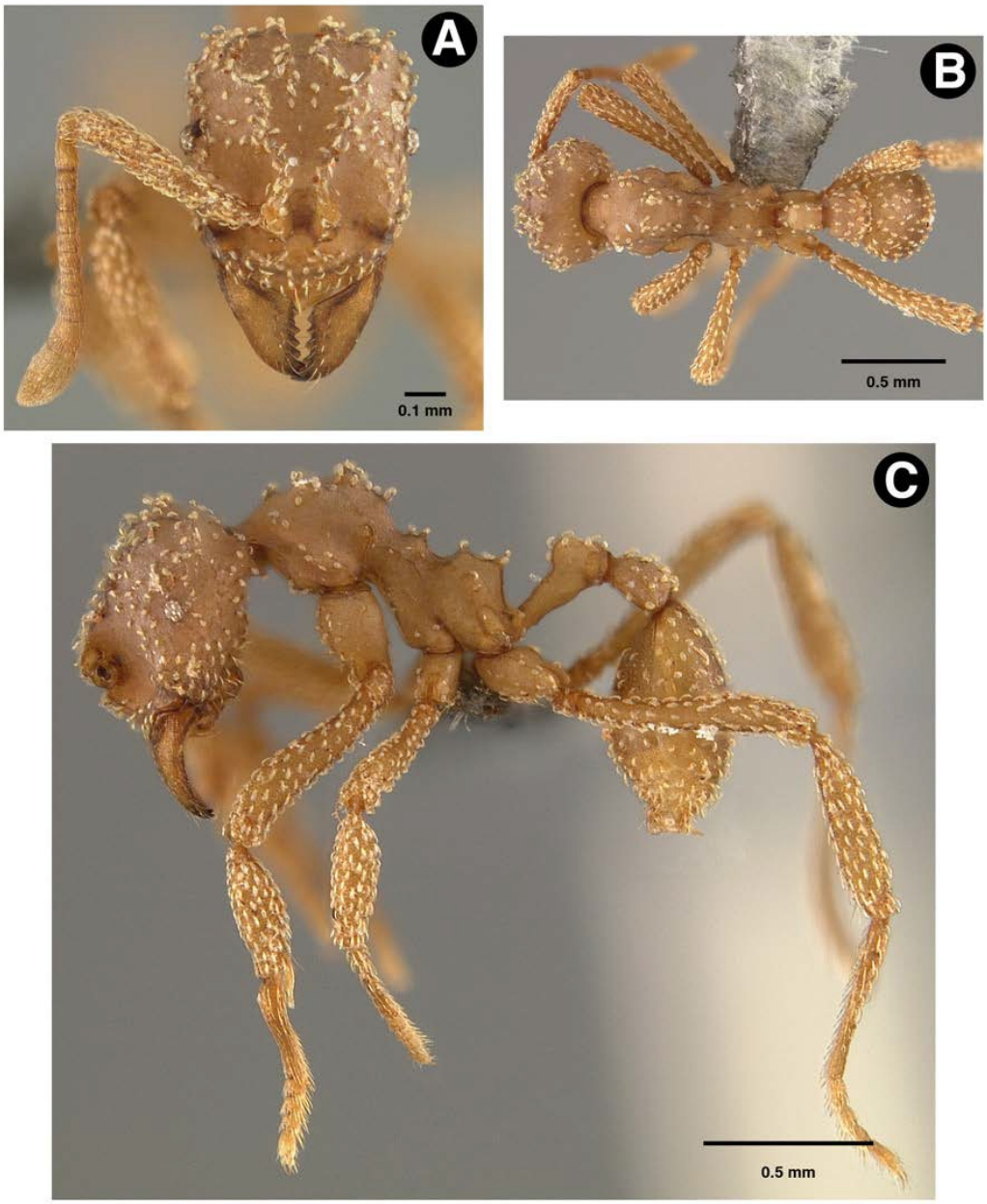


Figure 2.73. Holotype worker of *Myrmicocrypta JSC–030* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

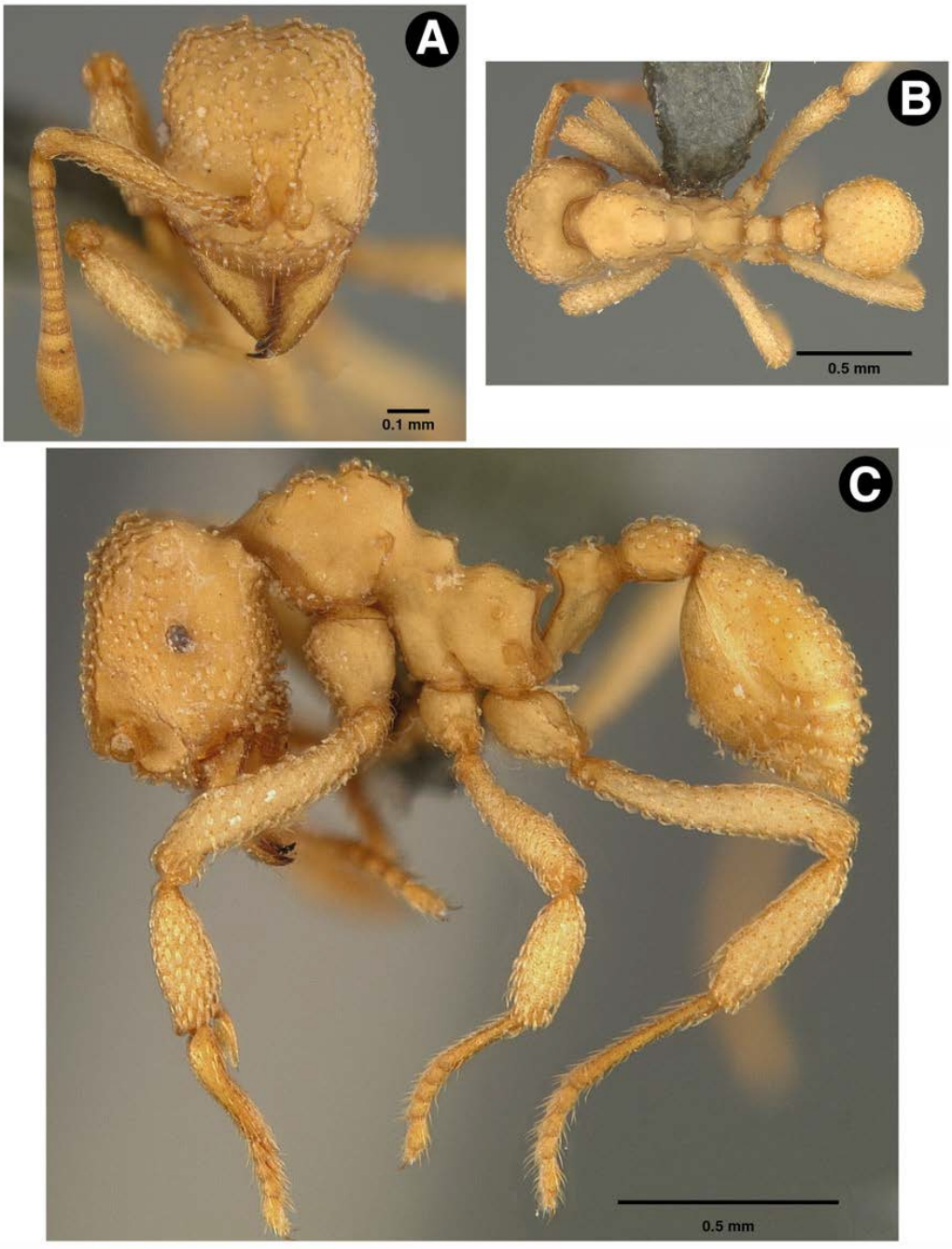


Figure 2.74. Holotype worker of *Myrmicocrypta JSC–033* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

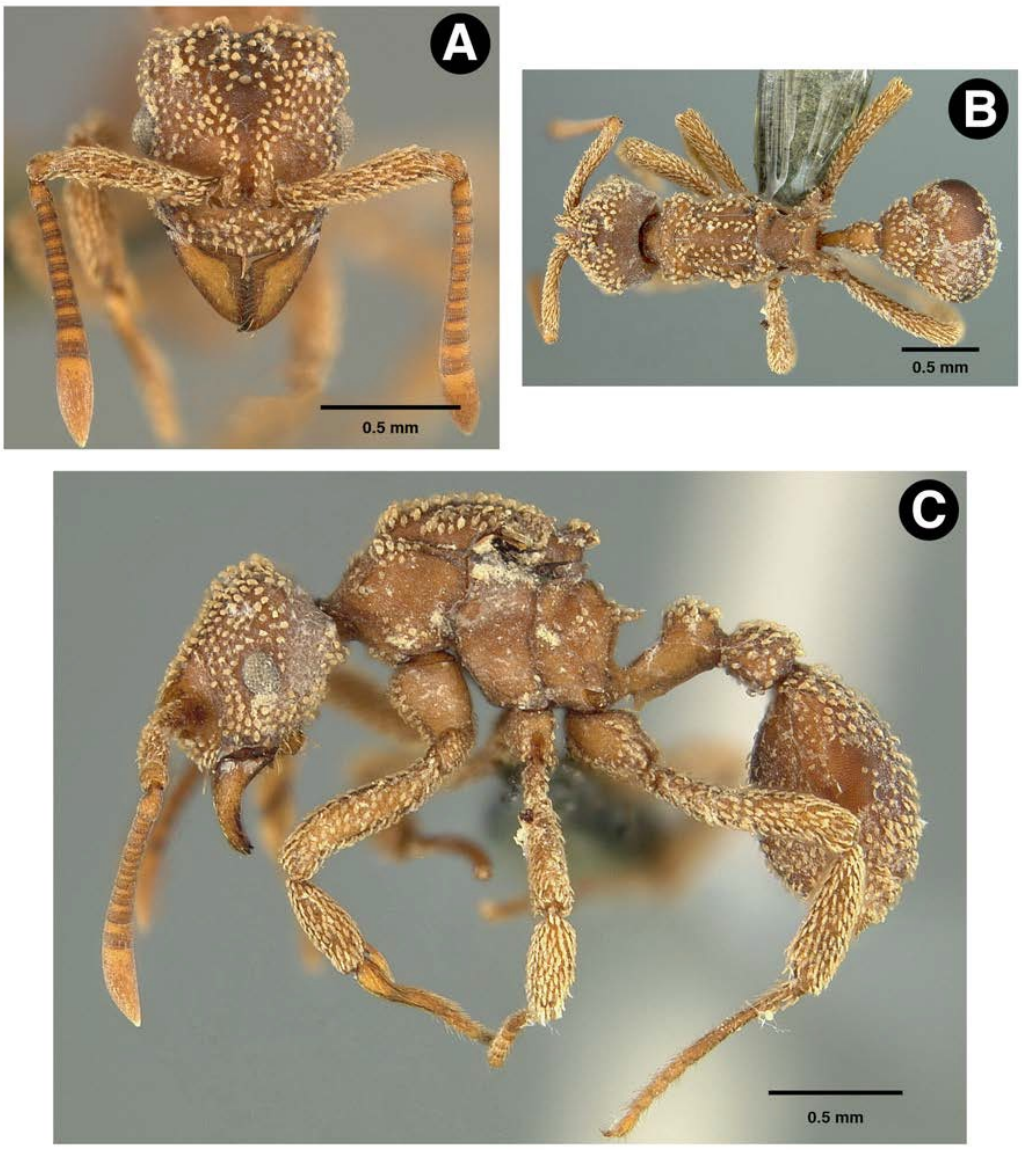


Figure 2.75. Queen of *Myrmicocrypta JSC–033* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

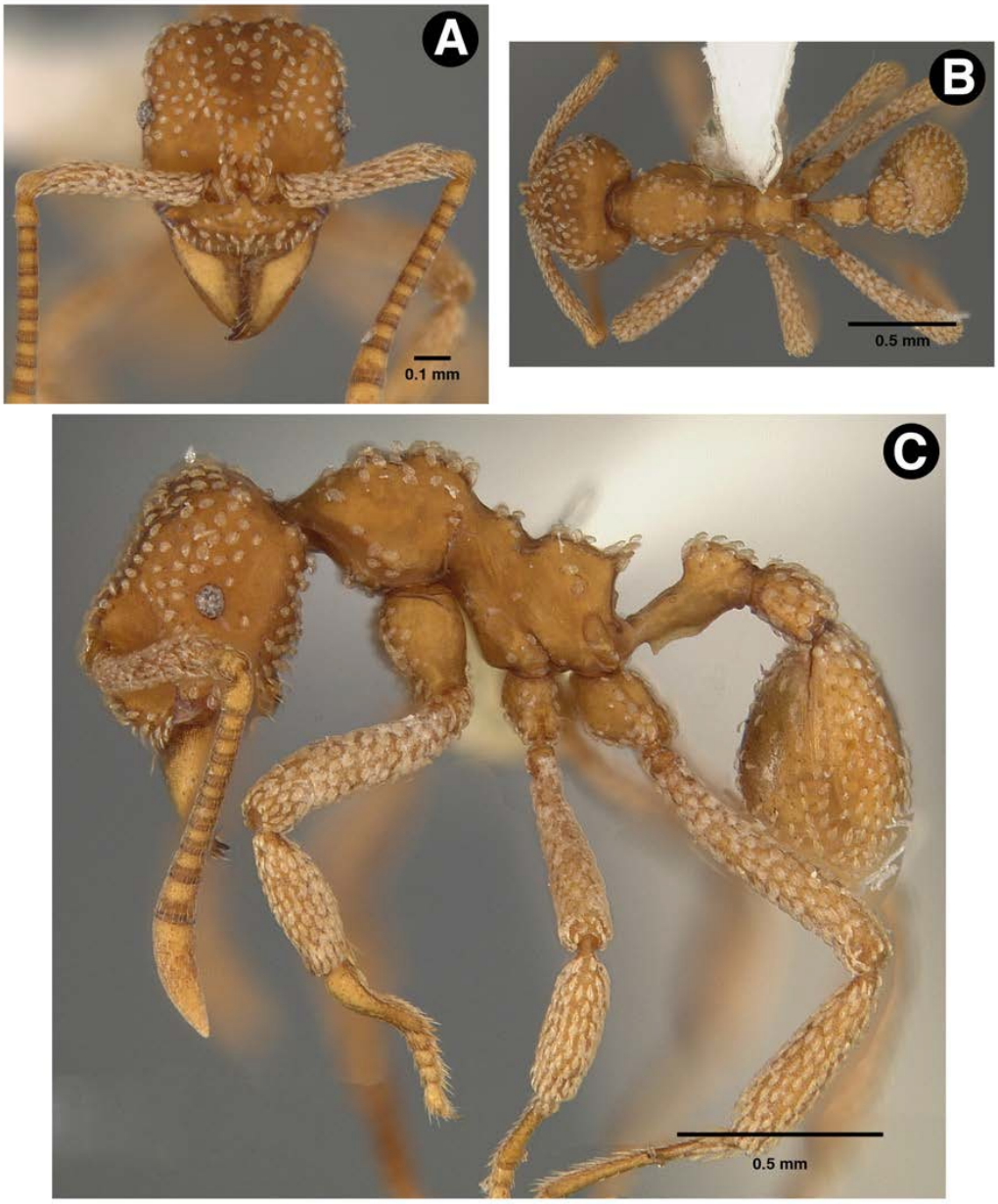


Figure 2.76. Holotype worker of *Myrmicocrypta JSC–034* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

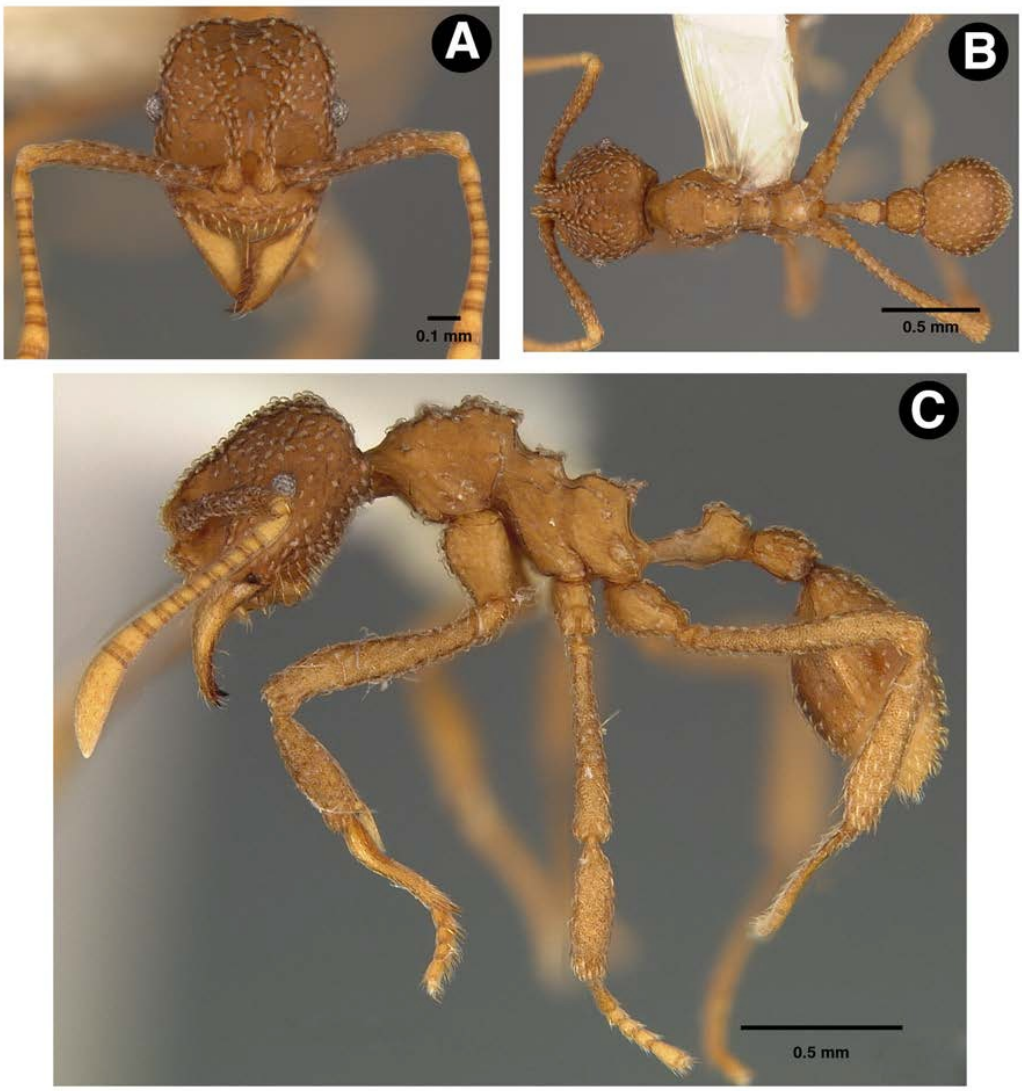


Figure 2.77. Holotype worker of *Myrmicocrypta JSC–037* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

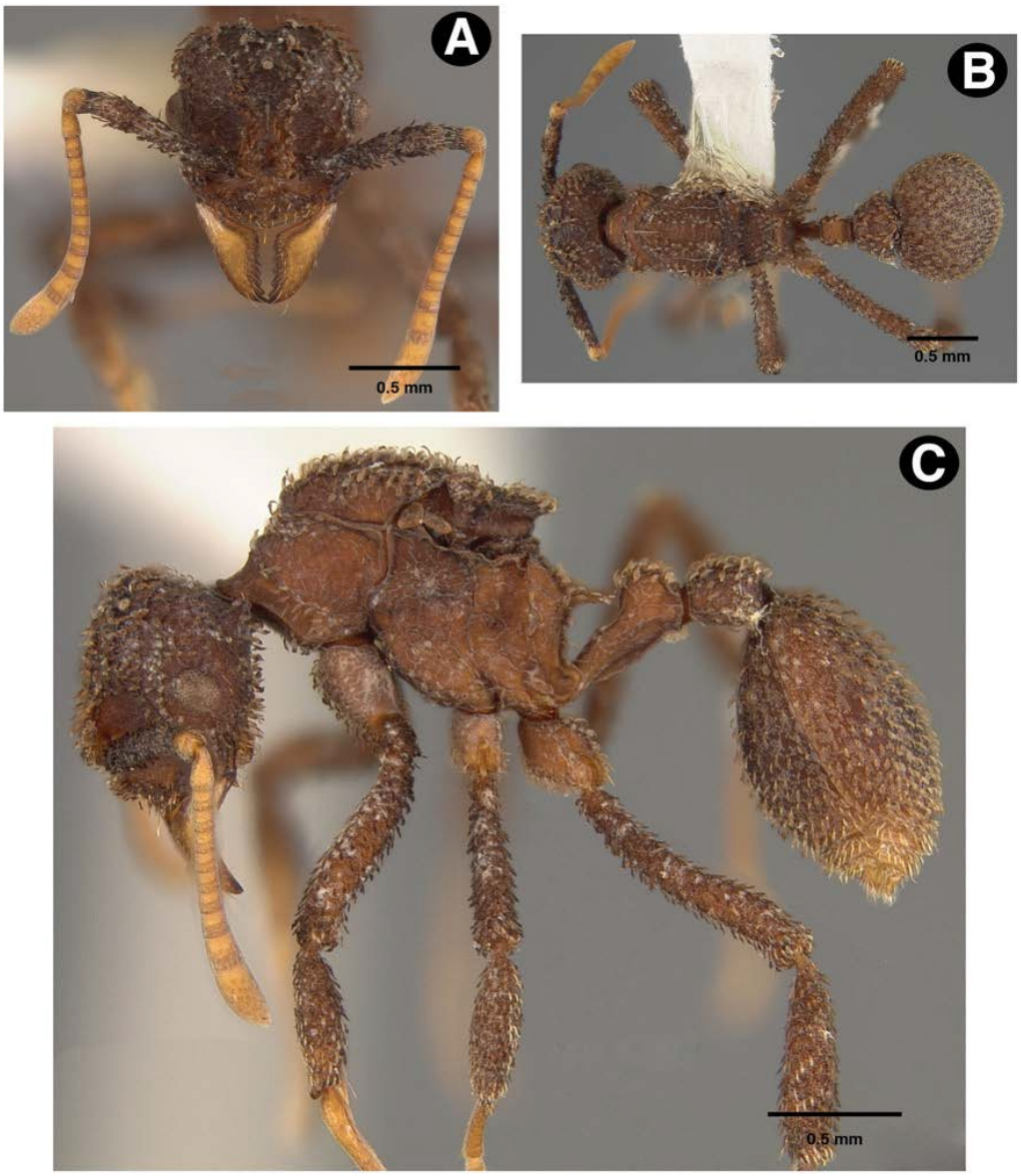


Figure 2.78. Paratype queen of *Myrmicocrypta JSC–037* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

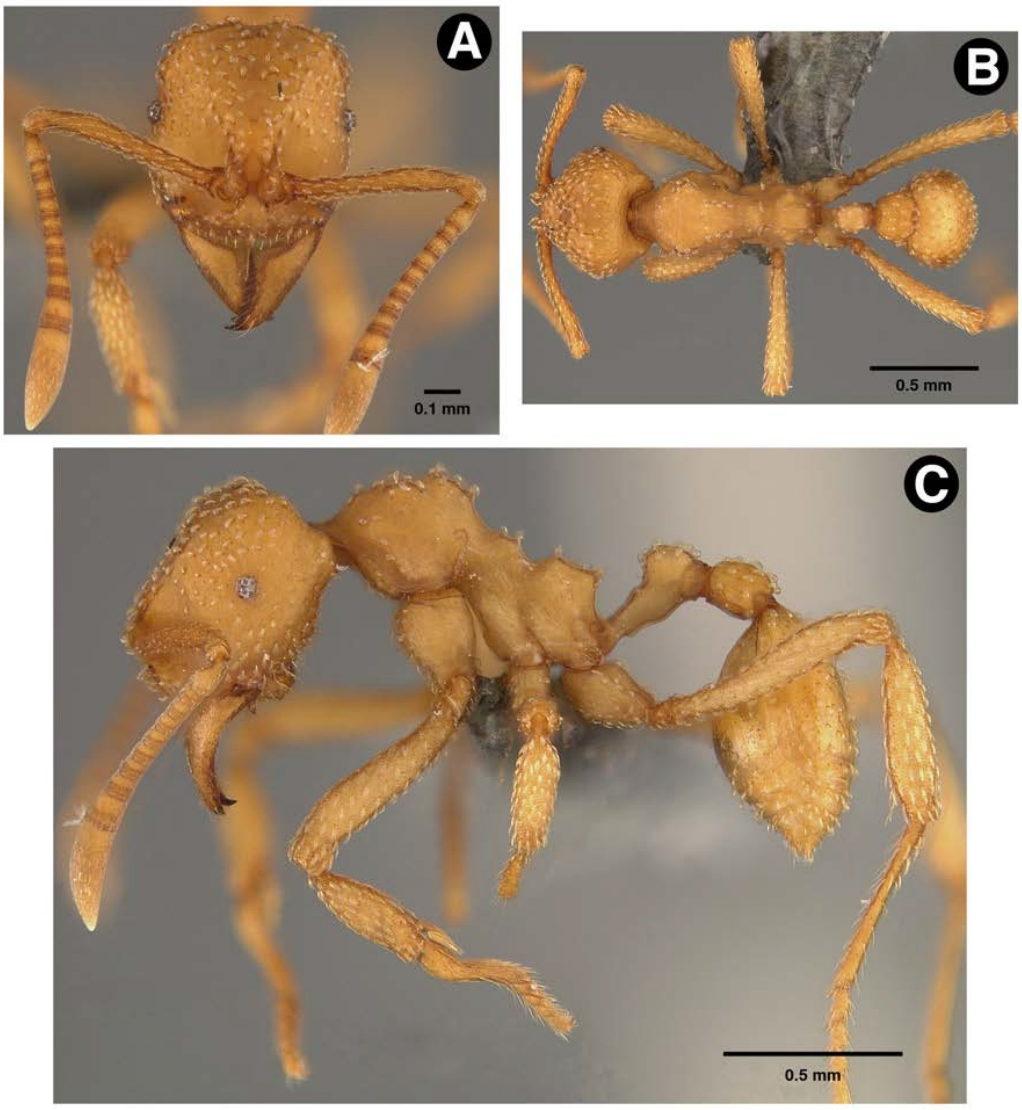


Figure 2.79. Holotype worker of *Myrmicocrypta JSC–039* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

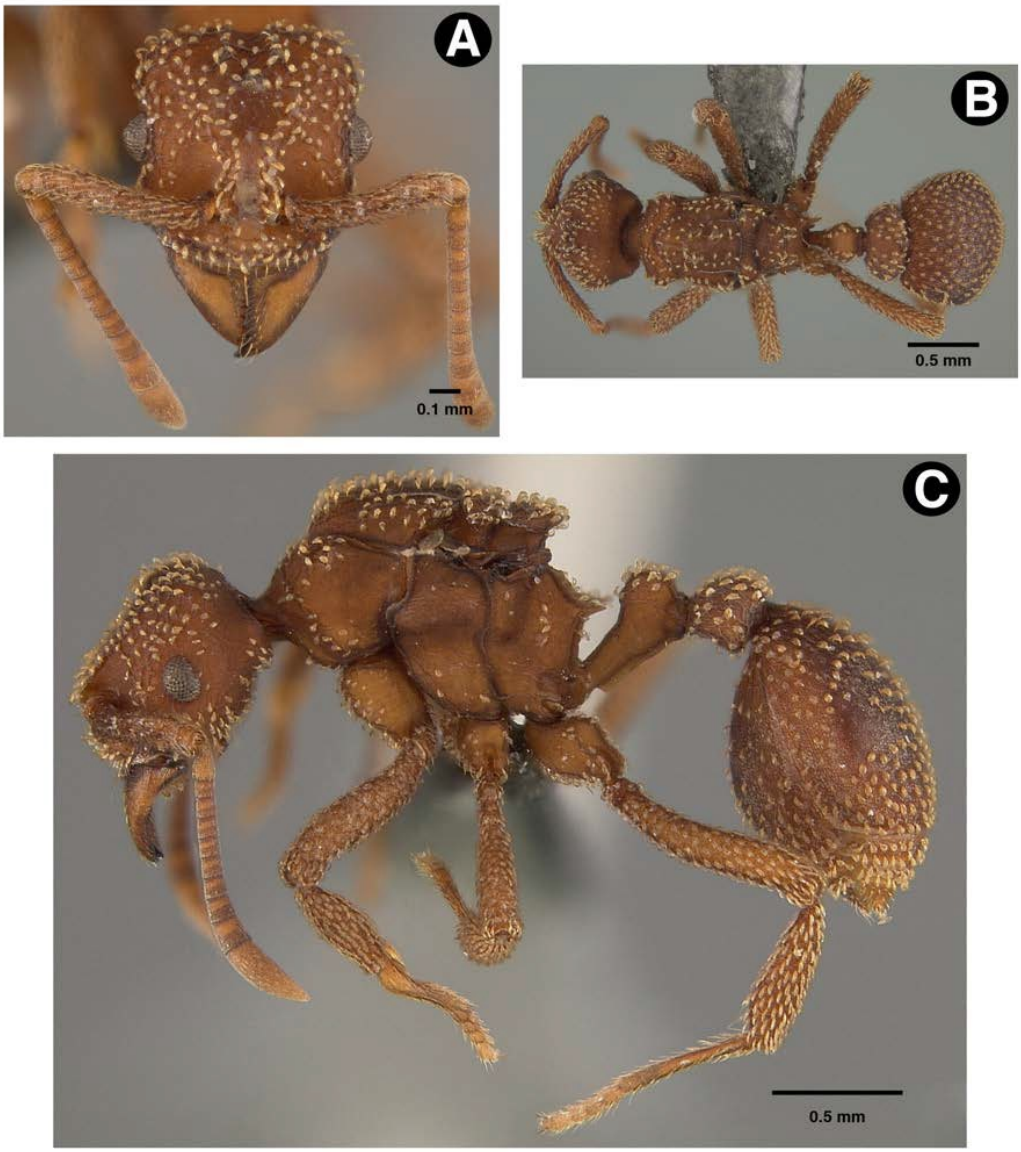


Figure 2.80. Paratype queen of *Myrmicocrypta JSC–039* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

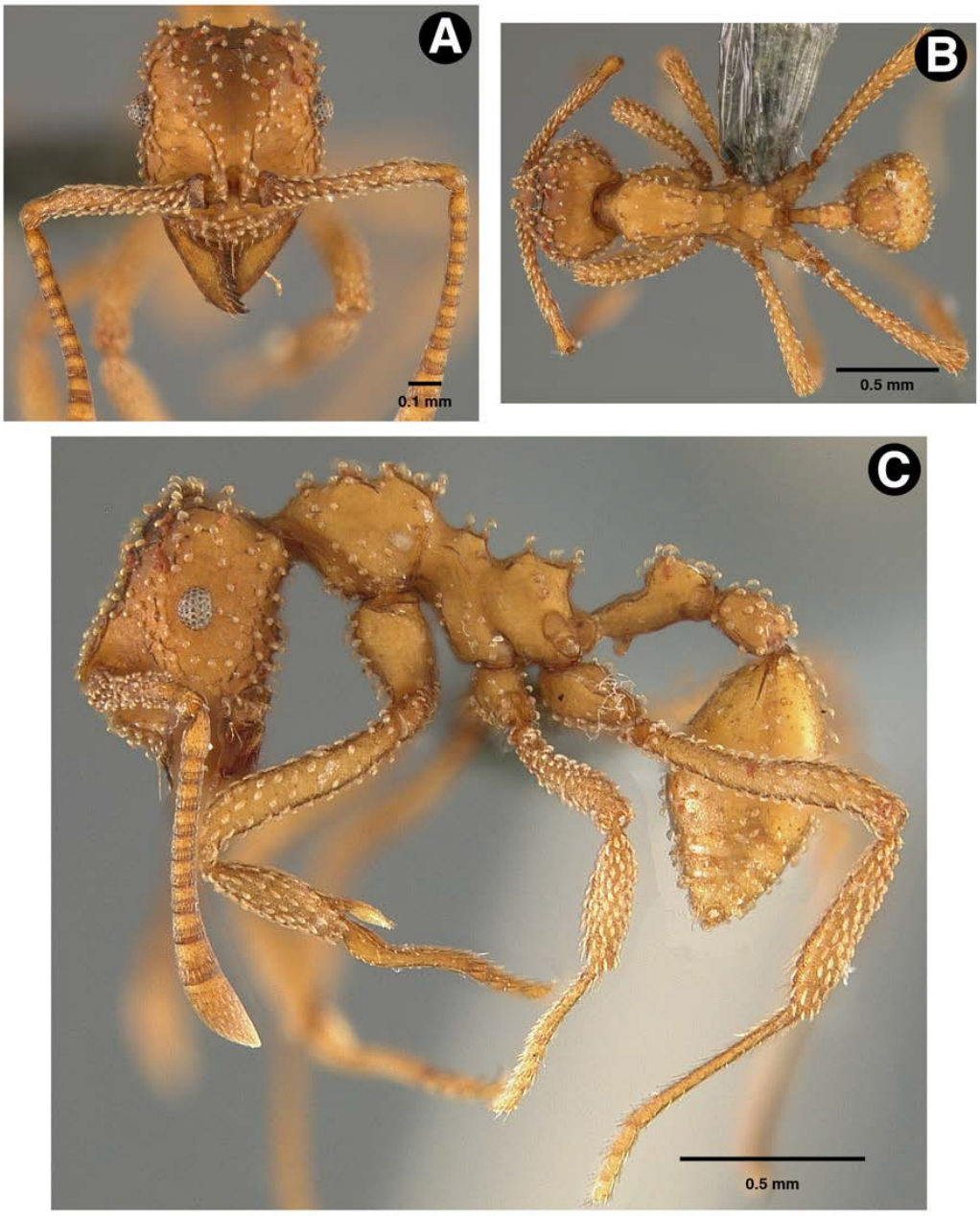


Figure 2.81. Holotype worker of *Myrmicocrypta JSC–042* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

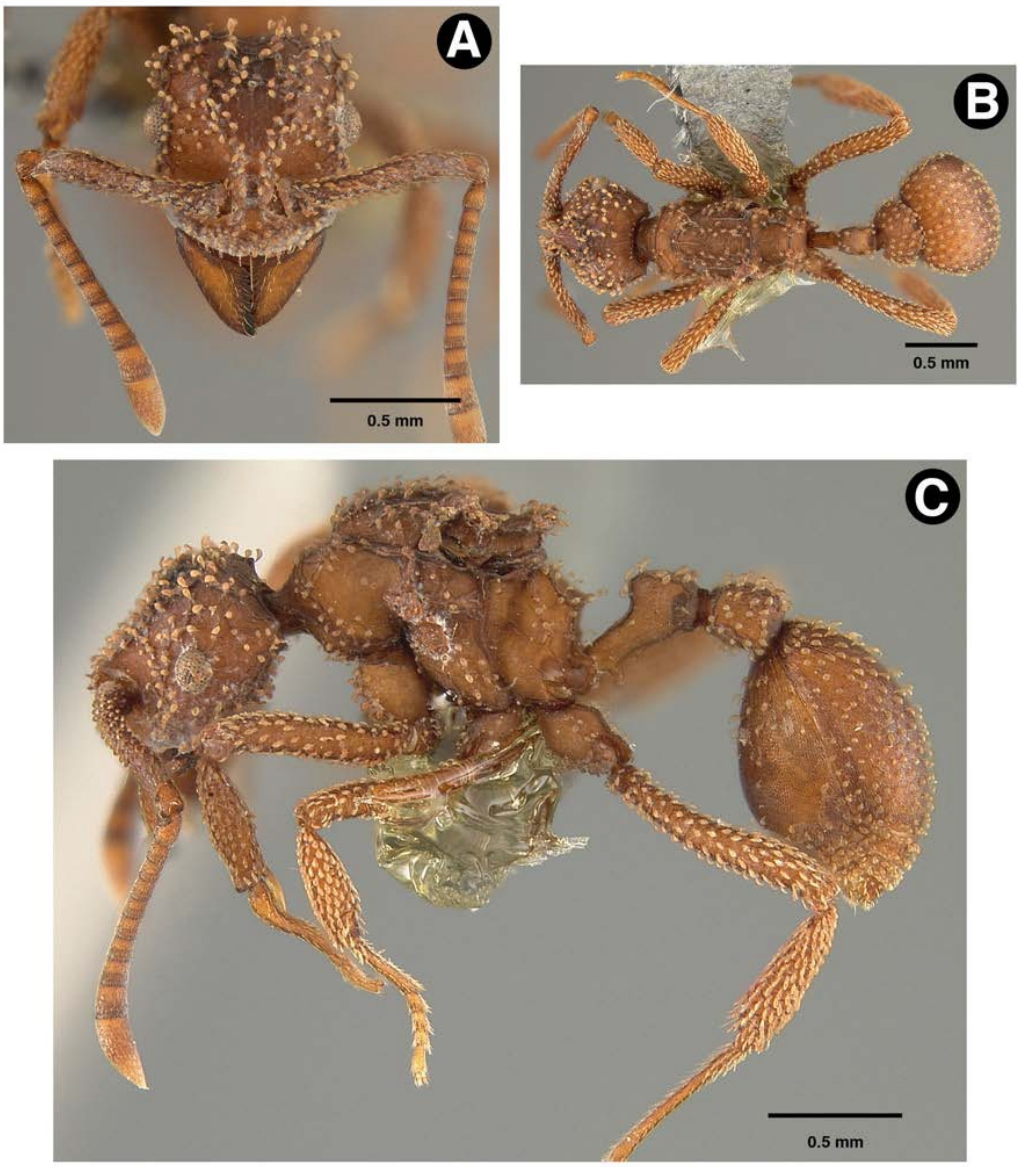


Figure 2.82. Paratype queen of *Myrmicocrypta JSC–042* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

Figure 2.83. Holotype worker of *Myrmicocrypta JSC–046* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

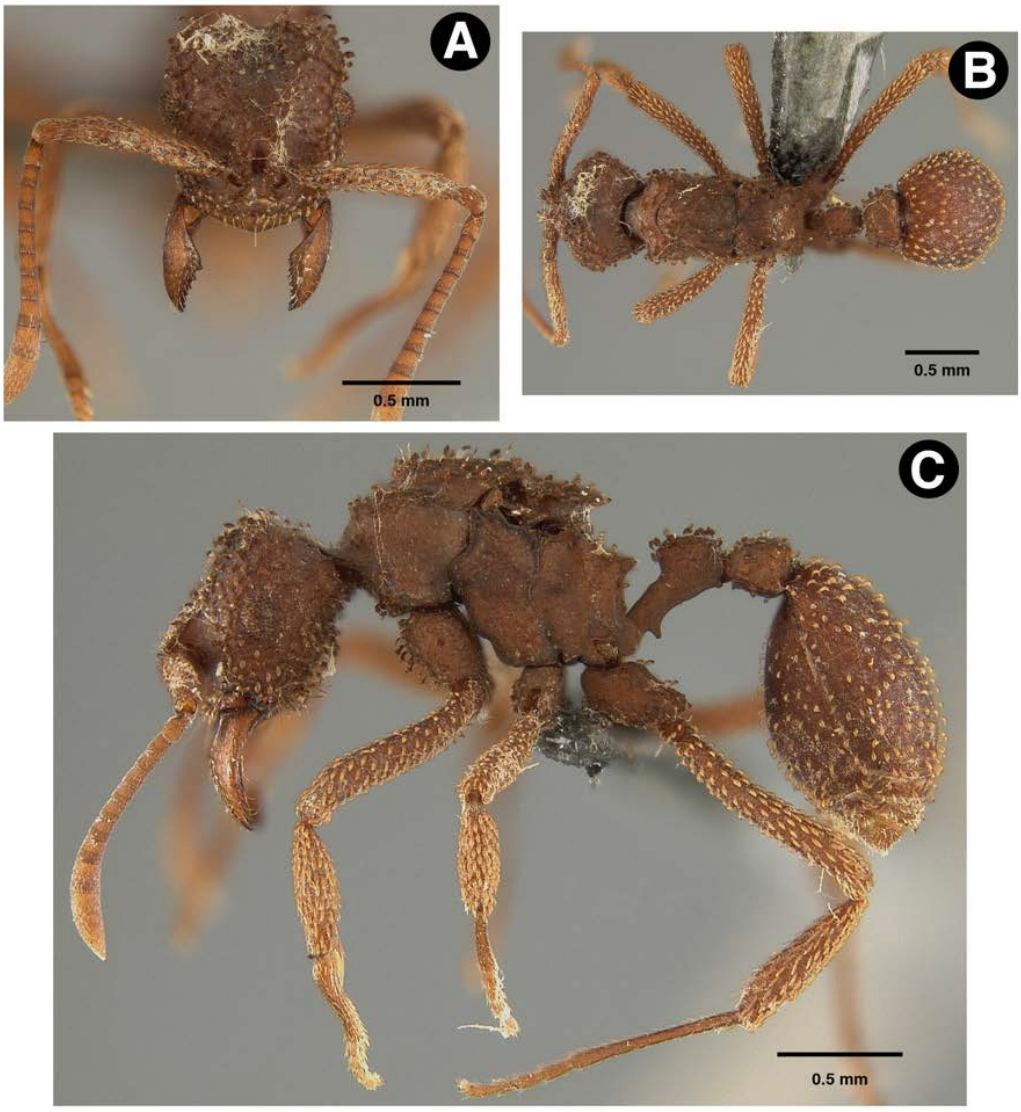


Figure 2.84. Paratype queen of *Myrmicocrypta JSC–046* **sp. nov**. (A) Full--face view. (B) Dorsal view. (C) Lateral view.

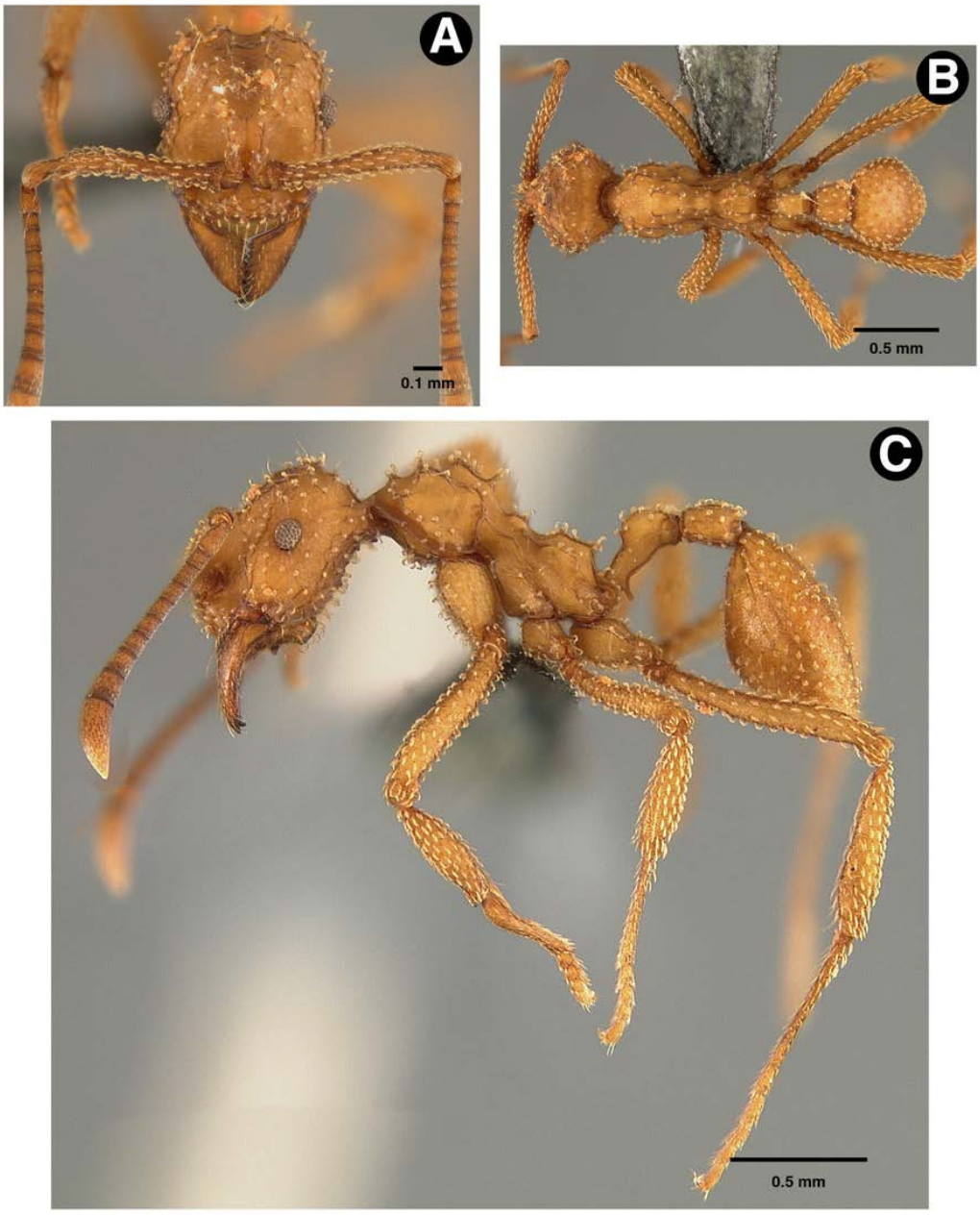


Figure 2.85. Holotype worker of *Myrmicocrypta JSC–047* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

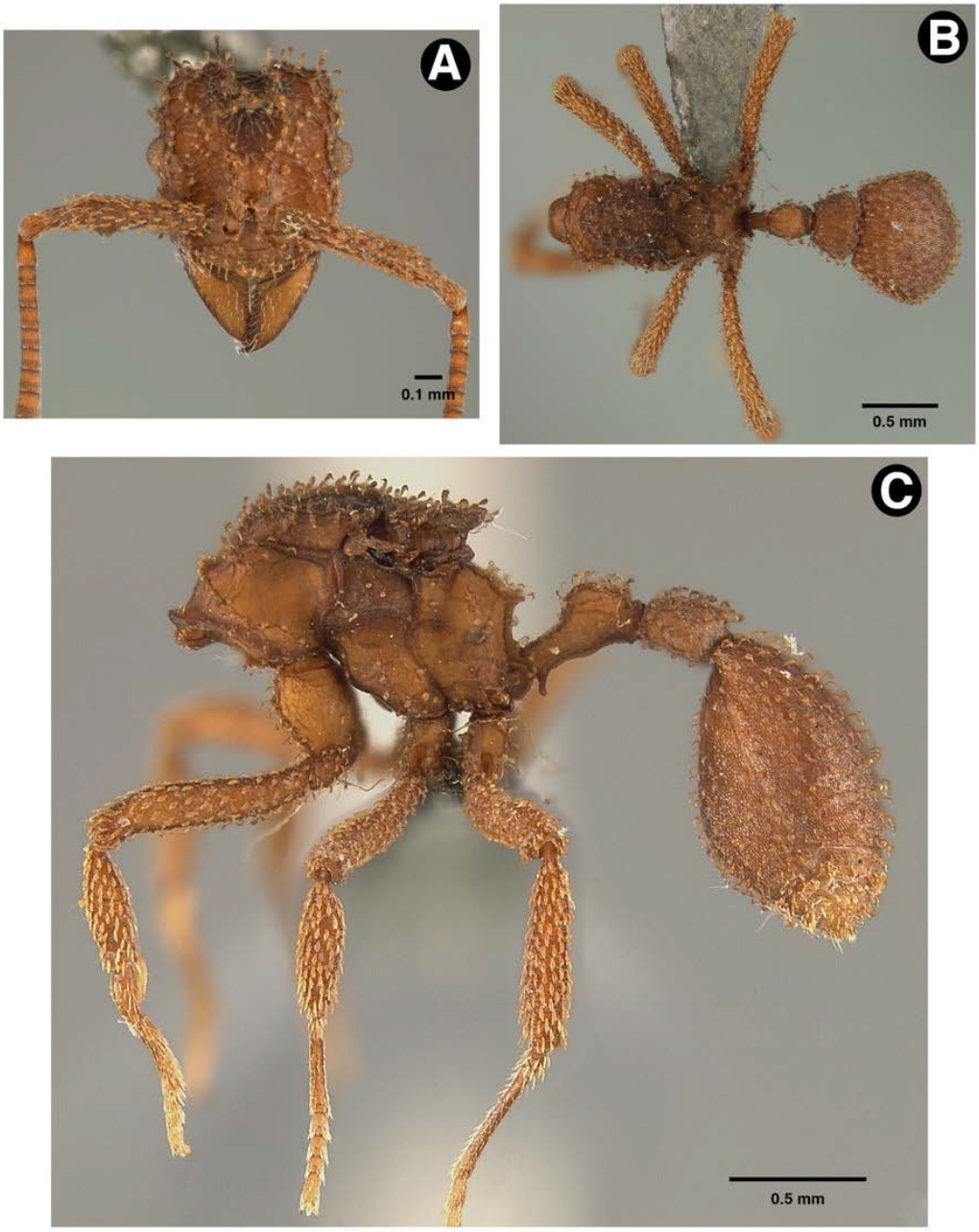


Figure 2.86. Paratype queen of *Myrmicocrypta JSC–047* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

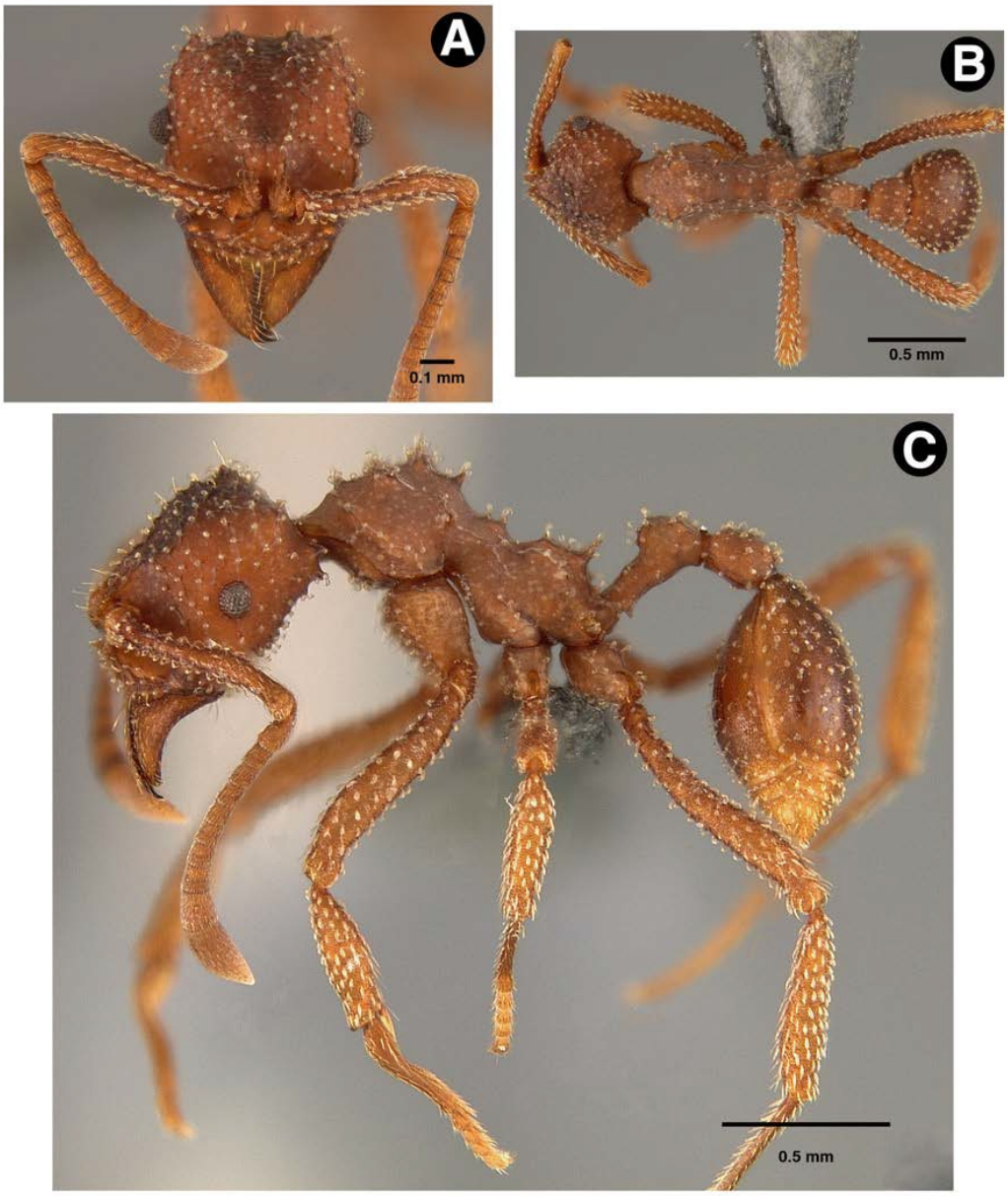


Figure 2.87. Holotype worker of *Myrmicocrypta JSC–048* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

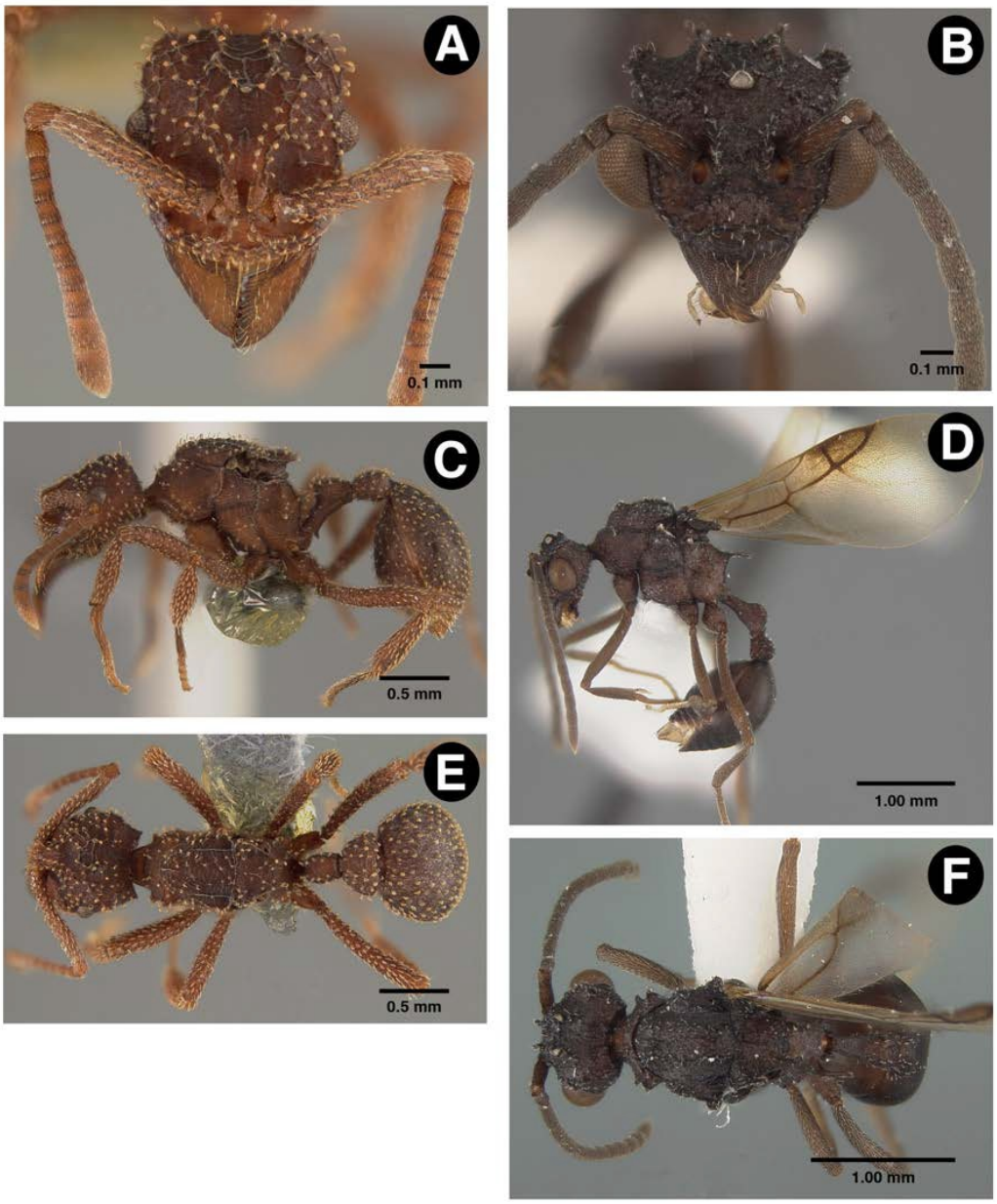


Figure 2.88. Paratype queen (A, C, E) and male (B, D, F) of *Myrmicocrypta JSC–048* **sp. nov**. (A, B) Full-face view. (C, D) Lateral view. (E, F) Dorsal view.

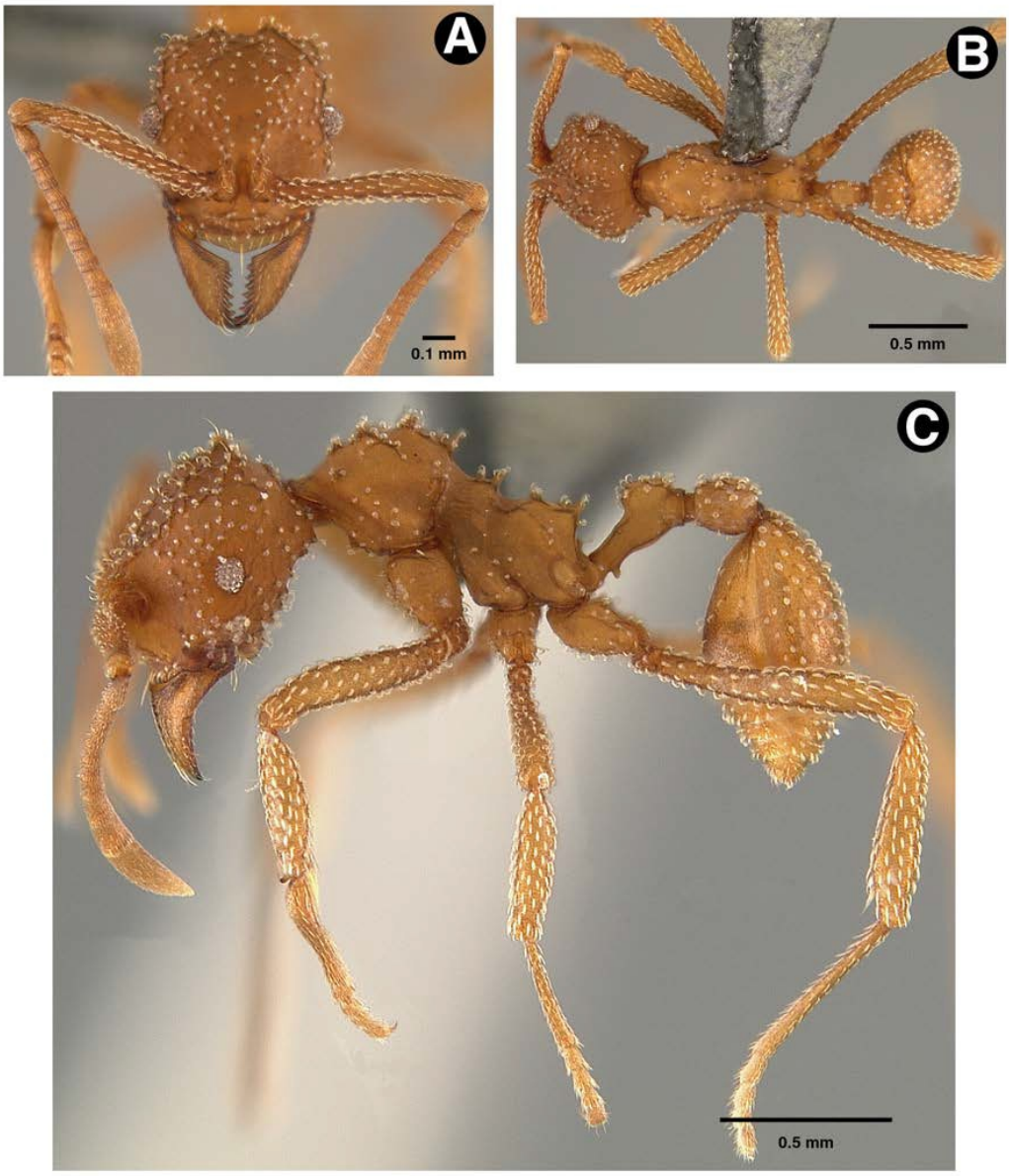


Figure 2.89. Holotype worker of *Myrmicocrypta JSC–049* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

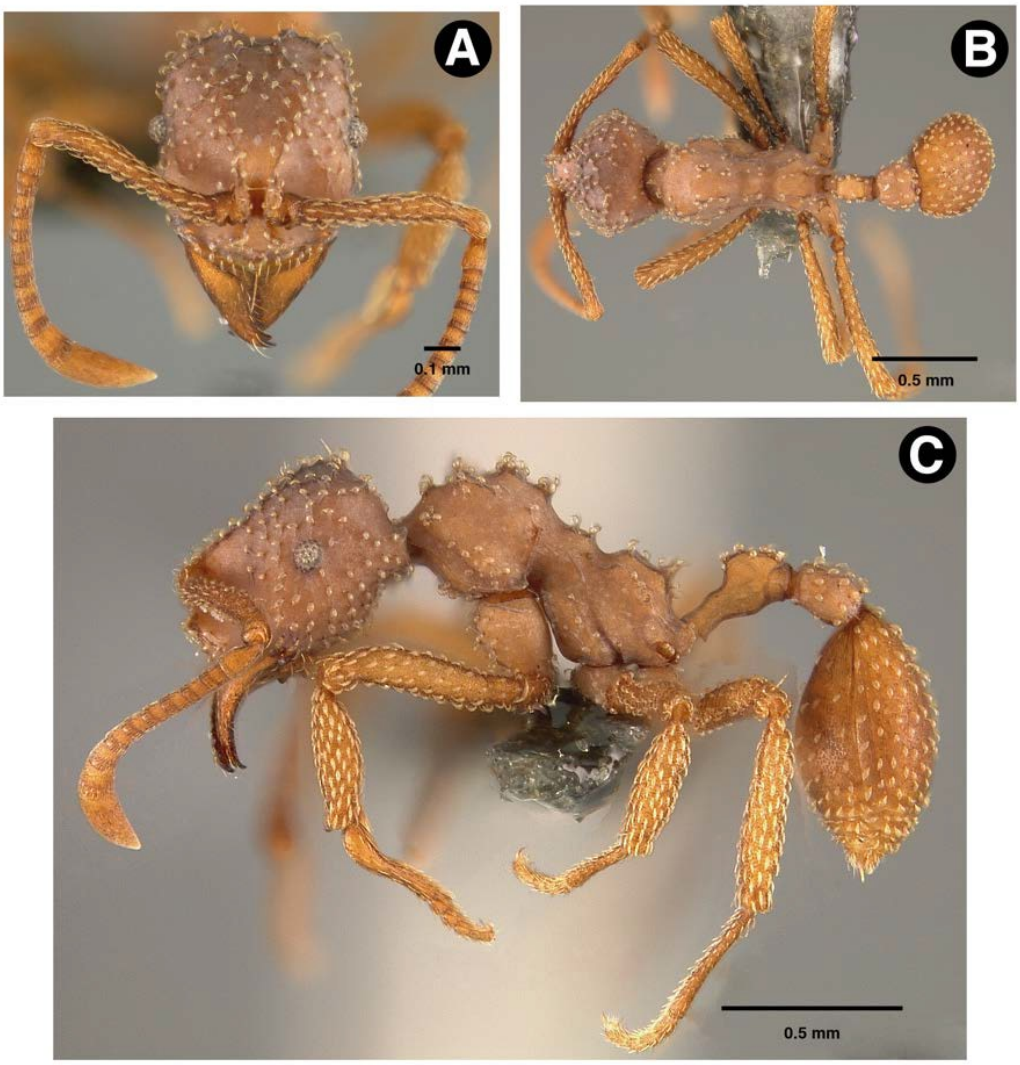


Figure 2.90. Holotype worker of *Myrmicocrypta JSC–050* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

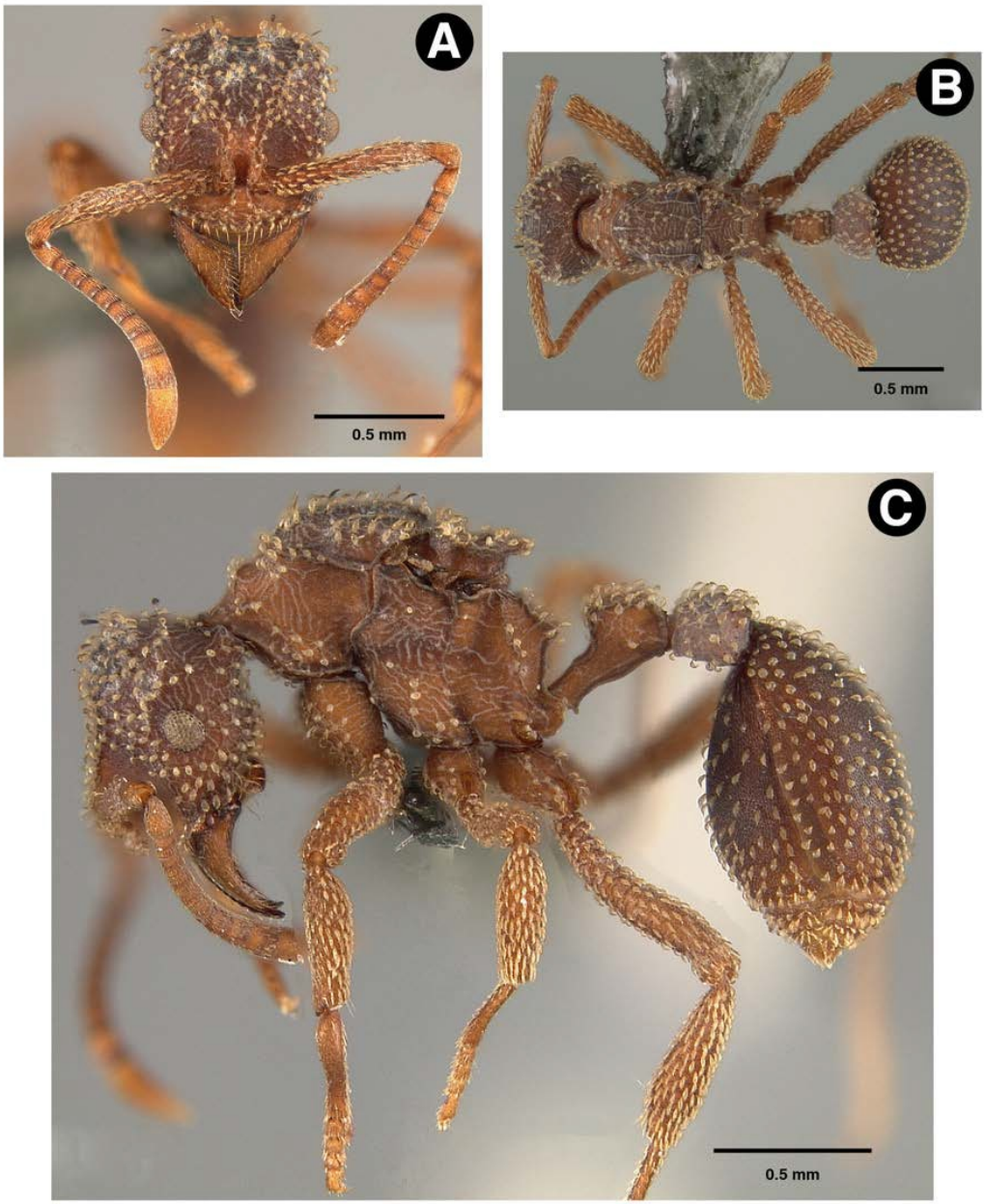


Figure 2.91. Paratype queen of *Myrmicocrypta JSC–050* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view.

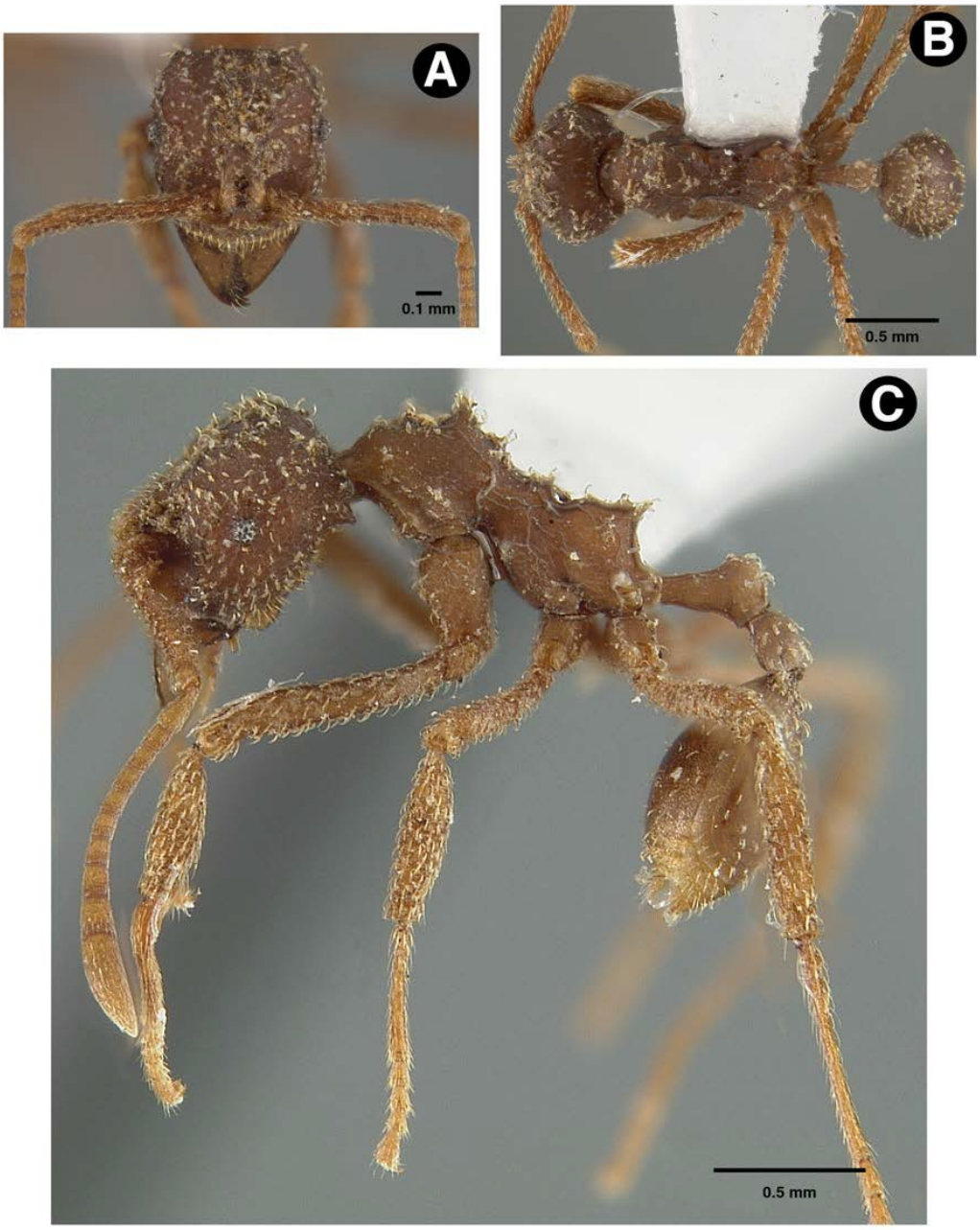


Figure 2.92. Holotype worker of *Myrmicocrypta JSC–051* **sp. nov**. (A) Full-face view. (B) Dorsal view. (C) Lateral view. (Photographs by E. Okonski)

Chapter 3: *Cyatta abscondita*: Taxonomy, evolution, and natural history of a new fungus-farming ant genus from Brazil.

By

Jeffrey Sosa-Calvo, Ted R. Schultz, Carlos R.F. Brandão, Christiana Klingenberg, Rodrigo M. Feitosa, Christian Rabeling, Maurício Bacci Jr., Cauê T. Lopes, Heraldo L. Vasconcelos

3.1. Introduction

New insect species are being discovered at a rate that is at least twice the historical average (Westwood, 1833; Stutz, 2009; IISE, 2011). As we might expect, many newly discovered species are cryptic species (i.e., multiple species previously thought to comprise a single species) and/or are easily referable to well-known genera or species groups. A significant number of newly discovered species, however, are phylogenetically important, i.e., they are the sole representatives of previously unknown, anciently diverged lineages and, as such, sources of new information about early insect evolution. New supraspecific taxa (e.g., new genera, families, etc.) are commonly erected for such species. For example, a new order of insects, the Mantophasmatodea, was described as recently as 2002 (Zompro, 2001; Cameron et al., 2006; Klass et al., 2003; Klass et al., 2002; Picker et al., 2002) (currently considered a suborder of Notoptera (Arillo and Engel, 2006)).

Despite their status as a relatively well-studied group, ants (Formicidae) are no exception to this trend of increasing species discovery (Bebber et al., 2007). Over 12,700 ant species in 308 genera have so far been described (Bolton, 2013; Ward, 2007), yet most ant systematists estimate that there are twice as many extant species (Hölldobler and Wilson, 1990; Ward, 2010), which would make ants the most speciose family of social insects (Ward, 2007). In recent years, more than 19 new extant and *ca.* 17 extinct ant genera and one subfamily (Martialinae) have been described (Dlussky et al., 2004; Dubovikov, 2004b, a; Engel and Grimaldi, 2005; Fernandez, 2003, 2004; Fisher, 2006; Bolton and Fisher, 2008, 2012; Cover et al., 2007; Fisher, 2009; Wild and Cuezzo, 2006; Rabeling et al., 2008; Branstetter, 2009; Fernandez et al., 2009; Klingenberg and Brandão, 2009; Terayama, 2009; Lapolla et al., 2012; Archibald et al., 2011; Silva et al., 2009; Yamane et al., 2008; Barden and Grimaldi, 2013).

Fungus-farming "attine" ants are exclusively New World in distribution, ranging from the United States in the North to Argentina in the South (Weber, 1958a, 1966; Wheeler, 1907) with six genera (*Acromyrmex, Atta, Cyphomyrmex, Mycetophylax, Mycocepurus,* and *Trachymyrmex*) also present in the Caribbean (Klingenberg and Brandão, 2009; Weber, 1945; Wheeler, 1907). To date, 256 valid species have been described in 15 extant genera and in one ichnogenus (*Attaichnus* Laza) (Bolton, 2013; Klingenberg and Brandão, 2009). Because attine ants participate in complex associations with their cultivated fungi and other microbial symbionts, they have become model systems for the study of

symbiosis and coevolution (Chapela *et al.*, 1994; Currie *et al.*, 2003a; Currie *et al.*, 1999b; Currie et al., 2003b; Green *et al.*, 2002; Hinkle et al., 1994b; Mueller, 2002; Mueller et al., 1998a; Munkacsi et al., 2004; Villesen *et al.*, 2004; Cafaro and Currie, 2005a; Gerardo *et al.*, 2006a; Gerardo *et al.*, 2006b; Mehdiabadi et al., 2006; Mikheyev *et al.*, 2006; Mikheyev *et al.*, 2007b; Mueller *et al.*, 2005b; Schultz *et al.*, 2005; Taerum et al., 2007; Mikheyev et al., 2007a; Caldera et al., 2009). Attine ants have additionally become model systems for comparative evolutionary studies of mating frequency/polyandry, gyne number, parthenogenesis, social parasitism, caste polyethism and polymorphism, nesting behavior, foraging behavior, and diverse microbial symbioses (Mehdiabadi and Schultz, 2010; Yek et al., 2012; Currie, 2001b; Barke et al., 2011; Mueller, 2002; Mueller and Gerardo, 2002; Mueller *et al.*, 2005b; Mueller et al., 2004; Mueller *et al.*, 1998a; Mueller *et al.*, 2001; Rabeling and Kronauer, 2013; Rabeling et al., 2009). Leaf-cutter ants in particular are the subjects of a century of applied research due to their status as serious pests of agriculture in Central and South America (Autuori, 1941; Belt, 1874; Autuori, 1942; Blanton and Ewel, 1985; Cherrett and Peregrine, 1976; Fowler, 1979; Delabie et al., 1997; Farji-Brener, 2001; Fowler and Claver, 1991; Hölldobler and Wilson, 1986, 2010; Wirth et al., 2007; Lopes, 2005; Varón et al., 2007; Wirth et al., 2003).

Here we describe the sole representative species of a new genus, *Cyatta abscondita* **gen n.** et **sp n.**, in the fungus-farming ant tribe Attini (Formicidae: Myrmicinae) and document its presence in the Brazilian Cerrado, a global biodiversity hotspot (Myers et al., 2000); in the Caatinga, a xeric shrub-land and

thorn forest in northeastern Brazil; and in Atlantic semi-deciduous forest, considered a transitional zone between humid Atlantic forests and the drier biomes of the Caatinga and Cerrado (Lopes et al., 2011). We describe the morphology, behavior, fungal associations, nest architecture, and other biological characters of *C. abscondita* that are potentially informative about plesiomorphic character states within the tribe Attini and within the informal clade Neoattini and, consequently, about the early evolution of ant farming behavior.

3.2. Materials and Methods

3.2.1. Material examined

The specimens examined have been deposited in the following institutions:

BLME	Coleção Entomológica, Bacci Laboratory of Molecular Evolution, São Paulo State University (UNESP), Rio Claro, Brazil.
CRC	C. Rabeling Collection, Cambridge, MA, U.S.A.
DZUP	Coleção Entomológica "Pe. Jesus Santiago Moure", Departamento de Zoologia, Universidade Federal do Paraná, Curitiba, PR, Brazil.
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, MA, U.S.A.
MZSP	Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil.

MBC–UFU Museu de Biodiversidade do Cerrado, Universidade Federal de Uberlândia, Uberlândia, Minas Gerais, Brazil.

USNM United States National Museum of Natural History, Washington, DC, U.S.A.

3.2.2. Morphological measurements and specimen preparation

All measurements were taken to the nearest 0.001 mm and, unless otherwise noted, are in millimeters. Images of worker and gyne were generated at the USNM Ant Lab using a JVC KY–F75U digital camera mounted on a Leica Z16 APO steromicroscope attached to a Dell Optiplex GX620 computer. Composite images were assembled using Auto-Montage Pro® (Version 5.03.0061 BETA) software (Synoptics Ltd.). Images of the male were generated at the MCZ using a Leica DFC 420 digital camera mounted on a Leica MZ16 dissecting scope. Composite images were assembled using Leica Application Suite (Version 4.0) and Helicon Focus (Version 5.3) software packages. The only two larvae collected were dehydrated sequentially through a series of ethanol concentrations to 100% absolute and then critical-point dried in a Balzers CPD–030 using liquid CO_2 at the Scanning Electron Microscopy (SEM) Lab in the SI–NMNH. Once the ethanol was replaced with CO_2 the samples were slowly heated to the critical point, slowly depressurized back to atmospheric pressure, dried, and mounted on aluminum stubs. The two prepared larvae and an adult worker paratype were sputter-coated with 60:40 wt% Gold:Palladium alloy

on a Cressington Scientific 108 auto/SE sputter coater to a thickness of 20–25 nm. Scanning Electron Micrographs (SEMs) of these specimens were generated using a Philips XL–30 ESEM with Lanthanum Hexaboride (LaB6) source and with a backscatter detector. All images were cropped and edited using Photoshop CS5® (Version 12.0) (Adobe Inc.).

The measurements, indices, abbreviations, and morphological terminology utilized throughout follow Gauld & Bolton (Gauld and Bolton, 1988), Klingenberg & Brandão (Klingenberg and Brandão, 2009), Rabeling *et al.,* (Rabeling *et al.*, 2007a), Serna & Mackay (Serna and Mackay, 2010), and Sosa-Calvo & Schultz (Sosa-Calvo and Schultz, 2010) and literature cited therein, with modifications where noted. Characters and terminology used in the description of the larvae are based on Schultz & Meier (Schultz and Meier, 1995b). The following abbreviations are used in the description: w= worker, dg= dealate gyne, m= male.

Latitude and longitude coordinates were converted to decimal degree when needed by using the Earth Point Web Site (http://www.earthpoint.us/Convert.aspx). In cases where coordinates were not documented in the specimen label, the coordinates were estimated using Google Earth v7.0 (http://www.google.com/earth/index.html) and are presented within brackets. The distribution map of *Cyatta abscondita* was generated using the software ArcGIS v10.1 (Esri, Redlands, CA).

3.2.3. Field observations and nest excavations

Field work was conducted at Fazenda Água Limpa from 20–27 February 2009 (JSC, TRS), 12–18 April 2010 (JSC, TRS, CTL), and 14–22 September 2011 (JSC, TRS, CTL); and at the Broa preserve from 21–28 July 2011 (CR, MB). Fazenda Água Limpa (FAL) is a 4490 ha experimental farm and conservation area of the Universidade de Brasília located at S15.94938° W47.93567°, ~30 km from Brasília, DF, Brazil, at an altitude of 1048–1160 m. The Broa preserve, one of the southernmost Cerrado preserves of São Paulo state, is located at S22.18517° W47.87754°, 9.5 km northwest of Itirapina in São Paulo state, Brazil, at an altitude of 530 m.

At FAL, nest entrances were located by following foragers carrying bait (Cream of Rice cereal liberally distributed on the ground) as they returned to the nest. Nests were excavated by first digging a trench about 1 meter wide and 1.5 meters deep and located about 1 meter from the nest entrance, and then by carefully shaving away soil in the direction of the nest entrance until either tunnels or nest chambers were encountered; see (Rabeling et al., 2007b; Solomon et al., 2011) for a detailed description of the methodology. During the course of the excavation, the trench was deepened as necessary and the dimensions, depths, and relative positions of tunnels and chambers were measured, photographed, and sketched. Fungus gardens were transferred from subterranean chambers to plastic containers with flame-sterilized spoons, knives, and/or forceps. Colonies were maintained in live culture in plastic containers, the

bottoms of which were lined with plaster saturated with water. At Broa, nest contents were preserved in 95% ethanol after a few days, once the ants had reconstituted and restabilized their fungus gardens and removed all soil particles. Two FAL nests (JSC110920-01 and JSC110919-02) were maintained in live culture for up to four months (nest 4, see Table 1).

Prior to 2009, only four isolated specimens had turned up in mass-collected ant samples. These include, from a leaf-litter sample, one specimen from riparian forest or Cerradão at Fazenda Olho D'água [611m; S18.90628º W45.53527º], Paineiras, Minas Gerais (MG), collected in 1999 and, from pitfall trap samples, one specimen from Caatinga at Reserva Particular do Patrimônio Natural (RPPN) Serra das Almas [330m; S05.16479° W40.67978°], Crateús, Ceará (CE), in 2003 and two specimens from Cerrado *sensu stricto* from the Reserva Ecológica do Instituto Brasileiro de Geografia e Estatística (IBGE) (1100m; S15.85000° W48.05000°), DF, Brasília, in 2008. More recently, in 2011, four additional stray specimens were taken in pitfall traps in Cerrado *sensu stricto* at Reserva Particular de Patrimônio Natural (RPPN) do Acangau (671m; S17.1790833° W 47.0583056°), Paracatu, Minas Gerais (MG), and in fragments of semideciduous forest at Fazenda Águas Claras (494m; S21.4023º W48.6873º), Pindorama, São Paulo (SP), and at Estação Experimental (414m; S21.5222º W49.3013º), Sales, (SP).

3.2.4. Molecular phylogenetics

DNA extraction, amplification, and sequencing were carried out at the Laboratories of Analytical Biology (LAB) at the National Museum of Natural History, Smithsonian Institution, Washington, DC. Ant genomic DNA was extracted from a worker collected at FAL, Brasília using the Qiagen DNEasy Tissue Kit. Four nuclear protein-coding genes, elongation factor 1-alpha paralog F1 (EF1α F1), elongation factor 1-alpha paralog F2 (EF1α F2), wingless (wg), and long wavelength rhodopsin (LW Rh) were amplified and sequenced following methods outlined in previous studies (Schultz and Brady, 2008; Rabeling *et al.*, 2011). Sequences are deposited in GenBank as accession numbers KF569882–KF569887.

DNA sequences, consisting of ~2.5 kbp, were added to the aligned data set of Schultz & Brady (Schultz and Brady, 2008) and aligned by eye in MacClade 4.08 (Maddison and Maddison, 2003). Data were partitioned and modeled as in Schultz & Brady (Schultz and Brady, 2008) and analyzed using MrBayes 3.1.2 (Ronquist and Huelsenbeck, 2003) with two independent runs of 10 million generations, each distributed over eight chains (seven heated and one cold; temperature parameter 0.05). To avoid known problems with branch-length estimation (Marshall *et al.*, 2006), (Marshall, 2010), branch length priors were shortened as follows: *prset applyto = (all) brlenspr = unconstrained:exponential (100)*. For each partition, we applied moderately informative Dirichlet priors to the rate multipliers. Burn-in and stationarity were assessed by comparing the mean and variance of log likelihoods, both by eye and by using the Bayes Factor comparison in Tracer 1.5.0 (Rambaut and Drummond,

2007b); by examination of the MrBayes ".stat" output file; and by examination of the split frequencies diagnostic. Based on this information, burn-in was set at 1 million generations.

3.2.5. Divergence time estimation

The time of divergence of the new genus *Cyatta* was estimated using the Bayesian uncorrelated lognormal approach as implemented in the program BEAST v1.7.5 (Drummond *et al.*, 2012) using a normal prior distribution for the root age (as described in Schultz & Brady (Schultz and Brady, 2008)). Beast XML files were generated using the complementary program BEAUti v1.7.4 (as implemented in the BEAST package). The results combine two runs of 100 million generations each. Burn-in, convergence, and mixing were assessed by examining time series plots and ESS values in Tracer 1.5.0 (Rambaut and Drummond, 2007b). Based on this information, burn-in was set at 20 million generations for each run.

3.3. Results

3.3.1. Taxonomy

***Cyatta* gen. n.**

(Figures 3.1–3.4)

Type species: *Cyatta abscondita* **sp. n.**, by present designation.

Worker: Small, monomorphic attine ant, total length (TL)= 2.29–2.56; Weber's length (WL)= 0.58–0.65. Color pale yellow to light brown. Body densely reticulate and covered with minute simple appressed hairs, more abundant on dorsum of head, waist segments, and gaster than on mesosoma. Palp formula 4,2. Anterior margin of clypeus produced into a convex, almost triangular, smooth, shining flange, i.e., "clypeal apron," with long unpaired median seta that originates closer to its posterior margin. Psammophore absent. Masticatory margin of mandibles 4–toothed. Antennal scrobes and preocular carinae absent. Antennae 11–segmented. Frontal lobes reduced, barely covering antennal insertions and diverging anteriorly. Frontal area subtriangular, distinct. In full-face view, posterior cephalic margin inflated laterally and strongly notched medially. Tubercles on mesosomal dorsum short, attenuate, and blunt. Metapleura with two spiniform processes between mid and hind coxae. Propodeum armed with a pair of short triangular spines. Node of petiole high, well-developed. Gaster lacking carinae or tubercles. In lateral view, pygidium rounded, laterally overlapping and concealing the hypopygium; in ventral view, pygidium posteromedially emarginate (i.e., V–shaped), the triangular hypopygium fitting within the emargination of the pygidium.

Gyne: Preocular carina absent. Mandible 4–toothed, apical tooth nearly twice as long as preapical tooth. Parapsidal lines inconspicuous.

Male: Mandibles broadly triangular with apical and subapical teeth present. Anterior margin of clypeus (clypeal apron) convex, projecting over mandibles, and with a long median seta. Discal cell present in forewing.

Etymology. *Cyatta* is a neologism constructed in part from the Brazilian Tupi language word *Cy,* meaning "sister," referring to its status, along with the genus *Kalathomyrmex*, as the sister clade to the remaining genera of the informal clade Neoattini, to which the genus *Atta*, the most conspicuous member of the Neoattini, belongs.

***Cyatta abscondita,* sp. n.**

(Figures 3.1–3.4)

Holotype*, worker*: labeled: "BRAZIL: DF: Brasília; Faz. Água Limpa; 1106 m; 47.90133º W 15.9524º S ±5m; 20.ix.2011; (*J. Sosa-Calvo, T.R. Schultz, C.T. Lopes*); nest series; Cerrado *sensu stricto*; in ground; JSC110920-01" [MZSP, unique specimen identifier No. USNMENT00758173].

Paratypes, same data as holotype [3w, MZSP, USNMENT00758172, 00756921, 00758307], [1dg, 4w, USNM, USNMENT 00758174, 00758223, 00758316–18] [3w, USNM, USNMENT00521881 (EtOH vial)]. Same data as holotype, but "19.ix.2011; JSC110919-02" [1dg, MZSP, USNMENT00758175], [2w, USNM, USNMENT00758176–77] [1w, USNM, USNMENT00521910

(EtOH vial)]. Same data as holotype, but "16.iv.2010; JSC100416-04" [1w, MZC, USNMENT00758180] [1w, USNM, USNMENT00521908 (EtOH vial)]. Same data as holotype, but "1099 m; 47.90129º W 15.95242º S ±3m; 23.ii.2009; (*J Sosa-Calvo & TR Schultz*); nest series on ground; JSC090223-26" [1w, USNM, USNMENT00758178]. Same data as previous entry, but "16.iv.2010; nest series underground; JSC100416-01" [1w, DZUP, USNMENT00758319] [2w, 1dg (currently misplaced) USNM, USNMENT00758323–24, 00758325] [3w, USNM, USNMENT00521886 (EtOH vial)]. Same data as holotype, but "Garden near dorms; 1071 m; 47.93567º W 15.94938º S ±3m; 12.iv.2010; (*J Sosa-Calvo, TR Schultz, CT Lopes*); nest series; back yard; under ground; JSC100412-01" [1w, DZUP, USNMENT00758224], [1w, MZSP, USNMENT00758179], [3w, USNM, USNMENT00758320–22] [3w, USNM, USNMENT00521917 (EtOH vial)].

Worker measurements. Holotype (Paratypes, n=9). TL 2.40 (2.29–2.56), WL 0.62 (0.58–0.65), HL 0.53 (0.50–0.55), HW 0.48 (0.48–0.51), SL 0.48 (0.43–0.50) ML 0.34 (0.32–0.36), EL 0.13 (0.12–0.13), PL 0.17 (0.14–0.19), PPL 0.22 (0.20–0.24), GL 0.52 (0.49–0.64), CI 90 (90–95), SI 101 (90–100), MI 64 (63–68), FLD 0.17 (0.17–0.18).

Additional material examined. Same data as holotype, but "1099 m; 47.90129º W 15.95242º S ±3m; 16.iv.2010; (*J Sosa-Calvo & TR Schultz*); stray worker; JSC100416-08" [1w, USNM, USNMENT00521890 (EtOH vial)]. Same

data as previous entry, but "15.iv.2010; (*J Sosa-Calvo & TR Schultz*); nest entrance; JSC100415-03" [4w, USNM, USNMENT00521907 (EtOH vial)]. **BRAZIL: CE**: Crateús; Croatá; RPPN Serra das Almas; [330m; 40.67978° W 05.16479° S]; 20–30.iv.2003; (*Y Quinet*); pitfall trap; Caatinga, *Carrasco*; SP 60 [1w, MZSP]. **DF**: Brasília; Reserva Ecol. IBGE; Parcela Bienal Tardia (Projeto Fogo); 1100m; 48.05000° W 15.85000° S; 30.i.2008; (*J Maravalhas*); pitfall trap;. Cerrado *sensu stricto*; B2/CT [2w, MZSP]. **MG:** Paineiras; Fazenda Olho D'Água; [611m; 45.53527º W 18.90628º S]; 22–24.v.1999; (*AA Tavares*); Winkler #2; Cerrado [1w, MZSP]. **MG:** Paracatu; Reserva Particular de Patrimônio Natural do Acangau; 671m; 47.0583056° W 17.1790833° S; 12.iv.2011; (*TLM Frizzo*); pitfall trap; Cerrado *sensu stricto* [2w, MBC–UFU]. **SP:** Itirapina; 9.5 km northwest of Itirapina; Broa preserve; 530m; 47.87754° W 22.18517° S; 21.vii.2011; (*C Rabeling & M Bacci Jr*); nest series; Cerrado *sensu stricto*; under ground; CR110721-04 [1w, MZSP, USNMENT00758220; 1m, MZSP, USNMENT00758204], [1w, MZC, USNMENT00758221], [2w, USNM, USNMENT00758219, USNMENT00758222], [6w, BLME & CRC, USNMENT00758190–95]. Same data, but CR110721-05 [1w, MZSP, USNMENT00758217], [1w, MZC, USNMENT00758218], [1w, USNM, USNMENT00758206], [10w, BLME & CRC, USNMENT00758207, USNMENT00758253–61]. Same data, but CR110721-08 [3w, BLME & CRC, USNMENT00758196–98]. Same data, but 26.vii.2011, CR110726-09 [3w, BLME & CRC, USNMENT00758199–201]. Same data, but 28.vii.2011, CR110728-01 [3w, BLME & CRC,

USNMENT00758262-65], [1w, USNM, USNMENT00758205]. **SP:** Pindorama; Fazenda Águas Claras; 494m; 48.6873º W 21.4023º S; 16.viii.2011; (*GA Castilho*); Floresta Estacional Semidecidual; pitfall B1 [1w, MZSP]. **SP:** Sales; Estação Experimental; 414m; 49.3013º W 21.5222º S; 17.viii.2011; (*GA Castilho*); Floresta Estacional Semidecidual; pitfall I4 [1w, MZSP].

Measurements. TL 2.03–2.60, WL 0.52–0.66, HL 0.48–0.55, HW 0.46–0.54, SL 0.42–0.51, ML 0.20–0.38, EL 0.10–0.14, PL 0.13–0.19, PPL 0.21–0.25, GL 0.47–0.59, CI 87–95, SI 91–104, MI 40–68, FLD 0.16–0.18 (n=13).

Etymology. The specific name "*abscondita*" refers to the exceedingly secretive nature of this species, which, after being recognized from a few rare specimens, proved frustratingly elusive during multiple attempts to locate it in the field.

Worker. *Head*: in full-face view subrectangular, slightly longer than wide (CI 87–95); sides subparallel. Mandible subtriangular with four well-developed teeth; apical tooth twice as large as subapical tooth; diastema between subapical tooth and 3rd tooth shorter or slightly shorter than diastema between 3rd and 4th teeth (Fig. 2c); dorsum of mandible reticulate and with appressed hairs (Fig. 2d); masticatory margin of mandible, including apical tooth, smooth, shining, and darker in color than rest of head, with long, simple hairs. Clypeal apron (anteclypeus) convex to almost triangular, smooth, and shining; unpaired

median setae (length 0.07–0.10 mm) originating slightly before (anterior to) posterior edge of clypeal apron and almost or as long as antennal pedicel, not reaching apex of mandible (Figs 2c,d); clypeus with pair of lateral transverse carinae, each extending from below frontal lobe to mandibular insertion. Medially these carinae developed into lamellae perpendicular to clypeal face, thus forming a wall that divides the clypeus laterally into anterior and posterior areas, very likely homologous with clypeal morphology of closest relative, *Kalathomyrmex emeryi* (Fig. 2c); medially clypeus is not so divided, face extending posterad between frontal lobes. Frontal lobes reduced, convex, barely covering antennal insertions (Figs 1a, 2c). Frontal carina fading out posteriorly at midlength of compound eye (Figs 1a, 2c). Well marked triangular area with concave anterior margin between frontal lobes reticulate, bordered anteriorly by rounded finger of clypeus, which extends broadly posterad between frontal lobes. Compound eye set slightly before middle of head, with 7–9 ommatidia at maximum length and 6 ommatidia at maximum width (33–47 ommatidia in total). Antennal scape covered with minute, simple, appressed hairs; antennal scape wider at 7/10 of its length, and slightly surpassing posterolateral corners of head when laid back over head capsule; first funicular segment (pedicel) slightly longer than or as long as second and third funicular segments combined. In full-face view, cephalic margin deeply notched medially (i.e., at vertex) and rounded laterally (Fig. 1a), shallow vertexal sulcus extending medially towards frontal lobes, fading at eye level; in lateral view, ventral face of head slightly convex. Hypostomal teeth absent. Palp formula 4,2 (Figs 2a,b).

Mesosoma: Profile of promesonotal dorsum in lateral view distinctly tuberculate, tubercles attenuate and blunt (Figs 1c,e, 2a). In dorsal view, promesonotum with raised shield-like area, broad anteriorly and narrowing posteriorly, distinctly separated from lower, lateral promesonotum; raised area formed anteriorly by triangular lateral pronotal tubercles and two median low and approximate pronotal tubercles and posteriorly by eroded remnants of promesonotal tubercles; lower, lateral area of promesonotum in dorsal view subtriangular, broader and anterolaterally angled anteriorly; in lateral view, inferior corner of pronotum rounded, lacking spines or angles. Anepisternum indistinctly separated from katepisternum. Metanotal groove relatively broad and strongly impressed, in lateral view extending to antero-ventral margin of metapleuron. Metapleura ventrally with two spiniform processes between mid and hind coxae, best seen by removing hind legs. Basal (dorsal) face of propodeum in lateral view a low, rounded, protuberance posterior to metanotal groove; in dorsal view, basal face very small, raised above remainder of propodeum, and narrowing anteriorly; declivous face of propodeum behind protuberance concave; propodeal spines triangular (Fig. 1c), obliquely directed upwards and strongly diverging in dorsal view; declivity of propodeum much longer than base (dorsum); propodeal spiracle opening in an angle of 45° in relation to main body axis; in lateral view, propodeal lobes rounded without posterior projections.

Peduncle of petiole vestigial; in lateral view, petiolar node well developed, subquadrate, with anterior face almost straight and vertical; dorsum

of petiolar node short and almost flat, meeting vertical posterior face in slightly rounded angle; ventral face of petiole slightly concave or straight medially, lacking petiolar process (Figs 1c,e); in fronto-dorsal view, node of petiole shallowly V shaped, dividing node into a pair of rounded tubercles. Postpetiole robust, almost twice as long as petiole and slightly less than 0.5x gaster length; in dorsal view, postpetiole subtriangular, anterior margin rounded, lateral margins slightly diverging posteriorly; posterior margin with deep median impression, forming two distinct small lobes; in lateral view, anterior portion of postpetiole convex, postpetiole relatively compressed dorsoventrally; ventral projections absent (Figs 1c,e). In profile, gaster elliptical and dorsally finely reticulo-striate; in dorsal view, apical margin of pygidium (gastral segment IV, i.e., abdominal segment A7) medially emarginate, bilobed; gastral sternite IV (hypopygium, i.e., A7) covered with simple decumbent hairs; in lateral view, pygidium rounded, laterally overlapping and concealing the hypopygium; pygidium weakly reticulate and shiny; in ventral view, pygidium posteromedially emarginate (i.e., V–shaped), the triangular hypopygium fitting within the emargination of the pygidium (Figs 2e,f). Sting apparatus present, protruding through emargination on pigydium.

Color pale yellow to light brown; antennae, mandibles, and legs lighter than rest of body. Body integument areolate, with short appressed simple hairs, appearing almost hairless.

Gyne. As in worker description, but with caste-specific morphological differences as follows. All gynes studied are dealate. *Head:* Eyes large, with 10–11 ommatidia in maximum length and 9 ommatidia in maximum width, ~65 ommatidia total; median ocellus rounded, located in a median sulcus extending almost from the occipital carina in the back of the head to the middle of the frons; integument surrounding ocelli darker in color than elsewhere. Clypeus with unpaired median seta arising on short transverse wrinkle-like ridge that crosses clypeal apron; two to four short simple appressed hairs on clypeal apron on each side of median clypeal seta. In full-face view, cephalic border with median (vertexal) notch, not as deep as in worker. Mandibles dorsally coarsely rugose.

Mesosoma: Pronotal dorsum conspicuously areolate, lacking anterior pronotal tubercles; lateral pronotal tubercles present, blunt and small; humeral pronotal tubercles vestigial. Mesoscutum, in dorsal view, rounded to slightly ovate and overall reticulo-rugose; dorsum of mesoscutum, in profile, almost flat; mesoscutal sulcus, in dorsal view, short, not extending more than 1/4 length of mesoscutum; notauli absent; parapsidal lines short, inconspicuous, and extending nearly to lateral margin of mesoscutum; transscutal suture conspicuous. Scuto-scutellar sulcus deep and with ~7 transverse carina; margin of axilla rounded, dorsally reticulo-rugose. Scutellum posteriorly weakly bidentate, dorsally rugose and with a shallow median longitudinal groove. Anapleural sulcus deep, with transverse carinae, dividing mesopleuron into anepisternum and katepisternum. Metanotal groove extended into a complete metanotal-propodeal suture (*sensu*

Serna & Mackay (Serna and Mackay, 2010)). In profile, metanepisternun (*sensu* Serna & Mackay (Serna and Mackay, 2010) present, small. In profile, metanotal groove conspicuous, continuous with mesometapleural suture. Ventral metapleural processes present as a pair of spiniform tubercles between the mid and hind coxae, similar to, but longer than, those present in worker. Propodeum with pair of short, right-angled denticles; dorsum, lateral margin, and declivity of propodeum reticulate. *Metasoma*: petiole as in worker. Dorsum of postpetiole reticulo-rugose. Dorsum of gastral tergite IV (A7) rugulose; pilosity as in worker; gastral tergite and sternite IV (pygidium and hypopygium; A7) as in worker.

Measurements. TL 3.27–3.32, WL 0.86–0.87, HL 0.65–0.66, HW 0.60–0.63, SL 0.56, ML 0.41–0.42, EL 0.16–0.17, PL 0.25–0.28, PPL 0.29–0.30, GL 0.79–0.81, CI 91–96, SI 89–93, MI 62–65, FLD 0.20–0.21 (n=2).

Male. A medium-sized male with head large relative to size of the mesosoma. Mandibles broadly triangular, apical and subapical teeth present large; remaining tooth minute, indistinct; texture coarsely granulate. Palp formula 4,2. Clypeus broadly trapezoidal in frontal view; anterior margin convex, with a long median seta (0.11 mm) originating at the anterior margin and projecting over the mandibles; in lateral view anterior margin of clypeus forming a lamella projecting over the mandibles. Frontal lobes triangular, only partly covering the condylar bulbs of the scape in full face view. Antennae with 13

segments; scape surpassing the posterior border of the head by 1/3 of its length. Antennal funicular segment II (0.08 mm) almost as long as funicular segment I (pedicel; 0.11 mm) (Figs 3a,b). Eyes conspicuously large, at maximum diameter approximately half as long as the entire head, counting ~15 ommatidia in maximum width and ~23 ommatidia in maximum length. Ocelli large, elevated above the remainder of the head. Surface of head coarsely granulate, finely rugulose around the ocelli. Tergum of promesonotum not distinctly enlarged, giving the mesosoma a rather slender appearance in lateral view. In dorsal view, lateral pronotal teeth pyramidal, twice as wide at the base than high, with sharp tips. Propodeal spines reduced to broad teeth with rounded tips. Anterior peduncle of the petiole about the same length as the petiolar node. Postpetiole wider than long; trapezoidal in dorsal view; posterior margin slightly concave. In lateral view, postpetiole with a broadly rounded ventral lobe. Reticulate sculpture on gaster finer in appearance than on the remainder of body, which tends to be areolate; gastric tergites moderately lustrous; rest of body with a weak silky shine. Body surface sparsely covered with short appressed setae, only ventral side of postpetiole with 10 erect setae. Body dark, blackish brown; legs and antennae slight lighter in color, yellowish to dark brown. Forewings with closed basal (BC), costal (CC), submarginal (SMC1), marginal (MC), and subbasal (SBC) cells; submarginal cell 2 and discal cell 2 open (Fig. 3d). Hindwings with closed basal cell and open marginal subbasal and discal cells (Fig. 3d). Left forewing with closed discal (DC1) cell, whereas the right forewing lacking this cell. The presence of a closed discal cell in the forewing is, so far as is known to

us, unique in the Attini; this character is absent in all other attine genera, including the closest relative of *C. abscondita*, *Kalathomyrmex emeryi*. A closed discal cell is plesiomorphically present in many ant species, including those in genera closely related to the Attini such as the Blepharidattini, Cephalotini, Dacetonini, and Pheidolini.

Measurements. EL 0.25, EW 0.27, FL 0.81, FLD 0.21, GL 0.87, HL 0.58, HW 0.73, IOD 0.42, ML 0.21, MI 37, PL 0.27, PPL 0.25, PPW 0.38, PrW 0.54, PW 0.21, SL 0.54, TL 3.21, WL 1.04, CI 126, SI 127 (n=1).

Larva. Description based on SEM study of two specimens, late-(probably fourth) instar larvae of uncertain (but probably worker) caste. Due to collapsed condition of specimens, habitus profile could not be characterized with certainty, but is consistent with the "attoid" profile category of Wheeler & Wheeler (Wheeler and Wheeler, 1976), i.e., with a moderately curved, ventrally shortened profile. Thoracic-abdominal articulation apparently absent, thoracic intersegmental constrictions superficial, deep lateral depressions associated with abdominal spiracles absent, all states shared with other Attini. Remarkably, body hairs present dorsally and laterally, a condition otherwise common in the Myrmicinae but rare in the Attini, in which larvae usually lack dorsal and lateral hairs. In the Attini, such hairs are known to be present only in the larvae of *Mycocepurus goeldii* and *M. smithii* (Schultz and Meier, 1995b), where their

presence may be plesiomorphic, and in *Sericomyrmex* and some *Acromyrmex* species, where their presence is likely secondarily derived. Predominant hair type bifurcate with "anchor tips" (Figs 4a,d). Two rows of dorsomedian, very long anchor-tipped hairs present (Fig. 4e). Labrum monolobate, narrow, bulging. Anterior setae present as papillae. Mandibles typically attine: short, fleshy, subconical. A distinct, undivided apical mandibular tooth and no subapical teeth; spinules evenly distributed on all mandibular surfaces. Mandibular gnathobases absent. Basal portions of maxillae fused with head capsule. Maxillary palp widely removed laterad from galea, a synapomorphy for the Neoattini. Galea reduced, present as two sensilla surmounting a low protuberance, as in all Attini except for some *Myrmicocrypta* species. Maxillary palp digitiform, maxillary accessory palpal sensillum absent. A single seta present laterad of maxillary palp, a character shared with *Mycocepurus* species. As in most attines, labium feebly protruding, lateral sericteral protuberances absent, labial palps digitiform. Labial spinules present on anterior surface slightly dorsal to the sericteries. Hypopharyngeal spinules multidentate and apparently densely distributed. On the head, genal lobes absent, a state in the Attini shared with *Myrmicocrypta*, *Apterostigma*, *Mycocepurus*, and *Mycetarotes* species. Supra-antennal setae present and abundant, a condition common in the subfamily but otherwise present in the lower Attini only in *M. goeldii*. Subantennal (genal) setal arrangement plesiomorphic for the tribe, consisting of around 12 setae on each gena. Supraclypeal setae present and setiform. Two clypeal setae present. Spinules absent on the head dorsad of the labrum, the state

common to most attines. Due to the poor condition of specimens, most ventral thoracic/abdominal characters could not be studied, including the presence/absence of: leg vestiges, prothoracic food anchor, ventromedian protuberances on various segments, papilliform spinules, and hairs.

Two setal sockets occur ventral of the anal opening on abdominal segment IX (Fig. 4f). No other setae are associated with the anal opening. Ventral anal lip absent.

Comments. The new genus *Cyatta* shares with other genera belonging to the tribe Attini: (i) the presence of a thick unpaired median seta arising from the clypeal apron (considered a synapomorphy for the tribe by Brandão & Mayhé-Nunes (Brandão and Mayhé-Nunes, 2001); but, along with the clypeal apron, presumed secondarily lost in *Kalathomyrmex* (Klingenberg and Brandão, 2009)); (ii) 11 antennal segments in the worker and gyne, 13 in the male (the latter secondarily reduced in some *Cyphomyrmex*, *Mycetagroicus*, *Sericomyrmex*, *Trachymyrmex*, and social parasites); (iii) palpal formula 4,2 (plesiomorphic for the Attini, secondarily reduced in *Apterostigma* and some social parasites). Larvae of *Cyatta* share with the larvae of other attine genera the: (iv) thoracic-abdominal articulation apparently absent; (v) thoracic intersegmental constrictions superficial; (vi) deep lateral depressions associated with abdominal spiracles absent; (vii) short, narrow labrum; and (viii) fleshy, subconical mandibles. Behaviorally, *Cyatta* shares with other Attini the cultivation of fungi for food.

The genus *Cyatta* shares with other members of the neoattine clade: (i) the antennal scape of the male long, longer than the sum of the length of antennal funicular segments I–III; (ii) the first funicular segment (pedicel) of the antenna of the male longer than second funicular segment; (iii) the petiole in workers somewhat sessile; (iv) the lack of hypostomal teeth in workers and gynes; and (v) the maxillary palp of the larva widely removed laterad from the galea.

Cyatta shares with its sister genus, *Kalathomyrmex,* (i) the lack of a tubercle or spine on the inferior lateral margin of the pronotum, a symplesiomorphy shared with the paleoattine clade; (ii) the clypeus with a pair of lateral transverse carinae, each extending from the frontal lobe to the mandibular insertion and each medially developed into a lamella perpendicular to the clypeal face, thus forming a wall that divides the clypeus laterally into anterior and posterior areas; and (iii) the mandibles of the male with three teeth, of which the apical and preapical teeth are the largest and have a multidentate (saw-like) margin.

Cyatta differs from its sister genus *Kalathomyrmex,* however, by (i) having, on the forewing of the male (forewing of gyne unknown), a closed marginal cell (Fig 3d) (open in the forewings of both the male and gyne of *Kalathomyrmex* [Klingenberg and Brandão ((Klingenberg and Brandão, 2009)), therein as radial cell]); (ii) the mesoscutum of the male with strongly impressed notauli (absent in the male of *Kalathomyrmex*); (iii) the pronotum of the male with lateral pronotal tubercles present, pyramidal (the pronotum in the male of

Kalathomyrmex lacks any tubercles); and (iv) the psammophore absent in the worker, the gyne, and the male.

In addition to the previously mentioned absence of an inferior pronotal tubercle in adult workers, shared with *Kalathomyrmex*, *Cyatta* differs from all or most other Neoattini in a number of larval character states shared with the Paleoattini, suggesting that they may be retained symplesiomorphies, including: (i) dorsal and lateral body hairs present and abundant, shared with *Mycocepurus* species; (ii) a single seta present laterad of the maxillary palp, shared with *Mycocepurus* species; (iii) supra-antennal setae present and abundant, shared with *Mycocepurus goeldii*; (iv) genal lobes absent, shared with the paleoattines and the neoattine genus *Mycetarotes*. Larval characters are unstudied in *Kalathomyrmex.* In addition, the worker and gyne of *Cyatta* differ from members of the neoattine clade by (v) the node of the petiole well developed, high (Figs 1c,d, 2a).

Most notably, *Cyatta* differs from all other attine genera and species by the following autapomorphies: (i) mandible of the worker and gyne with four teeth (Figs 1b, 2c); (ii) in ventral view, metapleura of the worker and gyne with two spiniform processes between the mid and hind coxae, apparently absent in the male; (iii) apical margin of the pygidium medially emarginate, V-shaped (Figs 2e,f); and (iv) forewing of the male with a closed discal cell (Fig. 3d).

Based on the extreme degree of morphological divergence and the results of the divergence dating analyses (see below), we have chosen to describe *Cyatta*

as a new genus rather than to describe it as a species within the genus *Kalathomyrmex*.

3.3.2. Discovery history

In 2003, a single stray worker of *C. abscondita* was taken in a pitfall trap as part of an ant survey conducted at the Reserva Particular do Patrimônio Natural Serra das Almas, Crateús, CE, Brazil, a relatively undisturbed area of Caatinga, a biome characterized by deciduous thorny woodland vegetation (Araújo et al., 2005). The specimen was deposited in the MZSP ant collection, where it was at first associated with the *Mycetophylax* species group, but subsequently recognized as a new neoattine genus by CK and CRFB. This isolated specimen inspired the first attempt to locate *C. abscondita* in the field in Serra das Almas in 2009 by CRFB and RMF. Unfortunately, it was the end of the rainy season and the soil was covered by a dense layer of grass, impairing observations of all small and inconspicuous ants. Visual searching and leaf-litter extraction failed to locate additional specimens, as did subsequent surveys at the same locality.

In 2008, two workers were taken in pitfall traps in the Instituto Brasileiro de Geografia e Estatística (IBGE) Cerrado preserve, near FAL in Brasília, DF, Brazil. These specimens, deposited in the MZSP, inspired attempts by JSC, TRS, CTL, and HLV to locate the species at this locality beginning in 2009. The first such attempt yielded only the collection of a series of stray workers and an

unsuccessful nest excavation; however, subsequent visits resulted in the excavations of multiple nests and collections of gynes, larvae, and cultivated fungi.

The only known male of the species was fortuitously collected in 2011 by CR and MB when they accidentally encountered two nests of *C. abscondita* while excavating a nest of *Mycocepurus goeldii* in the Broa Preserve, Itirapina, SP, Brazil.

The earliest known collection of *C. abscondita* was that of a stray worker taken in a leaf-litter sample in Paineiras, MG, in 1999, only recently discovered in the entomological collection at MZSP and recognized as belonging to this species. Most recently, in 2011, two workers of *C. abscondita* were recovered from pitfall traps in fragments of semideciduous forests in the Sales and Pindorama municipalities in northwestern São Paulo state. This history of discovery indicates that *C. abscondita* is rarely collected by traditional methods. The cryptic nature of foragers and of nest entrances makes it almost invisible to traditional hand collecting. The rarity of individuals in pitfall and leaf-litter samples remains puzzling, since the concentrations of nests encountered at FAL and Broa Preserve suggest that it is locally abundant. Now that the genus and species are recognized and described, we hope that additional specimens will be identified in unsorted material in collections as well as in newly collected material from ant surveys in Brazil and perhaps even elsewhere in South America.

3.3.3. Natural history

3.3.3.1. *Macrohabitat.*

Most collections of *C. abscondita* are from Cerrado localities (Fig. 5). These include Fazenda Água Limpa (FAL) near Brasília, the Broa preserve in São Paulo, the IBGE Cerrado preserve in Brasília, DF, the Fazenda Olho D'Água in Paineiras, MG, and the Reserva Particular do Patrimônio Natural (RPPN) do Acangau in Paracatu, MG, all of which are characterized by diverse Cerrado phytophysiognomies, ranging from campo limpo to Cerrado *sensu stricto* (Tannus et al., 2006). The predominant habitat, Cerrado *sensu stricto,* is a low canopy arboreal woodland that is characterized by the presence of small trees with a canopy height of less than 7 meters, shrubs, and abundant ground vegetation (Coutinho, 1978; Eiten, 1983; Gottsberger and Silberbauer-Gottsberger, 2006). Cerrado soil is typically a red-yellow latosol, largely composed of well-drained and nutrient-poor quartz sand with moderate clay content below 15% (Bramorski et al., 2012; Tannus *et al.*, 2006). Both FAL and Broa have typical Cerrado climates with a marked dry season from May to September and with a mean annual temperature and precipitation of 23°C and ~1420 mm, respectively (Gottsberger and Silberbauer-Gottsberger, 2006). For a complete account of vegetation and soil compositions at FAL and Broa, see (Oliveira-Filho and Ratter, 2002) and (Felfili et al., 2000). The label data associated with the *C. abscondita* worker from Fazenda Olho D'Água indicates

that it was obtained from a leaf-litter sample from a Winkler extractor. This suggests that this worker was likely taken in either a riparian forest or in "Cerradão," because it is in such areas that trees are dense enough to produce conspicuous accumulations of leaf litter.

Some specimens of *C. abscondita* have been taken outside the Cerrado biome (Fig. 5). Most notably, a stray worker was recovered from a pitfall sample taken in 2003 in a relatively undisturbed area of Caatinga, a biome characterized by deciduous thorny woodland vegetation (Araújo *et al.*, 2005), in the RPPN Serra das Almas, Crateús, CE, Brazil. More recently, in 2011, two workers of *Cyatta abscondita* were taken in pitfall traps in fragments of semideciduous forests in northwestern São Paulo state. This region is considered a transition zone between Cerrado and endangered coastal Atlantic Forest (Necchi Jr et al., 2012).

3.3.3.2. *Microhabitat.*

Four nests of *Cyatta abscondita* were excavated at FAL and two nests at Broa (summarized in Table 1). Nest entrances of four additional nests were located at FAL; however, attempted excavations of these nests failed. At FAL, seven of the excavated nests occurred on the side of a little-used dirt service road in Cerrado *sensu stricto* (Fig. 6b) and the eighth (nest 1, Table 1) on the lawn of the FAL dormitories (Fig. 6a). The roadside nests were directly exposed to sunlight for most of the day, whereas the lawn nest was shaded by the adjacent

building in the morning and afternoon. At the Broa preserve, both nests occurred in the shade of trees in Cerrado *sensu stricto*. Both Broa colonies were excavated serendipitously during excavations of *Mycocepurus goeldii* nests and the *C. abscondita* nest entrances were not observed.

3.3.3.3. *Foraging behavior.*

Foraging workers of *Cyatta abscondita* are difficult to locate because colony sizes are small, workers forage individually, and individuals are very small and cryptic (Fig. 6c). In mid-September, which coincides with the beginning of the rainy season at FAL, three to four individuals from three different nests, including nests 3 and 4 (Table 1), were observed foraging at night between 22h and 23h. In February and April, at the end of the rainy season, ants from five FAL nests, including nests 1 and 2 (Table 1), were likewise observed foraging individually only after sunset. Only in the case of FAL nest 1 were workers observed to forage in the early afternoon on two consecutive days in April between 13h and 15h during a time when the nest entrance was shaded from direct sunlight. Unlike the other nests, nest 1 occurred in a well-watered, human-managed grassy lawn. Nests 5 and 6 (Table 1), which were collected in July at the height of the dry season at the Broa preserve in São Paulo State, were located in the shade and, unfortunately, neither foraging nor nest-building activity was observed.

The entrance of one FAL nest (JSC090223-26) was located ~4.5 centimeters from the entrance of an adjacent *Mycocepurus goeldii* nest. At around 23h a *Cyatta abscondita* worker was observed lurking slightly inside the nest entrance while workers of *M. goeldii* foraged on bait (granules of Cream of Rice cereal) placed near the nest entrances. When *M. goeldii* workers were absent, the *C. abscondita* worker darted out to retrieve a piece of bait and quickly returned to its nest. This lurking and rapid foraging behavior was repeated until the supply of bait was depleted. In rare cases of contact between *C. abscondita* and *M. goeldii* workers, *C. abscondita* workers were observed to remain motionless. Aggressive interactions were not observed.

3.3.3.4. *Nest architecture*.

At FAL, nest entrances of *Cyatta abscondita* consisted of a single, inconspicuous, hole in the ground of approximately 1 mm in diameter without any accompanying mound or turret (Figs 6c,d). As mentioned above, the entrance of one nest was located in the mound of a *Mycocepurus goeldii* colony ~4.5 cm from the *M. goeldii* nest entrance. At the Broa preserve, nest chambers of *C. abscondita* were encountered serendipitously while excavating *M. goeldii* nests and the nest entrances were not observed.

At FAL, excavations of eight nests were attempted. Four excavations (JSC090223-26, JSC110914-02, JSC100415-03, JSC100416-04) failed (i.e., neither chambers containing fungus gardens nor gynes were found, but workers

were collected at their respective nest entrances), but chambers containing fungus gardens were located in four nests (Table 1). Nests contained three to eight chambers. In FAL nests 1 and 3, which contained 4 and 3 chambers respectively, chambers were roughly arranged vertically below the nest entrance (Table 1), although it is possible that additional, laterally dispersed chambers were missed during the excavations. At FAL, nests 2 and 4 contained 7 and 8 chambers, respectively, some of which occurred at the same depth but were laterally separated from each other (Fig. 6f). The shallowest chamber encountered (nest 3, FAL) was 29 cm deep and the deepest chamber (nest 6, Broa) was 195 cm deep. Because no gynes were found during the nest excavation at Broa, it is entirely possible that additional chambers occurred below a depth of 2 meters. Chambers were elliptically shaped, 1–2.5 cm wide and 2–5 cm high (Fig. 6e). The largest garden chamber encountered (nest 2, FAL) was 2.5 x 5.5 cm; at Broa, a similarly sized chamber (nest 5) contained ~50 hanging garden filaments (Fig. 6e). Some chambers were empty; in one case, an empty chamber contained three polydesmid millipedes.

3.3.3.5. *Demography*.

Dealate gynes were collected in three of the eight excavated nests, suggesting that in five nests additional chambers remained undiscovered in the soil, or that gynes escaped into adjacent tunnels. In each of the three queenright nests (nests 2, 3, and 4), a single gyne was consistently encountered in the

deepest chamber (see Table 1); however, additional chambers may have been present at greater depths, because excavations were generally terminated upon encountering the gyne. Brood was found only in FAL nest 4, which was collected in September, the beginning of the rainy season, suggesting that colonies of *Cyatta abscondita* reduce their reproductive activities during the dry season. The maximum number of workers encountered in colonies ranged from ~20 (FAL nest 4) to 26 (Broa nest 5). One male was collected in nest 5 at Broa on 21 July.

3.3.3.6. *Garden morphology*.

Gardens were pendant and arranged in filamentous curtains suspended from the chamber ceiling (Fig. 5e), similar to the fungus gardens of *Mycocepurus* species (Fernández-Marin *et al.*, 2005; Rabeling and Bacci, 2010; Rabeling *et al.*, 2009; Rabeling *et al.*, 2007b) and of *Kalathomyrmex emeryi* (TRS, JSC, pers. obs.). Single fungal curtains were 5–6 mm long and 1–2 mm wide and a maximum number of 50 curtains were found in a single chamber. Curtains were directly attached to the soil of the chamber ceiling rather than to rootlets. In nest 4, which was maintained in laboratory culture for three months, workers attached garden filaments to the plastic ceiling of the nest box and cultivated suspended gardens. The filaments were firmly attached to the plastic ceiling by an unknown mechanism.

3.3.4. Phylogeny

Results of molecular phylogenetic analyses incorporating four nuclear gene sequences from *Cyatta abscondita* confirm the previous finding (Schultz and Brady, 2008) that the tribe Attini is divided by an ancient divergence into two major clades, the Paleoattini and the Neoattini (Fig. 7). *Cyatta abscondita* occupies a relatively isolated position in the latter clade, distantly related to the monotypic genus *Kalathomyrmex* Klingenberg & Brandão, the result of an early divergence in the Neoattini. Its phylogenetic position, nested well within the paraphyletic group of "lower attine ants," strongly supports the hypothesis that *C. abscondita* practices "lower attine agriculture" (Schultz *et al.*, 2005).

A relaxed-clock-divergence dating analysis conducted in BEAST using the Bayesian uncorrelated lognormal approach with a normal prior on the root node (as described in Schultz & Brady (Schultz and Brady, 2008)), resulted in a chronogram in which *Cyatta* occupies a position identical to that in the MrBayes results shown in Figure 7. The BEAST chronogram indicates that *Cyatta* and *Kalathomyrmex* diverged 26 Ma (95% CI= 18–34) and that the earliest possible divergence of the clade (*Cyatta* + *Kalathomyrmex*) from the rest of the Neoattini occurred 44 Ma (95% CI= 37–51).

3.4. Discussion

The pursuit and discovery of phylogenetically informative new species are arguably among the most important enterprises in systematic biology.

Numerous studies have demonstrated the significant effects of taxon representation on phylogenetic inference, including, in addition to tree topology, ancestral character state reconstruction, divergence time estimation, and inferences of evolutionary rates (Heath et al., 2008; Ward *et al.*, 2010; Soares and Schrago, 2012). Ward *et al*. (Ward *et al.*, 2010) showed that the exclusion of a single relict species resulted in the incorrect reconstruction of the phylogeny of the ant subfamily Dolichoderinae (Formicidae). In addition, the recently discovered ant genus *Martialis*, a relict subterranean species known from the Amazon forest in Brazil, has been shown to be the only hitherto known representative of an early diverging branch of the ant tree of life (Rabeling *et al.*, 2008). Within the Attini, the recently described ant genus *Mycetagroicus* (Brandão and Mayhé-Nunes, 2001; Brandão and Mayhé-Nunes, 2008) was found to be the sister group to the higher attine ants (*Sericomyrmex*, *Trachymyrmex*, *Acromyrmex*, and *Atta*) and thus to occupy a phylogenetic position transitional between lower and higher agriculture (Schultz and Brady, 2008); however, until very recently its fungal cultivar association remained unknown. Subsequent field work documented that *Mycetagroicus cerradensis* cultivates a lower attine fungus, suggesting that biological investigations of the genus are critical for understanding the evolutionary transition from lower to higher agriculture (Solomon *et al.*, 2011). This strategy of reciprocal illumination (i.e., information gathered from the field informing phylogenies, and phylogenies guiding field work) plays a key role for reconstructing and understanding the macro- and micro-evolutionary processes driving the attine agricultural symbiosis.

The results reported here indicate that *Cyatta abscondita* possesses an intriguing mosaic of characters, some that are shared with paleoattines, others that are shared with neoattines, and at least one that is shared only with non-attine ants. Because the Neoattini, Paleoattini, and the non-attine Myrmicinae span the ancestral node of the tribe Attini, this combination of character states suggests that the morphology, behavior, fungal associations, nest architecture, and other biological characters of *C. abscondita* are potentially informative about plesiomorphic character states within the tribe and, consequently, about the early evolution of ant agriculture.

At least one character of *C. abscondita,* the presence of a closed discal cell in the forewing of the male, is unknown in all other Attini. If, as we suspect, this is a retained plesiomorphy rather than an autoapomorphy, then the absence of the discal cell in other Attini must be the result of at least three parallel losses, one in the Paleoattini, one in the Neoattini, and one in *Kalathomyrmex*.

Another character previously unknown in the Attini is the presence of at least two rows of elongate anchor-tipped hairs (Figs 4a,e) on the mid-dorsum of the larva. The function of such anchor-tipped hairs has recently been studied in the non-fungus-farming ant *Pheidole rhea*, which utilizes these specialized setae to hang fourth-instar larvae from the nest walls (Penick et al., 2012). The widespread presence of this character state in non-fungus-farming ants strongly suggests that it is plesiomorphic for the Attini and that its presumably derived absence in most Attini may be connected to the fact that larvae are usually more

or less enveloped in mycelium deep within the fungus garden rather than hung from the chamber wall.

Presumed plesiomorphic adult character states shared by *C. abscondita* and the Paleoattini include the presence of a rounded inferior lateral margin of the pronotum, also retained in *Kalathomyrmex emeryi*. All other neoattine genera, from *Mycetarotes* to the leaf-cutter ants, have a denticle or tooth in this position. A number of larval character states are shared with species of the paleoattine genus *Mycocepurus*, including the presence of dorsal and lateral hairs, the presence of a single seta laterad of the maxillary palp, and abundant supra-antennal setae. The absence of genal lobes is shared with all Paleoattini as well as, in the Neoattini, with *Mycetarotes* species. (Larval characters of *Kalathomyrmex* have not yet been documented.) The striking pendant, curtain-like morphology of the fungus garden is a character state shared with *Mycocepurus* species as well as with *Kalathomyrmex*.

Presumed neoattine synapomorphies shared by *C. abscondita* and other Neoattini include, in adults, (i) the lack of hypostomal teeth, also secondarily lost in some species of *Apterostigma*; (ii) the antennal funicular segment II of males short, as long as or slightly longer than funicular segment I (pedicel), whereas in the males of the paleoattine genera the funicular segment II is long, almost twice as long than the pedicel; and (iii) the wide separation of the maxillary palp from the galea in the larvae.

Although both molecular and morphological data indicate that *Cyatta abscondita* is the sister species of *Kalathomyrmex emeryi*, it is a very distant

sister, having diverged from their most recent common ancestor approximately 26 mya. As far as is currently known, *C. abscondita* shares with *Kalathomyrmex* two unique morphological characters, the form of the clypeus and the morphology of the mandibles in the male. In common with the paleoattines, but differing from all other neoattines, *C. abscondita* also shares with *Kalathomyrmex* a rounded inferior pronotal corner. In contrast to these shared character states, two synapomorphic and one symplesiomorphic, *C. abscondita* notably lacks the defining feature of *Kalathomyrmex*, the basket-like psammophore (Gr. *kalathos* = "basket") and differs not only from *Kalathomyrmex* but from all other Attini in a number of striking characters, including the 4–toothed mandible, the presence of paired ventral pleural spiniform processes, and the presence of a discal cell in the wing of the male. In fact, the morphology of *C. abscondita* is a mosaic of characters of the paleoattine and neoattine clades as well as of closely related non-attine myrmicines. For these reasons we choose to recognize *Cyatta abscondita* as a distinct genus within the fungus-farming ants.

The discovery, description, and mapping of biological diversity is essential for devising strategies for protecting biodiversity hotspots, i.e., areas that support high concentrations of endemic species and that are threatened due to the rapid loss of habitat as a result of years of unsustainable human exploitation (Myers *et al.*, 2000), (Guénard et al., 2012). The Brazilian Cerrado is one such biodiversity hotspot. With only 20% of the original primary habitat remaining, and with only 6.2% of that habitat protected, the Brazilian Cerrado

sustains more than four thousand species of endemic plants and more than a hundred species of endemic vertebrates (Myers *et al.*, 2000). The Caatinga is even less protected than the Cerrado (Silva et al., 2004). The discovery of *Cyatta abscondita* in the Cerrado and in the poorly explored Caatinga habitats of Brazil suggests that increasing the search for cryptic and inconspicuous species will lead to discoveries that will fundamentally alter our understanding of insect evolutionary history.

Table 3.1. Colony demographies and nest measurements of six excavated *Cyatta abscondita* nests, including depths and dimensions of individual chambers, chamber contents, fungus garden morphology, ant demographics, and additional natural history information.

						Chamber Dimensions (cm)			
Nest	**Locality**	**Col. Code**	**Date**	**Chamber No.**	**Depth (cm)**	**Height**	**Width**	**Depth**	**Demography, garden morphology, notes**
1	FAL	JSC100412-01	April 12–18, 2010	1	70	1.2	3	N/A	Two pendant garden filaments
				2	70	1.5	2.5	N/A	Empty; 3 polydesmid millipedes
				3	~75	2.5	5	5	24 pendant garden filaments
				4	80	2.5	3.5	N/A	Pendant garden; 8 workers (1 callow)
2	FAL	JSC100416-01	April 17-18, 2010	1	40	0.5	1	N/A	Small pendant gardent; no ants
				2	46	1.5	2.5	N/A	Small pendant garden; 2 workers
				3	50	0.5	1	N/A	Empty
				4	55	2	3	N/A	Small pendant garden; 2 workers
				5	56	2.6	3	N/A	Pendant garden; 2 worker
				6	61	2.5	5.5	N/A	Empty
				7	71	2.5	3	N/A	Pendant garden; some workers; **dealate queen**
3	FAL	JSC110919-02	September 19, 2011	1	29	1.5	5.5	1.3	Empty
				2	35	2	3	1.2	Pendant garden; 1 worker
				3	44	1.5	2	0.5	Small pendant garden; 2 workers; **dealate queen**
4	FAL	JSC110920-01	September 20, 2011	1	38	2	3	1	Small pendant garden
				2	42	3	2	2	Two workers
				3	43.5	2	2.5	3	Two workers
				4	46	2	3	1.5	15-20 pendant garden filaments
				5	50	1.5	1.5	1.5	Small pendant garden, 2 workers
				6	59.5	1.5	3.5	1.2	Large pendant garden; 7 workers
				7	82	1.8	2.5	3	Large pendant garden; 4 workers
				8	104	1.9	4	3.5	Large pendant garden; several workers; larvae; **dealate queen**
5	Broa	CR110721-05	July 21, 2011	1	52	1.5	3	N/A	Fungus garden; 13 workers
		CR110721-04		2	80	1.5	5	N/A	~50 pendant garden filaments; 10 workers; **1 male**
		CR110721-08		3	130	1	2.5	N/A	Fungus garden; 3 workers
		CR110721-07		4	160	?	?	?	Fungus garden; no ants; chamber collapsed during excavation
6	Broa	CR110726-09	July 26-28, 2011	1	102	?	?	?	Fungus garden; 3 workers; chamber collapsed during excavation
				2	195	1	3	N/A	Fungus garden; 4 workers

For each nest, chambers are arranged according to depth, descending from the shallowest to deepest chambers. Chamber height refers to the chamber's vertical axis, chamber width to the horizontal axis parallel to the plane of excavation, and chamber depth to the horizontal axis perpendicular to the plane of excavation. FAL: Fazenda Água Limpa, Brasília; Broa: Broa Preserve, Itirapina; see text for more details.

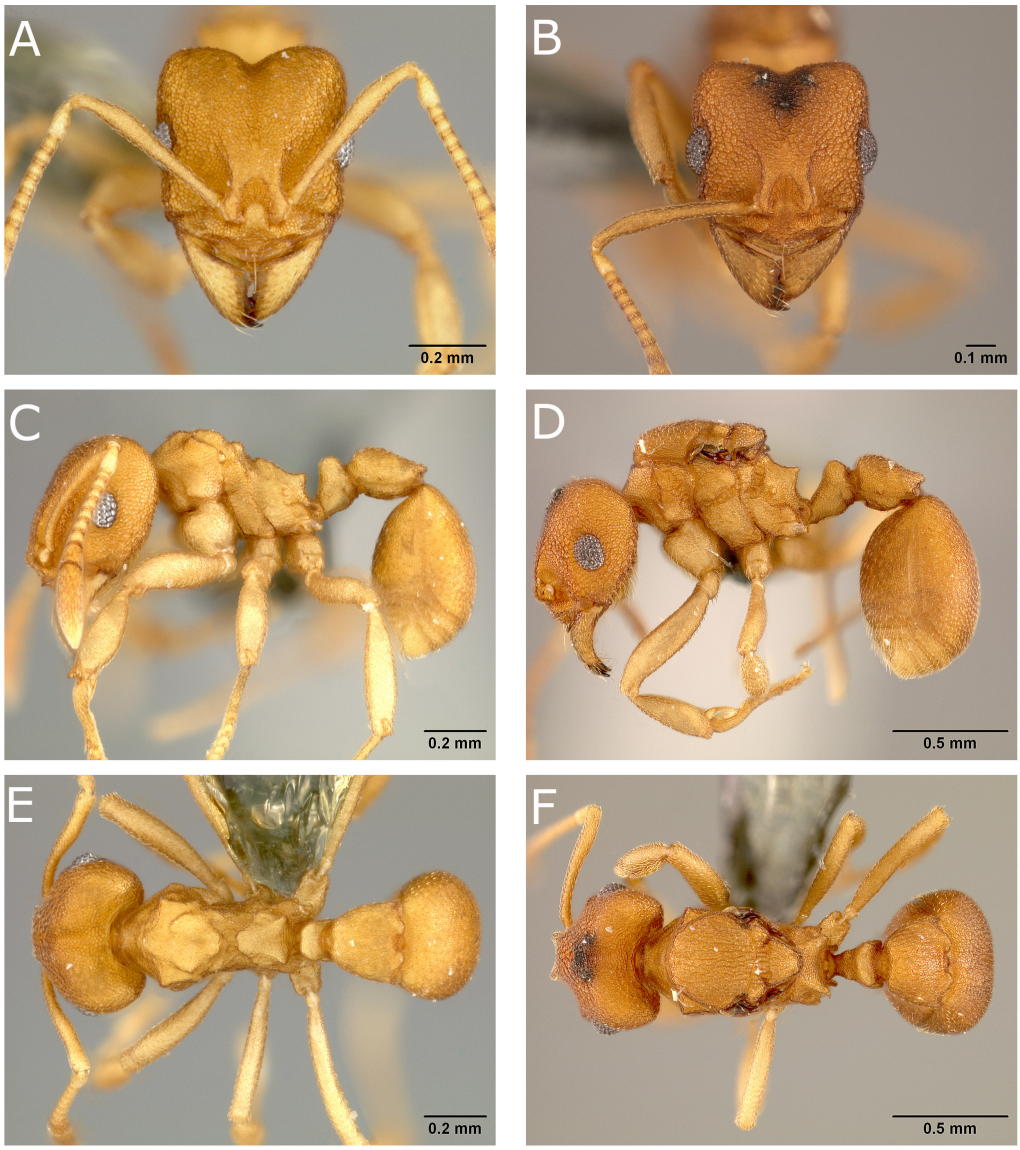


Figure 3.1. Holotype worker (USNMENT00758173) (A, C, E) and paratype gyne (USNMENT00758174) (B, D, F) of *Cyatta abscondita*. (A, B) Full-face view. (C, D) Lateral view. (E, F) Dorsal view.

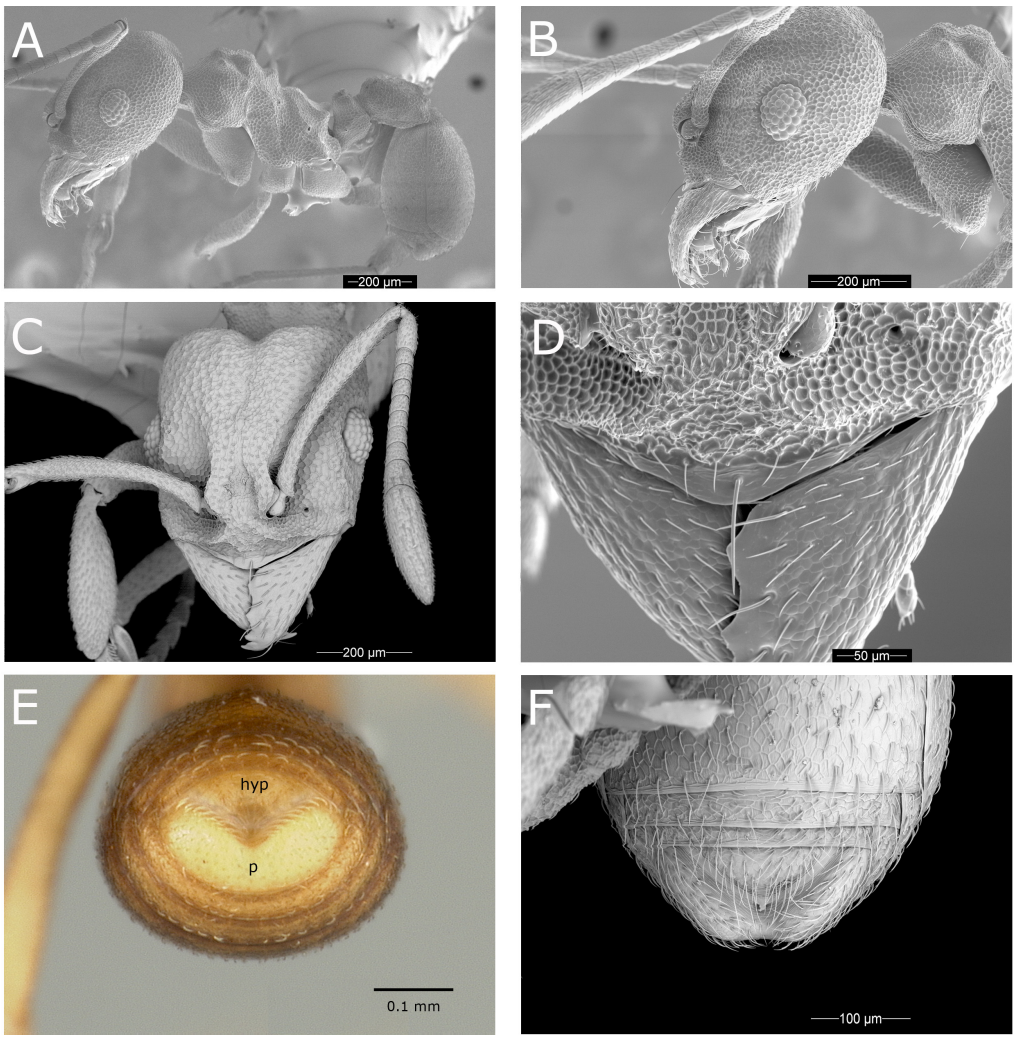


Figure 3.2. Paratype worker (USNMENT00758223) of *Cyatta abscondita*. (A) Habitus, lateral view. (B) Head, lateral view, indicating palp formula. (C) Head, full-face view. (D) Clypeal apron indicating origin of median unpaired seta. (E) Metasoma, posterior view. Pygidium (p) 'V'-shaped, hypopygium (hyp) triangular. (F) Metasoma, ventral view, showing the median emargination of the pygidum and the triangular shape of the hypopygium.

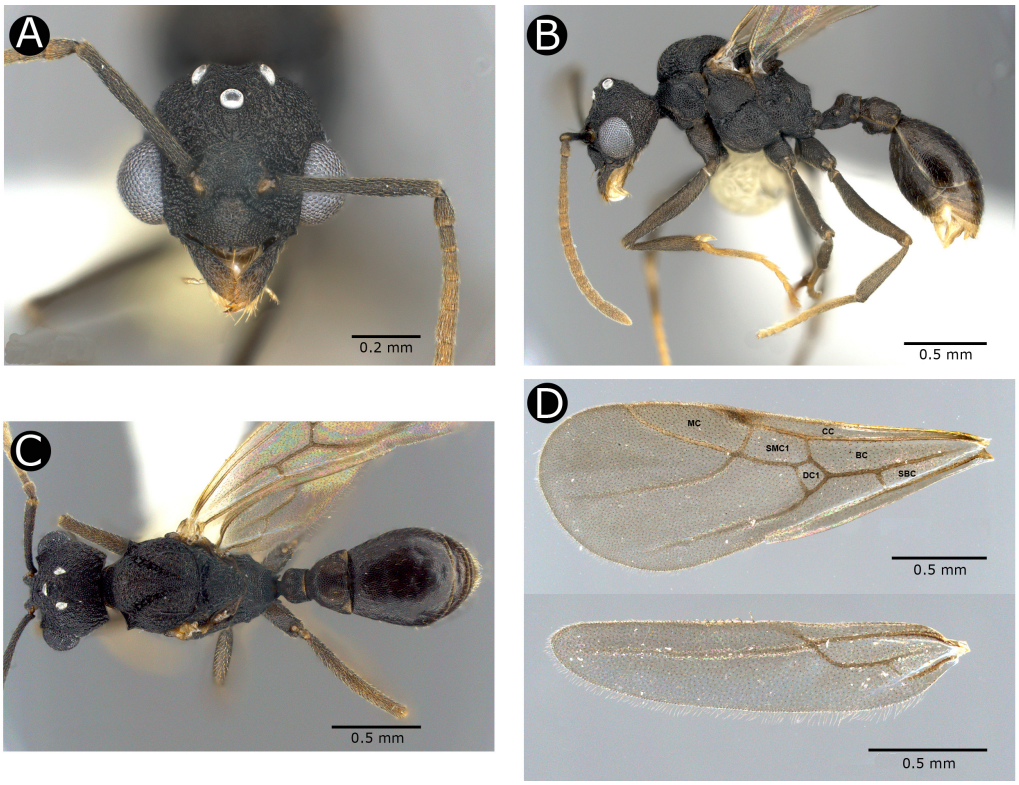


Figure 3.3. Male of *Cyatta abscondita* (USNMENT00758204). (A) Full-face view. (B) Lateral view. (C) Dorsal view. (D) Wings: forewing (top), hindwing (bottom). Cells: basal (BC), costal (CC), submarginal (SMC1), marginal (MC), subbasal (SBC), and discal (DC1).

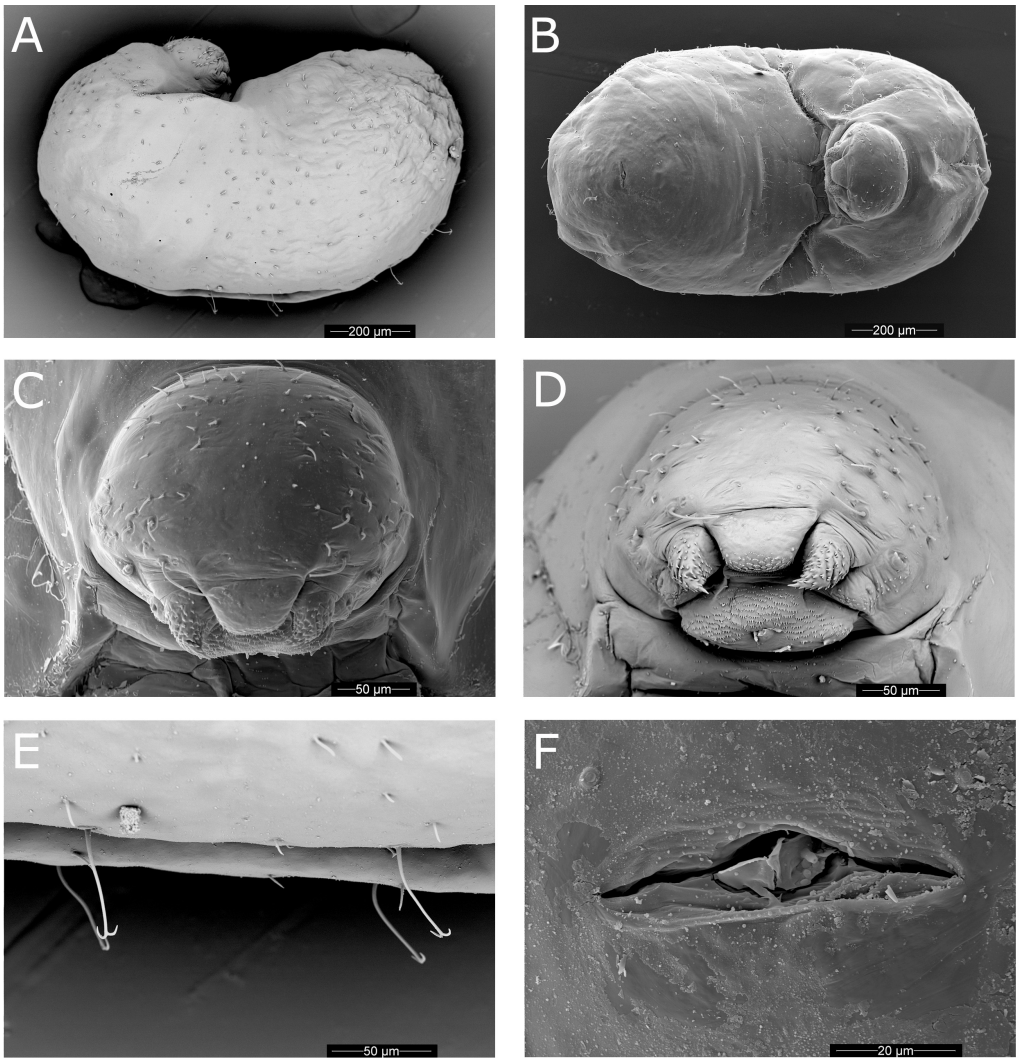


Fig. 3.4. Larva of *Cyatta abscondita*. (A) Lateral view. (B) Ventral view. (C) Head, dorsal view. (D) Head, anteroventral view. (E) Anchor-tipped hairs on dorsum. (F) Anal region (white arrows indicate setal sockets; ventral at top).

Figure 3.5. Known distribution of *Cyatta abscondita*.

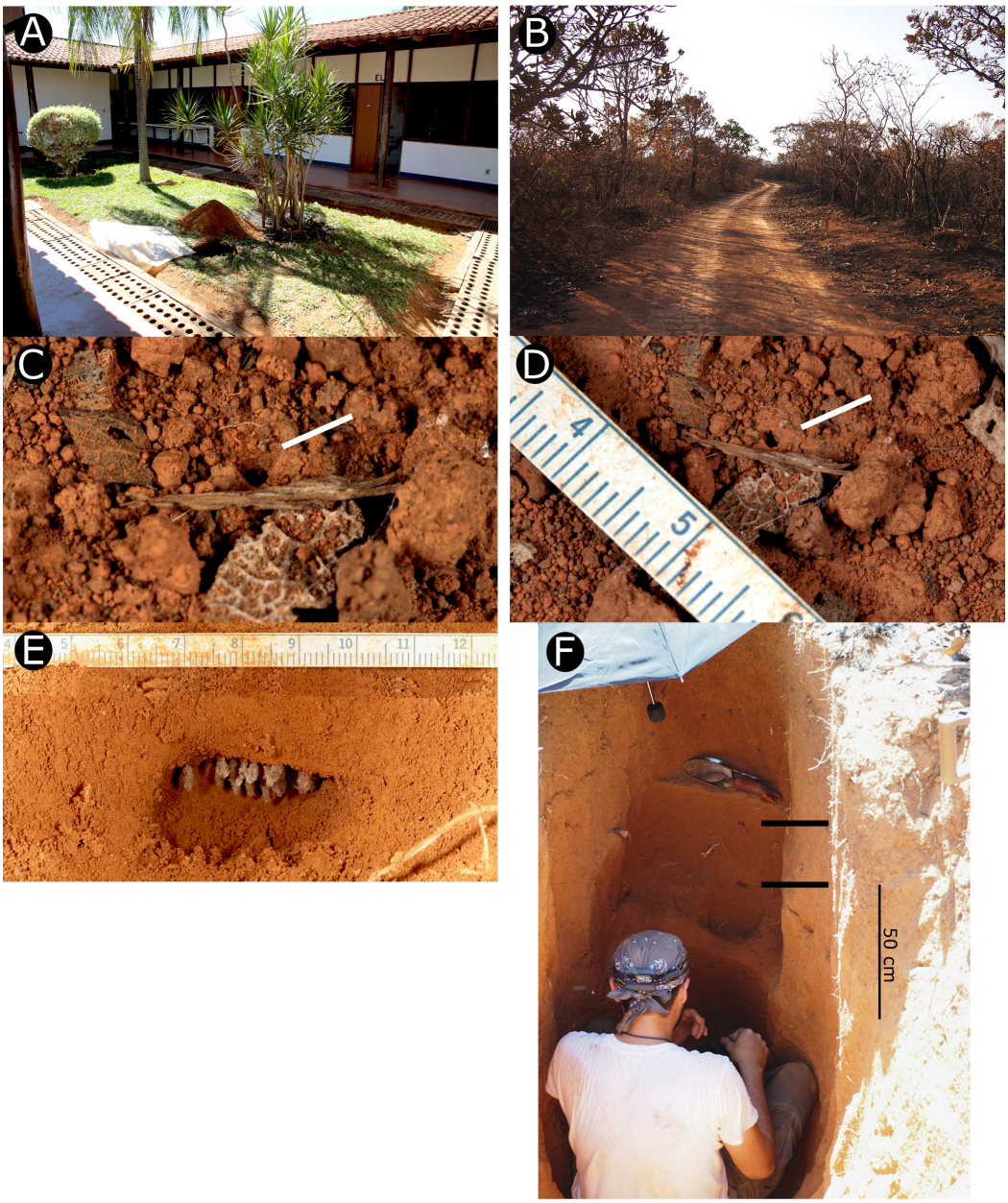


Figure 3.6. Habitat of *Cyatta abscondita*. (A, B) Fazenda Agua Limpa (FAZ). (A) Excavation of nest JSC100412-01 in dormitory garden area. (B) Cerrado *senso stricto*, where colonies were found on the side of the road. (C, D) Nest entrance of *Cyatta abscondita* (white arrows). (C) Worker entering nest. (D) Nest entrance of *Cyatta abscondita*, consisting of an inconspicuous ~1mm diameter hole in the ground. (E) Chamber with pendant fungus garden. (F) Excavation of nest 4 (JSC110920-01). Black bars indicate two chambers, the lower one 104 cm below the surface.

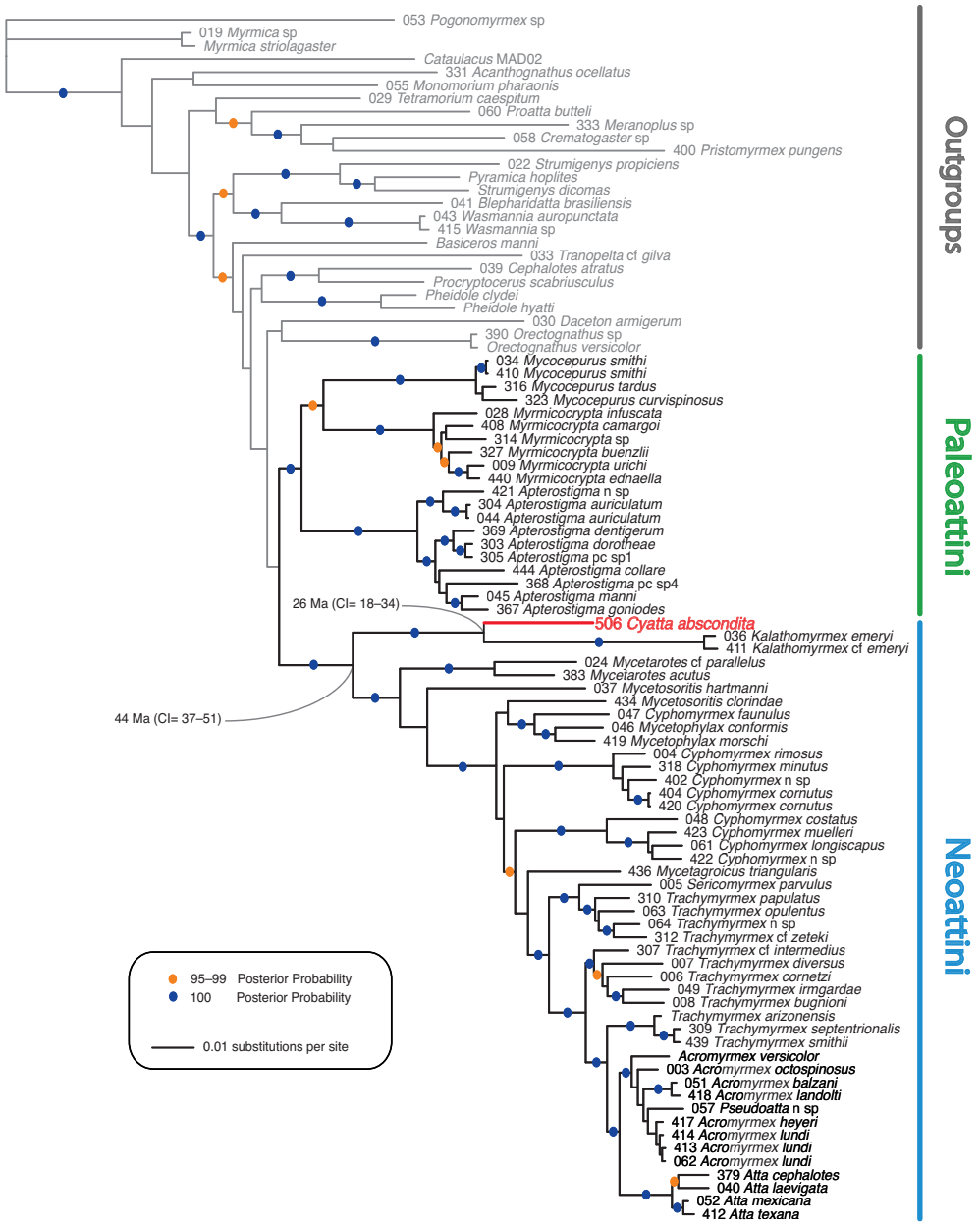


Figure 3.7. Phylogenetic position of *Cyatta abscondita.* This phylogeny of 66 fungus-farming and 26 outgroup ant species results from a Bayesian analysis of four nuclear protein-coding genes (see text for details). Fungus-farming ant species are indicated by bold black branches; the branch subtending *Cyatta abscondita* is indicated in red. Gray branches correspond to non-fungus-farming taxa. Blue dots on branches represent Bayesian posterior probabilities of 100; orange dots represent Bayesian posterior probabilities of 95–99. Divergence time of *Cyatta* and *Kalathomyrmex* estimated at 26 Ma (95% CI= 18–34) and divergence of the clade (*Cyatta* + *Kalathomyrmex*) from the rest of the Neoattini estimated at 44 Ma (95% CI= 37–51).

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