

**THE NEW WORLD GYPSY ANTS OF
THE GENERA *APHAENOGASTER* AND *NOVOMESSOR*
(HYMENOPTERA: FORMICIDAE)**

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TABLE OF CONTENTS

TABLE OF CONTENTS	3
PREFACE	6
ABSTRACT	7
Key to the genera and species complexes: workers	18
Key to the genera and species complexes: females	22
Key to the genera and species complexes: males.....	23
Clave para géneros y complejos: obreras.....	25
Clave para géneros y complejos: hembras	29
Clave para géneros y complejos: machos	30
Key to the species of <i>Novomessor</i> : workers	32
Key to the species of <i>Novomessor</i> : females.....	35
Key to the species of <i>Novomessor</i> : males	36
Clave para las especies de <i>Novomessor</i> : obreras	37
Clave para las especies de <i>Novomessor</i> : hembras	40
Clave para las especies de <i>Novomessor</i> : machos.....	41
<i>phalangium</i> species complex	42
Key to the <i>phalangium</i> species complex: workers.....	44
Key to the <i>phalangium</i> species complex: males	51
Clave para el complejo de <i>phalangium</i> : obreras.....	53
Clave para el complejo de <i>phalangium</i> : machos.....	59
Key to the <i>subterranea</i> species complex: workers	61
Key to the <i>texana</i> species subgroup: workers	78
Key to the <i>subterranea</i> complex: females	98
Key to the <i>subterranea</i> complex: males.....	115
Clave para las especies del complejo <i>subterranea</i> : obreras.....	131
Clave para las especies del complejo <i>subterranea</i> : hembras.....	168
Clave para las especies del complejo <i>subterranea</i> : machos	185

LIST OF SPECIES	201
<i>Aphaenogaster araneoides</i> Emery	202
<i>Aphaenogaster ashmeadi</i> (Emery).....	208
<i>Aphaenogaster boulderensis</i> M. Smith.....	214
<i>Aphaenogaster brevicollis</i> Forel	222
<i>Aphaenogaster carbonaria</i> Pergande.....	228
<i>Aphaenogaster carolinensis</i> Wheeler	233
<i>Aphaenogaster flemingi</i> M. Smith	241
<i>Aphaenogaster floridana</i> M. Smith	247
<i>Aphaenogaster fulva</i> Roger.....	253
<i>Aphaenogaster honduriana</i> Mann	264
<i>Aphaenogaster huachucana</i> Creighton.....	268
<i>Aphaenogaster inermis</i> Forel	275
<i>Aphaenogaster lamellidens</i> Mayr	282
<i>Aphaenogaster mariae</i> Forel.....	290
<i>Aphaenogaster megommata</i> M. Smith.....	298
<i>Aphaenogaster mexicana</i> (Pergande).....	306
<i>Aphaenogaster miamiana</i> Wheeler.....	310
<i>Aphaenogaster montana</i> W. Mackay new species	320
<i>Aphaenogaster mutica</i> Pergande.....	330
<i>Aphaenogaster occidentalis</i> (Emery).....	335
<i>Aphaenogaster patruelis</i> Forel.....	346
<i>Aphaenogaster phalangium</i> Emery.....	353
<i>Aphaenogaster picea</i> (Wheeler).....	358
<i>Aphaenogaster punctaticeps</i> W. Mackay	366
<i>Aphaenogaster punctatissima</i> W. Mackay new species	370
<i>Aphaenogaster relictata</i> Wheeler and Mann	375
<i>Aphaenogaster reticulaticeps</i> W. Mackay new species	379
<i>Aphaenogaster rudis</i> Enzmann	389

<i>Aphaenogaster smithi</i> Gregg new revived status.....	400
<i>Aphaenogaster tennesseensis</i> (Mayr).....	407
<i>Aphaenogaster texana</i> Wheeler	416
<i>Aphaenogaster treatae</i> Forel.....	425
<i>Aphaenogaster uinta</i> Wheeler.....	434
<i>Aphaenogaster umphreyi</i> Deyrup and Davis	441
<i>Novomessor albisetosus</i> Mayr	445
<i>Novomessor cockerelli</i> André	455
<i>Novomessor ensifer</i> (Forel).....	465
PLATES	503

PREFACE

The gypsy ants of the genera *Aphaenogaster* and *Novomessor* have long fascinated us as they are long-legged “elegant” common ants.

Identification is difficult due to the lack of recent keys to the species in the United States and no complete keys to the New World species. In addition, we describe three new species. We also provide keys in both English and Spanish to cover the regions where these ants occur. Hopefully this work will allow entomologists, ecologists, behaviorists and other investigators to identify these fascinating ants. We examined the types of nearly all the species, and provide photographs of the workers of all of the species and photographs of the females and males of several species.

We include keys to the workers, known females and males of all of the New World species, as well as redcriptions, illustrations, maps and lists of localities. We relied primarily on specimens we have collected over the past 50 years, as well as specimens in major collections.

This book has been carefully edited by Drs. Aaron Ellison and Miguel Vázquez Bolaños, and was greatly improved by including their suggestions.

We dedicate this book to Aaron Ellison, as well as Nick Gotelli, Elizabeth Farnsworth and Gary Alpert in recognition of their outstanding work for non-specialists “A Field Guide to the Ants of New England”.

ABSTRACT

Aphaenogaster and *Novomessor* are similar genera of common soil and log nesting ants in North America, extending from Canada to northern South America. We revise the New World members of these genera and provide keys to the workers, females and males as well as diagnoses, illustrations and maps.

Three new Mexican species of *Aphaenogaster* are described and five new synonyms are proposed. The species include: *Aphaenogaster araneoides* Emery (= *A. araneoides* var. *canalis* Enzmann), *A. ashmeadi* (Emery) (= *A. treatae hardeni* Wheeler), *A. boulderensis* M. Smith, *A. brevicollis* Forel, *A. carbonaria* Pergande, *A. carolinensis* Wheeler, *A. flemingi* M. Smith (= *A. macrospina* Smith, *A. texana nana* Wheeler **new synonymy**), *A. floridana* M. Smith, *A. fulva* Roger (= *Myrmica aquia* Buckley, *A. fulva rubida* Enzmann, *A. fulva pusula* Enzmann **new synonymy**), *A. honduriana* Mann, *A. huachucana* Creighton, *A. inermis* Forel (= *A. araneoides* var. *nitidiventris* Forel, *A. araneoides* var. *canalis* Enzmann), *A. lamellidens* Mayr (= *A. lamellidens nigripes* M. Smith), *A. mariae* Forel, *A. megommata* M. Smith, *A. mexicana* (Pergande), *A. miamiana* Wheeler (= *A. azteca* Enzmann **new synonymy**), *A. montana* W. Mackay **new species**, *A. mutica* Pergande, *A. occidentalis* (Emery) (= *A. borealis* Wheeler, *A. valida* Wheeler, *A. valida* var. *manni* Wheeler), *A. patruelis* Forel (= *A. willowsi* Wheeler, *A. bakeri* Wheeler), *A. phalangium* Emery, *A. picea* (Wheeler) (= *A. texana punctithorax* Cole **new synonymy**), *A. punctaticeps* Mackay, *A. punctatissima* W. Mackay **new species**, *A. relictata* Wheeler and Mann (= *A. relictata epinotalis* Wheeler and Creighton **new synonymy**), *A. reticulaticeps* W. Mackay **new species**, *A. rudis*

Enzmann, *A. smithi* Gregg **new resurrected status**, *A. tennesseensis* Mayr (= *Atta laevis* Mayr, *Myrmica subrubra* Buckley, *Stenamamma ecalcaratum* Emery), *A. texana* Emery (= *A. texana* var. *furvescens* Wheeler, *A. silvestrii* Menozzi, *A. crinimera huachucana* Cole), *A. treatae* Forel (= *A. wheeleri* Mann, *A. treatae pluteicornis* Wheeler and Wheeler, *A. treatae* var. *alabamensis* Wheeler and Wheeler), *A. uinta* Wheeler and *A. umphreyi* Deyrup and Davis, *Novomessor albisetosus* (Mayr) (= *A. minor* Enzmann), *N. cockerelli* (André) (= *A. sonora* Pergande), and *N. ensifer* (Forel) (= *A. manni* Wheeler and Creighton).

Myrmica opposita Say, 1836 remains an unplaced taxon in Myrmicinae (Smith, 1979).

Revisión de las Hormigas Gitanas de los Géneros *Aphaenogaster* y *Novomessor* (Hymenoptera: Formicidae) del Nuevo Mundo

RESUMEN

Los géneros *Aphaenogaster* y *Novomessor* son similares y comunes que anidan en suelos y troncos podridos de América del Norte, y se extienden desde Canadá hasta el norte de Sudamérica. Revisamos los miembros de estos géneros del Nuevo Mundo y damos claves para las obreras, las hembras y los machos, así como diagnósticos, ilustraciones y mapas.

Describimos tres especies nuevas mexicanas de *Aphaenogaster* y proponemos cinco sinónimos nuevos. Las especies incluyen: *Aphaenogaster araneoides* Emery (= *A. araneoides* var. *canalis* Enzmann), *A. ashmeadi* (Emery) (= *A. treatae hardeni* Wheeler), *A. boulderensis* M. Smith, *A. brevicollis* Forel, *A. carbonaria* Pergande, *A. carolinensis* Wheeler, *A. flemingi* M. Smith (= *A. macrospina* Smith, *A. texana nana* Wheeler **sinonimia nueva**), *A. floridana* M. Smith, *A. fulva* Roger (= *Myrmica aquia* Buckley, *A. fulva rubida* Enzmann, *A. fulva pusula* Enzmann, **sinonimia nueva**), *A. honduriana* Mann, *A. huachucana* Creighton, *A. inermis* Forel (= *A. araneoides* var. *nitidiventris* Forel, *A. araneoides* var. *canalis* Enzmann), *A. lamellidens* Mayr (= *A. lamellidens nigripes* M. Smith), *A. mariae* Forel, *A. megommata* M. Smith, *A. mexicana* (Pergande), *A. miamiana* Wheeler (= *A. azteca* Enzmann **sinonimia nueva**), *A. montana* W. Mackay **especie nueva**, *A. mutica* Pergande, *A. occidentalis* (Emery) (= *A. borealis* Wheeler, *A. valida* Wheeler, *A. valida* var. *manni* Wheeler), *A. patruelis* Forel (= *A. willowsi* Wheeler, *A. bakeri*

Wheeler), *A. phalangium* Emery, *A. picea* (Wheeler) (= *A. texana punctithorax* Cole **sinonimia nueva**), *A. punctaticeps* Mackay, *A. punctatissima* W. Mackay **especie nueva**, *A. relictata* Wheeler y Mann (= *A. relictata epinotalis* Wheeler y Creighton **sinonimia nueva**), *A. reticulaticeps* W. Mackay **especie nueva**, *A. rudis* Enzmann, *A. smithi* Gregg **estado nuevo**, *A. tennesseensis* Mayr (= *Atta laevis* Mayr, *Myrmica subrubra* Buckley, *Stenammina ecalcaratum* Emery), *A. texana* Emery (= *A. furvescens* Wheeler, *A. silvestrii* Menozzi, *A. huachucana crinimera* Cole), *A. treatae* Forel (= *A. wheeleri* Mann, *A. treatae pluteicornis*, *A. alabamensis* Wheeler y Wheeler), *A. uinta* Wheeler y *A. umphreyi* Deyrup y Davis, *Novomessor albisetosus* (Mayr) (= *A. minor* Enzmann), *N. cockerelli* (André) (= *A. sonora* Pergande), y *N. ensifer* (Forel) (= *A. manni* Wheeler y Creighton).

Introduction

Aphaenogaster and *Novomessor* are genera of elongate, slender ants (Fig. 1), which are very fast and agile in the field. Most species nest in the soil under stones or in logs, some of the desert species nest in the soil with the nest entrance surrounded by pebbles. These ants are carnivorous, and collect dead insects, as well as tend Homoptera or collect nectar. The colonies are moderately large to very large. This is a common genus and occurs in all habitats, but is especially common in forested ecosystems.

Aphaenogaster was described by Mayr in 1853. Emery described the genus *Novomessor* in 1915, which was synonymized with *Aphaenogaster* by Brown in 1974. Hölldobler et al. revived *Novomessor* in 1976, but it was returned to synonymy by Bolton in 1982. DeMarco and Cognato have recently resurrected *Novomessor* in 2015, based on 42 multistate morphological characters and five genes, and showed it is more closely related to *Veromessor* (which was recently resurrected from synonymy with *Messor* by Ward et al., 2015, and includes *Veromessor andrei* Mayr, *V. julianus* Pergande and *V. pergandei* Mayr, among others). *Aphaenogaster* is not monophylous (Faircloth et al., 2015), and the ants that have been previously assigned to *Aphaenogaster* actually represent four different clades (Ward et al., 2015, *A. occidentalis* and *N. albisetosus* clustering with *Messor*, and *A. araneoides* separate from other New World species).

The US species of the two genera were revised by Creighton (1950), the *Aphaenogaster fulva-texana-rudis* group of species by Umphrey (1996), and the *phalangium* complex by Longino and Cover (2004) and by Mackay and Dash (2016). DeMarco (2015) provided a key to species.

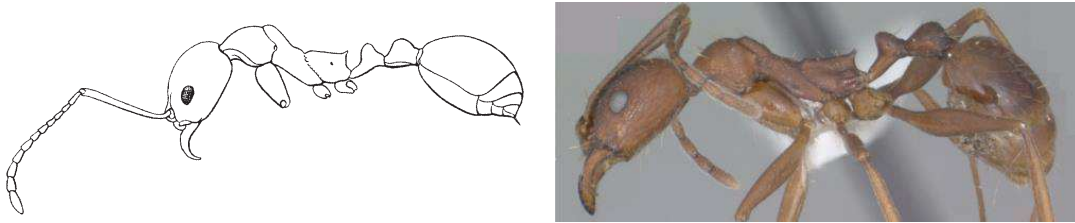


Fig. 1. Side view of a worker of *A. texana* (modified from Creighton, 1950; from wwwAntWeb.org, Jen Fogarty photographer).

The workers (Fig. 1) usually can be easily distinguished by their elongate, slender habitus (general appearance). Their head is usually longer than broad, the eye is large, convex and placed at the anterior middle of the head. The mesonotum of the worker is elongate and depressed, the propodeum usually has a pair of spines or small teeth. The workers could be confused with the minor workers of *Pheidole*, but differ in usually being much larger (over 3 mm total length, usually less than 3 mm in *Pheidole*), and that the antennal club is poorly defined and consists of four segments (well defined in *Pheidole* and usually consisting of three segments, possibly four or even five). The mandible normally has many small teeth or denticles, not the two well-developed apical teeth that are found in *Pheidole*.

The female usually has long legs and is a relatively slender ant, although the mesosoma is large and winged in most species (Fig. 2). The mandible has many small teeth or denticles, the antenna has a poorly defined, four-segmented club. The eye is relatively large, and generally covers at least $\frac{1}{4}$ of the side of head. The propodeum has spines, or at least blunt tubercles.

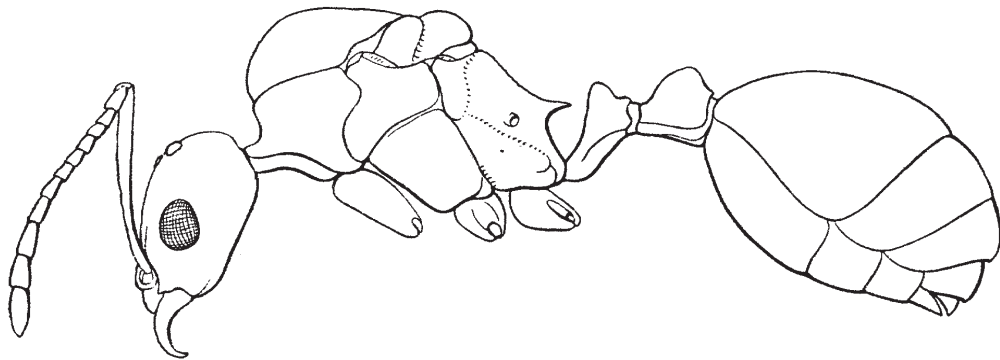


Fig. 2. Side view of a female of *A. texana* (modified from Creighton, 1950; from wwwAntWeb.org, Jen Fogarty photographer; from wwwAntWeb.org, Zach Lieberman photographer).

Males are easily recognized by the dorsally-ventrally flattened head, and the form of the propodeum, which is much lower and more slender than the remainder of the massive mesosoma (Fig. 3). The antenna does not have a well-developed club.

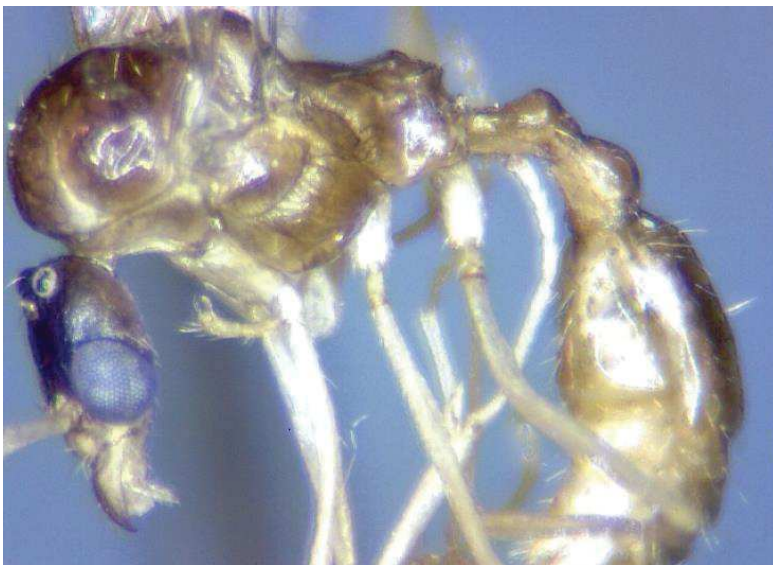
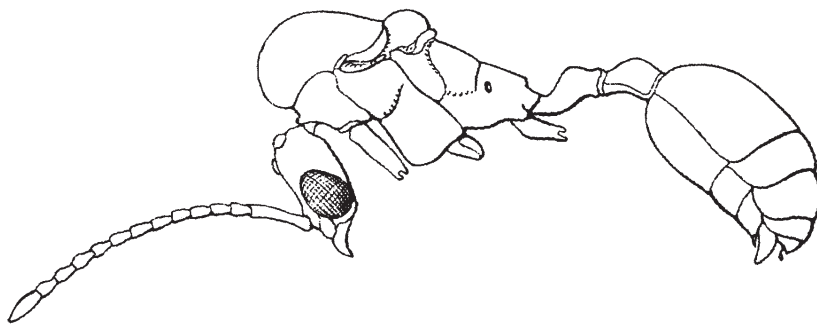


Fig. 3. Side view of a male of *A. texana* (drawing modified from Creighton, 1950).

Methods and Materials

Specimens were borrowed from several institutions and curators as follows:

AMNH American Museum of Natural History, James Carpenter, Christine LeBreu

CASC California Academy of Sciences, Robert Zuparko, Vincent Lee, Brian Fisher

COOK Collection of Jerry Cook (USA), Jerry Cook

CSTD Collection of Shawn Dash (USA) Shawn Dash

CWEM Collection of William and Emma Mackay, University of Texas at El Paso (USA)

GBFM Graham Fairchild Museo de Invertebrados (Panamá), Diomedes Quintero, Roberto A. Cambra

IAVH Collection of the Humboldt Institute (Colombia), Fernando Fernández, Tania Arias

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

INBio Institute for Biodiversity (Costa Rica), Manuel Solis

LACM Los Angeles County Museum of Natural History, Weiping Xie, Roy Snelling

MCSN Museo Civico di Storia Naturale (Italy), Roberto Poggi

MCZC Harvard Museum of Comparative Zoology, Stefan Cover, Jignasha Rana

MIZA Instituto de Zoología Agrícola (Venezuela), John Lattke

MZSP Museu de Zoologia da Universidade de São Paulo (Brasil),
Roberto Brandão

MHNG Museum d'histoire naturelle, Ville de Geneve (Switzerland),
Bernhard Merz

NHMB Naturhistorisches Museum Basel (Switzerland), Daniel
Burckhart

NHMW Naturhistorisches Museum Wien (Austria), Stefan Schödl,
Herbert Zettler, Manuela Vizek

QCAZ Museo de Zoologia, Pontificia Universidad Católica del Ecuador,
Juan Vieira, David Donoso

UNCM Museo de Entomología "Francisco Luis Gallego", Raul Vélez
Angel (Colombia)

USNM United Status Nacional Museum, Ted Schultz

Terminology

Specimens were measured using an ocular micrometer in a dissecting microscope. The following abbreviations are used (all measurements in mm.):

HL Head length, anterior of median lobe of clypeus to mid-point of posterior margin.

HW Head width, maximum excluding eyes.

EL Eye length, maximum dimension.

SL Scape length, excluding basal condyle.

WL Weber's length, anterior border of pronotum to posterior border of lobe of metapleural gland.

CL Clypeal length, from tops of posterior lobes of clypeus to anterior median edge.

CW Clypeal width, measured at level of tentorial pits.

FFL Front femur length (maximum).

FFW Front femur width (maximum).

CI Cephalic Index, HW/HL X 100.

SI Scape index, SL/HL X 100 (note HL used instead of HW).

CLI, CW/CL X 100.

FFI, FFW/FFL X 100.

Generally, the sculpture is shown only on $\frac{1}{2}$ of the head.

The scale bars are 1 mm.

Many photographs were downloaded from AntWeb, thanks due to the outstanding work of Dr. Brian Fisher of the California Academy of Sciences and his team. Other photographs were taken using a Zarbeco microscope, a ZC203 2-megapixel camera and FocusLock software, the best we could afford on our retirement income.

The three new species are registered in ZooBank.

Key to the genera and species complexes: workers

1. Larger ants, total length usually at least 8 mm; notopropodeal suture poorly marked on dorsum of mesosoma (Fig. 4); propodeal spines (Fig. 4) long and sharp; most common in arid and semiarid regions *Novomessor*

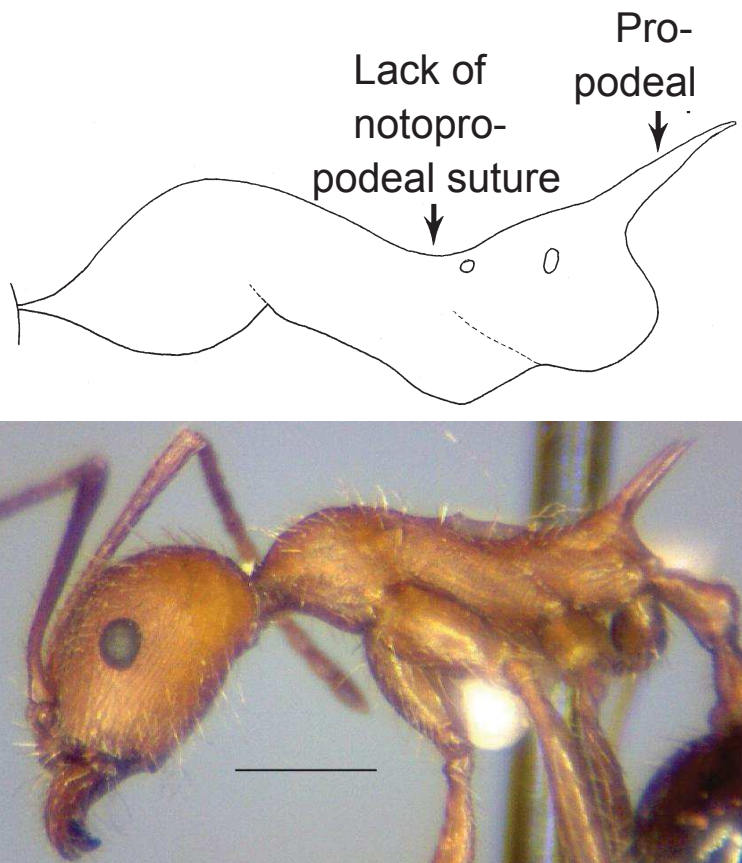


Fig. 4. Head and mesosoma of a worker of *N. albisetosus*, showing the lack of a notopropodeal suture and the long propodeal spines (from Mackay and Mackay, 2002).

- Smaller ants, total length rarely over 7 mm; notopropodeal suture clearly marked on dorsum of mesosoma (Fig. 5); propodeal spines (Fig. 5) often short (long in some species) and poorly developed, may be absent; most common in mesic sites (*Aphaenogaster*) 2

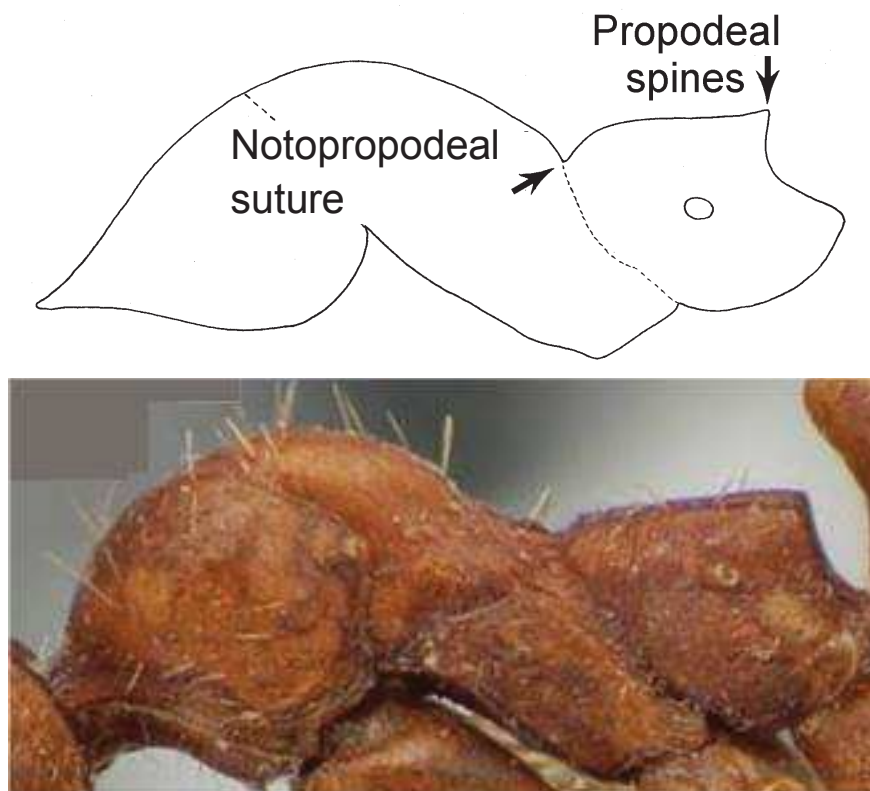


Fig. 5. Outline of the mesosoma of a worker of *A. uinta*, showing the notopropodeal suture and the short propodeal angles or spines (Utah, CWEM). The photograph is from www.AntWeb.org.

2(1). Posterior part of head narrowed into elongated neck (Fig. 6);
México south to Colombia *phalangium* species complex

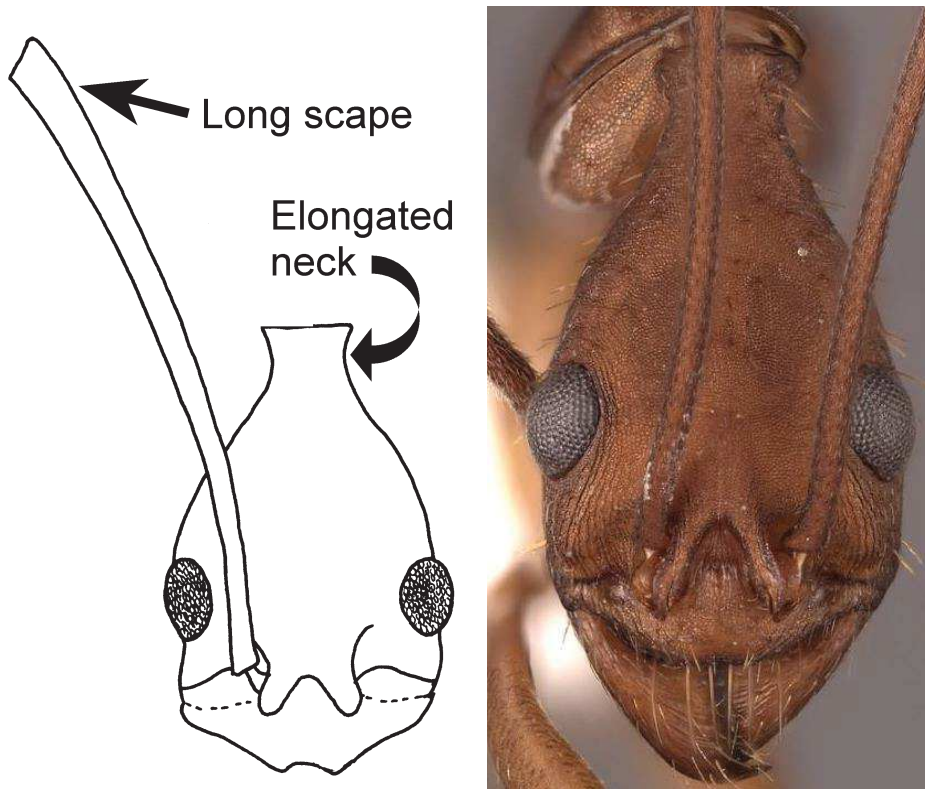
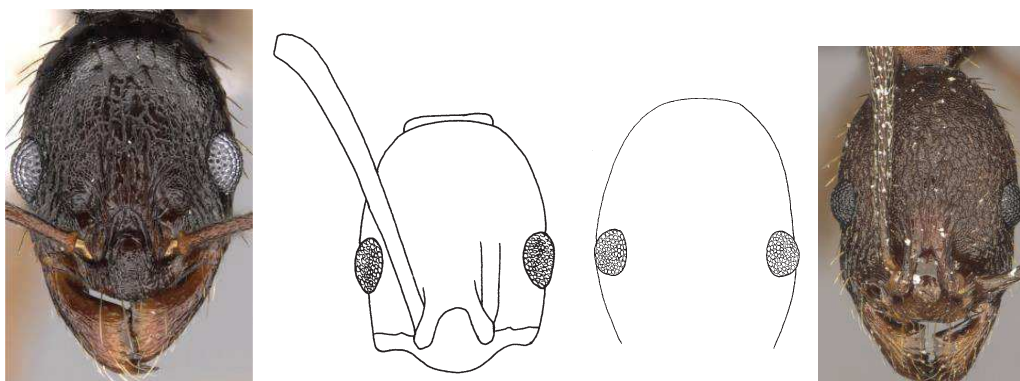


Fig. 6. Head of a worker of *A. araneoides* (La Selva, Costa Rica, CWEM) (Photograph from AntWeb, Alexandra Westrich photographer).

- Posterior part of head not narrowed into neck (Fig. 7); primarily USA and México (*subterranea* species complex) **3**



honduriana

texana

Fig. 7. Heads of workers of *A. honduriana* (Atlántida, Honduras, CWEM) and *A. texana* (from Mackay and Mackay, 2002) (Photographs from AntWeb).

- 3(2).** Head not greatly elongated (Fig. 7, left) cephalic index (CI, Head width/head length X 100) greater than 77 *subterranea* subgroup
- Head more elongated (Fig. 7, right), CI less than 79
..... *texana* subgroup

Key to the genera and species complexes: females

1. Relatively large, total length greater than 8 mm; United States and Mexico *Novomessor*
 - Relatively small, total length under 8 mm; widely distributed . **2**
- 2(1).** Posterior part of head narrowed into neck (Fig. 6); mesosoma without any evidence of having wings; México south to Colombia
 *phalangium species* complex
 - Posterior part of head rounded, or straight (Fig. 8); mesosoma with wings or wing scars; found primarily in the United States and Mexico
 *subterranea species complex*



Fig. 8. Head of a female of *A. honduriana* (from AntWeb, Estella Ortega photographer).

Key to the genera and species complexes: males

- 1. Relatively large, total - length over 6 mm; southwestern United States and northern Mexico *Novomessor*
- Relatively small, total length under 5 mm; widely distributed . 2

- 2(1). Posterior part of head narrowed into neck (Fig. 9); México south to Colombia *phalangium species* complex

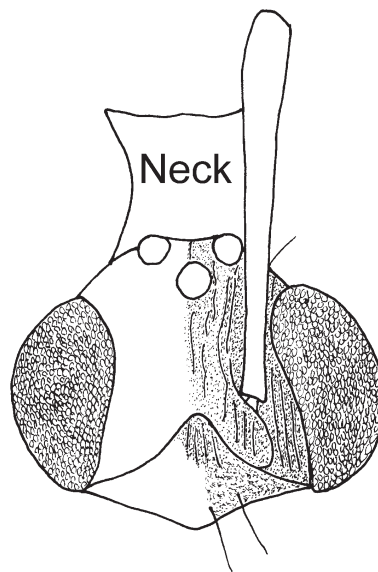


Fig. 9. Head of a male of *A. araneoides* (from Mackay and Dash, 2016).

- Posterior part of head rounded, or nearly straight (Fig. 10), (posterior part of head may be narrowed into neck from Mexico); found primarily in United States and Mexico
 (*subterranea* species complex) 3

3(2). Head generally less elongated (Fig. 10, left), cephalic index usually more than 77..... *subterranea* subgroup

- Head generally more elongated (Fig. 10, right), cephalic index usually less than 80 *texana* subgroup

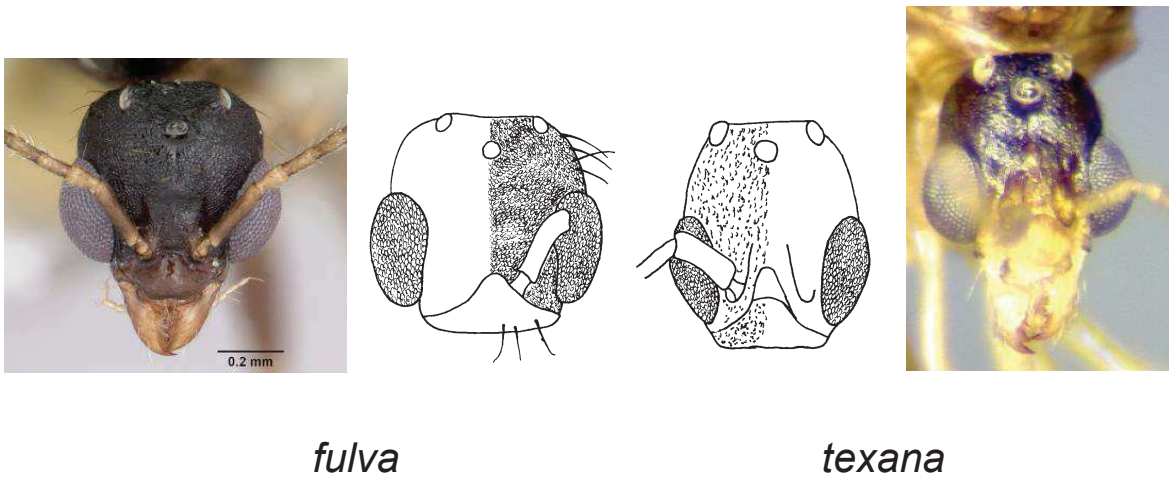


Fig. 10. Heads of males of *A. fulva* (Photograph from AntWeb, April Nobile photographer, Pendleton Co., West Virginia, MCZC) and *A. texana* (Graham Mountains, AZ, MCZC)

**Clave para géneros y complejos de *Aphaenogaster*:
obreras**

1. Hormigas grandes, longitud total por lo general mayor a 8 mm; sutura notopropodeal poco marcada en el dorso del mesosoma (Fig. 11); espinas propodeales largas y agudas (Fig. 11); más comunes en las regiones áridas y semiáridas *Novomessor*

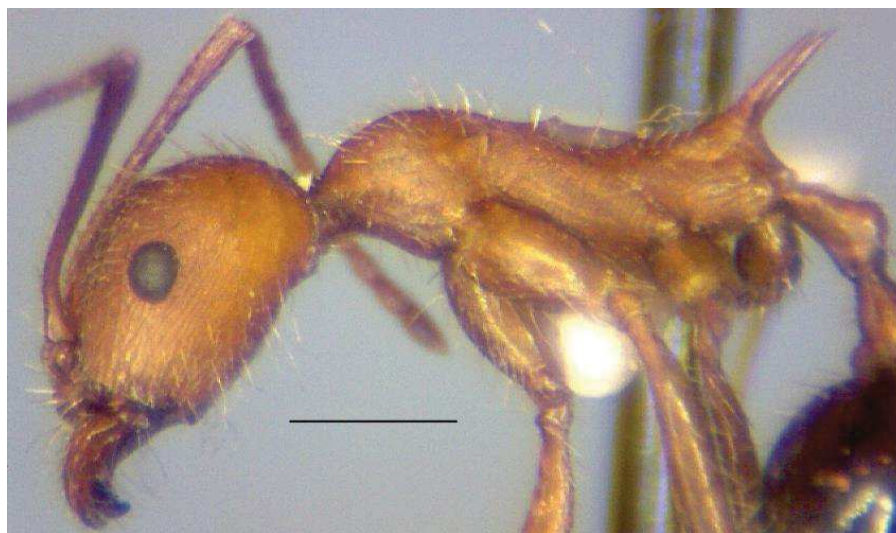
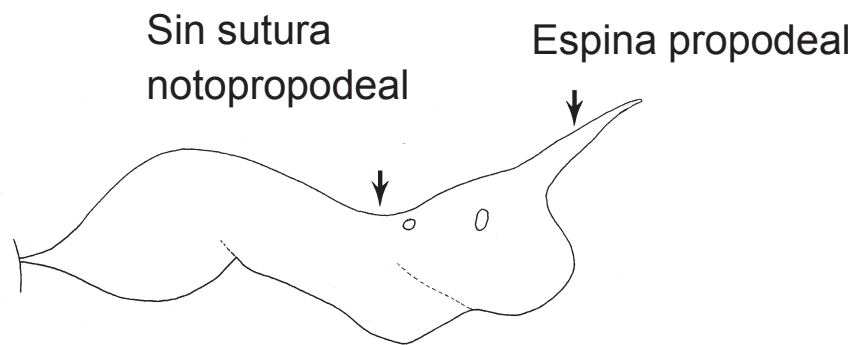


Fig. 11. Mesosoma de una obrera de *N. albisetosus*, mostrando la falta de una sutura notopropodeal y las espinas propodeales largas (de Mackay y Mackay, 2002).

- Hormigas más pequeñas, rara vez la longitud total es mayor a 7 mm; sutura notopropodeal claramente marcada en el dorso del mesosoma (Fig. 12); espinas propodeales no tan largas (largas en algunas especies) usualmente poco desarrolladas (Fig. 12), pueden estar ausentes; más común en sitios méxicos (*Aphaenogaster*) **2**

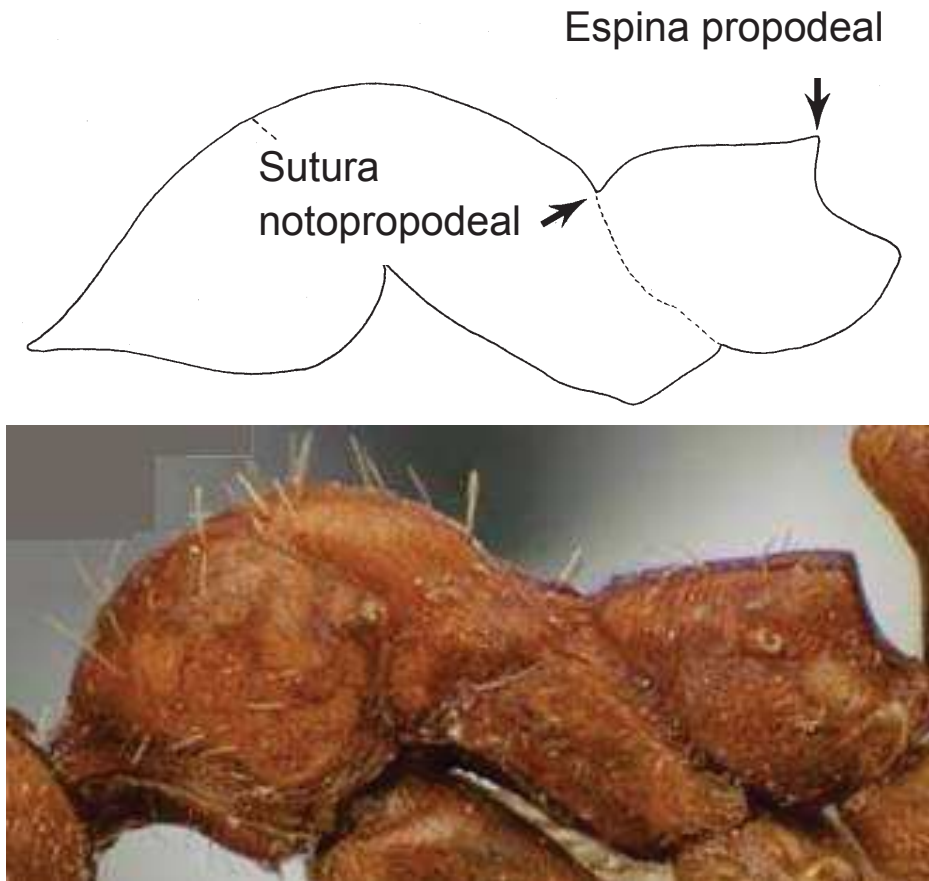


Fig. 12. Mesosoma de una obrera de *A. uinta*, mostrando la sutura notopropodeal y los ángulos propodeales o espinas cortas (Utah, EUA, CWEM).

2(1). Parte posterior de la cabeza se reduce a un cuello alargado (Fig. 13); México hasta Colombia complejo *phalangium*

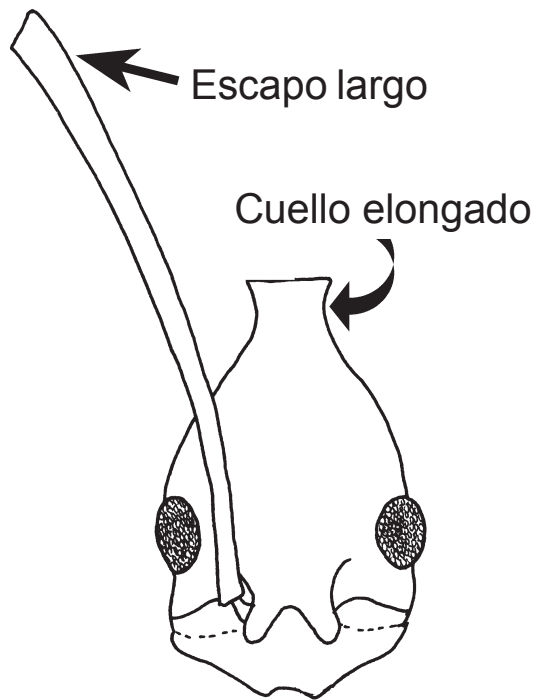


Fig. 13. Cabeza de una obrera de *A. araneoides* (La Selva, Costa Rica, CWEM) (Fotografía de AntWeb).

- Parte posterior de la cabeza no se reduce a un cuello (Fig. 14); principalmente EUA y México **(complejo *subterranea*) 3**

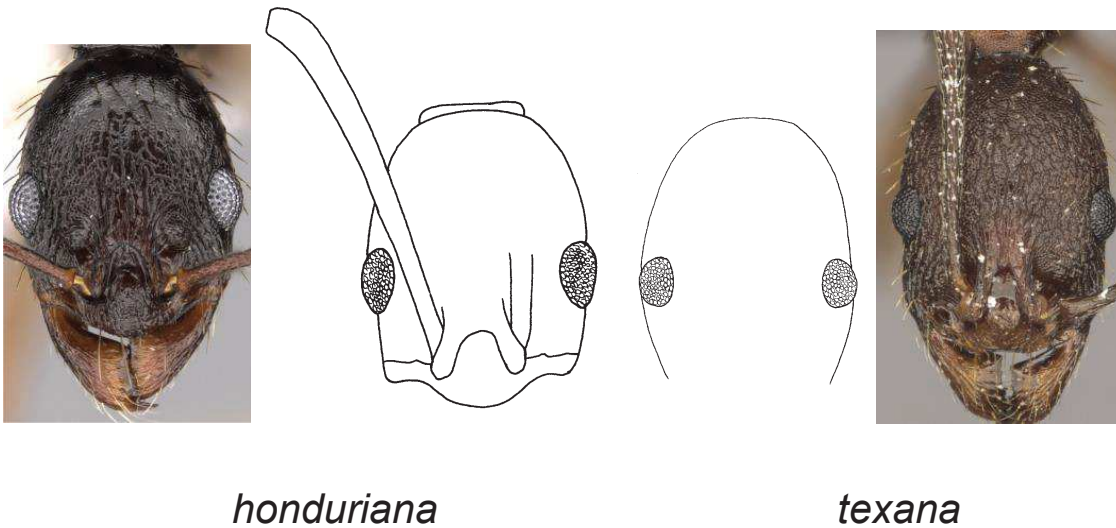


Fig. 14. Cabezas de obreras de *A. honduriana* (Atlántida, Honduras, CWEM) y *A. texana* (de Mackay y Mackay, 2002) (Fotografías de AntWeb).

- 3(2).** Cabeza no muy alargada (Fig. 14, izquierda) índice cefálico (IC, ancho de la cabeza / longitud de la cabeza X 100) superior a 77 **subgrupo *subterranea***
- Cabeza más alargada (Fig. 14, derecha), IC inferior a 79 **subgrupo *texano***

**Clave para géneros y complejos de *Aphaenogaster*:
hembras**

1. Relativamente grande, longitud total mayor a 8 mm; Estados Unidos y México *Novomessor*
- Relativamente pequeña, longitud total menos a 8 mm; ampliamente distribuida **2**
- 2(1).** Parte posterior de la cabeza se reduce a un cuello (Fig. 13); mesosoma sin evidencia de tener alas; México hasta Colombia **complejo *phalangium***
- Parte posterior de la cabeza redondeada o recta (Fig. 15); mesosoma con alas o cicatrices; se encuentra principalmente en los Estados Unidos y México **complejo *subterranea***



Fig. 15. Cabeza de una reina de *A. honduriana* (de www.AntWeb.org, de Estella Ortega).

**Clave para géneros y complejos de *Aphaenogaster*:
machos**

1. Relativamente grande, longitud total mayor a 6 mm; suroeste de los Estados Unidos y norte de México *Novomessor*
- Relativamente pequeño, longitud total menor a 5 mm; ampliamente distribuida 2
- 2(1). Parte posterior de la cabeza se reduce formando un cuello (Fig. 16); México hasta Colombia **complejo *phalangium***

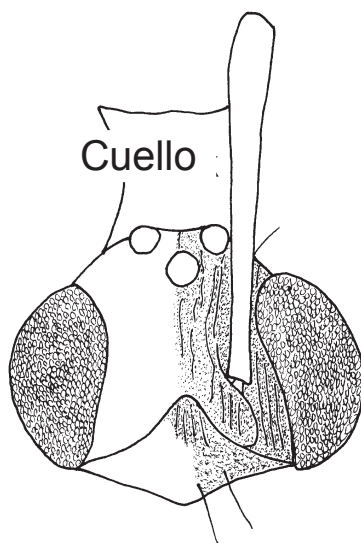


Fig. 16. Cabeza de un macho de *A. araneoides* (de Mackay y Dash, 2016).

- Parte posterior de la cabeza redondeada o casi recta (Fig. 17), (parte posterior de la cabeza puede ser reducida a un cuello en especies de México); se encuentra principalmente en EUA y México
 **(complejo *subterranea*) 3**

3(2). Cabeza generalmente menos alargada (Fig. 17, izquierda), índice cefálico por lo general mayor a 77 **subgrupo *subterranea***

Cabeza generalmente más alargada (Fig. 17, derecha), índice cefálico por lo general menor a 80 **subgrupo *texano***

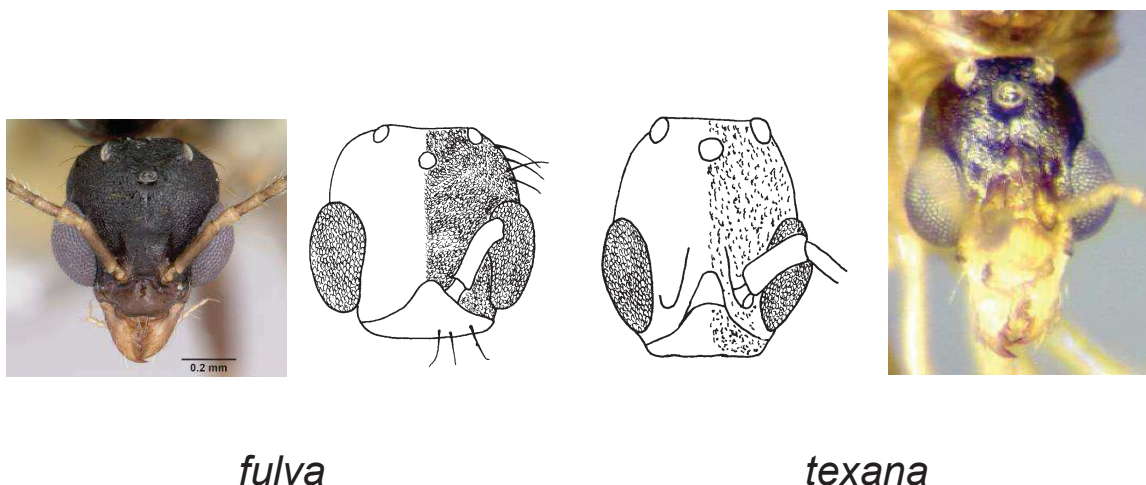


Fig. 17. Cabezas de machos de *A. fulva* (fotografía de AntWeb de April Nobile), Condado de Pendleton, West Virginia, EUA, MCZC) y *A. texana* (Montañas de Graham, Arizona, EUA, MCZC)

Key to the species of *Novomessor*: workers

1. Posterior border of head elongated into definite, constricted neck, which is narrower than area anterior to neck and to posterior nuchal carina (Fig. 18); México *ensifer* (Forel)

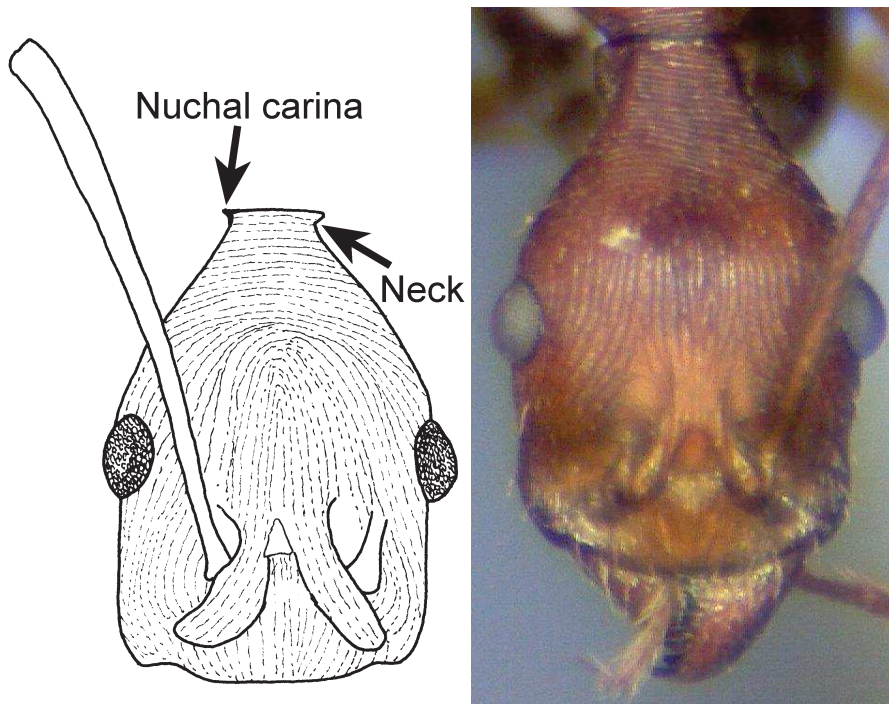


Fig. 18. Head of a worker of *N. ensifer* (Guerrero, México, CWEM).

- Occipital neck absent, posterior border rounded (Fig. 19), southwestern USA and northern México **2**

2(1). Head nearly always with transverse rugae and rugulae posteriorly (Fig. 19), at least some rugae near insertion of antenna curved medially towards insertion (Fig. 19); head (excluding mandibles) only slightly longer (up to 2.1 mm, Fig. 19) than broad ($78 < \text{cephalic index} < 95$); frons usually granulate; dorsum of pronotum usually partially punctate and weakly shining; common in arroyos and desert canyons
 *albisetosus* Mayr

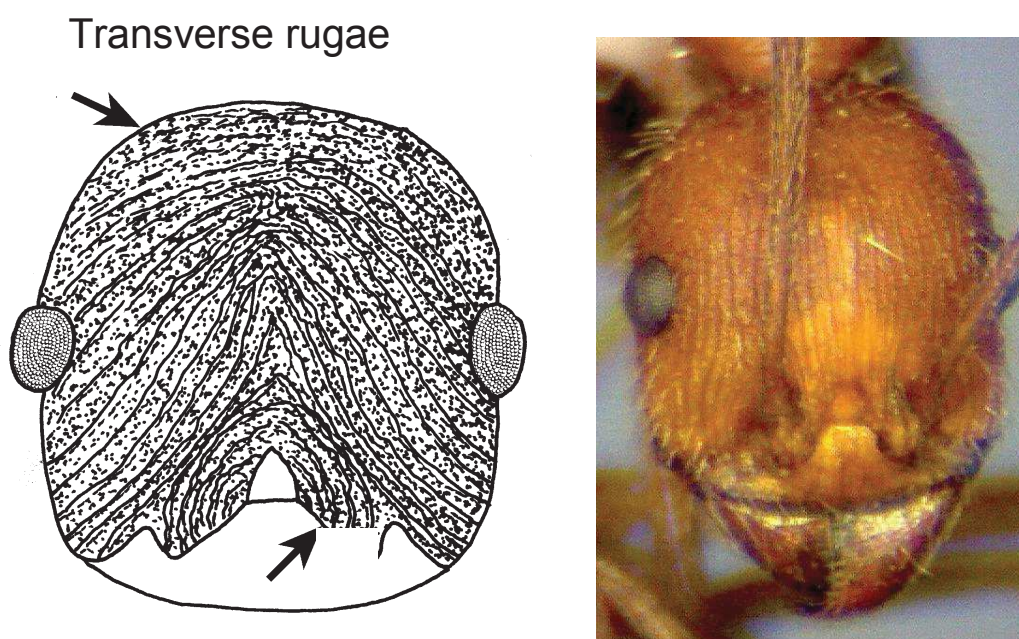


Fig. 19. Head of a worker of *N. albisetosus* (Cochise Co., New Mexico, CWEM).

- Head rarely with transverse rugulae posteriorly, usually without even longitudinal rugulae, replaced towards posterior border with fine, coriaceous sculpture (Fig. 20), most rugae near insertion of antenna directed anteriorly or bent towards side of head (Fig. 20); head (excluding mandibles) at least $1\frac{1}{3}$ as long (usually at least 2.1 mm in length) as broad ($65 < CI < 77$, Fig. 20); dorsum of pronotum usually partially smooth and glossy; common in open desert habitats *cockerelli* André

Without transverse rugae

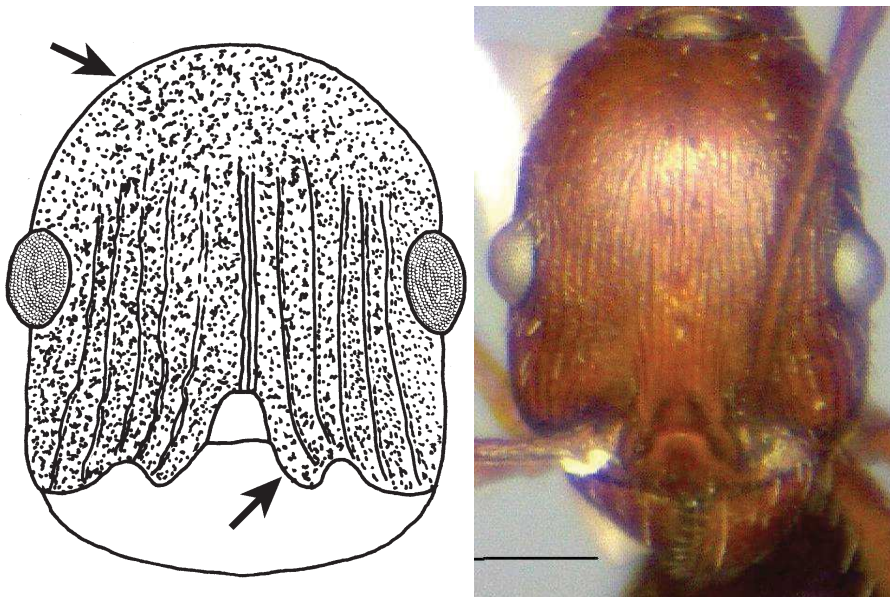


Fig. 20. Head of a worker of *N. cockerelli* (Eddy Co., NM, CWEM).

Key to the species of *Novomessor*: females

1. Head elongated (CI \approx 72), width of nuchal carina at back of head \approx 1 mm, extending well past sides of head as sharp flange (Nuchal carina, Fig. 18); México ***ensifer* (Forel)**
 - Head less elongated (CI $>$ 75), width of nuchal carina $>$ 1.2 mm), collar barely extending past sides of head (Fig. 21); México and US **2**
- 2(1).** Head (Fig. 21, left) relatively shorter (HL $<$ 2.4 mm, CI 84-88) ***albisetosus* Mayr**
 - Head (Fig. 21, right) longer (HL $>$ 2.4 mm, CI 78 - 83) ***cockerelli* André**



albisetosus



cockerelli

Fig. 21. Heads of females of *Novomessor albisetosus* and *N. cockerelli*.

Key to the species of *Novomessor*: males¹

1. Scape (Fig. 22, left) generally shorter (0.54 - 0.56 mm); head (Fig. 22, left) less elongated (HL 1.22 - 1.36 mm, CI 75 - 84) *albisetosus* Mayr
- Scape (Fig. 22, right) generally longer (0.54 - 0.70 mm); head (Fig. 22) slightly longer (HL 1.24 - 1.38 mm, CI 69-76) *cockerelli* André



albisetosus



cockerelli

Fig. 22 Heads of males of *Novomessor albisetosus* and *N. cockerelli*.

¹ The male of *N. ensifer* is unknown and not included in the key. It would occur in central México, and would be expected to have a head narrowed posteriorly.

Clave para las especies de *Novomessor*: obreras

1. Borde posterior de la cabeza alargado, formando un cuello angosto, que es más estrecho que la zona anterior al cuello y a la carina nugal posterior (Fig. 23); México *ensifer* (Forel)

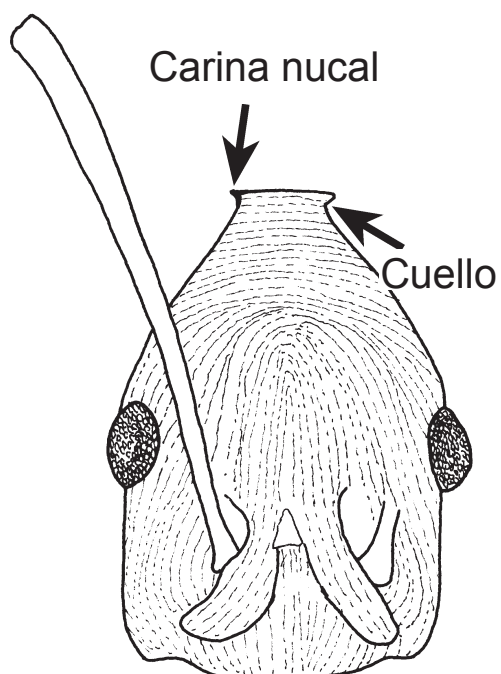


Fig. 23. Cabeza de una obrera de *N. ensifer* (Guerrero, México, CWEM).

- Cuello occipital ausente, borde posterior redondeado (Fig. 24), el suroeste de EUA y el norte de México 2

2(1). Parte posterior de la cabeza casi siempre con arrugas y arrugitas transversales y onduladas que se extienden casi hasta el borde posterior (Fig. 24), arrugas cerca de la inserción de la antena están incurvadas hacia la inserción (Fig. 24); cabeza (excluyendo las mandíbulas) un poco más larga (hasta 2,1 mm, Fig. 24) que ancha ($78 < \text{índice cefálico} < 95$ [IC = ancho de la cabeza dividida por la longitud de la cabeza X 100]); frente generalmente granuloso; dorso del pronoto generalmente punteado parcialmente y débilmente brillante; común en arroyos y cañones del desierto *albisetosus* Mayr

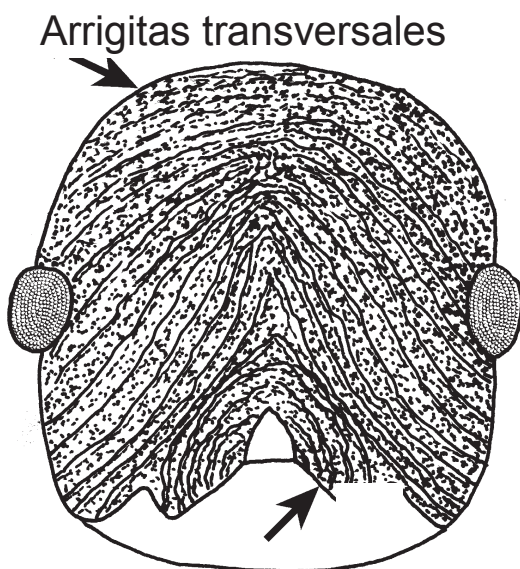


Fig. 24. Cabeza de una obrera de *N. albisetosus* (Condado de Cochise, New Mexico, CWEM).

- Parte posterior de la cabeza casi siempre sin arrugas transversales ni longitudinales, con rugosidades longitudinales onduladas bien desarrolladas sólo en medio anterior dorsal de la cabeza (Fig. 25), la mitad posterior con rugosidades débiles que se sustituyen hacia el borde posterior con escultura fina y coriácea, la mayoría de las arrugas cerca la inserción de la antena dirigidas derecho o hacia el lado de la cabeza (Fig. 25); cabeza (excluyendo mandíbulas) al menos $1\frac{1}{3}$ tan larga (por lo general mayor a 2,1 mm de longitud) como ancha ($65 < IC < 77$, Fig. 25); dorso del pronoto por lo general parcialmente liso y brillante; común en hábitats abiertos del desierto *cockerelli* André

Sin arrugas transversales

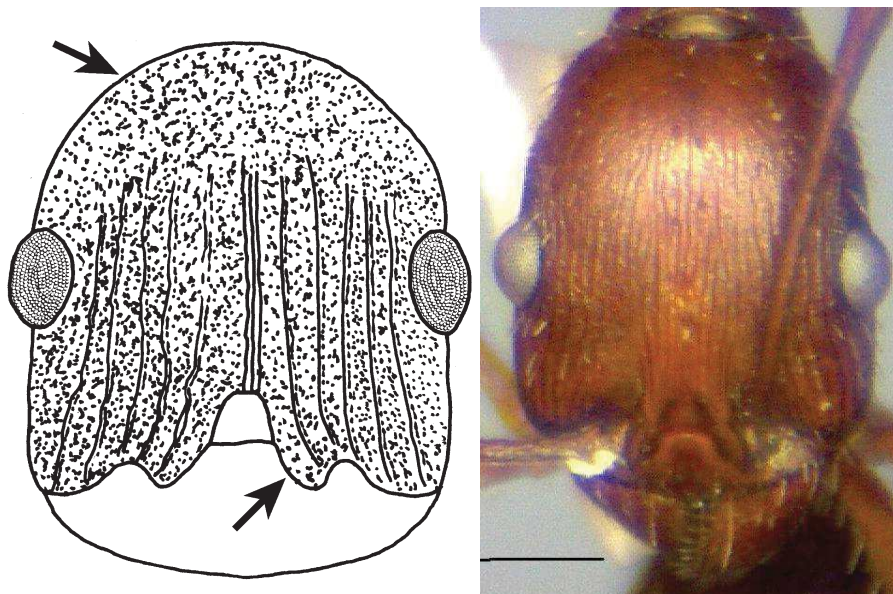


Fig. 25. Cabeza de una obrera de *N. cockerelli* (Condado de Eddy, New México, EUA, CWEM).

Clave para las especies de *Novomessor*: hembras

1. Cabeza alargada (IC [índice cefálico, ancho de la cabeza / largo de la cabeza X 100 \approx 72), ancho de la carina nugal en la parte posterior de la cabeza \approx 1 mm, se extiende mucho más allá de los lados de la cabeza (Fig. 23); México *ensifer* (Forel)

- Cabeza menos alargada (IC $>$ 75), la anchura de la carina nugal $>$ 1,2 mm), se extiende apenas a los lados anteriores de la cabeza (Fig. 26); México y Estados Unidos **2**

2(1). Cabeza (Fig. 26, izquierda) relativamente más corta (longitud de cabeza $<$ 2,4 mm, IC 84-88) *albisetosus* Mayr

- Cabeza (Fig. 26, derecha) más larga (longitud de cabeza $>$ 2,4 mm, IC del 78 - 83) *cockerelli* André



albisetosus



cockerelli

Fig. 26. Cabezas de reinas de *Novomessor albisetosus* and *N. cockerelli*.

Clave para las especies de *Novomessor*: machos²

1. Escapo (Fig. 27, izquierda) generalmente corto (0,54 - 0.56 mm); cabeza menos alargada (largo de cabeza 1,22 - 1,36 mm, IC el 75 - 84) *albisetosus* Mayr
- Escapo (Fig. 27, derecha) generalmente largo (0,54 a 0,70 mm); la cabeza ligeramente más largo (largo de cabeza 1,24 - 1,38 mm, IC 69 - 76) *cockerelli* André



albisetosus



cockerelli

Fig. 27. Cabezas de machos de *Novomessor albisetosus* and *N. cockerelli*.

² El macho de *N. ensifer* es desconocido y no está incluido en la clave. Ocurre en el centro de México, y debe tener un cuello angosto posteriormente.

***phalangium* species complex**

This complex contains some of the most spectacular ants in the genus, with long legs and elongated necks. These characters make them easily recognized, but unfortunately differentiating the species is difficult. They are tropical ants, occurring from México south to Colombia. The elongated neck evolved independently in the *phalangium* complex and in *Novomessor* (*ensifer*), as well as in many other genera, notably *Dolichoderus*, *Pheidole* and *Camponotus* among the New World ants. The slender neck probably allows more mobility of the head.

Aphaenogaster with elongated necks are also found in the Old World and our New World ants may form a monophyletic group with these Old-World ants. As often as elongated necks have independently evolved in different ant groups, they may also not be closely related.

Longino and Cover (2004) provided a revision of the group, and reduced the 6 taxa to two: *A. araneoides* and *A. phalangium*. We could not agree with their synthesis, based on several points (Mackay and Dash, 2016). First their characterization of *A. phalangium* is incorrect, which can be easily determined by examining the lectotype of *A. phalangium* that they designated. This specimen lacks the erect hairs on all surfaces of the posterior femur and would therefore easily key to *A. araneoides* in their key (page 655). It has about 12 erect hairs on the left posterior femur, all restricted to the lower surface, fewer than the number of similar hairs on the lectotype of *A. araneoides* (designated by Longino and Cover), which has 13 such hairs. Their concept of *A. phalangium* corresponds to *A. inermis*, the only species which has abundant hairs on all of the surface of the femora. *Aphaenogaster phalangium* is a valid species and can be

separated from the closely related *A. araneoides* by the rougher sculpturing on the dorsum of the head, and in usually having the first gastral tergite at least partially smooth and glossy (usually completely punctate and dull in *A. araneoides*). We also included *A. mexicana* in this species complex (Mackay and Dash, 2016), a species which was not listed in Longino and Cover (2004). Finally, we consider *A. brevicollis* to be a valid species, differing from the other three species in being more robust and in having a shorter neck.

The females are wingless and ergatoid (Longino and Cover, 2004).

The males of the *araneoides* species complex are easy to recognize by the elongated neck and with the dorsal surface of the propodeum strongly depressed, making the propodeum very narrow in profile. These characteristics would allow it to be separated from all the other genera in the tropics. Unfortunately, the males are very similar to each other and very difficult to identify. The key (below) will hopefully help in the identification.

Key to the *phalangium* species complex: workers

1. Antenna with 11 segments, pedicel (first segment of funiculus) as long as next three segments (Fig. 28); frontal lobes large, completely covering base of scape *Apterostigma*³

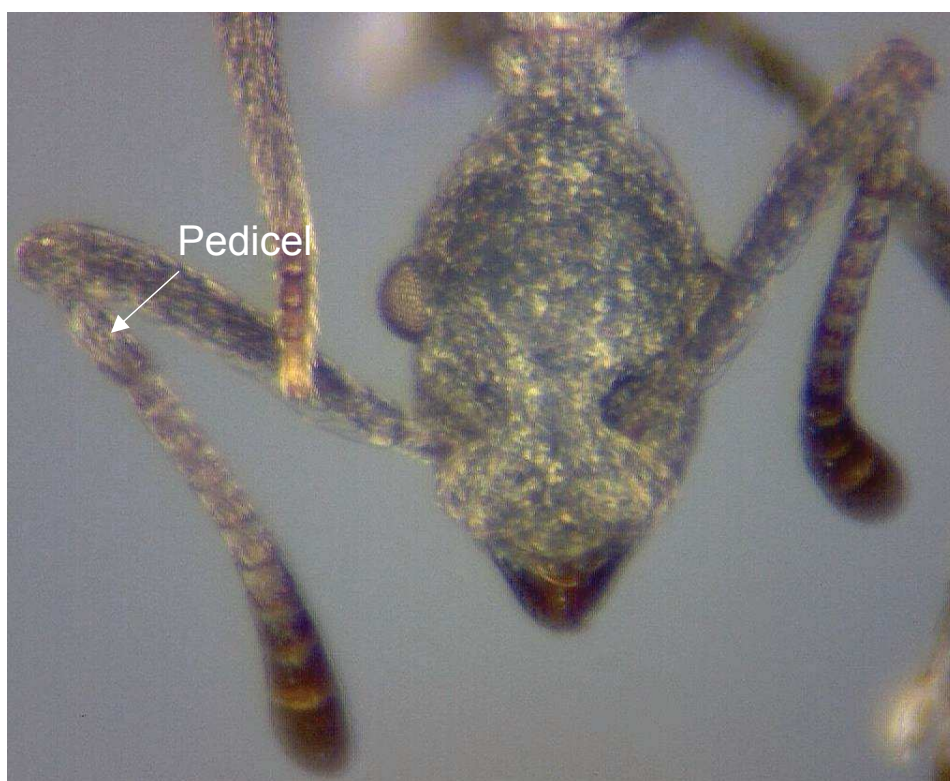


Fig. 28. Head of a worker of *Apterostigma auriculatum*.

³ *Apterostigma* included as it is easy to confuse the worker with *Aphaenogaster*.

- Antenna nearly always with 12 segments, pedicel not as above; frontal lobes not covering complete base of antennal scape **2**

2(1). Antenna with 3 (Fig. 29), 4 or rarely 5 segmented club; third mandibular tooth much smaller than second and smaller than, or subequal to fourth (Fig. 30, left); propodeal spines often very long (longer than width between bases) *Pheidole* spp. minor workers⁴



Fig. 29. Head of a minor worker of *Pheidole ajax* (CWEM).

⁴ Some *Pheidole* workers are large ants that are easily confused with *Aphaenogaster*.

- Antenna without well-defined club; third mandibular tooth approximately same size as second and much larger than fourth (Fig. 30, right); propodeal spines shorter than distance between bases (Fig. 31) or usually absent 3

*P. gouldi**A. inermis*

Fig. 30. Mandibles of a minor worker of *Pheidole gouldi* (Guatemala City, Guatemala, CWEM) and a worker of *Aphaenogaster inermis* (Colombia, Chocó, CWEM). Drawings are at the same scale, photographs at different scales.

- 3(2).** Side and top of pronotum mostly smooth and glossy; propodeal spines small, but developed (Fig. 31, left); known only from western and central México *mexicana* (Pergande)
- Side and top of pronotum nearly completely sculptured; propodeal spines nearly always absent, but represented by swollen regions (Fig. 31, right); found in Central America south to Colombia (presently unknown from México) **4**

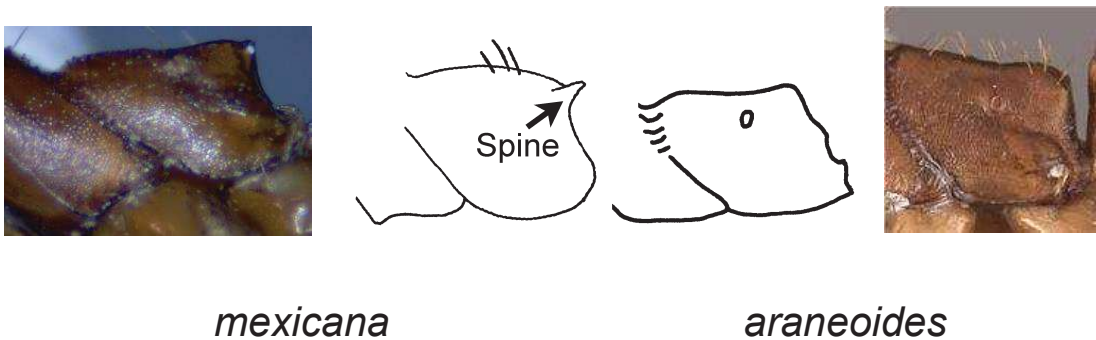


Fig. 31. Propodea of workers of *A. mexicana* (drawing of the paralectotype, USNM) and *A. araneoides* (La Selva, Costa Rica).

- 4(3).** All surfaces of posterior femur covered with erect, bristly hairs (Fig. 32); Nicaragua south into Colombia *inermis* Forel



Fig. 32. Posterior left femur of the lectotype worker of *A. inermis*.

- Erect hairs on posterior femur restricted to flexor (lower) surface (Fig. 33) 5

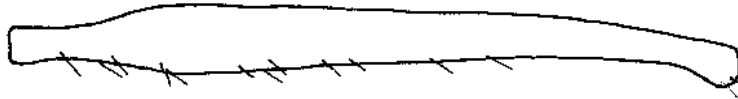


Fig. 33. Posterior left femur of the lectotype worker of *A. phalangium*.

- 5(4).** Neck of posterior part of head relatively short, about twice as wide as long, head abruptly narrowing posteriorly (Fig. 34, left, 35, middle); head width greater than 1.4 mm (at posterior edge of eye); uncommon, Panamá *brevicollis* Forel
- Neck longer, at least as long as broad, gradually narrowing posteriorly (Fig. 34, right,); head width less than 1.2 mm (at posterior edge of eye); common and widely distributed 6



brevicollis



araneoides

Fig. 34. Heads of workers of *A. brevicollis* and *A. araneoides*.

- 6(5).** Region of head posterior to eye level densely and relatively finely punctate (Fig. 35, left), transverse striae, if present, mostly restricted to sides of neck, or pass over dorsum of neck near apex of neck, sculpture of head similar to sculpture on dorsum of first gastral tergite, nearly always densely punctate (Fig. 36, left); El Salvador south to Panamá *araneoides* Emery
- Region posterior to eye level granulated and roughly sculptured, dull (Fig. 35, right), transversely and longitudinally reticulated, striae usually pass across dorsum of neck, neck may be polished near apex; first gastral tergite nearly always partially to completely smooth and glossy (Fig. 36, right), sculpture much finer than that on head; Guatemala south into Colombia *phalangium* Emery



araneoides



brevicollis

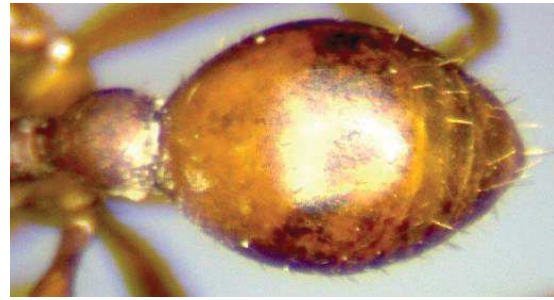


phalangium

Fig. 35. Sides of the heads of workers of *A. brevicollis* and *A. phalangium* and *A. araneoides*.



araneoides



phalangium

Fig. 36. Postpetioles and first gastral tergites of workers of *A. araneoides* and *A. phalangium*.

Key to the *phalangium* species complex, based on males⁵

- 1. Posterior femur often with erect or suberect hairs on extensor (dorsal) surface (Fig. 37), in addition to flexor (ventral) surface; Nicaragua south into Colombia *inermis* Forel

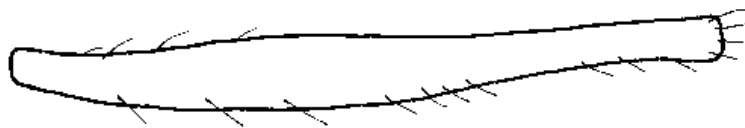


Fig. 37. Posterior left femur of a male of *A. inermis* (paralectotype of *A. nitidiventris*).

- Posterior femur without erect or suberect hairs on extensor surface (Fig. 38), suberect hairs possibly present on flexor surface; El Salvador to Colombia 2



Fig. 38. Posterior femur of a male of *A. araneoides* (Batan, Costa Rica, MCZC).

⁵ The males of *A. mexicana* are unknown.

- 2(1).** Roughly sculptured, specifically most of dorsum of head and scutum granulated; mesopleuron (episternum) with few erect or suberect hairs; rarely collected; Panamá *brevicollis* Forel
 - Finely sculptured, head and scutum densely punctated; mesopleuron without erect or suberect hairs; common, widely distributed, including Panamá **3**
- 3(2).** Third antennal segment nearly twice length of fourth (Fig. 39, left); side of petiole and postpetiole partially smooth and shining; Guatemala south into Colombia *phalangium* Emery
 - Third antennal segment only slightly longer than fourth (Fig. 39, right); side of petiole and postpetiole finely punctate and dull; El Salvador south to Panamá *araneoides* Emery

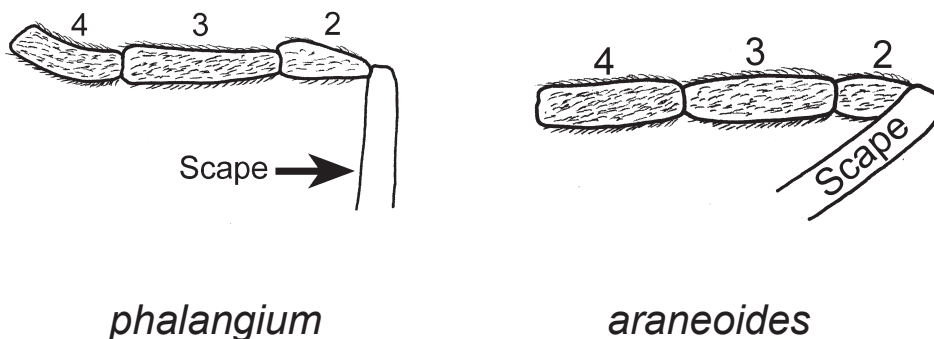


Fig. 39. Part of the scape and first few funicular segments of males of *A. phalangium* and *A. araneoides*.

Clave para las especies del complejo de *phalangium*: obreras (de Mackay y Dash, 2016).

1. Espinas propodeales bien desarrolladas, mucho más largas que la distancia entre las bases (Fig. 40, izquierda); sutura notopropodeal poco desarrollada; México *Novomessor ensifer* (Forel)
 - Espinas propodeales no desarrolladas o poco desarrolladas (Fig. 40, derecha); sutura notopropodeal bien desarrollada; México, América Central y Colombia **2**



Novomessor ensifera



A. inermis

Fig. 40. Mesomas de *Novomessor ensifera* y *A. inermis*

- 2(1). Lado y dorso del pronoto predominante liso y brillante; espinas propodeales presentes (Fig. 41, izquierda); América Latina **3**
 - Lado y dorso del pronoto casi completamente esculturados; espinas propodeales casi siempre ausentes (Fig. 41, derecha), pero tubérculos pequeños pueden estar presentes (Fig. 41, derecha); América Central hasta Colombia (no reportada para México) **4**

3(2). Relativamente grande (longitud total 6 mm); espinas propodeales (Fig. 41, izquierda) pequeñas (largura $\frac{1}{2}$ distancia que separa las bases); mesonoto sin repisa transversal; reportada solamente de centro-oeste de México (Nayarit, Jalisco, Puebla) *mexicana* (Pergande)

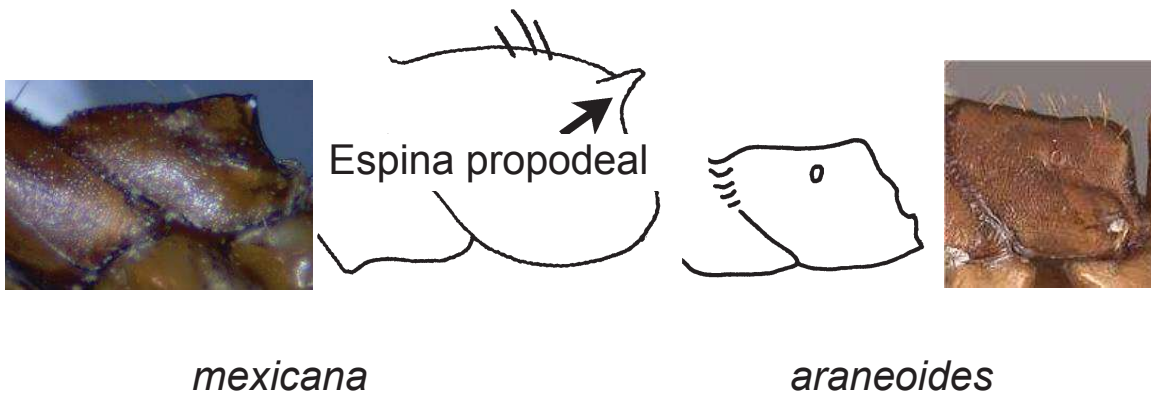


Fig. 41. Propodeo de una obrera de *A. mexicana* (paralectotipo, USNM).

- Relativamente pequeña (longitud total 3.5 mm); espinas propodeales (Fig. 42) muy largas (largura tres veces la distancia que separa las bases); mesonoto con repisa transversal; América Latina
 algunas especies de *Pheidole*



Fig. 42. Mesosoma de una obrera menor de *Pheidole ajax*.

- 4(2). Toda la superficie del fémur posterior cubierta con pelos rectos (Fig. 43); Nicaragua hasta Colombia ***inermis* Forel**

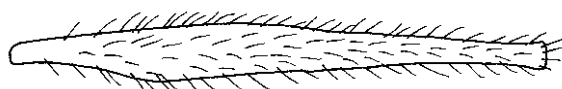


Fig. 43. Fémur posterior izquierdo de la obrera de *A. inermis* (lectotipo).

- Pelos rectos, si presentes, restringidos a la superficie ventral del fémur posterior (Fig. 44) **5**

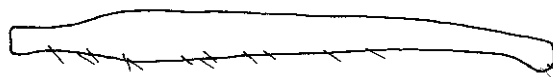


Fig. 44. Fémur posterior izquierdo de la obrera de *A. phalangium*.

5(4). Cuello en la parte posterior de la cabeza relativamente corto, aproximadamente dos veces más ancho que largo, cabeza abruptamente angosta posteriormente (Fig. 45, izquierda); anchura de la cabeza (al extremo posterior del ojo) mayor a 1,4 mm; no común, norte de Panamá

..... *brevicollis* Forel

- Cuello largo, por lo menos más longitud que ancho, cabeza gradualmente angosta posteriormente (Fig. 45, derecha); ancho de la cabeza menos que 1,2 mm; común **6**



brevicollis



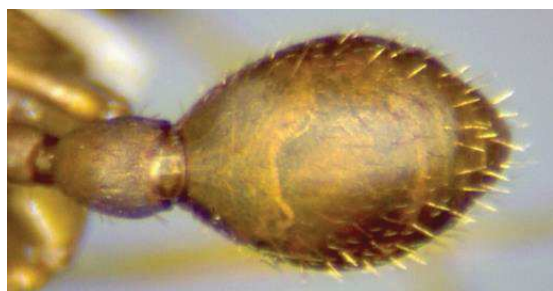
araneoides

Fig. 45. Cabezas de obreras de *A. brevicollis* y *A. araneoides*.

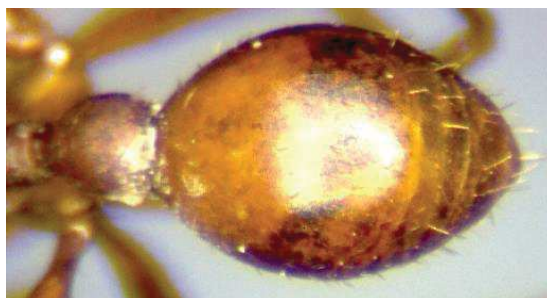
6(5). Parte de la cabeza posterior del ojo con puntuaciones densas y finas (Fig. 46, izquierda), estrías transversas, si presentes, restringidas casi siempre a los lados del cuello, o pasando por encima de la nuca cerca al ápice del cuello, escultura de la cabeza semejante a la escultura en el dorso del primer tergito del gáster, casi siempre punteado fuertemente (Fig. 47, izquierda); El Salvador al sur hasta Panamá .. ***araneoides* Emery**
 - Parte posterior del ojo granulada y esculpurada fuertemente, opaca (Fig. 46, derecha), reticulada transversalmente y longitudinalmente, estrías usualmente pasan por encima del cuello, el cual puede ser liso cerca del ápice; primer tergito del gáster casi siempre parcialmente liso y brillante (Fig. 47, derecha), escultura del gáster mucha más fina que la escultura de la cabeza; Guatemala al sur hasta Colombia
 ***phalangium* Emery**

*araneoides**phalangium*

Fig. 46. Lado de la cabeza de la obrera de *A. phalangium* y *A. araneoides* (Fotografías de AntWeb, Alexandra Westrich).



araneoides



phalangium

Fig. 47. Pospecíolo y la primer tergito del gáster de obreras de *A. araneoides* and *A. phalangium*.

Clave para de las especies del complejo de *phalangium*: machos

(Se desconoce el macho de *A. mexicana*) (de Mackay y Dash, 2016)

1. Fémur posterior muchas veces con pelos rectos en la superficie dorsal, y con pelos en la superficie ventral (Fig. 48); Nicaragua hasta Colombia ***inermis* Forel**

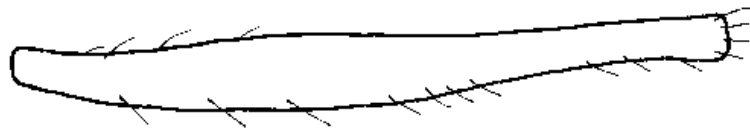


Fig. 48. Fémur izquierda posterior de un macho de *A. inermis* (paralectotipo de *A. nitidiventris*).

- Fémur posterior sin pelos rectos o con pelos rectos solamente en la superficie ventral (Fig. 49) **2**



Fig. 49. Fémur posterior de un macho de *A. araneoides* (Batan, Costa Rica, MCZC).

2(1). Escultura fuerte, específicamente en mucho del dorso de la cabeza y escudo granulado; mesopleuron (epiesterno) con pocos pelos rectos y subrectos; no común, del norte de Panamá

..... *brevicollis* Forel

- Con escultura más fina, cabeza y escudo punteados densamente; mesopleuron sin pelos rectos ni subrectos; común

3

3(2). Tercer artejo de la antena casi dos veces más longitud que el cuarto artejo (Fig. 50, izquierda); lado del pecíolo y pospecíolo parcialmente lisos y brillantes, Guatemala hasta Colombia

..... *phalangium* Emery

- Tercer artejo de la antena un poquito más longitud que el cuarto artejo (Fig. 50, derecha); lado del pecíolo y pospecíolo opaco y esculturado; Guatemala hasta Panamá

araneoides Emery

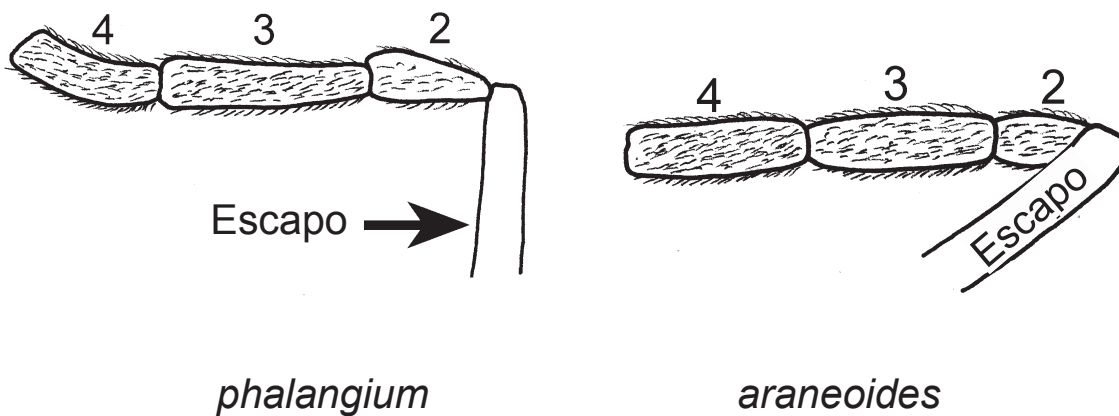
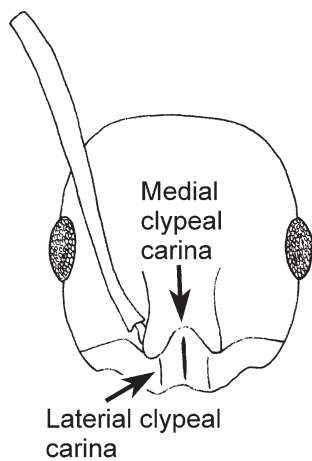


Fig. 50. Parte del escapo y algunos artejos funiculares de machos de *A. phalangium* and *A. araneoides*.

Key to the *subterranea* species complex: workers

- 1. Head not greatly elongated (Fig. 51 left and center), cephalic index (CI, Head width/head length X 100) greater than 77 (*subterranea* subgroup) **2**
- Head more elongated (Fig. 51, right), CI nearly always less than 79 (*texana* subgroup) **21**



mutica

texana

Fig. 51. Head of a cotype and a lectotype worker of *A. mutica* (from AntWeb.com), and of a worker of *A. texana* (from wwwAntWeb.org, Zach Lieberman photographer).

2(1). Antennal scape extending less than or up to two funicular segments past posterior lateral corner of head (Fig. 52) 3

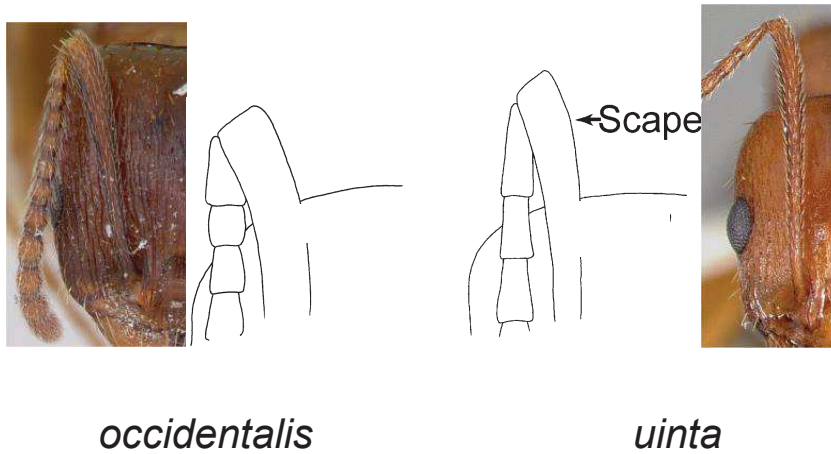


Fig. 52. Posterior lateral corners of the heads of workers of *A. occidentalis* and *A. uinta* (photographs from AntWeb).

- Antennal scape extending more than first two funicular segments past posterior lateral corner of head (Fig. 53) 7

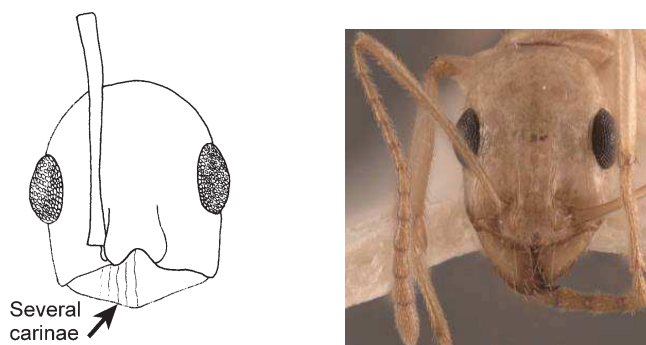


Fig. 53. Head of a worker of *A. megommata* (Riverside Co., California, CWEM). The photograph is from AntWeb, Alexandra Westrich photographer.

- 3(2). Posterior lateral corner of head coarsely sculptured (Fig. 54, left); Mexico and Haiti 4
- Posterior lateral corner of head mostly smooth and shiny, sometimes with weak sculpture (Fig. 54, right); widely distributed, including Mexico 5



montana



uinta

Fig. 54. Left corners of the head of workers of *A. montana* (paratype) and *A. uinta*.

4(3). Propodeal spines about as long as distance between bases (Fig. 55); petiolar node rounded; state of Nuevo Leon, Mexico
 *montana* Mackay

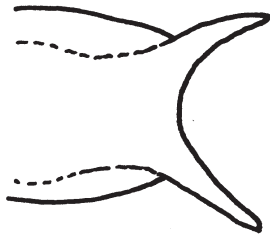


Fig. 55. Dorsal view of the propodeal spines of a workers of *A. montana* (paratypes, CWEM).

- Propodeal spines longer than distance between bases (Fig. 56); petiolar node with sharp apex; Haiti *relicta* Wheeler and Mann



Fig. 56. Propodeal spines of a cotype worker of *A. relicta* as seen from the side and from above (from AntWeb.org, Ryan Perry photographer).

5(3). Head with very feeble interrugal punctate sculpture between poorly developed rugulae (Fig. 57, left); propodeal spines generally poorly developed, length usually less than $\frac{1}{3}$ length of distance between bases (Fig. 58, left); head and mesosoma orange yellow, gaster deep brown to black, at least gaster darker in color than head; uncommon, Idaho, Utah, California and Colorado ***uinta* Wheeler**

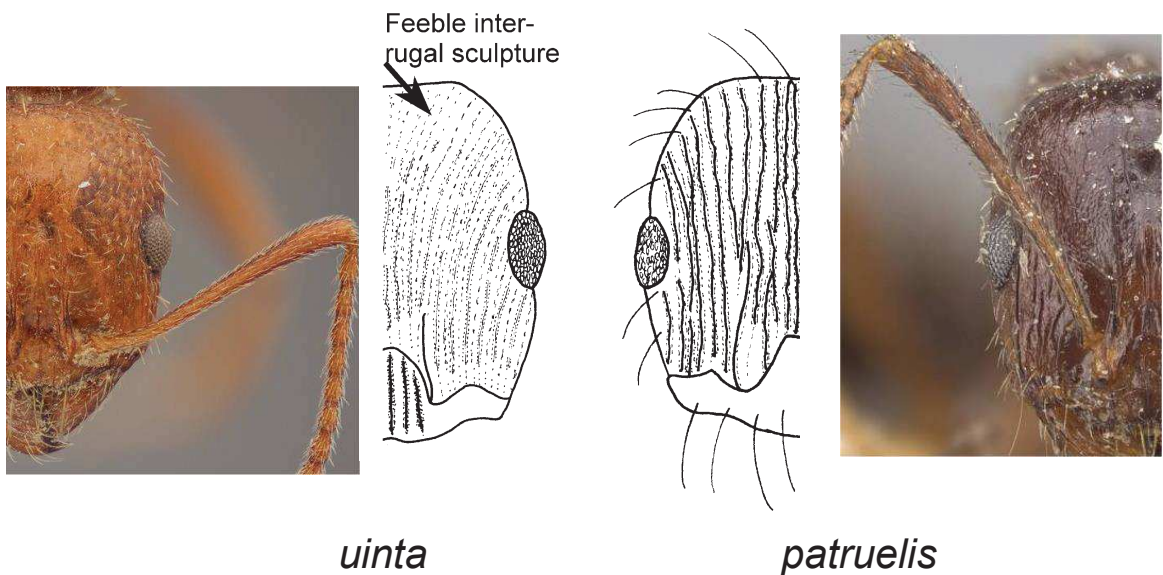
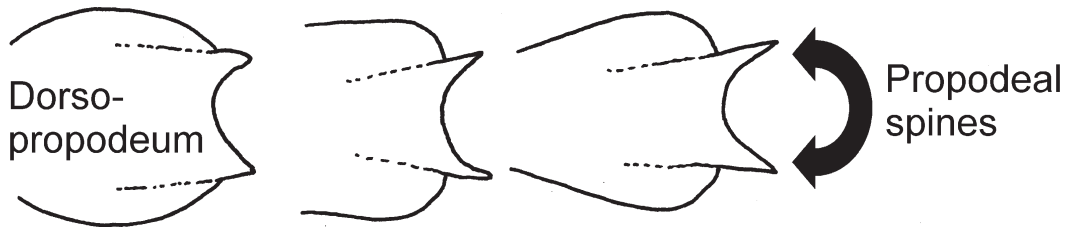
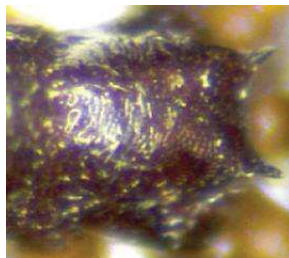


Fig. 57. Half of head of a worker of *A. patruelis* (left) and of an *A. uinta* worker (right), showing the differences in sculpture (photograph from wwwAntWeb.org).

- Head with abundant fine punctures between developed longitudinal rugulae (Fig. 57, right); propodeal spines usually longer, about $\frac{1}{3}$ - $\frac{1}{2}$ length of distance between bases (Fig. 58, center and right); usually castaneous brown to dark brown with slightly darker gaster, gaster and head usually about same color; common, western USA and Baja California, México **6**



uinta



patruelis



occidentalis

Fig. 58. Dorsopropodea of workers of *A. uinta* (Twin Falls Idaho, CWEM), *A. patruelis* (Isla Guadalupe, México, CWEM) and *A. occidentalis* (Mendocino Co, CA, CWEM) (first photographs from Ant-Web).

- 6(5). Propodeal spines relatively longer (Fig. 58, right); common and widely distributed, western Canada and USA as far south as Los Angeles and as far east as South Dakota *occidentalis* Emery
- Propodeal spines relatively shorter (Fig. 58, middle); rarely collected, Baja California and associated islands *patruelis* Forel

7(2). Propodeum without spines or teeth, although swellings or slight protuberances or angles may be present (Fig. 59); Baja California, México 8

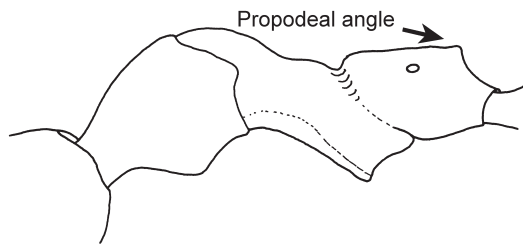


Fig. 59. Mesosoma of a worker of *A. mutica*. The photograph is from AntWeb.

- Propodeum armed with definite spines or teeth (Fig. 60), although may be poorly developed; widely distributed 9

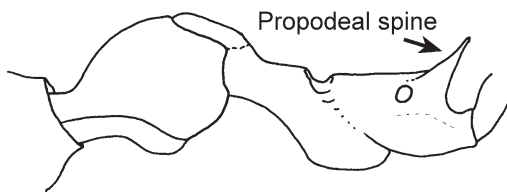


Fig. 60. Mesosoma of a worker of *A. treatae* (Haywood Co., North Carolina, CWEM). The photograph is from AntWeb, April Nobile photographer.

8(7). Medium brown to dark brown, with lighter colored legs; mesopleuron finely sculptured (Fig. 61), predominantly with transverse striae, or mostly smooth and shining; México *carbonaria* Pergande

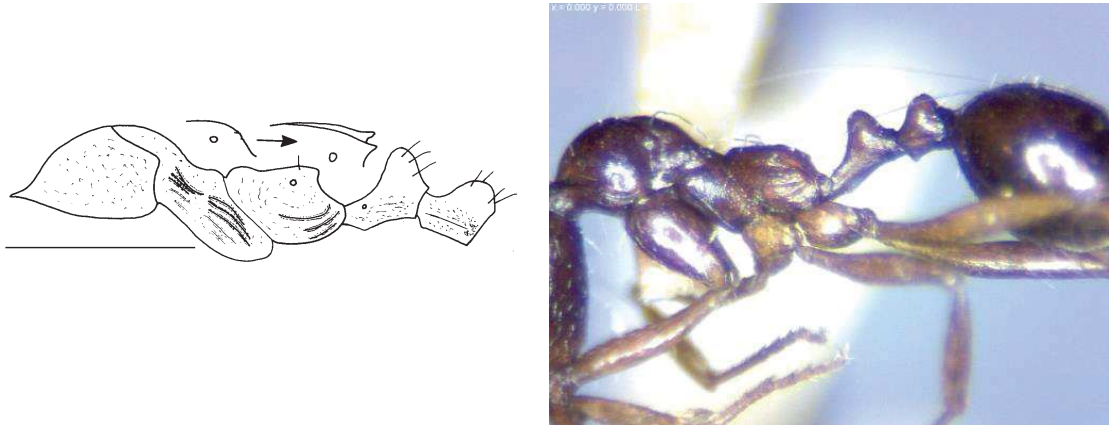


Fig. 61. Side view of a worker of *A. carbonaria* (Baja California Sur, México CWEM). The upper insets of the drawing show the propodeum with the least developed and well-developed processes on the propodeum.

- Concolorous pale brown; mesopleuron densely punctated; southern tip of Baja California, México *mutica* Pergande

- 9(7). Postpetiolar node wider than long (as seen from above, Fig. 64); propodeal spines more than twice as long (Fig. 64) as distance between base (viewed from above); eastern half of USA and Canada (as far west as Dakotas south to Oklahoma) **10**
- Postpetiolar node (Fig. 62) nearly always longer than wide (as seen from above); propodeal spines less than twice as long as distance between base (viewed from above); widely distributed including eastern USA and Canada **11**



Fig. 62. Petiole and postpetiole (from above) of a worker of *A. floridana*.

10(9). Basal quarter of first gastral tergum with striae which diverge posteriorly (Fig. 63); dorsum of head covered with coarse rugae; uncommon, eastern USA *mariae* Forel

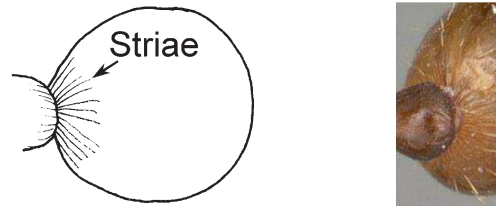


Fig. 63. Dorsum of the first gastral tergum of a worker of *A. mariae* (Ames, Iowa, CWEM). The photograph is from AntWeb, April Nobile photographer.

- Basal quarter of first gastral tergum smooth and glossy (Fig. 64); dorsum of head with poorly defined striae; common
..... *tennesseensis* (Mayr)

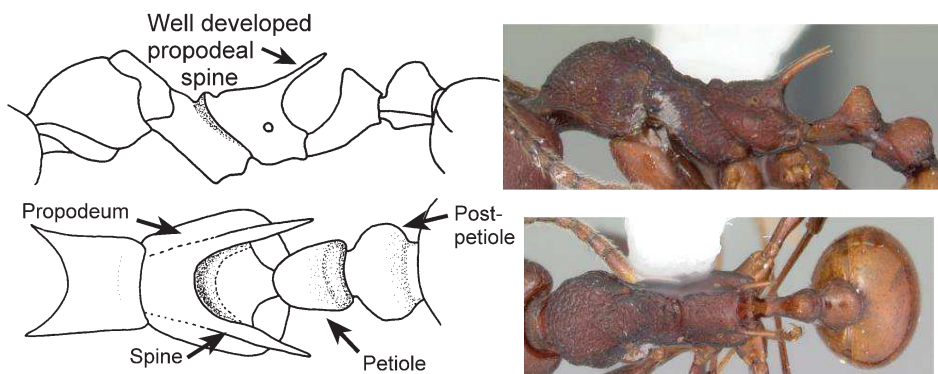
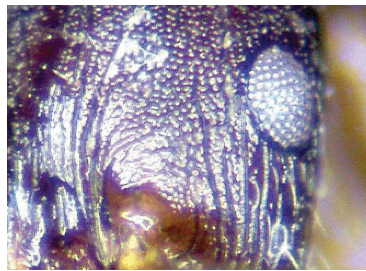
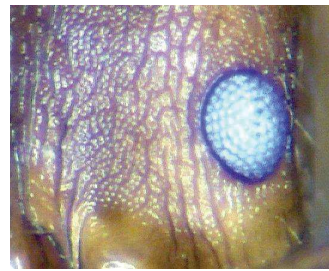


Fig. 64. Mesosoma, petiole and postpetiole of a worker of *A. tennesseensis* (Seviere Co., Tennessee, CWEM). The photographs are from AntWeb, April Nobile photographer.

- 11(9).** Region between the eye and frontal carina covered predominantly with punctures (Fig. 65, left) **12**
- Region between eye and frontal carina covered predominantly with longitudinal striae or rugae, or outer ½ with striae, inner ½ lightly sculptured (Fig. 65, right) **13**



picea



rudis

Fig. 65. Region between the eye and frontal carina of workers of *A. picea* and *A. rudis*.

12(11). Eye with 13-15 ommatidia in greatest diameter (Fig. 70); propodeal spines slightly incurved (viewed from above, Fig. 66); dorsopropodeum with transverse rugulae; reddish brown; southeastern USA ...
 *miamiana* Wheeler

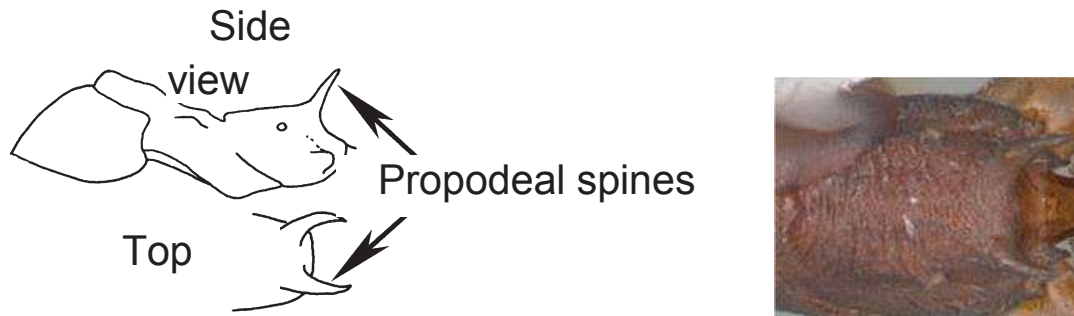


Fig. 66. Mesosoma of a worker of *A. miamiana*. The inset shows the propodeal spines as seen from above (Photograph from AntWeb, April Nobile photographer).

- Eye with 10-12 ommatidia in greatest diameter; propodeal spines divergent, but small (Fig. 67); rugulae on dorsopropodeum feeble and often replaced with punctures; dark brown; common in northeastern and eastern USA *picea* (Emery)

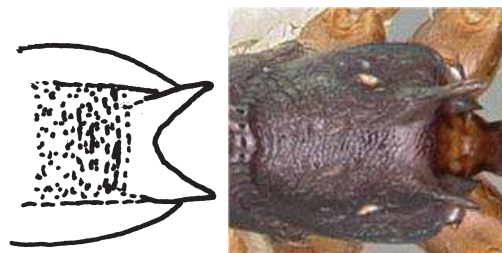


Fig. 67. Dorsopropodeum of a worker of *A. picea* (Murray Co., Georgia, CWEM, compared with types). The photograph is from AntWeb.

- 13(11).** Eye relatively large (Figs. 69 and 70), maximum diameter twice (or more) maximum diameter of scape (with 10 or more ommatidia in greatest diameter); widely distributed **14**
- Eye relatively small (Fig. 68), with about 8 ommatidia along longest axis, maximum diameter only slightly greater than maximum diameter of scape; SE USA, occurring in xeric habitats
 *umphreyi* Deyrup and Davis

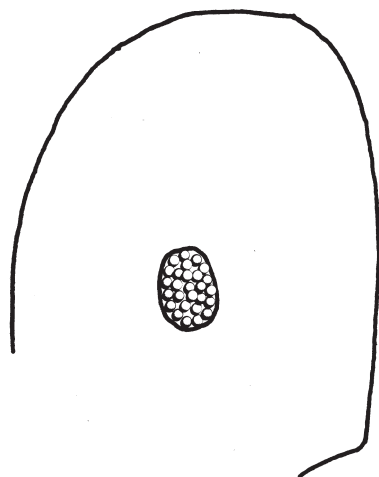


Fig. 68. Side of the head of a worker of *A. umphreyi* (paratype, CWEM). The photograph is a paratype worker from AntWeb, Ryan Perry photographer.

- 14(13).** Pale yellow with large eyes (diameter greater than 18 ommatidia, (Fig. 69); xeric areas of SW USA, NW México
 *megommata* M. Smith

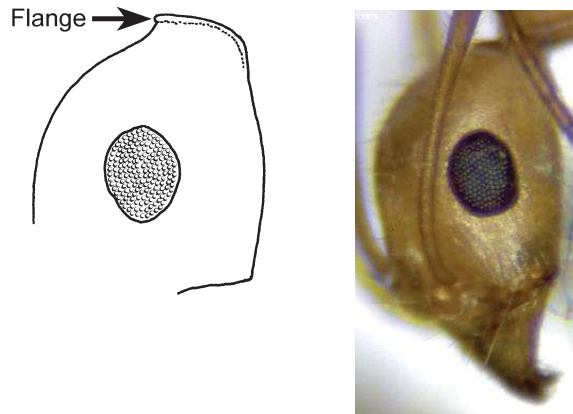


Fig. 69. Side of the head of a worker of *A. megommata* (Clark Co., NV, CWEM).

- Medium brown, reddish brown to dark brown; eyes smaller (10 - 13 ommatidia in maximum diameter, Fig. 70); mostly central and eastern USA **15**

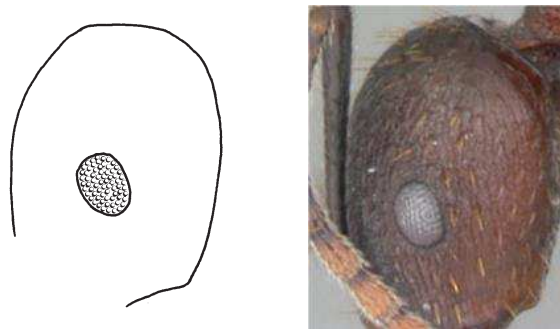


Fig. 70. Side of the head of a worker of *A. fulva* (Tuscaloosa Co., Alabama, CWEM) (Photographs from AntWeb, April Nobile photographer).

15(14). Torulus with posteriorly directed tooth (Fig. 71, move scape anteriorly and view obliquely from side); NE to SE USA
 *lamellidens* Mayr

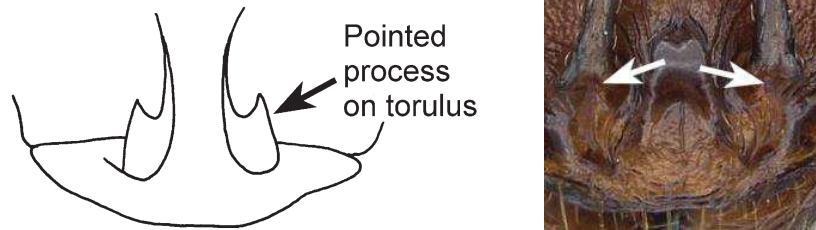


Fig. 71. Torulus of a worker of *A. lamellidens*, showing the tooth or pointed process. The photograph is from AntWeb, Jayanthi Puniamoorthy photographer.

- Torulus without posteriorly directed process or tooth (Fig. 65), rounded posteriorly **16**

16(15). Propodeal spines nearly as long as length of posteropropodeum, and pointed somewhat vertically (Fig. 72); mesonotum raised as bilobed welt (Fig. 72); most of USA *fulva* Roger

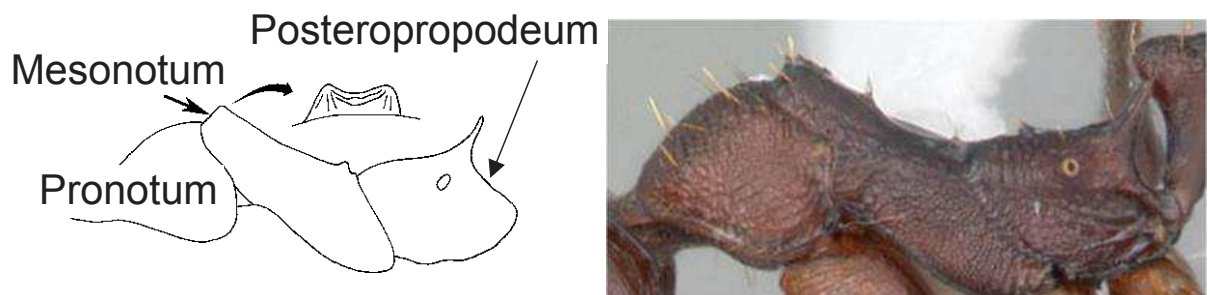


Fig. 72. Outline of the mesosoma of a worker of *A. fulva*, showing the metanotal welt from the side and from the front (inset) (Photographs from AntWeb).

- Propodeal spines usually much shorter than length of posteropropodeum (Fig. 73), and pointed posteriorly, nearly in same plane as dorsopropodeum (Fig. 74); mesonotum at most slightly swollen
 17

17(16). Posterior tibia longer than head length; AZ, NM, to eastern TX, Jalisco, Mexico *punctaticeps* Mackay

- Posterior tibia approximately as long as, or shorter than head length; primarily eastern USA and Canada 18

18(17). Propodeal spines relatively longer, about as long as distance between bases, noticeably incurved (Fig. 66); dorsopropodeum with several transverse rugulae (Fig. 66); rarely collected; southern USA occasional specimens of *miamiana* Wheeler

- Propodeal spines relatively shorter (Fig. 73), rarely longer than $\frac{2}{3}$ length of distances between bases, only slightly incurved; dorsopropodeum with few or no transverse rugulae (Fig. 73); very common in eastern USA 19



Fig. 73. Propodeal spines of a worker of *A. rudis* as seen obliquely from the top and front (Washington Co., Mississippi, CWEM).

- 19(18).** Ferruginous reddish-brown (Fig. 72); rare (*rudis*) or absent (*uinta*) north of Connecticut and Rhode Island **20**
 - Dark brown (Fig. 74); rare south of Massachusetts
 *picea* (Emery)



Fig. 74. Worker of *A. picea* (Photographs from AntWeb, A.W. Thomas photographer).

- 20(19).** Dorsum of pronotum densely punctate (Fig. 75, left); common in eastern USA *rudis* (Emery)
 - Dorsum of pronotum nearly smooth and shining (Fig. 75, right); rarely collected, western USA *uinta* Wheeler



rudis



uinta

Fig. 75. Pronota of workers of *A. rudis* and *A. uinta*.

Key to the *texana* species subgroup: workers

- 21(1). Propodeum unarmed, or with only poorly developed angles (Fig. 76, left) 22
 - Propodeum with definite spines (Fig. 76, right) 26

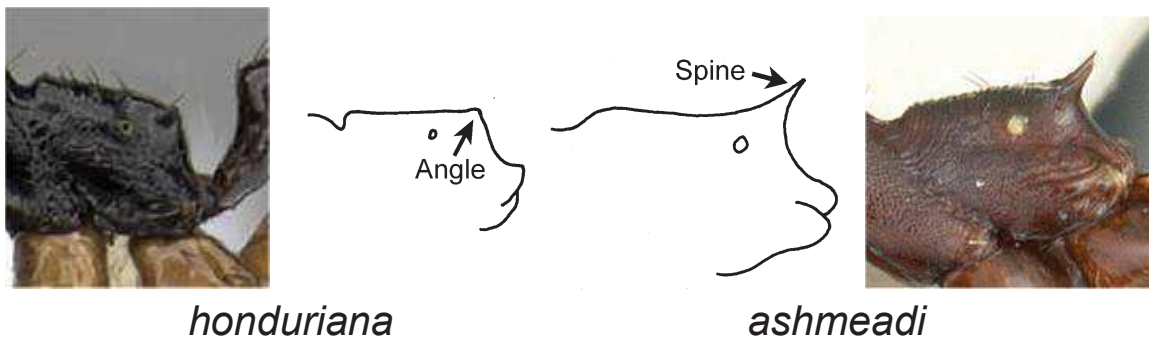


Fig. 76. Propodea of workers of *A. honduriana* (14 k S Cordoba, Honduras, CWEM) and *A. ashmeadi* (Highlands Co, FL, CWEM), showing the development of propodeal spines (drawn at same scales) (Photographs from AntWeb, April Nobile photographer).

- 22(21).** Eye relatively large, malar area (region between base of mandible and anterior edge of eye) equal to or shorter than maximum diameter of eye (Fig. 77, left); Honduras, California and México **23**
- Eye relatively small, malar area longer than maximum diameter of eye (Fig. 77, right); head and mesosoma pale brown; southwestern United States and México **24**

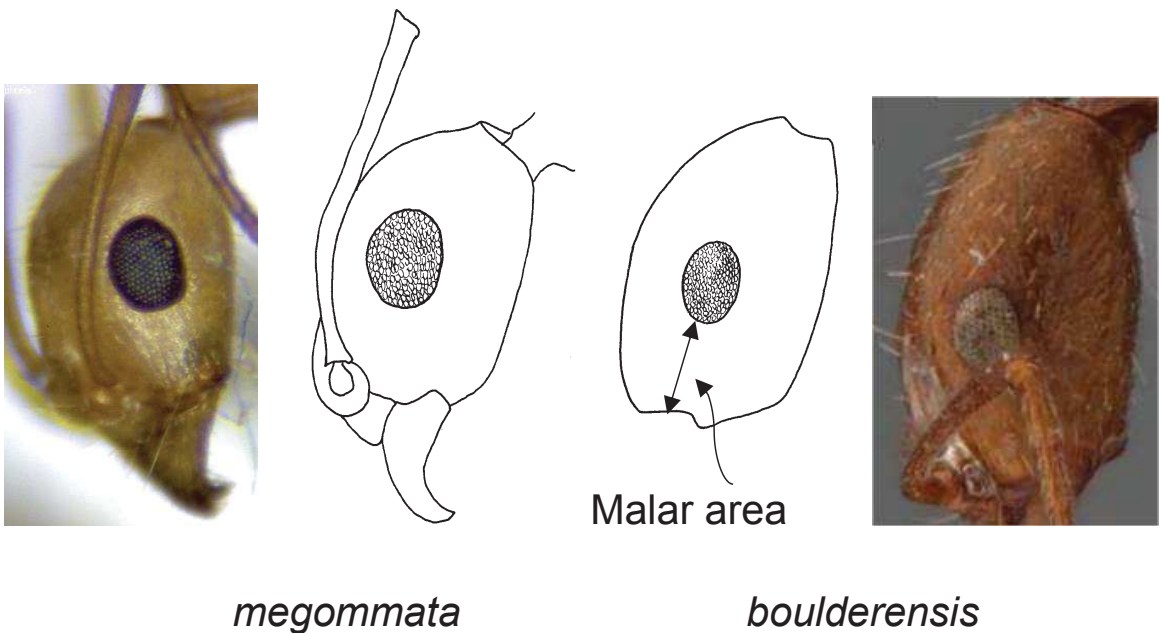


Fig. 77. Side of the head and eye of a worker of *A. megommata* (La Paz, Arizona, MCZC) and a worker *A. boulderensis* (paratype, MCZC) (Photograph from AntWeb, Gracen Brilmyer photographer).

- 23(22). Concolorous dark brown (Fig. 78, left); Honduras
 ***honduriana* Mann**
 - Concolorous pale brown, or with a slightly darker gaster (Fig.
 78, right); SW USA and NW Mexico ***megommata* Smith**

*honduriana**megommata*

Fig. 78. Workers of *A. honduriana* and *A. megommata* (from Ant-Web, Estella Ortega and Alexandra Westrich photographers).

- 24(22). Gaster black or darker than mesosoma (Fig. 79, left); SW USA
 ***smithi* Gregg**
 - Gaster brown or nearly concolorous with (Fig. 79, right); widely
 distributed **25**

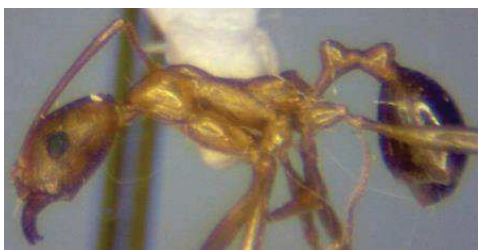
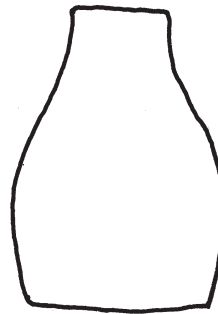
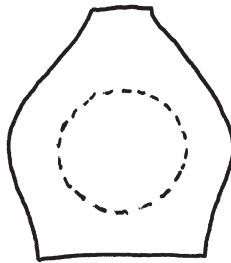
*smithi**boulderensis*

Fig. 79. Workers of *A. smithi* and *A. boulderensis*.

25(24). Node of postpetiole (Fig. 80, left) nearly circular (seen from above); with inner lateral sharp point at base of scape (Fig. 81, left); metasternal tooth well developed, sharp (Fig. 82, left); Nevada to southern Arizona, east to New Mexico and western Texas south into Baja California and Sonora, México *boulderensis* **M. Smith**



boulderensis

floridana

Fig. 80. Postpetioles of *A. boulderensis* (Grand Canyon, AZ, CWEM) and *A. floridana* (Archbold Biological Station, FL, CWEM), drawn at same scale (Photographs from AntWeb, Gracén and Nobile photographers).

- Node of postpetiole elongated (Fig. 80, right); with laterally and anteriorly directed blunt lobe at inner base of scape (Fig. 81, right); metasternal process poorly developed (Fig. 82, right); SE USA
 *floridana* M. Smith

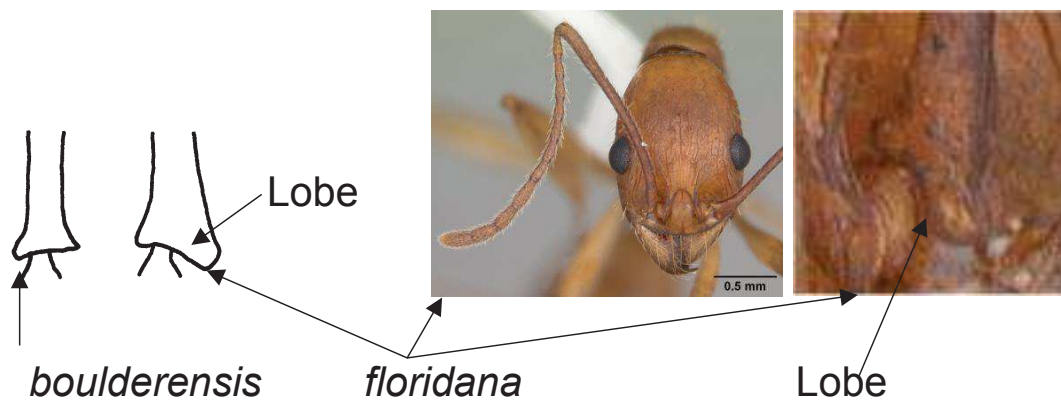


Fig. 81. Base of scapes of workers of *A. boulderensis* (Palm Canyon, Arizona, CWEM) and *A. floridana* (Gainesville, Florida, CWEM) (Photographs from AntWeb, April Nobile photographer).

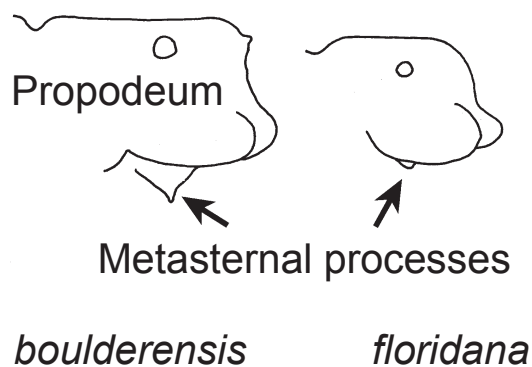


Fig. 82. Metasternal processes of a worker of *A. boulderensis* (Grand Canyon, Arizona, CWEM), and metasternal process of a worker of *A. floridana* (Archbold Biological Station, FL, CWEM), drawn at the same scale.

- 26(21).** Antennal scape with conspicuous lobe which extends posteriorly along basal fourth or fifth of scape (Figs 83 and 84) **27**
- Antennal scape without large basal lobe, or if small lobe is present, projects anteriorly and does not involve basal fifth of scape (Fig. 81) **28**

27(26). Lobe on scape moderately large, length approximately equal to greatest diameter of eye (Fig. 83); uncommon *ashmeadi* Emery



Fig. 83. Lobe of the scape of a worker of *A. ashmeadi* (Highlands Co., Florida, CWEM) (Photograph from AntWeb, April Nobile photographer).

- Lobe on scape very large, length approximately twice greatest diameter of eye (Fig. 84); common and widely distributed ... *treatae* Forel

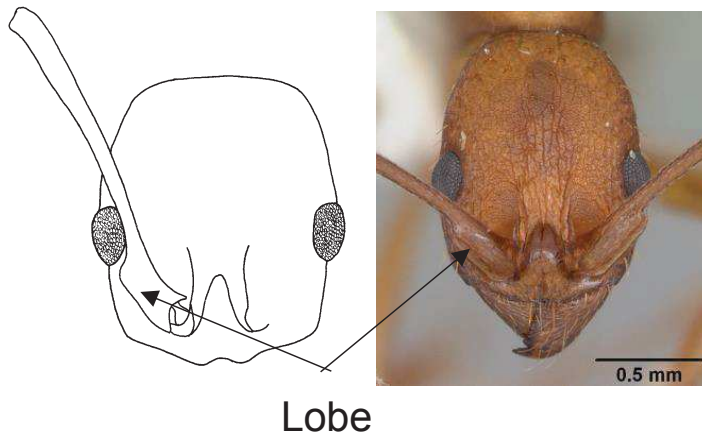


Fig. 84. Head of a worker of *A. treatae* (Haywood Co., North Carolina, CWEM). The photograph is from AntWeb, April Nobile photographer.

- 28(26).** Propodeal spines very well developed (Fig. 85), longer than (or about as long) distance between bases (seen from above) **29**

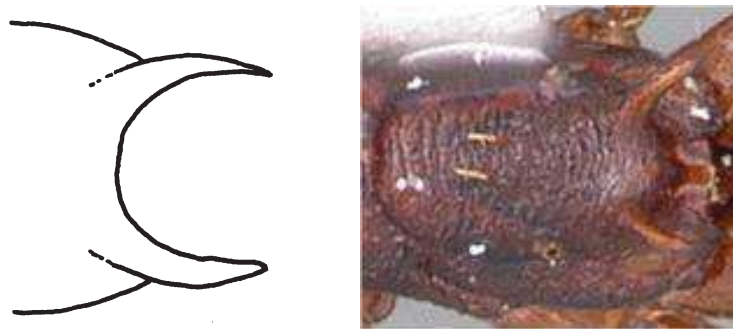


Fig. 85. Propodeal spines of a worker of *A. lamellidens*, obliquely seen from the top and front (William Co., Virginia, CWEM). The photograph is from AntWeb, April Nobile photographer.

- Propodeal spines poorly (Fig. 86 and 87) or moderately developed, shorter (usually about ½ length) than distance between bases (Fig. 88 and 89) 32

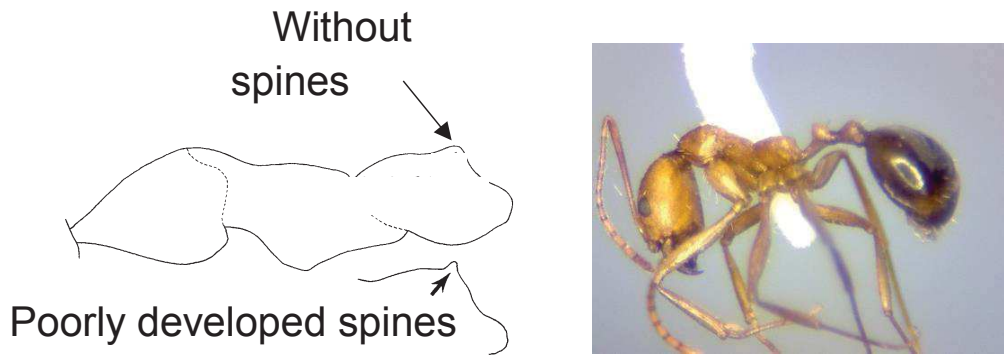


Fig. 86. Outline of the dorsum of the mesosoma of a worker of *A. smithi*, showing the lack of propodeal spines on the propodeum. The inset shows the most developed propodeal spine seen in this species. The photograph shows a complete worker from the side.



Fig. 87. Mesosoma, petiole and postpetiole of a worker of *A. texana*, showing the normal propodeal spines. The photograph is of a worker as seen from the side.

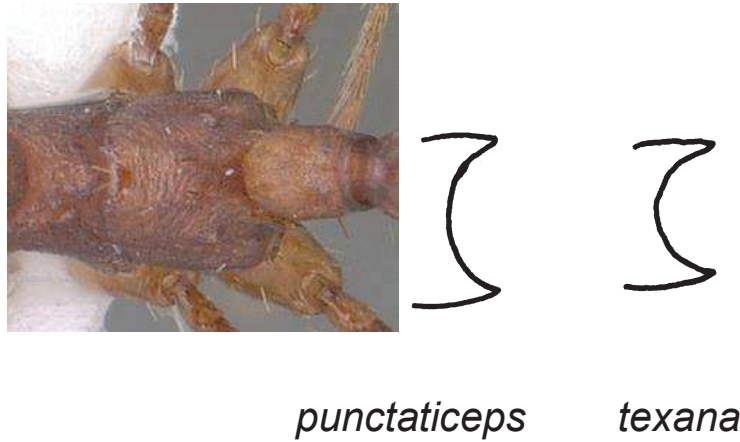


Fig. 88. Propodeal spines of workers of *A. punctaticeps* Socorro Co., New Mexico, CWEM) and *A. texana* (Sabine Co, Texas, CWEM) as seen obliquely from the top and front.

29(28). Sculpture poorly developed, sections, especially dorsum of pronotum (Fig. 89), smooth; rarely collected, SE USA *flemingi* Smith

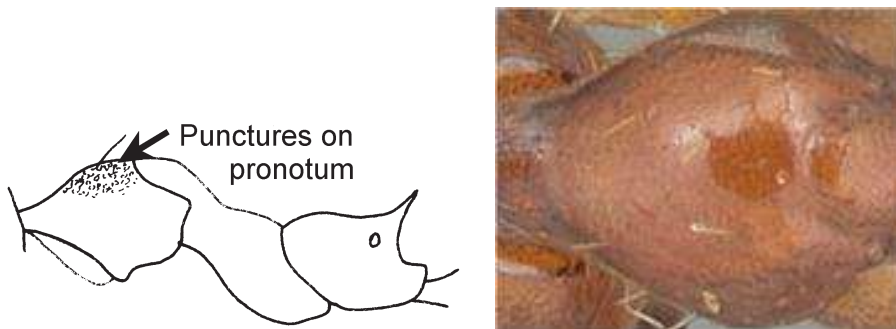


Fig. 89. Mesosoma and petiole of a worker of *A. flemingi*, showing the slender propodeal spines (specimen from type series, but not labeled as type). The photograph shows the dorsum of the pronotum.

- Sculpture strongly developed, head and mesosoma, including dorsum of pronotum (Fig. 90) striate, coarsely granulate or punctate; common, South Carolina south to Florida, west to Texas **30**



Fig. 90. Pronotum of a worker of *A. lamellidens*.

- 30(29).** Posterior edge of torulus with spine-like projection or process (push scape anteriorly and view obliquely from side) (Fig. 91 and 92); dorsum of pronotum with granulate, rough sculpture or transverse striae (Fig. 90); eastern USA *lamellidens* Mayr

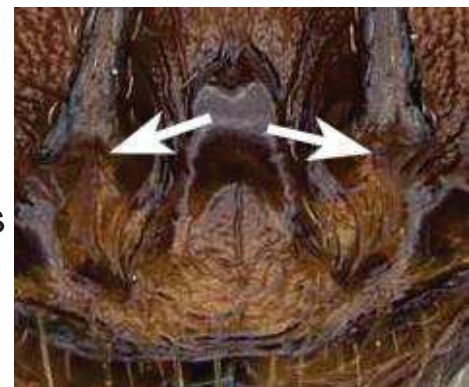
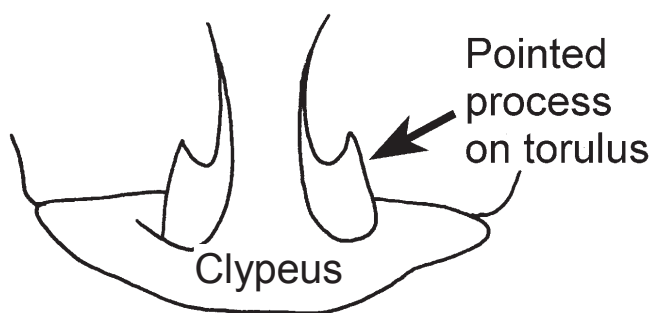


Fig. 91. Torulus of a worker of *A. lamellidens*, showing the pointed process. The photograph is from AntWeb, Jayanthi Puniamoorthy photographer.

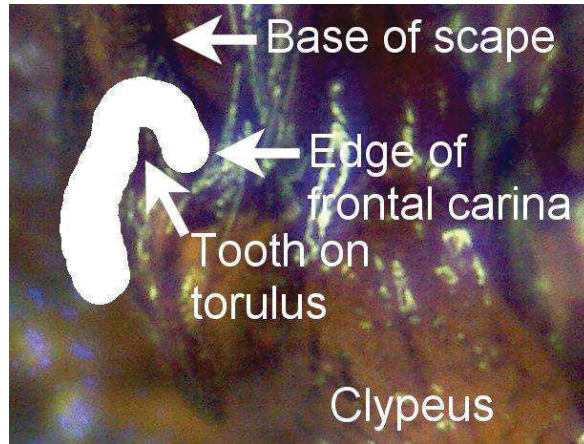


Fig. 92. Tooth on torulus of a worker of *A. lamellidens*.

- Posterior edge of torulus without spine, completely rounded (Fig. 93); dorsum of pronotum punctate, sculpture not roughened; SE USA **31**



Fig. 93. Anterior part of head of a worker of *A. picea*, showing a lack of a pointed process on the torulus (Murray Co., Georgia, CWEM, compared with types) (Photograph from AntWeb, April Nobile photographer).

31(30). Eye small, about 8 ommatidia in maximum diameter (Fig. 68); mesonotum (Fig. 94) elevated above level of pronotum (side view)
 *umphreyi* Deyrup and Davis

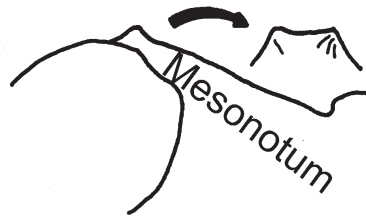


Fig. 94. Mesonotum of a worker of *A. umphreyi* (paratype, CWEM) as seen from the side. The upper inset shows the mesonotal swelling as seen from the front.

- Eye larger, with about 9-12 ommatidia in maximum diameter (Fig. 70); mesonotum at about same level or lower than pronotum (Fig. 95) *carolinensis* Wheeler

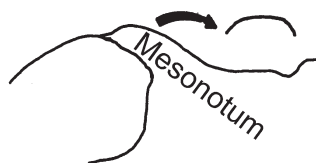


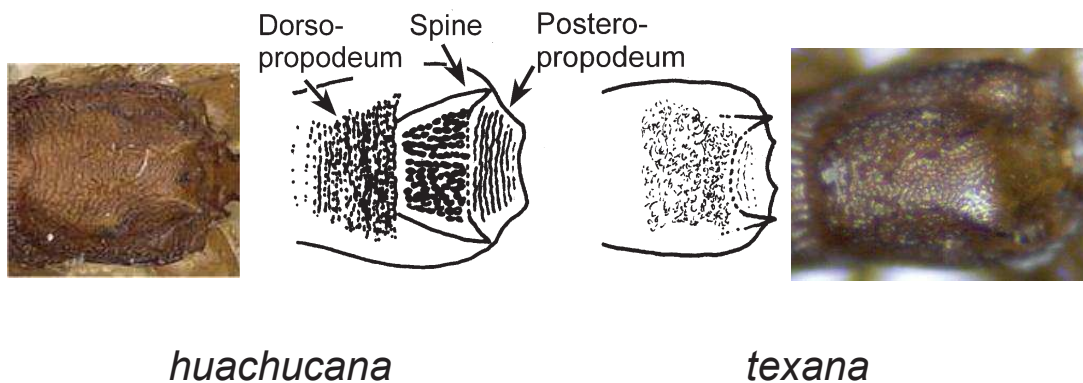
Fig. 95. Mesonotum of a worker of *A. carolinensis* (Iberia Parish, Louisiana, CWEM), as seen from the side. The upper inset shows the mesonotal swelling as seen from the front (Photograph from AntWeb, Cerise Chen photographer).

32(28). Anterior dorsopropodeum with distinct transverse striae or rugae (Fig. 96, left); region between propodeal spines with distinct punctures; base of antennal scape with small, angular lobe, which projects anteriorly and is rounded externally (Fig. 97, right); SW USA, NW México

..... *huachucana* Creighton

- Anterior dorsopropodeum without transverse striae or with poorly defined transverse striae (Fig. 96, right); region between propodeal spines smooth, or with poorly defined punctures; base of antennal scape with poorly defined lobe that is sharp externally (Fig. 97, left and middle)

..... **33**



huachucana

texana

Fig. 96. Dorsopropodea of workers of *A. huachucana* (Cochise Co., Arizona, CWEM) and *A. texana* (Sabine Co., Texas, CWEM) as seen directly from above, showing the differences in sculpture.

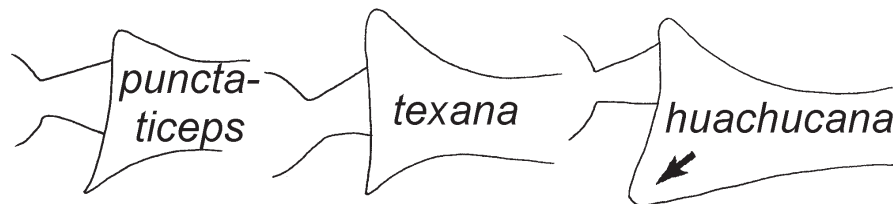


Fig. 97. The base of the scape of workers of *A. punctaticeps*, *A. texana*, and *A. huachucana* (the arrow indicates the lobe) (from Mackay and Mackay, 2002).

33(32). Posterior tibial length slightly longer to much longer than head length (excluding mandibles); propodeal spines generally about $\frac{1}{4}$ length (Fig. 96, left) of distance between bases (look obliquely from front and from above); predominantly from western USA and all of México **34**

- Posterior tibia equal in length or slightly shorter to much shorter than head length; propodeal spines generally about $\frac{1}{2}$ length of distance between bases (Fig. 96, right); distributed over entire USA **36**

34(33). Posterior tibia longer than HL (head length 0.89 - 0.95 times length of posterior tibia); scape length 1.12 - 1.23 times head length; dorsum of head without prominent coarse rugae, few poorly defined rugae present posterior to frontal area and malar area, remainder of head mostly punctate (Fig. 98); dorsum of pronotum mostly punctate; rare, collected in southern Arizona, southern New Mexico, to eastern Texas
..... *punctaticeps* Mackay

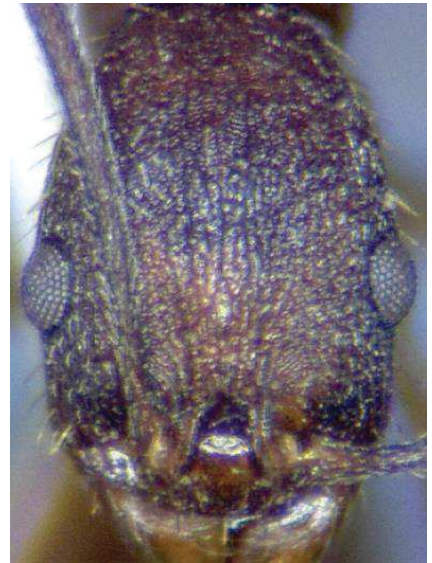


Fig. 98. Head of a worker of *A. punctaticeps*.

- Posterior tibia slightly longer than HL (head length 0.90 - 0.99 times length of posterior tibia); scape length 1.14 - 1.20 times head length; dorsum of head either nearly completely punctate (Fig. 99, left) or with reticulated rugulae (Fig. 99, right); México **35**



punctatissima



reticulaticeps

Fig. 99. Heads of paratype workers of *A. punctatissima* and *A. reticulaticeps*.

35(34). Dorsum of head nearly completely punctate (Fig. 99, left); base of gaster mostly punctate (Fig. 100); Colima and Jalisco, Mexico
 *punctatissima* Mackay

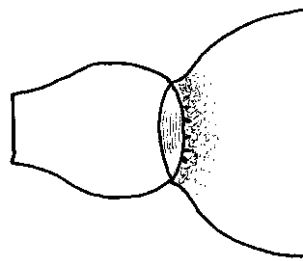


Fig. 100. Postpetiole and anterior part of gaster (dorsal view) of a worker of *A. punctatissima* (holotype, MCZC, photograph of lectotype, CWEM).

- Dorsum of head punctate, interspersed with reticulated rugulae (Fig. 99, right); base of gaster usually with mostly short (0.15 mm) striae (Fig. 101); posterior tibia approximately as long as head length; SL about 1.2 times HL; northeastern México *reticulaticeps* Mackay

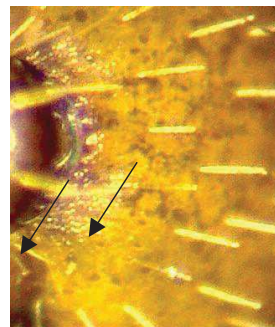
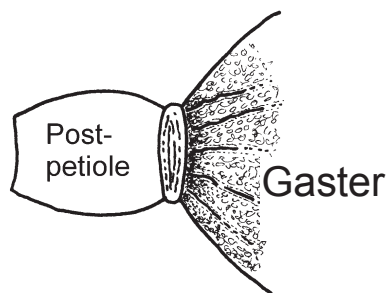


Fig. 101. Postpetiole and anterior part of gaster (dorsal view) of a worker of *A. reticulaticeps* (paratype, CWEM).

36(33). Posterior tibia slightly shorter than head length (about 0.04 mm shorter, head length about 1.08 times tibia length), occasionally same length; dorsum of head with prominent, coarse reticulated rugae (Fig. 102); scape relatively long (1.16 or more times longer than head length); often reddish brown; common in southern United States and northern Mexico, rarely collected in eastern USA *texana* (Emery)



Fig. 102. Outline of the head of a worker of *A. texana*, showing the coarse sculpturing.

- Posterior tibia much shorter than head length (head 1.2 - 1.53 times longer than posterior tibia); dorsum of head with or without prominent reticulated rugae (Fig. 103); scape relatively short (1.06 - 1.15 times longer than head length); very common in eastern USA **37**



rudis



picea

Fig. 103. Heads of workers of *A. rudis* and *A. picea*.

- 37(36). Ferruginous reddish-brown (Fig. 104, left) ... *rudis* (Emery)
- Dark brown (Fig. 104, right) *picea* (Emery)



rudis



picea

Fig. 104. Workers of *A. rudis* (Photograph from AntWeb, April Nobile photographer) and *A. picea* (Photograph from AntWeb, April Nobile photographer).

Key to the *subterranea* complex: females⁶

1. Scutum mostly smooth and shining, possibly lightly coriaceous or moderately punctate (Fig. 105, left) **2**
 - Scutum longitudinally striate or covered with other sculpturing, medial or anterior regions may be smooth and glossy (Fig. 105, right) ...
 **11**

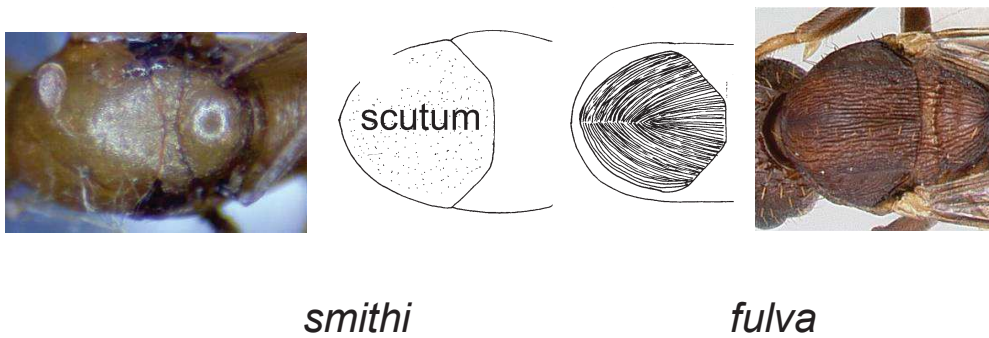


Fig. 105. Scuta of females of *A. smithi* (Utah, CWEM) and of *A. fulva* (North Carolina, MCZC).

⁶ The females of *A. carbonaria*, *A. mutica*, *A. punctaticeps*, *A. punctatissima*, *A. relictata* y *A. umphreyi* were not seen or have not been described, and are not included in the key.

2(1). Propodeal spines long, widened and flattened dorsally-ventrally, especially distally (Fig. 106) ***tennesseensis* (Mayr)**

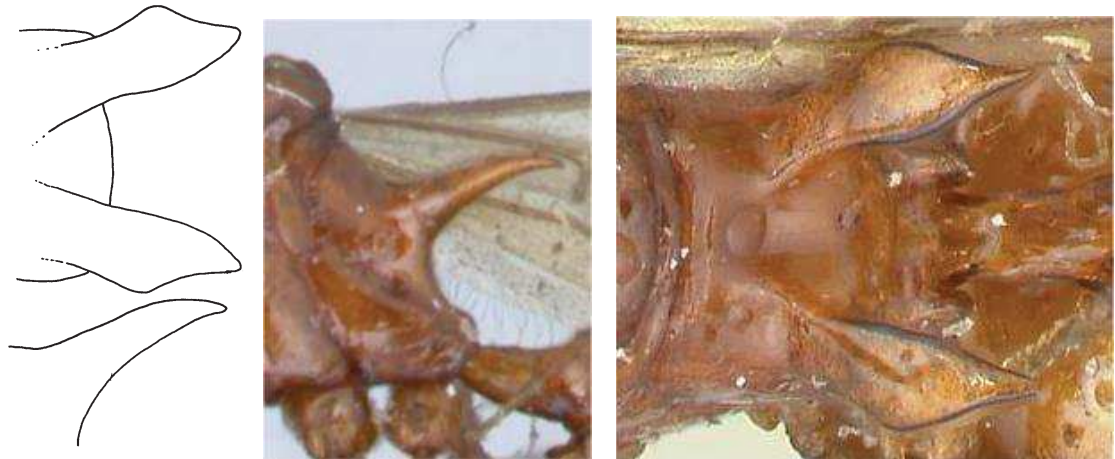


Fig. 106. Propodeal spines of a female of *A. tennesseensis*, as seen from the side and from above (Jefferson Co., Indiana, CWEM). The photograph is from AntWeb, Christiana Klingenberg photographer (type specimen).

- Propodeal spines round (Fig. 107), may be flattened obliquely from sides (Fig. 109) **3**

- 3(2).** Pale yellowish-brown (Fig. 107, left); found in arid regions in western North America *megommata* Smith
- Reddish brown or dark brown (Fig. 107, right); usually found in mesic areas 4



megommata



patruelis

Fig. 107. Females of *A. megommata* and *A. patruelis*.

4(3). Scutellum reaching or extending past metanotum (Fig. 108, left); reddish brown; USA and Baja California 5

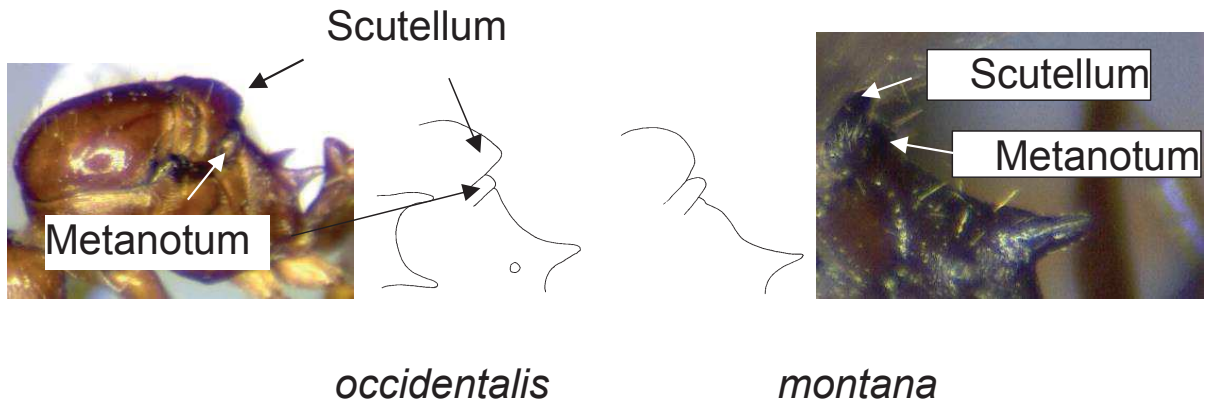


Fig. 108. Scutellum, metanotum and propodeal spines of a female of *A. occidentalis* (Monterrey Co., CA CWEM, top view of the propodeal spines and side view of the scutellum) and scutellum and metanotum of a female of *A. montana* (paratype, side view). The type female photograph is from AntWeb.

- Metanotum reaching or extending beyond scutellum (Fig. 108, right) 6

5(4). Propodeal spines strongly flattened laterally with dorsal carina (Fig. 109, right) and slightly bent ventrally (Fig. 109, left); scutellum extends well past posterior edge of metanotum; Baja California, México
 *patruelis* Forel

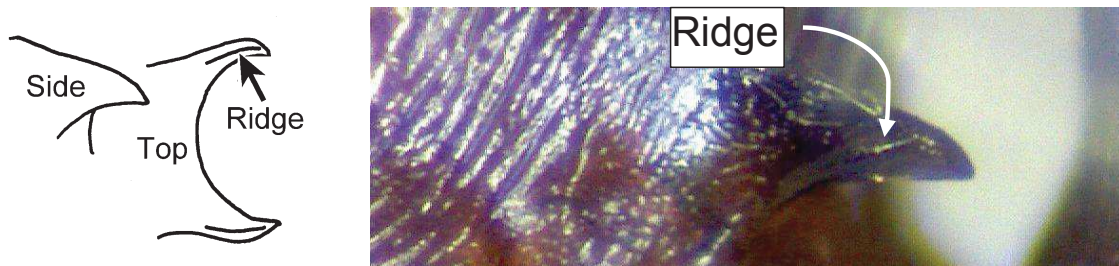


Fig. 109. Propodeal spines of a female of *A. patruelis* as seen from the side (left) and from the top (middle) and photograph (right, the ridge is reflective).

- Propodeal spines slightly flattened laterally, pointed posteriorly (Fig. 110); scutellum usually extending only slightly past metanotum (Fig. 108, right); western USA **8**



Fig. 110. Propodeal spines of a female of *A. occidentalis* as seen from the side (left) and top (right). The photographs are from Ant-Web, April Nobile photographer.

- 6(4). Dark brown (Fig. 111, left); northeastern Mexico (Nuevo León) ***montana* Mackay**
- Pale brown (Fig. 111, right) reddish brown; western USA east to western Texas, Mexico (Baja California Sur) **7**



montana



smithi

Fig. 111. Heads of females of *A. montana* and *A. smithi*.

- 7(6). Pale brown, gaster only slightly darker colored than mesosoma; scape with sparse, tiny suberect hairs, ocelli large, separated by 1 ocellular diameter (Fig. 112, left) ***boulderensis* M. Smith**
- Reddish brown with black gaster; scape with abundant tiny suberect hairs; ocelli small, separated by distance greater than diameter (Fig. 112, right) ***smithi* Gregg**

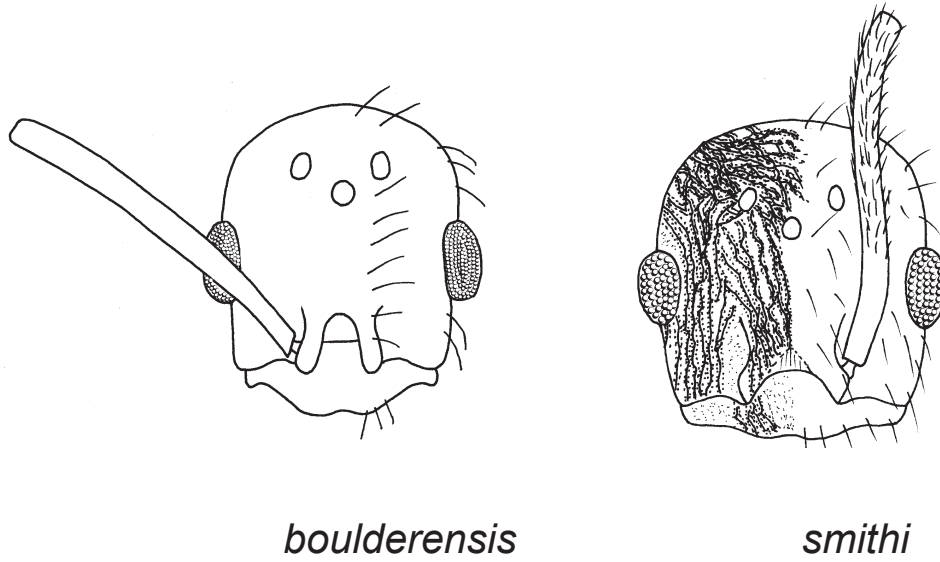


Fig. 112. Head of females of *A. boulderensis* (Washington Co., Utah, EUA, LACM) and *A. smithi* (Coral Pink Sand Dunes, Kane Co. Utah, CWEM).

8(5). Antennal scapes extending slightly past posterior lateral corners of head (Fig. 113); common **9**

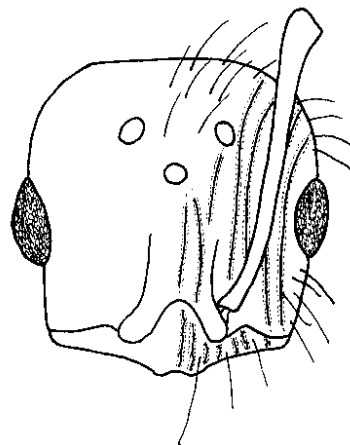


Fig. 113. Head of a female of *A. uinta*.

- Antennal scapes extending greater length past posterior lateral corner of head (Fig. 114); rarely collected variant from Michigan
 ***rudis* Wheeler**

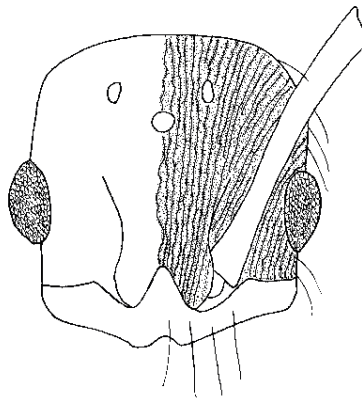


Fig. 114. Head of a female of *A. rudis* (Livingston, Michigan, MCZC).

- 9(8).** Ocelli relatively large, lateral ocellus separated by median ocellus by about 1 diameter (Fig. 112, left); ferruginous red
 ***boulderensis* M. Smith**
- Ocelli relatively small, separated by about 2 diameters of median ocellus (Fig. 113); dark brown **10**
- 10(9).** Spaces between rugae on dorsum of head punctate with beaded appearance (Fig. 115); common ***occidentalis* (Latreille)**
- Spaces between rugae of head partially smooth and shining (Fig. 113); rarely collected, Idaho, Utah, SW Colorado ***uinta* Wheeler**



Fig. 115. Head of a female of *A. occidentalis* (a type from AntWeb, April Nobile photographer).

11(1). Scutum covered with granulated rough sculpturing (Fig. 116);
Honduras *honduriana* Mann

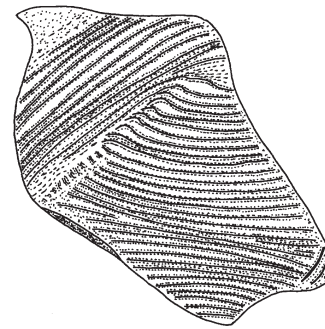


Fig. 116. Female of *A. honduriana*, seen from above (from Ant-Web, Estella Ortega photographer).

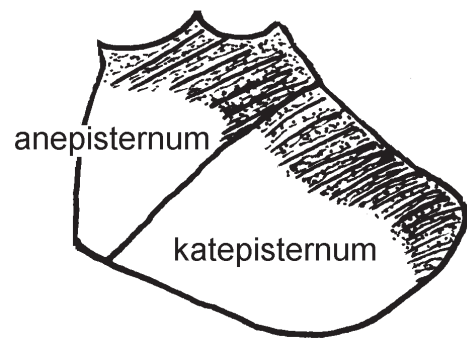
- Scutum (Fig. 105, right) covered with nearly longitudinal striae (small area on anterior part or sides of pronotum may be smooth and shining); US and México **12**

12(11). Katepisternum completely striate (Fig. 117, top) ***fulva* Roger**

- Katepisternum nearly completely smooth and glossy (Fig. 117, bottom) **13**



fulva



floridana

Fig. 117. Mesopleura of females of *A. fulva* (Suncombe Co., VA CWEM) and *A. floridana* (Citrus Co., Florida, MCZC) (Photographs from AntWeb, April Nobile photographer).

13(12). Base of scape with large lobe (Fig. 118); anepisternum completely or nearly completely striate (Fig. 117, top) **14**

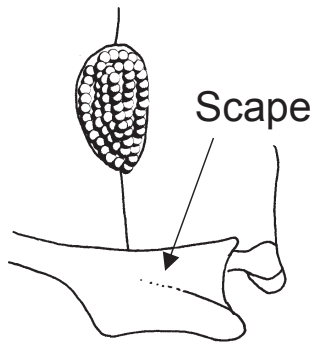


Fig. 118. Base of the scape and eye of a female of *A. treatae* (Wake Co., NC CWEM). The photograph is from AntWeb, April Nobile photographer.

- Base of scape without such large lobe (Fig. 115); sculpture of anepisternum variable **15**

14(13). Lobe at base of antennal scape approximately as long as greatest diameter of eye (Fig. 118); common and widely distributed from eastern USA south to Florida, west to Oklahoma and eastern Texas *treatae* Forel

- Lobe shorter than greatest diameter of eye; uncommon, Alabama, Georgia and Florida *ashmeadi* (Emery)

15(13). Upper edge of torulus with broad flattened lobe-like process that appears as tooth when viewed from front (Fig. 119) *lamellidens* Mayr

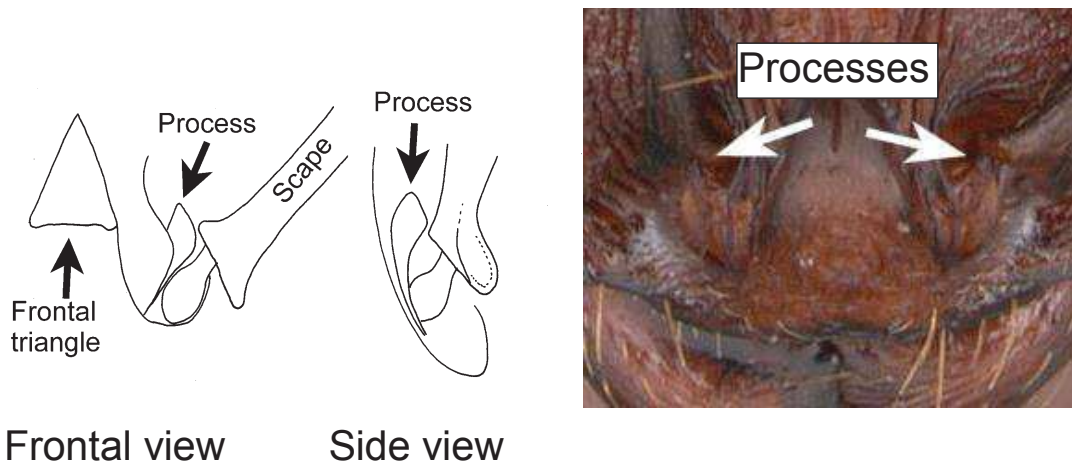


Fig. 119. Torulus of a female of *A. lamellidens* (Prince William Co., VA, CWEM) showing the lobe-like process. The photograph is from AntWeb, April Nobile photographer.

- Upper edge of torulus without lobe (Fig. 115) or if present, not appearing as tooth in frontal view 16
- 16(15).** Mostly from western USA and western Mexico 17
- Mostly from eastern USA and eastern Mexico 18

17(16). Propodeal spines somewhat laterally flattened; lobe at base of scape poorly developed (Fig. 120); very common *texana* (Emery)



Fig. 120. Head of a female and base of the lobe of the scape of *A. texana* (Gila Co., AZ, MCZC).

- Propodeal spines rounded; lobe at base of scape well developed (Fig. 121); rarely collected *huachucana* Creighton

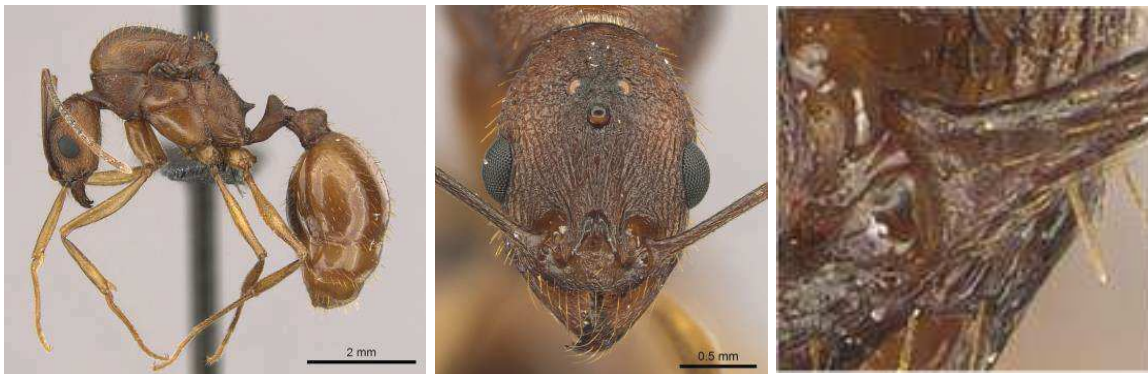
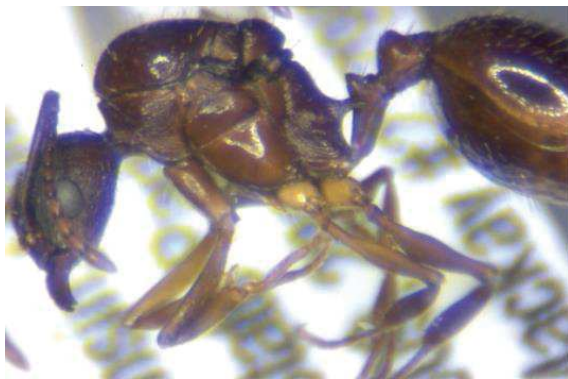


Fig. 121. Female of *A. huachucana* as seen from the side, the head and the base of the lobe of the scape (Photographs from AntWeb, Zach Lieberman photographer)

- 18(16).** Dark brown (Fig. 122, left) *picea* (Emery)
- Ferruginous brown (Fig. 122, right) or yellowish brown (Fig. 125), gaster may be darker **19**



picea



miamiana

Fig. 122. Females of *A. picea* and *A. miamiana* (Photograph from AntWeb, April Nobile photographer).

- 19(18).** Gaster nearly concolorous with mesosoma; common **20**
- Gaster usually darker brown (Fig. 122); rarely collected
- *miamiana* Wheeler

20(19). Antennal scape strongly flared at base, diameter about twice that of scape slightly distally (Fig. 123); not commonly collected, Mississippi, Louisiana, Florida **21**

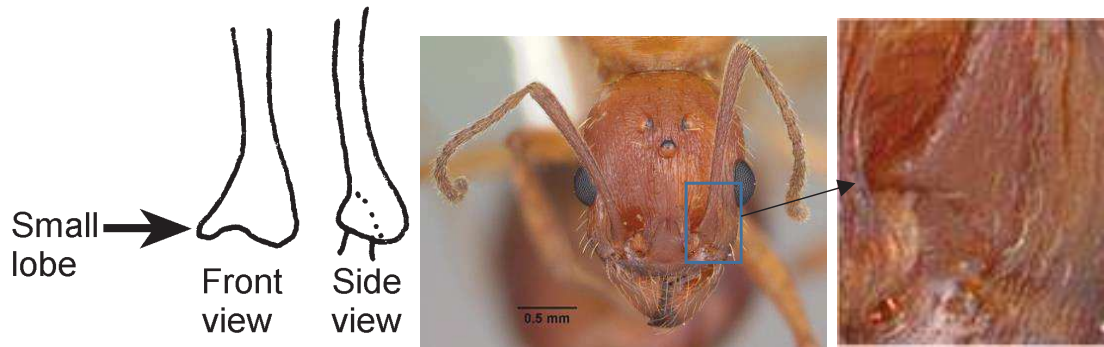


Fig. 123. Base of the scape of a worker of *A. floridana*, as seen from the front and from the side, showing the small lobe. The photographs are from AntWeb, April Nobile photographer.

- Base of scape about 1.5 X or less diameter of adjacent area; mostly eastern USA **22**

21(20). First gastral tergite smooth and shining, at least posteriorly; eastern and southeastern USA *flemingi* M. Smith

- First gastral tergite completely punctate; SE USA *floridana* M. Smith

22(20). Propodeal spines very long (0.33 mm) and robust (Fig. 124); sculpture on scutum very course, with about 15 rugae across dorsal surface; eastern USA *mariae* Forel

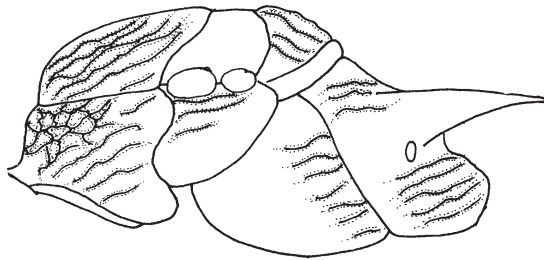


Fig. 124. Mesosoma and propodeal spines of a female of *A. mariae* (Colebrook, Connecticut, MCZC). The photograph is from AntWeb, April Nobile photographer.

- Propodeal spines shorter (up to 0.28 mm) and slender (Fig. 125); sculpture on scutum finer, consisting of at least 20 striae across surface **23**

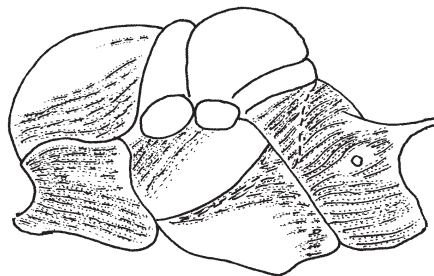


Fig. 125. Mesosoma and propodeal spines of a female of *A. rudis* (Livingston, Michigan, MCZC). Generally, the females of *A. rudis* are darker brown.

23(22). Reddish brown (Fig. 126) or dark brown; common **24**
 - Yellowish or yellowish brown (Fig. 125); rarely collected, eastern USA *carolinensis* Wheeler

24(23). Striae on scutum nearly parallel posteriorly, mostly smooth between striae (Fig. 126, left) katepisternum nearly completely smooth and shiny (Fig. 125); common, mostly eastern USA *rudis* (Emery)
 - Striae on scutum converging medially posteriorly, granulate between striae (Fig. 126, right); katepisternum slightly roughened anteriorly, with horizontal striae posteriorly; northeastern and central México *reticulaticeps* Mackay

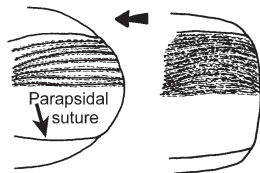
*rudis**reticulaticeps*

Fig. 126. Scuta of females of *A. rudis* (Marshall Co., Alabama, CWEM) and *A. reticulaticeps* (paratype). The arrow points anteriorly.

Key to the males of the *subterranea* species complex

The males of *A. ashmeadi*, *A. boulderensis*, *A. carbonaria*, *A. flemingi*, *A. honduriana*, *A. mutica*, *A. punctaticeps*, *A. punctatissima*, *A. relictata*, *A. smithi*, and *A. umphreyi* were not seen or have not been described and are not included in the key. Few males were seen of other species, and the characters used in the key may not account for the total variation within a species. Some of the species must appear more than once in the key due to the variation in the propodeal armature and the sculpturing on the scutum, which can be found in a single series. Dried males are often distorted (especially the scutum) and are nearly always difficult or impossible to identify, especially with single isolated specimens. If in doubt, try both sets of couplets. Note that a photograph of a male of *A. honduriana* is on AntWeb.

- 1. Propodeum with distinct, but small spines (Fig. 127) or broad, sharp-tipped angles; southeastern USA 2

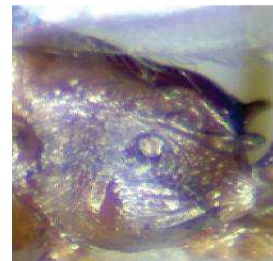
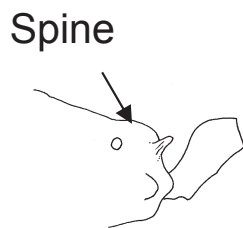


Fig. 127. Propodeum and petiole of a male of *A. floridana* (Levy Co., FL, CWEM).

- Propodeum with at most broadly rounded or angulate thick protuberances (Fig. 128); widely distributed 5

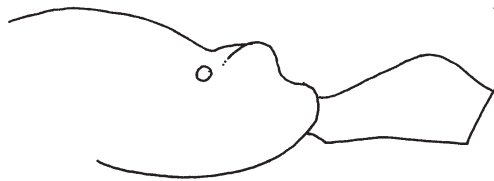


Fig. 128. Propodeum and petiole of a male of *megommata* (San Bernardino Co., CA, CWEM).

- 2(1). Katepisternum obliquely striated (Fig. 129); eastern USA and southeastern Canada rare specimens of *tennesseensis* Mayr
- Katepisternum smooth and shining (Fig. 128) 3

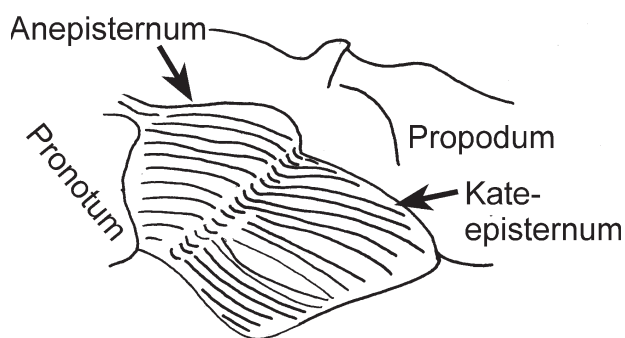


Fig. 129. Katepisternum of a male of *A. tennesseensis* (Jefferson Co., Indiana, CWEM).

- 3(2). Base of scape slightly broadened (Fig. 130, left); propodeal spines slender, longer than distance between bases; eastern USA
 very rare specimens of *treatae* Forel
- Base of scape not broadened (Fig. 130, middle); propodeal spines small angles or spines; eastern and southeastern USA 4

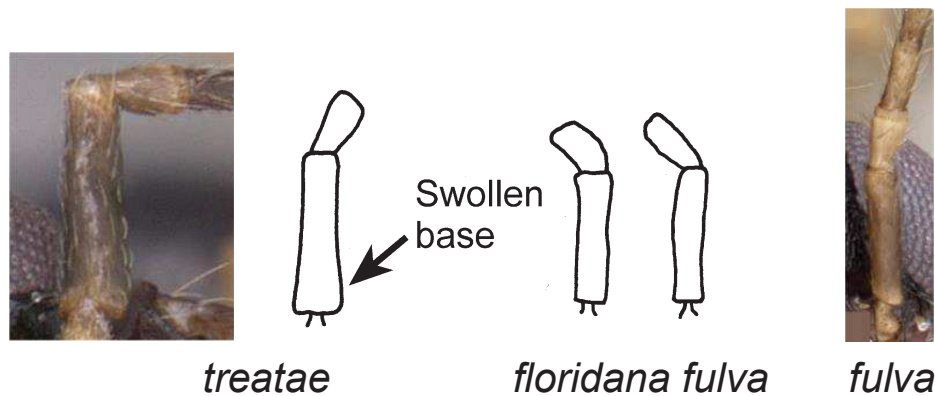
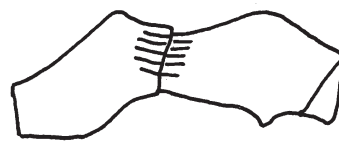


Fig. 130. Scapes of males of *A. treatae* (Wade Co., North Carolina, CWEM), *A. floridana* (Levy Co., Florida, CWEM) and *A. fulva* (Buncombe Co., North Carolina, CWEM) (Photographs from AntWeb, April Nobile photographer).

- 4(3). Dorsum of petiole broadly rounded (Fig. 131, left); dark brown; southeastern USA ***floridana* M. Smith**
 - Dorsum of petiole somewhat angulate (Fig. 131, right); medium brown; widely distributed, mostly eastern USA
 rare specimens of ***rudis* (Emery)**



floridana



rudis

Fig. 131. Petioles and postpetioles of males of *A. floridana* and *A. rudis* (Barrow Co., Georgia, CWEM).

- 5(1). Anterior half of dorsopropodeum only slightly higher than posterior half (Fig. 132), surface nearly horizontal to metanotum **6**
 - Anterior half of dorsopropodeum much higher than posterior half, sloping upward to metanotum (Fig. 140) **7**

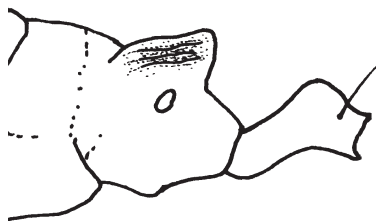


Fig. 132. Propodeum of a male of *A. fulva* (West Virginia, MCZC) (Photographs from AntWeb, April Nobile photographer).

- 6(5). Pale yellow (Fig. 128); southwestern USA . *megommata* Smith
- Dark brown (Fig. 133), northeastern México
- *montana* Mackay

- 7(5). Upper border of fused torulus/frontal lobe with triangular lobe appearing as small angle in frontal view (Fig. 133, difficult to see); uncommon, mostly eastern USA
- *lamellidens* Mayr

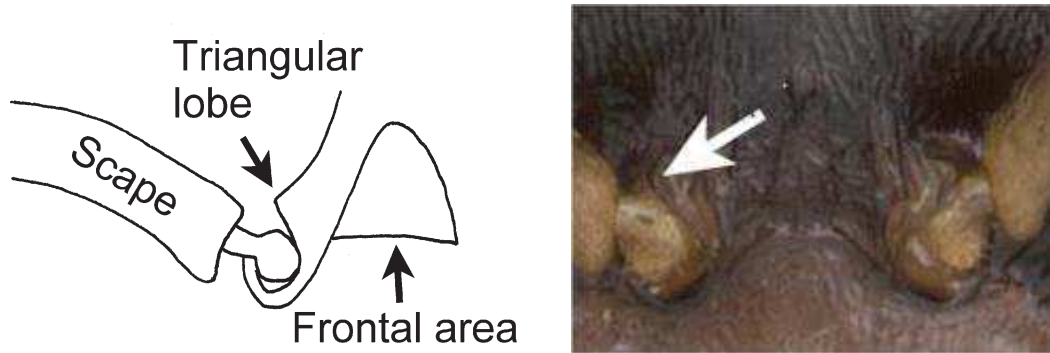


Fig. 133. Frontal lobe and base of the scape of a male of *A. lamellidens* (Prince William Co., VA, CWEM). The photograph is from AntWeb, April Nobile photographer.

- Upper border of fused torulus/ frontal lobe without small angle (Fig. 134); common and widely distributed
- 8

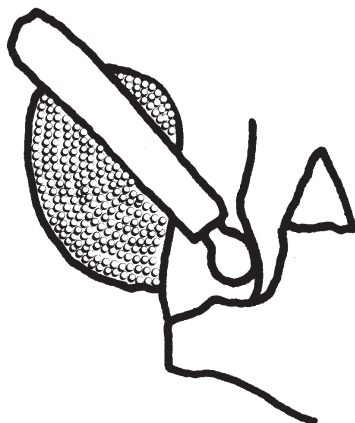
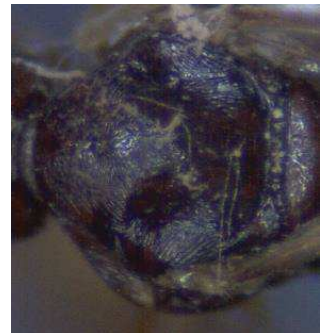
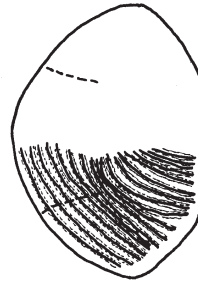
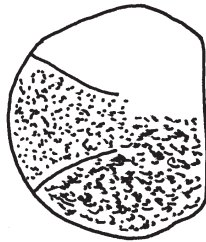


Fig. 134. Frontal carinal lobe and scape of a male of *A. tennesseensis* (Jefferson Co., Indiana, CWEM).

- 8(7).** Dorsum of scutum completely roughly sculptured (Fig. 135, left), possibly weakly shining medially and laterally **9**
 - Dorsum of scutum weakly sculptured, or sculptured only posteriorly, anterior half or more partially smooth and shining (Fig. 137) ... **12**

- 9(8).** Mesopleuron with horizontal striae (Fig. 129); dorsum of scutum with few nearly longitudinal striae (Fig. 135, right); mostly eastern USA and eastern Canada *tennesseensis* Mayr
- Mesopleuron mostly smooth and shining (Fig. 128), possibly striate posteriorly or on katepisternum; dorsum of scutum punctate or granulate (Fig. 135, left); eastern USA and eastern Canada **10**



treatae

tennesseensis

Fig. 135. Scuta of males of *A. treatae* and *A. tennesseensis*.

- 10(9).** Sternopetiolar area with sharp well-developed ventral flange (Fig. 136, left); northeastern México *reticulaticeps* Mackay
 - Sternopetiolar area without ventral flange or with poorly developed flange (Fig. 136, right); mostly eastern USA, southeastern Canada, not reported from México **11**

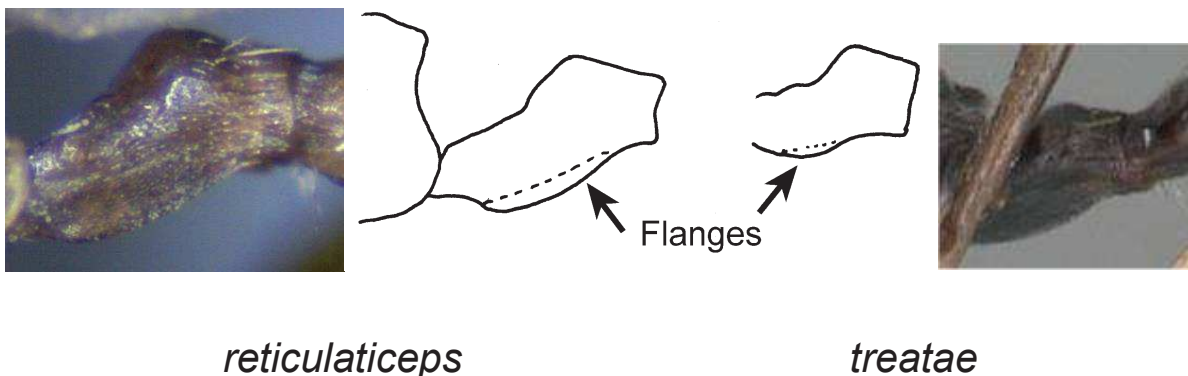


Fig. 136. Sternopetiolar processes of males of *A. reticulaticeps* (paratype) and *A. treatae* (Wade Co., North Carolina, CWEM). The photograph is from AntWeb, April Nobile.

- 11(10).** Base of scape slightly widened (Fig. 130, left), occasionally forming slight lobe *treatae* Forel
 - Base of scape not widened, not forming lobe (Fig. 134) ...
 *fulva* Roger

- 12(8).** Anterior half of scutum finely sculptured, partially smooth and glossy, posterior half densely, but finely punctate or striate (Fig. 137) ... **13**

 - Scutum mostly or entirely smooth and glossy, shiny (Fig. 138) **16**

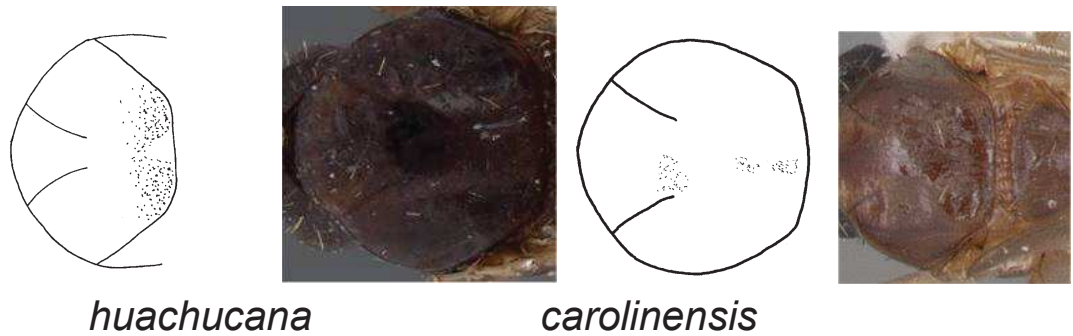


Fig. 137. Scuti of males of *A. huachucana* and *A. carolinensis* (photographs from AntWeb, Gracen Brilmyer and April Nobile photographers).

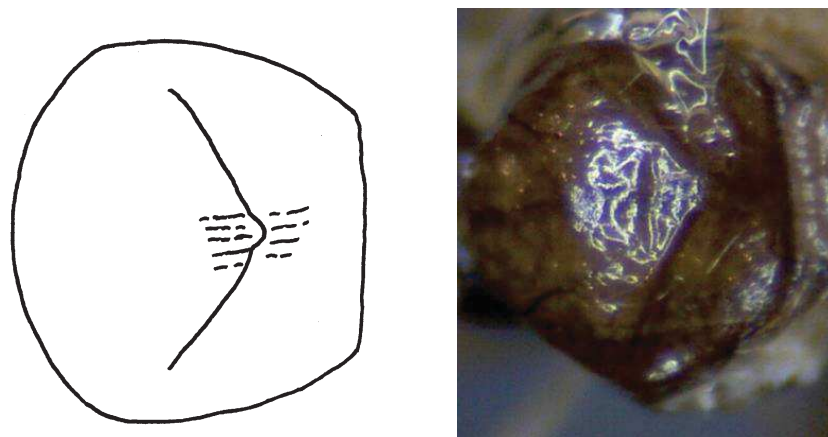
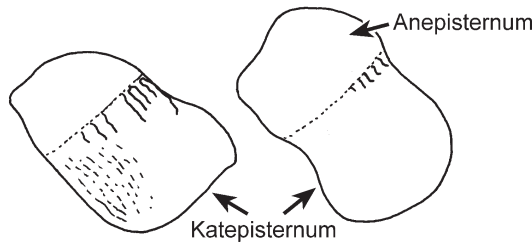


Fig. 138. Scutum of a male of *A. picea* (Richland Co., Ohio, CWEM). Drying will distort the surface.

- 13(12).** At least anterior ½ of katepisternum finely sculptured (Fig. 139, left), mixture of punctures and coriaceous texture, but shining; western USA *huachucana* **Creighton**
 - Nearly entire katepisternum smooth and shining (Fig. 139, right); mostly eastern USA and eastern México **14**



huachucana

carolinensis

Fig. 139. Mesopleura of males of *A. huachucana* (Cochise Co., Arizona, CWEM) and *A. carolinensis* (McMinn Co., Tennessee, CWEM).

- 14(13).** Propodeum weakly angulate between faces (Fig. 140, left); eastern USA (as far west as eastern TX) *carolinensis* Wheeler
 - Propodeum with definite angle between faces (Fig. 140, right); southeastern USA and northeastern México **15**

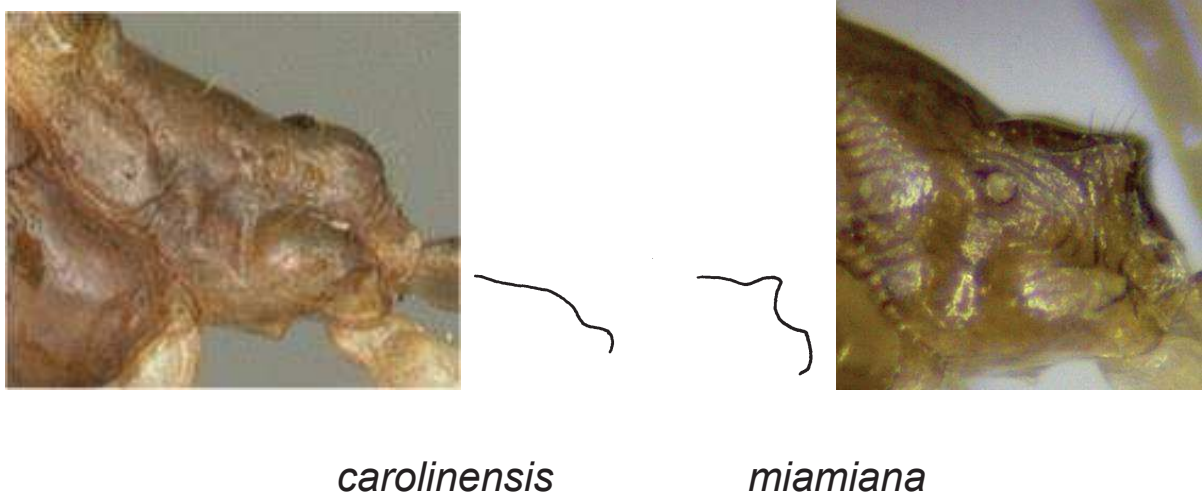


Fig. 140. Propodeal angles of males of *A. carolinensis* (McMinn Co., Tennessee, CWEM) and *A. miamiana* (Hempstead Co., Arkansas, CWEM).

- 15(14).** Dark brown (Fig. 136); TL \approx 5 mm; northeastern México
 *reticulaticeps* Mackay
 - Medium brown (Fig. 140, right) to dark brown; TL \approx 3.5 - 4.0 mm; southeastern USA, northeastern México *miamiana* Wheeler
- 16(12).** Dark brown to black (Fig. 141) **17**
 - Medium brown to pale brown (Fig. 140) **21**

17(16). Propodeal protuberances angulate (Fig. 141), often nearly forming teeth or sharply truncated processes (Fig. 142); western USA and southwestern Canada *occidentalis* (Emery)

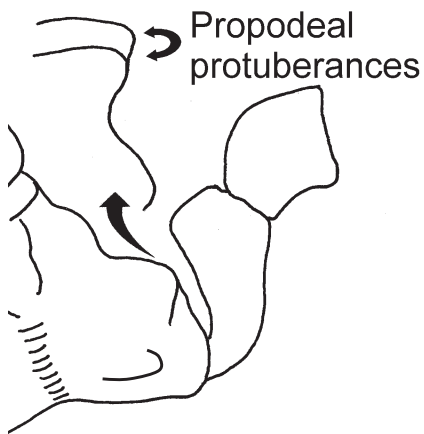


Fig. 141. Propodeum and propodeal protuberances (seen obliquely from side in inset) of a male of *A. occidentalis*.



Fig. 142. Variations in propodeal processes within a single series of males of *A. occidentalis* (Fallon Co., MT, CWEM).

- Propodeal protuberances rounded posteriorly (Fig. 143) **18**

18(17). Scutellum strongly protruding (Fig. 143); propodeal protuberance poorly developed (Fig. 143) **19**

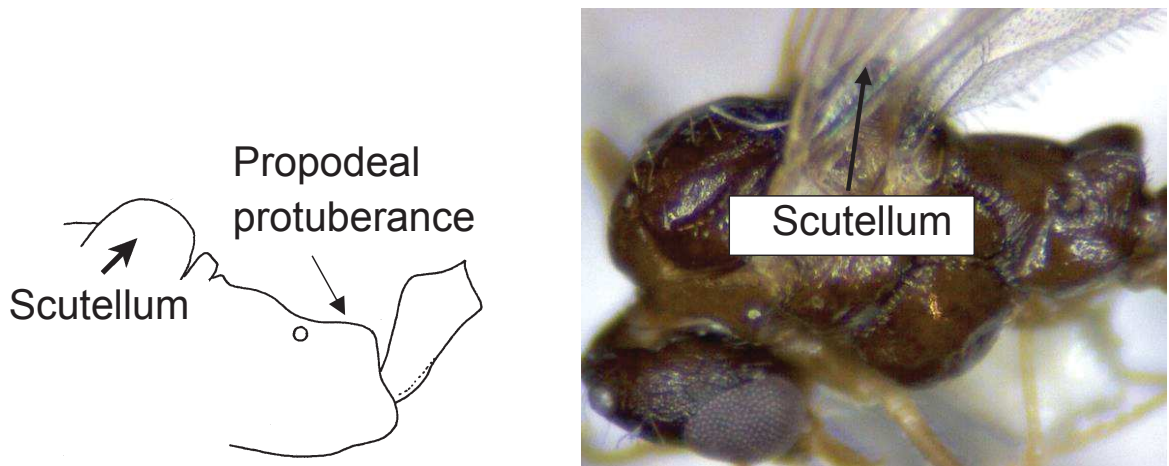


Fig. 143. Part of the mesosoma and petiole of a male of *A. fulva* (Tuscaloosa Co., AL, CWEM).

- Scutellum weakly protruding (Fig. 144); propodeal protuberance developed (Fig. 144) **20**

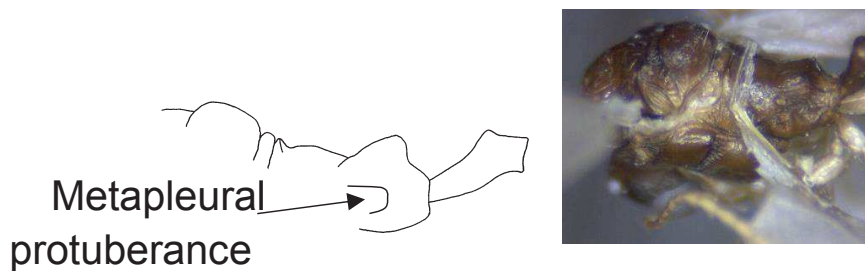


Fig. 144. Mesosoma of a male of *A. picea*.

- 19(18).** Scutum with oblique longitudinal striae laterally from notauli (Fig. 145, left); eastern half of USA *fulva* Roger
 - Scutum without striae, punctate or partially shining (Fig. 145, right); mostly western half of USA *texana* Wheeler

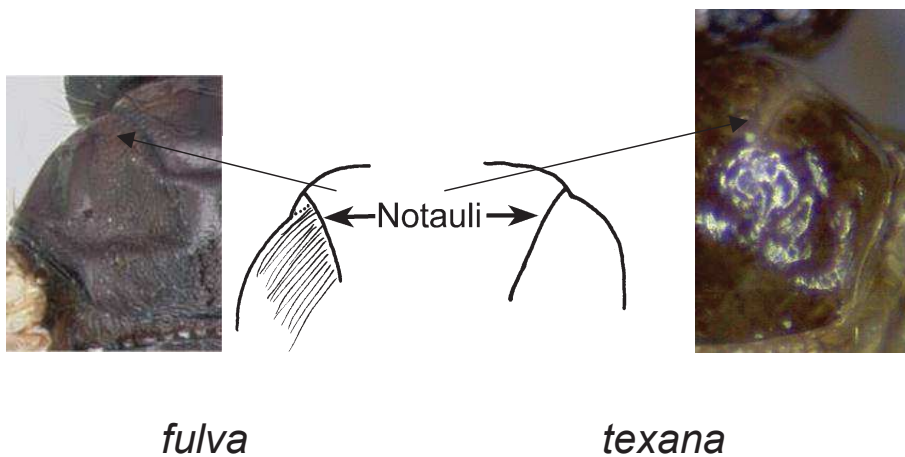


Fig. 145. Scuti of males of *A. fulva* (Buncombe Co., North Carolina) and *A. texana* (Tutus Co. Texas, CWEM).

- 20(18).** Scutum nearly completely smooth and glossy; (Fig. 145, right); metapleural protuberance rounded posteriorly (Fig. 144); common, eastern USA *picea* (Emery)
 - Scutum weakly shining and punctated posteriorly, strongly shining anteriorly (Fig. 137, left); protuberance near metapleural gland well developed, sharply pointed posteriorly (Fig. 146); islands near Baja California, Mexico *patruelis* Forel

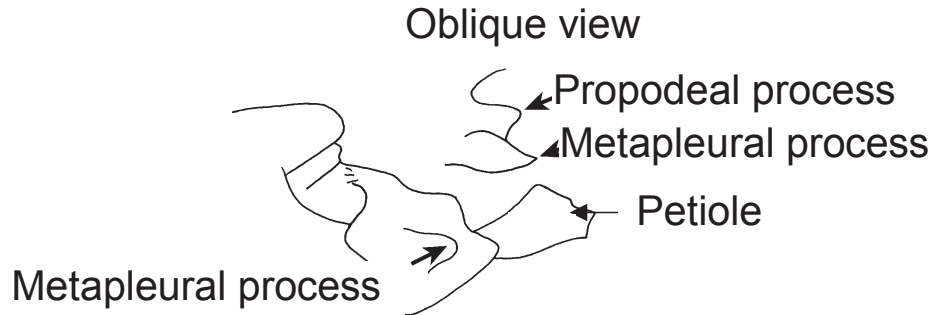


Fig. 146. Propodeum and petiole of a male of *A. patruelis* (Guadalupe Island, California, topotype, MCZC). The inset shows an oblique view from the side and from above.

21(16). Relatively large, total length usually greater than 4 mm; rarely collected, western USA *uinta* Wheeler
 - Relatively small, TL less than 3.7 mm **22**

22(21). Scape relatively short (0.23 mm), length about as long as first two funicular segments combined; first tergum of gaster with fan-like striae radiating from base (Figs. 101, 160); rarely collected, but widely distributed mostly in eastern USA *mariae* Forel
 - Scape longer (0.28 mm), length notably longer than combined length of first two funicular segments; first tergum without striae; common **23**

- 23(22).** Teeth on lower border of aedeagus well developed, about as long as distance between teeth (Fig. 147, left); mostly eastern USA
 *rudis* (Emery)
- Teeth on lower border of aedeagus poorly developed, mostly simply denticles (Fig. 147, right); mostly southwestern USA
 *texana* Wheeler

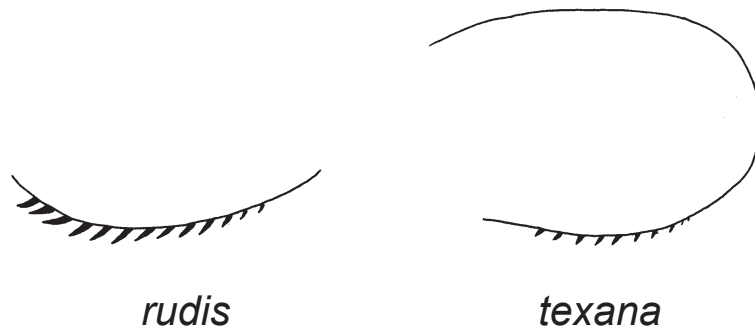


Fig. 147. Aedeagi of males of *A. rudis* (Barrow Co., Georgia CWEM) and *A. texana* (Titus Co., TX CWEM).

Clave para las especies del complejo *subterranea*: obreras

1. Cabeza no muy alargada (Fig. 148, izquierda), índice cefálico (IC, anchura de la cabeza / longitud de cabeza X 100) superior a 77 (subgrupo *subterranea*) 2

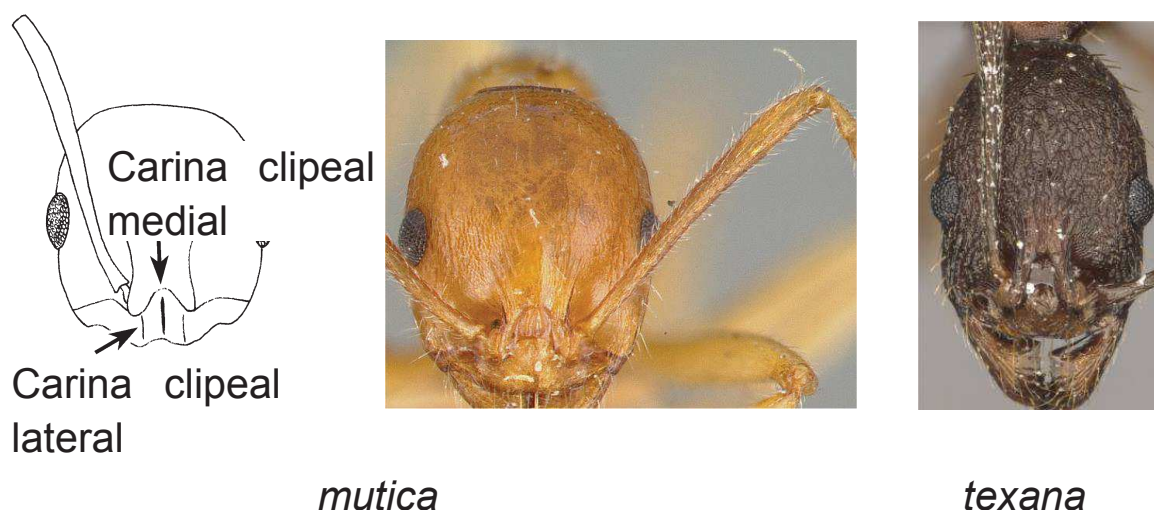


Fig. 148. Cabeza de una obrera de *A. mutica* (cotipo) y obrera (lectotipo de AntWeb.org) y de una obrera de *A. texana* (de AntWeb, de Zach Lieberman).

- Cabeza más alargada (Fig. 148, derecha), IC casi siempre menor a 79 (grupo *texana*) 21

2(1). Escapo de la antena se extiende menor a dos artejos funiculares más allá de la esquina lateral posterior de la cabeza (Fig. 149) **3**

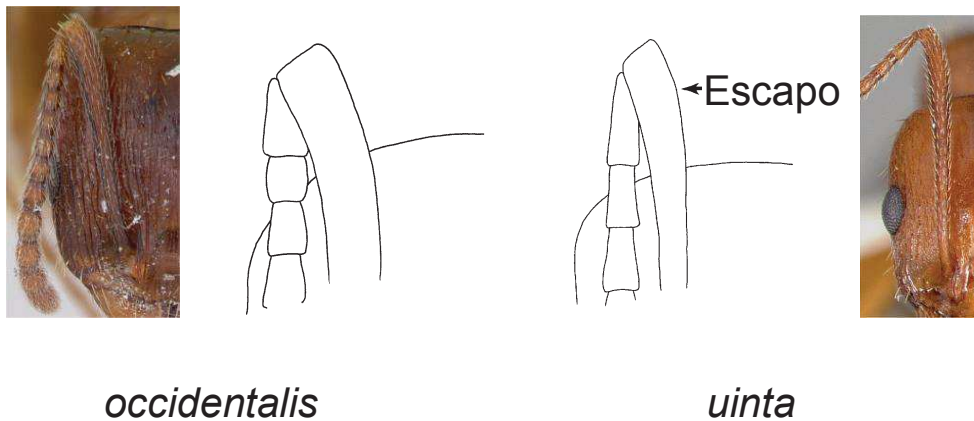


Fig. 149. Esquinas laterales posteriores de cabezas de obreras de *A. occidentalis* y *A. uinta* (derecha) (de Mackay y Mackay, 2002).

- Escapo antenal se extiende más allá de la esquina lateral posterior de la cabeza por mayor a dos artejos funiculares (Fig. 150) **7**

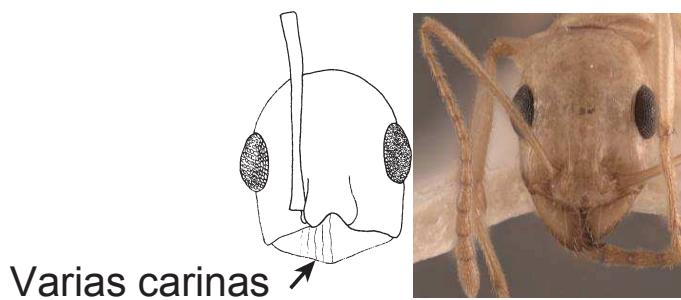


Fig. 150. Cabeza de una obrera de *A. megommata* (Condado de Riverside, California, EUA, CWEM). La fotografía es de AntWeb, de Alexandra Westrich.

- 3(2).** Esquina lateral posterior de la cabeza densamente esculpurada (Fig. 151, izquierda); México y Haití **4**
- Esquina lateral posterior de la cabeza en su mayoría lisa y brillante, a veces con esculpura débil (Fig. 151, derecha); ampliamente distribuida, incluyendo México **5**

*montana**uinta*

Fig. 151. Esquina izquierda de obreras de *A. montana* (paratype) and *A. uinta*.

4(3). Espinas propodeales casi tan largas como la distancia entre las bases (Fig. 152); nodo del pecíolo redondeado; Estado de Nuevo León, México *montana* Mackay

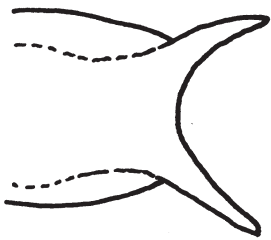


Fig. 152. Vista oblicua de las espinas propodeales de una obrera de *A. montana* (paratipo, CWEM).

- Espinas propodeales más largas que la distancia entre las bases (Fig. 153); nodo del pecíolo con ápice agudo; Haití
..... *relicta* Wheeler y Mann



Fig. 153. Espinas propodeales de una obrera cotipo de *A. relicta*, vistas del lado y desde arriba (de AntWeb.org, de Ryan Perry).

5(3). Cabeza con la escultura intrarrugal muy débil entre arrugas poco desarrolladas (Fig. 154, izquierda); espinas propodeales generalmente poco desarrolladas, longitud generalmente inferior a $\frac{1}{3}$ de la distancia entre las bases (Fig. 155, izquierda); cabeza y mesosoma amarillo anaranjado, gáster de color marrón oscuro a negro; no común, Idaho, Utah y Colorado, EUA *uinta* Wheeler

Escultura intrarrugal débil

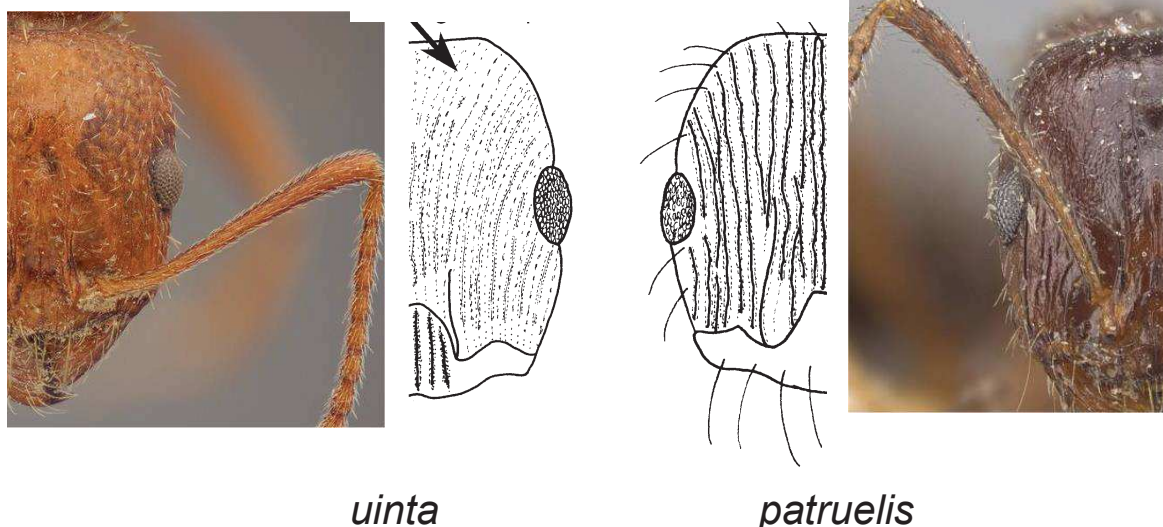
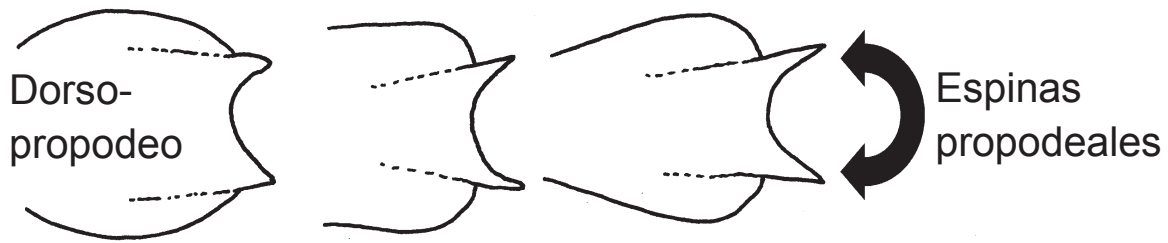
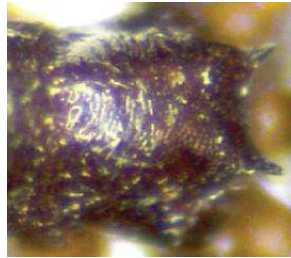
*uinta**patruelis*

Fig. 154. La mitad de la cabeza de una obrera de *A. patruelis* (izquierda) y de una obrera de *A. uinta* (derecha), que muestran las diferencias en escultura (Fotografías de AntWeb).

- Cabeza con punturaciones finas y abundantes entre las arugas longitudinales desarrolladas (Fig. 154, derecha); espinas propodeales generalmente más largas, aproximadamente $\frac{1}{3}$ - $\frac{1}{2}$ la longitud de la distancia entre las bases (Fig. 155, central y derecha); por lo general marrón castaño a marrón oscuro con gáster ligeramente más oscuro; común, el oeste de EUA y Baja California, México **6**



uinta



patruelis



occidentalis

Fig. 155. Dorsopropodeos de obreras de *A. uinta* (Twin Falls, Idaho, EUA, CWEM), *A. patruelis* (Isla Guadalupe, México, CWEM) y *A. occidentalis* (Mendocino Co, California, EUA, CWEM).

- 6(5). Espinas propodeales relativamente más largas (Fig. 155, derecha); común y ampliamente distribuida, el oeste de Canadá y EUA al sur hasta Los Angeles y al este hasta South Dakota, EUA *occidentalis* Emery
- Espinas propodeales relativamente cortas (Fig. 155, mitad); raramente colectada, Baja California y las islas asociadas *patruelis* Forel

- 7(2). Propodeo sin espinas o dientes, aunque abultamientos o ángulos pueden estar presentes (Fig. 156); Baja California, México 8

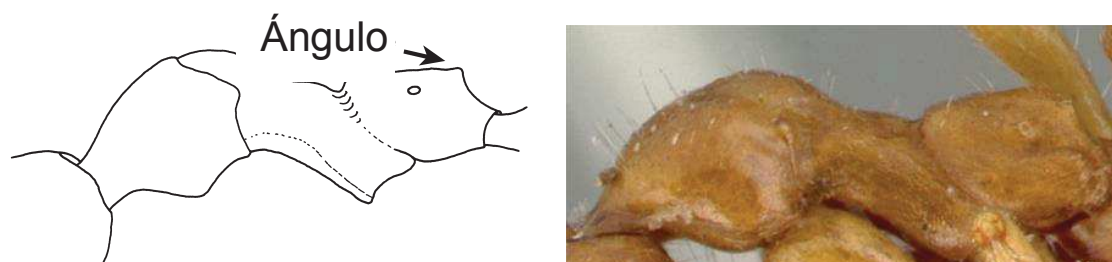


Fig. 156. Mesosoma de una obrera de *A. mutica* (MCZC). La fotografía es de AntWeb.

- Propodeo armado con espinas o dientes definitivos (Fig. 157), aunque pueden ser poco desarrolladas; ampliamente distribuida 9



Fig. 157. Mesosoma de una obrera de *A. treatae* (Condado de Haywood, North Carolina, EUA, CWEM). La fotografía es de AntWeb, de April Nobile.

8(7). Marrón medio a marrón oscuro, con patas de color marrón amarillento; mesopleuron finamente esculpado (Fig. 158), en su mayor parte con estrías transversales, o casi lisa y brillante; México
 ***carbonaria* Pergande**

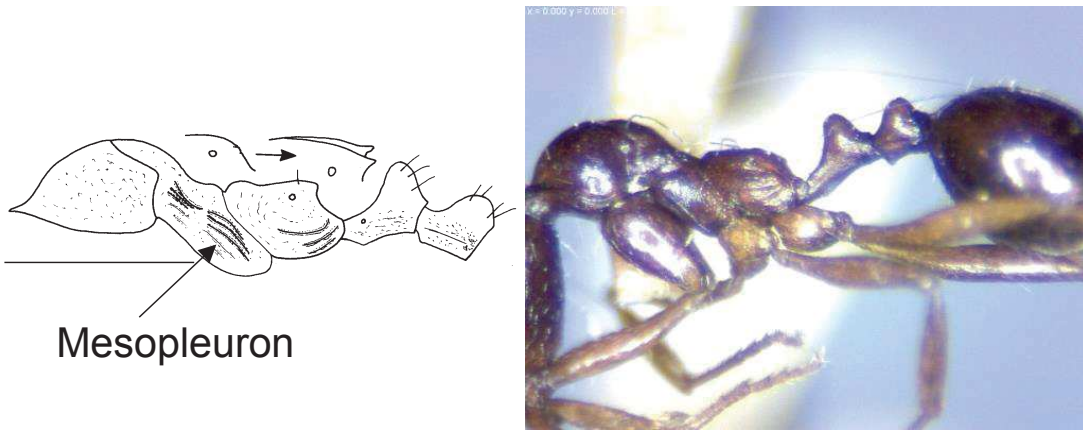


Fig. 158. Vista lateral de una obrera de *A. carbonaria* (Baja California Sur, México, CWEM). Las inserciones superiores muestran el propodeo con los procesos propodeales menos desarrollados hasta bien desarrollados.

- Color marrón pálido; mesopleuron densamente punteado; extremo sur de Baja California, México ***mutica* Pergande**

9(7). Nodo pospeciolar más ancho que su longitud (vista superior, Fig. 161); espinas propodeales mayor a dos veces más largas (Fig. 161) que la distancia entre las bases (vista superior); la mitad oriental de EUA y Canadá (hacia el oeste hasta las Dakotas del Sur hasta Oklahoma) .. **10**

- Nodo postpeciolar (Fig. 159) casi siempre más elongado que ancho (visto desde arriba); espinas propodeales menor a dos veces tan largas que la distancia entre las bases (vista superior); distribuida ampliamente incluyendo el este de EUA y Canadá **11**



Fig. 159. Pecíolo y pospeciolo de una obrera de *A. floridana* (desde arriba) (de AntWeb, fotografía de April Nobile).

10(9). Cuarto basal del primer tergito del gáster con estrías que divergen posteriormente (Fig. 160); dorso de la cabeza cubierto con arrugas gruesas; no común, EUA *mariae* Forel



Fig. 160. Dorso del primer tergito del gáster de una obrera de *A. mariae* (Ames, Iowa, EUA, CWEM).

- Cuarto basal del primer tergo gastral liso y brillante (Fig. 161); dorso de la cabeza con estrías poco definidas; común en EUA *tennesseensis* (Mayr)

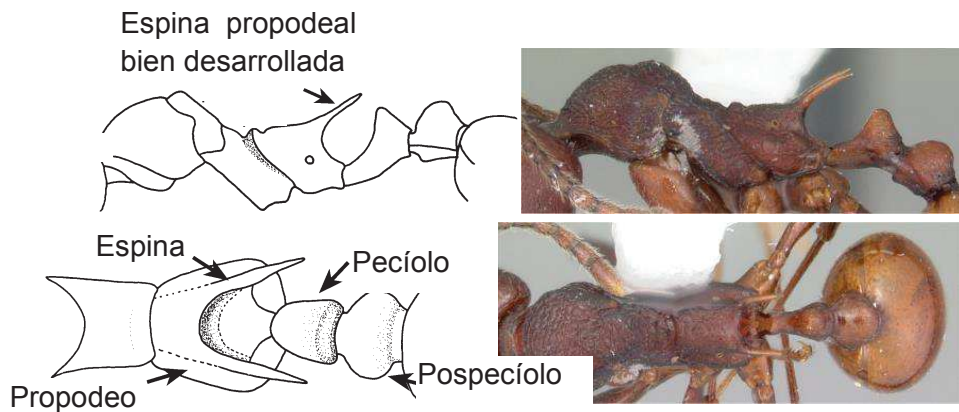


Fig. 161. Mesosoma, pecíolo y pospecíolo de una obrera de *A. tennesseensis* (Condado de Seviere, Tennessee, EUA, CWEM) vistos lateral y superior. Las fotografías son de AntWeb, de April Nobile.

- 11(9).** Región entre el ojo y la carina frontal cubierta en su mayor parte con punturaciones (Fig. 162, izquierda) **12**
- Región entre el ojo y la carina frontal cubierta en su mayor parte con estrías o arrugas longitudinales, o mitad exterior con estrías, mitad interior con escultura ligera (Fig. 162, derecha) **13**

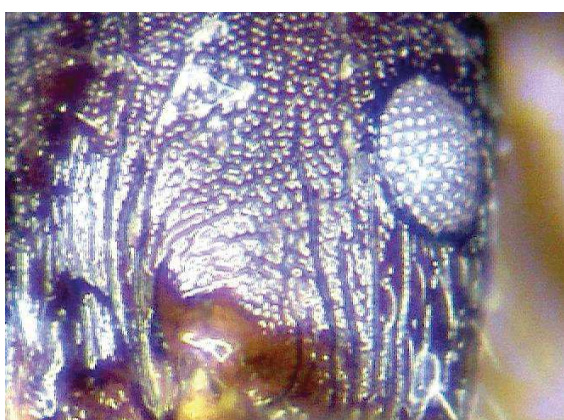
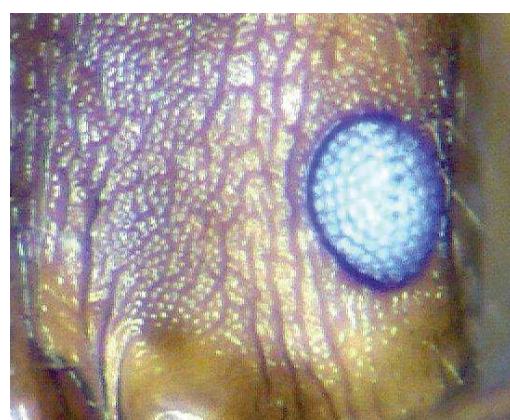
*picea**rudis*

Fig. 162. Región entre el ojo y la carina frontal de obreras de *A. picea* and *A. rudis*.

12(11). Ojo con 13-15 omatidios en el diámetro mayor (Fig. 167); espinas propodeales ligeramente incurvadas (visto desde arriba, Fig. 163); dorsopropodeo con arrugas transversales; marrón rojizo; el sureste de EUA *miamiana* Wheeler



Fig. 163. Mesosoma de una obrera de *A. miamiana*. El recuadro abajo muestra las espinas propodeales vistas desde arriba, fotografía de arriba (de AntWeb, fotografía de April Nobile).

- Ojo con 10 - 12 omatidios en el diámetro mayor; espinas propodeales divergentes (Fig. 163); arrugas en el dorsopropodeo débiles, muchas veces sustituidas por puntuaciones (Fig. 164); marrón oscuro; común en el noreste y el este de EUA *picea* (Emery)

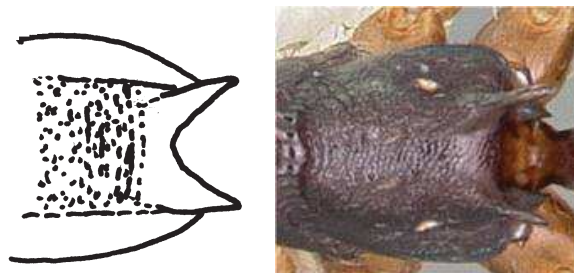


Fig. 164. El dorsopropodeo de una obrera de *A. picea* (Condado de Murray, Georgia, EUA, CWEM) que muestra las espinas propodeales vistas desde arriba.

13(11). Ojo relativamente grande (Figs. 166 y 167), diámetro máximo dos veces (o más) el diámetro máximo del escapo (con 10 o más omatidios en el diámetro máximo); ampliamente distribuido en EUA, Baja California **14**

- Ojo relativamente pequeño (Fig. 165) con cerca de 8 omatidios en el eje más largo, diámetro máximo sólo ligeramente mayor que el diámetro máximo del escapo; sureste de EUA, de hábitats áridos
 *umphreyi* Deyrup y Davis

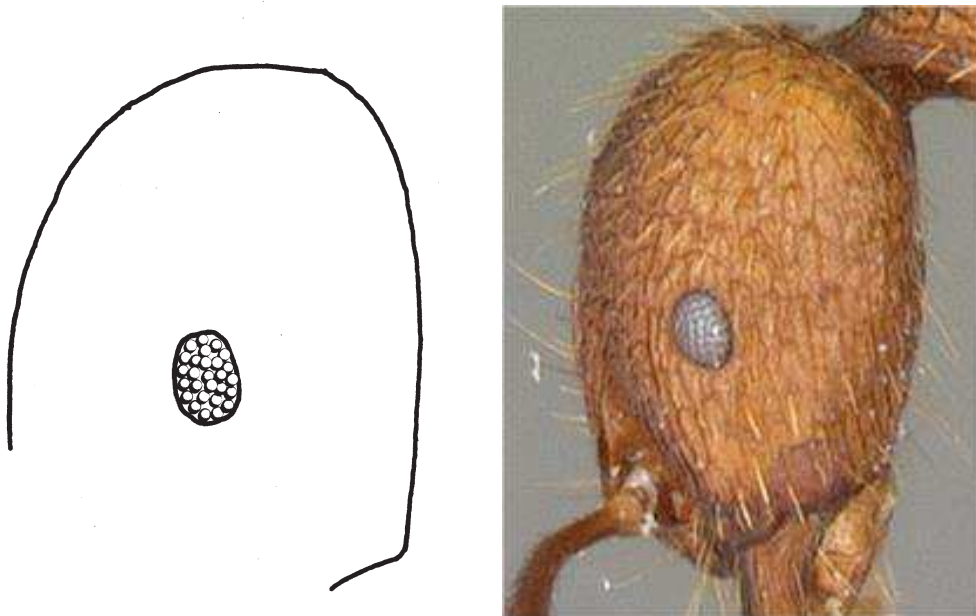


Fig. 165. Vista lateral de la cabeza de una obrera de *A. umphreyi* (paratipo, CWEM). La fotografía es de AntWeb, de Ryan Perry.

14(13). Color amarillo pálido con ojos grandes, diámetro con mayor a 18 omatidios (Fig. 166); zonas xerófilas de suroeste de EUA, nordeste de México *megommata* M. Smith

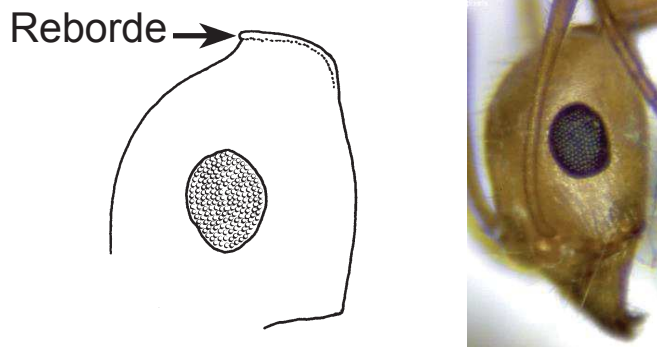


Fig. 166. Vista lateral de la cabeza de una obrera de *A. megommata* (Condado de Clark, Nevada, CWEM).

- Marrón medio, marrón rojizo hasta marrón oscuro; ojos de tamaño mediano (10 - 13 omatidios en diámetro máximo, Fig. 167); común en áreas centrales y orientales de EUA **15**

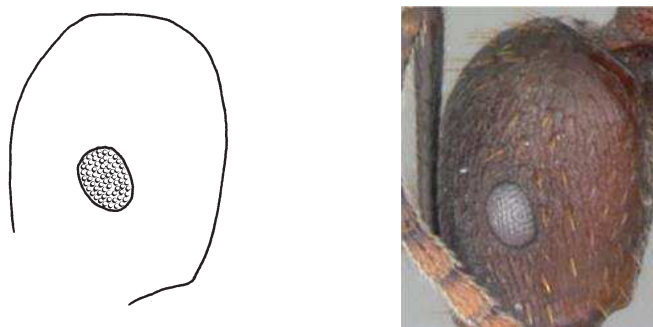


Fig. 167. Vista lateral de la cabeza de una obrera de *A. fulva* (Condado de Tuscaloosa, Alabama, EUA, CWEM) (de AntWeb.com, fotografía de April Nobile).

15(14). Tórulo con un diente dirigido posteriormente (Fig. 168, mueva el escapo anteriormente y vea oblicuamente desde el lado); este de EUA *lamellidens* Mayr

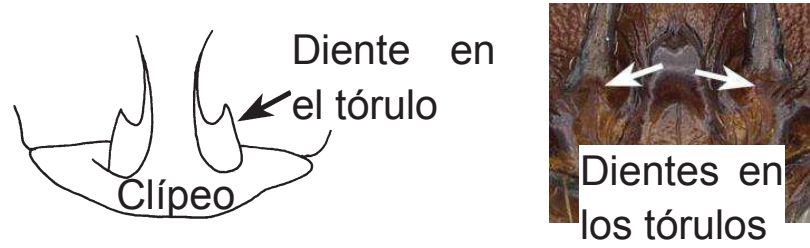


Fig. 168. Tórulo de una obrera de *A. lamellidens*, que muestra el diente o proceso agudo. La fotografía es de AntWeb, de Jayanthi Puniamoorthy.

- Tórulo sin diente así (Fig. 162), redondeado posteriormente . **16**

16(15). Espinas propodeales casi tan largas como la longitud del postero-propodeo, y dirigidas un poco verticalmente (Fig. 169); mesonoto fuertemente elevado y débilmente bilobulado (Fig. 169); la mayor parte de EUA *fulva* Roger

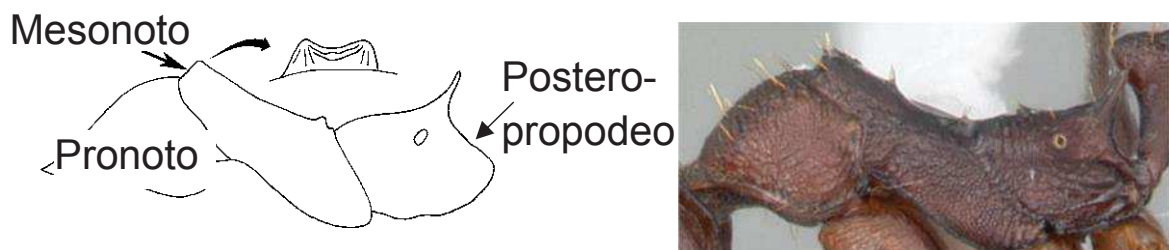


Fig. 169. El mesosoma de una obrera de *A. fulva*, mostrando la elevación del metanoto desde un lado y desde el frente (en recuadro).

- Espinas propodeales por lo general mucho más cortas que la longitud de posteropropodeo (Fig. 170), y dirigidas posteriormente, casi en el mismo plano que el dorsopropodeo (Fig. 171); mesonoto ligeramente hinchado **17**

17(16). Tibia posterior más larga que la longitud de la cabeza; Arizona, New México, este de Texas, EUA, Jalisco en México *punctaticeps* Mackay

- Tibia posterior aproximadamente tan larga como, o más corta que la longitud de la cabeza; principalmente el este de EUA y Canadá ... **18**

18(17). Espinas propodeales relativamente largas, casi tan largas como la distancia entre las bases, notablemente encorvadas (Fig. 163); dorso-propodeo con varias arrugas transversales (Fig. 163); no común, sur de EUA muestras ocasionales de *miamiana* Wheeler

- Espinas propodeales relativamente cortas (Fig. 164), rara vez mayor a $\frac{2}{3}$ la longitud de la distancia entre las bases, sólo ligeramente encorvadas hacia dentro; dorsopropodeo con pocas o ningún arrugas transversales (Fig. 170); muy común en el este de EUA **19**



Fig. 170. Espinas propodeales de una obrera de *A. rudis* como se ven oblicuamente desde la parte superior y frontal (Condado de Washington, Mississippi, EUA, CWEM).

- 19(18).** Marrón rojizo, ferruginoso (Fig. 172) **20**
 - Marrón oscuro (Fig. 171) *picea* (Emery)



Fig. 171. Obrera de *A. picea* (de AntWeb, fotografía de A.W. Thomas).

- 20(19).** Dorso del pronoto densamente punteado (Fig. 172, izquierda); común en el este de EUA *rudis* (Emery)
 - Dorso del pronoto casi liso y brillante (Fig. 172, derecha); raramente colectada, Nevada y California *uinta* Wheeler



rudis

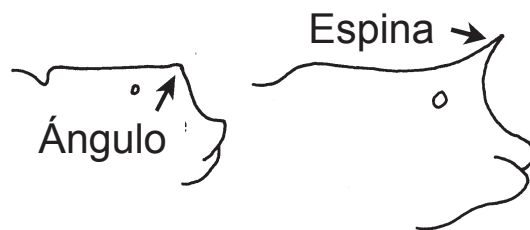


uinta

Fig. 172. Pronotos de obreras de *A. rudis* and *A. uinta*.

Clave para las especies del subgrupo *texana*, basada de las obreras

- 21(1). Propodeo desarmado, o sólo con ángulos poco desarrollados (Fig. 173, izquierda) 22
 - Propodeo con espinas definidas (Fig. 173, derecha) 26



honduriana

ashmeadi

Fig. 173. Propodeos de obreras de *A. honduriana* (14 k S de Córdoba, Honduras, CWEM) y *A. ashmeadi* (Condado de Highlands, Florida, EUA, CWEM), mostrando el desarrollo de las espinas propodeales (dibujadas en las mismas escalas) (fotografía de April Nobile, de AntWeb).

22(21). Ojo relativamente grande, el área malar (región entre la base de la mandíbula y el borde anterior del ojo) igual o más corta que el diámetro máximo del ojo (Fig. 174, izquierda); cabeza y mesosoma amarillos o marrón oscuros; Honduras, noroeste de México y California **23**

- Ojo relativamente pequeño, área malar más larga que el diámetro máximo del ojo (Fig. 174, derecha); cabeza y mesosoma de color marrón pálido; suroeste de EUA y noroeste de México **24**

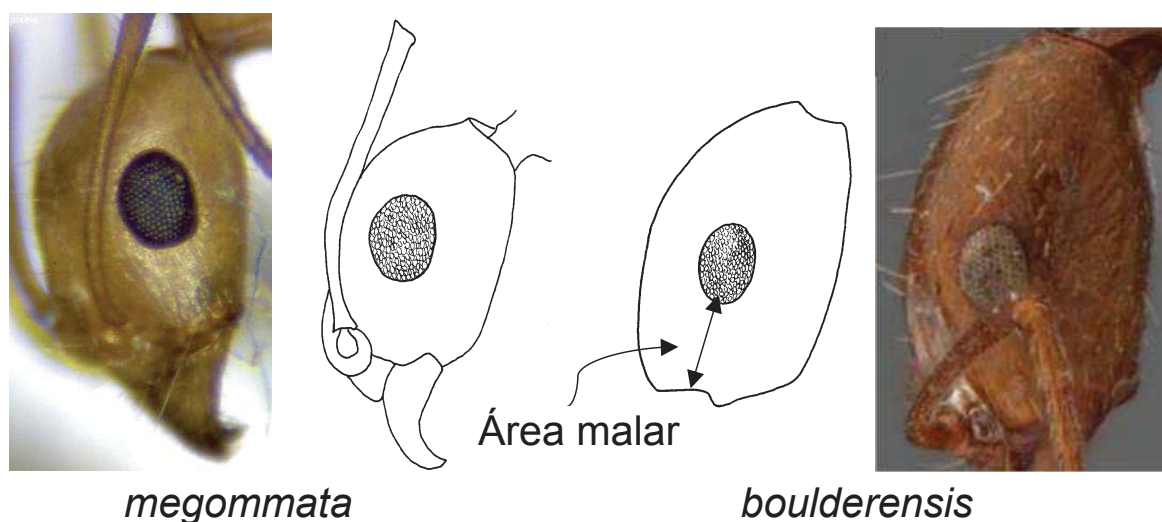


Fig. 174. Vistas laterales de las cabezas y de los ojos de obreras de *A. megommata* (La Paz, Arizona, MCZC) y de *A. boulderensis* (paratipo, MCZC).

- 23(22).** Totalmente marrón oscuro (Fig. 175, izquierdo); Honduras *honduriana* **Mann**
 - Totalmente marrón pálido o amarillo, o con el gáster ligeramente más oscuro (Fig. 175, derecha); suroeste de EUA, Baja California, México *megommata* **Smith**

*honduriana**megommata*

Fig. 175. Obrera de *A. honduriana* y de *A. megommata* (fotografías de Estella Ortega y Alexandra Westrich, de AntWeb).

- 24(22).** Gáster negro o más oscuro que el mesosoma (Fig. 176, izquierda); suroeste de EUA *smithi* **Gregg**
 - Gáster marrón o casi del mismo color que el mesosoma (Fig. 176, derecha); ampliamente distribuida **25**

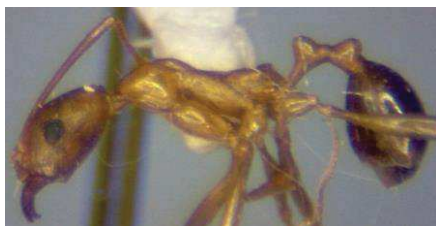
*smithi**boulderensis*

Fig. 176. Obrera de *A. smithi* y de *A. boulderensis*.

25(24). Nodo de pospecíolo (Fig. 177, izquierda) casi circular (visto desde arriba); punta en la base del escapo afilada y dirigida en sentido lateral y anterior (Fig. 178, izquierda); diente metaesternal bien desarrollado, agudo (Fig. 179, izquierda); Nevada hasta Texas, al sur hasta Baja California y Sonora, México *boulderensis* M. Smith

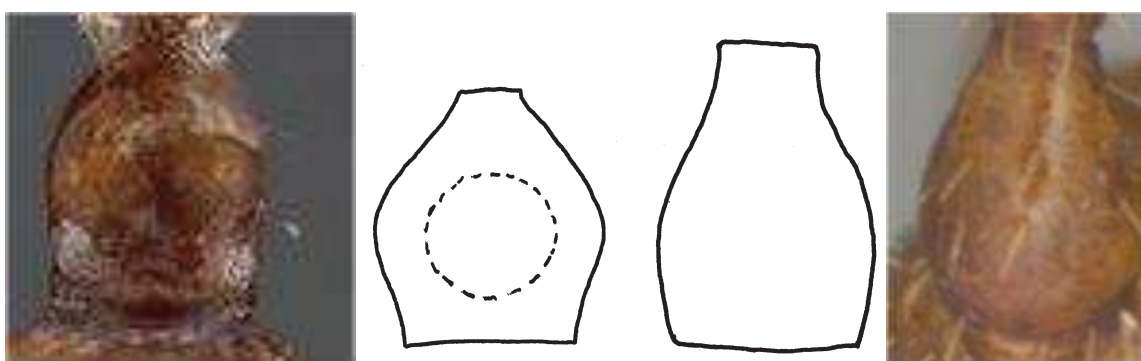
*boulderensis**floridana*

Fig. 177. Pospecíolos de *A. boulderensis* (Gran Cañón, Arizona, EUA, CWEM) y *A. floridana* (Estación Biológica Archbold, Florida, EUA, CWEM), a la misma escala (fotografía de April Nobile, de AntWeb,).

- Nodo de pospecíolo alargado (Fig. 177, derecha); lóbulo en la base del escapo redondeado y dirigido lateralmente y anteriormente (Fig. 178, derecha); proceso metaesternal poco desarrollo (Fig. 179, derecha); sureste de EUA ***floridana* M. Smith**

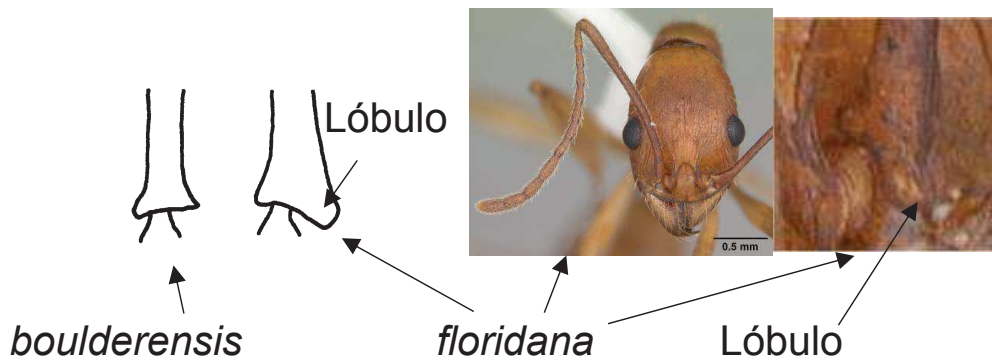


Fig. 178. Base de escapos de las obreras de *A. boulderensis* (Palm Canyon, Arizona, EUA CWEM) y *A. floridana* (Gainesville, Florida, EUA, CWEM).

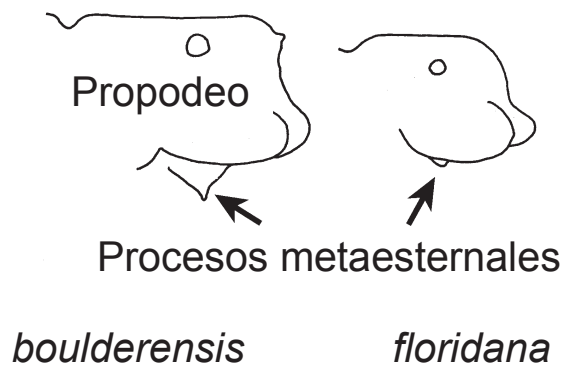


Fig. 179. Procesos metaesternales de una obrera de *A. boulderensis* (coxa posterior removida, Grand Canyon, Arizona, EUA, CWEM), y de una obrera de *A. floridana* (coxa de en medio retirado, Estación Biológica Archbold, Florida, EUA, CWEM), dibujado a la misma escala.

- 26(21).** Escapo antenal con lóbulo conspicuo que se extiende posteriormente a lo longitud de la cuarta o quinta parte basal del escapo (Figs. 180 y 181) **27**
- Escapo antenal sin gran lóbulo basal, o si hay un lóbulo pequeño, proyecta en sentido anterior y no implica la quinta parte basal del escapo (Fig. 188) **28**
- 27(26).** Lóbulo de la base del escapo moderadamente grande, longitud aproximadamente igual al diámetro mayor del ojo (Fig. 180); poco común *ashmeadi* **Emery**



Fig. 180. Lóbulo del escapo de una obrera de *A. ashmeadi* (Condado de Highlands, Florida, EUA, CWEM) (fotografía de April Nobile, de AntWeb).

- Lóbulo del escapo muy grande, longitud aproximadamente dos veces mayor del diámetro máximo del ojo (Fig. 181); común y ampliamente distribuido ***treatae* Forel**

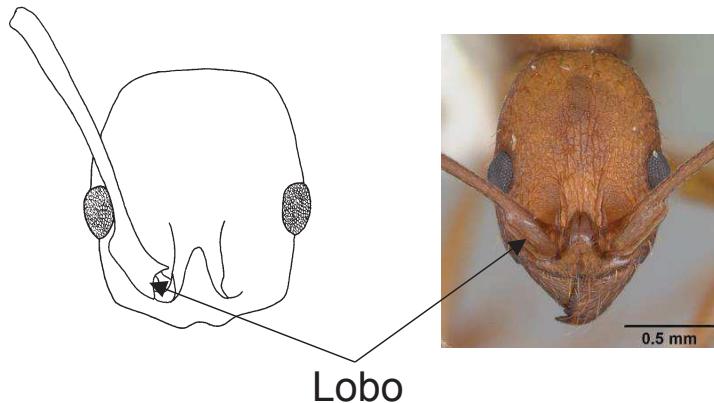


Fig. 181. Cabeza de una obrera de *A. treatae* (Condado de Haywood, North Carolina, EUA, CWEM). La fotografía es de AntWeb, de April Nobile.

- 28(26).** Espinas propodeales muy bien desarrolladas (Fig. 182), más largas que, o casi tan largas como la distancia entre las bases (vista superior) **29**



Fig. 182. Espinas propodeales de una obrera de *A. lamellidens*, vistas oblicuamente desde la parte superior y frontal (Condado de William, Virginia, EUA, CWEM). La fotografía es de AntWeb, de April Nobile.

- Espinas propodeales poco (Fig. 183) o moderadamente desarrolladas (Fig. 184), más cortas (por lo general alrededor de $\frac{1}{2}$ la longitud) de la distancia entre las bases (Figs. 185 y 186) 32

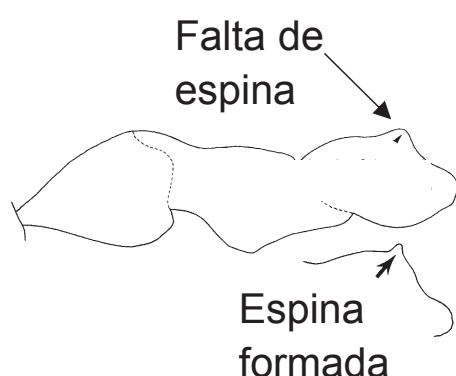


Fig. 183. Dorso del mesosoma de una obrera de *A. smithi* (CWEM), que muestra la falta de espinas propodeales. El recuadro abajo muestra la espina propodeal más desarrollada de ésta especie (de Mackay y Mackay, 2002). La fotografía es de una obrera vista del lado.

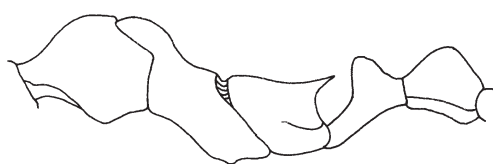
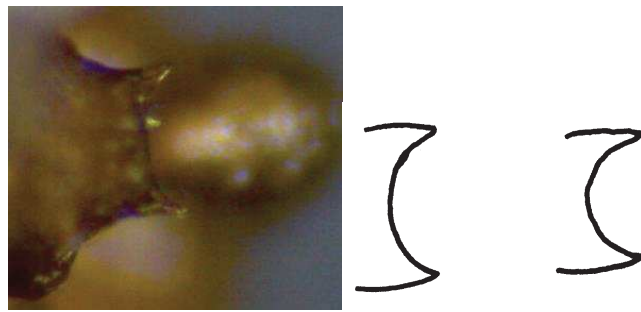


Fig. 184. Mesosoma, pecíolo y pospecíolo de una obrera de *A. texana*, que muestra las espinas propodeales normales. La fotografía es de una obrera, vista del lado.



punctaticeps *texana*

Fig. 185. Espinas propodeales de las obreras de *A. punctaticeps* (Condado de Socorro, New Mexico, EUA, CWEM) y *A. texana* (Condado de Sabine, Texas, EUA, CWEM) como se ve oblicuamente desde la parte superior y frontal.

29(28). Escultura poco desarrollada (Fig. 186), secciones, especialmente dorso del pronoto, lisas; raramente colectado, sureste de EUA
..... *flemingi* Smith



Fig. 186. Mesosoma y pecíolo de una obrera de *A. flemingi*, que muestra las espinas propodeales delgadas (especimen de la serie tipo, pero no etiquetada como tipo). La fotografía muestra el dorso del pronoto.

- Escultura fuertemente desarrollada, cabeza y mesosoma, incluyendo dorso del pronoto (Fig. 187), con estrías, granulado gruesamente o puntiforme; común, South Carolina al sur hasta Florida, al oeste hasta Texas, EUA **30**



Fig. 187. Pronoto de una obrera de *A. lamellidens*.

- 30(29).** Borde posterior del tórulo con una proyección o proceso (Fig. 188 y 189) como espina (empujar el escapo hacia delante y ver oblicuamente desde el lado); dorso del pronoto granulado o con estrías transversales (Fig. 187), escultura fuerte; este de EUA *lamellidens* Mayr

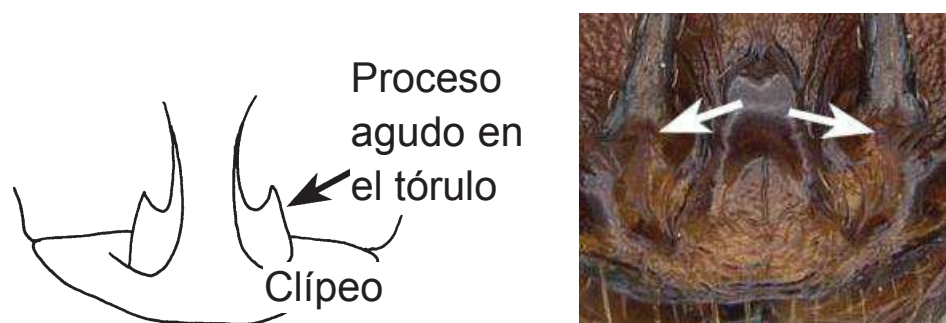


Fig. 188. Tórulo de una obrera de *A. lamellidens*, que muestra el proceso agudo. La fotografía es de AntWeb, fotografía de Jayanthi Puniamoorthy.



Fig. 189. Diente en el tórulo de una obrera de *A. lamellidens*.

- Borde posterior del tórulo sin proceso agudo, completamente redondeada (Fig. 190); dorso del pronoto puntiforme, escultura no tan fuerte **31**

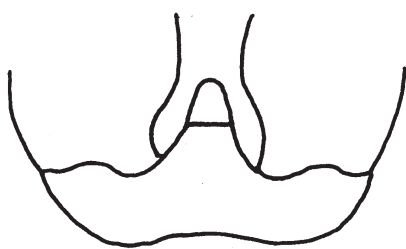


Fig. 190. Parte anterior de la cabeza de una obrera de *A. picea* (Condado de Murray, Georgia, EUA, CWEM), que carece del proceso agudo (de AntWeb, fotografía de April Nobile).

31(30). Ojo pequeño, de unos 8 omatidios en el diámetro máximo (Fig. 165); mesonoto (Fig. 191) elevado sobre el nivel del pronoto (vista lateral); sureste de EUA *umphreyi* Deyrup y Davis

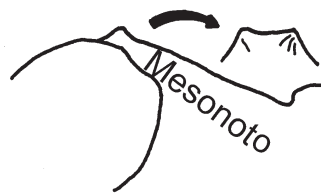


Fig. 191. Vista lateral del mesonoto de una obrera de *A. umphreyi* (paratipo, CWEM). El recuadro superior muestra el mesonoto abultado, vista frontal.

- Ojo más grande (Fig. 167), con aproximadamente 9-12 omatidios en el diámetro máximo; mesonoto aproximadamente al mismo nivel que el propodeo (Fig. 192); sureste de EUA, incluyendo Florida
 *carolinensis* Wheeler

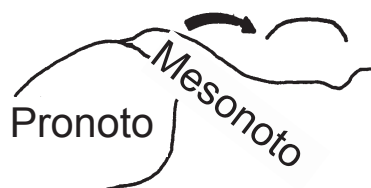


Fig. 192. Mesonoto de una obrera de *A. carolinensis* (Condado de Iberia, Louisiana, EUA, CWEM), como se ve desde el lado. El recuadro superior muestra la hinchón mesonotal como se ve desde la parte delantera (fotografía de Cerise Chen, de AntWeb).

32(28). Dorsopropodeo anteriormente con estrías transversales distintas o rugosidades (Fig. 193, izquierda); región entre las espinas propodeales con punturaciones distintas; base del escapo antenal con lóbulo angular pequeño, que se proyecta en sentido anterior y se redondea al exterior (Fig. 194, derecha); suroeste de EUA, noroeste de México

..... *huachucana* Creighton

- Dorsopropodeo anteriormente sin estrías transversales o con estrías transversales poco definidas (Fig. 193, derecha); región entre espinas propodeales lisa, o con punturaciones poco definidas; base del escapo antenal con lóbulo poco definido que puede ser agudo externamente (Fig. 194, la izquierda y la media) **33**

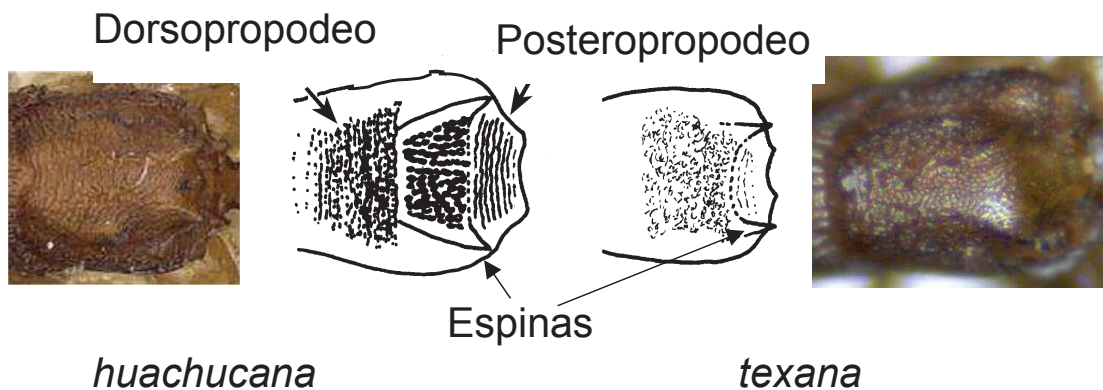


Fig. 193. Vistas superiores de los dorsopropodeos de obreras de *A. huachucana* (Condado de Cochise, Arizona, EUA, CWEM) y *A. texana* (Condado de Sabine, Texas, EUA, CWEM), mostrando las diferencias en la escultura (fotografías de AntWeb, de Ryan Perry).

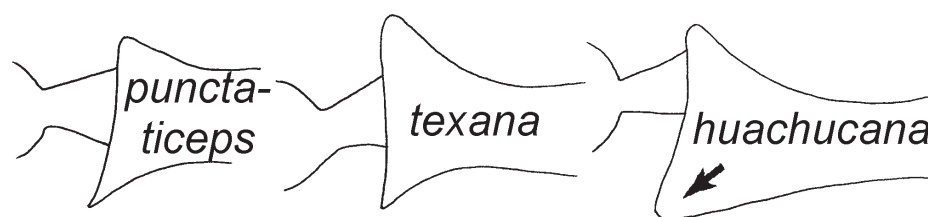


Fig. 194. La base del escapo de las obreras de *A. punctaticeps*, *A. texana*, y *A. huachucana* (la flecha indica el lóbulo) (de Mackay y Mackay, 2002).

- 33(32).** La tibia posterior ligeramente más larga hasta mucho más larga que la longitud de la cabeza (excluyendo las mandíbulas); espinas propodeales generalmente cerca de $\frac{1}{4}$ de la longitud (Fig. 193, izquierda) de la distancia entre las bases (mire oblicuamente desde el frente y desde arriba); predominantemente del oeste de EUA y de todo México **34**
- La tibia posterior igual o ligeramente más corta hasta mucho más corta que la longitud cefálica; espinas propodeales generalmente cerca de $\frac{1}{2}$ de la longitud de la distancia entre las bases (Fig. 193, derecha); distribuido sobre todo en EUA **36**

34(33). Tibia posterior mucho más larga que la longitud de la cabeza (longitud de la cabeza 0,89 - 0,95 veces la longitud de la tibia posterior); dorso de la cabeza sin arrugas prominentes y gruesas, pocas arrugas poco definidas presentes posterior al área frontal y área malar, el resto de la cabeza en su mayoría punteada (Fig. 195); longitud del escapo de 1,12 - 1,23 veces la longitud cefálica; dorso del pronoto en su mayoría punteado; no común, colectada en el sur de Arizona, sur de Nuevo México, al este de Texas, EUA *punctaticeps* Mackay



Fig. 195. Cabeza de una obrera de *A. punctaticeps*.

- Tibia posterior ligeramente más larga que la longitud cefálica (largura de la cabeza 0,90 - 0,99 veces la longitud de la tibia posterior); dorso de la cabeza, casi completamente punteada; longitud del escapo 1,14 - 1,20 veces la longitud de la cabeza (Fig. 196); México **35**



punctatissima



reticuliceps

Fig. 196. Cabezas de obreras (paratipos) de *A. punctatissima* y *A. reticuliceps*.

35(34). Dorso de la cabeza casi completamente punteado (Fig. 196, izquierda); base del dorso del gáster puntiforme en su mayoría (Fig. 197); Colima y Jalisco, México *punctatissima* Mackay

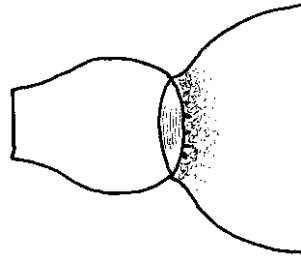


Fig. 197. Pospecíolo y parte anterior del gáster (vista dorsal) de una obrera de *A. punctatissima* (holotipo, MCZC).

- Dorso de la cabeza punteado, intercalado con arrugas reticuladas Fig. 196, derecha); base del gáster por lo general con estrías (Fig. 198) sobre todo cortas (0,05 mm); la tibia posterior aproximadamente tan larga como la longitud de la cabeza; longitud del escapo alrededor de 1,2 veces la longitud de la cabeza; noreste de México *reticulaticeps* Mackay

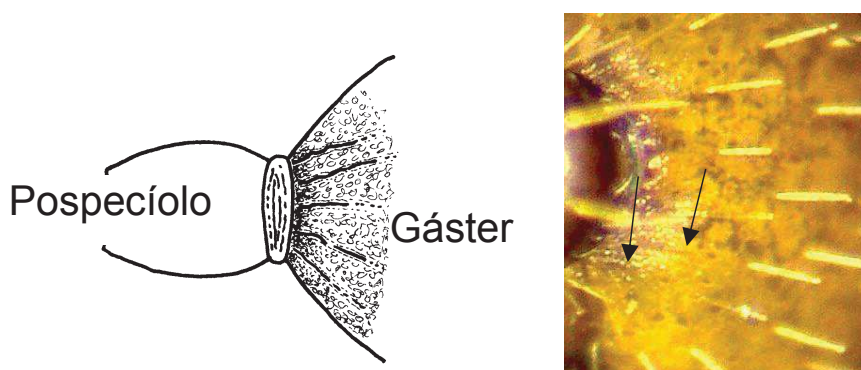


Fig. 198. Pospecíolo y parte anterior del gáster (vista dorsal) de una obrera de *A. reticulaticeps* (paratipo, CWEM).

36(33). Tibia posterior ligeramente más corta que la longitud de la cabeza (aproximadamente 0,04 mm más corta, longitud de la cabeza alrededor de 1,08 veces la longitud de la tibia), ocasionalmente la misma longitud; dorso de la cabeza con arrugas prominentes, reticuladas y gruesas (Fig. 199); escapo relativamente longitud (1.16 o más veces más longitud que la longitud de la cabeza); normalmente marrón rojizo; común en el sur de Estados Unidos y norte de México, rara vez colectada en el este de EUA *texana* (Emery)



Fig. 199. Cabeza de una obrera de *A. texana*, que muestra la escultura gruesa.

- Tibia posterior mucho más corta que la longitud cefálica (cabeza de 1,2 - 1,53 veces más larga que la tibia posterior); dorso de la cabeza con o sin arrugas reticuladas prominentes (Fig. 200); escapo relativamente corto (1,06 - 1,15 veces más longitud que la longitud de la cabeza); muy común en el este de EUA 37

*rudis**picea*Fig. 200. Cabezas de *A. rudis* y *A. picea*.

- 37(36). Ferruginoso marrón rojizo (Fig. 201, izquierda) .. *rudis* (Emery)
- Marrón oscuro (Fig. 201, derecha) *picea* (Emery)

*rudis**picea*

Fig. 201. Obreras de *A. rudis* (de AntWeb, fotografía de April Nobile) y *A. picea* (de AntWeb, fotografía de April Nobile).

Clave para las especies del complejo *subterranea*: hembras ⁷

1. Escudo (esclerito detrás del pronoto) en su mayoría liso y brillante, posiblemente ligeramente coriáceo o moderadamente puntiforme (Fig. 202, izquierda) 2
- Escudo longitudinalmente estriado o cubierto de otra escultura, regiones medial o anteriores pueden ser lisas y brillantes (Fig. 202, derecha) 11

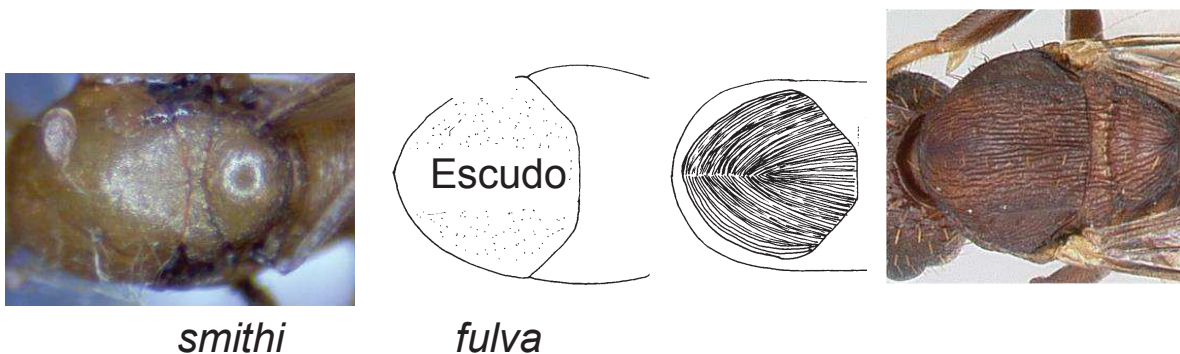


Fig. 202. Escudos de hembras de *A. smithi* (Utah, EUA, CWEM) y de *A. fulva* (North Carolina, EUA, MCZC).

⁷ Las hembras de *A. carbonaria*, *A. mutica*, *A. punctaticeps*, *A. punctatissima*, *A. relictata* y *A. umphreyi* no fueron vistas o no son descritas y no están incluidas en la clave.

2(1). Espinas propodeales largas, anchas y aplanadas dorsoventralmente, sobre todo distalmente (Fig. 203) ***tennesseensis* (Mayr)**

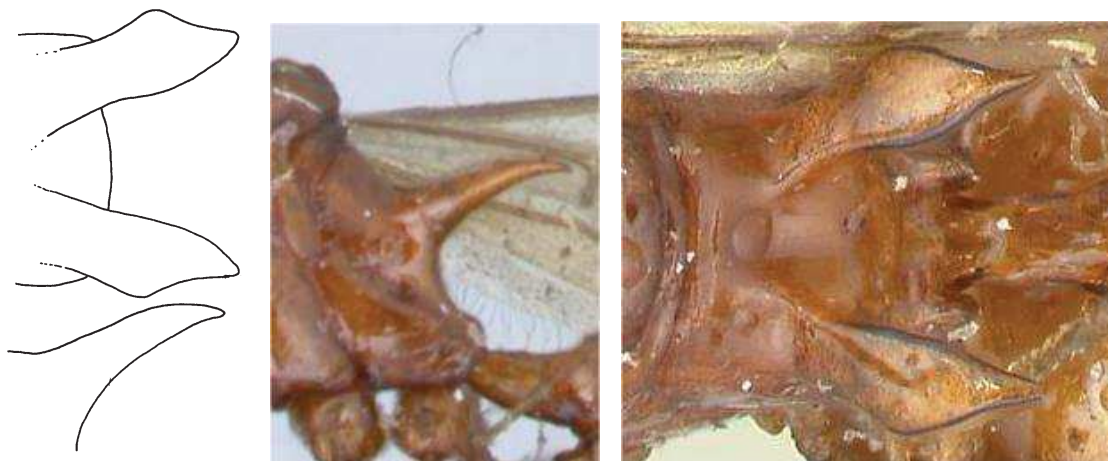


Fig. 203. Espinas propodeales de una hembra de *A. tennesseensis*, vista de lado (izquierdo) y desde arriba (derecha) (Condado de Jefferson, Indiana, EUA, CWEM). Las fotografías son de AntWeb, de Christiana Klingenberg (especimen tipo).

- Espinas propodeales redondeadas (Fig. 204), pueden ser aplanadas oblicuamente desde los lados (Fig. 206) **3**

- 3(2).** Marrón amarillento pálido (Fig. 204, izquierda); se encuentra en las regiones áridas del oeste de América del Norte, incluyendo México *megommata* Smith
- Marrón rojizo o marrón oscuro (Fig. 204, derecha); por lo general se encuentran en áreas mésicas, de amplia distribución **4**



megommata

patruelis

Fig. 204. Reinas de *A. megommata* y *A. patruelis*.

4(3). Escutelo alcanza o se extiende más allá del metanoto (Fig. 205, izquierda); marrón rojizo; EUA y Baja California 5

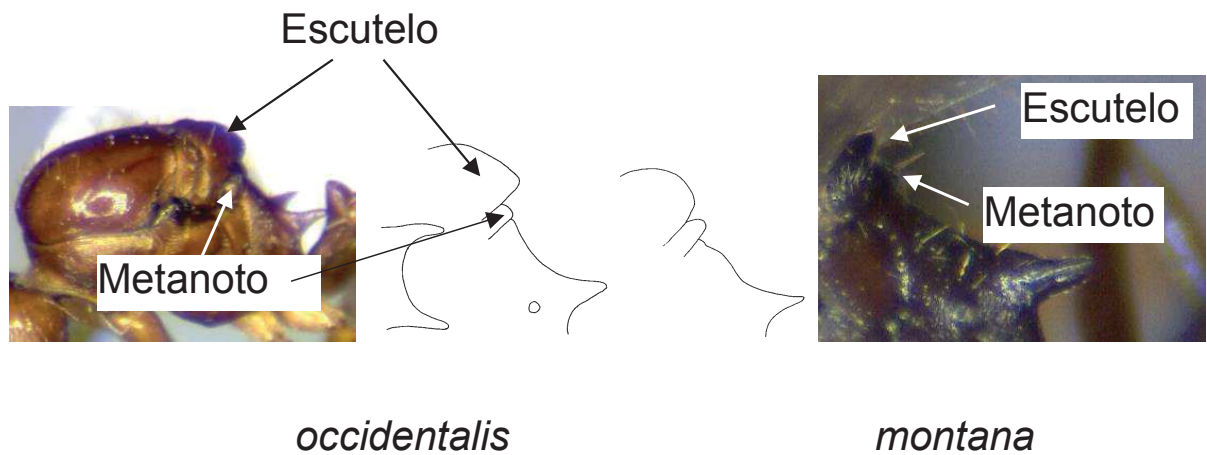


Fig. 205. Escutelo metanoto y espinas propodeales de una hembra de *A. occidentalis* (Condado de Monterrey, California, EUA, CWEM), vistas superior de las espinas y lateral del escutelo) y escutelo y metanoto de una hembra de *A. montana* (paratipo, vista lateral). La fotografía es de AntWeb, un espécimen tipo.

- Metanoto alcanza o se extiende más allá del escutelo (Fig. 205, derecha) 6

5(4). Espinas propodeales fuertemente aplanadas lateralmente con carina o cresta dorsal (Fig. 206, derecha) y ligeramente dobladas ventralmente (Fig. 206, izquierda); escutelo se extiende mucho más allá del borde posterior del metanoto; Baja California, México *patruelis* Forel

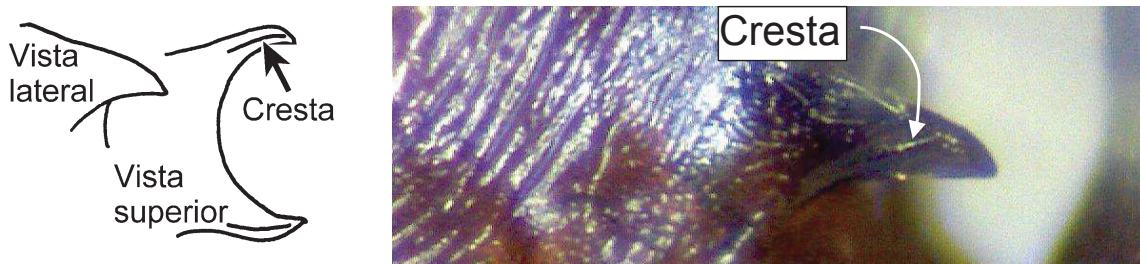


Fig. 206. Espinas propodeales de una hembra de *A. patruelis* vista de lado (izquierdo) y desde la parte superior (derecha).

- Espinas propodeales ligeramente aplanadas lateralmente (Fig. 207), dirigidas posteriormente; escutelo por lo general se extiende sólo ligeramente pasado el metanoto (Fig. 205, derecha); oeste de EUA **8**



Fig. 207. Espinas propodeales de una hembra de *A. occidentalis* vista de lado (izquierdo) y superior (derecha).

- 6(4). Marrón oscuro (Fig. 208, izquierda); el noreste de México (Nuevo León) *montana* Mackay
 - Marrón pálido (Fig. 208, derecha) a marrón rojizo; oeste de EUA hasta oeste de Texas, México (Baja California Sur) 7

*montana**smithi*

Fig. 208. Cabezas de reinas de *A. montana* y *A. smithi*.

- 7(6). Marrón pálido, gáster sólo ligeramente más oscuro que el color del mesosoma; escapo con pelos diminutos, subrectos y dispersos, ocelos grandes, separados por 1 diámetro ocelular (Fig. 209, izquierda)
 *boulderensis* M. Smith
 - Marrón rojizo con gáster negro; escapo con pelos abundantes minúsculos y subrectos; ocelos pequeños, separados por una distancia mayor que el diámetro del ocelo (Fig. 209, derecha) *smithi* Gregg

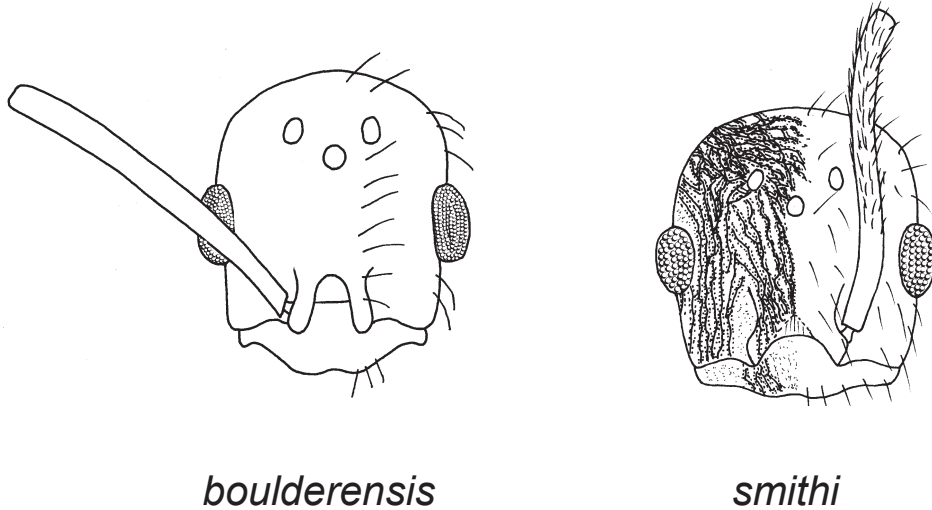


Fig. 209. Cabeza de una reina de *A. boulderensis* (Condado de Washington Utah, EUA, LACM) y una reina de *A. smithi* (Condado de Kane, Utah, EUA, CWEM).

8(5). Escapos antenales se extienden ligeramente más allá de las esquinas laterales posteriores de la cabeza (Fig. 210); común 9

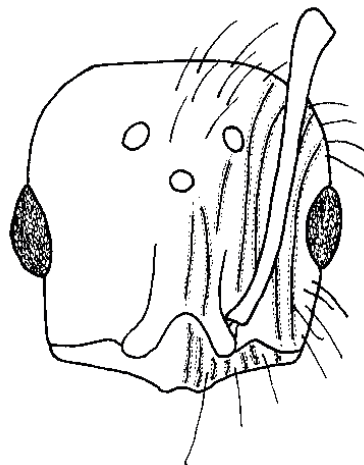


Fig. 210. Cabeza de una hembra de *A. uinta*.

- Escapos antenales sobrepasan una mayor distancia de las esquinas laterales posteriores de la cabeza (Fig. 211), poco frecuentes, Michigan, EUA ***rudis* Wheeler**

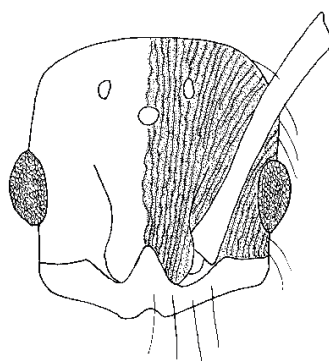


Fig. 211. Cabeza de una hembra de *A. rudis* (Livingston, Michigan, MCZC).

- 9(8).** Ocelos relativamente pequeños, separados por cerca de 2 diámetros del ocelo mediano (Fig. 212); marrón oscuro **10**
- Ocelos relativamente grandes, ocelos laterales separados del ocelo medio por alrededor de 1 diámetro (Fig. 209, izquierda); rojo ferruginoso ***boulderensis* M. Smith**
- 10(9).** Los espacios entre las arrugas de la cabeza parcialmente lisos y brillantes (Fig. 210); raramente colectadas, Idaho, Utah, Colorado, EUA ***uinta* Wheeler**
- Los espacios entre las arrugas en el dorso de la cabeza punteados con apariencia de pequeñas burbujas (Fig. 212); comunes en oeste de EUA ***occidentalis* (Latreille)**



Fig. 212. Cabeza de una reina de *A. occidentalis* (tipo de AntWeb, de April Nobile).

11(1). Escudo cubierto con escultura fuertemente granulada (Fig. 213);
Honduras *honduriana* Mann

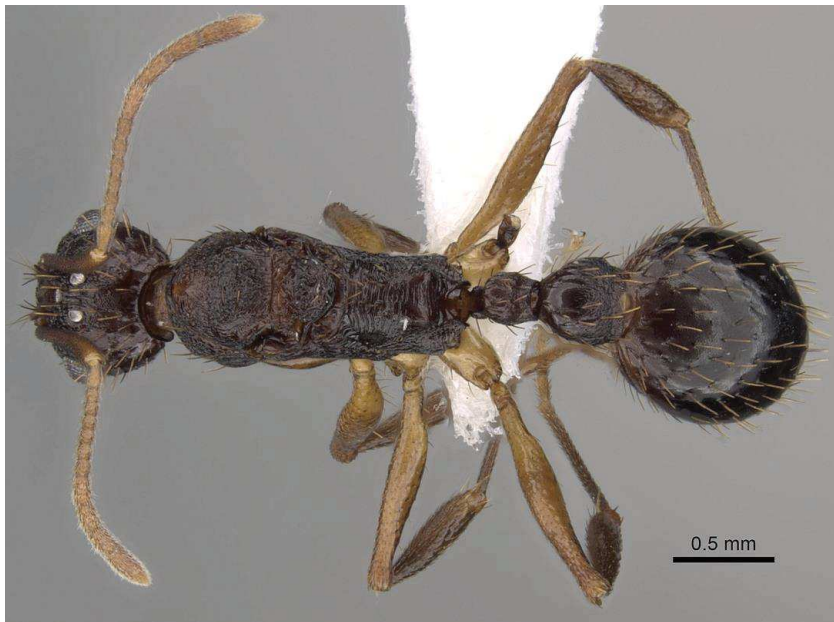
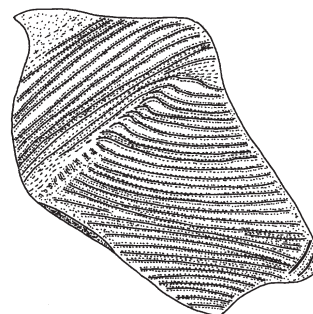


Fig. 213. Hembra de *A. honduriana*, vista desde arriba (de AntWeb, fotografía de Estella Ortega).

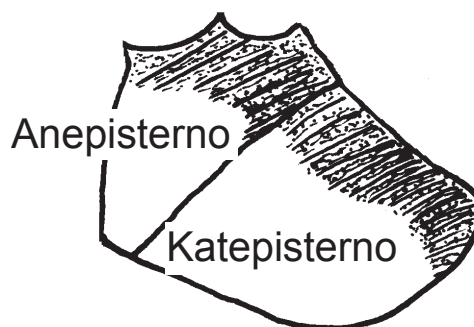
- Escudo (Fig. 202, derecha) cubierto con estrías longitudinales (área pequeña en la parte anterior o lateral del pronoto puede ser lisa y brillante); Estados Unidos y México **12**

12(11). Katepisterno completamente estriado (Fig. 214, arriba) *fulva* Roger

- Katepisterno casi completamente liso y brillante (Fig. 214, abajo) **13**



fulva



floridana

Fig. 214. Mesopleurones de hembras de *A. fulva* (Condado de Suncombe, Virginia, EUA, CWEM) y de *A. floridana* (Condado de Citrus, Florida, EUA, MCZC) (fotografía de April Nobile, de AntWeb).

13(12). Base del escapo con lóbulo grande (Fig. 215); anepisterno estriado por completo o casi por completo (Fig. 214, arriba) **14**

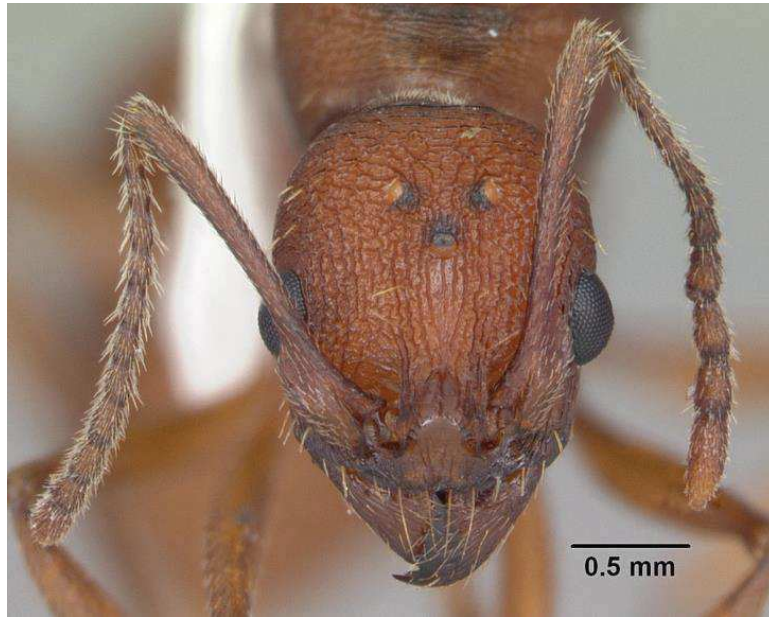
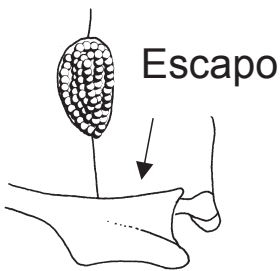


Fig. 215. Base del escapo y ojo de una hembra de *A. treatae* (Condado de Wake, North Carolina, EUA, CWEM). La fotografía es de AntWeb, de April Nobile.

- Base del escapo sin lóbulo grande (Fig. 212) **15**

14(13). Lóbulo en la base del escapo antenal aproximadamente tan longitud como el diámetro máximo del ojo (Fig. 215); común y ampliamente distribuida desde el este de EUA al sur hasta Florida, al oeste hasta Oklahoma y el este de Texas ***treatae* Forel**

- Lóbulo más corto que el diámetro máximo del ojo; no común, Alabama, Georgia y Florida, EUA ***ashmeadi* (Emery)**

15(13). Borde superior del tórulo con proceso en forma de lóbulo apla-
nado que parece como un diente vista de frente (Fig. 216)
..... *lamellidens* Mayr

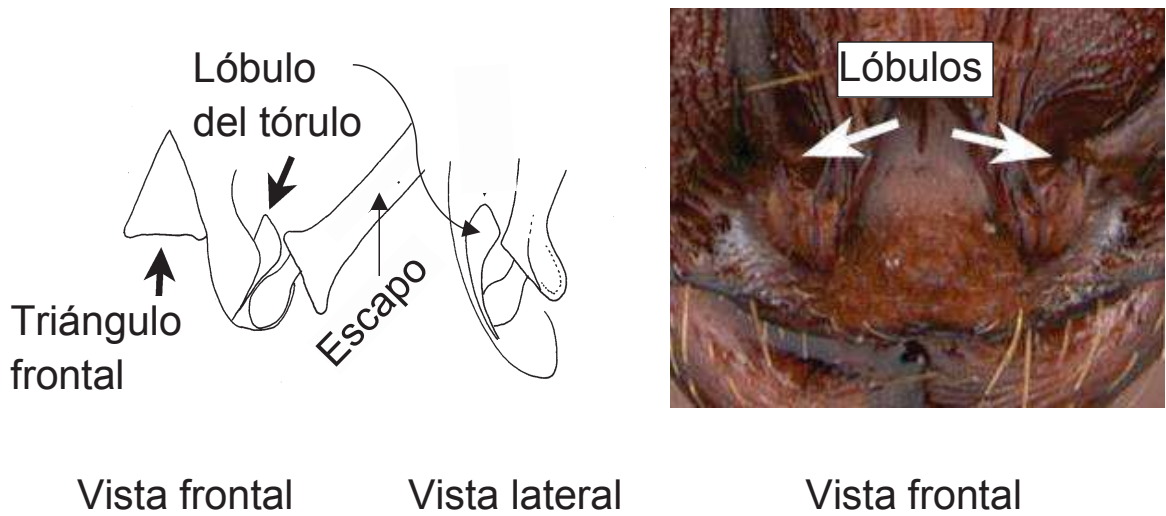


Fig. 216. Tórulo de una hembra de *A. lamellidens* (Condado de Prince William, VA, CWEM) que muestra el proceso en forma de lóbulo. La fotografía es de AntWeb, de April Nobile.

- Borde superior de tórulo sin lóbulo o si está presente, no aparece como diente en vista frontal (Fig. 212) 16
- 16(15).** Más común en el oeste de EUA y el oeste de México 17
- Más común en EUA oriental y el este de México 18

17(16). Espinas propodeales un poco aplanadas lateralmente; lóbulo en la base del escapo poco desarrollado (Fig. 217); muy común
 *texana* (Emery)

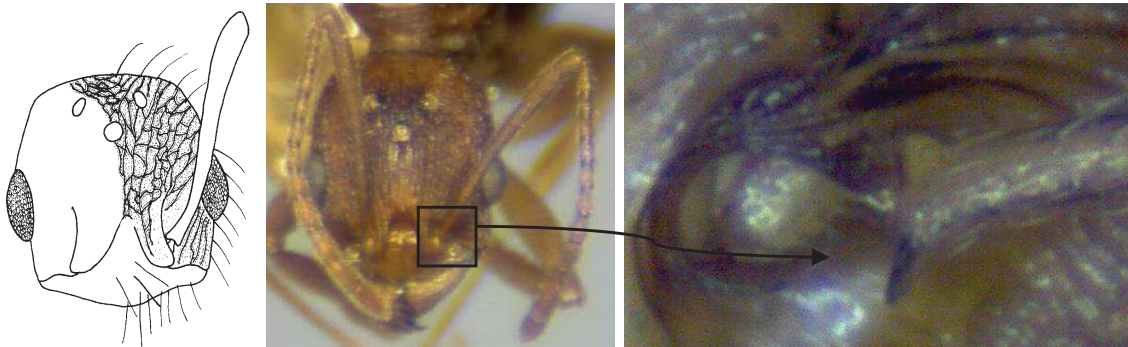


Fig. 217. Cabeza de una hembra de *A. texana* (Condado de Gila, Arizona, MCZC).

- Espinas propodeales redondeadas; lóbulo en la base del escapo bien desarrollado (Fig. 218); raramente colectada
 *huachucana* Creighton

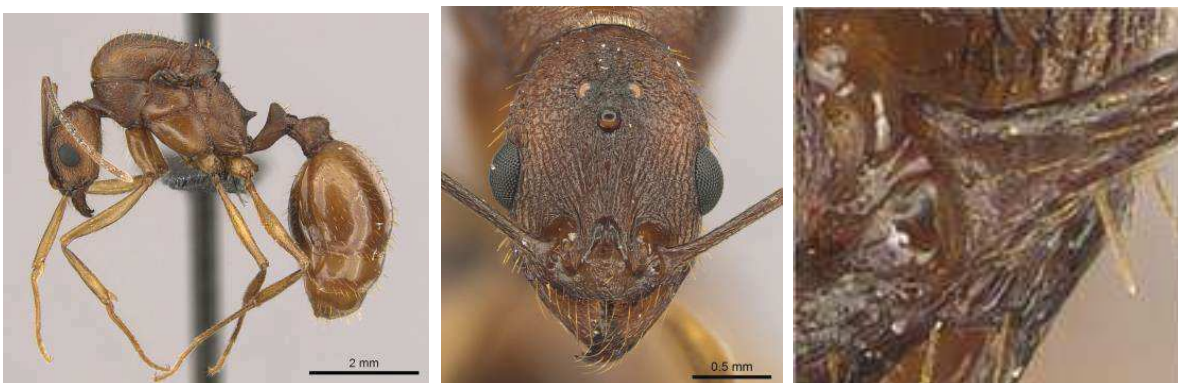


Fig. 218. Hembra de *A. huachucana* vista del lado, cabeza y base del lobo del escapo (de AntWeb, fotografía de Zach Lieberman).

- 18(16).** Marrón oscuro (Fig. 219, izquierda) *picea* (Emery)
 - Marrón ferruginoso (Fig. 219, derecha) o marrón amarillento (Fig. 222), gáster puede ser más oscuro **19**

*picea**miamiama*

Fig. 219. Reina de *A. picea* y de *A. miamiama* (Fotografía de AntWeb, April Nobile).

- 19(18).** Gáster casi el mismo color que el mesosoma; común **20**
 - Gáster marrón oscuro por lo general (Fig. 219, derecha); raramente colectada *miamiana* Wheeler

20(19). Escapo antenal con base ampliada como campana, el diámetro aproximadamente doble del escapo ligeramente distal (Fig. 220); no común, Mississippi, Louisiana, Florida, EUA **21**

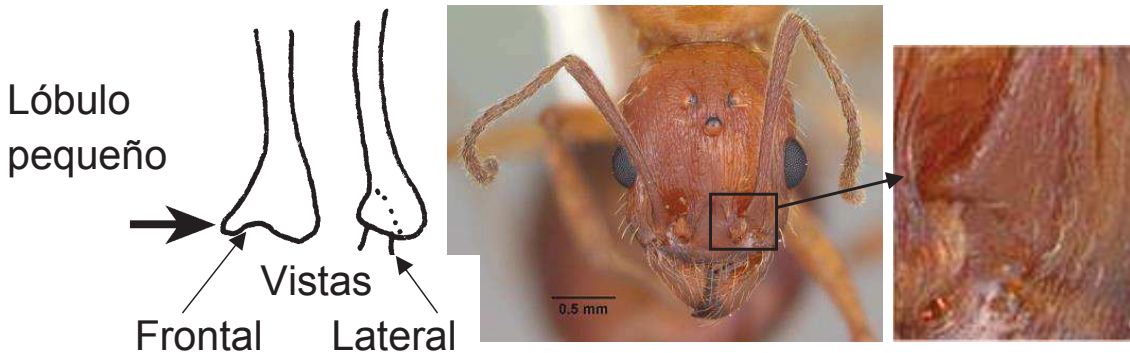


Fig. 220. Base del escapo de una obrera de *A. floridana*, vista de frente y de lado, mostrando el lóbulo pequeño en forma de campana.

- Base del escapo aproximadamente 1,5 X o menor a diámetro del área adyacente (Fig. 217); sobre todo en el este de EUA, pero también se encuentra en Florida **22**

21(20). Primer tergito gastral liso y brillante, al menos en sentido posterior; este y sudeste de EUA ***flemingi* M. Smith**

- Primer tergito gastral completamente punteado; sureste de EUA ***floridana* M. Smith**

22(20). Espinas propodeales muy largas (0,33 mm) y robustas (Fig. 221); escultura en el escudo muy fuerte, con alrededor de 15 arrugas en toda la superficie dorsal; el este de EUA *mariae* Forel

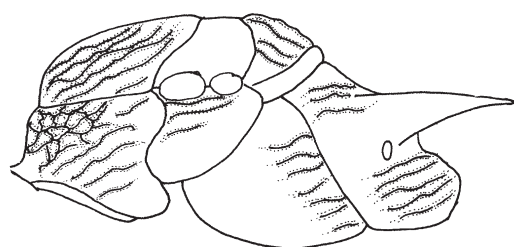


Fig. 221. Mesosoma y espinas propodeales de una hembra de *A. mariae* (Colebrook, Connecticut, MCZC). La fotografía es de AntWeb, April Nobile.

- Espinas propodeales más cortas (hasta 0,28 mm) y delgadas; (Fig. 222); escultura en el escudo más fina, que consiste de al menos 20 estrías sobre la superficie dorsal **23**

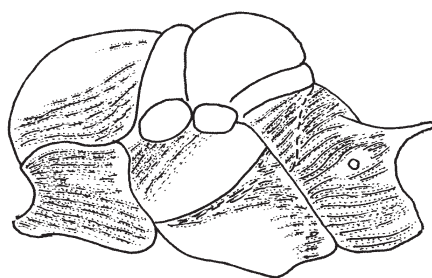


Fig. 222. Mesosoma y espinas propodeales de una hembra de *A. rudis* (Livingston, Michigan, EUA, MCZC). Usualmente la reina de *A. rudis* es de un color más oscuro.

23(22). Marrón rojizo (Fig. 221) o marrón oscuro; común **24**
 - Amarillento o marrón amarillento (Fig. 222); no común, el este de EUA *carolinensis* Wheeler

24(23). Estrías en el escudo casi paralelas posteriormente, sobre todo áreas lisas entre las estrías (Fig. 223, izquierda); katapisterno casi completamente liso y brillante (Fig. 222); comunes, en su mayoría del este EUA *rudis* (Emery)

- Estrías en el área medial del escudo convergentes posteriormente, áreas entre las estrías granuladas (Fig. 223, derecha); katapisterno ligeramente rugoso anteriormente, con estrías horizontales posteriormente; noreste y área central de México *reticulaticeps* Mackay

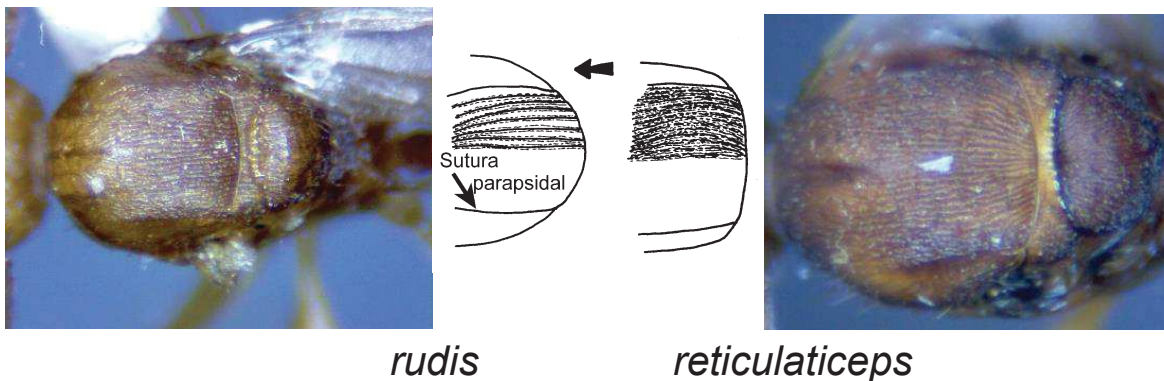


Fig. 223. Escudos de hembras de *A. rudis* (Condado de Marshall, Alabama, EUA, CWEM) y de *A. reticulaticeps* (paratipo). La flecha señala la parte anterior.

Clave para las especies del complejo *subterranea*: machos

1. Propodeo con espinas pequeñas (Fig. 224), pero distintas, o ángulos de punta afilada; EUA 2



Fig. 224. Propodeo y pecíolo de un macho de *A. floridana* (Condado de Levy, Florida, EUA, CWEM).

- Propodeo con un máximo de protuberancias gruesas o ángulos ampliamente redondeados (Fig. 225); extensamente distribuida, incluyendo México 5

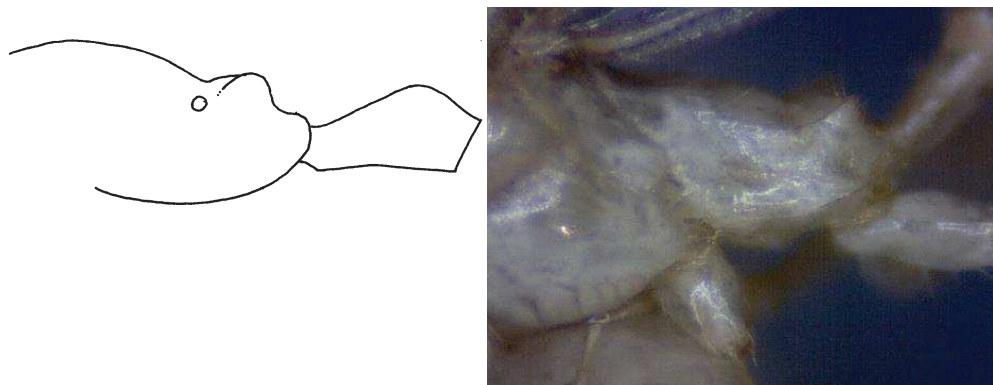


Fig. 225. Propodeo y pecíolo de un macho de *A. megommata* (Condado de San Bernardino, California, EUA, CWEM).

- 2(1). Katepisterno estriado horizontalmente (Fig. 226); el este de EUA y el sudeste de Canadá ... especímenes raros de *tennesseensis* Mayr
- Katepisterno liso y brillante (Fig. 225) 3

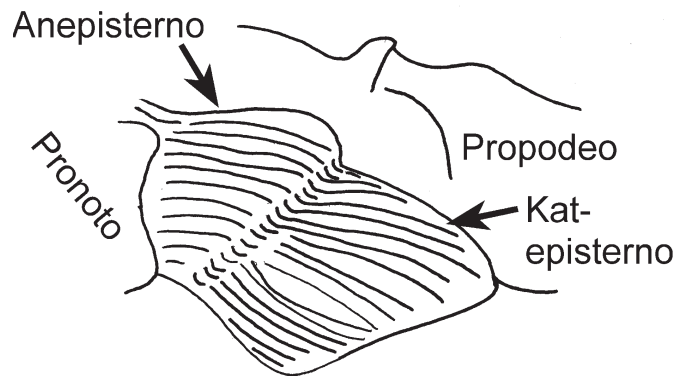


Fig. 226. Katepisterno de un macho de *A. tennesseensis* (Condado de Jefferson, Indiana, EUA, CWEM).

- 3(2). Base del escapo ligeramente ancho (Fig. 227, izquierda); espinas propodeales delgadas, más largas que la distancia entre las bases; el este de EUA especímenes muy raros de *treatae* Forel
 - Base del escapo no ancho (Fig. 227, centro, derecha); espinas propodeales en forma de ángulos o espinas pequeños 4

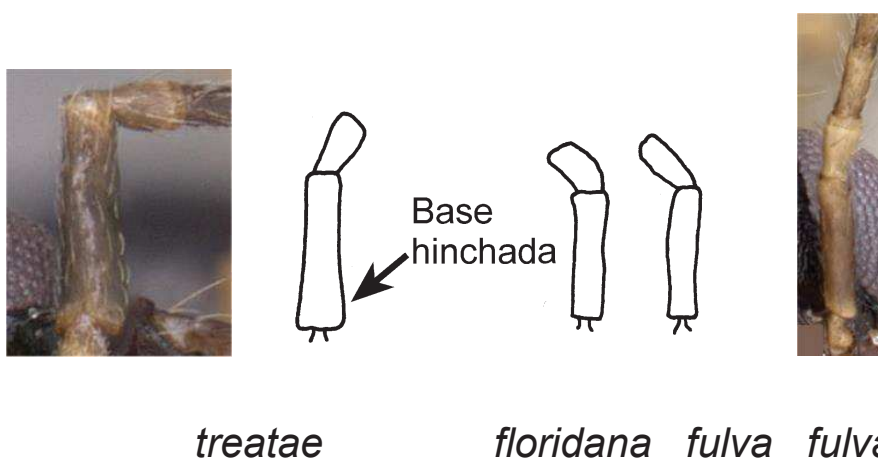


Fig. 227. Escapos de machos de *A. treatae* (Condado de Wade, North Carolina, EUA, CWEM), *A. floridana* (Condado de Levy, Florida, EUA, CWEM) y *A. fulva* (Condado de Buncombe, North Carolina, EUA, CWEM) (de AntWeb, fotografía de April Nobile).

- 4(3). Dorso del pecíolo ampliamente redondeado (Fig. 228, izquierda); marrón oscuro; el sudeste de EUA ***floridana* M. Smith**
 - Dorso del pecíolo algo angulado (Fig. 228, derecha); marrón medio; sobre todo el este de EUA ... especímenes raros de ***rudis* (Emery)**

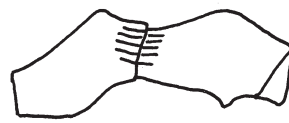
*floridana**rudis*

Fig. 228. Pecíolo de un macho de *A. floridana* y de *A. rudis*.

- 5(1). Parte media anterior del dorsopropodeo sólo ligeramente superior a la mitad posterior (Fig. 229), la superficie casi horizontal **6**
 - La mitad anterior del dorsopropodeo más elevado que la mitad posterior, inclinado hacia arriba para el metanoto (Fig. 237) **7**

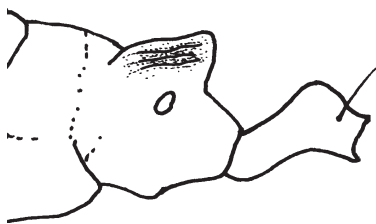


Fig. 229. Propodeo de un macho de *A. fulva* (West Virginia, EUA, MCZC) (de AntWeb, fotografía de April Nobile).

- 6(5). De color amarillo pálido (Fig. 225); el suroeste de EUA
 *megommata* Smith
 - Marrón oscuro (Fig. 230), el noreste de México
 *montana* Mackay
- 7(5) Borde superior de la fusión del tórulo/lóbulo frontal con proceso triangular que aparece como pequeño ángulo en vista frontal (Fig. 230, difícil de ver); sobre todo el este de EUA *lamellidens* Mayr

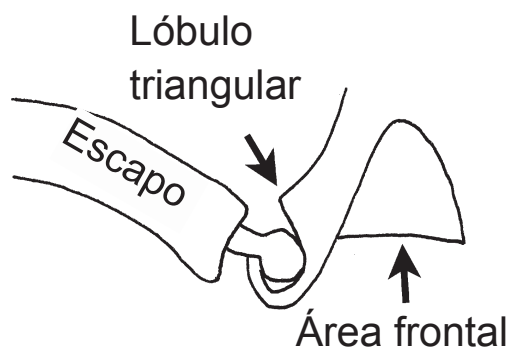


Fig. 230. Lóbulo triangular en el tórulo/lóbulo frontal y la base del escapo de un macho de *A. lamellidens* (Condado de Prince William, Virginia, EUA, CWEM). La fotografía es de AntWeb, de April Nobile.

- Borde superior del tórulo/ lóbulo frontal sin ángulo pequeño (Fig. 231) 8

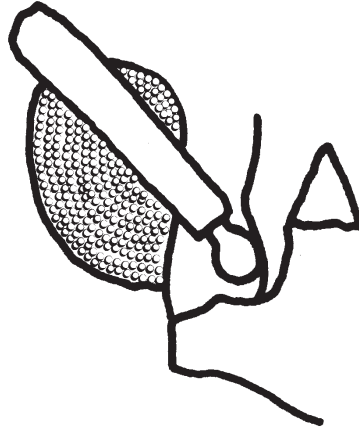


Fig. 231. Carina frontal y la base del escapo de un macho de *A. tennesseensis* (Condado de Jefferson, Indiana, EUA, CWEM).

- 8(7).** Dorso del escudo (esclerito detrás del pronoto) esculpado por completo (Fig. 232), a veces débilmente brillante, medialmente y lateralmente **9**
- Dorso del escudo esculpado débilmente, o esculpado solo posteriormente, mitad anterior o más, parcialmente lisa y brillante (Fig. 232, izquierda) **12**

9(8). Mesopleuron (anepisterno + katepisterno) con estrías oblicua-mente (Fig. 226); dorso del escudo con pocas estrías en su mayoría lon-gitudinal (Fig. 232, derecha); sobre todo el este de EUA y el este de Ca-nadá *tennesseensis* Mayr

- Mesopleuron en su mayoría liso y brillante (Fig. 229), a veces estriado posteriormente o en el katepisterno; dorso del escudo puntiforme o granulado (Fig. 232, izquierda); el este de EUA y el este de Canadá **10**

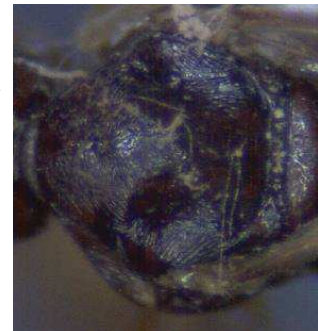
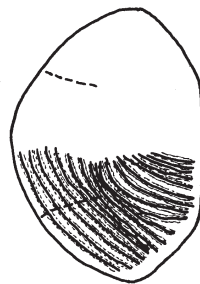
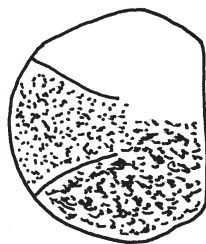
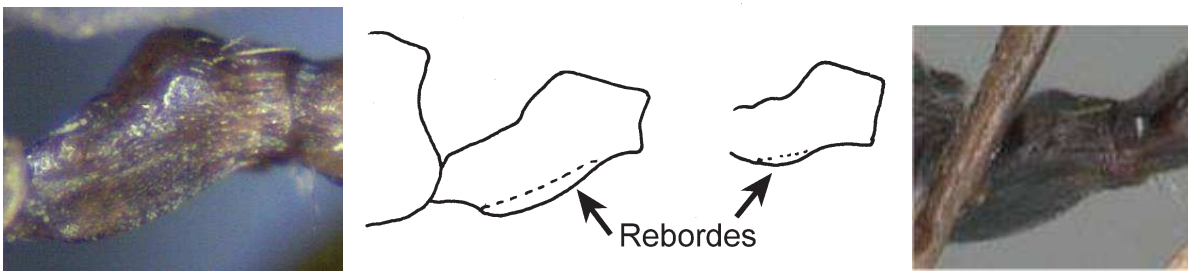
*treatae**tennesseensis*

Fig. 232. Escudos de machos de *A. treatae* y *A. tennesseensis*.

- 10(9).** Área esternopetiolar con fuerte reborde o brida ventral bien desarrollado (Fig. 233, izquierda); Noreste de México *reticulaticeps* Mackay
- Área esternopetiolar sin reborde ventral o con reborde poco desarrollado (Fig. 233, derecha); sobre todo el este de EUA, el sureste de Canadá, no han sido reportadas en México **11**



reticulaticeps

treatae

Fig. 233. Los rebordes de áreas esternopetiolares de machos de *A. reticulaticeps* (paratipo) y *A. treatae* (Condado de Wade, North Carolina, EUA, CWEM). La fotografía es de AntWeb, de April Nobile.

- 11(10).** Base del escapo se amplía ligeramente, formando ocasionalmente un leve lóbulo Fig. 227, izquierda) *treatae* Forel
- Base del escapo no se amplía, no forma lóbulo (Fig. 227, derecha) *fulva* Roger

- 12(8).** La mitad anterior del escudo usualmente finamente esculpurada, parcialmente lisa y brillante, mitad posterior densamente, pero finamente punteada o estriada (Fig. 234) **13**
 - Escudo en su mayoría o totalmente liso y brillante (Fig. 235) ...
 **16**

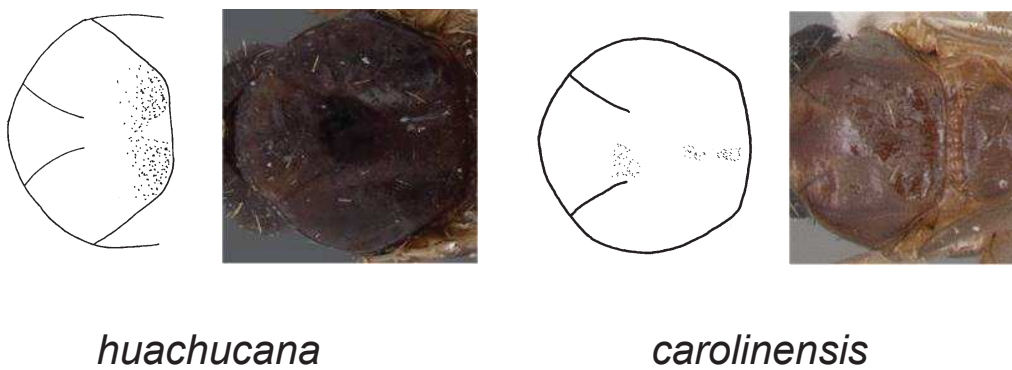


Fig. 234. Escudos de machos de *A. huachucana* y *A. carolinensis*.

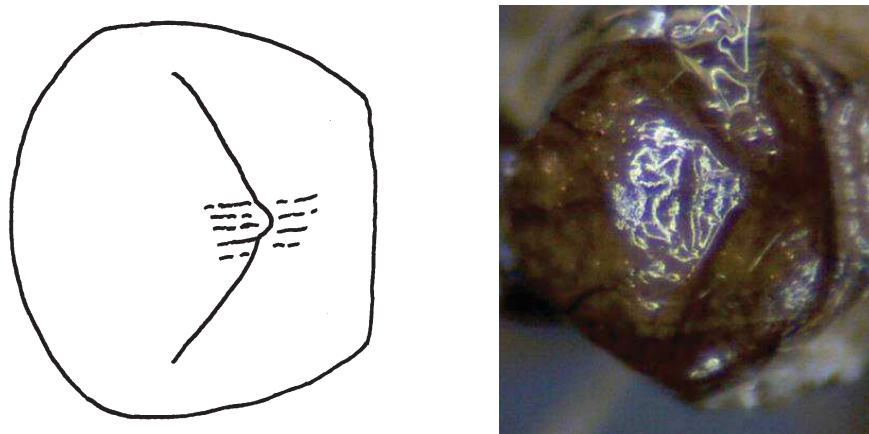


Fig. 235. Escudo de un macho de *A. picea* (Condado de Richland, Ohio EUA, CWEM).

13(12). Al menos la mitad anterior de katepisterno finamente esculturado (Fig. 236, izquierda), con mezcla de punturaciones y textura coriácea, brillante; el oeste de EUA ***huachucana* Creighton**
 - Casi la totalidad del katepisterno liso y brillante (Fig. 236, derecha); sobre todo el este de EUA y el este de México **14**

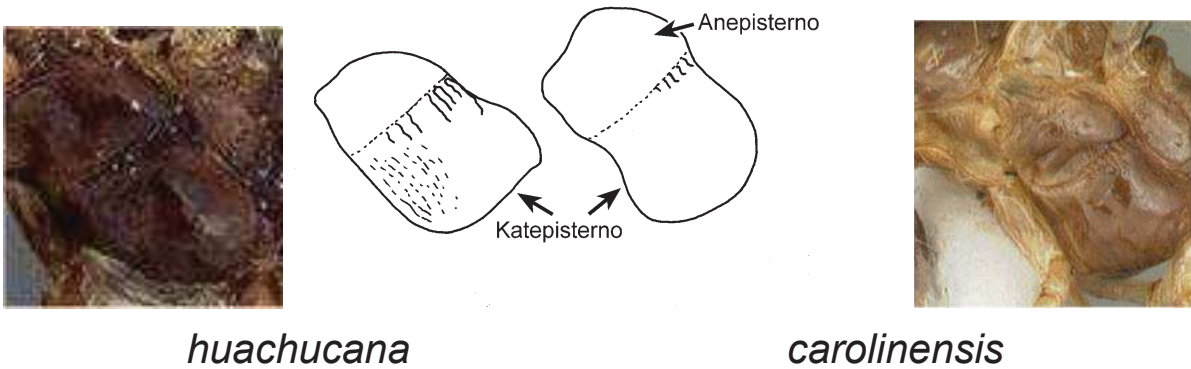


Fig. 236. Mesopleurones de machos de *A. huachucana* (Condado de Cochise, Arizona, EUA, CWEM) y *A. carolinensis* (Condado de McMinn, Tennessee, EUA, CWEM) (Fotografías de AntWeb, de Gracén Brilmyer).

- 14(13).** Propodeo débilmente angulado entre las caras (Fig. 237, izquierda); el este de EUA (hacia al oeste hasta el este de Texas) *carolinensis* Wheeler
 - Propodeo con ángulo definido o proceso entre las caras; (Fig. 237, derecha); el sureste de EUA y el noreste de México **15**

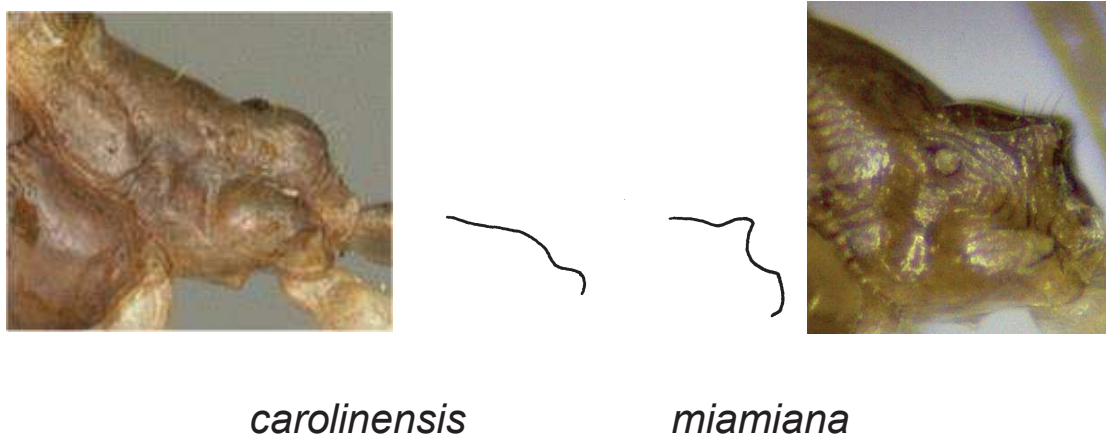


Fig. 237. Ángulos propodeales de machos de *A. carolinensis* (Condado de McMinn, Tennessee, EUA, CWEM) y *A. miamiana* (Condado de Hempstead, Arkansas, EUA, CWEM).

- 15(14).** Marrón oscuro (Fig. 236, izquierda) ; longitud total \approx 5 mm; Noreste de México *reticulaticeps* Mackay
 - Marrón medio (Fig. 236, derecha) a marrón oscuro; LT \approx 3,5 - 4,0 mm; sureste de EUA, el noreste de México *miamiana* Wheeler
- 16(12).** Marrón oscuro a negro (Fig. 238) **17**
 - Marrón medio a marrón pálido (Fig. 237) **21**

17(16). Protuberancias propodeales fuertemente anguladas (Fig. 238), a veces casi formando dientes o procesos fuertemente truncados (Fig. 239); oeste de EUA y suroeste de Canadá *occidentalis* (Emery)

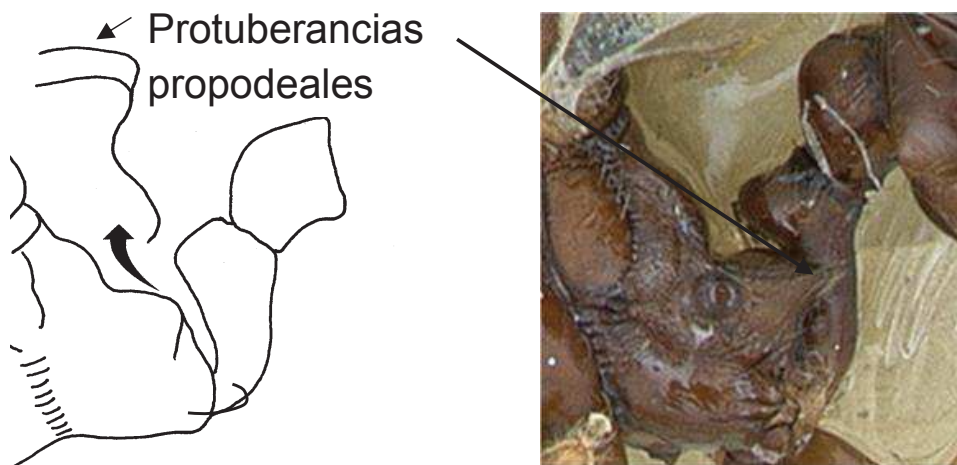


Fig. 238. Propodeo y protuberancias propodeales (visto oblicuamente desde el lado en el recuadro) de un macho de *A. occidentalis*.



Fig. 239. Las variaciones en los procesos propodeales dentro de una serie de machos de *A. occidentalis* (Condado de Fallon, Montana, EUA, CWEM).

- Protuberancias propodeales redondeadas posteriormente (Fig. 240) **18**

18(17). Escutelo sobresale fuertemente (Fig. 240); protuberancia propodeal poco desarrollada (Fig. 240) **19**

Escutelo

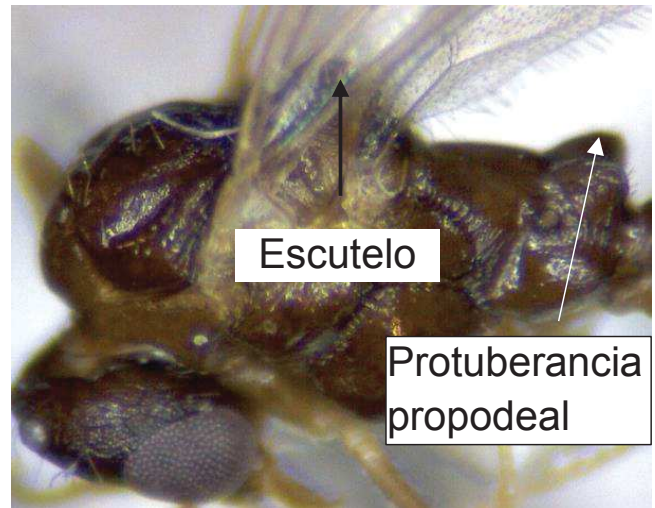
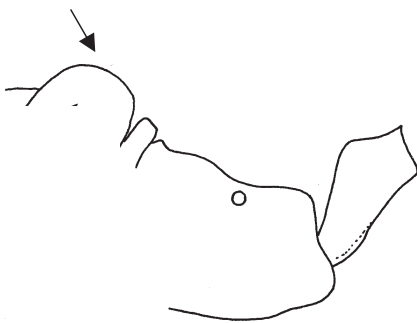


Fig. 240. Parte de la mesosoma y pecíolo de un macho de *A. fulva* (Condado de Tuscaloosa, Alabama, EUA, CWEM).

- Escutelo débilmente saliente (Fig. 241); protuberancias propodeales más desarrolladas (Fig. 241) **20**

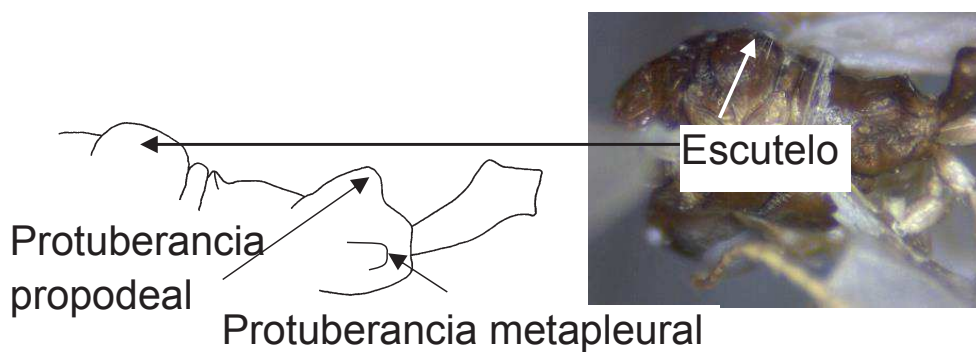


Fig. 241. Dorso del mesosoma de un macho de *A. picea*.

- 19(18).** Escudo con estrías longitudinales oblicuas lateralmente desde los notaulos (Fig. 242, izquierda); la mitad oriental de EUA *fulva* Roger
 - Escudo sin estrías, punteado o parcialmente brillante (Fig. 242, derecha); sobre todo la mitad occidental de EUA *texana* Wheeler

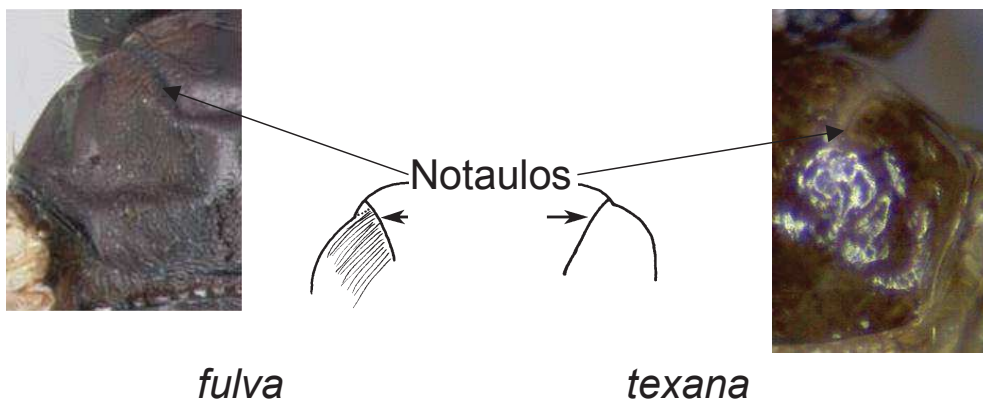


Fig. 242. Escudos de machos de *A. fulva* (Condado de Buncombe, North Carolina, EUA, CWEM) y *A. texana* (Condado de Tutus, Texas, EUA, CWEM) (Fotografías de AntWeb).

- 20(18).** Escudo casi completamente liso y brillante (Fig. 242, derecha); protuberancia metapleurale redondeada posteriormente (Fig. 241); común en el este de EUA *picea* (Emery)
 - Escudo brillante anteriormente y punteado posteriormente (Fig. 234, izquierda); protuberancia cerca glándula metapleurale bien desarrollada, puntiaguda en sentido posterior (Fig. 243); islas cerca de Baja California, México *patruelis* Forel

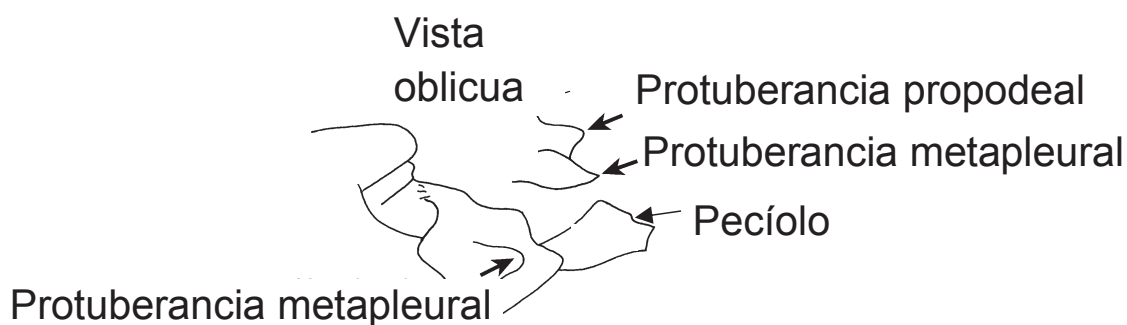


Fig. 243. Propodeo y pecíolo de un macho de *A. patruelis* (Isla Guadalupe, México, topotipo, MCZC). El recuadro muestra una vista oblicua desde el lado y arriba.

21(16). Relativamente grande, por lo general una Longitud Total superior a 4 mm; rara vez colectada en el oeste de EUA *uinta* Wheeler
 - Relativamente pequeño, LT menor a 3,7 mm; distribuida ampliamente **22**

22(21). Escapo relativamente corto (0,23 mm), longitud casi tan larga como los dos primeros artejos funiculares combinados; rara vez encontrada, pero ampliamente distribuida en su mayoría en el este de EUA *mariae* Forel
 - Escapo más longitud (0,28 mm), longitud notablemente más que la longitud combinada de los dos primeros artejos funiculares; común ...
 **23**

- 23(22).** Dientes en el borde inferior del edeago bien desarrollados, casi tan largos como la distancia entre los dientes (Fig. 244, izquierda); sobre todo al este de EUA *rudis* (Emery)
 - Dientes en el borde inferior del edeago poco desarrollados, simplemente dentículos (Fig. 244, derecha); más que todo del suroeste de EUA *texana* Wheeler

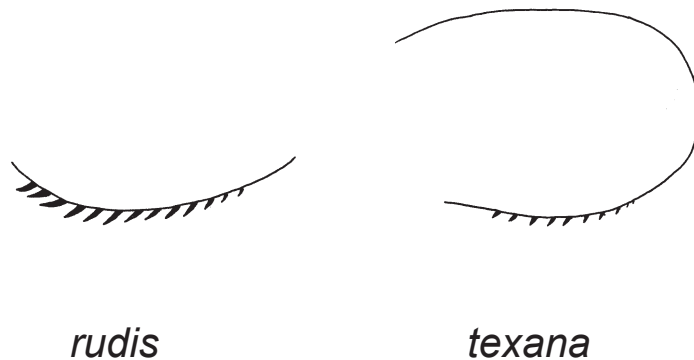


Fig. 244. Edeagos de machos de *A. rudis* (Condado de Barrow, Georgia, EUA, CWEM) y *A. texana* (Condado de Titus, Texas, EUA, CWEM).

LIST OF SPECIES

araneoides, *Aphaenogaster* 202 *phalangium* complex
Compare with *ensifera*, *phalangium*

***Aphaenogaster araneoides* Emery**

Worker Figs. 6, 34 (head), 35 (head from side), 31 (propodeum), 36 (dorsum of gaster), 245 (mesosoma).

Male Figs. 9, 246 (head), 38 (femur), 39 (antenna), 246 (side view).

Map 1.

Plates 1 (worker).

Aphaenogaster araneoides Emery, 1890:48, Plate 5, Fig. f8, ♀, Costa Rica: Alajuela [Longino and Cover, 2004 state true type locality Jiménez] [lectotype seen, designated by Longino]; also described as new by Emery, 1894:54; Borgmeier, 1949: 206 ♂; Longino and Cover, 2004:4 dealate ♀; Mackay and Dash, 2016; *Aphaenogaster* (*Ischnomyrmex*) *araneoides*: Forel, 1899:60; *Stenammas araneoides*: Forel, 1907:4; *Aphaenogaster* (*Deromyrma*) *araneoides*: Emery, 1915:71

Diagnoses:

Worker. The worker of this species is easily recognized, as the posterior part of the head is narrowed into a slender, constricted neck. The head is mostly punctate, with a few scattered striae. The mesonotum is raised into a bump, and the notopropodeal suture is depressed below the level of the remainder of the mesosoma. The region between the two faces of the

araneoides - Central America

Nests in and under rotten logs

Wet tropical forest

Compare with *brevicollis*, *phalangium*; *Novomessor ensifera*

propodeum is rounded, with little evidence of tubercles or spines. The first tergum of the gaster is completely punctate, and is generally only weakly shining.

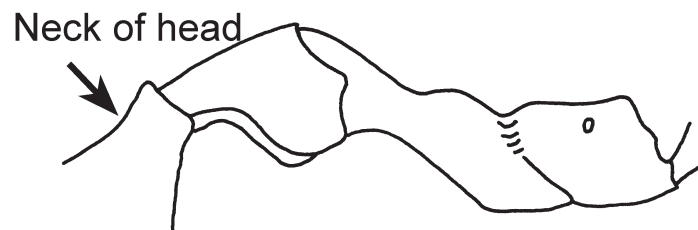


Fig. 245. Mesosoma of a worker of *A. araneoides* (La Selva, Costa Rica).

Female. Longino and Cover (2004) briefly characterize the wingless ergatoid female. Winged “normal” females apparently do not exist (McGlynn et al., 2003).

Male. The mandible has 11-12 well developed teeth, decreasing in size from the apex. The eyes are very large, occupying most of the sides of the head; the ocelli are also very large (0.18 mm maximum diameter) and are separated by less than one minimum diameter. The narrowed neck of the head is well developed as in the worker. The mesosoma has the same shape as in the males of the other species in this complex, with a narrow propodeum and without propodeal angles or processes. All surfaces except for the gaster are dull and finely punctate, except for the side of the

araneoides - Central America

Nests in and under rotten logs

Wet tropical forest

Compare with *brevicollis*, *phalangium*; *Novomessor ensifera*

mesosoma, which is also covered with poorly defined striae. The gaster is smooth and glossy. The entire ant is ferrugineous red.

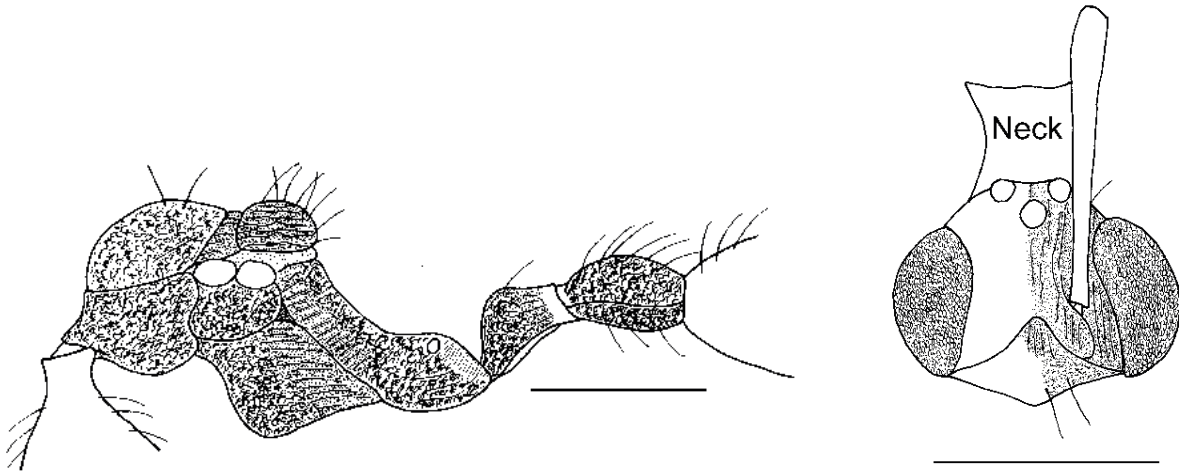


Fig. 246. Mesosoma and head of a male of *A. araneoides* (Bataan, Costa Rica, MCZC).

Comparison:

The worker of this species is very similar to that of *A. phalangium*, but can be generally separated as the first tergum of the gaster is punctate, not mostly smooth and glossy as in *A. phalangium*. Additionally, the punctate head would separate it from *A. phalangium*, in which the head is mostly covered with striate and granulated sculpture. The neck is more constricted and narrowed than that of *A. brevicollis*.

It can be separated from the Mexican *Novomessor ensifer*, in which the neck is also narrowed, by the well-marked notopropodeal suture, and the

araneoides - Central America
Nests in and under rotten logs
Wet tropical forest

Compare with *brevicollis*, *phalangium*; *Novomessor ensifera*

lack of propodeal spines (which are well-developed in *N. ensifer*). The lack of propodeal spines would also separate it from the Mexican *A. mexicana*.

The male is nearly identical to that of *A. phalangium*, but can be separated by the form of the antenna: the third segment of the antenna is only slightly larger than the fourth segment. In *A. phalangium* the third segment is nearly twice as long as the fourth segment.

Distribution:

EL SALVADOR: 2 - 4 k S Quezaltepeque. **HONDURAS:** Cortés, Lago Yojoa. **NICARAGUA:** San Juan & Sarapaquai Rivers [10°42'N 58°W]. **COSTA RICA:** **Alajuela**, Río Peñas Blancas (CWEM); **Cartago**, Turrialba, vicinity of Guápiles (CWEM); **Heredia**, Corcovado National Park, La Selva, 6 k W Puerto Viejo, La Selva (CASC); **Limón**, Bataan; **Puntarenas**, Fila Cruces, Monteverde, 6 k S Monteverde. **PANAMA:** **Bocas del Toro** (CWEM); **Panamá**, Canal Zone, Fort Sherman. **COLOMBIA:** unknown locality (based on males).

araneoides - Central America

Nests in and under rotten logs

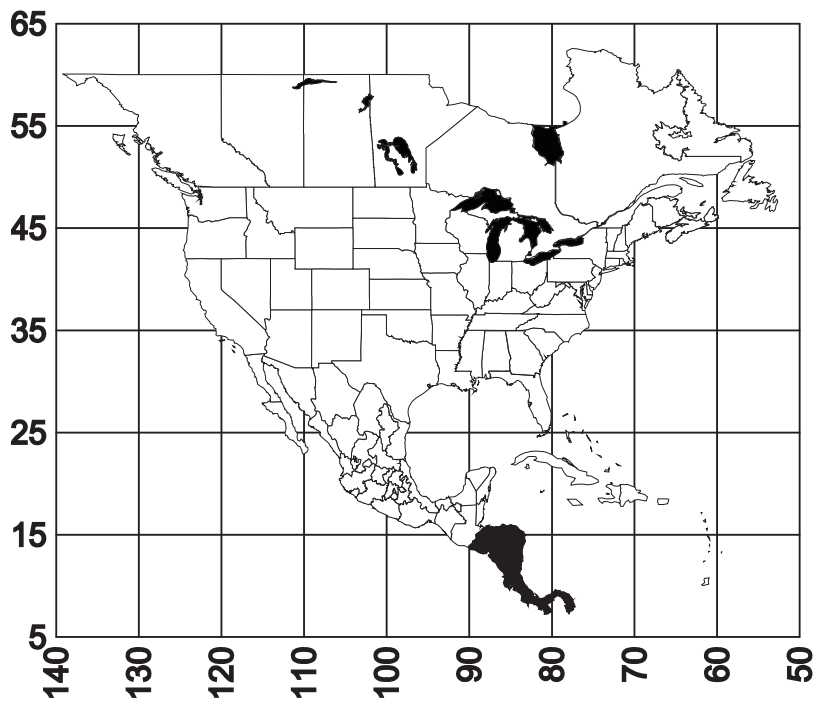
Wet tropical forest

araneoides, *Aphaenogaster*

206

phalangium complex

Compare with *brevicollis*, *phalangium*; *Novomessor ensifera*



Map 1. *Aphaenogaster araneoides*.

Habitat:

Lowland rain forest, wet-tropical rain forest, up into tropical wet, montane forest.

Biology:

Aphaenogaster araneoides nests in and under rotten logs in tropical forests. One nest was collected in a twig.

araneoides - Central America
Nests in and under rotten logs
Wet tropical forest

Compare with *brevicollis*, *phalangium*; *Novomessor ensifera*

Workers forage diurnally and nocturnally. They are apparently carnivores, as foragers have been collected in traps baited with Vienna sausage, fish, chicken parts, and a dead snake. They forage on the ground and up into the vegetation.

Brood were present in nests in July and August. Most workers were collected as loose foragers, or in leaf litter samples.

These ants are found in clay and loam soils, ranging in color from brown to dark brown.

araneoides - Central America
Nests in and under rotten logs
Wet tropical forest

Compare with *treatae*

***Aphaenogaster ashmeadi* (Emery)**

Worker Figs. 76 (propodeum), 83 (base of scape), 247 (mesosoma), 247 (head).

Female Figs. 248 (side view), 248 (head).

Map 2.

Plate 2 (worker).

Stenammas (*Aphaenogaster*) *treatae* var. *ashmeadi* Emery, 1895:302 ♀, USA: Florida; *Aphaenogaster ashmeadi*: Wheeler, 1913:114; *Aphaenogaster* (*Attomyrma*) *treatae* var. *ashmeadi*: Emery, 1921:60
Aphaenogaster treatae hardeni Wheeler, 1919:50, ♀ (Creighton, 1950:142) [3 cotypes seen, MCZC]

Diagnoses:

Worker. The scape of the worker is widened at the base, but the widened region is very short. The clypeus has a number of poorly defined carinae, and the entire dorsum of the head is covered with a granular-rugose sculpturing. The entire mesosoma is sculptured, mostly with punctures, and is only weakly shining. The propodeal spines are relatively short, their length is less than that of the posteropropodeum.

ashmeadi - Eastern United States

Nests in soil

Hardwood and pine forests

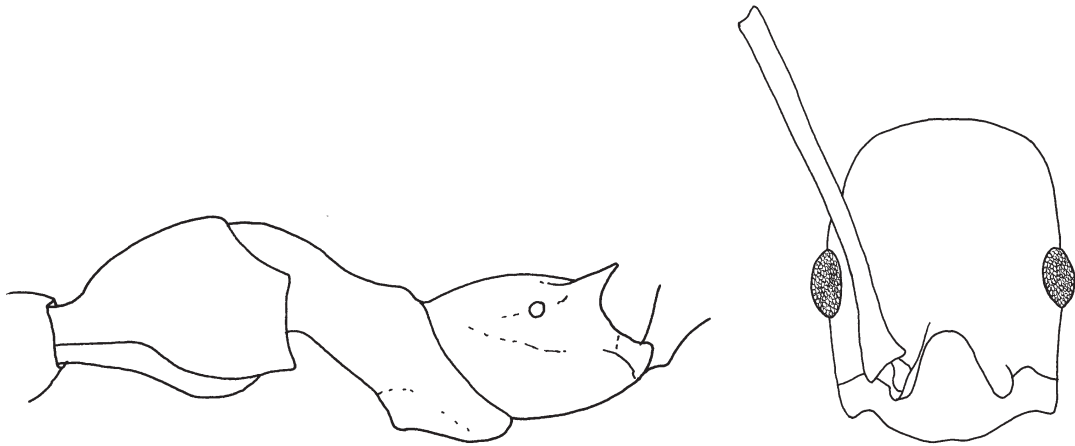
Compare with *treatae*

Fig. 247. Mesosoma and head of a worker of *A. ashmeadi* (Citrus Co., Florida, MCZC).

Female (previously undescribed). The female is dark ferrugineous red with a predominantly black gaster. The total length is 7.13 mm. The head length is 1.73 mm, the head width is 1.28 mm. The scape is 1.78 mm in length, and extends past the posterior lateral corner of the head by the first 2 funicular segments. The base of the scape is modified into a distinct lobe, which is not as long as the maximum diameter of the eye. The scutum is nearly completely covered with longitudinal striae, the pronotum has similar striae, the mesopleuron is partially smooth and shiny, although there is weak evidence of striae across many of the smooth sections. The propodeal spine is well-developed (0.3 mm in length) and slightly curved inward when viewed from above.

ashmeadi - Eastern United States

Nests in soil

Hardwood and pine forests

Compare with *treatae*

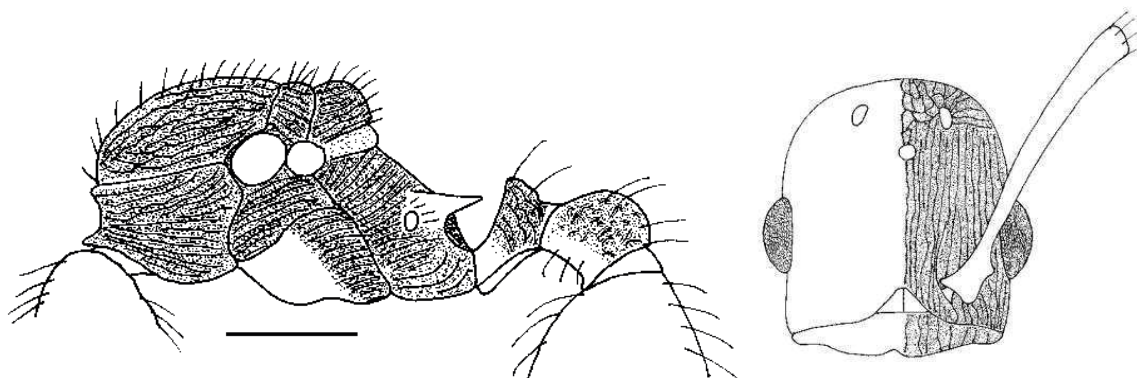


Fig. 248. Mesosoma and head of a female of *A. ashmeadi* (Citrus Co., Florida, MCZC).

Male. Unknown.

Comparison:

The worker is one of the two species which have a large lobe at the base of the antennal scape. It can be easily separated from the other species, *A. treatae*, as the lobe is only approximately as long as the greatest diameter of the eye, not twice as long as in *A. treatae*.

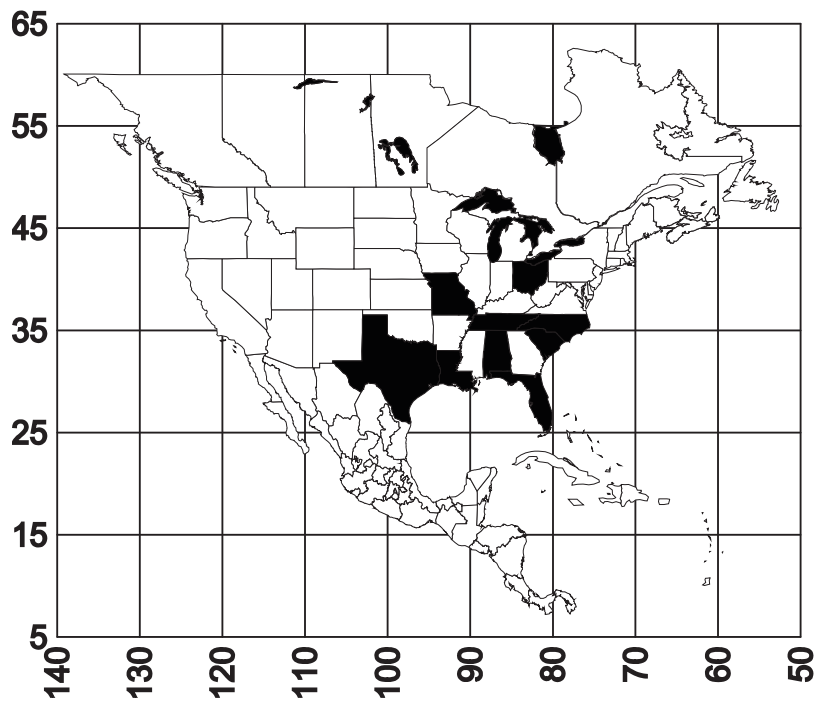
The female could also be confused with that of *A. treatae*, as both species have large lobes at the bases of the scapes. They can usually be separated as the lobe is shorter than the maximum length of the eye in *A. ashmeadi*, and longer than the greatest eye length in *A. treatae*.

ashmeadi - Eastern United States

Nests in soil

Hardwood and pine forests

Compare with *treatae*



Map 2. *Aphaenogaster ashmeadi*.

Distribution:

USA: **Alabama** (CWEM); **Florida**, Alachua, Citrus, Columbia, Gilchrist, Hernando, Marin, Santa Rosa Cos., Highlands Co., northern Florida (Lubertazzi and Tschinkel, 2003); **Louisiana** (Dash, 2004; Dash and Hooper-Bùi, 2008); **North Carolina** (Guénard et al., 2012, 2015); **Ohio** (Coovert, 2005); **South Carolina** (Davis, 2009; Resasco et al, 2014); **Tennessee** (Smith, 1979); **Missouri** (Smith, 1979); **Texas** (Smith, 1979).

ashmeadi - Eastern United States

Nests in soil

Hardwood and pine forests

Compare with *treatae*

Habitat:

Sand pine, oak scrub, live oak, laurel oak. It tolerates disturbed conditions.

We found *A. ashmeadi* in mixed hardwoods and longleaf-pine savannas. Dash (2004) found it in the following ecoregions: east gulf-coastal plain longleaf-pine forest, and west gulf-coastal plain longleaf-pine forest. It also occurs in urban habitats (Guénard et al, 2015).

Biology:

Aphaenogaster ashmeadi nests in sandy soil, with the nest entrance normally camouflaged, or located under objects, such as stones or pieces of wood.

Aphaenogaster ashmeadi is an opportunist species (Chen et al., 2015) and is among the larger slower ants (in terms of body length moved per second) in the Apalachicola National Forest of Florida (Mason et al., 2015). Workers forage into soybean fields from the turkey oak and mesophilic woods (Whitcomb et al., 1972).

We collected workers at cat food baits; Dash (2004) collected them in pitfall traps and in bait vials.

Tschinkel (2011) studied the nest architecture of *A. ashmeadi*. Nests were less well defined than those of *A. floridana*, and *A. treatae*. Chambers were small and often not well differentiated from the main shaft, which was sometimes vertical and sometimes inclined. The nests were

ashmeadi - Eastern United States

Nests in soil

Hardwood and pine forests

subterranea complex

213

Aphaenogaster ashmeadi

Compare with *treatae*

smaller than in the other two species (above), with an average depth of 14 cms., and a mean of 137 workers (34 - 300).

ashmeadi - Eastern United States

Nests in soil

Hardwood and pine forests

boulderensis, *Aphaenogaster* 214 *subterranea* complex
Compare with *carbonaria*, *floridana*, *huachucana*, *megommata*,
montana, *mutica*, *smithi*

***Aphaenogaster boulderensis* M. Smith**

Worker Figs. 77 (head from the side), 80, (postpetiole from above), 81 (base of scape), 79, 249 (side view), 82 (metasternal process), 249 (side view).

Female Figs. 112, 250 (head), 250 (side view).

Map 3.

Plate 3 (worker).

Aphaenogaster (Attomyrma) boulderensis Smith, 1941:120 ♀, USA: Arizona, Boulder Dam (Horseshoe island, Mead Lake) (2 paratype ♀ CASC, MCZC [both seen])

Diagnoses:

Worker. The workers lack propodeal spines, although small angles may be present. The carinae on the clypeus are poorly developed, although a median carina is usually present. The head is elongate, and narrowed posteriorly. The eyes are relatively small, the maximum diameter is less than is the distance between the anterior border of the eye and insertion of the mandibles. The dorsum of the head is densely, but finely punctate, and partially smooth and shining. The mesosoma has similar

boulderensis - SW USA
In soil and rock cracks
Desert canyons

Compare with *carbonaria*, *floridana*, *huachucana*, *megommata*,
montana, *mutica*, *smithi*

sculpture, but most of the propodeum is relatively smooth and glossy. The sculpture and pilosity are similar to those of *A. smithi*.

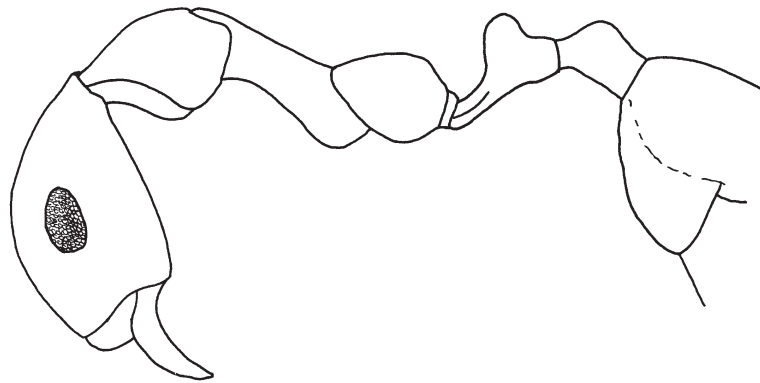


Fig. 249. Head, mesosoma, petiole, postpetiole and gaster of a paratype worker of *A. boulderensis*.

Female (previously undescribed). The female is a moderately large (total length 8 mm) pale brown specimen. The mandibles have eight teeth; the anterior border of clypeus is concave medially; the base of the scape has an outwardly directed small lobe; the eyes are large and occupy approximately $\frac{1}{3}$ of the head length, the ocelli are large, separated by approximately one diameter; the scape is relatively long, surpassing the posterior border of the head by about $2\frac{1}{2}$ funicular segments. The scutum is mostly smooth, with fine coriaceous sculpture, the scutellum is similar, with fine punctures, the side of the pronotum is weakly shining, the ane-

boulderensis - SW USA

In soil and rock cracks

Desert canyons

Compare with *carbonaria*, *floridana*, *huachucana*, *megommata*,
montana, *mutica*, *smithi*

pisternum it is mostly shiny, with fine sculpture posteriorly, the katepisternum is smooth and glossy, with fine sculpturing along the anterior edge, near the anapleural suture, and posteriorly; the metanotum extends slightly past the scutellum (in profile); the propodeum is rugose, with transverse rugae on the anterior part of the dorsopropodeum, the propodeal spines are well-developed, with blunt tips, the petiole, postpetiole, and gaster are similar to other species in the genus.

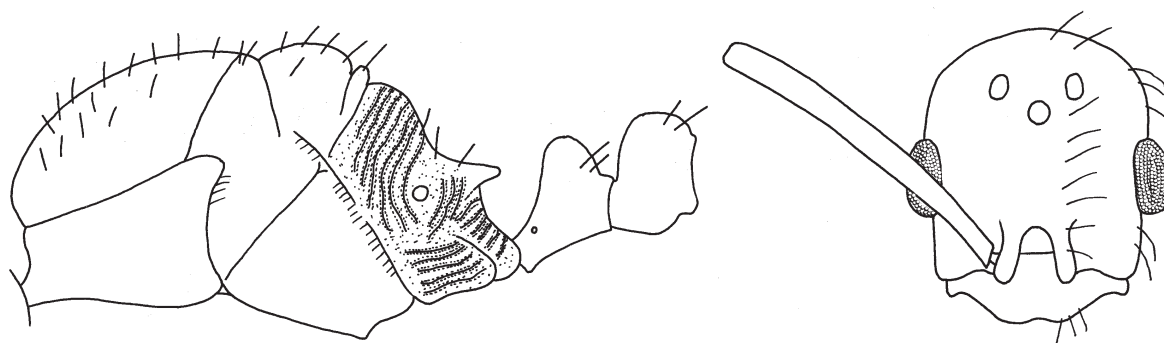


Fig. 250. Mesosoma, petiole, postpetiole and head of a female of *A. boulderensis* (Utah, Washington Co., 8 mi S St. George, LACM).

Erect hairs are abundant on the dorsal and ventral surfaces of the head, sides of the head, the hairs on the scapes are tiny and suberect, erect short (up to 0.2 mm) blunt-tipped hairs are present on the scutum and scutellum, the propodeum has few erect hairs, the petiole and postpetiole have erect hairs pointed posteriorly, all surfaces of the gaster have erect hairs.

boulderensis - SW USA

In soil and rock cracks

Desert canyons

Compare with *carbonaria*, *floridana*, *huachucana*, *megommata*,
montana, *mutica*, *smithi*

Male. Unknown.

Comparison:

The worker of this species could be confused with *A. megommata*. It differs in having a smaller eye, with about fifteen facets in the greatest diameter (20 facets in *A. megommata*), and in having the eye located about 1.5 times the maximum ocular diameter from the insertion of the mandible (side view of head). Additionally, it is ferruginous red, as compared to the pale tan *A. megommata*.

It can be easily separated from *A. smithi*, as the gaster is approximately the same color as the mesosoma, not black as in *A. smithi*. Additionally, many surfaces (especially the head and mesosoma) are shining in *A. boulderensis*, whereas they are dull and opaque in *A. smithi*. The sternopetiolear spine is present, whereas it is absent in *A. smithi*. Finally, the lateral carinae on the clypeus are usually absent in *A. smithi*.

The females of *A. boulderensis* can be easily separated from those of *A. smithi* by the brown gaster, not shiny black as in *A. smithi*. See the discussion of *A. smithi* for more characteristics to separate the females of the two species.

Creighton (1950) stated that both he and Wheeler confused *A. mutica* with *A. boulderensis*, but the two species are clearly distinct. See the discussion of *A. mutica* for a consideration of the differences between these two species.

boulderensis - SW USA

In soil and rock cracks

Desert canyons

boulderensis, *Aphaenogaster* 218 *subterranea* complex
Compare with *carbonaria*, *floridana*, *huachucana*, *megommata*,
montana, *mutica*, *smithi*

Aphaenogaster boulderensis workers are very similar to those of *A. floridana*. They can be easily separated on the basis of the distributions: *A. boulderensis* is from western USA, *A. floridana* from southeastern USA. *Aphaenogaster boulderensis* has a poorly developed, sharp process at the base of the scape, *A. floridana* has a more developed, broadly rounded lobe.

Aphaenogaster boulderensis workers could be confused with the Mexican *A. carbonaria*, as both species lack propodeal spines (and the distributions may overlap in México). They can be easily separated on the basis of color, *A. boulderensis* is light to medium brown, *A. carbonaria* is dark brown. *Aphaenogaster boulderensis* has larger eyes, with about 15 ommatidia in the largest diameter, *C. carbonaria* has smaller eyes with about 11 ommatidia along the greatest diameter.

Finally, it would be possible to confuse *A. boulderensis* workers with those of *A. huachucana*. They can be easily distinguished as the dorsum of the pronotum is smooth in *A. boulderensis* and roughly sculptured in *A. huachucana*.

The female is distinct, and differs from those of most of the others in the genus by the long antennal scape, smooth scutellum, and the elongated metanotum. It can only be confused with the female of *A. montana*. They are easily separated by the distribution (*A. montana* is found in northeastern Mexico) and color (*A. montana* is dark brown).

The female of *A. boulderensis* could be confused with that of *A. smithi*. They can be easily separated by color, as that of *A. smithi* is reddish

boulderensis - SW USA
In soil and rock cracks
Desert canyons

Compare with *carbonaria*, *floridana*, *huachucana*, *megommata*,
montana, *mutica*, *smithi*

brown, with the contrasting black gaster. The dorsum of the head in *A. boulderensis* is relatively weakly sculptured, with fine rugae and very little evidence of reticulation, whereas in *A. smithi* the dorsum of the head is completely covered by coarse reticulated rugae. Finally, the ocelli of *A. boulderensis* are larger, separated by approximately one ocellar diameter; in *A. smithi* the ocelli are separated by more the one ocellar diameter. The females of the two species are distinct, supporting the separation of *A. boulderensis* as different species.

Distribution:

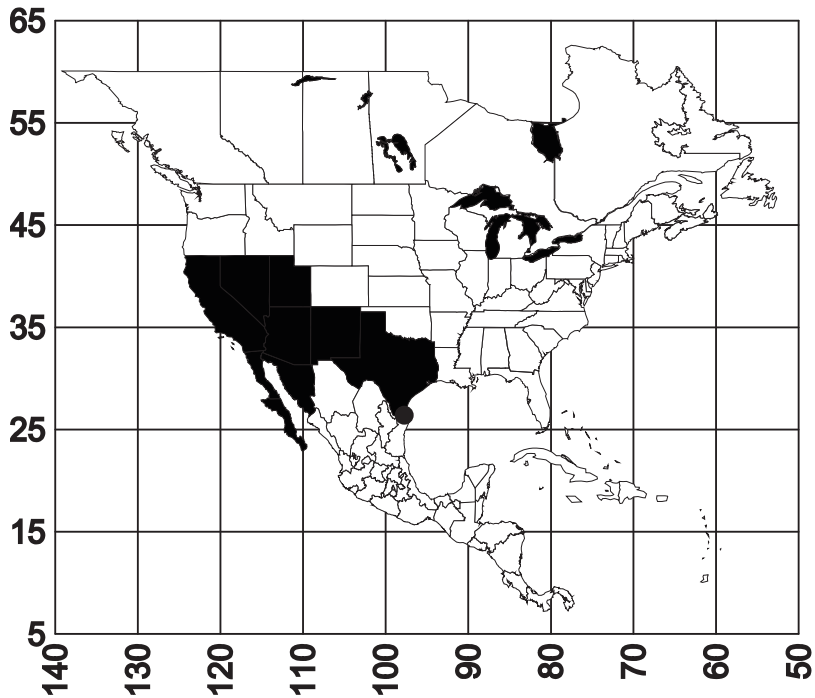
USA: **Arizona**, Coconino Co., Grand Canyon (South Canyon, CWEM), Yuma Co., Palm Canyon (CWEM, LACM), Kofa Game Reserve (2 mi SE Jct. 24, LACM); **California**, Imperial Co., 2.8 mi NNW Ocotillo (Fossil Canyon, LACM), 6.9 mi SSE Ocotillo (LACM), Riverside Co., Palm Springs (LACM); **Nevada** (Smith, 1979; Wheeler and Wheeler, 1986); **New Mexico**, Socorro Co., Sevilleta National Wildlife Refuge (CWEM); **Texas**, El Paso Co., Franklin Mountains (CWEM); **Utah**, Washington Co., 8 mi S St. George (LACM, female) (Allred, 1982). **MEXICO:** **Baja California**, peninsula (Boulton and Ward, 2002; Johnson and Ward, 2002; Varela-Hernández and Jones, 2013) and **Baja California Islands** (Boulton and Ward, 2002); **Baja California Sur**, Isla Santa Cruz (CWEM), Isla San Pedro Martir (CWEM); **Sonora** (Johnson and Ward, 2002).

boulderensis - SW USA

In soil and rock cracks

Desert canyons

boulderensis, *Aphaenogaster* 220 *subterranea* complex
Compare with *carbonaria*, *floridana*, *huachucana*, *megommata*,
montana, *mutica*, *smithi*



Map 3. *Aphaenogaster boulderensis*. The record from Brownsville, TX is based on a possible misidentification of *A. mutica* (see Creighton, 1950:143).

Habitat:

Desert canyons.

boulderensis - SW USA

In soil and rock cracks

Desert canyons

subterranea complex

221

Aphaenogaster boulderensis

Compare with *carbonaria*, *floridana*, *huachucana*, *megommata*,
montana, *mutica*, *smithi*

Biology:

This species nests in cracks of cliffs, and the nests are difficult to find and to excavate (pers. obs). Cole (1966) thought that it probably nests beneath stones and forms small colonies.

We found *A. boulderensis* in rocky areas with fine sand and clay.

Gronenberg (2001) studied the development of the brain in *A. boulderensis* and the size of the optic lobe (Gronenberg and Liebig, 1999).

boulderensis - SW USA

In soil and rock cracks

Desert canyons

Compare with *araneoides*, *inermis*, *mexicana*, *phalangium*

***Aphaenogaster brevicollis* Forel**

Worker Figs. 34, 252 (head), 35 (head from side), 251 (side view).

Male Figs. 253 (side view), 254 (head).

Map 4.

Plate 4 (worker).

Aphaenogaster (Ischnomyrmex) phalangium var. *brevicollis* Forel, 1899:59 ♀, ♂, Panama, Volcán de Chiriquí [lectotype worker, 1 paralectotype ♀, 1 paralectotype ♂ here designated MHNG]; *Aphaenogaster (Deromyrma) phalangium* var. *brevicollis*: Emery, 1921:65

Diagnoses:

Worker. The worker is a robust specimen as compared with other species in the *phalangium* species complex.

The entire dorsum of the head is covered with granulate sculpture, which forms poorly defined longitudinal striae; the sculpture on the mesosoma is similar, and the propodeal spines are not developed. The sculpture on the petiole is similar to that of the mesosoma, the postpetiole and most of the first tergum of the gaster are predominantly punctate. Short (0.15 mm) erect blunt-tipped hairs cover most surfaces except for the tibiae and tarsi.

brevicollis - Panamá

Litter extraction

Tropical oak and bamboo forests

Compare with *araneoides*, *inermis*, *mexicana*, *phalangium*



Fig. 251. Posterior part of head, mesosoma, petiole and postpetiole of the lectotype worker of *A. brevicollis*.

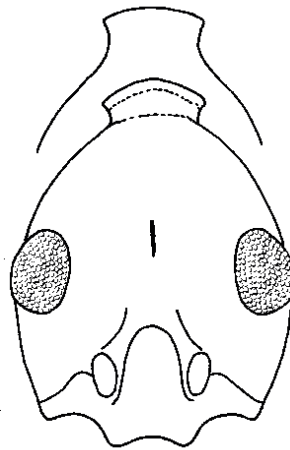


Fig. 252. Head of the lectotype worker of *A. brevicollis*. The inset shows the neck as seen from above.

Female. Undescribed.

Male. The male is an intermediate sized (total length 6 mm) ferruginous red specimen with large eyes and a greatly elongated neck. The

brevicollis - Panamá

Litter extraction

Tropical oak and bamboo forests

Compare with *araneoides*, *inermis*, *mexicana*, *phalangium*

propodeum is very narrow and is armed only with a pair of swellings. The posterior femur has a few erect hairs on the ventral surface, but none on the sides nor on the dorsal surface. The mesopleuron has a few erect hairs. All surfaces, except for the legs and gaster, are sculptured. The mandibles are finely striate and moderately shining, the head, propodeum, petiole and postpetiole are covered in fine granulate or punctate sculpture, with a few poorly defined striae between the eyes, on the side of the mesosoma and side of the propodeum.

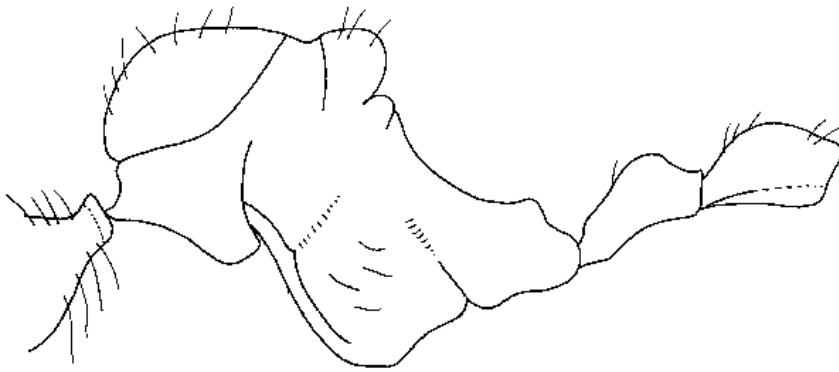


Fig. 253. Posterior part of head, mesosoma, petiole and postpetiole of a paralectotype male of *A. brevicollis*.

brevicollis - Panamá

Litter extraction

Tropical oak and bamboo forests

Compare with *araneoides*, *inermis*, *mexicana*, *phalangium*

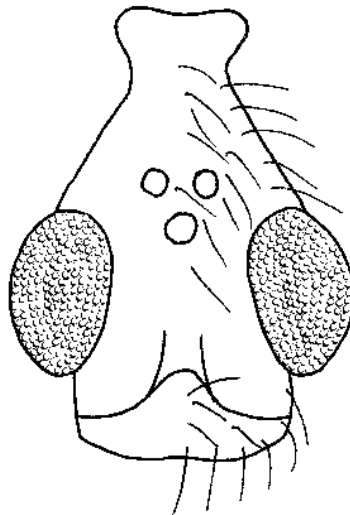


Fig. 254. Head of a paralectotype male of *A. brevicollis*.

Comparison:

The workers of *A. brevicollis* could be confused with those of *A. phalangium*. Both species are roughly sculptured and have short erect blunt-tipped hairs covering most surfaces. The two species can be separated, as *A. brevicollis* has a wider head (> 1.4 mm at posterior edge of the eye) as compared to *A. phalangium* (< 1.2 mm at same position). Additionally, *A. brevicollis* is known only from northern Panamá, whereas *A. phalangium* is widely distributed in Central America. The same characteristics would separate *A. brevicollis* from *A. araneoides*. *Aphaenogaster brevicollis* does not have the erect hairs on all surfaces of the posterior femur as does *A. inermis* and is not partially smooth and shiny as is *A. mexicana*.

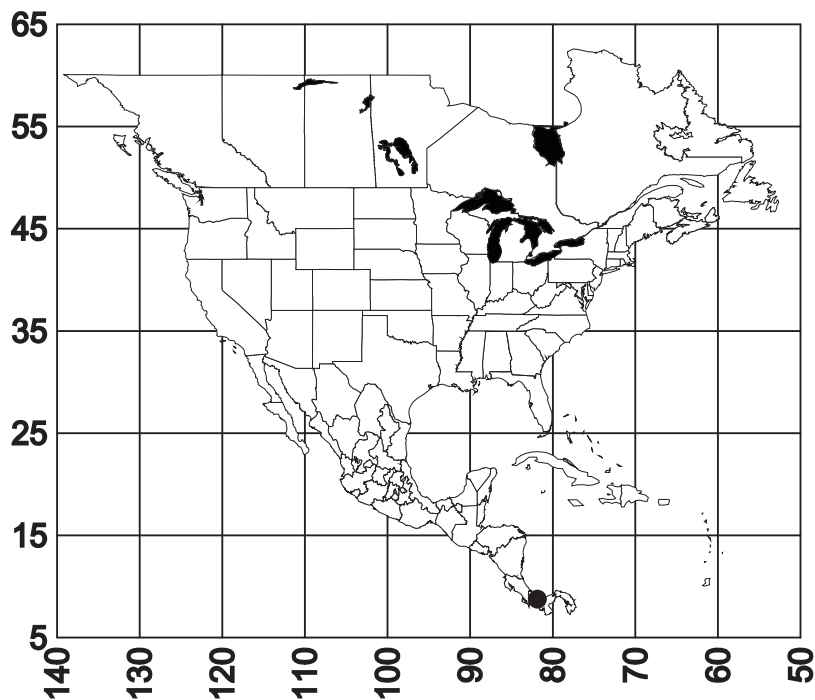
brevicollis - Panamá

Litter extraction

Tropical oak and bamboo forests

Compare with *araneoides*, *inermis*, *mexicana*, *phalangium*

Longino and Cover (2004) considered *A. brevicollis* to bridge the gap between *A. araneoides* and *A. phalangium*. It actually appears to us to be distinct robust species with a wide head and a relatively short neck, not closely related to either one of them.



Map 4. *Aphaenogaster brevicollis*

Distribution:

PANAMA: Chiriquí (La Fortuna, Finca La Suisse, Volcán de Chiriquí, CWEM), Volcán de Chiriquí, 1650m and S slope of El Volcán, 1000m (CASC).

brevicollis - Panamá

Litter extraction

Tropical oak and bamboo forests

phalangium complex

227

Aphaenogaster brevicollis

Compare with *araneoides*, *inermis*, *mexicana*, *phalangium*

Habitat:

Oak and bamboo forest at 1200m.

Biology:

Unknown, except workers have been collected from the extraction of oak forest and wet montane forest leaf litter in June.

brevicollis - Panamá

Litter extraction

Tropical oak and bamboo forests

carbonaria, *Aphaenogaster* 228 *subterranea* complex
Compare with *mutica*, *patruelis*

***Aphaenogaster carbonaria* Pergande**

Worker Figs. 61, 255 (side view), 256 (head).

Map 5.

Plate 5 (worker).

Aphaenogaster carbonaria Pergande, 1894:163 ♀, Mexico: La Laguna [2 type workers seen, CASC]; Wheeler, 1917:516; Wheeler, 1934:133; *Stenamma* (*Messor*) *carbonaria*: Emery, 1895:308; *Aphaenogaster patruelis carbonaria*: Forel 1899:58; *Aphaenogaster* (*Attomyrma*) *patruelis carbonaria*: Emery, 1921:59

Diagnosis:

Worker. The clypeus has a medial carina, in addition to approximately eight lateral carinae. The head is relatively short (head length 1.2 mm, head width 1 mm); the antennal scape extends approximately the first three funicular segments past the posterior lateral corner of the head. The sculpturing on the head consists of poorly defined striae, and is glossy in the middle region, and somewhat more punctate laterally. The maximum diameter of the eye is 0.25 mm, and the eye is located slightly more than one diameter from the anterior margin of the head. The mesosoma is deeply depressed at the notopropodeal suture; the top of the mesonotum is approximately the same height as the top of the propodeum; and the

carbonaria - Baja California, México

Unknown

Unknown

Compare with *mutica*, *patruelis*

propodeal spines are absent or only poorly developed as protuberances or angles. The sculpturing on the mesosoma is fine and most regions are at least weakly shining, the sculpturing on the side of the propodeum and mesopleuron consists of very poorly defined striae with most parts smooth and shining. The postpetiole is approximately as long as wide (viewed from above), and is only slightly wider than the petiole.

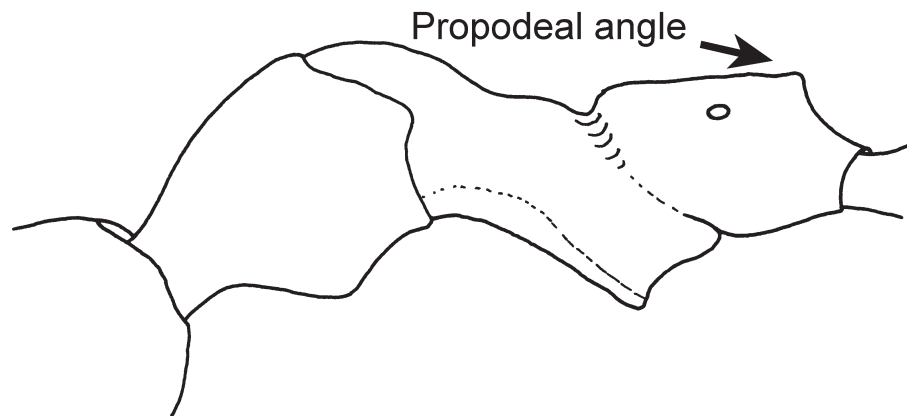


Fig. 255. Mesosoma of a worker of *A. carbonaria* (Baja California, CWEM).

carbonaria - Baja California, México

Unknown

Unknown

Compare with *mutica*, *patruelis*

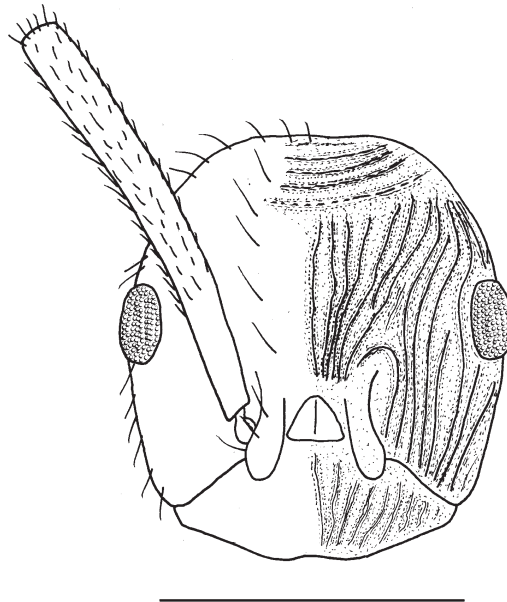


Fig. 256. Head of a worker of *A. carbonaria* (Baja California CWEM).

Female and male. Unknown.

Comparison:

The worker of this species appears to be able to be separated from that of *A. patruelis*, as it lacks definite spines on the propodeum, which are present on *A. patruelis*. The anterior border of the clypeus is not as indented as in *A. patruelis*, and the clypeal carinae are more developed in *A. carbonaria*. It is possible that *A. carbonaria* is a synonym of *A. patruelis*.

carbonaria - Baja California, México

Unknown

Unknown

Compare with *mutica*, *patruelis*

The distribution and the lack of propodeal spines would reduce the chances of this species being confused with any others. *Aphaenogaster carbonaria* could be confused with *A. mutica*, but can be easily separated by striae on clypeus (only the median carina is well defined in *A. mutica*) and fine sculpturing on the mesopleuron (densely punctate in *A. mutica*). It is predominately dark brown, not medium brown as is *A. mutica*. Both species are found in Baja California and the associated islands.

Distribution:

MEXICO: **Baja California Sur** (Laguna Sierra near Todos Santos, CWEM; Johnson and Ward, 2002; Varela-Hernández and Jones, 2013).

Habitat:

Unknown.

Biology:

Unknown.

carbonaria - Baja California, México

Unknown

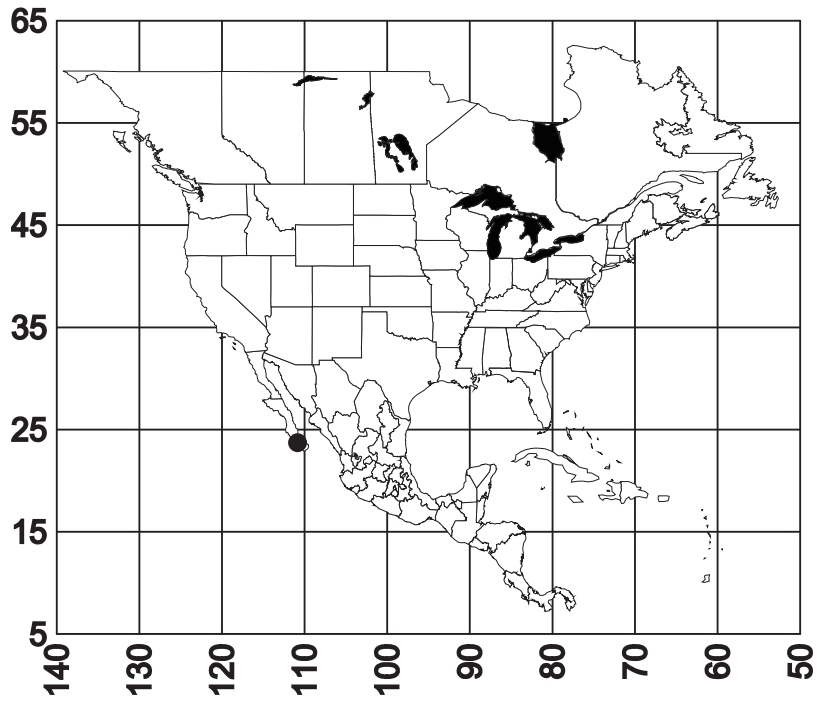
Unknown

carbonaria, *Aphaenogaster*

232

subterranea complex

Compare with *mutica*, *patruelis*



Map 5. *Aphaenogaster carbonaria*.

carbonaria - Baja California, México

Unknown

Unknown

Compare with *fulva*, *lamellidens*, *miamiana*, *picea*, *rudis*, *texana*

***Aphaenogaster carolinensis* Wheeler**

Worker Figs. 95 (mesonotum), 257 (side view), 257 (head).

Female Figs. 258 (side view), 258 (head).

Male Figs. 137 (scutum from above), 139 (mesopleuron), 140 (propodeum), 259 (side view), 259 (head).

Map 6.

Plates 6 (worker), 7 (female), 8 (male).

Aphaenogaster texana carolinensis Wheeler, 1915:414 ♀ ♀, USA: North Carolina, Tryon (12 ♀ ♀, 1 ♀ cotypes seen MCZC); *Aphaenogaster* (*Attomyrma*) *texana* var. *carolinensis*: Emery, 1921: 60; *Aphaenogaster* (*Attomyrma*) *texana carolinensis*: Creighton, 1950:153

Diagnoses:

Worker. The head is elongated (1.1 mm, head width 0.78 mm), as is the scape (1.25 mm), which extends approximately $\frac{1}{3}$ length past the posterior lateral corner of the head. The anterior edge of the mesonotum is slightly elevated from the surface of the pronotum; the propodeal spines are moderately developed (0.13 mm).

carolinensis - E United States

Nests in soil, under stones, in and under rotten logs, under bark
Forests, grasslands, urban habitats

Compare with *fulva*, *lamellidens*, *miamiana*, *picea*, *rudis*, *texana*

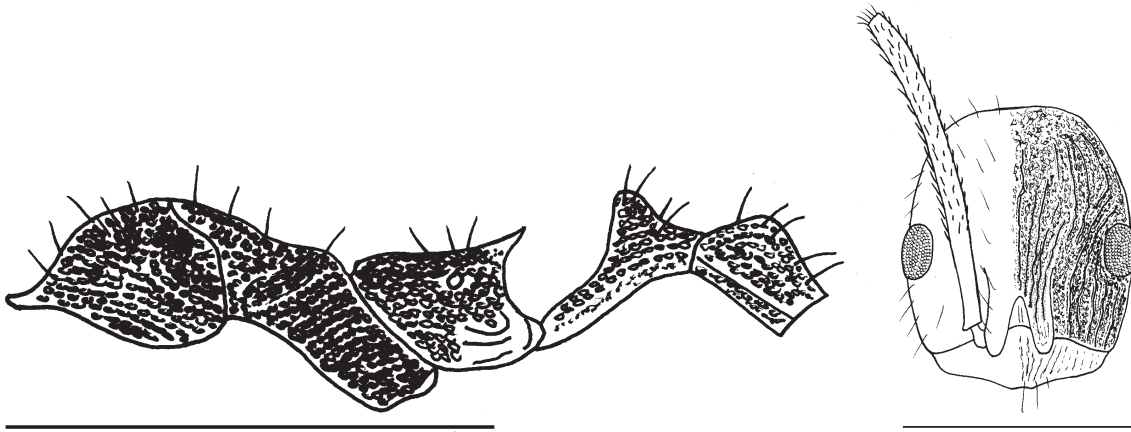


Fig. 257. Mesosoma, waist and head of a worker of *A. carolinensis* (McMinn Co., Tennessee, CWEM).

The regions of the head near the eye and much of the middle of the head have reticulated striae, much of the remainder of the head and the region between the striae is punctate. Most of the mesosoma is densely and evenly punctate, the petiole and postpetiole are mostly finely coriaceous and partially shining; the gaster (except near the base) is smooth and glossy.

Female. The head of the female is not as elongate as in the worker (head length 1.35 mm, head width 1.13 mm) the scape (1.33 mm) extends about $\frac{1}{4}$ length past the posterior lateral corner of the head. The dorsum of the head is covered with somewhat reticulated rugae or striae. The scutum is completely striated; the mesopleuron is nearly completely

carolinensis - E United States

Nests in soil, under stones, in and under rotten logs, under bark

Forests, grasslands, urban habitats

Compare with *fulva*, *lamellidens*, *miamiana*, *picea*, *rudis*, *texana*

smooth and glossy. The propodeal spines are well-developed (length 0.3 mm). The spines of the cotype are strongly flattened, wide, with a blunt tip; the spines on most other specimens are slender, not strongly flattened, and with a moderately acute tip. Most specimens are yellowish brown.

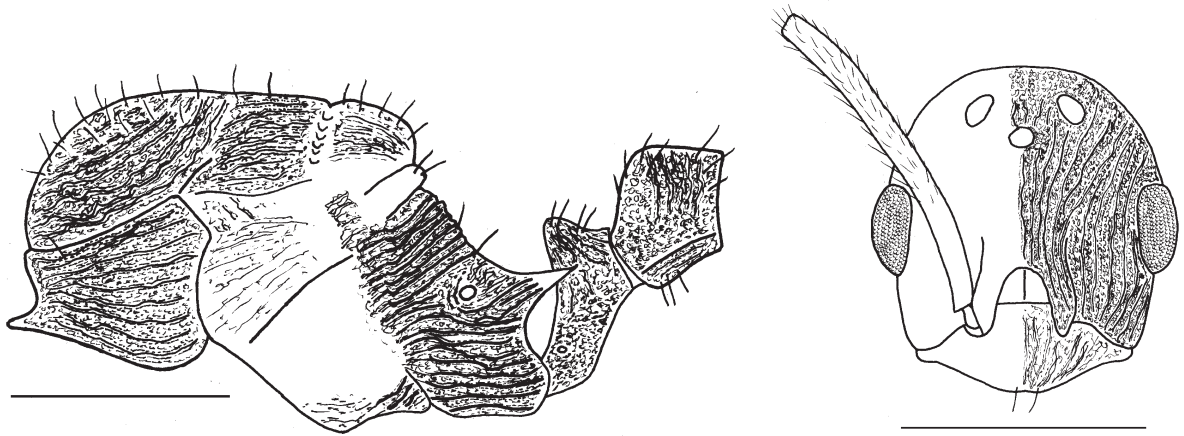


Fig. 258. Mesosoma, waist and head of a female of *A. carolinensis* (McMinn Co., Tennessee, CWEM).

Male (previously undescribed). The specimens are small (total length 4.2 mm), medium brown specimens, with yellowish brown legs. The scutum is mostly sculptured, with somewhat shiny patches anteriorly. The propodeal processes are poorly developed and mostly rounded posteriorly.

carolinensis - E United States

Nests in soil, under stones, in and under rotten logs, under bark

Forests, grasslands, urban habitats

Compare with *fulva*, *lamellidens*, *miamiana*, *picea*, *rudis*, *texana*

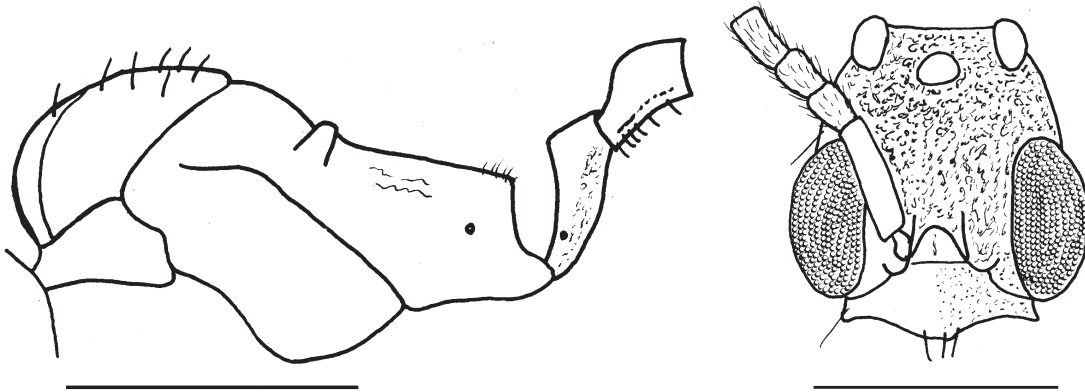


Fig. 259. Mesosoma, waist and head of a male of *A. carolinensis* (McMinn Co., Tennessee, CWEM).

Comparison:

The worker and female of *A. carolinensis* closely resemble those of *A. texana* and *A. rudis*. The workers of *A. carolinensis* differ from those of *A. texana* and *A. rudis* in having longer propodeal spines. The spines of *A. carolinensis* are usually about as long as the distance between the bases, in *A. texana* and *A. rudis* they are about as half as long is the distance.

The worker, female and male of *A. carolinensis* are lighter in color than the nearly black *A. picea*.

The worker of *A. carolinensis* can be confused with that of *A. fulva*. They can usually be separated as the posterior half of the head of *A. car-*

carolinensis - E United States

Nests in soil, under stones, in and under rotten logs, under bark

Forests, grasslands, urban habitats

Compare with *fulva*, *lamellidens*, *miamiana*, *picea*, *rudis*, *texana*

olinensis is predominantly punctate, that of *A. fulva* predominantly covered with rugulae. The propodeal spines are generally only slightly longer than the space between the bases, but are noticeably longer than the space in *A. fulva*. Both have a swollen mesonotum, but it is more swollen and sharper in *A. fulva*. The females of the two species are easily separated as the katepisternum of the female of *A. carolinensis* is mostly smooth and glossy, not completely horizontally striated as in *A. fulva*. The males of *A. carolinensis* have the anterior half of the scutum finely sculptured, that of *A. fulva* have the scutum completely smooth.

Aphaenogaster carolinensis workers can be easily confused with those of *A. miamiana* (Deyrup, 2003). *Aphaenogaster carolinensis* is a smaller ant, if you have specimens to compare. The propodeal spines are small, usually noticeably shorter than the distance between the bases, not about as long or longer as is the case in *A. miamiana*. The head of *A. carolinensis* is narrower than is the head of *A. miamiana*. The females and males of the two species are nearly identical; some hints in the discussion of *A. miamiana* may be useful for separating them.

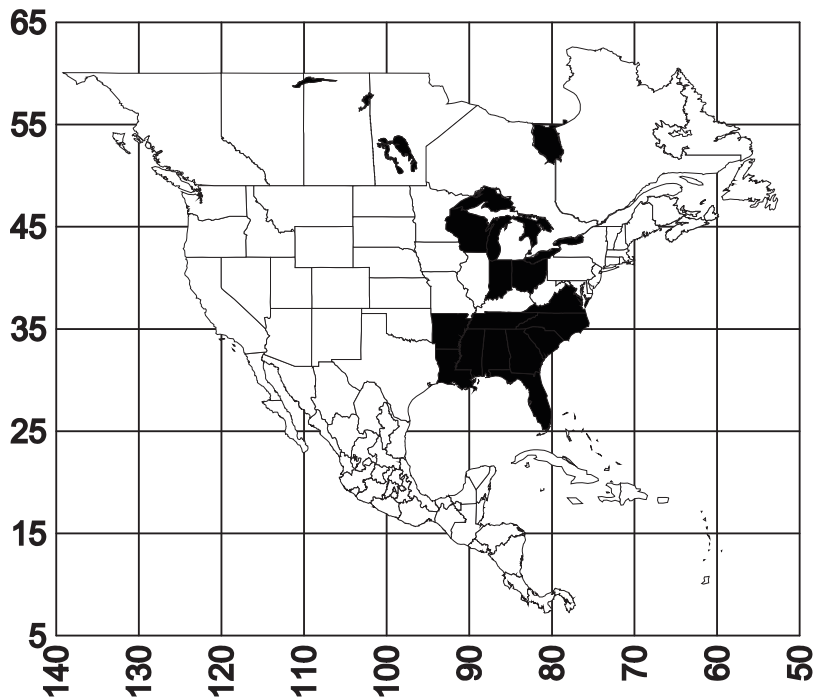
If you are keying specimens of *A. lamellidens* in which the head is somewhat elongated, and miss seeing the posteriorly directed tooth on the torulus (which is hard to see), you will arrive at *A. carolinensis*. It can be easily separated from *A. carolinensis* as the propodeal spines of *A. lamellidens* are very long, with the length being approximately equal to the distance between the bases. In *A. carolinensis* the spines are shorter than the distance between the bases. *Aphaenogaster lamellidens* is also a larger ant, which can be easily see if you have workers available of both species.

carolinensis - E United States

Nests in soil, under stones, in and under rotten logs, under bark

Forests, grasslands, urban habitats

Compare with *fulva*, *lamellidens*, *miamiana*, *picea*, *rudis*, *texana*



Map 6. *Aphaenogaster carolinensis*.

Distribution:

USA: **Alabama**, Franklin Co., Tuscaloosa Co. (CWEM); **Arkansas**, Hempstead Co. (CWEM) (General and Thompson, 2007, 2008); **Florida**, Highlands Co., Putnam Co. (CWEM) (see also Deyrup, 2003); **Georgia** (Umphreyi, 1996); **Indiana** (Morris, 1942; Munsee, 1967); **Louisiana** (CWEM; Dash, 2004; Dash and Hooper-Bùi, 2008); **Mississippi** (CWEM; MacGown et al., 2010); **Ohio**, Ottawa Co.; **North Carolina**,

carolinensis - E United States

Nests in soil, under stones, in and under rotten logs, under bark

Forests, grasslands, urban habitats

Compare with *fulva*, *lamellidens*, *miamiana*, *picea*, *rudis*, *texana*

Beaufort Co., Wayne Co. (CWEM) (Guénard et al., 2012, 2015); **South Carolina** (Umphrey, 1996); **Tennessee**, McMinn Co. (CWEM); **Virginia**, Prince William Co., Spotsylvania Co. (CWEM) (Guénard et al., 2012); **Wisconsin**, Monroe Co., Mill Bluff State Park (CWEM).

Habitat:

We found nests in grasslands, deciduous forests, mature forests (*Carya*, *Magnolia*, pine), but also in urban habitats. *Aphaenogaster carolinensis* is normally a forest habitat species (Menke et al., 2011), and has been collected in longleaf-pine savanna and in wet flatwoods. It also occurs in urban habitats (Guénard et al., 2015).

Biology:

Aphaenogaster carolinensis nests in the soil, occasionally under stones, as well as under bark, and in and under rotten logs (pers. obs). Menzel (2012) also states it nests under logs and bark.

The workers are timid and escape when the nest is opened. Workers forage on the surface of the soil and are attracted to cat food baits. We collected workers attracted to fire ant baits (see Bhatkar and Whitcomb, 1970 for recipe). It has been collected with pitfall traps, baits, and flight intercept traps (Dash, 2004) and is a seed dispersing ant (Ness, 2004).

We found brood in nests from June to August, sexuals were found in nests in May and June.

carolinensis - E United States

Nests in soil, under stones, in and under rotten logs, under bark

Forests, grasslands, urban habitats

carolinensis, *Aphaenogaster* 240 *subterranea* complex
Compare with *fulva*, *lamellidens*, *miamiana*, *picea*, *rudis*, *texana*

We generally found nests in clay soils, but were also be found in rocky clay, sandy loam or even sand, with soil colors ranging from gray, light brown to red.

Experiments with interacting pairs of species show that durations of interactions with *A. lamellidens* were significantly longer than with other species (Menzel, 2012).

carolinensis - E United States

Nests in soil, under stones, in and under rotten logs, under bark
Forests, grasslands, urban habitats

Compare with *floridana*, *huachucana*, *lamellidens*, *tennesseensis*, *texana*

***Aphaenogaster flemingi*. M. Smith**

Worker Figs. 89 (mesosoma), 89 (pronotum from above), 260 (head).

Female Figs. 261 (side view), 261 (head).

Map 7.

Plate 9 (worker).

Aphaenogaster texana flemingi Smith, 1928:275, ♀, USA: Mississippi, A&M College; Wheeler and Wheeler 1972:238, larva; *Aphaenogaster (Attomyrma) flemingi*: Creighton, 1950:143

Aphaenogaster (Attomyrma) texana subsp. *nana* Wheeler, W. M. 1932: 6 ♀, USA Unidentifiable taxon consisting of minors: Creighton, 1950: 151-152; Smith, 1979: 1364, **new synonymy**

Aphaenogaster texana macrospina Smith, 1934:386-387, Figs. 1, 2, ♀, USA: South Carolina, Charleston; *Aphaenogaster (Attomyrma) macrospina*: Creighton, 1950:145 (Smith, 1958:113)

Diagnoses:

Worker. The worker of *A. flemingi* can be recognized as the dorsal surface of the pronotum is very finely sculptured, and strongly shining,

flemingi - E United States

Nests in sandy soil

Forests, salt marshes

Compare with *floridana*, *huachucana*, *lamellidens*, *tennesseensis*, *texana*

and the propodeal spines are well-developed, slender and sharp. The antennal scapes are very long, surpassing the posterior lateral margin of the head by about three funicular segments.

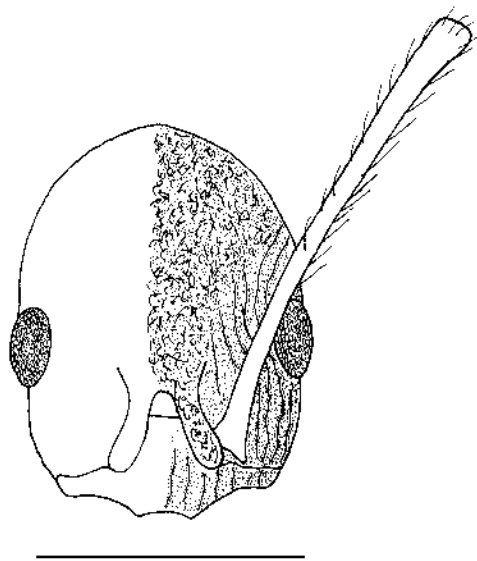


Fig. 260. Head of a worker of *A. flemingi* (Broward Co., Florida, MCZC).

Female (previously undescribed). The antennal scape of the female is also long, extending about three funicular segments past the posterior lateral corner of the head. The base of the scape is strongly flared. The pronotal spines are very well-developed, but thickened at the base, and not

flemingi - E United States,
Nests in sandy soil
Forests, salt marshes

Compare with *floridana*, *huachucana*, *lamellidens*, *tennesseensis*, *texana*

slender as in the worker. The pronotum is only weakly shining, and covered with transverse striae.

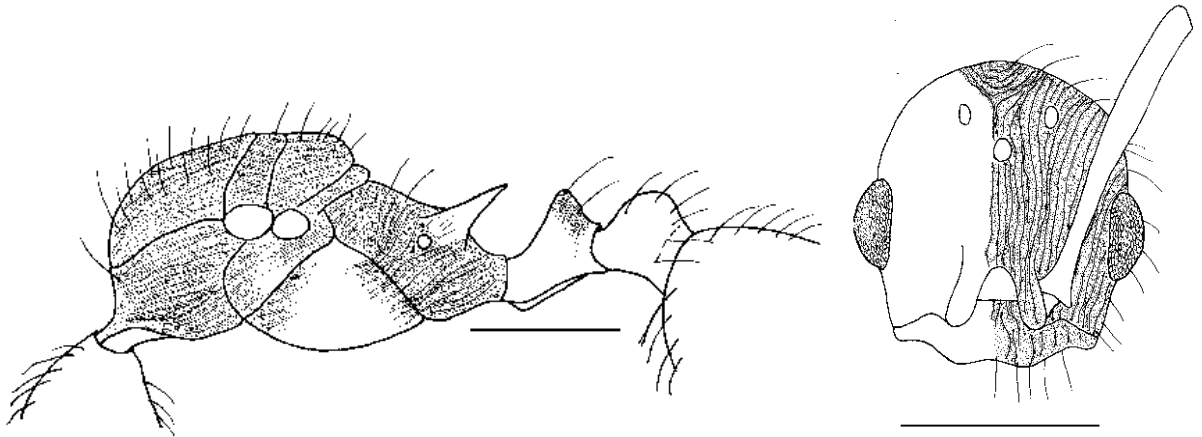


Fig. 261. Mesosoma, waist and head of a female of *A. flemingi* (Broward Co., Florida, MCZC).

Male. Unknown.

Comparison:

The weakly developed sculpture, especially on the dorsum of the pronotum, separate the worker of this species from nearly all of the others. This species could be confused with *A. tennesseensis*, but can be easily separated by the lack of sculpture on the pronotum, and the elongated postpetiole (seen from above).

flemingi - E United States

Nests in sandy soil

Forests, salt marshes

Compare with *floridana*, *huachucana*, *lamellidens*, *tennesseensis*, *texana*

Aphaenogaster flemingi could be confused with *A. lamellidens*, as it also has a small lobe on the posterior edge of the torulus, which partially covers the bulb of the condyle. The small lobe is difficult to see, and does not appear to be a tooth when the worker is seen in full-face view. The female has a similar lobe on the torulus, but can be separated from the female of *A. lamellidens* because the lobe does not appear as a tooth in frontal view.

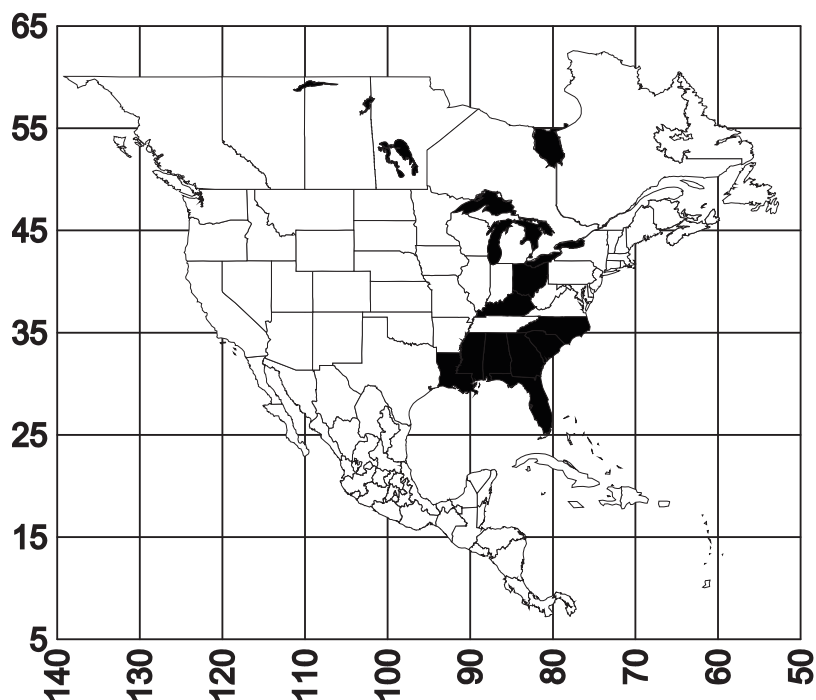
The long propodeal spines, about as long as the distance between the bases, will separate the workers of *A. flemingi* from similar species that lack propodeal spines (*A. floridana*) and those which have short propodeal spines, such as *A. texana* and *A. huachucana*.

Wheeler described *A. texana* subsp. *nana* based on minors (Creighton, 1950), leading it to be considered to be an unidentifiable taxon. The only species presently known from Florida which closely matches the description, especially the smooth and shiny pronotum, is *A. flemingi*. Therefore, we will consider it to represent the minim of this species, and synonymize it.

Distribution:

USA: **Alabama**, Sumter Co.; **Florida**, Broward Co., Hernando Co., Highland Co., Monroe Co.; northern Florida (Lubertazzi and Tschinkel, 2003), **Georgia**, Richman Co.; **Kentucky** (Smith, 1979); **Louisiana** (Dash, 2004, Dash and Hooper-Bùi, 2008); **Mississippi**, Harrison Co., Oktibbeha Co.; **North Carolina** (Guénard et al., 2012, 2015); **Ohio** (Coovert, 2005); **South Carolina** (Davis, 2009).

flemingi - E United States,
Nests in sandy soil
Forests, salt marshes



Map 7. *Aphaenogaster flemingi*.

Habitat:

Aphaenogaster flemingi inhabits the litter or soil under eastern red cedar trees in the southeastern US (Hill and Brown, 2010). It is also known from salt marshes (Deyrup, unpublished data). In the Florida Keys it was found in dry open pineland (Deyrup et al., 1988), and found on Big Pine Key in pine rock land (Moreau et al., 2014). It shows an increase in abundance with an increasing amount of herbaceous ground cover (Lubertazzi and Tschinkel, 2003).

flemingi - E United States

Nests in sandy soil

Forests, salt marshes

Compare with *floridana*, *huachucana*, *lamellidens*, *tennesseensis*, *texana*

Biology:

Aphaenogaster flemingi is native to southeastern North America (Hill and Brown, 2010). It nests in sandy soil, and has been collected in the nest of the leaf cutting ant *Atta texana* (pers. obs.).

Alate females were collected in a nest in mid-May (pers. obs.).

It preys on the red oak borer (Cerambycidae) (Ware and Stephen, 2006) and is a seed dispersing ant (Ness, 2004).

King et al. (2013) showed weak effects of the experimental introduction of the red imported fire ant (*Solenopsis invicta*) on *A. flemingi* populations in a naturally invaded pine-savanna ecosystem in north Florida.

flemingi - E United States,
Nests in sandy soil
Forests, salt marshes

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

***Aphaenogaster floridana* M. Smith**

Worker Figs. 81, 123 (head and scape), 62 (petiole and postpetiole, seen from above), 80 (postpetiole seen from above), 81 (base of scape), 82 (metasternal process), 262 (side view), 262 (head).

Female Figs. 117 (mesopleuron), 263 (side view), 263 (head).

Male Figs. 127, (propodeum and petiole), 130 (scape), 131 (petiole and postpetiole), 264 (side view).

Map 8.

Plates 10 (worker), 11 (male).

Aphaenogaster (Attomyrma) floridana Smith, 1941:118, ♀, USA: Florida, Gretna; Wheeler and Wheeler, 1960:7, larva

Diagnoses:

Worker. The scape of the worker of *A. floridana* extends about three funicular segments past the posterior lateral corner of the head. The base of the scape is enlarged into an outer facing lobe. The dorsum of the pronotum is finely sculptured, and smooth and glossy; the propodeum lacks pronotal spines (tiny angles may be present).

floridana - SE United States

Nests in sandy soil

Oak and pine forests, grassy habitats

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

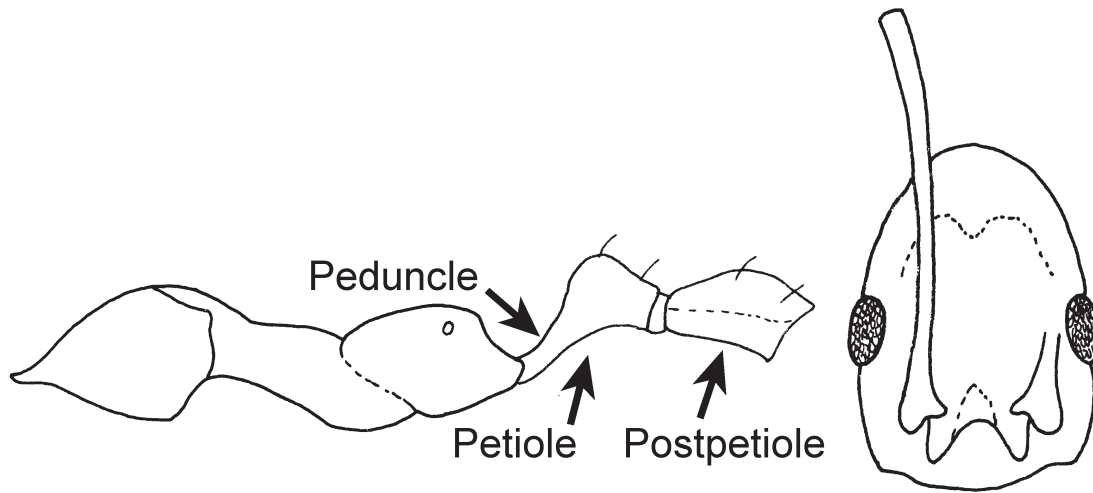


Fig. 262. Mesosoma, waist and head of a worker of *A. floridana* (Highlands Co., Florida, CWEM).

Female (previously undescribed). The scape of the female of *A. floridana* is similar to that of the worker, however, the propodeum has well-developed spines. The pronotum is transversely striate and only weakly shining.

floridana - SE United States

Nests in sandy soil

Oak and pine forests, grassy habitats

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

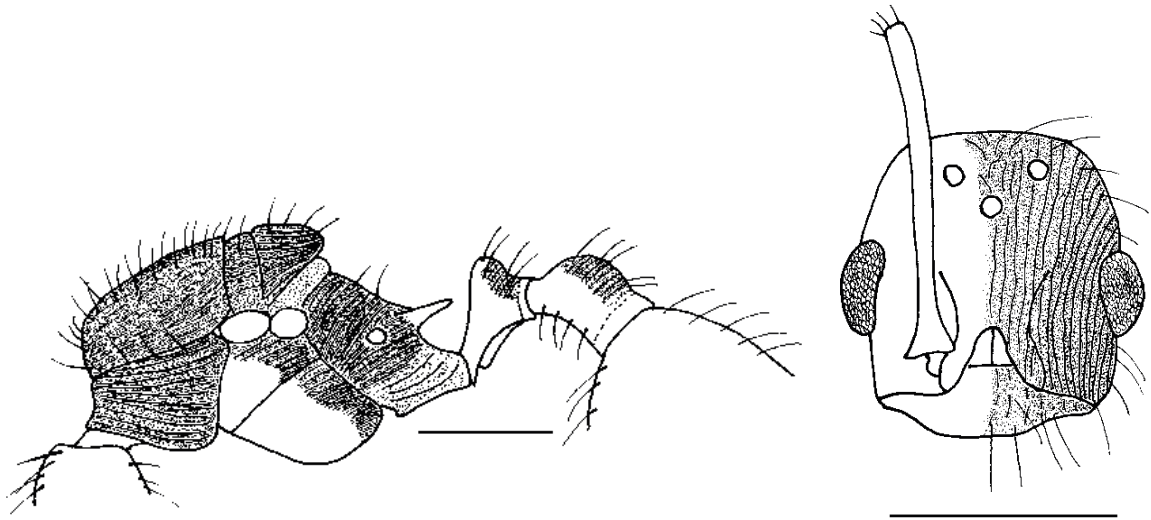


Fig. 263. Mesosoma, waist and head of a female of *A. floridana* (Citrus Co., Florida, MCZC).

Male (previously undescribed). The male of *A. floridana* is very distinctive. The dorsopropodeum is nearly straight from the metanotum to the posteropropodeum, and is usually armed small spines (Fig. 217). Additionally, the petiolar node is only convex dorsally, and does not form a distinct angle as in most of the other species in the New World.

floridana - SE United States
Nests in sandy soil
Oak and pine forests, grassy habitats

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

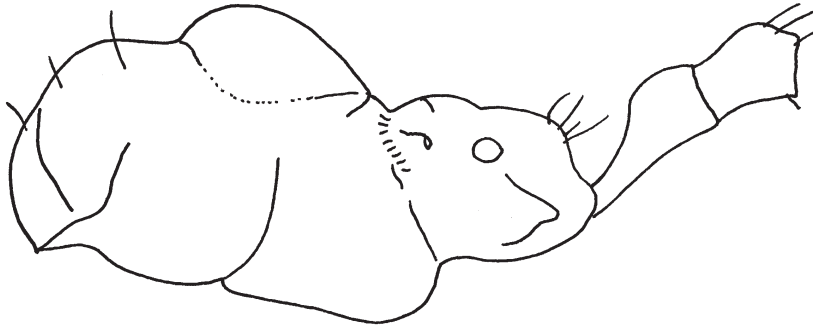


Fig. 264. Mesosoma, petiole and postpetiole of a male of *A. floridana*.

Comparison:

It would be unlikely to confuse the workers of *A. floridana* with any of the others, due to the unusual structure of the base of the scape, and the lack of propodeal spines.

Aphaenogaster floridana could possibly be confused with *A. lamellidens*, as it also has a small lobe on the posterior edge of the torulus, which partially covers the bulb of the condyle. The small lobe is difficult to see, and does not appear to be a tooth when the worker is seen in full-face view, as it does in *A. lamellidens*. The female of *A. floridana* has a similar lobe on the torulus, but can be separated from *A. lamellidens* because it does not appear as a tooth in frontal view.

The lobe at the base of the scape of the worker resembles that of *A. huachucana*, but they would not be confused as *A. huachucana* is from western US and has propodeal spines. The lobe is much less developed

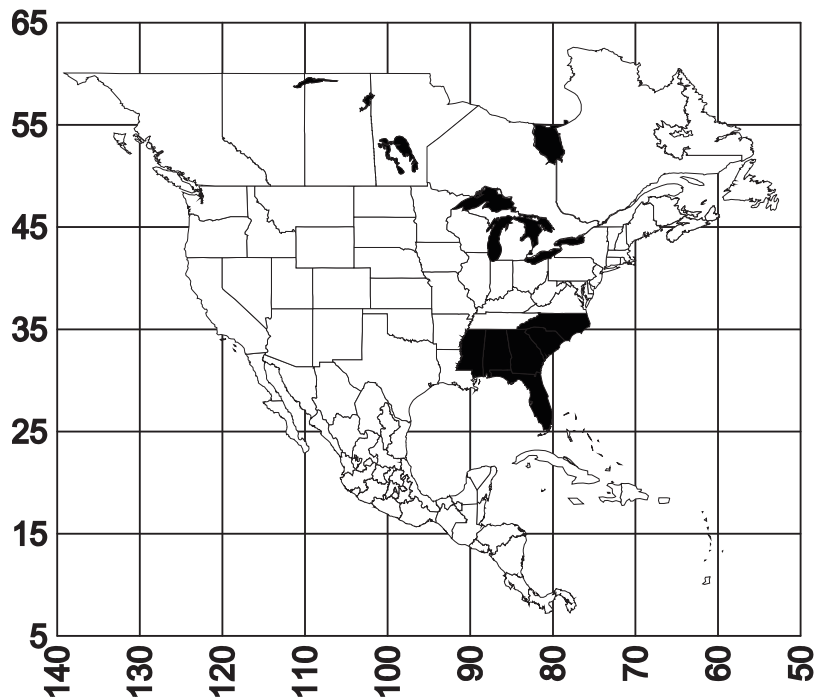
floridana - SE United States

Nests in sandy soil

Oak and pine forests, grassy habitats

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

that those of *A. ashmeadi* and *A. treatae*, which also have well developed propodeal spines.



Map 8. *Aphaenogaster floridana*.

Distribution:

USA: **Alabama** (Smith 1979); **Georgia**, Wayne Co., Doctortown (MCZC) (Graham et al., 2008); **Florida**, Alachua Co. (CWEM), Bay Co. (MCZC), Highlands Co. (CWEM, MCZC), Citrus Co. (MCZC), Levy Co. (CWEM), Santa Rosa Co., Elgin Air Force Base (MCZC), Walton

floridana - SE United States

Nests in sandy soil

Oak and pine forests, grassy habitats

floridana, *Aphaenogaster* 252 *subterranea* complex
Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

Co. (MCZC), northern Florida (Lubertazzi and Tschinkel, 2003); **Mississippi**, Greene Co., Leakesville (STDC); **North Carolina** (Guénard et al., 2012, 2015); **South Carolina** (Van Pelt and Gentry, 1985).

Habitat:

Pine savannah, longleaf pine, turkey oak forests, open shrubby habitats, sparse grassy habitats.

Biology:

This is an opportunist species (Chen et al., 2015) of which little is known.

Nests are found in sandy soil, with the nest being at least 80 cm deep. The nest entrance is often hidden with parts of plant debris. Nest populations may be small, with fewer than 50 workers. Nests apparently have a single queen.

Tschinkel (2011) studied the nest architecture. He found the nest are highly vertical and linear, with little lateral spreading. Chambers in the upper part of the nest are connected by two or three shafts, those in the lower part of the nest are connected by a single shaft. Nests are 13 to 92 cm in depth, with an average of 183 (28-466) workers.

floridana - SE United States
Nests in sandy soil
Oak and pine forests, grassy habitats

subterranea complex,

253

Aphaenogaster fulva

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

***Aphaenogaster fulva* Roger**

Worker Figs. 70 (head from the side), 72 (mesosoma), 265 (side view), 266 (head).

Female (Fig. 267 (side view), 105 (scutum showing sculpture), 117 (mesopleuron), 268 (head).

Male Figs. 10, 269 (head), 130 (scape), 132 (propodeum and petiole), 143 (scutellum, propodeum and petiole), 145 (scutum and notaulus), 269 (side view).

Map 9.

Plates 12 (worker), 13 (female), 14 (male).

Aphaenogaster fulva Roger, 1863a:190, ♀, USA: 'North America' [no types found]; Mayr, 1886:445-446, ♀ ♂; *Stenamma (Aphaenogaster) fulvum*: Emery, 1895:303-304; *Aphaenogaster fulva*: Wheeler, 1913:114; *Aphaenogaster (Attomyrma) fulva*: Emery, 1921:57

Myrmica (Monomorium) aquia Buckley, 1867:341 ♀, ♀, USA: Virginia, *Aquia* (Mayr, 1886:445); *Stenamma (Aphaenogaster) fulva aquia*: Emery, 1895:304-305; unrecognizable taxon in *Aphaenogaster*: Creighton, 1950:148; Smith, 1979:1363, synonymy by Shattuck and Cover, 2016:10, 13

fulva - United States

Nests in rotten bark of logs and stumps, rarely under stones,
house pest

Forests, grasslands

fulva, *Aphaenogaster*

254

subterranea complex

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

Aphaenogaster fulva var. *rubida* J. Enzmann, 1947:147-148, Plate 8
(Brown, 1949:49)

Aphaenogaster fulva var. *pusilla* J. Enzmann, 1947:150 ♀ [First available
use of *Stenammas* (*Aphaenogaster*) *fulvum aquia* var. *pusillum* Emery,
1895:306 unavailable name] **new synonymy**

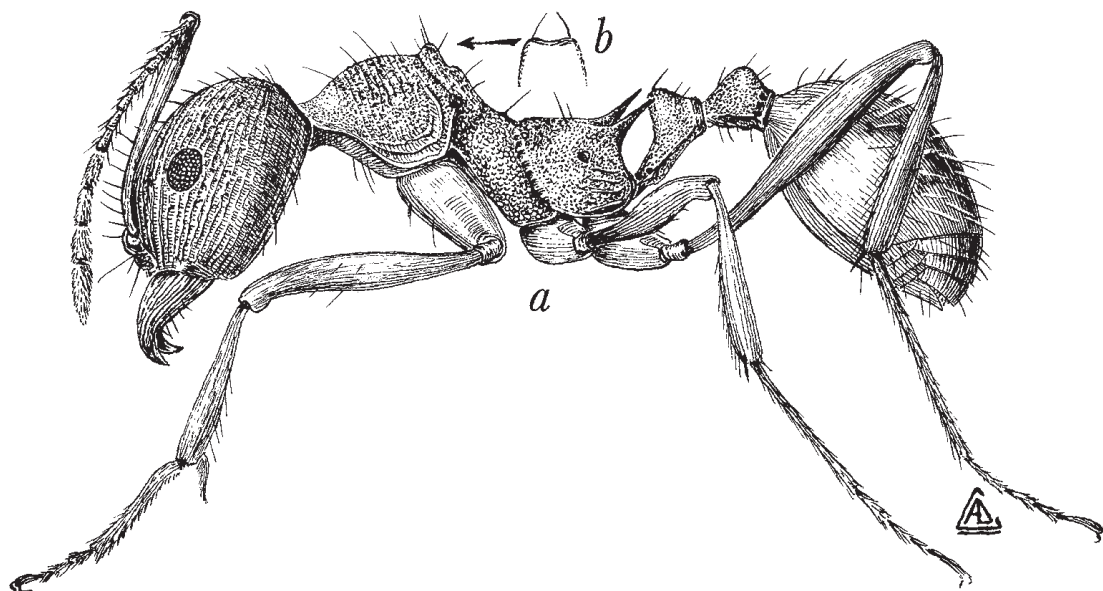


Fig. 265. Side view of a worker (“a”) of *A. fulva*, showing the posterodorsal view of the strongly projecting anterior border of the mesonotum (“b”), which is cleft or impressed in the center (from Smith, 1965).

fulva - United States

Nests in rotten bark of logs and stumps, rarely under stones,
house pest

Forests, grasslands

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

Diagnoses:

Worker. The worker of *A. fulva* is easily separated from nearly all other species in the genus by the form of the mesonotum, which is abruptly elevated above the level of the pronotum (Fig. 64b). This structure is actually a welt, which is concave in the middle (as seen from behind - Fig. 123), or may appear as two broad tubercles. It is generally covered with several reticulated rugae or striae. The head is not greatly elongated.

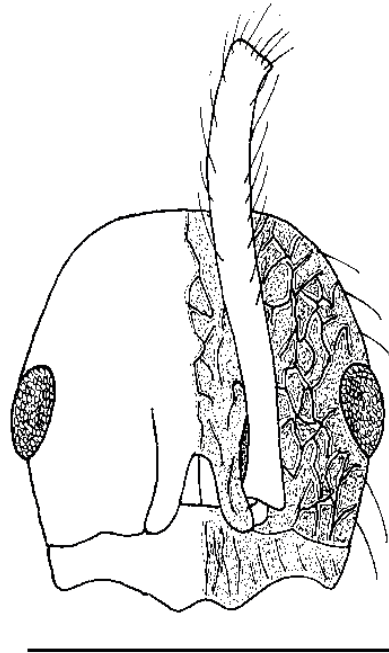


Fig. 266. Head of a worker of *A. fulva* (Prospecttown, New Jersey, MCZC).

fulva - United States

Nests in rotten bark of logs and stumps, rarely under stones,
house pest

Forests, grasslands

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

In addition, the region between the eye and the frontal carina generally has numerous coarse rugae (may be mostly punctate in smaller workers) and the propodeal spines are well-developed (nearly always about as long as the distance between the bases) and pointed slightly vertically. The eye is relatively large, the diameter nearly equal to the length from the eye to the insertion of the mandible.

Female. Specimens are large (total length 6.5 mm) ferruginous red with the head and most of the mesosoma coarsely sculptured. Most of the anepisternum and katepisternum are sculptured (at least the anterior $\frac{2}{3}$).

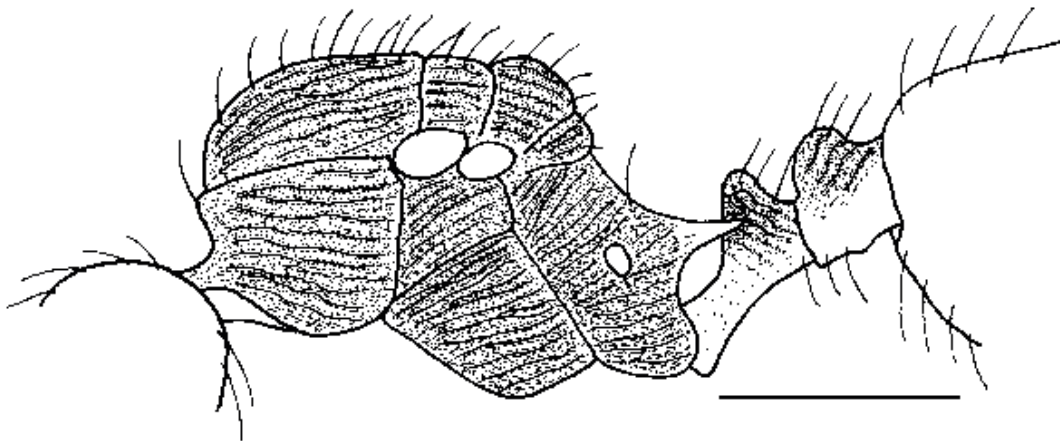


Fig. 267. Mesosoma, petiole and postpetiole of a female of *A. fulva* (near Cherokee, North Carolina, MCZC).

The sculpture of the head is similar to that of the worker.

fulva - United States

Nests in rotten bark of logs and stumps, rarely under stones,
house pest

Forests, grasslands

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

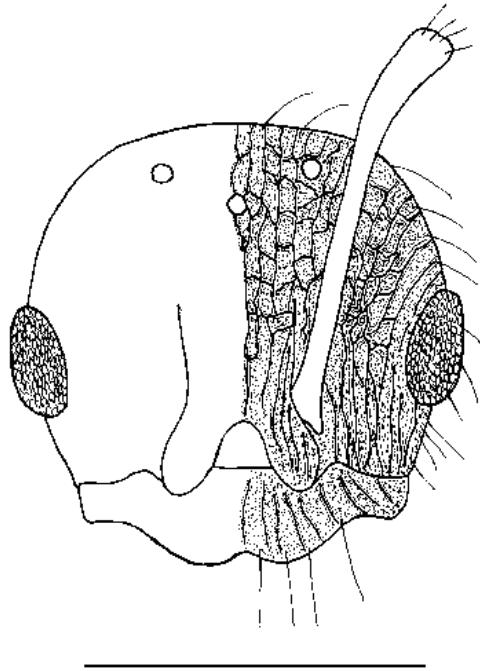


Fig. 268. Head of a female of *A. fulva* (near Cherokee, North Carolina, MCZC).

Male. The male is a small (total length 4 mm) black specimen in which the scutum is mostly smooth and glossy, the anterior half of the dorsopropodeum slopes downward to a level of the posterior half, which is armed with large tubercles.

fulva - United States

Nests in rotten bark of logs and stumps, rarely under stones,
house pest

Forests, grasslands

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

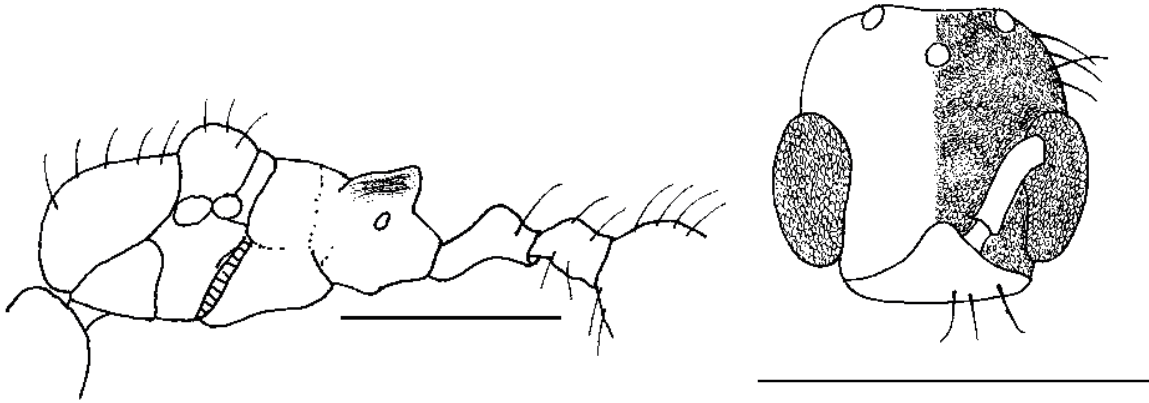


Fig. 269. Mesosoma, waist and head of a male of *A. fulva* (Pendleton Co., West Virginia, MCZC).

Comparison:

This species can be separated from the Florida species *A. umphreyi*, which also has a welt on the mesonotum, by the larger eyes, larger propodeal spines, and well-developed spurs on both the middle and posterior tibiae. Additionally, this species is much more common.

It is sometimes difficult to separate this species from *A. rudis* and *A. picea*, which may also have well-developed, bilobed processes on the mesonotum and sometimes propodeal spines that are nearly as long as the distance between the bases. Workers of *A. fulva* generally have much more developed propodeal spines, and spines are also directed more vertically. Workers from incipient nests of *A. fulva* are often very similar to

fulva - United States

Nests in rotten bark of logs and stumps, rarely under stones,
house pest

Forests, grasslands

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

those of *A. picea*, and it may be impossible to separate them. Such workers of *A. fulva* are generally lighter in color than those of *A. picea* and the propodeal spines are notably pointed somewhat vertically, not posteriorly as in the workers of *A. picea* and *A. rudis*. The region between the eye and frontal carinae in *A. fulva* is generally covered primarily with reticulated rugae, more so than that of the other two species, especially *A. picea*, which is often predominantly covered with punctures. It is very helpful to have the queen or a winged female with such a series, as the female of *A. fulva* has a completely sculptured mesopleuron, which it is primarily smooth and glossy in the other two species.

Aphaenogaster tennesseensis may also have a well-developed, bilobed process on the mesonotum, but the propodeal spines of *A. tennesseensis* are much more developed (about twice as long as the distance between the bases) and the postpetiole of *A. tennesseensis* is more round in shape (wider than long) as seen test from above, which easily separates it from *A. fulva*.

If you miss the posteriorly directed tooth on the torulus of *A. lamellidens* in the key to workers, you may arrive at *A. fulva* (or *A. carolinensis*). Although the propodeal spines of *A. lamellidens* may be somewhat directed upwards, it has only a weakly swollen mesonotum, not strongly swollen and laterally sharpened or at least angulate (best seen from above) like that of *A. fulva*. The gaster of *A. lamellidens* is often slightly lighter in color in *A. lamellidens* as compared to *A. fulva*. Finally, *A. lamellidens* is slightly larger, which can be seen when comparing the workers.

fulva - United States

Nests in rotten bark of logs and stumps, rarely under stones,
house pest

Forests, grasslands

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

Aphaenogaster fulva, especially the smaller workers, could be confused with workers of *A. carolinensis*. The propodeal spines of *A. fulva* are nearly always longer, with the length being greater than the distance between the bases, not less than the distance as in *A. carolinensis*. The mesonotum is much more swollen, with lateral angles or points (best seen obliquely from above), not rounded or at most with blunted angles as in *A. carolinensis*. If only a single small worker is available, it may not be possible to correctly separate these species.

Distribution:

USA: Alabama (CWEM; MacGown and Forster, 2005); **Arkansas** (CWEM; General and Thompson, 2007, 2008, 2009, 2011); **Colorado** (Smith, 1979); **Connecticut** (Ellison, pers. comm.); **Indiana** (CWEM; Morris, 1942; Munsee, 1967); **Florida**, Putnam Co. (CWEM); **Georgia** (CWEM); **Illinois** (CWEM, DuBois and LaBerge, 1988); **Kansas** (DuBois, 1985); **Kentucky** (CWEM); **Louisiana** (CWEM; Dash, 2004; Dash and Hooper-Bùi, 2008); **Maine** (Ellison, pers. comm.); **Maryland** (CWEM); **Massachusetts** (CWEM); **Michigan** (CWEM) (Wheeler et al., 1994); **Mississippi** (CWEM; MacGown et al., 2010; MacGown and Brown, 2006); **Nebraska**, Polk Co. (CWEM); **New Mexico** (Mackay and Mackay, 2002); **North Carolina** (CWEM) (Resasco et al, 2014; Guénard et al., 2012, 2015); **Ohio** (CWEM); **Pennsylvania** (CWEM); **Rhode Island** (Ellison and Farnsworth, 2014); **South Carolina** (CWEM, Davis, 2009); **Tennessee** (CWEM), **Texas**, Cass Co., Cross Co., Sabino

fulva - United States

Nests in rotten bark of logs and stumps, rarely under stones,
house pest

Forests, grasslands

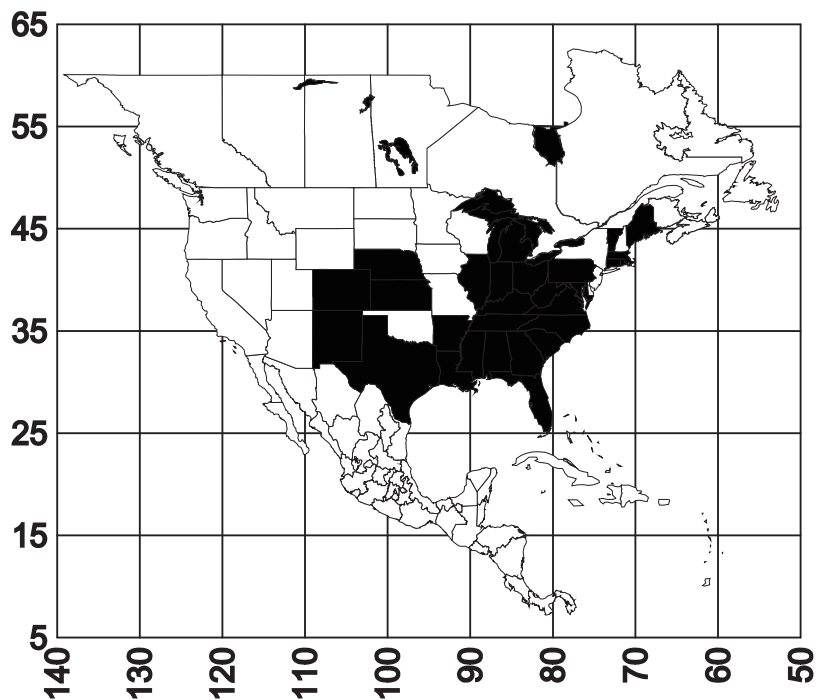
subterranea complex

261

Aphaenogaster fulva

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

Co., Tyler Co., (CWEM); **Vermont** (Smith, 1979); **Virginia** (CWEM); **Washington DC** (CWEM); **West Virginia** (Culver, 1974); **Wisconsin** (CWEM).



Map 9. *Aphaenogaster fulva*.

Habitat:

Aphaenogaster fulva is found in a variety of forested habitats, including mixed hardwood forests, mesic forests and meadows, *Pinus strobus*

fulva - United States

Nests in rotten bark of logs and stumps, rarely under stones,
house pest

Forests, grasslands

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

forest (Washington DC), beech – magnolia forests, cypress swamp, bottomland hardwood forest, riparian deciduous forest (DuBois and LaBerge, 1988), long-leaf pines and savannahs, hardwood /pine forest, and pine-oak forests (pers. obs.). It has been collected from upland longleaf-pine savannas, in a calcareous prairie. It inhabits grasslands to oak-hickory forests in Kansas (DuBois, 1985). *Aphaenogaster fulva* is found in the northwest in mixed pine-hardwood forest and the west gulf-coastal plain longleaf pine forest ecoregions (Dash, 2004). It occurs in oak forests, as well as loblolly and shortleaf pine communities in Maryland (Frye and Frye, 2012). It is one of the four dominant ant species in a longleaf pine plantation in South Carolina (Whitford and Gentry, 1981) and is the dominant species in large patches of forest with low historical land-use intensity in western North Carolina (Mitchell et al., 2002). It also occurs in urban habitats (Guénard et al, 2015).

Biology:

Aphaenogaster fulva nests in and under bark of logs and stumps or rarely under stones (pers. obs.). Nests are small to medium sized and nests around and in rotten wood of houses (Smith, 1965).

Brood were collected in, June, July and August; sexuals were collected in nests in June and July. DuBois (1985) found reproductives in nests in Kansas in June. The workers are not aggressive, and escape with the brood (pers. obs.).

fulva - United States

Nests in rotten bark of logs and stumps, rarely under stones,
house pest

Forests, grasslands

Compare with *ashmeadi*, *flemingi*, *huachucana*, *lamellidens*, *treatae*

Workers are attracted to Vienna sausage baits (pers. obs.). *Aphaenogaster fulva* is a seed dispersing ant (Ness, 2004), and an important disperser of the seeds of *Viola* (Ellison et al., 2012). Workers use pieces of leaf, mud and sand grains as tools to carry soft foods from distant sources to the colony (Fellers and Fellers, 1976). It feeds on insects (Dash, 2004), natural live food and dead insects, eats peanut butter, but is not a house pest of major importance (Smith, 1965).

Soils in areas where nests occur range from clay to sandy-loam with colors ranging from brown, grey, dark brown, to red (pers. obs.).

Pseudoscorpions have been found in nests, as well as workers of *Hypoponera*, and one nest had two *Formica* queens (pers. obs.). *Aphaenogaster fulva* is rarely infected by the phorid fly *Pseudacteon* (Porter and Alonso, 1999) and is the host of the hoverfly parasite

Microdon coarctatus (Ellison et al., 2012). It is also the host of the scarabid beetle *Cremastocheilus variolosus* (Cazier and Statham, 1962). The psalaphid beetle *Temesiphorus costalis* feeds on the brood (Park, 1933). It is associated with 10 species of phoretic mites (Campbell et al., 2013). It is possibly a temporary host of other members of the genus (especially *A. tennesseensis* and *A. mariae*, Smith, 1979).

Ardila-Garcia et al. (2010) provide an estimate and comparison of the genome size with $2n=36$ (Crozier, 1977).

fulva - United States

Nests in rotten bark of logs and stumps, rarely under stones,
house pest

Forests, grasslands

honduriana, *Aphaenogaster* 264

subterranea complex

Compare with *araneoides*

***Aphaenogaster honduriana* Mann**

Worker Figs. 7 (head), 76 (propodeum), 78 (side view), 270 (petiole and postpetiole).

Female Figs. 8, 271 (head), 116 (top view), 271 (side view).

Map 10.

Plate 15 (worker).

Aphaenogaster (Deromyrma) honduriana Mann, 1922:23-24, Fig. 11, ♀
♀, Honduras: Lombardía, San Juan Pueblo

Diagnoses:

Worker. The clypeus is covered with very fine rugulae, the entire dorsum of the head is sculptured. The scape extends nearly $\frac{1}{2}$ length past the posterior lateral corner of the head, and the posterior part of the head is not narrowed into a neck. The mesosoma is completely sculptured, mostly with punctures, although the dorsum of the pronotum is moderately smooth and glossy. The propodeum is angulate between the faces, but the spines are absent.

honduriana - Honduras

Nests in rotten wood and twigs

Tropical forest

Compare with *araneoides*

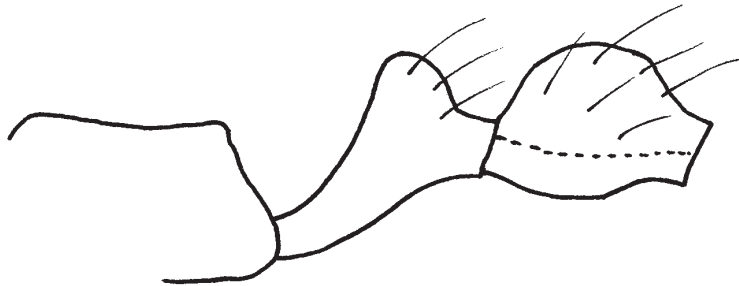


Fig. 270. Propodeum, petiole and postpetiole of a worker of *A. honduriana* (14 k S La Ceiba, Honduras, MCZC).

Female. These are small specimens (total length 4.7 mm), only slightly larger than the worker. The scapes are long, extending nearly $\frac{1}{2}$ length past the posterior lateral corner of the head. The head is coarsely covered with a tangle of reticulated rugae and punctures, giving it a granulate appearance. Much of the sculpture of the mesosoma is similar, except part of the side of the pronotum and most of the katepisternum are moderately shiny and smooth. The propodeum is armed with a pair of small angles. Nearly all surfaces are covered with long (0.1 mm) erect hairs.

honduriana - Honduras

Nests in rotten wood and twigs

Tropical forest

Compare with *araneoides*

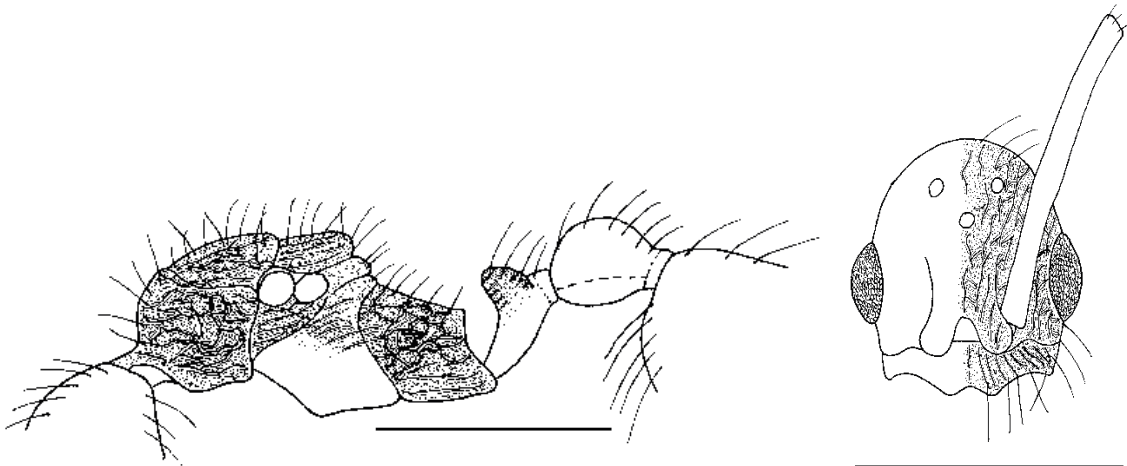


Fig. 271. Mesosoma, waist and head of a female of *A. honduriana* (14 k S La Ceiba, Honduras, MCZC).

Male. Unknown. A photograph is available on AntWeb.

Comparison:

It would be unlikely to confuse this species with any of the known taxa in Central America. The only other species known from this area, *A. araneoides*, has a well-developed neck.

Distribution:

HONDURAS: **Atlántida:** 14 k S La Ceiba, Lombardía, Mann (CWEM, MCZC).

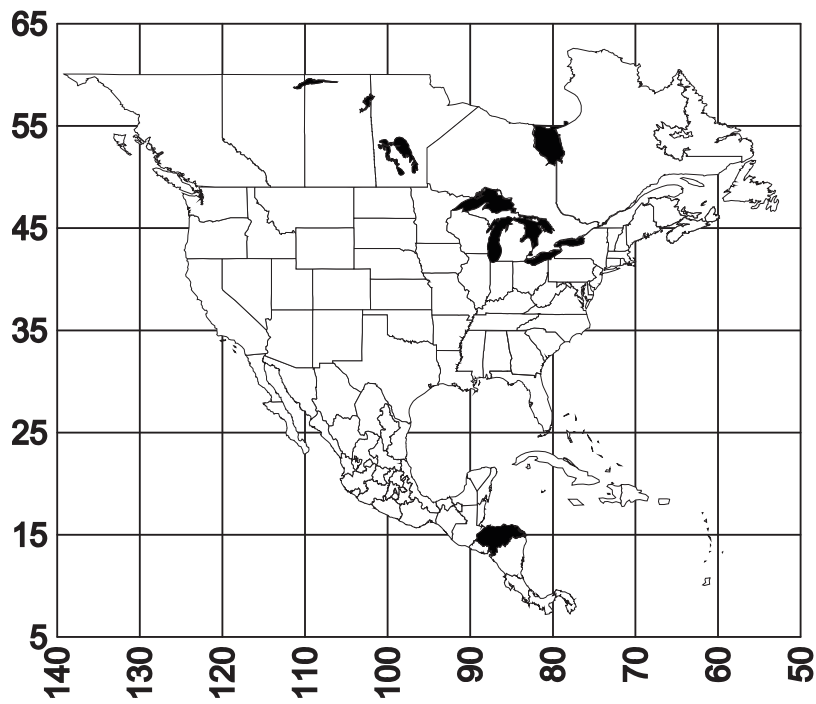
honduriana - Honduras
Nests in rotten wood and twigs
Tropical forest

subterranea complex

267

Aphaenogaster honduriana

Compare with *araneoides*



Map 10. *Aphaenogaster honduriana*

Habitat:

Steep tropical forest slope.

Biology:

This species nests in rotten wood and twigs, and was apparently common in the region of San Juan Pueblo (Mann, 1922). Specimens are occasionally collected in leaf litter.

honduriana - Honduras

Nests in rotten wood and twigs

Tropical forest

huachucana, *Aphaenogaster* 268 *subterranea* complex
Compare with *boulderensis*, *carolinensis*, *flemingi*, *floridana*, *rudis*,
texana

***Aphaenogaster huachucana* Creighton**

Worker Figs. 96 (propodeum from top), 97 (base of scape), 272 (side view), 273 (head).

Female Figs. 121, 274 (side view), 121, 274 (head), 121 (base of scape).

Male Figs. 137 (scutum from above with sculpture), 139 (mesopleuron), 275 (side view), 275 (head).

Map 11.

Plates 16 (worker), 17 (female), 18 (male).

Aphaenogaster (Attomyrma) huachucana Creighton, 1934:189-193, ♀, USA: Arizona, Ramsey Canyon, Huachucana Mountains [3 cotype ♀ seen (CASC), 14 ♀, 4 ♀ cotypes seen (MCZC)]; Creighton, 1952:94-99, ♀ (Plate 7: Figs. 3, 6), ♂ (Plate 7 Figs 2, 5)

Diagnoses:

Worker. This species is difficult to recognize. The antennal scape is long, extending more than 2 funicular segments past the posterior lateral corner of the head. The head is elongate (head width / head length about

huachucana - SW United States, NW México
Nests in and under stones
Hardwood forests

Compare with *boulderensis*, *carolinensis*, *flemingi*, *floridana*, *rudis*,
texana

0.67). The propodeal spines are short and broad at the base. The key character, the small, angular lobe at the base of the antennal scape (Fig. 122), projects forward, but is difficult to see.

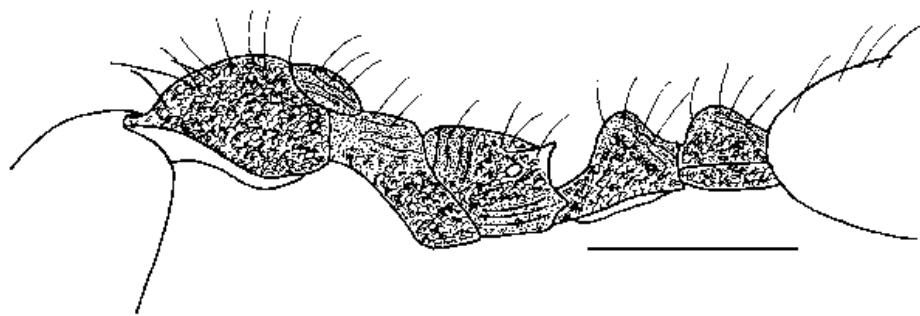


Fig. 272. Mesosoma, petiole and postpetiole of a cotype worker of *A. huachucana* (MCZC).

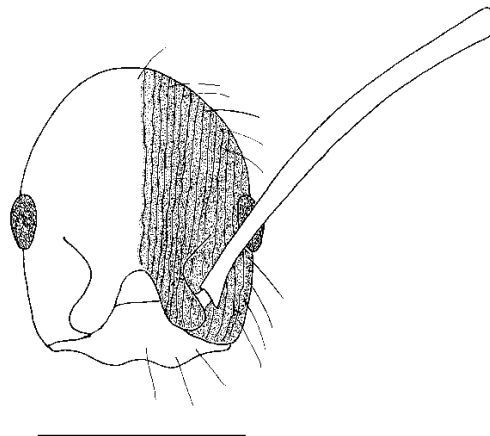


Fig. 273. Head of a syntype worker of *A. huachucana* (MCZC).

huachucana - SW United States, NW México
Nests in and under stones
Hardwood forests

huachucana, *Aphaenogaster* 270 *subterranea* complex
Compare with *boulderensis*, *carolinensis*, *flemingi*, *floridana*, *rudis*,
texana

Female. This is a large (7-8 millimeters total length), ferrugineous red specimen, with a concolorous gaster. Most surfaces are heavily sculptured, except the mesopleuron, which is partially smooth and glossy.

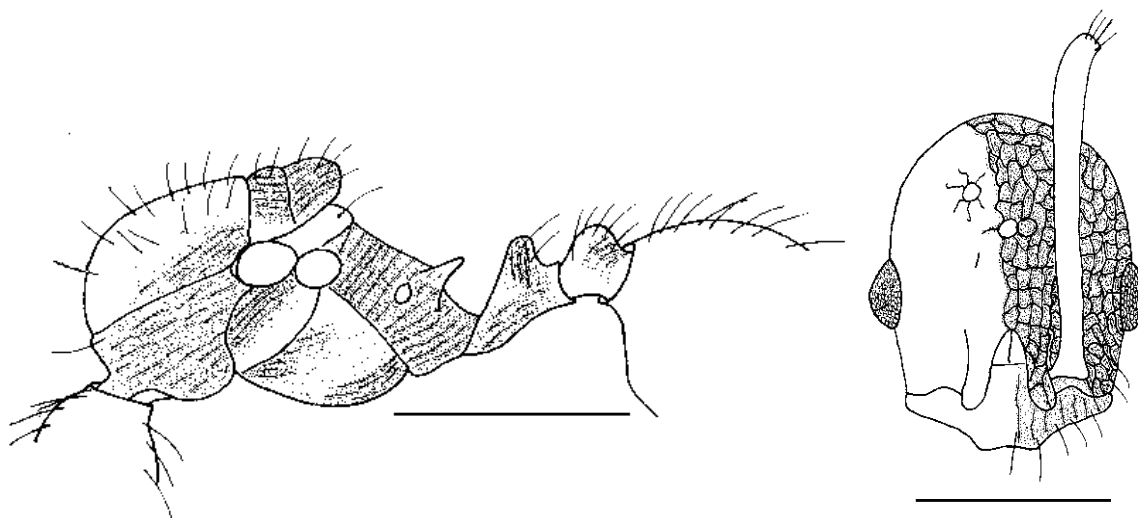


Fig. 274. Mesosoma, waist and head of a cotype female of *A. huachucana* (MCZC).

Male. The male of *A. huachucana* is a small (total length about 3 mm), medium brown specimen in which the posterior half of the scutum is finely punctate, but still moderately shining, the anterior half of the katepisternum is punctate and coriaceous, but shiny and the dorsopropodeum is low and angulate between the faces.

huachucana - SW United States, NW México
Nests in and under stones
Hardwood forests

Compare with *boulderensis*, *carolinensis*, *flemingi*, *floridana*, *rudis*,
texana

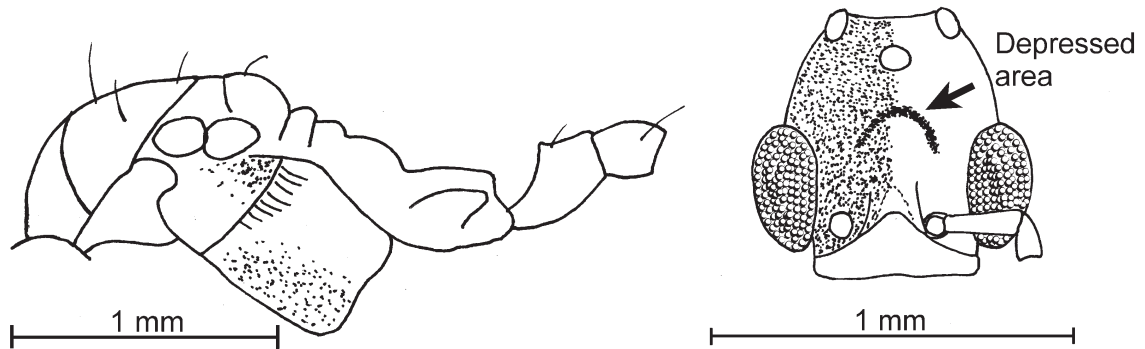


Fig. 275. Mesosoma, waist and head of a male of *A. huachucana* (Chiricahua Mountains, Cochise Co., AZ, CWEM).

Comparison:

The worker could be confused with that of *A. boulderensis*. They can be easily separated, as *A. huachucana* has the head covered with rough rugose sculpturing, whereas the head of *A. boulderensis* is mostly covered with fine punctures, at least posteriorly. The propodeum of *A. huachucana* is armed with small, but well-developed propodeal spines, *A. boulderensis* lacks the spines.

It is difficult to separate *A. huachucana* from *A. texana*. *Aphaenogaster huachucana* generally has a brown gaster, that of *A. texana* is often dark. The base of the scape has a larger and blunter (outer side) lobe, than does *A. texana*. *Aphaenogaster huachucana* is rarely collected, *A. texana* is very common and widely distributed throughout the southern and eastern USA south into northern Mexico, *A. huachucana* is found in southwestern

huachucana - SW United States, NW México

Nests in and under stones

Hardwood forests

huachucana, *Aphaenogaster* 272 *subterranea* complex
Compare with *boulderensis*, *carolinensis*, *flemingi*, *floridana*, *rudis*,
texana

USA and western México. Both of these species are difficult to separate from *A. rudis* and its allies, but usually can be separated by larger lobe on the base of scape.

Aphaenogaster huachucana workers can be separated from *A. floridana* workers (SE USA) as the latter completely lack propodeal spines or have only tiny angles.

Aphaenogaster huachucana can be separated from *A. flemingi* (eastern USA) as the posterior half of the head is coarsely sculptured with rugulae whereas the same area is finely striolate and coriaceous and finely punctate in *A. flemingi*. Also, the propodeal spines of *A. flemingi* are longer, the length is about as long as the distance between the bases.

It would be most likely to confuse the male of *A. huachucana* with those of *A. carolinensis* and *A. miamiana*, both from the eastern United States, as all three species have the moderately roughly sculptured posterior half of the scutum. The latter two species have a nearly completely shiny katepisternum, which makes separation simple.

The male can be easily separated from that of *A. texana* by the roughly sculptured scutum which is completely smooth and shiny in *A. texana*, except for a small but triangular area at the posterior edge of the scutum.

Distribution:

USA: Arizona (CWEM; Huachuca Mountains, Ramsey Canyon, CASC); Hunt and Snelling, 1975); **Colorado** (Gregg, 1963); **New Mexico** (Mackay and Mackay, 2002); **Texas** (west Texas, east of El Paso,

huachucana - SW United States, NW México
Nests in and under stones
Hardwood forests

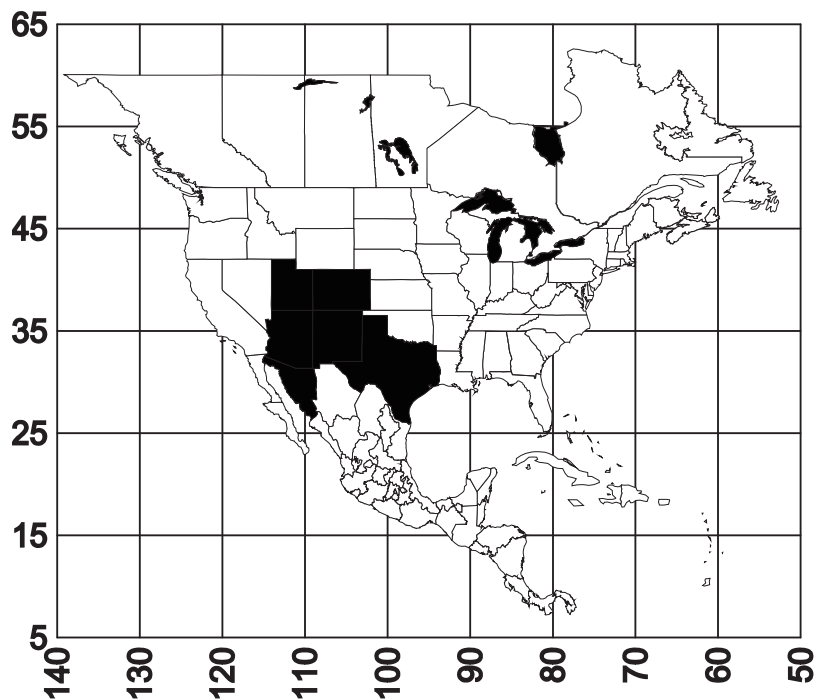
subterranea complex

273

Aphaenogaster huachucana

Compare with *boulderensis*, *carolinensis*, *flemingi*, *floridana*, *rudis*,
texana

(fossils, see Mackay and Elias, 1992); **Utah** (Allred, 1982). **MEXICO:**
Sonora (Alatorre-Bracamontes and Vásquez-Bolaños, 2011). It was
widely distributed in the Chihuahuan Desert, in the late Quaternary (Mac-
kay and Elias, 1992).



Map 11. *Aphaenogaster huachucana*.

huachucana - SW United States, NW México

Nests in and under stones

Hardwood forests

huachucana, *Aphaenogaster* 274 *subterranea* complex
Compare with *boulderensis*, *carolinensis*, *flemingi*, *floridana*, *rudis*,
texana

Habitat:

Aphaenogaster huachucana is found in oak forests, alligator bark juniper thickets, and pinyon-cedar woodlands. One series was from a riparian habitat (pers. obs.). Nests are found in northern mesic evergreen forest, in a zone of pines 2000-2500m or in shady aspen or pine groves or full sun on steep slopes (Creighton, 1952).

Biology:

This ant nests under stones, and is uncommon (pers. obs.), or between stones on rock slides (Creighton, 1952), in open, arid sites in fine sand/clay with abundant stones (pers. obs.).

Sexuals are found in nests in July (Creighton, 1952). They may be reproductively isolated from *A. texana*, as the flights probably occur in July, possibly not later in the summer (Creighton, 1952).

huachucana - SW United States, NW México
Nests in and under stones
Hardwood forests

phalangium complex

275

Aphaenogaster inermis

Compare with *araneoides*, *brevicollis*, *phalangium*

***Aphaenogaster inermis* Forel**

Worker Figs. 30 (mandible), 32 (posterior femur), 40, 276 (side view), 276 (head).

Male Figs. 37 (posterior femur), 277 (side view), 278 (head).

Map 12.

Plate 19 (worker).

Aphaenogaster (Ischnomyrmex) araneoides var. *inermis* Forel, 1899:60, ♀ ♂, Costa Rica (restricted by lectotype worker, 5 paralectotype ♀, 2 paralectotype ♂, designated by Mackay and Dash, 2016:8, MHNG]; *Aphaenogaster (Deromyrma) araneoides inermis*: Wheeler and Wheeler, 1953:64, larva; *Aphaenogaster (Deromyrma) araneoides* var. *inermis*: Kempf 1972:23; *Aphaenogaster inermis*: Mackay and Dash, 1916: 7

Aphaenogaster araneoides var. *nitidiventris* Forel, 1912:15, ♀ ♂ Costa Rica?: Cañas Gordas (Mackay and Dash, 1916: 7)

Aphaenogaster (Deromyrma) araneoides var. *canalis* J. Enzmann, 1947:149, plate 8 ♀, Panamá (Mackay and Dash, 1916: 7)

inermis - Central America, Colombia

Nests in and under rotten logs

Tropical forests

Compare with *araneoides*, *brevicollis*, *phalangium*

Diagnoses:

Worker. *Aphaenogaster inermis* workers are elongate, delicate ants. Most surfaces are covered by short (0.1 mm in length) blunt-tipped hairs. The distinguishing characteristic is that all surfaces of the posterior femur are covered with suberect hairs (the other femora have similar hairs).

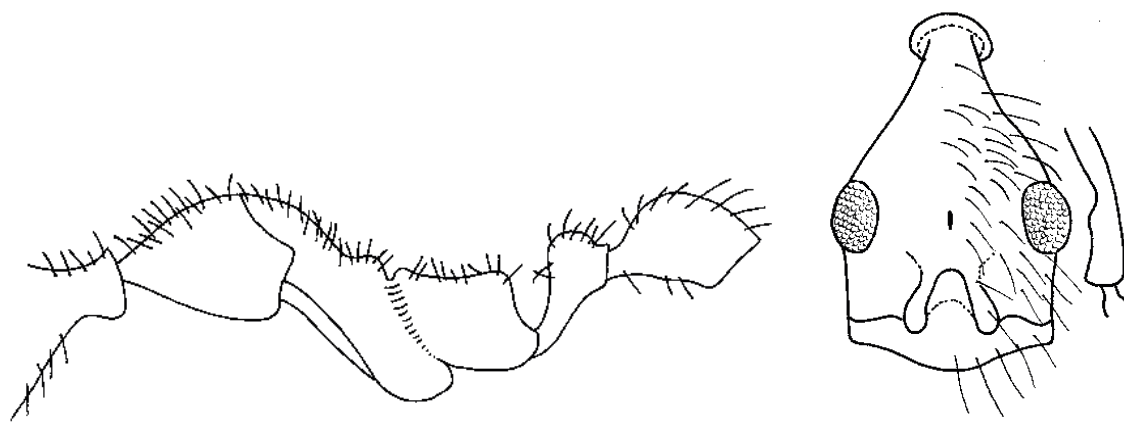


Fig. 276. Posterior part of the head, mesosoma, petiole and post-petiole of the lectotype worker of *A. inermis*. The inset shows the base of the scape as seen from above (magnified 1.6 X scale of head).

The sculpture on the head is relatively fine, and consists mostly of punctures, the mesosoma has punctures, together with mostly longitudinal poorly defined striae and the petiole, postpetiole are dull and finely

inermis - Central America, Colombia

Nests in and under rotten logs

Tropical forests

Compare with *araneoides*, *brevicollis*, *phalangium*

punctate, the surface of the gaster ranges from opaque to smooth and glossy.

Female. Unknown.

Male. *Aphaenogaster inermis* specimens are moderate in size (total length 6 mm) and reddish brown. The neck is greatly elongated and slender as in the worker. The eye is large and covers nearly $\frac{1}{2}$ of the side of the head; the ocelli are large and closely spaced (maximum diameter 0.1 mm, distances between ocelli slightly less than 0.1 mm). The propodeum lacks spines or bumps, but is slightly swollen at these positions.

The head is mostly finely, but densely punctate, the neck region has a few transverse striae. The scutum and scutellum are roughly sculptured and granulate, the side of the mesosoma has poorly defined, mostly horizontal striae. The petiole and postpetiole are mostly finely punctate and weakly shining, at least dorsally. The first tergum of the gaster is coriaceous and somewhat smooth and shining, less sculptured than the head.

Both the dorsal and ventral surfaces of the head have scattered, relatively long (up to 0.25 mm in length) erect hairs, as does the mesosoma, the petiole, postpetiole and gaster, all of the femora have a few erect hairs, those on the posterior femur are more abundant and about 0.1 mm in length, many of the hairs are suberect.

inermis - Central America, Colombia

Nests in and under rotten logs

Tropical forests

Compare with *araneoides*, *brevicollis*, *phalangium*

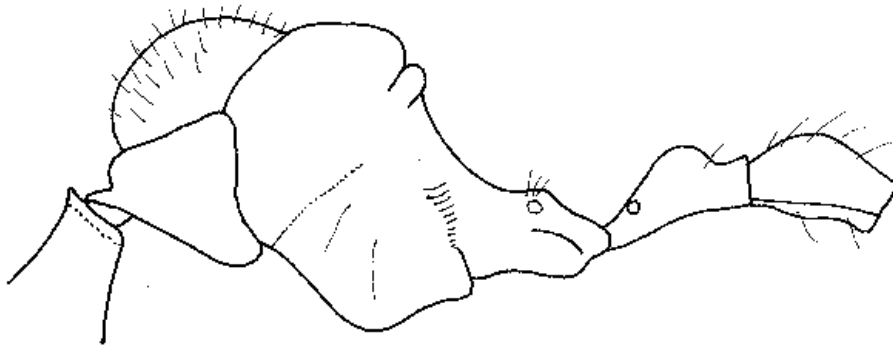


Fig. 277. Posterior part of the head, mesosoma, petiole and post-petiole of a paralectotype male of *A. inermis*.

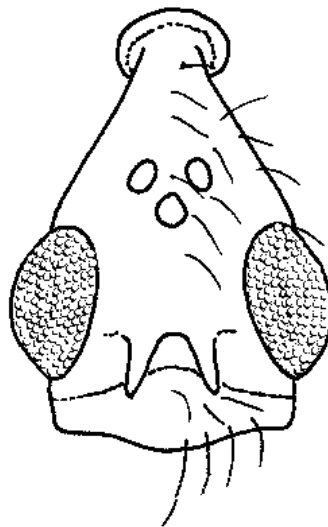


Fig. 278. Head of a male of *A. inermis* (paralectotype of *A. nitidiventris*).

inermis - Central America, Colombia

Nests in and under rotten logs

Tropical forests

Compare with *araneoides*, *brevicollis*, *phalangium*

Comparison:

The worker of *A. inermis* could be confused with that of *A. araneoides*, but differs in that the posterior femur has erect and suberect hairs on all surfaces, including the dorsal surface. The posterior femur of *A. araneoides* has only a few hairs on the ventral surface.

The head is mostly finely, but densely punctate, the neck region has a few transverse striae. The scutum and scutellum are roughly sculptured and granulate, the side of the mesosoma has poorly defined, mostly horizontal striae. The petiole and postpetiole are mostly finely punctate and weakly shining, at least dorsally. The first tergum of the gaster is coriaceous and somewhat smooth and shining, less sculptured than the head (densely sculptured in specimens from Colombia).

Both the dorsal and ventral surfaces of the head have scattered, relatively long (up to 0.25 mm in length) erect hairs, as does the mesosoma, the petiole, postpetiole and gaster, all of the femora have a few erect hairs, those on the posterior femur are more abundant and about 0.1 mm in length, many of the hairs are suberect.

The males can be separate from all of the similar males with elongated necks as there are usually a few erect and suberect hairs on the dorsum of the posterior femur, which are absent in the other species.

inermis - Central America, Colombia

Nests in and under rotten logs

Tropical forests

inermis, *Aphaenogaster*

280

phalangium complex

Compare with *araneoides*, *brevicollis*, *phalangium*

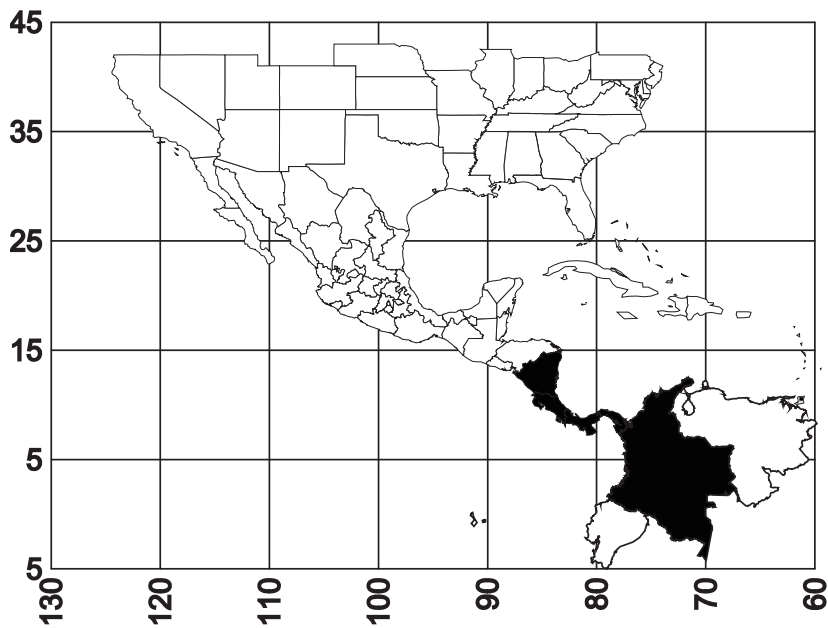
Distribution (specimens seen):

NICARAGUA: Río San Juan, 5.1 mi SE El Castillo (CWEM).

COSTA RICA: Guanacaste, Maritza Field Station (CWEM).

PANAMA: Panamá, Barro Colorado Island (CWEM); Chiriquí, Monte Verde, Gariche, Potrerillos Arriba, (CWEM).

COLOMBIA: Chocó, Quibdó, Tutunedo, 5°41'16"N, 76°39'56"W, 48 m, 18xi-2001, J. Neita (5 ♀♀ Facultad de Agronomía, Universidad Nacional de Colombia), Tadó, Corregimiento de Salero, 5°16'10"N, 76°33'10"W, 90m (CWEM).



Map 12. *Aphaenogaster inermis*.

inermis - Central America, Colombia

Nests in and under rotten logs

Tropical forests

Compare with *araneoides*, *brevicollis*, *phalangium*

Habitat:

Aphaenogaster inermis has been found in an open area in a tropical forest next to river (5m), transitional dry tropical forest to wet montane forest (875m), to dense tropical forest.

Biology:

Aphaenogaster inermis nests in and under logs. Brood were present in a nest in July. The workers are timid, and escape with the brood.

Workers forage into the litter and can be collected from litter extractions and with pitfall traps.

The soils in these areas are dark brown clay-loam.

inermis - Central America, Colombia

Nests in and under rotten logs

Tropical forests

lamellidens, *Aphaenogaster* 282 *subterranea* complex
Compare with *flemingi*, *floridana*

***Aphaenogaster lamellidens* Mayr**

Worker Figs. 71, 91, 92 (torulus), 90 (pronotum), 279 (side view), 85 (propodeal spines from above); 280 (head).

Female Figs. 119 (torulus), 281 (side view), 282 (head).

Male Figs. 133 (torulus), 283 (side view), 284 (head).

Map 13.

Plates 20 (worker), 21 (female), 23 (male).

Aphaenogaster lamellidens Mayr, 1886: 444-445, ♀ ♀ ♂, USA: Virginia; Wheeler, 1913:114; Taber and Cokendolpher, 1988:95, karyotype; *Stenammas* (*Aphaenogaster*) *lamellidens*: Emery, 1895:302; *Aphaenogaster* (*Attomyrma*) *lamellidens*: Emery, 1921:58

Aphaenogaster (*Attomyrma*) *lamellidens nigripes* M. Smith, 1923:308, ♀, USA: Mississippi, Agricultural and Mechanical College (Creighton, 1950:144)

Diagnoses:

Worker and Female.

The worker and female can be recognized and separated from all of the other species in the genus by the tiny tooth on the posterior edge of the torulus. The clypeus has several small, poorly defined carinae, the dorsum of the head is covered with rough sculpture, which is mostly granular.

lamellidens - E USA

Nests in and under rotten logs and stumps, under bark, house pest
Hardwood forests, grasslands, urban habitats

Compare with *flemingi*, *floridana*

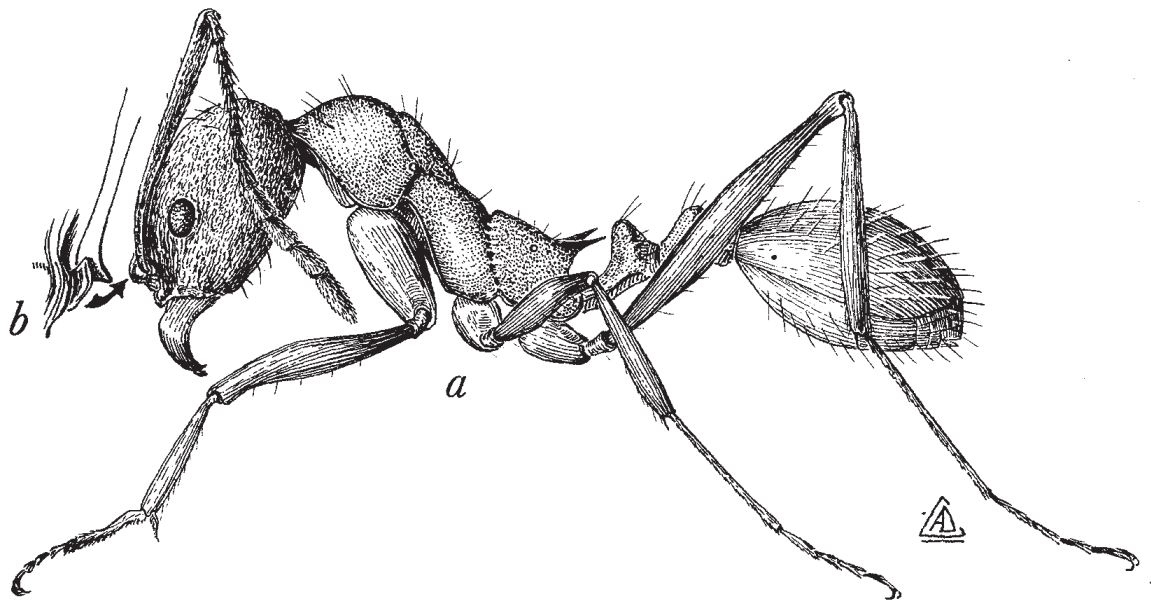


Fig. 279. Side view of a worker (“a”) of *A. lamellidens*. The inset (“b”) shows the tooth of the torulus (from Smith, 1965).

The scape extends slightly more than the first two funicular segments past the posterior lateral border of the head. The entire mesosoma, including the side and top of the pronotum, is densely sculptured, mostly granular. The propodeal spines are very well-developed, and nearly as long as the length of the posteropropodeum of the worker.

lamellidens - E USA

Nests in and under rotten logs and stumps, under bark, house pest
Hardwood forests, grasslands, urban habitats

Compare with *flemingi*, *floridana*

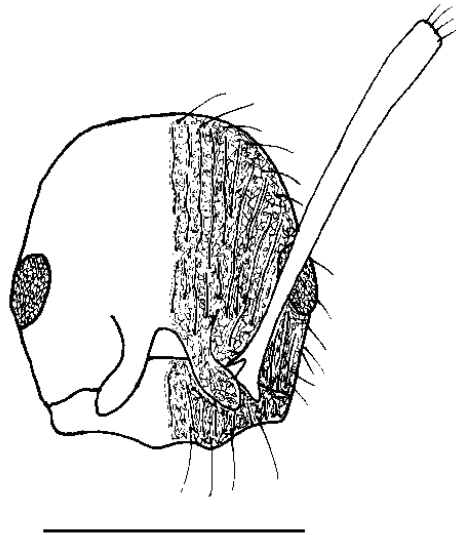


Fig. 280. Head of a worker of *A. lamellidens* (Calvert Co., Maryland, MCZC).

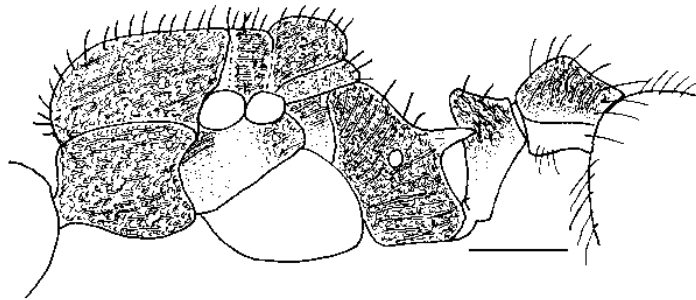


Fig. 281. Mesosoma, petiole and postpetiole of a female of *A. lamellidens* (Orange Co., North Carolina, MCZC).

lamellidens - E USA

Nests in and under rotten logs and stumps, under bark, house pest
Hardwood forests, grasslands, urban habitats

Compare with *flemingi*, *floridana*

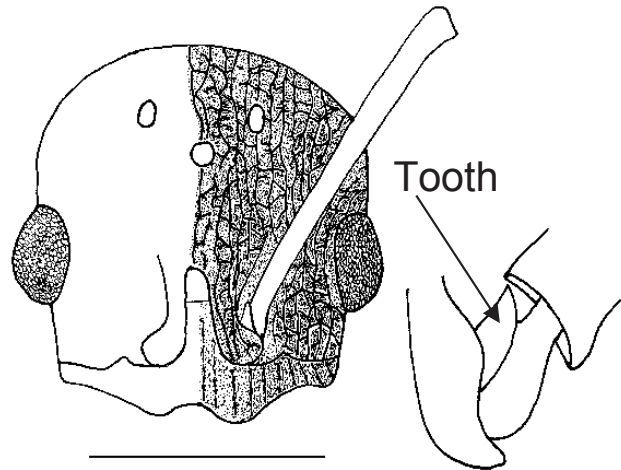


Fig. 282. Head of a female of *A. lamellidens* (Calvert Co., Maryland, MCZC). The inset shows the base of the scape and the tooth on the torulus (enlarged).

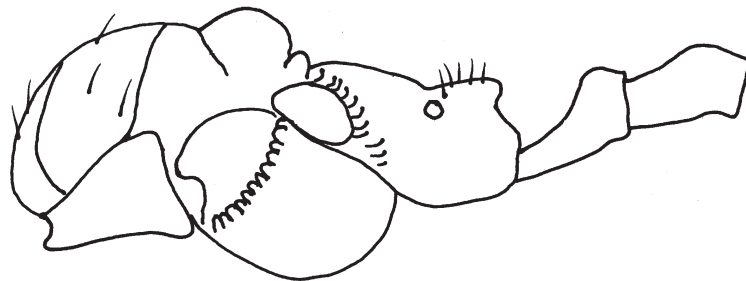


Fig. 283. Mesosoma, petiole and postpetiole of a male of *A. lamellidens* (Taylorsville, MS, LACM).

lamellidens - E USA

Nests in and under rotten logs and stumps, under bark, house pest
Hardwood forests, grasslands, urban habitats

Compare with *flemingi*, *floridana*

Male. This is a small (5 mm total length) medium brown ant. It can be recognized by a small, pointed triangle shaped plate at the posterior border of the torulus. Unfortunately, the structure is difficult to see and is easily ignored. The head is strongly narrowed posteriorly and the ocelli and eyes are relatively small.

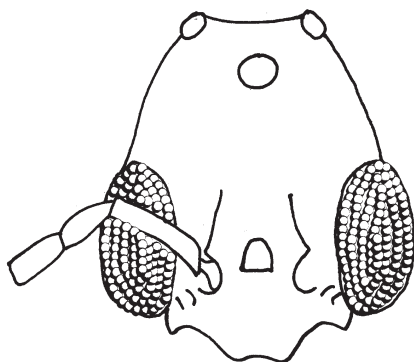


Fig. 284. Head of a male of *A. lamellidens* (Taylorsville, MS, LACM).

Comparison:

This species should not be confused with any other species of *Aphaenogaster* the New World, by the presence of the flattened, pointed plate located on posterior edge of the torulus in the worker, female and male. Other species (*A. floridana*, *A. flemingi*) have a smaller lobe but it

lamellidens - E USA

Nests in and under rotten logs and stumps, under bark, house pest
Hardwood forests, grasslands, urban habitats

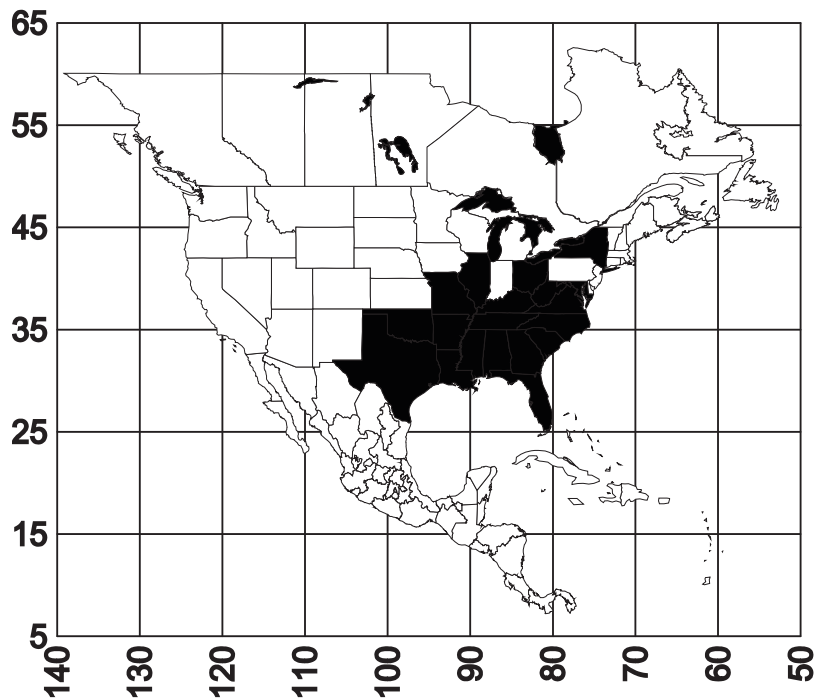
subterranea complex

287

Aphaenogaster lamellidens

Compare with *flemingi*, *floridana*

does not appear to be a posteriorly directed spine (in frontal view) as it does in *A. lamellidens*.



Map 13. *Aphaenogaster lamellidens*.

Distribution:

USA: Alabama (MacGown and Forster, 2005); **Arkansas**, Hempstead, Marion, Scott, Searcy Cos. (CWEM) (General and Thompson, 2007, 2008, 2009, 2011); **Florida**, Alachua, Columbia, Hernando, Lake

lamellidens - E USA

Nests in and under rotten logs and stumps, under bark, house pest
Hardwood forests, grasslands, urban habitats

Compare with *flemingi*, *floridana*

Cos. (CWEM); **Georgia**, Clark Co., (CWEM); **Illinois** (Smith, 1979; DuBois and LaBerge, 1988); **Kentucky** (CWEM); **Louisiana**, Elizabeth Par. (CWEM) (Dash, 2004; Dash and Hooper-Bùi, 2008); **Maryland** (CWEM); **Mississippi** (MacGown and Brown, 2006; MacGown et al., 2010; CWEM); **Missouri** (CWEM); **New York** (Smith, 1979); **North Carolina** (CWEM); Beaufort Co., Tryon (CASC) (Stuble et al., 2013a; Resasco et al, 2014; Guénard et al., 2012, 2015); **Ohio** (Coovert, 2005); **Oklahoma**, Atoka Co. (CWEM); **South Carolina** (CWEM); **Tennessee**, Palaski (CWEM); **Texas**, Cass, Fannin, Sabine Cos. (CWEM); **Virginia** (CWEM); **West Virginia** (Culver, 1974).

Habitat:

Nests were generally found in hardwood forests, juniper forests, one nest was in a pine/oak forest and a few nests were found in grasslands or open areas in the forest. It also found in laurel oak, white oak, black oak, post oak, red maple, pignut hickory, longleaf pine forests (pers. obs.).

Aphaenogaster lamellidens occurs in urban habitats (Guénard et al, 2015), oaks, as well as loblolly and shortleaf pine communities in Maryland (Frye and Frye, 2012). DuBois and LaBerge (1988) found nests in deciduous forests. In Louisiana it is found in pine-savanna as well as mixed pine hardwood forest and west gulf-coastal plain longleaf-pine forest ecoregions (Dash, 2004).

lamellidens - E USA

Nests in and under rotten logs and stumps, under bark, house pest
Hardwood forests, grasslands, urban habitats

Compare with *flemingi*, *floridana*

Biology:

Aphaenogaster lamellidens nests in rotten wood (branches, logs, stumps), under bark of standing loblolly pines or in the soil at the base of trees. One nest contained about 100 workers, another about 200 workers (pers. obs.). Smith (1965) reports a few hundred to several thousand workers in a nest. Small nests are timid, but larger nests can have aggressive workers which attack (pers. obs.).

Brood and sexuals were collected in nests in June to August. New colonies are started in May.

This ant is a seed disperser and ant plant seed-dispersal mutualisms may be more robust to climate change than currently assumed (Stuble et al., 2014a).

Most nests were found in areas with clay soils, clay loam, two nests were found in sandy areas (sandy clay to sandy gravel). Soil color ranged from gray, light brown, brown, to red (pers. obs.).

One nest was mixed with *Aphaenogaster rudis* (pers. obs.). A nest of *Pheidole dentata* contained a male of *A. lamellidens*. In experiments with interacting pairs of species, the durations of interactions with *A. lamellidens* were significantly longer than with other species (Menzel, 2012).

Concerning the number of chromosomes, $2n=38$ (Crozier, 1977; Taber and Cokendolpher, 1988).

It is a pest in houses, living in the floor boards (Smith, 1965).

lamellidens - E USA

Nests in and under rotten logs and stumps, under bark, house pest
Hardwood forests, grasslands, urban habitats

mariae, *Aphaenogaster*

290

subterranea complex

Compare with *tennesseensis*

***Aphaenogaster mariae* Forel**

Worker: Figs. 63 (gaster seen from above), 285 (mesosoma), 285 (head), 286 (propodeum and gaster from above).

Female Figs. 124 (mesosoma), 287 (side view), 287 (head).

Male Figs. 288 (side view), 288 (head).

Map 14.

Plate 23 (worker).

Aphaenogaster mariae Forel, 1886:41 (page 4 of reprinted article), ♀, USA: Florida [Lectotype and 6 paralectotypes designated]; Mayr, 1886:443; *Stenamma* (*Aphaenogaster*) *mariae*: Emery, 1895:301; *Aphaenogaster* (*Attomyrma*) *mariae*: Creighton, 1950:145

Diagnoses:

Worker.

The workers are roughly sculptured. The dorsal surface of the head is covered with rugae interspersed with punctures. Most of the mesosoma is covered with similar coarse rugae, with a few scattered punctures between the rugae. The propodeal spines are very well-developed, and point directly backwards, nearly forming a straight line with the dorsum of the propodeum. The basal $\frac{1}{5}$ - $\frac{1}{4}$ of the first gastral tergite is discovered with

mariae - E USA

Nests in trees, dead branches, under bark

Oak and pine forests, deciduous forests, grasslands, urban habitats

Compare with *tennesseensis*

posteriorly divergent striae, which may not be noticed unless the light is reflected from that region. The scape is not enlarged near the base. The postpetiole (seen from above) is slightly wider than long.

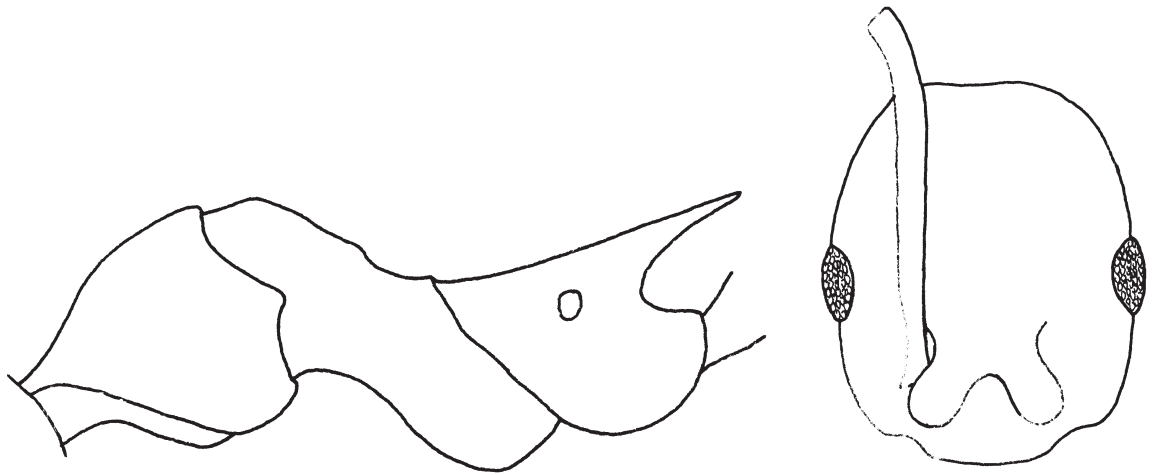


Fig. 285. Mesosoma and head of a worker of *A. mariae* (Ames, Iowa, MCZC).

mariae - E USA

Nests in trees, dead branches, under bark

Oak and pine forests, deciduous forests, grasslands, urban habitats

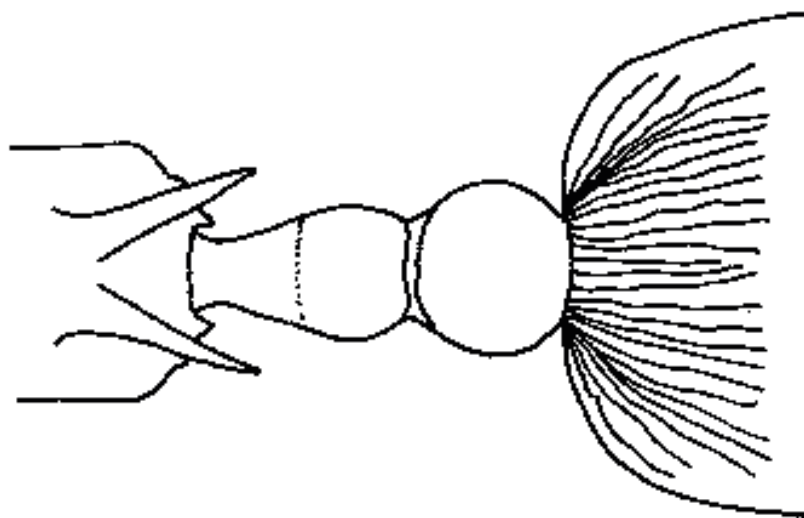
Compare with *tennesseensis*

Fig. 286. Propodeum, petiole, postpetiole and base of first gastral tergite of the lectotype worker of *A. mariae* as seen from above.

Female (previously undescribed). The head is covered with coarse reticulated rugae. The ocelli are tiny (0.05 mm in diameter). The sculpture on the mesosoma is very coarse, consisting mostly of reticulated rugae which cover nearly all surfaces except for the lower anepisternum and the lower and anterior half of the katepisternum. The propodeal spines are very long and pointed posteriorly. The node of the petiole is very sharp, more so than in most other species. The petiole has a very well-developed sternopetiole flange, as does the postpetiole. The anterior $\frac{1}{4}$ of the gaster is covered with diverging striae as in the worker.

mariae - E USA

Nests in trees, dead branches, under bark

Oak and pine forests, deciduous forests, grasslands, urban habitats

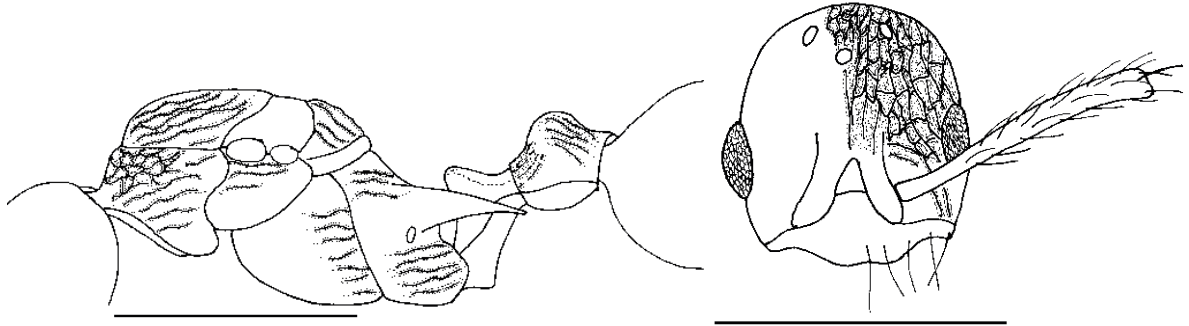
Compare with *tennesseensis*

Fig. 287. Mesosoma, waist and head of a female of *A. mariae* (Colebrook, Connecticut, MCZC).

Male (previously undescribed). The specimen is a small (total length 3.5 mm) medium brown ant. The scape is short, approximately as long as the first two funicular segments combined. The ocelli are relatively small. The dorsum of the head is granulated and weakly shining, nearly the entire scutum is smooth and polished, with only sculpturing posteriorly. The propodeal processes are weakly angulate posteriorly, the metapleural processes are swollen and weakly angulate posteriorly. The striae at the base of the gaster are only weakly developed.

mariae - E USA

Nests in trees, dead branches, under bark

Oak and pine forests, deciduous forests, grasslands, urban habitats

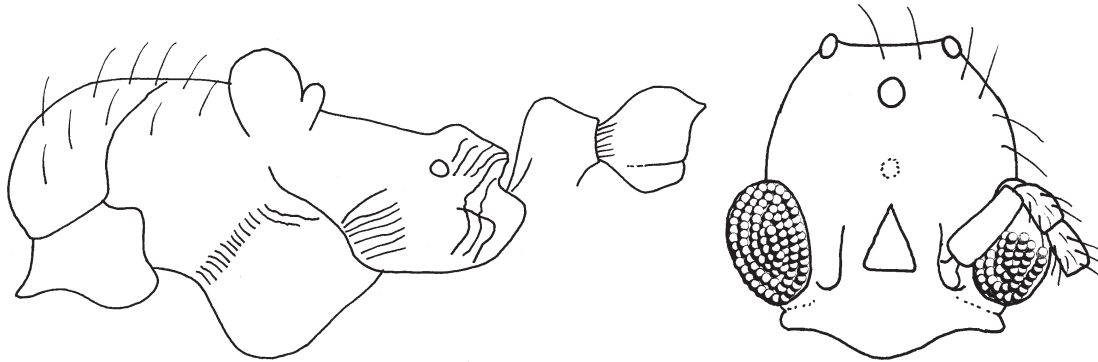
Compare with *tennesseensis*

Fig. 288. Mesosoma, waist and head of a male of *A. mariae* (Jackson, Ohio, LACM).

Comparison:

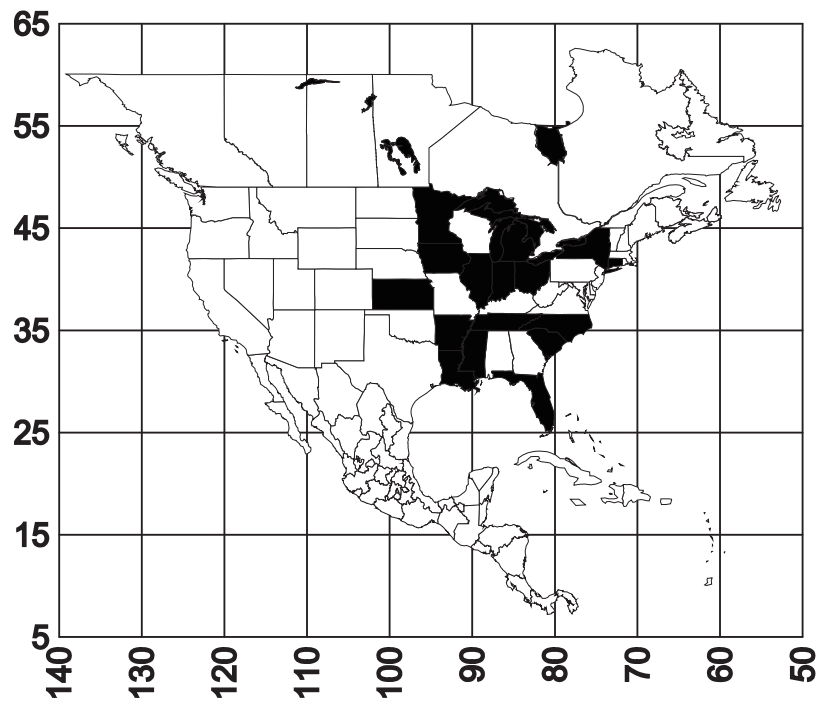
The diverging striae on the first tergum of the gaster will separate the worker and female of this species from all of the others in the New World. The widened postpetiole would separate it from all of the others except for *A. tennesseensis*. It is similar to *A. tennesseensis* in having greatly developed propodeal spines and a wide postpetiole. It differs from *A. tennesseensis* by being much more roughly sculptured, and with propodeal spines which point posteriorly in both the worker and the female and *A. tennesseensis* lacks the diverging striae at the base of the gaster.

The relatively short antennal scape of a male would separate it from most of the others in the genus.

mariae - E USA

Nests in trees, dead branches, under bark

Oak and pine forests, deciduous forests, grasslands, urban habitats

Compare with *tennesseensis*Map 14. *Aphaenogaster mariae*.**Distribution:**

Arkansas, Searcy Co., Richland Creek (CWEM); **Connecticut**, Colebrook (MCZC) (Ellison et al., 2012); **Florida** (Ellison et al., 2012); **Illinois**, Urbana (CASC) (DuBois and LaBerge, 1988); **Ohio**, Ashtabula Co., Jackson Co., Jackson (CASC, LACM); **Indiana** (Munsee, 1967); **Iowa**, Story Co., Ames (CWEM) (Ellison et al., 2012); **Kansas** (DuBois, 1985); probably occurs in **Louisiana** (Dash and Hooper-Bùi, 2008); **Minnesota**, Houston Co. (MCZC); **Michigan** (Wheeler et al., 1994); **Mississippi** (MacGown et al., 2010, MacGown and Brown, 2006); **New York** (Smith,

mariae - E USA

Nests in trees, dead branches, under bark

Oak and pine forests, deciduous forests, grasslands, urban habitats

Compare with *tennesseensis*

1979); **North Carolina** (Resasco et al, 2014; Guénard et al., 2012, 2015); **Ohio** (CWEM; Coover, 2005); **South Carolina** (Davis, 2009); **Tennessee**, Sevier Co., Chilhowee Mts., (CASC).

Habitat:

Aphaenogaster mariae is found in oak forests, as well as loblolly and shortleaf pine communities in Maryland (Frye and Frye, 2012). In Kansas it occurs in shaded areas of deciduous forests, bluestem prairie and oak-hickory forests (DuBois, 1985; DuBois and LaBerge, 1988). It also occurs in urban habitats (Guénard et al, 2015).

Biology:

Aphaenogaster mariae is arboreal (DeMarco, 2015) and nests in treetops (Ellison et al., 2012). MacGown and Brown (2006) found a nest in a dry, dead tree, and collected workers with peanut butter on the bark of the oaks *Quercus pagoda* and *Q. velutina* in Mississippi. DuBois (1985) found nests in dead branches or under loose bark of living trees in Kansas. Workers forage at the wound site of the red oak borer cerambycid beetle (Hay, 1974). The workers from Minnesota were collected in a rodent nest (pers. obs.).

Sexual were present in nests in September and a loose female was collected in September, suggesting late fall flights.

It is considered to be a temporary social parasite of other species of *Aphaenogaster* based largely on morphological features of the queens

mariae - E USA

Nests in trees, dead branches, under bark

Oak and pine forests, deciduous forests, grasslands, urban habitats

subterranea complex

297

Aphaenogaster mariae

Compare with *tennesseensis*

(DuBois, 1985), especially of *A. fulva* (Smith, 1979). Dealate queens were found with workers of *A. fulva* (MacGown and Brown, 2006).

It may lose the r-m vein in the wing completely, while keeping the central part of the radial sector, producing a pattern similar to that of *Octostruma* (Brown and Nutting, 1949).

mariae - E USA

Nests in trees, dead branches, under bark

Oak and pine forests, deciduous forests, grasslands, urban habitats

megommata, *Aphaenogaster* 298 *subterranea* complex
Compare with *boulderensis*, *floridana*, *montana*, *mutica*

***Aphaenogaster megommata* M. Smith**

Worker Figs. 53 (head), 69, 77 (side of head), 78, 289 (side view), 289 (petiole and postpetiole from above).

Female Figs. 107, 290 (side view), 290 (head).

Male Figs. 128 (propodeum and petiole), 291 (side view), 291 (head), 292 (atypical propodeum).

Map 15.

Plates 24 (worker), 25 (female), 26 (male).

Aphaenogaster (Attomyrma) megommatus M. Smith, 1963:244 - 246, Fig. 1, ♀, USA: Nevada, Washoe Co., Pyramid Lake, 1 mi N Camp Foster; Cole, 1966:9-11 ♀ (Figs. 13, mesosoma, petiole and postpetiole, 14, petiole and postpetiole seen from above), ♂ (Figs. 9, paramere, 10, vosella, 11, aedeagus, 12, abdominal sternites); Wheeler and Wheeler, 1972:238 larva

Diagnoses:

Worker. The eye of the worker is very large and strongly protuberant, with 18 to 20 facets in its greatest diameter. The eye is separated from the point of the insertion of the mandibles by approximately its greatest diameter. It is a sordid, pale, yellowish tan, with strongly contrasting, black eyes.

megommata - W USA
Nests in soil, small mound
Desert scrub

Compare with *boulderensis*, *floridana*, *montana*, *mutica*

The propodeal angles are poorly developed.

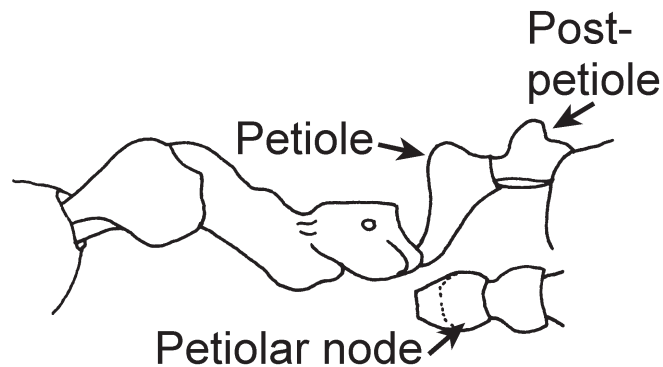


Fig. 289. Mesosoma of a worker of *A. megommata* (La Paz Co., Arizona, MCZC).

Female. These ants are intermediate sized (total length 6 - 7 millimeters) pale brown or yellow ants. The dorsum of the scutum and scutellum are smooth and polished. The side of the pronotum and the mesopleuron are mostly smooth and glossy, the propodeum is dull and striated, with transverse striae on the dorsopropodeum. The base of the gaster has short striae (0.05 mm in length) and the first 0.25 mm has scattered punctures, the remainder is finely coriaceous, but glossy. The propodeal spines are well developed, but blunt-tipped.

megommata - W USA
Nests in soil, small mound
Desert scrub

Compare with *boulderensis*, *floridana*, *montana*, *mutica*

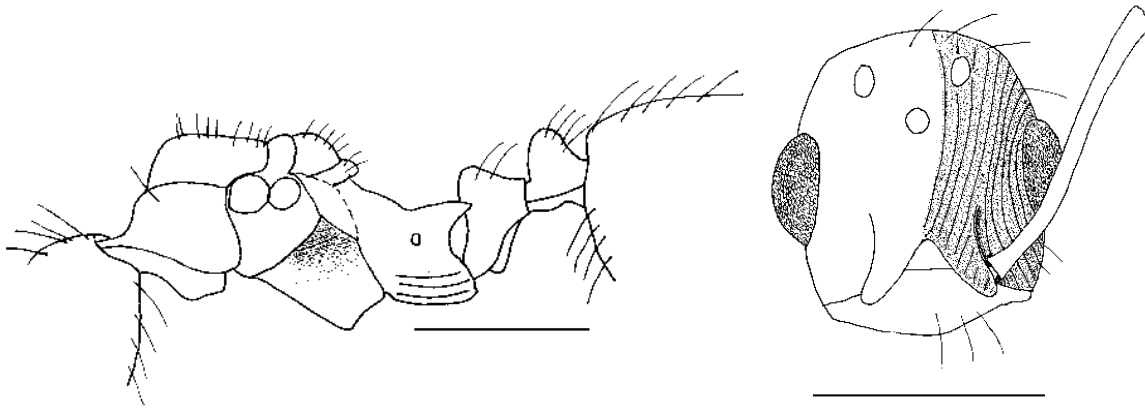


Fig. 290. Mesosoma, waist and head of a female of *A. megommata* (La Paz Co., Arizona, MCZC).

Male. These ants are easy to recognize as they are small (total length 4 mm) pale brown or yellowish ants. The scape is relatively short, about as long as the combined length of the first two funicular segments. The scutum and scutellum are mostly smooth and glossy. The propodeum is generally completely narrowed, with the anterior part of the dorsopropodeum being only slightly higher than the posterior part. An unusual specimen from Nevada has the first half of the propodeum swollen and forms a depression immediately anterior to the propodeal processes, which are angulate (Fig. 255). It could be a new species.

megommata - W USA

Nests in soil, small mound

Desert scrub

Compare with *boulderensis*, *floridana*, *montana*, *mutica*

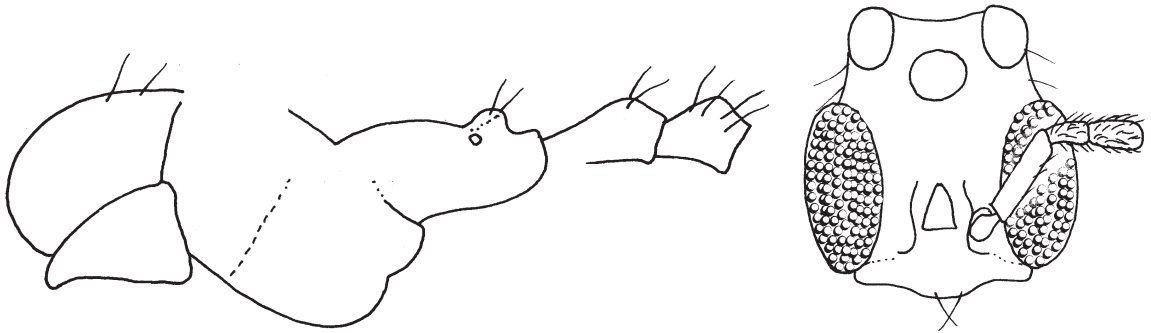


Fig. 291. Mesosoma, petiole and postpetiole of a male of *A. megommata* (Rice, CA, CWEM).

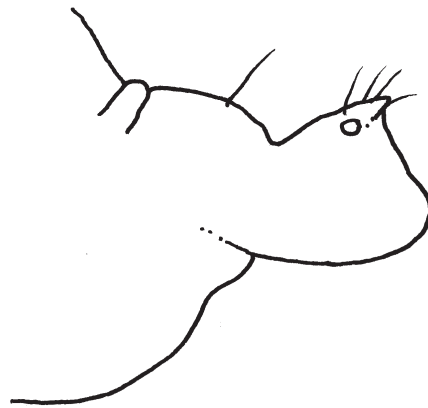


Fig. 292. Propodeum of an atypical male of *A. megommata* (Mercury, Nevada, LACM).

megommata - W USA
Nests in soil, small mound
Desert scrub

Compare with *boulderensis*, *floridana*, *montana*, *mutica*

Comparison:

Aphaenogaster megommata is one of the only small species which is found in arid areas, which will make it easy to recognize.

Aphaenogaster megommata workers could be confused with those of *A. boulderensis*. It differs in having a larger eye (about 15 facets in the greatest diameter in *A. boulderensis*), with the eye being located closer to the mandibles (about 1.5 times the greatest ocular diameter in *A. boulderensis*), and being a lighter color (*A. boulderensis* is ferruginous red).

Workers are very similar to those of the rarely collected *A. mutica* (Baja California, México), differing in having a larger eye (length about $\frac{1}{3}$ length of head, when viewed from the side, as compared to about $\frac{1}{5}$ in *A. mutica*). The yellowish color would also separate it from the reddish-brown *A. mutica*.

Aphaenogaster megommata workers could be easily confused with those of *A. floridana* (southeastern USA). Both species have pale yellowish or pale brown workers, without or with poorly developed propodeal spines. It can be easily separated as the scape of *A. megommata* lacks the swollen region at the base of the scape that is present in *A. floridana*.

It is interesting to note that the males of *A. megommata* and *A. montana* are the only North American species in which the dorsopropodeum is nearly straight and horizontal to the metanotum. The male, as well as the female and worker of *A. megommata* is pale yellow, whereas the male and other castes of *A. montana* are dark brown. They do not appear to be closely related as *A. megommata* has the elongated head of the *texana*

megommata - W USA

Nests in soil, small mound

Desert scrub

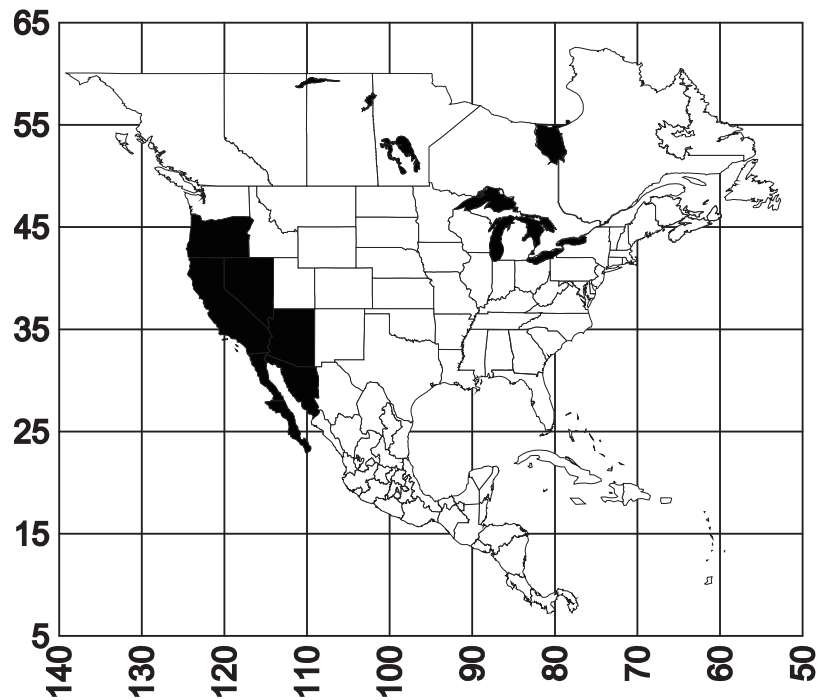
subterranea complex

303

Aphaenogaster megommata

Compare with *boulderensis*, *floridana*, *montana*, *mutica*

subgroup, whereas *A. montana* has a quadrate head like the other members of the *subterranea* subgroup.



Map 15. *Aphaenogaster megommata*.

Distribution:

USA: **Arizona**, La Paz Co., (CWEM) (Smith, 1963; Cole, 1966); **California**, Riverside, San Bernardino Cos. (CWEM), San Diego Co., Pinon Mnt. Valley [33°13'N 116°21'W], 1160m (LACM) (Smith, 1963; Cole, 1966); **Nevada** (CWEM; Smith, 1963; Cole, 1966; Wheeler and

megommata - W USA

Nests in soil, small mound

Desert scrub

Compare with *boulderensis*, *floridana*, *montana*, *mutica*

Wheeler, 1986); **Oregon**, Malheur Co., 13 mi. south of junction of Highway 78 on Highway 95 (CASC) (Smith, 1963; Cole, 1966). **MEXICO: Baja California**, Isla Cedros (CASC), Isla Ventana (CASC), Baja California Islands (Boulton and Ward, 2002; Varela-Hernández and Jones, 2013, 2015); **Baja California Sur** (Cole, 1966; Johnson and Ward, 2002); **Sonora** (Varela-Hernández and Jones, 2013).

Habitat:

Aphaenogaster megommata is found in arid ecosystems, including desert scrub, creosotebush scrub, mesquite flats and Joshua tree woodlands. Although they are widely distributed, they are not commonly collected, except in Nevada.

Biology:

Nests of *A. megommata* are found in the soil, generally a small mound with a single entrance hole (pers. obs.).

These ants are crepuscular or nocturnal (foraging at 10:30 pm), but may forage all day on cooler days (pers. obs.).

Flights triggered by photoperiod, rather than rainfall (Johnson, 2000a, 2006).

They often nest in light brown sandy or clay soils, or rocky loam (pers. obs.).

Nests are generally found at great distances from water tanks in the eastern Mojave Desert (Nash et al., 2004), showing a possible negative impact of cattle grazing.

megommata - W USA

Nests in soil, small mound

Desert scrub

subterranea complex

305

Aphaenogaster megommata

Compare with *boulderensis*, *floridana*, *montana*, *mutica*

Wheeler and Wheeler (1986) reported a number of myrmecophiles in nests, including *Myrmecophila manni* (Orthoptera: Gryllidae), *Puto atriplicis?* (Homoptera: Pseudococcidae), *Conibiosoma elongatum* (Coleoptera: Tenebrionidae), *Araeoschizus armatus* (Coleoptera: Tenebrionidae), *Araeoschizus* sp. and *Trichochrous quadricollis* (Coleoptera: Melyridae).

megommata - W USA

Nests in soil, small mound

Desert scrub

mexicana, *Aphaenogaster*

306

phalangium complex

Compare with *araneoides*, *phalangium*; *Novomessor ensifer*

***Aphaenogaster mexicana* (Pergande)**

phalangium species complex

Worker Figs. 31 (worker propodeum), 293 (side view, top view of dorsopropodeum, petiole and postpetiole), 293 (head and mandible).

Map 16.

Plate 27 (worker).

Ischnomyrmex mexicanus Pergande, 1896:893-894, MEXICO: Tepic ♀ [lectotype worker seen as photograph, CASC, paralectotype worker, USNM #'s 53997 & 55164, designated by Mackay and Dash, 2016:8; *Aphaenogaster* (*Deromyrma*) *mexicana*: Emery, 1921:65

Diagnosis:

Worker. The worker is a small (total length 6 mm), ferruginous red ant, with a slightly darker postpetiole and gaster. The antennal scape extends well past the posterior edge of the head, which is developed into a slender neck, with a flanged posterior border.

The head is finely granulated and partially smooth and glossy, the pronotum is mostly smooth and shiny, and the mesopleuron and the side of the propodeum are sculptured with punctures, which are aligned in rows,

mexicana - central México

Unknown

Unknown

Compare with *araneoides*, *phalangium*; *Novomessor ensifer*

forming poorly developed striae. The propodeal armature consists of small spines.

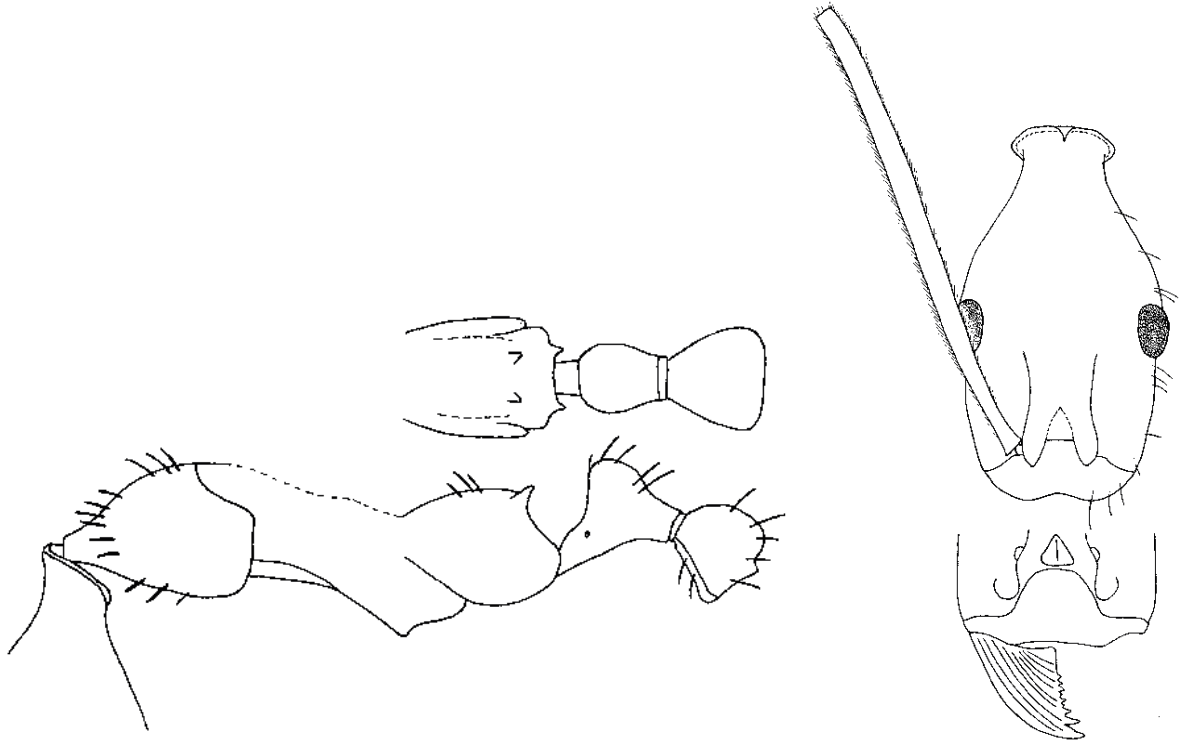


Fig. 293. Mesosoma, waist and head of the paralectotype worker of *A. mexicana* (USNM). Part of the mesosoma is hidden by the legs. The upper inset of the mesosoma shows the propodeum, petiole and postpetiole as seen from above. The lower inset of the head shows the clypeus and mandible as seen in frontal view.

mexicana - central México

Unknown

Unknown

Compare with *araneoides*, *phalangium*; *Novomessor ensifer*

Female and male. Unknown.

Comparison:

This species can be separated from most of the others in the genus by the slender neck. It could be confused with the other Mexican species with an elongated neck: *N. ensifer*, but is easily separated as it is much smaller. *Aphaenogaster araneoides* and *A. phalangium* are similar and are of a similar size, but neither is yet found in México, and they completely lack angles on the propodeum. Additionally the sculpturing of the pronotum of these two species, as well as the remainder of the species in the *phalangium* species complex, is rough. The petiolar node is higher and more developed than it is in the remainder of the species in the *phalangium* species complex, similar to most of the other North American species.

A paralectotype (US National Museum, # 53997 & 55164) was designated in order to stabilize the identity of this species. The second specimen mentioned by Pergande (1896) is in the CASC and is labeled as a lectotype (designator unknown).

Distribution:

MEXICO: Jalisco (CWEM, Villalvazo-Palacios et al., 2015), **Nayarit** (Tepic); **Puebla** (Vázquez-Franco, 2014).

mexicana - central México

Unknown

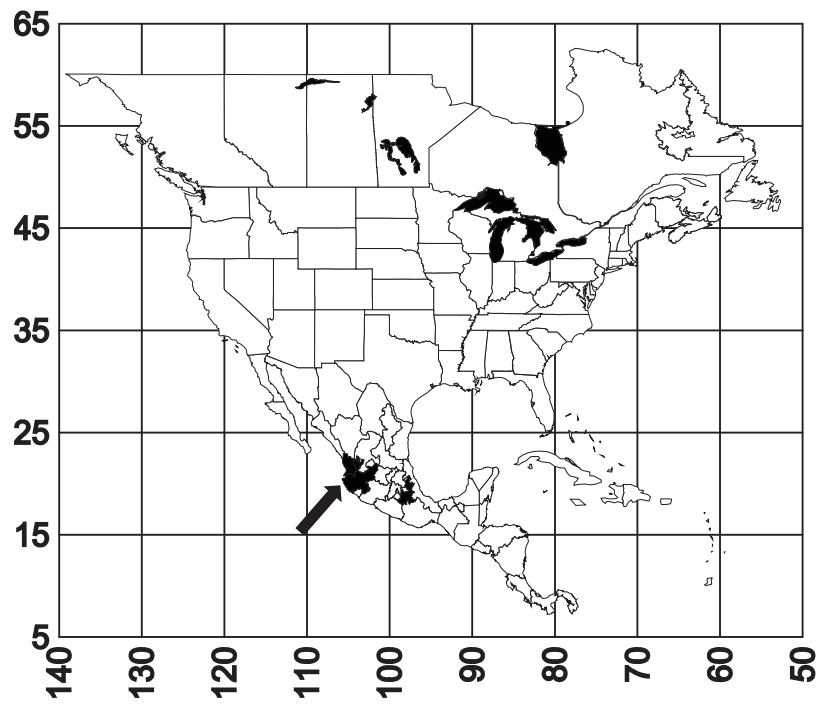
Unknown

subterranea complex

309

Aphaenogaster mexicana

Compare with *araneoides*, *phalangium*; *Novomessor ensifer*



Map 16. *Aphaenogaster mexicana*.

Habitat:

The region around Tepic is extensively disturbed, but would have had vegetation in the 1890's.

Biology:

Unknown.

mexicana - central México

Unknown

Unknown

miamiana, *Aphaenogaster* 310 *subterranea* complex

Compare with *carolinensis*, *fulva*, *picea*, *rudis*, *texana*

***Aphaenogaster miamiana* Wheeler**

Worker Figs. 66 (mesosoma side and from above), 294 (head).

Female Figs. 122, 295 (side view), 296 (head).

Male Figs. 140 (propodeal spine), 297 (side view), 298 (head).

Map 17.

Plates 28 (worker), 29 (female), 30 (male).

Aphaenogaster (*Attomyrma*) *texana* var. *miamiana* Wheeler, 1932:5

♀ ♀ ♂, USA: Florida, Miami (cotype ♀, ♀, ♂ MCZC, seen);

Aphaenogaster (*Attomyrma*) *miamiana*: Creighton, 1950:145

Aphaenogaster fulva var. *azteca* Enzmann, J. 1947:150 ♀, México (with-

out specific locality) [First available use of *Stenamamma*

(*Aphaenogaster*) *fulvum aquia* var. *aztecum* Emery, 1895:305], con-

sidered to be a valid species by Shattuck and Cover, 2016:10, 12-13,

new synonymy

Diagnoses:

Worker. The head of *A. miamiana* is not greatly elongated and the scape extends about three funicular segments past the posterior lateral corner of the head.

miamiana - SE USA

Nests in and under logs and stumps, in twigs, under stones

Forests and clearings

Compare with *carolinensis*, *fulva*, *picea*, *rudis*, *texana*

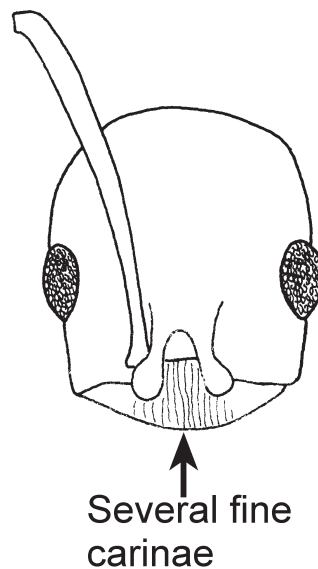


Fig. 294. Head of a cotype worker of *A. miamiana*.

The dorsum of the pronotum is covered with wavy rugulae and is nearly completely dull. The anterior border of the mesonotum is slightly raised above the level of the posterior edge of the pronotum, but much less so than in *A. fulva*. The propodeal spines are nearly in the same plane as the dorsopropodeum (angle about 170°) the propodeal spines curve slightly inwardly as viewed from above.

Female. The female is a moderately large (total length 6 mm), bicolored ant (head and mesosoma red, gaster dark brown). The eyes are moderately large (0.4 mm or approximately 18 ommatidia in greatest diameter). The antennal scape extends approximately $1\frac{1}{2}$ funicular segments past the posterior lateral corner of the head.

miamiana - SE USA

Nests in and under logs and stumps, in twigs, under stones

Forests and clearings

Compare with *carolinensis*, *fulva*, *picea*, *rudis*, *texana*

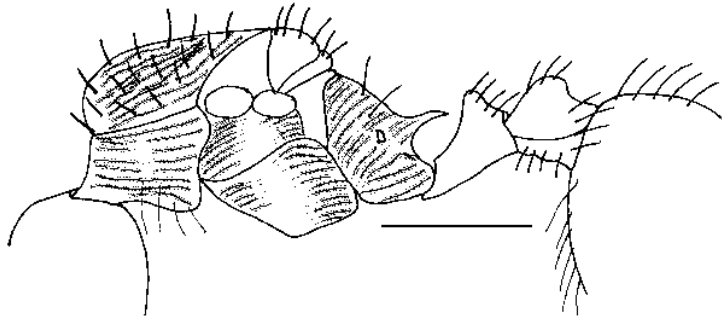


Fig. 295. Mesosoma of a female of *A. miamiana* (Broward Co., Florida, MCZC).

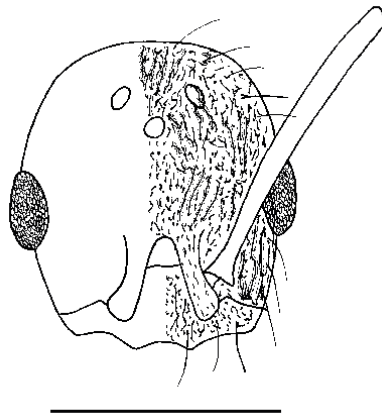


Fig. 296. Head of a cotype female of *A. miamiana*.

Most of the scutum is covered with longitudinal striae, except for the anterior part, which is smooth and glossy. The mesopleuron is partially striated, with the central part mostly smooth and glossy. The propodeal

miamiana - SE USA

Nests in and under logs and stumps, in twigs, under stones

Forests and clearings

Compare with *carolinensis*, *fulva*, *picea*, *rudis*, *texana*

spines are thick and short (2.3 mm), and divergent posteriorly, with little suggestion of an inward curvature.

Male. The male is a tiny (total length 3 mm) brown ant with a darker head and pale-yellow appendages. The scape is short (0.3 mm) and extends approximately $\frac{2}{3}$ of the distance to the level of the anterior edge of the medial ocellus. The propodeum is depressed as males of most of the other species in the genus, and the propodeal armature is reduced to blunt angles.

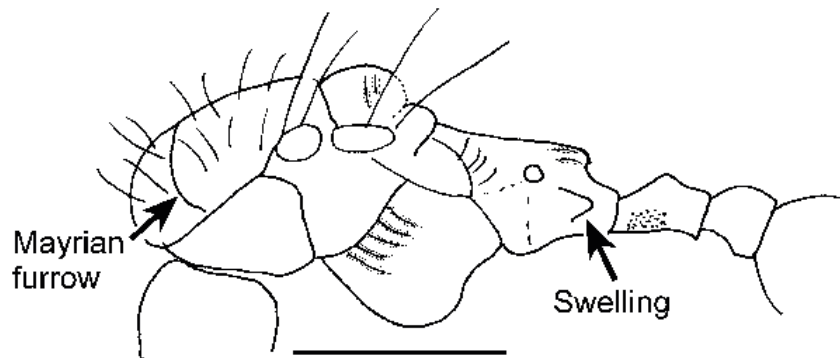


Fig. 297. Mesosoma of a cotype male of *A. miamiana*.

miamiana - SE USA

Nests in and under logs and stumps, in twigs, under stones

Forests and clearings

Compare with *carolinensis*, *fulva*, *picea*, *rudis*, *texana*

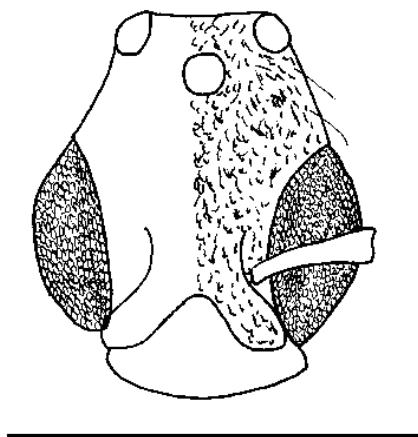


Fig. 298. Head of a cotype male of *A. miamiana*.

Comparison:

The workers of this species are nearly identical to those of *A. picea* and *A. rudis*. They can usually be separated by the larger eyes (length nearly always 13 or more ommatidia in the maximum diameter), and that the propodeal spines are about as long as the distance between their bases and are usually curved inwards (seen from above). It is not always possible to separate worker ants of *A. miamiana* from those of *A. rudis*.

Workers of *A. rudis* from David Crockett State Park in Tennessee, have short propodeal spines. The eyes have 12 or 13 ommatidia in the greatest diameter. The propodeal spines curve inwards, and the female has a dark gaster, suggesting that they could be *A. miamiana* (representatives will be deposited in the MCZC).

miamiana - SE USA

Nests in and under logs and stumps, in twigs, under stones

Forests and clearings

Compare with *carolinensis*, *fulva*, *picea*, *rudis*, *texana*

There are apparently no obvious and consistent characters to separate the females of *A. miamiana* and *A. rudis*, other than color (*A. miamiana* has a darker gaster). The propodeal spines can be slightly slenderer and the overall surface is slightly shinier in *A. miamiana*. Separation from *A. picea* is slightly less problematic, as the female of *A. picea* is dark reddish-brown, with brownish legs, and the antennal scape of *A. picea* is slightly longer, extending approximately two funicular segments past the posterior lateral corner of the head. The propodeal spines are very similar in the two species. There is little overlap in the distribution of the two species, with *A. miamiana* being found in southeastern USA and *A. picea* being more common in northeastern USA (Ellison, pers. comm.).

The males of *A. miamiana* and *A. rudis* are nearly identical. The scutum of *A. miamiana* is slightly shinier than that of *A. rudis* (and most other similar species). The node of the petiole is rounded, not slightly angulate as in *A. rudis* (and most other similar species).

Workers of *A. miamiana* could be confused with those of *A. fulva*. The anterior edge of the mesonotum is slightly raised, but not to the extent found in *A. fulva*.

The females of *A. fulva* are larger than those of *A. miamiana*, are roughly sculptured, with the entire dorsum of the scutum covered by longitudinal rugae, and the propodeal spines are much longer (length 0.5 mm). The males of *A. fulva* are also larger (at least 3.5 mm in total length) and the propodeal armature is developed into broad, blunt tubercles, not simple angles as in *A. miamiana*.

miamiana - SE USA

Nests in and under logs and stumps, in twigs, under stones

Forests and clearings

Compare with *carolinensis*, *fulva*, *picea*, *rudis*, *texana*

Aphaenogaster miamiana can be separated from *A. texana* and its relatives, as the head is not greatly elongated. *Aphaenogaster texana* and *A. miamiana* exhibit very distinct geographic ranges and have little overlap with the other species (Warren et al., 2011).

Aphaenogaster miamiana is sometimes confused with *Aphaenogaster carolinensis* (Umpfrey, 1996). The sculpture posterior and medially to the eye of the worker is more reticulated in *A. miamiana* than it is in *A. carolinensis*. The underside of the head is also more punctate. *Aphaenogaster miamiana* is also larger (head width is generally greater than 1 mm, versus usually less than 1 mm in *A. carolinensis*) and darker if you have specimens to compare. The head is also less elongate in *A. miamiana*, with a cephalic index around 80, as compared to around 70 in *A. carolinensis*.

The females of the two species are nearly identical. Females of *A. miamiana* are slightly darker, especially the gaster. The sculpture and pilosity appear to be identical. The head of *A. miamiana* is slightly more quadrate (CI \approx 85) than that of *A. carolinensis* (CI \approx 80).

The males of *A. miamiana* are nearly identical to those of *A. carolinensis*, but based on the type series, can be separated on the bases of being larger and not as dark brown.

Shattuck and Cover (2016) considered *A. azteca*, to be a valid species pointing out the differences between it and *A. fulva* to which it is clearly distinct. We examined the same possible worker of the type series sent by Emery to the MCZC. This specimen of *Aphaenogaster fulva* var. *azteca*

miamiana - SE USA

Nests in and under logs and stumps, in twigs, under stones

Forests and clearings

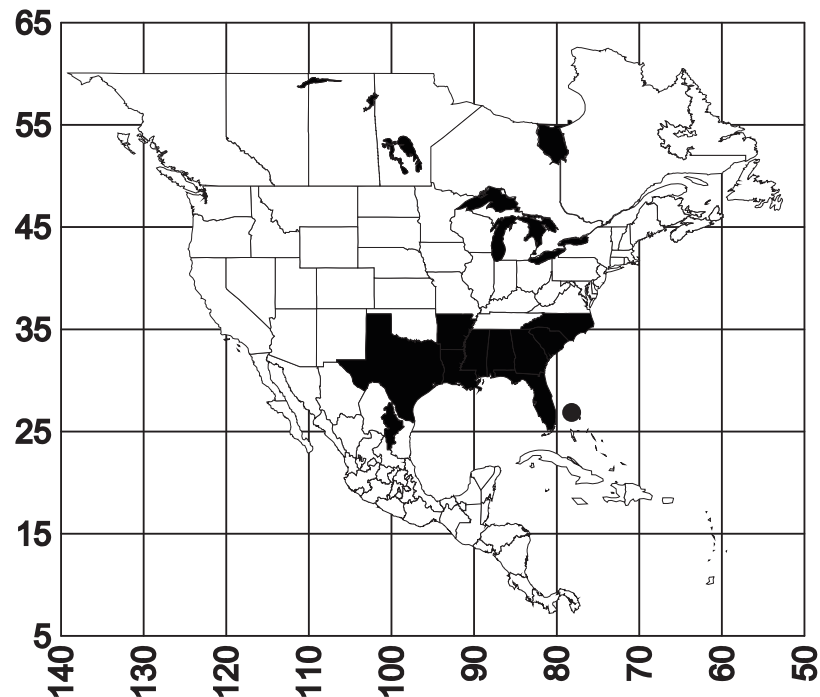
subterranea complex

317

Aphaenogaster miamiana

Compare with *carolinensis*, *fulva*, *picea*, *rudis*, *texana*

appears to us to be a synonym of *A. miamiana* as it does not appear to differ significantly from the types of *A. miamiana*.



Map 17. *Aphaenogaster miamiana*.

Distribution:

USA: **Alabama**, Houston, Marion Tuscaloosa Cos. (CWEM) (MacGown and Forster, 2005); **Arkansas**, Cross, Hempstead, Prairie, Saint Francis Cos. (CWEM); **Florida**, Broward, Dade, Monroe, Cos. (CWEM), Key Longitude Paradise Key, (MCZC), Pinellas Co. (CASC) (Deyrup et

miamiana - SE USA

Nests in and under logs and stumps, in twigs, under stones

Forests and clearings

Compare with *carolinensis*, *fulva*, *picea*, *rudis*, *texana*

al., 1988; Big Pine, Big Torch, Elliot, Key Largo, Middle Torch, and Upper Matecumbe Keys); **Georgia** (Guénard et al., 2012); **Louisiana**, Calcasieu Parish (CWEM) (Dash and Hooper-Bùi, 2008); **Mississippi**, Clark Co. (CWEM) (MacGown et al., 2010); **North Carolina** (Lucky et al., 2014); **South Carolina** (Guénard et al., 2012); **Texas** (MacGown and Forster, 2005). Creighton (1950) reported that it was once present in New York, but the population since died out. **MEXICO**: **Nuevo León** (CWEM); without locality [type specimen of *A. azteca*] (MCZC). **BAHAMAS**: Water Cay N of Great Bahamas Island.

Habitat:

Nests are often found at the edges of the forest, or in the open grassy areas, in eucalyptus forests, hardwood forests, pinyon pine forests, pine forests and pine oak communities.

Biology:

Aphaenogaster miamiana is native to southeastern North America (Umphrey, 1996). It nests in and under logs and in stumps or under stones, smaller nests are found in twigs on the forest floor (pers. obs.). It nests in rotten wood or in the ground (Deyrup et al., 1988), or in dead hummocks in the Florida Keys (Deyrup et al., 1988; Moreau et al., 2014).

Workers are generally timid and escape when the nest is disturbed. Larger nests are aggressive and the workers bite (pers. obs.).

Brood and sexuals were found in nests in June.

miamiana - SE USA

Nests in and under logs and stumps, in twigs, under stones

Forests and clearings

subterranea complex

319

Aphaenogaster miamiana

Compare with *carolinensis*, *fulva*, *picea*, *rudis*, *texana*

Foragers were attracted to surface and subterranean live meal worm baits.

Nests were encountered in areas with soils ranging from sandy loam, rocky loam to clay and in color ranging from white to dark brown.

It is rarely infected by the phorid fly *Pseudacteon* (Porter and Alonso, 1999).

miamiana - SE USA

Nests in and under logs and stumps, in twigs, under stones

Forests and clearings

montana, *Aphaenogaster* 320 *subterranea* complex
Compare with *boulderensis*, *megommata*, *mutica*, *occidentalis*, *relicta*,
uinta

***Aphaenogaster montana* W. Mackay new species**

Worker Figs. 54 (upper corner of head), 55 (propodeal spines from above), 299 (side view), 299 (head).

Female Figs. 108 (scutellum and metanotum from side), 300 (side view), 111, 300 (head).

Male Figs. 301 (side view), 301 (head).

Map 18.

Plates 31 (worker), 32 (female), 33 (male).

Diagnoses and descriptions:

Worker. Apical mandibular tooth very well developed, second and third teeth well developed but less than $\frac{1}{2}$ as large, followed by approximately 6 small denticles; anterior border of clypeus concave; head widened posteriorly, with posterior border nearly straight; eyes extend past sides of head; scape extends approximately first two funicular segments past posterior lateral corner of head; pronotum and mesonotum broadly convex; propodeal spines moderately well developed, length approximately equal to length of posteropropodeum as seen from side, nearly as long as distance between bases (seen from above); node of petiole blunt, nearly forming dorsal face.

montana - NE México
Nests under stones and in dead trunks
Pine-oak forests

Compare with *boulderensis*, *megommata*, *mutica*, *occidentalis*, *relicta*,
uinta

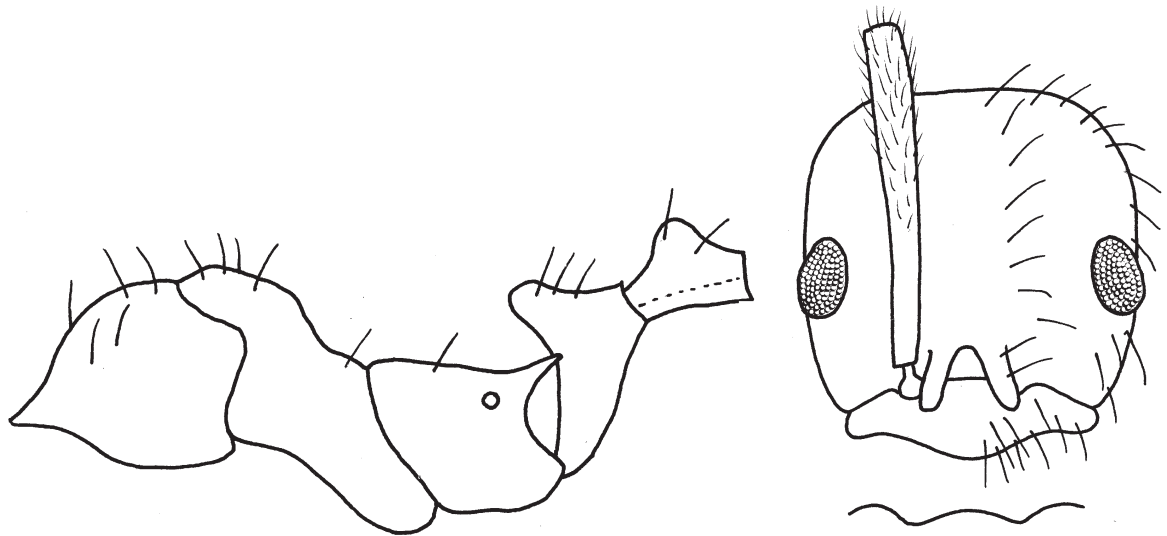


Fig. 299. Mesosoma, waist and head of the holotype worker of *A. montana*. The inset below the head shows the outline of the anterior margin of the clypeus as seen from the front.

Erect hairs present on mandibles, anterior border of clypeus, sides of head, posterior border, dorsal and ventral surfaces of head, many hairs on scape, especially near apex, nearly erect, erect hairs present on dorsum of mesosoma, coxae, femora, most hairs on tibiae nearly appressed, but few hairs on flexor surfaces, especially near tibial spur nearly erect, erect hairs present on dorsum of petiole and postpetiole and all surfaces of gaster; appressed hairs present on scape, dorsum of mesosoma and gaster.

montana - NE México

Nests under stones and in dead trunks

Pine-oak forests

Compare with *boulderensis*, *megommata*, *mutica*, *occidentalis*, *relicta*,
uinta

Mandibles striated, clypeus longitudinally striated, dorsum of head with rugulae diverging posteriorly, interspaces punctate, dorsum of mesosoma with fine rugulae and punctate, side of pronotum with obvious horizontal striae, mesopleuron mostly and completely punctate, metapleuron with horizontal striae, side of propodeum punctate, petiole and postpetiole finely punctate and partially shining, gaster smooth and glossy.

Dark reddish black with brown appendages.

Measurements – HL 1.22 - 1.26, HW 1.04 - 1.14, EL 0.25 - 0.26, SL 1.20 - 1.24, WL 1.64 - 1.78. CI 85 - 90, SI 98.

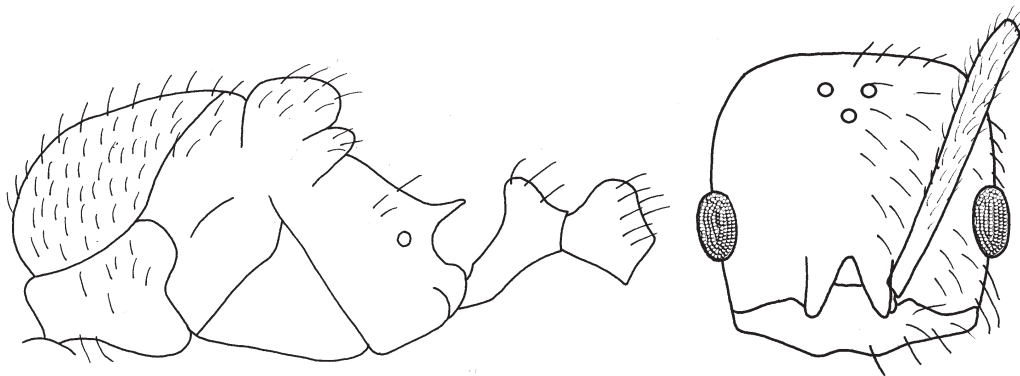


Fig. 300. Mesosoma, waist and head of a paratype female of *A. montana*.

Female. Mandible, clypeus and head shape similar to that of worker; scape extends approximately two funicular segments past posterior lateral

montana - NE México

Nests under stones and in dead trunks

Pine-oak forests

Compare with *boulderensis*, *megommata*, *mutica*, *occidentalis*, *relicta*,
uinta

corner of head; ocelli small (diameter of 0.1 mm); propodeal spines well developed, length greater than length of posteropropodeum; apex of petiole narrower and sharper than in worker.

Erect hairs and appressed pubescence as in worker.

Head coarsely sculptured with diverging rugae; scutum mostly smooth and glossy at least anteriorly, pronotum with horizontal irregular striae, mesopleuron nearly completely smooth and glossy, metapleuron with horizontal rugulae, dorsal face of propodeum with transverse rugulae, petiole and postpetiole partially shiny, lower surfaces punctate, gaster smooth and glossy.

Dark brown with slightly lighter colored appendages.

Measurements – HL 1.42 - 1.44, HW 1.28 - 1.32, EL 0.39 - 0.40, SL 1.28 - 1.34, WL 2.74 - 2.82. CI 90 - 92, SL 90 - 93.

Male. Mandible with 5 teeth, 2 apical-most teeth larger than 3 basal-most teeth; anterior margin of clypeus convex; eyes large, covering more than $\frac{1}{2}$ side of head; ocelli moderate sized (maximum diameter 0.08 mm), separated from lateral ocellus by slightly more than 1 maximum diameter; scape short, approximately $\frac{2}{3}$ length of maximum diameter of eye; mesosoma swollen, especially scutellum; propodeum nearly square, anterior part of dorsal face sloping slightly upward; propodeum slightly angulate posteriorly.

montana - NE México

Nests under stones and in dead trunks

Pine-oak forests

Compare with *boulderensis*, *megommata*, *mutica*, *occidentalis*, *relicta*,
uinta

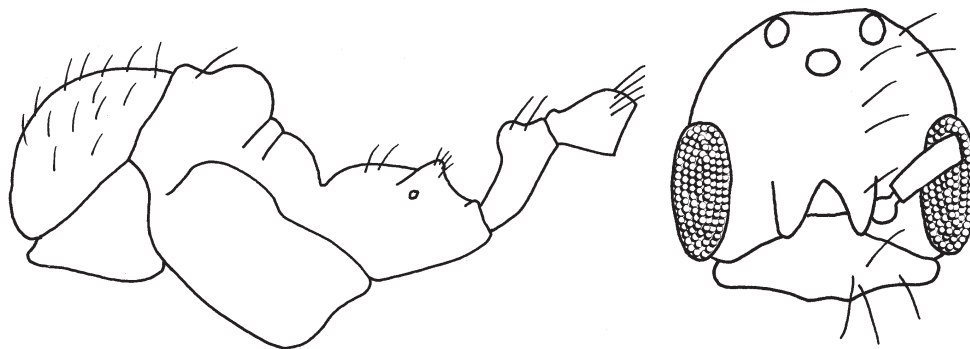


Fig. 301. Mesosoma, waist and head of a paratype male of *A. montana*.

Erect hairs present on mandibles, clypeus, dorsal and ventral surfaces of head, dorsum of mesosoma, dorsum of petiole, along the lower anterior edge of postpetiole and dorsum of postpetiole, and all surfaces of gaster, coxae and femora have few erect hairs, tibiae with mostly appressed hairs.

Head punctate and dull, most of scutum smooth and glossy, posterior $\frac{1}{3}$ with fine, longitudinal striae, scutellum mostly punctate or striate, pronotum partially punctate and shining, most of mesopleuron smooth and glossy, metapleuron smooth and glossy, lateropropodeum and dorsopropodeum punctate and dull, petiole and postpetiole weakly shining, partially punctate, gaster smooth and glossy.

Dark brown, appendages slightly lighter in color.

Measurements – HL 0.80 - 0.82, HW 0.68 - 0.72, EL 0.35 - 0.36, SL 0.26 - 0.28, WL 1.96 - 2.12. CI 85 - 88, SL 33 - 34.

montana - NE México

Nests under stones and in dead trunks

Pine-oak forests

Compare with *boulderensis*, *megommata*, *mutica*, *occidentalis*, *relicta*,
uinta

Etymology:

From Latin, *montanus*, meaning pertaining to mountains, referring to the habitat of this species.

Comparison: This species could be confused with the very similar *A. occidentalis*. The workers of both species have relatively short roughly sculptured heads, the pronotum of both species are mostly rounded and depressed at the notopropodeal sutures. The propodea have moderately well-developed spines in both species, and the color of both species is dark brown to reddish black. They can be easily separated, as the antennal scape of *A. montana* extends approximately the first two funicular segments past the posterior lateral corner of the head, whereas it extends only a single funicular segment past the border of the head in *A. occidentalis*. Another useful characteristic is that the occipital corners (as seen from above) are somewhat sculptured in *A. montana*, whereas they are smooth and glossy in *A. occidentalis*.

The females are also very similar, but the female of *A. montana* is darker brown. The two characters mentioned to distinguish the workers work very well for separating the females of these two species.

The males can be easily separated by the shapes of the propodea. The propodeum of the male of *A. montana* is nearly square in shape as seen from the side, and does not have the upwardly sloped shape found in the males of *A. occidentalis*.

montana - NE México

Nests under stones and in dead trunks

Pine-oak forests

Compare with *boulderensis*, *megommata*, *mutica*, *occidentalis*, *relicta*,
uinta

The shape of the propodeum of the male is similar to that of the male of *A. megommata*. These two species can be easily separated, is the male of *A. montana* is very dark brown, that of *A. megommata* is pale yellow. The shape of the propodeum is also similar to that of the male of *A. subterranea* from Europe, except the dorsopropodeum of *A. montana* is nearly twice as long as the posteropropodeum, not approximately as long as in *A. subterranea*.

The workers of *A. montana* are also very similar to those of *A. uinta* and *A. mutica*. The scapes of all three species extend approximately the first two funicular segments past the posterior border of the head. *Aphaenogaster montana* can be easily separated from these other two species, as it has moderately well-developed propodeal spines, not simple angles or tubercles as in the latter two species. Also, the head of *A. montana* is heavily sculptured, including the posterior-lateral corners, not partially smooth as in the heads of the other two species. The distributions of the three species (*A. occidentalis*, *A. uinta* and *A. mutica*) do not overlap, with *A. montana* found in northeastern Mexico, and the other three species collected in western United States and northwestern Mexico.

Aphaenogaster montana would be unlikely to be confused with *A. relicta* from Haiti, based on the distribution, and the much smaller propodeal spines found in *A. montana*.

The female of *A. montana* is distinctive in that the scutellum is smooth and polished and the metanotum extends past the edge of the scutellum. This could cause confusion with the female of *A. boulderensis* which

montana - NE México

Nests under stones and in dead trunks

Pine-oak forests

Compare with *boulderensis*, *megommata*, *mutica*, *occidentalis*, *relicta*,
uinta

shares these two characteristics. They can be easily separated by the distributions, as *A. boulderensis* is found in western United States and Baja California, México. Additionally, the female of *A. boulderensis* is pale brown, and the scapes extend approximately 2 ½ funicular segments past the posterior lateral corner of the head, with a head in full face view.

It is interesting to note that the males of *A. montana* and *A. megommata* are the only North American species in which the dorsopropodeum is nearly straight and horizontal to the metanotum. The male, worker and female of *A. montana* are dark brown, those of *A. megommata* are pale yellow, so they are easy to separate. Otherwise the two species are completely different. The worker of *A. montana* has a quadrate head and belongs to the *subterranea* subgroup, the worker of *A. megommata* has an elongated head and belongs to the *texana* subgroup.

Type series:

Holotype worker (MCZC), 47 paratype workers, 23 paratype females, 17 paratype males (CASC, CWEM, LACM, IEMJ, MCZC, USNM), MEX, NL, 55 k NE Dr. Arroyo, 10Jun1988, 2570m, W. Mackay #'s 10991, 10996, 10999, 11000.

Material examined:

Type series.

montana - NE México

Nests under stones and in dead trunks

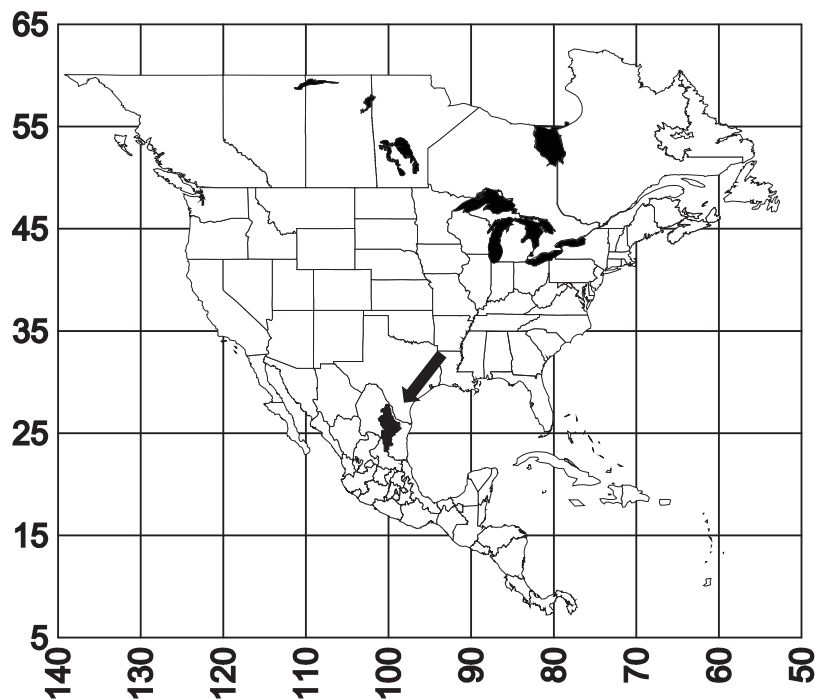
Pine-oak forests

montana, *Aphaenogaster*

328

subterranea complex

Compare with *boulderensis*, *megommata*, *mutica*, *occidentalis*, *relicta*,
uinta



Map 18. *Aphaenogaster montana*.

Distribution:

Known only from type locality.

Habitat:

Open areas in high elevation pine/oak forests.

montana - NE México

Nests under stones and in dead trunks

Pine-oak forests

subterranea complex

329

Aphaenogaster montana

Compare with *boulderensis*, *megommata*, *mutica*, *occidentalis*, *relicta*,
uinta

Biology:

Aphaenogaster montana nests under stones (rocky loam soil) and in dead trunks. Nest populations are small, but the workers are aggressive and bite. Brood and sexuals were collected in nests in June.

montana - NE México

Nests under stones and in dead trunks

Pine-oak forests

mutica, *Aphaenogaster*

330

subterranea complex

Compare with *boulderensis*, *carbonaria*, *megommata*, *occidentalis*,
patruelis, *uinta*

***Aphaenogaster mutica* Pergande**

Worker Figs. Figs. 51, 303 (head), 59, 302 (mesosoma).

Map 19.

Plate 34 (worker).

Aphaenogaster mutica Pergande, 1896:891, ♀, MEXICO: Baja California Sur, San Jose del Cabo [1 “paratype” seen, CASC, 1 cotype worker seen MCZC]; Wheeler, 1915:413

Diagnosis:

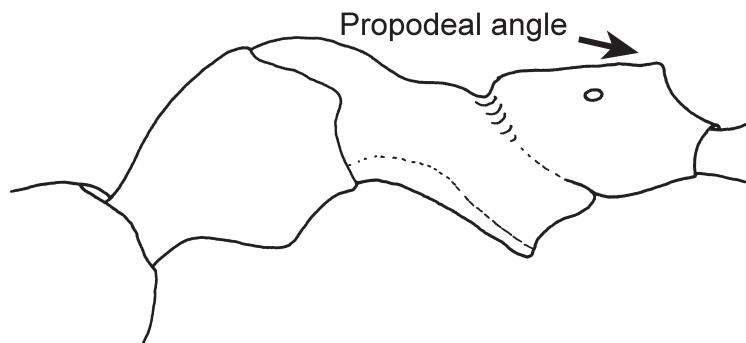


Fig. 302. Mesosoma of a cotype worker of *A. mutica* (MCZC).

Worker. The worker is a small (total length slightly less than 5 mm) medium brown ant with a slightly darker gaster. Most of the dorsum of

mutica - Baja California, México

Unknown

Arid ecosystems

Compare with *boulderensis*, *carbonaria*, *megommata*, *occidentalis*,
patruelis, *uinta*

the head is smooth and shining, with a few very fine striolae in the vicinity of the eyes.

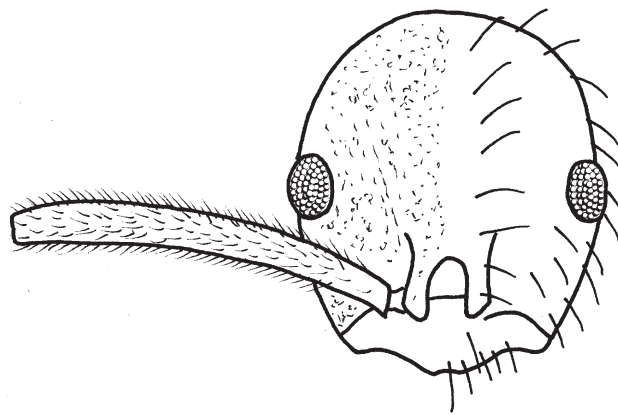


Fig. 303. Head of the “paratype” worker of *A. mutica* (CASC).

The antennal scape extends about $\frac{1}{2}$ of the length of the first funicular segment past the posterior lateral corner of the head. The dorsum of the pronotum is finely sculptured, and shining, the propodeum has a pair of poorly developed angles.

Female and male. Unknown.

Comparison:

This species has been confused with *A. boulderensis* (Creighton, 1950), although the two species are not similar. The head of *A. mutica* is very

mutica - Baja California, México

Unknown

Arid ecosystems

Compare with *boulderensis*, *carbonaria*, *megommata*, *occidentalis*,
patruelis, *uinta*

short, similar to that of *A. uinta* and *A. subterranea*. The antennal scape is also short as in these three species. The head and scape of *A. boulderensis* are both very elongated.

Aphaenogaster mutica is very similar to *A. uinta*. The head is slightly less sculptured, the propodeal processes are less developed, it is slightly smaller and slightly less hairy than the typical *A. uinta*, but otherwise they are nearly identical.

Aphaenogaster mutica is also similar to *A. occidentalis*. It can be easily separated as the head and pronotum are not sculptured as in *A. subterranea*, and the propodeal spines are not developed as they are in *A. subterranea*. See the discussion of *A. occidentalis* for more hints on how to separate the two species.

Some of the other species with less elongated heads, especially *A. carbonaria* and *A. patruelis* could be confused with *A. mutica*. *Aphaenogaster mutica* is easily separated by the lighter color (the latter two species are dark brown, and have more heavily sculptured heads).

This species is similar to *A. megommata*. The overall form of the mesosoma and petiole are similar. It differs in having a shorter scape (the scape of *A. megommata* extends about 2 funicular segments past the posterior lateral corner of the head) and smaller eyes (length about $\frac{1}{5}$ length of the side of a head, versus $\frac{1}{3}$ the length in *A. megommata*). The propodeum is armed with poorly developed angles, which are slightly more developed in *A. megommata*. Finally, it is bicolored (head in mesosoma reddish brown, gaster slightly darker, with the appendages being yellowish

mutica - Baja California, México

Unknown

Arid ecosystems

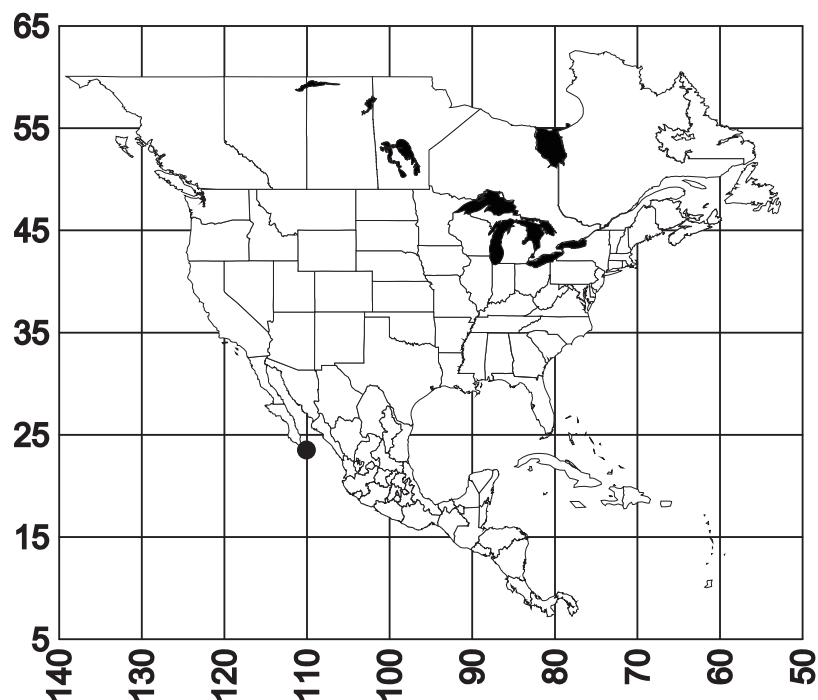
subterranea complex

333

Aphaenogaster mutica

Compare with *boulderensis*, *carbonaria*, *megommata*, *occidentalis*,
patruelis, *uinta*

brown), which contrasts with the concolorous yellowish workers of *A. megommata*.



Map 19. *Aphaenogaster mutica*.

Distribution:

MEXICO: Baja California Sur (San José del Cabo; Johnson and Ward, 2002). A record from the Brownsville region of Texas is apparently a misidentification of *A. boulderensis*, see Creighton, 1950:143. Wheeler,

mutica - Baja California, México

Unknown

Arid ecosystems

mutica, *Aphaenogaster*

334

subterranea complex

Compare with *boulderensis*, *carbonaria*, *megommata*, *occidentalis*,
patruelis, *uinta*

1915:412 lists workers from Terlingua, Brewster Co., TX and Cerro Chilicote, Chihuahua, which although they “agree perfectly with Pergande’s description” are assumed to be misidentifications.

Habitat:

Arid ecosystems.

Biology:

Unknown.

mutica - Baja California, México

Unknown

Arid ecosystems

subterranea complex

335

Aphaenogaster occidentalis

Compare with *mutica*, *patruelis*, *uinta*

***Aphaenogaster occidentalis* (Emery)**

Worker Figs. 52 (scape), 58 (dorsopropodeum), 304 (side view).

Female Figs. 115, 305 (head), 108 (propodeal spines from above, scutellum and metanotum from side), 110 (propodeal spines from side and from above), 305 (side view).

Male Figs. 141 (propodeum and propodeal spines), 142 (variation in propodeal spines), 306, 307 (side view), 308 (head).

Map 20.

Plates 35 (worker), 36 (female).

Stenamamma (*Aphaenogaster*) *subterraneum occidentale* Emery, 1895:301-302, ♀, USA: Washington, Pullman City [9 “paratype” ♀, 5 syntype ♀ seen, MCSN]

Aphaenogaster subterranea valida W. Wheeler, 1915: 411, ♀, ♀, ♂ (8 ♀, 3 ♀, 4♂ cotypes seen, MCZC), USA: Colorado, Cheyenne Cañon near Colorado Springs; *Aphaenogaster* (*Attomyrma*) *subterranea valida*: Emery, 1921:60 (Shattuck and Cover, 2016:10, 13-14)

Aphaenogaster subterranea borealis Wheeler, 1915:412, ♀, Canada, British Columbia, Kootenay Lake (7 cotype workers seen MCZC) (Creighton 1950:150)

occidentalis - W USA, W Canada

Nests in soil, under stones, in/under logs and stumps, under bark

Grasslands to forests

Compare with *mutica*, *patruelis*, *uinta*

Aphaenogaster subterranea valida var. *manni* Wheeler, 1917:516, ♀, (23 cotype workers seen MCZC) (unavailable name, material referred to *Aphaenogaster occidentalis* by Creighton, 1950:150)

Diagnoses:

Worker. The workers are small, medium brown ants in which the scape extends past the posterior lateral border of the head by about two funicular segments. are rounded and similar in shape.

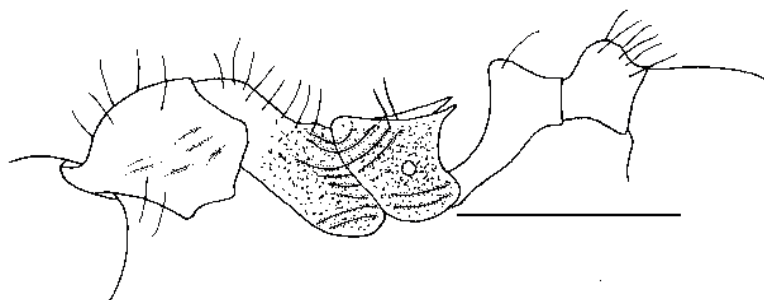


Fig. 304. Mesosoma, petiole and postpetiole of a worker of *A. occidentalis* (cotype worker of *A. valida*, MCZC).

The promesonotum is a single, convex unit, with the promesonotal suture poorly marked. The dorsopropodeum is level and straight, the propodeal spines are relatively poorly developed. The apices of the petiole and postpetiole

occidentalis - W USA, W Canada

Nests in soil, under stones, in/under logs and stumps, under bark

Grasslands to forests

Compare with *mutica*, *patruelis*, *uinta*

Female. The total length is 6.3 mm. The scape extends nearly the first funicular segment past the posterior lateral corner of the head.

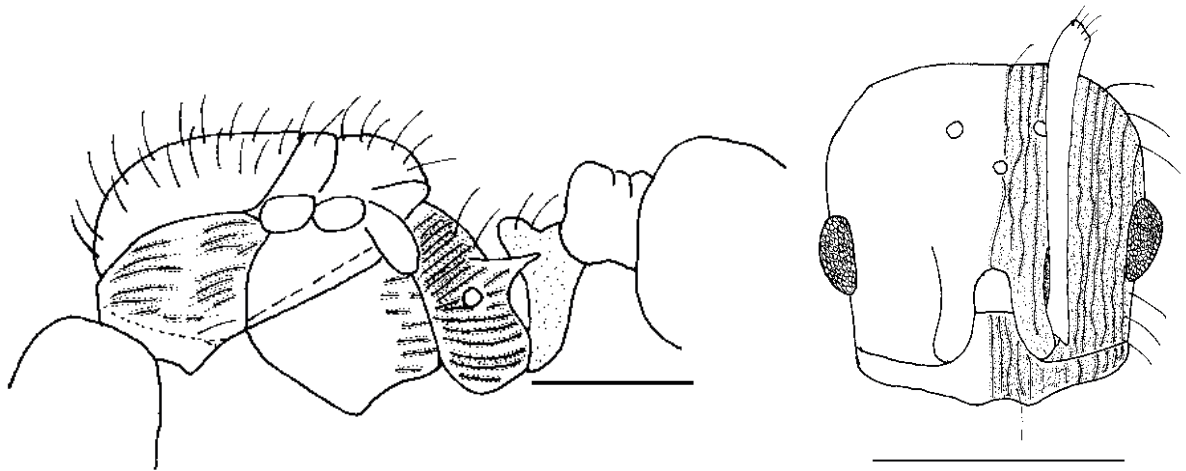


Fig. 305. Mesosoma, waist and head of a female of *A. occidentalis* (cotype of *A. valida*, MCZC).

The scutellum extends past the metanotum (side view) and the propodeal spines are well-developed. Most of the head is covered with coarse rugae and the scutum is mostly smooth and shiny with evidence of fine striolae posteriorly, the scutellum is also smooth and glossy.

occidentalis - W USA, W Canada

Nests in soil, under stones, in/under logs and stumps, under bark

Grasslands to forests

Compare with *mutica*, *patruelis*, *uinta*

Male. These are medium sized (5 mm total length) dark brown ants. The propodeal protuberances are well-developed, with the region between them being concave on the dorsopropodeum, and the posterior lateral part of the process angulate, nearly forming a small spine. The scutellum extends past and overhangs the edge of the metanotum. The dorsum of the scutum is mostly smooth and glossy, although it is sculptured anteriorly and posteriorly.

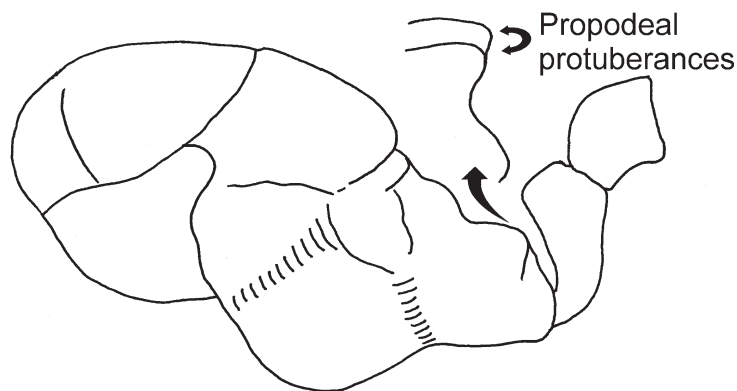


Fig. 306. Mesosoma, petiole and postpetiole of a male of *A. occidentalis* (Mill Creek Canyon, Utah, MCZC). The inset shows the small propodeal protuberances as seen obliquely from above and from the side.

occidentalis - W USA, W Canada

Nests in soil, under stones, in/under logs and stumps, under bark

Grasslands to forests

Compare with *mutica*, *patruelis*, *uinta*

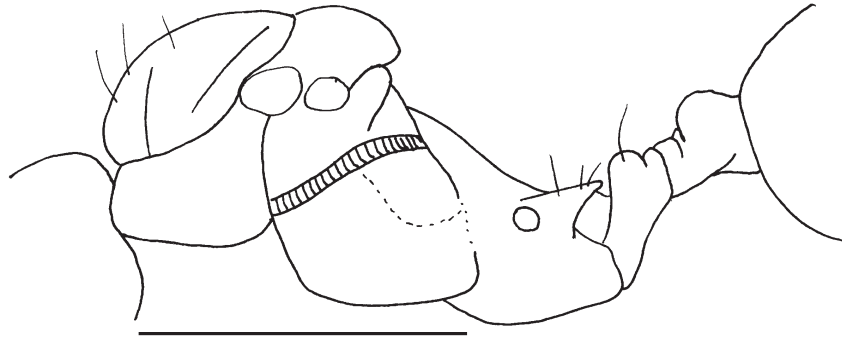


Fig. 307. Mesosoma, petiole and postpetiole of a male of *A. occidentalis* (cotype of *A. valida*, MCZC). Note the longer propodeal spines.

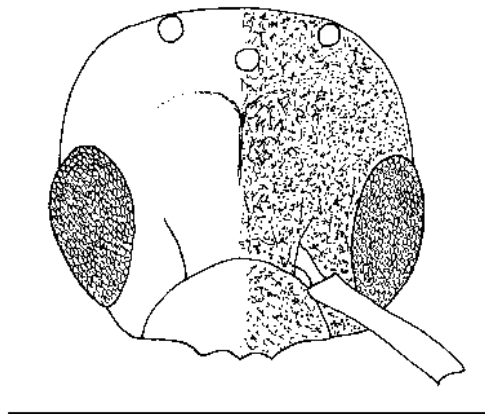


Fig. 308. Head of a male of *A. occidentalis* (cotype of *A. valida*, MCZC).

occidentalis - W USA, W Canada

Nests in soil, under stones, in/under logs and stumps, under bark

Grasslands to forests

Compare with *mutica*, *patruelis*, *uinta*

Comparison:

Aphaenogaster mutica and *A. patruelis* are nearly identical to *A. occidentalis*. Workers of *A. occidentalis* have a more sculptured head, which are obviously punctate between the striae. Those of *A. patruelis* workers are slightly less punctate, and are restricted the islands off the west coast of Mexico. The head of workers of *A. uinta* are even more finely sculptured, with a few fine striae with mostly coriaceous sculpturing between the striae. *Aphaenogaster mutica* has only poorly defined striae on the dorsum of the head, with fine striolate or coriaceous sculpture between the striae, leaving much of the head, especially the posterior half, mostly smooth and glossy. The workers of *A. occidentalis* have relatively well developed propodeal spines, the propodeal spines of workers of *A. patruelis* are slightly less developed, those of *A. uinta* are generally only pointed angles and the propodeum of *A. mutica* are nearly unarmed, with only at most tiny pointed bumps present.

The female of *A. mutica* is unknown. The female of *A. patruelis* can be separated from those of the other two species by the shape of the propodeal spines, which are somewhat laterally flattened and pointed ventrally towards the apex. The spines of the females of the other two species are not as flat laterally, and are pointed posteriorly. The space between the reticulated striae or rugulae on the head of *A. occidentalis* are mostly filled with punctures, the posterior $\frac{1}{5}$ of the head is mostly smooth and shining. The head of the female of *A. uinta* has rugae, but the intrarrugal spaces and are mostly shiny and finely punctate.

occidentalis - W USA, W Canada

Nests in soil, under stones, in/under logs and stumps, under bark

Grasslands to forests

Compare with *mutica*, *patruelis*, *uinta*

The distributions of the four species would be helpful in separating them. *Aphaenogaster mutica* and *A. patruelis* are found in Baja California and the islands off of the coast. *Aphaenogaster uinta* is known only from Southern Idaho, Nevada, Utah, and southwestern Colorado. *Aphaenogaster occidentalis* is much more common than the other three species, and is found throughout the western half of the United States and southwestern Canada.

Aphaenogaster subterranea occurs in Europe. Emery separated *A. subterranea occidentalis* using minor differences including a longer head and thinner scapes (see Creighton, 1950:149). Comparison of workers from Czechoslovakia and Spain with specimens of *A. subterranea occidentalis* from California shows them to be essentially identical, and both of the subspecies in the United States may be found to be synonyms of the typical *A. subterranea* from Europe. Although the workers and females of *A. occidentalis* and European specimens of *A. subterranea* are nearly identical, the males of *A. subterranea* appear to consistently have spines on the propodeum and those of *A. occidentalis* nearly always have only pointed propodeal protuberances, it appears that they are different species.

The subspecies *A. subterranea valida* intergrades with *A. subterranea occidentalis* and was shown to be a synonym by Shattuck and Cover (2016), a conclusion we independently reached. Creighton (1950) separated this subspecies from *A. subterranea occidentalis* on the basis of the larger workers (6 mm in length versus 4.5 mm in length in *A. subterranea occidentalis*), larger females (8 mm in length versus 6.5 mm in length)

occidentalis - W USA, W Canada

Nests in soil, under stones, in/under logs and stumps, under bark

Grasslands to forests

Compare with *mutica*, *patruelis*, *uinta*

and darker color (castaneous brown versus piceous brown). None of these characters appear to be reliable. We have several series of *A. subterranea occidentalis* from northern California with workers ranging from 2.8 - 5 mm, and specimens of *A. subterranea valida* from Utah which are as small as 5 mm. The queens of two series of *A. subterranea occidentalis* are nearly 8 mm in length. Specimens of *A. subterranea valida* from Utah are often medium brown, much lighter than the darker *A. subterranea occidentalis*.

Aphaenogaster occidentalis can be easily confused with members of the genus *Stenamma*. It differs in that the eyes are of a normal size (small to tiny in *Stenamma*) and the scapes extend past the posterior lateral corners, although usually less than the first two funicular segments (barely reach the posterior lateral corners in *Stenamma*). *Aphaenogaster occidentalis* could be confused with minor workers of *Pheidole*, but can be separated by the similar shapes of the petiole and postpetiole. Also, the scape is shorter than that of the minors of most species of *Pheidole*.

Distribution.

USA: **Arizona** (Hunt and Snelling, 1975); **California** (CWEM; Ratchford et al., 2005; northern CA south to at least San Francisco, Clark et al., 2008); **Colorado**, western half of Colorado as far south as La Plata Co. near the New Mexico border (CWEM; Gregg, 1963); **Idaho** (CWEM; Yensen et al., 1977); **Montana**, eastern border (CWEM) (Wheeler and Wheeler, 1998); **New Mexico** (CWEM); **Nevada** (Wheeler and Wheeler, 1986; MontBlanc, 2005); **Oregon** (Ratchford et al., 2005);

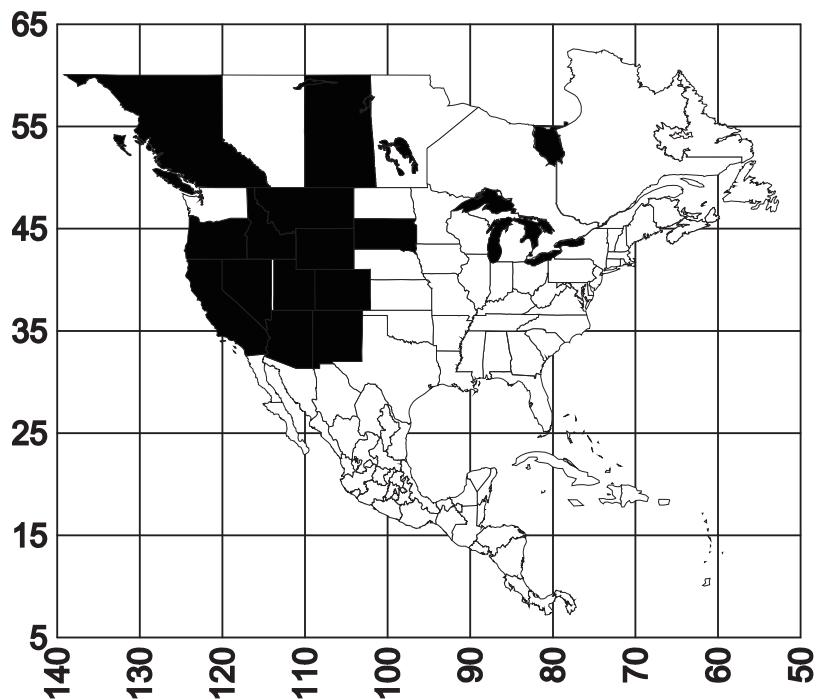
occidentalis - W USA, W Canada

Nests in soil, under stones, in/under logs and stumps, under bark

Grasslands to forests

Compare with *mutica*, *patruelis*, *uinta*

South Dakota (Smith, 1979); **Utah** (CWEM; Allred, 1982) (Smith, 1979); **Wyoming** (CWEM; Wheeler and Wheeler, 1988). **CANADA: British Columbia** (CWEM; Heron, 2005); **Saskatchewan** (49°22'N 107°53' W) (Radtke et al., 2014). Although *A. occidentalis* was not listed in North Dakota (Wheeler and Wheeler, 1963), we collected it within 20 k of the western border of the state (Fallon Co., MT) and would expect it to occur in the state.



Map 20. *Aphaenogaster occidentalis*.

occidentalis - W USA, W Canada

Nests in soil, under stones, in/under logs and stumps, under bark

Grasslands to forests

occidentalis, *Aphaenogaster* 344 *subterranea* complex
Compare with *mutica*, *patruelis*, *uinta*

Habitat.

Aphaenogaster occidentalis is found in a variety of habitats, including grasslands, grassland with a few shrubs, arid shrubland, moist shady foot-hill canyons, oak forest, red cedar, redwood forests, disturbed pine forest, pine/fir/spruce forest, at elevations ranging from 300 to 2090 m (pers. obs.).

It occurs in grass, herbs, sagebrush, rabbit bush, maple and oak as well as fir forests (Allred, 1982). Clark et al. (2008) found it in urban habitats, but not in forest habitats; Ratchford et al. (2005) found it most common in forests. Creighton (1950, as *A. subterranea valida*) stated that colonies are often in areas of moderately heavy cover, although it prefers open and rather dry nest sites. Nests in Nevada were found in habitats ranging from cool deserts to coniferous forests (Wheeler and Wheeler, 1986).

Biology.

Aphaenogaster occidentalis nests are generally in the soil, usually under a stone or adjacent to a tree or stump, but occasionally nests are found under the bark of logs and stumps or in rotten stumps or under and in rotten logs. One small nest was under a stick.

Workers are timid and escape when the nest is disturbed. One nest had a ball of 200 ants with six dealate females.

Brood and sexuals were found in nests in June and July (pers. obs.). Eggs were found in nests in June and July, larvae in late June (Allred, 1982). A flight occurred at 17:00 on 12-ix-1971 near Reno, Nevada (Wheeler and Wheeler, 1986).

occidentalis - W USA, W Canada

Nests in soil, under stones, in/under logs and stumps, under bark
Grasslands to forests

Compare with *mutica*, *patruelis*, *uinta*

Soils where nests occur range from clay loam, rocky clay, loam, rocky loam to sand, light brown to dark brown in color (pers. obs.).

This is a common ant in Nevada, which is the host of the pseudococcid mealybug *Chorizococcus arborvitus* (Wheeler and Wheeler, 1986).

This species forages diurnally (pers. obs.). The similar *A. subterranea* uses tools to transport liquid food (Lörinzi, 2014). The ants drop soil or pieces of plant material into a honey solution and then carry the soaked object back to the nest.

Aphaenogaster occidentalis is an opportunist species (MontBlanc, 2005), carbohydrate:protein ratios may be especially low for this granivorous species, which accepted sucrose solutions but rejected casein solutions (Kay, 2002). It is attracted to meat juices (Allred, 1982). It is the only ant species that disperses the seeds of the exotic spotted knapweed (*Centaurea maculosa*) (Jensen and Six, 2006).

It is rapidly displaced by the imported, *Linepithema humile* in northern California (Sanders et al., 2003).

occidentalis - W USA, W Canada

Nests in soil, under stones, in/under logs and stumps, under bark

Grasslands to forests

Compare with *carbonaria*, *mutica*, *occidentalis*

***Aphaenogaster patruelis* Forel**

Worker Figs. 57, 309 (head), 58 (dorsopropodeum), 309 (side view).

Female Figs. 107, 310 (side view), 109 (propodeal spines from side and from above), 310 (head).

Male Figs. 146 (propodeum and processes), 311 (side view), 311 (head).

Map 21.

Plates 37 (worker), 38 (female).

Aphaenogaster patruelis Forel, 1886:41 (page 4 of reprinted article), ♀, MEXICO: Baja California, Isla Guadalupe [lectotype worker, 1 paralectotype worker, here designated, MHNG, 2 ♀ and 1 ♂ topotypes, MCZC], *Stenamma (Aphaenogaster) subterranea patruelis*: , 1895:302; *Aphaenogaster patruelis*: Wheeler, 1934: 132-133, ♂
Aphaenogaster (Attomyrma) patruelis willowsi Wheeler, 1933:64, *Aphaenogaster patruelis willowsi*: Wheeler 1934:133 (Creighton, 1950:146)

Stenamma (Aphaenogaster) patrule bakeri Wheeler, 1904:270, ♀, USA: California, Santa Catalina Island; *Aphaenogaster patrule bakeri*: Wheeler, 1916:143 [cotype ♀ seen, LACM]; *Aphaenogaster (Attomyrma) patruelis bakeri*: Emery, 1921:59 (Smith, 1979: 1362)

patruelis - Islands near California, USA and Baja California, MX,

Nests under stones, in *Cupressus*

Arid habitats

Compare with *carbonaria*, *mutica*, *occidentalis*

Diagnoses:

Worker. The clypeus of *A. patruelis* usually has a medial longitudinal carina and may or may not have additional lateral carinae. The eyes are separated from the anterior margin of the head by slightly more than one maximum diameter (side view). Much of the head is glossy, but it is almost entirely covered with longitudinal rugae or reticulated striae.

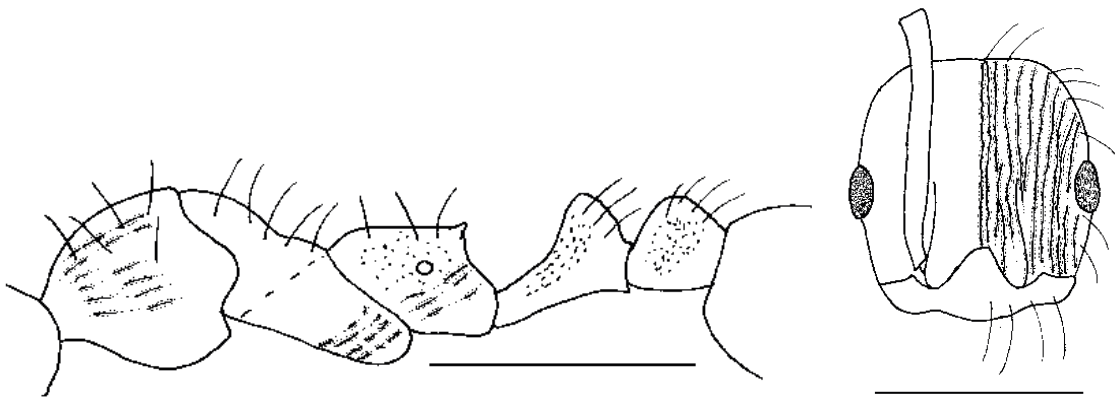


Fig. 309. Mesosoma, waist and head of a worker of *A. patruelis*, showing the sculpture on the mesopleuron (San Clemente Island, California, MCZC).

Many of the hairs on the scapes are erect or suberect. The antennal scapes of the largest workers surpass the occipital margin by little more than the length of the first two segments of the funiculus. The pronotum

patruelis - Islands near California, USA and Baja California, MX,

Nests under stones, in *Cupressus*

Arid habitats

Compare with *carbonaria*, *mutica*, *occidentalis*

and mesonotum, and at least part of the mesopleuron is smooth and shining. The propodeal spines are very small, but are formed into definite spines.

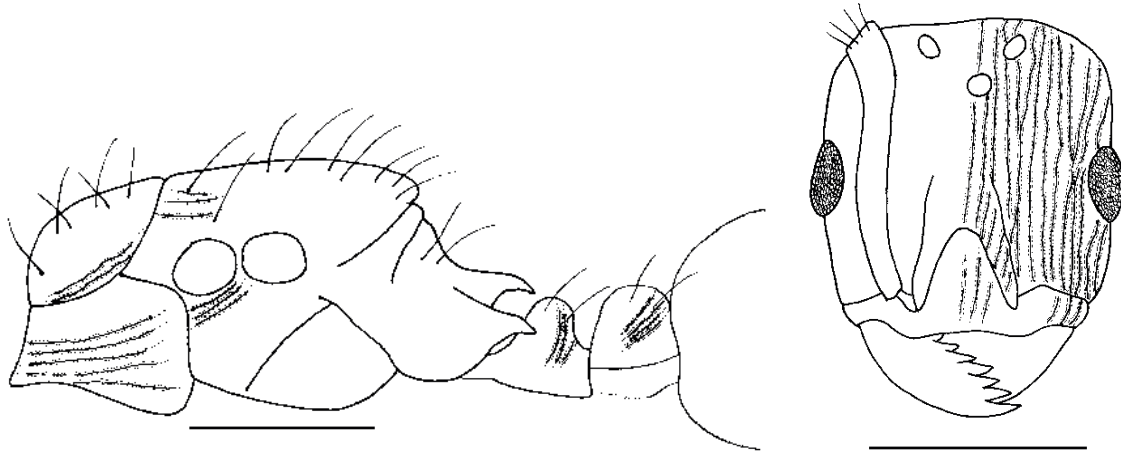


Fig. 310. Mesosoma, waist and head of a female of *A. patruelis* (San Clemente Island, California, MCZC).

Female (previously undescribed). The clypeus of *A. patruelis* is similar to that of the worker. The sculpturing of the head is somewhat finer than that of the worker, specifically the sculpture between the longitudinal rugae is mostly smooth and glossy. The hairs on the scape are suberect, and mostly confined to the area near the apex. The anterior part of the pronotum has transverse striae, the posterior lateral part is smooth and shiny, as is the scutum and the scutellum. The propodeal spines are very well-developed and are laterally flattened.

patruelis - Islands near California, USA and Baja California, MX,
Nests under stones, in *Cupressus*
Arid habitats

Compare with *carbonaria*, *mutica*, *occidentalis*

Male. Two male specimens of *A. patruelis* are deposited in the MCZC and the LACM. The specimen in the MCZC is missing the head and gaster, that in the LACM has the anterior part of the mesosoma distorted. The eye is very large (maximum diameter 0.41 mm, side view) and the ocelli are very small (diameter of medial ocellus 0.06 mm).

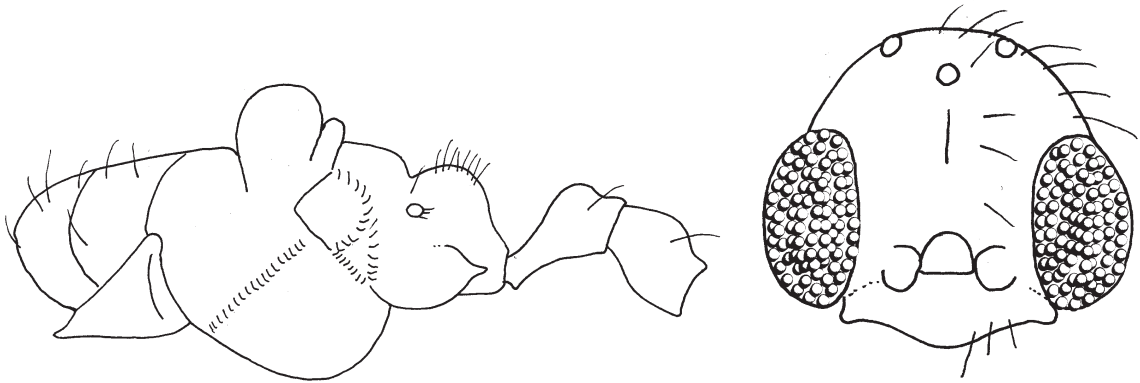


Fig. 311. Mesosoma, waist and head of a male of *A. patruelis* (San Clemente Island, California, LACM).

The dorsum of the scutum is mostly smooth and glossy, except for the posterior part which is finely punctate and coriaceous. The scutellum is swollen, the propodeal protuberances are rounded. The metapleural process is well-developed and forms a weakly sharpened angle posteriorly, which is the best character for separating the males of this species from the others.

patruelis - Islands near California, USA and Baja California, MX,
Nests under stones, in *Cupressus*
Arid habitats

Compare with *carbonaria*, *mutica*, *occidentalis*

Comparison:

Workers from Guadalupe Island in the CASC collected by H. Keifer are identical to the types, other workers collected by R. Aalbu differ from type series in being darker and in having more erect propodeal spines. Another worker collected by R. Aalbu on Guadalupe Island is only 3 mm long (normal length 4+ mm) and lacks spines on the propodeum, but is probably also *A. patruelis*.

Aphaenogaster carbonaria from Baja California (Sierra Laguna and El Chinche) differs from the typical *A. patruelis* in being darker, slightly larger in size, having longer antennal scapes, and the base of the propodeum is less convex, with a pair of short ridges at the posterior end, terminating in sharp angles or protuberances, instead of acute denticles as in the typical form (Wheeler, 1934). Both the petiolar and postpetiolar nodes are higher and more conical, and the color is reddish) and the legs and scapes are darker brown. The hairs on the appendages, especially on the flexor surfaces of the femora and tibiae, are much more developed. The frontal area is sharply carinulate in the middle, the head more abundantly rugulose, and the clypeus and the mandible more coarsely rugose (Wheeler, 1934). *Aphaenogaster carbonaria* is likely a synonym of *A. patruelis*, but will be considered a separate species until more material becomes available.

patruelis - Islands near California, USA and Baja California, MX,
Nests under stones, in *Cupressus*
Arid habitats

Compare with *carbonaria*, *mutica*, *occidentalis*

Aphaenogaster patruelis could be confused with *A. mutica*, which has a more elongated head, and is from the continental United States. It can be separated by the poorly defined striae on the mesopleuron, which are in the form of punctures in *A. mutica*.

Aphaenogaster patruelis also resembles *A. occidentalis*. Suggestions for separating the species can be found in the discussion of *A. occidentalis*.

It is difficult to evaluate the validity of *A. patruelis bakeri* from Catalina Island off the coast of southern California. *Aphaenogaster patruelis bakeri* is pale brown in color, and the sculpture is finer, with much of the head and the dorsum of the pronotum being smooth and glossy. It will be continued to be considered to be a synonym until males and females and additional material becomes available.

Distribution:

This species appears to be restricted the islands off the coasts of **USA: California**, Catalina Island and Santa Barbara Island and **MEXICO: Baja California**, Isla Guadalupe (CWEM), Isla San Nicolás [California?] (Smith, 1979), Baja California offshore islands (CWEM, Johnson and Ward, 2002).

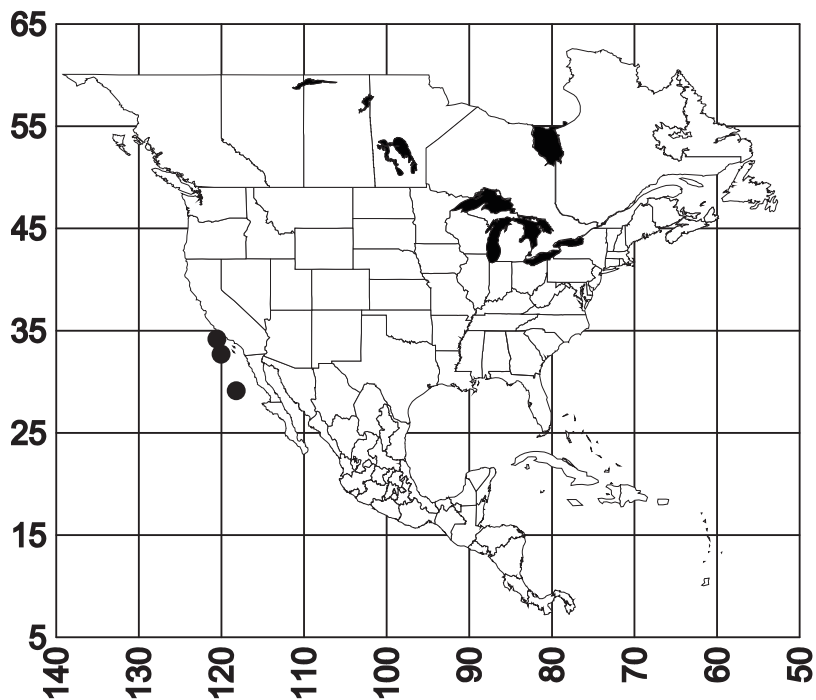
patruelis - Islands near California, USA and Baja California, MX,
Nests under stones, in *Cupressus*
Arid habitats

patruelis, *Aphaenogaster*

352

subterranea complex

Compare with *carbonaria*, *mutica*, *occidentalis*



Map 21. *Aphaenogaster patruelis*.

Habitat:

Arid island habitats at an elevation of 1200m.

Biology:

Specimens were collected from *Cupressus guadalupensis*. One series was collected under a stone.

patruelis - Islands near California, USA and Baja California, MX,
Nests under stones, in *Cupressus*
Arid habitats

Compare with *araneoides*, *brevicollis*

***Aphaenogaster phalangium* Emery**

Worker Figs. 33 (posterior femur), 35 (side view of head), 36 (gaster from above), 312 (side view), 312 (head).

Male Figs. 39 (antenna), 313 (side view), 313 (head).

Map 22.

Plates 39 (worker), 40 (male).

Aphaenogaster phalangium Emery, 1890:47, plate 5, figs. 6 and 7, ♀, ♂, Costa Rica: probably from Alajuela (Longino and Cover, 2004), Emery, 1894:54 [lectotype ♀ seen, designated by Longino]; *Aphaenogaster (Ischnomyrmex) phalangium* Forel, 1899:59; *Aphaenogaster (Deromyrma) phalangium*: Emery, 1915:71

Diagnoses:

Worker. The worker of *A. phalangium* is easily recognized by the narrowed neck at the posterior margin of the head. The head is mostly covered with coarsely granulated striae, with the striae near the posterior border of the head being mostly transverse across the dorsum of the neck. The mesosoma is mostly covered with similar striae, and the mesonotum forms a bump (seen best in profile). The region between the two faces of the propodeum is formed into poorly defined bumps. The dorsum of the first tergum is nearly always completely smooth and glossy.

phalangium - Central America, Colombia

Nests in and under logs

Tropical forests

Compare with *araneoides*, *brevicollis*

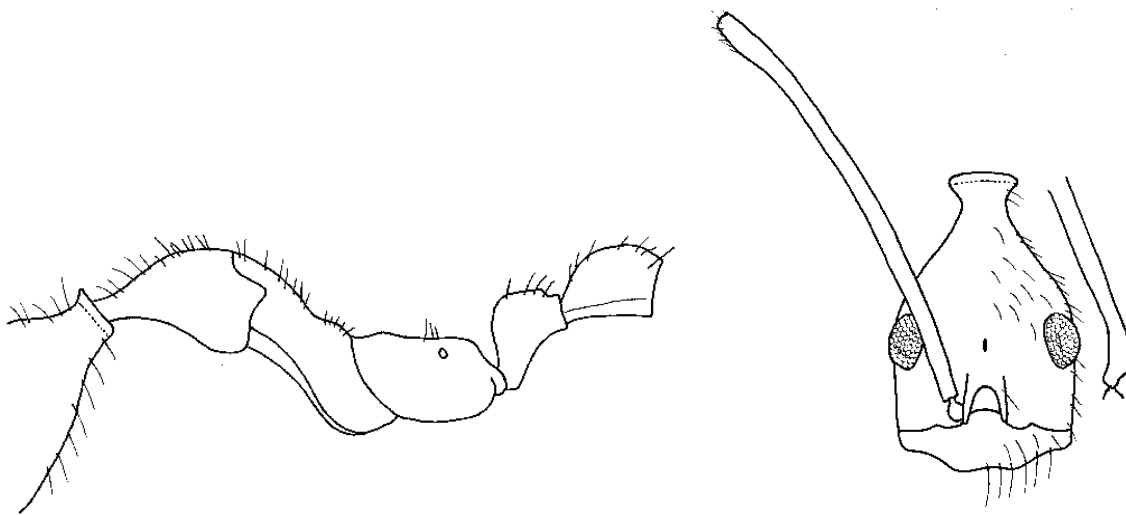


Fig. 312. Mesosoma and petiole of the lectotype worker of *A. phalangium*. The inset on the right side of the head shows the base of the left scape as seen from above.

Female. Unknown.

Male. The male of *A. phalangium* has the elongated neck and depressed propodeum, characteristics of the males of the *phalangium* species complex. The entire dorsum of the head of *A. phalangium* is covered with striate (punctures in *A. araneoides*), and the first tergum is nearly always smooth and glossy, not normally punctate as in *A. araneoides*.

phalangium - Central America, Colombia

Nests in and under logs

Tropical forests

Compare with *araneoides*, *brevicollis*

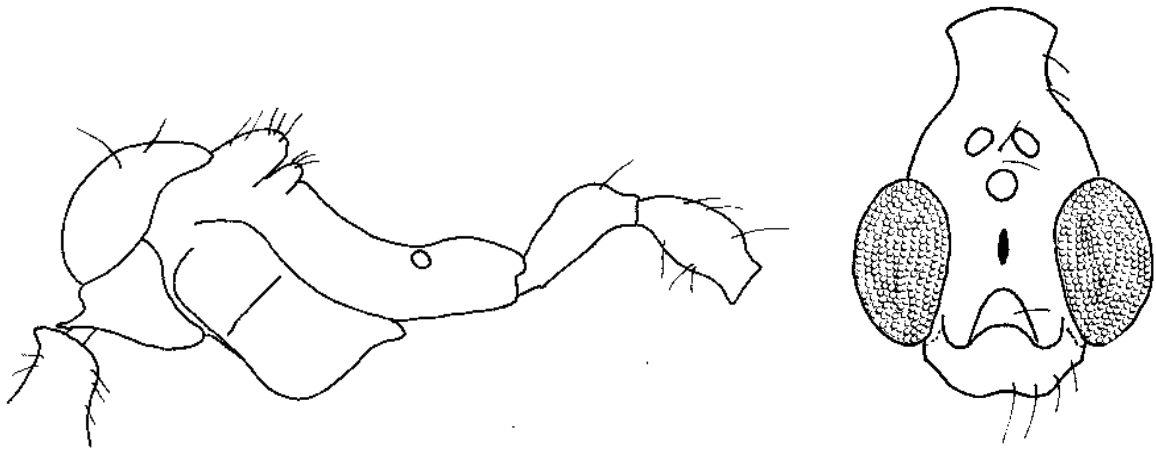


Fig. 313. Mesosoma, waist and head of a male of *A. phalangium* (Izabal, Guatemala, CWEM).

Comparison:

Aphaenogaster phalangium can be easily separated from the Mexican *N. ensifer*, in which the neck is also narrowed, in being a smaller ant, with the notopropodeal suture well marked. The lack of propodeal spines would separate it from the similar Mexican *A. mexicana*.

The lack of erect hairs on the upper surface of the femur would separate the male of *A. phalangium* from the male of *A. inermis*, and the lack of erect hairs on the mesopleuron would separate it from those of *A. brevicollis*. It is difficult to separate the male of *A. phalangium* from that of *A. araneoides*, but the funiculi of the specimens available suggest that the

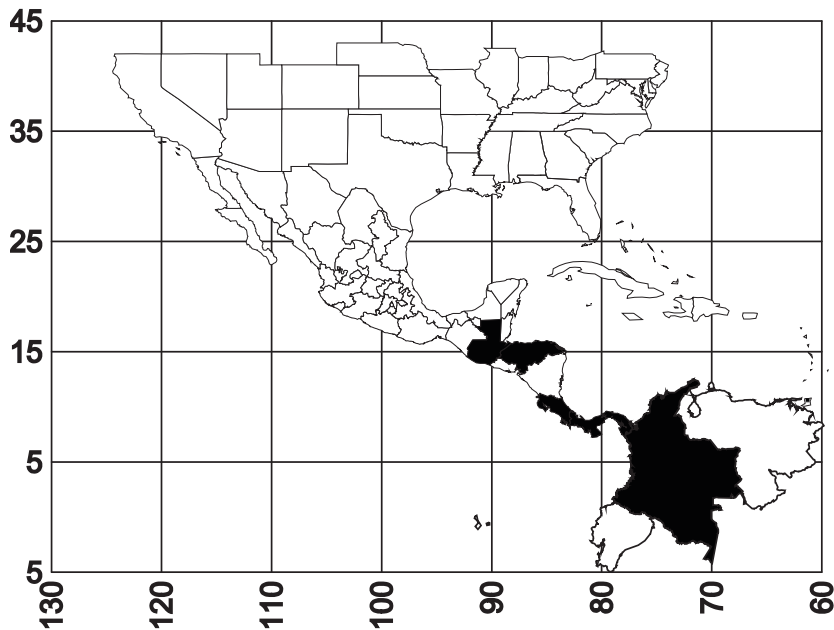
phalangium - Central America, Colombia

Nests in and under logs

Tropical forests

Compare with *araneoides*, *brevicollis*

second segment (third antennal segment) of *A. phalangium* is approximately twice as long as the third segment, not only slightly longer than the third, as in males of *A. araneoides*.



Map 22. *Aphaenogaster phalangium*.

Distribution:

COLOMBIA: Chocó, Quibdó (ICN). **COSTA RICA:** Cartago, Turrialba, 2000', 17-vii-1965 (1 ♂ CASC); Puntarenas, San José, Cerrado Helado (CWEM). **GUATEMALA:** Izabal, Parque Arqueológico Quiriguá (CWEM). **HONDURAS** (Kempf, 1972). **PANAMÁ:** Panamá,

phalangium - Central America, Colombia

Nests in and under logs

Tropical forests

phalangium complex 357 *Aphaenogaster phalangium*
Compare with *araneoides*, *brevicollis*

Barro Colorado (CWEM), San Blas, Nusagandi, 350m, 27-vii-1995 (1 ♂ CASC); **Darién** (Longino and Cover, 2004).

Habitat:

Oak and bamboo forest, tropical rain forest.

Biology:

Aphaenogaster phalangium nests in and under logs. Brood and males were present in nests in July. Nests are found in brown loam soil. Workers are very rapid and escape when the nest is disturbed. Specimens were also collected in leaf litter extractions.

phalangium - Central America, Colombia
Nests in and under logs
Tropical forests

Compare with *carolinensis*, *fulva*, *miamiana*, *rudis*, *texana*

***Aphaenogaster picea* (Wheeler)**

Worker Figs. 65 (sculpture near eye), 67 (dorsopropodeum), 74, 104 (side view), 93 (anterior part of head), 103 (head).

Female Figs. 122, 314 (side view), 314 (head).

Male Figs. 138 (Scutum), 144 (scutellum, propodeum and petiole), 315 (side view), 315 (head).

Map 23.

Plates 41 (worker), 42 (female), 43 (male).

Stenamamma (*Aphaenogaster*) *fulvum* var. *piceum* Wheeler, 1908: 621 ♀, ♀, ♂, USA: Connecticut [first available use of *Stenamamma* (*Aphaenogaster*) *fulvum aquia* var. *piceum* Emery, 1895:305-306, unavailable name, ♀ lectotype, 29 ♀, 4 ♀, 9 ♂ paralectotypes, here designated, MCSN]; *Aphaenogaster* (*Attomyrma*) *fulva* var. *picea*: Emery, 1921:57; *Aphaenogaster fulva picea*: Buren, 1944:284; *Aphaenogaster* (*Attomyrma*) *rudis picea*: Creighton, 1950:148; *Aphaenogaster picea*: Bolton, 1995: 72

Aphaenogaster texana subsp. *punctithorax* Cole, 1938: 239-240, Fig. 2 ♀
USA: Tennessee, Great Smokey Mountains, Gregory's Bald, Unidentifiable taxon, minors of unknown species: Creighton, 1950:

picea - E USA, E Canada

Nests in/under logs, stumps, branches, twigs, under stones

Hardwood forests, pine forests urban habitats

Compare with *carolinensis*, *fulva*, *miamiana*, *rudis*, *texana*

151-152; junior synonym of *A. picea*: Smith, 1951: 796; unidentifiable taxon; incertae sedis in *Aphaenogaster*: Smith, 1979: 1364

new synonymy

Diagnoses:

Worker. The worker of *A. picea* is a small to moderate sized (total length 3.5-4.5 millimeters) dark reddish brown to black ant, often with lighter colored appendages. The heads of the smaller workers are mostly punctate, especially the region between the eye and the frontal carina. Larger workers generally have striae mixed with punctures in this region. The mesonotum is usually somewhat elevated and may form a protruding structure, which is slightly concave in the middle (seen from the front). The propodeal spines are generally short, shorter than the distance between the faces.

The side view and head are nearly identical to those of *A. rudis* (Figs. 301, 302).

Female. The female is a moderate sized (total length 5.5 - 7 mm) dark brown ant with medium brown appendages. The region between the eye and the frontal carina is covered with a combination of diverging striae and punctures.

Most of the scutum is finely sculptured with longitudinal striae, except for the anterior edge which is possibly smooth and shiny. Most of the mesopleuron is smooth and glossy. The propodeal spines are well-developed and often somewhat flattened laterally.

picea - E USA, E Canada

Nests in/under logs, stumps, branches, twigs, under stones

Hardwood forests, pine forests urban habitats

Compare with *carolinensis*, *fulva*, *miamiana*, *rudis*, *texana*

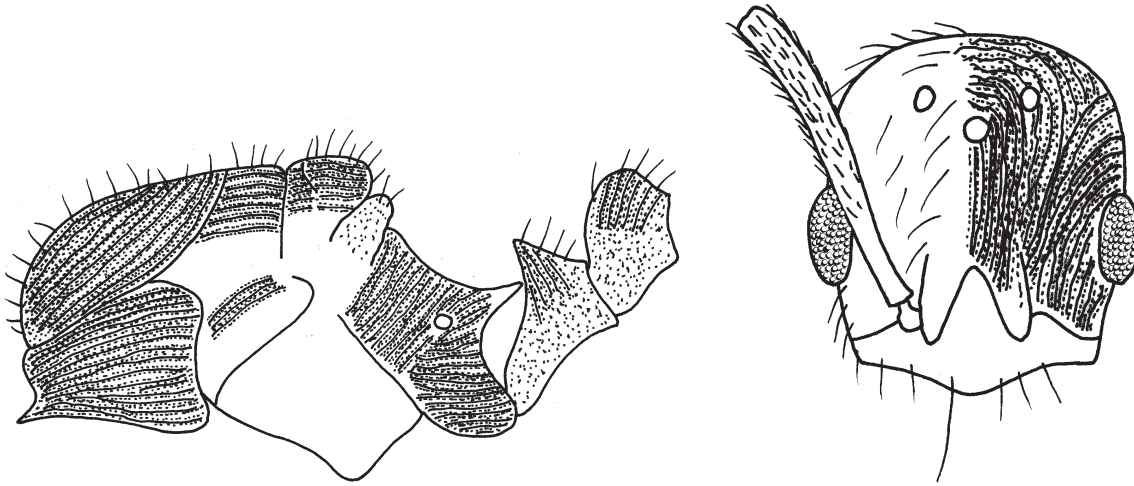


Fig. 314. Mesosoma, waist and head of a paralectotype female of *A. picea*.

Male. The male of *A. picea* is a small (total length 4 mm), dark brown to black ant. Surfaces are predominantly shining, including the scutum, scutellum, mesopleuron and the side of the propodeum. The posterior third of the scutellum has fine transverse striae and the lateropropodeum near the propodeal protuberance has fine, nearly vertical striae and is also partially punctate. The scutellum does not strongly protrude from the outline of the mesosoma. The anterior $\frac{2}{3}$ of the dorsopropodeum slopes downward, with the posterior $\frac{1}{3}$ of the dorsopropodeum being nearly horizontal. The propodeal processes are angulate, but are not formed into spines. The processes may be covered with vertical striae. The petiole and

picea - E USA, E Canada

Nests in/under logs, stumps, branches, twigs, under stones

Hardwood forests, pine forests urban habitats

Compare with *carolinensis*, *fulva*, *miamiana*, *rudis*, *texana*

postpetiole are partially shining, but are sculptured with punctae on the sides. The gaster is smooth and glossy.

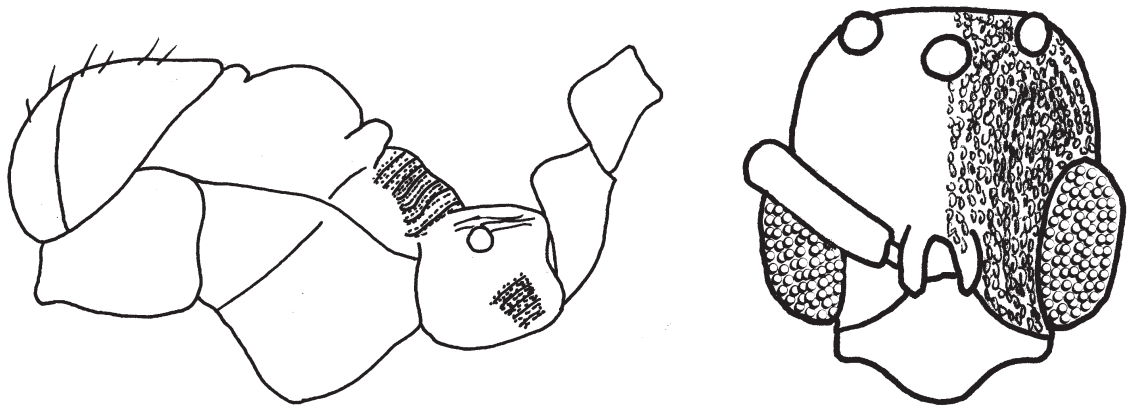


Fig. 315. Mesosoma, waist and head of a paralectotype male of *A. picea*.

Comparison:

Aphaenogaster picea is a very common dark *Aphaenogaster* found in Eastern United States. It would most likely be confused with *A. rudis*. The workers, females and males can usually be separated as they are very dark, nearly black (those castes of *A. rudis* are generally reddish brown). The colors are mostly uniform within a nest. The region between the eye and the frontal carina of the worker is often mostly punctate, not mostly striate as is normal in *A. rudis*. *Aphaenogaster picea* is more northerly in distri-

picea - E USA, E Canada

Nests in/under logs, stumps, branches, twigs, under stones

Hardwood forests, pine forests urban habitats

Compare with *carolinensis*, *fulva*, *miamiana*, *rudis*, *texana*

bution than *A. rudis* and inhabits higher elevations, tolerating temperatures 2 degrees lower than *A. rudis*; climate change should shift the distributions of the two species (Warren and Chick, 2013).

It is difficult to separate *A. picea* from a number of other reddish-brown species including *A. carolinensis*, *A. fulva*, *A. miamiana* and *A. texana*, some of which overlap its distribution. The key will hopefully be useful in separating these similar species.

The morphological and behavioral characters once thought to define *A. carolinensis*, *A. picea* and *A. rudis* do not associate with their hypothesized species limits, which suggests that these species are not monophyletic; even *A. picea* and *A. rudis* are not monophyletic (DeMarco, 2015). The short branch lengths between them in the proposed phylogeny suggests that these ants have likely recently radiated, and the lack of gene lineage sorting explains the non-monophyly of species (DeMarco, 2015). Conversely, these results may indicate that clades of multiple species represent fewer but morphologically varied species (DeMarco, 2015). Additional biological information concerning pre- and post-mating barriers is needed before a complete revision of species boundaries for *Aphaenogaster* can be determined (DeMarco, 2015).

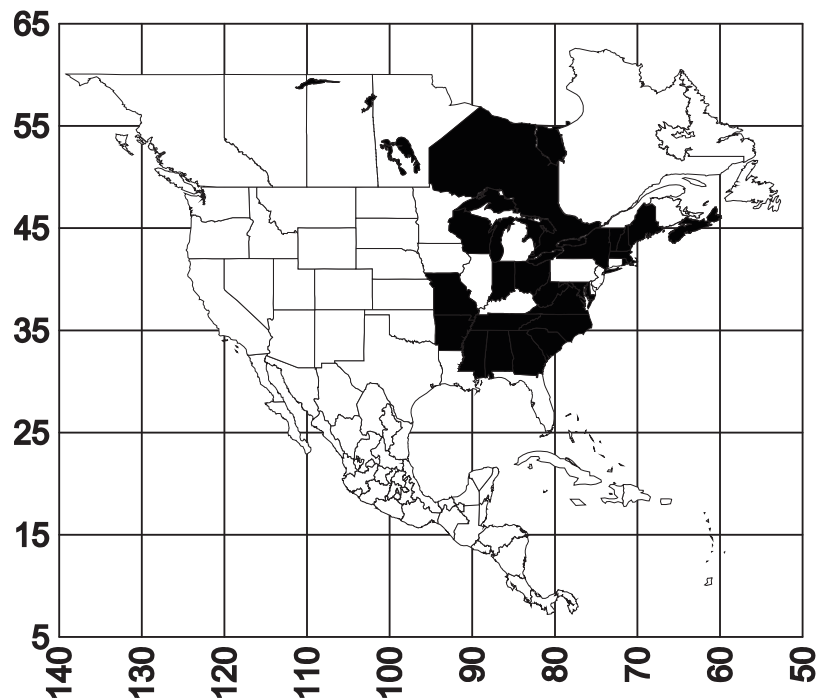
There has been confusion over the identity of *Aphaenogaster texana* subsp. *punctithorax*. We collected specimens from the Great Smokey Mountains that match Cole's description (except they are not dark greyish brown) that appear to be *A. picea*, supporting Smith (1951).

picea - E USA, E Canada

Nests in/under logs, stumps, branches, twigs, under stones

Hardwood forests, pine forests urban habitats

Compare with *carolinensis*, *fulva*, *miamiana*, *rudis*, *texana*



Map 23. *Aphaenogaster picea*.

Distribution:

USA: **Alabama** (MacGown and Forster, 2005); **Arkansas** (General and Thompson, 2007); **Georgia** (CWEM); **Indiana** (Morris, 1942; Munsee, 1967); **Louisiana** (CWEM); **Maine** (CWEM); **Maryland** (CWEM); **Massachusetts** (CWEM); **Missouri** (CWEM); **New Hampshire** (CWEM); **New York** (CWEM); **North Carolina** (CWEM; Warren et al., 2014; Guénard et al., 2012, 2015); **Ohio** (CWEM; Coover, 2005); **Rhode Island** (CWEM; Ellison and Farnsworth, 2014); **South Carolina** (Davis, 2009); **Tennessee** (CWEM); **Vermont** (Ellison, pers.

picea - E USA, E Canada

Nests in/under logs, stumps, branches, twigs, under stones

Hardwood forests, pine forests urban habitats

Compare with *carolinensis*, *fulva*, *miamiana*, *rudis*, *texana*

comm); **Virginia** (CWEM); **West Virginia** (CWEM); **Wisconsin** (CWEM). **CANADA: Nova Scotia** (Smith, 1979); **Ontario** (CWEM).

Habitat:

This species is found in hardwood oak forests, hardwood forests, mixed hardwoods and pines, and pine oak forests. Nests are generally found in mixed hardwood forests, often it in open areas, including city parks.

Aphaenogaster rudis is the dominant ant in eastern US temperate hardwood forests (King and Tschinkel, 2013), and in mature oak-hickory forest in North Carolina (Warren et al., 2014), and one of the dominant ants in inland pine barrens in New York state (Barber, 2015). It increased in abundance away from the forest edge (Ivanov and Keiper, 2013) and was resilient to changes in forest ground cover or overstory and persisted in similar abundance in both healthy and declining hemlock forests (Ribbon, 2014). It became more common after restoration of prescribed burns of grasslands (Menke et al., 2015) and has adapted to urban habitats (Uno et al., 2010; Guénard et al, 2015).

Biology:

Aphaenogaster picea nests in rotten branches on the ground, in hollow twigs, in and under rotten logs and stumps, under bark and occasionally in the soil under stones. One nest was found in the abandoned thatched nest of a member of the *Formica rufa* group.

Workers are generally timid and escape when the nest is opened, but larger nests can be aggressive.

picea - E USA, E Canada

Nests in/under logs, stumps, branches, twigs, under stones

Hardwood forests, pine forests urban habitats

Compare with *carolinensis*, *fulva*, *miamiana*, *rudis*, *texana*

Brood and sexuals were collected in nests in June and July.

Aphaenogaster rudis begins foraging early in the spring (Warren et al., 2011) and is a key seed disperser (Warren et al., 2014). Eliaosomes (protein rich food source attached to a seed) provided a sufficient source of food for the maintenance of lab colonies of *A. picea* (Clark and King, 2012). Workers were collected from a subterranean Vienna sausage bait (pers. obs.).

They are found in areas with soils ranging from clay, clay loam, sand, sandy loam and rocky loam in colors ranging from gray, light brown to dark brown to red.

Solenopsis picea and *S. rosellae* as well as *Formica nitidiventris* were found in nests. We have collected well over 100 nests of various sizes, and in have often found nest queens, but have never found a nest containing *A. tennesseensis*.

picea - E USA, E Canada

Nests in/under logs, stumps, branches, twigs, under stones

Hardwood forests, pine forests urban habitats

puncticeps, *Aphaenogaster* 366 *subterranea* complex
Compare with *huachucana*, *punctatissima*, *texana*

***Aphaenogaster puncticeps* W. Mackay**

Worker Figs. 88 (propodeal spines), 97 (base of scape), 98 (head), 316 (side view).

Map 24.

Plate 44 (worker).

Aphaenogaster puncticeps Mackay, 1989:47-49, Figs. 1, 4, 6, 7, ♀,
USA: New Mexico, Doña Ana County, Jornada Experimental Range

Diagnosis:

Worker. The head of *A. puncticeps* is elongate (head width / head length 0.71), and nearly completely covered with punctures and without well-defined rugae. Most of the mesosoma has similar sculpture. The propodeal spines are small. The posterior tibia is much longer than the head length.

Female and male. Unknown.

Comparison:

This species is similar to *A. texana*, but differs in that the posterior border of the head is moderately pointed (rounded in *A. texana*) and the dor-

puncticeps - SW USA, W México
Nests in rodent burrows
Desert shrublands

Compare with *huachucana*, *punctatissima*, *texana*

sum of the head is primarily punctate (rugose with punctures in the intrarugal spaces in *A. texana*). It can be separated from *A. huachucana* and *A. texana* by the shape of the base of the scape. The latter two taxa have a large, blunt angular lobe which projects forward at the base of the scape. *Aphaenogaster punctaticeps* and *A. texana* have a smaller and sharply pointed lobe. Additional characters for separating these species are included in the key.

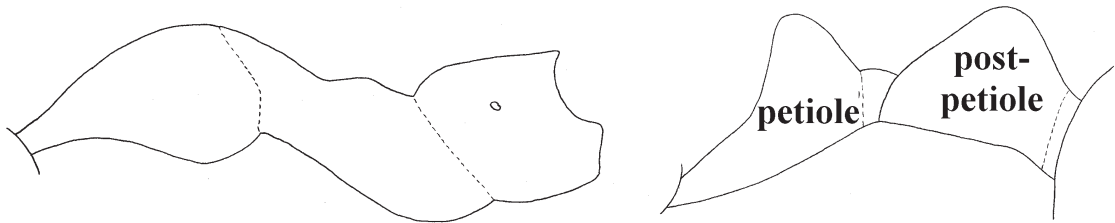


Fig. 316. Outline of the mesosoma, petiole and postpetiole of a worker of *A. punctaticeps*, showing the presence of small propodeal spines on the propodeum.

Distribution:

USA: Texas, Sabine Co., Smith Co.; SE **Arizona**, Cochise Co.; **New Mexico**, Doña Ana Co., 45 k NE Las Cruces [Jornada Long Term Ecological Research Site, type locality, MCZC]), Socorro Co., Sevilleta National Wildlife Refuge (CWEM). **MEXICO:** Jalisco (Villalvazo-Pala-

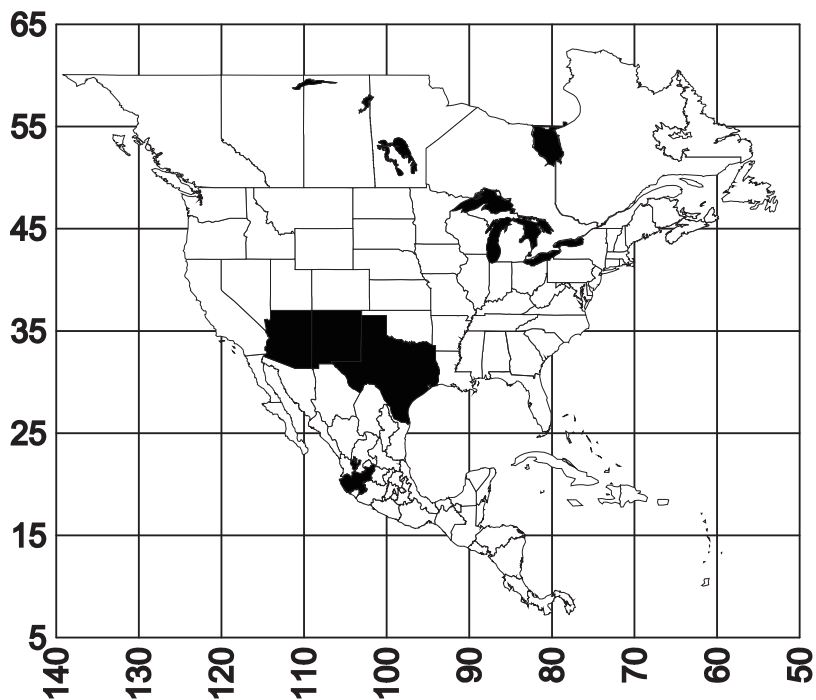
punctaticeps - SW USA, W México

Nests in rodent burrows

Desert shrublands

puncticeps, *Aphaenogaster* 368 *subterranea* complex
Compare with *huachucana*, *punctatissima*, *texana*

cios et al., 2015). It was widely distributed in the Chihuahuan Desert during the late Quaternary, found in packrat midden samples as old as 35,000 years before present (Mackay and Elias, 1992).



Map 24. *Aphaenogaster puncticeps*.

Habitat:

It is found in desert shrublands, specifically creosotebush scrub.

puncticeps - SW USA, W México

Nests in rodent burrows

Desert shrublands

subterranea complex

369

Aphaenogaster punctaticeps

Compare with *huachucana*, *punctatissima*, *texana*

Biology:

Aphaenogaster punctaticeps is a rare rodent burrow specialist, nesting in kangaroo rat mounds (Cover, pers. comm., pers. obs.) or in prairie dog towns (Fagerlund, pers. comm.; Davidson and Lightfoot, 2007). It apparently pilfers from the seed caches of the rodents. Specimens can be collected by baiting pieces of cookies at the entrances to the mammal mounds.

punctaticeps - SW USA, W México

Nests in rodent burrows

Desert shrublands

punctatissima, *Aphaenogaster* 370

subterranea complex

Compare with *ensifer*, *punctaticeps*, *texana*

***Aphaenogaster punctatissima* W. Mackay new species**

Worker Figs. 99, 196 (Head), 100 (petiole and gaster from above), 317 (side view), 317 (head).

Map 25.

Plate 45 (worker).

Diagnosis and description:

Worker. Mandible with 3 well developed teeth, followed by approximately 10 denticles, apical tooth about 1 ½ times larger than following tooth, third tooth slightly smaller than second; anterior border of clypeus weakly concave, roughly sculptured with several carinulae which converge anteriorly; head elongate and strongly narrowed posteriorly (full face view of the complete head); scape extends about 3 funicular segments past posterior lateral corner of head; eyes relatively large, about 13 ommatidia in maximum diameter, located slightly more than one maximum diameter from insertion of mandibles; promesonotum broadly convex; propodeal spines short (0.1 mm in length); dorsum of petiole broadly rounded, generally forming poorly defined dorsal face.

Erect hairs abundant on mandibles, clypeus, dorsal and ventral surfaces of head, sides of head, posterior margin, dorsum of mesosoma, coxae, femora, hairs on tibiae nearly appressed, erect hairs present on petiole,

punctatissima - W central México

In leaf litter and under log

Dry cloud forest

Compare with *ensifer*, *punctaticeps*, *texana*

postpetiole and gaster; appressed pubescence sparse on dorsum and ventral surfaces of head and on gaster.

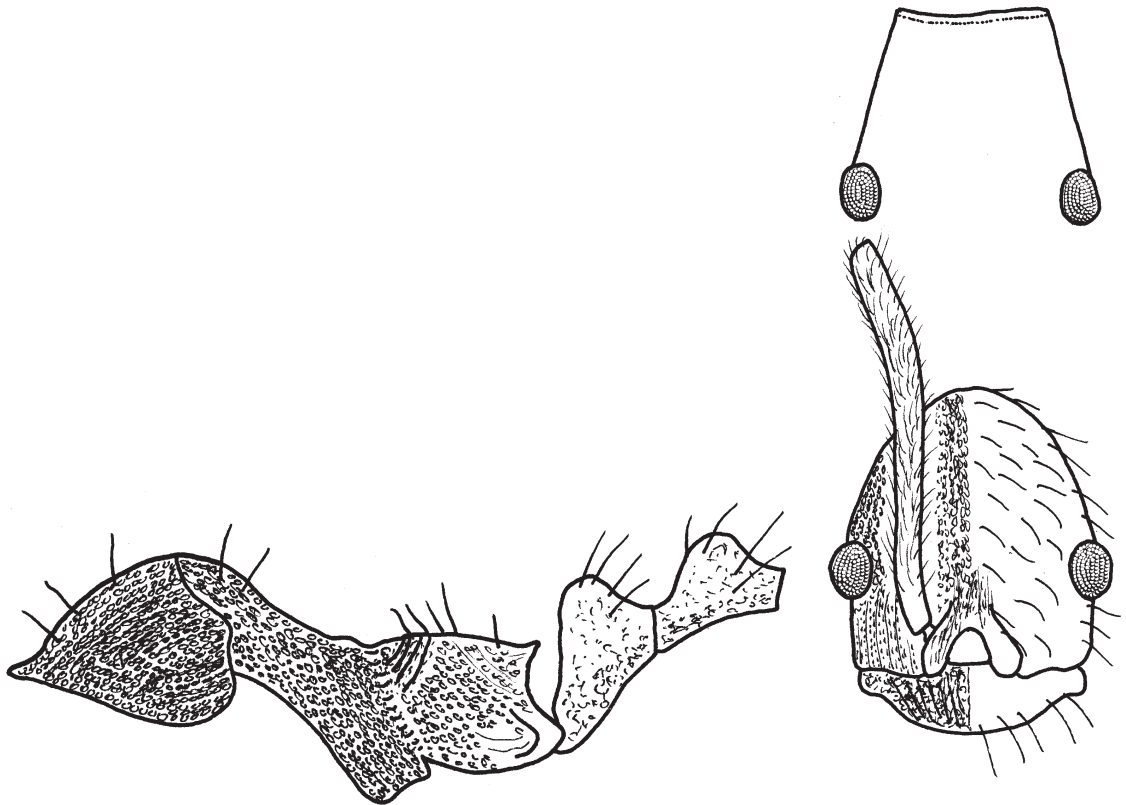


Fig. 317. Mesosoma, waist and head of the holotype worker of *A. punctatissima*. The upper inset above the head shows the posterior part of the head seen directly from above.

punctatissima - W central México

In leaf litter and under log

Dry cloud forest

punctatissima, *Aphaenogaster* 372

subterranea complex

Compare with *ensifer*, *punctaticeps*, *texana*

Head densely and evenly punctate, few poorly defined rugulae intermixed with punctures, mesosoma punctate, pronotal neck with few transverse striolae, anterior region of dorsopropodeum with poorly defined transverse striolae, petiole and postpetiole coriaceous to punctate, weakly shining, gaster with very fine coriaceous sculpture, mostly smooth and glossy.

Dark reddish brown, mandibles, first funicular segment and last few funicular segments lighter in color, legs, petiole slightly lighter in color.

Measurements – HL 1.24-1.48, HW 0.84-1.02, SL 1.48-1.74, EL 0.28-0.30, WL 1.90-1.92. Indices CI 68-69, SL 118-119.

Female and male. Unknown.

Etymology: From Latin, *punctus*, meaning a “punch”, referring to the punctured sculpture of most of the surfaces of the worker.

Type series:

MEXICO, Col., 19 km NE Colima, 1-viii-88, 1219m, R. Anderson 88-19, holotype worker (MCZC), 10 paratype workers (CASC, CWEM, IEMJ, LACM, MCZC, USNM, Universidad de Guadalajara).

Comparison:

This species could be confused with *A. texana*, but can be easily separated in that the head is the nearly completely punctate, and does not have

punctatissima - W central México

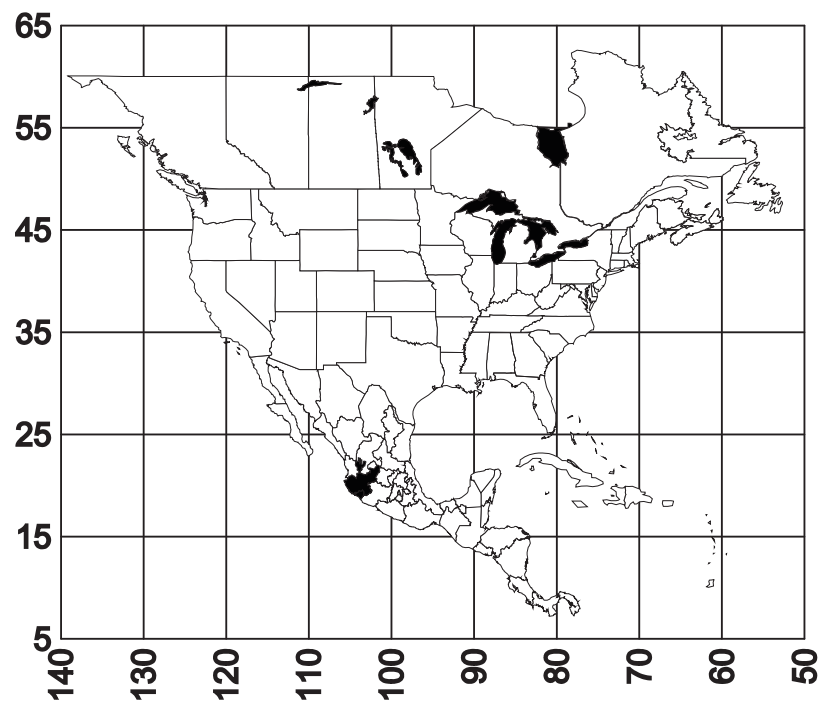
In leaf litter and under log

Dry cloud forest

Compare with *ensifer*, *puncticeps*, *texana*

the roughened striae found on the head of *A. texana*. *Aphaenogaster punctatissima* would most likely be confused with *A. puncticeps*, which also has more striae on the head. It differs from both of these species in that the apex of the petiole is more rectangular shaped and nearly forms a dorsal face, it is rounded in the other two species.

It is easily separated from *N. ensifer* which also occurs in Colima and Jalisco as the worker of *A. punctatissima* lacks the elongated neck, which the workers of *N. ensifer* have.



Map 25. *Aphaenogaster punctatissima*.

punctatissima - W central México

In leaf litter and under log

Dry cloud forest

punctatissima, *Aphaenogaster* 374 *subterranea* complex
Compare with *ensifer*, *punctaticeps*, *texana*

Distribution:

Known only from **MEXICO: Colima**, type locality and road to Reserva de la Biosfera Sierra de Manantlán, 15-iv-2006, P. Lenhart (1 ♀ CWEM); **Jalisco**, Puerto los Mazos, 1-i-1989, E. Ross and R. Stecker (3 ♀ ♀ CASC, CWEM).

Habitat:

Tropical forest, seasonally dry cloud forest at 1250 - 1550 meters elevation.

Biology:

Specimens were collected by hand and from the extraction of litter. One specimen was in leaf litter under a log.

punctatissima - W central México
In leaf litter and under log
Dry cloud forest

***Aphaenogaster relict* Wheeler and Mann**

Worker Figs. 56 (propodeal spines), 318 (mesosoma).

Map 26.

Plate 46 (worker).

Aphaenogaster relict Wheeler and Mann, 1914:25 - 27, Fig. 8c, ♂, ♀, ♂, Haiti Diquini, Petionville, Port au Prince and mountains north of Jacmel; *Novomessor relictus*: Emery, 1915:73 (three cotype ♀ seen, MCZC)

Aphaenogaster relict epinotalis Wheeler and Mann, 1914:27, Figs. 8a, 8b, ♀ Haiti: Manneville; *Veromessor relict epinotalis*: Wheeler and Creighton, 1934:384; *Aphaenogaster relict epinotalis*: Bolton 1995:69 **New synonymy**

Diagnosis:

Worker. The worker is a moderate sized (total length about 6 mm) reddish black ant with slightly lighter colored postpetiole, first part of the first gastral tergite and legs. The head is somewhat rectangular shaped, but narrowed posteriorly, the head length is 1.4 mm, the head width 1.1 mm. The scape extends approximately $\frac{1}{3}$ length past the posterior lateral corner of the head.

relict - Haiti

Nests in soil under stones

Moist hillsides

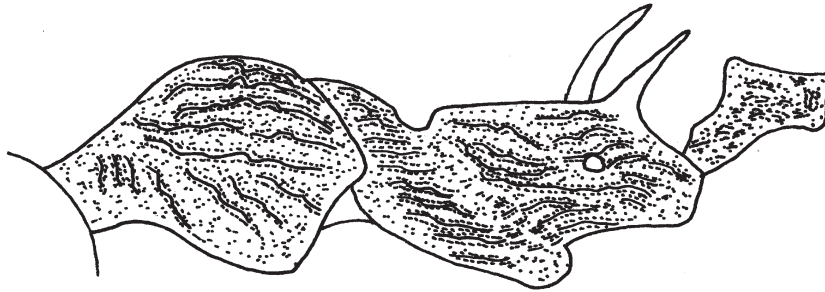


Fig. 318. Mesosoma, petiole and first gastral tergite of a cotype worker of *A. relicta* (MCZC).

The propodeal spines are extremely long (0.51 m), slender and acute at the tips. Nearly all surfaces are sculptured, the head and mesosoma with coarse reticulated rugae, the petiole, postpetiole and most of the first tergum are densely, but finely punctate and dull. Most of the ventral surface of the gaster is smooth and shiny.

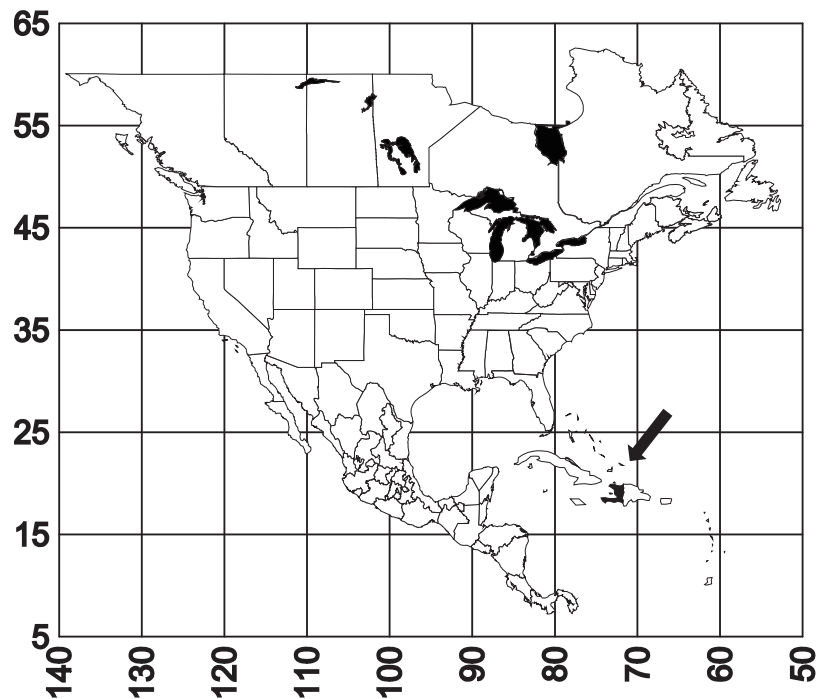
Female and male. Unknown.

Comparison:

The worker of this species is very distinct, due to the rough sculpturing and the long propodeal spines. It would be difficult to confuse this species with any of the others in the genus.

The types of *A. relicta epinotalis* were not found, but based on the descriptions, the differences seem insignificant.

relicta - Haiti
Nests in soil under stones
Moist hillsides



Map 26. *Aphaenogaster relict*.

Material examined:

Type series.

Distribution:

Known only from the type series in Haiti. .

Habitat:

Unknown

Biology:

relict - Haiti

Nests in soil under stones

Moist hillsides

Aphaenogaster relicta nests in the soil under stones in moist localities, usually on hillsides. The workers move rapidly and are timid (Wheeler and Mann, 1914).

relicta - Haiti
Nests in soil under stones
Moist hillsides

subterranea complex

379

Aphaenogaster reticulaticeps

Compare with *huachucana*, *miamiana*, *punctaticeps*, *punctatissima*,
texana

***Aphaenogaster reticulaticeps* W. Mackay new species**

Worker Figs. 99, 319 (head), 101 (petiole and gaster from above), 319 (side view).

Female Figs. 126 (scutum with sculpture), 320 (side view), 320 (head).

Male Figs. 136 (sternopetiole process), 321 (side view), 321 (head).

Map 27.

Plates 47 (worker), 48 (female), 49 (male).

Diagnoses and description:

Worker. Mandible with three well defined distal teeth, apical-most tooth more developed than the other two, remainder of mandible with approximately seven denticles, most poorly defined; clypeus concave medially (in frontal view of clypeus); head elongated, strongly narrowed posterior to eyes; eyes extend slightly past sides of head; scape extends about $\frac{1}{3}$ length past posterior lateral corner of head; pronotum and mesonotum nearly forming continuous arc, mesonotum slightly swollen; notopropodeal suture depressed; propodeal spines short, slightly more than $\frac{1}{2}$ length of posteropropodeum, about $\frac{1}{2}$ length of distance between bases, diverging.

reticulaticeps - NE México

Nests under stones or in stump

Riparian oak forest, cottonwoods, pines

Compare with *huachucana*, *miamiana*, *punctaticeps*, *punctatissima*,
texana

Erect hairs abundant on mandibles, anterior margin of clypeus, dorsal and ventral surfaces of head, sides of head, posterior margin, dorsum of mesosoma, few erect hairs on coxae and femora, hairs on tibiae slightly raised from surface, erect hairs on petiole, postpetiole and gaster; appressed hairs sparse, few evident on head and dorsum of gaster.



Fig. 319. Mesosoma, waist and head of the holotype worker of *A. reticulaticeps*.

Head completely covered with reticulated rugulae, interspaces punctate, mandibles striate, clypeus with longitudinal reticulated striae, dor-

reticulaticeps - NE México

Nests under stones or in stump

Riparian oak forest, cottonwoods, pines

subterranea complex

381

Aphaenogaster reticulaticeps

Compare with *huachucana*, *miamiana*, *punctaticeps*, *punctatissima*,
texana

sum of mesosoma dull, anterior $\frac{1}{2}$ of dorsal face of propodeum with transverse striae, sides of mesosoma dull, with poorly defined rugulae, petiole and postpetiole dull, gaster smooth and glossy.

Ferruginous red, head and gaster often slightly darker.

Measurements – HL 1.44 - 1.60, HW 0.98 - 1.16, SL 1.72 - 1.88, WL 2.07 - 2.18, PTL 1.72-1.74; CI 68-73, SL 118-119.

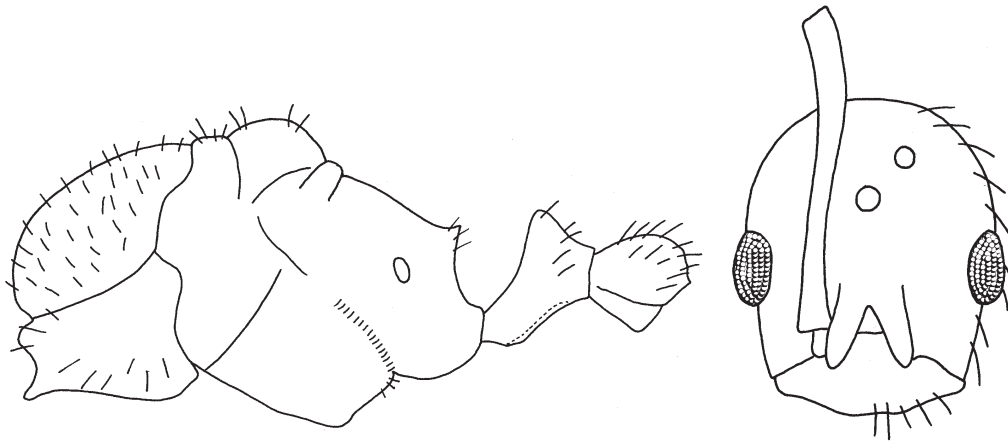


Fig. 320. Mesosoma, waist and head of a paratype female of *A. reticulaticeps*.

Female. Mandible and clypeus as in worker; head less elongated and less narrowed posteriorly as compared to worker; eyes extend past sides of the head; scape extends $\frac{1}{4}$ length past posterior lateral corner; ocelli relatively small (maximum width of median ocellus 0.11 mm, separated

reticulaticeps - NE México

Nests under stones or in stump

Riparian oak forest, cottonwoods, pines

reticulaticeps, *Aphaenogaster* 382

subterranea complex

Compare with *huachucana*, *miamiana*, *punctaticeps*, *punctatissima*,
texana

from lateral ocellus by 0.19 mm); propodeal spine poorly developed, about $\frac{1}{4}$ length of posteropropodeum.

Erect hairs and appressed pubescence as in worker.

Head densely covered with reticulated rugulae with interspaces punctate, giving head granulated appearance, pronotum with horizontal reticulated rugulae, scutellum mostly covered with longitudinal rugulae, small anterior part smooth and glossy, mesopleuron with poorly defined striae and punctures on posterior $\frac{1}{3}$, remainder mostly smooth and glossy, dorsal face of propodeum with transverse striae, metapleuron with horizontal rugulae, petiole and postpetiole mostly punctate, with posterior faces transversely striated, gaster smooth and glossy.

Ferruginous red, gaster may be lighter or darker colored than mesosoma.

Measurements – HL 1.62 - 1.64, HW 1.26 - 1.28, EL 0.39 - 0.43, SL 1.72 - 1.74, WL 3.02 - 3.08. CI 78, SL 106.

Male. Mandible with apical tooth well defined, second tooth well developed, followed by approximately six small teeth or denticles; anterior margin of clypeus convex; head narrowed posteriorly; eyes extend well past sides of head; scape short, slightly longer than first two funicular segments; dorsopropodeum declining posteriorly in nearly straight line, propodeal angles present; apex of petiole with small angle.

Erect hairs present on mandibles, clypeus, dorsal and ventral surfaces of head, dorsum of mesosoma, coxae and femora, hairs on tibiae nearly

reticulaticeps - NE México

Nests under stones or in stump

Riparian oak forest, cottonwoods, pines

Compare with *huachucana*, *miamiana*, *punctaticeps*, *punctatissima*,
texana

appressed, erect hairs present on dorsum of petiole and dorsum of post-petiole, and all surfaces of gaster; appressed pubescence very sparse, few tiny hairs evident on gaster.

Concolorous pale brown, head slightly darker and legs slightly lighter in color.

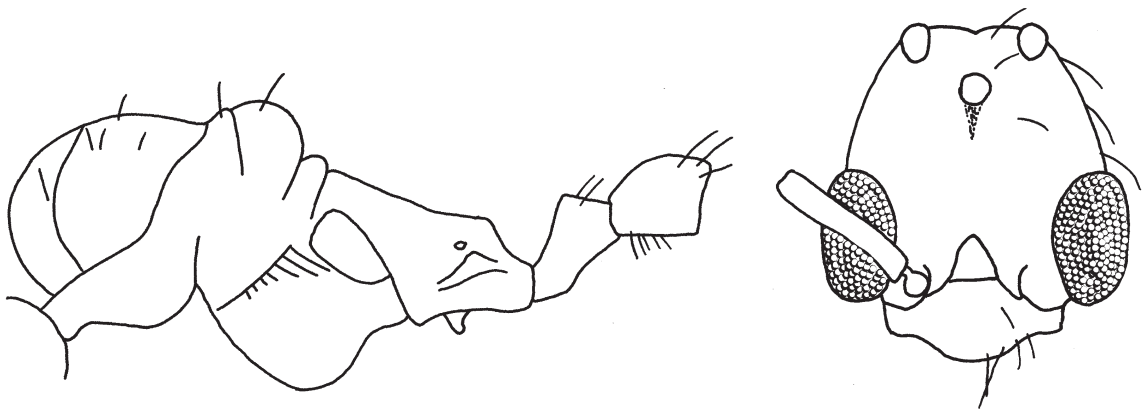


Fig. 321. Mesosoma, waist and head of a paratype male of *A. reticulaticeps*.

Measurements – HL 0.90 - 0.94, HW 0.68 - 0.72, EL 0.40 - 0.41, SL 0.36 - 0.42, WL 2.24 - 2.34; CI 76 - 77, SL 40 - 45.

Etymology:

From Latin, *reticulatus*, meaning netlike, referring to the sculpturing on the head.

reticulaticeps - NE México
Nests under stones or in stump
Riparian oak forest, cottonwoods, pines

reticulaticeps, *Aphaenogaster* 384 *subterranea* complex
Compare with *huachucana*, *miamiana*, *punctaticeps*, *punctatissima*,
texana

Type series:

Holotype worker (MCZC #11013-10P), 43 paratype workers, 3 paratype females, 3 paratype males (CWEM, IEMJ, MCZC), MEX, NL, El Salto, (Zaragoza), 10Jun.1988, 1415m, W. Mackay #'s 11009-7, 11009-8, 11010-10, 11013-4, 11013-6, 11013-6P, 11013-10P, 11017-5, 11017-9, 11017-10, 11018, 11018-7P.

Material examined:

Type series and **MEXICO**: **Nuevo León**, Chipinque Park, 29-iv-1990, J. Garcia Pérez #'s 87, 103, 106 (16 ♀♀ CWEM), same locality, 18-iii-1986, W. Mackay #'s 7657, 7659 (28 ♀♀ CWEM), Santiago, Cola de Caballo, 4-iv-1987, F. Pérez # 25 (9 ♀♀ CWEM); **Puebla**, 10.5 k N Izúcar Matamoros, 26-v-1988, W Mackay # 10401 (CWEM); **Querétaro**, Mpio. Jalpán de Serra, El Pilón, 20-iii-2005, M. Rocha, B Templado (8 ♀♀, 1 dealate ♀ CWEM, Robert Jones collection); **Tamaulipas**, 15.08 k SW Ciudad Victoria, 24-iii-2008, W&E Mackay #'s 22905, 22906, 22908, 22922 (105 ♀♀, 1 dealate ♀ CWEM).

Comparison:

Aphaenogaster reticulaticeps workers could be confused with those of *A. huachucana* (southwestern USA, northwestern México). The workers of the two species can be separated, as *A. reticulaticeps* lacks the broad outer lobe at the base of the antennal scape (a sharp pointed process is

reticulaticeps - NE México
Nests under stones or in stump
Riparian oak forest, cottonwoods, pines

Compare with *huachucana*, *miamiana*, *punctaticeps*, *punctatissima*,
texana

present). The head of *A. reticulaticeps* is also more coarsely sculptured. The females of the two species are very similar, but can be easily separated as the ocelli of *A. reticulaticeps* are separated by about 2 ocellar diameters, but only about 1 diameter in *A. huachucana*. The males can be separated as those of *A. reticulaticeps* are relatively larger, with a total length about 5 mm, that of *A. huachucana* about 3.5 mm.

Aphaenogaster reticulaticeps could also be confused with *A. texana*, and the two species may overlap in their distributions. The most certain way to separate the workers is by comparing the length of the posterior tibia to the head length. The tibia of *A. reticulaticeps* is about 0.1 mm longer than the head length, whereas the hind tibial length of *A. texana* is approximately equal to the head length. Additionally, the rugulae on the head of the *A. texana* are not as coarse as those of *A. reticulaticeps*. The females of the two species are very similar, but that of *A. texana* tends to be less sculptured. For example, much of the anterior edge of the scutum is smooth and polished in *A. texana*, whereas only a small patch lacks sculpture in the female of *A. reticulaticeps*. The katepisternum of *A. texana* has only a few striae and punctures all along the posterior margin, whereas much of the katepisternum of *A. reticulaticeps* is covered with sculpture. The males of the two species are nearly identical. That of the darker brown *A. reticulaticeps* is larger (total length about 5 mm) than the paler brown *A. texana*, which is also smaller (total length about 4 mm). In addition, the propodeal angles are more developed in *A. reticulaticeps* than they are in *A. texana*, which often has a rounded propodeum.

reticulaticeps - NE México

Nests under stones or in stump

Riparian oak forest, cottonwoods, pines

reticulaticeps, *Aphaenogaster* 386 *subterranea* complex
Compare with *huachucana*, *miamiana*, *punctaticeps*, *punctatissima*,
texana

Aphaenogaster reticulaticeps workers can be easily separated from *A. punctatissima*, which occurs in eastern Mexico, by the reticulated rugulae on the dorsum of the head; the head of *A. punctatissima* is completely punctate. This characteristic would also separate it from *A. punctaticeps*, which occurs in the southwestern United States. The heads of smaller workers of *A. reticulaticeps* may be partially punctate, especially posteriorly, but can be separated from these other two species on the basis of the distribution, or by examining large workers in the series.

Aphaenogaster reticulaticeps overlaps with the similar *A. miamiana* in northeastern México, and they are superficially very similar. The workers of *A. reticulaticeps* have smaller propodeal spines, about 0.13 - 0.18 mm in length, much less than $\frac{1}{2}$ the distances between the bases of the spines. The spines of *A. miamiana* are much longer, about 0.25 - 0.30 mm in length, longer than the distances between the bases. Likewise, the propodeal spines of the female of *A. reticulaticeps* are tiny, about 0.11 mm in length and much shorter than the distance between the bases, and almost round (slightly flattened on the outside surface). The spines of the female of *A. miamiana* are about 0.25 mm in length, nearly as long as the distance between their bases, and flattened obliquely from the sides (the dorsal face of the spines faces upwards and outwards from the propodeum). The males of *A. reticulaticeps* are relatively large, about 5 mm total length, while those of *A. miamiana* are smaller, less than 4 mm TL.

reticulaticeps - NE México
Nests under stones or in stump
Riparian oak forest, cottonwoods, pines

subterranea complex

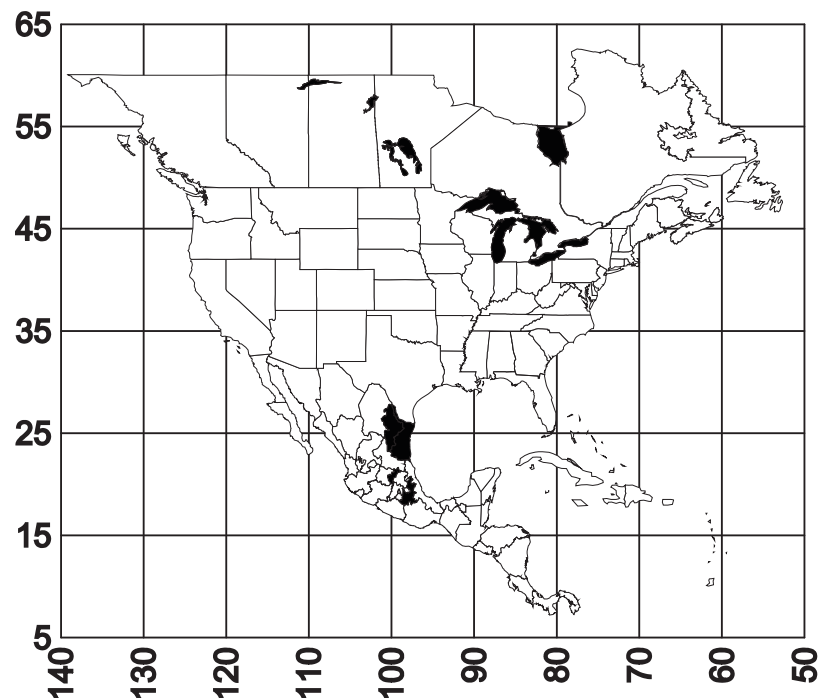
387

Aphaenogaster reticulaticeps

Compare with *huachucana*, *miamiana*, *punctaticeps*, *punctatissima*,
texana

Distribution:

Northeastern México.



Map 27. *Aphaenogaster reticulaticeps*.

Habitat: These ants are found in disturbed riparian oak forest (along open sewer system) and in cottonwoods, subtropical forest (pines, with 7 species of oaks and extensive brush) and in oak woodlands, 1191 to 2540 m in elevation.

reticulaticeps - NE México

Nests under stones or in stump

Riparian oak forest, cottonwoods, pines

reticulaticeps, *Aphaenogaster* 388 *subterranea* complex
Compare with *huachucana*, *miamiana*, *punctaticeps*, *punctatissima*,
texana

Biology:

Aphaenogaster reticulaticeps nests under stones. One nest was in a stump. Nests contain a single queen, and brood and sexuals were found in nests in March and June. Workers are timid and escape when the nest is disturbed and the males fly.

Workers were collected in a subterranean Vienna sausage bait, and were collected loose in the vegetation.

Soils range from clay soil, rocky clay, to rocky loam, light to dark brown in color.

Camponotus sericeiventris workers were found in one nest.

reticulaticeps - NE México
Nests under stones or in stump
Riparian oak forest, cottonwoods, pines

Compare with *huachucana*, *miamiana*, *picea*, *texana*

***Aphaenogaster rudis* Enzmann**

Worker Fig. 65 (sculpture near eye of worker), 73 (propodeal spines, top view), 75 (pronotum, top view), 103, 323 (head), 104, 322 (side view).

Female Figs. 114 (head), 125 (mesosoma), 126 (scutum with sculpture), 324 (side view), 324 (head).

Male Figs. 131 (petiole and postpetiole), 147 (aedeagus), 325 (side view), 325 (head).

Map 28.

Plates 50 (worker), 51 (female), 52 (male).

Aphaenogaster fulva var. *rudis* J. Enzmann, 1947:115, ♀, ♀ [first available use of *Stenammina* (*Aphaenogaster*) *fulvum aquia* var. *rude* Emery, 1895:305, District of Columbia, Virginia, N. Carolina, unavailable name, 36 syntype ♀ seen MCSN]; *Aphaenogaster* (*Attomyrma*) *fulva* var. *rudis*: Emery, 1921: 57; *Aphaenogaster* (*Attomyrma*) *rudis*: Wheeler and Wheeler, 1953:56-57, Figs. 1-20, larva; Crozier, 1970: 125, karyotype; *Aphaenogaster* (*Attomyrma*) *rudis*: Creighton, 1950: 147

Diagnoses.

Worker. Workers have shortened heads (head width / head length about 0.81), the scapes extend more than two funicular segments past the

rudis - USA, E Canada

Nests under/in logs and stumps, in twigs and stems, under stones,
Mesic forests, grasslands

rudis, *Aphaenogaster*

390

subterranea complex

Compare with *huachucana*, *miamiana*, *picea*, *texana*

posterior lateral corners of the head and the workers have moderately sized propodeal spines.

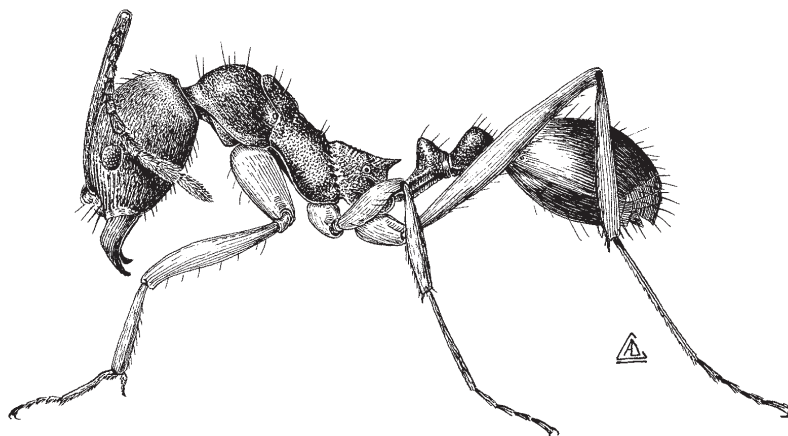


Fig. 322. Side view of a worker of *A. rudis* (from Smith, 1965).

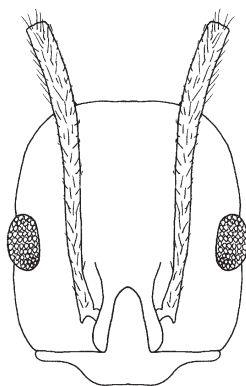


Fig. 323. Outline of the head of a worker of *A. rudis*.

rudis - USA, E Canada

Nests under/in logs and stumps, in twigs and stems, under stones,
Mesic forests, grasslands

Compare with *huachucana*, *miamiana*, *picea*, *texana*

Female. The female is a moderate sized (total length 6-7 mm) reddish brown specimen, often with a darker gaster. The scutum and scutellum are nearly entirely covered with longitudinal striae, as is the lateropronotum. The mesopleuron is nearly completely smooth and glossy. The propodeal spines are about $\frac{1}{2}$ length of the distance between their bases. The dorsum of the petiole is angulate.

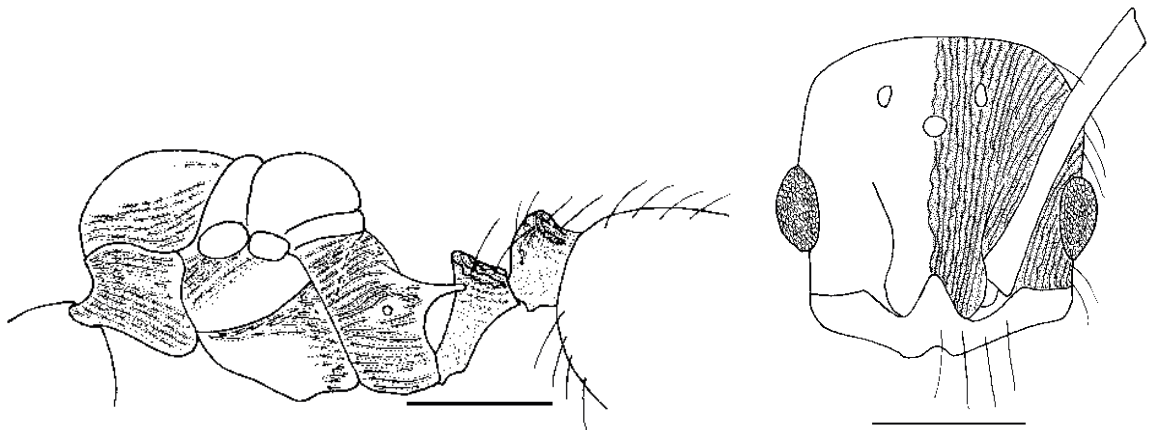


Fig. 324. Mesosoma, waist and head of a female of *A. rudis* (Livingston, Michigan, MCZC).

rudis - USA, E Canada

Nests under/in logs and stumps, in twigs and stems, under stones,
Mesic forests, grasslands

Compare with *huachucana*, *miamiana*, *picea*, *texana*

Male (previously undescribed). The male is nearly identical to that of *A. picea*, usually differing by being lighter in color. The teeth on the ventral border of the aedeagus are numerous and tiny (Fig. 111, left).

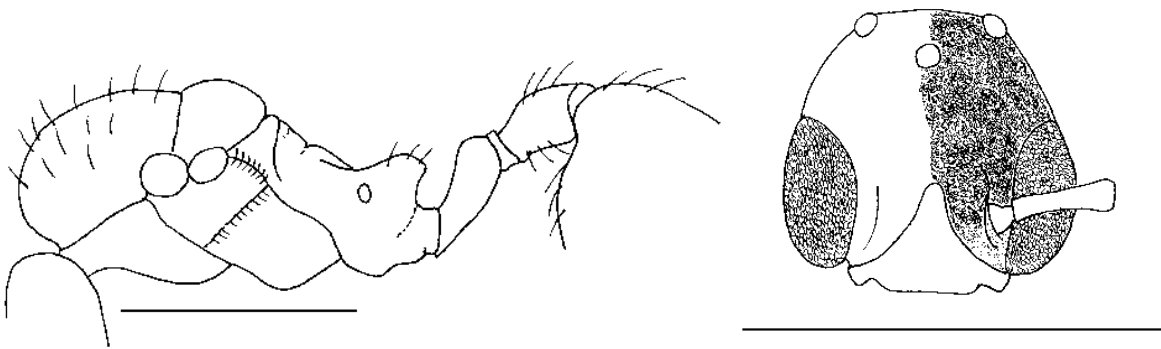


Fig. 325. Mesosoma, waist and head of a male of *A. rudis* (Livingston, Michigan, MCZC).

Comparison:

The workers, females and males of *A. rudis* are nearly identical morphologically to those of *A. picea*. In most cases they can be separated as the workers and females are generally reddish brown (not dark brown to black as in *A. picea*); the male is often medium brown to even pale brown, making it possible to separate from the dark brown to black male of *A. picea*. The region between the eye and the frontal carina of the worker of

rudis - USA, E Canada

Nests under/in logs and stumps, in twigs and stems, under stones,
Mesic forests, grasslands

Compare with *huachucana*, *miamiana*, *picea*, *texana*

A. rudis is usually covered predominantly with reticulated striae. Occasionally, specimens cannot be reliably separated into one species or the other.

Aphaenogaster picea is more northerly in distribution and inhabits high elevations whereas *A. rudis* is more southerly and inhabits lower elevations, and climate change should shift the distributions (Warren and Chick, 2013), although ant plant seed-dispersal mutualisms may be more robust to climate change than currently assumed (Stuble et al., 2013a). *Aphaenogaster rudis* requires 6 °C higher spring temperatures than *A. picea* to break winter diapause and begin foraging (Warren and Bradford, 2013).

Aphaenogaster rudis can be separated from *A. fulva* by the lower level of the anterior edge of the mesonotum, the top of which is at about the level of the pronotum (or only slightly higher).

The propodeal spines are more developed than those in *A. huachucana* from the southwestern United States. *Aphaenogaster rudis* occurs in eastern United States.

Aphaenogaster rudis can be very difficult to separate from *A. miamiana*. The eyes of the workers of *A. rudis* nearly always have 12 or fewer ommatidia in the greatest diameter; the eye of the worker of *A. miamiana* apparently always has 13 or more ommatidia. The propodeal spines of *A. rudis* are always shorter than the distance between the faces; the spines are approximately as long as the width between the faces, or longer in *A. miamiana*. The propodeal spines in *A. rudis* workers generally diverge

rudis - USA, E Canada

Nests under/in logs and stumps, in twigs and stems, under stones,
Mesic forests, grasslands

Compare with *huachucana*, *miamiana*, *picea*, *texana*

outwards, but are noticeably curved inwards in *A. miamiana* (seen from above).

Several series of *A. rudis* were collected at the Davy Crockett State Park in Tennessee. The propodeal spines are short, but curved inwards and the eyes of some of the workers contain 13 ommatidia in the greatest diameter, which makes them very difficult to separate from *A. miamiana*. They will be considered to be *A. rudis* and samples of the series will be deposited in the MCZC.

Crozier (1977) suggested that *A. rudis* was a species complex, based on karyotypes, which was followed up by Umphrey (1996) who used morphometric discrimination including karyotypes and a key to separate the species in the *fulva-rudis-texana* complex, including 4 probable undescribed species. DNA suggests that morphologically defined *A. rudis* consists of 4 polyphyletic separate taxa (DeMarco, 2015). Umphrey (1996) recognizes a form he refers to as N22b. It appears to be a valid species and can be separated from *A. rudis* by its larger size.

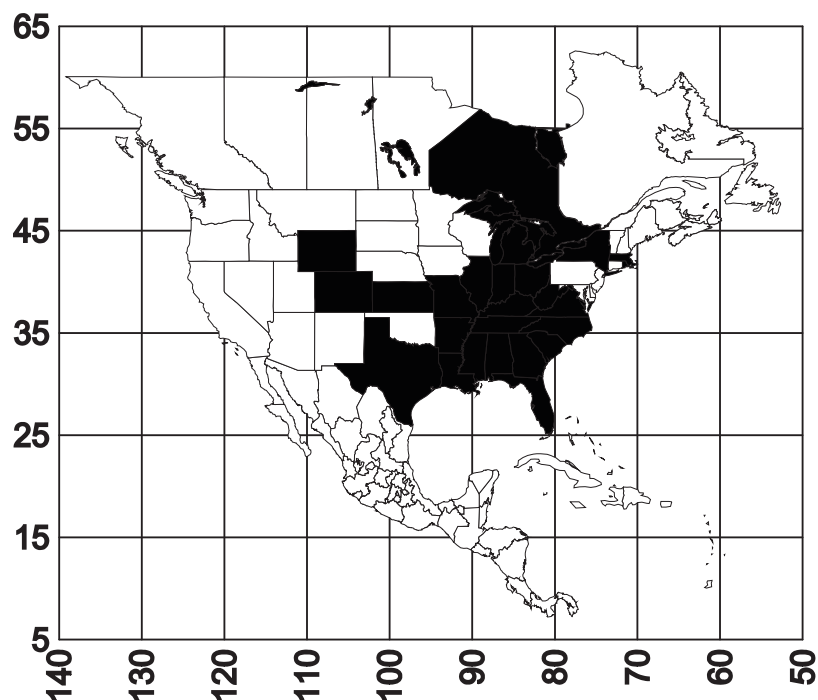
Umphrey (1996) recognizes another form he refers to as N17, which apparently cannot be separated morphologically from the typical *A. picea*. We compared workers, females and males of specimens from Ohio (where N1 occurs but *A. picea* does not, see Umphrey, 1996) with those from Virginia, and could not see any obvious differences, except the females from Virginia had slightly more sculpture on the anepisternum than the specimens from Ohio. Umphrey (1996) states that this form probably has a more eastern distribution than does *A. picea*, and differs in having a karyotype of 17 as compared to *A. picea*, which has a karyotype of 18. It

rudis - USA, E Canada

Nests under/in logs and stumps, in twigs and stems, under stones,
Mesic forests, grasslands

Compare with *huachucana*, *miamiana*, *picea*, *texana*

is probably a separate sibling species. The complex probably consists of at least three species: *A. rudis*, *A. picea* and what Umphrey referred to as N17 (Lubertazzi, 2012).



Map 28. *Aphaenogaster rudis*.

Distribution:

USA: **Alabama** (CWEM; MacGown and Forster, 2005); **Arkansas** (CWEM; General and Thompson, 2011); **Colorado** (Gregg, 1963); **Florida** (CWEM; Smith, 1965); **Georgia** (CWEM); **Illinois** (Gregg, 1963);

rudis - USA, E Canada

Nests under/in logs and stumps, in twigs and stems, under stones,
Mesic forests, grasslands

Compare with *huachucana*, *miamiana*, *picea*, *texana*

DuBois and LaBerge, 1988); **Indiana** (CWEM); **Kansas** (DuBois, 1985); **Kentucky** (CWEM); **Louisiana** (CWEM; Dash and Hooper-Bùi, 2008, as *texana-rudis*); **Massachusetts** (Gregg, 1963; Stuble et al., 2013b); **Michigan** (CWEM; Wheeler et al., 1994); **Mississippi** (CWEM); **Missouri** (CWEM); **New York** (CWEM); **North Carolina** (CWEM; Stuble et al., 2013b; Resasco et al, 2014; Guénard et al., 2012, 2015); **Ohio** (Coovert, 2005); **Rhode Island** (Ellison and Farnsworth, 2014); **South Carolina** (CWEM; Davis, 2009; Resasco et al, 2014, *rudis* complex); **Tennessee** (CWEM); **Texas**, Bandera Co. (STDC), Fannin, Polk Cos. (CWEM); **Virginia** (CWEM; Kjar, 2009); **West Virginia** (Culver, 1974); **Wyoming** (Wheeler and Wheeler, 1988). **CANADA: Ontario** (CWEM).

Habitat:

Nests are found in mesic forest sites, woodlands, mixed pine and hardwoods, riparian forest, dense forest, in openings in the forest and even in grasslands (pers. obs.). (Smith, 1965) found them in open fields to dense woods and DuBois and LaBerge (1988) found them in deciduous forests.

It is abundant in the forests of Virginia (Kjar, 2009) and is found in oaks, as well as loblolly and shortleaf pine communities in Maryland (Frye and Frye, 2012). It occurs in shaded deciduous forests in Kansas (DuBois, 1985). It can adapt to urban habitats (Uno et al., 2010; Guénard et al, 2015).

rudis - USA, E Canada

Nests under/in logs and stumps, in twigs and stems, under stones,
Mesic forests, grasslands

Compare with *huachucana*, *miamiana*, *picea*, *texana*

Biology:

Aphaenogaster rudis is a common ant in eastern United States forests (Lubertazzi, 2006; Lubertazzi and Adams, 2010). It nests in and under logs and in stumps, in rotten standing trees, and can occasionally be found in twigs and hollow plant stems or under stones or simply in the soil (pers. obs.). DuBois (1985) stated that they nest under stones and in rotten wood in Kansas and under stones, in the soil or in rotten logs in Illinois (DuBois and LaBerge, 1988). Smith (1965) reported that *A. rudis* nested in exposed soil, under logs and stones, with nests containing several hundred to few thousand workers. Usually a single queen with up to 15 immatures pass winter as eggs or larvae, sexuals appear in the nest by late July (Smith, 1965). They have a high rate of colony relocation to new nest sites, even in the absence of nest disturbances (Smallwood, 1992).

Workers are generally timid, but those in larger nests can be aggressive (pers. obs.).

We collected brood and sexuals in nests in June to August, new nests are formed in July.

They eat seeds and pollen of ground nesting bees (Smith, 1965) and prey on termites (Buczowski and Bennett, 2007, 2008) and on the gypsy moth (Alalouni et al., 2013). Workers are attracted to Vienna sausage baits (pers. obs.). They are responsible for up to 90% of seed dispersal in some communities (Zelikova et al., 2008; Ness et al., 2009) and are considered as keystone seed dispersers. They are the most important seed dispersing ant in two forest sites in southwestern Ohio (Kwit et al., 2012). *Aphaenogaster rudis* exhibits a high sex ratio expression (Lubertazzi,

rudis - USA, E Canada

Nests under/in logs and stumps, in twigs and stems, under stones,
Mesic forests, grasslands

Compare with *huachucana*, *miamiana*, *picea*, *texana*

2006; Lubertazzi and Adams, 2010). Nests with diets supplemented with seeds (Morales and Heithaus, 1998) or elaiosomes produce significantly more females in the lab and more males in field nests (Bono and Heithaus, 2002). Workers use debris as tools, with workers dropping it into liquid foods to protect workers from becoming entangled or drowning in liquids, which allows them to carry the liquid back to the nest with the debris, and discouraging the food source from being used by other ant species (Fellers and Fellers, 1976; Banschbach et al., 2006).

Heithaus et al. (2005) showed that when workers collected sufficient diaspores, the nest would become satiated and nearly cease foraging within a few hours, for a period of several days, but would continue to collect larvae of *Tenebrio obscurus*, at least until the second day when nearly all food collection was suppressed.

Attygalle et al. (1998) describe the trail pheromone. *Aphaenogaster rudis* found baits faster than other ant species with a median discovery time of 1 minute in North Carolina forests and was also the most abundant ant (Stuble et al., 2013a).

Nests are found in soils ranging from clay, clay loam, sand, sandy-loam, rocky clay, ranging in colors from light brown, dark brown to red (pers. obs.).

It is apparently a host to the temporary social parasite *A. tennesseensis* (Smith, 1965). We have excavated nearly 100 nests, and have never found in mixed nest with *Aphaenogaster tennesseensis*.

rudis - USA, E Canada

Nests under/in logs and stumps, in twigs and stems, under stones,
Mesic forests, grasslands

Compare with *huachucana*, *miamiana*, *picea*, *texana*

Lubertazzi (2012) summarized the biology of *A. rudis* /*A. picea*/N17 (see Humphrey, 1996). This group of ants is among the first to become active in the spring as soon as the snow melts. They abandon the winter nest in early summer for a new site on the ground or near the ground surface and colony growth occurs throughout the summer. They move to a new nesting site in the autumn, and finally to the winter nesting site as temperatures drop. New nests are started with a single queen. Solid food is generally brought back by single foragers, but recruitment occurs with larger food items, using a trail pheromone. It scavenges on small invertebrates and parts of insects. Nest densities range from 0.5-1.3 nests per m², with a mean of 266 - 613 workers per nest, up to over 1000 workers, with larger colonies allocating more energy towards reproduction.

rudis - USA, E Canada

Nests under/in logs and stumps, in twigs and stems, under stones,
Mesic forests, grasslands

smithi, *Aphaenogaster*

400

subterranea complex

Compare with *boulderensis*, *floridana*, *mutica*

***Aphaenogaster smithi* Gregg new revived status**

Worker Figs. 79, 86 (side view), 326 (head), 326 (mesosoma).

Female Figs. 105 (scutum showing sculpture), 111, 112, 327 (head), 327 (side view).

Map 29.

Plates 53 (worker), 54 (female).

Aphaenogaster (*Attomyrma*) *boulderensis smithi* Gregg, 1949: 171-172, ♀, USA: New Mexico, Malpais Lava Beds near Carrizozo; considered a synonym of *A. boulderensis* by Shattuck and Cover, 2016:10, 12

Diagnoses:

Worker. The workers can be recognized by the lack of propodeal spines (Fig. 307), although tiny bumps or small teeth may be present. The head and the scape are elongated. They are nearly always reddish brown with a strongly contrasting glossy black gaster.

smithi - SW USA

Nests in rocky cliffs and sandy soils

Arid shrublands

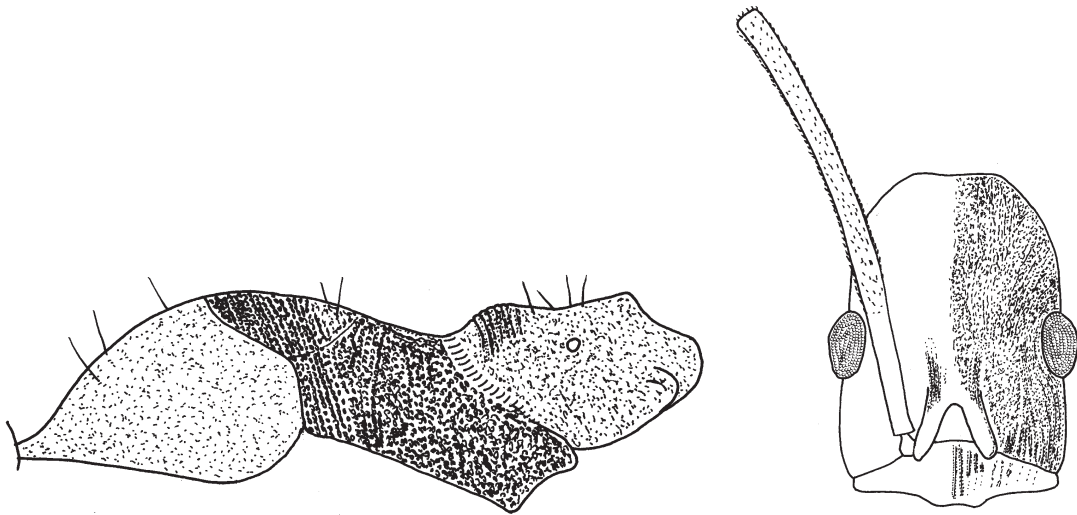
Compare with *boulderensis*, *floridana*, *mutica*

Fig. 326 Mesosoma and head of worker of *A. smithi* (Hudspeth Co., Texas, CWEM).

Female (previously undescribed). The female is a moderately large (total length 7 mm) reddish brown ant with a black gaster. The mandibles have approximately eight teeth (basalmost teeth consist of tiny denticles), the anterior medial border of the clypeus is slightly concave, the eyes are relatively small, occupying less than $\frac{1}{3}$ of the side of the head, the ocelli are relatively small, separated by more than one diameter from the adjacent ocelli, the scape extends past the posterior lateral corner of the head. The dorsum of the head is completely covered by reticulated rugulae. The scutellum is weakly sculptured, mostly coriaceous and moderately shining, the scutellum is similar but is covered with weak punctures. The side

smithi - SW USA

Nests in rocky cliffs and sandy soils

Arid shrublands

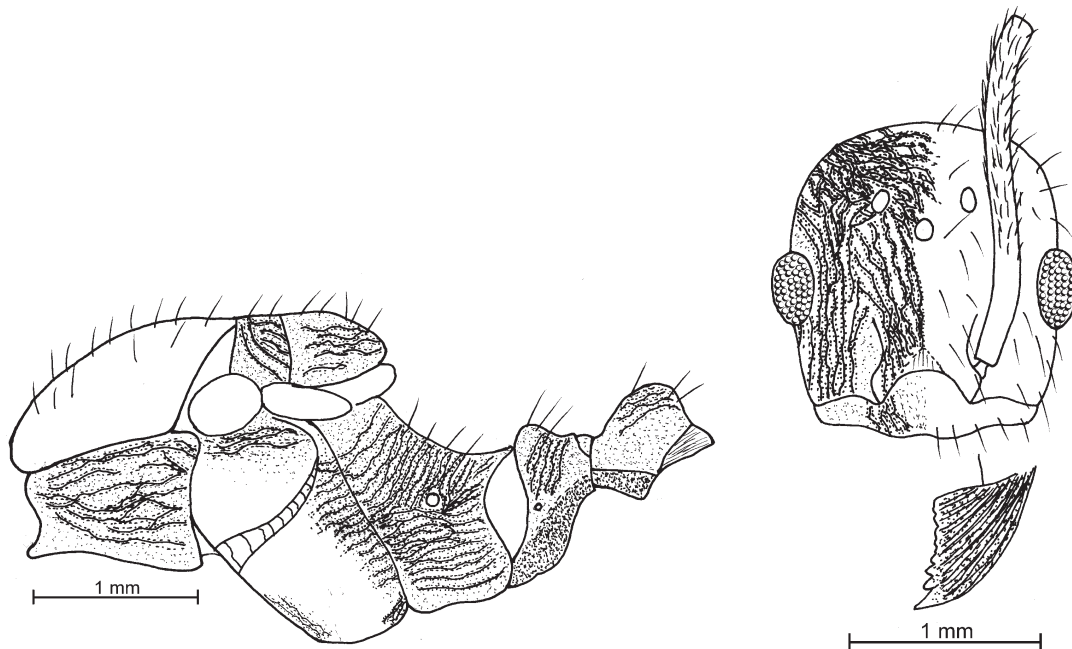
Compare with *boulderensis*, *floridana*, *mutica*

Fig. 327. Mesosoma, waist and head of a female of *A. smithi* (Coral Pink Sand Dunes, Kane Co. Utah, CWEM).

of the pronotum is covered with coarse reticulated rugulae, the mesopleuron is mostly smooth and shiny, with some coarse sculpturing dorsally on the anepisternum, and posteriorly on the katepisternum. The metanotum extends slightly past the edge of the scutellum as seen in profile. The propodeum is covered with rugae, which pass across the dorsopropodeum and posteropropodeum. The propodeal spines are well-developed and sharp. The petiole and postpetiole are similar to those in other species,

smithi - SW USA

Nests in rocky cliffs and sandy soils

Arid shrublands

Compare with *boulderensis*, *floridana*, *mutica*

except that most of the surfaces are covered with reticulated rugulae. The gaster is glossy, with fine punctures.

Male. Unknown.

Comparison:

The worker is very similar to that of *A. boulderensis* and was considered a synonym by Shattuck and Cover (2016), but differs in that it is a red ant with a black gaster, which is a color pattern that we have never seen in *A. boulderensis* (which occurs in AZ, NV, TX, México: Baja California). As discussed below the females are different, thus we will consider it a valid species. Gregg (1949) further separates the two species, stating that the head is longer and tapers more gradually towards the posterior border. The punctation of the head and mesosoma is quite dense, giving the surface an opaque appearance, which contrasts to *A. boulderensis* where the surfaces are rather shining. The sternopetiole spine, which is present in *A. boulderensis*, is absent in *A. smithi*.

This species could be confused with *A. mutica*, but can be separated as the dorsopropodeum is less than twice as long as the posteropropodeum, whereas in *A. mutica* this distance is two times or more the length of the posteropropodeum (Gregg, 1949). The pronotum and mesonotum of *A. smithi* are completely punctate, whereas the pronotum and anterior dorsal portion of the mesonotum of *A. mutica* are highly polished, with little or no trace of sculpturing. The petiole and postpetiole nodes of *A.*

smithi - SW USA

Nests in rocky cliffs and sandy soils

Arid shrublands

Compare with *boulderensis*, *floridana*, *mutica*

boulderensis smithi are dull, in contrast to *A. mutica*, in which they are polished (Gregg, 1949).

Aphaenogaster smithi can be separated from *A. floridana* based on several characteristics (Gregg, 1949). Both species are similar, in that they have an elongated, tapering head, with an occipital flange, a generally attenuated body, and a spineless propodeum. The propodeum is less abruptly angulate, with a trace of spines, as compared to *A. floridana* in which the propodeum is more abruptly angulate and nearly without any trace of spines. The metasternal region between the middle and posterior pairs of coxae of both *A. boulderensis* and *A. smithi* have a small spine, which is absent in *A. floridana* (this spine can be seen in by rotating the mesocoxa anteriorly or by removing it).

Two worker specimens in the LACM from Imperial Co., CA differ in being smaller and less sculptured than normal. Unfortunately, they are in poor condition and are assumed to be nanitic workers of this species.

The females of *A. smithi* and *A. boulderensis* could be easily confused as the scutum is relatively smooth and the metanotum extends past the posterior border of the scutellum in both species. They can be separated based on color, as the female of *A. smithi* is reddish brown with a strongly contrasting black gaster, whereas the female of *A. boulderensis* is pale brown, with the gaster nearly the same color as them as the mesosoma. The dorsum of the head of *A. smithi* is covered completely with reticulated rugae, which are very coarse, the head of *A. boulderensis* has some rugae, with very little evidence of reticulation. The ocelli of *A. smithi* are

smithi - SW USA

Nests in rocky cliffs and sandy soils

Arid shrublands

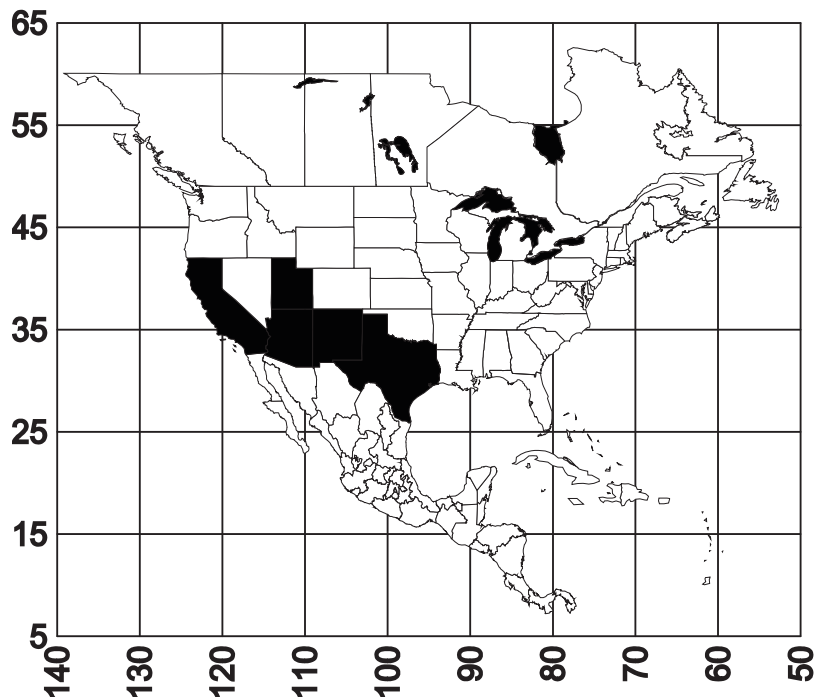
subterranea complex

405

Aphaenogaster smithi

Compare with *boulderensis*, *floridana*, *mutica*

relatively small, and are separated by more than one ocellar diameter. Those of *A. boulderensis* are larger and separated by approximately one diameter.



Map 29. *Aphaenogaster smithi*.

Distribution:

USA: California, Imperial Co., Fossil Canyon, 2.8 mi NNW Ocotillo, 6.9 mi SSE Ocotillo (LACM); **Arizona**, Cochise Co., Chiricahua Mts. (MCZC); **New Mexico**, Bernalillo Co., Petroglyph Park (MCZC), Doña

smithi - SW USA

Nests in rocky cliffs and sandy soils
Arid shrublands

smithi, *Aphaenogaster*

406

subterranea complex

Compare with *boulderensis*, *floridana*, *mutica*

Ana Co., Organ Mountains (Long Canyon) (CWEM), Lincoln Co., near Carrizozo (Malpais Lava Beds of Tularosa Basin (type locality), (Smith, 1979), Sevilleta Wildlife Refuge (CWEM); **Texas**, El Paso Co., El Paso, Franklin Mnts. (CWEM), Hudspeth Co., 25 k SSW Van Horn (CWEM); **Utah**, Kane Co., Coral Pink Sand Dunes State Park (female, CWEM).

Habitat: *Aphaenogaster smithi* is found in creosotebush scrub to juniper and sagebrush shrubland.

Biology: This species nests in rocky cliffs. The specimens from Utah were in an area of red .

smithi - SW USA

Nests in rocky cliffs and sandy soils

Arid shrublands

subterranea complex

407

Aphaenogaster tennesseensis

Compare with *fulva*, *mariae*

***Aphaenogaster tennesseensis* (Mayr)**

Worker Figs. 64 (top and side views), 328 (side view), 329 (head).

Female Figs. 106 (propodeal spines from side and above), 330 (side view), 330 (head).

Male Figs. 129 (katepisternum), 134 (frontal carina), 135 (scutum from above with sculpture), 331 (side view), 331 (head).

Map 30.

Plates 55 (worker), 56 (female), 57 (male).

Atta tennesseensis Mayr, 1862:743, ♀, USA: Tennessee; *Aphaenogaster tennesseensis*: Roger, 1863b:30; Mayr, 1886:446; *Stenamamma* (*Aphaenogaster*): *tennesseensis* Emery 1895:301; *Aphaenogaster* (*Atomyrma*) *tennesseensis*: Emery, 1921:60; Wheeler and Wheeler, 1953:61-62, larva

Atta laevis Mayr 1862:743 - 744, ♀, USA: Tennessee; *Aphaenogaster laevis*: Roger, 1863b:30 (Mayr, 1886:446)

Myrmica subrubra Buckley, 1867:336, ♀, ♀ (Mayr, 1886:365)

Stenamamma (*Aphaenogaster*) *tennesseense* var. *ecalcaratum*: Emery, 1895:301, ♀, New Hampshire [lectotype ♀, 6 paralectotype ♀, 1 paralectotype ♀, 1 paralectotype ♂, here designated, MCSN, 3 cotype ♀ seen, MCZC] (Creighton, 1950:151)

tennesseensis - E USA, E Canada

Nests in/under rotten logs, stumps, branches, under bark, under stones
Hardwood and deciduous forests, urban habitats

tennesseensis, *Aphaenogaster* 408

subterranea complex

Compare with *fulva*, *mariae*

Diagnoses:

Worker. The entire surface of the clypeus is covered with fine striae, the scape extends about three funicular segments past the posterior lateral corner of the head.

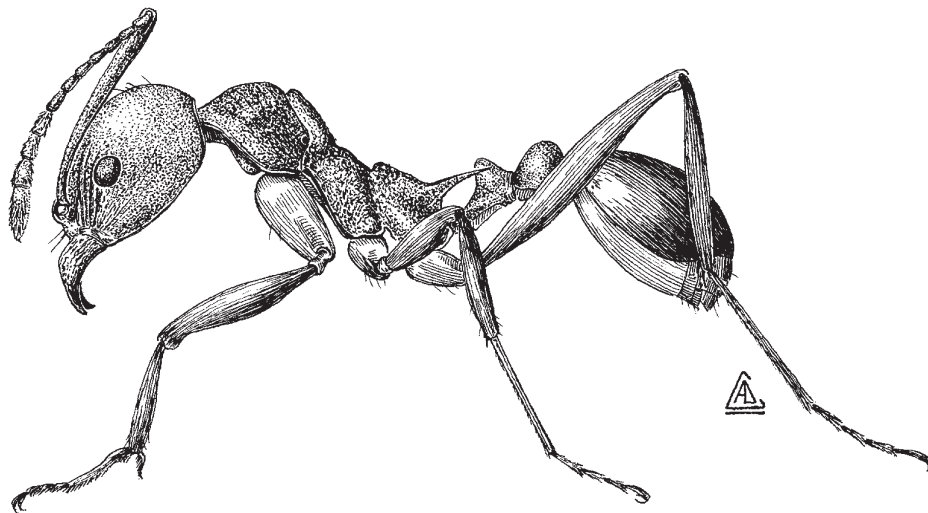


Fig. 328. Side view of a worker of *A. tennesseensis* (from Smith, 1965).

The entire mesosoma, including the top and side of the pronotum, is coarsely granulate and dull. The propodeal spines are very long, longer than the dorsopropodeum. The postpetiole, viewed from above, is oval shaped, wider than long.

tennesseensis - E USA, E Canada

Nests in/under rotten logs, stumps, branches, under bark, under stones
Hardwood and deciduous forests, urban habitats

Compare with *fulva*, *mariae*

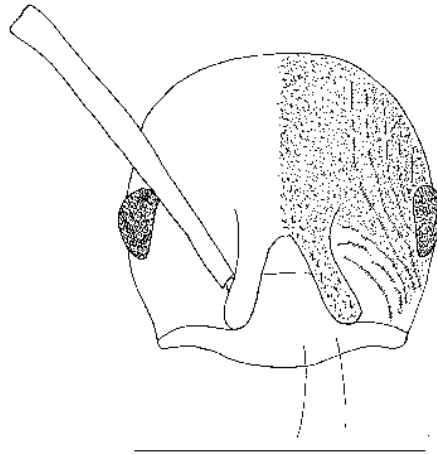


Fig. 329. Head of a worker of *A. tennesseensis* (Falls Church, Virginia).

Female. The female is easily recognized by the greatly developed propodeal spines and the shape of postpetiole, which is wider than long as in the worker.

The sides of head are nearly straight and parallel; the eyes extend well past the sides of the head; the scape extends approximately the first two funicular segments past the posterior lateral corner of the head. The propodeal spines are extremely well-developed, very thickened at the base, usually bent ventrally near the apex. The petiole is angulate to sharp at the apex; the postpetiole is much broader than long.

tennesseensis - E USA, E Canada

Nests in/under rotten logs, stumps, branches, under bark, under stones

Hardwood and deciduous forests, urban habitats

Compare with *fulva*, *mariae*

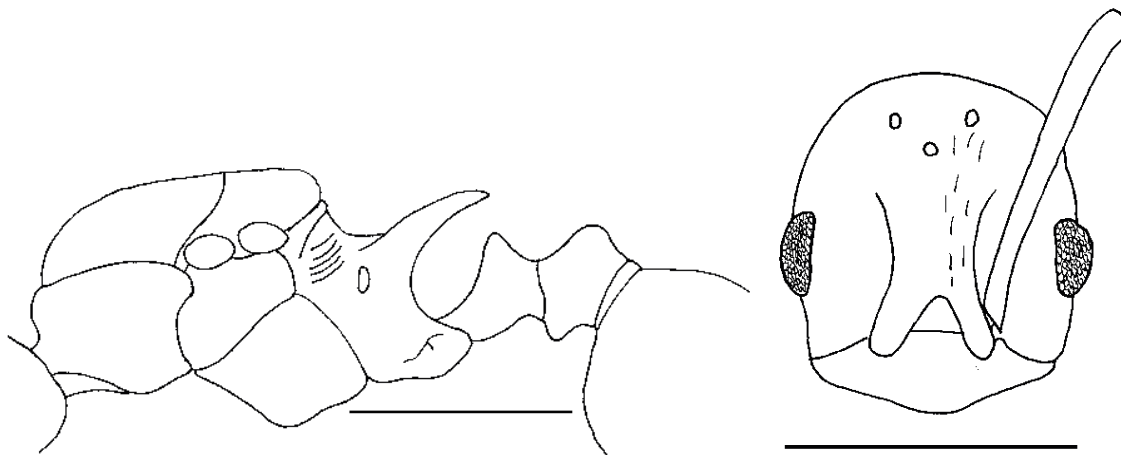


Fig. 330. Mesosoma, waist and head of a female of *A. tennesseensis* (Mobile Co., Alabama, MCZC).

Erect hairs are sparse, few are present on the mandibles and the ventral surface of the head. The hairs on the funiculus are nearly appressed, the remainder of the body has only very fine, sparse, appressed pubescence.

Most surfaces are smooth and glossy, including the head, mesosoma, petiole, postpetiole and gaster. The mandibles are finely striated and dull, the clypeus has poorly developed, longitudinal striae.

Measurements of females - HL 1.12 - 1.15, HW 0.97 - 1.02, SL 1.12 - 1.15, WL 1.95 - 2.03. CI 85 - 89, SL 99 - 103.

tennesseensis - E USA, E Canada

Nests in/under rotten logs, stumps, branches, under bark, under stones

Hardwood and deciduous forests, urban habitats

Compare with *fulva*, *mariae*

Male description (previously undescribed). Mandible with 5 - 6 defined teeth; eye occupies nearly $\frac{1}{2}$ of head length; scape short, length less than maximum diameter of eye (seen from side); propodeal spines ranging from blunt protuberances to small, ventrally bent spines; petiole with nearly straight anterior face that broadly rounds into posterior face; post-petiole about 1.5 times as broad as long.

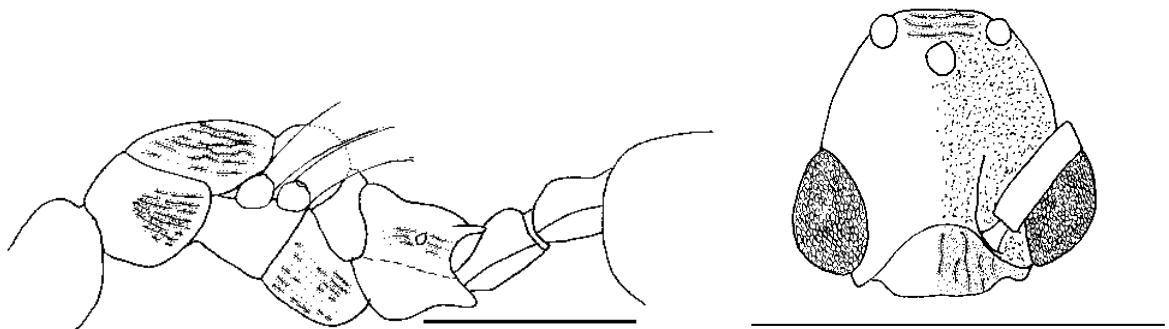


Fig. 331. Mesosoma, waist and head of a male of *A. tennesseensis* (Colebrook, Connecticut, MCZC).

Erect hairs present on mandibles, anterior margin of clypeus, and on posterior half of gaster; suberect hairs present on funiculus; remainder of body with sparse tiny appressed hairs.

Mandibles finely striate with scattered punctures, clypeus with poorly defined semicircular striae which open posteriorly, dorsum of head finely
tennesseensis - E USA, E Canada

Nests in/under rotten logs, stumps, branches, under bark, under stones
Hardwood and deciduous forests, urban habitats

tennesseensis, *Aphaenogaster* 412 *subterranea* complex
Compare with *fulva*, *mariae*

striated, with scattered punctures, mesosoma finely striate, dorsal face of propodeum with slightly finer sculpturing, petiole, postpetiole, and gaster finely sculptured.

Concolorous medium brown, with lighter brown appendages.

Measurements:

HL 0.79 - 0.86, HW 0.64 - 0.67, SL 0.28 - 0.29, WL 1.60 - 1.70. CI 78 - 81, SL 33-36.

Comparison:

The workers and females of two species (*A. tennesseensis* and *A. mariae*) can be separated from all of the others in the genus by the long propodeal spines and the shape of the postpetiole as seen from above, which is wider than long. Unfortunately, the propodeal spines of the male are not much greater developed as in some of the other species, but the postpetiole is noticeably wider than long. The two species can be separated as the worker, female and to a lesser extent in the male of *A. mariae* have fan-like striate diverging posteriorly at the base of the gaster, which are absent in all castes of *A. tennesseensis*. Thus, these similar species can be easily separated.

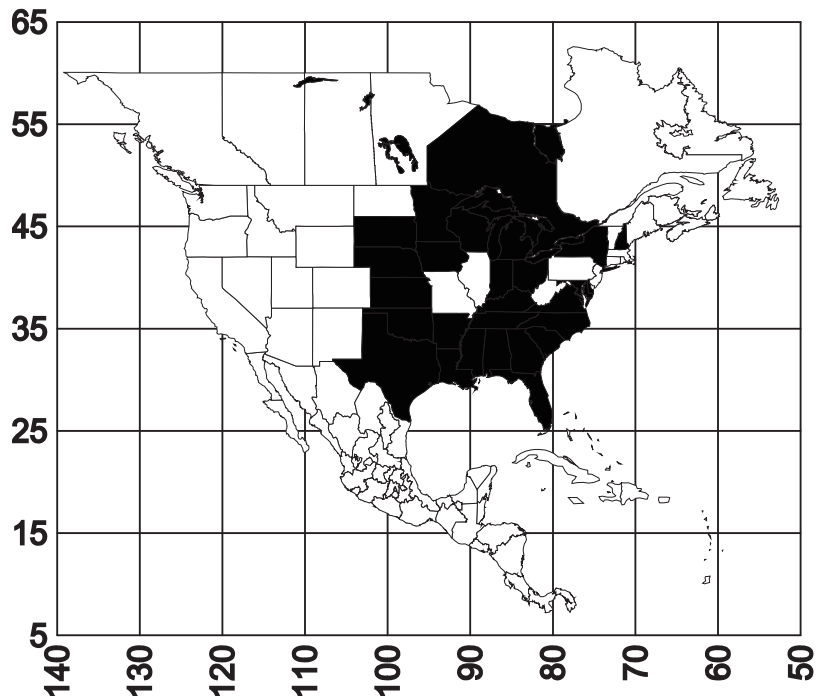
Aphaenogaster tennesseensis workers could be confused with those of *A. fulva* as both species often have a well-developed protruding processes on the mesonotum. They can be easily separated as *A. fulva* has shorter propodeal spines (about as long as the distance between the spines) and an elongated postpetiolar node (seen from above).

tennesseensis - E USA, E Canada

Nests in/under rotten logs, stumps, branches, under bark, under stones

Hardwood and deciduous forests, urban habitats

Compare with *fulva*, *mariae*



Map 30. *Aphaenogaster tennesseensis*.

Distribution:

USA: **Alabama** (MacGown and Forster, 2005); **Arkansas** (General and Thompson, 2007, 2008, 2009); **Delaware** (CWEM); **Florida** (Covert, 2005), Santa Rosa County; **Georgia** (CWEM); **Indiana** (CWEM; Morris, 1942; Munsee, 1967); **Iowa** (CWEM); **Kansas** (DuBois, 1985); **Kentucky** (CWEM); **Louisiana** (CWEM; Dash and Hooper-Bùi, 2008); **Maryland** (CWEM, CASC); **Michigan** (Wheeler et al., 1994); **Minnesota** (Smith, 1979); **Mississippi** (MacGown et al., 2010); **Nebraska**

tennesseensis - E USA, E Canada

Nests in/under rotten logs, stumps, branches, under bark, under stones

Hardwood and deciduous forests, urban habitats

Compare with *fulva*, *mariae*

(CWEM); **New Hampshire** (CWEM); **New York** (CASC); **North Carolina** (CWEM; Resasco et al, 2014; Guénard et al., 2012, 2015); **Ohio** (Coover, 2005); **Oklahoma** (Ellison et al., 2012); **South Carolina** (CWEM, Davis, 2009); **South Dakota** (CWEM); **Tennessee** (Guénard et al., 2012); **Texas** (Moody and Francke, 1982), Hemphill Co.; **Virginia** (CWEM); **Wisconsin** (CWEM). **CANADA: Ontario** (Smith, 1965).

Habitat:

Aphaenogaster tennesseensis is found in hardwood forests, deciduous forests, oak forests, riparian forest, red maple, sourwood forests, white cedar and marshy bottomland woodland and pine and spruce forests. They were found in shaded deciduous forests in Kansas (DuBois, 1985; DuBois and LaBerge, 1988), but are able to adapt to urban habitats (Uno et al., 2010).

Biology:

Aphaenogaster tennesseensis nests in and under rotten logs as well as in stumps, branches and standing dead tree trunks of oaks, maples and pines, and under the bark of these trees. It occasionally nests under stones (pers. obs.). Moody and Francke (1982) found a nest under the bark of a large horizontal tree trunk, another at the base of tree. Smith (1965) reported that it lives in the soil only when females occur in the nest of the two presumably host species (see below), otherwise it is a wood inhabiting species, nesting in decaying logs and stumps. DuBois (1985) found them nesting in rotten wood in Kansas.

tennesseensis - E USA, E Canada

Nests in/under rotten logs, stumps, branches, under bark, under stones

Hardwood and deciduous forests, urban habitats

Compare with *fulva*, *mariae*

We found brood in nests in July and August; sexuals in June, July and August. DuBois (1985) found males in nests in September.

Nests have from a few hundred workers (Smith, 1965) to 2,000-5,000 ants (Ellison et al., 2012).

Workers are timid and escape when the nest is disturbed.

Aphaenogaster tennesseensis is one of the two major predators on the red oak borer (Cerambycidae) (Muilenburg et al., 2008) and they are predators on the gypsy moth (Alalouni et al., 2013). Workers use pieces of leaf, mud and sand grains as tools to carry soft foods from distant sources to the colony (Fellers and Fellers, 1976).

They occur in areas with soils ranging from clay, clay loam and sandy soils in colors from gray, brown, to dark brown (pers. obs.). Moody and Francke (1982) found them in areas with fine sandy loam soil and silt clay loam.

The small queen size is characteristic of ants which start colonies by temporary parasitism (Talbot, 1979). It may be a temporary social parasite of *A. fulva*, *A. picea* and *A. rudis* (Smith, 1965; Ellison et al., 2012). Wheeler (1910) found two mixed colonies of this species with *A. rudis*, near Rockford, Illinois. Social parasitism has not been fully investigated and isolated queens are found alone in Kansas (DuBois, 1985) suggesting that more work needs to be done on the biology of this species. We have excavated 16 nests, and have not found other species of *Aphaenogaster* in the nests.

It is associated with 11 species of phoretic mites (Campbell et al., 2013).

tennesseensis - E USA, E Canada

Nests in/under rotten logs, stumps, branches, under bark, under stones

Hardwood and deciduous forests, urban habitats

texana, *Aphaenogaster* 416 *subterranea* complex
Compare with *carolinensis*, *fulva*, *huachucana*, *miamiana*, *picea*,
punctaticeps, *rudis*

***Aphaenogaster texana* Wheeler**

Worker Figs. 1, 87, 333 (side view), 7, 51 (head), 88 (propodeal spines from above), 96 (propodeum from above), 97 (base of scape), 102, 332, 334 (head and scape).

Female Figs. 2, 335 (side view), 120, 335 (head), 120 (base of scape).

Male Figs. 3, 336 (side view), 10, 336 (head), 145 (scutum and notaulus), 147 (aedeagus).

Map 31.

Plates 58 (worker), 59 (female), 60 (male).

Stenammas (*Aphaenogaster*) *fulva aquia* var. *texana* Emery, 1895:306, ♀,
USA: Texas [unavailable name, 2 syntype ♀ seen MCSN];
Aphaenogaster texana: Wheeler, 1915: 412 - 413, ♀, ♂;
Aphaenogaster (*Attomyrma*) *texana*: Wheeler and Wheeler, 1953:62,
larva

Aphaenogaster texana var. *furvescens* Wheeler, 1915:413, ♀ ♀, USA:
Arizona, Huachucana Mountains, Miller Cañón, 5800 ft. and Ramsay
Cañón, same elevation (6 cotype ♀, 1 cotype ♀ seen, MCZC);

texana - S USA, N México

Nests under stones, rarely in rotten wood, under bark

Hardwood and deciduous forests, grasslands

subterranea complex

417

Aphaenogaster texana

Compare with *carolinensis*, *fulva*, *huachucana*, *miamiana*, *picea*,
punctaticeps, *rudis*

Aphaenogaster (Attomyrma) texana var. *furvescens*: Emery, 1921:60
(Creighton, 1950:152)

Aphaenogaster (Deromyrma) silvestrii Menozzi, 1929: 282 (Creighton,
1950: 152-153)

Aphaenogaster (Attomyrma) huachucana crinimera Cole, 1953:82-83,
Fig. 1, ♀ ♀ ♂, USA: New Mexico, 5 mi. S of Mescalera on state route
24, elevation 6,950 ft. (5 ♀, 2 ♀, 2 ♂ paratypes seen MCZC) (Shattuck
and Cover, 2016:10, 14)

Diagnosis:

Worker. Workers of *A. texana* have elongate heads (head width / head length about 0.77), the scapes of the largest workers extend about three to four funicular segments past the posterior lateral border of the head. The head has rugae mixed with punctures and the posterior lateral border is rounded.

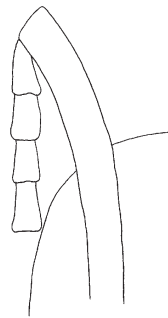


Fig. 332. Occipital corner and scape of a worker of *A. texana* (from Mackay and Mackay, 2002).

texana - S USA, N México

Nests under stones, rarely in rotten wood, under bark

Hardwood and deciduous forests, grasslands

texana, *Aphaenogaster*

418

subterranea complex

Compare with *carolinensis*, *fulva*, *huachucana*, *miamiana*, *picea*,
punctaticeps, *rudis*

The propodeal spines are weakly or moderately developed.

Total Length of lectotype 5.2 mm. HL 1.26 mm, HW 0.99 mm

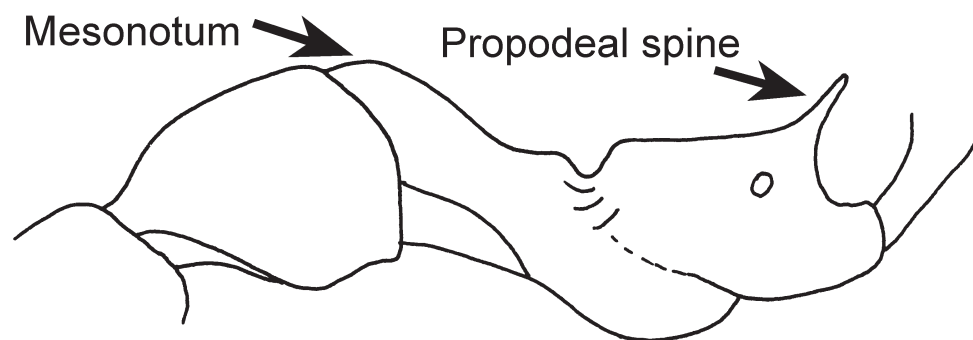


Fig. 333. Mesosoma of a worker of *A. texana*.

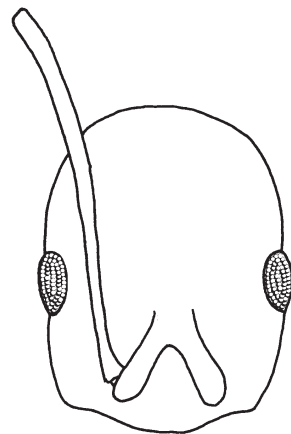


Fig. 334. Head of a worker of *A. texana* (paratype worker of *A. crinimera*).

texana - S USA, N México

Nests under stones, rarely in rotten wood, under bark

Hardwood and deciduous forests, grasslands

Compare with *carolinensis*, *fulva*, *huachucana*, *miamiana*, *picea*,
punctaticeps, *rudis*

Female. The head of the female is similar to that of the worker, but less elongated, and somewhat rectangular-shaped (head length 1.6 mm, head width 1.2 mm). The dorsal surface of the head is nearly covered with reticulated rugae.

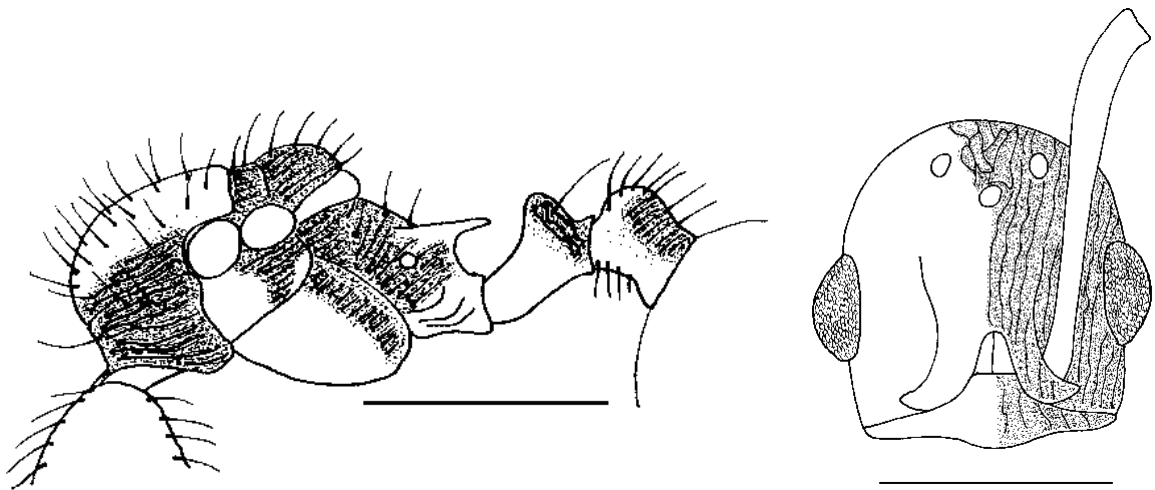


Fig. 335. Mesosoma, waist and head of a female of *A. texana* (paratype of *A. crinimera*, MCZC).

The scutum is completely covered with longitudinal striae (the anterior edge is partially smooth and glossy), the scutellum has similar transverse striae, the side of the pronotum has transverse striae, the mesopleuron is nearly completely smooth and glossy. The propodeal spines are well-developed (length 0.2 mm) and thicker than they are in the worker.

texana - S USA, N México

Nests under stones, rarely in rotten wood, under bark

Hardwood and deciduous forests, grasslands

texana, *Aphaenogaster*

420

subterranea complex

Compare with *carolinensis*, *fulva*, *huachucana*, *miamiana*, *picea*,
punctaticeps, *rudis*

Male. Specimens are moderately large (3 mm up to 5 mm total length)
pale to dark brown ants.

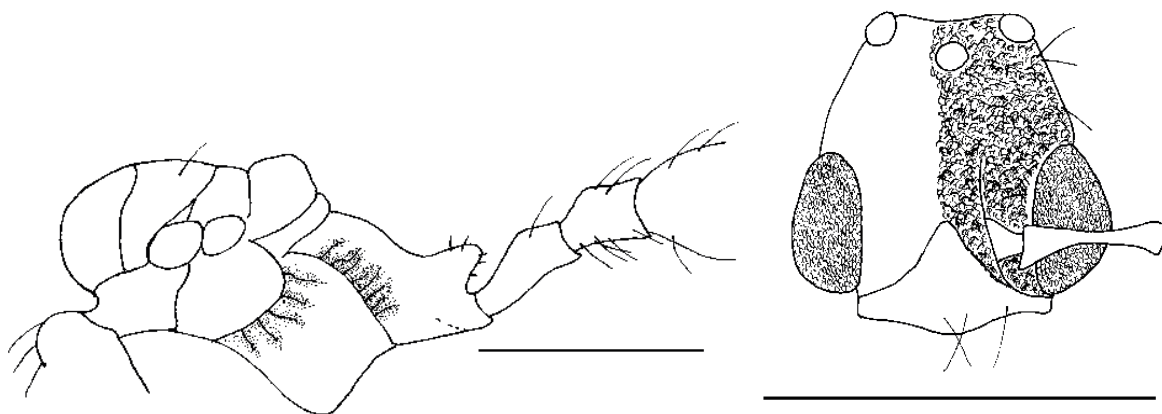


Fig. 336. Mesosoma, waist and head of a male of *A. texana* (para-type of *A. crinimera*, MCZC).

The scutum is mostly smooth and glossy with some sculpture along the edges; the metanotum strongly bulges from the surface. The propodeum is armed with two bluntly rounded processes that have dorsal longitudinal carinae, with region between the processes being concave.

texana - S USA, N México

Nests under stones, rarely in rotten wood, under bark

Hardwood and deciduous forests, grasslands

Compare with *carolinensis*, *fulva*, *huachucana*, *miamiana*, *picea*,
punctaticeps, *rudis*

Comparison:

The workers of this species could be confused with those of *A. punctaticeps*, but can be separated on the basis of the sculpture of the head (punctate in *A. punctaticeps*) and the rounded posterior lateral border (more pointed in *A. punctaticeps*). The head is much more elongate than that of *A. rudis* (compare Figs. 302 and 319).

The males are very similar to those of *A. fulva* but can be easily separated by the larger ocelli, which are separated by approximately one maximum diameter. The ocelli are much smaller in males of *A. fulva*. Both species have a bulging scutellum, which separates them from the remainder of the *Aphaenogaster* males.

The workers and females of *A. carolinensis* tend to be somewhat smaller (large workers 4.5 mm in length [$1.3 < WL < 1.7$ mm]; female 5.5 mm in length) than those of the “typical” *A. texana* (large workers 5.5 mm in length [$1.7 < WL < 2.1$ mm]; female 7 mm in length), lighter in color, and found in the eastern part of the United States, there is overlap in the sizes of the workers and females, color varies, and the “typical” *A. texana* is found as far east as Florida.

Aphaenogaster texana could be confused with *A. huachucana*. Characters that may be useful for separating them can be found in discussion of *A. huachucana*.

Aphaenogaster texana could also be confused with *A. rudis* and its allies, but can generally be separated by a larger lobe at the base of scape.

texana - S USA, N México

Nests under stones, rarely in rotten wood, under bark

Hardwood and deciduous forests, grasslands

Compare with *carolinensis*, *fulva*, *huachucana*, *miamiana*, *picea*,
punctaticeps, *rudis*

Aphaenogaster huachucana crinimera was described as a subspecies of *A. huachucana*, but is not close to it (Stefan Cover, per. comm.). It seems to be part of the *rudis-texana* tangle and is not distinguishable from the sympatric *A. texana* (S. Cover, per. comm.) and is thus considered to be a synonym.

The females of *A. crinimera*, *A. huachucana*, *A. miamiana*, *A. picea*, *A. rudis* and *A. texana* are nearly identical and difficult to separate. The key to the females may be helpful in identifying them.

Aphaenogaster texana and *A. miamiana* exhibit very distinct geographic ranges and have little overlap with the other species (Warren et al., 2011).

Distribution.

USA: **Alabama** (Creighton, 1952); **Arizona** (CWEM, MCZC; Creighton, 1952; Hunt and Snelling, 1975); **Arkansas** (CWEM; General and Thompson, 2007, 2008, 2009); **Florida**, Dade Co., Miami (Creighton, 1952), Santa Rosa Co. (CWEM); **Georgia** (CWEM); **Illinois** (DuBois and LaBerg, 1988); **Kansas** (Creighton, 1952; DuBois, 1985); **Mississippi**, Oktibbeha Co. (CWEM); **North Carolina**, Wake Co. (CWEM) (Guénard et al., 2012, 2015); **Oklahoma**, Kay Co., Ponca City (CWEM); **South Carolina** (Creighton, 1952); **Tennessee**, Great Smoky Mountains (Creighton, 1952); **Texas** (CWEM; central Texas, Creighton, 1952); **Virginia** (Guénard et al., 2015). **MEXICO:** **Baja California**,

texana - S USA, N México

Nests under stones, rarely in rotten wood, under bark

Hardwood and deciduous forests, grasslands

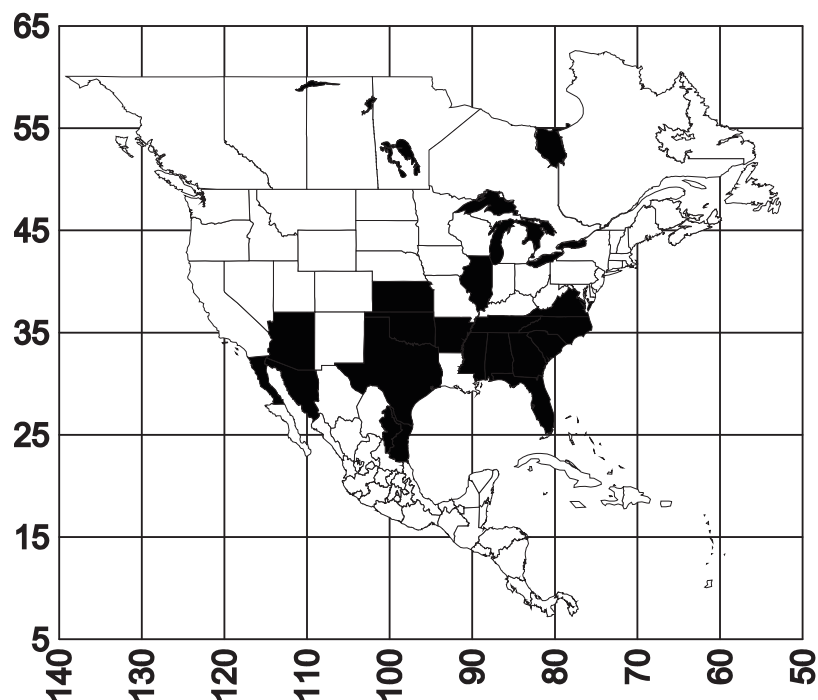
subterranea complex

423

Aphaenogaster texana

Compare with *carolinensis*, *fulva*, *huachucana*, *miamiana*, *picea*,
punctaticeps, *rudis*

Nuevo León, Sonora, Tamaulipas (all from Alatorre-Bracamontes and Vásquez-Bolaños, 2011).



Map 31. *Aphaenogaster texana*.

Habitat.

Aphaenogaster texana occurs in a variety of habitats, including riparian deciduous forests (DuBois and LaBerge, 1988), a densely shaded stream in an area of large pines (Cole, 1953), pine forests (Apache, ponderosa, and Chihuahua), oak forests (*Quercus emoryi* and white oak), alligator

texana - S USA, N México

Nests under stones, rarely in rotten wood, under bark

Hardwood and deciduous forests, grasslands

Compare with *carolinensis*, *fulva*, *huachucana*, *miamiana*, *picea*,
punctaticeps, *rudis*

bark juniper forests, grassy areas within dense pines and scrub oak on a south facing slope. Nests are generally found in deciduous and mixed hardwood forests, as well as pine forests and juniper forests. They are also found in bluestem prairie, oak-hickory forest to shaded deciduous forest (DuBois, 1985). Creighton (1952) found them in the lower part of the evergreen oak belt on sunny open slopes (2050m and below).

Biology.

Aphaenogaster texana nests under stones, especially deeply embedded stones in moist soil. It rarely nests in or under logs or under the bark of logs. DuBois (1985) stated they nest under stones or in rotten wood

Workers are very active and agile and generally escape when the nest is excavated, but large nests can be aggressive.

Brood was found in nests in April and June, sexuals from June until late July. All nests excavated had a single gyne.

Aphaenogaster texana nests appear to rely on a few, highly capable foragers (Pearce-Duvet et al., 2011) and was more affected most than the other *Aphaenogaster* spp. by precipitation (Warren et al., 2011).

Nests were found in soils ranging from clay, clay loam, sand, sandy loam, sandy gravel, rocky loam and rocks in colors ranging from light brown to dark brown.

Myrmecophila sp. crickets were found in the nests.

texana - S USA, N México

Nests under stones, rarely in rotten wood, under bark

Hardwood and deciduous forests, grasslands

Compare with *ashmeadi*

***Aphaenogaster treatae* Forel**

Worker Figs. 60 (mesosoma), 84, 338 (head), 337 (base of scape), 338 (side view).

Female Figs. 118 (eye and base of scape), 118, 339 (head), 339 (side view).

Male Figs. 130 (scape), 135 (scutum from above with sculpture), 136 (sternopetiole process), 340 (side view), 340 (head).

Map 32.

Plates 61 (worker), 62 (female), 63 (male).

Aphaenogaster treatae Forel, 1886: xl, pages 4-5 of reprinted article, ♀, ♀, ♂, USA: New Jersey, Vineland [Lectotype ♀, 6 paralectotype ♀, 3 paralectotype ♂, 3 paralectotype ♀, here designated MHNG]; Mayr, 1886:444; *Stenammon (Aphaenogaster) treatae*: Emery, 1895: 302; *Aphaenogaster treatae*: Wheeler, 1913:114; *Aphaenogaster (Atto-myrrma) treatae*: Emery, 1921:60; M. Smith, 1947: 554; Creighton, 1950: 153-154

Aphaenogaster treatae wheeleri Mann, 1915: 51 [23 ♀, 1 ♀ cotypes seen, MCZC] (Creighton, 1950:153)

Aphaenogaster treatae pluteicornis Wheeler, and Wheeler, 1934:7, Figs. 1 a, b, ♀, ♀, ♂; *Aphaenogaster (Atto-myrrma) pluteicornis*: Wheeler and Wheeler, 1953:62, larva (Shattuck and Cover, 2016:10, 12)

treatae - E USA, E Canada

Nests under stones or in soil

Hardwood, pine and deciduous forests, grasslands

Compare with *ashmeadi*

Aphaenogaster (*Attomyrma*) *treatae* var. *alabamensis* Wheeler and Wheeler, 1934: 11 ♀, ♀ (Creighton, 1950:153)

Aphaenogaster treatae pluteicornis var. *oklahomensis* Wheeler and Wheeler, 1934:10, Figs 1 c, d, ♀ [unavailable name, material referred to *A. pluteicornis* by Creighton, 1950:153] **material referred here**

Diagnoses:

Worker. The worker is easily recognized by the large lobe at the base of the scape, with a length that is nearly twice the maximum diameter of the eye.

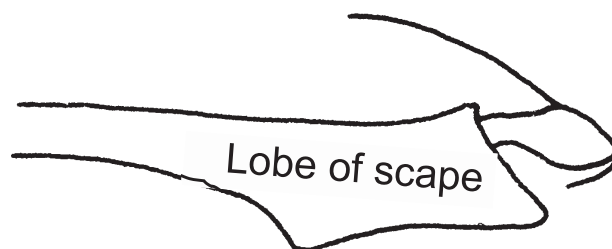


Fig. 337. Lobe of the scape of a worker of *A. treatae* (Haywood Co., North Carolina, CWEM).

The head is mostly covered with reticulated rugae, interspersed with punctures. The notopropodeal suture is well marked on the dorsum of the mesosoma; the propodeal spines are small. The postpetiole is much larger than the petiole, nearly twice as wide when viewed from above.

treatae - E USA, E Canada

Nests under stones or in soil

Hardwood, pine and deciduous forests, grasslands

Compare with *ashmeadi*

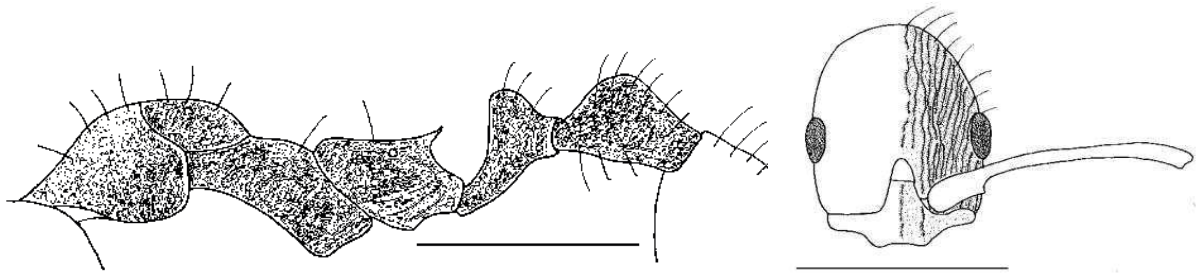


Fig. 338. Mesosoma, waist and head of a worker of *A. treatae* (Suffolk Co., New Jersey, MCZC).

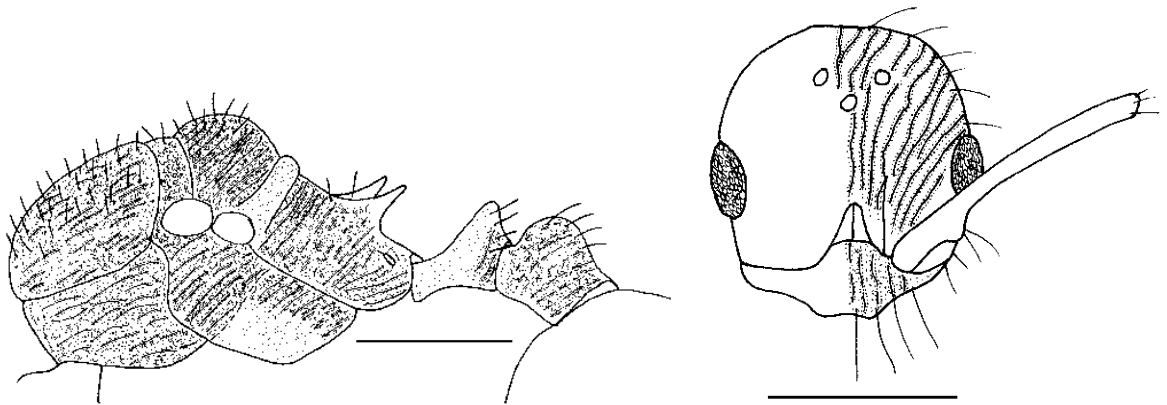


Fig. 339. Mesosoma, waist and head of a female of *A. treatae* (15 mi W Manahawkin, New Jersey, MCZC).

Female. Specimens are moderately large (total length 7 - 8 millimeters) ferruginous red ants. A large lobe is present at the base of the scape

treatae - E USA, E Canada

Nests under stones or in soil

Hardwood, pine and deciduous forests, grasslands

Compare with *ashmeadi*

as in the worker. The eyes are moderately sized, separated from the insertion of the mandible by approximately one diameter. The dorsum of the head is covered with reticulated rugae. The propodeum has well developed sharp spines which are broadened at the base. Most of the mesopleuron is striated, but often the anterior half of the katepisternum as well as the lower half is moderately smooth and glossy.

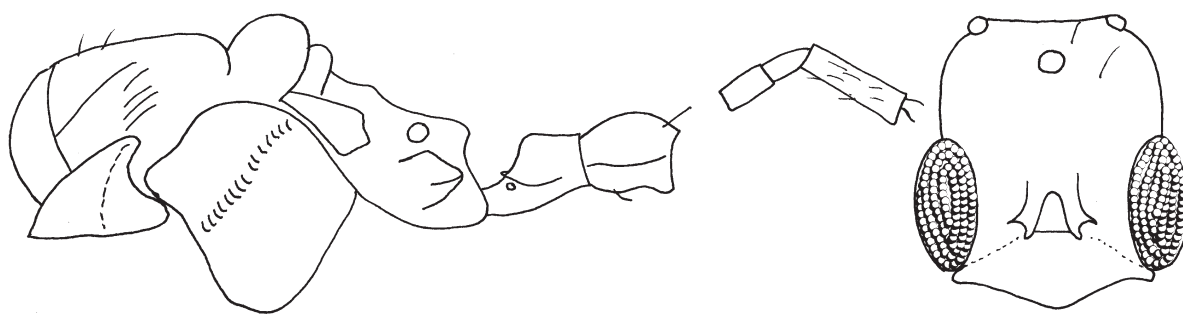


Fig. 340 Mesosoma of a male of *A. treatae* (Poteau, Oklahoma, LACM). The inset to the left of the head shows the scape and the first two funicular segments as seen from above.

Male. The specimens are small (total length 4.5 mm) and dark brown. The eyes occupy approximately $\frac{1}{2}$ of the side of the head; the ocelli are relatively small (0.08 mm maximum diameter), separated by nearly 2 maximum diameters. The base of the scape is not enlarged.

treatae - E USA, E Canada

Nests under stones or in soil

Hardwood, pine and deciduous forests, grasslands

Compare with *ashmeadi*

The dorsum of the scutellum is moderately shining anteriorly, and mostly covered with fine punctures posteriorly; the propodeum forms a nearly straight line from the metanotum to the tips of the small, rounded protuberances posteriorly. The metapleural lobes are swollen, but are rounded posteriorly.

Comparison:

The large lobe at the base of the scape of the worker separates this species from nearly all the others, except for *A. ashmeadi*. It can be separated from *A. ashmeadi*, as the lobe is nearly twice the length of the eye, not approximately the same length as the eye as in *A. ashmeadi*.

The female can be easily separated from that of *A. ashmeadi* by the very large lobe at the base of the scape.

Aphaenogaster treatae pluteicornis has been separated from *A. treatae treatae* (Creighton, 1950) as the head (mandibles excluded) is one-third longer than broad (one-fourth longer than broad in *A. treatae treatae*), the sides of the head begin to narrow immediately behind eyes (sides not narrowed immediately behind the eyes in *A. treatae treatae*), the posterior border is narrow and flat in middle (broadly and evenly rounded in *A. treatae treatae*); and of the posterior third of the head is granulose, but only rarely with longitudinal rugae (longitudinal rugae usually extend to the posterior border in *A. treatae treatae*). None of these characteristics appear to be consistent, based on two specimens of what Creighton la-

treatae - E USA, E Canada

Nests under stones or in soil

Hardwood, pine and deciduous forests, grasslands

Compare with *ashmeadi*

beled as possibly being part of the type series (MCZC). The cephalic index of the two specimens ranges from 69 - 72, which is within the range of the “typical” *A. treatae* (68 - 73). The shape of the head does not appear to differ from that of the “typical” *A. treatae*. The posterior borders of the heads of both taxa appear to be somewhat flat in the middle, depending on the angle of view. Finally, the sculpturing on the posterior part of the head is predominately granulose in both taxa. Thus, *A. treatae pluteicornis* appears to be a synonym.

Distribution:

USA: **Alabama** (CWEM; MacGown and Forster, 2005); **Arkansas** (General and Thompson, 2007, 2009, 2011); northern **Florida** (Luber-tazzi and Tschinkel, 2003); **Georgia** (CWEM; Graham et al., 2008); **Illinois** (Smith, 1979; DuBois and LaBerge, 1988); **Indiana** (Munsee, 1967); **Kansas** (DuBois, 1985); **Kentucky** (CWEM); **Louisiana** (Dash, 2004); **Massachusetts** (Ellison et al., 2012); **Michigan** (CWEM; Wheeler et al., 1994; Ellison et al., 2012); **Mississippi** (MacGown and Brown, 2006; MacGown et al., 2010); **North Carolina** (CWEM; Guénard et al., 2012, 2015); **Ohio** (Coovert, 2005); **Oklahoma** (Smith, 1979); **Rhode Island** (Ellison and Farnsworth, 2014); **South Carolina** (Davis, 2009; Resasco et al., 2014); **Tennessee** (Guénard et al., 2015; eastern Tennessee, Callcott et al., 2000); **Texas**, Rusk, Sabine Cos. (CWEM); **Virginia** (Guénard et al., 2015). **CANADA:** **Ontario** (Smith, 1979).

treatae - E USA, E Canada

Nests under stones or in soil

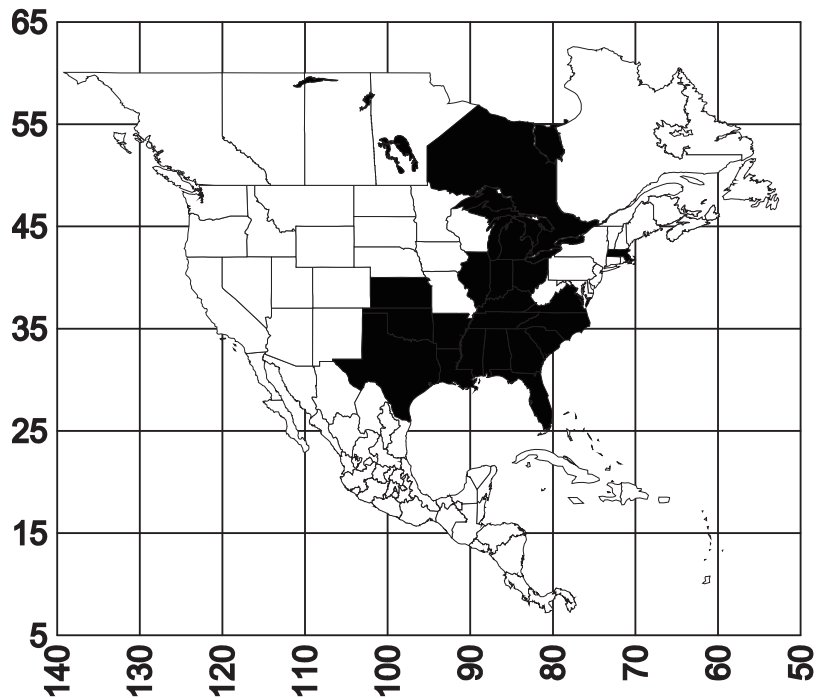
Hardwood, pine and deciduous forests, grasslands

subterranea complex

431

Aphaenogaster treatae

Compare with *ashmeadi*



Map 32 *Aphaenogaster treatae*.

Habitat:

We found *A. treatae* nesting in mixed hardwood forests, pine forests and mixed hardwood / pine forests and in an open weedy area along a road. In Illinois it is found in open fields or near the edge of deciduous forests (DuBois and LaBerge, 1988).

treatae - E USA, E Canada

Nests under stones or in soil

Hardwood, pine and deciduous forests, grasslands

Compare with *ashmeadi*

It is one of the four dominant ant species in a longleaf pine plantation in South Carolina (Whitford and Gentry, 1981) and occurs in urban habitats (Guénard et al, 2015). It may be an indicator species of tillage and insecticide use at the field margins (Peck et al., 1998).

Biology:

Aphaenogaster treatae nests under stones (pers. obs.) or at the base of plants and under stones (Ellison et al., 2012) or simply in the soil (DuBois and LaBerge, 1988). The entrance is usually a small opening in the soil (DuBois, 1985).

It is among the larger slower ants (in terms of body length per second) in the Apalachicola National Forest of Florida (Mason et al., 2015).

We found brood and females in nests in July, and single nest queens were present in nests.

Tschinkel (2011) studied the nest architecture of *A. treatae*. Nests were simpler than those of *A. floridana*, in that there was usually a single vertical shaft connected to simple chambers. The mean depth was 15 cms, with an average of 168 (22-294) workers.

Aphaenogaster treatae has unusual flights in that they take place at high temperatures (25-31°C), but only if light is reduced either by continuous gray skies or more frequently by moving clouds (Talbot, 1966). Most flights take place when temperatures have been too high for workers to forage until clouds arrive. A flight may be completed under a cloud which lasts only seven minutes. During the yearly flight period (from late

treatae - E USA, E Canada

Nests under stones or in soil

Hardwood, pine and deciduous forests, grasslands

Compare with *ashmeadi*

June to early August) alates are constantly alert for these brief clouds and may emerge within a minute after the sun is shaded, and they can all disappear within one-half minute after it shines again (Talbot, 1966).

Together with the ant species *Formica dolosa*, they dispersed 60 % of the fruit of the vulnerable broom crowberry (*Corema conradii*) in fruit-baiting experiments, suggesting they may function as primary dispersers (Hilley and Thiet, 2015). It is an important predator on the red oak borer (Cerambycidae) (Donley and Acciavatti, 1980; Ware and Stephen, 2006). Workers use pieces of leaf, mud and sand grains as tools to carry soft foods from distant sources to the colony (Fellers and Fellers, 1976).

It is rare and usually confined to sand in Indiana (Morris, 1942). We found it in light brown to brown sandy soils.

One nest was mixed with *Crematogaster* (pers. obs.). It is a species that does not appear to compete well with *S. invicta* in eastern Tennessee (Callcott et al., 2000).

Ardila-Garcia et al. (2010) provide an estimate and comparison of the genome size, with $2n=42$ (Crozier, 1977).

treatae - E USA, E Canada

Nests under stones or in soil

Hardwood, pine and deciduous forests, grasslands

uinta, *Aphaenogaster*

434

subterranea complex

Compare with *mutica*, *occidentalis*

***Aphaenogaster uinta* Wheeler**

Worker Figs. 5, 341 (mesosoma), 52 (scape), 54 (left corner of head), 57, 341 (head), 58 (dorsopropodeum).

Female Figs. 113, 342 (head), 342 (side view).

Male Figs. 343 (side view), 343 (head).

Map 33.

Plate 64 (worker).

Aphaenogaster uinta Wheeler, 1917: 517, ♀, ♀, ♂, USA: Utah, Salt Lake County, East Mill Creek (cotype ♀, ♀, ♂ seen, MCZC);
Aphaenogaster (*Attomyrma*) *uinta*: Emery, 1921:60; Creighton, 1950:154

Diagnoses:

Worker. The scapes of workers of *Aphaenogaster uinta* extend past the posterior lateral corner of the head by up to or over two funicular segments. The rugae on the dorsum of the head are weakly developed and the spaces between the rugae are weakly shining. The head is relatively short (head width / head length about 0.8).

uinta - NW USA

Nests under stones

Arid scrubland to coniferous forests

Compare with *mutica*, *occidentalis*

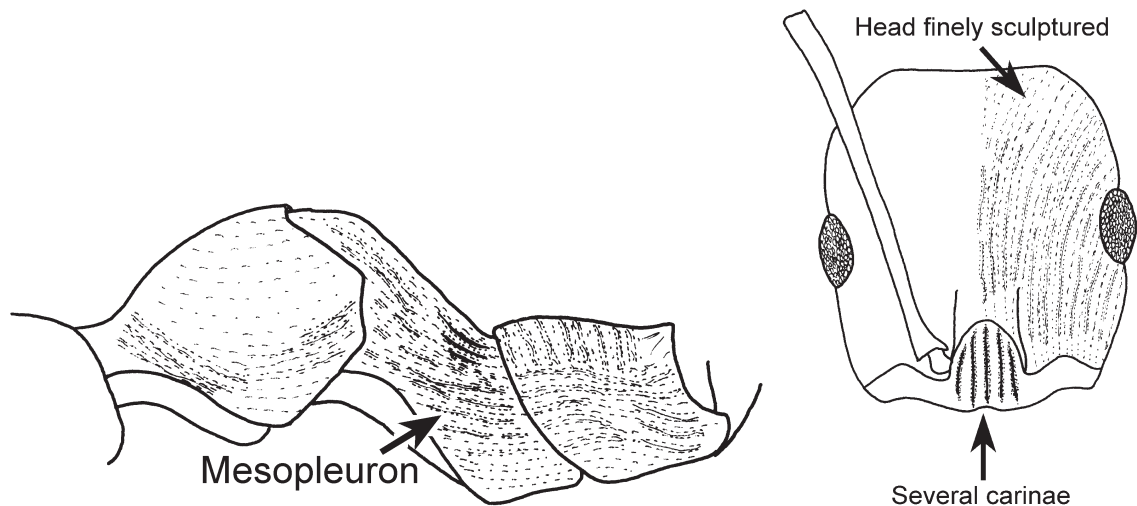


Fig. 341. Mesosoma and head of a cotype worker of *A. uinta*, showing the sculpture on the mesopleuron (MCZC).

The propodeal spines are poorly developed and weakly developed at the base.

Female. The female is relatively large (7.35 mm total length) and is yellowish-brown with a medium brown colored gaster. The scape extends about the first funicular segment past the posterior lateral corner of the head. The head is coarsely sculptured with rugae, the intrarrugal spaces are mostly shiny and finely punctate. The scutellum is completely smooth and shiny. The mesopleuron is mostly smooth and glossy, although there are signs of poorly defined striae on most of the surfaces. The scutellum extends slightly past the posterior border of the metanotum.

uinta - NW USA

Nests under stones

Arid scrubland to coniferous forests

Compare with *mutica*, *occidentalis*

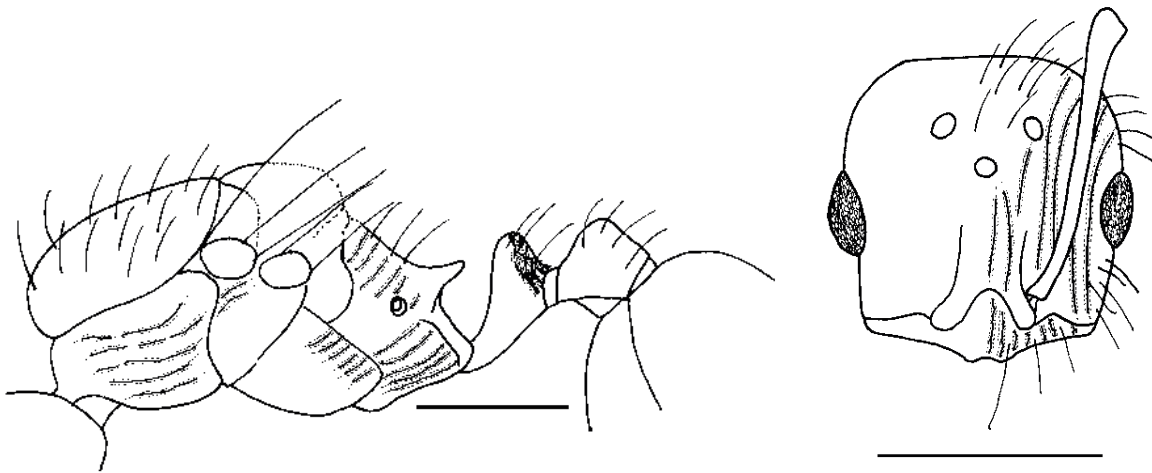


Fig. 342. Mesosoma, waist and head of a cotype female of *A. uinta* (MCZC).

Male. The male of *A. uinta* is a relatively large (total length 4.7 mm) medium brown specimen. The dorsum of the scutum is smooth and glossy anteriorly and longitudinally striate posteriorly. The propodeal tubercles rise above the surface on the dorsopropodeum, creating a concave area anteriorly, and are rounded posteriorly. The node of the petiole is rounded.

uinta - NW USA

Nests under stones

Arid scrubland to coniferous forests

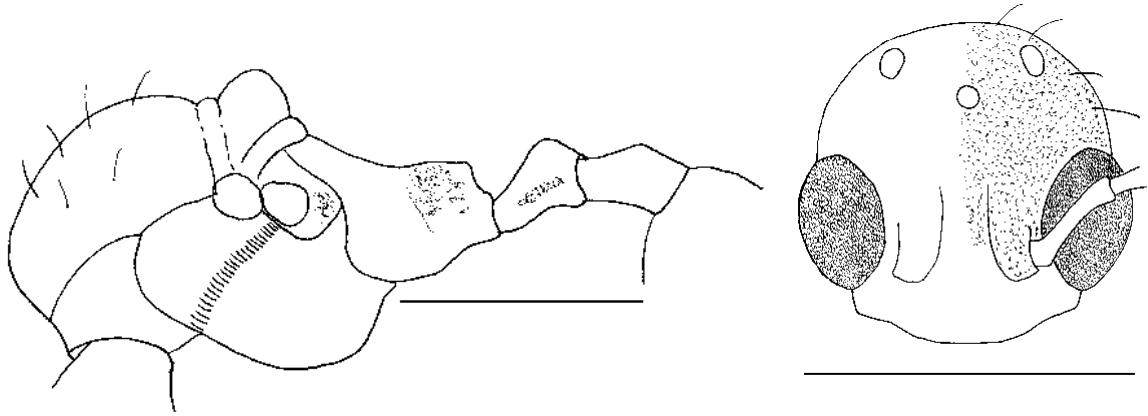
Compare with *mutica*, *occidentalis*

Fig. 343. Mesosoma, waist and head of a cotype male of *A. uinta* (MCZC).

Comparison:

The workers and females of *A. uinta* are very similar to those of *A. occidentalis* (western North America). The distributions of the two species also overlap. They can usually be separated as the heads of both the workers and females of *A. uinta* have less sculpturing in the intrarrugal spaces and *A. uinta* is rarely collected, *A. occidentalis* is very common. The discussion of *A. occidentalis* has other suggestions for separating the two species.

Workers of *A. uinta* are nearly identical to those of *A. mutica* (Baja California, Mexico). The workers can be separated as the head of *A. uinta* is more sculptured (much of the head of *A. mutica* is smooth and glossy, especially the posterior half) and the propodeal spines are developed into at least sharp angles (poorly developed or absent in *A. mutica*).

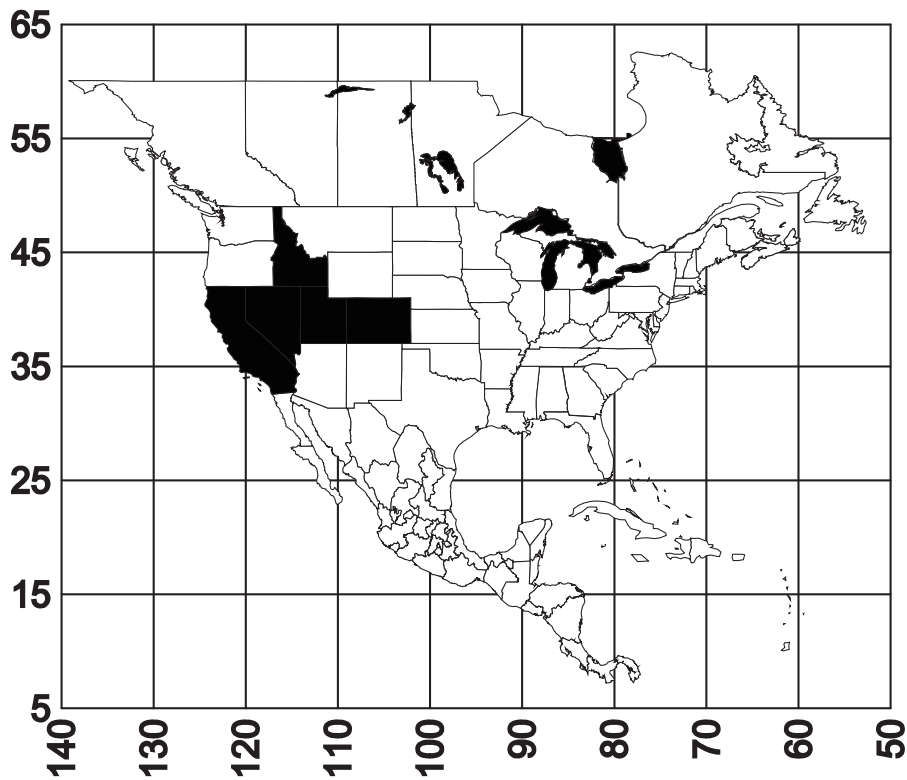
uinta - NW USA

Nests under stones

Arid scrubland to coniferous forests

Compare with *mutica*, *occidentalis*

Some workers, especially specimens we collected from Berlin Co. (Ichthyosaur State Park), Nevada, have longer scapes (may extend more than the first 2 funicular segments past the posterior border of the head), and often have more suberect hairs along the shaft, but will be considered to be *A. uinta*, as they are otherwise identical and the sexuals of these forms have apparently not been collected.



Map 33. *Aphaenogaster uinta*.

uinta - NW USA

Nests under stones

Arid scrubland to coniferous forests

Compare with *mutica*, *occidentalis*

Distribution:

USA: California, Glenn Co., Mendocino Nat. For. (CASC), Los Angeles Co., Angeles Crest Highway (CWEM); **SW Colorado** (Gregg, 1963); **Idaho**, Twin Fall Co. (CWEM; Clark and Blom, 2007; Yensen et al., 1977); central **Nevada** (Wheeler and Wheeler, 1986; MontBlanc, 2005); **Utah** (CWEM; Allred, 1982).

Habitat:

Aphaenogaster uinta is found in arid regions (pers. obs.). Although all species of opportunists have low abundances everywhere, *Aphaenogaster uinta* was significantly more abundant in sagebrush than in cheatgrass-dominated plots in Utah (Ostojka et al., 2009). Allred (1982) found it in sagebrush and montane habitats. Creighton (1950) reports that it is one of the few ants that thrives near the Great Salt Lake and nests in fully exposed arid areas. It occurs in habitats ranging from cool desert to coniferous forests in Nevada (Wheeler and Wheeler, 1986). We collected it in arid big sage/ juniper-pine shrubland.

Biology:

It is an opportunist species (MontBlanc, 2005), which nests under stones (Allred, 1982). We collected it in diurnal Vienna sausage baits and nocturnal pitfall traps in dry rocky clay. A mating flight occurred in Tonopah, Nevada on 13-vii [no year specified] (Wheeler and Wheeler,

uinta - NW USA

Nests under stones

Arid scrubland to coniferous forests

uinta, *Aphaenogaster*

440

subterranea complex

Compare with *mutica*, *occidentalis*

1986). The pselaphid beetle *Pilopius ocellaris* was found in a nest (Wheeler and Wheeler, 1986).

uinta - NW USA

Nests under stones

Arid scrubland to coniferous forests

subterranea complex

441

Aphaenogaster umphreyi

Compare with *fulva*

***Aphaenogaster umphreyi* Deyrup and Davis**

Worker Figs. 68 (side view of head), 94 (mesonotum), 344 (side view), 345 (head).

Map 34.

Plate 65 (worker).

Aphaenogaster umphreyi Deyrup and Davis, 1998:88-94, Figs. 1 and 2,
♀, Florida, Putnam Co., 3 mi east of Melrose

Diagnosis:

Worker. The worker of *A. umphreyi* is characterized by unusually small eyes, raised mesonotum, coarse sculpture, short propodeal spines, and unusually small hind tibial spurs. It is reddish-brown in color, and the legs and gaster are yellowish brown (Deyrup and Davis, 1998).

Female and male. Unknown.

Comparison:

Aphaenogaster umphreyi could be confused with *A. fulva*. Both species have coarse sculpture on the head and mesosoma, upward-pointing propodeal spines, and the strongly swollen and elevated, notched anterior

umphreyi - SE USA

Nests in soil and in rotten wood

Oak and pine woodlands, scrub habitats, urban areas

Compare with *fulva*

edge of the mesonotum. It differs in having smaller eyes, smaller propodeal spines, heavy zigzag carinae on the sides of the pronotum and on the propodeum and reduced spurs on the middle and posterior tibiae.

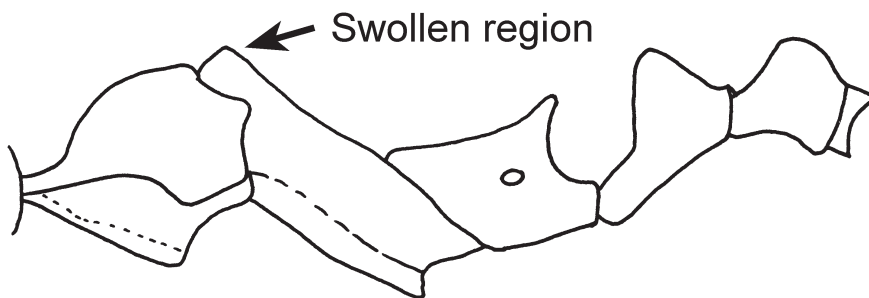


Fig. 344. Mesosoma and petiole of the holotype worker of *A. umphreyi*.

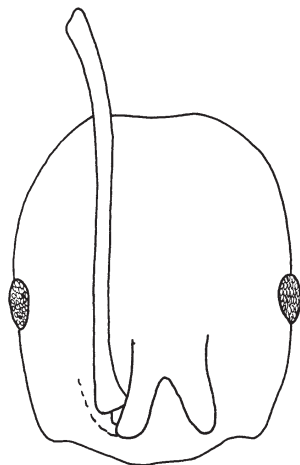


Fig. 345. Head of a paratype worker of *A. umphreyi*.

umphreyi - SE USA

Nests in soil and in rotten wood

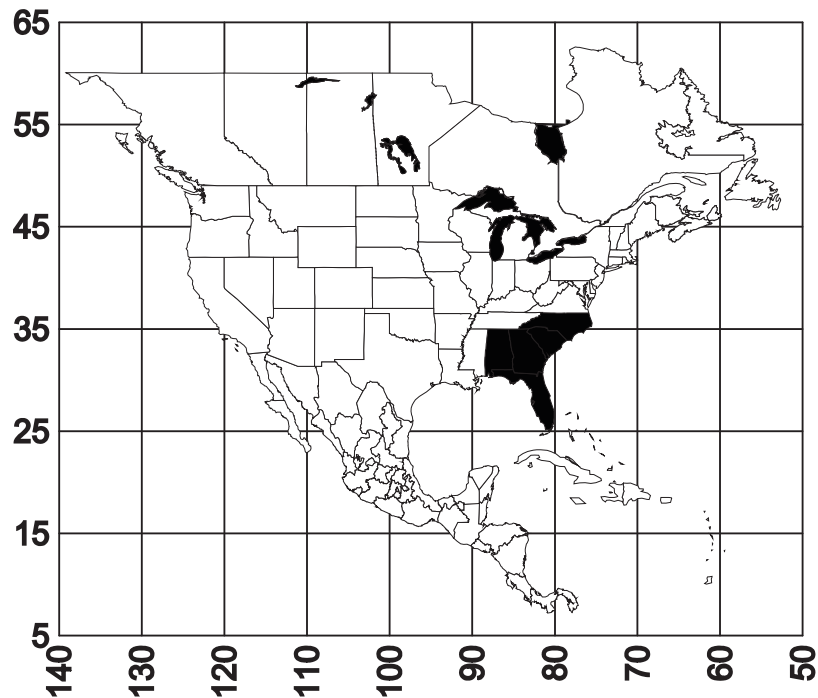
Oak and pine woodlands, scrub habitats, urban areas

subterranea complex

443

Aphaenogaster umphreyi

Compare with *fulva*



Map 34. *Aphaenogaster umphreyi*.

Distribution:

USA: **Alabama**, Tuscaloosa County (CWEM); **Florida**, Alachua, Highlands, Liberty, Marion, Okaloosa, Putnam Cos.; **Georgia**, 21st District., Lot 431, Decatur Co.; Emanuel Co. (MacGown and Hill, unpublished; Guénard et al., 2012); **North Carolina** (Resasco et al, 2014); **South Carolina** (Resasco et al, 2014).

umphreyi - SE USA

Nests in soil and in rotten wood

Oak and pine woodlands, scrub habitats, urban areas

Compare with *fulva***Habitat:**

Aphaenogaster umphreyi is found in sandy uplands of the Southeast, in open oak woodlands, longleaf pine - laurel, oak xeric hammock, slash pine, Florida scrub habitat, disturbed habitats and in urban environments (Deyrup and Davis, 1998). It is found in sandy, scrub type habitat (MacGown and Hill, unpublished).

Biology:

One nest was collected in the soil besides a rotten pine log, another in a rotten stump (pers. obs.). This species may nest in the roots of *Quercus inopina* (Deyrup and Davis, 1998).

This is a rare (Alonso, 2010) or difficult to find (Deyrup and Davis, 1998), subterranean species (MacGown and Hill, unpublished) which is among the larger, slower ants (in terms of body length per second) (Mason et al., 2015). If it is active aboveground, it forages nocturnally. We collected these ants loose on the ground during the day in a campground area with open areas and mixed hardwood forests, with brown clay soils.

umphreyi - SE USA

Nests in soil and in rotten wood

Oak and pine woodlands, scrub habitats, urban areas

Compare with *cockerelli*, *ensifer*

***Novomessor albisetosus* Mayr**

Worker Figs. 4, 346 (side view), 19 (head).

Female Figs. 21, 348 (head), 347 (side view), 349 (wing).

Male Figs. 22, 351 (head), 350 (side view).

Map 35.

Plates 66 (worker), 67 (female), 68 (male).

Aphaenogaster albisetosus Mayr, 1886:446-447, ♀, New Mexico (no specific locality); *Stenamma (Aphaenogaster) albisetosus*: Emery, 1895: 306; *Ischnomyrmex albisetosus*: Wheeler, 1910:280; *Novomessor albisetosus*: Emery, 1915:73; Emery, 1921:67, Plate 1, Fig. 16, ♂; Wheeler and Creighton, 1934:343, 349-353, Fig. 3, ♀; Wheeler and Wheeler, 1953:70 larva, Figs. 26-31; DeMarco and Cognato, 2015:6-7; *Aphaenogaster albisetosus*: Brown, 1974:47

Aphaenogaster minor J. Enzmann, 1947: 147-148, Plate 8 ♀ (Brown, 1949:49)

Diagnoses:

Worker. The worker can be recognized as being a large (total length approximately 8 mm), dark red specimen, usually with a darker gaster. The head is not greatly lengthened (head length usually < 2 mm), and the cephalic rugae nearly extend to the posterior edge of the head, often being transverse near the apex. The notopropodeal suture is difficult to see,

albisetosus - SW USA, NW México

Nests in soil, usually with pebble-covered mound, often under stone

Arid scrubland, grasslands, dry forests

Compare with *cockerelli*, *ensifer*

especially on the dorsum, and the propodeal spines are very long and sharp.

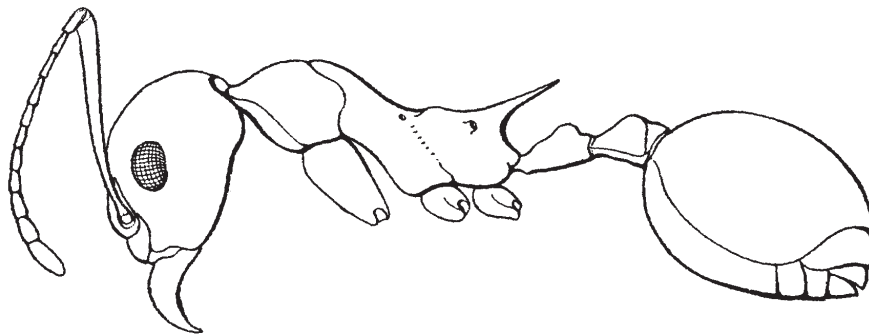


Fig. 346. Side view of a worker of *N. albisetosus* (modified from Creighton, 1950).

Female. The female is also a large (total length approximately 1 cm), dark reddish-brown specimen, usually with a darker gaster. The head is not greatly elongated (HL about 2 mm) and the cephalic rugae nearly reach the posterior margin of the head. The propodeal spines are long and sharp-toothed. The sternopetiole process is always well developed, pointed downwards, and is in the form of a sharp tooth or a blunt process.

albisetosus - SW USA, NW México

Nests in soil, usually with pebble-covered mound, often under stone

Arid scrubland, grasslands, dry forests

Compare with *cockerelli*, *ensifer*

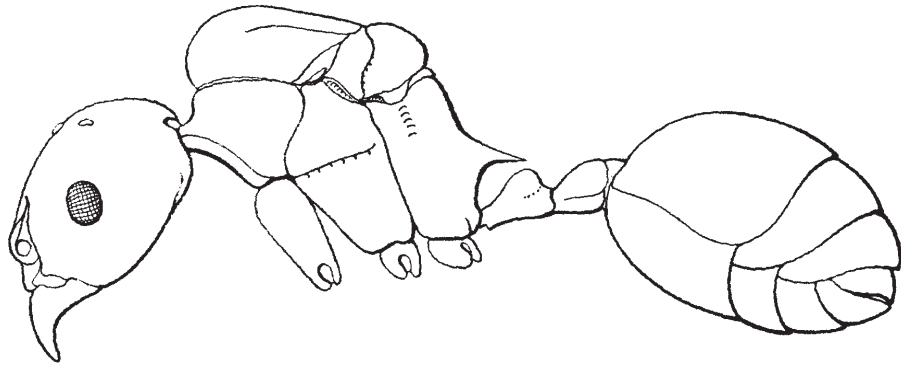


Fig. 347. Side view of a female of *N. albisetosus* (modified from Creighton, 1950).

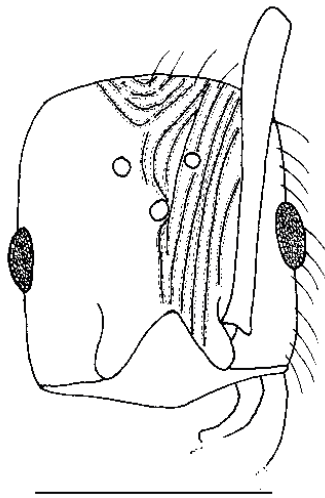


Fig. 348. Head of a female of *N. albisetosus* (Davis Co., Texas, MCZC).

albisetosus - SW USA, NW México

Nests in soil, usually with pebble-covered mound, often under stone
Arid scrubland, grasslands, dry forests

Compare with *cockerelli*, *ensifer*

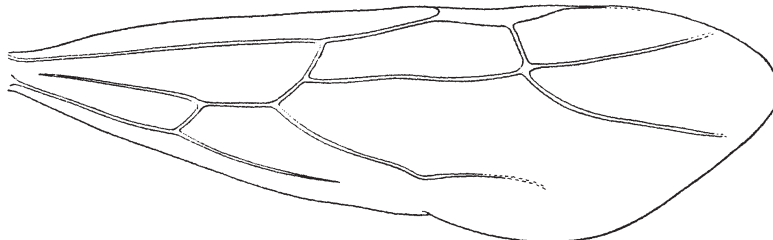


Fig. 349. Wing of a female of *N. albisetosus* (modified from Creighton, 1950).

Male. The male is a large black specimen (total length 6 mm).

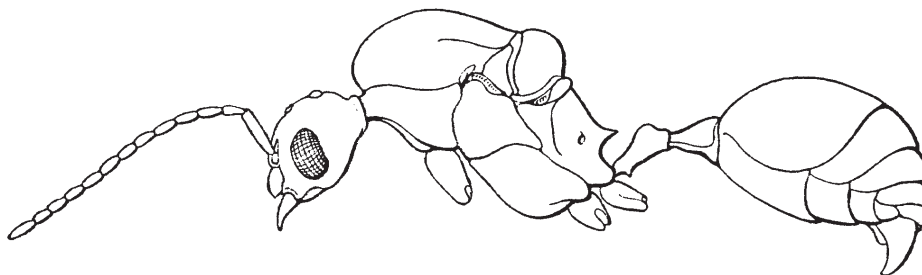


Fig. 350. Side view of a male of *N. albisetosus* (modified from Creighton, 1950).

albisetosus - SW USA, NW México

Nests in soil, usually with pebble-covered mound, often under stone

Arid scrubland, grasslands, dry forests

Compare with *cockerelli*, *ensifer*

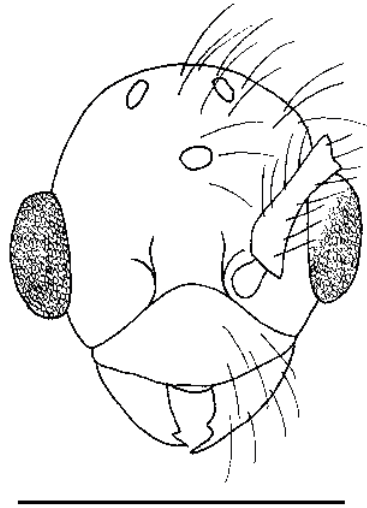


Fig. 351. Head of a male of *N. albisetosus* (Wickenburg, Arizona, MCZC).

The propodeal spines reduced to small angles. The dorsopropodeum is much lower in level as compared to the scutellum, as in most other members of the genus. The ventral surface of the petiole generally has a well-developed, ventrally directed spine.

albisetosus - SW USA, NW México

Nests in soil, usually with pebble-covered mound, often under stone

Arid scrubland, grasslands, dry forests

Compare with *cockerelli*, *ensifer*

Comparison:

This is the second most common species of the genus in the arid regions of the Southwestern United States and northern México (*N. cockerelli* is the most common).

The worker would only be confused with *N. cockerelli*. Most workers can be distinguished from those of *N. cockerelli* as they have a less elongated head and the posterior region of the head is more sculptured.

Separating females is very difficult, but those of *N. albisetosus* usually have shorter heads (2.26 - 2.36 mm), as compared to females of *N. cockerelli* (2.52 - 2.68 mm). The sternopetiolear process of *N. albisetosus* is more developed than that of *N. cockerelli*, and is directed ventrally, not anteriorly as in *N. cockerelli*.

It is difficult to separate the males of *N. albisetosus* and *N. cockerelli*. The head of the male of *N. albisetosus* is less elongated (head length 1.22 - 1.26 mm, Cephalic index 75 - 84) than is the head of *N. cockerelli* (HL 1.24 - 1.38 mm, CI 69 - 76). The sternopeduncular tooth of the petiole is slightly more developed in *N. albisetosus* than it is in the male of *N. cockerelli*. Wheeler and Creighton (1934) provide more details for separating the females and males of *N. albisetosus* and *N. cockerelli*.

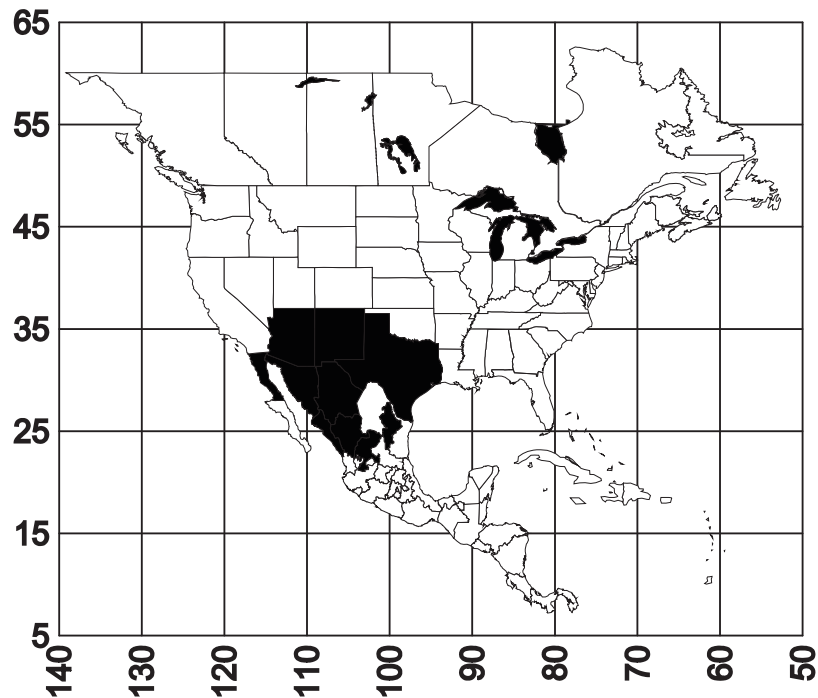
Workers of *N. albisetosus* can be easily separated from the similar Mexican species *N. ensifer* by the lack of a constricted neck. The females can be separated, as that of *N. albisetosus* lacks the flange on the nuchal carina, which is present on the female of *N. ensifer*. The unknown male of *N. ensifer* probably has a more elongated head, which would probably be narrowed posteriorly.

albisetosus - SW USA, NW México

Nests in soil, usually with pebble-covered mound, often under stone

Arid scrubland, grasslands, dry forests

Compare with *cockerelli*, *ensifer*



Map 35. *Novomessor albisetosus*.

Distribution:

USA: **Arizona**, Huachuca Mountains, Pima Co., L. Sabino Canyon, Gila Bend, Bisbee, Graham Co., Bonita, Coyote Mts., Globe, Huachuca Mts., Nogales, Oracle, Pineleño Mts., and Texas Pass (CWEM), Baboquivari (Creighton 1934); **New Mexico**, Catron Co., Catwalk, Frisco Hot Springs, 20 k N Glenwood; Eddy Co., 12 mi. N Carlsbad, 10 mi. S Carlsbad, Last Chance Canyon (fossil), Hidalgo Co., Steines, Lordsburg

albisetosus - SW USA, NW México

Nests in soil, usually with pebble-covered mound, often under stone

Arid scrubland, grasslands, dry forests

Compare with *cockerelli*, *ensifer*

(CWEM; Mackay and Mackay, 2002); **Texas**, Presidio, Chisos Mts., Del Rio, Fort Davis (CWEM); east to Chisos Mts. (Creighton, 1955), Pecos Co., Sheffield (Wheeler and Creighton, 1934) (Moody and Francke, 1982). **MÉXICO: Baja California** (Varela-Hernández and Jones, 2013); **Chihuahua**, 18kN Flores Magón (CWEM; Creighton, 1955; Alatorre-Bracamontes and Vásquez-Bolaños, 2011); **Durango** (Creighton, 1955), **Nuevo León**, El Puerto (CWEM); **Sinaloa** (CWEM); **Sonora**, Nogales, 34 mi N Hermosillo, 40 mi N Hermosillo, (CWEM) (Creighton, 1955, Alatorre-Bracamontes and Vásquez-Bolaños, 2011); **Zacatecas** (CWEM), see map in (Moody and Francke, 1982).

Habitat:

Novomessor albisetosus is usually found in arid areas ranging from Chihuahuan Desert creosote scrub, mesquite forest, *Acacia* shrubland to oak forests, but may be found in grasslands and in oak woodlands, pinyon juniper forests, riparian habitats and arid ecosystems up to 2000 meters in elevation. When it is found in extremely arid ecosystems, it is usually found in the bottoms of arroyos or in areas near water. It is often found in rocky soil with boulders.

Novomessor albisetosus is found in habitats at higher in elevation than *N. cockerelli* (Creighton, 1955), and inhabits cooler areas (Creighton 1955; Johnson, 2006). It is also found in mesquite dune fields (Eldridge et al., 2009).

albisetosus - SW USA, NW México

Nests in soil, usually with pebble-covered mound, often under stone

Arid scrubland, grasslands, dry forests

Compare with *cockerelli*, *ensifer*

Biology:

Novomessor albisetosus nests in the soil, usually with a cleared area around the nest, and often with pebbles surrounding the entrance. Nests are also found under stones, and are generally found on sloping surfaces, such as the sides of arroyos. There is generally a single entrance hole, although it may be large or there may be more than a single hole. Nests of *N. albisetosus* are somewhat smaller than those of *N. cockerelli*. Nest densities reach 0.7 nests per hectare (Eldridge et al., 2009).

The workers move very rapidly, and can be very aggressive when the nest is disturbed, with an irritating and slightly painful bite, but are unable to sting. They are generally only active in the evening, at night, and in the morning, but on cool or even cold days workers can be actively foraging (pers. obs.). They forage primarily in the evening and morning when the soil surface temperatures are between 20° and 40° (Whitford et al., 1980). They feed on a variety of materials, especially pieces of dead insects; foragers come to blacklights, where they capture living insects (pers. obs.). Workers are attracted to Vienna sausage baits. *Novomessor albisetosus* are solitary foragers that recruit nestmates to food and are omnivores/scavengers (Johnson, 2000). Wetterer et al. (2002) investigated the effect of forager size, load size and resource use in *N. albisetosus*. They found that it is an omnivorous species, feeding on seeds/fruits (43%), arthropods (21%), plant parts (25%) and other items (10%). Whitford et al., (1980) found that only 6.6% of the food items were insects and insect parts. Most foragers carried loads singly, but groups of ants would move large items, but there was no significant relationship between worker

albisetosus - SW USA, NW México

Nests in soil, usually with pebble-covered mound, often under stone

Arid scrubland, grasslands, dry forests

Compare with *cockerelli*, *ensifer*

mass and load mass. Foragers recruit others when they encounter large food items and cooperate in carrying such items back to the nest (Hölldobler et al., 1978), using stridulation to attract the other workers (Markl and Hölldobler, 1978).

McDonald (1984) found that workers dropped pebbles and sand into honey water as well as into distilled water if the samples were close to the nest, and carry the soil soaked in honey water to the nest.

Brood were collected in nests from March to July, sexuals in March, June and July (pers. obs.). Workers evacuate the queen when the nest is attacked by army ants (Smith and Haight, 2008).

Pseudoscorpions have been found in nests.

They are generally found in rocky or gravelly soils that range from light brown, dark brown to red in color, but can rarely be found in sandy soils or even clay soils (pers. obs.), but have been found in sandy soils (Moody and Francke, 1982).

Abrasion by soil results in increased water loss across the cuticle (Johnson, 2000b).

Additional information can be found in Wheeler (1910), Wheeler and Creighton (1934), Cole (1934 and Creighton (1955).

albisetosus - SW USA, NW México

Nests in soil, usually with pebble-covered mound, often under stone

Arid scrubland, grasslands, dry forests

Compare with *albisetosus*, *ensifer*

***Novomessor cockerelli* André**

Worker Figs. 20 (head), 352 (side view).

Female Figs. 21, 353 (head), 353 (side view).

Male Figs. 22, 27, 354 (head), 354 (side view).

Map 36.

Plates 69 (worker), 70 (female), 71 (male).

Aphaenogaster (Ischnomyrmex) cockerelli André, 1893:150, ♀, Mexico: Chihuahua, Moctezuma; *Stenamma (Ischnomyrmex) cockerelli*: Forel, 1901:128; *Ischnomyrmex cockerelli*: W. Wheeler, 1910: 280, fig. 155; *Novomessor coquerelli*: Emery, 1915:73; *Novomessor cockerelli*: Wheeler and Creighton, 1934:352-353 ♀, ♂; M. Smith, 1947:554; Wheeler and Wheeler, 1960:10 larva; DeMarco and Cognato, 2015:6-7; *Aphaenogaster cockerelli*: Brown, 1974:47

Aphaenogaster sonorae Pergande, 1893:34-35 ♀, Mexico: Sonora, Hermosillo; *Novomessor sonorae*: Emery, 1915:73 (Wheeler and Creighton, 1934:352)

cockerelli - W USA, N México

Nests in soil, usually with pebble-covered mound, often partially under stone

Arid scrubland, oak woodlands

Compare with *albisetosus*, *ensifer*

Diagnoses:

Worker. This ant is easily recognized, as it is a large (total length 8 mm), dark red specimen, usually with a darker gaster, an elongated species with long legs and two well-developed spines on the propodeum. The notopropodeal suture is poorly marked on the dorsum of the mesosoma, and the head is relatively elongated (head length over 2 mm), and the posterior $\frac{1}{3}$ is usually covered only with fine punctures or poorly defined irregular striae.

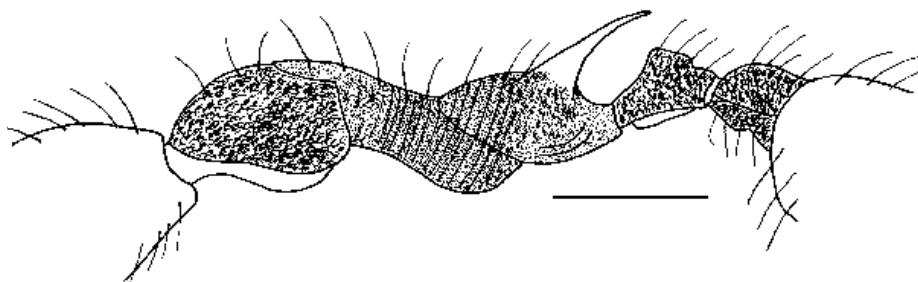


Fig. 352. Mesosoma, petiole and postpetiole of a worker of *N. cockerelli* (Cochise Co., Arizona, MCZC).

Female. The female is a large (total length over 1 cm), dark red specimen, usually with a partially black gaster. The head is elongated (head length approximately 2.5 mm) and not as strongly narrowed posteriorly as in the worker. The rugae usually extend to near the posterior margin

cockerelli - W USA, N México

Nests in soil, usually with pebble-covered mound, often partially
under stone

Arid scrubland, oak woodlands

Compare with *albisetosus*, *ensifer*

of the head, and there are usually transverse striae near the posterior margin. The propodeal spines are elongated and sharp-tipped. The sternopetiolar process is generally an anteriorly directed bump.

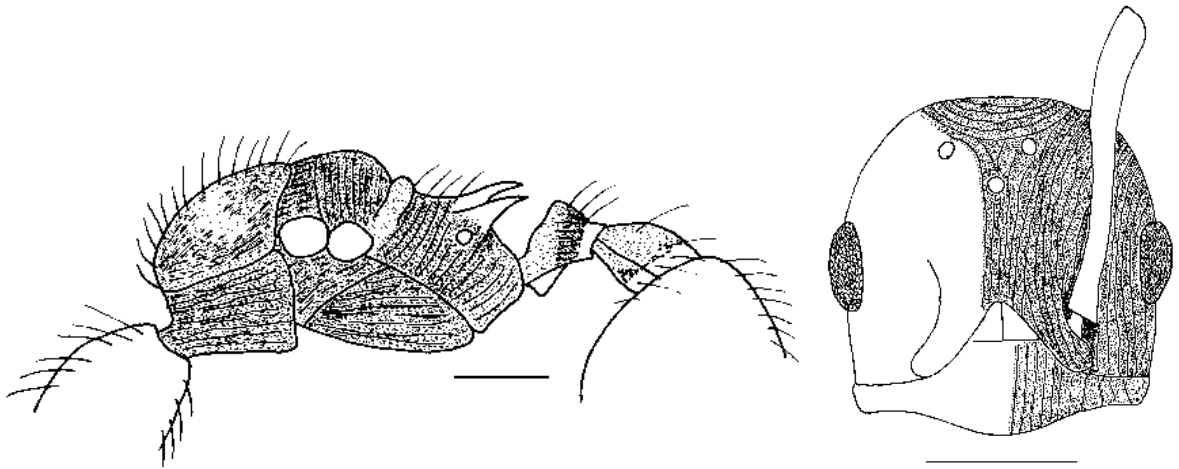


Fig. 353. Mesosoma, waist and head of a female of *N. cockerelli* (Cochise Co., Arizona, MCZC).

Male. The male is a relatively large (total length 6 mm), black specimen, with only blunt angles on the propodeum. The dorsopropodeum is much lower than the level of the scutellum, as in the other members of the genus. The sternopetiolar process is generally poorly developed.

cockerelli - W USA, N México

Nests in soil, usually with pebble-covered mound, often partially under stone

Arid scrubland, oak woodlands

Compare with *albisetosus*, *ensifer*

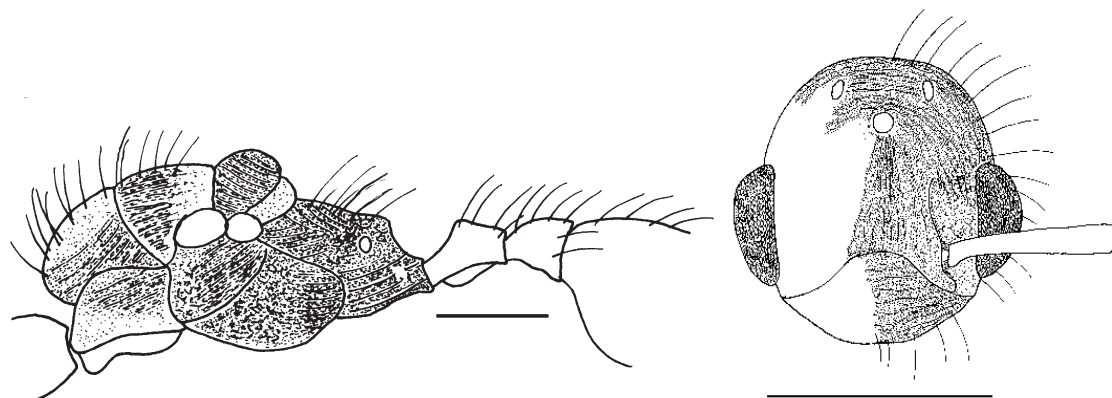


Fig. 354. Mesosoma, waist and head of a male of *N. cockerelli* (Cochise Co., Arizona, MCZC).

Comparison:

This species is a member of the *albisetosus* species complex, which consists of large ants that can be easily separated from the other species in the New World by their size. The elongate head of the worker, together with the relatively fine sculpturing on the posterior $\frac{1}{3}$ of the head, usually distinguishes them from those of the closely related *N. albisetosus*, although individual specimens of the two species can be difficult to separate. The females of the two species are difficult to separate; those of *N. cockerelli* generally have a more elongated head, and a poorly developed, anteriorly directed sternopetiolar process.

The males are very difficult to separate from those of *N. albisetosus*. They generally have longer heads (at least 1.24 mm in length) and longer

cockerelli - W USA, N México

Nests in soil, usually with pebble-covered mound, often partially under stone

Arid scrubland, oak woodlands

Compare with *albisetosus*, *ensifer*

scapes (0.54 - 0.60 mm). The sternopeduncular process of the petiole is poorly developed, as compared to that of *N. albisetosus*.

Workers can be easily separated from those of the similar Mexican species, *N. ensifer*, by the lack of the constricted neck. The female of *N. cockerelli* is also easily separated, as it lacks the large flange found on the nuchal carina of *N. ensifer*.

The unknown male of *N. ensifer* would probably have a constricted neck, or at least the head should be strongly narrowed posteriorly, which may allow them to be separated from males of *N. cockerelli*.

Distribution:

USA: **Arizona**, Picacho Pass, (CWEM) (Smith, 1979); southern **California** (Smith, 1979), southern **Nevada** (Creighton, 1955; Wheeler and Wheeler, 1986); **New Mexico** (CWEM; Mackay and Mackay, 2002); **Texas**, Brewster Co., Hudspeth Co., northeast to Palo Duro Canyon, Val Verde Co., (CWEM), east to Del Rio, Nava (Creighton, 1955). Wheeler and Creighton (1934) provide more localities. **MÉXICO:** **Aguascalientes** (Rodríguez-Elizalde and Escoto-Rocha, 2015); **Baja California** (Varela-Hernández and Jones, 2013); **Chihuahua** (CWEM; Creighton, 1955; Alatorre-Bracamontes and Vásquez-Bolaños, 2011); **Coahuila** (CWEM; Creighton 1955; Alatorre-Bracamontes and Vásquez-Bolaños, 2011); **Durango** (CWEM; Creighton, 1955); **Nuevo León**, El Puerto, 5 mi. north of Colonia Guerrero (CWEM) (Alatorre-Bracamontes and Vásquez-Bolaños, 2011); **San Luis Potosí** (CWEM); **Sonora**, 22 mi. W

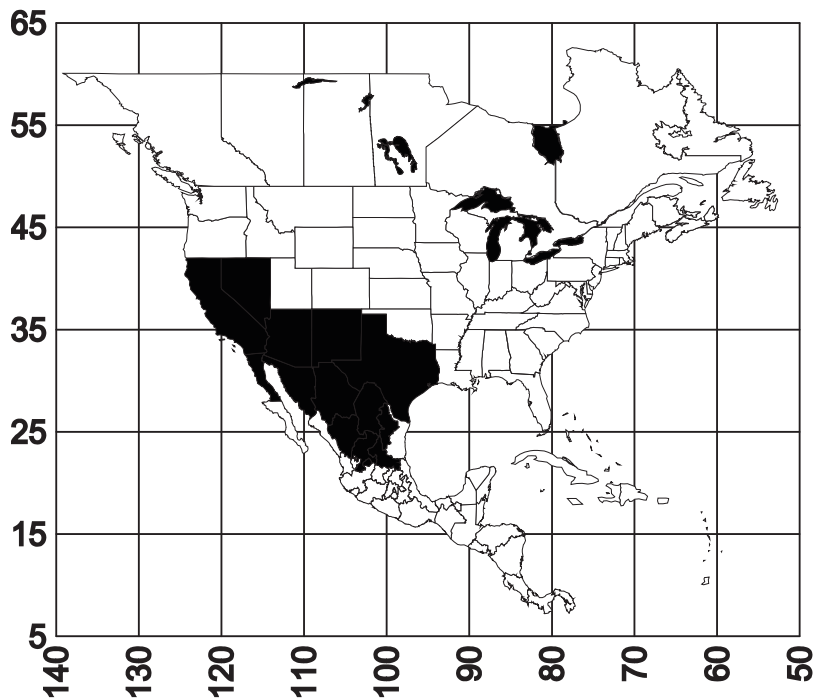
cockerelli - W USA, N México

Nests in soil, usually with pebble-covered mound, often partially under stone

Arid scrubland, oak woodlands

Compare with *albisetosus*, *ensifer*

Sonoyta, (CWEM) (Creighton, 1955; Alatorre-Bracamontes and Vásquez-Bolaños, 2011; Rodríguez-Elizalde and Escoto-Rocha, 2015); **Zacatecas** (Wheeler and Creighton, 1934; Creighton, 1955).



Map 36. *Novomessor cockerelli*.

Habitat:

This is the most common member of *Novomessor* in arid ecosystems in the southwestern USA and northwestern México. It is most commonly found in creosotebush scrub, but also in fluff grass and open areas with

cockerelli - W USA, N México

Nests in soil, usually with pebble-covered mound, often partially under stone

Arid scrubland, oak woodlands

Compare with *albisetosus*, *ensifer*

annuals, in flatter and dryer sites than *N. albisetosus*, but can also be found in mesquite shrublands, oak woodlands and riparian habitats, usually at elevations below 1500m, but up to 2200m.

Biology:

Nests are very similar to those of *N. albisetosus*, with a cleared area of up to one-meter diameter. They are usually found in the soil with the entrance surrounded by pebbles. Even nests under stones usually have the entrance surrounded by pebbles.

A nest reaches reproductive maturity in 3-4 years (Barton et al., 2002). Nest location is persistent with a mean life span of 5.1 years, with no significant change in nest densities over 23 years in southeastern Arizona (Chew, 1995). Nest density ranges up to 14 nests per hectare in creosotebush shrubland (Eldridge et al., 2009). Colonies of *Novomessor cockerelli* are monogynous (single queen) and polydomous (multiple nests) resulting in a large portion of the nest workers being physically isolated from the queen for extended periods of time (Ebie et al., 2015). Some workers experimentally isolated from the queen in laboratory nests laid viable eggs, which developed into males (Ebie et al., 2015). Nests in southeastern Arizona are shallow with a mean about 30 cms where they reach the caliche level (Chew, 1995). One completely excavated nest had 1535 workers and the tunnels perforated the caliche layer at the Jornada Experimental Range in southern New Mexico (pers. obs.). Beetles, spiders, pseudoscorpions and silverfish have been found in nests (pers. obs.).

cockerelli - W USA, N México

Nests in soil, usually with pebble-covered mound, often partially
under stone

Arid scrubland, oak woodlands

Compare with *albisetosus*, *ensifer*

This species is very aggressive, but cannot sting; the bite is very fastidious when large numbers are attacking (pers. obs.). Workers evacuate the queen when the nest is attacked by army ants (Smith and Haight, 2008).

Brood were collected in nests from April, June, July and August; sexuals were in nests in May to August. A mating flight occurred at 20:00 in May.

Workers forage primarily in the evening and morning when soil surface temperatures are between 20° and 40° (Whitford et al., 1980). Workers occasionally forage during the night (pers. obs.). Foraging occurs throughout the day during the cool part of the year or even on cloudy days during the summer (pers. obs.).

Novomessor cockerelli are solitary foragers that recruit nestmates to food and are omnivores/scavengers (Johnson, 2000a). Workers recruit others when they encounter large food items and cooperate in carrying such items back to the nest (Hölldobler et al., 1978). They use stridulation to attract other workers to large prey items (Markl and Hölldobler, 1978).

Workers collect insects found around black light traps and are captured in pitfall traps. Workers are attracted to subterranean and surface baits containing Vienna sausage and will climb into the vegetation to Vienna sausage traps (pers. obs.). Prey usually consists of dead or dying insects, parts of plants and seeds (pers. obs.). Nearly half of diet was insects and insect parts (Whitford et al., 1980). When a partially disabled grasshopper is encountered, the first worker finding it mounts the dorsum of the grasshopper and clamps its mandibles over the wings, thus preventing escape

cockerelli - W USA, N México

Nests in soil, usually with pebble-covered mound, often partially under stone

Arid scrubland, oak woodlands

Compare with *albisetosus*, *ensifer*

by flight (Fowler and Whitford, 1983). Workers which arrive subsequently systematically remove additional appendages. This behavioral coordination allows *N. cockerelli* to efficiently exploit large orthopteran prey which would otherwise escape if workers attempted to capture these individually (Fowler and Whitford, 1983). Workers continued to collect high protein tuna baits until soil temperatures reached lethal levels (Whitford et al., 1980; Whitford and Steinberger, 2009). Nests respond to experimental changes in the distribution and type of available resources by adjusting the numbers of ants engaged in foraging and other tasks outside the nest, and by adjusting the temporal patterns of these activities (Sanders and Gordon, 2002).

Novomessor cockerelli inhabits lower, hotter areas than *N. albisetosus* (Creighton 1955; Johnson, 2006), where disturbance by the nests changes the availability of water and nutrients (Eldridge et al., 2009) and impacts soil protozoan communities (Rodriguez Zaragoza et al., 2007).

Nests have been collected in a variety of soil types (Moody and Francke, 1982). Soils range from sand (dunes), sandy-loam, clay loam, rocky sand, to rocky gravel, with colors ranging from white, grey, light brown, brown to red (pers. obs.).

Novomessor cockerelli apparently competes with the honey pot ant *Myrmecocystus mexicanus* (Chew, 1995). It also competes with the harvester ant *Pogonomyrmex barbatus* for seed resources in the Chihuahuan desert (Barton et al., 2002), where it plugs entrances of *P. barbatus* nests

cockerelli - W USA, N México

Nests in soil, usually with pebble-covered mound, often partially
under stone

Arid scrubland, oak woodlands

Compare with *albisetosus*, *ensifer*

before sunrise (Gordon, 1988; Barton et al., 2002). This delays the beginning of the *P. barbatus* activity period for 1 - 3 h. Nest-plugging shifts the onset of foraging of *P. barbatus* forward towards midday, when high temperatures force the colony back inside the nest. *Pogonomyrmex barbatus* colonies do not compensate for late emergence by increasing their foraging rate. Thus nest-plugging by *N. cockerelli* decreases the foraging capacity of *P. barbatus* colonies (Gordon, 1988).

The nymphs of *Arenivaga* sp. (Orthoptera: Polyphagidae) were found in a nest (Wheeler and Wheeler, 1986).

cockerelli - W USA, N México

Nests in soil, usually with pebble-covered mound, often partially
under stone

Arid scrubland, oak woodlands

Compare with *albisetosus*, *cockerelli*

***Novomessor ensifer* (Forel)**

Worker Figs. 18 (head), 40, 355 (side view).

Female Figs. 356 (side view), 356 (head).

Map 37.

Plate 72 (worker).

Aphaenogaster (Ischnomyrmex) ensifera Forel, 1899:59 ♀, Mexico: Michoacán; *Aphaenogaster (Deromyrma) ensifera*: Emery, 1915:71; *Novomessor ensifera*: DeMarco and Cognato, 2015:6-7

Aphaenogaster manni Wheeler and Creighton, 1934:353-354, ♀, México, Colima, Colima (holotype ♀ seen MCZC) (Brown, 1974:46)

Diagnoses:

Worker. This is an easily recognized Mexican species, as the constricted neck along the posterior border of the head is well-developed, the head is covered by striae, which are mostly longitudinal on the anterior two-thirds of the head, but transverse on the posterior one-third, the mesosoma is covered with transverse striae, which are very fine on the pronotum, and much coarser on the side of propodeum, the notopropodeal suture is poorly developed, and the propodeal spines are very long and sharp.

ensifera- central México

Nests in soil

Disturbed open rain forest

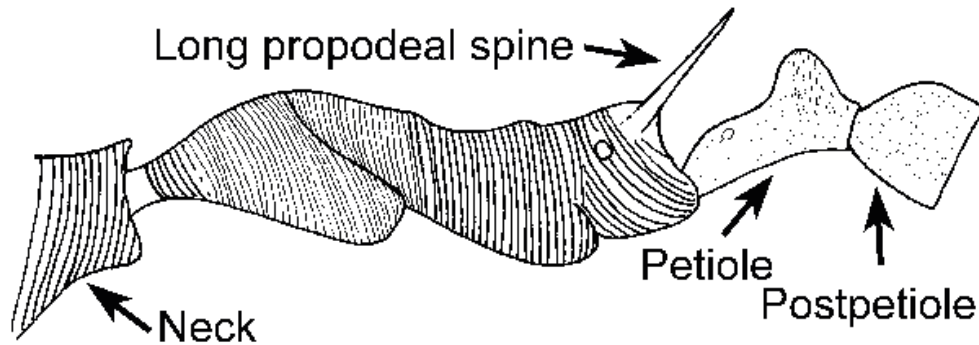


Fig. 355. Posterior edge of head, mesosoma, petiole and postpetiole of a worker of *N. ensifer* (Jalisco, México, CWEM).

Female description (previously undescribed).

Mandible with 3 apical teeth well developed, first tooth about twice length of second, second and third teeth nearly equal in size, remainder of mandible with poorly defined denticles; anterior clypeal border slightly convex; eyes positioned on sides of head, head somewhat elongated and narrowed posteriorly, nuchal carina with well-developed flange which is mostly perpendicular to long axis of head, width of nuchal carina 1.06 mm; scapes extending approximately first funicular segment past posterior lateral corner of head; mesosoma winged, robust; propodeal spines well developed (length 0.7 mm); sternopetiolar process poorly developed, somewhat pointed anteriorly (similar to that of *N. cockerelli*).

ensifer- central México
Nests in soil
Disturbed open rain forest

Compare with *albisetosus*, *cockerelli*

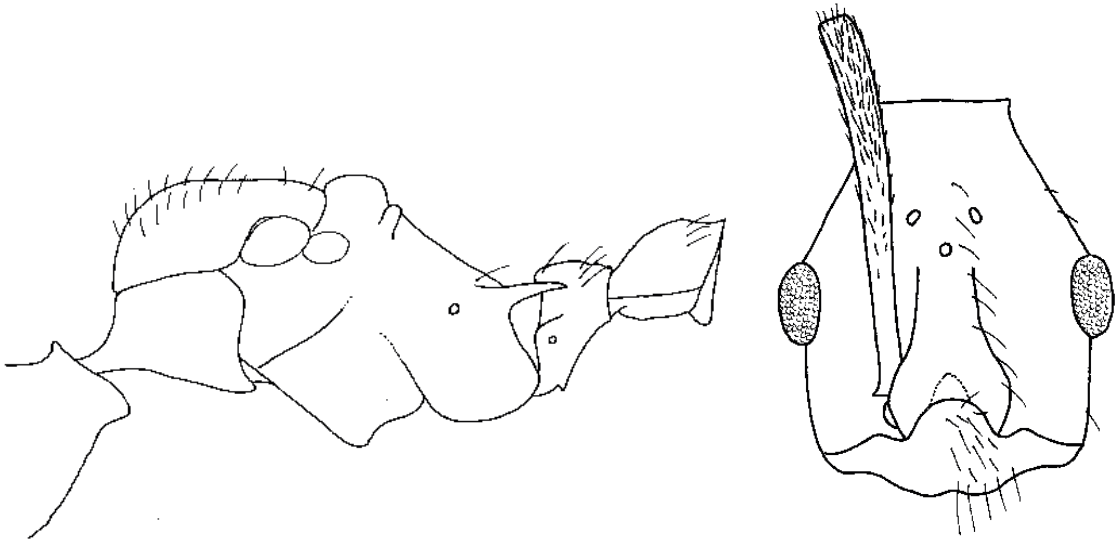


Fig. 356. Mesosoma, waist and head of a female of *N. ensifer* (Jalisco, México, LACM).

Erect hairs abundant along anterior border of clypeus, surface of clypeus, dorsal and ventral surfaces of head, dorsum of mesosoma, coxae and femora, hairs on tibiae mostly appressed, erect hairs present on dorsum of petiole, dorsal and ventral surfaces of postpetiole, on all surfaces of gaster; appressed pubescence very sparse.

Most surfaces at least moderately shiny, gaster smooth and glossy, mandibles striated, clypeus with fine striae which converge anteriorly, anterior $\frac{2}{3}$ of head with reticulated rugae, posterior $\frac{1}{3}$ of head (posterior to ocelli) transversely striated, with striae oriented anteriorly on sides; side of mesosoma mostly striate with spaces between striae smooth and glossy, scutum longitudinally striate with striae converging posteriorly,

ensifer- central México

Nests in soil

Disturbed open rain forest

Compare with *albisetosus*, *cockerelli*

scutellum with fine, transverse striolae, shiny anteriorly, dorsopropodeum with transverse striae, posteropropodeum mostly smooth and glossy, petiole with mostly vertical striae on upper half, finely punctate on lower half, postpetiole finely punctate.

Ferruginous red with gaster partly black.

Measurements.

HL 2.68, HW 1.94, EL 0.53, SL 2.40, WL 4.10, CI 72, SL 90.

Male. Unknown.

Comparison:

This species could be confused with *N. albisetosus* and *N. cockerelli* which are similar in size and general form, but lack the constricted neck. It could also be confused with *A. araneoides* and *A. phalangium* which have a similar neck, but have well-developed notopropodeal sutures, and lack spines on the propodeum. The Mexican *A. mexicana* (total length 6 mm) is similar, but smaller and the processes on the propodeum are simple angles, not elongated spines as in *N. ensifer*.

Interestingly, this species is morphologically similar to *A. swammerdami* from Madagascar. They differ in that the worker of *N. ensifer* is much more sculptured (smooth and glossy in *A. swammerdami*), has in less narrowed neck, less developed notopropodeal suture (well-developed in *A. swammerdami*) and much larger propodeal spines (small in *A. swammerdami*). As the notopropodeal sutures are so different in the

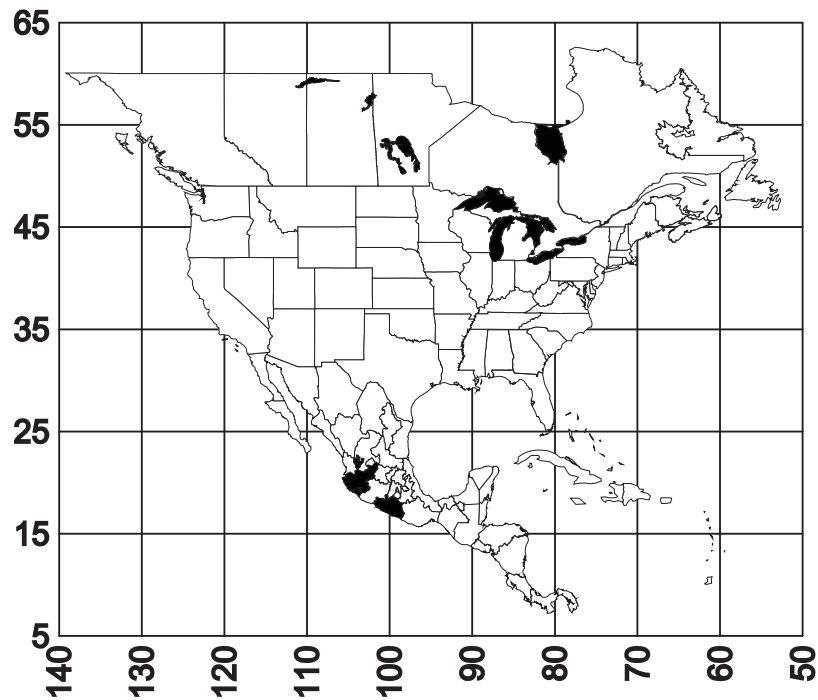
ensifer- central México

Nests in soil

Disturbed open rain forest

Compare with *albisetosus*, *cockerelli*

two species, this similarity is probably an example of convergent evolution.



Map 37. *Novomessor ensifer*.

Distribution:

MEXICO: Colima (Colima, 9 mi S Colima, 14 k N Tecomán, CWEM); **Guerrero** (50 k N Acapulco, Puente Mexcola, CWEM; Escalante-Jiménez and Vázquez-Bolaños, 2015); **Jalisco** (Autlán, Ayquila, El Limón, Sierra de Quilla, CWEM; Villalvazo-Palacios et al., 2015).

ensifer- central México

Nests in soil

Disturbed open rain forest

ensifera, *Novomessor*

470

Compare with *albisetosus*, *cockerelli*

Habitat:

Highly disturbed rain forest.

Biology:

These ants nest in the soil. We collected workers loose on the ground and loose in the vegetation in disturbed rain forest, with light brown rocky clay soils. Foragers were especially active after a rain and foraged during the day (pers. obs.). Flights are triggered by rainfall (Johnson, 2000a, 2006).

ensifer- central México

Nests in soil

Disturbed open rain forest

Acknowledgments

We are grateful to our close friend and fellow myrmecologist Margarita Villapalacio for sending us two specimens of *A. mexicana*, as well as many other interesting ants. Many curators loaned us types and other specimens and are listed in the Materials and Methods section. Dr. Gary Alpert provided accommodations while we worked at the MCZC. We would like to thank Drs. Aaron Ellison and Miguel Vásquez Bolaños for critical reviews of the manuscript.

The research was supported by the National Science Foundation, grant Number DBI 0405470, generous donations from the estate of Maxie Groce Templeton matched by our personal savings account and the Ernst Mayr Fund of the Harvard Museum of Comparative Zoology.

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503

PLATES



Plate 1. *Aphaenogaster araneoides* worker (lectotype, from wwwAntWeb.org, Alexandra Westrich photographer).

Worker

505

Aphaenogaster ashmeadi

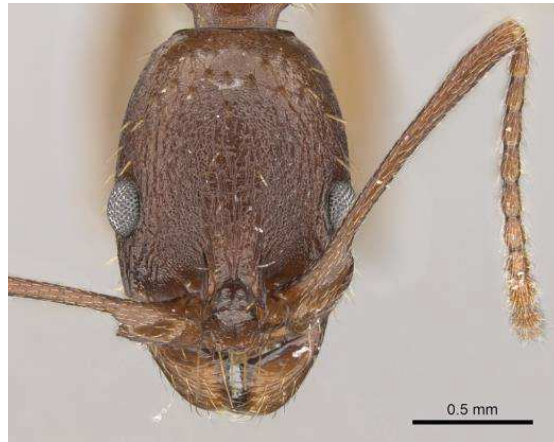


Plate 2. *Aphaenogaster ashmeadi* worker (from www.AntWeb.org, Cerise Chen photographer).



Plate 3. *Aphaenogaster boulderensis* worker (from wwwAnt-Web.org, April Nobile photographer).

Worker

507

Aphaenogaster brevicollis



Plate 4 *Aphaenogaster brevicollis* worker (Chiriquí, Panamá, CWEM, W. Mackay photographer). The inset shows the posterior view of the head in direct view. The scale bars are 1 mm.

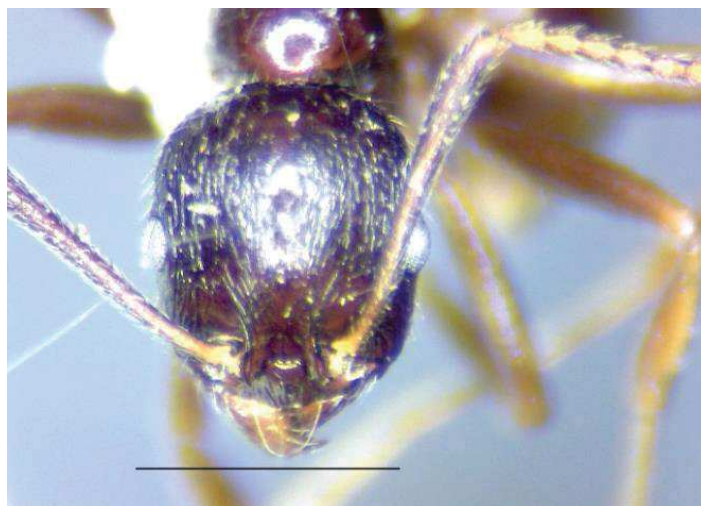


Plate 5. *Aphaenogaster carbonaria* worker (Baja Colorado Sur, México, CWEM, W. Mackay photographer). The scale bars are 1 mm.

Worker

509

Aphaenogaster carolinensis

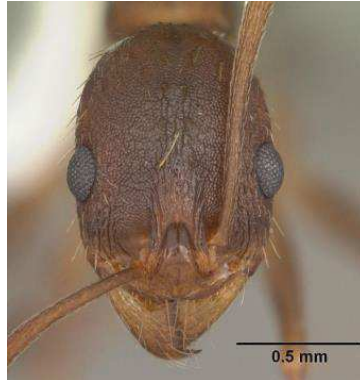


Plate 6. *Aphaenogaster carolinensis* worker (from wwwAnt-Web.org, April Nobile photographer).



Plate 7. *Aphaenogaster carolinensis* female (Tennessee, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

Male

511

Aphaenogaster carolinensis



Plate 8. *Aphaenogaster carolinensis* male (Tennessee, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

flemingi, *Aphaenogaster*

512

Worker



Plate 9. *Aphaenogaster flemingi* worker (from [wwwAntWeb.org](http://www.AntWeb.org), April Nobile photographer).

Worker

513

Aphaenogaster floridana



Plate 10. *Aphaenogaster floridana* worker (from [wwwAntWeb.org](http://www.AntWeb.org), April Nobile photographer).

floridana, *Aphaenogaster*

514

Male

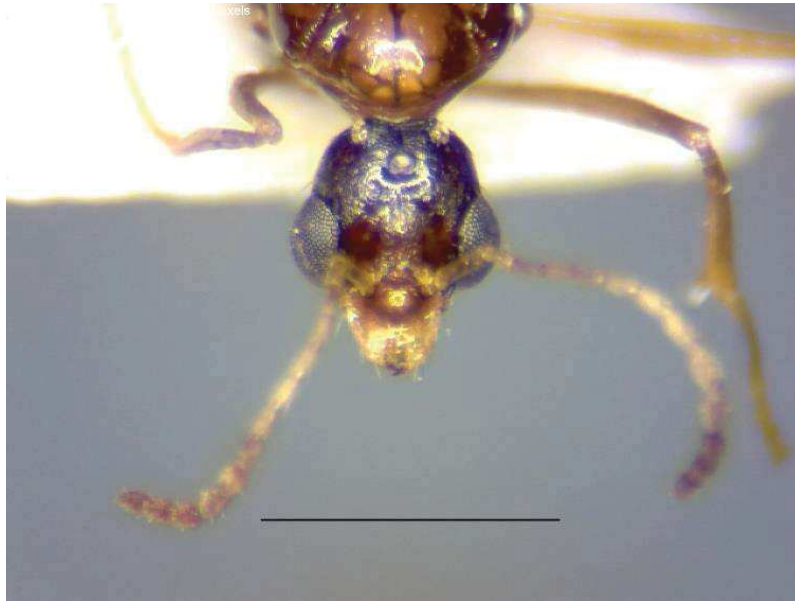


Plate 11. *Aphaenogaster floridana* male (Florida, USA, CWEM, W. Mackay photographer). The insetThe scale bars are 1 mm.

Worker

515

Aphaenogaster fulva



Plate 12. *Aphaenogaster fulva* worker (type, from wwwAnt-Web.org, Christiana Klingenberg photographer).

fulva, *Aphaenogaster*

516

Female



Plate 13. *Aphaenogaster fulva* female (Alabama, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

Male

517

Aphaenogaster fulva



Plate 14. *Aphaenogaster fulva* male (North Carolina, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

honduriana, *Aphaenogaster*

518

Worker



Plate 15. *Aphaenogaster honduriana* worker (from wwwAnt-Web.org, Estella Ortega photographer).

Worker

519

Aphaenogaster huachucana

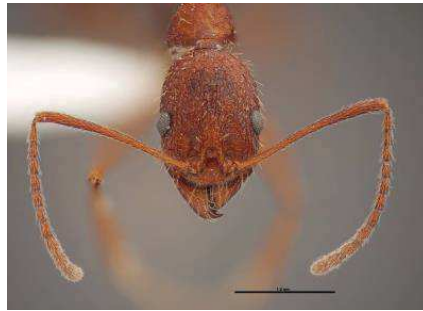


Plate 16. *Aphaenogaster huachucana* worker (from wwwAnt-Web.org, Gracen Brilmyer photographer).

huachucana, *Aphaenogaster*

520

Female



Plate 17. *Aphaenogaster huachucana* female (Arizona, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

Male

521

Aphaenogaster huachucana

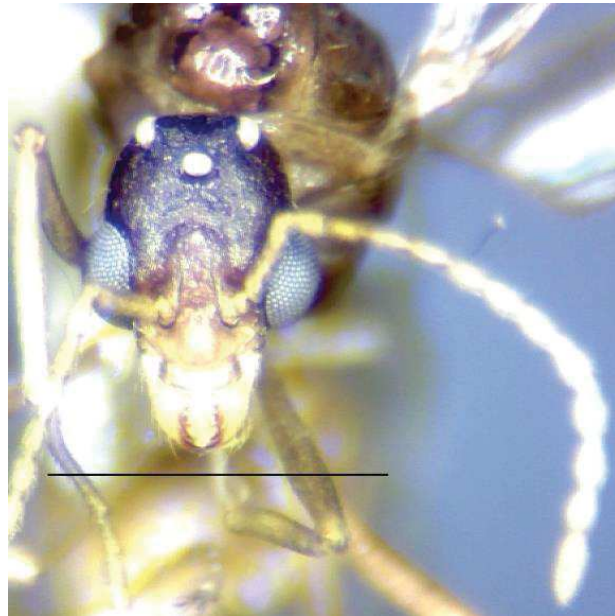


Plate 18. *Aphaenogaster huachucana* male (Arizona, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

inermis, *Aphaenogaster*

522

Worker



Plate 19. *Aphaenogaster inermis* worker (from www.AntWeb.org, Estella Ortega photographer).

Worker

523

Aphaenogaster lamellidens



Plate 20. *Aphaenogaster lamellidens* syntype worker (from wwwAntWeb.org).



Plate 21. *Aphaenogaster lamellidens* female (Virginia, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

Male

525

Aphaenogaster lamellidens

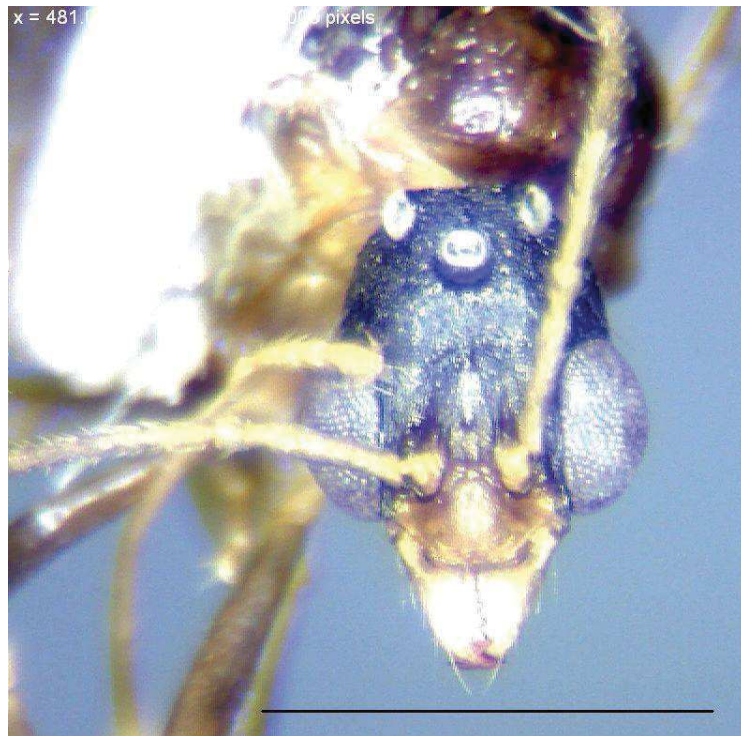


Plate 22. *Aphaenogaster lamellidens* male (Arizona, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

mariae, *Aphaenogaster*

526

Worker



Plate 23 *Aphaenogaster mariae* type worker (from wwwAnt-Web.org, Will Ericson photographer).

Worker

527

Aphaenogaster megommata

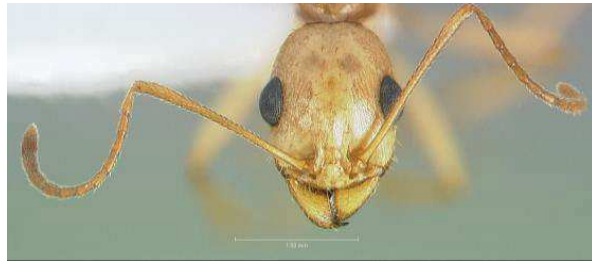


Plate 24. *Aphaenogaster megommata* worker (from wwwAnt-Web.org).

megommata, *Aphaenogaster*

528

Female

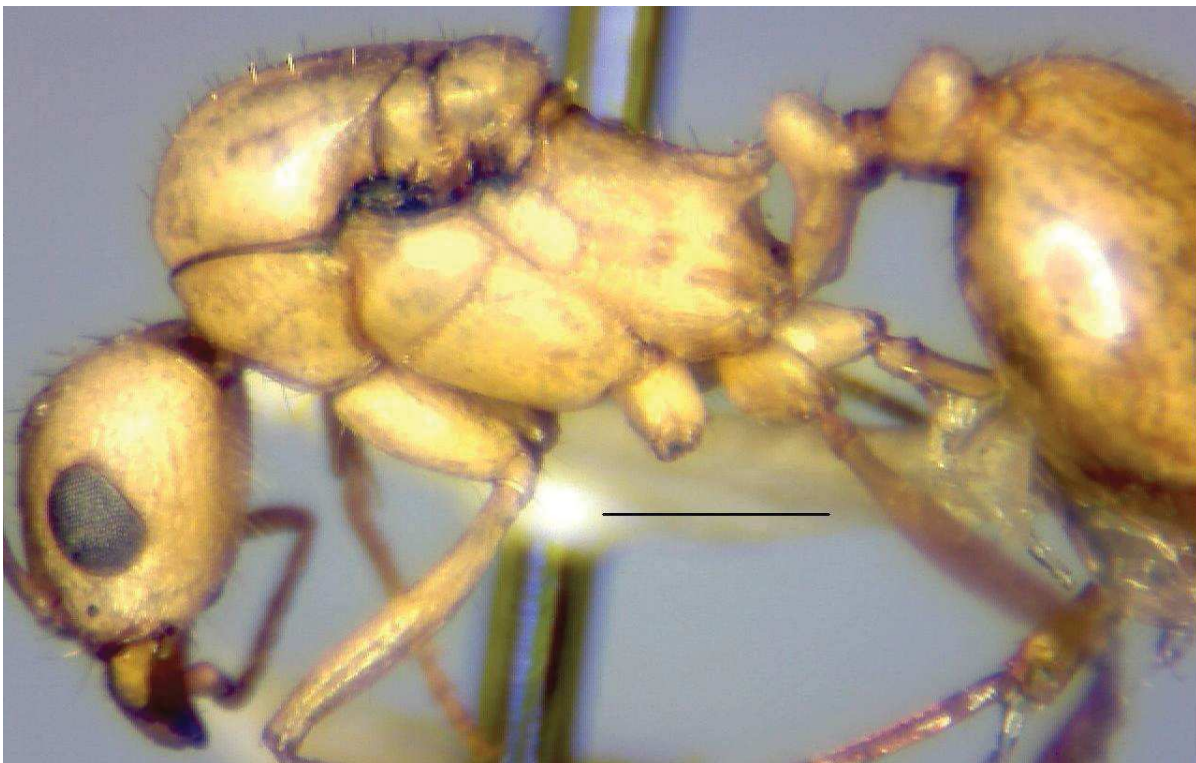


Plate 25. *Aphaenogaster megommata* female (California, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

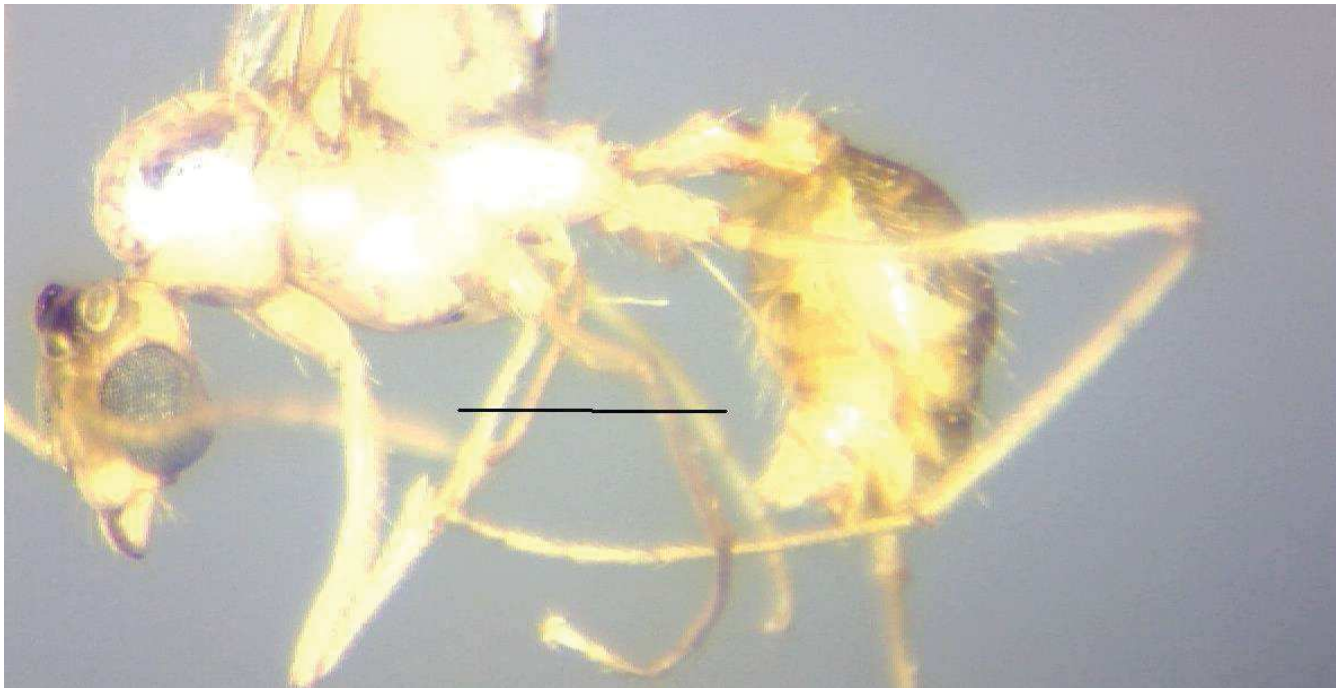
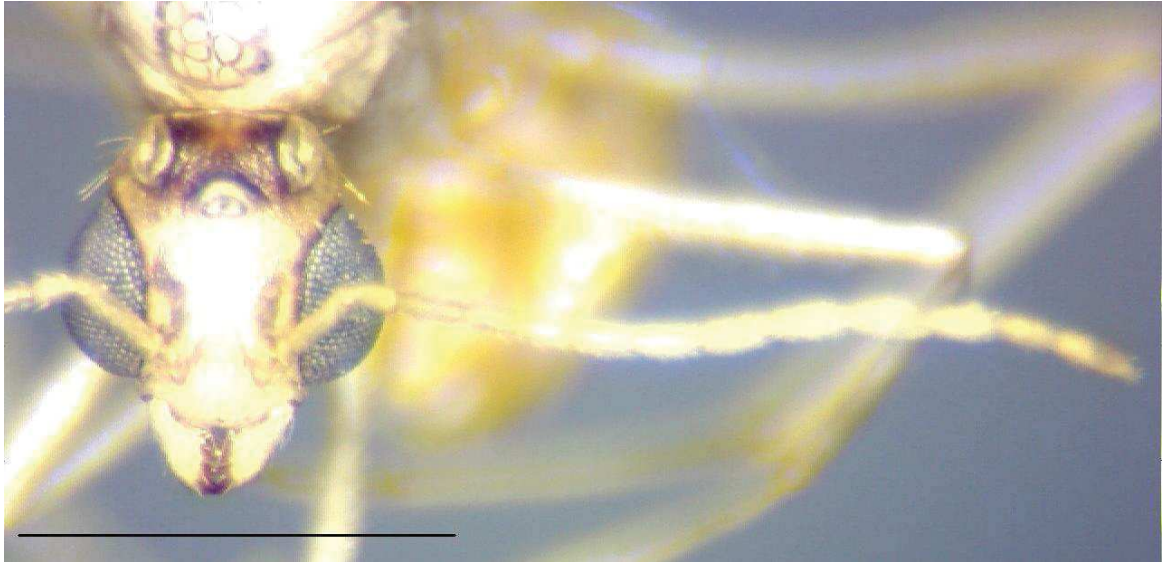


Plate 26. *Aphaenogaster megommata* male (California, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

mexicana, *Aphaenogaster*

530

Worker

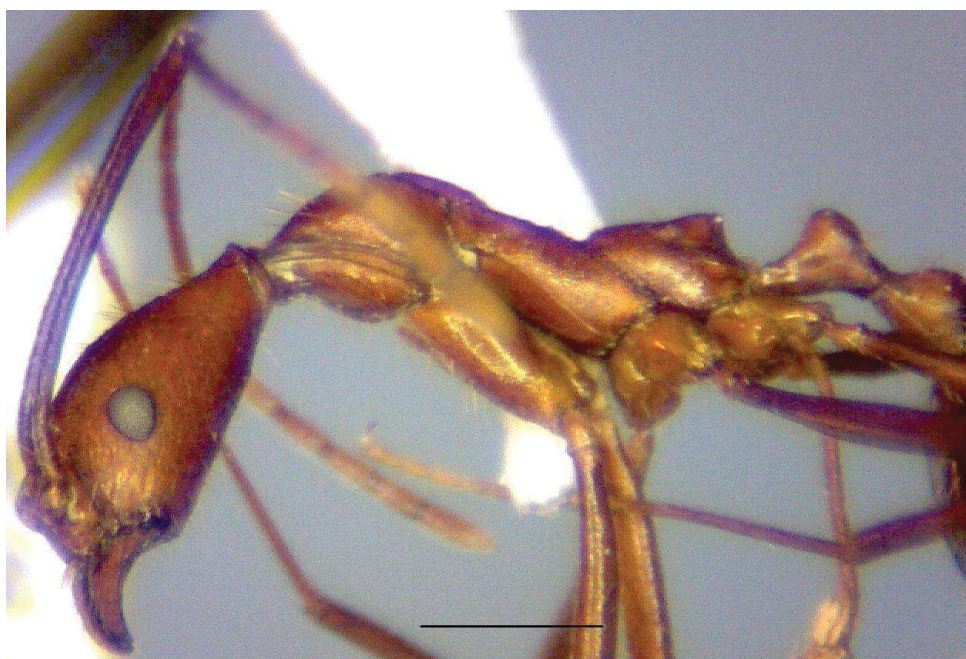
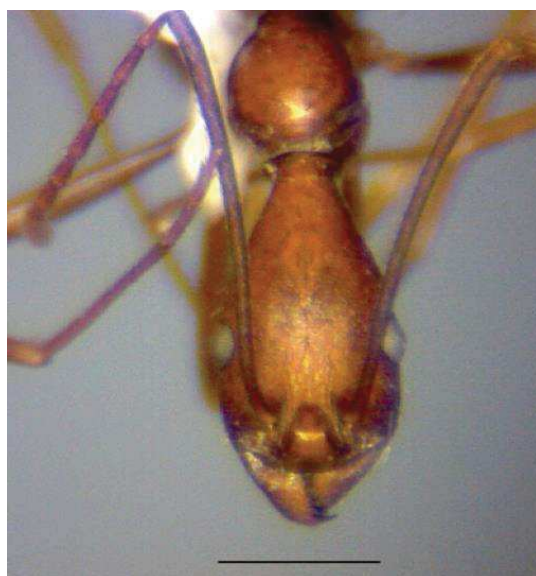


Plate 27. *Aphaenogaster mexicana* worker (Photograph by William Mackay).

Worker

531

Aphaenogaster miamiana



Plate 28. *Aphaenogaster miamiana* worker (from [wwwAntWeb.org](http://www.AntWeb.org), April Nobile photographer).

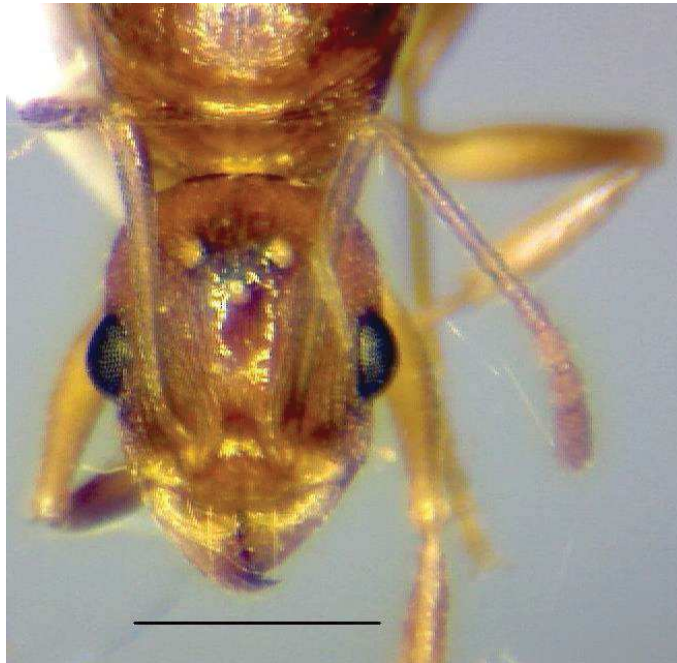


Plate 29. *Aphaenogaster miamiana* female (Arkansas, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

Male

533

Aphaenogaster miamiana

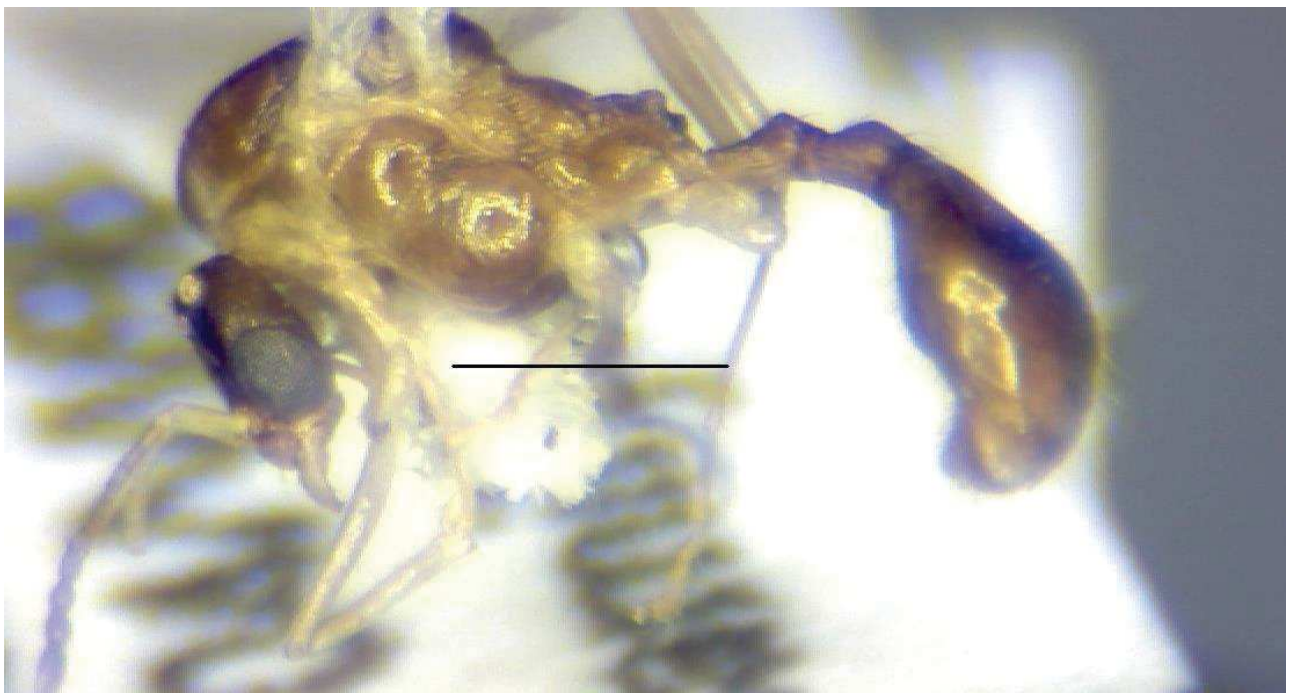


Plate 30. *Aphaenogaster miamiana* male (Arkansas, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.



Plate 31. *Aphaenogaster montana* worker (paratype, CWEM, W. Mackay photographer). The scale bars are 1 mm.

Female

535

Aphaenogaster montana



Plate 32. *Aphaenogaster montana* female (paratype, CWEM, W. Mackay photographer). The scale bars are 1 mm.



Plate 33. *Aphaenogaster montana* male (paratype, CWEM, W. Mackay photographer). The scale bars are 1 mm.

Worker

537

Aphaenogaster mutica



Plate 34. *Aphaenogaster mutica* lectotype worker (from wwwAnt-Web).



Plate 35. *Aphaenogaster occidentalis* type worker (from wwwAnt-Web.org).

Female

539

Aphaenogaster occidentalis



Plate 36. *Aphaenogaster occidentalis* female (California, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

patruelis, *Aphaenogaster*

540

Worker



Plate 37. *Aphaenogaster patruelis* worker (from [wwwAntWeb.org](http://www.AntWeb.org), Will Ericson photographer).

Female

541

Aphaenogaster patruelis

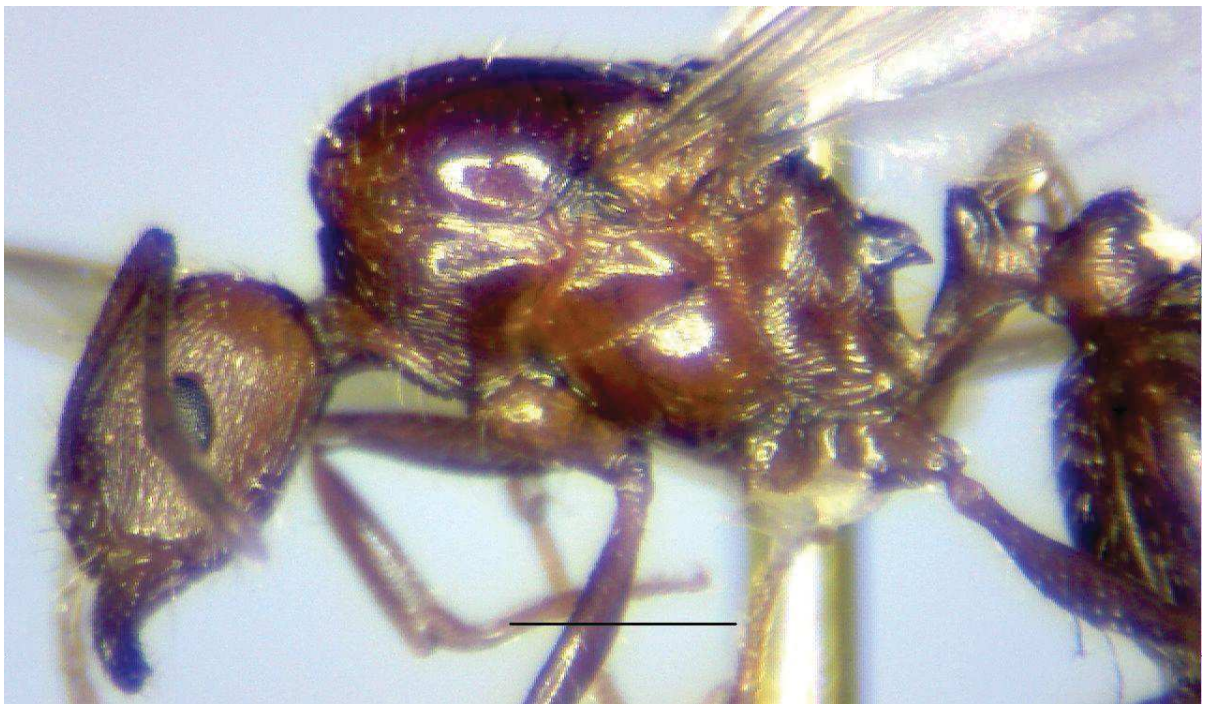


Plate 38. *Aphaenogaster patruelis* female (Guadalupe Island group, Mexico, CWEM, W. Mackay photographer). The scale bars are 1 mm.

phalangium, Aphaenogaster

542

Worker



Plate 39. *Aphaenogaster phalangium* syntype worker (from wwwAntWeb.org, Estella Ortega photographer).

Male

543

Aphaenogaster phalangium

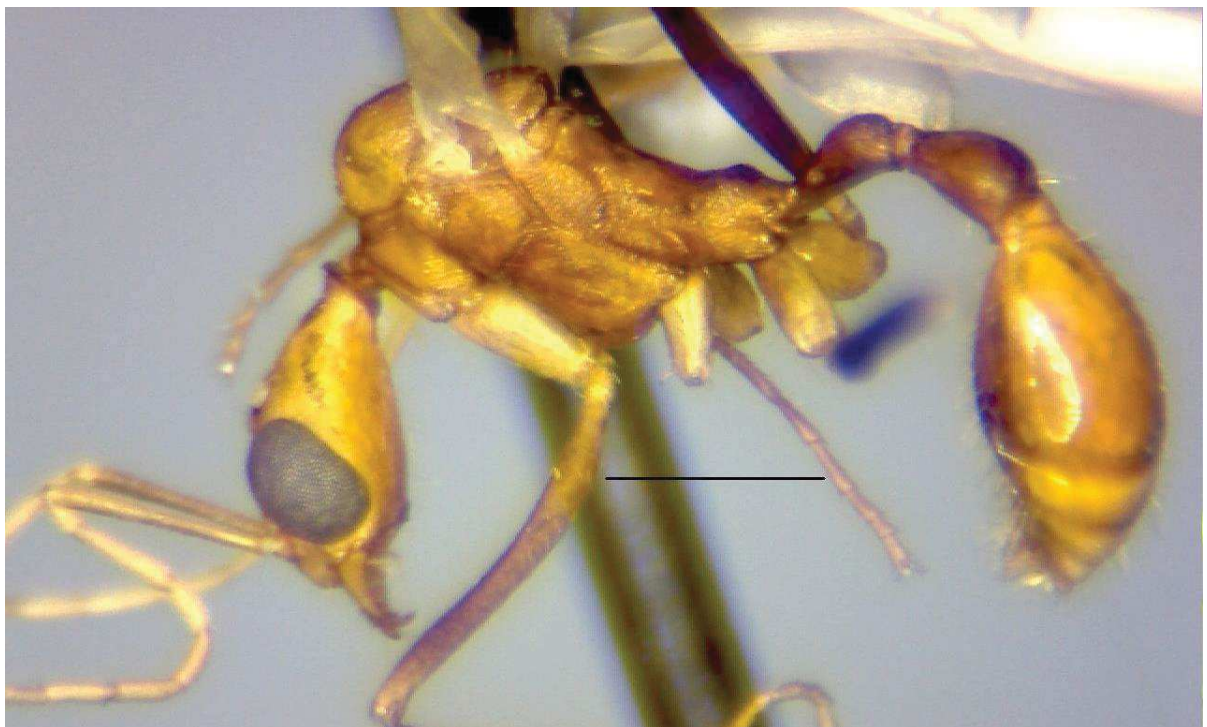
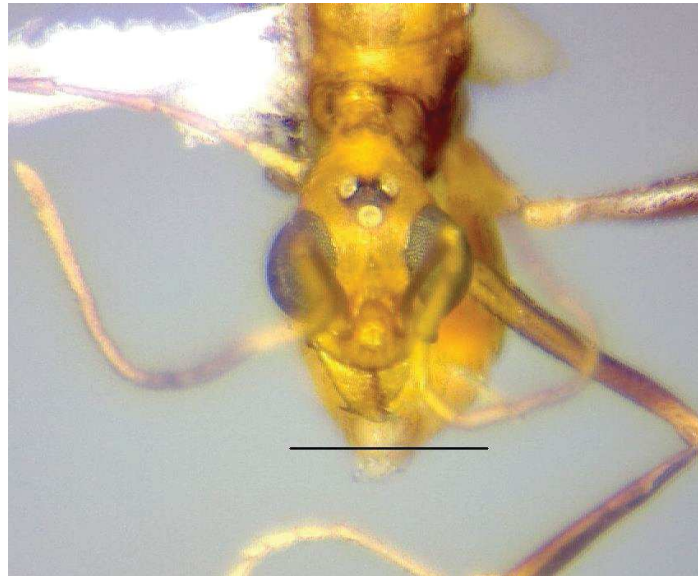


Plate 40. *Aphaenogaster phalangium* male (Izabal, Guatemala, CWEM, W. Mackay photographer). The scale bars are 1 mm.

picea, *Aphaenogaster*

544

Worker

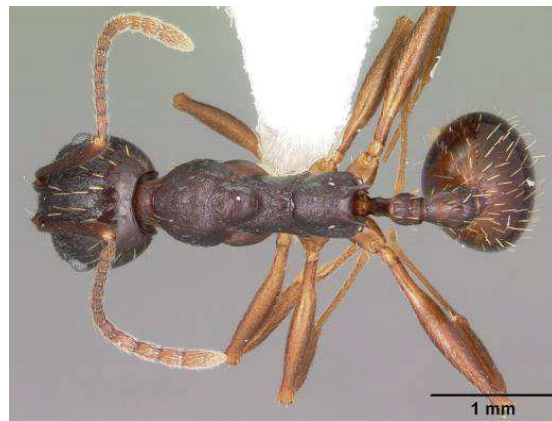


Plate 41 *Aphaenogaster picea* worker (from wwwAntWeb.org, April Nobile photographer).

Female

545

Aphaenogaster picea

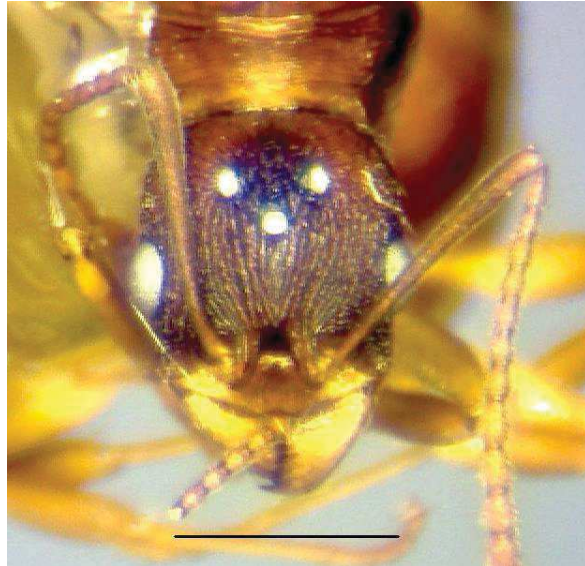


Plate 42. *Aphaenogaster picea* female (Georgia, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

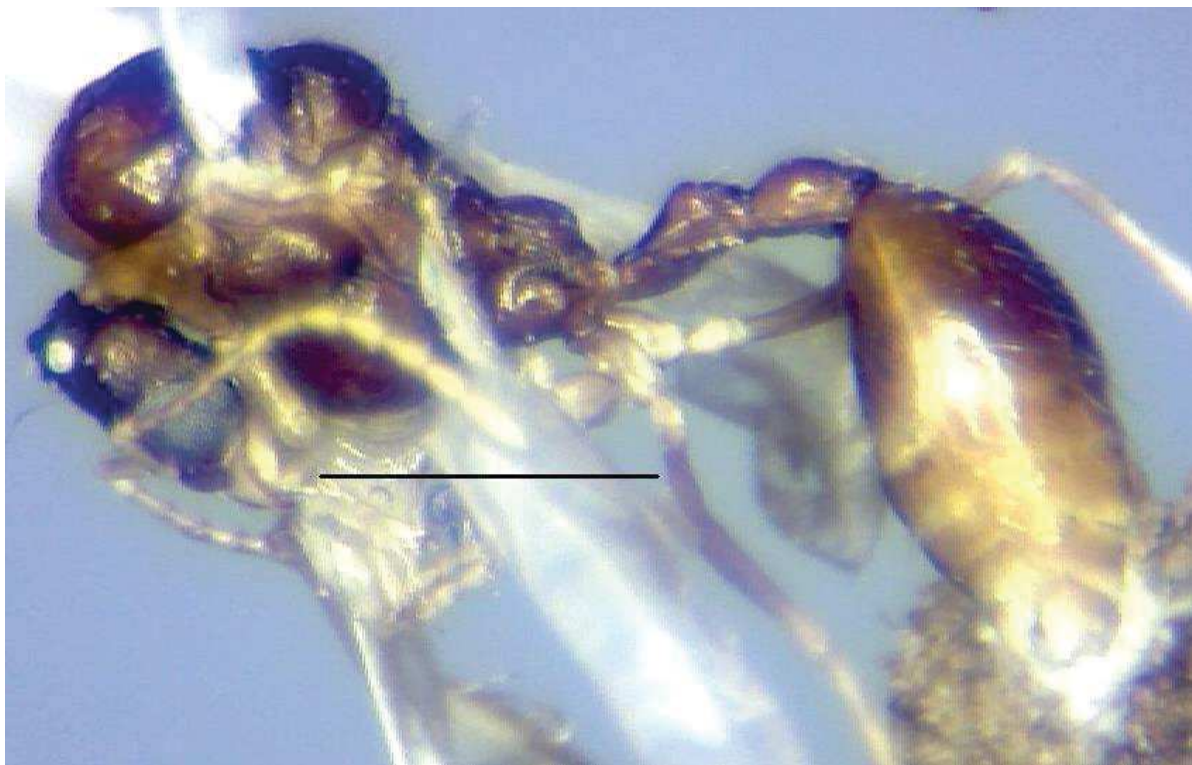


Plate 43. *Aphaenogaster picea* male (Georgia, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

Worker

547

Aphaenogaster punctaticeps

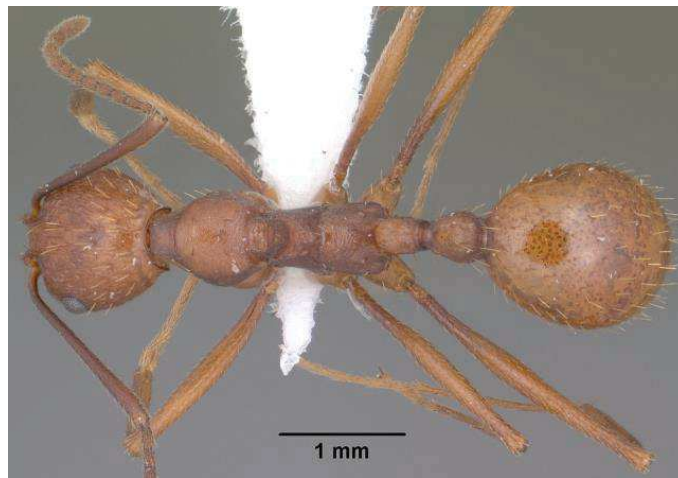
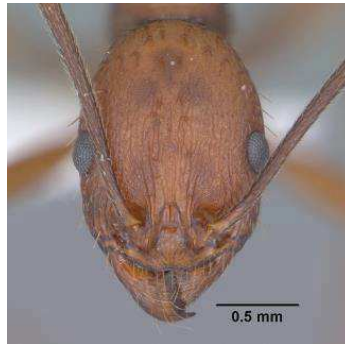


Plate 44. *Aphaenogaster punctaticeps* worker (from wwwAnt-Web.org, Jen Fogarty photographer).



Plate 45. *Aphaenogaster punctatissima* paratype worker (CWEM).
The scale bars are 1 mm.

Worker

549

Aphaenogaster relictus



Plate 46. *Aphaenogaster relictus* cotype worker (from wwwAnt-Web.org, Ryan Perry photographer).



Plate 47. *Aphaenogaster reticulaticeps* paratype worker (CWEM).
The scale bars are 1 mm.

Female

551 *Aphaenogaster reticulaticeps*

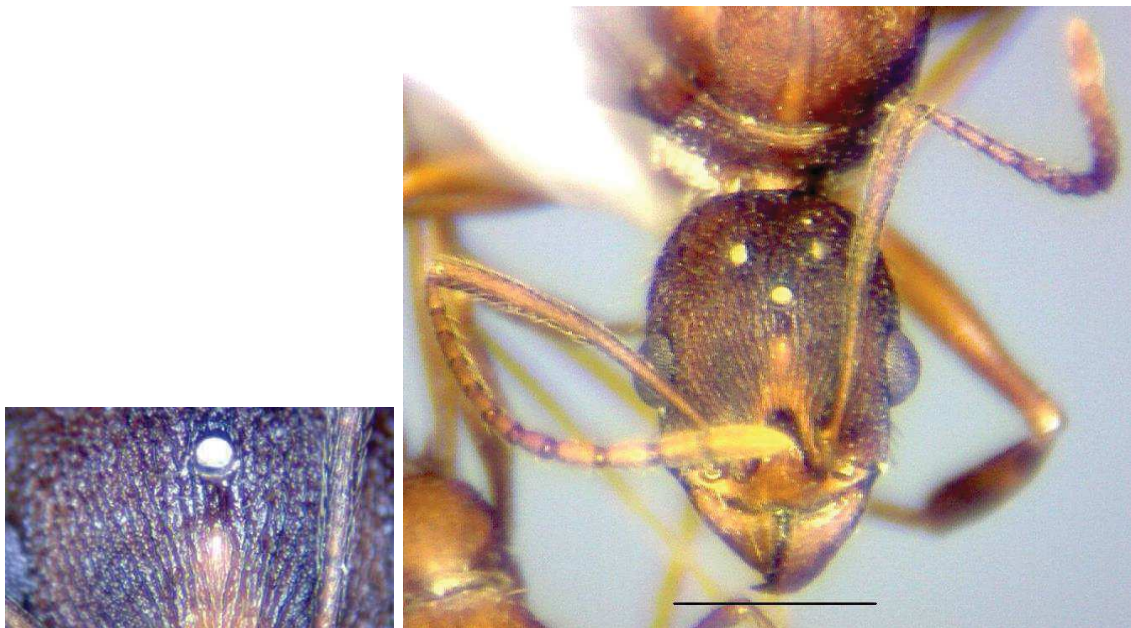


Plate 48. *Aphaenogaster reticulaticeps* paratype female (CWEM).
The scale bars are 1 mm.



Plate 49. *Aphaenogaster reticulaticeps* paratype male (CWEM).
The scale bars are 1 mm.

Worker

553

Aphaenogaster rudis



Plate 50. *Aphaenogaster rudis* worker (from www.AntWeb.org, April Nobile photographer).

rudis, *Aphaenogaster*

554

Female



Plate 51. *Aphaenogaster rudis* female (Tennessee, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

Male

555

Aphaenogaster rudis

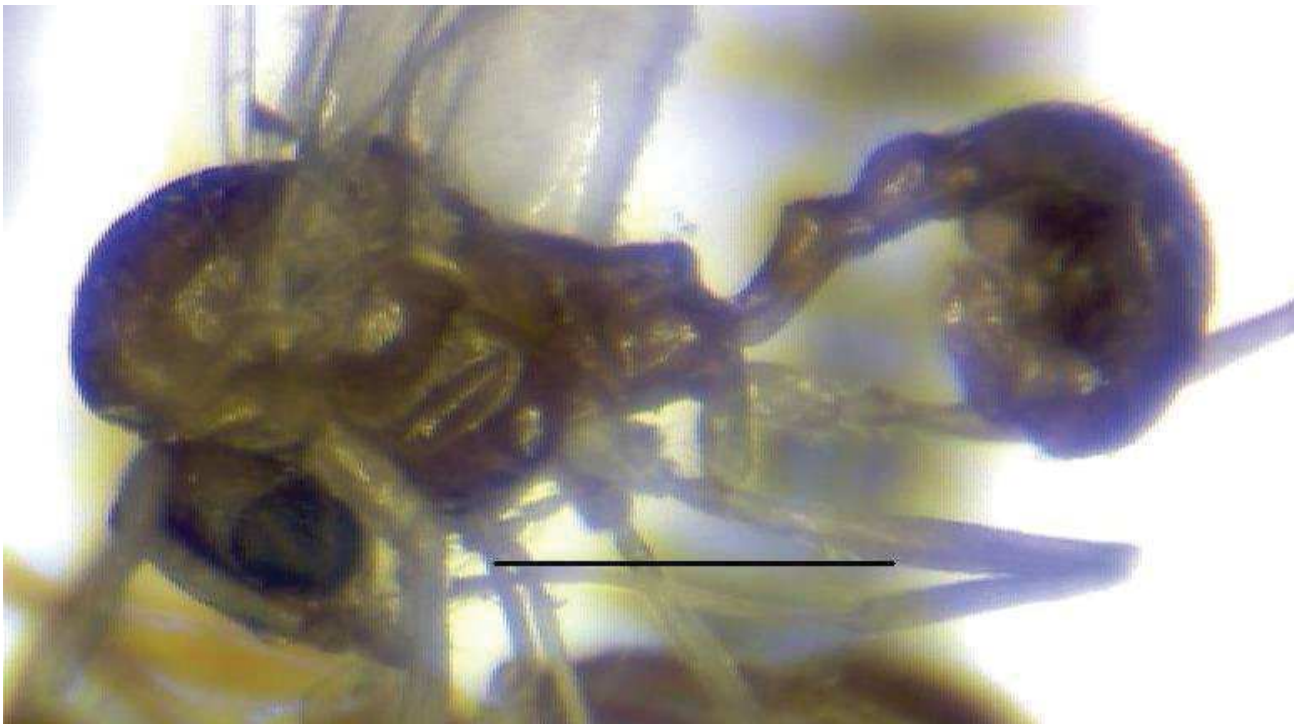


Plate 52. *Aphaenogaster rudis* male (Tennessee, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

smithi, *Aphaenogaster*

556

Worker

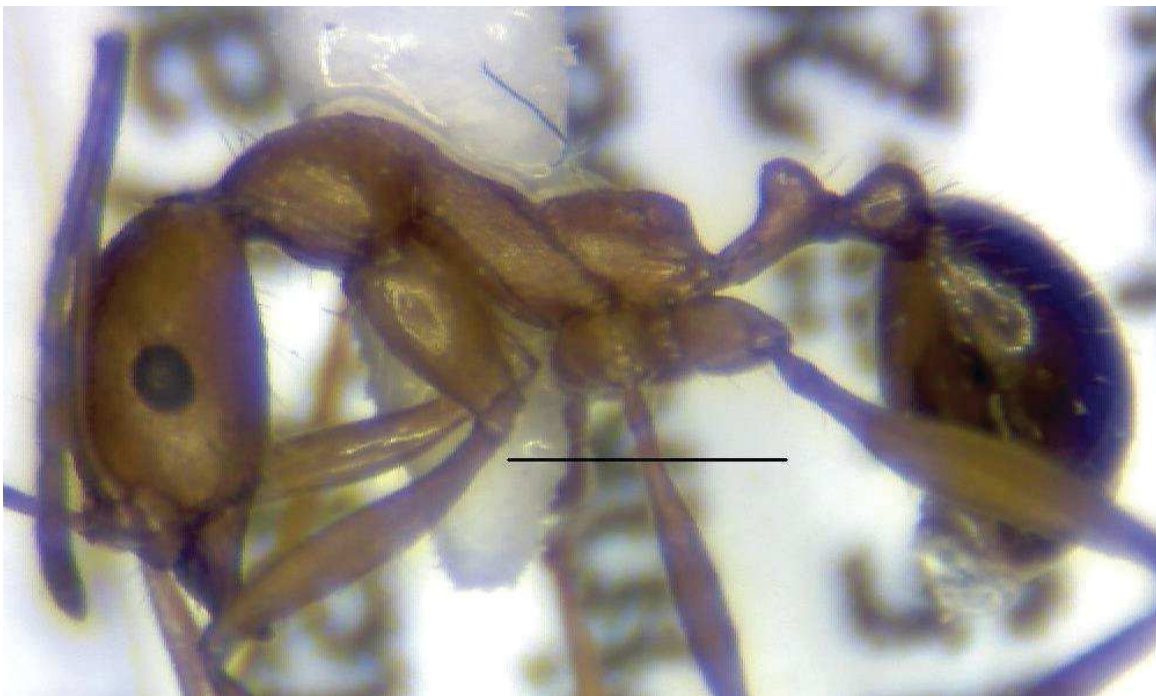
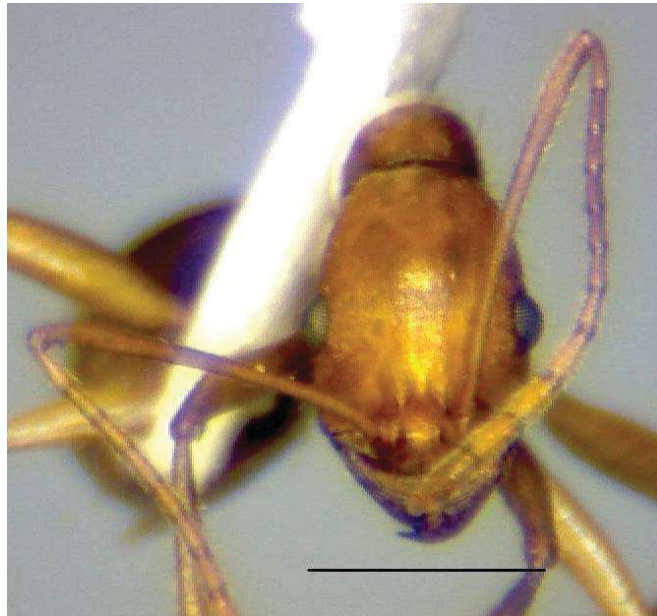


Plate 53. *Aphaenogaster smithi* worker (Utah, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

Female

557

Aphaenogaster smithi



Plate 54. *Aphaenogaster smithi* female (Utah, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

tennesseensis, *Aphaenogaster* 558

Worker



Plate 55. *Aphaenogaster tennesseensis* type worker (from wwwAntWeb.org).

Female

559

Aphaenogaster tennesseensis



Plate 56. *Aphaenogaster tennesseensis* female (Indiana, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

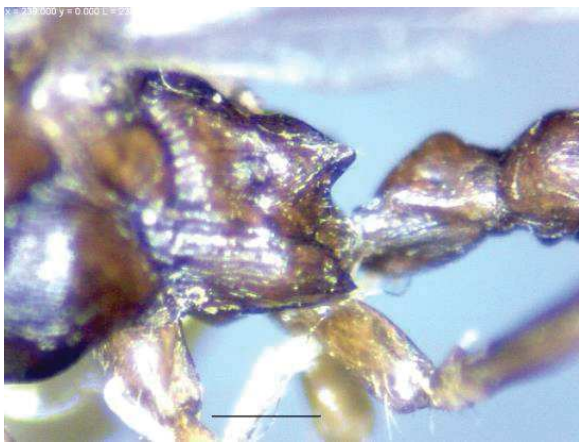


Plate 57. *Aphaenogaster tennesseensis* male (Indiana, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

Worker

561

Aphaenogaster texana



Plate 58. *Aphaenogaster texana* worker (from wwwAntWeb.org, Alexandra Westrich photographer).

texana, *Aphaenogaster*

562

Female



Plate 59. *Aphaenogaster texana* female (Texas, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

Male

563

Aphaenogaster texana

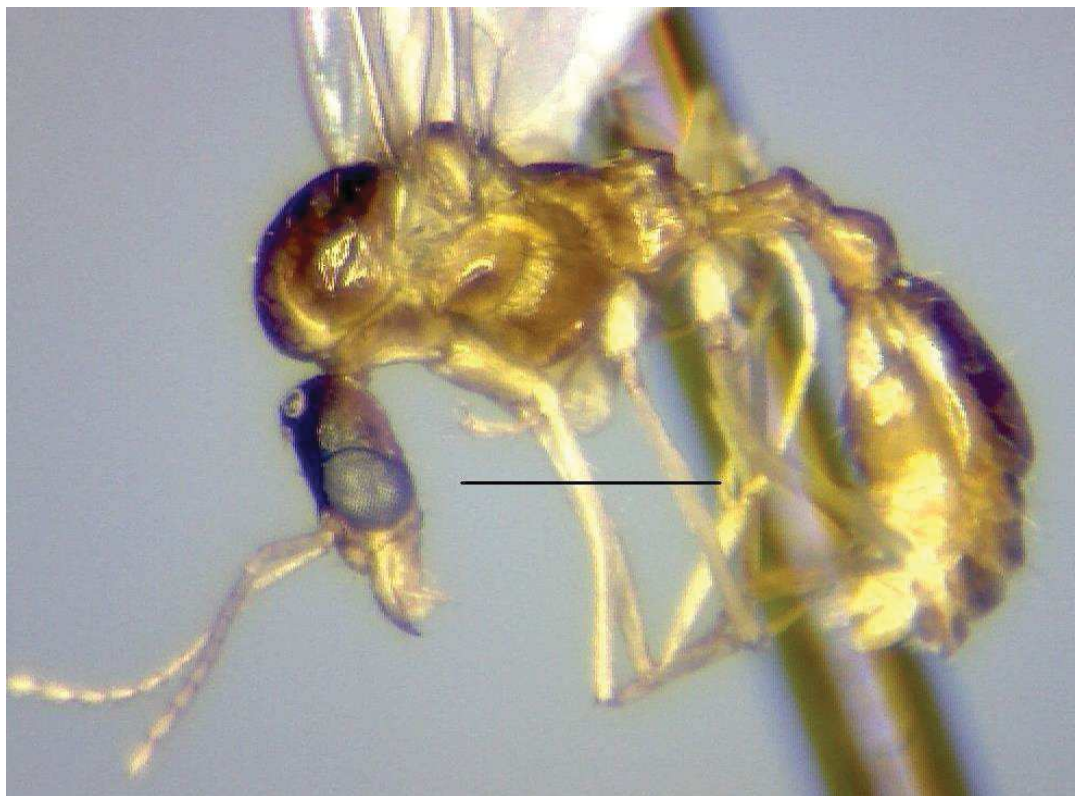


Plate 60. *Aphaenogaster texana* male (Texas, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

treatae, *Aphaenogaster*

564

Worker



Plate 61. *Aphaenogaster treatae* lectotype worker (from wwwAnt-Web.org, Zach Lieberman photographer).

Female

565

Aphaenogaster treatae

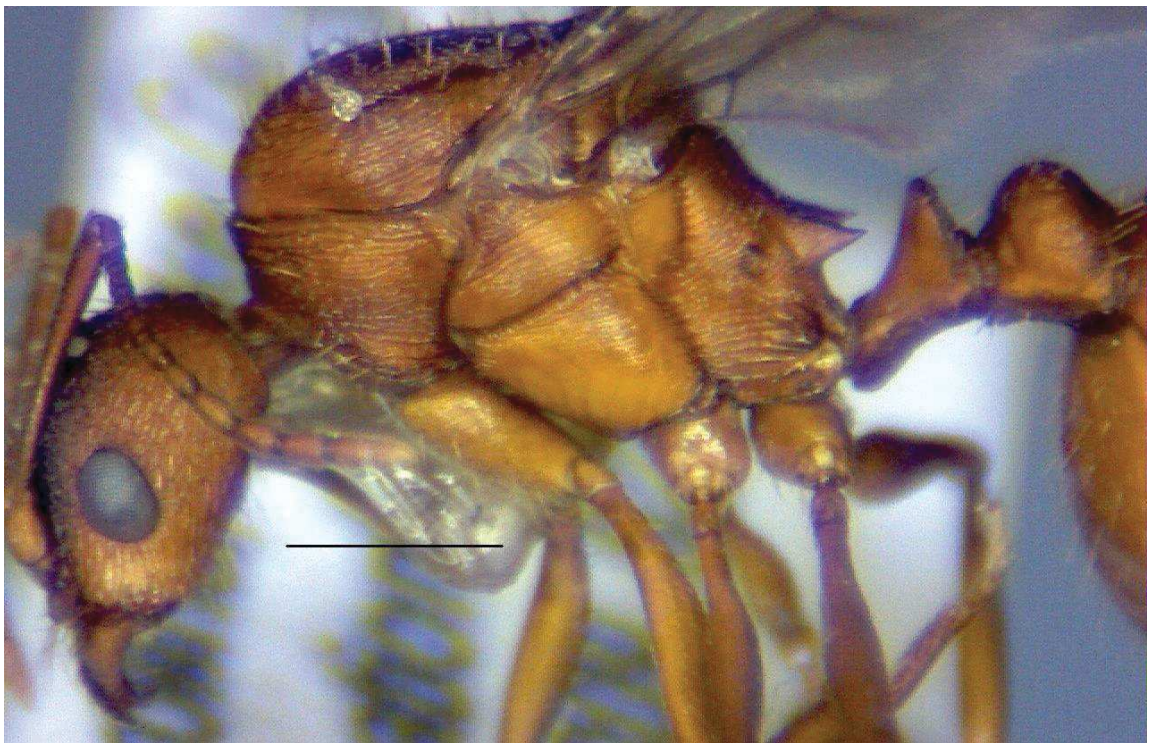


Plate 62. *Aphaenogaster treatae* female (North Carolina, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

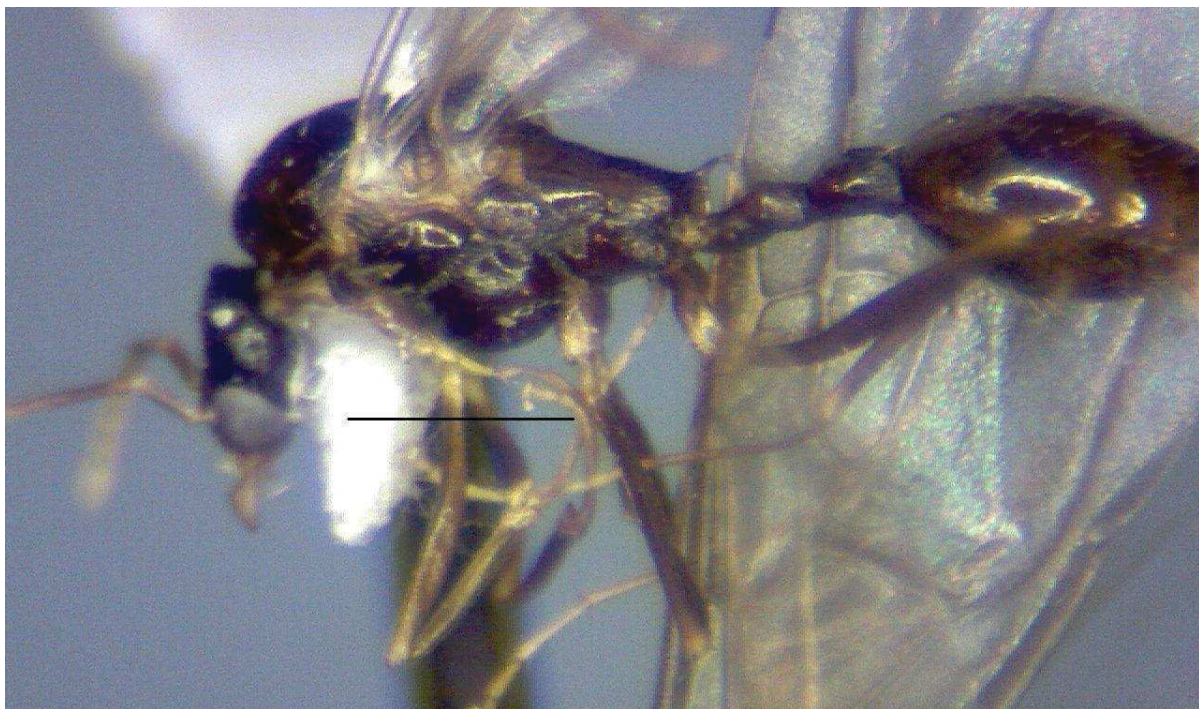
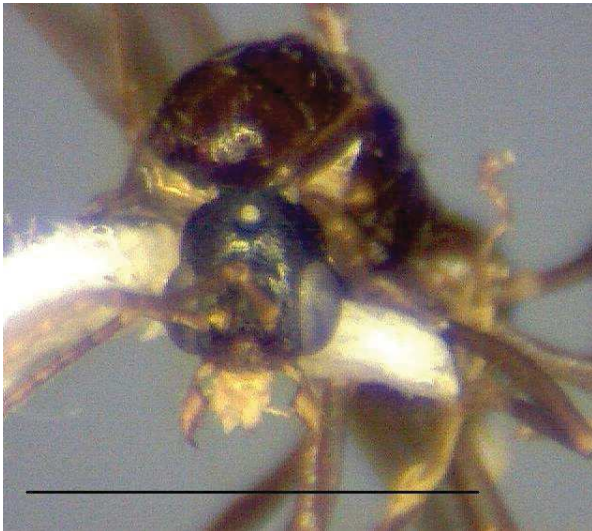


Plate 63. *Aphaenogaster treatae* male (North Carolina, USA, CWEM, W. Mackay photographer). The scale bars are 1 mm.

Worker

567

Aphaenogaster uinta



Plate 64. *Aphaenogaster uinta* worker (paratype, from wwwAnt-Web.org, Gracen Brilmyer photographer).

umphreyi, *Aphaenogaster*

568

Worker



Plate 65. *Aphaenogaster umphreyi* paratype worker (from wwwAntWeb.org, Ryan Perry photographer).

Worker

569

Novomessor albisetosus



Plate 66. *Novomessor albisetosus* syntype worker (from AntWeb, Ryan Perry photographer).

albisetosus, *Novomessor*

570

Female

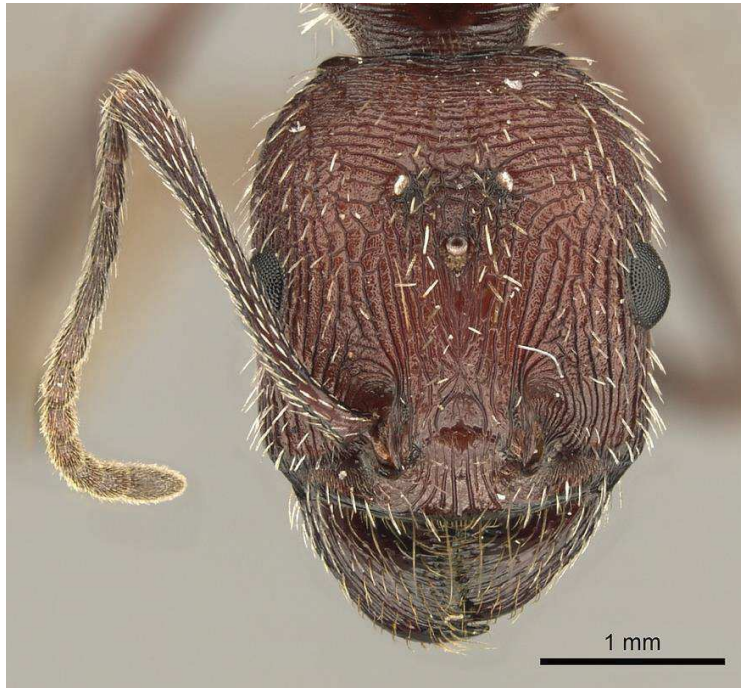


Plate 67. *Novomessor albisetosus* female (from AntWeb, Zach Lieberman photographer).

Male

571

Novomessor albisetosus

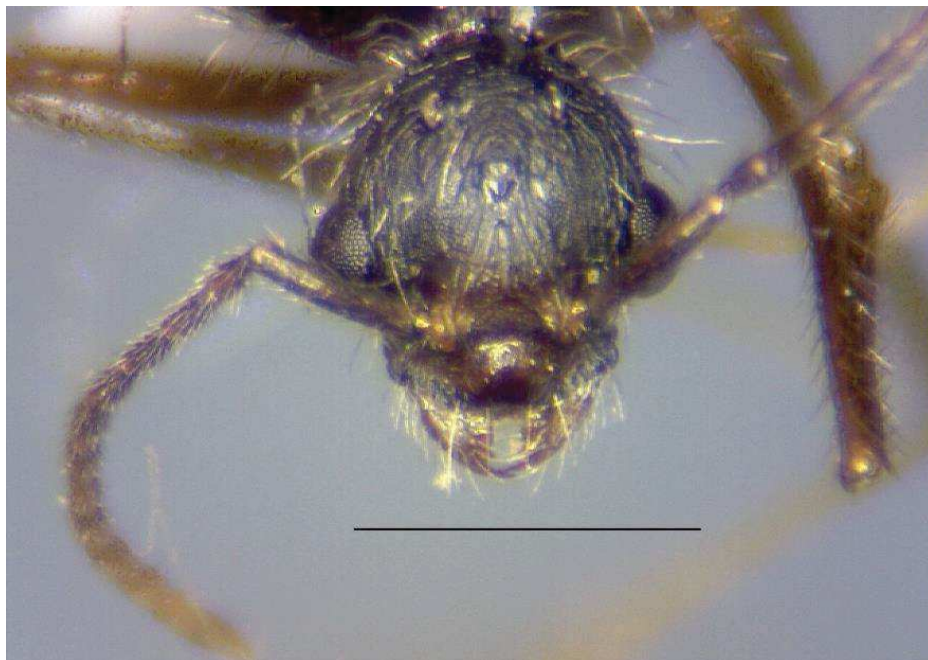


Plate 68. *Novomessor albisetosus* male (William Mackay photographer). The scale bars are 1 mm.

cockerelli, *Novomessor*

572

Worker



Plate 69. *Novomessor cockerelli* type worker (from AntWeb, Zach Lieberman photographer).

Female

573

Novomessor cockerelli



Plate 70. *Novomessor cockerelli* female (William Mackay photographer). The scale bars are 1 mm.

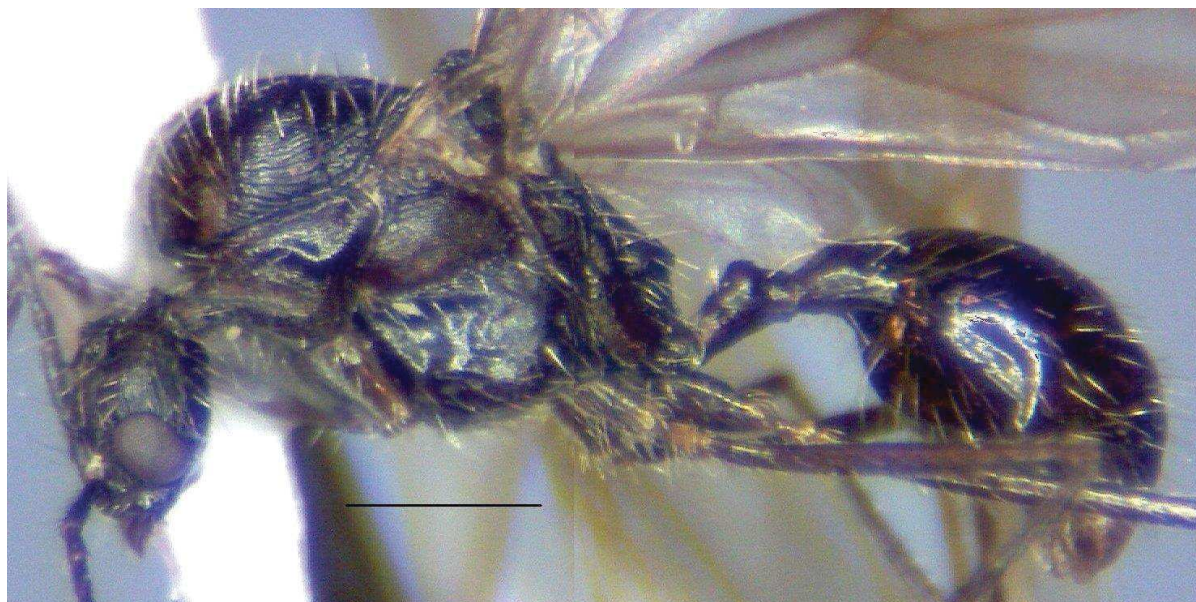


Plate 71. *Novomessor cockerelli* male (William Mackay photographer). The scale bars are 1 mm.

Worker

575

Aphaenogaster ensifera



Plate 72. *Novomessor ensifer* type worker (from AntWeb, Zach Lieberman photographer).

INDEX

A

aggressive.....	262, 289, 318, 329, 364, 397, 424, 453, 462
<i>alabamensis</i>	= treatae
<i>Aphaenogaster (Deromyrma) ensifera</i>	= <i>Novomessor ensifer</i>
<i>Aphaenogaster albisetosus</i>	= <i>Novomessor albisetosus</i>
<i>Aphaenogaster andrei</i>	= <i>Veromessor andrei</i>
<i>Aphaenogaster araneoides</i>	202
<i>Aphaenogaster ashmeadi</i>	208
<i>Aphaenogaster boulderensis</i>.....	214
<i>Aphaenogaster brevicollis</i>.....	222
<i>Aphaenogaster brevicornis</i>	= <i>Stenammas brevicornis</i>
<i>Aphaenogaster carbonaria</i>	228
<i>Aphaenogaster carolinensis</i>.....	233
<i>Aphaenogaster cockerelli</i>	= <i>Novomessor cockerelli</i>
<i>Aphaenogaster ensifera</i>	= <i>Novomessor ensifer</i>
<i>Aphaenogaster flemingi</i>	241
<i>Aphaenogaster floridana</i>	247
<i>Aphaenogaster fulva</i>	253
<i>Aphaenogaster honduriana</i>	264
<i>Aphaenogaster huachucana</i>	268
<i>Aphaenogaster inermis</i>.....	275
<i>Aphaenogaster julianus</i>	= <i>Veromessor julianus</i>
<i>Aphaenogaster lamellidens</i>	282
<i>Aphaenogaster manni</i>	= <i>Novomessor ensifer</i>

<i>Aphaenogaster mariae</i>	290
<i>Aphaenogaster megommata</i>	298
<i>Aphaenogaster mexicana</i>	306
<i>Aphaenogaster miamiana</i>	310
<i>Aphaenogaster minor</i>	= <i>Novomessor albisetosus</i>
<i>Aphaenogaster montana</i>	320
<i>Aphaenogaster mutica</i>	330
<i>Aphaenogaster occidentalis</i>	335
<i>Aphaenogaster patruelis</i>	346
<i>Aphaenogaster patruelis carbonaria</i>	= <i>carbonaria</i>
<i>Aphaenogaster pergandei</i>	= <i>Veromessor pergandei</i>
<i>Aphaenogaster phalangium</i>	353
<i>Aphaenogaster picea</i>	358
<i>Aphaenogaster punctaticeps</i>	366
<i>Aphaenogaster punctatissima</i>	370
<i>Aphaenogaster relictata</i>	375
<i>Aphaenogaster rudis</i>	389
<i>Aphaenogaster smithi</i>	400
<i>Aphaenogaster sonora</i>	= <i>Novomessor cockerelli</i>
<i>Aphaenogaster subterranea borealis</i>	= <i>Aphaenogaster occidentalis</i>
<i>Aphaenogaster subterranea occidentalis</i>	= <i>Aphaenogaster occidentalis</i>
<i>Aphaenogaster subterranea valida</i>	= <i>Aphaenogaster occidentalis</i>
<i>Aphaenogaster subterranea valida</i> var. <i>manni</i>	= <i>Aphaenogaster occidentalis</i>
<i>Aphaenogaster tennesseeensis</i>	407
<i>Aphaenogaster texana</i>	416
<i>Aphaenogaster treatae</i>	425

<i>Aphaenogaster treatae hardeni</i>	= <i>Aphaenogaster ashmeadi</i>
<i>Aphaenogaster treatae pluteicornis</i> var. <i>oklahomensis</i>	= <i>treatae</i>
<i>Aphaenogaster uinta</i>	434
<i>Aphaenogaster umphreyi</i>	441
<i>Apterostigma auriculatum</i>	44
<i>aquia</i>	= <i>fulva</i>
<i>Araeoschizus armatus</i>	305
<i>Araeoschizus</i> sp.	305
<i>araneoides</i> var. <i>canalis</i>	= <i>inermis</i>
<i>araneoides</i> var. <i>inermis</i>	= <i>inermis</i>
<i>araneoides</i> var. <i>nitidiventris</i>	= <i>inermis</i>
<i>Arenivaga</i> sp.....	464
Argentine ant.....	345
<i>Atta laevis</i>	= <i>Aphaenogaster texana</i>
<i>Atta tennesseensis</i>	= <i>Aphaenogaster tennesseensis</i>
<i>Atta texana</i>	246
<i>azteca</i>	= <i>miamiana</i>

B

BAHAMAS

<i>A. miamiana</i>	318
<i>bakeri</i>	= <i>patruelis</i>
bee	397
<i>borealis</i>	= <i>occidentalis</i>
brain	221

C

Camponotus sericeiventris..... 388

CANADA

British Columbia

A. occidentalis..... 344

Nova Scotia

A. picea 363

Ontario

A. picea 363

A. rudis..... 396

A. tennesseensis..... 414

A. treatae..... 430

Saskatchewan

A. occidentalis..... 344

canalis = *inermis*

cattle grazing 304

Centaurea maculosa 345, 483

cerambycid beetle 296, 433

Cerambycidae..... 246, 415, 433, 495

Chorizococcus arborvitus 345

chromosomes..... 289

Clave para las obreras del subgrupo *texana* 148

Claves del complejo *subterranea*

hembras 168

machos 185

obreras 131

Claves para complejo *phalangium*

machos	59
obreras	53

Claves para los géneros y complejos de especies

hembras	29
machos	30
obreras	25

Claves para *Novomessor*

hembras	40
machos	41
obreras	37

COLOMBIA

<i>A. araneoides</i>	205
----------------------------	-----

Chocó

<i>A. inermis</i>	280
-------------------------	-----

<i>A. phalangium</i>	356
----------------------------	-----

competition	463
-------------------	-----

<i>Conibiosoma elongatum</i>	305
------------------------------------	-----

cookie	369
--------------	-----

<i>Corema conradii</i>	433, 482
------------------------------	----------

COSTA RICA

Alajuela

<i>A. araneoides</i>	205
----------------------------	-----

Cartago

<i>A. araneoides</i>	205
----------------------------	-----

<i>A. phalangium</i>	356
----------------------------	-----

Guanacaste	
<i>A. inermis</i>	280
Heredia	
<i>A. araneoides</i>	205
Limón	
<i>A. araneoides</i>	205
Puntarenas	
<i>A. araneoides</i>	205
<i>A. phalangium</i>	356
<i>Cremastocheilus variolosus</i>	263
<i>Crematogaster</i>	433
<i>crinimera</i>	= <i>texana</i>
crowberry.....	433, 482
<i>Cupressus guadalupensis</i>	352
D	
diaspore.....	398, 482
E	
<i>ecalcaratum</i>	= <i>tennesseensis</i>
EL SALVADOR	
<i>A. araneoides</i>	205
eliaosome.....	365, 397
<i>epinotalis</i>	= <i>relicta</i>
F	
<i>Formica</i>	263
<i>Formica dolosa</i>	433

<i>Formica nitidiventris</i>	365
<i>Formica rufa</i> group	364
<i>fulva picea</i>	= <i>picea</i>
<i>fulva</i> var. <i>azteca</i>	= <i>miamiana</i>
<i>fulva</i> var. <i>pusilla</i>	<i>fulva</i>
<i>fulva</i> var. <i>rubida</i>	= <i>fulva</i>
<i>fulva</i> var. <i>rudis</i>	= <i>rudis</i>
<i>furvescens</i>	= <i>texana</i>

G

genome size	263, 433, 472
ground nesting bees	397
Gryllidae	305

GUATEMALA

Izabal

<i>A. phalangium</i>	356
gypsy moth	397, 415, 472

H**HAITI**

<i>A. relictta</i>	377
<i>hardeni</i>	= <i>ashmeadi</i>

HONDURAS

Atlántida

<i>A. phalangium</i>	356
<i>A. honduriana</i>	266

Cortés

<i>A. araneoides</i>	205
hoverfly parasite.....	263
<i>huachucana crinimera</i>	= <i>texana</i>
<i>Hypoponera</i>	263

I

interacting pairs of species	240, 289
<i>Ischnomyrmex albisetosus</i>	= <i>Novomessor albisetosus</i>
<i>Ischnomyrmex cockerelli</i>	= <i>Novomessor cockerelli</i>
<i>Ischnomyrmex mexicanus</i>	= <i>Aphaenogaster mexicana</i>

K

kangaroo rat mounds	369
---------------------------	-----

Keys to Novomessor

females.....	35
males.....	36
workers.....	32

Keys to phalangium complex

males.....	51
workers.....	44

Keys to species complexes

males.....	23
workers.....	18

Keys to subterranea complex

females.....	98
males.....	115
workers.....	61
knapwood.....	345

L

<i>laevis</i>	= <i>tennesseensis</i>
<i>lamellidens nigripes</i>	= <i>lamellidens</i>
leaf litter.....	207, 227, 267, 357, 374
lethal temperature	461
<i>Linepithema humile</i>	345

M

<i>macrospina</i>	= <i>flemingi</i>
<i>manni</i>	= <i>Novomessor ensifer</i>
<i>manni (subterranea valida)</i>	= <i>occidentalis</i>
Melyridae	305

MEXICO

Aguascalientes

<i>N. cockerelli</i>	459
----------------------------	-----

Baja California

<i>A. boulderensis</i>	219
<i>A. megommata</i>	304
<i>A. patruelis</i>	351
<i>A. texana</i>	422
<i>N. albisetosus</i>	452
<i>N. cockerelli</i>	459

Baja California Sur

<i>A. boulderensis</i>	219
<i>A. carbonaria</i>	231
<i>A. megommata</i>	304
<i>A. mutica</i>	333

Chihuahua

<i>A. huachucana</i> (fossil).....	273
<i>A. mutica</i> ?.....	334
<i>N. albisetosus</i>	452
<i>N. cockerelli</i>	459

Coahuila

<i>N. cockerelli</i>	459
----------------------------	-----

Colima

<i>A. punctatissima</i>	374
<i>N. ensifer</i>	469

Durango

<i>N. albisetosus</i>	452
<i>N. cockerelli</i>	459

Guerrero

N. ensifer 469

Jalisco

A. mexicana 308

A. punctaticeps 367

A. punctatissima 374

N. ensifer 469

Nayarit

A. mexicana 308

Nuevo León

A. mexicana 318

A. montana 327

A. reticulaticeps 384

A. texana 423

N. albisetosus 452

N. cockerelli 459

Puebla

A. mexicana 308

A. reticulaticeps 384

Querétaro

A. reticulaticeps 384

San Luis Potosí

N. cockerelli 459

Sinaloa

N. albisetosus 452

Sonora	
<i>A. boulderensis</i>	219
<i>A. huachucana</i>	273
<i>A. megommata</i>	304
<i>A. texana</i>	423
<i>N. albisetosus</i>	452
<i>N. cockerelli</i>	459
Tamaulipas	
<i>A. reticulaticeps</i>	384
<i>A. texana</i>	423
Zacatecas	
<i>N. albisetosus</i>	452
<i>N. cockerelli</i>	460
<i>Microdon coarctatus</i>	263
<i>minor</i>	= <i>Novomessor albisetosus</i>
mite	263, 415
mixed nests	289, 415
<i>Myrmecocystus mexicanus</i>	463
<i>Myrmecophila manni</i>	305
<i>Myrmecophila</i> sp.	424
<i>Myrmica</i> (<i>Monomorium</i>) <i>aquia</i>	= <i>Aphaenogaster fulva</i>
<i>Myrmica opposita</i>	unplaced taxon in Myrmicinae
<i>Myrmica subruba</i>	= <i>Aphaenogaster tennesseensis</i>

N

<i>nana</i>	= <i>flemingi</i>
nest architecture	212, 252, 432, 461, 493
nest density	399, 453, 461
nest life span	461
nest population	399, 415, 461

NICARAGUA

Rio San Juan

<i>A. araneoides</i>	205
<i>A. inermis</i>	280
<i>nigripes</i>	= <i>lamellidens</i>
<i>nitidiventris</i>	= <i>inermis</i>
<i>Novomessor albisetosus</i>	445
<i>Novomessor cockerelli</i>	455
<i>Novomessor ensifer</i>	465

O

<i>oklahomensis</i>	= <i>treatae</i>
opportunistic species	212, 252, 345, 439
<i>opposita</i>	unplaced taxon in Myrmicinae
optic lobe	221

P**PANAMA**

Bocas del Toro

<i>A. araneoides</i>	205
----------------------------	-----

Chiriquí	
<i>A. brevicollis</i>	226
<i>A. inermis</i>	280
Darién	
<i>A. phalangium</i>	357
Panamá	
<i>A. araneoides</i>	205
<i>A. inermis</i>	280
<i>A. phalangium</i>	356
<i>patruelis willowsi</i>	= <i>patruelis</i>
pebbles.....	11, 453, 454, 461
pest	263, 289
<i>Pheidole ajax</i>	45
<i>Pheidole dentata</i>	289
<i>Pheidole gouldi</i>	46
phorid fly	263, 319
photoperiod	304
<i>Pilopius ocularis</i>	440
pitfall traps	212, 239, 281, 439, 462
<i>pluteicornis</i>	= <i>treatae</i>
<i>Pogonomyrmex barbatus</i>	463
Polyphagidae	464
prairie dog town	369
protozoan communities	463
psalaphid beetle	263
Pselaphidae	440
<i>Pseudacteon</i>	263, 319

Pseudococcidae	305, 345
pseudoscorpion	263, 454, 461
<i>punctithorax</i>	= <i>picea</i>
<i>pusillum</i>	= <i>fulva</i>
<i>Puto atriplicis?</i>	305

Q

<i>Quercus inopina</i>	444
------------------------------	-----

R

recruit nestmates	453, 462
red imported fire ant	246, 474
red oak borer	246, 296, 415, 433, 482, 488, 495
rocky cliff	406
rodent nest	296, 369
<i>rubida</i>	= <i>fulva</i>

S

sand dune	406, 463
sandy soil	433
scarabid beetle	263
seed disperser	289, 365, 397, 482, 484, 498
silverfish	461
<i>silvestrii</i>	= <i>texana</i>
social parasite	296, 398, 415
<i>Solenopsis invicta</i>	246, 433
<i>Solenopsis picea</i>	365
<i>Solenopsis rosellae</i>	365

<i>sonorae</i>	= <i>Novomessor cockerelli</i>
spider	461
<i>Stenamma (Aphaenogaster) treatae</i> var. <i>ashmeadi</i>	= <i>Aphaenogaster ashmeadi</i>
<i>Stenamma albisetosus</i>	= <i>Novomessor albisetosus</i>
<i>Stenamma araneoides</i>	= <i>Aphaenogaster araneoides</i>
<i>Stenamma carbonaria</i>	= <i>Aphaenogaster carbonaria</i>
<i>Stenamma cockerelli</i>	= <i>Novomessor cockerelli</i>
<i>Stenamma fulva</i>	= <i>Aphaenogaster fulva</i>
<i>Stenamma fulva aquia</i> var. <i>texana</i>	= <i>Aphaenogaster texana</i>
<i>Stenamma fulvum aquia</i> var. <i>rude</i>	= <i>rudis</i>
<i>Stenamma fulvum</i> var. <i>piceum</i>	= <i>Aphaenogaster picea</i>
<i>Stenamma lamellidens</i>	= <i>Aphaenogaster lamellidens</i>
<i>Stenamma mariae</i>	= <i>Aphaenogaster mariae</i>
<i>Stenamma patrulee bakeri</i>	= <i>Aphaenogaster patruelis</i>
<i>Stenamma subterranea patruelis</i>	= <i>Aphaenogaster patruelis</i>
<i>Stenamma tennesseense</i> var. <i>ecalcaratum</i>	= <i>tennesseensis</i>
<i>Stenamma tennesseensis</i>	= <i>Aphaenogaster tennesseensis</i>
<i>Stenamma treatae</i>	= <i>treatae</i>
stridulation	454, 462
<i>subrubra</i>	= <i>tennesseensis</i>
subterranean	319, 341, 345, 365, 388, 444, 462

T

<i>Temesiphorus costalis</i>	263
<i>Tenebrio obscurus</i>	398
Tenebrionidae	305

termite	397, 474
<i>texana carolinensis</i>	= <i>carolinensis</i>
<i>texana macrospina</i>	= <i>flemingi</i>
<i>texana nana</i>	= <i>flemingi</i>
<i>texana</i> subsp. <i>punctithorax</i>	= <i>picea</i>
<i>texana</i> var. <i>furvescens</i>	= <i>texana</i>
<i>texana</i> var. <i>miamiana</i>	= <i>miamiana</i>
tool use.....	263, 345, 397, 415, 433, 454, 492
trail pheromone	398, 399
<i>treatae hardeni</i>	= <i>ashmeadi</i>
<i>Trichochoous quadricollis</i>	305

U

UNITED STATES

Alabama

<i>A. ashmeadi</i>	211
<i>A. carolinensis</i>	238
<i>A. flemingi</i>	244
<i>A. floridana</i>	251
<i>A. fulva</i>	260
<i>A. lamellidens</i>	287
<i>A. miamiana</i>	317
<i>A. picea</i>	362
<i>A. rudis</i>	395
<i>A. tennesseensis</i>	413
<i>A. texana</i>	422
<i>A. treatae</i>	430

<i>A. umphreyi</i>	443
Arizona	
<i>A. boulderensis</i>	219
<i>A. huachucana</i>	272
<i>A. megommata</i>	303
<i>A. occidentalis</i>	343
<i>A. punctaticeps</i>	367
<i>A. smithi</i>	405
<i>A. texana</i>	422
<i>N. albisetosus</i>	451
<i>N. cockerelli</i>	459
Arkansas	
<i>A. carolinensis</i>	238
<i>A. fulva</i>	260
<i>A. lamellidens</i>	287
<i>A. mariae</i>	295
<i>A. miamiana</i>	317
<i>A. picea</i>	362
<i>A. rudis</i>	395
<i>A. tennesseensis</i>	413
<i>A. texana</i>	422
<i>A. treatae</i>	430

California

<i>A. boulderensis</i>	219
<i>A. megommata</i>	303
<i>A. occidentalis</i>	343
<i>A. patruelis</i>	351
<i>A. smithi</i>	405
<i>A. uinta</i>	439
<i>N. cockerelli</i>	459

Colorado

<i>A. fulva</i>	260
<i>A. huachucana</i>	272
<i>A. occidentalis</i>	343
<i>A. rudis</i>	395
<i>A. uinta</i>	439

Connecticut

<i>A. fulva</i>	260
<i>A. mariae</i>	295

Delaware

<i>A. tennesseensis</i>	413
-------------------------------	-----

Florida

<i>A. ashmeadi</i>	211
<i>A. carolinensis</i>	238
<i>A. flemingi</i>	244
<i>A. floridana</i>	251
<i>A. fulva</i>	260
<i>A. lamellidens</i>	287
<i>A. mariae</i>	295
<i>A. miamiana</i>	317
<i>A. rudis</i>	395
<i>A. tennesseensis</i>	413
<i>A. texana</i>	422
<i>A. treatae</i>	430
<i>A. umphreyi</i>	443

Georgia

<i>A. carolinensis</i>	238
<i>A. flemingi</i>	244
<i>A. floridana</i>	251
<i>A. fulva</i>	260
<i>A. lamellidens</i>	288
<i>A. miamiana</i>	318
<i>A. picea</i>	362
<i>A. rudis</i>	395
<i>A. tennesseensis</i>	413
<i>A. texana</i>	422
<i>A. treatae</i>	430
<i>A. umphreyi</i>	443

Idaho

<i>A. occidentalis</i>	343
<i>A. uinta</i>	439

Illinois

<i>A. fulva</i>	260
<i>A. lamellidens</i>	288
<i>A. mariae</i>	295
<i>A. rudis</i>	395
<i>A. texana</i>	422
<i>A. treatae</i>	430

Indiana

<i>A. carolinensis</i>	238
<i>A. fulva</i>	260
<i>A. mariae</i>	295
<i>A. picea</i>	362
<i>A. rudis</i>	395
<i>A. tennesseensis</i>	413
<i>A. treatae</i>	430

Iowa

<i>A. mariae</i>	295
<i>A. tennesseensis</i>	413

Kansas

<i>A. fulva</i>	260
<i>A. mariae</i>	295
<i>A. rudis</i>	395
<i>A. tennesseensis</i>	413
<i>A. texana</i>	422

<i>A. treatae</i>	430
Kentucky	
<i>A. flemingi</i>	244
<i>A. fulva</i>	260
<i>A. lamellidens</i>	288
<i>A. rudis</i>	395
<i>A. tennesseensis</i>	413
<i>A. treatae</i>	430
Louisiana	
<i>A. ashmeadi</i>	211
<i>A. carolinensis</i>	238
<i>A. flemingi</i>	244
<i>A. fulva</i>	260
<i>A. lamellidens</i>	288
<i>A. mariae</i> (probably).....	295
<i>A. miamiana</i>	318
<i>A. picea</i>	362
<i>A. rudis</i>	395
<i>A. tennesseensis</i>	413
<i>A. treatae</i>	430
Maine	
<i>A. fulva</i>	260
<i>A. picea</i>	362
Maryland	
<i>A. fulva</i>	260
<i>A. lamellidens</i>	288
<i>A. picea</i>	362

<i>A. tennesseensis</i>	413
Massachusetts	
<i>A. fulva</i>	260
<i>A. picea</i>	363
<i>A. rudis</i>	395
<i>A. treatae</i>	430
Michigan	
<i>A. fulva</i>	260
<i>A. mariae</i>	295
<i>A. rudis</i>	395
<i>A. tennesseensis</i>	413
<i>A. treatae</i>	430
Minnesota	
<i>A. mariae</i>	295
<i>A. tennesseensis</i>	413
Mississippi	
<i>A. carolinensis</i>	238
<i>A. flemingi</i>	244
<i>A. floridana</i>	252
<i>A. fulva</i>	260
<i>A. lamellidens</i>	288
<i>A. mariae</i>	295
<i>A. miamiana</i>	318
<i>A. rudis</i>	395
<i>A. tennesseensis</i>	413
<i>A. texana</i>	422
<i>A. treatae</i>	430

Missouri

<i>A. ashmeadi</i>	211
<i>A. lamellidens</i>	288
<i>A. picea</i>	363
<i>A. rudis</i>	396

Montana

<i>A. occidentalis</i>	343
------------------------------	-----

Nebraska

<i>A. fulva</i>	260
<i>A. tennesseensis</i>	413

Nevada

<i>A. boulderensis</i>	219
<i>A. megommata</i>	303
<i>A. occidentalis</i>	343
<i>A. uinta</i>	439
<i>N. cockerelli</i>	459

New Hampshire

<i>A. picea</i>	363
<i>A. tennesseensis</i>	414

New Mexico

<i>A. boulderensis</i>	219
<i>A. fulva</i>	260
<i>A. huachucana</i>	272
<i>A. occidentalis</i>	343
<i>A. punctaticeps</i>	367
<i>A. smithi</i>	405
<i>N. albisetosus</i>	451

<i>N. cockerelli</i>	459
New York	
<i>A. lamellidens</i>	288
<i>A. mariae</i>	295
<i>A. miamiana</i> ?	318
<i>A. picea</i>	363
<i>A. rudis</i>	396
<i>A. tennesseensis</i>	414
North Carolina	
<i>A. ashmeadi</i>	211
<i>A. carolinensis</i>	238
<i>A. flemingi</i>	244
<i>A. floridana</i>	252
<i>A. fulva</i>	260
<i>A. lamellidens</i>	288
<i>A. mariae</i>	296
<i>A. miamiana</i>	318
<i>A. picea</i>	363
<i>A. rudis</i>	396
<i>A. tennesseensis</i>	414
<i>A. texana</i>	422
<i>A. treatae</i>	430
<i>A. umphreyi</i>	443
North Dakota	
<i>A. occidentalis</i> ?	344

Ohio

<i>A. ashmeadi</i>	211
<i>A. flemingi</i>	244
<i>A. fulva</i>	260
<i>A. lamellidens</i>	288
<i>A. mariae</i>	295, 296
<i>A. picea</i>	363
<i>A. rudis</i>	396
<i>A. tennesseensis</i>	414
<i>A. treatae</i>	430

Oklahoma

<i>A. lamellidens</i>	288
<i>A. tennesseensis</i>	414
<i>A. texana</i>	422
<i>A. treatae</i>	430

Oregon

<i>A. megommata</i>	304
<i>A. occidentalis</i>	343

Pennsylvania

<i>A. fulva</i>	260
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Rhode Island

<i>A. fulva</i>	260
<i>A. picea</i>	363
<i>A. rudis</i>	396
<i>A. treatae</i>	430

South Carolina

<i>A. ashmeadi</i>	211
<i>A. carolinensis</i>	239
<i>A. flemingi</i>	244
<i>A. floridana</i>	252
<i>A. fulva</i>	260
<i>A. lamellidens</i>	288
<i>A. mariae</i>	296
<i>A. miamiana</i>	318
<i>A. picea</i>	363
<i>A. rudis</i>	396
<i>A. tennesseensis</i>	414
<i>A. texana</i>	422
<i>A. treatae</i>	430
<i>A. umphreyi</i>	443

South Dakota

<i>A. occidentalis</i>	343
<i>A. tennesseensis</i>	414

Tennessee

<i>A. ashmeadi</i>	211
<i>A. carolinensis</i>	239
<i>A. fulva</i>	260
<i>A. lamellidens</i>	288
<i>A. mariae</i>	296
<i>A. picea</i>	363
<i>A. rudis</i>	396
<i>A. tennesseensis</i>	414
<i>A. texana</i>	422
<i>A. treatae</i>	430

Texas

<i>A. ashmeadi</i>	211
<i>A. boulderensis</i>	219
<i>A. fulva</i>	261
<i>A. huachucana</i>	272
<i>A. lamellidens</i>	288
<i>A. miamiana</i>	318
<i>A. mutica</i> , actually <i>A. boulderensis</i> ?.....	333
<i>A. punctaticeps</i>	367
<i>A. rudis</i>	396
<i>A. smithi</i>	406
<i>A. tennesseensis</i>	414
<i>A. texana</i>	422
<i>A. treatae</i>	430
<i>N. albisetosus</i>	452
<i>N. cockerelli</i>	459

Utah

<i>A. boulderensis</i>	219
<i>A. huachucana</i>	273
<i>A. occidentalis</i>	343
<i>A. smithi</i>	406
<i>A. uinta</i>	439

Vermont

<i>A. fulva</i>	261
<i>A. picea</i>	363

Virginia

<i>A. carolinensis</i>	239
<i>A. fulva</i>	261
<i>A. lamellidens</i>	288
<i>A. picea</i>	363
<i>A. rudis</i>	396
<i>A. tennesseensis</i>	414
<i>A. texana</i>	422
<i>A. treatae</i>	430

Washington D. C.

<i>A. fulva</i>	261
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West Virginia

<i>A. fulva</i>	261
<i>A. lamellidens</i>	288
<i>A. picea</i>	363
<i>A. rudis</i>	396

Wisconsin

<i>A. carolinensis</i>	239
<i>A. fulva</i>	261
<i>A. picea</i>	363
<i>A. tennesseensis</i>	414

Wyoming

<i>A. occidentalis</i>	344
<i>A. rudis</i>	396

V

<i>valida</i>	= <i>occidentalis</i>
<i>Veromessor relictus epinotalis</i>	= <i>relictus</i>
<i>Viola</i>	263

W

<i>wheeleri</i>	= <i>treatae</i>
<i>willowsi</i>	= <i>patruelis</i>
wing venation.....	297