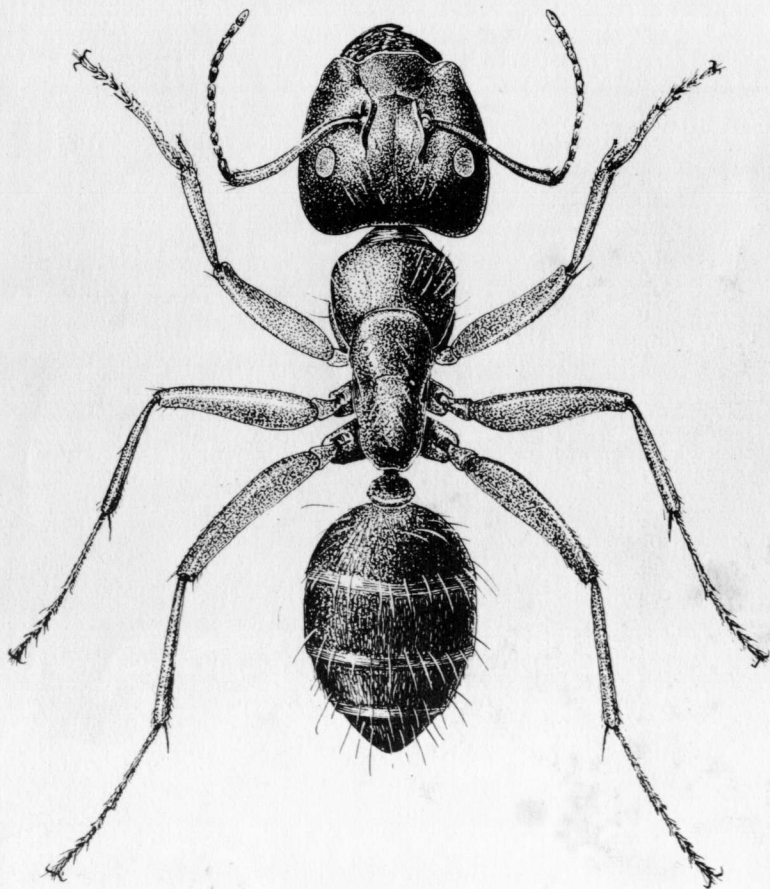


M.R. Smith
WILLIAM L. BROWN 1965

HOUSE-INFESTING ANTS of the EASTERN UNITED STATES

Their Recognition, Biology, and Economic Importance



Technical Bulletin No. 1326
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UNITED STATES DEPARTMENT OF AGRICULTURE

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Cover illustration: Worker of black carpenter ant *Camponotus pennsylvanicus* (DeGeer).

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WILLIAM L. BROWN

**By
Marion R. Smith
Entomology Research Division**

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HOUSE-INFESTING ANTS OF THE EASTERN UNITED STATES:

Their Recognition, Biology, and Economic Importance

By Marion R. Smith,¹ *entomologist, Entomology Research Division, Agricultural Research Service*

INTRODUCTION

Each year numerous requests for information on the identification and control of house-infesting ants are received by various Federal and State agencies, colleges and universities, boards of health, and pest-control operators. Individuals in these organizations who handle such requests find themselves greatly handicapped because of the lack of comprehensive literature dealing with common house-infesting ants. Often they are unable to identify the ants either to genus or species. This bulletin has been prepared to take care of some of the needs of technical and semitechnical workers. However, no attempt has been made to cover the highly specialized field of ant control. Originally, I had hoped to include all house-infesting ants of the United States. Because of the lack of knowledge of these ants in several regions, especially western North America, it was thought best to include only ants of the eastern United States. However, many of the ants discussed occur also in the Western States.

In this bulletin I have furnished keys to species, based on workers of all the well-known, house-infesting ants of the eastern United States. Each species is fully described and figured, and its biology and economic importance discussed. I have also given the available common names of the species (including those approved by the Entomological Society of America); stated whether the ant was introduced, and if so, its probable original home; outlined its range of distribution, especially in the United States; and indicated whether it has been confused with other species. Technical terms are given in a glossary. Important references are listed under each species and also in the bibliography. Because the biology of only a very few ants has been intensively studied, much of the information given is based on miscellaneous observations. Although the bulletin deals primarily with ants as house pests, every way in which a species is known to be inimical to man is also mentioned.

When ants infest a house, they may be represented by workers, females, or males, or any possible combination of these castes. Since the worker is the most common, troublesome, and best known, this bulletin deals with it only.

Smith (1943) presents a means of identifying males to genus, and Creighton (1950), of females and workers to species. However, the identification of males and females to species is a difficult task and is not generally recommended.

¹ Retired.

Classification and Bionomics

Ants belong to the order Hymenoptera, which also includes the wasps and bees. The ants comprise the family Formicidae, and are distinguished from their nearest relatives by two important characters: One of these is the differentiation of the abdomen into two well-marked regions—a slender, one- or two-segmented, freely moving pedicel, and a larger, more compact terminal portion, the gaster; the other separating character is the elbowed antenna, in which the first segment, or scape, is greatly elongated in both the female and the worker. In the male, the antenna frequently does not appear to be elbowed, since the scape is not always noticeably lengthened.

Ants can be distinguished from termites, with which they are commonly confused, by the strong constriction or "waist" between the thorax and the abdomen, and the two pairs of wings of which the anterior pair is much larger than the posterior pair, both having few veins. Termites, on the other hand, have two pairs of wings, approximately equal in size with numerous veins. They have a tendency to lose their wings more readily than the ants. Termites also differ from the winged ants in that the abdomen is broadly joined to the thorax.

There are normally three distinct castes of ants: Workers, females, and males. The male is generally winged, and retains its wings until death. Its size is usually intermediate between that of the worker and the female, and the male is characterized by its protruding genital appendages, the presence of ocelli, poorly developed or vestigial mandibles, and extraordinarily large eyes, which are out of proportion to the remainder of the head. Apparently, the sole function of the male is to mate with the unfertilized female; when mating has been accomplished, the male perishes. Mating may take place in the nest, on the ground, or in the air. Males are produced in old or very large colonies only, where there is an abundance of food, since much nourishment is required to bring males to maturity. After attaining maturity, the male usually does not remain long in the parental nest. After leaving it, he may even succumb to predators and the elements without having mated.

The female, generally the largest of the three castes, normally possesses wings but loses them after mating. She usually possesses three ocelli in addition to the pair of large compound eyes, a large thorax to accommodate the two pairs of wings, and a large abdomen for the production of numerous eggs. The primary function of the female or queen is reproduction, but in many of the more highly specialized ants, the queen also cares for and feeds the first brood of workers on her salivary secretions. She may live for many years; upon her death she is commonly replaced by a daughter queen. However, ants may have one or more queens, according to the species.

The worker, which is also a female, is never winged except as a rare abnormality. The workers of most species lack ocelli. The thorax is simple, apparently composed of three segments, but in reality there are four. Workers are not always of the same size or morphological structure in a given species. When workers are of approximately the same size and structure within a species, we say the species is

monomorphic (one form) (example: the Argentine ant *Iridomyrmex humilis* (Mayr)). When workers within a single species display two distinct sizes and structures, we say the species is dimorphic (two forms) (example: *Pheidole dentata* (Mayr)). When the workers within a species are of varying size and structure, from small through intermediate to large, the species is termed polymorphic (many forms) (example: the black carpenter ant *Camponotus pennsylvanicus* (DeGeer)). The function of the worker is to construct and repair the nest, feed the immature and adult ants of the colony including the queen, care for the brood, and defend the nest. Formerly it was thought that workers seldom, if ever, laid eggs. If they did so, the eggs, being unfertilized, would, as in the honey bee, develop into males. Recent evidence appears to indicate that workers of most, if not all, ant species lay eggs, and that the eggs of at least some species can produce workers and females, as well as males. However, our knowledge of this subject is very limited and much more study is needed.

Ants have four developmental stages: Egg, larva, pupa, and adult. The egg is almost microscopic in size, varying in shape according to the species. It may be spherical, broadly elliptical, or cylindrical. On hatching, it produces a soft, legless larva. The larva may also vary in size, shape, and pilosity according to the species. One of the most common forms is more or less translucent, gourd or squash-shaped, with the head borne at the narrow end. In shape, the pupa resembles the adult that it is to become, but differs from the adult in being soft, unpigmented, and lacking in power to move from place to place in response to warmth, light, and humidity. In some species of ants, all of the pupae are naked; in others, the pupae are borne in cocoons spun by the larvae; and in still others, the pupae are both naked and enclosed. The cocoons are papery or parchmentlike. When an individual within a cocoon transforms to the adult, it may emerge without help, or it may require assistance by the workers. Queen pupae are the largest of all, and can be immediately recognized by their unusually large thorax and abdomen, the former bearing wing pads. Male pupae, which are somewhat smaller than queen pupae, can be distinguished by their wing pads and protruding genital appendages. Worker pupae are the smallest of all, and resemble adult workers except for their pale color, soft body wall, and incapacity to move about.

The adult, after emergence, may require a few days to attain complete maturity. While lacking full body color and hardness of the body wall, the ant is commonly known as a "callow." Frequently, 6 weeks to 2 months or more are required for development from the egg to the adult stage, the time depending largely on the season of the year and the temperature.

There are a number of ways by which ants may establish new colonies. One is a process known as splitting or budding, in which a fertilized daughter or queen leaves the parental nest accompanied by a number of sister workers who aid her in establishing and carrying on the functions of a new colony. Such a process is common to the legionary ants, *Neivamyrmex nigrescens* (Cresson) and *N. opacithorax* (Emery). Another way is a form of temporary parasitism, in which a fertilized female or queen of one species seeks, and may obtain, adop-

tion in a colony of another species of ant, called the "host ant." This may be accomplished in several ways: (1) By entering a queenless colony of the host species, (2) by killing the queen of the host species herself, or (3) by inducing the workers of the host species to kill their own queen. In every case the end result, if successful, is the same; the queenless colony of the host ant accepts the alien or invading queen. Such temporary parasites include *Lasius umbratus* (Nylander) and probably some of the species of *Acanthomyops*. Their hosts are usually common species of *Lasius* (*Lasius*) such as *alienus* (Foerster) and *neoniger* Emery. One of the most common methods of establishing a new colony is for the fertilized queen (after losing her wings, forcibly or otherwise) to construct, or enter a preformed cell or cavity in wood or under the bark of a stump or log, close the chamber, and rear her first brood (unaided by workers) from the nourishment supplied by her salivary glands. The small, undernourished workers, which compose the first brood, then open up the nest and bring in food from the outside for the queen, her brood, themselves, and for future broods. As the colony becomes older and the amount of food greatly increases, more and larger workers are successively produced, and soldiers, females, and males appear. To attain this state of maturity, in which a colony may contain several thousand workers, many males and females, and innumerable brood, requires a long time—perhaps 3 to 5 years or more. After attaining this state of maturity, a colony may continue to produce these castes and immature stages for a number of successive years; just how long, we do not know. The method herein described is typical of many species of ants, especially the species of *Camponotus*, including our common black carpenter ant *C. pennsylvanicus*.

Economic Importance

Ants are among the most common and abundant of all our insects. The probable reason for their success is that they are highly adaptable to different environments, foods, and nesting sites, and possess great reproductive ability, hardiness, and alertness. These attributes cause ants to be one of man's chief insect competitors, and inimical to him in numerous ways. Ants may affect man adversely by infesting his house or buildings, where they may cause annoyance by feeding on human foods, or cause structural damage by their nesting activities. They mar the appearance of lawns, golf courses, and parks with their numerous and unsightly nests, steal seeds from seed beds, feed on seeds whether the seeds are germinating or not, defoliate plants, and gnaw into various parts of plants, especially roots and buds. They foster and spread other injurious insects such as plant lice and mealybugs, which in turn may injure the plant directly by their feeding activities or may spread a plant disease from an infected to a healthy plant. They may gnaw holes in various types of cloth, fabrics, and certain rubber goods, or remove the rubber insulation from telephone and electric wires, or damage the wiring of other electrical equipment. Ants sometimes kill young poultry or other birds, and small mammals, and occasionally may act as intermediate hosts for parasites of birds and small mammals. They are especially annoying because of their biting

or stinging. The effects on a human are dependent upon the number of attacking ants, and that person's degree of allergy. Ants may also spread such human diseases as dysentery, typhoid fever, or tuberculosis by feeding on and crawling over sputum, faeces, and carrion.

The importance of ants as pests cannot be overestimated. For instance, during one year the total amount of literature issued to the public on ants ranked sixth among U.S. Department of Agriculture publications. A former head of an entomology unit within the Department of Agriculture informed me that requests for information on ant identification and control ranked very high among the total received for a number of years. At a very early date, the U.S. Department of Agriculture recognized the importance of ants as pests, and issued publications on them (certainly as early as Marlatt, 1898). In the early publication referred to, three species were discussed: The Pharaoh ant *Monomorium pharaonis* (Linnaeus), the small black ant *Monomorium minimum* (Buckley), and the pavement ant *Tetramorium caespitum* (Linnaeus). They were briefly discussed as to recognition, biology, economic importance, and control. Since that date, the Department has periodically issued bulletins and circulars by various authors on house-infesting ants, as well as on those affecting ranges, orchards, forests, field crops, and agriculture in general. Many, if not most, of our States have issued similar publications, especially on house-infesting ants.

I am convinced from my nearly 50 years of experience with ants that few homes escape infestation over a long period of years, and that innumerable homes suffer almost constant or recurring infestations. The degree to which such homes suffer may vary from almost negligible to severe. An ant like the Pharaoh ant *Monomorium pharaonis* (Linnaeus), or the Argentine ant *Iridomyrmex humilis* (Mayr), may be an almost continuous pest over months or even years, whereas other species may infest a house on rare occasions and only for a limited time. Frequently, infestations of the latter kind will cease abruptly of their own accord without obliging the housekeeper to resort to control measures. House-infesting ants may be likened to common colds—everyone is subject to them, and while they may be very annoying, the damages suffered are usually of short duration and are seldom severe.

During the 25 years that have elapsed since I bought a new, mostly brick home, the structure, especially the kitchen, has been infested by seven species of ants: *Crematogaster cerasi* (Fitch), *Solenopsis molesta* (Say), *Monomorium minimum* (Buckley), *Tapinoma sessile* (Say), *Lasius alienus* (Foerster), *Tetramorium caespitum* (Linnaeus), and *Camponotus castaneus* (Latreille). The last-named species appeared only once in the house, fed on angel cake, and left of its own accord. All the other ants have infested the house at various intervals during warm weather over a long period of years. Occasionally two species have infested the kitchen at once, but the species were not in close contact with each other. *M. minimum* was found nesting in the soil near the foundation wall below the kitchen, and *S. molesta* in a rotten plank of a small porch adjoining the kitchen. *T. sessile* showed a fondness for sweets, whereas *S. molesta* and *M. minimum* fed on meats, grease, or crackers with much shortening. The most persistent

and annoying of all the ants was *C. cerasi*, which originally nested in a locust tree (riddled with burrows of *Megacyllene robiniae* (Foerster)) growing within a few feet of the front of the house. After the tree was removed, the ants occurred in great numbers on the English ivy that covered most of the walls of the house. The ants seemed to derive most, if not all, of their food from the honeydew excreted by aphids on these vines. At this time I could not be sure where the ants were nesting, but I did see them enter and leave small holes in the mortar between the bricks composing the walls of the house. I am strongly of the opinion that many of the holes were made by the ants themselves. After having had ivy on the house for many years and frequent trouble with ants invading the kitchen, I decided to remove all the ivy except a small amount on the front of the house. After that, the ants ceased to infest the kitchen, and I cannot now recall when I last had an infestation there.

Housekeepers frequently wonder why they have ants in their homes, and are greatly perplexed as to where they come from. Ants are often accidentally brought into the house by the housekeeper herself; for example, on firewood stored in the basement. Such firewood, if faulty or in the proper stage of decay, can harbor colonies of the carpenter ant *Camponotus* spp., acrobatic ants (*Crematogaster* spp.), and others. Stray workers of many species of ants can be brought into the house on fruits from the orchard, vegetables from the garden, or even on laundry baskets from the yard. Small species like the Pharaoh ant are ideally adapted for new nesting sites, and can be transported in parcel post packages, grocery packages, trunks, and other objects. Most ants nest in the soil, in wood, or in other places outdoors, and infest houses from there. Sometimes it is possible to locate the outside trail leading from the ant's nest to the house, but in many cases this is very difficult or impossible. Infestations originating outdoors normally occur in the warm seasons of the year and are, as a rule, seldom severe or long-lasting. Several species of ants that normally nest outdoors, have become adapted to nesting in the woodwork or masonry of houses. Their presence in such places can often be determined by the frequent and numerous individuals seen at various periods of the year, even during cold weather, and by extraneous material such as wood fiber, gravel, seeds, and bodies of dead insects thrown out from holes in the woodwork and masonry. At certain periods of the year, the colonies may give rise to numerous winged males or females, or both; housekeepers often mistake them for termites (see p. 2).

Although sanitation and care will frequently keep ants from infesting a home, *they are not sure preventives*. Any housekeeper who fails to wash her dishes and pots immediately after they are used, or who leaves open containers on the cabinet shelves or tables, or allows children to spill food on the table or floor, is simply inviting ant trouble. Care should be taken at all times to keep from accidentally bringing ants into the house from outdoors, or from having them infest the house because of dirty dishes, open containers, or food carelessly spilled. If a homeowner allows certain areas of the woodwork of the house to become faulty or rotten from moisture or other causes, various species of ants may be expected to colonize there, especially the black carpenter ant *Camponotus pennsylvanicus* (DeGeer), lesser carpenter ants

Camponotus (*Myrmentoma*) spp., and certain species of acrobatic ants, *Crematogaster* spp. Piles of litter or compost, if left undisturbed for any length of time, form ideal nesting places for such ants as the Argentine ant *Iridomyrmex humilis* (Mayr), the odorous house ant *Tapinoma sessile* (Say), and the southern fire ant *Solenopsis xyloni* McCook. The general environment outside the house, both natural and man-made, has a great deal to do with whether or not the house will be infested; and if so, by what species of ants. Houses in heavily wooded areas, for instance, are especially subject to infestation by the black carpenter ant, whereas homes in open areas may expect infestations from such ants as the southern fire ant *Lasius neoniger* Emery, and others.

Collecting, Shipping, and Identifying Ants

The ideal way to submit ants for identification is to place a number of clean, uncrushed, live specimens in a 70-percent (or higher) solution of ethyl alcohol in a small bottle or vial. The ants will die within a few minutes. *Never use formaldehyde* because this chemical is too irritating to the eyes and nose of the determiner. Cheap cologne or bay rum will serve, but only as a last resort. The bottle or vial should then be carefully wrapped in soft paper, cotton, or similar material and enclosed in a fully addressed mailing tube or strong cardboard box completely addressed to the individual or organization expected to make the identification. The name and address of the sender should always appear, and the addresses should be legible. The ants themselves should never be placed directly in contact with loose cotton because their antennae, legs, maxillary and labial palpi become entangled in, and broken by, the cotton fibers; without these appendages in perfect condition it is very difficult, often impossible, to make accurate determinations. If preserving fluids are not available, place the specimens between layers of soft paper, such as facial tissue, and enclose in a small but strong cardboard box or mailing tube. An accompanying letter should give all possible details concerning the infestation, especially whether or not the ants have previously infested the house, and if so, for approximately how long; what areas are infested, the period or periods of the year during which the infestations occur, nature of damage, foods preferred, and whether the ants are nesting inside or outside the house.

The specimens described in this paper were studied with a Spencer² stereoscopic binocular microscope equipped with 9 X oculars and 2.3, 4.8, 6.8 objectives, which gave magnifications of 20.7 X, 43.2 X, and 61.2 X, respectively. The magnification most commonly used was 43.2 X for ants varying in size from approximately 2.5 to 6 mm.; above this size the 20.7 X magnification seemed best for the very large ants, such as species of *Camponotus*. The light employed was a General Electric² No. 82 bulb. These data are furnished because it is very important that the person who is identifying ants either have similar

² Mention of a proprietary product in this publication does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture and does not imply its approval by the Department to the exclusion of other products that may also be suitable.

equipment or know that the ants may not appear exactly as described if different magnifications or light intensities are used.

It is often necessary to examine a subject from several aspects to determine such characters as the exact color and shape, or the degree of sculpturing. It is recommended that, if possible, more than one individual be studied, since taxonomic characters vary from specimen to specimen. When one first determines a species, he may be troubled by the variability of certain characters, but while identifying the species on numerous occasions, he gradually acquires what is known as a "habitus picture"; that is, he recognizes the species without difficulty just as one would recognize a well-known human individual. Even if one is positive that he knows a certain person, *accurately* describing him to someone else is usually very difficult or impossible. Likewise, a person may positively know a certain insect without being able to describe it. The surest method of recognizing a species of ant is to know definitely the characters that distinguish it.

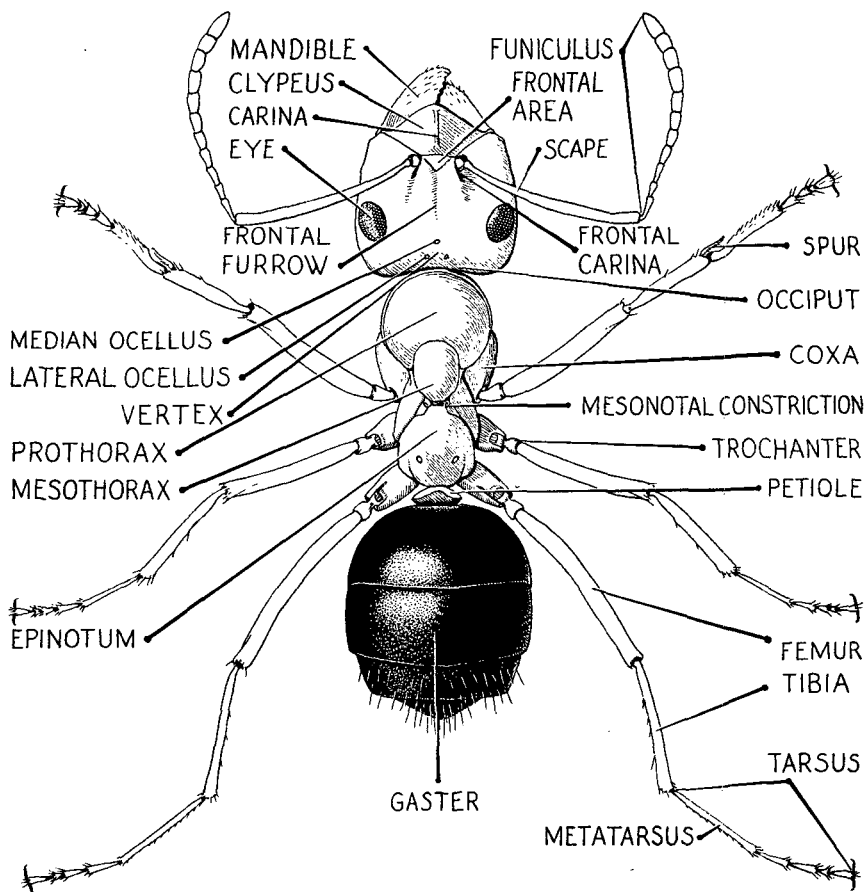


Figure 1.—*Fornica exsectoides* Forel, Allegheny mound ant, dorsal view of worker showing anatomical structures.

KEY TO SUBFAMILIES OF FORMICIDAE

(For the identification of workers, especially major workers or soldiers)

1. Abdominal pedicel composed of two segments, the petiole and postpetiole (fig. 23). Sting present but not always visible externally ----- 2
 Abdominal pedicel composed of a single segment, the petiole (fig. 1). Sting lacking ----- 3
2. Frontal carinae placed very close to each other, almost touching, and not covering the antennal insertions. Antennae attached almost at the edge of the mouth. Eyes lacking or else extremely small, ocelluslike. Workers polymorphic. Three species ----- *Dorylinae* Leach (p. 10).
 Frontal carinae not placed very close to each other (fig. 1), each carina bearing a lobe that more or less conceals the antennal insertion. Antennae not attached, almost at the edge of the mouth. Eyes usually noticeably large and composed of a number of ommatidia. Workers monomorphic, dimorphic, or polymorphic. Twenty-three species.
Myrmicinae Lepeletier (p. 10).
3. Cloacal orifice terminal, circular, surrounded by a fringe of hairs ¹(fig. 48, CO). Antennal fossa not always touching the posterior border of the clypeus. Workers of many of the species capable of emitting either a formic acid, or a pleasant, lemon-verbena or citronella odor. Workers monomorphic or polymorphic. Eighteen species.
Formicinae Lepeletier (p. 14).
 Cloacal orifice ventral, transverse, slit-shaped, not surrounded by a fringe of hairs (fig. 31, CO). Antennal fossa touching the posterior border of the clypeus. Workers of most of the species capable of emitting a characteristic, disagreeable, rotten coconut or tapinoma odor. Workers monomorphic. Erect hairs extremely sparse or lacking on the dorsum of the thorax. Six species ----- *Dolichoderinae* Forel (p. 13).

¹ The fringe of hairs may sometimes be partly or entirely worn away.

KEYS TO SPECIES

Key to Species of Subfamily Dorylinae Leach

1. A tooth between the base and apex of each tarsal claw (fig. 2, b). The only U.S. species.
Labidus coecus (Latreille) (p. 17).
 The tooth lacking between the base and apex of each tarsal claw----- 2
2. Head densely sculptured, subopaque. Superior border of mandible, especially near its junction with the masticatory border of the mandible, convex (fig. 3, b).
Neivamyrmex nigrescens (Cresson) (p. 18).
 Head sparsely sculptured, shiny. Superior border of mandible not as described above (fig. 4, b).
Neivamyrmex opacithorax (Emery) (p. 19).

Key to Species of Subfamily Myrmicinae Lepeletier

1. Antenna with 10 segments, the last two segments of the funiculus enlarged and forming a distinct club. Clypeus longitudinally bicarinate. Epinotum unarmed----- 2
 Antenna with more than 10 segments----- 5
2. Eye extremely small, usually composed of not more than 4 to 6 ommatidia. Workers monomorphic, unusually small, 1.5-2 mm. in length (fig. 23).
Solenopsis molesta (Say) (p. 43).
 Eye normal sized and composed of many ommatidia. Workers polymorphic, ranging in size from 1.6 to 6 mm----- 3
3. Mandible strongly incurved. Anterior border of mesopleuron irregular in outline, usually bearing one or more spines or teeth. Petiolar node narrow in profile. Head extraordinarily large, out of proportion to remainder of body (fig. 21, a, b) *Solenopsis geminata* (Fabricius) (p. 40).
 Mandible not strongly incurved. Anterior border of mesopleuron regular in outline, lacking spines or teeth. Petiolar node not unusually narrow in profile----- 4
4. Antennal scape short, when fully extended its apex reaching approximately half the distance between the eye and the posterior border of the head. Masticatory border of the mandible usually with three distinct teeth. Petiole commonly with antero-ventral tooth (fig. 20, a, b).
Solenopsis xyloni McCook (p. 38).
 Antennal scape longer, when fully extended its apex reaching more than half the distance between the eye and the posterior border of the head. Masticatory border of mandible usually with four distinct teeth. Petiolar and postpetiolar

- nodes, when viewed from above and behind, with apparent longitudinal impressions or grooves (fig. 22, a, b). Introduced species. *Solenopsis saevissima richteri* Forel (p. 41).
5. Antenna with 11 segments----- 6
 Antenna with 12 segments----- 11
6. Dorsal surface of thorax with three pairs of prominent spines. Legs extraordinarily long. Workers polymorphic, 1.5-12 mm. in length (fig. 27) *Atta texana* (Buckley) (p. 50).
 Characters not as described above----- 7
7. Gaster viewed from above not subcordate. Postpetiole not attached to dorsal surface of the base of the gaster. Frontal carina forming a partial groove or scrobe for the reception of the scape. Border of the eye nearest the mandible forming an acute angle (fig. 26). Introduced species.
Wasmannia auropunctata (Roger) (p. 48).
 Gaster subcordate when viewed from above. Postpetiole attached to dorsal surface of the base of the gaster. Frontal carina not forming a partial groove or scrobe for the reception of the scape----- 8
8. Antennal scape unusually short, scarcely attaining or barely surpassing the posterior border of the head. Epinotal spines remarkably short, much shorter than the distance between their bases, parallel and convex on the outer sides. Worker small and usually weakly sculptured (fig. 12,a).
Crematogaster ashmeadi Mayr (p. 28).
 All characters not as described above----- 9
9. Hairs coarse, bristlelike, rather numerous, and well distributed on the thorax. Thoracic dorsum subopaque or opaque, coarsely rugose or striate (fig. 15,a).
Crematogaster lineolata (Say) (p. 32).
 Hairs more slender and either confined to a small group on each shoulder of the pronotum or else in appearance mixed with suberect or erect pubescence----- 10
10. Pubescence appressed. Thorax usually with only a few erect hairs. Dorsum of thorax with definite longitudinal striae or fine rugae (fig. 13). *Crematogaster cerasi* (Fitch) (p. 30).
 Pubescence usually suberect or erect on head and thorax only, never on gaster. Dorsum of thorax with fine punctures, but never with rugae (fig. 14).
Crematogaster clara Mayr (p. 31).
 Epinotum unarmed. Clypeus usually bicarinate----- 12
 Epinotum armed. Clypeus not bicarinate----- 15
12. Workers dimorphic. Posterior portion of head and also of epinotum transversely rugulose (fig. 19). Introduced species----- *Monomorium destructor* (Jerdon) (p. 37).
 Workers monomorphic. Posterior portion of head and also of epinotum not bearing transverse rugulae----- 13

13. Thorax distinctly lighter in color than the head and gaster, which are normally dark brown or blackish (fig. 18). Introduced species—*Monomorium floricola* (Jerdon) (p. 36). Color not as described above----- 14
14. Body uniform dark brown or black and largely smooth and shining (fig. 16).
Monomorium minimum (Buckley) (p. 33).
 Body light brown or yellowish to yellowish red except the posterior portion or the gaster. Head, thorax, petiole, and postpetiole finely punctulate, subopaque (fig. 17). Introduced species—*Monomorium pharaonis* (Linnaeus) (p. 34).
15. Workers dimorphic. Head extraordinarily large in proportion to the size of the body. Length of body 1.5–3 mm. Antenna with a very distinct 3-segmented club----- 16
 Workers not dimorphic. Head not extraordinarily large in proportion to the size of the body----- 18
16. Ventral surface of head in profile with a pair of distinct teeth or spines anteriorly. Mesonotum, in profile, with a transverse, steplike impression (fig. 11).
Pheidole dentata Mayr (p. 27).
 Characters not as described above----- 17
17. Head sculptured, subopaque, except for a small smooth and shiny area on or near the occipital border (fig. 10).
Pheidole floridana Emery (p. 26).
 The posterior half of the head largely smooth and shiny. Body light to dark brown (fig. 9).
Pheidole bicarinata vinelandica Forel (p. 25).
18. Posterior border of clypeus not forming a sharp, raised margin in front of the antennal fossa. Slender ants with long legs and antennae. Length 3.5–7 mm. Antennae with indistinct 4-segmented club----- 19
 Posterior border of clypeus forming a sharp, somewhat raised margin in front of the antennal fossa. Neither slender ants nor with unusually long legs and antennae. Length 2.5–4 mm. Antennae with a 3-segmented club. Introduced species----- 22
19. Lateral face of the frontal lobe bearing a flange which extends posteriorly in the form of a tooth (fig. 5,b).
Aphaenogaster lamellidens Mayr (p. 20).
 Lateral face of frontal lobe without a toothed flange----- 20
20. Postpetiolar node broader than long, suboval in shape. Epinotal spines longer than the dorsal surface or base of the epinotum. Body almost devoid of erect hairs (fig. 7).
Aphaenogaster tennesseensis (Mayr) (p. 23).
 Postpetiolar node not as described above. Epinotal spines shorter than the dorsal surface or base of the epinotum. Body with numerous erect hairs----- 21
21. Anterior border of mesonotum forming a strongly projecting transverse welt or gibbosity, the gibbosity impressed

or concave in the center. Epinotal spines as long as, or longer than, the declivous surface of the epinotum, and directed upward (fig. 8, a, b).

Aphaenogaster fulva Roger (p. 24).

Anterior border of mesonotum not as described above. Epinotal spines not as long as the declivous surface of the epinotum (fig. 6)-----*Aphaenogaster rudis* (Emery) (p. 21).

22. Head bearing a partial sulcus or groove for the reception of the antennal scape. Thorax reticulate-rugose. Head and thorax yellowish red or reddish (fig. 25). Introduced species-----*Tetramorium quineense* (Fabricius) (p. 47).
Head not bearing a partial sulcus or groove for the reception of the antennal scape. Head and thorax longitudinally striated and dark brown or blackish (fig. 24). Introduced species-----*Tetramorium caespitum* (Linnaeus) (p. 45).

Key to Species of Subfamily Dolichoderinae Forel

1. Dorsal surface of epinotum in the form of a prominent conical or tuberculate elevation posteriorly. Maxillary palpus unusually long, the third segment approximately as long as the combined lengths of the fourth, fifth, and sixth segments. Ventral surface of head with a weakly developed psammophore. Mesonotum in profile with a perceptible angle anterior to the mesoepinotal suture (fig. 30).

Dorymyrmex pyramicus (Roger) (p. 56).

Characters not as described above----- 2

2. Petiolar node vestigial; when viewed from above, more or less hidden by the base of the gaster (fig. 31,a)----- 3
Petiolar node not vestigial, suberect to erect, and usually easily seen in profile----- 4

3. Body color rather uniform, either a light brown or black. Length 2.4-3.25 mm. (fig. 31,a). *Tapinoma sessile* (Say) (p. 57).

Head dark, the thorax and gaster commonly with pale areas of variable size; legs, mouth parts, and antennae very pale. Length 1.3-1.5 mm. (fig. 32). Introduced species.

Tapinoma melanocephalum (Fabricius) (p. 59).

4. Head subtriangular. Mandible with both teeth and fine denticulae. Thorax usually without erect hairs. Epinotum in profile, short, approximately twice as high as long. Body a uniform light brown or brown (fig. 28). Introduced species-----*Iridomyrmex humilis* (Mayr) (p. 52).
Head subrectangular. Mandible with small or large teeth but no fine denticulae. Thorax usually with a few erect hairs on the pronotum or epinotum. Epinotum in profile not twice as high as long (fig. 29).

Iridomyrmex pruinosus (Roger) (p. 54).

Key to Species of Subfamily Formicinae Lepeletier

1. Antenna inserted at or very close to the posterior border of the clypeus. Workers monomorphic. Pronotum, in profile, not flattened----- 9
 Antenna inserted a considerable distance from the posterior border of the clypeus. Workers polymorphic. Large species, 4-12 mm. in length. Pronotum, in profile, usually flattened. Clypeal border and antennal fossa never touching each other----- 2
2. Scapes and legs with abundant long, coarse, yellowish, sub-erect to erect hairs; the hairs on the legs not arranged as a row of short, graduated bristles on the flexor surfaces of each middle and hind tibia (fig. 37).
Camponotus abdominalis floridanus (Buckley) (p. 69).
 All of the characters not as described above----- 3
3. Anterior border of clypeus with a distinct narrow, median emargination or impression (fig. 38,b). Workers 4-9 mm. in length----- 4
 Anterior border of clypeus without a distinct narrow, median emargination or impression. Workers 6-12 mm. in length-- 6
4. Cheeks and clypeus without elongate piligerous foveolae---- 5
 Cheeks and clypeus with elongate piligerous foveolae. Head, thorax, petiole and legs yellowish red or reddish (fig. 38,a).
Camponotus caryae discolor (Buckley) (p. 70).
5. Body normally a uniform or almost uniform dark brown or black (fig. 39)-----*Camponotus nearcticus* Emery (p. 72).
 Body, exclusive of the gaster, yellowish red or reddish (fig. 40)-----*Camponotus rasilis* Wheeler (p. 73).
6. Clypeus ecarinate or scarcely carinate. Head of major worker, excluding the mandibles, slightly broader than long. Clypeal fossae well developed. Head and thorax subopaque or opaque----- 7
 Clypeus carinate. Head of major worker, excluding the mandibles, as long as broad or longer than broad----- 8
7. Body blackish or black. Pubescence appressed, pale yellow or white, and noticeably long on the dorsal surface of the gaster (fig. 35)
Camponotus pennsylvanicus (DeGeer) (p. 63).
 Posterior portion of the thorax, the petiole, legs, and base of the gaster yellowish red or reddish. Pubescence golden yellow and usually short on the dorsal surface of the gaster (fig. 36)----*Camponotus ferrugineus* (Fabricius) (p. 67).
8. Head shiny. Middle and hind tibia each with a row of graduated, erect, bristles on their flexor surface (fig. 33).
Camponotus castaneus (Latreille) (p. 60).

Head subopaque. Middle and hind tibia each without a row of graduated, erect, bristles on their flexor surface (fig. 34).
Camponotus tortuganus Emery (p. 62).

9. Eye located nearer to the base of the mandible than to the posterior border of the head----- 10
 Eye located nearer to the posterior border of the head than to the base of the mandible----- 11
10. Antennae and legs extraordinarily long. Body slender and bearing long coarse, suberect to erect, grayish or whitish hairs; the suberect to erect hairs normally absent from the scapes. Integument with a peculiar grayish-violaceous luster or sheen (fig. 41). Introduced species.
Paratrechina longicornis (Latreille) (p. 74).
 Unlike alternative above in one or more characters. Scapes usually, and tibiae always, with coarse, suberect to erect hairs (fig. 42)----*Paratrechina* (Nylanderia) spp. (p. 76).
11. Thorax with a strong constriction in the mesonotum, the constriction somewhat subcylindrical. Scape extending approximately one-half its length beyond the posterior border of the head. Gaster from above, with the base meeting each side in a distinct angle (fig. 43).
Prenolepis imparis (Say) (p. 78).
 Differing from the above in one or more characters----- 12
12. Maxillary palpus short, 3-segmented. Eye unusually small to small. Body hairs commonly barbed.¹ Workers capable of emitting pleasant lemon-verbena or citronella odors-- 13
 Maxillary palpus long, 6-segmented. Eye normal. Body hairs not barbed. Workers capable of emitting distinct formic acid odors----- 16
13. Petiolar node, in profile, with a narrow and rather sharp summit (fig. 48,a)----- 14
 Petiolar node, in profile, with a thicker, blunt summit (fig. 49)----- 15
14. Antennal scape when fully extended with its apex considerably surpassing the posterior border of the head. A small tooth on the superior border of the mandible near the junction of the mandible's superior and masticatory border (fig. 48, b). Erect hairs on the dorsal surface of the gaster largely confined to a transverse row on the posterior border of each segment (fig. 48, a).
Acanthomyops interjectus (Mayr) (p. 88).
 Antennal scape when fully extended with its apex either not attaining or else not surpassing the posterior border of the head. The small tooth lacking on the superior border of the mandible as described for *interjectus*. Dorsal surface of gaster with widely distributed, abundant, erect hairs (fig. 47)-----*Acanthomyops claviger* (Roger) (p. 86).

¹ It may be difficult to see the barbs on the hairs except under high magnification: not less than 61.2.

15. Cheeks with a number of long, erect hairs. Dorsal surface of gaster with numerous long, erect hairs. Scapes and funiculi strongly thickened from base to apex (fig. 50).

Acanthomyops latipes (Walsh) (p. 91).

- Cheeks lacking erect hairs. Dorsal surface of thorax and gaster with short, erect, hairs. Scapes and funiculi perceptibly but not strongly thickened from base to apex (fig. 49)-----*Acanthomyops murphyi* (Forel) (p. 89).

16. Terminal segments of the maxillary palpus successively and gradually decreasing in length toward the apex of the palpus. Petiole in profile with a narrow and thin summit, the dorsal border usually with a very distinct emargination. Dorsal surface of gaster bearing abundant short, suberect hairs of approximately the same length (fig. 46)-----*Lasius umbratus* (Nylander) (p. 84).

Terminal segments of the maxillary palpus rather long and of approximately the same length-----

17

17. Antennal scapes and tibiae with numerous suberect or erect hairs. Penultimate basal tooth of mandible markedly reduced in size relative to the two flanking teeth; or the gap between the penultimate and terminal basal teeth tends to be larger in area than the terminal basal tooth and variable in shape. Color light brown to medium brown, rarely dark brown. Anterior border of the median clypeal lobe obtusely angular (fig. 45)-----*Lasius neoniger* Emery (p. 81).

- Antennal scapes and tibiae either without suberect or erect hairs or usually with less than 10 each. Penultimate and terminal basal teeth subequal in size, and the gap between them of about the same area as the terminal tooth and constant in shape. Body color brown, to very dark brown, or approaching blackish. Anterior border of the median clypeal lobe forming an even, broad, parabolic curve (fig. 44)-----*Lasius, alienus* (Foerster) (p. 80).

DISCUSSION OF THE SPECIES

Labidus coecus (Latreille)

This is a native and widely distributed species, ranging from Oklahoma and Arkansas to Texas and Louisiana, and south to Argentina.

Taxonomic Characters

Subfamily and generic characters: Polymorphic. Antenna extremely short, 12-segmented. Frontal carinae placed extremely close to each other, not concealing antennal insertions. Clypeus remarkably short, almost lacking. Eye absent or extremely small, ocelluslike. Epinotum unarmed. Tarsal claw with a tooth between its base and apex. Abdominal pedicel composed of two segments, the petiole and postpetiole. Sting present, but not always exerted. *Specific characters:* Workers 2.9–9.7 mm. long. Scape short, scarcely attaining more than mid length of head. Petiole with an anteroventral protuberance or spine. Most of body smooth and shiny except posterior half or more of thorax. Body color castaneous to reddish brown.

Biology and Economic Importance

This legionary ant lives in more or less temporary nests in decayed logs and stumps, or in the ground beneath stones and other objects. The ant may also nest beneath basement floors, or in and around foundation walls. Colonies are exceedingly large, containing many thousands of individuals. Workers are light-avoiding and are not often seen. Natural foods are arthropods, small mammals, and birds, which the ants kill and eat as carrion or refuse. Nuts and foods of a high protein content form much of their diet. The ants may invade houses in search of the latter foods, or meat. They can kill chickens and small pets, and also bite and sting fiercely. The species has also been known to short-circuit telephone wires by removing the lead sheathing. However, the ants are predators of many injurious insects such as the

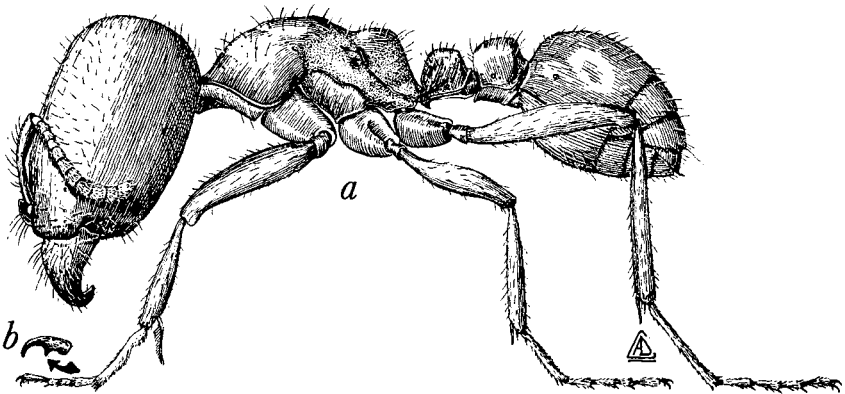


Figure 2.—*Labidus coecus* (Latreille): a, Lateral view of worker; b, lateral view of tarsal claw showing tooth.

third-stage larva of the secondary screw-worm *Callitroga macellaria* (Fabricius).

References: Wheeler and Long, 1901, p. 159; Wheeler, 1908b, pp. 408-409; Wheeler, 1926, p. 264; Lindquist, 1942, pp. 850-852; Creighton, 1950, pp. 61-62; Enzmann, 1951, pp. 449-450; Borgmeier, 1955, pp. 91-93, figs.; Hess, 1958, pp. 35-37.

Neivamyrmex nigrescens (Cresson)

This is a native species which ranges from Nebraska and Virginia south to California and Florida, thence into Mexico. It is the most common and widely distributed species of *Neivamyrmex* in the United States.

Taxonomic Characters

Subfamily and generic characters: Polymorphic. Antenna rather short, stout, 12-segmented. Eye extremely small, ocelluslike. Frontal carinae placed extremely close to each other, not covering antennal insertions. Clypeus extremely short, almost lacking. Epinotum unarmed. Tarsal claw lacking a tooth between its base and apex. Abdominal pedicel composed of two segments, the petiole and post-petiole. Sting present but not always exerted. *Specific characters:* Workers 2.8-5.8 mm. long. Apex of scape noticeably surpassing an imaginary line connecting posterior borders of eyes. Superior border of mandible meeting masticatory border of the mandible in a rounded outline or convexity (fig. 3,b). Body, exclusive of gaster, opaque, the surface largely covered with dense, granular punctures interspersed with coarse foveolae, the foveolae especially apparent on dorsum of head and thorax. Body color highly variable, from light brown through dark reddish brown to almost black.

Biology and Economic Importance

This species has temporary nesting sites similar to those of *Labidus coecus*. On a number of occasions I have received specimens from houses under conditions indicating the ants may have been nesting beneath the basement floor or in and around the foundation walls.

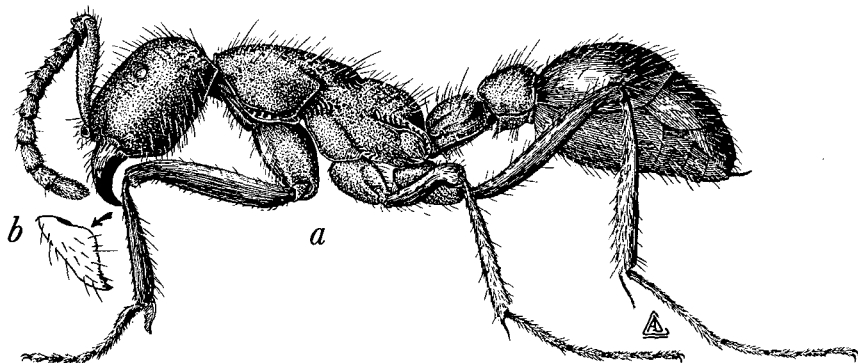


Figure 3.—*Neivamyrmex nigrescens* (Cresson): a, Lateral view of worker; b, right mandible showing the convex superior border.

Schneirla estimates that very large colonies may contain as many as 150,000 to 250,000 workers. As far as known, each colony has only one functional or mother queen. New colonies are formed by a splitting process in which a daughter queen leaves the parental nest, accompanied by a number of workers. A mature colony is capable of producing a small number of females, some of which may be fertilized in the nest by their brothers, but this does not preclude mating outside the nest, or with males of other colonies. Since females are never winged, they can make no nuptial flight. The functional queen in a colony is not capable of taking care of her brood—a task delegated to the workers. Males have emerged from nests from September into November. Workers are less light-avoiding than those of *coecus*; in fact, many of their foraging activities take place in daylight. The natural food of these ants is not well known but random observations indicate they are highly predacious on other insects such as beetles, termites, and the adults and brood of other ants. Newell reports the species as an important predator on the Argentine ant. Workers frequently seek meat for food in houses and stores. The presence of ants (workers or males, or both) in a house can be very annoying to a housekeeper, who frequently mistakes the males for termites or other insects. On several occasions I have received specimens of workers of *N. fallax* Borgmeier and *N. pilosus mexicanus* (F. Smith) that had fallen into crude, unprotected country wells in localities in the Gulf Coast States, causing the water to have a foul odor and an unpleasant taste. Although neither *nigrescens* nor any of the other legionary ants treated in this paper have been received from such situations, it would not be surprising if they were found under these circumstances.

References: Wheeler, 1900, pp. 563-574; Wheeler and Long, 1901, pp. 170-172; Newell, 1914, p. 147; Wheeler, 1926, pp. 263-266; Smith, 1927, pp. 401-404; Cole, 1940, p. 38; Smith, 1942, pp. 537-539, fig.; Creighton, 1950, pp. 64-66, fig.; Borgmeier, 1955, pp. 498-500, figs.; Schneirla, 1958, pp. 215-255.

Neivamyrmex opacithorax (Emery)

N. opacithorax is a native species that ranges from Kansas to Virginia, south to California and Florida, thence into Mexico (Baja California) and Costa Rica.

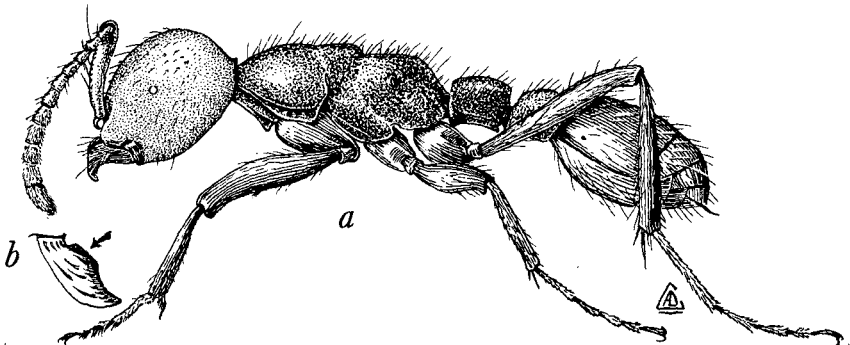


Figure 4.—*Neivamyrmex opacithorax* (Emery): a, Lateral view of worker; b, right mandible showing the non convex superior border.

Taxonomic Characters

Subfamily and generic characters: Same as for *nigrescens*. *Specific characters:* Workers 2.2–4.6 mm. long. Similar to *nigrescens* except antenna apparently not so stout, scape not quite as long, nor eye as distinct. Superior border of mandible with a straight (at least not convex) margin between basal tooth and masticatory border (fig. 4,b). Color usually lighter, ranging from light to dark reddish brown; thorax usually the darkest, legs and gaster lighter than head and petiole. Sculpture noticeably different from that of *nigrescens*; in the latter species, head, thorax, petiole, and postpetiole are densely sculptured and opaque, whereas in *opacithorax* only the thorax and petiole are densely sculptured and opaque.

Biology and Economic Importance

This species so closely resembles *nigrescens* in biology and economic importance that only a few additional comments are necessary. *N. opacithorax* is apparently less common in the Eastern United States than *nigrescens*. The two species are similar in that males of each emerge from nests during September to November. The following notes on *opacithorax*, indicating that the ants may infest houses from nests outdoors, were sent in by a correspondent in Kansas City, Mo., about September 10, with several males and associated workers. He wrote as follows concerning them: "My own attention was first attracted to them when some few of them got into our living room, coming up from beneath the fireplace, and the next day into an adjoining room, coming this time from a cold air register, each time being noticed almost immediately and disposed of by spraying. Further search disclosed the fact that they entered the basement through a small hole or two in the foundation wall about which they swarmed. . . . I have seen nothing more of any winged ones. There are several armies of ants which have been working between unknown places and the rock foundation of our home. They enter small cracks from the outside. These might be the same species."

References: Wheeler and Long, 1901, p. 163; Wheeler, 1908b, p. 411; Smith, 1942, p. 560, fig.; Borgmeier, 1955, pp. 504–506, figs.; Schneirla, 1958, pp. 214–255.

Aphaenogaster lamellidens Mayr

This is a native species ranging from Illinois to New York and south to Louisiana and Florida.

Taxonomic Characters

Subfamily and generic characters: Body slender, with long legs and antennae. Antenna 12-segmented, with an indistinct 4-segmented club. Frontal carinae not placed close to each other, partly concealing the antennal insertions. Eye well developed and with numerous ommatidia. Promesonotal and mesoepinotal sutures well defined. Epinotum armed with a pair of prominent spines. Abdominal pedicel composed of two segments, the petiole and postpetiole. Petiole distinctly pedunculate. Gaster from above oval, without truncate base. *Specific characters:* Workers 4.1–6.5 mm. long. Distinguished from the other species of *Aphaenogaster* by the following characters: Outer face of frontal lobe bearing a flange which projects rearward in the

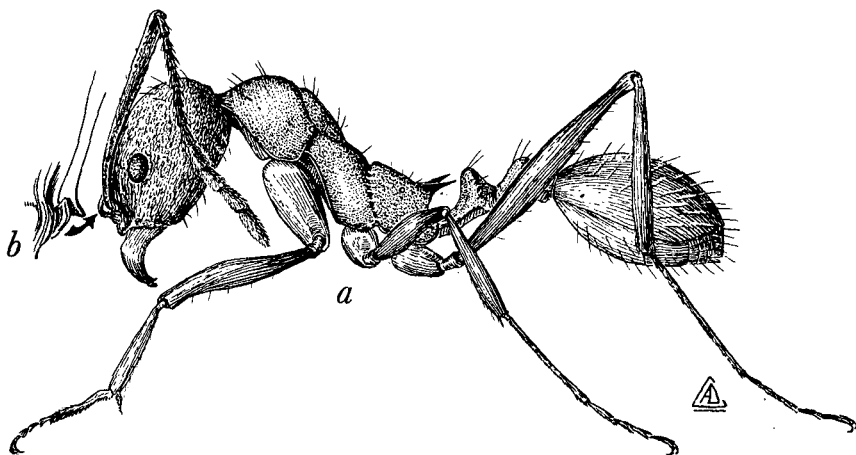


Figure 5.—*Aphaenogaster lamellidens* Mayr: *a*, Lateral view of worker; *b*, frontal lobe showing the highly characteristic flange which terminates posteriorly in a tooth.

form of a tooth (fig. 5, *b*); epinotal spines shorter than base of epinotum; head, thorax, petiole, and postpetiole reddish, the gaster yellowish; usually the scapes, femora, and tibiae are dark or blackish. The most dependable character for distinguishing the species is the peculiar flange of the frontal lobe. As mentioned under *tennesseensis*, that species and *lamellidens* are somewhat similar, although the resemblance is only superficial. However, the thoracic sculpture of *lamellidens* is less coarse, especially on the sides of the thorax.

Biology and Economic Importance

This species, which appears to be more common in the southern section of its range than elsewhere, typically nests in wood. It forms colonies of a few hundred to several thousand individuals in stumps and logs that vary from fairly well preserved to well decayed. Dennis states that *lamellidens* is a highly adaptable form that nests in open or shady situations and in dry-to-moist habitats. He thinks it is the most common species of *Aphaenogaster* in Tennessee, but he has never found it above 2,500 feet. Wheeler claims to have found females starting incipient colonies in sand, but no other observers appear to have confirmed this observation. Dennis reports a nest in the brick chimney of a house. I have received specimens of workers said to have emerged from grooves in the floor boards of a home, the grooves apparently having been made by the ants or other insects. The species is similar to *fulva* in general feeding habits and economic importance.

References: Wheeler, 1905b, p. 383; Dennis, 1938, pp. 285, 304; Cole, 1940, p. 52; Van Pelt, 1958, p. 13.

Aphaenogaster rudis (Emery)

A. rudis is a native species, which ranges from Illinois to Massachusetts and south to Colorado and Florida. This ant appears in our earlier literature under the name *A. fulva aquia* (Buckley).

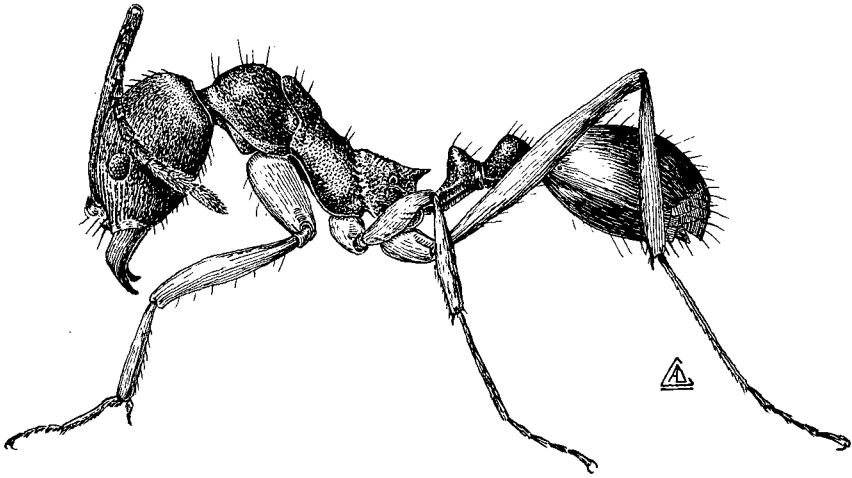


Figure 6.—*Aphaenogaster rudis* (Emery), lateral view of worker.

Taxonomic Characters

Subfamily and generic characters: Same as for *lamellidens*. *Specific characters:* Workers 4.5–5 mm. long. Frontal lobe not bearing a flange which projects posteriorly in the form of a tooth as figured for *lamellidens*. Head varying in sculpture from longitudinally rugulose-reticulate (especially anterior portion) to mainly punctate. Pronotum varying from punctuate to transversely rugulose, more commonly punctate. Anterior border of mesonotum not in the form of a transverse welt or gibbosity that is cleft or impressed in the center, as described and figured for *fulva*. Epinotal spines short, seldom as long as basal half of epinotum. Erect hairs present on most of dorsal surface of body in contrast to *tennesseensis*. Body color light brown to brown, with antennae and legs usually lighter.

Biology and Economic Importance

A very common and highly adaptable species. The ants may nest in exposed soil or under stones, logs, in decaying wood, leaf litter, hollow stems of plants, or under the bark at the base of trees. Nests occur in open fields and open and dense woods up to altitudes of at least 5,000 feet. The species is especially a woodland-nesting form. Colonies are seldom large, usually ranging from less than a hundred to several thousand individuals, one of the largest recorded having approximately 3,500 individuals. Population studies by Headley and Talbot showed that although most colonies contained only a single wingless female, a number had 2, 3, 4, or as many as 15 females. Fusion of colonies, in some instances, may account for the large number of females. The immature stages of this species pass the winter as eggs and larvae. Males and winged females reach maturity in late July, apparently from overwintering larvae. Headley found that nests excavated in the ground were composed of one to four galleries, ranging in length from 1 to 34 inches deep, from which 2 to 17 chambers radiated. This species is a host of the temporary ant parasite *A.*

tennesseensis. The natural food of *rudis* is insects (which they kill or eat as refuse), seeds, and the pollen of ground-nesting bees. Headley was able to trace workers to their nest by feeding them bread crumbs. *A. rudis* is quite similar to *fulva* in its economic habits and importance.

References: Hendrickson, 1930, pp. 78-79; Dennis, 1938, pp. 286-287, 305; Wesson and Wesson, 1940, pp. 90, 94; Headley, 1943, p. 25; Headley, 1949, pp. 265-272; Talbot, 1951, pp. 302-307; Talbot, 1957, pp. 377-379.

Aphaenogaster tennesseensis (Mayr)

This is a native species, which ranges from South Dakota and Ontario, south to Oklahoma and Georgia. It is not only one of the most striking forms of *Aphaenogaster*, but one of the most easily recognized.

Taxonomic Characters

Subfamily and generic characters: Same as for *lamellidens*. *Specific characters:* Workers 4.1-5.3 mm. long. *A. tennesseensis* may be distinguished from the other species of *Aphaenogaster* by the following characters: Strongly protuberant mesonotum (especially anterior portion); a pair of extraordinarily large epinotal spines noticeably thickened at the base, very acute apically, and longer than the base of the epinotum (best seen from above); the peculiarly shaped postpetiolar node which, when seen from above, is slightly broader than long and definitely broader posteriorly than anteriorly; the coarse thoracic sculpture, much of which is reticulate-rugose; the almost complete absence of erect hairs on the dorsal surface of the body; the sparse, appressed pubescence; and the body color (the head, thorax, petiole, and postpetiole reddish, the gaster yellowish, and the appendages dark). The species bears a superficial resemblance to *lamellidens*.

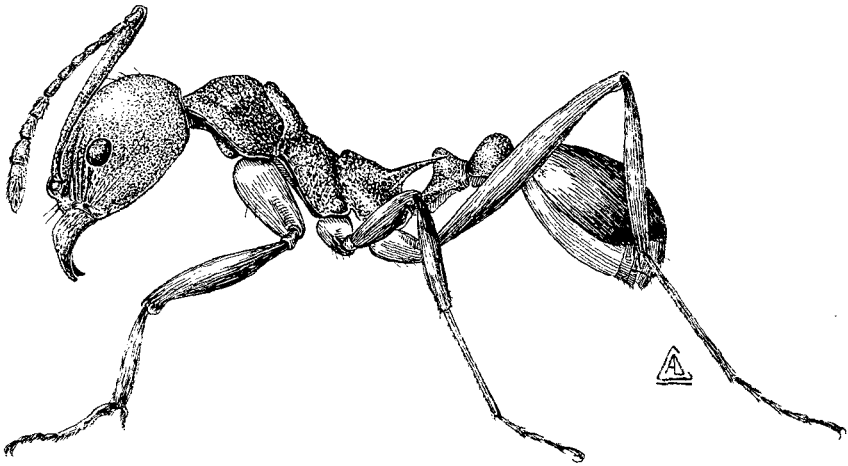


Figure 7.—*Aphaenogaster tennesseensis* (Mayr), lateral view of worker.

Biology and Economic Importance

No complete biological studies have been made on *tennesseensis*. During its early stages of colony formation, this species is probably a temporary parasite in the ground nests of *A. rudis* and *A. rudis picea* (Emery). Both *A. rudis* and *rudis picea* have similar habits, and most commonly nest in the soil; *picea*, however, seems to occur at high altitudes. Indicative of this are the small size of the female, her highly polished body, and very large epinotal spines, and the peculiar fact that *tennesseensis* lives in ground nests only when its females occur in the nests of *rudis* and *picea*. Otherwise, the species is exclusively a wood-nesting ant, found typically in wooded areas. The ants live in decaying logs and stumps, or in decayed spots in both live and dead trees. Van Pelt has found this species to be rare in the Blue Ridge Mountains at altitudes from 4,100 to 4,500 feet. Colonies vary from a few hundred to several thousand individuals. The species appears to be more common in the northern section of its range. Its feeding habits and economic importance are quite similar to those of *fulva*.

References: Wheeler, 1905b, pp. 373, 383; Gaige, 1914, pp. 3-5, 11-13; Wheeler, 1926, pp. 114, 447-448, 450; Dennis, 1938, pp. 287-288, 305; Gregg, 1944, pp. 456, 465; Van Pelt, 1963, p. 212.

Aphaenogaster fulva Roger

This native species ranges from Nebraska to Vermont south to Colorado and Florida.

Taxonomic Characters

Subfamily and generic characters: Same as for *lamellidens*.
Specific characters: Workers 3.5-5.8 mm. long. *A. fulva* is distinguished from the other species of *Aphaenogaster* by the shape of the

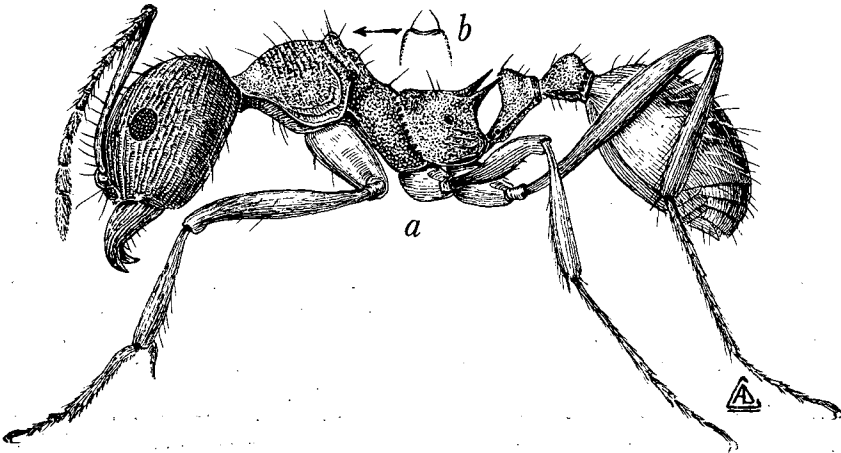


Figure 8.—*Aphaenogaster fulva* Roger: *a*, Lateral view of worker; *b*, posterodorsal view of the strongly projecting anterior border of the mesonotum which is cleft or impressed in the center.

anterior border of the mesonotum, which forms a strongly projecting transverse welt or gibbosity cleft, or is impressed in the center (fig. 8, b); and by epinotal spines, which are highly characteristic in being unusually long and acute, as long as or longer than the declivous face of the epinotum, and with their apices directed considerably upward. The general body color is usually light brown to dark brown, the gaster and appendages often being darker.

Biology and Economic Importance

This species nests in small- to moderate-size colonies in rotting wood, such as logs or stumps, and in the soil beneath stones and other objects. It is very characteristically found in wooded areas, but also shows a high adaptability to various types of ecological habitats. Van Pelt reports occasional colonies of this species in the Blue Ridge Mountains at altitudes of from 3,500 to 4,500 feet. The natural food of *fulva* is live and dead insects. Workers are not known to seek or eat honeydew. The ants have been found nesting in the soil around the base of houses and in the rotting wood of houses. Although workers infest houses, I have only one record of their infesting household foods; that was peanut butter. Probably they will show a preference for meat or food with a high protein content. The species does not appear to be a house pest of any major importance.

References: Wheeler, 1905b, pp. 373, 383; Wheeler, 1916, pp. 585-586; Wheeler, 1926, pp. 81, 83, 206, 448, 453; Dennis, 1938, pp. 285-286; Headley, 1943, p. 25; Van Pelt, 1958, pp. 12-13; Van Pelt, 1963, p. 212.

Pheidole bicarinata vinelandica Forel

This is a native species, which ranges from Nebraska to New York and south to Arizona and Florida.

Taxonomic Characters

Subfamily and generic characters: Dimorphic. Head extraordinarily large in proportion to body, with prominent occipital lobes and a frontal furrow. Antenna 12-segmented, with a distinct 3-segmented

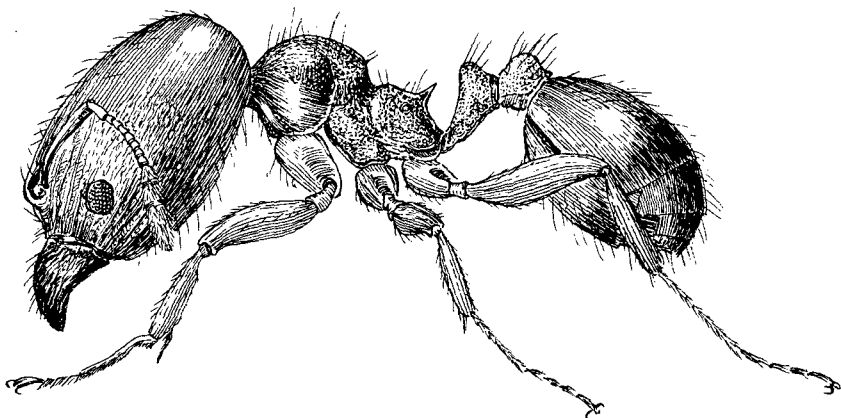


Figure 9.—*Pheidole bicarinata vinelandica* Forel, lateral view of worker.

club. Frontal carinae not placed close to each other, partly concealing antennal insertions. Abdominal pedicel of two segments, the petiole and postpetiole. Petiole pedunculate. Postpetiolar node frequently angulate or conical on the sides. *Specific characters*: Workers 1.6–3 mm. long. Head subrectangular, longer than broad, bilobed, and with a median furrow. Scape short, extending approximately to midlength of head. Middle of anterior border of clypeus emarginate. Anterior half of head largely longitudinally rugulose; posterior half, smooth and shiny. Thorax with prominent humeral angles. Postpetiolar node distinctly broader than long, laterally angulate. Body color yellowish or light brown to darker brown.

Biology and Economic Importance

These ants, a common and widely distributed species of *Pheidole*, form small- to moderate-size colonies in rotting wood, and also nest in exposed soil, or under the cover of objects. Nests are commonly constructed in open areas, or where the ground is covered with grass and weeds. The species is highly adaptable, living in deserts, on mountains, beaches, and in many other situations. Nests may occur at altitudes ranging from a few feet to at least 6,000 feet. The natural food is honeydew, seeds, and small insects. Vickery records workers transporting individuals of the corn root aphid *Anuraphis maidiradicis* (Forbes) from plant to plant in cottonfields. Workers have been known to feed on meats, greases, and breads in houses. The species is an intermediate host of the tapeworm of wild and domesticated turkeys, *Raillietina georgiensis* Reid and Nugara, of the chicken tapeworm *R. echinobothrida* (Megnin), and of the domestic fowl tapeworm *R. tetragona* (Molin).

References: Wheeler, 1904, p. 301; Wheeler, 1906a, pp. 336–337; Vickery, 1910, pp. 102, 105, 116; Gaige, 1914, pp. 5–7; Horsfall, 1938, pp. 409–421; Dennis, 1938, pp. 282, 304; Cole, 1940, p. 42; Reid and Nugara, 1961, pp. 885–889.

Pheidole floridana Emery

A native species, *floridana* ranges from North Carolina to Florida and through the Gulf Coast States to Texas.

Taxonomic Characters

Subfamily and generic characters: Same as for *bicarinata vinelandica*. *Specific characters*: Workers 1.5–2.6 mm. long. Anterior border of clypeus with a median emargination. Clypeus with a median longitudinal carina, on each side of which a few smaller, longitudinal rugulae are present. Head bilobed and with a frontal furrow. Scape short, extending to about midlength of head. Frontal carinae about length of scapes, distinctly widening posteriorly and forming a partial scrobe for the reception of each scape, and with a flattened or depressed area to the side of, and posterior to, the scape. Head largely punctulate, subopaque except for a smooth and shiny area of variable size that may include the posterior third or fourth of the head, or only a narrow, transverse band on the occipital lobes. Thorax with distinct humeral angles. Postpetiolar node distinctly wider than long and angulate or conical laterally. Body color yellowish or very light brown.

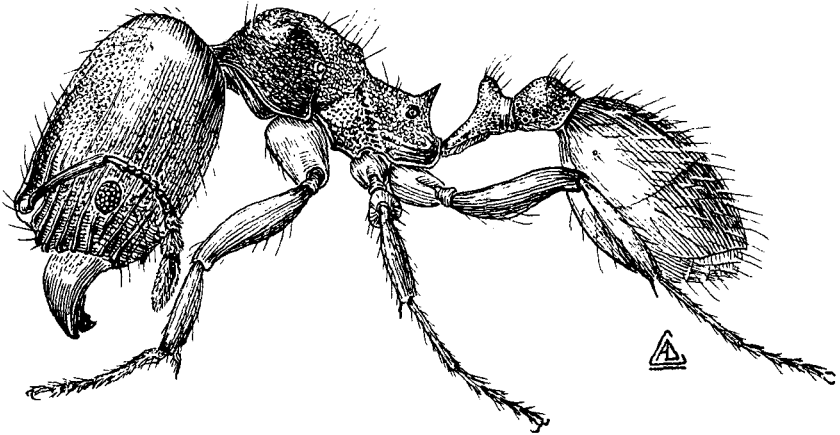


Figure 10.—*Pheidole floridana* Emery, lateral view of worker.

Biology and Economic Importance

This species, the least common of the three *Pheidoles* discussed in this paper, appears to be confined largely, if not entirely, to the coastal area, where the ants construct nests in the exposed soil or under the cover of objects; they also nest in logs and stumps, in or under litter, and at the base of trees. Van Pelt reports the species occurring in and around houses in the Welaka Reserve of Florida, and attracted to grease and peanut butter; we have received reports of their nesting in a chimney. Although collecting seeds is a common habit of ants in the genus *Pheidole*, no information is available as to whether the ants feed on honeydew or gather the seeds of weeds and grasses for food, but workers are said to feed on the germinating seed of long leaf pines.

References: Smith, 1930, p. 3; Van Pelt, 1958, pp. 16–17. .

Pheidole dentata Mayr

This native species ranges from Kansas and Virginia south to Texas and Florida.

Taxonomic Characters

Subfamily and generic characters: Same as for *bicarinata vinelandica*. *Specific characters:* Workers 2.4–3.8 mm. long. Head bilobed and with a median furrow. Anterior border of clypeus with a median emargination. Scape extending very noticeably past midlength of head. Anterior half of head sculptured, opaque; posterior half smooth and shiny. Ventral surface of head with a pair of prominent teeth or spines on anterior border (best seen in profile). Much of the mesonotum in the form of a transverse step-like process (best seen in profile). Postpetiolar node very distinctly broader than long, and subangular on each side. Sides of thorax, excluding those of prothorax, sculptured, subopaque. Dorsal surface of gaster with erect hairs of

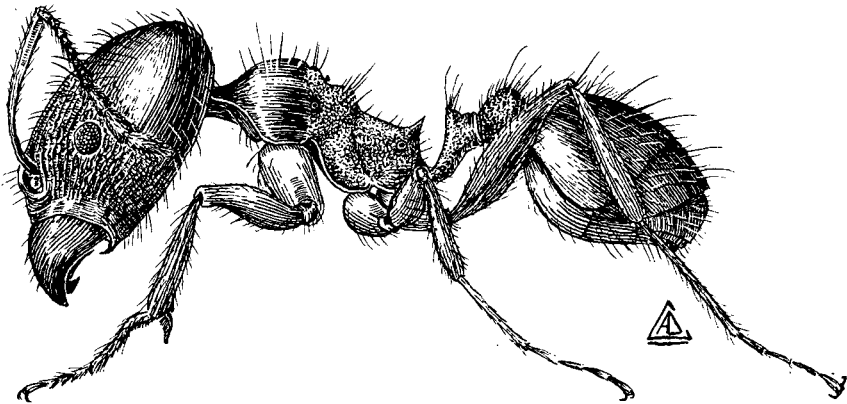


Figure 11.—*Pheidole dentata* Mayr, lateral view of worker.

variable length, some unusually long. Body color light brown to dark brown.

Biology and Economic Importance

This is an especially common species of *Pheidole* in the Southern States. The ants form small to large colonies in the exposed soil or under the cover of objects such as stones, logs, wood, or debris; they also nest in rotting wood. Their natural food is largely live and dead insects, seeds, and honeydew. Vickery found that workers of *dentata* have the same relation to *Anuraphis maidiradicis* (Forbes) in cotton-fields as do workers of *bicarinata vinelandica*. This ant is probably an intermediate host of the domestic fowl tapeworm *Raillietina tetragona* (Molin) since workers have been seen to carry gravid segments of the tapeworm into their nest. In houses, the ants are known to feed on meats, grease, liver, molasses, peanut butter, and fruit juices; it is believed that they have a preference for high-protein foods.

References: Vickery, 1910, pp. 102, 105, 116; Mitchell and Pierce, 1912, p. 71; Dennis, 1938, pp. 281, 304; Case and Ackert, 1940, pp. 393-395; Cole, 1940, p. 44; Hess, 1958, pp. 31-32, 55-59, 62-64; Van Pelt, 1958, pp. 14-15.

Crematogaster ashmeadi Mayr

A native species, which ranges from Texas east to Virginia and Florida. It is a strictly southern or southeastern species.

Taxonomic Characters

Subfamily and generic characters: Monomorphic. Head subquadrate or subrectangular. Antenna 11-segmented, with a 3-segmented club. Frontal carinae placed far apart, subparallel, partly concealing antennal insertions. Thorax short, stout. Mesoepinotal region with a pronounced constriction. Epinotum with a pair of spines of variable size and shape. Abdominal pedicel of two segments, the petiole and postpetiole. Petiole trapezoidal, broadest anteriorly (fig. 12,b). Postpetiole dorsally with a longitudinal impression or furrow, which

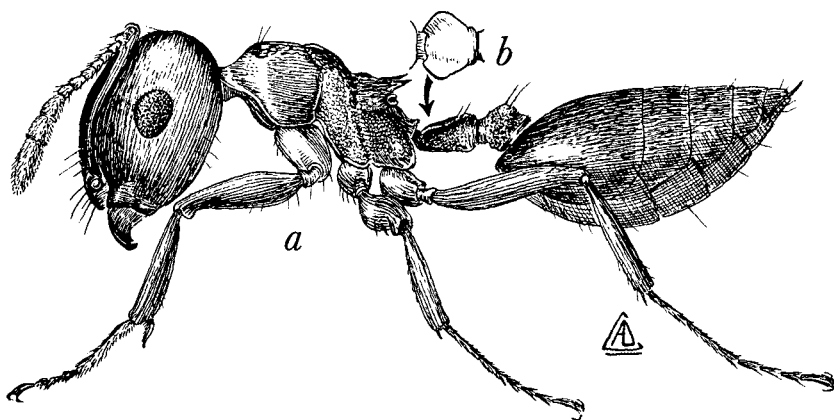


Figure 12.—*Crematogaster ashmeadi* May: a, Lateral view of worker; b, dorsal view of petiole.

forms two more or less distinct hemispheres (fig. 15,b). Postpetiole attached to dorsal surface of base of gaster. Gaster subcordate, more convex ventrally than dorsally, and with an acute apex. Sting present but not always exerted. *Specific characters:* Workers 2.6–3.2 mm. long. Head largely shiny except for sculpture on frontal carinae, cheeks, and clypeus. Scape short, its apex scarcely attaining, or barely surpassing, the posterior border of the head. Dorsal surface of thorax so finely sculptured as to appear rather smooth and shiny in most lights. Side of thorax distinctly punctulate; subopaque on meso-metapleuron. Mesonotum slightly impressed anteriorly on each side, subtruncate posteriorly, with a median longitudinal carina on its disc. Epinotal spines normally shorter than distance between base of spines, the spines much thickened basally, subparallel, acute apically. Erect hairs sparse on body, especially thorax. Pubescence on body sparse, closely appressed. Body color highly variable, that of head and thorax ranging from light reddish brown through brown to black.

Biology and Economic Importance

This ant is largely arboreal, nesting in cavities in plants and trees, insect galls, and logs and stumps. Colonies are apparently small to moderate in size. Workers tend honeydew-excreting insects, but also feed on both dead and live insects. The ants frequently nest in the woodwork of houses, in rafters, shingles, and posts. They damage insulating board and hard fiberboard, and remove the rubber insulation from telephone wires, causing short circuits. In houses, the ants seem to be omnivorous, but may show a slight preference for meats and sweets. Experimental tests by Smith and Weiss have shown that this ant can transmit *Azalea* flower spot, *Orulinia azaleae* Weiss.

References: Smith, 1924, pp. 79–80; Wheeler, 1932, p. 7; Cole, 1940, p. 46; Smith and Weiss, 1942, p. 42; Van Pelt, 1958, pp. 21–22.

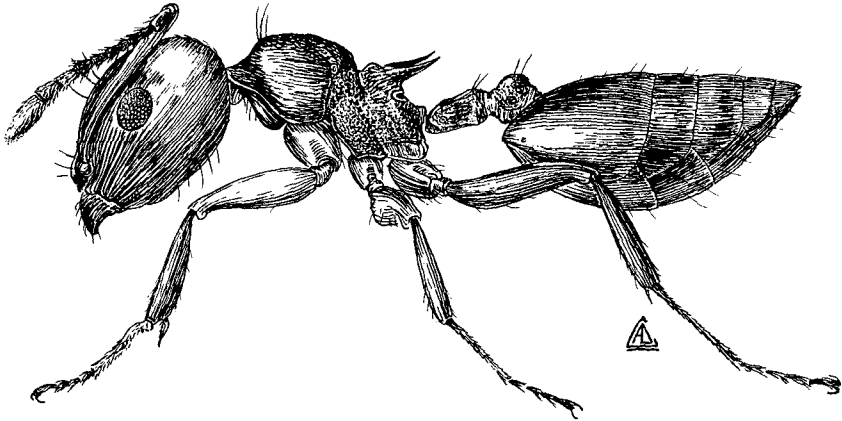


Figure 13.—*Crematogaster cerasi* (Fitch), lateral view of worker.

Crematogaster cerasi (Fitch)

A native species, which ranges from southern Canada through the eastern Rocky Mountains to New Mexico and east through the Black Hills to the Ozarks and Georgia. It is occasionally called the cherry ant. This species has been frequently confused with other species of *Crematogaster*, especially *lineolata*.

Taxonomic Characters

Subfamily and generic characters: Same as for *ashmeadi*. *Specific characters*: Workers 2.6–4 mm. long. Scape when fully extended usually noticeably surpassing posterior border of head. Promesonotum subopaque, bearing fine longitudinal striae or rugulae, the sculpture from some aspects or in certain lights, however, appearing to be finely punctulate. Mesonotum with a median carina (best seen in profile). Mesoepinotal impression usually strongly defined. Epinotal spines divergent, long and acute, straight or occasionally curved. Sides of thorax sculptured, subopaque. Erect hairs on thorax normally confined to a small cluster on each pronotal shoulder. Body pubescence closely appressed. Head and thorax varying from reddish brown to dark brown or almost black.

Biology and Economic Importance

C. cerasi nests in small-to-large colonies in the ground beneath objects, and in rotting stumps and logs, branches, and empty nuts on the surface of the soil. Nests occur in diverse habitats such as open fields, pastures, marshes, and woods. Van Pelt reports the species as occurring in the Blue Ridge Mountains in occasional colonies at altitudes from 5,100 to 5,500 feet, and rarely from 5,600 to 6,000 feet. Workers in large colonies are aggressive and emit a repulsive odor. They tend honeydew-excreting insects, and feed on both live and dead insects. Winged forms commonly emerge from their nests from late June to mid November. *C. cerasi* appears to be the most common house-infesting form of *Crematogaster*, at least in Virginia and Maryland. The

ants have been found in various parts of houses such as the roof, siding, ceiling, and porch, but most commonly in and around door and window frames, where any caste or combination of castes may appear. Some correspondents insist that the ants have done appreciable damage to the woodwork, but others maintain they can detect no damage. In some instances the ants seem to occupy, and perhaps enlarge, preformed cavities in the wood made by other insects. Although the ants feed on various household foods, I have no definite information on their food preferences. On one occasion specimens were reported to have caused a short circuit in an electric transformer by removing the insulation. This ant may be an intermediate host of the poultry tapeworm *Raillietina tetragona* (Molin); worker ants have been seen carrying gravid tapeworm segments into their nest.

References: Gaige, 1914, pp. 3-4, 8-9; Talbot, 1934, p. 420; Case and Ackert, 1940, pp. 393-395; Amstutz, 1943, p. 168; Wheeler and Wheeler, 1944, p. 245; Gregg, 1944, pp. 456, 462; Talbot, 1957, pp. 376-378, 381; Kanno, 1959, pp. 125, 157; Van Pelt, 1963, p. 212.

Crematogaster clara Mayr

This native species ranges from Indiana to New Jersey and south to Texas and Florida. It is common in the lower Mississippi Valley. In earlier literature the species has been recorded erroneously as *laeviuscula* Mayr.

Taxonomic Characters

Subfamily and generic characters: Same as for *ashmeadi*. *Specific characters:* Workers 3.3-4 mm. long. Scape rather long when fully extended, usually noticeably surpassing posterior border of head. Head shiny except for the areas dulled by the sculpturing on cheeks and clypeus. Mesonotum with median carina. Mesoepinotal impression well defined. Dorsum of thorax (promesonotum) with very fine sculpture, largely punctulations; the area subopaque or shiny, especially when viewed with varying brightness or direction of light. Side of thorax sculptured and subopaque except for that of prothorax,

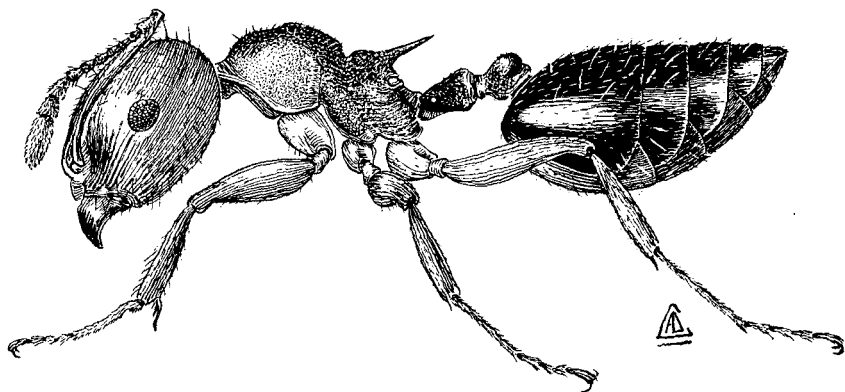


Figure 14.—*Crematogaster clara* Mayr, lateral view of worker.

which is smooth and shiny. Epinotal spines long and divergent, straight or occasionally curved, acute apically. Pubescence long, suberect, and relatively dense, at least on head and thorax; admixed with long erect hairs, especially on head and anterior part of thorax. Body color varying from a yellowish or very light brown through brown to blackish.

Biology and Economic Importance

The ants nest in moderate to large colonies in cane stems, branches, trees, and rotten stumps and logs. Buren, in unpublished data, says favorite habitats are flatwoods, swamps, and marshes. As in most species of *Crematogaster*, workers feed largely on honeydew and the flesh of live and dead insects. The ants are known to nest in the woodwork of houses, and to infest household foods. Like *ashmeadi*, they are almost omnivorous but seem to show a slight preference for sweets and meat. They can cause short circuits in telephone wires by removing the rubber insulation. Workers have been reported to have killed newly hatched birds.

References: Smith, 1924, p. 80; Dennis, 1938, pp. 272, 274, 283, 304; Cole, 1940, pp. 29, 47.

Crematogaster lineolata (Say)

This species occurs in southern Canada and ranges south along the Rocky Mountains and east to Florida. It has sometimes been called the lined acrobatic ant. Various species of *Crematogaster* have been misdetermined as *lineolata* in our earlier literature.

Taxonomic Characters

Subfamily and generic characters: Same as for *ashmeadi*. *Specific characters:* Workers 2.5–3.5 mm. long. Occiput and vertex of head occasionally punctulate, subopaque. Scape when fully extended noticeably surpassing posterior border of head. Dorsum of thorax sub-

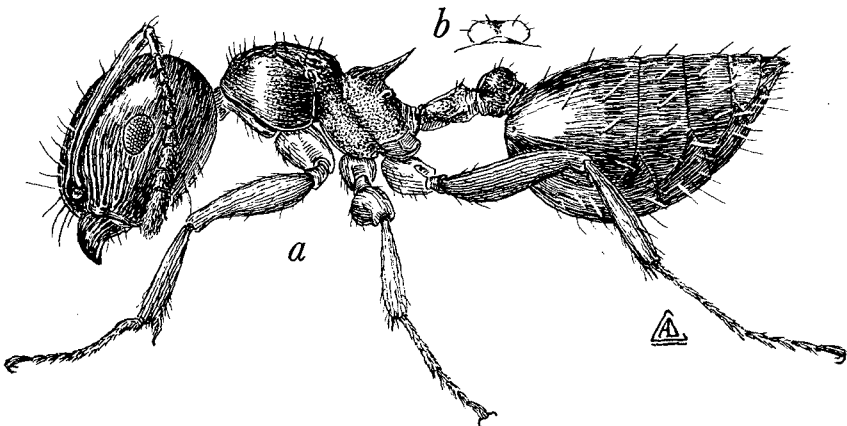


Figure 15.—*Crematogaster lineolata* (Say): a, Lateral view of worker; b, posterodorsal view of postpetiole.

opaque or opaque; promesonotum typically roughly sculptured, bearing coarse longitudinal rugae or striae, interspersed with punctures. Sides of thorax sculptured, subopaque. Erect hairs on dorsum of thorax coarse or bristlelike, moderately numerous, and rather well distributed. Mesonotum with median carina. Mesoepinotal impression well defined. Epinotal spines normally rather long and divergent, straight or occasionally curved. Pubescence short and closely appressed. Body color ranging from light brown through dark brown to blackish. This common and widely distributed species can be readily distinguished by its pilosity, pubescence, and sculpture.

Biology and Economic Importance

This species nests in moderately large to large colonies in exposed soil or under stones and other objects, and in logs, stumps, and dead trees. Van Pelt records the species nesting in the Blue Ridge Mountains in occasional colonies at altitudes of 3,500 to 5,500 feet. Workers feed largely on honeydew obtained from honeydew-excreting insects, and on live and dead insects. They have been recorded as predators of winged termites, the immature stages of the cotton boll weevil, grape curculio, and codling moth. When alarmed, workers bite fiercely, and give off a repulsive odor. Males and winged females have been observed in the nest or emerging from the nest from mid June to late September. Like other species of *Crematogaster*, *lineolata* nests in the woodwork of houses, and also infests household foods. Although largely omnivorous, *lineolata* seems to show a slight preference for sweets and meats, or foods of a high protein content. The ants sometimes occupy the nests of wood-nesting wasps.

References: Wheeler, 1905b, pp. 378-379; Wheeler, 1906b, pp. 1-18; Davis and Bequaert, 1922, p. 8; Dennis, 1933, p. 282; Cole, 1940, pp. 29, 46-47; Wesson and Wesson, 1940, p. 93; Van Pelt, 1963, p. 212.

Monomorium minimum (Buckley)

Little black ant. This is a native species, which ranges throughout southeastern Canada and the northern and eastern sections of the United States. Its range in western North America has not yet been accurately delimited. In our literature, this species was formerly and incorrectly called *minutum* Mayr, or a subspecies of *minutum*.

Taxonomic Characters

Subfamily and generic characters: Monomorphic. Head distinctly longer than broad. Antenna 12-segmented, with well-defined, 3-segmented club. Frontal carinae short, not close together, partly concealing the antennal insertions. Clypeus with a pair of longitudinal carinae which are often extended beyond the anterior margin of the clypeus as more or less distinct teeth. Prothorax with rounded humeri. Promesonotal suture absent or obsolescent. Mesoepinotal region with well-defined constriction. Epinotum unarmed. Abdominal pedicel composed of two segments, the petiole and postpetiole. Gaster usually with distinct basal angles (best seen from above). Sting present but not always exerted. *Specific characters:* Workers 1.5-2 mm. long. Body almost entirely smooth and shiny except for

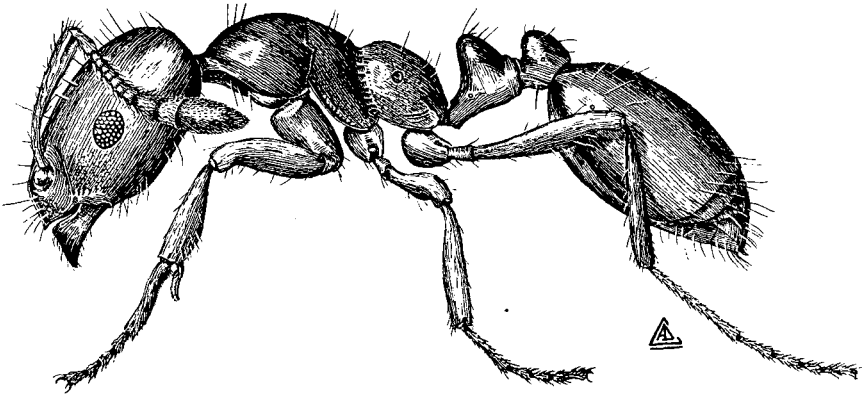


Figure 16.—*Monomorium minimum* (Buckley), little black ant, lateral view of worker.

some weak sculpturing on cheeks, anterior border of head, and meso-metapleuron. Body dark brown to black, typically black. Body pubescence sparse, closely appressed, most evident on dorsum of gaster.

Biology and Economic Importance

M. minimum is one of the most common and best known of our house-infesting ants, but no detailed biological work has been done on the species. Under natural conditions the ants are highly adaptive in their nesting and feeding habits. They may nest in exposed soil or under cover of objects and in rotting or faulty wood. Van Pelt has found colonies of this ant rare in the Blue Ridge Mountains at altitudes of 4,100 to 5,000 feet. Colonies are generally moderate to large in size, and contain numerous fertile females. Males and winged females have been recorded from June to August. Workers are predacious and carnivorous on other insects, tend plant lice or other honeydew-excreting insects, visit floral and extrafloral nectaries of plants, and may even feed on the pollen in flowers of certain plants. The ants may invade houses from outdoors, or nest in the woodwork or masonry of the building. Because they are small, the ants are not capable of doing any appreciable damage to building materials. Workers feed on a wide variety of household foods such as sweets, meats, bread, grease, oils, cornmeal, fruits, and fruit juices. I have received reports of recently hatched bluebirds and kingfishers being killed by these ants.

References: Marlatt, 1898, p. 3, fig.; Dennis, 1938, pp. 271-272, 274, 279-280; Metcalf and Flint, 1939, p. 770; Cole, 1940, pp. 14, 29, 40; Gregg, 1944, pp. 454, 456, 466; Smith, 1950, p. 281; Hess, 1958, pp. 26-27, 55-60, 62, 63; Van Pelt, 1963, p. 212.

Monomorium pharaonis (Linnaeus)

Pharaoh ant. An introduced species which is thought to be native to the African Region. The ant has been widely distributed to all parts of the world by commerce. It is one of the most common and best known of all house-infesting ants. The Pharaoh ant probably occurs in every town or city of commercial importance in the United States. Although not widely or uniformly distributed in such localities, it is

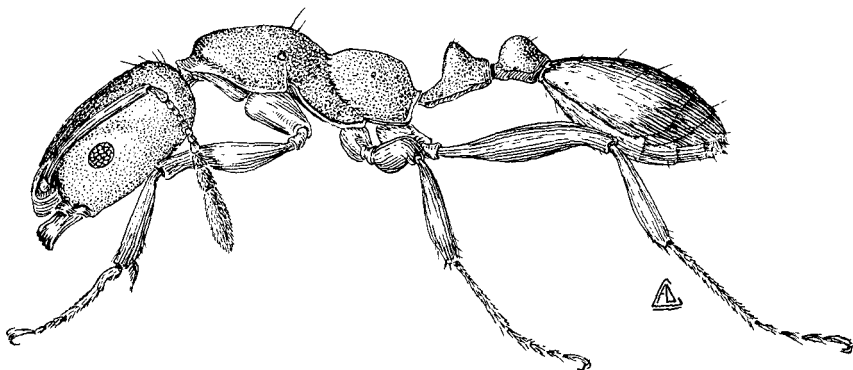


Figure 17.—*Monomorium pharaonis* (Linnaeus), Pharaoh ant, lateral view of worker.

especially common in hotels, large apartment houses, groceries, or other places where food is commercially handled. It is believed that on numerous occasions in our earlier literature the Pharaoh ant was confused with the thief ant *Solenopsis molesta*.

Taxonomic Characters

Subfamily and generic characters: Same as for *minimum*. *Specific characters:* Workers monomorphic, approximately 2 mm. long. Each segment of antennal club gradually increasing in size toward the apex of club. Clypeal carinae rather weakly defined. Pair of teeth on the anterior border of clypeus absent or obsolescent. Eye comparatively small, with approximately 6–8 ommatidia in its greatest diameter. Prothorax with subangular shoulders. Thorax with well-defined mesoepinotal impression. Erect hairs on body sparse. Pubescence of body sparse, closely appressed. Head, thorax, petiole, and postpetiole densely but weakly punctulate, dull, or subopaque; the clypeus, gaster, and mandibles shiny. Body color ranging from yellowish or light brown to reddish. Gaster with varying amounts of infuscation, which is confined largely to apical portion.

Biology and Economic Importance

The ants normally nest in inaccessible places in buildings, where they undoubtedly breed continuously the year around, and produce prodigious numbers of individuals. For instance, in 2 years on his premises, Bellevoye captured 1,360,000 workers, 1,809 wingless females, 94 winged females, and 560 males. These figures do not account for the innumerable individuals he was unable to trap. Home owners have been known to consider selling their houses because of the ravages of this pest. A ship owner is known to have lost a great deal of time and spent \$4,000 in trying to eradicate these ants from his ship. Approximately 38 days are required for the development of the worker from egg to adult and 42 days for the development of the male and female. In houses, the ants often nest in such odd places as between sheets of stationery, layers of linens, and other abnormal places. In one instance, a person returning from an extended trip to the Canal Zone found a colony between clothing in his trunk. Practically omnivorous,

the ants are known to feed on jelly, sugar, syrup, and other sweets, cakes and breads, pies, butter, liver, and bacon. They seem to have a preference for grease, fats, and meats. Workers feed on both dead and live insects. Very often they appreciably damage insect collections by feeding on dried specimens. Reports have been received of ants gnawing holes in silk, rayon, and rubber goods. The Pharoah ant is without doubt the most persistent and difficult of all our house-infesting ants to control or eradicate. The success of this species is probably due to their many reproductive females, their ability to breed the year around, their accessibility to an unlimited amount of food, and to the fact that females do not have to expose themselves to the elements or enemies by traveling great distances to find suitable nesting sites. Numerous daughter colonies apparently are produced by a splitting or budding process from an original mother colony, since no nuptial flights have been observed. A spread of many miles would therefore have to be accomplished by man. Those especially interested in the biology and control of this species should consult Peacock et al. (1950).

References: Bellevoe, 1889, pp. 230-233; Marlatt, 1898, pp. 1-2 fig.; Herrick, 1914, pp. 173-176, fig.; Donisthorpe, 1927, pp. 103-109, fig.; Smith, 1934, pp. 139-149; Metcalf and Flint, 1939, p. 770; Peacock and Baxter, 1950, pp. 171-178; Peacock, Hall, Smith, and Goodfellow, 1950, pp. 1-50; Sudd, 1953, pp. 17-18.

Monomorium floricola (Jerdon)

This is an introduced species whose original home appears to be the African or Oriental Region, probably the latter. It is now established in a number of localities in Alabama and Florida, especially the latter State.

Taxonomic Characters

Subfamily and generic characters: Same as for *minimum*. *Specific characters:* Workers 1.4-1.8 mm. long. Body unusually slender. Clypeal teeth apparently absent or obsolescent. Gaster much narrowed basally (best seen from above). Body largely smooth and shiny except for sculpturing on cheeks, clypeus, and mesometapleuron. Body hairs and pubescence sparse; pubescence appressed, scarcely discernible. Body strikingly bicolored, head and gaster dark brown or

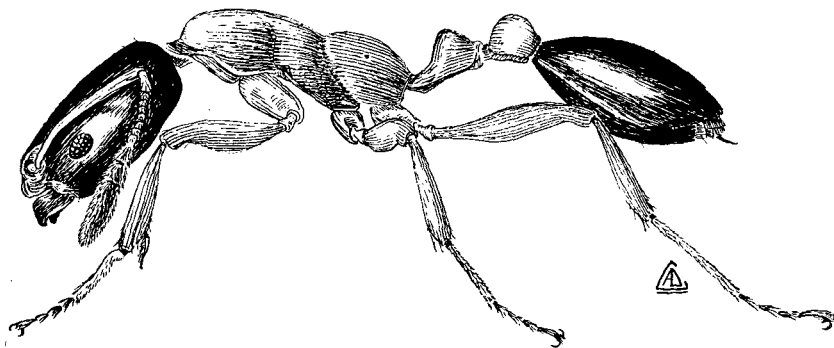


Figure 18.—*Monomorium floricola* (Jerdon), lateral view of worker.

blackish, and thorax, petiole, postpetiole, and appendages noticeably lighter. The worker of *floricola* is easily distinguished from the other species of *Monomorium* by its unusually slender and very strikingly bicolored body.

Biology and Economic Importance

Under normal conditions *floricola* appears to be largely, if not exclusively, an arboreal species, nesting in twigs and branches or under the bark of trees and other plants. It may nest in dead as well as live wood. Colonies are of diverse size, but are frequently large. As with *destructor*, there are numerous fertile females, but they differ from females of most species in not ever having borne wings. Workers visit the floral and extrafloral nectaries of plants, tend honeydew-excreting insects, and feed on insects, many of which they doubtlessly kill. In Puerto Rico this is one of the most important ants associated with the pineapple mealybug *Pseudococcus brevipes* (Ckll.). The ants commonly infest houses and feed on household foods, but little is known about their food preferences except that on occasions they have eaten sugar and fed on fountain syrup in drug stores. I do not know whether the ants invade houses from outdoors or nest in the house, but they are probably capable of both. However, their small size prevents them from doing any appreciable damage to woodwork or masonry.

References: Wheeler, 1905a, pp. 87-88; Marlatt, 1916, p. 3; Wheeler, 1924, p. 108; Smith, 1936, pp. 833-834; Plank and Smith, 1940, pp. 59-60, 63.

Monomorium destructor (Jerdon)

This is an introduced species, the original home of which is probably the Oriental Region. The species is established in Tennessee and especially in a number of localities in Florida.

Taxonomic Characters

Subfamily and generic characters: Same as for *minimum* with the following exceptions: Workers variable in size, somewhat dimorphic.

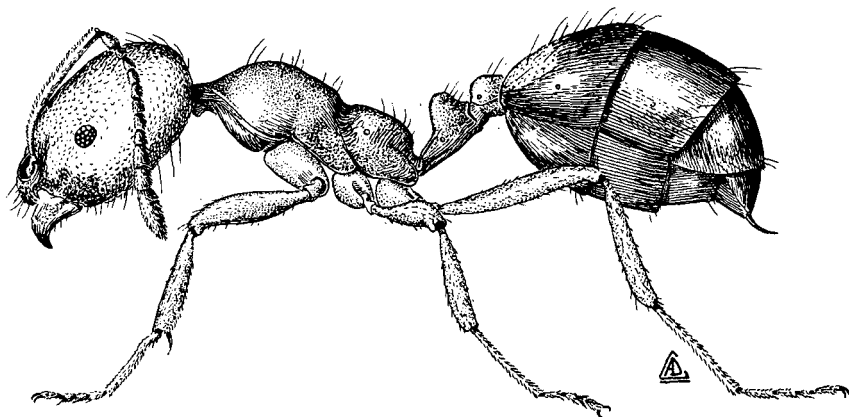


Figure 19.—*Monomorium destructor* (Jerdon), lateral view of worker.

Head in larger individuals proportionally broader with respect to length. First two segments of antennal club subequal. Clypeal carinae and clypeal teeth absent or obsolescent. *Specific characters:* Workers 1.8–3.0 mm. long. Dorsal surface of posterior border of head and dorsal surface of epinotum with fine transverse rugulae. Mesopleuron and side of epinotum sculptured, remainder of body largely smooth and shiny. Body hairs sparse, widely distributed, long and slender, suberect to erect. Body color pale yellowish or very light brown, with gaster noticeably infuscated, this infuscation varying in degree and extent.

Biology and Economic Importance

M. destructor lives in large colonies containing many fertile females. The ants nest in the soil or in buildings, depending largely upon whether they occur in tropical, semitropical, or temperate regions. Workers are highly predacious on other insects but also tend honeydew-excreting insects and feed on seeds. They move slowly in single file and appear to follow the trail by scent. The ants are a common and important house-infesting form. They are almost omnivorous and feed on such household foods as cookies, sweets, breads, meats, oils, greases, and animal substances. They gnaw holes in fabrics and rubber goods, and remove the rubber insulation from electric or telephone wires. (On one occasion they were reported to have apparently damaged exposed polyethylene cable by gnawing into it.) People are reported to have been bitten or stung fiercely while in bed. One investigator found bubonic plague bacteria in the feces of ants that had fed on plague-infected rats.

References: Wroughton, 1892b, p. 186; Wheeler, 1906c, pp. 23–24; Marlatt, 1916, p. 3; Clarke, 1922, pp. 329–333; Wheeler, 1926, pp. 10, 153, 221; Smith, 1936, p. 839; Kalshoven, 1937, pp. 65–71; O'Rourke, 1956, pp. 109–110; Kempf, 1960, pp. 506–507.

Solenopsis xyloni McCook

Southern fire ant. This native species ranges from California to South Carolina (southern part) and Florida (northwest corner). It is especially common in some of the Gulf Coast States. *S. xyloni* has been confused with the fire ant *Solenopsis geminata* (Fabricius) on many occasions.

Taxonomic Characters

Subfamily and generic characters: Polymorphic. Antenna 10-segmented, with 2-segmented club. Eye well-developed and with numerous ommatidia. Frontal carinae far apart, partly concealing antennal insertions. Clypeus bicarinate, the anterior border with 2 to 5 teeth. Masticatory border of mandible with 3 to 4 well-defined teeth. Mesoepinotal region of thorax with well-developed suture or impression. Epinotum unarmed. Abdominal pedicel composed of two segments, the petiole and postpetiole. Sting present but not always exerted. Much or most of body smooth and shiny. *Specific characters:* Workers 1.6–5.8 mm. long. Head not extraordinarily large, as with *geminata* (p. 40), distinctly less than twice as broad as pronotum. Mandible not as strongly incurved as that of *geminata*. Masticatory border of man-

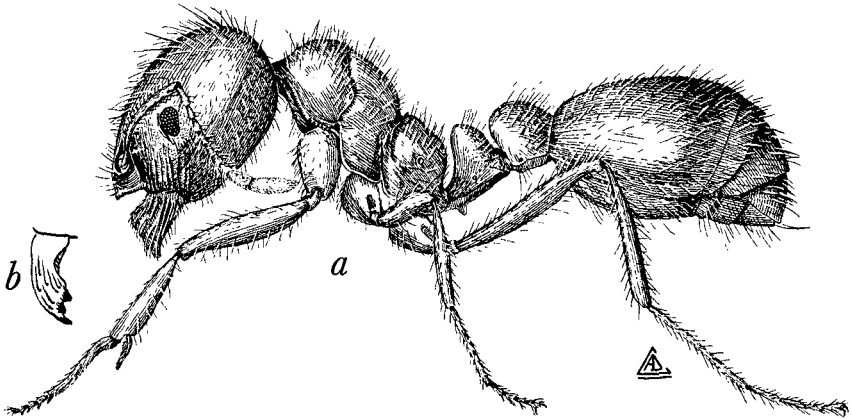


Figure 20.—*Solenopsis xyloni* McCook, southern fire ant: a, Lateral view of worker; b, right mandible showing shape of mandible and number and arrangement of teeth.

dible with three well-developed teeth (fig. 20, b), often a fourth or vestigial tooth posterior to the well-developed teeth. Antennal scape short, apex of scape, when fully extended, reaching about half way between eye and posterior border of head. Anterior border of mesopleuron continuous, without toothlike or other irregularities. Petiolar node, in profile, not sharp or bladelike at the summit as in *geminata*. Petiole usually with a distinct anteroventral tooth. Surface of mesopleuron very finely sculptured, scarcely subopaque. Body, especially gaster, usually very hairy. Body color varying from yellowish to reddish, with gaster dark, especially around the posterior border of the gastric segments.

Biology and Economic Importance

S. xyloni is largely a ground-nesting species, the colonies of which may be freely exposed or under the cover of stones and other objects. The ants also nest in wood, sometimes even in the woodwork or masonry of houses. Colonies are frequently very populous. Outdoors, the earth is commonly thrown from the nest in irregular and variable-sized, crater-shaped masses of loose soil. Workers are slow-moving when compared with such agile and quick-moving ants as the Argentine ant *Iridomyrmex humilis* (Mayr). They are very sensitive to vibrations or jars, however, and when one steps on a nest, the workers rush out and viciously sting one's feet or legs. A complete study has not yet been made of the biology of *xyloni*. On numerous occasions recently fertilized females have been seen establishing nests independently in the soil. The large population of some colonies suggests, however, that more than one female takes part in reproductive activities. The ants are practically omnivorous, feeding on seeds, honeydew, flesh, the juices or sap of fruits and plants, and various human foods. The ants are especially known for their predacious habits, although they will also eat dead insects. Especially in the Gulf States and California, *xyloni* is one of the worst of the ant pests. The species affects man in

many ways. It builds ugly mounds on lawns; stings painfully, affecting individuals in different ways according to their degree of allergy (a small infant is reported to have been stung to death by the ants); steals seeds from seed beds; kills young or newly hatched poultry, quail, and other birds; girdles nursery stock, such as citrus and pecans; gnaws into the buds of okra and althea, and into potato tubers, dahlia stems, strawberry fruits, and the fruit of egg plants; bites holes in various fabrics such as woolens, silks, linen, and nylon; removes rubber insulation from around telephone wires and fouls telephone equipment with extraneous material; tends honeydew-excreting insects, and feeds on household foods such as nuts, cereals, cookies, butter, grease, meats, and fruits. These ants are especially fond of food with a high protein content.

References: Smith 1936, pp. 120-122; Eckert and Mallis, 1937, pp. 19-21, figs.; Mallis, 1938, pp. 89-91; Eagleson, 1940, p. 700; Smith, 1950, pp. 271-272; Hess, 1958, pp. 58-59; Blum, Roberts, and Novak, 1961, pp. 73-74.

Solenopsis geminata (Fabricius)

Fire ant. A native species which ranges from Texas to South Carolina and Florida and south to at least Costa Rica. It also occurs in the West Indies. The species occurs in most, if not all, of Florida and ranges inland in other States at distances varying up to as much as 150 miles. The species has frequently been confused with *wyloni*. The name, "tropical fire ant" seems much more descriptive than that adopted by the Entomological Society of America.

Taxonomic Characters

Subfamily and generic characters: Same as for *wyloni*. *Specific characters:* Workers 2.4-6 mm. long. Head extraordinarily enlarged, more than twice as broad as pronotum, strongly bilobed posteriorly. Mandible sharply curved inward or "bowed" (fig. 21, b), the masticatory border frequently toothless. Anterior border of mesopleuron

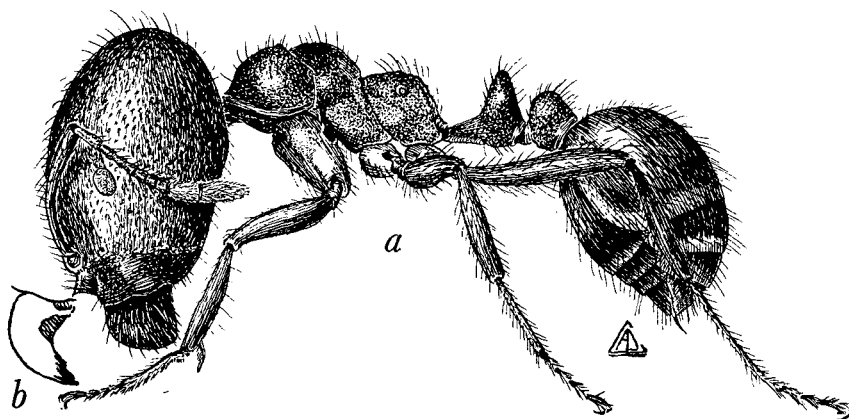


Figure 21.—*Solenopsis geminata* (Fabricius), fire ant: a, Lateral view of worker; b, right mandible showing shape of mandible and the almost toothless condition of the masticatory border.

normally with toothlike or other irregularities. Thorax commonly sculptured and opaque on mesopleuron and side of epinotum, this sculpturing sometimes extending onto dorsum of epinotum. Petiolar node narrow in profile, especially dorsally, where it is somewhat bladeliike. Color so highly variable as to defy accurate description; some individuals largely yellowish or light redish, others largely blackish, yet others with a mingling of light and dark colors. Species readily distinguished by the extraordinarily large head; strongly incurved and often toothless mandible; narrow petiolar node with sharp bladeliike summit (in profile); and anterior border of mesopleuron, which is usually irregular in outline with spines or other projections.

Biology and Economic Importance

This species closely resembles *S. xyloni* in biology and economic importance. Until the introduction of the imported fire ant into Florida, *geminata* was not only the most common but the worst fire ant pest in that State. *S. geminata* usually nests in the ground, from which it throws out earth in irregular piles, some of which may be as large as a bushel basket. The piles are commonly constructed around clumps of vegetation. The species may also nest in the soil under objects or in rotting wood. The ants usually nest in open areas in dry to moist soil of variable composition. Although no detailed studies have been made on the biology of this species, observations to date suggest possibly no more than one reproductive female per nest. Males and females have been seen making nuptial flights from late May to early June. Colonies are frequently populous. The fire ant is especially noted for its predacious habits. Experiments conducted in Puerto Rico have shown that up to 91 percent of pupae of flies such as *Musca domestica* (Linnaeus), *Callitroga macellaria* (Fabricius), and *Sarcophaga* spp. have been destroyed by the fire ant and other ants. The fire ant is considered to be one of the most important predators of all the ants. It has been shown experimentally that workers of the fire ant can carry viable germs of dysentery on their bodies for at least 24 hours. This species affects man in ways almost identical to those of *xyloni* and its food preferences are quite similar. These ants have been reported to gnaw holes in rubber surgical gloves.

References: Wheeler, 1914, pp. 164-165; Clark, 1931, p. 5; Smith, 1936, pp. 838-839; Travis, 1941, pp. 15-22; Lindquist, 1942, pp. 850-852; Griffiths, 1942, pp. 271-272; Pimentel, 1955, pp. 28-30.

Solenopsis saevissima richteri Forel

Imported fire ant. This form has been introduced from South America, probably Argentina; *richteri* is a subspecies of *saevissima* (F. Sm.), a smooth, shiny, yellowish ant whose native home is also South America. It was first officially recorded in the United States from Mobile, Ala., in 1930, but apparently had been present there for at least 10 to 12 years. Infestations of various extent are now present in the Southern States from North Carolina and Florida west to Arkansas, Louisiana, and Texas, exclusive of Tennessee. There is no question that man has played an important role in the spread of this ant by his commercial activities. As hitch hikers, the ants have

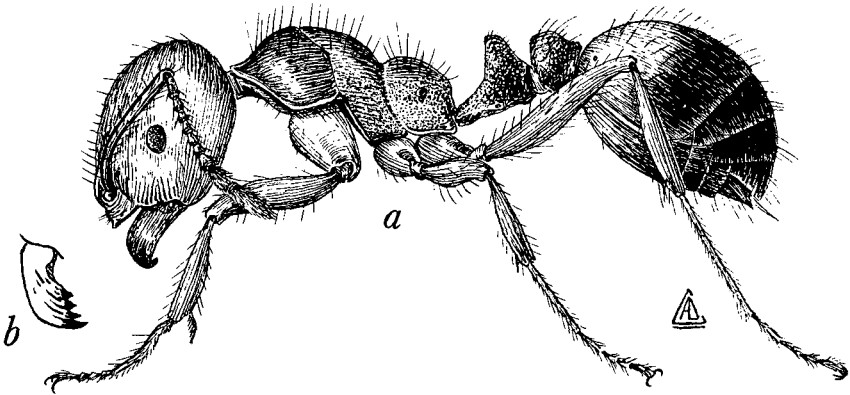


Figure 22.—*Solenopsis saevissima richteri* Forel, imported fire ant: a, Lateral view of worker; b, right mandible showing shape of mandible and number and arrangement of teeth.

been carried by trucks, trains, and private cars. They have also been spread by shipments of nursery stock, building materials, logs, stumps, and soil. Their spread by flight, crawling, or by heavy rain storms is apparently of less significance.

Taxonomic Characters

Subfamily and generic characters: Same as for *xyloni*. *Specific characters:* Worker 2.8–6 mm. long. Head not remarkably large, distinctly less than twice as broad as pronotum. Mandible not sharply curved inward or bowed as in *geminata*, masticatory border with four well-defined teeth (fig. 22,b). Apex of scape extending more than half the distance between upper border of eye and posterior border of head. Anterior border of mesopleuron continuous, not bearing teeth or irregular projections. Mesopleuron and side of epinotum with sculpture dense enough to appear subopaque. Dorsal surface of petiolar and postpetiolar nodes, when viewed from above and behind, bearing apparent longitudinal furrows or foveolae. Typical species with deep piceous brown or blackish body except for a broad band of yellowish red at base of gaster. Non-typical form varying so widely in color as to defy accurate description; in general, red and black predominate and are usually intermingled. Reddish color most commonly covers the body except much of the gaster, which is blackish. Non-typical form is by far the most common.

Biology and Economic Importance

The complete biology of *richteri* is unknown. The ants usually nest in the soil in open areas, less frequently in wooded areas in or around stumps and logs. Nests may be constructed in various types of soil ranging from loose to compact and varying greatly in the amount of moisture. In open areas, the earth is usually thrown from the nests in piles ranging from a few inches to as much as 3 feet or more in height. The larger mounds are generally dome-shaped or conical. The mound contains numerous galleries and chambers, both above and below the soil level. The ants frequently abandon one nest site

to seek another. Fully mature colonies may contain thousands of ants, including males and winged females. Due to the size of some colonies it is assumed that they contain more than one reproductive female. One observer reports that he has found 23 wingless (or apparently fertile) females in a colony.

In the Gulf coast area, males and winged females can be found in numerous nests almost any month of the year. Nuptial flights, however, commonly take place in the spring but have also been observed from late December to late February. The ants occasionally nest in houses. Workers are almost omnivorous, feeding on the flesh of insects, birds, mammals, the sap or juices of plants and fruits, seeds, honeydew, and household foods such as meat, butter, cheese, peanut butter, nuts, breads, bacon, and grease. They seem to show a preference for foods of a high protein content. The ants are not only carnivorous but highly predaceous. Nests are often constructed on lawns, disfiguring them and interfering with mowing. Paved sidewalks and public roads are sometimes undermined by the nests of the ants. Workers are highly aggressive and sting viciously; people allergic to their stings can suffer great discomfort or even death. The ants steal seeds from seedbeds and feed on the germinating seed of corn, causing a high percentage of loss. Workers are known to gnaw holes in fabrics, especially if soiled. They tend or may foster honeydew-excreting insects such as plant lice, mealybugs, and scales. They are known to kill young rabbits, pigs, and other mammals, and quail and other birds are especially vulnerable to the ants at hatching time. The ants are often so abundant in gardens and fields that the gathering of vegetables and other crops is almost impossible. The ants gnaw into the roots, stems, buds, and fruit of plants such as cabbages, collards, okra, eggplant, and field peas. Young plants are seriously damaged by girdling or the removal of outer bark from roots or stems; young citrus stock is especially subject to this kind of attack.

References: Creighton, 1930, pp. 88-89; Lyle and Fortune, 1948, pp. 833-834; Green, 1952, pp. 592-597; Anonymous, 1954, pp. 1-8, fig.; Jung and Derbes, 1957, pp. 372-373; Caro, Derbes, and Jung, 1957, pp. 475-488, figs.; Anonymous, 1958, pp. 1-21, figs.; Favorite, 1958, pp. 445-448; Blum, Roberts, and Novak, 1961, pp. 73-74.

Solenopsis molesta (Say)

Thief ant. A native species, which ranges through the eastern and central United States from southern Canada to the Gulf Coast. It is one of the smallest species discussed in this paper. The name "thief ant" refers to the habit of nesting in or very near the nests of other ants, which they rob of food and brood. At times this species has been confused with the Pharaoh ant; the two species, however, differ in many characters, some of which are easily recognizable.

Taxonomic Characters

Subfamily and generic characters: Same as for *wyloni* with the following exceptions: Workers monomorphic. Eye minute, with 4-6 ommatidia or less. *Specific characters:* Workers extremely small, 1.3-1.8 mm. long. Scape extending more than half the distance between eye and posterior border of head. Antennal club unusually large and elongate, approximately one and one-third times the combined lengths

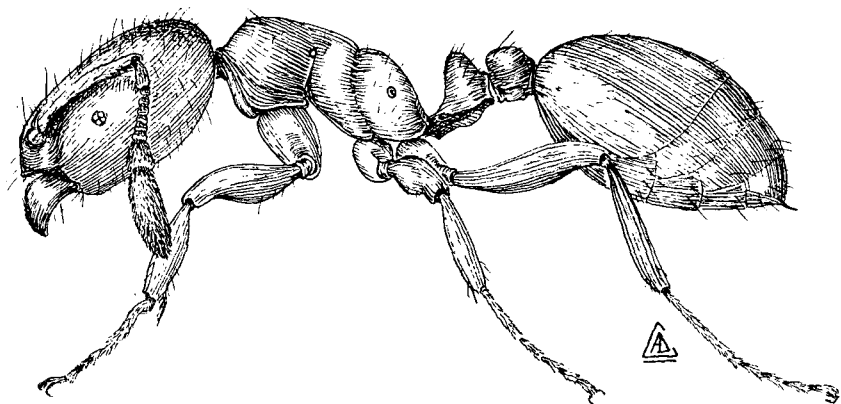


Figure 23.—*Solenopsis molesta* (Say), thief ant, lateral view of worker.

of remainder of funiculus. Anterior border of clypeus with two distinct teeth, the lateral tooth absent or obsolescent. Mandible normally with four teeth. Dorsal surface of head with sparse, scattered piligerous punctures which are apparently absent from a median area extending from clypeus to posterior border of head; punctures distinct in some kinds of lighting and indistinct in others. Postpetiolar node (viewed from above) wider than long, widest near the middle of its length. Body hairs moderately abundant and well distributed, suberect to erect, rather long. Body largely smooth and shiny. Body color ranging from yellowish or light brown to dark brown.

Biology and Economic Importance

S. molesta is one of our well-known and common species of house-infesting ants. Colonies contain many hundreds to a few thousand individuals. The ants nest in exposed soil or under cover of stones and other objects, in rotting wood, and in the woodwork and masonry of houses. Van Pelt has found colonies of this ant common in the Blue Ridge Mountains at altitudes of 3,500 to 5,500 feet. Nuptial flights have been observed from late July to early fall; the sexed forms copulate in flight. A single fertile female is capable of establishing her nest alone but she may not always do so; one observer noted a nuptial flight in which some females carried at least one worker each attached to her body. Workers are almost omnivorous. They feed on both dead and live insects and are especially noted for being predaceous. They are also highly granivorous and feed on planted or germinating corn, milo, sorghum, feterita, and kafir, often causing considerable damage to these crops. Workers are fond of honeydew and are known to tend plant lice, mealybugs, and scale insects. They feed on many household foods such as meats, breads, sweets, ripened fruits, animal fats, vegetable oils, nuts, and dairy products. They appear to prefer foods with a high protein content. In most instances the ants nest in houses, commonly in hot weather. In some homes they may give trouble periodically over a long period of years but in others they appear only infrequently. I once found the ants nesting in a rotten porch floor near a kitchen, which they were invading to feed on crackers

with a high fat content. The ants are a great annoyance to housekeepers because of their extremely small size, which allows them to enter containers not accessible to larger ants. The workers are well adapted for infesting cabinets, shelves, and containers, and often do so even though the housekeeper has been unusually careful to keep everything closed and scrupulously clean. Unverified reports indicate that females may bite or sting people in bed at night. This species may be an intermediate host of the poultry tapeworm *Railletina tetragona* (Molin); worker ants have been seen carrying gravid segments of the tapeworm into their nest.

References: McColloch and Hayes, 1916, pp. 23-38; Hayes, 1920, pp. 1-54, figs.; Metcalf and Flint, 1939, pp. 389, 770; Case and Ackert, 1940, pp. 393-395; MacNamara, 1945, p. 40; Smith, 1950, p. 269; Van Pelt, 1963, p. 212.

Tetramorium caespitum (Linnaeus)

Pavement ant. This introduced species was undoubtedly brought into the United States by the early colonists from Europe. The ants are most common in cities and towns of the Atlantic Seaboard States, but are more sparsely distributed inland except in large centers of commerce, such as Cincinnati and St. Louis. Although not primarily an urban species, *caespitum* is confined largely to metropolitan areas in the United States. In Washington, D.C., and its metropolitan area, the species is not only one of the most common, but probably the predominant, house-infesting ant.

Taxonomic Characters

Subfamily and generic characters: Monomorphic. Head subquadrate or subrectangular, with emarginate posterior border. Frontal carinae placed far apart but partly concealing antennal insertions. Antenna 12-segmented, with 3-segmented club. Posterior border of clypeus forming a sharp ridge or rim in front of antennal fossa. Pronotum (viewed from above) with angular shoulders. Promesonotal suture absent or obsolescent. Epinotum with a pair of spines of

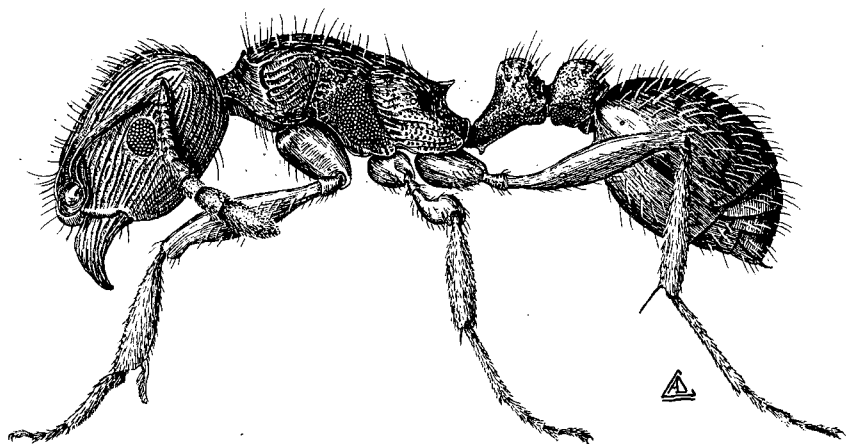


Figure 24.—*Tetramorium caespitum* (Linnaeus), pavement ant, lateral view of worker.

variable length. Metasternum extended posteriorly on each side to form a distinct spine or rounded lamella. Femora noticeably enlarged. Abdominal pedicel composed of two segments, the petiole and postpetiole. Sting present but not always exerted. *Specific characters:* Workers approximately 2.5–3 mm. in length. Apex of scape lacking more than its greatest width of attaining posterior border of head. Frontal carinae placed far apart, the distance between them widening posteriorly, not forming scrobes for the reception of antennal scapes. Clypeus with a prominent median carina and with a number of less distinct lateral carinae. Mesoepinotal suture forming a strongly defined constriction both laterally and dorsally on thorax. Femora and tibiae noticeably enlarged. Epinotum with a pair of very short spines or tubercles. Postpetiolar node (viewed from above) distinctly wider than long. Dorsal surface of head and much of dorsal surface of thorax with definite longitudinal striae. Body hairs fairly abundant, slender, suberect to erect, most of them rather long. Body color ranging from light brown through brown to blackish, the appendages lighter.

Biology and Economic Importance

No comprehensive study has yet been made of the biology of *caespitum* in the United States, although it is a common house and garden pest. Nests are usually constructed in exposed soil, or under the cover of stones, pavement, or other objects, and in rotting wood. The ants also nest in houses, most commonly around or between the lower masonry walls of the foundation. Entomologists are frequently asked to identify refuse from the nests of *caespitum*; it is usually composed of small particles of gravel, seeds, fragments of dead insects, and sometimes fine wood fibers. Colonies are moderately large to large. Winged males and females have been seen every month of the year, most commonly during June and July. Smith, L. B., states that in the Norfolk, Va., area nuptial flights occur between June 20 and July 30. According to Donisthorpe, females are capable of founding colonies unaided by workers. The ants are almost omnivorous and feed on both dead and live insects, honeydew, seeds, the sap of plants, and various household foods such as meats, grease, nuts, potato chips, cheese, honey, and bread, but the ants seem to show a preference for meats or grease. Workers steal seeds from seed beds and girdle, scar, or scarify the roots or stems of tomatoes, cabbages, peppers, eggplants, carrots, beets, radishes, turnips, lettuce, parsley, *Gaillardia*, *Coreopsis*, and *Aster*. Lange has shown that workers of the pavement ant can often cause severe and extensive damage to sugarbeet plants by their attack on the germinating seed, and especially on the primary roots just below the crown. Plants were commonly killed by girdling while the ants were apparently seeking the sap. Workers are also known to gnaw into Irish potato tubers. They tend or foster plant lice and mealybugs, especially subterranean forms. An entomologist once found winged forms of this ant entangling and breaking threads in an acetate rayon-nylon manufacturing plant and soiling the threads. Unverified reports have been made of the ants gnawing holes in a child's rayon underwear and stinging or biting children, causing them to have an allergic rash or a skin reaction.

Workers of *caespitum* have been shown definitely to be an intermediate host of the poultry tapeworms *Raillietina tetragona* (Molin) and *R. echinobothrida* (Megnin). On a few occasions in the United States, queenless colonies of these ants (with workers) have been found to contain peculiar black (winged) females and pale, callow, wingless, pupoid males of a parasitic ant, *Anergates atratulus* (Schenck). This parasite is associated only with *caespitum* and is dependent on its host for food and care, since *atratulus* has lost its worker caste through parasitism. It has undoubtedly been introduced from Europe with its host species.

References: Marlatt, 1898, pp. 3-4, fig.; Herrick, 1914, pp. 174, 176; Smith, 1915, pp. 353-365; Essig, 1926, pp. 862-863; Donisthorpe, 1927, pp. 193-198, fig.; Wheeler, 1927, pp. 163-165; Walker and Anderson, 1937, pp. 312-314; Horsfall, 1938, pp. 409-421; Rau, 1945, p. 119; O'Rourke, 1956, p. 111; Lange, 1961, pp. 1063-1064, fig.

Tetramorium guineense (Fabricius)

No universally approved common name has been given this species but on various occasions it has been called the Guinea ant. This introduced species is probably of African origin. It has been widely disseminated by commerce to various regions of the earth, especially the warmer ones. *T. guineense* is frequently intercepted in plant quarantine. In our more northern latitudes this ant frequently nests in greenhouses. It is most commonly encountered in the southern United States, especially in the Gulf Coast region, where it occurs in both urban and rural areas, more commonly the former.

Taxonomic Characters

Subfamily and generic characters: Same as for *caespitum*. *Specific characters:* Workers approximately 3-3.5 mm. long. Eye well developed, strongly convex. Frontal carinae far apart, the distance between them gradually widening posteriorly, each forming a long scrobe for reception of antennal scape. Clypeus with three prominent longitudinal carinae. Prothorax (viewed from above) with very distinct

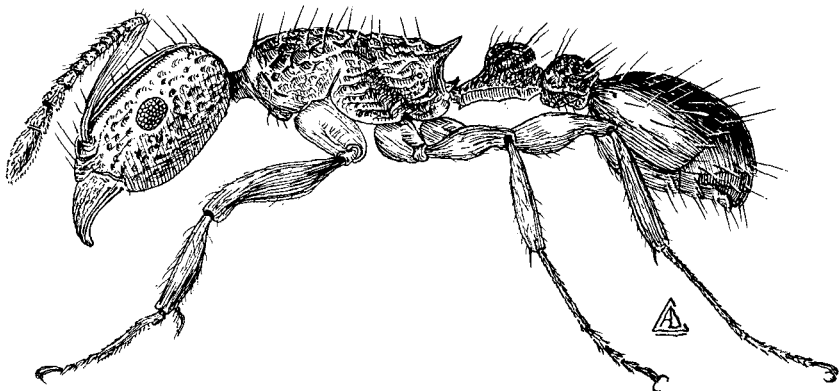


Figure 25.—*Tetramorium guineense* (Fabricius), lateral view of worker.

angular shoulders. Thorax compressed on each side (best seen from above). Petiolar node, in profile, subrectangular. Body sculpture largely rugulose-reticulate, especially on thorax, petiole, and post-petiole; gaster smooth. Body hairs fairly abundant, slender, suberect to erect, rather long. Body color varying from light brown to reddish brown with a usually much darker gaster.

Biology and Economic Importance

Very little information has been published on the biology of this species. It is known, however, that *guineense* nests in small- to moderate-size colonies in exposed soil or under cover of stones and other objects, in rotting logs and stumps, in the stems of plants, and in the branches or under the bark of trees. The ants also nest in houses and buildings, and were once found in the drawer of an unoccupied desk. The species does not appear to be a house pest of major importance, if we are to judge from the small number of letters received from housekeepers concerning it. Workers are very fond of honeydew, and will tend plant lice and mealybugs. The ants also feed on dead and live insects. As house pests, they are almost omnivorous and feed on fruits, vegetables, meats, and grease.

References: Phillips, 1934, pp. 23-24; Smith, 1936, pp. 851-852; Swezey, 1942, p. 179.

Wasmannia auropunctata (Roger)

Little fire ant. The ESA-approved common name, "little fire ant," is misleading in that "fire ants" belong to the genus *Solenopsis* Westwood, and this species is not a *Solenopsis* or even closely related to it. It is true, however, that *auropunctata*, like species of *Solenopsis*, has a "firelike" sting. This ant, which is of Neotropical origin, has been introduced into several localities in Florida. It occurs in Mexico, Central and South America, and the West Indies.

Taxonomic Characters

Subfamily and generic characters: Workers are monomorphic. Frontal carinae far apart but partly concealing antennal insertions. Antenna 11-segmented. Abdominal pedicel composed of two seg-

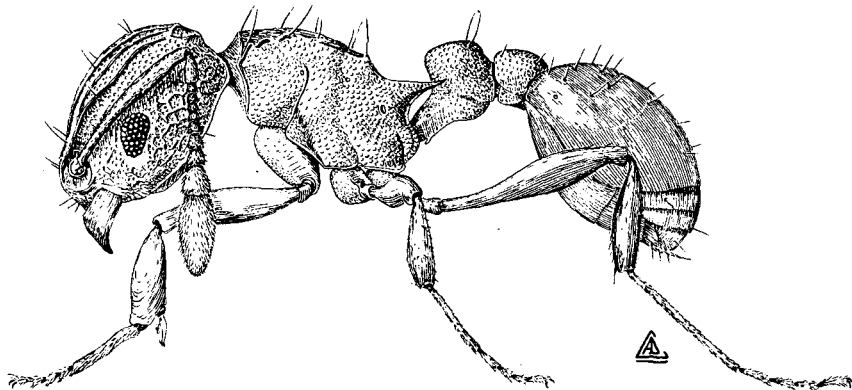


Figure 26.—*Wasmannia auropunctata* (Roger), little fire ant, lateral view of worker.

ments, the petiole and postpetiole. Sting present but not always exerted. *Specific characters:* Workers approximately 1.5 mm. long. Frontal carinae widely spaced, each forming a partial scrobe for reception of antennal scape. Antenna with a 3-segmented club; the last two segments of the club greatly enlarged and giving the false impression of a 2-segmented club. Apex of scape not attaining posterior border of head. Posterior border of head emarginate. Eye elongate, coarsely faceted, placed obliquely to longitudinal axis of head and forming a sharp angle, the apex of which is directed antero-ventrally. Dorsal surface of head punctulate, the posterior region with weak, longitudinal rugulae. Sculpture of thorax highly variable, rugulose, or rugulose-reticulate, or both. Prothorax (viewed from above) with angular humeri. Promesonotal suture absent or obsolescent. Epinotal spines rather close together basally, each rather long and with acute apex. Petiolar node, in profile, subrectangular; from above, very distinctly longer than broad. Hairs of body sparse, long and slender, widely distributed. Body color ranging from light brown to golden brown, gaster often slightly darkened.

Biology and Economic Importance

These ants nest in exposed soil and also in the soil beneath objects, in rotting wood, plant cavities, debris, under the bark or at the bases of leaf sheaths of plants and trees, and in houses. Nests in the soil are usually indefinite in form and may be compound; it is often difficult to delimit the area of a nest. Nesting habits vary greatly with respect to ecological habitats and climatic conditions. The ants appear adapted to nesting in very dry to very moist areas. During drouth periods the ants nest deeper in the soil, and during floods the nests may even be moved into trees. Colonies are usually populous and may contain more than one reproductive queen. Because the ants are sensitive to cold, it is believed they are not capable of living outdoors in the colder regions of the United States. Workers are noted for their love of honeydew, which they obtain by tending plant lice, mealybugs, scales, and white flies; workers have even been seen transporting immature stages of the cottony cushion scale, *Icerya purchasi* Maskell. Workers feed on dead insects, other arthropods, and small animals, and are probably predacious on many insects. The ants are especially noted for their painful and long-lasting stings, the effects of which may continue for several days. Allergic individuals may become pale and nervous or even shaky from several stings of these ants. Unlike *Solenopsis* spp., which sting on little or no provocation, the workers of *auropunctata* are not aggressive and sting only when pressed by clothing or other objects. However, so feared are they that it is difficult to get laborers to work in groves or fields where these ants are abundant. In houses, they may infest clothing, beds, or food. Workers feed on bacon, fatty beef, peanut butter, olive and cottonseed oils, milk, juice of ripe oranges, or the oil of ripe avocados. They seem to show a preference for fat meats and oil. Since no complete biological study of this species has been made, the ants may have other habits inimical to man of which we are not aware.

References: Wheeler, 1908a, pp. 143-144; Wheeler, 1919b, p. 304; Wolcott, 1936, pp. 549-550; Smith, 1936, p. 854; Spencer, 1941, pp. 4-14; Fernald, 1947, p. 428; Wolcott, 1948, pp. 826-828; Osburn, 1948, pp. 11-12; Smith, 1950, p. 275.

Atta texana (Buckley)

Texas leaf-cutting ant, also known by such common local names as night ant, cut ant, parasol ant, pack ant, fungus ant, and red town ant. This native species occurs in eastern Texas and western Louisiana, largely between 92° and 101° long., but it is not necessarily uniformly distributed over this area. Thirteen Louisiana parishes are infested. The species also occurs in northeastern Mexico.

Taxonomic Characters

Subfamily and generic characters: Polymorphic. Antenna 11-segmented, without a well-defined club. Head subcordate, strongly bilobed. Frontal carinae far apart, partly concealing antennal insertions. Dorsum of thorax with three pairs of prominent spines, the anterior ones the largest. Abdominal pedicel composed of 2 segments,

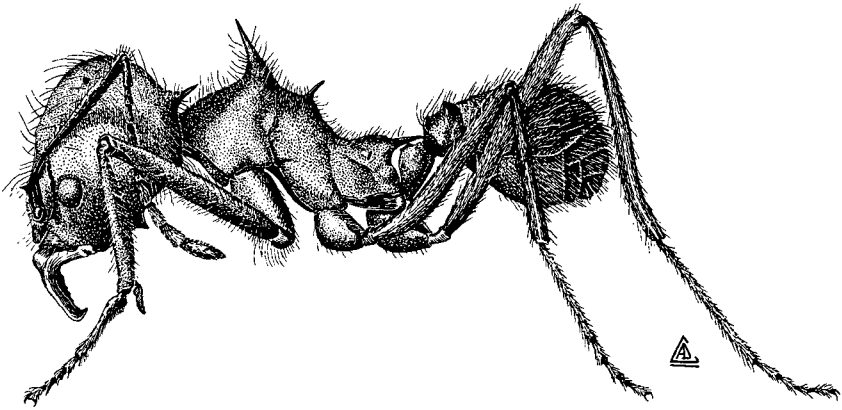


Figure 27.—*Atta texana* (Buckley), Texas leaf-cutting ant, lateral view of worker.

the petiole and postpetiole. Sting present but not always visible. Legs extraordinarily long. *Specific characters:* Workers 1.5–12 mm. long. Anterior border of clypeus with a median emargination, on each side of which there is a tooth. Mandible large, flattened, with a long masticatory border bearing numerous teeth. A spine present at posterior end of each frontal lobe. A longitudinal carina lying between eye and frontal carina and terminating ventrally in a small spine. Each occipital lobe bearing two spines, a large one at posterior corner of head and a smaller one anterior to it. A small spine present on inferior angle of prothorax. Gaster without tubercles. Body densely and minutely punctate. Body usually dull dark brown or rust brown.

Biology and Economic Importance

Nests, found exclusively in the soil, are usually constructed in well-drained sand or loamy soils and commonly on slopes with a southern or western exposure. The central portion of the exterior part of the nest is usually higher than the remainder, and is composed of a differently colored soil. The interior of the nest, which sometimes reaches a depth of 15 to 20 feet, contains innumerable chambers interconnected

by galleries with each other and with the surface of the soil. Walter et al., counted 911 chambers in a single large nest. Within many of the chambers the ants grow a specific fungus on a substratum composed largely, if not entirely, of macerated leaves. The adult ants not only feed on the fungus but they also feed it to their brood, which develop within the chambers. The minor workers cultivate the fungus and care for the brood, the medium-size workers cut and transport the leaves to the nest, and the very large workers guard the nest. The surface of the soil above the nest bears numerous holes, each surrounded by crescent- or crater-shaped piles of earth. These piles vary greatly in size and are usually most numerous above the central exterior part of the nest, becoming more widely and irregularly spaced laterally. The galleries leading from the craters to the interior of the nest ventilate and regulate the interior temperature and moisture, and allow for the passage of leaves brought in by the workers and for the exit of ants at the time of the nuptial flight. A very large nest may occupy an exterior surface of 4,500 square feet and have 1,000 or more entrance holes. Some nests are very old, the colony having occupied the same general nesting site for more than 60 or 70 years.

Workers frequently forage from 300 to 600 feet from the nest and make conspicuous foraging paths. During the summer they forage mostly at night, but in the fall, winter, or spring when the air temperature ranges between 45° and 90° F., foraging takes place during the day unless it is too cold or wet. The ants cut leaves from almost any type of plant, but Wheeler stated that they attack only one type of plant at a time; he thought they preferred small or narrow leaves regardless of texture. Also transported by the ants are the floral parts of plants, caterpillar droppings, Spanish moss, seeds of juniper, hackberry, and yaupon, corn, cornmeal, flour, rice, peas, wheat, oats, chops, bread, cake, chickenfeed, sugar, beans, ground coffee, and even chewing tobacco.

The nuptial flights take place from early April into June. Walter et al stated that the flights occur on clear, moonless nights and that immense numbers take part in the flights. J. C. Moser (unpublished data) also found that the nuptial flights took place just before dawn on dark, still, moonless nights. He also noted that a single colony was capable of giving off successive flights over a period of weeks before exhausting itself of sexual forms. At one time it was thought that a single colony contained only one reproductive female or queen, but Moser has recently found as many as five wingless, presumably fertile females in a single colony. No one has made a detailed count of the number of individuals in a colony, but in a very large one it must run into as many as several hundred thousands.

The ants may affect man by invading his house and stealing farinaceous or other foods, by cutting leaves from his domesticated plants, by stealing seeds, by building unsightly nests on his premises, and by damaging roads, walks, stock, or equipment by cave-ins of the nests. When a nest is broken into and the ants are greatly disturbed, the large workers can inflict painful bites which often produce blood. McCook stated that the bites of workers are not as painful as are the stings of the harvesting ant *Pogonomyrmex barbatus* (F. Smith). Frequently, the

workers attach themselves so firmly to clothing, and hold on for such long periods that the clothes can go to the laundry and be returned with the heads of the ants still attached.

References: McCook, 1879, pp. 33-40; Wheeler, 1907, pp. 729-742; Hunter, 1912, pp. 1-4; Snyder, 1937, pp. 14-17; Walter, Seaton, and Mathewson, 1938, pp. 1-18; Smith, 1939, pp. 1-11.

Iridomyrmex humilis (Mayr)

Argentine ant. This species, which is native to Brazil and Argentina, has been widely distributed by commerce to numerous parts of the world. It was apparently brought into New Orleans on coffee ships from Brazil sometime before 1891 and spread rapidly over most of the Southern States. Largely confined to urban areas, *humilis* is now established in many localities in the Southern States, except Kentucky and Virginia. It also is widely distributed in California. Small localized infestations occur in St. Louis, Baltimore, and Chicago.

Taxonomic Characters

Subfamily and generic characters: Monomorphic. Antenna 12-segmented, without a club. Antennal fossa touching posterior border of clypeus. Eye placed well toward the median line of the head. Maxillary palpus neither long nor with unusually long third segment. Promesonotal suture distinct. MesoePINOTAL region with a strong constriction or impression. Abdominal pedicel composed of a single segment, the petiole. Petiolar scale well developed, inclined or sub-erect, usually easily seen in profile. Cloacal orifice ventral, transverse, slit-shaped, and without a fringe of hairs (fig. 31,co). Integument soft and flexible. *Specific characters:* Workers 2.2-2.6 mm. long. Body slender. Head oval or somewhat subtriangular. Clypeus distinctly broader than long, convex in middle, and with broad emargination on its anterior border. Eye well-developed, with approximately 12 to 14 ommatidia in its greatest diameter. Apex of scape noticeably surpassing posterior border of head. Mandible with two large apical teeth, followed by a number of small, irregular teeth or denticulae. In profile, promesonotum forms a long gentle unbroken arch in front of mesoePINOTAL impression or constriction. Epinotum

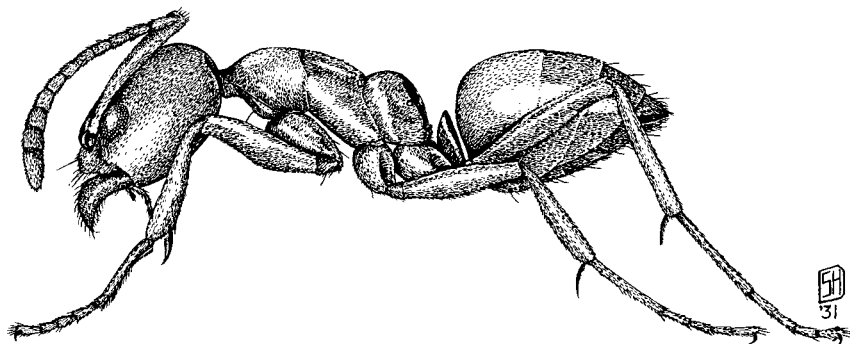


Figure 28.—*Iridomyrmex humilis* (Mayr), Argentine ant, lateral view of worker.

in profile very distinctly higher than long, with convex base and flattened declivity. Body hairs sparse, normally absent from thorax. Body color more or less uniform light brown or brown. Workers, when freshly crushed, emit a stale, greasy or musty odor.

Biology and Economic Importance

Although much of the wide distribution of the Argentine ant in the United States has resulted from commercial shipments of plants and plant products, building materials, household goods, groceries, and other materials, the species has also been disseminated to a lesser degree by natural means, including heavy rains and floods. This ant's success as a competitive species can be attributed to its ability to nest in diverse types of habitats, to produce prodigious numbers of individuals because of the many reproductive females in a colony, to thrive on a wide variety of foods, to live on a friendly intercolony basis with its own species, and to exterminate other species of ants. It is an arch enemy of the Southern fire ant, *Solenopsis xyloni* McCook, a species with which it has to compete for both space and food. It nests in exposed soil and soil under cover, and also occurs in rotten wood, faulty places in trees, refuse piles, bird nests, bee hives, and other places.

Males and winged females are normally produced in the spring, usually in April or May. Since nuptial flights are seldom if ever witnessed, it is assumed that most mating takes place in the nest. In regard to the nuptial flights, Skaife writes as follows concerning this ant at the Cape in South Africa: "There is no nuptial flight at all in the case of the Argentine ant. I have never seen even the semblance of a nuptial flight during the many years I have kept this species under observation. What happens at the Cape is this: On hot, still nights after midsummer, particularly if rain is threatening, winged males leave the nests. They often come to lights at this time, but no females are to be seen among them. I have never come across a winged female outside the nest. The young queens stay at home, and there they are sought out by the males, from other nests as well as their own, and there the mating takes place." New colonies apparently are formed by one or more fertile females, migrating from the mother colony accompanied by a group of workers. The female seems unable to raise her brood alone. In winter especially, several colonies may combine to form larger colonies in favorable nesting sites. In early spring or summer the large winter colonies may divide into a number of smaller colonies or units. Workers are predaceous, carnivorous, and granivorous. They feed on the secretions of the floral and extrafloral parts of certain plants, gnaw into the buds of some fruit trees such as citrus, or even into ripened fruits such as figs. Workers tend and foster injurious honeydew-excreting insects such as plant lice, scales, and mealybugs; the resulting damage is severe in citrus groves and sugarcane plantations. The number of individuals present in an area where this ant is well established is beyond comprehension. The very active workers get into every conceivable place both in and out of doors. They exterminate all native ants except a few small, nonaggressive species. The Argentine ant becomes the one dominant form in an area infested by it. Large files of workers can be seen running up and down trees,

on fences, the ground, and elsewhere. Although common in urban areas and regarded as a city-loving ant, the species has also become well established in rural areas.

The Argentine ant is one of the most persistent and troublesome of all our house-infesting ants. Native ants normally infest houses at random, frequently only in small numbers and for only short periods of time. Argentine ants, on the other hand, will infest every house persistently, continuously, and in large numbers, once they are well established in a given area. Extremely cold weather will cause the ants to enter a period of inactivity or dormancy, but a thaw or an unusually warm period will result in the ants resuming activity. A housekeeper in an infested area can expect to have trouble in her home year after year unless the ants are fought on a community basis. Workers feed on almost every type of food, including sweets, meats, pastries, fruits, dairy products, eggs, animal fats, and vegetable oils. The ants are especially fond of sweets. Although the amount of food eaten may not be large, the housekeeper usually throws the remainder away because of contamination. In addition, the ants make themselves objectionable by crawling on or in every imaginable place such as stoves, refrigerators, shelves, beds, and clothing. The worker ant has no sting. Its bite is rather feeble, and usually occurs only on provocation. The ants also steal seeds from seedbeds, disrupt or destroy bee colonies, drive setting hens from the nest, especially when the eggs are accidentally broken, and kill hatching chicks. Their habit of crawling everywhere, especially over refuse, filth, sputum, faeces, carrion, or sewage, affords them an opportunity to transport the causative organisms of dysentery, typhoid fever, and tuberculosis.

References: Newell, 1908, pp. 20-34; Newell, 1909, pp. 174-192; Newell and Barber, 1913, pp. 1-98, figs.; Smith, 1936, pp. 1-39, fig.; Metcalf and Flint, 1939, pp. 764, 769; Smith, 1950, pp. 285-287; Skaife, 1962, p. 12.

Iridomyrmex pruinosus (Roger)

This native species ranges from Wisconsin to New York, south to New Mexico and Florida, and also occurs in the West Indies. It is not only common, but widely distributed in the southern United States.

Taxonomic Characters

Subfamily and generic characters: Same as for *humilis*. *Specific characters:* Workers 1.8-2.5 mm. long. Head subrectangular. Clypeus broader than long, moderately convex, its anterior border rounded, nonemarginate. Mandible with five to six teeth on masticatory border, these decreasing in size (but not uniformly) from apex to base. Apex of scape distinctly surpassing posterior border of head. Erect hairs rather sparse on body; dorsal surface of thorax with a few erect hairs on pronotum and epinotum, and occasionally on mesonotum (frequently hairs are lacking on one of these regions, especially on mesonotum or epinotum). Body covered with dense grayish or pruinose pubescence which in some lights conceals the ground surface and in other lights fails to do so. Body color highly variable, commonly uniform dark brown or black, or with gaster lighter. Easily dis-

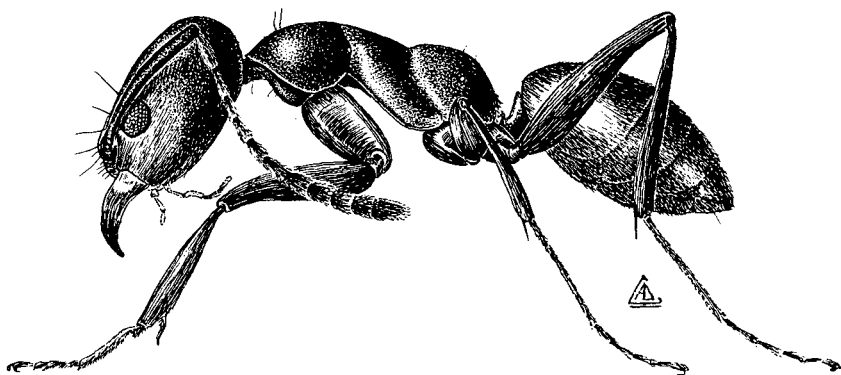


Figure 29.—*Iridomyrmex pruinosus* (Roger), lateral view of worker.

tinguished from *humilis* by shape of head, difference in mandibular dentition, presence of erect hairs on thorax, stouter and more densely pubescent body, and by the odor of fresh specimens, which is like rotten coconut in *pruinosus* and a stale musty or greasy odor in *humilis*.

Biology and Economic Importance

The ants seem to prefer open habitats such as fields, meadows, pastures, and entirely bare areas, and will also nest in open woods out of dense and prolonged shade. Nests are constructed in exposed soil or soil under the cover of stones, other objects, and under the bark of logs and stumps. Entrance holes of nests in the soil commonly have crater-shaped mounds of earth surrounding them, but the craters may be imperfectly shaped, or the ground may be more or less bare. Colonies are small to moderate-sized. Males and winged females have been observed in Florida from May into July. Workers are very fond of honeydew, and tend honeydew-excreting insects; they also live on both live and dead insects. The very agile, fast-moving workers form pronounced foraging trails. M. S. Blum, in a letter to the author, wrote that the ants lay down on their foraging trails a methyl-n-amyl ketone substance, which is emitted from the gaster. Workers have been induced to follow artificial trails on which this synthetic chemical has been placed. The odor emitted by live or freshly killed workers has been likened to that of rotten coconuts and is similar to the odor of ants of the genus *Tapinoma*.

This species is a house pest particularly in the Gulf Coast States. Most frequently the ants invade houses from outdoors, but it is quite likely that they may nest within houses as well. Although workers feed on most of the foods commonly eaten by ants, they seem to show a preference for sweets. This ant may be an intermediate host of the poultry tapeworm *Raillietina tetragona* (Molin), since worker ants have been seen carrying gravid segments of the tapeworm into their nests.

References: Wheeler, 1905b, p. 389; Dennis, 1938, pp. 271-272, 294; Cole, 1940, pp. 64-65; Case and Ackert, 1940, pp. 393-395; Hess, 1958, pp. 43-45, 55-60, 62-64; Van Pelt, 1958, p. 39.

Dorymyrmex pyramicus (Roger)

Pyramid ant. It is also known as the lion ant because of its aggressive habits. *D. pyramicus* is a native species, which ranges from Oregon to New York and south to California and Florida. Although this species is widely distributed over most of the United States, it is probably more common in the southern half. It has also been recorded from Mexico, South America, and the West Indies.

Taxonomic Characters

Subfamily and generic characters: Workers monomorphic. Antennal fossa touching posterior border of clypeus. Antenna 12-segmented, without club. Eye placed well toward median line of head. Mandible with five to six teeth, the apical tooth very long and pointed. Maxillary palpus unusually long, 6-segmented; third segment approximately as long as combined lengths of fourth, fifth, and sixth. Ventral surface of head with a weakly developed psammophore. Thorax with distinct promesonotal and mesoepinotal sutures. Posterodorsal surface of epinotum conical or tuberculiform. Legs long and slender. Abdominal pedicel composed of a single segment, the petiole. Petiole well developed, scalelike, suberect to erect, narrow or thin in profile. Base of gaster with an impression. Cloacal orifice ventral, transverse, slitshaped, without a fringe of hairs (fig. 31, co). Sting lacking. Anal glands present, producing a characteristic disagreeable, rotten-coconut odor. Integument soft, flexible. *Specific characters:* Workers approximately 3 mm. long. Mesonotum in profile forming a perceptible angle anterior to the mesoepinotal suture. Body hairs sparse, thorax usually without erect hairs. Pubescence fairly dense on thorax and gaster, causing these regions in some lights to appear subopaque and in other lights to be noticeably shiny. Body color highly variable, ranging from almost uniform light brown to uniform dark brown or blackish, with gaster frequently darker than head and thorax.

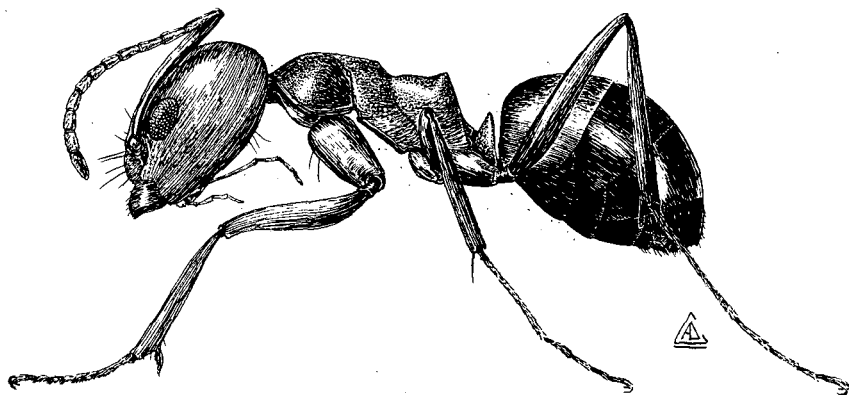


Figure 30.—*Dorymyrmex pyramicus* (Roger), pyramid ant, lateral view of worker.

Biology and Economic Importance

Nests are constructed in the soil, usually in open sunny places such as meadows, pastures, sandy or bare areas; seldom under objects. The typical nest has a single opening leading by a gallery to a chamber which is usually near the surface of the soil. The excavated earth is thrown up around the central nest opening in a circular crater, usually about 2 to 4 inches or larger in diameter. Sometimes it is a semi-circular or irregular mass, or it is not present at all. The ants nest in various types of soils such as sand, loam, clay, or limestone chalk. Nests are frequently built in, or very near, the nests of other ants, such as the harvesting ants *Pogonomyrma occidentalis* and *P. barbatus*. Colonies are small to moderate-sized, containing up to only a few thousand individuals. In Mississippi, male and female pupae have been observed in nests in late May. Observations indicate that in some nests, males and females can pass the winter in the adult stage. Workers are agile and fast-moving, and forage in conspicuous files. They are highly carnivorous and predacious, but they are exceedingly fond of honeydew, and tend insects excreting this substance. I have witnessed them attacking larvae of the corn earworm *Heliothis zea* (Boddie). Another observer has seen them attacking workers of the fire ant *Solenopsis geminata*. *D. pyramicus* is economically important because of its house-infesting habits, and the numerous and ugly mounds it builds on lawns. Workers commonly invade houses from outdoors. They feed on a wide variety of human foods but seem to show a preference for sweets. I have received unverified reports of these ants biting children.

References: Smith, 1936, pp. 864-865; Cole, 1940, pp. 30, 61-62; Mallis, 1941, p. 76; Hess, 1958, pp. 40-42, 55-59, 62-64.

Tapinoma sessile (Say)

Odorous house ant. A native species, which ranges from Canada through the entire United States and into Mexico. In some of our States, the ants may be absent from desert areas.

Taxonomic Characters

Subfamily and generic characters: Monomorphic. Antenna 12-segmented, without club. Antennal fossa touching posterior border of clypeus. Eye located well toward median line of head. Middle of anterior border of clypeus emarginate. Mandible with two apical teeth followed by a number of smaller teeth or denticulae. Promesonotal and mesoepinotal sutures distinct, the latter very pronounced. Flattened and sloping declivity of epinotum very distinctly longer than base of epinotum. Abdominal pedicel a single segment, the petiole. Petiolar node vestigial, strongly flattened or inclined, concealed from above by base of gaster. Cloacal orifice ventral, transverse, slit-shaped, not surrounded by a fringe of hairs (fig. 31,co). Sting lacking. Anal glands present, which produce a characteristic disagreeable, rotten-coconutlike odor. Suberect or erect hairs very sparse on body, absent from thorax. Integument soft, flexible. *Specific characters:* Workers 2.4-3.25 mm. long. A prominent suberect

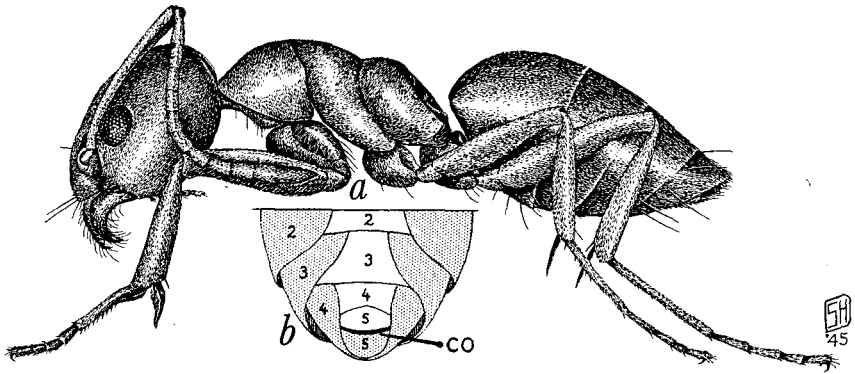


Figure 31.—*Tapinoma sessile* (Say), odorant house ant: a, Lateral view of worker; b, ventral surface of apex of gaster; co, the transverse, slit-shaped cloacal orifice.

or erect hair on each side of clypeal emargination best seen in profile. Body color variable, ranging from more or less uniform brown to uniform black.

Biology and Economic Importance

This common and widely distributed ant is one of our most adaptable species, occurring from sea level to 10,500 feet. It nests in a wide variety of habitats, ranging from sandy beaches, pastures, open fields, woodlands, and bogs, to houses. Most nests in the soil are beneath objects such as stones or logs, but this versatile species also nests under the bark of logs and stumps, in plant cavities, insect galls, refuse piles, and bird and mammal nests. Nests in the soil are indefinite in form, shallow, and of little permanency. The colonies range in size from a few hundred individuals to many thousands, and contain numerous reproductive females. The individuals of the various colonies are not antagonistic to each other, but are hostile to the introduced Argentine ant. Mating takes place in the nest between males and their sister females, but nuptial flights have also been observed. Although females have been observed to establish colonies independently, it is also highly possible that the ants may form new colonies when one or more fertile females leave the parental colony accompanied by a number of workers. Workers are active and rapid, and normally travel in files. When alarmed, the workers dash around excitedly in an erratic manner, quite often with the posterior part of their abdomen elevated. Workers also emit from their abdominal glands an odor which has been likened to that of rotten coconut. In Mississippi, male pupae have been noted from April 16 to 30, and males and winged females from May 1 to 15. In bogs in southeastern Michigan, Kannooski has observed nuptial flights from June 26 to July 15. Few ants exceed *sessile* in their love for honeydew. Not only do workers eat honeydew avidly, but they assiduously attend such honeydew-excreting insects as plant lice, scale insects, mealybugs, and membracids. In some instances, workers have been observed transporting live plant lice. When mealybugs have been disturbed by collectors, the worker ants have tried to pick them up and carry them away. Workers visit the floral and extrafloral nectaries of plants in search of their glandular

secretions. Like many species of ants, the workers feed on both dead and live insects.

T. sessile, one of our more important house infesting ants, is capable of invading houses from outdoors, or nesting inside. Although the ants feed on a wide variety of household foods, such as raw and cooked meats, cooked vegetables, dairy products, fruit juices, and pastries, they appear to show a preference for sweets. Their active habit of crawling over plants in search of honeydew may eventually incriminate them in the transmission of plant diseases.

References: Essig, 1926, pp. 863-864, fig.; Smith, 1928, pp. 307-329, figs.; Metcalf and Flint, 1939, p. 770; Cole, 1940, pp. 14, 30, 63-64; Smith, 1950, pp. 283-284; Kownowski, 1959, pp. 126-129.

Tapinoma melanocephalum (Fabricius)

Although probably of African or Oriental origin, this introduced species has been so widely distributed by commerce that it is impossible to determine its original home. The species is established in a number of localities in southern Florida. In more northern latitudes, *melanocephalum* seems unable to maintain itself, except in greenhouses or perhaps heated buildings.

Taxonomic Characters

Subfamily and generic characters: Same as for *sessile*. *Specific characters:* Workers extremely small, 1.3-1.5 mm. long. Apex of scape distinctly exceeding posterior border of head. Antennae and legs somewhat thickened in appearance. Prothorax compressed laterally and with rather pronounced shoulders. Thorax broadest through anterior part of prothorax. Appendages very pale or milky white in color. Head usually darker than remainder of body, thorax and gaster commonly with light and dark areas of variable size. Dorsum of thorax without erect hairs. This species is readily recognized by its extremely small size and peculiar color markings. *T. melanocephalum* and *Solenopsis molesta* are the smallest ants discussed in this paper.

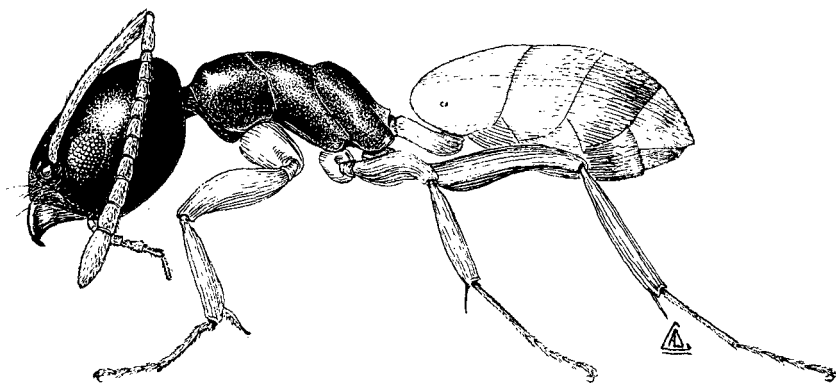


Figure 32.—*Tapinoma melanocephalum* (Fabricius), lateral view of worker.

Biology and Economic Importance

This unusually small ant is highly adaptable in its nesting habits. It is found in the soil, rotten wood, decayed parts of trees or under the bark, in plant cavities, houses, and greenhouses. Colonies may be moderate to large in size; they contain numerous reproductive females. The members of different colonies are not antagonistic to each other. New colonies probably are formed by the migration of one or more reproductive females accompanied by a number of workers. It is not definitely known whether the ants may also establish new colonies by means of nuptial flights. Workers have a habit of running rapidly and erratically. They can emit an odor like that of rotten coconuts ("*Tapinoma*-like"). Workers are very fond of honeydew and tend honeydew-excreting insects for this substance. They also feed on both dead and live insects.

Pimentel has shown that in Puerto Rico, worker ants destroy eggs and first-stage larvae of the housefly *Musca domestica* (Linnaeus). There, the ants are known locally as albaricoque, and in Cuba as hormiga bottegaria. In Cuba, the ants are known to disseminate the grass root mealybug *Ripersia radiculicola* Morrison, on the roots of sugarcane. The species is important as a house pest. Not only can the ants invade houses from outside, but can nest within the house as well. Although the ants feed upon many household foods, they seem to show a preference for sweets, having been observed feeding on sugar, cakes, and fountain syrup.

References: Wheeler, 1919a, pp. 275-276; Wheeler, 1926, pp. 154, 156; Stahl and Scaramuzza, 1929, pp. 6-7; Phillips, 1934, pp. 20-21; Smith, 1936, pp. 861-862; Eidmann, 1944, p. 459; King, 1948, p. 395; Pimentel, 1955, p. 29.

Camponotus castaneus (Latreille)

This native species ranges from Iowa to New York, south to Texas and Florida. It is perhaps most abundant in the southeastern United States. Although rather widely distributed, it is relatively uncommon in many areas.

Taxonomic Characters

Subfamily and generic characters: Polymorphic. Antennal fossa not touching posterior border of clypeus. Antenna articulated at a considerable distance from posterior border of clypeus. Antenna 12-segmented, without a club; funiculus slender. Clypeus distinctly carinate. Eye well developed. Pronotum more or less flattened (best seen in profile). Abdominal pedicel composed of a single segment, the petiole. Cloacal orifice terminal, circular, surrounded by a fringe of hairs (fig. 48,co). Sting lacking. Workers capable of emitting a strong formic acid odor. *Specific characters:* Large ants, workers 7-10 mm. long. Head (mandibles excluded) as long as wide, or longer than wide. Cheeks without erect hairs. Apex of scape noticeably surpassing posterior border of head; funiculus unusually slender. Clypeus distinctly but not strongly carinate; middle of anterior border of clypeus extended forward as a lobe, its anterior border scalloped. Epinotum with indistinct boundary between base and declivity. Middle and hind tibiae each with a row of graduated bristles; no erect

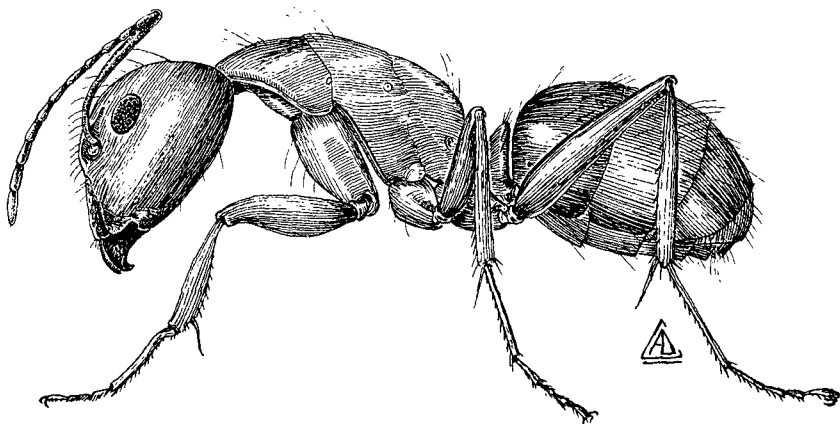


Figure 33.—*Camponotus castaneus* (Latreille), lateral view of worker.

hairs except at apex of each of these segments. Pubescence extremely sparse and closely appressed on body, almost lacking. Body distinctly shiny. Color ranging from yellowish to yellowish red, head and gaster commonly darker than thorax.

Biology and Economic Importance

C. castaneus constructs its nests in rotten logs and stumps, in exposed soil, or in the soil under the cover of objects; also in combined log and soil media. Van Pelt states that he found colonies rare in the Blue Ridge Mountains at altitudes between 4,600 and 5,000 feet. Colonies are small to moderate in size, consisting of a few hundred to seldom more than a thousand or so individuals. Data on the formation of colonies are very limited. It appears, however, that a new colony is founded independently by a newly fertilized female, and that there may not be more than one reproductive female per colony. Our records indicate that in the greater Washington, D.C., metropolitan area, males and winged females may be produced during April or May, since these sexed forms have been taken outside of, or away from, their nests from May to mid-June. Most, if not all, the nuptial flights apparently take place at night. In some colonies there is evidence that males and winged females overwinter in the parental nest, and do not make their nuptial flight until the following year. Workers appear very timid or excited when their nest is exposed, dashing madly and rapidly about trying to hide. Like many ants, the workers tend honeydew-excreting insects for the palatable honeydew. Workers also feed on both live and dead insects.

Although *castaneus* frequently infests houses, it is not a species of major importance. Workers are largely crepuscular or nocturnal, invading houses principally after dusk and commonly disappearing before daybreak. Workers usually appear in small numbers in houses, and often show little interest in household foods. Apparently they are fond of sweets, since they have been reported feeding on sugar and angel cake. The author lived in his home for 16 years before *castaneus* workers invaded his kitchen; they remained only a short

while and disappeared without his having to resort to control measures. The ants have never appeared in the house again, although it has been 7 years since the invasion. Although workers commonly invade houses from outdoors, there have been instances when it appeared that they may have been nesting within the house.

References: Wheeler, 1910a, p. 323; Smith, 1924, pp. 123-124; Wesson and Wesson, 1940, pp. 90, 103; Cole, 1940, pp. 14, 30, 84; Van Pelt, 1958, pp. 41-43; Van Pelt, 1963, p. 212.

Camponotus tortuganus Emery

A native species, which ranges over at least the southern half of Florida, including the Keys and the Tortugas, it has been collected as far north as Orlando (Orange County).

Taxonomic Characters

Subfamily and generic characters: Same as for *castaneus*. *Specific characters:* Large ants, workers 6-11 mm. long. Head very noticeably longer than broad and narrowed anteriorly. Anterior margin of clypeus extended forward as a prominent lobe, the anterior border of which is slightly excised or emarginate. Frontal carinae placed close to each other, elongate, lyrate. Eye prominent, strongly convex. Clypeus with a sharp, well-defined carina. Base of epinotum very noticeably longer than declivity. Tibiae of all legs without erect hairs. Each middle and hind tibia without a row of graduated bristles on the flexor surface, but with a sulcate lateral surface. Body hairs fairly abundant, long, yellowish or golden, according to the light. Head, thorax, and petiole finely shagreened, subopaque. Body color ferruginous brown, head darker than thorax; gaster dark brown or black but subject to much variation in color, with light bands or spots on some of the segments. Head commonly with areas of infuscation.

Biology and Economic Importance

Except for a brief biological note by Wheeler, nothing has been published on the biology or economic importance of *tortuganus*, although

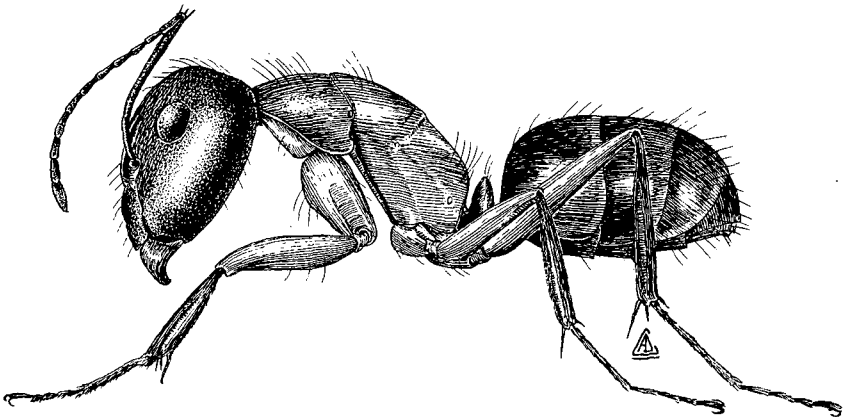


Figure 34.—*Camponotus tortuganus* Emery, lateral view of worker.

it is a frequent house pest. Almost all of the information presented here has been compiled from statements, unfortunately lacking in detail, from housekeepers in submitting specimens for determination. Random notes and observations indicate that *tortuganus* nests in small colonies in rotting wood and in the soil beneath stones. Although the ants may invade houses from outdoor nests, they also live in houses, where they may be a pest for long periods of time. The ants have been reported to nest in the sidings, rafters, and possibly the porch roof of houses, but there is no indication of the amount of damage the ants caused. Even house trailers are not immune to invasion. Workers can be especially active after dark, but this does not preclude diurnal activity as well. No records are available of the food habits of *tortuganus*. Should the species follow the pattern of most *Camponotus* species, the workers may be expected to feed on honeydew and small insects. Large numbers of males and winged females have been collected in houses from late May to mid-July.

Reference: Wheeler, 1932, pp. 13-14.

Camponotus pennsylvanicus (DeGeer)

Black carpenter ant. A native species, this ant ranges from North Dakota to Quebec and Ontario, and south to Texas and Florida. It is of especial interest historically because it was the first native North American species to be described (DeGeer, 1773).

Taxonomic Characters

Subfamily and generic characters: Polymorphic. Abdominal pedicel composed of a single segment, the petiole. Cloacal orifice terminal, circular, surrounded by a fringe of hairs (fig. 48,co). Sting lacking. Workers capable of emitting a strong formic acid odor. Head of largest workers as broad as long, broader behind than in front, and of a very stout appearance. Antenna 12-segmented, without a club.

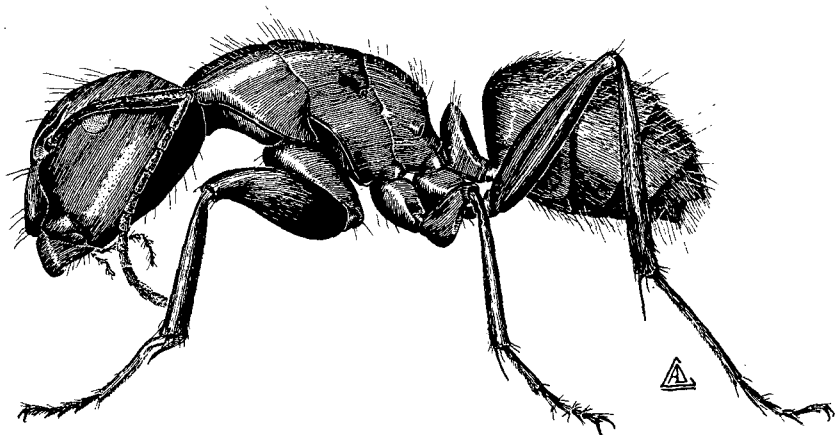


Figure 35.—*Camponotus pennsylvanicus* (DeGeer), black carpenter ant, lateral view of worker.

Scape flattened basally, noticeably thickened toward the apex, extending past the posterior corner of the head except in the largest workers. Antennal fossa well separated from the posterior border of the clypeus. Frontal carinae lyrate in shape. Eye well-developed, flattened or weakly convex, nearer the posterior border of the head than to the base of the mandible. Clypeus ecarinate or else scarcely carinate in largest workers. Middle of the anterior border of the clypeus extended as a slight lobe. A deep impression or fossa on the lateral border of the clypeus, especially in the largest workers. Pronotum flattened; noticeably so in the larger workers. *Specific characters:* Large ants, workers 6-13 mm. long. Body color typically black but some individuals may have reddish thoracic pleuron, petiole, and legs. Thorax and gaster typically subopaque or opaque, the gaster covered with dense, long, appressed, pale yellowish or ashy pubescence. Body hairs suberect or erect, yellowish, and moderately abundant. Species subject to considerable variation in color and sculpture. Variation in color especially apparent on thorax and petiole, which may be very light red or brown. Sculpture of head and thorax may also be weaker, making them more shiny than in typical form. Typical form, however, readily distinguished by black body and long, appressed, pale yellowish or ashy-colored pubescence on dorsum of gaster.

Biology and Economic Importance

Exclusively (or almost so) a wood-nesting form, *Camponotus pennsylvanicus* is one of our best known and most adaptable ants. It is especially common in the eastern and central United States. Van Pelt has found colonies of this species common in the Blue Ridge Mountains at altitudes between 3,500 and 5,500 feet. The life history of the species, as studied by Pricer at Urbana, Ill., is briefly as follows: Nuptial flights of overwintering males and females in parental colonies take place from May to late July. A single, fertilized female establishes a nest in a self-made, or preformed, cavity, usually under the bark of a tree, log, or stump; this is done without the aid of workers. In this sealed cavity she brings her first brood of workers (usually up to 27 or more individuals) to maturity on her salivary secretions. During this time she does not gather any food for herself from outside the nest. Since the first brood does not have an ample supply of food, the workers are small (minor workers). The next and following broods are all fed by the workers, and as the food supply gradually increases, so does the size of the workers produced. After a number of years, a colony will contain numerous workers of various sizes, some of the largest being extraordinarily large (major workers). Workers too large to be called minor, and too small to be called major, are designated as intermediate workers. The number and size of workers progressively increases each year at a much accelerated rate until the colony reaches maturity, at which time there will be present not only a few thousand workers, but males and winged females, and numerous eggs, larvae, and pupae.

Pricer estimated that a colony could not produce males and winged females until it contained approximately 2,000 or more workers, and that to do this, a colony must be at least 3 to 6 or more years old. The largest colony he observed contained 3,018 workers, a reproductive fe-

male, 196 winged or virgin females, 174 males, and 842 larvae. No doubt there are colonies that considerably exceed this number of individuals. Pricer believed that after a colony has once started to produce males and winged females, it will continue to do so each year for an indefinite period. During winter, when reproduction ceases, the immature stages live in the colony as larvae. A mature colony, during the warm months of the year, may contain a reproductive female, winged females, males, workers, eggs, larvae, and pupae. It is normal for a colony to have a single queen. In life-history studies of this ant, McCook found that the first-brood workers were reared in late June or early July, and required 60 days to pass from the egg to the adult stage.

Under natural conditions, black carpenter ants nest in live and dead standing trees and in rotting logs and stumps, but they are also adapted to nesting in houses and buildings, telephone and telegraph poles, or in other wood or wood products used by man. The ants nest in logs and stumps, which vary widely in degree of decay and moisture content. Most observers maintain that carpenter ants enter live trees through cracks, scars, knot holes, and decayed or faulty places. Once inside the tree, they remove the faulty wood and extend their burrows into the adjacent sound wood. It would appear that almost all types of trees may be attacked. The ants have been recorded from poplar, cherry, white and pitch pine, balsam, elm, willow, maple, hickory, chestnut, cottonwood, juniper, aspen, and scarlet, red, black, white, and post oaks. This list no doubt is incomplete. Graham thought that this species and *ferrugineus* did considerable damage to standing white cedar trees in Minnesota. For remarks on this finding, see footnote on *ferrugineus*, p. 69.

Although nests are frequently only a few feet from ground level, at times they can be very high in trees. McCook reported that the top of a white pine nearly 75 feet from the ground was nearly cut off by the excavation of these ants. Felt (McCook, 1876) stated that two balsam trees were so riddled by galleries of ants, the trees broke off during a heavy wind storm. The black carpenter ant is generally regarded as a wood-nesting species. Although it has been reported nesting in the soil, such reports should be questioned, for in most, if not all, instances the observers have not ascertained whether the ants are nesting in an invisible root or stump far below the surface of the ground.

The natural food of the ants consists largely of dead and live insects, honeydew obtained from plant lice or treehoppers, the juices of well-ripened fruits, sap of certain plants, and refuse. Although workers tend plant lice, no one has observed them fostering or cultivating the lice, as do some of our well-known species of *Lasius* and *Acanthomyops*. The ants feed on a wide variety of household foods such as sweets (honey, syrup, sugar, jam, preserves, jelly), raw and cooked meats, fruits (pears, apples, oranges), melons, cakes, and boiled eggs.

The ant is inimical to man because of its habit of nesting in the wood of houses and other buildings, telephone and telegraph poles, and other wood or wood products; because it feeds on household foods; and because it annoys housekeepers by its presence in houses. One correspondent complained that a carpenter ant bit her arm while she was

asleep and that a welt later resulted from the bite. She also stated that she had found one of the ants attached to the lip of her dog. Although this ant has no sting, the large workers can inflict a painful bite with their strong mandibles, and the wound can be aggravated by the injection into it of formic acid.

During the warmer months of the year workers may invade houses from their nests outdoors in trees, logs, stumps, or other places. Quite often the ants make conspicuous trails on the lawn or soil in passing to and from their nest. Infrequently the ants are accidentally brought into houses on firewood stored in the basement. It appears quite definite that houses in the vicinity of trees, logs, or stumps suffer more from carpenter ant attack than houses some distance from them, and that older houses are more frequently attacked than new ones because the woodwork in them may be in poorer condition. The ants seem to enter houses through faulty, decayed, or moist wood, and although their nest may begin there, it may extend into adjacent solid woodwork. Black carpenter ants may attack the woodwork of houses in various places but quite often they attack the beams, underpinnings, porch pillars, window casings, and external trim. The presence of a nest in a house can often be detected by the fine sawdust and fragments of insects thrown out by the ants from small holes in the woodwork. Simeone states that laboratory studies and numerous observations of carpenter ant damage to buildings suggests that the ants prefer to nest in moist wood. Attempts to induce the ants to colonize in wood containing less than 15 percent moisture were generally unsuccessful. He further remarks that the moisture content in well-constructed, heated structures should ordinarily vary from 6 to 10 percent, and properly air-seasoned lumber, from 12 to 15 percent; wood kept at this moisture equilibrium should be free from carpenter ant attack. Excessive moisture content of wood is therefore to be prevented by keeping it from direct contact with the ground, from seepage, from condensation, or poor ventilation. Workers frequently (but not always) forage at night, and for that reason the housekeeper may fail to see them. In their search for moisture, the ants may appear in the bathroom, the kitchen sink, and lavatories. Workers will even crawl on to dishrags or towels in their quest for moisture. Black carpenter ants occasionally nest in houses in such unusual places as trunks, or chests of drawers stored in the attic or basement. They have also been reported occurring in a roll of waxed paper.

Friend and Carlson, in studying damage by these ants to chestnut poles in Connecticut, found that 10 percent of the poles had to be replaced each year because of the ants' nesting habits. At the time of their investigations, each replaced pole cost \$30 to \$35. Most of the damage occurred from ground level to about 6 feet above ground, and consisted of both longitudinal and radial injury, the latter being the most serious. They were of the opinion that nests originated in decayed spots, deep checks, knot holes, or other types of injury, and that the solid wood was not attacked until the colony became large. Snyder, however, found that sound chestnut poles set in dry ground in woodlands were damaged by the ants to some extent, but he did not elaborate on the nature of the wood at the ants' point of entry.

The hardness of these ants is almost beyond belief. Fielde found that 50 percent of the ants survived for 70 hours while submerged in water, but none survived 95 hours of this treatment. A beheaded worker was kept alive for 41 days. McCook reported the ants capable of surviving 48 hours of freezing on ice, and Weber has stated that although this species was driven out, or almost exterminated from certain drought areas in the 1930's, the ants soon repopulated the areas after the return of normal conditions.

Although black carpenter ants are usually not regarded as being aggressive or vicious, especially in their relation to other species, Rau, the author, and others have witnessed pitched battles between what was thought to be two alien colonies of this species, resulting in innumerable dead and injured ants that had been cut to pieces by the strong mandibles of other workers. One could find numerous specimens with a gaster, head, or part or all of the antennae and legs completely cut off, as if someone had used a pair of sharp scissors.

A native ant such as the black carpenter ant, which nests in trees, logs, stumps, poles, and other wood or wood products, is expected to be distributed by commerce. England and New Zealand especially, have reported the introduction of black carpenter ants. No doubt the species frequently has been carried into many countries by commerce, but so far as I am aware, it has failed to establish itself.

The ants are parasitized by at least two species of flies belonging to the family Phoridae. One of the best known is *Apocephalus pergandei* Coquillett. The larva of *pergandei* feeds on the interior of the head of a living ant until the ant succumbs from the attack. As Wheeler so aptly put it, the larva causes the ant to "literally lose its head." The parasitic fungi *Cordyceps unilateralis* (Tulasne), *Desmidiospora myrmecophila* Thaxter, and *Beauveria globulifera* Speg. attack this ant. An ant killed by *C. unilateralis* bears a conspicuous stalk on which is borne an enlarged fruiting body. The fruiting body of *lateralis* is attached to the side of the stalk. None of these parasites, insect or fungus, seem to exert any appreciable effect in controlling the population of the black carpenter ant.

References: McCook, 1876, pp. 277-289; McCook, 1883, pp. 303-307; Fielde, 1904, pp. 170-174; Pricer, 1908, pp. 177-218; Davis, 1908, pp. 10-12; Snyder, 1910, p. 8; Malloch, 1912, pp. 411-529; Mitchell and Pierce, 1912, pp. 67-76; Gaige, 1914, pp. 25-28; Graham, 1918, pp. 32-40; Davis and Bequaert, 1922, pp. 22-23; Bequaert, 1922, pp. 389-401; Wheeler, 1926, pp. 10, 83, 85, 131, 188, 189, 191, 208, 393, 407, 417, 419, 422, 453; Donisthorpe, 1927, pp. 401, 403; Rau, 1934, p. 215; Friend and Carlson, 1937, pp. 913-929, figs.; Friend, 1942, pp. 12, 14; Townsend, 1945, pp. 1-27; Gregg, 1946, p. 753 (footnote); Creighton, 1950, p. 16; Simeone, 1954, pp. 1-19; Van Pelt, 1963, p. 212.

Camponotus ferrugineus (Fabricius)

Red carpenter ant. The selection of the ESA-approved common name "red carpenter ant," for this species was unfortunate, in my opinion, since it may cause confusion with *Camponotus noveboracensis* (Fitch), which is largely red (thorax, petiole). A name more closely agreeing with the scientific name and coloring would have been the "rust-colored carpenter ant." This native species ranges from Nebraska to New York, south to Georgia.

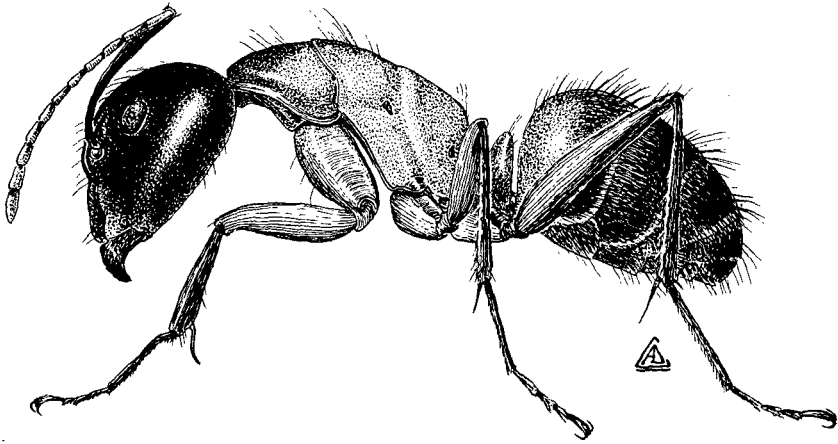


Figure 36.—*Camponotus ferrugineus* (Fabricius), red carpenter ant, lateral view of worker.

Taxonomic Characters

Subfamily and generic characters: Same as for *pennsylvanicus*. *Specific characters:* Workers approximately the same size as those of *pennsylvanicus*, about 6–13 mm. long. Distinguished largely by coloring and pilosity. Most of the thorax (usually mesothorax and epinotum), petiole, base of gaster, and much of the legs yellowish ferruginous; remainder of body and legs blackish or black (allowance must be made for considerable variation). Head, thorax, and gaster opaque or subopaque. Hairs and pubescence deeper, or more golden yellow than those of *pennsylvanicus*, especially on gaster. Pubescence on gaster dense and appressed. Near apex of each middle and hind tibia, a short row of graduated bristles.

Biology and Economic Importance

This species closely blankets the distribution of *Camponotus pennsylvanicus*, but is apparently not as widely distributed or as common. It is a low-altitude form (Cole did not find any nests in the Great Smoky Mountains of Tennessee above an altitude of 4,200 feet) that lives by preference in wooded areas; here the ants normally nest in, and beneath, well-rotted logs and stumps, their galleries often extending for considerable distances into the soil. They also nest in dead, standing trees. Colonies may range from less than a hundred to considerably more than 3,000 individuals. Males and winged females are produced only by large colonies several years old, but it appears that there is only one reproductive female per colony. Males and females produced during one year can overwinter in the parental nest and make their nuptial flights the following year. A new colony is established by a single fertile female, unaided by workers. Workers feed on small insects, honeydew, the juice of fruits, and the sap of plants. Workers tend honeydew-excreting insects, but there is no evidence that they foster or disseminate them. *C. ferrugineus*, although similar to *pennsylvanicus* in many of its habits, is apparently not the major house pest or potential wood-destroying species that *pennsylvanicus* is, although Graham states that both *pennsylvanicus* and *ferrugineus* have

done considerable damage to standing white cedar in Minnesota by gaining entrance through a decayed or wound spot and mining out both faulty and sound wood for considerable distance.³

My unpublished records indicate that although workers, males, and females, singly or in various combinations, have been observed in houses, only in a few instances have actual nests been located, and then only in faulty or moist wood, especially that which has been subjected to water damage. I have no record of household foods eaten by these ants; nor have I been able to locate any published information on the subject.

References: Pricer, 1908, pp. 177-218; Graham, 1918, pp. 32-40; Wesson and Wesson, 1940, pp. 90, 103; Cole, 1940, pp. 30, 86; Gregg, 1946, p. 753 (footnote); Brown, 1950, pp. 158-161.

Camponotus abdominalis floridanus (Buckley)

Florida carpenter ant. A native ant which ranges from Alabama and Horn Island (off the coast of Mississippi) east to North Carolina and Florida. This subspecies, although widely distributed in Florida, apparently does not occur very far inland in the other States from which it has been reported. It is one of the common, if not the most common, *Camponotus* species in Florida. *C. abdominalis* (F.) is a well-known neotropical ant, which is so highly variable that it has produced many subspecies.

Taxonomic Characters

Subfamily and generic characters: Polymorphic. Antenna articulated at a considerable distance from the posterior border of the clypeus. Antennal fossa not touching the posterior border of the clypeus. Antenna 12-segmented, without a club. Scape flattened basally; very much broadened throughout except basally. Frontal carinae not placed close together, lyrate in shape. Clypeus largely in the form of a lobe,

³ Both Gregg and the author think that Graham may have confused *pennsylvanicus* and *ferrugineus* with *Camponotus herculeanus* (L.) and *C. noveboracensis* (Fitch).

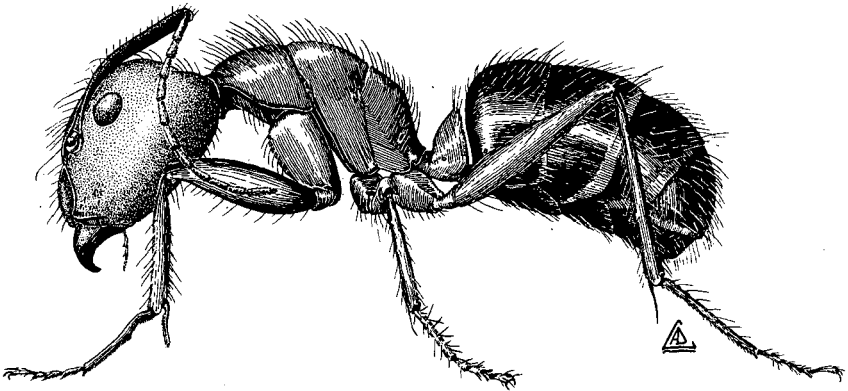


Figure 37.—*Camponotus abdominalis floridanus* (Buckley). Florida carpenter ant, lateral view of worker.

the anterior border of which is broadly but weakly emarginate. Clypeus with a rather distinct carina. Abdominal pedicel composed of a single segment, the petiole. Cloacal orifice terminal, circular, surrounded by a fringe of hairs (fig. 48, co). Sting lacking. Workers capable of emitting a distinct formic acid odor. *Specific characters:* Large ants, workers 5.5–10 mm. long. Scape with scattered suberect or erect hairs. Head subopaque or opaque; thorax, petiole, and gaster shiny. Head reddish, thorax and petiole yellowish or yellowish-red, scape and gaster blackish or black, quite often base of first gastric segment yellowish or yellowish-red. Legs with numerous suberect hairs which, although long, are shorter than those on body. Body with abundant, long, suberect or erect yellowish hairs. In some lights gaster has grayish or violaceous cast. Species readily distinguished by its characteristic color and pilosity.

Biology and Economic Importance

This subspecies commonly nests in the ground beneath objects, in dead branches of trees, and in and beneath rotting logs and stumps. However, the ants are highly adaptive in their nesting habits and in their choice of ecological habitats. Colonies are moderate to large in size. In Florida, nuptial flights apparently occur most commonly from June to August. New colonies are founded by a single fertilized female, independent of aid from workers. It is normal for a colony to have a single reproductive female. Under natural conditions the ants feed largely on small insects and honeydew, and may eat both live or dead insects. They tend plant lice, mealybugs, and scales. Workers are active both day and night. The aggressive, pugnacious habits of the workers have earned for them the common name "bull dog" ants. While on some occasions it definitely appears that the ants have invaded houses from outdoors, there is not the slightest doubt that they also nest within the structure of buildings. On several occasions, correspondents have reported them nesting in and damaging the woodwork of porches, roofs, kitchen sinks, and paneling. The ants feed on such household foods as molasses, honey, and liver. Workers are also known to disrupt colonies of bees by plundering their hives for food or living quarters. This ant undoubtedly ranks as one of the most important house-infesting ants in Florida.

References: Wheeler, 1932, p. 15; Schneirla, 1944, pp. 3–4; Creighton, 1950, pp. 395–396; Smith, 1950, pp. 299–300; Van Pelt, 1958, pp. 46–49.

Camponotus caryae discolor (Buckley)

A native ant, *Camponotus caryae discolor* (Buckley) ranges from Kansas and Iowa to Ohio, south to Texas and Florida. The subspecies is probably most common in the lower Mississippi Valley region or the Central States, but appears to be much less generally common than *Camponotus rasilis* Wheeler and *C. nearcticus* Emery. *C. caryae* (Fitch) is a North American ant whose distribution appears to be largely eastern. It is thought to have produced at least one or more valid subspecies.

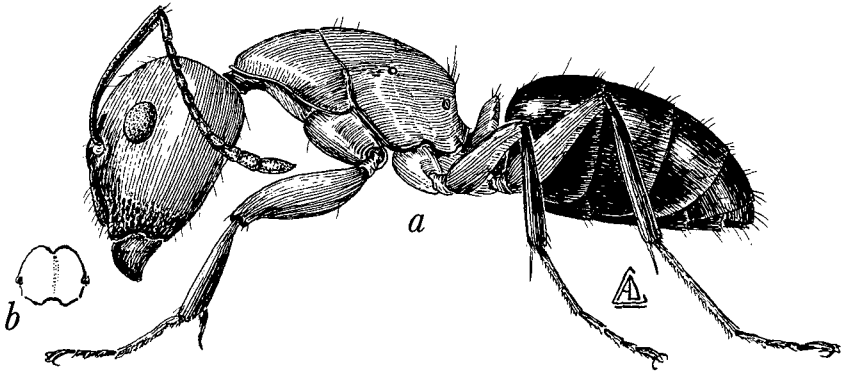


Figure 38.—*Camponotus caryae discolor* (Buckley): *a*, Lateral view of worker; *b*, frontal view of clypeus showing the emargination or impression at the middle of its anterior border.

Taxonomic Characters

Subfamily and generic characters: Polymorphic. Antenna 12-segmented, without a club. Antennal fossa not touching the posterior border of the clypeus. Middle of the anterior border of the clypeus with a distinct but narrow emargination or impression (fig. 38, *b*). Clypeus weakly carinate or almost ecarinate. Each middle and hind tibia without a row of bristles on their flexor surface. Abdominal pedicel composed of a single segment, the petiole. Cloacal orifice terminal, circular, surrounded by a fringe of hairs (fig. 48, *co*). Sting lacking. Workers capable of emitting a distinct formic acid odor. *Specific characters:* Workers 3.5–7.5 mm. long. Head, thorax, and petiole yellowish red or reddish, the gaster blackish or black. Anterior portion of head, especially cheeks and clypeus, punctulate, subopaque; clypeus and especially cheeks with elongate, piligerous foveolae. Closely resembles *Camponotus rasilis* Wheeler but can be distinguished from that species by the peculiarly sculptured and more subopaque anterior portion of head and by the short, erect hairs of clypeus and cheeks. Body of *discolor* is usually lighter, more yellowish, and smaller than that of *rasilis*.

Biology and Economic Importance

The biology of this ant is so similar to that of *rasilis* that it hardly requires further comment here. On several occasions the ants were collected under conditions that clearly indicate they were nesting in houses. There they are potentially capable of nesting in preformed or natural cavities, or in rotting or faulty wood. It is doubtful that their excavating activities could cause any appreciable damage because of the small size of the ants, and the small colonies. I have no records of household foods being infested by the workers.

References: Mitchell and Pierce, 1912, pp. 75–76; Wesson and Wesson, 1940, p. 103; Hess, 1958, pp. 47–48, 56, 58–59.

Camponotus nearcticus Emery

A native species, *nearcticus* ranges from North Dakota to Ontario, south to Colorado and Florida. Creighton states that the species has a discontinuous distribution, and occurs from British Columbia to California and eastward to Idaho. Unfortunately, from 1917 to 1940 the species was confused in our literature with *caryae* (Fitch), a much less common species but one with somewhat similar habits and appearance.

Taxonomic Characters

Subfamily and generic characters: Same as for *caryae discolor*. *Specific characters:* Workers 4.5–7.5 mm. long. Clypeus with rather large foveolae which bear suberect or erect hairs; foveolae of cheeks smaller and more numerous but not bearing suberect or erect hairs. Scape without erect hairs, except at apex. Legs entirely or almost entirely without hairs except at apices of segments. Petiolar node narrow in profile, the anterior surface moderately convex, posterior surface flattened. Body pubescence sparse, scattered, closely appressed and not concealing the surface; most abundant and easily seen on gaster. Body of typical form blackish or black but color subject to considerable variation; occasionally some of the segments or areas of body largely reddish or brownish. Body shiny, the head least, the gaster most. Typical form easily recognized by its black and rather shiny body, emarginate clypeus, and lack of erect hairs on cheeks.

Biology and Economic Importance

C. nearcticus is not only one of the most widely distributed species of the subgenus *Myrmentoma* discussed here, but also one of the most common. The ants of this subgenus, which are smaller (3–7 mm.) than most *Camponotus*, are distinguished especially by the emargination or impression at the middle of the anterior border of the clypeus. Most of the known forms are eastern.

Under natural conditions *nearcticus* forms small colonies of less than a hundred to several hundred individuals in dead twigs and branches of trees, in or beneath the bark of dead and live trees, in

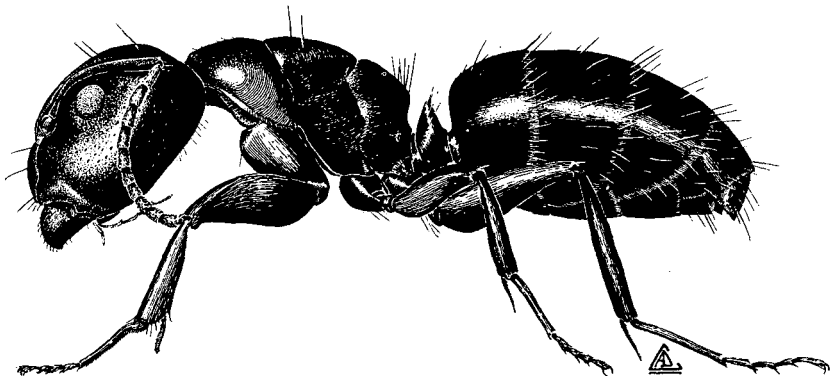


Figure 39.—*Camponotus nearcticus* Emery, lateral view of worker.

insect galls, pine cones, beneath the bark of logs and stumps, hollow stems of plants, and in wooden posts. The species will also accept hollow wooden traps designed for certain wasps. Nests have been noted especially in such trees as pine, oak, and hickory. Although mainly a lowland form, the species has been collected at altitudes of approximately 6,000 feet. It is not known when the males and winged females are produced, but there is abundant evidence to indicate that these forms overwinter in the parental nest; they no doubt make their nuptial flights the following year. Kanno'ski states that recently mated females seek cavities in which to start new colonies. These females establish their nest independently of aid from workers. The timid, hard-to-capture workers crawl over trees and shrubs in search of honeydew for food, a diet which is largely supplemented by dead insects. They forage both day and night. On numerous occasions I have received all castes of this ant from houses, where they have been found nesting in the woodwork, especially in the roofing; the owners of such premises have especially mentioned the moistness of the nesting sites. Since housekeepers have seldom complained of the ants infesting household foods, I assume the ants are of minor importance in this respect.

References: Wheeler, 1905b, pp. 402-403; Smith, 1924, p. 125; Cole, 1940, pp. 15, 29, 83; Van Pelt, 1958, pp. 44-45; Kanno'ski, 1959, pp. 119-120, 134.

Camponotus rasilis Wheeler

A native species which ranges from Nebraska south to Texas, South Carolina, and Florida. The species is apparently most common in the Gulf Coast States where it is more abundant than either *nearcticus* or *caryae discolor*.

Taxonomic Characters

Subfamily and generic characters: Same as for *caryae discolor*.
Specific characters: Workers 4-9 mm. long. Cheeks and clypeus with distinct but not unusually large or coarse foveolae; foveolae on cheeks

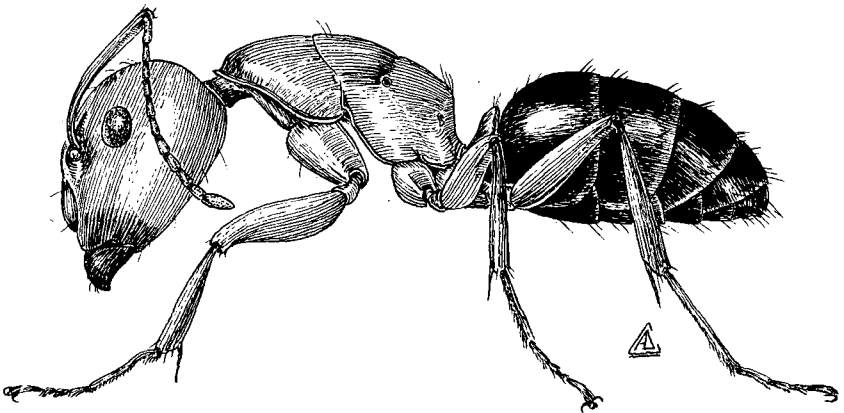


Figure 40.—*Camponotus rasilis* Wheeler, lateral view of worker.

not bearing short, erect, or suberect hairs. Gaster smooth and shiny, head and thorax shagreened and more subopaque, head in certain lights somewhat shiny. Workers of typical species have yellowish red or reddish head, thorax, and petiole, and blackish or black gaster. Occasionally the base or much of the first gastric segment is lighter than the remainder of the gaster. Femora and tibiae of legs lacking or almost lacking erect hairs. Bears superficial resemblance to *caryae discolor* but can be distinguished from that species by less coarse, subopaque cheeks and clypeus, and especially by lack of short, erect hairs arising from foveolae of cheeks.

Biology and Economic Importance

The ants form small colonies of only a few hundred individuals. They nest in galleries made by borers in twigs and branches of trees; in insect galls, particularly those of *Disholcaspis cinerosa* (Bassett) on oak; in cavities in the stalks of plants; under the bark of trees; in logs and stumps, wooden posts, and in houses. A new colony is founded by a single fertilized female, unaided by workers. It is normal for males and winged females produced in one year to overwinter in the parental nest and make their nuptial flights the next year. The natural food of *rasilis* workers is largely the honeydew excreted by scale insects and plant lice on the surface of leaves and twigs of trees and plants. This diet is largely supplemented by the dead bodies of insects. The species frequently nests in the woodwork of houses, although it may also invade houses from outdoors. Quite often workers invade houses at night. It is assumed that the ants start their nest in faulty wood or preformed cavities. On one occasion a colony was found nesting in the roller of a window shade. Because of the small size of the ants and their colonies, it does not seem possible for them to do any significant damage to woodwork. Workers frequently feed on such household food and drink as breads, fruits, cakes, syrup, sugar, jam, and coca cola. The ants appear to show a preference for sweets.

References: Wheeler, 1910b, pp. 227-228; Smith, 1924, p. 126; Smith, 1950, pp. 297-298; Hess, 1958, pp. 48-49, 56, 58-59.

Paratrechina longicornis (Latreille)

Crazy ant. This introduced species, apparently of African or, more likely, Oriental origin, has become widely disseminated by commerce to various parts of the World. It is frequently intercepted in plant quarantine. The species is well established in many towns and cities of the Gulf coast region, especially in Florida. Farther north and inland it is more sporadically distributed, occurring in apartment buildings, hotels, and greenhouses. The crazy ant gets its name from the worker's habit of darting here and there in a jerky, haphazard manner, as if lacking a definite sense of direction.

Taxonomic Characters

Subfamily and generic characters: Monomorphic. Antenna 12-segmented, without a club. Scape extraordinarily long, apex surpassing posterior border of head by at least one-half the length of the

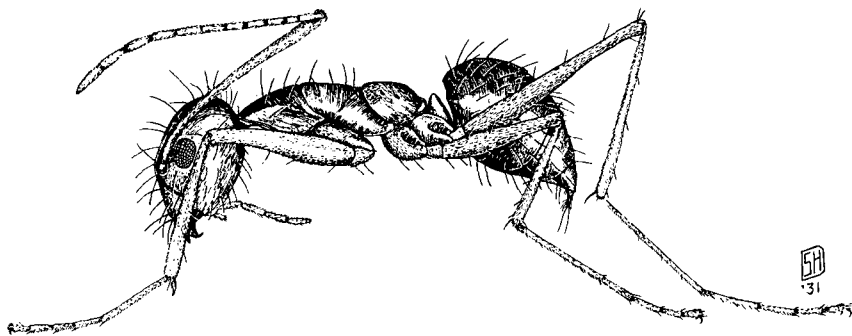


Figure 41.—*Paratrechina longicornis* (Latreille), crazy ant, lateral view of worker.

scape. Antennal fossa inserted very close to posterior border of clypeus, lacking the width or less of the fossa of touching the posterior border of the clypeus. Eye large, strongly convex, placed closer to base of mandible than to posterior border of head. Clypeus subcarinate. Maxillary palpus long, 6-segmented. Legs extraordinarily long. Base of gaster with an impression. Base of gaster angulate on each side of impression (viewed from above). Abdominal pedicel composed of a single segment, the petiole. Cloacal orifice terminal, circular, surrounded by a fringe of hairs (fig. 48,co). Sting lacking. Integument soft and flexible. *Specific characters:* Workers 2.2–3 mm. long. Body strikingly slender, with extraordinarily long antennae and legs. Body with long, coarse, well-scattered, suberect to erect, grayish or whitish hairs. Suberect or erect hairs normally absent from scape. Legs with shorter suberect hairs. Head, thorax, petiole, and gaster dark brown to blackish or black, ground surface with peculiar gray to violaceous luster or sheen.

Biology and Economic Importance

The slender-bodied, long-legged worker is capable of moving rapidly, and even jumping, according to some observers. Wroughton states that the ant is endowed with a keen sense of smell, which enables it to locate food quickly. The species is highly adaptable, living in both very dry and rather moist habitats, and nesting in such places as trash, refuse, cavities in plants and trees, rotten wood, and the soil under objects. Colonies are moderate-sized to populous. Because no intensive work has been done on the biology of *longicornis*, many details of its life history are lacking. Workers are almost omnivorous. They feed on both live and dead insects, seeds, honeydew, fruits, plant exudates, and many household foods. They obtain the honeydew by tending plant lice, mealybugs, and scales. Pimentel states that in Puerto Rico, workers killed larvae and adults of *Musca domestica* (Linnaeus), *Callitroga macellaria* (Fabricius), *Sarcophaga* sp., and others. The workers of *longicornis* and those of several other species of ants destroyed 91 percent of the potential fly population. Fox and Garcia-Moll (1961) have observed workers of this ant species attacking larvae of the Oriental rat flea *Xenopsylla cheopis* (Rothschild) under laboratory conditions, and suggest that the ants may be important in reducing the population of this flea under natural conditions.

Workers are known to gather small seeds of such crops as lettuce and tobacco from seed beds. In sections of our country subject to very cold weather or pronounced winters, the ants nest in apartment and hotel buildings, where they are potential pests the year around. Workers feed on many household foods such as meats, grease, sweets, fruits, and vegetables, and on liquids, such as fountain syrup and soft drinks. The ants seem especially fond of sweets. It was reported that one soda fountain in Florida discontinued business because of the ravages of this pest.

References: Wroughton, 1892a, pp. 41-42; Phillips, 1934, pp. 18-19; Smith, 1936, pp. 869-870; Smith, 1950, pp. 289-290; Pimentel, 1955, pp. 28-30; Fox and Garcia-Moll, 1961, pp. 1065-1066.

Paratrechina (Nylanderia) spp.

This heading includes mostly native species, with a few that have been introduced. Ants of this subgenus are widely distributed over the hot and temperate regions of the World. Their distribution in the United States is still poorly known, but better understood east of 100° longitude. Males and their associated genitalia afford the only reliable means of identifying these ants to species. The species can seldom be identified on the basis of workers alone; however, should the reader wish to attempt such determinations, he is referred to Creighton (1950, pp. 404, 405-410).

Taxonomic Characters

Subfamily and generic characters: Same as for *longicornis* except as follows: Length 2.2-4 mm. Apex of scape exceeding posterior border of head by at least one-fifth or more of the length of the scape. Scape of most species usually with noticeable, prominent, suberect to erect hairs. Antennal fossa very close to, or touching, posterior border of clypeus. Eye well developed. Clypeus carinate or subcarinate. Thorax somewhat stout. Mesonotum more or less distinctly separated

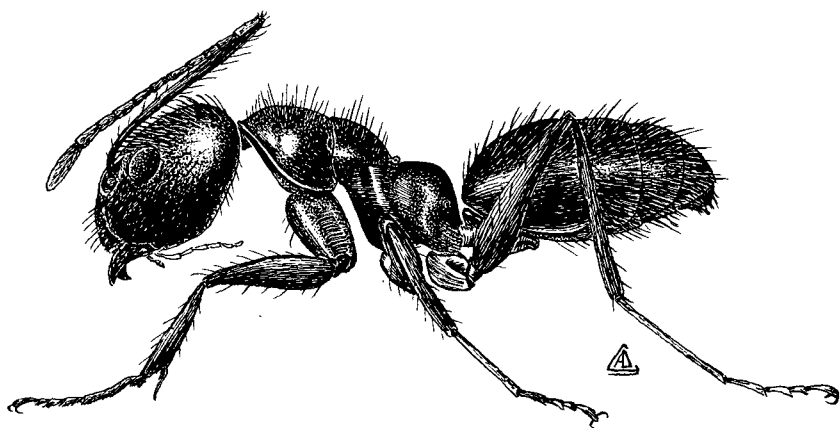


Figure 42.—*Paratrechina (Nylanderia) sp.*, lateral view of worker.

from adjacent regions of thorax by sutures or impressions. Mesoepino-tal suture very distinct dorsally and bearing within this region a pair of rather prominent spiracles. Base of epinotum usually shorter than declivity. Petiolar node usually inclined. Base of gaster with a distinct impression, on each side of which the gaster is more or less angulate (best seen from above). Legs with rather long, suberect to erect hairs. Pubescence on body rather short, closely appressed, and often fairly dense, especially on gaster. Body with scattered, long, coarse, suberect to erect hairs that vary from light yellowish to dark brown, depending upon the species. Body commonly shiny, often depending upon the light in which the body is viewed. Body color usually yellowish, brown, or blackish.

Biology and Economic Importance

Most of these ants are native species which normally nest outdoors. A few introduced species are capable of living outdoors in the extreme Southern States, but can exist only in greenhouses or heated buildings farther north. Our native species, especially, are potential house pests. Workers of most species are mild-mannered, nonaggressive, rather active ants, capable of foraging both day and night. Ants of this subgenus form small colonies of only a few hundred individuals in diverse dry-to-moist habitats; they occur in beaches, fields, meadows, and woods. The ants are mainly lowland forms, none of our Eastern States species ranging above 5,000 feet. The ants may nest in the exposed soil, or under the cover of objects, in rotten wood, under the bark of logs and stumps, in twigs, or in plant cavities. No complete biological studies have been made of any of the species. Males and winged females of the native species are known to overwinter in the parental nest and make their nuptial flights the following year. A newly fertilized female is capable of establishing a colony unaided by workers. Workers tend plant lice, mealybugs, and scale insects for honeydew, and also feed on both live and dead insects and the juices of fruits. They feed on a wide variety of household foods such as sweets, pies, fruits, fruit juices, fountain and table syrup, and meats. They are especially fond of sweets, and in some localities have been called "sugar ants" because of their fondness for this food. They may invade houses and stores from outdoors, but also nest within the structures of buildings. They are not capable of causing any appreciable damage to woodwork or masonry because of their small size and small numbers, but they can be very annoying to housekeepers and store owners. Although not numerous in species, the ants are sometimes extremely numerous in colonies and individuals, especially in certain areas. At least one species in this subgenus may possibly be an intermediate host of the poultry tapeworm *Raillietina tetragona* (Molin); workers of an undetermined species have been seen carrying gravid segments of that tapeworm into their nest.

References: Wheeler, 1905b, pp. 374, 390-393; Phillips, 1934, pp. 18-19; Dennis, 1938, pp. 295, 306; Case and Ackert, 1940, pp. 393-395; Cole, 1940, pp. 14-15, 66; Hess, 1958, pp. 54-58, 62-63.

Prenolepis imparis (Say)

A name commonly applied to this species is the "false honey ant." This native species ranges at least from Nebraska to Ontario and south to Texas and Florida.

Taxonomic Characters

Subfamily and generic characters: Monomorphic. Antenna 12-segmented, without a club. Apex of scape surpassing posterior border of head by approximately one-half length of scape. Antennal fossa extremely close to or touching posterior border of clypeus. Eye prominent, convex, placed closer to posterior border of head than to base of mandible. Clypeus subcarinate. Mandible with oblique masticatory border bearing 5 or 6 stout teeth. Maxillary palpus 6-segmented, usually long. Thorax small, slender, divided into two parts by a remarkably strong constriction in the mesonotum, which causes this region to appear subcylindrical. A pair of prominent spiracles occurs dorsally in the constriction. Abdominal pedicel composed of a single segment, the petiole. Cloacal orifice terminal, circular, surrounded by a fringe of hairs (fig. 48,co). Sting lacking. Base of gaster with a strong impression; seen from above, base of gaster meets each side in a decided angle. Integument soft, flexible. *Specific characters:* Workers 2-4 mm. long. Body hairs whitish or pale yellowish, suberect to erect, more abundant on head and gaster than on thorax, apparently longest on gaster. Scape with abundant, fine, oblique hairs or pubescence. Legs with fine, closely appressed pubescence; almost free of suberect or erect hairs except basally. Body smooth and shiny. Body color variable, ranging from pale castaneous to piceous brown or blackish, head and thorax often lighter than gaster. Readily recognized by the characteristic subcylindrical mesonotum, and the smooth, shiny body.

Biology and Economic Importance

This ant normally constructs its nest in the soil, seldom under the cover of stones or other objects. It nests by preference in moist clay or loamy soils in well-shaded locations such as woodlands. Van Pelt has collected occasional colonies in the Blue Ridge Mountains at altitudes of between 3,500 and 5,000 feet. Exteriorly, the nest has a

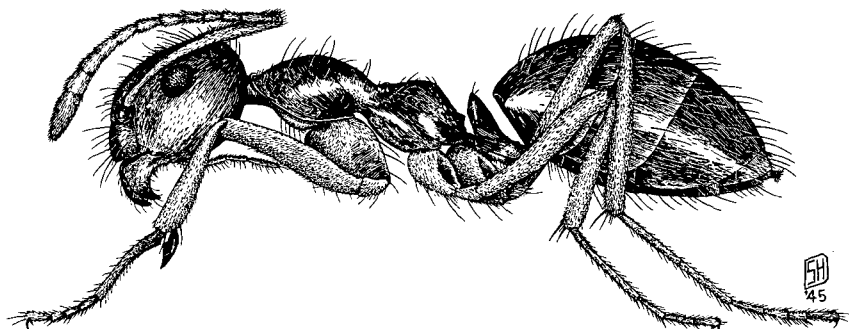


Figure 43.—*Prenolepis imparis* (Say), lateral view of worker.

single central opening surrounded by a more or less circular crater of characteristic earthen pellets. The nest is usually 18 to 51 inches deep and has a single gallery leading below, from which there extends in linear sequence about 6 to 40 lateral chambers, thus forming a rather compact, well-defined nest. Colonies are rather small, seldom containing over a few thousand individuals. Brood production takes place from middle to late summer, but no brood is overwintered. During the winter an old, characteristic colony will contain a single reproductive female, numerous workers, and males and winged females. In early spring, usually March to April, the overwintering males and winged females make their nuptial flight. Most of the mating, however, appears to take place on the ground. As far as I am aware, this is the first species of the season to make its nuptial flight; it could therefore be considered a harbinger of spring! A new colony is founded by a newly fertilized female, which discards her wings and seeks a crevice in the ground all by herself. Workers forage at night, during cool or cloudy days, or during rains, working at lower temperatures (40° to 65° F.) than any of our other species of ants. In fact, they frequently appear outside the nest when the soil is frozen. Workers are mild-mannered, nonaggressive ants. Few ants exceed *imparis* in their love for honeydew. Workers assiduously tend plant lice, scale insects, and treehoppers, none of which, however, are kept or fostered by *imparis*. Workers often become so engorged with honeydew that their gasters are distended like balloons, and they walk with difficulty. In the possession of a greatly distended gaster, they bear a striking resemblance to our true honey ants, *Myrmecocystus* spp.

They feed on live and dead insects, the juices of well-ripened or decaying fruits, the sap or juice extracted from flower buds, or the tender growth of certain plants, and on the germinating seeds of long leaf pines. Although workers commonly invade houses from outdoors, there is evidence that, in some cases at least, the ants nest inside, since on numerous occasions winged females and males have been collected inside houses from January to March. The ants are incapable of structural damage, but they can be a considerable annoyance to housekeepers. Workers feed on such household foods as sweet corn, corned beef, meats, cakes, breads, sugar, honey, syrup, watermelon, and fruits. The ants seem to be especially fond of sweets, and may be economically important when workers search for honey in weakened beehives. They can damage roses and oranges by gnawing into the flower buds for the sap or juice. Workers have been used by blue jays in "anting" (see Glossary, p. 93). Experimental tests by Smith and Weiss have shown that this ant can transmit azalea flower spot, *Orulmia azalea* Weiss.

References: Wheeler, 1930, pp. 1-15; Smith and Weiss, 1942, p. 42; Talbot, 1943, pp. 31-44; Talbot, 1945, pp. 506-507; Hess, 1938, pp. 52-53, 55-57, 59, 63; Van Felt, 1963, p. 213.

Lasius alienus (Foerster)

Cornfield ant. This species has a discontinuous distribution in North America. According to Wilson, it ranges from British Columbia to northern California, and from North Dakota to Nova Scotia, south to Arkansas and northern Florida. The species also occurs in the mountains of southern Arizona. *L. alienus* appears to be sparse or absent in the southern Rockies and Great Basin, and is rare or locally distributed in the Gulf Coast States. This is the form that has passed in earlier American literature under the varietal or subspecific name *americanus* Emery. In America, it has been frequently confused with *Lasius neoniger* Emery (p. 81), which it resembles so closely that one must be very cautious in accepting literature records without knowing the full history.

Taxonomic Characters

Subfamily and generic characters: Workers monomorphic. Antenna 12-segmented, without a club. Antennal fossa very close to, or touching, posterior border of clypeus. Frontal carinae not placed close to each other. Eye well developed, located closer to posterior border of the head than to base of mandible. Ocelli, if present, small and indistinct. Maxillary palpus long, 6-segmented, terminal segments of approximately the same length. Mesoepinotal impression well defined, bearing a pair of distinct spiracles. Declivity of epinotum more than twice as long as base of epinotum. Abdominal pedicel composed of a single segment, the petiole. Petiolar node scalelike, thin or narrow in profile, and either vertical or not strongly inclined. Cloacal orifice terminal, circular, surrounded by a fringe of hairs (fig. 48,co). Sting lacking. Integument soft and flexible. Workers active, not light-avoiding, and capable of emitting a strong formic acid odor. *Specific characters:* Workers approximately 2-2.5 mm. long. Penultimate and terminal basal teeth of mandible sub-

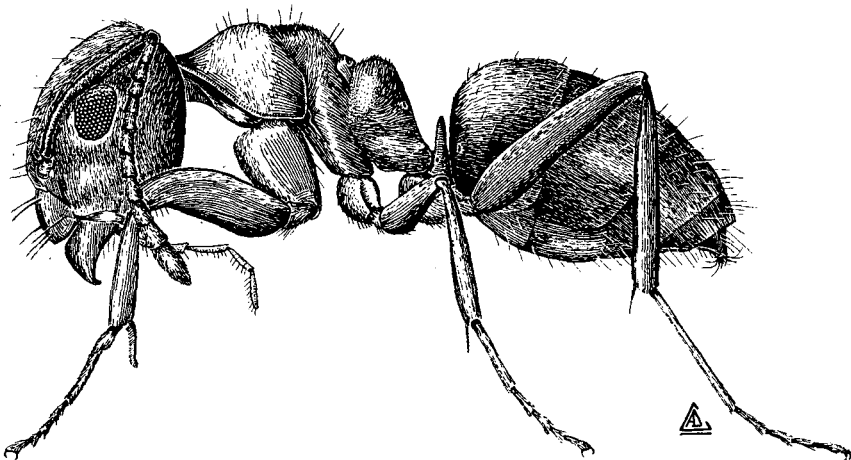


Figure 44.—*Lasius alienus* (Foerster), cornfield ant, lateral view of worker.

equal in size, the gap between them of about the same area as terminal tooth, constant in shape. Middle of anterior border of clypeal lobe forming an even, broad, parabolic curve. Scape exceeding, by approximately one-fifth its length, the posterior border of head. Eye large, usually with about 16 ommatidia in its greatest diameter. Antennal scapes and tibiae either without suberect or erect hairs, or more commonly with less than 10 each. Body color brown to very dark brown, approaching blackish.

Biology and Economic Importance

L. alienus and *L. neoniger* are similar in many of their habits, but not especially in their habitats. Wilson states that in North America *alienus* has a predilection for well-shaded woodlands, where it nests in rotting logs and stumps and under stones. *L. neoniger*, on the other hand, prefers open habitats (for further details see p. 82). The ranges of the two species frequently overlap in open woods and the borders of forests. Van Pelt has found colonies of *alienus* abundant in the Blue Ridge Mountains at 5,000 feet, common at 6,000 feet, and occasional at 6,100 to 6,500 feet. The individuals composing a nest are moderately, to very, numerous. They are quite similar to *neoniger* in their method of establishing colonies, and in the growth of colonies. Males and winged females occur in nests from midsummer to fall, the nuptial flights usually taking place during August and September. In Europe, a reproductive female was kept in an artificial nest for 9 years (until she died), and during that time she produced a small brood of workers each year. In North America it is quite likely that this common species of *Lasius* is host to one or more temporary ant parasites belonging to *Lasius* (*Chthonolasius*) and *Acanthomyops*. For a discussion of how the parasitism may take place, see the remarks under *L. umbratus* (p. 85).

The feeding habits of *alienus* are almost identical to those of *neoniger*. Like the latter species, the ants eat both dead and live insects, gather nectar from the floral and extrafloral nectaries of plants, tend honeydew-excreting insects, and foster and transport certain subterranean plant lice from the roots of one plant to another. Workers may invade houses from outdoors in their search for food such as sweets and meats. The ants are also capable of nesting in houses, usually in faulty woodwork or masonry of the basement or lower sections. Although they are frequent house pests, the ants are seldom persistent. Individuals are frequently infected with the parasitic fungus *Laboulbenia formicarum* Thaxter, as are those of *neoniger* (see p. 84).

References: Gaige, 1914, pp. 17-19; Donisthorpe, 1927, pp. 242-247; Wilson, 1955, pp. 77-89; Kownowski, 1959, pp. 119-120, 135-136; Van Pelt, 1963, p. 213.

Lasius neoniger Emery

L. neoniger is a native species with a discontinuous distribution. According to Wilson, the main range is from Idaho to Quebec and Ontario, south to Florida, and south through Wyoming, Colorado, and New Mexico. The species also occurs in two small areas in eastern California. It is not known to occur in the Pacific Northwest. In American literature this species has frequently been confused with

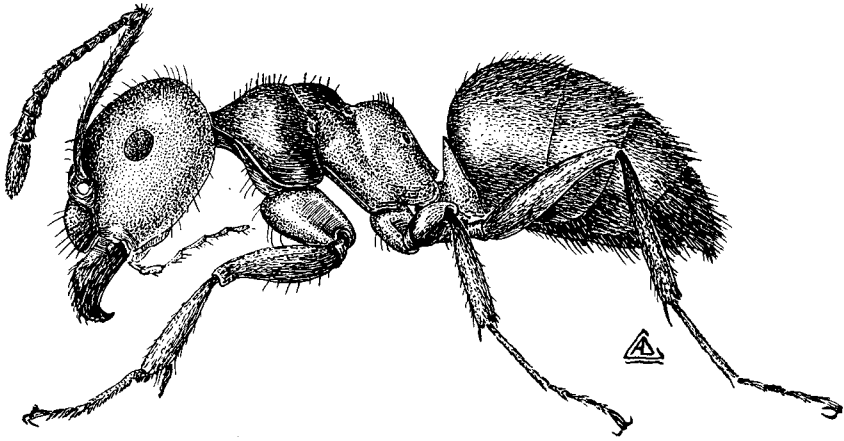


Figure 45.—*Lasius neoniger* Emery, lateral view of worker.

alienus (= *americanus* Emery). In fact, Wilson considers that the work done by Forbes and associates on *americanus* applies largely, if not entirely, to *neoniger*.

Taxonomic Characters

Subfamily and generic characters: Same as for *alienus*. *Specific characters:* Workers of approximately the same size as *alienus*, 2–2.5 mm. long. Antennal scapes and tibiae with numerous suberect or erect hairs. Anterior border of clypeal lobe obtusely angular medianly. Penultimate basal tooth of mandible markedly smaller than the two flanking teeth, or gap between penultimate and terminal basal teeth tends to be larger in area than the terminal basal tooth, and variable in shape. Color light to medium brown, rarely dark brown.

Biology and Economic Importance

Wilson states that in the eastern United States *neoniger* is frequently the dominant species of *Lasius* in lawns, cultivated fields, and grassy road strips. It is also a common ant in prairies, beaches, and sand dunes. The species nests almost exclusively in open areas, either beneath stones or in the exposed soil, where the presence of its nests is usually indicated by numerous but small craters of soil surrounding a central opening. The craters are often very abundant—sometimes as many as 10 per square yard. A nest appears to be composed of a number of shallow, interconnected chambers (seldom more than 10 to 15 inches deep), occurring over a rather large and irregular area.

To my knowledge, no careful population counts have been made, but the adult population composing a large colony must amount to thousands. Present evidence indicates that there may be not more than one reproductive queen per colony, and that queenless colonies will accept a fertilized and dealate female from a nuptial flight. Nuptial flights ordinarily take place in late afternoon of the late summer and autumn months (August to October). The flights are usually, but not always, associated with storms and rains. Flight from some colonies consist only of males; others, of a mixture of males and females.

Often immense numbers of individuals compose the flight, and the air may be literally "filled with ants." Tanquary believed that fertilization of the females took place in the nests prior to the nuptial flights, since he had never seen a male and female in copulation outside of the nest. After the flights it is common for the fertilized females to shed their wings and enter small self-made cavities in the ground. These queens remain alone in their chambers over winter, and do not normally lay eggs or start a new brood until the following spring. Successive broods are produced over an unknown number of years until at last the colony is large enough to produce males and winged females. Some colonies under certain conditions may become hosts of temporary parasites of other ants belonging to such genera as *Lasius* and *Acanthomyops*. Gregg has found a mixed colony of *L. umbratus* and *neoniger*, and Talbot has found a mixed colony of *A. murphyi* and *neoniger*. Talbot indicates that in ordinary summer weather workers of *neoniger* are largely nocturnal, their activity beginning to rise in the late afternoon, continuing through the night, and decreasing toward morning.

Workers feed on both dead and live insects, the secretions of floral and extrafloral nectaries, and the honeydew excreted by plant lice, mealybugs, and other honeydew-excreting insects. Not only do these ants assiduously tend many different kinds of plant lice, but they also foster and transport certain subterranean plant lice.

The relationship of this ant to the corn root aphid *Anuraphis maidiradicis* (Forbes), is a classic example of mutualism. The ants store and care for the aphid eggs in their nest during the winter. In the spring when the aphids have hatched from the eggs, the ants carry them to the roots of certain grasses and weeds where the aphids remain and feed until the corn has grown enough to support the aphids; the ants then carry them to the corn roots. In this relationship they protect, care for, and transport the aphids as the occasion may require. *L. neoniger* has the same general relationship to *Anuraphis maidiradicis* on the roots of cotton. Orlob found that *Lasius neoniger* was of secondary importance in the spread of barley yellow dwarf virus by the aphid *Schizaphis (Toxoptera) graminum* (Rondani) on barley and oats. The ants were of importance in this role because they increased aphid populations largely by their protection of the plant lice from natural enemies, and also by furnishing the lice ideal quarters in which to breed. Orlob apparently thinks that the role of ants in bodily carrying infected lice from plant to plant is of little significance. *L. neoniger* is a frequent house invader, usually from outdoors, quite often following rains. These invasions are of short duration and lack the persistency of those of the Pharaoh ant, Argentine ant, or Pavement ant. Workers are general feeders on household foods, but seem to show a slight preference for sweets and meats. The ants can also be pests of some importance on golf courses where their innumerable earthen craters not only mar the appearance of the course, but also interfere with the game. Observers have noted workers and males of this ant being used by starlings, *Sturnus vulgaris* (Linnaeus), and grackles, *Quiscalus quiscula* (Linnaeus), in "anting." Occasional individuals of this ant, especially workers, bear fine, gravel-like objects

externally on their bodies. Close examination under a microscope reveals them to be a parasitic fungus, *Laboulbenia formicarum* Thaxter. So far as I am aware, the fungus has no appreciable effect on the ant's vitality.

References: Forbes, 1908, pp. 31-44, figs.; Tanquary, 1913, pp. 417-443; Severin, 1920, pp. 1-9; Metcalf and Flint, 1939, pp. 371-374, 770; Talbot, 1945, pp. 504-506; Talbot, 1946, pp. 65-70; Schread and Chapman, 1948, p. 4; Talbot, 1953, pp. 3-12; Wilson, 1955, pp. 97-104; Orlob, 1964 (1963), pp. 95-106.

Lasius umbratus (Nylander)

According to Wilson, this species is native to both Eurasia and North America. It ranges from Nova Scotia to the Gulf Coast, but is rare in the latter region, fairly common in the southern Rocky Mountains, but sparse or absent over most of western North America; there are no records of it from British Columbia, northern Idaho, or northern California. It is the form that has passed in previous American literature as a variety or subspecies of *umbratus* under the name of *aphidicola* (Walsh).

Taxonomic Characters

Subfamily and generic characters: Same as for *alienus* except as follows: Eye with approximately 12 ommatidia in its greatest diameter. Antenna 12-segmented, the segments gradually increasing in size toward the apex of the funiculus but not forming a distinct club. Apex of scape surpassing posterior border of head by less than one-third the length of scape. Maxillary palpus with apical segments noticeably decreasing in length. Thorax rather short, stout. Declivity of epinotum at least twice as long as base of epinotum. Petiolar node in profile very narrow or thin, tapering from base to apex. Base of gaster scarcely, or not at all, impressed. *Specific characters:* Workers 3.3-3.7 mm. long. Scares and tibiae normally without erect or suberect hairs. Dorsal surface of gaster with numerous, well-distributed, short, suberect hairs. Body pubescence short, closely appressed, apparently

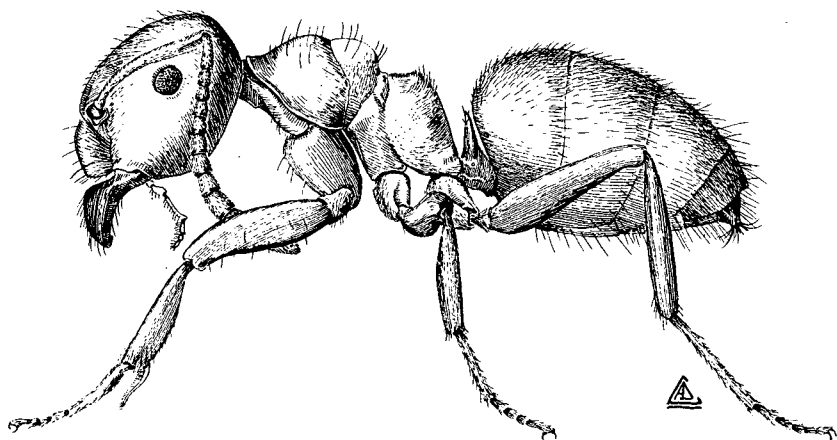


Figure 46.—*Lasius umbratus* (Nylander), lateral view of worker.

denser on dorsal surface of gaster than elsewhere. Body shiny or subopaque depending upon the nature of light and position from which viewed. Body color variable, commonly light brown or brown. Worker easily recognized by number and relative proportions of segments composing maxillary palpus, the very thin or narrow petiolar node (in profile), the usual absence of suberect or erect hairs on scapes and tibiae, and the presence of numerous, well-distributed, short, suberect hairs on the dorsal surface of the gaster.

Biology and Economic Importance

This species occurs in varied habitats such as woodlands, meadows, swamps, and prairies. It has very diverse nesting habits, nesting in the exposed soil, or under the cover of objects, and in and around rotting stumps and logs. The exposed nests are often large earthen mounds in woodlands and prairies, with grass growing from the mounds. In much of eastern North America the ant is regarded as a woodland species with a preference for moist nesting sites such as under stones or in rotten wood. Van Pelt has found colonies of this species common in the Blue Ridge Mountains at 3,500 to 4,000 feet, and occasionally at 4,000 to 5,500 feet. Colonies are very populous and are thought to contain only a single reproductive female. The ants are highly subterranean and light-avoiding, seldom appearing above the surface of their nest. Workers forage mostly at night and are noted for their love of honeydew, not only tending but fostering subterranean plant lice, mealybugs, and coccids on the roots of plants. The ants no doubt supplement this food with small insects which they kill, and also find dead. No detailed life history studies have been made on *umbratus* in North America; most of our knowledge of the species is based on numerous but scattered observations. It appears that nuptial flights may take place from July to October, and that males and winged females may remain in some of the parental nests during the winter. Limited experiments and observations in Europe indicate that *umbratus* is a temporary parasite in the nests of *Lasius niger* (Linnaeus) and *L. alienus*. The fertilized female of *umbratus* may be adopted in colonies of *niger* and *alienus* by entering a queenless colony of the host, by killing the host queen, or by workers of the host species killing their own queen. There may be other methods of founding colonies not yet known. In North America we do not know how *umbratus* establishes new colonies, but assume it to be by the same methods as in Europe.

Wheeler stated that he had often found wingless females under stones as if in the act of founding colonies independently (but never with brood), so he inferred that these females must establish colonies by temporary parasitism. Wilson stated that *umbratus* does not seem to form the aerial swarms or clouds that are common to some species of *Lasius*, such as *alienus* and *niger*. I have received workers, males and winged females, singly or together, from houses from late June to October with indications that they were nesting in or around the basement walls, like our various species of *Acanthomyops*. No records have been received of workers infesting household foods, but the ants are objectionable to housekeepers, and the winged forms are often mistaken for termites. The ants are of economic importance because

of their close relationship with subterranean plant lice, mealybugs, and coccids, and it is highly possible that workers may transmit plant diseases by their transportation of these insects. Observers have noted catbirds, *Dumetella carolinensis* (Linnaeus), and robins, *Turdus migratorius* Linnaeus, using workers of *umbratus* in "anting."

References: Wheeler, 1905b, pp. 373, 397; Wheeler, 1910a, pp. 236-237; Wheeler, 1917, pp. 167-176; Donisthorpe, 1927, pp. 264-272; Rau, 1934, pp. 207-208; Dennis, 1938, pp. 273-274, 296, 306; Wheeler and Wheeler, 1944, pp. 257-258; Wilson, 1955, pp. 162-164; Kannoński, 1956, p. 181; Kannoński, 1959, pp. 120, 141; Van Pelt, 1963, p. 213.

Acanthomyops claviger (Roger)

Smaller yellow ant. A native species, which ranges from Washington to Ontario, south to New Mexico and Florida. It is one of the most common species of *Acanthomyops*, especially in the eastern and central United States.

Taxonomic Characters

Subfamily and generic characters: Monomorphic. Antenna 12-segmented. Antennal fossa very close to or touching the posterior border of the clypeus. Eye very small to small, placed closer to posterior border of head than to base of mandible. Maxillary palpus short, 3-segmented. Abdominal pedicel composed of a single segment, the petiole. Cloacal orifice terminal, circular, surrounded by a fringe of hairs (fig. 48, co). Sting lacking. Body not large but stout and with a smooth, shiny integument. Body hairs commonly barbed. Body color usually a pale yellowish to yellowish red. Workers light-avoiding, capable of emitting a pleasant odor similar to lemon verbena or citronella. *Specific characters:* Bearing superficial resemblance to *interjectus* but distinguished from that species by its smaller size (3-4 mm. long); absence of pronounced tooth on superior border of mandible near junction of masticatory and superior borders (fig. 48, b); shorter scape, apex of which never surpasses posterior border of head; very distinctly clavate funiculus, all segments of which are broader than long, except the first and last; and pilosity of dorsum

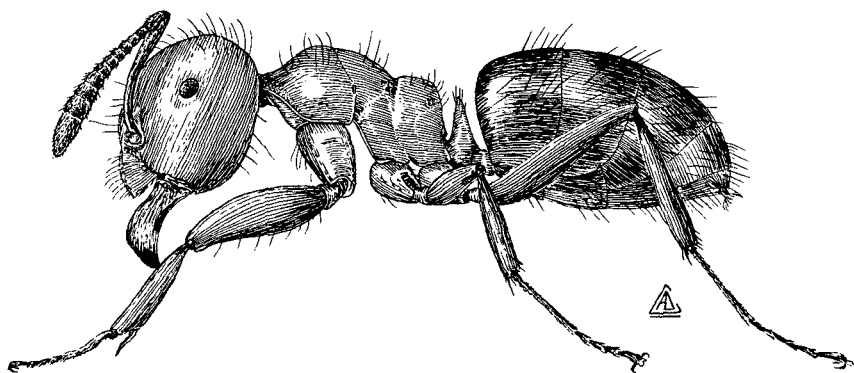


Figure 47.—*Acanthomyops claviger* (Roger), smaller yellow ant, lateral view of worker.

of gaster, whose suberect or erect hairs are usually abundant and well-scattered over entire dorsum. Petiolar node in profile similar to that of *interjectus* in being very narrow and sharp at summit.

Biology and Economic Importance

One of the most common species in the genus, *Acanthomyops claviger* forms populous colonies in the exposed soil, but more often under the cover of stones or other objects, and in the rotting wood of logs and stumps. The nests are found in such habitats as woodlands (preferably the open type), pastures, and grassy fields. Cole found nests in Utah at an altitude of 10,000 feet, and Van Pelt has found occasional colonies in the Blue Ridge Mountains at altitudes between 3,500 and 5,500 feet. Like other *Acanthomyops*, these ants are largely subterranean and nocturnal. They derive most of their food from honeydew obtained from subterranean plant lice (*Prociphilus*, *Anuraphis*, and other genera) and mealybugs, which they foster on the roots of both wild and domesticated plants. Like all of our *Acanthomyops*, these ants emit a pleasant odor when disturbed; it has been likened to that of lemon verbena or citronella. M. S. Blum *in litt.*, wrote that the worker emits the pleasant odor from the head, and the distinct formic acid odor from the gaster, the latter detectable only when the gaster is crushed. Most of the conclusions concerning the biology of these ants have been drawn from miscellaneous observations. It appears that this species takes its nuptial flights from late August into November, especially during the month of September. One observer noted that during September many square miles of water between Welch's Point and Pond Point, Long Island, were covered with an average of 35 to 50 winged forms per square foot. There is much evidence that males and winged females overwinter in some of the nests, either indoors or out, because these forms frequently "swarm out" during the winter. These emergences during late December and extending into February are not believed to be nuptial flights, but are regarded as swarming because of stimulation by favorable temperature and moisture.

No definite information is available on how new colonies are formed. Quite often wingless, solitary females are found in the soil beneath stones during the winter and early spring. They probably represent fertilized females from the nuptial flights of the previous fall. Wheeler stated that the female of *claviger* is capable of establishing a colony unaided by workers, but there may be other methods of founding colonies. Buren intimates that *claviger* may be a temporary parasite in the nest of some other ant, probably *Lasius neoniger*. *A. claviger* has the same general house-infesting habits as *interjectus*, and a relationship to plant lice and mealybugs similar to that species. Workers have been used by starlings, *Sturnus vulgaris* Linnaeus, and males and winged females by blue jays, *Cyanocitta cristata* (Linnaeus), in "anting."

References: Wheeler, 1903, pp. 149-163; Wheeler, 1905b, p. 398; Tanquary, 1911, pp. 294-300; Cole, 1940, pp. 70-72; Cole, 1942, p. 375; Headley, 1943, p. 30; Buren, 1944, p. 298; Groskin, 1947, pp. 69, 72; Van Pelt, 1963, p. 213.

Acanthomyops interjectus (Mayr)

Larger yellow ant. A native species, *interjectus* ranges from Washington to Ontario and south to New Mexico and Florida. The species is more common in the eastern and central United States. This ant has occasionally been called the perfumed yellow ant.

Taxonomic Characters

Subfamily and generic characters: Same as for *claviger*. *Specific characters:* Workers 4–4.5 mm. long. Superior border of mandible with a small but distinct tooth, which is borne near junction of masticatory and superior borders of mandible (fig. 48,b). Apex of scape distinctly surpassing posterior border of head. Penultimate segments of funiculus not broader than long. Petiole with a high node which in profile is rather narrow and sharp at summit. Dorsum of gaster with long, suberect to erect hairs, which are largely confined to first gastric segment and to posterior border of each of the succeeding segments, where they form distinct transverse rows.

Biology and Economic Importance

Unfortunately no complete biological study has been made of *interjectus*, although it is one of our largest and most common species of *Acanthomyops*. Numerous but scattered observations indicate that the ants form rather populous colonies, which nest in the exposed soil or under the cover of stones or other objects, and in rotting logs and stumps. The nests in exposed soil are usually mounds, frequently quite large, especially in Illinois and Wisconsin. The ants commonly nest in wooded areas, as well as in pastures, meadows, grassy fields, and in or around the foundation walls of houses and other buildings. It is believed that males and winged females can overwinter in some of the parental nests, and make their nuptial flights the following spring, about late March or early April. It is also quite likely that winged forms produced during a given season must reach maturity by early to late summer, and make nuptial flights shortly thereafter.

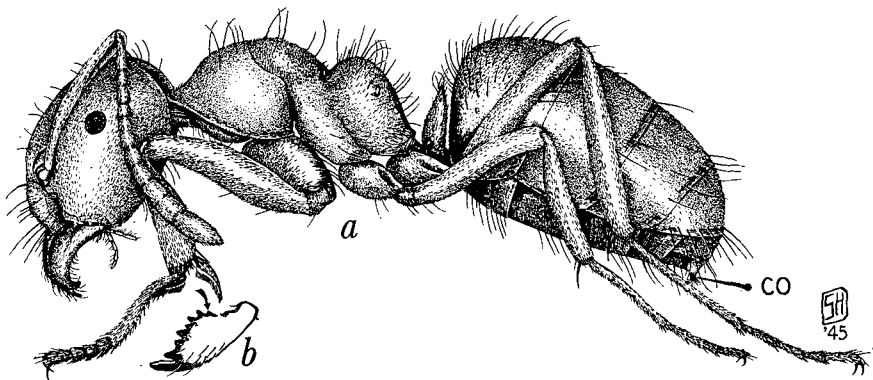


Figure 48.—*Acanthomyops interjectus* (Mayr), larger yellow ant: a, Lateral view of worker; b, left mandible showing small tooth on the superior border near the junction of the masticatory and superior border; co, the terminal orifice, which is surrounded by a fringe of hairs.

At Ardmore, Pa., Groskin observed the ants swarming from a colony 18 separate times between 6:30 and 8:30 p.m., from June 12 to July 29. On June 12, 13, 15, 23, and 24, five nuptial flights were made. He found that mating can take place on the ground in the vicinity of the nest. Wheeler stated that the female of *interjectus* is capable of founding her colony independently. The female may also establish her colony by becoming a temporary parasite on some other species of ant, most probably a common species of *Lasius*, such as *alienus* or *neoniger*. To my knowledge, no one has yet found a mixed colony of *interjectus* and another host ant. The ants are largely subterranean in habit. Workers do most of the nest building and foraging at night, and are seldom seen above the surface of the soil in the daytime, except near their nest, even during swarming and nuptial flights.

The ants feed almost exclusively on honeydew obtained from subterranean plant lice and mealybugs. They not only tend these insects, but foster them on the roots of wild and domesticated plants. Frequently, *interjectus* nests beneath basement floors, or in and around foundation walls of houses and other buildings. The ants may be objectionable to housekeepers by throwing out earth from cracks in the floor or basement walls, or by giving off numerous winged males and females, which are often mistaken for termites. The swarming of these ants in houses may occur from late fall to early spring, but is especially prevalent from midwinter to early spring. I have no records of workers feeding on household foods; nor do I know of any significant injury to masonry or woodwork of homes or other buildings. On one occasion, workers were reported to have fallen into an open well. The ants are capable of damaging plants by fostering and spreading plant lice and mealybugs that feed on plant roots. Some of the mealybugs and plant lice may spread viruses or other plant diseases, for which the ants may be directly responsible by carrying these insects from one plant to another.

References: Wheeler, 1905b, pp. 373, 397-398; Tanquary, 1911, pp. 294-300; Smith, 1928, pp. 14-18; Groskin, 1947, pp. 67-72; Smith, 1950, pp. 293-294.

Acanthomyops murphyi (Forel)

This native species ranges from Montana to Ontario and south to Colorado and Georgia. According to Wheeler (1917, a), "this form appears to belong to the dryer and warmer portions of the transition zone, and to be rare in all parts of its range."

Taxonomic Characters

Subfamily and generic characters: Same as for *claviger*. *Specific characters:* Workers 3-3.7 mm. long. Distinguished by small size, small eye, which contains approximately 8 ommatidia in its greatest diameter and measures 0.10 mm. here; short scape, apex of which scarcely attains or barely surpasses posterior border of head; slender but subclavate funiculus, all segments of which appear to be as long as broad or longer than broad; thick petiolar node with blunt summit (in profile); and unusually short body hairs, which are especially abundant and noticeable on epinotum and petiole.

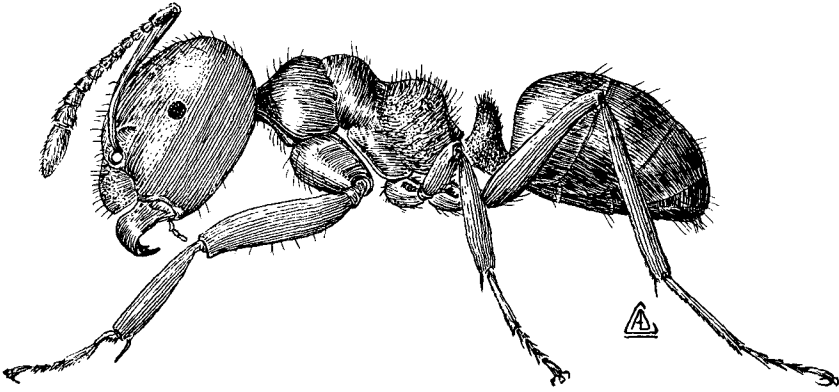


Figure 49.—*Acanthomyops murphyi* (Forel), lateral view of worker.

Biology and Economic Importance

Less is known about *murphyi* than any other species of *Acanthomyops* discussed in this paper. Since the ant is only infrequently collected, there are almost no published notes on its biology. Although rather widely distributed, the species seems to be uncommon throughout its range. The ants usually nest in populous colonies in the soil beneath stones and other objects, more frequently in the open woods in our Eastern States. Creighton remarks that in the West, their nests often occur in cottonwood groves near stream bottoms. It is quite likely they may also nest in rotting stumps and logs. The workers undoubtedly obtain most of their food from honeydew of subterranean plant lice and mealybugs on the roots of plants. Vickery records them tending the corn root aphid *Anuraphis maidiradicis* (Forbes), an important pest of corn, cotton, and other crops.

Fragmentary records indicate that males and winged females are probably produced from approximately June 15 to midsummer or late summer, and that nuptial flights take place thereafter, perhaps extending into the fall. Forel witnessed a nuptial flight in North Carolina on July 16 following a rain; at the same time he also observed isolated wingless (presumably fecund) females running around on the ground. It appears from these and other observations that the ants can make their nuptial flights during the day, at dusk, or in the early night, and that they can mate in or on the soil without the necessity of a flight. As with *interjectus*, males and winged females also overwinter in the parental nest and make their nuptial flights the following year, perhaps in the spring. It is likely that new colonies are formed by the fertilized queen becoming a temporary parasite in the nest of another species of ant, most probably one or more of the common forms of *Lasius*. The peculiar aberrant, highly pilose female of *murphyi* suggests that this species is probably a temporary parasite.

Dr. Mary Talbot (in press) has the following to say: "Young colonies of *Acanthomyops* are extremely difficult to find because they are hypogaeic at all times except when the mature colonies come to the surface for flights. It has been assumed that *Acanthomyops* females become temporary social parasites when beginning a colony. One bit

of evidence was found to substantiate this. On August 22, 1961 a small mixed colony of *A. murphyi* and *Lasius neoniger* containing *A. murphyi* worker pupae was found under a stone set firmly into a hillside. Part of the mixed colony was kept alive in the laboratory for several days. Whenever the container was opened, workers of *Lasius* and *Acanthomyops* cooperated in carrying pupae out of the light. A week after I made the collection, the mixed colony was still there. Aside from this, I have seen no evidence of colony founding in my ten years at the reserve."

A. murphyi has the same general house-infesting habits as *interjectus*, but apparently is much less common in this respect than *interjectus* and *claviger*. Our unquestionable records show that *murphyi* has been collected in houses mostly during June, July, and August. An observer noted that the purple grackle, *Quiscalus quiscula* (Linnaeus), used workers and winged females of this species in "anting."

References: Forel, 1901, p. 369; Wheeler, 1905b, p. 398; Vickery, 1910, p. 105; Wheeler, 1917a, p. 530; Creighton, 1950, p. 432.

Acanthomyops latipes (Walsh)

This native species ranges from Alaska and Quebec south to New Mexico and South Carolina. It is widely but apparently sporadically distributed, and is most common in the eastern and central United States, although less common in the Eastern States than *claviger* and *interjectus*. Creighton (1950) states that the species is not common south of the latitude of Pennsylvania.

Taxonomic Characters

Subfamily and generic characters: Same as for *claviger*. *Specific characters:* Workers 3.5–3.75 mm. long. Head subrectangular, longer than broad, with slightly emarginate posterior border. Scape rather short, when fully extended its apex either scarcely attaining or barely surpassing posterior border by less than greatest width of scape. Funiculus noticeably enlarged through segments 6–11, only the first

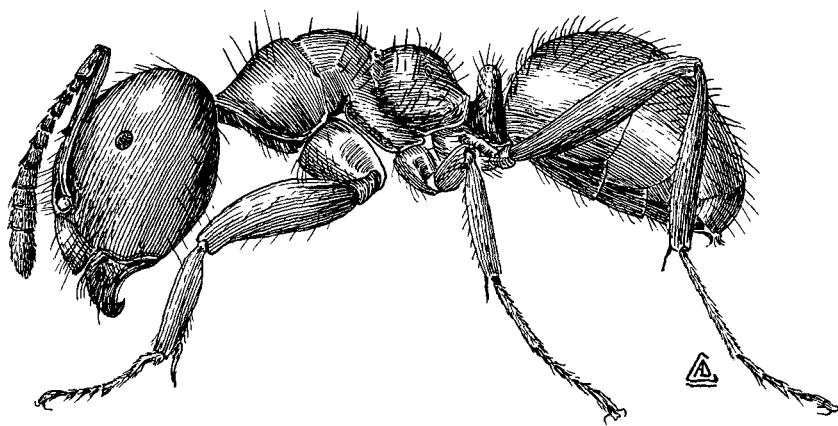


Figure 50.—*Acanthomyops latipes* (Walsh), lateral view of worker.

and last segments of funiculus distinctly longer than broad. Eye small, approximately 0.13 mm. in its greatest diameter, usually with 8 or 9 ommatidia in this diameter. Petiolar node in profile thick and with blunt, nontapering summit. Body hairs rather abundant, erect or suberect, slender and long, apparently longest on gaster. Hairs present on cheeks, gula, and petiolar node. Distinguished especially by the thick petiolar node with blunt summit and the long, suberect or erect body hairs. There seems to be considerable variation in *latipes*. Specimens I consider typical have heads distinctly longer than broad with subparallel sides and emarginate posterior border.

Biology and Economic Importance

A. latipes is one of the less common species of *Acanthomyops* treated in this paper. The ants usually nest in open woodlands, grassy fields, meadows, and pastures in rather dry to moist soils. Nests may be constructed in the exposed soil, under stones or other objects, or at the base of stumps. Weber believes that its habit of nesting under large rocks affords it, as well as other ants, protection during severe drouth periods such as occurred in South Dakota in the thirties. Quite often soil nests are in the form of earthen mounds a foot or more in diameter and several inches high, with grass growing from them; they contain a large number of entrance and exit holes. Workers are largely subterranean and nocturnal and feed almost exclusively on honeydew which they obtain from subterranean plant lice and mealybugs on the roots of wild and domesticated plants. No detailed biological studies of *latipes* have been made, but numerous and scattered observations appear to indicate that males and winged females are produced in early to mid summer, and that these adult forms, common in nests during July and August, take their nuptial flights in August and September, but it is believed that some of the males and winged females can overwinter in parental nests and make nuptial flights the following year. The species is unique in possessing two forms of females, an alpha and a beta. The beta form, which is the more common of the two, but also the more aberrant, is yellowish red, heavily pilose, with short, thick antennae and extraordinarily broadened and flattened femora and tibiae. The alpha form is darker and somewhat intermediate in structure between *claviger* and the beta form. One of the theories explaining the dimorphism of the females is that it may be a hybridism between *claviger* and *latipes*. To support this theory Wheeler mentions the occurrence of nests of the two species within 20 feet of each other producing nuptial flights at the same time (Sept. 17, 1902).

Limited data suggest that the female of *latipes* probably founds her colony by becoming a temporary parasite on some other species of ant, most probably a *Lasius*. To support this belief, Wheeler found mixed colonies of *latipes* and *L. alienus* (= *americanus*) in the field on five occasions. Tanquary, in a large series of experiments with *latipes* and eight species of *Lasius* and *Acanthomyops*, induced *latipes* to obtain adoption in one colony of *alienus* and one colony of *A. interjectus*. One of the requisites of a parasitic species is that it produce an abundance of females; this is true of *latipes*. Another is that the parasitic species seek one or more common, widespread hosts. The two forms of *Lasius* in the eastern United States most accessible and satisfactory as hosts

for *latipes* would probably be *L. neoniger* and *alienus*. The house-infesting habits of *latipes* are generally similar to those of *interjectus*. It would appear that the species is a much less common house pest than *claviger* and *interjectus*. I have received *latipes* for identification on only two occasions, both from South Carolina, once from a drugstore where winged females were emerging on June 30, and once from a house where females were collected on July 24.

References: Wheeler and McClendon, 1903, pp. 149-163; Wheeler, 1905b, p. 398; Tanquary, 1911, pp. 294-300; Cole, 1942, p. 375; Weber, 1942, pp. 61-62; Buren, 1944, p. 298; Cole, 1954, p. 284; Kannoński, 1956, p. 181.

GLOSSARY

Abdominal pedicel. The one or two basal segments of the abdomen between the epinotum and gaster.

Anal glands. Glands near the anus of worker ants of the subfamily Dolichoderinae, which produce a sticky secretion with a disagreeable odor; the secretion is often ejected on other ants as a means of offense or defense.

Angulate. Having angles.

Antenna. The segmented, flexible appendage articulated to the head on the external side of the frontal carina and posterior to the clypeus; it is an organ of sensation, such as touch and smell.

Antennal club. The very much enlarged or clublike distal segments of the funiculus; may be composed of two or more segments, commonly two- or three-segmented.

Antennal fossa. The concavity or socket in the head in which the base of the antenna is articulated.

Antennal insertion. Literally, the place where the base of each antenna is articulated to the head (see antennal fossa).

Antennal scape. The greatly elongated first segment of the antenna; the scape lies between the articulation of the antenna to the head and the funiculus (fig. 1).

Anterior border of clypeus. The anterior margin of the clypeus above the mandibles and between the cheeks.

Anterior border of mesonotum. The border of the mesonotum directly posterior to (behind) the pronotum, and commonly separated from the pronotum by the promesonotal suture.

Anterior border of mesopleuron. The front border of the side of the mesothorax; this commonly lies somewhat above and behind the front coxa; the ant *Solenopsis geminata* normally has an irregular border of toothlike or spined projections.

Antero-ventral tooth of petiole. An irregular or toothlike protuberance on the ventral surface of the petiole, usually somewhat in front of the petiolar node (fig. 20).

Anting. A term applied by ornithologists to a habit of many birds of allowing ants to crawl on them, or of placing ants on their bodies. One possible explanation is that the ants remove vermin from the bird's body by ejecting formic acid. Another is that the formic acid emitted by the ants may stimulate the birds themselves.

Apical teeth. The larger or more distinct teeth borne on the masticatory border of the mandible near and also at its junction with the lower or inferior border.

Appendages. The antennae, mandibles, and legs.

Appressed. Lying close to or against; the term usually applies to the position occupied by hairs or pubescence in respect to the body surface.

Arboreal. Nesting or foraging in trees.

Armed. Bearing a pair of spines, or toothlike projections.

Barbed hairs. Hairs bearing bristlelike lateral hairs; such hairs are characteristic of ants of the genus *Acanthomyops* and are best seen under high magnification.

- Basal teeth of mandible.** In the broad sense, the teeth on the masticatory border of the mandible, exclusive of the apical teeth; in ants of the genus *Lasius*, the term applies to the three dorsal-most teeth.
- Base of mandible.** The point where the mandible is articulated to the head.
- Base of epinotum.** The dorsal surface of the epinotum lying between the mesoepinotal suture and the declivity of the epinotum.
- Bicarinate.** With two ridges or keels; such structures are common on the clypeus of ants of the genera *Solenopsis* and *Monomorium*.
- Bilobed.** With two lobes; the term applies especially to the soldier of species of the genus *Pheidole*, the head of which is divided into two prominent, occipital lobes posteriorly.
- Body hairs.** The longer, and usually coarser, suberect to erect hairs of the body and appendages; normally slender and flexible, the hairs at times may be very coarse or bristlelike.
- Bristles.** Coarse, stiff hairs; the term is applied commonly to the row of graduated bristles on the flexor surface of the middle and hind tibia.
- Carina (pl., carinae).** An elevated ridge or keel of varying height and sharpness (fig. 1).
- Carnivorous.** Flesh-eating.
- Castaneous.** Bright red brown or chestnut brown.
- Caste.** A term applied to various nature forms of ants, such as worker, female, male, soldier, et cetera.
- Cheek.** The area on the side of the head between the eye and the base of the mandible.
- Cloacal orifice terminal,** circular, surrounded by a fringe of hairs. The cone-shaped structure with a circular opening surrounded by a fringe of hairs at the apex of the gaster (fig. 48,co); the structure is characteristic of ants of the subfamily Formicinae. It is not always easily identifiable because the apical segments of the gaster may be retracted, or the fringe of hairs worn away.
- Cloacal orifice transverse,** ventral, slit-shaped, without a fringe of hairs. This structure can be observed when the ventral surface of the gaster is exposed; it is then seen as a transverse slit without a fringe of hairs, which is located in front of the apex of the gaster (fig. 31,co). Characteristic of the subfamily Dolichoderinae.
- Compound nest.** A nest composed of several similar and interrelated nests.
- Compressed.** The appearance of having been pressed in at the sides.
- Conulate.** Somewhat cone-shaped.
- Clypeus.** That portion of the head bounded anteriorly (below) by the labrum, posteriorly (above) by the frons, and laterally by the cheeks (fig. 1).
- Clypeal fossa.** A rather deep concavity or pitlike impression on the side of the clypeus; especially characteristic of the major workers of *Camponotus pennsylvanicus*.
- Clypeus with a median longitudinal carina.** That is, with a longitudinal ridge extending through the median plane of the clypeus (fig. 1).
- Dealate.** Wingless; a term applied to formerly winged females or queen ants that have shed their wings.
- Declivity of epinotum.** The posterior surface of the epinotum; the area is in front of the petiolar node, and is usually inclined.
- Declivous surface of the epinotum.** Same as declivity of epinotum.
- Denticulae.** Extremely small, often not clearly discernible, teeth on the masticatory border of the mandible; the same border may contain both teeth and denticulae.
- Dimorphic.** Literally two forms; the term applies to worker ants having two distinct sizes and shapes, a large major worker or soldier and a smaller, normal worker. The genus *Pheidole* is noted for its dimorphic workers.
- Dorsally.** Pertaining to the upper surface.
- Dorsal surface.** The upper surface.
- Dorsum.** The upper surface.
- Ecarinate.** Without a carina or ridge.
- Emarginate.** Notched.
- Emargination.** A notch.
- Epinotal spine.** A nonarticulate spine or toothlike projection borne on the epinotum near where the base and declivity meet; especially characteristic in ants of the subfamily Myrmicinae.

- Epinotum.** That part of the thorax behind the mesoepinotal suture; in worker ants the term is loosely applied, since the region morphologically is composed of two segments, an anterior metathorax and a posterior epinotum (fig. 1).
- Erect.** Standing out; the term usually applies to the position of the larger hairs that are nearly vertical to the body surface.
- Excised.** With a deep cut or notch. See emargination.
- Extrafloral nectaries.** Plant structures not associated with flowers that produce a sweet secretion or nectar relished by ants as food.
- Eye.** The eye, or compound eye, is one of the paired organs of sight; it is composed of a highly variable number of units called ommatidia; the size of the eye, and the position it occupies on the side of the head vary greatly (fig. 1). See also ocellus.
- Facet.** The external surface of an ommatidium; one of the seeing units composing the compound eye.
- Farinaceous.** Made of meal or flour; mealy.
- Femur (pl., femora).** The large thighlike segment of the leg between the trochanter and tibia (fig. 1).
- Ferrugineous.** Rusty red-brown.
- Flange.** A projecting rim or edge (fig. 5,b).
- Flexor surface.** With reference to the leg, the posterior or hind edge of the tibia.
- Floral nectaries.** Certain parts of flowers that secrete a sweet liquid or nectar relished by ants for food.
- Fore tibia.** Tibia of the anterior or front leg.
- Foster.** The term applied to the intimate relationship of ants with honeydew-excreting insects in which the ants gather, distribute, or care for these insects. The ants benefit from the association by obtaining honeydew for food and the honeydew-excreting insects benefit by receiving care and protection.
- Foveolate.** With a deep depression.
- Frontal area.** The small triangular area lying between the frontal carinae and posterior to (above) the clypeus (fig. 1).
- Frontal carina.** The longitudinal ridge on the inner side of the insertion of the antenna (fig. 1).
- Frontal furrow.** The longitudinal impression or groove extending from the frontal area toward the median or anterior ocellus (fig. 1).
- Frontal lobe.** The platelike extension of the frontal carina above the insertion of the antenna.
- Funiculus.** All of the antenna excluding the scape (fig. 1).
- Gaster.** That portion of the abdomen behind the petiole in ants with a single-segmented petiole, and behind the postpetiole in ants with a two-segmented petiole (fig. 1).
- Gibbosity.** A protruding area.
- Graduated bristles.** Bristles arranged in a row at equidistant, well-spaced intervals; see bristles and figure 33.
- Granivorous.** Feeding on grain or seeds.
- Habitat.** The natural abode of an animal or plant.
- Hair.** The longer and usually coarser pile of the body and appendages in contrast to pubescence; especially on the body, the hairs are usually more erect or suberect.
- Hind tibia.** The slender, usually long segment of the hind leg between the femur and first tarsal segment (fig. 1).
- Honeydew.** A sweetish alimentary excretion produced by certain insects such as plant lice, mealybugs, and scales, and greatly relished as food by ants.
- Humeral angles.** The anterolateral corners of the prothorax.
- Hypogaean.** Subterranean.
- Incurved.** With a strong convexity externally and a strong concavity inwardly; typical in mandibles of *Solenopsis geminata* (F.).
- Infuscation.** A smoky gray-brown or blackish tinge.
- Integument.** The outer covering, or cuticle, of the insect's body.
- Lamella.** A thin plate or leaflike process.
- Lyrate.** Lyre-shaped.
- Male.** In ants, the male functions only for the purpose of mating and dies shortly after this takes place; it is smaller than the female and possesses wings. It is characterized by a small head, large eyes, and prominent genital appendages.

- Mandible.** One of the pair of biting jaws lying below or anterior to the clypeus, the masticatory border of which bears teeth (fig. 1).
- Mandible strongly incurved.** With a strong convexity externally and a strong concavity inwardly; typical in mandibles of *Solenopsis geminata* (F.).
- Masticatory border of mandible.** The chewing border of the mandible; that border which bears the teeth (fig. 20,b).
- Maxillary palpus.** One of the paired, segmented, feelerlike structures beneath the front portion of the head, anterior and lateral to the labial palpus (fig. 42); it is normally longer than the labial palpus.
- Mesoepinotal impression.** A pronounced transverse furrow or groove at, or in the vicinity of, the mesoepinotal suture.
- Mesoepinotal suture.** The suture separating the mesonotum from the epinotum.
- Mesonotum.** The dorsal surface of the mesothorax.
- Mesopleuron.** The side of the mesothorax; in general, that area above the coxa of the second leg.
- Mesothorax.** The second segment of the thorax; the segment bearing the second pair of legs (fig. 1).
- Metapleuron.** The side of the metathorax; in general, the area above the coxa of the third leg.
- Metasternal spine.** A spine borne at or near the posterolateral angle of the thorax; typical of *Tetramorium guineense* (F.) (fig. 25).
- Middle tibia.** That segment between the femur and first tarsal segment of the second or middle leg.
- Monomorphic.** Of one form; descriptive of those worker ants which are not appreciably different in size or form, as *Monomorium pharaonis* (L.).
- Nuptial flights.** The mating flight of female and male ants. It should be understood that all ants do not need to take flight and mate in the air; some mate inside of the nest, others on the soil, plants, or other objects outside of the nest.
- Obsolescent.** In the process of disappearing or of becoming useless.
- Ocellus (pl., ocelli).** A small, single-lens eye located on the vertex of the head, usually 3 in a triangle (fig. 1); ocelli are not present on worker ants of all species.
- Occipital border.** The hind margin of the head.
- Occipital lobes.** The prominent, posterolateral corners of the head, characteristic of the major workers (soldiers) of species of *Pheidole*.
- Occiput.** That portion of the head between the vertex and neck (fig. 1).
- Ommatidium (pl., ommatidia).** One of the visual units comprising a compound eye.
- Omnivorous.** Eats everything.
- Opaque.** Not shiny; without luster; nontransparent.
- Pedicel.** The one or two basal segments of the abdomen between the epinotum and gaster.
- Pedunculate.** Set on a stalk.
- Penultimate tooth of mandible.** Next to the last tooth of the mandible; the last tooth is the one on the masticatory border nearest the superior border.
- Petiolar node.** The greatly enlarged portion of the petiole. The node may be of diverse sizes and shapes.
- Petiolar node scalelike, in profile.** The node is narrow and upright or inclined (figs. 30 and 43).
- Petiole.** A pedicel composed of only one segment, or the first segment of a two-segmented pedicel (fig. 1).
- Piceous.** Pitchy dark brown; between fuscous and black.
- Piligerous foveolae.** Coarse, pitlike depressions that bear erect hairs; present on the cheeks of *Camponotus caryae discolor* (Buckley) (fig. 38, a).
- Pilosity.** Hairiness, in contrast to pubescence, which is usually shorter, finer, and more appressed.
- Posterior border of clypeus.** The transverse suture at the rear of the clypeus which lies in front of the antennal insertions, the frontal carinae, and the frontal area (fig. 1).
- Postpetiolar node.** The greatly enlarged portion of the postpetiole. The node may be of diverse sizes and shapes.
- Postpetiole.** The second or posterior segment of a two-segmented pedicel.

- Polymorphic.** Many forms. The term refers to those species of ants having minor, intermediate, and major workers; ants of the genus *Camponotus* are excellent examples.
- Predacious.** Living by preying on other animals.
- Promesonotal suture.** The suture separating the pronotum from the mesonotum; it may be well developed or more or less obsolete.
- Promesonotum.** The combined pronotum and mesonotum.
- Pronotum.** The dorsal surface of the prothorax.
- Prothorax.** The first segment of the thorax; the segment bearing the first pair of legs (fig. 1).
- Pruinose.** Giving the effect of a frosted covering, or "bloom"; characteristic of *Iridomyrmex pruinosus*.
- Psammophore.** Beard; referring to the long hairs beneath the head which are arranged in a comblike series (fig. 30).
- Pubescence.** Short, fine, often strongly appressed hairs covering the body and appendages. See also pilosity.
- Punctulate.** Covered with fine, almost obsolete punctures.
- Queen (female).** The individual that normally carries on reproduction; she is usually larger than the worker or male, and before mating, normally possesses two pairs of wings; in most colonies the queen, after establishing her nest and rearing her first brood alone, functions only as an egg producer, with the care and feeding of the brood relegated to the workers.
- Reticulate-rugose.** Consisting of netlike sculpturing intermixed with irregular and rough wrinkles.
- Rugose.** Irregularly and roughly wrinkled.
- Rugulose.** Irregularly but not roughly wrinkled.
- Rugulose-reticulate.** Irregularly but not roughly wrinkled combined with netlike sculpturing.
- Scape.** The greatly elongated first segment of the antenna; it lies between the funiculus and the articulation of the antenna to the head (fig. 1).
- Scrobe.** A groove for the reception of the appendage; as the antennal scrobe for the reception of the scape (fig. 25).
- Spine.** A nonarticulated thornlike outgrowth of the body wall; especially applicable to the paired projections on the epinotum of ants, especially those of the subfamily Myrmicinae. See epinotal spine.
- Spiracle.** An external opening of the respiratory system.
- Sting.** The modified ovipositor; a needlelike organ near the apex of the gaster used as an organ of offense or defense; absent or vestigial in some subfamilies of ants such as the Dolichoderinae and Formicinae. Since the sting is capable of retraction, it can not always be seen on a worker or female ant.
- Striate.** Marked with fine, more or less parallel, impressed lines.
- Subcarinate.** Scarcely carinate; that is, without a very distinct ridge or keel; the term is commonly used to describe the nature of the single, longitudinal carina of the clypeus.
- Subcordate.** Approximately heart-shaped; the term is applied to the shape of the gaster of ants of the genus *Crematogaster* and is best seen from above.
- Suberect hairs.** Hairs borne at a distinct angle to the surface of the body or its appendages, neither appressed nor vertical (*q.v.*).
- Subopaque.** Nearly opaque.
- Sulcate.** Grooved or furrowed.
- Sulcus.** A groove or furrow.
- Superior border of mandible.** The dorsal border of the mandible; that border nearest the anterior border of the clypeus.
- Suture.** A seam or impressed line indicating the divisions of the parts of the body wall.
- Tarsal claw.** One of the pair of claws borne on the apical tarsal segment of the leg.
- Teeth.** Strictly speaking, the irregularly shaped structures on the masticatory border of the mandible used for biting or chewing; broadly speaking, any projections of the body wall that are toothlike in form.
- Temporary host.** The species of ant whose colony is invaded temporarily by a queen of an alien species. See temporary parasite.
- Temporary parasite.** The female of certain ants who seeks adoption in a colony of an alien species. To accept such a queen the alien colony must be queenless, the queen is killed by her own workers, or by the invading queen; after

- the death of the host workers, the colony eventually becomes purely one of the same species as the invading queen.
- Tend.** Applied to the visits of ants on insects for the purpose of obtaining honeydew for food.
- Terminal basal tooth.** The most-dorsal tooth on the masticatory border of the mandible; the tooth nearest the clypeus.
- Tibia.** The fourth division of the leg; the slender segment between the femur and first tarsal segment (fig. 1).
- Trapezoidal.** In the form of a four-sided figure, two sides of which are parallel and two are not.
- Unarmed.** That is, without a pair of spines or toothlike projections.
- Ventral.** The lower surface; opposite the back, or upper surface.
- Vertex.** That portion of the head lying between the front and occiput and midway between the sides of the head (fig. 1).
- Vestigial.** Small or degenerate; in the process of disappearing.
- Viable.** Capable of living.
- Virgin female (virgin queen).** The unmated individual, or the one that still bears two pairs of wings; it is assumed that this individual never sheds her wings until she has mated; see also definition of queen (female).
- Worker.** Usually an undeveloped female, differing from the queen in its smaller size, lack of wings, and other morphological features; the normal functions of the worker are foraging for food, care of the brood and nest, and defense of the colony.

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