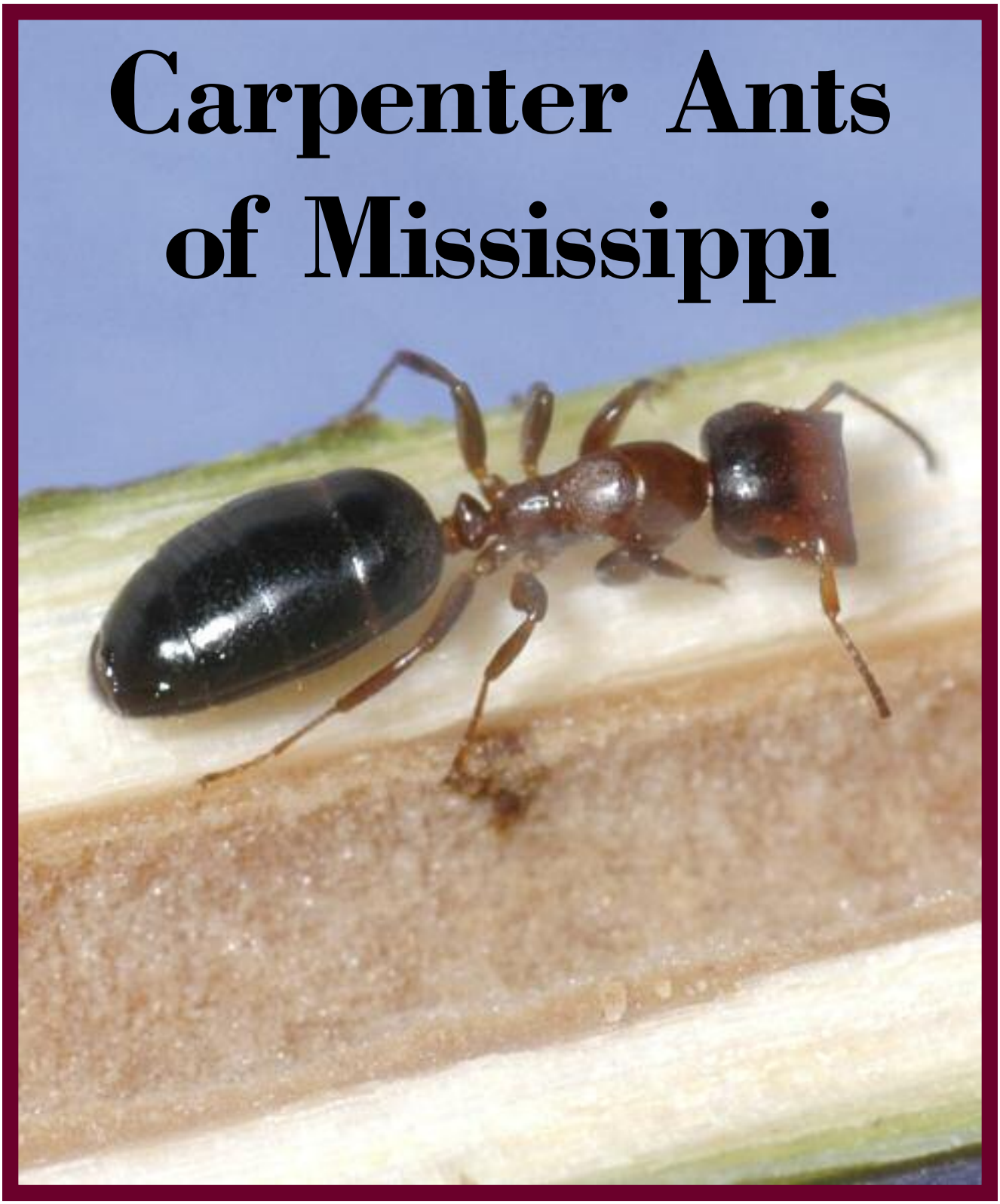
Bulletin 1158 August 2007

Carpenter Ants of Mississippi



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Cover figure. A major worker of *Camponotus mississippiensis* Smith crawling on a split section of a twig of white ash (*Fraxinus americanus* L.) located in the Sessums community in Oktibbeha County. A colony of these ants was discovered nesting inside of the hollowed center portion of this twig, which was between 1.5 and 2 cm in diameter.

Carpenter Ants of Mississippi

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Contents

Carpenter Ants of Mississippi

Abstract

Fifteen species of *Camponotus* (Formicidae) in five subgenera are reported from Mississippi based on a survey by the Mississippi Entomological Museum from 2001–2007 and previous records. This report includes a taxonomic list and brief descriptions of species, biological information, economic importance, control measures, distribution maps, and identification keys.

Introduction

Ants in the genus *Camponotus* Mayr (Hymenoptera: Formicidae) are collectively known as carpenter ants because some species nest in wood, including man-made structures. As a result, several species are major economic pests. Carpenter ants are among the largest and most common ants in the world and are found in all biogeographical regions (Bolton, 1995). More than 900 species of *Camponotus* are known worldwide, with 50 species reported from the United States (Hansen and Klotz, 2005) and 20 species found east of the Mississippi River (Deyrup, 2003; Smith, 1979). Despite their large size and abundance, carpenter ants are difficult to identify, and their distributions in Mississippi have not been clearly delimited. The objectives of this study were to determine which species occur in the state, determine distributional patterns, and provide identification keys for the species.

Camponotus is divided into 46 subgenera worldwide, but only seven occur in North America. The subgenera *Camponotus, Colobopsis, Myrmentoma, Myrmothrix,* and *Tanaemyrmex* occur in Mississippi. Ants in the subgenus *Camponotus* typically nest in wood and are considered to be true carpenter ants (although species in other subgenera may also nest in wood). These are large ants with some workers exceeding 15 mm in overall length. Ants in this subgenus nest primarily in forests, but they will also nest in fence posts, telephone poles, houses, and other wooden structures. Species in this subgenus are the most commonly seen and have the most economic importance because they may be structural pests. The subgenus *Colobopsis* includes arboreal ants that are specialized for nesting in twigs, galls, or other plant cavities. Due to their cryptic nesting habits, these relatively small ants are rarely seen. The large workers, or majors, of *Colobopsis* have severely truncated heads that are used to block the nest entrances, thus serving as living doorways. The smaller workers, or minors, of *Colobopsis* lack the modified heads of the majors, and their identification can be challenging if they are unassociated with majors. Species in the subgenus *Myrmentoma* are also arboreal and nest under bark and in dead branches, hollow plant stems, seedpods, and other natural cavities. They are smaller than the "true" carpenter ants, with major workers usually attaining a length of only 8 or 9 mm. Identifications of species in this group are difficult because of their morphological variation throughout their geographic range. The subgenus *Myrmothrix* is represented in Mississippi by only one species, *C. floridanus* (Buckley), which appears to be restricted to coastal areas where it nests in wood. Species of the subgenus *Tanaemyrmex* are relatively large, soil-nesting ants.

Much of the baseline information on ant distributions in Mississippi is from surveys by Marion Smith in the 1920s and early 1930s (1924a,b,c; 1927; 1928a,b; 1931; and 1932). Smith (1924c, 1927, 1931) reported 17 taxa of carpenter ants from Mississippi including eight species and nine additional subspecies and varieties. Since the time of Smith's reports, numerous changes have occurred in the taxonomic status and nomenclature of *Camponotus*, and the 17 taxa recognized by Smith are now considered to represent 13 species.

In this bulletin, we report 15 species of *Camponotus* in five subgenera as occurring in Mississippi: *C.*

(*Camponotus*) *americanus* Mayr, *C*. (*Camponotus*) *chromaiodes* Bolton, *C*. (*Camponotus*) *pennsylvanicus* (DeGeer), *C*. (*Colobopsis*) *impressus* (Roger), *C*. (*Colobopsis*) *mississippiensis* Smith, *C*. (*Colobopsis*) *obliquus* Smith, *C*. (*Myrmentoma*) *caryae* (Fitch), *C*. (*Myrmentoma*) *decipiens* Emery, *C*. (*Myrmentoma*) *discolor* (Buckley), *C*. (*Myrmentoma*) *nearcticus* Emery, *C*. (*Myrmentoma*) *snellingi* Bolton, *C*. (*Myrmentoma*) *subbarbatus* Emery, *C*. (*Myrmothrix*) *floridanus*, *C*. (*Tanaemyrmex*) *castaneus* (Latreille), and *C*. (*Tanaemyrmex*) *socius* Roger. *Camponotus floridanus*, a species not included on Marion Smith's list, was reported from Mississippi by D.R. Smith (1979). *Camponotus subbarbatus* was reported recently from Mississippi (MacGown and Brown, 2006). One additional species listed by Smith, *Camponotus* (*Myrmothrix*) *atriceps* (F. Smith), was collected in Mississippi in 1925. However, the specimens were collected on bananas shipped from another country, and they do not appear to have become established in the state. Therefore, they are not included on the current state list.

Two of the five eastern species not found in Mississippi, *C. herculeanus* (L.) and *C. noveboracensis* (Fitch), are northern species, whereas the other three species have subtropical distributions in the United States. *Camponotus sexguttatus* (F.) and *C. tortuganus* Emery are known from southern Florida, and *C. planatus* Roger is known from southern Texas and southern Florida. *Camponotus herculeanus* is a dominant ant found in boreal and alpine forests in northern United States and Canada with its range extending west to the mountains of New Mexico (Creighton, 1950; Smith, 1979). *Camponotus noveboracensis* is found from the East Coast to the West Coast of the northern United States, but it is more common in the East between the latitudes 40° and 48° (Creighton, 1950). This species typically occupies higher elevations than *C. pennsylvanicus* or *C. chromaiodes* (Wheeler, 1910), and its range is intermediate between the more northern *C. herculeanus* and the more southern *C. pennsylvanicus*. It is unlikely that *C. herculeanus* and *C. noveboracensis* will be found in Mississippi due to their habits of nesting at high elevations and in areas where cooler temperatures prevail. *Camponotus planatus* and *C. sexguttatus* are considered to be exotic ants (Deyrup, 1991; Wetterer and Wetterer, 2003), and they could potentially be found in Mississippi in the future if their distributions expand. *Camponotus tortuganus* is native to Florida, and it is unlikely to be found in Mississippi because its known range has not been shown to expand in recent times.

CHECKLIST OF THE *CAMPONOTUS* SPECIES OF MISSISSIPPI

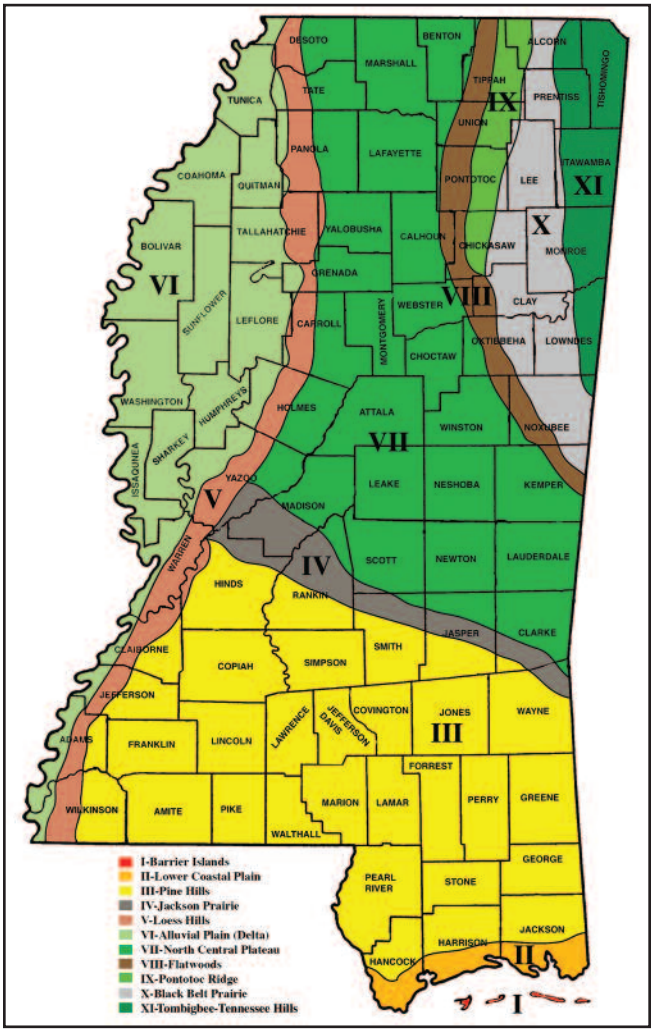
(Species are arranged by subgenus)

FORMICINAE
- CAMPONOTINI
  - *Camponotus* Mayr
    - *americanus* Mayr
    - *chromaiodes* Bolton
    - *pennsylvanicus* (DeGeer)
  - *Colobopsis* Mayr
    - *impressus* (Roger)
    - *mississippiensis* Smith
    - *obliquus* Smith
  - *Myrmentoma* Forel
    - *caryae* (Fitch)
    - *decipiens* Emery
    - *discolor* (Buckley)
    - *nearcticus* Emery
    - *snellingi* Bolton
    - *subbarbatus* Emery
  - *Myrmothrix* Forel
    - *floridanus* (Buckley)
  - *Tanaemyrmex* Ashmead
    - *castaneus* (Latreille)
    - *socius* Roger

Camponotus pylartes Wheeler and its subspecies *C. pylartes fraxinicola* Smith have been reported from eastern North America; however, these records may be based on misidentifications of *C. impressus* (Roger) and *C. obliquus* Smith. Deyrup (2003) listed *C. pylartes* Wheeler from Florida, but has since decided that those specimens are actually *C. obliquus* (Mark Deyrup, Pers. Comm.). Specimens from both Alabama and Mississippi previously thought to have been *C. pylartes fraxinicola*, are now thought by the senior author to be *C. impressus* or *C. obliquus*. The validity of *C. pylartes* as a species is in question, and both *C. pylartes pylartes* and *C. pylartes fraxinicola* likely will be synonymized with *C. impressus* in the near future (William MacKay, Pers. Comm.).

Study Area

Mississippi is an ideal state for the study of ants because it includes a wide variety of habitats and has relatively warm temperatures throughout most of the year. Much of Mississippi is forested, and woodland habitats in the state are known to support a high diversity of ants (Hill *et al*., 2005; MacGown and Brown, 2006). Mississippi has prairie remnants with a biota including many species disjunct from the midwestern plains (Brown, 2003; Hill, 2005). Most of Mississippi (Map 1) lies in the Gulf Coastal Plain physiographic region, with only the extreme northeastern corner of the state in Tishomingo County being found in the Cumberland Plateau. The state has been divided into 11 distinct physiographic regions (Cross *et al,* 1974; Lowe, 1919; Testa and Lago, 1994) or four basic ecoregions with 21 subdivisions (Chapman *et al*., 2004). Because of its location, Mississippi serves as a unique transitional zone between several different regions of the country. Part of Tishomingo County in northeastern Mississippi and the loess hills adjacent to the Mississippi-Yazoo Alluvial Plain and extending into southeastern Louisiana have many plant and insect species occurring in the northeastern United States. The southeastern region of the state shares many common species of plants and animals with both southern Alabama and Florida. These various physiographic regions, coupled with major ports on the Gulf Coast where exotic species may enter the state, make it probable that a great diversity of ant species will be found in this area.



Map 1. Map of Mississippi showing counties and physiographic regions (adapted from Lowe, 1919 and Cross *et al,* 1974).

METHODS AND MATERIALS

From 2001 through 2007, the Mississippi Entomological Museum (MEM) conducted surveys of ants in Mississippi to provide baseline data on native species to complement regional imported fire ant management programs initiated by the United States Department of Agriculture-Agricultural Research Service (USDA-ARS). Collections of ants were made from all 11 physiographic regions (or four ecoregions) and in all 82 counties of the state (Map 1).

Collections of ants were made using a variety of methods, including pitfall traps, Lindgren funnel traps, black light traps, malaise traps, baiting (Keebler Sandies Pecan Shortbread® cookies, StarKist® chunk light tuna in water, Bar S® hotdogs [chicken, beef, and pork], and various brands of peanut butter), soil and litter sampling, tearing apart rotting wood and hollow stems of grasses and other plants, and visual searching for ants and nests. Specimens were collected and stored in 90-95% ethanol, which would permit future use for possible DNA analysis. Representative voucher specimens were pinned, labeled with collection data, and stored in the MEM.

Species determinations were made using a combination of identification keys including Creighton (1950), Smith (1965), Snelling (1988), MacKay and MacKay (2002), and MacKay and MacKay (www.utep.edu/leb/ants/Camponotus.htm), comparisons with identified material, information from original descriptions, biological observations, morphological examinations, and through correspondence and cooperation with various specialists in the group.

Specimens were examined with Leica MZ12.5 and Leica MZ16 stereomicroscopes with fiber optic illumination. Photographs of specimens and scale-lines were made with the use of a Media Cybernetics Evolution MP digital camera (5 megapixel) mounted on a Leica MZ12.5 stereomicroscope and Image ProPlus 5.1 autoformatting software. Drawings were made using a drawing tube mounted on a Leica MZ16 stereomicroscope, and measurements were made using a micrometer mounted inside one of the eyepieces. County records given in the following discussion are based on data from specimens stored in the Mississippi Entomological Museum (MEM) and literature records.

TAXONOMIC CHARACTERS

This study of *Camponotus* focuses on workers because they have more obvious diagnostic characters that can be used for separating species. Workers of most carpenter ants are polymorphic, meaning that they have several sizes or forms. An exception is the *Colobopsis* subgenus, which only has a dimorphic worker caste. In some cases, major workers are needed for definitive identification because some characters used for identification are not expressed as strongly or may even be lacking in minor workers.

Ants in the genus *Camponotus* are generally large with workers ranging in size from 3–15 mm or more in length and queens (also referred to as females) of some species attaining a length of 19 mm or more. As with all insects, ants have three primary body regions: head, thorax, and abdomen. However, carpenter ants (as well as all other ants) appear to have four primary body regions: head, alitrunk (also called the mesosoma), waist, and gaster (Figure 1). The alitrunk is composed of the thoracic segments, which are fused to the first abdominal segment, called the propodeum. Due to the manner in which the thorax is fused to the propodeum, the entire alitrunk is sometimes mistakenly referred to as the thorax. The alitrunk is followed by a narrow waist that includes the second abdominal segment, the petiole, which is in the form of a protuberant node (some ant species also have a second node, the postpetiole). Following the waist is the gaster, which includes the remaining abdominal segments.

The heads of the largest workers of many species of carpenter ants are as broad as they are long, giving them a very stout appearance (Figure 2). Heads of smaller workers are more elongate. Mandibles of workers are strong and obvious with between four and six stout teeth. The clypeus is variable in shape, ranging from a rounded square, to being wider than long, or longer than wide; the anterior border extends as a weak lobe medially (in the *Colobopsis* subgenus, the clypeus of majors appears flattened due to the truncation of the head in this group). The anterior margin of the clypeus may be entire, toothed, or notched medially. The clypeus usually lacks a median carina, although larger workers may be slightly carinate, and some species may be distinctly carinate. Workers

have a 12-segmented antenna that lacks a club. The antennal scape is thickened apically, but sometimes flattened basally, and extends beyond the occipital region of the head, except in large workers. Antennal fossae are well separated from the posterior border of the clypeus. Frontal carinae are obvious, lyrate in shape, and partially conceal the antennal bases. Eyes are well developed, somewhat flattened to weakly convex, and are located nearer the posterior border of the head than to the mandible. Workers lack ocelli, although females and males have three ocelli each, located posteriorly near the occiput of the head in dorsal view. The maxillary palps are six-segmented and the labial palps are four-segmented.

Workers of most species have an indistinct metanotal suture between the promesonotum and the propodeum, although this suture is present in *C. sexguttatus* and some members of the subgenus *Colobopsis*. Species lacking an obvious metanotal suture have the shape of the alitrunk in a smoothly curved arc (as seen in profile).

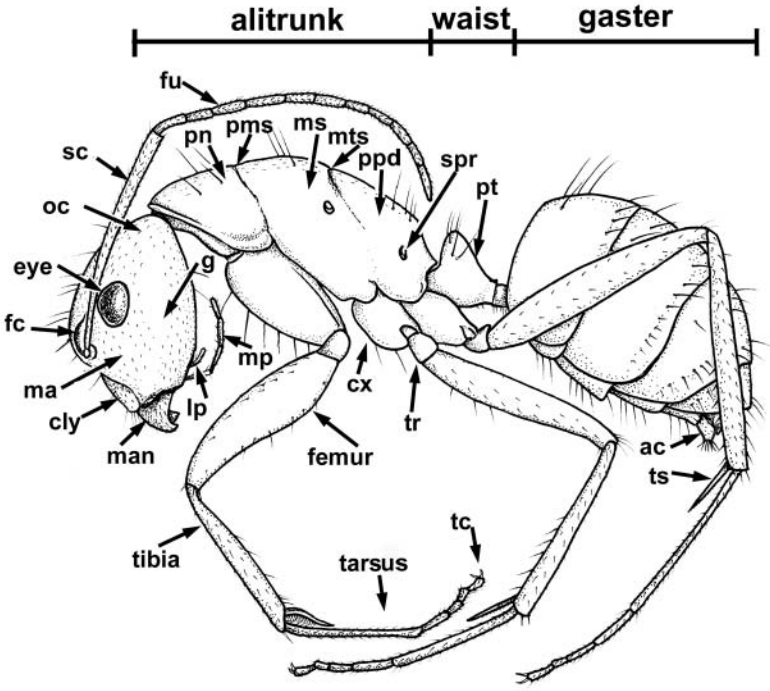


Figure 1. Profile view of a *Camponotus* sp. worker showing morphological features: acidopore, alitrunk, cly-clypeus, cx-coxa, eye, femur, fc-frontal carina, fu-funiculus, g-gena, lp-labial palp, man-mandible, ma-malar area, mp-maxillary palp, ms-mesonotum, mts-metanotal suture, oc-occipital region, pms-promesonotal suture, pn-pronotum, ppd-propodeum, pt-petiole, sc-scape, spr-spiracle, tarsus, tc-tarsal claws, tibia, and ts-spur.

Carpenter ant workers (and queens) lack a sting at the apex of the gaster, which is present in some species of ants, but instead have an acidopore, which is a semicircular- to circular-shaped structure formed from the hypopygium that often projects as a nozzle fringed by an apical ring of setae. The acidopore, which is common to all members of the subfamily Formicinae, is a structure that allows the ant to forcefully shoot formic acid as a defensive mechanism.

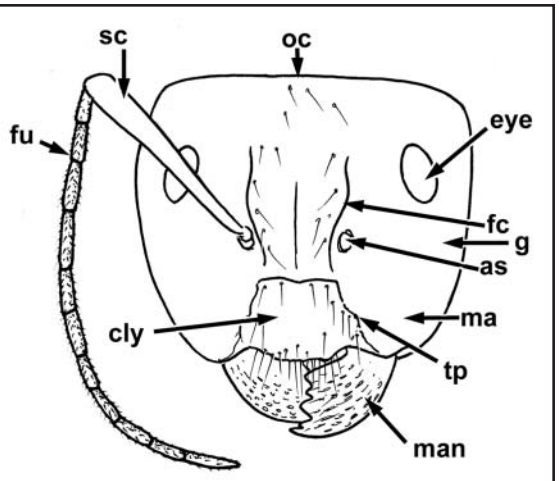


Figure 2. Full-face view of *Camponotus* species major worker showing morphological features of head: as-antennal socket (or fossa), cly-clypeus, eye, fc-frontal carina, fu-funiculus, g-gena, ma-malar area, man-mandible, occ-occipital margin of head, sc-scape, and tp-tentorial pit.

Workers always lack wings, whereas both males and queens possess two pairs of wings, although queens later shed their wings when they start new colonies. Queens and males have modified alitrunks to accommodate flight muscles for the wings. However, queens share many characteristics of the workers, and identification keys for workers will generally work well for the queens as well. In contrast, males have obvious differences in sexual structures and are typically much smaller than queens and usually smaller than workers. Males of many species are similar to one another, and their identification is difficult if they are not associated with a colony.

Many species of *Camponotus* are similar in size and coloration to ants in the genus *Formica*. However, workers of *Camponotus* can be easily separated from *Formica* by the absence of ocelli and, in most species, a metanotal suture, both of which are distinctive in *Formica* workers.

Biology

Carpenter ants are social insects that nest in colonies. Mature colonies of some species may number many thousand individuals, whereas others may have less than 10 individuals. When a colony approaches maturity, a generation of winged females and males is produced. These winged forms, known as alates, swarm from the colony some time in the spring and mate in the air. After mating and falling to the ground, the males die, and the females lose their wings and search for nesting sites. Nests are often started under bark or in wood of rotting logs or debris on the ground, in decayed wood of live or dead trees, or in moist wood of structures. After finding a nesting site, the queen seals herself in a chamber where she lays a small number of eggs. After 2–5 weeks, depending on the species and temperature, the eggs hatch into small, white, and legless larvae. The queen's body fat and flight muscles are metabolized and fed orally to early larvae for their nourishment.

The larvae pass through four instars in 2–3 weeks at which time they enter a prepupal, and finally a pupal stage, the latter lasting for 2–4 weeks. Pupae of most species are encased in cocoons from which emerging adults are incapable of extricating themselves without help from the queen. By the time the first brood has progressed to the prepupal stage in late summer, the queen lays a second batch of eggs. These eggs hatch and advance to the first, second, or third instar before the colony usually enters a dormant stage for the winter. Workers produced in the first brood are small, with little size variation, and are called minims or minors. Their job is to forage, feed and groom the queen, maintain and enlarge the nest, and help with brood care. In the following spring, the queen lays more eggs while the second brood of larvae is in the pupal stage. Colony growth is slow for the first 2 years, and major and media (intermediate size between minor and major workers) workers are not even produced until the third season in some species. Colonies usually must be at least 3–6 years old to produce alates (Hansen and Klotz, 2005).

Although carpenter ants cannot sting, they are capable of inflicting a somewhat painful bite with their large mandibles. They also can forcefully eject formic acid from their acidopore, which can create an unpleasant burning sensation on the skin.

Carpenter ants feed primarily on insects and other small invertebrates (both living and dead), but they may supplement their diets with plant secretions, honeydew from aphids and other plant-sucking insects, and seeds (Klotz *et al*., 1999). They also may gather household foods including fats, sugar, and other sweets, thereby becoming a nuisance in houses, restaurants, picnic sites, and other areas where people consume food.

Camponotus may forage for food during both day and night, but as temperatures increase, they typically forage more at night. Nocturnal foraging has some distinct advantages for carpenter ants. They may avoid predators that rely on sight to select their prey. By foraging at night, they may also eliminate competition with diurnal species for the same resources. Because carpenter ants are primarily active at night, they must depend on physical cues and chemical trails to find their way to and from the nest (Klotz *et al*., 1999). These chemical trails may be well developed and maintained through vegetation and other obstacles both above ground and underground (Klotz *et al*., 1999).

Economic Importance

Some species of *Camponotus*, especially those in the subgenus *Camponotus*, are called carpenter ants because they excavate galleries in wood for their colonies. Because of the proclivity of some species to use wood as nesting sites, carpenter ants are considered serious economic pests (Hansen and Klotz, 2005). They can cause structural damage to man-made structures and damage lumber, telephone poles, fence posts, or other wood products. Some species of carpenter ants nest in the interiors of living trees, weakening the trees and exposing them to other pests and pathogens. Trees infested with carpenter ants are generally unsuitable for lumber harvest (Hansen and Klotz, 2005).

Most species of *Camponotus* nest in natural microhabitats rather than in man-made structures. Some species nest in soil or under rocks, whereas others are arboreal and nest in dead branches. Other species nest in hollow stems or other cavities of plants. The primary species of carpenter ants that nest in man-made structures also are commonly found in forests, where they prey on other insects and help in the natural decay process of stumps, rotting logs, and other wood debris. They also may serve as natural biocontrol agents of various forest pest insects by preying upon them (Klotz, *et al.,* 1999). In addition, carpenter ants provide a food source for many species of animals. Because carpenter ants often nest in rotting wood, they are considered indicator species of healthy forest ecosystems. In managed forests, especially of the monoculture type, habitat variety is minimal, and therefore, carpenter ant abundance and diversity are negatively affected (Klotz, *et al.,* 1999).

Only nine of the 15 species occurring in Mississippi nest in man-made structures with any regularity. Of these, the black carpenter ant, *C. pennsylvanicus*, is by far the most commonly encountered species. The other eight species, *C. chromaiodes* (red carpenter ant)*, C. americanus, C. castaneus*, *C. decipiens, C. discolor, C. floridanus*, *C. nearcticus,* and *C. snellingi*, are also found in man-made structures, but on a much less frequent basis. The members of the subgenus *Colobopsis* have more specialized nesting habits, preferring twigs or hollow stems of a particular thickness (Tynes, 1964).

Typically, carpenter ants that nest in man-made structures infest wood that is already damaged or rotting, and they usually attack areas where excessive moisture accumulates (Smith, 1965). Consequently, porches, roofs, kitchens, bathrooms, or any areas that may have wood in contact with the ground or otherwise moist conditions are likely areas for infestations from carpenter ants. Therefore, the presence of carpenter ants in the home often indicates other primary problems, such as roof or plumbing leaks, rotting floor joists, studs, porch beams, or windowsills, and other similar situations. However, carpenter ants may also nest in dry sound wood (Hansen and Klotz, 2005), and their nests may be found throughout structures including in various types of insulation and sheathing (Hansen and Klotz, 2005).

Carpenter ants are difficult to keep out of structures and may enter wood through cracks or normal spaces found between siding and sheathing, between flooring and subflooring, or similar places. The presence of carpenter ants may be detected by coarse sawdust piles inside or outside of buildings, fence posts, or trees . Carpenter ants do not actually eat the wood; they chew it into small pieces that they discard outside of their resulting tunnels. Eventually, a nest is formed in this manner. Their need to travel from the nest to forage for food can help identify the location of a colony, and depending on the number of workers seen foraging, their movement can indicate the size of the colony.

Damage is in the form of tunnels or galleries created as workers chew the wood. Tunnels gradually grow as the colony grows. Galleries usually follow soft portions of wood and parallel the grain. The inner surfaces of galleries are kept clean and have the appearance of coarsely sanded wood. This appearance differs from termite galleries, which are lined with moist soil. Structural damage usually occurs during warmer periods of the year when carpenter ants are more active, which, in Mississippi, can be most of the year.

CONTROL

Baits are among the easiest and most effective ways to control carpenter ants. Although carpenter ants do not readily accept most baits formulated for fire ants or other types of indoor pest ants, they will readily take specially formulated carpenter ant baits. Unfortunately, these baits are difficult to find locally and must usually be bought through mail order or Internet suppliers. However, they usually work well enough that they are worth the extra effort and expense.

One commercially available, granular bait for carpenter ants contains the active ingredient abamectin. This bait can be applied outdoors to eliminate colonies nesting in trees. It can also be applied in basements, attics, crawl spaces, garages, and other indoor locations. Abamectin bait can be used to treat cracks, crevices, or voids where carpenter ants are nesting. Another specific carpenter ant bait contains fipronil and is formulated as a gel. Gel baits are designed primarily for indoor use. Place these baits along foraging trails and in or near nest sites for as long as the ants are taking them. Do not apply insecticide sprays near baiting locations because they will repel ants from the bait site. Carefully read and followed label directions when using baits.

Because indoor carpenter ant infestations often indicate some type of moisture problem resulting from structural or plumbing leaks, it is important to determine where the ants are nesting and, if the nest is indoors, to determine if such leaks exist and need to be repaired. Because carpenter ants forage most actively at night, using a flashlight to follow foraging trails back to their source is one of the best ways to locate nest sites.

If nest sites can be located, they can be treated directly with insecticides labeled for this type of indoor use (read and follow label directions). Premixed, ready-to-use insecticides containing active ingredients such as cyfluthrin, deltamethrin, lambda-cyhalothrin, or permethrin provide both contact and residual control. Nest sites in wall voids or other inaccessible locations can be treated using insecticide dusts containing active ingredients such as deltamethrin, which are specifically labeled for this use. Dust treatments should be applied according to label directions using a special bulb duster to inject dust through small holes drilled into the void (appropriate precautions should be taken when drilling around plumbing and electrical wiring). Bulb dusters may be difficult to find locally and may have to be specially ordered.

KEY TO *CAMPONOTUS* SPECIES IN THE SOUTHEAST

This key is based on major workers, but most smaller workers as well as queens can be identified with it. However, it cannot be used for identification of males. Due to variation in *Camponotus* species and lack of identification characters in minors, identification of some smaller workers (especially species in the *Myrmentoma* subgenus) may be difficult (if not impossible) unless they are associated with other workers from a colony. (This key was modified from Creighton, 1950; Snelling, 1988; M. Deyrup, Pers. Comm.; and W.P. MacKay, Pers. Comm.)

1 Head of major abruptly truncate in front (Figures 6–8), circular in cross section; fore femur enlarged (Figure 28); intermediate sized workers (medias) absent (subgenus *Colobopsis*) 2

Head of major not truncate (Figure 3); fore femur not obviously enlarged (Figure 27); medias present 4

2(1) Angle where side of head meets truncate anterior face with a distinct flange or rim (Figure 7); truncate face with small shallow punctures and fine reticulations (Figure 7); metanotal suture shallowly impressed or absent on both major and minor (Figures 22, 37) ..... *mississippiensis*

Angle where side of the head meets truncate anterior face without flange or rim, but instead either serrate or blunt (Figures 6, 8); anterior face coarsely punctate with heavy reticulations (Figures 6, 8); metanotal suture shallowly to deeply impressed (Figures 35–36) 3

3(2) Head of major with large, coarse, and sharp reticulations and foveolate punctures on side and truncated area, with edges of punctures touching one another (Figure 8); top of head with numerous erect hairs (best seen in profile**)** (Figure 8); metanotal suture shallowly impressed in major and minor; propodeum angulate between dorsal and declivous faces (Figure 24); majors usually 3.75 mm or less in length..... *obliquus*

Head of major with reticulations or foveolate punctures smaller, less deep, and usually not touching each other (Figure 6); posterior area of head with few erect hairs (Figure 6); metanotal suture of both major and minor deeply impressed; propodeum usually rounded between dorsal and declivous faces (Figure 23); majors 4.5 mm or more in length ..... *impressus*

4(1) Antennal scapes and legs with long, coarse, brown or golden, erect hairs on all surfaces (Figures 15, 44)..... 5

Antennal scapes and legs without long erect hairs (Figures 3, 31)..... 6

5(4) Alitrunk arched over entire length, metanotal suture not impressed (Figure 20); larger size, length of major about 10 mm, minor about 7 mm, and queen about 14 mm; head and alitrunk reddish colored, gaster dark brownish to blackish colored (Figure 44); coastal Mississippi ..... *floridanus*

Arch of alitrunk broken by deeply impressed metanotal suture (Figure 19); smaller, length of major about 5 mm, minor about 4 mm, and queen about 8 mm; color black; occurring in Florida..... *sexguttatus*

6(4) Small ants, workers 3–6 mm in length; head (including gena and malar area), alitrunk, and gaster with abundant, long, golden hairs (Figure 21); occurring in southern Texas and southern Florida ..... *planatus*

Workers usually much larger, length more than 6 mm; body with sparse hairs (Figure 31), or with abundant hairs except on gena and malar area of *C. socius* (Figure 17, 45) 7

7(6) Clypeus with anterior margin feebly projecting and depressed in the middle with a narrow, median notch, above which is often a short, triangular impression (Figures 9–14); major not exceeding 8 mm length (minors of *C. subbarbatus* often lack a median notch) (subgenus *Myrmentoma*)..... 8

Clypeus with anterior margin not projecting and usually without notch medially, but if notch is present, then without triangular impression above it (Figures 3–5, 15–18); major usually much more than 8 mm length, rarely less 13

8(7) Malar area with conspicuous suberect to erect hairs arising from coarse and somewhat elongate foveae (minors of *C. subbarbatus* often lack erect hairs on malar area) (Figures 9, 11, 14)..... 9

Malar area without suberect or erect hairs or elongate fovea (Figures 10, 12–13) (sometimes a few erect hairs near base of mandibles and malar area punctate but without elongate foveae)..... 11

9(8) Clypeus usually with less than 12 long, erect hairs adjacent to margins (hairs longer than those found on malar area) with few (0–3) on medial area (Figure 14); gaster usually with transverse light and dark brown stripes (Figure 43) ..... *subbarbatus*

Clypeus with more than 20 hairs, many (especially those in mid-clypeal region) as long as erect hairs on malar area (Figures 9, 11); gaster usually dark brown to black (Figures 39, 41) 10

10(9) Erect hairs on clypeus of varying lengths with shortest hairs being about same length as those on malar region (Figure 9); concolorous dark brown to black (Figure 39) ..... *caryae*

Erect hairs on clypeus of two distinct lengths, long and short, with short hairs being shorter than those on malar region (Figure 11); head, mesosoma, petiole, and appendages red, gaster blackish (Figure 41) ..... *discolor*

Note: Some taxonomists consider *C. caryae* and *C. discolor* to be a single species, *C. caryae.*

11(8) Body black, occasionally alitrunk reddish, but gaster all black and head with at least some black coloration (Figure 38); appear to be associated with pine trees and oaks ..... *nearcticus*

Head and alitrunk reddish colored, gaster at least partly black (Figures 40, 42) 12

12(11) Gaster all black (Figure 40); typically having small colonies, in twigs, cavities, galls, seedpods, etc. ..... *decipiens*

First and second gastral tergites yellowish to yellowish-red (Figure 42); colonies often larger, often found nesting in dead and sometimes rotting trees or logs ..... *snellingi*

Note: Some taxonomists consider *C. decipiens*, *nearcticus*, and *snellingi* to be a single species, *C. nearcticus.*

13(7) Occipital corners covered with numerous erect hairs (Figures 17–18,), median carina present and distinctive on clypeus (Figures 17–18) 14

Occipital corners without numerous erect hairs (Figures 3–5, 16); clypeus lacking median carina or if present, not distinct (Figure 3–5) 15

14(13) Bicolored with head and alitrunk reddish and gaster brownish-black; integument shiny; middle and hind tibia lacking erect bristles on flexor surfaces (Figure 30); anterior corners of clypeus angled (Figure 18); workers small, majors less than 10 mm in length; found in southern Florida ..... *tortuganus*

Color reddish-brown with gaster sometimes darker and usually with transverse dark bands (Figure 45); body surface opaque in appearance; middle and hind tibia with erect bristles arranged in graduated row on flexor surfaces (Figure 29); anterior corners of clypeus rounded (Figure 17); workers much larger, majors 13 mm or more in length; found in sandy areas in southern Mississippi ..... *socius*

15(13) Both alitrunk and gaster mostly reddish colored (Figures 31–32) 16

Alitrunk black or with some reddish color, but gaster either entirely black or black with some reddish color near base where it joins with petiole (Figures 33–34) 17

16(15) Malar area with numerous erect hairs (best seen in majors) (Figure 3); head usually completely to mostly black, occasionally dark reddish-brown, the rest of body yellowish-brown or reddish-brown colored and often with some brownish mottling on dorsum of alitrunk (Figure 31) ..... *americanus*

Malar area with few or no erect hairs (Figure 16) (if present, then usually restricted to the area just above mandible); uniform orangish-red, head occasionally a darker shade than rest of body but not black (Figure 32) ..... *castaneus*

17(15) Body usually black, but base of legs occasionally with some reddish color or legs mostly reddish-brown (Figure 34); appressed hairs on gaster moderately numerous and barely overlapping posterior edges of the gastral tergites, usually much less than a third of the total hair length extending past posterior edge (Figure 26), hairs silvery-white ..... *pennsylvanicus*

Petiole, base of gaster, legs, and posterior part of propodeum usually reddish, remainder of the body black (Figure 33) (color variable, sometimes with less red present); appressed hairs found on gaster numerous and long, overlapping posterior edges of the gastral tergites by at least half their lengths (best seen in dorsal view) (Figure 25), hairs golden ..... *chromaiodes*

Discussion of *Camponotus* Species in Mississippi

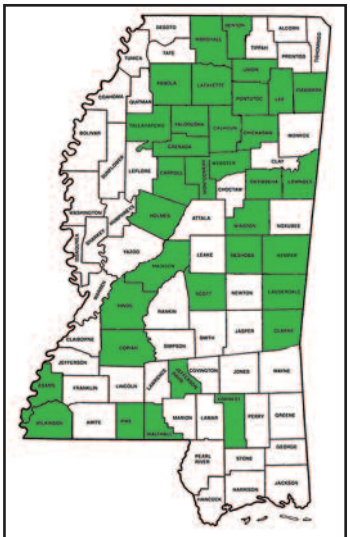
Subgenus Camponotus *Mayr*

Species in the subgenus *Camponotus* are large ants with workers ranging approximately 6–14 mm in length. The clypeus is ecarinate to only scarcely carinate, antennal scapes are not flattened at the bases, clypeal fossae are well developed, and the heads of major workers are usually broader than long. This subgenus includes three species in Mississippi.

Camponotus (*Camponotus*) *americanus* Mayr

Figures 31, 46, Map 2

Camponotus americanus is a very common and widespread species in central and north Mississippi. Major workers are approximately 10 mm in length, and minor workers are somewhat smaller. This ant is relatively shiny with a dark reddish-brown to blackish head, light brown to brown gaster, and often a lighter brown alitrunk. Several erect hairs are present on the gena and malar area of the head (Figure 3). Pubescence on the body is sparse overall, noticeable only on the gaster and the alitrunk dorsum, and limited on the sides of the alitrunk. The head is finely punctate to somewhat coriaceous with a few scattered and somewhat deeper punctures. Specimens seen from Alabama and Mississippi usually have a mottling of darker brown spots on the dorsum of the alitrunk.



Map 2. Distribution of *Camponotus americanus* in Mississippi.

The only species in the Southeast that is likely to be confused with *C. americanus* is *C. castaneus*; the latter species has a more uniform orangish to reddish-brown color over the entire body, including the head, and lacks erect hairs on the gena and malar area.

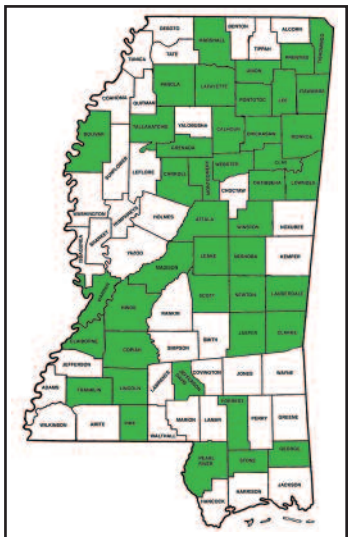
Camponotus americanus is occasionally found in the home, but it is not considered a structural pest, as it is one of the few members of the subgenus *Camponotus* that usually nests in the soil rather than in wood. It occasionally can be found nesting in rotting logs and stumps. Alates of this species have been collected from March 20 through May 19.

Smith (1979) gave the distribution of this species in North America as occurring from Ontario south to Florida and west to Michigan, Iowa, Missouri, Oklahoma, and Texas, but it was not included in the most recent list of Florida ants (Deyrup, 2003). *Camponotus americanus* has been collected or reported from the following counties in Mississippi: Adams, Benton, Calhoun, Carroll, Chickasaw, Clarke, Copiah, Forrest, Grenada, Hinds, Holmes, Itawamba, Jefferson Davis, Kemper, Lafayette, Lauderdale, Lee, Lowndes, Madison, Marshall, Montgomery, Oktibbeha, Panola, Pike, Pontotoc, Scott, Tallahatchie, Union, Walthall, Webster, Wilkinson, Winston, and Yalobusha (MEM). It also has been collected or reported in Neshoba County and Oakland (county unknown) (Smith 1924c).

Camponotus (*Camponotus*) *chromaiodes* Bolton

Figures 33, 48, Map 3

Camponotus chromaiodes is a replacement name for *Formica* ferruginea F., a junior homonym that was treated by Smith (1924c) as "*C. herculeanus* subsp. *pennsylvanicus* var. *ferrugineus*." The common name of this species, red carpenter ant, is somewhat misleading because other species may be more reddish overall, such as *C. americanus, C. castaneus*, and C. *noveboracensis* (a more northern species).



Map 3. Distribution of *Camponotus chromaiodes* in Mississippi.

Workers range in length from 6–13 mm or more. Major and minor workers of this species are usually dark with a black head and gaster and have at least some ferrugineous coloration on the body, especially on the propodeum, petiole, base of gaster, bases of legs, and sometimes extending over much of the alitrunk. Coloration of this species is extremely variable with the entire alitrunk sometimes being almost a deep ferrugineous red to mostly black with very little reddish coloration. Erect hairs are lacking on the gena,

malar area, occipital corners of the head, and the scape, except apically (Figure 4). The gaster is covered with golden appressed pubescence that almost hides the surface, with many of the appressed hairs being as long as the erect hairs present. Scattered, appressed, golden pubescence is found on the alitrunk, including the side of the propodeum. Queens are similar to the workers in appearance, but they are larger with much of the alitrunk dark in color. The male is mostly black and smaller than the queen.

In this area, the only species with which one might confuse *C. chromaiodes* is *C. pennsylvanicus*, which is typically blacker in color. The appressed hairs on the gaster of *C. chromaiodes* are more numerous and longer than those in *C. pennsylvanicus*, they overlap the posterior edges of the gastral tergites (Figure 25, best seen on tergites 1-3) by at least half of their lengths, and they are golden rather than silvery white.

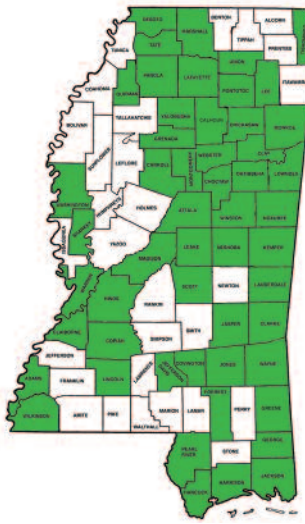
Camponotus chromaiodes usually nests in soil beneath dead wood or in dead wood below ground. This species occasionally nests in rotting wood above ground — including logs and stumps, standing dead trees — or in moist, rotten parts of buildings. In all of these cases, the galleries of their colonies usually extend into the soil. This nesting behavior generally limits *C. chromaiodes* to drier upland forest habitats, whereas *C. pennsylvanicus*, a related and similar species, typically nests in dead wood above ground and can be found in floodplain forests. M.R. Smith (1965) mentioned that this species was sometimes collected in houses but that it was rarely found nesting in them; when found nesting in houses, it was only in faulty or moist wood. However, J. MacGown has seen this species nesting in great numbers in dry redwood lumber in a lumberyard. This species often has large colonies and is exceedingly common in forests of the southeastern United States. In 2003, J. MacGown discovered a large colony of *C. chromaiodes* in a very dry stump of a dead *Pinus* sp. tree, measuring 3 m in height and 0.6 m in diameter, located on a hill in a forested area along the Natchez Trace Parkway in Itawamba County. He split the stump with a hatchet, after which thousands of workers poured forth from galleries that completely riddled the stump. Alates of this species have been collected in Mississippi from June 31 through September 11.

This species has been reported from the northeastern states west to Illinois, Kansas, Michigan, and Nebraska and south to Mississippi and Alabama (Smith, 1979; MacGown and Forster, 2005), but it has not been reported from Florida (Deyrup, 2003). This is a very common and widespread ant in central to north Mississippi, but it appears to be less common in the coastal counties. It has been collected or reported from Attala, Bolivar, Calhoun, Carroll, Chickasaw, Claiborne, Clarke, Clay, Copiah, Franklin, Forrest, George, Grenada, Hinds, Itawamba, Jasper, Jefferson Davis, Lafayette, Lauderdale, Leake, Lee, Lincoln, Lowndes, Madison, Marshall, Monroe, Montgomery, Newton, Oktibbeha, Panola, Pearl River, Pike, Pontotoc, Prentiss, Scott, Stone, Tallahatchie, Tishomingo, Union, Warren, Webster, and Winston counties (MEM), as well as from Neshoba County and Oakland (county unknown) (Smith 1924c).

***Camponotus* (*Camponotus*) *pennsylvanicus* (DeGeer)**

Figures 34, 49, Map 4

Camponotus pennsylvanicus, the black carpenter ant, is one of the best known, most adaptable, and perhaps the most common of carpenter ants in the eastern and central United States. This ant, described in 1773, is also interesting historically because it was the first native North American ant species to be named.



Map 4. Distribution of *Camponotus pennsylvanicus* in Mississippi.

Black carpenter ant workers range in length from 6–13 mm or more. All castes of this species, including the major and minor workers, queens, and males, are black or blackish, although some specimens have dark, reddish-brown coloration on the propodeum, petiole, base of gaster, or bases of legs. This species lacks erect hairs on the gena, malar area, occipital corners of head, and scape, except apically (Figures 5, 49), but it has numerous erect hairs on the dorsal surface of the alitrunk, petiole, and the entire surface of the gaster (Figure 34). Appressed pubescence is sparse on most surfaces of the body but is fairly abundant on the dorsum of the alitrunk, somewhat scattered on the side of the propodeum, and very abundant and long on the gaster. The appressed hairs on the gaster are longer than elsewhere on the body (almost as long as the erect hairs), and most of the hairs overlap bases of hairs positioned more posteriorly.

Camponotus pennsylvanicus appears similar to dark-colored specimens of *C. chromaiodes*. *Camponotus chromaiodes* usually has enough reddish color on the posterior portion of the alitrunk to distinguish it from *C. pennsyl-*

vanicus, but examination of the appressed hairs on the gastral dorsum is sometimes necessary for identification. In *C. pennsylvanicus,* the appressed hairs on the gaster are silvery-white and relatively numerous, and they barely overlap the posterior edges of the gastral tergites, with usually much less than a third of the total hair length extending past the edge (Figure 26). In *C. chromaiodes*, these hairs are golden colored and very numerous, and they overlap the posterior margins of the gastral tergites by at least half of their lengths.

Camponotus pennsylvanicus nests in a wide variety of microhabitats, in living and dead trees, rotten logs or stumps in forested areas, telephone poles, fence posts, and buildings. This species is the most common carpenter ant found nesting inside homes or other buildings. It also commonly forages in homes and other places where people have food, such as picnic sites. Black carpenter ants can have large colonies with thousands of workers that persist for several years (Smith, 1965). Alates have been collected in Mississippi from March 26 through August 10, as well as on November 26.

Camponotus pennsylvanicus is a widespread species in the eastern and midwestern United States and ranges from New England south to Florida and west to North Dakota and Texas (Smith, 1979). This is a very common and widely distributed species in Mississippi and has been collected in Adams, Attala, Calhoun, Carroll, Chickasaw, Choctaw, Claiborne, Clarke, Clay, Copiah, Covington, DeSoto, Forrest, George, Greene, Grenada, Hancock, Harrison, Hinds, Jackson, Jasper, Jefferson Davis, Jones, Kemper, Lafayette, Lauderdale, Leake, Lee, Lincoln, Lowndes, Madison, Marshall, Monroe, Montgomery, Neshoba, Noxubee, Oktibbeha, Panola, Pearl River, Pontotoc, Quitman, Scott, Sharkey, Tate, Tishomingo, Union, Warren, Washington, Wayne, Webster, Wilkinson, Winston, and Yalobusha counties (MEM).

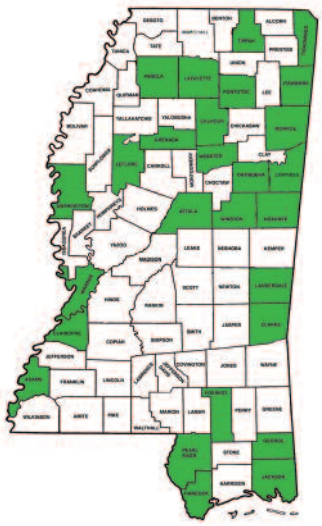
Subgenus Colobopsis *Mayr*

Major workers and queens in subgenus *Colobopsis* have severely truncated heads (Figure 35), cylindrical bodies, and short legs with enlarged fore-femora (Figure 28) that have been modified for living in hollow stems of grasses, twigs of plants, or galls. Minor workers do not have truncated heads but are similar to the majors and queens in having enlarged fore-femora, cylindrical bodies, and other characteristics. Only three species of this subgenus are known to occur in Mississippi.

Camponotus (*Colobopsis*) *impressus* (Roger)

Figures 35, 50, 53, Map 5

Major and minor workers of *Camponotus impressus* are 4–5 mm and 3–3.5 mm in length, respectively. The majors can be recognized by the truncated area of the head rounding broadly into the sides of the head (Figures 6, 53) and the alitrunk being distinctly depressed at the metanotal suture (Figures 23, 35). The propodeum of the major is usually rounded between the dorsal and declivious faces (Figure 23), but it is usually more angulate in minors. Sculpturing of the truncated area of the head is a mixture of foveolae and smaller punctures, and most of the foveolae are well separated from adjacent foveolae. The anterior third of the head is usually yellow to reddish-brown, and the posterior two-thirds of the head is reddish-brown to dark brown. The heads of queens are similar to major workers, with identical sculpturing and usually with the anterior third being yellow to reddish-brown. Minors, similar to majors, have the metanotal suture deeply depressed below the surface of alitrunk, and the propodeum forms an angle between the dorsal and declivious faces. *Camponotus impressus* can be distinguished from the other two species in this region, *C. mississippiensis* and *C. obliquus*, by the deeply impressed metanotal suture of both the major and minor. The propodeum of the majors is usually rounded between dorsal and declivious faces (angulate in minors), and the angle of truncation of the head of major and queen is rounded to slightly serrate. In *C. mississippiensis* and *C. obliquus*, the metanotal suture of the majors and minors is only shallowly impressed, and the propodeum of both majors and minors is angulate between faces. In *C. mississippiensis*, the angle where the truncation of the head occurs is very sharp with a pronounced rim or flange present, and sculpturing on the truncated face is very shallow and fine, with the truncated area somewhat shining in appearance. In *C. obliquus*, the truncated portion of the head is separated from the rest of the head by a somewhat serrate and distinct ridge and has reticulations that are much larger and more numerous than in *C. impressus*. In



Map 5. Distribution of *Camponotus impressus* in Mississippi.

addition, many more erect hairs are present on the posterior region of the head of majors in *C. obliquus* than in *C. impressus*.

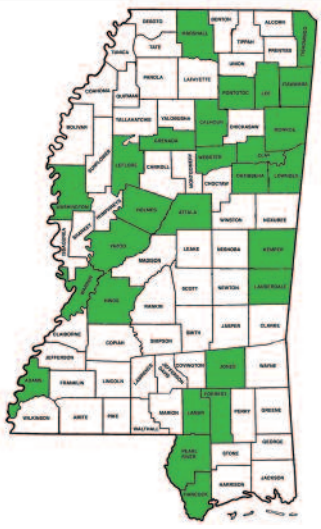
This species has been confused historically with *C. pylartes fraxinicola,* which may not be a valid species (MacKay, www.utep.edu/leb/antgenera.htm). MacGown has seen colonies of *C. impressus* with individual major workers showing variation to such an extent that they could easily have been identified as the two species, *C. impressus* and *C. pylartes fraxinicola*. Historic MEM specimens from Mississippi identified as *C. pylartes fraxinicola* have been recently identified as *C. impressus*; therefore, published accounts of *C. pylartes fraxinicola* from the state are probably *C. impressus* as well.

Both M.R. Smith (1923, 1930) and J.C. Tynes (1964) described the biology and distribution of *C. impressus* and *C. pylartes fraxinicola* in Mississippi. *Camponotus impressus* has been recorded from various localities in Mississippi nesting in *Carya glabra* (Mill.) (pignut hickory, Juglandaceae), *Fraxinus americana* L. (white ash, Oleaceae), *Solidago* spp. (goldenrod, Asteraceae), branches of *Quercus falcata* Michx. (Fagaceae), and galls produced by a wasp, *Callirhytis cornigera* (O. S.) (Cynipidae) (Tynes, 1964). Nests of *C. pylartes fraxinicola*, which were probably *C. impressus*, have been recorded in 21 plant species in Mississippi including *Fraxinus americana*, *Carya illinoinensis* (Wang.) (pecan), *Carya* spp. (hickory), *Q. falcata*, *Solidago* sp., *Rhus glabra* L. (smooth sumac, Anacardiaceae), *Catalpa speciosa* Warder (catalpa tree, Bignoniaceae), *Berchemia scandens* (Hill) (rattan vine, Rhamnaceae), *Campsis radicans* (L.) (trumpet creeper, Bignoniaceae), *Sambucus canadensis* L. (elderberry, Caprifoliaceae), *Erianthus ravennae* (L.) (plumegrass, Poaceae), *Prunus persica* (L.) Batsch (peach, Rosaceae), *Melia azedarach* L. (chinaberry tree, Meliaceae), *Cornus florida* L. (flowering dogwood, Cornaceae), *Crataegus uniflora* Meunchh. (Rosaceae), *Ulmus americana* L. (American elm, Ulmaceae), *Smilax* spp. (greenbriar, Liliaceae), *Maclura pomifera* (Raf.) Schneid. (osage orange, Moraceae), *Gleditsia triacanthos* L. (honey locust, Fabaceae), *Vitis labrusca* L. (grape, Vitaceae), and *Populus deltoides* Marsh (cottonwood, Salicaceae) (Tynes, 1964). Because *C. impressus* typically nests in plants, it would not be expected to occur in any man-made structures, although alates are sometimes attracted to lights. Alates have been collected in Mississippi from July 2 through August 20.

Smith (1979) gave the distribution in the United States as Maryland south to Florida, west to central Texas, north to Kansas. In Mississippi, *Camponotus impressus* has been collected in Claiborne, Clarke, George, Grenada, Jackson, Lafayette, Lowndes, Noxubee, Oktibbeha, Panola, Pontotoc, Tippah, Union, Webster, and Winston counties (MEM), as well as Calhoun and Pearl River counties (Tynes, 1964). Records of *C. pylartes fraxinicola* (which were likely *C. impressus*) are from Adams, Attala, Forrest, Hancock, Itawamba, Lauderdale, Leflore, Monroe, Tishomingo, Warren, and Washington counties (Tynes, 1964).

Camponotus (*Colobopsis*) *mississippiensis* Smith

Figures 37, 52, 55, Map 6



Map 6. Distribution of *Camponotus mississippiensis* in Mississippi.

The majors of *Camponotus mississippiensis* are easily recognized as having a deeply concave, truncated surface on the head with the sides of the truncated area very sharp and well defined, except in the dorsal clypeal region. In dorsal view, the sides of the head diverge anteriorly enclosing the hollowed-out anterior portion (Figure 55). Punctures on the anterior half of the head, including the truncated area, are numerous but much smaller and shallower than in the other two *Colobopsis* species found in Mississippi. The metanotal suture of both the major and the minor is not obviously impressed (Figure 22). Majors and minors vary in length from 4.5–5 mm and 3.5–4 mm, respectively.

Camponotus mississippiensis has been the most commonly collected species of *Colobopsis* in the state and was so named for this reason (Smith, 1923). This species is known to nest only in twigs and small branches of living white ash trees, *Fraxinus americana*. Longitudinal galleries are mined from the soft portions of twigs for rearing the young, and these galleries may be several centimeters to almost 2 m in length (Smith, 1923; Tynes, 1964). The galleries may be connected to the outside of the twig by one to several small entrance holes. Colonies are easily found by searching white ash branches for small holes, then cutting a branch off and slicing it down the center with a knife. MacGown has found many colonies of this species at his home in the Sessums Community, just outside of Starkville, Mississippi. This species is thought to feed primarily on honeydew excreted by aphids, scale insects, and

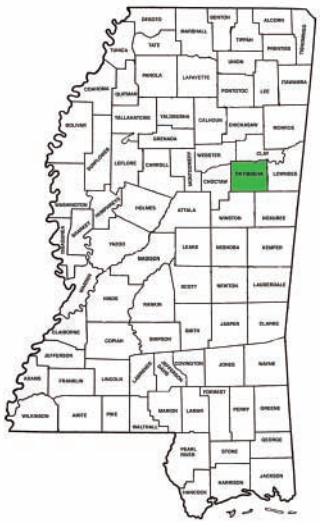
other sap-feeding insects. Reproduction apparently occurs throughout the year in Mississippi, as nests collected from various dates in the year may contain eggs and larvae (Smith, 1923). Like other members of the subgenus, this species is unlikely to be found in a house or other structure, with any possible encounters limited to alates. Although they nest in living trees, *C. mississippiensis* does not appear to adversely affect the overall health of the trees, other than the branches in which they colonize.

In the United States, *Camponotus mississippiensis* has been reported from Maryland south to Florida and west to Illinois, Louisiana, and Oklahoma (Smith, 1979). However, Deyrup (2003) does not list this species from Florida. In Mississippi, this species has been recorded from Adams, Clay, Itawamba, Kemper, Lauderdale, Lee, Lowndes, Marshall, Oktibbeha, and Pontotoc counties (MEM), as well as Attala, Calhoun, Forrest, Grenada, Hancock, Hinds, Holmes, Jones, Lamar, Leflore, Monroe, Pearl River, Tishomingo, Warren, Washington, Webster, and Yazoo counties (Tynes, 1964).

***Camponotus* (*Colobopsis*) *obliquus* Smith**

Figures 36, 51, 54, Map 7

Camponotus obliquus is the smallest of the *Colobopsis* species in the state, with majors measuring only 3.5–4 mm in length. The head is truncated, similar to other species of the subgenus Colobopsis. This species varies in color of the truncated area of the head from reddish-brown to yellowish-red, but it is reddish-brown on the rest of the body. The alitrunk is reddish-brown, and the gaster varies from dark reddish-brown to brownish-black. The margins of the truncate area are somewhat serrate. The truncated area of the head of majors and queens has coarse and relatively large foveolate punctures and reticulations with the edges touching one another (Figure 8). These coarse foveolate punctures are also present on the sides and top of the head, extending from the truncated area posteriorly to at least the midpoint of the head or more. The major and queen have numerous short erect hairs on the head, especially noticeable on the middle to posterior areas in profile view (Figures 8, 54), and a few scattered, short erect hairs on the dorsum of the pronotum (Figure 24). The alitrunk of the major is only slightly impressed at the metanotal suture (Figure 24). The dorsal face of the propodeum of the major is convex, while the declivious (or posterior) face is concave, and the angle formed by the two faces is somewhat angulate to slightly rounded (Figure 24). The metanotal suture of the minor is shallowly impressed, and the area between the propodeal faces is usually angulate.



Map 7. Distribution of *Camponotus obliquus* in Mississippi.

This species most closely resembles *C. impressus,* from which it differs in having a head with reticulations that are larger and sharper on the truncated area and more numerous and coarser on the side and in having more erect hairs on the posterior area. Additionally, both majors and minors have the metanotal suture only shallowly impressed and the propodeum angulate between the faces.

This species was described by M.R. Smith (1930) from three majors that he found nesting in the husk of a hickory nut (*Carya* sp.) 5 miles southwest of Starkville in Oktibbeha County. Recently, colonies of this species have been found in vines of *Berchemia scandens*. Due to its specialized nesting habits, it is not likely to be found in households. The only records of this species outside Mississippi are from Alabama (Smith, 1979) and Florida (M. Deyrup, Pers. Comm.).

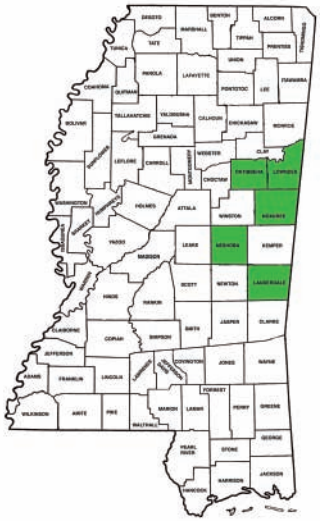
Subgenus Myrmentoma *Forel*

Species in the subgenus *Myrmentoma* can be characterized as having a notch or emargination in the middle of the anterior border of the clypeus (Figures 9–14), which is not present in species of other subgenera in Mississippi. Members of this subgenus are also considerably smaller than species in the *Camponotus* and *Tanaemyrmex* subgenera. Majors, minors, and queens all have a gaster that is very shiny, an alitrunk that is somewhat opaque with coriaceous sculpturing, a head with fine, dense punctation, and a body with somewhat sparse pubescence. Males of species in *Myrmentoma* are morphologically indistinguishable from one another.

Camponotus (*Myrmentoma*) *caryae* (Fitch)

Figures 39, 57, Map 8

Major and minor workers range from approximately 3.5–7.5 mm in length. Workers and queens can be recognized by the presence of numerous erect hairs on the gena and malar areas and on the clypeus, with those on the clypeal disc including many that are about equal in length to those on the malar area (Figures 9, 57). In addition, this species is concolorous dark brown to black. Coloration is the only practical way to distinguish it from the closely related *C. discolor* (Buckley), which has a reddish head, alitrunk and petiole and a blackish gaster. There is some variation within these two species, and it is possible that *C. discolor* will become a junior synonym of *C. caryae* in the future (W. MacKay, Pers. Comm.). Alates have been collected on January 22 (historic specimens, possible overwintering in a nest) and on May 20.



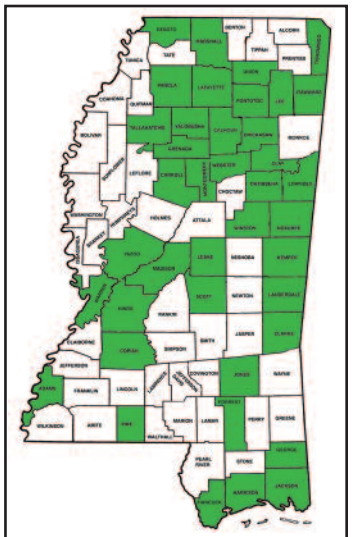
Map 8. Distribution of *Camponotus caryae* in Mississippi.

This species ranges from New York south to Florida and west to Michigan and Ohio (Deyrup, 2003; Smith, 1979). Smith (1924c) considered this species to be widely distributed and associated with *Carya* spp. throughout Mississippi. However, records in the MEM are limited to Lauderdale, Lowndes, Neshoba, Noxubee, and Oktibbeha counties.

Camponotus (*Myrmentoma*) *decipiens* Emery

Figures 40, 58, Map 9

Camponotus decipiens, referred to in older literature as *C. rasilis* Wheeler, appears to be a common species in Mississippi. Workers range from 3.5–7.5 mm in length. Majors, minors, and queens of this species all have a very shiny gaster, a somewhat opaque alitrunk with coriaceous sculpturing, the head finely but densely punctate, and a dull mandible surface. They lack erect hairs on the gena and malar area, but they have one to two pairs of erect hairs on the posterior margin of the clypeus and a few long, erect hairs (usually two to four) on the lateral edges of the clypeus and above the tentorial pits (Figures 10, 58). Specimens in our region have a reddish head, alitrunk, legs, and petiole, and a blackish to black gaster.



Map 9. Distribution of *Camponotus decipiens* in Mississippi.

Some taxonomists consider *C. decipiens*, *C. nearcticus,* and *C. snellingi* to be color forms of one another. These species may be synonymized in the future, in which case the name *C. nearcticus* would have priority. Workers and queens of *C. snellingi* have similar coloration to *C. decipiens*, but they usually have longer bodies and the first two tergites of the gaster are yellowish red. *Camponotus snellingi* often has larger nests as well and is frequently found in large colonies in dead trees, often still standing. *Camponotus nearcticus* is concolorous dark brown to black. Both *C. nearcticus* and *C. snellingi* usually have more erect hairs on the clypeus than *C. decipiens*.

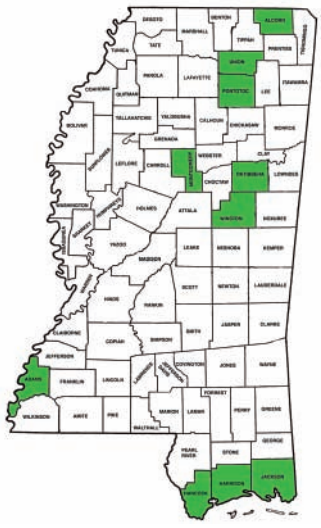
Camponotus decipiens typically has relatively small colonies with a few hundred workers at most, often less than 100. This species often nests under tree bark, as well as in logs, stumps, houses, wooden posts, plant stalk cavities, large seed pods, galleries created by other insects (including carpenter ants in the subgenus *Colobopsis*) in tree twigs and branches, and insect galls [especially those of *Disholcaspis cinerosa* (Bassett) (Cynipidae) on oak (*Quercus* spp.)] (Smith, 1965). MacGown has found colonies of approximately 100 individuals in vacated nests

of *C. mississippiensis* in *F. americanus* twigs and colonies with as few as five individuals in dry seedpods of *Campsis radicans*. He also found a colony in vacated galls of *Callirhytis cornigera* (Cynipidae) on branches of *Quercus phellos* L. J. Hill has observed workers foraging on the ground near the trunk of *Diospyrus virginiana* L. (Ebenaceae) in a Black Belt Prairie remnant, and MacGown has observed workers crawling on leaves of *D. virginiana*, also in the Black Belt. *Camponotus decipiens* occasionally nests in houses, but because of their small colony size, they are not considered a serious structural pest. They also feed on many household food products, especially sweets. In their natural habitat, their food comes largely from honeydew secreted by scale insects and aphids and is supplemented with dead insects (Smith, 1965). In Mississippi, alates have been collected from March 27 through April 22 and on October 24.

This species ranges from Georgia and northern Florida west to western Texas and north into North Dakota (Snelling, 1988). In Mississippi, this species has been collected in Adams, Calhoun, Carroll, Chickasaw, Clarke, Clay, Copiah, DeSoto, Forrest, Grenada, George, Hancock, Harrison, Hinds, Itawamba, Jackson, Jasper, Jones, Kemper, Lafayette, Lauderdale, Leake, Lee, Lowndes, Madison, Marshall, Montgomery, Noxubee, Oktibbeha, Panola, Pike, Pontotoc, Scott, Sunflower, Tallahatchie, Tishomingo, Union, Warren, Webster, Winston, Yalobusha, and Yazoo counties (MEM).

Camponotus (*Myrmentoma*) *discolor* (Buckley)
Figures 41, 59, Map 10

Camponotus discolor workers range from approximately 3.5–7.5 mm in length. Workers and queens of this species have a reddish-colored head, alitrunk, and petiole, as well as a blackish gaster (Figure 41). Workers and queens have numerous erect hairs on the gena and malar areas and clypeus. Erect hairs on the clypeal disc are usually of two distinct lengths, with the shortest hairs being shorter than those on the gena and malar area (Figures 11, 59).



Map 10. Distribution of *Camponotus discolor* in Mississippi.

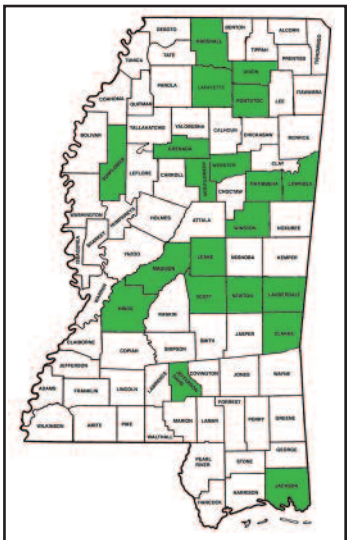
Camponotus discolor is most similar to *C. caryae* and differs mostly in color, with *C. caryae* usually being concolorous dark brown. Some taxonomists have suggested informally that *C. discolor* and *C. caryae* are only color forms, but at this time, they are still considered separate species. *Camponotus subbarbatus*, a similar species, lacks erect hairs on the clypeal disc — or at most has only a few (one to three) — and has very long hairs along the lateral margins of the clypeus that are much longer than those on the malar area.

This rarely collected species is typically only found in natural habitats. As in other *Myrmentoma* species, it nests in many different habitats. It is an infrequent nester in houses and is unlikely to cause serious structural damage due to the small colony size and relatively small size of the workers. Snelling (1988) states that this species is common in central Texas and usually associated with *Quercus* spp. but has also been collected from *Carya* spp., *Salix* spp. (Salicaceae), and *Populus deltoides*.

Smith (1979) gives the range of this species as Ohio, South Carolina, and Florida west to North Dakota, Iowa, Kansas, and Texas. In Mississippi, *Camponotus discolor* has been found in Adams, Hancock, Harrison, Jackson, Montgomery, Oktibbeha, Pontotoc, Union, and Winston counties (MEM), as well as Alcorn County (Smith, 1931).

Camponotus (*Myrmentoma*) *nearcticus* Emery
Figures 38, 56, Map 11

Camponotus nearcticus workers range from approximately 3.5–7.5 mm in length. They lack erect hairs on the sides of the gena and malar area. However, they have one to two pairs of erect hairs on the posterior margin of the clypeus and four to 10 long, erect hairs (usually more than six) on the lateral edges of the clypeus above the tentorial pits (Figures 12, 56). Specimens in our region are usually concolorous brownish-black to black, although some specimens may have the head and/or alitrunk reddish-black.



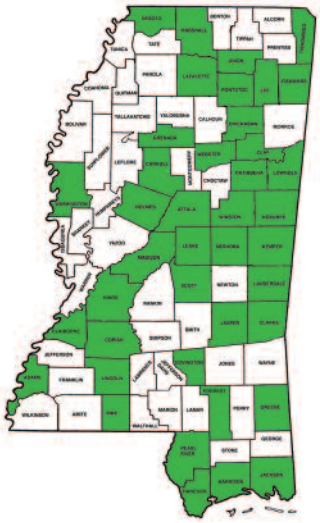
Map 11. Distribution of *Camponotus nearcticus* in Mississippi.

Camponotus nearcticus is a very common and widely distributed species. This species, like *C. decipiens*, usually forms relatively small colonies with less than a hundred to several hundred individuals. They nest in a wide variety of places, such as in dead twigs and branches of trees; in hollow stems, logs and stumps; in or beneath the bark of living and dead trees; and in insect galls, pine cones, wooden posts, and woodwork of buildings, especially in the roofing (Smith, 1965). Alates have been collected in Mississippi on January 1 and from April 9 through June 19.

In North America, this species is widespread and ranges from Ontario south to Florida and west to British Columbia (Hansen and Klotz, 2005). *Camponotus nearcticus* has been collected from these Mississippi counties: Clarke, DeSoto, Grenada, Hinds, Jackson, Jefferson Davis, Lafayette, Lauderdale, Leake, Lowndes, Madison, Marshall, Montgomery, Newton, Oktibbeha, Pontotoc, Scott, Sunflower, Union, Webster, and Winston (MEM).

Camponotus (*Myrmentoma*) *snellingi* Bolton
Figures 42, 60, Map 12

This species was treated by Smith (1924c) as *Camponotus fallax* rasilis var. *pavidus* Wheeler. Snelling (1988) erroneously elevated this varietal name to species status, recognizing it as *C. pavidus*. Because *C. pavidus* is a junior homonym of an earlier species name, it subsequently was replaced by *snellingi* (Bolton, 1995).



Map 12. Distribution of *Camponotus snellingi* in Mississippi.

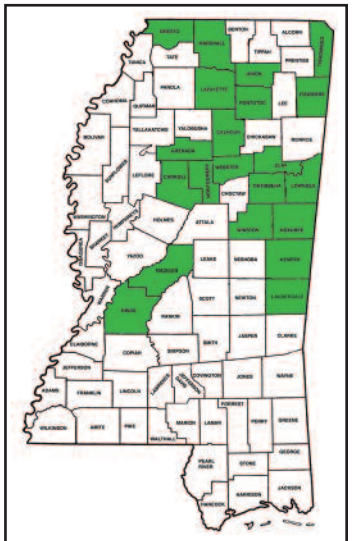
Camponotus snellingi workers range from approximately 3.5–8 mm or more in length. This species has an orangish-red head, alitrunk, legs, and petiole, as well as a bicolored gaster with the first two segments orangish-red and the remaining segments blackish. They lack erect hairs on the sides of the gena and malar area, but they have one or two pairs on the posterior margin of the clypeus and four to 10 long, erect hairs (usually more than six) on the lateral edges of the clypeus above the tentorial pits (Figures 13, 60).

Camponotus snellingi nests in dead twigs and branches of trees, under bark of live and dead trees, in partly rotting logs and stumps, and in standing dead trees. This species, unlike *C. decipiens* and *C. nearcticus*, often has very large colonies with thousands of individuals, although it sometimes has smaller colonies with less than a hundred workers. The larger nests seem to be typical in central and northern Mississippi and Alabama. However, in the southern parts of its range, especially Florida, nests tend to be in smaller twigs and branches, rather than in larger rotting trees, stumps, and logs, which often harbor *C. floridanus* instead (Mark Deyrup, Pers. Comm.). This species is not considered a serious household or structural pest and seems to prefer natural forested habitats. However, because of its propensity for nesting in wood, it could be encountered in homes or other buildings. When searching for ants in forested areas, MacGown and J. Hill have found this to be one of the easiest *Camponotus* species to find, and it is a very common ant species in Mississippi. Alates have been collected from March 26 through May 26.

Snelling (1988) considered this species common from Georgia and Florida to central Texas. Mississippi records of this species are from Adams, Attala, Carroll, Chickasaw, Claiborne, Clarke, Clay, Copiah, Covington, DeSoto, Forrest, Greene, Grenada, Hancock, Harrison, Hinds, Holmes, Itawamba, Jackson, Jasper, Kemper, Lafayette, Lauderdale, Leake, Lee, Lincoln, Lowndes, Madison, Marshall, Montgomery, Neshoba, Noxubee, Oktibbeha, Pearl River, Pike, Pontotoc, Scott, Stone, Tishomingo, Union, Washington, Webster, and Winston counties (MEM).

Camponotus (*Myrmentoma*) *subbarbatus* Emery
Figures 43, 61, Map 13

Camponotus subbarbatus workers range from approximately 3.5–6.5 mm in length. Both workers and queens have an orangish-red head, alitrunk, legs, and petiole. They have a bicolored gaster with the first segment reddish, and the following segments often have transverse, dark brownish-black stripes present at the posterior edges of the tergites. In many specimens, the coxae are strikingly pale in comparison to the alitrunk. Majors of this species have erect



Map 13. Distribution of *Camponotus subbarbatus* in Mississippi.

hairs present on the malar area, which may be few or absent in minors. The clypeus has erect hairs on and adjacent to the margins that are longer than the ones on the malar area, and it has few or no erect hairs on the clypeal disc (Figures 14, 61).

Minor workers of *C. subbarbatus* are difficult to identify because the median notch in the clypeus, which is the main character for distinguishing the subgenera, is not clearly evident. Occasional minors of *C. subbarbatus* have a darker gaster with less obvious stripes and could be confused with *C. decipiens* or *C. snellingi*, both of which lack erect hairs on the malar area of the head.

Although *Camponotus subbarbatus* was only recently discovered in Mississippi (MacGown and Brown, 2006), it appears to be relatively common, especially in the northern half of the state, in rich mixed and deciduous forests where it nests in rotting wood. This species readily comes to tuna bait and has been found foraging on dead pine trees and on the ground. It has also been collected from nuts of *Carya glabra*. In late fall 2003 in Oktibbeha County, J.G. Hill found a colony inside a small, well-rotted, deciduous branch on the ground with all castes present including alate males and queens. Alates have been collected on April 13 and October 29.

This is a common species along the Atlantic coastal states from New England to Georgia and west to Tennessee, Mississippi, Iowa, Kansas, Michigan, and Ohio (Smith, 1979; Snelling, 1988), but it has not yet been found in Florida (Deyrup, 2003). *Camponotus subbarbatus* has been found in these Mississippi counties: Calhoun, Carroll, Clay, DeSoto, Grenada, Hinds, Itawamba, Kemper, Lafayette, Lauderdale, Leake, Lowndes, Madison, Marshall, Montgomery, Noxubee, Oktibbeha, Pontotoc, Tishomingo, Union, Webster, and Winston (MEM).

Subgenera Myrmothrix *Forel*

Species in this subgenus can easily be distinguished from other subgenera found in Mississippi by their abundant pilosity that covers the entire body, including the scapes and tibiae. There is only one species of *Myrmothrix* found in Mississippi — *Camponotus floridanus*.

Camponotus (*Myrmothrix*) *floridanus* (Buckley)

Figures 44, 62, Map 14

Camponotus floridanus is an average to large ant, ranging in length from approximately 6.5–12 mm. Both workers and queens have a reddish-brown head, alitrunk, petiole, and legs, as well as a shiny blackish to black gaster. This species has abundant pilosity covering the entire body, including the scapes and tibiae, with the erect hairs of the alitrunk curved and directed toward the head (Figures 20, 44).

Map 14. Distribution of *Camponotus floridanus* in Mississippi.

Camponotus floridanus is somewhat similar to *C. socius* — having long erect hairs on the head and body — but it differs in that it is very shiny, rather than opaque. Furthermore, it has a black gaster (Figure 44), instead of a banded gaster, and it has erect setae on the scapes (Figure 15), which are lacking in *C. socius*.

Camponotus floridanus typically nests in and under rotting logs and stumps, usually in damp areas. However, J. Hill found a colony nesting in sand under a log on dunes on Dauphin Island in Mobile County, Alabama. This species is considered to be a house-infesting ant and may nest in the woodwork of buildings, feed on household foods, and damage bee hives (Smith, 1979). It is a common ant in Florida, but in Mississippi, *C. floridanus* appears to be restricted to the coast where it nests in wood. Alates have been collected from May 22 through June 22.

This species ranges from North Carolina to Florida and west to southern Mississippi (Smith, 1979). In Mississippi, this species has only been collected in Jackson County (MEM), although it is probably found throughout the coastal counties.

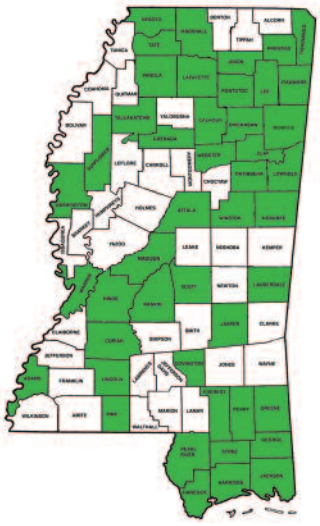
Subgenus Tanaemyrmex *Ashmead*

Species in the subgenus *Tanaemyrmex* are large ants with workers ranging in length from approximately 6–14 mm. The clypeus is usually distinctly carinate. If weakly carinate, then the antennal scapes are flattened at the base. The clypeal fossae are shallow, and the heads of major workers are as long as broad or distinctly longer than broad. This subgenus includes only two species in Mississippi.

Camponotus (*Tanaemyrmex*) *castaneus* (Latreille)

Figures 32, 47, Map 15

This species lacks an evident median carina on the clypeus; consequently, it has been moved back and forth between the *Tanaemyrmex* and *Camponotus* subgenera. *Camponotus castaneus* workers range in length from 7–11 mm or more. All of the castes of *C. castaneus* can be recognized by their color, which ranges from yellowish-red to orangish-brown, with the gaster sometimes slightly darker. This is a very shiny species, and most surfaces are at least partly glossy and shining with little pubescence present. The malar area usually lacks erect hairs (Figures 16, 47) (if present, then only two to six hairs and none near the eyes). Antennal scapes lack erect hairs, except apically. The base of scape is flattened and sometimes widened.



Map 15. Distribution of *Camponotus castaneus* in Mississippi.

This species is very similar to *C. americanus* but differs in that it is usually concolorous yellowish-red to orangish-brown and lacks erect hairs on the gena and usually the malar area (if erect hairs are present, then they are few and are absent on the sides of the head). *Camponotus americanus* has a head that is darker (often approaching black) than the rest of the body and has erect hairs on the gena and malar area (best seen in major workers).

Camponotus castaneus nests in rotting logs and stumps, in exposed soil, or in soil under objects. J. Hill observed a colony of this species in Oktibbeha County that was located approximately 1.5 meters above the ground between the trunk and a branch of an living *Juniperus virginiana* L. (eastern red cedar, Cupressaceae). The nest was constructed of grass thatch and soil incorporated in with the moss that was growing on the tree. Although *C. castaneus* sometimes nests in wood, it is not considered a serious pest of wood products. While ants of this species may be encountered in houses or other structures, they usually enter buildings only to search for food, rather than to nest in them. Alates have been collected from May 1 through June 19 and during September 24-27.

Camponotus castaneus has been reported in the United States from New York south to Florida west to Iowa, Oklahoma, and Texas (Smith, 1979). This species is very common and widespread in Mississippi and has been collected or reported from Adams, Attala, Calhoun, Chickasaw, Clay, Copiah, Covington, DeSoto, Forrest, George, Greene, Grenada, Hancock, Harrison, Hinds, Itawamba, Jackson, Jasper, Kemper, Lafayette, Lauderdale, Lee, Lincoln, Lowndes, Madison, Marshall, Monroe, Noxubee, Oktibbeha, Panola, Pearl River, Perry, Pike, Pontotoc, Prentiss, Rankin, Scott, Stone, Sunflower, Tallahatchie, Tate, Tishomingo, Union, Warren, Washington, Webster, and Winston counties (MEM). It was also reported in Mt. Olive (county unknown; there are several communities called Mt. Olive in Mississippi) (Smith, 1924c).

Camponotus (*Tanaemyrmex*) *socius* Roger

Figures 45, 63, Map 16

Camponotus socius is an average to large ant, ranging in length from about 6.5–13 mm. Workers and queens of this species are medium orangish-brown to dark orangish-brown, with all surfaces dull and opaque. The gaster has a banded appearance with orangish spots or wide orangish stripes against a dark brown background (Figure 45). The occipital corners, posterior margin, and sides of the head

Map 16. Distribution of *Camponotus socius* in Mississippi.

near the eyes have numerous long, erect hairs, but the gena and malar area have few or no erect hairs (Figures 17, 63). The anterior border of the clypeus is concave, and the lateral corners are rounded.

This species is very distinctive and can be recognized easily by the orange color, the banded orangish and dark-brown gaster, the long antennae, and the numerous long, erect setae found on the entire body and head (but not the scapes, as in *C. floridanus*). This is a beautiful species when seen alive in the field.

This species is apparently more common in the southern portion of Mississippi and seems to prefer somewhat sandy soils, where they make their nests. Nests are also made in branches and rotten logs that have been covered by sand (Smith, 1979). J. Hill discovered a colony in Wayne County at the base of a small southern red oak (*Q. falcata*) that had been almost completely girdled by fire in gopher tortoise breeding ground. Workers were observed foraging on the ground and on the lower limbs of nearby trees. Although active during the day, it seems to be more active nocturnally.

At one time, this species was considered an exotic import from Brazil (Smith, 1979), but now it seems more probable that it is a native to the United States (Deyrup *et al*., 2000). This species is known from North Carolina south to Florida and west to Louisiana (Smith, 1979). *Camponotus socius* has been collected in Mississippi from George, Harrison, Stone, and Wayne counties (MEM), as well as Bolivar County (Smith, 1924b).

Additional information on *Camponotus* and other ants is available on the MEM Formicidae of Alabama and Mississippi website at www.msstate.edu/org/mississippientmuseum/Researchtaxapages/Formicidaehome.html.

The information on insect control presented in this publication is for educational and preliminary planning purposes only. Specific insecticides (brand names or active ingredients) mentioned in this publication are used as examples only. Other appropriately labeled products containing similar active ingredients should provide similar levels of control. Always carefully read and follow the insecticide label.

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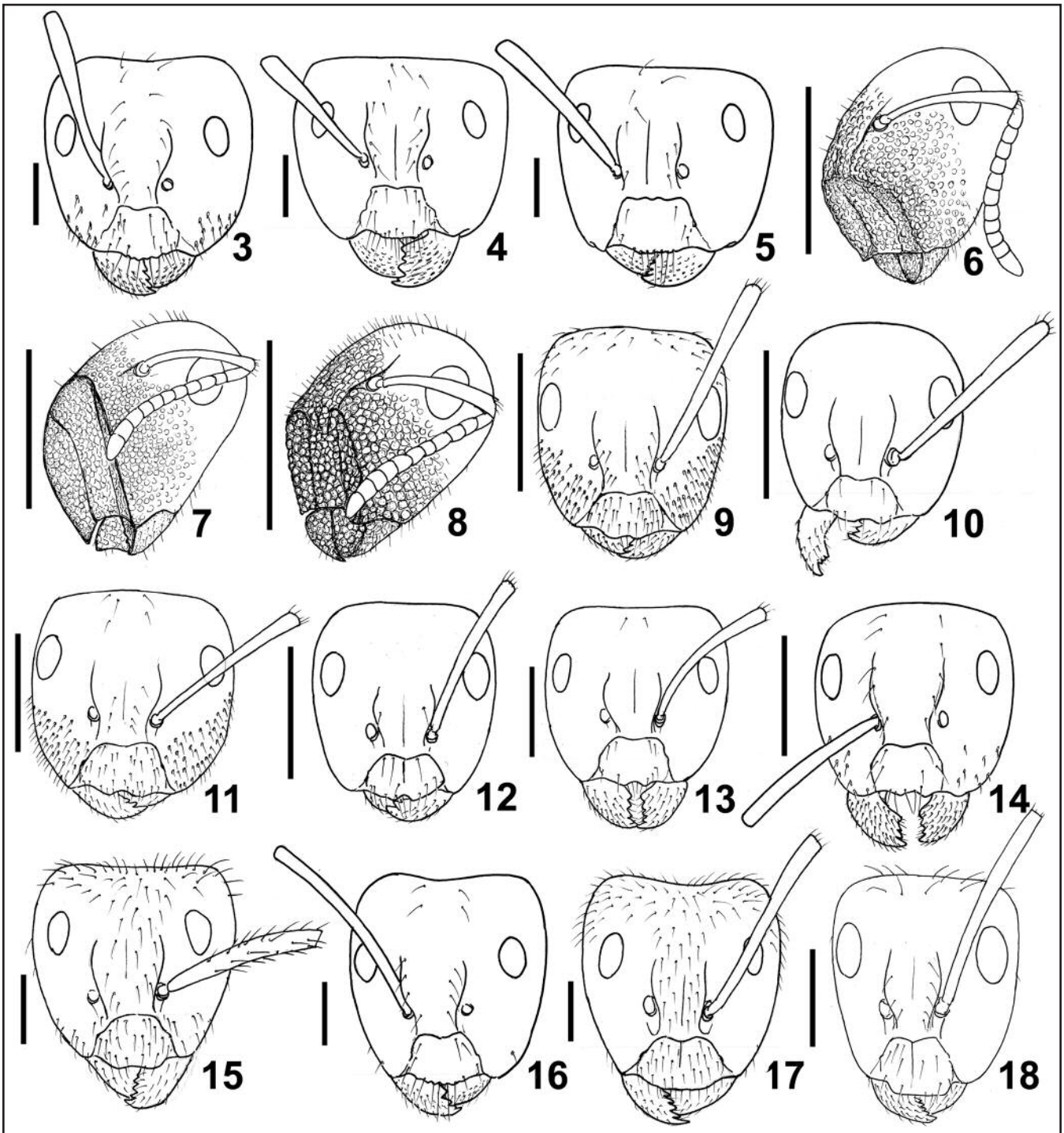
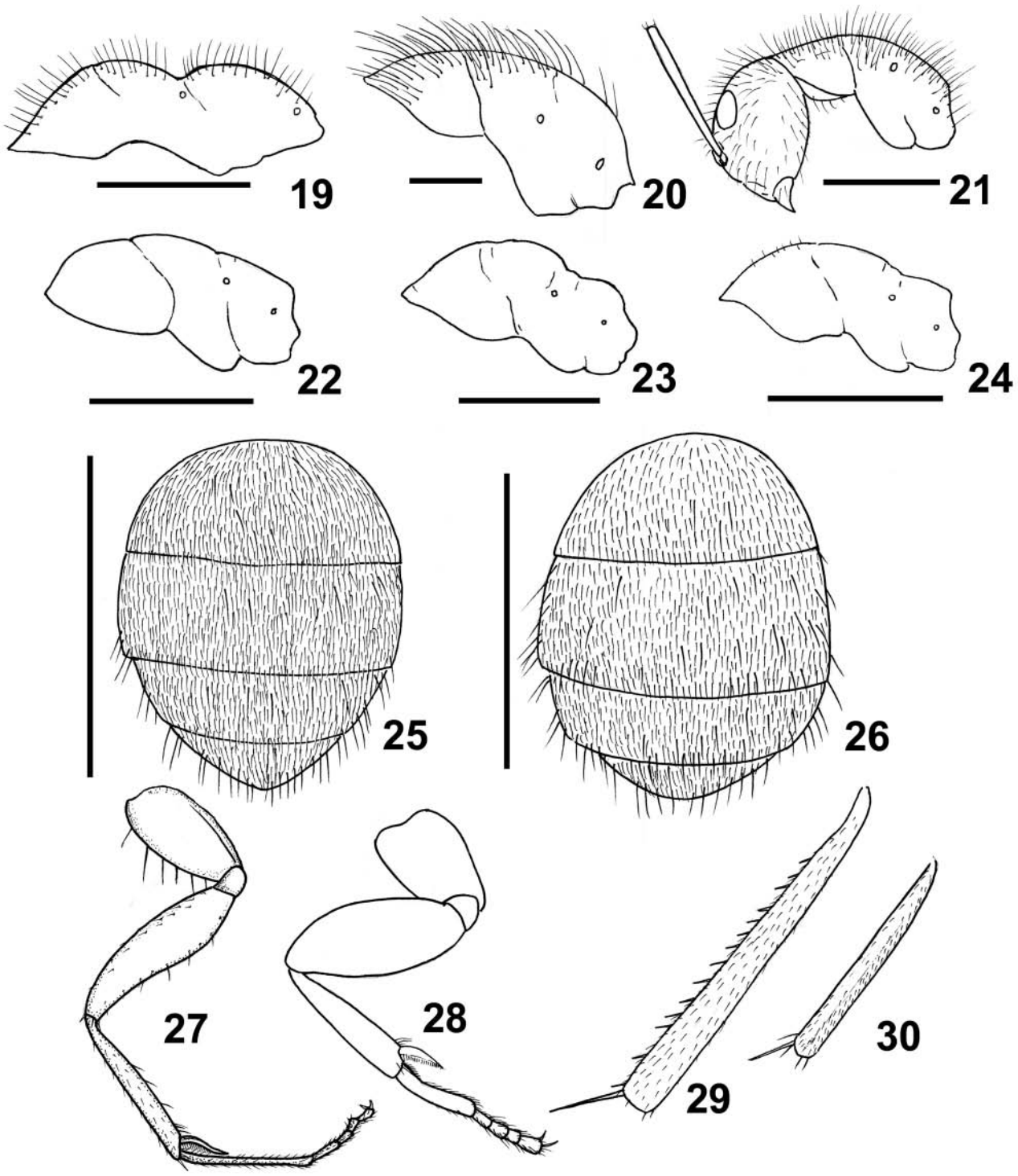
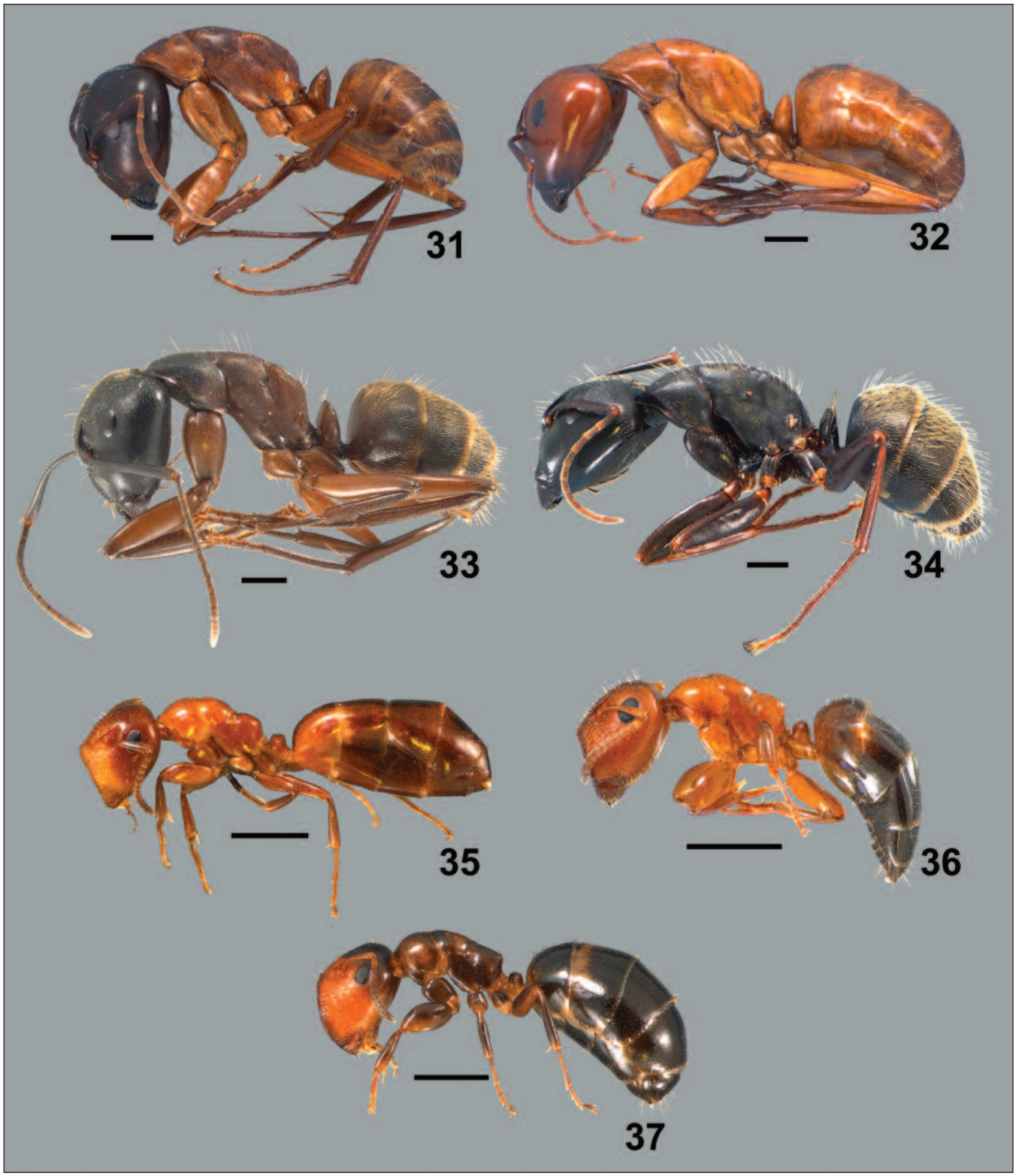


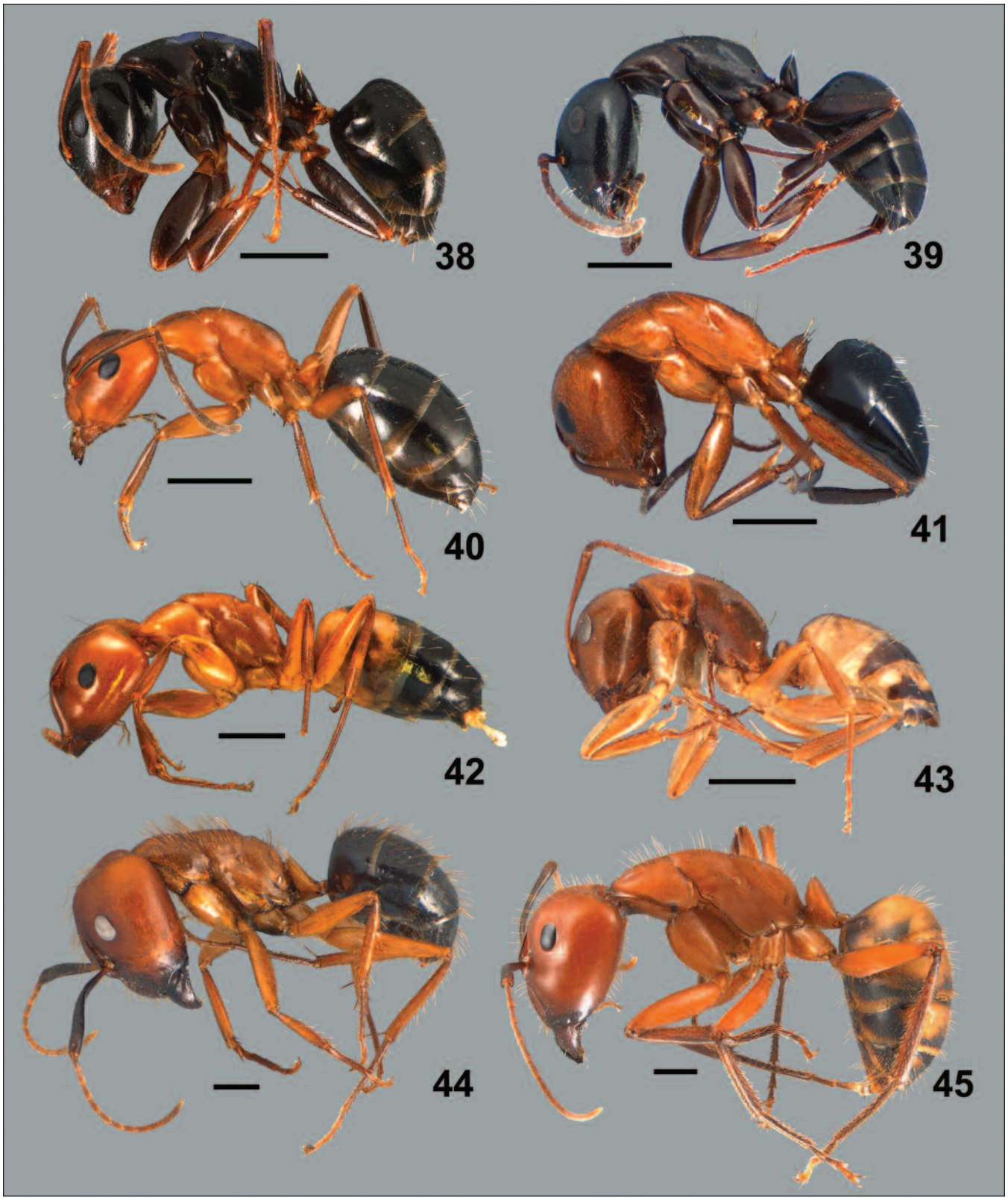
Figures 3–18. Heads of *Camponotus* spp. workers. **(3)** *C. americanus*, **(4)** *C. chromaiodes*, **(5)** *C. pennsylvanicus*, **(6)** *C. impressus*, **(7)** *C. mississippiensis*, **(8)** *C. obliquus*, **(9)** *C. caryae*, **(10)** *C. decipiens*, **(11)** *C. discolor*, **(12)** *C. nearcticus*, **(13)** *C. snellingi*, **(14)** *C. subbarbatus*, **(15)** *C. floridanus*, **(16)** *C. castaneus*, **(17)** *C. socius*, and **(18)** *C. tortuganus*. Scale bars equal 1.00 mm.



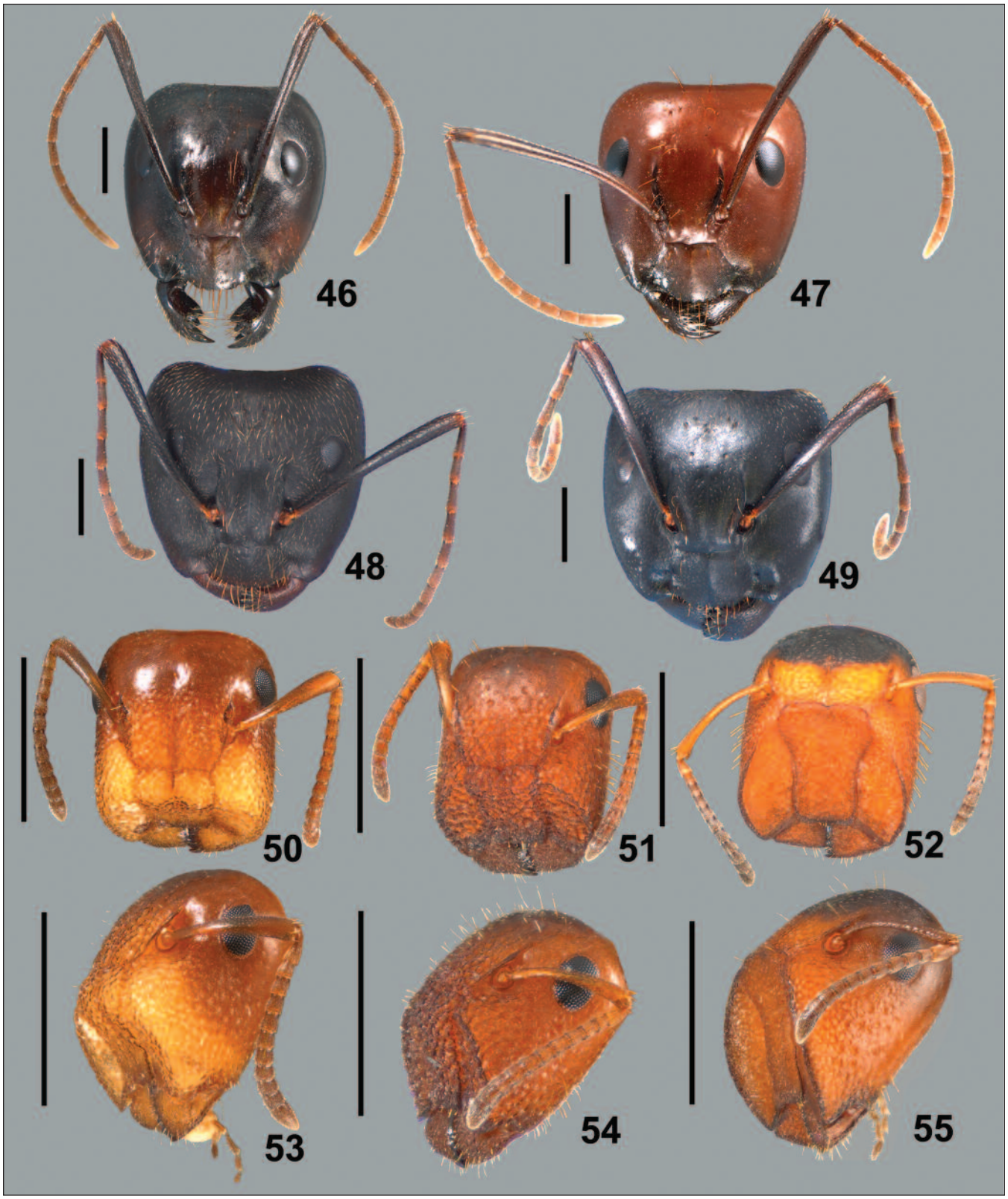
Figures 19–30. Alitrunk of **(19)** *Camponotus sexguttatus* and **(20)** *C. floridanus*; alitrunk and head of **(21)** *C. planatus*; alitrunk of **(22)** *C. mississippiensis*, **(23)** *C. impressus*, and **(24)** *C. obliquus*; dorsal view of the gaster of (**25)** *C. chromaiodes* and **(26)** *C. pennsylvanicus*; foreleg of **(27)** *C. castaneus* and **(28)** *C. impressus*; hind tibia of **(29)** *C. socius* and **(30)** *C. tortuganus*. Scale bars equal 1.00 mm.



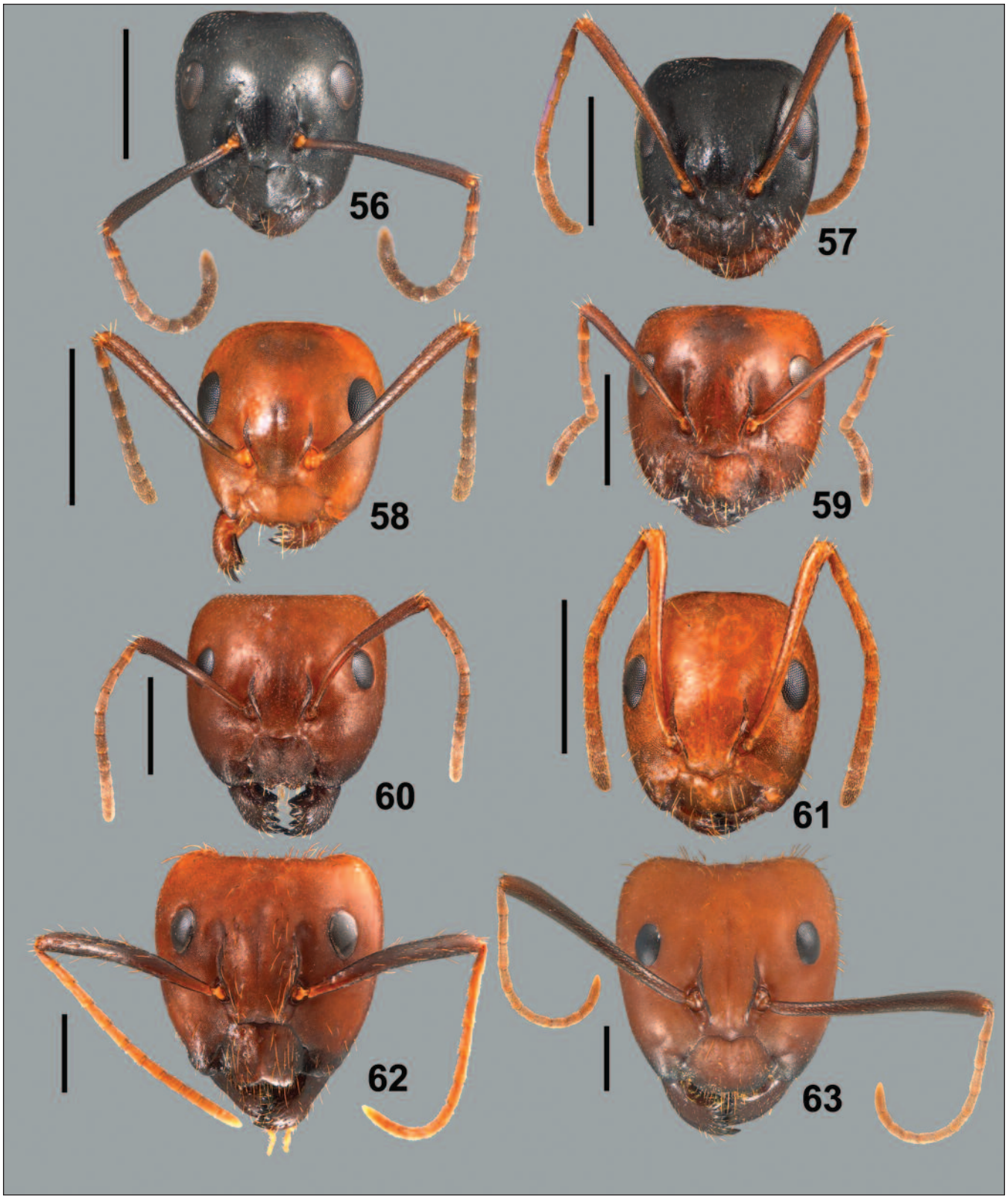
Figures 31–37. Profile views of *Camponotus* spp. workers: **(31)** *Camponotus americanus*, **(32)** *C. castaneus*, **(33)** *C. chromaiodes*, **(34)** *C. pennsylvanicus*, **(35)** *C. impressus*, **(36)** *C. obliquus*, and **(37)** *C. mississippiensis*. Scale bars equal 1.00 mm.



Figures 38–45. Profile views of *Camponotus* spp. workers: (**38**) *Camponotus nearcticus*, **(39)** *C. caryae*, (**40**) *C. decipiens*, **(41)** *C. discolor*, **(42)** *C. snellingi*, **(43)** *C. subbarbatus*, **(44)** *C. floridanus*, and **(45)** *C. socius*. Scale bars equal 1.00 mm.



Figures 46–55. Frontal views of heads of *Camponotus* spp. workers: **(46)** *Camponotus americanus*, **(47)** *C. castaneus*, **(48)** *C. chromaiodes*, **(49)** *C. pennsylvanicus*, **(50)** *C. impressus*, **(51)** *C. obliquus* and **(52)** *C. mississippiensis*. Angled views of heads of **(53)** *C. impressus*, **(54)** *C. obliquus*, and **(55)** *C. mississippiensis.* Scale bars equal 1.00 mm.



Figures 56–63. Frontal views of heads of *Camponotus* spp. workers: **(56)** *Camponotus nearcticus*, **(57)** *C. caryae*, **(58)** *C. decipiens*, **(59)** *C. discolor*, **(60)** *C. snellingi*, **(61)** *C. subbarbatus*, **(62)** *C. floridanus*, and **(63)** *C. socius*. Scale bar equals 1.00 mm.

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