

The Identification and Distribution of the Army Ants of the United States of America (Hymenoptera, Formicidae, Ecitoninae)

JULIAN F. WATKINS II

Department of Biology, Baylor University, Waco, Texas 76798

ABSTRACT: This paper contains a taxonomic list of the 26 species of army ants (Ecitoninae) in the United States of America, along with keys to the males and workers, 149 figures, distribution maps, a graph of male flight periods, discussion and cited references.

Although monographs of army ants of the United States (M. R. Smith, 1942) and the New World (Borgmeier, 1955; Watkins, 1976) have been published, they are difficult to use. Smith's paper is outdated and includes only 16 of the 26 presently known United States species, Borgmeier's is in German and does not include several recently described species, and the keys in both New World monographs are long and complex due to the necessity of including about 120 New World species of *Neivamyrmex*.

In addition to updating the nomenclature and including more current and detailed distribution maps, this present paper provides shorter and more useable keys for identifying the workers and males of the 26 species of United States army ants. One problem likely to be encountered in using these keys results from the close relationship and similar morphology of the workers of *N. texanus*, *N. nigrescens*, and *N. californicus* (Watkins, 1972). Although the males of *N. texanus* and *N. nigrescens* are distinct and easy to separate, the differences in the workers are more subtle and difficult to adequately describe in a key. The male of *N. californicus* is unknown and some workers are distinct from those of *N. nigrescens*; however, other workers from southern California are intermediate between these two species. Therefore, *N. californicus* may be only a western form of *N. nigrescens*, or, more correctly, *N. nigrescens* (1872) may be a form of *N. californicus* (1870).

Males of different army ant species are usually more distinct than the workers and can often be more positively identified, especially when their genitalia (Pl. 6, Fig. 4) are examined. Although extraction of the genitalia may damage the specimens and is time consuming, their examination will often result in a more accurate identification. Two U.S. species(?) whose males cannot be separated by differences in genitalia are *N. macropterus* and *N. fuscipennis* (Watkins, 1975). Males of *N. macropterus* from western Mexico with their large yellowish wings are easy to distinguish from males of *N. fuscipennis* from central Texas with their smaller blackish wings; however, males, which I judge to be *N. macropterus*, from west Texas, New Mexico, and Arizona have hyaline wings and are difficult to distinguish from some *N. fuscipennis* specimens.

The 26 species of army ants known from the United States are largely confined to the southern states (Pl. 11) and only five of these species (*N. opacithorax*, *N. carolinensis*, *N. nigrescens*, *N. texanus*, *N. pilosus*) extend east of the Mississippi River. While three species (*N. opacithorax*, *N. carolinensis*, *N. nigrescens*) are

each known from more than ten states, nine species (*Nomamyrmex esenbecki*, *Neivamyrmex agilis*, *N. melanocephalus*, *N. pauxillus*, *N. rugulosus*, *N. baylori*, *N. microps*, *N. mojave*, *N. nyensis*) are each known from a single state. In addition to *N. californicus* and *N. moseri*, the last four species listed above are known only from the United States. The remaining 20 U.S. species are also found in Mexico, with four of them extending into Central America, and four extending through Central and South America into northern Argentina (Watkins, 1976).

Army ants of U.S. species are mostly hypogaecic in their nesting, raiding, and migrating behavior, except those of *N. californicus*, *N. harrisi*, *N. nigrescens*, *N. opacithorax*, *N. pilosus*, *N. texanus*, and *N. esenbecki*, whose raids and migrations are often partially epigaecic, especially when the soil moisture is high. *Neivamyrmex pilosus* is the only U.S. species whose workers frequently extend their raiding columns up large trees. U.S. army ants prey largely on the brood of other ants; however, they sometimes include a variety of other insects.

Emergence of males is seasonal (Pl. 10) and most U.S. species fly at night except *N. nigrescens*, *N. opacithorax*, *N. texanus*, and probably *N. baylori*, *N. microps*, and *N. mojave* (Baldrige et al., 1980).

List of Species, Authors, Dates and Known Castes of
Army Ants in the United States of America
(w = worker, q = queen, m = male)

Labidus

coecus (Latreille, 1802), wqm

Neivamyrmex

agilis Borgmeier, 1953, w

andrei (Emery, 1901), m

baylori Watkins, 1973, m

californicus (Mayr, 1870), wq

carolinensis (Emery, 1894), wqm

fallax Borgmeier, 1953, w

fuscipennis (Wheeler, 1908), m

harrisi (Haldeman, 1852), wqm

leonardi (Wheeler, 1915), w

macropterus Borgmeier, 1953, m

melanocephalus (Emery, 1895), w

melsheimeri (Haldeman, 1852), m

microps Borgmeier, 1955, m

minor (Cresson, 1872), m

mojave (M. R. Smith, 1943), m

moseri Watkins, 1968, wq

nigrescens (Cresson, 1872), wqm

nyensis Watkins, 1977, w

opacithorax (Emery, 1894), wqm

pauxillus (Wheeler, 1903), wq

pilosus mandibularis (M. R. Smith, 1942), m

pilosus mexicanus (Fr. Smith, 1859), wqm

rugulosus Borgmeier, 1953, w
swainsoni (Shuckard, 1840), m
texanus Watkins, 1972, wqm
Nomamyrmex
esenbecki wilsoni (Santschi, 1920), wm

Keys to Genera of Army Ants of the United States

Workers

- 1. Posterodorsal corners of propodeum with angular projections (Pl. 2, Fig. 6) *Nomamyrmex*
- Posterodorsal corners of propodeum without angular projections (Pl. 2, Figs. 7-11) 2
- 2. Concave surface of tarsal claw with small tooth (Pl. 2, Fig. 4) ... *Labidus*
- Concave surface of tarsal claw without tooth (Pl. 2, Fig. 5) .. *Neivamyrmex*

Males

- 1. Gastric tergites with conspicuous tufts of long, dense setae (Pl. 6, Fig. 3) *Nomamyrmex*
- Gastric tergites without conspicuous tufts of long, dense setae 2
- 2. Subgenital plate with two apical teeth (Pl. 6, Fig. 6) *Labidus*
- Subgenital plate with three apical teeth—two large outer apical teeth and one very small inner subapical tooth (Pl. 6, Figs. 7-19) .. *Neivamyrmex*

Keys to Species of Army Ants of the United States

Nomamyrmex

Nomamyrmex esenbecki wilsoni is the only species of this genus known from the United States. Worker (Pl. 2, Figs. 1, 6; Pl. 4, Fig. 1). Male (Pl. 6, Figs. 1, 3, 5; Pl. 7, Fig. 2; Pl. 8, Fig. 16; Pl. 9, Fig. 1).

Labidus

Labidus coecus is the only species of this genus known from the United States. Worker (Pl. 2, Figs. 2-4, 7; Pl. 4, Fig. 2). Male (Pl. 6, Figs. 2, 6; Pl. 7, Fig. 1; Pl. 8, Fig. 17; Pl. 9, Fig. 2).

Neivamyrmex

Workers

- 1. Anteroventral tooth of petiole with a prominent acute spine directed posteroventrad (Pl. 2, Fig. 8); *caution*: petiole tooth may be concealed by metacoxa; entire body *usually* black to blackish brown *pilosus*
- Anteroventral tooth of petiole (if present) without a prominent acute spine directed posteroventrad (Pl. 2, Figs. 9-11; Pl. 3, Figs. 1-11); color variable, but never uniformly black 2
- 2. Reddish brown alitrunk distinctly lighter in color than blackish brown head and gaster; concave portion of posterior head margin slightly narrower than greatest width of alitrunk (dorsal view, Pl. 4, Fig. 4) *melanocephalus*

- Alitrunk not distinctly lighter in color than head and gaster; concave portion of posterior bead margin as wide or wider than greatest width of alitrunk (dorsal view, Pl. 4, Figs. 5-17) 3
- 3. Head densely granulated (i.e., texture like sandpaper) 4
- Head not densely granulated, but may have numerous punctations (i.e., setae-bearing depressions) 6
- 4. Inner basal surface of mandible with a straight edge which forms an angular corner at its juncture with the masticatory surface (Pl. 1, Fig. 6); petiole node only slightly longer than wide (dorsal view, Pl. 4, Fig. 8) *rugulosus*
- Inner basal surface of mandible with a convex edge which curves into the masticatory surface without forming an angular corner (Pl. 1, Figs. 3, 4); length of petiole node about 1.5 times its width (dorsal view, Pl. 4, Figs. 6, 7) 5
- 5. Declining surface of propodeum slightly concave and forms a somewhat angular corner with its dorsal surface (lateral view, Pl. 2, Fig. 11) ..
..... *texanus*
- Declining surface of propodeum not concave and forms a rounded corner with its dorsal surface (lateral view, Pl. 2, Fig. 10) *nigrescens*
- 6. Node of petiole elongate (dorsal view, Pl. 4, Figs. 5, 9, 12, 13) 7
- Node of petiole subquadrate (dorsal view, Pl. 4, Figs. 10, 11, 14-17).. 10
- 7. Suture between promesonotum and mesopleuron complete and distinct (major worker, lateral view, Pl. 3, Fig. 6); dorsum of node of petiole more elevated posteriorly (lateral view, Pl. 3, Fig. 6) *agilis*
- Suture between promesonotum and mesopleuron incomplete (lateral view, Pl. 3, Figs. 1, 3, 7); dorsum of node of petiole not more elevated posteriorly (lateral view, Pl. 3, Figs. 1, 3, 7) 8
- 8. Basal surface of mandible with a small tooth shortly before its juncture with the masticatory surface (Pl. 1, Fig. 11); dorsum of mesonotum and propodeum form a level surface (lateral view, Pl. 3, Fig. 7); eye reduced to a yellow speck below cuticle and without a distinct cornea (Pl. 1, Fig. 11) *nyensis*
- Basal surface of mandible without a small tooth shortly before its juncture with the masticatory surface (Pl. 1, Figs. 5, 7); dorsum of propodeum slightly to moderately depressed below dorsum of mesonotum (lateral view, Pl. 3, Figs. 1, 3); eye with a distinct convex cornea (Pl. 1, Fig. 5, 7) 9
- 9. Inner basal surface of mandible with a convex edge which curves into the masticatory surface without forming an angular corner (Pl. 1, Fig. 5); lateral surface of pronotum *usually* completely granulated
..... *californicus*
- Inner basal surface of mandible with a straight edge which forms an angular corner or small tooth at its juncture with the masticatory surface (Pl. 1, Fig. 7); lateral surface of pronotum *usually* partially smooth *opacithorax*
- 10. Eye ocellus-like with a distinct convex cornea (Pl. 1, Figs. 8, 9) 11
- Eye absent or reduced to a yellow speck below the cuticle without a convex cornea (Pl. 1, Figs. 12-15) 12

- 11. Largest workers more than 4 mm long, with angular posterior head corners (lateral view, Pl. 3, Fig. 4); frontal carina curves in front of antennal fossa to form a broad lamella which gradually narrows laterally (Pl. 1, Fig. 8) *harrisi*
 - Largest workers less than 4 mm long, with rounded posterior head corners (lateral view, Pl. 3, Fig. 5); frontal carina abruptly narrows in front of antennal fossa to form a narrow lamella which may be incomplete (Pl. 1, Fig. 9) *carolinensis*
- 12. Basal tooth of mandible broadly triangular (Pl. 1, Figs. 12, 13) 13
 - Basal tooth of mandible "thumb-like" (Pl. 1, Figs. 14, 15) 14
- 13. Frontal carina continues completely around front of antennal fossa as a broad upturned lamella causing the rim of the fossa to be almost as high in front as along its sides (Pl. 1, Fig. 12); dorsal surface of propodeum appears longer than declining surface (lateral view, Pl. 3, Fig. 8) *leonardi*
 - Frontal carina abruptly narrowed and does not form an upturned lamella around front of antennal fossa (Pl. 1, Fig. 13); declining surface of propodeum appears as long or longer than dorsal surface (lateral view, Pl. 3, Fig. 9) *fallax*
- 14. Occipital arch of head smooth and completely delimited from vertex and gena by a fine occipital suture or ridge (50×, posterodorsal view, Pl. 4, Fig. 16); mandible of major with a small to medium basal tooth plus four or more irregular masticatory teeth (ventral view, Pl. 1, Fig. 16) *pauxillus*
 - Occipital arch of head punctate and usually not completely delimited from lateral vertex and gena by an occipital suture or ridge (50×, posterodorsal view, Pl. 4, Fig. 17); mandible of major with a large basal tooth plus three unequal masticatory teeth (ventral view, Pl. 1, Fig. 17) *moseri*

Males

- 1. Mandible spatulate with distal half as broad or broader than basal portion (Pl. 5, Figs. 1-4) 2
 - Mandible usually sickle-shaped; i.e., at least slender and gradually tapered distally (*note: N. pilosus mexicanus* has a convex area along inner median portion of mandible) (Pl. 5, Figs. 5-20) 5
- 2. Distance from lateral ocellus to margin of compound eye about equal to or less than diameter of median ocellus (Pl. 5, Fig. 1) *harrisi*
 - Distance from lateral ocellus to margin of compound eye at least two times diameter of median ocellus (Pl. 5, Figs. 2-4) 3
- 3. Gaster black to blackish brown; setae on venter of petiole short (shorter than width of metatibia), whitish, slanted posteroventrally (Pl. 8, Fig. 20); prominent transverse swelling present above antennal fossa (Pl. 5, Fig. 2) *nigrescens*
 - Gaster reddish brown; setae on venter of petiole long (longer than width of metatibia), golden, erect (Pl. 8, Fig. 21); transverse swelling above antennal fossa weak to absent (Pl. 5, Figs. 3, 4) 4
- 4. Apex of stipes with a tall dorsal projection (Pl. 9, Fig. 5); mandible

- usually about equally wide along its entire length out to a tapered apex (Pl. 5, Fig. 3); length of body 11–13 mm *texanus*
- Apex of stipes without a dorsal projection (Pl. 9, Fig. 6); distal two-thirds of mandible usually slightly convex along its inner border (Pl. 5, Fig. 4); length of body 10–11 mm *opacithorax*
5. Distance from lateral ocellus to margin of compound eye less than diameter of median ocellus (Pl. 5, Figs. 6–8, 10, 12, 13, 15, 16) 6
- Distance from lateral ocellus to margin of compound eye about 1.5 to 3 times diameter of median ocellus (Pl. 5, Figs. 17–20) 12
6. Dorsal apical projection of sagitta elongated into a broad beak-like projection which extends well beyond the ventral apical projections (lateral view, Pl. 7, Figs. 8–10); dorsolateral surface of head forms a rounded corner between lateral ocellus and compound eye (frontal view, Pl. 5, Figs. 6–8) 7
- Dorsal apical projection of sagitta rounded, not elongated into a beak-like projection, and not extending far beyond the ventral projections (lateral view, Pl. 7, Figs. 7, 11–14); dorsolateral surface of head does not form a corner between lateral ocellus and compound eye (frontal view, Pl. 5, Figs. 10, 12, 13, 15, 16) 9
7. Volsella not forked (Pl. 8, Fig. 7); length of body less than 8 mm *melsheimeri*
- Volsella forked (Pl. 8, Figs. 8, 9); length of body more than 8 mm 8
8. Forewing lightly to darkly infuscated and relatively short (about 2.5 times length of alitrunk); distance from lateral ocellus to compound eye usually about one-half diameter of median ocellus (Pl. 5, Fig. 7) *fuscipennis*
- Forewing hyaline to yellowish brown and relatively long (about 3 times length of alitrunk); distance from lateral ocellus to compound eye usually about one-fourth (or less) diameter of median ocellus (Pl. 5, Fig. 8) *macropterus*
9. Mandible with a slight (*N. pilosus mandibularis*) to moderate (*N. pilosus mexicanus*) convex area along the inner median surface (Pl. 5, Figs. 10, 12); occipital margin of head distinctly upturned (Pl. 5, Figs. 9, 11) *pilosus*
- Mandible distinctly sickle-shaped; i.e., distally curved inward and gradually tapered to sharp apex (Pl. 5, Figs. 13, 15, 16); occipital margin of head not upturned (Pl. 5, Fig. 14) 10
10. Front coxa about as wide as long (Pl. 8, Fig. 18); apex of stipes divided into a long rectangular dorsal process and a large triangular ventral process (Pl. 9, Fig. 12) *andrei*
- Front coxa longer than wide (Pl. 8, Fig. 19); apex of stipes not divided into dorsal and ventral processes (Pl. 9, Figs. 13, 14) 11
11. Length of body 7–9 mm; length of mandible about equals height of compound eye (Pl. 5, Fig. 15); dorsal border of stipes broadly triangular (Pl. 9, Fig. 13) *minor*
- Length of body 11–13 mm; length of mandible distinctly greater than height of compound eye (Pl. 5, Fig. 16); dorsal border of stipes not triangular (Pl. 9, Fig. 14) *swainsoni*

12. Dorsolateral surface of head forms a rounded corner between lateral ocellus and compound eye (frontal view, Pl. 5, Fig. 17); length of body 5–6 mm *baylori*
 – Dorsolateral surface of head does not form a corner between lateral ocellus and compound eye (frontal view, Pl. 5, Figs. 18–20); length of body 8–11 mm 13
13. Distal one-half of mandible slightly curves inward—almost straight (Pl. 5, Fig. 18); volsella not forked (Pl. 8, Fig. 14); length of body 10–11 mm *carolinensis*
 – Distal one-half of mandible strongly curved inward (Pl. 5, Figs. 19, 20); volsella forked (Pl. 8, Fig. 15); length of body 8–9 mm 14
14. Stipes slightly indented along its posterior surface and with a strongly angular (about 90°) posterodorsal corner (lateral view, Pl. 9, Fig. 17); proximal segment of protarsus about one-half as long as protibia ..
 *mojave*
 – Stipes broadly rounded apically and with a broadly triangular (about 120°) dorsal subapical projection (lateral view, Pl. 9, Fig. 18); proximal segment of protarsus distinctly shorter than one-half length of protibia
 *microps*

Acknowledgments

Although too numerous to list them all here, I appreciate the many individuals and institutions which have contributed to the collection records accumulated during the past 24 years upon which the distribution maps in this publication are based. In addition to many publications, records include data from collection lists and thousands of specimens sent to me for identification or examined at various institutions including the National Museum of Natural History, American Museum of Natural History, Los Angeles County Museum of Natural History, University of Kansas, Kansas State University, North Carolina State University, University of Florida and Baylor University. This research was supported by a University Research Committee Grant 005-F83-URC and the Department of Biology of Baylor University.

Literature Cited

- Baldrige, R. S., C. W. Rettenmeyer, and J. F. Watkins. 1980. Seasonal, nocturnal and diurnal flight periodicities of Nearctic army ant males (Hymenoptera: Formicidae). *J. Kansas Entomol. Soc.* 53:189–204.
- Borgmeier, T. 1953. Vorarbeiten zu einer Revision der neotropischen Wanderameisen. *Studia Entomol.*, Nr. 2, 51 pp., 35 figs. (*N. agilis*, p. 45; *N. fallax*, p. 48, figs. 31, 33; *N. macropterus*, p. 40, figs. 14, 16; *N. rugulosus*, p. 49)
- . 1955. Die Wanderameisen der neotropischen Region (Hym. Formicidae). *Studia Entomol.*, Nr. 3, 716 pp., 87 pls. (*N. microps*, p. 635, taf. 56, figs. 6, 10)
- Cresson, E. T. 1872. Hymenoptera Texana. *Trans. Amer. Entomol. Soc.* 4:153–292. (*N. minor*, p. 195; *N. nigrescens*, p. 194)
- Emery, C. 1894. Studi sulle formiche della fauna neotropica. *Bull. Soc. Entomol. Ital.* 26:137–242, pls. 1–4. (*N. carolinensis*, *N. opacithorax*, p. 184)
- . 1895. Beitrage zur kenntnis der nordamerikanischen Ameisenfauna. *Zool. Jahrb. Syst.* 8:257–360, 1 pl. (*N. melanocephalus*, p. 260; *N. opacithorax*, p. 259)
- . 1901. Note sulle Doriline. *Bull. Soc. Entomol. Ital.* 33:43–56, 8 figs. (*N. andrei*, p. 53, fig. 6)

- Haldeman, S. S. 1852. Insects, in Stansbury's exploration and survey of the valley of the Great Salt Lake of Utah. Philadelphia, Lippincott, Grambo, pp. 366-379, pls. 9-10. (*N. harrisi*, p. 367, pl. 9, figs. 4-6; *N. melsheimeri*, p. 368, pl. 9, figs. 7-9)
- Latreille, P. A. 1802. Histoire naturelle des fourmis. Paris, 1. (*L. coecus*, pp. 270-271, pl. 9, fig. 56)
- Mayr, G. 1870. Neue Formiciden. Verh. z. b. Ges. Wien 20:939-996. (*N. californicus*, p. 969)
- Santschi, F. 1920. Formicides africains et americains nouveaux. Ann. Soc. Entomol. France 88:361-390, 16 figs. (*Nomamyrmex esenbecki wilsoni*, p. 366)
- Shuckard, W. E. 1840. Monograph of the Dorylidae, a family of the Hymenoptera Heterogyna. Ann. Natur. Hist. or Mag. Zool. Bot. and Geol. 5:188-201, 258-272, 315-329, 396-398. (*N. swainsoni*, p. 201)
- Smith, F. 1859. Catalogue of the hymenopterous insects in the collection of the British Museum 7, 76 pp., 3 pls. (*N. pilosus mexicanus*, p. 7)
- Smith, M. R. 1942. The legionary ants of the United States belonging to *Eciton* subgenus *Neivamyrmex* Borgmeier. Amer. Midl. Natur. 27:537-596, 23 figs. (*N. pilosus mandibularis*, p. 548, pl. 3, fig. 14)
- . 1943. A new male legionary ant from the Mojave Desert, California. Lloydia 6:196-197, fig. 1.
- Watkins, J. F. 1968. A new species of *Neivamyrmex* (Hymenoptera: Formicidae) from Louisiana. J. Kansas Entomol. Soc. 41:528-531, figs. 1-7.
- . 1972. The taxonomy of *Neivamyrmex texanus*, n. sp., *N. nigrescens* and *N. californicus* (Formicidae: Dorylinae), with distribution map and keys to the species of *Neivamyrmex* of the United States. J. Kansas Entomol. Soc. 45:347-372, 64 figs.
- . 1973. *Neivamyrmex baylora*, n. sp. (Formicidae: Dorylinae) from Waco, Texas, U.S.A. J. Kansas Entomol. Soc. 46:430-433, figs. 1-8.
- . 1975. The relationship of *Neivamyrmex fuscipennis* to *N. macropterus* (Dorylinae: Formicidae). Southwest Natur. 20:85-90.
- . 1976. The Identification and Distribution of New World Army Ants (Dorylinae: Formicidae). Baylor Univ. Press, Waco, Texas. 102 pp., 20 pls.
- . 1977. *Neivamyrmex nyensis*, n. sp. (Formicidae: Dorylinae) from Nye County, Nevada, U.S.A. Southwest. Natur. 22:421-425, figs. 1-4.
- Wheeler, W. M. 1903. A decade of Texan Formicidae. Psyche 10:93-111, 10 figs. (*N. pauxillus*, p. 93, fig. 1)
- . 1908. The ants of Texas, New Mexico and Arizona. Bull. Amer. Mus. Nat. Hist. 24:399-485, 2 pls. (*N. fuscipennis*, p. 417)
- . 1915. Some additions to the North American ant-fauna. Bull. Amer. Mus. Nat. Hist. 34:389-421. (*N. leonardi*, p. 392)

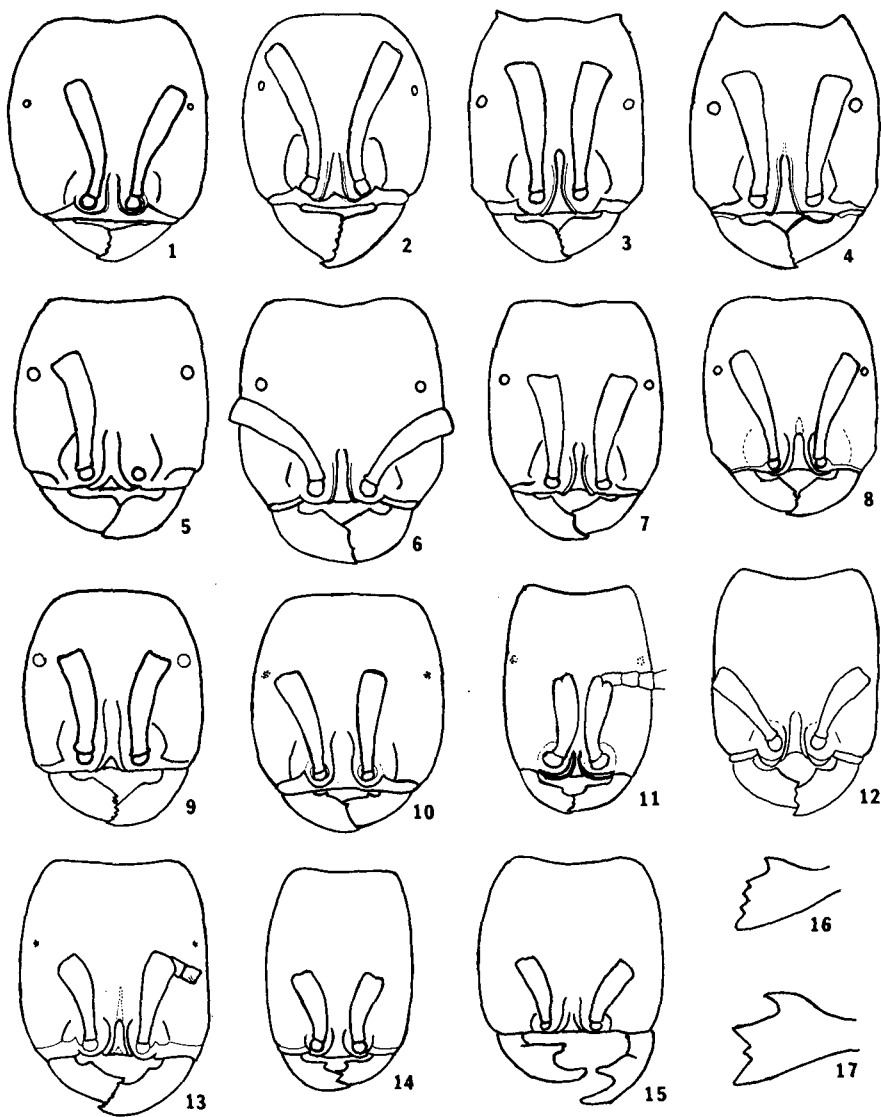


Plate 1. Figs. 1-17. 1-15. Heads of workers of (1) *Neivamyrmex pilosus mexicanus*, (2) *N. melanocephalus*, (3) *N. nigrescens*, (4) *N. texanus*, (5) *N. californicus*, (6) *N. rugulosus*, (7) *N. opacithorax*, (8) *N. harrisi*, (9) *N. carolinensis*, (10) *N. agilis*, (11) *N. nyensis*, (12) *N. leonardi*, (13) *N. fallax*, (14) *N. pauxillus*, (15) *N. moseri*. 16, 17. Mandibles of (16) *N. pauxillus*, (17) *N. moseri*.

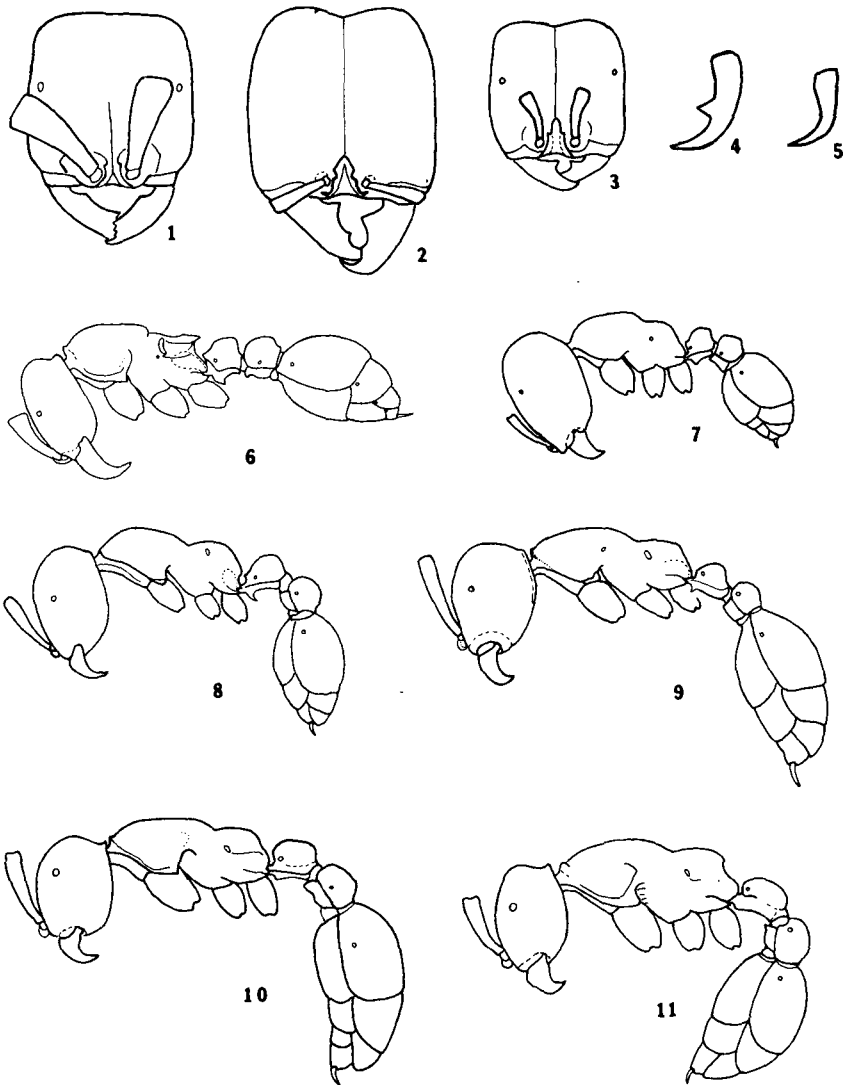


Plate 2. Figs. 1-11. 1-3. Heads of workers of (1) *Nomamyrmex esenbecki wilsoni*, (2) *Labidus coecus major*, (3) *L. coecus median*. 4, 5. Claws of (4) *L. coecus*, (5) *Neivamyrmex pilosus*. 6-11. Lateral views of workers of (6) *Nomamyrmex esenbecki wilsoni*, (7) *Labidus coecus*, (8) *Neivamyrmex pilosus mexicanus*, (9) *N. melanocephalus*, (10) *N. nigrescens*, (11) *N. texanus*.

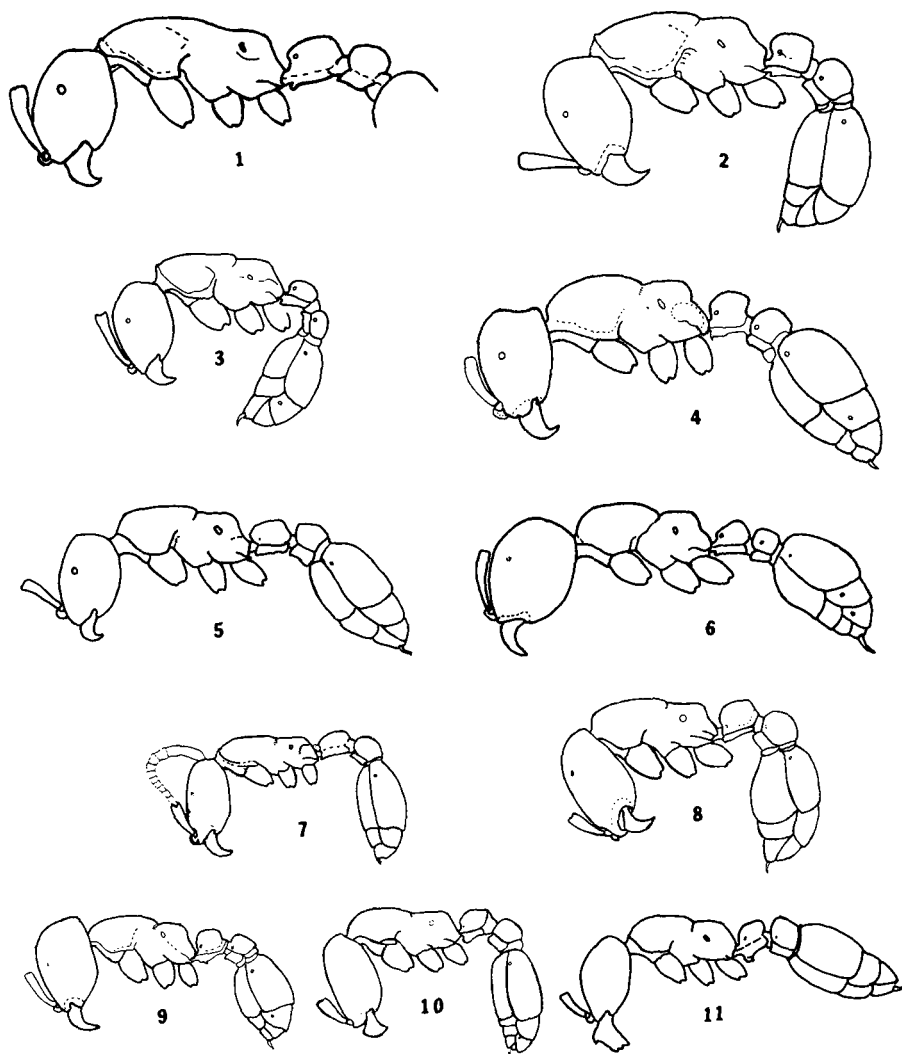


Plate 3. Figs. 1-11. Lateral views of workers of (1) *Neivamyrmex californicus*, (2) *N. rugulosus*, (3) *N. opacithorax*, (4) *N. harrisi*, (5) *N. carolinensis*, (6) *N. agilis*, (7) *N. nyensis*, (8) *N. leonardi*, (9) *N. fallax*, (10) *N. pauxillus*, (11) *N. moseri*.

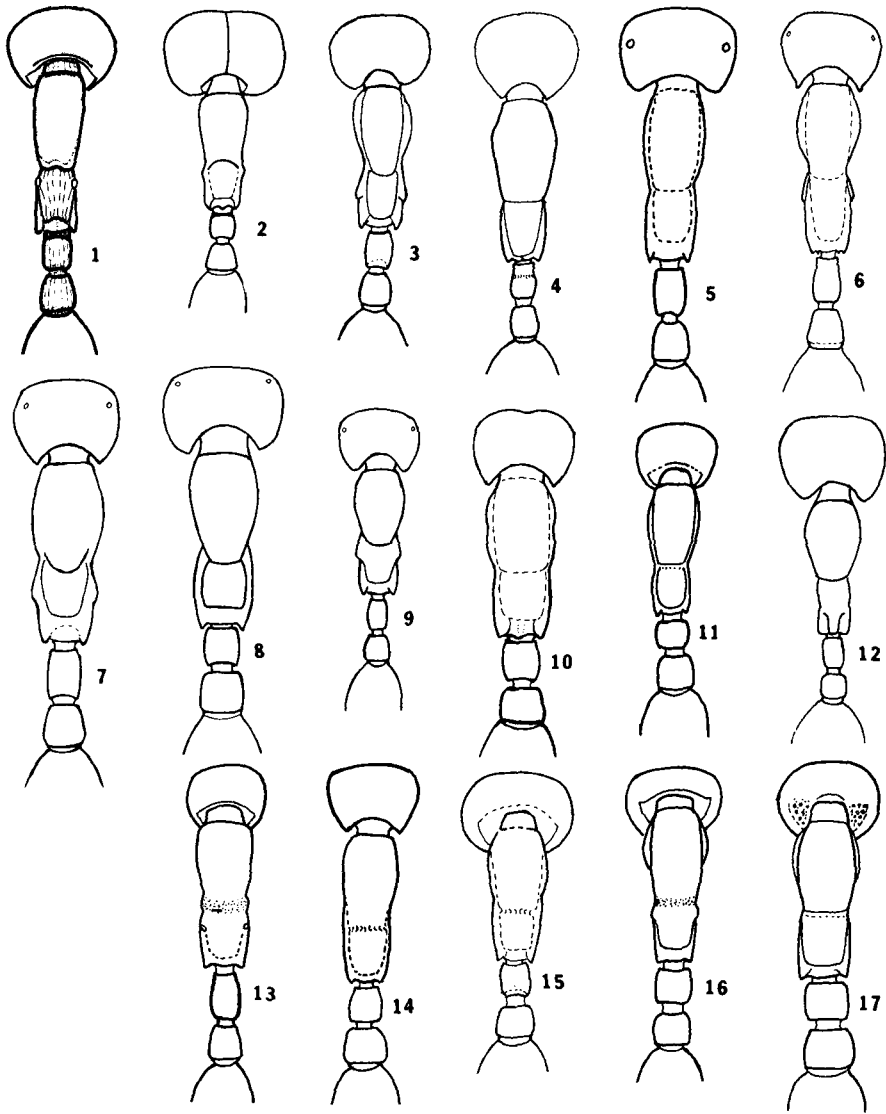


Plate 4. Figs. 1-17. Dorsal views of workers of (1) *Nomamyrmex esenbecki wilsoni*, (2) *Labidus coecus*, (3) *Neivamyrmex pilosus mexicanus*, (4) *N. melanocephalus*, (5) *N. californicus*, (6) *N. nigrescens*, (7) *N. texanus*, (8) *N. rugulosus*, (9) *N. opacithorax*, (10) *N. harrisi*, (11) *N. carolinensis*, (12) *N. agilis*, (13) *N. nyensis*, (14) *N. leonardi*, (15) *N. fallax*, (16) *N. pauxillus*, (17) *N. moseri*.

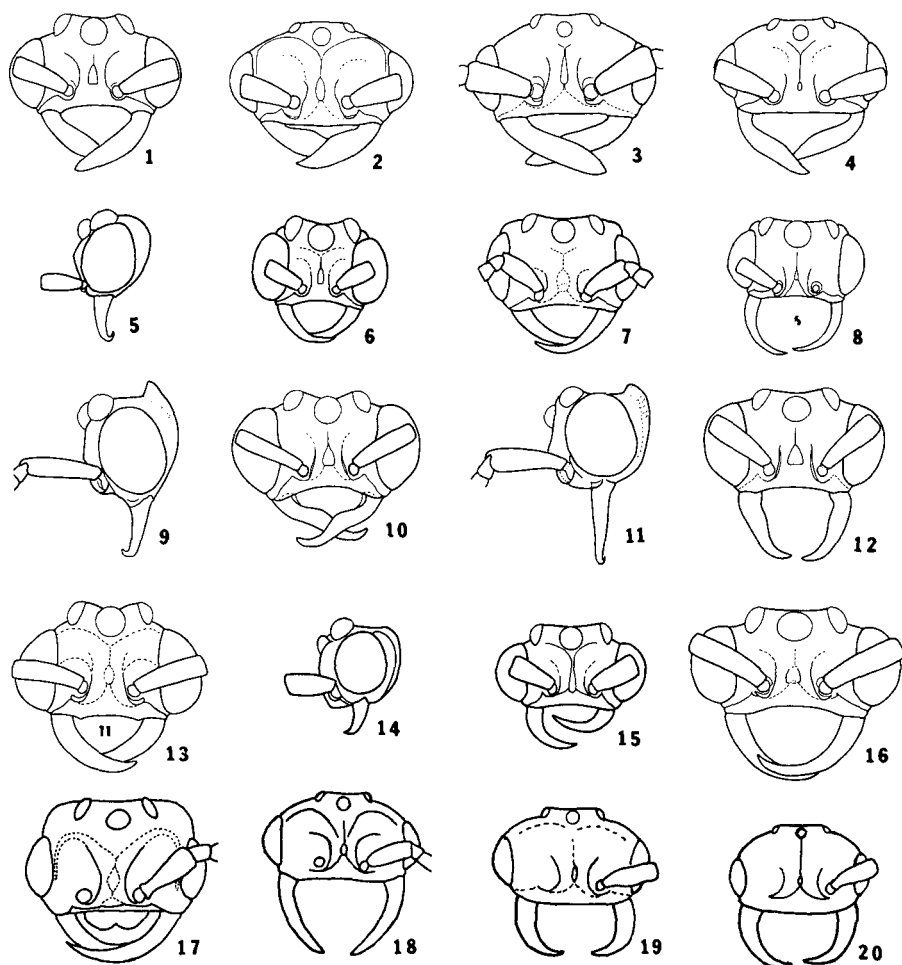


Plate 5. Figs. 1–20. Heads of males of (1) *Neivamyrmex harrisi*, (2) *N. nigrescens*, (3) *N. texanus*, (4) *N. opacithorax*, (5, 6) *N. melsheimeri*, (7) *N. fuscipennis*, (8) *N. macropterus*, (9, 10) *N. pilosus mexicanus*, (11, 12) *N. pilosus mandibularis*, (13) *N. andrei*, (14, 15) *N. minor*, (16) *N. swainsoni*, (17) *N. baylora*, (18) *N. carolinensis*, (19) *N. mojave*, (20) *N. microps*.

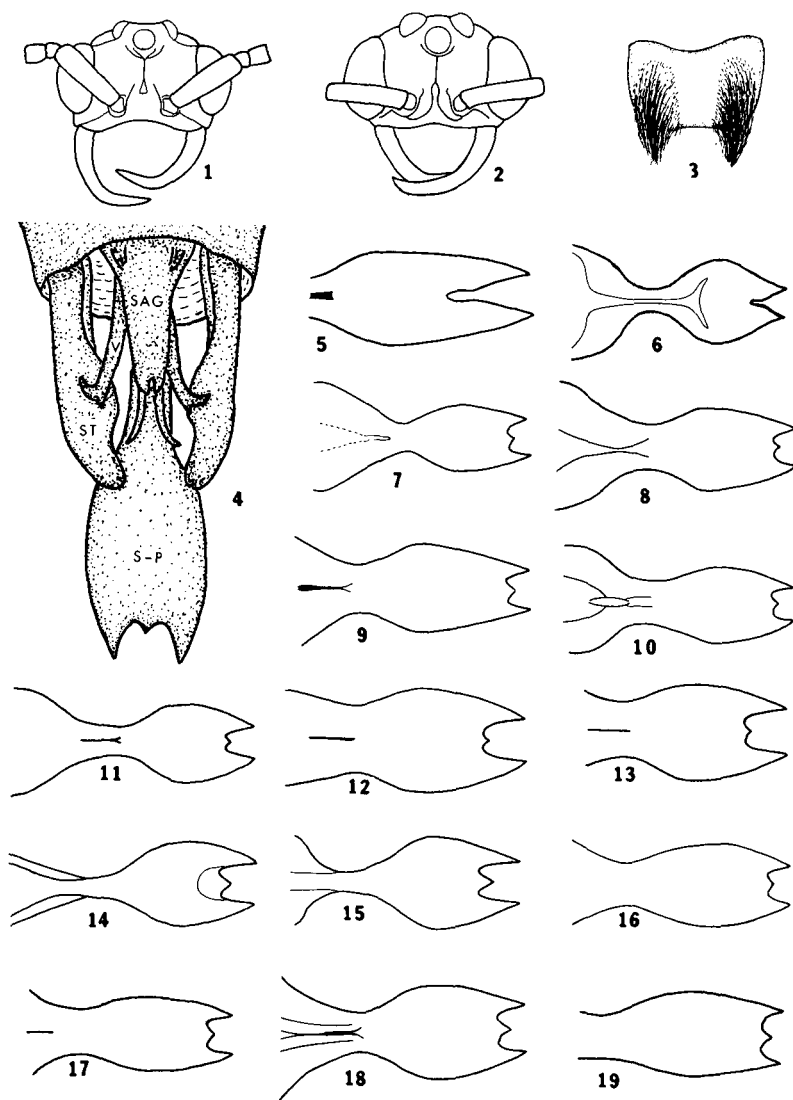


Plate 6. Figs. 1-19. 1, 2. Heads of males of (1) *Nomamymex esenbecki wilsoni*, (2) *Labidus coecus*. 3. Dorsal view of fifth tergite of male of (3) *Nomamymex esenbecki wilsoni*. 4. Genitalia of male of (4) *Neivamymex swainsoni* with apical gastric segments removed (SAG = sagitta, V = volsella, ST = stipes, S-P = subgenital plate). 5-19. Subgenital plates of males of (5) *Nomamymex esenbecki wilsoni*, (6) *Labidus coecus*, (7) *Neivamymex harrisi*, (8) *N. nigrescens*, (9) *N. texanus*, (10) *N. opacithorax*, (11) *N. melsheimeri*, (12) *N. fuscipennis*, (13) *N. macropterus*, (14) *N. pilosus mexicanus*, (15) *N. pilosus mandibularis*, (16) *N. andrei*, (17) *N. minor*, (18) *N. swainsoni*, (19) *N. baylori*.

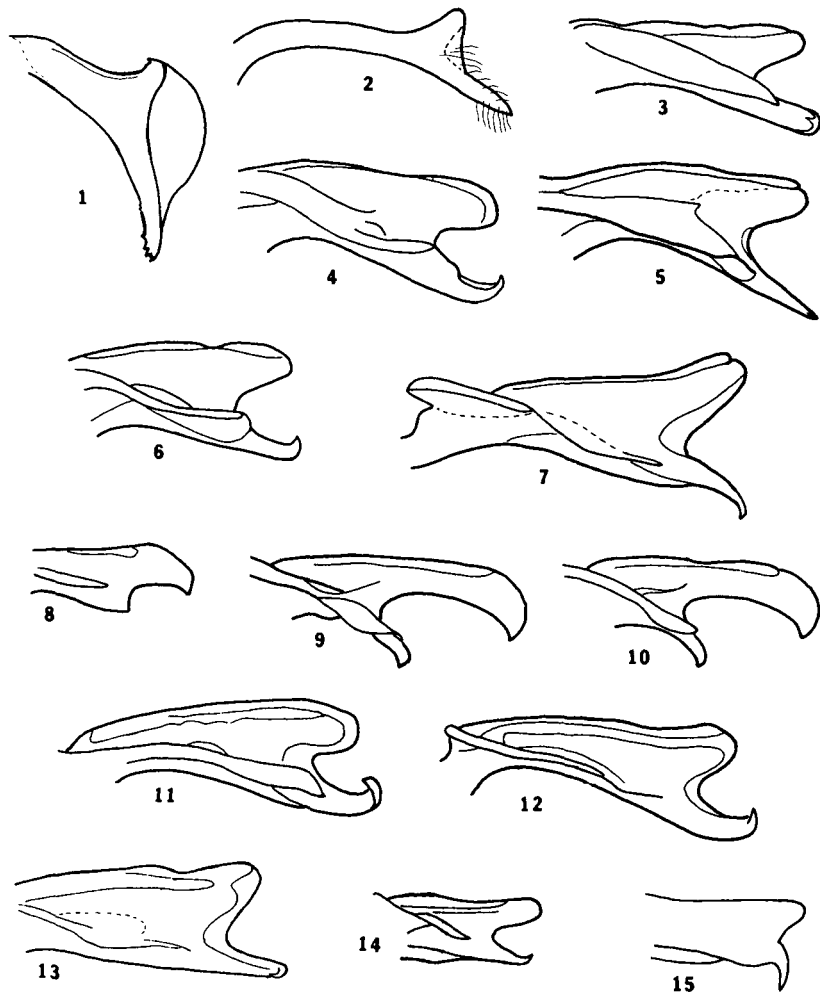


Plate 7. Figs. 1-15. Sagittae of males of (1) *Labidus coecus*, (2) *Nomamyrmex esenbecki wilsoni*, (3) *Neivamyrmex harrisi*, (4) *N. nigrescens*, (5) *N. texanus*, (6) *N. opacithorax*, (7) *N. swainsoni*, (8) *N. melsheimeri*, (9) *N. fuscipennis*, (10) *N. macropterus*, (11) *N. pilosus mexicanus*, (12) *N. pilosus mandibularis*, (13) *N. andrei*, (14) *N. minor*, (15) *N. baylori*.

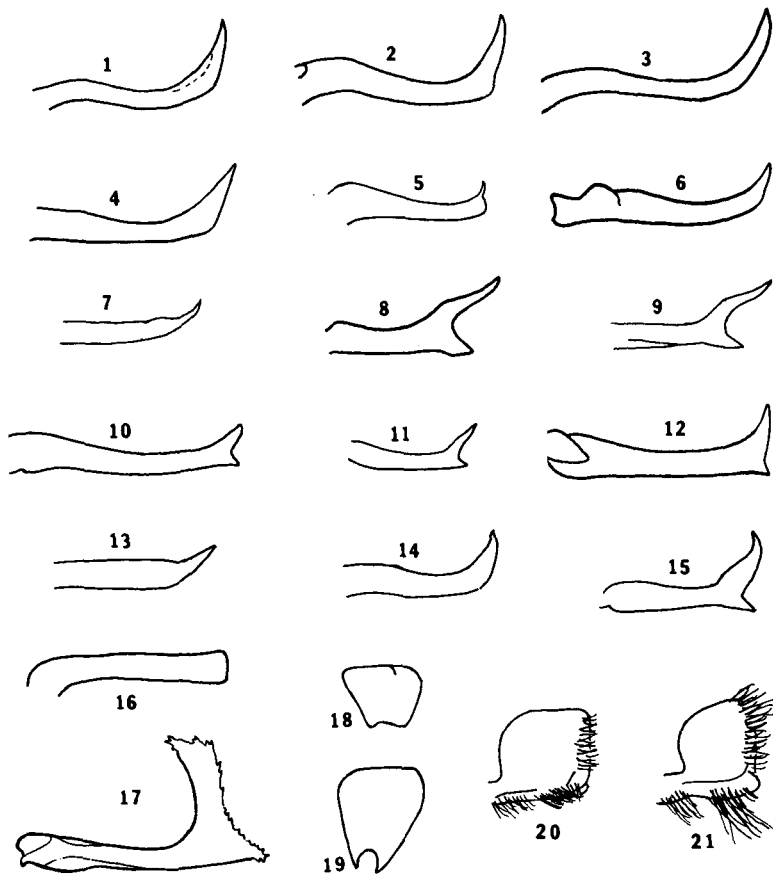


Plate 8. Figs. 1-21. 1-17. Volsellae of males of (1) *Neivamyrmex harrisi*, (2) *N. nigrescens*, (3) *N. texanus*, (4) *N. opacithorax*, (5) *N. pilosus mexicanus*, (6) *N. pilosus mandibularis*, (7) *N. melsheimeri*, (8) *N. fuscipennis*, (9) *N. macropterus*, (10) *N. andrei*, (11) *N. minor*, (12) *N. swainsoni*, (13) *N. baylori*, (14) *N. carolinensis*, (15) *N. mojave*, (16) *Nomamyrmex esenbecki wilsoni*, (17) *labidus coecus*. 18, 19. Procoxae of males of (18) *Neivamyrmex andrei*, (19) *N. swainsoni*. 20, 21. Lateral views of petioles of males of (20) *N. nigrescens*, (21) *N. texanus*.

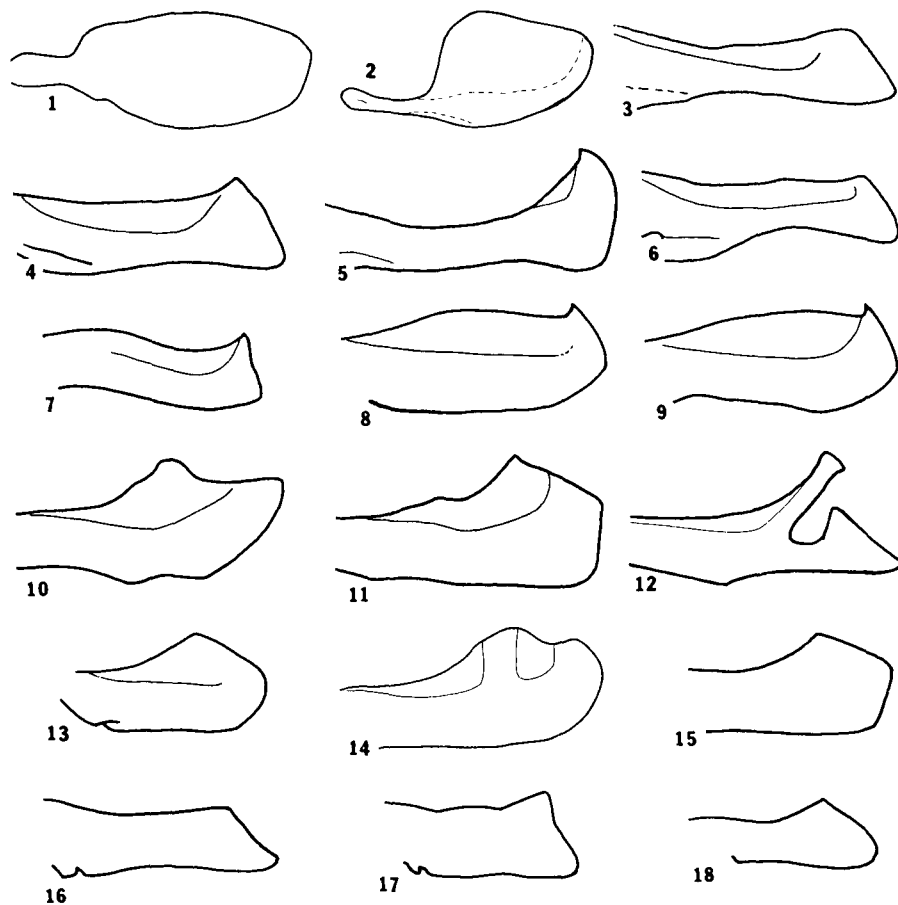


Plate 9. Figs. 1-18. Stipites of males of (1) *Nomamyrmex esenbecki wilsoni*, (2) *Labidus coecus*, (3) *Neivamyrmex harrisi*, (4) *N. nigrescens*, (5) *N. texanus*, (6) *N. opacithorax*, (7) *N. melsheimeri*, (8) *N. fuscipennis*, (9) *N. macropterus*, (10) *N. pilosus mexicanus*, (11) *N. pilosus mandibularis*, (12) *N. andrei*, (13) *N. minor*, (14) *N. swainsoni*, (15) *N. baylori*, (16) *N. carolinensis*, (17) *N. mojave*, (18) *N. microps*.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
L. coecus		██████████	██████████	██████████	██████████							█
No. esenbecki			█									
N. melshheimeri				██████████	██████████	██████████	██████████	██████████	██████████			
N. swainsoni					██████████	██████████	██████████	██████████				
N. carolinensis					██████							
N. harrisi						██████████	██████████	██████████	██████████	██████████		
N. pilosus mex.						██████████	██████████	██████████				
N. pilosus mand.						█	██████████	██████████				
N. macropterus						██████████	██████████	██████████				
N. minor						██████████	██████████	██████████	██████████			
N. andrei							██████████	██████████	██████████			
N. fuscipennis								██████████	██████████	██████████		
N. nigrescens								██████████	██████████	██████████	██████████	
N. opacithorax								█	██████████	██████████	██████████	██████████
N. texanus									██████████	██████████	██████████	
N. baylori										█		
N. microps											█	
N. mojave											█	
Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Plate 10. Flight periods of male army ants in the United States of America (based on collection records). L. = *Labidus*, No. = *Nomamyrmex*, N. = *Neivamyrmex*.

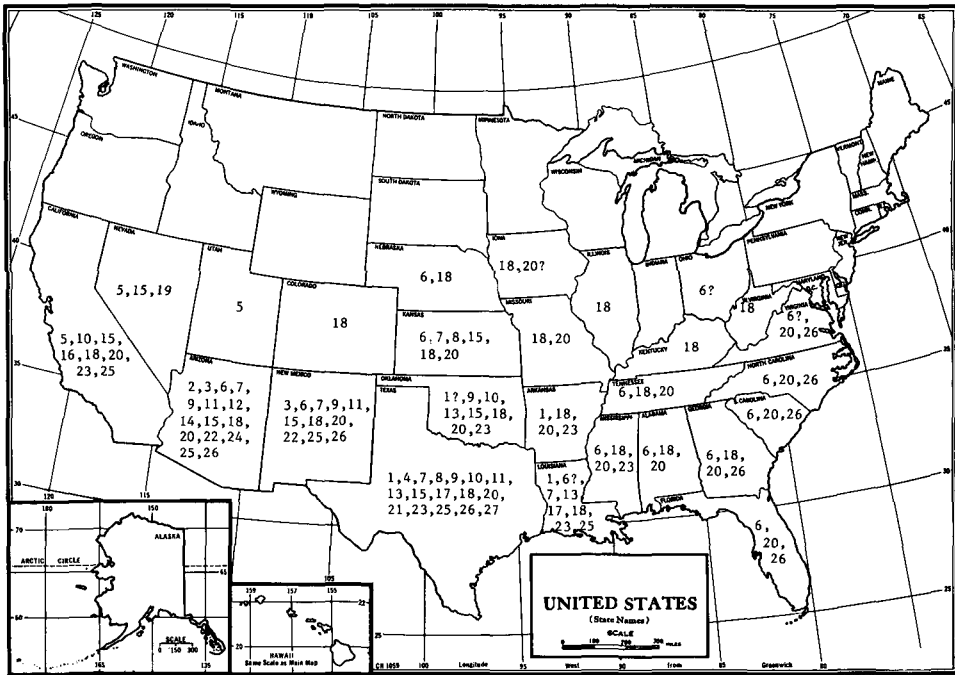


Plate 11. Distribution of army ants in the United States: *Labidus coecus* (1), *Neivamyrmex agilis* (2), *N. andrei* (3), *N. baylori* (4), *N. californicus* (5), *N. carolinensis* (6), *N. fallax* (7), *N. fuscipennis* (8), *N. harrisi* (9), *N. leonardi* (10), *N. macropterus* (11), *N. melanocephalus* (12), *N. melsheimeri* (13), *N. microps* (14), *N. minor* (15), *N. mojave* (16), *N. moseri* (17), *N. nigrescens* (18), *N. nyensis* (19), *N. opacithorax* (20), *N. pauxillus* (21), *N. pilosus mandibularis* (22), *N. pilosus mexicanus* (23), *N. rugulosus* (24), *N. swainsoni* (25), *N. texanus* (26), *Nomamyrmex esenbecki wilsoni* (27).

Index to Distribution Maps

Species	Map No.		
<i>L. coecus</i>	26	<i>N. minor</i>	25
<i>N. agilis</i>	10	<i>N. mojave</i>	17
<i>N. andrei</i>	11	<i>N. moseri</i>	20
<i>N. baylora</i>	24	<i>N. nigrescens</i>	3
<i>N. californicus</i>	4	<i>N. nyensis</i>	16
<i>N. carolinensis</i>	2	<i>N. opacithorax</i>	1
<i>N. fallax</i>	19	<i>N. paucillus</i>	22
<i>N. fuscipennis</i>	14	<i>N. pilosus mandibularis</i>	7
<i>N. harrisi</i>	15	<i>N. pilosus mexicanus</i>	8
<i>N. leonardi</i>	23	<i>N. rugulosus</i>	18
<i>N. macropterus</i>	13	<i>N. swainsoni</i>	12
<i>N. melanocephalus</i>	9	<i>N. texanus</i>	5
<i>N. melsheimeri</i>	21	<i>No. esenbecki wilsoni</i>	27
<i>N. microps</i>	6		

