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A TAXONOMIC REVIEW OF NEIVAMYRMEX MOSERI, N. PAUXILLUS, AND N. LEONARDI, INCLUDING NEW DISTRIBUTION RECORDS AND ORIGINAL DESCRIPTIONS OF QUEENS OF THE FIRST TWO SPECIES[1]

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ABSTRACT

Original descriptions of queens of two species, *Neivamyrmex moseri* Watkins and *N. pauxillus* (Wheeler), and revised descriptions of workers of those species and *N. leonardi* (Wheeler) are given. A table of known castes, new distribution records, and revised keys to workers and queens of *Neivamyrmex* from the United States are presented.

This study was prompted by recent collections of army ants in Texas and Mexico, including undescribed queens of two species. Previous collection records of *N. moseri* Watkins from Louisiana, *N. pauxillus* (Wheeler) from Texas and Hidalgo, Mexico, and *N. leonardi* (Wheeler) from California and Baja California have been published. Smith (1942) recorded workers of ten species and queens of only four species of *Neivamyrmex* from the United States. This paper lists workers of one additional species and queens of three additional species (Table 1). The queen of *N. pilosus* was previously recorded from the United States by Borgmeier (1955). Keys to workers and queens of *Neivamyrmex* from the United States are revised to include the new forms. Types are deposited in the Museum of Comparative Zoology (MCZ), Harvard University, Cambridge, Mass.; the American Museum of Natural History (AMNH), New York; or in private collections as noted.

Key to Species of Major Workers of *Neivamyrmex* from the United States
(Based in part on M. R. Smith, 1942)

1. a. Head and gaster brownish black to black 2
   b. Head and gaster dark reddish brown to yellow 3

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B

2. a. Alitrunk same color as head and gaster, smooth and shining, except mesopleura, metapleura, and mesoepinotal constriction; petiole with a large acute ventral spine directed posteroventrad ..... *pilosus*
   b. Alitrunk lighter in color than head and gaster, strongly sculptured; petiole with a small ventral slightly acute protuberance directed ventrad ..... *melanocephalus*
3. a. Petiole, from above, distinctly longer than broad 4
   b. Petiole, from above, subquadrate, sometimes slightly longer than broad, robust 6
4. a. Head shining, not densely sculptured 5
   b. Head and alitrunk densely sculptured and not shining ..... *nigrescens*
5. a. Promesonotum mat dorsally ..... *opacithorax*
   b. Promesonotum distinctly shining ..... *californicus*
6. a. Broad lamella in front of antennal fossa 7
   b. Lamella in front of antennal fossa narrow or absent 8
7. a. Posterodorsal corners of head with distinct angular projections when viewed from the front; eyes distinct with convex cornea; major workers 4–5 mm in length ..... *harrisi*
   b. Posterodorsal corners of head somewhat rounded when viewed from the front; eyes apparently absent, except faint yellowish specks can be seen below cuticle of some specimens; major workers 3–4 mm in length ..... *leonardi*
8. a. Eyes absent 9
   b. Eyes present, although sometimes reduced to indistinct yellowish specks below cuticle 10
9. a. Posterior border of head, in profile, somewhat angular (Fig. 14); head shining with sparse small punctations and striations; mandible usually with a basal tooth plus three or four small teeth and one large apical tooth (Figs. 17–19) ..... *pauxillus*
   b. Posterior border of head, in profile, more rounded (Fig. 8); head moderately punctated; mandible usually with a basal tooth plus two large teeth and a smaller median tooth (Fig. 11) ..... *moseri*
10. a. Head and promesonotum smooth and shining; anteroventral spine of petiole sharp and distinct, projecting posteroventrad; eyes indistinct, reduced to yellowish specks below the cuticle (best seen on specimens preserved in liquid) ..... *fallax*
    b. Head and promesonotum densely sculptured; anteroventral projection of petiole somewhat angular, but without a sharp posteroventrally projecting spine; eyes distinct, with raised cornea ..... *carolinensis*

Key to Species of *Neivamyrmex* Females (Queens) from the United States

1. a. Eyes present 2
   b. Eyes absent 6
2. a. Posterodorsal corners of head distinctly angular and projecting when viewed from above 3
   b. Posterodorsal corners of head rounded or not projecting when viewed from above 4
3. a. Head and alitrunk with dense, coarse sculpturing; promesonotal suture present ..... *nigrescens*
   b. Head and alitrunk smooth with scattered punctures; promesonotal suture absent ..... *harrisi*
4. a. Petiole, from above, trapezoidal; color reddish black to blackish brown ..... *pilosus*
   b. Petiole, from above, rectangular or subquadrate; color reddish brown to yellowish brown 5
5. a. Promesonotum densely sculptured; promesonotal suture weakly impressed; length more than 14 mm ..... *opacithorax*
   b. Promesonotum smooth and shining, but with numerous punctures; promesonotal suture absent; length less than 14 mm ..... *carolinensis*
6. a. Mesoepinotal suture, from above, complete (Fig. 22); head, in profile, approximately two times longer than thick (Fig. 20); basal and masticatory margins of mandibles forming one evenly rounded surface without teeth (Fig. 24) ..... *moseri*
   b. Mesoepinotal suture, from above, incomplete (Fig. 23); head, in profile, approximately three times longer than thick (Fig. 21); two small teeth at the junctures of the basal and cutting margins of mandibles (Fig. 25) ..... *pauxillus*

Neivamyrmex moseri Watkins ☿ ♀
(Figs. 8–13, 20, 22, 24)

Neivamyrmex moseri Watkins, 1968, J. Kansas Entomol. Soc. 41:528, ☿.

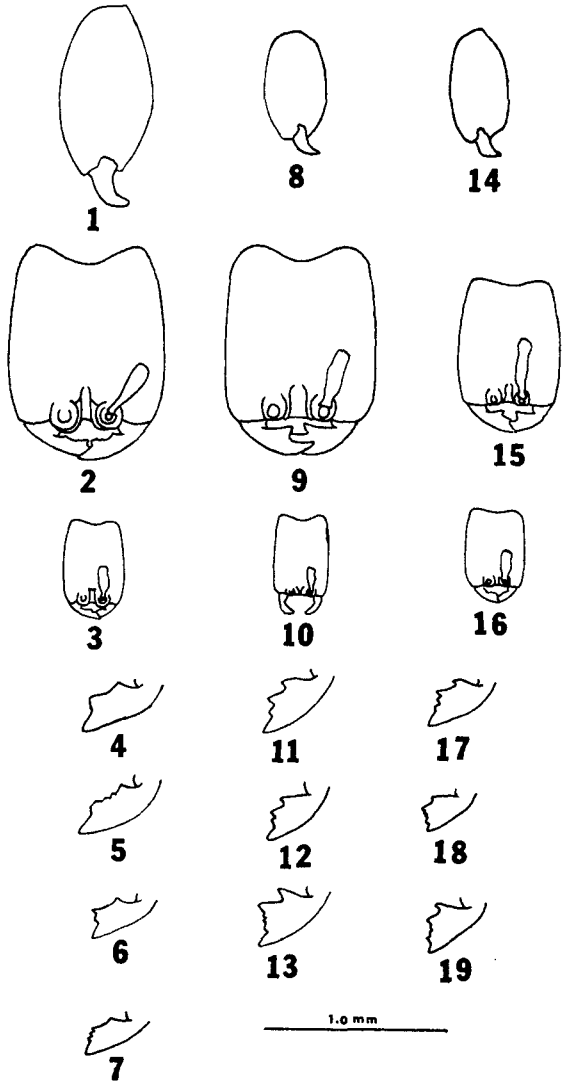
WORKER. Length 1.6–3.6 mm. Head (excluding mandibles) sometimes slightly broader than long [holotype major, Watkins (1968: Fig. 1)], but usually about equally as broad as long (majors, Fig. 9), to 1.5 times longer than broad (minors, Fig. 10), and with a somewhat rounded posterior border in profile (Fig. 8). Mandible of major with large triangular basal tooth, tooth sometimes slightly curved; masticatory border usually with three teeth, middle tooth less than half length of outer teeth with apical tooth longest (Figs. 11–12), rarely middle tooth replaced with two smaller teeth (Fig. 13). Promesonotum of majors approximately 1.33 times longer than broad from dorsal view. Gaster somewhat oval in largest majors to distinctly flattened in minors

TABLE 1. Species and known castes of *Neivamyrmex* from the United States. (Known caste indicated by ×.)

Species	Worker	Queen	Male
N. andrei (Emery)	..	..	×
N. californicus (Mayr)	×	..	..
N. carolinensis (Emery)	×	×	×
N. fallax Borgmeier	×	..	..
N. fuscipennis (Wheeler)	..	..	×
N. harrisi (Haldeman)	×	×	×
N. leonardi (Wheeler)	×	..	..
N. melanocephalus (Emery)	×	..	..
N. melsheimeri (Haldeman)	..	..	×
N. microps Borgmeier	..	..	×
N. minor (Cresson)	..	..	×
N. mojave (M. R. Smith)	..	..	×
N. moseri Watkins	×	×	..
N. nigrescens (Cresson)	×	×	×
N. opacithorax (Emery)	×	×	×
N. pauxillus (Wheeler)	×	×	..
N. pilosus (F. Smith)	×	×	×
N. pilosus mandibularis (M. R. Smith)	..	..	×
N. swainsoni (Shuckard)	..	..	×

(workers 2.5 mm long with gasters 2 times longer than high). Head of major with numerous coarse punctures. Otherwise workers resembling description by Watkins (1968).

FEMALE (Queen, Physogastric). Length 11.8 mm. Head: median length without mandibles 1.20 mm, greatest width 1.05 mm, ratio of length to width 1.14; sides subparallel, posterodorsal corners rounded, posterior margin deeply concave, frontal sutures distinct, but not forming carinae between or in front of antennal fossae; anterior border of clypeus almost straight; mandibles abruptly bent inward and pointed; basal and masticatory margins of mandible forming one continuous convex surface without teeth; eyes absent; antennal scape robust, incrassated, length 0.40 mm, least width near base 0.10 mm, greatest width near apex 0.20 mm; flagellum length 1.15 mm, segments one through seven broader than long, segments eight through ten as long as broad, apical segment three times longer than broad. Alitrunk: length 2.0 mm, greatest width 0.90 mm, greatest height (mesothorax) 0.60 mm; promesonotum in profile somewhat flattened with pronotum gently sloped downward; anterior half of epinotum slightly convex; promesonotal suture absent; mesoepinotal suture weak and visible only when viewed dorsally; sloping surface of epinotum straight, forming an obtuse angle with dorsal surface; alitrunk from dorsal view 2.2 times longer than broad with almost parallel sides, but with slightly convex areas on anterior portions of epinotum. Petiole: from dorsal view wider than long, length 0.574 mm, width 0.80 mm, sides slightly



FIGS. 1–19. Figs. 1–7, Workers of *Neivamyrmex leonardi*: 1, head of major, lateral view; 2, head of major, frontal view; 3, head of minor, frontal view; 4–7, mandibles of majors, anteroventral views. Figs. 8–13, Workers of *N. moseri*: 8, head of median, lateral view; 9, head of major, frontal view; 10, head of minor, frontal view; 11–13, mandibles of majors, anteroventral views. Figs. 14–19, Workers of *N. pauxillus*: 14, head of major, lateral view; 15, head of major, frontal view; 16, head of minor, frontal view; 17–19, mandibles of majors, anteroventral views.

convex, anterior border straight except for small indentation in middle, posterior border straight; in profile, height 0.475 mm, dorsal surface weakly convex, ventral surface straight. Gaster: physogastric, length 7.8 mm, greatest width at fourth segment 2.8 mm, greatest height at third segment 3.1 mm. Tergites: one trapezoidal, slightly wider than long; two through four approximately 1.5 times wider than long, somewhat rectangular with slightly convex posterior and lateral borders and irregular anterior borders; five conical and slightly longer than broad. Sternites: one slightly wider than long, semicircular; two slightly wider than long, somewhat trapezoidal with moderately notched anterior borders; three and four slightly longer than wide, rectangular except deeply notched anterior borders; five 1.5 times longer than wide with almost parallel sides. Legs: hind leg reaching posterior border of second sternite, coxa length 0.575 mm, trochanter length 0.125 mm, femur length 0.50 mm, tibia length 0.675 mm, first tarsal segment twice as long as second segment, segments three, four, and five almost equal length with four being the shortest. Color yellowish brown with abdominal sclerites slightly lighter. Body shining with numerous moderately coarse punctures on head, alitrunk, and petiole. Hairs erect and numerous on head, mandibles, antennae, legs, and anterior border of pronotum, sparse to absent on rest of body, except short appressed hairs visible on posterior borders of abdominal sclerites, longest hairs on legs and pronotum.

MALE. Unknown.

Types. Holotype major and paratype minor deposited in the MCZ; paratypes deposited in the AMNH, Borgmeier's collection, São Paulo, Brazil, and Watkin's collection, Baylor University, Waco, Texas.

Type Locality. U.S.A., Kisatchie National Forest, Rapides Parish, Louisiana, 92° 36′ long., 31° 14′ lat.

Geographical Distribution. U.S.A., Louisiana and Texas.

Materials Studied. One holotype major, one paratype minor (MCZ), and paratypes (Watkins's collection) collected by J. C. Moser, 13 April 1959. Numerous workers and one queen (Watkins's collection) from Bowmer Ranch, Bell Co., Texas, collected by J. F. Watkins II, 18 April 1970.

Distinctive Characteristics. *Workers*: small size, complete lack of eyes, absence of lamella in front of antennal fossa, rounded posterior border of head in profile, and shape of mandibles. *Queens*: complete lack of eyes, complete mesoepinotal suture, thickness of head in profile, and shape of mandibles.

Biology. Workers from Rapides Parish, Louisiana, were collected from a colony found at a depth of one foot in the mound of excavated subsoil of a large nest of *Atta texana* (Buckley). Workers and one queen from Bell Co., Texas, were collected from a bivouac that contained about 100 cubic centimeters of workers clustered around a physogastric queen in a cavity beneath a stone on the soil surface of a rocky

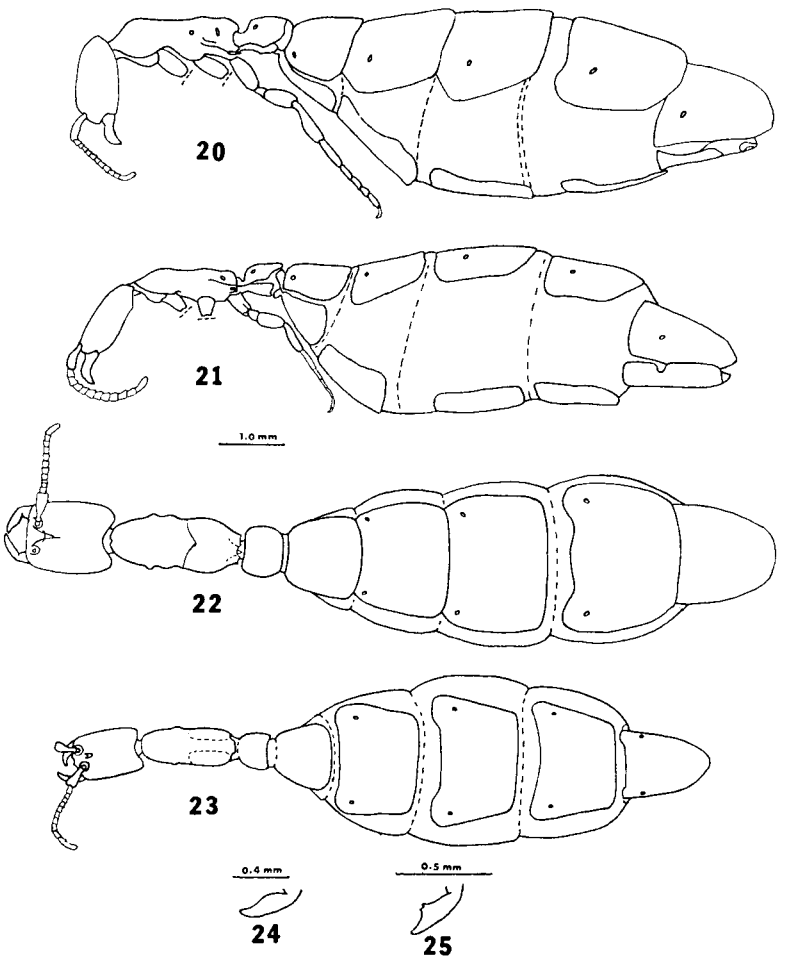
meadow (collection time 12:30 P.M., soil under rock moist, soil temp 22.2 C, air temp 23.9 C, relative humidity about 90%). Workers followed trails deposited by workers of *N. nigrescens* and *N. opacithorax* in the laboratory.

Neivamyrmex pauxillus (Wheeler) ☿ ♀
(Figs. 14–19, 21, 23, 25)

Eciton (Acamatus) pauxillum Wheeler, 1903, Psyche 10:93, ☿ ; Wheeler, 1908, Bull. Amer. Mus. Natur. Hist. 24:412, ☿ ; Emery, 1910, Gen. Insect. 102:25, ☿.
Eciton (Neivamyrmex) pauxillum, M. R. Smith, 1942, Amer. Midl. Natur. 27:569, ☿ ; Creighton, 1950, Bull. Mus. Comp. Zool. 104:75, ☿ ; Muesebeck, et al., 1951, U.S.D.A. Mono. 2:781.
Neivamyrmex pauxillus, Borgmeier, 1953, Stud. Entomol. 2:19, ☿ ; Borgmeier, 1955, Stud. Entomol. (1) 3:570, ☿ ; Krombein, et al., 1958, U.S.D.A. Mono. 2, First Suppl.:109.

WORKER. Length 1.7–2.9 mm. Head 1.14–1.3 times longer than broad (Figs. 15–16), with somewhat angular posterior border in profile (Fig. 14). Mandible of major with a large basal tooth, tooth sometimes slightly curved; a medium sized tooth present at juncture of basal and masticatory borders, a larger tooth forming apex, and two or three small teeth between them (Figs. 17–19). Narrow lamella in front of antennal fossa. Promesonotum of major approximately 2 times longer than broad in dorsal view. Gaster distinctly flattened (workers 2.6 mm long with gasters 1.7 times longer than high). Head smooth and shining with sparse small punctures. Otherwise workers generally resembling descriptions by Wheeler (1903), Smith (1942), and Borgmeier (1955).

FEMALE (Queen, Physogastric). Length 10.25 mm. Head: median length without mandibles 1.15 mm, greatest width 0.8 mm, ratio of length to width 1.44, sides parallel, posterior corners rounded, posterior margin concave, frontal carinae absent between and in front of antennal bases. Distinct, somewhat crescent-shaped frontal impression. Anterior border of clypeus with a small, shallow, median concavity. Mandibles, when viewed from the front, evenly curved and sharply pointed at apices; two tiny teeth visible at junctures of basal and masticatory edges when viewed anteroventrally, otherwise mandibles without teeth. Eyes absent. Antennal scape enlarged distally, slightly curved outward, length 0.35 mm, least width near base 0.075 mm, greatest width near apex 0.125 mm; flagellum length 1.0 mm, segments gradually increasing in length, segments one through six slightly broader than long, segment seven as long as broad, segments eight through ten slightly longer than broad, apical segment 2.6 times longer than broad. Alitrunk: length 1.6 mm, width 0.7 mm, height (mesothorax) 0.5 mm; in dorsal view 2.3 times longer than broad, sides almost parallel, two elongate oval areas on posterolateral portions; dorsum of promesonotum in profile forming continuous almost flat surface with epinotum, except pronotum slightly convex; promesonotal and mesoepinotal sutures absent; dorsal and sloping surfaces of epinotum rounded at their junc-



FIGS. 20–25. Figs. 20, 22, 24, Queen of *Neivamyrmex moseri*; lateral and dorsal views, and anteroventral view of mandible. Figs. 21, 23, 25, Queen of *N. pauxillus*; lateral and dorsal views, and anteroventral view of mandible.

ture, sloping surface almost straight. Petiole: in dorsal view length 0.5 mm, width 0.65 mm, sides moderately convex, posterior border straight; in profile height 0.46 mm, dorsal surface almost straight, except rounded anteriorly, ventral surface convex. Gaster: physogastric, length 7.2 mm, greatest width at third segment 3.1 mm, greatest height at third segment 3.0 mm. Tergites: one through four trape-

zoidal, five conical, one widest posteriorly, two through five widest anteriorly with slightly concave anterior borders, one and five longer than wide, two through four wider than long. Sternites: one trapezoidal, two through four somewhat trapezoidal with concave anterior borders, three and four with slightly concave lateral borders, five elongate, slightly narrowed posteriorly, and with a small distinct notch near center of each lateral border. Legs: hind leg reaching middle of sternite two; lengths of coxa, 0.5 mm; trochanter, 0.1 mm; femur, 0.5 mm; tibia, 0.57 mm; first tarsal segment as long (0.4 mm) as second and third segments combined, segments two through five approximately equal in length. Color yellowish brown with head, alitrunk, legs, and petiole slightly darker than abdominal sclerites. Body smooth and shining with short appressed hairs most numerous on head and legs. Numerous erect hairs on mandibles. Head, alitrunk, and petiole with small punctations, punctations most numerous on head.

MALE. Unknown.

Types. Syntype workers deposited in the MCZ and AMNH.

Type Locality. U.S.A., Austin, Texas.

Geographical Distribution. U.S.A., Texas; Mexico, Hidalgo.

Material Studied. Two syntype workers (MCZ) collected by W. M. Wheeler, 25 May 1901; numerous workers and one queen (Watkins's collection) from Bowmer Ranch, Bell Co., Texas, collected by J. F. Watkins II, 18 April 1970.

Additional Collection Records (Specimens not examined). Workers from Paisano Pass near Alpine, Texas, collected by W. M. Wheeler; workers from 5 miles north of Zimapan, Hidalgo, collected by W. S. Ross.

Distinctive Characteristics. *Workers*: small size, complete lack of eyes, narrow lamella in front of antennal fossa, angular posterior border of head in profile, and shape of mandibles. *Queens*: complete lack of eyes, incomplete mesoepinotal suture, thinness of head in profile, and shape of mandibles.

Biology. Workers collected from Austin, Texas were taken from the soil beneath a stone (Wheeler, 1903). Workers and one queen from Bell Co., Texas, were collected from a bivouac containing about 100 cubic centimeters of workers clustered around a physogastric queen in a cavity beneath a stone, and from tunnels and cavities in the soil beneath the stone on the soil surface of a rocky meadow (collection time 12:10 P.M., soil beneath stone moist, soil temp 22.2 C, air temp 23.9 C, relative humidity about 90%).

Neivamyrmex leonardi (Wheeler) ♀

(Figs. 1–7)

Eciton (*Acamatus*) *leonardi* Wheeler, 1915, Bull. Amer. Mus. Natur. Hist. 34:392, ♀; Mallis, 1941, Bull. S. Calif. Acad. Sci. 40:62.

Eciton (*Acamatus*) *peninsulare* Mann, 1926, Psyche 33:98, ♀.

Eciton (Neivamyrmex) leonardi M. R. Smith, 1942, Amer. Midl. Natur. 27:570, ♀; Muesebeck, et al., 1951, U.S.D.A. Mono. 2:780; Creighton, 1950, Bull. Mus. Comp. Zool. 104:72.
Eciton (Neivamyrmex) peninsulare, Borgmeier, 1949, Rev. de Entomol. 20:101, ♀.
Neivamyrmex leonardi, Borgmeier, 1953, Stud. Entomol. 2:10, 18; Borgmeier, 1955, Stud. Entomol. 3:431, ♀; Krombein, et al., 1958, U.S.D.A. Mono. 2, First Suppl.:109.

WORKER. Length 1.5–3.8 mm. Head almost as broad as long (major, Fig. 2) to 1.3 times longer than broad (minor, Fig. 3), with a somewhat angular posterior border in profile (Fig. 1). Mandible of major with a broadly triangular basal tooth; margin between basal tooth and masticatory border concave and sometimes with small irregular teeth; masticatory border with indentation sometimes containing a small blunt tooth; occasionally masticatory border not indented and with one large apical tooth and two or more small acute teeth, these teeth sometimes irregular (Figs. 4–7). Rugae on mandibles of all workers most easily seen with specimens in liquid. Lamella in front of antennal fossa broad. Yellowish eye specks below cuticle visible in all workers in alcohol, but usually not visible in dried specimens. Head usually rather smooth with scattered small punctures, but occasionally coarsely punctate. Promesonotum of major approximately 1.8 times longer than broad in a dorsal view. Gasters of all workers 1.8 times longer than high. Dorsum of alitrunk coarsely punctured with distinctly smooth propleura, and shagreened meso- and metapleura. Otherwise workers generally agreeing with descriptions by Wheeler (1915), Smith (1942), and Borgmeier (1955).

FEMALE (QUEEN) AND MALE. Unknown.

Types. Syntype workers deposited in the MCZ.

Type Locality. U.S.A., Point Loma near San Diego, California.

Geographical Distribution. U.S.A., Calif. and Texas; Mexico, Baja California and Tamaulipas.

Material Studied. Two syntype workers (MCZ) collected by P. Leonard; numerous workers collected by J. F. Watkins II from McLennan Co., Texas (23 April 1965, 24 June 1967, 10 June 1968), Bosque Co., Texas (15 April 1967), and Río Corona, Tamaulipas, Mexico (31 August 1967).

Additional Records (Specimens not examined). Workers from La Palma Davila, Baja California, collected by W. M. Mann (February 1923).

Distinctive Characteristics. *Workers*: small size, broad lamella in front of antennal fossa, rugate mandibles, shape of mandibles, and presence of eye spots below the cuticle of specimens preserved in alcohol.

Biology. Workers from La Palma Davila, Baja Calif. were taken from a single cluster beneath a stone (Mann, 1926). Several thousand workers (incorrectly identified as *N. pauxillus* by Watkins in Watkins and Cole, 1966; and Watkins, Cole, and Baldridge, 1967) from McLennan Co., Texas, were collected from the soil under a

small stone, and these workers followed chemical trails deposited by workers of *N. nigrescens*, *N. opacithorax*, *N. pilosus*, *N. harrisi* (= *wheeleri*), and *Labidus coecus* in the laboratory (Watkins, et al., 1967). Workers of *N. leonardi* from the same colony were also strongly attracted to secretions deposited by a queen of *N. nigrescens* (Watkins and Cole, 1966). On 10 June 1968, Watkins observed a few workers of *N. leonardi* traveling in a weak nocturnal raiding column of *N. opacithorax* at Waco, McLennan Co., Texas.

LITERATURE CITED

Borgmeier, T. 1955. Die wanderameisen der neotropischen region (Hym. Formicidae). Stud. Entomol. (1)3:1–716.

Mann, W. M. 1926. Some new Neotropical ants. Psyche 33:97–107.

Smith, M. R. 1942. The legionary ants of the United States belonging to *Eciton* subgenus *Neivamyrmex* Borgmeier. Amer. Midl. Natur. 27:537–590.

Watkins, J. F., II. 1968. A new species of *Neivamyrmex* (Hymenoptera: Formicidae) from Louisiana. J. Kansas Entomol. Soc. 41:528–531.

———, and T. W. Cole. 1966. The attraction of army ant workers to secretions of their queens. Texas J. Sci. 18:254–265.

———, T. W. Cole and R. S. Baldridge. 1967. Laboratory studies on interspecies trail following and trail preference of army ants (Dorylinae). J. Kansas Entomol. Soc. 40:146–151.

Wheeler, W. M. 1903. A decade of Texan Formicidae. Psyche 10:93–111.

———. 1915. Some additions to the North American ant-fauna. Bull. Amer. Mus. Natur. Hist. 34:389–421.