

THE NEARCTIC SPECIES OF THE GENUS *PSEUDOMYRMEX* (HYMENOPTERA:
FORMICIDAE)

Philip S. Ward
Department of Entomology
University of California
Davis, CA 95616
U. S. A.

Quaestiones Entomologicae
21: 209-246 1985

ABSTRACT

The Nearctic ants of the genus Pseudomyrmex are revised, with the consequent recognition of ten species, belonging to three species groups: gracilis group (P. mexicanus Roger), elongatus group (P. cubaensis Forel, stat. nov.; P. elongatus Mayr), and pallidus group (P. apache Creighton; P. brunneus F. Smith; P. ejectus F. Smith; P. leptosus Ward, sp. nov. [type locality: Payne's Prairie, 8 mi. S. Gainesville, Florida]; P. pallidus F. Smith; P. seminole Ward, sp. nov. [type locality: John Pennekamp State Park, Munroe Co., Florida]; P. simplex F. Smith). P. peruvianus Wheeler, stat. nov., described as a variety of P. ejectus, is considered a distinct species. The following are proposed as new synonyms of P. simplex: P. delicatulus Forel = P. capperi Forel = P. panamensis Forel = P. vittatus Forel. The Nearctic Pseudomyrmex are characterized by marked geographical variation, coupled with the frequent occurrence of sympatric sibling species.

RÉSUMÉ

Les fourmis Néarctiques du genre Pseudomyrmex sont révisées, avec la reconnaissance résultante de dix espèces, appartenant de trois groupes d'espèces: groupe gracilis (P. mexicanus Roger), groupe elongatus (P. cubaensis Forel, stat. nov.; P. elongatus Mayr), et groupe pallidus (P. apache Creighton; P. brunneus F. Smith; P. ejectus F. Smith; P. leptosus Ward, sp. nov. [lieu d'origine du type: Payne's Prairie, 8 mi. S. Gainesville, Florida]; P. pallidus F. Smith; P. seminole Ward, sp. nov. [lieu d'origine du type: John Pennekamp State Park, Munroe Co., Florida]; P. simplex F. Smith). P. peruvianus Wheeler, stat. nov., décrite comme une variété de P. ejectus, est considéré une espèce distincte. Les noms suivant sont proposés comme nouveaux synonymes de P. simplex: P. delicatulus Forel = P. capperi Forel = P. panamensis Forel = P. vittatus Forel. Les Pseudomyrmex Néarctiques sont caractérisés par variation géographique marquée, accompagnés de l'occurrence fréquente des espèces sympatriques très similaires.

INTRODUCTION

The predominantly Neotropical ant genus, *Pseudomyrmex*, is fraught with species-level taxonomic problems. Among the few species which occur in the United States, those allied to *P. pallidus* have been repeatedly confused (e.g., Creighton, 1950). This is partly due to the failure of earlier taxonomists to examine relevant type material, exacerbated by the existence of sibling species and extensive geographical variation. Preparatory to a more comprehensive revision of the *pallidus* group in the Neotropical region, I here present a review of all *Pseudomyrmex* species in the United States, most of which belong to the *pallidus* group. This allows the methodological groundwork to be presented and permits clarification of the identity of several common species.

The North American *Pseudomyrmex* literature is summarized in D. R. Smith (1979). Creighton (1950) recognized four species, described one more in 1952, and gave a key to the

United States species in 1955. In the present treatment I recognize nine North American species, of which two are new. In addition I have included one other species which ranges up to the margin of the Nearctic region in northern Mexico. Since there has been widespread misidentification of Nearctic *Pseudomyrmex*, literature records for most species need to be reconfirmed. I have attempted to determine the identity of species cited in the North American literature, in those cases where associated museum material has been available for examination.

A salient feature of the *Pseudomyrmex pallidus* group (and perhaps a characteristic of the genus as a whole) is the frequent occurrence of two or more closely related species in a given locality. There are usually small but reliable morphological differences which serve to distinguish the members of such sympatric assemblages. However these locally diagnostic characters show a marked propensity towards geographical variation. Thus, establishing the diagnostic features of species (as opposed to local populations) requires the examination of specimens from a broad geographical area. In the present context, this has meant examining material from both North and Central America since most of the Nearctic species are not confined to the United States. Moreover, since the characters often involve aspects of size and shape, it has been necessary to make a rather large number of metric measurements in order to accurately assess the limits of intra- and interspecific variation. The keys to Nearctic species depend to some extent on these measurements.

Descriptions of the worker caste of each species have been kept concise, with descriptive details encapsulated in the ranges of 19 measurements and indices which precede the diagnosis (expanded to 26 metrics for new species). This helps to standardize and economize the descriptive process. It also deemphasizes the kind of typological thinking which is likely to impede taxonomic progress in *Pseudomyrmex*. In this regard, the illustrations should be used prudently; they represent "typical" specimens, but reference should also be made to the keys and species descriptions where the known bounds of variation are indicated.

MATERIALS AND METHODS

Collections are referred to by the following abbreviations:

- BMNH British Museum of Natural History, London
- GCW G. C. & J. Wheeler collection, San Antonio, TX
- LACM Los Angeles County Museum, Los Angeles, CA
- MCSN Museo Civico di Storia Naturale, Genoa, Italy
- MCZ Museum of Comparative Zoology, Cambridge, MA
- MHN Muséum d'Histoire Naturelle, Geneva, Switzerland
- MNHU Museum für Naturkunde der Humboldt-Universität, Berlin, D. D. R.
- NHMB Naturhistorisches Museum, Basel, Switzerland
- NHMV Naturhistorisches Museum, Vienna, Austria
- PSW P. S. Ward collection, University of California, Davis, CA
- UCD Bohart Museum of Entomology, University of California, Davis, CA
- USNM National Museum of Natural History, Washington, DC

Scanning electron micrographs were taken with a Philips SEM 501, using gold-palladium coated specimens. Precautions were taken to avoid distortion of the micrograph by (i) careful positioning of the specimen on the stub, and (ii) measuring the CRT image with calipers and making any tilt-correction necessary to restore the true proportions.

Terms for integument sculpture are taken from Harris' (1979) glossary.

Metric measurements were made at 50X power on a Wild microscope, with a Nikon micrometer wired to an Autometronics digital readout. All measurements were made in millimeters, to the nearest thousandth of a millimeter. Most have been rounded to two decimal places for presentation here.

The following measurements are cited (when the head is held in full-face, dorsal view, it is positioned so that the median ocellus and the frontal carinae lie in the same focal plane):

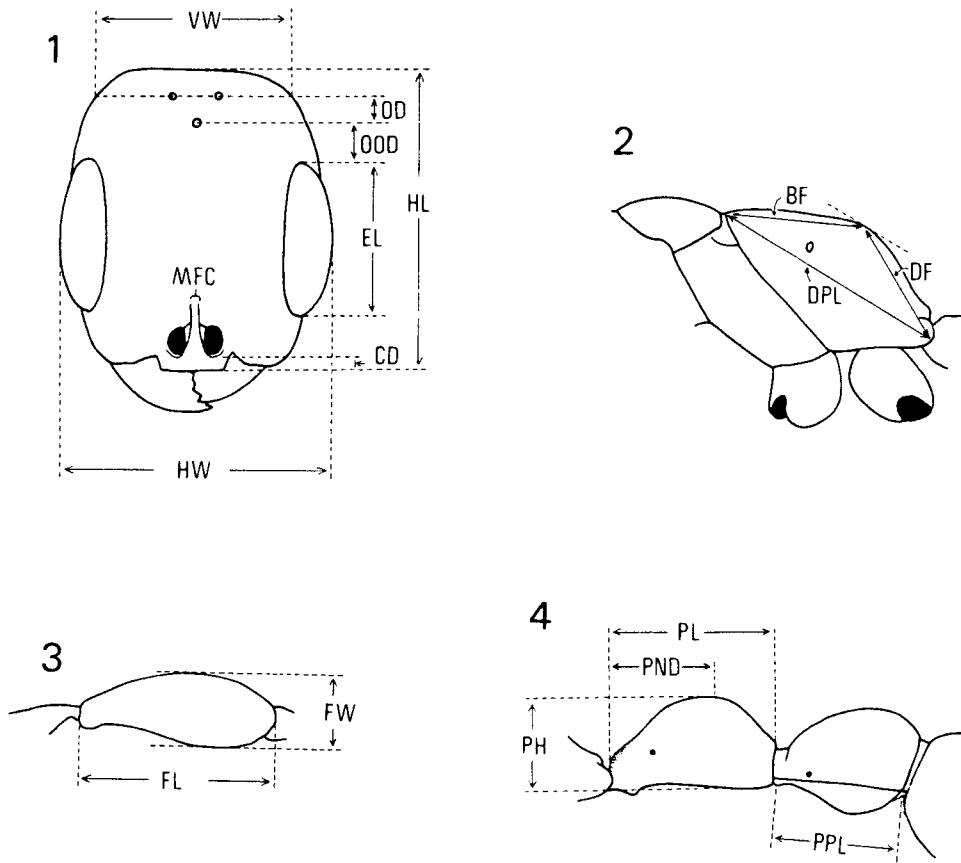
- HW Head width: maximum width of head, including the eyes, measured in full-face, dorsal view (Figure 1).
- VW Vertex width: width of the posterior portion of the head (vertex), measured along a line drawn through the lateral ocelli, with the head in full-face, dorsal view (Figure 1).
- HL Head length: midline length of head proper, measured in full-face, dorsal view, from the anterior clypeal margin to the midpoint of a line drawn across the occipital margin (Figure 1).
- EL Eye length: length of compound eye, measured with the head in full-face, dorsal view (Figure 1).
- OD Ocellar distance: distance from the middle of the median ocellus to the midpoint of a line drawn between the lateral ocelli, measured with the head in full-face, dorsal view (Figure 1).
- OOD Oculo-ocellar distance: distance from the middle of the median ocellus to a line drawn across the posterior margins of the compound eyes (Figure 1) (this distance is negative in value if the posterior margin of the compound eye exceeds the median ocellus).
- CD Clypeal distance: distance from the anterior clypeal margin to a line drawn across the anterior margins of the frontal carinae (Figure 1).
- MFC Minimum frontal carinal distance: minimum distance between the frontal carinae, measured with the head in full-face, dorsal view (Figure 1).
- EW Eye width: maximum width of compound eye, measured along its short axis, in an oblique dorso-lateral view of the head.
- SL Scape length: length of the first antennal segment, excluding the radicle.
- LF1 Length of first funicular segment: maximum measurable length of the first funicular segment (pedicel), excluding its basal articulation.
- LF2 Length of second funicular segment: maximum measurable length of the second funicular segment.
- FL Forefemur length: maximum measurable length of the forefemur, measured in posterior view (Figure 3).
- FW Forefemur width: maximum measurable width of the forefemur, measured from the same view as FL, at right angles to the line of measurement of FL (Figure 3).
- DPL Diagonal length of the propodeum: length of the propodeum, measured in lateral view along a diagonal line drawn from the metapleural lobe to the

- metanotal groove (Figure 2).¹
- BF** Length of the basal (= dorsal) face of the propodeum, measured in lateral view from the metanotal groove to the point on the surface of the propodeum which is maximally distant from the diagonal propodeal line (Figure 2).
- DF** Length of the declivitous face of the propodeum, measured in lateral view from the metapleural lobe to the point on the surface of the propodeum which is maximally distant from the diagonal propodeal line (Figure 2).
- MP** Depth of metanotal groove ("mesopropodeal impression"), measured in lateral view from the bottom of the metanotal groove to a line drawn across the dorsal surface of the mesonotum and propodeum.
- PL** Petiole length: length of the petiole, measured in lateral view from the lateral flanges of the anterior peduncle to the posterior margin of the petiole (Figure 4).
- PND** Petiolar node distance: distance from the anterior margin of petiole to the maximum height of the node measured from the same view as PL and along the same line of measurement (Figure 4).
- PH** Petiole height: maximum height of the petiole, measured in lateral view at right angles to PL, but excluding the anteroventral process (Figure 4).
- PPL** Postpetiole length: length of the postpetiole, measured in lateral view, from the anterior peduncle (of the postpetiole) to the point of contact with the fourth abdominal tergite (Figure 4).
- DPW** Dorsal petiolar width: maximum width of the petiole, measured in dorsal view.
- PPW** Dorsal postpetiolar width: maximum width of the postpetiole, measured in dorsal view.

Indices calculated from the preceding measurements include the following ratios:

- CI** Cephalic index: HW/HL
- OI** Ocular index: EW/EL
- REL** Relative eye length: EL/HL
- REL2** Relative eye length, using HW: EL/HW
- OOI** Oculo-ocellar index: OOD/OD
- VI** Vertex width index: VW/HW
- FCI** Frontal carinal index: MFC/HW
- CDI** Clypeal distance index: CD/HL
- SI** Scape index: SL/HW
- SI2** Scape index, using EL: SL/EL
- SI3** Scape index, using LF2: SL/LF2
- FI** Forefemur index: FW/FL
- PDI** Propodeal index: BF/DF

¹In *Pseudomyrmex* DPL is more appropriate than WL (Weber's length of the mesosoma (alitrunk), taken from the anterior pronotal margin to the metapleural lobe) since the articulation of the pronotum with the mesothorax renders the measurement of WL imprecise.



Figures 1-4. Views of a generalized *Pseudomyrmex* worker, illustrating some measurements. 1. Frontal view of head. CD, clypeal distance; EL, eye length; HL, head length; HW, head width; MFC, minimum distance between frontal carinae; OD, ocellar distance; OOD, oculo-ocellar distance; VW, vertex width. 2. Lateral view of propodeum. BF, length of basal (= dorsal) face of propodeum; DF, length of declivitous face of propodeum; DPL, diagonal propodeal length. 3. Posterior view of forefemur. FL, forefemur length; FW, forefemur width. 4. Lateral view of petiole and postpetiole. PH, petiolar height; PND, petiolar node distance; PL, petiolar length; PPL, postpetiolar length.

MPI	Metanotal index: MP/HW
NI	Petiole node index: PND/PL
PL1	Petiole length index: PH/PL
PL12	Petiole length index, using PPL: PPL/PL
PHI	Petiole height index, using PPL: PH/PPL
PW1	Petiole width index: DPW/PL
PW12	Petiole width index, using PPW: DPW/PPW
PPW1	Postpetiole width index: PPW/PPL
PPW12	Postpetiole width index, using HW: PPW/HW

SYNOPSIS

Workers of *Pseudomyrmex* may be recognized by their large compound eyes (REL 0.39–0.61), closely set frontal carinae and antennal insertions (FCI 0.01–0.07), and short scapes (SI 0.40–0.51). There is a distinct postpetiole and a well-developed sting.

Among the Nearctic fauna I recognize three species groups, whose workers may be diagnosed as follows (the *gracilis* group preceding the other two on the basis of its distinctive size and habitus):

***gracilis* group (see also Kempf 1958)**

Large black, orange, or bicolored species (HW > 1.20), with broad head, large eyes (REL > 0.50), and relatively long scapes (SI ~ 0.50); frontal carinae subcontiguous; lateral margins of pronotum angled; petiole usually long, with a distinct anterior peduncle. Erect pilosity abundant on body and appendages, including propodeum, scapes, and legs.

***elongatus* group**

Small, brown species (HW 0.56–0.75), with elongate head (CI < 0.80) and long eyes (REL 0.47–0.58); scapes relatively short (SI ~ 0.45); frontal carinae subcontiguous; lateral margins of pronotum rounded; petiole very short, without a distinct anterior peduncle (PLI 0.65–0.91; PW1 0.55–0.74). Erect pilosity present on most parts of body, including mesonotum and propodeum.

***pallidus* group**

Small yellow, orange or brown species (HW 0.55–1.04), with elongate head (CI 0.75–0.91); scapes usually short; frontal carinae contiguous or subcontiguous; lateral margins of pronotum rounded; petiole usually slender, with an anterior peduncle (PLI 0.43–0.69; PW1 0.38–0.65). Erect pilosity scarce, lacking on the mesonotum and propodeum.

SYNONYMIC LIST OF NEARCTIC *PSEUDOMYRMEX* SPECIES

gracilis group

P. mexicanus Roger, 1863

elongatus group

P. elongatus Mayr, 1870

= *P. tandem* Forel, 1906

P. cubaensis Forel, 1901, *stat. nov.*

pallidus group

- P. apache* Creighton, 1952
P. brunneus F. Smith² 1877
 = *P. nigritus* Enzmann, 1945, *syn. nov.*
P. ejectus F. Smith, 1858
P. leptosus *sp. nov.*
P. pallidus F. Smith, 1855
P. seminole *sp. nov.*
P. simplex F. Smith, 1877
 = *P. delicatulus* Forel, 1899, *syn. nov.*
 = *P. capperi* Forel, 1899, *syn. nov.*
 = *P. panamensis* Forel, 1899, *syn. nov.*
 = *P. vittatus* Forel, 1912, *syn. nov.*

Key to species: workers (excluding *P. leptosus* new species of which the worker is unknown)

- 1 (a) Erect hairs conspicuous on most parts of body, including mesonotum and propodeum 2
 (b) Erect pilosity very sparse, lacking on mesonotum and (nearly always) propodeum 4
 2 (a) Large, bicolored orange and black species (HW > 1.40); head approximately as wide as long (CI > 0.95); petiole with a long anterior peduncle (PLI < 0.55) (Figure 12); Florida, Texas south to Panama *P. mexicanus* Roger, p. 225
 (b) Small, unicolored brown species (HW < 0.80); head notably longer than wide (CI < 0.80); petiole short (PLI > 0.60) (*e.g.*, Figure 6) 3
 3 (a) Larger species (HW ≥ 0.64), with shorter eyes (REL2 0.63–0.73), and a lower, thinner petiole (PLI 0.65–0.78) (Figures 5,6); Florida, West Indies *P. cubaensis* Forel, p. 226
 (b) Smaller species (HW ≤ 0.64), with longer eyes (REL2 0.73–0.82), and a higher, broader petiole (PLI 0.76–0.91) (Figures 7,8); Florida, Texas south to Colombia *P. elongatus* Mayr, p. 227
 4 (a) Head and gaster usually dark brown; small species (HW < 0.82), with a deep, wide metanotal groove (*e.g.*, Figure 14) (MPI 0.046–0.097); basal face of propodeum generally shorter than declivitous face (PDI 0.56–1.07) 5
 (b) Head and gaster golden yellow to orange-brown (fourth abdominal tergite may have darker fuscous patches); variable in size (HW 0.55–1.04), metanotal groove usually relatively shallow (*e.g.*, Figure 43) (MPI 0.005–0.054); if metanotal groove very deep (MPI ≥ 0.046), then basal face of propodeum notably longer than declivitous face (PDI ≥ 1.10) 6
 5 (a) Basal face of propodeum about one half to three quarters the length of the declivitous face (PDI 0.56–0.75) (Figure 13); petiole with long anterior peduncle, the node somewhat displaced posteriorly (N1 0.57–0.65); petiole and postpetiole very broad (PWI 0.54–0.65; PPWI 1.26–1.54) (Figure 15):

²Occuring no farther north than northern Mexico

- Mexico** *P. brunneus* F. Smith, p. 231
- (b) Basal face of propodeum longer (PDI 0.70–1.07) (Figure 14); summit of petiolar node in a more anterior position (NI 0.48–0.60); petiole and postpetiole less broad (PWI 0.40–0.52; PPWI 0.93–1.25) (Figure 16); southeastern United States, south to Costa Rica
..... *P. ejectus* F. Smith, p. 231
- 6 (a) Fourth abdominal tergite (first “gastric” tergite) smooth and strongly shining, more or less devoid of appressed pubescence; vertex of head smooth and shining; broad forefemur (FI 0.45–0.52); small species, with relatively long eyes (HW 0.55–0.74; OI 0.49–0.55; REL 0.52–0.61); Florida, West Indies, Mexico south to Brazil
..... *P. simplex* F. Smith, p. 238
- (b) Fourth abdominal tergite subopaque, covered with a (usually dense) mat of fine appressed pubescence; vertex of head at least slightly coriarius, weakly shining to subopaque; longer forefemur (FI \leq 0.45); generally larger species, with relatively shorter eyes (HW 0.68–1.04; OI 0.54–0.65; REL 0.39–0.54) 7
- 7 (a) Eyes short (REL 0.39–0.44); scapes relatively long, subequal to eye length (SI2 0.90–1.00); median (protruded) portion of anterior clypeal margin laterally rounded (Figure 9); frontal carinae relatively well-separated, the minimum distance between them subequal to the basal width of the scape (MFC 0.033–0.066, FCI 0.034–0.070); southwestern United States, northern Mexico
..... *P. apache* Creighton, p. 229
- (b) Eyes longer (REL 0.43–0.54); scapes notably shorter than eye length (SI2 0.68–0.85); median portion of anterior clypeal margin laterally angulate (*e.g.*, Figure 42); frontal carinae variable, often more closely contiguous so that the minimum distance between them is notably less than the basal width of the scape (MFC 0.011–0.042, FCI 0.015–0.047) 8
- 8 (a) Larger species (HW 0.87–0.96); frontal carinae relatively well-separated (MFC 0.029–0.042, FCI 0.031–0.047); eyes relatively short (REL 0.43–0.48); median portion of anterior clypeal margin weakly angulate, thus appearing tridentate (Figure 44); Gulf states, Mexico
..... *P. seminole* *sp. nov.*, p. 237
- (b) Smaller species (HW 0.68–0.89); frontal carinae more closely contiguous (MFC 0.011–0.024, FCI 0.015–0.033); eyes averaging a little longer (REL 0.45–0.54); median portion of anterior clypeal margin usually straight (Figure 42); southern United States, south to Costa Rica
..... *P. pallidus* F. Smith, p. 234

Key to species: queens

- 1 (a) Large, bicolored orange and black species (HW > 1.45); erect pilosity abundant on most parts of body, including propodeum; petiole with a long anterior peduncle (PLI < 0.55); Florida, Texas south to Panama
..... *P. mexicanus* Roger, p. 225

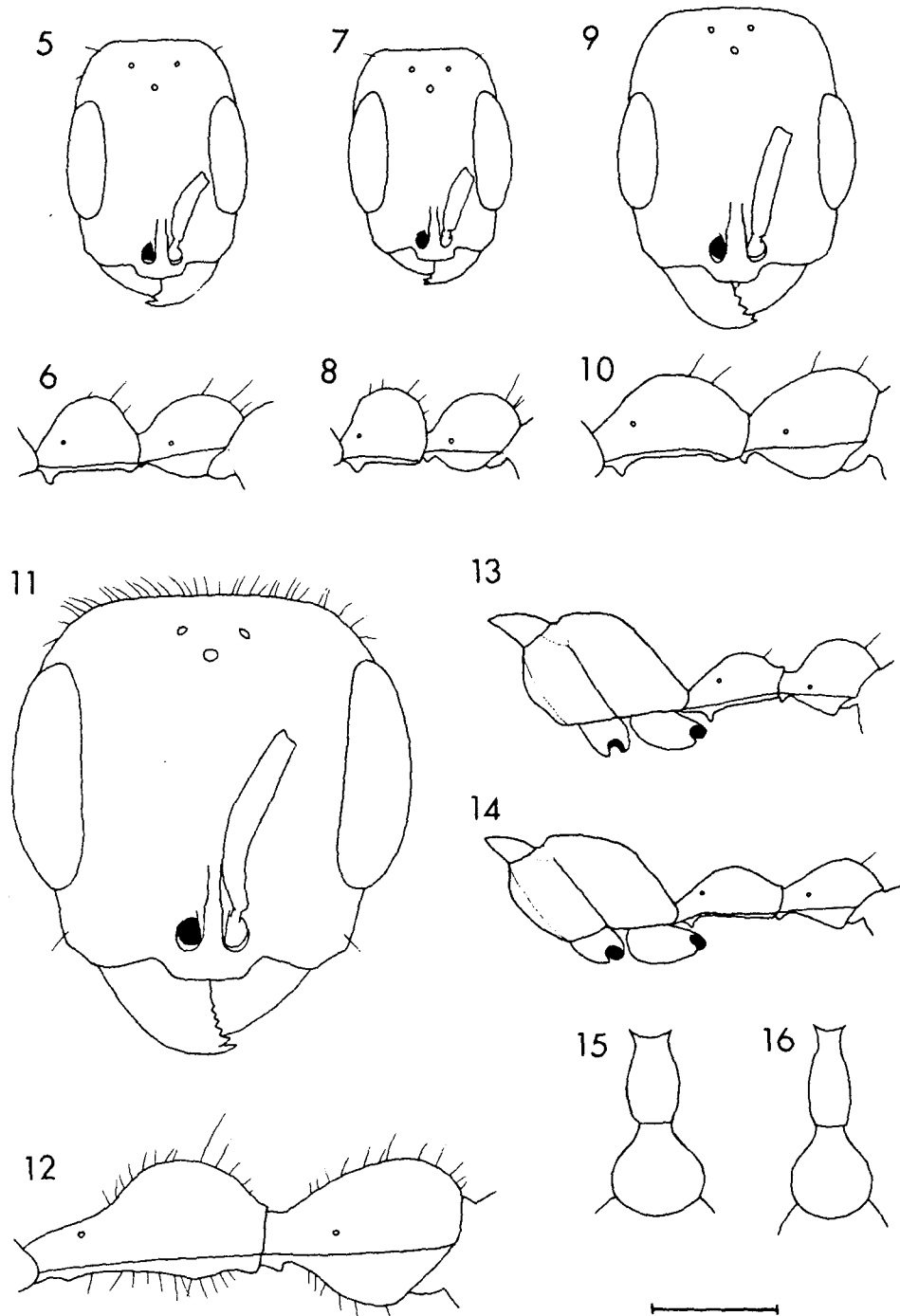
- (b) Smaller species (HW < 1.10); *either* petiole very short and without a conspicuous peduncle (PLI > 0.55), *or* erect pilosity sparse (lacking on propodeum) 2
- 2 (a) Head densely punctate, and more than 1.5 times as long as wide (CI 0.57–0.64); petiole short (PLI 0.58–0.76); usually some erect hairs on the propodeum 3
- (b) Head varying from finely punctate, to coriarius, to smooth and shining, and no more than 1.5 times as long as wide (CI 0.66–0.86); petiole relatively long (PLI 0.43–0.58); propodeum essentially lacking erect setae 4
- 3 (a) Larger species (HW 0.65–0.72, in a sample of 10 queens); eye length less than one half head length (REL 0.43–0.47, n = 10); petiole moderately long (PLI 0.58–0.67, n = 10); Florida, West Indies
P. cubaensis Forel, p. 226
- (b) Smaller species (HW 0.56–0.58, n = 5); eye length about one half head length (REL 0.48–0.53); petiole short (PLI 0.66–0.76, n = 5); Florida, Texas south to Colombia
P. elongatus Mayr, p. 227
- 4 (a) Head and gaster dark brown; small species (HW 0.62–0.75); frontal carinae closely contiguous (MFC 0.010–0.018, FCI 0.015–0.026); petiole long and slender, more than twice as long as high (PLI 0.43–0.48) 5
- (b) Head and gaster golden yellow to orange-brown (small fuscous patches may be present on gaster); mostly larger species (HW 0.57–1.03); if HW < 0.80, then *either* the frontal carinae tend to be less closely contiguous (MFC 0.016–0.035; FCI 0.022–0.046) *and/or* the petiole is relatively short (PLI 0.48–0.58) 6
- 5 (a) Petiole and postpetiole relatively broad, the latter about 1.25 times as wide as long (PHI 0.72, PWI 0.48, PPWI 1.26, in single specimen examined); frons opaque, fine punctures more or less obscured by coarse coriarius sculpture; Mexico
P. brunneus F. Smith, p. 231
- (b) Petiole and postpetiole less broad, the latter about as wide as long (PHI 0.57–0.67, PWI 0.42–0.48, PPWI 1.00–1.12; n = 13); frons usually weakly shining, distinctly punctulate on a weaker coriarius background; southeastern United States south to Costa Rica
P. ejectus F. Smith, p. 231
- 6 (a) Fourth abdominal tergite (first "gastric" tergite) smooth and shining, appressed pubescence inconspicuous, hairs (if present) separated by about their lengths; vertex of head usually smooth and shining, with scattered fine punctures; small species (HW 0.57–0.75), with contiguous frontal carinae (MFC 0.008–0.021; FCI 0.014–0.029) and relatively long eyes (REL 0.65–0.80); SI2 0.52–0.68 (n = 17 for this and preceding measurements); Florida, West Indies, Mexico south to Brazil
P. simplex F. Smith, p. 238
- (b) Fourth abdominal tergite weakly shining to subopaque, with a (usually dense) mat of appressed pubescence; *either* vertex of head weakly shining to subopaque, and coriarius with punctures, *or* SL about three-quarters of EL (SI2 0.75–0.77); generally larger species (HW 0.66–1.03); frontal carinae less closely contiguous (MFC 0.016–0.095; FCI 0.022–0.094); eyes

- usually shorter (REL2 0.52–0.71); SI2 0.64–0.95 (n = 61) 7
- 7 (a) Larger species (HW 0.85–1.03, HL 1.28–1.46); frontal carinae relatively well separated (MFC 0.053–0.095; FCI 0.052–0.094); eyes relatively short (REL2 0.52–0.58) 8
- (b) Smaller species (HW 0.66–0.92, HL 0.82–1.15); frontal carinae more closely contiguous (MFC 0.016–0.035; FCI 0.022–0.046); eyes longer (REL2 0.59–0.71) 9
- 8 (a) Eye length (EL) more than 1.25 times scape length (SI2 0.70–0.80; n = 10); petiole longer, with a more slender anterior peduncle (PLI 0.43–0.49, PWI 0.41–0.51; n = 10); Gulf states, Mexico *P. seminole* sp. nov., p. 237
- (b) Eye length less than 1.20 times scape length (SI2 0.85–0.95; n = 10); petiole shorter and broader (PLI 0.49–0.57, PWI 0.54–0.60; n = 10); southwestern United States, northern Mexico *P. apache* Creighton, p. 229
- 9 (a) Head, especially upper half, smooth and shining, with scattered fine punctures (Figure 34); occipital margin broadly rounded, so that VI 0.68–0.75 (n = 11); small species (HW 0.67–0.70; n = 11); Florida *P. leptosus* sp. nov., p. 233
- (b) Head coriarious and weakly shining, punctures coarser (Figure 36); lateral margins of occiput more sharply rounded, giving head a more quadrate shape (VI 0.71–0.88; n = 30); larger species, on average (HW 0.66–0.92; n = 30); southern United States, south to Costa Rica *P. pallidus* F. Smith, p. 234

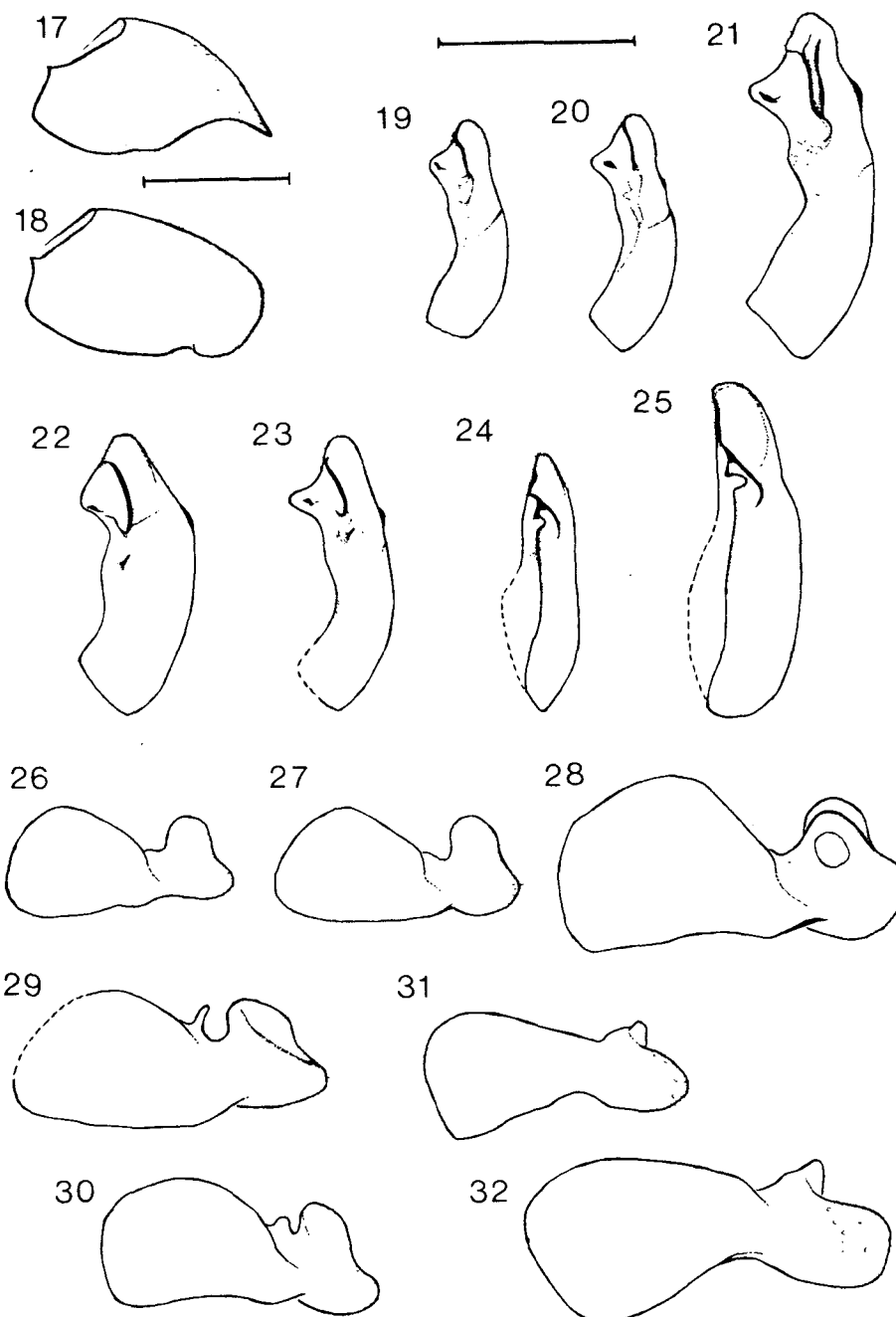
Key to species: males (excluding *P. brunneus* F. Smith, of which the male is unknown).

- 1 (a) Larger species (HW > 1.30); head wider than long (CI > 1.05); Florida, Texas south to Panama *P. mexicanus* Roger, p. 225
- (b) Smaller species (HW < 1.00); head longer than wide (CI < 0.98) 2
- 2 (a) Posterior margin of pygidium (eighth abdominal tergite) convex and pointing posteroventrally (Figure 17); posterior margin of hypopygium straight or broadly convex 3
- (b) Posterior margin of pygidium recurved forward, and forming a pocket which opens anteroventrally (Figure 18); posterior margin of hypopygium concave 5
- 3 (a) Head elongate (CI < 0.80), upper half densely punctate; eyes relatively long, EL about three-quarters of head width (REL2 0.71–0.83) 4
- (b) Head broader (CI > 0.80) and not densely punctate; eyes shorter, EL about one-half head width (REL2 0.50–0.57); southwestern United States, northern Mexico *P. apache* Creighton, p. 229
- 4 (a) Larger species, with very elongate head (HW 0.76–0.82, CI 0.65–0.71, in a sample of 6 males); eyes short relative to head length (REL 0.49–0.51; n = 6); SI 0.26–0.28 (n = 6); in dorsal view, outer margin of paramere indented distally (Figure 25); Florida, West Indies *P. cubaensis* Forel, p. 226

- (b) Smaller species, with less elongate head (HW 0.59-0.62, CI 0.69-0.76; n = 7); eyes relatively longer (REL 0.55-0.58; n = 7); SI 0.22-0.25 (n = 7); in dorsal view, outer margin of the paramere not notably indented (Figure 24); Florida, Texas south to Colombia *P. elongatus* Mayr, p. 227
- 5 (a) In lateral view, caudal end of paramere consisting of a large dorsal lobe preceded by a small, dorsal spine (Figures 29, 30); *either* forefemur rather broad (FI \geq 0.36) *or* posterior margin of hypopygium with a median, ventral protuberance 6
- (b) In lateral view, caudal end of paramere consisting of a dorsal lobe, unpreceded by a smaller spine (Figures 26-28); forefemur relatively elongate (FI \leq 0.36); posterior margin of hypopygium lacking a distinct ventral protuberance 7
- 6 (a) Forefemur relatively elongate (FI 0.30-0.36; n = 7); in dorsal view, inner caudal margin of paramere strongly concave (Figure 23); posterior margin of hypopygium with a median, ventral protuberance; southeastern United States south to Costa Rica *P. ejectus* F. Smith, p. 231
- (b) Forefemur broader (FI 0.36-0.51; n = 11); in dorsal view, inner caudal margin of paramere more or less straight (Figure 22); posterior margin of hypopygium without a distinct ventral protuberance; Florida, West Indies, Mexico south to Brazil *P. simplex* F. Smith, p. 238
- 7 (a) Larger species (HW 0.81-0.92; n = 6); eyes relatively shorter (REL2 0.56-0.59; n = 6); dorsal lobe of paramere much broadened and bicarinate along its dorsal margin, and invaginated below the margin so that in lateral view a distinct lunule is visible (Figure 28); Gulf states, Mexico *P. seminole* sp. nov., p. 237
- (b) Smaller species (HW 0.61-0.84; n = 17); eyes relatively longer (REL2 0.58-0.71; n = 17); dorsal lobe of paramere consisting of a thin lamella, without a lunule (Figures 26, 27) 8
- 8 (a) Larger species (HW 0.67-0.84; n = 12); scape generally subequal in length to second funicular segment (SI3 0.80-1.13; n = 12); in dorsal view, outer margin of the paramere indented distally, posterior to a small but distinct protuberance (Figure 20); southern United States south to Costa Rica *P. pallidus* F. Smith, p. 234
- (b) Smaller species (HW 0.61-0.68; n = 5); scape length exceeding length of second funicular segment (SI3 1.11-1.25; n = 5); in dorsal view, outer margin of the paramere lacking a protuberance and showing no distinct distal indentation (Figure 19); Florida *P. leptosus* sp. nov., p. 233



Figures 5-12. *Pseudomyrmex* workers: frontal views of head, and lateral views of petiole and postpetiole. 5,6. *P. cubensis* (Florida); 7,8. *P. elongatus* (Florida); 9,10. *P. apache* (Arizona); 11,12. *P. mexicanus* (Texas).
 Figures 13-16. *Pseudomyrmex* workers. 13, 14, lateral views of mesothorax, propodeum, petiole, and postpetiole. 15, 16, dorsal views of petiole and postpetiole. 13,15 *P. brunneus* (Mexico); 14,16. *P. ejectus* (Mexico).
 All drawings to same scale; scale line = 0.5 mm.



Figures 17,18. *Pseudomyrmex* males: lateral views of eighth abdominal tergite (pygidium). 17. *P. apache* (Texas); 18. *P. seminole* (Florida). Scale line = 0.5mm.

Figures 19-32. Left parameres of *Pseudomyrmex* males. 19-25, dorsal views, with caudal end uppermost; 26-32, lateral views, with caudal end to the right. 19,26. *P. leptosus* (paratype, Florida); 20,27. *P. pallidus* (Florida); 21,28. *P. seminole* (paratype, Florida); 22,29. *P. simplex* (Florida); 23,30. *P. ejectus* (Texas); 24,31. *P. elongatus* (Florida); 25,32. *P. cubaensis* (Florida). Scale line = 0.5 mm.

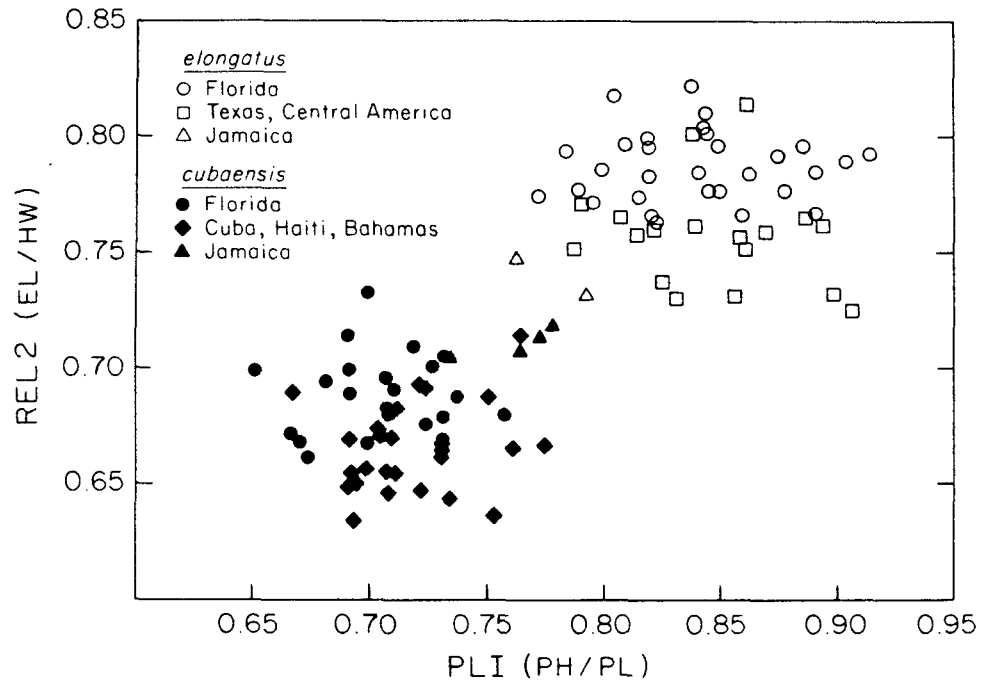
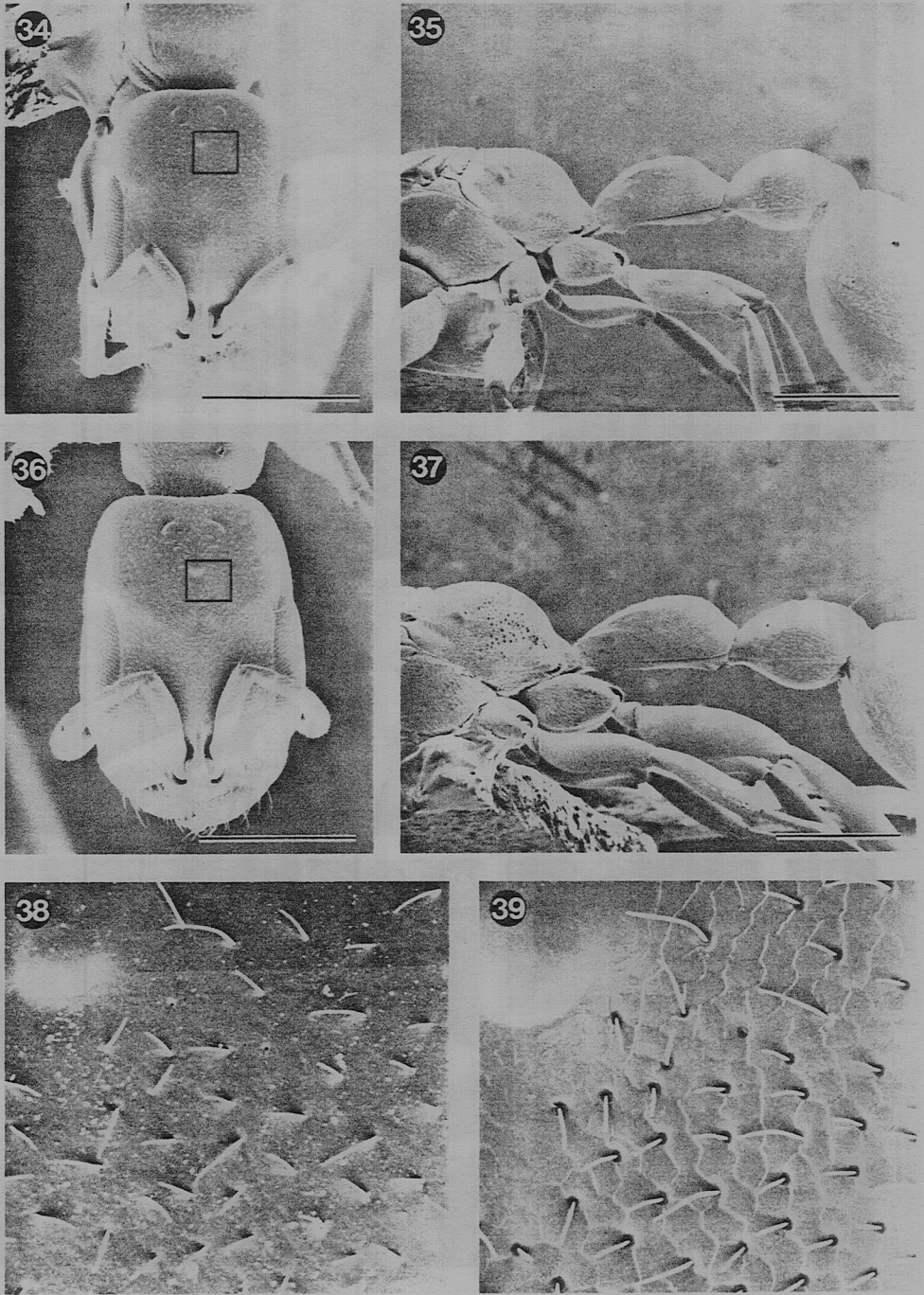
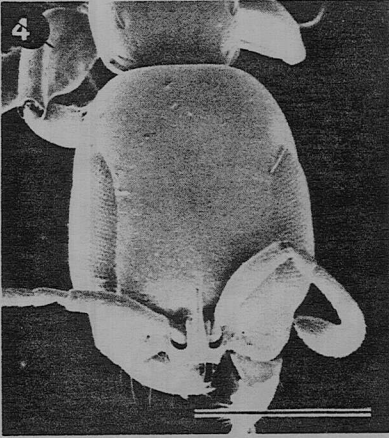


Figure 33. Plot of relative eye length (REL2) and petiole length index (PLI) in workers of *Pseudomyrmex cubaensis* and *P. elongatus*.

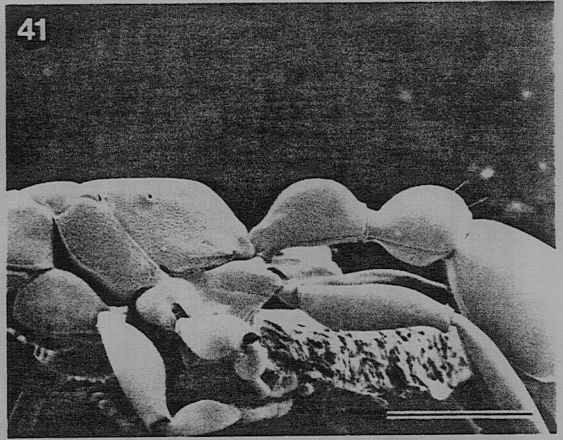


Figures 34-39. *Pseudomyrmex* queens. 34, 36, dorsal views of head; 35, 37, lateral views of mesosoma (part), petiole, postpetiole, and gaster (part); 38-39, close-up views of head sculpture, from insets. 34,35,38, *P. leptosus* (holotype, Florida); 36,37,39, *P. pallidus* (Florida). Scale lines = 0.5 mm.

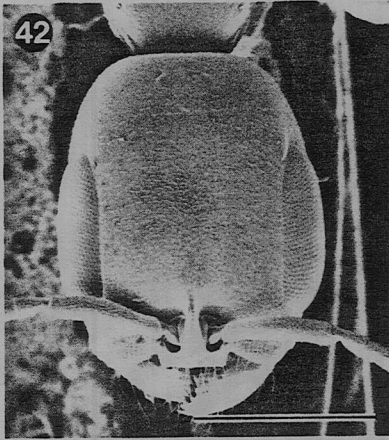
40



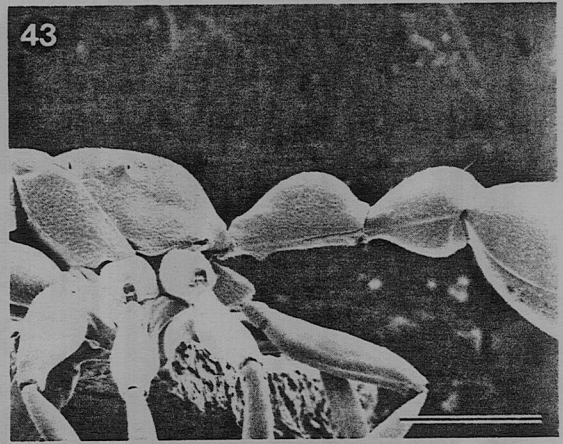
41



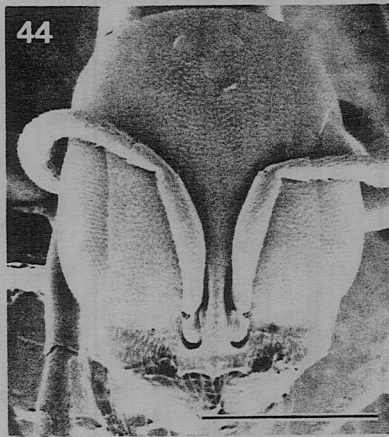
42



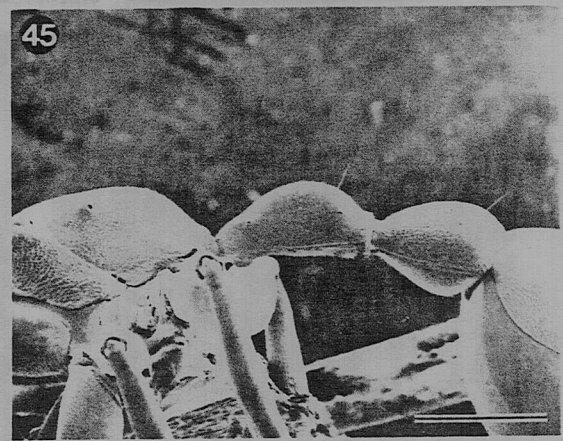
43



44



45



Figures 40-45. *Pseudomyrmex* workers. 40, 42, 44, dorsal views of head; 41, 43, 45, lateral views of mesosoma (part), petiole, postpetiole, and gaster (part). 40,41, *P. simplex* (Florida); 42,43, *P. pallidus* (Florida); 44,45, *P. seminole* (holotype, Florida). Scale lines = 0.5 mm.

SPECIES ACCOUNTS

gracilis group*Pseudomyrmex mexicanus* Roger
(Figs. 11, 12)

Pseudomyrma mexicana Roger, 1863, p. 178. Syntype worker(s), Mexico (not in MNHU) [Not examined].

Pseudomyrma gracilis var. *mexicana* Roger; Wheeler, 1901, p. 204.

Pseudomyrma gracilis var. *mexicana* Roger; Wheeler, 1908, p. 421.

Pseudomyrma gracilis mexicana Roger; Mitchell & Pierce, 1912, p. 69.

Pseudomyrma gracilis var. *mexicana* Roger; Wheeler & Bailey, 1920, pp. 259, 262. [Description of larva, and contents of food pellets].

Pseudomyrma gracilis subsp. *mexicana* Roger; Wheeler, 1942, pp. 166, 167.

Pseudomyrma gracilis mexicana Roger; Creighton, 1950, p. 80.

Pseudomyrmex mexicanus Roger; Whitcomb *et al.*, 1972, pp. 31-33.

Worker Measurements ($n = 13$): HL 1.50–1.72, HW 1.53–1.70, MFC 0.036–0.051, CI 0.98–1.02, OI 0.49–0.54, REL 0.54–0.60, REL2 0.54–0.60, OOI (–0.19)–(+0.39), VI 0.71–0.81, FCI 0.023–0.033, SI 0.47–0.51, SI2 0.80–0.92, FI 0.37–0.41, PDI 1.03–1.32, MPI 0.058–0.073, NI 0.62–0.71, PLI 0.46–0.51, PWI 0.41–0.47, PPWI 0.94–1.12.

Worker Diagnosis.— Immediately distinguishable from all other Nearctic *Pseudomyrmex* by its large size (worker HW > 1.40) and bicolored, orange and black markings. Head broad (CI \sim 1.00), frontal carinae moderately well separated (MFC \sim 0.04), eyes large (REL \sim 0.58); occipital margin convex to flat, in full-face, dorsal view; pronotum laterally margined; metanotal groove distinct; basal face of propodeum rounding into declivitous face, and not distinctly differentiated from it; petiole and postpetiole elongate, the former with a well-developed anterior peduncle. Integument mostly subopaque, due to fine coriarius or punctulate sculpture. Appressed and erect hairs common on most parts of the body, including mesonotum, propodeum, legs, and scapes. Gaster and most of head black; mesosoma (= alitrunk), petiole, and postpetiole orange, with varying amounts of black infuscation (commonly the pronotum is orange, while the mesonotum and propodeum are dark).

Comments.— I have been unable to locate type material of *P. mexicanus* (not present in MNHU, according to F. Koch, *in litt.*). Application of this name to the Nearctic representative of the *gracilis* group is based upon the original description and the type locality. *P. mexicanus* belongs to a complex of closely related forms of uncertain taxonomic status, distinguished mainly on the basis of color (the so-called *gracilis* complex, within the *Pseudomyrmex gracilis* group). These taxa are often listed as subspecies of *gracilis*, despite the fact that some forms are broadly sympatric. *P. mexicanus* is similar to the Central American taxon, *bicolor* Guerin; the latter is ostensibly darker on average, with a more slender petiole. However, the members of the *gracilis* complex exhibit notable variation in color patterns and in the shape of the petiole. A thorough systematic analysis is needed to disentangle the intra- and inter-specific components of this variation. The occurrence of modal color patterns and transitional forms suggests that some of the taxa are incompletely isolated (semispecies).

Biology.— *P. mexicanus* nests in dead or cavity-ridden branches in a wide variety of trees, shrubs, and herbs. Museum records include nests from the following plants: *Baccharis*, *Cladium*, *Peperomia*, *Prosopis*, *Rhizophora*, and *Salix*. Apparently introduced into Florida in recent times (first collected in 1960), *P. mexicanus* is now common in the southern half of the state, where it occurs in hardwood hammocks, mangrove, and old field second growth habitats. Whitcomb *et al.* (1972) provide notes on nesting and feeding behavior in Florida.

Material Examined (GCW, LACM, MCZ, PSW, UCD, USNM).—

FLORIDA: *Collier Co.*: Collier-Seminole St. Pk. (P. S. Ward); *Dade Co.*: Hialeah (C. Stegmaier); Homestead A.F.B (G. C. & J. Wheeler); Long Pine Key (G. C. & J. Wheeler); Mahogany Hammock, Everglades Natl. Pk. (R. Wagner; G. C. & J. Wheeler); Old Flamingo Rd., Everglades Natl. Pk., 10 m (P. S. Ward); *Indian River Co.*: Vero Beach (L. & C. W. O'Brien); *Monroe Co.*: Bear Lake Trail, near Flamingo, Everglades Natl. Pk. (G. C. & J. Wheeler); John Pennekamp State Pk. < 5 m (P. S. Ward).

TEXAS: *Aransas Co.*: Goose I. St. Pk., 5 m (P. S. Ward); *Brazoria Co.*: 4 mi SW West Columbia (P. S. Ward); *Cameron Co.*: 5 mi W Boca Chica (G. C. & J. Wheeler); 10 mi W Boca Chica (W. S. Creighton), Brownsville (Darlington; Jones & Pratt; D. J. & J. N. Knull; Lattimore & Bottimer; McMillan; C. H. T. Townsend); Harlingen (W. Buren); Laguna Madre, 25 mi SE Harlingen (D. E. Hardy); no specific locality (Dreyer; D. J. & J. N. Knull); *Hidalgo Co.*: Bentsen Rio Grande St. Pk. (E. E. Grissell & A. S. Menke; P. S. Ward); Mission (P. C. Avery); Pharr; Santa Ana Refuge (P. S. Ward); no specific locality (D. J. & J. N. Knull); *Kenedy Co.*: 27°10'N, 97°40'W (J. E. Gillaspay); *Kleberg Co.*: Kingsville (J. E. Gillaspay); *Live Oak Co.*: 4 mi S George West (R. Snelling); *Nueces Co.*: Corpus Christi (R. A. Cushman; Jones & Pratt); *Victoria Co.*: Victoria (J. D. Mitchell).

Other material, tentatively identified as *P. mexicanus*, from Mexico, Guatemala, Nicaragua, Costa Rica, Panama and Jamaica.

elongatus group*Pseudomyrmex cubaensis* Forel *stat. nov.*

(Figs. 5, 6, 25, 32)

Pseudomyrma elongata var. *cubaensis* Forel, 1901, p. 342. Holotype (unique syntype) worker, Bahía Honda, Cuba (MHN) [Examined].

Pseudomyrma elongata; Wheeler (nec Mayr), 1905, pp. 85-87 (partim).

Pseudomyrma elongata var. *cubaensis* Forel; Forel, 1913, p. 215 [Description of queen].

Pseudomyrma elongata var. *cubaensis* Forel; Wheeler, 1913a, pp. 484-485.

Pseudomyrma elongata var. *cubaensis* Forel; Wheeler & Mann, 1914, p. 18.

Pseudomyrma elongata var. *cubaensis* Forel; Mann, 1920, p. 405

Pseudomyrma elongata; Wheeler & Bailey (nec Mayr), 1920, pp. 260, 265 [Description of larva, and contents of food pellets].

Pseudomyrma elongata; Wheeler (nec Mayr), 1932, p. 4 (partim).

Pseudomyrma elongata; Wheeler (nec Mayr), 1942, p. 165.

Pseudomyrma elongata; Creighton (nec Mayr), 1950, pp. 79-80 (partim).

Pseudomyrmex elongata; Creighton (nec Mayr), 1955, pp. 17-20 (partim).

Pseudomyrmex elongatus; Wheeler & Wheeler (nec Mayr), 1956, p. 384 [Description of larva].

Worker Measurements ($n = 21$, except for HL, HW, CI, REL, REL2, and PLI, where $n = 52$): HL 0.84–1.05, HW 0.64–0.75, MFC 0.017–0.029, CI 0.69–0.77, OI 0.52–0.58, REL 0.47–0.51, REL2 0.63–0.73, OOI 0.41–0.95, VI 0.74–0.83, FCI 0.024–0.044, SI 0.44–0.48, SI2 0.64–0.74, FI 0.42–0.48, PDI 1.09–1.44, MPI 0.038–0.084, NI 0.53–0.63, PLI 0.65–0.78, PWI 0.55–0.69, PPWI 1.01–1.25.

Worker Diagnosis.— A small, brown species with elongate head (HW 0.64–0.75, CI 0.69–0.77) and with erect pilosity on the mesonotum and propodeum. Very similar to *P. elongatus* Mayr (*q.v.*), except averaging larger, with relatively short eyes (REL2 0.63–0.73) and a longer petiole and postpetiole (PLI 0.65–0.78). Head punctate, the punctures maximally separated by about their diameters.

Comments.— Originally described as a variety of *P. elongatus*, *P. cubaensis* was synonymized with the former by Creighton (1955, p. 18). However it appears to be consistently distinct from the smaller *elongatus*-like form with which occurs sympatrically in south Florida. The most important differences are in the relative length of the eye and the shape of the petiole. A two-dimensional plot of REL2 and PLI cleanly separates all Floridian and most other material into two taxa (Figure 33). In Jamaica the two forms are less distinct. It is possible that *P. elongatus* and *P. cubaensis* represent a remnant circular Rassenkreis stretching around the

Gulf of Mexico, with intermediate populations in Jamaica.

Apart from the differences in eye length and petiole shape, *P. cubaensis* also tends to have a broader head, narrower forefemur (FI 0.42-0.48), longer postpetiole (PPWI 1.01-1.25), and fewer (but longer) erect setae on the petiole, postpetiole, and fourth abdominal tergite. The body sculpture and appressed pubescence^{are} lighter than in Florida *P. elongatus*, producing a shinier appearance, particularly on the occiput, propleuron, petiole, and postpetiole. (Elsewhere *P. elongatus* may have an equally shiny integument, e.g. in Texas.)

Differences between queens and males of the two species are given in the respective keys.

Biology.— In Florida, I have collected *P. cubaensis* in dead twigs of *Rhizophora mangle* and *Conocarpus erectus*. There are museum records of nests in *Tillandsia* (Florida) and *Cladium* (Bahamas), and of workers foraging on *Ficus aurea*, mangrove, sea grape, and acacia. Wheeler's (1905) records of Bahamaian "*elongatus*" in culms of *Uniola* and *Cladium* and in hollow twigs of gum mastic, sea grape, and buttonwood, refer in part to *P. cubaensis* (see also discussion of *Pseudomyrmex subater* Wheeler & Mann under *P. elongatus*).

Material Examined (LACM, MCZ, PSW, UCD, USNM).—

FLORIDA: *Collier Co.*: Collier-Seminole St. Pk. (P. S. Ward); Marco (W. T. Davis); *Dade Co.*: Biscayne Bay (Slosson); Cards Point (W. M. Wheeler); Long Pine Key (W. M. Wheeler); Miami Beach (W. E. Brown; A. C. Cole); Paradise Key (D. Fairchild; W. M. Wheeler); no specific locality (J. N. Knull); *Highlands Co.*: Archbold Biol. Stn. (R. Silberglied); Highlands Hammock State Park (L. & C. W. Obrien); near Sebring (R. W. Klein); no specific locality (F. J. Moore); *Hillsborough Co.*: no specific locality (J. C. Bowyer); *Lake Co.*: no specific locality (W. A. Hiers); *Lee Co.*: Ft. Meyers [= Ft. Myers]; *Monroe Co.*: Lower Matecumbe Key (W. M. Wheeler); N. Key Largo (R. W. Klein); Key West; No Name Key (P. S. Ward); *Osceola Co.*: Lake Alfred (M. H. Muma); *Palm Beach Co.*: Boynton Beach (Wood & Davidson); *Sarasota Co.*: Long Branch Key (A. C. Cole); Sarasota (A. C. Cole); 30 mi SE Sarasota (J. Longino).

BAHAMAS. Andros Island (W. M. Wheeler); Mangrove Cay, Andros Island (B. Cole); Conception Island (G. Greenway); Gun Point, Crooked Island (B. Valentine & R. Hamilton); New Providence (B. Cole).

CUBA: Aguada de Pasajeros (W. M. Wheeler); Anafe, Havana (G. Aguayo); Carnoa, Havana (G. Aguayo); Cayamas (Baker; E. A. Schwartz); Cienaga de Japata (W. M. Wheeler); Guanajay, Pinar del Rio (E. O. Wilson); Guavivó Cave, Soledad (F. Smith); Jiquari (Barbour & Shaw); La Milpa, near Cienfuegos (G. Salt); Pinares Oriente (W. M. Mann); Santa Clara, Las Villas Prov. (E. O. Wilson); Soledad, Cienfuegos (C. T. & B. B. Brues; W. S. Creighton; J. G. Myers; F. Smith; N. A. Weber).

HAITI: Grande Rivière (W. M. Mann); Mtns. N. of Jacmel (W. M. Mann).

JAMAICA: Troy (Wight); Balaclava (Wight).

Pseudomyrmex elongatus Mayr

(Figs. 7, 8, 24, 31)

Pseudomyrma elongata Mayr. 1870, p. 413. Syntype worker(s), Colombia, (Lindig) (not in NHMV) [not examined].

Pseudomyrma elongata var. *tandem* Forel. 1906, p. 228. Syntype workers, El Hiquito, near San Mateo, Costa Rica (P. Biolley) (MNHN) [Examined] [Synonymy by Creighton, 1955, p. 18].

Pseudomyrma elongata Mayr; Wheeler, 1932, p. 4 (partim).

Pseudomyrma elongata Mayr; Creighton, 1950, pp. 79-80 (partim).

Pseudomyrmex elongata Mayr; Creighton, 1955, pp. 17-20 (partim).

Pseudomyrmex elongatus Mayr; Wilson, 1964, p. 4.

Worker Measurements ($n = 24$, except for HL, HW, CI, REL, REL2, and PL1, where $n = 50$): HL 0.78–0.91, HW 0.56–0.64, MFC 0.013–0.024, CI 0.68–0.74, OI 0.52–0.58, REL 0.50–0.58, REL2 0.73–0.82, OOI 0.13–0.48, VI 0.82–0.90, FCI 0.021–0.041, SI 0.42–0.48, SI2 0.55–0.64, FI 0.45–0.56, PDI 0.95–1.45, MPI 0.036–0.072, NI 0.55–0.63, PL1 0.76–0.91, PW1 0.62–0.74, PPWI 1.09–1.40.

Worker Diagnosis.— A small, brown species with elongate head and eyes (HW 0.56–0.64, CI 0.68–0.74); frontal carinae subcontiguous; occipital margin flat or slightly concave, in full-face dorsal view; basal and declivitous faces of propodeum well differentiated; petiole short, broad, and rounded (PL1 0.76–0.91); postpetiole wider than long. Head densely punctate

and usually more or less opaque; remainder of body finely punctate or coriarius-imbricate, varying from opaque to sublucid. Erect pilosity and fine appressed pubescence present on most parts of body, including mesonotum and propodeum; fourth abdominal tergite with a rather dense mat of appressed pubescence.

Comments.— This is the smaller of two *elongatus*-like species in North America. I am considering it conspecific with *P. elongatus* Mayr on the basis of (i) the original description of *P. elongatus*, particularly the indication that HL is 1.5 times HW, and (ii) worker material from Costa Rica (leg. Biolley) (MNHN, NHMV) determined as *P. elongatus* by Mayr and Forel. There is a confusing variety of *elongatus*-like forms in Central and South America, which require detailed taxonomic study. Until such a study is carried out, it seems expedient to refer to the North American species as *P. elongatus* and to leave *P. tandem* Forel as a provisional synonym.

P. subater Wheeler & Mann (1914), originally described as a subspecies of *P. elongatus*, was recognized as a distinct species by Creighton (1955). It may be distinguished from *P. elongatus* and *P. cubaensis* by the shinier integument, conspicuous pilosity (grading insensibly from appressed pubescence to fine suberect and erect setae), broad head (CI 0.83–0.88), short eyes (REL2 0.54–0.58 in *P. subater*, > 0.62 in *P. elongatus* and *P. cubaensis*), distinct petiolar shape (gradually inclined anterior face rounded into a sharply declining posterior face so that NI 0.61–0.72), and conspicuous anteroventral tooth on the postpetiole. Apart from two “cotype” workers in the MCZ from Haiti, I have seen material of *P. subater* (misidentified as *P. elongatus*) from the Bahamas (Andros Island, Nassau) and the same, or a closely related species, from Jamaica (Kingston). Wheeler’s (1905) record of “*elongatus*” from the Bahamas appears to be based on a combination of *P. subater* and *P. cubaensis*, judging from material in the MCZ.

Recent collections of *P. subater* from the Bahamas by Blaine Cole show that this species has striking bright orange queens, which look superficially like those of *P. pallidus*. Cole also made a collection from a single *Cladium* culm which contained both *P. subater* and *P. cubaensis* workers. These findings suggest that Wheeler’s (1905) and Mann’s (1920) records of dulotic associations between “*flavidula*” and “*elongata*” may have been based in part on pure colonies of *P. subater*, or mixed colonies of *P. subater* and *P. cubaensis*.

Biology.— *P. elongatus* nests in dead twigs in a variety of woody shrubs and trees. I have collected *P. elongatus* colonies in twigs of *Avicennia germinans*, *Baccharis halimifolia*, *Laguncularia racemosa* and *Rhizophora mangle* in Florida, and in *Gliricidia sepium*, *Helicteres*, and *Inga* in Costa Rica and Panama. Among museum material there are records of *P. elongatus* nesting in a “climbing vine” and “mangrove stems” in Florida, in *Quercus virginiana* and *Prosopis* (Texas), and in *Quercus fusiformis* (Nuevo Leon, Mexico).

Material Examined (GCW, LACM, MCZ, PSW, UCD, USNM).—

FLORIDA: *Collier Co.*: Everglade[s] (W. T. Davis); *Dade Co.*: Coconut Grove; Miami: Rattlesnake Hammock, Homestead (R. Gregg); Shark Valley, Everglades Natl. Pk. (P. S. Ward); no specific locality (J. N. Knull); *Highlands Co.*: Archbold Biol. Stn., Lake Placid (T. C. Schneirla); *Lee Co.*: Ft. Myers (W. M. Barrows); *Monroe Co.*: Big Pine Key (E. O. Wilson); John Pennekamp St. Pk., < 5 m (P. S. Ward); Key Largo; Key West (E. O. Wilson); N. Key Largo (R. W. Klein); Plantation Key (E. O. Wilson).

TEXAS: *Cameron Co.*: 5 mi W Boca Chica (G. C. & J. Wheeler); 10 mi W Boca Chica (R. R. Snelling); Harlingen (W. Buren); *Hidalgo Co.*: Mission (W. Buren); Monte Alto (W. S. Creighton); *Kenedy Co.*: 26 mi N Raymondsville (W. S. Creighton).

MEXICO: *Nayarit*: Maria Magdalena, Is. Tres Marias (R. R. Snelling); *Nuevo Leon*: El Pastor, Montemorelos, 2000 ft (W. S. Creighton); *San Luis Potosi*: Rio Amahac, Tamazunchale, 300 ft (W. S. Creighton); 3 mi N. Valles (W. S. Creighton); *Sinaloa*: Mazatlan (P. J. Spangler); *Tamaulipas*: Cañon de el Abra, 1000 ft (W. S. Creighton).

COSTA RICA: *Guanacaste Prov.*: 1 km SW Pto. Coyote, < 5 m (P. S. Ward); *Puntarenas Prov.*: Llorona, Corcovado Natl. Park, 10 m (P. S. Ward); Manuel Antonio Natl. Pk., 5 m (P. S. Ward); Monteverde, 1200 m (P. S. Ward); Sirena,

Penin. Osa. 50 m (J. Longino).

JAMAICA: Ford 1 mi SE Stony Hill (E. A. Chapin).

PANAMA: 2 km W Gamboa, Canal Zone, 30 m (P. S. Ward); 6 km NW Gamboa, Canal Zone, 50 m (P. S. Ward), 6 km NW Gatun Dam, Canal Zone, 75 m (P. S. Ward).

pallidus group

Pseudomyrmex apache Creighton

(Figs. 9, 10, 17)

Pseudomyrmex apache Creighton, 1952, p. 134. Nidoparatype workers, females, males. Brown Canyon, Baboquivari Mtns., Arizona, 4400 ft. 2.ix.1951, in *Quercus oblongifolia* 502 (W. S. Creighton) (LACM, MCZ) [Examined].

Pseudomyrma pallida; Wheeler (nec F. Smith), 1908, p. 420 (partim).

Pseudomyrmex apache Creighton; Creighton, 1954, pp. 9–15 [Distribution].

Pseudomyrmex apache Creighton; Wheeler & Wheeler, 1956, p. 380 [Description of larva].

Pseudomyrmex apache Creighton; Creighton, 1963, pp. 1–4 [Biology].

Pseudomyrmex apache Creighton; Wheeler & Wheeler, 1973, pp. 41–42.

Worker Measurements ($n = 35$): HL 1.02–1.30, HW 0.83–1.04, MFC 0.033–0.066, CI 0.75–0.84, OI 0.58–0.65, REL 0.39–0.44, REL2 0.48–0.54, PPI 1.10–2.00, VI 0.74–0.84, FCI 0.034–0.070, SI 0.46–0.51, SI2 0.90–1.00 FI 0.38–0.44, PDI 0.87–1.19, MPI 0.007–0.044, NI 0.51–0.64, PLI 0.54–0.61, PWI 0.48–0.56, PPWI 1.02–1.19.

Worker Diagnosis.— Head broad; eyes short (EL subequal to SL); anterior clypeal margin laterally rounded; frontal carinae subcontiguous, MFC subequal to the basal width of scape; occipital margin flat to broadly convex, in full-face, dorsal view; pronotum with weak lateral margination; metanotal groove usually weak; petiole relatively short, broad, and high with a rather sharply inclined anterior face. Head opaque to sublucid, densely punctulate on a coriarius background; mesosoma and petiole subopaque, coriarius-imbricate; postpetiole and gaster opaque to sublucid, covered with numerous, fine piligerous punctures. Erect setae sparsely present on scape, head, pronotum, petiole, postpetiole, gaster, and legs (generally absent on mesonotum and propodeum); typically four pairs of erect setae on dorsum of head, and two or three pairs each on pronotum, petiole, and postpetiole. Fine, appressed pubescence scattered over body, including fourth abdominal tergite. Rich orange-brown, the head (and sometimes legs and gaster) a little darker.

Comments.— Although I have placed *P. apache* in the *pallidus* group as a matter of convenience, it is a rather distinct species showing only superficial resemblance to other members of the group. It is the only species to possess such well separated frontal carinae, laterally rounded anterior clypeal margin, short eyes relative to scape length, and (in the male) ventrally pointed pygidium. *P. apache* workers also tend to be larger, more densely sculptured (hence less shiny), and more setose than those of other *pallidus* group species. Size alone (worker HW > 0.83) will separate *P. apache* from all species except *P. pallidus* and *P. seminole*. Apart from character differences outlined in the keys (of which eye size relative to scape length and shape of male terminalia are most distinctive), *P. apache* can usually be distinguished from *P. pallidus* and *P. seminole* by the presence of a pair of erect setae, one on either side of the median ocellus, in the worker. In *P. apache* workers these two setae are always present and usually as long as the ocellar distance (OD). In *P. seminole* and *P. pallidus* workers these setae are either absent or shorter than OD.

Biology.— A denizen of xeric habitats, *P. apache* nests in sizable dead branches (1–12 cm diameter) of various trees (especially live oaks) and large woody shrubs, usually taking advantage of beetle-bored cavities. By state and country, nest-site records are as follows:

Texas: *Prosopis glandulosa*, *Quercus grisea*.

Arizona: *Populus* sp., *Prosopis* sp., *Quercus arizonica*, *Q. emoryi*, *Q. grisea*, *Q. oblongifolia*, *Q. turbinella*.

California: *Arctostaphylos manzanita*, *Fraxinus* gall, *Pinus attenuata* cone, *Quercus chrysolepis*, *Q. wislizenii*, *Umbellularia californica*.

Mexico: *Prosopis* sp., *Quercus emoryi*, *Q. fusiformis*, *Q. oblongifolia*, *Q. santaclarensis*.

Of 13 nests which I have dissected (from Texas, Arizona and California), five contained no dealate females, six contained a single queen, one contained two functional (i.e. inseminated) queens, and one contained 6 dealate queens. Thus this species is at least occasionally polygynous and (judging from the queenless nests) polydomous. For two of the five queenless nests, queenright nests were located on the same tree or shrub.

I have seen two instances of lone foraging (presumably colony founding) dealate queens: one on the trunk of a *Quercus arizonica* tree in September (Arizona) and the other on an *Arctostaphylos* bush in February (northern California). The latter queen was dissected and found to be inseminated but possessing preoviposition ovaries (ovarioles short; corpora lutea absent). Alates of *P. apache* have been collected in March, April, and July to November, suggesting that mating may occur in more than one season.

Material Examined (BMNH, GCW, LACM, MCZ, PSW, UCD, USNM).—

ARIZONA: *Cochise Co.*: Carr Canyon, Huachuca Mtns., 5400 ft (W. S. Creighton); 6200 ft (C. W. O'Brien). Cave Crk. Ranch, Chiricahua Mtns., 5000 ft (G. E. Wallace); Chiricahua Mt. (D. J. and J. N. Knull); Chiricahua Mtns. (J. N. Knull); Chiricahua Natl. Monum. Cpgrd., 5400 ft (W. S. Creighton); Cochise Stronghold, Dragoon Mtns., 5200 ft (W. S. Creighton); Coronado Peak, 2020 m (P. S. Ward); Garden Canyon, Huachuca Mtns., 5800 ft (W. S. Creighton); Huachuca Mt. (J. N. Knull); Miller Canyon, Huachuca Mtns. (W. S. Creighton); Portal (G. Alpert); 3 km SW Portal, 1510 m (P. S. Ward); 7 km SE Sunnyside, 1670 m (P. S. Ward); *Gila Co.*: Globe (Nuttig); *Graham Co.*: Cottonwood Canyon, Peloncillo Mtns., 4800 ft (W. S. Creighton); Graham Mtns., 3500-4500 ft (R. M. Bohart); Post Canyon, Pinaleno Mtns., 5000-6000 ft (W. M. Wheeler); *Mohave Co.*: Hualapai Mtns., S. of Kingman, 1450 m (E. Schlinger); *Pima Co.*: Abra Wash, Growler Mtns., Organpipe Cactus Natl. Monum., 1300 ft (W. S. Creighton); Alamo Canyon, Ajo Mtns., Organpipe Cactus Natl. Monum., 2200 ft (W. S. Creighton); Brown Canyon, Baboquivari Mtns., 4400 ft (W. S. Creighton); Forestry Cabin, Baboquivari Mtns., 3500 ft (W. S. Creighton); Organpipe Cactus Natl. Monum. (E. R. Tinkham); Sabino Canyon (V. L. Vesterby); San Miguel (E. D. Alpert); Tucson (J. Knull); *Santa Cruz Co.*: Canelo Pass, 5300 ft (W. S. Creighton); Madera Canyon, Santa Rita Mtns. (W. S. Creighton), 4880 ft (C. R. Kovacic; V. L. Vesterby); Nogales (Burdine; D. J. & J. N. Knull); Peña Blanca Springs, 3700 ft (W. S. Creighton); Sweetwater, Santa Rita Mtns., 4000 ft and 6000 ft (W. S. Creighton); Tumacacori Mt. (D. J. & J. N. Knull); *county unknown*: Catal Springs (Hubbard & Schwartz); Santa Catalina Mtns. (M. Chrisman); Santa Rita Mtns. (R. M. Bohart; J. Knull).

CALIFORNIA: *Butte Co.*: 6 km N Feather Falls, 600 m (P. S. Ward); *Colusa Co.*: 1 km W Fout Springs, 600 m (P. S. Ward); *Imperial Co.*: Winterhaven (R. L. Westcott); *Lake Co.*: Borax Lake (E. L. Westcott); *Los Angeles Co.*: Altadena; Eaton Canyon Pk. (M. E. Thompson); Foothill, Pasadena (A. H. Sturtevant); 3 mi N. Mt. Baldy (E. Weidert); Tanbark Flat (R. C. Bechtel; R. M. Bohart); *Napa Co.*: Mt. St. Helena (J. S. Buckett); 4 km E summit Mt. St. Helena, 450 m (P. S. Ward); *Orange Co.*: Irvine Pk. (K. Brown); Trabuco Canyon (M. E. Irwin); Trabuco east (E. Eidert); *Riverside Co.*: Blythe (R. M. Hardman); Deep Canyon (W. P. MacKay); Dripping Springs, Agua Tibia Mtns., 1500 ft (W. S. Creighton); Pinon Flat, San Jacinto Mtns. (R. L. Macdonald); Poppet Flats (G. Clark); Riverside (E. I. Schlinger); Whitewater (A. L. Melander); Winchester (W. Icenogle); *San Bernardino Co.*: nr. Cajon pass; *San Diego Co.*: Jacumba (D. J. & J. N. Knull); 5.9 mi NE Ramona, Hwy. 78 (S. & S. Fromer, S. Larisch); 5.2 mi NW Ramona, Hwy. 78 (S. & S. Fromer, S. Larisch); no specific locality; *Santa Barbara Co.*: Canyon del Medio, Santa Cruz I. (R. O. Schuster & E. C. Toftner); *Santa Clara Co.*: no specific locality; *Solano Co.*: Cold Canyon, 420 m (P. S. Ward); *Tehama Co.*: 26 km WSW Red Bluff, 240 m (P. S. Ward); *Tulare Co.*: Ash Mtn. Powerhouse #3 (D. J. Burdick; J. A. Halstead); Ash Mtn., Sequoia Natl. Pk. (M. G. Fitton); Horse Creek Rd. (O. L. Brawner); *Ventura Co.*: Saticoy (R. E. Barrett); *Yolo Co.*: 3 km SW Guinda, 150 m (P. S. Ward); 4 km NW Rumsey, 150 m (P. S. Ward); *county unknown*: mtns. near Claremont [Los Angeles or San Bernardino Co.] (Baker).

DISTRICT OF COLUMBIA: Washington (B. P. Currie) [Dubious locality record].

TEXAS: *Bexar Co.*: San Antonio (P. S. Ward); *Duval Co.*: Freer (R. R. Rodgers); San Diego; *Edwards Co.*: Camp Wood (C. R. Ward); *Goliad Co.*: no specific locality (J. D. Mitchell); *Hidalgo Co.*: Monte Alto, 60 ft (W. S. Creighton); *La Salle Co.*: Fowlerton, 300 ft (W. S. Creighton); *Maverick Co. (?)*: El Indigo [= El Indio?] (D. H. Bixby); *Presidio Co.*: Arsaca Canyon, Chinati Mtns., 4800 ft (W. S. Creighton); *Starr Co.*: no specific locality (D. J. & J. N. Knull); *Travis Co.*: Austin (P. S. Ward); *Uvalde Co.*: no specific locality (D. J. & J. N. Knull).

MEXICO: *Baja California Norte*: 25 mi N El Arco (W. H. Ewart); *Baja California Sur*: 72 mi NW La Paz, 100 ft (R. R. Snelling); San José del Cabo; 7 mi NW Santa Rosalia, 850 ft (R. R. Snelling); 2.7 mi SE Valle Peridido; *Chihuahua*: 3 mi S Encinillas, 4900 ft (W. S. Creighton); 16 mi W Gral. Trias, 5800 ft (W. S. Creighton); Nogales Ranch, Sierra de en Medio, 5200 ft (W. S. Creighton); Ojo del Cerro Chilicote (C. H. T. Townsend); 23 mi S Parral, 5500 ft (W. S. Creighton); 34 mi S Parral, 5800 ft (W. S. Creighton); *Durango*: Villa Ocampo [=Ocampo], 5700 ft (W. S. Creighton); *Nuevo Leon*: China, 600 ft (W. S. Creighton); *Sonora*: 30 mi SE Agua Prieta (V. Roth); 4.8 mi S Cananea (V. Roth).

Pseudomyrmex brunneus F. Smith

(Figs. 13, 15)

Pseudomyrma brunnea F. Smith (1877), p. 63. Holotype (unique syntype) worker, Mexico (BMNH) [Examined].

Pseudomyrma brunnea var. *nigrita* Enzmann, 1945, p. 82. Syntype workers, Mirador, Mexico (E. Skwarra) (MCZ) [Examined]. *Syn. nov.*

Worker Measurements ($n = 10$): HL 0.77–0.86, HW 0.67–0.72, MFC 0.012–0.024, CI 0.83–0.90, OI 0.57–0.63, REL 0.51–0.56, REL2 0.58–0.64, OOI 0.67–1.20, VI 0.70–0.78, FCI 0.017–0.035, SI 0.43–0.50, SI2 0.69–0.80, FI 0.41–0.45, PDI 0.56–0.75, MPI 0.052–0.075, NI 0.57–0.65, PLI 0.47–0.58, PWI 0.54–0.65, PPWI 1.26–1.54.

Worker Diagnosis.— Small, brown species, with wide head and broadly rounded occipital margin (HW 0.67–0.72, CI 0.83–0.90). Similar to *P. ejectus* F. Smith (*q.v.*) except as follows: basal face of propodeum between one half and three quarters the length of declivitous face (PDI 0.56–0.75); petiole shorter and broader than that of *P. ejectus* (PWI 0.54–0.65); petiolar node somewhat displaced posteriorly; postpetiole short and wide (PPWI 1.26–1.54). Front of head opaque, densely coriarius-imbriate; sculpture becoming weaker towards the vertex, with scattered, fine punctures on a (usually) sublucid, coriarius background; mesosoma subopaque, coriarius to coriarius-imbriate; petiole, postpetiole, and gaster increasingly (in that order) less coriarius and more smooth and shining. Erect pilosity very sparse: appressed pubescence scattered over body; abdominal tergite IV with appressed hairs separated by about their lengths, and not obscuring the shiny integument. Body dark brown, little or no contrast in color between the head, mesosoma, petiole, postpetiole, or gaster; mandibles and apical ends of tarsi luteous.

Comments.— This appears to be an uncommon Mexican species, which occurs sympatrically with *P. ejectus*. The major differences between the two species are in the shapes of the propodeum, petiole, and postpetiole (note especially the non-overlapping values of PWI and PPWI). In addition, *P. brunneus* tends to have a more densely sculptured (and opaque) head than *P. ejectus* and to exhibit less contrasting light and dark brown coloration on the mesosoma, petiole and postpetiole.

Biology.— At Cola de Caballo, near Monterrey, I collected workers and larvae of *P. brunneus* in dead twigs of a small tree, probably *Melia azedarach*, and in the dead stalk of an unidentified mint. The latter nest contained a single dealate queen. *P. ejectus* was also found nesting in a dead mint stalk at this locality.

Material Examined (BMNH, MCZ, PSW, UCD).—

MEXICO: *Nuevo Leon*: Cola de Caballo, 38 km SSE Monterrey, 600 m (P. S. Ward); *Veracruz*: Mirador (E. Skwarra); *state unknown*: "Mexico".

Pseudomyrmex ejectus F. Smith

(Figs. 14, 16, 23, 30)

Pseudomyrma ejecta F. Smith (1858), p. 157. Two syntype workers, "Brazil?" (BMNH) [Examined]. One syntype here designated as LECTOTYPE.

Pseudomyrma brunnea; Wheeler (nec F. Smith), 1908, pp. 420–421.

Pseudomyrma brunnea; Mitchell & Pierce (nec F. Smith), 1912, p. 69.

Pseudomyrma brunnea; Wheeler (nec F. Smith), 1913b, p. 240.

Pseudomyrma brunnea; Wheeler (nec F. Smith), 1932, p. 3.

Pseudomyrma brunnea; Creighton (nec F. Smith), 1950, p. 79.

Pseudomyrmex brunneus; Wheeler & Wheeler (nec F. Smith), 1956, p. 382 [Description of larva].

Worker Measurements ($n = 50$): HL 0.65–0.97, HW 0.56–0.81, MFC 0.007–0.021, CI 0.78–0.89, OI 0.52–0.62, REL 0.51–0.59, REL2 0.61–0.70, OOI 0.46–1.52, VI 0.64–0.78, FCI 0.010–0.030, SI 0.43–0.49, SI2 0.64–0.76, FI 0.36–0.50, PDI 0.70–1.07, MPI 0.046–0.097, NI 0.48–0.60, PLI 0.43–0.57, PWI 0.40–0.52, PPWI 0.93–1.25.

Worker Diagnosis.— Head wide, broadly rounded (HW 0.56–0.81, CI 0.78–0.89); anterior clypeal margin medially straight, laterally angulate; frontal carinae closely contiguous; occipital margin convex, flat, or slightly concave, in full face, dorsal view; pronotum broadly rounded; metanotal groove wide and rather deep (MPI 0.046–0.097); basal face of propodeum subequal in length to declivitous face, and poorly differentiated from it (PDI 0.70–1.07); petiole and postpetiole relatively long and slender (PWI 0.40–0.52); anteroventral tooth present on petiole. Head subopaque to weakly shining, the frons punctulate on a coriarius imbricate background; sculpture weakening towards the vertex, which is correspondingly more shiny; mesosoma and petiole sublucid, coriarius-imbricate; postpetiole and gaster more or less smooth and shining. Erect pilosity very sparse; appressed pubescence inconspicuous; appressed hairs on abdominal tergite IV not forming a dense mat nor obscuring the shiny integument. Head (except clypeus and mandibles), mesonotum, propodeum, and gaster dark brown; pronotum, petiole, and postpetiole generally a lighter brown, of varying contrast; clypeus, mandibles, and apices of legs light brown to pale luteous.

Comments.— The lectotype and paralectotype workers of *P. ejectus* in the BMNH agree well with the common species in southeastern United States which has been masquerading under the name “*brunneus*”. I have also seen material which I would consider conspecific with *P. ejectus* from Mexico, Jamaica, Belize, and Costa Rica, but not from South America. (There are other *ejectus*-like taxa in Central and South America, some undescribed.) It seems likely that the types of *ejectus* came from the United States or Central America rather than Brazil. Differences between *P. ejectus* and *P. brunneus* are discussed under the latter species.

Described as a variety *P. ejectus*, *P. peruvianus* Wheeler (1925, p. 11) is here considered to be a distinct species (*stat. nov.*). Three syntype workers in the MCZ from Chaquimayo, Peru (leg. Holmgren) have a smooth, shining, punctulate head whose light brown color contrasts with the dark brown gaster; more clearly differentiated basal and declivitous faces of the propodeum than *P. ejectus* (PDI 1.06–1.09); and a short, high, and (in dorsal view) thin petiole such that PLI 0.60–0.65 and PHI 0.77–0.83 (PLI 0.43–0.57 and PHI 0.54–0.78 in *P. ejectus*).

Biology.— *P. ejectus* nests in dead twigs or stalks of woody and herbaceous plants. Among the *P. ejectus* nest series which I have examined there are records from the following plant genera: *Carya*, *Cladium*, *Conostegia*, *Prosopis*, *Quercus*, *Rhus*, *Spilanthes*, *Vernonia*, and *Vitis*. In southeastern United States alates have been collected in the months of March, June, July, and September. Three out of five nests which I dissected (from Florida, Texas, and Mexico) contained a single dealate female; the other two nests were queenless. In Florida some nests of this species are polygynous (R. W. Klein, pers. comm.).

Material Examined (BMNH, GCW, LACM, MCSN, MCZ, NHMB, PSW, UCD, USNM).—

ALABAMA: Baldwin Co.: Jackson's Oak (W. S. Creighton); Marlow's Ferry, Fish R. (W. S. Creighton); Mobile Co.: Dog R., Mobile (W. S. Creighton); Irvington (Van Aller); Mobile (W. D. Pierce); Theodore (A. H. Sturtevant); Whistler (A. H. Sturtevant); county unknown: Kushla (A. H. Sturtevant).

FLORIDA: *Alachua Co.*: Gainesville (R. W. Klein; N. L. H. Krauss); *Collier Co.*: Everglades (W. M. Barrows), Immokalee (M. Deyrup); Royal Palm Pk. (Melander). *Dade Co.*: Coconut Grove; Homestead (W. F. Buren; G. B. Merrill); Homestead Air Force Base (G. C. & J. Wheeler); Long Pine Key (W. M. Wheeler); Miami (W. T. Davis); Old Flamingo Rd., Everglades Natl. Pk. 10 m (P. S. Ward); Paradise Key (W. M. Wheeler); Pinelands Trail, Everglades Natl. Pk. (G. C. & J. Wheeler); Shark Valley, Everglades Natl. Pk. (P. S. Ward); Visitor Centre, Everglades Natl. Pk. (G. C. & J. Wheeler); no specific locality (J. N. Knull); *Duval Co.*: Fort George; *Highlands Co.*: Archbold Biol. Stn., Lake Placid (T. C. Schneirla, J. Walker); Highlands Hammock St. Pk. (P. S. Ward); Sebring (I. E. Harper); *Hillsborough Co.*: Pine Crest [= Pinecrest] (W. M. Wheeler); no specific locality (J. C. Bowyer); *Indian River Co.*: Vero Beach (L. & C. W. O'Brien); *Leon Co.*: Anders Branch, Tall Timbers Res. Stn. (J. F. Lynch); Tallahassee (G. C. & J. Wheeler); *Monroe Co.*: Key Largo (H. V. Weems); 12 mi N Key Largo (P. S. Ward); N. Key Largo (R. W. Klein); *Orange Co.*: no specific locality (C. Nelson; B. L. Smith; E. Storrs); *Palm Beach Co.*: Boynton Beach (Wood & Davidson); Palm Beach; *Pinellas Co.*: Belle Air [= Belleair]; Dunedin (Blatchley); Largo (Bradley & Knorr); *Taylor Co.*: Williams Landing (R. Smith); *Volusia Co.*: Haw Creek (T. Pergande?), county unknown; Everglades Natl. Pk. (G. C. & J. Wheeler).

GEORGIA: *Chatham Co.*: Savannah (H. T. Vanderford); *Decatur Co.*: no specific locality (Kannowski); *Glynn Co.*: Brunswick (N. L. H. Krauss); *Seminole Co.*: no specific locality (Kannowski).

LOUISIANA: *Beauregard Co.*: DeKidder (W. Buren).

MARYLAND: *St. Marys Co.*: Leonardtown (O. L. Cartwright).

SOUTH CAROLINA: *Chesterfield Co.*: Cheraw St. Pk. (G. C. & J. Wheeler).

TEXAS: *Bexar Co.*: Ft. S. Houston (R. B. Kimsey); San Antonio (P. S. Ward; R. Williams); San Antonio NE Preserve (R. B. Kimsey); *Brazoria Co.*: 4 mi SW West Columbia (P. S. Ward); *Cameron Co.*: 10 mi W Boca Chica (W. S. Creighton); Brownsville (P. J. Darlington; J. Knull); *Comal Co.*: New Braunfels (W. M. Wheeler); *Hidalgo Co.*: Bentsen R. Grande St. Pk., Mission (W. S. Creighton; P. S. Ward); Santa Ana Refuge (P. S. Ward); no specific locality (J. Knull); *Kenedy Co.*: 26 mi N Raymondsville (W. S. Creighton); *Live Oak Co.*: Three Rivers (W. S. Creighton); *McLennan Co.*: Waco; *Travis Co.*: Austin (G. Bush & W. L. Brown; P. S. Ward); *Victoria Co.*: Victoria (W. E. Hinds; J. D. Mitchell).

MEXICO: *Guerrero*: 18 mi S Chilpancingo (F. D. Parker & L. A. Stange); *Nuevo Leon*: Cola de Caballo, 38 km SSE Monterrey, 600 m (P. S. Ward); *Quintana Roo*: San Miguel, Cozumel I. (N. L. H. Krauss); *Tabasco*: Frontera (R. Andrews); *Tamaulipas*: Matamoros (F. F. Bibby); *Veracruz*: Los Tuxtlas (R. L. Jeanne); Mirador (E. Skwarra); Palma Sola (R. Andrews); Remutadero (E. Skwarra); Tinajas (F. D. Parker & L. A. Stange).

BELIZE: Rideau Camp (P. Broomfield).

COSTA RICA: *Guanacaste Prov.*: Agua Caliente (W. M. Wheeler); *Puntarenas Prov.*: Monteverde, 1200 m (P. S. Ward); *San José Prov.*: Alfombra, 850 m (P. S. Ward); San José (W. M. Wheeler).

JAMAICA: Lapland, Catadupa; Ford 1 mi SE Stony Hill (E. A. Chapin).

Pseudomyrmex leptosus Ward sp. nov.

(Figs. 19, 26, 34, 35, 38)

Holotype queen.—Payne's Prairie, 8 mi S Gainesville, Alachua Co., Florida, 5.viii.1982, R. W. Klein (MCZ) (ex lab colony established from a mixed nest of *P. leptosus* and *P. ejectus* originally collected 16.v.1982). HW 0.70, HL 0.86, EL 0.41, PL 0.53, PH 0.27.

Paratype queens, males.—Payne's Prairie, 8 mi S Gainesville, R.W. Klein (ex lab colony established from mixed nest of *P. leptosus* and *P. ejectus* originally collected 16.v.1982); Gainesville, Alachua Co., Florida, R. W. Klein (ex lab colony established from mixed nest of *P. leptosus* and *P. ejectus* originally collected 15.v.1982) (BMNH, LACM, MCZ, PSW, UCD, USNM).

Worker.—Unknown.

Queen Measurements ($n = 11$): HL 0.83–0.91, HW 0.67–0.70, MFC 0.019–0.027, CI 0.77–0.82, OI 0.53–0.59, REL 0.47–0.51, REL2 0.59–0.63, OOI 0.92–1.58, VI 0.68–0.75, FCI 0.028–0.039, CDI 0.047–0.057, SI 0.45–0.48, SI2 0.75–0.77, FI 0.42–0.47, NI 0.60–0.68, PL1 0.47–0.51, PLI2 0.72–0.84, PHI 0.59–0.68, PWI 0.43–0.51, PWI2 0.50–0.57, PPWI 1.02–1.18, PPWI2 0.61–0.67.

Queen Diagnosis.—A small orange species with broadly rounded, shiny head (HW 0.67–0.70, VI 0.68–0.75); anterior clypeal margin medially straight or slightly convex, laterally angulate; distance between frontal carinae less than basal width of scape; occipital margin convex, flat, or weakly concave, in full-face, dorsal view; lateral margins of pronotum rounded; basal face of propodeum rounding into declivitous face; petiole relatively slender, twice as long as high; anterior face of petiole convex, in lateral view; postpetiole as wide or wider than long. Front of head finely but densely punctulate, on a more or less smooth, shining background; fine

punctures becoming less dense towards the occiput, which is also smooth and shining; petiole and most of mesosoma sublucid, finely or obscurely punctulate on a weak coriarius background; propleuron subopaque, coriarius-imbricate; postpetiole and gaster weakly shining, the sheen partially obscured by numerous, fine piligerous punctures. Erect pilosity very sparse; several erect setae on dorsum of head, pronotum, mesonotum, metanotum, petiole, postpetiole and gaster; erect pilosity essentially absent from propodeum, scapes, and mid and hind femora. Fine appressed pubescence present, but not obscuring sculpture on most parts of body; appressed pubescence moderately dense on abdominal tergite IV, only partially obscuring the shiny integument. Body light orange-brown; a conspicuous pair of anterolateral, dark fuscous patches on abdominal tergite IV.

Comments.— This species is known only from queens and males collected in, or reared from, two mixed nests of *P. leptosus* and *P. ejectus* from the vicinity of Gainesville, Florida (R. W. Klein, leg.).³ The original colonies each contained two dealate queens of *P. leptosus* (together with *P. ejectus* workers, and brood of both species), and Klein subsequently reared *P. leptosus* alates in the laboratory.

P. leptosus queens are readily distinguishable from those of *P. apache* and *P. seminole* on the basis of size alone (HL > 1.25 in *P. apache* and *P. seminole*, HL < 0.95 in *P. leptosus*). *P. leptosus* queens differ from those of *P. simplex* by the possession of a wider, more broadly rounded head (CI ≥ 0.77 VI ≤ 0.75, in *P. leptosus*; CI ≤ 0.77, VI ≥ 0.80, in *P. simplex*), shorter eyes (REL2 ≤ 0.63 in *P. leptosus*; REL2 ≥ 0.65 in *P. simplex*), more divergent frontal carinae, and narrower forefemur (FI 0.42–0.47 in *P. leptosus*, FI 0.49–0.55 in *P. simplex*). The differences between *P. leptosus* and *P. pallidus* queens are more subtle. All of their measurements and indices overlap, although *P. leptosus* tends to be smaller and (more importantly) to possess a more broadly rounded head, so that VI 0.68–0.75 (VI 0.71–0.88 in *P. pallidus*). The most important distinction between the two species lies in the sculpture of the frons and vertex: finely punctate on a predominantly smooth, shiny background in *P. leptosus*; more coarsely punctate on a sublucid, coriarius background in *P. pallidus* (Figures 38, 39). Despite some size-related sculptural variation in *P. pallidus* even the smallest *P. pallidus* queens possess more strongly developed coriarius sculpture on the head than *P. leptosus* queens. The postpetiole and gaster of *P. leptosus* also tend to be shinier than those of *P. pallidus*. There are slight differences in the male genitalia of the two species, as outlined in the key to males.

Biology.— This species is apparently a workerless, social parasite of *P. ejectus*. Details on the life history and behavior of *P. leptosus* will appear elsewhere (R. W. Klein, in prep.).

Material Examined (BMNH, LACM, MCZ, PSW, UCD, USNM).—

FLORIDA: *Alachua Co.*: Gainesville (R. W. Klein); Payne's Prairie, 8 mi S Gainesville (R. W. Klein).

Pseudomyrmex pallidus F. Smith

(Figs. 20, 27, 36, 37, 39, 42, 43)

Pseudomyrma pallida F. Smith (1855), p. 160. One syntype queen (dealate), one syntype worker. "U.S." (BMNH) [Examined]. Syntype worker here designated as LECTOTYPE.

Pseudomyrma flavidula: Wheeler (nec F. Smith), 1905, pp. 83-85, 87 (partim)

Pseudomyrma flavidula: Wheeler (nec F. Smith), 1908, p. 419.

³I recently received an additional collection of *P. leptosus*, from Munroe Co., Florida (Hwy. 94, 10 mi. W Tamiami Ranger Station, 26.xi.1984. *P. leptosus* queens in nest with *P. ejectus* workers, Blaine Cole leg.).

- Pseudomyrma pallida* F. Smith; Wheeler, 1908, pp. 419-420 (partim).
Pseudomyrma flavidula; Mitchell & Pierce (nec F. Smith), 1912, p. 69.
Pseudomyrma pallida F. Smith; Mitchell & Pierce, 1912, p. 69.
Pseudomyrma flavidula; Mann (nec F. Smith) 1920, p. 405 (partim).
Pseudomyrma flavidula; Wheeler & Bailey (nec F. Smith), 1920, pp. 260, 265 [Description of larva, and contents of food pellets].
Pseudomyrma flavidula var. *delicatula*; Wheeler & Bailey (nec Forel), 1920, p. 265 (partim) [Description of food pellet contents].
Pseudomyrma flavidula; Wheeler (nec F. Smith), 1932, p. 4 (partim).
Pseudomyrma pallida F. Smith; Wheeler, 1932, p. 4 (partim).
Pseudomyrma pallida F. Smith; Creighton, 1950, pp. 80-82 (partim).
Pseudomyrmex pallidus F. Smith; Wilson, 1964, pp. 4-5 (partim).
Pseudomyrmex pallidus F. Smith; Wheeler & Wheeler, 1973, pp. 41-44.

Worker Measurements ($n = 70$): HL 0.78-1.06, HW 0.68-0.89, MFC 0.011-0.024, CI 0.77-0.91, OI 0.54-0.62, REL 0.45-0.54, REL2 0.53-0.65, OOI 0.78-2.08, VI 0.67-0.84, FCI 0.015-0.033, SI 0.41-0.49, SI2 0.68-0.85, FI 0.37-0.45, PDI 1.10-1.52, MPI 0.022-0.054, NI 0.54-0.67, PLI 0.47-0.62, PWI 0.38-0.52, PPWI 0.85-1.18.

Worker Diagnosis.— Medium-sized species (for the *pallidus* group), with moderately broad head (HW 0.68-0.89, CI 0.77-0.91); anterior clypeal margin medially flat, laterally angulate; distance between frontal carinae less than basal width of scape; eyes moderately long, EL greater than scape length; occipital margin convex, flat or weakly concave, in full-face, dorsal view; lateral margins of pronotum rounded; metanotal groove present but shallow; basal face of propodeum longer than declivitous face, and more or less differentiated from it; petiole slender, with a distinct anterior peduncle and anteroventral tooth. Head subopaque to weakly shining; frons densely punctulate on a coriarius background; punctures less dense on the vertex which remains (at least weakly) coriarius; dorsum of mesosoma and petiole sublucid, coriarius-punctulate, becoming coriarius-imbricate laterally; postpetiole and gaster weakly shining, covered with numerous, very fine piligerous punctures. Erect pilosity sparse, lacking on mesonotum, propodeum, and mid and hind femora; one to several erect setae on dorsum of head, pronotum, petiole, postpetiole, and abdominal tergite IV. Fine, appressed pubescence present on most parts of body, forming a moderately dense mat on abdominal tergite IV, which partially obscures the sheen of the integument. Body orange-brown, with paler mandibles and appendages; a pair of anterolateral fuscous patches sometimes present on abdominal tergite IV.

Comments.— This is the most common and widespread member of the *pallidus* group. *P. pallidus* shows considerable geographical variation in size, sculpture, and body proportions (note wide ranges of some metrics). However the workers are consistently orange-brown in color, with contiguous frontal carinae (MFC < 0.025), moderately long eyes (REL2 > 0.52), and (at least weakly) coriarius-punctulate sculpture on the vertex. No other Nearctic species possesses this combination of characters. Specific differences between *P. pallidus* and other orange *Pseudomyrmex* (*P. apache*, *P. leptosus*, *P. seminole*, and *P. simplex*) are discussed under those species.

Biology.— *P. pallidus* exhibits diversity in its choice of nesting sites. While it shows a preference for dead stalks or culms of herbaceous plants, it will also nest in dead twigs or branches of shrubs and trees in some localities.

By state, the Nearctic nest-site records are from the following plants (based on personal observations or on museum material which I have examined):

Florida: *Ambrosia artemisiifolia*, *Andropogon*, *Bidens*, *Cladium jamaicense*, *Uniola paniculata*.

Georgia: *Callicarba*.

Texas: *Baccharis*, *Heterotheca subaxillaris*, *Iva ciliata*, *Melia azedarach*, *Prunus*, *Ptelea trifoliata*, *Uniola paniculata*.

Arizona: *Gossypium thurberi*, *Quercus emoryi*, *Q. oblongifolia*.

California: *Acacia greggii*, *Hyptis emoryi*.

The number of functional queens in a colony varies widely. The majority of *P. pallidus* nests which I dissected from Texas and Florida were queenless or monogynous, but sometimes larger numbers of mated, dealate queens cohabited (up to a maximum of 22). Since *P. pallidus* colonies are often polydomous, the number of queens per colony may be higher.

P. pallidus alates have been collected in every month of the year, indicating that mating occurs in more than one season.

Material Examined (BMNH, GCW, LACM, MCSN, MCZ, MHN, NHMB, PSW, UCD, USNM).—

ALABAMA: *Mobile Co.*: Mobile (Van Aller); Spring Hill, Mobile (W. S. Creighton); Theodore (A. H. Sturtevant); Whittier (A. H. Sturtevant); *county unknown*: Kushla (A. H. Sturtevant)

ARIZONA: *Cochise Co.*: Carr Canyon, Huachuca Mtns. 5400 ft (W. S. Creighton); Huachuca Mtns., T.24S, R.20E, sec. 4, SW quadr., 5850-5900 ft (R. R. Snelling); Portal, Chiricahua Mtns. (R. M. Bohart); Ramsey Canyon, Huachuca Mtns., (W. S. Creighton); *Graham Co.*: Cottonwood Pass, Peloncillo Mtns., 4800 ft (W. S. Creighton) *Maricopa Co.*: Tempe (W. M. Wheeler); *Pima Co.*: Brown Canyon, Baboquivari Mtns., 4400 ft (W. S. Creighton); Forestry Cabin, Baboquivari Mtns., 3500 ft (W. S. Creighton); Molino Basin, Santa Catalina Mtns., 4200 ft (W. S. Creighton); *Santa Cruz Co.*: Bathub Canyon, Santa Rita Mtns. (L. F. Byars); Nogales (C. A. Geesey; C. H. Spitzer); *county unknown*: Santa Rita Mtns., (J. Knull).

CALIFORNIA: *Riverside Co.*: Deep Canyon (G. C. & J. Wheeler); *San Bernardino Co.*: 49 Palms, Joshua Tree Natl. Monum., 900 m (P. S. Ward); Yucca Valley (Melander).

FLORIDA: *Alachua Co.*: Gainesville (C. J. Drake; R. W. Klein); Payne's Prairie, 8 mi S Gainesville (R. W. Klein); *Collier Co.*: Marco (W. T. Davis); *Dade Co.*: Agri. Res. Educ. Centre, Homestead (R. W. Klein); Dodge I., Miami (G. Stegmaier); Homestead (C. W. O'Brien); Homestead Air Force Base (G. C. & J. Wheeler); Old Flamingo Rd., Everglades Natl. Pk., 10 m (P. S. Ward); Miami Beach (W. Wirth); no specific locality (J. Knull); *Duval Co.*: Fort George; *Glades Co.*: Fishheating Creek, Palmdale (M. Deyrup); *Highlands Co.*: Archbold Biol. Stn., Lake Placid (T. C. Schneirla); Highlands Hammock St. Pk. (C. W. O'Brien); *Leon Co.*: Sheep I., Tall Timbers Res. Stn. (J. F. Lynch); *Monroe Co.*: Bahia Honda Recr. Area, 5m (P. S. Ward); Big Pine Key (P. S. Ward; E. O. Wilson); John Pennekamp St. Pk., < 5m (P. S. Ward); 12 mi N Key Largo (P. S. Ward); 16 mi N Key Largo (P. S. Ward); Key West (T. Pergande); Loggerhead Key, 1.9 mi S Cudjoe Key (R. Thorington, J. Layne & P. Cone); Lower Matecumbe Key (W. M. Wheeler); Mrazek Pond, Everglades Natl. Pk. (L. & C. W. O'Brien); No Name Key (P. S. Ward); Refuge Nature Trail, Big Pine Key, 10 m (P. S. Ward); *Pinellas Co.*: Dunedin (Blatchley); *Sarasota Co.*: Long Branch Key, Sarasota (A. C. Cole); *county unknown*: "Florida" (T. Pergande; S. Henshaw).

GEORGIA: *Chatham Co.*: nr. Savannah (R. A. Cushman); *Richmond Co.*: Augusta (R. R. Snelling).

LOUISIANA: *Beauregard Co.*: DeRidder (W. Buren); *Caddo Co.*: Shreveport (W. Buren; R. A. Cushman); *Madison Co.*: Tallulah (E. R. Kalmbach).

MISSISSIPPI: *Adams Co.*: Sibley (A. Fleming); *Jackson Co.*: Pascagoula; *Lauderdale Co.*: Meridian (H. T. Vanderford); *Smith Co.*: Taylorsville (W. S. Creighton)

NEW JERSEY: *Cape May Co.*: Dias Creek.

NORTH CAROLINA: *New Hanover Co.*: Wrightsville [= Wrightsville Beach?] (W. T. Davis).

TEXAS: *Bexar Co.*: San Antonio (G. A. Prucia; P. S. Ward); 10 mi NW San Antonio (W. S. Ross); *Brazos Co.*: College Station (R. S. Peigler); *Cameron Co.*: Brownsville (J. Knull); *Comal Co.*: New Braunfels (Darlington); *Fort Bend Co.*: Richmond (Cushman & Pierce); *Goliad Co.*: no specific locality (J. D. Mitchell); *Gonzales Co.*: Palmetto St. Pk. (P. S. Ward); *Hidalgo Co.*: Bentsen Rio Grande St. Pk. (P. S. Ward); Santa Ana Refuge (P. S. Ward); no specific locality (D. J. & J. N. Knull); *Kleberg Co.*: Padre I. Natl. Seashore (P. S. Ward); *Matagorda Co.*: Wadsworth (P. S. Ward); *Nueces Co.*: Mustang I. St. Pk. (P. S. Ward); Port Aransas, 5 m (P. S. Ward); 3.4 km SW Port Aransas, 5 m (P. S. Ward); 11 km SW Port Aransas, 5 m (P. S. Ward); 18 km SW Port Aransas, 5 m (P. S. Ward); *Travis Co.*: Austin (D. Tupa; W. M. Wheeler); Barton Creek, Austin (P. S. Ward); Brackenridge Field Stn., Austin (P. S. Ward); *Victoria Co.*: Victoria (J. D. Mitchell); *Willacy Co.*: 7 mi N. Rio Hondo (W. S. Creighton); *county unknown*: Devils River (E. A. Schwartz).

MEXICO: *Baja California Sur*: Las Barrancas (W. M. Mann); 7 mi N, Santiago (W. H. Ewart); 2.7 mi SE Valle Perdido (R. R. Snelling); *Chiapas*: Tonola (A. Petrunkewitch); Tuxtla Gutierrez (N. L. H. Krauss); *Chihuahua*: El Paso, Texas, POE (V. J. Shiner); *Durango*: 6 mi E San Lucas, 6200 ft (W. S. Creighton); *Guerrero*: Acapulco (Baker); 18 mi S Chilpancingo (F. D. Parker & L. A. Stange); Revolcadero, nr. Acapulco (N. L. H. Krauss); *Hidalgo*: San Miguel (W. M. Mann); *Morelos*: Cuernavaca (N. L. H. Krauss); *Nayarit*: Tepic; *Nuevo Leon*: Iturbide, 1800 m (P. S. Ward); *Quintana Roo*: San Miguel, Cozumel I. (N. L. H. Krauss); *Sinaloa*: 1.1 mi W El Quehite (M. L. Siri); Isabel I. (H. H. Keifer); Mazatlan (R. M. Bohart; P. J. Spangler); 20 mi S Villa Union (E. I. Schlinger); *Sonora*: Alamos (A. Mintzer); 4.8 mi S Cananea (V. Roth); Cocorit (F. D. Parker & L. A. Stange); 5 mi N Santa Cruz, 4700 ft (W. S. Creighton); *Tamaulipas*: Brownsville [= Matamoros?]; *Veracruz*: Cordoba; Jalapa (N. L. H. Krauss); La Buena Ventura (A. Petrunkewitch); Los Tuxtlas (R. L. Jeanne); Mirador (E. Skwarra); *Veracruz*: *state unknown*: Tetela [Oaxaca or Puebla].

BAHAMAS: Mangrove Cay, Andros I. (W. M. Mann); Nassau (W. M. Wheeler); San Salvador I. (J. F. Lynch); South Bimini I. (C & P. Vaurie); Watlings I. (J. Greenway).
 BELIZE: Augustine (J. Reiskind); Rideau Camp (P. Broomfield).
 COSTA RICA: *Cartago Prov.*: Cartago (N. L. H. Krauss); Paraiso (N. L. H. Krauss); *Guanacaste Prov.*: 15 km SW Bagaces, Comelco (H. V. Daly); Finca la Pacifica, 7 km SW Cañas (H. V. Daly); Hacienda la Pacifica, nr. Cañas, 50 m (P. S. Ward); 1 km SW Pto. Coyote, < 5 m (P. S. Ward); Santa Rosa Natl. Pk., < 5 m, 270 m (P. S. Ward); *Limon Prov.*: Linda Vista, 540 m (P. S. Ward); Puerto Viejo, < 5 m (P. S. Ward); *Puntarenas Prov.*: Monteverde (H. V. Daly); Monteverde, 1220 m, 1350 m, 1400 m (P. S. Ward); *San José Prov.*: 1 km N La Ese, 1400 m (P. S. Ward); Pavas, 1000 m (P. S. Ward); San José (W. M. Wheeler); Hamburg Farm (F. Nevermann).
 CUBA: Santa Barbara, Isla de Pinos (S. C. Bruner).
 EL SALVADOR: Cerro Verde (L. J. Bottimer); La Libertad (N.L.H. Krauss); San Salvador (L. J. Bottimer).
 GUATEMALA: Antigua (W. M. Wheeler); San Lucas, Toliman (W. M. Wheeler).
 HONDURAS: La Ceiba (F. J. Dyer).

Pseudomyrmex seminole Ward, *sp. nov.*

(Figs. 18, 21, 28, 44, 45)

Pseudomyrma flavidula; Wheeler (nec F. Smith), 1905, pp. 83–85 (partim).

Pseudomyrma pallida; Wheeler (nec F. Smith), 1932, p. 4 (partim).

Holotype worker: John Pennekamp State Pk., Munroe Co., Florida, < 5 m, 14.ix.1982, ex colony in dead *Andropogon* culm, roadside near mangrove, P. S. Ward acc. no. 5723 (MCZ). HW 0.90, HL 1.05, EL 0.50, PL 0.59, PH 0.29.

Paratype workers, queens, males: Two nest series from John Pennekamp St. Pk., Munroe Co., Florida, 14.ix.1982, ex dead *Andropogon* culms, P. S. Ward acc. nos. 5722, 5723; two nest series and ground foragers from 12 mi N. Key Largo, Munroe Co., Florida, 10.i.1979, ex dead *Andropogon* culms, and foraging on ground, P. S. Ward acc. nos. 3199, 3202, 3203 (BMNH, LACM, MCZ, PSW, UCD, USNM).

Type series is restricted to material from these two adjacent localities. Other specimens believed to be conspecific are listed below under "Material Examined".

Worker Measurements ($n = 26$): HL 0.98–1.16, HW 0.87–0.96, MFC 0.029–0.042, CI 0.81–0.89, OI 0.57–0.63, REL 0.43–0.48, REL2 0.53–0.56, OOI 1.04–1.94, VI 0.75–0.85, FCI 0.031–0.47, SI 0.42–0.47, SI2 0.75–0.85, FI 0.38–0.44, PDI 1.05–1.40, MPI 0.017–0.045, NI 0.53–0.62, PLI 0.46–0.53, PWI 0.39–0.47, PPWI 0.93–1.09.

DPL 0.75–0.87, MP 0.015–0.042, CDI 0.040–0.064, PLI2 1.11–1.34, PHI 0.56–0.67, PWI2 0.50–0.59, PPWI2 0.48–0.57.

Worker Diagnosis.— Relatively large species, with broad head (HW 0.87–0.96, CI 0.81–0.89); median portion of anterior clypeal margin obtusely (and weakly) angulate, sharply angulate laterally (Figure 44); distance between frontal carinae subequal to, or slightly less than, basal width of scape; eyes relatively short (REL 0.43–0.48); occipital margin convex or flat, in full face, dorsal view; lateral margins of pronotum rounded; metanotal groove wide but shallow; basal face of propodeum rounding into declivitous face, the former equal to, or longer than, the latter; petiole and postpetiole long and slender, the former with a distinct anterior peduncle and (usually) prominent, rounded anteroventral tooth. Mandibles very weakly striate, with scattered punctures; head subopaque to sublucid, densely punctulate on a coriarius background; mesosoma and petiole subopaque, coriarius-punctulate, becoming coriarius-imbricate laterally; postpetiole and gaster subopaque, with numerous fine piligerous punctures. Erect pilosity sparse, lacking on mesonotum and propodeum: one to several pairs of erect setae on dorsum of head, pronotum, petiole, postpetiole and abdominal tergite IV. Fine appressed hairs present on most parts of body, and forming a rather dense mat on abdominal tergite IV. Body orange brown; mandibles and apices of appendages variably paler.

Comments.— Essentially a Gulf Coast species, *P. seminole* occurs sympatrically with the closely related *P. pallidus*. Workers of *P. seminole* may be recognized by the less convergent

frontal carinae (MFC \geq 0.029 in *P. seminole*, \leq 0.024 in *P. pallidus*), shorter eyes, and weakly angulate median portion of the anterior clypeal margin (compare Figures 42 and 44). The angulate clypeus of *P. seminole* tends to be a little more produced than that of *P. pallidus* workers (CDI 0.040–0.064 in *P. seminole*, 0.030–0.054 in *P. pallidus*). On average, the petiole and postpetiole of *P. seminole* are longer and more slender than those of *P. pallidus*, but there is sufficient variation in both species that the relevant metrics overlap broadly. Differences between the queens of the two species are more pronounced and the male genitalia of *P. seminole* are quite distinct (see keys to queens and males).

Biology.— I have collected nests of *P. seminole* in dead stalks or culms of *Andropogon*, *Heterotheca subaxillaris*, *Uniola paniculata*, and an unidentified woody legume. None of these nests was polygynous; some were queenless, indicating that this species is polydomous.

On Padre Island, east Texas *P. seminole* is patchily distributed in a continuous population of *P. pallidus*. Both species use the same nest sites (*Heterotheca* stalks and *Uniola* culms). I have observed incipient *P. seminole* colonies consisting of (i) a single, dealate queen, (ii) a single, dealate queen with brood, and (twice) (iii) a single dealate queen in association with *P. pallidus* workers. In one of the latter instances a dealate *P. pallidus* queen and five workers occupied one *Uniola* internode, while the *P. seminole* queen occupied an adjacent cavity; in the second instance, the *P. seminole* queen coexisted with seven *P. pallidus* workers (but no queen) plus brood of unknown identity, in a single dead *Heterotheca* stalk. These observations suggest that *P. seminole* may be a facultative, temporary social parasite of *P. pallidus*.

Alates or alate pupae have been collected in most months of the year, indicating a rather continual production of sexuals.

Material Examined (BMNH, GCW, LACM, MCZ, PSW, UCD, USNM).—

FLORIDA: *Alachua Co.*: Gainesville (R. W. Klein); no specific locality (T. H. Hubbell); *Dade Co.*: Agric. Res. Educ. Centre, Homestead (R. W. Klein); Homestead Air Force Base (G. C. & J. Wheeler); Paradise Key (H. & A. Howden). *De Soto Co.*: Prairie Creek, 11 mi S. Arcadia (M. Deyrup); *Highlands Co.*: Highlands Hammock St. Pk. (C. W. O'Brien); *Hillsborough Co.*: no specific locality (B. P. Moore); *Indian River Co.*: Vero Beach (L. & C. W. O'Brien); *Monroe Co.*: John Pennekamp St. Pk. < 5 (P. S. Ward); Key Largo (A. C. Cole); 12 mi N Key Largo (P. S. Ward); *Osceola Co.*: Kissimmee; *Pinellas Co.*: Dunedin (Blatchley); *Polk Co.*: Lakeland (W. T. Davis).

LOUISIANA: *East Baton Rouge Co.*: Baton Rouge (M. R. Smith); *Iberia Co.*: New Iberia (A. H. Sturtevant).

MISSISSIPPI: *Harrison Co.*: Gulfport.

TEXAS: *Cameron Co.*: Brownsville (J. Knull); *Nueces Co.*: Mustang I. St. Pk. (P. S. Ward); Port Aransas, 5 m (P. S. Ward); 3.4 km SW Port Aransas, 5 m (P. S. Ward); 11 km SW Port Aransas, 5 m (P. S. Ward).

MEXICO: *Tamaulipas*: 7 km WSW El Encino, 140 m (P. S. Ward)

BAHAMAS: Nassau (W. M. Wheeler).

Pseudomyrmex simplex F. Smith

(Figs. 22, 29, 40, 41)

Pseudomyrma simplex F. Smith 1877, p. 64. Holotype (unique syntype) worker, São Paulo ["St. Paul"], Brazil (BMNH) [Examined].

Pseudomyrma delicatula Forel, 1899, p. 93. Syntype workers, one dealate queen, Kingston, Jamaica (Forel) (MHN) [Examined.] *Syn. nov.*

Pseudomyrma delicatula var. *panamensis* Forel, 1899, p. 93. Holotype (unique syntype) worker, Pantaleon, Guatemala, 1700 ft (Champion) (MHN) [Examined]. *Syn. nov.*

Pseudomyrma delicatula var. *capperi* Forel, 1899, p. 93. Syntype workers, Jamaica (Capper) (MHN) [Examined.] *Syn. nov.*

Pseudomyrma acanthobia race *delicatula*, var. *vittata* Forel, 1912, p. 26. Syntype workers, Ceara, Brazil (Rocha) (MHN) [Examined]. *Syn. nov.*

Pseudomyrma flavidula var. *delicatula* Forel; Wheeler, 1913, p. 484.

Pseudomyrma flavidula var. *delicatula* Forel; Wheeler & Mann, 1914, p. 17.

Pseudomyrma flavidula; Wheeler (nec F. Smith), 1932, p. 4 (partim).

Pseudomyrma pallida; Creighton (nec F. Smith), 1950, pp. 80–82 (partim).

Pseudomyrmex pallidus Wilson (nec F. Smith), 1964, pp. 4–5 (partim).

Worker Measurements ($n = 46$): HL 0.70–0.92, HW 0.55–0.74, MFC 0.009–0.017, CI 0.75–0.85, OI 0.49–0.55, REL 0.52–0.61, REL2 0.62–0.77, OOI 0.55–1.92, VI 0.68–0.83, FCI 0.013–0.025, SI 0.40–0.48, SI2 0.56–0.72, FI 0.45–0.52, PDI 1.27–1.94, MPI 0.005–0.043, NI 0.53–0.65, PL1 0.50–0.69, PWI 0.39–0.60, PPWI 0.97–1.31.

Worker Diagnosis.— Relatively small species, with moderately elongate head (HW 0.55–0.74, CI 0.75–0.85); median portion of anterior clypeal margin straight, laterally angulate; frontal carinae very closely contiguous (minimum distance between them much less than the basal width of scape); eyes relatively long (REL 0.52–0.61); occipital margin concave, flat, or slightly convex, in full face, dorsal view; lateral margins of pronotum rounded; metanotal groove very weak and shallow; basal face of propodeum longer than declivitous face, and more or less clearly differentiated from it; petiole relatively short, with an anterior peduncle and anteroventral tooth; postpetiole often wider than long, somewhat globose in lateral view. Head predominately smooth and shining; frons with scattered fine punctures of variable size, on a smooth or obsolete coriarius background; punctures less dense on the vertex, which is smooth and shining; mesosoma and petiole sublucid, dorsally weakly coriarius-punctulate, laterally coriarius-imbricate; postpetiole and gaster more or less smooth and shining. Erect pilosity sparse, lacking on mesonotum, propodeum, mid and hind femora, and (often) petiole; typically a pair of erect setae on pronotum, postpetiole, and adjacent to the eyes. Fine, appressed pubescence very sparse, notably so on postpetiole and abdominal tergite IV. Light orange brown, mandibles and clypeus a paler luteous; a pair of anterolateral fuscous patches usually present (sometimes weak) on abdominal tergite IV.

Comments.— This species is the smallest one of a trio of orange *Pseudomyrmex* (*P. pallidus*, *P. seminole*, *P. simplex*) which have been confused repeatedly in the United States. *P. simplex* workers are recognizable by their smooth, shiny, punctulate head; broad forefemur ($FI \geq 0.45$); and shining fourth abdominal tergite which is devoid of a dense mat of appressed pubescence. In addition the workers have long eyes, closely contiguous frontal carinae, a very shallow metanotal groove, and a short petiole and postpetiole. The *simplex* and *delicatulus* types share these essential features, along with the other material which I have examined. There is a fair range of variation in size and body proportions (see metrics). *P. simplex* tends to be lighter in color than related species, and the fuscous patches on abdominal tergite IV are usually conspicuous, at least in Florida populations (less so in Central and South America).

Biology.— *P. simplex* shows a preference for nesting in dead twigs of woody shrubs or trees, rather than in dead stalks of herbaceous plants. In Florida, I have collected nests in dead twigs or stalks of *Baccharis halimifolia*, *Cladium jamaicense*, *Laguncularia racemosa*, *Metopium toxiferum*, and *Nectandra coriacea*; there are also museum records from *Carya floridana* and *Swietenia mahagoni*.

In Costa Rica I recorded nests of *P. simplex* in dead twigs of *Anacardium*, *Ardisia revoluta*, *Avicennia germinans*, *Conocarpus erectus*, *Gliricidia sepium*, *Hibiscus tiliaceus*, and *Terminalia catappa*.

Most *P. simplex* nests I dissected were queenless (indicating a high level of polydomy), some were monogynous, and one contained two functional (i.e. inseminated, with well-developed ovaries) dealate queens.

Alates have been collected in May, June, and September in Florida.

Material Examined (BMNH, GCW, LACM, MCSN, MCZ, MHN, NHMB, PSW, UCDC, USNM).—

FLORIDA: *Charlotte Co.*: Punta Gorda (W. T. Davis); *Collier Co.*: Marco (W. T. Davis); *Dade Co.*: Biscayne Bay (A. Slosson); Long Pine Key, Everglades Natl. Pk., 10 m (P. S. Ward); Mahogany Hammock, Everglades Natl. Pk. (G. C. & J. Wheeler); Miami (G. B. Merrill; C. F. W. Muesebeck; C. Stegmaier); Paradise Key (H. S. Barber); Pinelands Trail, Everglades Natl. Pk. (G. C. & J. Wheeler); no specific locality (J. N. Knull); *Highlands Co.*: Archbold Biol. Stn., Lake Placid (J. Walker); *Monroe Co.*: Big Pine Key (P. S. Ward; E. O. Wilson) John Pennekamp St. Pk., < 5 m (P. S. Ward); N Key Largo (R. W. Klein); 16 mi N Key Largo (P. S. Ward); Refuge Nature Trail, Big Pine Key, 10 m (P. S. Ward); Key West; *Pinellas Co.*: Dunedin (Blatchley); *Sarasota Co.*: Long Branch Key, Sarasota (Cole).

MEXICO: *Quintana Roo*: San Miguel, Cozumel I. (N. L. H. Krauss); *Tamaulipas*: Tampico (F. C. Bishop).

BAHAMAS: Gun Point, Crooked I. (B. Valentine & A. Hamilton); Mangrove Cay, Andros I. (B. Cole); New Providence (B. Cole).

BELIZE: Belize (N. L. H. Krauss); El Cayo (N. L. H. Krauss); Punta Gorda (P. Broomfield).

CAYMAN IS.: Grand Cayman (M. E. C. Giglioli)

COSTA RICA: *Guanacaste Prov.*: Hacienda la Pacifica, nr. Cañas, 50 m (P. S. Ward); 1 km SW Pto. Coyote, < 5 m (P. S. Ward); Santa Rosa Natl. Pk., < 5 m, 5 m. (P. S. Ward); Taboga Hill (C. R. Carroll); *Limon Prov.*: Cahuite Natl. Pk. < 5 m (P. S. Ward); *Puntarenas Prov.*: Lagarto, 120 m (P. S. Ward); Llorona, Corcovado Natl. Pk., 10 m (P. S. Ward); Manuel Antonio Natl. Pk. 5 m, 20 m (P. S. Ward); Osa Peninsula, Corcovado (J. Longino); *San José Prov.*: San José (W. M. Wheeler); *province unknown*: "Costa Rica" (Tonduz).

CUBA: Cogimar (W. M. Wheeler); Yunquede, Baracoa, Ote (P. J. Darlington).

EL SALVADOR: Quezaltepeque (M. Irwin & D. Cavagnaro).

GUATEMALA: Escuintla (P. J. Spangler); Livingston (Barber & Schwartz); Pantaleon (Champion); "Guatemala" (Stoll).

HAITI: Cape Haitien (W. M. Mann).

HONDURAS: La Ceiba (F. J. Dyer); Tegucigalpa (F. J. Dyer).

JAMAICA: Balaclava (Wight); Kingston (A. Forel; P. Vogel); Lapland, Catadupa; Mandeville (Wight); Montego Bay; "Jamaïque" (Capper).

PANAMA: Ancon, Canal Zone (W. M. Wheeler); Barro Colorado I., Canal Zone (W. L. Brown and E. S. McCluskey; Zetek); Cristobal, Canal Zone (H. F. Dietz); 2 km SE Fort Kobbe, Canal Zone, 10 m (P. S. Ward); 5 km WNW Gatun Dam, Canal Zone, 160 m (P. S. Ward).

PUERTO RICO: Mayagüez (M. R. Smith).

TRINIDAD: Port of Spain (R. Thaxter); St. George (J. Noyes).

WEST INDIES: St. Lucia (N. A. Weber).

BRAZIL: *Amazonas*: Rio Taruma Mirim-Igapó (J. Adis); *Bahia*: Bondaz; *Ceara*: no specific locality (Rocha); *Pará*: Ourem; Santarem, Taperinha (R. L. Jeanne); Tacura; Tucuruí (W. L. Overal); *Paraíba*: Independencia (Mann & Heath); *Rio de Janeiro*: Mendes (Eidmann); *São Paulo*: São Paulo.

COLOMBIA: Huila (B. & E. MacKay); Serranía de Macuira, 6-8 km S. Nazareth, 70-200 m (W. L. Brown & R. C. Kugler).

ECUADOR: Rio Palenque (L. Gillespie).

PERU: Piura (Townsend).

DISCUSSION

Coexistence of congeners

Every Nearctic species of *Pseudomyrmex* occurs sympatrically with two or more congeners in at least some portion of its range. Where two or more species co-occur, they often use a broadly overlapping array of nest-sites. For example, in the Florida Keys, *Cladium* culms are occupied by both *P. pallidus* and *P. simplex*, although *P. simplex* also nests in woody twigs, and *P. pallidus* will nest in *Andropogon* culms (a nest-site shared with *P. seminole*); on Padre Island, east Texas *P. pallidus* and *P. seminole* occupy the same nest-sites (*Uniola* culms and *Heterotheca* stalks); in northern Mexico, *P. ejectus* and *P. brunneus* were both recorded nesting in dead mint stalks at the same location. In none of the above instances were workers of the coexisting species found together in the same *individual* nest-site, but they could be found in adjacent stalks separated by only a few meters. The impression to be gained from these field observations is that there is a rather high degree of overlap among related species using the dead stalks or culms of *herbaceous* plants. These nest-sites can be expected to have a short half-life, relative to dead woody twigs or branches. The ephemeral nature and continual production of such sites may allow the coexistence of nest-site competitors, in a manner analogous to competing fish on coral reef patches (Sale, 1977).

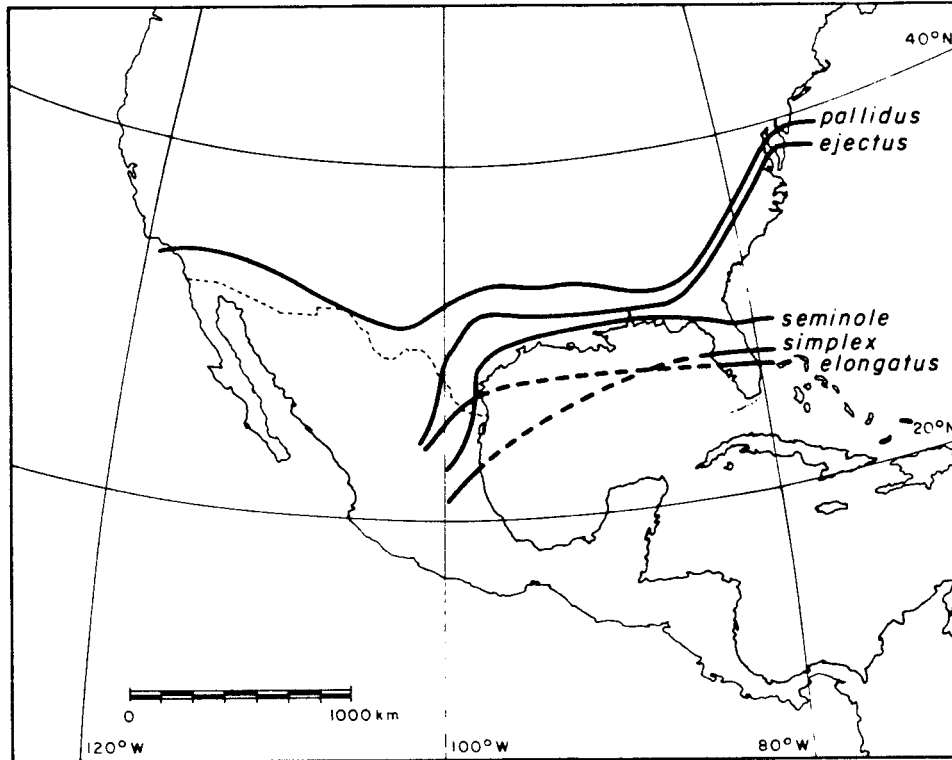


Figure 46. Northern limits of some Nearctic *Pseudomyrmex*. All of these species, except *P. seminole*, range south through Central America.

Geographical distribution and speciation

Although most Nearctic *Pseudomyrmex* species show extensive overlap of their geographical ranges, each species has a rather distinctive northern limit (Figure 46). This variable penetration into North America of essentially Neotropical taxa results in a gradient of species diversity which is maximal in southern Texas and southern Florida. The disjunct distributions across the Gulf of Mexico suggest a possible basis for previous differentiation and speciation. Thus *P. cubaensis* may represent an earlier Florida-Antillean isolate cut off from Central American populations of *P. elongatus* by a cooling trend. By this interpretation, contemporary populations of *P. elongatus* in Florida and Texas (which show some morphological differentiation) represent the severance of a more recent Gulf Coast connection.

Other closely related species of Nearctic *Pseudomyrmex* have rather different distribution patterns. In three cases, the range of one member of a sibling species pair is rather limited in

extent and is completely enclosed within the range of the other member (*P. brunneus* by *P. ejectus*, *P. leptosus* by *P. pallidus*, *P. seminole* by *P. pallidus*). This suggests that the more localized species was derived from a divergent, daughter population of the widespread species (Type 1b allopatric speciation in the parlance of Bush (1975)). One might even question whether the differentiation always proceeded allopatrically, since *P. seminole* shows evidence of being a temporary social parasite of *P. pallidus*, its presumptive ancestor. Moreover the social parasitic species *P. leptosus* is very localized and is surrounded by, sympatric with, and morphologically similar to *P. pallidus* (although its only known host is *P. ejectus*, a less closely related species). In any event, differentiation to the point of attaining reproductive isolation appears to be a plausible event on both a local and a broad geographical scale.

ACKNOWLEDGEMENTS

I am grateful to the following persons for loans of material or access to collections: Cesare Baroni-Urbani (NHMB), Claude Besuchet (MHN), Barry Bolton (BMNH), Max Fischer (NHMV), Al Newton (MCZ), Roberto Poggi (MCSN), David R. Smith (USNM), Roy Snelling (LACM), and G. C. & J. Wheeler (GCW). Additional valuable material was received from Blaine Cole and Rudi Klein. I thank Bill Brown for comments on the manuscript. This work was supported by NSF DEB-8204230.

LITERATURE CITED

- Bush, G. 1975. Modes of animal speciation. *Annual Review of Ecology and Systematics* 6:339-364.
- Creighton, W. S. 1950. The ants of North America. *Bulletin of the Museum of Comparative Zoology* 104:1-185.
- Creighton, W. S. 1952. *Pseudomyrmex apache*, a new species from southwestern United States. *Psyche* 59:131-142.
- Creighton, W. S. 1954. Additional studies on *Pseudomyrmex apache*. *Ibid.*, 61:9-15.
- Creighton, W. S. 1955. Observations on *Pseudomyrmex elongata*. *Journal of the New York Entomological Society* 63:17-20.
- Creighton, W. S. 1963. Further observations on *Pseudomyrmex apache*. *American Museum Novitates* 2156:1-4.
- Enzmann, E. V. 1945. Systematic notes on the genus *Pseudomyrma*. *Psyche* 51:59-103.
- Forel, A. 1899. Formicidae. *Biologia Centrali-Americana. Hymenoptera* 3:1-160.
- Forel, A. 1901. Variétés myrmécologiques. *Annales de la Société Entomologique de Belgique* 45:334-382.
- Forel, A. 1906. Fourmis néotropiques nouvelles ou peu connues. *Ibid.*, 50:225-249.
- Forel, A. 1912. Formicides néotropiques. IV. Sous-famille Myrmicinae (suite). V. Sous-famille Dolichoderinae. VI. Sous-famille Camponotinae. *Mémoires de la Société Entomologique de Belgique* 20:1-92.
- Forel, A. 1913. Fourmis d'Argentine, du Brésil, du Guatemala et de Cuba. *Bulletin de la Société Vaudoise des Sciences Naturelles* 49:203-250.
- Harris, R. A. 1979. A glossary of surface sculpturing. California Department of Food and Agriculture Occasional Papers in Entomology No. 28.
- Kempf, W. W. 1958. Estudos sobre *Pseudomyrmex*. II. *Studia Entomologica* 1:433-462.

- Mann, W. M. 1920. Additions to the ant fauna of the West Indies and Central America. *Bulletin of the American Museum of Natural History* 62:403–439.
- Mayr, G. 1870. Formicidae novogranadenses. *Sitzunberichte der Akademie der Wissenschaften Wien* 61:370–417.
- Mitchell, J. D. and W. D. Pierce. 1912. The ants of Victoria County, Texas. *Proceedings of the Entomological Society of Washington* 14:67–76.
- Roger, J. 1863. Die neu aufgeführten Gattungen und Arten meines Formiciden-Verzeichnisses. *Berliner Entomologische Zeitschrift* 7:131–214.
- Sale, P. F. 1977. Maintenance of high diversity in coral reef fish communities. *American Naturalist* 111:337–359.
- Smith, D. R. 1979. Formicoidea. In Krombein, K. V. *et al.* (Eds.). *Catalogue of Hymenoptera in America north of Mexico*. Vol. 2. Washington, D.C.: Smithsonian Institution Press, pp. 1323–1467.
- Smith, F. 1855. Descriptions of some species of Brazilian ants belonging to the genera *Pseudomyrma*, *Eciton* and *Myrmica*. *Transactions of the Entomological Society of London* 3:156–169.
- Smith F. 1858. *Catalogue of hymenopterous insects in the collections of the British Museum*. Part VI. Formicidae.
- Smith, F. 1877. Descriptions of new species of the genera *Pseudomyrma* and *Tetraoponera*, belonging to the family Myrmicidae. *Transactions of the Entomological Society of London*, 1877, pp. 57–72.
- Wheeler, G. C. and J. Wheeler. 1956. The ant larvae of the subfamily Pseudomyrmecinae. *Annals of the Entomological Society of America*, 49:374–398.
- Wheeler, G. C. & J. Wheeler. 1973. *Ants of Deep Canyon*. Philip L. Boyd Deep Canyon Desert Research Center, University of California, Riverside.
- Wheeler, W. M. 1901. Notices biologiques sur les fourmis mexicaines. *Annales de la Société Entomologique de Belgique* 45:199–205.
- Wheeler, W. M. 1905. The ants of the Bahamas, with a list of the known West Indian species. *Bulletin of the American Museum of Natural History* 21:79–135.
- Wheeler, W. M. 1908. The ants of Texas, New Mexico, and Arizona. I. *Ibid.*, 24:399–485.
- Wheeler, W. M. 1913a. The ants of Cuba. *Bulletin of the Museum of Comparative Zoology* 54:479–505.
- Wheeler, W. M. 1913b. Ants collected in the West Indies. *Bulletin of the American Museum of Natural History* 32:239–244.
- Wheeler, W. M. 1925. Neotropical ants in the collections of the Royal Museum of Stockholm. *Arkiv för Zoologi* 17A(8):1–55.
- Wheeler, W. M. 1932. A list of the ants of Florida with descriptions of new forms. *Journal of the New York Entomological Society* 40:1–17.
- Wheeler, W. M. 1942. Studies of neotropical ant-plants and their ants. *Bulletin of the Museum of Comparative Zoology* 90:1–262.
- Wheeler, W. M. and I. W. Bailey. 1920. The feeding habits of pseudomyrmine and other ants. *Transactions of the American Philosophical Society* 22:235–279.
- Wheeler, W. M. and W. M. Mann. 1914. The ants of Haiti. *Bulletin of the American Museum of Natural History* 33:1–61.
- Whitcomb, W. H., H. A. Denmark, W. F. Buren and J. F. Carroll. 1972. Habits and present distribution in Florida of the exotic ant, *Pseudomyrmex mexicanus*. *Florida Entomologist*

55:31-33.

Wilson, E. O. 1964. The ants of the Florida keys. *Breviora* 210:1-14.

Appendix I. *Pseudomyrmex* queens and males. Ranges of metric measurements and indices.

Queens	<i>mexicanus</i>	<i>cubaensis</i>	<i>elongatus</i>	<i>apache</i>	<i>brunneus</i>	<i>ejectus</i>	<i>leptostus</i>	<i>pallidus</i>	<i>seminole</i>	<i>simplex</i>
HL	1.56-1.98	1.02-1.23	0.91-0.96	1.28-1.46	0.83	0.86-0.99	0.83-0.91	0.82-1.15	1.31-1.42	0.80-1.02
HW	1.52-1.76	0.65-0.72	0.56-0.59	0.85-1.02	0.67	0.62-0.75	0.67-0.70	0.66-0.92	0.96-1.03	0.57-0.75
MFC	.039-.062	.021-.038	.016-.032	.053-.095	.010	.011-.018	.019-.027	.016-.035	.065-.075	.008-.021
CI	0.89-0.98	0.57-0.64	0.59-0.64	0.66-0.75	0.81	0.73-0.79	0.77-0.82	0.68-0.86	0.72-0.76	0.69-0.77
OI	0.46-0.51	0.52-0.54	0.49-0.55	0.57-0.63	0.54	0.51-0.60	0.53-0.59	0.51-0.60	0.55-0.62	0.49-0.54
REL	0.55-0.60	0.43-0.47	0.48-0.53	0.37-0.40	0.54	0.50-0.54	0.47-0.51	0.45-0.51	0.41-0.43	0.49-0.57
REL2	0.59-0.65	0.68-0.80	0.77-0.89	0.52-0.58	0.67	0.67-0.71	0.59-0.63	0.59-0.71	0.55-0.57	0.65-0.80
OOI	(-0.25)-0.35	0.33-0.82	0.07-0.30	1.08-1.56	1.10	0.59-1.02	0.92-1.58	0.55-1.54	0.77-1.16	0.47-1.01
VI	0.73-0.89	0.85-0.93	0.89-0.93	0.84-0.91	0.71	0.74-0.85	0.68-0.75	0.71-0.88	0.90-0.93	0.80-0.88
FCI	.024-.038	.031-.053	.029-.055	.052-.094	.015	.015-.026	.028-.039	.022-.046	.066-.075	.014-.029
SI	0.46-0.49	0.47-0.50	0.45-0.49	0.46-0.50	0.45	0.43-0.49	0.45-0.48	0.42-0.53	0.39-0.45	0.41-0.47
SI2	0.72-0.79	0.61-0.71	0.55-0.62	0.85-0.94	0.67	0.63-0.72	0.75-0.77	0.64-0.79	0.70-0.80	0.52-0.68
FI	0.39-0.45	0.44-0.53	0.46-0.51	0.42-0.46	0.50	0.45-0.52	0.42-0.47	0.42-0.54	0.46-0.53	0.49-0.55
NI	0.60-0.68	0.61-0.69	0.58-0.67	0.57-0.66	0.66	0.60-0.68	0.60-0.68	0.56-0.67	0.63-0.66	0.61-0.71
PLI	0.48-0.52	0.58-0.67	0.66-0.76	0.49-0.57	0.48	0.43-0.48	0.47-0.51	0.44-0.58	0.43-0.49	0.48-0.55
PWI	0.44-0.52	0.57-0.66	0.60-0.68	0.54-0.60	0.48	0.42-0.48	0.43-0.51	0.40-0.55	0.41-0.51	0.42-0.54
PPW1	1.05-1.25	1.16-1.25	1.17-1.41	1.15-1.28	1.26	1.00-1.12	1.02-1.18	0.97-1.23	1.00-1.11	0.99-1.23
sample size	9	10	5	10	1	13	11	30	10	17

(continued on next page)

Appendix I (continued)

	<i>mexicanus</i>	<i>cubaensis</i>	<i>elongatus</i>	<i>apache</i>	<i>brunneus</i>	<i>ejectus</i>	<i>leptotus</i>	<i>pallidus</i>	<i>seminole</i>	<i>simplex</i>
Males										
HL	1.25-1.37	1.08-1.22	0.80-0.88	0.91-1.08	-	0.75-0.92	0.68-0.77	0.72-0.97	0.89-1.07	0.73-0.93
HW	1.32-1.52	0.76-0.82	0.59-0.62	0.82-0.98	-	0.66-0.77	0.61-0.68	0.67-0.84	0.81-0.92	0.58-0.78
MFC	0.27-0.31	0.13-0.17	0.08-0.12	0.15-0.20	-	0.11-0.12	0.10-0.11	0.12-0.16	0.12-0.16	0.09-0.16
CI	1.10-1.14	0.65-0.71	0.69-0.76	0.85-0.95	-	0.78-0.88	0.88-0.89	0.82-0.96	0.85-0.91	0.78-0.88
OI	0.51-0.56	0.57-0.63	0.58-0.64	0.63-0.71	-	0.62-0.68	0.52-0.64	0.59-0.69	0.67-0.72	0.58-0.68
REL	0.60-0.63	0.49-0.51	0.55-0.58	0.47-0.49	-	0.50-0.55	0.51-0.62	0.50-0.58	0.49-0.53	0.52-0.60
REL2	0.53-0.57	0.71-0.77	0.73-0.83	0.50-0.57	-	0.61-0.67	0.59-0.71	0.58-0.64	0.56-0.59	0.61-0.76
OOI	(-0.10)-0.17	0.13-0.44	0.06-0.22	0.22-0.93	-	0.18-0.48	(-0.17)-0.73	0.11-0.68	0.29-0.54	(-0.09)-0.38
VI	0.60-0.67	0.57-0.62	0.54-0.62	0.55-0.67	-	0.53-0.64	0.50-0.56	0.47-0.60	0.57-0.62	0.53-0.64
FCI	0.20-0.20	0.17-0.22	0.14-0.19	0.18-0.21	-	0.15-0.17	0.16-0.18	0.16-0.20	0.15-0.17	0.15-0.21
SI	0.16-0.18	0.26-0.28	0.22-0.25	0.22-0.27	-	0.29-0.33	0.30-0.32	0.27-0.33	0.28-0.32	0.25-0.31
SI2	0.30-0.33	0.36-0.38	0.30-0.34	0.43-0.51	-	0.45-0.52	0.42-0.55	0.44-0.54	0.47-0.57	0.36-0.47
SI3	0.57-0.68	0.77-0.89	0.68-0.80	0.75-0.96	-	0.80-1.02	1.11-1.25	0.80-1.13	0.70-0.97	0.78-0.98
FI	0.31-0.33	0.35-0.38	0.32-0.38	0.25-0.29	-	0.30-0.36	0.26-0.28	0.29-0.35	0.30-0.36	0.36-0.51
NI	0.73-0.75	0.66-0.73	0.62-0.69	0.61-0.74	-	0.63-0.68	0.60-0.65	0.63-0.72	0.61-0.67	0.63-0.73
PLI	0.29-0.36	0.45-0.53	0.46-0.52	0.39-0.55	-	0.35-0.49	0.42-0.45	0.31-0.44	0.39-0.45	0.42-0.56
PWI	0.27-0.33	0.35-0.40	0.34-0.39	0.36-0.45	-	0.31-0.39	0.30-0.33	0.28-0.35	0.31-0.36	0.34-0.44
PPWI	0.72-0.80	0.72-0.85	0.68-0.79	0.86-0.99	-	0.71-0.87	0.70-0.82	0.69-0.90	0.69-0.85	0.77-0.93
sample size	4	6	7	9	-	7	5	12	6	11