pleura and propodeum moderately shiny, distinctly shagreened. Terga polished and shiny, with scattered piligerous punctures; sterna very lightly shagreened, a little duller than terga.

Color. Blackish brown; mandibles, antennae and legs light brown. Wings clear, veins and stigma pale yellowish.

Terminalia: Figures 174, 186, 194.

Type Material. Holotype worker, allotype male; 1 female, 12 male, 25 worker paratypes: 1 mi W Desemboque de los Seris, Sonora, MEXICO, 5 Feb. 1972 (E. M. Fisher), in LACM. Additional paratypes: 17 workers, 5 mi S Puerto Libertad, Sonora, MEXICO, 6 Feb. 1972 (E. M. Fisher; LACM); 200 workers, Puerto Libertad, Sonora, MEXICO, 16–17 Apr. 1957 (W. S. Creighton, Nos. 233, 342; LACM). One male, five worker paratypes to AMNH, GCW, MCZ, and USNM.

Etymology. Nequazcatl, the Aztec (Nahuatl) name for the honey ants.

Distribution. Known only from the State of Sonora, Mexico, chiefly from the coast of the Gulf of California, but inland to Hermosillo (Fig. 363).

Additional Localities. MEXICO. Sonora: Hermosillo, 780′, 12 Mar. 1969 (R. R. Snelling, No. 69–92; LACM); 10 mi N Hermosillo, 800′, 15 June 1951 (W. S. Creighton; LACM); 10 mi S Hermosillo, 700′, 10 Nov. 1952 (W. S. Creighton; LACM); 6 mi S Peón, 0′, 11 Nov. 1952 (W. S. Creighton; LACM).

Ecology. Habitats for *nequazcatl* include Palo Verde-Cactus shrub and coastal sand dune desert. Workers were found foraging at mid-day at Hermosillo. Here, nests were in coarse-grain sandy clay and tumuli up to 25 cm in diameter were composed of coarse sand particles. At Puerto Libertad Creighton found nests situated in deep sand. His notes indicate that the ants construct ". . . a beautiful crater with steep sides and a diameter of about one foot when full-sized." His notes also indicate that he took a "colytid" (colydiid?) beetle from one nest. This beetle has not been located, but may have been a tenebrionid of the genus *Araeoschizus*.

Alates of both sexes were found on Feb. 5 near Desemboque de los Seris. It may be assumed that the mating flight occurs following spring rains. In all probability there are mating flights in the autumn, coinciding with the rains in October or November.

Discussion. This species most closely resembles such species as *kennedyi, kathjuli* and *wheeleri*. From all of these, the worker is separable by the exceptionally long, slender, flexuous pronotal hairs. Larger workers commonly possess abundant appressed pubescence on the third tergum, while smaller workers do not, but this is not consistent. The vertex, particularly between the eye and the ocelli is polished and impunctate in *nequazcatl*. In the other species of this group it is mostly lightly shagreened and with distinct punctures, especially in *kennedyi*.

In the female, the very sparsely punctate vertex will distinguish that caste from those of the other species. The parapsis is shiny and sparsely punctate, except near the parapsidal line, as in *kennedyi*. The closely micropunctate first tergum will further separate this caste from the female of *kathjuli;* the much longer mesoscutal hairs will distinguish it from *kennedyi* and the black gaster will separate it from *wheeleri*.

The polished, impunctate gastric terga will readily separate the male from those of *kathjuli* and *wheeleri*. From the latter it is further distinguished by the ventrally convex aedeagus which has minute teeth. The minute aedeagal teeth will also serve to distinguish *nequazcatl* from *kathjuli*. The much longer erect mesoscutal hairs will further separate *nequazcatl* from *kennedyi*.

Myrmecocystus (Endiodioctes) wheeleri Snelling

Figures 117–126, 163, 175, 195, 196

Myrmecocystus melliger semirufus var. *testaceus*, Wheeler 1908. Bull. Amer. Nat. Hist. 24:355–356 *(in part, misidentification);* Wheeler 1912. Psyche 19:174, 176 *(misidentification);* Cole 1934. Ann. Entomol. Soc. Amer. 27:402 *(misidentification);* Mallis 1940. Bull. So. Calif. Acad. Sci. 40:81 *(in part, misidentification).*

Myrmecocystus semirufa, Creighton 1950. Bull. Mus. Comp. Zool. 104:449 *(in part, misidentification).*

Myrmecocystus melliger semirufus testaceous (sic!), Cook 1953. Ants of California, 345–346 *(in part, misidentification).*

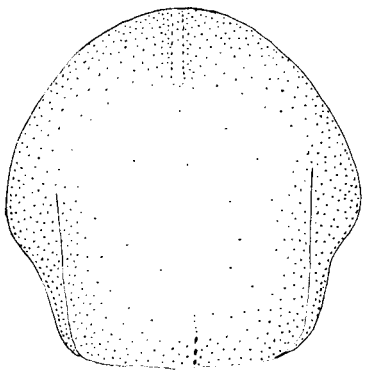
Myrmecocystus wheeleri Snelling 1971. Contr. Sci., L.A. Co. Mus. 214:11–15. ♀♀♂; Wheeler & Wheeler 1973. Ants of Deep Canyon, 127.

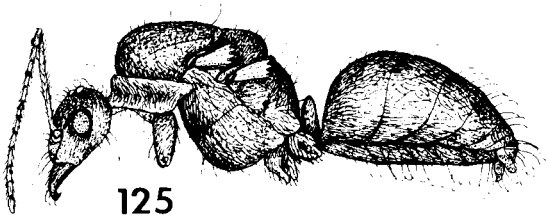
Diagnosis. Worker: Uniformly orange-ferruginous, rarely legs and gastric apex brownish; longest occipital hairs about equal to EL, longest pronotal hairs about 0.5 × MOD; third tergum densely pubescent; tibial hairs mostly decumbent. *Female:* penultimate segment of maxillary palp more than twice as wide in basal third as at apex; thorax and gaster extensively ferruginous. *Male:* ventral lobe of aedeagus concave in profile, coarsely serrate.

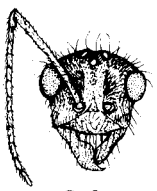
WORKER. *Measurements:* HL 0.93–1.26 (1.26); HW 0.83–1.10 (1.10); SL 1.16–1.60 (1.60); WL 1.6–2.0 (2.0); PW 0.60–0.83 (0.83).

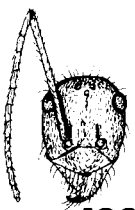
Head: A little longer than broad, CI 81–96 (86), distinctly shorter than scape; SI 130–153 (145). In frontal view, head broadest at, or a little below, the eyes, sides straight or slightly, evenly convex, narrowed slightly toward mandibular insertions. Occiput in frontal view broadly rounded laterally, summit slightly convex or flattened. Eye small, barely longer than first flagellomere; OMD 1.5–2.1 (2.1) × EL. Mandible usually with seven teeth.

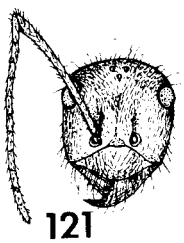
Thorax: Slender, PW 0.36–0.43 (0.41) × WL. Basal face of propodeum broadly rounded into posterior face.

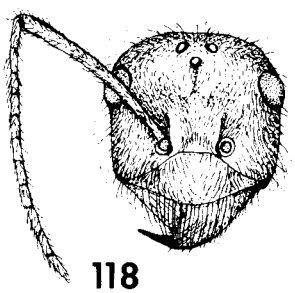


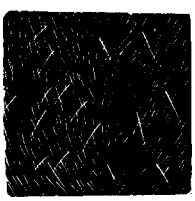


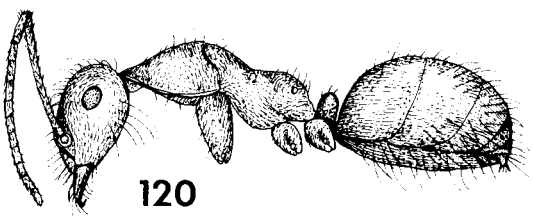


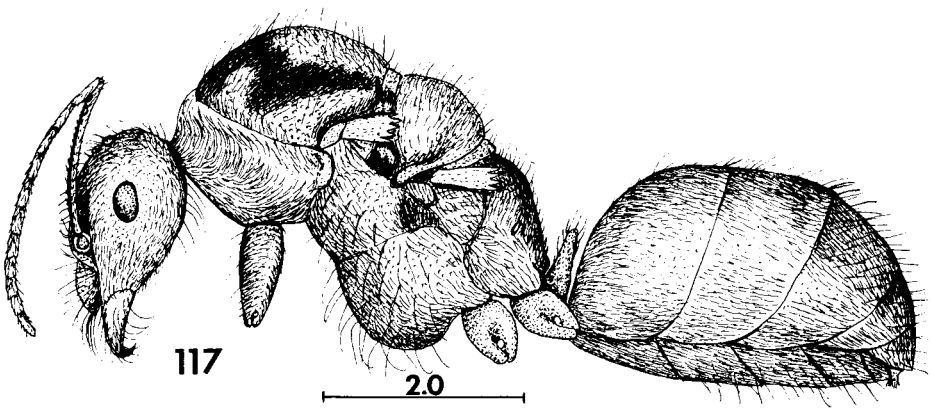












FIGURES 117–126. *M. wheeleri*. 117, female, lateral view; 118, head of female, frontal view; 119, mesoscutum of female, distribution of punctures; 120, major worker, lateral view; 121, head of major worker, frontal view; 122, head of minor worker, frontal view; 123, petiole of major worker, lateral (left) and posterior (right) views; 124, major worker, vestiture of third tergum; 125, male lateral view; 126, head of male, frontal view.

Petiole: In profile, about as thick as high, narrowed toward evenly rounded apex; crest evenly convex in frontal view; in dorsal view, node 1.4–1.5 × wider than long.

Vestiture: Appressed pubescence sparse, short, on head, denser on occiput and vertex; distinctly longer and denser on thorax, coxae and femora, petiole and first three gastric terga. Pubescence very sparse or absent from fourth and fifth terga. Erect hairs sparse on head, confined mainly to clypeus, frontal area and occiput, those of occiput distinctly longer than EL, of frons and clypeus variable, but mostly shorter than EL; malar area with scattered erect hairs less than 0.5 × EL. Pronotum with 12–18 erect hairs of irregular length, longest about 0.5 × MOD, a variable number of much shorter hairs on neck; mesonotum with about a dozen erect hairs, less than 0.5 × EL; metanotum usually without erect hairs; propodeum with 12 or more erect hairs of variable length, the longest equal to at least 0.5 × EL. Petiolar scale with 6–10 fine, erect short hairs on crest. Discs of gastric segments with sparse erect hairs, about equal to 0.5 × EL, hairs of tergal margins only slightly shorter than EL. Scape with abundant fine, short suberect hairs on inner and lower faces. Inner face of fore femur without erect hairs except along lower margin, these about as long as those of outer face. Middle and hind tibiae with abundant fine, subdecumbent hairs on all surfaces, these a little shorter than minimum thickness of the tibiae.

Color: Orange-ferruginous, often with lower half of face more yellowish; fourth and fifth gastric segments often infuscate. Rarely most of thorax, gaster and legs infuscate in some minors.

FEMALE. *Measurements.* HL 1.8; HW 1.8; SL 1.8; WL 4.0; PW 2.5.

Head: As broad as long, CI 100; as long as scape; SI 100. In frontal view, head parallel-sided, as broad at mandibular insertions as at lower eye level. Occiput rounded laterally, without evident corners, slightly convex in middle. Eye small, 1.3 times length of first flagellomere; OMD 1.6 × EL; IOD 2.5 × OD; OOD 3.5 × OD. Penultimate segment of maxillary palp broadest at basal third, strongly narrowed toward apex.

Thorax: Robust, PW 0.62 × WL. In profile, posterior half of mesoscutum flat, apical margin below level of convex scutellum; scutellum and metanotum forming continuous convex surface.

Petiole: In profile compressed-cuneate, crest sharp; distinctly notched; from above, about three times wider than long.

Vestiture: Pubescence long, notably dense only on first three gastric terga, variably fully appressed to subappressed, especially on head.

Erect hairs present on all parts of face, least abundant on malar area immediately below eyes, and between eyes and ocelli; occipital hairs irregular in length, longest about as long as EL, hairs on frons and clypeus equally variable, but a little shorter. Hairs abundant on thoracic dorsum and sides, highly variable in length, some longer than EL (especially on sides); basal third of propodeum with abundant long hair, apical two-thirds with very short erect hairs, especially toward apex and around gland opening. Crest and sides of petiolar scale with numerous long erect hairs, gastric terga with abundant fully erect hairs on disc, separated by less than their own lengths, mostly about half as long as EL. Fore femur without conspicuous erect hair on inner face. Tibiae with abundant suberect hairs which are about as long as minimum thickness of hind tibia. Scape with abundant suberect, short hairs on outer and lower faces. Forewing without marginal fringe, hind wing fringed on posterior margin.

Integument: Head moderately shiny, lightly tessellate; frontal lobes with close, fine punctures of variable size, round to ovoid, separated by about a puncture diameter; malar area more sparsely, coarsely punctate. Center of mesoscutum impunctate, median area laterally with scattered fine punctures, becoming close and more distinct in lateral thirds and apically; anteriorly, median portion with sparse micropunctures; punctures denser and coarser on parapsis. Punctures of scutellum finer than of adjacent portion of scutum, sparse in middle, denser laterad; anepisternum minutely roughened between coarse, close punctures, katepisternum equally coarsely, more closely punctate; metapleura and propodeum similar to lower half of mesopleura. Discs of first two terga finely and densely micropunctate, but with punctures in middle irregularly spaced, some interspaces as much as two or three puncture diameters; third tergum uniformly, densely micropunctate.

Color: Orange-ferruginous, the following brownish: rectangular median mark on anterior half of mesoscutum, broad lateral stripes on posterior four-fifths of mesoscutum, irregular blotch on mesopleura above and irregular blotch on mesepisternum. Apical gastric segments lightly infuscated. Wings whitish hyaline, radial vein and stigma brownish, remainder of veins yellowish.

MALE. *Measurements.* HL 0.86–0.90; HW 0.83–0.90; SL 1.03–1.10; EL 0.30–0.33; WL 2.0–2.2; PW 1.16–1.23.

Head: Margins distinctly convergent toward mandibular insertions; head as broad as long or slightly longer (CI 96–100); distinctly shorter than scape; SI 119–128. OMD 0.80–0.90 × EL. Anterior ocellus ⅔ diameter of lateral ocelli; IOD 2.5–3.0 × OD; OOD 2.5–3.0 × OD. Mandible without basal teeth. Clypeus with short transverse depression below middle.

Petiole: In profile, higher than long, narrowed above, crest convex; in frontal view, evenly convex from side to side, except for vague to prominent median notch; in dorsal view about twice as wide as long.

Vestiture: Erect hairs abundant on body, those of scutellum as long as EL, length elsewhere generally

shorter but variable. Erect hairs of hind tibia about as long as thickness of scape. Pubescence sparse on head and thorax, abundant on propodeum and first four terga. Forewing without marginal fringe, hind wing with fringe on posterior margin only.

Integument. Head moderately shiny, lightly shagreened, with very sparse micropunctures and scattered coarse punctures. Malar area with a few very coarse, elongate punctures. Occiput duller, more closely micropunctate. Mesoscutum moderately shiny, sharply shagreened and with scattered coarse punctures. Scutellum shinier, less sharply shagreened, with scattered coarse punctures. Mesopleura slightly shiny, very densely shagreened, with scattered coarse punctures. Propodeum similar, but with shinier midline posteriorly. Summit of first tergum shiny and very sparsely punctate in middle; sides of summit of first tergum, entire second and third terga, moderately shiny, closely and uniformly micropunctate.

Color: Uniformly blackish, appendages light brownish.

Terminalia: Figures 175, 195, 196.

Type Material. Holotype worker, allotype male, 193 worker and two female paratypes, 6 mi SE of Pearblossom, 3500′, Los Angeles Co., Calif., 15 August 1965 (R. R. Snelling). Holotype, allotype and most paratypes in LACM; additional paratypes in AMNH, GCW, MCZ, MNHG, and USNM.

Distribution. Central California to Baja California (presumably), dry coastal valleys and desert margins (Fig. 365).

Localities. UNITED STATES. California: Merced Co.: 2.5 mi S Delhi, 4 June 1967 (R. R. Snelling, No. 67-100; LACM). *Fresno Co.:* Jacalitos Cyn., 6 mi S Coalinga, 25 Aug., 3 Sept. 1959 (R. R. Snelling; LACM). *San Luis Obispo Co.:* 5 mi NE Santa Margarita, 24 June 1963 (G. I. Stage; LACM). *Ventura Co.:* Camp Ozena, Upper Cuyama Cyn., 8-27 June 1963 (C. W. Kirkwood; LACM). *Kern Co.:* Bakersfield, 7 Oct. 1937 (A. Mallis; LACM, USNM). *Los Angeles Co.:* Bouquet Cyn., 23 Aug. 1954 (R. R. Snelling; LACM); Little Rock Dam, 3400′, 2 May 1970 (R. R. Snelling, No. 70-1; LACM); Bob's Gap, 3500′, 6 mi SE Pearblossom, various dates (R. R. Snelling; includes type series; LACM); Glendale, July 1941 (E. I. Schlinger; UCD); Eaton Cyn., San Gabriel Mts., 6 June 1963 (R. R. Snelling; LACM); Altadena, various dates and collectors (LACM, RHC, UCD, USNM); Irwindale, 500′, 4 Apr. 1963 (R. R. Snelling; LACM); Los Angeles, 9 June 1936 (A. Mallis; LACM); Claremont (Baker; AMNH). *San Bernardino Co.:* Cajon Cyn., 7.7 mi NW Cajon, 5 July 1964, 4 Aug. 1963 (R. R. Snelling; LACM); 4.3 mi N San Bernardino, 5 July 1964 (R. R. Snelling; LACM); 2 mi E Mentone, 200′, 13 Apr. 1963 (W. S. Creighton; LACM); Etiwanda, 28 Oct. 1967 (R. J. Hamton; RJH). *Riverside Co.:* 2 mi E San Jacinto, 1900′, 6 Mar. 1967 (R. R. Snelling; LACM); 4 mi W Anza, 15 June 1963 (R. R. Snelling; LACM); 2 mi W Dripping Spgs., 1300′, 4 June 1952 (W. S. Creighton; LACM); 9 mi E Temecula, 1200′, 20 Apr. 1969 (R. R. Snelling, No. 69-115; LACM); same locality, 3 May 1969 (R. R. Snelling, No. 69-121; LACM); Elsinore Mts., near summit Hwy. 74, 24 June 1964 (E. F. Riek & G. I. Stage; LACM); [Nightingale, 4000′ Wheeler and Wheeler, 1973:127]. *San Diego Co.:* 2 mi N Warner spgs., 8 July 1956 (R. M. Bohart; UCD); Pt. Loma, no date (P. Leonard; MCZ).

Ecology. This ant has been collected near sea level (Pt. Loma) to about 4000 feet in the San Jacinto Mts. It ranges from arid and semiarid regions of the San Joaquin Valley southward in dry coastal canyons and inland valleys and enters the western margins of the Mojave and Colorado Deserts. Habitats include California Steppe, Saltbush-Greasewood Shrub, California Oakwoods, Chaparral, Coastal Sagebrush Shrub, Juniper-Pinyon Woodland and Creosote bush-Bur sage Shrub.

Mallis (1940) described the crateriform tumulus to be about 5 in. diameter, with a single entrance about 0.5 in. diameter, but noted that two days later the same nest had two entrances about 1 in. apart. His observations were made near Bakersfield; the ants were seen to forage at mid day and to move rapidly over the sand.

The Wheelers (1973) found that one nest which they observed in Deep Canyon was in exposed sandy soil and surmounted by a ". . . shallow irregular earthworks 9 × 13 inches . . ." with ". . . several irregular entrances . . ." Exoskeletal fragments of arthropods, mostly ants, were in the refuse pile.

A worker was seen by Mallis (1940) bringing the abdomen of a honey bee to the nest. Arthropod remnants are abundant in the refuse piles of *wheeleri,* as already noted by the Wheelers. Head capsules of other ant species are often abundant, especially those of *Pogonomyrmex,* other *Myrmecocystus* and *Formica.* Since I've never seen *wheeleri* attacking other ants, these may be the result of scavenging, rather than predation. Live insects are regularly taken, especially immature cicadellids and small Lepidoptera larvae.

Foraging workers of this ant regularly visit flowers for nectar; they seem to be especially prone to visit species of *Eriogonum* (Polygonaceae) and prostrate *Euphorbia* (Euphorbiaceae). Although I have never found repletes in any of the nests I have studied, there is one replete in the material collected by P. Leonard at Pt. Loma.

Nest founding females have been found in Chaparral areas of southern California in early March after warm rains. The presence of alates in the nests in summer months (6 June and 15 Aug.) suggests that this species also takes advantage of summer and autumnal rains for mating flights. Known activity of the reproductives is summarized in Table 4.

Discussion. This ant has been erroneously identified by Wheeler (1908, 1912) as Emery's *testaceus.* The specimens from Phoenix, Arizona, thought by Wheeler to be transitional between this ant and *"semirufus" (i.e., kennedyi)* are actually *romainei.*

Although workers of *wheeleri* are usually wholly orange-ferruginous there are some samples in which

TABLE 4

Activity of Reproductives of:

Locality	Date	Activity
M. wheeleri Snelling		
CALIF., 2 mi E San Jacinto	6 Mar. 1967	♂♂ in nest
CALIF., 6 mi SE Pearblossom	16 Mar. 1972	♂♂ in nest
CALIF., Eaton Cyn.	6 June 1963	♂♂ in nest
CALIF., Camp Ozena	8–27 June 1963	deälate ♀ on ground
CALIF., 6 mi SE Pearblossom	15 Aug. 1965	♀♀ in nest
CALIF., 6 mi SE Pearblossom	22 Aug. 1965	♂♂ in nest
M. romainei Cole		
COLO., Trinidad	26 Aug. 1951	♀♀ in nest
COLO., 30 mi E Pueblo	26 Aug. 1951	♀♀ in nest
N.MEX., Albuquerque	May 1905	♀♀ in nest
N.MEX., Jornada Exp. Range	24 Apr. 1973	♂♂ in nest
N.MEX., Jornada Exp. Range	25 July 1973	♂♂, ♀♀ in nest
N.MEX., 2 mi San Juan	3 Sept. 1951	♀♀ in nest

legs and the apical gastric segments may be brownish, especially in minor workers. Such specimens are common in material collected at Little Rock Dam. Since the basal gastric segments may be yellowish in occasional specimens of *flaviceps* and *kennedyi*, and are normally so colored in *kathjuli*, other means of separation must be used. The presence of abundant pubescence on the third tergum will immediately separate *wheeleri* from *kennedyi*. The occipital and pronotal hairs are much shorter in *kennedyi* than in *wheeleri* and the tibial hairs are suberect to erect rather than decumbent.

The resemblance of *flaviceps* to *wheeleri* in pilosity is closer, since both possess abundant pubescence on the third tergum. In *flaviceps*, however, the tibial hairs are suberect to erect, the pronotal hairs do not exceed 0.5 × MOD and the occipital hairs are not equal to EL.

The most closely related species appears to be *kathjuli* and workers of the two species are very similar in most features. The pronotal hairs are a little longer in *wheeleri*, about 0.85–0.90 × MOD, than in *kathjuli*, about 0.60–0.65 × MOD. In the latter species, the sides of the first two terga are brownish and many of the hairs of the tibiae are suberect to erect.

The very broad segments of the maxillary palp and largely ferruginous gaster will immediately separate the female of *wheeleri* from all except *kathjuli*. The frontal lobes are uniformly punctate and the punctures separated by less than a puncture diameter in *wheeleri;* in *kathjuli* the punctures are very irregularly spaced, with many interspaces of 1–2 puncture diameters. The summit of the first tergum and the discs of the second and third, are uniformly closely micropunctate in *wheeleri* females. There are extensive impunctate areas on the first tergum, at least, in the *kathjuli* females seen.

Although male *Myrmecocystus* are a monotonously similar lot, offering few distinguishing characteristics, that of *wheeleri* is the proverbial exception. The ventral lobe of the aedeagus, instead of being strongly convex and finely serrate, as in all other species, is concave and coarsely serrate (Fig. 195). Otherwise, this sex is very similar to that of *kathjuli* but with shorter body hairs.

ROMAINEI GROUP

Myrmecocystus (Endiodioctes) koso new species

Figures 127–135, 164, 176, 199, 200

Myrmecocystus comatus, Cole 1966. B. Young Univ. Sci. Bull. 7:21 *(misidentification)*.

Diagnosis. Worker: Malar area with 10 or more erect hairs; HW less than 1.7 mm; pronotal hairs uneven in length, longest less than MOD, hairs mostly distinctly longer than on mesonotum; third tergum always, and fourth usually, densely pubescent; face with numerous irregularly spaced coarse, shallow punctures. *Female:* Parapsis with extensive impunctate areas and punctures of two sizes; penultimate segment of maxillary palp slender, nearly parallel-sided; malar area with numerous erect hairs; median area of first two terga largely impunctate; HW 1.8 mm or less. *Male:* ventral lobe of aedeagus convex in profile; mesoscutal disc shiny, very lightly tessellate to smooth, in contrast to parapsis; scutellum lightly tassellate and shiny; first three terga with median areas apubescent or nearly so; hing wing with fringe hairs along basal half of posterior margin; longest occipital and mesoscutal hairs more than 0.5 × MOD; HW less than 0.8 mm.

WORKER. *Measurements.* HL 0.83–1.63 (1.63); HW 0.73–1.67 (1.67); SL 0.97–1.93 (1.93); WL 1.3–2.7 (2.7); PW 0.5–1.2 (1.2).

Head: Longer than broad to slightly broader than long (largest workers). CI 87–102 (102), usually dis-