

## A Revision of the Honey Ants, Genus *Myrmecocystus*, First Supplement (Hymenoptera: Formicidae)

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**Abstract.**—A revision of the honey ants, genus *Myrmecocystus*, first supplement (Hymenoptera: Formicidae) by Roy R. Snelling, *Bull. Southern California Acad. Sci.*, 81(2):69-86, 1982. New distribution data are given for ten western species. Two new species are described: *M. (Eremnocystus) arenarius* is described from all castes; the type locality is Blow Sand Mts., Churchill Co., Nevada. *M. (M.) christineae* is described from all castes from the Ivanpah Mts., San Bernardino Co., California. New keys to the species of subgenera *Eremnocystus* and *Myrmecocystus* s. str. are provided and the two new species are appropriately illustrated.

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### Introduction

My revision of the honey ant genus *Myrmecocystus* was published in 1976. Since then, I have acquired interesting new distribution records for some species. Enough material of two undescribed species, then known from only a few specimens, is now available that these can be added to the known species.

The descriptive format is the same as that of my revision and figures in parentheses are those appropriate to the holotype or allotype, respectively.

### New Records

All records, except as otherwise noted, are based on specimens in LACM. Specimens were collected by the author (RRS) or the author and C. D. George (CDG) unless otherwise noted.

#### *Myrmecocystus (Endiodioctes) intonsus* Snelling

Mexico, *Baja California Sur*: 51 km W La Paz, 274 m elev., 26 Aug. 1977 (RRS, No. 77-54); Estacion Microondas "Ligui," 425 m. elev., 48 km S Loreto, 25 Aug. 1977 (RRS, No. 77-50).

#### *Myrmecocystus (Endiodioctes) mendax* Wheeler

U.S.A., *California, Imperial Co.*: Black Mtn. Rd., 1000' elev., 4 rd mi SE Hwy. 78, 5 May 1978 (RRS & CDG, No. 78-24). *Inyo Co.*: Willow Cr., 2400' elev., Inyo Mts., 17 Mar. 1976 (D. Giuliani); south Saline Range, 2500' elev., 22 Apr. 1974 (D. Giuliani). *Riverside Co.*: Hidden Spgs., 2100' elev., 24.5 rd mi WSW Wiley's Well, 25 Oct. 1978 (RRS, No. 78-135). *San Bernardino Co.*: Morningstar Mine Rd., 4200'-4260' elev., Ivanpah Mts., 9.5 mi NNE Cima, 14 Apr. 1977 (RRS & CDG, No. 77-12).

## Remarks

The collection at Morningstar Mine Rd. included alates of both sexes in the nest which was situated on a rocky slope. That at Black Mtn. Rd. was on an unusually arid ridge top in Cactus Scrub.

*Myrmecocystus (Endiodioctes) depilis* Wheeler

U.S.A., Arizona, Yuma Co.: Kofa Game Refuge, 3 Oct. 1978 (RRS & P. Mehlihop), in Creosote bush Scrub.

*Myrmecocystus (Endiodioctes) romainei* Cole

U.S.A., California, San Bernardino Co.: Morningstar Mine Rd., 4200'–4260' elev., 13 Apr. 1977 (RRS & CDG, No. 77-5, 11, 13, 14, 15), in Joshua Tree Woodland.

## Remarks

Nests were common in this area. Alates of both sexes were present in many nests.

*Myrmecocystus (Eremnocystus) colei* Snelling

U.S.A., California, Los Angeles Co.: Hwy. 138, 2700' elev., 12.2 mi W Hwy. 14, 15 Sept. 1978 (RRS & CDG, No. 78-60, 61, 62).

## Remarks

Previous records for this ant have been from coastal valley stations. The Mojave Desert samples are a little less pilose than those from coastal stations. Our samples were from the bed of a sandy wash dominated by *Salsola iberica* in rolling grassland which had been Joshua Tree Woodland until cleared.

*Myrmecocystus (M.) mexicanus* Wesmael

Mexico, Baja California: sand dunes, 8 km N Guerrero Negro, 8 Sept. 1977 (RRS, No. 77-71).

## Remarks

Several colonies were found in this series of coastal dunes. Nest entrances were in the dune sand and lacked the conspicuous tumulus of coarse gravel characteristic of this species. Coarse gravel was not present in the area.

*Myrmecocystus (M.) navajo* Wheeler

Mexico, Baja California: 8 km N Punta Prieta, 300 m elev., 23 Aug. 1977 (RRS, No. 77-43).

*Myrmecocystus (M.) testaceus* Emery

U.S.A., California, San Bernardino Co.: Morningstar Mine Rd., 4100'–4200' elev., 4.5 mi N Cima, 15 Apr. 1977 (RRS & CDG, No. 77-20).

## Remarks

This is the first record for *testaceus* in the eastern Mojave Desert of California and is far removed from other Southern California localities. The site is Joshua Tree Woodland.

*Myrmecocystus (M.) ewarti* Snelling

U.S.A., Nevada, Clark Co.: 6 mi E Searchlight, 24 Nov. 1969 (G. & J. Wheeler, Nev. 590, in the collection of the Wheelers).

*Myrmecocystus (M.) pyramicus* M. Smith

U.S.A., Nevada, Clark Co.: 3 mi W Cottonwood Cove, 1200' elev., 10 Dec. 1970 (G. & J. Wheeler, Nev. 1496, in the collection of the Wheelers).

*Myrmecocystus (Eremnocystus) arenarius* new species

Figures 1-6, 13, 15, 19, 21, 23

## Diagnosis

*Worker*.—Scape, malar area and propodeum with abundant erect hairs; erect pronotal hairs abundant; pubescence of second tergum sparse to scattered. *Female* and *Male*.—Forewing without erect hairs on membrane.

## Description

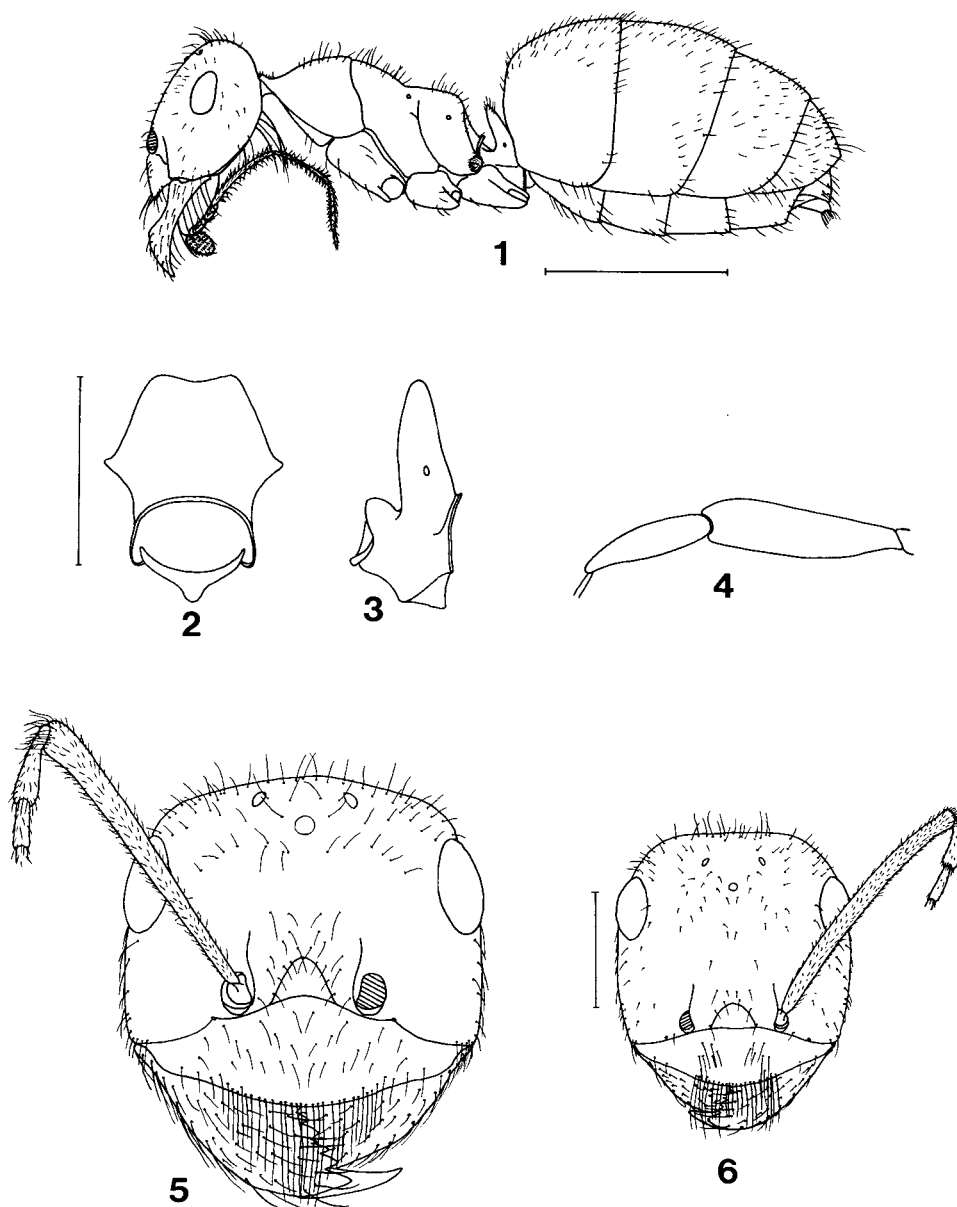
*Worker*.—Measurements: HL 0.65–1.02 (0.95); HW 0.58–0.90 (0.89); SL 0.66–1.07 (0.96); WL 0.83–1.40 (1.22); PW 0.42–0.63 (0.59).

Head: Longer than broad in all sizes, CI 105–119 (105); in full face view, malar margins nearly straight and convergent toward mandibles in smallest specimens, slightly convex in largest; occiput nearly flat in smallest workers, weakly convex in largest, sides broadly rounded; as long as, to a little shorter than, scape, SI 100–110 (101). Eye small to moderately large, EL 1.00–1.40 (1.31)  $\times$  first flagellomere; OMD 1.17–1.54 (1.29)  $\times$  EL. Mandible with seven teeth.

Thorax: Moderately robust, PW 0.43–0.52 (0.48)  $\times$  WL. Mesonotum, in profile, nearly straight in smallest workers, broadly rounded into a sloping posterior face in largest specimens. Basal face of propodeum, in profile, short and broadly rounded into posterior face in small specimens, distinct, long, and abruptly rounded into posterior face in largest specimens.

Petiole: In profile, compressed and narrowly cuneate; spiracles distinctly projecting in larger specimens; crest broadly concave, in posterior view, in large specimens, flat or weakly notched in small individuals.

Vestiture: Pubescence scattered on head; long and dense, but not concealing surface, on thorax and first gastric tergum. Second tergum with scattered pubescence, usually more conspicuous (especially in larger individuals) along base, midline and at sides of disc. Erect hairs numerous on head; malar area with 5–11 suberect hairs; scape with sparse erect hairs and numerous shorter, decumbent to subdecumbent hairs; all surfaces of femora and tibiae with numerous erect and suberect hairs. Promesonotum with numerous erect hairs, the longest more than  $0.5 \times \text{MOD}$ ; metanotum usually without erect hairs; dorsum of propodeum with 6 or more fine, short erect hairs. Petiolar scale with erect hairs on sides and crest. Terga with numerous discal hairs, becoming a little longer on succeeding segments.



Figs. 1-6. *Myrmecocystus arenarius*. 1, worker, lateral view, appressed pubescence not shown; scale = 1 mm. 2, 3, petiole of worker, posterior and lateral views; scale = 0.50 mm. 4, female, maxillary palp segments 4-6, vestiture not shown. 5, 6, female and worker head in frontal view, appressed pubescence not shown; scale = 0.50 mm.

**Integument:** Clypeus shiny, with scattered fine and coarse piligerous punctures; remainder of head subpolished, very weakly shagreened, with scattered piligerous punctures, frontal lobes virtually impunctate. Thoracic dorsum shiny, lightly shagreened. Gaster shiny, feebly shagreened.

Color: Medium to dark brown, appendages a little lighter; mandibles and apical part of clypeus yellowish brown, mandibular teeth dark red.

*Female*.—Measurements (mm): HL 1.36–1.38; HW 1.36–1.41; SL .36–.38; WL 2.51–2.78; PW 1.71–1.87.

Head: As broad as, or a little broader than, long, CI 95–100; in full face view, malar margin nearly straight or very weakly convex; distinctly longer than scape, SI 85–95. Eye small, EL  $1.00\text{--}1.20 \times$  first flagellomere; OMD  $1.00\text{--}1.25 \times$  EL. Mandible with seven teeth. Lateral ocelli slightly smaller than anterior ocellus, IOD  $2.62\text{--}3.28 \times$  OD; OOD  $3.50\text{--}4.14 \times$  OD. Fifth segment of maxillary palp broad at base, broadest near middle, distinctly narrowed distad; fourth segment narrowest at base, gradually broadened distad.

Thorax: Robust, PW  $0.62\text{--}0.73 \times$  WL. Posterior half of mesoscutum flattened; scutellum sloping and flat or very gently convex in profile. Basal portion of propodeum, in profile, sloping and abruptly rounded onto declivous face.

Petiole: Strongly compressed in profile, summit thin; in frontal view, sides a little convergent above; median emargination broad, deep, angulate; from above about  $3 \times$  wider than long.

Vestiture: Pubescence appressed, very scattered on head, most abundant (but still sparse) on lower malar area; appressed to subdecumbent on mesoscutum, scattered; longer, sparse, prostrate to suberect on sides of thorax, densest on pronotum and propodeum; appressed and scattered on tergal discs, becoming a little more abundant toward sides and apical margins.

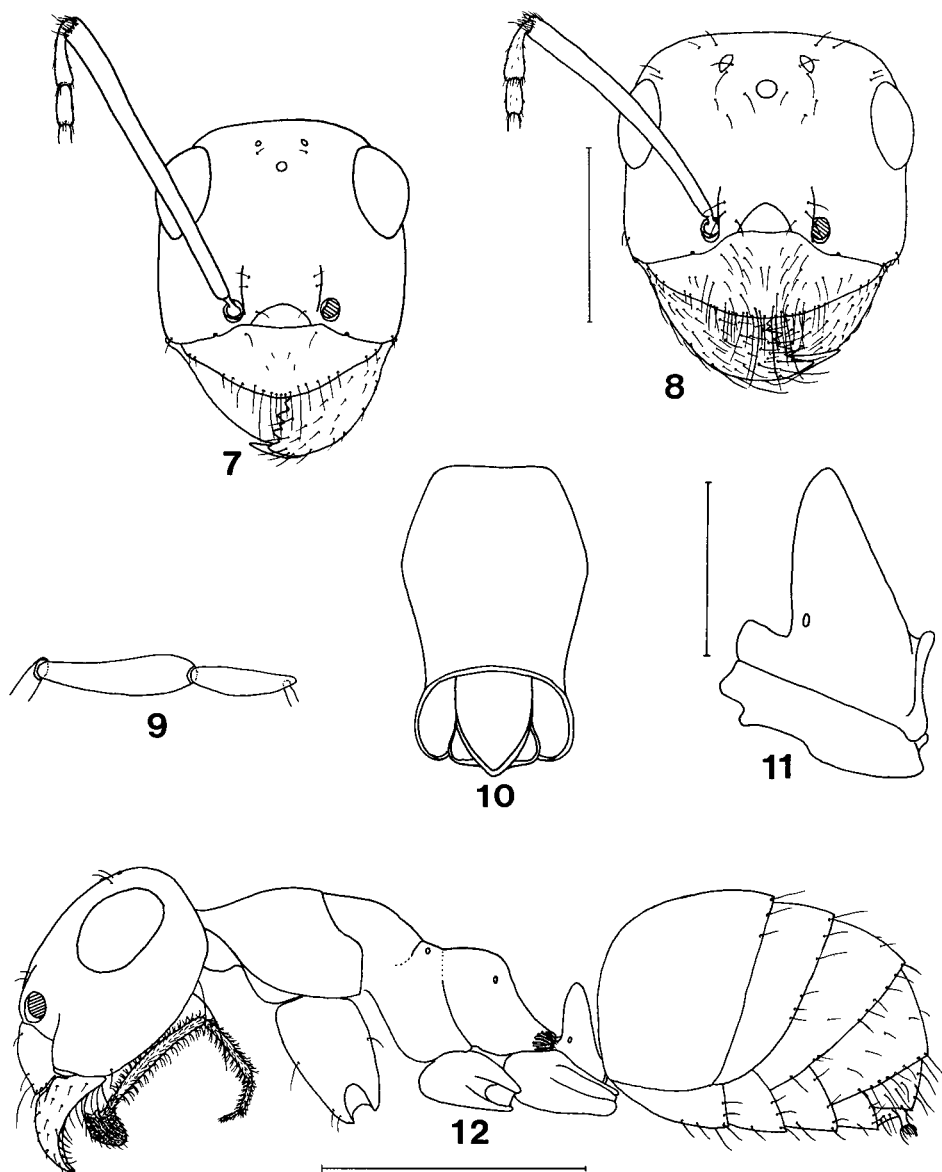
Scape with pubescence subdecumbent to suberect and with scattered fine, suberect hairs; femora and tibiae with abundant appressed to subdecumbent pubescence and numerous subdecumbent to erect hairs on all surfaces, least abundant on dorsal (extensor) femoral surfaces. Malar area, in frontal view, with 6–10 subdecumbent hairs; remaining frontal and dorsal head surface with rather sparse, short subdecumbent to erect hairs, longest hairs on occiput more than  $0.5 \times$  MOD. Scutum with sparse suberect to erect hairs, mainly peripherally, longest no more than  $0.5 \times$  MOD; scutellum with scattered suberect to erect hairs, longest more than MOD; pleura with scattered suberect to erect hairs, longest about  $0.5 \times$  MOD; propodeum with sparse erect hairs across base and at sides of declivity. Petiolar scale with a few short, erect hairs on sides and across summit. All terga with sparse, suberect to erect hairs, becoming longer and coarser caudad, longest on disc of second segment no more than  $0.5 \times$  MOD.

Membrane of forewing without obvious erect hairs at  $45\times$ ; forewing without fringe hairs and hindwing with a very few on basal half of posterior margin.

Integument: Shiny and very weakly, or not at all, shagreened on most areas, including gastric terga; metapleuron and propodeum conspicuously duller.

Head generally with scattered minute punctures; clypeus with a few fine punctures. Mesoscutum with scattered fine punctures, middle of disc nearly impunctate; minute punctures even more scattered. Scutellum with sparse, fine setigerous punctures. Anepisternum for the most part with sparse to scattered fine and minute punctures; katapisternum similar but with posterior and posterodorsal zones of dense punctures; metapleuron and propodeum densely and finely punctate. Tergal discs with sparse to scattered minute to ultraminate punctures.

Color: Medium brown, sides and propodeum darker; appendages light brown. Wings hyaline, veins and stigma yellowish brown.



Figs. 7–12. *Myrmecocystus christineae*. 7, 8, worker and female head in frontal view, appressed pubescence not shown; scale = 1.0 mm. 9, female, maxillary palp segments 4–5, vestiture not shown. 10, 11, petiole or worker, posterior and lateral views; scale = 0.25 mm. 12, worker, lateral view; appressed pubescence not shown; scale = 1.0 mm.

*Male*.—Measurements (mm): HL 0.60–0.64 (0.64); HW 0.54–0.60 (0.60); SL 0.58–0.64 (0.64); WL 1.15–1.33 (1.33); PW 0.76–0.88 (0.76).

Head: Slightly to distinctly longer than broad, CI 104–117 (106), as long as, or longer than, scape, SI 94–100. In frontal view, margins distinctly convergent toward mandibular bases; occiput broadly convex, lateral angles broadly rounded. Eye large, OMD 0.47–0.65 (0.53)  $\times$  EL; lateral ocelli slightly larger than anterior,

IOD 3.20–4.00 (3.75)  $\times$  OD; OOD 2.75–3.25 (3.25)  $\times$  OD. Mandible with distinct preapical cleft and one or two small teeth on cutting margin.

Thorax: Stout, PW 0.57–0.70 (0.57)  $\times$  WL. Mesoscutum broad, vertical in front, posterior half flat or weakly concave; scutellum, in profile, with flat dorsal surface and abruptly sloping posterior face. Basal face of propodeum, in profile, narrow, convex and abruptly rounded into posterior face.

Petiole: Cuneate in profile, posterior face weakly convex, summit narrowly rounded; posterior view, crest straight or broadly and very shallowly concave.

Pilosity: Pubescence very fine, short, very scattered, most conspicuous on metapleuron and side of propodeum.

Scape with numerous very fine and short subdecumbent to suberect hairs; femora and tibiae with longer, coarser, sparse suberect hairs on all surfaces. Head and thorax with sparse to scattered subdecumbent to erect hairs, longest occipital hairs about 0.5  $\times$  MOD. Gastric terga with sparse, subdecumbent to erect hairs, longest on disc of second segment no more than 0.5  $\times$  MOD. Wings as in female.

Integument: Shiny and, at most, very weakly shagreened on most surfaces of head, thorax and gaster; metapleuron and basal face of propodeum moderately shiny, closely, though weakly, punctulate.

Color: Medium brown, occiput and thoracic dorsum a little darker, gaster a little paler. Appendages light brown. Wings hyaline, veins and stigma very pale brownish.

Terminalia: Figures 19, 21, 23.

#### *Type material*

Holotype worker, allotype and 211 worker, 8 female, 10 male paratypes: E end Blow Sand Mts., elev. 4600', (T 15N, R 30E), Churchill Co., NEVADA, 14 Mar. 1979 (R. C. Bechtel and R. W. Rust). Additional paratypes: 173 workers, 4 females, 11 males, same locality, 4 Apr. 1979 (R. C. Bechtel and R. L. Bradley). Holotype, allotype and most paratypes in LACM; paratypes in AMNH, MCZ, USNM and collection of G. C. & J. Wheeler.

#### *Additional Localities*

*Nevada, Churchill Co.:* Sand Mountain, elev. 4000', 1 July 1970 (G. C. & J. Wheeler, NEV. 1220); same locality, elev. 4200', 14 Mar. 1979 (R. C. Bechtel and R. W. Rust). *Washoe Co.:* 6 mi N Nixon, elev. 4200', 2 July 1977 (R. R. Snelling, G. C. & J. Wheeler; RRS No. 77-48, GJW No. NEV. 4191); same locality, 26 June 1965 (G. I. Stage); 2.8 mi W Wadsworth, 22 June 1963 (G. I. Stage).

#### *Etymology*

*L., arenarius* (pertaining to, or of, sand) because of the apparent preference of this ant for habitats of fine dune sand.

#### *Distribution*

At present known only from central Nevada, in areas of fine, drifting sand.

#### Discussion

The preeminent characteristic of this species is the great reduction of the appressed pubescence in all castes. In workers pubescence is abundant only on the dorsal

surface of the first gastric tergum. Moderately dense pubescence is present only on the metapleuron, the base of the propodeum and, to a lesser degree, on the propodeal sides of the females and males.

Another unusual feature of this ant is shared by the sexual forms and is, as far as known, unique within this subgenus. Typically, within *Eremnocyclus*, the membranes of the wings are beset with numerous fine, very short, subdecumbent to erect white hairs. These hairs are readily discernable at a magnification of 45 $\times$ . In other subgenera the membrane is dotted with what appear to be, at 45 $\times$ , minute papillae. In fact, they are hairs, but this becomes apparent only at high magnifications (see figure 33 of my 1976 revision). The wing membrane of *M. arenarius* is as it is in these other subgenera and thus atypical for a species of *Eremnocyclus*.

While it might, perhaps, be argued that this represents a breakdown of an important characteristic separating *Eremnocyclus* from *Endiodictes* in particular, I do not think this is the case. The presence of hairs on the wing membrane seems to be a primitive feature retained within *Eremnocyclus* generally, but modified in *Endiodictes*. In other characteristics *Endiodictes* is clearly the least advanced of the several subgenera of *Myrmecocyclus*.

Within *Eremnocyclus*, *M. arenarius* is a species with a number of derived character states. Chief among these are the great reduction of appressed pubescence, the fine and very scattered punctation (especially in the sexual forms) and the compressed petiolar scale of the worker. The isolation of this species from others within *Eremnocyclus* is also an important factor. Only *M. hammettensis* is even geographically near *M. arenarius* and that is one of the most pilose of the *Eremnocyclus*. It is highly improbable that there has been any genetic interchange between the two.

Females of *M. arenarius* are most similar to those of *M. tenuinodis*, another species in which the worker petiolar scale is compressed. This species, like *M. arenarius*, exhibits a preference for nest sites in fine sand which is prone to drifting. A third species whose worker possesses a compressed petiolar scale is *M. lugubris*, the female of which is unknown. If the female of *M. lugubris* is found to be sufficiently like those of *M. arenarius* and *M. tenuinodis*, and I predict that this will be so, we will have a complex of three species aligned along a roughly north-south axis with *M. lugubris* occupying the middle portion.

As I envision this particular complex, the protospecies once occupied a continuous range from what is now western and central Nevada to the head of the Gulf of Mexico and partway down either side of the Gulf. This protospecies may have been not very different from the present *M. yuma*, a species not particularly similar to those of the *lugubris* complex but nearer them than any others. During the Tertiary the three desert regions became sharply differentiated from one another; the Great Basin became higher and cooler, the Mojave and Sonoran lower and hot. Protospecies populations became isolated from one another and each developed along its own peculiar line in the absence of genetic moderation from other populations.

### *Ecology*

The Wheelers and I were able to study this species briefly one day at a station six miles north of Nixon. This is an area of fine, drift-prone sand along the east



side of Pyramid Lake. There was a sparse cover of *Salsola pestifer* and *Dalea polyadenia*. In one sector the annual, *Abronia turbinata*, was present and in bloom.

Two nests were situated in unstable sand with sparsely distributed *Salsola* and scattered *Dalea* plants. The third was in stabilized sand with denser cover, including *Abronia*. The only ant species common there was *Pogonomyrmex californicus* (Buckley). *Veromessor lariversi* M. Smith and *Conomyrma insana* (Buckley) were also present but uncommon.

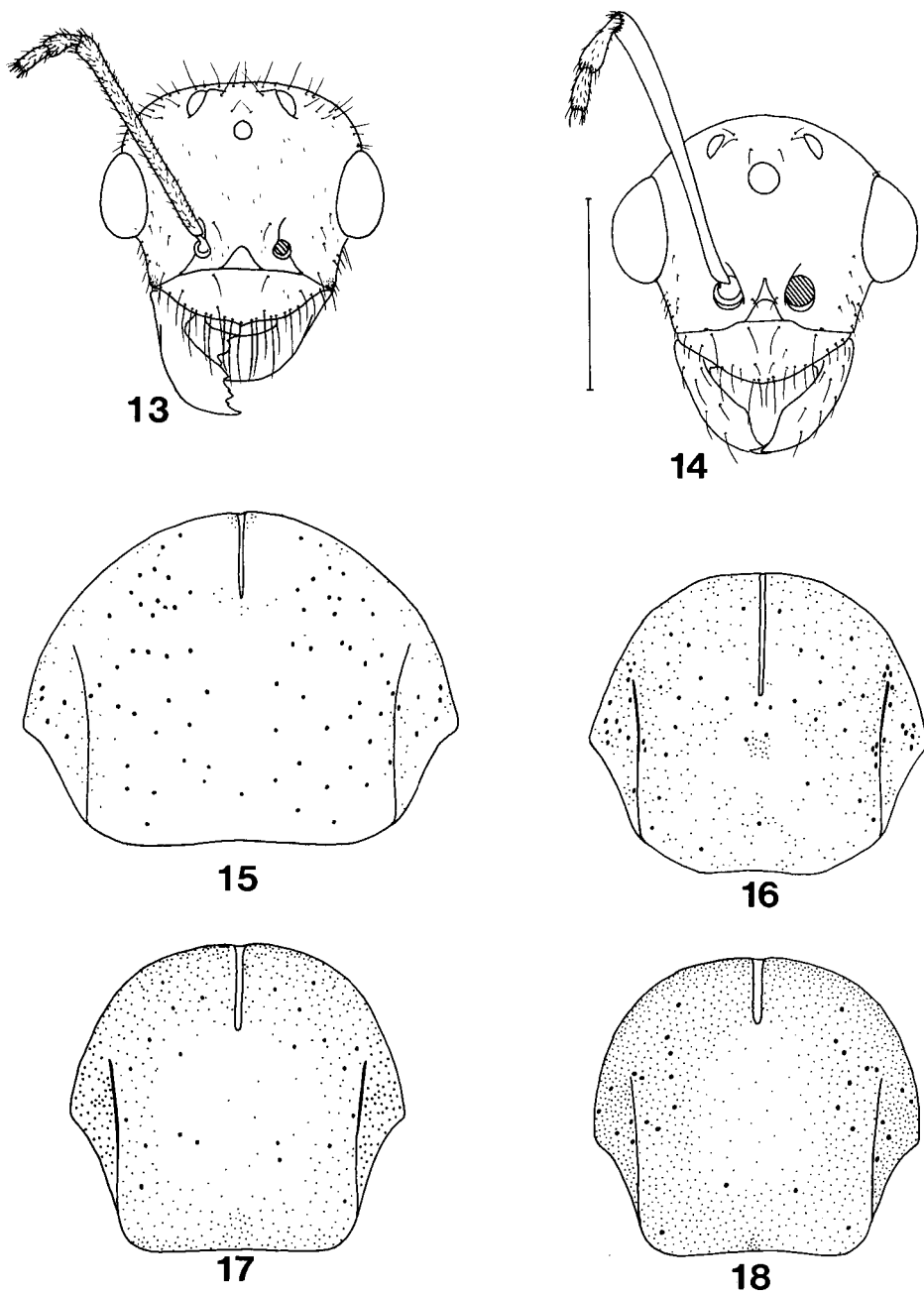
Workers of *M. arenarius* were found foraging up to midmorning. Some were carrying miscellaneous fragments of other arthropods. A number of workers were also seen at nectaries of the *Salsola*. A single semireplete worker was recovered from one nest, but the unstable condition of the sand rendered deep excavation impractical.

The following key to species of *Eremnocystus* will replace that of my revision.

### Key to Species of *Eremnocystus*

#### Workers

1. Antennal scape and dorsum of propodeum without fully erect hairs ..... 2
  - Antennal scape, usually, and dorsum of propodeum, always, with some fully erect hairs (propodeal hairs may be short and inconspicuous in *M. perimeces*; this species has an unusually elongate head, CI 70–81) ..... 3
2. Pronotum and mesonotum with at least eight conspicuous, fully erect white hairs; petiolar scale strongly compressed in profile, crest distinctly notched ..... *lugubris* Wheeler
  - Pronotum and mesonotum each with no more than two fully erect hairs; petiolar scale not notably compressed, crest slightly concave or flat, but not conspicuously notched ..... *creightoni* Snelling
3. Scape and/or tibiae, usually both, with conspicuous fully erect hairs; or, head moderately broad, CI 89 or more ..... 4
  - Scape and tibia without erect hairs and head unusually elongate, CI 70–81 ..... *perimeces* Snelling
4. Scape with conspicuous erect or semierect hairs; femora and tibiae with abundant erect hairs, some present on dorsal femoral surfaces; petiolar scale variable, but often compressed with summit distinctly notched ..... 5
  - Scape with no erect hairs, except at apex; femora and tibiae with few erect hairs, none on dorsal femoral surface; petiolar scale thick in profile, crest flat or slightly convex ..... *yuma* Wheeler
5. Scape with scattered erect and numerous suberect to subdecumbent hairs; malar area with fewer than 6 erect hairs in frontal view; if more, pubescence of second tergum much less dense than that of first ..... 6
  - Scape with numerous fully erect hairs; malar area with 10+ erect hairs in frontal view and second tergum fully as densely pubescent as first ..... *hammettensis* Cole
6. Pubescence of second tergum as dense as that of first ..... 7
  - Pubescence of second tergum much sparser than that of first ..... *arenarius* n. sp.
7. Appressed pubescence abundant on frons and third tergum; petiolar scale



Figs. 13–18. *Myrmecocystus* spp. 13–14, male, frontal view of head: 13, *M. arenarius* and 14, *M. christineae*; scale = 0.50 mm. 15–18, mesoscuta of females: 15, *M. arenarius*; 16, *M. christineae*; 17, *M. pyramicus*; 18, *M. ewarti*.

- thick, at level of spiracle distinctly more than twice the length of the spiracle, crest flat or convex ..... *colei* Snelling
- Appressed pubescence sparse on frons and third tergum; petiolar scale thin, at spiracle less than twice the length of spiracle, crest conspicuously notched ..... *tenuinodis* Snelling

#### Females

1. Mesoscutum, finely, densely and uniformly punctate ..... 2
- Mesoscutal punctation not uniform, punctures often of two sizes, with a large median impunctate area *or* with widely scattered punctures *or* with impunctate disc and median longitudinal punctate zone ..... 3
2. Punctures subcontiguous on side of clypeus, very coarse, distinctly coarser than those of upper half of mesopleuron; occiput distinctly shiny, with scattered fine punctures; mid and hind femora without fully erect hairs except a few along lower side ..... *creightoni* Snelling
- Punctures on side of clypeus distinctly separated, no coarser than on upper half of mesopleuron; occiput slightly shiny, densely shagreened, with fine obscure punctures; mid and hind femora with conspicuous fully erect hairs on all surfaces ..... *colei* Snelling
3. Fourth segment of maxillary palp elongate-clavate, conspicuously broader at apex than at base; parapsis sparsely punctate, punctures irregular in size and spacing, but mostly separated by two or more puncture diameters ... 4
- Fourth segment of maxillary palp not clavate, about as broad in basal third as in apical third; parapsis with punctures uniform in size and spacing ..... 6
4. Summit of first gastric tergum and much of discs of second and third shiny and polished, very nearly impunctate; scutellum with extensive nearly impunctate areas on either side of middle ..... 5
- Summit of first gastric tergum and entire discs of second and third terga shiny between fine and evenly spaced piligerous punctures; scutellum with sparse, evenly spaced minute punctures ..... *tenuinodis* Snelling
5. Fifth segment of maxillary palp uniformly broad, not conspicuously narrowed over apical one-half; forewing with numerous fringe hairs along costal margin ..... *hammettensis* Cole
- Fifth segment of maxillary palp conspicuously narrowed over apical one-half (Fig. 4); forewing without fringe hairs on costal margin ..... *arenarius* n. sp.
6. Face with abundant fine punctures between eyes and frontal lobes; clypeus shiny, polished; appressed gastric pubescence whitish; mesopleural hairs about as long as those of mesoscutum ..... *yuma* Wheeler
- Face sparsely punctate between eye and frontal lobe; clypeus dull, densely sculptured; appressed gastric pubescence brownish; mesopleural hairs conspicuously longer than those of mesoscutum, little shorter than those of scutellum ..... *perimeces* Snelling

*Myrmecocystus (Myrmecocystus) christineae* new species

Figures 7–12, 14, 16, 20, 22, 24

## Diagnosis

*Worker*.—Erect hairs absent from malar area, scape tibiae and mesosomal dorsum; upper margin of eye little below occipital corner; basal face of propodeum flat or slightly rounded in profile. Female: Fifth segment of maxillary palp broadest in middle; OOD  $1.8\text{--}2.5 \times \text{OD}$ ; scape, except at apex, with fine, appressed pubescence only; tibial hairs decumbent, sparse; mesoscutum, between parapsides, with sparse, fine punctures and scattered coarse punctures, center nearly impunctate. Male: Scape with appressed pubescence only, except at tip; tibiae with very short decumbent hairs; forewing with fringe hairs along apical margin, hindwing with fringe hairs along apical and posterior margins; forewing without discoidal cell; HL less than 0.8 mm.

## Description

*Worker*.—Measurements: HL 0.77–1.13 (1.12); HW 0.63–1.03 (1.02); SL 0.97–1.33 (1.33); WL 1.03–1.63 (1.63); PW 0.43–0.72 (0.70) mm.

Head: Longer than broad, CI 75–94 (91), a little shorter than scape, SI 113–130 (119). In frontal view, sides of head nearly parallel in small workers, slightly convex in largest workers and widest at about midpoint of malar area. Occiput, in frontal view, flat, sides convex, not at all angulate. Eye large, EL  $1.4\text{--}1.7 (1.5) \times \text{first flagellomere}$ ; OMD  $0.75\text{--}1.04 (1.00) \times \text{EL}$ ; upper margin nearly coincident with occipital corner. Mandible with seven or eight teeth.

Thorax: Moderately robust to robust, PW  $0.43\text{--}0.72 (0.70) \times \text{WL}$ . Basal face of propodeum, in profile, flat or slightly rounded, broadly rounded into longer posterior face.

Petiole: Elongate-cuneate in profile, summit narrowly rounded; crest, from behind, weakly notched; from above about twice wider than long.

Vestiture: Clypeus with a few erect hairs; two pair of very short erect hairs on margins of frontal lobes and a pair on vertex. Thorax without erect hairs. Crest of petiole without erect hairs. First two gastric terga without erect hairs on disc; remaining terga with scattered suberect discal hairs. Scape and outer tibial faces without visible hairs of any declination.

Pubescence fine, sparse and short on head and mesosomal dorsum; longer and a little denser on mesosomal side and on gastric terga; everywhere appressed, but with some suberect pubescence on basal area of first tergum.

Integument: Moderately shiny over most areas, clypeus polished, with scattered fine punctures; malar area somewhat shagreened, with sparse, elongate punctures; frontal lobes closely, sharply and finely punctate; frons and vertex similar but punctures a little finer.

Color: Light brownish yellow; occiput sometimes brownish; appendages paler.

*Female*.—Measurements: HL 1.67–1.73; HW 1.67–1.77; SL 1.57–1.67; EL  $0.53\text{--}0.57$ ; WL 3.5–3.7; PW 2.0–2.2 mm.

Head: As broad as, or a little broader than long, CI 100–104; longer than, or as long as, scape, SI 92–100. In frontal view, broadest below eyes, sides weakly convex. Occiput, in frontal view, flat, corners broadly rounded. Eye large, EL  $1.3\text{--}1.5 \times \text{first flagellomere}$ ; OMD  $1.0\text{--}1.6 \times \text{EL}$ ; IOD  $2.2\text{--}2.9 \times \text{OD}$ ; OOD  $1.8\text{--}$

2.5 × OD. Mandible variable, usually with five conspicuous, widely spaced teeth (in addition to apical tooth) and with two to four smaller denticles between these. Fifth segment of maxillary palp broad over much of its length, narrowed at base and apex.

Thorax: Robust, PW 0.54–0.63 × WL. In profile, posterior two-thirds of mesoscutum flattened. Scutellum slightly convex, strongly sloping and forming continuous plane with metanotum and base of propodeum.

Petiole: Compressed in profile, crest narrowly rounded; distinctly notched in frontal view; from above, about three times wider than long.

Vestiture: Head with sparse, short, suberect hairs across occiput and with scattered longer hairs (about 0.5 × MOD); frontal lobes with sparse short, suberect to erect hairs; clypeus with numerous short and long suberect to erect hairs on disc; malar area with 3–6 short, decumbent to suberect hairs. Mesoscutum with scattered short and long, suberect to erect hairs; scutellum with 4–6 long, erect hairs and a few short, erect hairs; side of thorax with widely scattered, short, erect hairs; propodeum without erect hairs over base, disc and sides; terga with scattered, short, suberect to erect hairs on discs which are progressively longer on succeeding segments. Inner face of profemur without erect hairs, though 15+ present along lower margin; meso- and metatibia with numerous fine, decumbent hairs.

Forewing with fringe hairs along apical margin; hindwing with fringe hairs along apical and posterior margins.

Pubescence appressed, general, abundant only on malar area, sides of thorax, propodeum, scape and first four terga.

Integument: Clypeus and supraclypeal area smooth or lightly shagreened between sparse, coarse punctures; frontal lobes moderately shiny between close micropunctures and sparse coarse punctures; occiput dull and shagreened between close micropunctures and sparse coarse punctures; malar area dull and shagreened between close, coarse, elongate punctures.

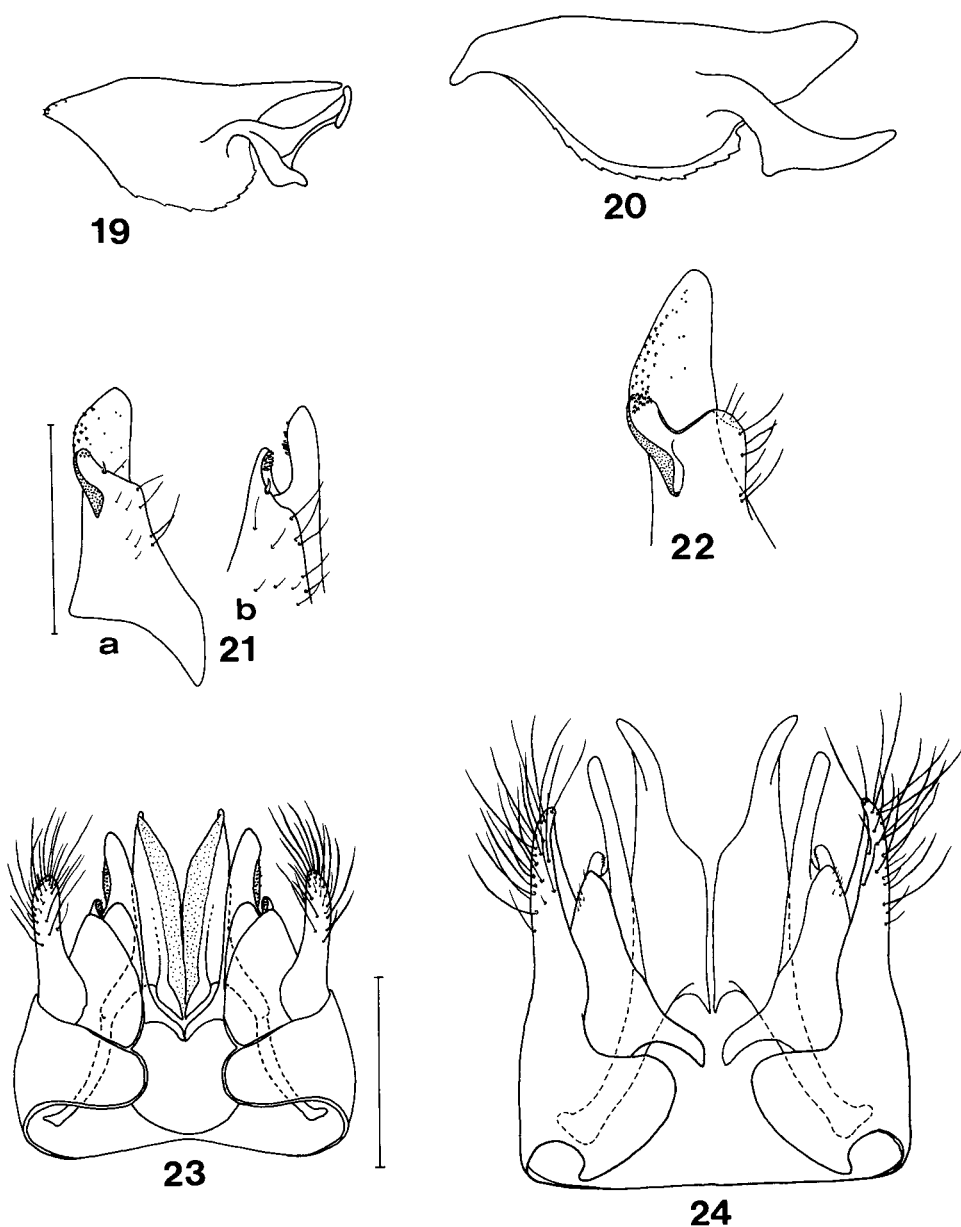
Pronotum moderately shiny, sides and dorsal margin closely micropunctate, neck with punctures very obscure. Parapsis shiny, with close micropunctures and sparse coarse punctures; mesoscutal disc shiny, with sparse micropunctures, nearly impunctate in middle. Scutellum shiny, with scattered micropunctures and a few coarse punctures (from which the long hairs arise). Anepisternum and katepisternum moderately shiny between close micropunctures and sparse coarse, piliferous punctures. Propodeum dull, densely shagreened and closely micropunctate.

First three terga shiny between close micropunctures and scattered coarse punctures, punctures a little more separated and less distinct on second segment.

Color: Yellow, frontal area of head light brown; appendages paler yellow. Wings clear, veins and stigma light to medium brown.

*Male*.—Measurements: HL 0.62–0.70 (0.66); HW 0.53–0.60 (0.57); SL 0.66–0.73 (0.66); EL 0.28–0.30 (0.30); OMD 0.10–0.15 (0.13); WL 1.23–1.40 (1.30); PW 0.70–0.80 (0.77) mm.

Head: Margins slightly convergent toward mandibular insertions; distinctly longer than broad, CI 79–88 (85); a little shorter than, to a little longer than, scape, SI 95–114 (100); OMD 0.33–0.50 (0.44) × EL; anterior ocellus little smaller than lateral ocelli; IOD 2.50–3.50 (3.00) × OD; OOD 1.00 × OD. Mandible without preapical teeth, preapical notch weak or absent. Clypeus usually with transverse preapical depression.



Figs. 19–24. *Myrmecocystus* spp., male terminalia, 19–20, aedeagus in profile: 19, *M. arenarius* and 20, *M. christineae*; same scale as 23–24. 21–22, inner view of volsella (and ventral view, 21): 21, *M. arenarius* and 22, *M. christineae*; scale = 0.125 mm. 23, 24, genital capsule, ventral view: 23, *M. arenarius* and 24, *M. christineae*; scale = 0.25 mm.

Thorax: Stout, PW 0.52–0.59 (0.59)  $\times$  WL. Propodeum, in profile, without defined basal face.

Petiole: Sharply cuneate in profile; in frontal view, crest weakly notched; in dorsal view about twice wider than long.

Vestiture: Erect hairs short and sparse on clypeus, absent from frontal lobes; a single pair, short and suberect, in ocellar area; absent from mesoscutum; four to six short, suberect hairs on scutellum; first three terga without erect hairs, but with sparse, decumbent hairs; remaining terga and the sterna with moderately long, suberect to erect sparse hairs. Hairs of tibiae short, fine and decumbent to appressed. Scape with appressed pubescence only. Wings as in female.

Integument: Moderately shiny on most areas, shiny between notaulices, with sparse piligerous micropunctures: scattered coarse punctures on mesokatepisternum.

Color: Uniformly brownish; appendages pale yellowish. Wings clear, veins and stigma light brown.

Terminalia: Figures 20, 22, 24.

#### Type Material

Holotype worker, Morningstar Mine Rd., elev. 4200'–4260', 9.5 mi NNE Cima, San Bernardino Co., CALIF., 14 Apr. 1977 (C. D. George and R. R. Snelling; RRS No. 77-9); allotype male, same data but RRS No. 77-10; holotype and allotype in LACM. Paratypes: 16 females, 724 workers, 68 males, same data, RRS No. 77-9, 10, 16. Paratypes in AMNH, GCW, LACM, MCZ, USNM.

#### Etymology

This species is dedicated to Christine D. George who materially assisted in collecting and studying this new species and who is currently investigating *Myrmecocystus* ecology in the Mojave Desert.

#### Distribution

At present known only from the Ivanpah Mountains of the Mojave Desert. The species probably occurs in suitable habitats of adjacent ranges in California and Nevada.

#### Discussion

In my revision of *Myrmecocystus* the nominate subgenus was divided into the *mexicanus*, *pyramicus* and *testaceus* species groups. The present species appears to be annectant between the *mexicanus* group and the *pyramicus* group. The mesosomal profile of the worker is very similar to that of *mexicanus* group species, as is the number of mandibular teeth of the female and worker. The displacement of the eyes of the worker toward the occipital margin is about as in the *pyramicus* group, although this is shared with *navajo* in the *mexicanus* group. The great reduction in erect body hairs in both female and worker accords with the *pyramicus* group.

Following is a revised key to the species of *Myrmecocystus* s. str. to include *M. christineae*.

#### Key to Species of *Myrmecocystus* S. Str.

##### Workers

1. Dorsal surface of propodeum strongly, angularly projected upward over posterior two-thirds; erect hairs very sparse, with few or none on outer face of hind tibia; upper eye margin little below upper margin of head . . . 2

- Dorsal surface of propodeum either flat or evenly convex; body often abundantly hairy; upper eye margin usually well below upper margin of head ..... 3
- 2. With at least two erect pronotal hairs as long as apical breadth of scape; first tergum with a few erect hairs on disc; hind tibia with a few erect hairs on outer face beyond basal third ..... *ewarti* Snelling
- Erect pronotal hairs, when present, shorter than apical breadth of scape; first tergum without erect discal hairs; hind tibia without erect hairs on outer face beyond basal third ..... *pyramicus* M. Smith
- 3. Fully erect hairs conspicuous on thoracic dorsum, discs of first and second terga and on scape and tibiae ..... 4
- No erect hairs on thoracic dorsum, discs of first and second terga, scape or tibiae ..... *christineae* n. sp.
- 4. Head, pronotum and gaster with abundant appressed pubescence; mid and hind tibiae usually with numerous erect hairs along apical half of outer face; upper eye margin often distinctly below occipital corner; if metanotal suture impressed, HL exceeds 1.3 mm ..... 5
- Head, pronotum and gaster shiny, with little or no appressed pubescence; mid and hind tibiae with not more than 3 or 4 erect hairs beyond basal third of outer face, usually none; upper eye margin coincident with occipital corner; metanotal suture deeply impressed and dorsal face of propodeum convex ..... *navajo* Wheeler
- 5. Large, highly polymorphic species, HL 1.0–2.0 mm or more, usually in excess of 1.3 mm; metanotal suture usually impressed and propodeum as long as high or longer, juncture of dorsal and posterior faces broadly rounded ..... 6
- Smaller, moderately polymorphic species, HL 0.8–1.4 mm; metanotal suture not impressed; propodeum higher than long, juncture of dorsal and posterior faces abruptly rounded, often subangulate ..... *testaceus* Emery
- 6. Eye with numerous erect hairs which are longer than diameter of ocular facets; mandible with 8 or 9 teeth; color uniformly brownish, gaster a little darker ..... *melanoticus* Wheeler
- Eye with erect hairs, when present, very diffuse, length less than diameter of ocular facets; mandible with 9 or 10 teeth; color usually distinctly yellow, but may be extensively brownish in southern populations ..... *mexicanus* Wesmael

#### Females

- 1. Fifth segment of maxillary palp broadest in middle, narrowed basally and apically; hind femur without erect hairs on dorsal surface; hind tibia with hairs decumbent, never fully erect ..... 2
- Fifth segment of maxillary palp broadest well basad of middle, gradually narrowed toward apex or parallel sided; hind femur with erect hairs on dorsal surface; hind tibia with abundant fully erect and suberect hairs .... 5
- 2. Antennal scape with decumbent or appressed hairs only except a few erect hairs at tip; ocelli normal, OD less than 0.12 mm ..... 3



- Antennal scape with conspicuous coarse erect and suberect hairs; ocelli large, OD greater than 0.15 mm ..... *navajo* Wheeler
- 3. Fourth segment of maxillary palp gradually widened from base to apex; fine punctures of parapsis abundant and uniformly spaced (Figs. 17, 18); side of frontal lobe shiny between close, fine punctures ..... 4
- Fourth segment of maxillary palp distinctly clavate (Fig. 9); fine punctures of parapsis very irregularly spaced (Fig. 16); side of frontal lobe dull and roughened between fine punctures which are at least partially obscured ..... *christineae* n. sp.
- 4. Fine punctures of parapsis conspicuously coarser than those of disc of mesoscutum (Fig. 17); first tergum with fewer than 6 erect hairs on disc, often none; interocellar distance about equal to ocellocular distance .... *pyramicus* M. Smith
- Fine punctures of parapsis not obviously coarser than those of disc of mesoscutum (Fig. 18); first tergum with at least 12 erect to suberect hairs on disc; interocellar distance less than ocellocular distance .. *ewarti* Snelling
- 5. Thorax and gaster brown, legs usually yellowish; HW usually less than 1.85 mm; penultimate segment of maxillary palp slender, parallel-sided ..... *testaceus* Emery
- Thorax and gaster light brownish yellow to yellow, legs concolorous with thorax; HW 1.90 mm or more; usually more than 2.0 mm; penultimate segment of maxillary palp distinctly broadest basad ... *mexicanus* Wesmael

#### Males

- 1. Scape and tibia without conspicuous standing hairs; hind wing with fringe hairs on posterior margin ..... 2
- Scape always and tibia usually with conspicuous standing hairs; posterior margin of hind wing variable ..... 4
- 2. Forewing with conspicuous fringe hairs along apical margin; HL less than 0.80 mm ..... 3
- Forewing without fringe hairs along apical margin; HL in excess of 0.90 mm ..... *pyramicus* M. Smith
- 3. Mesopleuron shiny, indistinctly, or not at all, shagreened; forewing usually with discoidal cell ..... *ewarti* Snelling
- Mesopleuron slightly shiny, distinctly shagreened; forewing without discoidal cell ..... *christineae* n. sp.
- 4. Occipital hairs shorter than maximum diameter of lateral ocellus; posterior and/or apical margins of hind wing with at least a few long fringe hairs .. 5
- Many occipital hairs longer than maximum diameter of lateral ocellus; hind wing without fringe hairs ..... *testaceus* Emery
- 5. Small species, HW less than 0.8 mm; scape with scattered erect hairs, tibia with numerous decumbent hairs; apical margin of forewing without fringe hairs ..... *navajo* Wheeler
- Large species, HW greater than 0.9 mm; scape and tibia usually with abundant erect or suberect hairs; if erect hairs reduced or absent, apical margin of forewing with at least vestiges of fringe ..... *mexicanus* Wesmael and *melanoticus* Wheeler

## Literature Cited

Snelling, Roy R. 1976. A revision of the honey ants, genus *Myrmecocystus* (Hymenoptera: Formicidae). Nat. Hist. Mus. Los Angeles Co. Bull., 24:1-163.

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