

western Arizona, northwestern Sonora and northern Baja California (Fig. 372).

Localities. UNITED STATES. California: Imperial Co.: 6 mi E Glamis, 925', 30 Mar. 1967 (R. R. Snelling; LACM). *Riverside Co.:* Deep Canyon, 800'–975', various dates (G. C. & J. Wheeler; GCW); 1.5 mi N Thousand Palms, 190', 5 Feb. 1967 (R. R. Snelling, LACM); Deception Cyn. and Fan Hill, Joshua Tree Natl. Mon., 26 Jan. 1967 (R. J. Hamton; RJH); Carrizo Creek Cyn., San Jacinto Mts., 1100', 27 Feb. 1963 (M. Ewart; LACM). *San Bernardino Co.:* 23 mi S Needles, 475', 31 Jan. 1967 (R. R. Snelling; LACM); 44 mi E Twentynine Palms, 2 Oct. 1963 (R. R. Snelling; LACM).

Ecology. The type series was found nesting in a sandy stream bed in Creosote Bush-Bur Sage Desert. The entrance was surrounded by a large crateriform tumulus of fine sand particles. Known habitats range from Creosote Bush and Palo Verde-Cactus Shrub Deserts to Piñon-Juniper Woodland, with most records from Creosote Bush and Creosote Bush-Bur Sage Deserts. The elevational range is from 190' near Thousand Palms to 1100' at Carrizo Creek Canyon, both in Riverside County.

Foraging activity is nocturnal; workers gather nectar from plants and solicit aphids. They have also been observed to bring in remnants of dead arthropods. Repletes were found in the type series nest.

The activities of the sexual forms are unknown. Presumably the mating flight takes place at night, most likely following a rain. The sexual forms have been found in the nests during the early spring months (Table 8).

Discussion. Present data indicate that this species replaces the similar *pyramicus* in southern California on the Mojave and Colorado Deserts. It is probably to be found also in adjacent portions of Arizona, Sonora and Baja California.

The workers of *ewarti* may be separated from those of *pyramicus* by the presence of a number of erect hairs on the pronotum and first tergum. A pair of pronotal hairs, which seems always to be present in *ewarti*, is as long as or longer than the apical breadth of the scape. Although occasional specimens of *pyramicus* may have one or two erect pronotal hairs, they are always much shorter. Erect hairs are present on the hind tibia of *pyramicus* but absent in *ewarti*. The median area of the clypeus of *ewarti* has four or more long, erect hairs; in *pyramicus* clypeal hairs are confined to the margins.

The single female available of *ewarti* is very similar to those of *pyramicus* but has a number of erect hairs on the clypeal disc, the antennal scape possesses numerous fine suberect hairs, long erect hairs are abundant on the outer face of the fore femur and there are erect hairs on the hind tibia. The malar area of *ewarti* is less sharply shagreened, the punctures below the eyes are larger and are round (clearly elongate in *pyramicus*).

The best character to separate the females of these species seems to be that of mesoscutal punctation. The discal area in *ewarti* is rather uniformly finely, sparsely piligerously punctate. There are, in addition, a number of much coarser, setigerous punctures scattered over the disc. The piligerous punctures of the parapsis are little coarser than those of the median area, and are mostly separated by two or more times a puncture diameter. In *pyramicus*, the center of the mesoscutum is virtually impunctate, the setigerous punctures are fewer and less conspicuous, and the punctures of the parapsis are much coarser than those of the median area, and are mostly separated by a puncture diameter or less.

The males are very similar and, until more specimens of *pyramicus* are available, the differences noted here must be considered provisional. In size, *pyramicus* males are conspicuously longer; head length of males of this species exceeds 0.90 mm, while that of *ewarti* is less than 0.80 mm. However, *Myrmecocystus* males vary greatly in size within a single colony, so the size difference must be considered with this variability in mind. The lower margin of the fore femur of *ewarti* has a number of long, erect hairs as well as many extremely fine, short ones. The few males seen of *pyramicus* possess, in addition, about as many long hairs and an equal, or greater, number of hairs about half as long as the longer. The most conspicuous difference is the presence of a discoidal cell in *ewarti* males and its lack of those of *pyramicus*. Finally, *ewarti* males have a well developed fringe of hairs on the apical margin of the fore wing and apical and posterior margins of the hind wing. There is no fringe on the forewing of *pyramicus* and on the hind wing it is extremely sparse, most of the hairs separated by much more than their own lengths.

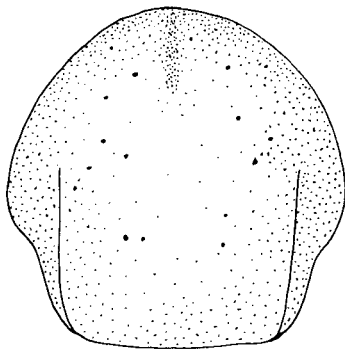
Myrmecocystus (Myrmecocystus) pyramicus M. Smith

Figures 299–307, 324, 325, 336, 337

Myrmecocystus mexicanus subsp. *navajo*, Cole 1934. Ann. Entomol. Soc. Amer. 27:402. (*misidentification*)

Myrmecocystus pyramicus M. Smith 1951. Great Basin Nat. 11:91–94. ♀. Cole 1957. Jour. N. Y. Entomol. Soc. 65:129–130. ♀♂.

Diagnosis. Worker: Few or no erect hairs on malar area, antennal scape and tibiae (except beneath); propodeum, at juncture of dorsal and posterior faces, angularly produced upward; petiolar scale compressed; erect pronotal hairs, when present, shorter than apical breadth of scape. *Female.* Penultimate maxillary palp segment narrowed basally and apically; tibiae without erect hairs; OOD 3 × OD; first tergum without erect discal hairs; mesoscutum, between parapsides, with scattered coarse and fine punctures. *Male.* Forewing



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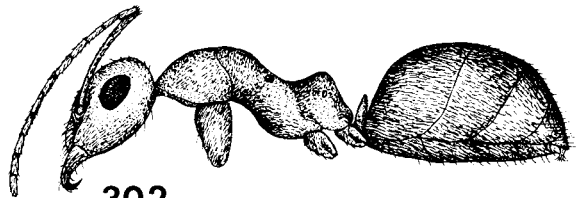
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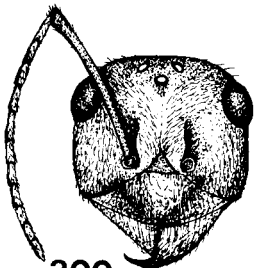
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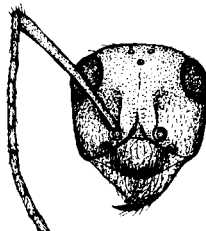
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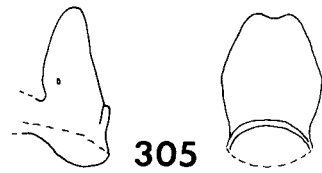
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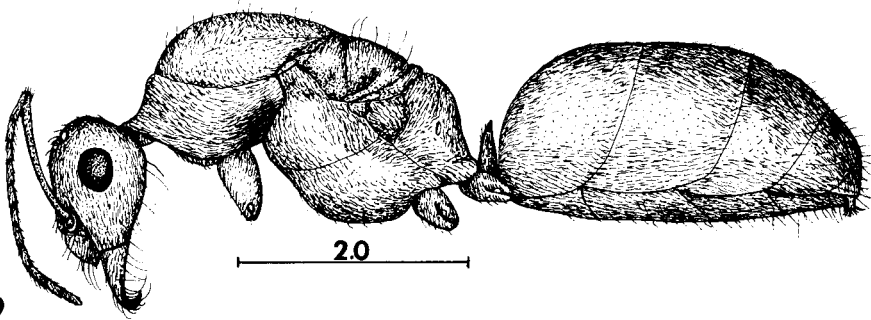
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FIGURES 299-307. *M. pyramicus*. 299, female, lateral view; 300, head of female, frontal view; 301, mesoscutum of female distribution of punctures; 302, major worker, lateral view; 303, head of major worker, frontal view; 304, head of minor worker, frontal view; 305, petiole of major worker, lateral (left) and posterior (right) views; 306, male, lateral view; 307, head of male, frontal view.

without fringe hairs on apical margin; scape and tibiae without erect hairs.

WORKER. *Measurements.* HL 0.83–1.26; HW 0.73–1.23; SL 1.06–1.50; WL 1.2–1.9; PW 0.50–0.76.

Head: Longer than broad in all sizes, CI 85–97; distinctly shorter than scape, SI 117–132. In frontal view head broadest about midway between eyes and mandibular bases, sides thus convex but only slightly so; sides slightly narrowed toward mandibular insertions. Occiput, in frontal view, flattened, sides convex, not angulate. Eye large, 1.5–2.0 × first flagellomere; OMD 0.90–1.15 × EL. Mandible seven-toothed, occasionally with an intercalary denticle between subbasal and basal teeth.

Thorax: Slender, PW 0.38–0.46 × WL. Basal face of propodeum pyramidally produced upward at juncture with posterior face, about half as long as posterior face.

Petiole: Compressed when viewed in profile; from behind, crest narrow, angularly excised in middle; from above, about twice wider than long.

Vestiture: Erect cephalic hairs sparse, confined to clypeus, frontal lobes and occiput, those of clypeus much shorter on disc than at sides; longest occipital hairs less than 0.5 × MOD. Pronotal hairs sparse, sometimes absent, longest hairs always shorter than apical breadth of scape; mesonotum with 2–6 short erect hairs; propodeum without erect hairs. Petiolar scale with a few inconspicuous fine hairs on crest. First tergum with hairs on apical margin only; second tergum usually without erect discal hairs, occasionally a few fine hairs present laterad; following terga with scattered short discal hairs and usual longer marginal hairs. Scape, femora (except beneath) and tibiae (except beneath) without erect hairs (rarely 2 or 3 short suberect hairs on basal one-fourth of hind tibia).

Pubescence dilute, very short, but producing evident sheen on cephalic and thoracic dorsa and first three terga.

Integument: Front of head shiny, polished between punctures; clypeal punctures sparse, coarse; frontal punctures dense, fine; malar area shagreened, duller than frons, with scattered elongate fine punctures; integument otherwise moderately shiny, finely shagreened.

Color: Light brownish yellow, legs and antennae more yellowish; mandibular teeth ferruginous to blackish ferruginous.

FEMALE. *Measurements.* HL 1.43–1.50 mm; HW 1.56–1.60; SL 1.46–1.53; EL 0.50–0.53; OMD 0.50–0.53; WL 3.3–3.4; PW 1.9–2.0.

Head: Broader than long, CI 107–109; a little shorter than to a little longer than, scape, SI 93–102. In frontal view, head broadest immediately above mandibular insertions, sides straight. In frontal view, occiput flat in middle, sides broadly rounded, without lateral angles. Eye large, about 1.5 × first flagellomere; EL 0.93–1.06 × OMD. OOD 3 × OD; IOD 3 × OD.

Penultimate segment of maxillary palp broadest in middle, narrowed basally and apically.

Thorax: Robust, PW 0.55–0.60 × WL. In profile, posterior half of mesoscutum, scutellum and metanotum forming a continuous, flattened curve.

Petiole: In profile, compressed, crest sharp; distinctly angularly notched; from above, about twice wider than long.

Vestiture: Cephalic pilosity about as described for worker; pronotum with erect hairs on anterior margin; mesoscutum and scutellum with scattered long, erect yellowish hairs arising from coarse punctures; pleura with scattered erect long yellow hairs; propodeum without conspicuous erect hairs; first tergum with erect hairs on apical margin only; second tergum without erect discal hairs, or with a few scattered short hairs, third and fourth terga with scattered short erect hairs; scape without erect hairs except cluster near apex; femora with erect hairs on ventral margin only; hind tibia with sparse short subdecumbent hairs; very short fringe hairs present on apical margin of fore wing and apical and posterior margins of hind wing.

Pubescence long, yellowish, appressed to decumbent on head, thorax and appendages; fully appressed and abundant on first three terga, both shorter and sparser on fourth.

Integument: Clypeus coarsely punctate, interspaces shagreened and dull along midline, subpolished and shiny on lateral lobes; front of head otherwise shiny between punctures, frontal lobes finely and densely punctate, frons more finely and sparsely punctate, area between eyes and frontal lobes very sparsely and more coarsely punctate; occiput duller, very finely punctate and with finely shagreened interspaces; malar area dull, shagreened, coarsely punctate, punctures denser near mandible, those near eye elongate.

Pronotum moderately shiny between sparse, fine punctures, interspaces delicately shagreened. Parapsis densely, finely punctate, moderately shiny; disc of mesoscutum shinier, with sparse, very fine punctures laterad and scattered coarse punctures and broad central portion largely impunctate. Scutellum shiny, with sparse fine punctures, a little coarser and closer laterad. Pleura moderately shiny, closely and finely punctate. Propodeum slightly shiny, strongly shagreened, sparsely, finely and obscurely punctate.

First three terga moderately shiny, finely and sparsely punctate.

Color: Yellowish, cephalic, thoracic and gastric dorsa more brownish; legs and scapes paler. Fore wings transparent whitish, cells on costal margin with yellowish tint; veins and stigma ferruginous or brownish.

MALE. *Measurements.* HL 0.70–0.86; HW 0.66–0.76; SL 0.83–0.96; EL 0.33–0.40; WL 1.7–2.1; PW 0.95–1.13.

Head: Sides slightly convergent toward mandibular insertions; head a little longer than broad, CI 88–95; distinctly shorter than scape; OMD 0.50 × EL; ante-

rior ocellus a little smaller than lateral ocelli; IOD 2.6–3.7 × OD; OOD 1.6–2.0 × OD. Mandible with preapical notch and/or preapical tooth.

Petiole: In profile, distinctly higher than long, sharply cuneate; in frontal view, sides somewhat convergent toward broadly emarginate crest; from above, about twice wider than long.

Vestiture: Erect hairs yellowish, sparse on head and thorax, longest on scutellum, but these distinctly shorter than MOD; propodeum without conspicuous erect hairs; scape and tibiae without erect hairs, or tibiae with scattered fine reclinate hairs; first two terga without erect hairs except on apical margins; remaining terga with numerous long yellowish hairs. Fore wing without fringe hairs; hind wing with fringe on posterior margin and scattered short hairs on apical margin.

Pubescence sparse and inconspicuous on head and thorax, denser on propodeum above and first two terga.

Integument: Moderately shiny, with piligerous micropunctures, a few scattered coarse punctures on scutum and pleura.

Color: Uniformly light brownish, appendages yellowish to yellowish brown. Wings whitish hyaline, stigma and veins pale yellowish.

Terminalia: Figures 325, 336, 337.

Type Material. Nevada Dominion Mine, Pyramid Mining District, 5 mi W Mullen Gap, Washoe Co., NEVADA, 7 April 1951 (I. La Rivers). Holotype and paratypes in USNM; additional paratypes in collections of AMNH, LACM, MCZ and of Ira La Rivers.

Distribution. Southern Oregon and Idaho, south to Nevada. May occur in western Utah and Sagebrush Desert of California (Mono and Inyo Counties) (Fig. 372).

Specimens Studied. UNITED STATES. Oregon: Lake Co.: Alkali Lake, Hwy. 395, 9 June 1967 (R. R. Snelling, No. 67-123; LACM). Malheur Co.: 39 mi W Jordan Valley, 4500', 20 June 1967 (R. R. Snelling, No. 67-176, 177; LACM). Idaho: Owyhee Co.: 3.3 mi S Given's Hot Spgs., 2350', 20 June 1967 (R. R. Snelling, No. 67-171; LACM); 4 mi S Walters Ferry Bridge, 13 May 1967 (N. Yensen; LACM). Butte Co.: 5 mi E Arco, 5400', 15 June 1967 (R. R. Snelling, No. 67-155, 156; LACM). Nevada: Humboldt Co.: Soldier Meadows, 4400', 1 July 1965 (R. C. Bechtel; NDA); same locality, 15 July 1966 (R. C. Bechtel & P. C. Martinelli; NDA). Washoe Co.: Mullen Gap, 5 mi W Pyramid Lake, 18 May 1952 (I. La Rivers, No. 1551; USNM); Nevada Dominion Mine, Mullen Gap, 5 mi W Pyramid Lake, 7 April 1951 and 8 May 1951 (I. La Rivers; USNM). Nye Co.: Potts, 6700', 27 Sept. 1966 (R. C. Bechtel & P. C. Martinelli; NDA). White Pine Co.: 2 mi N McGill, 6000', 15 July 1970 (G. C. & J. Wheeler, No. Nev. 1333; GCW); 19 mi SW Ely, 6000', 14 July 1970 (G. C. & J. Wheeler, No. Nev. 1304; GCW).

Ecology. This Great Basin species has been collected in areas of Great Basin Sagebrush, Sagebrush Steppe and Saltbush-Greasewood Desert. In the Sagebrush

Steppe of Idaho the elevational range is from 2350' to 5400'. In Nevada, where most records are from Great Basin Sagebrush areas, the elevation range is from about 4000' to 6700'. All records of this species are from Upper Sonoran or Transition Zone localities.

Although foraging is mostly nocturnal, I have found *pyramicus* workers active outside the nest at midday in Oregon and Idaho. In both instances, though, rain was imminent and the sky was completely overcast. As expected, workers gather nectar from flowers and extrafloral nectaries, as well as from aphids and pseudococcids. They are also general scavengers. Repletes have been recovered from nests in Idaho.

The type series was collected by Ira La Rivers, with the notation "swarming nr. sundown." These specimens were collected on 7 April 1951. The reproductives have been taken in the nests in April, June and September (Table 8). Mating flights evidently occur during spring and late summer rainy periods.

The type series was collected from a "... small, open mound nest in a sand clearing of *Artemisia tridentata* . . ." Nests which I have observed were all marked by a low crateriform tumulus of fine to coarse sand grains. Since all these were seen during the summer rainy season, the tumuli were likely worn down. Most of the nests have been located in deep, sandy soil. An exception was that discovered in Owyhee County, Idaho. This nest was in deep alkali pan. This soil was very dense and excavation was not complete, but the nest probably continued down into an underlying layer of sand, as the tumulus consisted wholly of coarse sand particles.

Discussion. This species has been adequately described by Smith (1951) and by Cole (1957). The strongly, angularly projecting propodeum is characteristic of this species and the closely related *ewarti* of California. The lack of erect hairs on the pronotum, disc of the first tergum and the extensor surface of the hind tibia will separate workers of *pyramicus* from those of *ewarti*. For a fuller treatment, see *Discussion* under *ewarti*.

TESTACEUS GROUP

Myrmecocystus (Myrmecocystus) testaceus Emery

Figures 308–315, 320, 321, 332, 333

Myrmecocystus melliger semirufa var. *testacea* Emery 1893. Zool. Jahrb. f. Syst. 7:667. ♀.

Myrmecocystus mexicanus subsp. *mojave* Wheeler 1908. Bull. Amer. Mus. Nat. Hist. 24:360–361. ♀; Leonard 1911. Trans. San Diego Soc. Nat. Hist. 1:87–92 (*biology*); Wheeler 1912. Psyche 19:173, 179, Fig. 1. ♀ ♀ ♂; Cole 1934. Ann. Entomol. Soc. Amer. 24:403. Mallis 1941. Bull. So. Calif. Acad. Sci. 40:81.

Myrmecocystus mexicanus, undescr. var., Cole 1934. Psyche 41:225.

Myrmecocystus mexicanus subsp. *idahoensis* Cole 1936. Entomol. News 47:118. ♀ ♀ ♂.