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A New Species of Myrmecophilous Scarabaeidae, with Notes on Other Species (Coleoptera, Cremastocheilini)

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Since the publication of two papers by the author (1938, 1940) dealing with the tribe Cremastocheilini, considerable behavioral, ecological, and distributional data have been gathered on a number of the more uncommon species. Additional specimens of a number of species that were described from single specimens have been collected, thereby making possible a more complete and accurate definition of these species. The new species herein described is the subject of a continuing study on biology and behavior being carried out in collaboration with Miss Marjorie Statham.

The author would like to express his appreciation to Miss Statham for collecting data on and specimens of several species and for making the illustration of the new species. Thanks are also due to Drs. E. G. Linsley, P. D. Hurd, R. G. Van Gelder, and G. D. Butler and Mr. George Bradt who made available specimens and other information which assisted in this study. To Dr. William S. Creighton and Dr. Marion R. Smith the writer is indebted for the determination of the species of ants with which the beetles were associated.

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Genuchinus ineptus (Horn)

Cremastocheilus ineptus HORN, 1885, Trans. Amer. Ent. Soc., vol. 12, p. 127.

Nothing has been known previously about the habits of this uncommon North American scarab and whether or not species in the genus *Genuchinus* are associated with ants as are other genera and species in the tribe Cremastocheilini. So far as is known, the relatively few specimens in collections have been picked up in casual collecting by accident and not in their natural environment. On June 26, 1954, the author was collecting specimens of the buprestid *Thrincopyge ambiens* (LeConte) from sotol plants (*Dasylirion wheeleri* Watson) at a location 9 miles northeast of Portal, Cochise County, Arizona, and quite by accident discovered one of the habitats of this scarab beetle. The buprestids are usually found at the base of the leaves or more commonly in the central stalk of new leaves that have not yet separated. In order to get them out one has to work one's way carefully into the plants, pulling the leaves down so as to avoid the sharp recurved spines on their edges, and examining each axil as one works towards the center. It was while doing this that the first specimen of *G. ineptus* was discovered in the axil of a leaf about halfway up the plant, and as several more were collected in this manner it was observed that there were ants running about in the vicinity of the beetle. A dead but still moist and pulpy sotol plant which was the site of an ant colony was taken apart, and three *G. ineptus* specimens were found with the ants in the moist decaying pulp on the interior of the stalk below leaf level. The ants were later determined by Marion R. Smith as acrobatic ants, *Crematogaster californica* Emery.

On June 11, 1956, at the Southwestern Research Station, Chiricahua Mountains, Cochise County, Arizona, 5400 feet, Ellen Ordway collected a single specimen near the base of a dead pine log about one-fourth of an inch inside the pulpy wood. Although no notes on ants were made at this time, subsequent collections of the beetle in the same type of habitat proved that it was again associated with *C. californica.*

For many years the symbiotic relationships between members of the tribe Cremastocheilini and various species of ants have been explained on the basis of the presence of pubescent glandular areas on the pronotum of the beetle from which the ants "milk" a sweet secretion. These pubescent areas are present in all species of the genus *Cremastocheilus* and may well function as supposed. However, there are no such areas on the pronotum or visible elsewhere on the body of *G. ineptus.* If the relationship between this species and the ant *C. californica* is symbiotic, as might be concluded from the above discussion, then a different explanation must be found to account for it.

Cremastocheilus stathamae Cazier, new species

Figure 1

MALE: Small size, slender, black above and beneath, legs dark reddish brown; clypeus, head, pronotum, elytra, meta-epistoma clothed with tomentose areas. Head coarsely punctate, punctures separated by less than half of their own widths, posterior margin deeply declivous, vertex with shallow, median impression, elongate tomentose area behind impression; canthus prominent, apex clothed with short, stout spines; clypeus same width as head including eyes, anterior margin strongly reflexed medially, shallowly laterally, strongly carinate medially, large white tomentose areas on each side of median carina, anterior margin and carina sparsely clothed with short hair, lateral surface almost impunctate, shining; mentum cupuleform, margin slightly produced posteriorly at middle. Pronotum wider than long, widest at anterior third, shallowly constricted before hind angles, hind angles prominent, slightly reflexed laterally, prominent pubescent area beneath; anterior angles shallowly emarginate, deeply impressed inside, anterior pro-episternal projection prominent, angles deeply incised laterally to pubescent areas; surface trilobed, lateral impressions shallow medially, very deep anteriorly, posteriorly strongly impressed, ending in deep pit inside posterior angles, shallowly, sparsely, irregularly punctate, punctures separated by about their own widths laterally, each puncture with a short brown hair near anterior margin of puncture, lateral margins with wide tomentose band extending from emarginate anterior angles to basal third, posterior margin broadly tridentate; scutellum acutely pointed apically, shallowly impressed, surface alutaceous, with five large setigerous punctures. Elytra one-third wider than pronotum, slightly wider at base, lateral margins shallowly sinuate behind humeral umbone, strongly reflexed downward, apices evenly rounded; surface irregular, slight elevations on each side of apex of scutellum, sutural margins strongly elevated medially, shallow but prominent lateral discal ridges at base, irregularly punctate, punctures usually elongate, some punctures united on disc, each puncture with short, brown, basal hair, subsutural impression with irregular row of irregularly placed tomentose spots, lateral discal ridge with large tomentose spot at apical third. Under surface sparsely, shallowly punctate, each puncture with short brown hair, surface shining; reflexed portion of metasternum tomentose; abdomen concave, first abdominal segment tomentose laterally, with narrow, tomentose, apical band complete, second segment with apical tomentose band extending to about lateral third, segments 3 and 4 with shorter tomentose bands;

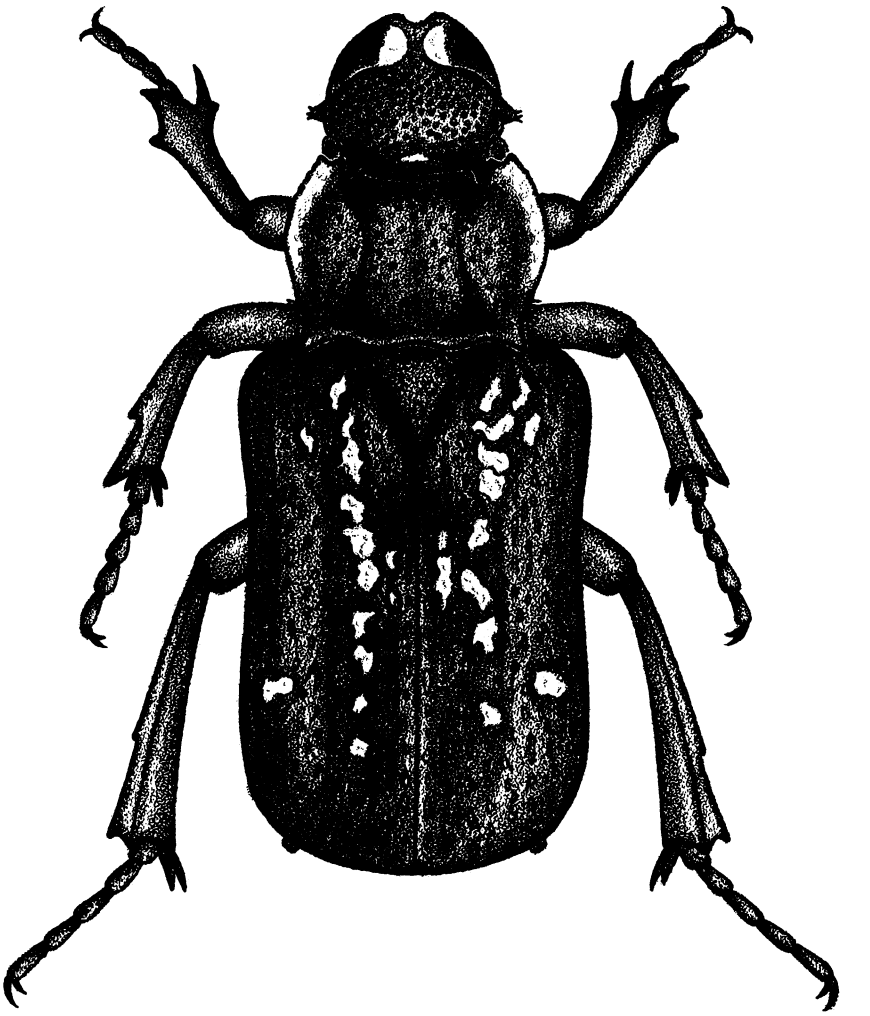

FIG. 1. Holotype male of *Cremastocheilus stathamae*, new species. Drawn by Marjorie Statham.

pygidium subcylindrical, slightly flattened dorsally, surface densely punctate above, sparsely punctate beneath; legs sparsely setigerously punctate, slightly flattened, anterior tibiae bidentate externally, middle tibiae shorter than femora, hind tibiae as long as femora, striately punctate, small tooth posterior to middle on outer edge; tarsi five-segmented. Length, 8 mm.; width, 3.5 mm.

FEMALE: Similar to male except for convex abdomen. Length, 9 mm.; width, 4 mm.

TYPE MATERIAL: Holotype, male, collected 2.5 miles northeast of Portal, Cochise County, Arizona, August 7, 1959 (M. Statham). Allotype female with same data except the date is August 3, 1959, in the collection of the American Museum of Natural History. Twenty-six male and 45 female paratopotypes collected between August 2 and August 7 (M. Statham and M. Cazier) deposited in the collections of the American Museum of Natural History and at its Southwestern Research Station; University of California, Berkeley; California Academy of Sciences; University of Arizona; and Arizona State University. One paratopotype collected on August 3, 1959, by Stan Watkins is deposited in his collection. One male paratype was collected at the Southwestern Research Station, 5 miles west of Portal, Cochise County, Arizona, 5400 feet, July 20, 1958, by M. Cazier.

The series is remarkably uniform in most characteristics, except that the pile may be long or short, the hind pronotal angles vary from being almost straight to being strongly everted, some specimens are more piceous than black, and the tomentose spots in the middle elytral depression vary in size, shape, number, and arrangement.

This species is most closely related to *C. spinifer* Horn which was described from Texas, but a comparison with Horn's type revealed several differences. *Cremastocheilus stathamae* is darker in color and has the tomentose areas on the head, pronotum, elytra, and under surface which are lacking in *C. spinifer*.

The species is named after Miss Marjorie Statham in partial gratitude for the tremendous number of excellent field observations and accurate data that she recorded over a period of some 42 days in the desert heat and miserable punkie-infested area. Were it not for her diligence and perseverance, most of the new information on the behavior and habits of this species, contained in a separate publication, would not have been available.

Cremastocheilus mentalis Cazier

Figures 2, 3

Cremastocheilus mentalis CAZIER, 1940, Bull. Brooklyn Ent. Soc., vol. 35, no. 4, p. 129.

When the author described this species from a single female, certain characters were given that would separate it from the closely allied *C. planipes* Horn. These differences were of necessity based on the exam-

ination of very few specimens, and, while they will still serve to separate the two, except for the size and hind pronotal angles, other differences are more pronounced now that additional specimens of *C. planipes* and a long series of *C. mentalis* are available. In *C. planipes* the body is piceous or black, the legs are dark red, and the entire surface is shiny. In *C. mentalis* both the body and the legs are dark red, and the surface is opaque owing to the finely reticulate sculpturing between the punctures. Although some of the females of *C. planipes* are larger than any specimens of *C. mentalis* thus far examined, there are both males and females that are the same size or smaller than *C. mentalis*. In the type specimen of *C. mentalis* the hind pronotal angles are flattened, but the series collected near the type locality show considerable variability in this character, and many of them are like *C. planipes* in this respect. Based on the specimens of both species examined to date there is much more variability in size in *C. planipes* than in *C. mentalis* represented from several localities.

NEW LOCALITIES: Ten miles west of Patagonia, Santa Cruz County, Arizona, September 13 and 23, 1958 (E. G. Linsley, P. D. Hurd, R. G. Van Gelder, M. A. Cazier); Sopori, Pima County, September 14, 1958 (G. Bradt, M. A. Cazier); 1 mile west of Montezuma Pass, Huachuca Mountains, Cochise County, September 6, 1950 (W. J. Gertsch, M. A. Cazier).

On September 13, 1958, while collecting with E. G. Linsley and P. D. Hurd, the author found a large population of *C. mentalis* located 10 miles west of Patagonia, Santa Cruz County, Arizona, only 9 miles east of Nogales, the type locality of the species. The population was located in the bottom of a large, dry wash (about one-eighth of a mile wide), and individuals were collected for a distance of about one-fourth of a mile along the wash and adjacent bottom land. They were found in association with three large species of ants: *Novomessor albisetosus* (Mayr), *Pogonomyrmex maricopa* Wheeler, and *Pogonomyrmex barbatus* (F. Smith), and the small ant *Dorymyrmex pyramicus* (Roger).[1] During several hours spent in collecting and observing on September 13, and again on September 23 with Richard Van Gelder, none of the ants was observed to bring beetles out of their nests, but a number were seen being taken in or were trying to get in on their own accord. The nests of *N. albisetosus* were located primarily at the base of plants or beside rocks, and the openings were large and irregular, with little or no mound material. Those of the harvester ants *P. maricopa* and *P. barbatus* had the characteristic large, bare mound in the grassy areas, with large openings in the center, and many

[1] Determinations made by Dr. William S. Creighton.

of the nests were connected by wide clear trails through the dry grass or well-trodden paths over open ground.

The three species of large ants were observed dragging or carrying the beetles towards their nests, from one to six ants to a beetle, or in several instances the beetles rushed into the nest opening before being detected by the ants. One specimen of *N. albisetosa* was found carrying a beetle in an upside-down position, and both beetle and ant fell out of sight into

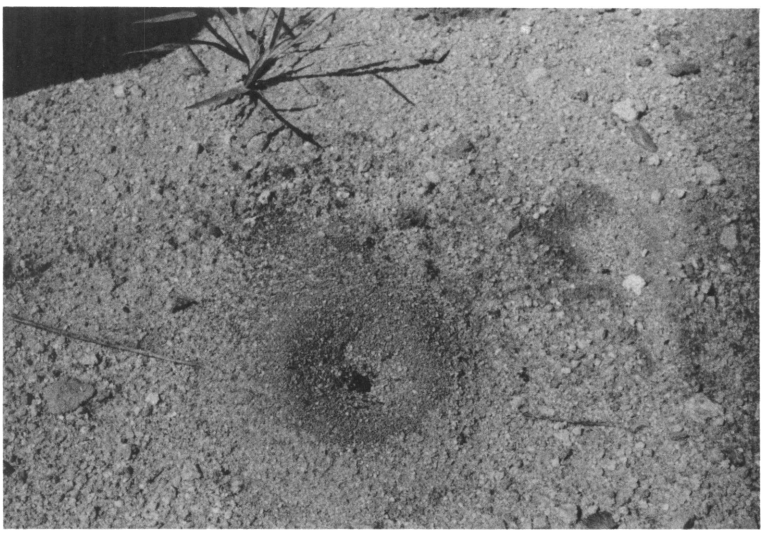

Fig. 2. Turret around nest entrance of *Dorymyrmex pyramicus*, with head of an individual of *Cremastocheilus mentalis* inserted in entrance. Photograph by Richard G. Van Gelder.

the nest upon arriving. Three specimens of *C. mentalis* were found under stones and twigs on the perimeter of a *P. barbatus* nest, but they were on the opposite side of the clearing (which was 8 feet in diameter) from the foraging trail that was being used at that time by the ants and had thus been undetected. On being uncovered, all three specimens moved away from the nest area, and one flew after walking about 2 feet.

The nests of *D. pyramicus* were located almost exclusively in the open in either soil or sandy areas. The characteristic craters (fig. 2) are from 2 to 4 inches in diameter, and the entrance holes are very small, usually admitting only the head of the beetle but in one or two cases admitting both the head and thorax. The first observations on the association between this small ant and *C. mentalis* were made when several beetles

were found with only the tips of their abdomens showing in the nest entrance. One beetle was observed walking an erratic course in an open sandy area and was followed for 20 minutes before it came to within about 6 inches of a *D. pyramicus* nest, where it turned 90 degrees and headed directly for it. When within 3 inches of the nest the beetle was approached by a single ant, whereupon the beetle turned away from the

FIG. 3. Close-up view of the nest that is shown in figure 2, with ants carrying materials away from nest entrance around the head of the beetle. Photograph by Richard G. Van Gelder.

nest and rapidly moved away until the ant was no longer in contact. The beetle then turned back towards the nest. This same procedure was followed three times before the beetle finally arrived at the side of the crater unmolested by the ants. Once at this point, the activity of the beetle increased, and it rushed over the crater and buried its head in the nest entrance (figs. 2, 3) moving the head, pronotum, and legs in an effort to dig in. The ants that were on the outside started carrying pebbles away from the nest entrance around the head of the beetle, and after a short period, when the beetle was gently removed, it was found that the ants on the inside were doing the same thing underground.

On several occasions as many as 11 specimens of *D. pyramicus*, attached to the legs of a beetle, were seen unsuccessfully trying to move it, and twice a beetle was observed walking away from the vicinity of a nest with

four or five ants still attached. It was also observed that, if an ant attached itself to a leg of a beetle, the beetle would move in irregular circles in the opposite direction from the side the ant was on.

According to Creighton (1950, p. 348), *D. pyramicus* is predaceous but will feed on honeydew when available. This latter behavior may account in part for the apparent symbiotic relationship with *C. mentalis*, because this beetle has four pubescent glandular areas on the pronotum which may be "milked" by the ants. The avoidance reactions of the beetle at certain times may be responses either to contact or to the strong butyric acid odor of the ant (Creighton, 1950, p. 348). Nothing is known at the present time about the behavior and relationship between the beetle and the ant inside the nest.

Cremastocheilus (*Macropodina*) *beameri* Cazier

Cremastocheilus (*Macropodina*) *beameri* CAZIER, 1940, Bull. Brooklyn Ent. Soc., vol. 35, no. 4, p. 126.

This species was described originally from three old specimens that had no data as to ant associations. On July 14, 1959, Marjorie Statham collected two male specimens flying about in an open mesquite thicket where the predominant ant nests were of the harvester *Pogonomyrmex barbatus* (F. Smith). While this is not conclusive proof of a more intimate association between the two species, it is indicative of what may eventually be found. Furthermore, *P. barbatus* is known to be associated with other species of *Cremastocheilus*.

NEW LOCALITIES: One mile west of Portal, Cochise County, Arizona, July 14, 1959, 4800 feet (M. Statham); Southwestern Research Station, Chiricahua Mountains, Cochise County, Arizona, July 20, 1958, 5400 feet (M. Cazier); Tempe, Maricopa County, Arizona, October 11, 1959, found dead in swimming pool (John M. Kraft); El Mirador Ranch, 4 miles northwest of Sasabe, Boboquivari Mountains, Pima County, Arizona, September 3, 1950, 3900 feet (W. Gertsch, M. Cazier).

In the type and two paratypes there is no indication of hair or tomentose areas on the elytra. The specimen from Tempe has a few long hairs at the base of the elytra, and under high magnification a few irregular tomentose spots are visible. The female specimen from El Mirador Ranch has the elytra sparsely but uniformly clothed with long, brown pile, each hair arising from the base of a large, elongate puncture. The surface is also sparsely clothed with irregular, transverse bands and spots of white tomentum. When more specimens are available, the Pima County and Maricopa County populations may prove to represent a distinct species or subspecies.

Cremastocheilus lengi Cazier

Cremastocheilus lengi CAZIER, 1938, Bull. Southern California Acad. Sci., vol. 37, no. 2, p. 86.

Since this species was originally described in 1938, from six specimens, numerous isolated examples have been collected from a number of different localities. All except one of these have had no indication of ant species in association. One specimen was found dead near a colony of *Myrmecocystis mimicus* Wheeler and might have been ejected from the colony of these honey ants, which commonly are hosts to *Cremastocheilus stathamae*, new species, at least in the Chiricahua Mountains of Arizona.

NEW LOCALITIES: Two and one-half miles northeast of Portal, Cochise County, Arizona, September 11, 1959 (M. Statham); 3 miles east of Montezuma Pass, Huachuca Mountains, Cochise County, September 7, 1950, 5000–5500 feet (T. Cohn, P. Boone, M. Cazier); Deer Creek Ranch, Galiuro Mountains, 65 miles north of Wilcox, Graham County, Arizona, July 18, 1956 (D. and G. Mansfield-Jones); Yanks Springs, 4 miles southeast of Ruby, Pajarites Mountains, Santa Cruz County, Arizona, 4000 feet, September 5, 1950 (W. Gertsch, M. Cazier); 5 miles east of Portal, Chiricahua Mountains, Cochise County, Arizona, September 14, 1955 (E. Ordway, G. E. Bohart); Southwestern Research Station, Chiricahua Mountains, Cochise County, Arizona, October 1, 1955 (C. and M. Cazier); Fort Huachuca, Cochise County, July 10, 1900; Madera Canyon, Santa Rita Mountains, Pima County, Arizona, August 25, 1952, and September 8, 1953 (Lloyd M. Martin).

Cremastocheilus constricticollis Cazier

Cremastocheilus constricticollis CAZIER, 1940, Bull. Brooklyn Ent. Soc., vol. 35, no. 4, p. 127.

This species was described from a single female collected at Bonita, Graham County, Arizona. When new material that is now available was examined, it became apparent that the type specimen must have been rubbed or old, because the description of the pilosity on the head, pronotum, and elytra is incomplete. In unrubbed specimens the pilosity on these structures is unlike that of any other species in the genus, and much more complicated in its arrangement. The golden pile in the transverse impression on the front of the head is long, about half of the width of the head, and extends from the base of each canthus in a half circle over the vertex of the head. These hairs may be nearly erect or lean anteriorly. The sides of the median carina are densely clothed with long and short golden pile which extends outward and slightly forward, covering the tomentose area beneath. The posterior edge of the median portion of the

reflexed clypeus is densely clothed with golden pile which extends posteriorly and becomes entangled with the pile on the sides of the median carina. The anterior edge of the clypeus is moderately clothed with short, golden pile except for an area on each side of the middle, where the pile is long, about half of the width of the pronotum, and extending directly forward. In some specimens these long hairs are separated, and in others they are matted together and resemble horns. The pronotum is sparsely clothed with long, erect, golden hair that is longer than the pronotum is wide at its widest part. The densely pilose, "glandular" areas on the anterior portion of the pronotum are located both on the under side of the apical angles and on the inside in a depression behind the head. The base of the elytra has a few erect hairs of about the same length as those on the pronotum.

One specimen of this species was collected in association with the honey ant *Myrmecocystis mimicus* Wheeler, another was collected near a colony of this ant species, and a third was found crawling away from a colony of *Pogonomyrmex barbatus* (F. Smith) which was swarming over the ground in ball-like clusters. The beetle was not, however, seen coming out of the nest or being attended by the ants.

NEW LOCALITIES: Ashton Draw, 18 miles east of Douglas, Cochise County, Arizona, September 4, 1957 (M. Cazier); 2.5 miles northeast of Portal, Cochise County, Arizona, August 22 and September 10, 1959 (M. Statham), same locality, August 3, 1959 (M. Cazier); 6 miles east of Portal, Cochise County, Arizona, July 3, 1958 (M. Cazier); Southwestern Research Station, Chiricahua Mountains, Cochise County, Arizona, July 2, 1956, 5400 feet (Frank N. Young); 1 mile west of Portal, Cochise County, Arizona, July 16, 1959 (M. Statham); Faraway Ranch, Chiricahua Mountains, Cochise County, Arizona, August 11, 1937 (E. D. Ball); Madera Canyon, Santa Rita Mountains, Pima County, Arizona, August 22 and 25, 1954 (Lloyd M. Martin).

Cremastocheilus quadricollis Casey

Cremastocheilus quadricollis CASEY, 1915, Memoirs on the Coleoptera, vol. 6, p. 368.

This species was described from a single specimen collected at Waco, Texas, and very few examples of it are in collections at the present time. The female specimen herein recorded from Mexico does not differ in any important respect from a male collected in Texas, but the new record extends the known distribution considerably to the south and west.

NEW LOCALITY: Yerbanis, Durango, Mexico, August 24, 1953, David Rockefeller 1953 Mexican Expedition (C. and P. Vaurie).

Cremastocheilus pulverulentus Cazier

Cremastocheilus pulverulentus CAZIER, 1940, Bull. Brooklyn Ent. Soc., vol. 35, no. 4, p. 131.

Since the description of this species from a single female specimen collected in New Mexico, the writer has seen no additional specimens until recently when two were submitted for identification by G. D. Butler from the University of Arizona. In the female specimen the entire dorsal surface of the head except for the clypeus is pulverulent. The impressed portion of the mentum is also pulverulent, and the femora are clothed with this bloom only along the margins. The dorsal surface of the head, pronotum, and elytra, the upper portion of the pygidum, and the abdominal segments are sparsely clothed with long, erect hair. The color is black instead of dark reddish brown as in the type. The male specimen is like the type except that it, too, is black in color.

NEW LOCALITIES: One female, Tucson, Pima County, Arizona, August 22, 1954 (G. D. Butler); one male, Canello, Santa Cruz County, Arizona (M. Larson).

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