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NOTES ON THE ANT *NOVOMESSOR MANNI* WHEELER AND CREIGHTON

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IN a revision of the ant genera *Novomessor* and *Veromessor,* Wheeler and Creighton (1934) discussed in detail the two known species of *Novomessor* and added a third, *manni,* based on a single worker collected by W. M. Mann at Colima, Mexico. As far as I know, there have been no further collections of this ant in the ensuing 20 years, except for the collections on which this study is based, which are in the Museum of Zoology, University of Michigan.

Irving J. Cantrall, curator of the Edwin S. George Reserve of the University of Michigan, collected a series of *manni* workers near the type locality during a Museum expedition to west-central Mexico in February, 1953. A check of the ant collection in the Museum revealed a single worker from Michoacán, collected by T. H. Hubbell. While in Mexico in August, 1953, my wife and I made a special trip to Colima in an attempt to secure larger series and information on the habits and habitat of this species. With the exception of Hubbell's specimen, these collections were taken near enough to the type locality to be considered topotypic.

The examination of more than 1000 workers from these collections indicates that in a large nest series several of the specific characters are variable. These features together with more precise measurements are presented below. The dimensions of the worker are as follows: head length (exclusive of mandibles) 1.93–2.53 mm.; maximum head width (immediately posterior to the eyes) 1.25–1.69 mm.; maximum diagonal length of the thorax in lateral view 3.12–3.88 mm.; over-all length 7.28–9.63 mm. The antennal scapes in repose surpass the occipital margin by a distance equal to one-third to one-fourth of their total length. The second segment of the antennal funiculus is notably shorter than the first segment; the third and fourth segments are approximately equal in length and longer than the second; the fifth

and succeeding segments (except the last) successively diminish in length. The eyes are large, each containing approximately 400 facets. The epinotal spines, in side view, gradually decrease in thickness distad; the spines are two-thirds to three-fourths as long as the dorsal surface of the epinotum. The dorsal surface of the gaster has a honeycomb-like network of minute polygonal ridged pits which are coarse and close-set on the anterior part of the first gastric segment, and more delicate and widely spaced on the remainder of the gaster. Pubescence is abundant on the funiculi and tarsi and sparse on the genae, gula, thorax, gaster, and coxae. Short, fine, curved hairs are present on the lower inner border of the mandibles. The hairs on the antennal scapes are reclinate. Erect and suberect hairs occur sparsely on most surfaces of the body, but are highly variable in number. Hairs are never as abundant as in *N. cockerelli* and *N. albisetosus*. The color of mature specimens is very constant and agrees well with the original description.

Small workers from an incipient colony differ from the larger workers mainly in size, degree of sculpture, and in their slightly lighter coloration. Head length (exclusive of mandibles) 1.52–1.69 mm.; maximum head width 0.98–1.12 mm.; maximum diagonal length of the thorax in lateral view 2.37–2.75 mm.; over-all length 5.56–6.50 mm. The antennal scapes surpass the occipital margin by a distance equal to approximately three-eighths of their total length. The eyes are smaller, each containing only approximately 200 facets. The head is more granulose and only moderately shining. The epinotal spines are much shorter, being at most one-third the length of the dorsal surface of the epinotum. Hairs are less numerous on all surfaces. The prolongation of the occiput into a triangle-shaped neck is present in all of the workers.

The terrain in which *manni* occurs consists of basins and low mountains on the Pacific slope between the pine-oak forest on the interior mountains and the Pacific Ocean. The city of Colima lies in one of these basins, and it was in this basin that our study was made. The soil consists of many large stones buried in rather coarse sand. The precipitation is periodic, with a wet season in late summer and fall and a dry season in the spring. The plant association occupying this habitat is an arid scrub-thorn forest consisting of two strata of plants: (1) an upper stratum of shrubs and trees which forms a virtually level surface 15 to 25 feet in height, broken only by scattered tall cacti (*Lemaireocereus* sp.); (2) a sparse to moderately abundant ground cover of low herbs and grasses. Several plants from this community

were collected and have been identified by Rogers McVaugh of the University of Michigan Herbarium, as follows:

UPPER STRATUM

Acacia cymbispina Sprague and Riley
Acacia sp.
Caesalpinia pulcherrima (L.) Sw.
Casearia pringlei Briquet

LOWER STRATUM

Abutilon sp.
Anoda cristata (L.) Schlecht.
Cassia uniflora Mill.
Cathestecum erectum Vasey and Hack.
Commelina sp.
Cuphea sp.
Digitaria sanguinalis (L.) Scop.
Ixophorus unisetus (Presl) Schlecht.
Mimosa sp. (probably *paucifoliolata* Micheli)
Panicum hirticaule Presl
Quamolit coccinea (L.) Moench
Setaria liebmannii Fourn.

This arid scrub-thorn forest occurs below 5000 feet on the Pacific slope from northwestern Jalisco to Guerrero. Its floristic composition may vary from one part of the range to another, but the basic structure remains the same. Hubbell's specimen was collected in a dry pastured area on a stony hillside bearing *Acacia* shrubs, *Opuntia* and other cacti, and foot-tall grasses.

Nests of *manni* are numerous in the basin at Colima, but their abundance decreases sharply in the mountains. My wife and I found several nests on a sandy hillside, but were unable to locate any nests in parts of the same hillside where sand had not accumulated. We also looked for nests in the sandy coastal plain southeast of Manzanillo, but the absence of large stones buried in the soil appears to prevent *manni* from founding nests in this area. Thus, it seems that a soil containing both sand and buried stones is necessary for the establishment of *manni* nests.

We were unable to excavate completely any of the large nests. The stony soil made the job impossible with ordinary collecting equipment in the short time available; however, the data obtained from the complete excavation of a small incipient colony and the partial excava-

tion of three large colonies seem sufficient to permit interpretation of the structure of the nests in fair detail. The nests were usually situated under one or more stones in the soil. The nest opening was a single hole from one to four inches in diameter at the side of a stone or between two stones. No craters of excavated soil were seen surrounding the openings of nests built under stones. Although over 25 nests of *manni* were observed in two small areas near Colima, only one nest was found which was not built under a stone on the soil surface. This was built at the base of an *Acacia* plant and had a recognizable crater surrounding the opening. In all other respects this nest was similar to the others. Each nest had a single wide passageway which descended almost straight down into the soil for several inches and widened out under a stone to form a gallery for the larvae and pupae. The galleries were irregular in shape and quite large, measuring three to eight inches in diameter. The passageway continued deeper into the soil with galleries formed wherever a stone was encountered. How deep these passageways go is unknown. One nest was excavated to a depth of 15 inches, but had to be abandoned when we broke our spade handle. The passageway was still going down with no evidence of horizontal branching.

Larvae and pupae were usually found unsorted in the uppermost galleries. A peculiar feature of the larvae was noted in several nests. Some of them were joined together side by side by hooked hairs which are present on the sides of the larvae, and were so joined that they resembled a small, open-ended, hollow sphere. Such an arrangement is probably an advantage to the workers in moving the larvae about and in keeping them together in a group.

A single incipient colony consisting of a dealate female, 31 workers, 6 pupae, 15 larvae, and 10 eggs was found under a stone. The opening at the base of the stone was one inch in diameter, and the passageway extended down seven inches. Three galleries were noted under buried stones, each gallery containing larvae. The pupae were in the uppermost gallery; the female and the eggs were in the deepest gallery. When discovered, the female attempted to abandon the nest. The workers made no attempt to protect her, but instead began to pick up the brood. Small workers in this nest probably represent the first brood, whereas later broods likely developed into large workers only. Small workers were rare or absent in the larger nests.

Nothing is known of the mating activities of *manni*. Alate forms were absent in all observed nests in August, and they are not represented in Cantrall's February collection. Neither were pupae of the

sexual forms found in August. The larvae in our collections do not seem to be large enough to represent sexual forms. For these reasons I believe that the mating flight takes place in spring or early summer. Since in the Davis Mountains of Texas alates of *cockerelli* and *albisetosus* occur in nests in June, it may be that the alates of *manni* are also produced at this time of the year.

It is unfortunate that only a single incipient colony was found, since much can be inferred on the nest-founding activities of the female by examination of such colonies. I feel certain, however, that the female begins the nest by forming a small gallery under a protecting object, usually a stone, but sometimes a partly exposed root of a woody plant. The dependence upon stones buried in the soil for the construction of a nest supports such a belief. This nest-founding behavior, which is unusual for females of xerophilous species, has recently been observed in *Veromessor pergandei* by Creighton (1953: 16).

Workers were seen foraging throughout the day (9:00 A.M. to 5:00 P.M.), although their abundance was greatly diminished in the middle of the day, when the air temperature was approximately 95° to 100° F. (the surface temperature must have been considerably higher). Workers foraged in greatest numbers from 9 to 11 A.M. and from 3 to 5 P.M. Since we did not stay at Colima at night, but commuted from Manzanillo each day, nothing is known of the nighttime activities of this ant. Most of the foraging was done on the ground; a few workers were found on low herbage, but they did not seem to feed on the plants. No seeds were found stored in the nests, and no workers were seen gathering seeds. It seems likely that dead insects provide the bulk of the diet. Parts of dead insects were found in several nests. The foraging workers of one nest were watched one morning while they brought three dead insects (an ichneumon fly, a bembicine wasp, and a small moth) to the nest. The workers forage singly and often work 25 feet or more from the nest. On discovering a dead insect the worker immediately starts to pull the food toward the nest. As other workers discover the food, they join in the project, but with a noticeable lack of co-operation. Although each worker attempts to pull the food in a separate direction, eventually the food is somehow brought to the nest. Sometimes the dead insect is accidentally torn apart, and each worker will carry a piece to the nest.

Living mites and collembolans were collected in one nest, but have yet to be identified. Their status in the nest has not been determined.

The locality records of the collections on which this study is based are as follows:

COLIMA: 3 mi. SE of Colima, elevation 1400 feet, I. J. Cantrall; 5 mi. SE of Colima, elevation 1800 feet, P. B. Kannowski; 9 mi. SW of Colima, elevation 1600 feet, P. B. Kannowski.

MICHOACÁN: Rancho Limón (La Luna district), 24 km. WSW of Cerro Tancítaro, elevation 4800 feet, T. H. Hubbell.

Hubbell's collection from Michoacán is the only significant addition to knowledge of the range of *manni*, and this specimen extends the range only about 100 miles. Since *manni* is very abundant in its habitat at Colima, and since Hubbell's collection was made in a similar type of habitat (although at higher elevation), it is possible that this ant is restricted to the arid scrub forest on the Pacific slope. If this is the case, the range of *manni* would largely coincide with the range of this plant association. Thus, one might expect to find *manni* from northwestern Jalisco to Guerrero.

The ranges of *cockerelli* and *manni* seem certain to be distinctly separated, although they may closely approach each other in the vicinity of Guadalajara. Cantrall has recently collected *cockerelli* at Rincón de Romos, Aguascalientes (6100 feet). We searched for *Novomessor* nests in a grassland habitat near Guadalajara (5100 feet), but had no success. *N. cockerelli* probably occurs in the desert highlands between Aguascalientes and Guadalajara, whereas *manni* may occur on the Pacific slope southwest of Guadalajara.

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