

# New Data on the Habits of *Myrmecocystus melliger* Forel

by

WILLIAM S. CREIGHTON

and

ROBERT H. CRANDALL

The observations presented in this paper were made by the junior author during 1953 on a nest of *Myrmecocystus melliger* Forel near Tucson, Arizona. There is seldom justification for publishing information based on a single case. In this instance, however, the findings are so remarkable that the senior author feels no hesitation in getting them into print.

It may be stated at once that the character of the above colony has supported the view advanced by the senior author in 1950 (1) that sooner or later a nest of *melliger* would be discovered which would contain both repletes (see Figure 4) and major workers with orbicular

heads. Indeed, there were a number of repletes in the above colony which had orbicular heads, a clear proof that W. M. Wheeler was incorrect in claiming validity for his subspecies *orbiceps*. Wheeler (2) believed that the typical *melliger* produced repletes but not majors with orbicular heads and that the subspecies *orbiceps* could produce the latter type of major but not repletes. Since Wheeler was mistaken in this view, his subspecies *orbiceps* will have to be regarded as a synonym of the typical *melliger*.

This matter is, however, of minor importance compared to other features of the colony. When W. M. Wheeler began working with *Myrmeco-*

*cystus* about 1908 (2), he followed closely the field methods which McCook (3) had used in his celebrated studies of the honey ants. That is to say, Wheeler assumed, as McCook had done, that the nest of *Myrmecocystus* is a shallow one and that the size of the colony is small. His account of the nest of *M. melliger orbiceps* follows:

"The nest, which is always in stony soil, has the form of an obscure crater, with an irregular or arcuate and sometimes very large entrance (2-3.5 cm. in diameter) leading down obliquely into the soil. The main gallery thus formed breaks up at a depth of 20-30 cm. into short passages and flat, irregular chambers. The colonies are rather small, comprising hardly more than 300-500 individuals . . ."

Since Wheeler was convinced that the nest of *Myrmecocystus* does not descend more than a foot or so into the soil, he was satisfied that he had excavated many colonies "completely." Because he found repletes in some of these colonies and collected insect remains (but no repletes) in others, he developed the theory that certain species of *Myrmecocystus* are replete-formers while others are insectivorous and lack the capacity for producing repletes. As has been shown elsewhere (1), this concept strongly influenced Wheeler's taxonomic treatment of the genus. From studies of the junior author it seems probable that Wheeler was dealing with very partially excavated nests in every case and that his theories concerning the "replete habit" of *Myrmecocystus* resulted from the examination of small fragments of colonies which he erroneously supposed to represent the entire complement of the nest. There is thus a factual basis for abandoning Wheeler's theory on the presence or absence of repletes in the nests of *Myrmecocystus*, for the situation is not as he supposed it to be and neither he, nor anyone else, has produced reliable evidence that there are species of *Myrmecocystus* which are solely insectivorous and cannot produce repletes.

The excavation of the nest studied by the junior author was carried down to a depth of sixteen feet. In the course of the excavation at least 1500 repletes were unearthed, together with many hundred normal workers. It is significant that the queen was not discovered until the last chamber was laid open. It is of even more in-

terest that fully engorged repletes, which became detached from the ceilings of the chambers, often managed to climb back up the walls and to re-attach themselves to the roof again. Heretofore such action has been regarded as physically impossible. The field notes of the junior author follow:

"Excavation was begun on a colony of this species (*M. melliger* Forel) on August 23, 1953. This colony was situated nine miles north of Tucson, at an elevation of approximately 2500 feet in an area marked by palo-verde, barrel cactus, saguaro, creosote bush and bur sage. (See Figure 1) The last plant (*Franseria deltoidea* Torr.) was particularly abundant. Since it harbored coccids, it is possible that these insects may have been the source of the honey collected by the *melliger* workers. However, the coccids were tended only by a species of *Crematogaster* during the period when these observations were made. The original excavation covered an area approximately ten feet by five feet. This area was dug to a depth of 12 to 18 inches, uncovering several hundred ants (but no repletes) and all occupied lateral extensions of their tunnels. The vertical limit of these tunnels seemed to be determined by the occurrence of an almost rock-like stratum of caliche below the rock and gravel surface layer.

"On August 25 one lead alone remained. This was a small gallery (removed some ten feet from the original surface exit) impossible of passage by a replete, leading straight down into the formidable caliche. To follow this was all pick work. Several hours of hacking away at this, a small piece at a time, allowed us to follow the lone and small passageway to a depth of thirty inches, where ramification and enlargement in every direction began. New hundreds of ants were encountered and, in cracking apart the caliche, the first lone replete was discovered in a large chamber. A second very large (more than pea-size) replete was found in another room and, subsequently, hundreds of tiny larvae were uncovered. Everything was completely worked out laterally to the extent of a square yard. One small, vertical channel remained and this was obviously in use by the ants.

"Aug. 26. Excavation was continued to a depth of four feet. Still in caliche. Nine more repletes were taken and scores of ordinary work-



Figure 1: Site of nest of *Myrmecocystus melliger* Forel excavated by the junior author.



Figure 2: View down the sixteen foot shaft dug alongside the nest of *Myrmecocystus melliger* Forel. The junior author is pointing to one of the larger chambers.

ers were destroyed in shoveling out the earth. One vertical channel remained to what might be a new stratum of galleries.

"Aug. 27. Going deeper, thirty-four more repletes were unearthed.

"Aug. 28. At a depth of six to seven feet, after emergence from the reddish caliche into a fine, powdery, white earth of almost dust-like texture, eighty-four more repletes were taken intact and many others crushed, for by this time I was becoming careless. Fifty-two of these repletes were taken in one large chamber, approximately 12 inches long, 8 inches wide and about  $1\frac{1}{2}$  inches high. This chamber was at a depth of seven feet. At this depth many chambers were packed almost to the ceiling with worker cocoons. These numbered many hundreds and scattered among them in the ratio of about 1:100 were queen cocoons. One lone vertical lead remained.

"Aug. 29. We dug deeper. One hundred and fifty-seven more repletes were taken. Sixteen female larvae, almost mature, were also secured. At the  $7\frac{1}{2}$  to 8 foot level there were several small chambers and three large ones, approximately a foot square and one inch high. From one of these chambers two small vertical leads descended.



Figure 3: Nest chamber with repletes clinging to the roof.

"Aug. 30. Additional excavation at the 8 foot level gave four hundred and twenty-seven more repletes, thirty to fifty queen larvae and an indefinite number of small larvae. One vaulted chamber, six inches across and almost two inches high, was packed with one hundred and thirty-nine repletes. Vertical tunnels still leading down and, as before, too small to permit the passage of a replete.

"Aug. 31. Two men were employed to dig a well, four feet square, at the edge of the ant excavation. (See Figure 2) These men pushed down three more feet to the eleven foot level, where their picks exposed a chamber with at least forty repletes in it. (See Figure 3)

"At this point the excavation was interrupted for a little more than a month. During this period the shaft was covered with damp burlap to prevent desiccation and to inhibit the movement of the ants until work could be resumed.

"Oct. 4. Excavation was begun again at the eleven foot level. At 11½ feet a large chamber approximately 12 x 12 inches produced over one hundred repletes.

"Oct. 11. Two professional grave-diggers, working under conditions of stifling dust from fine, dry soil of almost flour-like texture, dropped the working shaft to thirteen feet. During this part of the excavation at least one hundred and ten repletes were taken, fifty-one of these intact. About one hundred quarter-grown larvae were also removed.



Figure 4: A replete and a normal worker of *Myrmecocystus melliger* Forel.

"Oct. 12. It became necessary to bolt two ten foot ladders together to reach the bottom of the pit. This was then excavated to the fifteen foot level. At thirteen feet solidified soil was encountered. This sandy semi-caliche was very difficult to excavate. This layer continued downward as far as the excavation was carried. Between the thirteen and fifteen foot levels one hundred and sixty-one uninjured repletes were taken. In addition, one hundred and two crushed repletes were

collected. Because of the absence of skilled supervision during these long hours of labor, it seems probable that an equal number of repletes were shovelled away, flattened and unnoticed in the thousands of pounds of soil removed. It is estimated that over fifteen tons of soil were removed during the entire operation. At the fifteen foot level, one lone, but much-used passage still pointed the way down.

"Oct. 14. The excavators enlarged and deepened the shaft, reaching a total depth of sixteen feet and three inches. Spacious chambers at the sixteen foot level contained a total of three hundred and fifty-seven additional repletes. At this depth the characteristics of the chambers and the galleries were identical with those first encountered. The latter showed the same sleek, blackened, brick-like surfaces and they were backed by a framework of surrounding rootlets one half an inch in thickness. At the very bottom, in a small room, the queen was found. This insect is so much larger than the other members of the colony that her passage through

many of the vertical tunnels must be a difficult accomplishment."

If the above colony represents the usual condition for a nest of *melliger*, and there is nothing to indicate that the nest was abnormal, then it is obvious that myrmecologists have been grossly underestimating the size and the extent of the nests of this species. Despite the labor involved it would repay anyone who is in the position to do so to dig out other colonies in a similar fashion. Until this is done, it will not be certain that the large size of the Tucson colony is the ordinary condition in the case of *melliger*, although the writers believe that this is the case. It is also likely that such methods of excavation applied to the supposedly "insectivorous" species (*mimicus*, *mendax*, etc.) will show that repletes are present in the lower levels of the nest.

#### References

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3. WHEELER, W. M. 1908. Honey Ants, with a Revision of the American Myrmecocysti. Bull. Amer. Mus. Nat. Hist. Vol. 24 (20).