

by the large size and dark color of the ants and their wings, the stillness and purity of the air and the unobstructed view over the level desert. Unfortunately our haste to reach Phoenix before night and the prospect of a very muddy road ahead, made it impossible to stop and observe the conclusion of the flight and the subsequent behavior of the *versicolor* queens. On previous visits to Arizona I had found the species in the neighborhood of Benson, Tucson and Yucca. The past summer I took it also near Oracle in the Santa Catalina Mountains, near Casa Grande and a few miles from Texas Pass on the western slopes of the Dragoon Mountains. In all these localities the colonies are sporadic and by no means abundant so that it is difficult to account for the vast number of males and females engaged in the flight described above, unless we assume that they represented the entire annual sexual output of a large number of colonies distributed over a very extensive territory.

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## THE PLEOMETROSIS OF MYRMECOCYSTUS.

BY WILLIAM MORTON WHEELER.

It has long been known that the colonies of some species of ants never possess more than a single fertile queen, whereas in other species several such queens are normally present. Wasmann has recently named the former condition "haplometrosis," the latter "pleometrosis."<sup>1</sup> Among North American ants the species of *Camponotus*, *Polyergus*, *Pogonomyrmex*, *Aphaenogaster* and *Lasius* are normally haplometrotic, whereas the species of *Formica*, *Tapinoma*, *Crematogaster*, *Pheidole*, *Monomorium* and *Myrmica* are pleometrotic. This condition undoubtedly arises in most colonies secondarily from a primitive haplometrosis through the deälation and adoption of one or more daughter queens. Large colonies of *Formica obscuriventris*, *e. g.*, often contain a number of daughter queens in various stages of deälation. The number of queens thus accumulated in some colonies is considerable. I have counted more than thirty in a single medium-sized colony of the typical *F. fusca*, and a single mound of *F. exsectoides* may contain nearly

<sup>1</sup>These terms are equivalent to "monogyny" and "polygyny" employed by students of the social wasps, though somewhat more expressive as they call attention to the maternal or nursing activities.

or quite as many. Occasionally, however, the pleometrosis is primary. In other words, two or more queens may establish a colony together. Forel, Bönner and I have found cases in which two queens of the European *Lasius flavus* were starting a colony in the same small cavity under a stone. Donisthorpe has seen three and Crawley and Wasmann four queens of this species in similar association. On two or three occasions I have also seen twin queens of our North American *L. brevicornis* with young brood under a stone. In some of these cases the colony undoubtedly becomes secondarily haplometrotic by one queen killing the other or by the colony splitting into two, each with its own queen. According to von Buttell-Reepen, Mrázek and Crawley, this seems to be regularly the case with *L. niger*, when two or more queens are constrained to found a colony together in an artificial nest.

The following observation, made during the past summer while I was with the Cornell Biological Expedition, throws some additional light on primary pleometrosis. On July 29 the heaviest rain in six years fell in Phoenix, Ariz., and temporarily inundated parts of the desert south of that city in the neighborhood of Higley. On July 30 we left our camp about 30 miles north of Florence and proceeded along the road to Phoenix over soil which had been drenched by this rain, with the result that our three motor cars were repeatedly stuck in the mud. While the younger and lustier members of the party were extricating our cars and two others which had been stalled all night in deep puddles, I took advantage of the delay to study the ants along the roadside. Many colonies of various species, whose nests had been inundated, were moving to drier ground. My attention was especially attracted by dozens of incipient nests of *Myrmecocystus melliger* Forel subsp. *mimicus* Wheeler. The large reddish queens had evidently celebrated their nuptial flight immediately after the storm and were now busily digging into the wet adobe soil, making small craters about two inches in diameter with eccentric opening. The wall of the craters consisted of small pellets about one-eighth of an inch in diameter, evidently carried up in the psammophore, or crate of peculiar stiff hairs with which the gular surface of the head is furnished in these ants. On seizing a queen just as she was carrying out and dropping her pellet on the wall of the crater I was surprised to see

another queen leave the entrance with a similar burden. This led me to examine some twenty nests—all, in fact, that I had time to excavate before I was obliged to proceed with the party. My rather hurried observations showed that about half of the craters had been established by single queens but that the others were each the work of two coöperating queens. One crater actually contained five queens, four deälated and one with intact wings! It appears, therefore, that about 50 per cent. of the colonies of *mimicus* are pleometrotic in origin. That they probably remain so is indicated by the fact that on former excursions in Arizona I have on several occasions taken more than one deälated queen from a single adult colony of this ant.

The foregoing observation is of interest to the myrmecologist, because the *mimicus* queens were actively coöperating in the construction of a single nest as if they had been so many workers, whereas in the rare cases of *Lasius flavus* and *brevicornis* above cited the consociation of two queens may be interpreted as due to an accidental meeting under the same stone just after the marriage flight. Of course, it is very probable that in all the cases the queens in the same nest were sisters that had met after fecundation, since queens from different maternal nests would hardly work together so harmoniously. Nevertheless, the very high percentage of cases of primary pleometrosis in *mimicus* points to the existence in this ant of a pronounced tendency for recently fecundated sisters to assemble in pairs or even greater numbers for the purpose of founding and developing a colony in common.

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## THE DISTRIBUTION OF THE NOSE FLY AND OTHER SPECIES OF GASTROPHILUS IN THE UNITED STATES.<sup>1</sup>

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The distribution of the species of bot flies in the United States is a question which has been much neglected. Each is of considerable importance to stock raisers and farmers in this country and

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