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A NATURALLY OCCURRING TERATOLOGY IN THE RED IMPORTED FIRE ANT (HYMENOPTERA: FORMICIDAE)

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Two aberrant forms of the red imported fire ant *Solenopsis invicta* Buren have been reported in the literature. The first was a gyandromorph (an individual having both male and female characteristics) found by Hung (1975) and the second, an intercaste (an individual with characteristics intermediate between a worker and a female alate) by Glancey et al. (1980). We now report the finding of a new morphological form which was apparently caused by environmental factors.

In October 1984, some field colonies were collected along State Road 100, about 2 miles south of Starke, Florida. The colonies were separated from the soil using our standard drip technique (Banks et al. 1981) and placed in rearing cells. While we were collecting brood from the cells, we noticed some unusual pupae in one of the colonies. Examination of the pupae revealed that the forms were quite unlike anything we had seen before. The antennae and tarsi of these forms were completely deformed.

In a normal pupae (Fig. 1) the antennal scape extends outward at an angle of 45° from the mid-line of the frons, past the insertion of the mandible. The funiculus is bent back at a 45° angle so that the tips of the antennae approach each other. In the deformed pupae (Fig. 1) the scapes were close together and extended along the mid-line of the frons. The funiculus was bent back at an angle of 90° toward the mid-line.

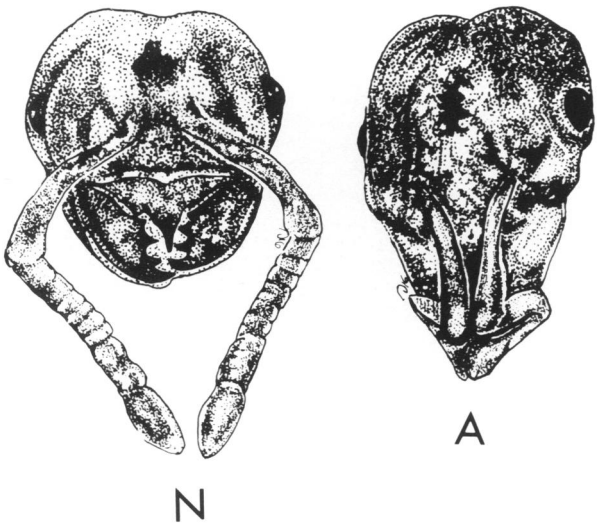

Fig. 1. Drawing of a normal (N) and abnormal worker pupa showing the relative positions of the antennae.

A total of 31 aberrant pupae were collected from the entire colony, representing about 2 percent of the total number of brood collected. The pupae were segregated along with five normal brood tenders to care for them. Fifteen of the pupae successfully eclosed while the remainder died.

The pupal deformities were also expressed in the newly eclosed workers. The antennae maintained the 90° bend of the funiculus, even after eclosion and, because of the antennal bend, the ants had difficulty in touching the substrate with the tips of the antenna (Fig. 2). The femora of the first legs were shortened and the tarsi of the second and third legs appeared to have two or three full twists, resulting in the spiral condition (Fig. 3). It was extremely difficult for the ants to walk on these deformed legs.

Bioassays were conducted to determine the behavior of the deformed ants toward trails, brood and the queen. A trail was streaked using 0.25 worker equivalents of the hexane extract of the Dufour's gland. The deformed ants were able to move along the trail by pulling themselves along with their spiral tarsi. Contact with the trail pheromone was maintained by the ants bending their heads down to allow the antennal tips to touch the trail. The ants were tested for brood-tending response by allowing them to contact pieces of brood taken from their own nest. The deformed ants did not respond at all to the brood, whereas normal siblings responded in 4 to 6 seconds. When the deformed workers were exposed to their mother queen, they neither groomed nor fed her.

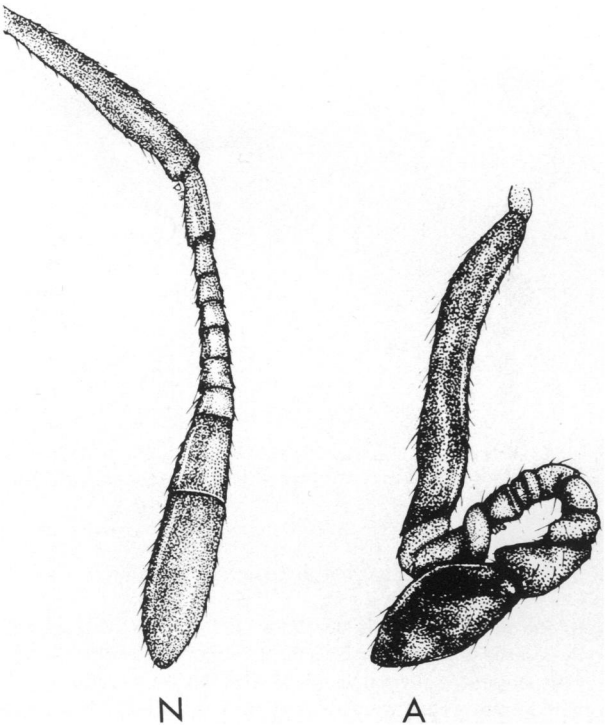

Fig. 2. Drawing of the antennae of an eclosed normal (N) and abnormal (A) worker ant. The abnormal antennae extended straight out from the frons, could not be bent or flexed, and were permanently held parallel to the floor of the nest.

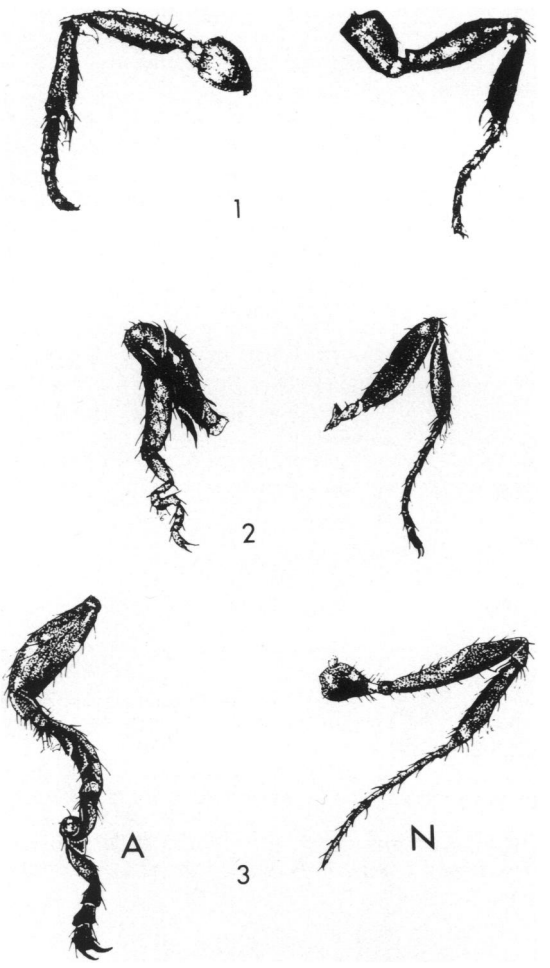

Fig. 3. Drawing of the legs of eclosed normal (N) and abnormal (A) worker ants. The twisted condition of the 2nd and 3rd pair of legs prevented the ants from normal locomotion.

Dissections of the deformed ants showed no deformities of the crops, esophagii, or intestines.

According to Berndt and Wisniewski (1984), deformities such as we found in *S. invicta* are easily induced in the Pharaoh's ant, *Monomorium pharaonis*, by altering the humidity. They demonstrated several years ago that low temperatures had no effect on development of deformities. They were able to induce spiral legs and deformed antennae if they subjected prepupae to RH's of 30-50% under laboratory conditions and if they excluded any workers or young larvae from the experiment.

The eclosing workers were found to have only the second and third pair of legs affected by the humidity. Berndt and Wisniewski (1984) also state that the natural

occurrence of such deformities is extremely rare. They cite two reasons for this, 1) brood tenders seek optimum environmental conditions within the nest for rearing the young, and 2) deformed larvae or pupae are usually removed. Our observations differ from these in that we did find the deformed ants under natural conditions, all 3 pairs of legs were affected, and the pupae were found with other workers and brood.

Berndt and Wisniewski explain the deformities by concluding that final development of both the antennae and tarsi occurs during a very narrow window of time, usually 20-30 min (under laboratory conditions). Under stress conditions of low RH, fluid which normally would be used to extend and harden the extremities is lost to the dryness of the environment. Lacking the needed fluid, the cuticle then collapses back upon itself into the so- called "deformities". It is difficult to imagine that under natural conditions workers would place prepupae in a separate part of the nest in which there was very low humidity. It is equally difficult to imagine that the workers neglected to move a set of the prepupae from an area of dryness. If Berndt and Wisniewski are correct, then exposure of the pupae to the low RH must have occurred at some time when the mound was disturbed. Since the mounds were located along a roadside, this could happen if they were disturbed by mowing equipment or moving vehicles.

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