Field Observations of *Pheidole pilifera* (Roger) and *Paratrechina arenivaga* (Wheeler) (Hymenoptera: Formicidae) In A Black Belt Prairie Remnant In Mississippi

JoVonn G. Hill
Mississippi Entomological Museum, Mississippi State University, Box 9775,
Mississippi State, MS 39762

ABSTRACT

Observations of foraging behavior, a preference for *Panicum virgatum* seeds, and nesting site information of *Pheidole pilifera* in a Black Belt Prairie remnant in Mississippi are presented. Aggressive interactions of *Paratrechina arenivaga* and *P. pilifera* involving insect carcasses are also noted.

INTRODUCTION

Pheidole pilifera (Roger), like most *Pheidole* species, has a dimorphic worker caste. The small minor workers do most of the foraging, whereas the larger major workers primarily dehusk seeds and defend the colony. The minors of *P. pilifera* are dark reddish brown, approximately 1-1.50 mm long with a head width of about 0.54 mm and head length of about 0.60 mm, whereas the majors are a lighter reddish brown, approximately 3-3.50 mm long and have a strikingly large head with a width of about 1.60 mm and a head length of about 1.72 mm (Wilson, 2003). *Pheidole pilifera* is reported to primarily be a seed harvester and to excavate crater nests (Smith, 1924; Gregg, 1963; Smith, 1979; Wilson, 2003). It is the most geographically widespread species of Nearctic *Pheidole*. This species can be found throughout the United States, with the exception of Florida, southern Texas and the Pacific Northwest (Wilson, 2003). In Colorado, Gregg (1963) found *P. pilifera* nesting from 1,524 to 2,591 m above sea level in gravel, alluvium, clay, loam, and under rocks. Whereas in south central Ohio, Wesson and Wesson (1940) found it to be very common in both dry and moist fields and meadows, with one colony found in the woods, and in the southeastern portion of its range, *P. pilifera* is known to inhabit open, grassy areas, especially those with sandy soils containing little clay (Wilson, 2003 citing S. Cover pers. comm.). In his list of ants of Mississippi, M. R. Smith (1924) considered this species to be uncommon in Mississippi, nesting in pastures or grassy fields, and to have a more northern distribution. Surveys for ants throughout Mississippi from 2002 to 2005 by the Mississippi Entomological Museum (MEM), this species was found only in Black Belt Prairie remnants.

Paratrechina arenivaga (Wheeler) is a yellow formicine ant measuring about 1.92-2.75 mm in total length. This species has been reported to create small crater nests almost exclusively in highly drained sands of low nutrient content with well spaced vegetation (with the exception of one collection from loess bluffs along the Missouri River in Iowa) and to forage strictly nocturnally on honeydew and insect carcasses (Smith, 1928; Trager, 1984). Populations of *P. arenivaga* are usually present only where its habitat is in a relatively natural condition, although this species often inhabits the more disturbed

areas of it, such as those swept by fire, fire lanes, foot paths, primitive road beds, dune blowouts, and openings between vegetation (Trager, 1984). This species can be found from New Jersey to Nebraska and south to Florida and eastern Texas but is apparently absent from the Appalachian region (Trager, 1984).

OBSERVATIONS

Observations of these *P. pilifera* and *P. arenivaga* were made at a Black Belt Prairie remnant in the Tombigbee National Forest in Chickasaw County, Mississippi (33°55'35"N 88°51'13"W) on 15 November 2004. During the day of observation the weather conditions were partly cloudy with a temperature of approximately 24.4 °C; there had been windy thunderstorms the previous day. The soil texture from the site was analyzed by the Mississippi State University Soil Testing Laboratory and was classified as loam, being a mixture containing 7.5% clay, 42.25% silt, and 50.25% sand. The soil had a pH of 8.0.

From approximately 2:30 to 5:30 P.M., several foraging minor workers of *P. pilifera* were followed back to their colony. The only noticeable evidence of the nest site was a small hole in the ground, approximately 3 mm in diameter. The ground cover surrounding the colony was visually estimated to be 20%, and was comprised of several small clumps of *Schizachyrium scoparium* (Michx.) (Poaceae) that were 15 cm tall. Foraging minors exited the colony and either headed north or west. The group of minors that went due west were followed for further observation. After approximately 1.5 m, these minors split up with some individuals going north and others continuing west. Again, the minors that headed west were followed, and after another two meters this group of minors branched into individuals that appeared to be searching randomly. One of these workers was followed for 10 meters away from the nest, and then visual contact with the ant was lost. All of the returning workers appeared to be carrying the seeds of *Panicum virgatum* L. (Poaceae). No *P. pilifera* were found on the seed heads of *P. virgatum* in the immediate foraging area or in spider webs in several of those seed heads. It was not clear where the minors were finding the seeds, but they may have been taking advantage of the previous day's storm, which probably knocked down many seeds, negating the need for the ants to go up into the grass to harvest the seeds.

A small feeding trial was made by placing piles of seeds from various species of plants from the surrounding area along the foraging trail, starting 20 cm away from the colony entrance. Seeds were placed in the following order heading away from the colony: *Ratibida pinnata* (Vent) (Asteraceae), *Erigeron* sp. (Asteraceae), *Aster patens* Ait. (Asteraceae), *Liatris squarrosa* (L.) (Asteraceae), *Schizachyrium scoparium*, *Sorghastrum nutans* (L.) (Poaceae), *Silphium laciniatum* (L.) (Asteraceae), and *Panicum virgatum*. Minor workers quickly selected the *P. virgatum* seeds from the pile and carried them into the nest. The other seeds were ignored except for four *S. nutans* seeds and one *S. scoparium* seed which were carried from the pile but, with the exception of one *S. nutans* seed, were abandoned after several minutes and not taken into the colony. This was possibly due to the larger size of the *S. scoparium* and *S. nutans* seeds, as the minors appeared to have trouble transporting them. During this time several workers of *Paratrechina arenivaga* were observed moving freely through the *P. pilifera* foraging trail and around the nest entrance.

Approximately one hour after the seeds were presented, a dead mosquito (Diptera: Culicidae) was placed between the

S. nutans and *S. scoparium* seed piles. Several *P. pilifera* minors began to transport the dead insect as a group and managed to move it about eight cm before a single *P. arenivaga* worker quickly took it from them. After this, whenever a *P. pilifera* minor, usually carrying a seed, approached the mosquito, which was still on the *P. pilifera* trail, the *P. arenivaga* worker attacked the *P. pilifera* minors. The *P. arenivaga* worker pounced on top of individual *P. pilifera* minor, faced the rear of the body, and then held it down for several seconds while curling its gaster under, presumably spraying the *P. pilifera* in the face with formic acid. Upon release, the *P.pilifera* minors staggered away while leaving their seeds behind. Next, a hind femur of *Amblytropidia mysteca* (Saussure) (Orthoptera: Acrididae) was placed adjacent to the entrance of the *P. pilifera* colony. A major *P. pilifera* worker, the first one seen during this observation, quickly picked up the leg and dragged it into the colony. After the leg was taken into the nest, the influx of *P. virgatum* seeds began to fill up the nest entrance, until a small pile had accumulated on top of it. This suggests that the grasshopper leg might have become stuck at some point or the major was progressing into the colony slower than the minors were bringing in seeds. Six *P. arenivaga* workers were observed moving rapidly around the *P. pilifera* colony entrance. They began removing the accumulation of seeds from the nest entrance, while continuously warding off the addition of new seeds that were being added by the *P. pilifera* minors. After they cleared the entrance, the *P. arenivaga* workers entered the *P. pilifera* nest. After about thirty minutes the *P. arenivaga* were visible again and they were attempting to remove the grasshopper leg from the nest. Meanwhile, the returning *P. pilifera* minors would either drop their seeds into, or just outside of the nest entrance, which seemingly made it more difficult for the *P. arenivaga* to remove the grasshopper leg. It was not clear whether or not the *P. pilifera* minor was still attempting to pull the leg into the nest, but based on the movements of the *P. arenivaga* workers it seemed to be the case. These observations went on for about one hour and thirty minutes with the *P. arenivaga* pulling the leg near the entrance whereupon the leg would disappear back down into the nest, apparently being pulled by workers of *P. pilifera*. After thirty minutes and with darkness approaching, the grasshopper leg was removed with forceps from the nest. The *P. arenivaga* left the area soon thereafter.

DISCUSSION

These observations present several interesting aspects of the behavior of these two species. During their encounter, the *P. pilifera* workers never showed any aggressive action towards the *P. arenivaga*. The strong preference of *P. pilifera* for *P. virgatum* seeds should be of interest to land mangers that try to restore or manage Black Belt prairies as *P. pilifera* seems to be an "indicator" of undisturbed or a healthy prairie. (J.G. Hill pers. obs.) The lack of a crater surrounding the nest entrance of the *P. pilifera* colony differed from other authors' accounts of this species (Smith, 1924; Gregg, 1963; Smith, 1979; Wilson, 2003). Also, the diurnal activity and foraging of *P. arenivaga* is contrary to Trager's (1984) assertion that it is strictly a nocturnal species. Voucher specimens, with the identity of *P. arenivaga* verified by J. MacGown, have been deposited in the MEM collection.

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