DEFENSIVE PATROL PATTERNS OF *PSEUDOMYRMEX SPINICOLA*

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Abstract. The ant-acacia mutualism relies on effective defense of the tree by the ants. The social structure of ant colonies allows for organized defense patterns in many species. We hypothesized that *Pseudomyrmex spinicola* patrolling strategies would be organized to increase defensive efficacy. However, we found no difference between the proportion of patroller ants on the stem or the resource-rich branch, nor did we find differences in the distance that these patrollers moved. There may be organization to acacia-ant patrolling behavior, but it was not evident in this study.

Key Words: Acacia collinsii, *movement patterns, patrollers,* Pseudomyrmex spinicola

INTRODUCTION

Acacia collinsii depends on *Pseudomyrmex spinicola* to defend against herbivory and to clear surrounding ground of weeds and vines. The benefits of this mutualism have been demonstrated by the decreased biomass and growth in acacias without ants compared to those with ants (Janzen 1967). This defense against insects seems to be the job of patroller ants, a behavioral caste that inspects the terrain with their antennae and are the first to attack invaders (Gordon 1987). Up to 25% of the ant population on acacias are constantly patrolling against insect attack (Janzen 1967).

Given that most valuable tree resources (beltian bodies, nectaries, and leaves) are located primarily on branches, we hypothesized that *P. spinicola* preferentially patrol resource-rich areas. Specifically, we predicted that: 1) a greater proportion of branch ants would be patrollers than stem ants, and 2) stem patrollers would cover more distance than branch patrollers due to the decreased proportion of patrollers on the stem.

METHODS

Data were collected on 9 January 1996 along the access road at Palo Verde Biological Station, Guanacaste, Costa Rica. We haphazardly chose ten *Acacia collinsii* trees 1 - 2 m in height, and then chose three to six ants on each tree for a total of 36 ants. We watched focal ants either on the stem or a branch for ten minutes and recorded all actions and movements.

There was a natural separation among ants in distance traveled. Those ants that moved > 40 cm in ten minutes were defined as patroller ants. Ants that spent > 60% of their time on a stem or a branch were defined as stem or branch specialists.

We compared the proportion of stem and branch ants that were patrollers with a chi-square test and compared the distance that stem and branch patrollers moved using a t-test.

RESULTS

Of 36 ants, 33% were stem ants and 58% branch ants. (The remaining 9% of ants split their time between branches and stems.) The percentage of stem ants that were patrollers was nearly twice that of branch ants, but this difference was not significant (42% vs. 24%, $X^2 = 1.54$, df = 1, $0.50 > P > 0.10$). Stem ants and branch ants move very similar distances during 10 minute observations (mean $\pm$ SE = 54.0 $\pm$ 2.7 vs. 51.2 $\pm$ 3.2 cm, t = 0.28, df = 8, P = 0.79).

DISCUSSION

Our results did not support the hypothesis that *P. spinicola* patrol resource-rich areas of acacia trees more than other areas of the tree. Because we did not find a significantly greater proportion of patrollers on the branch than on the stem, we could not relate the need for resource defense with patrol patterns. However, we did observe organization in individual ant activities. Certain ants spent more time gathering food by carrying beltian bodies from the leaves to the thorn. Others acted as "checkpoints" by remaining in one location and touching antennae with each passing ant. These patterns suggest that acacia ants have organized behaviors. It also seems likely that patrolling is a role-specific activity, but distance traveled may not define patrollers. Future studies could further examine ant social structure by defining those behavioral roles based upon percentage of time spent at various activities.

LITERATURE CITED

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