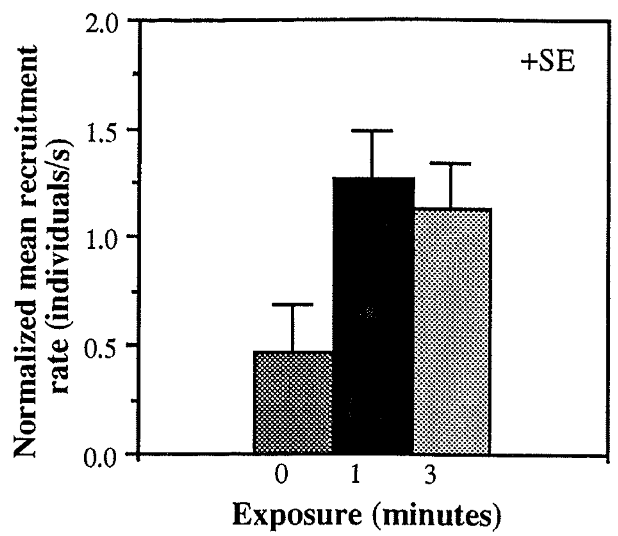

Figure 2. Mean recruitment rate for ants disturbed by a surrogate intruder exposed to ant attack for 0, 1 or 3 minutes.

The emitted signal is most likely chemical, in contrast to visual or auditory, because "vines" were transported to different trees and recognized by conspecific ants. Our data supports previous reports of ants releasing phenomones upon attacking an intruder (Janzen, 1983).

Earlier literature indicates that P. spinicola responds more aggressively to disturbance than other acacia ants found in Palo Verde (Balser et. al., 1992FSP). Signal recognition of pheromones provides one possible explanation. Because we found no signficant difference between 1 and 3 minute treatments in both reaction time and recruitment rate, either a) ant secretion of pheromone is not proportional to duration of attack or b) any response is not directly proportional to phenomone level.

As the day progressed, ant activity appeared to decrease on both the source tree and the sample trees. This study normalized the ant activity level to compare response times, but the effect of temperature, time, and radiation on the ants requires further study. The importance of wind in dispersing chemical signals and interspecific signal recognition remain to be investigated.

Ant protection of A. collinsii appears to be aided by chemical signals (phenomones) even when applied to foreign objects. They also persist after an attack. Our findings thus indicate that colony reaction time and recruitment rate increase as a result of chemical communication by P. spinicola.

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REACTION OF PSEUDOMYRMEX SPINICOLA TO INTRODUCED CONSPECIFICS ON ACACIA COLLINSII

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ABSTRACT (JLB & PSW)

Previous studies demonstrated Pseudomyrmex spinicola (red ants) aggressively defend their host, Acacia collinsii against other invading Pseudomyrmex species. We hypothesized that P. spinicola would aggressively react to invading conspecifics proportional to the distance between colonies, assuming that genetic relatedness decreases with distance. We then tested for a trend in resident P. spinicola reaction to invading conspecifics by comparing transport distance with: 1) time to first contact with resident; 2) number of subsequent contacts with residents in thirty seconds; 3) number of aggressive contacts. We found no signficant trend in any of the three comparisons. We conclude that P. spinicola does not appear to perceive conspecific transplants as a threat.

Key Words: Pseudomyrmex spinicola , Acacia collinsii , Pseudomyrmex flavicornis, intraspecific aggression

INTRODUCTION (DML)

A. collinsii is host to two species of ants (P. spinicola and P. flavicornis) in a symbiotic relationship. A single ant species inhabits each tree. The tree provides the ant with food and housing. In return, the ant defends the tree from plants encroaching on its growing space, herbivores and other foreign insects. Pheromones secreted by acacia-ants may play a role in host ant recognition of invading ants and coordination of a defense reaction to the invaders. A previous study showed that P. spinicola aggressively attacks P. flavicornis that are experimentally introduced to their tree (Gilmartin et al., 1991FSP).

P. spinicola may move to new and possibly occupied A. collinsii when their host tree dies or becomes too crowded. We thus asked whether P. spinicola reacts aggressively to invading conspecifics as well. We proposed that invading P. spinicola from more distant trees might be more distantly related to the host ants and therefore treated more as "aliens". Based on this, we tested whether there is any change in the intensity of host P. spinicola reaction with an increase in distance between the host ant's tree and the invading ant's tree. Specifically, we predicted that introduced ants from trees at all distances would be: 1) detected as rapidly as host ants, 2) involved in the same number of encounters with the host ants subsequent to initial detection, and 3) involved in the same number of aggressive encounters with the host ants.

METHODS (DKS)

This experiment was performed approximately 1km east of the OTS field station at Palo Verde National Wildlife Refuge, Guanacaste Province, Costa Rica.

We chose a focal acacia tree (A. collensii). Ten meters from this tree, we haphazardly selected five other acacia trees of the same species (inhabited by the red ant P. spinicola) up to 90m away, using a SONIN electronic distance measuring tool (Sonin Inc., Scarsdale, NY). In addition we chose two more trees at approximately 350m and 700m by counting paces on the main road.

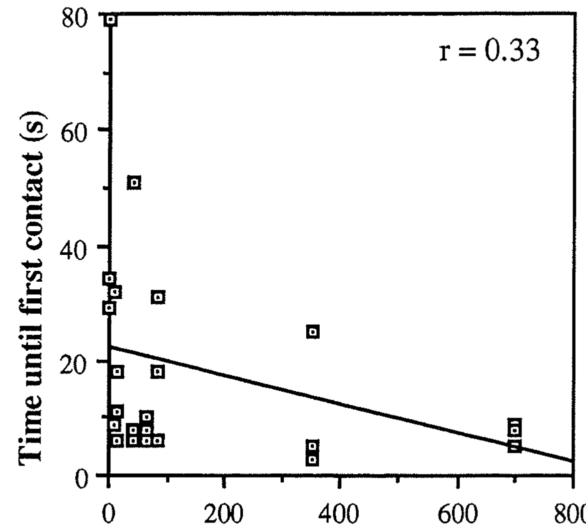
We removed three ants from each of the seven trees, and placed them onto branch tips of the focal tree at eye level using small twigs. As a control, we removed and re-introduced resident ants. We also transplanted another species of (the black ant, P. flavicornis) in order to determine what constituted an aggressive encounter.

We selected branches that were relatively free from ants at their tips (= 10cm). Branches were reused but not consecutively. We recorded the time from placement onto the branch and first encounter (physical contact) with a resident ant, as well as the number of subsequent encounters in 30s. In addition, we noted how many of the encounters were aggressive.

Data were analyzed with linear regression.

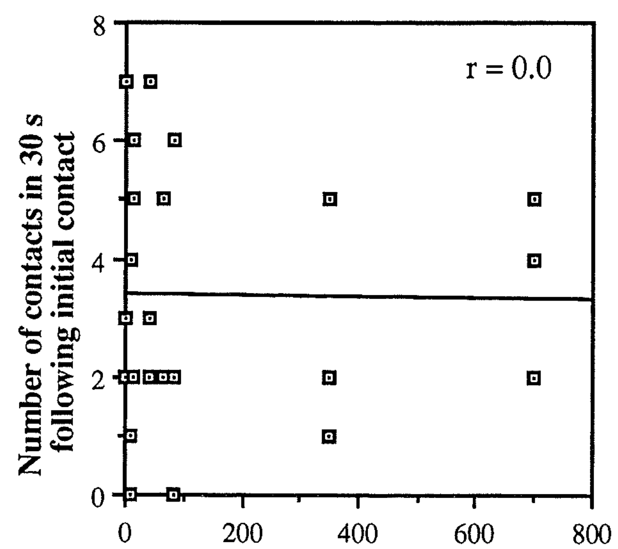
RESULTS (MEB)

When conspecific ants from test trees were placed on the focal tree, the time elapsed before first contact with a host ant decreased slightly with distance to the test tree (Figure 1). The relationship, however, was not significant ($r = -0.30$, $p = 0.15$). The number of contacts at 30 seconds following initial contact was also not significantly related to transport distance ($r = -0.02$, $p = 0.92$; Figure 2), nor was the number of aggressive contacts ($r = -0.06$, $p = 0.77$; Figure 3).



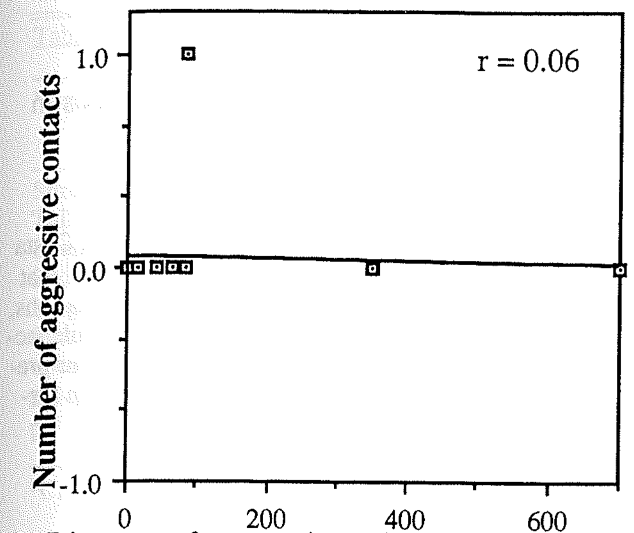
Distance of source from focal tree (m)

Figure 1: Effect of transport on time until first ant contact.



Distance of source from focal tree (m)

Figure 2: Effect of transport distance on number of secondary ant contacts in 30 s.



Distance of source from focal tree (m)

Figure 3: Effect of transport distance on number of aggressive contacts.

Placing a black ant (P. flavicornis) on the focal tree produced two results: either the black ant avoided the host ants and jumped from the tree, or the host ants killed the black ant ($n = 3$). P. spinicola encounters, whether among focal tree ants or between focal and test tree ants, involved rubbing antennae together or contact without interruption of previous travel pattern. There were no aggressive encounters.

DISCUSSION (JLB & PSW)

We were unable to show that P. spinicola would aggressively react to invading conspecifics proportional to the distance between colonies. It is possible that transplants of P. spinicola are either not recognized as foreign by the resident population, or not perceived as threatening to the host system. This suggests that P. spinicola are not restricted to a certain tree's colony and can move independently among A. collinsii trees.

Variation in our results for time to first contact and number of subsequent contacts may reflect different initial densities of residents at the selected invasion sites, disturbance of branch during transfer and increased activity of residents throughout the course of study. It is also possible that genetic variation might be more pronounced at distances greater than 700m.

Two topics need further investigation in order to more fully understand conspecific relations between colonies of P. spinicola: 1) What degree of genetic divergence, if any will elicit an aggressive encounter, and 2) Do P. spinicola colonies ever differ by that degree?

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