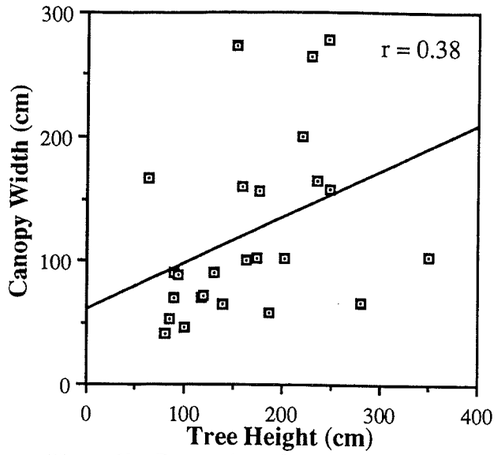

Figure 1b. Regression of canopy width as a function of tree height for understory trees.

ficiently robust to detect important patterns. More likely, ecological factors independent of gap and understory differences control most of the variation in these parameters.

Our understory trees were shorter than those in the gap areas. This suggests the two data sets differed in terms of species composition and growth stages where could have confounded our data.

Further study should inlcude large sample sizes, and an investigation of microhabitats within these areas. It would also help to narrow the scope of the topic, focusing on one species or family and perhaps discern between genetic or phenotype variation.

LITERATURE CITED

Coley, P.D., J.P. Bryant and F.S. Chapin, III. 1985. "Resource availability and plant herbivore defense." Science 230: 895-899.

AGGRESSIVE RESPONSE OF LEAF-CUTTER ANTS (ATTA CEPHALOTES) TO DIFFERENT COLONIES AND CASTES OF CONSPECIFICS

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ABSTRACT (ANS)

We examined the aggressiveness of A. cephalotes exposed to conspecifics from differing colonies in two separate experiments. In Experiment 1, soldiers and workers were introduced to a test colony and observed for 90 seconds. We found a significantly greater aggressive response to soldiers than to workers, implying that A. cephalotes colonies respond differently to different castes. In Experiment 2, we introduced workers and soldiers to three colonies and recorded the time of first attack on the intruder. Colonies differed significantly in response times, but none of them showed increased aggressiveness toward soldiers. Our results imply that aggressiveness varies among colonies and raises further questions about intraspecific interactions.

Key Words: Atta cephalotes, intraspecific aggression, caste differentiation

INTRODUCTION (ANS)

Colonies of leaf-cutter ant (Atta cephalotes) are common in many areas of lowland rainforest. Given their high density in some areas, intraspecific interactions between colonies seem likely. In natural systems, however, we observed no overlap of established foraging trails. Aggressive interactions between colonies were confirmed by preliminary observations and led us to investigate the role of different castes in intercolony interactions.

In the Atta social system, tasks are divided between soldiers and workers. Because soldiers are larger individuals who likely pose a greater threat to a foreign colony, we tested the hypothesis that A. cephalotes respond more aggressively to introduced soldiers than to introduced workers harvested from a different, conspecific colony. We predict that ant colonies would respond more quickly to intruders that were soldiers than to intruders that were workers.

METHODS (ANS)

This study was conducted in Corcovado National Park, Osa Peninsula, Costa Rica near the Sirena field station. The site was a tropical premontane wet forest which was dominated by secondary growth. We selected sections of ant trails that crossed man-made trails.

For the first experiment, we exposed one colony of A. cephalotes to conspecifics from two different colonies and to members of their own colony as a control. All colonies were separated by several hundred meters. Ten soldiers and ten workers were collected, marked and introduced to a trail of the test colony. Soldiers were identified large size and differing behavior patterns.

Intruders were observed for 90 seconds. Any aggressive response, usually biting of the legs, was recorded. A Chi-square analysis was used to test for differences in the number of ants that elicited aggressive response.

For the second experiment, we quantified

ant aggressiveness by measuring time to first attack on introduced intruders. Five soldiers and five workers, always from the same source colony, were marked and introduced to three separate colonies. Five native soldiers and five native workers were also marked and reintroduced as a control. We observed intruders for 5 minutes and recorded the time of first attack.

We used a Mann-Whitney U-test to compare the times to aggressive response of the host colony.

RESULTS (BME)

The colony of Atta cephalotes examined in Experiment 1 was more aggressive to introduced soldiers than to introduced workers ($X^2 = 5.14$, df = 1, $p < 0.025$; Table 1). The colony tested did not respond more aggressively to either one of the source colonies in terms of the total number of ants attacked ($X^2 = 0.14$, df = 1, $p = 0.5$; Table 1). The control ants reintroduced to the study colony elicited no aggression.

In Experiment 2, Colony A showed no aggression toward any intruder castes, while colonies B and C attacked all intruders. Colony B showed no difference in its time to attack introduced workers (53.8 ± 54.9s) versus introduced soldiers (23.4 ± 9.1s), (U = 18, $n_1 = n_2 = 5$, $p > 0.10$; Table 2). Colony C similarly showed no differences in the time to attack introduced workers (44.4 ± 44.7s) versus introduced soldiers (36.6 ± 27.1s), (U = 13, $n_1 = n_2 = 5$, $p > 0.10$; Table 2). None of the control ants elicited an aggressive response. Colonies B and C did not differ in the average time to attack intruders (U = 57, $n_1 = n_2 = 10$, $p > 0.10$).

Table 1: Data from Experiment 1 comparing the levels of aggression to introduced soldier and worker ants. (Units: number of ants.)

Intruder from Colony 1 (# of ants)				Intruder from Colony 2 (# of ants)			
Soldier		Worker		Soldier		Worker	
Attack	Assim.	Attack	Assim.	Attack	Assim.	Attack	Assim.
10	0	3	7	10	0	5	5

Table 2: Data from Experiment 2 comparing the levels of aggression to introduced soldiers and workers in three colonies. (Units: number of ants.)

	Soldier		Worker	
Host Colony	Attack	Assimilate	Attack	Assimilate
A	0	5	0	5
B	5	0	5	0
C	5	0	5	0

DISCUSSION (BME)

Experiment 1 supported our hypothesis that colonies may respond differently to different castes of intruders, but Experiment 2 contradicted these results. This discrepancy could be because introduced "soldiers" were taken from foraging trails, an area not frequented by the true soldier caste (Schwartz, pers. comm.). "Soldiers" may have actually been large workers. This confusion could have confounded our results, although it is not clear how this would have affected our results. Another possibility is that lingering attack phenomone from one aggressive interaction increased ant sensitivity to subsequent introduction. Our research was unable to provide a rigorous test of our hypothesis. With our small sample size, we may not have been able to discern a difference in aggression to different castes.

Experiment 2 indicated that colonies may differ in their aggression towards intruding conspecifics (Table 2). Variation among colonies may have been due to varying distances between the test site and the nest entrance. Both Colony B and Colony C, which exhibited high aggression, were tested within 2.5m of the nest entrance. Colony A, which did not exhibit aggression, was tested > 12m from the nest, on a foraging trail that seemed to have a lower density of ants than test sites at the other colonies. Perhaps A. cephalotes colonies do not defend their foraging trails far from the nest, but instead allocate their resources towards defending the trails closer to the nest.