ACACIA COLLINSII HEALTH AND THE DISTRIBUTION OF *PSEUDOMYRMEX SPINICOLA* AND *PSEUDOMYRMEX FLAVICORNIS*

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Abstract. The proportion of *Pseudomyrmex spinicola* to *Pseudomyrmex flavicornis* is greater in shady than in open sites. In addition, *P. spinicola* are reported to be more aggressive than *P. flavicornis*. If we assume that the more aggressive *P. spinicola* are more successful in colonizing the healthiest trees, then tree health should be greatest in shaded sites. We compared the vigor of *Acacia collinsii* growing in the sun and shade. Contrary to our hypothesis, tree health appeared to be poorer in the shady site. *P. flavicornis* were not present in either site and thus, we could not correlate ant species distribution to tree health.

Key Words: Pseudomyrmex spinicola, Pseudomyrmex flavicornis, Acacia collinsii

INTRODUCTION

The ant-acacia system is a well known mutualism in tropical dry forests. In return for defending the acacia from herbivory and encroaching vegetation, the ants receive shelter in the form of swollen thorns and nourishment from proteinacious Beltian bodies and extrafloral nectaries. At Palo Verde National Wildlife Refuge, Guanacaste Province, Costa Rica, *Pseudomyrmex spinicola*, an aggressive red ant, and *Pseudomyrmex flavicornis*, a less aggressive black ant, are commonly associated with *Acacia collinsii* (Balser et al, 1992). *P. flavicornis* occupies acacias in open habitats, while *P. spinicola* is common in both open and shady areas. If the more aggressive *P. spinicola* outcompetes *P. flavicornis* for the most productive trees, then the distribution of ant species should reflect variations in tree health. Therefore, we hypothesized that acacias occurring in shady habitats should be healthier than those growing in open habitats. We compared acacia tree health in an open and a shady site and noted the distribution of ant species in each site.

METHODS

We surveyed the health of acacias growing in the open and in the shade on the morning of 8 January 1996 at Palo Verde. Two sites were chosen that differed in relative amount of canopy cover. The more open site was located in a pasture bordering the marsh at the south end of the Sendero National de Venada. The shady site was located in the tree-covered former pasture bordering the main park road, 500 m east of the OTS biological station.

At each site, we extended a transect 25 m from an arbitrarily selected point within an area of numerous acacias. All acacias within 1 m on either side of the transect were sampled for diameter at breast height (DBH), height, foliage health, and ant species present (n = 47 trees in open habitat and 34 trees in shade). We measured DBH with a straight edge and estimated tree height. Foliage health was classified on a scale of 0-3, with 0 being dead and 3 being well-covered by leaves. Canopy cover (percentage of sky obscured by trees) was estimated every 5 m along the transect and placed into one of four quartiles.

RESULTS

Tree health, as reflected by DBH, foliage health and tree height, tended to be greater in the open habitat than in the shade. Trees in the open site were somewhat taller than those in the shaded site (mean ± SE = 1.9 ± 0.25 vs. 1.2 ± 0.30 m, $t = 1.81$, $df = 79$, $P = 0.06$). The foliage health index was higher for trees in the open site as well (mean ± SE = 2.0 ± 0.14 vs. 1.2 ± 0.3, $t = 2.45$, $df = 79$, $P < 0.01$). Average trunk diameter at breast height was also greater in the open site, but this difference was not significant (mean ± SE = 1.0 ± 0.21 vs 0.75 ± 0.20 m, $t = 0.80$, $df = 79$, $P = 0.40$). As expected, average canopy cover was less in the open transect than in the shady transect (mean ± SE = 26 ± 11 vs. 10 ± 4%, $t = -2.57$, $df = 10$, $P < 0.02$). All trees on both transects were inhabited by *P. spinicola*.

Discussion

Our results refute the hypothesis that more aggressive *P. spinicola* dominate in shady habitats because tree health is better in shady habitats. Instead, we found that open site trees seemed healthier than shady site trees. Unfortunately, we found no trees inhabited by *P. spinicola* in either transect and therefore, could not directly correlate tree health and ant species distribution.

Ruben and Hourdequin (1996) suggested that acacias do better in disturbed pasture than in wide open sites. Because our open site was actually a somewhat shaded pasture, we may not have sampled the acacias in the poorest health. Less competitive black ants may only be found in these acacias. Future studies could test whether acacia tree health is greatest in pastures, intermediate in shady areas, and poorest in wide open areas. The broader question that remains is whether tree health determines ant colonization preferences or whether distribution of ant species determines tree health.

Literature Cited

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