# THE EFFECTS OF ACACIA ANT PRESENCE ON ANT LION DENSITY

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*Abstract*. We examined the factors determining the distribution and abundance of ant lion larvae in Palo Verde National Park, Costa Rica. We hypothesized that ant lion larvae density would be greater in the litter-free patches around ant-acacia trees than in other bare soil patches due to higher food availability. We found that ant lion densities were significantly higher around acacia trees, but could not show that these areas had a higher amount of food. Ant lion larvae may instead prefer acacia tree patches because the ants there create a more consistent and suitable habitat than in transient bare patches of soil. (ALG)

## INTRODUCTION (JVK)

Ant lions of the genus *Myrmeleon*, found throughout Costa Rica, lay their eggs singly in dry, open patches of soil. After hatching, the larva plows backwards across the soil just underneath the surface in search of a suitable place to construct a pit. The predaceous larva then remains at the bottom of the conical pit until maturity, during which time it feeds upon ants and other small arthropods (Janzen 1983). We might expect that ant lion larvae select pit location based on available patches of soil, maximum prey density, and minimum intraspecific competition. We noted that ant lion pits seem to be more abundant in cleared patches surrounding acacia trees than in patches of bare soil elsewhere. This may represent an adaptation to select sites near acacia trees, if the ants inhabiting these trees provide a consistent food source. We hypothesized that ant lion density would be greater around ant acacia trees than in exposed soil patches not around acacia trees, as a result of disproportionately high food input in these areas.

## METHODS (JJS)

This study took place on 9 and 10 January 1992 at Palo Verde National Park, Costa Rica. The study site was located west of Sendero Guayacanito and North of Sendero La Penca near the OTS biological station. We sampled the densities of ant lion traps in bare soil patches along four parallel transects of 10m width. A patch was sampled if it was bare ground, greater than 10cm x 10cm, and had any part within 5m of the transect line. The transects were 1-1.5km long, depending on terrain, and were 50m apart.

Each patch was sampled for ant lion trap density and it was noted if an ant acacia (*Acacia collensii*) grew within the contiguous cleared area. Area was determined by fitting simple geometric shapes (circles, rectangles, and triangles) to cover the entire plot. Prey density was sampled by placing tanglefoot traps of a standard size (5cm x 15cm) on ten plots of each type (acacia and non-acacia). These plots were selected randomly and the traps were left out for five hours.

## RESULTS (ALG)

In our four transects, we examined 82 patches of exposed soil (total area=1101m$^2$) around acacia trees and 67 patches of soil (total area=102m$^2$) not associated with acacias. We counted 723 ant lions under acacia trees and 102 in non-associated patches (Table 1).

Table 1. Ant lion densities related to the presence of acacia trees.

| | Exposed soil associated with acacias | Exposed soil unassociated with acacias |
|---|---|---|
| # of patches surveyed | 82 | 67 |
| Mean patch area (m$^2$) | 13.43±14.46 | 1.53 ±2.69 |
| Total # ant lions | 723 | 102 |
| Median # ant lions/m$^2$ | 0.14 | 0 |

The median number of ant lions per m$^2$ in the acacia-associated patches was 0.14, and for non-acacia-associated patches the median was 0. This difference was found to be statistically significant using a Mann-Whitney U test, after converting the U to a t-value due to the large sample size (t=5.29, p<0.001). We used the median instead of the mean due to the large number of zeroes in both samples (85 of 149 total samples had no ant lions).

We also compared the areas of the acacia-associated and non-associated patches using a Student's t-test. The acacia-associated patches were found to be significantly larger (t=3.71, p<0.001).

However, when comparing available prey density, the number of insects caught in the tanglefoot traps in the acacia-associated patches (total of 3 insects) was not different from the number caught in the non-acacia patches (total of 2 insects; U=56.5, p>0.1).

## DISCUSSION (ALG)

Although the data we collected supported our hypothesis that the density of ant lions in the exposed soil around the acacia trees was greater than in the exposed soil not associated with acacia trees, we have been unable to show that this was related to a greater prey density.

Even though we designed the tanglefoot traps to census crawling insects, two of the five insects caught were not crawlers (one grasshopper and one dipteran), and several times we observed ants testing the traps with antennae or one foot and then going around it. As a result, we believe this method may not provide an adequate measure of prey availability and increased prey density could still be the reason for increased ant lion density. We recommend direct observation of small plots to estimate prey density in the future. Additionally, one could manipulate ant lion densities so that they were equal in both acacia and non-acacia patches and record the rate of ant capture per trap.

An alternative explanation for the increased frequency of ant lions under ant acacias could be that cleared acacia patches provide suitable substrate for ant lion colonization that is stable over the two or three years necessary for the ant lions to mature (Janzen 1983). To determine if it is stability that explains the higher density of ant lions around acacia trees, one could test for a correlation between the length of time a patch exists and the density of ant lions in both acacia and non-acacia patches. If the increase in ant lion density is due more to strata stability than to increased prey density, then an interesting paradox develops. Assuming acacia trees with all litter cleared from their bases have higher

fitness than trees with litter, then, by creating a more favorable environment for the tree, the ants create a more hostile environment for themselves by maintaining habitat for the ant lions, one of their predators.

## Literature Cited

Janzen, D.H. *Costa Rica Natural History*. University of Chicago Press. Chicago, 1983: 742-3.