# Prey density: a determing factor of *Myrmelon* density

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*Abstract.* Ant lion larvae (*Myrmeleon sp.*) have been shown to select sites to build their pit traps based on soil temperature and texture. We hypothesized that ant lions will densely congregate in areas of high prey density. We found that prey density correlates with ant lion density. The number of available prey per ant lion also increased with ant lion density. Ant lions appear to operate as optimal foragers in a patchy environment.

*Keywords. ant lion, optimal foraging*

## INTRODUCTION

The larvae of *Myremelon sp.* (lacewings) are commonly known as "ant lions." They build funnel-shaped pits of diameter 15-45 mm and depth 1-2 cm that function as traps for ants and other small insects (Janzen, 1983). Several studies have investigated the abiotic factors, such as soil temperature and texture, that influence the spatial density of pits (Topoff, 1977, Klein, 1982). Our study investigates whether prey abundance influences ant lion density. We hypothesize that ant lion density will increase with prey abundance. More specifically, ant lion density will increase as the available prey per individual increases.

## METHODS

On January 14, 1999, we randomly chose 11 ant lion clusters to sample on the air strip south of the OTS station at Palo Verde, Costa Rica. Soil temperature and texture, which are known to affect ant lion density, were relatively uniform among our sample sites.

Ant lion clusters were defined as areas with 3 or more active ant lion pits each within 30 cm of another pit. Sample clusters were at least 50 cm apart. Around each cluster, a rectangular "pit zone boundary" was defined. The perimeter of the rectangle was set 5 cm from the furthest outlying pits. The area of this rectangle and the number of ant lion pits within it were recorded to measure ant lion density. A "boundary zone" was then defined by extending the length and width of the pit zone by 50 cm, 25 cm on both sides of each corner (Fig. 1).

At each of the 11 sites, we determined prey density by site counts—counting each crawling insect found within both the pit zone and boundary zone ("active sampling"). At five of the sites, a pit fall trap was placed in the middle of each side of the boundary zone. These sites were chosen to represent a range of ant lion densities from low to high. After 24 hours, the traps were removed and the insects were counted ("passive sampling").

## RESULTS

Active sampling of prey density by site counts showed that ant lion density increases with prey density ($r^2$=0.87, df=1, p=0.025; Fig. 2). Further, active sampling revealed that available prey per ant lion is positively associated with ant lion density ($r^2$=0.81, df=1, p=0.023; Fig. 3). The results from pit fall traps were not significant, but showed trends similar to those of site counts: prey density increased with ant lion density ($r^2$=0.095, df=1, p=0.30), and available prey per ant lion increased with ant lion density ($r^2$=0.48, df=1, p=0.69).

## DISCUSSION

Since there appeared to be no difference in the physical substrate between low and high density ant lion clusters, differences in ant lion density in our samples cannot be explained by differences in the physical environment.

Furthermore, as the winged adult disperses and mates away from the site of larval development, local high densities of ant lions cannot be explained by higher reproductive output resulting from high prey availability per ant lion. Therefore, it seems that the most likely causal explanation for high ant lion density involves prey density.





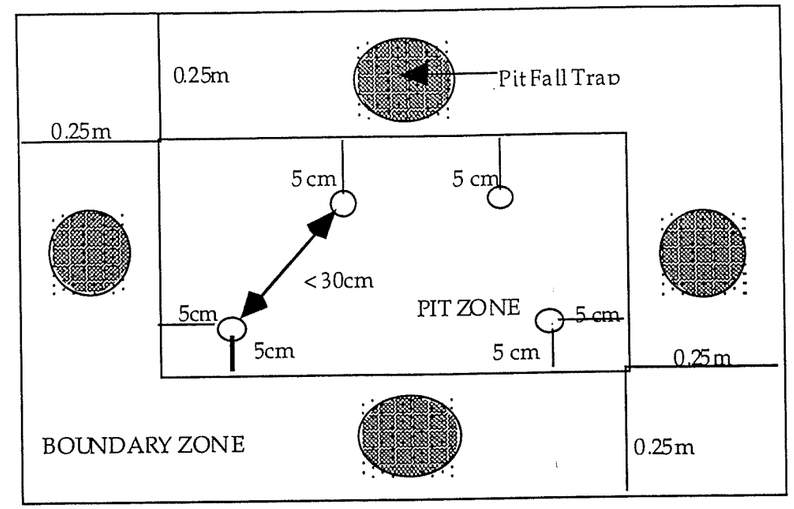


Fig. 1. Diagram of Experimental Design

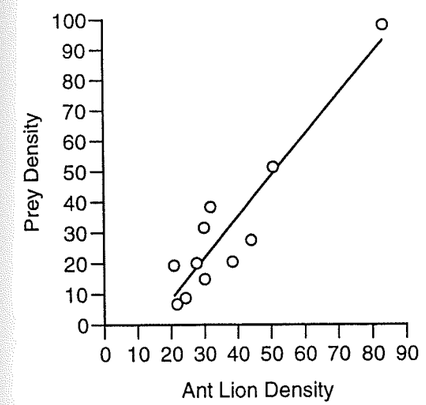


Fig. 2. Ant lion density correlated with prey density (n=11)(r2=0.87, df=1, p=0.025). Prey abundance measured by site counts at Palo Verde National Park, Costa Rica.

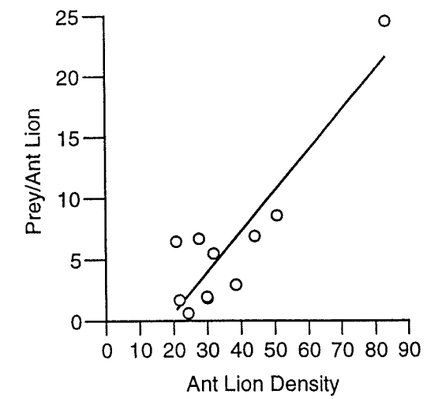


Fig. 3. Available prey per ant lion with increasing ant lion density (n=11) (r2 =0.81, df=1, p=0.0002). Prey abundance measured by site counts at Palo Verde National Park, Costa Rica.

The limited mobility of larvae makes it unlikely that they can redistribute in response to prey density, except on a very local scale. So ant lion habitat selection probably occurs at the adult stage. It is possible, but unlikely, that females oviposit randomly but larvae survive better in areas of high prey density. More likely, females select oviposition sites in habitats containing high prey densities. It is unclear how females could directly assess prey density. Rather, they may respond to vegetation structure or other physical factors associated with high prey density.

## LITERATURE CITED

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