THE EFFECT OF PIT SIZE AND ANT SIZE ON PREDATION EFFICIENCY OF MYRMELEON

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Abstract (J.K.)

Small, medium, and large pit sizes of Myrmeleon had no effect on the capture rate of small, medium, or large ants. While no effects of pit size were found, medium - sized ants were captured significantly more often across all pit sizes than small or large ants. Two possible explanations:

1) Medium-sized ants may have been less adapted to escaping from sandy, ground pits. The medium-sized ants used were Pseudomyrmex ferruginea which are tree-dwelling ants.
2) Physics of motion of the medium-sized ants may put them at a disadvantage relative to smaller or larger ants, due to their speed and weight.

Introduction (G.Y.)

We determined whether Myrmeleon pit size or the size of their ant prey were correlated to capture success. First, we hypothesized that capture rate of combined prey sizes would increase between pits of increasing size group. Second, we hypothesized that capture rate of combined pit sizes would decrease between prey of increasing size group.

The pit plays the crucial role of preventing escape of prey, and it is noteworthy that pit diameter is a fairly accurate measure of Myrmeleon size (Janzen, p. 743, 1983). We reasoned that larger and presumably more experienced Myrmeleon would be more effective predators. The presence of this effect could indicate that as Myrmeleon grow, their survival probability increases. Furthermore, identification of an optimal prey size could indicate the existence and direction of a selective pressure on prey size among ants exposed to Myrmeleon.

Methods (D.G.)

Myrmeleon pits were located in a study area next to the driveway of the Palo Verde National Park OTS Field Station, Costa Rica. Ninety pits were randomly flagged, then ranked according to diameter. Thirty one pits ranging from 10mm to 25mm were classified as small, twenty-seven pits ranging from 26mm to 38mm were classified as medium, and thirty-two pits 39mm to 65mm were classified as large pits. Ant prey

selected were sweet ants (mean length = 3.0mm), Pseudomyrmex ferruginea (mean length = 6.1mm), and Formicinae ants (mean length = 6.9mm). We decided that one introduction would be done per pit. Pits were alternately and systematically assigned to each of the three prey size classes. This resulted in nine to eleven replicates for each ant size class tested on each pit size class (Table 1). If the ant passed over the bottom and exited the pit, the trial was scored as an escape; if there was a capture, the trial was scored as a capture success.

Results (A.S.)

The attack success rates of the ant lions are summarized in Table 1. We found no difference in capture rates (for all ant sizes combined) between small and medium ant lion pits ($U=6$, $n_1=3$, $n_2 = 3$, $p > .05$), or medium and large ant lion pits ($U = 8$, $n_1 = 3$, $n_2 = 3$, $p > .05$).

However, we found that, for all ant lion pit sizes, combined medium ants were captured at a greater rate than small ants ($U = 9$, $n_1 = 3$, $n_2 = 3$, $p < .05$) or large ants ($U = 9$, $n_1 = 3$, $n_2 = 3$, $p < .05$). Small and large ants were not captured at different rates ($U = 7$, $n, = 3$, $n_2 = 3$, $p > .05$).

For the data in Table 1, there was no heterogeneity capture rates ($G = 0.301$, $p>0.5$).

Discussion (C.G.)

Although we were unable to statistically support an increase in Myrmeleon capture success according to its pit size, we did note two trends in part of our data set supporting this hypothesis. In both the small and large sized ant trials, the medium and large sized Myrmeleon pits had more than two times the success rate as did the small Myrmeleon pits (Table 1). However, the data for the medium sized ant trial do not support this trend. The medium sized ants floundered in the sand, and were unable to escape the Myrmeleon pits, as the lightweight and agile small ants did. The large ants walked out easily.

However, we suggest that ant species' behavior differences affected our results at least as much as their size differences did. The medium sized ants we used were P. ferruginea, adapted to life on an acacia tree rather than on sandy soil with abundant Myrmeleon pits. We support this observation by noting than on average the large ants differed by merely 0.8mm from the medium sized ants; yet, substantially fewer large ants were caught in the pits than medium ants. Both the large and small ants were from the immediate vicinity of the Myrmeleon pits, and are therefore more likely to be adapted to

escaping Myrmeleon pits than the P. ferruginea are.

To eliminate capture efficiency differences due to ant species rather than ant size, we suggest a future experiment using only one size of ant, and different sized Myrmeleon pits since capture efficiency directly affects the speed with which a larvae will reach adulthood, different capture rates of different sized ant lions could affect their eventual survivorship.

Table 1 Success Rates of Ant Lions at Palo Verde, Costa Rica. Ant Lion Pit Size. Numbers in parentheses are number of successes per number of trials.

	small	medium	large
small	(2/11) 18%	(5/9) 56%	(5/11) 45%
medium	(7/10) 70%	(6/9) 67%	(8/11) 72%
large	(1/10) 10%	(4/9) 44%	(4/10) 40%