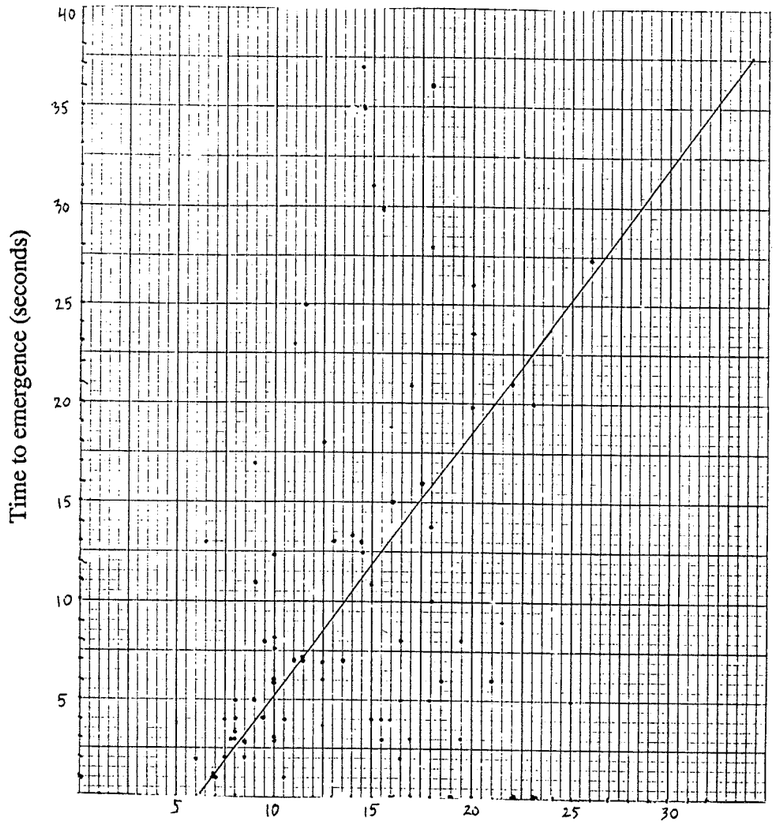
Figure 1 Time of emergence as a function of shell size of Paguridae at Corcovado, Costa Rica.



Shell size index [(length+width) / 2]

RECRUITMENT IN PARAPONERA CLAVATA TO A FOOD SOURCE

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Abstract

I studied the recruitment behaviors of Paraponera clavata at La Selva Research Station, Costa Rica. Because of conflicting reports on whether or not P. clavata recruits to a food source, I hypothesized that this species does recruit, but that the response is weaker further from the nest.

Recruitment occurred in four of fifteen trials but was statistically insignificant. Disturbing the ants by marking them appears to be the reason for the lack of recruitment in the other trials.

Introduction

P. clavata is a very primitive species of ant both in body form and social structure. They would therefore be expected to lack complex behaviors such as recruitment to a food source (Janzen, 1983). However, nectar is a primary food source of P. clavata (Janzen, 1983) and would often be found in caches too large for a single ant to carry back in one trip. Recruitment would therefore be expected. Furthermore, in an OTS field project (Balas drag ass, June-Aug, La Selva) it was noted that some recruitment occurred at sugar water caches located near the nest. I decided to examine this discrepancy more closely.

I hypothesized that recruitment would occur at a simulated nectar source. I also hypothesized that since recruitment may not be a well developed behavior in P. clavata, recruitment will be weaker at sources further form the nest. I predicted that fewer ants would be recruited as the distance to the nest increased.

Methods

I studied the recruitment behaviors of Paraponera clavata to a food source at La Selva Research Station, Costa Rica. I located two nests, both at the base of trees. One was near the library at the station, the other was in the arboretum.

For my night observations I marked two sites at 1 meter, 3 meters, and 5 meters from each nest. I placed a soda bottle cap of honey at a 1 meter and a 3 meter site and monitored them from 2030 to 2130. I moved the honey to 2 other 1 and 3 meter sites at each nest and monitored them from 2130 to 2300. The next day, starting at 0945, I located ants near the nest and presented honey to them by pouring it directly on the ground

or vegetation near the ant. I then marked the ant with liquid paper, whether or not it picked up honey. I made a control honey cache by honey 1-2 meters away on a similar substrate. I noted general activity levels in the area and the reaction of the ant to being marked. I then measured the distance from the honey to the nest. I returned several times over the next few hours to the honey and noted how many ants were present. I repeated this procedure for as many ants as I could find. My observation periods were from 0945 to 1220, 1630 to 1825, and 0930 to 1115.

Results

No ants visited the honey during my first night's observations. I noted that at 2230 the general activity level around the nest seemed to increase. Most of the ants were moving on the trunk of the tree near the nest. One ant came to within 20cm of a cache 1m from the nest but did not appear to notice the honey.

The next day, with my new methods, I was able to collect some data. However, due to the small sample size and large number of variables that I was not able to control for, I was unable to do any statistical analyses of the data. I have summarized the important information from each trial in Table 1. There were four sites that I consider to have shown recruitment. These are: Nest 1, number 2, 3, and 5, and Nest 2, number 1. My criterion for recruitment is that the site not be on a trail, and that more than two unmarked ants arrive and feed on the honey after the first ant has left. I also required that the control not be visited, or had many fewer ants. Only one of the controls was visited, (site 3) but this was after recruitment had occurred at site 3.

Discussion

During my night observations, I did not attract any ants to the honey. I had originally planned to wait until an ant found the honey, and then put another honey site 1-2 meters away. If more ants arrived and went to the first site, I would conclude that recruitment had occurred and they had followed a pheromone trail laid down by the first ant. But since no ant found the honey, I never placed the control.

There are several possible reasons that the ants were not attracted to the honey. Although I was not shining my light on the site all the time, I was sitting quite close and had my light on. This may have disturbed the ants. Another possibility is that the ants forage for nectar only in the trees. They may have trails to the trees and they use only those. The ants on the ground may be searching only for insects. If they were using auditory or olfactory cues and had a search image for insects, they would not find the honey caches. Since the ants took the honey on the following day, I can rule out the

possibility that they do not eat honey. However, they may forage for nectar only during the day.

Of my daytime observations, there were only four trials that showed recruitment (shown on Table 1). These were sites located off trails and many ants arrived. One of the controls was found but not until long after recruitment had been shown. Since one of these trails was located 14.2 miles from the nest, I conclude that recruitment is not restricted to the immediate area around the nest. In three other trials many ants appeared at the site (Nest 1, number 1; Nest 2, number 1 and 2) but the site was located on a well used trail. All of the ants could have found the sites without any recruitment involved.

There was little or no increased activity at the remaining eight sites. In seven of these, the ant was greatly agitated by either being marked or the honey pouring. It is likely that ants don't recruit to food when they are disturbed. All of these ants left without taking honey. In two of the recruitment trials, the ant was disturbed but recruitment still occurred. Considering the time needed for recruitment (300 and 320 minutes), it seems likely that another ant later found the honey and did the recruiting.

There was one trial where the ant was not disturbed by marking, yet recruitment did not occur (Nest 1, no. 4). This trial was very close to Nest 1, no 3, and occurred at the same time. The path that the ant from no. 4 used to return to the nest joined the path to no. 3, which was being used extensively by that time. The ant from no. 4 went to cache no. 3 in its next foraging trip from the nest, but went to no. 4 on its third trip. It is possible that the pheromone trail to no. 3 was stronger and pulled ants away that might have gone to no. 4.

There are several general areas of activity around each nest. For Nest 1, no. 1 and 2 were located on a nearby tree, and sites 3, 4, and 5 were on the heliconias. In Nest 2, site numbers 7, 1, 4, and 10 were in one area. Numbers 8, 3, 5, 6, and 9 were also somewhat clumped. Since sites are located where I was able to find ants, it appears that there are some areas that are patrolled more. Controls for the sites were also in these areas, therefore I feel that recruitment did occur in some trials.

The major drawback with my methods is that the ants were disturbed by being marked. This marking turned out to be an unimportant step in the methods, and I would omit it in any further study. Furthermore, Janzen (1983) states that the ants have varying levels of activity throughout the day, and are generally more active at night. I attempted to control for this by trying to collect data at night, but had to abandon my original methods. Due to time constraints, I was not able to carry out my new methods at night as I would have liked.

Compared to other ants I have observed, P. clavata seems to have very poor recruitment. However, I feel that my data would have shown some recruitment had I been able to collect enough data to statistically analyze it. For further study, I recommend not

marking ants, and doing trials simultaneously or at night.

Table 1: Recruitment of P. clavata to honey cache at La Selva Research Station, Costa Rica.

Nest & Site#	Distance from nest (m)	Time started	Ant upset by marking	#min after start that ants arrive	#ants that come	Site on trail (Y/N)	Comments
1:1	1.5	0945	no	30	28	yes	no control cache
1:2	2.5	1126	yes	300	19*	no	cache not checked in between times
1:3	4	1630	no	120	2	no	marked ant went to #3 trails merged
1:4	4.4	1630	no	39	7*	no	control site found 3 ants
1:5	5	0930	no	45	10*	no	control found 4 ants
2:8	1	0957	yes	75	1	no	4 ants at control
2:3	1.3	1033	yes	420	3	no	
2:5	3	1051	yes	—	—	no	not revisited
2:6	3	1755	no	15	5	yes	control not found
2:9	6	1202	yes	—	—	no	did not pause at honey
2:2	9	1023	yes	90	20	yes	very well used trail
2:7	14	0955	yes	—	—	no	another ant passed but did not stop
2:1	14.2	1011	yes	320	6*	no	well used area, marked ant not present
2:4	15	1044	yes	—	—	no	
2:10	16	1750	yes	—	—	no	ant only came to within 2cm of honey

Literature Cited

Ed. Janzen, Daniel. Costa Rican Natural History. University of Chicago Press. 1983.