

# The Relationship between the Ponerine Ants and the Nasutiform Termites on the Island of Dominica

By

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## Abstract

Ants of the genus *Odontomachus* have been seen closely interacting with nasutiform termites of the family Termitidae on the island of Dominica. I hypothesized that there is some sort of symbiotic relationship between these two groups of insects. Several controlled behavioral experiments were conducted and analyzed in search of their relationship. The results strongly suggest that no symbiotic relationship exists. Several naturally existing mounds were then analyzed and resulted in the conclusion that a parasitic relationship does exist. The ants benefit from the termites by being provided with a home and a convenient food source consisting of the termites, while the termites receive no benefit at all.

## Introduction

Over the past few years a group of ants and termites have been seen interacting together on the island of Dominica. This is not a known occurrence anywhere else in the world with these specific ants and termites. It was suspected that there is some form of symbiosis between these two insect groups. The ants are in the order Hymenoptera, family Formicidae, subfamily Ponerinae and genus *Odontomachus*. They are almost an inch long, with very large scissor like appendages above their mouth. They are solitary hunters with a primitive caste system, and have been observed attacking and eating the termites. The termites are of the order Isoptera, family Termitidae and are commonly known as hose nose termites because the soldiers have a hose like (nasutiform) nose. They can exude a toxin from this nose for defense and have been know to use it on the ants. This nasutiform is unlike that of the other termite families in which the soldiers have very large well sclerotized mandibles. They have a caste system consisting of a male and

like that of a freshly decaying log. Therefore, the only relationship that can be found between these two species is quincidental parasitism. The termites provide a home for the ants unintentionally and the ants benefit by the occasional meal of a straggling termite.

#### **Future Research**

Future research should be done comparing the termite colonies found on the ground in logs with those that are built high in trees. Also, mounds from older islands should be studied. If these two groups of insects live so close together, they might evolve to have more of a relationship or defenses in order to cope.

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3. 3<sup>rd</sup> Group: the ants and termites were gregarious, hanging out with their same species. The ants avoided the termites but threw them when they got too close. It seemed like a form of discipline.

#### Experiment IV

1 ant, 2 worker termites, and 2 soldier termites were placed in a petri dish.

1. 1<sup>st</sup> Group: the termites, mainly the workers, chased the ants and the ants would run away from or through the termites. When ever a termite would fall over on its back a soldier would help it up, not a worker. Everything (termites and ants) is much more active when the workers are present. The ants avoided the termites as much as possible, but stunned them if the termites came up from behind them.
2. 2<sup>nd</sup> Group: the ants avoided the soldiers, but ended up killing and eating the workers.
3. 3<sup>rd</sup> Group: the ants avoided the termites the whole time.
4. 4<sup>th</sup> Group: the ants ran away from the termites but seemed to get more aggressive each time they were confronted. Finally, the ants killed the workers and a soldier who was very persistent. Overall, the ants avoided the soldiers much more than the workers.

## Appendix II

In social colonies, queens and kings have been known to take over workers and soldiers of a different colony if their reproductives are gone. Alates were collected during a swarm in the Guest House of the Springfield Plantation on Tuesday, June 1, 1999. They were put in various small containers with pieces of wood, leaves, and soil. Different ratios of ants and soldiers and workers, collected from the Bee House mound, were added to the containers, also. These experiments were done to see if the termites made a home for the ants as they were building, thus incorporating them into their colony willingly.

1. 1st Container: This had 4 alates (hopefully at least one male and one female), and soldiers and workers. This was a control group with no ants.
2. 2<sup>nd</sup> Container: This had 4 alates and nothing else. This was another control just in case the added workers and soldiers did not work out.
3. 3<sup>rd</sup> Container: This had 4 alates, soldiers, workers, and one ant.
4. 4<sup>th</sup> Container: This had 4 alates, soldiers, workers and one ant. This was the same as the 3<sup>rd</sup> container for more confident results.
5. 5<sup>th</sup> Container: This had 4 alates, soldiers, workers, and 4 ants. (Note: the termites can kill one ant if they do not want it there but probably not four.)
6. 6<sup>th</sup> Container: This had soldiers, workers, and ants. This colony died, the termites going first. The ants probably killed and ate the termites before they died of starvation.

All the ants soldiers and workers died. It is likely that the ants killed and ate the soldiers and workers. The ants then died themselves from starvation since the termites were their only food source. The alates began to build their colony, but because of little time no more results were found.

## Appendix I

### Experiment I

1 ant and 4 soldier termites were placed in a petri dish to observe behavior.

1. 1<sup>st</sup> Group: (10 minutes long) the ant avoided the termites (not vice versa). The termites would run up to the ant and it would run away.
2. 2<sup>nd</sup> Group: (6 minutes long) the ant ran away from the termites the second the ant's antenna touched it. Major avoidness was observed.
3. 3<sup>rd</sup> Group: (5 minutes long) the termites ran up to the legs of the ant and it ran away when it discovered the termites were there.

### Experiment II

1 ant and 1 soldier termite were placed in a petri dish.

1. 1<sup>st</sup> Group: (1 minute long) the ant stunned the termite the second they came into contact with each other by snapping its scissors like appendages.
2. 2<sup>nd</sup> Group: (2 minutes long) the termite was killed by the same form of snapping as the first example.
3. 3<sup>rd</sup> Group: (5 minutes long) the termite ran up to the ant and was flung away. The ant then proceeded to avoid the termite by staying as far away as possible from it.
4. 4<sup>th</sup> Group: (3 minutes long) the ant ran away from the termite (major avoidness).
5. 5<sup>th</sup> Group: (5 minutes long) more avoiding from the ant was observed.

### Experiment III

4 ants and 4 soldier termites were placed in a petri dish.

1. 1<sup>st</sup> Group: the ants avoided the termites this time by running away and jumping, making a snapping sound when they jumped. Then the ants stunned the termites by snapping and flinging them across the petri dish.
2. 2<sup>nd</sup> Group: some ants avoided the termites and some stunned and threw them. No termites were killed.

female reproductive (king and queen), soldiers and workers. Several controlled experiments have been conducted in hopes of proving the hypothesis.

### **Methods**

Several behavioral experiments were conducted in order to study the interacting behavior of the ants and termites. Some were done by observing the resulting behavior of varying ratios of ants to termites in petri dishes (See Appendix I). Other experiments were conducted by pairing up reproductive males and females (alates) and initiated the formation of new colonies in containers with adequate amounts of building materials. With some of the alates, soldiers and workers, and/or ants were also included (See Appendix II). Controls were made for each experiment in order to minimize inaccurate conclusions.

### **Results**

Results from each experiment are found in appendices I and II.

### **Discussion**

No evidence was found for any type of symbiotic relationship between the ants and termites from the experiments. Other mounds and infested logs were sought after to get an idea of what is going on since the hypothesis for this experiment was disproved. On the trail leading to the Check Hall River, five fallen logs were found. Every log that had termites in it was a recently fallen log. The parts of the log that had the chiton eaten away were softer and housed the Ponerinae ants. The ants were always found right where the ground and decaying log met. In two logs there were ants but no termites. These logs appeared to have all the chiton recently eaten out of them and were still slightly moist. After turning over the logs, the ants were found in the very dark, fresh soil beneath. Some logs did not have termites or ants. These logs had almost no structure and crumbled to dirt at the slightest touch. They contained Diplopods, pill bugs, and Acaridae. The reason the termites and ants are frequently found living together is because they live in closely related habitats. The termites need hard wood because it contains chiton, their food source. The ants live in places consisting of loose dirt with a high organic matter content