

Plant and Ant Interactions in Costa Rica



Costa Rica Independent study
Summer 03

Consider the ant. If you find that statement to be a bit perplexing, you won't be at all surprised to know that most people don't consider ants, or insects in general, to have any true value to the world. I now join the elite with a recent trip to Costa Rica, which has drastically changed my opinion on the subjects of ants and all insects of the planet.

Rather than all insects (which are far too numerous to limit speculations of their value to one essay) this paper will focus on ants, particularly the Pseudomyrmex species, and their significant interactions with individual forms of flora.

Ants are quite amazing creatures. Their societies are so well-maintained and organized that the possibility of anarchy within a colony would be an absurd suggestion. Most ant colonies will continue to live and survive for as long as the queen is alive, which can be many years. The fact that ants work well to keep themselves and their species alive is not an entirely unfathomable thought, however, as most, if not all species on the planet do that exact same thing (which the evolution theory clearly points out). But it is also true that certain ants work quite well to keep alive another completely unrelated living organism – such as a form of vegetation.

The leaf cutter ant is one excellent example of this. Ants in this colony devote their entire lives to collecting bits of leaves from plants or trees to bring back to their colony. While these actions are certainly harmful to the tree that is being ravaged, it is not that plant which depends on the procedures of these ants for its existence. The ants do not eat the leaves from the trees and plants they take them from, rather they bring the bits back to their nest and chew it up, mixing chemicals from their spit with the chemicals that make up the plant leaves. From that mixture of ant secretions and plant juices grows

a fungus, one which would not even exist if it were not for the actions of the ants.

Although the ants only grow the fungus as a food source, the fact that they are able to grow a species that would not be in existence without them is entirely remarkable.

Ants that grow a species of fungus as a food source is indeed amazing, but think of a species of ant that will fight to the death any intruder who sets foot or wing on its home tree. Although the Azteca ant does just this, with fighter ants pouring out of holes in the trunk of the Cecropia tree when there is a disturbance, the species I wish to focus on is the Pseudomyrmex ant.

Pseudomyrmex ants are found living in the large swollen thorns of Acacia trees. They eat the tiny berry-like fruits that the tree grows, which are rich in fats and proteins, and in return for the food and shelter that the tree provides for them, they in return fight bitterly for the tree's survival.

On my trip to Costa Rica, the site which contained the most of the trees in question was in Palo Verde. These trees, and ants, were everywhere. The Acacia trees for the most part looked quite healthy and insect-free, in fact the trees that did not seem to be healthy, or the ones that had many insect or caterpillar signs (eaten leaves), were as a general rule the trees in which the Pseudomyrmex ants no longer seemed to inhabit. This clearly points to the idea that these trees would not be able to survive without the ants, quickly succumbing to the creatures that find their leaves to be delicious.

I decided to try an experiment to see just how viciously and thoroughly these ants would fight for the protection of their homes. When this experiment was still in its planning stages, I had obtained an "ant-catcher", an instrument which used two glass

tubes and a glass vial as a method in which to quickly and safely acquire my test subjects, a.k.a. the ants. Unfortunately, due to rough baggage handling, the glass tubes broke before they had a chance to be of use. Not to be stopped from my acquisition of ant-knowledge, I improvised by using a pair of tweezers and a small, plastic Q-Tip container.

To start my experiment, I chose one Acacia tree (which henceforth will be known of as the 'subject tree') and shook it a few times to be sure that the ants were still active in that particular plant. When the ants swarmed out of the swollen thorns I knew I had picked an ideal tree. To test the theory that the ants would protect the Acacia by stopping the growth from other plants, I placed a large leaf on one of the thorns (after I waited for them to settle down a bit). The ants which were inside that thorn immediately came out to investigate, but that seemed to be the extent of it, they didn't seem to be too concerned. Not to be daunted from my task of irritating these ants, I took my experiment to the next stage.

As the Acacia trees in Palo Verde can be found in relative short distance from each other, I wondered how the ants would react if I took ants from trees of various distances away and placed them on my subject tree.

The first tree which I kidnapped ants from was approximately 2 feet away from the subject tree. I used the tweezers to grab a leaf which the ant was crawling on, then quickly placed the leaf into the container and shut the lid. I then took that subject ant to my original tree and coaxed it out onto one of the leaves. I was quite surprised to see that the ants living on my subject tree did not seem to be too concerned with the arrival of the

new ant, although the foreign ant clearly seemed agitated at being in an unfamiliar territory.

I continued my experiment by next grabbing an ant from an Acacia which was about 15-20 feet away from my subject tree, and again placing the ant on that tree. Once more, there was not too much of a stir in the ants who lived in the tree, they just didn't seem to care. I began to wonder if there was something wrong with the ants on the tree I had chosen, or if they simply didn't mind if I brought them new recruits to their protective army.

The next tree I took an ant from eased my fears, however. This Acacia was approximately 30-40 feet away from the subject tree, and when I brought an ant from this tree to meet its new family, the ants on the original Acacia did not approve. They attacked him viciously, and I eventually lost sight of him.

I continued my experiment, in the name of science, and found a tree that was 50-60 feet away from the original. I again brought the ant from this tree to the ants from the first tree, fully expecting the same kind of bloodbath (this may seem cruel, but I had been bitten a few times thus far, so I may have been out for some sick kind of revenge) and I was astonished to find that there was not a stir in the ants from the subject Acacia. This didn't seem to make sense, as I thought that distance was the main factor that played in whether the ants would attack an ant in the same species, and as this tree was even further away, what could be going on here?

In an effort to see if perhaps this one ant was a fluke, I found a tree that was much further away, over 100 feet, and grabbed a couple of ants to take back with me. When I

took them to my subject tree and released them, they were both attacked, and most likely killed.

I next decided to take my experiment in a slightly different direction. I found on the ground a dead dragonfly, and took it with me to the subject Acacia tree. (It went through my mind that it probably would have been better to use a live insect, but I had qualms against hurting the dragonflies, as they were the only things that were keeping the mosquitoes away from me.) I tried carefully to place the dragonfly on the subject tree despite the mounting wind and the threat of rain coming. After a few unsuccessful tries, I was able to wedge the dragonfly body in between a few twigs and thorns. The wind brought an illusion of life into the dragonfly as its wings began moving realistically. I had just barely stepped back before the ants on the subject tree completely swarmed the dead dragonfly. They fought the dead insect much more viciously than they fought the live ants, I was completely shocked at their quick behavior in this test.

After the completion of the dragonfly experiment, I had to consider my tests done, as the wind had picked up much too strongly for me to continue, although the sight of the trees being blown back and forth in the wind made me wonder why wind doesn't seem to bother the ants, as it is a disturbance of the tree. Perhaps another experiment should be done as an attempt to answer that question, but unfortunately it will have to wait for my next trip to Costa Rica.

My conclusions in these experiments are in no means complete, as I did not have the materials or the time necessary to do completely thorough studies on the ant's behaviors. The results of my data did seem to point to the *Pseudomyrmex* ant being

territorial against other *Pseudomyrmex* ants only when the new ants were from far enough away to not have a recognizable scent. The tree which surprised me in not evoking a response was in all likelihood simply a fluke. Or, there is a possibility that the ants that did not evoke reaction were ants that were in some way related to the ants of the subject tree, perhaps their mother was originally from the subject colony and flew off to start her own colony. More analysis and many more of the same experiments would have to be done on many different trees to know conclusively. As for the dragonfly, it seems evident that the ants won't tolerate insects of another species, even dead ones. Other *Pseudomyrmex* ants might have a fighting chance, but insects of other species would certainly not.

If further experiments were in my future, I would attempt to take ants of other species (such as leaf-cutters or army ants, or perhaps even a bullet ant) and seeing how it would handle against the *Pseudomyrmex*, as perhaps any ant species is more tolerated by the *Pseudomyrmex* than other insects. It might also be interesting to see what a colony of ants which live on an Acacia might do if the entire tree was swarmed by army ants, would they abandon the tree or fight to the death? And is there anything that could indeed get the *Pseudomyrmex* to abandon their home in search of another tree, or would they always "go down with the ship"?

There are still many questions left unanswered after my return from Costa Rica, questions that are intriguing if not to anyone else, then to me. My only hope is that someday someone will figure out the riddle that is the *Pseudomyrmex* ant.

DATA SHEET

Test object	Reaction of subject ants
Leaf	investigated, but pretty much left it alone.
Acacia ant on tree approx. 2 feet away	No reaction from subject ants, new ant seemed disorientated.
Ant from Acacia tree approx. 15-20 feet away	No reaction from subject ants, confusion in new ant
Ant from acacia tree approx. 30-40 feet away.	subject ants attacked new ant.
Ant from Acacia 50-60 feet away	No reaction from subject ants
Ants from Acacia > 100 feet away	Both ants were attacked by subject ants.
Dead dragonfly	Attacked viciously by subject ants