Notes on the Foraging Behavior of a Leaf-cutting Ant on Oenocarpus bacaba in the Northwest Amazon of Colombia

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A group of ants whose peculiar foraging behavior is of great concern to agriculturists and horticulturists is found in many areas of the Neotropics and subtropics. These ants, variously known as leaf cutters, gardening ants, or parasol ants, clip sections from the leaves of herbs, shrubs, and trees, and carry these pieces to their nests, where they culture "fungus gardens" upon the leaf residue. According to Weber (1972), of the approximately 10,000 known species of ants, only 180-200 species exhibit this behavior. The most conspicuous by their size, and the best known, are the genera Acromyrmex and Atta.

Much attention has been devoted to the ants' habit of defoliating plants in forests and cultivated areas. Descriptive accounts of these ants are to be found in many of the early books concerning natural history in the American tropics (Andre, 1904; Barbour, 1945; Bates, 1863; Belt, 1874; Orton, 1870). Regarding their activity in the Amazon, Orton (1870) wrote "But the most prominent by their immense numbers are the dreaded saubas (Atta sp.). Well beaten paths branch off in every direction through the forest, on which broad columns may be seen marching to and fro, each bearing vertically a circular piece of leaf—unfortunately they prefer cultivated trees, especially the coffee and orange...."

In contrast to the well-known above-ground activities of these ants, much less is known of their subterranean activities in fungus gardening. At first it was thought that the ants or their young consumed the cut leaves. Thomas Belt, a nineteenth century naturalist, was the first to describe the true purpose of their unique foraging behavior (Belt, 1874) "these ants are so common throughout tropical America, and have excited the attention of nearly every traveller, there still remains much doubt as to the use to which the leaves are put. Some naturalists have supposed that they use them directly as food; others that they roof their underground nests with them. I believe the real use they make of them is as a manure, on which grows a minute species of fungus, on which they feed—that they are, in reality, mushroom growers and eaters...." In a letter to Charles Darwin published in the June 11, 1874, edition of Nature, Fritz Muller supported this theory, based on his investigations of the stomach contents of the leaf-cutting ants. There is a close association between the ants and the fungus, in that neither can survive without the other. Each colony cultures only one species of fungus, and the workers of the colony insure that no other contaminated types of fungus or mold take over.

Leaf-cutting ants are of economic significance throughout their range. They destroy great areas of cultivated plants and grasslands, rendering them useless for agriculture, and the ants actually compete with cattle for food. Weber (1972) notes that ten adult colonies of Atta cepigrua use the same amount of grass as an entire cow. Many agriculturists from north temperate regions who visit the tropics for the first time and are unfamiliar with the destructive habits of these ants often fail to understand the reasons for the paucity of fruit trees and vegetable crops cultivated by the local people in otherwise lush tropical environments. These northern "experts" often ascribe these cultivation practices to the supposed lethargy of the people, when in fact the presence or absence of leaf-cutting ants dictates the types of crops that can be grown. Wilson (1971) relates the story of a foreigner living in British Honduras who planted all types of vegetables in his garden against the advice of the local Indians, who awoke one morning to find his garden completely defoliated, and "Into a hole in the mound [of earth], ants, moving in quickened steps, were carrying bits of our cabbage, tops of the carrots, the beans—in fact our entire garden was going down that hole." These insects play such a visible and important role in the lives of the inhabitants of tropical America, that colloquial folk names have been given to them throughout their range, including bachaco (Venezuela), coqui (Peru), sauc (Paraguay), and saula (Brazil).

The economic benefits derived from
I am not much used to flower-gathering, but I have always been fascinated by the beauty of flowers and the way in which they grow. When I was a young child, I used to spend hours in the garden, picking flowers and arranging them in a vase. I remember one particular day when I was about ten years old, I went to the garden with my mother to pick some flowers. We had been told that there was a beautiful garden nearby, and we decided to visit it. The garden was filled with all sorts of flowers, from lilies to roses, and we spent the whole day picking them. It was a wonderful experience, and I remember thinking that I would like to spend the rest of my life picking flowers and studying their beauty.

As I grew older, I continued to be fascinated by flowers. I started to read books about botany and flower-gathering, and I began to learn more about the different types of flowers and how they grow. I discovered that there are many different types of flowers, each with its own unique characteristics. Some flowers are fragrant, while others are not. Some flowers are easy to grow, while others are more difficult. I have always been fascinated by the way in which flowers change throughout the year, and I have always tried to study them carefully.

Over the years, I have continued to study flowers and to pick them whenever I can. I have learned a lot about the different types of flowers and how they grow, and I have enjoyed sharing my knowledge with others. I have also discovered that flowers can be used for a variety of different purposes, from decoration to medicine. I believe that flowers are a beautiful and important part of the world, and I will always be fascinated by them.
That it changes in rate of collection and type of material preferred, depending on the season or time of day. He also mentions that the ants avoid sunny, heated trails, which may account for the absence of any ants seen collecting on the palm itself, especially in view of the sunny condition when the plant was studied. Do the ants return any benefit to the palm, either by protecting it or perhaps by encouraging some sort of mycorrhizal association in the soil, or by nurturing it through the vast mass of underground “manure” produced by the colony from the leaf residue? Weber (1972) stated that the fungus cultivated in leaf cutter nests exhibits biological activity against certain plant pathogens. Are the ants then doing the palm a further service through protection against attack by plant diseases? Are there other palm flower-ant relationships and are they less evident in jungle areas where the ants have a greater selection of succulent plant parts to forage from? Indeed further research and observation is needed to answer these and other related questions which arise from such observations on Amazonian palms. While this single observation of *Atta vespertina* is of no significance by itself, it is presented in an attempt to stimulate further observations of this type by other students of the Palmae, hoping that a portion of the time spent in the field will be devoted to studies on such insect-palm relations as might be evident. Those living within the natural distribution of the palms have a great advantage in this area of study in that yearlong observations can be made and careful field experiments carried out. Future work will surely reveal much needed information on palm-animal interaction, along with their possible coevolutionary implications, vital topics in view of the current rate of the destruction of the rain forest and attempted elimination of what are presently thought to be insect pests.

**Acknowledgements**

This study is part of an ongoing thesis investigation of the biology and systematics of the *Jessenia-Oenocarpus* complex. Past field work, during which the previous observations were made, was supported in part by grants from Sigma Xi, the Anderson Fund of Harvard University, and Centro de Desarrollo Integrado “Las Gaviotas” in Bogota, Colombia. I wish to thank sincerely all those persons and institutions who have been so kind in assisting in this investigation. Although too numerous to mention herein, for this particular topic the interest and assistance of the following is gratefully acknowledged: Dr. Paulo Lugari C., Dr. T. Plowman, Dr. M. L. Corne, Dr. E. O. Wilson, J. L. Zarucchi, H. J. Hoyos, C. W. Greene, Jardín Botánico “Joaquin Antonio Uribe” in Medellín, and Instituto de Ciencias Naturales, Universidad Nacional de Colombia.

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