

The role of major-caste workers within *Eciton* ant colonies



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Background/Motivation

Eciton is a genus of new world army ant found throughout Central and South America. Most species within this genus exhibit a high level of polymorphism, the characteristic of multiple morphologies represented within a single species. Within ants, these different morphologies are often called castes (Oster and Wilson, 1978).

Across the vast majority of ant species, there exists a specific morphology for queen, male, and worker ants. In addition, the worker caste can be further broken into multiple distinct castes, including majors, submajors, medias, and minors (Franks, 1985). *Eciton* major-caste workers are easily recognized by their large size and long, ice-tong shaped mandibles (Gotwald et al., 1969; Figure 1).



Figure 1. An *Eciton burchelli* major-caste worker. Note the minor-caste worker in the bottom center of the photograph. Photo from Alexander Wild, alexanderwild.com.

Across scientific literature, the role which *Eciton* major-caste workers play within the colony is often speculated or assumed to be colony defense. However, while other *Eciton* castes, such as the submajor-caste workers, have been examined in detail, no scientific study to-date has studied the function of *Eciton* major-caste workers (Powell and Franks, 2006).

We propose to determine the role of major-caste workers, or “soldiers,” within *Eciton* colonies.

Hypothesis/Predictions

We hypothesize that the primary role of major-caste workers within *Eciton* colonies is defense against vertebrate threats.

We predict that *Eciton burchelli* major-caste workers will spend the greatest percentage of time observed stationary in a defensive position or moving along raiding columns, followed by defending the colony against vertebrate threats, and the least amount of time defending the colony against invertebrate threats (Figure 2).

This prediction is based upon the fact that ant mandibles are specialized for specific tasks. The ice-tong mandibles of *Eciton* major-caste workers would be unable to slice food or carry items (Gotwald et al., 1969). However, they would be highly efficient at piercing and holding vertebrate skin and flesh.

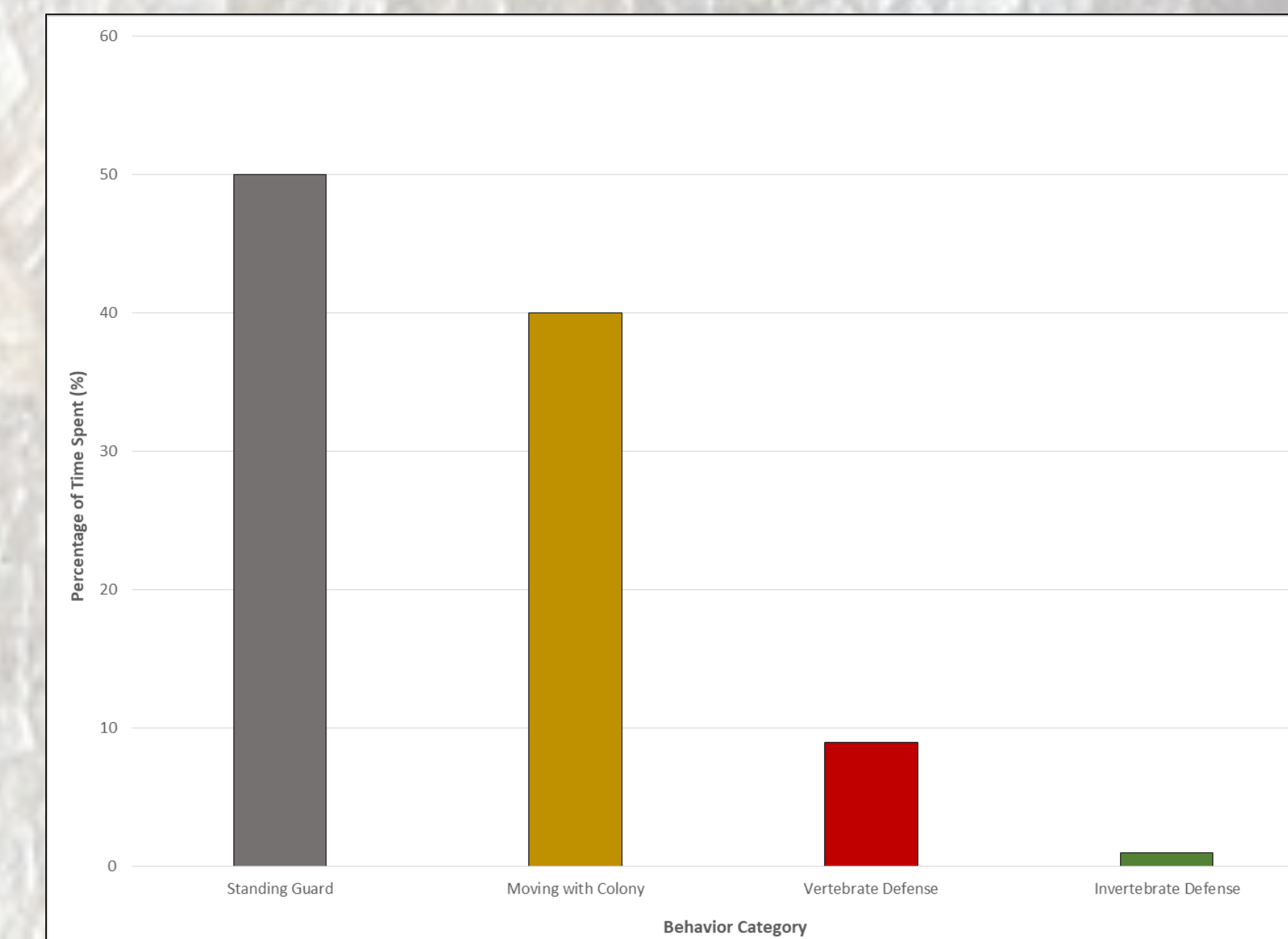


Figure 2. Prediction of *Eciton burchelli* major-caste worker time expenditure breakdown. Note that we predict percentage of time spent in vertebrate defense will be greater than percentage of time spent in invertebrate defense.

Study Design

We will conduct a field experiment on Barro Colorado Island, Panama, to observe the behavior of *Eciton burchelli* major-caste workers (Franks and Fletcher, 1983). Observations will be performed daily during June and July. At the inception of the study, a colony of *Eciton burchelli* will be located. This colony will be the target of observation until the colony relocates, at which point a new colony will be found for observation.

Each day, the colony of *Eciton burchelli* will be observed three times at three different sites along a raiding column. Raiding columns were chosen for the sites of observation due to the risk of ants only displaying behaviors in response to the presence of researchers near the nest. Sites will be determined by finding the current front of the raiding column at the start time of a given observation period (Figure 3). This location will be the site of observation for the hour as the ants continue to move past (Rettenmeyer, 1963).



Figure 3. An *Eciton burchelli* raiding column. Note the major-caste worker near the center of the photo, identifiable by the large size, pale head, and ice-tong shaped mandibles. Photo from Alexander Wild, alexanderwild.com.

Observations will be performed during three time periods daily, from 6:00-7:00, 10:30-11:30, and 15:00-16:00. This is because *Eciton burchelli* raids are only conducted during daylight (Rettenmeyer, 1963). Major-caste workers at the sites will be observed for 10 seconds every 5 minutes over the course of the hour (Human and Gordon, 1998).

Behavior of the major-caste workers during these 10-second periods will be recorded as one of four categories. This includes (1) standing guard, (2) moving with the colony, (3) defending the colony against vertebrate threats, and (4) defending the colony against invertebrate threats.

Intended Analysis

Due to the fact that our dependent variable, percentage of time, is discrete, and our independent variable, behavior category, is categorical with >2 groups, we will analyze the data collected using an Analysis of Variance Analysis, or ANOVA, test.

The results of this ANOVA test will allow us to determine the breakdown of *Eciton burchelli* major-caste worker time expenditure. Through the interpretation of these results, we can answer the fundamental question of this study by comparing time spent defending the colony against vertebrate threats to the time spent defending the colony against invertebrate threats. The proportion of time spent standing guard and moving with the colony could also provide interesting insights, as the possibility remains that the primary function of major-caste workers is the visual intimidation and discouragement of potential threats. The results of this study could extend to any *Eciton* species which exhibits major-caste workers.

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