# Species composition and habitat associations of ant communities in the Natural Areas Teaching Lab

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## Objectives

We had three primary objectives in conducting this study: 1) to compile a species list for ant communities of the NATL, 2) to identify relationships between habitat type and species presence and 3) to assess the relationships among ant species that shape community assembly. Addressing these subjects will increase our understanding of the biota associated with the oak hammock and upland pine habitats at the site and will generate an annotated species list that will complement the data on other invertebrate taxa that have already been surveyed at the NATL. Additionally, because ants are often sensitive to disturbance and changes in habitat quality, our study provides baseline data for future studies on the effects of management activities on and community composition.

## Methods

We conducted the field work for this project during summer 2005, focusing our sampling efforts on the oak hammock and upland pine sections of the NATL. Two undergraduate volunteers, Frank Bouchard and Rika Koka, assisted with both the field and laboratory components of this study. We employed pitfall traps, bait stations, litter extraction (using Winkler sacks) and hand-collecting to sample the ant community. Each of these methods produced different types of data amenable to addressing different questions.

We placed a total of 285 pitfall traps in the oak and pine habitats. These traps were placed in transects running perpendicular to the border of the tract, which also will allow us to assess the edge effects on species composition. We used 15 dram vials for our pitfall traps, which we buried flush with the soil and covered to prevent interference from rainfall. All pitfall traps were opened for 48 hr. We placed 120 bait stations in the same area that we sampled with pitfall traps. Each bait station comprised one 15 dram vial containing a small piece of Vienna sausage placed on its side on the ground. Bait stations were open for 1 hr, at which time we quickly capped the vials to trap the ants inside. We also extracted ants from litter collected from both pine and oak habitats. This entailed collecting approximately 1 L of sifted litter per sample and extracting ants with mini-Winkler sacks. We collected 35 litter samples, but our collection methods were haphazard and will not allow quantitative comparisons between habitat types. In order to accurately survey the entire community, we complemented the systematic collection using pitfall traps and litter with hand collection in all sites.

## Preliminary results

We have sorted and identified 6891 specimens from 32 species (Appendix 1). All samples were sorted in the lab and vouchers have been prepared for each species (currently held in the E.M. Bruna lab).

The pitfall traps were most useful for evenly sampling the terrestrial ant assemblages for between-habitat comparisons, and this method also generated a large

species list. Preliminary analyses indicate that species presence and abundance varied substantially between the oak hammock and pine habitats (Table 1). The pine had a higher species richness overall (22, vs. 15 in the oak) and had a higher number of species per trap (mean ± SD = 4.47 ± 1.70 for pine vs. 2.33 ± 1.17 for oak). Multiple species were unique to one habitat type.

The bait stations attracted one ant species not sampled anywhere else (*Monomorium viride*), but otherwise represented only a subsample of the species collected in the pitfall traps. The species present at the baits tended to be good competitors and were often present in very large numbers. As was the case for the pitfall traps, there appear to be a number of community-level differences between the oak hammock and pine ant communities (Table 2). Most notable is the dominance of *Solenopsis invicta* in the pine habitat but the near absence of this species in the oak forest. The dominance of this species is likely the direct cause of the lower species richness at baits in the pine (10, vs. 13 in the oak).

Several subterranean and leaf litter species that were not sampled with pitfall traps or baiting were collected from litter, including *Crematogaster minutissima*, *Eurhopalothrix floridana* and *Pyramica membranifera*. Hand-collecting also added a number of species to the list, including *Pseudomyrmex gracilis* and *Solenopsis pergandei*.

**Forthcoming work**

Species accumulation curves suggest that the final count will be somewhat higher than that presented here, but that our sampling was fairly thorough at least for terrestrial species. Processing the remaining 120 pitfall traps and ~ 15 litter samples will probably add species to the list. However, our methods were not suitable for sampling subterranean or arboreal ant species so any list generated should not be viewed as a complete inventory of the site.

Future analyses will include more detailed assessment of the relationships between habitat type and community characteristics. These analyses will address differences in diversity related to habitat and distance from the edge, patterns of dominance at baits and the effects of *Solenopsis invicta* on community diversity. We also intend to conduct correlation analysis on the abundance of species to test for non-random segregation or co-occurrence among particular pairs of species. Our final report will include the results of these analyses.

Table 1. Collection data from 120 pitfall traps run 18-20 May, 2005. Shown are the number of samples in which each species was present and the total number of individuals.

| | No. samples | | No. individuals | |
|---|---|---|---|---|
| | Oak | Pine | Oak | Pine |
| Aphaenogaster ashmeadi | 1 | 6 | 1 | 10 |
| Aphaenogaster carolinensis | 6 | 0 | 6 | 0 |
| Aphaenogaster floridana | 1 | 0 | 1 | 0 |
| Brachymyrmex depilis | 1 | 3 | 1 | 6 |
| Brachymyrmex musculus | 0 | 9 | 0 | 36 |
| Camponotus atriceps | 1 | 0 | 2 | 0 |
| Camponotus castaneus | 12 | 3 | 15 | 4 |
| Camponotus floridanus | 12 | 2 | 12 | 4 |
| Cardiocondyla emeryi | 0 | 9 | 0 | 28 |
| Crematogaster ashmeadi | 0 | 1 | 0 | 1 |
| Cyphomyrmex rimosus | 0 | 12 | 0 | 20 |
| Dorymyrmex bureni | 0 | 10 | 0 | 41 |
| Formica pallidefulva | 4 | 22 | 5 | 58 |
| Hypoponera opacior | 2 | 8 | 2 | 9 |
| Odontomachus brunneus | 21 | 17 | 25 | 22 |
| Pheidole dentata | 53 | 24 | 150 | 116 |
| Pheidole dentigula | 40 | 28 | 96 | 76 |
| Pheidole metallescens | 0 | 12 | 0 | 59 |
| Pheidole moerens | 1 | 18 | 1 | 150 |
| Pyramica eggersi | 0 | 2 | 0 | 2 |
| Pyramica sp 1 | 0 | 1 | 0 | 1 |
| Solenopsis carolinensis | 30 | 40 | 76 | 131 |
| Solenopsis invicta | 0 | 37 | 0 | 124 |
| Solenopsis nickersoni | 1 | 0 | 1 | 0 |
| Solenopsis tennesseensis | 1 | 1 | 1 | 1 |
| Trachymyrmex septentrionalis | 2 | 1 | 2 | 1 |

Table 2. Collection data from 120 bait stations run for 1 hr on 14 June, 2005. Shown are the number of samples in which each species was present and the total number of individuals.

| | No. samples | | No. individuals | |
|---|---|---|---|---|
| | Oak | Pine | Oak | Pine |
| Aphaenogaster ashmeadi | 3 | 0 | 11 | 0 |
| Aphaenogaster carolinensis | 3 | 0 | 33 | 0 |
| Camponotus atriceps | 3 | 1 | 16 | 6 |
| Camponotus floridanus | 1 | 0 | 1 | 0 |
| Cardiocondyla emeryi | 0 | 1 | 0 | 1 |
| Formica pallidefulva | 3 | 1 | 3 | 19 |
| Monomorium viride | 0 | 1 | 0 | 1 |
| Odontomachus brunneus | 4 | 1 | 10 | 1 |
| Paratrechina faisonensis | 3 | 1 | 5 | 1 |
| Pheidole dentata | 5 | 5 | 19 | 86 |
| Pheidole dentigula | 4 | 0 | 24 | 0 |
| Pheidole metallescens | 1 | 0 | 61 | 0 |
| Pheidole moerens | 11 | 8 | 457 | 168 |
| Solenopsis carolinensis | 14 | 11 | 376 | 249 |
| Solenopsis invicta | 2 | 26 | 16 | 3968 |

Appendix 1. Cumulative species list sorted by subfamily (for all collections sorted and identified as of 5 Dec, 2005).

Dolichoderinae (1 sp.)
- Dorymyrmex bureni

Formicinae (6 spp.)
- Brachymyrmex depilis
- Brachymyrmex musculus
- Camponotus castaneus
- Camponotus floridanus
- Formica pallidefulva
- Paratrechina faisonensis

Myrmecinae (22 spp.)
- Aphaenogaster ashmeadi
- Aphaenogaster carolinensis
- Aphaenogaster floridana
- Cardiocondyla emeryi
- Crematogaster ashmeadi
- Crematogaster minutissima
- Cyphomyrmex rimosus
- Eurhopalothrix floridana
- Monomorium viride
- Pheidole dentata
- Pheidole dentigula
- Pheidole metallescens
- Pheidole moerens
- Pyramica eggersi
- Pyramica membranifera
- Pyramica sp.
- Solenopsis invicta
- Solenopsis nickersoni
- Solenopsis pergandei
- Solenopsis tennesseensis
- Strumigenys louisianae
- Trachymyrmex septentrionalis

Ponerinae (2 spp.)
- Hypoponera opacior
- Odontomachus brunneus

Pseudomyrmicinae (1 spp.)
- Pseudomyrmex gracilis