



Diversity of the Leaf Litter Ant *Strumigenys* in Suburban Regions of the Three Village Area

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Abstract

The leaf litter ant *Strumigenys* is one of the most diverse ant genera in the world, encompassing every continent except Antarctica. The genus has received a great amount of attention throughout the 21st century, with research on its morphology, phylogenetic relationships, and organismal chemistry. Yet its diversity is still shown to be heavily underestimated, especially in urban and suburban regions. Complementing the investigations done in the past two years, the current study intends to provide a more comprehensive evaluation on ant biodiversity in the Three Village Area. The objective of this campaign is to show the potential presence of cryptic leaf litter and underground species and test the effectiveness of each collecting technique; the identification of such species will be performed via morphological taxonomy and DNA barcoding.

Introduction

Is there a presence of cryptic leaf litter and underground ant species (primarily *Strumigenys*) in the Three Village Area unexplored by previous studies? Do the three selected collection methods (Berlese funnels, subterranean traps, and sifting by hand) differ in effectiveness?

Hypothesis: Cryptic leaf litter and underground ant species such as *Strumigenys* are present in the Three Village Area. The three selected methods do differ in effectiveness, and this shall be assessed based on the species richness and total number of individuals collected.

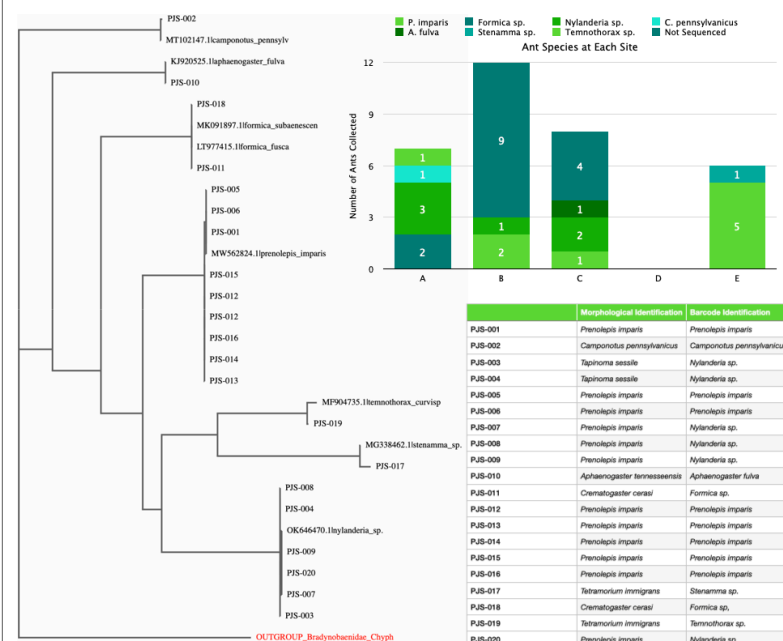
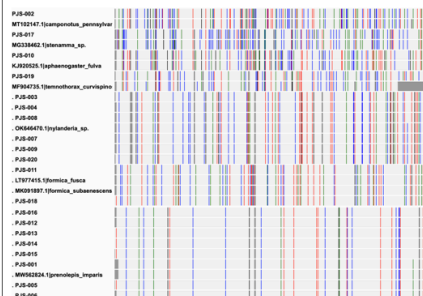
Three Village Area collection sites: school, young deciduous forest

- Sites A is wooded area often waterlogged during heavy rains.
- Sites B, C are sports areas close to the wooded campus edge.
- Sites D, E are in a neglected yard, similar to a natural deciduous forest.

Materials & Methods

- Berlese (tullgren) funnels: wet vegetation placed in funnel on top of beaker containing ethanol; heat lamp dries vegetation and forces microorganisms down into ethanol
- Subterranean traps: 15 mL falcon tubes with holes drilled at the sides close to the top; ethanol in the bottom and food attached to the cap; entire contraption placed underground; organisms attracted by food and fall into ethanol
- Hand sifting: collected vegetation spread on tinfoil plate; organisms forced out and collected
- Samples were collected, cleaned, and then transferred to ethanol vials to be stored in the freezer.
- Using a dissecting microscope the selected ants were visual identified with taxonomic keys photographed/documentated, uploaded on DNALC SampleDB.
- DNA was extracted from the samples and isolated. PCR was performed for amplification. The results were then run through gel electrophoresis with a ladder to check for successful amplification and to determine which samples could be sequenced. The results were very good for all 20 samples.
- All DNA sequences were analyzed in the DNA Subway Blue Line to evaluate nucleotide base differences with their corresponding species through BLASTN and MUSCLE.
- Neighbor-joining, maximum-likelihood phylogenetic trees were generated, and analyzed when a 100% similarity score was not achieved.

Tables & Figures



Results

- Ants belonging to the *Strumigenys* genus have not been identified in our study.
- Despite of this, our collection yielded several cryptic leaf litter or underground ant species:
- *A. fulva* - found in mesic forests and meadows. Nests are found in logs and stumps or under stones. It is a temporary host of other members of the genus.
- *Stenamma* sp. - a cryptic "leaf-litter" ant genus that occurs in mesic forest habitats throughout the Holarctic region, Central America, and part of northwestern South America
- *Temnothorax* sp. - trophic generalists, feeding on a wide variety of scavenged items; arboreal, living within hollow stems, old beetle or termite galleries, or in galls
- Sifting by hand is more efficient (collected more ants and ant species) than the other techniques. Successful collection by Berlese funnels in previous studies is not replicated.
- Compared to last year's study, this collection offered far higher ant biodiversity, suggesting the benefit of implementing multiple collection techniques and targeting poorly explored locations such as underground or vegetation.

Discussion

Due to lack of equipment and time, we were unable to measure the soil moisture at collection sites to assess its correlation with collecting efficiency. For similar reasons and its redundancy in function with Berlese funnels, we replaced Winkler extractors with the hand sifting method of collection. The surprisingly lack of *Strumigenys* ants may result from the low temperature in early spring and the disturbance of collection by frequent rain. Though not as effective in ant collection as other techniques, the Berlese funnel allowed the capture of large number of diverse microorganisms, including springtails, centipedes, mites, etc.

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