Revealing elevational distributions of ants

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Introduction

Ant species are incredibly diverse in morphology and behavior. Their diversity lets them survive in many habitats, and their distribution can be evaluated by sampling regular points on an elevational gradient, along which the environment changes drastically. Evaluating the communities of ants will help us understand how habitat changes affect ants in the future.

Methods

The survey was conducted by placing 4 replicate pitfall traps at 100 ft or 200 ft elevation intervals located at Mt. Blue, Camden Hills, the Perkins arboretum, Frye Mountain, and Kennebec Highlands.

- Pitfall traps were created by hole-punching 23-27 holes along the rims of plastic cups, and they contained about 40 ml of propylene glycol.
- Four pitfall traps with lids were placed in the ground with the holes exposed, at each elevation (2 on each side, placed 10m and 15m away from the trail).
- Pitfall traps were collected once every one to two weeks for 4 times, and separated into vials of bycatch and ants.
- Ants were pinned by using wood glue to attach the ants to small triangular pieces of paper.

Punching holes in cups was difficult

MacGown, Joe. "Aphaenogaster picea" . mississippientomologicalmuseum .org.msstate.edu

Data Analysis

A. All traps without ants were marked as 0 ants, and records from spilled traps were discarded.
B. To adjust for uneven sampling, we took averages of abundance per elevation.
C. Species counts were aggregated according to genus.
D. Data was cleaned and graphed in R.

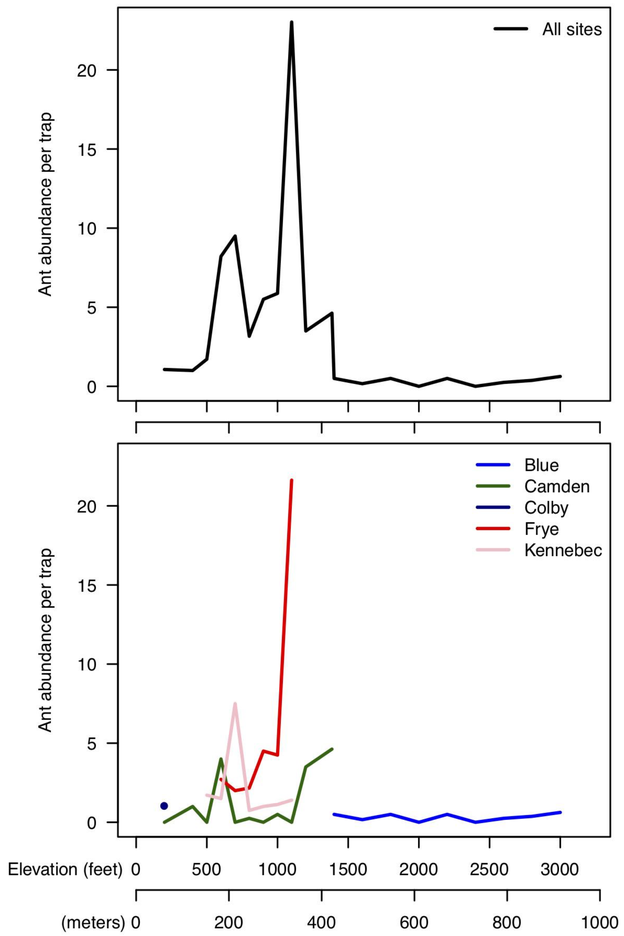


Figure 1: Ant abundance by elevation (upper) and by site (lower)

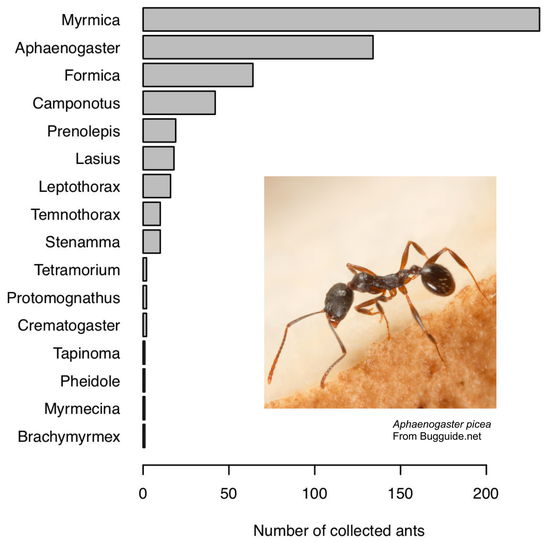
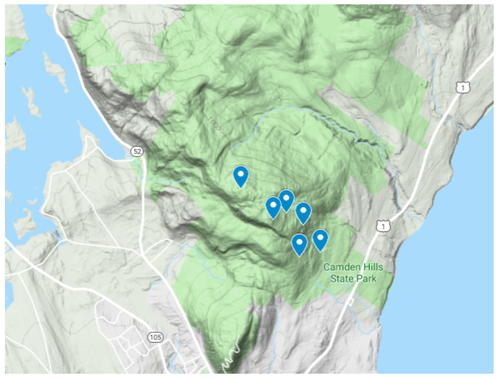


Figure 2: Ant abundance by genus

Results

Ant abundance exhibits a mid-elevational peak, where an average of 23 ants appeared in each cup on the 1100 ft elevation of Frye Mountain (Figure 1). Few ants were observed in high elevations, although only Mt. Blue was sampled in such elevations.

The rank distribution of individuals per genus(Figure 2) displayed a characteristic concave curve. *Myrmica* was the most frequently caught genus, but *Aphaenogaster picea* has the highest count on the species level.



Pitfall sites of Camden Hills (sites on Mt. Blue and Frye Mountain follow the same pattern, not shown due to space limit)

Conclusions

The patterns shown in the data were well-anticipated using ecological experience and knowledge of elevational gradients.

- **Abundance by elevation:** It seems that ants are rarer in high elevations, perhaps due to the changes in temperature and plant composition. As ants are known to be most active in warm environments, we can anticipate that they would be collected most at lower elevations. However, the graphs may be misleading due to the differences between mountain sites. For instance, the largest peak in Figure 1 was an anomaly due to some other biological factor such as proximity to a colony of species that exists in high abundance, or proximity to a major food source. The data can also be interpreted as peaking in intermediate elevations, potentially due to the mid-domain effect.
- **Abundance of species:** As expected, a few genera dominate a region, and there are many rare genera. The data fit a hollow curve well. Further investigations may reveal the strategies of rare species and the reasons that common species are so abundant.

The ant team atop Camden Hills