The Impact of Food Availability on Ant Species in Fields vs. Suburban Areas on Long Island Using DNA Barcoding

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Abstract

Anthropogenic activity and resource availability heavily influence ant distribution. We trapped ants in rural fields and suburban areas using various food baits to measure abundance and preferences. *Tapinoma sessile* dominated suburban areas due to its attraction to human foods and artificial sugars, whereas *Temnothorax curvispinosus* preferred open, rural habitats. Our findings demonstrate that human-introduced food sources in suburban ecosystems significantly alter local ant abundance and behavior.

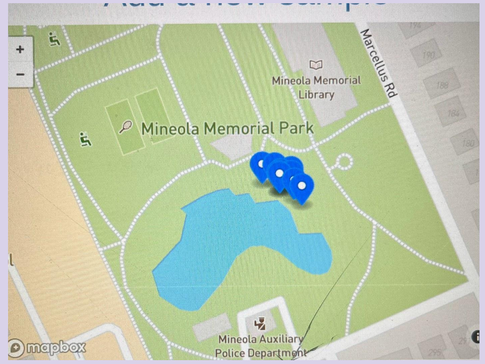
Introduction

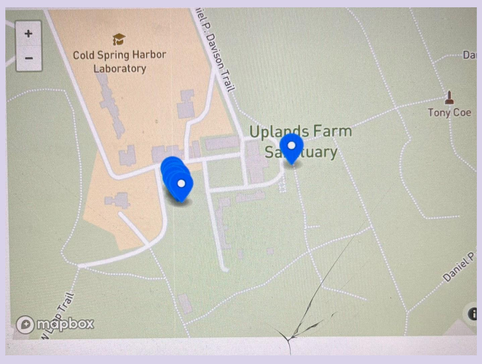
As "ecosystem engineers," ants are ecologically significant species that shape environments through seed dispersal, soil aeration, and nutrient cycling (Turns, 2022). While their flexible diets drive their evolutionary success, accelerating urbanization has altered natural ecosystems by introducing human food waste and processed foods (City Life, 2026). For instance, urban ants in Manhattan exhibit specific carbon signatures associated with processed human diets, confirming a direct link between human activity and ant foraging habits (Penick 2015).

This study compared ant species diversity and feeding preferences between rural fields and suburban parks to determine how food availability influences local populations. Understanding these dynamics provides insight into the broader ecological impacts of human development. We hypothesized that field-dwelling ants prefer natural food sources, whereas suburban ants prefer processed, human-introduced foods.

Food Type	Bait	Uplands Farm (field)	Memorial Park (suburban)
Sweet	Candy (processed)	*Lasius neoniger* (4)	
	Maple Syrup (natural)		*Lasius neoniger* (2), *Tapinoma sessile* (6)
Protein	Beef Jerky (processed)		
	Worms (natural)		
Fat	Peanut Butter (processed)		
	Organic Walnuts (natural)	*Temnothorax curvispinosus* (5)	

Figure 7. Ant species collected in each type of pitfall trap.





Figures 1 and 2. Samples 1-9 from Cold Spring Harbor, Uplands Farm Sanctuary (left) and Samples 11-20 Memorial Park, Mineola (right)

Results

Lasius neoniger and *Temnothorax curvispinous* were found at Uplands Farm (field) and *Lasius neoniger* and *Tapinoma sessile* were found at Memorial Park (suburban) for a total of 17 successfully barcoded samples (Figure 7). Ants were not collected in every pitfall trap; there were 7 traps without any ants in them at all, and the only traps that had ants were the maple syrup trap, the hard candy, and the walnut trap.

Methods and Materials

Ants were collected in late March and early April from Uplands Farm Sanctuary, Cold Spring Harbor (field) and Memorial Park, Mineola (suburban) (Figures 1 and 2). To ensure consistency, Uplands Farm samples were taken from similar ground cover, such as leaf litter and tree bases. At both sites, pitfall traps containing 3 mL of 70% ethanol were spaced 5 meters apart for unbiased sampling (Figure 8 and 9). Traps were baited with three resource categories: proteins (beef jerky, dead worms), fats (peanut butter, walnuts), and sweets (hard candy, maple syrup). Ants were photographed (Figures 3 and 4), with the help of iNaturalist to identify each species. DNA was isolated from the ant using a Chelex isolation method. PCR amplification was performed on the COI region and gel electrophoresis was used to confirm successful amplification (Figure 5 and 6). DNA Subway was used to compare the sample sequence against known sequences in genetic databases, and all species were successfully identified.

References

Figure 8. Image of Finished Pitfall traps

Figure 9. Process of planting pitfall traps

Figure 3. Microscopic view of CSH Ant, *Temnothorax curvispinous*

Figure 4. Microscope view of Mineola Ant, *Lasius neoniger*

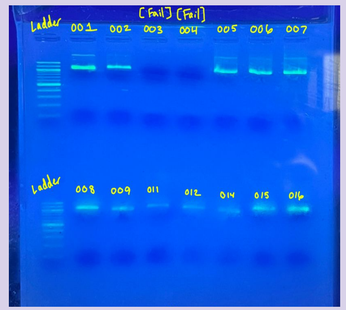


Figure 5. Gel electrophoresis results for DQW 001-016

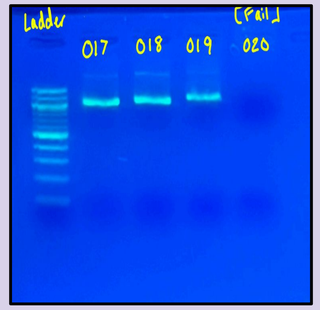


Figure 6. Gel electrophoresis for DQW 017-020.

Discussion

Species richness was equal between environments (two species each). Both habitats attracted *Lasius neoniger*, but *Temnothorax curvispinosus* was exclusive to the field (Uplands Farm) and *Tapinoma sessile* to the suburban park (Memorial Park). These distributions align with known behaviors: *T. sessile* thrives near human activity and artificial sugars (Buczkowski et al.), while the "acorn ant" *T. curvispinosus* naturally targets woodland resources like the walnut bait.

Our primary hurdle was data collection, as several empty traps delayed the process and limited consistent sampling. While urbanization typically reduces native diversity (Salyer et al., 2014), we observed no differences in richness. Future studies should expand across a broader environmental gradient (e.g., forests, urban centers) using more traps, varied baits, and a longer collection period to better capture shifting diversity patterns.

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