

Investigating Native and Invasive Ant Communities in College Station, Texas

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Abstract: The purpose of this study was to examine the diversity of ant species and determine the prevalence of invasive and native ant species in College Station, Texas. Different types of bait were placed in various urban landscapes at regular time intervals for five weeks. Of the six ant species collected, the Red Imported Fire Ant (*Solenopsis invicta*) was the most common species in all areas except the residence halls. This is most likely because inhabited areas are frequently treated with insecticides to control fire ant populations. Lastly, areas with the highest amount of human activity exhibited the lowest species diversity as a result of the negative effects of urbanization. Among the two invasive ant species collected, the tawny crazy ant (*Nylanderia fulva*) was detected, which represents the first documented case of this invasive ant in Brazos County.

Keywords: Red Imported Fire Ant (*Solenopsis invicta*), Tawny Crazy Ant (*Nylanderia fulva*), Species Diversity, Native Ants, Invasive Ants

Environments in Texas have long been overrun by invasive ant species, which have been displacing native ant species for years. The experiment specifically examined which ant species are prevalent in the College Station area. This is significant, because if invasive ant species are predominant, the impact on the environment would be profound. Fire ants alone lead to the death to many living things, and can damage both environmental areas and human infrastructure, costing millions (Vinson 2013). Native ants, on the other hand, are preferable, because they have natural predators that can control both their populations and their impact on the environment.

Several native ant species are known to reside in Texas, such as the pyramid ant (*Dorymyrmex* spp.), the bigheaded ant (*Pheidole* spp.), the acrobat ant (*Crematogaster* spp.), the odorous house ant (*Tapinoma sessile*), and the little black ant (*Monomorium minimum* spp.) (Lennon). However, there are several non-native ant species present. This includes the argentine

ant (*Iridomyrmex humilis*), the ghost ant (*Tapinoma melanocephalum*), the fire ant (*Solenopsis invicta*), and the tawny crazy ant (*Nylanderia fulva*) (Lennon).

At the time this experiment was started, the tawny crazy ant invasion had not yet reached the College Station area according to Dr. Robert Puckett, Assistant Professor and Extension Specialist at the Texas A&M Department of Entomology (Puckett 2015). The presence of the *N. fulva* would not bode well for the environment because of their aggressive behavior towards other ant species, the way they invade human residences and outdoor machinery, and their ability to attain high numbers in a single population (Zhang et al. 2015).

The objectives for this study were to 1) examine the diversity of native ant species in the College Station area, 2) evaluate the percentage of native to non-native ants, and 3) test the hypothesis that invasive ant species have displaced native ants in various local ecosystems. The methods used for this experiment involved preparing three different

types of bait on index cards and placing them in different environments. The collection method was modeled after a previous study examining ant abundance along an urbanization gradient (Buczowski and Richmond 2012). Using different types of bait and examining more than one area ensured that the bait appealed to a wide variety of ant species and that we obtained a large sampling area. A large and diverse collection of specimens gives us more accurate conclusions relative to the total population in our habitats. One method of collection that was not utilized in this experiment was using a turkey baster to manually collect ants from the surrounding

Materials and Methods

This study was conducted at four locations in College Station, Texas using peanut butter, corn syrup, and hot dog chunks as bait. The places were chosen to represent different environments: an inhabited area, a grassy field, a forested area, and an aquatic environment. The food items were placed individually on index cards and situated in the following four locations: near the Lechner and McFadden residence halls, Spence Park, the White Creek greenbelt, and the pond near the Texas A&M golf course. When collecting data, the note cards were placed in the given location for two hours at any time of day and frozen afterwards. The ants were collected three times a week from October to November 2015.

For the first three weeks of collection, the species found in each area were not recorded. Instead, the ant was recorded as either a fire ant or a native ant. However, the collection records were more specific for the last two weeks because of guidance from an expert in the field. Ants were enumerated and identified with the consultation of Dr. Robert Puckett. Species diversity and evenness were analyzed using the Shannon-Wiener index (Beals 2000).

environment. This method was not used in the interest of keeping the disruption to the surrounding ecosystem at a minimum. In addition, collecting ants by means of the bait gave us results that were more indicative of the natural environment found at each of our habitats. When looking at the number of native versus invasive ant species present in a habitat, the bait left out for a period of time allowed ants from a wider area to be collected. The turkey baster method would likely have concentrated on a single ant species, which was too specific for the study's purpose of examining species abundance in a habitat.

Results

Six total ant species were found in the College Station area, two of them invasive. The fire ant was the most common species collected. However, areas that saw human activity such as the residence halls and Spence Park exhibited fewer of fire ants than relatively untouched areas, namely White Creek and the pond. Each environment was home to two or three species of ants.

The residence halls exhibited a low percentage of fire ants compared to the other three collection sites, as shown in Figure 1. Instead, the predominant ant species was the bigheaded ant (*Pheidole* spp.). The fire ant (*Solenopsis invicta*) was the most prevalent species in Spence Park, but the odorous house ant (*Pheidole* spp.) comprises a significant portion of the ants, accounting for over a quarter of the ants in the area. Also, Spence Park does not have the species richness of the other three locations, being home to only two species instead of three.

The majority of the ants that inhabited White Creek were fire ants (*S. invicta*), as illustrated by Figure 1. Two tawny crazy ants (*Nylanderia fulva*) were found at White Creek as well. At the pond, the fire ant was again the main species. A fifth of the total ant species collected were native, with a relatively equal number of odorous house

ants (*Pheidole* spp.) and acrobat ants (*Crematogaster* spp.).

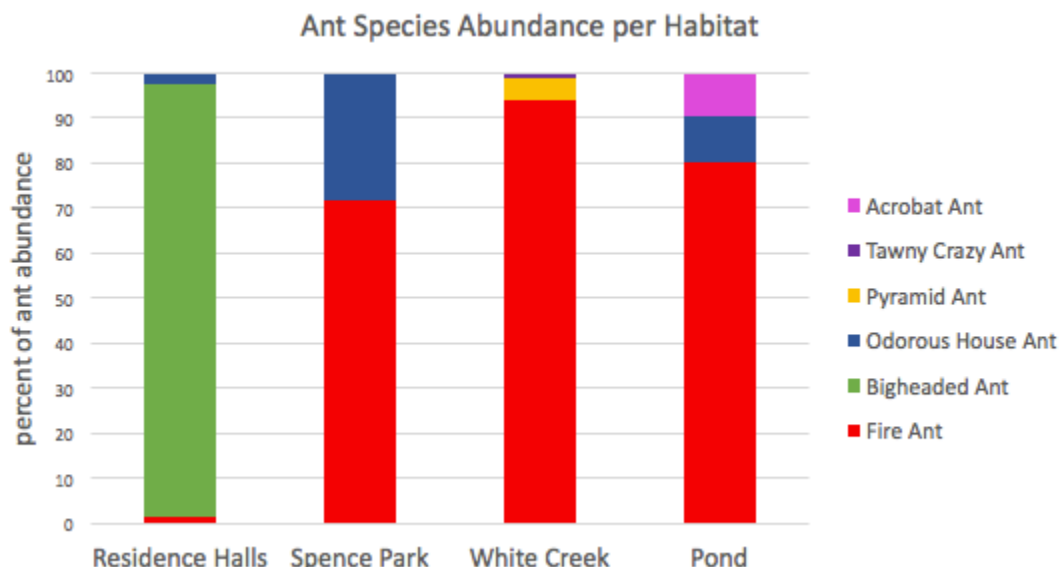


Fig. 1. The abundance of ant species in four different habitats in the College Station area

At the residence halls, the ant species diversity was 0.192 with a species evenness of 0.175. Spence Park exhibited a diversity of 0.597 and an evenness of 0.861. White Creek had a diversity of 0.202 with an evenness of 0.184. The pond showed a diversity of 0.640 and an evenness of 0.583. The pond had the greatest species diversity, and the residence halls showed the lowest diversity. Spence Park had the most equitable distribution of ant species, and the residence halls had the least.

Discussion

In the experiment, the fire ant (*Solenopsis invicta*) was the primary ant species in College Station. However, multiple native species were present in the various habitats. In the area surrounding the residence halls, a greater proportion of the bigheaded ant was found in relation to fire ants. This could be the result of insecticides used to target *S. invicta*, especially given that the area is inhabited by humans. Fire ants usually reside in areas near people and animals such as lawns, schoolyards, parks and golf courses and places with moisture and near homes where food is readily

available (Puckett 2015). All of the areas selected for this experiment are favorable environments for fire ants, but there are discrepancies in the amount of diversity found at each particular habitat. Urbanization has negative long-term effects on ant diversity (Buczowski and Richmond 2012), which is why the residence halls exhibited the lowest diversity. On the other hand, the pond is relatively untouched by humans and, therefore, yielded a higher diversity.

While evaluating the abundance and diversity of ant species, the study detected the first tawny crazy ant (*Nylanderia fulva*) in College Station, Texas. A relatively small number of the species was found at White Creek, indicating that their arrival is fairly recent. The tawny crazy ant, also called the raspberry crazy ant, is a new ecologically-dominant species that is invading the southeastern United States (Lebrun 2013). The tawny crazy ant is in the process of displacing the fire ant (*S. invicta*) through biological means. *N. fulva* excretes formic acid from its abdomen, neutralizing the venom of *S. invicta* and acts as an effective defensive technique (Lebrun 2014). This allows the *N. fulva* worker ants to

outcompete both invasive and native ant species for resources and territory (Zhang et al. 2015). They are already causing irritation to inhabitants and significant damage to electrical equipment in local places such as the suburbs of Houston, as well as Mississippi, Alabama, Louisiana, Florida and Georgia (The University of Texas at Austin 2013). The tawny crazy ant does not react to the poisonous baits used to control fire ant populations and are easily transportable by humans via cars (The University of Texas at Austin 2013), so students driving from Houston to Texas A&M University could potentially be helping the invasive species to

spread geographically. As tawny crazy ants continue to grow in number in College Station, fire ants will likely be displaced as the most common ant in the area.

While collecting the ants, there may have been minor errors in identifying the ants during the first three weeks before we had the guidance of Dr. Puckett. Another possible source of error may have occurred while counting the ants. Because the baits used for the experiment were incredibly viscous, ants would clump together in the peanut butter or corn starch, making an exact count difficult.

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