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SPATIAL DISTRIBUTION AND DENSITY OF *NYLANDERIA PUBENS* (HYMENOPTERA: FORMICIDAE) ON URBAN LOTS

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Abstract The tropical and subtropical super colony tramp ant, *Nylanderia pubens*, the Caribbean crazy ant (CCA), was originally described from the Greater Antilles Islands and now has spread throughout the Caribbean and South America. In 1950, CCA was first reported in Florida and now is spread throughout the state and along the Gulf of Mexico coast. These ants invade areas; spreading out across large regions and disrupting natural ecosystems. In order to better control these pest ants, we need to understand their spatial dynamics in their habitat. This study examined the spatial distribution and density of CCA on urban lots in North Central Florida. The ant population was sampled on two urban lots over the course of a year. In late March and April, CCA were found in discrete areas around the lots. As the season progressed through July and August and the temperature increased, the infestation spread from the initial focal points to broader areas. The number of ants at each location also increased. In late September and October, the infestation became less broad. The number of ants at each location also decreased as temperature decreased. These results demonstrate the rapid growth in population range and size during warm months, and indicate that control strategies should begin early in the year to prevent the spread of the infestation.
Key Words Caribbean Crazy Ants, spatial dynamics, urban environments, ant management

INTRODUCTION

Exotic ants can cause disruption in an ecosystem and can be expensive to control (Vitousek et al., 1996; McGlynn, 1999; Abbott 2006). Many of the invasive ants form super colonies. A super colony is a defined as ,a unicolony that is polygynus (multiple queens), polydomous (multiple nest entrances), and the workers do not show any aggression between nests (Holldobler and Wilson, 1990).

Caribbean crazy ants (Nylanderia pubens) (CCA) are exotic ants that invaded Florida and the United States in the 1950's from the Antilles Islands (McGlynn, 1999). These ants form large super colonies and have become a major pest species infesting urban and farm areas (MacGown and Layton, 2010). Caribbean crazy ant control with both baits and residual pesticides has proven to be ineffective (MacGown and Layton, 2010).

Understanding the population dynamics for this ant in urban areas is the first step in designing an efficient control strategy. This paper reports a field study of the spatial dynamics of CCA infestations on two urban lots. The infestations were monitored following the densities and the focal points over the year.

MATERIALS AND METHODS

Two urban lots were chosen for the study; one in Gainesville, FL and one in Citra, FL. The lots were gridded out in four by four meter squares. At each vertex, a marker was placed. The location in Gainesville is a recreational park, in which a 880-m2 CCA-infested area was marked as a sampling site. In Citra, the sampling boundaries were set by using a portion of the developed landscape; using the house as the center point.

The lots were sampled bi-weekly to determine where the ants were foraging. Sampling was done by placing a 7.5 by 5.5 cm index card with approximately 5 mL (1 teaspoon) of honey as flat as possible on the ground at

each grid vertex. After 30 minutes, pictures were taken of the cards with a digital camera (Sony Cyber-shot, 8.1 mega-pixels). The sampling cards were collected and removed from the property after sampling was finished. The pictures were downloaded to a computer, and the ants were identified and counted on the pictures projected on the computer screen. The procedure allowed the pictures to be magnified as needed to allow better discrimination of the ant species or separate individuals.

Data Analysis

Density is defined as the total number of ants divided by the total sampling area. The CCA density at each location was calculated and graphed by the date. For construction of graphs of the ant populations over time, the data was smoothed by using a three- point moving average, which provided a better representation of the ant population progression, minimizing extreme variations due to temporal factors such as extreme temperature and precipitation patterns. Comparisons of the ant populations at different sites were made visually using the prepared graphs. The spatial distribution was compared using surface graphs made in Excel (Microsoft Corp, Redmond, Wash), and representing the ant density at sampling sites throughout the plots.

RESULTS AND DISCUSSION

In both locations, the density of ants was low in April when temperatures were low (Figure 1). During this time, there is probably little if any brood production, so gathering of resources is in a limited area. First foraging ants were observed in discrete areas on the lots (Figure 2a). The densities escalated and reached their peaks in late July through early September. The Gainesville lot peaked earlier in the end of July and early August and the Citra lot peaked in early and mid- August. This is most likely due to differing weather conditions at each location. During the peak times, the spatial distribution of the ants also increased and ants were found at high number across the lots (Figure 2b). This is the time of year when the ant queens are expected to be producing the most brood and causing the colonies to expand and search more extensively for food resources.

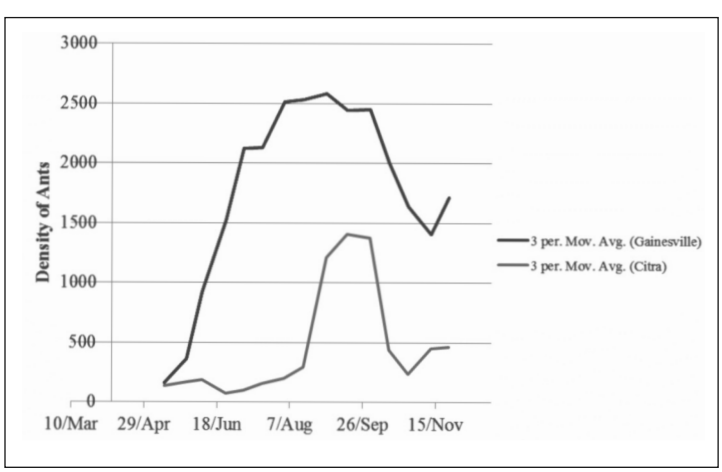

Figure 1. Density of Caribbean crazy ants on two urban lots in Gainesville and Citra, Florida, USA during 2010.

This data suggest that treatments for CCA should be done early in the season rather than later in the season. Figure 2a show that early in the season a pest control technician would only have to treat approximately 22% of the lot as compared to 88% of the lot late in the season (Figure 2b). The early treatment would stop the movement of the infestation and reduce the amount of pesticide that would have to be applied. The data also shows that pesticide applications can be stopped in the middle to end of September (Figure 1). The ants are naturally dying off, and no need to use extra pesticide.

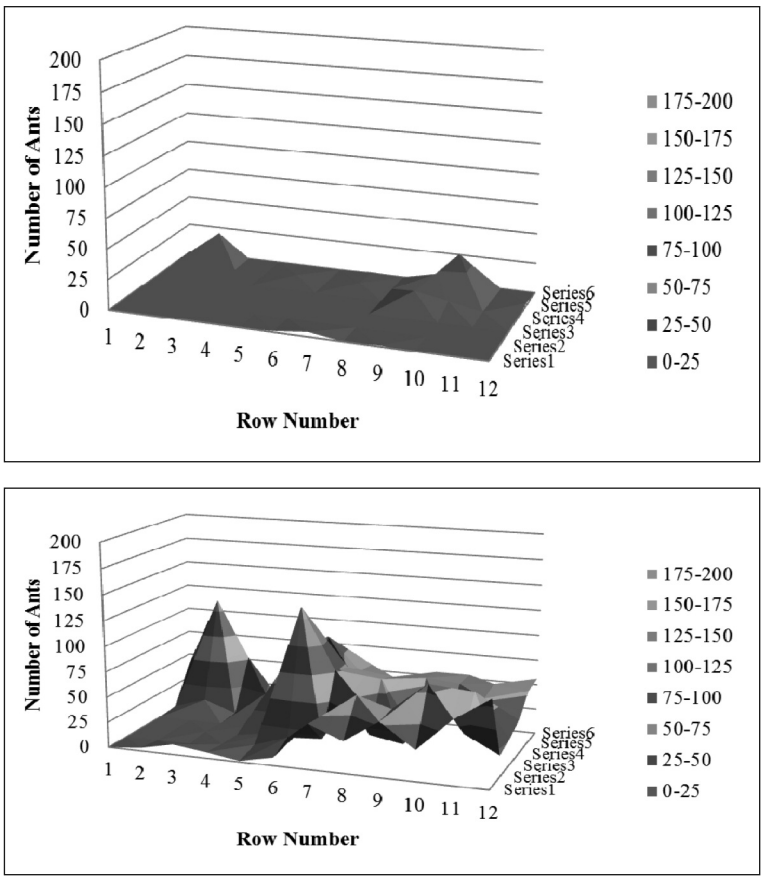

Figure 2. Distribution of Caribbean crazy ants on the lot Gainesville, FL, USA, at low ant density points on Apr/26/2010 (a) and in mid season with widespread distribution on Aug/16/2010 (b).

Understanding the population dynamics and spatial distribution of a pest is a valuable tool in designing an efficient control strategy. In general, super colony ants are hard to control, but targeted applications of pesticide early in the season could help effectively control an ant population.

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