

# Update

NPMA LIBRARY UPDATE

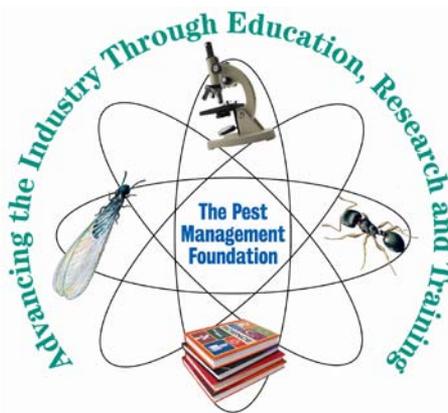
JULY/AUGUST  
2010

Insert this update into the NPMA Pest Management Library, which can be purchased from the Resource Center. Phone: (703) 352-NPMA (6762); Fax: (703) 352-3031

## Understanding Reproductive Strategies and Colony Relatedness to Enhance Control of the **ASIAN NEEDLE ANT, *PACHYCONDYLA CHINENSIS* (EMERY), A STINGING INVASIVE ANT OF MEDICAL IMPORTANCE**

**By Andrew S. Tebeau, Patricia A. Zungoli and Eric P. Benson**  
Department of Entomology, Soils and Plant Sciences  
Clemson University

The Asian needle ant, *Pachycondyla chinensis*, (Emery), is native to Southeast Asia and Japan. It was first documented in Georgia in 1932, and also was discovered in North Carolina, Virginia and the District of Columbia at about the same time. While the ant has been established in the United States for a long time, it is a relatively new pest problem. The ant's distribution was patchy when it was first recorded, and if it was considered as more than a novelty at that time, there is no record of it achieving pest status until approximately six years ago when it was found in South Carolina. Since then we have also documented it from Tennessee and Ala-



## NPMA LIBRARY UPDATE

bama. Asian needle ant populations are locally abundant in the habitats where they occur.

It now is considered a pest for two primary reasons. It has a potent sting and it displaces native ant species in both urban and forested habitats. The medical and ecological implications of the Asian needle ant justified further investigation.

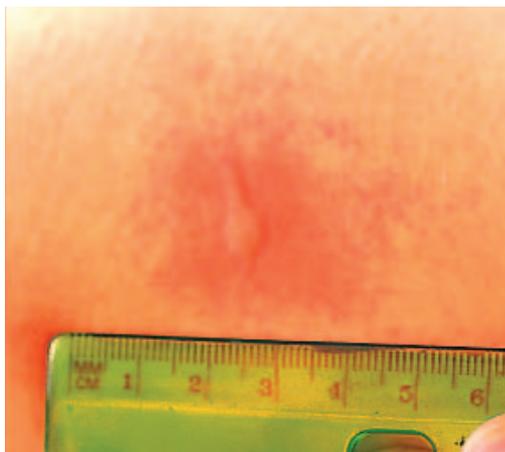
The Asian needle ant sting results in minor to intense pain with temporary to prolonged swelling and itching. The pain often is described as ending only to return over a period of several hours. Anaphylaxis has been documented in three sting victims in the United States; in all cases the single or multiple stings were the result of a single ant. There also are accounts in the literature of allergic reactions to Asian needle ants including anaphylaxis in Korea and Japan. Stings typically occur when ants get trapped in clothing or when being brushed off the skin. Unlike fire ants, these ants are not aggressive unless threatened, and stings by multiple ants are not expected unless a person is in direct contact with a nest site.

The results of ecological research indicate that the Asian needle ant competes with and displaces native species. Ant species expected to occur were absent when the Asian needle was present. It nests in damp areas in soil beneath rocks, mulch, leaf debris and landscape objects, and in logs and tree

stumps. In locations where it is well established, it is found under nearly all man-made objects in yards. It was not found in open areas such as lawns and is not expected to compete with fire ants for this reason. The size of nest populations in our study ranged from 39 workers up to nearly 6,000 with 0 to 37 queens. In a Japanese study in the Asian needle ant's native range, colonies were smaller averaging about 32 workers each. These data indicate that the Asian needle ant may become a true invasive species in North America. Typically, invasive species have larger populations in their non-native environment due to the lack of competition and natural enemies.

In South Carolina, Asian needle ant workers are active from March through October with swarming beginning in May, peaking in July and declining rapidly into September. Workers and swarmers do not typically enter buildings in large numbers, but isolated occurrences of a few ants coming indoors are common.

The research funded by the Pest Management Foundation and presented here was conducted to gain a better understanding of the reproductive strategies and relatedness of Asian needle ant colonies through the use of DNA analysis. This was interesting scientifically, but also important from a practical standpoint. Understanding the relationship between colonies and nest sites provides us



*Photos by Eric Paysen.*



*Photo by Eric Paysen.*

with a foundation for developing targeted management strategies.

Microsatellite markers were used to evaluate inbreeding, population structure, relatedness, and mating frequency of the Asian needle ant including inter- and intra-colony relatedness to explore the possibility of unicoloniality. Twenty-one colonies from six locations in South Carolina were collected for analysis in this study. The six locations were separated by a minimum of three miles and a maximum distance of approximately 110 miles. Colony sizes were small ranging between 17 and 165 workers with an average of 78.5. Queen numbers were between 0 and 25 with an average of 4.9. Multiple queens were found in 33% of the colonies. Multiple nest sites for a single colony, polydomy, were determined for 52% of the colonies. The population structure was determined to be made up of eight distinct populations in the six locations. At two

locations the samples were collected from two separate populations. At one of these sampling locations, nests were intermixed between two populations. Estimations of reproductive migration between populations were low. When tested, nests in local populations were genetically similar and no more related to themselves than to neighboring nests. In this study, nestmate queens were not equally related to the offspring. This may be due to either a dominant queen producing more offspring or queens moving from adjacent colonies. Results indicate high inbreeding caused by within nest mating, suggesting that reproductives were not moving at a high rate between geographic locations, but more frequently between closely spaced nests. This is expected if alate ants are not swarming far from their original nest site. Based on DNA analysis of the sperm storage organ in females, the spermatheca, some queens mate with multiple males. Within a

NPMA  
LIBRARY  
UPDATE



*Photo by Eric Paysen.*

location, nests were not genetically different from neighboring nests, but on a global scale, unicoloniality was not indicated based on relatedness.

These data relate to development of management strategies for the Asian needle ant in several ways. In an earlier study, only minimal control was achieved after application of a perimeter treatment combined with a targeted treatment to nest sites close to the homes. The treatment strategy was not effective in significantly reducing the number of Asian needle ants captured. Although the treatment also targeted nest sites, it was not sufficient in reaching the numerous nest sites of these ants when dealing with a large local population. From other studies and in the one presented here, we know that Asian needle ants in urban settings are found in moist habitats under mulch, leaf debris and man-made objects, and that locally, colonies are genetically related with ants able to move freely between nest sites. This information indicates that applications of bait around nest sites may be more effective than liquid treatments since it can be difficult to identify and treat all nest sites when they are abundant. If ants are related and moving between adjacent sites the opportunity for bait to be spread from one site to another is increased and ants located in undetected nests close to the baiting site would be more likely to access and feed on the toxicant. We are beginning studies on bait control of the Asian needle ant with an emphasis on seasonal food preferences and preferred bait texture. Careful and thorough inspection to identify as many nest sites as possible will be an important part of any management program. 🐜