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WHY DO CERTAIN ANTS THRIVE IN THE URBAN ENVIRONMENT?

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Abstract Of the nearly 10,000 known ant species, less than 100 are considered pests and fewer than 30 have adapted to urban disturbance. Some species, such as the Pharaoh's ant have a truly cosmopolitan distribution, nesting in and out of doors in tropical climates and only indoors in temperate climates. Most urban ants require moist nesting substrates, found primarily outdoors, thereby considerably narrowing their range to that within suitable climates. The success of the most serious urban pest ants is most likely due to a combination of limited intraspecific aggression, a possible consequence of reduced genetic diversity following escape from the native range, and release from ecological constraints. I will review the behavioral and ecological determinants that are thought to be responsible for the broad distribution and success of urban pest ants.
Key Words Urban ants, tramp species, invasive species, behavior, ecology

INTRODUCTION

This is an exciting and important period for research on urban ants at many levels of investigation. Along with the relatively rapid and far-reaching worldwide distribution of goods and services has spread an ever-increasing number of ant species adapted to anthropogenic disturbance and dependent on humans for their dispersal. While most of the ants found in and around residences and industrial setting are local species, and are a minor nuisance and relatively easy to control if necessary, an increasing array of exotic tramp ant species are encountered by pest management professionals, which in many cases have proved refractory to prevailing management strategies. Here, I will review the behavioral and ecological determinants that are thought to be responsible for the broad distribution and success of urban pest ants.

DISCUSSION

A small but important subset of these tramp species cause problems well beyond the urban residence or food processing plant. These invasive ants have disrupted native ant and other arthropod communities and their negative impact is evident across trophic levels through the elimination of rare pollinators, seed dispersers and predators. Because these ants consume honeydew produced by homopterans, they are considered serious agricultural pests as their hompteran-tending activity interferes with biological control practices. Once established, invasive ants have proven difficult to control and virtually impossible to eradicate. Obtaining a better understanding of the causes and consequences of ant invasions remains crucial to achieving the ultimate goal of reducing problems associated with these invaders. The widespread success of ants stems, in large part, from their elaborate social behavior. This feature as well as their being among the most successful taxa of invasive organisms has attracted considerable attention from ecologists, behavioral biologists and agricultural entomologists. Therefore, information derived from this cadre of investigators should benefit the urban insect management specialist as well. Figure 1 lists urban ant species with subsets of tramp and invasive species and was taken from Smith (1965), Passera (1994), Holway et al. (2002), and Na and Lee (2001).

A feature shared by many urban tramp ants is that the populations are unicolonial, that is, they form expansive and multiple queened colonies. These supercolonies lack distinct behavioral boundaries among physically separate nest and can span hundreds to thousands of kilometers (Tsutsui et al., 2000; Giraud et al., 2002). It has been suggested that unicoloniality allows species such as *L. humile*, *W. auropunctata* and *P. megacephala* to become locally abundant and consequently dominate the native ant community.

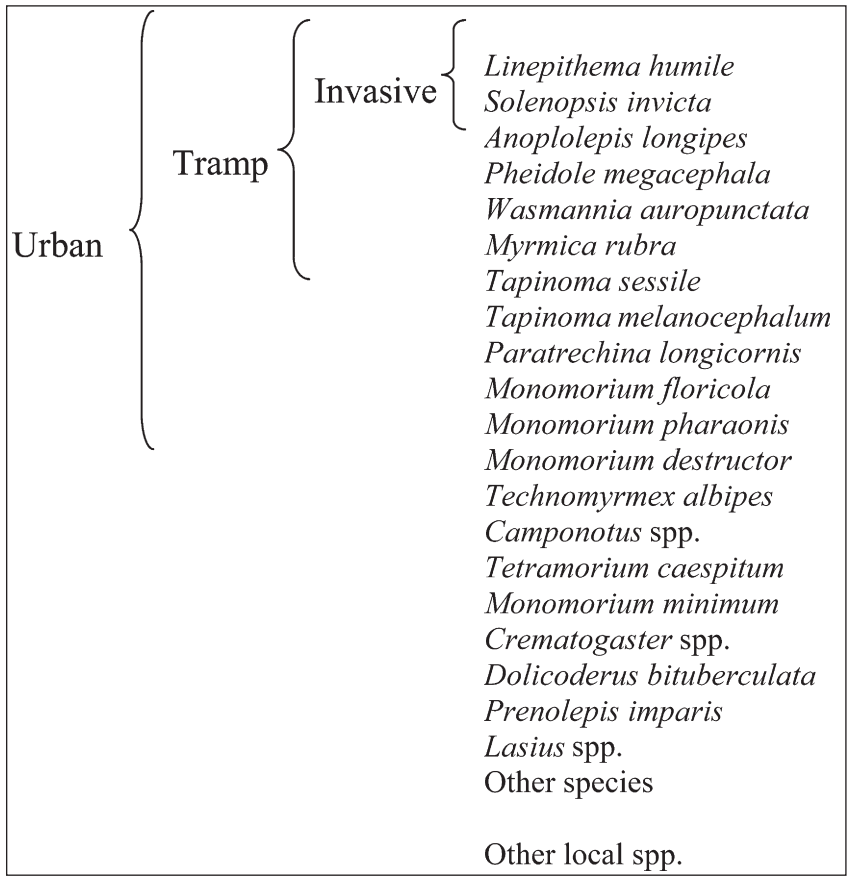

Figure 1. List of the species of urban ants of major worldwide importance.

While by no means unique to the urban ant complex, urban ant species are omnivorous. They opportunistically consume live and dead animals and harvest carbohydrate-rich plant and insect exudates. Homopteran honeydew may be a consistent and high quality energy source that supports colony growth and high worker numbers, which may contribute to their local dominance. Omnivory and opportunistic foraging also bring these ants into human dwellings where a variety of foods may persist for varying periods.

Urban tramp ants are also distinguished by the relative importance of human-mediated vs. natural dispersal. In populations of some urban ants (e.g. *L. humile*, *M. pharaonis*) winged dispersal of female reproductive forms is rare or absent and colonies often reproduce by budding. *Tapinoma sessile* disperses both by nuptial flights and budding.

Many urban ants have general and somewhat flexible nesting habits, which allows them to associate closely with humans. This vagile behavior allows colonies to vacate an area in response to physical disturbance or insecticide applications, or to exploit favorable sites where food may be near at hand. Polydomy, where all nests function in an apparently cooperative fashion, is evident in many urban species, including satellite nests of the non-tramp *Camponotus* species. This structure not only helps resist colony extinction under unfavorable abiotic conditions, but also allows the colony to secure and protect resources in a larger area (e.g. *Lasius* [Traniello and Levings, 1986]). In those species with dependent (non-claustral) colony foundation small propagules commonly fail because queens lack sufficient metabolic reserves. Queens are not even necessary for successful colony establishment in some urban ant species. Argentine ant and Pharaoh's ant workers can rear eggs and early instar larvae into sexuals (Edwards, 1987; Passera et al., 1988)

Urban ants vary in their requirements for human habitat disturbance for successful establishment. One extreme features many of the *Camponotus* species that thrive in undisturbed forests. These ants may or may not abandon their nests when a building is erected. On the opposite end of the scale of human dependence is *M. pharaonis*, which are rarely found outside human structures. While many urban ants will co-exist with non-urban species, some such as *L. humile*, *A. longipes* and to a lesser extent *S. invicta*, dominate the landscape driving out other ants (Ward, 1987; Porter and Sauvignon, 1990).

Based on the limited information from *S. invicta* and *L. humile* (Ross et al., 1996; Tsutsui et al., 2000), some introduced urban ant population have reduced genetic diversity compared to populations from the native range, consequently genetically different individuals are rarely encountered and therefore intraspecific aggression seldom occurs. Colonies may become large and pestiferous because unicolonial species do not defend territorial boundaries against conspeciifcs. Therefore they can allocate workers to secure resources for worker production rather than colony defense (Macom and Porter, 1996).

The challenge before us is to further delimit the conditions mediating the success of the increasing number of ant species that thrive in our urban settings. A thorough understanding of these ecological and behavioral determinants will pave the way for the development of novel effective IPM systems that reduce potential human health risks and minimize adverse environmental in residential and public areas.

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