UF IFAS Extension UNIVERSITY of FLORIDA

EENY600

Pavement ant *Tetramorium caespitum* (Linnaeus) (Insecta: Hymenoptera: Formicidae)[1]

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Introduction

The pavement ant, *Tetramorium caespitum* L. is one of the most commonly encountered ants in the United States. The first introduction into the United States occurred from Europe in the beginning of the nineteenth century. Since then, the ant has become well established and is prevalent in urban areas in the northern U.S. and parts of Canada. While the presence of pavement ants in the U.S. has been acknowledged for decades, the extent of their invasiveness and severity as a pest is not well characterized.

Taxonomy

Two recognized species of European ants, *Tetramorium caespitum* and *Tetramorium impurum*, closely resemble one another. The *Tetramorium caespitum/impurum* species complex is currently undergoing taxonomic evaluation, a process that is also occurring in other species complexes within the genus Tetramorium around the world (Bharti and Kumar 2012, Sharaf et al. 2012, Garcia and Fisher 2014).

Genetic, morphological, and chemical comparisons were used to justify seven distinct species identified from within the European *Tetramorium caespitum/impurum* species complex (Schlick-Steiner et al. 2006). Of these, the cryptic species *Tetramorium* species E was identified as the only species from complex that has been introduced into the United States. The designation *Tetramorium* species E is not an official scientific name, so for the sake of this article, *Tetramorium caespitum* will refer to this species of pavement ant.

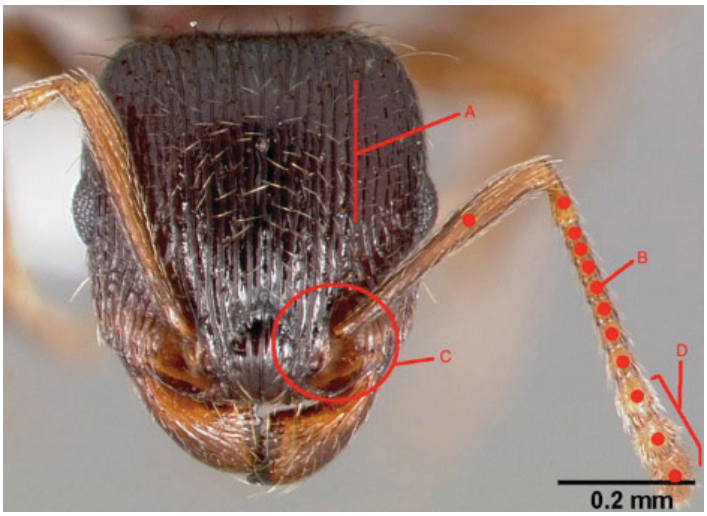

Figure 1. A) Parallel rugae (ridges) running lengthwise on head. B) Antennae with 12 segments (dots representing each segment). C) Characteristic raised ridge at the antennal insertion. D) Antennal club 3-segmented.
Credits: April Noble www.antweb.org

Distribution

The pavement ant has a very broad native distribution within Europe. The pavement ant species found in the United States has a wide native range in Europe, reaching from Spain to Turkey and Germany to Greece (Schlick-Steiner et al. 2006).

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In North America, *Tetramorium caespitum* can be readily found in urban areas in the northeastern United States, the Midwest, and the Pacific Northwest, and it has been found in urban areas in other states as well. While it was predicted in 2008 that the pavement ant could spread to 23 other U.S. states and 5 Canadian provinces, more recent literature demonstrates that the pavement ant can already be found in nearly half of these states (Steiner et al. 2008, Vanek and Potter 2010, Ellison et al. 2012; www.schoolofants.org).

Description

Pavement ant workers range in color from dark brown to nearly black. Workers are smaller than other castes and reach sizes of 2.75-3.2 mm. They are characterized by a head and thorax sculptured with longitudinal, parallel or concentric fine ridges (rugae), pits with unique raised rims surrounding antennal insertions, 12-segmented antennae with three-segment club, a single pair of propodeal spines, and a two segmented "waist" (petiole and postpetiole) (Fisher and Cover 2007, Ellison et al. 2012).

Head

The clypeus descends near antennae, creating a raised ridge between the antennal insertion and the mouthparts (Fig. 1C). The antennae have twelve segments with a three-segment club. Rugae (ridges) run parallel up the front and sides of the head. Mandibles have seven teeth.

Thorax and Abdomen

The thorax is sculptured with parallel (or concentric curved) rugae (Fig. 2). A pair of spines extend from the propodeum (the first abdominal segment that is fused to the thorax). An anteroventral tooth is present on the pedicel of the petiole. The petiole and post-petiole are roughly similar in shape (boxy) and size, with the postpetiole a little larger and shinier.

Sting

These ants have a stinger that is modified and broadened distally into a triangular 'flag', likely making this appendage less effective as a defensive stinger but providing more surface area for the application of trailing pheromone (Attygale and Morgan 1983) (as seen in Fig. 2E).

In cities in Missouri and adjacent parts of Kansas and Illinois, the closely related species *Tetramorium tsushimae* may be found, apparently excluding *Tetramorium caespitum* wherever it is established. It is difficult to distinguish these two. Workers of *Tetramorium caespitum* are generally larger and have shorter propodeal spines than workers of *Tetramorium tsushimae*. Young workers of *Tetramorium tsushimae*, unlike those of *Tetramorium caespitum*, possess a lighter color thorax in comparison to head and gaster, although their appearance becomes more uniform as they age (Wild 2014).

Figure 2. A) Parallel rugae (ridges) running along thorax. B) Petiole has two, boxy segments. C) Propodeal spine. D) Anteroventral tooth. E) Stinger.
Credits: Michael Branstetter www.artweb.org

Biology and Behavior

Reproduction and Development

Pavement ants form large colonies, often containing over 10,000 workers. As with most ants, there are distinct castes: one or a few reproductive queens, and a large number of non-reproductive female workers. In early summer, winged reproductive females and males are produced. Mating occurs during nuptial flights in which alate (winged) reproductive ants leave colonies and mate in swarms. Generally, one sex predominates the reproductives produced by a specific nest of pavement ants (Bruder and Gupta 1972). It takes 42-63 days (at 21-24°C) for a fertilized egg to develop into a worker pavement ant in an established colony, although worker development occurs more quickly when a queen first starts a new colony (Bruder and Gupta 1972).

Colonies of *Tetramorium caespitum* are usually monogynous - they are started by a single reproductive queen that carries out all reproduction for the lifetime of that colony - but they occasionally may have two, or possibly more, queens. The majority of nests occupy 1.2-4.8 m^2 in area and are 0.45-0.90 m deep (Bruder and Gupta 1972), with multiple crater-shaped mound entrances per nest. Mounds near entrances are not always obvious, as they are built up after rains but slowly collapse thereafter.

Foraging and Fighting

Workers recruit nestmates to a discovered food source through the use of pheromones. This allows for large groups of workers to process bulky food items and bring them back to the colony. Direct homing has been documented in worker ants of *Tetramorium caespitum* returning to the colony with food. Based on a reference light source and an awareness of the direction and distance they have traveled, *Tetramorium caespitum* can calculate a direct, straight-line path back to their colony while carrying food (Shen et al. 1998), making them very efficient foragers. Pavement ants are generalists and their diet includes arthropods, honeydew, seeds, and pollen. The average area over which a colony of *Tetramorium caespitum* maintains a territory in its native range was estimated to be 43 m^2 (Brian et al. 1967).

Large-scale fights (Fig. 3) between non-related pavement ant colonies are common in the spring and beginning of summer when the ants are developing their territories (Ellison et al. 2012).

Figure 3. Pavement ants from neighboring colonies fight for control over territory.
Credits: Alexander Wild

Other Animal Associates

A known social parasite of *Tetramorium caespitum* colonies, *Anergates atratulus,* was also introduced into North America along with *Tetramorium caespitum*. Although *Anergates atratulus* is rare, it is broadly distributed and can be found from the eastern coast of the U.S. to as far west as Colorado (Dash and Sanchez 2009).

Several species of aphids, springtails, and mites have been found residing in pavement ant colonies in North America (Bruder and Gupta 1972). Nicoletiid Thysanura (silverfish) are also commonly found in nests of this ant. Additionally, in the introduced range, nests of smaller ants like *Monomorium minimum* and *Solenopsis molesta* are often found near nests of pavement ants (Bruder and Gupta 1972).

Mymecophilous (ant mutualist) lycaenid butterfly larvae can be found secreting carbohydrates in pavement ant nests, providing a food source for the ants in return for protection (Fiedler and Maschwitz 1998).

Habitats

Colonies of pavement ants can be found in several soil types ranging from sand to loam. Pavement ants prefer to nest in areas with minimal vegetation (Bruder and Gupta 1972), which makes them predisposed to favor urban habitat.

In its introduced range, *Tetramorium caespitum* thrives in human-modified environments. In surveys of urban environments where pavement ants are found, they generally account for the majority of all ants found at baits and around residences (Buczkowski and Richmond 2012). These ants are also very resilient, being one of only a few species of ants found to recolonize an area after intensive human development, such as construction projects (Buczkowski and Richmond 2012).

In a survey of ant diversity on medians in New York City, *Tetramorium caespitum* was found to be the most abundant species (found on 93% of medians sampled) and was most common on smaller medians with fewer plants (Pećarević et al. 2010).

Economic Importance

Pavement ants are often considered invaders of homes because sidewalks, walkways, and patios make ideal habitat for these animals. However, it remains unclear whether these ants can infest homes with damaging consequences or if inquisitive workers just become aesthetic pests when they make it into residences or are abundant on a patio. One record suggests that *Tetramorium caespitum* can be troublesome because they defend agricultural aphid pests (Merickel and Clark 1994), although pavement ants are less protective of aphids than other common ants (Katayama and Suzuki 2003). In Kentucky, *Tetramorium caesptium* have been documented to build protective structures made of soil around Magnolia scale insects, significantly lowering the number of scales parasitized by flies and increasing damage to these plants (Vanek and Potter 2010). Ecologically, pavement ants may competitively exclude native ants from urban environments (Lessard and Buddle 2005).

Although *Tetramorium caespitum* is an introduced species, it may be beneficial in some scenarios. One example would be the potential for this ant to keep out more damaging ant invaders. In laboratory experiments, workers from colonies of *Tetramorium caespitum* destroyed recently founded colonies of the red imported fire ant, *Solenopsis invicta* (King and Phillips 1992). Such conflict in nature may help impede the northern expansion of fire ants. The pavement ant may also be an important ecosystem service provider in urban environments, by dispersing seeds, aerating soil, and recycling nutrients.

Management

Pavement ant workers can be nuisance pests when they enter homes and recruit colony members to accessible human food products or remnants. The best way to prevent ants from entering homes is to locate and block potential entryways and to keep homes clean with food secured.

For more information on ant management, see this guide: http://edis.ifas.ufl.edu/ig080

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