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VARIATION IN NESTING BEHAVIOR OF THE ARBOREAL ANT *CAMPONOTUS SERICEIVENTRIS* (HYMENOPTERA: FORMICIDAE)

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The genus *Camponotus* Mayr, 1861 is one of the richest in species within the family Formicidae, comprising about a thousand described species with worldwide distribution ranging from the northern temperate to the tropical south (Fernández 2003) and they are easily found in the Brazilian territory (Loureiro & Queiroz 1990).

Some *Camponotus* species have omnivorous habits and form populous colonies (Feldhaar et al. 2007; Elisei et al. 2012), and they are referred to as carpenter ants because they prefer soft wood of live or dead trees, which facilitate the construction and maintenance of the nest in arboreal habitats (Fernández 2003; Yamamoto & Del-Claro 2008). They can also build their nests under rocks, epiphytes, organic matter, but seldom in the soil (Hölldobler & Wilson 1990; Delabie 1991). In urban environments, they can readily be found nesting in man-made substrates (Campos-Farinha et al. 1997; Bueno & Campos-Farinha 1999).

The species *Camponotus sericeiventris* (Guérin-Méneville, 1838) (Hymenoptera: Formicidae) is reported as being typically arboreal (Yamamoto & Del-Claro 2008), and their nests usually are found in tree large trunks and branches (Longino 2002). This species can be found throughout the Neotropical region and they feed on nectaries and on exudates of insect prey (Rico-Gray 1993; Del-Claro & Oliveira 1999; Yamamoto & Del-Claro 2008).

The nesting habits of *C. sericeiventris* have been studied in natural environments (Longino 2002; Yamamoto & Del-Claro 2008), but their nesting habits are still poorly known in urban environments. Due to constant presence of *C. sericeiventris* in cities and its ecological interactions, it is an interesting species for monitoring the environmental condition of urban areas. Hence, the present study aimed at advancing knowledge about the nesting behavior of *C. sericeiventris* in an urban area, and to describe its unusual behavior of nesting on the soil.

Surveys were conducted in an urban area of Juiz de Fora, southeastern Brazil (S 21° 46' -W 43° 21', 678 m asl) from Jun 2012 to Jun 2014 for quantification colonies of *C. sericeiventris*. We found 10 colonies nesting in vegetation and/or in elevated man-made substrates. Only one colony was found within the soil. We disturbed this colony 3 times: the first time in Jun 2012, the second in Jun 2013, and the third in Jun 2014, and we conducted regular monitoring to determine the colony's activity during this period.

The colony was about 2 m distant from a forest fragment (Fig. 1A), located beneath the ground among the roots of a *Spathodea campanulata* P. Beauv. (Bignoniaceae) tree and below 2 × 5 m cement plates 10 cm thick (Fig. 1B and C). By removing the plates, we found an active orifice for entry and exit of ants (Fig. 1D). We recorded immature and adults, including winged individuals during the 3 disturbance events, a fact which shows that the colony was well established in this site (Fig. 1E and 1F). Therefore, even after the first disturbance in 2012, the colony remained active and in the same location, suggesting the importance of the chosen nesting site.

During the whole study it was possible to observe the ants' activity of excavating and removing soil from the occupied cavity to outside of the plate (Fig. G). This behavior evidences that workers are able to use their arboreal abilities to excavate soil, and therefore, make a subterranean space suitable for the colony. Therefore, this is the first report on *C. sericeiventris* performing underground excavation activities. A more detailed observation of the occupied cavity revealed that the ants had excavated a cavity about 5 inches (about 13 cm) deep below the concrete plate and that the surface of the soil in the cavity was coated with a substance secreted by the ants. This was apparent, because the texture of the soil at the site had been modified (Fig. H), and it appeared to be impervious to water.

The new nesting site recorded in the present study differs from the ones found by Longino (2002) and Yamamoto & Del-Claro (2008), who studied the same species in a natural environment and observed that, even with a change in the landscape, the colonies were exclusively established in tree trunks. Elisei et al. (2012) located a colony of *C. sericeiventris* in a man-made substrate, more specifically under a roof more than 8 m above the ground, which shows the preference of this species for nesting high above ground, and which may reflect its arboreal habit. Although it is not common in this genus, some species can found their colonies in soil at ground level, as observed in *C. sericeus* (Fabricius, 1798) (Mody & Linsenmair 2003), *C. socius* Roger, 1863 (Tschinkel 2005), and *C. gigas* (Latreille, 1802) (Chung & Mohamed 1993), but this behavior is rare compared to the other nesting habits of members of this genus.

This unusual behavior of *C. sericeiventris* in urban environments may be explained by the phenomenon known as a "heat island", whose main

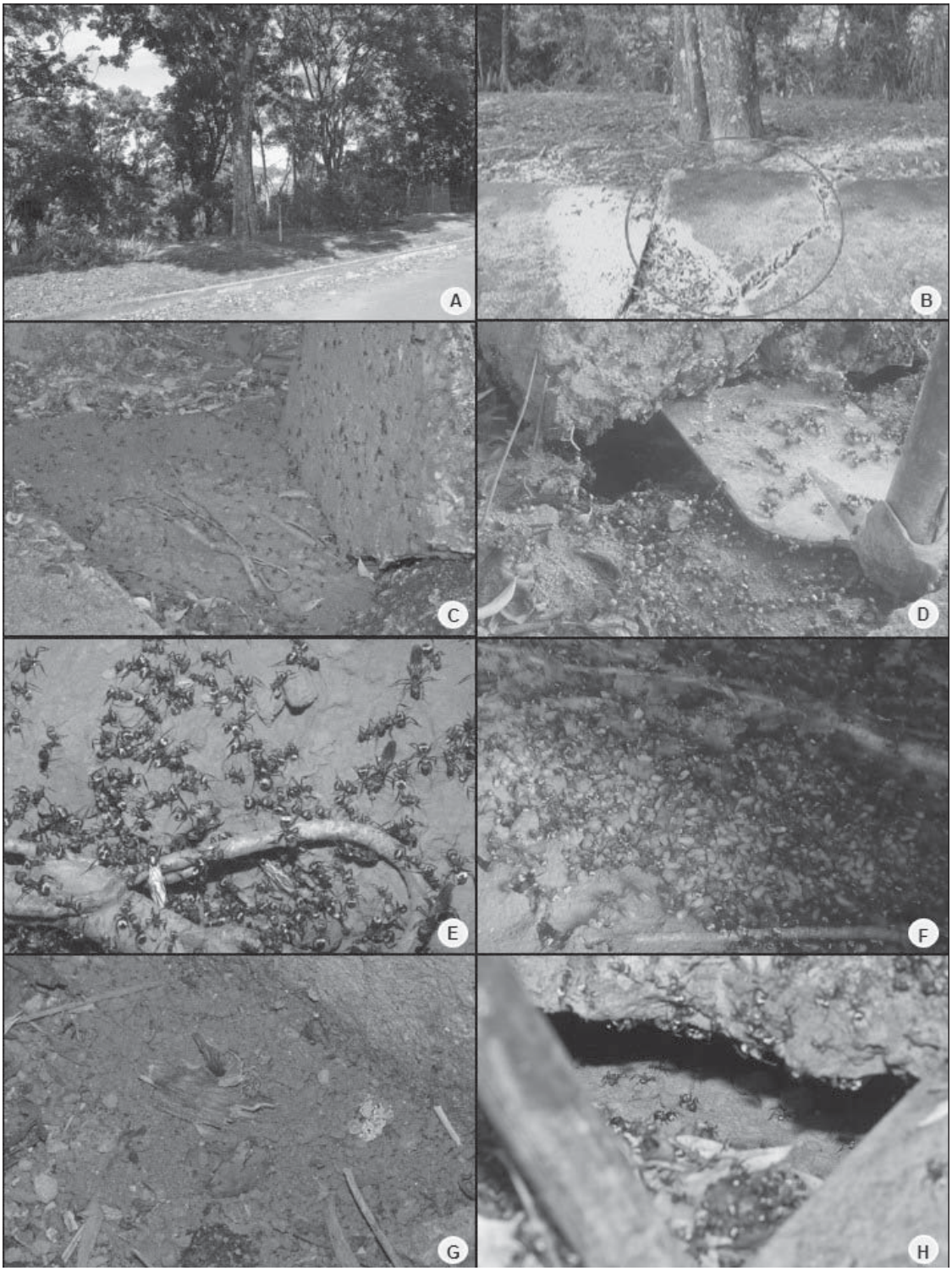

Fig. 1: A – Proximity to a forest fragment, B and C – Foundation site of the colony of *Camponotus sericeiventris*, D – Removal of cement plates using a tool, E – Winged form of *C. sericeiventris*, F – Workers, eggs, and pupae of *C. sericeiventris*, G – Deposit of excavated soil, H – Excavated area for the foundation of the colony of *C. sericeiventris*.

difference in relation to the natural environment is a thermal differential, which causes an increase in air temperature in cities. The replacement of green spaces with buildings, sidewalks, and paved streets, roads and parking lots alters the thermal characteristics of the surface and causes an increase in the temperature of cities (Uchôa 2011). Comparing the temperature of the surface of the concrete plate and below the nest plate revealed that the nest temperature remained constant with little variation of about 1.5 °C throughout the day, while at the same time the temperature of the concrete plate varied about 7 °C. Therefore, the thermal stability provided below the concrete plate seems to have afforded suitable nesting for *C. sericeiventris,* which had settled there in good conditions, as was proven by the production of winged forms for at last 3 breeding seasons (2012-2014).

The above described behavioral aspect of *C. sericeiventris* seems to favor the establishment of colonies in urban environments. Thus, this is the first study that describe a variation in the nesting site of the arboreal species, *C. sericeiventris*, by the occupation of unusual places in an urban environment, and thereby meet the needs of its colony. This nesting behavior demonstrates that this species is an interesting model for studies in urban environments.

Summary

This is the first record of nesting in the soil by the ant *Camponotus sericeiventris* (Guérin-Méneville, 1838), which has arboreal habit. The study was conducted in southeastern Brazil, in an ant colony located in a subterranean site. This study describes, for the first time, the ability of this arboreal species to vary its nesting site by the occupation of an unusual place in an urban environment; and this study demonstrates that this species is an interesting model for studies in urban environments.

Key Words: carpenter ant, Formicidae, Hymenoptera, urban ant

Resumo

Este é o primeiro registro de nidificação em solo para a formiga *Camponotus sericeiventris* (Guérin-Méneville, 1838). O estudo foi desenvolvido no sudeste do Brasil, em uma colônia localizada em área subterrânea, que possui hábito arborícola. Esse estudo é o primeiro relato que descreve a capacidade de variar o local de nidificação da espécie arborícola, por meio da ocupação de local incomum em ambiente urbano o que torna a espécie um modelo interessante para estudos nesse tipo de ambiente.

Palavras-Chave: Formicidae, formiga carpinteira, formiga urbana, Hymenoptera

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