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SPRINGTAILS (COLLEMBOLA) FROM NESTS OF PONERINAE (HYMENOPTERA: FORMICIDAE) ANTS IN BRAZILIAN CACAO PLANTATIONS

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Ant nests are a habitat for a range of organisms living in association with their ant host, including many symbionts, detritivores and parasites (Hölldobler & Wilson 1990). In the mineral and organic components of a *Pogonomyrmex* ant nest, the density of microarthropods is 30 times higher than in the surrounding soil (Wagner et al. 1997), and the diversity of these animals is also increased in some ant nests (Boulton et al. 2003). Among the microarthropods, springtails are especially frequent and abundant in ant nests, and the Cyphoderinae are recognized for having many synecomorph species (Christiansen 1950; Kistner 1982). Several Cyphoderinae have been recorded from nests of disparate ant genera such as *Pogonomyrmex* (Porter 1985; Wagner et al. 1997), *Lasius* (Dekoninck et al. 2007), *Myrmecia* (Gray 1974) and species in the tribe Attini (Kistner 1982). Sometimes, other families of springtails such as Entomobryidae, Onychiuridae and Isotomidae (Porter 1985; Hopkin 1997), have been found in ant nests. Nevertheless, among the Symphypleona the only record of Sminthuridae in nests of disparate ant species is from Egypt (Bakr et al. 2007).

The ant subfamily Ponerinae comprises more than 1,150 described species worldwide (Bolton 2014), and a recent revision of the former genus *Pachycondyla* (Schmidt & Shattuck 2014) divided it into 19 genera. These ponerinae ants are very diverse in morphology, behavior and nesting habits, with most of the New World species nest in dead wood and hollow twigs. Their colonies are small, from a few dozen to a few thousand workers (MacKay & MacKay 2010; Schmidt & Shattuck 2014). Information about the fauna associated with the nests of these ants of former *Pachycondyla* is scarce, with only records of mites, beetles and snails in the nests (Santos, pers. com.). Presently there is no record of springtail from the nests of any Neotropical Ponerinae. In this subfamily, the occurrence of springtails has been recorded until now only in parabiotic nests of an African *Platythyrea*, as well as in a compound nest of an Asiatic *Diacamma* with dacetine ants (Kaufmann et al. 2003; Yéo et al. 2006)

In the present study we record for the first time several springtail species in nests of the Ponerinae ants *Mayaponera constricta* (Mayr) and *Neoponera inversa* (Smith) collected in cacao plantations of the south of the state of Bahia, Brazil. Both ant species belong to the *Pachycondyla* genus group of the tribe Ponerini actually (Schmidt & Shattuck 2014).

Two complete nests were collected in 2 different localities of the state of Bahia, Brazil; the first, of *N. inversa* (Smith), in a cacao plantation, at Itajuipe (S 14° 43' 0.81" W 39° 21' 52.26") in a "derruba total" agrosystem (see Delabie et al. 2007) in decomposing tree trunk with dry fruits of cacao on soil, and the second of *M. constricta* (Mayr) in the same habitat but at Barro Preto (S 14° 48' 35" W 39° 25' 24"). Springtails were collected directly in each nest, by use of a brush.

Four Collembola species were recorded associated with the ant nests, 2 with *M. constricta* and 3 with *N. inversa*. The springtail *Cyphoderus similis* Folsom (Cyphoderidae) was common in both nests (30 specimens: 20 females, 2 males and 8 juveniles). Five females of *Proisotoma minima* (Absolon) and 2 females of *Pseudosinella* sp. (Entomobryidae) were found only in the *N. inversa* nest, while 2 specimens (females) of *Sphaeridia serrata* Folsom & Mills (Sminthurididae) were recorded in the nest of *M. constricta* only.

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Cyphoderus is the largest genus of the springtail subfamily Cyphoderinae, with more than 60 species distributed around the World, of a total of 123 in the whole subfamily (Bellinger et al. 1996-2014). Most of the members of this genus are associated with social insect nests, i.e., termites, bees and ants (Christiansen 1992). Four *Cyphoderus* species are recorded in Brazil until now: *C. agnotus* Böerner, *C. arlei* Cassagnau, *C. innominatus* Mills and *Cyphoderus* cf. *similis* Folsom, but none has been cited from ant nests in Brazil until now. There are only 3 other springtail species recorded from ant nests (without citation of the ant species) in Brazil: *Mastigoceras camponoti* Handschin, *Seira edmanni* (Stach) and *Cyphoderodes xenopus* Börner, and all of them are springtail species originally described from Brazil (Abrantes et al. 2010). *Mastigoceras camponoti* has been recorded in tropical rain forests in the states of Minas Gerais, Manaus and Rio de Janeiro (Stach 1935; Cassagnau & Oliveria 1992) and from Caatinga vegetation (xerophytic thorn woodlands) in Ceará state, northeastern Brazil (Palacios-Vargas unpublished data). Specimens of *S. eidmanni* have been recorded in the states of Rio de Janeiro and São Paulo (Mendonça et al. 2009; Abrantes et al. 2010). *Cyphoderodes xenopus* is the only species of the genus known in the New World at this moment and the type material was collect in São Leopoldo, state of Rio Grande do Sul.

Cyphoderus similis individuals have been recorded as phoretic on alate females and males *of Solenopsis invicta* Buren, ready to leave the nest of for their mating flight; *C. similis* is the only phoretic collembolan known at this time using ants for a carrier (Moser & Blomquist 2011). This species has a wide distribution in America; it has been cited from litter, soils caves and ant nests in Mexico (Palacios-Vargas 1997). This is the first record of the species from an ant nest in Brazil.

Cyphoderinae is the most common subfamily of springtails found in ant nests, and the family Sminthurididae is here recorded for first time in this habitat, and *S. serrata* is cited for the first time from Brazil. The known distribution of *P. minima* in this country has been expanded in this study, because it was previously known from soil samples from the state of Minas Gerais only.

There is no available information available about springtails associated with Ponerinae nests (Hölldobler & Wilson 1990), and according to our results *Cyphoderus* species show little selectivity for ant species, as they were found in former studies (Christiansen 1950). It is thus probable that species of Sminthurididae, Isotomidae and Entomobryidae maintain closer relations with their host species, although no detail information is so far available. Our observations bring important new information about the synecomorphic fauna associated with Ponerinae, since this is the first record of springtails associated with nests of these ants. A more detailed study about the springtail fauna living in ant nests need to improve knowledge of these relationships.

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Summary

Collembola found in nests of *Mayaponera constricta* and *Neoponera inversa* ants are recorded for the first time. *Cyphoderus* was the commonest springtail genus in nests of both ant host species. The occurrence of *Sphaeridia serrata* in ant nests is recorded for the first time. Two other springtails (*Proisotoma minima* and *Pseudosinella* sp.), which were less abundant, were also found in these nests. Data about distribution of springtail species in nests of ants in Brazil are given, as well as new records of springtail species in Brazil.

Key Words: *Cyphoderus*, Symphypleona, synecomorphs, Bahia, *Mayaponera, Neoponera*

Resumen

Se registran por primera vez varios Collembola en nidos de hormigas *Mayaponera constricta* y *Neoponera inversa*. *Cyphoderus* es el colémbolo más común en los nidos de ambas especies de hormigas hospederas. Se registra por primera vez la presencia de *Sphaeridia serrata* en nidos de hormigas. Otras dos especies (*Proisotoma minima* y *Pseudosinella* sp.) también se encontraron en estos nidos, aunque en menor abundancia. Se dan los datos sobre la distribución de las especies de Collembola en nidos de hormigas en Brasil, así como de nuevos registros de colémbolos para el país.

Palabras Clave: *Cyphoderus*, Symphypleona, sinecomorfos, Bahía, *Mayaponera, Neoponera*

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