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Neoscapteriscus borellii and *Neoscapteriscus tenuis* (Orthoptera: Gryllotalpidae): first record in tobacco plantations in the state of Bahia, Brazil

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Species of Gryllotapidae are commonly known as mole crickets. These solitary crickets (Bailey et al. 2015) are differentiated from other crickets by their morphological and behavioral adaptations related to their subterranean lifestyle (Ulagaraj 1975; Howard et al. 2008; Bailey et al. 2015). All species of *Neoscapteriscus* (Orthopera: Gryllotalpidae) occur naturally in the Neotropical region (Cadena-Castañeda 2015; Cigliano et al. 2016), but since the mid-eighteenth century, some species have been accidently introduced elsewhere and cause damage to several crops in the Americas (Nickle 2003) and Australia (Rentz 1995), and sometimes are considered important pests where they occur (Heads et al. 2013).

These insects are included among pests of pasture, turfgrass and vegetable crops (Walker 1982; Schuster & Price 1992; Adjei et al. 2003; Bailey et al. 2015). They cause direct loss by feeding on roots from within tunnels, and indirectly by mechanical damage when they dig tunnels in the soil around plants (Walker 1982; Schuster & Price 1992; Xu et al. 2012). The species *Neoscapteriscus borellii* (Giglio-Tos) and *Neoscapteriscus tenuis* (Scudder) are thought to have originated in South America (Nickle 2003) and aside from their status as pests, distribution and biological information on these insects are needed. *Neoscapteriscus tenuis* is an omnivorous species and is considered to be plant pests when occurring in high population densities (Fowler et al. 1985). *Neoscapteriscus borellii* nymphs feed on both vegetative and animal materials, but adults are primarily herbivorous (Silcox & Brandenburg 2011). In Brazil, *S. tenuis* was reported in the states of Ceará, Pará, Piauí, Mato Grosso do Sul, and Rio Grande do Norte, and *S. borellii* in Ceará, Goiás, Minas Gerais, Mato Grosso, Pará, Paraíba, Pernambuco, Rio de Janeiro, Rio Grande do Norte, Rio Grande do Sul, São Paulo, and Santa Catarina (Nickle 2003).

There are few surveys of *Neoscapteriscus* species in Brazilian agricultural systems. The only surveys were in Ceará (Vieira et al. 1976; Bastos 1977) in vegetables, and (Bastos 1977); in São Paulo (Fowler et al. 1985, 1986, 1989), and in Rio Grande do Sul, (Canhedo-Lascombe & Corseuil 1996) in vegetables, rice plantations, and golf courses. Thus, there is a lack of information about the distribution and biology of these insects. Here we present the first records of *N. borelli* and *N. tenuis* in tobacco plantations in Bahia State, Brazil.

Adults and nymphs of mole cricket were captured using pitfall traps placed in tobacco plantations (Fig. 1A) from Dec 2011 to Jun 2012 in the municipalities of Cruz das Almas (12.6670° S, 39.1000° W), Governador Mangabeira (12.5600° S, 39.8000° W), and Muritiba (12.6100° S, 38.5900° W) in the Recôncavo Baiano, Bahia, Brazil. The traps were buried in the soil, and consisted of polystyrene cups (15 cm height, 7 cm diam) containing 150 mL of 50% ethanol. The sampling was conducted in 1 tobacco plantation in each municipality. In each site, 10 traps were positioned in a 100 m transect with the traps equally spaced (10 m apart). Each of the sites was sampled on 14 different dates at 15 d intervals using traps that remained in field for 48 h. The insects were stored in 70% ethanol, mounted on entomological pins, identified and deposited at the Entomology Museum of the Universidade Federal do Recôncavo da Bahia. The identification was based on taxonomic key of Nickle (2003).

We collected a total of 169 specimens of *Neoscapteriscus*, of which 104 were nymphs. The available keys and descriptions for the identification of *Scapteriscus* Scudder (Orthopera: Gryllotalpidae) species present only characteristics of adults and, therefore, nymphs were not identified to the species level. Twenty four individuals of *N. borellii* and 41 of *N. tenuis* were collected from the tobacco plantations. This is the first record of *N. borellii* and *N. tenuis* in Bahia State (Fig. 1B, C). This finding expands the area of distribution of these species in Brazil. Clearly, both species are well distributed in Brazil and well adapted for the Neotropical region (Nickle 2003). Also, due to their vast dietary diversity (Xu et al. 2013) they can spill over and establish in other regions. For example, *N. borellii* was introduced accidentally in North America via commercial sailing vessels from

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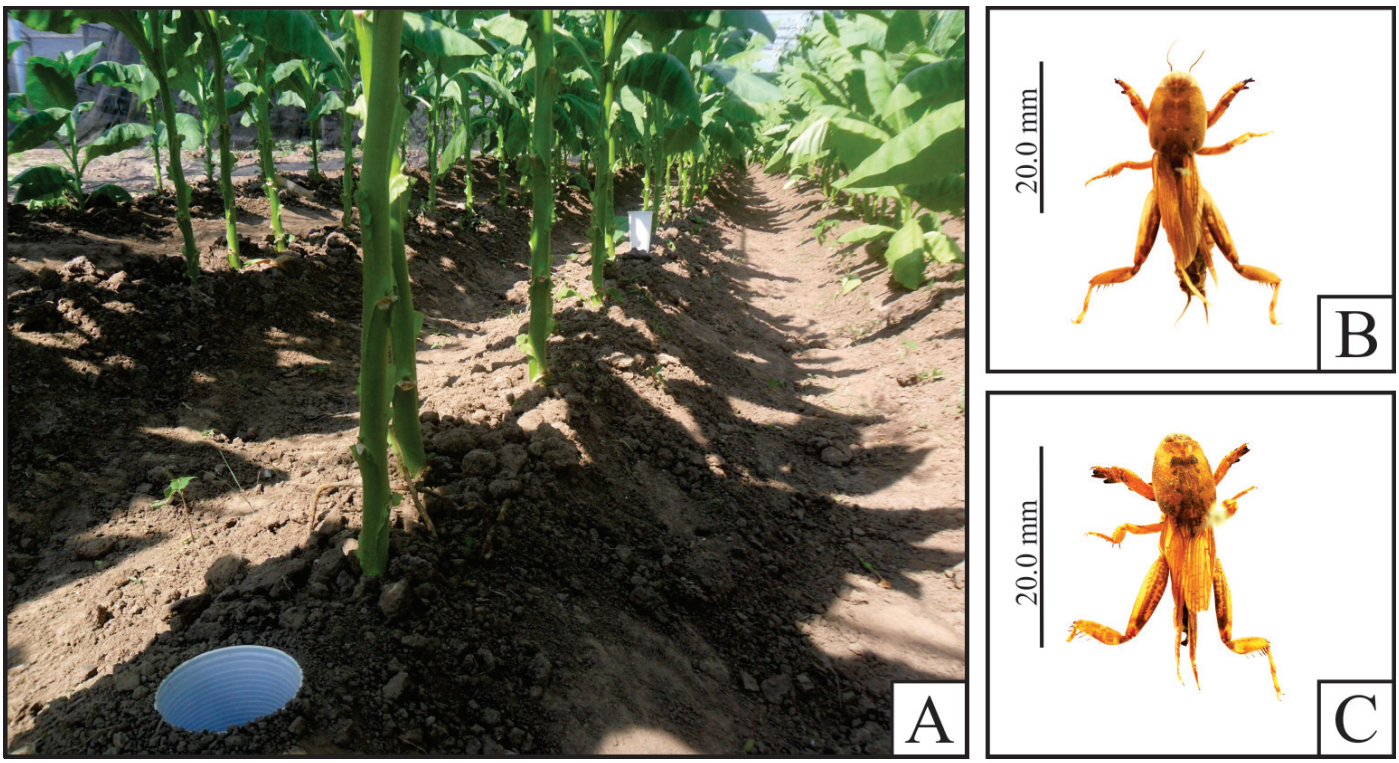


Fig. 1. Traps and collected species. (A) Pitfall traps in tobacco plantation, (B) *Neoscapteriscus borellii* (Giglio-Tos), dorsal view (C) *Neoscapteriscus tenuis* (Scudder), dorsal view.

South America (Walker & Nickle 1981), and now is one of the most common species of mole crickets in the southeastern United States (Nickle 2003; Bailey et al. 2015). Adults are long-winged and can fly, dispersing readily to new areas (Ulagaraj 1975; Dillman et al. 2014), which might be one of the reasons that explain their extensive distribution in Brazil.

The species of Gryllotalpidae previously known from Bahia State are: *Neoscapteriscus abbreviatus* (Scudder), *Neoscapteriscus didactylus* (Latreille), *Neocurtilla hexadactyla* (Perty), and *Neoscapteriscus vicinus* (Scudder). However, except in the studies of Nickle (2003) and Nickle & Castner (1984) the occurrence of these species is not well documented, and the taxonomy and bio-ecology of these species have not been studied. Previous records of *Neoscapteriscus* species in Bahia State include: *N. abbreviatus* (8 specimens) collected in the municipality of Salvador in 1951 (Nickle & Castner 1984); *N. didactylus*, reported as pests of tobacco plants in Bahia, but with information that makes it impossible to differentiate them from the other species of the same genus (Costa 1967); and records of *N. hexadactyla* and *N. vicinus*, without any other information (Silva et al. 1968).

It is likely that *N. borellii* and *N. tenuis* might be causing mechanical damage to *Nicotiana tabacum* L. (Solanaceae) roots due to their extensive gallery construction in the soil. Although these plants produce alkaloids that are toxic to some herbivorous insects (Pakdeechanuan et al. 2012; Sagheer et al. 2013), species of mole crickets are reported to damage tobacco seedlings by feeding (Barret 1902; Walker 1982; Schuster & Price 1992) and *N. didactylus* was designated a pest in tobacco plantations in the state of Bahia (Costa 1967). The herbivorous habits of *N. borellii* and *N. tenuis* (Fowler et al. 1985; Adjei et al. 2003; Silcox & Brandenburg 2011) suggests that they may also consume tobacco, however, this needs to be confirmed. Furthermore, high density of these species might cause economic damage through tunneling activity (Fowler et al. 1985; Silcox & Brandenburg 2011). Thus, the occurrence of *N. borellii* and *N. tenuis* in tobacco plantations in the region of Recôncavo Baiano deserves attention due to their possible direct or indirect damage. Tobacco has great socioeconomic importance due to the generation of employment and income in agriculture and industry (Specht et al. 2006). Brazil is the second largest producer and largest global exporter of tobacco (Meucci et al. 2015), and Bahia has tobacco as its principal export product (Baud & Koonings 1999). In particular, tobacco is socially and economically important in the area of Recôncavo Baiano.

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Summary

The mole crickets *Neoscapteriscus borellii* (Giglio-Tos) and *Neoscapteriscus tenuis* (Scudder) (Orthoptera: Gryllotalpidae) are recorded for the first time in Bahia State, Brazil in tobacco (*Nicotiana tabacum* L. [Solanaceae]) plantations. Insects were collected using pitfall traps in tobacco plantations in the municipalities of Cruz das Almas, Governador Mangabeira, and Muritiba, Bahia, Brazil. The presence of nymphs and adults of these species suggests that mole crickets may threaten tobacco productivity due to the root damage caused by excavation and/or feeding by these subterraneous insects.

Key Words: Mole crickets; *Nicotiana tabacum*; Recôncavo Baiano; root-feeding insects

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Sumário

As paquinhas *Neoscapteriscus borellii* (Giglio-Tos) e *Neoscapteriscus tenuis* (Scudder) (Orthoptera: Gryllotalpidae) são registradas pela primeira vez para o estado da Bahia, Brasil em plantios de fumo, *Nicotiana tabacum* L. (Solanaceae). Insetos foram coletados usando armadilhas pitfall em plantios de fumo nos municípios de Cruz das Almas, Governador Mangabeira e Muritiba, Bahia. A presença de ninfas e adultos destas espécies pode ser uma potencial ameaça para a produção de tabaco devido aos danos em raízes no subsolo, provocados pela escavação e/ou alimentação destas espécies subterrâneas.

Palavras Chave: Paquinhas; *Nicotiana tabacum*; Recôncavo Baiano; insetos alimentadores de raiz

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