

Mole crickets (Orthoptera: Gryllotalpidae) in Grenada, West Indies

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Abstract

FRANK JH, WOODRUFF RE, THOMAS MC. 2002. Mole crickets (Orthoptera: Gryllotalpidae) in Grenada, West Indies. Entomotropica 17(3):207-212.

Scapteriscus didactylus (Latreille) and *Neocurtilla hexadactyla* (Perty) are the two mole cricket species known from Grenada, Lesser Antilles. Damage to turf and to vegetable seedlings was found in June 1990 to be caused by *S. didactylus*. However, year-round ultraviolet light trap samples yielded only one specimen of *S. didactylus* among 186 specimens of *N. hexadactyla*. The proportions of the two species captured in light traps bear no relationship to their relative importance to agriculture and horticulture. Almost all (175) of the light-trapped *N. hexadactyla* were females, and all but one were trapped in September-April; this, and the similar ovarian condition of dissected females suggests that the reproductive cycle of this species has an annual rhythm in Grenada, but that the reproductive period is extensive. The reproductive cycle of *S. didactylus* in Grenada is not obvious.

Additional key words: Caribbean, damage, *Neocurtilla hexadactyla*, reproductive cycle, *Scapteriscus didactylus*.

Resumen

FRANK JH, WOODRUFF RE, THOMAS MC. 2002. Grillotopos (Orthoptera: Gryllotalpidae) en la isla caribeña de Granada. Entomotropica 17(3):207-212.

Scapteriscus didactylus (Latreille) y *Neocurtilla hexadactyla* (Perty) son las dos especies de Gryllotalpidae de Granada, Antillas Menores. Los daños observados en junio de 1990 a gramas y semilleros de vegetales diversos fueron causados por *S. didactylus*. Sin embargo, en las muestras de trampa de luz ultravioleta capturadas durante todo un año se colectó solamente un espécimen de *S. didactylus* entre 186 especímenes de *N. hexadactyla*. Las proporciones de las dos especies capturadas en trampas de luz no tienen alguna relación con su importancia relativa en la agricultura y horticultura. Casi todas (175) de las *N. hexadactyla* capturadas en trampa de luz fueron hembras, de las cuales 174 fueron capturadas entre septiembre y abril; ésta, y la condición similar de los ovarios de todas las hembras disecadas, sugieren que el ciclo reproductivo de la especie tiene un ritmo anual en Granada, pero el período de reproducción es extensivo. El ciclo reproductivo anual de *S. didactylus* en Granada no es obvio.

Palabras clave adicionales: Antillas, ciclo reproductivo, daños, *Neocurtilla hexadactyla*, *Scapteriscus didactylus*.

Introduction

Insect pests of food crops in the Lesser Antilles (Leeward Islands and Windward Islands) were reviewed by Fennah (1947). He illustrated a long-winged adult of a *Scapteriscus* species which he listed as "*Scapteriscus vicinus* Scudd. The West Indian Mole-cricket" and stated to be "common in all islands of the Lesser Antilles". He attributed damage by it to three groups of crops in the following terms: (1) Arrowroot (*Maranta arundinacea* L.) - "grown on a large scale only in St. Vincent" - "a minor to negligible pest in this crop"; (2) Maize, corn (*Zea mays* L.) - "generally, a minor pest of maize, but can be very troublesome over small areas in light soil"; (3) Tomato, eggplant, peppers, potatoes (*Lycopersicum esculentum* Mill., *Solanum melongena* L., *Capsicum* spp., *Solanum tuberosum* L.) -

"a major pest, especially serious after the crop has been transplanted or is less than eight inches [20 cm] high. In small plots up to 25% replacement may be necessary as a result of its depredations". He mentioned *Neocurtilla hexadactyla* (Perty) as "a comparatively uncommon insect" which "may occasionally be found feeding on arrowroot". Groome (1970, page 21) in his "Natural History of Grenada" stated: "the Mole Crickets, *Scapteriscus* and *Gryllotalpa* can become a pest to crops and to gardens and lawns."

The assertion above that *Scapteriscus vicinus* is an agricultural problem in Grenada is confusing, because that species has not been reported from the West Indies by taxonomists. The statement that *Neocurtilla hexadactyla* is a pest in Grenada also is confusing,

because evidence from elsewhere in the West Indies suggests that it is not. The report that a species of *Gryllotalpa* causes problems in Grenada adds to the confusion, because this genus is unknown from the West Indies; although *N. hexadactyla* was originally described in the genus *Gryllotalpa*, it was made the type species of *Neocurtilla* in 1906, so Groome's (1970) meaning is unclear (did he mean that a hitherto unmentioned *Gryllotalpa* species caused problems in Grenada, or was his taxonomy hopelessly [64 years] out-of-date?). In 1990-1991, one of us (REW) visited Grenada often to collect Orthoptera and other insects and used ultraviolet light traps extensively. Two of us (JHF and MCT) then took the opportunity to visit Grenada to examine the claims of damage caused by Gryllotalpidae. There are several methods of collecting Gryllotalpidae, such as (A) using ultraviolet or other forms of light traps to attract winged adults, (B) using sound-emitters that simulate the songs of males of particular species to attract winged adults, (C) searching for galleries (horizontal tunnels in the soil surface) then (C₁) digging by hand, (C₂) using mechanical methods of digging, such as soil-corers and tree-spades that require use of a tractor, (C₃) pouring a dilute household detergent on the soil surface to irritate the insects and force them out of the soil, and (C₄) installing and operating pitfall traps. For lack of time and resources, we used only methods A and C₃.

The mole cricket species reported from Grenada by taxonomists are *Neocurtilla hexadactyla* and *Scapteriscus didactylus* (Latreille) (Brunner von Wattenwyl 1893). *N. hexadactyla* is also reported from Cuba (Gundlach 1891), Puerto Rico (Rehn 1903), Antigua (Caudell 1922), Montserrat (Rehn 1905), Guadeloupe (Saussure 1894), Barbados (Tucker 1953), St. Vincent (Brunner von Wattenwyl and Redtenbacher 1892; Rehn 1905), Grenada (Brunner von Wattenwyl 1893), and Trinidad (Bruner 1906). The only recent taxonomic literature on it in the West Indies is confirmation of its occurrence in Cuba with notes on its habits by Zayas (1974). Brunner von Wattenwyl (1893) noted only that the specimen(s) from Grenada came from Balthazar, without noting a date or habitat. The collections available to Brunner von Wattenwyl were made by H. H. Smith who was sent from England to make collections of insects in Grenada. Smith's specimens are in the Natural History Museum (London).

Scapteriscus didactylus specimens from Puerto Rico, Dominica, Martinique, St. Lucia, St. Vincent, Grenada, and Trinidad were examined by Nickle and Castner (1984). The two females and one male they examined from Grenada are housed in the American

Museum of Natural History and the U.S. National Museum of Natural History and the only information on their labels is the name of the collector (W. E. Broadway), the date (XI-1905), and the country name (Grenada). This species later was reported from St. Thomas and St. John (U.S. Virgin Is.) by Ivie and Nickle (1986), and from the Dominican Republic by Frank et al. (1987). Its occurrence in Cuba (Cook 1906; Rehn 1909; Bonfils 1981) was denied by Bruner and Scaramuzza (1936), Nickle and Castner (1984), and Ruiz and Fernandez (1996) as having been based on misidentification. It is listed in the older literature from Jamaica (Gowdey 1926) and Haiti (Wolcott 1941), but recent confirmation is lacking, and location of Gowdey's and Wolcott's specimens is unknown.

The distribution of mole cricket species in the West Indies is not fixed. The four species thus far reported are probably all immigrants. Further immigration (from one island to another as well as from the mainland) is conceivable. In Cuba, Puerto Rico and St. Croix occurs *Scapteriscus abbreviatus* Scudder (Nickle and Castner 1984, Ivie and Nickle 1986, Frank and Keularts 1996, Ruiz and Fernandez 1996), and in Puerto Rico occurs *S. imitatus* Nickle and Castner (Nickle and Castner 1984). The two species reported by taxonomists from Grenada are *Neocurtilla hexadactyla* and *Scapteriscus didactylus*, but the specimens on which the reports were based were collected before 1906, and additional species might have immigrated even before Fennah's (1947) report.

Methods

Beginning in January 1990, an ultraviolet light trap for insects was operated most weekday nights for 14 months, from dusk to dawn, at the Agricultural Experiment Station, Mirabeau, St. Andrew Parish. Mole crickets thus collected were preserved in 70% isopropanol, enabling females to be dissected later to determine their reproductive condition. On 7-14 June 1990, a household detergent ("Squeezy") was added to water (very roughly 4 ml/litre) and this water was poured onto the soil surface (method of Short and Koehler 1979) wherever mole cricket galleries (horizontal tunnels at the soil surface) were discovered in Grenada. The soil surface, after application of detergent in water, was observed for at least 2 min. Mole crickets surfacing from the soil were preserved in 70% isopropanol for later examination, without regard to developmental stage. Mole cricket galleries were discovered by inspection of likely areas (turf, seedling beds, vegetable plots, areas above the high-tide mark of beaches) and by asking farmers and

homeowners for information on damage by mole crickets. Preserved mole cricket specimens were examined by one of us (JHF) in the laboratory, identified using the key of Nickle and Castner (1984), and pronotal lengths of nymphs were measured with calipers as an indication of developmental stage (method of Frank et al. 1987). Representative females were dissected to investigate their reproductive condition. Three such dissections represented each of the months (September-February) in which >3 were trapped, one such dissection represented each of the months (March-April, July) in which 1-3 were trapped, and there were no representatives of the remaining months (May-June, August) in which none was trapped.

Results

A total of 265 light trap samples from Mirabeau contained 184 *N. hexadactyla* (Table 1). Overall, 69 *N. hexadactyla* were trapped in the months of January-April (no. of samples = 105), only one was trapped in May-August (n = 81), and 114 were trapped in September-December (n = 79). In total, 173 females, but only 11 males, were trapped, a highly disproportionate sex ratio. Males were captured only in January, February and October. Only one *S. didactylus* was taken by light at Mirabeau: a male on 27 September 1990.

Light-trapped female *N. hexadactyla* specimens contained small eggs, at an early stage of development, in the ovarioles in all of them. None had fully-developed eggs.

Two additional light trap samples, from other localities, yielded mole crickets, in both instances *N. hexadactyla*: St. Mark Parish, Diamond Estate, 9 October 1990, R.E. Woodruff, A. Thomas, and J. Telesford, at light at night (1 female); St. Andrew Parish, Grand Etang, 26 September 1990, R.E. Woodruff, A. Thomas, J. Telesford, at light at night (1 female). Other light trap samples by R.E. Woodruff, A. Thomas and J. Telesford at various localities in 1990-1991, and by J.H. Frank and M.C. Thomas on 7-15 June 1990 at various localities yielded no mole crickets.

Two additional mole cricket specimens collected in 1990 were made available. Both are *N. hexadactyla*. Collection records are: St. David Parish, Vincennes, 15 May 1990, by hand, A. Thomas (1 male); St. George Parish, St. George's, on golf course, 15 June 1990, J. Telesford (1 male). Both localities are ones from which our samples yielded only *S. didactylus*. The first was taken while land was being tilled in preparation for planting. There is no record of the method of collection of the second.

Sampling by soap-flush yielded 68 specimens of *S. didactylus* from the following localities. Numbers in parentheses following mention of nymphs are pronotal length of each individual (in mm) (M = male(s), F = female(s)).

A. St. Andrew Parish, Mirabeau, Agricultural Experiment Station, in vegetable plot, 11 June 1990: 1 M, 2 nymphs (4,2; 1,5).

B. St. Andrew Parish, Mirabeau, Ministry of Agriculture Training School, in turf, 9 June 1990: 4 M, 3 F, 9 nymphs (8,2; 8,1; 8,1; 7,1; 7,1; 6,2; 5,6; 3,5; 2,4).

C. St. Andrew Parish, Telescope, above high-tide mark on beach, 7 June 1990: 3 F, 5 nymphs (5,2; 5,1; 3,3; 3,7; 3,1).

D. St. Andrew Parish, Tivoli, in loose soil near river, 13 June 1990: 2 M, 1 nymph (4,4).

E. St. Andrew Parish, Balthazar, in seedling beds, 11 June 1990: 1 M, 2 F, 10 nymphs (7,7; 6,5; 6,5; 5,8; 4,2; 4,2; 3,6; 3,5; 3,2; 2,9). This is the site of the *N. hexadactyla* specimens collected by H. H. Smith and examined by Brunner von Wattenwyl (1893).

F. St. David Parish, Vincennes, in vegetable plot, associated with damage to cabbage seedlings, 15 June 1990: 1 F, 5 nymphs (8,1; 7,8; 7,1; 6,4; 5,1).

G. St. David Parish, Windsor Forest, making galleries in lawn, 8 June 1990: 1 M, 1 F, 6 nymphs (5,0; 3,4; 2,2; 2,1; 2,0; 1,9).

H. St. George Parish, Grand Anse, above high tide mark on beach, 14 June 1990: 1 nymph (3,8).

I. St. George Parish, St. George's, making galleries in golf course green, 8 June 1990: 1 M, 4 F, 2 nymphs (6,9; 6,0).

J. St. Patrick Parish, Sauteurs, around house above high tide mark above beach, 12 June 1990: 1 M, 1 F, 1 nymph (2,4).

Discussion

Light trap collections yielded 186 *N. hexadactyla* and only one *S. didactylus*, whereas soap-flush sampling of galleries yielded 68 *S. didactylus* and no *N. hexadactyla*. Even at the Agricultural Experiment Station, where *N. hexadactyla* adults were caught at light, galleries near the building yielded only *S. didactylus*. The two collection methods gave contrasting indications of which mole cricket species was abundant. Only one specimen of *N. hexadactyla*, a male, was caught by other methods: at site F, on 15 May 1990, while land was being turned from hard-packed soil to tilled seedling bed, before damage was observed; only *S. didactylus*

TABLE 1. Distribution by month of *Neocurtilla hexadactyla* taken in a light trap at Mirabeau, Grenada. The Ratio for each month (number of samples examined: number of samples with *N. hexadactyla*) provides the frequency of occurrence per sample. The number (N°) is the number of specimens of *N. hexadactyla* trapped, 184 specimens in total.

Month	Ratio	N°
Jan 1990	15:5	9
Feb 1990	15:6	8
Mar 1990	21:3	3
Apr 1990	21:2	2
May 1990	26:0	0
Jun 1990	20:0	0
Jul 1990	28:1	1
Aug 1990	7:0	0
Sep 1990	26:20	48
Oct 1990	26:10	45
Nov 1990	12:5	10
Dec 1990	15:9	11
Jan 1991	19:12	17
Feb 1991	14:14	30

was found after the ground was planted with seedlings. Only one *N. hexadactyla* specimen was taken on a golf course, but the method of collection was not recorded, and this is not evidence of damage to golf course turf by this species. Light trap collections did not indicate the species of mole cricket causing damage in Grenada.

In June 1990, the size (age) distribution of *S. didactylus* in Grenada was: nymphs <5 mm (21), nymphs 5-7 mm (14), nymphs >7 mm (8), adult females (16), adult males (10). These five totals (Figure 1) follow a nearly identical numerical progression to those found in collections of *S. didactylus* in the Dominican Republic in October 1986 (Frank et al. 1987, Figure 1). Future collections elsewhere and at other times of year, may indicate whether this is a stable age distribution (which would suggest that this species is multivoltine) or whether it changes during the year.

Neocurtilla hexadactyla was stated by Bruner and Scaramuzza (1936) not to feed on tobacco in Cuba, despite earlier reports of damage by it, even though its galleries are sometimes encountered in tobacco seedling beds. Bruner et al. (1975) blamed *N. hexadactyla* for damage, by tunnelling, to tomato seedling beds in western Cuba, but made no claim that it feeds on the seedlings; they made no reference to damage by it to any other crops. Apart from Fennah's (1947) statement that *N. hexadactyla* is uncommon but feeds occasionally on arrowroot [see introduction] there appears to be no other published mention of damage by *N. hexadactyla* elsewhere in the Caribbean. King and Saunders (1984) contended that the mole cricket causing damage in the West Indies is *S. didactylus*, not *N. hexadactyla* —

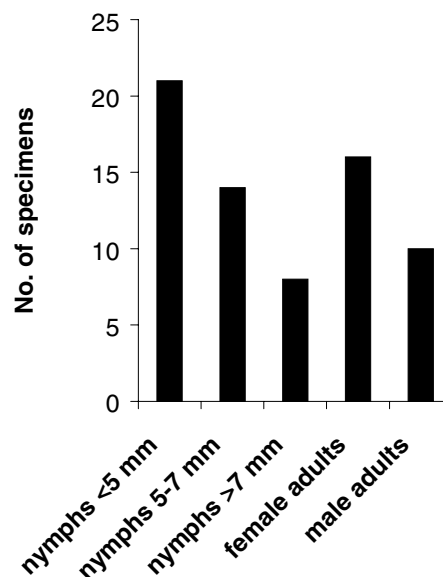


FIGURE 1. Size distribution of nymphs, and gender distribution of adults, of *Scapteriscus didactylus* captured by soap-flush samples in Grenada in June 1990. The size distribution is based on pronotal length in mm.

although they provided no documentation, they seem to be correct (except that they had no knowledge of damage by *S. abbreviatus* in a few islands).

The species reported by Fennah (1947) as "*S. vicinus*" must have been *S. didactylus*. The genus reported by Groome (1970) as "*Gryllotalpa*" must have been *Neocurtilla*. We found no other mole crickets in Grenada and doubt that others are now present, although it is possible that in the future *S. vicinus* or a species of *Gryllotalpa* may immigrate. We consider only those organisms that have been purposefully introduced to be introduced, following Zimmerman (1948), and all other adventive species to be immigrants, following Frank and McCoy (1990).

We are yet uncertain about Fennah's claim that *N. hexadactyla* is uncommon compared with *S. didactylus*. Light trap collections of *N. hexadactyla* suggest that it is not uncommon in Grenada, and this may also be true of other islands which it has colonized. However, it seems to occupy habitats other than those where it is likely to cause damage to agriculture or horticulture. We cannot yet characterize these habitats. Our findings suggest that *S. didactylus* occupies light soils (sands and tilled soils), but Zayas (1974) suggested that *N. hexadactyla* occupies light soils in Cuba. We wonder whether Zayas (1974) erred in transcription of evidence. We say this for two reasons. First, we did

not find *N. hexadactyla* in light soils in Grenada. Second, *N. hexadactyla* was characterized by Semlitsch (1986) as an inhabitant of heavy soils in the southern USA where it is believed to be native (and thus probably is an immigrant to the West Indies).

Collections in Grenada indicated that *S. didactylus* occurs in light soils, including sand and the finely-tilled soils of seedling beds, but also in the more compacted soils of turf (although especially around the edges of sand traps). They did not indicate the soils preferred by *N. hexadactyla* other than that the only specimen collected by hand was found in a more compacted soil. In a laboratory in Florida, we saw that *N. hexadactyla* forms galleries, like those of *Scapteriscus*, when it is confined in 5 cm of moist, loose, sandy soil in plastic boxes. The fact that such galleries in Grenada yielded only *S. didactylus* suggests that *N. hexadactyla* adults and nymphs were absent in the habitats searched, or were for unknown reason less susceptible to dilute household detergent, or at least were relatively very uncommon. This may indicate habitat preference, relative rarity, or such strong seasonality that eggs alone are present in early June. The annual pattern of light trap catches and the similar ovarian condition of all dissected females suggest a long breeding period, making it unlikely that eggs alone (without any other stages) occur in June.

It is curious that the ratio of *N. hexadactyla* females:males should have been 175:11 (94% female) in the light trap catches. A similar ratio (96,6% female) was reported by Chukanov and Lapshin (1990) for *Gryllotalpa unispina* Saussure adults attracted to traps using simulated song of males near Ashkhabad, USSR. *Neocurtilla* is a close relative of *Gryllotalpa*. However, the song of males is an attractant for females, whereas it is not obvious why ultraviolet light should be more attractive to females than to males. We suspect that the relative numbers of the two sexes attracted and trapped by ultraviolet light simply reflect the relative numbers flying.

Neocurtilla hexadactyla was claimed by Fowler and Vasconcelos (1989) to be a pest of crops in Brazil's Amazon basin based largely on numerous specimens they saw in museum collections, and without specific note of damage to crops by it. If the specimens were collected at light traps, then the situation in the Amazon basin may parallel the situation that we observed in Grenada: presence of the species as indicated by collections made by light trap does not indicate that it causes damage to crops, even if it is the most abundant mole cricket species collected at light.

The taxonomic composition of the mole crickets present in Grenada seems not to have changed in more than a century, and 19th century taxonomic publications are still valid. Mid-20th century reports (1947-1974) of the damage caused by mole crickets there implicate the wrong genera and species. The only species that we observed causing damage was *Scapteriscus didactylus* (not *Scapteriscus vicinus*, not *Neocurtilla hexadactyla*, no member of the genus *Gryllotalpa*). JHF and MCT visited Grenada for only 10 days in June 1990, and perhaps did not encounter some situations despite a concerted effort to find Gryllotalpidae, but they reversed the challenge to future investigators: it must now be proven that *N. hexadactyla* does cause damage. One of us (REW) spent much more time in Grenada and made extensive collections of Orthoptera: the challenge now is to demonstrate that Woodruff *et al.* (1998), expanded in this paper, did not overlook any other species of Gryllotalpidae.

Acknowledgments

We thank D. Francis-Ellis, A. Thomas and J. Telesford (Ministry of Agriculture, St. George's, Grenada) for logistical help in Grenada. We acknowledge funds from the Food and Agriculture Organization of the United Nations, which made possible the work of R.E. Woodruff culminating in the checklist of Grenada insects (Woodruff *et al.* 1998). T.J. Walker and Will Hudson kindly reviewed drafts of the manuscript, and two recent publications on the Cuban fauna were pointed out by an anonymous reviewer. This is Florida Agricultural Experiment Station journal series no. R-03796.

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Recibido: 18-x-2000

Aceptado: 08-x-2001

Correcciones devueltas por el autor: 24-vi-2002