

## SYSTEMATICS, MORPHOLOGY AND PHYSIOLOGY

### Description and Key to the Fifth-Instars of Some Cicadas (Hemiptera: Cicadidae) Associated with Coffee Plants in Brazil

DHB MACCAGNAN<sup>1</sup>, NM MARTINELLI<sup>2</sup>

<sup>1</sup>Univ Estadual de Goiás, Unidade Universitária de Iporá, Iporá, GO, Brasil

<sup>2</sup>Fac de Ciências Agrárias e Veterinárias, Depto de Fitossanidade, UNESP, Jaboticabal, SP, Brasil

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#### Correspondence

DOUGLAS H B MACCAGNAN, Univ Estadual de Goiás, UnU Iporá, Av. R-2, Q. 1- Jardim Novo Horizonte II, 76200-000, Iporá, GO, Brasil; [douglashbm@hotmail.com](mailto:douglashbm@hotmail.com)

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#### Abstract

Fifth-instars of the cicada species *Dorisiana drewseni* (Stål), *Dorisiana viridis* (Olivier), *Fidicina mannifera* (Fabricius), *Fidicinoides pronoe* (Walker) and *Carineta fasciculata* (Germar) are described and illustrated. Moreover, a key to the nymphs of these species along with *Quesada gigas* (Olivier) is also provided.

#### Introduction

Cicadas (Hemiptera: Cicadidae) have an immature life stage underground which is much longer than the adult stage, lasting several years (Boulard 1965, Pachas 1966, Logan 2006). During the nymphal period, when they are closely associated with their hosts, they feed on xylem roots (White & Strehl 1978) and may occasionally cause damage to the plants. This is the case of coffee crops in Brazil, where there is a complex of species associated with this plant (Martinelli & Zucchi 1997, Martinelli 2004, Waller *et al* 2007, Santos & Martinelli 2007, Santos *et al* 2010). In order to recognize the specificity of the nymphs is useful to assess the infestation and increase the knowledge on their morphology, biology and ecology.

The only previous study on the morphology of cicada nymphs on coffee in Brazil is that of Maccagnan & Martinelli (2004), which describes and offers a key to the identification of all five instars of *Quesada gigas* (Olivier) mainly on the basis of the structure of the foreleg. The forelegs of cicada nymphs are modified appendages used for digging and their importance in species identification

has been recognized by several authors (Boulard 1965, Pachas 1966, Hayashi, 1976, Ellingson *et al* 2002).

In the female fifth-instar, the ventral view of the abdominal apex, where there is genital development, is similar among the species. But in the male, the genital development that occurs on the 10<sup>th</sup> sternite is species specific (Duffels & Ewart 1988).

The purpose of this work was to describe and present a key to the identification of the fifth-instars of some cicada species associated with coffee trees in Brazil.

#### Material and Methods

Fifth-instars available in 80% ethanol and deposited in the Entomology Collection at the Departamento de Fitossanidade da Faculdade de Ciências Agrárias e Veterinárias (FCAV/UNESP), municipality of Jaboticabal (SP) were used. All nymphs studied were collected by digging beneath the coffee trees, and were observed feeding on their roots. Localities and dates of capture are given under "Material studied".

Observations of the morphological features of the nymphs were carried out with the use of a stereomicroscope and mainly dealt with the general shape of the body and the structures of the foreleg, the mesothoracic and metathoracic tibiae and the male 10<sup>th</sup> sternite. Drawings were made with the aid of a camera lucida attached to the microscope. Measurements of the fifth-instars included: (1) length of the body measured from the apex of postclypeus to the distal margin of the abdomen; (2) postclypeus length measured on front view from its suture with the anteclypeus to the frontoclypeal suture; (3) crown length measured on dorsal view along its median line from frontoclypeal suture to the its posterior margin; (4) head width measured on dorsal view from the outer extremity of one eye to the other; (5) pronotum length measured on dorsal view along its median line; (6) pronotum width measured at the posterior margin; and (7) fore femur length measured along the median line of its external side. For all measurements, a caliper rule of 0.05 mm precision was used.

The terminology adopted to describe the structures of the foreleg was based on Duffels & Ewart (1988). In this work the femoral formula proposed by Maccagnan & Martinelli (2004) was used to indicate the number and sequence of the teeth of the fore femur, being that the first number refers to the sum of the posterior and accessory teeth, the second one refers to the number of intermediate teeth and the third refers to the numbers of the teeth on the femoral comb. The morphological features of *Q. gigas* were taken from Maccagnan & Martinelli (2004).

## Results and Discussion

Fifth-instars of the following cicada species were studied: *Dorisiana drewseni* (Stål), *Dorisiana viridis* (Olivier), *Fidicina mannifera* (Fabricius), *Fidicinoides pronoe* (Walker) and *Carineta fasciculata* (Germar).

In general, the fifth-instar is easily identified from the remaining instars by the well developed and rounded eye-capsule, developed wing cases, anterior wing cases overlapping the posterior ones throughout its length and extending beyond the apex of the abdomen when the nymphs have recently molted, or reached between the 4<sup>th</sup>-6<sup>th</sup> uromer length when the fifth-instars are fully developed (Fig 1). The fore tarsi are well developed and folded along the inner surface of the tibiae (Fig 2a). Sexing is possible, being that the female fifth-instars bear the ovipositor cases as posterior projections from the 8<sup>th</sup> to 9<sup>th</sup> sternite (Fig 3a).

The adults of some cicada taxa can be diagnosed by the number of tarsomeres, for example, there are two tarsomeres in Fidicinina and three tarsomeres in Guyalnina (Boulard & Martinelli 1996). However, all the studied fifth-instars have two tarsomeres only.

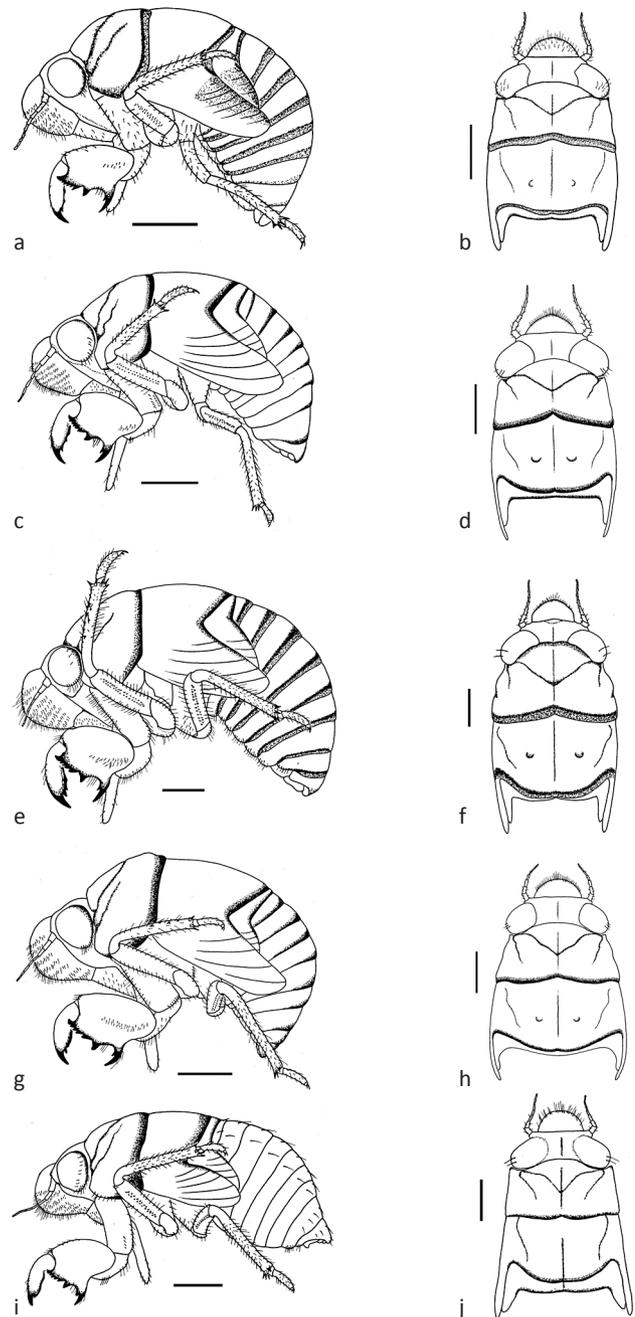


Fig 1 Fifth-instars. a) *Dorisiana drewseni*, general lateral view of body; b) *D. drewseni*, dorsal view of head and thorax; c) *Dorisiana viridis*, general lateral view of body; d) *D. viridis*, dorsal view of head and thorax; e) *Fidicina mannifera*, general lateral view of body; f) *F. mannifera*, dorsal view of head and thorax; g) *Fidicinoides pronoe*, general lateral view of body; h) *F. pronoe*, dorsal view of head and thorax; i) *Carineta fasciculata*, general lateral view of body; j) *C. fasciculata*, dorsal view of head and thorax. Scale = 3 mm.

Some characteristics of the nymphs are preserved in the last exuviae, especially from the fore femur and the male 10<sup>th</sup> sternite, as noted by the comparison with the descriptions given by Motta (2003). Although the measurements of the head and pronotum are not preserved in the exuviae, those

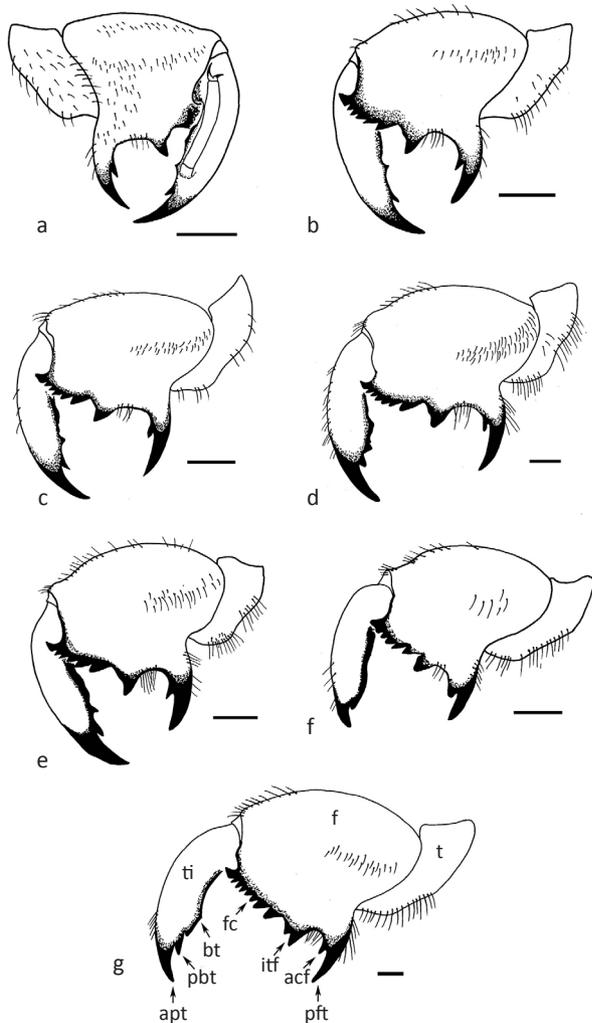


Fig 2 Left foreleg of fifth-instars. a) *Dorisiana drewseni*, inner view; b) *D. drewseni*, outer view; c) *Dorisiana viridis*, outer view; d) *Fidicina mannifera*, outer view; e) *Fidicinoides pronoe*, outer view; f) *Carineta fasciculata*, outer view; g) *Quesada gigas*, outer view. acf. Accessory tooth of femur; apt. Apical tooth of tibia; bt. Blade of tibia; f. Femur; fc. Femoral comb; itf. Intermediate tooth of femur; pbt. Point of blade of tibia; pft. Posterior tooth of femur; t. Trochanter; ti. Tibia. Scale = 1 mm.

of the postclypeus and foreleg maintain the same shape and dimensions, thus measurements of the postclypeus and foreleg taken from the exuviae should be comparable to those of fifth-instars (Table 1).

#### *Dorisiana drewseni* (Stål)

Body brownish in coloration, curved in lateral view, covered with sparse bristles in the ventral region (Fig 1a).

**Head.** In dorsal view, including eyes, about four times wider than long, about the same width as anterior margin of pronotum (Fig 1b). In ventral view, rostrum surpassing posterior coxa.

**Thorax.** In dorsal view, pronotum with the length slightly

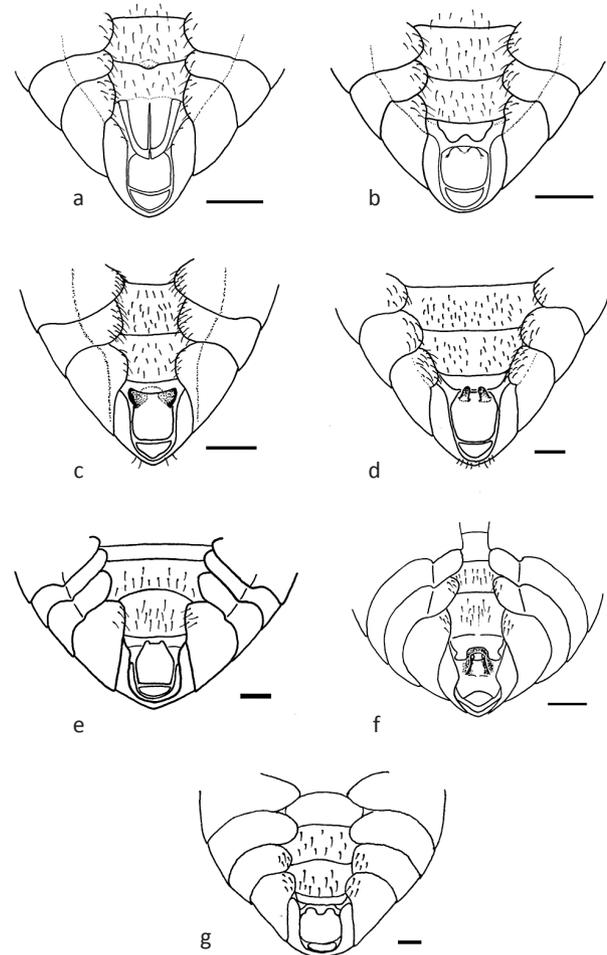


Fig 3 Abdominal apex in ventral view. a) *Dorisiana drewseni*, female; b) *D. drewseni*, male; c) *Dorisiana viridis*, male; d) *Fidicina mannifera*, male; e) *Fidicinoides pronoe*, male; f) *Carineta fasciculata*, male; g) *Quesada gigas*, male. Scales = 1 mm.

less than the mesonotum; metanotum very small when compared with the pronotum and mesonotum (Fig 1b). Wing cases developed, reaching abdominal segments, shaded in the upper region (Fig 1a). In the foreleg, femur with long and sharp posterior tooth, slightly bent forward, about two and a half times longer than the width of its base; small and sharp accessory tooth present; intermediate tooth with projection in one of its sides; femoral comb usually with six teeth (femoral formula 2-1-6), the first tooth wider and projected forward (Fig 2b). Tibia arched, flattened laterally; apical tooth long; blade of tibia with a distinct tooth; point of blade of tibia developed and separated from the apical tooth by strong incision (Fig 2b). Tarsi developed, folded over the inner surface of the tibia, two segmented, the apex much longer and fitted with a pair of claws of unequal sizes (Fig 2a). In the hind legs, tibia with four apical spines, in some cases, internally with a very smaller spine (Fig 4a). Tarsi two segmented, the apical much longer and

Table 1 Measurements (mm) (mean  $\pm$  standard deviation) of fifth-instar nymphs cicadas collected from coffee trees in Brazil.

Species	Sex	Number of specimens studied	Body length	Postclypeus length	Postclypeus width	Head length	Head width	Pronotum Length	Pronotum width	Fore femur length
<i>Dorisia</i>	♂	5	14.2 $\pm$ 1.83	2.9 $\pm$ 0.20	2.6 $\pm$ 0.22	1.6 $\pm$ 0.15	6.1 $\pm$ 0.45	3.3 $\pm$ 0.24	6.1 $\pm$ 0.60	3.1 $\pm$ 0.22
<i>drewezeni</i>	♀	3	12.9 $\pm$ 0.70	2.7 $\pm$ 0.20	2.3 $\pm$ 0.17	1.6 $\pm$ 0.06	5.8 $\pm$ 0.24	3.2 $\pm$ 0.22	6.1 $\pm$ 0.49	2.9 $\pm$ 0.08
<i>Dorisia</i>	♂	3	14.6 $\pm$ 0.53	3.4 $\pm$ 0.10	2.9 $\pm$ 0.18	1.8 $\pm$ 0.10	6.9 $\pm$ 0.15	3.8 $\pm$ 0.15	6.8 $\pm$ 0.13	3.6 $\pm$ 0.05
<i>viridis</i>	♀	13	14.7 $\pm$ 1.08	3.6 $\pm$ 0.22	2.9 $\pm$ 0.22	1.8 $\pm$ 0.17	6.8 $\pm$ 0.31	3.8 $\pm$ 0.22	7.0 $\pm$ 0.37	3.6 $\pm$ 0.16
<i>Fidicina</i>	♂	10	27.0 $\pm$ 3.11	6.0 $\pm$ 0.15	4.9 $\pm$ 0.21	2.9 $\pm$ 0.25	11.2 $\pm$ 0.34	7.5 $\pm$ 0.25	12.4 $\pm$ 0.68	5.9 $\pm$ 0.19
<i>mannifera</i>	♀	11	26.4 $\pm$ 1.96	5.7 $\pm$ 0.12	4.7 $\pm$ 0.14	2.9 $\pm$ 0.24	10.8 $\pm$ 0.27	7.3 $\pm$ 0.36	12.5 $\pm$ 0.56	5.7 $\pm$ 0.19
<i>Fidicinoides</i>	♂	9	17.6 $\pm$ 1.83	4.4 $\pm$ 0.51	3.5 $\pm$ 0.33	2.0 $\pm$ 0.15	8.4 $\pm$ 0.97	4.9 $\pm$ 0.63	9.0 $\pm$ 1.26	4.2 $\pm$ 0.51
<i>pronoe</i>	♀	6	17.9 $\pm$ 1.65	4.4 $\pm$ 0.17	3.7 $\pm$ 0.09	1.9 $\pm$ 0.13	8.4 $\pm$ 0.32	4.9 $\pm$ 0.11	9.5 $\pm$ 0.45	4.2 $\pm$ 0.18
<i>Carineta</i>	♂	88	16.9 $\pm$ 1.87	3.3 $\pm$ 0.17	2.9 $\pm$ 0.14	2.0 $\pm$ 0.16	6.3 $\pm$ 0.25	3.7 $\pm$ 0.19	6.5 $\pm$ 0.36	3.3 $\pm$ 0.20
<i>fasciculata</i>	♀	85	18.0 $\pm$ 2.30	3.5 $\pm$ 0.18	3.0 $\pm$ 0.18	2.1 $\pm$ 0.20	6.7 $\pm$ 0.28	3.9 $\pm$ 0.21	7.1 $\pm$ 0.48	3.5 $\pm$ 0.22
<i>Quesada</i>	♂	199	27.7 $\pm$ 3.54	6.0 $\pm$ 0.32	4.7 $\pm$ 0.28	2.8 $\pm$ 0.28	11.0 $\pm$ 0.45	7.2 $\pm$ 0.34	11.8 $\pm$ 0.66	6.3 $\pm$ 0.30
<i>gigas</i>	♀	197	26.9 $\pm$ 3.33	5.7 $\pm$ 0.31	4.5 $\pm$ 0.29	2.7 $\pm$ 0.27	10.6 $\pm$ 0.45	6.9 $\pm$ 0.40	11.3 $\pm$ 0.73	6.1 $\pm$ 0.32

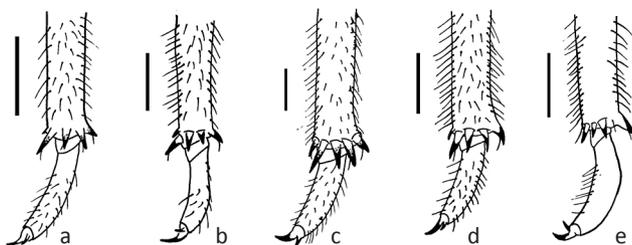


Fig 4 Spines at the apex of hind tibia. a) *Dorisia drewezeni*; b) *Dorisia viridis*; c) *Fidicina mannifera*; d) *Fidicinoides pronoe*; e) *Carineta fasciculata*. Scales = 1 mm.

fitted with a pair of claws of unequal sizes.

**Abdomen.** The size varies according to the development of the nymph, so it may be reduced with the distal extremity of the hind wing almost reaching the apex of the abdomen, or elongated, with the distal extremity of the hind wing reaching the middle of the abdomen. Female: 8<sup>th</sup> and 9<sup>th</sup> sternite with two sharp protrusions in the posterior margin (Fig 3a). Male: 10<sup>th</sup> sternite with two globular protrusions in the anterior margin (Fig 3b).

#### Measurements (mm)

**Male** (n = 5): body length: 14.2 (12.5-17.3); postclypeus: length 2.9 (2.7-3.1), width 2.6 (2.3-2.9); crown: length 1.6 (1.5-1.8), width 6.1 (5.6-6.7); pronotum: length 3.3 (3.0-3.5), width 6.1 (5.6-7.0); fore femur length 3.1 (2.8-3.4).

**Female** (n = 3): body length: 12.9 (12.2-13.6); postclypeus: length 2.7 (2.6-3.0), width 2.3 (2.2-2.5); crown: length 1.6 (1.5-1.6), width 5.8 (5.6-6.0); pronotum: length 3.2 (3.0-3.4), width 6.1 (5.6-6.5); fore femur length 2.9 (2.9-3.0).

**Material studied.** BRAZIL. Minas Gerais: São Sebastião do

Paraíso, xii – 2001 (D. H. B. Maccagnan), 1 ♂; ibidem, iv – 2002 (D. H. B. Maccagnan), 1 ♀; Monte Santo de Minas, Farm Sapé, i – 1998 (N. M. Martinelli), 1 ♂; ibidem, iv – 1998 (N. M. Martinelli), 1 ♂. São Paulo: São Manuel, ii – 2003 (D. H. B. Maccagnan), 1 ♂ and 1 ♀. Paraná: Rolândia, ii – 2003 (D. H. B. Maccagnan), 1 ♂ and 1 ♀.

**Comment.** 12.5% of the specimens studied had a femoral comb with seven teeth.

#### *Dorisia viridis* (Olivier)

Body color brownish, curved in lateral view, covered with sparse bristles, mainly in the ventral region (Fig 1c).

**Head.** In dorsal view, crown including eyes, about four times wider than long, slightly wider than the anterior margin of pronotum (Fig 1d). In ventral view, rostrum reaching posterior coxae.

**Thorax.** In dorsal view, pronotum and mesonotum with similar length, metanotum length very short in comparison with the pronotum and mesonotum (Fig 1d). Wing cases developed, reaching abdominal segments (Fig 1c). In the foreleg, femur with long and sharp posterior tooth, slightly bent forward, length approximately three times longer than the width of its base; small and sharp accessory tooth and an intermediate tooth present; femoral comb usually with six teeth, the anterior tooth bigger and projected forward (femoral formula 2-1-6) (Fig 2c). Tibia arched, flattened laterally; apical tooth long; blade of the tibia with a distinct tooth; tip of the blade of the tibia developed and separated from the apical tooth by a strong incision (Fig 2c). Tarsi developed, folded over the inner surface of the tibia, two segmented, the apical tarsomere much longer and fitted with a pair of claws of

unequal sizes. In the mid leg, tibia with two, sometimes three, short spines on its length. When two, distance between these spines similar to the distance between the distal spine to the tibia apex (Fig 5a). In the hind leg, tibia with four apical spines, and in some cases there is a very small spine internally (Fig 4b). Tarsi two segmented, the apical tarsomere much longer and fitted with a pair of claws of unequal sizes.

**Abdomen.** Size varying according to the development of the nymph, sometimes reduced, with the distal extremity of hind wing almost reaching the apex of abdomen, or elongated, with the distal extremity of hind wing reaching the middle of the abdomen. Female: 8<sup>th</sup> and 9<sup>th</sup> sternites with two sharp protrusions in posterior margins. Male: 10<sup>th</sup> sternite with two strong projections forming an open angle at the anterior margin (Fig 3c).

#### Measurements (mm)

**Male** (n = 3): body length: 14.6 (12.9-15.8); postclypeus: length 3.4 (3.2-3.5), width 2.9 (2.8-3.0); crown: length 1.8 (1.8-1.9), width 6.9 (6.7-7.1); pronotum: length 3.8 (3.6-4.1), width 6.8 (6.6-7.0); fore femur length 3.6 (3.6-3.7).

**Female** (n = 13): body length: 14.7 (12.2-16.4); postclypeus: length 3.6 (3.0-3.8), width 2.9 (2.3-3.1); crown: length 1.8 (1.4-2.0), width 6.8 (6.0-7.2); pronotum: length 3.8 (3.5-4.2), width 7.0 (6.4-7.7); fore femur length 3.6 (3.2-3.7).

**Material studied.** BRAZIL. *Paraná*: Rolândia, ii – 2003 (D. H. B. Maccagnan), 3 ♂ and 13 ♀.

**Comment.** A femoral comb with seven teeth occurred in 12.5% of the studied specimens.

#### *Fidicina mannifera* (Fabricius)

Body dark brown in coloration, curved in lateral view, legs and ventral region covered with many bristles (Fig 1e).

**Head.** In dorsal view, crown including the eyes, about four times wider than long; slightly wider than the margin anterior of the pronotum (Fig 1f). In ventral view, rostrum reaching posterior coxae.

**Thorax.** In dorsal view, pronotum and mesonotum with similar lengths, metanotum very short in comparison with the pronotum and mesonotum (Fig 1f). Wing cases

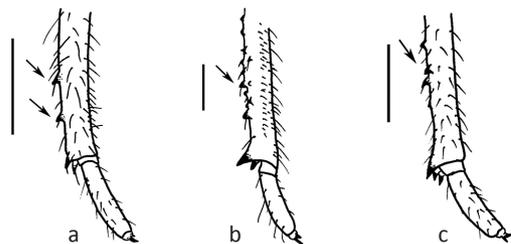


Fig 5 Spines along the length of mid tibia. a) *Dorisiana viridis*; b) *Fidicina mannifera*; c) *Fidicinoides pronoe*. Scales = 1 mm.

developed, reaching abdominal segments (Fig 1e). In the foreleg, femur with a long and sharp posterior tooth, slightly bent forward, about two times longer than the width of its base, small and sharp accessory tooth and a strong intermediate tooth present; femoral comb usually with seven teeth, the first one wide and projected forward (femoral formula 2-1-7) (Fig 2d). Tibia arched, flattened laterally; apical tooth long; blade of the tibia with teeth; tip of blade of tibia developed and separated from the apical tooth by a strong incision (Fig 2d). Tarsi developed, folded over the inner surface of the tibia, each two segmented, with the apical tarsomere much longer and fitted with a pair of claws of unequal sizes. In the mid legs, tibia with many protrusions along the outer side (Fig 5b). In the hind legs, apex of tibia with five spines (Fig 4c). Tarsi two segmented, the apical ones much longer and fitted with a pair of claws of unequal sizes.

**Abdomen.** Size varies according to the development of the nymph, sometimes reduced, with the distal extremity of hind wing almost reaching the apex of abdomen, or elongated, with the distal extremity of hind wing reaching the middle of abdomen. Female: 8<sup>th</sup> and 9<sup>th</sup> sternites with two sharp posterior marginal protrusions. Male: 10<sup>th</sup> sternite with two strong projections close to the anterior margin (Fig 3d).

#### Measurements (mm)

**Male** (n = 10): body length: 27.0 (22.4-31.1); postclypeus: length 6.0 (5.8-6.3), width 4.9 (4.7-5.4); crown: length 2.9 (2.4-3.3), width 11.2 (10.8-12.0); pronotum: length 7.5 (7.0-7.8), width 12.4 (11.1-13.2); fore femur length 5.9 (5.6-6.3).

**Female** (n = 11): body length: 26.4 (23.4-29.5); postclypeus: length 5.7 (5.5-6.0), width 4.7 (4.5-4.9); crown: length 2.9 (2.5-3.2), width 10.8 (10.5-11.3); pronotum: length 7.3 (6.5-7.7), width 12.5 (11.7-13.7); fore femur length 5.7 (5.3-6.0).

**Material studied.** BRAZIL. *São Paulo*: Jaboticabal, FCAV, x – 2002 (D. H. B. Maccagnan), 8 ♂ and 10 ♀; idem, xi – 1990, (N. M. Martinelli), 2 ♂ and 1 ♀.

**Comment.** A femoral comb with eight teeth occurred in 35% of the specimens studied.

#### *Fidicinoides pronoe* (Walker)

Body brownish in coloration, well curved in lateral view, covered with bristles scattered mainly in the ventral region (Fig 1g).

**Head.** In dorsal view, crown including eyes, about four times wider than long, slightly wider than the anterior margin of the pronotum (Fig 1h). In ventral view, rostrum reaching posterior coxa.

**Thorax.** In dorsal view, wider posteriorly, pronotum with a smaller surface than the mesonotum; metanotum very

small when compared with pronotum and mesonotum (Fig 1h). Wing cases developed, reaching abdominal segments (Fig 1g). In the foreleg, femur with long and sharp posterior tooth, slightly bent forward, about two times longer than the width of its base, small and sharp accessory tooth, a strong intermediate tooth; femoral comb usually with six teeth, the first tooth wider and projected forward (femoral formula 2-1-6) (Fig 2e). Tibia arched, flattened laterally, apical tooth long, blade of the tibia with a distinct tooth; tip of blade of tibia developed and separated from the apical tooth by a strong incision (Fig 2e). Tarsi developed, folded over the inner surface of the tibia, two segmented, and the apical much longer and fitted with a pair of claws of unequal sizes. In the mid leg, tibia with at least three protrusions along its length. The distance between these protrusions is less than the distance between the distal one to the apex of tibia (Fig 5c). In the hind legs, tibia with four spines, the outer one robust, in some cases there is a very small spine internally (Fig 4d). Tarsi two segmented, the apical one much longer and fitted with a pair of claws of unequal sizes.

**Abdomen.** The size varies according to the development of the nymph, sometimes reduced, with the distal margin of the hind wing almost reaching the apex of abdomen, or elongated, with the distal margin of hind wing reaching the middle of abdomen. Female: 8<sup>th</sup> and 9<sup>th</sup> sternites with two sharp protrusions in the posterior margin. Male: 10<sup>th</sup> sternite with two soft processes in the anterior margin (Fig 3e).

#### *Measurements (mm)*

**Male** (n = 9): body length: 17.6 (16.2-20.0); postclypeus: length 4.4 (4.0-4.7), width 3.5 (3.3-3.8); crown: length 2.0 (1.9-2.2), width 8.4 (8.0-9.0); pronotum: length 4.9 (4.5-5.3), width 9.0 (8.0-9.8); fore femur length 4.2 (3.8-4.5).

**Female** (n = 6): body length: 17.9 (15.7-19.8); postclypeus: length 4.4 (4.1-4.5), width 3.7 (3.6-3.8); crown: length 1.9 (1.7-2.1), width 8.4 (8.2-9.0); pronotum: length 4.9 (4.8-5.1), width 9.5 (9.0-10.2); fore femur length 4.2 (4.0-4.5).

**Material studied.** BRAZIL. *Minas Gerais*: Coromandel, ix/x – 1996 (R. C. Rangel), 8 ♂ and 5 ♀. *São Paulo*: Lençóis Paulista, Farm L. Wart, xi – 1984 (S. Zambon), 1 ♂ and 1 ♀.

**Comment:** A femoral comb with five teeth occurred in 6.7% of the specimens studied.

#### *Carineta fasciculata (Germar)*

Body brown, narrow and elongated, abdomen with bristles scattered mainly in the ventral region (Fig 1i).

**Head.** In dorsal view, crown including eyes, about three times wider than long. About the same width as the anterior margin of pronotum (Fig 1j). In ventral view, rostrum reaching posterior coxae.

**Thorax.** In dorsal view, pro and mesonotum similar in

length, metanotum reduced in length (Fig 1j). Wing cases developed, reaching abdominal segments (Fig 1i). In the foreleg, femur with long and sharp posterior tooth, slightly curved, its length of about one and a half times the width of its base; small, a robust and not sharp accessory tooth and an intermediary tooth present; femoral comb usually with five or six teeth (femoral formula 2-1-5 or 2-1-6) (Fig 2f). Tibia arched, flattened laterally; apical tooth relatively robust, the blade of tibia without any tooth, tip of the blade of tibia under-developed and separated from apical tooth by a light incision (Fig 2f). Tarsi developed, folded over the inner surface of the tibia, two segmented, being the apical one much longer and provided with a pair of claws of unequal sizes. In hind legs, apex of tibia with four spines, the external stronger than the remaining (Fig 4e).

**Abdomen.** Size varies according to the development of the nymph, may be reduced, with the distal extremity of hind wing almost reaching the apex of abdomen, or elongated, with the distal extremity of hind wing reaching middle of abdomen. Female: 8<sup>th</sup> and 9<sup>th</sup> sternites with two sharp protrusions in the posterior margin. Male: posterior margin 9<sup>th</sup> sternite with two protrusions and 10<sup>th</sup> sternite with strong ventral projection (Fig 3f).

#### *Measurements (mm)*

**Male** (n = 88): body length: 16.9 (13.9-21.6); postclypeus: length 3.3 (3.0-3.6), width 2.9 (2.4-3.1); crown: length 2.0 (1.6-2.6), width 6.3 (5.6-7.1); pronotum: length 3.7 (3.3-4.3), width 6.5 (5.5-7.5); fore femur length 3.3 (2.7-3.9).

**Female** (n = 85): body length: 18.0 (12.8-25.1); postclypeus: length 3.5 (3.0-3.9), width 3.0 (2.7-3.5); crown: length 2.1 (1.8-2.6), width 6.7 (5.9-7.2); pronotum: length 3.9 (3.5-4.5), width 7.1 (6.1-7.9); fore femur length 3.5 (3.0-4.0).

**Material studied.** BRAZIL. *Minas Gerais*: Piedade de Caratinga, x – 2002, 11 ♂ and 17 ♀. *Espírito Santo*: Iúna, xii – 2000 (M. J. Fornazier), 22 ♂ and 13 ♀; Venda Nova do Imigrante, ii – 2001 (M. J. Fornazier), 7 ♂ and 5 ♀; idem, iii – 2001 (M. J. Fornazier), 3 ♂ and 6 ♀; idem, iv – 2001 (M. J. Fornazier), 4 ♂ and 5 ♀; Vargem Alta, 2001, 9 ♂ and 3 ♀. *São Paulo*: São Manuel, ii – 2003 (D. H. B. Maccagnan), 3 ♀. *Paraná*: Carlópolis, ii – 1991 (R. A. da Silva), 6 ♂ and 8 ♀; idem, xii – 1991 (R. A. da Silva), 5 ♂ and 2 ♀; idem, without date (R. A. da Silva), 21 ♂ and 23 ♀.

**Comment.** Femoral comb with five or six teeth occurred in similar proportions, 52% and 48% respectively.

*Identification key to the fifth-instar nymphs of some cicada species associated with coffee plantations in Brazil*

1. Femoral comb with seven or more teeth; length of anterior femur more than 5 mm long .....

- 1'. Femoral comb with less than seven teeth; length of anterior femur less than 5 mm long ..... 3
2. Intermediate tooth of femur bifurcate (Fig 2g). Male 10<sup>th</sup> sternite with two soft globular protrusions in the anterior margin (Fig 3g) ..... *Quesada gigas*
- 2'. With a single intermediate tooth on femur (Fig 2d). Male 10<sup>th</sup> sternite with two strong projections close to the anterior margin (Fig 3d) ..... *Fidicina mannifera*
3. Blade of tibia without any tooth; apex of the blade of tibia under-developed and separated from apical tooth by a light incision (Fig 2f). Male with posterior margin of 9<sup>th</sup> sternite with two protrusions and 10<sup>th</sup> sternite with strong ventral projection (Fig 3f) ..... *Carineta fasciculata*
- 3'. Blade of tibia with teeth; apex of the blade tibia developed and separated from the apical tooth of tibia by a strong incision ..... 4
4. Tibia on mesothoracic legs with spines or protrusions along its length ..... 5
- 4'. Tibia on mesothoracic legs without spines or protrusions along its length. Wing cases shaded in the upper region (Fig 1a). Male 10<sup>th</sup> sternite with two globular protrusions in the anterior margin (Fig 3b) ..... *Dorisiana drewseni*
5. Mid tibia with two short spines along its length, being the distance between these spines similar with the distance between the distal spine to the apex of tibia (Fig 5a). Male 10<sup>th</sup> sternite with two strong projections forming an open angle at the anterior margin (Fig 3c) ..... *Dorisiana viridis*
- 5'. Mid tibia with about three protrusions along its length, being the distance between these protrusions less than the distance between the distal one to the apex of tibia (Fig 5c). Male 10<sup>th</sup> sternite pentagonal with two soft processes in the anterior margin (Fig 3e) ..... *Fidicinoides pronoë*

The assessment of the cicada infestation in coffee culture is based on number of nymphs in their roots (Souza *et al* 2007). With the use of the identification key to the fifth-instars nymphs of cicada will be possible be sure about the specie in any season of the year, in the detriment of the adults that are present in only few months of year (Martinelli & Zucchi 1997). This key may serve as a base to future researches about the ecology and biology of these species by association of the nymphs with the hosts.

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