Cicadas (Hemiptera, Auchenorrhyncha, Cicadidae) from Brasilia (Brazil): exuviae of the last instar with key of the species

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ABSTRACT. Eight cicada species were collected in an urban area of Brasilia (Brazil). Their nymphal casts were characterized and a dichotomous key was prepared to identify cicada species.

KEY WORDS. Cerrado, Dorisiana, Fidicina, Fidicinaoides, Majeorona, Quesada, Neotropical.

The annual appearance of cicadas (Hemiptera, Auchenorrhyncha, Cicadidae) with their exuviae shed on tree trunks and their characteristic acoustic signals, occurring from the middle of August until December, is so intense in Brasilia that it even becomes an obligatory subject in the local media. Despite their abundance and eloquence, there are no studies about them. The use of morphological exuviae characterization to identify species is important because it is useful for population and community studies, insect plant interactions as well as phylogenetic and taxonomic purposes. MARTINELLI & ZUCHI (1997) utilized adult cicada characters from the state of São Paulo. The objective of this study is to record the cicadas which occur in an urban area of Brasilia, as well as to characterize the general morphology of the exuviae and construct a dichotomous key for species identification based on cicada exuviae.

MATERIAL AND METHODS

The city of Brasilia (15°46’S, 47°55’W, altitude around 1000 m) is located in the cerrado region, at the Brazilian Central Plateau. The climate, following the classification system of Köppen, is Aw, being characterized more by precipitation than temperature, with a dry season extending from the middle of May until mid-September, and a rainy season during the rest of the year.

Emerging individuals were collected from September to December, 1999, in an urban area of Brasilia. Ivone R. Diniz (University of Brasilia, Distrito Federal, Brazil) collected the specimens, Nilza M. Martinelli (São Paulo State University, Jaboricobaal, São Paulo State, Brazil) and Allen F. Sanborn (Barry University, Florida, USA) identified the species. Collected specimens are deposited in the Entomological Museum of the University of Brasilia. Nymphal skins can be classified to sex by the developing genitalia at the tip of the abdomen. Several exuviae from each sex, for each species, were examined and the body length between the rostrum and last abdominal segment was measured with digital calipers (0.01 mm resolution).

RESULTS AND DISCUSSION

Exuviae description

Until now eight species were collected in the urban area of Brasilia: Quesada gigas (Olivier, 1790), Fidicina mammifera (Fabricius, 1803), Fidicinaoides pronoe (Walker, 1850), Dorisiana viridis (Olivier, 1790), Dorisiana dreweseni (Stål, 1854), Majeorona aper (Walker, 1850), Fidicinaoides determinata (Walker, 1858) and Dorisiana sp. The nymphal skins of cicadas can be used as a reliable indicator and the body length and general coloration of the exuviae are good cues for species determination. The male developing genitalia (sternum 10) are very characteristic for each species (Figs. 1, 4-10). But many morphological characters present in the antennae, legs and female developing genitalia (Fig. 2) are very similar among the eight species. Besides the external developing genitalia there is a dimorphism in size of the exuviae between the sexes for some species (Tab. I). The males are bigger than females in Q. gigas, F. determinata and D. viridis. In Dorisiana sp. the opposite occurs.

An example of general exuviae characterization, following the description of Quesada gigas. Light beige coloration, with small white patches, especially on the lateral surfaces; they are the largest exuviae of Brasilia (see Tab. 1), with males (3.7 to 4.4 cm) being larger than females (3.4 to 4.0 cm). First sternite bearing a median protuberance. Antennae with nine segments. Anterior femur (Fig. 3) is the most developed segment, adapted for digging, dark brown, teeth and spines black, bearing a three subset of spines (or tooth) separated by a short distance from each other. First tooth (in proximal to distal direction) is the largest (Fig. 3 t1), with the most distal being half of the size in relation to their partner. Last subset in a series of seven to eight small teeth (exceptionally five or six), known as the comb, up to apical portion, spine larger than the others. Q. gigas from São Paulo state presents different exuviae morphology in relation to body length, antennae and anterior femur (MARTINELLI & ZUCHI 1987).
Figs. 1-3. (1) Ventral view of male abdomen (Majeorona aper); (2) ventral overview of female developing genitalia (Fidicina mannifera); (3) First leg (trochanter, femur and tibia) of Quesada gigas. (c) Femoral comb, (dv) dorsal valve or gonapophysis, (F) femur, (st) sternum, (T) tibia, (tg) tergum, (Tr) trochanter, (t1, t2) femoral teeth, (vv) ventral valve or gonapophysis. The terms are from BOULARD (1965) and CHAPMAN (1998).

Table I. General coloration and body length of male and female cicada exuviae from Brasília. White patches present (Y) or absent (N). (N) Examined number, (Min and Max) minimum and maximum length observed, (M) mean, (S and NS) significative and no significative difference, (SD) standard deviation, (t) t test. All measures in centimeters.

<table>
<thead>
<tr>
<th></th>
<th>Color</th>
<th>Patches</th>
<th>Male</th>
<th>Female</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>N</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>Quesada gigas</td>
<td>Light beige</td>
<td>Y</td>
<td>20</td>
<td>3.72</td>
<td>4.37</td>
</tr>
<tr>
<td>Fidicinaoides determinata</td>
<td>Beige</td>
<td>Y/N</td>
<td>20</td>
<td>3.17</td>
<td>3.76</td>
</tr>
<tr>
<td>Majeorona aper</td>
<td>Dark beige</td>
<td>N</td>
<td>20</td>
<td>3.10</td>
<td>3.72</td>
</tr>
<tr>
<td>Fidicina mannifera</td>
<td>Dark beige</td>
<td>N</td>
<td>20</td>
<td>2.75</td>
<td>3.27</td>
</tr>
<tr>
<td>Fidicinaoides pronoe</td>
<td>Light beige</td>
<td>Y/N</td>
<td>20</td>
<td>2.32</td>
<td>2.84</td>
</tr>
<tr>
<td>Dorisiana sp.</td>
<td>Whitish beige</td>
<td>N</td>
<td>20</td>
<td>1.85</td>
<td>2.21</td>
</tr>
<tr>
<td>Dorisiana viridis</td>
<td>Light beige</td>
<td>N</td>
<td>20</td>
<td>1.76</td>
<td>2.06</td>
</tr>
<tr>
<td>Dorisiana drewseni</td>
<td>Light beige</td>
<td>N</td>
<td>20</td>
<td>1.35</td>
<td>1.64</td>
</tr>
</tbody>
</table>
Some aspects of general appearance probably are due to conditions of eclosion. Rostrum stylet in horizontal position near to base of hind coxae or standing (vertical) close to anterior femur. Waist between the thorax and abdomen more or less accentuated according to exuviae curvature. In the same way, total length of exuviae depends on the grade of the arch. In addition, the straighter the exuviae is, the longer it will become. The samples of this study apparently include this length diversity but, as expected, there are individuals which deviate from the normal length range. For example, some Q. gigas male exuviae can be 3.2 cm although the minimum expected was about 3.5 cm.

**Key for species identification using exuviae**

Species may be differentiated by the morphology of their exuviae (see Figs. 1, 4-10). Females of *M. aper* and *F. mannifera* present dubious characteristics and are not easy to distinguish them.

1. Large or medium size, length ≥ 2.6 cm .............................. 2
1'. Length ≤ 2.6 cm ................................................................. 5
2. Light beige coloration ........................................................ 3
2'. Dark beige/brown coloration ............................................ 4
3. Light beige with white patches, male > 3.7 cm, female > 3.3 cm ....................................................... *Fidicinoides determinata*
3'. Normal beige with or without white patches; medium size, male: 3.1-3.8 cm, female: 3.0-3.4 cm; male developing genitalia longer than wider and without anterior barbs; protemoral intermediary tooth single or slightly undulated ........................................... *Fidicinoides determinata*
4. Medium large (male: 3-3.7 cm; female: 2.9-3.5 cm), light gray sternites, generally with soil attached, male developing genitalia with two light protuberances ..... *Majeorona aper*
4'. Medium small (male: 2.7-3.3 cm; female: 2.5-3.3 cm), more intense coloration, more “glossy”, dark gray sternites; male

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Figs. 4-10. Terminal segments of the male nymphal exuviae (ventral view). (4) *Fidicinoides determinata*; (5) *Quesada gigas*; (6) *Fidicina mannifera*; (7) *Dorisiana viridis*; (8) *Fidicinoides pronoe*; (9) *Dorisiana sp.*; (10) *Dorisiana drewseni*.
developing genitalia with two proximate barbs; profemur
darker coloration ........................................ Fidicina mannifera
5. Length: 2.2-2.6 cm, light beige, white patches can be present,
normal setae ........................................... Fidcinoides pronoe
5'. Not as above .................................................. 6
6. Length: 1.8-2.4 cm, whitish beige coloration, pilous body,
larger and more abundant setae .................... Dorisiana sp.
6'. Normal light beige coloration, normal setae ............ 7
7. Small (male: 1.6-2.1 cm), male developing genitalia with
two barbs .................................................. Dorisiana viridis
7'. Very small (male ≤ 1.6 cm), male developing genitalia
with two protuberances ......................... Dorisiana drewseni

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REFERENCES

BOULARD, M. 1965. Notes sur la biologie larvaire des cigales
(Hom. Cicadidae). Annales de la Societe Entomologique


café (Homoptera, Cicadidae, Cicadinae). Anais da Sociedade Entomológica
do Brasil, Londrina, 16: 51-60.

MARTINELLI, N.M. & R.A. ZUCCHI. 1997. Cigarras (Hemiptera:
Cicadidae: Ticiae) associadas ao café: distribuição, hospedeiros e chave para as espécies. Anais da Sociedade
Entomológica do Brasil, Londrina, 26:133-143.

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