SYSTEMATICS, MORPHOLOGY AND PHYSIOLOGY

Morphological Characters and Karyology of *Miogryllus piracicabensis* Piza (Orthoptera: Gryllidae)

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Neotropical Entomology 33(3):337-340 (2004)

Caracteres Morfológicos e Cariologia de *Miogryllus piracicabensis* Piza (Orthoptera: Gryllidae)

RESUMO - O gênero *Miogryllus* inclui um número considerável de espécies, sendo que a maioria delas ainda não está descrita. A quantidade de detalhes morfológicos sobre as espécies conhecidas nem sempre é suficiente para seu reconhecimento, faltando dados sobre as estruturas fálicas e da *pars stridens*, bem como aqueles referentes à cariologia. O presente trabalho tem o propósito de suprir tal situação para o caso de *M. piracicabensis*.

PALAVRAS-CHAVE: Gryllinae, citogenética, esclerito fálico, *par stridens*, proventículo

ABSTRACT - The genus *Miogryllus* includes a considerable number of species, most of them still undescribed. From those already described, the amount of afforded details on morphology is not always enough to recognize the species, missing information on phallic and *pars stridens* structures as well as karyology. The present paper aims to improve these information, on the species *M. piracicabensis*.

KEY WORDS: Gryllinae, phallic sclerites, *par stridens*, proventiculus structure, cytogenetics

Ten species of the genus *Miogryllus* Saussure, 1877 are listed by Otte *et al*. (2001), who included te genus in the tribe Sciobiini. Two of them are from África (*M. argiropterus* Rochebrune, 1934 and *M. nemobioides* Chopard, 1936) one from Central America (*M. ensifer* Scudder, 1896) one from North America (*M. lineatus* Scudder, 1896) and six from South America (*M. bohlsii* Giglio-Tos, 1895, *M. convolutus* Johannson, 1763, *M. incertus* Giglio-Tos, 1894, *M. piracicabensis* Piza, 1960, *M. tucumanensis* Giglio-Tos, 1894 and *M. verticalis* Serville, 1839), with *M. convolutus* and *M. verticalis* being also represented in North America.

The large number of synonyms listed by some of its species (eight for *M. convolutus*, three for *M. lineatus* and ten for *M. verticalis*) illustrate the present confuse stage in the taxonomy of the genus. The main reasons for that are the high variability between *Miogryllus* species, the wide geographical distribution and the unsuitable descriptions of some species, with no accurate morphological (mainly genitalia) as well as karyological and bioacustical references.

The present paper aims to add more detailed information about one species identified as *M. piracicabensis* after comparing the specimens here studied (Fig. 1) with the Piza's male and female types deposited in the insect collection of the Zoology Department of the Escola de Agricultura Luiz de Queiroz (ESALQ) in São Paulo State, Brazil.

Our specimens were collected at little more than 30 km from the type specimens locality.

Material and Methods

Specimens of *M. piracicabensis* were collected at Floresta Estadual "Edmundo Navarro de Andrade", during day time, hidden under stones or rotten logs. The geographic coordinates are: 22º24'48"S – 47º31'29"W.

Meiotic stages were studied in male testes fixed in Carnoy I followed by acetic acid 40% treatment during few minutes to separate the cells. Suspension was then centrifugated and the supernatant medium discarded for post fixing of the remnant in Carnoy I. The centrifugation and change of fixative was repeated three times and finally the suspended cells were dropped in a hot slide until drying. The staining was done with 1% lacto-acetic orcein.

The *pars stridens* and proventriculus were removed, submitted to critical point Balzers CPD 050, and glued to stubs, covered with gold and examined under the scanning electron microscope Zeiss DSM 900.

The collecting date and number of specimens obtained are as follows: V-98 2, ♂♂, 3♀♀ and 1 ♀ nymph; 22-VI-98, 2♀♀; 9-III-99, 1♂ nymph and one ♀; 11-III-99, 1♂; 22-IV-99, 3 ♂♂ and 3 ♀♀; 16-V-99, 3♂♂, 2♀♀; 6-V-2000, 1 ♂, 1 ♀; 18-X-2000, 1 ♀; 10-II-2001, 1 ♀ nymph; 8-IV-2001, 1♂, 2 ♀♀.

Fig. 1. *M. piracicabensis*. a) female. b) male. Enlargement bar: 5 mm

Results

Measurements. Measurements of seven morphological characters of 11 males and 15 females are provided in Table 1.

Male Phallic Sclerites and Spermatophore. PECS are present as two parallel independent bars (Fig. 2a). DECS form a single "H" shaped dorso lateral sclerite. Two rear lateral projections are furnished with bristles. The rear border has a thin triangular projection in the middle line and the frontal border has two lateral projections. PECS and DECS are connected by fibrous tissue as shown in Fig. 2c. PENS is a single sclerite shaped as shown in Fig. 2a, b, c. DENS are represented by two independent sclerites nearly touching in the middle line. Each sclerite is formed by a lateral and mesal lobe connected to form a single sclerite (Fig. 2b). Its lateral lobes are connected to PENS by fibrilar tissue, as shown in Fig. 2a, b, c.

Stylet is a thin elongate sclerite placed at the dorsal side of the spermatophoric chamber (Fig. 2c). At its fore ends it has an apodeme for muscle attachment (Fig. 2c). Lateral and rear views of the spermatophore are shown in Fig. 2d and 2e respectively.

The spermatophoric chamber is quite large (Fig. 2c).

Table 1. Measurements (x ± SD) of external morphological characters in 11 males and 15 females of *M. piracicabensis* collected at Floresta Estadual "Edmundo Navarro de Andrade", Rio Claro - SP, Brazil.

Measurements	Male	Female
Body length	12.1 ± 0.76	13.4 ± 1.48
Femur-III lenght	9.8 ± 0.67	10.7 ± 0.78
Pronotum lenght	2.6 ± 0.23	2.8 ± 0.22
Pronotum width	4.4 ± 0.26	4.9 ± 0.36
Distance between external eyes borders	4.5 ± 0.26	4.7 ± 0.25
Tegmen length	4.6 ± 0.84	3.5 ± 0.74
Ovipositor	-	11.6 ± 1.12

Pars stridens. The number of teeth is 84.73 ± 4.02 (n = 11) distributed along 1.5 mm. The inner end teeth of the file turn to small rounded structures (Fig. 3b).

Proventriculus Structure (Fig. 3c and d). Five is the most common number of denticles found in median teeth. Denticles of lateral teeth are more numerous and also variable in number. At the side of the lateral teeth, near its base, a bunch of setae are observed (Fig. 3c, indicated by black arrow).

Karyology. The chromosome number is 2n = ♂ = 25; ♀ = 26, with an X0 (male) – XX (female) sex determining mechanism.The X is metacentric (does not appear as such in the first metaphase (Fig. 4a) but it was observed clearly metacentric in many other first metaphases). At least three autosomal pairs seem to be formed by metacentric cromossomes (see arrows) as observed in the first metaphase of Fig. 4c. During diplotene and diakinesis stages

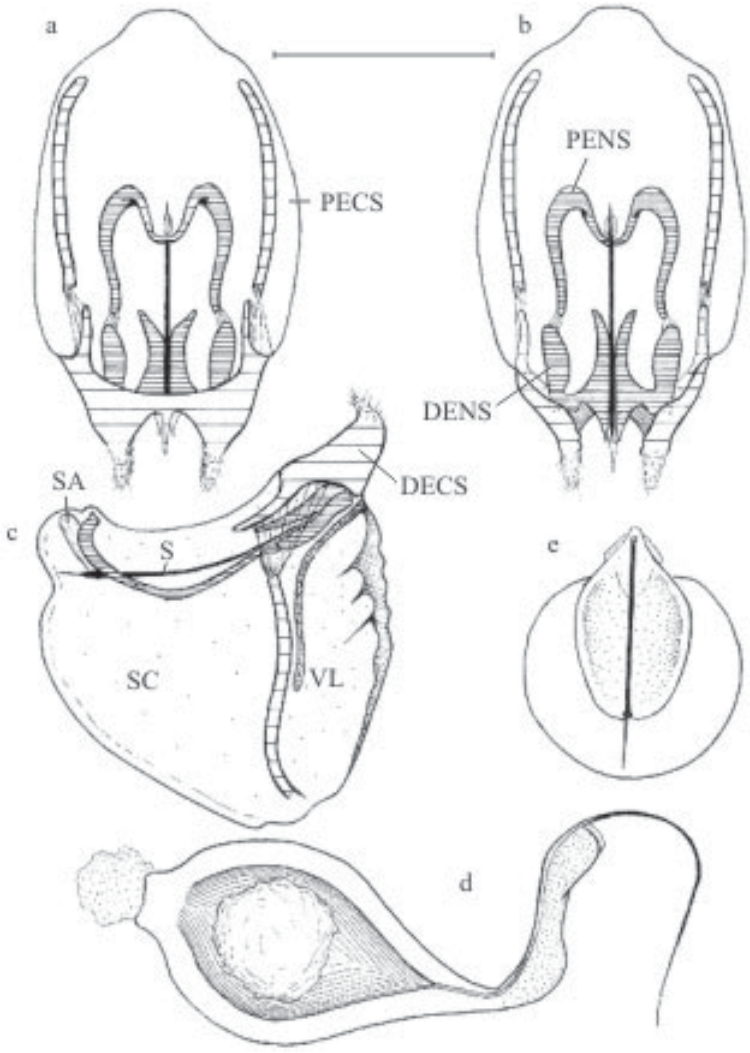

Fig. 2. *M. piracicabensis*. Phallic structure. a) dorsal view, b) ventral view, c) lateral view, d) spermatophore in lateral view,e) spermatophore in rear view. Enlargement bar: 1 mm. PECS = proximal ectophallic sclerites; DECS = distal ectophallic sclerite, PENS = proximal endophallic sclerite, DENS = distal endophallic scletires, S = stylet, SA = stylet apodeme, SC = spermatophoric chamber, VL = ventral lobe

the X chromosome is not strongly heterochromatic and by this reason it is difficult to recognize (Fig. 4 a, b). C-metaphases were obtained but the quality of the few nuclei photographed did not allow to mount a reasonable good karyogram.

Discussion

Piza's 1960 description of *M. piracicabensis* includes morphological measurements of only two specimens (one male and one female). Both male and female types have well developed wings. None of the 26 adult specimens (11 males and 15 females) collected in Rio Claro have developed wings, but the presence of wings are eventual in many species and sometimes discarded after dispersal flights. Piza's description does not provide information on male genitalia, *pars stridens,* proventriculus structures or chromosomes.

The only revision of the genus *Miogryllus* was published by Hebard (1915) and it deals mainly with North American species - few of them present in the Neotropical region - including measurements of external morphological characters of some species.

Many specimens of the genus *Miogryllus* from São Paulo, Minas Gerais, Paraná and Santa Catarina states are kept in the Biology Dept. collection of Univ. Estadual Paulista (Rio Claro - SP). Identification of this material will, however, need to wait until future chromosomal and bioacustical information are available. No calling song was observed and only very low mating songs were registered when female and males were kept together.

Acknowledgments

Our gratitude to Dr. Elliot W. Kitajima from the Núcleo

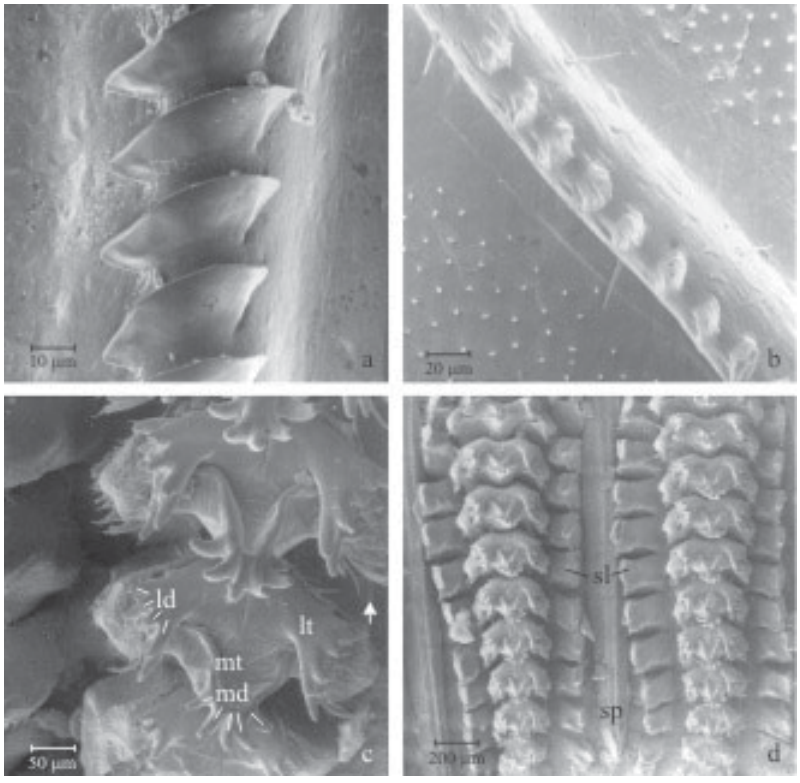

Fig. 3. *Pars stridens* of *M. piracicabensis*. a) teeth in the middle section, b) teeth at the inner end of the file. Proventriculus structure of *M. piracicabensis*. c) detail of the central and lateral teeth, d) low magnification of the structure (lt = lateral tooth, mt = median tooth, ld = lateral denticles, md = median denticles, st = sclerotized lobe, sp = sclerotized partitions, arrows in "c" indicate bunch of setae).

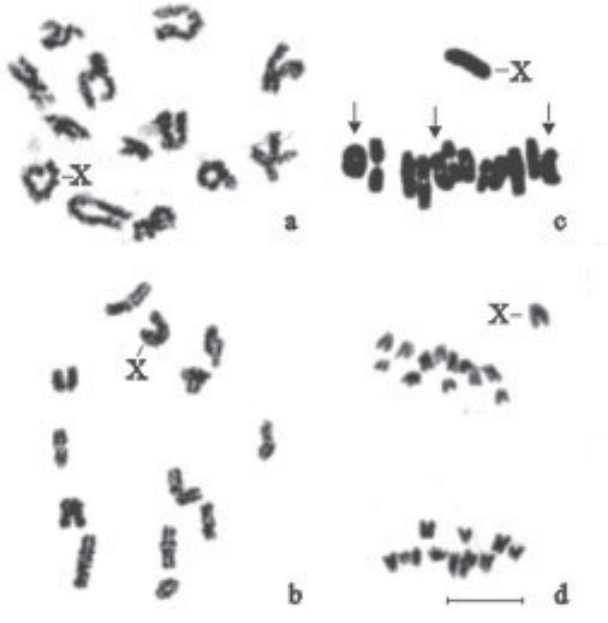

Fig. 4. *M. piracicabensis* male meiosis: a) diplotene, b) diakinesis, c) first metaphase, d) first anaphase. Enlargement bar: 10 µm.

de Apoio à Pesquisa, em Microscopia Eletrônica Aplicada à Pesquisa Agropecuária (NAP / MEPA), ESALQ (Escola de Agricultura Luis de Queiroz), USP. who furnished technical assistance and allowed to use the Scanning Electron Microscopy.

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Received 30/06/03. Accepted 10/04/04.