

SYSTEMATICS, MORPHOLOGY AND PHYSIOLOGY

Adelosgryllus rubricephalus: A New Genus and Species of Cricket (Orthoptera: Phalangopsidae)

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Adelosgryllus rubricephalus: Um Novo Gênero e Espécie de Grilo (Orthoptera: Phalangopsidae)

RESUMO - Um novo gênero e espécie de grilo falangopsídeo *Adelosgryllus rubricephalus* é descrito. Ilustrações de espécimes macho e fêmea e a descrição dos escleritos fálcos, assim como os cromossomos e a distribuição geográfica conhecida são relatados. Uma discussão sobre a posição taxonômica desse grilo dentro da família Phalangopsidae é incluída.

PALAVRAS-CHAVE: Grylloidea, morfologia, esclerito fálco, cromossomo

ABSTRACT - *Adelosgryllus rubricephalus*, a new genus and species of phalangopsid cricket are described. Illustrations of male and female specimens as well as descriptions of phallic sclerites, chromosomes and geographical known distribution are furnished. A discussion on the species taxonomic status of this cricket within the family is also included.

KEY WORDS: Grylloidea, morphology, phallic sclerite, chromosome

During the last twenty years few more than twenty specimens of this elusive species were obtained. Some of them were collected as nymphs and completed their development in the laboratory, though some of them died before reaching the adult stage. The species was found throughout a wide Brazilian territory, including the states of São Paulo, Paraná and Goiás. A single nymph specimen was observed, but not collected, far north in the Federal University, Campus in Recife, Pernambuco State. They occur in diverse habitats from "cerrado" to forest vegetation and also in urban areas, always close to the ground among leaf litter, sometimes hiding within or under rotten wood or walking in the foliage during day time. With its black body, red head, the first millimeters of the antenna flagellum black, followed by a white segment and finishing dark again, it seems to be mimicking an ant or a wasp.

Material and Methods

Meiotic stages were studied in male testes fixed in Carnoy I followed by acetic aqueous solution 40% treatment during few minutes to separate the cells. Suspension was then centrifugated to approx. 1200 r/m and the supernatant medium discarded for post fixing of the residues 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.

Results

Generic Characters. Ocelli absent. Males with tegmen covering approximately half the abdomen (Fig. 1) with Cu₂ vein provided with *pars stridens* (Fig. 2b). Lateral field of the tegmen with three branching veins (Fig. 2b). Mirror divided by two veins. Female tegmina (Fig. 3) in the majority of specimens as short triangular pads, not touching in the middle line. In some specimens the tegmina are well developed, covering most of the abdomen. In both sexes, wing in general absent, but in some specimens they are fully developed. Legs moderately short. Cephalic tibiae with an oval auditory foramina on the internal face only. Dorsal edge of the hind tibiae armed with four internal and three external movable spines, and without denticles along its whole length. The apical three external spine (Fig. 2c) are smaller than the three internal (Fig. 2d). The internal spines decrease in length from the dorsal, approximately 1 mm long, to the ventral. Among the externals the second one is the longer (Fig. 2c). First tarsomere unarmed in the dorsal face (Fig. 2c and d).

Holotype ♂ n° 13, Iguaçu, 10.VI.2002

Measurements. Body length 8.0 mm. Hind femur = 5.8; Pronotum length = 1.6; Pronotum width = 2.1; Distance between eyes external borders = 1.9; Fore wing length = 3.5 mm. Hind wing wanting.



Figure 1. Male of *A. rubricephala* of the specimen n° 9 collected in Itirapina.

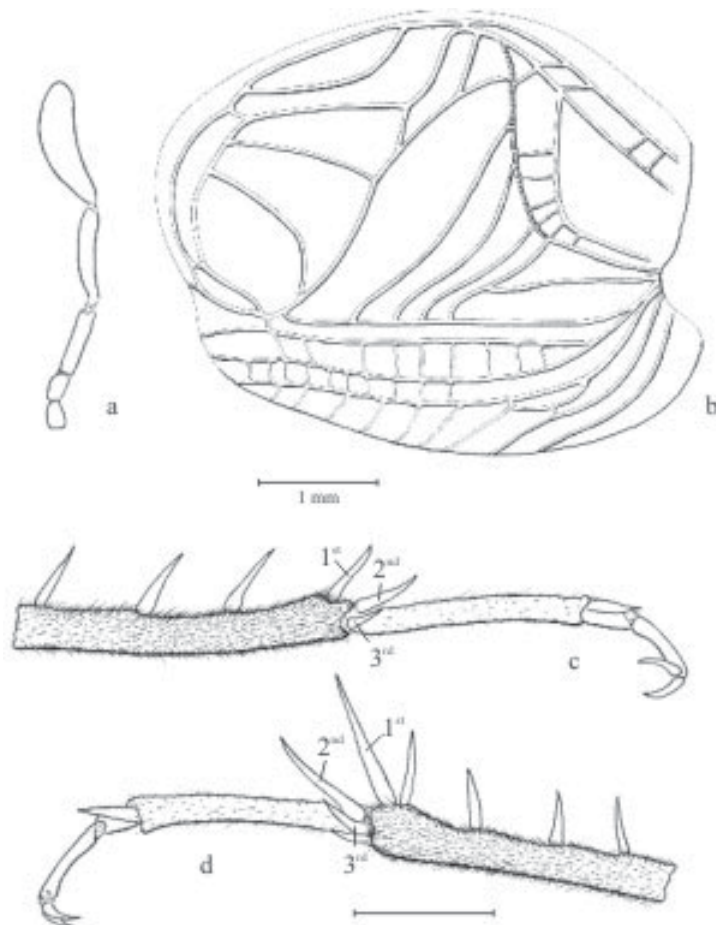


Figure 2. *A. rubricephala*. Fig. a) Maxillary palpus from male n° 9 collected in Itirapina; b) Tegmen of specimen n° 6 from Rio Claro; c) Hind leg of female n° 7, showing the distal end of the external face; d) Idem, inner face (the apical spurs are numbered 1st from the dorsal to the 3rd ventral).

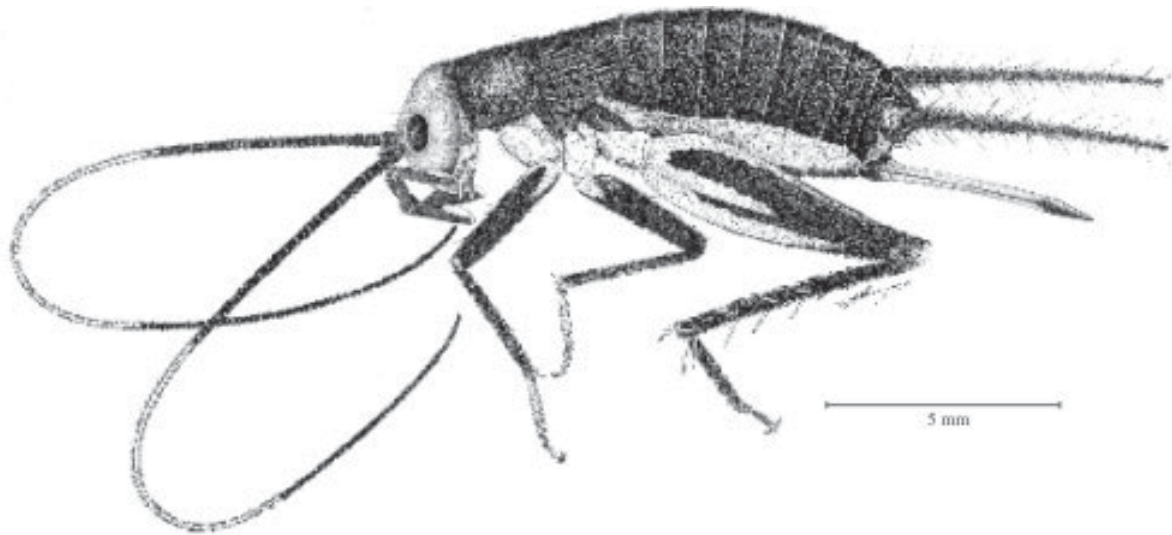


Figure 3. Female of *A. rubricephala* drawn from a photograph of specimen n° 7.

Color Characters. Head salmon red. Eyes black. Maxillary palpi dark with the fifth segment moderately dilatated and creamy white in its half ventro apical face prothorax. Tegmina and dorsal face of abdomen black. Coxae creamy white. External face of femur legs with approximately half its surface dark. All of them with a dorsal and median clear stripe. Hind leg with an additional third ventro external clear stripe, and with the ventral edges black and clear between them. Inner surface of legs predominantly light. Tibiae and tarsomeres of the three legs uniformly dark.

Other Characters. Fore and caudal borders of prothorax armed with bristles, more scattered in the remaining surface.

Paratypes. São Paulo State: Rio Claro, Floresta Estadual Edmundo Navarro de Andrade (22° 24' 48" S - 47° 31' 29" W): 1 ♀ (n° 1) - XI.1981; 1 ♂ (n° 2) - 20.XI.1986; 1 ♂ (n° 6) - 2.XI.2000; 1 ♀ (n° 7) - 14.XI.2000. Louveira (approx. 23° 05' S - 46° 58' W): 1 ♀ (n° 3) - 23.XI.1996. Itirapina, 8 km. W. of Itirapina, Cerrado Vegetation (approx. 22° 15' S - 47° 54' W): 1 ♂ (n° 4) - 28.XI.1996; 1 ♂ (n° 9) - 29.XI.2002. Descalvado, São Leopoldo do Mandic Farm (approx. 21° 54' S - 47° 36' W): 1 ♀ (n° 8) - 14.XI.2002.

Góias State: 17 km. E. of Pirenópolis (15° 48' 11" S - 48° 51' 94" W): 1 ♂ (n° 5) - 17.VIII.1997.

Paraná State, Foz do Iguaçu (approx. 25° 32' S - 54° 35' W): 1 ♂ (n° 14), 1 ♀ (n° 11), 1 ♀ (n° 12) - 10.VI.2002; 1 ♀ (n° 15), 1 ♀ (n° 16), 1 ♀ (n° 17), 1 ♀ (n° 18), 1 ♀ (n° 19), 1 ♀ (n° 21) - 16.IV.2003; 1 ♀ (n° 10) - 15.VI.2003.

Known geographic distribution (Fig. 4).

Male Genitalia

PECS - They form at each proximo-lateral field of the phallus two poorly sclerotized triangular sclerites (Fig. 5a and c). They connect by membrane with DECS.

DECS - (Fig. 5a, b and c). It covers the dorso-lateral fields of the phallus and extends caudally into two convergent process with tuft of hairs in its apical ends. Most of the dorsal field is membranous and in the dorso-proximal side is nearly touching



Figure 4. *A. rubricephala*. Known geographical distribution of specimens 1 = Rio Claro, 2 = Itirapina, 3 = Descalvados, 4 = Louveira, 5 = Pirenópolis, 6 = Iguaçu, (enlargement bar = 500 km).

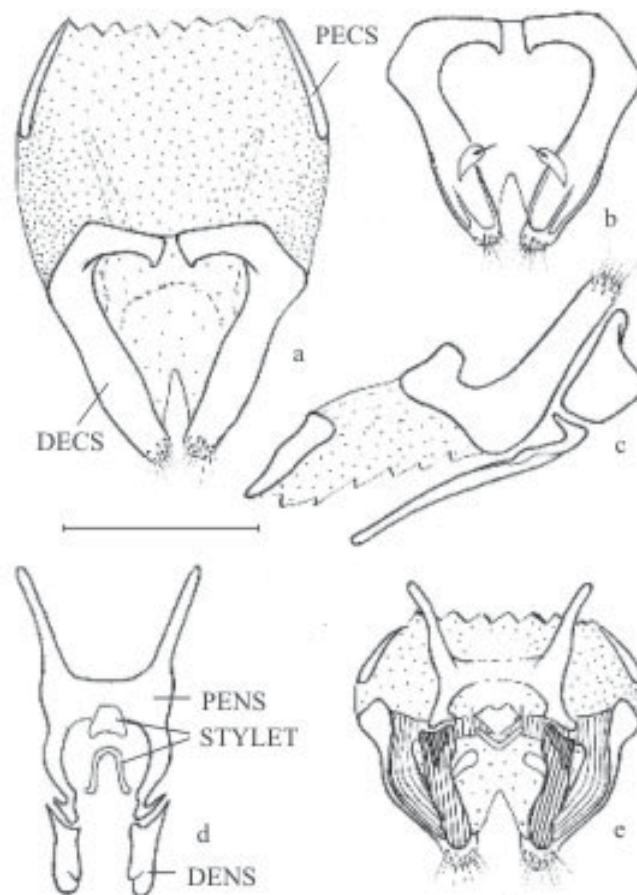


Figure 5. Phallic structure of *A. rubricephala*. a) Dorsal view; b) Ventral view of DECS; c) Lateral view; d) Ventral view of PENS, DENS and S's; e) Rear view. (PECS = Proximal ectophallic sclerites; DECS = Distal ectophallic sclerites; PENS = Proximal endophallic sclerite; DENS = Distal endophallic sclerites).

in the middle line. When treated with water diluted KOH the convergent process turns to be nearly parallel.

PENS - (Fig. 5d, c and e). In form of a single H shaped sclerite. The pair of backward directed processes connects with the DENS at its terminal end.

DENS - (Fig. 5d, c and e). Trapezoid shaped in lateral view and strongly sclerotized.

Stylet - (Fig. 5d and e). Represented by a small trapezoid shield and an independent U shaped bar.

Spermatophoric chamber. It is formed by an invagination of the ventral membrane of the dorsal lobe where the two small stylet sclerites are fixed in the middle line.

Secondary sclerites. Two very small tear shaped sclerites (Fig. 5b, small arrows) approx. 1,4 tenths of mm. They seem to be derived from the ventral partially sclerotized face of the DECS or the rear side of DENS.

Etymology. From the greek word *Adelos* that means 'unseen', 'obscure' because it is difficult to found specimens and also for the difficulty to relate the species to any already described group of crickets within Phalangopsidae.

Chromosomes. Only three males and one female from São

Paulo State and one female from Foz do Iguaçu (Paraná State) were cytologically analyzed.

The chromosomes from the Iguaçu female ($n^{\circ} 10$) show a $2n = 18$ with two large pairs of submetacentrics and six pairs of acrocentric autosomes (Fig. 6b). Specimens studied from São Paulo State are 1 ♂ ($n^{\circ} 4$) from 8 km N of Itirapina, 1 ♂ from Rio Claro ($n^{\circ} 6$), 1 ♂ ($n^{\circ} 8$) from Descalvado and 1 ♀ ($n^{\circ} 7$) from Rio Claro.

The four specimens from São Paulo show a $2n \text{ ♂} = 19$ and $2n \text{ ♀} = 20$ with a pair of submetacentric autosomes, two pairs of acrocentrics with small arms quite distinct and six pairs of smaller pairs of acrocentric chromosomes (see Fig. 6a and Fig. 7). The submetacentric autosomes of all the specimens have an arm relation (r) slightly less than 1.5 in the limit with metacentric. The sex determining mechanism in all the specimens is of the $XO \text{ ♂}$, $XX \text{ ♀}$ type, with the X metacentric and of approximately the same size as the submetacentric autosomes. In photographs of a diplotene (Fig. 7a) and diakinesis (Fig. 7b) from specimen $n^{\circ} 8$ (Descalvado) and a first metaphase (Fig. 7c) and first anaphase (Fig. 7d) from specimen $N^{\circ} 6$ (Rio Claro) are shown. The specimen from Rio Claro is heteromorphic for the size of the small arm of one the long acrocentric pairs of autosomes (see arrows in Fig. 7c and d).

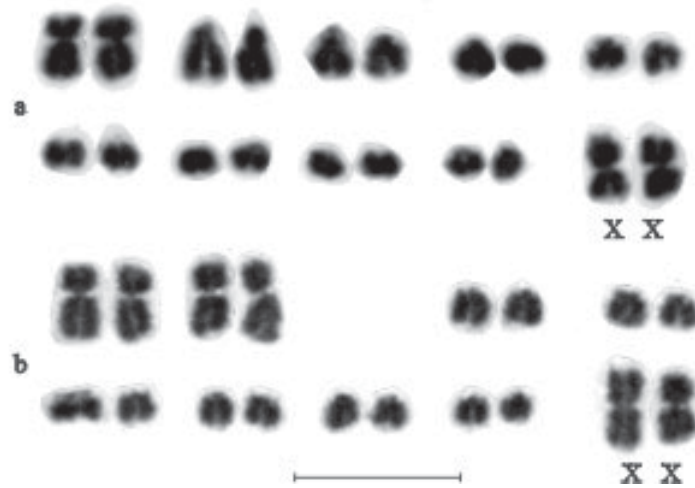


Figure 6. *A. rubricephala*. Metaphases obtained from cecae cells in females. a) specimen n° 7 from Rio Claro. b) specimen n° 10 collected in Iguaçu. Enlargement bar = 10 µm for both figures

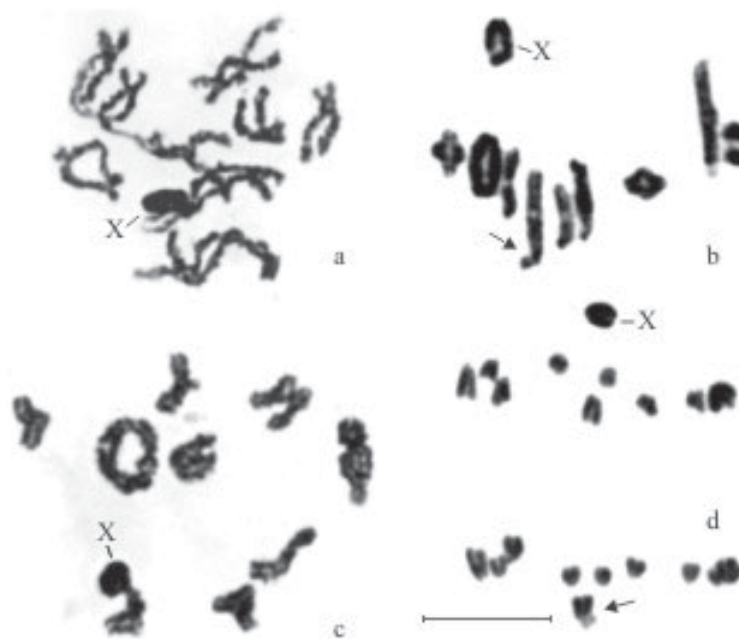


Figure 7. *A. rubricephala*. Male meiosis. Figs. a and b, diplotene and diakinesis from the specimen n° 8 collected in Descalvado. Fig. c and d first metaphase and first anaphase from specimen n° 6 collected in Rio Claro. Enlargement bar = 10 µm for all the figures

Intraspecific Variability Observed. Three females from Iguaçu (specimens n° 15, 19 and 21) presented long fore wings (6.0, 4.5 and 5.0 mm respectively) and the female n° 21 has besides a normal developed pair of wings which surpass 4.8 mm the caudal end of the abdomen.

Depository. The male holotype (n° 13) and a female paratype (n° 17) will be kept in the Museu de Zoologia of the Universidade de São Paulo - USP. The remaining specimens are deposited in the collection of the Departamento de Biologia of the Instituto de Biociências, UNESP, Campus of Rio Claro.

Discussion

A. rubricephalus, since represented by a few specimens, raises several questions that can not be answered for a while. One of them is to know whether the specimens distributed throughout such a wide geographic range, belong to a single or to a group of closely related species. They are alike in their size and color pattern, and males from São Paulo, Góias and Paraná states share the same basic phallic structure which is of the conventional or less derived type, with the four basic sclerites placed in its normal positions. Karyotypes of male

specimens analysed from the São Paulo State are $2n \text{ ♂} = 19$; $2n \text{ ♀} = 20$, while those of Iguaçú are $2n \text{ ♂} = 17$; $2n \text{ ♀} = 18$, due to the presence of a centric autosomal fusion between the two large acrocentric chromosomes observed in the São Paulo karyotype. The divergence does not mean necessarily that they belong to two different species, since within both groups or in intermediate populations polymorphism could be detected for such rearrangement when more specimens are studied. Even that the majority of specimens are wingless the eventual presence of wing means that they may sometimes spread along considerable distances, making difficult the species to split in geographic races or new species.

Another question to be solved is to which family the species belongs. If Bruner (1916) key from the South American species of crickets is considered, *A. rubricephalus* belongs to the family Phalangopsidae (Phalangopsinae, according Bruner), except that the species has not the rear tibiae with "canthi serrulate" but uniform instead.

More recently, Desutter (1988) raised a group of some new and some already described genera to the family rank (Paragryllidae and Neoacrididae), dividing the only subfamily (Phalangopsinae) of Phalangopsidae into two tribes: Phalangopsini and Luzarini. But the number of movable spines in the dorsal face of the hind tibiae of *A. rubricephalus* (4I, 3E) does not fit with those of Desutter's three families: Paragryllidae (3I - 3E), Neoacrididae (3I - 4E) and Phalangopsidae (4I - 4E).

Otte (1994) in his Orthopteran Species File, treat the phalangopsids as a subfamily, but the present version of Otte *et al.* (2001) gives them the family rank. The tribal arrangement on both versions are also considerable different. This changes in a short period of time show that a settlement of the phalangopsid systematic is far of being definitive and that an intensive work of collecting and careful comparative analysis, mainly of the male genitalia structure, needs to be done.

The Neotropical fauna of crickets is probably the most poorly known if compared with other regions. Our own experience in the Neotropical region shows that it is at present easier to collect new genera and species than those already described.

At first sight *A. rubricephalus* looks to belong to the subfamily Trigonidiinae, but the lack of a depressed second

tarsomere joint discard this possibility. On the other hand, the structure of the proximal endophallic sclerite, shared by species of the family Trigonidiidae which consist into two caudally convergent bars, is not present in *A. rubricephalus* (Fig. 5). For a while, the authors consider that the best option is to place the species within the Phalangopsidae, without any obvious relation with other taxonomic groups of this family.

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