



Systematics, Morphology and Biogeography

## Description of the male of *Evandromyia gaucha* Andrade Filho, Souza, Falcão (Psychodidae, Phlebotominae)



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### ABSTRACT

Here, we present the description of male of the sand fly species *Evandromyia gaucha*. Six male specimens of *E. gaucha*, together with conspecific females, were collected in native forest areas of the municipalities of Porto Alegre, Caçapava do Sul (type locality of *E. gaucha*) and Santa Cruz do Sul, in Rio Grande do Sul state, Brazil. The specimens are distinguished from other species of the rupicola series of the genus *Evandromyia* by the presence of dilatation in the apical quarter of the genital filaments followed by tapering of the final portion.

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### Introduction

Studies on phlebotomine sand fly fauna in Rio Grande do Sul State, Brazil, were motivated by notification of autochthonous cases of cutaneous leishmaniasis (Souza et al., 2008; Eckert and Souza, 2010) and, from 2008 by the first report of *Lutzomyia longipalpis* (Souza et al., 2009; Santos et al., 2011) and confirmation of canine and human visceral leishmaniasis in some municipalities in the Brazil–Argentina border (Deboni et al., 2011; Tartarotti et al., 2011).

New areas of Rio Grande do Sul state were sampled and in three of them, Andrade Filho et al. (2007) described a new sand fly species, *Evandromyia gaucha*, of the rupicola series, based on females. Some males of phlebotomine sand flies collected in new areas of Rio Grande do Sul presented similar morphology to the rupicola series. However, it was not possible to ascribe any of these males to any other species, suggesting they could be the males of *E. gaucha*. The rupicola series was proposed by Young and Fairchild (1974) in *Lutzomyia* genus and later transferred to *Evandromyia* genus by Galati (1995). The rupicola series was composed by only two species, *E. correalimai* (Martins Godoy and Silva, 1962), described by male and female specimens and *E. rupicola* known only by male. However, in the last six years, another three species have been added to this series: *E. gaucha*, *E. grimaldii* Andrade Filho et al., 2009 and

*E. tylophalla* Andrade and Galati, 2012. Galati et al. (2011) revised the rupicola series, re-described the male of *E. rupicola* and presented a species identification key, as well as providing comments on the geographical distribution of each species.

The aim of this study is to provide the description of the male of *E. gaucha*, provide new geographical records for this species, and contribute to the knowledge of the rupicola series in Rio Grande do Sul State.

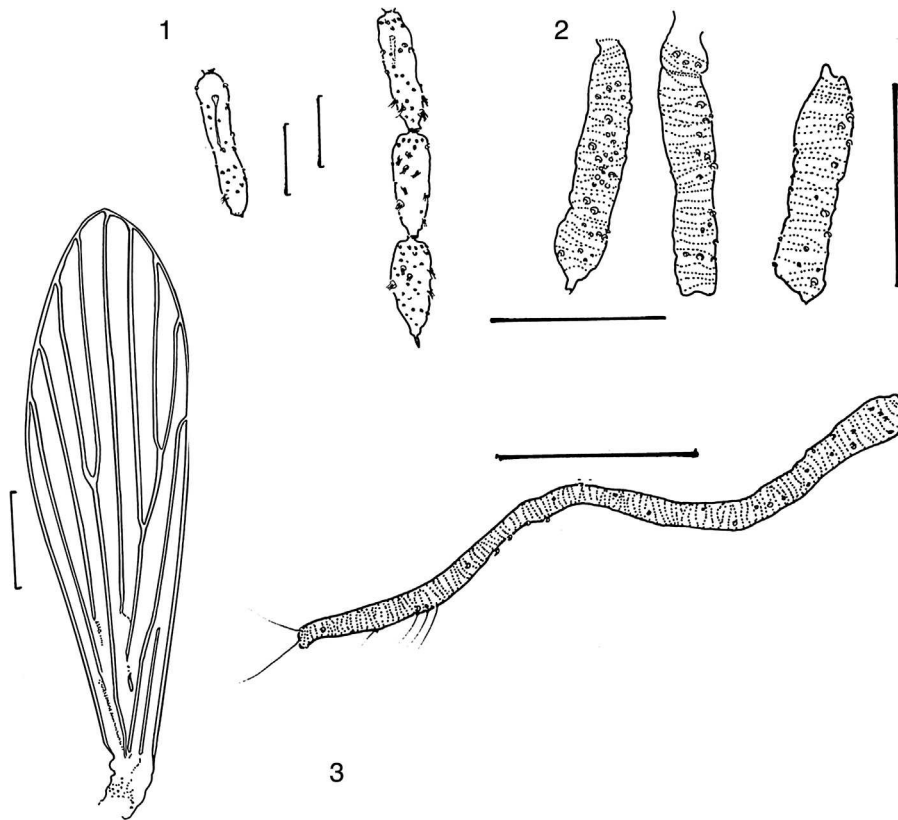
### Material and methods

Phlebotomine sand flies were collected with CDC light traps, from 6 p.m. to 6 a.m., in native forest environments in the municipalities of Caçapava do Sul, Porto Alegre and Santa Cruz do Sul, Rio Grande do Sul State, Brazil. In the last two municipalities, the collections were made in bushland and a peri-urban area, and in Caçapava do Sul in a riparian forest of the Santa Bárbara stream, locality II, District of Santa Bárbara.

The specimens were sent to the laboratory at the “Núcleo de Flebotomíneos”, “Seção de Reservatórios e Vetores”, Instituto de Pesquisas Biológicas-Laboratório Central de Saúde Pública do Rio Grande do Sul, prepared and mounted in Berlese medium on microscopical glass slides. The specimens were measured under a microscope (Olympus®), using an ocular micrometer and applying the correction factor for the different objective lenses. The measurements are presented in micrometers (µm). Measurements of some characters were not made because the specimens were

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**Figs. 1–3.** *Evandromyia gaucha*. Male: (1) Flagellomeres XI, XII, XIII, XIV, scale bar = 100 µm; (2) palpi, scale bar = 50 µm. (3) Wing, scale bar = 30 µm.

mounted laterally or some structures were lost during the preparation process and mounting.

## Results

### Taxonomy

#### *Evandromyia gaucha* Andrade Filho, Souza, Falcão, 2007

**Male.** Sand fly of medium size, ca.  $2704 \pm 205$  ( $n=6$ ) in length. The general coloration is light brown, pronotum and pleura (except katepisternum and katepimeron) pale.

**Head:** Length (including clypeus)  $416 \pm 17$  ( $n=6$ ) long. **Eyes:**  $133 \pm 6$  ( $n=6$ ). Clypeus  $140 \pm 6$  ( $n=6$ ) long. Eyes length/head length ratio 0.32:1 ( $n=6$ ) and clypeus length/head ratio 0.34: 1 ( $n=6$ ). Antenna with ascoids with rudimental spur. Antennal formula F1–F13 2, F14 0, anterior prolongation short not reaching the distal end of the flagellomere, pre-apical papilla present on F1–F3 1 (Fig. 1), F4–F7 0, F8–F10 2, F11 3, F12 5, F13 5, F14 6 (Figs. 1 and 2), the ascoids in F13 have not been depicted in Fig. 1 due to the position of the segment which did not allow the representation of these structures. Flagellomere length: F1 =  $353 \pm 30$  ( $n=5$ ), F2 =  $150 \pm 11$  ( $n=5$ ), F3 =  $164 \pm 28$  ( $n=5$ ), F13 =  $76 \pm 5$  ( $n=4$ ) and F14 =  $72 \pm 1$  ( $n=4$ ). Palp formula: 1.4.2.3.5 ( $n=6$ ). Labrum–epipharynx (LE)  $209 \pm 14$  ( $n=6$ ) length. AIII/LE ratio 1.69:1. Palpomere length: P1 =  $39 \pm 4$  ( $n=6$ ); P2 =  $147 \pm 10$  ( $n=6$ ); P3 =  $160 \pm 10$  ( $n=6$ ); P4 =  $122 \pm 10$  ( $n=6$ ); P5 =  $368 \pm 35$  ( $n=5$ ). Hyaline sensillae (Newstead's spines) are implanted in the median region of the third palpomere. Labial sutures united.

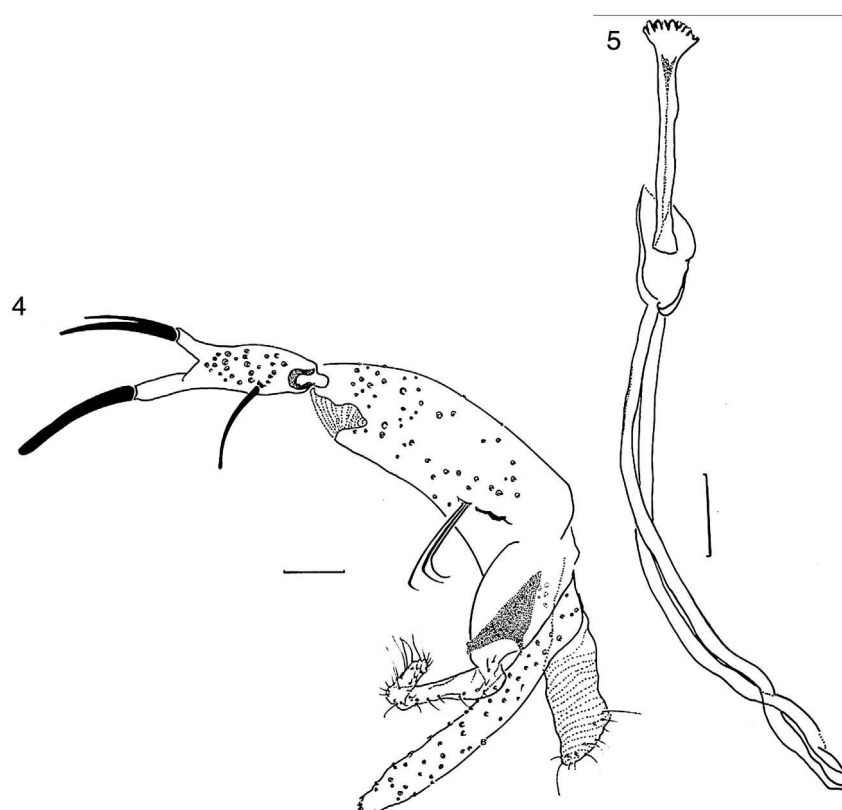
**Cervix:** ventro-cervical sensillae present.

**Thorax:**  $560 \pm 40$  ( $n=6$ ) long and mesonotum  $492 \pm 31$  ( $n=6$ ) long. Presence of 1–4 ( $n=6$ ) proepimeral setae and 15–23 ( $n=6$ ) anepisternal setae. Setae on the anterior region of the

katepisternum present. **Wing** (Fig. 3):  $2088 \pm 98$  ( $n=6$ ) long and  $526 \pm 24$  ( $n=6$ ) wide. Ratio: length/width 3.97. Veins:  $R_5$   $1254 \pm 50$  ( $n=5$ ),  $\alpha$   $435 \pm 40$  ( $n=6$ ),  $\beta$   $252 \pm 31$  ( $n=6$ ),  $\gamma$   $276 \pm 25$  ( $n=5$ ),  $\Delta$   $80 \pm 37$  ( $n=6$ ),  $\pi$   $160 \pm 35$  ( $n=5$ ). All coxa brown. Legs without distinctive features. Length of femur, tibia, tarsomere I and tarsomeres II+III+IV+V, respectively:  $816 \pm 53$  ( $n=5$ ),  $932 \pm 58$  ( $n=5$ ),  $568 \pm 44$  ( $n=6$ ),  $726 \pm 15$  ( $n=6$ ); median leg:  $800 \pm 49$  ( $n=3$ ),  $1094 \pm 88$  ( $n=4$ ),  $630 \pm 61$  ( $n=3$ ),  $759 \pm 14$  ( $n=4$ ); posterior leg:  $874 \pm 65$  ( $n=5$ ),  $1338 \pm 112$  ( $n=5$ ),  $701 \pm 96$  ( $n=5$ ),  $800 \pm 14$  ( $n=4$ ).

**Abdomen** (Fig. 2):  $1992 \pm 183$  long ( $n=6$ ). Presence of tergal papillae on the tergites V to VII. Gonocoxite  $241 \pm 18$  ( $n=6$ ) length  $101 \pm 6$  ( $n=6$ ) with a sclerotized longitudinal band on its basal internal face and a narrow tubercle, in which are inserted 3–4 wide and long bristles. Gonostylus  $177 \pm 13$  ( $n=6$ ) long with four spines: one apical; two external spines implanted in the apex of a single tubercle, the inferior one being shorter and thinner than the superior, the internal spine is setiform and situated in the basal quarter. Absence of the pre-apical seta. Paramere  $223 \pm 8$  ( $n=6$ ) long and  $73 \pm 8$  ( $n=6$ ) maximum width in the base. Presence of an apical process in the paramere facing the base of the gonocoxite, and covered with several setae on the dorsal surface (Fig. 4). Aedeagus simple, with an acute apex. Lateral lobe  $310 \pm 21$  ( $n=6$ ) long and  $32 \pm 3$  ( $n=6$ ) wide. Genital pump  $198 \pm 12$  ( $n=6$ ) long. Genital filament thick, with  $378 \pm 26$  ( $n=6$ ) length and  $10 \pm 1$  ( $n=6$ ) width and present dilatation in its apical quarter, tapering in its final portion, which is pointed (Fig. 5). Genital filament/genital pump ratio 1.91:1 ( $n=6$ ).

**Material examined:** Brazil. Rio Grande do Sul: Porto Alegre, Lageado neighborhood, forest in the Jacques da Rosa Road ( $30^\circ 12' 05,02''$  S and  $51^\circ 08' 49,57''$  W) – three males, 30.XI.2010, 07.XII.2010 and 26.IV.2011 (Souza GD and Flores CF cols.); Caçapava do Sul, II District Santa Bárbara, riparian forest of the stream



**Figs. 4–5.** *Evandromyia gaucha*. Male: (4) Terminalia, scale bar = 50  $\mu\text{m}$  (5) Genital pump and genital filaments, scale bar = 50  $\mu\text{m}$ .

Santa Bárbara (30°32'52,83" S and 53°37'15,70" W) – two males, 08.I.2006 (Souza GD) and 15.II.2008 (Souza GD, Souza IPF and Souza RPF cols.); Santa Cruz do Sul (29°41'03,5" S and 52°26'42,4" W) – one male, 09.V.12 (Loebens JA, Cardoso DG and Bavaresco FP cols.).

The specimens were deposited in the Coleção Científica do Núcleo de Flebotomíneos, Seção de Reservatórios e Vetores, Instituto de Pesquisas Biológicas – Laboratório Central de Saúde Pública do Rio Grande do Sul: numbers 445; 751; 1058; 1059; 1060; 1061.

## Discussion

The attribution of males studied here to *Evandromyia gaucha* was based on the similarity of the body color, morphological and morphometric characters such as length of wing and femora and number of upper anepisternal setae. Male and female specimens are sampled in the same day in Caçapava do Sul and Porto Alegre. In addition, one male specimen from Caçapava do Sul was collected together with the holotype of the species reported in Andrade Filho et al. (2007).

Males of *E. gaucha* and *E. correalimai* are very similar, but they can be distinguished from each other by the genital filaments, which are longer in *E. gaucha*, lack striations in their apical part, and the tips are tapered, while in *E. correalimai* the apex is blunt. According to Galati et al. (2011), the male of *E. correalimai* presents papillae on the tergites IV to VII, while *E. gaucha* male presents papillae on the tergites V to VII.

The male described here can also be distinguished from *E. tylophalla* by caliber of the genital filaments, which are thicker in *E. gaucha* and the absence of tubercle on the dorsal surface of aedeagus (Andrade and Galati, 2012). *Evandromyia grimaldii* presents the length of the genital filament of about 501 micrometers (Andrade Filho et al., 2009), being about 1.3 times longer than in *E. gaucha* (average of 378  $\mu\text{m}$ ). *Evandromyia rupicola* has a spiniform internal spine in gonostylus shorter and thinner than the lower external

spine, while in *E. gaucha* both spines have similar size, but one is thinner than the other. The shape of the apical process on paramere can also be used to separate male of *E. gaucha* from all other males of this series, because it is more developed and larger than in the other species.

## Conflicts of interest

The authors declare no conflicts of interest.

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