Descriptions of *Lutzomyia* (*Evandromyia*) *georgii* n. sp. and a Synopsis of the Series *infraspinosa* (Diptera: Psychodidae)

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Lutzomyia georgii *n. sp. and the female of* L. tarapacaensis *in the Series* infraspinosa *of the subgenus* Evandromyia *are described, from specimens collected in rainforest in the north of the State of Pará, Brazil. The new species was taken together with five other* Evandromyia *species including* L. infraspinosa (sensu strictu) *in the same locality.* L. georgii *has previously been confused with both* L. begonae *and* L. infraspinosa, *whereas* L. tarapacaensis *would run to* L. infraspinosa *in recent taxonomic keys. The fact that both* L. georgii *and* L. tarapacaensis *are locally sympatric with* L. infraspinosa *helps to clarify the taxonomic limits of the latter species. New keys to the subgenus* Evandromyia *are provided.*

Key words: Phlebotominae - new species - Series *infraspinosa* - taxonomy - Amazônia - Brazil

The subgenus *Evandromyia* Mangabeira was reviewed by Young and Arias (1977) who separated the species into two groups, the Series *infraspinosa* for seven species with simple aedeagi and dorsal spatulate setae at the tips of the surstyles, and the Series *monstruosa* for two species with aedeagi with long ventral extensions and surstyles lacking spatulate setae. These authors illustrated male and female specimens of a taxon in the Series *infraspinosa* collected in Manaus, north of the Amazon River, which they classified as *Lutzomyia begonae* (Ortiz and Torres) known at that time only from the description of the male holotype from Venezuelan Amazonas. While recognizing that the males from Manaus differed from the description of the holotype of *L. begonae*, these differences were provisionally attributed to geographical variation within a single species. Young and Duncan (1994) maintained the previous classification of *Evandromyia*, except that *L. begonae*, *sensu* Young and Arias 1977, was transferred to *L. infraspinosa* (Mangabeira), the type species of the subgenus. This decision was based on information that *L. begonae* and the form described as *L. begonae* from Manaus had been taken together at the same locality in southern Venezuela, indicating that they are not conspecific. Young and Duncan (1994) treated *L. infraspinosa* as a geographically variable species including forms with an acute ventral process on the lower arm of each paramere, from Manaus (Brazil) and Leticia (Colombia) (their Fig. 124 G), and the typical form in which this process is absent (their Figs 124 E, H). In the same year (Fernandez et al. 1994) an additional species belonging to the Series *infraspinosa*, *L. sipani*, was described from males collected in Loreto Department, northeast Peru. Barrett et al. (1996) illustrated the male terminalia of yet another form which in the key of Young and Duncan (1994, p. 303) runs to *L. infraspinosa*, and which they considered to be a distinct species, without formally naming it. In the same year, LePont et al. (1996) described and named a single, badly damaged, male specimen from the Bolivian Amazon Region, as *L.* (*Evandromyia*) *tarapacaensis*, noting the similarity of the new species to Fig. 4 of Barrett et al. (1996). The recently described *L. aldafalcaoae* Santos, Andrade Filho and Honer 2001, based on three male specimens from the Brazilian Pantanal, also belongs to the *infraspinosa* Series according to the criteria of Young and Arias (1997), although the spatulate setae of the surstyle appear to be shorter and more numerous than in other species of the Series (Santos et al. 2001).

We have now taken six distinct taxa of the subgenus *Evandromyia* together in the same locality in the north of the State of Pará, including *L. monstruosa* (Floch and Abonnenc), *L. inpai* Young and Arias, *L. bourrouli* (Barretto and Coutinho), *L. infraspinosa* (*sensu strictu*), *L. tarapacaensis* and the species here described as new. The new species is identified with the material from Manaus classified as *L. begonae* by Young and Arias (1977), and *L. tarapacaensis* is identified with *L.* (*Evandromyia*) sp. of Barrett et al. (1996, Fig. 4). We have compared this material with a specimen of *L. begonae* (*sensu strictu*) from Serra Pacaraima, Roraima, Brazil that agrees with the description of the holotype designated by Ortiz and Torres (1975). By choosing the type locality for the new species, where it occurs together with *L. infraspinosa* and *L. tarapacaensis*, we hope to establish that these are valid taxa rather than geographical variants of a broadly defined *L. infraspinosa* (or of *L. begonae*, or of each other). The purpose of the present communication is to aid in the identification of *L.* (*Evandromyia*) males and females, and to make available a new name for use in faunistic studies in progress.

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MATERIALS AND METHODS

Additional information on the type locality Serra do Cachorro is given in Freitas and Barrett (1999) and Quate and Alexander (2000). Measurements are mean values in mm with range in parentheses for specimens cleared in NaOH and phenol and slide mounted in Canada balsam. A male specimen of *L. begonae* (*sensu strictu*) used for comparison is from Brazil, Roraima, Serra Pacaraima, marco BV – 8 near the frontier with Venezuela (approx. 4º30'N, 61º8'W), CDC light trap at 1 m, 26/6/1988 (Nelson Fé, col.). Character states of the female of *L. begonae* used in the key are derived from Feliciangeli et al. (1988). The holotype of *L. tarapacaensis* is in Montpellier, France (Le Pont et al. 1996) and, due to current Brazilian restrictions on the exchange of biological material, we did not request to examine it.

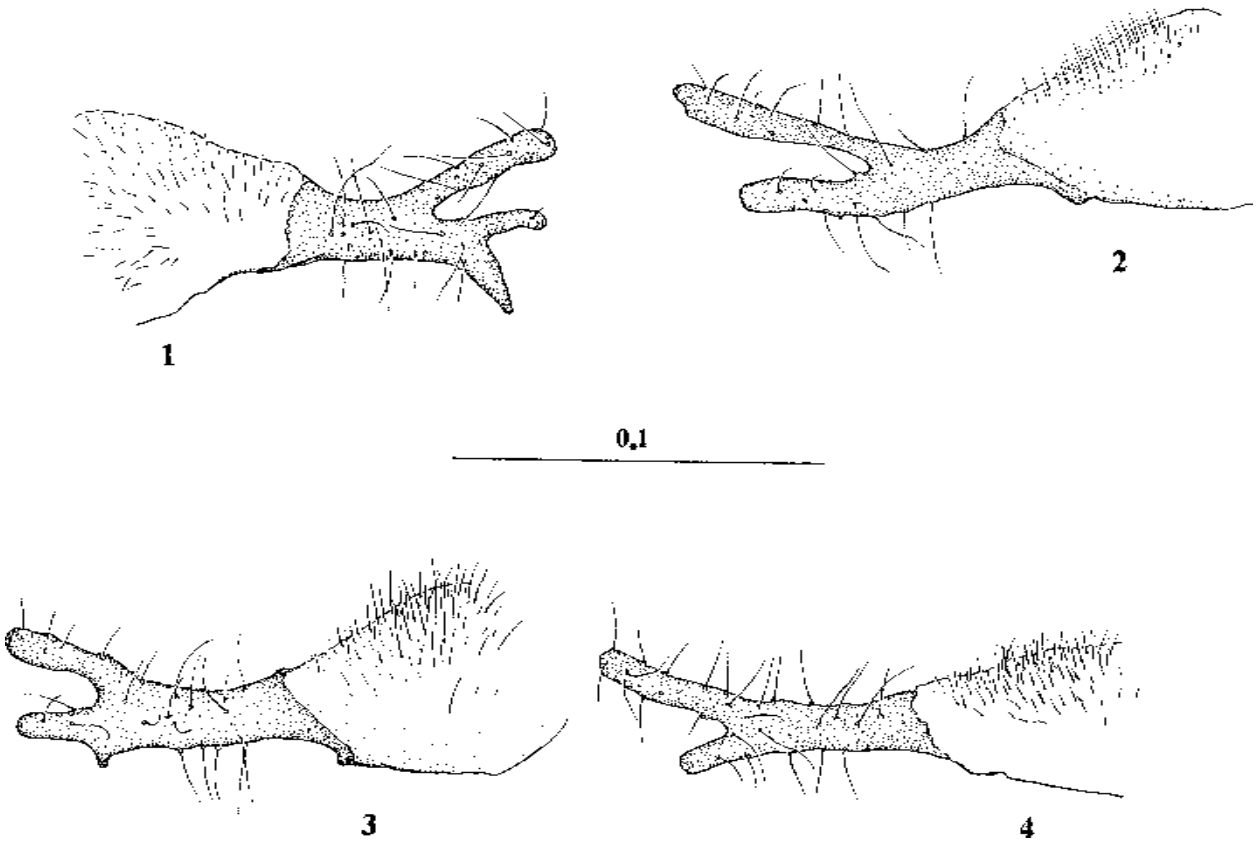
TAXONOMIC DESCRIPTIONS

Lutzomyia georgii, n. sp. (Figs 3, 5-14)

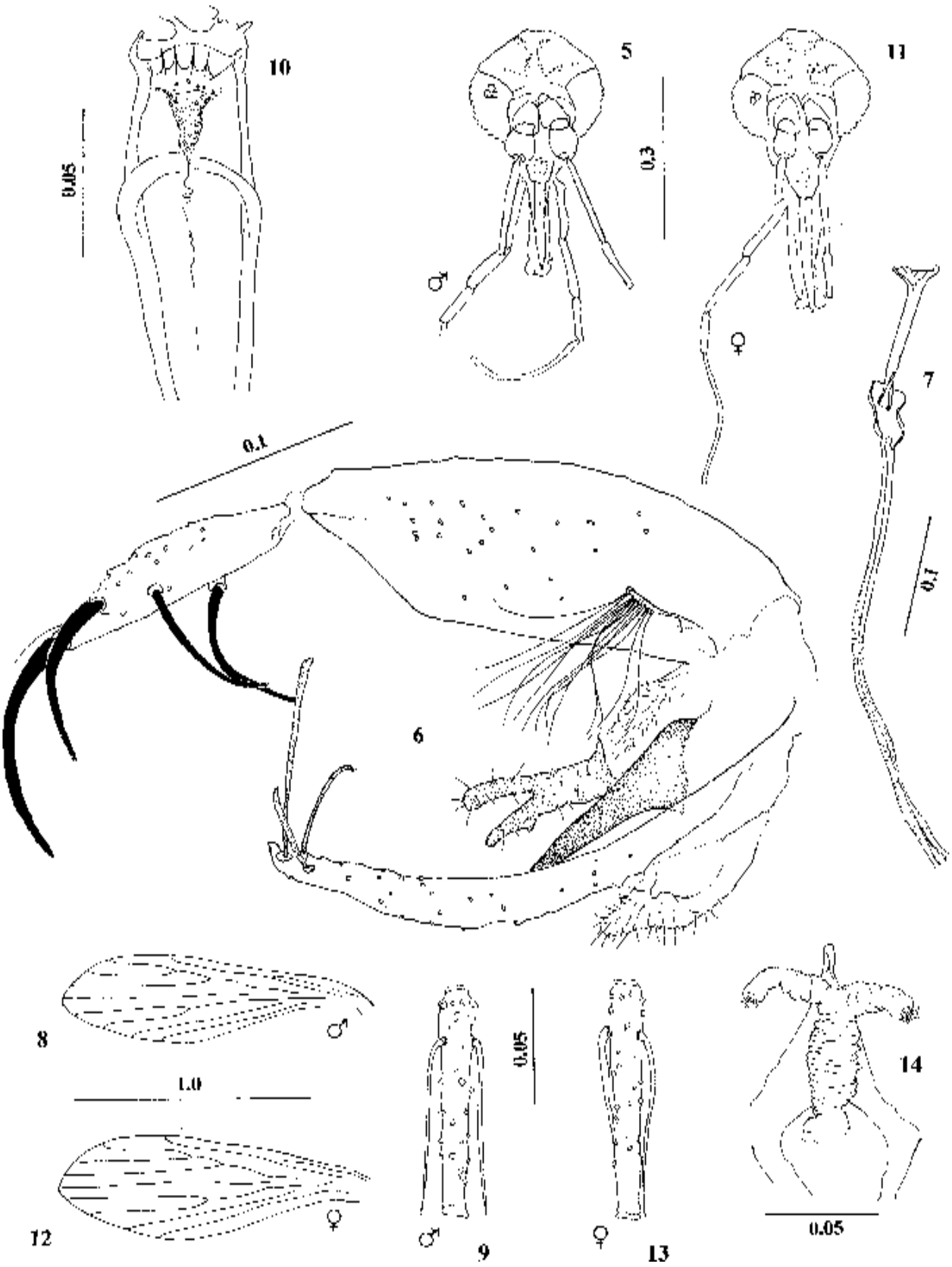
L. begonae, in part: Young and Arias (1977, Figs 2A, B, C, D and 2F, G, H, I); Ryan (1986, Fig. 18); not Ortiz and Torres.

L. infraspinosa, in part: Young and Duncan (1994, Fig. 124 G); not Mangabeira.

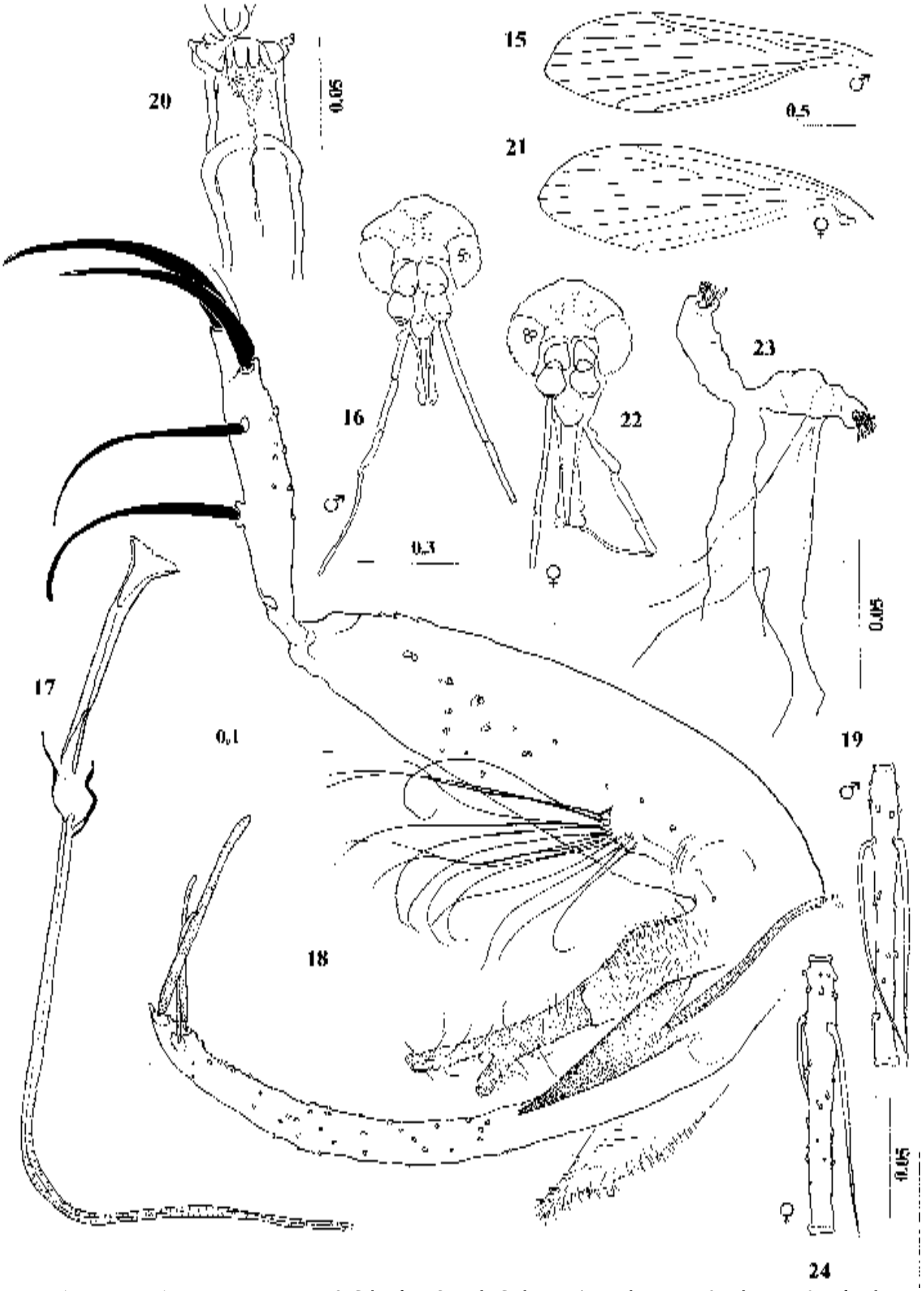
Male: small for the subgenus *Evandromyia*, 1.76 (1.74-1.77) long; colouration medium brown throughout, including mesonotum, coxae and pleura. Head (Fig. 5) height from vertex to tip of clypeus 0.29 (0.28-0.30), width 0.26 (0.25-0.26). Eyes separated by 0.11 (0.10-0.11), equivalent to 7.1 facet diameters; interocular suture incomplete. Cibarium with a row of 6-8 vestigial horizontal teeth; arch complete; pigment patch weakly marked, narrow and tapering. Pharynx unarmed, 0.12 (0.12-0.13) long. Flagellomere I 0.17 (0.16-0.18) long; II + III 0.19 (0.19-0.20). Paired ascoids present on flagellomeres I-XIII, simple, long, generally surpassing the apex of the flagellomere (Fig. 9). Labrum 0.16 (0.15-0.17) long. Maxillary palps 0.54 (0.51-0.56) long, length of palpomeres: 1, 0.03 (0.02-0.03); 2, 0.09; 3, 0.12 (0.11-0.12); 4, 0.08 (0.07 – 0.08); 5, 0.23 (0.21-0.24); P2 > P4. Thorax (0.37-0.38) long. Wing (Fig. 8) length 1.36 (1.34- 1.38), maximum width 0.38 (0.37-0.41). Length of wing vein sections: *alpha* 0.30 (0.27-0.33), *beta* 0.15 (0.14-0.17), *gamma* 0.20 (0.19-0.22), *delta* 0.04 (0.02-0.05). Pleura with 17 (16-21) upper and 2 lower episternal setae. Length of femora, tibiae and basitarsi: foreleg 0.61 (0.59-0.62), 0.57 (0.55- 0.58), 0.33; midleg 0.61, 0.72, 0.40; hindlegs missing in available specimens from type locality. Abdomen 1.38 (1.37-1.39) long. *Genitalia*: gonostyle 0.14 long, 0.03 wide, armed with four long, strong spines and a subterminal seta; one spine is apical, one subapical, the other two inserted as in Fig. 6. Gonocoxite 0.25 long, 0.09 wide, with a basal tuft of long narrow flexible setae inserted on a sclerotized longitudinal carina on the inner face of the structure. Paramere bifurcate, 0.17 long, wide at base, narrowing on distal half; lower arm with a tooth-like protu-



Distal aspect of parameres of males of the Series *infraspinosa*. Fig.1: *Lutzomyia begonae* (Ortiz and Torres), Serra Pacaraima, Roraima, Brazil. Fig. 2: *L. infraspinosa* (Mangabeira). Fig. 3: *L. georgii* n. sp. Fig. 4: *L. tarapacaensis* Le Pont et al. Figs 2-4 from specimens from Serra do Cachorro, Pará, Brazil. Scale units in mm.



Lutzomyia georgii n. sp. Figs 5-9, holotype male. Figs 10-14, allotype female. Fig. 5: head. Fig. 6: terminalia. Fig. 7: genital pump and filaments. Fig. 8: wing. Fig. 9: flagellomere II. Fig. 10: cibarium. Fig. 11: head. Fig. 12: wing. Fig. 13: flagellomere II. Fig. 14: spermathecae, sperm duct and genital fork. Scale units in mm



Lutzomyia tarapacaensis LePont, Torrez-Espejo & Galati from Serra do Cachorro, PA Brazil. Figs 15-19 male. Figs 20-24 female. Fig. 15: wing. Fig. 16: head. Fig. 17: genital pump and filaments. Fig. 18: terminalia. Fig. 19: flagellomere II. Fig. 20: cibarium. Fig. 21: wing. Fig. 22: head. Fig. 23: spermathecae, sperm duct and genital fork. Fig. 24: flagellomere II

berance basally on the lower surface. Aedeagus conical, well sclerotized. Genital pump (Fig. 7) 0.16 long, genital filaments 0.37 long or 2.3 x length of pump; filaments narrow, truncated at apex, finely striated transversally on distal half. Surstyle 0.26 (0.25-0.27) long, cylindrical, not strongly inflated, distinctly curved, with three spatulate setae apically of which the terminal one is clearly the largest. Cercus subtriangular.

Female: small for the subgenus, 1.79 (1.78-1.81) long; colouration as in male. Head (Fig. 11) height from vertex to tip of clypeus 0.34 (0.32-0.36), width 0.27 (0.26-0.29). Interocular distance 0.11 (0.11-0.12) equivalent to 7.5 facet diamters; interocular suture incomplete. Cibarium (Fig. 10) with a uniform row of four horizontal teeth; chitinous arch complete; pigment patch weakly marked, narrow and tapering. Pharynx unarmed, with fine striations in posterior third, 0.15 (0.15-0.16) long. Flagellomere I 0.18 (0.18-0.20) long, II + III 0.19 (0.19-0.20) and not shorter than I. Ascoids and antennal formula as in male (cf. flagellomere II, Fig. 13). Labrum 0.24 (0.23-0.24) long. Maxillary palps 0.62 (0.60 -0.65) long, length of palpomeres: 1, 0.03; 2, 0.11 (0.10-0.12); 3, 0.13; 4, 0.09 (0.08-0.09); 5, 0.26 (0.24-0.28). Thorax 0.44 (0.43-0.46) long from anterior margin of mesonotum to tip of scutellum. Wing (Fig. 12) length 1.51 (1.42-1.58), maximum width 0.49 (0.46-0.50); length of wing vein sections: *alpha* 0.40 (0.37-0.44), *beta* 0.18 (0.15-0.20), *gamma* 0.22 (0.21-0.23), *delta* 0.09 (0.07-0.12). Pleura with 20 (18-22) upper and 2 (2-3) lower episternal setae. Length of femora, tibiae and basitarsi: foreleg 0.65 (0.64-0.66), 0.63 (0.62- 0.64), 0.37 (0.37-0.38); midleg 0.65 (0.64 -0.66), 0.77 (0.76-0.78), 0.42 (0.41-0.42); hindleg 0.70 (0.69-0.71), 0.90 (0.86 -0.95), 0.47 (0.47-0.48); femora lacking spines. Abdomen 1.35 (1.34 -1.35) long. *Genitalia*: (Fig. 14) spermathecae tubular, elongate, lightly wrinkled; terminal knob oval, small but salient; common duct short and wide, length 1.7x its width, heavily striated horizontally throughout most of its length; individual ducts obsolescent. Genital fork strongly sclerotized, length of stem 1.3x its width at level of bifurcation. Cerci subtriangular.

Type material: *Holotype* ♂: BRAZIL, Pará, Oriximiná, Serra do Cachorro lower slopes approx. 200 m a.s.1. approx. 2 km south of 00º59'43"S and 057º07'09"W on the Rio Cachorro, mata de cipó 21/5/1998, light trap at 1m (TVB, F Lima Santos, RG Queiroz) slide number 01, Canada balsam. Allotype female (Slide 07) and five male (slides 02-06) and three female (slides 08-10) paratypes, same data. Holotype, allotype and paratypes in collection of the Instituto Nacional de Pesquisas da Amazônia. One male and one female paratype to be deposited in the Fiocruz collection at the Centro de Pesquisas René Rachou, Belo Horizonte, Brazil.

Etymology - Genitive case of the personal name *Georgius*, of which Jorge is a modern equivalent, for Jorge Ramon Arias in recognition of his contributions to the taxonomy of the subgenus *Evandromyia* and other Phlebotominae.

Lutzomyia tarapacaensis Le Pont, Torrez-Espejo and Galati 1996. (Figs 4, 15-24)
Lutzomyia sp.: Barrett et al. (1996, Fig. 4).

Male: as described for holotype, with the following additional observations and consistent minor differences. Interocular distance 0.10 equivalent to 6.8 facet diameters. Cibarium with a row of 4 vestigial horizontal teeth. Flagellomere I 0.26 (0.25-0.26) long; II + III 0.26, not longer than I. Paired ascoids present on flagellomeres I-XIII, simple, long, attaining or surpassing the apex of the flagellomere. Fifth palpomere P5 0.23 (0.22- 0.24) long, P4 subequal to P2. Pleura with 10 (9-12) upper and 1 (1-2) lower episternal setae. Length of femora, tibiae and basitarsi: foreleg, 0.71, 0.64, 0.34; midleg 0.64, 0.78, 0.41; hindleg 0.72, 0.98, 0.49; femora unarmed. Genital pump (Fig. 17) 0.14 (0.13-0.14) long, genital filaments 0.34 long or 2.5x length of pump. Surstyle 0.33 long. Cercus subtriangular.

Female: length of insect 1.9 (1.9-2.0), colouration uniformly pale throughout. Head (Fig. 22) height from vertex to tip of clypeus 0.33 (0.30-0.35), width 0.27 (0.26-0.28). Interocular distance 0.11 (0.10-0.12) equivalent to 6.1 facet diameters; interocular suture incomplete. Cibarium (Fig. 12) with a uniform row of 4 horizontal teeth above an irregular line of 6-8 small vertical teeth; chitinous arch complete; pigment patch narrowly tapering and indistinct. Pharynx unarmed, with fine striations in posterior third, 0.15 (0.13-0.16) long. Flagellomere I 0.25 (0.23-0.27) long, II + III 0.24 (0.23-0.25) and not longer that I. Ascoids and antennal formula as in male. Labrum 0.20 (0.18-0.21) long. Maxillary palps 0.57 (0.52-0.60) long; length of palpomeres: 1, 0.03; 2, 0.09 (0.08-0.10); 3, 0.12 (0.11-0.13); 4, 0.08 (0.07-0.09); 5, 0.24 (0.22-0.26); 4 subequal to 2. Thorax 0.44 (0.38-0.7) long. Wing (Fig. 21) length 1.64 (1.49-1.75), width 0.54 (0.47-0.57). Length of wing vein sections: *alpha* 0.41 (0.34-0.44), *beta* 0.21 (0.19-0.24), *gamma* 0.26 (0.23-0.28), *delta* 0.14 (0.13-0.19). Pleura with 13 (9-18) upper and 2 (1-2) lower episternal setae. Length of femora, tibiae and basitarsi: foreleg, 0.73 (0.66-0.76), 0.73 (0.65-0.77), 0.44 (0.39-0.46); midleg 0.71 (0.68-0.74), 0.90 (0.88-0.93), 0.50 (0.49-0.52); hindleg 0.77 (0.76-0.78), 1.09 (1.07-1.11), 0.57 (0.56-0.58); femora unarmed. Abdomen 1.52 (1.50-1.56) long. *Genitalia*: (Fig. 23) spermathecae tubular, elongate, smooth-walled; terminal knob oval, small, invaginated in main body of structure; common duct relatively long and narrow, length 3.6x its width, smooth-walled; individual ducts not apparent. Genital fork strongly sclerotized, length of stem at least 2x its width at level of bifurcation. Cerci subtriangular.

Material examined - Five male and ten female specimens collected together with the type series of *L. georgii* in the same traps (Serra do Cachorro). Voucher specimens to be deposited at the Instituto Nacional de Pesquisas da Amazônia and The Centro de Pesquisas René Rachou.

TAXONOMIC KEYS

Key to males of the subgenus *Evandromyia*

1. Surstyle with dorsal spatulate setae at tip. Aedeagus simple. Paramere divided or undivided..... 2
   Surstyle without dorsal spatulate setae. Aedeagus with a long ventral projection. Paramere trifurcate.....12

2. Paramere undivided or simply bifurcate. If bifurcate, lower arm with at most a small tooth-like protuberance.....3
   Paramere divided, with a long ventral projection on lower

arm (i.e., paramere trifurcate) (Fig. 1)..... *L. begonae*

3. Paramere undivided.....4
Paramere bifurcate.....7

4. Surstyle with a pair of dorsal spatulate setae at tip. Tip of paramere indented.....*L. sipani*
Surstyle with 3 to 7 dorsal spatulate setae at tip. Tip of paramere entire.....5

5. Surstyle with 3 spatulate setae at tip. Gonocoxite with 5-8 small setae inserted in the basal tuft of long setae. Tips of genital filaments slender.....*L. bourrouli*
Surstyle with 4 or more spatulate setae at tip. Tips of genital filaments slender or inflated.....6

6. General colour of insect dark brown including pleura. Basal tuft of gonocoxite consisting entirely of long setae. Surstyle with 4 spatulate setae at tip. Tips of genital filaments slender.....*L. pinottii*
General colour of insect light brown. Surstyle with 4 or more spatulate setae at tip. Tips of genital filaments inflated.....*L. aldafalcaoae*

7. Spines of gonostyle short and strong, restricted to the distal third of the structure. Gonocoxite with a basal tuft of 7-8 short setae inserted on a tubercle.....*L. cerqueirai*
Gonostyle with longer spines, not restricted to the distal third. Gonocoxite with a basal tuft of long setae inserted individually on a longitudinal carina.....8

8. Surstyle with a pair of spatulate setae at tip. Gonocoxite with a basal tuft of 4-6 persistent setae..... .....*L. brachyphalla*
Surstyle with 3 spatulate setae at tip. Gonocoxite with a basal tuft of 12+ persistent setae.....9

9. Genital filaments very thick, especially near end. Paramere broad throughout.....*L. inpai*
Genital filaments thin. Paramere broad basally, much narrower on distal half.....10

10. General colour light brown. Lower arm of paramere with a ventral tooth-like projection (Fig. 3)..... .....*L. georgii* n. sp.
General colour pale. Lower arm of paramere simple.....11

11. Lower arm of paramere inserted obliquely, its length less than half that of upper arm (Fig. 4)..... .....*L. tarapacaensis*
Lower arm of paramere parallel to upper arm and more than half its length (Fig. 2).....*L. infraspinosa*

12. Ventral projection of aedeagus much longer than dorsal part of structure. Basal tuft of gonocoxite with 6 or 7 setae.....*L. monstruosa*
Ventral projection of aedeagus much shorter than dorsal part of structure. Coxite tuft with 12+ setae..... .....*L. teratodes*

Key to females of the subgenus *Evandromyia*
(The females of *L. sipani* and *L. aldafalcaoae* are undescribed; the pleura and scutum of *L. sipani* are probably heavily pigmented as in the male)

1. Spermathecae tubular, strongly recurved apically; common sperm duct very short.....9
Spermathecae otherwise, common duct well developed.....2

2. Spermathecae and ducts smooth-walled.....3
Spermathecae segmented, rugose or striated.....4

3. Main body of spermathecae oval, terminal knob salient, individual ducts much longer than spermathecae..... .....*L. cerqueirai*
Spermathecae tubular, elongate, terminal knob apparently invaginated; individual ducts not differentiated from main body of structure (Fig. 23)..... .....*L. tarapacaensis*

4. Spermathecae dilated, less than twice as long as wide, apparently inserted directly on common duct..... .....*L. inpai*
Spermathecae elongate, their length at least 3x their width.....5

5. Pleura and scutum heavily pigmented..... .....*L. bourrouli* and *L. pinottii*
Pleura and scutum lightly pigmented or pale.....6

6. Spermathecae segmented or grossly rugose.....7
Spermathecae lightly striated.....8

7. Spermathecae uniformly segmented, their width subequal to common duct.....*L. brachyphalla*
Spermathecae irregularly rugose, narrower than common duct.....*L. infraspinosa*

8. Pleura and scutum pale. Palpomere 5 about 2.5x length of P4.....*L. begonae*
Pleura and scutum light brown. Palpomere 5 >3x length of P4.....*L. georgii* n. sp.

9. Spermathecae and individual sperm ducts subequal in width.....*L. teratodes*
Spermathecae twice as wide as individual ducts..... .....*L. monstruosa*

DISCUSSION

L. georgii n. sp., *L. sipani*, *L. tarapacaensis* and *L. aldafalcaoae* can be attributed to the subgenus *Evandromyia*, Series *infraspinosa*, because of the diagnostic presence of dorsal spatulate setae at the tip of the surstyle. Males of *L. georgii* can readily be differentiated from other members of the subgenus by using the key provided, or simply by the characteristic shapes of the parameres. Among the *Evandromyia* females with spermathecae apparently lacking individual sperm ducts, *L. georgii* and *L. tarapacaensis* can be distinguished from *L. inpai* by the posession of spermathecae that are much longer than wide. *L. tarapacaensis* has smooth-walled spermathecae and sperm ducts, whereas in *L. georgii* the common duct is conspicuously striated. Females of *L. georgii* and *L. tarapacaensis* were associated with their respective males by general body colour (much paler in *L. tarapacaensis*) and by the palpal formulae, palpomere P4 being subequal in length to P2 in males and females of *L. tarapacaensis*, and P2 being distinctly (12-22%) longer than P4 in *L. georgii*.

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