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LUTZOMYIA REDUCTA FELICIANGELI ET AL., 1988, A HOST OF *LEISHMANIA AMAZONENSIS*, SYMPATRIC WITH TWO OTHER MEMBERS OF THE *FLAVISCUTELLATA* COMPLEX IN SOUTHERN AMAZONAS AND RONDÔNIA, BRAZIL (DIPTERA: PSYCHODIDAE)

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A member of the Lutzomyia flaviscutellata *complex from Rondônia and southern Amazonas States, Brazil, is so close to the Venezuelan* Lutzomyia olmeca reducta *Feliciangeli et al., 1988, that it is regarded as belonging to the same species. Since this phlebotomine co-exists with* L. olmeca nociva *in Brazil, the subspecific status of the former is untenable and is raised to specific rank, as* Lutzomyia reducta. *The Brazilian material is described and illustrated, and compared with specimens of* L. o. nociva *and* L. flaviscutellata *from the same area. Keys to the known taxa of the* flaviscutellata *complex are presented.*

Leishmania amazonensis *was isolated from one heavily infected specimen of* L. reducta, *making this the third species of the* flaviscutellata *complex to be implicated as a vector of this parasite in Brazil. The relative abundance of the three sympatric* flaviscutellata *complex species varies locally and appears to be related to soil drainage.* L. reducta *constituted about 25% of all phlebotomines captured in Disney traps at poorly drained and well drained sites, but appears not to colonize areas subject to periodic flooding.* L. olmeca nociva *was restricted to poorly drained areas not subject to flooding, whereas* L. flaviscutellata *was ubiquitous.* L. reducta *has never been detected north of the Amazon river in Brazil, but absence of records from western and northwestern Amazonas State may reflect lack of collecting in these areas.*

Key words: Phlebotominae – taxonomy – biogeography – ecology – *Lutzomyia reducta* (new status) – *Lutzomyia flaviscutellata* – *Lutzomyia olmeca nociva* – *Leishmania amazonensis* – Amazônia

The *Lutzomyia flaviscutellata* complex is a distinctive group of phlebotomines in the medically important subgenus *Nyssomyia* (Lewis, 1975 a, b; Fairchild & Theodor, 1971). During the course of environmental impact studies in the area of the Samuel hydroelectric project in the State of Rondônia, Brazil, a previously unknown species of this complex, co-existing with *Lutzomyia flaviscutellata* (Mangabeira, 1942) and *Lutzomyia olmeca nociva* Young & Arias, 1982, was identified as a host of *Leishmania (Leishmania) amazonensis* Lainson & Shaw, 1972.

The third species appears to be identical with *Lutzomyia olmeca reducta* Feliciangeli et al., 1988, from the Venezuelan side of the Pico da Neblina region on the Brazilian-Venezuelan border. In this paper we describe the Brazilian material and compare it with the sympatric species of the complex. As two new species of the *flaviscutellata* complex have been described since the most recent key to the subgenus *Nyssomyia* (Ready & Fraiha, 1981), keys to the known taxa of the complex are included. *L. reducta* is elevated to species rank because it occurs together with *L. olmeca nociva* over a wide area, without any morphological evidence of hybridization. The presence of three closely related species in the same area raises interesting questions of biogeography and resource partitioning, and available ecological data are therefore also presented.

TAXONOMY

All measurements are in mm and correspond to the mean (range in parentheses) of 7 specimens for males and 31 female specimens of

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L. reducta. Distribution of erect hair sockets of abdominal tergites is based on six additional female specimens. Terminology follows Young (1979) and Lewis (1975 a, b). Since our material is not recognizably different in any major respect from the original description (Feliciangeli et al., 1988), only characters which supplement that description or show consistent minor differences are mentioned here. Copies of the full description of the Brazilian material are available on request from the authors.

Lutzomyia reducta Feliciangeli, Ramírez Pérez & Ramírez, 1988, new status, Figs 1, A-L; 2, I-L; 3C; 4C.

Lutzomyia sp. 3, Freitas et al., 1987.

Lutzomyia olmeca reducta Feliciangeli et al., 1988, Figs 22-31.

Male – Interocular distance 0.10 or six facet diameters. Ascoids present on all flagellomeres except last 3; tips of those on II ending before apex of flagellomere. Newstead's sensilla apparently restricted to median two-thirds of palp III. Pleura with 6 upper and 3 lower episternal setae. Genital filaments ca. 2.5 X length of pump.

Female – Interocular distance seven facet diameters. Ascoids as in male except present on flagellomere XII. Ventral maxillary teeth 23, lateral teeth 13. Newstead's sensilla apparently restricted to median two-thirds of palp III. Cibarium with 10 (8-12) equidistant horizontal teeth, lateral teeth as in Fig. 1A, and 50 + vertical teeth, median ones largest. Pleura with 4-6 upper and 2-4 lower episternal setae. Abdominal tergite I with 37 (27-47) erect-hair sockets, tergite II with 31 (20-53), tergite III with 9 (5-12), remaining tergites with none, except tergite V rarely with 1. Spermatheca with 11 (11-12) segments, individual ducts 0.027 (0.021-0.032) long.

Material Examined – Brazil, Rondônia State, 50 km east of Porto Velho at Samuel Hydroelectric Dam, right margin dyke km 35, light trap 10 July 1985, 1 ♀, T. V. Barrett et al.; Samuel, light traps and Disney traps, 20 Nov.-2 Dec. 1986, 7 ♂, 31 ♀, Freitas et al.; Brazil, Amazonas State, various localities between the Tapauá and Coari rivers, light and Disney traps 2-12 Feb. 1988, 2 ♂, 7 ♀, T. V. Barrett et al.

* The female of *L. inornata* is undescribed.

KEYS TO ADULTS OF THE *LUTZOMYIA FLAVISCUTELLATA* COMPLEX

Males

1a. Scutellum dark . . . . . *L. inornata*
1b. Scutellum pale, contrasting with anterior part of mesonotum 2
2a. Flagellomere I shorter than palp 3
2b. Flagellomere I longer than palp 4
3a. Genital filaments more than 3 X length of pump . . . . . *L. olmeca nociva*
3b. Genital filaments less than 2.5 X length of pump . . . . . *L. flaviscutellata*
4a. Genital filaments at least 3 X length of pump 5
4b. Genital filaments less than 2.5 X length of pump . . . . . *L. reducta*
5a. Palp segment V longer than palp segment II and equal to palp segment III. . . . . *L. olmeca olmeca*
5b. Palp segment V subequal to palp segment II and shorter than palp segment III . . . . . *L. olmeca bicolor*

*Females**

1a. Terminal knob of spermatheca broad and short, individual ducts subequal in length to common duct and to spermatheca. . . . . *L. olmeca olmeca*
1b. Terminal knob of spermatheca distinctly longer than wide 2
2a. Individual duct subequal to common duct and ca. 1.5 X length of spermatheca . . . . . *L. olmeca nociva*
2b. Individual duct of spermatheca less than half length of common duct 3
3a. Stem of genital fork slender in ventral view, 6-7 horizontal teeth in cibarium . . . . . *L. flaviscutellata*
3b. Stem of genital fork broad and bladelike in ventral view, 8-12 (rarely 7) horizontal teeth in cibarium. 4
4a. Common duct of spermatheca ca. 2.5 X length of individual duct. *L. olmeca bicolor*
4b. Common duct of spermatheca more than 3 X length of individual duct . . .*L. reducta*

ECOLOGY AND DISTRIBUTION

The Samuel hidroelectric project in Rondônia State is situated in a region of tropical rainforest on the river Jamari at approximately 8°44'S, 63°25'W. Data for the years 1984-1986 show an annual rainfall of around

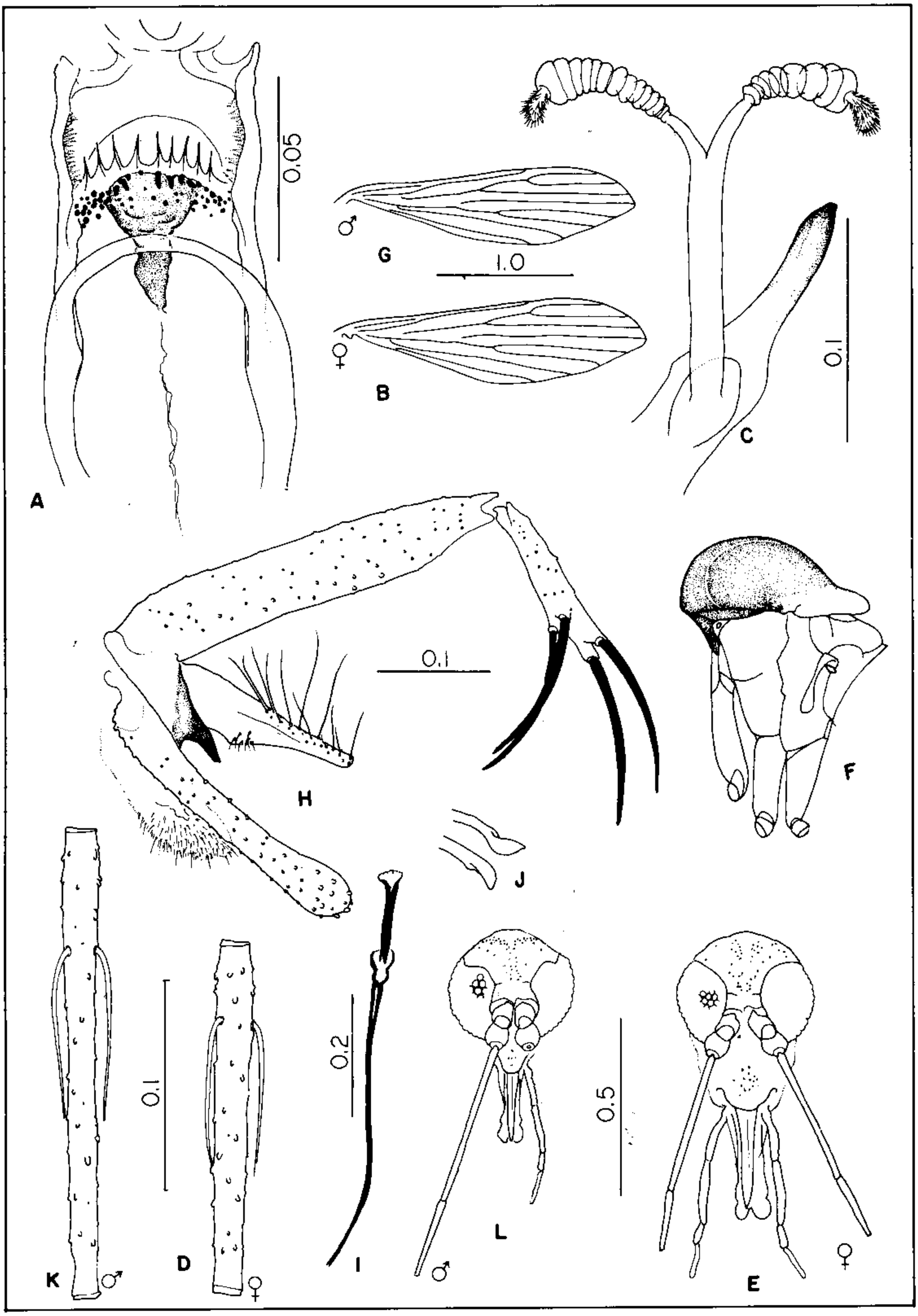

Fig. 1: *Lutzomyia reducta* from Rondônia. A, cibarium; B, wing of female; C, spermatheca and genital fork; D, flagellomere II of female; E, head of female; F, thorax of female; G, wing of male; H, male genitalia; I, genital pump and filaments; J, tips of genital filaments; K, flagellomere II of male; L, head of male. Scales in mm.

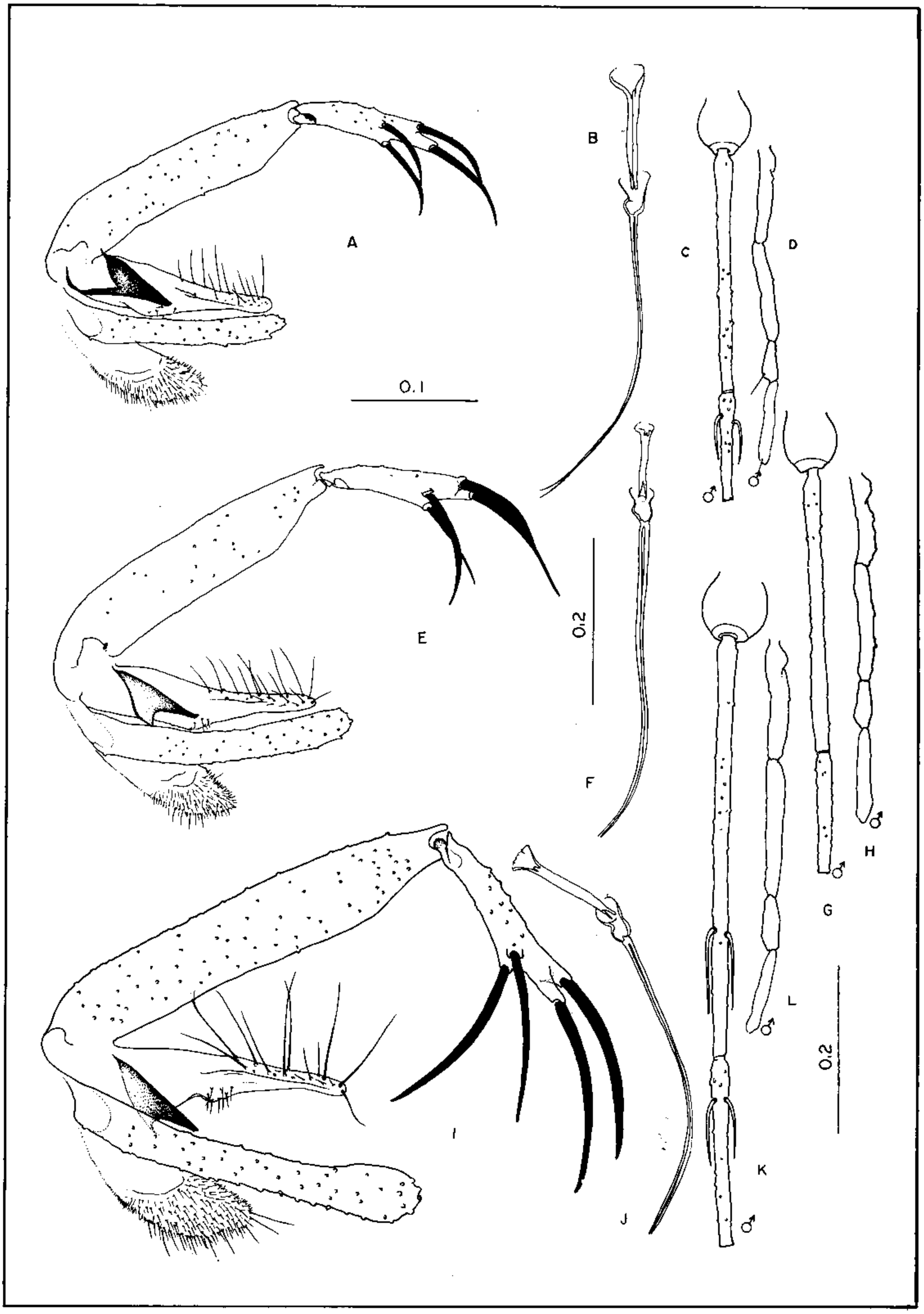

Fig. 2: males of the *Lutzomyia flaviscutellata* complex from Cachoeira Samuel, Rondônia, Brazil. Genitalia, genital pump and filaments, basal antennal segments, and palp of A-D: *L. flaviscutellata*, E-H: *L. olmeca nociva*, I-L: *L. reducta*. Homologous structures to same scale. Antennae and palpi to same scale. Scale in mm.

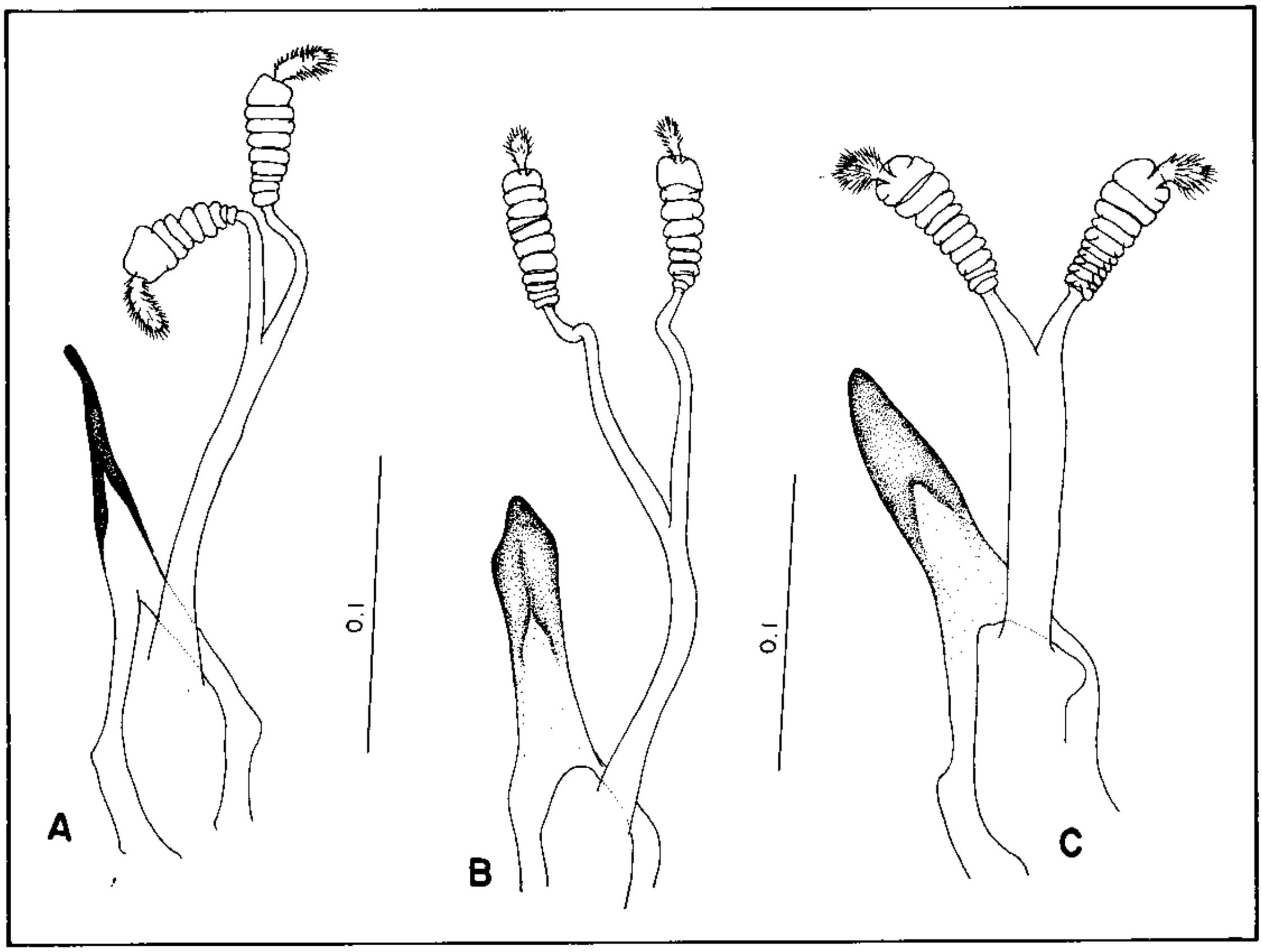

Fig. 3: females of the *Lutzomyia flaviscutellata* complex from Cachoeira Samuel, Rondônia, Brazil, Spermatheca and genital fork of A: *L. flaviscutellata*, B: *L. olmeca nociva*, C: *L. reducta*. To same scale. Scale in mm.

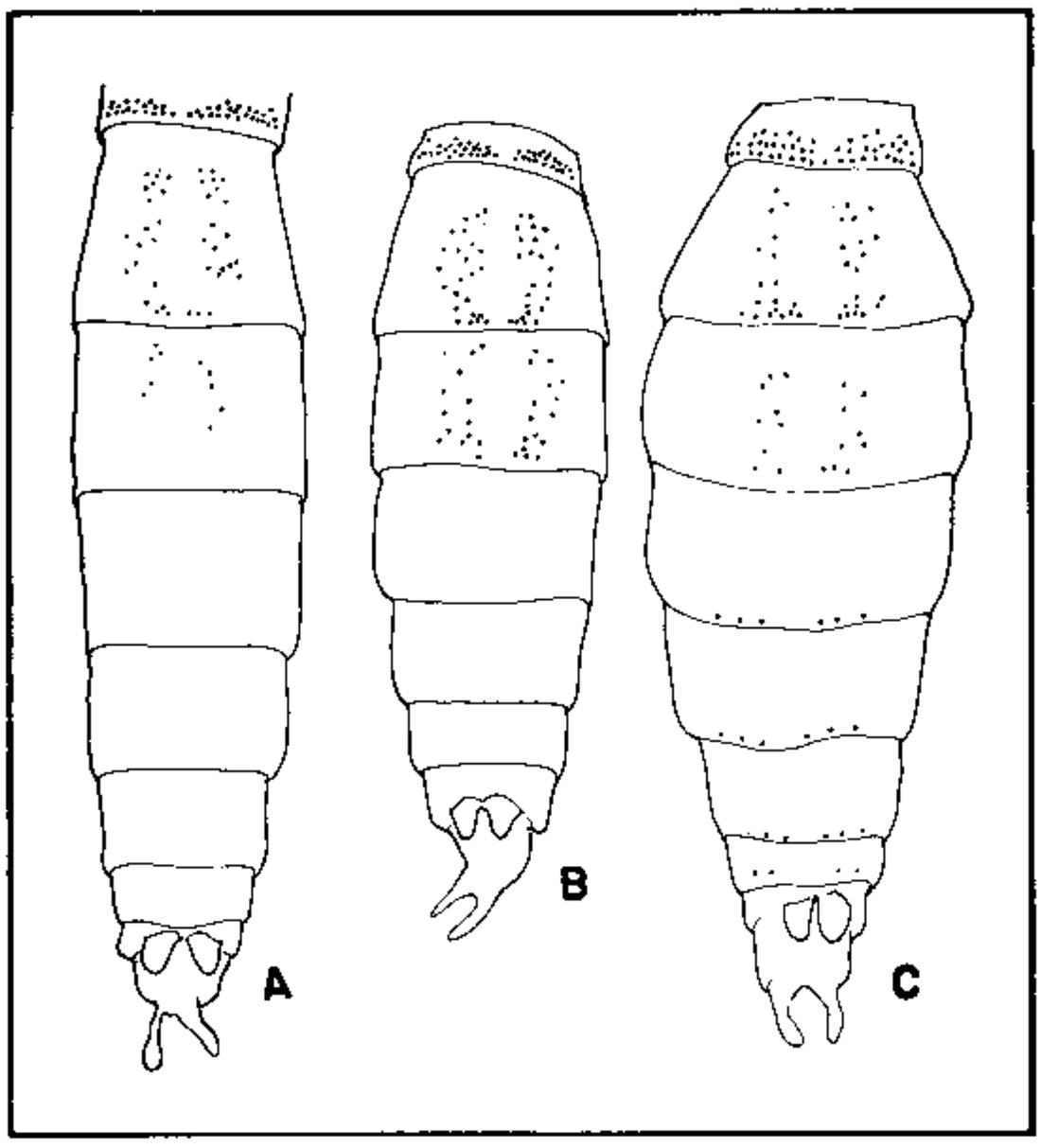

Fig. 4: females of the *Lutzomyia flaviscutellata* complex from Cachoeira Samuel, Rondônia, Brazil. Sockets of erect hairs on abdominal tergites I-VI of A: *L. reducta*, B: *L. flaviscutellata*, C: *L. olmeca nociva*.

2400 mm unevenly distributed throughout the year, with a pronounced dry period during the months June to September. Median temperature was around 27 °C, with a maximum of 34.3 and a minimum of 19.0 °C. The monthly relative humidity was in the range 80-100%.

The phlebotomine fauna, with 65 species among 10868 individuals collected, is dominated by *Psychodopygus* spp. in the wet season and *L. (Nyssomyia)* spp. in the dry season. In pooled results of light-trap samples, *L. flaviscutellata*, *L. reducta* and *L. olmeca nociva* represented 1.84%, 0.45% and 0.14%, respectively, of total phlebotomines. Four *L. flaviscutellata* and 3 *L. reducta* were among 1438 females taken on human bait.

Among 950 females of *L. flaviscutellata*, 300 of *L. reducta* and 95 of *L. olmeca nociva* dissected, a single specimen of *L. reducta* was found to be heavily infected with flagellates which extended into the whole of the midgut, crop, hind triangle and hindgut. There was no

TABLE

Relative abundance of species of the *flaviscutellata* complex in Disney trap samples at three sites in Samuel, Ro; Brazil, 1985-1987

Species	Lagoa do Feijoal (seasonally flooded)		Right margin km 4 (poorly drained)		Right margin km 40 (well drained)	
	Wet season	Dry season	Wet season	Dry season	Wet season	Dry season
L. flaviscutellata	0%	89%	54%	64%	63%	0%
L. reducta	0%	0%	22%	16%	25%	0%
L. o. nociva	0%	0%	10%	0%	0%	0%
Sample size	0	265	618	25	1720	4

vertebrate blood in the midgut and development of the ovaries corresponded to Christophers' stage I. The isolate was identified as *Leishmania amazonensis,* on the basis of morphology and behaviour in culture and hamsters (Freitas et al., 1987) and serodeme and zymodeme analysis (Grimaldi et al., in press).

Samples from guineapig-baited Disney traps revealed differences in the local relative abundance of the *flaviscutellata* complex species within the Samuel study area (Table), apparently related to drainage characteristics of the soil. Whereas *L. flaviscutellata* is ubiquitous, neither of the other two species was captured at Lagoa do Feijoal, a riverbank site seasonally flooded by rainwater. *L. reducta* made up about a quarter of all phlebotomines captured both in a low-lying area of poorly drained soil and at a well-drained rocky outcrop, whereas *L. o. nociva* appears to be restricted to the poorly drained area.

In southern Amazonas State, *L. reducta* was collected in an area approximately 370 km northwest of Samuel, in the Solimões river basin. A preliminary light-trap sample of 563 phlebotomines from this area contained 14% *L. flaviscutellata,* 3.6% *L. olmeca nociva* and 0.53% *L. reducta.*

In the forest near Manaus, to the north of the river Amazon, *L. reducta* was never detected in samples which include over 3000 *L. flaviscutellata* and over 6000 *L. olmeca nociva.*

DISCUSSION

In addition to the microscopic characters described above and in the references cited, *L. reducta, L. olmeca nociva* and *L. flaviscutellata* can be distinguished from phlebotomines not included in the *flaviscutellata* complex (except the little-known *L. inornata*) by their pigmentation and by the elongated head in the females. These characters are visible to the naked eye and are useful for preliminary sorting of samples.

Although we have not examined type material of *L. olmeca reducta,* the description (Feliciangeli et al., 1988) leaves us in no doubt that we are dealing with this phlebotomine in southern Amazonas and Rondônia. We can be fairly certain that *L. reducta* does not occur in the area immediately north of Manaus, but few collections have been made in the west and northwest of Amazonas State, and the geographic distribution of this species may yet turn out to be continuous.

We are treating *L. reducta* as a species, rather than a subspecies of *L. olmeca,* because it occurs together with *L. olmeca nociva* in areas separated by at least 370 km, and because no morphologically intermediate forms were encountered among the material examined or among over 570 individuals of *L. reducta* subsequently identified.

L. reducta is the third species of the *flaviscutellata* complex to be found infected with *L. amazonensis* in Brazil (Cf. Arias et al., 1987), and although the single isolation represents an infection rate of only 3.3 per thousand, such low rates are also characteristic of *L. flaviscutellata* and *L. olmeca nociva.* The heavy infection seen in *L. reducta* suggests that this species acts as a natural vector.

The correlation of Disney trap samples with soil drainage in preliminary results from Rondô-

nia suggests that the local distribution and relative abundance of *flaviscutellata* – complex species may be determined by different requirements of the immature stages.

RESUMO

Lutzomyia reducta **Feliciangeli et al., 1988, um hospedeiro de** *Leishmania amazonensis,* **simpátrico com duas outras espécies do complexo** *flaviscutellata* **no sul do Amazonas e Rondônia, Brasil (Diptera: Psychodidae)** – Um flebotomíneo do complexo *Lutzomyia flaviscutellata,* de Rondônia e do sul do Amazonas, Brasil é tão parecido com *Lutzomyia olmeca reducta,* que é considerado como sendo da mesma espécie. Este flebotomíneo ocorre junto com *L. olmeca nociva,* portanto o nome é emendado para o nível de espécie, como *Lutzomyia reducta.* O material do Brasil é descrito e ilustrado, e comparado com exemplares de *L. o. nociva* e *L. flaviscutellata* da mesma área. Chaves para as espécies e subespécies do complexo *flaviscutellata* são incluídas.

Leishmania amazonensis foi isolada de um exemplar de *L. reducta* altamente infectado, tornando esta espécie a terceira a ser implicada como vetor desta leishmânia no Brasil. A abundância relativa das três espécies simpátricas do complexo *flaviscutellata* varia em escala local e aparenta ter relação com a drenagem do solo. *L. reducta* constituiu cerca de 25% dos flebotomíneos capturados em armadilhas Disney em locais mal e bem drenados, porém não foi encontrada em locais sujeitos a inundações. *L. olmeca nociva* era restrita às áreas mal drenadas não sujeitas a inundações, enquanto *L. flaviscutellata* foi capturada nestes dois ambientes e também numa área periodicamente inundada. *L. reducta* não tem sido assinalada ao norte do Rio Amazonas no Brasil, porém a ausência de registros do oeste e noroeste do Estado do Amazonas possa refletir a falta de levantamentos nestas áreas.

Palavras-chave: Phlebotominae – taxonomia – biogeografia – ecologia – *Lutzomyia reducta* (stat. nov.) – *Lutzomyia flaviscutellata* – *Lutzomyia olmeca nociva* – *Leishmania amazonensis* – Amazônia

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