

ON *LUTZOMYIA FLAVISCUTELLATA* (MANGABEIRA) AND
L. OLMECA (VARGAS AND DIAZ-NAJERA)
(DIPTERA: PSYCHODIDAE)

By G. B. Fairchild¹ and O. Theodor²

Abstract: The phlebotomine sandfly species *Lutzomyia flaviscutellata* (Mang.), *L. olmeca* (V. & D.-N.) and *L. olmeca bicolor* n. ssp. from Panamá are described and figured, and their habits, distribution and relationship to transmission of cutaneous leishmaniasis reviewed.

Lutzomyia flaviscutellata has become of interest recently as it has been proved to transmit cutaneous leishmaniasis to rodents and possibly to man in Pará, Brazil (Lainson & Shaw 1968). Works on the transmission of leishmaniasis in British Honduras (Williams 1965, Disney 1968) and Mexico (Biagi et al. 1965) also considered *L. flaviscutellata* (*apicalis*) as the vector, but the species in British Honduras and Mexico (Quintana Roo) proved to be *L. olmeca* (Vargas & Diaz-Najera 1959) and not *flaviscutellata*. A form closely related to *L. olmeca* was found in 1952 in Panama by Fairchild and a paper was prepared describing the Panama form as a new species. Specimens were sent to Dr Hervé Floch in French Guiana for comparison with *L. apicalis*. Dr Floch considered the Panama form as identical with *apicalis* and the proposed description was therefore not published. Subsequent determinations of specimens from Br. Honduras and Colombia by Fairchild were based on this misinformation.

It seems therefore desirable to give more detailed information on the above group of species so that species suspected as vectors of leishmaniasis can be identified with certainty.

The proportions of palpal and antennal segments here given are averages and hence do not always agree with the specimens figured.

***Lutzomyia flaviscutellata* (Mangabeira)**

FIG. 1c, 2c, 3c, d, 4c, 5c, 6c

Flebotomus flaviscutellata Mangabeira, 1942, Mem. Inst. Osw. Cruz 37(2): 144-48, fig. 50-57, ♂, Aurá, Belém, Pará, Brazil.—Barretto, 1946, Rev. Brasil. Biol. 6(4): 534-35 (with *apicalis* F. & A. as syn.); 1947, Arq. Zool. Est. S. Paulo 5(4): 201 (full references).

Lutzomyia flaviscutellata: Martins, Falcão & da

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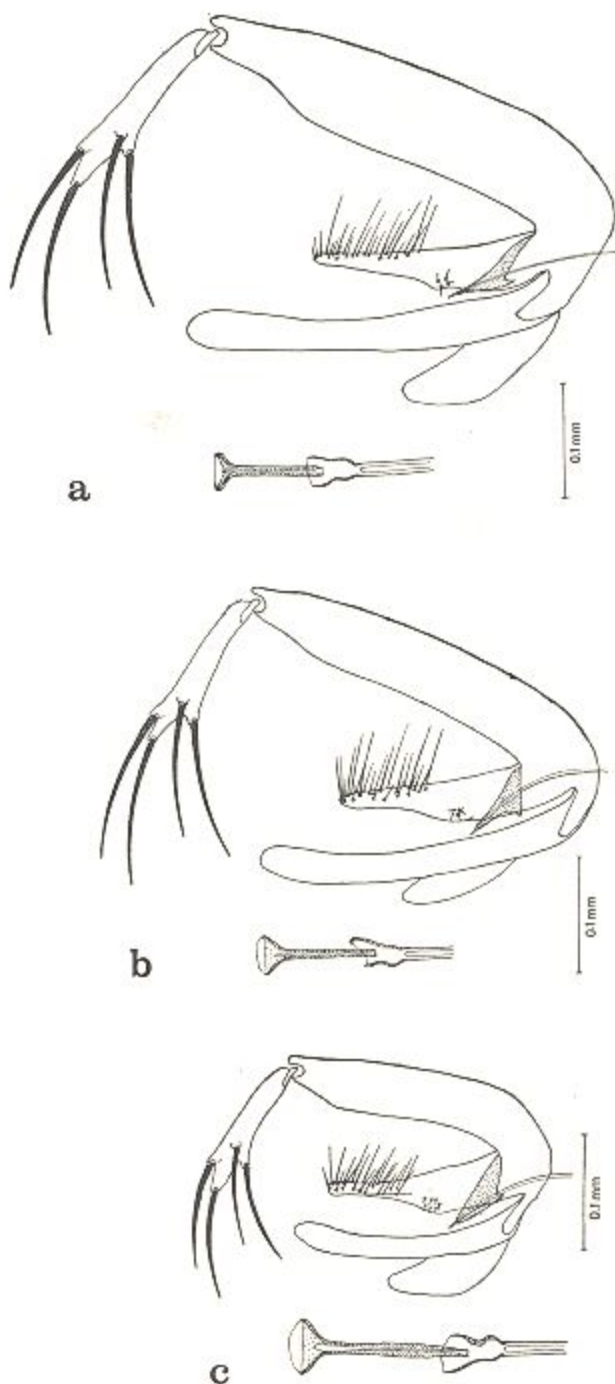


FIG. 1. Male genitalia and sperm pumps. a, *L. olmeca*; b, *L. olmeca bicolor*; c, *L. flaviscutellata*.

Silva, 1963, Rev. Brasil. Biol. 23(4): 334, Roraima, Brazil.

Phlebotomus apicalis Floch & Abonnenc, 1943, Inst. Pasteur Guyane Terr. Inini, Pub. No. 61, p. 25-29, fig. 13-14, ♂, ♀, no types or locality designated; 1952, Faune l'Un. Franc. XIV. Dipt., Phlebotomes Guyane Ant. Franc., Off. Res. Sci. Outre-Mer., Paris, p. 127-29, fig. 47-48, ♂, ♀, near Cayenne, Fr. Guiana.—Wijers & Linger, 1966, Ann. Trop. Med. Parasitol. 60(4): 506, Surinam.

Coloration unusually striking. Head, mesonotum, anterior upper corner of mesanepisternum nearly black in alcohol specimens. Posterior part of mesonotum, scutellum, coxae and pleura contrastingly light. A sharp border exists between the dark part of the mesonotum and the light pleura. Abdomen dark, but anterior half of first tergite light, posterior part dark. Legs, except coxae, dark.

♂. Length 1.8-1.9 mm (alcohol specimens). Wing: Length 1.9-2 mm, width 0.53 mm. Alpha = 0.5 mm; beta = 0.24 mm; gamma = 0.05-0.12 mm. Wing index $\frac{\alpha}{\beta} = 2-2.4$. (Mangabeira gives the wing index as 1.6, but his drawing of the wing shows a wing index of 2.3). Postspiracular setae 7-10; anepisternal setae 2-3, rarely 4-5. Palps: Formula: 1.4.2.5.3. Relative length of segments: 1-2.8-4-1.5-3. Antennae: A3 = 0.29-0.32 mm. A3 > 4 + 5. Ascoids on A4 about 1/3 of length of segment. Epipharynx: 0.16-0.17 mm. A3/E = 1.7-1.8. Cibarium with 5-6 irregular rows of small teeth. Genitalia: Coxite 0.27 mm, style 0.12 mm; 1 seta terminal, 1 subterminal, 2 setae at about the same level at 0.65 of segment. No small subterminal seta. Parameres slender, with blunt, rounded end and dorsal setae in the apical half. 5-7 short setae at the ventral bulge. Aedeagus short, conical, with truncate end. Lateral lobes 0.2-0.24 mm, reaching but little beyond the end of the parameres, shorter than the coxite. Pump very

large, 0.2 mm, nearly as long as the lateral lobes. Filaments with pointed tips, 0.4 mm. F/P = 2-2.3.

♀. Length 2-2.2 mm. Wing: Length 2.2-2.4 mm; width 0.6-0.64 mm. Alpha = 0.6-0.7 mm; beta = 0.24-0.3 mm; gamma = 0.16-0.19 mm. Wing index $\frac{\alpha}{\beta} = 2.2-2.6$. Postspiracular setae 8-11; anepisternal setae 1-4. Head long, eyes large, clypeus about 1/3 of length of head. Palps: Formula: 1.4.5.2.3. R.L. 1-2.6-3-1.3-2.3. Antennae: Scape with a small posterior process. A3 = 0.3-0.33 mm. A4 = 0.12 mm. A3 > 4 + 5. Ascoids A4 about 1/2 as long as the segment. Epipharynx: 0.28-0.3 mm. A3/E = 1.1-1.25. Cibarium with 6-7 long horizontal teeth, with a wider space between the median teeth; 6-8 rows of vertical teeth, the median larger than the lateral teeth. A row of small teeth extends from the vertical teeth posteriorly along the lateral frame. Pigmented area strongly sclerotized, dark, sharply defined, extending posteriorly further than in other species and forming the posterior bulge which is membranous in most other species. Pharynx lamp-glass shaped, with weak ridges posteriorly. Spermathecae with 9-12 segments which become smaller towards the base, the terminal segment about 2 × as long as the next in distended spermathecae. Terminal knob very large, about 2 × as long as wide, as long as the 2-3 terminal segments in distended spermathecae. Individual ducts narrow near the spermathecae, markedly shorter than the common duct. Stem of genital fork slender.

The species as presently recognized has been recorded so far from Brazil (Roraima, Amazonas, Pará, Mato Grosso, Brasilia, Minas Gerais, Espirito Santo, Rio de Janeiro), Trinidad, French Guiana, and Surinam.

Sherlock & Carneiro (1962) described a female from Bahia, Brazil, which they considered as the female of *L. flaviscutellata*. The male was not described. This female differs from that of *flaviscutellata* in its much shorter clypeus, shorter 3rd antennal segment and a different cibarial armature. It is thus apparently not the female of *flaviscutellata* and this form needs further study.

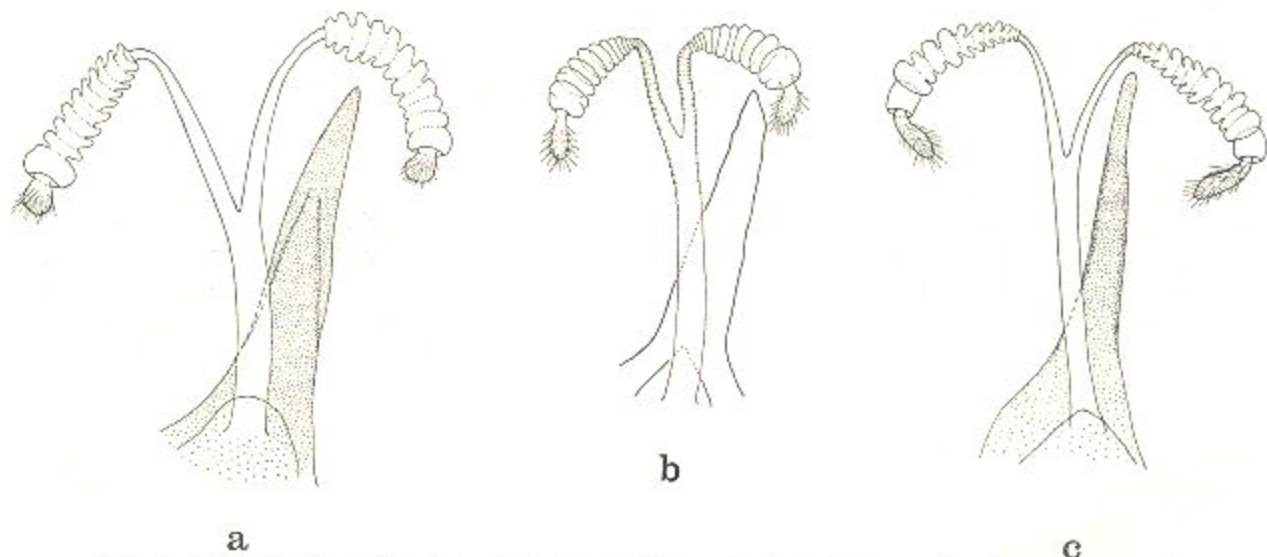


FIG. 2. Spermathecae. a, *L. olmea*; b, *L. olmea bicolor*; c, *L. flaviscutellata*. a and c drawn after mounting in gum medium; b in phenol.

Shaw & Lainson (1968) record that about 3000 specimens were caught in traps baited with rodents and only 5 females on man. Floch & Abonnenc (1952: 129) state that it bites man, but is rare. Wijers & Linger (1966) report the species as the third most abundant man-biting species in Surinam. It thus appears that the species prefers rodents but will bite man under certain circumstances.

Material examined. Several hundred specimens from Belém, Pará, BRAZIL (type locality), coll. Lainson & Shaw; 3 ♀♀ from TRINIDAD and a drawing of the ♂ genitalia kindly provided by Dr D. J. Lewis agree with material from the type locality; 1 ♀ from Cayenne, FRENCH GULANA; 3 ♂♂ from Tingua, Rio de Janeiro; 1 ♂ from Manaus, Amazonas; 1 ♂ from Viana, Espírito Santo; 1 ♀ from Petropolis, Rio de Janeiro; 1 ♀ from Bananal, Brasília, Distrito Federal. Prof. Martins, Belo Horizonte, who kindly sent the above specimens, states (in litt.) that he also has specimens from Roraima and Mato Grosso. The species is thus apparently distributed throughout Brazil, from Roraima in the north to Rio de Janeiro.

One female from Belém, Pará is designated as female plesiotype and deposited in the Department of Parasitology, Hebrew University, Jerusalem.

Lutzomyia olmeca (Vargas & Diaz-Najera)

FIG. 1a, 2a, 3a, 4a, 5a, 6a

Phlebotomus olmecus Vargas & Diaz-Najera, 1959, Rev. Inst. Salub. Enf. Trop. Mex. **19**(2): 147-52, pl. 5-6. ♂, ♀, Teapa, Tabasco, Mexico.

Lutzomyia (Lutzomyia) olmeca: Williams, 1966, Ann. Trop. Med. Parasitol. **60**(3): 358, 361-63, Br. Honduras.

Phlebotomus apicalis: Fairchild & Hertig, 1959, Ann. Ent. Soc. Amer. **52**(1): 121-23, Tela, Honduras; Chiapas and Tabasco, Mexico.—Williams, 1965, Ann. Trop. Med. Parasitol. **59**(4): 397-402, Br. Honduras.

Phlebotomus (Psychodopygus) apicalis: Lewis & Garnham, 1959, Proc. R. Ent. Soc. Lond., Ser B **28**(5-6): 81, fig. 9-17, Br. Honduras.

Phlebotomus (Psychodopygus) flaviscutellatus: Biagi, de Biagi & Beltran, 1965, La Prensa Medica, Mexico, **30**(9-12): 267-72, Quintana Roo, Mexico.—de Biagi, Beltran & Biagi, 1966, Rev. Invest. Salud Pub. Mexico **26**(2): 141-42, foto 1, Quintana Roo, Mexico; 1966, op. cit. **26**(4): 270 (key), fig. IV.

The species was described from Teapa, Tabasco, Mexico. Examination of the types, kindly lent by

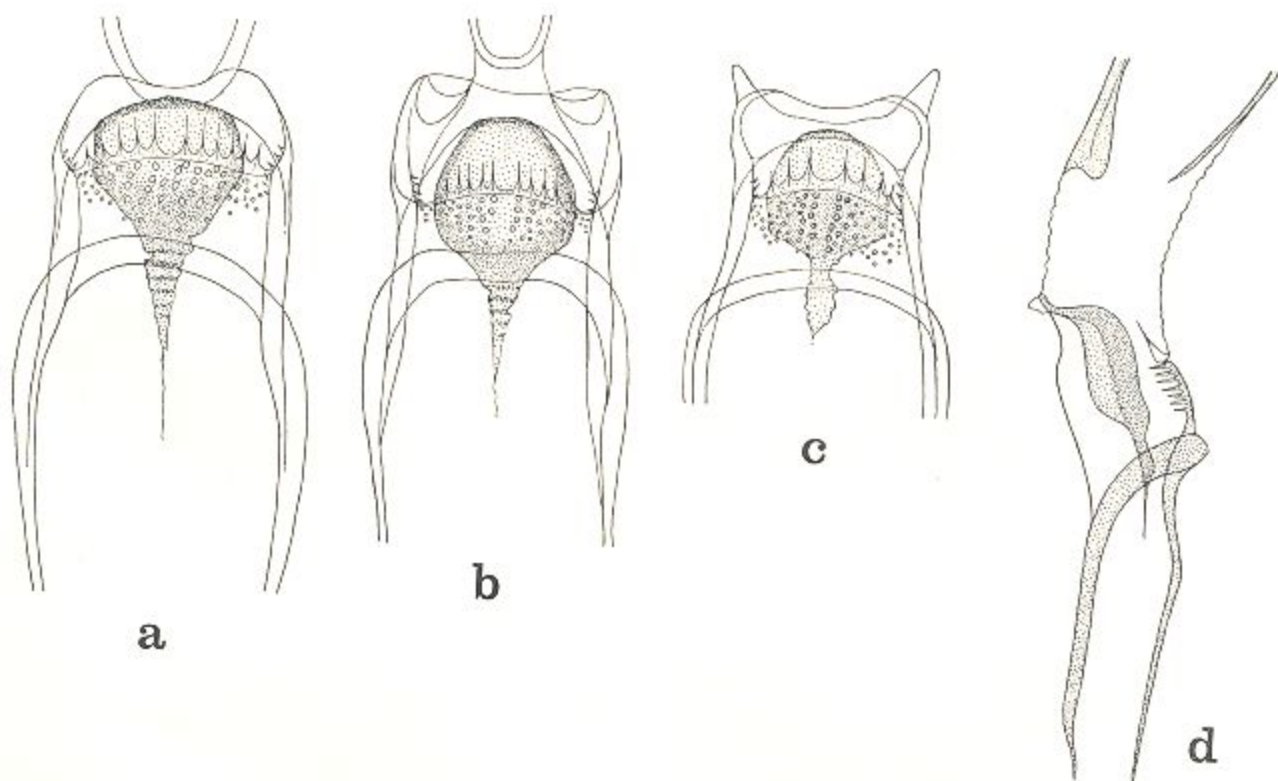


FIG. 3. Female cibaria, ventral view. a, *L. olmeca*; b, *L. olmeca bicolor*; c, d, *L. flaviscutellata*, d, saggital view, dorsal side to left.

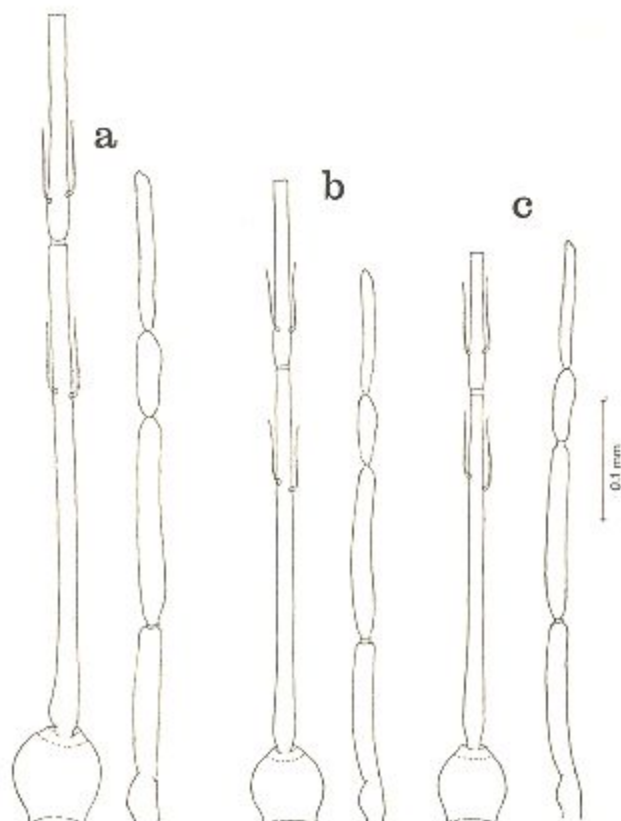


FIG. 4. Basal antennal segments and palpi, ♀. a, *L. olmeca*; b, *L. olmeca bicolor*; c, *L. flaviscutellata*.

Prof. Diaz-Najera, proved that the female type does not belong to this species but is apparently *L. ylephiletor*. Material from British Honduras, collected by Dr Lewis and Dr Disney proved identical with the male type. Lewis & Garnham (1959) give a short description of the female of *L. olmeca* (as *apicalis*) from British Honduras.

Coloration as in *L. flaviscutellata*.

♂. Length 2.75 mm. *Wing*: Length 2.4-2.6 mm, width 0.58-0.64 mm. Alpha = 0.5-0.56 mm; beta = 0.37 mm; gamma = 0.05-0.1 mm, 0.2 in 1 specimen. Wing index $\frac{\text{alpha}}{\text{beta}} = 1.3-1.7$ (1.3 on 1 wing, 2 on the other in 1 specimen). Postspiracular setae 4-6; anepisternal setae 2-3. *Palps*: Formula: 1.4.2.(3.5.). R.L. 1.-2.6-4.-1.6-4. *Antennae*: A3 very long, 0.53 mm. A3 = 4 + 5 or slightly shorter than 4 + 5. Ascoids A4 about 1/6 of length of segment. *Epipharynx*: 0.2 mm. A3/E = 2.3-2.7 mm. *Cibarium* with several irregular rows of small teeth, the posterior row more regular and consisting of larger pointed teeth in some specimens. *Genitalia*: Coxite slender, 0.4 mm long, style 0.2 mm. One seta terminal, 1 subterminal, the 2 median setae on 0.6 or 0.7 of the segment. Aedeagus short, conical, pointed, slightly truncate. Parameres slender, more pointed than in *flaviscutellata*. 4-5 short setae at the ventral bulge. Lateral lobes 0.4 mm, as long as the coxite, markedly projecting beyond the end of the parameres. Pump 0.14-0.16 mm, much smaller than in *flaviscutellata*, less than 1/2 the length of the lateral lobe. Filaments 0.45 mm. F/P = 3.4.

♀. Length 2.5-2.6 mm. *Wing*: Length 2.4-2.6 mm, width 0.64-0.7 mm. Alpha = 0.6 mm; beta = 0.35 mm; gamma =

0.08-0.16 mm (0.032 in 1 specimen). Wing index $\frac{\text{alpha}}{\text{beta}} = 1.3-1.9$. Postspiracular setae 6-10; anepisternal setae 2-4. Proportions of head as in *flaviscutellata*. *Palps*: Formula: 1.4.(2.5).3; R.L. 1-3-4-1.5-3. *Antennae*: A3 = 0.37-0.42 mm. A3 = 4 + 5 or slightly longer than 4 + 5. Ascoids 4 about 1/3 of length of segment. *Epipharynx*: 0.28-0.42 mm. A3/E = 1.2-1.5. *Cibarium* with a row of 10-12 long, pointed horizontal teeth, with a larger space between the median teeth. 4-6 rows of vertical teeth, the median larger than the lateral teeth. Lateral rows on the frame as in *flaviscutellata*. Pigmented area well defined, strongly sclerotized, wider posteriorly than in *flaviscutellata*. *Pharynx* as in *flaviscutellata*. *Spermathecae* with 12-13 segments, the apical segment longer than the others which decrease little in width towards the base, but the last 2 segments small. Terminal knob broad and short, not longer or only slightly longer than the last segment. Stem of genital fork blade-like.

L. olmeca differs from *flaviscutellata* in the male in the much larger genitalia, the much longer antennae,

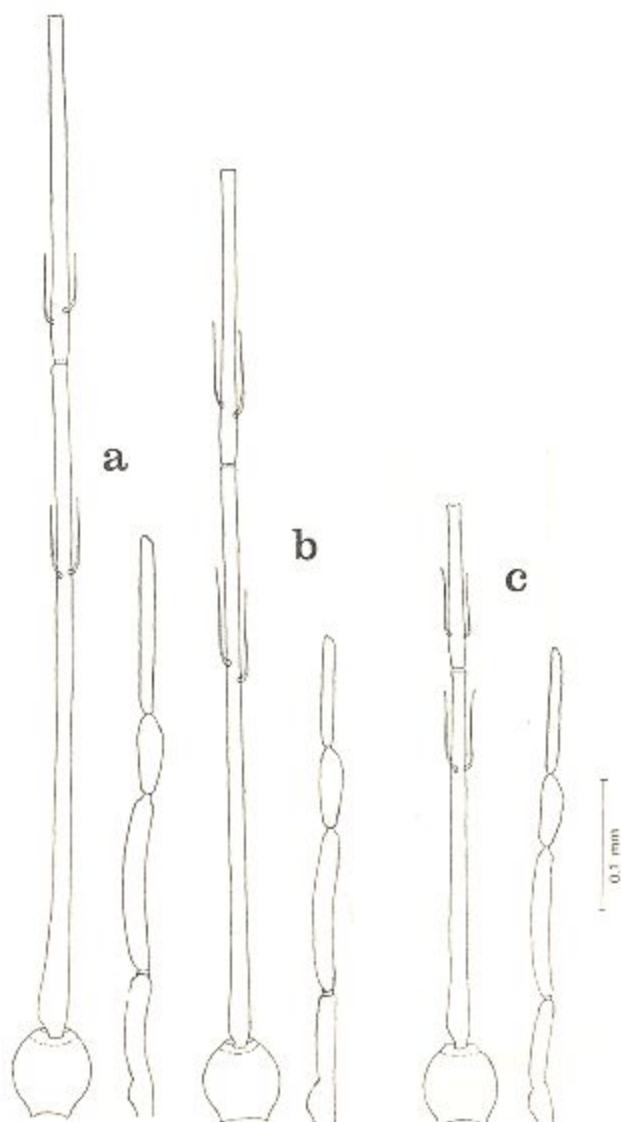


FIG. 5. Basal antennal segments and palpi, ♂. a, *L. olmeca*; b, *L. olmeca bicolor*; c, *L. flaviscutellata*.

the longer palp segment 5 and the longer lateral lobes. The pump is much smaller than in *flaviscutellata*. The female differs in the more numerous horizontal teeth in the cibarium (10-12 as against 6-7 in *flaviscutellata*) and differences in the spermathecae, particularly in the form of the terminal knobs.

The species has been recorded from Tabasco, Chiapas and Quintana Roo in Mexico, British Honduras, Honduras and Guatemala. It has been recorded as biting man occasionally in the forest (Williams 1965, Disney 1968). Biagi et al. (1965) record that the species bites man readily in the laboratory and they consider it as anthrophilic and as a vector of leishmaniasis to man.

Material examined. MEXICO: ♂ holotype, Teapa, Tabasco, 7.X.1957. One ♀, same locality, 16.XII.1953, coll. Alegria. This ♀ is designated as allotype. Ocosocoautla, Chiapas, 1 ♂, 1 ♀, tree buttresses in oak forest, 8.IV.1951; Sta. Maria, Chiapas, 1 ♀ at light; Palenque, Chiapas, 1 ♀, in tree buttresses, all coll. Fairchild.

GUATEMALA: Tical Peten, 1 ♀, biting man, coll. McConnell.

BRITISH HONDURAS: Belize, San Antonio, 20.I.1965, 4 ♀♀, 3 ♂♂, coll. Disney. Central Farm, 22.I.1965, 8 ♀♀, 1 ♂, coll. Disney. Cool Shade, 29.I.1958, 1 ♀, coll. Lewis & Garnham.

HONDURAS: Tela, Lancetilla, 12, 19.XI.1953, at light, 16 ♂♂, 10 ♀♀, coll. Hills.

Lutzomyia olmeca bicolor, n. ssp.

FIG. 1b, 2b, 3b, 4b, 5b, 6b

Phlebotomus apicalis: Johnson & Hertig, 1961, Ann. Ent. Soc. Amer. 54(6): 773 (larva, pupa).—Thatcher, 1968, J. Med. Ent. 5(3): 295, Panama. —Rodriguez, 1956, Rev. Ecuat. Hyg. Med. Trop. 13(2): 80, Los Rios, Ecuador.

Lutzomyia flaviscutellata: P. Barreto, 1969, Caldasia 10(49): 464, Rio Raposo, Colombia.

Specimens from Panama resemble *L. olmeca* closely, but differ constantly in a number of characters. They are therefore considered as a new subspecies. There are no records of *L. olmeca* or of the new subspecies from the area between Honduras and Panama. Although intensive collecting has been carried out only in El Salvador and Costa Rica, it is unlikely that this striking form would have been overlooked. Johnson & Hertig (1961) give details on egg laying and on the larvae.

♂. Length 2.75 mm. Wing: Length 2.2 mm, width 0.52 mm. Alpha = 0.5 mm; beta = 0.32 mm; gamma = 0-0.6 mm. Wing index $\frac{\text{alpha}}{\text{beta}}$ = 1.4-1.6. Postspiracular setae 8-10; anepisternal setae 1-3. Palps: Formula: 1.4.(2.5).3; R.L. 1-3-4-2-1.9-3.1. Antennae: A3 = 0.48 mm. A3 = 4 + 5. Ascoids 4

about 1/2 the length of the segment. Epipharynx: 0.18 mm. A3/E = 2.2-2.6. Cibarium with several rows of small teeth. A small, indistinct pigmented area present in some specimens. Genitalia: Coxite 0.36 mm. Style 0.16 mm. One seta terminal, 1 subterminal, the 2 median setae at 0.7 of the segment. Parameres as in *L. olmeca*. Lateral lobes 0.32 mm, shorter than the coxite. Pump 0.135 mm, less than 1/2 as long as the lateral lobe. Filaments 0.4 mm. F/P = 3. Aedeagus short, pointed, slightly truncate.

♀. Length 2.4-2.5 mm. Wing: Length 2.2-2.4 mm, width 0.65 mm. Alpha = 0.52-0.65 mm; beta = 0.29-0.37 mm; gamma = 0.05-0.16 mm. Wing index $\frac{\text{alpha}}{\text{beta}}$ = 1.5-2.2. Postspiracular setae 9-11; anepisternal setae 2-4. Palps: Formula: 1.4.5.2.3; R.L. 1-3.1-4-1.9-2.6. Antennae: A3 = 0.31-0.38 mm. A3 = 4 + 5 or slightly longer than 4 + 5. Ascoids A4 about 1/2 the length of the segments. Epipharynx: 0.26-0.29 mm. A3/E = 1.2-1.37. Cibarium with 8-9 horizontal teeth, rarely 7 or 10 and a wider space between the median teeth. 3-4 rows of vertical teeth, the median teeth larger. Lateral vertical teeth less numerous than in *L. olmeca*. Pigmented area as in *L. olmeca*, but narrower posteriorly. Pharynx as in *L. olmeca*. Spermathecae with 9-12 segments, the apical segment larger than the others. The segments decrease markedly in size towards the base. Terminal knob as long as the 2 terminal segments, resembling that of *flaviscutellata*. Stem of genital fork broad and blade-like, as in *olmeca*.

The subspecies differs from the nominate form in the male in the shorter palp segment 5 which is about as long as segment 2, while it is as long as segment 3 in *L. olmeca*, and in the shorter coxite and lateral lobes. The cibarium of the female has 8-9 horizontal teeth in most specimens and the form of the pigmented area differs slightly. The spermathecae differ from those of *L. olmeca* mainly in the form of the terminal knobs which are oblong and resembles those of *flaviscutellata*.

In life this is an unusually striking sandfly due to the nearly black wings, mesonotum and abdomen contrasting with the silvery white pleura. Hairs on wings unusually long and dense; costa clothed with pale yellow hairs, becoming silvery ligulate scales at base, rest of wing with dark gray hairs with a bluish reflection; costal veins pale, others darker. Mesonotum blackish, with very long erect dark hairs. Pleura and coxae white, the last with silvery ligulate scales and setae; femora and bases of tibiae dark-scaled, rest of tibiae and tarsi silvery white-scaled. Abdomen dark, blackish, the hairs mostly dark above, lighter below. Hairs on first tergite erect, others apparently semi-recumbent. After mounting, the mesonotum is seen to be deeply pigmented to just anterior to the wing bases, the posterior part and scutellum being without pigment. The dark pigmentation extends onto the pronotal lobes anteriorly, and the heads of the halteres are also infuscated. The pleura and coxae are entirely pale, the femora, and to a lesser extent the tibiae and tarsi, are moderately dark, the abdomen is

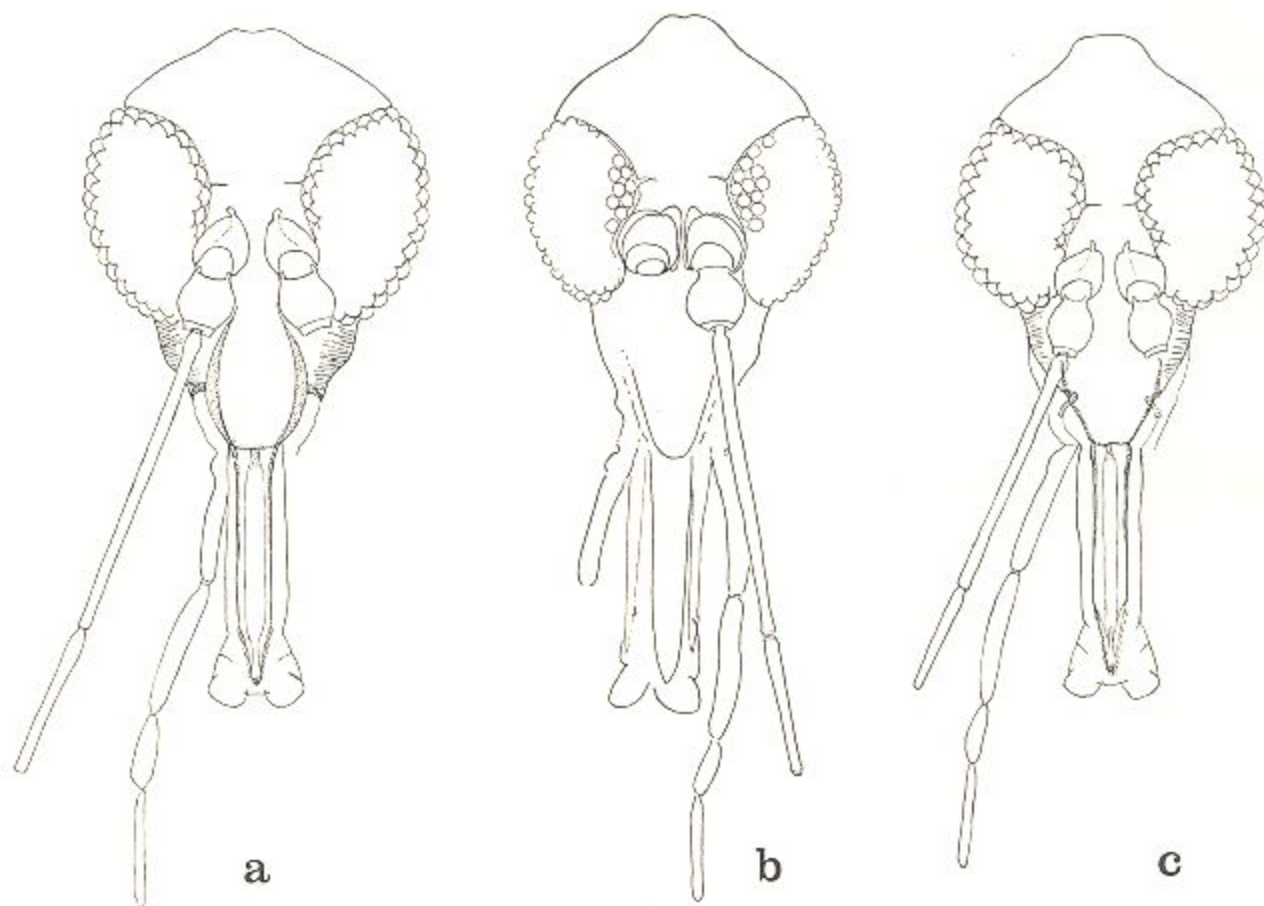


FIG. 6. Female heads, dorsal view. a, *L. olmeca*; b, *L. olmeca bicolor*; c, *L. flaviscutellata*.

wholly deeply pigmented, as is the head, including the palpi.

Material examined. Holotype ♂, slide 3901, Mojinga swamp, nr. Ft. Sherman, CANAL ZONE, PANAMA, 8.I.1952, light trap, coll. Blanton. Female allotype, slide 3353, Cruces Trail, Forest Reserve, CANAL ZONE, PANAMA, 5.VII.1951, light trap, coll. Hertig & Hartmann.

Seven ♂, 25 ♀ paratypes from the following localities: Loma Borracha, Fort Sherman Reservation, 1 ♂, 1 ♀, slides 3852, 3853, 25.XI.1951; 1 ♂, 4 ♀♀, slides 3855, 4025, 4026, 4028, 4071, 29.XI.1951, 8.V., 18.VI.1952, light trap, coll. Blanton. Mojinga swamp, Fort Sherman Reservation, c. z., 1 ♂, 7 ♀♀, slides 3886, 3516, 3888, 4039, 4060, 4101, 4109, 4135, VIII.-XII.1951, light trap, coll. Blanton. La Jolla Field, near Pacora, PANAMA, 8 ♀♀, slides 365, 1020-1024, 1384, 1385, 8.II.1945, in horse-baited stable trap, coll. Hertig & Fairchild. Rio Pequeni, Madden Lake, 1 ♀, slide 1000, 28.IX.1947, coll. Fairchild. San Antonio, upper Rio Pequeni, Madden Lake, 2 ♀♀, slides 1422, 1428, 25.II.1949, tree buttresses, coll. Trapido & Galindo. Rio Corotu, Puerto Armuelles, Chiriqui,

PANAMA, 1 ♂, 1 ♀, slides 3223, 3219, 9.VI.1951, Shannon trap at light, coll. Hertig. La Victoria, Cerro Jefe, PANAMA, 1 ♂, slide 2366, 29.VIII.1950, Shannon trap at light, coll. Hertig & Galindo. Fort Clayton, c. z., 1 ♀, slide 3823, 12.XII.1951, horse-baited stable trap, coll. Blanton. Juan Mina, Chagres River, c. z., 1 ♀, slide 3221, 24.VI.1949, coll. Trapido. Fort San Lorenzo, c. z., slide 4021, 6.V.1952, light trap, coll. Blanton.

The species was rarely taken in Panama until Thatcher (1968) used castor-oil traps baited with small mammals, when a number were taken in traps near ground level at Achiote, Colon Prov. Subsequently it proved to be the dominant species taken from forest floor litter and in rodent-baited castor oil traps at Sasardi, San Blas, while recently it proved fairly abundant in the upper Rio Tuira basin in Darien Prov. (Christensen 1970, pers. commun.). It occurs throughout Panama in areas of heavy forest and high rainfall. It has also been taken at Alto Curiche, Teresita and Sautata in the Dept. Choco in Colombia. In this area intensive collections were made from March to November 1967 in connection with a biomedical survey. *L. olmeca*

bicolor was taken regularly in small to moderate numbers, mostly in Malaise and light traps, but also 5 times biting small mammals and 19 times biting man. Other records from COLOMBIA are: Santander, St. Vicente de Chucuri, 1 ♂; Rio Raposo and Palmeras del Pacifico, Buenaventura, 4 ♀♀. It has also been reported by Rodriguez (1956) from Quevedo, Prov. Los Rios, Ecuador, as *apicalis*, but we have not seen this material.

It is possible that careful search in the wide gaps in distribution between the above discussed populations of *L. flaviscutellata*, *L. olmeca olmeca* and *L. olmeca bicolor* will reveal the presence of intermediate forms and that we are dealing with a single clinically variable species. Until evidence for this is forthcoming, we prefer the present treatment based on morphological characters of the available material.

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