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Description of a new phlebotomine species (Diptera: Psychodidae, Phlebotominae) and new records of sand flies from the State of Acre, northern Brazil

CAROLINA BIONI GARCIA TELES[1,2], RUI ALVES FREITAS[3], ARLEY FARIA JOSÉ DE OLIVEIRA[4], GUILHERME MAERSCHNER OGAWA[2], EDICARLOS ANDRÉ CAVALCANTE DE ARAÚJO[1], JANSEN FERNANDES MEDEIROS[5], FELIPE ARLEY COSTA PESSOA[6] & LUÍS MARCELO ARANHA CAMARGO[1,2]

[1]*Departamento de Medicina, Faculdade São Lucas, Porto Velho, RO. E-mail: carbioni2004@yahoo.com.br*
[2]*Instituto de Ciências Biomédicas 5, Universidade de São Paulo (USP), Monte Negro, RO, Brasil. E-mail: spider@icbusp.org*
[3]*Coordenação Sociedade, Ambiente e Saúde, Instituto Nacional de Pesquisas da Amazônia, Manaus, AM, Brasil.*
[4]*Universidade Federal do Estado do Amazonas, Manaus, AM, Brasil. E-mail: soubioo@hotmail.com*
[5]*Fundação Oswaldo Cruz (FIOCRUZ RONDÔNIA), Rondônia, RO, Brasil. E-mail: jmedeiro@gmail.com*
[6]*Centro de Pesquisa Leônidas e Maria Deane, Fundação Oswaldo Cruz, Manaus, AM, Brasil.*
E-mail: facpessoa@amazonia.fiocruz.br

Abstract

Groundbreaking studies of phlebotomine sand fly populations in Assis Brasil, State of Acre, Brazil, resulted in the collection of 13 new records of phlebotomine sand flies and one previously undescribed species. *Lutzomyia naiffi* **sp. nov.** is described here. The new species is similar to *Lutzomyia columbiana* (Ristorcelli & Van Ty) in measurements and other morphological characters.

Key words: *Lutzomyia naiffi* **sp. nov.**, taxonomy, Neotropical region

Introduction

Some phlebotomine species serve as vectors for species of *Leishmania* Ross to animals and humans. In the municipality of Assis Brasil, State of Acre, Brazil, a significant number of cases of American Tegumentary Leishmaniasis (ATL), (1,098 cases/100,000 inhabitants) were reported between 2001 and 2010 (SINAN 2011). This warranted the study of phlebotomine sand fly diversity in the region, particularly to identify possible vectors of the ATL agents. The study also provided a basis for the preparation and implementation of protocols aimed at treating and controlling leishmaniasis.

Studies of phlebotomine sand flies in the State of Acre are still scanty, and little biological information is available (Martins & Silva 1964; Arias & Freitas 1982; Silva-Nunes *et al*. 2008). 52 sand fly species have previously been reported in the state (Aguiar & Medeiros 2003; Azevedo *et al*. 2008); therefore, sand flies were sampled in the municipality of Assis Brasil in order to acquire a more comprehensive basic knowledge of the fauna. The survey resulted in the discovery of a species new to science, which is described here. 13 species are also newly recorded for the State of Acre, Brazil.

Material and methods

Specimens were collected from different areas in the municipality of Assis Brasil located approximately 330 km south west of Rio Branco (capital of the State of Acre), in the mesoregion of the Acre valley, on the left bank of the

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Acre river. This area of Brazil borders Bolivia and Peru. The local climate is typically tropical with an average rainfall of 1,940 mm and temperature of 26.5°C. The economy is based on subsistence agriculture (coffee, corn and rice) and extractive production (Brazil nut and latex) as well as small-scale cattle farming (beef and milk production) and small timber exploitation.

Phlebotomine sand flies were captured between November 2009 and October 2010 with CDC light traps placed approximately 100 meters from domestic habitats. Collections were carried out monthly on six consecutive nights from 18:00 to 06:00 with four traps placed under trees at 150 cm above the ground.

Species identification, nomenclature and morphological terminology are in accordance with Young & Duncan (1994). In the description of the new species, the values (µm) of the holotype are given, followed in parentheses by those of a single paratype. Measurements were obtained by using an Olympus CBA microscope and a calibrated micrometer scale. Specimens were mounted in Canada balsam and morphological characters were illustrated with the aid of a camera lucida.

Results

Lutzomyia naiffi Freitas & Oliveira sp. nov.

(Figs. 1–6)

Description. **Male**. Total body length (thorax to the end of the style), 1620 (1580). Overall Color: Light brown, slightly contrasting with pleurae and coxae. Head: length (from vertex to clypeus apex), 330 (320), width and interocular distance unmeasurable due to bilateral flattening during mounting process; eyes normal, with incomplete interocular suture; cibarium normal, without denticles, virtually complete chitinous hyaline arc; elongated and blurred narrow pigmented spot; antenna with flagellomere I = 190 (180) long; II + III = 200 (200); IV = 100 (110); V-IX = 90 (90); X and XI = 80 (80); XII and XIII = 60 (60); XIV = 50 (50), flagellomere I slightly shorter than II + III. Simple, elongated ascoids inserted nearly at the same level, with apices sometimes reaching the apical third of flagellomeres, not visible in apical two flagellomeres. Antennal formula: AIII-AXIV.2, AXV-AXVI.0. Pharynx without denticles or striations posteriorly, measuring (130) long. Labrum 190 (170) long. Palpus with total length of 490 (470), segments individually measuring: P1 = 30 (30); P2 = 100 (90); P3 = 100 (90); P4 = 90 (90); P5 = 170 (160), palpal formula: 1.4. (2.3). 5.; P5 slightly smaller than P2 + P3. Newstead's campaniform sensilla inserted medially on third palpus segment. Thorax: length: 400 (390) from the anterior edge of the mesonotum to the scutellum apex. Anepisternum with 6 (8) upper, 2 (2) lower bristles. Wing length, from insertion point to apex, 1320 (1300), maximum width 360 (390); alar indices: alpha = 220 (230), beta = 190 (180), gamma = 230 (240), and delta = 10 (10), gamma slightly greater than alpha. Legs of holotype and paratype absent. Abdomen: length from first tergite to style apex 1210 (1190); style length 80 (80), style width 30 (30), with two to four spines distributed as follows: three strong spines at apical 1/3, 1 apical, 1 subapical and 1 external placed immediately below subapical spine, 1 smaller, more narrow spine inserted medially halfway at middle 1/3 of style; subterminal bristle present. Coxite (Fig 4) length 190 (190), width 100 (100), with a tuft of approximately 20 long, foliaceous, flexible bristles, grouped in circular area on medial surface of coxite. Paramere length 140 (150), width 40 (40), wider basally, narrowing apically, apex dilated, turned dorsally, covered with long, slim bristles. Conical, elongate aedeagus with slim apex extending to approximately mid length of lateral lobe. Lateral lobe length 190 (160), normal aspect, unarmed, equal in length or slightly shorter than coxite. Genital filaments length 480 (440), slightly greater than five (5) times the length of genital pump, superficially striated, with round apex; genital pump length 90 (80).

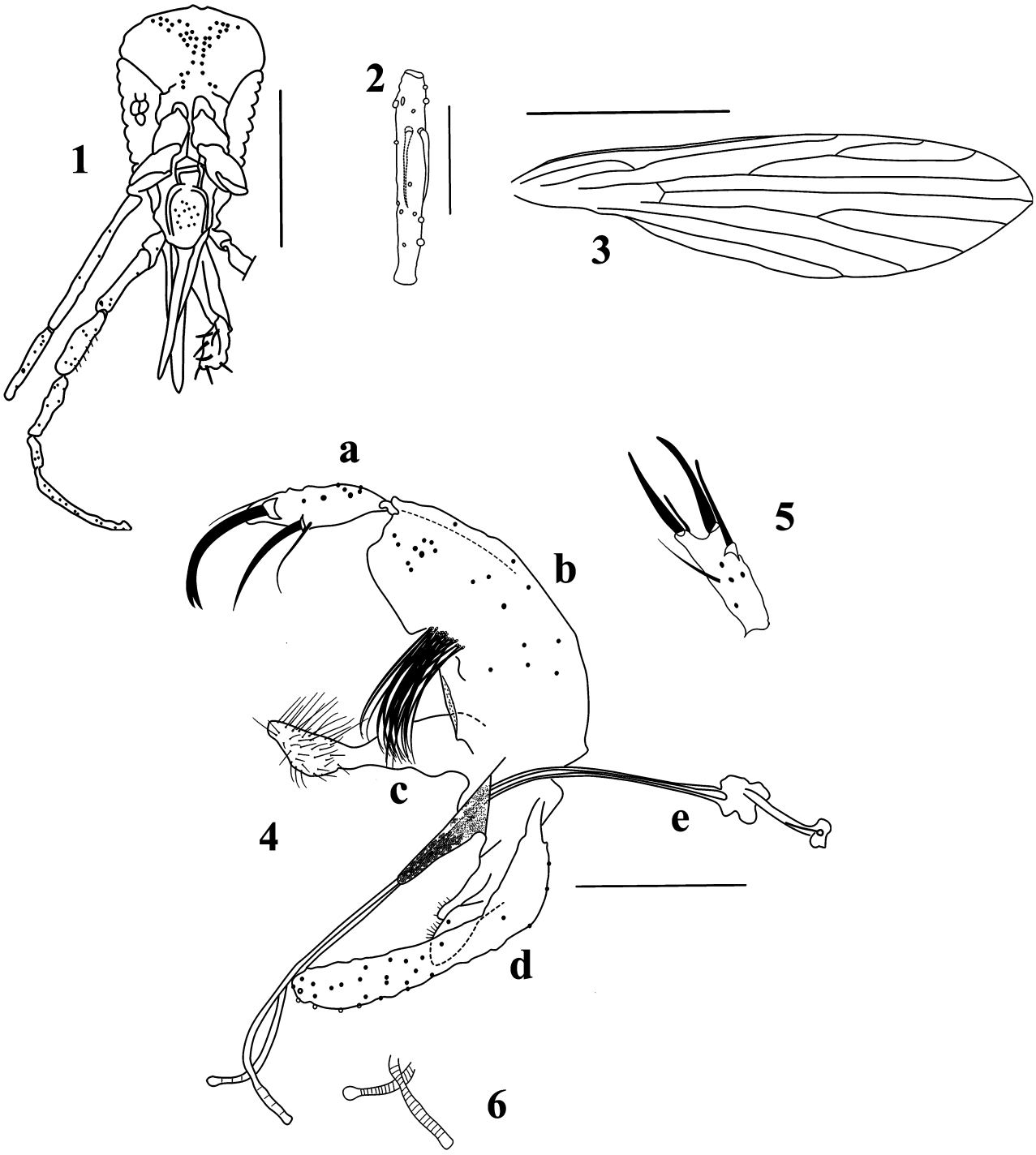
Female. Unknown.

Type data and depository. Holotype (male), Brazil, State of Acre, Assis Brasil municipality, São Francisco road, 10º56'29"S 69º34'01"W, CDC light trap, 06/IX/2009, coll. L.M.A. Camargo and C.B.G. Teles. Paratype (male), same data as holotype. Type specimens are deposited in the entomological collections of the National Institute of Research of Amazonia (INPA).

Etymology. *Lutzomyia naiffi* is named in honor of our research colleague and friend, Mr. Roberto Daibes Naiff, for his substantial contributions to the field of medical entomology and parasitology in Brazil.

Comments. Based on morphological characters, *Lutzomyia naiffi* undoubtedly belongs to the *verrucarum* group, defined by Theodor (1965) and Young & Duncan (1994). This species group is characterized by the

following combination of character states: antennal ascoids simple; palpomere 5 longer than palpomere 3; coxite with persistent setae, style with four spines, subterminal seta present; paramere simple, without arms or extensions. The *verrucarum* group sensu Theodor (1965) was originally divided into two series, the *serrana* series, which includes species with two or three strong spines on the style, and the *verrucarum* series, which includes species with four spines on the style. In contrast, Kreutzer *et al.* (1990) placed all species of the *verrucarum* series with an isolated basal spine and three distal spines in the *townsendi* series and all other species with two distal median spines in the *verrucarum* series.



FIGURES 1–6. *Lutzomyia naiffi* **sp. nov.** Holotype male. 1, Head frontal view, Bar: 200 µm. 2, Flagellomere II, Bar: 50 µm. 3, Wing, Bar: 500 µm. 4, Terminalia (a, style; b, coxite; c, paramere; d, lateral lobe; e, pump, genital filaments and aedeagus), Bar: 100 µm. 5, Style in ventral position. 6, Tip of genital filament.

Lutzomyia naiffi is similar to *L. columbiana* (Ristorcelli & Van Ty 1941) in the shape of the parameres, although it differs in the following main aspects: the coxite bristle tuft, which is basal in *L. columbiana* and medial in *L. naiffi*; the position and thickness of the spines of the style, with *L. columbiana* having four strong spines of similar thickness, two inserted more basally and one inserted medially on the style, though all are nearly at the same level, while in *L. naiffi*, the two more basal spines (one of them being smaller and much thinner than the other) are inserted a little beyond the middle of the structure; the genital ducts of *L. naiffi* are longer than those of *L. columbiana* and slightly more than five times the genital pump length, while in *L. columbiana* they are about three times the pump length. *Lutzomyia naiffi* is different from all other species of the *verrucarum* group due to the presence of an internal median spine on the style that is much thinner compared to those of other species in the group. Nonetheless, the two more basal spines are situated almost at the same level as in other species of the *verrucarum* series; therefore, we propose that the new species should be included in this series. Galati (1995) treated the *verrucarum* group as part of genus *Pintomyia* Costa Lima, subgenus *Pifanomyia* Ortiz & Scorza.

The center of endemism of the *verrucarum* group is in northwestern South America with species distributed mainly in the Andes (Bejarano *et al*. 2003). However, some species of the verrucarum group, such as *Lutzomyia odax* (Fairchild & Hertig), *Lutzomyia nevesi* (Damasceno & Arouck) and *Lutzomyia serrana* (Damasceno & Arouck) are known to occur in Brazil.

TABLE 1. New records of sand flies in the genus *Lutzomyia* captured in Assis Brasil Municipality, Acre State, Brazil, with geographical distribution of the species.

Subgenera / Groups	Species	Distribution
Evandromyia	*Lutzomyia tarapacaensis* Le Pont, Torres-Espejo & Galati	Bolívia*, Brasil (Amazonas, Pará, Rodônia)
Nyssomyia	*Lutzomyia reducta* Feliciangeli, Ramirez Peréz & Ramirez	Venezuela*, Peru, Brazil (Amazonas, Rodônia)
Pyntomyia	*Lutzomyia christenseni* Young & Duncan	Panamá*, Colômbia, Trinidad e Tobago, Brazil (Amazonas, Amapá, Pará, Rondônia, Tocatins, Maranhão, Goiás, Mato Grosso do Sul, São Paulo)
Psychodopygus	*Lutzomyia bispinosa* (Fairchild & Herting)	Panamá*, Belize, Honduras, Guatemala, Nicarágua, Costa Rica, Suriname, Colômbia, Guiana Francesa, Equador, Brazil (Amapá, Amazonas, Bahia, Mato Grosso, Pará, Rondônia, Roraima)
	Lutzomyia yucumensis (Le Pont, Caillard, Tibayrenc & Desjeux)	Bolívia*, Peru, Brazil (Rondônia, Mato Grosso)
Trichophoromyia	*Lutzomyia melloi* (Causey & Damasceno)	Brasil (Amazonas*, Pará, Rodônia)
aragaoi group	*Lutzomyia abunaensis* (Martins, Falcão & Silva)	Equador, Peru, Bolívia, Brazil (Rondônia*, Amazonas)
	Lutzomyia brasiliensis (Costa Lima)	Guiana Francesa, Peru, Brazil (Amazonas, Pará, Rondônia, Maranhã, Ceará, Bahia, Goiás, Mato Grosso, Minas Gerais*, Rio de Janeiro, São Paulo)
dreisbachi group	*Lutzomyia dreisbachi* (Causey & Damasceno)	Venezuela, Colômbia, Suriname, Peru, Guiana Francesa, Brazil (Amazonas*, Amapá, Rondônia, Roraima, Pará)
migonei group	*Lutzomyia andersoni* Le Pont et Desjeux	Bolívia*, Brazil (Amazonas, Acre)
	Lutzomyia termitophila Martins, Falcão & Silva	Brasil (Rondônia, Tocantins, Piauí, Minas Gerais*, Bahia, Rio de Janeiro, São Paulo, Goiás, Mato Grosso)
	Lutzomyia williamsi (Damasceno, Causey & Arouck)	Venezuela, Brazil (Amazonas, Pará*, Rondônia)
saulensis group	*Lutzomyia wilsoni* (Damasceno & Causey)	Brazil (Amazonas*, Rondônia)

*Type locality

New records of sand fly species

Among the captured species, three were identified as genus *Brumptomyia* França & Parrot, and 56 as genus *Lutzomyia* França of which two male specimens were identified as a previously unknown species. Among the species of *Lutzomyia* collected in this study, 13 are reported for the first time in the State of Acre (Table 1).

Discussion

The first record of *Lutzomyia abunaensis* and *L. yucumensis* in Brazil was from the State of Rondonia, and they are now recorded from the State of Acre. Both species have also been recorded from Peru and/or Bolivia (Young & Duncan 1994; Biancardi *et al*. 1982). *Lutzomyia dreisbachi* has been recorded many times in the Amazon basin, except in Bolivia. However, as Assis Brasil borders Bolivia, it is probable that *L. dreisbachi* will also be found in the latter. *Lutzomyia andersoni* was recorded for the first time in Brazil in the State of Mato Grosso (Missawa & Maciel 2007) and the State of Amazonas (Barbosa *et al*. 2008). We suspect that it is probably a widely distributed species in the Amazon Basin. *Lutzomyia bispinosa*, *L. williamsi*, *L. wilsoni* and *L. brasiliensis* are also wide spread in the Brazilian Amazon (Galati 2003; Young & Duncan 1994). *Lutzomyia christenseni*, *L. termitophila* and *L. melloi* are distributed throughout the Brazilian Amazon (Galati 2003; Young & Duncan 1994), but their distribution will probably be extended to Peru and Bolivia if additional sampling occurs there in the future. *Lutzomyia tarapacaensis*, described from Bolivia, was registered in the States of Pará, Amazonas (Freitas & Barrett 2002) and Rondônia (Teles *et al*. in press). It is likely widely distributed throughout the Amazon basin. *Lutzomyia* (*N*.) *reducta* has been recorded from the States of Amazonas and Rondônia (Galati 2003) and was determined to be naturally infected with *Leishmania amazonensis* Lainson & Shaw (Freitas *et al*. 1989).

The diversity of phlebotomine sand flies in the State of Acre remains among the lowest in the North Region of Brazil when compared with other states in this region (Aguiar & Medeiros 2003). This is undoubtedly due to a paucity of local surveys of the sand fly fauna, and the number of species of sand flies will probably increase significantly if additional surveys in the state are completed.

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References

Aguiar, G.M. & Medeiros, W.M. (2003) *Distribuição regional e habitats das espécies de flebotomíneos do Brasil*. In EF Rangel, R Lainson (eds.), *Flebotomíneos do Brasil*. Fiocruz, Rio de Janeiro, pp. 207–255.

Arias, J.R. & Freitas, R.A. (1982) The know geographical distribution of sand flies in the state of Acre, Brazil (Diptera: Psychodidae). *Acta Amazônica*, 12, 401–408.

Azevedo, A.C.R., Costa, S.M., Pinto, M.C.G., Souza, J.L., Cruz, H.C., Vidal, J. & Rangel, E.F. (2008) Studies on the sandfly fauna (Diptera: Psychodidae: Phlebotominae) from transmission areas of American cutaneous leishmaniasis in state of Acre, Brazil. *Memórias do Instituto Oswaldo Cruz*, 103, 760–767. http://dx.doi.org/10.1590/S0074-02762008000800003

Barbosa, M.G.V., Fé, N.F., Marcião, A.H.R., Silva, A.P.T., Monteiro, W.M. & Guerra, J.A.O. (2008) Fauna de flebotomíneos (Diptera: Psychodidae) em um foco de leishmaniose tegumentar americana na área Peri urbana de Manaus, Estado do Amazonas. *Revista da Sociedade Brasileira de MedicinaTropical*, 41, 485–491. http://dx.doi.org/10.1590/S0037-86822008000500010

Bejarano, E.E., Rojas, W., Uribe, S. & Vélez, I.D. (2003) Sistemática de especies de *Lutzomyia* del grupo verrucarum Theodor, 1965 (Diptera: Psychodidae). *Biomédica*, 23, 87–102.

Biancardi, C.B., Arias, J.R., Freitas, R.A. & Castellon, E.G. (1982) The know geographical distribution of sand flies in the state of Rondonia, Brazil (Diptera: Psychodidae). *Acta Amazônica*, 12, 167–179.

Freitas, R.A., Barrett, T.V. & Naiff, R.D. (1989) *Lutzomyia reducta* Feliciangeli et al. 1988, a host of *Leishmania amazonensis*, sympatric with two other members of the *Flaviscutella* complex in Southern Amazonas and Rondonia, Brazil (Diptera: Psychodidae). *Memórias do Instituto Oswaldo Cruz*, 84, 363–369. http://dx.doi.org/10.1590/S0074-02761989000300011

Freitas, R.A. & Barrett, T.V. (2002) Descriptions of *Lutzomyia (Evandromyia) georgii* n. sp. and a synopsis of the series infraspinosa (Diptera: Psychodidae). *Memórias do Instituto Oswaldo Cruz*, 97, 239–245. http://dx.doi.org/10.1590/S0074-02762002000200017

Galati, E.A.B. (1995) Phylogenetic systematics of Phlebotominae (Diptera, Psychodidae) with emphasis on American groups.*Boletín de la Dirección de Malariología y Saneamiento Ambiental*, 35, 133–142.

Galati, E.A.B. (2003) *Morfologia e Taxonomia*. *Classificação de Phlebotominae*. In: EF Rangel, R Lainson. (eds). *Flebotomíneos do Brasil*. Fiocruz, Rio de Janeiro, p. 23–51.

Kreutzer, R., Palau, M., Morales, A., Fero, C., Feliciangeli, D. & Young, D. (1990) Genetic relationships among phlebotomine sand flies (Diptera: Psychodidae) in the verrucarum species group. *Journal of Medical Entomology*, 27, 1–8.

Martins, A.V. & Silva, J.E. (1964) Notas sobre os flebotomíneos do estado do Acre, com a descrição de duas espécies novas (Diptera, Psychodidae). *Revista Brasileira de Biologia*, 24, 127–138.

Missawa, N.A. & Maciel, G.B.M.L. (2007) List of species in the genus *Lutzomyia*, França, 1924 (Psychodidae, Phlebotominae) from the state of Mato Grosso. *Revista da Sociedade Brasileira de Medicina Tropical*, 40, 11–14.

Ristorcelli, A. & Van Ty, D. (1941) Phlebotomines d'une rigion de Colombie an la verruga du Peru est devenue endemique depuisou trios ans (secunde note). *Annales de parasitologie Humaine et Comparée*, 18, 251–269.

Silva-Nunes, M., Cavasini, C.E., Silva, N.S. & Galati, E.A.B. (2008) Epidemiologia da leishmaniose tegumentar e descrição das populações de flebotomíneos no município de Acrelândia, Acre, Brasil. *Revista Brasileira de Epidemiologia*, 1, 241–251. http://dx.doi.org/10.1590/S1415-790X2008000200006

SINAN (2012) Sinan: Ministério da Saúde. Secretaria de Vigilância em Saúde, Brasília. Available from: http://www.saude.gov.br/Sinanweb(Accessed May 24, 2012).

Teles, C.B.G., Basano, S.A., Zagonel-Oliveira, M., Campos, J.J., Oliveira, A.F.J., Freitas, R.A., Medeiros, J.F., Pessoa, F.A.C., Barral, A. & Camargo, L.M.A. (2012) Epidemiological aspects of american cutaneous leishmaniasis and phlebotomine sand fly population in the municipality of Monte Negro, State of Rondonia, Brazil. *Revista da Sociedade Brasileira de Medicina Tropical* (in press).

Theodor, O. (1965) On the classification of American phlebotomine. *Journal of Medical Entomology, 2*, 171–197.

Young, D.G. & Duncan, M.A. (1994) Guide to the identification and geographic distribution of *Lutzomyia* sand flies in Mexico, the West Indies, Central and South America (Diptera: Psychodidae). *Memoirs of the American Entomological Institute*, 54, 1–881.