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Abundance and Monthly Frequency of Phlebotomine Sand Flies (Diptera: Phlebotominae) in Some Municipalities in the State of Rio de Janeiro, Brazil

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Abstract. The present study had the objective of estimating the abundance and monthly frequency of vector phlebotomines for American cutaneous leishmaniasis (ACL) in the municipalities of Saquarema, Rio Bonito, Piraí and Rio Janeiro, in the state of Rio de Janeiro. Seven sites located in these municipalities were monitored over a 10 to 12-month period. *Lutzomyia migonei* (França) *Lutzomyia* (*Pintomyia*) *fischeri* (Pinto) and *Lutzomyia* (*Nyssomyia*) *intermedia* (Lutz & Neiva) the vectors for ACL, were recorded in all four of these municipalities. In this study, it was noteworthy that *Lutzomyia* (*Lutzomyia*) *longipalpis* (Lutz & Neiva) the vector of visceral leishmaniasis (VL) was registered. In addition to these vectors, three other phlebotomine species, including *Lutzomyia edwardsi* (Mangabeira), *Lutzomyia sallesi* (Galvão & Coutinho) and *Lutzomyia firmatoi* (Barreto, Martins & Pellegrino) were captured in peridomestic environments at the seven monitoring sites (MS) over a 1476-hour period. A total of 23,187 specimens were captured leishmaniasis vector species accounted for 99.6% of the specimens captured. *Lutzomyia* (*N.*) *intermedia* presented the highest abundance (SISA = 1.0) and was recorded at all monitoring sites, with the highest mean Williams values. *Lutzomyia migonei* was the second most abundant and was found at all sites except MS_6 (SISA = 0.66). *Lutzomyia* (*L.*) *longipalpis, Lutzomyia sallesi*, *Lutzomyia firmatoi* and *Lutzomyia* (*P.*) *fischeri* were occasionally observed at the MS. These studies point to the need for adoption of policies involving actions of health education, associated with the notion of environmental management and the basics concepts of the disease, as element of success of an integrated program of entomological surveillance and control of American cutaneous leishmaniasis.

Keywords: Sandfly; Abundance index; Frequency monthly; Municipality of Rio de Janeiro.

Abundância e Frequência Mensal de Flebotomíneos (Diptera: Phlebotomiae) em Alguns Municípios do Estado do Rio de Janeiro, Brasil

Resumo. O presente estudo teve o objetivo de estimar a abundância e frequência mensal de algumas espécies de flebotomíneos incriminados como vetores da Leishmaniose Tegumentar Americana (LTA), nos municípios de Saquarema, Rio Bonito, Piraí e Rio Janeiro, no Estado do Rio de Janeiro. Sete sítios localizados nesses municípios foram monitorados ao longo de um período de 10 a 12 meses. *Lutzomyia migonei* (França), *Lutzomyia* (*Pintomyia*) *fischeri* (Pinto) e *Lutzomyia* (*Nyssomyia*) *intermedia* (Lutz & Neiva), foram registrados em todos os quatro municípios. *Lutzomyia* (*Lutzomyia*) *longipalpis* (Lutz & Neiva) vetor comprovado da Leishmaniose Visceral (LV), foi registrado. Além desses vetores, outras três espécies de flebotomíneos, incluindo *Lutzomyia edwardsi* (Mangabeira), *Lutzomyia sallesi* (Galvão & Coutinho) e *Lutzomyia firmatoi* (Barreto, Martins & Pellegrino) foram capturados em ambiente domiciliar nos sete sítios de monitoramento (SM) durante um período de 1.476 horas totalizando 23.187 espécimes. Espécies responsáveis pela transmissão das leishmanioses totalizaram 99,6%. *L.* (*N.*) *intermedia* apresentou a maior abundância (SISA = 1,0) e foi registrada em todos os SM, com os maiores valores médios de captura. *Lutzomyia migonei* foi a segunda mais abundante e também foi encontrada em todos os locais, exceto MS6 (SISA = 0,66). *Lutzomyia* (*L.*) *longipalpis*, *Lutzomyia sallesi*, *Lutzomyia firmatoi* e *Lutzomyia* (*P.*) *fischeri* foram ocasionalmente observadas nas SM. Esses estudos apontam para a necessidade de adoção de políticas que envolvam ações de educação em saúde, associados à noção de manejo ambiental e conceitos básicos da doença, como elemento de sucesso de um programa integrado de vigilância entomológica e controle da LTA.

Palavras-chave: Flebotomíneos; Frequência mensal; Índice de abundância; Municípios do Rio Janeiro.

Over recent decades, American cutaneous leishmaniasis (ACL) and visceral leishmaniasis (VL) have been increasing in incidence and expanding geographically, thus giving rise to new eco-epidemiological scenarios in the Americas (WHO 2013). In Brazil, leishmaniasis is considered to be an emerging endemic disease of increasing magnitude, with clear expansion across the national territory. It is now present in all Brazilian states (Ministério da Saúde 2003, 2007).

Over the last 24 years, several outbreaks of ACL have been recorded in municipalities in the state of Rio de Janeiro. In all studies on the potential vectors, the presence of *Lutzomyia* (*Nyssomyia*) *intermedia* (Lutz & Neiva) has been highlighted, thus suggesting that this is the main vector for *Leishmania* (*Viannia*) *braziliensis* (Vianna) (Rangel *et al.* 1986; Oliveira Neto *et al.*, 1988; Rangel *et al.*, 1990; de Souza *et al.* 1995; Meneses *et al.* 2002; Pita-Pereira *et al.* 2005; Alves 2007). On the other hand, *L. migonei* (França) probably acts as a secondary vector in this state (Pita-Pereira *et al.* 2005; Rangel & Lainson 2009). Pita-Pereira *et al.* (2011) determined natural *Leishmania* (*Viannia*) *braziliensis* (Vianna) infection in *Lutzomyia* (*Pintomyia*) *fischeri* (Pinto), using multiplex PCR methodology in an endemic area of American Cutaneous Leishmaniasis (ACL) in the periurban region of the municipality of Porto Alegre, Rio Grande do Sul State, Brazil.

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The present study had the objective of generating qualitative and quantitative data on the leishmaniasis vectors that frequent peridomestic environments, thus contributing towards adding information on the process of disease transmission in this state.

MATERIAL AND METHODS

Study location. The study location was in the state of Rio de Janeiro, in the southeastern region of Brazil, at 22°54'36" S and 43°10'32" W. The region has a high-altitude tropical climate, with a rainy season (summer) and dry season (winter), and mean temperature ranges from 16°C to 37°C over the year (IBGE 2009). The municipalities chosen for catching phlebotomines have had a history of notifications of human cases of ACL, and some entomological investigations have been conducted there, with the sole purpose of recording the phlebotomine species (Marzochi 1985).

Monitoring sites (MS_s). Seven MS_s were established in the municipalities of Saquarema, Rio Bonito, Piraí and Rio Janeiro in State of Rio de Janeiro, where phlebotomines were caught in peridomestic environments. Municipality of Saquarema (MS_1): this municipality is 100 km from the state capital (Rio de Janeiro), at an altitude of 2 m, and is in the coastal lowland mesoregion (lake district), at 22°55'12"S and 42°30'36"W. Municipality of Rio Bonito (MS_2): this is located in the metropolitan mesoregion of Rio de Janeiro (Macacu-Caceribu), at 22°42′28″S and 42°37′33″W. It is 72 km from the state capital, at an altitude of 40 m. Municipality of Piraí (MS_3): this is in the southern Fluminense mesoregion (Paraíba valley), at 22°43'03"S and 43°50'56"W. It is 89 km from the state capital, at an altitude of 387 m. Municipality of Rio de Janeiro: this is located in the metropolitan mesoregion of the state, at 22°54′10″S and 43°12′28″W. This municipality encompasses three major massifs: Pedra Branca, which crosses the city in an east-west direction (Pedra Branca peak, 1,024 m); Gericinó, to the north (Guandu peak, 900 m); and Tijuca or Carioca (Tijuca peak, 1,022 m). In the metropolitan region of Rio de Janeiro, four districts located in the region of the Pedra Branca massif served as sites for catching phlebotomines: Camorim (MS_4) (22°58'41"S and 43°25'50"W); Grumari (MS_5) (23°02'35"S and 43°32'05"W); Campo Grande (MS_6) (22°52'57"S and 43°33'45"W); and Barra de Guaratiba (MS_7) (22°59'24"S and 43°36'8"W) (Figure 1).

Sandfly trapping and identification. This was done by means of HP light traps (Pugedo 2005) three on each (indoor, peridomicily area and shelter animal) once a week in peridomestic environments (next to a henhouse, animal pen, banana plantation, etc), between 6 pm and 6 am, for 12 consecutive months at MS_1, MS_2, MS_3 and MS_4 (Nov 2007 – Oct 2008), and for 10 consecutive months at MS_5, MS_6 and MS_7 (Jan 2008 – Oct 2008). After the phlebotomines had been caught, they were processed in accordance with the method of Ryan *et al.* (1986), mounted individually and identified using the classification proposed by Young & Duncan (1984).

Abundance index and monthly frequency. The abundance of the species caught was estimated by means of the Standardized Index of Species Abundance (SISA) (Roberts & Hsi 1979). The tendency for vector species to occur over given time intervals was determined by calculating Williams means (Haddow 1954).

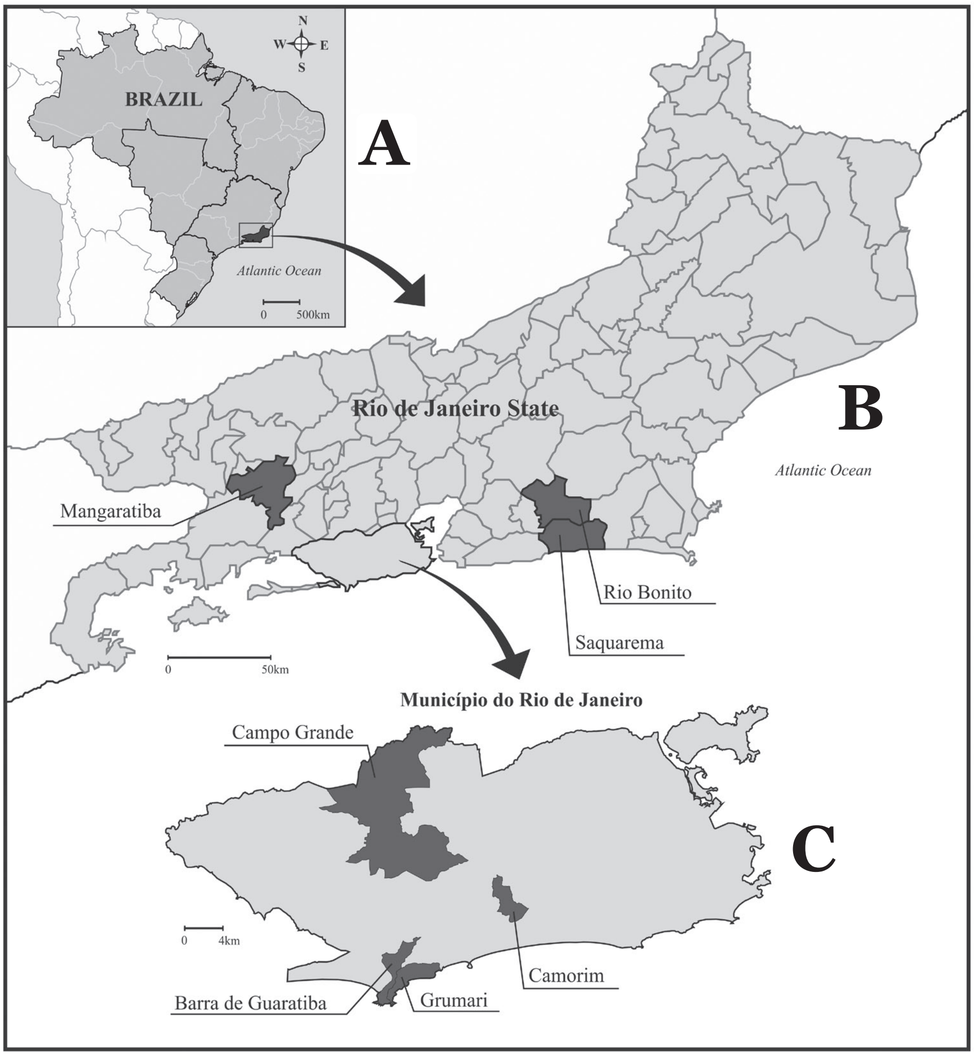

Figure 1. **A** - Map of Brazil, **B** - State of Rio de Janeiro, highlighting areas of study in the cities of Piraí, Rio Bonito and Saquarema, **C** - Rio de Janeiro city, areas of study in the Districts: Campo Grande, Barra de Guaratiba, Grumari and Camorim. (Font: Software Terra View 4.2.2).

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RESULTS

In the peridomestic environments located at the seven MS_s, *Lutzomyia* (*Lutzomyia*) *longipalpis* (Lutz & Neiva), *Lutzomyia edwardsi* (Manguabeira), *Lutzomyia migonei* (França), *Lutzomyia sallesi* (Galvão & Coutinho), *Lutzomyia firmatoi* (Barreto, Martins & Pellegrino), *Lutzomyia* (*Pintomyia*) *fischeri* (Pinto) e *Lutzomyia* (*Nyssomyia*) *intermedia* (Lutz & Neiva) were captured during a 1,476-hour period, total 23,187 specimens, among which *L. migonei*, *L.* (*P.*) *fischeri* and *L.* (*N.*) *intermedia*. These species accounted for 98.8% of the specimens captured. It was noteworthy that *L.* (*L.*) *longipalpis* accounted for 0.8% of the specimens caught. The other species represented 0.4% (Table 1).

Among the total number of specimens, females accounted for 63.4%. *L.* (*N.*) *intermedia* (SISA = 1.0) was the most abundant species, followed by *L. migonei* (SISA = 0.66) and *L.* (*P.*) *fischeri* (SISA = 0.44). The specie *L.* (*L.*) *longipalpis* was the fourth most abundant species (SISA = 0.22). *L. sallesi* (SISA= 0.17), *L. edwardsi* (SISA= 0.07) and *L. firmatoi* (SISA= 0.02).

Lutzomyia (*N.*) *intermedia* was found at all the MS_s, in the different municipalities, and was the most abundant species (SISA = 1.0). Following this, *L. migonei* was the second most abundant species, with SISA ranging from 0.56 (MS_1) to 0.80 (MS_7), such that the highest index was at MS_7. This species was not recorded at MS_6. *Lutzomyia* (*P.*) *fischeri* was only absent at MS_6, and at the other MS_s, SISA ranged from 0.26 (MS_1) to 0.61 (MS_7). *Lutzomyia* (*L.*) *longipalpis* was not recorded in the municipality of Rio de Janeiro during this period, but was caught in the other municipalities, with SISA ranging from 0.12 (MS_3) to 0.55 (MS_1). Other species without proved medical importance were also observed in the peridomestic environments was *L. edwardsi* (MS_1) presented SISA of 0.52 and *L. sallesi* showed SISA ranging from 0.13 to 0.30 (MS_3, MS_4, MS_5 and MS_7) .

In MS_1, 3,172 specimens were captured in 96 hours. In MS_2, 4,056 specimens were captured over a 288-hour period. In MS_3, 5,392 specimens were captured in 612 hours. In the municipality of Rio de Janeiro: at MS_4, 1,342 specimens were captured in 120 hours; at MS_5, 3,013 specimens were captured in 120 hours; at MS_6, 1,941 specimens were captured in 120 hours; at MS_7, 4,188 specimens were captured in 120 hours.

Lutzomyia (*N.*) *intermedia* was the most frequent species. In MS_1 2,947 specimens were captured (X_W = 201.7). At MS_2 3,858 at specimens were captured (X_W=268.2). At MS_3 5,127 specimens were captured (X_W=345.1). In the municipality of Rio de Janeiro, the following frequencies and X_W were observed in ten months of trapping. At MS_4 1,262 specimens (X_W=84.7), at MS_5 2,828 specimens (X_W=254.4), at MS_6 1,941 specimens (X_W=185.7) and at MS_7 3,717 specimens (X_W=319.7) (Figure 2).

Lutzomyia migonei was not found on the MS_6 (District Campo Grande). At MS_1 was not found in April, and 101 specimens (X_W=6.3) were captured. At MS_2 was not found in April, and 72 specimens (X_W=4.2). At MS_3 was found in all the months with 222 specimens captured (X_W=12.6). In the municipality of Rio de Janeiro, the following frequencies and X_W were observed in ten months of trapping. At MS_4 the specie was not found in August and 66 specimens were found (X_W=4.3), at MS_5 was found in all ten months (N=136; X_W=10.2) and at MS_7 was also found in all ten months 351 specimens (X_W=27.4). The X_W for *L. migonei* was lower at MS_2 and MS_4 than at MS_1, MS_3, MS_5 and MS_7 (Figure 3).

Lutzomyia (*P.*) *fischeri* was not found on the MS_6. At MS_1 the species was not captured in November, May, and 33 specimens were captured (X_W=1.8). At MS_2 the species was not captured in November, May, October and 27 specimens were captured (X_W=1.6). At MS_3 was captured in 10 months (except May and September), 34 specimens (X_W=1.9). In the municipality of Rio de Janeiro was not captured in MS_6. At MS_4 (N=14; X_W=0.7), MS_5 (N=49; X_W=4.0) and MS_7 (N=120; X_W=7.2). Compared with the other MS_s, the frequency of *L. (P.) fischeri* was highest at MS_7 (Figure 4).

Lutzomyia (*L.*) *longipalpis* was not observed in the municipality of Rio de Janeiro (MS_4, MS_5, MS_6 and MS_7) during the study period. At MS_1 the specie has not captured in July, and 91 specimens were captured (X_W=6.1). At MS_2 the species was not captured in June, July, and 99 specimens (X_W=4.3) were captured. At MS_3 the species was not captured in March, June, July, and 7 specimens were captured (X_W=0.4) (Figure 5).

DISCUSSION

The phlebotomine sand fly fauna of the state of Rio de Janeiro is composed of seven species of the genus *Brumptomyia* and 46 species of the genus *Lutzomyia* (Aguiar & Medeiros 2003). Among these species of the genus *Lutzomyia*, *Lutzomyia* (*L.*) *longipalpis* (Lutz & Neiva), *L. migonei*, *L.* (*P.*) *fischeri* (Pinto), *L.* (*P.*) *pessoai* (Coutinho & Barreto), *L.* (*Psychodopygus*) *ayrozai* (Barreto & Coutinho), *L.* (*P.*) *hirsuta hirsuta* (Mangabeira), *L.* (*N.*) *whitmani* (Antunes & Coutinho), *L.* (*N.*) *flaviscutellata* (Mangabeira) and *L.* (*N.*) *intermedia* can be highlight. These are proven or suspected vectors for ACL and VL in Brazil (Lainson & Rangel 2005; Rangel & Lainson 2009).

Over the process of adapting to new habitats, because of environmental changes, some phlebotomine species became adapted to new ecological scenarios, thereby reaching the domestic environment. This seems to be the case, to varying degrees, for *L.* (*P.*) *pessoai*, *L. migonei*, *L.* (*N.*) *whitmani, L.* (*P.*) *fischeri*, *L.* (*N.*) *intermedia* and *L.* (*L.*) *longipalpis* (Souza 2003).

In southeastern Brazil over the years, some of the associations among phlebotomines, mammals and parasites have undergone

Table 1. Total species percentage and index of abundance of the species, collected in transition area and forest in the Fiocruz Atlantic Forest Campus, Neighborhood Jacarepaguá the City of Rio de Janeiro, State of Rio de Janeiro. Period January 2009 to December 2010.

Species	M	F	Total	%	SISA
Lutzomyia (*Lutzomyia*) *longipalpis*	20	177	197	0.85	0.22
Lutzomyia edwardsi	26	22	48	0.21	0.07
Lutzomyia migonei	400	548	948	4.09	0.66
Lutzomyia sallesi	12	16	28	0.12	0.17
Lutzomyia firmatoi	-	9	9	0.04	0.02
Lutzomyia (*Pintomya*) *fischeri*	107	170	277	1.19	0.44
Lutzomyia (*Nyssomyia*) *intermedia*	7,917	13,763	21,680	93.50	1.0
Total	**8,482**	**14,705**	**23,187**	**100.00**	**--**

M - Males; F - Females

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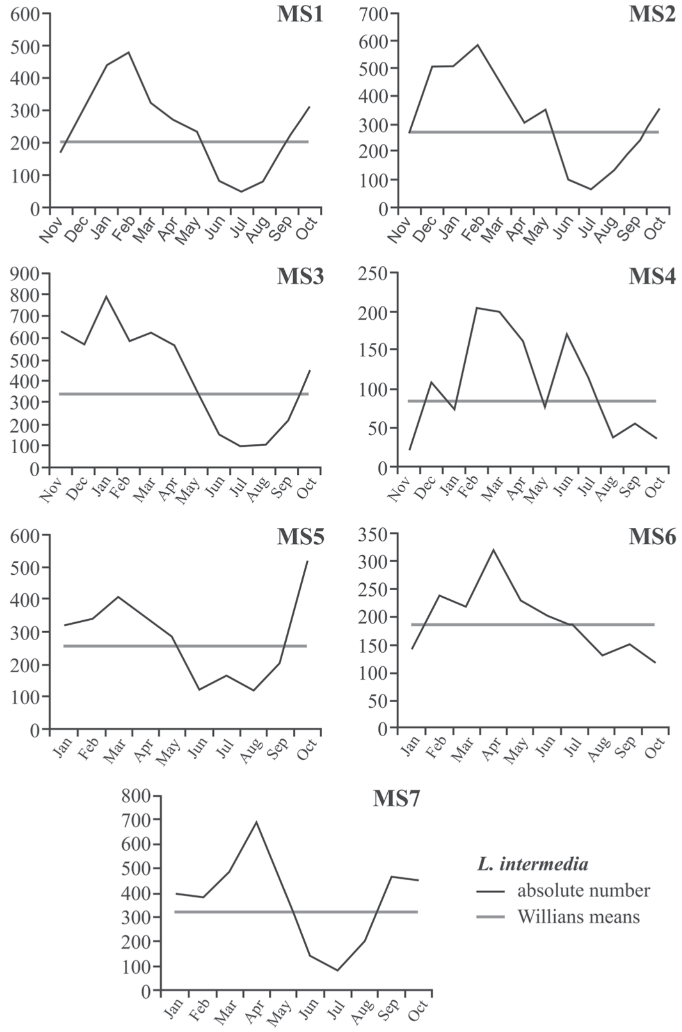

Figure 2. Monthly frequency and Williams means of the *Lutzomyia* (*Nyssomia*) *intermedia* in the different Municipality of Rio de Janeiro, State of Rio de Janeiro. MS1: Municipality of Saquarema; MS2: Municipality of Rio Bonito; MS3: Municipality of Piraí; MS4: Municipality of Camorim; MS5: Municipality of Rio de Janeiro (District Grumari); MS6: Municipality of Rio de Janeiro (District Campo Grande); MS7: Municipality of Rio de Janeiro (District Guaratiba).

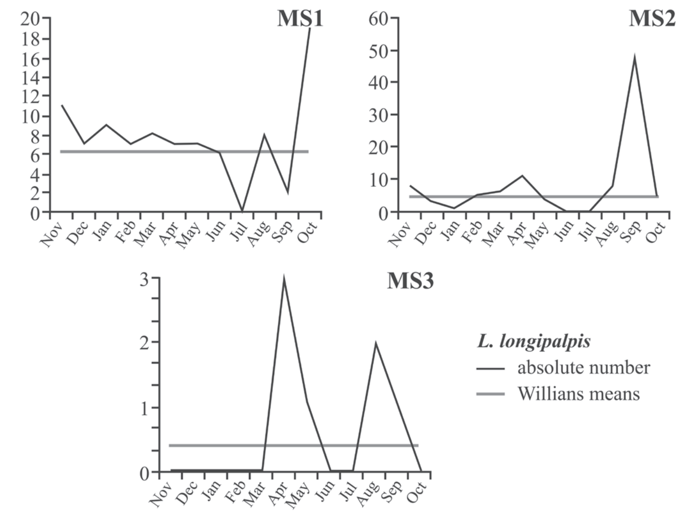

Figure 5. Monthly frequency and Williams means of the *Lutzomyia* (*Lutzomyia*) *longipalpis* in the different Municipality of Rio de Janeiro, State of Rio de Janeiro. MS1: Municipality of Saquarema; MS2: Municipality of Rio Bonito; MS3: Municipality of Piraí.

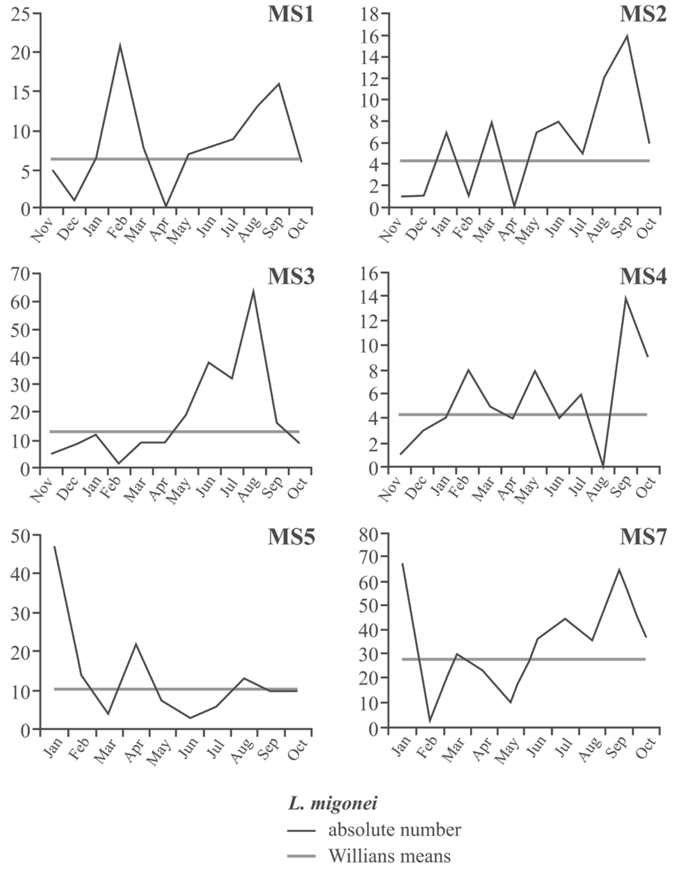

Figure 3. Monthly frequency and Williams means of the *Lutzomyia migonei* in the different Municipality of Rio de Janeiro, State of Rio de Janeiro. MS1: Municipality of Saquarema; MS2: Municipality of Rio Bonito; MS3: Municipality of Piraí; MS4: Municipality of Camorim; MS5: Municipality of Rio de Janeiro (District Grumari); MS7: Municipality of Rio de Janeiro (District Guaratiba).

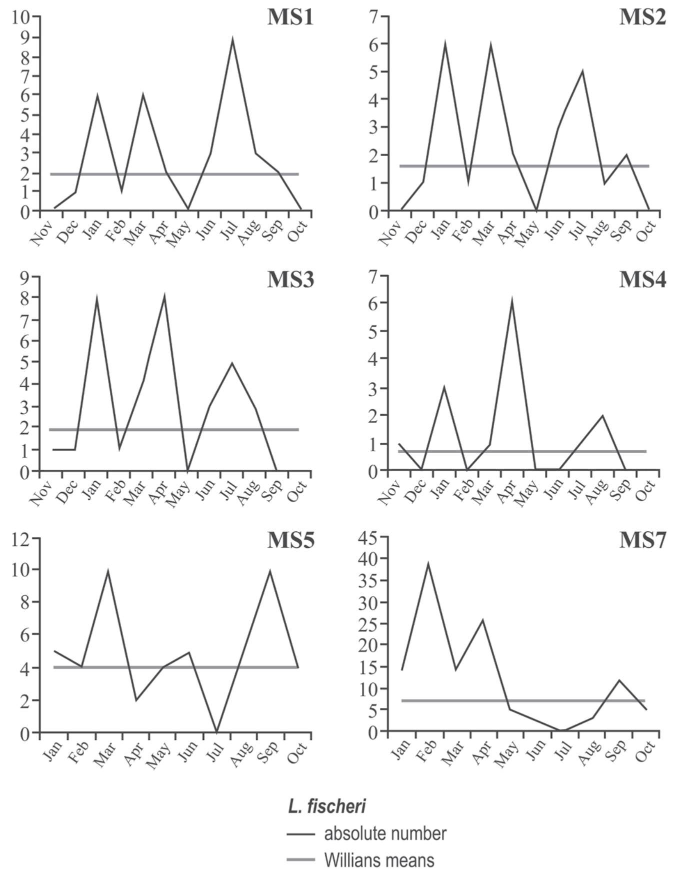

Figure 4. Monthly frequency and Williams means of the *Lutzomyia* (*Pintomyia*) *fischeri* in the different Municipality of Rio de Janeiro, State of Rio de Janeiro. MS1: Municipality of Saquarema; MS2: Municipality of Rio Bonito; MS3: Municipality of Piraí; MS4: Municipality of Camorim; MS5: Municipality of Rio de Janeiro (District Grumari); MS7: Municipality of Rio de Janeiro (District Guaratiba).

modification. Phlebotomine that were primitive vectors may have disappeared or become so uncommon that they effectively lost their function of leishmaniasis transmission. Their role will have been taken over by other species that were able to adapt to the new ecological conditions, and some of them have reached the domestic environment. This seems to have been the case, to varying degrees, for *L.* (*P.*) *pessoai*, *L.* (*P.*) *fischeri*, *L. migonei*, *L.* (*N.*) *whitmani*, *L.* (*N.*) *intermedia* and *L.* (*L.*) *longipalpis*. The first four of these are possibly involved in maintaining the infection among wild animals. This cycle still persists in the remains of degraded primary forests or in secondary forests (Lainson 1983). Of these six species cited, three seem to be better adapted to the peridomestic environment: *L.* (*L.*) *longipalpis*, which without doubt is responsible for dog-human transmission of AVL; *L.* (*N.*) *intermedia*, which seems to be the main domesticated vector for ACL, thus participating in a cycle involving dogs-phlebotomines-humans; and *L.* (*N.*) *whitmani*, which is an important vector for ACL in Brazil (Lainson 1983; Rangel 1995; Gontijo *et al.* 2002; Souza 2003).

Studies developed in various regions of the state of Rio de Janeiro have discussed aspects of the ecology of leishmaniasis vectors, especially in anthropized areas.

Lutzomyia (*N.*) *whitmani* has been observed in other areas of the northeast and southeast, thus suggesting that there is a differentiated degree of domestication (Lainson 1983; Rangel 1995; Gontijo *et al.* 2002; Souza *et al.* 2002; Rangel & Lainson 2009). The different degrees of adaptation to domestic environments may be the explanation for the absence of this species from the peridomestic areas of the MS_s studied. In state of Rio de Janeiro, so far, *L.* (*N.*) *whitmani* has always been recorded at low rates (Rangel *et al.* 1986, 1990; Carvalho 1993; Oliveira *et al.* 1995). Souza *et al.* (2001) recorded *L.* (*N.*) *whitmani* in Atlantic Forest reserves and also in shelters for domestic animals and in peridomestic areas, where it demonstrated anthropophilic habits. Furthermore, findings of this vector in the Posse district, in the municipality of Petrópolis, state of Rio de Janeiro, which is a rural environment, showed that *L. (N.) intermedia* and *L. (N.) whitmani* frequented both peridomestic areas and forest areas. Although these species have been caught throughout the year, they are seasonal: the former is found more frequently in the warmer months and the latter in the colder months. Thus, this promotes maintenance of the transmission cycle of ACL throughout the years at this locality (Souza *et al.* 2002, 2005). Greater attention to studies that might corroborate these findings in rural areas of the state continued to be needed.

Among the seven species registered at the different MS_s in the municipalities studied, the following vectors were recorded: *L. (L.) longipalpis*, *L. (P.) fischeri*, *L. migonei* and *L. (N.) intermedia*.

Lutzomyia (N.) intermedia has been recorded in Brazil in the northeastern, southeastern, southern and central-western regions (Young & Duncan 1994; Aguiar & Medeiros 2003). It has been proven to be a vector for *L. (V.) braziliensis* in southeastern Brazil (Forattini & Santos 1952; Forattini *et al.* 1972a, 1972b; Rangel *et al.* 1984; Pita-Pereira *et al.* 2005; Rangel & Lainson 2009).

Following the pattern that has already been observed in several areas in southeastern Brazil that are endemic for ACL, and especially state of Rio de Janeiro, the present study found that *L. (N.) intermedia* was present in all the peridomestic traps in the municipalities studied, and the abundance data confirmed that this species has become adapted to domestic and peridomestic environments. In state of Rio de Janeiro, this phlebotomine has been correlated with several epidemic outbreaks registered in different regions. Some of these were reposted in settlements that had been established in recently deforested areas located close to remnants of the Atlantic Forest (Rangel 1995). Studies conducted at the end of the 1990s were able to demonstrate that *L. (N.) intermedia* was also present in the forest, at a distance of 800 m from homes where there were human and canine cases of ACL (Menezes *et al.* 2002; Souza *et al.* 2002, 2005).

Occurrences of *L. migonei* in areas of ACL transmission have been recorded in the literature. These have occurred in association not only with forested areas with abundant vegetation and secondary forest and regrowth, but also with peridomestic environments (Araujo Filho 1979; Rangel *et al.* 1986; Souza *et al.* 2002, 2005; Rangel & Lainson 2009). Lainson (1983) suggested that this species was maintaining an enzootic cycle in secondary forest consequent to adapting to new environmental conditions and frequenting domestic and peridomestic areas. It has already been found presenting natural infection in states of Ceará and Rio de Janeiro (Azevedo *et al.* 1990, de Queiroz *et al.* 1994, Pita-Pereira *et al.* 2005). Regarding seasonality, some studies have indicated that this species may not occur in all months of the year and may even be absent in the dry and cold months (Barretto 1943; Forattini 1973). Other studies have reported that the greatest density of *L. migonei* may occur in the coldest and driest period of the year (Mayo *et al.* 1998), or in the hottest and rainiest months (Rangel *et al.* 1986). In the present study, this species was recorded at all the MS_s, with the exception of MS_6 (Campo Grande). The peak frequencies in the locations where it was found were not significant enough to determine any correlation between density and seasonality.

Some studies have discussed the potential role of *L. (P.) fischeri* in maintaining the wild enzootic disease, in association with *L. (V.) braziliensis* (Rangel & Lainson 2009; Pita-Pereira *et al.* 2011). In the present study, it was observed that the species did not occur continuously over the trapping period, and that separate peaks above X_W occurred independently of whether the months were cold or hot.

In the municipality of Rio de Janeiro, the density of *L. (L.) longipalpis* has been low, or the species has not been caught, including in localities with notifications of human cases of AVL (Souza *et al.* 2003). However, independent of the density, the species has already been recorded in Barra de Guaratiba, Serra do Barata, Serra do Viegas, Realengo, Mendanha and Rio Bonito (Souza *et al.* 1981). Between 1977 and 2006, 87 cases of AVL were confirmed in the municipality of Rio de Janeiro, coming from periurban areas on the inland-facing and shoreward slopes of the Pedra Branca massif and from the inland-facing slopes of the Gericinó massif. The canine infection rates decreased from 4.6% in 1984 to 1.6% in 2008. However, no presence of *L. (L.) longipalpis* was detected in some localities where human and canine cases were found. In 2007 and 2008, no new cases of the human disease were notified, but a worrying level of residual canine serological prevalence remains (Marzochi 2009).

In the state of Rio de Janeiro in 2011, the state epidemiological surveillance organization (GDTVZ) was notified of occurrences of AVL cases in dogs in the municipalities of Mangaratiba, Restinga da Marambaia, Maricá and Volta Redonda.

More recently, in the municipality of Rio de Janeiro, 25 canine cases were notified in the Cajú district, which is the port area of the municipality. A parasitological investigation was conducted, which confirmed that these dogs had been infected with *L. (L.) chagasi*, and an entomological investigation at this location confirmed that the vector *L. (L.) longipalpis* was present. Thus, the Cajú district was classified as the first urban focus with ACL transmission in the municipality of Rio de Janeiro. Furthermore, regarding occurrences of human ACL cases, an autochthonous case was recorded in the Santa Rosa district of the municipality of Volta Redonda in the same year (Technical Note 4/2011 GDTVZ /DTI/CVE/SVEA/ SVS-SESRJ; and Technical Note 01/2011/S/ SUBPAV/SVS). Studies on seasonality have correlated increased density of *L. (L.) longipalpis* with rainy or dry periods in different regions of Brazil (Rebêlo 2001; Amóra *et al.* 2010).

Meteorological data from "Instituto Nacional de Meteorologia (INMET)" covering the last 30 years indicate that the rainy season in the state of Rio de Janeiro begins in September and that the months of December to March are the rainiest months. At the MS_s with occurences of *L. (L.) longipalpis*, there was medium abundance in Saquarema and low abundance in Piraí, while this species was not recorded in the municipality of Rio de Janeiro (MS_4, MS_5, MS_6 and MS_7). In the localities with medium abundance, it was seen that the two X_W values were very close and that the peak densities occurred in October (MS_1) and September (MS_2), thus corresponding to the start of the rainy season. In the 1980s, absence or low frequency of this species was recorded in areas with AVL, and it was suggested that *L. migonei* might have a role as a possible vector for AVL (Souza *et al.* 1981). More recently, studies in Argentina (Salomón *et al.* 2010) and in Pernambuco (Carvalho *et al.* 2010) have corroborated the suspicion that this species is taking over the role of *L. (L.) longipalpis* as the vector species.

In the eco-epidemiological situation emerging from the processes of destruction of the vegetation cover, studies discussing *L. (V.) braziliensis* transmission in southeastern Brazil have highlighted the roles of *L. (N.) intermedia*, *L. (N.) whitmani* and *L. migonei* (Forattini *et al.* 1976; Taniguchi *et al.* 1991; Sttolf *et al.* 1993). These three species' demonstrated capacity for adaptation to anthropic environments impacted by a variety of actions needs to be taken into consideration. This capacity has defined a differentiated transmission profile.

Consequently, there is no doubt that *L. (N.) intermedia* have an important role in the eco-epidemiology of *L. (V.) braziliensis* in the state of Rio de Janeiro. The evidence makes it possible to define an epidemiological profile associated with communities in areas of old colonization. The importance of *L. migonei* also has to be borne in mind, probably as a secondary vector or for maintaining a transmission cycle for canine ACL.

Controlling ACL vectors is complex because of the existence of different transmission profiles. However, entomological surveillance studies allied with environmental management, with awareness-raining and mobilization among communities provide fundamental support towards the possibility of interfering in the process of ACL transmission in the state of Rio de Janeiro.

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