First Record of *Migonomyia Vaniae* (Galati, Fonseca & Marassá, 2007) (Diptera, Psychodidae, Phlebotominae) in the State of Rio De Janeiro.

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Abstract

Entomological surveillance studies in areas that have not yet been evaluated become important for the survey of local fauna, where new taxons or species records can be observed. In an investigation carried out at the Jequitibá headquarters of the Três Picos State Park, the presence of the species *Migonemyia vaniae* was observed, until then described and recorded only in the state of São Paulo, thus, we report the first encounter of the species in the state of Rio de Janeiro. Two male specimens of *Mg vaniae* with CDC light traps (HP model) were captured. Specimens of *Mg vaniae* and *Migonemyia migonei* were submitted to the clarification process and mounted between slide and coverslip in Berlese and identified under microscope following the Galati classification. Morphometric analyses of the ejaculatory pump and edeagais ducts and photographs of the structures were performed in order to compare the differences between species and record the first report of the species *Mg vaniae* in the state of Rio de Janeiro.

Introduction

The sandflies are dipterous insects of the Psychodidae family and subfamily Phlebotominae, presenting preferentially nocturnal twilight habits and are the vectors of *Leishmania* spp. (Rangel and Lainson, 2003).

Currently, 1026 taxa of the species group are described worldwide, being 985 valid and 32 fossils, and in the American Continent there are 546 species, 529 current and 17 fossils (Galati, 2019), where about 10% of these species may be involved in the transmission of human pathogens (Seccombe et al 1993, Young & Duncan 1994; Maroli et al 2013). Passive data on changes compared to ecoepidemiological studies in regions previously not investigated, considering that only a small portion of the total estimated arthropods in the world are described (Hamilton et al. 2011; Basset et al. 2012; Lamarre et al, 2015).

The Três Picos State Park (PETP) is in the Serra do Mar, in the mountainous Region of the state of Rio de Janeiro, in an area of 65,113.04 hectares, where the highest biodiversity index of the state is found. It is the largest nature conservation unit of integral state protection inserted in the limits of five municipalities, Cachoeiras de Macacu (about two thirds of its area are in this municipality), Nova Friburgo, Teresópolis, Guapimirim and Silva Jardim. This protection area is formed by a fragment of Atlantic Forest composed of dense ombrophylous forest and tropical climate (INEA, 2009). The headquarters of Jequitibá are in the municipality of Cachoeiras de Macacu from 400 to 500 meters from sea level. Studies on the survey of sandfly have not yet been carried out within the limits of PETP.

The present work aims to report the first record of the specie *Migonemyia vaniae* (Galati, Fonseca & Marassá, 2007), in the state of Rio de Janeiro, a species described during collections carried out in the rural area of the state of São Paulo in the Ribeira Valley, near the reserve in the Serra de Paranapiacaba (Galati et al. 2007). The species *Migonemyia vaniae* differs *Migonemyia rabelloi* (Galati & Gomes, 1992) and *Migonemyia migonei* (França, 1920), by presenting the length of the ejaculatory pump and the larger edeagal ducts in relation to the other species. Another important characteristic is the concavity formed by the paramer in its distal margin (Galati et al. 2007). Characteristics that should be carefully analyzed through morphometric analyses of the structures to confirm taxonomic identification.

Materials And Methods

Monthly captures were made at PETP Jequitibá headquarters located in Cachoeiras de Macacu (S: 22°24.834' HO: 42°36.825'), with the use of CDC light traps model HP (Pugedo et al 2005) during the period November 2016 to October 2017 for approximately 24 hours.

The traps were arranged in 5 monitoring stations (MS) established according to the tracks present inside the headquarters, these being: EM1: Entrance of headquarters, near bambuzal (S: 22°24.834'; HO: 42°36.825'); EM2: Crystal Trail, near the waterfall (S:22° 24.964'; HO: 42° 36.543'); EM3: Giant Jequitibá Trail, Near Jequitibá (S: 22° 25.067'; HO: 42° 36.610'); EM4: Observatory Trail, rising near the lake of the seed (S:22° 24.877'; HO: 42° 36.527'); EM5: Trail behind the visitation room, near the waterfall (S: 22° 25.010'; HO: 42° 36.391').

The collected material was euthanized by freezing and preserved in alcohol 70%. In the laboratory, the sandflies were submitted to a process of clarification and diaphanization in Elisa plates. The process was initiated with the immersion of the sandflies in 10% potash (KOH) for 2–3 hours, then being immersed in acetic acid for 20 minutes to remove excess fat, then washed in type II water for the same period and finally remained in lactophenol for 24 hours to clarify the structures used in the diagnosis of species (Vilela et al,2003;2018).

The male and female sandflies were mounted between slide and cover slip in Berlese liquid using stereoscopic magnifying glass and the specific diagnosis under optical microscope. The methodology of species identification was performed through the observation of morphological characters with the aid of the dichotomous key proposed by Galati (2003, 2019) and the abbreviations of species names as suggested by Marcondes (2007).

To confirm the species of first record in the state of Rio de Janeiro, the slides containing the specimens of *Migonemyia vaniae* and *migonemyia migonei* specimens were photographed under optical microscope (PrimoStar, Carl Zeiss®), connected to the AxioCam camera (Carl Zeiss®). Imaging Systems 4.7.2 (Carl Zeiss®) was used to perform measurements of the ejaculatory pump and edeagais in order to compare the two species of the genus.

Results And Discussion

After twelve months of capture of sandfly, two male specimens diagnosed as *Mg vaniae* were collected, a species that had not been recorded until then in the state of Rio de Janeiro. One specimen was collected in March 2017 and the other collected in November 2017, both in EM4. The species *Mg vaniae* had been described and reported in a rural region of the state of São Paulo at 260m above sea level and near an Atlantic Forest forest reserve in the Ribeira Valley, by Galati et al (2007).

Even though approximately 523 km between the coordinates to collection of the species described in the municipality of Santo André and The EM 4 of the PETP, the two fragments have important similarities in their biotopes. Both collection sites are fragments of the atlantic forest and have a dense ombrophilous

forest vegetation with tropical altitude climate (INEA, 2009; Secretariat of Infraestrutura and Meio Ambiente, 2020). These factors help to understanding the occurrence of the species in these localities. However, regarding altitude, PETP EM4 is at 464m sea level, while the meeting point of the species in the Ribeira valley is 260m above sea level, suggesting a variation in altitude of possible encounter of this species in biotopes similar to those described in these reports.

By performing the taxonomic identification of the *specimens of Mg migonei and Mg vanie*, it is possible to observe the two species presenting short IF smaller than the halves of the head length (Fig. 1A and 1B) and gonotile with the internal spine implanted very close to the apex (Fig. 1C and 1D), as described in the dichotomous key of Galati (2003, 2019), characteristic of species belonging to the genus *Migonemyia* spp.

Analyzing the two specimens of *Mg vaniae* we can observe the paramer in digitiform format and its dorsal margin slightly convex (Fig. 1C), while the specimens of *Mg migonei* present this paramer strongly convex in the dorsal margin (Fig. 1D). As shown in the original description of the species (Galati et al. 2007).

The confirmation of the presence of the species was carried out through the morphometry of the edeagal ducts of the species, characteristics pointed out in the description by Galati et al (2007). Thus, it was possible to observe that the two specimens of *Mg vaniae* had an average of 145.803 mm in spermatic pump length and 646.373 mm length of the edeagais duct, and the mean obtained after the morometry of four specimens of *Mg migonei* was 122.397mm and 545.006 respectively (Table I).

Table I: measurements of the spermatic pump (B.E.) and edeagais ducts (D.E.) of the species of *Migonemyia vaniae* and *migonemyia migoneia migonei*.

		<i>Mg vaniae.</i>	<i>Mg migone.</i>
specimen 1	B. E.	140,969	122,344
	O.d.	629,562	527,964
specimen 2	B. E.	150,638	135,977
	O.d.	663,185	543,928
specimen 3	B. E.	#	123,507
	O.d.	#	542,305
specimen 4	B. E.	#	107,761
	O.d.	#	565,828
Average	B. E.	145,8035	122,3973
	O.d.	646,3735	545,0063

These data corroborate the data described by Galati et al. 2007, which defines the difference between the species *Mg vaniae* and *Mg migonei* as follows, the latter presents pairâmer strongly convex in the dorsal margin between two concavities and ejaculatory ducts and ejaculatory pump measuring ≤ 590 mm and

130 mm respectively. While *Mg vaniae* presents digitiform and slightly convex paramer in the dorsal margin and ejaculatory ducts and permatic pump measuring ≥ 640 mm and 146 mm (Galati et al 2007; Galati 2019). Thus, the data presented confirm the registration for the first time in the state of Rio de Janeiro of the species *Mg vaniae*.

Declarations

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References

1. Basset, Y. *et al.* Diversidade de artrópodes em uma floresta tropical. *Ciência*. **338**, 1481–1484 (2012).
2. Galati, E. A. B. (2003). Classificação de Phlebotominae, pp. 23–51. In Rangel EF, Lainson R, Flebotomíneos do Brasil. Ed. Fiocruz:Rio de Janeiro.
3. Galati, E. A. B. (2016). Phlebotominae (Diptera, Psychodidae): Classificação, morfologia, terminologia e identificação de Adultos, Apostila – Disciplina PSP5127-1 Bioecologia e Identificação de Phlebotominae. Public Heath School. University of São Paulo.
4. Hamilton, A. J. *et al.* Quantifying uncertainty estimation of tropical arthropod species richness. *Am. Nat.* **176**, 90–95 (2011).
5. Secretaria de infraestrutura e meio ambiente. (2020). Paranapiacaba – Informações Gerais. (<https://www.infraestruturameioambiente.sp.gov.br/institutodebotanica/paranapiacaba/informacoes-gerais/>) Acesso em: 13/03/2020.
6. INEA. (2009). Plano de Manejo: Parque Estadual dos Três Picos, versão integral.1–627.
7. Lamarre, G. P. *et al.* Taxonomic and functional composition of arthropod assemblages across contrasting Amazonian forests. *J Anim Ecol. Jan.* **85** (1), 227–239 (2016).
8. Marcondes, C. B. A proposal of generic and subgeneric abbreviations for Phlebotomine sandflies (Diptera: Psychodidae: Phlebotominae) of the World. *Entomological News*. **118**, 351–356 (2007).
9. Maroli, M., Feliciangeli, M. D., Bichaud, L., Charrel, R. N. & Gradoni, L. Phlebotomine sandflies and the spreading of leishmaniasis and other diseases of public health concern. *Medical and Veterinary Entomology*. **27** (2), 123–147 (2013).
10. Rangel, E. & Lainson, R. *Flebotomíneos do Brasil*1–368(Editora da Fiocruz, Rio de Janeiro, 2003).
11. Seccombe, A. K., Ready, P. D. & Huddleston, L. M. A catalogue of Old World phlebotomine sandflies (Diptera: Psychodidae, Phlebotominae). *Occ. Pap. Syst. Entomol.* **8**, 1–57 (1993).
12. Young, D. G. & Duncan, M. A. 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 Entomology Institute*. **54**, 1–881 (1994).

Figures

Figure 1

HEAD AND GENITALIA OF MIGONEMYIA VANIAE AND MIGONEMYIA MIGONEI UNDER OPTICAL MICROSCOPE. 1A: MG VANIAE HEAD; 1B: MG MIGONEI HEAD; 1C: MG VANIAE GENITALIA PRESENTING THE PARAMER (ARROW) SLIGHTLY CONVEX IN THE DORSAL MARGIN. 1D: MG MIGONEI GENITALIA PRESENTING THE PARAMER (ARROW) STRONGLY CONVEX IN THE DORSAL MARGIN.