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# Description of a new species of *Psathyromyia* Barreto (Diptera, Psychodidae, Phlebotominae) from Amazonas state, Brazil

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ABSTRACT

A new species of phlebotomine sand fly is described and illustrated based on the male and female morphological characters of specimens collected from Tefé and Coari municipalities, Amazonas state. The phlebotomine sand flies were collected with CDC light traps used as aspirators at the base of tree trunks. Both male and female specimens collected in Tefé municipality were first identified as *Psathyromyia souzacastroi*. After the analysis of the holotype of *Pa. souzacastroi* deposited in Smithsonian Institute/Walter Reed Biosystematics Unit, it was observed that the morphotypes collected in Tefé municipality belong to a distinct species, which characterization is here presented.



## Introduction

*Psathyromyia* Barretto, 1962 was proposed as subgenus of the genus *Lutzomyia* França, 1924 and is currently treated as genus (Galati, 1995, 2003). This genus comprises a total of 39 species distributed in three subgenera, *Forattiniella* Vargas, 1978, *Xiphomyia* Artemiev, 1991 and *Psathyromyia sensu stricto*, the latter comprising 20 species included two species' series (lanei and shannoni) (Galati, 2003). The species of the subgenus *Psathyromyia* are characterized by the absence of papillae on the X–XI flagellomeres, ascoids with a posterior spur; absent of strong setae implanted in the apical region of males' gonocoxite and female with V palpal segment longer than the III (Galati, 2003). The lanei series is characterized by presenting rudimentary posterior prolongation of ascoids, male presents the internal spine implanted beyond the middle on gonostylus, females present the body of spermathecae ringed and have the individual ducts slender and longest than species from shannoni series. In the species of the shannoni series the posterior extension of the ascoids is long; male presents the internal spine of the gonostylus implanted in the middle or before this; in female the spermathecae body is smooth or segmented with the common duct usually longer than or equal to the individual duct (Galati, 2003).

*Psathyromyia souzacastroi* (Damasceno and Causey, 1944) was described based in two males collected in São Paulo de Olivença municipality, Amazonas state, Brazil. Subsequently, the species was recorded in Tefé municipality, state of Amazonas by Barrett et al. (1996) who described a presumably female of this species and some characters of the male terminalia. These authors reported differences some male characters, however they were considered just as variations within a single morphospecies. The purpose of the present paper is to describe a new species from Amazonas state, Brazil.

## Material and methods

The specimens were captured in tall primary "terra–firme" lowland rainforest at 03°40′42″ S, 64°21′30″ W in Tefé municipality, Amazonas state, Brazil. Other specimens were collected in tall primary "terra-firme" lowland rainforest at 04°55′27″ S/64°19′36.9″ W in Operational Geólogo Pedro de Moura's Base (04°53′7.33″ S; 65°20′59.99″ W) located in Urucu Oil Province, Coari municipality, Amazonas state, Brazil. The phlebotomine sand flies were captured using CDC traps as aspirator during the day on base of tree trunk in November 1991 in Tefé municipality (Barrett et al., 1996) and in October/2011 in Coari municipality by Dr. W. P. Tadei fieldwork team.

The female measurements follow Barrett et al. (1996) and in the present paper only pictures are presented. Morphological structures have been compared with the holotype of *Pa. souzacastroi* deposited in Smithsonian Institute/Walter Reed Biosystematic Unit, Suitland, MD, United States. The paratype of *Pa. souzacastroi* described by Damasceno and Causey (1944) was not found

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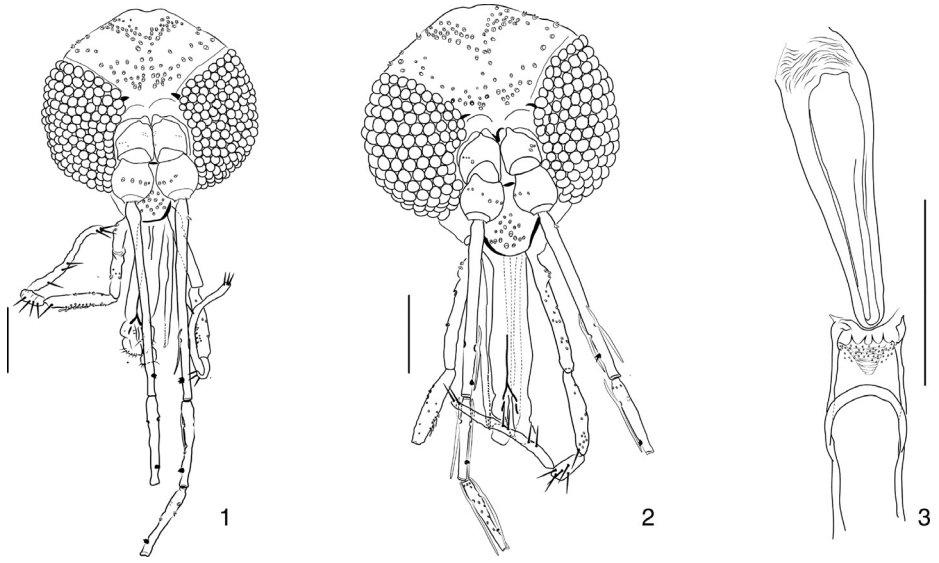



**Figs. 1–3.** *Psathyromyia barretti* **sp. nov**. 1, Head, holotype, male. 2, Head, paratype, female. 3, Pharynx and cibarium, paratype, female. Bar = 100 μm.


**Figs. 4–17.** *Psathyromyia barretti* **sp. nov.** 4, Flagellomere I; 5, Flagellomere II. 6, Flagellomere III. 7, Flagellomere XI. 8, Flagellomere XII. 9, Flagellomere XIII. 10, Flagellomere XIV, holotype, male. 11, III palpus segment, holotype, male. 12, Flagellomere II. 13, Flagellomere III, paratype, male. 14, Flagellomere I. 15, Flagellomere II. 16, Flagellomere III, paratype, female. 17, III palpus segment, paratype, female. Bar = 100 μm.

in the Entomological Collection of the Instituto Oswaldo Cruz, Rio de Janeiro, Brazil as mentioned as deposit site (Damasceno and Causey, 1944). The classification adopted follows Galati (2003) and the abbreviation of the genus names is that of Marcondes (2007). Terminology follows Cumming and Wood (2009) except for some specific terminology of Phlebotominae as described by Galati (2003). All specimens were prepared in KOH, acetic acid, alcohol and phenol. Measurements are given in micrometers for the holotype with mean and number of specimens measured in brackets for the paratypes.

## Taxonomy

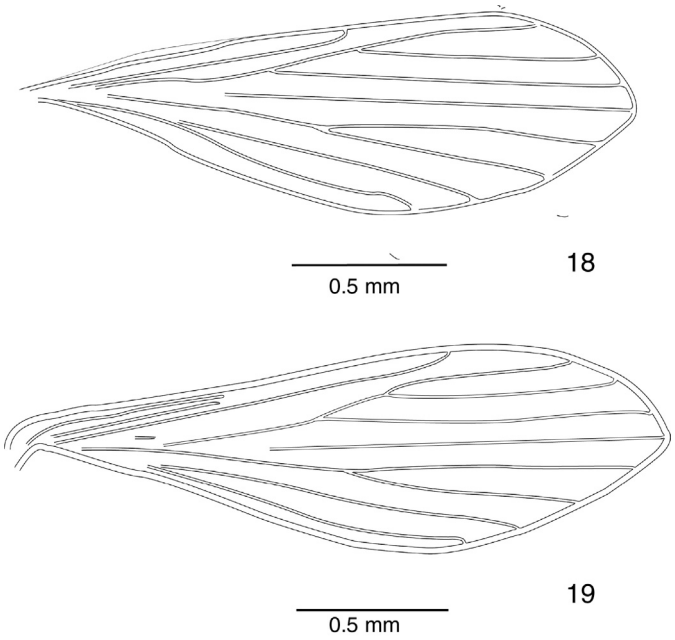
*Psathyromyia (Psathyromyia) barretti* ***sp. nov.*** *(Figs. 1–24)*

Description. Male (holotype): general color light brown. Body length (thorax + abdomen) 2234 (2201; *n* = 19).

*Head* (Fig. 1): height from vertex to tip of clypeus 329.1 (337.3; *n* = 19) long, 329.1 (343; *n* = 19) width; eye: length 227.8 (227.8; *n* = 19), width 126.6 (138.1; *n* = 19), interocular distance 82.3 (84.8; *n* = 19), 15.8 facet diameters (15.1; *n* = 19); interocular suture incomplete. Clypeus length 63.3 (88.1; *n* = 19), width 82.3 (67.3; *n* = 19); cibarial arch complete. Antenna: flagellomere lengths: I 303 (268.4; *n* = 19), II 133.3 (126.8; *n* = 19), III 130.3 (125.5; *n* = 19), XIII 66.7 (63; *n* = 8), XIV 54.5 (52.3; *n* = 8); ascoids visible on flagellomeres I–XII; posterior spur does not reach the base of the flagellomere, except in flagellomere I (Figs. 4–6 and 12–13); flagellomere I with the ascoids implanted on the apical third of the segment with their apices slightly before the papilla (Fig. 4); one papilla implanted apically on flagellomeres I–III (Figs. 4–6 and 12–13); antennal formula: flagellomeres I–XII 2 and XIII–XIV 0. Palpus segments length: I 42.4 (42.9; *n* = 19), II 90.9 (98.4; *n* = 19), III 109 (110.1; *n* = 17), IV 48.5 (54.2; *n* = 17), V160.6 (167.9; *n* = 15); palpal formula: 1.4.2.3.5; Newstead's sensillae (Newstead's spines) located in the apical two-third of the III palpus segment (Fig. 11). Labrum-epipharynx 206.1 (203.8; *n* = 19). Pharynx unarmed, finely striated posterior two-third. Labrum: labial sutures united (Figs. 1 and 2).

*Thorax*: ventro-cervical sensilla absent; pre-escutum, scutum, pronotum, paratergite, apex of scutellum contrasts strongly with pleura and coxae without sclerotization. Length 500 (497.8; *n* = 19); pleura with 12 (8–12; *n* = 19) anepisternal superior setae; 2 (2–4; *n* = 19) proepimeral setae; setae on the anterior margin of the katepisternum is absent. Wing (Fig. 18): 1830 (2010; *n* = 18) long, 526 (570.5; *n* = 18) wide; length/width ratio 3.5: 1.0; veins R5 1186 (1171; *n* = 9); *alpha* 463.6 (474.2; *n* = 14); *beta* 250.6 (265.3; *n* = 14); *gamma* 125.3 (151; *n* = 13); *delta* 162.9 (197.7; *n* = 14); *pi* 98.9 (102; *n* = 9). Length of femora, tibiae, basitarsi, and tarsomeres II + III + IV + V: foreleg 852.1 (929.2; *n* = 14), 1,429 (1,423; *n* = 14), 1,045 (1,006.1; *n* = 13), 904 (854; *n* = 13); midleg (888.4; *n* = 10), (1799.4; *n* = 10), (1152; *n* = 10), (965.4; *n* = 10); hindleg (874.3; *n* = 10), (1745; *n* = 11), (1126.1; *n* = 11), (919.8; *n* = 8).

*Abdomen:* 1,734 (1867; *n* = 19) long. Terminalia (Fig. 21): gonocoxite 348.1 (338.4; *n* = 19) long; 63.3 (70.3; 63.3–85.4; *n* = 19) wide; without a tuft of setae. Gonostylus 177.2 (173.6; *n* = 19) long; with four spines: an apical, the upper external preapical, the lower external and the internal, in the middle of the structure, at the same level. Paramere is simple, digitiform, length 221.5 (219.2; *n* = 19), narrowing abruptly in its distal half along the ventral margin; distal half with fine setae, as shown. Conical aedeagus short and truncate at apex. Epandrial lobe subcylindrical (= lateral lobe), 253.2 (266.2; *n* = 19) long. Sperm pump 196.2 (187.2; *n* = 19); ejaculatory ducts length 398.8 (407.4; *n* = 19), or 2.0 (2.2; *n* = 19) times the length of the sperm pump (Fig. 22).




**Figs. 18–19.** *Psathyromyia barretti* **sp. nov**. 18, Wing, holotype, male. 19, Wing, paratype, female. Bar = 100 μm.

*Female* (Figs. 2–3, 14–17, and 20): Two specimens are as described by Barrett et al. (1996), with the following additional observations. Eye: length 215.2, width 145.6; clypeus length 101.3, width 82.3; Newstead's sensillae located in the apical two-third of the III palpus segment (Fig. 17). Labrum-epipharynx (LE) 243.5. Posterior third of the pharynx is armed with about 20 transverse combs of minute teeth. Length of wing vein sections: R5 1,158.2; *pi* 84.7.

Type material: Twenty male and two female specimens were examined. Holotype, twelve male and two female paratypes from Brazil, state of Amazonas, Tefé municipality, tree trunks, Barrett and Santos (cols.) on 4 and 6/ix/91. Seven males captured in Coari municipality, Amazonas state, Brazil on 16/x/2011, tree trunks, W. P. Tadei fieldwork team (cols.).

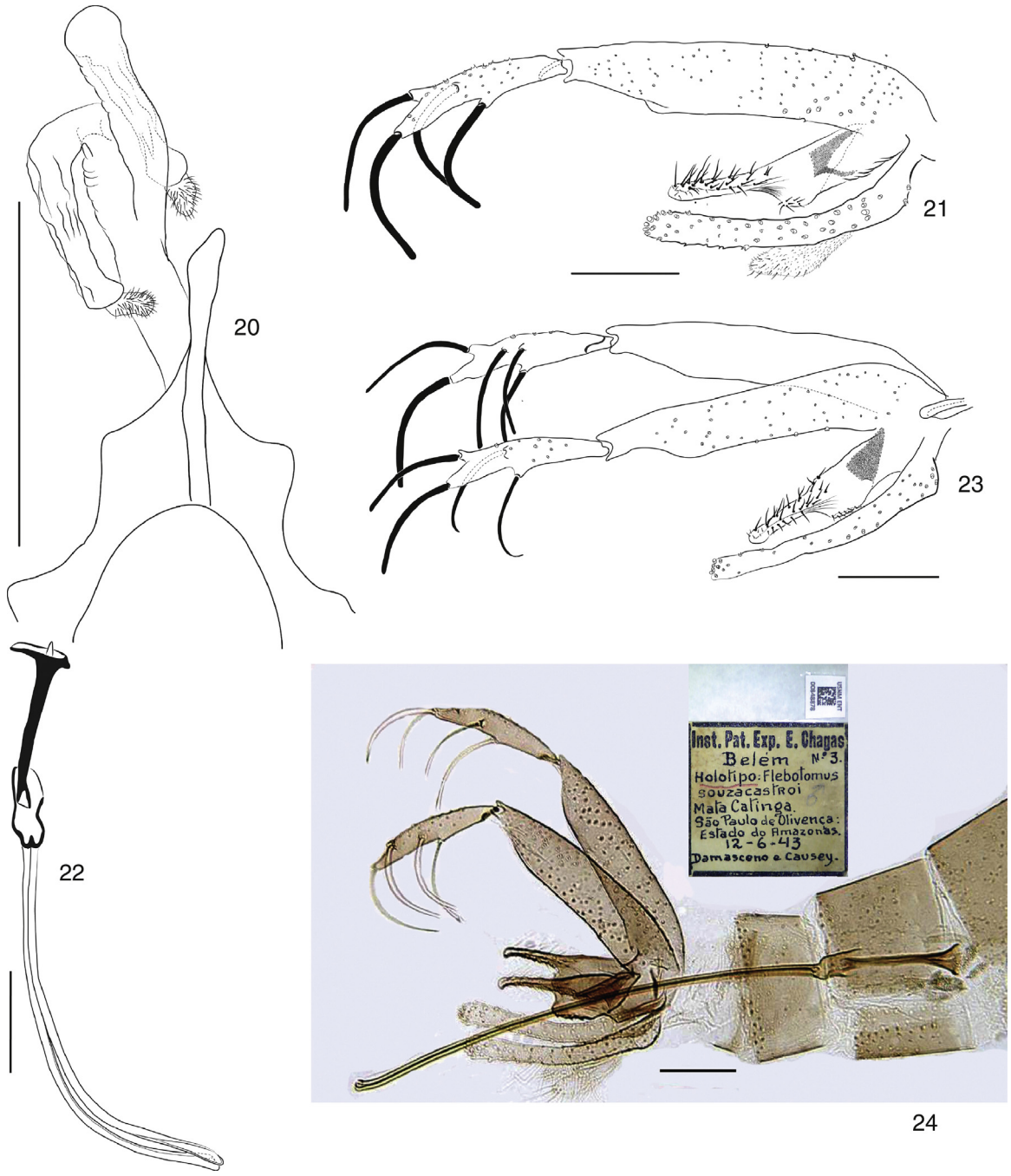
The type material will be deposited in the following institutions: Coleção de Invertebrados do Instituto Nacional de Pesquisas da Amazônia, Manaus (Holotype, 13 male paratypes and two female paratypes), Coleção de Flebotomíneos/Centro de Pesquisas René Rachou, Belo Horizonte/MG (four male paratypes) and Entomological Collection of the Smithsonian Institute/Walter Reed Biossystematic Unit, Suitland, MD/EUA (two male paratypes).

Etymology: This species is named to Dr. Toby Vincent Barrett for his contributions to medical entomology in the Amazon region.

### *Taxonomic discussion*

The males and females specimens captured in Tefé municipality, Amazonas state were previously identified as *Pa. souzacastroi* by Barrett et al. (1996). However, after checking the morphological structures of the holotype of *Pa. souzacastroi*, it was observed to be a distinct species.

*Psathyromyia barretti* **sp. nov**. was included in *Psathyromyia* for having the following characteristic of the genus cited by Barretto (1962) and adopted by Galati (2003): the form of the ascoids bigeniculate with apparent posterior spur, the palpal formula, gonocoxite without tuft of setae, gonostylus with four spines and the simple paramere of the male are of the genus (Barretto, 1962). It was allocated in subgenus *Psathyromyia s. str*. which is characterized by the absence of papillae on X–XI flagellomeres, male with




**Figs. 20–24.** *Psathyromyia barretti* **sp. nov.** 20, Spermathecae and genital fork, paratype, female. 21, Terminalia, holotype, male. 22, Sperm pump and ejaculatory ducts, holotype. 23, Terminalia, anomalous paratype, male. *Psathyromyia souzacastroi*. 24, Terminalia, holotype, male. Bar = 100 μm. Photo: Stoffer, J.

gonocoxite without strong setae implanted in the apical region and female with the V palpal segment longer than the III (Galati, 2003). The new species has been included in shannoni series because it presents ascoids with long posterior extension, that almost reaches the base of the flagellomeres II–XII in females (Figs. 5–6 and 12–13, 15–16); by the position of the internal spine implanted in the middle of gonostylus (Figs. 21 and 23).

Regarding the others species of the genus, *Psathyromyia barretti* **sp. nov.** can be easily distinguished. The male has the aedeagus truncated (Fig. 21), compatible with the width of the apex of their ejaculatory ducts, and in *Pa. souzacastroi*, it is narrow. The tip of the ejaculatory ducts in *Pa. barretti* **sp. nov.** is truncated (Fig. 22), while in *Pa. souzacastroi* is slender. In the new species the ejaculatory ducts are shorter than 2.5 times the length of the sperm pump (Fig. 22), whereas in *Pa. souzacastroi*, this ratio is *ca.* 3.0 times (Fig. 24). In *Psathyromyia cuzquena* (Martins et al., 1975) male has the ejaculatory ducts *ca.* 2.0 times the length of the sperm pump, but the tip of the ejaculatory ducts is slender, slightly dilated and curved (Martins et al., 1975). The new species has paramere with a flat apical and dorsal area and implantation of short setae, while the paramere of *Pa. souzacastroi* is on the apical half and is almost cylindrical in shape and covered with small setae which are larger in the dorsal region (Fig. 24). The internal spine in both the species *Pa. barretti* sp. n. and *Pa. souzacastroi* is implanted in the middle of gonostylus but differs in relation to the position of the upper and lower external spines. The lower external and internal spines on

the gonostylus of *Pa. barretti* **sp. nov**. are practically at the same level of implantation, while in *Pa. souzacastroi* the lower external spine is more apical than the internal. In *Pa. cuzquena* the internal spine of gonostylus is implanted before the apical third (Martins et al., 1975).

In a male specimen collected in Tefé municipality, it was observed that the gonostylus has five spines, three of which are external spines and hence, we concluded that this additional spine is a morphological anomaly (Fig. 23). Anomalies in phlebotomine are relatively common occurrence in some specimens. Usually, these anomalies occur mostly in the male terminalia and may be unilateral or bilateral, with different numbers of spines in gonostylus, with different numbers of setae in gonocoxite or paramere (Marcondes, 1999; Ximenes et al., 2002; Costa et al., 2012; Sanguinette et al., 2013). These anomalies may affect the systematics of the group because, when species are described from specimens based on an anomalous character, the specific character does not represent the actual condition of the group structure (Andrade-Filho et al., 2004).

The female of *Pa. barretti* **sp. nov**. can be distinguished from other species of *Psathyromyia* which has ascoids with long posterior extension and smooth-walled spermathecae with banana-shaped body: *Pa. shannoni* (Dyar, 1929), *Pa. abonnenc* (Floch and Chassingnet, 1947), *Pa. limai* (Fonseca, 1935) [senior synonymous of *Pa. pestanai* (Barretto and Coutinho, 1941) (Sabio et al., 2014)], *Pa. dendrophyla* (Mangabeira, 1941) and *Pa. scaffi* (Damasceno and Arouck, 1956), because in the new species the terminal knob is relatively larger than that of the other species and the individual ducts are almost wide as the body (Fig. 20) while they are distinctly narrower than the body in the other species. Further, the new species has pale pleura, while *Pa. dendrophyla*, and *Pa. scaffi* have paratergite and a brown anepisternum and katepisternum. The form of the spermathecae, individual and common ducts and the characters of the terminalia of the male clearly distinguish *Pa. barretti* **sp. nov**. from the others *Psathyromyia* (*Pa.*) species.

## Conflicts of interest

The authors declare no conflicts of interest.

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