Description of *Pintomyia* (*Pifanomyia*) *falcaorum* sp. n. (Diptera: Psychodidae: Phlebotominae), a Fossil Sand Fly from Dominican Amber

Reginaldo Peçanha Brazil+, José Dilermando Andrade Filho

Laboratório de Leishmanioses, Centro de Pesquisas René Rachou-Fiocruz, Av. Augusto de Lima 1715, 30190-002 Belo Horizonte, MG, Brasil

A new species of sand fly, Pintomyia (Pifanomyia) falcaorum *is described from an amber originated from the northern mountain range of Dominican Republic. The male sand fly specimen is well preserved and most features used in Phlebotominae taxonomy are seen with remarkable clarity.*

Key words: *Pintomyia (Pifanomyia) falcaorum* sp. n. - Phlebotominae - sand fly - Diptera - Psychodiae - amber - Dominican Republic

Phlebotomine sand flies (Diptera: Psychodidae) are the natural vectors of certain enzootic and zoonotic diseases, with nearly 400 species currently known from the Americas (Young & Duncan 1994).

Although psychodids are very small and lack hard parts on their bodies the fossil record of the family is relatively well documented, except for members of the subfamily Phlebotominae. The few findings include specimens preserved in amber of *Phlebotomites brevifilis*, *Phlebotomites longifilis* and *Mesophlebotomites hennigi*, three species from the Cretaceous period found in present-day Lebanon (Hennig 1972, Azar et al.1999) and *Phlebotomiella tipuliforme* from the Eocene, found in Baltic amber (Meunier 1905). There is only one record from the Neotropical and Nearctic regions, i.e., *Micropygomyia patterna (= Luztomyia paterna)* from the Oligocene/Miocene period, described from specimens in Mexican amber (Quate 1963). Young and Lawyer (1987) mentioned the discovery of 14 fossil specimens of phlebotomines, pertaining to two unknown species, from Dominican amber. Although they did not formally describe either species this publication includes a photograph of a female specimen of one of them.

Amber is commercially exploited in the north of Santiago and east of Santo Domingo of the Dominican Republic. The exact age of this amber is unknown, but it is estimated to be from the mid-Miocene, i.e, approximately 15-20 million years old (Iturralde-Vicente & MacPhee 1966).

Tegumentary leishmaniasis is present in the Dominican Republic, the first autochthonous cases having been reported by Bogaert-Díaz et al. (1974). At least two species of phlebotomines are known from the country and *Pintomyia* (*Pifanomyia*) *christophei* (Fairchild & Trapido) is the suspected vector of *Leishmania* (Zeledón et al. 1985).

MATERIALS AND METHODS

The piece of amber containing the specimen is oval, measuring 16 by 13 mm. The insect was measured using an Olympus CH2 optical microscope, fitted with a calibrated ocular micrometer. The drawings were done using a camera lucida adapted to the microscope. Photography was done with a Nikkon stereoscopic microscope (Nikkon Co, Tokyo) with the aid of external illumination.

Although it could only be observed at a magnification of ten times, the male is well preserved and the principal structures necessary for phlebotomine taxonomy are visible (Fig.1). We present a formal description of the specimen as *Pintomyia* (*Pifanomyia*) *falcaorum* sp.n., named in honour of Alda and Alberto Falcão, in recognition of their considerable contributions to current knowledge of this group of insects. The classification scheme used is that of Galati (1995).

Pintomyia (*Pifanomyia*) *falcaorum* sp.n.
(Fig. 2)

Holotype (measurements are given in micrometers): small phlebotomine (length 1,462), coloration pale chestnut, the pleurae paler than the notum.

Head: laid on its side, this impeding the measurement of its total length and width. Paired appendages complete. Mouthparts not distinguishable. Palpomeres measuring: 1-43; 2-92; 3-114; 4-99; 5-298, the palpal formula being 1.2.4.3.5, Newstead's spines not visible on the palps. Antennae with ascoids visible on flagellomeres AV, AVI, AVII, AVIII, AIX, AXII, AXIII and AXIV, not reaching the apex of the subsequent segment. Papillae present on AXIV, AXV, and AXVI and apparently absent on AV and AXIII. Measurements of the principal flagellomeres: AIII - 212; AIV - 114; AV - 106. AXV longer than AXVI.

Thorax: thoracic bristles not visible. Wings 412 long and somewhat narrow, entire length not visible. Principal wing indices: α (R2) - 284; β (R2 + R3) - 170; γ (R2 + R3 + R4) - 213; δ (part of R1 that extends beyond the junction of R2 + R3) - 28. Delta very short, not extending to junction of

This work is in memorian of Dr Larry Quate.

Financial support: CNPq (Pronex) and Fiocruz (Papes)

+Corresponding author. Fax: +55-31-3295.3566. E-mail: rpbrazil@cpqrr.fiocruz.br

Received 25 September 2001
Accepted 5 December 2001

Fig.1: *Pintomyia (Pifanomyia) falcaorum* sp. n. in Dominican amber. 200X

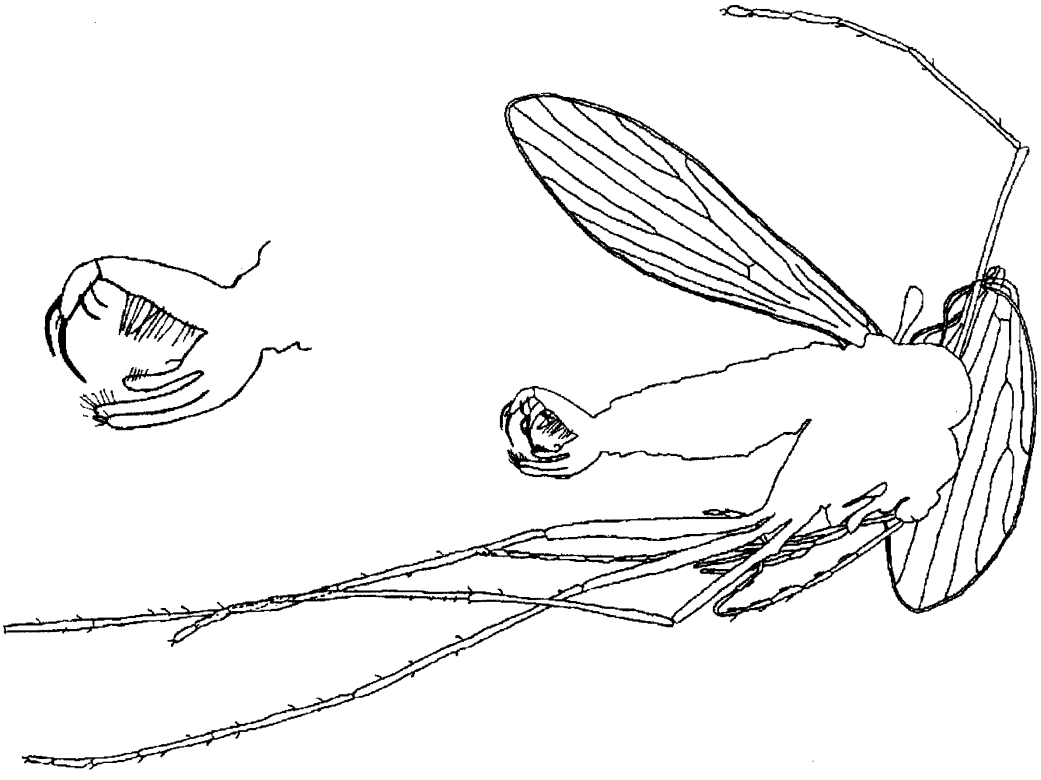

Fig.2: *Pintomyia (Pifanomyia) falcaorum* sp. n. General aspects and male genitalia

R2 + R3 on other wing. Legs without special characters, anterior, median and posterior femora measuring 596, 639 and 681, respectively. Anterior, median and posterior tibiae measuring 667, 809 and 951 respectively. Tarsomere with several spines along its length, first tarsal segment of anterior, median and posterior legs measuring 412, 482 and 596, respectively.

Abdomen: genital pump, genital filaments and aedeagus not visible. Style 114 long, with four well-developed spines, of which one is terminal, one sub terminal, one external arising from the middle of the structure and one internal situated on the basal third. Pre-apical bristle present. Coxite measuring 234 long by 71 wide, with a median group of bristles dispersed longitudinally along its length. Lateral lobe longer than the coxite, measuring 270. Paramere 170 long, presenting a group of apical bristles and with a spiniform bristle on its basal third.

Type material: *holotype*, Dominican Republic, North de Santiago, specimen in amber from the mid-Miocene period, deposited in the phlebotomine sand fly collection of the Centro de Pesquisas René Rachou (Fundação Oswaldo Cruz), Belo Horizonte, MG, Brazil.

TAXONOMIC DISCUSSION

Following Galati's classification (1995) the characters of the new species do not permit it to be placed with certainty in any of the known phlebotomine genera. However among the sub-tribes of the Phlebotomini it certainly belongs to the Lutzomyiina, despite our not having observed Newstead's spines on the third palpomere. Within this sub-tribe, the presence of four spines on the style, pre-apical bristles and AIII apparently greater than half the length of the head permit us to include the new species in the genus *Pintomyia*, subgenus *Pifanomyia*, since it lacks spines on the posterior femur. We are unable to place *P. (P.) falcaorum* within any of the series known. The absence of papillae on AXIII excludes it from the series *pacae* and the presence of two external spines on the style from the series *pia*. Members of both species of the series *monticola* have a uniformly dark brown thorax, while in the new species the pleurae are paler and contrast with the dark notum. Sand flies of the series *verrucarum*, *serrana* and *townsendi* have papillae on AV, unlike the new species. This suggests proximity to the series *evansi*, although the members of this series not possess the median tuft of bristles present in the new species and also sand flies of the series *verrucarum*.

The terminalia of the male of *P. (P.) falcaorum* is similar to that in species of the series *townsendi*, which possess ascoids on AXV and papillae on AV. Should the new species present these structures in spite of their being obscured in our specimen, it could still be distinguished by the presence of a median rather than basal tuft of bristles on the coxite.

The new species also presents a spine on the paramere, similar to that found on *Lutzomyia* (*Lutzomyia*) *falcata* Young, Morales & Ferro, although the position of the spines on the style is different, as is the tuft of bristles on the coxite.

Only two species of phlebotomines are found in the Dominican Republic, i.e., *P.* (*P.*) *christophei* and *Micropygomyia cayennensis hispaniolae* (Fairchild & Trapido). *P.* (*P.*) *falcaorum* sp. n. differs from the former in presenting four spines on the style, while *P. (P.) christophei* has only three. *M. c. hispaniolae* belongs to the sub-tribe Sergentomyiina, and could easily be separated from the new species by the presence of a tuft on the coxite and by the position of the spines on the style, among other characters.

The adoption of the genus *Lutzomyia* for the majority of the neotropical sand fly species can be justified (Young & Duncan 1994) however, we prefer to include this new fossil species in the classification of Galati (1995) that shows better phylogenetic affinity and can be useful for future studies with fossil sand flies.

REFERENCES

Azar D, Nel A, Solignac M, Paicheler JC, Bouchet F 1999. New genera and species of psychodid flies from Lower Cretaceous amber of Lebanon. *Palaeontol 42*: 1101-1136.

Bogaert-Díaz H, Rojas RF, De Martinez D, De Quiñones 1975. Leishmaniasis tegumentaria americana. Reporte de los primeros tres casos descubiertos em R.D. Forma anergica em tres hermanos. *Rev Dominicana Dermatol 9*: 19-33.

Galati EAB 1995. Phylogenetic systematics of Phlebotominae (Diptera, Psychodidae) with emphasis on American groups. *Bol Direc Malariol y San Amb 35* (Supl. 1): 133-142.

Hennig W 1972 Insektenfossilien aus der unteren Kreide. IV. Psychodidae (Phlebotominae), mit einer kritischen Übersicht über das phylogenetische System der Familie und die bisher beschriebenen Fossilien (Diptera). *Stuttgarter B Naturkunde* (Serie A) *241*: 1-69.

Iturralde-Vicent MA, MacPhee RDE 1966. Age and paleogeographical origin of Dominican amber. *Science 273*: 1850-1852.

Meunier F 1905. Monographie des Psychodidae de lámber de la baltique. *Ann Mus Nati Hungarici 3*: 235-255.

Quate LW 1963. Fossil Psychodidae in Mexican amber, Part 2 Diptera: Insecta. *J Paleontol 37*: 110-118.

Young DG, Duncan MA 1994. Guide to the identification and geographic distribution of *Lutzomyia* sandflies in Mexico, The West Indies, Central and South America (Diptera: Psychodidae). *Mem Amer Ent Inst 54*: 881.

Young DG, Lawyer PG 1987. New World vectors of the leishmaniases. In KF Harris, *Current Topics in Vector Research*, 1, Springer-Verlag, New York, p. 29-37.

Zeledón R, Bogaert-Díaz H, McPherson AB, Johnson RN, Murillo J 1985. Epidemiological observations on cutaneous leishmaniases in the Dominican Republic. *Trans R Soc Trop Med Hyg 79*: 881.