

NOTES ON THE PHLEBOTOMUS OF PANAMA
(Diptera, Psychodidae)

I. THE SUBGENUS BRUMPTOMYIA FRANCA AND PARROT 1921

By

G. B. FAIRCHILD AND MARSHALL HERTIG

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In 1943 one of us (Fairchild 1943) listed the *Phlebotomus* species then known from Panama, four described species and two other undetermined species which appeared to be new. In the subsequent four years we have made a special effort to collect these insects, using more effective techniques, and have amassed an estimated 10,000 specimens representing about 30 species. We hope to report on this material in a series of papers, of which this is the first.

The terminology of the structures useful in the taxonomy of *Phlebotomus* has evolved more or less independently, and the homologies with structures in other Diptera and other orders of insects remain incompletely worked out. We have chosen to use, with slight modification, the terminology of Christophers and Barraud (1926) and Tonnoir (1935), because we feel it to be the simplest, and because there seems to be no general agreement as to terminology among students of Diptera. We give below the terms to be used in this and subsequent papers, with some of their equivalents.

The *ascoids* or geniculate spines are apparently hollow spine-like structures of presumed sensory function found in pairs on all but the last few flagellar segments of the antennae; their shape and size are often of considerable taxonomic importance. The *cibarium*, buccal cavity, buccopharynx or anterior pharynx lies within the clypeus. It is a flat rectangular box-like structure usually bearing vertical and horizontal teeth on the proximal margin of its ventral side. These teeth are generally absent in the male, but their number and arrangement offer good characters in the female. There is also an arched ridge-like thickening of the ventral surface, the *chitinous arch* which seems to be the attachment of the salivary muscle. The chitinous arch is sometimes not visible centrally, and its degree of development and position offer good taxonomic characters. This structure has been neglected as a character of taxonomic importance, Hertig (1938) having first called attention to its utility. The *pigmented area* often seen just distal to the cibarial teeth, is on the dorsal surface of the cibarium and is the place of attachment for the posterior clypeal muscles according to Theodor (1932). The term "cibarium" was suggested to us by Dr. C. D. Michener as being more exact and concise than its more generally found equivalents. The *pharynx* or posterior pharynx lies within the head capsule. It appears to be longitudinally folded in somewhat the manner of a

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child's paper dart, and is triangular or three-winged in cross-section. It bears spines, teeth or ridges on its posterior end which are often of considerable taxonomic value.

The male *genitalia*, terminalia or hypopygia, are of paramount importance in the classification of the group. As is now well known, the genitalia are rotated through 180° soon after eclosion, so that the morphologically ventral parts become dorsal and vice versa. To avoid confusion, we will describe the parts as they appear on the insect. The most dorsal structures are a pair of two-segmented appendages, called the upper claspers or superior gonapophyses. The basal segment is the *coxite*, basal segment of upper gonapophyses, basistyle, side piece or gonostipes. It is simple or bears spines, modified setae or tufts of various sorts. The *style* is the terminal segment, dististyle or clasper, and bears from one to five or more strong spines. The *parameres*, intermediate appendages, median gonapophyses or median claspers, are situated below and at the base of the coxites. They may be simple, forked or branched and with or without spines, tufts of hairs or modified setae in various situations upon them. Between the parameres lies the *aedeagus*, intromittent organ, penis sheath, phallosome, mesosome or gubernaculum. It is a heavily sclerotized, more or less triangular structure, seemingly formed of two partially fused tubes through which pass the *genital filaments*, penis filaments or spicules, which are themselves tubular. Both structures show modifications of taxonomic value. The filaments pass into the abdomen and join in a heavily sclerotized structure known as the *genital pump*, or *pompetta*, which is believed to act as a pump to force the sperm through the genital filaments. Attached close to the base of the genitalia ventrally are two unsegmented appendages, the *lateral lobes*, lower claspers or inferior gonapophyses. They are usually at least half the length of the coxites, and may be much longer, slender or inflated, and occasionally with spines or modified setae at their tips. Below and between the lateral lobes lie the *cerci*, anal lobes, proctigers, submedian lamellae or membranous processes. They seem homologous with the female cerci, and indeed in some species where those of the female are of unusual shape, those of the male also have the same shape. They are generally rather uniform throughout the group, and are often omitted from figures and descriptions, though in some cases they are useful in associating the sexes.

Students of *Phlebotomus* have used for many years Greek letters to indicate certain parts of veins whose relative lengths are of taxonomic importance. Tonnoir (1935) established the homologies of these veins, but realized the convenience of the use of Greek letters and continued to employ them. Alexander (1944) condemned their use under the impression that they constituted new names for the veins. In reality the Greek letters stand only for certain definite segments of veins whose measurements projected onto a line tangent to the costa are used in calculating certain proportions believed to be of taxonomic value. Since their use is a great convenience and does not conflict with the established nomenclature of the veins, we shall continue to use them. *Alpha* corresponds to vein R_2 from its junction with R_3 , to the costa. *Beta* corresponds to the segment of R from the junction of R_2 and R_3

to its junction with R_4 . *Gamma* corresponds to the section of R from the forking of R_4 to the junction of R_5 . *Delta* is the section of R_1 which overlaps the junction of R_2 and R_3 . R_1 occasionally fails to reach or just reaches the junction of R_2 and R_3 , in which cases *Delta* is negative or zero. In our experience, the venational characters so extensively used by some previous workers have proven of rather limited value. With certain exceptions, notably the length of *Delta* relative to *Alpha*, they are of little help in separating closely allied species or in associating the sexes of the same species, and are not to be relied upon in the absence of other supporting characters.

The detailed measurements so often included in descriptions we find unnecessary. If the species shows good structural characters the measurements are largely superfluous; if it does not, the measurements are hardly to be relied upon to characterize it. We have therefore confined ourselves to the following measurements: total wing length, alpha, beta, gamma, delta, third antennal segment, palpal segments, head length, clypeal length, proboscis and vertical eye length. In some cases other measurements have been included where the structure concerned is particularly striking.

In measuring the palpi, we have combined the first and second segments, as the suture between them is oblique, often not distinct, and the first segment varies little in length. The so-called palpal formula, in which the segments are listed in order of increasing length, we have abandoned as useless. In many species two or more segments may be subequal, but varying sufficiently individually to yield different palpal formulas for different individuals of the same species. Conversely, quite distinct species with palpi of markedly different lengths may have the same palpal formula. Palpal measurements are useful in associating sexes, but tend to be a group character, several closely related species sharing the same measurements.

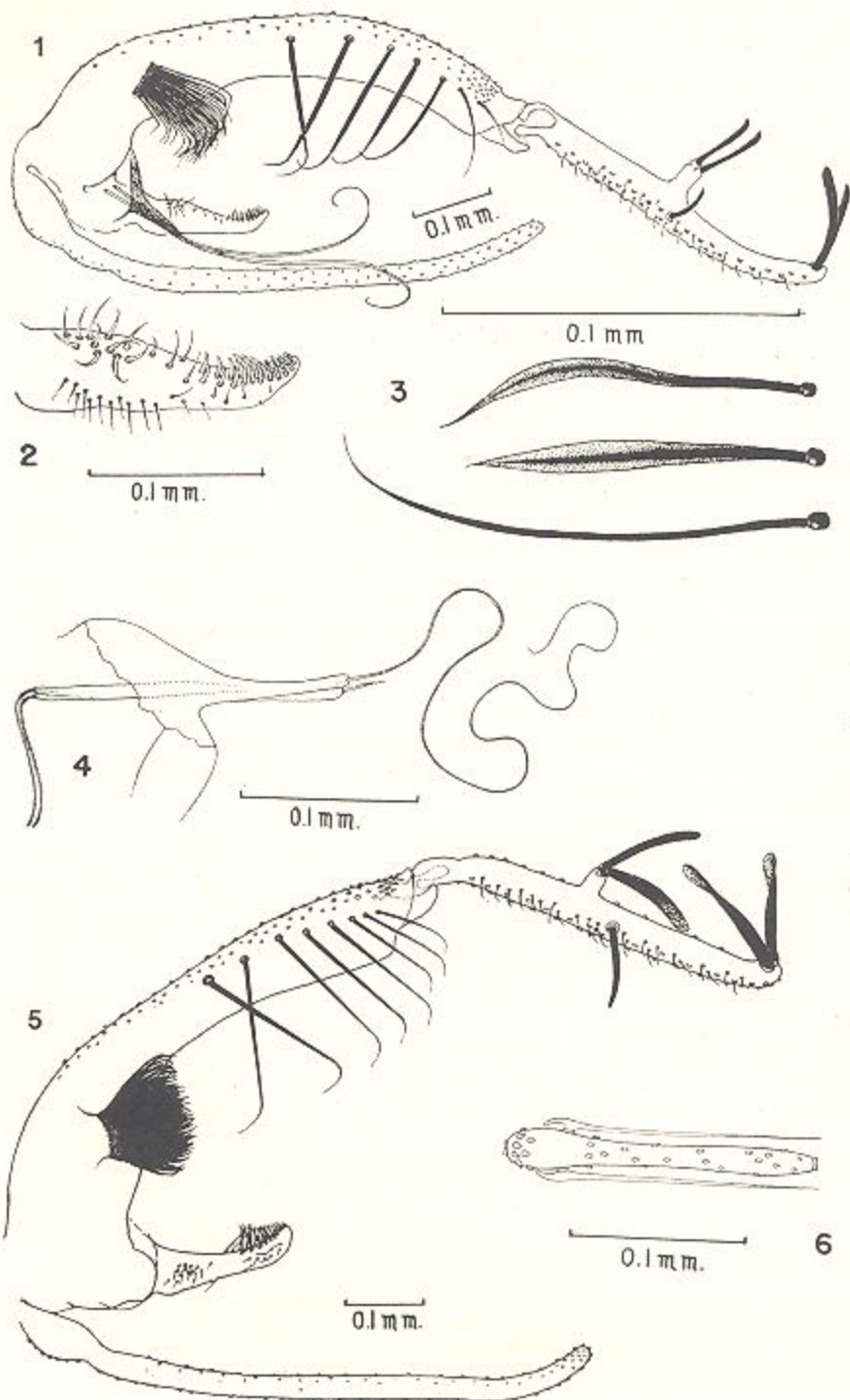
Subgenus *Brumptomyia* Franca and Parrot

1921, Arch. Inst. Pasteur de l'Afrique du Nord, 1, (3), pp. 280, 281, 283, fig. 4 (with *Ph. brumpti* Larr. and *Ph. vexator* Coq.). Dyar, 1929, Am. J. Hygiene, 10, (1), p. 112. (Subgenotype *P. brumpti* Larrousse.) Mangabeira, 1942, Mem. Inst. Oswaldo Cruz, 37, (2), pp. 208-210. Mangabeira and Galindo, 1944, Am. J. Hygiene, 40, pp. 189-190.

Mangabeira and Galindo (l. c.) have redefined the group and include ten neotropical species. Three species, *travassosi*, *avellari* and *guimaraesi* have been reared, and the morphology of the early stages and females described (Coutinho and Barreto 1941; Mangabeira 1942). *P. spinosipes* Floch and Abonnenc 1943, described from the female, has all the characters of the subgenus and could be placed here without hesitation were it not for the peculiar peg-like spines on the hind femora. These are reminiscent of the spines found on the hind femora of *P.*

EXPLANATION OF PLATE I

FIG. 1, *Phlebotomus hamatus*, internal aspect of genitalia, side view. FIG. 2, internal aspect of paramere of *P. hamatus*. FIG. 3, *P. galindoi*, spines of basal tuft. FIG. 4, aedeagus and genital filaments of *P. galindoi*. FIG. 5, *P. galindoi*, genitalia. FIG. 6, eighth flagellar segment of antenna of *P. galindoi*, showing ascoids.



fischeri and related species, on the basis of which Costa Lima erected the subgenus *Pintomyia*. However, the spines on *spinosipes* are peg-like, not sharply pointed as in *fischeri* and allied forms. In both cases they seem but modifications of the long setae usually found in the same situation.

The three species occurring in Panama are apparently quite rare, and we have taken no females referable to *Brumptomyia*. We have added a key to the males of the known species of the subgenus. The females are so similar that in most cases they are practically impossible to identify with certainty.

***Phlebotomus (Brumptomyia) hamatus* sp. nov.**

Figs. 1 and 2

This species is separated from *P. travassosi* Mang. 1942, its nearest relative in the subgenus *Brumptomyia*, by the differently shaped parameres, the greater number and development of the distal spines on the inner aspect of the coxite, the less dense basal tuft borne on a raspberry-like tubercle, and the shorter and less attenuated genital filaments. The ascoids appear to reach almost to the distal ends of their respective segments, and to have a short proximal prolongation, as figured for *travassosi* by Floch and Abonnenc (1942). The name is from Latin *hamatus*—bearing hooks.

The measurements of two of the three specimens at hand are given below in micra. The third specimen is much shrunken and accurate measurement is impossible.

Slide 112. Holotype. Third antennal segment, 384. Palpal segments: 1+2, 132; 3, 128; 4, 92; 5, 220. Wing: total length 2160; *Alpha*, 630; *Beta*, 234; *Gamma*, 342; *Delta*, 90. Head measurements: vertex to fronto-clypeal suture, 300; clypeus, 100; proboscis, 204; vertical eye length, 268.

Slide 222. Paratype. Third antennal segment, 340. Palpal segments: 1+2, 120; 3, 128; 4, 88; 5, 256. Wing not measurable. Head measurements: vertex to fronto-clypeal suture, 244; clypeus, 100; proboscis, 204; vertical eye length, 268.

Holotype male, Chilibrillo bat caves near Chilibre, Panama. Dec. 4, 1943. Taken from a crevice in limestone rock near the entrance to the caves. *Paratype* male, Cruces Trail, Madden Dam highway, Canal Zone, May 14, 1944. From between buttressed roots of a large hollow tree containing bats about 200 yards from highway along old Cruces Trail. *Paratype* male, Chorrera, Panama, 9 July 1944. Taken in an animal burrow. Types to be deposited in the Museum of Comparative Zoology, Cambridge, Mass.

***Phlebotomus (Brumptomyia) travassosi* Mangabeira**

1942. Mem. Inst. Oswaldo Cruz, 37, (2), pp. 201-205, figs. 137-142. (♂; Belem, Para, Brasil. In Armadillo burrows.) Op. cit., (3), pp. 375-382, figs. 1-14 (♀, larva, pupa). Floch and Abonnenc, 1945. Inst. Pasteur de la Guyane, Pub. No. 100, pp. 1, 7; Pl. 3 (♀).

Phlebotomus brumpti Floch and Abonnenc, 1942, Inst. Pasteur de la Guyane, Pub. No. 38, pp. 10-14, figs. 5-6. (♂, ♀; ? French Guiana); 1943, Op. cit., Pub. No. 62, p. 8 (♂; in key only).

A single male, La Victoria, Cerro Jefe, 2400 ft. elev. Oct. 4, 1946, Pedro Galindo coll. This specimen was secured from an armadillo burrow. Subsequent trips to the same locality have failed to yield additional material. This species differs from *hamatus* in the much denser basal tuft of the coxite, the more slender and more sparsely haired parameres, the lighter and fewer apical spines on the coxite and in the much longer and finer genital filaments. Measurements of our single specimen show no differences in wing and palpal proportions from *hamatus*.

***Phlebotomus (Brumptomyia) galindoi* sp. nov.**

Figs. 3-6

This species is somewhat larger than the two preceding in nearly all measurements and differs from both in various details of the genitalia, among which may be mentioned the heavy blade-like spines of the basal tuft, the more distal position of the unpaired spine on the style, and the very long genital filaments. Its closest relatives appear to be *P. brumpti* Larr. and *P. avellari* C. L. From the former it differs in the more distal position of the unpaired spine of the style, the more numerous, more flattened spines of the basal tuft, which are borne on a definite tubercle, the more slender parameres, which also lack dense dorsal hairs at their bases, and in the more slender and tubular aedeagus. From *avellari* the present species differs in the more slender parameres, and in the structure of the style and basal tuft.

The measurements of the unique holotype are given below in micra. Third antennal segment, 440; palpal segments: 1+2, 172; 3, 160; 4, 112; 5, 292; wing length, 2, 934; alpha, 828; beta, 342; gamma, 450; delta, 180.

Holotype male, 4 miles north of Boquete, Chiriqui Province, Panama. 4000 ft. elevation, 17 February 1947. Taken sweeping with a net. P. Galindo collector. To be deposited in the M. C. Z.

KEY TO BRUMPTOMYIA MALES

1. Coxite with a prominent basal tuft of hairs on the inner aspect.....2
Coxite without such a tuft, though with a few small scattered hairs.....*cardosoi* B. and C.
2. Basal tuft of very numerous fine hairs implanted in several contiguous straight rows. Parameres finger-like, slender. Spines of style in two groups, two apical and three median.....*travassosi* Mang.
Basal tuft otherwise.....3
3. Basal tuft implanted on a circular patch or raspberry-shaped tubercle.....4
Basal tuft diffuse, the hairs well separated and the area of implantation not differentiated.....10
4. Basal tuft of long fine hairs.....5
Basal tuft of short stout spine-like hairs.....8
5. Spines of style in three distinct groups.....6
Spines of style in but two distinct groups.....7
6. Spines on distal half of coxite, 6, with an additional single spine well separated from the others and near the middle of the segment. Parameres rather short and stout.....*guimaraesi* B. and C.
Spines on distal half of coxite, 4, no additional spine. Parameres slender and finger-like.....*cunhai* Mang...

7. Spines on distal half of coxite 4, rather small and slender. Parameres very slender, clubbed. Genital filaments exceedingly long and thread-like, **mangabeirai** B. and C.
Spines on distal half of coxite 7, the basal 5 straight, heavy and long. Parameres slipper-shaped. Genital filaments thread-like at their apices, not unusually long. **hamatus** sp. nov.
8. Spines of style in two groups, 2 apical and 3 median. 9
Spines of style in three groups, 2 apical, 2 median and 1 slightly distal of the median group. Parameres with dense hairs only apically. Hairs of basal tuft flattened and blade-like, borne on a distinct tubercle. **galindoi** sp. nov.
9. Parameres short and broad, not twice as long as wide. Tuft on base of coxite of short heavy spines. **avellari** C. L.
Parameres more slender, finger-shaped, with rather dense hairs dorsally on the basal part. Tuft on base of coxite of more numerous and more slender spine-like hairs. **brumpti** Larr.
10. Spines of style consisting of 1 apical, 1 subapical, 1 median and 2 basal, the last paired on a tubercle. Parameres slender and finger-like with numerous heavy bristles on the dorsal surface. **pintoi** C. L.
Style always with an apical pair of spines. 11
11. Parameres stouter, finger-like. Median spine of style well separated from basal pair. **nitzulescui** C. L.
Parameres thickened and spinose basally and with slender apical dorsally directed, finger-like process. Median spine of style at same level as basal pair. **troglydites** Lutz

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