# NOTES ON THE PHLEBOTOMUS OF PANAMA

## IX. Descriptions of Seven New Species[1]

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Collections of *Phlebotomus* sandflies in Panama now indicate the presence of 57 species within the boundaries of the Republic. Of these, 23 are species previously described from elsewhere, 6 have been described previously by us from Panama and 28 appear to be new. Of these last, we have selected the following 7 for description mainly because they are represented by reasonably abundant material and because we are fairly certain of the association of the sexes. The remaining 21 species will be described as good series become available and as we satisfy ourselves as to the association of the sexes. Types of the present species, as well as those previously described by us, will be deposited in the U. S. National Museum.

### Phlebotomus dysponetus sp. nov.

Plate 1, figs. 1–8

*Male.*—Wing length 1.89 to 2.07 mm. A medium sized rather dark sandfly, the mesonotum, pleura, coxae and dorsum of abdomen rather heavily infuscated. Abdominal setae erect or semi-erect, not scale-like. Post-spiracular setae about 14, lower mesanepisternal setae about 7. Proboscis slightly less than head height. Basal antennal segments and palpi as figured. Newstead's scales long, scattered over the middle third of third palpal segment. Ascoids as long as their respective segments, simple, as figured, paired on all but the terminal segment of antennae. Terminal segments not abruptly shorter than preceding ones. Wing venation as figured. Cibarium without horizontal teeth and lacking the heavily sclerotized structures below the tooth row found in female. Genitalia as figured, the genital pump large, the filaments hardly twice as long as pump, their tips dilated, as figured.

[1]Cost of publication is paid by the Gorgas Memorial Laboratory.

*Female.*—Wing length 1.83 to 2.07 mm. Externally similar to the male. Mesanepisternal setae fewer, ligulate and scale-like. No setae on lateral aspect of eighth tergite. Proboscis equal to or slightly exceeding head height. Basal antennal segments and palpi as in male, the antennal segments slightly shorter, the palpi slightly longer than in that sex. Ascoids as in male. Cibarium as in *acanthobasis* n. sp. Spermathecae as figured. Pharynx rather broad and well sclerotized, its posterior end with numerous fine transverse ridges which appear to be minutely denticulate. Wing as in male, clothed with hairs and a few ligulate scales at extreme base.

*Holotype* male, slide 2046, Juan Mina, Chagres river between Gamboa and Madden Dam, Canal Zone, 13 December, 1949, taken in an automatic fan type light-trap. H. Trapido coll. *Allotype* female, slide 2012, same locality, 15 December, 1949, taken in a hollow tree containing bats. M. Hertig coll. *Paratypes*, 40 males and 47 females mounted on slides from the following localities: Juan Mina, Chagres river region, C. Z., 1940, probably at light; 16 April, 1944, in hollow tree with bats; 3 May, 1944, same habitat; 14 Nov., 1949, in light trap; 15 Dec., 1949, in hollow tree with bats; 13 Dec., 1949, in light trap; 20 Dec., 1949, in light trap; 27 Oct., 1949, in light trap; 10 Nov., 1950, in light trap; 11 July, 1951, in Shannon trap at light; Darien, R. P., no data, probably El Real, at light, 1940; Old Panama, in holes and crevices in ruins, 27 Aug., 1943, 14 Dec., 1946, 3 June, 1944, 4 June, 1945, 7 Oct., 1947; Sta. Rosa, Chagres river region, in hollow tree, 26 May, 1945; Chiva Chiva, C. Z., in light trap, Oct., 1948; Madden Dam, C. Z., in light trap, 17 Nov., 1948; Tocumen airport, R. P., in light trap, 21 Jan., 1949; Nutivi, upper Rio Cricamola, Bocas Province, R. P., in pigsty, 15 June, 1949; Pacora, R. P., in animal burrow, 13 Aug., 1950; Suerre, Costa Rica, in buttresses, 29 April, 1951; Loma Borracha, C. Z., in light trap, Oct., 1951; Charco el Toro, Rio Maje, Panama Prov., R. P., in hollow tree, 23 March, 1950. In addition we have 538 unmounted specimens from the above localities and a number of additional localities in the Canal Zone, Panama and Costa Rica.

The species has been taken in all months of the year, though predominantly in the rainy season from May through December. Aside from one very large catch of 411 specimens from an animal burrow, most of our material has come from mosquito light traps or Shannon traps at light (123). Burrows have yielded specimens three times for a total of 447 specimens, holes and crevices in ruined walls 32 specimens, hollow trees with bats 18 specimens, and scattered examples from

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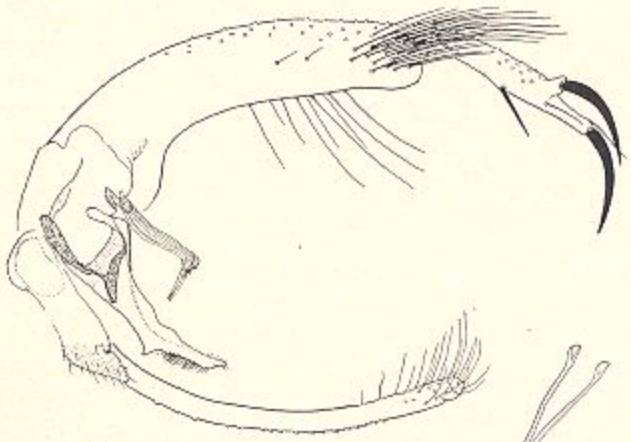
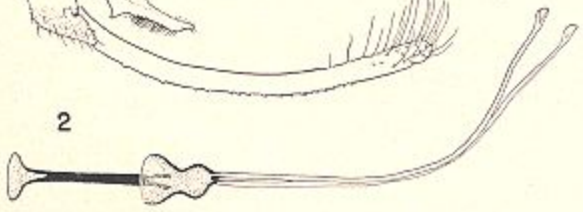
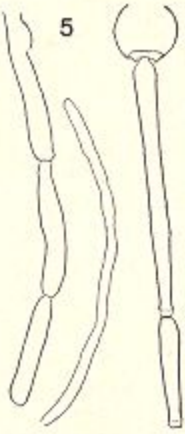
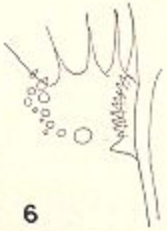
EXPLANATION OF PLATE I

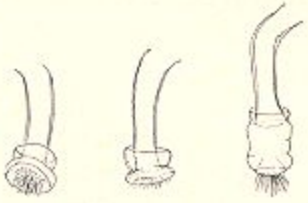
*Phlebotomus dysponetus* n. sp. FIG. 1, male genitalia, holotype, × 135. FIG. 2, genital pump and filaments, × 135. FIG. 3, basal tufts of coxite drawn in phenol, × 270. FIG. 4, antennal segment IV of male, × 270. FIG. 5, basal antennal segments and palpi of male, × 135. FIG. 6, cibarial teeth of female, the right side is folded so that the erect teeth are seen in profile, × 604.5. FIG. 7, spermathecae, the right-hand figure shows the heads fully expanded, the three figures to the left show various degrees of contraction, × 270. FIG. 8, wing of male holotype, × 32.

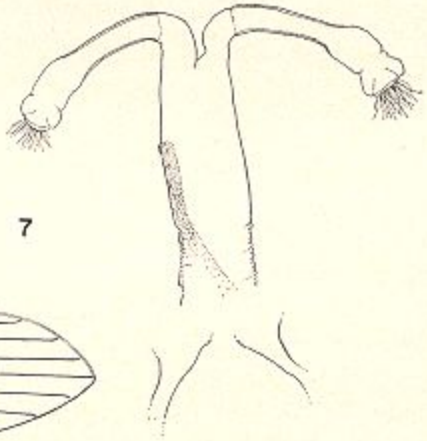


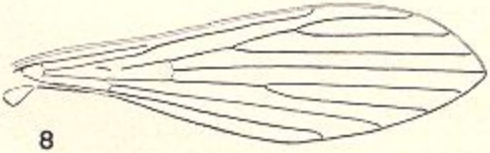












buttresses, hollow trees, and a house. A pigsty yielded 38 specimens, some said to be biting the pigs, which is the only host record we have for the species.

The species has been taken several times in heavy forest on the Atlantic side of the isthmus, but the bulk of the material comes from relatively dry gallery forest or second-growth scrub on the Pacific side. We have not taken it at any elevation in the mountains nor at Almirante in the very heavy Atlantic rain forest, where considerable collecting has been done. Its absence from horse baited mosquito traps is also significant, as these have been used extensively in localities where the species is taken fairly frequently at light.

*P. dysponetus* is closely related to *acanthobasis* n. sp. and to *triacanthus* Mang., *trispinosus* Mang., *equatorialis* Mang., and *choti* Floch and Abonnenc, for which Mangabeira (1942) proposed the subgenus *Pressatia*. It differs from all these in the slender parameres, lack of tuft of fine setae above the modified spines on the base of the coxite and in the greater inflation of the tips of the genital filaments. Mangabeira (1942a) has described the early stages and the female of *P. triacanthus*. *P. dysponetus* differs in this sex in details of the cibarium and spermathecae, though the differences are slight. The females of *P. choti* F. & A., described and figured by Floch and Abonnenc (1941) are also exceedingly similar. Both authors appear to have figured the spermathecae in a retracted condition, such as is usually seen in balsam mounts, with the sclerotized ducts telescoped into the tenuous heads.

### **Phlebotomus acanthobasis** sp. nov.

Plate II, figs. 9–19

*Male.*—Wing length 1.89 to 2.08 mm. A medium sized somewhat dusky sandfly, the mesonotum, pleura, coxae and abdominal sclerites rather evenly infuscated. Abdominal setae erect or semi-erect, not scale-like. Post-spiracular setae about 14, lower mesanepisternal setae about 3, the latter ligulate. Proboscis slightly less than head height. Basal antennal segments and palpi as in *P. dysponetus* n. sp. Newstead's scales scattered over middle third of third palpal segment. Ascoids simple, reaching to or beyond the ends of their respective segments, paired on all but the terminal segment. Wing venation as figured. Cibarium apparently without horizontal teeth, but with numerous reduced fine vertical teeth in the same position as the vertical teeth of the female. Pharynx slender, well sclerotized, unarmed. Genitalia as figured, notable for the numerous blade-like spines arising

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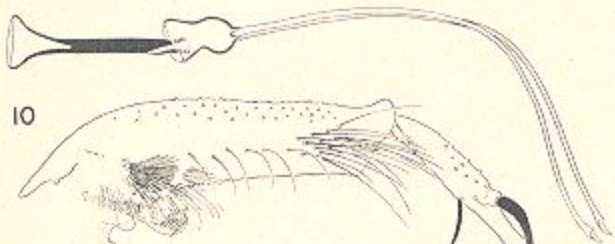
EXPLANATION OF PLATE II

*Phlebotomus acanthobasis* n. sp. FIG. 9, male genitalia, holotype, × 135. FIG. 10, pump and genital filaments of another specimen, × 135. FIG. 11, ventral view of paramere and tip of aedeagus of another specimen, × 270. FIG. 12, basal antennal segments and palpi of female, × 135. FIG. 13, female cibarium, × 270; FIG. 14, same specimen, × 604.5. FIG. 15, spermathecae, fully expanded and, to the left, a single head contracted, × 270. FIG. 16, first and second sternites, male left, female right, × 135. FIG. 17, female cercus, × 135. FIG. 18, wing, male, × 32. FIG. 19, frontal view of female head, × 49.



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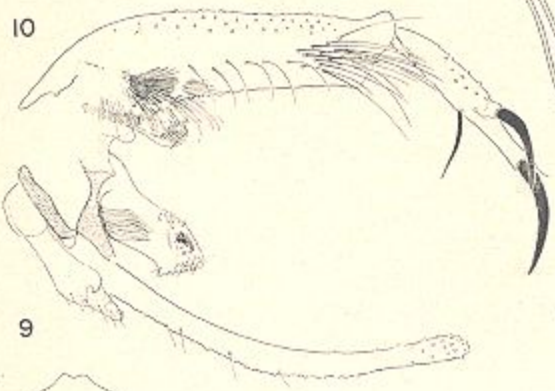

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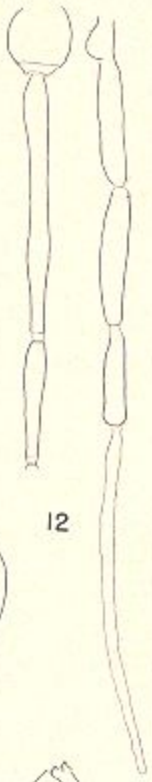

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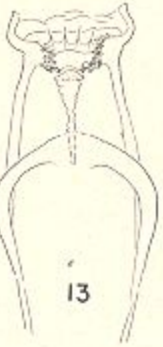

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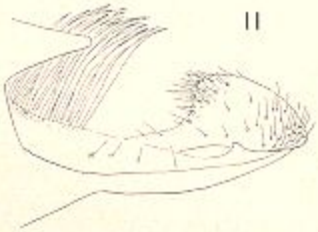

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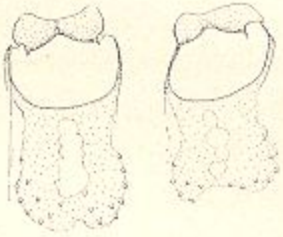

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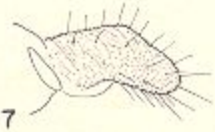

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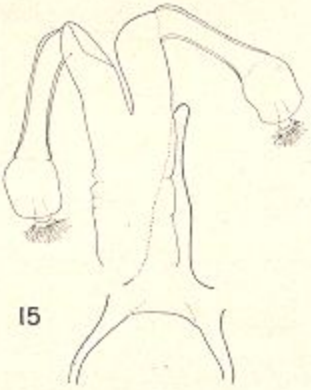

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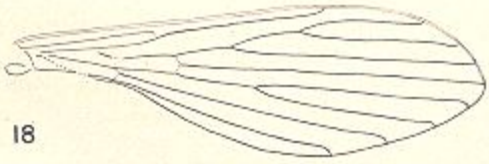

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on the ventral border of the inner aspect of the parameres. Basal tuft of hooked modified setae on coxite essentially as in *dysponetus*, but obscured by the dense tuft of long fine setae arising from a rather long finger-like protuberance above it. Genital pump large, the rather heavy filaments slightly more than twice as long as the pump, as figured.

*Female.*—Wing length 1.81 to 2.14 mm. Externally similar to the male. No setae on lateral aspect of eighth tergite. Proboscis equal to or slightly exceeding head height. Basal antennal segments and palpi as figured. Newstead's scales and ascoids as in male. Cibarium and spermathecae as figured. Pharynx unarmed, somewhat broader than in male, its posterior end finely ridged. Wing as in male, clothed with hairs and a few ligulate scales at base.

*Holotype* male, slide 2019, Gatuncillo, Chagres river between Gamboa, C. Z., and Madden Dam, 15 December, 1949. Taken in a hollow tree containing bats. M. Hertig coll. *Allotype* female, slide 2370, La Victoria, Cerro Jefe, nr. Pacora, Panama Prov., R. P., 29 August, 1950. Taken at light in a Shannon trap. Hertig & Galindo coll. *Paratypes*, 22 males and 32 females mounted on slides from the following localities: Juan Mina, Chagres river between Gamboa and Madden Dam, Canal Zone, 16 April, 3 and 30 May, 1944, in hollow tree with bats, 11 July, 1951, in hollow tree with bats and in Shannon trap at light; Chorrera, R. P., 18 March and 7 April, 1944, in animal burrow; Cerro Campana, Panama Prov., R. P., 18 Jan., 1947, in hollow tree with *Didelphis* opossum, 24 Aug., 1950, in Shannon trap at light; Upper Rio Pequeni, R. P., 26 March, 1949, probably in animal burrow; Nutivi, upper Rio Cricamola, Bocas del Toro Prov., R. P , 15 June, 1949, in pigsty; Palenque, Colon Prov., R. P., 14, 15 Sept., 1949, in hollow tree and in buttress; Rio del Medio, nr. Rio Gatun, C. Z., 14 Oct., 1949, in buttress; Gatuncillo, Chagres river above Gamboa, C. Z., 15 Dec., 1949, in hollow tree with bats; Charco el Toro, Rio Maje, Panama Prov., R. P., 22, 26 March, 1950, in hollow tree and in buttress; La Victoria, Cerro Jefe, nr. Pacora, R. P., 29 Aug., 1950, Shannon trap at light, 4 June, 1951, in automatic light trap; Almirante, Bocas del Toro, R. P., 16 May, 1951, in buttress, 5 July, 3 Aug., 1951, and 7 Jan., 1952, in Shannon trap at light; Cruces trail, C. Z., forest reserve, 10 and 25 Aug., 1951, in buttresses and in Shannon trap at light; Arraijan, R. P., 14 Aug., 1951, in automatic light trap; Gatun, C. Z., 29 Aug., 1951, in light trap; Mojinga swamp, nr. Ft. Sherman, C. Z., 5 Sept., 1951, in light trap; Madden Dam, C. Z., 21 Sept., 1951, in light trap; Loma Borracho, C. Z., 17 Oct., 1951, in light trap; Wauchope, Limon Prov., Costa Rica, 9 Aug., 1951, in buttress; Suerre, Guapiles, Costa Rica, 29 April, 1951, in buttress.

In addition to the above, we have 49 males and 18 females from the above localities and from Turrialba, Costa Rica, 11 and 12 Feb., 1952, at light, which have been identified and stored unmounted. The species has been taken in every month of the year, but the numbers are too small to show seasonal trends if such exist. We have taken the species 20 times attracted to light, either in a Shannon trap or in automatic light traps, but usually only one or two specimens at a time. It has been taken 11 times in buttresses, 6 times in animal

burrows, 5 times in hollow trees containing bats, 3 times in hollow trees without bats and once in a pigsty. Only twice have fair numbers been taken at one place, in an animal burrow in Costa Rica and in a bat tree in the Canal Zone; otherwise the species is comparatively scarce. The localities at which the species has been taken include areas of heavy forest on the Atlantic slope as well as comparatively dry scrub forest on the Pacific slope and up to about 2000 ft. elevation in the mountains. The Costa Rican localities are all on the Atlantic slope.

*P. acanthobasis* is related to *P. dysponetus* n. sp. *triacanthus* Mang., *trispinosus* Mang. and *choti* F. and A., differing from all these in the row of blade like spines on the base of the paramere below. The female differs from *dysponetus* only in the smaller terminal knob and longer individual ducts of the spermathecae. The cibarium is indistinguishable from that of *dysponetus*, but both species appear to differ from *triacanthus* and *choti* in having larger and heavier vertical teeth in the cibarium.

### **Phlebotomus aclydiferus** sp. nov.

Plate III, figs. 20–30; plate VI, figs. 61–62

*Male.*—Wing length 2.08–2.43 mm. A large dark sandfly, the mesonotum, pleura and legs all rather heavily infuscated. Abdominal setae erect or semi-erect, not scale like. Post-spiracular setae about 14, lower mesanepisternal setae about 2. Proboscis from tip of labium to base of maxillae a little shorter than head height from vertex to base of clypeus. Basal antennal segments and palpi as figured. Newstead's scales long, scattered along the distal two-thirds of third palpal segment. Ascoids similar to those of female, very long, with long posterior prolongations, paired on all flagellar segments except the last three. Terminal three segments not abruptly shortened, but segments progressively shortened from about segment XII. Wing as in female, though a little narrower. Cibarium and pharynx as in female, though teeth of former smaller and finer. Genitalia as figured. Genital filaments a little more than twice as long as pump, the latter slender, with small expansion of anterior end of plunger. The cerci, though smaller, are of same shape as those of female.

*Female.*—Wing length 2.16 to 2.64 mm. Similar in color and setal arrangement to the male. A few setae, about three, on lateral aspect of eighth tergite. Proboscis a little longer than head height. Basal antennal segments and palpi as figured, the palpi longer, antennal segments shorter than in male. Ascoids as figured, paired on all segments but the last two. Newstead's scales as in male. Cibarium, wing, spermathecae and cerci as figured. There are very fine denticles on the ridges of the pharynx. Wing veins clothed with slender setae, except at extreme base, where these are largely replaced by ligulate, square ended, striated scales.

*Holotype* male, slide 3489, Mojinga swamp, nr. Gatun, C. Z., 21 Aug., 1951. Taken in light trap. F. S. Blanton coll. *Allotype* female, slide 3359, Juan Mina, C. Z., 11 July, 1951. Taken between buttressed roots of a hollow tree with bats. Hertig, Galindo &

Hartmann colls. *Paratypes:* 24 males, 23 females from the following localities: Ft. San Lorenzo, C. Z., 24 Oct., 1943, in holes in ruins; Police station, Rio Pequeni, Madden Lake, C. Z., 23 June, 1944, in buttresses; San Antonio, Rio Pequeni, R. P., 25 Mar., 1949, in rock crevices near river; La Victoria, Cerro Jefe, nr. Pacora, R. P., 2000 ft. elev., 23 Jan., 1947, in animal burrow and rock crevices and 16 Dec., 1948, in buttresses or animal burrow; Rio Las Cascadas, Cerro Jefe, 26 Feb., 1948, at light; Puerto Pilon, Colon Prov., 2 Feb., 1947, in animal burrow; Juan Mina, C. Z., 20 Dec., 1949, in light trap and 11 July, 1951, in bat tree or buttress; Cerro Campana, Panama Prov., 24 Aug., 1950, at light; Puerto Armuelles, Chiriqui Prov., 9 June, 1951, at light; Cruces Trail, C. Z., 5 July, 1951, at light; Finca Nievecita, Almirante, Bocas del Toro Prov., 19 June, 1950, in buttress; Pacora, Panama Prov., 4 June, 1951, light trap; Mojinga swamp, Gatun, C. Z., 21 Aug. and 5 Sept., 1951, light trap. COSTA RICA: Guapiles, 17 June, 1950. MEXICO: Sta. Maria, Cintalapa, Chiapas, 11 April, 1951, Shannon trap at light.

In addition to the above 49 mounted specimens we have 138 males and 76 females unmounted from the above Panama localities and from Suerre, Turrialba and Pacurac in Costa Rica. We have taken the species in every month of the year save March and May, but it appears to be more abundant in the rainy season, from June through December. Most of our material has been taken attracted to light, either in a Shannon trap or automatic mosquito light trap. Twenty-two specimens were taken in animal burrows, 13 in buttresses and 10 in other habitats, including bat trees, crevices in rocks and holes in ruins. All but a few specimens have come from areas of heavy rain forest on the Atlantic slope of the continental divide or from elevations of 1500 ft. or more.

This species is not obviously related to any described Neotropical species, but comes nearest to such species as *P. dunhami* D. & C., *castanheirai* D. & C., and *campbelli* D. & C. in the structure of the male genitalia. The spermathecae and cibarium are of the same type found in *anduzei* Rozeb. and *apicalis* Floch & Abonnenc. These latter lack, however, the long proximal prolongations of the ascoids found in *aclydiferus*. *P. campbelli* D. & C. also has ascoids like *aclydiferus*, as an examination of the type in the U. S. National Museum shows.

There is some variation in certain structures. The spines at apex of coxite vary from two to four in number. In the material from Chiapas, Mexico, there is a very long seta on the outside of the coxite, reaching at least to the tip of the lateral lobes. In most Panama material, this seta is less developed. The parameres of the Mexican

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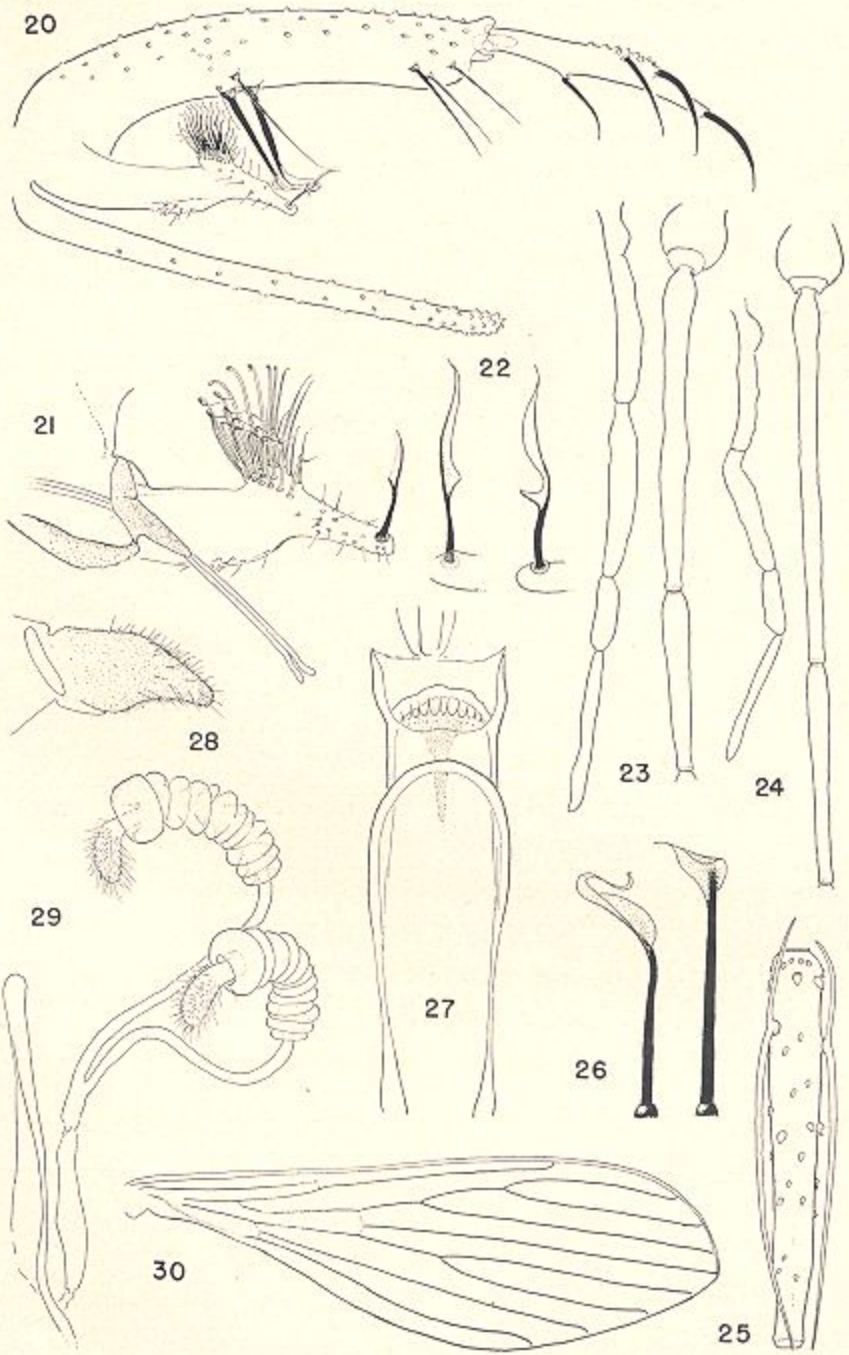
EXPLANATION OF PLATE III

*Phlebotomus aclydiferus* n. sp. FIG. 20, male genitalia, paratype, × 135. FIG. 21, paramere and aedeagus of another specimen, × 200. FIG. 22, spine on tip of paramere, two different specimens, × 270. FIG. 23, basal antennal segments and palpi of female, × 135. FIG. 24, same of male, × 135. FIG. 25, antennal segment VII of female, × 270. FIG. 26, spines of bare of coxite, × 270. FIG. 29, female cibarium, × 270. FIG. 28, female cercus, × 135. FIG. 29, spermathecae, drawn in phenol, × 270. FIG. 30, female wing, × 32.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specimens differ in having the inner rows of finer setae on the tuft very much reduced, while the outer row is of longer and heavier setae.

**Phlebotomus vexillarius** sp. nov.

Plate IV, figs. 31–41; plate VI, fig. 63; plate VII, fig. 73

*Male.*—Wing length 1.8 to 2.1 mm. A medium sized sandfly with mesonotum, head, abdominal tergites, pleura and coxae quite markedly infuscated. Abdominal setae apparently semi-erect. Post-spiracular setae present, 10 to 19 in number and 3 to 4 lower mesan-episternal setae. Proboscis a little less than head height. Palpi with segment V long, about equalling three preceding segments. Third antennal segment long, when in place on the head reaching to about the end of the third palpal segment. Ascoids short, hardly one-third the length of their respective segments, simple, paired on all but the last two segments. Newstead's scales few and slender, in a loose patch on distal third of third palpal segment. Wing venation as figured, veins clothed with setae except at extreme base where these are intermixed with ligulate striate scales. Cibarium with strong chitinous arch and narrow pigment patch but only faint vestiges of teeth. Pharynx posteriorly with numerous fine ridges.

Genitalia as figured, the specimen shown having lost one of the fan-like modified setae at the base of the coxite. Aedeagus stout and heavily sclerotized, the apex slender and turned downwards. Genital pump large, the filaments slender, a little more than twice as long as pump, their apices simple.

*Female.*—Wing length, 1.9 to 2.3 mm. Similar to male in color and vestiture. Proboscis a little longer than head height to base of clypeus. Third antennal segment reaching only to middle of third palpal segment and fifth palpal segment somewhat shorter than in male. Ascoids simple, much longer than in male, nearly reaching ends of their respective segments, present on all but the last segment, which is thickly beset with stout erect setae and is longer than either of the two next preceding segments. Cibarium and spermathecae as figured. Pharynx slender, with numerous fine ridges at proximal end, giving almost the appearance of being beset with fine hairs at right angles to its long axis. No setae (large deciduous hairs) on sides of eighth tergite nor scales on ninth tergite. Cerci slender.

*Holotype* male, slide 2151, Serrania Maje, Cerro Chucanti, Panama Province, Panama, 5 March, 1950, taken in tree buttress, R. Hartmann coll. *Allotype* female, slide 2319, Cerro Campana, Panama Province,

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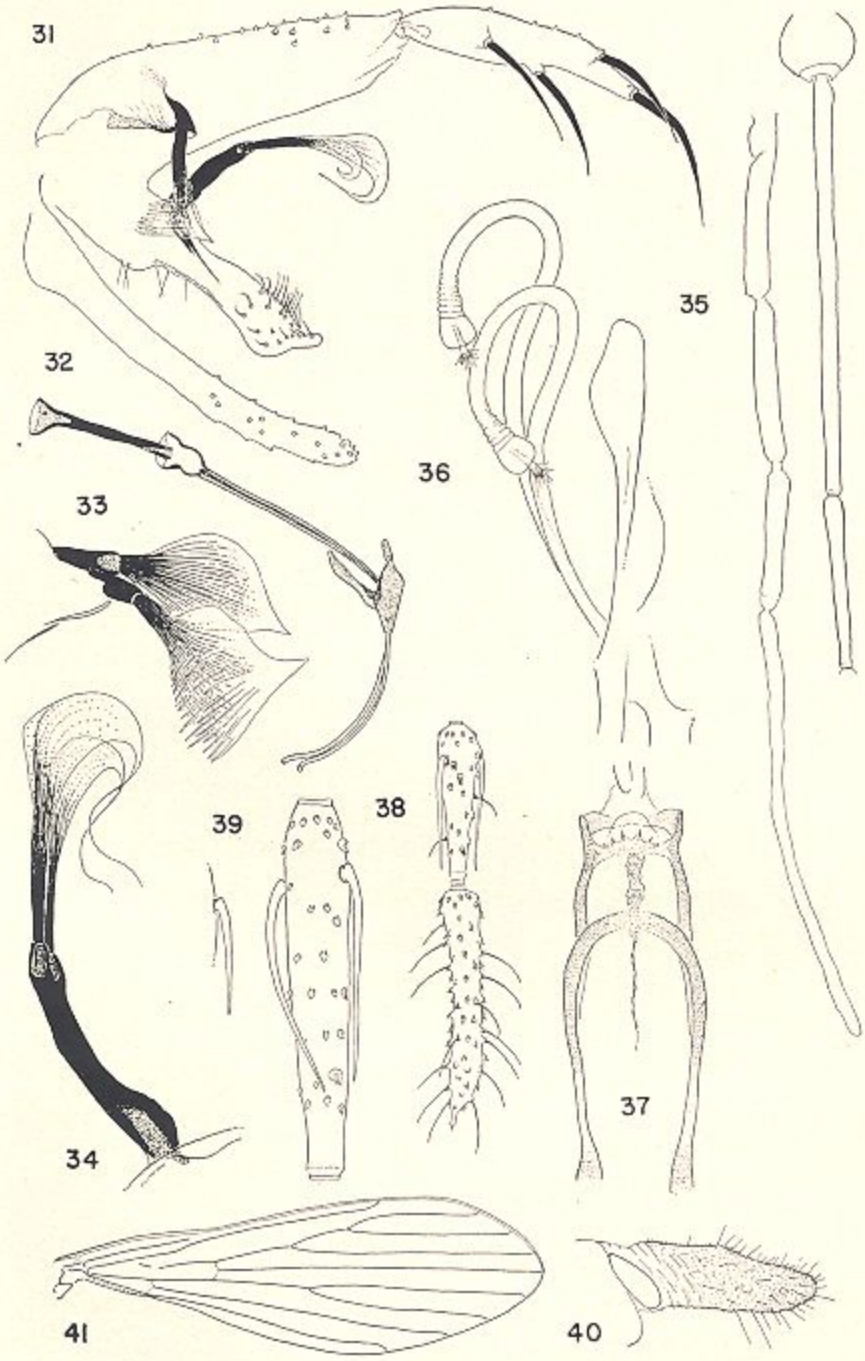
EXPLANATION OF PLATE IV

*Phlebotomus vexillarius* n. sp. FIG. 31, male genitalia, paratype, × 135. FIG. 32, pump and genital filaments, × 135. FIG. 33, modified spines on base of coxite, × 270. FIG. 34, modified spines on paramere, × 270. FIG. 35, basal antennal segments and palpi of male, × 135. FIG. 36, spermathecae, drawn in phenol, × 270. FIG. 37, female cibarium, × 270. FIG. 38, terminal antennal segments of female, × 200. FIG. 39, antennal segment IV of female and at left, ascoid of male, × 270. FIG. 40, female cercus, × 135. FIG. 41, male wing, × 32.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Panama, 25 Aug., 1950, taken in Shannon trap at light, M. Hertig coll. *Paratypes*, 6 male and 8 female specimens mounted in balsam on slides from the following localities: 2 males, same data as holotype; 1 male and 3 females, same locality as allotype, the male at light in a Shannon trap on 25 Aug., 1950, the females biting or resting on man, 9, 16 Aug., 2 Sept., 1950; 1 male, Rio del Medio, nr. Rio Gatun, C. Z., 15 Oct., 1949, in tree buttress; 1 male, Almirante, Bocas del Toro Province, Panama, 29 June, 1951, in tree buttress; 1 female, Tucue, Cocle Province, Panama, 19 July, 1950, biting man in daytime at ground level in the forest; 1 female, Cacique, Colon Province, Panama, 17 Sept., 1949, in tree buttress; 2 females, La Victoria, Cerro Jefe, nr. Pacora, Panama Province, Panama, 29 Dec., 1948, and 4 June, 1951, in light traps.

The name is from Latin *vexillum*, a flag or pennant, in reference to the structure of the modified setae on the coxite. We associate the sexes largely on the basis of structure of pharynx and cibarium and similarity of wing and palpal measurements. The appearance of the second sternite is also similar in the sexes. The species appears to be rare though widely distributed in heavily forested areas, and aside from the fact that it will bite man, we know nothing of its habits.

The bizarre development of the setae on the coxite and paramere are unique among American *Phlebotomus*, though approached by such species as *P. cruzi* Mang. and *P. edwardsi* Mang. The structure of cibarium, pharynx, spermathecae and style are not remarkable, and would place the species among a large group with four-toothed cibaria, unarmed pharynges, annulate spermathecae and a four-spined style, were it not for the unusual parameres. Armed parameres are uncommon in American *Phlebotomus*, and except for such aberrant groups as *Dampfomyia*, *Psychodopygus* and *Viannamyia*, occur only in the following species: *castroi* B. and C., *costalimai* Mang., *tupynambai* Mang., *williamsi* D., C. and A., *deanei* D. and A., *edwardsi* Mang., *longipalpis* L. & N., *cruzi* Mang. and *battistinii* Hertig. The first five of these have the paramere with only a single or double simple seta near the base, while the coxite bears a tuft of few to many simple setae. *P. edwardsi* bears four highly specialized setae on the paramere, but only simple setae on the coxite. *P. longipalpis* and *cruzi* are closely related species with two heavy setae on the parameres and more or less modified setae on the coxite. All the foregoing have four spines and an accessory seta on the style. The females of only *longipalpis* and *edwardsi* have been described. Both have annulate spermathecae, although those of *edwardsi* have only the terminal annulus retained. *P. longipalpis* has 10 teeth in an arched row in the cibarium, while *edwardsi* has 4 arranged much as in our species. *P. battistinii* has five heavy setae on the paramere and a group of variously modified spines on the coxite as well as five spines on the style. Its female has a four-toothed cibarium, and the spermatheca, from specimens in our possession, are annulate and somewhat like those of the present species.

On the whole, *vexillarius* appears to be a somewhat specialized and isolated form with no very close relatives, though probably derived from the same basic stock as the other species discussed above.

**Phlebotomus triramulus** sp. nov.

Plate V, figs. 42–51; plate VII, fig. 74

*Male.*—Wing length 1.74 to 2.16 mm. A large rather pale sandfly with the mesonotum but slightly infuscated. Post-spiracular setae 14 to 18, lower mesanepisternal setae 2 to 4, the latter narrowly ligulate. Abdominal setae erect, not scale-like. Proboscis a little less than head height. Basal antennal segments and palpi as figured. Newstead's scales rather long, in a loose patch on the middle third of the third palpal segment. Ascoids stout and long, equalling or exceeding their respective segments, without proximal prolongations, paired on all segments save the last two. Terminal segments not abruptly shortened. Wing as figured. Cibarium with a strong chitinous arch, incomplete in the middle, and with apparently four short rudimentary teeth. Pharynx as in female, with weakly denticulate ridges at posterior end. Genitalia as figured, the dorsal aspect of coxite thickly beset with deciduous ligulate scales, the external ventral aspect with semi-deciduous, rather stout and very long setae. Genital filaments somewhat more than three times as long as pump, their tips slightly expanded. Cerci as in female, though more slender.

*Female.*—Wing length 1.80 to 2.17 mm., as in male, though somewhat broader. Similar in color and setal arrangement to male, though there appear to be a few more post-spiracular setae. Setae on sides of eighth tergite usually absent, but rarely up to three may be present. Proboscis a little less than head height. Basal antennal segments and palpi as figured. Ascoids as in male, paired on all flagellar segments but the last. Newstead's scales as in male. Cibarium, spermathecae and cerci as figured, the abruptly digitate structure of the latter being unique so far as we know. Wing veins clothed with fine setae except at extreme base, where these are to a large extent replaced by ligulate square-ended scales.

*Holotype* male, slide 1754, Rio del Medio, near Rio Gatun, Colon Prov., Panama, 14 Oct., 1949, in tree buttress. R. Hartmann coll. *Allotype* female, slide 2376, La Victoria, Cerro Jefe, Panama Prov., R. P., 29 Aug., 1950, Yellow Fever Sta. C. at light in Shannon trap. Hertig and Galindo coll. *Paratypes*, 24 males, 36 females, mounted on slides from the following localities: Camp Chorrera, between Chorrera, Panama Prov., and the port, 18 March, 7 April and 9 July, 1944, in animal burrows; Barro Colorado Island, C. Z., 25 July, 1944, in animal burrow, O Mangabeira coll.; Cerro Campana, Panama Prov., 2000 ft. elev., 18 Jan., 1947, 4 July, 1948, in animal burrow, and 10 July, 1949, 2 Oct., 1949, in buttresses; La Victoria, Cerro Jefe, nr. Pacora, Panama Prov., 23 Jan., 1947, in animal burrow, 29 Aug. and 2 Sept., 1950, in Shannon trap at light, 5 Aug., 1951, in buttress, and 4 June, 1951, in mosquito light trap; Cerro Sta. Rita, Colon Prov., 6 May, 1948, in animal burrow; Cacique, Colon Prov., 17 Sept., 1949, in buttress; Palenque, Colon Prov., 14 Sept., 1949, in buttress and hollow tree; Rio del Medio, Rio Gatun, Colon Prov., 14 Oct., 1949, in buttress. In addition we have examined and identified, but not mounted, 545 males and 397 females from the above and the following additional locality: Mojinga swamp, nr. Gatun, C. Z., 15, 28 August,

4, 5, September, 4 October, 15, 26 November and 4 December, 1951, in mosquito light trap, F. S. Blanton coll.

The great bulk of this material was taken in animal burrows, or at light in a Shannon trap or mosquito light trap. On one notable occasion 467 specimens were taken from a single large burrow containing a "conejo pintado" (*Cuniculus paca*); many more could have been taken. Both sexes occurred in approximately equal numbers, but it is noteworthy that none of the females had fed. Only eight specimens were taken in buttresses and three in a hollow tree. Specimens have been taken in every month of the year save February, but most of the material was taken in the rainy season, from July to January. With the exception of Chorrera, all the localities from which this species has been collected were either on the Atlantic slope of the continental divide or at elevations of over 1500 ft. on the Pacific slope. The Chorrera locality was in a patch of scrubby woods near the edge of open grassy llanos; all the other localities are in heavy forest. The species has not been taken biting man or domestic animals and probably feeds on armadillos or some other burrowing mammal.

This species seems most closely related to *P. longispinus* Mang., *trichopygus* Floch and Abonnenc, *dasipodogeton* Castro, and *wagleyi* Causey and Damasceno. From all of these it differs in having the parameres three-branched, though the two distal branches are quite similar in shape to the corresponding structures in *longispinus* and *wagleyi*. In *trichopygus* and *dasipodogeton* it appears as though the two branches present on the parameres are homologous with the dorsal and ventral branches in the present species, the median clubbed branch being absent.

The females of *trichopygus* F. & A., *longispinus* Mang. and our species are quite similar, all having spermathecae with relatively short ducts, finely annulate or wrinkled globular or pear-shaped heads, and moderately protuberant terminal knobs. All have unarmed pharynges. *P. longispinus* and our species have four-toothed cibaria with patches of minute spines at the sides, while *trichopygus* has six well developed teeth.

### **Phlebotomus ylephiletor** sp. nov.

Plate VI, figs. 52–60

*Male.*—Wing length 1.65 to 1.80 mm. A rather small sandfly with the mesonotum and head quite strongly infuscated. Abdominal setae semi-erect, hair-like. Post spiracular setae present, 6 to 10 in number and 3 to 4 small lower mesanepisternal setae. Proboscis

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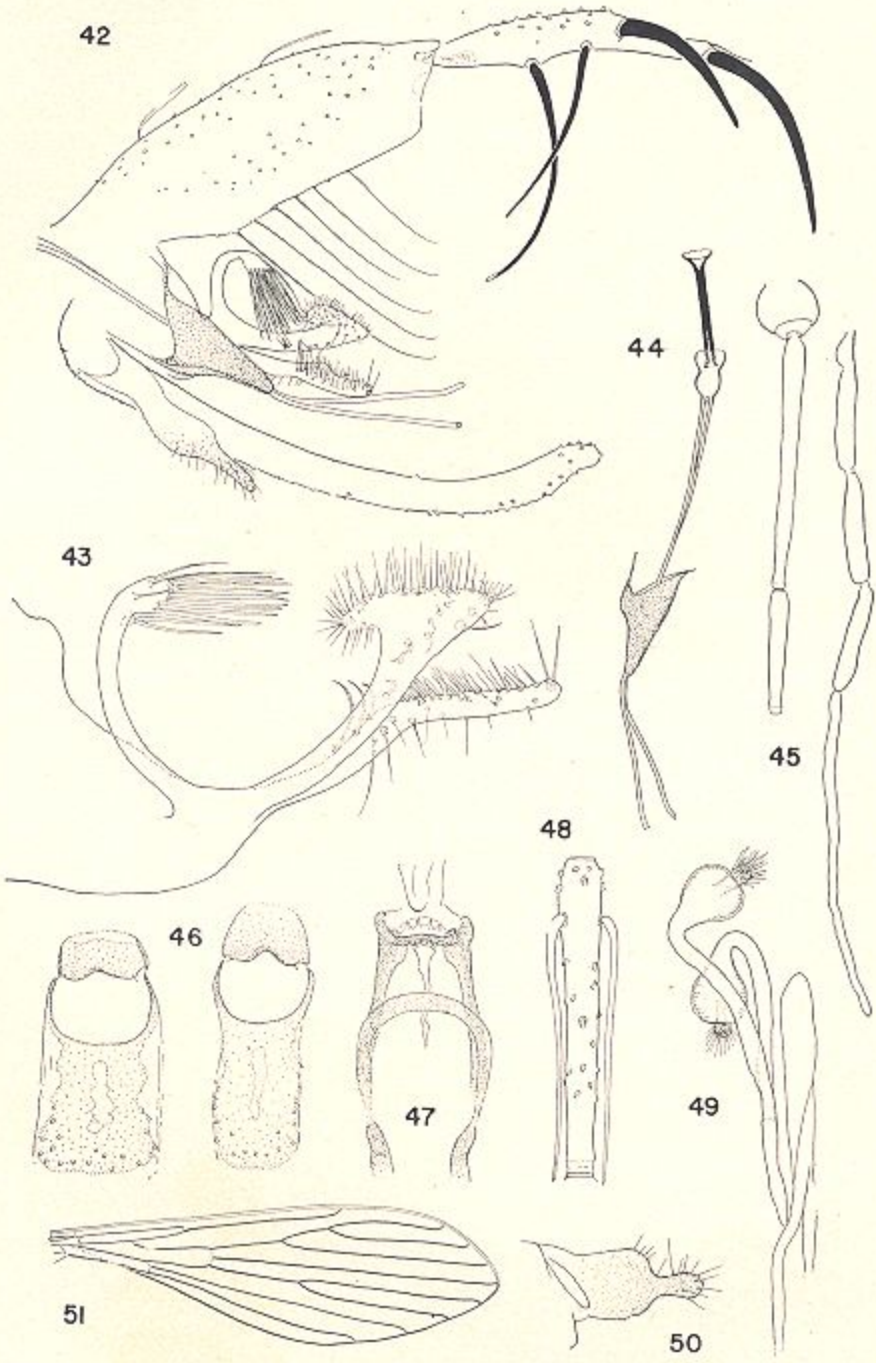
EXPLANATION OF PLATE V

*Phlebotomus triramulus* n. sp. FIG. 42, male genitalia, holotype, × 167. FIG. 43, apex of paramere, drawn in phenol, × 270. FIG. 44, genital pump and filaments, × 135. FIG. 45, basal antennal segments and palpi of male, × 135. FIG. 46, first and second sternites, female left, male right, × 135. FIG. 47, female cibarium, × 270. FIG. 48, male antennal segment IV, × 270. FIG. 49, spermathecae, drawn in water after KOH treatment, × 270. FIG. 50, female cercus, × 135. FIG. 51, male wing, × 32.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about equalling head height. Palpi with segment V about as long as I+II, longer than III, IV very short, about twice as long as wide, as figured. Third antennal segment as figured, reaching to about the middle of palpal segment III. Newstead's scales scattered over the middle third of palpal segment III. Ascoids very slender and thin-walled, difficult to see, not reaching the ends of their respective segments, paired on all but the terminal three segments. Terminal three segments of antennae rather abruptly shorter than preceding segments, the last segment with unusually long tapering tip. Wing with venation as figured, clothed with seta except at base, where these are intermixed with ligulate, square-ended scales. Cibarium with strong chitinous arch and rounded pigment patch, without horizontal teeth, but with vestiges of vertical teeth. Pharynx rather broad and well sclerotized, but more slender than female, unarmed, but with digitate ridges.

Genitalia as figured, the genital pump rather heavy and the filaments stout, the latter about twice as long as the pump. Cerci short and unmodified.

*Female.*—Wing length 1.91 to 2.16 mm. Larger and more heavily pigmented than male, the fifth palpal segment shorter than segments I+II, and the third antennal segment reaching only to middle of segment II. Antennae and ascoids as in the male, the latter a little longer, absent on the shortened three terminal segments. Wing venation as in the male, the wing somewhat broader, but with similar ligulate striate scales at base.

Cibarium as figured, quite heavily sclerotized, the vertical teeth heavy and numerous, obscured by the round dark pigment patch. Pharynx quite broad, heavily sclerotized and pigmented, its apex unarmed, but with weakly denticulate ridges and obscure digitate processes. Proboscis greatly exceeding head height. Spermathecae as figured, the terminal knob very large, the annuli semi-telescopic, varying in number from 6 to 9, depending on the degree of enlargement of the incipient annuli at the base. Ducts rather short, about as long as stem of genital fork, fusing just before the vagina. A tuft of about 12 setae on lateral aspects of eighth tergite. Vestiture of ninth tergite composed of long stout setae and slender striate scales intermixed.

*Holotype* male, slide 2448, Finca Nievecita, Almirante, Bocas del Toro Province, Panama, 17 June, 1950, taken between buttressed roots of a forest tree, R. Hartmann coll. (The specimen has the left

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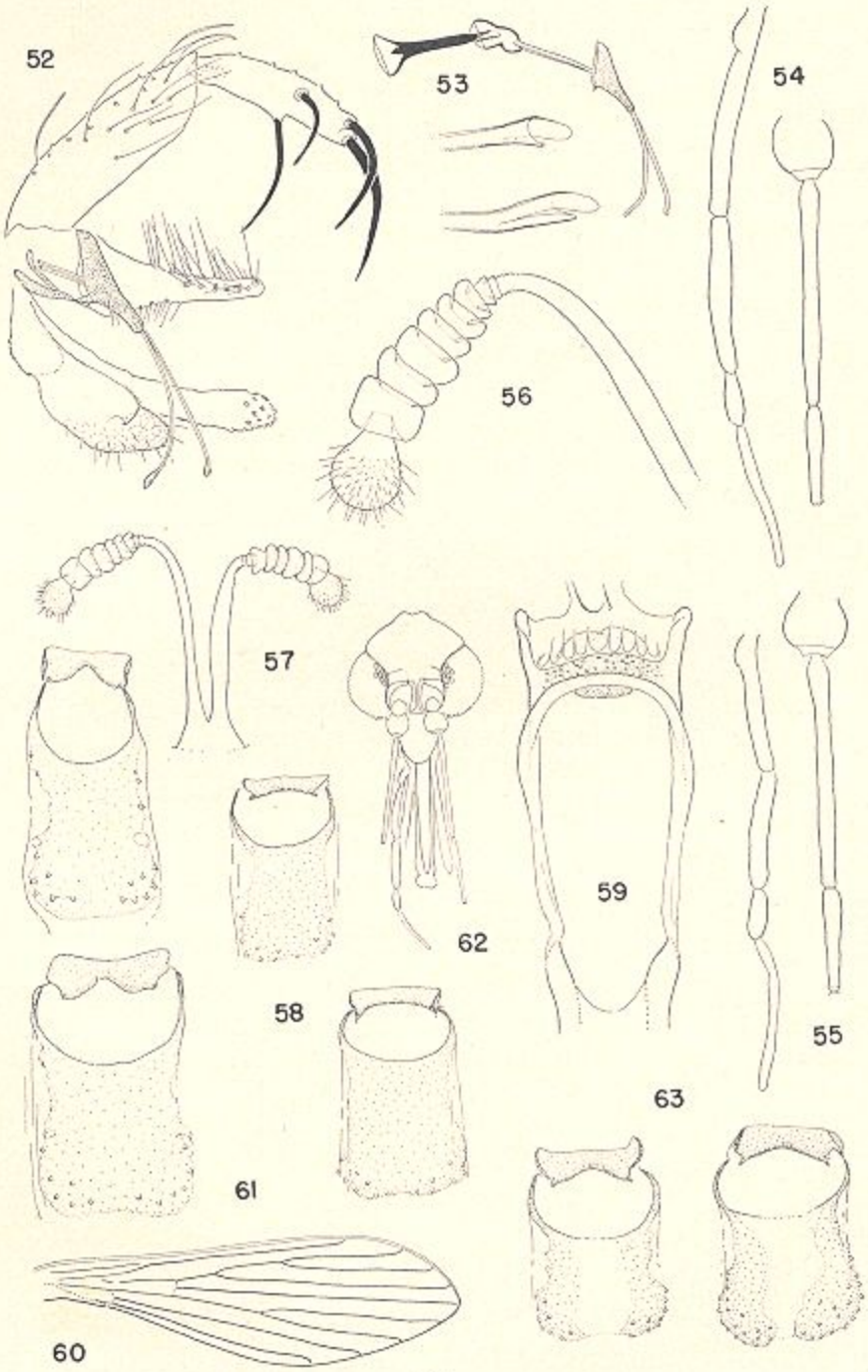
EXPLANATION OF PLATE VI

*Phlebotomus ylephiletor* n. sp. FIG. 52, male genitalia, holotype, × 200. FIG. 53, genital pump and filaments, × 135, and tips of genital filaments, × 604.5. FIG. 54, basal antennal segments and palpi of female, × 135. FIG. 55, same of male, × 135. FIG. 56, spermatheca, head, × 604.5. FIG. 57, spermathecae, × 270. FIG. 58, first and second sternites, male above, female below, × 135. FIG. 59, female cibarium, × 270. FIG. 60, male wing, × 32.

*Phlebotomus aclydiferus* n. sp. FIG. 61, first and second sternites, male above, female below, × 135. FIG. 62, head, female, × 49.

*Phlebotomus vexillarius* n. sp. FIG. 63, first and second sternites, male left, female right, × 135.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antenna abnormal, the segments much shortened, but is selected as type because it is the specimen from which the figure of the genitalia was made.) *Allotype* female, slide 1690, Cacique, Colon Province, Panama, 17 Sept., 1949, in buttresses of large Ficus tree in forest, R. Hartmann coll. *Paratypes*, 96 males and 68 females mounted in copal-balsam on slides from the following localities: Juan Mina, Chagres river above Gamboa, Canal Zone, 1940, in mosquito light trap, D. M. Jobbins coll. (1 ♂); same locality, 3 Feb., 1947, in hollow tree with bats (1 ♂); same locality, 31 Jan., 1950, in mosquito light trap, Trapido coll. (1 ♂); Rio del Medio, Rio Gatun, Canal Zone, 14–15 Oct., 1949, in buttresses in forest, R. Hartmann coll. (17 ♂, 6 ♀); Gatun, Canal Zone, 29 Aug., 1951, in mosquito light trap, F. Blanton leg. (2 ♂, 4 ♀); Chilibrillo bat caves, near Chilibre, Panama Province, Panama, 28 Nov., 1946, in rock crevices near cave entrance, M. Hertig coll. (1 ♂); La Victoria, Cerro Jefe, near Tocumen, Panama Province, 29 Aug.-2 Sept., 1950, taken in a Shannon trap at light, M. Hertig and P. Galindo colls. (3 ♂, 2 ♀); Cerro Campana, Panama Province, 7 Jan., 1947, in buttresses in forest, 2500 ft. elev., M. Hertig and G. Fairchild colls. (2 ♂, 2 ♀); same locality, 2 Oct., 1949, Yellow Fever Station no. 2, in buttresses and hollow tree, Hertig & Trapido colls. (2 ♂, 1 ♀); El Valle de Anton, Cocle Province, 5 Nov. and 7 Dec., 1948, in buttresses, P Galindo colls. (2 ♂, 5 ♀); same locality, 21 and 31 March, 1945, biting man in the forest at night, Trapido, Michener and Middlekauff colls. (13 ♀); same locality, 16 May, 1948, in hollow tree, Fairchild coll. (1 ♀); Sta. Fe, Veraguas Province, Panama, 2 March, 1947, in buttresses in forest at about 2500 ft. elev., P. Galindo coll. (24♂, 21 ♀, two slides with 4 and one with 6 specimens); Cacique, Colon Province, Panama, 17 Sept., 1949, in buttresses in forest, R. Hartmann coll. (7 ♂, 2 ♀); Robalo, Bocas del Toro Province, Panama, 30 Jan., 1947, in buttresses, P. Galindo coll. (1 ♂); Finca Nievecita, Almirante, Bocas del Toro Province, 17–22 June, 1950, in buttresses, Hartmann coll. (12 ♂, 7 ♀); Finca dos Caños, Almirante, Bocas del Toro province, 18 June, 1950, in buttresses, Hartmann coll. (3 ♂, 2 ♀); Almirante, Bocas del Toro Province, 29 June, 1951, buttresses (2♂, 2 ♀); 26 July, 1951, Shannon trap at light (1 ♂) and 11 Sept., 1951, buttresses, all Quiñones coll.; Concepcion, Chiriqui Province, Panama, 10 Nov., 1949, buttresses in bamboo grove at 1600 ft. elev., Trapido coll. (2 ♂, 1 ♀); Rio Corotu, Puerto Armuelles, Chiriqui Province, 20 April, 1950, in buttresses, R. Hartmann coll. (4 ♂, 1 ♀); Puerto Armuelles, Chiriqui Province, 9 June, 1951, in Shannon trap at light, M. Hertig coll. (1 ♂, 1 ♀); Palo Santo, Chiriqui Province, 2 March, 1951, in buttresses, R. Hartmann coll. (2 ♂); La Tula, near El Naranjo, Chiriqui Province, 20 May, 1950, biting man in the forest, 10:45 A. M., 4800 ft. elev., R. Hartmann coll. (1 ♀); Esquinas, Puntarenas Province, Costa Rica, 28 Nov., 1949, in buttresses, Trapido coll. (1 ♂, 2 ♀); Palmar Puntarenas Province, Costa Rica, 27 Nov., 1948, under tree roots near pigpen, Trapido coll. (1 ♀); Palenque, Chiapas, Mexico, 30 March, to 1 April, 1951, in tunnel in ruins and in buttresses in vicinity of ruins, Fairchild & Hartmann colls. (4 ♂, 3 ♀).

In addition to the above slide mounts, we have examined and identified 3538 additional specimens of this species from the following

localities. Most of this material has been cleared in KOH and stored in alcohol. Almirante, Bocas del Toro Province, July, 1951, to February, 1952, in buttresses, at light, or biting at ground level at night (2874 specimens); Mojinga swamp, near Ft. Sherman, Canal Zone, Sept., Nov. and Dec., 1951, in mosquito light trap, F. Blanton leg., (12); Cerro Campana, Panama Province, July, Aug. and Feb., biting man in the forest, at light and in rock crevices (50); Sta. Fe, Veraguas Province, Panama, June, 1949, biting man at ground level in the forest (8 ♀); Madden Dam, Canal Zone, 21 Sept., 1951, in mosquito light trap, F. Blanton leg. (1 ♀); Palo Santo, Chiriqui Province, 20 Feb. to 2 March, 1951, biting man, mostly out doors at night, but once in a house and once in daytime, in buttresses, rock crevices and at light in a Shannon trap (50); Costa Rica, various localities in the general area of Turrialba, Pacuare, Suerre and S. Juan Miramar, Valle del General, mostly taken in buttresses in Jan. and July, 1951, and Jan. and Feb., 1952, by Rosabal and Hertig (91); Palenque, Chiapas, Mexico, 28 March to 2 April, 1951, in buttresses and temple ruins, Fairchild and Hartmann colls. (18 ♂, 1 ♀); Ocosocautla, Chiapas, Mexico, 8 April, 1951, in shallow buttresses and holes in oak trees, Fairchild & Hartmann colls. (9 ♂).

This species belongs to a group of very similar appearing species, including *P. intermedius* L. & N., *whitmani* Antunes & Coutinho, *sylvicolus* F. & A., *anduzei* Rozeb., *trapidoi* n. sp. and a number of others with four spines on the style, simple parameres, rather short fifth palpal segment and with delta of the wing venation long, usually at least half as long as alpha.

From *intermedius* it can be separated in the male by the shorter lateral lobes, but little longer than the parameres and hardly twice as long as the cerci, the less modified tips of genital filaments, the more nearly paired terminal spines of the style, and by lighter pigmentation of thorax and head. In the female the spermathecae of *ylephiletor* have a relatively much larger terminal knob, the terminal annulus is enlarged, and the remaining annuli are fewer in number, 6 or 7, and decrease in size from apex to junction with the duct. The annuli are also semi-telescopic and there are several small incipient annuli at the base. In *intermedius* the annuli are of rather uniform size throughout, 10 to 12 in number and are not reduced much in size towards the base. The cibaria of both species are very similar and not certainly distinctive.

From *anduzei*, based on the description of Floch and Abonnenc (1944), *ylephiletor* differs very little. The terminal spines of the style are closer together in the latter species, the parameres relatively longer and the aedeagus more slender, not abruptly truncated. The genital filaments are also slightly longer, about twice as long as the pump. In the female, the spermathecae of *ylephiletor* have many fewer annuli and smooth rather than wrinkled ducts. The cibaria of the two species seem very similar, not separable with certainty.

From *sylvicolus* F. & A., also based solely on the original description, the present species differs in a blunter aedeagus, shorter genital filaments relative to the pump, relatively longer parameres and a blunter and more cylindrical style. In *sylvicolus* the style is about half the

length of the coxite, while in the present species it is fully three-fourths as long. The differences are difficult to describe, yet the figures give a quite distinct impression, and we believe comparison of actual specimens would show other differences.

From *whitmani* our species can readily be distinguished in the male by its much shorter and stouter genital filaments and heavier genital pump, by the blunter tips to the aedeagus, acutely pointed in *whitmani*, by the stouter and shorter parameres, and by the more nearly paired terminal spines of the style. In the female, the spermathecae of *whitmani* have many more and smaller annuli, a smaller terminal knob, and longer ducts. The cibaria of both are of the same type, not distinguishable with certainty, and both have dark heads and mesonota.

From *trapidoi* both sexes can be separated by the color of head and mesonotum, *trapidoi* being nearly without pigmentation. *P. trapidoi* has relatively longer coxites, style and lateral lobes, more slender parameres, the terminal spines on the style well separated and slightly shorter genital filaments with their tips merely slightly dilated. In the female the spermathecae of *trapidoi* have fewer and more uniform annuli, five to six, and no incipient annuli at the junction of the duct. The terminal knob is also broader based, less pedunculate, than in *ylephiletor*. The cibaria are not distinguishable with certainty.

The two species *ylephiletor* and *trapidoi* were at first not recognized as separate by us. Study of the very extensive material now available has enabled us to separate them easily on color, *ylephiletor* having a strikingly dark head and mesonotum. Spermathecae and style also show constant differences. Though both species attack man readily and are, in general, found together, *trapidoi* is very abundant in the tree tops while *ylephiletor* is very rare there, though it may be abundant near the foot of the same tree. *P. ylephiletor* is the dominant species in a number of localities at higher elevations in Chiriqui Province where *trapidoi* seems not to occur.

### **Phlebotomus trapidoi** sp. nov.

Plate VII, figs. 64–72

*Male.*—Wing length 1.49 to 1.74 mm. A small pale sandfly, the mesonotum and head not noticeably infuscated. Abdominal setae semi-erect. Post spiracular setae 4 to 6, lower mesanepisternal setae 3 to 5. Proboscis slightly less than head height. Fifth palpal segment longer than third, about equal to first and second together, as figured.

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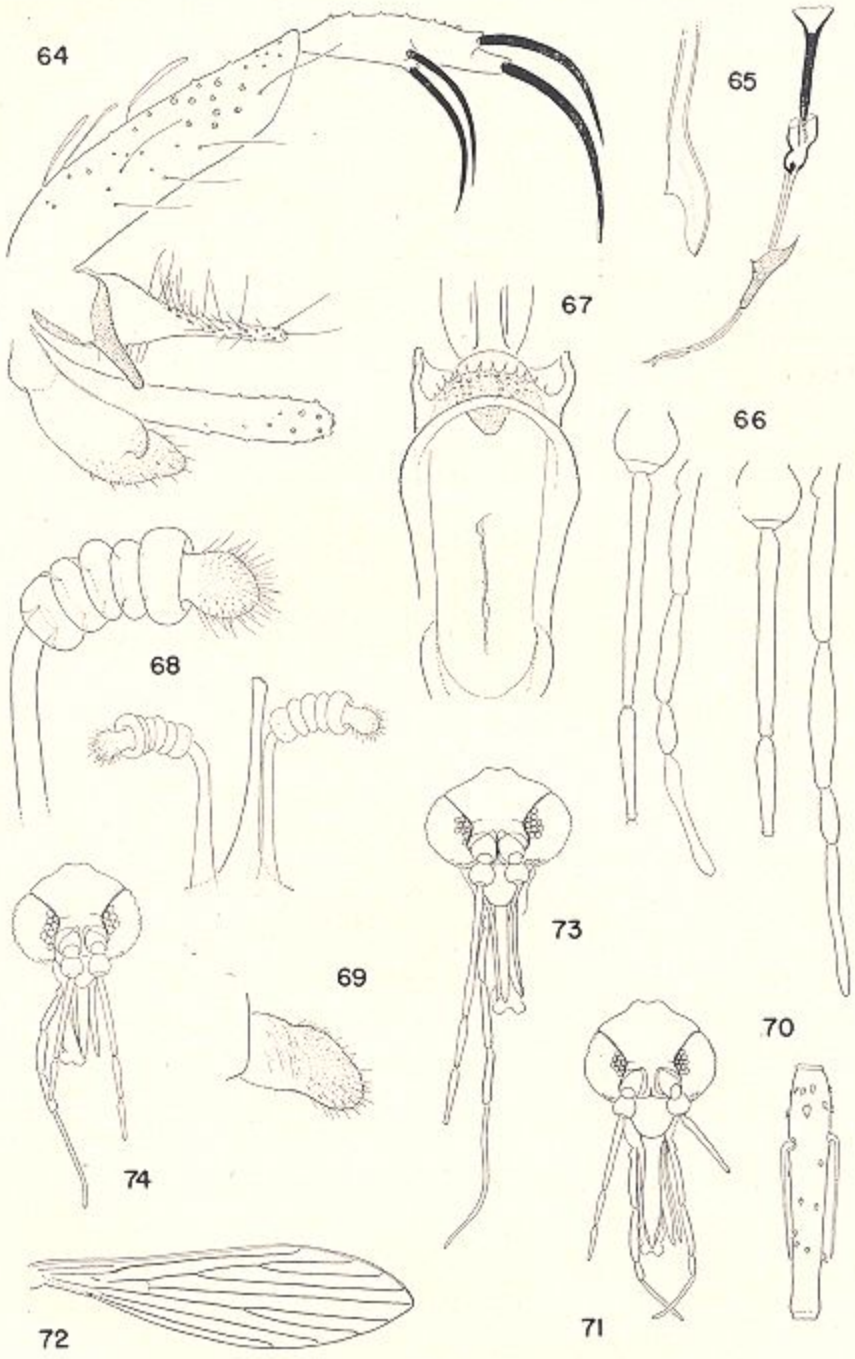
EXPLANATION OF PLATE VII

*Phlebotomus trapidoi* n. sp. FIG. 64, male genitalia, holotype, × 200. FIG. 65, pump and genital filaments, × 135, and tip of genital filament, × 604.5. FIG. 66, basal antennal segments and palpus of male, left and female, right, × 135. FIG. 67, female cibarium, × 270. FIG. 68, spermathecae, upper, × 604.5, lower × 270. FIG. 69, female cereus, × 135. FIG. 70, antennal segment IV of male, × 270. FIG. 71, female head, × 49. FIG. 72, male wing, × 32.

*Phlebotomus vexillarius* n. sp. FIG. 73, female head, × 49.

*Phlebotomus triramulus* n. sp. FIG. 74, female head, × 49.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Third antennal segment as figured, reaching beyond end of third palpal segment. Newstead's scales in a loose patch on middle third of third palpal segment. Ascoids simple, very thin-walled and difficult to see, not reaching ends of their respective segments and paired on all segments except the terminal three, which are abruptly shortened. Wing venation as figured, the veins clothed with hairs except of extreme base, where these are mixed with ligulate striate scales.

Cibarium with a strong chitinous arch, numerous minute erect teeth but no horizontal teeth, and a narrow triangular pigment patch. Pharynx slender, poorly sclerotized, unarmed but with fairly strong ridges or wrinkles at its posterior end. Genitalia as figured, the coxites clothed dorsally with rather numerous ligulate striate scales and with several irregular rows of fairly strong long setae on the lateral lower aspect, not shown in the figure. Genital pump fairly heavy, the filaments moderately stout, the latter about 1.5 times as long as the pump. Cerci of normal shape.

*Female.*—Wing length 1.89 to 2.01 mm. Similar to the male in external characters and color, though the mesonotum somewhat darker. Fifth palpal segment about equal to third, shorter than first and second together. Third antennal segment not reaching end of second palpal segment. Newstead's scales as in male. Ascoids and terminal antennal segments as in male, though the former somewhat longer. Wings as in male though relatively broader.

Cibarium as figured, often only 10 or 11 horizontal teeth visible. Pharynx rather broad, not strongly pigmented, unarmed except for weak digitate processes and transverse ridges. Spermathecae as figured, usually with five annuli, rarely with six, the annuli of the same diameter and no incipient annuli at the junction of the duct with the spermathecal body. Ducts opening separately into the vagina. Eighth tergite with a patch of setae laterally. Ninth tergite with numerous lorate or ligulate striate scales dorsally. Cerci short, of normal shape.

*Holotype* male, slide 3291, Almirante, Bocas del Toro Province, Panama, 19 June, 1951; taken between buttressed roots of large tree at Yellow Fever Station D; Quiñones coll. *Allotype* female, slide 2474, Finca Nievecita, Almirante, Bocas del Toro Province, Panama, 21 June, 1950; taken between buttressed roots of large tree, R. Hartmann coll. *Paratypes*, 21 males and 22 females mounted in copal-balsam from the following localities: El Valle, Cocle Province, Panama, 31 March, 1945, biting or resting on man in the forest, 9 P. M., H. Trapido and C. D. Michener colls. (1 ♂, 3 ♀); Madden Field, near Calzada Larga, Panama Province, Panama, 30 Oct. to 5 Nov., 1945, biting man, Marucci and Wood colls. (4 ♀); Cerro Campana, Panama Province, Panama. 17 Jan., 1947, in buttress in forest at 2500 ft. elev., Hertig & Fairchild colls. (1 ♂); Robalo, Bocas del Toro Province, Panama, 30 Jan., 1947, in buttress in forest, P. Galindo coll. (1 ♂); Sta. Fe, Veraguas Province, Panama, 20 March, 1947, in buttresses in forest at 2500 ft. elev., P. Galindo coll. (2 ♂); Upper Rio Las Cascadas, nr. La Victoria, Cerro Jefe, Panama Province, Panama, 26 Feb., 1948, at light, P Galindo coll. (2 ♀); La Victoria, Cerro Jefe, nr. Tocumen, Panama Province, Panama, 29 Dec., 1948, in an automatic mosquito light trap in forest at 2300 ft. elev. (1 ♂); Quebrada Escondida, upper

Rio Pequeni, Panama Province, Panama, 26 March, 1949, Galindo & Trapido colls. (1 ♀); Palenque, Colon Province, Panama, 14–15 Sept., 1949, in buttresses and large hollow tree in forest, R. Hartmann coll. (7♂, 4♀); Cacique, Colon Province, Panama, 17 Sept., 1949, in buttresses in forest, R. Hartmann coll. (2 ♂); Rio del Medio, Rio Gatun, Canal Zone, 15 Oct., 1949, in buttress in forest, R. Hartmann coll. (1 ♂); Finca Nievecita, Almirante, Bocas del Toro Province, Panama, 15–22 June, 1950, in buttresses in forest, R. Hartmann coll. (5 ♂, 3 ♀); Finca dos Caños, Almirante, Bocas del Toro Province, 18 June, 1950, in buttresses, R. Hartmann coll. (2 ♀); Almirante, Bocas del Toro Province, 29 June, 1951, in buttresses near Yellow Fever Stations, Quiñones coll. (3 ♀).

In addition to the mounted material listed above, we have examined 3065 specimens, about equally divided as to sex, which have been cleared in KOH and stored in alcohol. The bulk of this material (2495 specimens) is from Almirante, mostly taken biting man at night or resting on tree trunks at platforms built in the tree tops (1949 specimens); 412 specimens were from mosquito light traps run in Mojinga swamp, near Ft. Sherman, C. Z., while the remainder represent scattered small lots from Gatun, Madden Dam, Loma Borracha and Mindi dairy in the Canal Zone, La Victoria and the Pacora area east of Panama city, mostly taken in light traps, and two small lots from Cacique, Colon Prov., October, taken biting in the forest by day and El Real, Darien, taken biting in the tree tops in July. There are also 29 specimens from various localities in the neighborhood of Turrialba, Costa Rica, mostly from buttresses. Finally, through the kindness Dr. Luis A. Leon, of Quito, Ecuador, we have received a small lot of females of this species from Quevedos, Ecuador. These were taken biting man with *P. gomezi*, but whether in houses or outdoors is not known. This represents the first record, to our knowledge, of *Phlebotomus* from Ecuador.

Our records show that the species has been taken in every month of the year, though more abundantly from August to January. The bulk of the material was collected biting man at night in the tree tops or resting on the tree trunks nearby. It has also been taken biting man at ground level in the forest, both day and night, though in far less numbers. Mosquito light traps and Shannon traps with gasoline lantern have taken over 800 specimens. It is occasionally fairly common in buttresses, over 200 specimens, and has been secured once from an animal burrow and once, 21 specimens, from a hollow tree. Although other species are taken in the tree top catches, *trapidoi* is overwhelmingly the dominant species and is relatively scarce elsewhere, if collections at light are excluded. It appears to be as definitely arboreal as are such mosquitoes as *Haemagogus spegazzinii* and *Sabethes chloropterus*, at least in the adult stage.

The distribution in Panama is probably wider than our records indicate, as its tree-top habitat has been explored in only a few localities. As would be expected, most of the localities are in areas of heavy forest and abundant rainfall. It has been taken at seven places in the Canal Zone, all on the Atlantic side of the continental divide, three localities in Colon Province and four in Bocas del Toro Province, all

on the Atlantic side. Of the three localities in Panama Province, two are at elevations of over 1000 ft. in wet mountain forest, the third in heavy lowland forest near the coast. The single collection from Veraguas Province was also in wet mountain forest, while the singel collection from Darien Province was at a tree-top station in high virgin forest. The Costa Rican material was all from wet forest on the Atlantic slope. Rather extensive collections from Chriqui Province, and the Pacific slope of adjoining Costa Rica have not yielded this species, though both light trap and some night collecting in tree tops has been done.

We take great pleasure in dedicating this species to our colleague, Dr. Harold Trapido, who has been an indefatigable collector of *Phlebotomus* and whose studies of forest canopy mosquitoes led to the discovery of the arboreal habitat of this interesting species.

The close relationship of the two preceding species, *ylephiletor* and *trapidoi*, to *whitmani* of Brasil and Paraguay, which is stated by Barretto (1943) to be the commonest species biting man in zones of high leishmaniasis endemicity in Sao Paulo and which was found by Hertig in a recent survey to be the commonest species in the endemic zones of Paraguay, suggests that they may be of importance in the transmission of that disease in Panama. Although hardly conclusive, it is of interest to note that the collector who for nearly a year made the weekly tree-top catches at our Almirante station contracted cutaneous leishmaniasis. In French Guiana, Floch and Abonnenc state (1946) that *anduzei*, another closely related species, is the commonest species in the Colony and bites man readily.

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