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FROM PERU

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By

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A NEW GENUS OF BLOODSUCKING PSYCHODIDS FROM PERU¹

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In the course of studies on Carrion's disease carried out in Peru (Hertig, 1942) thousands of specimens of *Phlebotomus* were collected. Most of the field work was done in the verruga zone of the Rimac Valley. The sandfly material included all of the three species known from that region, *P. verrucarum*, *P. noguchii* and *P. peruensis*. Collections were made in houses, caves, excavations, pigpens, etc., both by day and by night. Included in the catches were occasional specimens of a psychodid somewhat larger than any of the local species of sandfly, rather like *Phlebotomus* in general appearance, but obviously not that genus. The first specimen, an unfed female from Puente Carrion in June, 1937, was successfully fed on a verruga patient. It was over a year, however, before another specimen was taken. At that time, the field work was shifted from Puente Carrion to points farther up the valley, where we began to get one or two specimens per month. The bloodsucking habit was quickly confirmed, since several of the first specimens contained red blood. They were taken in caves and houses along with *Phlebotomus*. Some were kept alive as long as possible in the hope (never realized) of obtaining eggs. Other live or fresh specimens were dissected or put up for sectioning, or mounted in balsam.

There was much spontaneous interest on the part of the whole staff in this new bloodsucking psychodid. In all our field work we were constantly on the look-out for it and there was considerable friendly competition for the honor of capturing the first male. In spite of this active interest the psychodid continued to be represented only by occasional females. About half of them had fed in nature. In September, 1941, after over four years of continuous collecting, the total was only 34 specimens. At the time of writing there are unfortunately not at hand details of the catches during the next year, but this psychodid continued to be rare until about August, 1942. At that time two members of the staff, Dr. Aristides Herrer and Sr. Maximo Puertas, were trying to locate sandfly breeding-places by searching likely spots at or soon after sundown, when sandflies begin to leave their diurnal shelters. At one spot they caught several of the new psychodids at one time, along with *Phlebotomus*, particularly *P. peruensis*. One of

¹This work was begun at the Instituto Nacional de Higiene y Salud Publica, Lima, Peru, and was continued as opportunity permitted while stationed at Gorgas Memorial Laboratory, Panama, as member of a unit of Sanitary Corps officers. The latter phases were carried on under a contract recommended by the Committee on Medical Research between the Office of Scientific Research and Development (the contract having been assumed later by the Office of the Surgeon General) and the Gorgas Memorial Laboratory.

the men was seen to be bitten by the new psychodid as well as by *Phlebotomus*. No males were found. This was near Matucana in the valley which joins the Rimac just below the town. Here, at a place about one kilometer up the valley and on the south side, an irrigation ditch is carried on top of a stone wall past a shallow concavity in the vertical rocky hillside. This spot, known to our staff as *Acequia Cueva*

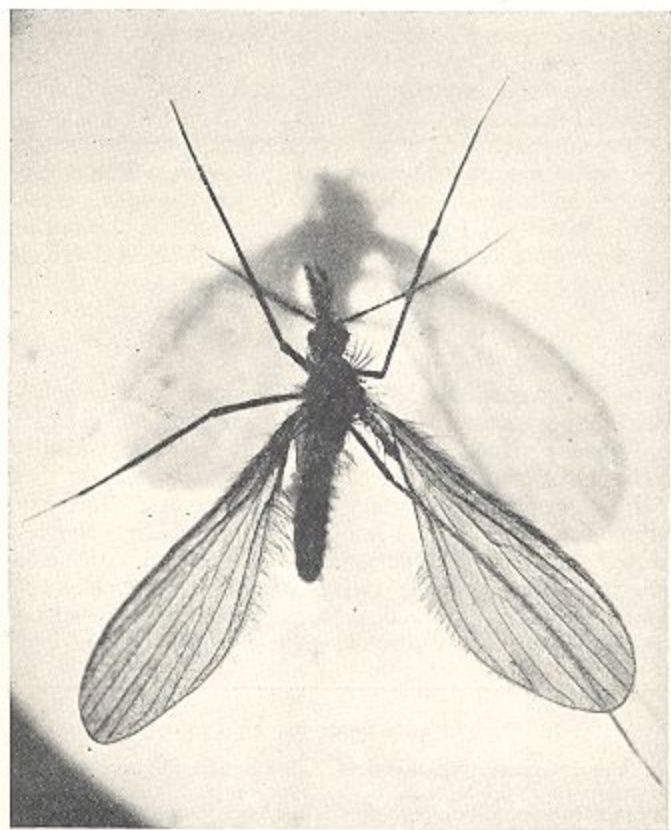


FIG. 1. *Warileya phlebotomanica*, live, unfed female, normal resting position; body and wing scales only slightly rubbed; $\times 13.5$. Compared with *Phlebotomus*, *Warileya* is slightly larger and much less hairy. The relatively long, broad and rounded wings are held outward at a greater angle and are more nearly horizontal. For comparison with photographs of several species of *Phlebotomus* at the same magnification, and for technique of photography, see Hertig (1942).

(ditch cave), was visited repeatedly with the express hope of securing males. All-told, several dozen females were taken, but not until October, 1942, was a male found, when Sr. Puertas sent one alive to the laboratory. Field work was discontinued early in December, 1942, when the writer left Peru. On two subsequent trips to Peru in connection with Army duties, this same place was revisited. In January, 1944, the irrigation ditch had been dry for some time and neither

Phlebotomus nor the new psychodid was found, but in August, 1945, Sr. Puertas caught two males together with about forty females.

The great majority of our specimens have come from Surco and Matucana, i.e., between 2000 and 2400 meters in altitude. Below this level we have taken only six specimens, distributed as follows: Puente Carrion, 2; Lanca, 1; Tornamesa, 1; Huinco (Santa Eulalia valley, 1800 meters), 2. It may be noted that *P. peruensis* is limited to approximately these same altitudes, which mark the upper part of the verruga zone, while the other two species of *Phlebotomus* occur throughout the whole verruga zone.

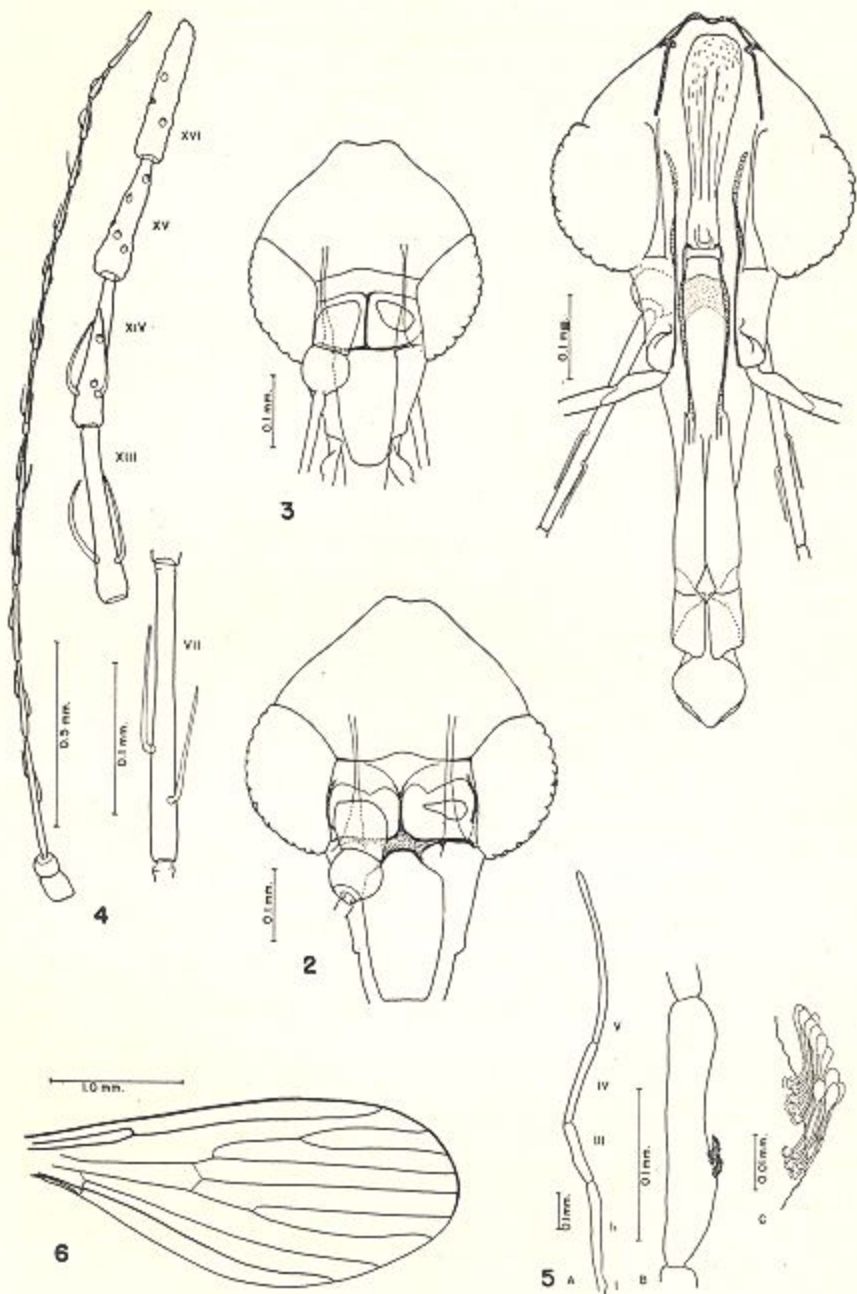
Little is known about the habits of the new psychodid. Man is certainly one of the hosts. In at least two cases biting was observed in nature. Several specimens were fed on man in the laboratory, and 11 out of the first 34 specimens were taken in houses. The rest were taken in caves, stone walls and pigpens. The technique which is successful in inducing oviposition by *Phlebotomus*, i.e., confining the fed female in a tube with a plug of moist plaster of Paris in one end (Hertig, 1940), failed completely in the case of the new psychodid.

Smears and sections were examined but no experimental work was done with this psychodid. We have no evidence as to any possible role in the transmission of verruga.

We have had access only to limited literature and material of genera other than *Phlebotomus*. However, a summary of the characters of the psychodid genera which Dr. O. A. Johannsen very kindly, and at considerable labor, provided for us, makes us feel certain that the new sandfly can not be included in any described genus. There is proposed the generic name *Warileya* in honor of W. A. Riley, the teacher and friend of so many of this generation of medical entomologists and parasitologists. The specific name *phlebotomanica* (fond of blood-letting) not only refers to the bloodsucking habit but in embodying the etymology of *Phlebotomus* symbolizes the relation to that genus.

EXPLANATION OF PLATE I

FIG. 1. Head, female, ventral view. The head and its appendages are very similar to those of *Phlebotomus*. Cibarium: central portion of chitinous arch broad, very faintly sclerotized, sharply outlined only on posterior margin. Cibarial armature limited to numerous very fine hairs (not shown) scattered over the clear area posterior to the chitinous arch; the conspicuous spines, usually found in *Phlebotomus*, lacking. FIG. 2. Head, female, dorsal view. The frontoclypeal suture is much thicker than in *Phlebotomus*. Compare with Figure 3. FIG. 3. Head, *P. verrucarum*, female, dorsal view. Compare with Figure 2. FIG. 4. Antenna, with details of certain segments. Number of segments, structure and distribution of ascoids as in *Phlebotomus*. FIG. 5. A. Palp, five-segmented, *Phlebotomus*-like; segment III slightly expanded, profile of inner surface with curved depression. B. Segment III, modified scales on inner surface; deciduous scales and fine hairs not shown. C. Segment III, detail of paddle-like, modified scales. There are two compact patches close together, the basal one with about 7 scales, the other with about 24, of which about a third are shown. This same segment in *Phlebotomus* characteristically bears similar modified scales either scattered or in patches. FIG. 6. Wing, female. The wing is broad with rounded apex, compared with the narrow, pointed wings of *Phlebotomus* in general; venation essentially the same; bases of R_{2+3} and M_1 faint and with pronounced curve.



Warileya phlebotomanica, gen. et spec. nov.

Drawings made with the aid of the camera lucida, from balsam mounts except as noted.

Warileya phlebotomanica, gen. et spec. nov.

Plates I, II

General appearance, similar to *Phlebotomus*; slightly larger and much less hairy than most species of that genus; light yellow in color. As seen grossly the most marked differences are in the wings which are relatively very large with rounded apices. They are held outward at a greater angle and are more nearly horizontal than in *Phlebotomus*. The photograph of a live, normal, unfed female may be compared with those of various species of *Phlebotomus*, at the same magnification, shown in Plate 5, Hertig, 1942.

In nature *Warileya* has the same short, hopping flight characteristic of *Phlebotomus*.

Head (Figs 1-5) closely similar to *Phlebotomus*, the antennae and palps having the same relative proportions, position and number of segments.

Proboscis as in *Phlebotomus*. No significant differences in the stylets were noted in the dissection of various specimens.

Antennae (Figs. 1, 4). Ascoids simple, geniculate, on segments III to XIV, extending to distal third of segment.

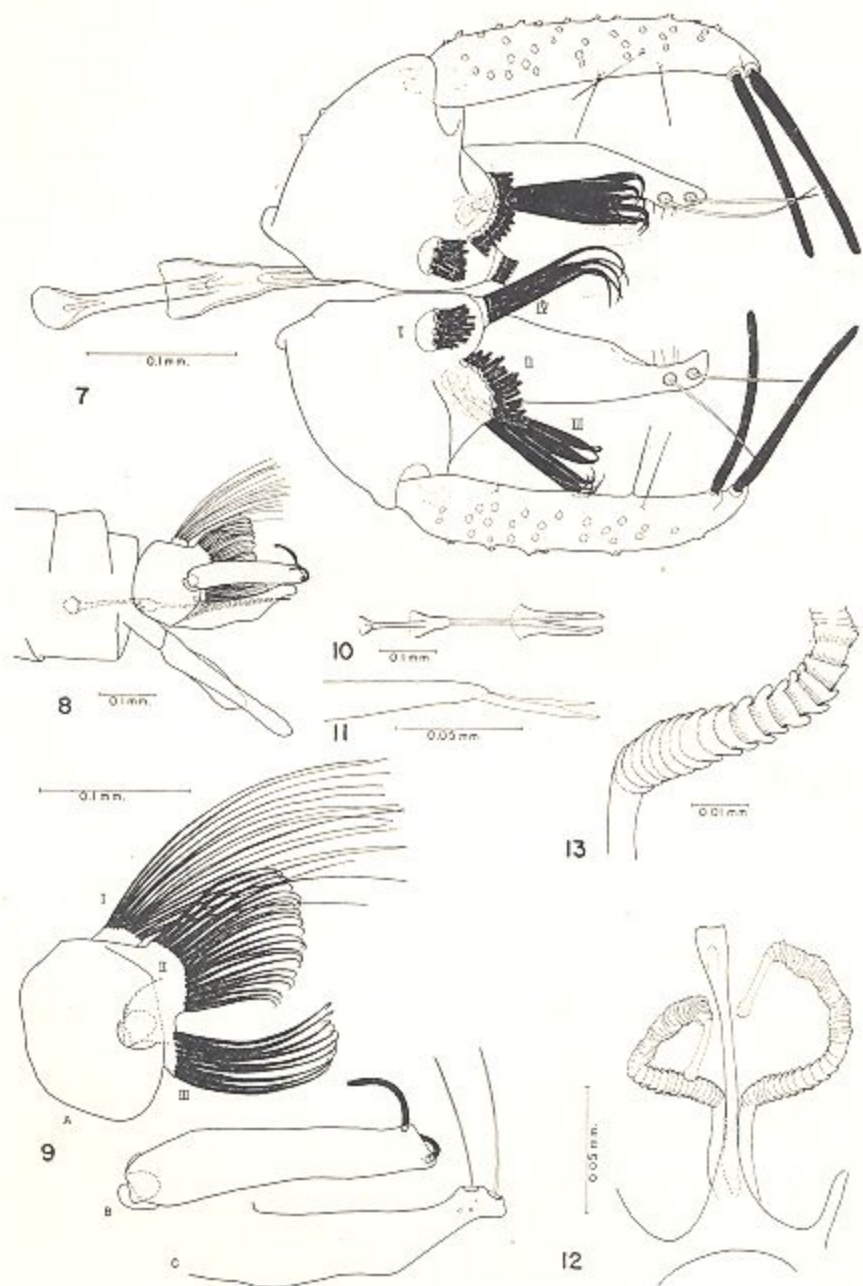
Palps (Fig. 5). Segment III slightly expanded, inner surface with curved depression as seen in profile; two patches of paddle-like, modified scales on inner surface at basal third. Similar modified scales, scattered or in patches, are found on the same palpal segment in *Phlebotomus*.

Frontoclypeal suture (Fig. 2) much thicker than in *Phlebotomus* (Fig. 3).

Cibarium, female (Fig. 1). The characteristic *armature* of *Phlebotomus* (conspicuous spines or teeth) lacking. However, the whole area posterior to the chitinous arch is studded with very fine spines or hairs (not shown in figure), which are more numerous and longer at the sides.

EXPLANATION OF PLATE II

Fig. 7. Male genitalia, dorsal view; phenol mount. The coxites are short, heavy truncated cones extending outward at right angles to the body axis, their dorso-posterior surfaces bearing four tufts of long heavy spines. The dorsal tufts are drawn as though cut off near their bases. The widely separated tips of the aedeagus are indicated by dotted lines. Lateral lobes not shown. Fig. 8. Male genitalia, side view; balsam mount. The lateral lobes arise from a common base, making them Y-shaped in dorso-ventral aspect. Fig. 9. Details, same preparation as Fig. 8. A. Coxite, only three of the four tufts shown. B. Style. C. Paramere. Fig. 10. Genital pump, filaments, aedeagus, dorsal view; same preparation as Fig. 7. Fig. 11. Tips of genital filaments extruded from aedeagus, side view; same preparation as Fig. 8. Exact location of openings not made out. Fig. 12. Spermathecae and part of genital fork, ventral view; balsam mount. The central portion of the spermathecae is composed of conspicuously sclerotized, telescoping annulations; distal portion thin-walled, with irregular trachea-like thickenings; basal part of ducts thin-walled but smooth and sharply defined. In phenol preparations the latter have been seen to empty separately into very thin-walled structures which broaden as they extend toward the posterior edge of the genital fork. Fig. 13. Spermatheca, detail, same preparation as Fig. 12. Each annulation bears on the inner surface a row of very fine hairs. Comparable structures have not been observed in *Phlebotomus*.



Chitinous arch heavily sclerotized only at the sides, the central portion a broad, faint band best seen in stained preparations, with only the posterior margin sharply defined.

Pharynx similar to *Phlebotomus*; posterior portion with folds, some with fine spines.

Wing (Fig. 6) broad with rounded apex, unlike the narrow, pointed wings of *Phlebotomus*; long in proportion to body length; scales along veins and margin very slender, never obscuring the venation, even in unrubbed specimens. *Venation* essentially the same as *Phlebotomus*; bases of R_{2-3} and M_1 very faint and with pronounced curve; fork of R_4 and R_5 close to base of R_{2-3} , making *gamma* very short.

Male genitalia (Figs. 7-11) strikingly different from *Phlebotomus* in general appearance, chiefly on account of the position and shape of the coxites and the enormous tufts which they bear. The structures are best seen in dorso-ventral aspect.

Coxite (Figs. 7-9) short, heavy, conical, extending laterally at right angles to the body and bearing four separate tufts of long, heavy spines on the dorsal and posterior surfaces:

Tuft I, about 20 long, curved spines arising as a compact clump from a circular prominence on the dorsal side and spreading so as to obscure partially the other tufts.

Tuft II, a double row of about 24 heavy spines, curved inward at the tips.

Tuft III, a single row of about eight flattened spines, thin at the edges and curving inward at the tips, arranged like the ribs of a folded fan.

Tuft IV, a single row of about six heavy spines with curved tips, the basal portion apparently fused. This tuft is obscured by the others in both lateral and dorsal view.

Style (Figs. 7-9) slender, cylindrical, with two heavy, apical spines; two or three fine, long, apparently non-deciduous hairs at the distal third.

Paramere (Figs. 7-9) simple, with two long, slender, colorless, dorsal, apical spines and several fine hairs on the inner surface near the apex.

Lateral lobes (Fig. 8) straight, diverging from a common base to form a Y.

Aedeagus (Figs. 7, 8, 10, 11) more deeply divided than in most species of *Phlebotomus*, the tips rather widely separated.

Genital pump and *filaments* (Figs. 7, 8, 10, 11) as in *Phlebotomus*.

Female genitalia. *Cerci* similar to *Phlebotomus*.

Spermathecae (Figs. 12, 13) paired tubes; basal portion smooth, sharply defined, followed by nearly twenty telescoping annulations, conspicuously sclerotized, each annulation bearing on the inside a row of extremely fine hairs; distal portion thin-walled with irregular, trachea-like thickenings, terminating in a straight slender tube with a knob-like expansion. The very fine hairs which, in *Phlebotomus*, usually radiate from this terminal knob or "head" have not been made out, although there are dot-like structures which could represent their bases.

In phenol mounts, the ducts have been seen to empty separately into two very thin-walled, flat structures which broaden as they extend toward the posterior margin of the genital fork. The details have not been made out.

A comparison with *Phlebotomus* is difficult since that genus displays a fantastic series of variations of what are fundamentally paired ducts with a common basal portion and ending usually in a marked expansion, which apparently serves as a reservoir, surmounted by a protuberance bearing fine hairs of unknown function. In *Warileya* the ducts are completely separate and there is no expanded portion. Internal hairs have not been noted in *Phlebotomus*.

TABLE I
MEASUREMENTS IN MILLIMETERS
Warileya phlebotomanica

	TWO MALES		SIX FEMALES		
	Balsam Mount	Temporary Phenol Mount	Balsam Mounts		
			Max.	Min.	Mean
Body length (thorax + abdomen, excluding ♂ hypopygium).....	1.97	1.64	2.49	1.85	2.27
Head—					
Total length, including proboscis.....	.70	.71	.99	.79	.89
Vertex to anterior margin of clypeus.....	.43	....	.71	.46	.55
Head, width.....	.35	....	.44	.29	.37
Eye, length.....	.17	....	.22	.17	.19
Vertex to eye, lateral profile.....	.19	....	.21	.18	.20
Antenna, segments III-XVI.....	1.97	2.14	2.36	1.85	2.16
Segment III.....	.32	.31	.33	.28	.31
Palp, segments I + II....	.25	.26	.38	.29	.33
III.....	.17	.16	.20	.15	.17
IV.....	.18	.21	.25	.14	.20
V.....	.41	.47	.50*	.43*	.47*
Wing, length.....	2.90	3.04	3.74	3.01	3.40
Width.....	1.08	1.10	1.43	1.12	1.25
alpha.....	.79	.78	1.09	.84	.95
beta.....	.50	.51	.59	.46	.53
gamma.....	.05	.03	.12	.03	.06
delta.....	.40	.41	.68	.52	.59

*The fifth palpal segments of the six females measured were somewhat shrunken. For this segment there have been substituted measurements of seven females subsequently mounted with little or no distortion.

Holotype male.—Specimen B, near Matucana, Rimac Valley, Peru, at the "Acequia Cueva" described above, 23 Aug., 45, coll. M. Puertas. Figures 7 and 10 were drawn from this specimen. One other male and at least 25 females were taken on the same occasion.

Allotype female, same place, date and collector as holotype.

Paratypes.—On hand at time of writing (Panama, 1947), all locations in Rimac Valley, Peru, 2 males, 55 females, as follows:

Males: slide, 1 ♂, Matucana, Acequia Cueva, 27 Oct., 42, coll. M. Puertas; in alcohol, 1 ♂, same place and collector, 23 Aug., 45.

Females: slides: 1 ♀, Puente Carrion, June, 37; 1 ♀, Matucana, Nov., 39; 2 ♀, Surco, 8 Aug., 42; 2 ♀, no data, but same region prior to 1942; 9 ♀ Matucana, Acequia Cueva, 23 Aug., 45. In alcohol: 1 ♀, Matucana, 21 Nov., 39; 1 ♀, Matucana, cave with mouse, 4 Nov., 40; 1 ♀, Rimac Valley before 1942; 1 ♀, Surco, biting man, 20 Aug., 45, coll. A. Herrero; 2 ♀, Surco, cave, 1 each on 23 and 25 Aug., 45; Matucana, Acequia Cueva, 16 ♀ on 23 Aug., 45, 18 ♀ on 25 Aug., 45, coll. M. Puertas. Where not specified, collectors were the field and laboratory staff or the writer.

Various additional females (labeled *Psychodidae-X*) were left at the Instituto Nacional de Higiene y Salud Publica, Lima. Since August, 1945, Sr. A. Caballero, Dr. Herrero's assistant, has collected a number of females and at least one male at the Matucana Acequia Cueva, which have been examined in alcohol by the writer.

Types to be deposited in the U. S. National Museum, Washington.

REFERENCES

- Hertig, M. 1940. Glass tubes for rearing *Phlebotomus* and other insects. *Science*, 92: 91-92.
1942. *Phlebotomus* and Carrion's disease. *Suppl. to Amer. Jour. Trop. Med.*, vol. 22, No. 5, July, 1942, 81 pp.