

# NOTES ON THE PHLEBOTOMUS OF PANAMA

## (Diptera, Psychodidae)

### III. *P. CRUCIATUS* COQ., TRINIDADENSIS NEWST. AND GOMEZI NITZ.<sup>1</sup>

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The three species treated in the present paper are considered together because two of them, *cruciatu*s and *trinidadensis*, have been confused with each other for many years, while *cruciatu*s and *gomezi* are closely related man-biting species likely to be confused with one another. *P. cruciatu*s does not occur in Panama, but is included for comparison with *gomezi* and to clarify its status.

#### *Phlebotomus cruciatu*s Coquillet

1907, Ent. News, 18, p. 102 (♀; Cacao, Trece Aguas, Alta Vera Paz, Guatemala). Haseman, 1907, Trans. Amer. Ent. Soc., 33, p. 322. Summers, 1913, J. London Sch. Trop. Med., 2, p. 115. Shannon, 1913, Proc. Ent. Soc. Washington, 15, p. 166. Larrousse, 1921, Etud. Syst. Med. Phleb., pp. 64, 74. Shannon, 1926, Journ. Wash. Acad. Sci., 16, p. 193, fig. 5 (♀ cerci). Not *Phlebotomus cruciatu*s Dyar (1929) and others. (The extensive references to the name listed by Barretto (1947), other than those here cited, are to *trinidadensis* Newst. in whole or in part, following Dyar.)

This species has been long misunderstood. Only Shannon and Dyar, aside from the original describer, had access to material, and the latter by associating males of another species completely submerged the true identity of *cruciatu*s.

We have recently had the opportunity of examining the type material of this species at the U. S. National Museum. The Types consisted of five females from Cacao, Trece Aguas, Alta Vera Paz, Guatemala, collected April 2, 15, 18 and 26, 1906, by Messrs. H. S. Barber and E. A. Schwarz. Of these, two specimens appear to have been mounted, but only one of these shows the structure of spermathecae and cibarium. We have measured both specimens and made camera lucida drawings of the cibarium, pharynx and spermathecae of the one which shows these structures (Slide No. 5051, labeled as Paratype).

The original description of this species is wholly inadequate, and has led others to regard the name as a *nomen nudum*. The description reads as follows: "Same as *vexator*, except that the hairs are chiefly yellow and the first submarginal cell is about three times as long as its petiole. Male unknown."

Mr. H. S. Barber, one of the collectors, records the species as a severe biter (Proc. Ent. Soc. Washington, 8 (3-4), p. 102, 1906 (1907)).

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and one of us in conversation with Mr. Barber on 16 Jan., 1946, elicited the information that he and Mr. Schwarz took the type specimens on several occasions, once biting in the jungle in the daytime, and at other times resting on the outside walls of a house at night where they were collecting other insects attracted to a lantern inside the screen door of the house.

On page 107 of the same number of the Proc. Ent. Soc. Washington there is a photograph of the type locality, which is stated to be at an elevation of about 900 ft. and in heavy rain forest.

We have recently received a number of specimens of *Phlebotomus* from various localities in Mexico through the courtesy of Dr. Luis Vargas. This material consists of 3 females from Tapachula, 2 females

TABLE I  
MEASUREMENTS IN MICRA

	<i>P. gomezi</i> , Panama.						<i>P. cruciatus</i> , Mexico and Guatemala.				
	Maximum		Minimum		Mean		Maximum	Minimum	Mean	Types	
	♂	♀	♂	♀	♂	♀				♀	♀
Ant. III.....	332	300	300	240	314	273	308	264	286	273	318
Palpi I + II.....	224	216	172	184	196	202	220	176	203	184	215
Palpi III.....	208	200	172	176	187	187	192	168	178	174	175
Palpi IV.....	148	140	120	116	133	130	148	128	136	165	140
Palpi V.....	424	440	240	240	358	352	456	240	358	347	300
Head height.....	280	288	256	260	268	276	280	248	265	397	433
Clypeus.....	140	148	116	132	126	139	132	120	126		
Proboscis.....	284	348	240	296	264	327	312	248	287	290	314
Eye height.....	240	236	208	208	224	219	232	209	214		
Wing length.....	2120	2080	1800	1850	1960	1970	2080	1830	1940	1790	2000
Alpha.....	612	648	504	504	550	568	558	396	502	447	546
Beta.....	288	278	216	180	237	234	306	216	259	249	278
Gamma.....	288	324	216	216	244	270	342	252	296	264	315
Delta.....	216	234	126	108	165	176	162	72	102	84	104

from Arroyo Expangale, Tabasco, 7 females from Finca El Vergel, Chiapas, 1 female from Tamazunchale, San Luis Potosi and 1 female from Guadalupe, Zaju, Chiapas. Other material sent us at the same time from Tapachula, Chiapas, and Matamoros, Campeche, was already mounted, but not well enough to make out the necessary details of structure, although we suspect they are the same species. The first fourteen specimens, mounted by us, agree very closely in the structure of the spermathecae with *cruciatus*, and we are inclined to believe they represent that species. Measurements of wing and palpi and structure of the cibarium also agree. Finally, one of us collected a single female from buttresses of a hollow tree in heavy forest in the lowlands of Guatemala near Esquintla which agrees closely with the Types and the Mexican material. We have seen then, at least fifteen females of what we believe to be true *cruciatus*.

On comparing this material and our drawings and notes on the Types with specimens of *P. gomezi* Nitz. 1931 (= *P. suis* Rozeboom, 1940) from Panama, we find no essential differences in measurements of palpi and wings. Although *delta* and *alpha* appear to average somewhat shorter in *cruciatius* than in *gomezi*, the measurements of individual specimens overlap, as shown in Table I. The spermathecae of *cruciatius* (Pl. I, figs. 5, 6) are of the same type as those of *gomezi* (Pl. I, figs. 2, 3) but the ducts are considerably shorter and thicker in *cruciatius*, and there is less contrast in the diameter of heads and ducts than in *gomezi*. The cibaria also appear to differ consistently. In *cruciatius* (Pl. I, fig. 4) the chitinous arch is well marked, complete, rather flat and quite distant from the teeth, while in *gomezi* it tends to be incomplete or very faint in the middle, more arched, and considerably closer to the teeth in Panama specimens. Barretto (1946) shows a complete but pointed arch for a specimen from Venezuela.

A further difference is to be seen in the structure of the cerci and the ninth tergite. In *cruciatius* the cerci (Pl. II, fig. 6) are very long and slender and bear three long stout hairs on the ventral side near the base. In *gomezi* the cerci (Pl. II, fig. 7) are shorter and more angled, but bear the same stout hairs. The ninth tergite of *cruciatius* (Pl. II, fig. 5) shows a curious papillate and heavily sclerotized area on the lateral anterior margin of the segment, entirely lacking in *gomezi*. Its degree of development varies in our material, but it is always present.

It is our opinion that these two forms may eventually prove to be races of a single species, but since we have no material from the extensive intermediate area, and the forms are distinguishable, it seems best to retain them as separate species for the present.

In regard to possible males of *cruciatius*, we have four males taken in company with the above mentioned female from near Esquintla, Guatemala. They are not distinguishable with certainty from males of *gomezi* from Panama, though our material is not in the best condition. The parameres appear somewhat more slender and the genital filaments slightly heavier than in Panama males, but the differences may be due to accidents of mounting. The figure of the paramere of *gomezi* given by Barretto (1946) differs to about the same degree from the appearance of Panama material as do the Guatemala males, but in an opposite direction, the Panama specimens showing an approximately intermediate condition.

The fact that the Types of *cruciatius*, and some of our Mexican material also, were taken biting man, is a further suggestive bit of evidence, as *gomezi* is one of the two species commonly taken biting man and other large animals in Panama. The Type of *gomezi* was taken in a lighted room in Venezuela, but we can find no published statement that it is a man-biting species in Venezuela, French Guiana or Brazil.

In regard to the identity of *suis* and *gomezi*, we accept provisionally their synonymy, although it may be well to point out certain discrepancies in the description of Venezuelan and Panamanian material. In his figure of the female cibarium, Barretto (1946, fig. 9) shows a high and rather pointed chitinous arch, while Panama material as figured by Rozeboom (1940) shows the arch evenly rounded and faintly or not at

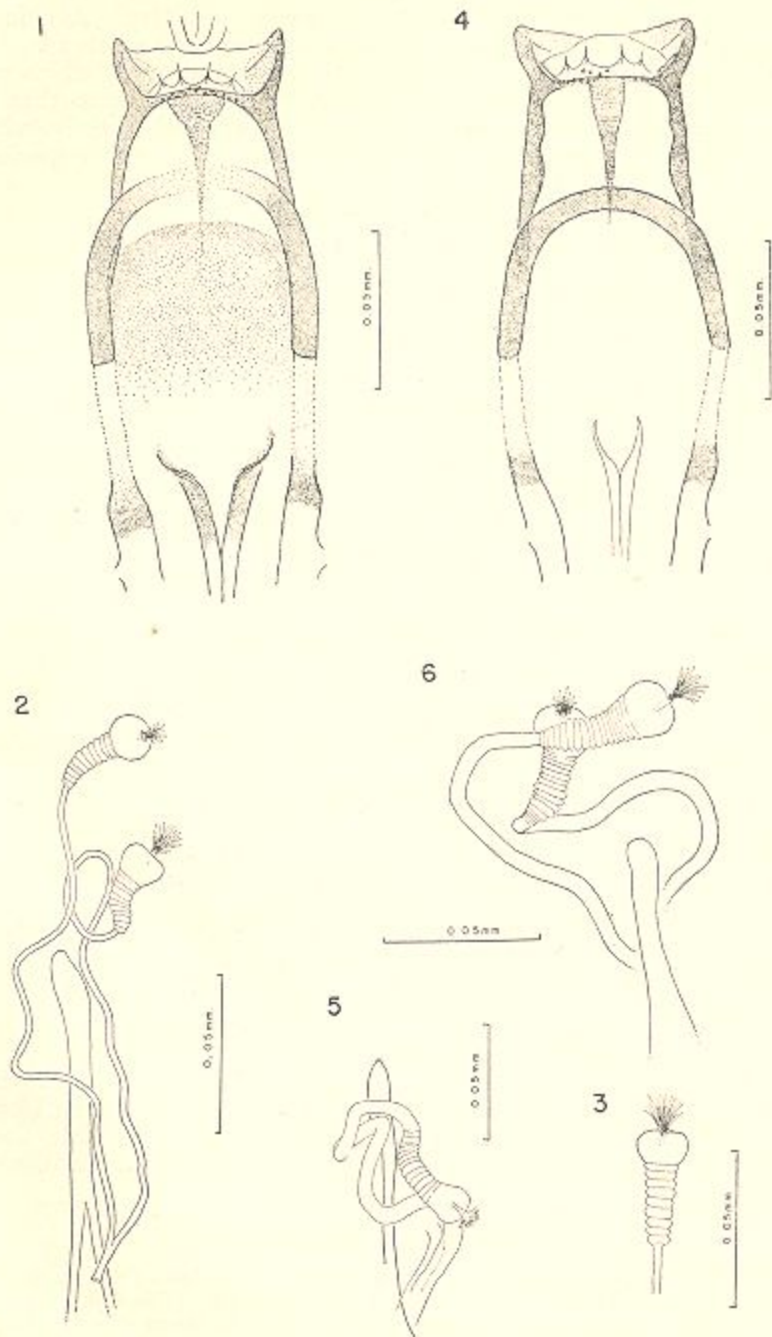
all visible centrally. We find both conditions and intergrades in our material, heavily stained specimens showing the arch practically continuous. A further character of possible importance in the cibarium of Panamanian *gomezi* is the prominently pigmented floor of the cibarium. This pigmentation begins abruptly just distal to the chitinous arch and fills out the distal two-thirds of the cibarium. We have noted this character in other species though it seems to have been overlooked by previous workers. It is best seen in unstained mounts, heavy staining obscuring the condition. Nitzulescu's (1931) figure of *gomezi* also shows a high and rather pointed arch. Barretto's figure shows two small lateral supplementary horizontal teeth in the cibarium, also shown by Nitzulescu, but not shown by Rozeboom nor seen by us, though we have seen material with a single supplementary tooth. In regard to Barretto's figure of the male, he shows a more clubbed paramere than any we have seen from Panama, the genital filaments in his specimen were apparently considerably more slender than in ours, and his basal tuft does not show the raspberry-like cluster of individual hair bases and the rather spreading habit of the tuft which seem quite characteristic of Panama material.

It might be well to point out also that *P. diabolicus* Hall from Texas appears to be quite closely related to *cruciatus* and *gomezi*. The male genitalia are very similar indeed to those of *gomezi*, and without material for comparison we are unable to point out valid differences. The differences indicated by Rozeboom (1940) in his description of *suis* apparently do not hold, as Hall's figure (1936) of *diabolicus* seems to have been misleading. Addis (1945) redescribed and figured *diabolicus* from topotypical material compared with the Types, and his figure of the genitalia shows no differences of importance from *gomezi*. The female of *diabolicus* described and figured by Addis differs from both *cruciatus* and *gomezi* in having six spines in the cibarium. It further differs from *cruciatus* in apparently lacking the papillate area on the ninth tergite and in more slender spermathecal ducts. However, the figure of the head of the spermatheca given by Addis is not entirely convincing, and may have been drawn from a shrunken specimen. The annulations are not clearly distinguished. From *gomezi* the female seems to differ further in having a well-marked chitinous arch and shorter spermathecal ducts. Measurements of wings, palpi, etc., show no significant differences between the three species, though *diabolicus* shows slightly shorter palpi and a slightly longer *gamma* than do the other two.

Both *gomezi* and *cruciatus* may occasionally show one or two small supernumerary teeth at the side, in the cibarium, and it is possible that *diabolicus* may eventually prove to be but a well-marked subspecies of

#### EXPLANATION OF PLATE I

Fig. 1. Cibarium of *P. gomezi* ♀ from Panama (Slide 833). Fig. 2. Spermathecae of *P. gomezi* from Panama, drawn in phenol. Fig. 3. Spermathecal head of *P. gomezi* from Panama showing maximum expansion, drawn in phenol. Fig. 4. Cibarium of *P. cruciatus* from Tapachula, Mexico (Slide 828). Fig. 5. Spermathecae of *P. cruciatus*, camera lucida drawing from a paratype, U. S. N. M. 5051. Fig. 6. Spermathecae of *P. cruciatus* from Tapachula, Mexico, drawn in phenol (Slide 827).



*cruciatus*, a statement which also holds for *gomezi*. The fact that *diabolicus* is also a man-biting species is especially suggestive. As things stand now, it would be impossible to separate from one another males of *gomezi* and *diabolicus*, or the presumptive *cruciatus* males which we have studied. The differences rest entirely on the females, so that if the advice of Mangabeira and Galindo (1944, p. 192) were to be literally followed it would be necessary to consider these forms as a single species.

### Phlebotomus gomezi Nitzulescu

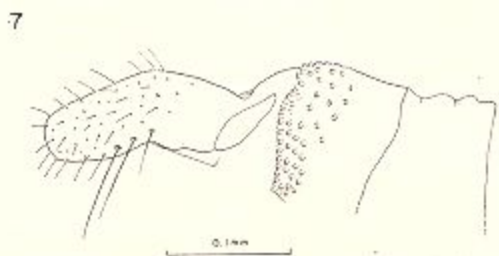
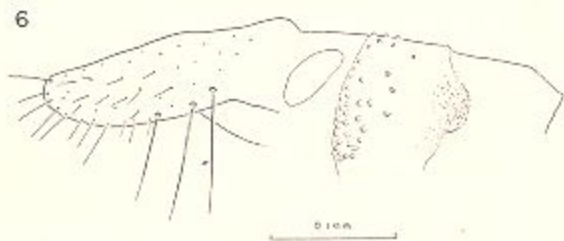
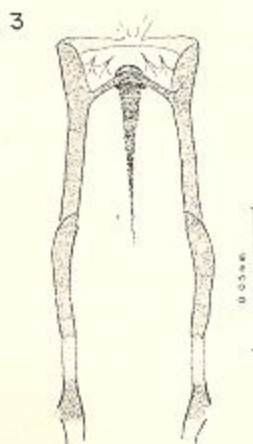
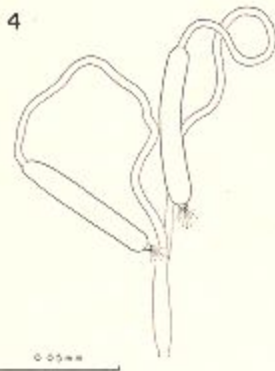
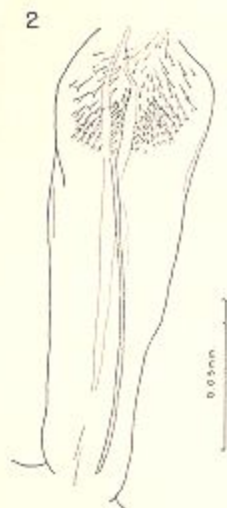
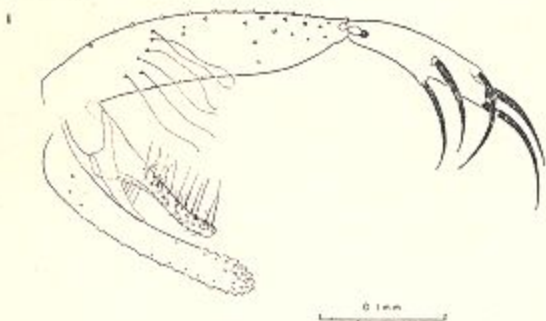
- 1931, Ann. Parasit. Hum. Comp., 9, pp. 247-255, figs. 1-6; Pl. IV (♀; San Cristobal, Venezuela). Costa Lima, 1932, Mem. Inst. Osw. Cruz, 26, pp. 67-68, figs. 83, 138 (♀; Venezuela). Bequaert, 1938, Carnegie Inst. Washington, Pub. No. 499, pp. 230, 233. Pinto, 1938, Zooparasit. Inter. Med. Vet., p. 152. Ortiz, 1942, Bol. Lab. Clin. Luis Razetti, 3, p. 167. Floch and Abonnenc, 1945, Inst. Pasteur Guyane, Pub. No. 100, p. 9. Barretto, 1946, An. Fac. Med. Univ. S. Paulo, 22, pp. 1-7, figs. 1-11 (= *suis* Rozeb. ♂, ♀; States of S. Paulo and Para, Brasil and Venezuela); 1947, Arq. Zool. Est. S. Paulo, 5, p. 202. Ortiz, 1947, Bol. Lab. Clin. Luis Razetti, Ano VIII, Vol. XV, p. 520 (= *suis* Rozeb. States of Aragua, Barinas and Tachira, Venezuela).
- Phlebotomus suis* Rozeb., 1940, Amer. J. Hygiene, 32, (1), Sec. C, pp. 8-11, figs. 1-5, (♂, ♀; Las Guacas, Panama). Mangabeira, 1941, Mem. Inst. Osw. Cruz, 36, p. 376 (♂; Aura, Belem, Para, Brasil). Floch and Abonnenc, 1943, Inst. Pasteur Guyane, Pub. No. 62, p. 7. Fairchild, 1943, Amer. J. Trop. Med., 23, p. 571 (Panama). Iriarte, 1944, Bol. Lab. Clin. Luis Razetti, 5, p. 269-273 (Venezuela). Floch and Abonnenc, 1945, Inst. Pasteur Guyane, Pub. No. 100, p. 9; 1947, Bol. Ent. Venezolana, 6 (1), p. 13.
- Phlebotomus japignyi* Floch and Abonnenc, 1944, Inst. Pasteur Guyane, Pub. No. 83, pp. 2-5, fig. 2-3 (♂, ♀; near Cayenne, French Guiana, in cavities in trees); 1945, op. cit., No. 100, p. 9. Barretto, 1947, Arq. Zool. Est. S. Paulo, 5, (4), p. 206. Floch and Abonnenc, 1947, Bol. Ent. Venezolana, 6, (1), p. 13.
- Phlebotomus trinidadensis* Callan, 1947, Rev. Ent. 18, (1-2), pp. 215-218.

In regard to *P. japignyi*, Floch and Abonnenc (1944) distinguish their species from *suis* in the male by relatively slightly shorter genital filaments, fewer and shorter hairs in the basal tuft of the coxite (10 in *japignyi*, 15 in *suis*) and slight differences in the relative lengths of the palpal segments. In the female they distinguish their species from *gomezi* and from *suis*. Their comparison with *gomezi* is made from the drawings published by Nitzulescu, and is based on slight differences in lengths of the spermathecal ducts and pharynx and structure of the spermathecal head. The differentiation from *suis* rests on the presence of 10-12 annulations of the head of the spermatheca, while in *suis* there are said to be but 8. In addition, the annulations are said to be "crenelated" in *japignyi* but rounded in *suis*.

In our material of *suis*, both the length and number of hairs in the tuft on the base of the coxite varies, actual counts ranging from 10 to 17 or more. The palpal measurements, as seen in the table, also vary considerably. Our female *suis* generally shows 9 annulations,

### EXPLANATION OF PLATE II

Fig. 1. Inner aspect of male genitalia of *P. trinidadensis* from Panama (Slide 134). Fig. 2. Pharynx of *P. trinidadensis* ♀ from Panama (Slide 880). Fig. 3. Cibarium of *P. trinidadensis* ♀ from Panama. Fig. 4. Spermathecae of *P. trinidadensis* from Panama, drawn in phenol. Fig. 5. Anterior margin of ninth tergite of *P. cruciatus* from Tabasco, Mexico, showing papillate area (Slide 1009). Fig. 6. Cerci and ninth tergite of *P. cruciatus* (Slide 1009). Fig. 7. Cerci and ninth tergite of *P. gomezi* from Panama (Slide 974).



but there may be more. The "crenelated" or rounded aspect of the annulations in profile is due to accidents of mounting, fully expanded and unshrunk specimens having rounded annulations, while even slightly shrunk specimens show the annulations angular in profile. Fine details of structure in these organs are difficult to make out at best, and variations in mounting technique lead to quite a different appearance. We can duplicate the appearance of all published figures of *suis*, *gomezi* and *japignyi* in our material, and we believe all three names refer to but one species.

Dr. E. McC. Callan has recently published (Rev. Ent. 18, (1-2), pp. 215-218, 1947) a note on the habits of "*P. trinidadensis*" in Trinidad. Since the species is said there to attack man readily, we were considerably surprised, as we have never found it biting man, or indeed any other animal, in Panama. Dr. Callan was kind enough to send us a vial of specimens taken biting in Trinidad, and these on mounting have proven to be all *P. gomezi*, 11 ♀ and 1 ♂. Dr. Callan states that his material was determined by Dr. O. Theodor, and it is reasonable to assume that the latter felt he was dealing with the same species described and figured by him in 1932 (Bull. Ent. Res., 23, pp. 22-23, figs. 8c, d) as possibly *trinidadensis* Newst. As we will show later, Newstead's female types are at present indeterminate, though they may have been this species, and the name must be based on the male. Theodor's figure differs so much from the appearance of the material sent us by Dr. Callan that we are at a loss to understand his determination.

We have identified some 356 specimens of this species, mostly females. They have been taken in all months of the year, but our data are not complete enough to show seasonal fluctuations in abundance. Specimens have been seen from localities in Darien, Panama, Colon and Los Santos provinces, as well as from several localities in Costa Rica, so that the species probably is widely distributed in the Republic. The majority of our specimens have been secured from horse- or calf-baited mosquito stable traps, but a considerable number have been taken biting man, both outdoors and in houses, even in quite urban areas. Scattered specimens have been taken in a light trap, in crevices in masonry walls, hollow trees, and in the crevices between the buttressed roots of large forest trees. Males are decidedly scarce, most of ours having been taken accompanying females in stable traps or resting on persons accompanying the biting females. One of our associates, Mr. Pedro Galindo, has recently taken the species in some numbers resting on the walls of houses in Calzada Larga, a small village in the Madden Lake area, so it is probable that it is semi-domestic.

This species and *P. panamensis* are the two common man-biting species in Panama, being about equally abundant. We have records of two or three other species biting man or domestic animals, but they are of minor importance in most areas. The bites are sharp and painful, out of all proportion to the size of the insect, and on susceptible persons produce an itching papule which may persist a week or more.

In our experience, sandflies are not often abundant enough in Panama to cause much annoyance; we seldom catch more than a dozen or so per night in stable traps, and two or three per night is the



usual catch, although rarely we have seen as many as 200 taken from a single stable trap.

### *Phlebotomus trinidadensis* Newstead

- 1922, Ann. Trop. Med. Parasit., 16, (1), p. 4, fig. 1 (♂, ♀, Trinidad). Galliard, 1934, An. Parasit. Hum. Comp., 12, (1), pp. 6-7. Mangabeira, 1942, Mem. Inst. Osw. Cruz, 37, (2), pp. 200-201. Floch and Abonnenc, 1947, Bol. Ent. Venezolana, 6, (1), p. 24.
- Phlebotomus yucatanensis* Galliard, 1934, An. Parasit. Hum. Comp., 12, (1), pp. 1-7, figs. 1-3. (♂, ♀; Chichen Itza, Yucatan, Mexico). Op. cit., 1934, 12, (3), pp. 200-201, fig. 5. Bequaert, 1938, Carnegie Inst. Washington, Pub. No. 499, p. 299 (in part).
- Phlebotomus cruciatus* Dyar, 1929, Amer. J. Hygiene, 10, (1), p. 119 (♂, ♀; Panama). Costa Lima, 1932, Mem. Inst. Osw. Cruz, 26, pp. 21-22. Hall, 1936, Proc. Ent. Soc. Washington, 38, (2), p. 28 (♂). Galvão and Coutinho, 1940, Rev. Ent., 11, (1-2), pp. 434, 437, Pl. I, fig. 11 (♀). Barretto, 1946, Rev. Brasil. Biol., 6, (3), p. 433; 1947, Arq. Zool. Est. S. Paulo, 5, Art. 4, pp. 194-195 (in part). Not *P. cruciatus* Coquillett, 1907.
- Phlebotomus yucatanensis* var. *baduelensis* Floch and Abonnenc, 1941, Inst. Pasteur de la Guyane, Pub. No. 15 (♂); 1941, op. cit., Pub. No. 28, pp. 1-3, fig. 1 (♀).
- Phlebotomus baduelensis* Floch and Abonnenc, 1944, Inst. Pasteur de la Guyane, Pub. No. 90, pp. 1-4, figs. 1-2, (♂, ♀; French Guiana); 1944, op. cit., Pub. No. 95, p. 3, fig. 1c (anomalous ♂); 1945, op. cit., Pub. No. 100, p. 7, Pl. 2 (♀). Barretto, 1946, Rev. Brasil. Biol., 6, (4), pp. 527-529.
- Phlebotomus longipalpis* Ristorcelli and Dao Van Ty, 1941, An. Parasit. Hum. Comp., 18, (4-5-6), pp. 252-255, fig. 1 (♀; Narino, Colombia). Not *P. longipalpis* Lutz and Neiva 1912.
- Phlebotomus vilhelai* Mangabeira, 1942, Mem. Inst. Osw. Cruz., 37, (2), pp. 196-201, figs. 131-146 (♂; Ceara and Para, Brasil).

Through the kindness of Mr. Paul Freeman we have been able to have Panama material compared with Newstead's Types at the British Museum. Mr. Freeman writes that the Types are not in very good condition and the staining is very faint. The male agrees with our material in details of the genitalia, including the hairs on the inner aspect of the coxite, and the genital filaments appear to be the same. Mr. Freeman was kind enough to measure the wings of the two males and a female from the type lot; his figures are included in the subjoined table (Table II). As will be seen, Newstead's specimens are rather smaller than the average of Panama specimens, but fall within the range of variation of our material. The palpi in the types are twisted and distorted, but Mr. Freeman believes they have the same structure and formula as our material. The female types were apparently not well cleared before mounting, and neither the cibarium nor spermathecae were visible. The wing measurements, however, fall within the range of variation of our series. Mr. Freeman was unable to make out the structure of the ascoids in the poorly stained types. We believe, therefore, that, at least in the case of the males, the above synonymy is correct. We are unable to consider the characters used to separate *baduelensis* Floch and Abonnenc, 1941 (= *vilhelai* Mangabeira, 1942) from *yucatanensis* Galliard of specific value as we believe that it is very probable that Galliard either overlooked the fine hairs on the inner aspect of the coxite or did not consider their presence worthy of mention. Even should a re-examination of Galliard's types prove their complete absence, their numbers are so variable in the material we have seen that we feel that at most they might be used to differentiate a geographic race or subspecies.

In the case of the females, little can be said. Remounting of Newstead's types would be of interest, but it might not prove that they were the same species as the male. The wing and palpal measurements are in fair agreement, but these characters are not definitive. Theodor's (1932, Bull. Ent. Res., 23, p. 22, fig. 8 c, d) description of females from Trinidad which he thought might be *trinidadensis* helps little, as his specimens were certainly not like the females which Galliard, Floch and Abonnenc and we have associated with *trinidadensis* males.

TABLE II  
MEASUREMENTS IN MICRA  
*P. trinidadensis*

	Panama Material								
	Maximum		Minimum		Mean		Cotype	Para-type	Cotype
	♂	♀	♂	♀	♂	♀			
	♂	♀	♂	♀	♂	♀	♂	♀	♀
Ant. III.....	260	240	200	196	228	221	.....	.....	.....
Palpi I + II.....	144	148	112	120	130	136	.....	.....	.....
Palpi III.....	148	152	112	136	131	140	.....	.....	.....
Palpi IV.....	116	116	100	100	105	109	.....	.....	.....
Palpi V.....	348	380	260	300	312	337	.....	.....	.....
Head height.....	220	236	200	212	211	222	.....	.....	.....
Glypeus.....	116	120	108	104	112	113	.....	.....	.....
Proboscis.....	152	188	140	168	146	174	.....	.....	.....
Eye height.....	176	196	156	168	165	182	.....	.....	.....
Wing length.....	1650	760	1380	1670	1490	1710	1420	1540	1600
Alpha.....	342	486	288	396	277	437	260	300	372
Beta.....	306	288	216	234	248	268	234	210	310
Gamma.....	258	306	234	252	261	279	270	250	240
Delta.....	162	270	126	162	156	214	100	100	200

Dyar's synonymizing of *trinidadensis* with *cruciatus* was based on wholly insufficient data, as Galliard and Theodor pointed out. We have seen both the Types of *cruciatus* Coq. and material from Venezuela and Panama determined by Dyar as *trinidadensis*. Dyar's males at least were *trinidadensis* in the present sense.

The description of *P. longipalpis* Lutz and Neiva given by Ristorcelli and Dao Van Ty agrees very closely with our material, differing only in slightly shorter measurements for the palpi and a somewhat longer *della*. The very characteristic cibarium and spermathecae lead us to believe that their single specimen was *trinidadensis*. Coutinho (1940, Rev. do Museu Paulista, 1, p. 334, figs. 8, 9) has figured material from Ceara near the type locality of *longipalpis* and his figures show a totally different species from that determined as *longipalpis* by Ristorcelli and Dao Van Ty.

*P. trinidadensis* is difficult to place in any group within the genus. The males seem closest to such species as *rorotaensis*, F. and A., *oswaldoi* Mang., *peresi* Mang. and *longipennis* Barr., in fact the differences between these species are slight indeed. This group grades into such species as *vexator* Coq. *noguchii* Shnn. and *stewarti* Mang. and Gal.

which have clearly marked non-deciduous hairs on the base of the coxite. Barretto (1946) has recently given a key to the males of species with five spines on the style. In the case of the females the picture is not at all clear. *P. oswaldoi* has been reared by Mangabeira (1942) and the female differs in important respects from females associated with the males of *trinidadensis* by Galliard, Floch and Abonnenc and ourselves, since it lacks the spinose pharynx, and has quite different spermathecae, though the cibarium is somewhat similar. Females thought to be those of *rorotaensis* by Floch and Abonnenc (1944, Inst. Pasteur Guyane, Pub. No. 90, p. 6, fig. 4) are very similar to those of *oswaldoi* Mang. and have been placed in the synonymy of the latter by Barretto (1947), though he retains the male as a distinct species. Floch and Abonnenc (1944) describe and figure, without naming, a female which they suspect may be the female of *peresi* Mang. This species has the pharynx and cibarium essentially as in *trinidadensis* Newst., and the spermathecae, though annulate, are of a similar shape. Putative females of the other species with 5-spined styles show widely different spermathecae, different cibaria and unarmed pharynges. As has often been pointed out, association of the sexes of *Phlebotomus* without actual bred material is always uncertain. In the case of the present species, however, this uncertainty seems to us small, and the rather unusual structure of the female cibarium and pharynx would seem to indicate a less close relationship to other species than might be postulated from the quite similar males.

The species has a wide range, being now definitely known from Brazil, Trinidad, French Guiana, Venezuela, Colombia, Panama and Yucatan. In Panama it is one of the most abundant species, having been taken in practically every month of the year and from a wide variety of habitats. It seems to be the dominant species in tree buttresses, where it outnumbers all other species combined. It has not been taken biting, or in animal baited traps, nor is it an ordinary frequenter of animal burrows and bat trees, so that we have no hint as to its preferred hosts.

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