

NOTES ON THE PHLEBOTOMUS OF PANAMA (DIPTERA: PSYCHODIDAE)
XII. THE GROUP ANTHOPHORUS, WITH DESCRIPTIONS OF
FOUR NEW SPECIES FROM PANAMA AND MEXICO¹

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The finding of additional species related to *Phlebotomus anthophorus* Addis has shown that the latter is but one member of a group, the other species of which do not share all the characters on which Addis felt entitled to base the subgenus *Dampfomyia*. Fairchild (1955) briefly redefined the group, placing it in the subgenus *Brumptomyia*, but a more detailed definition based on further study is presented here.

The Group Anthophorus. Small sandflies of pale to dusky coloration, the wings narrow and at least the fore tibiae shorter than fore femora. Second sternite with an open area in the middle, generally similar in structure in all species to *P. rosabali* n. sp. Eyes unusually small. Palpi long, the fifth segment much the longest, second, third and fourth subequal, though the last generally the shortest. Antennae rather short, the first flagellar segment hardly twice as long as the second and markedly less than the length of the first three palpal segments. Proboscis in female about equal to head height. Ascoids simple, generally reaching or surpassing ends of their respective segments in female, occasionally shorter in males, present on all but last segment in females, all but last two in males. Pharynx unarmed, with weak ridges at proximal end. Cibarium with two to six rather broad and blunt, often irregular horizontal teeth and a variable number of lateral teeth. Chitinous arch strong, broad at sides and close to cibarial armature. Spermathecae highly modified, the terminal portion with numerous bubble-like evaginations, often resembling a morula, the terminal knob

buried in the midst of these evaginations. Individual ducts short, broad or narrow, uniting in a broad or relatively narrow thin-walled common duct. Male genitalia with three or five spines and a subterminal seta, no basal tuft of setae on coxite, and with the parameres bearing an articulated dorsobasal setiferous arm, much as in *P. papatasi* Scop.

All the species appear to be uncommon; or at least we have not succeeded in finding their preferred habitats. Addis (1945, 1945a) took *P. anthophorus* biting domestic rabbits in Texas and succeeded in rearing adults from eggs laid by wild-caught females. He noted that the females preferred to feed during the morning daylight hours, both in nature and in captivity, an unusual habit among the predominantly nocturnal sandflies and one which may explain our inability to collect the species of this group in significant numbers.

We recognize six species as belonging to the group. Three of these are known in both sexes, two from females only and one from males only. A single female specimen, too poorly preserved for adequate characterization, may represent the opposite sex of *insolitus* n. sp. or an additional species. One species is known from Texas and Mexico, two from Mexico only, one from Costa Rica and Panama and two from Panama only.

In preparing the accompanying figures we have omitted depicting structures which appear not to show characters of specific value. Thus the genital pump and filaments of all the species are very similar in structure and proportions, as are the first three abdominal sternites, and are only figured for *P. rosabali*.

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KEY TO MALES

1. Style with three major spines, one of which is terminal, the basal spine more slender than the others. 2
Style with five spines, two of which are practically terminal and one reduced to a slender seta. Paramere with dorsal arm straight, but bent laterally at tip and bearing a large number of long, slender, hooked setae. **insolitus**
2. Dorsal arm of paramere strongly clubbed or spoon-shaped. **anthophorus**
Dorsal arm of paramere slender or but slightly thickened. 3
3. Dorsal arm of paramere nearly straight, the setae sparse, in a single row. Paramere slender, its ventral triangular spur slender and acute. **rosabali**
Dorsal arm of paramere curved, apically thickened, the setae numerous, in several rows. Paramere stouter, its ventral triangular spur obtuse. **dodgei**

KEY TO FEMALES

1. Ducts of spermathecae slender, tubular, the individual ducts at least as long as bodies of spermathecae. 2
Ducts of spermathecae very wide, the individual ducts thick and shorter than bodies of spermathecae. 3
2. Cibarium with two broad, ridged, blade-like teeth in the middle and clusters of slender lateral teeth. **anthophorus**
Cibarium with four spine-tipped median teeth and three or more shorter, blunt teeth on each side but no lateral teeth. **rubidulus**
3. Cibarium with four irregular median teeth and several smaller teeth at sides, but no lateral teeth. Chitinous arch very broad and flaring at sides. Spermathecae almost without individual ducts, the bubble-like evaginations large laterally but forming a dense cluster of finger-like excrescences at the flattened center about the terminal knob. **permirus**
Cibarium with four median teeth, the central pair largest, and with clusters of centrally directed spine-like teeth laterally. Chitinous arch more slender. Spermathecae with distinct neck-like individual ducts, the evaginations all of about the same size, forming a more or less globular morula-like mass. **dodgei**
. **rosabali**

Phlebotomus anthophorus Addis

Figs. 6, 19, 21.

- Phlebotomus (Dampfomyia) anthophorus* Addis, 1945, Jour. Parasit., 31(2): 119-125, figs. 1-9 (♂, ♀; Uvalde, Texas). 1945, Jour. Parasit., 31(5): 319; 322, figs. 1-5 (life history). 1945, Trans. Amer. Microscop. Soc., 64(4): 330; 332, figs. 1, 7.
- Flebotomus anthophorus*, Barretto, 1947, Arq. Zool. Est. S. Paulo, 5(4): 185.
- Phlebotomus anthophorus*, Vargas and Diaz Najera, 1952, Rev. Invest. Clin., Mexico, 4(1): 49 (Guerrero, Mexico). 1953, Rev. Inst. Salub. Enf. Trop., 13(1): 46-47, figs. 22-25. (Michoacan, Mexico). 1953, Rev. Inst. Salub. Enf. Trop., 13(4): 309.
- Phlebotomus (Bramptomysia) anthophorus*, Fairchild, 1955, Ann. Ent. Soc. Amer., 48(3): 192.

This species has been adequately described by Addis and redescribed by Vargas and Diaz Najera. Neither authors, however, were able to get a clear picture of the spermathecae from balsam-mounted material, so we include here a figure of these structures, drawn from a specimen in phenol. We have also included a figure of the

cibarium and the paramere for comparison with our figures of other species. We have seen females of this species, two labelled "Uvalde, Texas, 2 September 1943, Bishopp No. 14242, on rabbit," and five labelled "Uvalde, Texas, 28 September 1944, on rabbit, daytime, H. M. Brundrett coll., Bishopp No. 14245," as well as a single male from Mexico (Nuevo Leon, vic. Gruta de Garcia, 20 mi. N.W. of Monterrey, in rock crevices, 9 September 1955, Galindo and Trapido colls.). Vargas and Diaz Najera have reported the species from several localities in the State of Guerrero, and from the State of Michoacan, Mexico.

Phlebotomus dodgei Vargas and Diaz Najera

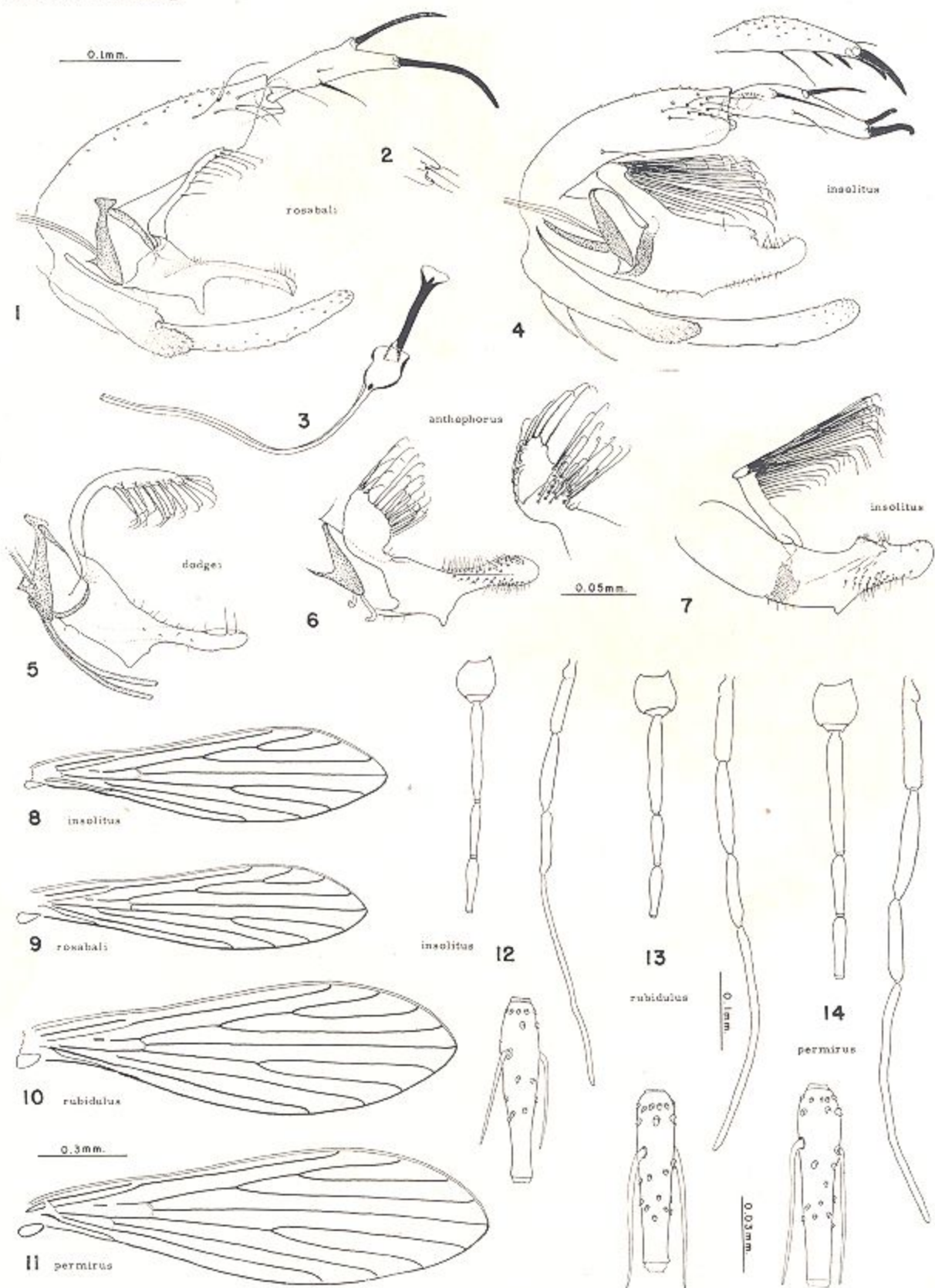
Figs. 5, 20.

1953, Rev. Inst. Salub. Enf. Trop., 13(1): 44-46, figs. 16-21 (♂, ♀; Cocula, Guerrero, Mexico). 1953, Rev. Inst. Salub. Enf. Trop., 13(4): 311 (States of Guerrero, Morelos and Michoacan).

This species is very close to *P. rosabali* n. sp., described below, where comparative notes will be found. The original description is adequate for recognition of the male, though the figures given of spermatheca and cibarium we think may in reality represent those of *P. anthophorus*; at least they do not agree with material which we believe is *dodgei* and are very similar to material of *anthophorus* from Uvalde, Texas. We have a male and two females taken from buttresses of large cypress trees along the Rio Sabanal, a small stream running through the outskirts of the city of Tuxtla Gutierrez, Chiapas, Mexico, on 23 March 1951. We include a figure of the parameres of the male and the spermathecae of the female, for comparison with *rosabali*. The figure of spermathecae was drawn from a specimen

EXPLANATION OF FIGURES

FIG. 1. *P. rosabali*, male genitalia, paratype, slide 3209, Costa Rica. FIG. 2. Tip of style of same specimen to show subterminal seta. FIG. 3. Genital pump and filaments of same specimen. FIG. 4. *P. insolitus*, male genitalia, paratype, slide 3616, Panama. FIG. 5. *P. dodgei*, paramere, slide 2966, Mexico. FIG. 6. *P. anthophorus*, paramere, slide 4888, Mexico, outer aspect at right. FIG. 7. *P. insolitus*, paramere from outer side, slide 3616. FIG. 8. *P. insolitus*, male wing, holotype, slide 4285, Panama. FIG. 9. *P. rosabali*, male wing, holotype, slide 3209, Panama. FIG. 10. *P. rubidulus*, female wing, holotype, slide 3884, Panama. FIG. 11. *P. permirus*, female wing, holotype, slide 2971, Mexico. FIG. 12. *P. insolitus*, male basal antennal segments and palp, slide 4285. FIG. 13. *P. rubidulus*, female basal antennal segments and palp, slide 3884. FIG. 14. *P. permirus*, female basal antennal segments and palp, slide 2971. FIGS. 1-7 are to the same scale, indicated at fig. 1, except for greater enlargement of fig. 2 and right hand part of fig. 6, which has scale indicated below it. FIGS. 8-11 are all to scale indicated at fig. 11 while figs. 12-14 have their scale indicated at fig. 13. The enlarged figures of single antennal segments showing ascoids are segment V in all cases.



mounted in copal-balsam and is, therefore, somewhat schematic, as the fine details visible in phenol are lost after mounting.

Phlebotomus rosabali n. sp.

Figs. 1-3, 9, 17, 18, 23, 25.

Male. Length of wing 1.14 mm. A small sandfly, the mesonotum and dorsum of thorax slightly infuscated. Abdominal setae mostly erect. Upper anepisternal setae 6-9, lower mesanepisternal setae 4. Eyes unusually small. Proboscis shorter than head height from vertex to base of clypeus. Antennal segments relatively short, the first flagellar segment not reaching end of second palpal segment or tip of proboscis on intact head, and being less than twice as long as second flagellar segment (fig. 18). Palpi long, about two-thirds length of antennae, the end of third palpal segment lying much beyond tip of proboscis on intact head. Newstead's scales club-shaped, on inner aspect of middle third of third palpal segment. Ascoids simple, reaching to or slightly beyond ends of their respective segments, present on all but last two antennal segments. Terminal three segments shorter than those preceding. Wing narrow, the venation as figured (fig. 9), but delta rather variable, even in the same specimen, varying from minus to about one-fifth alpha. Pharynx slender, unarmed, weakly ridged at apex. Cibarium with fine and irregular denticles but no true teeth, the chitinous arch weak.

Genitalia as figured (fig. 1), the filaments a little over twice as long as pump. The supernumerary seta shown above basal spine on style does not occur on the other style of the specimen figured, or on other specimens. Subterminal seta present, small and laterally placed close to base of terminal spine, so that it is difficult to see and does not appear in profile in any of the specimens examined (fig. 2). Lateral lobes with long terminal semi-deciduous setae, not shown in figure. Paramere and dorsal arm rather heavily sclerotized. First three sternites as figured (fig. 25).

Female. Length of wing 1.37 mm. Similar in color to male. Pleural setae more numerous, up to 16 upper anepisternals and 6 lower mesanepisternals. Proboscis slightly greater than head height, eyes small. Antennae and palps as in male, except that ascoids present on all but the terminal segment. Wing broader than in male, delta longer, up to one-half alpha. Pharynx broader than in male, ridged at apex. Cibarium as figured (fig. 23). Spermathecae as figured (fig. 17) though to a smaller scale than those of the other species. Ninth tergite with simple setae. Sides of eighth sternite and eighth tergite without setae. Cerci short with rather pointed apex. First three sternites as figured (fig. 25).

Holotype male, slide 3209, Puerto Armuelles, Chiriqui Prov., Panama, 9 June 1951, in tree

buttress, M. Hertig coll. Allotype female, slide 4237, Guarare, Los Santos Prov., Panama, 23 October 1952, in mosquito light trap, F. L. Blanton leg. Paratypes, 2 ♂ same data as holotype; 2 ♀ same data as allotype; 1 ♂ 2 ♀, Finca Socorrito, Barranca, Puntarenas Prov., Costa Rica, 17 December 1951, in tree buttresses, R. Rosabal coll.

The species is named in honor of Sr. Ricardo Rosabal C., to whose efforts nearly all of our knowledge of the Costa Rican *Phlebotomus* sandflies is due, and who collected part of the type series, reported by him (1954) as species No. 9. *P. rosabali* is quite closely related to *P. dodgei* Vargas and Diaz Najera, but can be distinguished in the male by the rather differently shaped parameres, with a straighter dorsal arm bearing fewer and shorter setae. In other respects the males are apparently indistinguishable. On the basis of mounted specimens, we are unable to distinguish the females of the two species, though careful comparison of fresh material in phenol may show small differences.

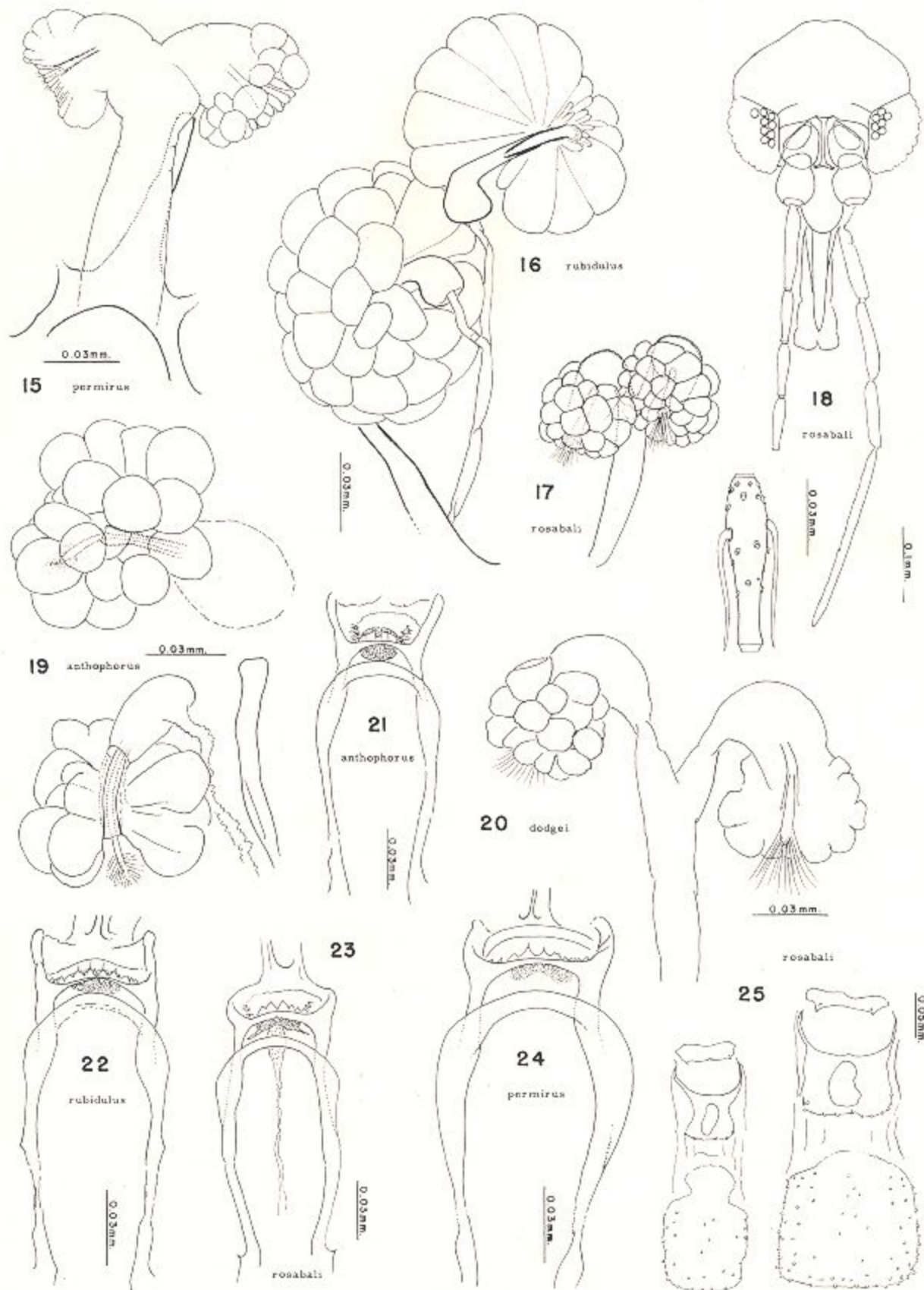
Phlebotomus insolitus n. sp.

Figs. 4, 7, 8, 12.

Male. Length of wing 1.14 mm. Mesonotum and dorsum of abdomen slightly infuscated. Abdominal setae apparently erect. Upper anepisternal setae 11-15, lower mesanepisternals 4-5, the latter at least broadly ligulate. Eyes small. Proboscis hardly half head height. Antennae and palpi about as in *P. rosabali*, though fifth palpal segment relatively longer (fig. 12). Newstead's scales not clearly visible on available material. Ascoids simple, not reaching ends of their respective segments, present on all save the last two flagellar segments. Terminal three segments not markedly shorter than those immed-

EXPLANATION OF FIGURES

FIG. 15. *P. permirus*, spermathecae, drawn from copal-balsam mount, holotype, slide 2971. FIG. 16. *P. rubidulus*, spermathecae, drawn in phenol, holotype, slide 3884. FIG. 17. *P. rosabali*, spermathecae, drawn in phenol from one of three specimens from same lot as holotype. FIG. 18. *P. rosabali*, male head and antennal segment V. FIG. 19. *P. anthophorus*, spermathecae, drawn in phenol, Uvalde, Texas. FIG. 20. *P. dodgei*, spermathecae, drawn from slide mount and somewhat diagrammatic, slide 2967, Mexico. FIG. 21. *P. anthophorus*, female cibarium, slide 3177, Uvalde, Texas. FIG. 22. *P. rubidulus*, female cibarium, slide 3884. FIG. 23. *P. rosabali*, female cibarium, slide 3811, Costa Rica. FIG. 24. *P. permirus*, female cibarium, slide 2971. FIG. 25. *P. rosabali*, first three sternites, male, slide 3209 at left, female, slide 4237 at right. All figures except fig. 17 are accompanied by scale lines. FIG. 17 was drawn in phenol and the magnification unfortunately was not recorded. The spermathecae are about the same size as those of *P. dodgei* in mounted specimens. FIGS. 15, 16, 19, and 20 show one spermatheca in surface view, the other in optical section at a plane passing through the center to show structure of the "head" or "terminal button."



dially preceding. Wing narrow, the venation as figured (fig. 8). Pharynx slender, weakly ridged at apex. Cibarium with faint indications of small horizontal denticles, a marked pigment patch and fairly strong chitinous arch.

Genitalia as figured (figs. 4, 7), the parameres varying in shape according to their orientation, the dorsal arm bent laterally outward at tip, so that its apex apparently lies outside the coxite. Genital filaments a little over twice as long as pump, weakly annulate distally, their tips unmodified. A dorsal subterminal seta present on apex of style. We have added a figure of the other style in external lateral view.

Holotype male, slide 3616, Almirante, Bocas del Toro Prov., Panama, 15 October 1951, taken in Shannon trap at light, Yellow Fever Station B, A. Quiñonez coll. Paratype male, slide 4285, same locality as holotype, 9 December 1952, taken in a mosquito light trap placed 39 feet above ground level in forest canopy, W. Hils coll.

It is possible that this is in reality the male of *P. rubidulus* n. sp., but it is so different from the other males of the group, whereas *rubidulus* is quite similar to *anthophorus* Addis, that we prefer to describe it as a distinct species until further evidence is available. The short ascoids and considerably smaller size of *insolitus* also throw doubt on its identity with *rubidulus*.

Phlebotomus rubidulus n. sp.

Figs. 10, 13, 16, 22.

Female. Wing length 1.425 mm. Mesonotum, pleura, abdomen and legs rather markedly infuscated. Upper anepisternal setae 14-15, lower mesanepisternal setae 4, the latter narrowly ligulate. Ninth tergite with simple setae, no setae on sides or dorsum of eighth abdominal segment. Eyes small. Proboscis slightly less than head height. Antennae and palpi as figured (fig. 13). Newstead's scales fairly numerous, scattered along middle half of third palpal segment. Ascoids simple, long, considerably exceeding ends of their respective segments, present on all but the terminal segment. Last three segments somewhat shorter than preceding segments. Wing somewhat broader than in preceding species, but still narrower than in most Neotropical species; venation as figured (fig. 10). Pharynx broad and well sclerotized, the posterior end with weak ridges. Cibarium as figured (fig. 22), with four rather broad, spine-tipped teeth and an uncertain number of small or crowded teeth at sides. There is also an indication of several vertical teeth or perhaps ridge-like thickenings just below the row of horizontal teeth. There is a heavy pigment patch of oval shape on the dorsal wall of the cibarium. Spermathecae as figured (fig. 16). Genital fork with a rather heavy stem.

Holotype female, slide 3884, Mojanga Swamp,

near Ft. Sherman, Canal Zone, 18 December 1951, in mosquito light trap, F. L. Blanton leg.

Another specimen from Almirante may be this species, but it is smaller, the wings badly folded and the spermathecae now shrunken and nearly invisible. It shows a very high chitinous arch which overlies and obscures the cibarial teeth and the stem of the genital fork is exceedingly slender. The specimen gives the impression of being teneral, but in any case is indeterminable with certainty.

Phlebotomus permirus n. sp.

Figs. 11, 14, 15, 24.

Female. Wing length 1.52 mm. Mesonotum and dorsum of abdomen rather strongly infuscated. Upper anepisternal setae 12-13, lower mesanepisternals 6. Ninth tergite with simple setae, eighth segment without setae. Cerci short, fairly acutely pointed. Eyes small. Proboscis equalling head height. Palpi and antennae as figured (fig. 14). Ascoids about as long as their respective segments, present on all but terminal segment. Last two segments of antennae shorter than preceding. Newstead's scales slender, clubbed, on middle third of third palpal segment. Wing as figured (fig. 11). Pharynx broad and well sclerotized, weakly ridged at proximal end. Cibarium as figured (fig. 24), with four main horizontal teeth, the central two largest, slightly irregular, and with an indeterminate number of closely crowded spine-like teeth at the sides. As in the previous species there are indistinct indications of a row of vertical teeth or ridge-like thickenings below the horizontal teeth. There is a rather indistinct reniform pigment patch on the dorsal wall of cibarium. Chitinous arch high and with broad flaring sides. Spermathecae as figured (fig. 15), drawn after mounting in copal-balsam, but showing very little evidence of collapse or shrinkage. Stem of genital fork rather broad and heavy.

Holotype female, slide 2971, Palenque, Chiapas, Mexico, 28 March 1951, taken in tree buttress in swampy forest near village, Fairchild and Hartmann colls.

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