

## UNDESCRIBED CULICINE LARVAE AND PUPAE FROM UGANDA.

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The setal nomenclature used in the following descriptions of pupae is that of Knight and Chamberlain (1948).

*Theobaldia (Theomyia) fraseri* Edwards.*Pupa.*

Dorsum of thorax and first six abdominal segments dark brown, with the trumpets darker, the rest of the integument dark yellow and the paddles transparent. *Thorax*: Trumpets very dark brown, short and with a large oblique opening. Hairs 1 and 7 very long and usually 2-branched (7 occasionally 3-branched), all other hairs about one-third the length of 7, except 8, which is nearly half the length of 7; hairs 2, 3, 8 and 9 often

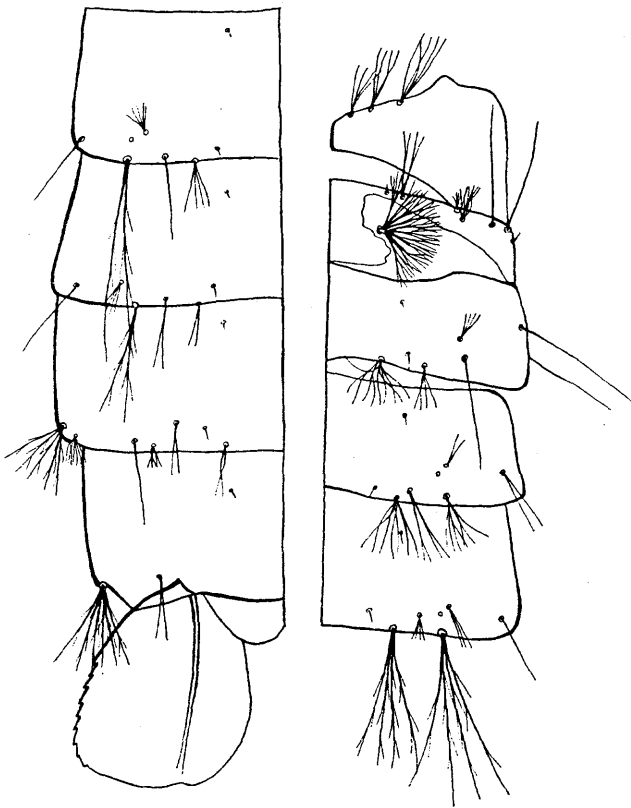


FIG. 1.—*Theobaldia (Theomyia) fraseri* Edwards. Pupal tergites.

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single but may be bifid and hairs 4, 5 and 6 are usually bifid (hair 5 sometimes having each branch divided again apically). Hairs 10–12 short and subequal, hair 10 with 4–7 branches and 11 and 12 2–5 branched with the branches sometimes split again apically.

*Abdomen*: Tergites as figured (fig. 1), with all the hairs appearing simple under low powers of the microscope, but the longer hairs are finely plumose when seen under high powers. There is a slight variation in the number of branches of the tufts and the branches may be divided again apically. Hairs 2 and 4 on segments VI and VII as well as hair 5 on the eighth segment may be bifid or single and hair 8 on segments VII and VIII has 5–7 and 6–8 branches respectively. *Sternites*: Hair 8 on segments III–VI a small hair-like spine; hair 9 is very short on segments III–VI, dendritic on III and bifid or trifid on the other segments; on segment VII it is about four times the length of this hair on the other segments and has about 13 branches, which are finely plumose under high powers of microscope. Hair 10 is single or bifid on the second segment, very short and with 2–3 branches on third and fourth segments, slightly longer and with 4–6 branches on the fifth segment and single and long on segments VI–VII. Hair 11 is much longer than the others and single, except on the eighth segment, where it is split into 2–3 branches beyond a half. Hair 12 is a single, very short seta, except on segment VII where it is bifid. The paddles have no terminal seta.

Described from the paedotype with associated adult and 3 other pelts from tree holes, Entebbe, Uganda.

*Aedes (Aedimorphus) leptolabis* Edwards.

Hopkins (1952) reports that the larva of this mosquito is not known for certain but that "those from forest pools are not separable from *A. domesticus*." Bred material of this species was recently obtained at Entebbe, Uganda, and the early stages are now known for certain. The larva shows small but distinct differences from that described for *A. (A) domesticus* Theobald.

*Larva.*

Distinguished from *domesticus* by having head seta *d* in front of C, the sub-ventral tuft at half and the upper caudal seta with about 10 branches.

*Head*: Antennae curved, infusate throughout, strongly spiculate and with a tuft of about 6 plumose branches just below a half. Setae A, B and C obviously plumose and with 12–13, 6–8 and 8–10 branches respectively; *d* small, in front of C and with about 6 branches; *e* and *f* small and usually 3-branched. The mentum has 17–18 narrow teeth on either side of the central tooth. *Abdomen*: Comb a row of 4–5 (usually 4) long, curved, dark, sharp pointed spines, each with a narrow basal fringe of short fine denticles. Siphon bilaterally convex at the middle, sharply tapering to tip and with an index of about  $4\frac{1}{2}$ – $5\frac{1}{2}$  (4.4–5.6, whole uncrushed larvae). Pecten not reaching to a half and composed of 12–16 dark spines, none of which is noticeably wider spaced and with the distal spines long and curved; each spine with one large ventral denticle and usually 1 or 2 smaller denticles below. The sub-ventral tuft at a half is short, fine and with 4–7 simple branches. The anal segment has a large saddle which is interrupted narrowly below and the saddle hair is about half its length, fine and with 2–3 branches or single; upper caudal seta with 9–13 short, equal branches, and the lower is single. The ventral brush consists of 4 tufts of many-branched setae in the barred area and 4 unpaired setae outside. "Gills" long, narrow and sharply pointed with the upper pair about three and a half times the length of the saddle and the lower pair about three quarters the length of the upper.

*Pupa.*

The pupa is similar to that of *A. (A.) hopkinsi* Edwards described by Edwards (1941), but may possibly be distinguished on the character of hair 8 on the eighth segment which, in this species, is about one-quarter the length of the paddles and single or split at the tip. Only three pupal pellets have been examined so this character may prove to be variable.

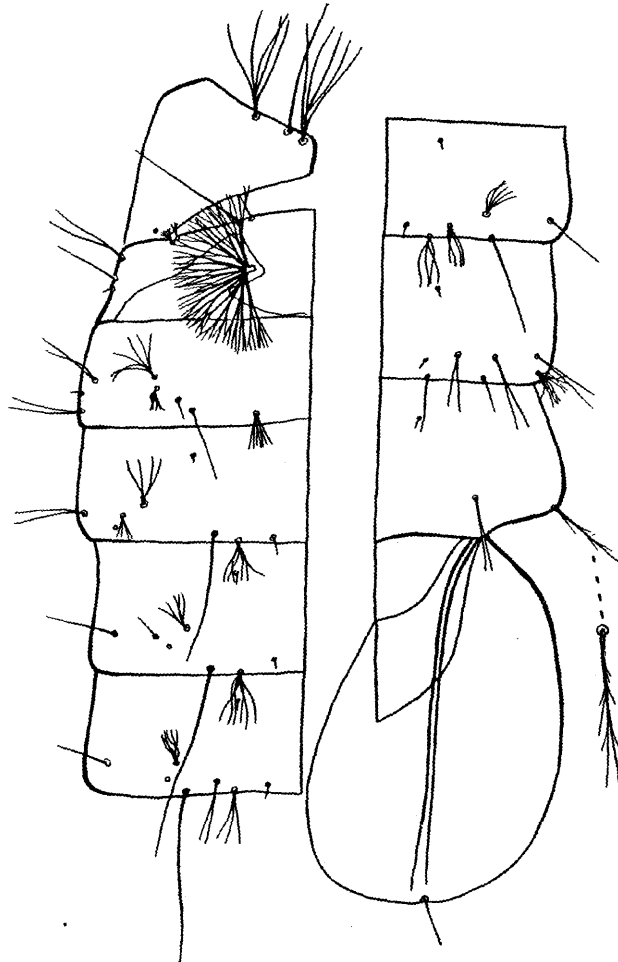


FIG. 2.—*Aedes (Aedimorphus) leptolabis* Edwards. Pupal tergites.

*Thorax*: Trumpets short (length about three times the greatest width) dark, almost cylindrical and with the opening small and not very oblique. Hairs all rather short and fine with 1 and 2 usually 3-branched, 3 bifid, 4, 5 and 7 with 3-5 branches and 6 usually single but may be bifid. Hairs 8 and 9 shorter than the trumpets and with 2-3 branches, which are usually split again apically. Hairs 10 and 12 with 4-6 branches and hair 11 is single, and all are about the same length. *Abdomen*: Tergites as figured (fig. 2) with hair 7 single or with up to 3 branches, hair 6 with 4-9 branches except on segment VII where it is

Hair 2 with about 7-12 branches on segment II, 5-6 branches on III-IV and 2-4 branches on the other segments. Hair 8 is short and single and fine on all segments except on segment VII, where it is a short tuft of 7-8 branches and on the eighth segment it is a stoutish hair, about a quarter the length of the paddles and simple or very sparsely and finely plumose and it may be split again apically. *Sternites*: Hairs 9 and 10 short and 2-4 branched, except on segments VI-VII, where 10 is longer and single. Hair 12 internal to 11 on segments III-V and external on VI-VII, short and spine like except on VII, where it is a longer hair. Hair 11 longer than the others and single or with up to 3 branches. The paddles are pale with very few fine spicules on the outer edge.

Described from the paedotype, 1 other larvae and 2 pupal pelts with associated adults and 16 whole larvae. The larvae were taken from ground pools at Zika, Entebbe, Uganda.

### *Culex (Neoculex) insignis* Carter.

#### *Larva.*

Hopkins (1952) says "the larva is partly described by MacGregor (1927, p. 175) fig. 42 under the name *rima* but the characters he gives will not distinguish it from *sunyanensis*". The larva of *insignis* described below is very like that of *C. (N.) sunyanensis* Edwards and no very definite distinguishing characters were found, but the one pelt available for study differs from *sunyanensis* as follows:

Head seta *d* bifid beyond the middle and the comb has about 50 scales only (the distal scales being markedly longer than the proximal ones.) The pecten has fewer teeth, 8 on one side and 9 on the other, the saddle is covered with rows of minute spicules and with 1 or 2 spines on the distal edge with the seta 4-branched and about a quarter the length of the saddle.

In addition the mentum is very like that figured by Hopkins (1952) for *C. (N.) wigglesworthi* Edwards, having 4 short teeth on either side of the large central tooth followed by large teeth and a minute tooth below. The antennae and head setae A and B are missing, but seta C is plumose and 2-branched and *e* and *f* are short tufts of 7-9 branches. The siphon is pale brown and sharply tapered to about one-third, after which the sides are parallel to just before the tip, where they are slightly divergent and the index is 8 in the mounted pelt. The pecten teeth have 4-6 fairly evenly spaced ventral denticles of about the same size which reach to near the tip. There seems to be about 6 pairs of subventral tufts all very short, simple and bifid, except the last which is single; the first tuft is placed well beyond the pecten (just below a third) and the last is near the tip. The upper caudal seta is 4-branched with 1 long and 3 short branches and the lower is single. The ventral brush has 6 pairs of many branched setae in the barred area and one unpaired seta outside. The "gills" are missing.

#### *Pupa.*

*Thorax*: with none of the hairs very long; hair 3 single, hairs 1, 4, 6, 8 and 9 bifid and hair 5 is 4-branched and 7 trifid. Hairs 10-12 are all about the same length and not very long and as illustrated (fig. 3), but hair 12 is trifid on the other side of the specimen examined. *Abdomen*: Tergites as figured (fig. 3) with hair 2 on the second segment having 10-15 branches. On the other side of the specimen figured hair 2 on segment III has 8 branches, hair 5 has 2 and hair 6 6 branches on segments VI and V respectively; hair 4 is bifid on segment V-VI, hair 7 is bifid and hair 2 is 4-branched on VI. *Sternites*: Hairs arranged as usual for *Culex* with 9 short and 2-3-branched; 10 with 3-6 branches and small except on

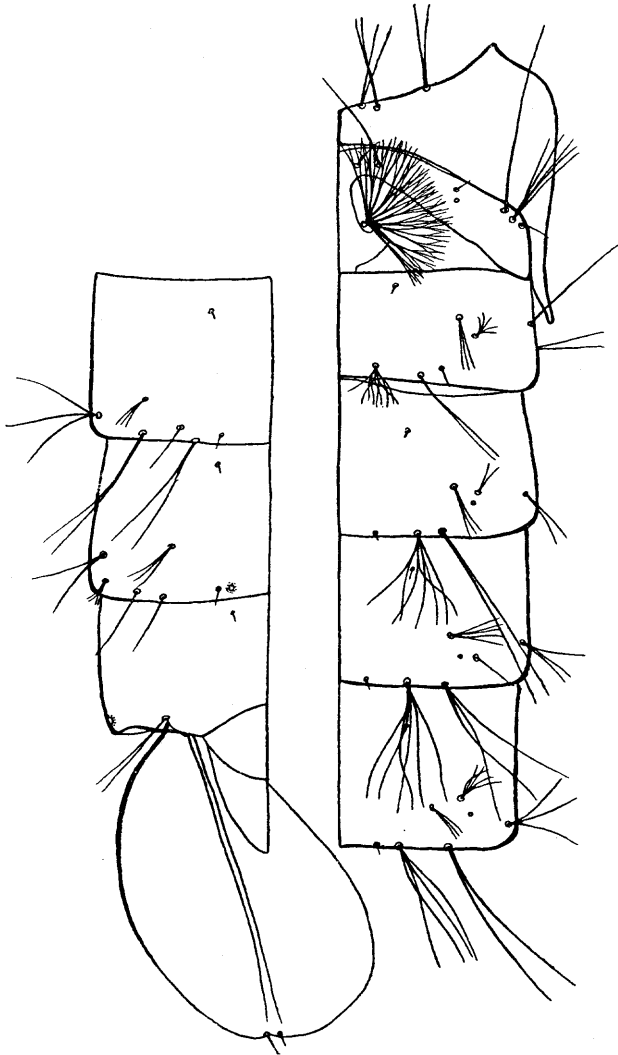


FIG. 3.—*Culex (Neoculex) insignis* Carter. Pupal tergites.

segments VI–VII, where it is longer and single; 12 is short and single or bifid and 11 is long and single or bifid.

Described from the paedotype with associated adult male. The larva was taken from a swamp at Musoli, Entebbe, Uganda.

*Culex (Culiciomyia) semibrunneus* Edwards.

*Larva.*

This larva runs down to the first section of couplet 63 in the key given by Hopkins (1952) for the genus *Culex* and may be differentiated from *C. decens*

Theobald and *C. individiosus* Theobald by having the lower and upper caudal setae single. Of the known *Culicomyia* larvae it most closely resembles *C. cinerellus* Edwards but differs by having 4 or 5 ventral denticles to the pecten teeth.

*Head*: The antennae are curved and obviously spiculate below the tuft (except for the inner edge which is smooth), they are infusate for the full length and the tuft of 24-29 plumose branches is at about three-quarters. Setae A, B and C are about the length of the head and with 5-8, 2 and 2-3 (usually 3) plumose branches respectively; *d* is short, fine and single and *e* and *f* have 2-3 and about 8 branches respectively. The mentum has 8-10 teeth on either side of the central tooth and the basal 3 are rather larger than the rest. *Abdomen* (fig. 4): Comb patch of 27-36 narrow scales. Siphon pale brown and with an

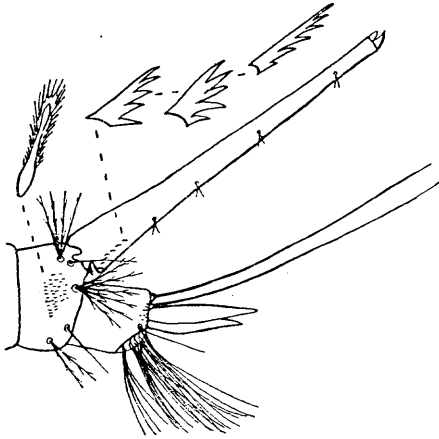


FIG. 4.—*Culex (Culicomyia) semibrunneus* Edwards. Larva.

index of about  $11\frac{1}{2}$ - $13\frac{1}{2}$  in whole unmounted larvae and about 8 in mounted pelts; the pecten has 8-12 teeth reaching to about one-sixth and each tooth has 4-5 rather large denticles evenly spaced along the ventral side (the apical denticle being almost or quite as long as the tip, which makes the spine appear to have a bifid tip); the 4 subventral tufts are shorter than the diameter of the siphon, simple and usually 2-branched but may be single. The saddle is large and complete, with a patch of small spines about the middle of the distal edge, and the seta is single, simple and not much shorter than the length of the saddle; both upper and lower caudal setae are single and the ventral brush has 5 pairs of many branched setae. The "gills" are pointed with the lower pair slightly shorter than the upper, which are about one and a half times the length of the saddle.

### *Pupa.*

*Trumpets* dark throughout, cylindrical, though slightly constricted beyond a half, long and narrow (the length is from 8-12 times the greatest breadth in mounted skins). The opening is not very oblique and is short, and in the middle of the lower edge there is a short slit; the tracheoid area reaches to a half. *Thorax*: None of the hairs very long and all, except 6, are about the same length as 8, which is about half the length of the trumpets; 6 is very much shorter. Hairs 1, 2 and 5 have from 3-5 branches, hair 3 can have up to 3 branches and hairs 4, 7 and 9 may be single or bifid. Hair 8 is bifid and 6 is usually

bifid but may be 3-branched. *Abdomen*: Tergites as figured (fig. 5) with the addition of a median dorsal patch of small spines on segments I-III which are distinct on I and II but fine on III. The shorter hairs 5 and 6 vary a little in the number of branches and either may have up to 6 branches on one of the segments. Hair 10 on the first segment may be single and hair 7 may be single or trifid, but is more usually bifid. Hair 8 is sometimes single on the

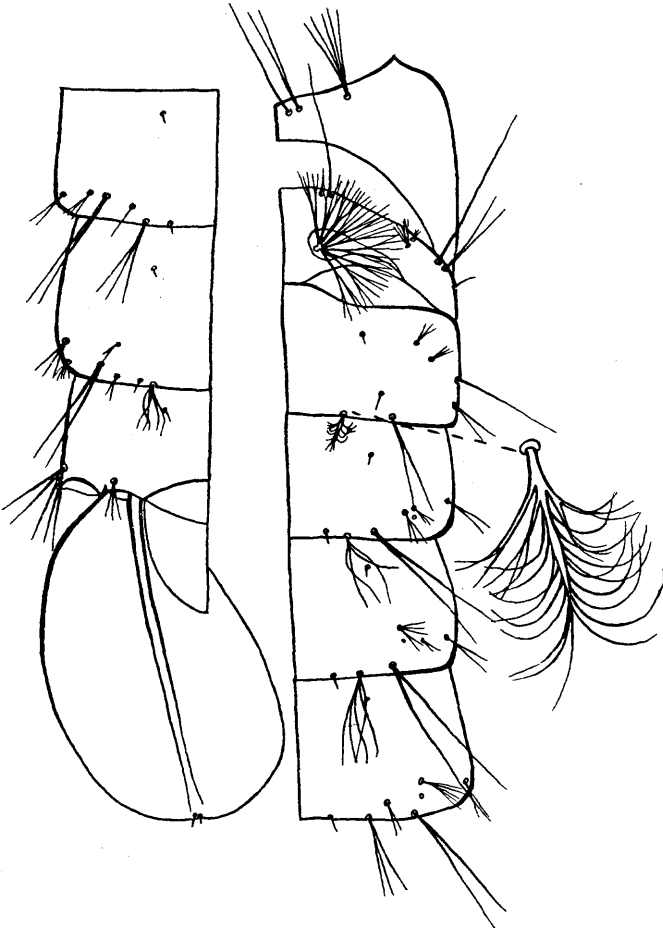


FIG. 5.—*Culex (Culicomyia) semibrunneus* Edwards. Pupal tergites.

first segment with 4-6 branches on the eighth and, although usually trifid, may have 2-4 branches on the seventh segment. Hair 2 has from 3-8 branches (usually 4) and hair 4 on the sixth segment has 2-4 branches (usually 2). *Sternites*: Hairs arranged as usual for *Culex* with hair 9 small and usually bifid but sometimes trifid, hair 10 small with 3-6 branches except on segments VI-VII where it is long and single, hair II usually single but can be bifid and hair 12 short and spine-like except on the seventh segment where it can be a short, bifid seta. The paddles are pale and transparent and with a smooth distal edge and there is a minute terminal seta and a smaller accessory hair.

Described from the paedotype and 19 other pelts with associated adults and a few whole larvae. The material was collected at Zika near Entebbe, Uganda, from a swamp.

*Note.*—The terminalia of the male imagos associated with the pelts differ from the description of the terminalia of *C. semibrunneus* given by Edwards (1941) in that they have a very short but quite distinct basal arm to the para-procts. The vestiture of the male palps, though, determines them as this species, the distal outstanding scales being round tipped.

### *Culex (Culex) quasiguiarti* Theobald.

The early stages of this mosquito are very like those of *C. univittatus* Theobald and no definite distinguishing character has been found to separate the larvae of these two species. According to Hopkins (1952) the saddle is smooth in *univittatus* but this is not always the case and larval pelts from Nairobi and Mombasa have the saddle covered with fine spines.

#### *Larva.*

*Head:* Antennae curved, spiculate on the outside below the tuft and pale with a dark band at the base and infusate beyond the tuft, which is at about three-quarters and consists of 20–25 plumose branches. Setae A, B and C have 7–9, 2 and 3 plumose branches respectively: *d* is single and *e* and *f* have 5–6 and 8–9 branches and all are small and fine. The mentum has 7 large teeth on either side with one very small, wider spaced tooth at the base. *Abdomen:* The comb is a patch of about 50 finely-fringed scales. The siphon is pale brown, with an index of about 7 (mounted skins) and there are 11–13 pecten teeth with the last 1 or 2 spines tending to be more widely separate and each spine has 3–5 (usually 4–5) ventral denticles; the 3 sub-ventral tufts are simple, much shorter than the diameter of the siphon and with 2–4 branches and there are 2 similar lateral tufts. The saddle is large and complete with a patch of small, fine spines on the distal edge and the saddle hair has 3–4 branches; the upper caudal seta has 1 long and 1 short branch and the lower is single; the ventral brush consists of 6 pairs of many-branched tufts. The “gills” are missing.

#### *Pupa.*

Similar to that of *C. univittatus* as described and figured by Kirkpatrick (1925) and when compared with pupal pelts of *univittatus* no diagnostic difference was found.

Described from the paedotype with associated adult male and one other slide with associated adult male. Three other mounts of larval and pupal skins with associated female adults do not differ from the above description and the females appear to be this species. The larvae were all taken from a swamp at Kitinda, Entebbe, Uganda.

*Note.*—In addition to *C. univittatus*, there are three other larvae with which this species might be confused. They are *C. antennatus* Becker, *C. decens* Theobald and *C. invidiosus* Theobald and, in fact, it is extremely difficult to separate with certainty any of these five larvae and that of *C. trifoliatus* Edwards described below. It appears, on the evidence of a small series of bred material of each species, that it is not possible to separate *C. univittatus*, *quasiguiarti*

and *trifoliatus*, but *antennatus* can be distinguished from all by having a shorter siphon and the pecten teeth have fewer and larger denticles. *C. decens* may possibly be separated from the rest by having the saddle hair with fewer branches (1-2 as against 2-4) and by having a longer siphon (index of mounted skins over 9). The series of 16 *invidiosus* pelts cannot be separated from *univittatus*, as they have a consistently shorter siphon than *decens* (index about 8 uncrushed and 6 crushed) and the saddle hair and head seta C are often 3-branched.

In Hopkins' (1952) key to the *Culex*, *C. zombaensis* Theobald runs down to couplet 65 and is distinguished from *univittatus* in this couplet by having a spiculate saddle. As has been pointed out above and by Mattingly (1953), this is an unreliable character. The *zombaensis* material I have examined consists of a few pelts with associated adults, and many whole larvae which agree with these pelts, and the character of the pecten spines will immediately distinguish this species from *univittatus*. In *zombaensis* the pecten spines are strongly curved (the distal spine in particular appearing very like a lion's claw) and the denticles are small and grouped at the base of the spine. In addition the comb teeth of *zombaensis* have a coarser fringe than shown by the scales of the comb of *univittatus* and it is sometimes not easy to decide whether they are spines or scales. In fact, it would be possible to run this larva down from couplet 20 of Hopkins' key to *C. theileri* Theobald, which *zombaensis* closely resembles, especially in the character of the pecten spines. It can, however, be separated from *theileri* by having short and inconspicuous subventral tufts on the siphon.

#### *Culex (Culex) trifoliatus* Edwards.

*larva.*

This larva is very like that of *C. (C.) univittatus* Theobald.

*Head*: Antennae curved and pale but darkened at base and beyond the tuft, which is at about two-thirds, and with 24 plumose branches on one side and 19 on the other. Setae A, B and C plumose and with 6, 2 and 2 branches respectively; *d* single and *e* and *f* with 4 and 6 branches respectively. Mentum with 7 teeth on either side. *Abdomen*: Comb a patch of about 30 scales. Siphon pale and with an index of about 7 in the mounted pelt and the pecten consists of 13 pale teeth, each having 3-4 denticles (the basal spines have 3 denticles and the more distal have 4). There are 3 subventral tufts, composed of 3 simple branches, which are shorter than the diameter of the siphon. The saddle is pale and complete and with a group of minute spines on the upper distal corner. The saddle seta and the upper caudal seta are missing but the lower caudal seta is single. The ventral brush consists of 6 pairs of many-branched setae and the "gills" appear pointed and about the length of the saddle.

Described from the paedotype with associated adult. The larva was taken from a ground pool at Sissa, near Entebbe, Uganda.

The paedotypes of the mosquitoes described in this paper will be deposited in the British Museum (Natural History), London.

#### ACKNOWLEDGEMENTS.

All the material described here was collected while on a visit to the Virus Research Institute, Entebbe, Uganda,

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