

REVISED KEYS TO THE KNOWN LARVAE OF AFRICAN  
CULICINAE.

BY F. W. EDWARDS, B.A., F.E.S.

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When, early in the present year, Dr. A. Ingram sent in to the Entomological Research Committee his collection of larvae and bred adults of CULICINAE from Bole, Northern Territories, Gold Coast, the writer decided to describe these as soon as possible, and the opportunity seemed favourable to include a thorough revision of the known larvae of the African CULICINAE. The results of this work are given in the following tables. The difficulties of classification might have been considerable, but for the valuable pioneer work of Messrs. Dyar and Knab\* in America, and the present author is glad to express his indebtedness to these writers, and would like to add his testimony, if any were needed, to the soundness of their general classification. The paper by Weschét in this journal is also very important, as it is the only one devoted to a study of the larvae of African CULICIDAE. Figures of most of the species not illustrated here will be found in it.

All the drawings here given are made from specimens collected by Dr. Ingram at Bole, and with the exception of *C. irridiosus*, which is figured on account of an apparent confusion between that species and *C. univittatus*; and of *S. sugens*, which was very inadequately described by G. Patton, these larvae are here described for the first time. Mr. Engel Terzi's excellent figures make descriptions, apart from those in the keys, superfluous.

*Table of Genera.*

- |  |                         |     |     |     |     |     |     |                                    |
|--|-------------------------|-----|-----|-----|-----|-----|-----|------------------------------------|
| 1. Siphon present  | ...                     | ... | ... | ... | ... | ... | ... | 2.                                 |
| Siphon absent  | ...                     | ... | ... | ... | ... | ... | ... | <i>Anopheles</i> .                 |
| 2. No ventral brush on anal segment; hairs on head reduced to one pair                                   | ...                     | ... | ... | ... | ... | ... | ... | <i>Eretmopodites</i> .             |
| Anal brush present   | ...                     | ... | ... | ... | ... | ... | ... | 3.                                 |
| 3. A lateral chitinous plate on the eighth abdominal segment†  | <i>Tororhynchites</i> . |     |     |     |     |     |     |                                    |
| Eighth abdominal segment with lateral comb   | ...                     | ... | ... | ... | ... | ... | ... | 4.                                 |
| 4. Siphon usually much elongated, its hair-tufts numerous (rarely absent or represented by single hairs) | ...                     | ... | ... | ... | ... | ... | ... | <i>Culex</i> , <i>Culicomyia</i> . |
| Siphon short or rather short, with only one pair of hair-tufts   | ...                     | ... | ... | ... | ... | ... | ... | 5.                                 |
| 5. Hair-tuft near base of siphon   | ...                     | ... | ... | ... | ... | ... | ... | 6.                                 |
| Hair-tuft near middle of siphon (often beyond)   | ...                     | ... | ... | ... | ... | ... | ... | 7.                                 |

\* "The Larvae of Culicidae classified as Independent Organisms." By Harrison G. Dyar and Frederick Knab; Journ. N. Y. Ent. Soc., XIV, 1906, pp. 169-230, pls. iv-xvi.

† Bull. Ent. Res. I, April 1910, pp. 6-50, pls. i-vii.

‡ This character also occurs in an undetermined larva of the *Aedes* group (see note under *Stegomyia sugens*). In this larva, however, the comb is present in addition, which is not the case in *Tororhynchites*.

6. Antennae short, with a small tuft on the inside ... .. *Theobaldia*.  
 Antennae long, with a large plume on the outside ... .. *Ingramia*.
7. Siphon with well-developed pecten ... .. 8.  
 Siphon with pecten absent or vestigial ... .. 9.
8. Head small, longer than broad, and armed with strong spines  
*Uranotaenia*.  
 Head with the ordinary hairs ... .. *Ochlerotatus*, *Stegomyia*.
9. Siphon normal, valves as usual ... .. *Mimomyia*.  
 A pair of strong, forwardly directed, curved spines at tip of  
 siphon ... .. 10.
10. Valves not enlarged; antennae much enlarged ... .. *Aedomyia*.  
 Valves enlarged into a saw-like structure; antennae long but not  
 much enlarged ... .. [*Taeniorhynchus*], *Mansonioides*.

## Genus ANOPHELES, Mg.

1. Shaft of antenna with hair-tuft; no plumose hairs in middle of  
 thorax overlapping occiput ... .. *mauritanus*, Grp.  
 Shaft of antenna without hair-tuft; plumose hairs present in  
 middle of thorax in front ... .. 2.
2. Rudimentary palmate hairs on thorax ... .. 3.  
 Palmate hairs of thorax altogether wanting ... .. 6.
3. External anterior frontal hair much branched, forming a pro-  
 nounced tuft ... .. *squamosus*, Theo., *pharoensis*, Theo.  
 External anterior frontal hair simple or slightly branched ... .. 4.
4. Posterior, and internal anterior frontal hairs simple ... .. *funestus*, Giles.  
 Posterior, and internal anterior frontal hairs branched ... .. 5.
5. Dark brown; filaments of palmate hairs longer ... .. *natalensis* (H. & H.).  
 Light brown; filaments of palmate hairs shorter ... .. *ardensis* (Theo.).
6. Median thoracic hairs overlapping occiput rudimentary ... .. *maculipennis*, Mg.  
 Median thoracic hairs overlapping occiput well developed ... .. 7.
7. Internal anterior frontal hair branched ... .. 8.  
 Internal anterior frontal hair simple ... .. 9.
8. Palmate hair of second abdominal segment fully developed, the  
 leaflets with a distinct shoulder; filaments of all palmate hairs  
 about  $\frac{1}{2}$  as long as the whole leaflet ... .. *costalis*, Lw.  
 Leaflets of palmate hair of second abdominal segment without  
 shoulder; filaments of all other palmate hairs under  $\frac{1}{2}$  as long as  
 the whole leaflet ... .. *jacobi* (H. & H.).
9. Hair at tip of antennae (between the two spines) split into two  
 ... .. *cinereus*, Theo.  
 Hair at tip of antennae split into three ... .. 10.
10. Palmate hair on second abdominal segment well-developed  
 ... .. *pretoriensis* (Theo.).  
 Palmate hair on second abdominal segment rudimentary ... .. *rufipes* (Gough).

The foregoing table is not given with any confidence, for, in the first place, I have been unable, from want of material, to devote much study to the larvae

of *Anopheles*. Secondly, the specific characters of *Anopheles* larvae are less well defined, or at least are more minute, than in those of other CULICIDAE, and hence errors of determination are easily made.

One probable case of such error is the larva described by Newstead and Carter as that of *A. squamosus*, var. *arnoldi*, Chr. This larva has an antennal hair-tuft, and in several other points agrees with Hill and Haydon's description of *A. mauritanus* (*paludis*), while it is very different from the form which Hill and Haydon figure as *A. squamosus*. It seems possible, if not probable, that the larvae in question are really those of *A. mauritanus*. I have been unable to separate the supposed larvae of *A. squamosus* and *A. pharoensis*.

#### GENUS TOXORHYNCHITES, Theo.

*T. brevipalpis*, Theo. As this is the only common African species, and the only one recorded from Sierra Leone, I have no hesitation in assigning to it a larva taken at Moyamba, Sierra Leone, by Dr. J. S. Pearson, in August 1912. This is the only *Toxorhynchites* larva that has been received here from Africa. The larva should be distinguishable by its large size alone, but the following brief description should make its determination easy:

*Head* large, highly chitinised; median hairs absent. Antennae rather short, cylindrical, without tuft, but with two or three fine single hairs near apex. *Thorax* with the plumose hairs short and thick, median ones rudimentary. *Abdomen* with plumose hairs on every segment, all set, like those of the thorax, in small chitinous sclerites. A large lateral plate on the eighth segment, replacing the comb. *Siphon* not much longer than anal segment, no pecten: hair-tuft of three plumose hairs situated near the base.

General appearance: dark brown above, light brown below.

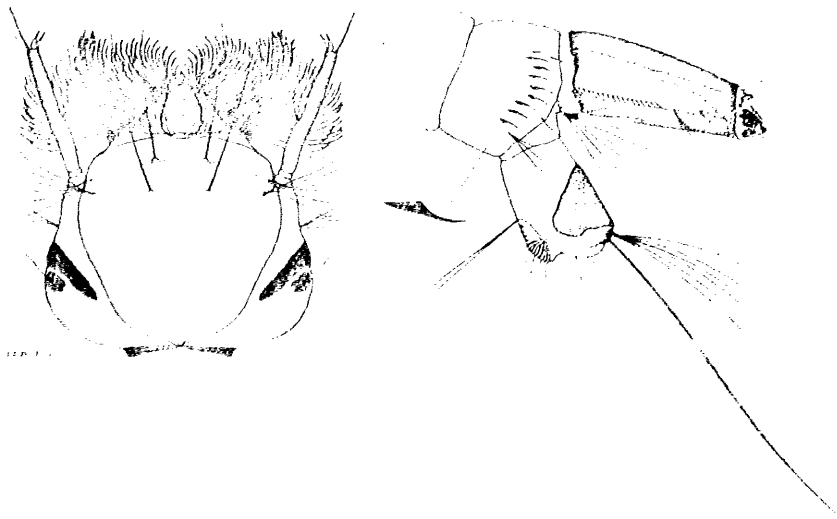


Fig. 1.—*Stegomyia sugens* (Wied.).

The hair beyond the tuft of the pecten is a very unusual feature.

## Genus OCHLEROTATUS, Arrib.

(including STEGOMYIA, Theo.)

1. Antennae short, without hair-tuft on shaft; anal brush small and not very distinct ... .. 2.
- Antennae longer, with hair-tuft; anal brush quite distinct ... 3.
2. Siphon more than twice as long as broad, the hair-tuft well beyond the middle; comb scales 8-9, barbed ... *S. fasciata* (F.).
- Siphon less than twice as long as broad, the hair-tuft at about the middle; comb scales 10-12, simple ... *S. africana*, Theo., and *S. apicoargentea*, Theo.
3. Median hairs on head, single... .. 4.
- Median hairs on head, triple or multiple ... .. 5.
4. Pecten without detached teeth outwardly; siphon less than three times as long as broad ... .. *S. sugens* (Wied).
- Pecten with detached teeth outwardly; siphon more than three times as long as broad ... .. *O. nigeriensis* (Theo).
5. Median tufts on head each composed of three hairs; pecten with 6-8 teeth wide apart ... .. 6.
- Median tufts on head each composed of 6 to 8 hairs; pecten with 12-18 teeth ... .. 7.
6. Siphon curved, four times as long as broad; comb with about 6 teeth; papillae four or five times as long as anal segment *O. punctothoracis* (Theo.).
- Siphon straight, three times as long as broad; comb with 8 teeth; papillae three times as long as anal segment *O. caliginosus* (Grah.).
7. Comb consisting of five large teeth ... .. *O. domesticus* (Theo.).
- Comb consisting of a patch of small scales (20-30?) ... .. 8.
8. Hair-tuft normal, branched, situated in middle of siphon *O. marshalli* (Theo.).
- Hair-tuft reduced to a single hair, situated at  $\frac{2}{3}$  of siphon *O. nigricephalus* (Theo.).

The larva of *O. longipalpis* Grünb. (*pollinator*, Grah.) has been insufficiently described, and the specimens in the British Museum are too damaged for purposes of tabulation.

The comb in the last two species is very difficult to see, and I cannot determine the number of scales.

The larva of *S. fasciata* when young has only the apical half of the siphon darkened, and this should greatly help in its determination, as I know of no other similar case.

The genera *Stegomyia* and *Ochlerotatus* do not seem separable from one another or from the genus *Aedes* when larvae alone are considered. All the known *Stegomyia* larvae, except that of *S. sugens*, agree in having a tuftless antenna; these species in the adult have the larger claws of the male simple, at least on the mid legs. *S. sugens*, however, which has toothed male claws, has typical *Stegomyia*

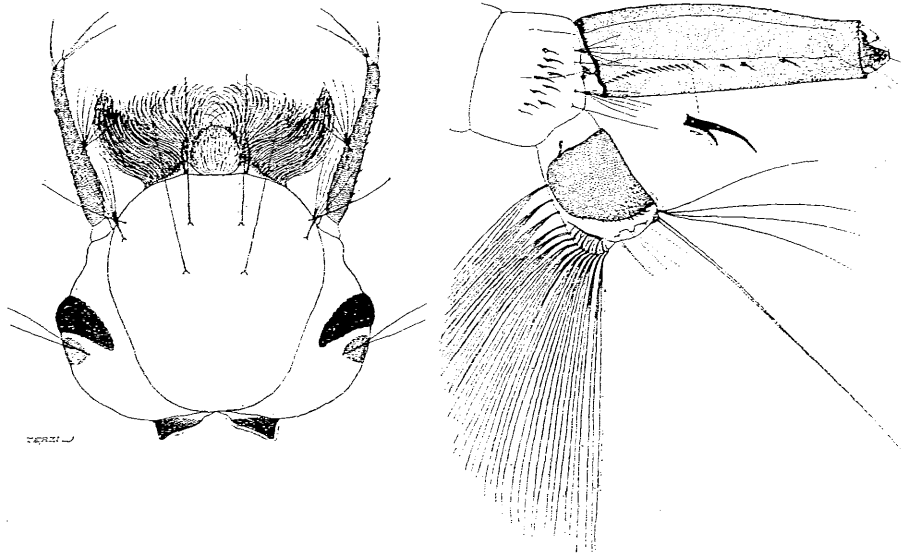


Fig. 2.—*Ochlerotatus nigeriensis* (Theo.).

The hair-tuft on the siphon has been omitted in the figure ; its position is mid-way between the two last teeth of the pecten.

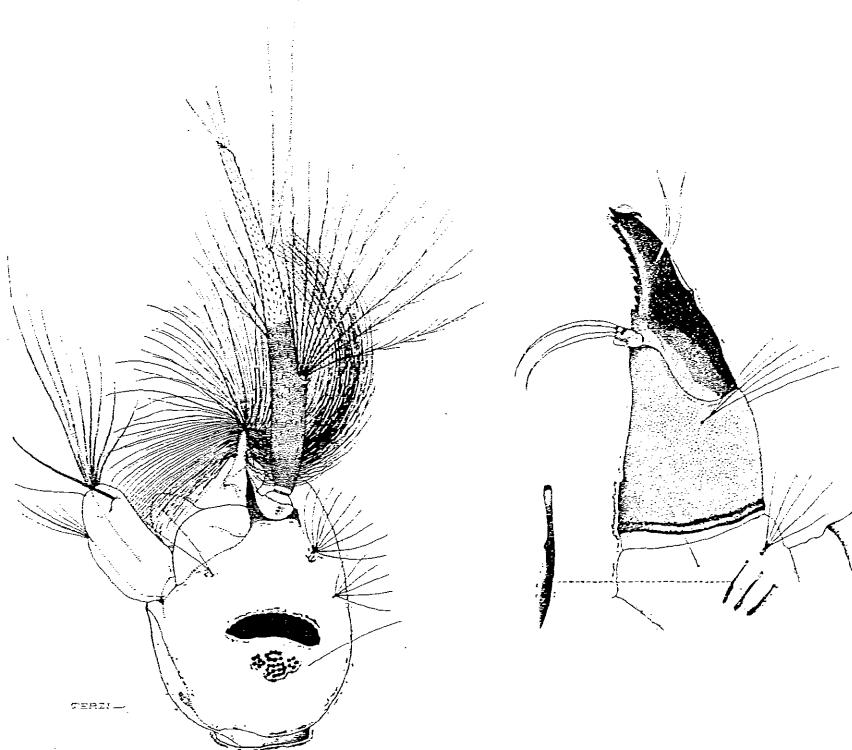


Fig. 3.—*Mansonoides africanus*, (Theo.).

palpi. Patton's figure of the larval head of *S. sugens* certainly does not correspond with the specimens sent by Dr. Ingram. Either Patton's drawing is incorrect, or there are two allied species, or a mistake may have been made by one collector or the other. It should also be mentioned that another very different larva has been received as that of *S. sugens*, possessing a lateral chitinous plate on the eighth segment, the edge of which plate is produced into comb-teeth. These larvae formed the majority of a mixed lot collected in Sierra Leone by Dr. J. Y. Wood, and forwarded for identification by Dr. J. H. Ashworth. The adults bred by Dr. Wood were *S. sugens* and *Uranotaenia nigripes*, but there were no *S. sugens* or *Uranotaenia* larvae amongst those which were preserved.

#### Genus MANSONIODES, Theo.

*M. africanus* (Theo).<sup>\*</sup> Fresh figures of this species are given, as those in Dr. Ingram's paper† were not sufficiently detailed. The larva has a rather close resemblance to that of the North American *Taeniorhynchus perturbans*, Walk.; but the larva of no African species of *Taeniorhynchus* has yet been found. The palpi are large, and, as in *Aedomyia*, they hang downwards. The strong curved spines found at the tip of the siphon tube in both genera may indicate a relationship. One striking peculiarity in this genus (seen also in *Taeniorhynchus*) is the extraordinary development of the valves, which are specialised for attaching the larva to its host-plant.

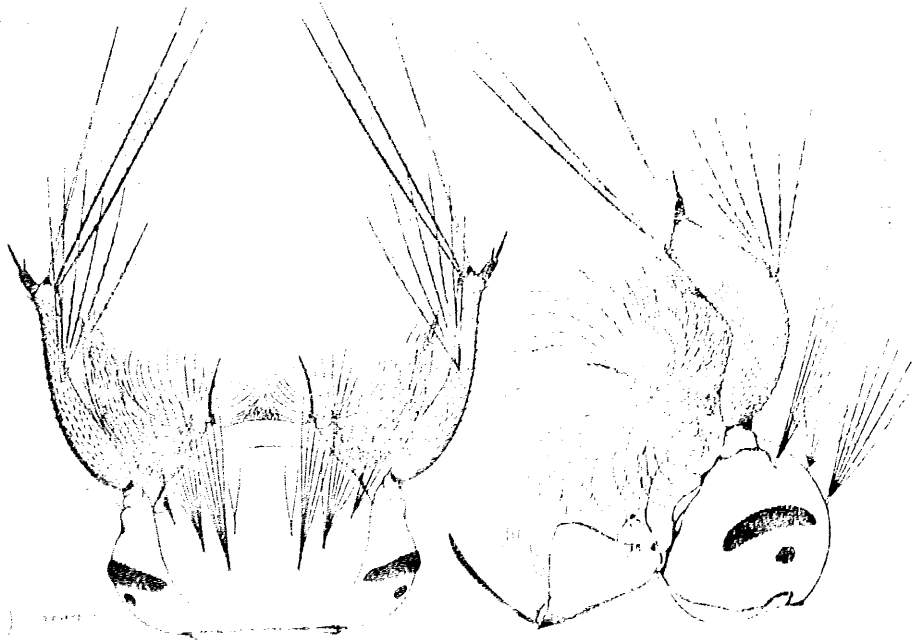


Fig. 4.—*Aedomyia catasticta*, Kuab.

\* An examination of the male genitalia proves that *M. africanus* is after all quite distinct from *M. uniformis*; figures will be given later. Both species occur commonly in Africa.

† Bull. Ent. Res. III, p. 76 (1912).

Genus *AEDOMYIA*, THEO.

*A. catasticta*, Knab. This larva is most peculiar. The antennae are enormous, and flattened laterally, the subterminal bristles, as in *Mansonioides*, being remarkably long. The palpi are very large, placed unusually far back on the head, and are provided with a large membranous flap and a long terminal spine. In all the specimens they are pendent. The plumose hairs on the front of the thorax are of a most extraordinary length, reaching far beyond even the tips of the antennal bristles. Though the siphon has no definite pecten, it has a transverse row of soft hairs near the base, and another row of similar hairs on the ventral side. Soft hairs are also present on the dorsal side of the anal segment, which, so far as I know, is an absolutely unique character.

There seems to be nothing very distinctive about the pupa. The respiratory tubes are moderately short and the anal flaps are normal in form.

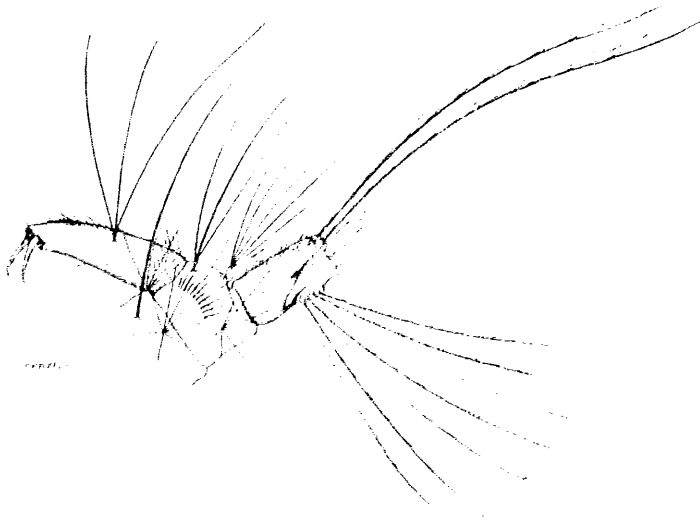


Fig. 5.—*Aedomyia catasticta*, Knab.

Genus *THEOBALDIA*, N.-L.

- Pecten with about 25 teeth, most of which are produced into long hairs; tuft of antennae moderately small ... *annulata* (Schränk).
- Pecten with seven teeth, which though acuminate are not produced into hairs; antennal tuft minute ... .. *spathipalpis* (Rond.).

Genus *CULEX*, L.

(including *CULICIOMYIA*, Theo.)

- 1. Siphon swollen towards the middle, with a more or less distinct dark ring near the apex; no distinct hair-tufts, these being represented by long solitary hairs... .. *duttoni*, Theo.
- Siphon not swollen towards the middle, hair-tufts usually distinct even if small ... .. 2.

2. Siphon short, not more than three times as long as its basal width :  
tufts in a ventral row ... .. 3.  
Siphon long, at least four times as long as its basal width (usually  
much longer) ... .. 4.
3. Mandibles large, dentate : anal segment pointed, longer than  
siphon : 8-10 pairs of hair-tufts on siphon, all ventral  
*tigripes*, Grp., var. *fuscus*, Theo.\*  
Mandibles normal ; anal segment truncate, shorter than siphon :  
6-7 pairs of hair-tufts on siphon, 4 or 5 ventral, 2 lateral  
*Culicomyia nebulosa* (Theo).

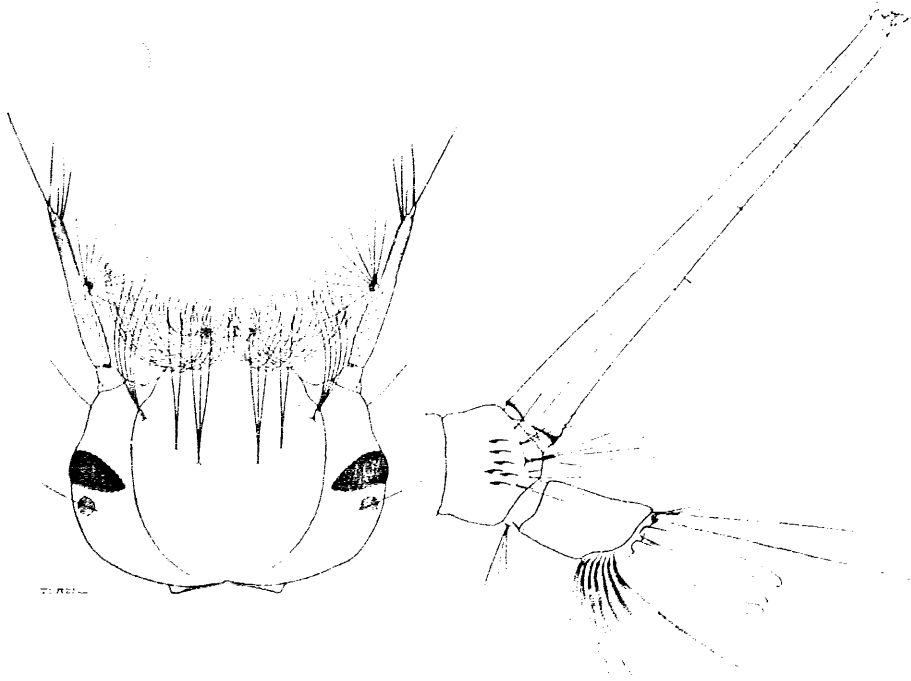


Fig. 6.—*Culex ager* (Giles), var. *ethiopicus*, Edw.

4. Comb of eighth segment with about 40 teeth in a triangular  
patch ... .. 5.  
Comb of eighth segment with less than 20 teeth : antennal plume  
at  $\frac{3}{4}$  or before ... ..

\* This species would fall into the genus *Lutzia* (= *Jamesia*) as used by Dyar and Knab, but as there is no tangible adult character to separate it from *Culex* I prefer not to use it. The larval characters distinguishing it from typical *Culex* are the predaceous habit, the outwardly folded mouth-brush modified into a prehensile pencil, and the pointed anal segment.

5. Siphon  $4 \times 1$ ; pecten with about 9 teeth; antennal tuft at about  $\frac{1}{4}$  ... .. *quintefasciatus*, Say.  
Siphon longer; pecten with 12-15 teeth; antennal tuft at about  $\frac{1}{2}$  ... 6.
6. Siphon  $5 \times 1$  ... .. *pipiens*, L.  
Siphon  $8 \times 1$  ... .. *decens*, Theo.; *invidiosus*, Theo.
7. Comb with 15-18 teeth, in two or three irregular rows ... .. 8.  
Comb with 4-8 teeth, in one row ... .. 9.
8. Siphon longer than the abdomen,  $20 \times 1$  ... .. *quarti*, Blanch.  
Siphon about the same length as the abdomen,  $13 \times 1$  ... .. *grahami*, Theo.
9. Siphon as long as abdomen; pecten with about 13 teeth, the last six far apart and reaching more than two-thirds of the length of the siphon ... .. *pruina*, Theo.  
Siphon not more than half as long as abdomen, pecten with at most 10 teeth, which reach at most one-third the length of the siphon ... .. 10.
10. Siphon with a more or less evident dark ring at one-third, the hair-tufts very long; head very dark ... .. *quasigebidus*, Theo.  
Siphon unicolorous, the hair-tufts short and inconspicuous; head not very dark ... .. 11.
11. Siphon less than half as long as abdomen; antennal tuft just before middle; pecten with five teeth, very short and close together ... .. *annularis*, Theo.  
Siphon about half as long as abdomen ... .. 12.
12. Pecten with only three teeth; antennal tuft just beyond middle  
*ager* (Giles), var. *ethiopicus*, Edw.  
Pecten with six teeth, the last two more detached ... .. *univittatus*, Theo.

There is unfortunately some confusion between the larvae of *C. invidiosus* and *C. univittatus*. The former have been received from Lagos (*Dr. W. M. Graham*) and Accra (*Dr. A. C. Connal*), while larvae identical with these, received from Bole (*Dr. A. Ingram*), were labelled as those of *C. univittatus*. *Dr. Ingram* also sent a perfectly distinct larva which was labelled as that of *C. invidiosus*. I have assumed that the labels have been accidentally transposed in the case of *Dr. Ingram's* specimens, and have taken the species labelled *C. invidiosus* to be *C. univittatus*.

I am unable to separate the larvae of *C. decens* (= *C. nigrocostalis*, Theo. and *C. lividocostalis*, Graham) and *C. invidiosus* (= *C. aquilus*, Graham), the characters given by Weschö being unreliable, but I believe the two are distinct. In the adult, *C. decens* can be distinguished by the reddish thorax (that of *C. invidiosus* being brownish), and (in the male) the banded abdomen. In the female the abdominal banding is not constant; the bands in *C. decens* are always narrow and may sometimes be interrupted. However, a close microscopical examination of the genitalia of a number of males of each species failed to

\* Characters given by Dyar and Knab. This is the species often referred to as *fatigans*. Wied.

† This determination is questionable. No specimens of *C. quarti* from Lagos are in the British Museum Collection.

reveal any differences. It is therefore quite possible that the two are really only forms of one species; they generally occur together, but specimens bred from one batch of larvae exhibit little variation.



Fig. 7.—*Calce anomalis*, Theo.

Two ventral siphonal hair-tufts have been omitted in the figure: one about in the middle, the other between it and the one shown; there is also a lateral pair near the apex. Two out of the three specimens had only four comb-teeth.

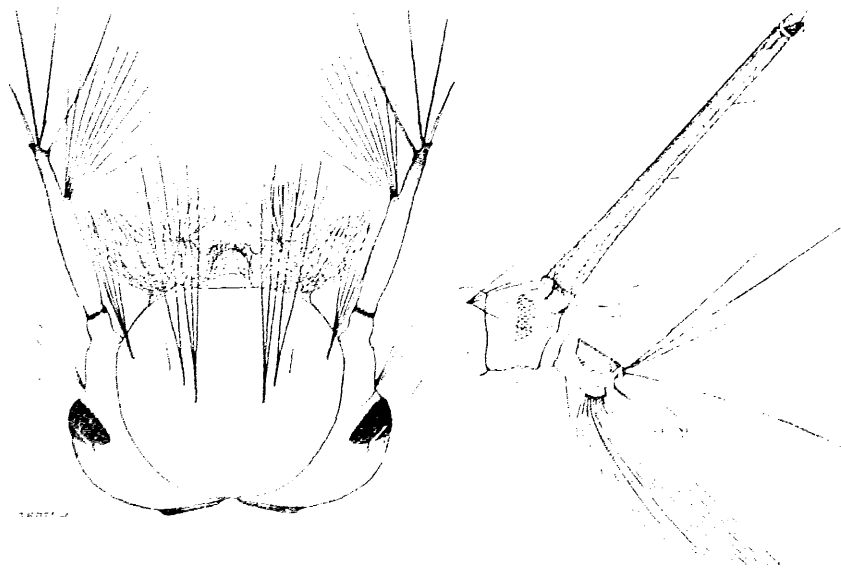


Fig. 8.—*Calce iridiosus*, Theo.

The specimen drawn was abnormal in having the chitinous ring of the anal segment incomplete. The siphon was damaged; perfect specimens received from Lagos (*Dr. A. C. Connal*) show six pairs of hair-tufts. The hairs on the head and the antennal tuft are plumose.

The slight differences noted by Wesché between different lots of *C. duttoni* larvae (distinguished by him under the names *dissimilis*, Theo. and *alboringatus*, Graham) are evidently not of specific value; the length of the siphon varies with the age of the larvae,<sup>26</sup> and also individually. Nor can much importance be attached to the anal papillae, which also vary somewhat. In the batch of larvae described by Wesché as *C. dissimilis*, there is only one which has kept its papillae, and in this the shorter pair are rather shrivelled, on account of which Wesché stated that the dorsal papillae were about double the length of the ventral. Normally in *C. duttoni* they are not much longer.

Apparently there may be a good deal of difference between larvae of different ages. Two larvae of *C. quasigebidus*, sent by Dr. Ingram, illustrate this well. Though seemingly of the same species (both having the well-marked dark ring on the siphon) they differ as follows: the larger has eight or nine teeth in the pecten, and three ventral pairs of plumose hair-tufts on the siphon, the chitinous ring on the anal segment is complete, and the head is very dark: the smaller has only six finer teeth in the pecten, four ventral tufts of simple hairs on the siphon, a chitinous saddle on the anal segment, and a light brown head.

*Culiciomyia* is also variable. Normally *C. nebulosa* has four ventral pairs of hairs-tufts on the siphon, but occasional specimens have five. The number of teeth in the pecten varies from two to five, and may not be the same on opposite sides of the siphon. Larvae from the same batch vary in the length and amount of plumosity of the antennal tuft. In the pupae, too, the notch in the anal flap is much more distinct in some specimens than in others, and may be almost indistinguishable. When the impossibility of separating the adults is also taken into consideration, there can be little doubt that the larvae and pupae described by Wesché as *Culiciomyia jectownensis* and *C. cinerea* are really varieties of *C. nebulosa*. It should be mentioned that neither of the larvae described by Wesché for *Pectinopalpus fuscus* can possibly belong to this species.

Genus MIMOMYIA, Theo.

- Large species; comb consisting of seven moderate-sized teeth, rather irregularly placed; posterior edge of anal segment slightly spinose ... .. *plumosa* (Theo.).
- Small species; comb consisting of six or seven large teeth placed almost in a straight line; posterior edge of anal segment markedly spinose ... .. *mimomyiaformis* (Newst.).

It is unfortunate that Dr. Ingram did not send home any larvae of this genus, except one of *M. plumosa*. He did, however, send pupae, and these can be distinguished by the following table. All have respiratory tubes of great length; this character also occurs in *Mansonioides* and *Tacniorhynchus*.

- 1. Anal flaps narrow, with a broad fringe of cilia, transparent, except at the tip, where they are darkened ... .. *splendens*, Theo.
- Anal flaps broader, not fringed, dark, with white spots ... .. 2.

<sup>26</sup> I have found this to be the case in breeding *Culex pipiens*, and still more strikingly in *Theobaldia annulata*. The younger larvae have the shorter siphons.

2. Anal flaps with two equal-sized white spots ... *plumosa* (Theo.),  
 Anal flaps with only one white spot... .. 3.  
 3. Respiratory tubes with the tip only white ... *mimomyiaformis* (Newst.),  
 Respiratory tubes with the apical third white, except for the  
 dark tip ... .. *hispida* (Theo.).

#### GENUS URANOTAENIA, Arrib.

The only African species of this genus whose larva is definitely known is *U. balfouri*, Theo., and this is typical in every respect.

*U. nigripes*, however, has had attributed to it a peculiar Sabethine larva (vide Theobald, Trans. Linn. Soc. xv, 1912, p. 93, under *Pseudoficalbia nepenthes*) which has some resemblance to that of *Eretmopodites*. So far as I can see from



Fig. 9.—*Ingramia malfeyti* (Newst.).

some badly made balsam preparations in the British Museum, this larva has no pecten and no hair-tuft on the siphon, no comb, and no cephalic hairs. It can have no possible connection with *Uranotaenia*, nor can it very well be *Eretmopodites*, if the comb is really absent.

#### GENUS INGRAMIA, Edw.

*I. malfeyti* (Newst.). This is the only species of the genus whose larva is known. The most marked character is the form of the antennae. As, however, these organs

are only present in one specimen, and seem to be somewhat distorted, the external position of the tuft may not be normal. The basally situated siphon tuft is unusual.

Genus ERETMOPODITES, Theo.

Siphon almost three times as long as broad, pecten present, containing three spines, two short and one long, tuft absent; comb-teeth sharply pointed ... .. *chrysogaster*, Grah.

Siphon hardly twice as long as broad, pecten absent, the only appendage of the siphon being the two-haired tuft; comb-teeth blunt-ended, and rather nearer together than in the preceding  
*inornatus*, Newst.

The pupae of these two species are easily distinguishable, for while in *E. chrysogaster* the anal flaps have only one terminal bristle, in *E. inornatus* they have several (from three to seven) in a tuft.

Young larvae of *E. chrysogaster* are very much like the full-grown ones, but have fewer comb-scales (about 12 instead of about 30).