

NOTES ON DUTCH-EAST-INDIAN MOSQUITOS.

By S. L. BRUG,

Centraal Militair Geneeskundig Laboratorium, Weltevreden, Java.

The material, upon which these observations were made is contained in the collection of the "Centraal Militair Geneeskundig Laboratorium" in Weltevreden (Java). To complete my observations many specimens in the collection of the British Museum were studied and compared.

Two species proved to be new: *Aedes* (*Skusea*) *umbrosus* and *Uranotaenia papua*.

Of seven species the hitherto unknown larvae are described: *Aedes* (*Stegomyia*) *albolineata*, *Aedes* (*Aëdimorphus*) *caecus*, *Aedes* (*Ochlerotatus*) *vigilax*, *Armigeres jugraensis*, *Armigeres obturbans*, *Culex brevipalpus*, and *Uranotaenia atra*.

Notes upon *Aedes* (*Aëdimorphus*) *vexans* and *Uranotaenia subnormalis* are added to this paper.

The descriptions and figures of the larvae have all been taken from larval skins. This method may have the drawback that the form of the head cannot be figured quite exactly, that the position of the cephalic hairs, as figured, cannot be wholly relied upon, and that a description of thoracic and abdominal hairs must mostly be omitted; but it has the immense advantage that one can identify the imago which actually emerged from the larval skin.

The drawings have been outlined with Abbe's drawing apparatus. The ventral cephalic hairs have also been described; but the systematic importance of these hairs can only be decided when the larvae of more species have been described in this way.

In naming the cephalic hairs I have used as far as possible the nomenclature of Stanton (1915) for Anopheline larvae; and the following groups of hairs may be distinguished:—

1. The frontal hairs: three pairs of hairs originating from the median foremost part of the dorsal side of the head. In *Stegomyia albolineata* it is doubtful whether this group of hairs should be considered as homologous with the frontal or with the clypeal hairs as seen in Anopheline larvae.

2. The occipital hairs.

3. A group of hairs inserted behind the root of the antenna, usually one hair dorsally and two hairs ventrally.

4. For the remaining ventral hairs I would propose the following terms: "mental" hairs, for those that are situated medially, near the mental plate; and "genal" hairs, for those situated more laterally.

I am greatly indebted to Mr. F. W. Edwards for enabling me to prepare this paper in the British Museum, for many valuable hints during my work, and for placing many specimens from the collection of the British Museum at my disposal.

***Aedes* (*Stegomyia*) *albolineata*, Theo.**

Description of larva (fig. 1).

Antenna: length of the shaft about two-fifths of the length of the head, very slightly curved; a three-branched, delicate hair inserted a little apically of the middle; on the apex there are three short simple hairs; there are no spines.

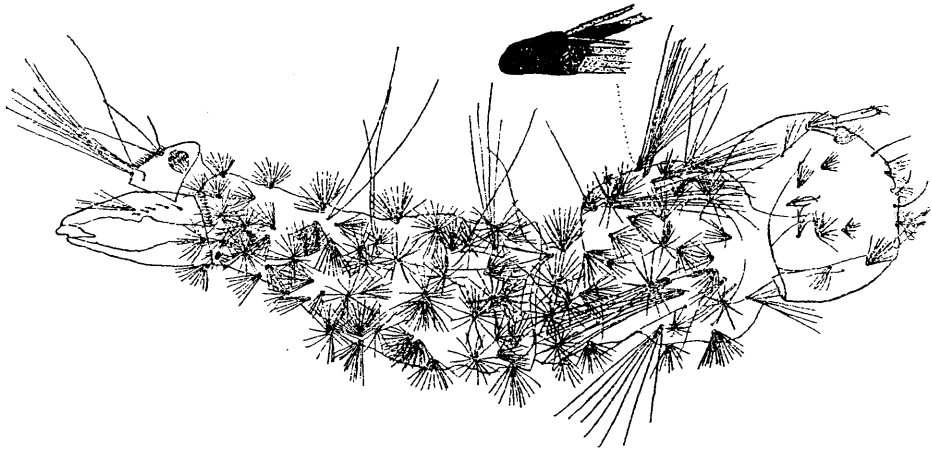


Fig. 1. Larva of *Stegomyia albolineata*, and enlargement of basal spine of thoracic hair.

Cephalic hairs (fig. 2, *a*): preclypeal hair spinose, straight; medial and posterior frontal (clypeal?) hairs many-branched; lateral frontal hair simple; the posterior one just behind the lateral one. Near the antenna is one dorsal, many-branched and one ventral hair, the latter with many rigid, straight, radiating branches. Two simple occipital hairs, the lateral one originating more posteriorly. Three mental hairs, the two foremost many-branched, the hindmost three-branched. One anterior simple and one posterior five-branched genal hair.

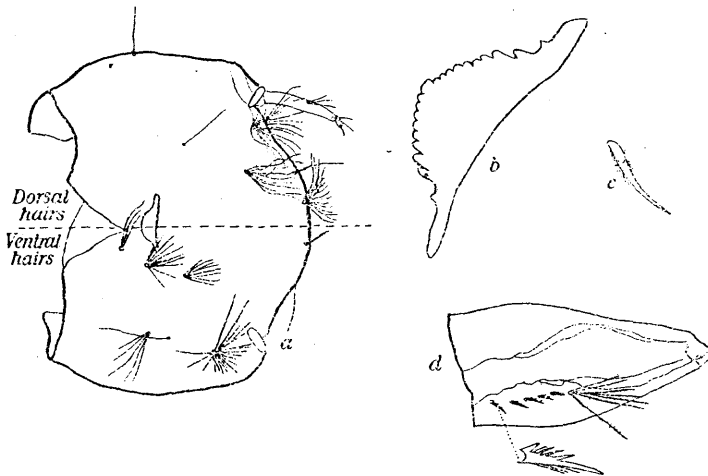


Fig. 2. Larva of *Stegomyia albolineata*: *a*, cephalic hairs; *b*, mental plate; *c*, scale from 8th segment; *d*, siphon.

Mental plate (fig. 2, *b*): anterior border evenly rounded; almost thrice as broad as long, with twenty short very obtuse teeth, the mid one and the lateral ones larger, the outermost one sharper than the others.

Thorax and abdomen bearing, in addition to the usual long segmental hairs, numerous many-branched shorter hairs with dark, straight, radiating branches. These parts are covered with a dense pile of dark, stout, short hairs. On the middle and at the hind margin of the thorax the bases of one of the long lateral hairs are provided with a conspicuous spine (fig. 1).

Scales on the eighth segment (fig. 2, c) elongate, curved, very sharp, with a fine basal fringe.

Siphon (fig. 2, d) twice as long as broad, broadened near the base, conical towards the apex. Pecten occupying nearly two-fifths the length of the siphon, consisting of five teeth, the basal one the largest, and with five secondary teeth and some hairs. One siphonal hair inserted a little basally of the middle, with seven barbed branches.

Ninth segment with a comb of some 45 small sharp teeth on its posterior border, and besides the anal brush a three-branched, fairly large hair (fig. 1).

***Aedes (Ochlerotatus) vigilax*, Skuse.**

Description of larva.

Antenna (fig. 3, a, b): length of the shaft about half the length of the head; constricted at the base; provided with minute spines; apex with one large and two smaller spines, the tip of the former being dark-coloured. A trifurcated hair inserted just below the middle and nearly half as long as the antenna.

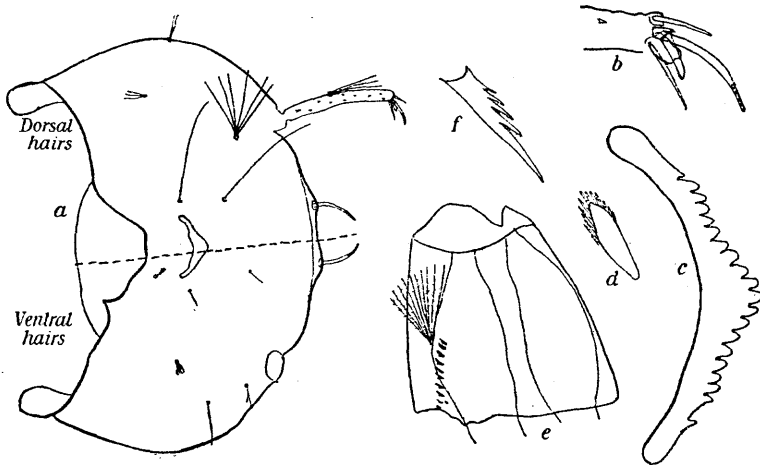


Fig. 3. Larva of *Aedes vigilax*: a, cephalic hairs; b, tip of antenna enlarged; c, mental plate; d, scale from 8th segment; e, siphon; f, spine on siphon.

Cephalic hairs (fig. 3, a): the tip of the preclypeal spinose hair is dark-coloured. Lateral and posterior frontal hairs long, simple; medial one absent. Near the base of the antenna one large dorsal six-branched hair and ventrally a small bifurcate one. Two small occipital hairs on each side, two- and three-branched. Mental hairs small, foremost and mid ones simple, hindmost trifurcate. One small four-branched genal hair and a larger simple one.

Mental plate (fig. 3, c) very narrow, with twenty obtuse teeth, the two outermost ones small and sharper.

Scales on the eighth segment (fig. 3, d) about twenty on each side, in three rows; point obtuse, fringe fairly conspicuous.

Siphon (fig. 3, e) as long as broad, with a row of ten spines, the apical one the largest and quadriserrate (fig. 3, f), the pecten extending for not quite half the length of the siphon, and a many-branched barbed hair at nearly the middle.

***Aedes (Aedimorphus) vexans*, Mg.**

This mosquito has a wide distribution (Europe, Asia, Australasia), the American representative (*A. sylvestris*) being recognised as identical with *A. vexans* (Edwards, 1917). By the examination of six *vexans* larvae, in the collection of the British Museum and originating from Ceylon, and comparison of the results with the descriptions and drawings of American and European larvae of Howard, Dyar and Knab (1912 and 1915), and also of Martini (1920), small differences could be detected, insufficient to establish different species, but indicating the existence of regional varieties, as suggested by Edwards. The differences were:—

	<i>A. sylvestris</i> .	European <i>A. vexans</i> .	Asiatic <i>A. vexans</i> .
Lateral clypeal hairs	in threes	in twos	in twos.
Posterior clypeal hairs	in twos	in twos	in twos.
Medial clypeal hairs	not described	not described	very small, in fours.
Pecten on syphon	barely to the middle.	to the middle	beyond the middle!
Number of teeth of pecten	15	18	19-22
Hair on siphon	in threes at the middle.	in threes or fours, beyond the middle	in threes. beyond the middle.

Aedes (Aedimorphus) caecus*, Theo.Description of larva.*

Antenna (fig. 4, *a*): length of the shaft nearly three-fourths of the length of the head; antenna slender, curved, constricted at the base, spinose. Largest apical spine about one-fourth the length of the antenna. Antennal hair six-branched, barbed, originating at about the middle of the shaft, half as long as the latter.

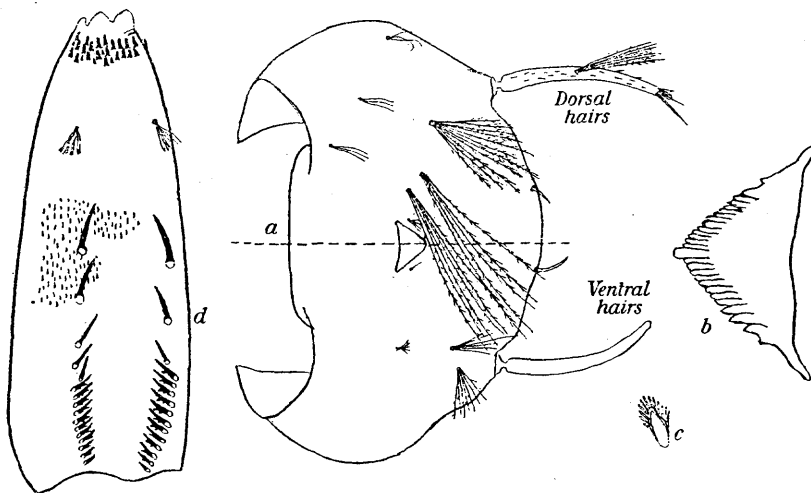


Fig. 4. Larva of *Aedes (Aedimorphus) caecus*: *a*, cephalic hairs; *b*, mental plate; *c*, scale from 8th segment; *d*, siphon.

Cephalic hairs (fig. 4, *a*): on the front edge there are two preclypeal spinose hairs on each side, the larger one inserted more medially and a little more ventrally than the smaller one. Frontal hairs: medial one very small, four-branched; lateral and posterior ones large, five and six-branched respectively, barbed, the posterior one originating only slightly behind the lateral one. Occipital hairs small, three

in a row, all three-branched. Near the antenna three hairs : one dorsal, two ventral, the former the largest, many-branched and barbed, the latter six- and seven-branched, one barbed, one with simple branches. One simple, very small mental hair. One very small, five-branched genal hair.

Mental plate (fig. 4, *b*) broader than long, with 27 teeth, the middle one large, protruding and truncate, the medial ones obtuse, the lateral ones larger and sharper, except the outermost one, which is rudimentary.

Scales on the eighth segment (fig. 4, *c*) : some 15 or 20 on each side (this cannot be seen clearly in the specimens at my disposal), short, nearly elliptical, conspicuously fringed, very transparent.

Siphon (fig. 4, *d*) slightly bulbous, somewhat more than two and a half times as long as broad. The pecten covers more than half the length of the siphon and consists of two parts, the basal part with some twelve closely ranged, mostly biserrate teeth, and the apical part with five (in one specimen there were only three on one side) larger, more remote teeth. One siphonal hair at about a fourth of the length of the tube from the apex, small, six- to eight-branched. A large patch of numerous small sharp spines in the middle of the tube. Another group of spines is situated sub-apically ; these spines are less numerous, larger, obtuse and in two or three rows.

Described from three larvae found in Batavia in cart-ruts.

Aedes (Skusea) umbrosus, sp. nov.

General appearance : small black mosquito.

♂. *Head* dorsally clothed with black flat scales and some black upright forked ones behind ; laterally with grey flat scales ; two conspicuous, black, parallel, vertical bristles projecting forward. *Antennae* : basal and last two segments dark brown, other segments with a brown band apically and a pale band basally of the black insertions of the hair whorls. On the latter segments no pile. *Proboscis* black, labellae pale, proboscis nearly as long as the antennae or as the abdomen. *Palpi* very small, black. *Clypeus* black.

Thorax : integument of mesonotum black, covered with very dark bronzy, narrow curved scales, except for a bare space before the scutellum. *Scutellum* black, scaled as mesonotum, without flat scales. *Mesonotum* and *scutellum* with many large black bristles. *Pleurae* blackish brown, with a small patch of flat pale scales on the base of the prosternum, a larger patch extending over the upper third of the sternopleura and mesepimeron, and a small patch on the sternopleura near the middle of the hind border. *Prothoracic lobes* dark brown, bristled, without scales.

Wings with dark brown scaling, lateral scales linear. First fork-cell longer than and as wide as second, the base of the former a little nearer the base of the wing than that of the latter. Length of the stem of the first fork-cell two-thirds the length of the cell. Stem of the second fork-cell as long as the cell. Apex of the sixth longitudinal vein only slightly beyond the base of the fork of the fifth longitudinal vein. *Halteres* with the stem yellowish, knob black.

Legs dark brown, inner sides of femora paler, unbanded. Patches of pale scales on the coxae. *Ungues* of the fore leg unequal, the larger one uniserrate ; of the mid leg unequal and simple ; of the hind leg small, equal and simple.

Abdomen dorsally blackish brown, with white basal lateral patches on the tergites ; venter blackish brown ; apex of abdomen very hairy, two dense tufts of large hairs on the lateral sides of the apex.

External genitalia : side-pieces (fig. 5, *b*) wider than long, with two large apical spines and on the inner side a somewhat smaller one and a very small one. *Claspers*

(fig. 5, *a*) inserted near the base of the side-pieces, very broad at the base, forked towards the top, strongly bent with the concavity on the inner side. Lateral branch of the fork simple, medial branch with a stout hair on the outer surface, a thick and a thin spine and two frail hairs on the apex. On the stem of the fork near the bifurcation, two hairs. On the basal enlargement of the clasper nine hairs, the six proximal ones in a group, the three distal ones more separated.

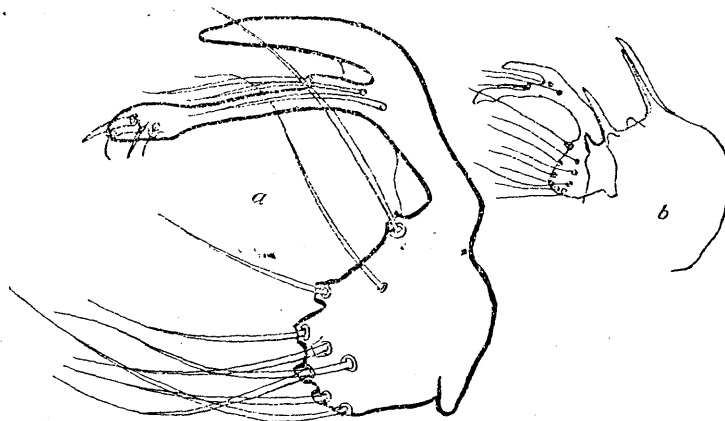


Fig. 5. Hypopygium of *Aedes (Skusea) umbrosus*, sp. n.: *a*, clasper; *b*, side-piece with clasper.

♀. *Head* much as in the male; dorsal and ventral black scaling separated by a narrow line of white flat scales. Antennae dark brown, with a pale pile on the second and following segments. Proboscis shorter than the abdomen.

Thorax and legs as in the male. Ungues of fore and mid legs equal and uniserrate; of hind legs equal and simple.

Wings: first fork-cell twice as long as its stem; second fork-cell one and a half times as long as its stem.

Abdomen black, with white lateral basal spots on each segment; dorsally these spots are separated from the bases of the segments by a small triangular patch of black scales. There are three spermathecae, all different in size, the largest one having a diameter about twice as long as that of the smallest one. The apical border of the postgenital plate (Christophers, 1923) is evenly rounded.

Described from four males, three caught in Tanah Grogot (S.E. Borneo) and one in Weltevreden (Java), and two females from Tanah Grogot. Types, male and female, in the British Museum.

This species is especially characterised by the male genitalia. In other respects it comes near *A. panayensis*, which, however, has the venter mostly white-scaled with brown apical bands, and near *A. butleri*, the female of which cannot be distinguished from that of *A. umbrosus*. From New Guinea I have a series of females, perhaps belonging to an undescribed species, which cannot be distinguished from *A. butleri* and *A. umbrosus* by external characters, but differ in their genitalia; the three spermathecae are very different in size, the diameter of the smallest being only one-third of that of the largest, and the hind border of the postgenital plates shows a sinuous depression in the middle.

Armigeres jugraensis*, Leic.Description of larva.*

Antenna (fig. 6, *a*): the shaft is not quite half as long as the head; the antenna stout, hairless and without spines.

Cephalic hairs (fig. 6, *a*): inner frontal hairs many-branched; outer frontal hairs simple; posterior frontal hairs four-branched. Near the antenna three hairs, a large three-branched dorsal one, a medium-sized, two-branched, and a small many-branched one ventrally. Medial occipital hair small, lateral occipital hair large, both with three branches. Inner mental hair small, four-branched; outer mental hair small, simple. One small simple genal hair.

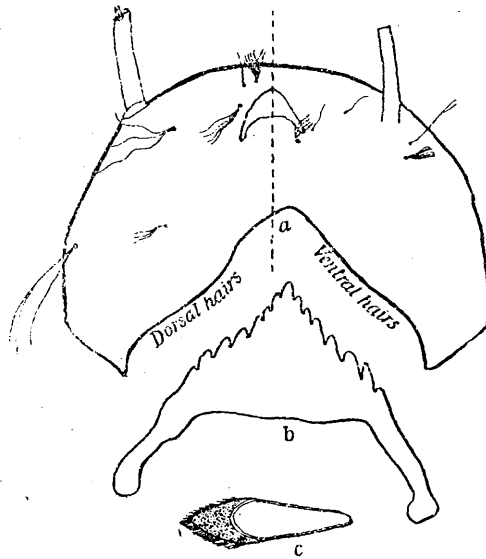


Fig. 6. Larva of *Armigeres jugraensis*: *a*, cephalic hairs; *b*, mental plate; *c*, scale from 8th segment.

Mental plate (fig. 6, *b*) one and a half times as broad as long; mid tooth medium-sized, on each side six teeth, the lateral ones larger, and a rudimentary outer tooth.

Scales on the eighth segment (fig. 6, *c*) on one side ten, on the other side fourteen, not sharply pointed, fringe very fine.

Siphon short, one-fourth longer than broad, without spines, with one bifurcated, minutely barbed hair, inserted at one-third from the apex.

***Armigeres obturbans*, Walk.**

The above description of the larva of *A. jugraensis* may also be applied to that of *A. obturbans*. This was to be expected, as the imagines of these species differ only in colour markings, the structure of the male hypopygia being practically identical.

The larva of *A. jugraensis* is described from one specimen, found in a hollow of a fallen tree in Samarinda (East Borneo); the structure of the larva of *A. obturbans* was studied from nine larval skins in the collection of the British Museum and originating from Ceylon.

Culex brevipalpus, Giles.*Description of larva.*

Antenna (fig. 7, b): length of the shaft, nearly three-fifths of that of the head. Antenna slightly bent, thickened below the middle, with a moderate number of minute spines all over the surface; a barbed, many-branched, fan-shaped hair inserted between the apical and subapical fifth of the shaft; there are three stout apical hairs.

Maxillae strongly projecting in all specimens.

Cephalic hairs (fig. 7, a): inner frontal hair small, bifurcated; lateral and posterior ones large, two-branched and barbed. Near the antenna originate dorsally a large many-branched and a smaller five-branched hair, both barbed, and ventrally a seven-branched barbed hair. Inner occipital hair small, three-branched; outer one (figured as ventral) small, simple. Mental hair small, four-branched. Genal hair small, many-branched.

Mental plate (fig. 7, c) broader than long, with 17-18 teeth, the middle one the largest.

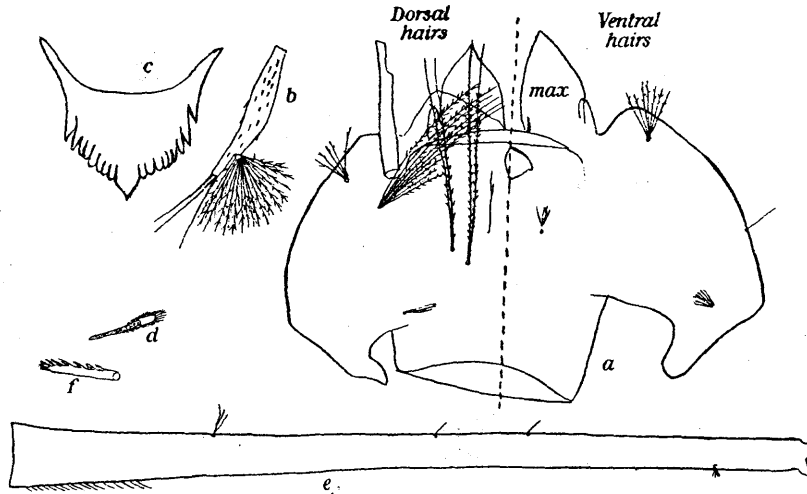


Fig. 7. Larva of *Culex brevipalpus*: a, cephalic hairs; b, antenna; c, mental plate; d, scale from 8th segment; e, siphon; f, spine on siphon.

Scales on eighth segment (fig. 7, d) 35-45 in number, elongate, obtuse, apically pale, basally dark, fringe fine and dense.

Siphon (fig. 7, e) about twelve times as long as broad; pecten occupying about one-sixth of the length of the tube, consisting of 16-20 teeth, the largest of the latter with ten secondary teeth (fig. 7, f). Four siphonal hairs, all small, apical and basal ones four- and three-branched respectively, middle ones simple.

Described from two larvae, found in a hollow of a fallen tree in Samarinda (East Borneo).

Uranotaenia subnormalis, Martini.

Synonym: *U. roperi*, Edw.

Edwards' suggestion (Edwards, 1922) that *U. roperi* might prove to be the female of *U. subnormalis* has been confirmed by the finding of the missing link, a male *U. roperi*. As to colour markings this male tallies well with the female described by

Edwards, the only difference being that the female shows broad, apical, lateral white spots on the third and fifth abdominal tergites, whereas the same segments of the male are adorned with complete apical white bands. The structure of the first hind tarsal segment is exactly the same as in Martini's *subnormalis*, and the measurements of the segments of the hind tarsus closely correspond with those in Martini's figure.

***Uranotaenia papua*, sp. nov.**

♀. *Head* clothed with broad, flat, mouse-grey, somewhat transparent scales; black upright forked ones behind and a narrow rim of white scales along the border of and between the eyes. Antennae much longer than the proboscis ($\pm 5:3$); torus yellowish brown, other segments brownish black; small hairs evenly distributed over the segments. Proboscis as long as the abdomen, dark brown, labellae pale brown. Palpi short, length one-ninth of that of the proboscis, brownish black.

Thorax: integument of mesonotum pale bronzy brown, clothed with bronzy brown, narrow curved scales, not forming a definite pattern, and black hairs. Anterior border with a row of gray flat scales, somewhat bluish in some lights. No row of flat scales in front of the wing-roots. Pleurae greyish yellow without ornamentation. Prothoracic lobes unscaled, with three large bristles. Scutellum wholly covered with flat bronzy scales. Wing scales dark brown. Legs dark bronzy brown, unbanded. Ungues equal and simple.

Abdomen short, truncate, dorsally with dark bronzy black scales; venter dark brown.

Described from two females caught by Lieut. de Rook in Pionierbivak, River Mamberano, North Coast of New Guinea.

This species is especially characterised by the presence of pale flat scales on the anterior border of the mesonotum in the absence of such scales on any other part of the mesonotum or the pleurae.

***Uranotaenia atra*, Theo.**

Description of larva.

Antenna (fig. 8, b): length not quite one-third of the length of the head; surface smooth; four apical hairs, two of which are longer than the breadth of the shaft, the longest but one with a black band near the base and a transparent area on both sides of the band.

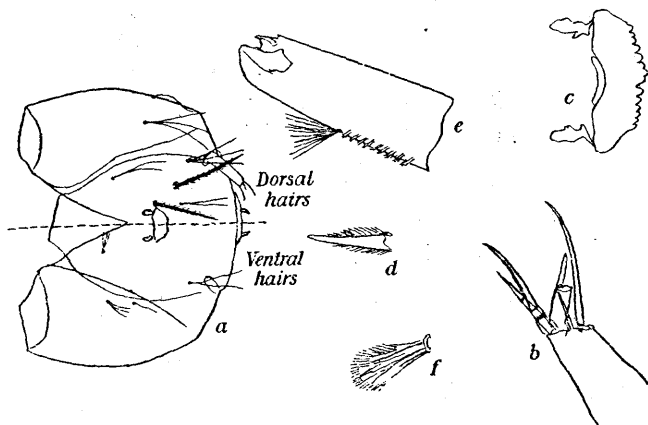


Fig. 8. Larva of *Uranotaenia atra*: a, cephalic hairs; b, tip of antenna; c, mental plate; d, scale from 8th segment; e, siphon; f, spine on siphon.

Cephalic hairs (fig. 8, *a*): on the hind part of the clypeus is a group of three hairs on each side; the outer and hind ones of this group are conspicuously thick, dark and delicately barbed, the inner one is thin, shorter and bifurcate. Near the antenna one dorsal three-branched and one ventral two-branched hair. Occipital hairs three, in a row, inner one two-branched, middle one three-branched, lateral one simple. One short, three-branched mental hair. Two short genal hairs, front one simple, hind one three-branched.

Mental plate (fig. 8, *c*) nearly two and a half times as broad as long, with fourteen obtuse teeth, not forming an angle in the middle.

Scales on the eighth segment (fig. 8, *d*): on each side 6-9 scales, which are elongate and obtuse, with the fringe reaching almost to the tip. On the dorsal side of the eighth segment there is a triangular chitinous thickening of the integument situated medially with the base of the triangle posteriorly and the apex of the triangle directed anteriorly. Laterally this segment also shows a patch of chitinous thickening on both sides, sharply bounded on the dorsal border, on the underside gradually passing into the thinner chitin of the venter.

Siphon (fig. 8, *e*) not quite three times as long as broad, sides straight, tube only slightly tapering towards the apex. The comb occupies less than half the length of the siphon and consists of 9-12 teeth; the latter are very delicate, transparent, not pointed, but enlarged toward the apex, longitudinally striated and densely but delicately fringed (fig. 8, *f*). The siphonal hair is inserted somewhat basally of the middle of the tube and many-branched.

Described from five larvae caught in brackish water on the coral islet Edam, in the Bay of Batavia (Java). Like most other *Uranotaenia* larvae, they take a horizontal position in the water, with the dorsal side at a short distance from the water surface.

REFERENCES.

- CHRISTOPHERS, S. R. (1923). The Structure and Development of the Female Genital Organs and Hypopygium of the Mosquito.—Ind. Jl. Med. Res., x, p. 699.
- EDWARDS, F. W. (1917). Notes on Culicidae with Descriptions of New Species.—Bull. Ent. Res., vii, p. 218.
- . (1922). A Synopsis of Adult Oriental Culicidae.—Ind. Jl. Med. Res., x, p. 436.
- HOWARD, L. O., DYAR, H. G., & KNAB, F. (1912 and 1915). The Mosquitoes of North and Central America and the West Indies, iv and ii, plate 66.
- MARTINI, E. (1920). Ueber Steckmücken.—Arch. für Schiffs- und Tropenkr. xxiv, Beih. 1, p. 136.
- STANTON, A. T. (1915). The Larvae of Malayan Anopheles.—Bull. Ent. Res. vi, p. 159.
-