

MOSQUITOES OF THE ETHIOPIAN
REGION

MOSQUITOES

OF THE

ETHIOPIAN REGION

III.—CULICINE ADULTS AND PUPAE

BY

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PREFACE

THIS volume completes the Monograph of the 'Mosquitoes of the Ethiopian Region,' publication of which was commenced by the Trustees of the British Museum (Natural History) in 1936; though its appearance has been somewhat delayed, this has been rather an advantage than otherwise. That it should be published in wartime needs no apology, for though the subject is treated from the standpoint of pure taxonomy, its importance in medicine is obvious. Incidentally, as evidenced by the list of collaborators printed on pages 463-466, it is a testimony, though perhaps only a small one, of the benefits that can derive from free international co-operation in those fields of human endeavour where mankind's real advancement is to be sought.

Comparison of the three volumes in the present series with those of Theobald's earlier 'Monograph of the Culicidae' will show many differences in systematic treatment and in the taxonomic opinions of the authors, but even the vastly greater material which was at the disposal of Dr. Edwards has by no means been sufficient to enable him to reach completely satisfying conclusions in all cases of doubt. It is evident that much further collecting is needed before the African fauna can be catalogued upon a basis that is secure both as to specific limits and generic conceptions, in spite of the fact that far greater progress has been made in the study of this group of insects than in any other during the last forty years. The information provided in these volumes, however, should enable anyone interested in the subject to identify all but a few of the African mosquitoes with certainty.

Of the illustrations to this volume the majority are original, those of male terminalia being drawn by the author, and the remainder by Mr. A. J. E. Terzi and Miss M. Mackay. The four coloured plates are by Mr. Terzi, and are commendable not only as good examples of the artist's work, but as demonstrating that mosquitoes may be things of beauty if seldom of joy. The originals of Plates I and IV were prepared at the instance and expense of the Board of Overseas Trade for exhibition in the British Pavilion in the Wembley Exhibition of 1924; Plates II and III were made specially for this work. Figures 5, 10, 11, 15, 19, 22, 23, 25, 26, 53 and 125 are reproduced from Theobald's 'Monograph of the Culicidae of the World.' The remaining figures have been borrowed, and the Trustees are grateful to the Editors of the following publications for the loan of blocks or (in a few cases) the permission, granted or assumed, to copy published figures: *Bulletin of Entomological Research*, Figs. 2, 3, 12, 17, 18, 29, 36, 45, 65, 68, 75, 93, 97, 99, 105, 108, 110, 112, 116, 119-21, 124, 127, 129, 131, 133, 136, 137, 146, 147, 151, 153a, 154, 158, 161, 162, 165-9, 172-4, 178-80, 183; *Annals of Tropical Medicine and Parasitology*, Figs. 39, 59a and b, 159, 1921; *Transactions of the Royal Society of Tropical Medicine and Hygiene*, Figs. 41, 42, 46; *Fauna of British India*, Figs. 4, 7, 32b; *Revue Zoo-*

logique Africaine, Figs. 63a, 87; *Publications of the South African Institute of Medical Research*, Fig. 134; *Monthly Bulletin of the Bureau of Health, Manila*, Fig. 128; *Publications of the Egyptian University, Faculty of Medicine*, Fig. 181; *Bulletin of the American Museum of Natural History*, Fig. 184.

In addition to completing the original plan by presenting an account of the adult and pupal taxonomy of Culicine mosquitoes and a chapter on the Zoogeography of Ethiopian mosquitoes, this volume includes a short supplement bringing the matter of the first two volumes up to date.

N. D. RILEY,

Keeper, Department of Entomology.

To the great regret of all who knew him Dr. Edwards died on November 15th, 1940, as this volume was about to go to press. In one of his last letters, written from Letchworth Hospital on November 1st, there occurs the following passage:—

“Naturally at such times as these one ponders again the old problems of the meaning and purpose of life. And the answer that presents itself seems to be the old one, that the true end of man is to glorify God: what more can one say? ‘Glorify God!’ How much can be implied by those two words! ‘God’: the Unity behind all the diversity of things; but at the same time the Trinity of Love, Truth, Beauty. ‘Glorify’: this seems to imply intensity of feeling, activity, harmony, joyful life, radiancy. So, to ‘glorify God’ is so to live ‘in tune with the Infinite’ that we ‘feel within ourselves the throb of the Universal Life,’ and by our lives demonstrate that love, truth and beauty are at the heart of all; to embody love in service, truth in sincerity, and beauty in worship, and all with joy and thanksgiving. Could we but live always in this way, suffering could be transmuted and even death prove but a sunrise.”

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INTRODUCTION

THE rapid increase in recent years of our knowledge of the Culicine mosquitoes of the Ethiopian Region is well exemplified by the fact that whereas about 180 species are recognized in my list of 1927, the present volume contains descriptions of about 290 species, besides some 40 named subspecies and varieties. This large increase is in part due to the rectification of errors through which forms which are now considered distinct species had been lumped together, but still more to the discovery of numerous forms which until recently were entirely unknown.

In the preparation of this book all the available material has been closely studied and every species has been redescribed. As a result of the scrutiny several additional means have been discovered of distinguishing between species and genera, and use has been made in the keys of some of the new characters (such as presence or absence of acrostichal bristles ; distribution of scales on pleurae and first abdominal segment ; presence or absence of scales on paratergite, and the shape of this part). These keys should be found workable by anyone who is prepared to pay close attention to them, but it is not claimed that they are infallible, nor can it be pretended that the identification of Culicine mosquitoes can ever be made an easy matter.

After the description of each species I have included a paragraph headed "Distribution." In this I have mentioned localities where the species has been found, with collectors' names, but the lists are not intended to be and are often far from being complete : they mainly refer to material in the British Museum or to other specimens whose identity I have recently checked. I have, however, endeavoured to include reference to all the species recorded from each of the countries of the British Empire in Africa.

SPECIES AND VARIETIES.

In the figures cited above, the word " about " is inserted advisedly, because the mosquitoes form no exception to the rule that the more intensively a group of animals is studied the more difficult it becomes to arrange in exact and satisfactory categories the various types of variation which are found to occur within the group. Increase of knowledge, especially of the early stages of insects, often reveals an unsuspected complexity. Adult insects which are closely similar in external appearances may prove on dissection to have quite dissimilar genitalia in the male or in both sexes, while others which differ obviously in colouring may have identical genitalia. Again it may be found that adults which are distinguishable only with difficulty if at all are strikingly different in one or more of their early stages and perhaps also in their habits. Examples of this latter phenomenon which have recently become familiar to research workers in Diptera are the " pupal species " of *Simulium*, in which

genus several different and non-intergrading types of pupae inhabiting the same stream may produce adults which are indistinguishable (even in the smallest details of genitalia); or the forms of *Anopheles maculipennis* which are distinguishable mainly by features of the eggs; or those gall-midges which are only known to differ by their obligatory association with different plants. In all such types of variation it is evident that the question "What is a species?" may be answered in different ways, but whatever answer be given it is clear that the situation cannot be understood until all stages of the species have been studied, hence it was thought desirable to include in this monograph an account of pupal morphology.

Among African Culicine mosquitoes some only of the problems indicated above have arisen. There are numerous cases of forms which differ to a greater or less extent in male genitalia, but in little else; such cases as now shown occur not only among dull-coloured species such as *Culex*, but also among those with striking and specialized ornamentation, such as *Eretmapodites* or the *argenteopunctatus* group of *Aedes*. Cases (apart from those of continuous variation) in which the ornamentation is obviously different but the male genitalia nearly identical are less frequent, but examples may be cited in *Aedes marshalli*, *capensis* and *kapretwae*, *A. aegypti* and *mascarensis* or *Culex pipiens* and *scotti*. As examples of forms which appear well distinguished in the larval stage but less clearly so in the adult may be mentioned *Culex vansomereni* and *toroensis*, or *Ficalbia hispida*, *lacustris* and *perplexens*; other similar cases have been noted by Barraud among Indian Culicines. No examples of "pupal species" have yet been noted among Culicines, apart from the species of *Ficalbia* just noted, which are also well distinguished as larvae, but Miss Evans described distinct forms of pupae occurring in *Anopheles obscurus*.

It may be that some of the forms here treated as distinct species or subspecies are natural hybrids between allied species, but it is hardly possible at present to form any conjectures on this question. That hybrids between Culicine mosquitoes may occur in nature seems not unlikely in view of the recent work of Toumanoff (1937), who successfully mated two such different insects as *Aedes aegypti* and *albopictus* and obtained fertile hybrids even to the third and fourth generation. Toumanoff's results however are in striking contrast with those of various workers on *Anopheles maculipennis*, who have shown that even the races of this species are to a greater or less extent mutually sterile.

In allotting a status to the forms examined I have thought it best to regard as distinct species forms which differ sharply (even if slightly) in any one of their stages and whose distribution is to a large extent coterminous, as for example *Eretmapodites chrysogaster*, *semisimplicipes* and *grahami*; if intermediates occur or if two forms which differ only slightly occupy different or but slightly overlapping territories (as with some *Eretmapodites*) I have treated them as varieties or subspecies. It has been the prevalent custom among Dipterists to use the term "variety" in a rather vague and comprehensive sense to indicate any rank below that of species, but it seems desirable to make use of the term "subspecies" for geographically representative and slightly differing forms, leaving "variety" to indicate cases of bridged variation in one area or of colour variation induced by local differences in environment. One reason for making this distinction is that the code of zoological nomenclature lays down the principle that subspecific names have the same status

as those of species and are subject to the priority rule, but makes no reference to names of lower categories, which therefore, it has been argued, have no status in nomenclature. Frequently, of course, the data at present available are insufficient to determine whether a given form should correctly be regarded as a species, subspecies or variety, and it may well be that changes in the status allotted to some of the forms described in this book will have to be made at a later date when more information is available.

AFRICAN CULICINE MOSQUITOES AND DISEASE.

Of the nearly three hundred species of African Culicines the large majority are innocuous to man ; most of them suck human blood only occasionally, if at all, and many are either so rare as to be of no account, or so rural and retiring in habits that they cannot be regarded as pests. Perhaps not more than half a dozen are to be regarded as constituting a serious menace on account of their disease-carrying capacities consequent upon a preference for human blood as food, these including *Aedes aegypti*, *Taeniorhynchus africanus* and *uniformis*, and *Culex fatigans* ; another score or so of species, chiefly of the genera *Aedes*, *Eretmapodites* and *Culex*, have also to be reckoned with as troublesome pests and potential disease-carriers in some districts. In this connection the studies of Davis and Philip (1931) and Kerr (1933) on food-preferences of Nigerian mosquitoes are of special interest.

The present state of knowledge with regard to the transmission of diseases of man and domestic animals by mosquitoes in tropical and South Africa may be summarized as follows :

YELLOW FEVER.—Before 1928 *Aedes aegypti* (*Stegomyia fasciata*) was thought to be the sole transmitting agent of the yellow fever virus. Since that date the work of Bauer (1928) and Philip (1929-31) in Nigeria has demonstrated that several other African mosquitoes are capable of transmitting the disease from monkey to monkey in the laboratory by biting, these including—

<i>Aedes</i> (<i>Stegomyia</i>) <i>simpsoni</i> .	<i>Aedes</i> (<i>Aedimorphus</i>) <i>stokesi</i> .
„ „ <i>africanus</i> .	<i>Eretmapodites</i> <i>chrysogaster</i> .
„ „ <i>luteocephalus</i> .	<i>Taeniorhynchus</i> (<i>Mansonioides</i>) <i>africanus</i> .
„ „ <i>vittatus</i> .	

Philip also found that the disease could be conveyed to a healthy monkey by injecting into it infected and crushed mosquitoes of the following species :

<i>Aedes</i> (<i>Aedimorphus</i>) <i>irritans</i> .	<i>Aedes</i> (<i>Banksinella</i>) <i>punctocostalis</i> .
„ „ <i>nigricephalus</i> .	<i>Culex</i> <i>thalassius</i> .

Of these *Aedes irritans* and *nigricephalus*, as well as *C. thalassius*, are troublesome biters and could probably be added to the former list ; and it would seem that most of the common biting mosquitoes of West Africa are to be regarded as potentially dangerous. The inclusion of *Taeniorhynchus africanus* in the list of experimental yellow-fever transmitters is disquieting, as this species is almost as ubiquitous as *Aedes aegypti*, and even more bloodthirsty ; moreover, as pointed out by Philip, it feeds more than once and is present in houses at all seasons.

Kerr (1932) obtained laboratory transmission of yellow fever by the bites of *Culex thalassius*, and also showed by the injection method that the virus could remain lethal in the body of *Taeniorhynchus uniformis* for at least 15 days. However, he considered *C. thalassius* an inefficient transmitter, and found that *T. uniformis* did not transmit the disease by biting. This last finding to some extent discounts Philip's results with *T. africanus*, as it is hardly to be expected that two species so similar in habits as well as in structure would show much difference in regard to disease transmission; it may be that neither of them need be taken into such serious consideration, as possible natural transmitters of the disease, as must some of the *Aedes*. The same may be said about *Culex fatigans*, which Davis (1932) experimented with in Brazil, using a virulent African strain of yellow fever. Davis was able to infect healthy monkeys by the bites of *C. fatigans*, but concluded that many of the mosquitoes were able to rid themselves of the virus, and that probably only a small number of them developed gland-infection.

It is probable that in Africa, as in South America, "jungle yellow fever" may be transmitted in nature by mosquitoes other than *Aedes aegypti*, but it has not yet been possible to establish this because, as noted by Findlay, in the endemic yellow-fever area of Africa no rural area has yet been found from which *aegypti* is absent. The whole subject of yellow-fever transmission, the distribution of the fever and its vectors, and the dangers of the spread of the disease through transport of the vectors by aircraft, has been reviewed by Whitfield (1939).

DENGUE.—No transmission experiments on dengue in Africa have been recorded, though the disease has been recorded from Mauritius and from Senegal and elsewhere on the Continent. The presumed vector is *Aedes aegypti*. Galliard (1931) states that at Port Gentil this mosquito produces cases of dengue throughout the year.

FILARIASIS (human).—The work of Taylor (1930), Connal (1931) and Hicks (1932) indicates that *Anopheles gambiae* and *funestus* are the main carriers of *Filaria bancrofti* in Africa, and that though various culicines may become infected with the worms, the development of the latter is usually arrested and they do not reach the proboscis of the mosquito. Connal and Hicks both found this to be the case with *Aedes aegypti*, as also did Barbeau (1930) in Mauritius, and Connal reached the same conclusion regarding *Taeniorhynchus africanus*.

Experiments with *Culex fatigans* have been contradictory; Barbeau obtained mature infections whereas Connal's results were entirely negative. Taylor observed one case of complete development in *Aedes ochraceus*.

RIFT VALLEY FEVER.—This is a virus disease affecting sheep in East Africa; it may also be pathogenic to man. Daubney and Hudson (1933) in transmission experiments found that the virus can be conveyed to mice and lambs by injection of infected extract of *Taeniorhynchus versicolor*, *fuscopennatus* or *microannulatus*.

BLUE-TONGUE.—A virus disease of sheep in South Africa, which was found by Nieschultz, Bedford and Du Toit (1934) to be transmissible by *Aedes (Banksinella) lineatopennis*.

HORSE-SICKNESS.—Another virus disease, affecting horses over a large part of Africa. Nieschultz, Bedford and Du Toit (1934, 1935) consider that mosquitoes are probably involved in its transmission, but experiments with various species of *Aedes* gave mainly negative results.

ACKNOWLEDGMENTS.

In the section on Zoogeography at the end of this book I have included a brief summary of our present knowledge of the distribution of mosquitoes in Africa, and the sources of this knowledge. I hope that the many field-workers who have provided the materials on which this book is based will accept this all too brief mention as indication of my grateful appreciation of each contribution, large or small. I cannot select names from this long list, except to say that to no one am I more deeply indebted than to my collaborator, Mr. G. H. E. Hopkins, without whose constant interest this work would perhaps never have been completed—or even begun. I must also express my appreciation of the ready co-operation accorded at all times by my assistant, Mr. R. L. Coe, and by the staffs of the Imperial Institute of Entomology, the London School of Hygiene and Tropical Medicine, and the Liverpool School of Tropical Medicine, as well as by Dr. H. Schouteden of the Congo Museum, and by Mon. E. Séguy of the Paris Museum.

I. TAXONOMY OF CULICINE ADULTS.

CHARACTERS USED IN CLASSIFICATION.

HEAD.

Eyes.—The eyes are always approximately similar in the two sexes, but exhibit variations in size which are sometimes useful as subsidiary characters in distinguishing species or genera. In most *Culex* the eyes are large and more or less in contact for some distance above the insertion of the antennae; in most *Aedes* they are somewhat smaller and are usually separated above the antennae by a *front* which varies in width according to the species. In all mosquitoes the surface of the eye is bare.

Clypeus.—This is of distinctive shape in the genera *Megarhinus* and *Harpagomyia*, otherwise it is of no value in classification except that in a few species it bears scales; clypeal hairs are not present in any African mosquitoes.

Proboscis.—This also is of distinctive structure in the genera *Megarhinus* and *Harpagomyia*, but otherwise it has been little used in classification, except that in the males of some *Ficalbia* it is markedly swollen at its tip; in most species of the *Aedes* group it is rather longer and more slender than in *Culex*. Generic and specific differences in the mouth-parts (other than the maxillary palpi) have not been investigated.

Palpi.—On account of the very different development of these organs in the two sexes and the great differences which may occur between nearly related species, these organs are not now used for generic classification, but are useful for defining subgenera and species. They exhibit much more diversity in the male than in the female sex, though in the latter their length relatively to that of the proboscis is of some taxonomic value. In the descriptions here given the male palpi are regarded as composed of a long segment or *shaft*, a second or penultimate segment and a terminal segment; the rudimentary basal segment is neglected, as is the incomplete division of the shaft into two segments.

Antennae.—In the males of African mosquitoes the antennae are usually plumose, but in *Harpagomyia* they are like those of the female; in *Orthopodomyia* and *Ficalbia* they are rather longer than in the other genera. In the females the relative length of the first two segments of the flagellum is often of use in identification, as is (in the genus *Culex*) the number of long hairs in the whorl at the base of each segment. In both sexes the presence or absence of scales on the basal segments is important. The enlarged basal segment (morphologically the second antennal segment, the first being vestigial) is here spoken of as the *torus*; it has also been called the scape or pedicel, but the term "scape" should be reserved for the true first segment. The remaining segments comprise the *flagellum*.

Vestiture.—The integument of the head behind the eyes and on the front between the eyes is always completely clothed with scales, which may be *erect* or *decumbent* (*i.e.* lying more or less flat against the surface of the head). Erect scales are narrow

at the base and gradually widened to the tip, which is forked or toothed. Decumbent scales are of two kinds—*narrow*, curved and pointed, or *broad*, flat, with square or occasionally rounded ends; intermediates between these two types are not often seen. The sides and under surface of the head are always clothed with broad decumbent scales only, but the *vertex* or upper part of the head may exhibit scaling of one of three different types: (1) erect scales confined to a few near occiput, other scales all broad and closely applied to the head; (2) erect scales numerous over a larger area and mixed with decumbent narrow scales, but broad flat scales numerous and forming a continuous band round the eye-margins; (3) whole vertex clothed with a mixture of erect scales and narrow decumbent scales, except close to eye-margins, where all the scales are narrow and decumbent. Every gradation may be seen between these types of scaling, not infrequently within the limits of a single genus or subgenus, though the arrangement is constant for each species or group of species.

In addition to the scales the upper surface of the head bears a row of *orbital bristles* close behind the eye-margins; the upper one or two pairs of these are sometimes distinguished as the *vertical bristles*, and the lower or true orbitals may be absent.

THORAX.

No part of the body is of more importance in classification than the thorax, one reason for this being that the structure is uninfluenced by sex, and the ornamentation only very slightly so. An appreciation of the structure of the thorax and the limits of its different sclerites is therefore essential for determination; it should be made clear by the accompanying figures and the following explanatory notes:

Prothorax.—As in all Diptera this is much reduced, but is composed of four main parts: anterior pronotal lobes (*apn*), posterior pronotal lobes (*ppn*), propleura, and prosternum. The *anterior pronotal lobes* (sometimes called simply pronotal lobes) are the prominences lying one on each side of the front of the thorax and protecting the head; they vary somewhat in size but are always separated above. The *posterior pronotal lobes* (also sometimes referred to as pro-epimera) form that part of the side wall of the thorax lying between the anterior pronotal lobes and the anterior spiracle, a very small *spiracular area* being separated off from the main portion by a strong ridge. The presence of *spiracular bristles* on this small area distinguishes the genera *Theobaldia* and *Uranotaenia*. The bristles and scales on the anterior and posterior pronotal lobes are of taxonomic importance, especially the scales, which may be present or absent, broad or narrow, and often differ in shape from those of the mesonotum. The term *propleura* is here used for the small portion lying immediately above the front coxa, with a projecting tongue extending round the front of the base of the coxa, and connected with the anterior pronotal lobes by a band; the lower part of the propleura bears setae which vary in number according to genus, species and sex (*Uranotaenia* having the minimum of one propleural seta), but the upper part is always bare. The propleura is sometimes called the "proepisternum," but as there is no clear division into episternum and epimeron the longer term seems unnecessary. The *prosternum* is the part between the two front coxae which has not hitherto been studied comparatively. It is usually entirely bare, but sometimes bears scales on its upper part, while in *Dunnius* and *Eretmapodites* it is

uniformly and densely scaly ; in a few species of *Culex* it bears a number of bristly hairs.

Mesothorax : dorsal.—Almost the whole of the upper surface of the thorax is formed by the *mesonotum*, which is divided into the scutum, scutellum, postnotum and paratergites. By far the greatest area is occupied by the *scutum*, this name being here used for the combined praescutum and scutum, these parts in the Culicidae not being divided by any recognizable suture. Just in front of the middle and immediately above the spiracle the lateral margin of the scutum is slightly prominent, forming the *scutal angle* ; in the middle posteriorly is a small area referred to as the *bare space* on account of the absence of vestiture upon it. The *scutellum* is trilobed in all genera except *Megarhinus*. The *postnotum* (also called post-scutellum, mesophragma, or, incorrectly, metanotum) is the part behind the scutellum. The *paratergite* is a small area on each side a little in front of the wing-root and cut off from the scutum by a strong furrow ; it varies in size and shape in different genera.

The scutum bears a *vestiture* of bristles and scales. The bristles are not uniformly distributed, but occur mainly in a *supra-alar* patch above and in front of the wing-root and in two or three longitudinal lines or stripes ; those along the median line are the *acrostichal bristles*, those along the other two lines the *dorso-central* bristles ; the acrostichal bristles are nearly always noticeably shorter and weaker than the dorso-centrals and are not infrequently entirely absent ; in any case they occur mainly on the anterior half of the scutum ; the dorso-central bristles also may be absent from the front part of the scutum and present only for a short distance in front of the scutellum, or even (*Megarhinus*) absent altogether. Scales are usually distributed uniformly and rather densely over the surface of the scutum except on the bare space, but in a few cases they are sparse or absent on certain areas, and not infrequently bare lines adjoin the lines of dorso-central bristles. The scutellum bears marginal bristles on each of its three lobes, and usually scales on its dorsal surface, the shape and density of these scales being important for classification, especially in the genus *Aedes*. The paratergites are usually bare, but in *Aedes* are clothed with scales, which may be broad or narrow, these scales usually resembling those of the pronotal lobes rather than those of the scutum. The postnotum is bare except in some species of *Eretmapodites*, where it bears a few small bristles.

Mesothorax : lateral.—Apart from the posterior pronotal lobes (defined above), most of the side of the thorax is occupied by the mesothoracic pleurae, comprising the following portions : *Post-spiracular* area, the area immediately behind the anterior spiracle ; it is largely membranous, the sclerotized portion being the anterior part of the anepisternite. *Sub-spiracular* area, the membranous area below the anterior spiracle and adjacent to the posterior postnotal lobes and propleura. *Sternopleura*, a large sclerotized area of the lower half of the pleurae between the front and middle coxae. *Pre-alar* area, a narrow upward extension of the sternopleura reaching to just in front of the base of the wing and separated from the anterior anepisternite (post-spiracular area) by a membranous cleft ; its upper portion is strongly convex and forms the *pre-alar knob*. *Mesepimeron*, a rectangular area of the posterior part of the pleurae, marked off by well-defined sutures from the surrounding areas ; it is also known as the pteropleura or pteropleurite—names which are more frequently used for the corresponding part in some other families of Diptera. *Meron*, a small

triangular piece immediately behind and above the base of the middle coxa and below the mesepimeron ; in all mosquitoes it is bare and in the African ones has no taxonomic significance.

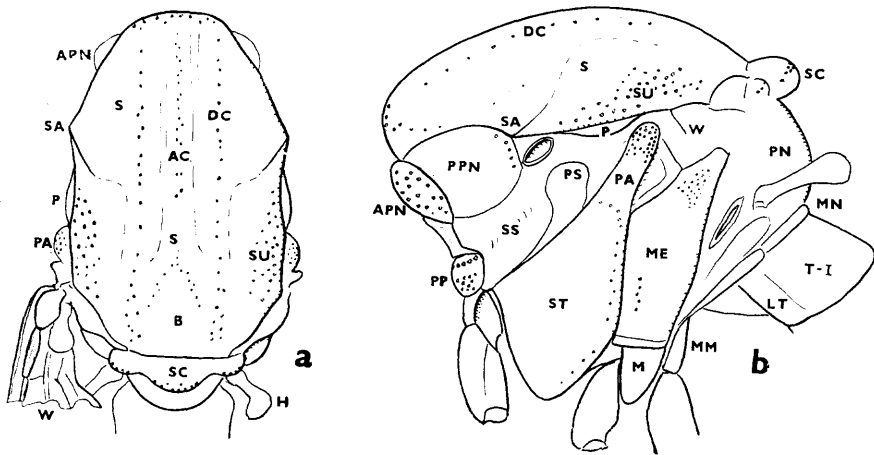


FIG. 1.—Parts of the thorax in a Culicine mosquito (*Culex tigripes* Grp.). a. Dorsal. b. Lateral. Bristles indicated by their scars. AC. Acrostichal bristles. APN. Anterior pronotal lobes. B. Bare pre-scutellar space. DC. Dorso-central bristles. H. Haltere. LT. Lateral lobe of first tergite. M. Meron. ME. Mesepimeron. MM. Metameron. MN. Metanotum. P. Paratergite. PA. Pre-alar area and knob. PN. Postnotum. PP. Propleura. PPN. Posterior pronotal area. PS. Post-spiracular area. S. Scutum (including praescutum). SA. Scutal angle. SC. Scutellum. SS. Sub-spiracular area. ST. Sternopleura. SU. Supra-alar area and bristles. T-I. First abdominal tergite. W. Base of wing.

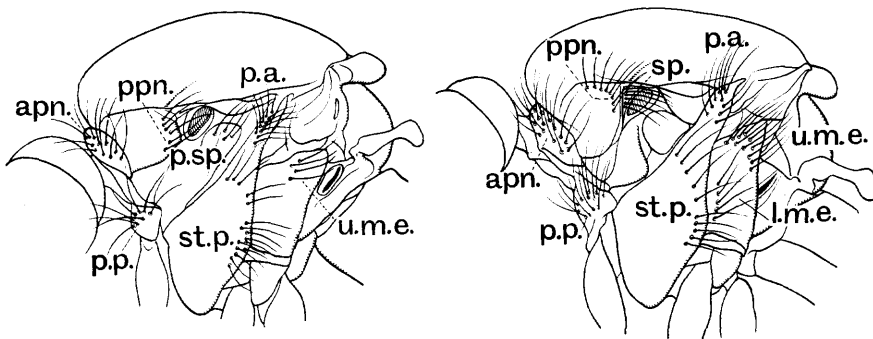


FIG. 2.—Pleural chaetotaxy of Culicine mosquitoes (after Barraud, 1933). a. Genus *Theobaldia*. b. Genus *Aedes*. apn., anterior pronotal; l.m.e., lower mesepimeral; p.a., pre-alar; p.p., propleural; ppn., posterior pronotal; p.sp., post-spiracular; sp., spiracular; st.p., sternopleural.

The hairs or bristles on the sides of the mesothorax are as follows : *Post-spiracular*, a small group in the middle of the post-spiracular area, found only in the genera *Aedes* and *Eretmapodites* and in the subgenus *Mansonioides*. *Sternopleural*, a more or less vertical row towards the posterior edge of the sternopleura, sometimes continued forwards along the boundary between this and the pre-alar area. *Pre-alar*, a group on the pre-alar knob. *Upper mesepimeral* or subalar, a group in the upper

corner of the mesepimeron immediately below the wing-root ; these and the pre-alar hairs are almost always present and therefore of little or no taxonomic interest. *Lower mesepimeral*, a small group (or frequently a single hair) below the middle or towards the lower edge of the mesepimeron ; very useful in distinguishing many species of *Aedes* and *Culex*.

The scales of the pleurae are even more valuable for purposes of specific differentiation than the bristles, a fact which I have not sufficiently appreciated until recently. The scales are usually all of one type, broad and flat, though in some *Aedes* narrow scales may be present in certain areas. In some genera (notably *Megarhinus*) the pleurae are very much more extensively scaly than in others (*e.g.* *Culex*, some species of which are almost completely devoid of pleural scales). The presence or absence of scales on the post-spiracular, subspiracular or pre-alar areas may provide means of distinguishing between closely related species.

Metathorax.—The metathorax, as in other Diptera, is very much reduced. Its dorsal portion (metanotum) forms a narrow and very inconspicuous strip between the postnotum (which was mistakenly thought by Theobald and some other writers to be the true metanotum) and the first abdominal tergite. The pleura of the metathorax is better developed than the notum, forming a rather narrow area (divided into two by a vertical suture) behind the mesepimeron and above the hind coxa ; it is of little or no taxonomic significance. The small piece lying immediately above the hind coxa I have here called the *metameron* ; it has been referred to by some writers as the meteusternum, and is the only part of the metapleura on which obvious scales may occur (as in *Aedes caspius*).

LEGS.

Orientation of surfaces.—For descriptive purposes the legs are imagined to be all fully extended outwards at right angles to the body ; the surfaces of femora, tibiae and tarsi which would in such an imaginary position face forwards are designated *anterior*, those which would face backwards are designated *posterior*, the upper and lower surfaces being termed *dorsal* and *ventral* respectively. This convention avoids the use of the ambiguous terms “inner” and “outer.”

Coxae.—The hairs or bristles on the coxae vary to some extent in different genera, but have not been used in classification. In *Uranotaenia* each hind coxa has a single bristly hair at its tip in front, curving in front of the trochanter ; most other genera have several hairs in this position.

Femora.—Small differences may occur in the shape of the femora in different genera ; for example in *Uranotaenia* the middle femora are more noticeably swollen towards the base than is usual in other mosquitoes. The presence of a scale-tuft at the tip of the middle femur characterizes the genus *Aëdomyia*. Specific differences are commonly found in the colour of the scales ; even when the legs as a whole show no definite pattern the proportion and arrangement of light and dark scales on the hind femur is often of great assistance in distinguishing between nearly related species.

Tibiae.—The comb-like row of microscopic bristles on the inner side of the tip of the hind tibia is better developed in *Aedes* than in most other genera, and the

tibial bristles are fewer, longer, and stronger in most species of *Ficalbia* than in most other mosquitoes, but otherwise no features of generic importance are found in the tibiae. Specific differences in the colour of the scales are common, especially in the size of the pale spot at the tip of the hind tibia.

Tarsi.—The relative lengths of certain segments provide criteria for distinguishing some genera. Thus in *Orthopodomyia* the fourth segment of the front tarsus is unusually short, very much shorter than the fifth; in *Culex* the first segment of the hind tarsus is usually of about the same length as the hind tibia, whereas in *Aedes* and most other genera it is distinctly shorter. Some of the most important generic distinctions are to be found in the tarsal claws and pulvilli. In nearly all species of *Aedes* and also *Eretmapodites*, but in no species of any other African genus of mosquitoes, the claws of the four anterior legs of the female each bear a sharp tooth on the under side near the middle; in many species of *Aedes* the claws of the

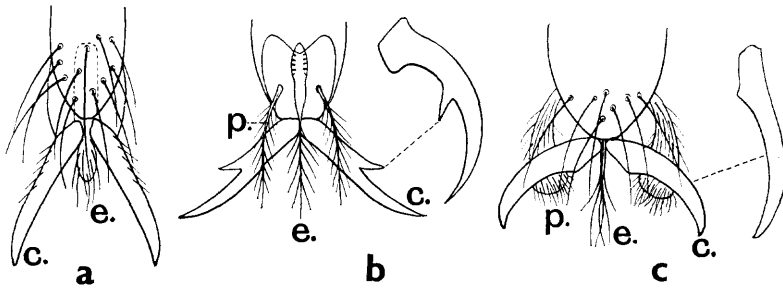


FIG. 3.—Tarsal characters of Culicine mosquitoes (after Barraud, 1933). a. Genus *Theobaldia*: simple claws, no pulvilli. b. Genus *Aedes*: toothed claws, rudimentary pulvilli. c. Genus *Culex*: simple claws, broad pulvilli. c., claw; e., empodium; p., pulvillus.

hind legs are similarly toothed. In the male these characters are complicated by the secondary sexual modifications of the claws, one claw on each of the four anterior legs being nearly always enlarged; the large claw usually bears one tooth but may have two (as in *Theobaldia*); the small claw is usually toothed in *Aedes*, simple in other genera. The males of the genus *Uranotaenia* are peculiar in that all the claws are simple, and those of the front legs both small. Between the claws a median hairy *empodium* is always present; it varies somewhat in length relatively to the claws but is rarely conspicuous. Below the base of the claws and on each side of the empodium are the *pulvilli*, a pair of pubescent pads found in all species of *Culex* and diagnostic of this genus. They should not be confused with the median empodium, nor with the fine hairs which are sometimes to be seen on the enlarged bases of the claws; they are more readily seen in the female *Culex* than in the male owing to the modification of the claws in the latter sex. Secondary male characters in the legs (apart from the modification of the claws as just mentioned) are of rare occurrence among mosquitoes, but interesting cases of such structures occur in the genera *Hodgesia*, *Uranotaenia* and *Eretmapodites*. The presence or absence and width and position when present of *pale rings* on the tarsi is important; when present these rings may be situated on the *basal* (proximal) or on the *apical* (distal) ends of the segments, or in some cases (chiefly in *Culex*) they may extend across both sides of the articulations.

WINGS.

Venation.—The wing-venation of Culicidae is of very uniform type throughout the family; but does provide some minor features of value for distinguishing genera and in some cases species. The nomenclature adopted here is that used by Barraud and other workers on mosquitoes, the veins being referred to by numbers. The alternative symbols and names of the veins on the Comstock-Needham system used by many workers are as follows:

Subcosta . . .	Sc . . .	Subcosta.
1 . . .	{ R . . .	Radius (basal portion).
	{ R ₁ . . .	First branch of radius.
2 . . .	{ R _s . . .	Radial sector.
	{ R ₂ +3 . . .	Stem of R ₂ and R ₃ (stem of upper fork).
2.1 . . .	R ₂ . . .	Second branch of radius } Radial fork (upper
2.2 . . .	R ₃ . . .	Third " " } fork-cell).
3 . . .	R ₄ +5 . . .	Fourth " "
4 . . .	M . . .	Media.
4.1 . . .	M ₁ +2 . . .	Branch of media } Median fork (lower
4.2 . . .	M ₃ . . .	" " } fork-cell).
5 . . .	Cu . . .	Cubitus.
5.1 . . .	Cu ₁ . . .	Branch of cubitus } Cubital fork.
5.2 . . .	Cu ₂ . . .	" " }
6 . . .	An . . .	Anal vein.
3-4 . . .	r-m . . .	Radio-medial cross-vein.
4-5 . . .	m-cu . . .	Medio-cubital cross-vein (posterior cross-vein).

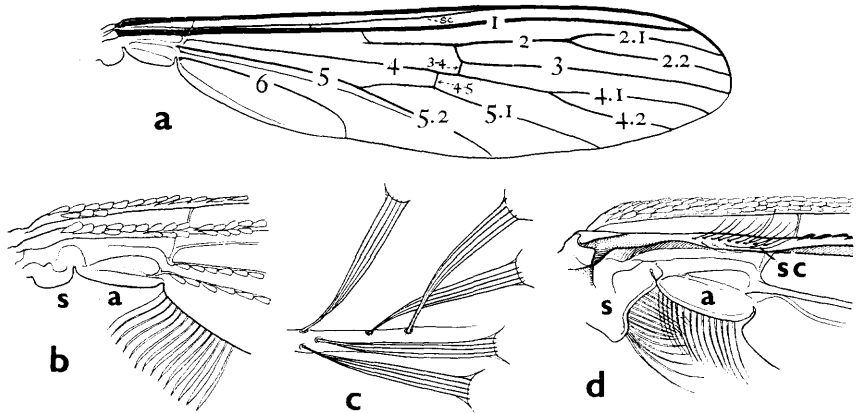


FIG. 4.—Wing-characters of Culicine mosquitoes (after Barraud, 1933). a. Venation of genus *Hodgesia*; notation as in text. *st.*, stem-vein. b. Base of wing of genus *Hodgesia*, showing bare alula (*a.*) and squama (*s.*). c. Forked wing-scales (genus *Hodgesia*). d. Base of wing of genus *Theobaldia* (underside) showing fringed alula (*a.*) and squama (*s.*), and hairs at base of subcostal vein (*Sc.*).

The short thickened basal portion of the radius is known as the *stem-vein*, or sometimes as the *remigium*.

The most fundamental venational difference between the genera is in the nature of the connection between veins 3 and 4. In *Megarhinus* vein 3 appears to be

prolonged a considerable distance towards the base of the wing, where it ends free, and to be connected with both 2 and 4 by short cross-veins, but from a comparison with other Diptera it is clear that this is not the true condition; the apparent cross-vein 2-3 must be morphologically the base of 3, and cross-vein 3-4 must be regarded as having a right-angled bend, the upper (horizontal) portion continuing vein 3 and extending as a spur beyond the bend. This is more or less the condition in Anophelini, but in all Culicine genera cross-vein 3-4 is a normal simple cross-vein placed close to base of 3. Venational differences among Culicini are chiefly to be found in the length of vein 6 and of the subcosta, in the relative positions of the bases of the forks of 2 and 4 and the length of the fork of 2 relative to its stem, and in the distance

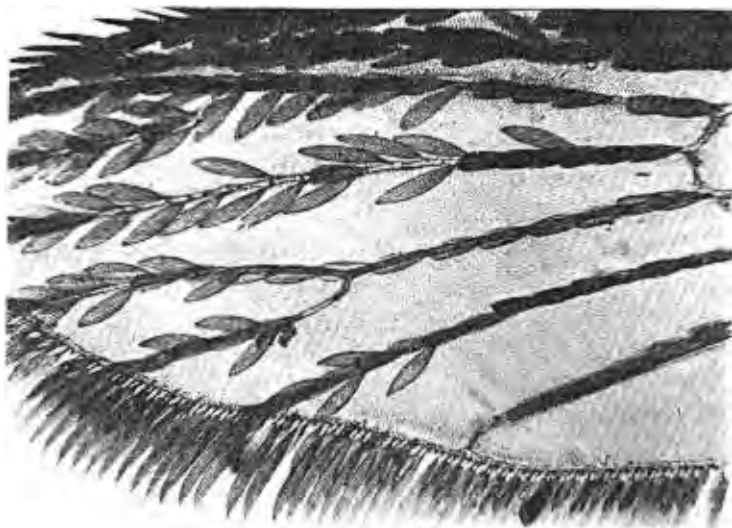


FIG. 5.—Portion of wing of *Uranotaenia alboabdominalis*, showing very fine dot-like microtrichia.
(After Theobald, 1910.)

apart of the two cross-veins. The three genera *Harpagomyia*, *Hodgesia* and *Uranotaenia* are collectively distinguished from other genera by having vein 6 relatively short; a line joining the tip of this vein with the base of 2 and the base of the fork of 5 would be at right angles to the main axis of the wing in these genera but would run very obliquely in the others. The genera *Megarhinus* and *Uranotaenia* and the subgenus *Mimomyia* of *Ficalbia* have the fork of 2 markedly shorter than its stem (the stem of the fork being the second section of vein 2, between the origin of 3 and the fork, *i.e.* R₂+3 in the Comstock-Needham nomenclature).

Alula and squama.—Near the base of the wing are two indentations of the posterior margin separating two small areas known as the *alula* and *squama*. The *squama* is the part nearest the thorax, and is covered by the *alula* when the wing is folded but may be seen clearly when the wing is extended. In most Culicine genera the *squama* bears a fringe of hairs on its margin; the absence of this fringe distinguishes the genera *Megarhinus*, *Harpagomyia*, *Hodgesia* and *Uranotaenia*. There is some

variation in regard to the fringe of scales on the margin of the alula, but this is less definite.

Scales.—The scales on the wing-veins are of two main types, some (usually short and broad) lying close along the veins, others (usually long and narrow) extending at a high angle from the vein. These two types have been called by Christophers *squame scales* and *plume scales*, and I have often referred to the latter as *outstanding scales*. Squame scales occur normally along the whole length of the *upper* surface of all veins except 2.1 and 2.2, plume scales on the *upper* surface of 2.1 and 2.2 and the *under* surface of 3, 4.1 and 4.2, and also (but less numerous) on 4, 5 and 6. In *Megarhinus* and in the subgenus *Mimomyia* of *Ficalbia* plume scales are few or absent, the under surfaces of most veins being bare. In *Aëdomyia*, in the subgenus *Mansonioides* of *Taeniorhynchus*, and in a few species of other genera, both squame scales and plume scales are very broad and approximately similar in size. *Hodgesia* is peculiar in having the plume scales emarginate at the tips.

Microtrichia.—The surface of the wing between the veins is covered with microscopic setae or *microtrichia*. These are similar in all mosquito genera except *Uranotaenia*, where they are very minute and not visible at a lower magnification than 100.

ABDOMEN.

In all Culicine mosquitoes the abdomen is completely clothed with broad flat scales, except sometimes on the first and last segments. The first tergite shows differences in scaling between the different genera or subgenera. On each side of this tergite is a small projecting lobe or wing separated from the main portion by a longitudinal furrow; this lobe may be either bare (as in *Culex* and *Taeniorhynchus*) or scaly (as in *Megarhinus* and nearly all *Aëdes*); it may be scaly even when the main portion of the tergite is largely bare of scales (as in *Allotheobaldia*), or the reverse may be the case (as in most *Uranotaenia*). The colour-pattern formed by the abdominal scales is of considerable importance in specific determination, although individual variation is frequent. In males and in unfed females the *tergites* (dorsal plates of the abdominal segments) are usually bent or curved round the sides and beneath the abdomen, tending to hide the smaller *sternites* (ventral plates), so that the sides of the tergites might be mistaken for the sternites, and care must be exercised in noting the pattern of the latter.

MALE TERMINALIA (HYPOPYGIUM).

In all male mosquitoes the tip of the abdomen rotates through 180° shortly after emergence from the pupa, so that structures which were originally dorsal become ventral and *vice versa*; this torsion affects the eighth (pre-genital) as well as the ninth (genital) and tenth (anal) segments. In the explanatory account which follows and in the specific descriptions the words *tergal* and *sternal* are therefore used to describe position, and indicate structures which were *originally* dorsal and ventral respectively, the tergites being actually ventral and the sternites dorsal in mature specimens. The terminology adopted here is the same as that used by me in recent papers and is essentially that of Christophers and Barraud (1923).

Though the eighth segment is not usually reckoned as part of the hypopygium, it may conveniently be considered in connection with it. The *eighth tergite* (sometimes wrongly referred to as the eighth sternite) often exhibits peculiarities of shape or vestiture. Normally it is a rectangular piece without any special development of hairs or bristles. In many *Culex* (especially the subgenus *Neoculex*) it has a deep median indentation of the posterior margin, and in *Eretmapodites* this is carried so far that the tergite is completely divided into two parts. In both these groups, and in others, the sides often bear numerous hairs and bristles which serve to shield the hypopygium. In some *Theobaldia* spines are developed on a median projection of the tergite. The true eighth sternite rarely shows any special features.

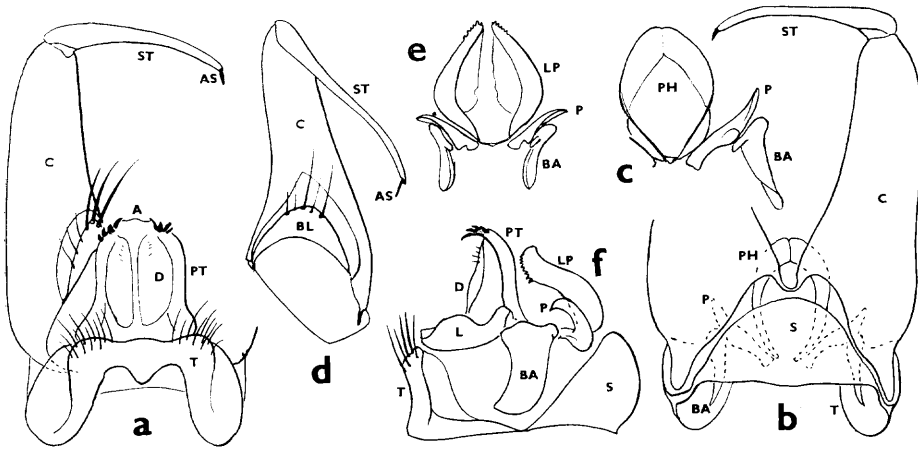


FIG. 6, ♂.—Parts of the male terminalia in Culicine mosquitoes (a-c, *Theobaldia fraseri* Edw.; d-f, *Ficalbia plumosa* Theo.). a. Terminalia (one coxite removed), tergal view. b. Ditto, sternal view. d. Inner aspect of coxite. c, e. Aedeagus. f. Side view of all basal parts (i.e. terminalia with coxite omitted). A. Membrane connecting paraprocts at anus. AS. Articulated spine of style (here terminal). BA. Basal apodeme (basal plate) of aedeagus. BL. Basal lobe (basal plaque) of coxite. c. Coxite. D. Tenth tergites (dorsal plates of proctiger). L. Lateral portion of paraproct. LP. Lateral plate of phallosome. P. Paramere. PH. Phallosome. PT. Paraproct (here with 3-4 spines on crown). S. Ninth sternite. sr. Style. T. Ninth tergite.

The *terminalia* proper (also called *hypopygium*, or, loosely, *genitalia*) comprise the following parts: (1) tergite and sternite of the ninth segment; (2) forceps, paired appendages of the ninth segment, each comprising a large basal segment (coxite) and a smaller second segment (style); (3) anal segment; (4) aedeagus or true external genital organs. These parts will be considered in the order named.

Ninth tergite.—This provides important specific characters, but is not much used for generic diagnosis. It is usually in the form of a narrow strip constricted in the middle and thus divided into two lobes which bear hairs or bristles (as in most *Aedes* and *Culex*). In its more primitive form (as in *Megarhinus* and some *Uranotaenia*) it is a somewhat rectangular hairy plate.

Ninth sternite.—This shows few features of interest and is therefore not usually mentioned in descriptions. It is exceptionally large in *Culex perfidiosus*.

Coxites (also called *side-pieces*, basal segment of forceps).—These exhibit great

diversity of form, especially as regards the various lobes and processes which may be developed on their inner faces. Normally the coxites are the largest parts of the hypopygium and each is in the shape of a stumpy human thigh; they are just in connection with one another sternally, and in the groin are connected with the anal segment and with the aedeagus. In the most primitive form the only modification of the coxite is a small bristly *basal lobe* on the area between the ventral root and the mid-sternal connection of the coxites; this is the structure found in the genera *Megarhinus*, *Harpagomyia*, *Hodgesia*, *Uranotaenia*, *Theobaldia*, *Orthopodomyia*, *Ficalbia* and *Aëdomyia*. Sometimes this basal lobe is separated from the rest of the inner face of the coxite by a membranous area, and in such cases it has sometimes been referred to as a *basal plaque*. In the genus *Culex* the lobe itself is intimately connected with the coxite, but comes to occupy a more distal position owing to the development of a large membranous area at its base, associated with an increase in size of the anal segment and aedeagus; in this case the lobe is known as the *subapical lobe*, and is complicated by a tendency to division into two parts and a high degree of specialization in its bristles. In some genera part or the whole of this basal lobe has more the form of a subsidiary appendage, which has been called the *claspette*. This term has chiefly been used for the structure found in a section of the complex genus *Aëdes*, where the claspettes form a characteristic pair of appendages arising from the base of each coxite on the sternal side; somewhat similar structures are found in the genus *Taeniorhynchus*. In some *Aëdes* there may be basal and apical lobes of the coxite in addition to the claspette, but the greatest complexity is reached in the genus *Eretmapodites*, where the coxite may bear three or four lobes or processes and various tufts of modified scales or bristles.

Style (also called *clasper*, distal segment of forceps).—This is normally a simple structure articulated with the tip of the coxite like the blade of a pocket-knife, and provided with a *terminal spine* and a few minute hairs. In some subgenera of *Aëdes* (*Aëdimorphus*, *Dunnius*) the style is subject to great modifications in shape and its spine is more or less removed from the tip. In *Eretmapodites* it usually bears scales and long hairs. In the subgenus *Banksinella* it is inserted subterminally instead of terminally on the coxite. In *Culex* it usually has a characteristic falcate shape and bears only two fine hairs in addition to the terminal spine, which is widened towards the tip instead of being pointed. In *Aëdomyia* the terminal spine is modified into a peculiar comb-like structure.

Anal segment (also called *proctiger*, tenth abdominal segment).—This consists typically of a pair of dorsal plates or *tenth tergites*, and a pair of ventro-lateral plates, tenth sternites or *paraprocts*. The paraprocts are of great assistance in defining genera and their relationships. Their most primitive form is perhaps that found in *Culex*, where they are provided with a tuft of hairs or spines at the tip, perhaps representing vestigial anal cerci. In *Megarhinus*, *Theobaldia* and some other genera the paraprocts have only a few strong teeth at the tip, and in *Aëdes* they are simple, without teeth. In *Uranotaenia* and *Aëdomyia* there are no very definite chitinizations of the proctiger, these genera resembling *Anopheles* in this respect.

Aedeagus.—As used in descriptive terminology of mosquitoes, this term includes collectively all the structures surrounding the opening of the male genital duct. The parts of the aedeagus may be distinguished from the segmental parts of the

hypopygium (tergite, sternite, forceps, proctiger) by the fact that there are never any articulated hairs on their surfaces. In all Culicine mosquitoes it is possible to recognize as parts of the aedeagus a pair of movable structures, the *parameres*, between which lies a central body, the *phallosome* (also called *mesosome*). The parameres are of little use in classification, but the phallosome is of the greatest importance. It may be in the form of a simple tube or scoop (as in *Mucidus* and *Ochlerotatus*), but more commonly it is divided into a pair of lateral plates connected by one or two bridges. These *lateral plates of the phallosome* (designated by the abbreviation *lp*) often bear various teeth or processes, the form of which is constant for any given species; the greatest complexity is attained in the genus *Culex* (see p. 243).

FEMALE TERMINALIA (OVIPOSITOR OR HYPOPYGIUM).

The terminal abdominal segments of the female have been very little studied in African mosquitoes, but it is known that they often exhibit well-marked generic and subgeneric distinctions, and in some cases (*e.g.* *Taeniorhynchus africanus* and *uniformis*) even nearly allied species differ considerably, so that it is probable that they could be used more than they have been for purposes of classification. The following brief account of their structure is based chiefly on the papers of Macfie and Ingram (1922), Christophers (1923), Gerry (1932) and Gjullin (1937) and on the examination of about thirty representative species; further notes are given in the diagnosis of each genus.

The hypopygium of the female mosquito differs from that of the male in several important respects: (1) It is never inverted, all the parts therefore retaining their primitive orientation; (2) the ninth segment is much reduced in size and bears no appendages; and (3) the anal segment bears conspicuous paired cerci. As in the male the eighth segment is more or less modified and can be considered in conjunction with the true hypopygium (genital and anal segments). As in the male, also, a distinction may be made between the segmental structures, which bear setae, and the chitinizations surrounding the genital openings, which are devoid of true setae (though they may bear setiform or spiniform processes). The genital segment is more or less retracted within the preceding one; it comprises the ninth tergite (dorsal) and the insula and atrium (ventral). The anal segment is usually visible externally; its chitinizations are the tenth tergite, cerci and subgenital plate. The only internal organs which have been used in classification are the chitinized spermathecae.

Eighth segment.—This segment as a whole may be much narrower than the preceding segments and more or less retractile (as in *Aedes*), or of about the same diameter (though shorter) and not or scarcely retractile (as in most other mosquitoes). When retractile it bears no scales, but scales are present on the normally exposed portions.

Eighth tergite.—This is usually more or less rectangular and broader than long; in *Aedes* (*Finlaya*) it is more pointed, but it shows no special modifications except in *Taeniorhynchus* (*Mansonioides*), in which subgenus it bears a remarkable row of teeth (Fig. 31, p. 104).

Eighth sternite (often called by students of other families of Diptera the *subgenital plate*).—This is usually larger than the tergite and in the position of rest acts as a

shield for the atrium and spermathecae. Its surface is usually evenly convex, but it may be folded in the middle so that the eighth segment is more or less laterally

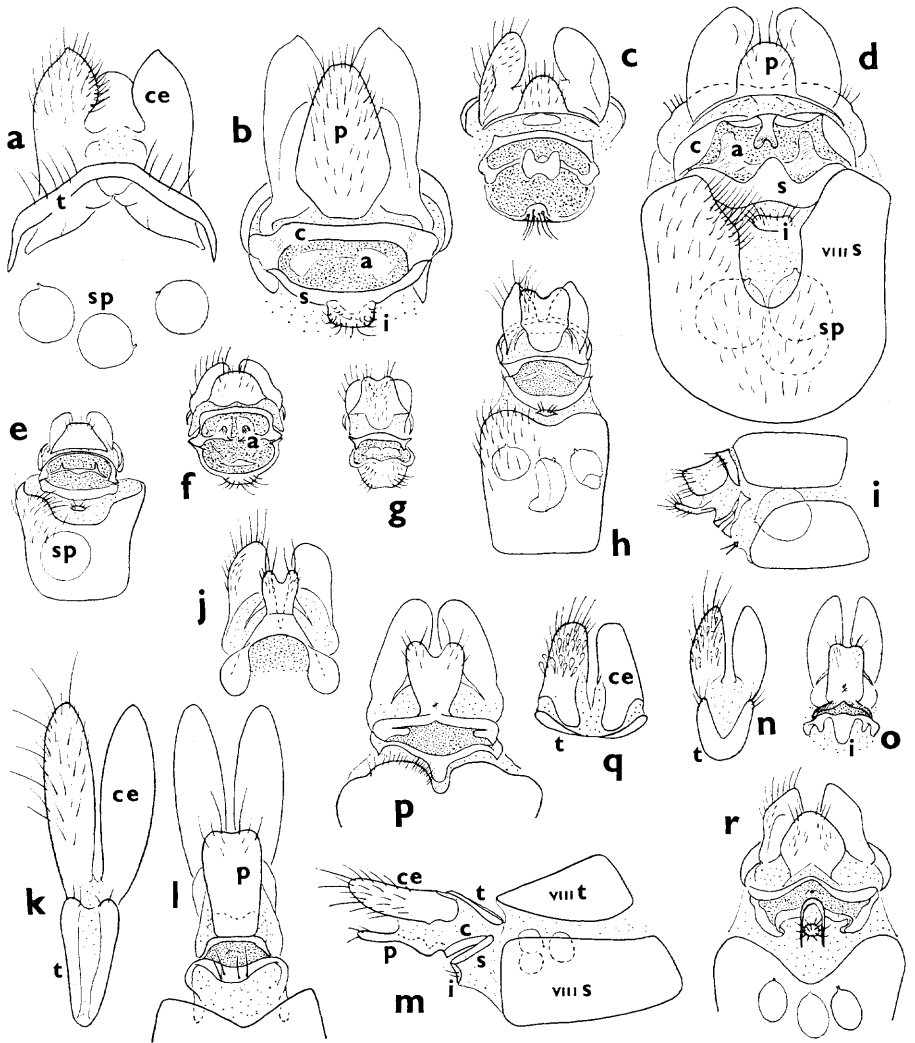


FIG. 6, 2.—Female terminalia of Culicine mosquitoes, all to same scale. a, b. *Megarhinus brevipalpis*. c. *Theobaldia fraseri*. d. *Th. longearcolata*. e. *Uranotaenia pallidoccephala*. f. *U. shillitonis*. g. *Harpagomyia farquharsoni*. h. *Ficalbia lacustris*. i. *F. mimomyiaformis*. j. *Orthopodomyia arboricollis*. k, l. *Aedes (Mucidus) mucidus*. m. *Aedes (Finlaya) pulchriorax*. n, o. *Aedes (Stegomyia) aegypti*. p. *Erctmapodites semisimplicipes*. q. *E. quinquevittatus*. r. *Culex moucheti*. a, k, n, q from above; i, m from side; rest from beneath. External membranes lightly, roof of atrium more heavily stippled. *VIII S*. Eighth sternite; *i*., insula; *s*., sigma; *c*., cowl; *p*., post-genital plate; *VIII t*., eighth tergite; *t*., ninth tergite; *ce*., cerci; *sp*., spermathecae; *a*., atrial plates.

compressed. Often its posterior margin is nearly straight, but in some genera and species it is more or less deeply indented in the middle.

Ninth tergite.—Usually a narrow strip of chitin bearing a few setae; it may be bilobed, as is the corresponding part in the male; in *Eretmapodites* it appears as a pair of small and quite separate transverse plates, while in *Aëdomyia* it is absent; in *Aëdes* it is large, shield-shaped and often longer than broad.

Insula.—A small free chitinous plate in the mid-ventral line, separated by membrane from the eighth sternite and usually folded inwards, so that it lies above the eighth sternite. It is not always distinguishable; when present it usually bears a few setae (varying in number in different species), though in some subgenera of *Aëdes* (*Stegomyia*, *Aëdimorphus*) it is quite bare; it probably represents the true ninth sternite.* Tonnoir has called the corresponding structure in Psychodidae the "internal sensory organ of the subgenital plate."

Tenth tergite.—In *Anopheles* this is said to be represented by a pair of small plates, one at the base of each cercus; I have not observed such plates in any African Culicines.

Cerci.—The pair of conspicuous flaps or plates at the tip of the abdomen, usually visible in the dry specimen. They vary greatly in size and shape in different genera and species, being usually more elongate in *Aëdes* than in other genera. In nearly all Culicines they are flattened (not cylindrical as in *Anopheles*). Only very rarely do they bear scales (*Stegomyia*, *Eretmapodites*).

Postgenital plate.—A single chitinous plate lying beneath the cerci, forming the ventral wall of the anal segment and projecting beyond it (hence called by Macfie and Ingram the "ventral processes of the tenth segment." It usually comprises two portions, which as suggested by Gerry probably represent the tenth and eleventh sternites of *Panorpa*; the proximal part (tenth sternite) may be wholly membranous (as in *Culex*) or membranous at the sides (as in most *Aëdes*) and is almost always bare; the distal part (eleventh sternite or post-genital plate proper) varies greatly in size and shape and in all Culicines bears rather numerous setae (in contrast with *Anopheles*, in which it bears only a pair of terminal setae).

Atrium.—This term was introduced by Christophers to designate the chamber which includes the openings of the oviduct, spermathecae and caecus (mucus gland). The opening of the atrium is surrounded by a chitinous rim (always devoid of setae), the two halves of which can be folded together to close the opening like the metal framework of a clasp purse. The anterior lip of this structure is known as the *sigma*, the posterior one the *cowl*.* The sigma, when present—it is often weak and indefinite—is closely associated with the insula; the cowl adjoins the post-genital plate, and in certain genera (*Aëdes*, *Orthopodomyia*) it is actually fused with the anterior margin

* Christophers seems to use the term "cowl" in a somewhat more extended sense than that in which it is here employed, including in it the adjoining membrane and the basal part of the post-genital plate; I prefer to restrict the term to the sclerotized posterior rim of the atrium. Macfie and Ingram speak of the sigma and cowl together as the ninth sternite; Gerry and Gjullin call the cowl the ninth sternite. I believe this is incorrect, and that the insula is the true ninth sternite. The designation of the cowl as the ninth sternite would be logical if it were the case, as often stated, that the genital opening of female Diptera lies between the eighth and ninth sternites; this, however, is probably not so, the real position being the same as in the male sex, between the ninth and tenth sternites. This is very obviously true in *Panorpa* (which is now generally accepted as representing the ancestors of the Diptera and embodying many of their characteristics), and the deduction seems clearly indicated that in Culicidae and other Nematocera the ninth sternite has atrophied and its function has been taken over by the eighth. The insula is in the position occupied by the ninth sternite in *Panorpa*, and is the only ventral structure between the eighth sternite and the post-genital plate which bears articulated setae; I therefore conclude that it must be the vestigial ninth sternite.

of this plate. The sides of the cowl, where it joins the insula, are sometimes much expanded (as in *Aedes*). In the roof of the atrium there are sometimes to be seen a pair of *atrial plates* extending towards the middle line from the angle of sigma and cowl; there may also be a median plate connecting the atrial plates and surrounding the spermathecal opening.

Spermathecae.—These vary in size, shape and number in different genera and species. Normally there are three, one slightly larger than the other two and all subspherical. In *Uranotaenia* and *Aedomyia* as well as in some *Ficalbia* and a few *Aedes* there is but a single large spermatheca, while in *Hodgesia* and *Mansonioides* one of the three may be rudimentary; in *Culex* they are oboval.

TECHNIQUE.

For the adequate study of adult mosquitoes two things are essential: well-preserved specimens in undamaged condition, and a good binocular microscope.

So many of the diagnostic features used in classification are provided by the vestiture that it is necessary for specimens used for determination to be as perfect as possible. The hairs and scales, especially of the thorax, are very easily rubbed off, and therefore bred specimens are apt to be in better condition than those captured with a net or otherwise. On the other hand, bred specimens, if killed and preserved too soon after emergence, will shrivel badly. They should therefore be kept alive for a day or two, in a dark place to prevent them flying about, and then mounted immediately after killing with chloroform or other killing agent.

If specimens are transfixed only the finest steel pins should be used; a pin such as Tayler's no. 20 is much too thick for this purpose, and should only be used if the specimen can be stuck on the point from beneath. It is usually preferable, however, to gum specimens on to card points rather than to pin them; only just sufficient gum should be used to hold the specimen firmly, and it should be fixed either by the under surfaces of the coxae or by one side of the thorax, so that in any case the dorsum and one side of the thorax are undamaged and well exposed to view. Whether pinned or gummied, the specimens need "staging" for readiness of handling and labelling.

For examination I use a binocular microscope with 32 mm. objective and eyepiece no. 4 or 5, giving a magnification of 80-100, which is sufficient for observing bristles, scales and most other structures. Lower magnifications than this do not usually reveal sufficient detail; greater enlargement, or the use of a monocular microscope, is usually unnecessary except for studying or drawing small details of genitalia. The pulvilli of *Culex* are easily seen owing to their whiteness when the dry specimen is examined against a dark background under the binocular, whereas they are much more difficult to make out in mounted specimens even at a considerably higher magnification. Similarly, the thoracic chaetotaxy is much more readily studied in the former manner.

PREPARATION OF GENITALIA.

In the preparation of permanent mounts of genitalia I use the following method: (1) Snip off tip of abdomen with a pair of fine scissors. (2) Place in a small quantity

of strong potash in a tube. (3) Place tube in a water-bath and bring water to the boil. (4) Turn out into a watch-glass and transfer to another watch-glass with glacial acetic acid; leave for 5 minutes (or more). (5) Transfer to clove oil. (6) Dissect so far as necessary in the oil and transfer the parts to a very small drop of thin balsam on a small piece of celluloid; arrange the parts carefully so as to give the desired view. (7) When dry add more balsam to embed the specimen completely, and if desired (though this is not essential) cover with a small piece of cover-slip. (8) The mount can now be stuck on the pin beneath the specimen from which it was removed.

For dissection I use the finest obtainable needles (no. 12, or if possible no. 16), or fine stainless steel pins stuck into match stalks. After dissection the parts, however small, can easily be transferred by first dipping the point of the needle into the drop of balsam and then touching the specimens with it in the oil. The best size for the celluloid "slide" is about 12×3.5 mm., and the coverslip (if used) may be about 2-2.5 mm. square. It is essential that the balsam used in mounting should be thin, otherwise hairs will be pulled off in the process of manipulation. The amount of dissection needed will naturally vary with the nature of the specimen; in the case of *Aedes* genitalia it is sufficient merely to part the hypopygium from the attached segments and mount it whole; for *Culex* it is desirable to pull off the two coxites and mount them in side view, and also to separate the aedeagus from the anal segment, an operation which requires a steady hand and careful manipulation under the high power of the binocular.

A still simpler method of mounting which I have used for the genitalia of some other small Diptera and which would probably serve equally well for mosquitoes is the following: (1) Place the tip of the abdomen for a few minutes in a watch-glass containing a mixture of cold potash and alcohol. (2) Remove to a dish of weak spirit, leave for a few minutes and dissect so far as desired. (3) Mount in a drop of De Faure's gum chloral on a celluloid slip as before. In this case a cover-slip is necessary, but the refractive index of the gum renders staining superfluous.

STAINING.

The more transparent structures in mosquito genitalia, such as the leaf-like appendages of the coxite-lobe in the genus *Culex*, are much more readily seen if they are well stained with carbol-fuchsin. The method of preparation is that described above for ordinary unstained balsam mounts; no additional operations are necessary, the only differences being that a drop or two of strong carbol-fuchsin solution is added to the watch-glass of acetic acid, and the specimens are allowed to remain in this for 12 hours or more instead of for a few minutes only. The effect of the stain varies according to its strength; if specimens are left for a short time (some minutes) in very strong stain the sclerotized parts tend to stain more deeply than the delicate parts and membranes, whereas if they are left a long time (hours or days) in weak stain the reverse effect is obtained, and this latter is usually preferable for mosquito genitalia.

It will often be found that when the fuchsin is added to the acetic acid a precipitate

is formed and then the stain will not act satisfactorily. The precipitate may be redissolved at once by adding a small drop of caustic potash and stirring.

PHARYNGEAL ARMATURES.

I have used the same method for preparing pharyngeal armatures of *Culex* as that described above for male hypopygia. Dr. A. M. Evans recommended boiling in carbol-fuchsin, but this seems to me both unnecessary and undesirable, as it renders the specimen so brittle that it is almost impossible to dissect it without causing too much damage. These minute structures must of course be studied under the high power of a monocular microscope.

CLASSIFICATION AND NOMENCLATURE.

The question as to how far classifications of insects should be based upon larval or pupal characters has been much debated, and divergent opinions have been expressed as to the relative value to be accorded to features of the adult and early stages where these appear to indicate conflicting systematic arrangements. Some workers, for example, Keilin and Thienemann, are inclined to regard larval characters as more indicative of relationship, and I have myself argued that all stages of an insect's life history must be taken into account in formulating a natural system. Study of the Culicidae, however, has convinced me that in cases of apparent conflict precedence must be given to adult characters. The point is well illustrated in the genus *Culex*. *C. tigripes* and *C. moucheti* have larvae so strikingly different from normal *Culex* that in a system based on larvae they would have to be placed in quite different genera; the larval peculiarities are in part adaptations to a special mode of life, but this cannot be said of all of them. The pupa of *C. moucheti* is also peculiar, but on the other hand the adults of both these species are ordinary *Culex*, and it has proved impossible to discover any definite features by which they can be separated generically.

The classification and arrangement of genera adopted here is practically that of my *Genera Insectorum* catalogue and of Hopkins's volume, but two slight changes have been made in arrangement because they appear to give a more natural sequence: the genus *Aëdomyia* is placed before instead of after the *Theobaldia-Taeniorhynchus* group of genera because the rudimentary anal segment of the male separates it sharply from these genera and associates it with *Uranotaenia*; and the subgenus *Skusea* is placed at the end of the genus *Aëdes* instead of next to *Ochlerotatus* and *Finlaya* because the male terminalia are very distinct and the phallosome is not really of the *Ochlerotatus* type as I at one time thought. One change from the nomenclature of the *Genera Insectorum* is made in deference to the opinion of the nomenclature committee of the Royal Entomological Society: the generic name *Taeniorhynchus* is revived in place of *Mansonia*.

DESCRIPTIONS OF GENERA AND SPECIES.

All blood-sucking mosquitoes other than Anophelines belong to the tribe Culicini, but the term "Culicine Mosquitoes" is commonly used to include also the non-biting species of the tribe Megarhinini, and an account of the African species of this tribe is therefore included here.

Tribe **MEGARHININI.**

This tribe includes the single genus *Megarhinus*, the essential features distinguishing it from the tribe Culicini being the following :

Clypeus (Fig. 7, b) broader than long, with the front margin slightly trilobed. Proboscis (fig. 7 d, e,) stout and rigid in the basal half, slender and more flexible in the distal half, mandibles and maxillae in both sexes not extending beyond the stout basal half, the whole organ usually hook-like ; labella rather long and narrow. Scutellum (Fig. 7, c) evenly rounded, not trilobed, with a continuous row of bristles, those in the middle shorter. Wings (Fig. 7, a) with upper fork extremely short, its stem several times longer than the cell ; cross veins as in Anophelini, 3-4 having a right-angled bend ; a slight emargination of the hind margin opposite vein 5·2, and a V shaped thickening of the membrane in cubital fork between 5·1 and 5·2.

Other features of the genus are indicated in the diagnosis below.

Genus **MEGARHINUS** Robineau-Desvoidy.

Megarhinus Robineau-Desvoidy, Mem. Soc. Hist. Nat. Lille, 3, p. 403 (1827).

Toxorhynchites Theobald, Mon. Cul. I, p. 244 (1901).

GENOTYPES.—*Megarhinus*, *Culex haemorrhoidalis* Fabricius (S. America) ; *Toxorhynchites*, *T. brevipalpis* Theobald (Africa).

The species of this genus are easily to be known from other mosquitoes by their large size and hooked proboscis, as well as by many other structural features as described below.

Head densely clothed with broad, flat scales ; no narrow scales present, and only a few erect scales on nape. Eyes touching above antennae. Two pairs of vertical bristles present, lower orbitals absent (in African species ; some American species possess them). Antennae in both sexes with a tuft of scales (larger in ♂ than in ♀) on first segment of flagellum, this segment longer than the following one ; in ♂ the flagellum (except for the two terminal segments) is unusually stout and rigid, and not much more than half as long as proboscis. Palpi in ♂ as long as proboscis or longer, slender, upturned, the two terminal segments together as long as the shaft or longer, with few or no hairs ; in ♀ of African species about a quarter as long as proboscis.

Thorax.—*apn* large, densely clothed with broad scales, with a row of bristles extending forwards and downwards. Suture between scutum and *ppn* obsolete. Scutum only moderately arched, densely clothed with scales, most of which are broad and round-tipped, those towards the margins having their upper surfaces convex (a peculiarity of this genus) ; dorso-central and acrostichal bristles entirely absent. Paratergite (Fig. 7, g, *p*) unusually large and always completely bare. Post-spiracular and sub-spiracular areas unusually small (smaller than in any

Culicine genus), the former uniformly chitinized. Scutellum with dense flat metallic scales. Pleurae heavily clothed with flat scales except on the meron and the post-spiracular and sub-spiracular areas, which are bare in all African species (*M. haemorrhoidalis* and some of the American species have the post-spiracular area scaly),

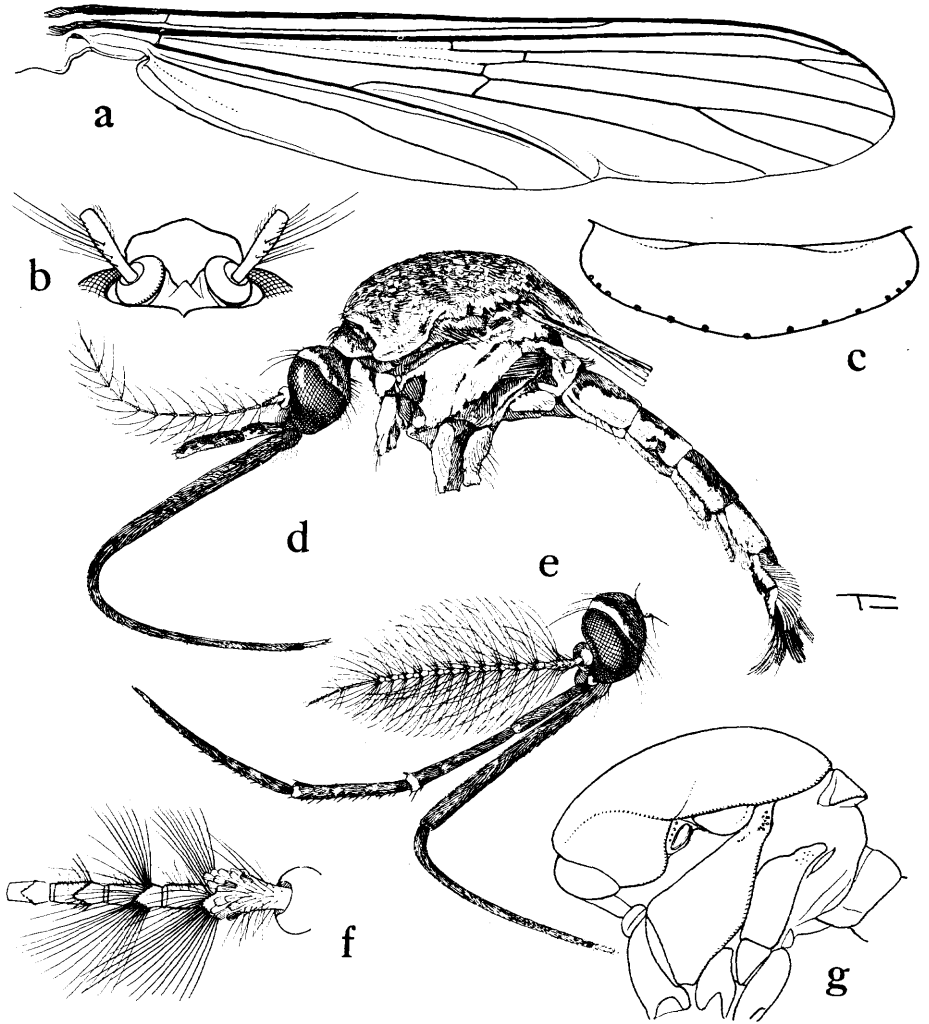


FIG. 7.—Tribal characters of Megarhinini (mainly after Barraud, 1933). a. Wing-venation. b. Clypeus. c. Scutellum. d. Body of ♀ in side view, showing hooked proboscis, pleural structure and scaling, etc. e. Head of ♂. f. Scale-tuft on antennae of ♂. g. Sclerites of thoracic pleurae, showing large paratergite, small post-spiracular area, and relative positions of meron and base of hind coxa (contrast Fig. 1, b).

and on small parts of the sternopleurae and mesepimeron. *ppn* densely scaly but without bristles, though numerous spiracular bristles are present. No post-spiracular bristles; sternopleurals rather few and weak. Base of meron level with base of hind coxa.

Legs normal; claws of ♀ all simple; pulvilli absent.

Wings with several peculiarities of venation as noted in diagnosis of tribe; veins of anterior half scaly but all scales short and broad; veins of posterior half largely bare. Squama devoid of fringe.

Abdomen in both sexes usually with long projecting hair-like scales on lateral margins of last few tergites. First tergite densely scaly, scales projecting over lateral edges.

♂ *Terminalia*.—Coxite simple; style long and slender, with long terminal spine; anal segment with well-developed paraprocts which have not more than two or three terminal teeth.

♀ *Terminalia* (*M. brevipalpis*, fig. 6 ♀, a).—Eighth tergite larger than sternite (an unusual feature), both simple, with posterior margin nearly straight. Ninth tergite ribbon-like, with few setae. Cerci broad, flat, almost horizontal. Insula rather large, with numerous short hairs. Post-genital plate somewhat tapering, almost uniformly clothed with short hairs, even on its basal part, not quite connected with cowl. Lateral portions of cowl much expanded, but no atrial plates. Spermathecae three, subspherical and equal.

HABITS.—Both sexes of *Megarhinus* are flower-feeders only, and fly by day with a characteristic loud humming. Most of the species are purely sylvan, but *M. brevipalpis* and *conradti* breed freely in water-butts and similar places near habitations and are often found indoors. Eggs are laid singly, usually on the surface of water, perhaps sometimes while the insect is in flight (Green, 1905).

The African species of this genus fall into two well-defined groups, each including three or four closely related species. The numerous characters distinguishing these groups are as follows:

Group A (*brevipalpis* group): Integument of thorax entirely black. Scales on *ppn* mostly dark blue or purplish like those towards margin of scutum. All scales of pleurae and coxae white. Sternopleura with rather numerous scattered white hairs, none of them strong. Lateral lobes of tergite 1 densely clothed with white scales; lateral margins of other tergites also rather broadly white scaled. Lateral tufts of tergite 7 black. Femora white scaled beneath. Hind tibia all dark, blue or purple. Hind tarsus with one distinct white ring, at base of second segment. Wings with the horizontal part of 3-4 about twice as long as the vertical part. Halteres with dark knob. Terminalia: Coxite with the setae of inner surface not unusually strong; style pale, its terminal spine of moderate length, about one-eighth as long as the style itself.

Group B (*lutescens* group): Integument of scutum mainly blackish, but that of pleurae and *ppn* mainly or entirely yellow. Scales of *ppn* and also of front coxae golden, contrasting with the dark greenish scales of scutum. Scales on pleurae largely white, but golden-brown on lower part of sternopleura and on pre-alar knob. Sternopleura with or without one or two strong dark setae and some scattered weaker hairs. Lateral lobes of tergite 1 with few or no scales; scales on lateral margins of other tergites golden or purplish. Lateral tufts of tergites 6-8 all red or orange. Femora golden scaled beneath. Hind tibia with a patch of whitish scales on outer side at distal third. Hind tarsus with a white ring at base of third

segment and indications of a second narrow white ring at some distance from base of first, but second segment all dark. Wings with the horizontal part of 3-4 several times as long as the vertical part. Halteres with yellow knob. Terminalia: Coxite with very long and stout setae on its inner surface; style dark, its terminal spine set at right angles and very long, almost one-third as long as the style itself.

KEY TO ETHIOPIAN SPECIES OF MEGARHINUS.

1. Lateral tufts of seventh abdominal tergite black 2.
These tufts orange or red 6.
2. Tufts of eighth tergite orange 3.
Tufts of eighth tergite black *evansae* Edw.
3. Abdomen largely blue or green-scaled above; hind tarsi in ♂ without long hairs 4.
Abdomen purple scaled above except on tergite 1; hind tarsi in ♂ with long hairs on first segment 5.
4. Sixth tergite with lateral hairs mainly or all white (♂ ♀); supra-alar bristles of ♀ golden; second front tarsal segment of ♀ almost all white . *brevipalpis* Theo.
Sixth tergite with black lateral hair-tuft on almost its distal half; supra-alar bristles black (♂ ♀); second front tarsal segment of ♀ at most half white, sometimes all dark ssp. *conradi* Grünb.
5. Sixth tergite with lateral hairs almost all white *barbipes* Edw.
Sixth tergite with many black lateral hairs distally *phytophagus* Theo.
6. Lateral tufts of segments 6-8 orange *lutescens* Theo.
These tufts red 7.
7. Red caudal tufts larger; ♂ palpi with penultimate segment bristly above and hairy beneath; abdomen purple *erythrurus* sp. n.
Red caudal tufts smaller; ♂ palpi with few bristles and no hairs 8.
8. Tergites 1-3 green scaled; mid coxae with white scales at base . *viridibasis* Edw.
At most tergite 1 green; mid coxal scales all golden *aeneus* Evans.

Megarhinus brevipalpis Theobald.

Toxorhynchites brevipalpis Theobald, Mon. Cul. 1, p. 245 (1901); Edwards, Bull. Ent. Res. 3, p. 3 (1912); Macfie and Ingram, Bull. Ent. Res. 13, p. 410 (1923).
Toxorhynchites marshalli Theobald, Mon. Cul. 3, p. 121 (1903).

Types.—*brevipalpis*, ♀ in B.M., Durban; *marshalli*, ♂ in B.M., Salisbury.

A large species of predominantly blue colour, with sternopleural scales all white; lateral hair-tufts of seventh abdominal segment black, of eighth orange; segment 2 of hind tarsi with a white basal ring, 3-5 all dark. Differs from its near allies in having the long lateral hairs of the sixth abdominal tergite either all white, or (rarely) with a few black ones at the apical corners; fifth sternite with the white area interrupted in middle; some or all of the bristles on scutellum and above wing-base usually golden, at least in ♀; front tarsi of ♀ with the first segment at most narrowly white at base, second white all round except at tip, third dark; mid tarsi of ♀ with rather broad and usually complete white rings at bases of first two segments.

♀. *Head* of varying metallic tints; palpi and proboscis blue; tori with some white scales. *Thorax* with metallic green scales dorsally, sides of scutum, *apn* and *ppn* blue-scaled, sometimes a few white scales on lower part of posterior pronotal lobes. *Abdomen* with the first tergite green above, white at sides; following tergites either blue shading to violet on last few tergites, or (in some specimens) green shading

to blue, sometimes the last few tergites with a reddish gloss; tergites 1-3 and 5-7 with white lateral basal patches, usually rather larger on 5 and absent on 4. Sternites 4 and 7 nearly all blue, 5 and 6 each with a pair of white triangular marks. Legs blue; fore and mid tarsi marked as noted in diagnosis; hind tarsi with some white scales at base of first segment and a broad white ring at base of second segment.

♂. Similar to ♀, but with the white markings of fore and mid tarsi much less extensive; no scales on tori; palpi all dark beneath, shaft with small patches of white scales, especially towards base; all abdominal tergites (including 4th) with basal lateral white patches. First flagellar segment of antennae with dark blue scales on outer side. No specially long hairs on first hind tarsal segment. *Terminalia* of the usual form.

Wing-length 6-8.5 mm.

Distribution.—The typical form of this species seems to be confined to east and south Africa. The following records may be confirmed:—KENYA: Mombasa (*de Boer*). ZANZIBAR (*Aders*). NYASALAND: Zomba (*Grey*), Mt. Mlanje (*Neave*). TANGANYIKA: Dar-es-Salaam (*Pomeroy*). N. RHODESIA: Lova Valley (*Harger*). S. RHODESIA: Salisbury (*Marshall*). NATAL: Durban (*Chubb*). BELGIAN CONGO: Elisabethville and Sankisia, Katanga (*Congo Mus.*).

Variation.—One female from Mombasa is peculiar in having a pale sheen over the dark parts of the abdomen and legs. A damaged female from Port St. John, Pondoland (*R. E. Turner*) has the whole of the second and most of the third segments of the middle tarsi white, but has the golden thoracic bristles of the type.

ssp. **conradti** Grünberg.

Toxorhynchites conradti Grünberg, Deutsch. Ent. Zeitschr. p. 405 (1907).

Toxorhynchites schultzei Enderlein, Zool. Anz. 94, p. 123 (1931).

Toxorhynchites tessmanni Enderlein, Zool. Anz. 94, p. 124 (1931).

Toxorhynchites brevipalpis Theobald (in part); Edwards (in part).

TYPES.—*conradti*, ♀ in Berlin Mus., Cameroons; *schultzei*, ♀ in Berlin Mus., Ubangi River; *tessmanni*, ♀ in Berlin Mus., Uam, Spanish Guinea.

Differs from typical *M. brevipalpis* as follows: Long lateral hairs of sixth abdominal tergite mainly black, the black hairs extending to about middle of tergite, white hairs sometimes absent; fifth sternite with a large white patch which is uninterrupted in middle; all the bristles on scutellum and above wing-base black in both sexes; front and middle tarsi of ♀ with the white scales reduced to narrow rings which are often incomplete and may be absent, the ring on the second front tarsal segment occupying at most the basal half and usually less.

Distribution.—This is the western representative of *M. brevipalpis* and is widely distributed from Sierra Leone to the Congo and Uganda. Specimens are in or have been examined at the British Museum from the following localities: GAMBIA (Liverpool S. T. M.). SIERRA LEONE: Moyamba (*St. G. Gray, J. A. G. Fido*); Freetown (*Arbuckle, Fraser, Smith, E. S. Wales*). GOLD COAST: Obuasi (*Graham*), Nsawam (*Ingram*). NIGERIA: Zungeru (*G. C. W. King*). FRENCH W. AFRICA: L. Asebbe, Fernan-Vaz. BELGIAN CONGO: Stanleyville and Bas Lomami (*Schwetz*), Coquilhatville (*Massey*); Tschoumbiri (*Mrs. Billington*); Lulanga River (*Rev. W. D. Armstrong*); Leopoldville and Tsumbiri (Liverpool S. T. M.); Matadi (*Wanson*).

UGANDA: Entebbe (*Hodges*); Lira (*Hopkins*). SUDAN: Sources Yubo, 5.20 N., 27.20 E. (*A. R. Hunt*).

Variation.—In addition to the individual variation noted in the diagnosis, the purple gloss of the abdomen may be more extensive, sometimes (especially in the male) leaving only the second and third or only the second tergite blue. One unusually small female in the British Museum from Nigeria has only a very few *dark* scales on the tori, and the fourth abdominal tergite has a white lateral patch like those of the other tergites. The three names bestowed by the German authors appear to refer to individuals of the same species varying slightly in the amount of white on the tarsi and of orange hair on the eighth abdominal segment.

Megarhinus phytophagus Theobald.

Toxorhynchites phytophygus Theobald, Mon. Cul. 5, p. 102 (1910).

Toxorhynchites phytophygus Edwards (emendation), Bull. Ent. Res. 3, p. 3 (1912).

TYPE.—♂ in B.M., Obuasi, Ashanti.

Differs from *M. brevipalpis* in the purple instead of blue tint of the abdomen in both sexes, and in the hairy base of the hind tarsi of the male; also in some other details, as noted below.

♀. Tori with a very few pale scales. Numerous white scales on lower part of *ppn*. Scutellar and supra-alar bristles all black. Abdomen with dorsal scales of tergites 2–7 all purple, without blue tinge even on 2; tergite 4 with a white lateral patch similar to the others, 5 with the white patch scarcely larger than the others, 6 with long lateral black hairs apically; sternite 5 with the white area only narrowly interrupted in middle. Front tarsi with segment 1 wholly dark, 2 wholly white, 3 white except at tip. Mid tarsi in type ♀ with some white scales on base of segment 1, 2 and 3 wholly white, 4 also white at base.

♂. Fifth abdominal sternite largely white scaled and sixth tergite with many long black hairs at sides apically as in ♀. Front tarsi all dark. Hind tarsi with rather numerous long black hairs on sides and under surface of segment 1 at base; 2 with a narrow and incomplete white ring.

Distribution.—GOLD COAST: Obuasi, type ♀ (*Graham*). SIERRA LEONE: Freetown, 1 ♂, 2 ♀ (*Blacklock and Evans*).

Variation.—The Sierra Leone specimens are smaller than the type, and the females have less white on the tarsi; both have the fourth segment of the middle tarsi entirely dark; in one the third segment is dark at the tip and in the other it is mainly dark.

Megarhinus barbipes Edwards.

Toxorhynchites barbipes Edwards, Bull. Ent. Res. 4, p. 47 (1913).

TYPE.—♂ in B.M., Mpanga Forest, Toro, Uganda.

♀. Unknown.

♂. Resembles the Sierra Leone ♂ of *M. phytophagus*, but abdominal scales darker, more bronzy-purplish; tergite 6 with the long lateral hairs almost all white; sternite 5 with a small pair of white areas, 6 with a larger pair; hind tarsi (Fig. 8) with the hairs on segment 1 longer and denser.

Distribution.—UGANDA : Mpanga Forest, Toro (*Neave*); known only from the type. Perhaps a local form of *M. phytophagus*.

Megarhinus evansae Edwards.

Megarhinus evansae Edwards, Proc. R. Ent. Soc. B, 5, p. 53 (1936).

TYPE.—♂ in B.M., Freetown.

Resembles *M. brevipalpis*, but differs from that and allied species in having the long lateral hairs of tergite 8 black like those of tergite 7; lateral hairs on about the distal half of tergite 6 also black. Scutum with a broad border of brilliant blue scales, only the central portion being green-scaled. Tergites 4 and 5 with small white lateral spots, similar to those of 2 and 3; sternite 5 with the white area broadly interrupted in middle. Front tarsi almost completely dark in both sexes. Wing-length 4.5–5 mm.

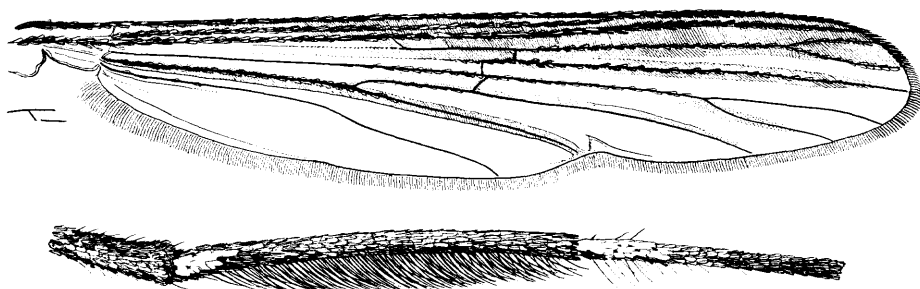


FIG. 8.—Wing and base of hind tarsus of *Megarhinus barbipes* Edw., ♂.

♀. Tori with a very few dark scales. Middle and hind tarsi with white rings at bases of first two segments, chiefly noticeable on under side.

♂. Colouring as in ♀. First segment of hind tarsi with some curved hairs at sides and beneath, but these not nearly so numerous as in *M. phytophagus*.

Distribution.—SIERRA LEONE : Freetown (*Evans, Wigglesworth*). Known only from one male and one female.

Megarhinus lutescens Theobald.

Toxorhynchites lutescens Theobald, Mon. Cul. 1, p. 233 (1901).

TYPE.—♂ in B.M., Salisbury.

A medium-sized species of predominantly golden colour, with sternopleural scales white in middle, golden-brown above and below; lateral hair-tufts of abdominal segments 6–8 all golden; segment 3 of hind tarsi with a white basal ring, 2, 4 and 5 all dark.

♂. *Head* with metallic greenish scales, blue round eye-margins. Tori without scales; first flagellar segment with a rather large tuft of dark scales. Palpi with shaft and penultimate segment golden beneath, only tip of latter dark, and with some golden scales above, terminal segment all dark; penultimate segment with at most half a dozen very short bristles.

Thorax with scutal scales mostly rather dull greyish-brown, not distinctly metallic ; *apn* with purplish scales, *ppn* with golden scales. Integument of scutum mainly blackish, but shoulders and whole of pleurae orange. No bristles or hairs on sternopleura, and only a very short hair on lower part of mesepimeron.

Abdomen coppery-golden above, pale golden beneath, without distinct markings, except sometimes a small purple triangle on sternite 7 ; golden lateral tufts of tergites 6 and 7 rather small, occupying only about half the length of each tergite.

Legs with coxae largely golden-scaled, some white scales at base of mid and hind coxae ; femora largely golden-scaled towards base, tibiae and tarsi purple shading to blue ; hind tibia with only a very few post-median white scales ; fore and mid tarsi almost all dark, second segment of mid tarsi not paler beneath ; hind tarsi with a complete white ring occupying two-thirds of the third segment and with an ill-defined white ring near base of first segment. *Terminalia* : Style scarcely widened in middle ; tergite with straight margin and about 10 setae in each lateral group.

♀. The single damaged specimen available resembles the ♂ (tarsi missing).

Wing-length 5-6 mm.

Distribution.—S. RHODESIA : Salisbury (*Marshall*). NYASALAND : Port Herald (*Old*) ; Mlanje (*Neave*) ; Maiwale (*Lamborn*). TANGANYIKA : Kilossa (*Loveridge*).

Variation.—The Nyasaland and Tanganyika specimens differ from the type in having a strong purple gloss over most of the dorsal surface of the abdomen.

Megarhinus erythrurus sp. n.

Megarhinus aeneus Edwards (*nec Evans* ?), Gen. Ins. Fasc. 194, pl. 1, fig. 7 (1932).

TYPE.—♂ in B.M., Ibadan.

Resembles *M. lutescens*, with which it agrees in the group characters noted above (p. 25), but differs strikingly in its large, red caudal tufts, as well as in male palpi and terminalia and in other respects.

♀. *Head* extensively blue in front, more golden or pale purplish behind ; scales all broad as usual. Tori devoid of scales. *Thorax* : Scutal scales with a more evident greenish tint than in *lutescens*, those on and in front of scutellum metallic, a small patch immediately above wing-root rather bright blue. Almost the lower half of sternopleura and the whole pre-alar area clothed with golden scales with a purple gloss. Sternopleura with one strong seta near middle and sometimes one or two weaker ones ; mesepimeron similarly provided. *Abdomen* with tergite 1 green or purple, 2-8 purple or violet above, more or less extensively golden on lateral margin towards base. Lateral tufts bright red in colour, larger than in *lutescens*, that on tergite 7 occupying almost the whole length of tergite (in perfect specimens). Sternite 7 with well-marked purple triangle, venter otherwise golden as in *lutescens*. *Legs* : Middle and hind coxae with patches of silvery-white scales at base, otherwise golden scaled. Middle tarsi with segment 1 whitish beneath at base, 2 white beneath for the whole of its length, 3-5 dark. Hind tarsi with the white ring on segment 3 incomplete posteriorly, and even on under surface occupying scarcely more than half the segment. Hind tibia with the pale post-median area more obvious than in *lutescens*.

♂. Colouring of body and legs as in ♀. Sternopleural hairs more numerous than

in ♀, several in upper half. Palpi largely yellow beneath as in *lutescens*, but differing conspicuously in the vestiture of the penultimate segment, which has about 15 short stiff bristles above and a row of about 15 longer hairs below. Red abdominal tufts longer than in ♀. *Terminalia* differing from those of *lutescens* in that the middle third of the style is about twice as wide as the two ends, and the tergite is rather deeply emarginate in the middle with about 20 hairs in each lateral group.

Wing-length 5.5–7.5 mm.

Distribution.—NIGERIA: Ibadan (*Kumm, Lamborn, Cauchi*).

These specimens had been determined as *M. aeneus*, but I now provisionally treat them as distinct, pending more information as to the identity of Evans's species.

Megarhinus viridibasis sp. n.

Megarhinus aeneus var. *viridibasis* Edwards, Bull. Ent. Res. 26, p. 133 (1935).

TYPE.—♀ in B.M., Kampala.

Intermediate between *M. lutescens* and *M. erythrurus*, but more closely allied to the former.

♀. Scutal scales sub-metallic greenish, as in *M. erythrurus*. Pleural scales more extensively white than in the other two forms; only a small patch of golden scales on lower part of sternopleura, and much of pre-alar area (except the knob) clothed with white scales. One sternopleural and one lower mesepimeral bristle in type (missing in second ♀). Abdomen with first three tergites clothed with metallic green scales, a slight admixture of purple scales on the third, rest purple. Caudal tufts red, that of tergite 7 occupying about two-thirds its length. Middle and hind coxae with white scales at base. Mid tarsi with a small area of white scales at base of first segment beneath, but second and following segments all dark. Hind tarsi with white ring of third segment complete, occupying nearly two-thirds its length.

♂. Resembles ♀ in colouring of body and legs (thorax much denuded). Caudal tufts red, larger than in ♀ but not so large as in ♂ of *M. erythrurus*. Palpi and terminalia as in *lutescens*.

Distribution.—UGANDA: Kampala, 1 ♀, and Soroti, 1 ♀ (*Hopkins*). NIGERIA: Afikpo, 1 ♂ (*Maclane*).

Although the male is damaged I think it must belong to the same species as the females; it is clearly quite different from the male of *erythrurus*, but it is quite possible that both *viridibasis* and *aeneus* should be regarded as subspecies of *lutescens*; the available material is too scanty for any conclusion to be formed on the point.

Megarhinus aeneus Evans.

Megarhinus (Toxorhynchites) aeneus Evans, Ann. Trop. Med. 20, p. 102 (1926).

TYPE.—♀ in Liverpool, Freetown.

Very similar to *M. erythrurus* and *viridibasis*, and possibly a form of one of them, but differs in having the scales of mid coxae all golden and the red caudal tufts very small and inconspicuous (this condition perhaps partly due to rubbing).

♀. *Head* as in other species of the genus; there are no narrow scales as mistakenly

stated in the original description, all the scales being equally broad. Palpi and base of proboscis in type with metallic green reflections (not evident in the second specimen). *Thorax* as in *erythrurus*. *Abdomen* purple above, first tergite green in type (not in second specimen). *Legs* much as in related species. Mid tarsi in type with white scales on second segment which extend all round on the proximal third and to three-fourths of the length of the segment ventrally; in the second ♀ the second mid-tarsal segment is only indefinitely pale beneath on the basal half. Third hind tarsal segment in type "with a broad basal creamy-white band" (it is now lost); in second ♀ with a white mark on basal half almost confined to anterior surface. *Wing-length*: 5 mm.

♂ unknown.

Distribution.—SIERRA LEONE: Freetown (*Evans*).

Evans remarks that the second female differs from the type not only in the amount of white on the legs, but also in pupal chaetotaxy, and that until more material is available "it is impossible to say whether this represents a distinct species." In the absence of a male from Freetown it is also impossible to say at present whether *M. aeneus* is conspecific with either of the Nigerian forms.

Tribe CULICINI.

In this tribe are included all the genera of African mosquitoes apart from *Anopheles* and *Megarhinus*. The chief distinctions in the adult stage from the *Megarhinini* are as follows:

Clypeus longer than broad, its front margin not trilobed. Proboscis of uniform thickness or somewhat swollen at tip, not hooked; labella not elongate. Scutellum trilobed, each lobe with a group of marginal bristles, those on the median lobe as long as those on the lateral lobes or longer. Wings with upper fork seldom shorter than its stem; cross-vein 3-4 not bent; no emargination of hind margin opposite vein 5.2, and no V-shaped thickening of membrane in cubital fork (the thickening is traceable in some genera, especially *Uranotaenia*, but it runs parallel with the hind margin).

The distinctions between the genera are small and somewhat obscure, but if care be exercised the following key should enable the genus of any African Culicine mosquito to be determined without great difficulty. The characters used are those which have been proved to define the genera most sharply.

KEY TO GENERA OF AFRICAN CULICINI.

1. Vein 6 ending about opposite level of base of fork of 5; squama bare 2.
 Vein 6 ending well beyond level of base of fork of 5; squama fringed 4.
2. Wing membrane without obvious microtrichia; fork of 2 shorter than its stem *Uranotaenia* L.-A. (p. 41).-
 Wing-membrane with distinct microtrichia; fork of 2 longer than its stem 3.
3. Proboscis hairy, with enlarged tip; clypeus narrow; wing-scales normal
 Harpagomyia de Meij. (p. 33).-
 Proboscis and clypeus normal; wing scales emarginate at tips
 Hodgesia (Theo.) (p. 37).-

4. All segments of ♀ antenna and last two of ♂ antenna short and thick ; very scaly insects with tuft on middle femur *Aëdomyia* N.-L. (p. 64).
 Antennae normal, slender ; middle femur without scale-tuft 5.
5. Post-spiracular bristles present 6.
 Post-spiracular bristles absent ; claws of ♀ all simple ; abdomen of ♀ blunt-tipped 8.
6. Claws of anterior legs of ♀ toothed (with rare exceptions) ; abdomen of ♀ usually pointed, seventh segment large 7.
 Claws of ♀ all simple ; abdomen of ♀ blunt-tipped, seventh segment reduced ; wing-scales all very broad . . . *Taeniorhynchus* subg. *Mansonioides* Theo. (p. 102).
7. Abdomen rarely with metallic silvery markings ; if so the thorax is not yellow ; paratergite narrow and usually with scales *Aedes* Mg. (p. 106)
 Abdomen with metallic silvery markings ; thorax partly or largely yellowish ; paratergite broad and bare *Eretmapodites* Theo. (p. 224).
8. Spiracular bristles present *Theobaldia* N.-L. (p. 67).
 Spiracular bristles absent 9.
9. First segment of front tarsi longer than remaining four together, fourth very short in both sexes *Orthopodomomyia* Theo. (p. 71).
 First segment of front tarsi not longer than remaining four together, fourth not shortened in ♀ 10.
10. Pulvilli present ; palpi of ♂ usually slender and upturned *Culex* L. (p. 242).
 Pulvilli absent ; palpi of ♂ not upturned 11.
11. Wings scantily scaled ; fork of vein 2 shorter than its stem
Ficalbia subg. *Mimomyia* Theo. (p. 75).
 Wings heavily scaled ; fork of vein 2 longer than its stem 12.
12. Small species, not yellow ; palpi of ♂ hairless and shorter than proboscis
Ficalbia Theo. (part) (p. 73).
 Larger species, often yellow ; palpi of ♂ hairy and longer than proboscis
Taeniorhynchus subg. *Coquillettidia* Dyar (p. 90).

HARPAGOMYIA de Meijere.

Malaya Leicester, Cul. of Malaya, p. 258 (1908) (nec *Malaya* Heller, 1892).

Harpagomyia de Meijere, Tijds. v. Ent. 52, p. 169 (1909).

Grahamia Theobald, Colonial Office Miscell. 237, p. 23 (1909).

GENOTYPES.—*Malaya*, *M. genurostris* Leicester (Malaya) ; *Harpagomyia*, *H. splendens* de Meijere (Java) ; *Grahamia*, *G. trichorostris* Theobald (W. Africa).

The small insects of this genus are very well distinguished from all other mosquitoes by the form of the proboscis and the remarkable feeding habits of the adults of both sexes. The colouring of the body—black with silvery markings on the abdomen—is similar to that of *Hodgesia*.

Head (Fig. 9) clothed only with broad flat scales with rounded ends, some of them forming a silvery spot on the vertex. Eyes contiguous or narrowly separated, notched at middle of occipital margin ; a pair of strong vertical bristles separated by a wide space from the smaller orbital bristles. Clypeus rather narrow and somewhat pointed. Palpi alike in the two sexes, scarcely longer than clypeus, without distinct joints. Antennae alike in the two sexes, flagellar segments all about equal in length. Proboscis shorter than abdomen, with a flexible joint at about two-thirds of its length, beyond which it is swollen and more rigid ; whole proboscis hairy, with a row of long upwardly-directed hairs along each side and four long curled hairs inserted near base of labella. Mandibles and maxillae absent in both sexes.

Thorax with *apn* separated, but not widely so, with a row of bristles on front

edge and flat silvery scales behind. Dorso-central bristles present but not numerous. Scutellum with flat silvery scales. Paratergite rather large, as in *Megarhinus*, bare. Only one propleural bristle; 1-2 posterior pronotal; 1-3 spiracular; 6-10 upper mesepimeral, but no sternopleural, pre-alar, or lower mesepimeral. Postnotum bare. Scales of pleurae silvery, covering a large area.

Legs normal, all tibiae of about equal length, or the hind pair slightly shorter.

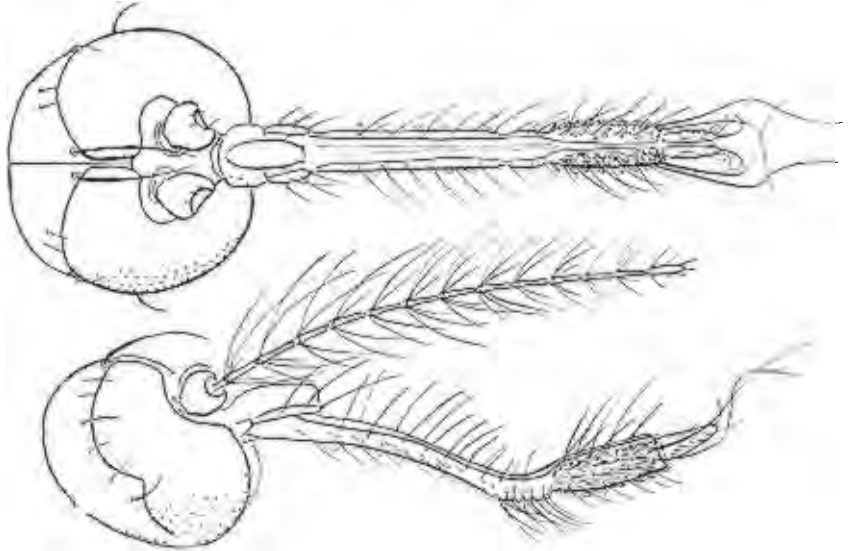


FIG. 9.—Head of *Harpagomyia taeniarostris* Theo., from above and from side.



FIG. 10.—Wing of *Harpagomyia trichorostris* Theo. (After Theobald, 1910.)

No secondary sexual modifications in ♂, except that the claws of the front legs are slightly unequal. No pulvilli. Hind coxa with a single shortish hair at tip in front.

Wings (Fig. 10) with distinct microtrichia on membrane. Fork of vein 2 as long as its stem or longer; 6 ending opposite or only a little beyond level of fork of 5; outstanding scales of veins slender, not notched at tip.

Abdomen black with silvery spots. Lateral lobes of first tergite clothed with silvery scales.

♂. *Terminalia*.—Coxite at least twice as long as broad; bearing scales on its dorsal

surface and with an ill-defined basal lobe bearing several simple spines; style simple, curved, with a short, thick, terminal spine; paraprocts simple, pointed, bare, and without teeth at the tip; phallosome divided or entire.

♀. *Terminalia* (*farquharsoni*. Fig. 6 ♀, g). Eighth segment not retractile; tergite with its posterior marginal hairs longer than in most other genera; sternite unmodified. Ninth tergite forming two large lobes joined by a narrow bar, and with lateral extensions. Insula unusually large, its setae fine, in two lateral groups. Cerci short and broad, blunt, nearly horizontal. Post-genital plate projecting somewhat beyond cerci, sides nearly parallel, proximal portion feebly chitinized, nearly bare, not reaching cowl. Atrial plates present. Sigma fused with insula. Spermathecae three, spherical, one large, the others somewhat smaller.

Habits.—The flies haunt tree-trunks where ants of the genus *Cremastogaster* are found, and obtain their food from the ants; the proboscis of the mosquito is evidently highly specialized for this purpose, and they probably do not feed in any other way. The following account was written by Farquharson (1918) on the feeding habits of *H. farquharsoni*, and would probably apply equally well to the other African species, as it agrees rather closely with observations made in Java, Ceylon and elsewhere in the East:

“*Harpagomyia* hovers an inch or less above the line of ants (at times resting on the stem and dodging out of the way when necessary), till it sees what is presumably a likely ant. If the ant is running downwards the mosquito drops down (in flight) also, keeping a little in front of the ant—as near as possible without touching it. The ant tries to evade it, but the mosquito as a rule declines to be put off, and the ant at last stops. The mosquito quickly settles and the usual rapid exchange begins, the mosquito thrusting out its proboscis—which when not in action is carried bent under the body much like the rostrum of a Reduviid bug—so that the swollen end is practically within the ant’s jaws. I have seen the ant’s palpi (*not* the antennae) vibrating on it. The swollen portion of the proboscis is undoubtedly capable of independent movement. . . . The ant may stop and give an alms to the beggar, passing on a moment or two later just as if it had met a friend, and the mosquito flies up and down again till another obliging ant is met.”

While feeding the mosquito vibrates its wings and holds its hind legs high so that the tarsi curve forward over the head. Feeding takes place by day.

Mating and egg-laying have not been observed, though Jacobson has described how males of *H. splendens* will hover round a seated female; the non-plumose antennae of the male suggest that mating swarms are not formed in the air as in most other mosquitoes.

KEY TO ETHIOPIAN SPECIES OF HARPAGOMYIA.

- | | |
|--|----------------------------|
| 1. Scutum with silvery median line | 2. |
| Scutum without such line | 3. |
| 2. Clypeus and palpi yellow | <i>taeniarostris</i> Theo. |
| Clypeus and palpi blackish | <i>trichorostris</i> Theo. |
| 3. Head with silvery spot in front | <i>farquharsoni</i> Edw. |
| Head all dark above | <i>fraseri</i> Edw. |

Harpagomyia taeniarostris Theobald.

Harpagomyia taeniarostris Theobald, Novae Culicidae, p. 34 (1911); Edwards, Trans. Ent. Soc. London, p. 499 (1922).

Harpagomyia trichorostris (Theobald) Ingram and de Meillon, S.-Afr. Inst. Med. Res. 22, p. 76 (1927).

TYPE.—♂ in B.M., Kampala.

Distinguished especially by having the clypeus, palpi and slender part of proboscis pale yellow, only the clypeus being occasionally darkened at the base; head with a large patch of silvery scales in front, which is not produced forwards between the eyes; scutum with a double median row of round, flat, silvery scales extending from front margin to well behind middle; scales of *ppn* pale golden; fairly large apical lateral silvery spots on abdominal tergites 5 and 6.

♂♀. General colour black, with silvery markings. Scutal scales mostly narrow and blackish; broad flat silvery scales on *apn*, scutellum (except the small lateral lobes) and most of pleurae, including subspiracular area, sternopleura, much of pre-alar area and all but lower part of mesepimeron. Abdomen black, with silvery lateral apical spots on all tergites except 3, which is entirely black, spots on 2 and 4 somewhat larger than the others. Legs dark. *Terminalia*: Coxite rather short, blackish, about twice as long as broad, with about 5 spines on basal lobe, 2 spines and about 4 stiff bristly hairs on inner face towards apex; lobes of tergite small and rounded, with a terminal row of about 8 bristly hairs; phallosome divided into two hook-like structures.

Wing-length about 2.5 mm.

Distribution.—UGANDA: Kampala (*Fraser*); Fort Portal (*Shillito*, *Edwards*). TANGANYIKA: Dar-es-Salaam (*Pomeroy*). ZULULAND (*Ingram*). NIGERIA: Kagerko (*Taylor*); Lagos (*Philip*). BELGIAN CONGO: Stanleyville (*Schwetz*); entre Tisala et Libenge (*Henrard*). SUDAN: Meridi (*Rutledge*).

Harpagomyia trichorostris Theobald.

Harpagomyia trichorostris Theobald, Mon. Cul. 5, p. 547 (1910); Edwards, Trans. Ent. Soc. London, p. 500 (1922).

TYPES.—♂♀ in B.M., Obuasi, Ashanti.

Differs from *H. taeniarostris* in having the clypeus, palpi and proboscis entirely blackish; the patch of silvery scales on front of head produced forwards a short distance between eyes, otherwise silvery markings quite as in *H. taeniarostris*.

♂. *Terminalia*.—Coxite yellowish and about three times as long as broad, basal lobe with about 10 spines; lobes of tergite thumb-like, with two strong spines at tip and one additional hair; phallosome undivided, rather strongly chitinized.

Distribution.—GOLD COAST: Obuasi (*Graham*). SIERRA LEONE: Freetown (*Evans*). Also recorded by Schouteden from Belgian Congo (*Collart*), but this may possibly refer to *H. taeniarostris*.

Harpagomyia farquharsoni Edwards.

Harpagomyia farquharsoni Edwards, Trans. Ent. Soc. London, p. 500 (1922).

COTYPES.—♂♂♀♀ in B.M. and Oxford, Ibadan.

Resembles *H. taeniarostris* and *H. trichorostris* in most respects, but differs

strikingly in lacking the double median line of silvery scales on the scutum, at most a small spot of such scales being present on the front margin; clypeus, palpi and proboscis blackish; scales of *ppn* silvery rather than golden; silvery lateral spots on abdominal tergites 5 and 6 very small or absent.

♂. *Terminalia*.—Resemble those of *H. taeniarostris*, except in structure of phallosome, which is quite different.

Distribution.—NIGERIA: Ibadan (*Farquharson, Pomeroy*); Lagos (*Dunn, Philip*).

Harpagomyia fraseri Edwards.

Harpagomyia fraseri Edwards, Trans. Ent. Soc. London, p. 499 (1922).

TYPE.—♂ in B.M., Entebbe.

Differs from the other three species in having all the scales on the top of the head black, no silvery area in front. Palpi, proboscis and clypeus dark; scutum with narrow dark scales only, no median silvery line; lateral silvery spots of abdominal tergites 5 and 6 fairly large.

♂. *Terminalia*.—Coxites dark, over twice as long as broad, basal lobe with four or five spines and a few hairs; lobes of tergite elongate, with five spines, of which the apical two are stronger; phallosome not divided, not very strongly chitinized.

Distribution.—UGANDA: Mpumu Forest (*Fraser*).

HODGESIA Theobald.

Hodgesia Theobald, Journ. Trop. Med., p. 17 (1904).

GENOTYPE—*H. sanguinea* Theobald (Uganda).

Very small black mosquitoes with silvery markings, superficially resembling *Harpagomyia*, but with normal, unmodified proboscis; the form of the wing-scales is unique among mosquitoes.

Head with all scales broad and flat, a patch of silvery scales in front as in *Harpagomyia*. Eyes narrowly separated. Orbital bristles few in number, but no conspicuous gap between the upper pair and the rest. Clypeus broader than in *Harpagomyia*. Proboscis of uniform thickness throughout or slightly swollen at tip in ♂, about as long as abdomen, without long hairs; mandibles and maxillae well developed in ♀. Palpi very short in both sexes. Antennae alike in the two sexes, not plumose, all flagellar segments subequal in length.

Thorax.—*apn* widely separated, with 3–4 bristles and usually with flat silvery scales. Dorso-central bristles fairly long, but not very numerous; no acrostichals. Scutellum with broad dark (not silvery) scales. Paratergites narrower than in *Harpagomyia*, bare. *ppn* usually with two strong bristles, but devoid of scales. A single propleural bristle; 0–1 sternopleural, 2 small upper and 1 strong lower mesepimeral; no spiracular, post-spiracular or pre-alar. Pleural scale-patches not large, chiefly on sternopleura.

Legs remarkable for the secondary sexual modifications of the tips of the tarsi in three of the four African species (Fig. 12). Claws simple; no pulvilli. Hind coxa with one inconspicuous hair at tip in front.

Wings (Fig. 4, a, b; Fig. 11) with distinct microtrichia on membrane; squama bare. Venation as in *Harpagomyia*; fork of vein 2 as long as its stem, 6 ending about opposite base of fork of 5. Outstanding scales of veins on outer part of wing long and narrow, but notched at tip; scales on upper surface of veins 3, 4 and 5 small and practically in single rows.

Abdomen black with silvery spots; it is noteworthy that as in *Harpagomyia*



FIG. 11.—Wing of *Hodgesia cyptopus* Theo. (After Theobald, 1910.)

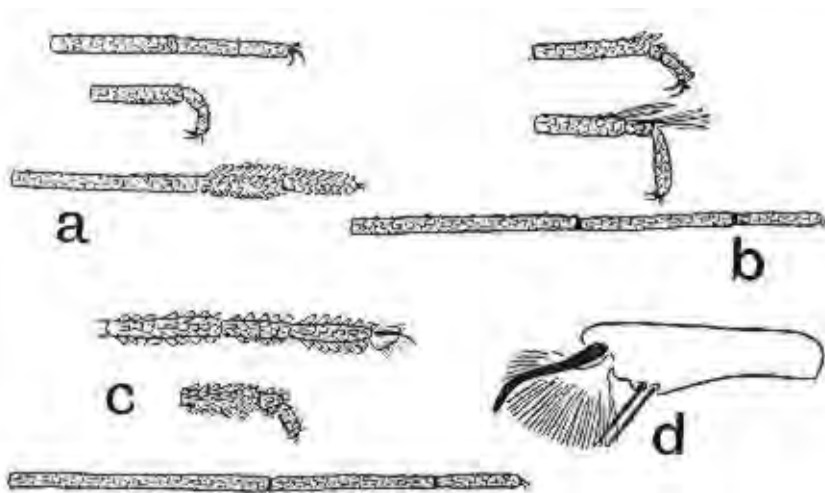


FIG. 12.—Tarsal characters of *Hodgesia* spp. a-c. Last three segments of front, middle and hind tarsi; d. Fifth segment of front tarsus more enlarged. a. *sanguinea*. b. *cyptopus*. c, d. *psectropus*.

these spots are usually absent from tergite 3. Lateral lobes of first tergite bare. Only one sclerotized spermatheca in ♀.

♂. *Terminalia* small, more or less hidden. Coxite short, without lobes; style simple, without distinct spine; paraprocts strong, ending in five or six strong teeth in vertical palmate arrangement; phallosome simple.

♀. *Terminalia*.—Eighth segment not retractile, tergite short and broad. Ninth tergite forming a narrow band. Insula narrow, with several evenly scattered setae. Cerci very short and broad, oblique. Post-genital plate nearly semi-circular, widely separated from cowl by membrane. Atrial plates present. Spermathecae three, nearly spherical, one of them apparently variable in size (in two specimens examined it is minute, in the third not much smaller than the other pair).

Habits.—Little is known regarding the habits of species of *Hodgesia*. *H. sanguinea* was stated by Dr. Aubrey Hodges, its original discoverer, to suck the blood of man, but this does not seem to have been confirmed.

The four African species are extremely similar in ornamentation, differing chiefly in peculiarities of the male tarsi. Other species occurring in the Oriental region and in Australia show rather greater differences, for example in the scaling of the pleurae.

KEYS TO ETHIOPIAN SPECIES OF HODGESIA.

- | | | |
|--|------|--|
| | ♂ ♀. | |
| 1. Third abdominal tergite practically all black | | <i>sanguinea</i> Theo. ; <i>psectropus</i> Edw. ; <i>nigeriae</i> Edw. |
| Third abdominal tergite with lateral pale spot | | <i>cyptopus</i> Theo. |
| | ♂. | |
| 1. Tip of front tarsus modified (fig. 12, c) | | <i>psectropus</i> Edw. |
| Tip of mid tarsus modified (Fig. 12, b) | | <i>cyptopus</i> Theo. |
| Tip of hind tarsus modified (Fig. 12, a) | | <i>sanguinea</i> Theo. |
| No tarsi specially modified | | <i>nigeriae</i> Edw. |

Hodgesia sanguinea Theobald.

Hodgesia sanguinac Theobald, Journ. Trop. Med. 7, p. 17 (1904).

Hodgesia sanguinis (Theobald) Edwards (emend.), Bull. Ent. Res. 3, p. 35 (1912).

Hodgesia sanguinea (Theobald) Edwards (emend.), Bull. Ent. Res. 21, p. 299 (1930).

TYPE.—♀ in B.M., Entebbe.

A very small black species, with a silvery-white spot on top of head in front, this spot being usually longer than broad ; silvery-white scales on *apn* ; two patches of silvery scales on sternopleura, the upper larger, extending over lower pre-alar area, separated from lower spot by an area of black scales ; mesepimeron without scales ; silvery-white lateral apical spots on abdominal tergites 1, 2, 4, 5, and 6 (3 and 7 being usually entirely black, with sometimes a few white scales on 3). Sternites 1–6 pale yellowish (usually invisible in pinned specimens), 7 black. Hind femora black all round on distal fifth and with a dark dorsal line reaching almost to the base.

♂. Front tarsi simple, with two small and equal claws, similar to those of the ♀ ; last two segments subequal in length ; empodium barely distinguishable. Middle tarsi slender, last two segments without specially long scales, fourth markedly shorter than fifth ; claws small and equal. Hind tarsi with the first segment slightly shorter than tibia, second and third equal in length, fourth scarcely longer than fifth, compressed and enlarged, with longer scales dorsally and ventrally, these scales densely packed and not roughened ; fifth segment with rather long suberect scales dorsally ; claws minute as usual (Fig. 12, a).

♀. Resembles ♂ in colouring, differing in having all the tarsi simple without special peculiarities.

Wing length 2–2.5 mm.

Distribution.—UGANDA : Entebbe (*Hodges*, *Fraser*) ; Namanve and Kampala (*Hopkins*) ; Kalungi (*Edwards*). Records from other countries are based on females only and probably refer to other species.

Hodgesia psectropus Edwards.

Hodgesia psectropus Edwards, Bull. Ent. Res. 21, p. 300 (1930).

TYPE.—♂ in B.M., Stanleyville.

Closely resembles *H. sanguinea*, but with strikingly different modifications of the tarsi of the ♂. White spot on front of head perhaps broader than in *H. sanguinea*, but markings of thorax, abdomen and hind femora as in that species.

♂. Front tarsi with the fourth and fifth segments subequal in length; apparently only one claw present, which is almost as long as the last tarsal segment; empodium remarkably enlarged and very hairy—a unique feature among mosquitoes (Fig. 12, c, d). Middle tarsi thicker than in the other species, last two segments more or less bent; fourth very short (scarcely as long as broad), but without unusual scales; fifth about twice as long as fourth, but still short, with two short and equal claws. Hind tarsi slender, simple; fourth segment nearly twice as long as fifth.

♀. Resembles the ♂ in colouring, and apparently indistinguishable from *H. sanguinea*.

Distribution.—BELGIAN CONGO: Stanleyville (*Schwetz*); Kinshasa (*Duren*). Females from Coquilhatville (*Yale Massey*) are probably this species.

Hodgesia nigeriae Edwards.

Hodgesia nigeriae Edwards, Bull. Ent. Res. 21, p. 300 (1930).

TYPE.—♂ in B.M., Lagos.

Closely resembles *H. sanguinea* and *H. psectropus*, but without special modifications of the tarsi. White spot in front of head rather longer than broad.

♂. Front tarsi simple, with two small and equal claws, empodium very small. Middle tarsi slender, fourth segment shorter than fifth, without long scales, fourth and fifth (in the specimens available) bent at right angles with third. Hind tarsi slender to the tip, without long scales on last two segments; first segment slightly longer than tibia, fourth quite twice as long as fifth.

♀. Apparently indistinguishable from *H. sanguinea*.

Distribution.—NIGERIA: Lagos (*Philip, Wigglesworth*); Badagry (*W. S. C.*). A female from Sierra Leone (Freetown, *Fraser*) is perhaps this species.

Hodgesia cytopus Theobald.

Hodgesia cytopus Theobald, Mon. Cul. 5, p. 545 (1910).

Hodgesia cytopus (Theobald) Edwards (emend.), Bull. Ent. Res. 3, p. 35 (1912) and 21, p. 299 (1930).

TYPE.—♂ in B.M., Obuasi.

Differs from the other three species in markings, as follows: Lateral pale spots of abdomen with a slight yellowish tint and less sharply separated, tending to form an interrupted stripe, the pale spot on the third tergite as large as the others. Hind femora much more extensively pale yellowish, being dark all round only at the extreme tip and with a dark dorsal line extending only a short distance back from tip. White spot on vertex slightly broader than long.

♂. Front tarsi not specially modified, but fourth segment markedly shorter

than fifth and with rather longer scales; claws rather larger than in *H. sanguinea*, but equal; empodium small. Middle tarsi slender, the fifth segment about twice as long as the fourth and bent at right angles to it; fourth with a tuft of very long projecting pale yellowish scales; a few similar scales at tip of third (Fig. 12, b). Hind tarsi simple, slender, first segment considerably longer than tibia, second longer than third, fourth quite twice as long as fifth.

♀. Resembles ♂ in colouring, but mid tarsi without scale-tuft.

Wing-length 2–2.5 mm.

Distribution.—GOLD COAST: Obuasi (*Graham*); Kumasi (*Watt*). BELGIAN CONGO: Stanleyville (*Schwetz*). UGANDA: Kasala (*Fraser*); Entebbe (*Hopkins*). Only a single specimen has been collected in each locality, and except for the type from Entebbe these specimens are females.

URANOTAENIA Lynch Arribalzaga.

Uranotaenia Lynch Arribalzaga, Rev. Mus. La Plata, 1, p. 375 (1891).

Pseudoficalbia Theobald, Trans. Linn. Soc. Zool. 15, p. 89 (1912).

GENOTYPES.—*Uranotaenia*, *U. pulcherrima* L.A. (S. America); *Pseudoficalbia*, *P. pandani* Theo. (Seychelles Is.).

Small or very small mosquitoes with short or very short fork to vein 2. Distinguished from all other mosquitoes by the apparent absence (when examined under a binocular microscope) of microtrichia on the wing membrane.

Head clothed mainly with broad flat scales; no narrow decumbent scales, but a number of erect scales usually present, these sometimes numerous and the area

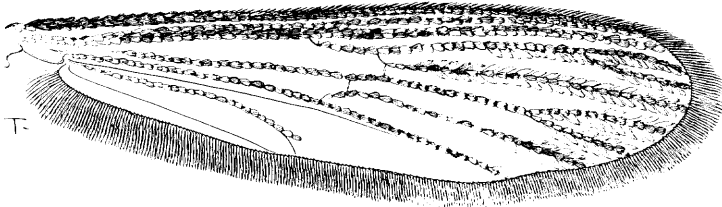


FIG. 13.—Wing of *Uranotaenia alboabdominalis* Theo.

occupied by them extending well forwards. Eyes touching above antennae and below proboscis. Orbital bristles not numerous, but the row not conspicuously interrupted. Proboscis variable in length, often somewhat swollen at tip, especially in ♂. Palpi in both sexes very short, not more than one-sixth as long as proboscis. Antennae of ♂ more or less plumose, of ♀ rather long, non-plumose, first flagellar segment not much longer than second, and without scales.

Thorax.—*apn* widely separated, usually with three or four bristles only; two above, divergent from one another, and one or two below, directed upwards. Scutum much arched; dorso-central bristles long, strong and numerous. Scutellum in all African species with broad dark brown scales. Paratergite long and narrow, always bare, though sometimes overlapped by scales on supra-alar area of scutum. Usually

only one propleural bristle; 1-2 posterior pronotal; 1-2 spiracular; 0 post-spiracular; 2 pre-alar; several upper sternopleural (sometimes numerous); 2-4 upper mesepimeral; 1 lower mesepimeral, unusually long and strong. Pleurae not very extensively scaled, usually only in one or two patches or stripes. Pre-alar area

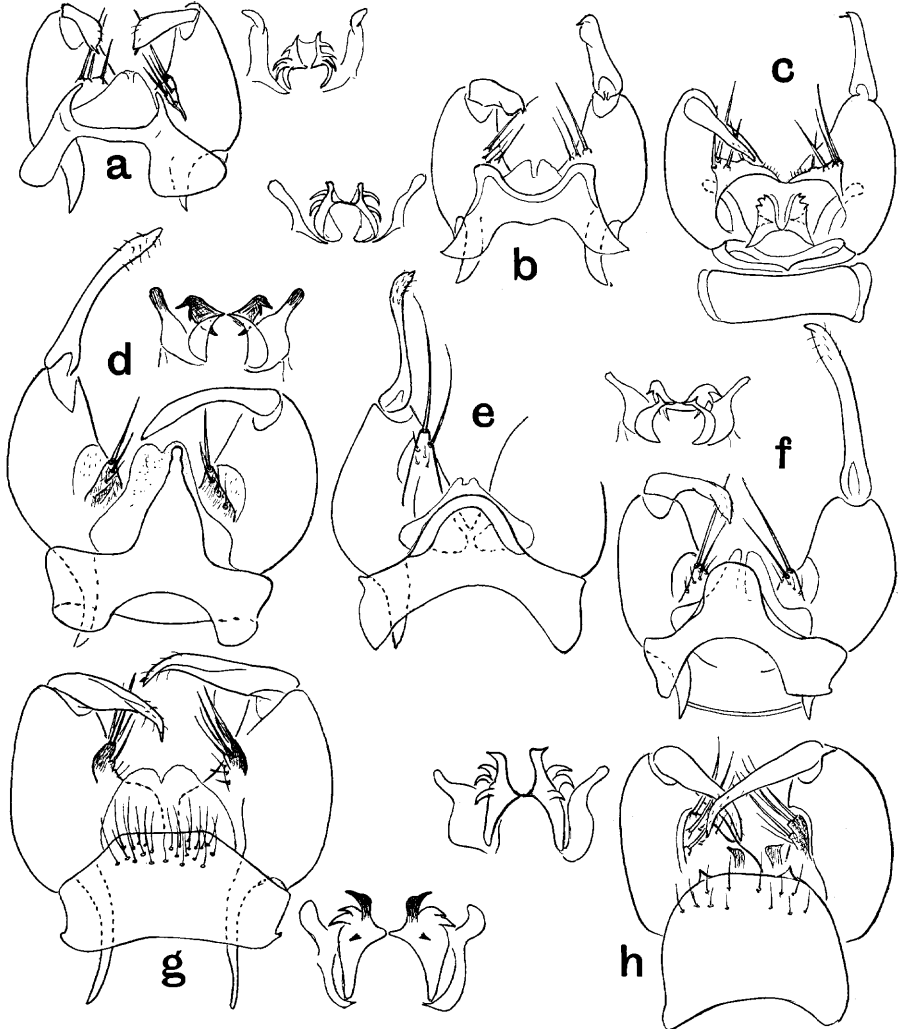


FIG. 14.—Terminalia of *Uranotaenia* spp.; whole organ in tergal view, with phallosome shown separately. a. *balfouri*. b. *bilineata*. c. *chorlevi*. d. *mashonaensis*. e. *nigromaculata*. f. *micromelas*. g. *shillitonis*. h. *henrardi*.

separated from sternopleura by a distinct furrow or suture (more obvious than in any other *Culicine* genus).

Legs slender, middle femora rather strongly swollen towards base. Tibiae and tarsi in some species with peculiar secondary sexual modifications in ♂, very different in character according to the species. Fourth front tarsal segment markedly longer

than fifth in both sexes. Front claws in both sexes simple, short and equal in length (except in the Palearctic *U. unguiculata*); though one may be broader than the other; middle claws in ♂ very unequal, one long and curved, the other very short, both simple; hind claws short and simple. Hind coxa with a single long, curved, bristly hair in front at tip.

Wings (Figs. 13, 19) with the microtrichia of membrane very fine and dense, appearing as fine dots under $\frac{1}{8}$ -in. objective, but under the ordinary magnifications of a binocular microscope the membrane appears quite clear. Vein scales usually all broad; few long scales, none of which are emarginate at their tips; on upper surface veins 3, 4, 5 and 6 have only single rows of very small scales. Fork of vein 2 always shorter than its stem, sometimes very much shorter. Vein 6 ending below or just before level of base of fork of 5 or base of 2, its tip strongly curved downwards. Squama devoid of fringe.

Abdomen blunt in ♀, without metallic markings. First tergite uniformly scaly above, but its lateral lobes with few small scales or none. Only one sclerotized spermatheca in ♀.

♂ *Terminalia* (Fig. 14) small. Tergite with or without hairs according to the species. Anal segment more or less completely membranous, without definite paraprocts (a feature in which this genus differs from all other Culicini except *Aëdomyia*). Coxite short, with small (sometimes indefinite) basal lobe bearing a few stout bristles. Style variable in length and thickness according to the species, usually with numerous minute hairs and with a small simple terminal spine. Phallosome strongly sclerotized, divided into two lateral plates connected by a single bridge, each plate with two to five strong teeth which are reflexed or point outwards.

♀ *Terminalia* (Fig. 6 ♀, e, f).—Eighth sternite more or less emarginate. Ninth tergite narrow, ribbon-like. Cerci short and broad. Insula moderate, free (*coeruleocephala*, *micromelas*) or fused with sigma (*shillitonis*). Post-genital plate broad, extending almost to cowl but not fused with it, posterior marginal setae long. Atrial plates present. Spermatheca single, large.

Habits.—Little is known of the habits of adult members of this genus. None of the African species has been observed to suck human blood, though Davis and Philip report having found chicken-blood in the gut of *U. annulata*. The eggs are said to be formed into rafts, the individual eggs placed vertically as in *Culex*.

When cataloguing the Culicidae in 1932 I divided the species of *Uranotaenia* into two groups (*Uranotaenia* and *Pseudoficalbia*), according to the presence or absence of a supra-alar stripe of broad flat scales. This arrangement was not very natural, especially as it did not take sufficient account of the considerable diversity in the second group. In the light of our present knowledge the African species of *Uranotaenia* may be placed in four groups defined as follows:—

A. Scutal scales mostly narrow, but a supra-alar stripe of broad scales; *apn* scaly; wings usually with some white scales in lines. Terminalia (where known) with tergite bare, its lateral corners produced into pointed processes or rounded knobs; style short and rather stout; *lp* with strong spines:

U. pallidocephala, *philonuxia*, *coeruleocephala*, *alboabdominalis*, *alba*, *mayeri*, *bilineata* and vars., *caliginosa*, *balfouri*.

B. Scutal scales all narrow (except *montana*) but *apn* scaly; wing-scales dark.

Terminalia (where known) with tergite bare, neither middle nor corners produced ; style short but less stout than in group A ; *lp* with very small hooks :

U. chorleyi, neireti, hopkinsi, montana, annulata, candidipes.

C. Scutal scales all narrow. *apn* devoid of scales. Terminalia with tergite bare, more or less produced in middle, but not at corners ; style long and slender ; *lp* with small spines :

U. ornata, nigripes, pandani, nepenthes, fusca, mashonaensis, nigromaculata.

D. Scutal scales all broad ; *apn* and pleurae also with broad scales. Terminalia with tergite hairy, without processes :

U. shillitonis, henwardi.

I do not consider that any of these groups are worthy of rank as subgenera, all the species exhibiting all the important generic characters in the adult stage.

KEY TO ETHIOPIAN SPECIES OF URANOTAENIA.

1. Scutal scales mostly or all narrow ; acrostichal bristles distinct 2.
Scutal scales all broad and flat ; no acrostichal bristles 28.
2. A distinct stripe or patch of flat white or blue scales on margin of scutum in front of wing-base ; wings white scaled at base (except in *alba*) 3.
No such distinct area of flat scales ; wing-scales usually all dark 14.
3. Sternopleura with a large patch of scales in middle, extending up to the uppermost bristles 4.
Sternopleura with a small patch or band of scales in middle, bare above and below 7.
4. A blue median stripe posteriorly on scutum ; legs of ♂ curiously modified
pallidocephala Theo. (p. 45).
No such marking ; legs of ♂ normal 5.
5. Sternopleura with anterior row of bristles, its scales pale brownish
coeruleocephala Theo. (p. 47).
Sternopleura without anterior bristles, its scales silvery-white 6.
6. Pre-alar flat scales white, in a rather large patch *philonuxia* Philip (p. 47).
Pre-alar flat scales bluish, in a rather narrow stripe *caliginosa* Philip (p. 52).
7. Abdomen with median apical white marks on two or more tergites 8.
Abdomen without median apical white marks on any tergites 11.
8. Tergites 2-7 all apically banded ; tori with scales *montana* Ingr. & de M. (p. 54).
Tergites 5-7 without apical bands, tori bare 9.
9. Tergites 1-4 either all white or with white apical bands 10.
Tergites 2 and 4 only with apical bands *alba* Theo. (p. 49).
10. Tergites 6 and 7 with basal pale bands ; femora not lined with white
alboabdominalis Theo. (p. 48).
Tergites 6 and 7 with apical lateral white spots ; posterior femora lined with white *mayeri* Edw. (p. 50).
11. Vein 1 white-scaled to middle of wing or nearly ; hind tarsi white-tipped 12.
Vein 1 dark-scaled, except on the basal (stem-vein) section *balfouri* Theo (p. 52).
12. Abdominal tergites with basal pale bands *bilineata* var. *connali* Edw.
and var. *obsoleta* Edw. (p. 51).
Abdomen unbanded 13.
13. Hind tibia white at tip ; hind tarsi distinctly pale-ringed *bilineata* Theo. (p. 50).
Hind tibia not distinctly white at tip ; hind tarsi only faintly ringed
var. *fraseri* Edw. (p. 51).
14. *apn* dark, with a dense covering of white or bluish scales 15.
apn either yellow, or bare, scales if present yellowish 17.

15. Hind tarsi all dark *chorleyi* Edw. (p. 53).
 Hind tarsi white-tipped, or with fourth segment white 16.
16. *apn* blackish below; larger species *neireti* Edw. (p. 53).
apn not so; smaller species *hopkinsi* Edw. (p. 54).
17. Thorax chocolate-brown above, lower half of pleurae abruptly pale yellow;
 hind tarsi white tipped; abdominal tergites apically banded 18.
 Thorax otherwise; hind tarsi all dark; tergites not apically banded 20.
18. Head scales mostly dark; hind tarsi pale at tip only *candidipes* Edw. (p. 56).
 Head scales yellowish; hind tarsi with two pale rings and pale tip 19.
19. Hind tibia practically all dark *annulata* Theo. (p. 55).
 Hind tibia rather broadly white at tip var. *apicotaeniata* Theo. (p. 56).
20. Thorax mainly or all yellow, contrasting with the black legs; abdomen more
 or less banded (bands basal) 21.
 Thorax more or less dark above; abdomen unbanded 25.
21. Scutum with brown markings on posterior half 22.
 Scutum without such markings 23.
22. Head scales black *ornata* Theo. (p. 56).
 Head scales yellowish *ornata* ssp. *musarum* Edw. (p. 58).
23. Scutal scales mostly yellow; tergites 2-7 with narrow pale basal bands
nigripes Theo. (p. 59).
 Scutal scales mostly black; tergites 2 and 3 (or only 2) unbanded 24.
24. Postnotum mostly or all brown *pandani* Theo. (p. 59).
 Postnotum entirely pale yellow like rest of thorax *nepenthes* Theo. (p. 59).
25. A black spot on scutal integument above wing-base 26.
 No such marking *fusca* Theo. (p. 61).
26. Pleurae pale 27.
 Pleurae mainly dark *micromelas* Edw. (p. 61).
27. Scutum darkened *mashonaensis* Theo. (p. 59).
 Scutum not or scarcely darker than pleurae *nigromaculata* nom. n. (p. 60).
28. *apn* with pale scales; pleurae largely dark *shillitonis* Theo. (p. 62).
apn with dark scales; pleurae all pale *henrardi* Edw. (p. 63).

Uranotaenia pallidocephala Theobald.

Uranotaenia pallidocephala Theobald, Third Rept. Wellcome Lab. p. 266 (1908), and Mon. Cul. 5, p. 511 (1910); Edwards, Bull. Ent. Res. 3, p. 41 (1912); Philip, Bull. Ent. Res. 22, p. 188 (1931).

Uranotaenia similis Theobald (figure of wing only), Third Rept. Wellcome Lab., p. 257 (1908).

Uranotaenia pallidocephala subsp. *cocrulea* Theobald, Third Rept. Wellcome Lab. p. 267 (1908).

Uranotaenia abnormalis Theobald, Mon. Cul. 5, p. 512 (1910).

TYPES.—*pallidocephala*, ♀ in B.M., Sudan; *similis*, ♀ in B.M., Sudan; *cocrulea*, ♂ in B.M., Sudan; *abnormalis*, ♂♀ apparently lost, Sudan.

Differs from all other African species in the remarkable modifications of the legs of the ♂ (Fig. 15), and also (in both sexes) in the possession of a median line of flat bluish or whitish scales on the posterior part of the scutum and extending across the middle of the median lobe of the scutellum.

♀. *Head* mainly clothed with bright blue scales, rather variable in tint; a small area of dark scales on nape. Proboscis dark, very slightly swollen at tip. *Thorax* with the integument rather dark brownish, middle of pleurae lighter and upper and lower parts of pleurae darker. Scales on *apn* blue. A short supra-alar line of bluish-white scales and a rather longer line of more definitely bluish scales in middle of posterior third of scutum and extending across mid lobe of scutellum, the scales on sides of mid lobe of scutellum blackish as usual. Pleurae with a large patch of

flat bluish-white or white scales in middle, bordered below by a larger and above by a much smaller patch of dark brown scales. Sternopleural bristles numerous, dark, forming an almost uninterrupted row on posterior margin (none on anterior margin). *Abdomen* dark above, pale beneath, without markings. *Legs* uniformly dark, except undersides of femora. Front tibia with a rather thick and short curved spine at tip. Tibiae and tarsi normal, first segment of front and middle tarsi much longer than second. *Wings* with dark scales, except for a few white scales at extreme bases of veins 4 and 5 and on stem vein.

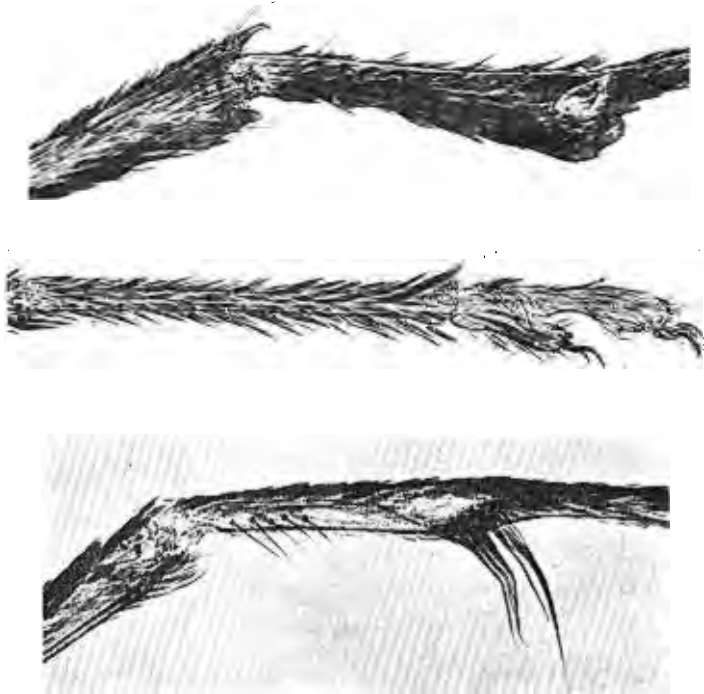


FIG. 15.—Secondary sexual characters in ♂ of *Uranotaenia pallidocephala* Theo. (after Theobald, 1910). a. Base of front tarsus. b. Tip of middle tarsus. c. Base of hind tibia.

♂. Coloration and scale characters as in ♀. Front tarsi with the first segment remarkably short, only about a quarter as long as tibia, thickened distally; second segment twice as long as first, rather sinuous. Middle tarsi with the first segment much shorter than second, but otherwise unmodified; fourth with a remarkable projection beneath, the projection ending in a curved claw-like bristle. Hind tibia on its under surface with three or four longish fine curved hairs close to base; a long bristle towards outer side and a tuft of matted and curved bristly hairs towards inner side at one-fourth of its length; a long fine straight bristle and some shorter fine hairs just before middle. Hind tarsi unmodified, first segment nearly as long as tibia.

Terminalia.—Tergite bare, its corners produced into sharp curved points. Style

rather short and broad, slightly enlarged on inner side before tip, which forms a small hook. Basal lobe only slightly indicated, with two moderately stout bristles. Two recurved and sharply pointed hooks; lateral hooks on *lp* in addition to the terminal hook.

Wing-length about 3.5 mm.

Distribution.—SUDAN: Bor to Mongalla, Upper White Nile (*King*). GABOON: Port Gentil (*Galliard*). UGANDA: Kampala (*Fraser, Hopkins*); Entebbe (*Hopkins*). BELGIAN CONGO: Stanleyville (*Schwetz*); Leopoldville (*Duren*). Records from Nigeria require confirmation.

***Uraenotaenia philonuxia* Philip.**

Uraenotaenia philonuxia Philip, Bull. Ent. Res. 22, p. 188 (1931).

TYPES.—♂♀ in B.M., Lagos.

Differs from all other African species in having the flat bluish-white scales in front of the wing base in the form of a large patch instead of a narrow line. Pleurae with a large area of bluish-white scales in middle, dark scales below. Legs of ♂ unmodified.

♀. *Head* clothed with bluish-white scales, not obviously darker in middle. Proboscis dark, slightly swollen at tip. First segment of antennal flagellum over half as long again as second. *Thorax* with integument rather dark brownish, somewhat lighter on lower part of pleurae. Dorsal scales all dark. Supra-alar area of white or bluish-white scales extending upwards much more than usual and so forming a large patch. Sternopleura almost completely covered with flat scales, a large area of white or bluish-white ones in middle, lower third and a small area in upper corner clothed with dark scales. Sternopleural bristles numerous and dark, forming a continuous row on posterior and upper margins, but the row not extending along the anterior margins. *Abdomen* uniformly dark brown above, lighter below; no markings. *Legs* dark. Front tibia with a curved spine at the tip, rather longer and more slender than the corresponding spine in *U. pallidocephala*. *Wings* mainly dark, but with white scales extending for some distance along base of vein 5; stem-vein white scaled; other veins dark to base.

♂. Ornamentation similar to ♀. No special modifications of legs; front tibial spine similar to that of ♀. *Terminalia* much as in *U. pallidocephala*, but processes of tergite shorter.

Wing-length 2.5 mm.

Distribution.—NIGERIA: Ebute Metta, near Lagos (*Philip*).

***Uranotaenia coeruleocephala* Theobald.**

Uranotaenia coeruleocephala Theobald, Mon. Cul. 2, p. 256 (1901); Edwards, Bull. Ent. Res. 3, p. 41 (1912); Philip, Bull. Ent. Res. 22, p. 189 (1931).

TYPE.—♀ in B.M., Bonny.

Differs from all other African species in having a continuous row of dark bristly hairs along the *anterior* as well as the upper and posterior margins of the sternopleura (Fig. 16). Supra-alar flat white scales forming a line (not a patch). Sternopleura with a large patch of light brownish (not white) scales.

♀. Much resembles *U. philonuxia* apart from the three characters mentioned in above diagnosis. Front tibia with a curved spine at tip beneath as in *U. philonuxia*.

♂. Resembles ♀ in ornamentation. Legs without any special peculiarities. *Terminalia* much as in *U. alboabdominalis*.

Distribution.—NIGERIA: Bonny (*Annett*); Lagos district (*Philip*). BELGIAN CONGO: Stanleyville (*Schwetz*; Liverpool S.T.M.). The specimen recorded by Theobald from Bahr-el-Ghazal was perhaps wrongly determined.

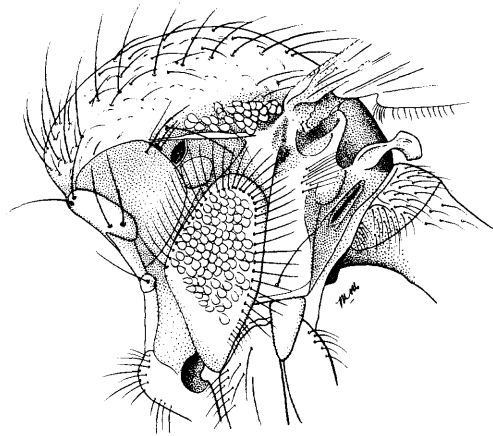


FIG. 16.—Side view of thorax of *Uranotaenia coeruleocephala*, showing pleural chaetotaxy.

***Uranotaenia alboabdominalis* Theobald.**

Uranotaenia alboabdominalis Theobald, Mon. Cul. 5, p. 508 (1910); Edwards, Bull. Ent. Res. 3, p. 40 (1912); Philip, Bull. Ent. Res. 22, p. 189 (1931).

TYPES.—♂♀ in B.M., Upper White Nile.

Readily distinguished from other African species by the largely white-scaled dorsum of the abdomen, and by the marking of the wings, the whitish cross-veins being unusual.

♀. *Head* largely pale blue or whitish above, with a black patch of variable size on nape. *Thorax* with integument uniformly dark brown dorsally, pleurae usually lighter, but darkened above and below the narrow band of white scales which crosses the middle of the sternopleura. Line of flat bluish-white scales running forwards from above wing-base to beyond middle of thorax, diverging from scutal margin in front. Lower sternopleural hairs rather few and pale. *Abdomen* with white apical bands on tergites 1-4, not reaching lateral margins of tergites, but often (as in the types) covering almost the whole of the dorsal surface, the band on tergite 3 sometimes smaller; 5 entirely dark; 6 and 7 normally with broad whitish *basal* bands; tergite 8 and all sternites largely pale. *Legs* dark except for under sides of femora; normally no obvious knee spots. Front tibia without a distinct spine at tip. *Wings* with the membrane often slightly tinted with brown except around cross-veins, where it is quite clear; cross-veins themselves whitish by reflected light. Scales

mostly brown, very dark on and towards costa in middle of wing, usually also darker on basal half of 3 and on 5.1. White scales present on stem vein and for a short stretch at base of vein 1, also on vein 5 almost as far as the fork and at base of costa on its lower edge.

♂. Resembles ♀ in ornamentation. No special modifications of legs.

Terminalia.—Coxite with few scales; basal lobe with about 4 bristles. Tergite bare, with short, rounded lateral lobes. Style short and rather broad, slightly enlarged before tip on inner side. *lp* broad, blackened, with one strongly recurved slender sharp-pointed lateral spine and a smaller apical one.

Wing-length 2-2.5 mm.

Distribution.—SUDAN: Bor and Azzan, Upper White Nile (*King*). GOLD COAST: Sunyani (*Ingram*). UGANDA: Kampala (*Fraser*); Entebbe (*Hopkins*). BELGIAN CONGO: Stanleyville (*Schwetz*); Kinshasa (*Duren*); Bumba (*Bequaert*).

Variation.—As noted above, the black area on the nape is variable in size; it is small in the type male, absent in the type female, but fairly large in most of the specimens from Uganda. The white basal bands on abdominal tergites 6 and 7 are also variable, and in the female from Bumba are absent. Most of the specimens from Stanleyville belong to a distinct variety in which the thorax is very dark, almost the whole pleurae being as dark as the mesonotum, and the hind femora and tibiae have distinct pale spots at the tips; in all these specimens the head is entirely blue, without the dark spot.

Uranotaenia alba Theobald.

Uranotaenia mashonaensis var. *alba* Theobald, Mon. Cul. 2, p. 262 (1901).

Uranotaenia alba Theobald, Mon. Cul. 3, p. 303 (1903); Edwards, Bull. Ent. Res. 3, p. 40 (1912); Philip, Bull. Ent. Res. 22, p. 189 (1931).

TYPE.—♂ in B.M., Salisbury.

Differs from *U. alboabdominalis* in the dark-scaled wings and reduced pale markings of the abdomen. (The specific name is a misnomer.)

♂. *Head* extensively dark-scaled in middle, blue at sides. *Thorax* as in *U. alboabdominalis*; integument in type lighter, lower half of mesepimeron entirely pale. *Abdomen* mainly dark above; tergites 2 and 4 with small apical creamy bands; 6 and 7 without pale scales basally, but with small apical lateral whitish triangles. *Legs* dark, only undersides of femora pale; front tibiae without distinct apical spine. *Wings* without obvious brown tint on membrane; cross-veins whitish by reflected light. *Vein-scales* almost all dark, even on base of vein 1; some white scales may be present on stem vein and extreme base of 5.

Terminalia as in *U. alboabdominalis*.

♀. Similar, but abdomen almost all dark, pale bands of tergites 2 and 4 represented by only a few white scales.

Wing-length 2.5-3 mm.

Distribution.—S. RHODESIA: Salisbury (*Marshall*); Shamva (*Leeson*); Bindura (*Haworth*). KENYA: Nairobi (*Van Someren*). TRANSVAAL: Northern district (*Ingram and De Meillon*). UGANDA: Kaskiro (*Gibbins*).

Uranotaenia mayeri Edwards.

Uranotaenia mayeri Edwards, Bull. Ent. Res. 3, p. 40 (1912); Philip, Bull. Ent. Res. 22, p. 189 (1931).

TYPE.—♀ in B.M., Oshogbo.

Differs from *U. alboabdominalis* especially in its striped posterior femora and general darker colour.

♀. *Head* nearly all black above, with only a narrow margin of blue scales round eyes. Antennae (including tori) and proboscis dark. *Thorax* with the integument uniformly dark brown, including pleurae. Lines of bluish-white flat scales in front of wing-base and across middle of pleurae, both narrower than in *U. alboabdominalis*. *Abdomen* largely dark above; tergites 1-4 with apical whitish bands, 5-7 each with apical lateral whitish triangles. Sternites all pale. *Legs* mainly dark; undersides of femora pale; mid femora also with a narrow white line on anterior surface from base nearly to tip; hind femora with a white line on antero-dorsal surface from base to tip; hind tarsi with narrow and indistinct pale rings at the joints. *Wings* with white scales at extreme base of vein 1 and for some distance at base of 5, scales otherwise dark; cross-veins not noticeably pale by reflected light.

♂ unknown.

Distribution.—NIGERIA: Oshogbo (*T. F. G. Mayer*). GOLD COAST: Accra (*Connal*). SIERRA LEONE: Njala (*Hargreaves*); Pujehun (*Davey*).

Uranotaenia bilineata Theobald.

Uranotaenia bilineata Theobald, Mon. Cul. 5, p. 517 (1910); Edwards, Bull. Ent. Res. 3, p. 39 (1912).

TYPES.—♂♀ in B.M., Obuasi.

Distinguished by having narrow lines of bluish-white scales on scutum and pleurae, vein 1 largely white scaled, and no apically-situated pale scales on the abdominal tergites; hind tarsi usually ringed.

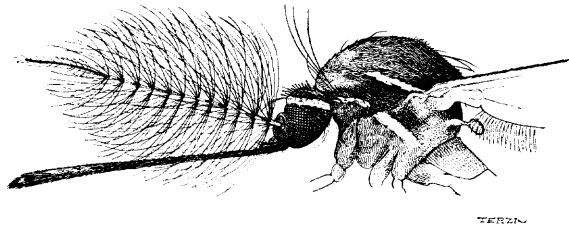


FIG. 17.—Head and thorax of *Uranotaenia bilineata* var. *connali* Edw.

♀. *Head* mainly dark, with a fairly broad pale blue margin to eyes and some long projecting pale blue scales in front. Proboscis dark; tori largely light brown, without scales as usual. First flagellar segment of antenna as usual about half as long again as second. *Thorax* (Fig. 17) with integument moderately light brown, somewhat darkened on each side of the pleural line. Line of blue scales in front of wing-base running rather obliquely and leaving a bare area on side of scutum. The blue scales on *apn* form almost a continuous line with those of the sides of the head

and across the middle of the sternopleura, and this line is continued across the mesepimeron by a paler band in the integument which is more or less covered with grey pollinosity (though it does not bear scales). Lower sternopleural bristles few. *Abdomen* uniformly dark brown on tergites, pale on sternites. *Legs* largely dark; front and middle tarsi lighter but not distinctly ringed; hind femora and tibiae with creamy knee-spots, hind tibia narrowly pale at base; hind tarsi with rather broad creamy-white rings on joints between segments 1, 2 and 3, segments 4 and 5 entirely creamy-white. *Wings* mainly dark scaled; a few white scales at base of Sc., 1 white scaled from base almost to middle of wing, but no white scales on 5 even at base.

♂. Ornamentation as in ♀. *Legs* normal. *Terminalia* (Fig. 14, b): Tergite bare, its lateral lobes broadly rounded; style rather short and broad, slightly enlarged on inner side just before tip; basal lobe indefinite, with 4-5 bristles; *lp* with two rather slender recurved teeth. Coxite with very few scales.

Wing-length about 2.5 mm.

Distribution.—GOLD COAST: Obuasi (*Graham*). UGANDA: Mpumu (*Fraser*).

Var. **fraseri** Edwards.

Uranotaenia bilineata var. *fraseri* Edwards, Bull. Ent. Res. 3, p. 39 (1912).

TYPE.—♀ in B.M., Mpumu.

Differs from the typical form in the markings of the hind legs; tibia only narrowly and indistinctly pale at base and tip, tarsus with only narrow and indistinct pale rings on first three segments (though the last two are entirely pale, as in the type). White scales not extending quite so far along vein 1. Abdomen all dark above.

Distribution.—UGANDA: Mpumu (*Fraser*). SUDAN: Meridi (*King*). NATAL: Umfolozi, Zululand (*Ingram* and *De Meillon*). S. RHODESIA: Salisbury (*Leeson*).

Var. **connali** Edwards.

Uranotaenia connali Edwards, Bull. Ent. Res. 3, p. 39 (1912).

TYPES.—♂♀ in B.M., Accra.

Differs from the typical form in having distinct creamy median basal spots on each of abdominal tergites 1-7. Hind legs marked as in the type. *Terminalia* practically as in the type.

Distribution.—GOLD COAST: Accra (*Connal*); Bjere, Volta River (*Ingram*). S. RHODESIA: Shamva (*Leeson*). BELGIAN CONGO: Matadi (*Wanson*).

Var. **obsoleta** Edwards.

Uranotaenia bilineata var. *obsoleta* Edwards, Proc. R. Ent. Soc. B, 5, p. 54 (1936).

TYPE.—♂ in B.M., Kasakiro.

Differs from the typical form as follows: Abdominal tergites 4-7 with creamy basal bands. Hind tibiae and tarsi with the pale markings only very faintly indicated, scarcely lighter than the ground-colour. *Terminalia* practically as in the type.

Distribution.—UGANDA: Kasakiro (*Gibbins*).

Uranotaenia balfouri Theobald.

Uranotaenia balfouri Theobald, First Rept. Wellcome Lab. p. 82 (1905); Edwards, Bull. Ent. Res. 3, p. 41 (1912); Ingram and Macfie, Bull. Ent. Res. 8, p. 90 (1917); Philip, Bull. Ent. Res. 22, p. 190 (1931).

TYPE.—♀ in B.M., Pibor, Sudan.

A small dark species with blue markings on head and thorax and at most with lateral pale spots on abdominal tergites; legs unbanded; no white scales on vein 1.

♀. *Head* black in middle, blue at sides, the relative proportions of the two colours rather variable; all the scales flat and close-lying, none (or rarely a very few) of the erect forked type present. Proboscis and antennae dark; tori without scales as usual. *Thorax* dark brown, pleurae for the most part as dark as dorsum, but lower part of mesepimeron and meron paler; no darker area above wing-base. A rather short supra-alar line of flat bluish scales running close to margin of scutum; a rather large patch (not a line) of flat bluish scales in middle of sternopleura. *Abdomen* dark brown above, tergites 1-6 with small apical lateral whitish spots. *Legs* dark, except for undersides of femora. *Wings* mainly dark scaled; white scales present only on stem vein and for a short distance at base of 5; cross-veins dark by reflected light.

♂. Resembles ♀ in ornamentation. A rather peculiar secondary sexual character is the presence of some fine pale curved hairs on the under side of the hind tibia in the middle, the number of these hairs rather variable. *Terminalia* (Fig. 14, a): Tergite bare, its lateral corners forming pointed finger-like processes. Coxite with few scales; basal lobe represented by a strong low ridge with 3-4 bristles. Style short, outer margin a little widened before tip but inner margin straight. *lp* narrow, with two small dark terminal teeth and one pale lateral recurved tooth.

Wing-length 2 mm.

Distribution.—GAMBIA (*Dutton*). SIERRA LEONE: Freetown (*Evans*). LIBERIA: data not noted. GOLD COAST: Bole, Sunyani and Accra (*Ingram*). NIGERIA: Yaba (*Graham, Philip*). UGANDA: Kampala (*Hancock*); Jinga (*Hopkins*); Entebbe (*Hopkins*). SUDAN: Pibor (*Balfour*); White Nile (*King*). BELGIAN CONGO: Stanleyville (*Schwetz*). KENYA: Kisumu (*Garnham*). TANGANYIKA: Dar-es-Salaam (*McKenzie*).

Variation.—Two males, from Kampala, Uganda (*Hopkins*) and Kumari, Gold Coast (*Watt*), may represent a distinct variety or species; they have no pale scales on the abdominal tergites and no curved ventral hairs on the hind tibia.

Uranotaenia caliginosa Philip.

Uranotaenia caliginosa Philip, Bull. Ent. Res. 22, p. 190 (1931).

TYPES.—♂♀ in B.M., Lagos.

Distinguished from all other Ethiopian species by the moderately large patch of silvery-white scales on sternopleura and the blackish patch in integument of scutum above the supra-alar scales.

♀. *Head* mainly black, bluish-white scales confined to small patches at the sides and a narrow eye-border. *Thorax* with integument mainly dark brown, but with a distinct blackish patch above each wing-root, the lower part of this black area

covered by the supra-alar stripe of bluish-white scales. Sternopleura bare on the lower half, clothed with metallic silvery-white scales on the upper half, these scales extending to the uppermost bristles (but not on to the pre-alar area). Lower part of mesepimeron greyish-pollinose. *Abdomen* uniformly blackish above and below. *Legs* blackish. *Wings* dark scaled, but all veins with a few white scales at extreme base, these scales extending furthest along vein 5.

♂. Resembles ♀ in ornamentation. No special features in legs; no fine hairs on under side of hind tibia.

Localities.—NIGERIA: Lagos district (*Philip*). BELGIAN CONGO: Ilambi, Lomami River, near Stanleyville (*Schwetz*).

Uranotaenia neireti Edwards.

Uranotaenia neireti Edwards, Bull. Ent. Res. 11, p. 138 (1920); Philip, Bull. Ent. Res. 22, p. 191 (1931).

TYPE.—♂♀ in Paris Museum, Madagascar.

Distinguished by having bluish flat scales on head, *apn* and pleurae, but none on scutum in front of wing-base. Abdomen dark; hind tarsi white-tipped; wing-scales all dark.

♂. *Head* mostly black-scaled; a spot of blue scales on vertex and another on each side. *Thorax* with narrow brown scales on scutum; integument dark brown, pleurae rather lighter, but darkened on each side of the patch of blue scales in middle; lower half of *ppn* blackish. *Abdomen* dark brown above, lighter beneath, without markings. *Legs* mainly dark brown; hind tarsi with distal half of third segment and whole of fourth whitish, fifth also with the scales white but the integument dark. No special modifications of tibiae or tarsi. *Wings* with all the scales dark, even at base. Upper fork more than half as long as its stem.

♀. Resembles ♂ in ornamentation (in the type ♀ the blue scales of head and thorax are replaced by greyish, but this is probably through fading).

Wing-length about 3 mm.

Distribution.—MADAGASCAR (*Ventrillon*). Specimens from Uganda have been referred with doubt to this species, but are now treated as a distinct species, *U. chorleyi*.

Uranotaenia chorleyi Edwards.

Uranotaenia chorleyi Edwards, Proc. R. Ent. Soc. B, 5, p. 54 (1936).

TYPE.—♂ in B.M., Kasala Forest, Chagwe, Uganda.

Very similar to *U. neireti*, differing as follows: Head with a broad and continuous band of blue scales in front. Pleurae almost uniformly pale, with only slight darkening above and below the spot of blue scales. Posterior pronotal lobes not in the least darkened on the lower half. Hind tarsi entirely dark.

Terminalia (Fig. 14, c).—Eighth tergite with hairs only towards posterior margin and ninth segment broad as in most of the preceding species. Ninth tergite bare, not produced at corners. Coxite with few scales, pointed basal lobe not much darkened and bearing the usual bristles. Style short but not stout, gradually

tapering and slightly curved. *lp* rather broad, blackened, lateral teeth not evident, terminal teeth small.

Wing-length about 2.7 mm.

Distribution.—UGANDA: Kasala Forest (*Fraser*). BELGIAN CONGO: Stanleyville (*Schwetz*; 2 damaged ♀♀ in Liverpool S.T.M.); Costermansville (*Schwetz*; 1 damaged ♀); Kisantu (*Le Wulf*); Kabare, Kivu (*Schwetz*).

***Uranotaenia hopkinsi* Edwards.**

Uranotaenia hopkinsi Edwards, Bull. Ent. Res. 23, p. 561 (1932).

TYPE.—♀ in B.M., Kampala.

A small dark species with white-tipped hind tarsi, otherwise without special ornamentation.

♀. *Head* mostly black above, with a narrow margin of bluish-white scales to eyes, hardly distinguishable in some specimens. Proboscis, palpi and clypeus dark; tori yellowish, bare. *Thorax* uniformly brown above, scutal scales darker than integument and narrow; a very few flat white scales on margin of scutum immediately in front of wing-base, not forming a definite line. Pleurae mainly yellowish, upper part slightly darkened; a patch of whitish scales in middle of sternopleura; *apn* dark, with numerous flat silvery-white scales. *Abdomen* uniformly dark brown above, whitish beneath. *Legs* dark brown; under sides of femora pale as usual; no knee-spots; fore and mid tarsi paler at tips, but indefinitely; hind tarsi definitely white at tip from before middle of third segment. *Wings* uniformly dark scaled even on stem vein; upper fork-cell short as usual; outstanding scales narrow.

♂ unknown.

Wing-length barely 2 mm.

Distribution.—UGANDA: Kampala (*Hopkins*); Nyansimbi Crater Lake (*Gibbins*).

***Uranotaenia montana* Ingram and De Meillon.**

Uranotaenia montana Ingram and De Meillon, S. Afr. Inst. Med. Res. 22, p. 80 (1927).

TYPES.—♂♀ in B.M., Zululand.

A rather large dark species with banded abdomen and legs; no blue tinge on the white scales of head and thorax; scales on tori; flat white scales in front of wing-base.

♀. *Head* clothed mainly with black flat scales with numerous black upright scales; a rather narrow border of white scales round eyes, those in middle in front not specially long. Antennae dark; tori with a patch of white scales on inner side, first flagellar segment with a few dark scales at base; second and third flagellar segments markedly shorter than first or fourth (a rather unusual feature). Proboscis dark. *Thorax* with integument mostly dark brown, including nearly whole of pleurae; a paler band crosses lower half of mesepimeron, leaving the lower edge of this sclerite rather narrowly dark brown. Sternopleura with a patch (rather than a line) of white scales in middle. Line of white flat scales in front of wing-base rather broad and running close to margin of scutum; no pale scales on front margin of thorax. *Abdomen* more tapering than usual, in appearance suggesting a small

Aëdes. Tergites mainly dark brown, 2-7 each with apical creamy bands which do not extend quite to the sides; sternites 1-5 pale, 6 and 7 dark at base. *Legs* mainly dark; all femora and fore and mid tibiae with small creamy-white spots at tip; hind tibiae broadly whitish at tip; hind tarsi with whitish rings across joints 1-2 and 2-3; all tarsi with segments 4 and 5 entirely whitish. *Wings* dark-scaled; white scales present only on extreme bases of veins 1 and 5.

♂. Ornamentation as in ♀. *Legs* normal. *Terminalia*: tergite narrow, bare, its corners not produced; coxite with few scales, basal lobe indefinite, with two rather long straight bristles; style rather short and broad, slightly enlarged on inner side before tip, with tip narrow and slightly hooked, terminal spine moderate; *lp* blackened, rather large but the two teeth minute.

Wing-length 3 mm.

Distribution.—ZULULAND (*Ingram*).

Uranotaenia annulata Theobald.

Uranotaenia annulata Theobald, Mon. Cul. 1, p. 250 (1901); Edwards, Bull. Ent. Res. 3, p. 41 (1912); Philip, Bull. Ent. Res. 22, p. 192 (1931) (in part).

Types.—♂♀ in B.M., Bonny.

Distinguished from all except the allied *U. candidipes* by the colouring of the thorax, the dark chocolate-brown dorsum contrasting strongly with the pale yellow lower half of the pleurae. A line of pale but narrow scales in front of wing-base; abdomen and legs banded.

♀. *Head* with the scales nearly all pale yellowish, mostly flat but with a few erect and forked; sometimes a few dark brownish flat scales tending to form a narrow median stripe. Proboscis and antennae dark; tori without scales; first three flagellar segments somewhat shorter than the following ones. *Thorax* dark chocolate-brown on dorsum, and also on upper part of pleurae; integument of lower half of pleurae, including lower half of *ppn* and also whole of *apn*, pale yellow, the two colours separated in practically a straight line. A rather broad but indefinite line of pale scales extends forwards on scutum from above wing-base, these scales all narrow, though a few nearest the wing-base are somewhat broader than the rest. A rather large patch of pale creamy-yellow scales on middle of sternopleura, immediately below the dark upper portion; similar pale yellow flat scales on *apn*. Lower sternopleural hairs few and pale. *Abdomen* mainly dark brown above, each tergite (except sometimes the first and seventh) with a conspicuous creamy apical band, not quite reaching sides; sternites pale scaled. *Legs* mainly dark; under sides of femora pale as usual; hind tibia only narrowly pale at tip, at most to an extent equal in length to its apical diameter; hind tarsi with segments 1-3 rather narrowly whitish at tip (on segment 3 the pale area occupying barely one-fifth of the length of the segment) and with a few whitish scales at base; all tarsi with segments 4 and 5 entirely creamy-white. *Wings* dark scaled, except on stem-vein, which bears creamy-white scales on its lower margin.

♂. Resembles ♀ in ornamentation. *Legs* normal; no special features of tibia or tarsi. *Terminalia* much as in *U. montana*, but style rather longer and basal lobe with only one long bristle, the second one shorter.

Wing-length about 2.5 mm.

Distribution.—NIGERIA: Bonny (*Annett*); Lagos (*Connal, Philip*). SIERRA LEONE: Pepel (*Gordon and Davy*). GAMBIA: Bathurst (*Innes*).

Variation.—In many specimens from Sierra Leone the pale rings on the first two segments of the hind tarsi are very narrow and sometimes indistinct; some of these specimens also show a much greater extent of dark scaling on the head than usual. That this is mere individual variation is shown by the fact that examples of the typical form were taken at the same time and place. In a specimen from Gambia (the only one examined from that country) the first two hind tarsal segments are entirely dark, the head-scales largely dark, and the pale abdominal bands distinct only on tergites 4 and 5.

Var. **apicotaeniata** Theobald.

Uranotaenia apicotaeniata Theobald, Mon. Cul. 5, p. 520 (1910).

TYPE.—♂ in B.M., Obuasi.

Differs from typical *U. annulata* as follows: Hind tibia more broadly whitish at tip, the white area about twice as long as tibial diameter; hind tarsi with each of the first three segments rather more broadly white at tip, these and the third segment also narrowly white at base; third segment as in the typical form with not more than the distal fourth white.

Distribution.—GOLD COAST: Obuasi and Sekondi (*Graham*); Sunyani (*Ingram*); Koforidua (*Storey*); Takoradi (*Pomeroy*). SUDAN: Meridi and R. Kobwa (*King*); Li Rangu (*Rutledge*). FERNANDO PO (*Gil Collado*).

Uranotaenia candidipes Edwards.

Uranotaenia nivipous Theobald, Entom. 45, p. 93 (1912) [*nec U. nivipes* Theobald, 1905].

Uranotaenia candidipes Edwards, Bull. Ent. Res. 3, p. 42 (1912); Ingram and de Meillon, S. Afr. Inst. Med. Res. 23, p. 165 (1929); Philip, Bull. Ent. Res. 22, p. 192.

TYPE.—♀ in Liverpool, Onderstepoort.

Differs from *U. annulata* as follows: A large area of dark brownish scales on vertex, yellow scales confined to sides of head and nape. Hind tarsi with first two segments all dark; third segment with about the distal two-thirds whitish, basal third dark; tip of hind tibia rather broadly whitish. All other characters as in *U. annulata*; apical bands of abdominal tergites equally distinct.

Terminalia much as in *U. annulata*.

Distribution.—TRANSVAAL: Onderstepoort (*Gough*); Mokeetsi and Potgietersrust (*Ingram and de Meillon*). S. RHODESIA: Shamva and Sinoia (*Leeson*). BELGIAN CONGO: Costermansville (*Schwetz*).

Uranotaenia ornata Theobald.

Uranotaenia ornatus Theobald, Mon. Cul. 5, p. 521 (1910); Edwards, Bull. Ent. Res. 3, p. 43 (1912); Philip, Bull. Ent. Res. 22, p. 191 (1931).

TYPE.—♂ in B.M., Obuasi.

Distinguished by the yellowish thorax with the posterior half of the mesonotum mostly dark brown; abdominal tergites with incomplete basal pale bands; head and legs blackish.

♀. *Head* clothed entirely with blackish scales, no white scales even at sides; upright scales few in number. Proboscis, palpi and antennae (including tori) blackish; first flagellar segment not much larger than second. *Thorax* (Fig. 18) with the integument mainly pale yellowish; a large roundish brown area occupying posterior half of scutum, outer edges of this area darker, above wing-base almost black, three longitudinal paler areas usually distinguishable within the brown area in front of scutellum. Postnotum mainly blackish, yellow at sides and usually with more or less evident indications of a yellowish median line. Scales on the pale anterior part of scutum pale yellowish, those on the brown posterior part blackish, both light and dark scales narrow; no scales on the blackish area in front of wing base, none on pleurae, and none on pronotal lobes. Sternopleural hairs few in number. Normally four

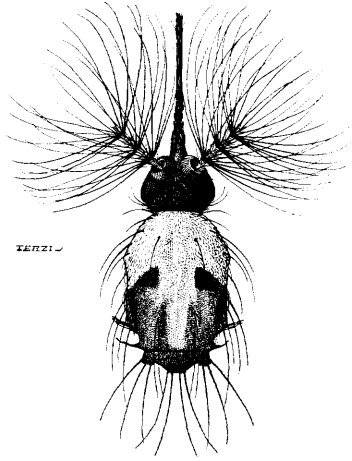


FIG. 18.—Head and thorax of *Uranotaenia ornata* Theo.

bristles on mid lobe of scutellum. *Abdomen* blackish above, tergites with lateral basal yellowish triangles, most distinct on tergites 4–6, on which they form narrow bands more or less interrupted in middle. Sternites largely pale. *Legs* mainly black scaled, only middle femora more or less pale beneath; trochanters yellow; front coxae with black scales in front. *Wings* with dark scales only; venation normal.

♂. Ornamentation as in ♀. *Legs* normal. *Terminalia*: Eighth tergite more hairy than in any of the preceding species, and with four stronger bristles near its middle. Ninth segment much narrower than the combined width of the two coxites, whereas in most of the preceding species it has almost the same breadth. Ninth tergite small, rounded in middle, not produced at corners, with a pair of minute hairs near middle (perhaps inconstant). Coxite larger and more swollen than in many species, but not much longer than broad; basal lobe small but rather prominent and blackened, bearing 5–7 long, slightly curved bristles, the longest of which reach tip of coxite. Style very long and slender, but somewhat thicker on about the basal half, slightly sinuous, with about 10 short hairs at tip; terminal spine stout and blunt. *lp* small, with about four very small apical teeth; parameres broader than in any of the preceding species.

Wing-length 2 mm.

Distribution.—GOLD COAST: Obuasi (*Graham*). SIERRA LEONE: Freetown (*Bacot, Evans*). NIGERIA: Lagos (*Connal, Philip*). S. RHODESIA: Shamva (*Leeson*). BELGIAN CONGO: Eala (*Henward*).

Var. **musarum** Edwards.

Uranotaenia ornata var. *musarum* Edwards, Proc. R. Ent. Soc. B, 5, p. 54 (1936).

TYPE.—♂ in B.M., Fort Portal.

Closely resembles *U. ornata*, differing as follows: Size larger. Flat scales of head nearly all yellowish, only a few darker ones in middle. Lower sternopleural bristles apparently rather more numerous (about 6–8 instead of about 4–6). Tori rather light brownish. Abdomen with narrow but complete basal whitish bands on tergites 3–7 or 4–7. *Terminalia*: Much as in typical *U. ornata*, but in the single specimen mounted the style is definitely less slender and straighter.

Wing-length 3 mm.

Distribution.—UGANDA: Mpumu (*Fraser*); Masindi (*Hopkins*); Fort Portal (*Shillito*).

Uranotaenia nigripes Theobald.

Ficalbia nigripes Theobald, Ann. Mag. Nat. Hist. (7) 15, p. 199 (1905); Theobald, Mon. Cul. 4, p. 578 (1907), and 5, p. 541 (1910).

Pseudoficalbia nigripes Theobald, Trans. Linn. Soc. London, 15, p. 89 (1912).

Uranotaenia nigripes Edwards, Bull. Ent. Res. 3, p. 43 (1912), and 7, p. 15 (1916); Philip, Bull. Ent. Res. 22, p. 191 (1931).

TYPE.—♂ in B.M., Freetown.

Distinguished from most other species without flat scales on scutum by the yellow thorax, contrasting strongly with the black head, abdomen and legs. Most abdominal tergites with basal pale bands.

♀. *Head* entirely black scaled; most scales flat and close-lying, but a fair number erect and forked. Proboscis, palpi and antennae black; first flagellar segment hardly longer than second. *Thorax* with the integument entirely yellow, except for the postnotum, which is dark brown with a yellowish median line. Scales on scutum all narrow and mostly yellow, but blackish scales occur in two rather broad stripes extending for some distance in front of scutellum along the lines of bristles. Scutellum rather densely clothed with flat scales which are mostly dark brown, but in some specimens with some paler scales intermixed. No scales on pronotal lobes or pleurae. Bristles black; sternopleural bristles few in number; normally four bristles on mid lobe of scutellum as usual. *Abdomen* mainly blackish above, tergites 2–7 with narrow pale yellowish basal bands, not easily distinguishable in shrunken specimens and sometimes absent on tergites 2 and 3; sternites brownish. *Legs* black, even on undersides of femora, only coxae and trochanters yellow; front coxae with brownish scales in front. *Wings* entirely dark-scaled, even on stem-vein; outstanding scales moderately broad. Upper fork-cell quite long for a member of this genus.

♂. Resembles ♀ in ornamentation. No peculiarities of legs. *Terminalia* much as in *U. ornata*, but eighth tergite without stronger bristles in middle.

Wing-length about 2.5 mm.

Distribution.—SIERRA LEONE: Freetown (Smith, Wood, Evans, Wigglesworth, Christophers, Hicks). BELGIAN CONGO: Lubutu-Walikali (Schwetz). FERNANDO PO (Gil Collado).

Uranotaenia pandani Theobald.

Pseudoficalbia pandani Theobald, Trans. Linn. Soc. London, 15, p. 90 (1912).

Uranotaenia nigripes (Theobald) Edwards (in part), Bull. Ent. Res. 3, p. 43, 1912.

Uranotaenia pandani Philip, Bull. Ent. Res. 22, p. 191 (1931).

TYPE.—♂♀ in B.M., Seychelles.

Closely resembles *U. nigripes*, of which it is possibly only a local form, differing chiefly as follows: Scales of scutum mostly black (in some specimens they are all black, others show a variable amount of yellow scaling towards front of scutum); scutellum apparently with fewer scales, and the mid lobe usually with three bristles; abdominal tergites 2 and 3 unbanded, 4-6 more or less distinctly banded. Postnotum rather variable in colour, sometimes all brown (darker or lighter), sometimes with median yellowish stripe as in typical *U. nigripes*.

Terminalia much as in *U. nigripes*, but one of the bristles of basal lobe markedly longer, stronger and straighter than the rest.

Distribution.—SEYCHELLES IS.: Mahé (Scott).

Uranotaenia nepenthes Theobald.

Pseudoficalbia nepenthes Theobald, Trans. Linn. Soc. London, 15, p. 92 (1912).

TYPE.—♀ in B.M., Silhouette.

Closely resembles *U. nigripes* and *U. pandani*; perhaps only a colour form of the latter, but differs from both in having the postnotum entirely pale yellowish like remainder of thorax integument. Scutal scales in the type mainly black, in other specimens extensively yellow (almost all yellowish in the Tamatave specimen). Scutellum with few scales; mid lobe with two or four bristles, lateral lobes with three. Distinct yellowish basal bands on abdominal tergites 3-6 (none on 2).

Distribution.—SEYCHELLES IS.: Silhouette, 1 ♂; Mahé, 1 ♂ (Scott). MADAGASCAR: Tamatave, East Coast, 1 ♀ (Lamborn); Anivorane, 2 ♀♀ reared from larvae found in a *corvette* indoors (Seyrig).

The Mahé specimen was mentioned by Theobald as a variety of *pandani*; it is however quite similar to the type of *nepenthes*. If the larvae which have been attributed to *U. nepenthes* are correctly associated the species is evidently entirely distinct from *U. nigripes* and more nearly related to the Oriental *U. xanthomelana* Edw.

Uranotaenia mashonaensis Theobald.

Uranotaenia mashonaensis Theobald, Mon. Cul. 2, p. 259 (1901); Edwards, Bull. Ent. Res. 3, p. 42 (1912); Ingram and de Meillon, S. Afr. Inst. Med. Res. 22, p. 70 (1927); Philip, Bull. Ent. Res. 22, p. 191 (1931).

Mimomyia mashonaensis Theobald, Mon. Cul. 3, p. 306 (1903).

TYPE.—♂♀ in B.M., Salisbury.

Distinguished by the presence of a black spot in the thoracic integument above wing-root, remainder of scutum brown, pleurae yellowish; no other ornamentation.

♀. *Head* clothed mostly with flat blackish scales ; flat creamy scales at sides and in a rim round eyes ; erect scales fairly numerous, variable in colour, yellowish to black. Tori light brownish, base as usual ; flagellum and proboscis dark. *Thorax* with the pleural integument wholly pale yellowish, including *apn* and *ppn* ; scutum darker than pleurae, and with a roundish black supra-alar spot bearing black bristles but devoid of scales ; a few narrow whitish scales on margin of scutum in front of the black spot, remaining scutal scales dark brown. An inconspicuous patch of pale yellowish scales in middle of pleurae, but none on pronotal lobes or mesepimeron. Sternopleura with a continuous row of bristly hairs, the lower ones pale. Normally four bristles on mid lobe of scutellum. *Abdomen* dark brown above, not much lighter below, without markings. *Legs* brownish (darker or lighter), only under sides of femora pale. *Wings* with the upper fork cell less short than in most other African species ; scales all dark.

♂. Resembles ♀ in ornamentation ; no special characters on legs.

Terminalia (Fig. 14, d).—Differing from that of all other African *Uranotaenia* in having the median portion of the ninth tergite produced into a finger-like process ; eighth tergite normal, with a posterior row of short hairs, all of them weak. Coxite not much swollen, basal lobe short, bearing two stout bristles and a few short hairs, the longer bristle not reaching tip of coxite. Style long and slender, terminal spine minute or absent. *lp* with small teeth.

Wing-length about 2.5–3 mm.

Distribution.—S. RHODESIA : Salisbury (*Marshall*). ZULULAND and N. TRANSVAAL (*Ingram and de Meillon*). BELGIAN CONGO : Elisabethville (*Schwetz*) ; Ituri (*Collart*). TANGANYIKA : Dar-es-Salaam (*Pomeroy*). KENYA : Nairobi (*van Someren*). UGANDA : Arua (*Hopkins*) ; Ruwenzori foothills (*Edwards*). SUDAN : White Nile (*King*).

***Uranotaenia nigromaculata* nom. n.**

Uranotaenia bimaculata Theobald, Mon. Cul. 5, p. 522 (1910) (♀), and Novae Culicidae, p. 31 (1911) (♂).

TYPE.—♀ in B.M., Obuasi.

Closely resembles *U. mashonaensis*, except that the scutum is very little darker than the pleurae, and consequently the black spot above the wing base is more apparent. No other external differences discovered. Wing, Fig. 19.

♂. *Terminalia* (Fig. 14, e) very different from those of *mashonaensis*. Eighth tergite with rather more numerous hairs than usual, two or three of those towards each side of the posterior now noticeably longer and stronger than the rest. Ninth tergite with median area broadly rounded, without finger-like process but with a broadly thickened margin. Coxite small but more swollen at base than in *mashonaensis* ; basal lobe elongate-conical, reaching much beyond middle of coxite, with two strong bristles, the longer of which reaches far beyond end of coxite. Style very slender in middle, somewhat thickened at base and tip, terminal spine minute. Phallosome as in *mashonaensis*.

Distribution.—GOLD COAST : Obuasi (*Graham*) ; Accra (*Connal*) ; Bjere (*Ingram*). NIGERIA : Lagos (*Sieger*). BELGIAN CONGO : Stanleyville (*Mouchet, Schwetz*) ;

Chutes François-Joseph, Kwango R. (*Schwetz*; ♀ only). UGANDA: Kampala (*Fraser*); Masindi (*Hopkins*).

I have hitherto confused this species with *U. mashonaensis*. My relegation of Theobald's *U. bimaculata* to synonymy proves to have been an error, but the name is preoccupied by *U. bimaculata* Leicester, a quite distinct Oriental species.



FIG. 19.—Wing of *Uranotaenia nigromaculata* Edw. (After Theobald, 1910.)

Uranotaenia micromelas Edwards.

Uranotaenia micromeles Edwards [printer's error], Ann. Mag. Nat. Hist. (10) 14, p. 326 (1934).

TYPES.—♂♀ in B.M., San Thomé.

Closely allied to *U. mashonaensis*, from which it differs chiefly in the much darker thorax, the greater part of the pleurae as well as the mesonotum being rather dark brown, only the pleural sutures, meron, and lower part of sternopleura yellowish; black area above wing-root rather smaller, less conspicuous owing to the darker mesonotum.

Terminalia (Fig. 14, f): Tergite bare, median area prominent but rounded. Style long and slender, almost straight, not sharply pointed. Basal lobe not prominent, pointed, with one long and strong bristle reaching end of coxite, and a second shorter one. Eighth tergite with a row of equal hairs on posterior margin.

Distribution.—San Thomé (*Tams*).

Uranotaenia fusca Theobald.

Uranotaenia fusca Theobald, Mon. Cul. 4, p. 564 (1907); Edwards, Bull. Ent. Res. 3, p. 42 (1912); Philip, Bull. Ent. Res. 22, p. 192 (1931).

Ficalbia inornata Theobald, Entom. 41, p. 108 (1908), and Mon. Cul. 5, p. 541 (1910).

Uranotaenia inornata Edwards, Bull. Ent. Res. 17, p. 126 (1926); Philip, Bull. Ent. Res. 22, p. 191 (1931).

TYPES.—*fusca*, ♀ in B.M., Mt. Aureol, Sierra Leone; *inornata*, ♀ in B.M., Transvaal (♂ types both lost).

A small dark species devoid of special ornamentation, except that the pleurae are more or less uniformly pale.

♀. *Head* clothed with flat dark brownish scales and numerous erect blackish scales; a narrow grey border to eyes. Proboscis dark. Tori light brownish; first flagellar segment very little longer than second. *Thorax* uniformly rather dark brown above (integument, scales, and bristles); no broad scales on scutum; no darker patch above wing-root. Pleurae more or less uniformly pale brownish-yellow including pronotal lobes; in some specimens (chiefly those from East and South Africa).

the mesepimeron and upper half of sternopleura are somewhat darkened; sternopleura with a small patch of scales in middle, of same colour as integument and therefore very inconspicuous; no scales on pronotal lobes. Mesonotal bristles particularly strong and numerous, the double row of acrostichals very distinct. *Abdomen* uniformly dark brown above; lighter beneath, but not conspicuously so. *Legs* dark brown, under sides of femora indefinitely lighter. *Wings* with dark brown scales only; fork of 2 rather long for this genus.

♂. Resembles ♀. No modifications of legs. *Terminalia*: Eighth tergite with fairly numerous hairs on distal third, not confined to posterior row, but none stronger than the rest. Ninth tergite bare, median portion broadly rounded. Coxite with few scales; basal lobe darkened, with about 5 long, straight bristles; 4-6 bristly hairs on inner face of coxite beyond lobe. Style rather long, straight, slightly thicker at base but not at tip; hairs at tip longer than in some species, terminal spine rather stout. *lp* small, formed of three equal, slightly recurved teeth.

Wing-length 2.2-3 mm.

Distribution.—SIERRA LEONE: Mt. Aureol (*Smith*); Freetown (*Hicks*). GOLD COAST: Kpong (*Ingram*). BELGIAN CONGO: Stanleyville and Elisabethville (*Schwetz*); Leopoldville (*Duren*). SUDAN: Kobara River (*King*). UGANDA: Entebbe (*Gowdey*); Jinja (*Hopkins*). KENYA: Nairobi (*Van Someren*); Kakamega (*MacDonald*). S. RHODESIA: Shamva (*Leeson*). TRANSVAAL (*Simpson*).

Synonymy.—In 1926 I expressed doubt as to the identity of *U. fusca* and *U. inornata*, but am now satisfied on the point. Theobald's mention of blue scales on the pleurae of *U. fusca* must either have been due to an error of observation, or else one of his two original females (now lost) belonged to a different species. For a time I thought I could distinguish a western form (*fusca*) with pale pleurae and an eastern form (*inornata*) with dark pleurae, but the difference is indefinite and the terminalia of the two forms are identical.

***Uranotaenia shillitonis* Edwards.**

Uranotaenia shillitonis Edwards, Bull. Ent. Res. 23, p. 561 (1932).

TYPES.—♂♀ in B.M., Nyakasura, Uganda.

A rather large dark species, without special ornament, but differing from all other *Uranotaenia* (except *U. henrardi*) in several respects, notably in having *all* the mesonotal scales broad and flat, and in the absence of acrostichal hairs.

♀. *Head* clothed with dark brown flat scales above, with whitish scales on the orbits, either as a continuous border or separate patches on sides and vertex; erect scales absent except for a row close to neck. Proboscis, palpi and antennae dark. palpi rather longer than usual in *Uranotaenia* and with fewer hairs. First segment of antennal flagellum scarcely as long as second. *Thorax* with mesonotal integument rather light brownish with a blackish patch above wing-root; colour of integument obscured by the dense coating of flat greyish-brown scales which leave only a small area in front of scutellum bare; scales over black integumental area darker brown, some whitish scales on margin of scutum in front of the dark area and also on the vertical front margin of scutum. Dorsocentral bristles strong and numerous as usual, but acrostichal bristles absent except a very few posteriorly. Ground-colour

of pleural integument light yellowish, but posterior pronotal lobes dark brown, and dark brown areas on sternopleura (above and below, leaving middle part pale) and on lower part of mesepimera. *apn* clothed with flat white scales; small patches of flat whitish scales in middle of sternopleura and below middle of mesepimera (this latter group of scales absent in most or all other *Uranotaenia*). Two or three posterior pronotal bristles instead of the usual one, and these set further back from the margin; one spiracular bristle as usual. *Abdomen* dark brown above, pale beneath, without markings. No hairs, or only a few very short marginal hairs not easily discernible, on any of the abdominal tergites except the first (another feature in which this species differs from most or all other *Uranotaenia*). *Legs* dark brown, unbanded; under sides of femora pale; coxae and trochanters pale yellowish; front coxae apparently without scales. *Wings* with dark brown scales only; all scales broad, including the outstanding scales on under surface of wing. Venation normal for the genus, except that the fork cells are longer than usual, upper fork more than half (sometimes more than three-quarters) as long as its stem.

♂. Resembles ♀ in colour and scaling. Legs normal; claws as usual in the genus, front pair small, equal and simple, mid pair very unequal and simple. Abdominal hairs very few and short. *Terminalia* (Fig. 14, g): Eighth tergite normal, with a posterior marginal row of short and equal hairs. Ninth tergite broad, without lateral or median processes, but with about 20 hairs (thus differing from all other African *Uranotaenia* except *henrardi*). Coxite broad, with more numerous scales than usual, chiefly on sternal side. Basal lobe prominent, darkened, with 4-5 bristles, one stronger than the rest. Style of moderate length, its distal fourth narrowed to a sharp point. Phallosome of the usual type of the genus, terminal tooth on a longish stalk, two lateral teeth large.

Wing-length 3-3.2 mm.

Distribution.—UGANDA: Nyakasura, Fort Portal (*Shillito*, *Hopkins*); Muko and Mt. Sabinio, Kigezi (*Edwards*, *Gibbins*); southern Ruwenzori (*D. R. Buxton*); Kampala (*Hopkins*). SUDAN: Katerunga, 21. vi. 1911 (*King*).

***Uranotaenia henrardi* Edwards.**

Uranotaenia henrardi Edwards, Rev. Zool. Bot. Afr. 27, p. 96 (1935).

TYPE.—♂ in Congo Museum, Leopoldville.

Allied to *U. shillitonis* Edwards, which it resembles in having all the scutal scales broad, but differs in the pale pleurae, dark scales on *apn*, and presence of acrostichal bristles.

♀. Unknown.

♂. *Head* as in *shillitonis*, erect scales confined to a few on nape, flat scales mainly dark but a pale border to eyes. *Thorax* with integument of scutum brownish, with a large black spot above wing-root; scales all broad, but not quite so broad as in *shillitonis*, also more pointed and less dense; black scales cover most of the black spot, some white ones towards lateral margin in front of this. Pleurae with integument wholly pale yellowish, including pronotal lobes; dark brown scales on *apn*, and a small patch of yellowish scales on sternopleura, but none on mesepimeron.

Acrostichal bristles present and biserial as usual, but short. *Abdomen, legs and wings* as in *shillitonis*.

Terminalia (Fig. 14, h) very much as in *shillitonis*, but tergite with only about 12 short hairs, and with a pair of small triangular tooth-like projections on posterior margin.

Wing-length about 2.5 mm.

Distribution.—BELGIAN CONGO: Leopoldville (*Henrard*), 1 ♂. UGANDA: Kalinzu Forest (*T. H. E. Jackson*), 1 ♂.

AËDOMYIA Theobald.

Aedeomyia Theobald, Mon. Cul. 2, p. 218 (1901).

Aëdomyia Edwards (emendation), Bull. Ent. Res. 3, p. 24 (1912).

Lepiothauma Enderlein, Wien. Ent. Zeit. 40, p. 25 (1923).

GENOTYPES.—*Aedeomyia*, *Aedes squamipennis* L.-A. (S. America); *Lepiothauma*, *L. furfurca* End (Africa).

Apart from the very distinctive ornamentation, species of this genus may easily be distinguished from all other mosquitoes by the form of the antennae in both sexes (Fig. 20).

Head.—Eyes separated by a scaly front. Vertex with fan-shaped erect scales and broad decumbent scales in front. A continuous row of orbital bristles. Proboscis somewhat shorter than abdomen, not swollen at tip in either sex. Palpi in both sexes about a quarter as long as proboscis. Antennae in ♂ somewhat shorter than proboscis, strongly plumose, but last two segments very little longer than the others and distinctly thickened. Antennae of ♀ noticeably shorter than proboscis; all flagellar segments short and thick, the first somewhat longer and thicker than the rest; hairs few and not very long.

Thorax very scaly, all the scales, both above and on the sides, being broad and flat, but rather loosely applied. Prosternum scaly (an unusual condition), but the narrow paratergite bare. *apn* rather small, widely separated and bristly. Several propleural bristles; several strong posterior pronotal; no spiracular or post-spiracular; numerous pre-alar and upper mesepimeral. Scutellum trilobed as usual, but median lobe with few bristles.

Legs moderately stout; middle and hind femora in both sexes with tufts of sub-erect scales apically. Fourth tarsal segment of front and middle legs in both sexes markedly shorter than fifth; first hind tarsal segment about as long as tibia. Claws of front and middle legs of ♂ slightly unequal, the larger with one long median tooth, the smaller simple; all claws of ♀ equal and simple. No pulvilli.

Wings rather short and broad, very densely scaly, scales on upper surface as long as those below and all broad. Forks both long; vein 6 reaching well beyond base of fork of 5. Squama fringed.

Abdomen with the first segment mainly clothed with scales, including lateral lobes. Tip blunt in ♀, eighth segment not retractile. ♂ *Terminalia* small. Coxite short, without distinct lobe. Style short, simple, with a comb-like terminal appendage replacing the ordinary spine (a unique feature of this genus). Anal segment largely membranous (as in *Uranotaenia*), but with a narrow chitinized strip on each

side; ninth tergite reduced to a narrow band of membrane; phallosome simple, rounded, without teeth or lateral plates.

♀. *Terminalia* (similar in both African species).—Eighth segment rather large, not retractile; tergite almost as large as sternite, latter with only two long setae on posterior margin (an unusual feature). Ninth tergite absent (a point in which *Aëdomyia* differs from all other African mosquitoes). Insula well sclerotized, transverse, with two groups of setae. Cerci very short and broad, horizontal. Post-genital plate broader than long, nearly rectangular, fused on to the very narrow cowl. No atrial plates. Spermatheca single, large, of peculiar shape, with a large funnel-like projection at base of duct.

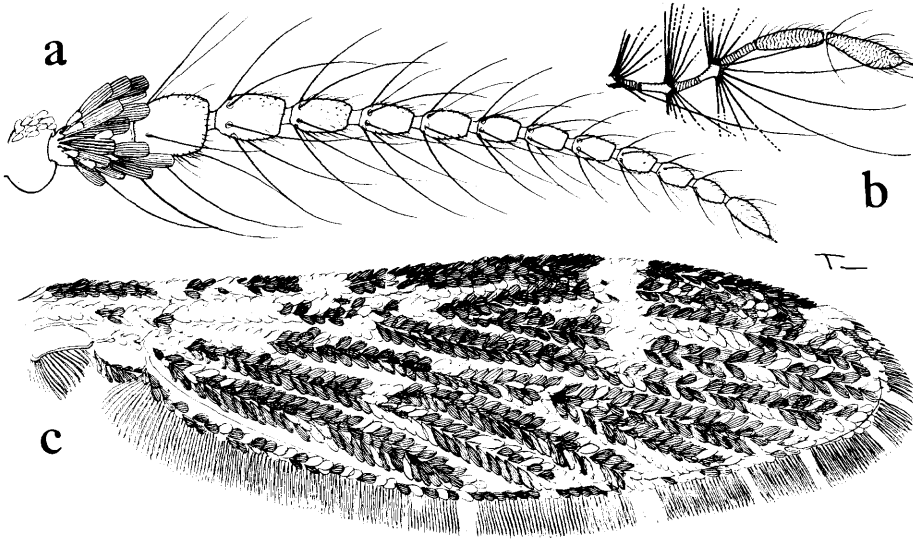


FIG. 20.—Antenna of ♀ and tip of antenna of ♂ *Aëdomyia* (after Barraud, 1933); wing of *Aëdomyia africana*.

***Aëdomyia africana* Neveu-Lemaire. (Pl. 3, fig. 12.)**

Aëdomyia africana Neveu-Lemaire, Arch. Parasit. 10, p. 273 (1906); Edwards, Bull. Ent. Res. 3, p. 25 (1912), 7, p. 228 (1917), and 20, p. 326 (1929).

Aëdomyia catasticta Edwards (nec Knab), Bull. Ent. Res. 3, p. 25 (1912).

TYPE.—♂ apparently lost, Duflé.

A small, heavily scaly mosquito with speckled and banded wings and legs; easily distinguished by the generic characters. Differs from the allied *A. fufurea* in the presence of a large area of yellow scales covering most of the scutum, in the uniformly appressed scales of the hind tibiae and tarsi, and in various other details.

♀. *Head* clothed with loosely applied flat scales and suberect broad fan-shaped scales, white in middle, mostly black at sides. Clypeus and tori brownish, with small flat white scales; first flagellar segment with a tuft of dark scales. Proboscis black with three white rings, one close to base, one in middle and one at tip (before labella), basal ring sometimes ill-defined, apical one often very narrow, occasionally absent (as in the type). Palpi about one-fifth as long as proboscis, black, with some

white scales in middle and at tip. *Thorax* with all the scales rather broad and flat, round-tipped. Scutum mainly covered by a large patch of bright yellow scales; some white scales on borders of this area, black scales at sides; a pair of tufts of sub-erect black scales some distance in front of scutellum; pre-scutellar area largely bare. Scutellar scales mostly white, some black ones at *base* of median lobe and on the small lateral lobes. White scales on *apn*; black scales covering *ppn*; patches of white scales on pleurae. *Abdomen* mainly dark above, more or less sprinkled with white scales at sides and beneath. *Legs* with numerous small white spots and narrow rings on femora and tibiae. Hind tarsi with two small white spots on first segment; a white ring embracing tip of first segment and base of second; another embracing tip of second segment and basal half of third; fourth segment white except tip, fifth all white. All scales of hind tibiae and tarsi appressed. *Wings* mostly dark but with scattered yellow scales; a patch of yellow scales at base; a small spot of white scales on costa and first vein near base; a narrow band of white scales beyond middle extending from costa to base of upper fork; small groups of white scales at bases of forks of veins 4 and 5 and at tip of 5.1; a white area in fringe opposite the last-mentioned spot.

♂. Resembles ♀ in ornamentation and in length of palpi. Penultimate segment of antenna not longer than terminal segment and without scales. *Terminalia* as figured; style somewhat tapering to tip.

Wing-length 2.5 mm.

Distribution.—GOLD COAST: Bole (*Ingram*); Accra (*Macfie*); Addah (*Braybrook*); Takoradi (*Pomeroy*). NIGERIA: Lagos (*Graham, Connal*); Lokoja (*C. F. Watson*); Benue R. (*Dalziel, Wigglesworth*). GABOON: Fernan Vaz (*Galliard*). SUDAN: Bor (*King*). UGANDA: Dufile (*Neveu-Lemaire*); Entebbe (*Hancock*); Jinja (*Gibbins*). NYASALAND: Fort Johnson (*Lamborn*). BELGIAN CONGO: Kakolo, Ituri (*Collart*); Leopoldville (*Duren*); Coquilhatville (*Henrard*).

***Aëdomyia furfurea* Enderlein.**

Lepiothauma furfurea Enderlein, Wien. ent. Zeit. 40, p. 25 (1923); Edwards, Bull. Ent. Res. 15 p. 262 (1925).

Aëdomyia furfurea Edwards, Bull. Ent. Res. 20, p. 325 (1929).

TYPE.—♀ in Berlin, Camerun.

Differs from *A. africana* as follows: Head with the erect scales black and yellow, few or no white ones in middle. Proboscis lacking the sub-basal white ring, but the median and apical rings rather broader. Mesonotum with a rather narrow stripe of yellow scales on anterior half, remainder mottled with black and white scales; pre-scutellar area almost entirely covered with scales; the two tufts of black scales more conspicuous. Scutellum with a small tuft of black scales at *apex* of median lobe. Hind tibia with the scales on the underside towards the base suberect. Hind tarsi with the *black* scales of the upper surface suberect, more especially those of segments 2 and 3. White rings of hind tarsi narrower, the fourth segment more than half black. Wings with few or no yellow scales at base; white markings similar to those of *A. africana*, but an additional white spot is present beyond middle of third vein.

♂. Resembles ♀. Antenna with penultimate segment slightly longer than terminal, and bearing a small tuft of white scales at its base above (a most peculiar feature, especially as none of the other flagellar segments except the first bear scales). *Terminalia* almost as in *A. africana*; style perhaps somewhat stouter and less tapering, and stiff bristles on basal lobe rather more numerous and coarser.

Wing-length 3.5 mm.

Distribution.—CAMEROONS: Mao Godi (*Riggenbach*). BELGIAN CONGO: Kisantu (*Le Wulf*); Elisabethville (*Miss A. Mackie*); Matadi (*Duren*). UGANDA: Kampala (*Hopkins*). TANGANYIKA: Dar-es-Salaam (*McHardy*).

THEOBALDIA Neveu-Lemaire.

Theobaldia Neveu-Lemaire, C.R. Soc. Biol. 54, p. 1331 (1902).

GENOTYPE.—*Culex annulatus* Schrank (Europe).

The two African species of this genus are large mosquitoes, each with very distinctive features but very dissimilar from one another. They are placed in different subgenera, but in common with other species of *Theobaldia* may be distinguished from other Culicine mosquitoes by having several posterior pronotal and also several spiracular bristles, but no post-spiraculars. They also have the following features in common:

Head with a mixture of narrow decumbent and erect scales on the whole of the vertex. Eyes almost touching. Orbital bristles numerous. Antennae of ♂ plumose, but markedly shorter than proboscis.

Thorax.—Anterior pronotal lobes widely separate, with irregularly arranged bristles and scales. Scutum with long dorso-central and short acrostichal bristles. Scutellum with narrow scales. Several lower mesepimeral bristles in addition to posterior pronotal and spiracular, these last pale in colour. Paratergite bare.

Legs not very slender. Fourth tarsal segment not shortened in ♀. Both claws of anterior legs usually toothed in ♂; all claws simple in ♀. No pulvilli.

Wings with distinct microtrichia as usual. Outstanding scales narrow. Vein 2 with fork longer than its stem; 6 ending well beyond base of fork of 5. Squama with long dense fringe.

Abdomen blunt in ♀, eighth segment not retractile. First tergite only partially scaled.

♂. *Terminalia*.—Coxite rather long, with small basal lobe. Style simple, long and slender with terminal spine. Paraprocts with a few terminal teeth.

♀. *Terminalia*.—Ninth tergite band-like; cerci rather short and broad; post-genital plate separate from cowl, with a few stronger setae on distal margin; insula free; atrial plates present; spermathecae three, large and equal.

Subgenus ALLOTHEOBALDIA Brolemann.

Allotheobaldia Brolemann, Ann. Soc. Ent. France, 88, p. 90 (1919).

GENOTYPE (and only known species).—*T. longiareolata* (Macquart).

Palpi of ♂ two-thirds to three-quarters as long as proboscis, somewhat hairy, last segment swollen. *Terminalia* of ♂ with long processes to tergite and with very large

phallosome. *Terminalia* of ♀ (Fig. 6 ♀, d) : Eighth sternite of unusual shape, with large rectangular median excavation, on each side of which is a tuft of hairs ; ninth tergite rather broad but narrowed in middle ; insula conspicuous, quite separate from the unusually large and strong sigma ; cowl with a median process projecting anteriorly.

In both sexes paratergite long and very narrow ; pleurae very scaly, a stripe of broad scales extends along upper margin of post-spiracular area immediately below paratergite ; first abdominal tergite largely without scales above, but its small lateral lobes scaly ; subcostal vein of wings with a patch of hairs beneath at base.

Theobaldia (Allotheobaldia) longiareolata Macquart.

Culex longiareolatus Macquart, Dipt. Exot. 1, 1, p. 34 (1938).

Culex spathipalpis Rondani, Bull. Soc. Ent. Ital. 4, p. 31 (1872).

Theobaldia longiareolata (Macquart) Edwards, Bull. Ent. Res. 12, p. 287 (1921) ; Barraud, Ind. J. Med. Res. 12, p. 139 (1924) ; Martini, Flieg. Pal. Reg. Cul. p. 214 (1930) ; Barraud, Fauna Brit. Ind. Dipt. 5, p. 88 (1934).

Types.—*longiareolatus*, ♀ in Paris Mus. ? , Canary Is. ; *spathipalpis*, ♂♀ in Florence Mus., Italy.

A large mosquito which could hardly be confused with any other in the African fauna ; distinguished at once from almost all other Culicines by having the costa entirely pale scaled on its anterior edge from base of wing to tip. Mesonotum with rather well-defined lines of whitish scales on a light brown ground. Femora and tibiae spotted and lined with white in a manner somewhat reminiscent of *Culex tigripes*.

♀. *Head* dark scaled in middle, with an orbital rim of white scales and a tendency to a double white line in middle. Proboscis all dark. Palpi about a quarter to nearly a third as long as proboscis, mostly dark but with many scattered white scales. Tori with some white scales ; first two segments of flagellum also with numerous white scales. *Thorax* rather light brown. Mesonotum clothed mainly with narrow pale brownish scales, and with rather broader whitish scales forming a more or less definite pattern, as follows : A median line from front margin to just in front of scutellum, where it forks ; a lateral line on anterior half of scutum, bending inwards at angle and then continued back to scutellum. Pleurae with rather dense whitish scales ; posterior pronotal lobes with broad yellowish scales above, white ones below. About 5-6 spiracular and about 4 lower mesepimeral bristles. *Abdomen* : Tergites with rather narrow basal white bands, otherwise covered with yellowish and dark brown scales in varying proportions (see note on variation) ; sternites pale-scaled. *Legs* (Fig. 21) : Femora mottled with white or pale yellowish scales and with a more or less complete but not sharply defined pre-apical white ring. Tibiae largely black-scaled, but with numerous white scales forming a row of elongate spots on the anterior surface, these spots on hind tibia, and sometimes also on middle tibia, more or less confluent to form an irregular white stripe. Tarsi with narrow white rings at bases of first three segments ; first segment also streaked with white on anterior surface. *Wings* (Fig. 21) with slight indications of small dark spots owing to aggregations of scales by cross-veins and at bases of forks. Costa clothed throughout its extent with whitish scales on its anterior surface, dark scales on its posterior surface. Fork-cells long, but longer in some specimens than in others.

♂. Resembles ♀. Antennae markedly shorter than proboscis. Palpi about four-fifths as long as proboscis, with white rings at bases of segments, last segment thickened. Terminalia very distinctive.

Wing-length 5-7 mm.

Distribution.—SUDAN: Dongola prov. (*King, Footner*); Damer (*King*); Erkowit (*King*); Khartoum (*Balfour*); Medani (*W. P. L. C.*). BRITISH SOMALILAND: Burao (*Drake-Brockman*). ABYSSINIA: Hala Halem (*Raffaele*). NATAL: Estcourt (*Marshall*); Weenen (*Thomasset*). ORANGE RIVER COLONY: Kroonstad (*Eckersley*). CAPE PROVINCE: Loredale (*Macvicar*); Deelfontein (*Hoggett*); Ceres, Katberg, Mossel Bay and Somerset East (*R. E. Turner*); Grahamstown and Cape Peninsula (*Barraud*); Drooze River between Calvinia and Williston (*K. H. Barnard*). S.-W.

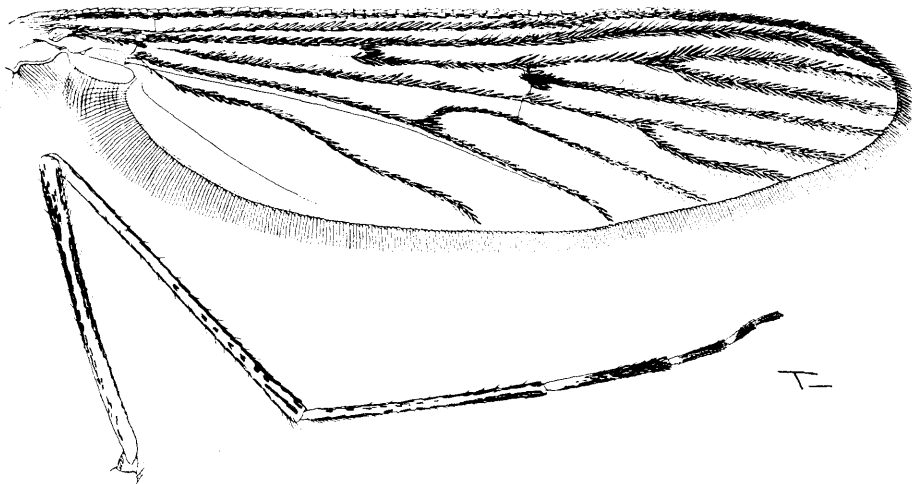


FIG. 21.—Wing and hind leg of *Theobaldia longiareolata* Meq.

AFRICA: Okahanja (*Krieg*); Aus (*Turner*); Windhoek (*Jordan*). TRANSVAAL: Onderstepoort, Pretoria, Johannesburg, etc. (*Bedford*).

Outside tropical Africa the species is widely distributed in the Mediterranean region from the Azores, Canary Is. and Madeira, through Spain to Macedonia, Persia and North-West India, and through Morocco and the whole of the northern Sahara to Egypt and Palestine.

Variation.—The chief variation is in the markings of the abdomen, of which there are two main types: (1) Tergites almost entirely covered with yellowish scales apart from the white basal bands, only occasionally with a small number of darker scales. This is the usual type throughout the Mediterranean region, and the specimens I have examined from the Sudan and Somaliland are of this type. (2) Tergites very extensively dark-scaled; in the darkest specimens all dark brown except for the white basal band, but more usually with a median stripe of yellowish scales, which varies in width and distinctness, and in the lightest specimens spreads out to form a narrow yellowish band on the hind border of each tergite. All the very numerous specimens examined from the countries of the South African Union belong to this form.

So far as our present evidence goes the distribution of *T. longiareolata* in Africa is discontinuous, and at first sight it would seem possible that this discontinuity has resulted in the separation of two distinct forms as noted above. However Barraud has described both these forms, with intermediates, as occurring in North-West India.

Subgenus **THEOMYIA** Edwards.

Theomyia Edwards, Bull. Ent. Res. 21, p. 303 (1930).

GENOTYPE (and only known species).—*T. fraseri* (Edwards).

Palpi of ♂ slender, bare, scarcely half as long as proboscis. *Terminalia* of ♂ with tergite simple, phallosome of normal size. In both sexes paratergite broader than in other *Theobaldia*; pleurae less scaly, no post-spiracular scales; no scales on lateral lobes of first abdominal tergite; subcostal vein of wings without hairs beneath at base.

Terminalia of ♀ (Fig. 6♀, c): Eighth sternite normal, very little emarginate; ninth tergite a uniformly narrow ribbon; insula small; no definite sigma; cowl without median process, but atrial plates connected with a large median thickening of roof of atrium.

Theobaldia (Theomyia) fraseri Edwards.

Leptosomatomyia fraseri Edwards, Bull. Ent. Res. 5, p. 74 (1914), and 12, p. 286 (1921).

Theobaldia (Theomyia) fraseri Edwards, Bull. Ent. Res. 21, p. 303 (1930).

TYPE.—♂ in B.M., Kasala, Uganda.

A rather large dark species without striking ornamentation, but readily distinguished by the pleural chaetotaxy and (in the male sex) by the rather short and slender palpi. Costa entirely dark; wings quite unspotted; tarsi narrowly ringed at base of first segment only.

♀. *Head* clothed with narrow whitish decumbent scales and numerous erect light brownish scales which are longer and narrower than usual. Proboscis dark, tip sometimes golden yellow, rather long and tapering; palpi dark, about one-fourth as long as proboscis or rather longer. Antennae with longer hairs than usual in this sex, appearing sub-plumose; tips of all flagellar segments except the last few with a secondary whorl of short hairs at tip. *Thorax* with integument dark, scutellum and postnotum yellowish. Scales of scutum and scutellum all narrow; pale yellowish scales form a pattern of rather broad and indefinite lines, arranged much as in *T. longiareolata*—a median line forking just in front of scutellum, a lateral line curving inwards at angle of scutum and continued back to scutellum, and a patch in front of wing-base; intervening scales dark brownish. Anterior pronotal lobes with narrow pale yellowish scales in front, broad silvery-white scales behind; posterior pronotal lobes with broad silvery-white scales only. Rather small patches of flat silvery-white scales on sternopleura and in middle of mesepimera. Spiracular bristles rather numerous and pale; several posterior pronotal bristles, also pale. *Abdomen*: Dorsal scales blackish, with a rather pronounced bluish lustre; tergites with small lateral white spots extending from the base for some distance along side margins; sternites mainly dark. *Legs* mainly blackish, with a blue or purplish lustre; front and middle

femora all dark in front, tibiae pale beneath and behind; middle tarsi with first segment more or less pale above; hind femora with the basal half whitish (except for a narrow dark ring at extreme base), apical half dark; hind tibia dark, with a narrow creamy ring at base, this ring widened on under side; hind tarsi dark, with a creamy ring at base of first segment and often a few pale scales at base of second segment. *Wings* dark-scaled, rather narrow, fork cells long.

♂. Ornamentation as in ♀. Antennae much more plumose, but only about two-thirds as long as proboscis. Palpi scarcely more than half as long as proboscis, slender, dark, with a few hairs at tip. *Terminalia* (Fig. 6, a-c) of the usual type of the genus—coxite tubular, somewhat tapering to tip, with an appressed basal lobe bearing several bristles; style long, slender, with short terminal spine; paraprocts with two or three strong teeth at tip.

Wing-length 5-6.5 mm.

Distribution.—UGANDA: Kasala Forest, Chagwe (*Fraser*). NIGERIA: Ibadan (*Golding, Philip*). SIERRA LEONE: Daru (*Murphy*). BELGIAN CONGO: Leopoldville (*Henrard*); Pawa, Uele (*Radna*); Matadi (*Wanson*). S. RHODESIA: Chirinda Forest (*Marshall*).

Variation.—The single (damaged) specimen from Chirinda Forest differs from the West African specimens examined in having the proboscis golden scaled except at the base, and the front and middle tarsi largely pale.

ORTHOPODOMYIA Theobald.

Orthopodomyia Theobald, Entomologist, 37, p. 236 (1904).

GENOTYPE.—*O. albipes* Leicester in Theobald (*l.c.*) (Malaya).

Medium-sized mosquitoes, usually with distinctive ornamentation; diagnosed by the fourth tarsal segment of the anterior legs being very short in the female as well as in the male, otherwise with most of the characters of *Taeniorhynchus* or *Ficalbia*.

Head with numerous erect scales; decumbent scales of vertex narrow. Eyes very narrowly separated. Orbital bristles numerous. Antennae in both sexes about as long as proboscis, in ♂ distinctly plumose. Palpi in ♂ about as long as proboscis, in ♀ also rather long (one-third proboscis or rather more). First flagellar segment in ♀ not lengthened.

Thorax.—*apn* widely separated, with numerous bristles. Scutum with numerous strong dorso-central and acrostichal bristles, the latter variable in length according to the species. Several posterior pronotal bristles, but no spiraculars and no post-spiraculars. Paratergite rather narrow and always bare.

Legs long; front and middle tarsi with the first segment a little longer than the remaining four together (in most other mosquitoes it is shorter), and the fourth segment very short, much shorter than the fifth in both sexes (not only in the male, as in other mosquitoes). Claws of ♀ all simple. Pulvilli absent.

Wings with distinct microtrichia as usual. Scales on upper surfaces of veins usually broad and symmetrical. Forks very long. Vein 6 ending far beyond base of fork of 5. Squama with long dense fringe.

Abdomen with scaling of first tergite variable according to the species ; tip blunt in ♀, eighth segment not retractile.

♂. *Terminalia*.—Coxite rather long, with small basal lobe. Style simple, long and slender, with terminal spine. Paraprocts with several terminal teeth. Phallosome simple.

♀. *Terminalia* (*arboricollis*, Fig. 6 ♀, j).—Eighth segment not retractile, tergite and sternite unmodified, their posterior margins straight. Ninth tergite forming a band of nearly even width, passing down sides of segment. Insula rather large, but weakly sclerotized and bare. Cerci large, stout, blunt, obliquely set. Post-genital plate much shorter than cerci, deeply emarginate, with long terminal setae ; proximal portion well sclerotized, bare, fused on to cowl as in *Aedes*. Sigma and atrial plates weak. Spermathecae three, spherical, one larger than the other two.

Orthopodomyia is a genus of few species, but widely distributed in Europe, Asia and America. It has not been found on the African mainland, but a single species occurs in Mauritius ; this is quite distinct from all those at present known from the Oriental region, though evidently related to them. There appear to be no records of blood-sucking by any species of this genus.

***Orthopodomyia arboricollis* d'Emmerez de Charmoy.**

Culex arboricollis d'Emmerez de Charmoy, Ann. Trop. Med. 2, p. 257 (1908).

Newsteadina arboricollis Theobald, Ann. Trop. Med. 2, p. 297 (1908).

Orthopodomyia arboricollis Edwards, Bull. Ent. Res. 11, p. 135 (1920) ; MacGregor and Gebert, Bull. Ent. Res. 13, p. 449 (1923).

Types.—♂♀ in Liverpool School of Tropical Medicine, Mauritius.

A medium-sized mosquito with much superficial resemblance to the species of *Mansonia*, subgenus *Mansonioides*, but readily distinguished by the long hind tarsi, which have broad white rings over the joints between the first three segments. Differs from similar Indian species of *Orthopodomyia* in markings of legs and wings.

♀. *Head*.—Vertex with pale decumbent narrow scales and dense black and white erect scales, those in front narrow, those behind more fan-shaped. Proboscis speckled with pale scales and with a narrow white ring well beyond middle. Palpi almost half as long as proboscis, with narrow white rings near base and middle. Antennae with small flat white scales on torus and first flagellar segment only.

Thorax.—Mesonotum clothed with narrow scales of several colours forming an indefinite pattern ; a broad whitish stripe in middle anteriorly, broadly bordered with yellow, sides more brownish, posterior half with three roundish patches of black scales. Pleurae with large patches of flat yellow and white scales loosely applied. Acrostichal bristles almost as long as dorso-centrals. *Abdomen* mainly dark, tergites with narrow and incomplete basal whitish bands. Lateral lobe of first tergite bare (it is scaly in the oriental *O. anopheloides*). *Legs* : Femora and tibiae mainly dark but extensively mottled with white and yellow scales, these pale scales however not tending to form spots as in the Indian species ; on the middle and hind femora pale scales are absent from a narrow black subapical ring ; hind tibia with a narrow black sub-basal ring. Tarsi black without scattered pale scales even on first segment of hind tarsi ; front tarsi with a narrow pale ring at base of first segment only ; mid tarsi with a few pale scales at articulations between first three

segments; hind tarsi with first segment narrowly white at base, a broad white ring embracing equally the tip of first and base of second segment, and rather narrower white rings embracing extreme tips of second and third and (more extensively) bases of third and fourth; fifth hind tarsal segment black (white in two allied Indian species). *Wings* densely clothed with broad asymmetrical scales on upper surface, and also on under surface of vein 2; scales on under surface of veins 3, 4 and 5.1 longer and narrower. Scales mostly dark, but many scattered white ones present, some of these forming irregular spots especially in the region round the cross-veins; four yellowish spots on costa, the first close to base and extending on to base of vein 1; second before middle, also extending rather broadly on to vein 1 (this marking absent in the allied Indian species); third just beyond middle, usually very small and confined to costa; fourth just before tip, small but extending on to vein 2.1.

♂. Ornamentation similar to ♀, but pale ring of proboscis situated nearer middle and abdominal bands more distinct. Palpi slender, equal in length to proboscis; last two segments very short, with a few pale hairs. Antennae with groups of very long, curly, white scales on each of first five or six flagellar segments (similar scales occur in the Oriental *O. anopheloides*, but not in *O. flavicosta* or *O. flavithorax*).

Wing-length 3.5–4.5 mm.

Distribution.—MAURITIUS only (Sir Ronald Ross; M. E. MacGregor).

FICALBIA Theobald.

(For references and synonymy see under subgenera.)

As now defined this genus is not an easy one to recognize, most of the features common to the three subgenera being of a negative character—absence of spiracular and post-spiracular bristles and of pulvilli, and of any unusual features in the tarsi. The swollen tip of the proboscis is noticeable in the males but not in the females.

Head.—Eyes touching or narrowly separated. Scaling various. Orbital bristles in a continuous row, but the upper pair longer. Proboscis of moderate length, considerably (often greatly) swollen at and towards the tip in ♂, slightly so in ♀. Palpi of ♂ variable; of ♀ not more than one-third as long as proboscis, usually less. Antennae rather long, fully as long as proboscis in both sexes (thus resembling *Orthopodomyia*); in ♂ rather stouter and more rigid than usual, strongly plumose, with the last two segments elongate, in ♀ frequently with the first flagellar segment elongate.

Thorax.—*apn* well separated and bristly. Dorso-central bristles usually strong, but may be absent. Paratergite narrow (except in *F. splendens*) and always bare. Several strong posterior pronotal and propleural bristles; no spiracular or post-spiracular, and usually no lower mesepimeral.

Legs in most species with the tibial bristles unusually long and strong. First hind tarsal segment shorter than tibia. Fourth segment of all tarsi of ♀ as long as fifth or longer. Claws of ♀ all simple; those of fore and mid legs of ♂ each with one tooth. No pulvilli.

Wings with the scales much alike in shape, usually broad. Vein 6 reaching beyond base of fork of 5. No hairs on veins at base of wing either above or below. Squama with long and complete fringe.

Abdomen with the first tergite only partially scaly, its small lateral lobes bare.

♂. *Terminalia* (Fig. 6, d-f).—Of simple type in all three subgenera, resembling those of *Megarhinus* or *Orthopodomyia*. Coxite rather long, with small bristly basal lobe. Style long, tapering, with short terminal spine. Paraprocts strong, with a few terminal teeth. Phallosome not studied in detail; in *F. plumosa* (Fig. 6, e) it is divided into a pair of plates which are finely divided on their distal margins, somewhat as in the subgenus *Coquillettidia*.

♀. *Terminalia* (Fig. 6 ♀, h, i).—Eighth segment not retractile, broad; sternite not much emarginate. Ninth tergite narrow, ribbon-like, more or less bilobed. Insula minute, with few hairs. Cerci broad and short, not curved. Post-genital plate usually projecting somewhat beyond cerci and more or less deeply emarginate, its proximal portion chitinized but bare and separate from cowl. No obvious atrial plates. Spermathecae either three in number, one large and the other two rather smaller (*lacustris*, *flavopicta*, *plumosa*), or a single large spermatheca may be present (*splendens*, *mimomyiaformis*, *mediolineata*, *uniformis*).

Habits.—Most species of this genus are found in rather open swamps. They seldom occur in large numbers and have not been found biting. Oviposition has only been observed in one species (see under subgenus *Ficalbia* below).

The three subgenera differ not only in the form of the male palpi and in the venation and scaling of the wings, as previously described, but also in chaetotaxy as noted in the diagnoses below.

KEY TO ETHIOPIAN SPECIES OF FICALBIA.

1. Wings scantily scaled; upper fork cell shorter than its stem (*Mimomyia*) 2.
Wings heavily scaled; upper fork cell as long as its stem or longer 10.
2. Head with broad scales only; tarsi dark 3.
Head with an area of narrow scales in middle; hind tarsi white-tipped 8.
3. Scutal scales green, pleural scales silvery *splendens* Theo. (p. 77).
Not so 4.
4. Hind tarsi dark to extreme base 5.
Hind tarsi with a few white scales or a narrow whitish ring at extreme base of first segment 6.
5. Abdominal tergite 2 with lateral pale spots only (3-7 banded or unbanded)
hispidata Theo. (p. 77).
Abdominal tergites 2-7 with median and lateral basal pale spots
lacustris Edw. (p. 79).
6. Head-scales and scutum blackish; abdomen unbanded *perplexens* Edw. (p. 79).
Head-scales and scutum paler; abdomen banded 7.
7. Head rather dark; hind femur all dark in front *femorata* Edw. (p. 80).
Head yellowish; hind femur mainly yellowish *pallida* Edw. (p. 80).
8. Hind tarsi with only the fifth segment all whitish *flavopicta* Edw. (p. 80).
Hind tarsi with fourth and fifth segments all whitish 9.
9. Small species; scutum mottled and with long dorso-central bristles
mimomyiaformis Newst. (p. 81).
Large species; scutum uniformly dark and without dorsocentral bristles
plumosa Theo. (p. 83).
10. Upper fork-cell much longer than its stem (about three times); legs and wings with pale markings (*Etorleptomyia*) *mediolineata* Theo. (p. 84).
Upper fork-cell only a little longer than its stem; wings and legs dark (*Ficalbia*) 11.

11. Scutum largely bare of scales *uniformis* Theo. (p. 86).
 Scutum with scales uniformly distributed 12.
 12. Scutum uniformly dark *nigra* Theo. (p. 88).
 Front margin of scutum broadly yellow *circumtestacea* Theo. (p. 88).

Subgenus **MIMOMYIA** Theobald.

Mimomyia Theobald, Mon. Cul. 3, p. 304 (1903).

Boycia Newstead, Ann. Trop. Med. 1, p. 33 (1 Feb., 1907).

Ludlowia Theobald, Mon. Cul. 4, p. 193 (18 March, 1907).

Megaculex Theobald, Mon. Cul. 4, p. 282 (18 March, 1907).

Hispidimyia Theobald, Mon. Cul. 5, p. 245 (1910).

GENOTYPES.—*Mimomyia*, *M. splendens* Theo. (Africa); *Boycia*, *B. mimomyiaformis* Newst. (Africa); *Ludlowia*, *L. chamberlaini* Ludl. (Philippine Is.); *Megaculex*, *M. albitarsis* Theo. (Africa); *Hispidimyia*, *H. hispida* Theo. (Africa).

Palpi of ♂ (Fig. 22) as long as proboscis or slightly longer, distinctly two-segmented, the shaft slender almost to the tip, second segment forming a short stout club, continuing the direction of the shaft, and provided with several spiny hairs but without definite hair-tufts. Proboscis of ♂ moderately swollen at tip, of ♀ scarcely so. Antenna of ♀ with first flagellar segment usually considerably longer than second, but variable according to the species. Scutal bristles variable as noted below; supra-alar bristles numerous, those curving downwards immediately above paratergite not very long. Pre-alar and upper mesepimeral hairs fairly numerous. Wings (Fig. 23) with fork of 2 shorter than its stem in both sexes; veins nearly bare except towards tip of wing, where they carry a few broad but small scales (wing more densely scaled in the Oriental *F. hybrida* Leic.).

On characters of scaling and chaetotaxy the African species fall into four distinct groups, corresponding with the definitions of *Mimomyia*, *Hispidimyia*, *Boycia* and *Megaculex*. If *Mimomyia* were readmitted to full generic rank, as distinct from *Etorleptomyia* and *Ficalbia*, these four groups might well be regarded as subgenera.

Group A (Mimomyia).—Eyes touching at a point. Erect scales of vertex confined to a small area on nape, otherwise scales all broad and flat. Dorso-central bristles present but not very long. Acrostichal bristles present, short, in two irregular rows. Silvery scales cover most of upper half of sternopleura, extending over pre-alar area and a large part of post-spiracular area. Upper sternopleural bristles confined to the posterior row, none on the ridge below pre-alar area. Paratergite much broader than in the other species. This includes only *F. splendens*.

Group B (Hispidimyia).—Eyes touching for a considerable distance. Head scales as in Group A. Dorso-central bristles few in number but strong, in one row. Acrostichal bristles absent. No scales on pre-alar or post-spiracular areas. Sternopleural bristles in a continuous row, which extends along the posterior margin and turns forwards along the ridge below pre-alar area. Paratergite narrow. Hind femur with few bristles at tip. This group includes *F. hispida*, *lacustris*, *perplexens*, *femorata* and *pallida*.

The Oriental *F. chamberlaini* Ludl. (genotype of *Ludlowia*) resembles the species of Group B in most respects, but has no dorso-central bristles, and the eyes are narrowly separated.

Group C (Boycia).—Eyes touching. Vertex with a large area of erect scales

mixed with narrow decumbent scales, extending forwards to eye-margins in middle. Dorso-central bristles present, quite numerous and strong. Pleural scales and bristles as in Group B. Paratergite narrow. Hind femur with only 2-3 curved bristles at tip above. *F. mimomyiaformis* (genotype of *Boycia*) has no acrostichal



FIG. 22.—Head of ♂, *Ficalbia (Mimomyia) hispida* Theo. (After Theobald, 1910.)



FIG. 23.—Wing of ♂, *Ficalbia (Mimomyia) hispida* Theo. (After Theobald, 1910.)

bristles, but in *F. flavopicta* a single sparse row of such bristles is present, these almost as strong as the dorso-centrals.

Group D (Megaculex).—Eyes touching for a considerable distance. Vertex as in Group C. Dorso-central bristles absent, except for a few immediately in front of scutellum; no acrostichals. Pleural scales and bristles and paratergite as in Groups B and C. Hind femur with 6 or more short curved bristles at tip above; tibial

bristles not so long as in the other species, none more than about twice as long as tibial diameter. This includes only *F. plumosa*.

Ficalbia (Mimomyia) splendens Theobald.

Mimomyia splendens Theobald, Mon. Cul. 3, p. 304 (1903); Edwards, Bull. Ent. Res. 3, p. 35 (1912); Ingram and Macfie, Bull. Ent. Res. 8, pp. 89, 152 (1917).

Ficalbia (Mimomyia) splendens Edwards, Gen. Ins. Culicidae, p. 111, and pl. 1, fig. 15 (1932).

TYPE.—♀ in B.M., Entebbe.

A small mosquito with very distinctive colouring, the green scales of the mesonotum distinguishing it at once from any other African Culicine.

♀. *Head* clothed with flat golden-yellow scales, sometimes with a green or purple gloss; no narrow decumbent scales, and only a few upright forked scales on nape, these also yellow in colour. Proboscis mainly yellowish, the swollen tip black at sides. Palpi yellowish with black tips, about a quarter as long as proboscis. Antennae with tori yellowish, rather hairy on inner side as in other species of this subgenus; first flagellar segment slightly thickened and only about half as long again as second. *Thorax* with the integument entirely shining black, including pronotal lobes and scutellum. Scutal scales all narrow, rather bright green in colour, scarcely metallic. Pleurae with a large area of flat silvery scales in middle; no scales on *apn* or *ppn*; only two posterior pronotal bristles. *Abdomen* mainly dark above, scales with a greenish gloss; tergite 1 and basal half of 2 yellowish; 3-7 with small basal lateral yellowish spot; venter pale. *Legs* largely yellow; front femora almost entirely so; middle and hind femora broadly purplish at tips on anterior surface; front tibiae purplish in front; hind tibiae broadly dark at tip; tarsi dark, first three segments with narrow and indistinct pale rings at base. Bristles of hind tibiae not more than about twice as long as tibial diameter. *Wings* with yellowish scales at base, otherwise dark-scaled. Halteres entirely yellow.

♂. Resembles ♀ in colouring. Palpi slightly longer than proboscis, the club-like second segment with a few short bristly spines but almost devoid of hairs.

Wing-length about 2.5 mm.

Distribution.—UGANDA: Entebbe (*Low*); Jinja (*Gibbins*). GOLD COAST: Bole (*Ingram*); Accra and Oblogo (*Macfie*). NIGERIA: Lagos (*Graham, Connal*). NYASALAND: Fort Johnston (*Lamborn*). SUDAN: Bahr-el-Jebel. BELGIAN CONGO: Leopoldville (*Duren*); Kilwa (*Schwetz*); Kasenyi, L. Albert (*Schwetz*).

Ficalbia (Mimomyia) hispida Theobald.

Hispidomyia hispida Theobald, Mon. Cul. 5, p. 245 (1910).

Ludlowia hispida Edwards, Bull. Ent. Res. 2, p. 245 (1911).

Mimomyia hispida Edwards, Bull. Ent. Res. 3, p. 36 (1912); Macfie and Ingram, Bull. Ent. Res. 7, p. 14 (1916).

Ficalbia (Mimomyia) hispida Edwards, Gen. Ins. Culicidae, p. 111 (1932); Edwards, Bull. Ent. Res. 26, p. 133 (1935).

TYPES.—♂♀ in B.M., Sudan (Gebel Ahmed and Bor).

A mosquito of medium size, without striking ornamentation except that the dark brown scutum contrasts rather noticeably with the pale yellowish pleurae and the yellow-scaled head. Hind tarsi all dark, even to extreme base; front femora all dark on anterior surface.

♀. *Head* clothed almost entirely with flat and close-lying pale yellowish scales ; no narrow decumbent scales even in middle ; erect forked scales confined to a small patch on nape. Proboscis dark above, with a yellow line beneath from base to tip. Palpi dark, about one-quarter as long as proboscis. Antennae with tori light brownish, darker in inner side, where there is a patch of short hair ; first flagellar segment very long, approximately three times as long as second. *Thorax* with the integument yellowish on sides, brown on most of scutum, which appears much darker owing to its uniform covering of dark brown narrow scales and dark bristles, pale narrow scales being present only on sides in front of wing-base and on scutellum. Dorsocentral bristles fairly numerous and of moderate length. *apn* yellowish and without scales ; *ppn* also yellowish, with some dark scales above, some or all of the 4-7 bristles on their posterior margin yellowish. Pleurae entirely yellow, without any trace of a dark spot on anepisternite ; bristles all yellowish ; a small inconspicuous patch of yellow scales in middle. No lower mesepimeral hairs. Postnotum mainly yellowish, usually with a narrow and ill-defined median darker stripe. *Abdomen* dark above, with a rather strong purple gloss ; tergites 2-7 with lateral basal triangular yellowish patches which are usually scarcely visible dorsally, no median basal pale spots ; tergite 1 almost completely clothed with dark scales ; tergite 8 yellow-scaled ; sternites all yellowish. *Legs* mainly dark brown, with a purple gloss ; femora largely yellowish beneath, hind femora largely pale anteriorly, the pale colour extending to tip below, but with a dark dorsal line extending to base ; no pale knee-spots ; middle tibiae pale on posterior surface, otherwise tibiae entirely dark ; no pale scales on tarsi except that the tips are very indistinctly lighter. Long scattered pale bristles on tibiae ; most noticeable on hind pair, where they are three or four times as long as the tibial diameter. *Wings* with the scanty scaling all dark. Halteres with dark knob.

♂. Resembles ♀ in colouring, but proboscis more extensively yellow ; shaft of palpi mainly yellow, the club dark and with dark hairs and bristles ; lateral basal pale spots of abdominal tergites larger, tending to spread dorsally towards middle line. Antennae with conspicuous yellowish plumes. Terminalia : Tergite broader than long, with a group of 3-5 hairs at each hinder corner.

Wing-length 3-3.5 mm.

DISTRIBUTION.—SUDAN : Bor and Gebel Ahmed (*King*) ; Thar Jath (*Ruttledge*). UGANDA : Kampala (*Hopkins*). GOLD COAST : Bole (*Ingram*). NIGERIA : Lagos (*Connal*). BELGIAN CONGO : Stanleyville (*Schwetz*) ; Leopoldville (*Duren*). TRANSVAAL : Tomango (*Ingram and de Meillon*).

Var. **palustris** Theobald.

Megaculex palustris Theobald, *Novae Culicidae* 1, p. 13 (1911).

F. (M.) hispida var. *palustris* Edwards, *Bull. Ent. Res.* 26, p. 134 (1935).

TYPES.—♂♀ in B.M., Kampala.

Differs from the typical form as follows : Postnotum almost wholly dark brown. Pleurae with a more or less distinct cloud on the anepisternite, behind the spiracle. Scutal integument and scales still darker. Abdominal tergites mostly with lateral pale spots only, but 5-7 usually with the spots larger, extending along the whole of

the sides and also meeting in middle at base. Hind femora rather more extensively dark anteriorly.

Distribution.—UGANDA: Kampala (*Frazer, Hancock, Hopkins*); Entebbe (*Hopkins*); Fort Portal (*Gibbins*). S. RHODESIA: Umtali (*Cuthbertson*). SUDAN: Meridi (*Rutledge*).

Var. **sunyaniensis** Edwards.

F. (M.) hispida var. *sunyaniensis* Edwards, Bull. Ent. Res. 26, p. 134 (1935).

TYPE.—♀ in B.M., Sunyani, Ashanti.

Differs from the typical form as follows: Postnotum entirely dark, and anepisternite with a dark spot, as in var. *palustris*. Abdominal tergites 3–7 in both sexes all with complete basal yellowish bands (tergite 2 with lateral spots only; no pale scales in middle at base). Hind femur as in the type form.

Distribution.—GOLD COAST: Sunyani (*Ingram*).

Ficalbia (Mimomyia) lacustris Edwards.

Ficalbia (Mimomyia) lacustris Edwards, Bull. Ent. Res. 26, p. 134 (1935).

TYPES.—♂♀ in B.M., Entebbe.

Closely allied to *F. (M.) hispida*, differing as follows: Scutal integument and scales almost entirely black or very dark brown, darker than the darkest specimens of *F. hispida*; *ppn* mainly blackish, and all their bristles black (though in contrast the pleurae are yellow, without any dark cloud on the anepisternite, and the postnotum is light brownish). Abdominal tergites 2–7 with small median as well as lateral basal pale spots (often visible only on tergite 2 in slightly shrunken specimens). First segment of flagellum of female antenna rather shorter than in *F. hispida*, not more than 2.5 times as long as second. Ninth tergite of male terminalia longer than broad, with 3–5 bristly hairs along each side.

Distribution.—UGANDA: Entebbe and Jinja (*Hopkins*); Olumat (*Hancock*). BELGIAN CONGO: Stanleyville (*Schwetz*). CHAD TERR.: Fort Lamy (*Galliard*). SUDAN: Thar Jath (*Rutledge*).

Ficalbia (Mimomyia) perplexens Edwards.

Ficalbia (Mimomyia) perplexens Edwards, Bull. Ent. Res. 23, p. 561 (1932).

TYPE.—♀ in B.M., Kampala.

Closely resembles *F. (M.) hispida* Theo., differing as follows: *Head* with the flat scales blackish in colour instead of yellow. First flagellar segment of ♀ antennae somewhat shorter, about 2.5 times as long as second. *Thorax*: Scutal integument and scales blackish, strongly contrasting with the uniformly pale yellow pronotal lobes and pleurae. (Postnotum darkened in middle, as in typical form of *F. hispida*.) *Abdomen*: Tergite 1 with only a small patch of dark scales in middle; tergite 8 dark-scaled like remainder of dorsum (colouring of abdomen otherwise as in typical form of *F. hispida*). *Legs*: Front femora much more extensively yellow, including basal half of anterior surface. Hind femora also more extensively yellow, the dark dorsal

line very narrow. First segment of hind tarsi with a few whitish scales at extreme base.

Distribution.—UGANDA: Kampala (*Hopkins*).

Ficalbia (*Mimomyia*) pallida Edwards.

Mimomyia pallida Edwards, Bull. Ent. Res. 15, p. 263 (1925).

TYPE.—♂♀ in B.M., Fort Johnston.

Much resembles *F. (M.) hispida*, and like it having a yellow-scaled head, but differs as follows: Size rather smaller (wing-length barely 3 mm.). *Head*: First flagellar segment of ♀ antennae shorter, barely twice as long as second. Proboscis dark all round at tip, the pale ventral line ending at about three-fourths of its length. *Thorax*: Scutum much paler, both integument and scales light brown, little darker than pleurae, though somewhat darker in middle than at sides. Postnotum wholly pale yellowish. *Abdomen* with narrow but complete yellow basal bands on each of tergites 2–7 (tergite 8 yellow-scaled as in *F. hispida*). *Legs* with the femora rather more extensively yellowish, the front femora yellowish at base on anterior surface (though not quite to such an extent as in *F. perplexens*), and hind femora with anterior surface mainly yellowish. First hind tarsal segment with a narrow yellow ring at base.

Distribution.—NYASALAND: Fort Johnston (*Lamborn*). GOLD COAST: Bole (*Ingram*). NIGERIA: Lagos (*Connal*). BELGIAN CONGO: Kwango River (*Schwetz*); Matadi (*Wanson*).

Ficalbia (*Mimomyia*) femorata Edwards.

Ficalbia (Mimomyia) femorata Edwards, Proc. R. Ent. Soc. B, 5, p. 54 (1936).

TYPE.—♀ in B.M., Uganda.

Very similar to *F. (M.) pallida*, which it resembles in its general pale colour, possession of a very narrow pale ring at base of first hind tarsal segment, and conspicuously banded abdomen, differing as follows: *Head* with the flat scales rather dark brownish, but varying in tint according to angle of view; first flagellar segment over twice as long as second. *Thorax* with a diffuse patch of blackish scales on front of mesonotum (scales and integument of scutum otherwise light brownish). *Legs*: All femora (instead of only the middle pair) with anterior surface almost entirely black-scaled, and even the posterior surface somewhat darkened (thus differing conspicuously from all other African species of the subgenus). Middle tibiae not distinctly pale posteriorly.

Distribution.—UGANDA: Kibanga, 3.ix.1910 (*Fraser*).

Ficalbia (*Mimomyia*) flavopicta Edwards.

Ficalbia (Mimomyia) flavopicta Edwards, Proc. R. Ent. Soc. B, 5, p. 54 (1936).

TYPE.—♂♀ in B.M., Kisumu.

Very distinct from all other African species by the markings of tarsi and abdomen, as described below; in regard to tarsal markings it resembles several Oriental species,

but these latter all have a flat-scaled vertex and different abdominal markings. The colouring of the head and thorax is suggestive of some species of *Aedes* (*Banksinella*).

♀. *Head* with a large area of narrow yellow scales on vertex, the erect scales on this area also pale yellow. Proboscis entirely dark. Palpi fully one-third as long as proboscis, dark, with a few white scales at tip. Tori dark, with the usual small dark brown scales and hairs. First flagellar segment three times as long as second. *Thorax* with the integument almost wholly dark brown. Scales of scutum largely dark brown but with an irregular mottling of yellow and a rather broad yellow border, the breadth of this border being increased by rather dense yellow scales on upper part of *ppn*. Dorsocentral and acrostichal bristles numerous and long. Mesepimeron with a few minute and inconspicuous hairs towards posterior margin below. *Abdomen* dark brown, without obvious purple gloss; tergites 2-7 with rather broad Λ -shaped yellow bands which reach the base of each segment in the middle but not at the sides, and are not quite in contact with the small yellowish lateral basal spots. *Legs* mainly dark, but tips of tibiae yellowish, and first four segments of all tarsi with narrow white basal rings, these rings most distinct on hind tarsi and just extending over tips of preceding segments; fifth hind tarsal segment all white. *Wings* mainly dark, but first vein with pale creamy-yellow scales on its basal third, a further feature suggestive of the subgenus *Banksinella*.

♂. Resembles ♀. Palpi of the normal form for the subgenus, dark, with narrow whitish rings in middle of shaft and at base of terminal segment.

Wing-length 4 mm.

Distribution.—KENYA: Kisumu (*Symes*).

Ficalbia (Mimomyia) mimomyiaformis Newstead.

Boycia mimomyiaformis Newstead, Ann. Trop. Med. 1, p. 34 (1 Feb. 1907).

? *Ludlowia sudanensis* Theobald, Mon. Cul. 4, p. 195 (18 March, 1907).

Mimomyia mimomyiaformis Edwards, Bull. Ent. Res. 3, p. 37 (1912); Ingram and Macfie, Bull. Ent. Res. 8, p. 89 (1917).

TYPES.—*mimomyiaformis*, ♂♀ in Liverpool, Boma, Congo; *sudanensis*, ♂ lost, Bahr el Jebel.

A small mosquito which might be mistaken for a *Uranotaenia* or for a small *Culex*; distinguished from other members of the genus *Ficalbia* except the much larger *F. plumosa* by the patch of narrow scales in the middle of the head, mottled mesonotum, conspicuously white-banded abdomen, and white-tipped tarsi.

♀. *Head* with an area of narrow whitish scales in middle above extending from nape to vertex; mixed with these narrow scales are rather numerous erect pale yellowish scales which also extend forwards almost to vertex; on each side of this area of narrow and erect scales is an area of flat creamy-white scales, and on each side of this again, towards eye-margins, a patch of flat dark brownish scales. Proboscis blackish, below as well as above, very slightly swollen at tip. Palpi dark, with a few white scales at tip, about a quarter as long as proboscis. Tori light brownish, hairy on inner side as in other members of the subgenus. First flagellar segment usually about twice as long as second, or rather more. *Thorax* with brownish integument, lighter on parts of pleurae but with a darker stripe extending across middle of sternopleura and lower part of mesepimeron. Scutal scales narrow, largely pale brown but with about six patches of dark brown scales, giving the thorax a mottled

appearance; narrow dark brown scales on *ppn*; two rather small patches of creamy-white scales on sternopleura, none on mesepimeron. Dorso-central bristles rather numerous and strong; no acrostichals. Several short pale hairs on lower part of mesepimeron posteriorly. *Abdomen* blackish-brown above, without any purple gloss; tergites 2-7 each with conspicuous white basal bands of moderate and even breadth, these not quite continuous with squarish lateral basal white spots. Sternites largely pale, narrowly dark on posterior margins. *Legs* largely blackish, under and posterior surfaces of femora whitish; tips of femora and tibiae with small creamy-white spots; all tarsi with the joints between segments 1-2 and 2-3 dark; hind tarsi with distal fifth or fourth of third segment white (chiefly on upper surface; usually dark to tip below), whole of fourth and fifth white. *Wings* rather more heavily scaled than in species of the *hispida* group; scales dark except for a fairly long stretch on base of vein R, where they are creamy-white. Halteres with black knob.

♂. Resembles ♀. Palpi mainly dark, with a narrow pale ring in middle; the club-shaped second segment with a few pale bristly hairs. Antennal plume pale brownish.

Wing-length about 2.5-3 mm.

Distribution.—NIGERIA: Lagos (*Connal*); Serri (*Simpson*); Sapele (*Wigglesworth*); Gadau (*Taylor*). BELGIAN CONGO: Boma (*Newstead*); Stanleyville (*Schwetz*). UGANDA: Kampala (*Hopkins*). SUDAN: Bahr el Jebel (*King*); Thar Jath (*Ruttlege*). TANGANYIKA: Dar-es-Salaam (*Pomeroy*). KENYA: Kilifi (*MacDonald*). ZANZIBAR: Pemba I. (*McCarthy*). S. RHODESIA: Shamva (*Leeson*). NYASALAND: Fort Johnston (*Lamborn*). TRANSVAAL: Tzaneen (*de Meillon*). CHAD TERR.: Fort Lamy (*Galliard*).

Dr. A. M. Evans carefully re-examined Newstead's types, with the result that it appears certain that one at least of them belongs to the form described above as typical rather than to the variety *pincerna*. The name *mimomyiaformis* may therefore be applied to this form.

Var. **pincerna** Graham.

Megaculex pincerna Graham, Ann. Mag. Nat. Hist. (8), 5, p. 267 (1910).

Ludlowia pincerna Edwards, Bull. Ent. Res. 2, p. 245 (1911).

TYPES.—♂♀ in B.M., Lagos, Nigeria.

Differs from the typical form as follows: First flagellar segment of ♀ usually only about 1.5 times as long as second (but sometimes longer, up to nearly 2.5 times as long). All tarsi with narrow creamy rings on the joints between segments 1-2 and 2-3 (these rings sometimes faint); third segment of hind tarsi with about the distal third white (both above and below). No other constant differences from the typical form discoverable.

Distribution.—NIGERIA: Lagos (*Graham, Connal*). GOLD COAST: Bole (*Ingram*); Takoradi (*Pomeroy*). UGANDA: Lira and Kampala (*Hopkins*). KENYA: Kilifi (*MacDonald*).

Although this variety has been taken together with the typical form at Lagos and Kampala, the material in the British Museum appears to indicate that var. *pincerna* predominates in the former locality, typical *mimomyiaformis* in the latter.

Ficalbia (Mimomyia) plumosa Theobald.

Culex plumosus Theobald, Mon. Cul. 1, p. 373 (1901).

Culex albitarsis Theobald, Mon. Cul. 2, p. 25 (1901).

Megaculex albitarsis Theobald, Mon. Cul. 4, p. 283 (1907).

Ludlowia plumosa Edwards, Bull. Ent. Res. 2, p. 245 (1911).

Mimomyia plumosa Edwards, Bull. Ent. Res. 3, p. 37 (1912), and 8, p. 332 (1929).

TYPES.—*plumosus*, ♂ in B.M., Salisbury; *albitarsis*, ♂ in B.M., Bonny.

A large mosquito which is unlikely to be confused with any other African species. Hind tarsi white-tipped as in *F. mimomyiaformis*, and many other details of ornamentation similar to that species, but size much larger, scutal scales uniformly dark brown, and dorsocentral bristles absent.

♀. *Head* clothed above with narrow decumbent pale scales and erect dark brown scales; areas of flat pale scales at sides much less extensive than in *F. mimomyiaformis*, no patch of flat dark scales adjoining eyes. Proboscis pale beneath except at tip. Palpi narrowly white-tipped, nearly a third as long as proboscis. Tori with numerous short hairs and very small dark scales on inner side as usual; first flagellar segment nearly three times as long as second. *Thorax* with integument brownish above, pleurae lighter without dark markings. Scutal scales narrow, dense, and uniformly dark brown; no dorsocentral bristles except for a group immediately in front of scutellum, and no acrostichals. Lower mesepimeral hairs present as in *F. mimomyiaformis*. *Abdomen* blackish above; tergites 2-7 marked with white basal bands which do not quite reach the sides and tend to be constricted in middle, also with squarish, lateral white spots which are not basal but placed near the middle of the side of each segment. Sternites yellowish. *Legs* mainly dark; small pale knee-spots present; first two segments of all tarsi with narrow white rings at base, third dark at base; fifth segment of fore and mid tarsi creamy; distal half of third and whole of fourth and fifth segment of hind tarsi white. *Wings* very scantily scaled (much more so than in *F. mimomyiaformis*), all scales dark. Halteres with dark knobs.

♂. Resembles ♀. Palpi with yellowish rings before middle and at tip of shaft; distal club-like segment with rather numerous long dark hairs on one side, no white scales at tip. Antennal plumes pale yellowish-brown. Terminalia (Fig. 6, d-f) of the normal structure for the genus, without noteworthy features.

Wing-length 4.5-6 mm.

Distribution.—NIGERIA: Bonny (*Annett*); Gadau (*Taylor*). GOLD COAST: Bole and Sunyani (*Ingram*). BELGIAN CONGO: Coquilhatville (*Yale Massey*); Stanleyville (*Schwetzn*); Boma (*Duren*). UGANDA: Jinja, Soroti, Kabale and Arua (*Hopkins*). S. RHODESIA: Salisbury (*Marshall*). SUDAN: Meridi (*Rutledge*).

Subgenus **ETORLEPTIOMYIA** Theobald.

Etorleptiomyia Theobald, First Rept. Wellcome Lab., p. 71 (1904).

GENOTYPE.—*E. mediolineata* Theobald.

Palpi of ♂ from two-thirds to five-sixths as long as proboscis, very slightly hairy and with the small terminal segment little if at all swollen. Proboscis of ♂ very much swollen on distal third, of ♀ very slightly so. Antennae of ♀ with first flagellar segment of about the same length as second and following segments. Eyes separated

by a narrow scaly front. Dorsal-central and acrostichal bristles both present; supra-alars moderately long; several pre-alar and upper mesepimeral bristly hairs. One of the bristles in lower sternopleural row strong and black. Whole insect more scaly than in the other subgenera. Scales of vertex mixed. Scales of *apn*, *ppn* and scutellum all or mostly broad and flat. Wings with all the veins densely covered with large broad scales, some of them heart-shaped (whence the generic name). Fork of vein 2 as long as its stem or longer.

Ficalbia (Etorleptiomyia) mediolineata Theobald.

Etorleptiomyia mediolineata Theobald, First Rept. Wellcome Lab. p. 71 (1904).

Etorleptiomyia mediopunctata Theobald (*lapsus*), Gen. Ins. Culicidae, p. 44 (1905), and Mon. Cul. 4, p. 506 (1907).

Anisocheleomyia quadrimaculata Newstead, Ann. Trop. Med. 1, p. 32 (1907).

Mansonioides? mediolineata Edwards, Bull. Ent. Res. 3, p. 24 (1912).

Ficalbia mediolineata Macfie and Ingram, Bull. Ent. Res. 13, p. 423 (1923).

Types.—*mediolineata*, ♀ in B.M., Pibor, Sudan; *quadrimaculata*, ♀ in Liverpool, Boma.

A small mosquito with very distinctive ornamentation, the narrow pale median dorsal line on the dark abdomen distinguishing it readily from any other African Culicine. Wings and legs with light markings.

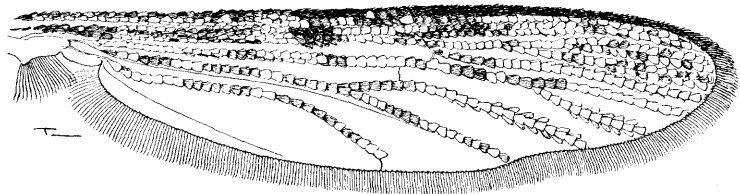


FIG. 24.—Wing of *Ficalbia (Etorleptiomyia) mediolineata* Theo.

♀. *Head* clothed largely with narrow decumbent and broader erect scales above, both types of scales yellowish; narrow yellowish scales on orbits and large patches of flat yellowish scales almost meeting at vertex. Proboscis sprinkled with pale scales above, largely pale beneath except at tip. Palpi narrowly white-tipped, nearly a quarter as long as proboscis. Tori clothed with flat pale scales but without hairs; first flagellar segment not much longer than second. *Thorax* with light brownish integument; postnotum with two dark brown stripes. Scutal scales narrow, largely yellowish in colour, blackish on sides at front and also mottled with black on posterior half. A small blackish spot surrounding the base of the black sternopleural bristle. Post-spiracular area partly scaly. Coxae each with two small spots of black scales, yellow-scaled in middle. *Abdomen* dark brown above with a narrow median dorsal line of pale yellowish scales, this line sometimes very narrowly interrupted on posterior margins of tergites; sternites almost entirely pale; tergites also with small basal lateral triangular yellowish patches, not visible dorsally. *Legs*: Front femora and tibia mainly yellow, with some scattered dark scales and a dark dorsal area beyond middle; middle femora mainly dark, with two yellow spots in front; hind femora mainly dark in front, pale behind; middle tibia mottled; hind tibia mainly blackish; all tarsi purplish-black, with narrow yellow rings at base of

first segment and at tips of each of the first three segments; first segment also with indications of a pale ring in middle. *Wings* (Fig. 24) with all scales very broad; costa entirely dark, but a variable number of whitish scales present on most of the other veins, usually tending to form small spots; stem of upper fork-cell nearly always white-scaled (including base of fork) and a short white spot usually present in middle of sixth vein.

♂. Resembles ♀. Proboscis much more swollen at tip and tending to show a yellow ring beyond middle. Antennal plumes dark brownish.

Wing-length about 2.5 mm.

Distribution.—NIGERIA: Lagos (*Graham, Philip*). GOLD COAST: Accra (*Ingram, Macfie*). UGANDA: Kampala (*Hopkins*). SUDAN: Pibor (*Balfour*); Thar Jath (*Ruttleidge*). NYASALAND: Fort Johnston (*Lamborn*). ZANZIBAR (*Aders*). TRANSVAAL (*Simpson*). BELGIAN CONGO: Leopoldville (*Henrard*); Boma (*Dutton and Todd*). CHAD TERR.: Fort Lamy (*Galliard*).

Subgenus **FICALBIA** Theobald.

Ficalbia Theobald, Mon. Cul. 3, p. 296 (1903).

Mimomyia Theobald (in part), Mon. Cul. 3, p. 304 (1903).

Ingramia Edwards, Bull. Ent. Res. 3, p. 43 (1912).

GENOTYPES.—*Ficalbia*, *Uranotaenia minima* Theobald (India); *Ingramia*, *Mimomyia malfeyti* Newst. (Africa).

Palpi of ♂ (Fig. 25) from one-sixth (in *F. minima*) to nearly two-thirds (in the African species) of the length of proboscis, slender and almost hairless; in ♀ quite short. Proboscis of ♂ much swollen on nearly the distal half, of ♀ only slightly swollen at tip. Antenna of ♀ with first flagellar segment considerably longer than second. Vertex with flat scales. Dorso-central bristles numerous and very long; acrostichal bristles also present but short, in a double row. Supra-alar bristles fewer than usual; one immediately above the narrow paratergite is very long, and (except when displaced in pinned specimens) curves down across upper part of mesepimeron. No pre-alar hairs, and at most 3 (usually 1 or 2) very short and fine upper mesepimerals. Scales of scutum unusually scanty, in both genotypes present only along narrow stripes adjacent to the dorso-central and acrostichal bristles. Pleurae with few or no scales. *Wings* (Fig. 26) with all the scales broad or rather broad and more numerous than in subgenus *Mimomyia* but not so dense as in *Etorleptiomyia*. Fork of vein 2 at least as long as its stem, usually longer. All the species are very small, and might easily be mistaken for *Uranotaenia*.

I have hitherto treated *Ficalbia* and *Ingramia* as two distinct subgenera, but a re-examination of the adults of the two genotypes shows that they are closely similar in almost every respect, including the scaling and chaetotaxy of the thorax; the larvae of both are now known, and are also closely similar. The resemblance is indeed greater in several respects between *F. uniformis* (*malfeyti*) and *F. minima* than it is between *F. uniformis* and the other African species. *F. uniformis* is peculiar in having a minute curved spine at the tip of the front tibia on the underside, and *F. minima* in having the palpi of the male as short as those of the female, but I would now regard these features as of specific value only.

Iyengar (1935) has described the oviposition and figured the eggs of Indian *F. minima*. The eggs are laid in irregular clusters (not closely packed masses as in *Mansonioides*) on leaves of *Pistia*, either along the edge of a leaf, or at the water-level on the upper surface of a leaf that is partly submerged. The egg is broadly rounded at the micropyle end which forms a circular cap on dehiscence, this cap remaining attached to the shell on one side.



FIG. 25.—Head of ♂, *Ficalbia (Ficalbia) circumtestacea* Theo. (After Theobald, 1910.)

***Ficalbia (Ficalbia) uniformis* Theobald**

Mimomyia uniformis Theobald, First Rept. Wellcome Lab., p. 80 (1904), and Mon. Cul. 4, p. 581 (1907).

Ingramia uniformis Edwards, Bull. Ent. Res. 3, p. 45 (1912).

Ficalbia (Ingramia) uniformis Edwards, Gen. Ins. Culicidae, p. 113 (1932).

TYPE.—♀ in B.M., Lado, Sudan.

A small dark species without special ornamentation, but rather well distinguished from almost all other African Culicines by the unusual scantiness of the mesonotal scales.

♀. *Head* clothed with flat pale yellowish-brown scales; some erect forked scales on nape. Proboscis, palpi and antennae dark. Palpi about one-sixth as long as proboscis. First flagellar segment in the typical form almost or quite three times as long as second. *Thorax* with the mesonotal integument shining brown (usually dark but sometimes lighter), in fully mature specimens with a strong bluish-metallic reflection. Dorso-central bristles very numerous and strong; a double row of shorter acrostichal bristles present; rows of small narrow dark brown scales associated with these bristles, and a small patch of similar scales above wing-root, but

scutum otherwise bare. Pleurae pale yellowish, sometimes darkened anteriorly below the spiracle; no scales. *Abdomen* brown above, tergites 2-7 with lateral basal triangular spots which tend to spread out dorsally and may form complete bands; venter pale. *Legs* dark, unmarked except that the lower and posterior surfaces of the femora are yellowish. *Wings* dark-scaled; in the typical form the outstanding scales (*i.e.* chiefly those on the underside of the wing) not very broad,



FIG. 26.—Wing of ♀, *Ficalbia (Ficalbia) circumstacea* Theo. (After Theobald, 1910.)

ligulate, or slightly clubbed. Stem of upper fork-cell in the typical form only slightly shorter than the upper branch of the fork.

♂. Resembles ♀, but proboscis greatly swollen at tip and often largely yellowish. Palpi slender, dark, about two-thirds as long as proboscis. Antennal plumes dark.

Wing-length 2-2.5 mm.

Distribution.—Specimens of the typical form as described above are in the British Museum from the following localities:—SUDAN: Lado (*Balfour*) UGANDA: Kampala (*Hopkins*). BELGIAN CONGO: Elisabethville (*Schwetzn*). NYASALAND: Fort Johnston (*Lamborn*). NIGERIA: Gadau (*Taylor*).

F. uniformis has also been recorded from S. RHODESIA: Salisbury (*Leeson*).

Var. *malfeyti* Newstead.

Mimomyia malfeyti Newstead, Ann. Trop. Med. 1, p. 29 (1907); Theobald, Mon. Cul. 5, p. 537 (1910).

Ingrami malfeyti Edwards, Bull. Ent. Res. 3, p. 44 (1912).

Ficalbia malfeyti Wigglesworth, Bull. Ent. Res. 20, p. 67 (1929).

Ficalbia (Ingramia) uniformis var. *malfeyti* Edwards, Gen. Ins. Culicidae, p. 113 (1932).

TYPEs.—♂♀ in Liyerpool, Boma, Congo.

Differs from the typical form as follows: First flagellar segment of female antenna less elongate, about twice as long as second (slightly more or less). Outstanding wing-scales (on undersides of veins, and on anterior edge of basal part of media) markedly broader, ovate. Upper fork-cell usually somewhat longer, its anterior branch quite one-third as long again as stem (but rather variable). These characters are not always clearly marked.

Distribution.—Specimens which seem definitely to belong to var. *malfeyti* rather than the typical *uniformis* have been examined from the following places: GOLD COAST: Bole (*Ingram*). NIGERIA: Lagos (*Connal*); Sapele (*Wigglesworth*). BELGIAN CONGO: Boma (*Dutton and Todd*); Stanleyville (*Schwetzn*). UGANDA: Kampala and Jinja (*Hopkins*); the specimens from Kampala were not taken at the same time as those of the typical form. SUDAN: Thar Jath and Shambe (*Rutledge*).

Ficalbia (Ficalbia) nigra Theobald.

Aedes niger Theobald, Mon. Cul. 2, p. 237 (1901).

Verrallina nigra Theobald, Mon. Cul. 3, p. 295 (1903).

Mimomyia africana Newstead, Ann. Trop. Med. 1, p. 28 (1907); Theobald, Mon. Cul. 5, p. 539 (1910).

Mimomyia fusca Theobald, Novae Culicidae, 1, p. 32 (1911).

Ingramia nigra Edwards, Bull. Ent. Res. 3, p. 44 (1912).

TYPES.—*niger*, ♀ in B.M., Old Calabar; *africana*, ♀ in Liverpool School of Tropical Medicine, Nouvelle Auvers, Congo; *fusca*, ♀ in B.M., Kampala.

A small black species without special ornamentation, chiefly noteworthy for the extraordinary length of the first flagellar segment of the female antenna.

♀. *Head* clothed with flat blackish scales; very few or no erect scales on nape. Palpi and proboscis dark; palpi very short, scarcely one-eighth as long as proboscis. Tori light brown, almost bare. First flagellar segment five or six times as long as second. *Thorax* dark brown above, slightly shining, but without any bluish-metallic reflections. Dorso-central and acrostichal bristles as in *F. uniformis*, but whole surface rather sparsely covered with dark brown scales. Pleurae lighter than mesonotum, but not conspicuously so; a patch of light brown scales in middle. *Abdomen* blackish above, brown below, unmarked. *Legs* dark brown, except undersides of femora. *Wings* dark, scales all rather broad.

♂. Scales of head lighter; erect forked scales on nape more numerous than in ♀.

♀. Palpi about three-quarters as long as proboscis. Antennal plumes dark.

Wing-length about 2 mm.

Distribution.—NIGERIA: Old Calabar (*Simpson*); Degema (*Collett*); Lagos (*Philip*). BELGIAN CONGO: Kinshasa (*Duren*); Nouvelle Anvers (*Dutton and Todd*). UGANDA: Entebbe (*Hodges*); Kampala (*Fraser*); Kasuku (*Hancock*).

Ficalbia (Ficalbia) circumtestacea Theobald.

Mimomyia circumtestacea Theobald, Third Rept. Wellcome Lab. p. 264 (1908) and Mon. Cul. 5, p. 534 (1910).

Ingramia circumtestacea Edwards, Bull. Ent. Res. 3, p. 44 (1912).

TYPES.—3♀ in B.M., Upper White Nile (*King*).

Resembles *F. nigra* in most respects, including the extremely long first flagellar segment of the female antenna, differing chiefly as follows: Mesonotal integument not entirely dark, but with a conspicuous yellow "collar" occupying the anterior fifth. Abdominal tergites with large basal lateral pale triangles.

Distribution.—SUDAN: Bor, Upper White Nile (*King*); Thar Jath and Shambe (*Ruttledge*). SIERRA LEONE: Pujehun (*Davey*).

TAENIORHYNCHUS Lynch Arribalzaga.*

Taeniorhynchus Lynch Arribalzaga, Rev. Mus. La Plata 1, p. 374 (1891).

Mansonia Blanchard, C.R. Soc. Biol. 53, p. 1045 (1901).

GENOTYPE.—Usually taken as *Culex titillans* Walker.

* The validity of this name and the identity of the genotype have been subjects of much dispute. These questions were referred to the Nomenclature Committee of the Royal Entomological Society of London and the Secretary of the International Commission on Zoological Nomenclature in 1935; they expressed a unanimous opinion in favour of the use of the name *Taeniorhynchus* rather than *Mansonia* for this genus. The position will be stated fully in a forthcoming publication on 'The Generic Names of the British Diptera Nematocera.'

Although this is one of the best-defined genera of mosquitoes in the larval stage, no sharp-cut features have yet been discovered in the adult stage which will separate all the species from all other genera of Culicini. The species may usually be distinguished from *Culex* by the shorter first hind tarsal segment and absence of pulvilli; from *Aedes* by the absence of teeth on the claws; and from *Ficalbia* by the shorter antennae of the males. The following characters are common to all the four subgenera (two of which are purely American).

Head.—Eyes touching, usually for a considerable distance. Orbital bristles in a continuous row. Vertex with numerous narrow erect scales, decumbent scales all narrow. Proboscis of moderate length, not swollen at tip in either sex. Palpi of ♂ as long as proboscis or longer, of ♀ not more than one-quarter as long as proboscis. Antennae of ♂ somewhat shorter than proboscis, plumose, with the last two segments elongate. Antennae of ♀ about as long as proboscis, all flagellar segments about equal in length.

Thorax.—*apn* well separated and bristly. Dorsal-central and acrostichal bristles present. Paratergite narrow and bare. Several strong posterior pronotal and numerous propleural bristles; pre-alar and upper mesepimeral hairs numerous; no spiraculars; usually several bristles about middle of mesepimeron.

Legs with the tibial bristles not unusually long. First hind tarsal segment shorter than tibia. Fourth segment on all tarsi of ♀ as long as fifth or longer. Claws all simple in ♀; on fore and mid legs of ♂ the larger claw usually with two teeth (one near base and one near middle), the smaller claw simple. No pulvilli.

Wings with the scales on upper surface mostly as long as those on the under surface (broad in some species, narrower in others). Vein 6 ending well beyond base of fork of 5; forks of 2 and 4 rather long. Squama with complete fringe. No hairs on veins at base of wing, above or below.

Abdomen with first tergite hairy, some scales in middle but none at sides.

♂. *Terminalia*.—Coxite with strong basal lobe or arm bearing one or two spines at its tip; style with short terminal spine.

♀. *Terminalia* very different in the two subgenera (see below), but in both the ninth tergite is strap-like, insula with numerous hairs, and cerci set nearly vertically and slightly concave above.

KEY TO ETHIOPIAN SPECIES OF TAENIORHYNCHUS.

1. Wing-scales narrow; tarsi without white rings (*Coquillettidia*) 2
- Wing-scales very broad; tarsi with white rings (*Mansonioides*) 15.
2. Dark species; tarsi and wing-scales uniformly dark *metallicus* Theo. (p. 91).
- Lighter species; tarsi and wing-scales partly yellow 3.
3. Brownish species; abdomen with broad dark bands; costa dark
versicolor Edw. (p. 92).
 Lighter; at least the abdomen largely or all yellow; costal scales partly or all yellow 4.
4. Thoracic integument yellow, with dark marks on pleurae 5.
- Thoracic integument otherwise 7.
5. A pair of patches of black scales on anterior half of mesonotum
pseudoconopas Theo. (p. 93).
 Scales on anterior half of mesonotum uniformly golden 6.

6. Wing-scales more uniform *annetti* Theo. (p. 94).
 Dark scales on wings tending to form two transverse bands *maculipennis* Theo. (p. 95).
7. Thoracic integument shining black, abdomen yellow 8.
 Thoracic integument at most brownish above 10.
8. Tibiae all blackish *nigrithorax* Theo. (p. 95).
 Tibiae not all blackish 9.
9. Hind tibiae black with a yellow ring beyond middle *flavocinctus* Edw. (p. 96).
 Hind tibiae yellow with a black ring in middle *cristatus* Theo. (p. 96).
10. Mesonotum largely brown ; wing-scales extensively dark *fuscopennatus* Theo. (p. 97).
 Thorax rather bright orange-yellow, like the abdomen 11.
11. Hind tibia with a black ring in middle 12.
 Hind tibia all yellow, without black ring *microannulatus* Theo. (p. 101).
12. Costa with some dark scales on basal half *grandidieri* Bd. (p. 98).
 Costal scales all yellow 13.
13. Hind tarsi with about the distal third of first segment black ; fourth segment
 yellow at base *aureus* Edw. ; *wahlbergi* Edw. (p. 100).
 Hind tarsi with about the distal fifth of first segment black ; fourth segment all
 black above 14.
14. Male styles with membranous lobe ; usually no black dots on first abdominal
 tergite *aurites* Theo. (p. 99).
 Male styles simple ; first abdominal tergite (as well as others) in both sexes
 with a black dot at each posterior corner *chrysosoma* Edw. (p. 99).
15. Pale scales of thorax arranged in patches ; tibiae with separate white spots
 anteriorly *africanus* Theo. (p. 103).
 Pale scales of thorax arranged in stripes ; tibiae with confluent creamy-white
 patches anteriorly *uniformis* Theo. (p. 105).

Subgenus **COQUILLETIDIA** Dyar.

Coquillettidia Dyar, Proc. Ent. Soc. Wash. 7, p. 45 (1905).

Chrysoconops Theobald (in part, not Goeldii), Mon. Cul. 4, p. 491 (1907).

GENOTYPE.—*Culex perturbans* Walker (North America).

Palpi of ♂ longer than proboscis ; tip of shaft and whole of last two segments somewhat swollen and hairy ; terminal segment not much shorter than penultimate and turned downwards rather than upwards. ♂. Terminalia (Fig. 27) : Basal lobe of coxite bearing a long spine, as long as the lobe itself ; paraprocts with several terminal teeth ; phallosome scoop-shaped but with thickened margins ; a row of fine teeth along each side. Abdomen of ♀ with seventh segment as large as sixth, the tergite rectangular ; eighth small but not retracted, its tergite rather large and without teeth or hooks ; sternite large but unmodified ; cerci scarcely pointed ; subgenital plate not or scarcely emarginate at tip and somewhat elliptical, free from cowl ; spermathecae three, subequal and spherical. In both sexes post-spiracular bristles are absent and the wing-scales are rather narrow (lanceolate to almost linear).

Most of the African species show a tendency to yellow colouring which is rare in other genera of Culicini ; the extreme of flavescence is reached by *T. microannulatus*, which is completely golden. All these yellow species show another rather peculiar feature in that *all* the decumbent scales of the head, including those at the sides and beneath, are narrow. The one African species which has the body and legs dark has

flat scales at the sides of the head, which is also the case in the European and North American species.

According to Hopkins (MS.) the species of this subgenus occurring in UGANDA are commonly found on bushes and vegetation in forests and more occasionally elsewhere. H. H. King notes regarding several species found in the southern Sudan that they were taken in heavily-timbered ravines or in undergrowth of banks.

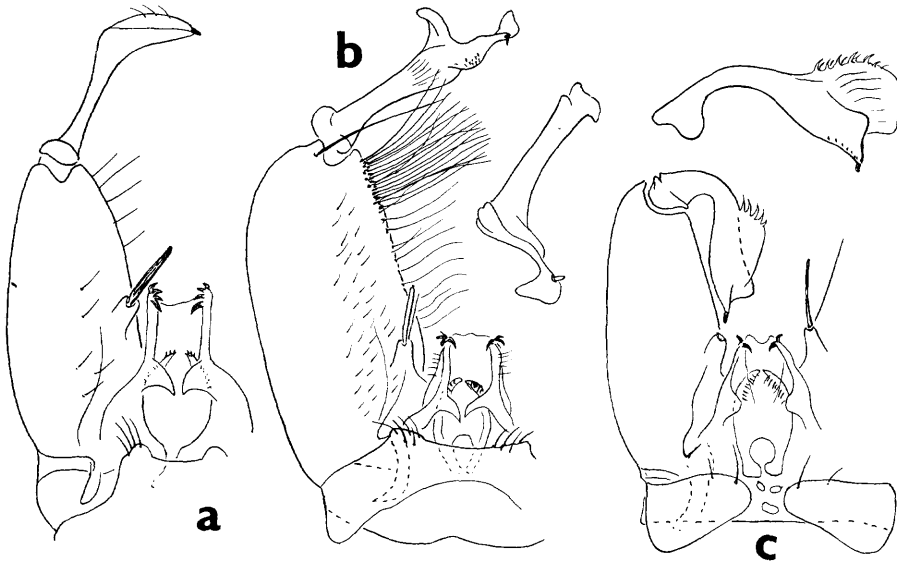


FIG. 27.—Terminalia of *Taeniorhynchus* (*Coquillettidia*) spp. a. *metallicus*. b. *versicolor*. c. *wahlbergi*.

Females of this subgenus form their eggs into rafts which float on the surface of water like those of *Culex*. Hopkins in Uganda has observed that *T. fuscopennatus* and related species will not lay except in darkness

Regarding blood-sucking, Hopkins (MS.) states that *T. fuscopennatus* "enters houses in large numbers and bites viciously at night." King has also recorded *T. cristatus* as biting viciously.

Taeniorhynchus (*Coquillettidia*) *metallicus* Theobald.

Culex metallicus Theobald, Mon. Cul. 2, p. 63 (1901).

(?) *Culex nigrochaetae* Theobald, ♂, Mon. Cul. 2, p. 60 (1901).

Taeniorhynchus violaceus Theobald, Third Rept. Wellcome Lab. p. 262 (1908).

Banksinella metallicus Theobald, Mon. Cul. 5, p. 408 (1910).

Chrysoconops nigra Theobald, Mon. Cul. 5, p. 434 (1910).

Taeniorhynchus metallicus Edwards, Bull. Ent. Res. 2, p. 252 (1911), and 3, p. 279 (1915); Carter, Ann. Trop. Med. 7, p. 588 (1913).

TYPES.—*metallicus*, ♂♀ in B.M., Bonny; *nigrochaetae*, ♂ lost, Lagos; *violaceus*, ♀ in B.M., Sudan; *nigra*, ♀ in B.M., Angola.

A dark species with unbanded legs, which might well be mistaken for a *Culex*, but easily identified by the large area of whitish scales covering most of the scutum, and the purplish, unbanded abdomen, these features not being found in combination in any other African culicine.

♀. *Head* dark brown, clothed with dark upright forked scales and whitish decumbent narrow scales, the former very long and narrow. Clypeus and tori blackish, bare. Proboscis blackish. Palpi blackish, about one-fourth as long as proboscis. *Thorax* with the integument almost uniformly blackish except for the yellowish scutellum; scutum scarcely shining. Anterior half or more of scutum covered with narrow creamy-white scales, posterior half rather more thinly scaled, scales dark brown except for some white ones around pre-scutellar area; scutellum with a few whitish scales, mid lobe with four strong bristles. Two small patches of silvery-white scales on sternopleura, but pleurae otherwise bare of scales (none on *ppn* or mesepimeron). *Abdomen* dark purple or violet above, tergites with small basal lateral whitish spots; sternites dark, with basal whitish bands. *Legs* mainly dark, the femora and tibiae with strong purple reflections; posterior surface of front tibia and dorsal surface of middle tibia and tarsus tending to be creamy; no knee-spots; hind femur largely whitish. *Wings* uniformly dark-scaled.

♂. Ornamentation as in ♀. Palpi exceeding proboscis by only half the length of terminal segment, wholly blackish; last two segments with dark hair-tufts. *Terminalia* (Fig. 27, a) of the normal structure for the subgenus, differing from those of the yellow species only in the form of the style, which is much swollen and keeled on the distal half, but without any membranous expansion.

Wing-length about 4 mm.

Distribution.—SIERRA LEONE: Belo (*Hargreaves*). GOLD COAST: Accra (*Mrs. W. Smith*). NIGERIA: Bonny (*Annett*); Lagos (*Graham*); Onitsha (*Wigglesworth*). BELGIAN CONGO: Mahagi Port, Lake Albert (*Schwetz*); Mwabo (*Seydel*); Boma (*Nicolay*); Ituri (*Collert*). UGANDA: Busoga (*Hodges*); Entebbe (*Gowdey*). SUDAN: Khor Felus (*King*). KENYA: Witu (*Neave*). NYASALAND: Karonga (*Eldred*). NATAL: Durban (*Bevis*). ANGOLA (*Wellman*). BECHUANALAND (*Lamborn*).

Taeniorhynchus (Coquillettidia) versicolor Edwards.

Taeniorhynchus versicolor Edwards, Bull. Ent. Res. 4, p. 50 (1913).

TYPE.—♀ in B.M., Nairobi.

A rather large species with banded legs, the hind tibia yellowish with black rings in middle and at tip. Differs from other species with similar leg-markings in the general tint being more brownish and the abdomen more extensively dark above, also in the arrangement of the light and dark scales of the wing. *Terminalia* of very distinctive structure.

♀. *Head* with numerous narrow erect forked scales and narrow yellowish decumbent scales. Tori brownish-yellow, clypeus darker. Palpi and proboscis yellowish, black-tipped, with a rather variable number of scattered black scales on the yellow parts. *Thorax* with the integument for the most part light brownish-yellow, scutum with three broad slightly darker brown stripes, the middle one abbreviated in front, side stripes abbreviated behind; pleurae with some obscurely darker patches, including small areas in middle of sternopleura, towards upper and lower margins of mesepimeron and on lower part of meron; base of hind coxa also darkened. Scutum and scutellum fairly densely covered with narrow scales, almost uniformly golden-brown in colour; bristles dark brown. Fairly large patches of creamy scales in

middle of sternopleura and in middle of mesepimeron, none on posterior pronotal lobes. *Abdomen* largely dark purplish-brown above, with complete basal pale yellowish bands on tergites 2-7, those of 5-7 much broadened laterally, tending to leave only a median apical triangle dark. Sternites mainly yellowish, with dark apical bands or triangles. *Legs*: Femora and the four anterior tibiae with mixed dark and light scales, the former tending to predominate, especially on anterior surface of mid-femora. Hind tibiae largely yellow, but tip rather broadly black, a black ring just beyond middle, and rather numerous dark scales on basal fourth. Tarsi with the first three segments yellow with black apical rings, last two segments all black; on the hind tarsi about the distal third of the first segment and rather more than the distal half of the second and third black. *Wings* predominantly dark; the costa either all dark or with a variable number of pale scales intermixed, usually also yellow-scaled at tip of wing; stems of forks, basal part of third vein, tip of upper branch of second vein and tip of lower branch of fifth vein more or less completely yellow scaled.

♂. Ornamentation as in ♀, but pale-scaled areas on wings less noticeable. Palpi exceeding proboscis by rather less than the length of the terminal segment; tip of shaft, distal half or so of penultimate and most of terminal segment blackish. *Terminalia* (Fig. 27, b) differing from those of all the other African species of the subgenus in having a conspicuous tuft of hairs on inner face of coxite near tip, and the spine on the basal lobe less developed. Coxites considerably swollen. Style of remarkable shape, with an expansion at the tip and another membranous expansion beyond middle; between these two expansions it is constricted; no hairs present.

Wing-length 4.5 mm. (♂) to 6 mm. (♀).

Distribution.—KENYA: Nairobi and Kabete (*Anderson*). UGANDA: Mbarara and Kabale (*McConnell*). BELGIAN CONGO: Blukwa, L. Albert (*Schwetz*); Elisabethville (*Seydel*); Lake Luhondo, Kivu (*Schwetz*).

Taeniorhynchus (Coquillettidia) pseudoconopas Theobald.

Chrysoconops pseudoconopas Theobald, Mon. Cul. 5, p. 443 (1910).

TYPE.—♀ in B.M., Mpumu, Uganda.

A predominantly yellow species, distinguished from most others with similar colouring by the distinct blackish marks on the yellow pleurae; the presence of distinct though rather narrow dark apical bands on the abdominal tergites; the dull (not shining) integument and rather denser covering of scales on the scutum; and the presence of fairly numerous scales on the scutellum. Differs from the two nearly allied species (*T. annetti* and *maculipennis*) in the presence of patches of black scales on anterior half of scutum and broader black rings of the hind tarsi.

♀. *Head* yellowish; all scales (erect and decumbent) yellow. Tori and clypeus yellow. Proboscis yellow, narrowly black at base and tip. Palpi yellow, with black tip and some black scales near base. *Thorax* with integument yellow, with a small brownish area on each side of scutum in front of wing-base, and distinct blackish marks on pleurae arranged as follows: a spot on post-spiracular area; another of equal size on upper part of mesepimeron; a smaller spot near lower edge of mesepimeron, in continuation of a stripe extending across middle of sternopleura; lower

part of meron also dark. Scales of scutum mostly golden-yellow on anterior two-thirds, black on posterior third; a pair of patches of black scales (rather variable in extent) towards front margin. Patches of yellowish scales present in middle of sternopleura and in middle of mesepimeron. *Abdomen* with integument mainly yellow, but dark brown areas present on apical corners of tergites; scales mostly yellow, but dark brown apical bands present on tergites 2-6 and in some specimens tergites 2-4 mainly brown-scaled. *Legs* yellow, with numerous dark scales on femora and on anterior tibiae; hind tibia with a narrow black ring in middle and another at tip; front and mid tarsi with each segment rather narrowly black at tip; hind tarsi with about the distal fourth of the first segment, distal half of second and third, and all except base of fourth and fifth segments black. *Wings* mainly yellow-scaled, costa almost entirely so; dark scales numerous on forks and on some other veins, especially the sixth, but not tending to give a spotted or ornamented appearance to the wing.

♂. Ornamentation as in ♀. Palpi exceeding proboscis by length of terminal segment; tip of shaft narrowly, of penultimate broadly black. *Terminalia* of the normal type for the subgenus, closely resembling those of *T. annetti*; style (Fig. 28, c) with a large, bare expansion on middle third, some fine hairs on outer margin on distal third.

Wing-length 5-6 mm.

Distribution.—UGANDA: Mpumu (*Sir D. Bruce*); Entebbe (*Gowdey*); Dwoli (*Hancock*); Nsagu (*Hopkins*). BELGIAN CONGO: Stanleyville (*Schwetz, Mouchet*); Deti, Ituri Forest (*F. Ron Smith*); Matadi (*Wanson*).

T. pseudoconopas has been treated as a synonym of *T. annetti*, on account of the close resemblance if not absolute identity of hypopygial structure; the differences in ornamentation however are quite well marked, and I now consider that it should be recognized as a distinct species. There are other instances in this subgenus (as also in *Ficalbia*) of forms which appear externally well distinguished showing no tangible differences in the terminalia.

Taeniorhynchus (Coquillettidia) annetti Theobald.

Taeniorhynchus Annettii Theobald, Mon. Cul. 2, p. 205 (1901).

Chrysoconops Annettii Theobald, Mon. Cul. 4, p. 491 (1907).

Taeniorhynchus annetti Edwards, Bull. Ent. Res. 2, p. 253 (1911), and 5, p. 279 (1915) [excl. syn.];

Carter, Ann. Trop. Med. 7, p. 586 (1913).

Mansonia annetti Dyar, Insec. Inscit. 13, p. 42 (1925).

TYPES.—♂♀ in B.M., Old Calabar.

Differs from *T. (C.) pseudoconopas* as follows: No black scales on anterior two-thirds of scutum, the whole of this area being clothed with bright golden-yellow scales. Sternopleura with its lower half almost uniformly darkened, so that the dark stripe across the middle does not stand out so clearly as in *T. pseudoconopas* (though the dark spot near lower edge of mesepimeron is quite distinct). Black rings of hind tarsi narrower; on the first segment the distal sixth and on the following three segments about the distal third black. Perhaps a slight though not readily definable difference in the shape of the ♂ style (Fig. 28, a).

Distribution.—NIGERIA: Old Calabar (*Annett*); Aro (*Neale*); Lagos (*Graham*);

Onitsha (*Wigglesworth*); Warri (*H. M. Douglas*); Akassa (*J. H. Collett*). Records from other countries require confirmation.

Taeniorhynchus (Coquillettida) maculipennis Theobald.

Chrysoconops maculipennis Theobald, *Novae Cul.* p. 27 (1911).

Taeniorhynchus maculipennis Carter, *Ann. Trop. Med.* 7, p. 585 (1913); Edwards, *Bull. Ent. Res.* 5, p. 279 (1915).

Mansonia maculipennis Dyar, *Insec. Inscit.* 13, p. 42 (1925).

Types.—♂♀ in B.M., Kampala.

Closely resembles *T. annetti*, notably in ornamentation of mesonotum and legs, differing chiefly as follows: Black mark near lower edge of mesepimeron often absent or indistinct. Stripe across middle of sternopleura distinct (as in *T. pseudoconopas*), the area below it not darkened. Wings with the dark scales tending to form two transverse bands, one in the middle and one near tip across forks (leaving tip and costal margin yellow), sixth vein dark. Style of ♂ *terminalia* (Fig. 28, b) quite differently shaped, being only very slightly widened in the middle and with a constriction beyond this widening, the tip narrower than in *T. annetti*.

Distribution.—UGANDA: Kampala (*Fraser, Baker, Hancock*); Ruwenzori foothills (*Edwards*). SUDAN: Meridi (*Rutledge*). NIGERIA: Kaduna and Kau Kanke, Zaria Prov. (*W. B. Johnson*). TANGANYIKA: Lueba, near Baraka (*R. Beis*). NYASALAND: Mlanje and Blantyre (*Davey*). TRANSVAAL: Tzaneen (*de Meillon*). BELGIAN CONGO: Albertville (*Henward*); Elisabethville (*Walravens*). N. RHODESIA: Ndola (*Jackson*).

Taeniorhynchus (Coquillettida) nigrithorax Theobald.

Chrysoconops nigrithorax Theobald, *Mon. Cul.* 5, p. 439 (1910).

Taeniorhynchus nigrithorax Edwards, *Bull. Ent. Res.* 2, p. 252 (1911).

Types.—♂♀ in B.M., Angola.

A species with very distinctive colouring, with shining black thorax, yellow abdomen, black tibiae and banded tarsi, this combination of characters being unknown in any other mosquito.

♀. *Head* yellow above, with dark brown erect scales and yellow decumbent narrow scales. Tori and clypeus dark brown; first three or four segments of antennal flagellum yellowish. Proboscis yellow, with about the distal fourth blackened. Palpi about one-fourth as long as proboscis, with mixed black and yellow scales, the former predominating. *Thorax* with the integument almost wholly shining black, including scutellum. Scutum with a scanty covering of yellowish scales, practically bare at sides; scutellum bare of scales, with six bristles on mid lobe. Patches of silvery-white scales present in middle of sternopleura and mesepimeron. *Abdomen* wholly yellow (integument and scales), no darkening even on corners of tergites. *Legs* with the coxae yellow; femora and tibiae almost wholly clothed with dark purple-metallic scales, even the hind femora yellowish for only a short distance at the base both in front and behind. Front and middle tarsi with the first two segments yellow with black tips, third mainly and fourth and fifth completely black. Hind tarsi black, with proximal half of first and rather less than proximal half of

second and third segments yellow. *Wings* with mixed yellow and black scales, the former predominating, especially on and towards costa.

♂. Ornamentation as in ♀, except that (in the single specimen available) the first hind tarsal segment is more extensively dark. Palpi exceeding proboscis by about length of terminal segment; shaft yellow, its tip and the whole of the last two segments black, plumes largely yellowish. *Terminalia* of the normal structure for the subgenus; style (Fig. 28, d) with a moderately large thin membranous expansion on outer side beyond middle, this expansion with a few hairs on its outer margin, the whole structure apparently identical with that of *T. fuscopennatus*.

Wing-length 4–5 mm.

Distribution.—ANGOLA: locality unrecorded (*Wellman*); Luimbale, Mt. Moco, 1800–1900 m. (*K. Jordan*).

Taeniorhynchus (Coquillettidia) flavocinctus Edwards.

Taeniorhynchus (Coquillettidia) flavocinctus Edwards, Proc. R. Ent. Soc. B, 5, p. 54 (1936).

TYPES.—♂♀ in B.M., Lubumbashi, Congo.

Much resembles *T. nigrithorax*, of which it is probably a geographical form, but differs as follows: Front and middle tibiae less uniformly dark. Hind tibia with a yellow ring before the tip. All femora rather more extensively yellow towards base; posterior surface of hind femora yellow nearly to middle. Abdomen with a variable number of black scales, especially towards posterior margins of both tergites and sternites; in some specimens posterior corners of tergites somewhat darkened but not black. Palpi of ♂ with base of penultimate segment yellow; terminalia agreeing in structure with *T. nigrithorax* and *T. fuscopennatus*.

Distribution.—BELGIAN CONGO: Lubumbashi, Kabunda, Futwe and Mwabo (*Seydel*); Elisabethville (*Schwetz*). TANGANYIKA TERR. (*R. F. Johnstone*). N. RHODESIA: Ndola (*Jackson*).

Taeniorhynchus (Coquillettidia) cristatus Theobald.

Chrysoconops cristatus Theobald, First Rept. Wellc. Lab. p. 78 (1904).

Taeniorhynchus cristatus Edwards, Bull. Ent. Res. 2, p. 253 (1911).

Chrysoconops nocturnus Theobald, Ann. Trop. Med. 7, p. 593 (1913); Edwards, Bull. Ent. Res. 15, p. 261 (1925).

TYPES.—*cristatus*, ♀ in B.M., Pibor, Sudan; *nocturnus*, ♀ in Liverpool School of Tropical Medicine, Bahr-el-Ghazal.

Resembles the last two species in its shining black thorax and yellow abdomen, but with the legs much more extensively yellow, the hind tibia with a black ring in middle as in *T. aurites* and related species.

♀. *Head* as in *T. nigrithorax*, except that the palpi are yellow, with a few black scales at the tip. *Thorax* and *abdomen* as in *T. nigrithorax*. *Legs* mainly yellow. All femora with the tips rather narrowly black and with scattered dark scales on anterior surface (less numerous on hind pair). Front and middle tibiae similar, but the tips less noticeably black. Hind tibia with a black ring in or scarcely beyond

middle, and with a rather narrower black tip. Front and middle tarsi yellow, with tips of first three segments narrowly dark, last two segments dark. Hind tarsi black, with slightly more than proximal half of first segment and half or less of following three segments yellow. *Wings* yellow, with a few scattered black scales.

♂. Ornamentation as in ♀. Palpi mainly yellow; a small spot of black scales at tip of shaft, distal half of penultimate and whole of terminal segment black-scaled, plumes mostly dark. Terminalia practically as in *nigrithorax*; membranous expansion of style moderately large and almost or quite bare (Fig. 28, i).

Wing length 4.5 mm.

Distribution.—SUDAN: Pibor (*Balfour*); Lau (*King*); Shamba, Thar Jath and Meridi (*Ruttlege*). UGANDA: Soroti (*Hopkins*). BELGIAN CONGO: Usumbara, Thysville and Kabinda, Katanga (*Schweetz*); Kisantu (*Le Wulf*). PORTUGUESE CONGO: San Salvador (*M. Gamble*). NYASALAND: L. Kilwa (*Neave*). SIERRA LEONE: Liberian border (*J. C. Murphy*); Kailahun (*Davey*). S. RHODESIA: Salisbury (*Leeson*).

Taeniorhynchus (Coquillettia) fuscopennatus Theobald.

Taeniorhynchus fuscopennatus Theobald, Mon. Cul. 3, p. 265 (1903); Edwards, Bull. Ent. Res. 2, p. 253 (1911), and 3, p. 26 (1912).

Chrysoconops fuscopennatus Theobald, Mon. Cul. 4, p. 492 (1907).

Culex drymoecius Speiser, Kilimandjaro Meru Exp., Dipt. Orth. p. 42 (1909).

Chrysoconops bakeri Theobald, Novae Cul., p. 19 (1911).

TYPES.—*fuscopennatus*, ♀ in B.M., Entebbe; *bakeri*, ♀ in B.M., Kampala; *drymoecius*, ♀ in Stockholm, Kilimandjaro and Usambara.

A yellowish-brown insect, resembling *T. cristatus* in many respects, but with the thorax much lighter. Differs from the other species having a black ring in the middle of the hind tibia in the more plentiful sprinkling of black scales on the abdomen, legs and wings.

♀. *Head* yellowish; erect scales brownish, decumbent scales yellow. Proboscis yellow, narrowly black at tip and with some black scales at base beneath. Palpi yellow, with a few black scales at tip. *Thorax* with integument somewhat shining, light yellowish-brown, scutum sometimes darker towards sides, but in typical examples with prescutellar area as well as scutellum yellowish. Scutum as in related species with rather scanty covering of scales; no scales on scutellum. No markings on pleurae, except that the postspiracular area and upper part of mesepimeron are indistinctly darkened. The usual patches of white scales present in middle of sternopleura and mesepimeron. *Abdomen* mainly yellow, but tending to appear brownish owing to extensive admixture of dark scales; these dark scales especially numerous towards posterior margins of segments but without producing definite bands. First tergite with a black integumental spot on each posterior corner; traces of similar but smaller spots on other tergites. *Legs* largely yellow, but with very numerous black scales on femora and on the four anterior tibiae. Hind tibia with a black ring in middle and a rather narrower one at tip. Front and middle tarsi with first three segments rather broadly black at tip; hind tarsi black, with rather more than proximal half of first and rather less than proximal half of second and third segments yellow; fourth segment usually narrowly yellow at base. *Wings*

with numerous dark scales evenly sprinkled on all the veins ; in the darkest specimens however the yellow scales remain fairly numerous on costa.

♂. Resembles ♀ in ornamentation. Palpi exceeding proboscis by length of last segment ; shaft yellow with tip narrowly black, penultimate segment with nearly the basal half yellow ; plumes mainly dark. *Terminalia* : Style (Fig. 28, f) with a moderately large median external membranous expansion, the structure exactly as in *T. nigrithorax*.

Wing-length about 5 mm.

Distribution —UGANDA : Entebbe (*Moffat, Low, Grieg, Bruce*) ; Kampala (*Fraser*) ; Kibera (*Christy*) ; Mbarara (*McConnell*). KENYA : Nairobi (*Anderson*). ABYSSINIA : Lake Awusa (*Nystrum*). ANGOLA : San Salvador (*Gamble*). BELGIAN CONGO : Katanga and Kivu (*Schwetz, Seydel*) ; Ituri (*Collart*). TANGANYIKA : Bulsoba (*Ritchie*) ; near Baraha (*Bois*). Also recorded from the Transvaal and Natal by Bedford.

Variation.—The specimens from Kivu and Tanganyika differ from the typical form in having the thorax darker, the scutellum being blackish. In one female from Entebbe referred doubtfully to this species the front and middle tarsi are almost entirely yellow, its other characters agreeing with the type.

Taeniorhynchus (Coquillettidia) grandidieri Blanchard.

Culex flavus Ventrillon [nec Motschulsky], Bull. Mus. Paris, 10, p. 550 (1904).

Taeniorhynchus flavus Edwards, Bull. Ent. Res. 11, p. 135 (1920).

Culex grandidieri Blanchard, Les Moust. p. 607 (1905).

Mansonia (Coquillettidia) grandidieri Edwards, Gen. Ins. 194, p. 118 (1932).

TYPES.—♂♀ in Paris, Madagascar.

A rather bright yellow species ; legs mainly yellow, but hind tibia with a black median ring and hind tarsi extensively black ; wings with many dark scales on costa.

♀. *Head* yellow, including clypeus and tori, also all scales. Proboscis yellow, narrowly black at tip and at base beneath. Palpi yellow, tip rather broadly clothed with black scales (more extensively so than in *T. fuscopennatus*). *Thorax* with integument wholly yellow ; patches of pleural scales white as usual. Very few scales on scutellum. Scales of scutum mostly light brownish-yellow with some mottling of golden yellow. *Abdomen* yellow, with a few black scales towards posterior margins of segments ; first tergite with a small black dot at each posterior corner. *Legs* yellow, with scattered black scales on femora and front and middle tibiae, less numerous than in *T. fuscopennatus*. All tibiae narrowly black at tips ; hind tibia with a black ring in middle. Front tarsi with segments 1-2, mid tarsi with segments 1-3 yellow, rather narrowly black at tips, remainder black. Hind tarsi with proximal two-thirds of first segment and proximal half of second and third segments yellow, remainder black. *Wings* with numerous dark scales on most of the veins, but distal part of costa and first vein, as well as stems of fork cells and bases of forks, with yellow scales only.

♂. *Terminalia* similar to those of *fuscopennatus*.

Wing-length 5 mm.

Distribution.—MADAGASCAR : Tananarive (*Ventrillon*).

Taeniorhynchus (Coquillettidia) aurites Theobald.

Taeniorhynchus aurites Theobald, Mon. Cul. 2, p. 209 (1901); Edwards, Bull. Ent. Res. 2, p. 252 (1911), and 3, p. 25 (1912).

Chrysoconops aurites Theobald, Mon. Cul. 4, p. 493 (1907).

Chrysoconops fraseri Theobald, Novae Cul. p. 22 (1911).

(?) *Taeniorhynchus auripennis* Edwards (♂ only), Bull. Ent. Res. 5, p. 279 (1915).

TYPES.—*aurites*, ♀ in B.M., Bonny; *fraseri*, ♂♀ in B.M., Kampala.

A bright yellow species; thorax and wings entirely yellow; legs mainly yellow, but with a distinct black ring in middle of hind tibia as in several related species. Fourth hind tarsal segment all black.

♀. *Head* yellow, including clypeus, tori and all scales. Proboscis yellow, narrowly black at tip and at base beneath. Palpi yellow, usually with a few black scales at tip, but these sometimes absent. *Thorax* bright yellow, including mesonotal scales and bristles; the usual two patches of white scales on pleurae; integument underlying these white pleural scales somewhat darkened. *Abdomen* bright yellow, often with a few black scales which are apt to be most numerous towards posterior margins of tergites 2-4. Small black dots on integument at posterior corners of tergites 2-5, usually only clearly visible when the abdomen is distended; similar dots sometimes present also on tergites 1 and 6, but more frequently absent from tergite 1. *Legs* yellow, with only a few scattered black scales on femora and on anterior tibiae; hind tibia with a narrow black ring in middle and very narrowly black at tip. Front tarsi yellow, tips of segments black (more broadly in some specimens than others; in the type female the black tips hardly distinguishable). Middle tarsi almost entirely yellow. Hind tarsi with segment 1 yellow with a black tip usually occupying only about one-sixth of its length; 2 and 3 with about the distal half black (sometimes segment 3 almost entirely black); 4 and 5 all black. *Wings* usually entirely yellow, sometimes a few dark scales present, especially on vein 6.

♂. Ornamentation as in ♀. Palpi exceeding proboscis by length of last segment; yellow; with a few black scales at tip of shaft and more at tip of penultimate segment; most of terminal segment black, plumes yellow. Abdominal tergites 2-4 often with narrow black apical bands or triangles. *Terminalia*: Style (Fig. 28, e) with a membranous expansion in middle, somewhat larger and more hairy than that of *T. fuscopennatus*.

Wing-length about 5 mm.

Distribution.—NIGERIA: Bonny (*Annett*); Lagos (*Philip, Graham*). GABOON: Fernan Vaz (*Galliard*). UGANDA: Entebbe (*Hodges*); Kampala (*Fraser, Hancock*). BELGIAN CONGO: Stanleyville and Lake Albert (*Schwetz*); Sandoa (*Chaussier*); Futwe and Mwabo (*Seydel*).

Records from the Southern Sudan (*King*) require confirmation, as males recently obtained in that region prove to be *chrysosoma*.

Taeniorhynchus (Coquillettidia) chrysosoma Edwards.

Taeniorhynchus chrysosoma Edwards, Bull. Ent. Res. 5, p. 281 (1915).

TYPE.—♂ in B.M., Karonga, Nyasaland.

Closely resembles *T. aurites*, differing almost solely in the form of the ♂ style

(Fig. 28, j), which is entirely simple, without a trace of the median membranous expansion found in other species of this group. A black dot is constantly present on the posterior corners of the first tergite; the palpi and abdomen of the male have fewer black scales than in *T. aurites*, and very few or no black scales are present on the palpi or abdomen of the female.

Distribution.—NYASALAND: Karonga (*Eldred*); Cholo (*Wood*); L. Chilwa (*Neave*); Maiwale (*Lamborn*). SUDAN: Bor to Tercekka, Kaka, Jebelein, Tonga (*Rutledge*).

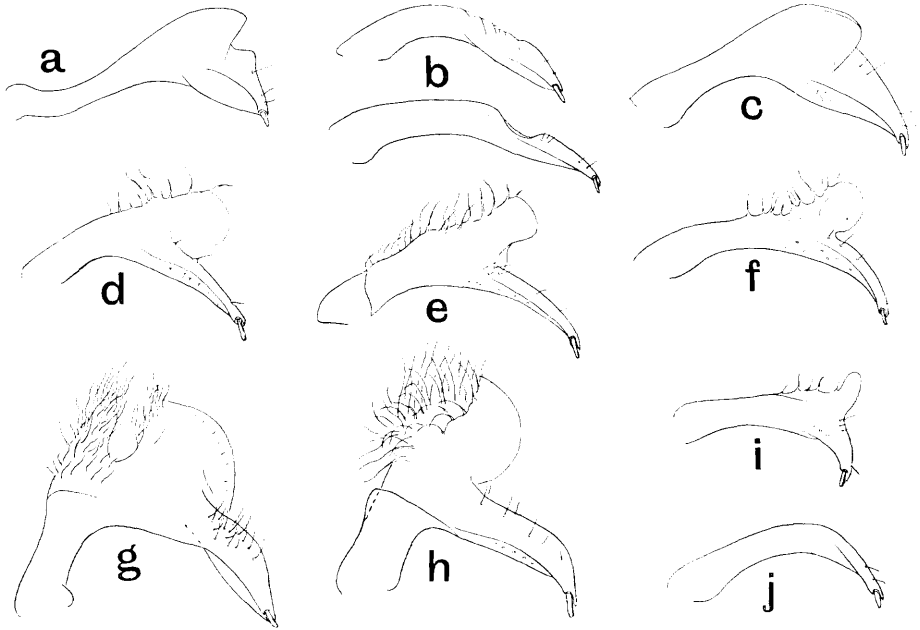


FIG. 28.—Male styles of *Taeniorhynchus* (*Coquillettia*) spp. a. *annetti*. b. *maculipennis* (two aspects). c. *pseudoconopas*. d. *nigrithorax*. e. *aurites*. f. *fuscopennatus*. g. *microannulatus*. h. *aureus*. i. *cristatus*. j. *chrysosoma*.

***Taeniorhynchus* (*Coquillettia*) *aureus* Edwards.**

Taeniorhynchus aureus Edwards, Bull. Ent. Res. 5, p. 281 (1915).

Mansonia aurea Dyar, Insec. Inscit. 13, p. 42 (1925).

TYPE.—♂ in B.M., Durban.

Closely resembles *T. aurites*, differing as follows: Hind tarsi with about the distal third of first segment black and with a distinct yellow ring at base of fourth segment. Few or no black scales on abdomen. *Terminalia* with the style (Fig. 28, h) larger, more bent, with a very large and very hairy median membranous expansion.

Distribution.—NATAL: Durban (*Muir, Chubb*). TANGANYIKA: Lueba, near Baraka (*R. Bois*). SUDAN: Menzi River (*King*); Meridi (*Rutledge*). BELGIAN CONGO: Elisabethville (*Seydel*). TRANSVAAL: Crocodile River (*Ingram*).

Taeniorhynchus (Coquillettia) wahlbergi Edwards.

Taeniorhynchus (Coquillettia) wahlbergi Edwards, Proc. R. Ent. Soc. B, 5, p. 55 (1936).

TYPE.—♂ in Stockholm Mus., Caffraria.

Closely resembles *T. aureus*, the hind tarsi having the same ornamentation, but abdomen with fairly numerous black scales on posterior borders of tergites, at least in ♂. *Terminalia* (Fig. 27, c) with the style quite different from that of either *T. aurites* or *aureus*; membranous expansion large but not very hairy and placed close to tip of style, with only a small beak-like projection beyond it.

Distribution.—S. Africa: Caffraria, *Wahlberg*.

Taeniorhynchus (Coquillettia) microannulatus Theobald.

Chrysoconops microannulata Theobald, Novae Cul. p. 26 (1911).

Taeniorhynchus microannulatus Edwards, Bull. Ent. Res. 3, p. 26 (1912), and 5, p. 278 (1915).

Taeniorhynchus chubbi Edwards, Bull. Ent. Res. 5, p. 280 (1915).

TYPES.—*microannulata*, ♀ in B.M., Kampala; *chubbi*, ♂ in B.M., Durban.

An almost completely yellow species; without any black ring on hind tibia, but with some dark scales on lower half of wing.

♀. *Head* yellow; some black scales at tips of palpi and proboscis, but none at base of latter. *Thorax* yellow (integument, scales and bristles); three inconspicuous patches of whitish scales on pleurae, two on sternopleura, the third as usual in middle of mesepimeron. *Abdomen* yellow; the usual dark dots at posterior corners of tergites, but no black scales. *Legs* yellow; few scattered black scales on femora and tibiae; all tarsi alike yellow, with tips of segments very narrowly black. *Wings* mainly yellow, but with rather numerous dark scales on lower half, more especially on sixth vein.

♂. Resembles ♀ in ornamentation; palpi with more black scales at tip. *Terminalia* almost exactly as in *T. aureus*, with an enormous hairy lobe in middle of style (Fig. 28, g).

Distribution.—NATAL: Durban (*Bevis*). UGANDA: Kampala (*Fraser, Hopkins*). SUDAN: Thar Jath (*Rutledge*). N. RHODESIA: Ndola (*Jackson*).

Var. **auripennis** Edwards.

Taeniorhynchus auripennis Edwards (♀ only), Bull. Ent. Res. 5, p. 279 (1915).

TYPE.—♀ in B.M., Entebbe.

Differs from typical *T. microannulatus* in having no dark scales on the palpi or wings; no obvious difference in terminalia.

Distribution.—UGANDA: Entebbe (*Grieg*). SUDAN: Bahr-el-Jebel (*Balfour*); S. of Shambe, Bahr el Ghazal (*King*); Wad Medani (*H. B. Johnston*); Thar Jath (*Rutledge*). TANGANYIKA: River Mto-ja-Kifaru, 600 m. (*C. Katona; Budapest Mus.*).

A re-examination of the types indicates the probability that the male type is a badly denuded specimen (lacking hind legs) of *T. aurites*, leaving the name applicable to the female type, which is most probably only a pale specimen of *T. microannulatus*. Two males examined with similar colouring (from Thar Jath and Kitona) have the terminalia as in *T. microannulatus*.

Subgenus **MANSONIOIDES** Theobald.

Mansonioides Theobald, Mon. Cul. 4, p. 498 (1907).

GENOTYPE.—*M. septemguttata* Theobald (Oriental Region).

Palpi of ♂ (Fig. 29) about as long as proboscis, not swollen apically and only moderately hairy; penultimate segment rather long and strongly upturned, terminal segment minute. Basal lobe of coxite in the form of a long arm with a short spine at its tip; paraprocts with several terminal teeth; phallosome simple, undivided. Abdomen of ♀ with seventh segment much shorter than sixth, the tergite with both anterior and posterior margins strongly concave; eighth segment (Fig. 31) small and normally retracted within seventh, its tergite with a terminal row of small but strong recurved hooks or teeth, its sternite large, with a flap-like prolongation on each side; cerci with upturned pointed tips; postgenital plate small, divided almost to the base into a pair of finger-like lobes, and attached to the narrow cowl; two large spermathecae, the third being small, pale, difficult to detect and perhaps sometimes

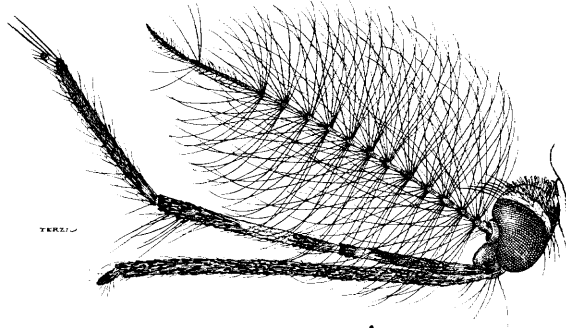


FIG. 29.—Head of ♂, *Taeniorhynchus* (*Mansonioides*).

absent. In both sexes fairly numerous post-spiracular bristles are present (but no post-spiracular scales) and the wing-scales are mostly or all very broad, many of them asymmetrical.

The peculiar structure of the tip of the female abdomen is connected with the remarkable egg-laying habits of species of this subgenus. The insect sits near the edge of a leaf of some water-plant (usually *Pistia*), "with her fore and mid-legs on the water and the hind legs on the leaf. She then dips the abdomen into the water and by flexion the tip of the abdomen is applied to the lower side of the leaf. In that position the wings, which are folded up, rest on the upper side of the leaf and the edge of the leaf is wedged in between the wing and the abdomen which is almost entirely submerged in water. The eggs are then extruded one by one and the base of the egg, as it emerges from the abdomen, is fixed on to the leaf." (Iyengar, 1933). The free micropylar end of the egg is drawn out into a long point (not a branched process as in some species of the allied American subgenus *Taeniorhynchus*), and on dehiscence the shell splits into two across the middle.

The species of *Mansonioides* are amongst the most blood-thirsty of all African mosquitoes, attacking man both inside and outside houses. Davis and Philip (1931)

found by precipitin tests that the blood-meals of *T. africanus* gave positive reactions only for human blood, and Kerr (1933) found that both *T. africanus* and *uniformis* definitely preferred human blood. Though mainly nocturnal in their activities (Kerr, 1933) they also bite freely by day (Hopkins, MS.).

Taeniorhynchus (Mansonioides) africanus (Theobald) (Pl. 3, fig. 11.)

Panoplites africana Theobald, Mon. Cul. 2, p. 187 (1901).

Mansonioides africanus Edwards, Bull. Ent. Res. 3, p. 378 (1912) and 4, p. 52 (1913); Ingram, Bull. Ent. Res. 3, p. 76 (1912); Ingram and Macfie, Bull. Ent. Res. 8, p. 137 (1917); Dyar, Insec. Inscit. 13, p. 43 (1925); Connal, Bull. Ent. Res. 19, p. 293 (1928); Schwetz, Rev. Zool. Afr. 18, p. 311 (1930); Edwards, Bull. Ent. Res. 21, p. 541 (1930).

Mansonia major Theobald, Mon. Cul. 3, p. 270 (1903).

TYPES.—*africana*, ♀ in B.M., Chiroino, Nyasaland; *major*, ♀ in B.M., Bahr-el-Ghazal.

A mosquito of medium size, distinguished from most other Culicines by the very broad wing-scales which are of mixed colours, dark and light; from the few species of other genera with somewhat similar wing-scales (*Aëdomyia*, *Ficalbia mediolineata*, *Aëdes furcifer*, etc.) it may be distinguished at once by the six white rings of the hind tarsi, these rings occurring at the base of each segment and in the middle of the first segment.

Differs from the allied *T. (M.) uniformis* in having the pale scales of the scutum aggregated into spots but not forming stripes; in the more sharply defined and whiter markings of the femora; and in the markings of the tibiae being in the form of sharply defined white spots.

♀ *Head* dark, clothed with dark erect scales (rather shorter than those of subgenus *Coquillettidia*) and whitish decumbent scales; a few broad flat scales at sides. Proboscis with a broad yellowish band in middle; some yellowish scales at tip, but basal and apical fourths mostly dark. Palpi about one-third as long as proboscis, clothed mostly with dark scales but white at tip. Tori and clypeus brownish, bare. *Thorax* with integument brownish, darker above. Scutum clothed mainly with dark brown scales; three groups of pale greyish scales towards each side, one on the shoulder, one behind this, the third and largest above wing-base; usually another patch of greyish scales in front of the pre-scutellar space, and similar scales on scutellum. Pleurae with patches of flat white scales on upper and lower sternopleura and on upper part of mesepimeron; a few such scales mixed with bristles on post-spiracular area. Some narrow whitish scales on *ppn*. *Abdomen* mainly dark brown above; usually with median dorsal patches of yellowish-white scales on tergites 1-3 (or 1-2); tergite 7 mostly white-scaled; lateral apical patches of pure white scales on tergites 2-6, usually very small on 4, larger and often visible dorsally on 3, 5 and 6; in addition tergites 5 and 6 have creamy-yellow basal lateral patches; venter clothed with creamy-yellow scales. *Legs* dark brown with sharply defined white markings. Femora each with five white marks on anterior surface (most distinct on hind pair, Fig. 30, c), the first near base, the fifth forming a narrow ring some distance before tip. Tibiae each with 7-9 white spots in a row on anterior surface, separate from one another but some larger than others and tending to form complete rings. Tarsi with white rings at base and in middle of first segment; in the case of the hind tarsi the basal white ring includes a black patch on the upper surface. Segments 2-3 of front and middle tarsi and 2-5 of hind tarsi each with a

white basal ring 2-3 times as long as diameter of segment. *Wings* (Fig. 30, a) with scattered light yellowish scales, usually almost as numerous as the dark brown ones.

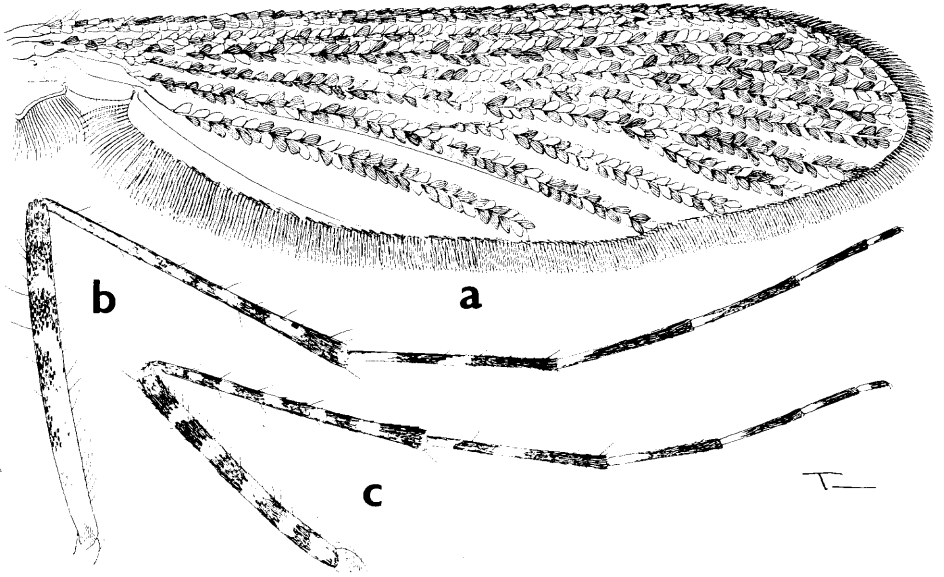


FIG. 30.—Wing and hind leg of *Taeniorhynchus* (*Mansonioides*) spp. a, c. *africanus*. b. *uniformis*.

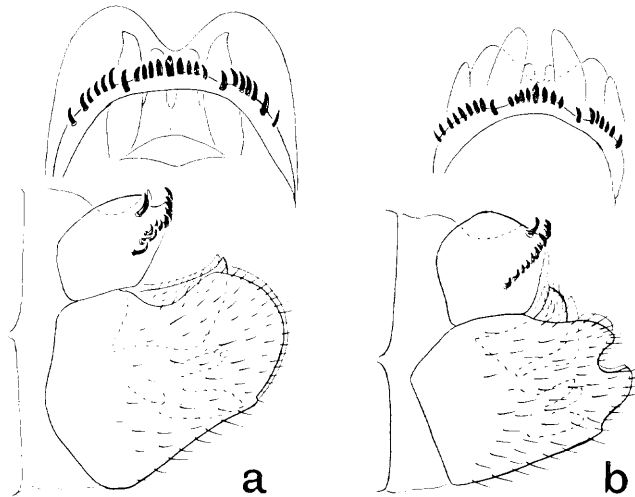


FIG. 31.—Tip of female abdomen, from above and from side, of *Taeniorhynchus* (*Mansonioides*) spp. a. *uniformis*. b. *africanus*.

Ovipositor (Fig. 31, b): Teeth of eighth tergite as shown in figure; each half of the large eighth sternite deeply notched at tip.

♂. Resembles ♀ in ornamentation. Palpi as noted for the subgenus; two narrow white rings on long segment and one at base of penultimate segment; the small

terminal segment clothed with white scales. *Terminalia*: Coxite with a row of 8-10 strong, almost spine-like bristles on internal tergal border. Style flattened, curved, pointed, hairy on external border distally. Basal arm of coxite pale, not or scarcely reaching beyond end of paraprocts, with a small, pale, spine at tip. Phallosome about as broad as long.

Wing-length 3-5 mm.; averaging about 4.5 mm.

Distribution.—Widely distributed and common throughout tropical Africa, except in heavily forested regions. GAMBIA. LIBERIA. SIERRA LEONE. GOLD COAST. NIGERIA: Northern and southern provinces; shore of Lake Chad. BELGIAN CONGO: Numerous localities in lowlands and in Katanga and Kivu. UGANDA: Numerous localities. SUDAN: White and Blue Nile, Bahr el Ghazal, Juba, El Fasher, etc. KENYA: Kisumu; Witu; Wangi; Nzoia; Lake Rudolf. TANGANYIKA: Kibanga; Kondo. NYASALAND: Numerous localities. NORTHERN RHODESIA: Luangwa R.; Mburuma. ABYSSINIA: Lake Zwai. BECHUANALAND: L. Ngami. NATAL: Durban. TRANSVAAL: Onderstepoort. ZULULAND: Manyana, Empangeni.

Var. **nigerrimus** Theobald.

Mansonia nigerrima Theobald, Mon. Cul. 5, p. 450 (1910).

Mansonioides africanus var. *nigerrimus* Edwards, Bull. Ent. Res. 4, p. 52 (1913).

TYPE.—♀ in B.M., Mpumu, Uganda.

Differs from typical *africanus* only in its darker colour. White marks on femora smaller; white rings on tarsi narrow, being but little longer than broad. Wings with fewer pale scales; in some specimens almost all the scales dark. *Terminalia* as in the typical form.

Distribution.—UGANDA: Mpumu (*Bruce*); Kafu River, Hoima-Kampala Rd. and Mabira Forest, Chagwe (*Neave*); Entebbe (*Moffat*); Kome Kole (*Hancock*). TANGANYIKA: Baraka (*Bois*).

Taeniorhynchus (Mansonioides) uniformis (Theobald) (Pl. 3, fig. 10.)

Panoplites uniformis Theobald, Mon. Cul. 2, p. 180 (1901).

Mansonioides uniformis Edwards, Bull. Ent. Res. 2, p. 254 (1911), 4, p. 51 (1913), and 14, p. 365 (1924).

Panoplites africanus var. *reversus* Theobald, Mon. Cul. 2, p. 189 (1901).

Mansonia marquesensis Dyar, Insec. Inscit. 13, p. 43 (1925).

TYPES.—*uniformis*, ♀ in B.M., Quilon, Travancore, S. India; *reversus*, ♀ in B.M., Zomba, Nyasaland; *marquesensis*, ♂ in Washington, Lourenço Marques.

Differs from *T. africanus* as follows: Pale scales of thorax usually with a greenish tint and forming broad continuous sublateral stripes; frequently also a median stripe of similar scales extending forwards for some distance from ante-scutellar space without reaching front margin. Markings on femora less distinct; hind femora (Fig. 30, b) extensively whitish below on basal half of anterior surface. Tibial markings of a creamy tint, not pure white; on anterior surface of middle and hind tibiae the pale spots tend to run together into streaks, on the middle tibia especially sometimes forming a continuous pale stripe. *Ovipositor* (Fig. 31, a): Teeth of eighth tergite differing slightly in arrangement; halves of eighth sternite entire. ♂ *Terminalia*: Basal arm of coxite longer and more strongly chitinized than in *M. africana*,

reaching almost to end of coxite, with a long, stout, dark terminal appendage, which is bifid at the tip. Phallosome considerably longer than broad.

Distribution.—This species is almost or quite as widely spread in Africa as *M. africana*, the two frequently occurring together. GAMBIA: Bathurst, Kulaw. SIERRA LEONE. GOLD COAST: Accra; Weshiang. NIGERIA: Many records from both northern and southern provinces. BELGIAN CONGO: Boma, Leopoldville, Stanleyville, Elisabethville, etc. UGANDA: Widespread. SUDAN: Pibor, Sobat, Lado, Zeraf, Fasher, Khandak, etc. ABYSSINIA: Lake Zwai, etc. KENYA: Nzoia R., L. Gango; Malindi. TANGANYIKA: Usumbura (*Bois*); Kondoa (*Zumpt*). ZANZIBAR (*Aders*). ANGOLA (*Wellman*). MOZAMBIQUE: Delagoa Bay; Lourenço Marques. NYASALAND: many records. BECHUANALAND: L. Ngami. NATAL: Durban. TRANSVAAL: Onderstepoort, occasional. ZULULAND (*Ingram*). MADAGASCAR: Tananarive (*Lamborn*).

Outside the Ethiopian region *M. uniformis* has been found in India, Ceylon, Malaya, Borneo, Java, Sumatra, Papua, Solomon Is., Northern Territory of Australia, Queensland, North and South China, Formosa, Japan.

AÈDES Meigen.

Aedes Meigen, Syst. Besch. Eur. Dipt. 1, p. 13 (1818); Dyar and Knab, J. N.Y. Ent. Soc. 14, p. 188 (1906); Edwards, Gen. Ins. Cul. p. 129 (1932).

GENOTYPE.—*A. cinereus* Meigen (Europe).

The large and cosmopolitan genus *Aedes* includes a great diversity of species and is not easy to define as a whole. All species of *Aedes* possess post-spiracular bristles, but such bristles are also present in *Eretmapodites* and in the subgenus *Mansonioides* of *Taeniorhynchus*. Nearly all species of *Aedes* possess scales on the paratergites, and such scales are never found in any other African genus, but they are absent in the subgenera *Skusea* and *Banksinella* and in a few species of *Stegomyia* and *Aëdimorphus*. Nearly all female *Aedes* have some or all of the claws toothed, but this is also the case in *Eretmapodites*, and on the other hand *Aedes pembaensis* and one or two other species of *Aedes* have simple claws. Most female *Aedes* have the abdomen somewhat pointed at the tip, the eighth segment being retractile, but this is by no means always obvious.

Head.—Eyes usually separated above by a narrow line, sometimes wider apart, with a scaly area between them. Scaling of vertex various. Orbital bristles in a continuous row. Proboscis not swollen at tip in either sex. Palpi of ♂ very variable in form according to the subgenus; but in all African subgenera approaching or sometimes exceeding the proboscis in length. Antennae in ♂ usually if not always somewhat shorter than proboscis, plumose, with the last two segments elongate. Antennae in ♀ with first flagellar segment not longer than second.

Thorax.—*apn* well separated and bristly. Dorso-central bristles usually present, but sometimes reduced to a few on posterior part of scutum (subgenus *Stegomyia*) or even absent (subgenus *Dunnius*). Paratergite narrow, usually bearing scales which may be broad or narrow. Several strong posterior pronotal and several post-spiracular bristles present, but no spiracular; pre-alar and upper mesepimeral numerous,

lower mesepimeral present or absent. Postnotum always bare. Pleurae usually extensively scaly.

Legs moderately slender; femora and tibiae with some scattered bristles but these usually short and inconspicuous. Hind tibia on inner side at tip with a close-set row of hairs. Fourth tarsal segment not shortened in ♀. First hind tarsal segment shorter than tibia. Claws of front and middle legs of ♂ unequal, usually each with one tooth (a few species of subgenus *Stegomyia* are exceptional); claws of ♀ usually toothed, at least on front and middle legs. Pulvilli absent or hair-like, never broad and distinct.

Wings with the scaling very variable according to the species; scales on under surface long and narrow, those on upper surface (except vein 2) usually short and broad. Microtrichia distinct. Fork of vein 2 usually about as long as its stem, seldom much longer or shorter; 6 ending well beyond base of fork of 5. Squama fringed.

Abdomen with lateral lobes of first tergite nearly always scaly, even when (as is frequently the case) the greater part of the tergite is clothed with hairs only.

♂. *Terminalia* varying in structure in different subgenera, but with the styles articulating more or less horizontally and paraprocts simple, often sharply pointed but without teeth or hairs at the tip.

♀. *Terminalia* showing subgeneric differences, but nearly all *Aedes* have the following features in common: Eighth segment more or less retractile (sometimes completely so), with a wide membrane separating it from the seventh. Ninth tergite usually shield-shaped and longer than broad (a feature found in no other African genus). Cerci more or less elongate, longer than post-genital plate, set nearly vertically. Post-genital plate elongate, its bare basal part narrow but well-sclerotized and fused with cowl. No definite atrial plates, but cowl expanded on each side at base. Spermathecae (with rare exceptions) three in number, spherical, one slightly larger than the others.

The genus *Aedes* is divided into rather numerous subgenera which are based primarily on the structure of the male terminalia and the form of the male palpi. These subgenera fall into two main groups. In the first of these groups (represented in Africa by *Mucidus*, *Ochlerotatus* and *Finlaya*; see Figs. 34 and 35) claspettes are present and are normally in the form of a finger-like process, bearing a hooked blade at its tip, arising from the base of the coxite on the sternal side; also at the base of the coxite, but on its tergal side and separated from the claspette by the membranous area which extends along the inner face of the coxite from base to tip, is a more or less developed basal lobe; the phallosome is undivided, scoop-shaped, and without teeth. In the second group (represented in Africa by *Stegomyia*, *Aëdimorphus*, *Banksinella*, *Diceromyia* and *Dunnius*) structures corresponding with the claspettes are indeed present, but are more in the form of a hairy basal lobe or plaque, never a finger-like process with a hooked appendage; this basal plaque is separated from the coxite itself by membrane instead of forming part of it; the membranous area on the inner face of the coxite may be less extensive; the phallosome is divided into lateral plates which are variously toothed. Some small and anomalous subgenera do not fit easily into either of these groups, *Skusea* being the only one of these occurring in Africa.

Most if not all the subgenera of *Aedes* include blood-sucking species, many of these being troublesome pests of man and domestic animals. In contrast with species of some other genera (such as *Culex* and *Taeniorhynchus*), most of the blood-sucking *Aedes* feed either at dusk or in shady places during the day; they are seldom active during the night.

So far as known the eggs of *Aedes* are always laid singly and often above water-level or in dry hollows; they are usually capable of surviving prolonged periods of desiccation, extending in some cases to several years.

KEYS TO ETHIOPIAN SUBGENERA OF AÆDES.

MALES.

1. Claspettes present, consisting of a columnar stem and a terminal blade; phallosome simple and scoop-shaped (Figs. 34, 35) 2.
- Claspettes absent or otherwise formed 4.
2. Cross-vein 4-5 just beyond 3-4 and clouded (Fig. 32) *Mucidus* (p. 109).
- Cross-vein 4-5 well before 3-4 and unclouded 3.
3. Coxite with basal lobe *Ochlerotatus* (p. 115).
- Coxite without definite basal lobe (apart from claspette) *Finlaya* (p. 119).
4. Coxite short and rounded, with complex subapical lobe; phallosome a simple tube; eighth tergite very large and bristly (Fig. 67) *Skusea* (p. 222).
- Coxite longer, with basal lobe; phallosome divided into lateral toothed plates; eighth tergite not unusually developed 5.
5. Palpi (Fig. 59) with a single upturned hairy segment beyond shaft, rarely with a nipple-like terminal segment; style subterminal *Banksinella* (p. 201).
- Palpi with two distinct segments beyond shaft, terminal segment rarely much shorter than penultimate; style terminal 6.
6. Palpi slender, upturned and bare; acrostichal bristles absent (except in *A. vittatus*); scales of vertex and scutellum broad 7.
- Palpi (Fig. 45) with last two segments more or less thickened, hairy and downturned (except in *O. gibbinsi*, which has scales of vertex and scutellum narrow); acrostichal bristles present; style modified or its spine subterminal 8.
7. Style with one terminal spine; tarsi white ringed *Stegomyia* (p. 125).
- Style with many spines; tarsi dark *Dunnius* (p. 218).
8. Coxite with scale-tuft; lower mesepimeral bristles present; *ppn* with broad scales *Diceromyia* (p. 214).
- Coxite without scale-tuft; lower mesepimeral bristles absent; *ppn* with narrow scales *Aëdimorphus* (p. 156).

FEMALES.

1. Cross-vein 4-5 just beyond 3-4 and clouded (Fig. 32) *Mucidus* (p. 109).
- Cross-vein 4-5 before 3-4 and unclouded (Fig. 53) 2.
2. One or more lower mesepimeral bristles present 3.
- No lower mesepimeral bristles 6.
3. Claws simple; tarsi dark *Skusea* (p. 222).
- Claws toothed as usual; tarsi white-ringed 4.
4. Scales of vertex and scutellum narrow *Ochlerotatus (caballus)* (p. 117).
- Scales of vertex and scutellum broad 5.
5. Tibiae white-ringed *Stegomyia (vittatus)* (p. 155).
- Tibiae not white-ringed *Diceromyia* (p. 214).

6. Either scutum with a double median stripe of round silvery scales, or hind tarsi with a broad white ring on second segment and the following segments dark ; eighth sternite large and non-retractile *Finlaya* (p. 119).
 Ornamentation otherwise 7.
7. Acrostichal bristles absent ; no narrow decumbent scales on vertex or scutellum ; cerci short 8.
 Acrostichal bristles present ; usually some narrow decumbent scales on vertex and scutellum ; cerci usually long and eighth segment small and retractile 9.
8. Hind tarsi with basal white rings on most or all segments ; pleurae not densely scaled *Stegomyia* (p. 125).
 Hind tarsi dark ; pleurae very densely scaled *Dumnius* (p. 218).
9. Paratergites scaly (except in *domesticus* group, with silvery scales on shoulders) ; tarsi various ; if segments are basally banded then scutellar scales all narrow *Aëdimorphus* (p. 156).
 Paratergites bare ; no silvery scales on shoulders, but scales on sides of scutum white or yellow ; tarsi dark *Banksinella* (p. 201).

Subgenus **MUCIDUS** Theobald.

Mucidus Theobald, Mon. Cul. 1, p. 268 (1901).

GENOTYPE.—*Culex alternans* Westwood (Australia).

Decumbent scales of vertex and scutellum narrow. Dorso-central and acrostichal bristles present. Posterior pronotal bristles unusually numerous (20–30). Several lower mesepimeral bristles present. Legs (Fig. 33) very long ; all claws of

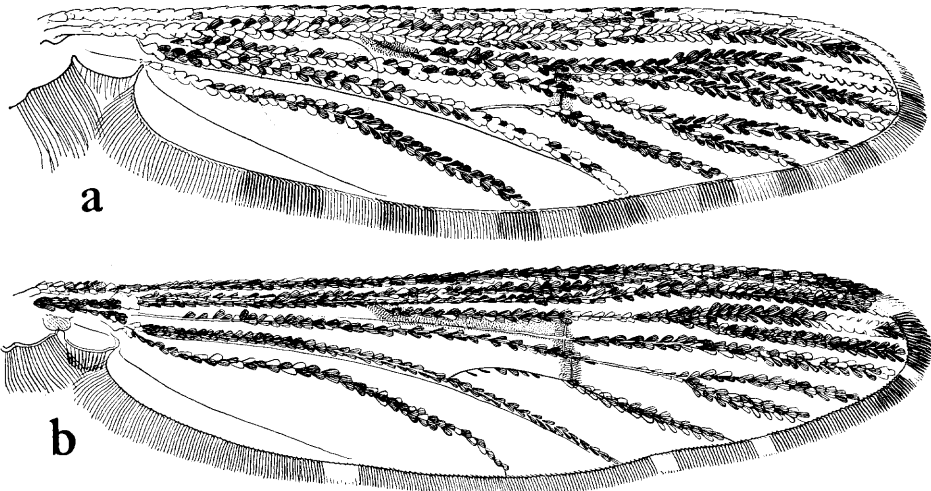


FIG. 32.—Wings of *Aëdes* (*Mucidus*) spp. a. *scatophagoides* (after Barraud, 1933). b. *grahami*.

♀ toothed ; tibiae variegated. Wings with dark clouds covering the cross-veins, 4–5 placed slightly beyond instead of before 3–4. Abdomen of ♀ very pointed, cerci long. Palpi of ♂ longer than proboscis, last two segments subequal, downturned, and very hairy. Palpi of ♀ unusually long, half as long as proboscis or more. ♂ *Terminalia* (Fig. 34) as in typical species of the subgenus *Ochlerotatus* ; coxite long, with a membranous area on its inner face extending from base to tip ; basal lobe

bearing one or more strong bristles; claspettes well developed with flattened appendage; style long, simple, with long terminal spine; phallosome scoop-shaped, simple, without teeth. ♀ *Terminalia* (Fig. 6 ♀, k, l): Eighth segment narrow and completely retractile, tergite well sclerotized (not membranous as in the American genus *Posrophora*), sternite notched in middle but sides not produced into flaps. Ninth tergite elongate, almost as long as cerci, deeply emarginate posteriorly but not at all anteriorly, weakly sclerotized in middle line. Insula transverse, with four longish setae. Cerci long and narrow. Post-genital plate not notched.

The African species of this genus are large mosquitoes with very distinctive ornamentation, the long and often twisted scales of the mesonotum and the erect scales of the legs giving them a mouldy appearance.

There are few records of blood-sucking by members of this subgenus, but Nieschultz, Bedford and Du Toit (1934) note that *scatophagoïdes* "fed readily on horses and took up a surprisingly large quantity of blood."

Hopkins (MS., 1932) wrote regarding *A. (M.) mucidus* in Uganda: "Eggs laid by fertilized females after three blood meals failed to hatch in the laboratory; they probably require to be dried. Eggs were large and laid singly."

KEY TO ETHIOPIAN SPECIES OF SUBGENUS MUCIDUS.

1. Front tibia with three distinct white rings of about equal breadth, at base, middle and tip *scatophagoïdes* Theo. (p. 110).
Front tibia broadly white at tip, without a median white ring 2.
2. Second and third segments of hind tarsi only rather narrowly white at base; costa largely yellow *mucidus* Karsch. (p. 112).
Third segment of hind tarsi white except at tip; costa dark 3.
3. Second segment of hind tarsi more than half brown *nigerrimus* Theo. (p. 113).
Second segment of hind tarsi white except at tip *grahami* Theo. (p. 114).

***Aëdes (Mucidus) scatophagoïdes* Theobald.**

Mucidus scatophagoïdes Theobald, Mon. Cul. 1, p. 277 (1901).

Mucidus scatophagoïdes Edwards, Bull. Ent. Res. 2, p. 246 (1911) and Ind. J. Med. Res. 10, p. 450 (1922); Barraud, Ind. J. Med. Res. 16, p. 1053 (1929).

Aëdes (Mucidus) scatophagoïdes Barraud, Fauna Brit. Ind. Dipt. 5, p. 145 (1934).

Mucidus sudanensis Theobald, Third Rept. Welle. Lab., p. 252 (1908).

Types.—*scatophagoïdes*, 2 ♀ in B.M., Myingyan, Burma, and Moradabad, N.-W.P., India; *sudanensis*, ♀ in B.M., Upper White Nile.

Differs conspicuously from the other three African species of the subgenus in the markings of the front and middle tibiae, which are only rather narrowly white at the tip and have a white ring in the middle; in the almost smooth front tibiae; in the presence of a white ring in the middle of the first tarsal segment of all legs; and in many other details.

♀. *Head* with the erect forked scales very long and narrow, pale yellowish in colour. White scales forming a narrow border to eyes all rather broad, even on vertex. Proboscis with the scales on about the distal half decumbent and yellow, on proximal half roughened and darker. Palpi about two-thirds as long as proboscis, with scales of mixed colours, except on terminal segment, where they are all white. *Thorax* with the mesonotal scales mostly white, woolly in appearance, some long white

scales forming three or four pairs of tufts ; shorter dark scales give a mottled appearance to the thorax, a patch on each side towards front especially noticeable. *Abdomen* with the scales on tergites 2-4 white in middle and on sides at base, mostly yellow posteriorly, with a more or less evident pair of dark patches towards base ; tergites 5-7 mostly or all white ; scales at sides of tergites 2-6 much roughened, especially posteriorly, all scales on 7 decumbent. *Legs* (Fig. 33, a) with all femora dark, rather

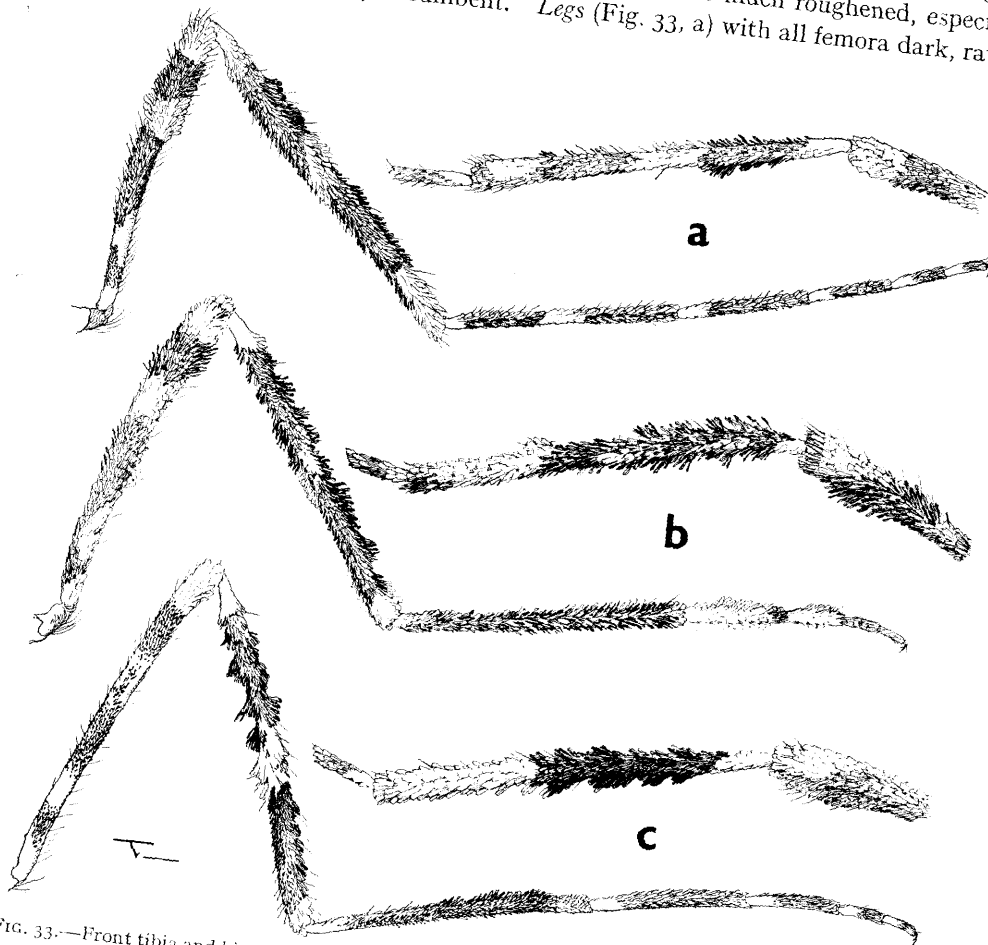


FIG. 33.—Front tibia and hind leg of *Aedes* (*Mucidus*) spp. a. *scatophagoides*. b. *grahami*. c. *mucidus*.

narrowly white at base and tip, and with two more or less distinct narrow white rings in between ; tibiae all yellowish-brown, with white rings of moderate width at base, middle and tip ; scales of front tibiae very little roughened ; tarsi all yellowish-brown, with six white rings of about equal width, one at base of each segment and one in middle of first segment. *Wings* (Fig. 32, a) with scales on base of costa and stem vein and on extreme bases of other veins white ; costa otherwise mainly yellow ; first vein with most of distal half yellow, also distal half of upper branch of second vein ; other veins mottled ; third vein heavily scaled above as well as below ; scales usually fairly numerous on stem of lower fork.

♂. Resembles ♀ in ornamentation, but wings less clearly marked. Palpi exceeding proboscis by rather more than the length of the last segment, which is very much swollen and slightly longer than the penultimate; plumes dense and mostly yellow; scales mostly yellow, white at bases of segments and in middle of shaft. *Terminalia* (Fig. 34, a): Appendage of style somewhat stouter than in the other species; basal lobe of coxite moderately large, rounded, with numerous stiff hairs, among which the two spines are inconspicuous; phallosome with a remarkable flange at the tip; appendage of harpago slender and pointed.

Wing-length 6–6.5 mm.

Distribution.—GAMBIA: Bathurst (*Liverpool S. T. M.*). GOLD COAST: Ada (*H. France*); Accra (*O'Brien*). N. NIGERIA: Lokoja (*Watson*); Gadau (*Taylor*). BELGIAN CONGO: Banana (*Wanson*). UGANDA: locality uncertain (*Moffat*); Butiaba (per *Hopkins*). SUDAN: Upper White Nile (*King*); Khartoum, on train from El Obeid (*San. Insp.*). NYASALAND: Chiromo (*Old*); Cholo and Ruo (*Wood*). MOZAMBIQUE (*Muir*). TRANSVAAL: Pretoria (*Bedford*). S. RHODESIA: Salisbury (*Cuthbertson*).

A. scatophagoïdes is also widely distributed through India, Burma and Ceylon.

***Aedes (Mucidus) mucidus* Karsch.**

Culex mucidus Karsch, Ent. Nachr. p. 25 (1887).

Mucidus mucidus Theobald [in part], Mon. Cul. 1, p. 272 (1901); Edwards [in part], Bull. Ent. Res. 2, p. 246 (1911) and Ind. J. Med. Res. 10, p. 450 (1922).

TYPE.—♀ in Berlin Mus., Delagoa Bay.

Resembles *A. scatophagoïdes* in its largely yellow costa, but differs conspicuously in the ornamentation of the front and middle tibiae, which are broadly white at the tip but otherwise largely black, without a median white ring; first tarsal segment also without median white ring. Differs from the two related species (and resembles *A. scatophagoïdes*) in having only rather narrow white rings on both the second and third segments of the hind tarsi.

♀. *Head* much as in *A. scatophagoïdes*, but palpi rather longer, fully three-quarters as long as proboscis. *Thorax* much as in *A. scatophagoïdes*. *Abdomen* similar, but all scales on tergite 6 as well as 7 close-lying. *Legs* (Fig. 33, c): Femora much as in *A. scatophagoïdes*. Tibiae with the brown scales much darker, on front and middle tibiae almost black; scales of front tibiae almost as much roughened as on the other pairs; front tibia with nearly the distal half snow white, proximal half blackish except for a narrow white ring at base; middle tibia similar but the white tip less extensive; hind tibia with three white rings as in *A. scatophagoïdes*. Front and middle tarsi almost uniformly brownish-yellow, with only a few white scales at base of first segment. Hind tarsi with segment 1 narrowly white at base, then brownish-yellow, then blackish on about the distal half; 2–5 each with a white ring at base, on 2 occupying about one-third and on 3 less than one-half of the length of the segment. *Wings* much as in *A. scatophagoïdes*, but costa with rather more dark scales on basal half; third vein with almost all the scales yellow, those on upper surface noticeably fewer and smaller than in *A. scatophagoïdes*.

♂. Resembles ♀. Palpi exceeding proboscis by length of last segment, which is much less swollen than in *A. scatophagoïdes*; plumes mostly yellowish, scales mostly yellow, with white wings as in *A. scatophagoïdes*; scales on last segment roughened.

Terminalia (Fig. 34, b) much resembling those of *A. scatophagoides*; phallosome narrowed at tip and with a somewhat similar but less developed flange.

Wing-length 5–8 mm., most specimens in British Museum about 7.5 mm.

Distribution.—UGANDA: Madi (*Carpenter*); Lira (*Hopkins*); Jinja (*Gibbins*). NATAL: Durban (*Gueinzuis*, 1857). MOZAMBIQUE: Delagoa Bay (*Karsch*).

Note.—The original description of *Culex mucidus* would seem to apply better to

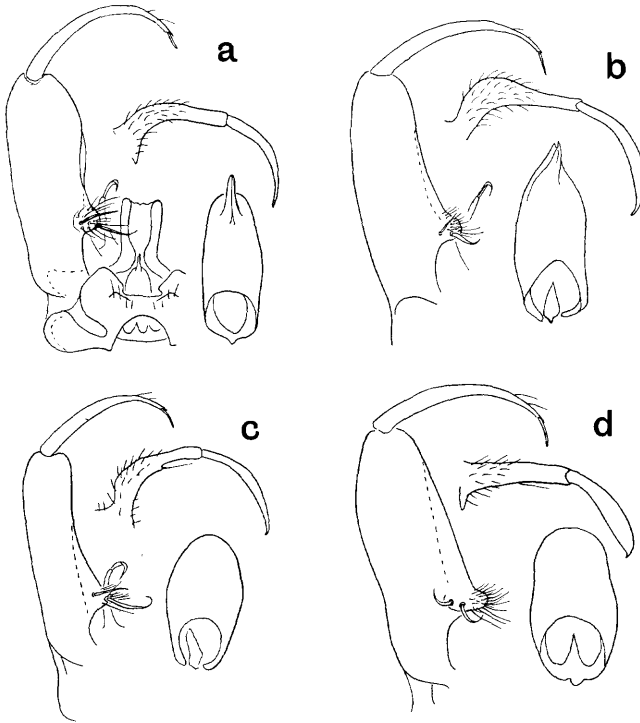


FIG. 34.—Terminalia, with claspette and phallosome shown separately to larger scale, of *Aedes (Mucidus)* spp. a. *scatophagoides*. b. *mucidus*. c. *nigerrimus*. d. *grahami*.

this species than to *A. nigerrimus*, because Karsch describes the front margin of the wing as yellow and the middle three segments of the hind tarsi as white on the basal half.

Aedes (Mucidus) nigerrimus Theobald.

Mucidus nigerrimus Theobald, Ann. Trop. Med. 7, p. 591 (1913).

TYPE.—♂ in Liverpool, Wadelai, Lado, Sudan.

♀. Much resembles *A. mucidus*, differing as follows: *Head* with the erect forked scales dark brown; palpi with white scales predominating on distal half. *Thorax* rather darker, with white scales less conspicuous. *Abdomen* with tergites 2–4 extensively dark brown at sides, white scales tending to form a continuous mid-dorsal stripe. *Legs* similar to those of *A. mucidus*, but femora darker; white ring in middle of hind tibia obsolete; front and middle tarsi with a more or less distinct white

ring at base of second segment; hind tarsi with nearly half of the second and about four-fifths of the third segment white. *Wings* darker than in *A. mucidus*; no definite white-scaled area at base; costa and first vein mainly dark, with a small yellow area at tip extending on to tip of upper branch of second vein, and sometimes with a second larger but less clearly defined yellow area beyond middle. Stem of lower fork bare or almost so. Third vein mainly dark and fairly densely scaly.

♂. Resembles ♀, but wings not so dark and with markings less defined. Palpi exceeding proboscis by length of last segment, which is scarcely thickened; plumes mostly light brownish; scales mostly white, with a heavy sprinkling of black, but no yellow ones. *Terminalia* (Fig. 34, c): Lobe of coxite less developed than in the other three species, with only a few hairs, so that the two spines appear more conspicuous. Phallosome smoothly rounded at tip, not narrowed and without flange.

Wing-length 5-7.5 mm.

Distribution.—MOZAMBIQUE: Delagoa Bay (*Sant' Anna*). KENYA: Kakamega (*Symes*). UGANDA: Kampala (*Hopkins*); Jinja (*Gibbins*). BELGIAN CONGO: Lake Albert (*Schwetz*). SUDAN: Lado (*King*).

Aëdes (Mucidus) grahami Theobald.

Mucidus africanus Theobald, Mon. Cul. 1, p. 274 (1901) [*nec Aëdes (Stegomyia) africana* Theobald 1901]; Edwards, Ind. J. Med. Res. 10, p. 450 (1922).

Mucidus grahami Theobald, Mon. Cul. 5, p. 127 (1910).

Aëdes (Mucidus) grahami Edwards, Gen. Ins. 194, p. 134 (1932).

TYPES.—*africanus*, ♀ in B.M., Old Calabar; *grahami*, ♀ in B.M., Obuasi, Ashanti.

♀. Resembles *A. nigerrimus* in most respects, notably in its dark wings with only a small yellow spot near tip of costa, differing as follows: *Head* with the scales forming the orbital row quite narrow, except those towards the sides, which are broader (this forming a rather clear distinction from the other three species). *Thorax* darker; to the naked eye the whitish mesonotal scales (in perfect specimens) form a vaguely lyre-shaped mark, enclosing a median dark stripe. *Abdomen* with the scales towards posterior margin of sixth tergite more roughened. *Legs* (Fig. 33, b): Hind tarsi with the scales of the first segment more uniformly dark (except for the white ring at base); second and third segments each white, with the tip only narrowly brown. *Wings* (Fig. 32, b) much as in *A. nigerrimus*.

♂. Resembles ♀. Palpi much as in *A. nigerrimus*, but scales on shaft largely yellow, with white areas at base and middle. *Terminalia* (Fig. 34, d): Coxite rather broader than in the other species; basal lobe well developed and hairy. Harpago rather shorter than in the other species, with the appendage more strongly chitinized and rather broader (but evidently subject to some variation). Phallosome rounded at tip, as in *A. nigerrimus*.

Distribution.—CAMEROONS: Missellele (*Zumpt*). NIGERIA: Old Calabar (*Annett*); Lagos (*Anderson*); Ibadan (*Lamborn*). GOLD COAST: Obuasi (*Graham*). BELGIAN CONGO: Stanleyville (*Schwetz*); Boma (*Nicolay*). UGANDA: Jinja (*Gibbins*). SIERRA LEONE (*Smith*). KENYA: Kabwach (*Teesdale*).

Variation.—Two rather distinct forms occur, possibly to be regarded as distinct varieties or even species. In the darker form (represented by the type of *A. grahami* and a series of specimens in the British Museum from Kenya, Uganda and the Congo)

the wings are very dark indeed, with the pale fringe spots obsolete or even absent ; the white tip of the front tibia occupies only about one-third of the length of the tibia, and there is sometimes a trace of a white ring in the middle of the dark part. In the lighter form (represented by the type of *africanus* and by some other female specimens from Nigeria and Sierra Leone) the wings are not so dark, with distinct pale spots in the fringe as in the other species ; the white tip of the front tibia occupies fully two-fifths of the length of the tibia (as in *A. mucidus* and *A. nigerrimus*) and there are no white scales in the dark area.

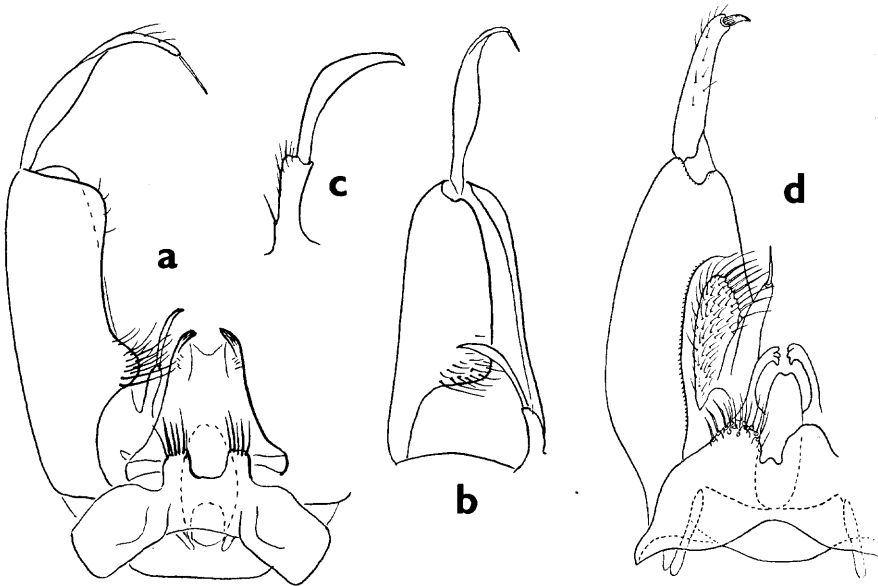


FIG. 35.—Terminalia of *Aedes* (*Ochlerotatus*) spp. a-c. *caballus*. d. *fryeri*. (b. coxite from inside; c. claspette more enlarged.)

Subgenus **OCHLEROTATUS** Lynch Arribalzaga.

Ochlerotatus Lynch Arribalzaga, Rev. Mus. La Plata, 2, p. 143 (1891); Edwards, Gen. Ins. Cul. p. 135 (1932).

GENOTYPE.—*O. confirmatus* L. A. (S. America).

Decumbent scales of vertex and scutellum narrow. Proboscis slender, longer than front femora. Dorso-central and acrostical bristles present ; lower mesepimerals present or absent. Wings with cross veins unclouded and normal in position, 4-5 before 3-4. Palpi of ♂ as long as or longer than proboscis, last two segments subequal, downturned and hairy. Palpi of ♀ usually less than a quarter as long as proboscis. ♂ *Terminalia* (Fig. 35): Coxite long; claspettes present in addition to basal lobe; style long, slender, flattened, with terminal spine; phallosome simple, smooth, scoop-shaped. ♀ *terminalia* very much as in subgenus *Mucidus*; eighth segment narrow and completely retractile, its sternite rather small and not produced at sides; insula narrow and transverse, with 4 or 6 setae; ninth tergite elongate; cerci long and narrow; postgenital plate not or very little notched; according to Gjullin's figures

the American species are all very similar, and most of them have the anterior margin of the ninth tergite more or less notched and the posterior margin of the eighth sternite straight, thus differing from *Mucidus*.

The species of this subgenus, though with fairly uniform terminalic structure, exhibit a good deal of diversity in vestiture and ornamentation. In most of the rather numerous South American species (including the genotype) there are no scales on the paratergite, the metameron, the base of the hind coxa, or the lateral lobes of the first abdominal tergite. The species of the group of *A. taeniorhynchus* Wied. (to which the African *A. fryeri* belongs) have few or no scales on the paratergite and none on the metameron or base of hind coxa, but fairly numerous scales on the lateral lobes of the first tergite. Most of the holarctic species, including *A. caspius*, have a more extensive scale development; the paratergites, lateral lobes of first tergite and base of hind coxa are densely scaly, and there are usually fairly numerous scales in a patch on the metameron, this last being a unique feature, as the metameron in other genera of mosquitoes and so far as I have observed in other subgenera of *Aedes* is always bare. The African *A. caballus* and the South American *A. albofasciatus* are related to the holarctic species. In some species (as for example *A. punctor* Kirby and *A. caballus* Theo.) scales are present on the membrane between the front coxa and the sternopleura, which again is unusual.

The subgenus is extremely poorly represented in the Ethiopian region, only three species occurring; as indicated in the above remarks they are not at all nearly related. They are tabulated under the subgenus *Aëdimorphus* (p. 157). *A. fryeri* belongs to the small *Culicelsa* group, in which the terminalia differ in several respects from normal *Ochlerotatus*.

***Aedes* (*Ochlerotatus*) *fryeri* Theobald.**

Culicelsa fryeri Theobald, Trans. Linn. Soc. London, 15 (1), p. 84 (1912).

Ochlerotatus fryeri Edwards, Bull. Ent. Res. 7, p. 218 (1917).

TYPE.—♀ in B.M., Aldabra I.

A small species with speckled wings and legs and with the tarsal segments basally ringed with white; very similar to some species of the subgenus *Aëdimorphus*, from which it differs in terminalic structure and in small details of ornamentation. Differs from *A. (Aëdimorphus) fowleri*, the species which it most resembles, in the somewhat stouter build and the presence of only a narrow line of pale scales instead of a pair of pale spots on the posterior margin of the sixth tergite.

♀. *Head*.—Decumbent scales of vertex all narrow and mostly pale. Proboscis with the distal third entirely dark, proximal two-thirds mostly pale-scaled. Palpi barely one-sixth as long as proboscis, dark, with a few white scales at tip (fewer than in *A. fowleri*). *Thorax* dark brown, scutum mottled with light and dark brown scales; narrow pale scales on scutellum. *ppn* with broad flat scales in middle, some black and some white; usually the scales towards upper margin are narrow but sometimes all are broad. No lower mesepimeral bristles. *Abdomen* dark brown above; tergites with white basal bands which do not quite reach the sides, and also with whitish spots at mid-length on each side; tergites 6 and 7 with posterior margins narrowly white scaled. *Legs* dark; femora and tibiae heavily sprinkled

with pale scales; first three segments of anterior tarsi and all segments of hind tarsi with narrow white basal rings. *Wings* with a moderate sprinkling of white scales on most of the veins, except the costa, which is entirely dark.

♂. Resembles ♀. Palpi scarcely as long as proboscis; last two segments hairy, subequal in length, together two-thirds as long as shaft segment, with narrow white rings at base. *Terminalia* (Fig. 35, d): Coxites rather stout, with large hairy basal plaque in addition to a small harpago, basal plaque quite separate from coxite (not forming part of tergal portion of coxite as does the basal lobe in most *Ochlerotatus*), and membranous area of coxite not reaching the tip; harpago with a stout seta at its tip; style with short and very stout terminal spine; paraprocts with two or three blunt teeth at tip; phallosome smooth and scuttle-shaped as in other species of the subgenus.

Wing-length 3-3.5 mm.

Distribution.—ALDABRA I.: (*Dupont, Fryer*). SEYCHELLES: Cosmoledo I (*Dupont*). MADAGASCAR: Majunga (*Lamborn*). KENYA: Mombasa (*Shircore*); Magogongi Swamp, near Witu (*Neave*).

Aëdes (Ochlerotatus) caballus Theobald.

Grabhamia caballa Theobald, Entom. 45, p. 93 (1912); Edwards, Bull. Ent. Res. 15, p. 261 (1925).

Ochlerotatus chelli Edwards, Bull. Ent. Res. 5, p. 275 (1915).

Aëdes (Ochlerotatus) chelli Edwards, Ann. S. Afr. Mus. 19, p. 159 (1924).

Aëdes (Ochlerotatus) caballus Edwards, Bull. Ent. Res. 15, p. 270 (1925).

TYPES.—*caballa*, ♀ in Liverpool School of Tropical Medicine, Onderstepoort; *chelli*, 3 ♀ in B.M., Dido, Kenya.

A rather small species, characterized especially by the colouring of the female abdomen, which is mainly creamy, with paired blackish spots on the tergites; proboscis and palpi dark; hind tarsi with whitish basal rings on the first three segments, last two usually all dark.

♀. *Head* with the decumbent scales of vertex all narrow and pale. Proboscis entirely black, without any pale scales even on under side. Palpi black, about one-fifth as long as proboscis. Clypeus and tori blackish. *Thorax* with blackish integument; scutal scales mostly or all pale buff-coloured, somewhat darker towards front, but without forming any definite pattern. *ppn* with narrow pale scales. Several lower mesepimeral bristles present. *Abdomen* with the dorsal surface largely creamy; tergites 2-4 each with a pair of large patches of blackish scales, reaching posterior margin, 5 and 6 with smaller dark patches; sternites mainly pale. *Legs* with the femora and tibiae clothed with creamy and black scales about evenly intermixed, the tips black; all tarsi blackish, normally with narrow white basal rings on the first three segments only; first hind tarsal segment gradually shading from pale to dark. *Wings* with a variable sprinkling of pale scales.

♂. Differs from ♀ in having no lower mesepimeral bristles and in the much darker colour of the abdominal scaling, tergites 2-5 being black with white basal bands and only 6-8 having a median white stripe in addition to the basal bands. Palpi exceeding proboscis by length of last segment, with dense dark plumes; scales mostly dark but some pale ones distally. *Terminalia* (Fig. 35, a-c): Coxite with small basal and apical lobes, the basal lobe with fairly numerous hairs, none of which

are modified into spines; style strap-shaped with long terminal spine as in typical species of the subgenus; harpago of normal form, with flattened blade-like appendage; phallosome normal.

Wing-length 3.2–4.5 mm.

Distribution.—TRANSVAAL: Pretoria (*Bedford*). S. RHODESIA: Shamva and Salisbury (*Leeson*). NATAL: Weenen (*Thomasset*). CAPE PROVINCE: Mossel Bay, Worcester, Swellendam and Ceres (*Turner*); Uitenhage (*Cockerell*). SOUTH-WEST AFRICA: Ovamboland (*Barnard*). ORANGE FREE STATE: Vaal River (*Ingram*). KENYA: Dido (*Chell*). SUDAN: Abu Tuba, Kordofan (*Ruttleidge*).

The species has also been found recently in Persia (Djask).

Variation.—Specimens from Kenya (types of *chelli*) and Persia, also from the Vaal River, have the wing-scales almost uniformly dark, with at most a few pale scales on the subcosta and first vein, but females from Natal all show a fairly heavy sprinkling of pale scales on all the veins, including the costa; all these specimens agree in having the white rings of the second and third hind tarsal segments quite narrow and the fourth hind tarsal segment entirely dark. Males in the British Museum from Pretoria differ from the other specimens in the markings of the hind tarsi, the rings of the second and third segments being broad, and a narrow white ring being present on the fourth segment; the wing-scales are uniformly dark. All three forms agree in terminalic structure.

Aedes (*Ochlerotatus*) *caspius* Pallas.

Culex caspius Pallas, Reise . . . Russ. Reichs, 1, p. 475 (1771).

Taeniorhynchus africanus Neveu-Lemaire, Arch. Parasit. 10, p. 271 (1905).

Mansonia arabica Giles, J. Trop. Med. p. 130 (1906).

Aedes (*Ochlerotatus*) *caspius* Edwards, Bull. Ent. Res. 12, p. 299 (1921); Kirkpatrick, Mosq. Egypt, p. 79 (1925); Barraud, Fauna Brit. Ind. Cul. p. 148 (1933); Marshall, Brit. Mosq. p. 179 (1938).

TYPES.—*caspius*, ♀ lost, shores of Caspian Sea; *africanus*, ♀ lost, Suez Canal; *arabica*, ♂♀ in B.M., Bahrein I., Persian Gulf.

Distinguished from the few other Ethiopian mosquitoes with the pale rings of the hind tarsi extending across the joints by having the wings heavily sprinkled with pale scales. The tarsal markings separate it from *A. caballus*, which has somewhat similar colouring of the abdomen.

♀. *Head* with the decumbent scales of vertex all narrow, white in middle, fawn-coloured towards sides. Proboscis extensively pale beneath. Palpi largely pale-scaled. *Thorax*: Scutal scales mostly fawn-coloured, normally with two white lines running the whole length. *apn* and *ppn* scales mostly broad and flat, white. Pleurae heavily scaled on most of their surface, even on metameron (a minor feature distinguishing this species from all other African *Aedes*); several lower mesepimeral bristles. *Abdomen* with the dorsal surface largely creamy; white spots at sides, visible dorsally in the middle of lateral margin of each segment; two squarish dark spots on each tergite, usually large on the proximal segments, but variable in size and sometimes obsolete. *Legs* with femora and tibiae, also first hind tarsal segment, heavily sprinkled with pale scales; creamy rings extend about equally and rather broadly on each side of joints 1–2, 2–3 and 3–4 of hind tarsi, segment 5 entirely

creamy-white. *Wings* with very heavy sprinkling of pale scales on all veins including costa.

♂. Similar to ♀, but abdominal tergites usually more extensively dark. *Terminalia* similar to those of *A. caballus* except that two of the hairs on basal lobe of coxite are modified into spines.

Wing-length 3–5 mm.

Distribution.—This is essentially a Palaearctic species, occurring on all the European and Mediterranean coasts and also in inland saline areas throughout Europe, North Africa and North Asia. It is included among the Ethiopian mosquitoes only because of its spread southwards up the Nile Valley and into Arabia. The following are the records from this area: SUDAN: Zeidab (*King*); Wad Medani and Gezira (*W.P.L.C.*).

Subgenus **FINLAYA** Theobald.

Finlaya Theobald, Mon. Cul. 3, p. 281 (1903).

GENOTYPE.—*F. poicilia* Theobald (Malaya).

Scaling of vertex and scutellum and other ornamentation very diverse. Proboscis slender, longer than front femora. At least a few dorso-central bristles present; acrostichal bristles absent in the African species (though present in the subgenotype and in some other Oriental species). Paratergite and lateral lobes of first abdominal tergite so far as observed always scaly. Lower mesepimeral bristles absent. Palpi of ♂ usually slightly shorter than proboscis; last two segments rather short, usually slightly thickened and downturned, but with few hairs. ♂ *Terminalia* very much as in *Mucidus* and *Ochlerotatus*; claspettes equally well developed and similar in form, but basal lobe of coxite scarcely indicated. ♀ *Terminalia* (Fig. 6 ♀, m). Eighth segment only partially retractile, compressed; eighth tergite longer than broad, with rounded posterior margin, scaly; eighth sternite large, somewhat notched in middle, but sides not produced, without scales; ninth tergite elongate, but variable in shape in different species (in *longipalpis* as long as cerci, very deeply emarginate posteriorly, but entire anteriorly; in *pulchrithorax* shorter but completely divided into a pair of elongate plates); cerci long, but not so long as in *Ochlerotatus*; insula broader than long, with about 6 setae; postgenital plate not or scarcely notched.

The African species of this subgenus are few in number in comparison with those of the Oriental region. They fall into two very distinct groups: the *wellmanni* group without metallic markings, and the *fulgens* group of black species with silvery markings on thorax and abdomen, somewhat as in some species of the subgenus *Stegomyia*. Though these groups appear at first sight to have little in common, definite evidence of their near relationship may be seen in the structure of the terminalia, and in the fact that most of the species have similar markings on the hind tarsi—two white rings only, a narrow one on the first and a broader one on the second segment.

None of the African species of this subgenus has been recorded as dangerous or troublesome. According to Bauer (1928) *A. longipalpis* and *ingrami* “could only rarely be induced to bite man.”

KEY TO ETHIOPIAN SPECIES OF FINLAYA.

1. Metallic silvery markings on thorax and abdomen, including a double row of silver scales extending nearly whole length of scutum in middle 2.
No metallic silvery scales on thorax or abdomen 4.
2. Hind tarsi with two white rings, that on segment 2 broad 3.
Tarsi all dark *monetus* Edw. (p. 122).
3. Median lobe of scutellum with black scales in middle, silvery scales at sides
longipalpis Grünb. (p. 120).
All scales on median lobe of scutellum silvery *fulgens* Edw. (p. 121).
4. Scutum with three narrow lines of whitish scales running most of its length, also bordered with whitish scales 5.
Scutum largely clothed with whitish scales, at least on front half, with or without a median pair of black stripes; hind tibia all dark; *ppn* with narrow scales above 6.
5. Hind tibia white at base beneath; *ppn* with broad flat white scales only
pulchrithorax Edw. (p. 124).
Hind tibia all dark; *ppn* with narrow scales above *barnardi* Edw. (p. 124).
6. Few narrow scales on vertex; wings all dark 7.
Narrow scales on vertex forming a broad stripe or a large patch 8.
7. Front tibia with a white posterior stripe; middle femur with basal half of posterior surface all white *wellmani* Theo. (p. 122).
Front tibia all dark; middle femur mainly dark posteriorly *ingrami* Edw. (p. 123).
8. Pale scales of scutum yellow; tip of hind tarsi dark; base of costa with whitish scales *embuensis* Edw. (p. 123).
Pale scales of scutum white; fifth hind tarsal segment at least partly white; wing scales all dark *nyasae* Edw. (p. 123).

Aedes (Finlaya) longipalpis Grünberg.

Stegomyia longipalpis Grünberg, Zool. Anz. 29, p. 383 (1905).

Ochlerotatus longipalpis Edwards, Bull. Ent. Res. 3, p. 17 (1912), and 7, p. 213 (1917).

Stegomyia pollinator Graham, Ann. Mag. Nat. Hist. (8) 5, p. 271 (1910).

Kingia pollinator Theobald, Mon. Cul. 5, p. 628 (1910).

TYPEs.—*longipalpis*, ♀ in Berlin, Duala, Camerun; *pollinator*, ♂♀ in B.M., Lagos.

An extremely distinctive species with black and silver thorax and metallic blue abdomen and legs; mesonotum with a conspicuous silvery stripe similar to that of some species of *Harpagomyia*; hind tarsi with a broad white ring on the second segment. Differs from the nearly allied *A. fulgens* in the less elongate palpi of the female and in the scaling of the scutellum and details of the leg-markings.

♀. *Head* black, with a broad silvery orbital margin connected with a silvery patch towards each side; all scales flat and close-lying except for a few semi-erect scales towards nape. Proboscis black. Palpi black, about one-third as long as proboscis, appearing thick owing to dense coating of scales. Tori and clypeus black, bare. *Thorax* (Fig. 36) black, with a double median stripe of flat metallic silver scales, this stripe forking in front of scutellum, the two branches extending across mid-lobe of scutellum, and leaving an area of flat black scales in the middle of this lobe; a large patch of flat silvery scales above wing-root; pleurae mainly covered with similar silvery scales, including whole of *ppn* and mesepimeron. *Abdomen* deep blue-black; tergites 1-6 with basal lateral silver patches, 6 and 7 also with a pair of subdorsal silver spots, 8 mainly silver-scaled. *Legs* metallic blue, front pair entirely so; middle and hind femora with a silver patch in middle in

front ; hind tibia with a large creamy patch at base beneath ; middle and hind tarsi each with a narrow white ring at base of first segment and a much broader one occupying most of second segment. *Wings* rather short (markedly shorter than abdomen) with black scales.

♂. Resembles ♀. Palpi slightly shorter than proboscis, slightly thickened distally, last two segments moderately hairy. *Terminalia* : Coxite long and narrow, with slight basal lobe bearing a few setae, one of which is slightly thickened ; harpago with long slender appendage.

Wing-length 2.5 mm. (small ♂)—4 mm. (large ♀).

Distribution.—NIGERIA : Lagos (*Graham, Connal, Wigglesworth*). GOLD COAST : Ofako (*Ingram*). SIERRA LEONE : Freetown (*Evans*). BELGIAN CONGO : Eala and Leopoldville (*Henrard*). CAMEROONS : Misselele (*Zumpt*). UGANDA : Katoba (*Gibbins*).

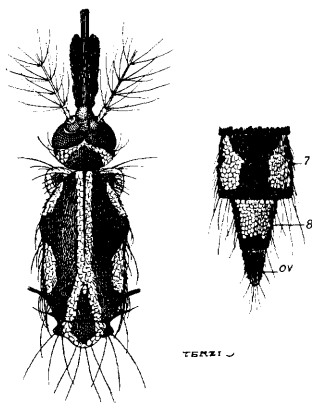


FIG. 36.—Head and thorax, and tip of abdomen, of *Aedes (Finlaya) longipalpis* Grünb.

Aedes (Finlaya) fulgens Edwards.

Ochlerotatus (Finlaya) fulgens Edwards, Bull. Ent. Res. 7, p. 213 (1917).

TYPE.—♂ in B.M., Zanzibar.

Very similar to *A. longipalpis*, differing as follows : Palpi of ♀ much longer, fully two-thirds as long as proboscis. Sublateral silvery patches of head rather larger. Median silvery stripe of mesonotum widening, but not distinctly forking in front of scutellum ; mid-lobe of scutellum, as well as the normally bare pre-scutellar area, entirely clothed with silver scales. Tergite 5 (as well as 6 and 7) with paired subdorsal silver spots ; traces of such spots often also present on tergites 2–4. Hind tibia entirely dark, even at base beneath. Mid tarsi with the first segment almost entirely white above ; hind tarsi with the first segment entirely dark, even at base.

Distribution.—ZANZIBAR (*Aders*). TANGANYIKA : Dar-es-Salaam (*Shircore, Haworth*). NYASALAND : Karonga (*Eldred*) ; Fort Johnston (*Lamborn*). KENYA : Mombasa (*De Boer*). N. RHODESIA : Lunda, Congo Border (*Silvester Evans*).

Aëdes (Finlaya) monetus Edwards.

Aëdes (Finlaya) monetus Edwards, Bull. Ent. Res. 26, p. 132 (1935).

TYPE.—♀ in B.M., Madagascar.

♀. Allied to *A. (F.) longipalpis* Grünb., and *A. (F.) fulgens*, Edw., which it resembles in its black and silver head and thorax, with *ppn* densely covered with round flat silver scales and a double row of similar scales running whole length of scutum and forking in front of scutellum, and in its blue-black abdomen and legs. Differs in having tarsi entirely dark; no silvery scales on middle or hind femora, latter creamy-white on basal half or more, with a dark dorsal line; no white at base of hind tibia beneath; two patches of silvery scales on each side of scutum, one immediately in front of wing-base (as in the other two species), the second further forwards, connected with the silvery area of *ppn*; abdominal tergites 6 and 7 with complete but irregular silvery bands. Palpi only one-fifth as long as proboscis, and therefore shorter than in either of the African species. Middle lobe of scutellum as in *A. fulgens* entirely covered with silver scales.

Distribution.—MADAGASCAR: Maevatanane (*Lamborn*).

Aëdes (Finlaya) wellmani Theobald.

Danielsia wellmani Theobald, Entom. 38, p. 103 (1905).

Ochlerotatus wellmani Edwards, Bull. Ent. Res. 3, p. 18 (1912).

Aëd. (Finlaya) wellmani Edwards, Bull. Ent. Res. 21, p. 295 (1930).

TYPE.—♀ in B.M., Angola.

Belongs to a group of closely allied species distinguished by having an extensive area of creamy-white scaling on anterior half of scutum; narrow scales on at least lateral lobes of scutellum; white rings on first two hind tarsal segments, that on the second segment being the broader. Differs from its allies chiefly in head scaling and in coloration of middle femur.

♀. *Head* with the scales on dorsal surface nearly all broad and flat, mostly creamy white, with a pair of large blackish patches; numerous yellowish erect scales and a very few decumbent narrow scales on nape. Proboscis black. Palpi black, about one-fourth as long as proboscis. Tori rather light brownish and quite bare. *Thorax* with the scutal scales all narrow, mostly creamy white, with a pair of blackish stripes almost reaching front margin, separated by a narrow line of creamy scales which forks in front of scutellum; a short black stripe on each side posteriorly, also separated from the median stripes by a narrow line of creamy scales. Scales on *ppn* all creamy-white, narrow above, broad and flat below. Median lobe of scutellum clothed mainly with flat dark scales. *Abdomen* black above; tergites with white basal lateral patches; 6 and 7 also with small median sub-basal spots; sternites with broad white basal bands. *Legs* without purple gloss. Front tibia with a white line on posterior surface from base almost to tip. Front tarsus with narrow white rings at bases of first two segments. Middle femur with about the basal three-fifths of posterior surface white, remainder black. Hind femur entirely white on basal half, then with a broad black ring, followed by a narrow white ring close to the tip, the scales at extreme tip being black. Middle and hind tibiae entirely black. Middle and hind tarsi with two white rings, that on second hind tarsal

segment occupying about half the segment ; remainder of hind tarsi dark, or with a few white scales at base of third segment. *Wings* uniformly dark scaled.

♂. Unknown.

Wing-length about 4 mm.

Distribution.—ANGOLA: Bihé (*Wellmann*). Other records probably all refer to one or other of the allied species.

Two slightly damaged specimens from Nyasaland (*Lamborn*) may belong to this or to a closely allied species. They agree with the above description except in having the upper proximal fourth of the posterior surface of the middle femur black.

Aëdes (Finlaya) ingrami Edwards.

Aëdes (Finlaya) ingrami Edwards, Bull. Ent. Res. 7, p. 296 (1930).

TYPE.—♀ in B.M., Aburi, Gold Coast.

♀. Differs from *A. wellmani* as follows: Median pair of black stripes on mesonotum not reaching so far forwards. Front tibia all black. Front tarsus with a few white scales at base of first segment only. Posterior surface of middle femur mainly black, with a white patch below before middle, and a smaller white patch below at tip.

♂ (?). Differs from ♀ in having anterior two-thirds of scutum clothed entirely with creamy-white scales, posterior third mainly dark; all abdominal tergites with complete basal white bands; front tibia with a white line behind; wings with white scales at base of costa. Palpi and terminalia almost as in *A. (F.) longipalpis*.

Distribution.—GOLD COAST: Aburi (*Ingram*); Accra (*Macfie*). NIGERIA: Lagos (*Graham*); Oshogbo (*Kumm*). SIERRA LEONE: Daru (*Murphy*). UGANDA: Bumbo (*Gibbins*); Mt. Debasien (*Hopkins*). SUDAN: Meridi (*Ruttleidge*). NYASALAND: Mt. Mlanje (*Neave*). KENYA: Kisumu (*Symes*). BELGIAN CONGO: Lundu, Kwango (*Mortiaux*); Eala (*Henrard*); Kakamega (*MacDonald*).

Aëdes (Finlaya) embuensis Edwards.

Aëdes (Finlaya) embuensis Edwards, Bull. Ent. Res. 21, p. 295 (1930).

TYPE.—♀ in B.M., Embu.

♀. Differs from *A. wellmani* as follows: Decumbent scales of dorsal surface of head all creamy-white, numerous narrow ones in a median stripe. Pale scales of scutum yellow (much of scutum and whole of scutellum denuded in type). Narrow but complete sub-basal white bands on each of tergites 5-7. Middle femur with posterior surface rather more extensively white, and also more obviously white at tip (hind legs missing in type). Base of costa clothed with creamy-white scales.

Distribution.—KENYA: Embu (*Orde-Browne*).

Aëdes (Finlaya) nyasae Edwards.

Aëdes (Finlaya) nyasae Edwards, Bull. Ent. Res. 21, p. 216 (1930).

TYPE.—♀ in B.M., Fort Johnston.

♀. Differs from *A. wellmani* as follows: *Head* with decumbent scales of vertex all white and mostly narrow. *Thorax* with the median pair of black stripes reaching

front margin. *Legs* with a purple gloss; front tibia all dark; front tarsus with two distinct white rings; middle femur as seen from behind mostly white on basal half, but with a dark dorsal line; hind tarsus with segment 5 either all white or darkened only on one side. As in *wellmani* and *ingrami* there are no pale scales at base of costa.

♂. Differs from ♀ in having all the mesonotal scales white, no black ones even on posterior third; abdomen with complete basal white bands on tergites. Terminalia and palpi as in *A. ingrami*.

Distribution.—NYASALAND: Fort Johnston (*Lamborn*).

***Aedes* (*Finlaya*) *barnardi* Edwards.**

Aedes (*Finlaya*) *barnardi* Edwards, Ann. S. Afr. Mus. 19, p. 161 (1924); Edwards, Bull. Ent. Res. 21, p. 296 (1930).

TYPES.—♀ in Cape Town and B.M., Oudebosch.

♀. Differs from *A. wellmani* as follows: *Head* without distinct dark patches above and with more numerous narrow scales. *Thorax* with the pale scales of scutum much less numerous, forming a narrow border all round and three narrow lines which run almost the whole length. *Abdomen* without mid-dorsal pale markings even on tergites 6-7. *Legs*: Front tibia all dark. Posterior surface of mid femur with a white stripe below on basal half.

Distribution.—CAPE PROVINCE: Oudebosch (*Barnard, Wood*); "Caffraria" (*Wahlberg, Stockholm Mus.*).

***Aedes* (*Finlaya*) *pulchrithorax* Edwards. (Pl. 3, fig. 14.)**

Aedes (*Finlaya*) *pulchrithorax* Edwards, Proc. R. Ent. Soc. B, 8, p. 17 (1939).

TYPES.—♂♀ in B.M., Nairobi.

An extremely distinctive species, with markings much as in *A. barnardi* but much more sharply defined and contrasted black and white; differs from *barnardi* and the members of the *wellmani* group in having hind femur black at base and hind tibia white at base beneath, and in several other details. The mesonotal pattern is curiously similar to that of *Culex pulchrithorax*, but the margin is not continuously white.

♀. *Head* with two large patches of flat black scales which cover most of dorsal surface; flat white scales at sides and around eyes, and a narrow median stripe (broadening on nape) of narrow yellowish scales. *Tori* black, covered with a hoary bloom though without scales. *Proboscis* and *palpi* black, *palpi* nearly one-third as long as *proboscis*. *Thorax* black, including bristles and most of scutal scales; scutum with three rather narrow lines of narrow yellowish scales, median line running whole length and forking just in front of scutellum, sublateral lines straight and nearly but not quite reaching margin in front; an area of narrow whitish scales on each side in front of wing-root, but no white scales on margin of anterior half of scutum. Median lobe of scutellum with a small area of narrow yellowish scales bordered by a few narrow blackish scales; lateral lobes without scales. *Pleurae* with patches of flat white scales; *apn* and paratergite with flat silvery-white scales; *ppn* with a large patch of flat silvery-white scales on upper half (no narrow scales).

Abdomen black above, tergites with silvery-white lateral basal spots; sternites similarly coloured. *Legs*: All femora black to tips above, without knee-spots; mid femur as seen from behind white beneath on basal half and also at tip; hind femur with most of proximal half creamy white all round, but with a narrow black ring at base, distal half all black; front tibia with a white line behind; middle tibia narrowly and hind tibia broadly white at base beneath; all tarsi with a narrow white ring at base of first segment; middle and hind tarsi with about the basal half of second segment white, remainder all black. *Wings* entirely black-scaled.

♂. Resembles ♀ in ornamentation, but the three yellowish-white stripes of scutum slightly broader, the sublateral pair reaching margin in front. Palpi about four-fifths as long as proboscis, last two segments slender and with very few hairs. *Terminalia* much as in *A. longipalpis*, blade of harpago perhaps a little broader.

Wing-length about 3 mm.

Distribution.—KENYA: Nairobi (*E. C. MacDonald*); Mt. Elgon (*Jackson*).

Subgenus **STEGOMYIA** Theobald.

Stegomyia Theobald, Mon. Cul. 1, p. 283 (1901).

Quasistegomyia Theobald, Second Rept. Wellcome Lab. p. 69 (1906).

Kingia Theobald, Mon. Cul. 5, p. 135 (1910).

Aniella Enderlein, Wien. Ent. Zeit. 40, p. 26 (1923).

GENOTYPES.—*Stegomyia*, *Culex fasciatus* Fab. = *aegypti* L.; *Quasistegomyia*, *Q. unilineata* Theo.;

Kingia, *S. luteocephala* Newst.; *Aniella*, *A. zicmanni* End. (? = *apicoargenteus* Theo.).

Ornate species, usually blackish with white markings on thorax. Decumbent scales on vertex, and scales on *apn* and scutellum, usually all broad and flat; scutellar scales usually white. Eyes in some species well separated with a scaly area between them. Paratergite usually and lateral lobes of first abdominal tergite always scaly. Proboscis in both sexes only about as long as front femur. Dorso-central bristles few and acrostichal bristles absent (except in *A. vittatus*). Lower mesepimeral bristles absent (except in *A. vittatus*). Palpi of ♂ about as long as proboscis, last two segments, slender, subequal, upturned, and with few or no hairs. Larger claw of front and middle legs of ♂ often simple, sometimes also the smaller claw; anterior claws of ♀ usually toothed, but simple in a few species. ♂ *Terminalia*: Coxite with membranous area on inner face extending from base to tip as in *Ochlerotatus*, but claspettes in the form of a hairy basal lobe or plaque attached to sternal side of coxite, this plaque in a few species with its inner part forming a small process bearing modified bristles; no definite lobes on tergal part of coxite. Style nearly always simple, with terminal spine. Phallosome divided into two lateral plates, each of which bears numerous teeth externally. ♀ *Terminalia* (*aegypti*, Fig. 6 ♀, n, o): Eighth segment largely retractile, somewhat compressed, its sternite with sides produced into conspicuous rounded flaps, the inner walls of which are sclerotized; ninth tergite shield-shaped, shorter than cerci, with wide and deep posterior emargination; insula longer than broad and bare; cerci broad and not very long, scaly; post-genital plate with rather shallow notch. According to Macfie and Ingram six other African species are similar; *vittata* differs in the tongue-like post-genital plate.

The numerous African species are for the most part very similar in structural

details, but *A. unilineatus*, *albopictus* and *granti* are peculiar in having the claws of the female simple; the tendency to loss of the tooth on the claws is also shown by *A. simpsoni*, in which the claws may be either simple or toothed. *A. mascarensis* is unique in the subgenus in lacking scales on the paratergite. *A. vittatus* shows several peculiarities, notably the presence of acrostichal and lower mesepimeral bristles, and of narrow decumbent scales on the nape.

The presence of a vertical ventral arm on the paraproct is a feature distinguishing most of the African from most of the Oriental species of the subgenus, but this distinction is less clear-cut than I formerly thought, the structure being absent in *A. metallicus*.

The brilliant white markings of the mesonotum probably serve as useful recognition-marks for those species which breed (and very probably mate) in rather dark tree holes. The larger spots on such species as *A. dendrophilus* are slightly concave and act as very efficient reflectors.

Apart from the notorious *A. aegypti*, this subgenus includes several species which frequently attack man, mainly out of doors. Kerr considers that *A. africanus* and *luteocephalus* probably prefer human blood, and these species as well as *simpsoni* and *vittatus* have been shown to be capable of conveying yellow fever (from monkey to monkey). Bacot (1916) found that *A. simpsoni* preferred biting at night.

KEY TO ETHIOPIAN SPECIES OF SUBGENUS STEGOMYIA.

1. Proboscis and tibiae with white lines. *granti* Theo. (p. 154).
 Proboscis and tibiae without white lines (unless at base of hind tibia) 2.
2. Each tibia with a white ring near middle (Fig. 37, f); proboscis largely pale
 *vittatus* Big. (p. 155).
 Tibiae otherwise; proboscis all black 3.
3. Front half of scutum entirely clothed with white scales *mascarensis* MacGr. (p. 153).
 Front half of scutum with white or yellow markings on black ground 4.
4. Front half of scutum with a pair of crescent-shaped or oval white, yellow
 or silver marks 5.
 Front half of scutum with a median white stripe only 26.
5. Anterior scutal markings snow-white or (rarely) yellow; white ring of third hind
 tarsal segment not unusually broad (often very narrow or absent). (Fig. 37,
 a-d) 6.
 Anterior scutal markings metallic silver; white ring of third hind tarsal segment
 much broader than the others (Fig. 37, e) 25.
6. Middle femora with a white stripe in front from base nearly to tip; clypeus in ♀
 scaly *aegypti* L. (p. 128).
 Middle femora without white stripe in front (unless indistinctly towards base);
 clypeus bare 7.
7. Hind tibiae entirely black, and middle femora with a white spot in middle in
 front 8.
 Hind tibiae (Fig. 37, d) with a white mark at or near base (usually on under
 surface), or if not, middle femora without a white spot in middle in front 12.
8. Prescutellar area covered with broad, round-ended, metallic silver scales
 *metallicus* Edw. (p. 134).
 This area with narrow (or at least pointed) non-metallic scales 9.
9. Scutum with a pair of median yellow lines, at least posteriorly 10.
 Scutum without median yellow lines; fourth hind tarsal segment almost all
 white (Fig. 37, c). *chaussieri* Edw. (p. 136.).

- 10. Fourth hind tarsal segment white at base, or all white (var. *kivuensis*) *subargenteus* Edw. (p. 132).
 Fourth hind tarsal segment all black 11.
- 11. Lateral lobes of scutellum black-scaled *woodi* Edw. (p. 133).
 Lateral lobes of scutellum white-scaled *simpsoni* Theo. (p. 133).
- 12. Scutal markings mostly white; middle and hind femora with white spots at tip 13.
 Scutal markings all yellow; all femora dark at tip 24.
- 13. Main white spots on scutum more rounded behind and separated from margin by at least a narrow area clothed with narrow dark scales (Fig. 39) 14.

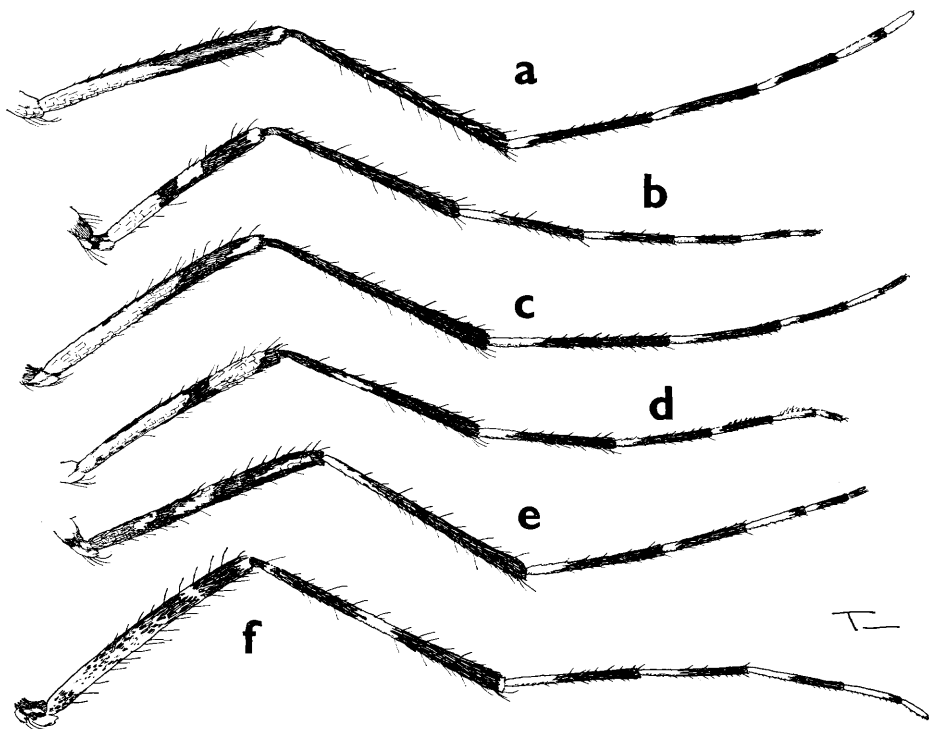


FIG. 37.—Hind legs of *Aedes* (*Stegomyia*) spp. a. *aegypti*. b. *subargenteus*. c. *chaussieri*. d. *apicoargenteus*. e. *africanus*. f. *vittatus*.

- Main white spots of scutum more pointed behind, reaching margin at scutal angle and for at least a short distance in front of it 16.
- 14. Hind femur with posterior surface nearly all black . . . *apicoargenteus* Theo. (p. 136).
 Hind femur (as usual) white posteriorly on about the basal half 15.
- 15. White mark on outer side of hind tibia extended to base on under side; fifth hind tarsal segment partly or all white *fraseri* Edw. (p. 139).
 White mark on outer side of hind tibia not extended ventrally; fifth hind tarsal segment black *schwetzi* Edw. (p. 139).
- 16. Scutum with the main white marks large; hind femur with a silvery-white streak on anterior side at tip 17.
 Scutum with the main white marks smaller, more crescent-shaped, and with a continuous median yellowish line; hind femur with only a small white spot above at tip 20.

17. Supra-alar white marks large ; a continuous median pale line on scutum
trinidad Gil C. (p. 141).
 Supra-alar white marks small ; no continuous median pale line 18.
18. Middle femur without white spot in middle in front . . . *dendrophilus* Edw. (p. 140).
 Middle femur with such a spot 19.
19. White spot on front margin of scutum composed of narrow scales ; fifth hind
 tarsal partly white *soleatus* Edw. (p. 142).
 White spot on front margin of scutum composed of broad scales ; fifth hind
 tarsal black *calceatus* Edw. (p. 142).
20. Middle femur with a white spot in middle in front 21.
 Middle femur without such a spot 23.
21. Each tibia with a narrow white ring slightly removed from base
pseudonigeria Theo. (p. 147).
 White marks on tibiae confined to extreme base and not forming rings 22.
22. Middle tibia with a whitish patch at base beneath . . . *poweri* Theo. (p. 145).
 Middle tibia practically all black *contiguus* Edw. (p. 145).
23. Third hind tarsal segment and hind tibia all black . . . *masseyi* Edw. (p. 146).
 Third hind tarsal segment with a white ring at base . . . *de-boeri* Edw. (p. 147).
24. Middle femur with a small white spot in middle in front ; thorax unusually
 narrow *angustus* Edw. (p. 150).
 Middle femur without this spot ; thorax normal . . . *bambusae* Edw. (p. 148).
25. Head mainly black ; abdomen unbanded *africanus* Theo. (p. 150).
 Head mainly yellow ; abdomen banded *luteocephalus* Newst. (p. 151).
26. Middle femur with a white spot in middle in front . . . *unilineatus* Theo. (p. 152).
 Middle femur without this spot *albopictus* Skuse (p. 153).

Aëdes (Stegomyia) aegypti Linnaeus. (Pl. 1 ; Pl. 2, fig. 1.)

Culex aegypti Linnaeus, Hasselquist's Reise nach Palestina, p. 470 (1762) ; Edwards, Bull. Ent.

Res. 2, p. 265 (1911) ; Dyar, Insec. Inscit. 8, p. 204 (1920) ; Patton, Ann. Trop. Med. 27,
 p. 182 (1933) ; Edwards, Ann. Trop. Med. 27, p. 357 (1933).

Culex argenteus Poiret, Journ. Phys. 30, p. 245 (1787) ; Knab, Insec. Inscit. 4, p. 60 (1916).

Culex fasciatus Fabricius, Syst. Antliat. p. 36 (1805).

Culex calopus Meigen, Syst. Besch. 1, p. 3 (1818).

Culex formosus Walker, List Dipt. Brit. Mus. 1, p. 4 (1848).

Culex inexorabilis Walker, List Dipt. Brit. Mus. 1, p. 4 (1848).

Culex insatiabilis Bigot, Ann. Soc. Ent. France (3), 7, p. 118 (1859).

Stegomyia nigeria Theobald, Mon. Cul. 1, p. 303 (1901).

Stegomyia fasciata Theobald et auct.

Aëdes argenteus auct.

Aëdes (Stegomyia) aegypti Barraud, Fauna Brit. Ind. Dipt. 5, p. 221 (1934), at auct.

TYPES.—*aegypti*, ♀ (?) non-existent, Egypt ; *argenteus*, ♀ (?) non-existent, Barbary ; *fasciatus*, ♂
 (?) non-existent, West Indies ; *calopus*, ♂♀ non-existent, Portugal ; *formosus*, ♀ in B.M. ;
 Sierra Leone ; *inexorabilis*, ♀ in B.M., West Africa ; *insatiabilis*, ♀ (?) non-existent, Madagascar ;
nigeria, ♀ in B.M., Bonny, S. Nigeria.

Readily distinguished from most other species of the subgenus by the form of the thoracic markings, and from the few with a somewhat similarly ornamented thorax by the presence of scales on the clypeus (in the female) and white lines on the front and middle femora.

♀. *Head* with ground-colour white ; two large black patches above and a smaller black patch on each side. Palpi broadly white-tipped. Clypeus with two patches of broad white scales. Eyes well separated, the space between them clothed with white scales. *Thorax* usually with ground-colour quite black. An area of broadish white scales in the shape of a narrow crescent, convex outwardly, towards each side

of anterior half of scutum ; from the posterior horn of the crescent a line of narrow white scales extends back to scutellum. On front margin of scutum a small patch of narrow white scales ; from this patch two narrow lines composed of narrow yellowish scales extend back nearly to scutellum, where they unite for a short distance and then fork in front of scutellum, enclosing the usual bare space. A very small patch of white scales above wing-base. Scutellum with white scales on all lobes, sometimes some black ones on apex of mid-lobe. Pleurae with patches of white scales ; *ppn* with a small patch of flat white scales towards posterior margin below and some narrow black scales above. *Abdomen* in normally coloured specimens black, with basal white bands on tergites 2-6 which are just separate from the lateral silvery-white spots ; tergites 7 with the lateral silvery patches large and visible dorsally but the median basal patch absent or quite small. *Legs* (Fig. 37, a) black. Front and middle femora with a white line on anterior surface from base to near tip ; hind femora with a similar white line indicated on distal half, proximal half of anterior surface all white ; tips of all femora narrowly silvery-white. All tibiae entirely black. Front and middle tarsi with narrow white rings at bases of first two segments ; hind tarsi with broader white rings at bases of first three segments, fourth segment white except tip, fifth normally all white. *Wings* with a white dot at base of costa, otherwise dark.

♂. Similar to ♀ except that the clypeus is usually bare, white scales if present being few in number. Palpi with two complete white rings on shaft and with the last two segments white at base beneath. *Terminalia* (Fig. 38, a) : tergite with two large conical lobes separated by a deep V-shaped emargination, each lobe with a few short hairs ; style somewhat widened in middle, with a slender, short terminal spine ; paraprocts with a ventral arm which is not much shorter than the main portion ; phallosome with fine teeth only.

Distribution.—Throughout the whole of the Ethiopian region this is a common domestic species. Records are available from almost every country of Africa ; in West Africa it is found not only in the towns but also, if less commonly, in small and remote settlements in all types of country ; according to Findlay it is common at Bathurst, but relatively rare elsewhere in Gambia, though no rural area has yet been discovered in West Africa from which it is absent. In East Africa it may be more restricted to urban areas. I have not found any published records from the Cape Province, but specimens are in the British Museum from Grahamstown (*Barraud*) and Port St. John (*Turner*). The absence of any record from Cape Town is perhaps accidental, but probably indicates that the species is at least less abundant there than in tropical Africa. It is (or was) common at Nairobi, this town being situated near the altitude limit of the species in East Africa, which appears to be about 6000 ft. The permanent range of *A. aegypti* is believed to lie within the 20°C. isotherms, as outdoor breeding does not continue at temperatures lower than 20° ; the extreme south and south-west of Africa lie outside this isothermal zone.

Variation.—*A. aegypti* is subject to much individual variation. This was studied by Summers-Connal (1927) especially as regards variation in markings of abdomen and hind tarsi. She found that in the Lagos district the dorsal surface of the abdomen may be entirely black or almost entirely white, with various intermediate

proportionate quantities of dark and light scales; the white bands on the tergites may be narrower or broader, and situated either on the basal or apical margins, or both. The amount of black at the tip of the fourth hind tarsal segment varies, as do the proportionate lengths of the fourth and fifth segments. Similar variations have been noted in other districts.

Another form of variation is seen in the colour of the thoracic integument and of the darker scales of the mesonotum, which are normally black (or nearly so), but may be brown, even of quite a light tint. Brown specimens appear to be associated especially with dry country or with coastal districts. Such light brown specimens were found by Drake-Brockman in the coast towns of British Somaliland, and specimens are in the British Museum from Zeila (*A. J. M. Paget*), Bahrein (*A. Bennett*), Aden (*A. Dawson*) and Dar-es-Salaam (*W. E. Haworth*), while D. J. Lewis writes (1939) that "in many specimens from Port Sudan, Suakin and Tokar the usual black scales are replaced by brown or yellow ones on various parts of the body, especially the mesonotum and parts of the abdomen and femora and vertex"; and again (April, 1940), "I have had a cage colony of the pale *Aedes aegypti* from Port Sudan breeding here for eight months now and the pale colour still persists." Somewhat similar brown specimens found near Brisbane (Queensland) by Bancroft were given the varietal name *queenslandensis* by Theobald.

There is little evidence that distinct local or biological races of *A. aegypti* exist unless the varieties *queenslandensis* (noted above) and *atrirtarsis* (see below) are such. Mathis (1934) reared strains from Greece, Cuba, Java and West Africa under identical experimental conditions and found that their biology was similar.

Hybridization.—The recent studies of Toumanoff (1937) on the experimental hybridization of this species and *A. albopictus* have already been noted (p. 2). A remarkable feature of these experiments was that all the offspring of a cross closely resembled the female parent, at least in ornamentation; in the cross *aegypti* ♂ × *albopictus* ♀ (which was easily obtained) all the many hundreds of offspring of the first and subsequent generations were precisely like *albopictus*, whereas in the reverse cross (which was only obtained once) they were like *aegypti*. Unfortunately no details were given of the morphological characters of the hybrids; it would be of particular interest to ascertain whether the male terminalia of the hybrids showed intermediate structure, and if not whether they resembled those of the male parent or those of the male corresponding with the female parent.

Connal (1925) attempted to cross-breed *A. aegypti* with *A. luteocephalus* and *A. longipalpis*, but with negative results.

Feeding and other habits.—*A. aegypti* is almost purely domestic and in feeding shows a preference for human blood, though in the laboratory it will also feed on dogs, goats, bandicoots, rats, rabbits, guinea-pigs or canaries (Bacot, 1916 and others), or even, in the absence of warm-blooded animals, on frogs or turtles (Woke, 1937). According to Marchoux (quoted by Kazeeff, 1935) it prefers to bite children rather than adults and Europeans rather than Africans. Bacot in West Africa concluded that "in captivity there seems to be no regular precedence of either pairing or feeding; both functions are practised at any hour of the day or night—late afternoon being perhaps the most favoured," he also found that the first meal is taken 1–2 days after emergence and subsequent meals at about 3-day intervals. Flu (1928) in

Surinam and Cardamitis (1929) in Greece independently stated that whereas the first blood-meal is always taken by day, later meals are taken only or at least mainly at night; if correct this is important in view of the fact that the mosquito can only become infective after a meal. Daytime biting is performed in a rather dim light. Dark surfaces are preferred to light ones; Brett (1938) showed that *aegypti* has a definite preference for settling on dark or red cloth, and that light (especially yellow) and blue cloths are much less attractive or even repellent. A perspiring skin attracts more readily than a dry one.

According to Hopkins (1939) *aegypti* though occurring in the houses of Europeans is not found in native huts in Kampala; he considers that this is due to the huts being too dark. This may partly explain the supposed preference of the mosquito for feeding on Europeans. Wanson (1936) in the Congo found that adult *aegypti* used crab-holes as day-time resting-places, although this species did not breed in such places.

Egg-laying.—Bacot (1916) found that at least one meal of blood is essential for the production of fertile eggs, and normally the eggs are ripened in batches, the females feeding after each oviposition. These observations have been confirmed, but much variation has been found to occur in the number of eggs laid and in the size of the batches. Bacot mentions females laying 712 and 837 eggs in 15 and 22 batches respectively; Mathis (1935) at Dakar obtained from each of 7 females an average total of 1360 eggs in 22 batches after 22 blood-meals extending over 87 days; Shannon and Putnam (1934) give a mean maximum of eggs per female of only 350. Eggs can survive several months desiccation, but in spite of this they are laid only on wet surfaces, and the females will die rather than oviposit on dry surfaces. Fertile eggs may be laid some weeks after the removal of males from a breeding-cage.

Length of life.—Adults of both sexes of *A. aegypti* can live for several weeks or months, but females are more long-lived than males, and both sexes live much longer in a moist atmosphere even when well provided with food. Beeuwkes and others (1933) found that at Yaba, Southern Nigeria, the length of life for males was 40–61 days and for females 70–116 days; at Gadau, Northern Nigeria, where the climate is dryer, the figures were 10–43 and 22–65 days respectively; length of life was increased by keeping the insects in an artificially moist chamber. Shannon and Putnam (1934) in Brazil give a mean life of 62 days for females fed on blood and of 82 days for those fed on honey. Adults probably cannot survive a dry season.

Davis (1932) found that a temperature of 36° C. shortened the length of life, and that a colony kept constantly at this temperature soon died out, though one kept at 18° C. maintained its strength. The optimum temperature of the species is about 28° C.; 42° C. is lethal alike to eggs (Bacot, 1916) and to adults, though the latter can stand a temperature of 45° C. for half an hour (Johnson, 1935). Actual freezing kills eggs in at most two days (Davis); a temperature of 6° C. is fatal to adults in 24 hours (Flu, 1920).

Range of flight.—Although the normal range of flight of *aegypti* is thought not to exceed 200 yards, Shannon and Davis (1930) showed that it may extend to 1000 yards or more, marked specimens released on a ship moored at this distance from shore having been recovered on land.

Var. **atritarsis** Edwards.

Bull. Ent. Res. 10, p. 129 (1920).

Types.—♂♀ in B.M., Accra.

Differs from the usual form in the much blacker legs; front and middle tarsi almost entirely black; hind tarsi with very narrow white wings at bases of segments 1-3 and 5, 4 entirely or almost entirely black. Palpi of ♂ with the white rings narrower than usual. *Terminalia* as in the typical form.

Distribution.—GOLD COAST: Accra (*Macfie*, 1919; *Pomeroy*, 1930). Not found elsewhere; perhaps a genuine local form rather than a sporadic variation.

Aëdes (Stegomyia) subargenteus Edwards.

Aëdes (Stegomyia) subargenteus Edwards, Bull. Ent. Res. 15, p. 262 (1925).

TYPE.—♀ in B.M., Fort Johnston.

Generally similar to *A. aegypti*, notably in thoracic ornamentation and in having white basal rings on all segments of hind tarsi, but differs in markings of femora and other details as follows:

Head with scales towards nape rather yellowish in tint. Clypeus bare. Eyes almost in contact for a short distance. *Thorax*: Crescent-shaped white marks on scutum abbreviated in front (the anterior horn of the crescent being absent); lines between posterior horn of crescent and scutellum yellow instead of white; scales forming the small white patch on anterior margin of mesonotum broadly racquet-shaped; the median pair of golden lines rather broader and extending from anterior white patch right back to scutellum. *Abdomen* with white basal bands only on tergites 3-6 (none on 2). *Legs* (Fig. 37, b): Front tibia with a narrow white ring at base. Middle and hind femora black, each with two white spots on anterior surface, one just beyond middle and the other close before tip; hind femur also creamy-white on basal third (this creamy-white area separated from the first white spot by a black area). Hind tarsi with the white rings on segments 4 and 5 rather narrow, occupying less than half of each segment. *Terminalia* (Fig. 38, e): Lobes of tergite low and only slightly separated, each with a row of 6-8 strong bristles; coxite with a group of bristly hairs on inner tergal side at base; paraproct with only a short basal arm; style somewhat curved, tapering, with stout terminal spine; phallosome as in *A. aegypti*.

Distribution.—NYASALAND: Fort Johnston (*Lamborn*). ZULULAND: Umfolosi (*Ingram*).

Var. **kivuensis** nov.

TYPE.—♀ in Congo Mus., N. Kivu

Differs from typical *subargenteus* only as follows: Head with broad white median stripe, no yellowish scales at back. White bands of tergites 3-6 perhaps narrower (abdomen of type is shrunken). Apical spots of middle and hind femora reaching extreme tip above, though followed by a few black scales at sides. Fourth and fifth segments of hind tarsi entirely white. Scales forming anterior white spot on scutum narrower and pointed.

Distribution.—BELGIAN CONGO: N. Kivu, Kibati lava plain, October, 1933 (*De Wulf*); a single ♀ in perfect condition.

Aèdes (Stegomyia) woodi Edwards. (Pl. 2, fig. 2.)

Aèdes (Stegomyia) woodi Edwards, Bull. Ent. Res. 13, p. 82 (1922), and 15, p. 265 (1925).

TYPE.—♀ in B.M., Cholo, Nyasaland.

Very similar to *A. subargenteus*, the mesonotal pattern being almost the same (with a pair of crescent-shaped white marks, abbreviated in front, and a pair of golden lines running the whole length), but differs as follows:

♀. *Head* as in typical *A. aegypti*, with large black patches and no yellowish scales towards nape. *Thorax*: White spot on anterior margin of scutum composed of narrow scales. Lateral lobes of scutellum with black scales instead of white. *Abdomen*: White bands of tergites 3–6 narrower. *Legs*: Hind femur with the first white spot confluent with the creamy-white area at base. Hind tarsi with narrow white rings at bases of segments 1 and 2, a somewhat broader ring on 3, 4 all black, 5 all white.

♂. Unknown.

Distribution.—NYASALAND: Cholo (*Wood*).

Aèdes (Stegomyia) simpsoni Theobald. (Pl. 2, fig. 3.)

Stegomyia simpsoni Theobald, Entom. 39, p. 224 (1905), and Mon. Cul. 4, p. 182 (1907); Edwards, Bull. Ent. Res. 3, p. 11 (1912).

Stegomyia lilii Theobald, Mon. Cul. 5, p. 160 (1910).

Stegomyia bromeliae Theobald, Novae Cul. p. 10 (1911).

TYPES.—*simpsoni*, ♂♀ in B.M., Transvaal; *lilii*, ♂♀ in B.M., Bor, Sudan; *bromeliae*, ♂♀ in B.M., Kampala.

Somewhat resembles *A. (S.) aegypti* and *A. subargenteus*, differing conspicuously in the larger white markings of the thorax and markings of femora and tarsi. Differs from most of the other African species of the subgenus in having the fourth hind tarsal segment entirely black.

♀. *Head* much as in *A. aegypti*, but clypeus bare and eyes only narrowly separated; a few erect yellow scales on nape. *Thorax* black. A somewhat pear-shaped area of broad white scales on each side of scutum, the pointed end of this white patch directed backwards, but not quite continuous with a white line from in front of scutellum; outer margin of white patch reaching scutal angle. On front margin of scutum a median spot composed of broad flat white scales. White supra-alar patch larger than in *A. aegypti*. The usual bare space in front of scutellum bordered on each side with a line of rather narrow to broadish white scales; the two lines in typical specimens continued forwards by lines of narrow yellow scales which may extend only a short distance, or may (as in the type) reach the white patch on the front margin. Scutellum with flat white scales only. *ppn* with a small patch of white scales as in *A. aegypti* but with fewer dark scales above. *Abdomen* as in typical *A. aegypti* with dull white basal bands and silvery-white lateral spots on 2–6; a small median basal spot and large lateral spots on 7. Cerci longer than in most other species of the subgenus. *Legs*: Front femur all dark; front tibia narrowly

white at base. Middle femur black with two white spots on anterior surface, one beyond middle and one at tip; middle and hind tibiae all dark. Hind femur on anterior surface creamy-white towards base, then with a pure white area, distal half mostly black, with a rather large white spot at tip; posterior surface white on about the basal half. Front and middle tarsi with segments 1 and 2 rather narrowly white at base, hind tarsi with segments 1-3 white at base (the three white rings equally broad), 4 all black, 5 white. Wings dark, no white scales at base of costa.

♂. Resembles ♀. Palpi with two white rings on shaft, the proximal one narrow; a large white patch on under side of terminal segment and sometimes a few white scales at base of penultimate segment beneath. *Terminalia* (Fig. 38, c): Lobes of tergite widely separated, less conical than in *A. aegypti*, each with six or more strong bristles, middle part of tergite gently concave; style more tapering, terminal spine rather longer but not stouter; basal ventral arm of paraproct rather longer; teeth of phallosome also rather longer, but numerous.

Wing-length 2.5-3.5 mm.

Distribution.—GAMBIA: Bathurst (*Innes*). SIERRA LEONE: Daru (*Simpson*); Freetown (*Bacot*). GOLD COAST: Aburi (*Ingram*); Takoradi (*Pomeroy*); Accra (*Macfie*). NIGERIA: Gadau (*Taylor*). GABOON: Mayumba Forest (*Galliard*). BELGIAN CONGO: Kabinda, Katanga and Usumbara (*Schwetzn*); Sandoa (*Chaussier*); Leopoldville (*Duren*). SUDAN: Bor (*King*); Juba (*San. Insp.*). UGANDA: Kampala (*Fraser, Hopkins*); Karumi (*McConnell*). TANGANYIKA: Dar-es-Salaam (*Haworth*). ZANZIBAR (*Aders*); Pemba I. (*McCarthy*). NYASALAND: Fort Johnston (*Lamborn*). TRANSVAAL (*Simpson*). S. RHODESIA: Salisbury (*Marshall*). ZULULAND: Ntambanana (*Bedford*). ABYSSINIA: Lake Hardin (*Drake-Brockman*). ANGOLA: Bihé (*Wellman*).

Variation.—Two slightly different forms occur. In the typical form from the Transvaal and Zululand the pair of narrow yellow lines run the whole length of the scutum and all the claws of the female are simple. In the other form, which may perhaps be known as var. *lilii*, the narrow yellow lines are more or less abbreviated in front, usually not reaching forwards beyond middle of scutum and in a few cases absent; the main white patches of the scutum are somewhat larger and the claws of the front and middle legs of the female are usually (not always) toothed. Most or all of the specimens examined other than those from Transvaal and Zululand belong to this second form.

Aedes (Stegomyia) metallicus Edwards. (Pl. 2, fig. 4.)

Quasistegomyia dubia Theobald, Mon. Cul. 5, p. 133 (1910) [*nec Stegomyia dubia* Theobald].
Stegomyia metallica Edwards, Bull. Ent. Res. 3, p. 12 (1912).

TYPE.—♂ in B.M., Bor, Sudan.

Differs from all other species of the subgenus in having the area in front of the scutellum almost covered with broad, flat, round-ended metallic silvery scales, these scales occurring in two patches with only a narrow bare area between them, and connected anteriorly by a small patch of narrow white scales. In most other characters resembling *A. simpsoni*, notably in ornamentation of hind tarsi, differing as follows:

Head with the patches of black scales on vertex comparatively small. *Thorax* : White patches on anterior half of scutum larger and more rounded ; no white line on posterior half of scutum between the white patch and scutellum ; no trace of the median pair of yellow lines. Scutellar scales all metallic silvery. *ppn* mainly covered by a much larger patch of flat metallic silvery scales. *Abdomen* with broader white bands on tergites 2-5, band on 6 metallic silvery. *Legs* : Front femur with a

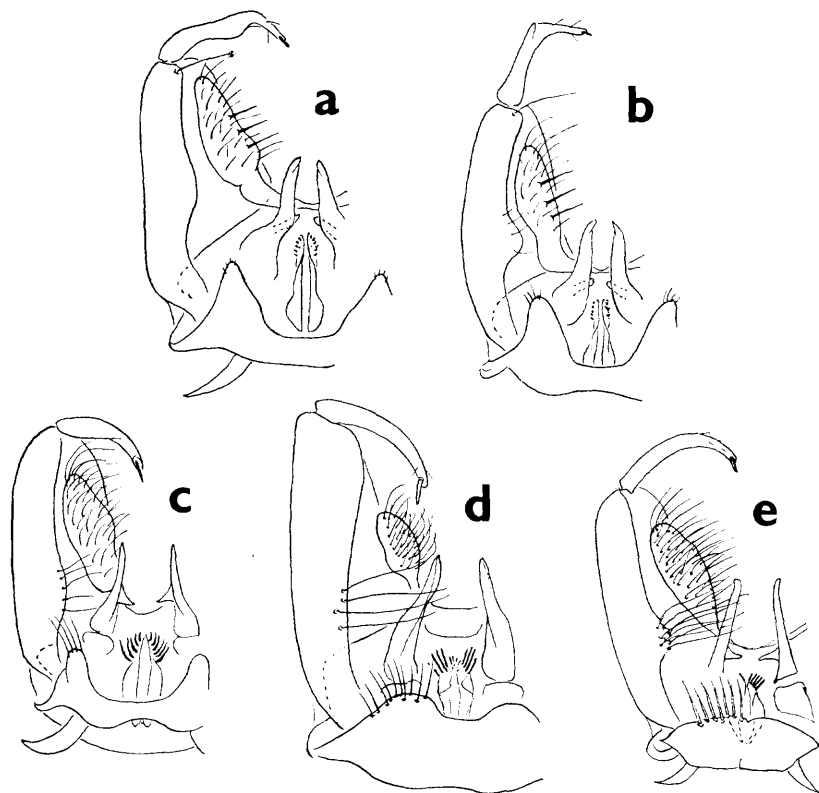


FIG. 38.—Terminalia of *Aedes* (*Stegomyia*) spp. (All drawn in tergal view and to same scale as all other figures here given of *Aedes* except those of subgenus *Mucidus*). a. *aegypti*. b. *mascarensis*. c. *simpsoni*. d. *metallicus*. e. *subargenteus*.

silvery patch on anterior surface close before tip. Hind femur on anterior surface with a metallic silver stripe from base to beyond middle and a metallic silver patch at tip, on posterior surface wholly black. Middle tarsus with first two segments wholly white on one side (white at base only on the other side). Hind tarsus with fifth segment black at tip. *Terminalia* (Fig. 38, d) : Style more tapering and strongly curved, with a much stouter terminal spine ; paraproct entirely without a basal ventral arm ; *lp* with only a few very long and slender teeth ; lobes of tergite closer together and more rounded.

Distribution.—GOLD COAST : Accra (*Macfie*). NIGERIA : Gadau (*Taylor*). SUDAN : Bor (*King*) ; Darfur (*Admiral Lynes*) ; Juba (*San. Insp.*). UGANDA :

Mbarara (*McConnell*). TANGANYIKA: Dar-es-Salaam and Lindi (*Haworth*). ZANZIBAR: Mnazi Moja (*Aders*). ZULULAND: Ntambanana (*Bedford*). TRANSVAAL: Komatipoort (*Ingram*). S. RHODESIA: Bindura, Shamva (*Leeson*).

Aëdes (Stegomyia) chaussieri Edwards. (Pl. 2, fig. 7.)

Aëdes (Stegomyia) chaussieri Edwards, Bull. Ent. Res. 13, p. 397 (1923), and 15, p. 266 (1925).
TYPES.—♀ in B.M., Sandoa, Congo.

Somewhat resembles *A. simpsoni*, notably in the large white patches on the scutum, white spot on middle femur, and entirely black hind tibia, differing in markings of hind tarsi (with fourth segment white instead of black) and in other respects, such as the absence of narrow pale lines on the thorax.

♀. *Head* with the flat scales towards nape largely yellow, the two black patches being largely replaced by yellow except towards the front. Eyes narrowly separated. Palpi broadly white-tipped as usual. *Thorax* with a pair of large somewhat pear-shaped or almost semicircular patches of broad white scales on anterior half of scutum; a small patch of broad white scales in middle of anterior margin, and small patches above each wing-root; no median pale line; many scales on posterior fourth of scutum (especially round pre-scutellar space) pale brownish yellow, not arranged in lines. Patch of white flat scales on *ppn* larger than in *A. simpsoni*. *Abdomen*: Tergites 2-6 with white basal bands, 7 with a median white basal spot, 1-7 with the usual silvery-white lateral basal patches. Cerci quite short. *Legs* (Fig. 37, c) as in *A. simpsoni* except that the white mark at the base of the front tibia is present on the under side only, and the hind tarsi have the white rings on the second and third segments narrower than that on the first, the fourth segment white except for extreme tip, fifth all black.

♂. Unknown.

Distribution.—BELGIAN CONGO: Sandoa (*Chaussier*); Elisabethville (*Seydel*). N.E. RHODESIA: near Lake Young (*Harger*).

Aëdes (Stegomyia) apicoargenteus Theobald. (Pl. 2, fig. 9.)

Stegomyia apicoargentea Theobald, Mon. Cul. 5, p. 172 (1910); Edwards, Bull. Ent. Res. 3, p. 10 (1912).

Kingia albertii Theobald, Rev. Zool. Afr. 2, p. 78 (1912); Edwards, Bull. Ent. Res. 15, p. 261 (1925).

Kingia maculoabdominalis Theobald, Ann. Trop. Med. 7, p. 597 (1913).

Aniella togoensis Enderlein, Wien. Ent. Zeit. 40, p. 25 (1923); Edwards, Bull. Ent. Res. 15, p. 262 (1925).

(?) *Aniella ziemanni* Enderlein, Wien. Ent. Zeit. 40, p. 27 (1923).

TYPES.—*apicoargentea*, ♀ in B.M., Ashanti; *albertii*, ♀ in Congo Mus., Ponthierville; *maculoabdominalis*, ♀ in Liverpool, Lado district; *togoensis*, ♀ in Berlin, Togo; *ziemanni*, ♀ in Berlin, S. Camerun.

A deep black species with a pair of round white spots on thorax, metallic silvery marks on last few abdominal tergites, and a white mark on outer side of hind tibia. In the typical form distinguished from all other African species of the subgenus except *woodi* by having black scales on the lateral lobes of the scutellum.

♀. *Head* mainly black; silvery-white round eyes and with white median and lateral stripes. Erect scales on nape black. Tori white-scaled and palpi broadly

white-tipped as usual. *Thorax* deep black, with narrow black scales on most of scutum. A pair of nearly round white spots on anterior half, these spots moderately large, composed of broad scales as usual, not reaching scutal angles but leaving margin of scutum rather broadly black. Supra-alar patch of white scales quite small. A metallic silvery patch in middle of front margin composed of broad rounded scales; no median yellow line. On posterior third of scutum are two short sublateral yellow lines and a very short median one, all ending at same level in front; scales bordering bare space black. Scutellum with white scales on middle lobe, black scales on lateral lobes. Patch of flat white scales on *ppn* moderately large. *Abdomen* usually entirely black above on tergites 1-4; 5-7 each with a large metallic silver patch in middle on 6 and 7, extending from base nearly to posterior margin of segment, on 5 broader but shorter; 8 also with a median silvery patch; 1-7 with the usual silvery lateral patches, but those on 7 not visible dorsally. *Legs* black. Front femora with scattered silvery scales tending to form an irregular ventral line, and with a small silvery patch beneath near tip. Middle femora with silvery scales as on front femora and also with two metallic silvery spots on anterior surface, one beyond middle and a larger one at tip. Hind femora on anterior surface with an irregular silvery stripe on basal three-fifths and a large silvery patch at tip, extending back some distance in a point. Posterior surface only narrowly white at base. Front tibia with a small white mark at base beneath. Middle tibia all black, except for a small creamy-white mark at extreme base on posterior surface only. Hind tibia with a small white patch at base beneath and a much larger white patch on outer side at one-third of its length, the two patches not connected. Front tarsi with narrow white rings at bases of first two segments. Middle tarsi with a narrow white ring at base of first segment; second mainly white above, black towards tip beneath. Hind tarsi with white basal rings on first three segments, decreasing in breadth, that on third segment very narrow; fourth white above except extreme tip, mostly black beneath; fifth mostly or all black. *Wings* uniformly black-scaled.

♂. Resembles ♀ in ornamentation, except that small silvery basal median patches are often present on tergites 3 and 4, and tergite 8 has two separate dorsal silvery patches. Palpi with two white rings on shaft (the basal one very narrow), last two segments with white marks at base beneath. *Terminalia* (Fig. 40, a): Lobes of tergite rather flat, widely separated by a rounded emargination, each having 6-8 longish hairs. Basal lobe of coxite with a free, flattened, thumb-like projection bearing at its tip a row of about five hairs. Style curved, tapering, with rather long and stout terminal spine. Paraprocts with wide base, terminal part not very long, with an almost equally long basal ventral area. *lp* with about 8 spine-like teeth forming the usual brush.

Wing-length 3-4.5 mm.

Distribution.—SIERRA LEONE: Daru (*Simpson, Murphy*); Mabang (*Gordon*). GOLD COAST: Aburi and Sunyani (*Ingram*); Obuasi and Kumasi (*Graham*). NIGERIA: Lagos (*Connal*). LIBERIA: Du River (*Bequaert*). UGANDA: Entebbe (*Low, Moffat*); Chagwe (*Fraser*); Kampala (*Hopkins*). BELGIAN CONGO: Ponthierville (*H.M. King Albert*); Stanleyville and Kabinda (*Schwetz*); Kinshasa (*Duren*); Kisantu (*Le Wulf*); Eala (*Henrard*). SUDAN: Khor Kokhwa, Lado District (*King*). CAMEROONS: Misselele (*Zumpt*).

Variation.—Some specimens from Uganda have silvery-white instead of black scales on the lateral lobes of the scutellum, but do not appear to differ from the typical form (which also occurred in the same locality) in any other way.

Synonymy.—A re-examination of the type of *K. maculoabdominalis* shows that it is this species rather than *fraseri* as I at one time supposed. *A. ziemanni* is included here as a doubtful synonym; the rather damaged type was described as having the fourth hind tarsal segment black; but this may have been an error as the remaining characters indicate this species rather than *A. simpsoni*.

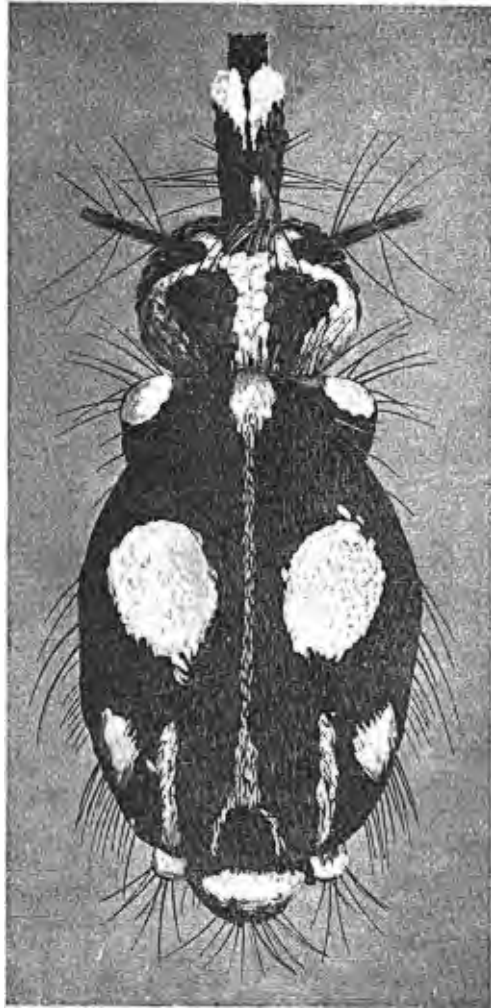


FIG. 39.—Head and thorax of *Aedes (Stegomyia) fraseri* Edw. (After Evans.)

Aëdes (Stegomyia) fraseri Edwards.

Stegomyia fraseri Edwards, Bull. Ent. Res. 3, p. 11 (1912), and 7, p. 210 (1917).

Aëdes (Stegomyia) blacklocki Evans, Ann. Trop. Med. 19, p. 119 (1925).

Types.—*fraseri*, ♀ in B.M., Mpumu, Uganda; *blacklocki*, ♀ in Liverpool, Sierra Leone.

Very similar to *A. apicoargenteus*, differing as follows: ♀. *Thorax* (Fig. 39): White patches of scutum somewhat larger and less rounded. Scales bordering pre-scutellar space yellow; a thin median yellow line extends forwards from this space and in some specimens reaches the white patch on the front margin. Scales on lateral lobes of scutellum always white. *Abdomen*: Tergite 4 as well as 5-7 with a silvery basal patch or rather band. *Legs*: Markings of femora of the same shape but not snow-white, without any metallic silvery lustre; hind femora much more extensively white at base on posterior surface; hind tibiae with the pale area at base beneath more yellowish and larger, connected with the white mark on outer side; last hind tarsal segment more extensively white above, but variable.

♂. *Terminalia* (Fig. 40, b): Thumb-like projection of basal lobe of coxite narrower than in *apicoargenteus* and bearing only two or three hairs at its tip.

Distribution.—SIERRA LEONE: Daru (*Blacklock*); Freetown (*Evans*); Njala (*Hargreaves*). GOLD COAST: Takoradi (*Pomeroy*). S. NIGERIA: Series in B.M. without further data. UGANDA: Mpumu (*Fraser*).

Variation.—In the type female (the only known specimen from Uganda) the white thoracic spots are only moderately large and do not nearly extend to the angle of the scutum; the hind femora have about the basal half of the posterior surface white. In all the other specimens examined the white thoracic spots are somewhat larger, almost reaching the angle of the scutum, and the hind femora have only about the basal fourth or third of the posterior surface white. It may be that two distinct geographical forms are represented; if so the West African form may be known as var. *blacklocki*.

Aëdes (Stegomyia) schwetzi Edwards. (Pl. 2, fig. 10.)

Aëdes (Stegomyia) schwetzi Edwards, Bull. Ent. Res. 17, p. 127 (1926).

TYPE.—♂ in B.M., Elisabethville.

Closely allied to *A. apicoargenteus*, differing as follows: Main white spots of scutum larger, almost reaching scutal angles. Pre-scutellar space rather broadly bordered with narrow yellow scales, this yellow border tending to coalesce with the short sublateral yellowish lines to form a W-shaped mark; a median yellow line extending forwards a short distance. Scutellar scales all white. Silvery scales almost covering posterior pronotal lobes. Abdominal tergites 2-7 (♂) or 3-7 (♀) with median basal silvery markings. White markings on anterior surface of femora with a rather less noticeable metallic gloss (though not definitely non-metallic as in *A. fraseri*). Middle tibia entirely black, even at extreme base on posterior surface. Hind tibia dark at base beneath (though with the white patch on outer surface equally conspicuous). Hind femora on posterior (inner) surface with nearly the basal half white. Hind tarsi with fifth segment (not fourth as stated in error in original description) entirely black, without any white scales at base. *Terminalia*

of ♂ (Fig. 40, e) with the hairs at tip of projecting portion of basal lobe much longer, about 8–10 in number.

In many of the points noted above *A. schwetzi* resembles *A. fraseri*, from which it differs most noticeably in having the hind tibia black at base beneath and the fifth hind tarsal segment entirely black, also in the terminalia.

Distribution.—BELGIAN CONGO: Elisabethville (*Schwetzi*); Ile Shashu (*Burgeon*).

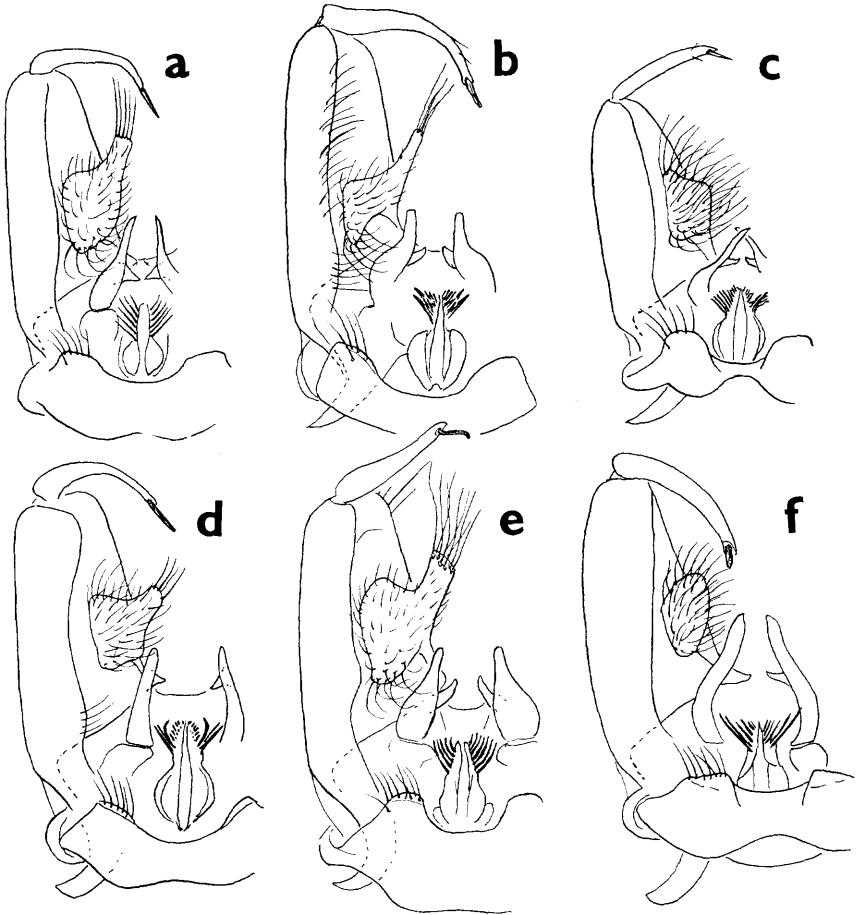


FIG. 40.—Terminalia of *Aedes* (*Stegomyia*) spp. a. *apicoargenteus*. b. *fraseri*. c. *dendrophilus*. d. *soleatus*. e. *schwetzi*. f. *calceatus*.

***Aedes* (*Stegomyia*) *dendrophilus* Edwards.**

Aedes (*Stegomyia*) *dendrophilus* Edwards, Bull. Ent. Res. 12, p. 74 (1921).

TYPE.—♂ in B.M., Oblogo, Gold Coast.

Allied to *A. apicoargenteus* and *A. fraseri*, which it resembles in most respects, differing chiefly as follows:

♀. Main white spots of scutum larger, reaching scutal angles. Anterior white spot small, usually composed partly or wholly of narrow scales, but sometimes wholly of broad scales as in the other two species. Yellow lines on posterior third

of scutum as in *A. apicoargenteus*, except that a few yellow scales are usually present bordering the bare space (fewer than in *A. fraseri*). Scutellum with white scales on lateral lobes (as in *A. fraseri*), a few black scales on apex of middle lobe. *Abdomen*: Small transverse basal whitish spots on tergites 4 and 5 as in *A. fraseri*; spots on 6 and 7 smaller than in the other two species and less distinctly silvery. *Legs*: Middle femora on anterior surface with a few white scales sometimes forming an indistinct line on basal half or towards middle, but without a distinct spot in middle; often entirely black at tip. Hind tibia with a creamy-white line on basal third which commences mid-ventrally and turns slightly towards external (anterior surface), but does not form a conspicuous external patch as in *A. fraseri*. Hind femur as in *A. fraseri*; the patch at the tip large, but without definite metallic gloss.

♂. *Terminalia* (Fig. 40, c) differing from that of *A. apicoargenteus*, *fraseri* and *schwezei* in having the style almost straight, and the basal plaque without any projecting portion but with denser hairs.

Distribution.—GOLD COAST: Oblogo, Nsawam and Aburi (*Ingram*). SIERRA LEONE: Freetown (*Butler*). NIGERIA: Ibadan (*Kumm*).

Variation.—Two forms are distinguishable in the material in the British Museum: A very small form (wing-length 2–2.5 mm.), with the scales forming the small anterior white spot of scutum narrow; and a larger form (wing-length 2.3–3.5 mm.) with these scales broad. The type series from Oblogo all belong to the small form, but both are represented among the specimens from Nsawam. Both lots were reared from tree-holes.

Aëdes (Stegomyia) trinidad Gil Collado.

Aëdes (Stegomyia) trinidad Gil Collado, Eos 11, p. 326 (1936).

TYPE.—♂ in Madrid University School of Agriculture, Fernando Po.

Another species of the *apicoargenteus* group, most closely related to *A. dendrophilus*, but differing from that and other species of the group in the much larger supra-alar white patches.

♀. Unknown.

♂. *Head* with the usual ornamentation, but clypeus stated to have a silvery spot; if this implies that the clypeus bears scales it would be a distinctive feature of the species separating it from all others of the subgenus in Africa except *A. aegypti*. *Thorax* much as in several related species except that the supra-alar white spot is larger, transversely rectangular, and united with the short sublateral white line, which extends a little forwards and backwards from the supra-alar spot, but does not reach the scutellum. A continuous median line of yellowish scales, forking around the bare space, becoming white in front, where it is composed of narrow scales. Main white spots large, reaching scutal angles, somewhat triangular in shape, ending in a rounded point behind. Scutellar scales all white. *Abdomen* with a narrow white band on tergite 2, broad bands on 3–7. *Legs* as in *A. dendrophilus*; middle femur without white spot in middle in front; hind femur white all round on about the basal half; hind tibia white at base beneath; hind tarsi with last two segments white above, fourth narrowly black at tip, dark on distal third beneath.

Distribution.—FERNANDO PO: Santa Isabel (*Gil and Bonet*).

Aëdes (Stegomyia) calceatus Edwards. (Fig. 41.)

Aëdes (Stegomyia) calceatus Edwards, Trans. R. Soc. Trop. Med. and Hyg. 18, p. 198 (1924).

TYPE.—♂ in B.M., Lindi.

Allied to *A. apicoargenteus*, *fraseri* and related species, which it resembles in most respects, including the presence of a large white patch, pointed at base, at tip of hind femur in front; front tibia with a narrow white ring at base; middle tibia almost all black; middle femur with two white spots in front (near middle and at tip); hind tibia white at base beneath. Differs from the allied species mentioned in having the abdominal tergites more regularly banded, but the white patches on 6 and 7 smaller and less silvery; and the middle tarsi more extensively white.

♀. *Head* with few or no yellow scales. *Thorax*: Main white scutal patches very large, reaching scutal angles. Median anterior patch small, composed of broad round-ended scales. Three short yellowish lines on scutum posteriorly, the median one forking around the bare space. Scutellar scales all white. Patch of white scales on *ppn* quite small. *Abdomen*: Nearly complete white basal bands present on tergites 2-5, median basal silvery-white spots on 6 and 7. *Legs*: Middle tibia with only a small pale dot at base on posterior surface. Middle tarsi with segments 1 and 2 entirely white behind and often mainly so above, each with a black line in front on distal two-thirds or more; 3 also white above at base, 4 and 5 black. Hind femur mainly white on basal half. Hind tibia with a straight white line beneath on basal fourth, not extending on to anterior surface. Hind tarsi with white rings at bases of first three segments, these rings gradually decreasing in breadth, but the third not very narrow; fourth segment white all round except at extreme tip; fifth black.

♂. *Terminalia* (Fig. 40, f): Tergite with a rather wide but shallow double emargination between the low, bristly lateral lobes. Basal plaque without free projecting portion and without modified hairs or spines. Style curved, tapering, with stout terminal spine. Paraprocts with the usual ventral arm. Proximal teeth of phallosome much longer and stronger than the distal ones.

Distribution.—TANGANYIKA: Lindi (*Haworth*). S. RHODESIA: Shamva and Bindura (*Leeson*).

Aëdes (Stegomyia) soleatus Edwards. (Fig. 42.)

Aëdes (Stegomyia) soleatus Edwards, Trans. R. Soc. Trop. Med. and Hyg. 18, p. 187 (1924).

TYPE.—♂ in B.M., Lindi.

Differs from *A. apicoargenteus* and all the nearly allied species (except *A. dendrophilus* and *A. trinidad*) in having the small spot on anterior margin of scutum composed of narrow scales only; otherwise very similar to *A. calceatus*, differing chiefly as follows:

♀. White bands of abdominal tergites 2-5 less complete, well separated from the silvery white lateral spots; on 6 and 7 longer, almost reaching the hind margin. Middle tarsi with the second segment almost wholly white. Hind tibiae with the white ventral line widened apically, so that a white patch is visible on outer surface near base. Hind tarsi with the fourth segment wholly white, fifth also white above, black beneath and at extreme tip.

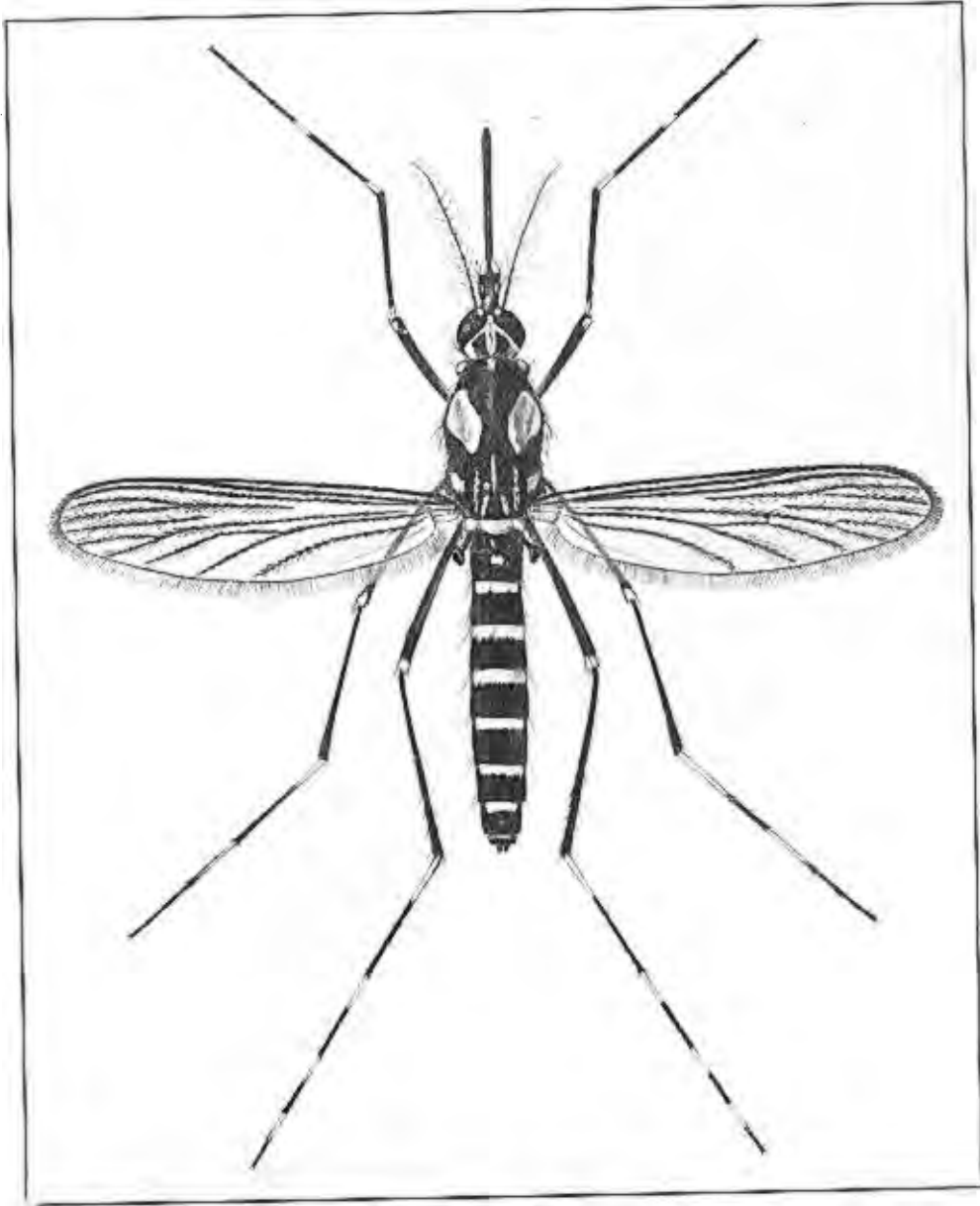


FIG. 41.—*Aedes (Stegomyia) calceatus* Edw. ♀.

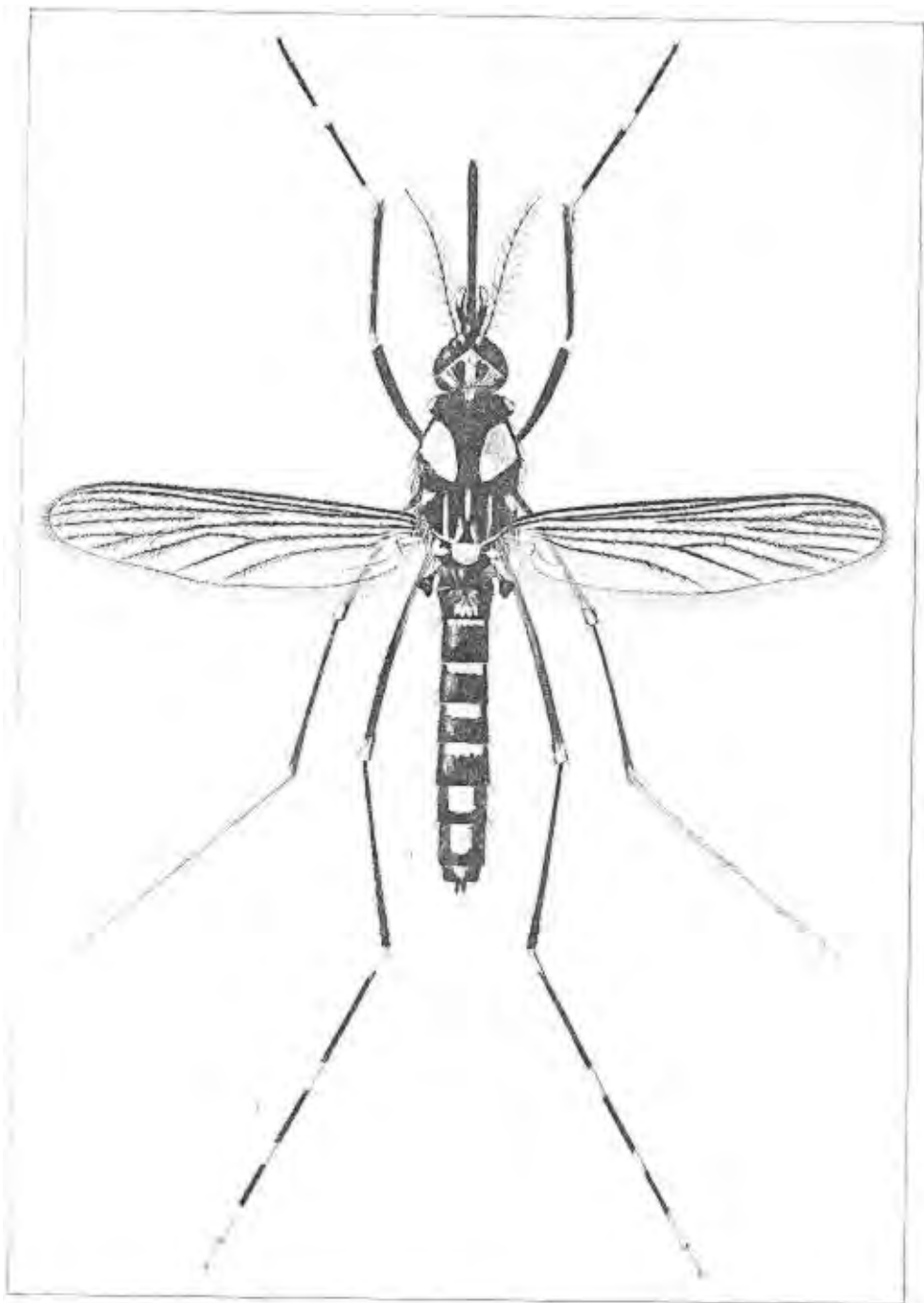


FIG. 42.—*Aedes (Stegomyia) solcatus* Edw. ♀.

♂. *Terminalia* (Fig. 40, d) : Tergite with a broad and deep median emargination. Basal plaque with several of the hairs towards inner margin somewhat thickened and twisted and placed on a slight projection ; style with much longer terminal spine.

Distribution.—TANGANYIKA : Lindi and Dar-es-Salaam (*Haworth*). S. RHODESIA : Shamva, Darwin, Bindura (*Leeson*).

This and the last species have been confused with *A. poweri*.

Aedes (Stegomyia) contiguus Edwards. (Pl. 2, fig. 11.)

Aedes (Stegomyia) contiguus Edwards, Proc. R. Ent. Soc. B, 5, p. 55 (1936).

TYPE.—♂ in B.M., Salisbury.

Differs from *A. apicoargenteus*, *fraseri*, *calceatus* and related species in the much smaller white marks at the tips of the middle and hind femora, these marks being scarcely longer than the diameter of the femur instead of two or three times as long as in the other species ; otherwise very similar to *A. calceatus*, differing chiefly as follows :

♀. *Thorax* with the main white scutal patches smaller, broadly crescent-shaped ; a narrow but fairly distinct median yellow line running whole length of scutum and forking in front of scutellum. *Legs* : Middle tarsi with white basal rings only on first two segments, second occupying only about half length of segment ; hind tibia with the white mark at base extending more obviously on to external surface ; hind tarsi with white ring on third segment very narrow.

♂. *Terminalia* (Fig. 43, b) differing very obviously in having the lobes of tergite contiguous, with practically no space between them, each lobe with 10 or more bristly hairs ; other structures much as in *A. calceatus*.

Distribution.—S. RHODESIA : Salisbury (*Marshall*). TRANSVAAL : Johannesburg (*de Meillon*).

In the females from Johannesburg the posterior sublateral lines of the scutum are white instead of yellow ; this is a further small distinction from *S. calceatus*, which does not show in the rather rubbed specimens from Salisbury. Distinctions from *A. poweri*, apart from the uniformly black middle tibia, are that the median yellow line of the thorax forks in front of the scutellum, and the second segment of the middle tarsi is black all round on the distal half or more.

Aedes (Stegomyia) poweri Theobald.

Stegomyia poweri Theobald, J. Econ. Biol. 1, p. 18 (1905), and Mon. Cul. 4, p. 185 (1907) ; Edwards, Bull. Ent. Res. 3, p. 10 (1912).

TYPE.—♀ in B.M., Natal.

Resembles *A. contiguus* and *A. deboeri* in having the white spots at tips of middle and hind femora quite small, but differs from those species and all others of the group in having a distinct white patch at base of middle tibia beneath.

♀. *Head* as in related species. *Thorax* with the main white scutal spots small, pear-shaped, not much larger than the supra-alar white spots. Sublateral lines on posterior third of scutum white instead of yellow. A thin but distinct median

yellow line running almost whole length of scutum, stopping in front of the bare space, which lacks the usual border of yellow scales. Scutellar scales white except for some black ones on apex of median lobe. Patch of white scales on *ppn* quite small. *Abdomen* with tergites 1 and 2 all dark above, 3-7 with narrow and incomplete creamy-white basal bands. *Legs*: Middle and hind femora with the small white knee-spots confined to the upper half of anterior surface. Middle femur with the usual round white spot near middle. Middle tibia with a distinct though short white mark at base, occupying the whole width of the ventral surface and visible from both in front and behind; hind tibia with a similar but rather longer white mark. Middle tarsi with a narrow white ring on first segment, second segment white with extreme tip black above and distal half black beneath. Hind tarsi as in *A. contiguus*.

♂. Unknown.

Distribution.—NATAL (*Power*). Other records require confirmation.

Aëdes (Stegomyia) masseyi Edwards. (Pl. 2, fig. 8.)

Aëdes (Stegomyia) masseyi Edwards, Bull. Ent. Res. 13, p. 397 (1923), and 15, p. 266 (1925).

TYPE.—♀ in B.M., Ruwe, Congo.

Differs (in the typical form) from all the other African species of the subgenus in having the third and fifth segments of the hind tarsi black, while the fourth is white; otherwise somewhat similar to *A. chaussieri* or *A. poweri*, but without the white spot in middle of middle femur in front.

♀. *Head* with the usual ornamentation; black patches large; erect scales on nape black; no yellow scales. *Thorax* black as usual. Lateral patches of white scales on anterior half of scutum moderately large and almost semicircular; from the posterior point of each patch a yellow line extends back to scutellum. Anterior white patch small, pointed behind (not rounded as in many species), composed of moderately broad but pointed scales; from this patch a single distinct line of narrow yellow scales extends back to the bare pre-scutellar space, where it stops abruptly without forking (the scales bordering this space being all black). Scutellar scales all white. *ppn* with a rather small patch of flat white scales. *Abdomen*: Tergites 3-6 with distinct white basal bands which do not quite touch the silvery-white lateral patches; 2 and 7 with rather large median white basal spots. *Legs*: Front femora black except at base beneath; middle femora nearly all black, with faint indications of a pale line on basal half in front and a rather large white spot at tip in front; hind femur white on rather less than the basal half, black on apical half, the black continued further towards base dorsally, and with a rather large white spot at tip in front. Front tibia with a narrow white ring at base, middle and hind tibiae entirely black. All tarsi with white rings occupying basal half or less of first two segments, otherwise black except that the fourth hind tarsal segment is entirely white.

Wings all dark.

♂. Unknown.

Distribution.—BELGIAN CONGO: Ruwe, Katanga (*Yale Massey*); Elisabethville (*Seydel*).

Variation.—Two females from Nairobi (*Van Someren*) probably belong to this

species. They agree with the Congo specimens in all respects except that the third hind tarsal segment has a narrow white ring at the base.

Aëdes (Stegomyia) de-boeri Edwards.

Aëdes (Stegomyia) de-boeri Edwards, Bull. Ent. Res. 17, p. 128 (1926).

TYPES.—♂♀ in B.M., Nairobi.

Resembles *A. dendrophilus* and *A. masseyi* in having no white spot in the middle of the middle femora in front, differing from *A. dendrophilus* and resembling *A. masseyi* in thoracic markings and in having the white spots at the tips of middle and hind femora only moderately large. Differs from *A. masseyi* chiefly as follows :

♀. Median yellow line of thorax forking in front of scutellum. Hind femur rather more extensively white at base, almost exactly the basal half being white and the black area not extending more towards base dorsally. Hind tibia with a creamy-white line at base beneath, extending fully one-fourth length of tibia. Hind tarsi with a narrow but distinct white ring at base of third segment. (As in *A. masseyi* the second segment of the middle tarsi is white all round on less than the basal half ; the fourth segment of the hind tarsi is practically all white and the fifth all black). Abdominal bands less complete than in *A. masseyi*.

♂. Palpi with only one white ring on shaft, the proximal ring being absent (feature distinguishing *A. de-boeri* from all other African species of the subgenus except *bambusae*). *Terminalia* (Fig. 43, a) : Lobes of tergite well separated as usual by a wide emargination, each lobe with 6–8 bristly hairs ; style nearly straight, scarcely tapering, with a long and not very stout terminal spine ; basal plaque with two small spines on its inner margin near the middle ; phallosome with numerous teeth distally, none of them large ; paraprocts with the usual ventral arm.

Distribution.—KENYA : Nairobi (*Anderson, Van Someren*) ; Elgeyo Escarpment (*Harger*).

ssp. **de-meilloni** Edwards.

Aëdes (Stegomyia) deboeri var. *demeilloni* Edwards, Proc. R. Ent. Soc. B, 5, p. 55 (1936).

TYPES.—♂♀ in B.M., Zululand.

Differs from typical *A. deboeri* as follows : Middle tarsi with the second segment white above almost to the tip (though remaining largely black at sides and beneath). Hind femora as in *A. masseyi*. Hind tibiae with the white mark at base smaller (in one specimen practically absent). Hind tarsi with the fifth segment as well as the fourth practically all white.

♂. Palpi and terminalia as in the typical form.

Distribution.—ZULULAND : Eshowe (*Ingram, de Meillon, Turner*).

Aëdes (Stegomyia) pseudonigeria Theobald.

Stegomyia pseudonigeria Theobald, Mon. Cul. 5, p. 166 (1910) ; Edwards, Bull. Ent. Res. 3, p. 9 (1912).

Stegomyia wellmanii Theobald, Mon. Cul. 5, p. 163 (1910).

TYPES.—*pseudonigeria*, ♀ in B.M., Owambu, Angola ; *wellmanii*, ♀ in B.M., Bailunda, Angola.

Resembles *A. de-boeri* and *poweri* in having the white knee-spots of the middle and hind femora quite small, but differs from those species and all others of the subgenus in having a narrow white ring, incomplete dorsally, close to but removed from the base of each tibia.

♀. *Head* and *thorax* much as in *A. poweri*, but some broadish scales present on each side of the bare pre-scutellar space, and the white sublateral lines, composed of quite broad scales. *Abdomen* with creamy basal bands, emarginate in middle, on each of tergites 2-5, silvery-white bands on 6 and 7. *Legs*: Middle femur with a few white scales on basal half of anterior surface tending to form an indefinite line; no white spot at middle. Hind femur as in related species with about the basal half white. Hind tibia with only the sub-basal ring, not differently marked from the other tibiae. White basal rings on first two segments of front and middle tarsi and first three of hind tarsi, last two segments of hind tarsi almost entirely white.

♂. Unknown.

Distribution.—ANGOLA: Bailunda, near Benguella and Owambu (*Wellman*). BECHUANALAND: Botletle River, Ngamiland (*Moffat*). S.-W. AFRICA: Ovamboland (*Barnard*).

Variation.—The specimens from Ovamboland have the last hind tarsal segment black instead of white.

***Aedes (Stegomyia) bambusae* Edwards. (Pl. 2, fig. 13.)**

Aedes (Stegomyia) bambusae Edwards, Bull. Ent. Res. 26, p. 134 (1935).

TYPES.—♂♀ in B.M., Kigezi District, Uganda.

Differs from all the other African species of the subgenus, except the allied *A. angustus*, in having all the mesonotal markings yellow instead of white, and in the absence of pale knee-spots on the hind femora.

♀. *Head* mainly dark above, with a yellowish median stripe and a narrow whitish border to the eyes. Tori with white scales and palpi white-tipped as usual. *Thorax* with blackish ground-colour as usual. Scutum on anterior half with a pair of broadly crescent-shaped yellow to golden-yellow marks which extend to the scutal angles, the anterior horn of the crescent produced forwards along margin almost to middle line in front, and the posterior horn continued backwards as a golden line to scutellum. A median golden-yellow line extending whole length of scutum, forking around the small bare pre-scutellar space, somewhat broadened towards front, all scales at its front end narrow. On each side a supra-alar patch of yellow scales. Scutellar scales creamy-white or yellowish. *ppn* with a small area of flat creamy-white scales, narrow black scales above. *Abdomen* with the usual lateral white spots on tergites 1-7 and with incomplete yellowish basal bands on 3-7. *Legs*: Front femora black, with a short yellowish ventral line at base; front tibia black, with the usual narrow basal pale ring (sometimes indistinct); front tarsi with two white rings, the second not very broad. Middle femora black, on anterior surface without any white spot at middle, but with a few white scales close before the tip, usually forming a small spot; middle tibia black; middle tarsi with a narrow white ring at base of first segment and a second white ring embracing nearly the whole second segment. Hind femora creamy-white on basal half, blackish on distal half, entirely without

pale scales at or near tip ; hind tibia with a white ventral line occupying from one-fifth to one-third of its length ; hind tarsi with narrow white rings at bases of segments 1-3, 4 all white, 5 white at base above. *Wings* dark, sometimes with a few pale scales at extreme base of costa.

♂. Ornamentation as in ♀. Palpi with only one white ring on shaft, the basal

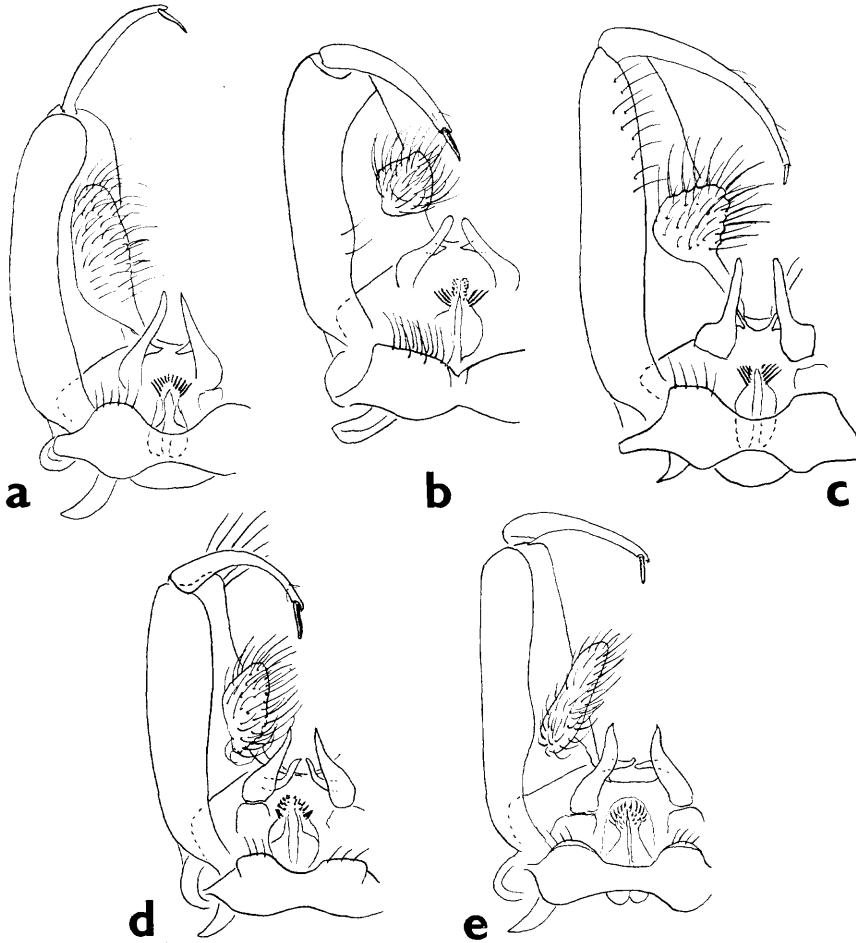


FIG. 43.—Terminalia of *Aedes* (*Stegomyia*) spp. a. *de-boeri*. b. *contiguus*. c. *angustus*. d. *africanus*. e. *luteocephalus*.

ring being absent or represented by a few scales only. *Terminalia*: Almost as in *A. de-boeri*, with two or three short spines on inner margin of basal plaque.

Distribution.—UGANDA (Kigezi district): Mts. Sabinio and Mgahinga, also at Muko (*Edwards, Gibbins*); Behungi, 8000 ft., December, 1932 (*Gibbins*).

Although this species, like the following, breeds in bamboos, it does not show the narrowing of the thorax which is such a marked feature of *A. angustus* as well as of some of the bamboo-breeding *Stegomyia* and *Armigeres* of the oriental region.

Aëdes (Stegomyia) angustus Edwards. (Pl. 2, fig. 14.)

Aëdes (Stegomyia) angustus Edwards, Bull. Ent. Res. 26, p. 135 (1935).

TYPES.—♂♀ in B.M., Kigezi District, Uganda.

Differs from all other African species of the subgenus, including *A. bambusae*, in the narrow, laterally compressed thorax. Resembles *A. bambusae* in having all the mesonotal markings yellow and no pale spots at the tips of the hind femora, but differs as follows :

♀. Mesonotal markings creamy-yellow rather than golden yellow, the patch above each wing root rather larger and in some specimens almost white ; crescent-shaped marks rather narrower, forming a more even curve with the posterior yellow lines ; median yellow line more conspicuously but quite gradually broadened towards front. Middle femora with a small but distinct white spot on anterior surface at middle (apparently absent in one specimen only), also with a rather more distinct subapical white spot. Hind tibia with the pale ventral line less developed, often occupying not more than the basal sixth of the tibia. Front tarsus with the second segment rather *more* extensively white ; middle tarsus with the second segment *less* extensively white, being usually black above at tip and mainly black beneath ; hind tarsus with the fifth segment all white above. Wings with a more obvious pale spot at base of costa.

♂. Palpi with the first white ring of shaft distinct. *Terminalia* (Fig. 43, c) : basal plaque shorter, with several thickened bristles on its distal margin, but no spines on its inner margin ; style longer than usual, when infolded reaching almost to base of basal plaque.

Distribution.—UGANDA : Mts. Sabinio and Mgahinga, also at Muko, Kigezi district (*Edwards, Gibbins*).

Aëdes (Stegomyia) africanus Theobald. (Pl. 2, fig. 5.)

Stegomyia africana Theobald, Mon. Cul. 1, p. 304 (1901) ; Edwards, Bull. Ent. Res. 3, p. 10 (1912).

Stegomyia dubia Theobald, Mon. Cul. 5, p. 170 (1910).

TYPES.—*africana* ♂♀ in B.M., Sierra Leone ; *dubia*, ♀ in B.M., Bihé, Angola.

Differs from all the other African species of the subgenus, except the nearly allied *A. luteocephalus*, in having the white ring of the third hind tarsal segment much broader than the others ; also in having *ppn* almost entirely covered with flat metallic scales, and in the markings of the thorax and abdomen.

♀. *Head* largely black above, the usual two black patches being connected in the middle ; a band of silvery scales round orbits and a yellow patch on nape. Tori with silvery scales ; palpi white-tipped as usual. *Thorax* black. Scutum with a pair of somewhat crescent-shaped marks which are more transversely placed than in the other species and conspicuously metallic silvery (not snow-white), the scales composing them almost circular ; a second patch of similar scales above and in front of each wing-root, continued towards middle line as a short transverse line of narrow yellow scales ; on front margin of scutum a double row of circular metallic silvery scales extending some distance and continued as a thin median line of narrow yellow scales nearly back to scutellum. Pleurae with rather small patches of silvery

scales, that on mesepimeron the largest, but leaving the lower part of the sclerite bare. *ppn* (in perfect specimens) covered almost completely with round metallic silvery scales. *apn* with black bristles and silvery scales. *Abdomen* nearly all black above, none of the tergites with median basal white or silvery markings, but the lateral silvery spots of tergites 7 and 8 very large and visible dorsally. *Legs* (Fig. 37, e) black. Front femora with a silvery line beneath on basal half; middle and hind femora each with three large metallic silvery patches on anterior surface, situated near base, about middle, and at tip. Front and middle tibiae all black; hind tibiae with a large white patch at base beneath. Front and middle tarsi each with narrow white basal rings on the first two and sometimes on the third segment; hind tarsi with narrow white wings on first two segments, third white except narrowly at tip, fourth with a narrow white ring at base, fifth black. *Wings* black scaled.

♂. Ornamentation as in ♀, except that the yellow area at back of head tends to be larger. Palpi with the usual markings. *Terminalia* (Fig. 43, d): tergite with widely separated lobes bearing short hairs; style curved, tapering, with longish terminal spine; basal plaque much as in the other species, without spines; paraprocts with the usual basal ventral arm; phallosome with short teeth only.

Wing-length 3.1-4.5 mm.

Distribution.—SIERRA LEONE: Freetown (*Austen, Evans*), Daru (*Murphy*). NIGERIA: Lagos (*Graham, Wigglesworth, Connal*); Forcados and Katari (*Simpson*). BELGIAN CONGO: Coquilhatville (*Yale Massey*); Stanleyville (*Schwartz*); Lualaba River (*Arbuckle*); Matadi (*Wanson*). UGANDA: Entebbe (*Low, Moffat*); Bugombo (*Hancock*); Mabira Forest (*Neave*); Kampala (*Hopkins*). ANGOLA: Bihé (*Wellman*). ABYSSINIA: Sidamo Prov. (*Nystrum*).

Aedes (Stegomyia) luteocephalus Newstead. (Pl. 2, fig. 6.)

Stegomyia luteocephala Newstead, Ann. Trop. Med. 1, p. 15 (1907); Edwards, Bull. Ent. Res. 3, p. 10 (1912).

Kingia luteocephala Theobald, Mon. Cul. 5, p. 136 (1910).

TYPE.—♀ in Liverpool School of Tropical Medicine, Kumba [? Tumba], Belgian Congo.

Similar in most respects to *A. africanus*, differing as follows:

Head in both sexes with a much more extensive area of yellow scales. *Thorax*: Median yellow line distinctly forking in front of scutellum; more numerous yellow scales present in a patch adjacent to the supra-alar silvery patch. *apn* with yellow bristles and golden scales. Patches of scales on upper part of sternopleura and on mesepimeron metallic golden instead of silvery, and more extensive, the mesepimeron being almost completely covered. *Abdomen* with more or less obvious dull yellow basal bands on tergites 2-6. *Legs*: Front tibia light brownish beneath for its whole length; hind femora narrowly whitish at base both in front and behind, with only two silvery patches (at middle and tip); hind tibia with a smaller yellowish patch at base beneath; hind tarsi with the third segment more widely black at tip, fourth all black. *Terminalia* (Fig. 43, e) hardly differing from those of *africanus*.

Distribution.—GAMBIA: Bathurst (*Innes*). SIERRA LEONE: Freetown (*Bacot, Evans*). GOLD COAST: Accra (*Macfie*); Saltpond (*W. M. Fraser*). NIGERIA: Lagos (*Connal, Graham*); Lokoja (*Watson*); Gadau (*Taylor*). SUDAN: Bor (*King*); Juba (*San. Insp.*).

Aëdes (Stegomyia) unilineatus Theobald. (Pl. 2, fig. 12.)

Quasistegomyia unilineata Theobald, Second Rept. Wellcome Lab. p. 70 (1906), and Mon. Cul. 4, p. 166 (1907).

Stegomyia gebeleinensis Theobald, Mon. Cul. 5, p. 157 (1910).

Howardina unilineata Edwards, Bull. Ent. Res. 3, p. 13 (1912).

Aëdes (Stegomyia) unilineata Edwards, Bull. Ent. Res. 15, p. 266 (1925); Barraud, Fauna Brit. Ind. Dipt. 5, p. 242 (1934).

TYPES.—*unilineata*, ♀ in B.M., Bahr-el-Ghazal; *gebeleinensis*, ♀ in B.M., Gebelein [Jebelein], Sudan.

Differs from all other species of the subgenus occurring on the African mainland in having a median white stripe of narrow scales, but no sublateral white patches

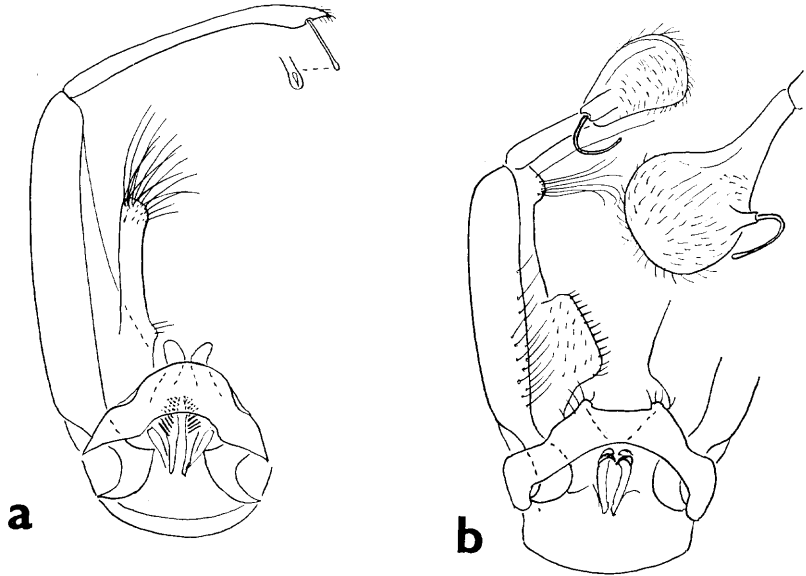


FIG. 44.—Terminalia of *Aëdes (Stegomyia)* spp. a. *unilineatus*. b. *vittatus*.

on the anterior half of the scutum; no other African Culicines show this type of marking.

♀. *Head* with a broad median white stripe which is continued forwards over the fairly wide space between the eyes, dorsal surface otherwise black. *Thorax* black or brownish-black with snow-white markings on scutum as follows: a median white stripe on anterior half, tapering to a point behind; a small spot on each scutal angle; a pair of small round spots, one towards each side at middle; three short lines, the median one forking round the bare space, in front of scutellum; and a small patch on the margin immediately in front of each wing-root, this last marking composed of broad flat scales, the rest of narrow scales. Scutellar scales white; *ppn* with flat white scales below, narrow black ones above. *Abdomen* with white basal bands and lateral spots on tergites. *Legs* black. Femora each with a small white knee-spot; middle femora with a round white spot in middle in front; hind femora white on basal two-thirds with a black dorsal line extending nearly to base. Tibiae all entirely black. Front and middle tarsi with narrow white rings at bases of first

two segments; hind tarsi with broader white rings on first four segments, fifth all white. *Wings* black scaled, with a white dot at base of costa.

♂. Ornamentation as in ♀. Palpi with two white rings on shaft and almost complete rings at bases of last two segments.

Terminalia (Fig. 44, a): Tergite strongly convex, almost semicircular, without lobes or bristles. Style long, straight, with long, slightly subterminal spine at right angles to shaft. Paraprocts without basal ventral arm. Basal plaque elongate, fringed with long hairs at tip, otherwise bare.

Distribution.—GOLD COAST: Accra (*Macfie*); Aburi (*Ingram*). NIGERIA: Baro (*Ingram*); Lokoja (*Wigglesworth*); Gadau (*Taylor*). SUDAN: Bahr-el-Ghazal, Jebelein and Erkwit (*King*); Juba (*San. Insp.*). KENYA: Dolo, Juba River (*Drake-Brockman*). NYASALAND: Port Herald (*Old*). TRANSVAAL: Tzaneen (*Ingram and de Meillon*).

Outside Africa the species is known to occur in Western India (Punjab, Delhi Province and Bombay). The Indian form does not differ from the African.

Aëdes (*Stegomyia*) *albopictus* Skuse.

Culex albopictus Skuse, Ind. Mus. Notes, 3, p. 20 (1894).

Stegomyia lamberti Ventrillon, Bull. Mus. Paris, 10, p. 552 (1904).

Aëdes (Stegomyia) albopictus Edwards, Bull. Ent. Res. 11, p. 134 (1930); Barraud, Fauna Brit. Ind. Dipt. 5, p. 233 (1934).

Types.—*albopictus*, ♀ in Sydney (N.S.W.), India; *lamberti*, ♂♀ in Paris, Tananarive.

Very similar to *A. unilineatus*, differing chiefly as follows: Median white stripe of scutum rather longer; the round white spots on posterior half of scutum absent, as is also the spot in the middle of the anterior surface of the middle femur. *Terminalia* with tergite of different shape, the middle part produced into a blunt point, coxite shorter and broader.

Distribution.—MADAGASCAR (*Ventrillon*). RÉUNION: St. Denis (*Surcouf*) MAURITIUS (*d'Emmerez de Charmoy, MacGregor*).

Also occurs abundantly throughout the Oriental region. The identity of Malagasy specimens with the Oriental form has been established by comparison of mounts of terminalia.

Aëdes (*Stegomyia*) *mascarensis* MacGregor.

Aëdes (Stegomyia) mascarensis MacGregor, Bull. Ent. Res. 14, p. 409 (1924); Edwards, Bull. Ent. Res. 15, p. 266 (1925).

Type.—Probably lost; neotypes ♂♀ in B.M., Mauritius.

A strikingly distinct species recognizable at once by the mainly white-scaled thorax.

♀. *Head* mainly clothed with white scales above, black at sides. Palpi white-tipped and proboscis black as usual. Clypeus bare. *Thorax* black, with anterior half or two-thirds of scutum entirely clothed with white scales, those in middle narrow, but those in a large patch adjacent to each scutal angle broader and more snowy white, suggesting a derivation from crescent-shaped white markings similar to those of *A. aegypti*, etc. Scutellar scales white. Small patches of white scales on pleurae but *ppn* and also the paratergites entirely devoid of scales. *Abdomen* with

narrow whitish basal bands on tergites 3-7. Legs black; femora with under sides pale, but without knee-spots; middle femur without spot or white line in front; tibiae all dark; front and middle tarsi with narrow white ring at bases of first two segments; hind tarsi with narrow white rings on first three segments, fourth with the basal half or more white, fifth all white. Wings dark scaled.

♂. Ornamentation as in ♀. Palpi with the usual white rings. *Terminalia* (Fig. 38, b): Tergite formed almost as in *A. aegypti*, being composed mainly of two large conical lateral lobes each with a few very short hairs at the tip; coxite rather short and broad, though not so broad as in *aegypti*, lobe with about three straight spines as in *aegypti*; style strongly elbowed a little beyond the middle, with rather short terminal spine; paraprocts with small ventral arm (?); phallosome with only very small teeth (smaller than in most other species of the subgenus, but exactly as in *aegypti*).

Distribution.—MAURITIUS (*MacGregor*).

The close resemblance in male terminalia between this species and *A. aegypti* is very surprising, as externally the two species are among the most distinct in the subgenus. A somewhat analogous case is that of *Culex scotti* and *C. pipiens* (see p. 332).

Aëdes (Stegomyia) granti Theobald.

Stegomyia grantii Theobald, Mon. Cul. 1, p. 306 (1901).

Howardina grantii Edwards, Bull. Ent. Res. 3, p. 13 (1912).

Aëdes (Stegomyia) granti Edwards, Bull. Ent. Res. 15, p. 266 (1925).

TYPE.—♀ in B.M., Sokotra.

A very distinctive species with ornamentation unlike that of any other species of the subgenus; distinguished especially by the white lines on the proboscis and legs and the colour of the thorax. The only African mosquito with which confusion might be possible is *Theobaldia longiareolata*.

♀. *Head* black above, with a white median stripe, a white orbital line, and a white scaled line between eyes. Proboscis with a white line above extending from base nearly to tip. Palpi white in middle as well as at tip. *Thorax* reddish-brown; scutum with a narrow median line of narrow white scales extending the whole length and forking in front of scutellum; a narrow line of small but broad white scales commences on front margin on each side of median line, passes round margin to scutal angle where it turns inwards and continues back to scutellum; another line of small flat white scales commences in front of lateral lobe of scutellum, passes above wing-root, and continues first along margin of scutum and then across *ppn*. Scutellar scales white. *Abdomen* with a narrow white basal band on middle part of each tergite which passes obliquely across sides of tergite to posterior corners. *Legs*: Front (?) legs missing in type. On middle (?) and hind legs, on the anterior surface, a white line extends the whole length of the femur and tibia and most of the first tarsal segment; femora also with a ventral white line; second and third tarsal segments with basal white rings (tip of hind tarsus missing). *Wings* with a white line on basal third of costa, otherwise dark.

♂. Unknown.

Distribution.—SOKOTRA (*Grant*). Unknown elsewhere.

Aedes (Stegomyia) vittatus Bigot.

Culex vittatus Bigot, Ann. Soc. Ent. France (4), 1, p. 327 (1861).

Stegomyia sugens Theobald [*nec* Wiedemann], Mon. Cul. 1, p. 300 (1901); Edwards, Bull. Ent. Res. 3, p. 9 (1912).

Scutomyia sugens Theobald, Gen. Ins. Culicidae, p. 19 (1905).

Stegomyia brumpti Neveu-Lemaire, Bull. Soc. Zool. France, 30, p. 8 (1905).

Reedomyia albopunctata Theobald, Mon. Cul. 4, p. 262 (1907).

Stegomyia vittata Edwards, Bull. Ent. Res. 7, p. 210 (1917).

Aedes (Stegomyia) vittatus Edwards, Bull. Ent. Res. 15, p. 265 (1925); Barraud, Fauna Brit. Ind. Dipt. 5, p. 245 (1934).

TYPES.—*vittatus*, lost, Corsica; *brumpti*, lost, Harrar; *albopunctata*, ♀ in B.M., Sierra Leone.

A very distinct species readily distinguished from any other mosquito by the leg-markings. The white spotted thorax bears some resemblance to that of some species of the subgenus *Aëdimorphus*, and there are several other features in which the adult, as well as the larva and pupa of *A. vittatus*, shows some approach to *Aëdimorphus*.

♀. *Head*, differing from that of all the other species of the subgenus in having an extensive area of erect forked scales and decumbent narrow scales, this area reaching forwards from nape almost to eye-margin. Clypeus with two small patches of white scales. Proboscis extensively pale in middle. Palpi white-tipped and with some white scales in middle. *Thorax* blackish-brown above, with three pairs of small round white spots composed of narrow scales. Scutellar scales white, some black ones at tip of middle lobe as in many other species. Mesepimeron with several bristles below middle (another unique character in this subgenus). *Abdomen* with white basal bands on tergites. Cerci longer than in the other species. *Legs* (Fig. 37, f): Femora with many scattered white scales and with narrow white pre-apical rings; tibiae each with a small white mark near base and a conspicuous white ring near middle. Tarsi each with white basal rings on first three segments; on hind tarsi fourth segment mainly and fifth wholly white. *Wings* dark scaled.

♂. Ornamentation as in ♀. Palpi with four complete white rings, two on shaft, one at base of each of the last two segments; slender, bare and upturned as in other *Stegomyia*.

Terminalia (Fig. 44, b): Style greatly enlarged distally, with long curved spine subterminal in position. Phallosome with fine teeth only. Coxite with a small apical hair-tuft; basal lobe large, short-haired.

Distribution.—SIERRA LEONE: Freetown (*Austen*); Daru (*Murphy*). GOLD COAST: Bole and Sunyani (*Ingram*). NIGERIA: Lokoja (*Watson*); Oshogbo (*Mayer*); Baro (*Simpson*). UGANDA: Entebbe (*Fraser, Strathcairn*). KENYA: "3rd Camp" (*Chell*). BELGIAN CONGO: Stanleyville (*Mouchet*). S. RHODESIA: Salisbury, etc. (*Leeson*). SUDAN: Hills east of Erkowit (*King*); Jebelein (*King*); Jebel Meidot (*Michelmores*); Dar Shol and Delami (*Ruttledge*); Talodi; Kajo Kaji; Wau. ABYSSINIA: Harrar (*Brumpt*). SOMALILAND: Buran (*Twigg*). TANGANYIKA: Lindi (*Haworth*). ZANZIBAR (*Aders*); Pemba I. (*McCarthy*). ADEN: Hinterland (*Yerbury, Patton*). ARABIA: Wadi Yain (*Philby*).

The species is also known to occur in Spain and Corsica; throughout India, Ceylon, Assam and Burma; and in Cochin China. It shows an appreciable variation (except in size) in any part of its range.

Subgenus **AËDIMORPHUS** Theobald.

- Aëdimorphus* Theobald, Mon. Cul. 3, p. 290 (1903).
Catageomyia Theobald, Thomson Yates Lab. Rept. 5, pt. 2, p. 1 (1903).
Ecculex Felt, N.Y. State Mus. Bull. 79, p. 391 b (1904).
Polyleptomyia Theobald, Gen. Ins. Cul. p. 21 (1905).
Duttonia Newstead, Ann. Trop. Med. 1, p. 17 (1907).
Mimetecculex Theobald, Third Rept. Welle. Lab. p. 258 (1908).
Myxosquamus Theobald, Mon. Cul. 5, p. 255 (1910).
Neopecomyia Theobald, Mon. Cul. 5, p. 261 (1910).
Stenoscutus Theobald, Mon. Cul. 5, p. 263 (1910).
Bathosomyia Theobald, Mon. Cul. 5, p. 267 (1910).

GENOTYPES.—*Aëdimorphus*, *Uranotaenia domestica* Theo.; *Catageomyia*, *C. senegalensis* Theo.; *Ecculex*, *Culex sylvestris* Theo.; *Polyleptomyia*, *P. albocephala* Theo.; *Duttonia*, *D. tarsalis* Newst.; *Mimetecculex*, *M. kingi* Theo.; *Myxosquamus*, *M. paludosus* Theo.; *Neopecomyia*, *N. uniannulata* Theo.; *Stenoscutus*, *S. africanus* Theo.; *Bathosomyia*, *B. abnormalis* Theo.

Ornamentation various, but scales of *ppn* (when present) usually all narrow (*A. lesoni* is an exception). Eyes usually only very narrowly separated. Proboscis usually distinctly longer than front femora, as in *Ochlerotatus*. Dorso-central and

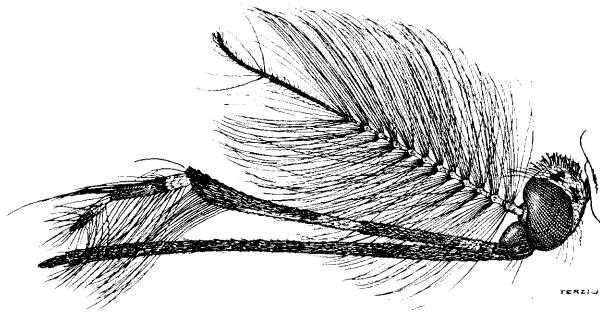


FIG. 45.—Head of ♂, *Aedes (Aëdimorphus) hirsutus* Theo.

acrostichal bristles always present and usually numerous; lower mesepimeral bristles absent. Paratergite scaly (except in *A. domesticus* and its two near relatives). *Palpi* of ♂ (Fig. 45) usually about as long as proboscis with the last two segments thickened, hairy and down-turned, terminal segment sometimes very small (as in *apicoannulatus* group); very exceptionally (*A. gibbinsi*) the male palpi are slender throughout, bare, and upturned at tip. Larger claw of front and middle legs of ♂ toothed; front and middle claws of ♀ always toothed; hind claws usually simple. ♂. *Terminalia*: Coxite with its inner face membranous, as in *Ochlerotatus*, *Stegomyia*, etc.; claspette represented either by a short process bearing one or two hairs at its tip or by a larger and sometimes densely hairy basal plaque; specialized scale-tufts never developed on surface of coxites. Style with the spine subterminal or well removed from the tip (except in *A. natronius*); very often the style is flattened distally and variously modified. Phallosome divided into two lateral plates, each bearing a number of teeth outwardly, the apical tooth often larger than the others. ♀. *Terminalia*: Eighth segment partially or completely retractile, sternite not large, cerci usually long, as in *Ochlerotatus* (short in *apicoannulatus* group). In *A. vexans* as figured by Gjullin the eighth sternite is notched (but sides not produced),

the insula is longer than broad and bare, and the post-genital plate is rather deeply notched; it remains to be ascertained whether these features characterize the subgenus as a whole. Macfie and Ingram examined five species and found that though three of them (*stokesi*, *domesticus* and *albocephalus*) had normal spermathecae, the other two (*irritans* and *punctothoracis*) possessed but a single large spermatheca.

Except for *Culex*, this subgenus includes a greater number of species of mosquitoes than any other in Africa. Some division into groups is therefore desirable, and this can best be done on the basis of the leg-markings and the scutellar scaling; the groups so defined seem to be in the main natural. The following nine groups may be recognized; in the first five and the last the basal lobe of the coxite is only very slightly developed, while in the other three it is large and hairy.

1 (*apicoannulatus* group). Differs from all the rest in that the hind tarsi have conspicuous white rings which are situated almost entirely on the distal ends of the segments; also in the short cerci of the female, and the breeding places (tree-holes instead of ground pools). Scutellum with flat white scales. Includes the first seven species.

2 (*argenteopunctatus* group). Distinguished by spots of silvery scales on scutum and paratergite. Scutellar scales silvery-white, broad. Tarsi all dark. Includes *A. argenteopunctatus* and the seven related species.

3 (*domesticus* group). Differs from all the rest in lacking scales on the paratergite, otherwise similar to group 2. Hind femur with a white spot above at some distance from tip. *A. domesticus*, *leptolabis* and *longiseta*.

4 (*tarsalis* group). Scutellum with silvery-white scales, mostly broad. Abdominal tergites with lateral spots usually snow-white. Tarsi dark. *A. filicis*, *tarsalis*, *yvonneae*, *phyllobasis*, *minutus*, *albocephalus*.

5 (*abnormalis* group). Scutellum with some or all of the scales broad (except *dalzieli*), but not usually silvery white. Abdominal tergites with lateral spots creamy white. Tarsi dark. *A. congolensis*, *abnormalis*, *wigglesworthi*, *alboventralis*, *leesoni*, *dalzieli*, *irritans*, *nigricephalus*.

6 (*lamborni* group). Differs from all the rest by the hind tarsi having broad white rings embracing the joints. *A. lamborni*, *boneti*.

7 (*dentatus* group). Scutellum with narrow scales only. Tarsi dark, or with two very narrow faint rings. *A. gibbinsi*, *quasiunivittatus*, *pachyurus*, *dentatus*, *subdentatus*, *caliginosus*, *cumminsi*, *pubescens*, *bevisi*.

8 (*vexans* group). Differs from the rest by the hind tarsi having a distinct white ring at the base of each segment. Scutellar scales all narrow. *A. arabiensis*, *centropunctatus*, *hirsutus*, *fowleri*, *durbanensis*, *natronius*.

9 (*ochraceus* group). Differs from all the rest in the conspicuously striped femora and tibiae. Scutellar scales all narrow. Tarsi dark. *A. ochraceus*.

Many species of this subgenus bite freely, chiefly out of doors and towards dusk. Kerr (1933) considers that *A. irritans* and *nigricephalus* probably prefer human blood, though according to Davis and Philip these species also attack chickens. *A. stokesi* will attack man, but according to Kerr probably prefers non-human blood. Newstead recorded that *A. argenteopunctatus* "bit viciously at midday," and Hopkins (MS.) reports having been bitten by *A. domesticus* in forests.

KEY TO ETHIOPIAN SPECIES OF SUBGENERA AEDIMORPHUS AND OCHLEROTATUS.

1. Scutellum with broad flat scales on at least one lobe (usually all scutellar scales broad, flat and white) 2.
- Scutellum with narrow scales only ; decumbent scales of vertex all narrow 31.
2. Hind tarsal segments with broad white apical bands which scarcely extend over the joints to bases of segments ; mesonotum usually with silvery spots 3.
- Hind tarsi otherwise 8.
3. Tori with silvery-white scales ; white shoulder-spots composed of broad scales 4.
- Tori bare 7.
4. Each femur with a white pre-apical spot *marshalli* Theo. (p. 160).
- No pre-apical white spots on femora 5.
5. A pair of small white spots in middle of scutum 5a.
- These spots absent 6.
- 5a. All tarsi extensively white (♀), or second mid-tarsal segment white-tipped (♂)
- Front and middle tarsi mainly or all dark (♂♀) *kapretwae* sp. n. (p. 162).
- *capensis* Edw. (p. 161).
6. Silvery scales on margins of scutum in front forming a rather narrow line
- *stokesi* Ev. (p. 163).
- These scales forming a rather broad stripe *haworthi* Edw. (p. 165).
7. White shoulder-spots composed of narrow scales ; hind femur with pre-apical white spot *simulans* N. & C. (p. 165).
- No white shoulder-spots ; no pre-apical white spot on hind femur *apicoannulatus* Edw. (p. 166).
8. Hind tarsi all dark 9.
- Hind tarsi with white rings which are about equally divided by the joints 30.
9. Scutum with four small white spots composed of broad scales 10.
- Scutum without such spots, or at most with a pair on shoulders 16.
10. Tori with white scales ; ♀ palpi white-tipped *insolens* Edw. (p. 171).
- Tori bare ; ♀ palpi all dark 11.
11. Mid and hind femora with pre-apical white spots *argenteopunctatus* Theo. (p. 167).
- Without such spots 12.
12. A spot of broad white scales on scutal angle *bedfordi* Edw. (p. 171).
- No white scales in this position 13.
13. Head-scales mostly narrow, flat ones confined to sides *mutilus* Edw. (p. 170).
- Head-scales nearly all broad and flat 14.
14. Some white scales above wing-root *hopkinsi* Edw. (p. 169).
- No white scales above wing-root 15.
15. White spot at tip of hind tibia longer than broad ; ♂ palpi markedly longer than proboscis *punctothoracis* Theo. (p. 168) ; *mixtus* Edw. (p. 170).
- White spot at tip of hind tibia scarcely as long as broad ; ♂ palpi scarcely longer than proboscis *microstictus* Edw. (p. 170).
16. A spot of broad white scales on each shoulder, and a pre-apical white spot on hind femur 17.
- These markings absent 18.
17. White mark at tip of hind tibia nearly one-fifth as long as tibia
- *domesticus* Theo. (p. 172) ; *longiseta* Edw. (p. 173).
- This mark only about one-eighth as long as tibia *leptolabis* Edw. (p. 173).
18. Lateral spots of abdominal tergites pure white ; white spot at tip of hind tibia nearly twice as long as broad ; scutellar scales usually all broad and white 19.
- Lateral spots of abdominal tergites dull creamy-white ; white spot at tip of hind tibia not or scarcely longer than broad ; scutellar scales often in part narrow or dark 23.

19. Most of the decumbent scales of vertex broad and flat . . . *minutus* Theo. (p. 177).
All scales of vertex narrow, including those adjacent to eyes 20.
20. Scutum with four pairs of small white spots, composed of narrow scales
filicis I. & de M. (p. 173).
Scutum unspotted, or at most with a pair of yellowish spots 21.
21. No post-spiracular scales 22.
At least a few post-spiracular scales present *albocephalus* Theo. (p. 177).
22. All scutellar scales broad *yvonneae* sp. n. (p. 176); *tarsalis* Newst. (p. 174).
Mid lobe of scutellum with some narrow scales (usually) *phyllolabis* Edw. (p. 176).
23. Nearly all scales of vertex broad and flat 24.
Decumbent scales of vertex all narrow, or at least (*abnormalis*, type ♂)
some narrow scales in median line 25.
24. Brown species; abdomen banded; hind tibia with small white spot at tip
irritans Theo. (p. 184).
Black species; abdomen unbanded; hind tibia all dark
nigricephalus Theo. (p. 185).
25. Scales on *apn* and *ppn* nearly all broad and flat *leasoni* Edw. (p. 183).
Scales on *apn* and *ppn* narrow 26.
26. Hind femur dark at tip, without pale knee-spot 27.
Hind femur with small pale knee-spot 28.
27. Lighter; decumbent scales of vertex mostly broad (♂); scutellar scales all
narrow (?) *abnormalis* Theo. (p. 180).
Darker; decumbent scales of vertex narrow (♂♀); scutellar scales narrow on
median lobe, broad on lateral lobes ssp. *kabwachensis* n. (p. 181).
28. Sternites usually with narrow dark bands; post-spiracular and sub-spiracular
scales few or absent 29.
Sternites unbanded, white; post-spiracular and sub-spiracular scales numerous
alboventralis Theo. (p. 182).
29. Mesepimeron unmarked; tergites with narrow pale bands in ♀; scutellum
with some narrow scales on median lobe *congolensis* Edw. (p. 178).
Mesepimeron with dark spot; tergites unbanded in ♀; scutellum with broad
scales on all lobes *wigglesworthi* sp. n. (p. 182).
30. Hind tibia with distal $\frac{1}{3}$ white (E. Africa) *lamborni* Edw. (p. 186).
Hind tibia with distal $\frac{1}{10}$ white (Fernando Po) *boneti* Gil C. (p. 187).
31. Femora and tibiae striped; tarsi largely yellowish *ochraceus* Theo. (p. 200).
Femora and tibiae not striped 32.
32. Hind tarsi dark (two faint rings in *bevisi*) 33.
Hind tarsal segments with distinct white basal rings 41.
Hind tarsal segments with pale rings embracing the joints, fifth segment pale
(*Ochlerotatus*) *caspius* Pall. (p. 118).
33. Hind tarsi with two narrow and faint pale rings *bevisi* Edw. (p. 194).
Hind tarsi entirely dark 34.
34. Head with the decumbent scales almost all pale; abdominal tergites of ♀
usually without complete pale bands 35.
Head (at least in ♀) with a distinct patch of dark decumbent scales on vertex;
abdominal tergites of ♀ usually with complete basal pale bands 37.
35. Scutum golden-scaled laterally (see also subgenus *Banksinella*); hind claws
simple *gibbinsi* Edw. (p. 187); *leucarthritis* Speiser (p. 188).
Scutum not golden-scaled laterally; hind claws toothed 36.
36. Mesepimeron bare below as usual *cumminsi* Theo. (p. 193).
Mesepimeron with soft hairs below *pubescens* Edw. (p. 194).
37. Post-spiracular scales all broad and flat 38.
Many or all of the post-spiracular scales narrow 40.
38. Hind femur pale beneath almost to tip; hind claws toothed
dentatus Theo. (p. 190); ? *pachyurus* Edw. (p. 191).

- Similar but hind claws simple *tricholabis* sp. n. (p. 179).
 Hind femur dark beneath on almost the distal third 39.
39. Hind claws simple *quasiunivittatus* Theo. (p. 189).
 Hind claws toothed *subdentatus* Edw. (p. 191).
40. Proboscis pale beneath ; sternites unbanded ; hind claws simple
dalzieli Theo. (p. 183).
 Proboscis all dark ; sternites banded ; hind claws toothed
caliginosus Graham (p. 191).
41. Lower mesepimeral bristles present ; last two hind tarsal segments usually
 all dark (*Ochlerotatus*) *caballus* Theo. (p. 117).
 Lower mesepimeral bristles absent ; last two hind tarsals not all dark 42.
42. Wing-scales all dark, including costal fringe ; femora and tibiae not con-
 spicuously speckled 43.
 Wing-scales not all dark ; femora and tibiae conspicuously speckled 44.
43. Abdomen with broad pale bands ; scutal scales uniformly brown
arabiensis Patton (p. 195).
 Abdomen without complete bands ; scutum mottled *centropunctatus* Theo. (p. 196).
44. Costal fringe whitish on distal half (at least in ♀), wing otherwise almost
 entirely dark-scaled *hirsutus* Theo (p. 196).
 Costal fringe dark, but whole wing with numerous scattered pale scales 45.
45. Abdominal tergites without patches of yellow scales 46.
 Tergites with apical lateral yellow patches 47.
46. Sixth tergite (♀) with a submedian pair of apical white patches
fowleri d'Emm. (p. 198).
 Sixth tergite (♀) with a narrow transverse apical white line
(*Ochlerotatus*) *fryeri* Edw. (p. 116).
47. Abdominal bands white *durbanensis* Theo. (p. 199).
 Abdominal bands yellow in middle *natronius* Edw. (p. 199).

Aedes (Aëdimorphus) marshalli Theobald.

Stegomyia marshalli Theobald, Mon. Cul. 1, p. 310 (1901).

Ochlerotatus marshalli Edwards, Bull. Ent. Res. 3, p. 18 (1912).

Scutomyia marshalli Theobald, Gen. Ins. Culicidae, p. 19 (1905).

TYPE.—♂♀ in B.M., Salisbury.

Belongs to a small group of species distinguished by having conspicuous spots of flat, silvery-white scales on the mesonotum and also on the tori, and conspicuous white apical rings on the first four segments of the hind tarsi, the fifth segment being all white ; scutellum with flat silvery-white scales ; *ppn* nearly bare ; no post-spiracular scales. Differs from the four nearly allied species in having a small round white spot on anterior surface of each femur at some distance from the tip.

♀. *Head* with narrow decumbent scales on vertex, dark in front, pale yellowish towards nape ; a pair of wedge-shaped spots of broad flat silvery-white scales on eye-margins, almost meeting in middle. Proboscis black above, more or less pale beneath. Palpi black, about a fifth as long as proboscis. Tori dark, with a conspicuous patch of silvery-white scales. *Thorax* with dark brown ground colour. Scutum with four conspicuous spots of broad flat silvery-white scales, one on each shoulder, adjacent to margin and occupying about half the length of *ppn*, and a pair in middle of about the same size ; paratergite heavily clothed with similar scales ; four or six short and often broken lines of smaller but broadish white scales on posterior part of scutum. Pleurae with small patches of flat silvery-white scales,

including one on sub-spiracular area, but *ppn* and post-spiracular area without scales. *Abdomen* mainly blackish, tergites with large silvery-white basal lateral spots; cerci very short. *Legs*: Femora with white pre-apical spots as noted above and with small white knee-spots; tibiae each with a conspicuous white spot at tip; front and middle tarsi black, with a white spot at tip of first segment only; middle tibiae indistinctly pale posteriorly; hind tarsi with rather broad white apical rings on each of the first four segments, extending slightly over joints on to bases of segments 2-4, last segment all white. *Wings* dark-scaled, with a silvery-white dot at base of costa.

♂. Resembles ♀, except that abdominal tergites 3-7 have complete silvery-white basal bands. Palpi about as long as proboscis, black, with a narrow white ring at base of terminal segment, last two segments moderately hairy. *Terminalia*: Basal lobe of coxite with about five short spines; style with a very stout simple spine on inner side beyond middle; some short hairs associated with this spine, distal portion beyond the spine narrowed.

Wing-length 3.5-4 mm.

Distribution.—S. RHODESIA: Salisbury (*Marshall*). TRANSVAAL: Komatipoort (*Ingram*). UGANDA: Lira (*Hopkins*). ANGOLA (*Wellman*). BELGIAN CONGO: Elisabethville (*Seydel*). KENYA: Mt. Elgon (*Jackson*).

Aëdes (Aëdimorphus) capensis Edwards. (Pl. 3, fig. 1.)

Aëdes (Ecculex) capensis Edwards, Ann. S. Afr. Mus. 19, p. 162 (1924).

Aëdes (Aëdimorphus) capensis Edwards, Bull. Ent. Res. 15, p. 267 (1925).

TYPES.—3 ♀ in Cape Town, Oudebosch.

Closely allied to *A. marshalli*, differing in thoracic ornamentation and in having no white pre-apical spots on any of the femora.

♀. *Head* as in *A. marshalli*. Proboscis and palpi all black. *Thorax* blackish or dark brown. Scutum with a few narrow white or yellowish scales in middle of front margin; a stripe or patch of broad silvery-white scales extending from near middle of front margin almost or quite to scutal angle; a pair of round spots of broad silvery-white scales in middle, and from just behind each of these spots a line of white or yellowish scales extends back to scutellum, these lines always distinct and many of the scales composing them often quite broad; a short line of white scales above each wing-root, and some narrow white scales on each side of the bare space. Scutellum with silvery-white scales as usual in this group, but the scales on median lobe tending to be less dense than on lateral lobes and some of them pointed. *Abdomen*, *legs* and *wings* as in *A. marshalli*, except for the absence of femoral spots.

♂. Resembles ♀. Palpi as in *A. marshalli*. *Terminalia* (Fig. 47, a) as in *marshalli*; no differences discoverable beyond slight individual variation.

Wing-length 4-5 mm.

Distribution.—CAPE PROVINCE: Oudebosch (*Barnard*). NYASALAND: Mlanje (*Neave*). KENYA: Limuru (*Van Someren and MacDonald*); Kisumu (*MacDonald*); Mt. Elgon (*Jackson*).

Variation.—Small differences in ornamentation occur between specimens from different localities, the form occurring in any one locality being apparently fairly

constant. Whether any of the East African forms are identical with the Cape form cannot be ascertained until better material is obtained from the type locality; I therefore describe them below without at present suggesting names for them.

A. (25 ♀, 16 ♂ from Mt. Elgon, reared from tree-hole in forest zone).

♀. Silvery mark on shoulder broadish in front, narrower behind, not reaching scutal angle, when seen obliquely in front view appearing more like a spot than a stripe. White spot at tip of hind femur not much longer than broad. Front and middle tarsi with a small white spot at tip of first segment, middle tarsi sometimes with a few white scales at tip of second segment.

♂. Thorax and hind femur as in ♀. Front and middle tarsi all dark, or with a few white scales at tip of first segment. Abdomen unbanded.

B. (5 ♀, 2 ♂ from Limuru, bred from bored and cut bamboos).

♀. Silvery mark on shoulder forming a narrow stripe of even width and reaching back to scutal angle. Hind femur as in A. Front tarsi with first segment broadly and second narrowly white at tip; middle tarsi with first two segments broadly and third narrowly white at tip.

♂. Thorax as in ♀, shoulder-stripe a little broader. Front tarsi all dark; middle tarsi with a small white spot at tip of first segment and a few white scales at tip of second. Abdomen unbanded.

C. (1 ♀, 3 ♂ from Kisumu).

♀. Silvery shoulder mark as in A, also hind femur. Front tarsi with a few white scales and middle tarsi with a small white spot at tip of first segment, rest dark.

♂. Front and middle tarsi all dark. Abdomen with whitish basal bands on tergites 3-5 or 3-6.

D. (1 ♂ from Mt. Mlanje).

♂. Silvery shoulder-stripe broad (almost as broad as in *A. howarthi*) and reaching scutal angle. Hind femur with the white spot at tip quite twice as long as broad. Front and middle tarsi all dark. (Terminalia as in the other forms, not like *howarthi*.)

***Aedes* (*Aëdimorphus*) *kapretwae* sp. n.**

Types.—♂♀ in B.M., Mt. Elgon.

Closely allied to *A. capensis*, which it resembles in most respects, but differs from that and all other species of the group in the more extensive white markings of the tarsi, as well as in details of thoracic scaling.

♀. *Head* much as in related species, but the wedge-shaped pale areas adjoining eyes above are creamy instead of silvery. Tori with silvery-white scales and proboscis all black as in *capensis*. *Thorax* dark brown, with markings arranged as in *capensis*, the scutum having a small patch of narrow yellowish scales in middle in front, a pair of round white (or in this case sometimes yellowish) spots in middle, behind which a conspicuous pair of yellow lines extend backwards to scutellum. On each shoulder is a rather narrow stripe which is composed of broad silvery-white scales only towards its front end, being edged in front with narrow yellowish scales and also composed of similar scales on its posterior part, as far as scutal angle. The median spots are in part (and to a variable extent) composed of narrow yellow scales. Scutellum with scales of median lobe creamy or golden instead of silvery-white, all pointed

and many of them quite narrow ; scales on lateral lobes broader and white but often also pointed. Pleurae as in *marshalli*. *Abdomen* as in *marshalli*. *Legs* black ; femora with small white knee-spots but no pre-apical white spots ; tibiae with the white spots at tip not or scarcely longer than broad. Front tarsi with segments 1-4 white-tipped, 5 also with some white scales above, dark beneath. Middle tarsi with segments 1-3 broadly white-tipped (3 sometimes all white above), 4 white above, more or less dark beneath, 5 mainly dark. Hind tarsi with segments 1-3 broadly white-tipped, 4 either all white or with a narrow dark ring in middle, 5 all white. *Wings* as in related species, with small white dot at base of costa.

♂. *Head* with the anterior wedge-shaped spots whiter than in ♀. Palpi slightly shorter than proboscis ; colour as in *capensis*, dark, with a white ring occupying less than basal half of terminal segment. *Thorax* much as in ♀, but shoulder-stripe composed mainly or entirely of broad silvery-white scales. *Abdomen* with whitish basal bands on tergites 3-6. *Legs* : Front tarsi entirely black. Middle tarsi black, with a small white spot at tip of first segment and a larger one at tip of second (this distinguishing the male of this species from that of any of the known forms of *A. capensis*). Hind tarsi with fourth segment variable in colour, either entirely white, or with a black ring in middle, or (in the darkest specimens) black with a white tip and a few white scales at base. *Terminalia* indistinguishable from those of *capensis* or *marshalli*.

Wing-length 3-5 mm.

Distribution.—KENYA : Mt. Elgon, forest zone above Kapretwa, c. 8000 ft., 9 ♂♂, 16 ♀♀, reared from larvae in tree-hole (*T. H. E. Jackson*). From the same tree-hole Mr. Jackson reared a long series of *A. capensis* (form A).

Aëdes (Aëdimorphus) stokesi Evans.

Ochlerotatus apicoannulatus Bacot, Y. Fever Comm. W. Afr. Ent. Rept. pp. 135, 143 (1916).

Aëdes apicoannulatus Edwards, Trans. R. Soc. Trop. Med. and Hyg. 16, p. 501 (1923) ; Edwards, Bull. Ent. Res. 15, p. 267 (1925).

Aëdes (Aëdimorphus) occidentalis Evans (*nec* Macquart), Ann. Trop. Med. 20, p. 99 (1926).

Aëdes (Aëdimorphus) stokesi Evans, Ann. Trop. Med. 23, p. 522 (1929).

Types.—♂♀ in Liverpool, Sierra Leone.

Closely allied to *A. marshalli* and *A. capensis* ; resembles the latter in the absence of pre-apical spots on the femora, but differs from both in lacking the pair of silvery-white spots in middle of scutum.

♀. *Head* as in *A. marshalli*. Proboscis and palpi all black. *Thorax* brownish, more reddish-brown in most dried specimens. Scutum clothed mostly with dark brown scales, very few or no pale ones in middle line in front ; a silvery patch on each shoulder, not quite reaching back to scutal angle ; a pair of sublateral lines of small, narrow yellowish scales are usually distinguishable on posterior half, but are much less obvious than in *capensis* ; few or no pale scales above wing-root. Scutellum with median lobe as densely scaled as lateral lobes, all scales broad, truncate at tip and silvery-white. Pleurae as in *marshalli*. *Abdomen, legs and wings* as in *capensis* ; white spot at tip of hind femur not much longer than broad. Front tarsi with a white spot at tip of first segment, usually quite large but sometimes smaller ; middle tarsi with similar but smaller white spot, often very small or even absent when the front tarsal spot is small.

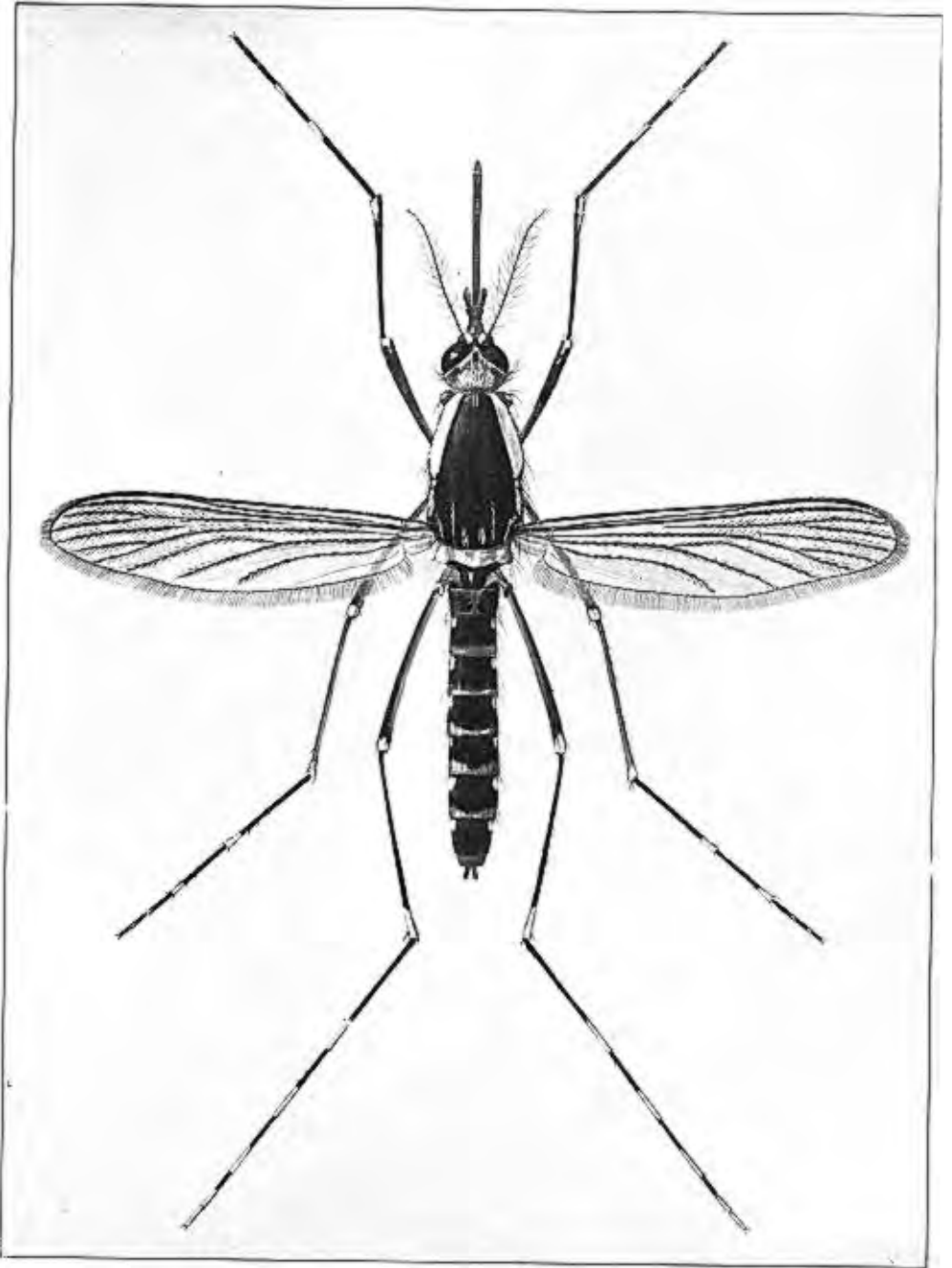


FIG. 46.—*Aedes (Aedimorphus) haworthi* Edw. ♀.

♂. Resembles ♀, except that middle tarsi are entirely dark in all specimens examined, and abdominal tergites 3-6 have dull whitish basal bands. Palpi as long as proboscis or almost so. *Terminalia* scarcely if at all different from those of *marshalli* or *capensis*.

Distribution.—SIERRA LEONE: Freetown (*Bacot, Evans*); Aberdeen (*Wigglesworth*). GOLD COAST: Oblogo, Aburi and Nsawam (*Ingram*); Accra (*Macfie*). NIGERIA: Lagos (*Connal*); Ibadan (*Kumm*). UGANDA: Kampala (*Hopkins*); Jinja (*Gillett*).

Aèdes (Aèdimorphus) haworthi Edwards. (Fig. 46.)

Aèdes (Aèdimorphus) haworthi Edwards, Trans. R. Soc. Trop. Med. and Hyg. 16, p. 498 (1923).

Aèdes haworthi Haworth, Trans. R. Soc. Trop. Med. and Hyg. 18, p. 191, plate (1924).

TYPE.—♂ in B.M., Dar-es-Salaam.

Closely related to *A. capensis* and *A. stokesi*, differing from one or both chiefly as follows: Silvery stripe on anterior lateral margin of scutum broader, extending over scutal angle. No silvery spots in middle of scutum. Middle tibia more extensively pale buff posteriorly, and front and hind tibiae also with a pale posterior line. Hind femur with the white spot at tip fully twice as long as broad. Front and middle tarsi with a distinct white spot at tip of second segment in addition to the one on the first segment. *Terminalia* (Fig. 47, b): Much as in *A. marshalli*, but style more swollen in middle, distal portion more slender, spine longer and accompanied by half a dozen or more long hairs.

Distribution.—TANGANYIKA: Dar-es-Salaam (*Haworth*). TRANSVAAL: Rolle Siding (*de Meillon*).

Variation.—In the typical series from Dar-es-Salaam the dorsal surface of the head is clothed with silvery-white scales to a much larger extent than in the related species, but the females from eastern Transvaal differ in having the dark areas much as in *A. marshalli* and *stokesi*.

Aèdes (Aèdimorphus) simulans Newstead & Carter. (Pl. 3, fig. 2.)

Reedomyia simulans Newstead and Carter, Ann. Trop. Med. 5, p. 240 (1911).

Ochlerotatus simulans Edwards, Bull. Ent. Res. 3, p. 18 (1912).

Aèdes (Aèdimorphus) simulans Edwards, Bull. Ent. Res. 15, p. 267 (1925).

TYPE.—♂ in Liverpool, Broomassie, Ashanti.

Resembles *A. marshalli* and related species in markings, the tarsi in particular having the same ornamentation, but differs in having no white scales on the tori, and the small silvery-white spots on the scutum composed of narrow scales; hind femur only with a white pre-apical spot.

♀. *Head* with a rather large area of white scales above towards front and extending between eyes; all these white scales narrow, black ones towards each side broad and flat. Proboscis differing from that of related species in having a large creamy-white area in middle beneath. Tori either quite bare or with a few small dark scales. *Thorax* dark brown; scutum clothed uniformly with small dark brown scales except for a round spot of narrow white scales on each shoulder and usually a pair of small

spots of narrow white scales in middle, but this latter pair of spots sometimes indistinct or absent. Paratergite completely covered with broad white scales as in *A. marshalli* and related species. Abdomen as in *A. marshalli*. Legs as in *A. marshalli*, except that the front and middle femora lack the white pre-apical spot. Wings as in related species.

♂. Resembles ♀, but proboscis with a complete white ring in middle and abdomen banded. Last segment of palpi with basal half white. Terminalia (Fig. 47, c) distinctive; coxite with the fine hairs on its inner face arranged in definite rows; style quite unlike that of *A. marshalli*, with a slender bare branch externally towards tip, the stouter terminal portion bearing a small leaf-like appendage.

Distribution.—GOLD COAST: "Broomassie" [Kumasi?], Ashanti (Donaldson). SIERRA LEONE: Freetown (Bacot, Evans). NIGERIA: Ibadan? (Kumm). BELGIAN CONGO: Stanleyville (Schwetz).

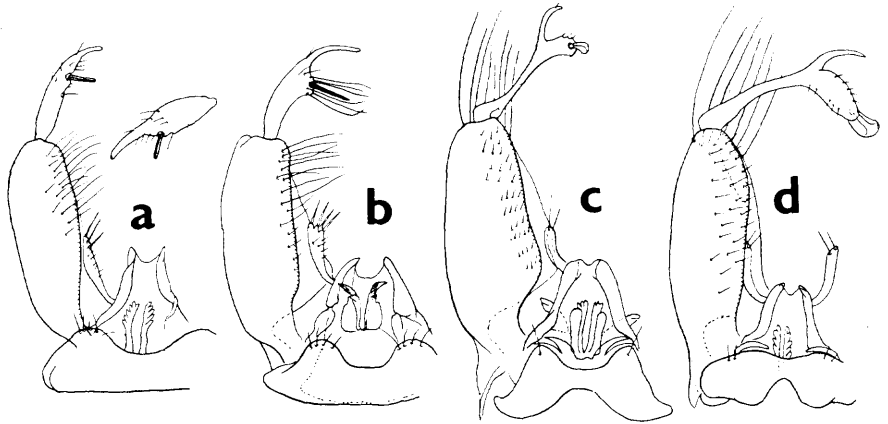


FIG. 47.—Terminalia of *Aedes* (*Aedimorphus*) spp. a. *capensis* (Mt. Mlanje). b. *haworthi*. c. *simulans*. d. *apicoannulatus*.

Aedes (*Aedimorphus*) *apicoannulatus* Edwards.

Ochlerotatus apicoannulatus Edwards, Bull. Ent. Res. 3, p. 18 (1912).

Aedimorphus alboannulatus Theobald (nec Macquart), Entom. 38, p. 154 (1905).

Aedes (*Aedimorphus*) *apicoannulatus* Evans, Ann. Trop. Med. 20, p. 100 (1926).

TYPE.—♂♀ in B.M., Sierra Leone.

Resembles *A. marshalli* and related species in markings of hind tarsi, and further resembles *A. simulans* in having the tori bare and the proboscis more or less ringed, but differs from all other members of the group in lacking the silvery-white spots on the scutum and also in head scaling.

♀. *Head* with a large area of flat black scales above, narrow golden scales on nape and a narrow border of narrow golden scales to eyes, but no white scales. Proboscis with a whitish ring in middle, incomplete above. Tori bare or with a few dark scales. *Thorax* dark brown, scutum clothed mostly with narrow brown scales but with numerous narrow golden scales scattered over the whole surface, no white ones. Some broad white scales present on paratergite in some specimens but this part bare

in others (perhaps rubbed). *Abdomen, legs and wings* as in *A. stokesi*; no pre-apical white spot on any of the femora.

♂. Resembles ♀, but proboscis with complete pale ring and abdomen banded. *Terminalia* (Fig. 47, d) resembling those of *A. simulans*, but hairs on coxite not arranged in rows—and leaf-like appendage of style larger.

Distribution.—SIERRA LEONE: Freetown (*Smith, Evans*).

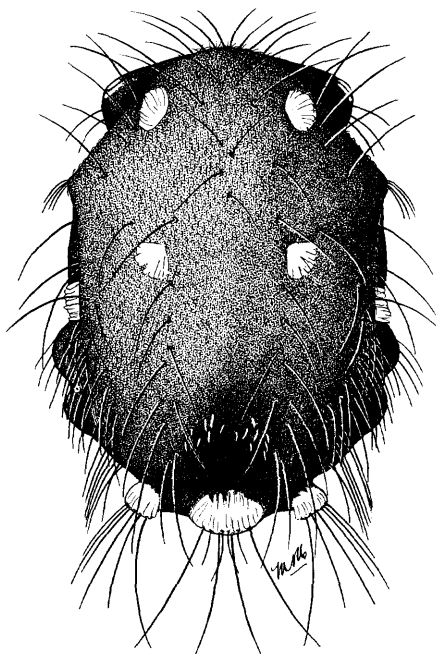


FIG. 48.—Thorax of *Aedes (Aedimorphus) argenteopunctatus* Theo. (Compare *Culex argenteopunctatus* Ventr., Fig. 103).

***Aedes (Aedimorphus) argenteopunctatus* Theobald.**

Stegomyia argenteopunctata Theobald, Mon. Cul. 1, p. 316 (1901).

Ochlerotatus argenteopunctatus Edwards, Bull. Ent. Res. 3, p. 20 (1912).

Aedimorphus quinquepunctata Theobald, Ann. Trop. Med. 7, p. 598 (1913); Edwards, Bull. Ent. Res. 15, p. 261 (1925).

Aedes (Aedimorphus) argenteopunctatus Edwards, Bull. Ent. Res. 15, p. 268 (1925).

TYPES.—*argenteopunctatus*, ♀ in B.M., Salisbury; *quinquepunctata*, ♀ in Liverpool, Lado district.

This typifies a group of species with very similar ornamentation, the scutellum and paratergite being clothed with silvery-white flat scales and the scutum having four small spots of similar scales, much as in *A. marshalli* and related species, but the tarsi are entirely dark. In the seven species of this group the tori are bare; palpi dark; post-spiracular scales absent; lateral abdominal spots silvery-white; cerci of female long and conspicuous. *A. argenteopunctatus* differs from the other species of the group in having distinct round pre-apical white spots on the anterior surface of the middle and hind femora.

♀. *Head* clothed mainly with broad flat scales, mostly black in colour, but with

four stripes of flat white scales, these stripes convergent behind and broadening in front, becoming silvery-white on eye-margins; a small patch of flat silvery-white scales between eyes in front; some narrow pale scales on nape. Proboscis dark brown, indefinitely paler beneath. Palpi dark, about one-eighth as long as proboscis. *Thorax* (Fig. 48) blackish-brown; scutum mainly clothed with narrow dark brown scales, the four small spots of flat silvery-white scales all conspicuous; a few narrow white scales around pre-scutellar space. Pleurae with three small patches of flat white scales; another small patch of such scales on *ppn*. *Abdomen* blackish above. *Legs*: All femora and tibiae with conspicuous silvery-white spots at tip. *Wings* with silvery-white spot at base of costa.

♂. Resembles ♀; lateral silvery spots of abdominal tergites more evident from above, but tergites unbanded. Palpi entirely dark, longer than proboscis by more than the terminal segment, last two segments densely hairy. *Terminalia* (Fig. 49, c): Style swollen apically but with stout stem, bearing a small dorsal horn, one small curved spine, and a leaf-like appendage; coxite with a row of longish hairs on inner margin tergally; tergite bare.

Wing-length about 3 mm.

Distribution.—SIERRA LEONE: Pujehun (*Davey*). NIGERIA: Katagum (*Watson*); Gadau (*Taylor*); Lagos (*Graham*). GOLD COAST: Bjere, Volta R. (*Ingram*). UGANDA: Mpumu (*Fraser*); Kayanja, Ankole (*McConnell*); Katonga Swamp (*Hopkins*). BELGIAN CONGO: Mwabo and Futwa (*Seydel*); Kisantu and Kabasha Escarpment (*De Wulf*); Ituri (*Collart*). SUDAN: Bahr el Ghazal (*Cummins*); Sobat (*Wenyon*); Matala (*King*); Talodi (*Cowland*); Khartoum (*Bedford*). NYASALAND: Zomba (*Neave*). S. RHODESIA: Salisbury (*Marshall*). KENYA: Nairobi (*Symes*).

Aëdes (Aëdimorphus) punctothoracis Theobald.

Aëdimorphus punctothoracis Theobald, Ann. Mag. Nat. Hist. (8) 5, p. 374 (1910).

Aëdimorphus punctithorax Theobald, Mon. Cul. 5, p. 205 (1910).

Ochlerotatus punctothoracis Edwards, Bull. Ent. Res. 3, p. 20 (1912).

Aëdes punctothoracis Edwards, Proc. R. Ent. Soc., B, 5, p. 49 (1936).

TYPE.—♂♀ in B.M., Accra.

Closely resembles *A. argenteopunctatus* in most respects, differing in the absence of the pre-apical white spots on the middle and hind femora, and the smaller size of the silvery-white spots of the scutum, which in this species are much less conspicuous.

♀. *Head* as in *A. argenteopunctatus*. *Thorax* often lighter brown in colour; the four white scutal spots usually each containing only about half a dozen scales; fewer scales on the paratergite and very few or none on *ppn*. No white scales on front margin between the anterior pair of spots, and no white scales on angle of scutum; few around pre-scutellar space and none above wing-root. *Legs* with the white spots at tips of femora and tibiae conspicuous, that at tip of hind tibia longer than broad.

♂. Palpi as in *A. argenteopunctatus*. *Terminalia* (Fig. 49, a): Style with slender stem and hammer-shaped head; dorsal horn shorter than in *A. argenteopunctatus*, the curved spine placed close to it, leaf-like appendage small; coxite with a row of hairs on inner tergal margin towards tip; phallosome with short teeth.

Distribution (as checked by examination of ♂ terminalia).—GOLD COAST: Accra

(Graham, Connal, Mrs. W. Smith). NIGERIA: Lagos (*Philip*). BELGIAN CONGO: Banana (*Wanson*). PORTUGUESE GUINEA: Bolama (*Segueira*).

The available records suggest that this may be a purely coastal species. Records from inland localities are based on females only and require confirmation; female specimens in the British Museum from Sierra Leone, Angola and Nyasaland may belong either to this or to one of the closely allied forms. Females from Bonthe, SIERRA LEONE (Davey) are almost certainly this species.

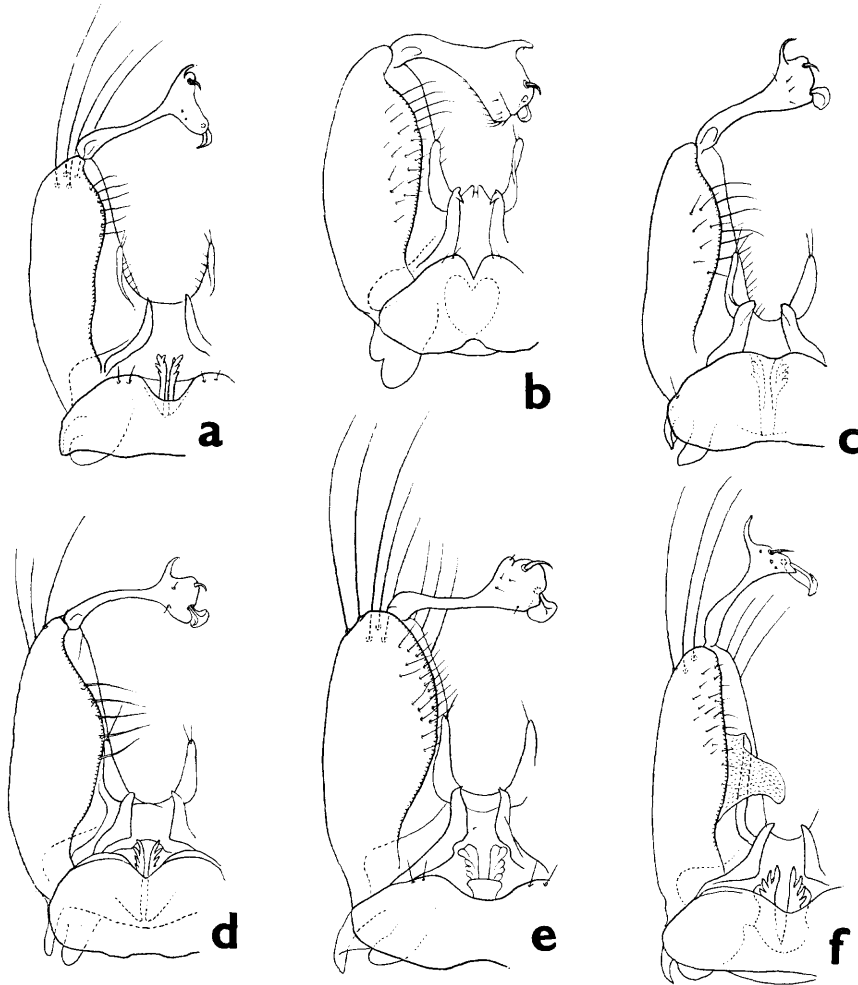


FIG. 49.—Terminalia of *Aedes* (*Aedimorphus*) spp. a. *punctothoracis*. b. *microstrictus*. c. *argenteopunctatus* (Gadua). d. *mixtus* (Kumasi). e. *mutilus* (Mpanga). f. *hopkinsi*.

Aedes (*Aedimorphus*) *hopkinsi* Edwards.

Aedes hopkinsi Edwards, Proc. R. Ent. Soc., B, 5, p. 49 (1936).

TYPE.—♂ in B.M., Lira.

Closely resembles *A. punctothoracis* in all external characters; the four silvery

spots of scutum not so small ; posterior third of scutum with more numerous narrow white scales, including a few immediately above wing-root.

♂. *Terminalia* (Fig. 49, f).—Differ strikingly from those of all other species of the group in the possession of a large fleshy lobe at base of coxite ; style resembling that of *A. punctothoracis*, but spine well removed from the base of the longer dorsal horn and leaf-like appendage larger ; teeth of phallosome longer.

Distribution.—UGANDA : Lira, Kampala and Entebbe (*Hopkins*).

Aëdes (Aëdimorphus) mixtus Edwards.

Stegomyia argenteopunctata Theobald (excl. type ♀), Mon. Cul. 1, p. 316 (1901).

Aëdes mixtus Edwards, Proc. R. Ent. Soc., B, 5, p. 49 (1936).

TYPE.—♂ in B.M., Kumasi.

Closely resembles *A. punctothoracis*, no constant external differences being discoverable. White spots of scutum not so small as in most specimens of *punctothoracis* ; scales around bare prescutellar space all narrow ; no white scales above wing-root.

♂. *Terminalia* (Fig. 49, d).—Style with slender stem and somewhat quadrate head, horn, spine and leaf present and about equidistant ; coxite with about five strong bristly hairs along middle part of inner tergal margin.

Distribution.—GOLD COAST : Kumasi (*Watt*). S. RHODESIA : Salisbury (*Marshall*).

Aëdes (Aëdimorphus) microstictus Edwards.

Aëdes microstictus Edwards, Proc. R. Ent. Soc., B, 5, p. 50 (1936).

TYPE.—♂ in B.M., Pretoria.

Closely resembles *A. punctothoracis*, but knee-spots less conspicuous ; white spot at tip of hind tibia smaller, scarcely as long as tibial diameter.

♂. Palpi scarcely longer than proboscis, less hairy at tip than in *A. punctothoracis*. *Terminalia* (Fig. 49, b) with style much broader than in related species, and coxite broader, structure otherwise similar.

Distribution.—TRANSVAAL : Pretoria (*Bedford*).

Aëdes (Aëdimorphus) mutilus Edwards.

Aëdes mutilus Edwards, Proc. R. Ent. Soc., B, 5, p. 50 (1936).

TYPE.—♂ in B.M., Mpanga Forest.

Closely resembles *A. punctothoracis*, but differs from that species and all others of the group in the head scaling. Size somewhat larger than in the other species.

♀. *Head* with the dorsal surface almost entirely covered with narrow scales, the silvery-white scales adjacent to eye-margins in middle narrow ; flat scales confined to sides. *Thorax* : Scales composing the four white scutal spots smaller than usual, though still broad and blunt-ended. Front margin of scutum with rather numerous narrow pale yellowish scales, but no pale scales on scutal angle or above wing-root. *Legs* : White spot at tip of hind tibia quite large.

♂. Resembles ♀. Palpi as in *A. punctothoracis*. *Terminalia* (Fig. 49, e) differing

from those of other species of the group in having the dorsal horn of the style reduced to a small tubercle; phallosome also differing in form; coxite with a patch of fine hairs towards inner tergal margin.

Wing-length 3.5–4.5 mm.

Distribution.—UGANDA: Mpanga Forest, Fort Portal (*Shillito*); Kampala (*Hopkins*). BELGIAN CONGO: Buta, 1922 (*Mouchet*).

Aëdes (Aëdimorphus) bedfordi Edwards.

Aëdes bedfordi Edwards, Proc. R. Ent. Soc., B, 5, p. 50 (1936).

TYPE.—♀ in B.M., Zululand.

Allied to *A. argenteopunctatus* and *A. punctothoracis*, and resembling the latter in having no pre-apical white spots on middle and hind femora; differs from these and allied species in having many more flat white scales on thorax.

♀. *Head* as in *A. argenteopunctatus*. *Thorax* blackish. The four white scutal spots characteristic of the group present and composed of numerous broad flat scales; in addition spots of similar scales are present on scutal angles and above wing-roots, and some similar scales occur round front margin of scutum; some scattered narrow pale scales also present. Paratergite more completely covered by flat white scales than in the allied species. *Abdomen, legs and wings* as in *A. argenteopunctatus*.

Wing-length 3 mm.

Distribution.—ZULULAND: Ntambanana, ii. 1923 (*Bedford*).

Aëdes (Aëdimorphus) insolens Edwards.

Aëdes insolens Edwards, Proc. R. Ent. Soc., B, 5, p. 50 (1936).

TYPE.—♀ in B.M., Arua.

Resembles *A. argenteopunctatus* and *A. punctothoracis*, differing from those species and all others of the group in the presence of white scales on the tori, scattered white scales on the tibiae, and in the white-tipped palpi.

♀. *Head* with almost all the scales broad and flat, mostly black, including the few between eyes; four white spots on front margin. Tori black (instead of dark or light brown as in related species), with a conspicuous patch of silvery-white scales. Proboscis conspicuously pale beneath its whole extent. Palpi with the fine hairs and very small scales at tip white. *Thorax* blackish. Scutum with the usual four spots of flat white scales, and behind these with an additional pair of spots composed of narrower scales; no white scales on front margin nor on scutal angles, but a group of flat white scales above wing-root; a small but distinct spot of flat white scales on *ppn*. *Abdomen* dark above, with the usual white lateral spots. *Legs* with some scattered silvery-white scales on mid femora and on all tibiae, most numerous on hind tibia.

Wing-length 4 mm

Distribution.—N.-W. UGANDA: Arua (*Hopkins*).

Aedes (Aedimorphus) domesticus Theobald.

Uranotaenia domestica Theobald, Mon. Cul. 2, p. 253 (1901).

Aedimorphus domesticus Theobald, Mon. Cul. 3, p. 291 (1903).

Ochlerotatus domesticus Edwards, Bull. Ent. Res. 3, p. 20 (1912).

Aedes (Aedimorphus) domesticus Edwards, Bull. Ent. Res. 15, p. 268 (1925), and Proc. R. Ent. Soc., B, 5, p. 50 (1936).

TYPES.—♀ in "in Dr. Annett's collection," Old Calabar.

This species and its two near allies are easily distinguished from others with dark tarsi and flat, white scales on scutellum by the presence of a single pair of white spots on the scutum, and a pre-apical white spot on the hind femur (none on the

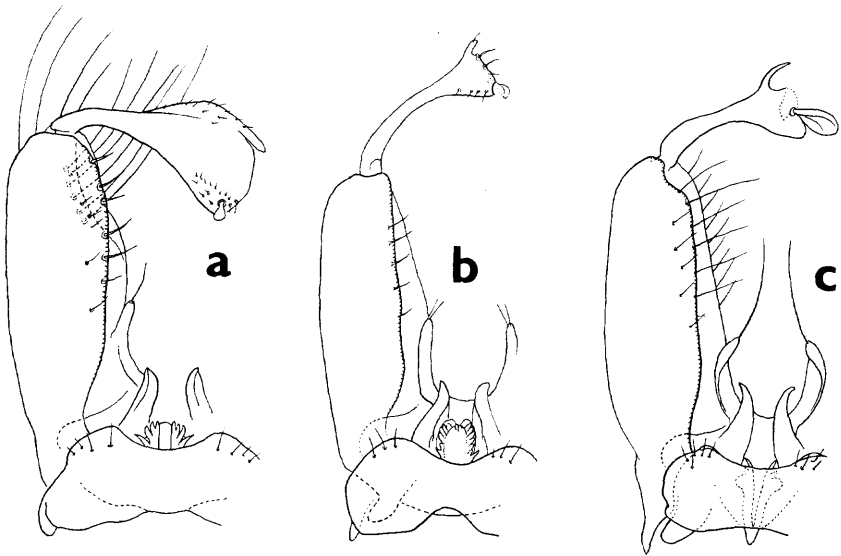


FIG. 50.—Terminalia of *Aedes (Aedimorphus)* spp. a. *domesticus*. b. *leptolabis*. c. *longisetus*.

other femora); also from the species of the *marshalli* and *argenteopunctatus* groups by having the paratergites bare. Terminalia of *A. domesticus* distinctive.

♀. *Head* with a large area of pale narrow scales on nape, flat blackish scales towards sides and in front, and a pair of patches of flat silvery-white scales adjoining eyes, not quite meeting in middle. Tori bare, light brownish. Proboscis and palpi blackish. *Thorax* reddish-brown; scutum clothed mainly with narrow dark brown scales, with a rather small but conspicuous rounded patch on each shoulder composed of broad flat white scales, no other pale scales on scutum; paratergite bare; scutellum completely clothed with flat silvery-white scales; pleurae with the usual three small patches of silvery-white scales; *ppn* with a few small narrow dark scales only. *Abdomen* dark above, tergites with small silvery-white basal lateral spots, visible dorsally only on tergite 7. *Legs* dark with white knee-spots; hind femur with a white spot on anterior surface at about three-fourths of its length, this spot usually large and conspicuous and extending somewhat on the dorsal surface; hind tibia

with a white area at tip which usually occupies about one-fifth of the length of the tibia. *Wings* with a white dot at base of costa as in most allied species.

♂. Resembles ♀, except that most of the abdominal tergites have complete or almost complete basal silvery-white bands. Palpi entirely blackish, slightly longer than proboscis, last two segments densely hairy. *Terminalia* (Fig. 50, a): Style very broad, with a small horizontal dorsal horn and a small leaf-like appendage, but no spine such as occurs in the *argenteopunctatus* group; basal lobe of coxite with a short terminal hair.

Wing-length 3.5–5 mm.

Distribution.—NIGERIA: Old Calabar (*Annett, Simpson*); Lagos (*Graham, Macfie, Wigglesworth*). GABOON: Fernan Vaz (*Galliard*). GOLD COAST: Accra (*Graham*); Kumasi (*Mrs. W. Smith*); Sekondi (*Simpson*). SIERRA LEONE: Daru (*Blacklock*). BELGIAN CONGO: Stanleyville (*Mouchet*). UGANDA: Entebbe (*Hodges*); Kampala and Jinja (*Hopkins*).

Variation.—In some specimens from Lagos the white pre-apical spot on the hind femur is small and indistinct, and the white spots on the eye-margins, shoulders and tip of hind tibia are also smaller than usual; terminalia of normal structure.

Aèdes (Aèdimorphus) leptolabis Edwards.

Aèdes leptolabis Edwards, Proc. R. Ent. Soc., B, 5, p. 51 (1936).

TYPE.—♂ in B.M., Nabadzidza, Uganda.

Closely resembles *A. domesticus* in almost all external features; white spots on shoulders perhaps smaller than the average in *domesticus*; white spot at tip of hind tibia also smaller, occupying only about one-eighth of the length of the tibia.

♂. *Terminalia* (Fig. 50, b).—Style with a slender stem and enlarged tip, bearing a very short erect dorsal horn and a couple of stiff setae on distal margin besides a small leaf-like appendage; basal lobe of coxite with a couple of short hairs; phallosome quite different from that of *A. domesticus*.

Distribution.—UGANDA: Nabadzidza (*Hancock*). BELGIAN CONGO: Pashié Stream, 1700 m., Katanga (*Schwetzel*); Leopoldville (*Henrard*); Kinshasa (*Duren*).

Aèdes (Aèdimorphus) longiseta Edwards.

Aèdes longiseta Edwards, Proc. R. Ent. Soc., B, 5, p. 50 (1936).

TYPE.—♂ in B.M., Stanleyville.

Closely resembles *A. domesticus* in all external features; the only apparent distinction in the single available specimen is that the white humeral spots are larger, but this may not be a constant difference.

♂. *Terminalia* (Fig. 50, c).—Style rather slender, but less so than in *A. leptolabis*; the enlarged tip with a prominent dorsal horn and large leaf; basal lobe of coxite with one very long terminal hair; paraprocts more pointed, and phallosome differing from that of *domesticus*.

Distribution.—BELGIAN CONGO: Stanleyville, 1928 (*Schwetzel*).

Aëdes (Aëdimorphus) filicis Ingram and de Meillon.

Aëdes (Aëdimorphus) filicis Ingram and de Meillon, S. Afr. Inst. Med. Res. 22, p. 58 (1927).

Types.—♂♀ in B.M., Zululand.

A species which might easily be confused with *A. punctothoracis* owing to the presence of white spots on the scutum, but these spots composed of narrow scales.

♀. *Head* clothed almost entirely with narrow scales, even including those adjacent to eyes in front, mostly dark, but a pair of conspicuous white patches on eye-margins. Proboscis and palpi blackish. Tori brown with a few small pale scales. *Thorax* blackish. Scutum with four pairs of small white spots situated on shoulders, scutal angles, above wing-base and in middle of scutum, all composed of narrow curved scales; in addition a few pale scales around pre-scutellar space. Paratergite and scutellum densely clothed with broad flat silvery-white scales. Pleurae with the usual three patches of broad white scales; no postspiracular nor subspiracular scales. *Abdomen* blackish above, tergites with the usual silvery-white basal lateral patches, those on tergite 8 visible dorsally. *Legs* black with silvery-white knee-spots; spot at tip of hind tibia longer than broad. *Wings* with the usual white dot at base.

♂. Resembles ♀; abdominal bands incomplete. Palpi all dark, scarcely longer than proboscis, last two segments moderately swollen and hairy. *Terminalia* (Fig. 51, a): Style greatly enlarged and somewhat quadrate on distal half, with a small horn, a short curved spine, and a leaf; coxae with a patch of short hair on tergal face.

Wing-length 3–5 mm.

Distribution.—ZULULAND (*Ingram*); Ntambanana (*Bedford*). CAPE PROVINCE: Blauwkranz (*de Meillon*); Kaaiman's Gat (*Wood*).

Aëdes (Aëdimorphus) tarsalis Newstead.

Duttonia tarsalis Newstead, Ann. Trop. Med. 1, p. 18 (1907).

(?) *Duttonia africana* Newstead, Ann. Trop. Med. 1, p. 20 (1907).

Reedomyia biannulata Theobald, Mon. Cul. 4, p. 263 (1907).

Reedomyia neobiannulata Theobald (type ♂), Mon. Cul. 5, p. 255 (1910).

Reedomyia bipunctata Theobald, Mon. Cul. 5, p. 256 (1910).

(?) *Neopecomyia uniannulata* Theobald, Mon. Cul. 5, p. 261 (1910).

(?) *Reedomyia sudanensis* Theobald, Ann. Trop. Med. 7, p. 595 (1912); Edwards, Bull. Ent. Res. 15, p. 261 (1925).

Ochlerotatus minutus Edwards (in part), Bull. Ent. Res. 3, p. 21 (1912).

(?) *Ochlerotatus africanus* Edwards, Bull. Ent. Res. 3, p. 21 (1912).

Ochlerotatus tarsalis Edwards, Bull. Ent. Res. 7, p. 219 (1917).

Types: *africana*, ♀ in Liverpool, Kasongo, Congo; *tarsalis*, ♂ in Liverpool, Kisui, Congo; *biannulata* and *neobiannulata*, ♂ in B.M., Sierra Leone; *bipunctata*, ♀ in B.M., Obuasi; *uniannulata*, ♀ in B.M., Kumasi; *sudanensis*, ♀ in Liverpool, Lado district.

This belongs to a small group of species which have the following characters in common: Proboscis, palpi and tarsi entirely black; scutum without special ornamentation, but scutellum partly or wholly clothed with flat white or silvery-white scales; abdominal tergites with the lateral spots brilliant silvery-white; hind tibia with a conspicuous silvery-white tip, the white area nearly or quite twice as long as the tibial diameter. *A. tarsalis* is most obviously distinguished from its allies by the structure of the terminalia; external differences are to be found in the scaling of the head, unbanded abdomen of the female, and absence of postspiracular scales.

♀. *Head* with all the decumbent scales on the dorsal surface narrow and curved;

a large area of black ones in middle, and an area of golden scales adjoining each eye, usually narrowly connected with a larger area of golden scales on nape. Tori light brownish, darker on inner surface, almost bare. *Thorax* rather dark reddish-brown; scales on scutum all narrow and mostly dark brown, some golden scales round front

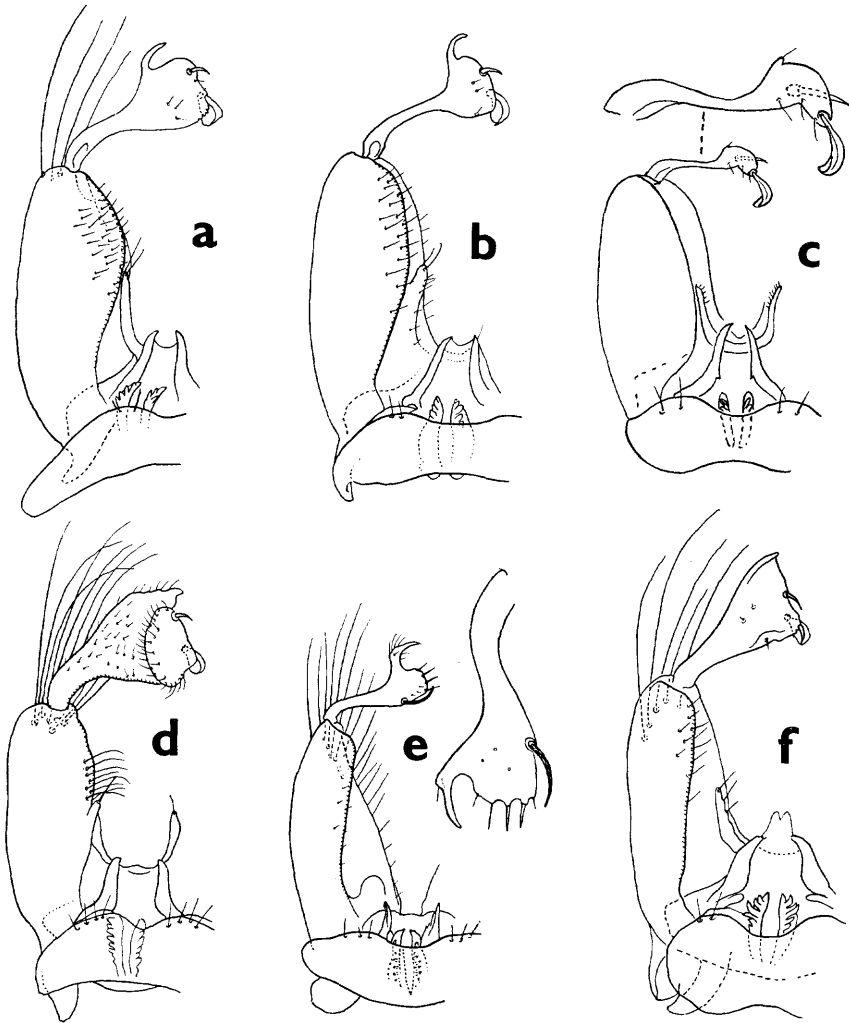


FIG. 51.—Terminalia of *Aedes* (*Aedimorphus*) spp. a. *filicis* (type). b. *tarsalis*. c. *yvonneae*. d. *minutus* (Zululand). e. *congolensis*. f. *phyllobabis*.

margin, on scutal angles, and in a more or less obvious pair of small spots in middle; in addition a very variable number of golden scales scattered over the whole surface, when most numerous obscuring the spots. Scutellum wholly covered with flat silvery-white scales (perhaps sometimes with a few black scales at tip of mid lobe); paratergite with similar scales. No postspiracular scales, but a small patch of flat, white, subspiracular scales present; *ppn* with some narrow dark scales above and

pale ones below, the latter variable in number and shape; *apn* with flat white scales. *Abdomen* black above, the silvery lateral spots hardly visible dorsally; sternites with moderately broad black apical bands. *Legs* black, with conspicuous silvery-white knee-spots; hind femur with a dark dorsal line extending to base, external surface mainly whitish but with an extensive black area before tip. *Wings* dark; no obvious pale dot at base of costa.

♂. Resembles ♀, except that most of the abdominal tergites have complete white basal bands. Palpi of normal form, wholly black, scarcely as long as proboscis. *Terminalia* (Fig. 51, b) rather closely resembling those of *A. filicis*, the only noteworthy difference being that the proximal portion of the style is more slender; even this character, however, seems to be subject to some variation.

Wing-length 3–5 mm.

Distribution.—SIERRA LEONE: Freetown (Smith, Bacot, Evans, Wigglesworth, Christophers). GOLD COAST: Obuasi (Graham). BELGIAN CONGO: Lubutu-Walikali (Schwetz); Movenka, Ituri (Collart). UGANDA: Kasala (Fraser); Arua (Hopkins). KENYA: Nairobi (Symes); Chuka (J. C. C.). SUDAN: Yidu, Lado (King).

Synonymy.—The specific names *tarsalis*, *biannulata* and *neobiannulata*, being based on male specimens, undoubtedly apply to the species here described. The other names which have been quoted as synonyms of *A. tarsalis* were all based on females and their correct application must remain uncertain; it is possible that some refer to other nearly related species (e.g. *phyllobabis*).

***Aëdes* (*Aëdimorphus*) *yvonneae* sp. n.**

TYPE.—♂ in B.M., Popokabaka.

Closely resembles *tarsalis*, except that in all three specimens available subspiracular as well as postspiracular scales are absent. Scutum with very distinct patches of golden scales on shoulders and a pair of roundish spots of similar scales in middle; no scattered golden scales.

♂. *Terminalia* (Fig. 51, c) differ markedly from *tarsalis* in form of style; horn represented by a mere tubercle, but spine and leaf much longer than in *tarsalis*.

Distribution.—BELGIAN CONGO: Popokabaka, Kwango Province, 1937 (Schwetz). The species is named after Madame Schwetz, who accompanied her husband on his expedition to the Kwango.

***Aëdes* (*Aëdimorphus*) *phyllobabis* Edwards.**

(?) *Neopecomyia uniannulata* Theobald, Mon. Cul. 5, p. 261 (1910).

Aëdes (*Aëdimorphus*) *phyllobabis* Edwards, Bull. Ent. Res. 20, p. 324 (1929).

TYPES: *uniannulata*, ♀ in B.M., Kumasi, Ashanti; *phyllobabis*, ♂ in B.M., Stanleyville.

Closely resembles *A. tarsalis*, differing chiefly in the ♂ terminalia.

♀. Most of the specimens examined differ from *A. tarsalis* in having some or all of the scalès on the mid lobe of the scutellum narrow, those on the tip of the lobe being black; the character however is variable, some specimens having almost all of the scutellar scales broad and white.

♂. Does not differ obviously in external features from *A. tarsalis*. Scutellar scales all broad and white. Palpi slightly longer than proboscis. *Terminalia* (Fig.

51, f): Style very broad, almost triangular in shape, without an erect dorsal horn; other structures much as in *tarsalis*, teeth of phallosome perhaps longer.

Distribution (as checked from examination of terminalia).—LIBERIA: Palata (*Bequaert*). BELGIAN CONGO: Stanleyville and Ruchuru (*Schwetz*). UGANDA: Mpanga Forest, Fort Portal (*Shillito*). KENYA: Kabwach Forest, Kisii (*Teesdale*).

Synonymy.—On the character of the scutellar scaling it now seems probable that the type female of *N. uniannulata* belongs to this species rather than to *A. tarsalis*, but as no males of *phyllobabis* have yet been found in the Gold Coast the substitution of the earlier name has not been made.

Aëdes (Aëdimorphus) minutus Theobald.

Stegomyia minuta Theobald, Mon. Cul. 1, p. 319 (1901).

Ochlerotatus minutus Edwards, Bull. Ent. Res. 7, p. 219 (1917).

TYPE.—♀ in B.M., Salisbury.

Differs most obviously from *A. tarsalis* and *phyllobabis*, as well as from all other similar species hitherto known, in the scaling of the head; broad flat scales covering most of the dorsal surface and leaving only a small area of narrow scales on the nape and a very few adjacent to each eye in front.

♀. Resembles *A. tarsalis* except in shape of head-scales. Scutellar scales all silvery-white and broad.

♂. Resembles ♂ of *A. tarsalis*. *Terminalia* (Fig. 51, d) with the style very broad and thick, pubescent nearly all over; without dorsal horn but with a short curved spine and a leaf as in related species; coxite with the long bristles at the tip on the sternal side forming a rather conspicuous tuft, also with a small tuft of hair on inner face near middle.

Wing-length about 3 mm.

Distribution.—SIERRA LEONE: Freetown (*Arbuckle*). GOLD COAST: Obuasi and Accra (*Graham*); Bjere, Volta R. (*Ingram*). NYASALAND: Mlanje (*Neave*). S. RHODESIA: Salisbury (*Marshall*). ZULULAND (*Ingram*).

Aëdes (Aëdimorphus) albocephalus Theobald.

Stegomyia albocephala Theobald, Mon. Cul. 3, p. 140 (1903).

Ochlerotatus albocephalus Edwards, Bull. Ent. Res. 3, p. 21 (1912), and 5, p. 276 (1915).

(?) *Reedomyia seychellensis* Theobald, Trans. Linn. Soc. London, 15, 1, p. 83 (1912).

Aëdimorphus punctithorax Theobald (♂ only), Mon. Cul. 5, p. 206 (1910).

TYPES.—*albocephala*, ♂ in B.M., Gambia; *seychellensis*, ♀ in B.M., Dennis I., Indian Ocean.

Resembles *A. tarsalis*, but fairly easily distinguished in both sexes by the presence of at least a few flat white scales on the post-spiracular area, also by the banded abdomen of the female and the very distinctive terminalia.

♀ *Head* with only a small area of narrow dark scales in front above. *Thorax* with the golden scales of scutum more evenly mixed with the dark ones and more numerous than in *A. tarsalis*. Scutellum with broad flat white scales on lateral lobes and sometimes also on median lobe, but more usually the median lobe has some or even all of its scales narrow. Scales of paratergite and *apn* mostly or all narrow. Pleuræ with more numerous scales; postspiracular as well as subspiracular scales present. *Abdomen* with more or less distinct whitish basal bands on most of the

tergites, these bands somewhat widened in middle and sometimes represented by median spots; lateral spots of tergites less brilliantly white than in *A. tarsalis*; sternites with narrow dark apical bands. Legs much as in *A. tarsalis*; hind tibia with a similar large white area at tip, but hind femur with smaller knee-spot and less extensive dark area apically on anterior surface.

♂. Resembles ♀, but areas of flat scales on sides of head more extensive; scales of scutellum usually all broad; and white bands of abdomen broader and complete. *Terminalia* (Fig. 54, b) differing from those of all related species in the form of the style, which is forked at the middle into two slender prongs, the lower prong bearing a short terminal spine, style otherwise entirely bare; coxite with a row of long hairs apically on sternal side, basal lobe more developed than in allied species, with several long hairs.

Distribution.—GAMBIA (*Dutton*). SIERRA LEONE: Freetown (*Davey*). GOLD COAST: Accra (*Connal, Macfie*); Takoradi (*Pomeroy*). NIGERIA: Lagos (*Kerr*). CAMEROONS: Kumba (*Zumpt*). BELGIAN CONGO: Banana (*Wanson*); Elisabethville (*Schwetz*); Kasenyi, L. Albert (*Schwetz*). TANGANYIKA: Dar-es-Salaam (*Pomeroy, McKenzie*); Lindi (*Haworth*). ZANZIBAR: Mnazi Moja (*Aders*). NATAL: Durban (*Christophers, Bevis*). S. RHODESIA: Salisbury (*Marshall*). ZULULAND: Ntambanana (*Bedford*). CAPE PROVINCE: Mossel Bay (*Turner*). INDIAN OCEAN: Dennis I. and Silhouette (*Scott*); Aldabra (*Fryer*) (these specimens are all females and confirmation of their identity is needed).

***Aedes* (*Aëdimorphus*) *congolensis* Edwards.**

Aedes (*Aëdimorphus*) *congolensis* Edwards, Rev. Zool. Afr. 15, p. 351 (1927).

(?) *Stenoscutus africanus* Theobald, Mon. Cul. 5, p. 263 (1910).

(?) *Reedomyia neobiannulata* Theobald (type ♀), Mon. Cul. 5, p. 255 (1910).

(?) *Ochlerotatus minutus* var. *stenoscutus* Edwards, Bull. Ent. Res. 3, p. 22 (1912).

TYPES.—*congolensis*, ♂♀ in B.M. and Tervueren, Stanleyville; *africanus* (= *stenoscutus*), ♀ in B.M., Obuasi; *neobiannulata*, ♀ in B.M., Accra.

This belongs to a small group of species, typified by *A. abnormalis*, the members of which resemble the *tarsalis* group in many respects, but differ in having the lateral pale spots of the abdominal tergites dull creamy-white instead of pure white or silvery-white, and the white tip of the hind tibia is less conspicuous, being scarcely longer than broad. In the ♂ terminalia the style lacks the leaf-like appendage, there is no basal lobe to the coxite, and the phallosome is differently constructed, being provided on each side with a regular row of about six equal teeth. Specific distinctions between the females in this group are small and rather indefinite; they are to be found chiefly in the scaling of the scutellum and pleurae and colouring of hind femur.

♀. *Head* with all the decumbent scales on vertex narrow and nearly all pale yellowish, no obvious area of dark scales in middle in front. Proboscis uniformly dark below as well as above. Palpi entirely dark. Tori almost entirely pale and bare. *Thorax* rather light brownish, pleurae uniform in tint and not lighter than dorsum. Scutum with narrow dark brown and golden-yellow scales which are not evenly mixed but form a coarsely mottled pattern; scutellum with creamy-white scales, mostly flat on lateral lobes, broad or narrow (usually mixed) on median lobe;

paratergite with a few broad white scales; very few or no post-spiracular or sub-spiracular scales. Prosternum with some hairs and scales. *Abdomen* mainly dark above, but most tergites with narrow and ill-defined basal whitish bands; sternites with or without narrow dark apical bands. *Legs* dark; hind femur white from base to tip on lower half of anterior surface, and with a small pale knee-spot above; creamy-white spot at tip of hind tibia about as long as broad.

♂. Similar to ♀, except that, as usual, the abdominal bands are more definite and the scutellar scales all broad; decumbent scales in middle of vertex narrow as in ♀. Palpi exceeding proboscis by very little less than the length of the last two segments. *Terminalia* (Fig. 51, e): Style very distinctive, with a strong dorsal horn bearing a number of fine hairs, a curved ventral spine beyond middle, and three slender spines and a hair or two in a row on the distal margin. Paraprocts very short.

Wing-length 3-4 mm.

Distribution.—Known definitely only from BELGIAN CONGO: Stanleyville (*Mouchet*). Females perhaps of this species are in the British Museum from GOLD COAST: Accra and Obuasi (*Graham*).

Synonymy.—The females from the Gold Coast described by Theobald as *S. africanus* and *R. neobiannulata* are quite similar to those from the Congo, but the synonymy must be considered doubtful as no males of this species have been found on the Gold Coast. In any case *congolensis* may remain the valid name for this species, because *africanus* is pre-occupied in *Aedes*, *neobiannulata* was founded mainly on a male *tarsalis*, and *stenoscutus*, being designated a variety (not a subspecies), should probably not take precedence over *congolensis*.

Aedes (Aedimorphus) tricholabis sp. n.

TYPE.—♂ in B.M., Gede.

Allied to *A. congolensis*, differing in the narrow scutellar scales. The long hairs on the male style provide a unique feature.

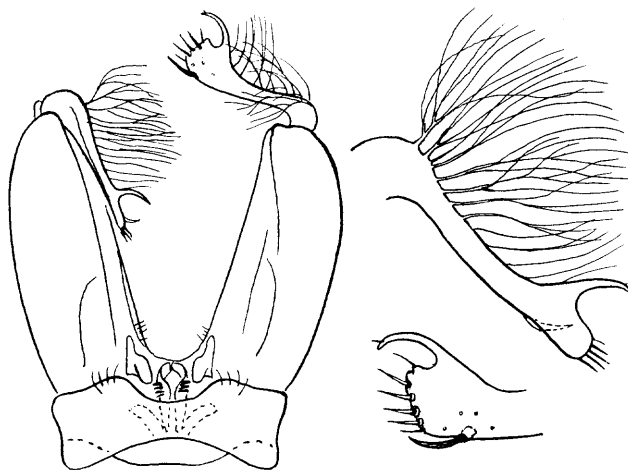


FIG. 51A.—*Aedes (Aedimorphus) tricholabis* sp. n. Terminalia.

♀. *Head* as in allied species with all decumbent scales of vertex narrow, a fairly large patch of dark ones in middle in front. Proboscis and palpi all dark. *Thorax* brown, scales mostly dark but some yellowish ones forming irregular patches on shoulders, on scutal angles, about middle and around pre-scutellar space. A few broad scales on paratergite. All scutellar scales narrow and yellowish. Many prosternal but very few post-spiracular scales. *Abdomen* with pale basal bands on tergites and dark apical bands on sternites. *Legs* as in *congolensis* except that the dark dorsal stripe of hind femur is broader, occupying nearly all anterior surface at tip. Hind claws simple.

♂. Resembles ♀ except that the decumbent scales of vertex are all pale. Palpi exceeding proboscis by scarcely more than terminal segment. *Terminalia* (Fig. 51A), very much resembling those of *congolensis*, particularly as regards the very short paraprocts and the shape and armature of the style, but remarkable in that the outer edge of the style is provided with a row of long soft hairs, most of which are branched, the one nearest the base having most branches.

Wing-length 3-4 mm.

Distribution.—KENYA: Gede, nr Mombasa, 2 ♂ 5 ♀ (MacDonald).

Although the males and females are much alike and were taken at the same place it is not quite certain that they belong together owing to the difference in colour of the head scales.

Aëdes (Aëdimorphus) abnormalis Theobald.

Bathosomyia abnormalis Theobald, Mon. Cul. 5, p. 268 (1910).

Ochlerotatus abnormalis Edwards, Bull. Ent. Res. 7, p. 220 (1917).

TYPE.—♂ in B.M., Obuasi.

Resembles *A. congolensis*, differing chiefly in the darker hind femur, which has no pale knee-spot, and in the terminalia.

♀. The females described by Theobald as *S. africanus* and *R. neobiannulata* were previously regarded by me as belonging to this species, but I now consider that they are more probably *A. congolensis*. No females of the typical form of *A. abnormalis* are available.

♂. The unique type is rather badly damaged, but the following details can be seen: *Head* with nearly all the decumbent scales flat and pale, only a few narrow pale scales on nape and in middle line. *Thorax*: Many of the pale scales of scutum rather broader than usual, especially those towards margins. All remaining scutellar scales narrow, even on lateral lobes. Integument uniformly brown, not very dark. No post-spiracular or sub-spiracular scales. *Legs*: Hind femur with the dark dorsal stripe broader than in *congolensis*, on distal sixth of femur occupying almost the whole of the anterior surface, tip dark, without trace of pale spot above. *Terminalia* (Fig. 52, a): Style with slender stem and greatly expanded distal portion, with a fairly long horn, a row of five sharp-pointed spines on the terminal margin, and a stronger spine adjacent to which is a small pubescent point, lower part of expanded portion bare; coxite broad in middle.

Wing-length about 3.5 mm.

Distribution.—GOLD COAST: Obuasi (Graham).

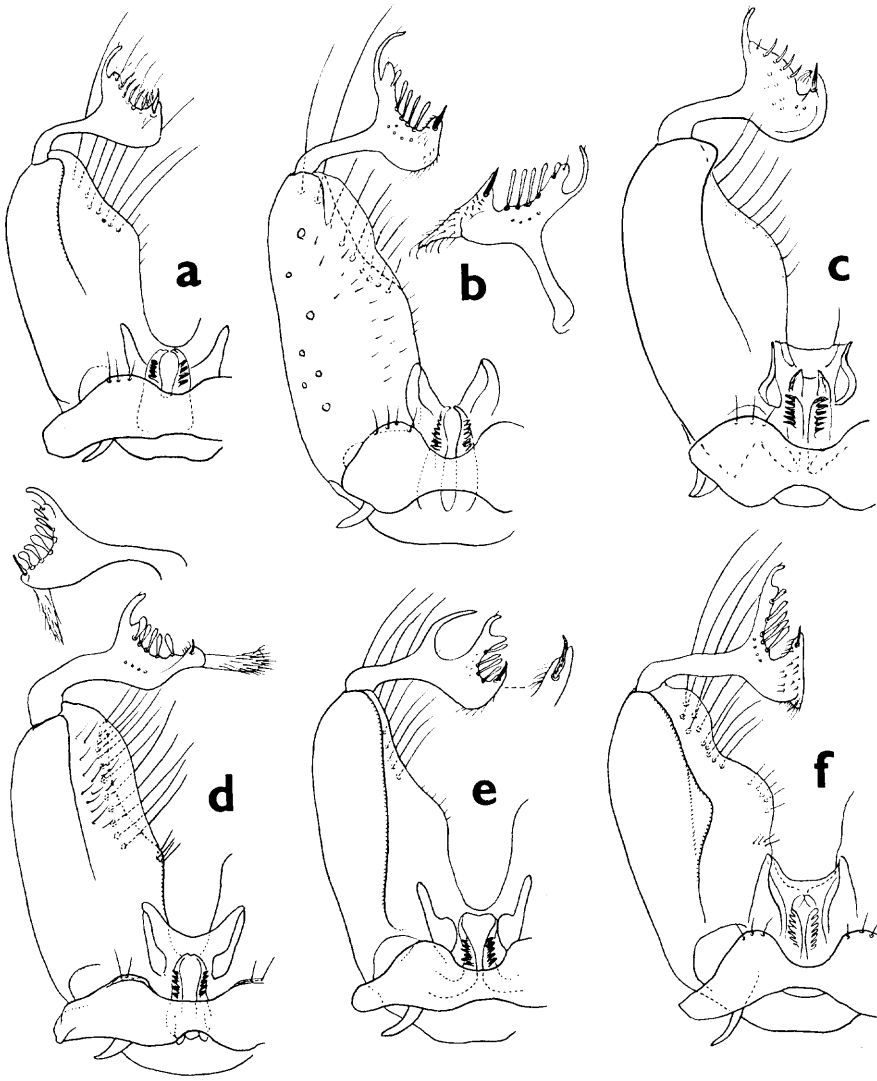


FIG. 52.—Terminalia of *Aedes* (*Aedimorphus*) spp. a. *abnormalis* (type). b. *wigglesworthi*. c. *abnormalis* ssp. *kabwachensis*. d. *alboventralis*. e. *leesoni*. f. *dalzieli*.

ssp. **kabwachensis** n.

TYPE.—♂ in B.M., Kabwach, Kenya.

Resembles the type in having no pale knee-spot on hind femur (in either sex) and about the distal sixth of anterior surface of hind femur dark; but differs in being much darker, the thoracic integument uniformly very dark brown. Scutellum in both sexes with broad scales on lateral lobes, narrow ones on median lobe.

♀. *Head* with all the decumbent scales of vertex narrow, mostly dark except on

nape and eye-margins. Proboscis all dark. *Thorax* with scutal scales all very narrow as usual, mostly dark. Numerous sub-spiracular and a few post-spiracular scales present. Paratergal scales narrow. *Abdomen* with narrow pale basal bands on most tergites.

♂. *Head*.—Scales almost all pale; a large area of narrow decumbent scales in middle. *Thorax* as in ♀; scutal scales quite narrow. *Terminalia* (Fig. 52, c) almost as in the type of *A. abnormalis*, the only obvious difference being in the shape of the expanded portion of the style.

Distribution.—KENYA: Kabwach Forest, Kisii, Kavirondo (*C. Teesdale*), series reared from larvae found in rock pool in stream-bed in dense shade.

***Aedes (Aëdimorphus) wigglesworthi* sp. n.**

Aedes (Aëdimorphus) abnormalis (Theobald) Wigglesworth, Bull. Ent. Res. 20, p. 64 (1929); Hopkins, Mosq. Ethiop. 1, p. 141 (1936).

TYPE.—♂ in B.M., Sapele.

A larger species than *A. congolensis* or *abnormalis*; scutellar scales broad and flat; mesepimeron with a dark spot; abdominal tergites of ♀ unbanded.

♀. *Head* with erect scales of vertex all dark, decumbent scales all narrow and pale; proboscis all dark. *Thorax* with integument of mesonotum rather light brownish, of pleurae more yellowish with some darker areas, including a distinct patch on lower part of mesepimeron. Prosternum bare. Scutum with light and dark scales forming a mottled pattern as in related species. Scutellum with almost all the scales broad, flat, creamy-white; few or no narrow scales even on median lobe. No post-spiracular and few or no sub-spiracular scales. Paratergal scales narrow. *Abdomen* all dark above, no trace of pale basal band on any tergite. *Legs* as in *A. congolensis*, the hind femur white to the tip on lower half or more of anterior surface and with distinct knee-spot.

♂. Resembles ♀, except that the abdominal tergites have distinct whitish basal bands. Palpi not or scarcely longer than proboscis, terminal segment slender and bare, penultimate hairy as usual. *Terminalia* (Fig. 52, b) resembling those of *A. dalzieli* rather than *A. abnormalis*, but differing from both in having the coxite less broad. Style as in *dalzieli* with the spines of the distal row round-tipped and slightly spatulate, and with the enlarged inner part bearing a hairy projection, but the apical horn is much longer.

Wing-length, ♀ 5 mm., ♂ 4 mm.

Distribution.—NIGERIA: Sapele (*Wigglesworth*); Lagos (*Philip*).

***Aedes (Aëdimorphus) alboventralis* Theobald.**

Protomacleaya alboventralis Theobald, Mon. Cul. 5, p. 251 (1910).

Ochlerotatus alboventralis Edwards, Bull. Ent. Res. 3, p. 21 (1912), and 7, p. 221 (1917).

TYPE.—♀ in B.M., Angola.

Very similar to *A. congolensis* and *A. abnormalis*, differing in the more scaly pleurae, colouring of hind femur, and especially in the structure of terminalia.

♀. *Head* as in the other two species. *Thorax* dark brown; scutum with narrow

dark brown, yellowish and usually also some white scales, forming an indefinite mottled pattern. Scutellar scales mostly flat and dull creamy-white; some narrow scales on each lobe. Some flat white scales on paratergite; *ppn* rather densely covered with scales, which are almost all narrow. Pleurae more densely scaly than in related species; numerous post-spiracular scales and a rather large patch of sub-spiracular scales present. *Abdomen* with distinct basal white bands to the tergites, these bands somewhat widened in middle; sternites either entirely pale-scaled or with a few dark scales apically, not forming definite bands. *Legs* dark, with small whitish knee-spots, spot at tip of hind tibia small and creamy-white; hind femur differing from that of *A. congolensis* and *abnormalis* in being dark all round for a short distance before the tip.

♂. Resembles ♀, but abdominal bands broader. Palpi longer than proboscis by length of last segment. *Terminalia* (Fig. 52, d) in general extremely similar to those of *A. wigglesworthi*, but style with the five or six blunt-tipped spines on posterior margin shorter, and the pubescent membranous flap adjacent to the pointed spine much more developed; coxite also differently shaped (ten or more mounts of specimens from different countries were examined and found to agree closely).

Wing-length 4-5 mm.

Distribution.—ANGOLA: Bihé (*Wellman*; females only). BELGIAN CONGO: Kabinda (*Schwetzer*); Elisabethville (*Seydel, Walravens*). UGANDA: Lira (*Hopkins*). S. RHODESIA: Shamva, Shamvangama River (*Leeson*). SUDAN: Delami (*Ruttleger*). KENYA: Kitui (*Anderson*).

Aëdes (Aëdimorphus) lesoni Edwards.

Aëdes (Aëdimorphus) lesoni Edwards, Bull. Ent. Res. 23, p. 562 (1932).

TYPE.—♂ in B.M., S. Rhodesia.

Very similar to *A. alboventralis*, but differs from that species and all others of the group in having most or all of the scales on *apn* and *ppn* (as well as on paratergite and scutellum) broad and flat. Hind femur rather more extensively dark towards tip on anterior surface; knee-spot very small. Sternites with narrow dark apical bands.

♀. Not certainly recognized. A single specimen from Zululand which may belong here is peculiar in having broad scales on each side of the pre-scutellar space.

♂. Palpi exceeding proboscis by length of last segment. *Terminalia* (Fig. 52, e) resembling those of *A. abnormalis* and *alboventralis*, but differing conspicuously in having a long dorsal horn in middle of style.

Distribution.—S. RHODESIA: Shamva (*Leeson*). BECHUANALAND: Gaberones (*D. Drew*).

Aëdes (Aëdimorphus) dalzieli Theobald.

Culicomyia dalzieli Theobald, Mon. Cul. 5, p. 234 (1910).

Aëdes rhecter Dyar, Insec. Inscit. 9, p. 51 (1921).

TYPES.—*dalzieli*, ♀ in B.M., Katagum, Nigeria; *rhecter*, ♂ in U.S.N.M., Washington, Lomagundi.

An interesting annectant species, resembling the species of the *dentatus* group in possessing only narrow scales on the scutellum, paratergite, *apn* and *ppn*, but obviously more closely allied to *A. abnormalis* and related species on account of the terminalic

structure. From the very similar *A. quasiunivittatus* it differs in having the proboscis (in ♀) more or less pale beneath except at base and tip, and most of the scales on the post-spiracular area as well as on paratergite narrow.

♀. Resembles *A. alboventralis* except for the difference in scaling mentioned above; also, the head has a patch of dark scales above in front, and the hind femur is rather more extensively dark (as in *A. leesoni*). Sternites almost entirely pale. Hind claws simple.

♂. Last segment of palpi strongly concave above and bare at base. *Terminalia* (Fig. 52, f) very similar to those of *A. abnormalis* and *alboventralis*, differing chiefly in form of coxite; style also somewhat differently shaped, with numerous hairs on the enlarged portion, terminal horn short.

Distribution.—MOZAMBIQUE: Lomagundi and Lorenzo Marquez (*Howard*). BELGIAN CONGO: Kinshasa (*Duren*). NIGERIA: Katagum (*Dalziel*); Gadau (*Taylor*). SUDAN: Juba (*Med. Inspector*). S. RHODESIA: Avondale Stream, Salisbury (*Leeson*).

Aëdes (*Aëdimorphus*) *irritans* Theobald.

Stegomyia irritans Theobald, Rept. Liverpool S. Trop. Med. Mem. IV, app. p. iii (1901), and Mon. Cul. 2, p. 313 (1901).

Catageiomyia senegalensis Theobald, Rept. Liverpool S. Trop. Med. Mem. XI, app. p. 1 (1903).

Aëdimorphus albotaeniatus Theobald, Mon. Cul. 5, p. 204 (1910).

Myxosquamus confusus Theobald, Mon. Cul. 5, p. 225 (1910).

Phagomyia irritans Theobald, Gen. Ins. Culicidae, p. 21 (1905).

Ochlerotatus irritans Edwards, Bull. Ent. Res. 3, p. 23 (1912), and 7, p. 220 (1917).

TYPES.—*irritans*, ♂♀ in B.M., Bonny; *senegalensis*, ♂♀ in B.M., St. Louis; *albotaeniatus*, ♂♀ in B.M., Accra; *confusus*, ♀ in B.M., Accra.

A small species without striking ornamentation but rather readily distinguished from others of the subgenus with dark tarsi by the largely flat-scaled head and almost complete absence of pale knee-spots; also by having the male palpi shorter than the proboscis.

♀. *Head* clothed mainly with broad flat scales; a small area of narrow scales on nape and a row of narrow yellowish scales round eye-margin. Palpi and proboscis dark; palpi about one-sixth length of proboscis. *Thorax* dark brown; scutum clothed with narrow dark brown scales with a rather numerous sprinkling of golden-yellow scales. Scutellum clothed mainly with flat scales, some narrow ones also, especially on lateral lobes; scales of median lobe mostly blackish, remainder creamy-white. Few or no post-spiracular but a patch of subspiracular scales present. *Abdomen* blackish, tergites with narrow creamy basal bands, sometimes obsolete in middle but only slightly widened at sides into small lateral spots; sternites with dark apical bands. *Legs* dark; femora pale on underside but without knee-spots; hind femur with anterior surface pale except at tip; hind tibia with a creamy-white spot at tip which is about as long as band. *Wings* (Fig. 53) dark.

♂. Resembles ♀, but abdominal bands broader. Palpi shorter than proboscis by about length of terminal segment; last two segments hairy and turned slightly downwards as usual. *Terminalia* (Fig. 54, a) somewhat as in *A. tarsalis* and related species; style enlarged towards tip, with a short curved spine and a small leaf but no horn (the figure given by me in 1917 was inaccurate as it did not show the leaf).

Wing-length 2.5–3.5 mm.

Distribution.—GAMBIA: Bathurst (*Innes*). SIERRA LEONE: Bonthe (*Davey*). GOLD COAST: Accra (*Connal*); Sekondi (*Graham, Simpson*); Aburi (*Macfie*); Takoradi (*Pomeroiy*). NIGERIA: Bonny (*Annett*); Lagos (*Graham*). SENEGAL: St. Louis. BELGIAN CONGO: Banana (*Wanson*). PORTUGUESE GUINEA: Bolama (*Sequeira*).



FIG. 53.—Wing of *Aedes (Aedimorphus) irritans* Theo.

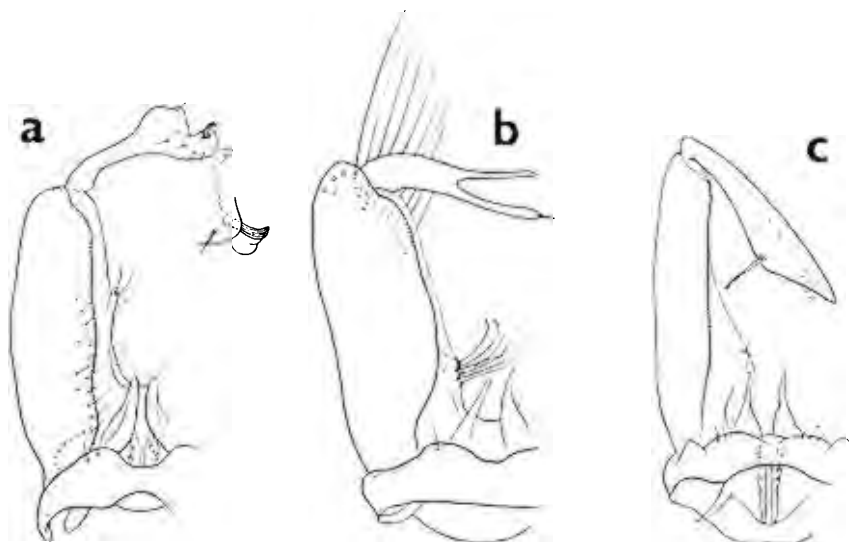


FIG. 54.—Terminalia of *Aedes (Aedimorphus)* spp. a. *irritans*. b. *albocephalus*. c. *nigricephalus*.

***Aedes (Aedimorphus) nigricephalus* Theobald.**

Stegomyia nigricephala Theobald, Rept. Liverpool S. Trop. Med. Mem. IV, app. (1901), and Mon. Cul. 2, p. 315 (1901).

Phagomyia nigricephala Theobald, Gen. Ins. Culicidae, p. 21 (1905).

Myxosquamus paludosus Graham, Ann. Mag. Nat. Hist. (8), 5, p. 270 (1910).

Ochlerotatus nigricephalus Edwards, Bull. Ent. Res. 3, p. 23 (1912), and 7, p. 220, fig. (1917).

TYPES.—*nigricephala*, ♀ "in Dr. Annett's collection" (now lost?), Bonny; *paludosus*, ♂♀ in B.M., Lagos.

A very black species with an almost completely flat-scaled head and no special ornamentation. The only other African *Aedes* with which it might be confused is *A. (Skusea) pemaensis*; the two do not occur in the same areas and have completely different terminalia.

♀. *Head* clothed almost entirely with broad flat scales; only a few erect scales on

nape, and a very few narrow ones on orbits; scales mostly black, usually a few are white. Tori, clypeus, proboscis and palpi blackish. *Thorax* blackish; scutum clothed with narrow blackish scales and sometimes a few yellowish scales, especially on front border. Scutellum clothed mainly with broad flat blackish scales, some narrow scales usually also present. Pleurae with rather large patches of flat white scales, including a few post-spiracular but no subspiracular; *apn* and *ppn* with narrow scales only, mostly dark. *Abdomen* black, tergites with white lateral basal spots; sternites with about the distal half black. *Legs* black; femora pale beneath; no knee-spots and no pale spot at tip of hind tibia. *Wings* dark.

♂. Resembles ♀. Palpi and proboscis equal in length. Abdomen unbanded. *Terminalia* (Fig. 54, c): Style simple, broadest beyond middle and bearing a long straight spine on inner margin at the broadest part, spine at right angles to style; coxite rather long and narrow, basal lobe small, bearing a single small hair.

Distribution.—GAMBIA: Bathurst (*Innes*). SIERRA LEONE: Bonthe (*Davey*). NIGERIA: Bonny (*Annett*); Lagos (*Graham, Philip, Wigglesworth, Macfie*); Degema (*Collett*); Forcados (*Simpson*); Buguma (*Hanley*). GOLD COAST: Takoradi (*Pomeroy*). SAO THOME (*Tams*). BELGIAN CONGO: Banana (*Wanson*). GABOON: Port Gentil (*Galliard*).

***Aedes* (*Aëdimorphus*) *lamborni* Edwards.**

Aedes (*Aëdimorphus*) *lamborni* Edwards, Bull. Ent. Res. 13, p. 398 (1923), and 17, p. 129 (1926).
TYPE.—♂ in B.M., Zomba.

A very distinct species, readily distinguished from all others of the subgenus except the allied *A. boneti* by the leg-markings; hind tibia broadly white at tip; hind tarsi with conspicuous white rings evenly divided by the joints.

♀. *Head* clothed above with erect forked scales and narrow decumbent scales, latter mainly dark but those on nape and orbits pale. Tori with a few small pale scales. Proboscis blackish. Palpi about one-fifth as long as proboscis, black, with a few white scales at tip (an unusual feature for this subgenus). *Thorax* dark brown, clothed above with dark brown scales but with many golden ones intermixed, especially on shoulders and in a pair of spots about middle; a few flat white scales above wing-root. Scutellum entirely clothed with flat white scales. Pleurae with patches of flat white scales including some on the pre-alar area in addition to postspiracular and subspiracular patches; *apn* and *ppn* with numerous narrow scales, few broad ones. *Abdomen* black above, tergites with pure white basal lateral patches; sternites with dark apical bands. Cerci very short and blunt, the eighth segment apparently hardly at all retractile, thus differing markedly from most other species of the subgenus and resembling the *marshalli* group. *Legs* mainly black; all femora and front and middle tibiae with small but distinct white spots at tip; middle tibia with some white scales at base; hind tibia pure white on almost the distal sixth; front and middle tarsi with a white spot at tip of first segment, slightly extending on to base of second; hind tarsi with broad white rings over joints between segments 1-2, 2-3 and 3-4; segment 5 entirely white, 1 dark at base. *Wings* dark, with a pale dot at base of costa.

♂. Resembles ♀, except that abdominal tergites have complete white basal bands.

Palpi slightly shorter than proboscis, last two segments subequal, downturned and hairy; some white scales at tip of shaft and at base of terminal segment. *Terminalia* (Fig. 55, a): Style of very distinctive form, forked before middle, the upper prong longer than the lower, which bears a straight terminal spine; coxite with hairy basal lobe and tergite with prominent bristly lobes as in the *dentatus* and *vexans* groups.

Wing-length 4.5 mm.

Distribution.—NYASALAND: Zomba (*Lamborn*). KENYA: Nairobi (*Van Someren*). N. RHODESIA: Serenje Boma, Kaomba River (*R. E. Lloyd*). TANGANYIKA: Amani (*McHardy*).

Aedes (Aëdimorphus) boneti Gil Collado.

Aedes (Aëdimorphus) boneti Gil Collado, Eos, 11, p. 323 (1936).

TYPE.—♂ in Madrid University School of Agriculture, Fernando Po.

Very similar to *A. lamborni*, but according to Gil's description differs as follows:

♂. *Head* with the narrow decumbent scales mainly white; a round spot of dark scales towards each side above, separate from the dark lateral areas. Palpi somewhat shorter, about five-sixths length of proboscis (the palpi are figured as hairless, but this is an error as "abundant long hairs" are mentioned in the description). *Thorax* with more numerous post-spiracular hairs and sternopleural scales. *Abdomen* without complete pale bands on tergites. *Legs* with white spot at tip of hind tibia about twice as long as broad, or one-tenth length of tibia; hind tarsus with the first two white rings narrower, second segment only very narrowly white at base; middle tarsi entirely dark. *Terminalia* undescribed.

♀. Unknown.

Distribution.—FERNANDO PO: Rebola (*Gil and Bonet*).

Aedes (Aëdimorphus) gibbinsi Edwards.

Aedes (Aëdimorphus) gibbinsi Edwards, Bull. Ent. Res. 26, p. 135 (1935).

TYPE.—♂ in B.M., Ruwenzori.

Distinguished from all other species of the subgenus by the slender, bare male palpi, and from most or all related species with dark tarsi and narrow scutellar scales by the absence of post-spiracular scales and the rather conspicuous border of golden scales to the mesonotum; this ornamentation is rather suggestive of some species of the subgenus *Banksinella*, but in these latter species the marginal scales of the mesonotum are sulphur-yellow rather than golden.

♀. *Head* with the decumbent scales of vertex all narrow and golden-yellow (no dark ones in middle in front), many of the erect scales also yellowish; the usual sublateral patches of flat black scales. Proboscis black. Palpi black, about one-sixth length of proboscis. *Thorax* blackish; scutum with a rather broad and almost continuous border of narrow golden scales and a pair of golden lines present on posterior half, frequently connected with the golden border by an oblique line along the suture from the scutal angle; pre-scutellar space bordered with golden scales; remaining scales of scutum dark brown. Scales of scutellum and *ppn* all narrow and golden in colour; paratergite with flat white scales; no post-spiracular scales.

Abdomen blackish, tergites with small median and larger lateral basal pale spots, the median spots often indistinct on the last few tergites. *Legs* dark; hind femur dark externally and beneath for some distance before tip, often with almost the distal third dark all round, knee-spots small but distinct; hind tibia with a creamy-white spot at tip which is somewhat longer than the tibial diameter. Hind claws simple. *Wings* dark; vein-scales narrow; base of upper fork markedly proximal to that of lower.

♂. Resembles ♀ in ornamentation. Palpi equal in length to proboscis, slender, almost devoid of hairs, last two segments slightly upturned and subequal in length. *Terminalia* (Fig. 55, b): Style with a stout blunt spine on a small prominence beyond

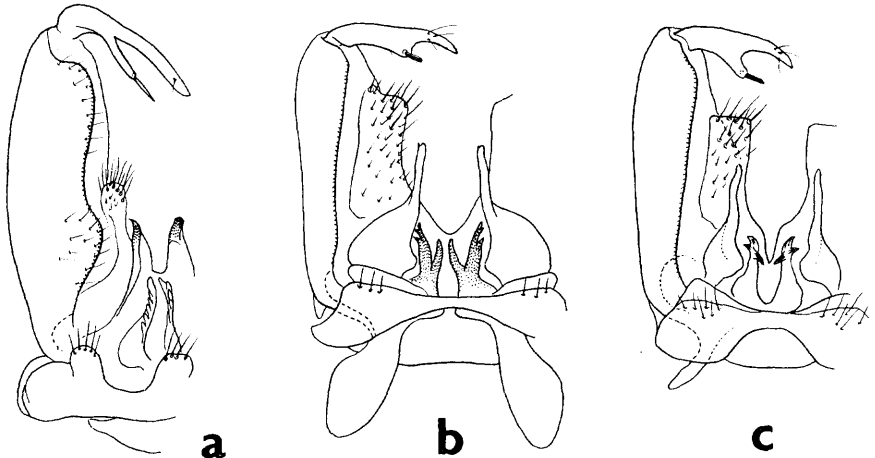


FIG. 55.—Terminalia of *Aedes* (*Aedimorphus*) spp. a. *lamborni*. b. *gibbinsi*. c. *quasiunivittatus*.

middle; basal lobe of coxite somewhat rectangular and reaching to near end of coxite; paraprocts and phallosome of remarkable form, the former very large, with a rod-like terminal portion.

Wing-length 4–5 mm.

Distribution.—UGANDA: Between Mts. Mgahinga and Sabinio, Kigezi district (*Edwards*) and Namwamba Valley, Ruwenzori (*Gibbins*); Kameranjoka (*Hopkins*). KENYA: Kericho, in forest along river, 1 ♂ (*MacDonald*).

***Aedes* (*Aedimorphus*) *leucarthritis* Speiser.**

Culex leucarthritis Speiser, Schwed. Zool. Exp. Kilimandjaro, 10, 4, p. 43 (1908).

Ochlerotatus leucarthritis Edwards, Bull. Ent. Res. 2, p. 251 (1911).

TYPE.—♀ in Stockholm N.H.M., Mt. Meru.

This is evidently very similar to *A. gibbinsi* and may perhaps be the same species: though until the male is discovered the identity cannot be established with any certainty. I examined the type in 1911 and again in 1923, and noted that it possessed the following features:

Vertex, front margin of scutum, scutellum and *ppn* with narrow golden scales (as in *gibbinsi*); hind tibia with the spot at tip about half as long again as tibial

diameter (also as in *gibbinsi*). Two short lines of golden scales in front of scutellum. Abdomen blackish above. (Perhaps differs from *gibbinsi* in lacking golden borders to the scutum posteriorly, and median spots on the abdominal tergites.)

Distribution.—TANGANYIKA: Mt. Meru, 3000 m., 1 ♀.

A single female from Mufindi, Tanganyika (*Zumpt*), may well belong to *A. leucarthrius*. It resembles *A. gibbinsi* in most respects, notably in the absence of post-spiracular scales and colour of scales on thorax, abdomen and hind femur, but has a few dark scales forming a small spot in the yellow area of the vertex; the border of yellow scales to the mesonotum is narrower and is widely interrupted behind the scutal angle.

Aedes (Aëdimorphus) quasiunivittatus Theobald.

Culex quasiunivittatus Theobald, Mon. Cul. 2, p. 32 (1901).

Ochlerotatus quasiunivittatus Edwards, Bull. Ent. Res. 2, p. 250 (1911), and 5, p. 276 (1915).

TYPE.—♀ in B.M., Salisbury.

A species without conspicuous ornamentation apart from the banded abdomen; allied to *A. gibbinsi* by structure of terminalia, but with normal male palpi. Differs from some allied species in having the hind claws simple in both sexes.

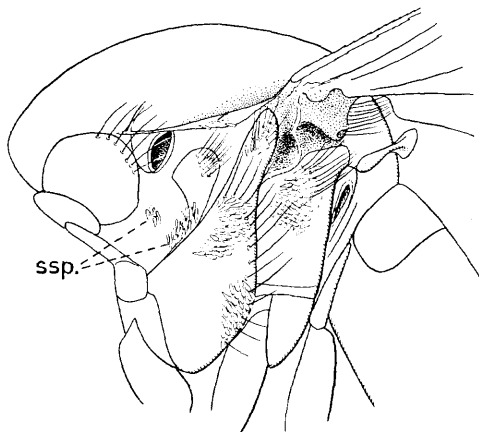


FIG. 56.—Pleural scaling of *Aedes (Aëdimorphus) quasiunivittatus* Theo.

♀. *Head* with a rather large area of dark brown decumbent scales in middle in front, separated from the sublateral areas of flat black scales by a V-shaped area of narrow pale scales. Proboscis entirely blackish above and below. *Thorax* dark brown; scutum clothed mainly with dark brown scales, but with a narrow border of yellowish scales (narrower and much less conspicuous than in *A. gibbinsi*) and some other yellowish scales rather vaguely tending to linear arrangement. Scales on *ppn* mostly yellowish, but some dark ones above; on paratergites broad, flat and whitish. Numerous post-spiracular scales present, broad and flat as usual; on the subspiracular area there is in addition to the usual elongate patch of scales a small adjacent patch in front (Fig. 56). *Abdomen* blackish above, but tergites 2–6 with distinct white basal bands which have their posterior margins somewhat rounded and are connected

with the lateral white spots. Venter usually mainly pale, with median basal dark patches on sternites. *Legs* dark; knee-spots small; hind femur mainly pale on anterior surface but with the distal third dark below as well as above, usually (but not always) leaving a whitish median line extending nearly to the tip. Hind tibia with a very distinct white apical spot, about as long as broad or somewhat longer. Hind claws simple. *Wings* as in *A. gibbinsi*.

♂. Resembles ♀, but abdominal bands rather broader. Palpi of same length as proboscis, tip of shaft and last two segments densely hairy, somewhat swollen as usual. *Terminalia* (Fig. 55, c): Very similar to those of *A. gibbinsi*, especially as regards form of style and basal lobe; spine of style situated on a more pronounced thumb-like prominence; paraprocts much less enlarged and phallosome differently toothed.

Wing-length about 5 mm.

Distribution.—ABYSSINIA: Djem-Djem Forest and Mt. Chilalo (*Scott*). KENYA: Nairobi (*Van Someren*); Moyale (*Chell*). UGANDA: Nyakasura, Fort Portal (*Shillito*); Kigezi (*Burton*). NYASALAND: Fort Johnston (*Lamborn*). S. RHODESIA: Salisbury (*Marshall*). NATAL: Estcourt (*Marshall*). TRANSVAAL: Pretoria (*Bedford*). BELGIAN CONGO: Kalonge, Kivu (*Schwetz*). SUDAN: Deriba Lakes, Jebel Murra (*M. Steele*).

***Aëdes* (*Aëdimorphus*) *dentatus* Theobald.**

Culex dentatus Theobald, First Rept. Wellcome Lab., p. 75 (1905).

Ochlerotatus dentatus Edwards, Bull. Ent. Res. 2, p. 248 (1911), 3, p. 23 (1912), and 5, p. 277 (1915).

Culex pallidopunctata Theobald, U.S. Afr. Dept. Agr., First Rept. Vet. Res. p. 267 (1911).

TYPES.—*dentatus*, ♀ in B.M., Abyssinia; *pallidopunctata*, ♀ in B.M., Transvaal.

Very similar to *A. quasiunivittatus*, differing most obviously in having the hind claws toothed in both sexes or at least in the female, and in structure of terminalia.

♀. *Head* as in *A. quasiunivittatus*. *Thorax* with the yellowish scales of scutum more irregularly scattered and sometimes more numerous, but not forming a definite pale border. Subspiracular area lacking the additional small group of scales which occurs in *A. quasiunivittatus*. Post-spiracular and paratergal scales broad and flat as usual. *Abdomen* with the basal pale bands of tergites more creamy-white. *Legs*: Hind femur with only a small dark area on anterior surface at tip; hind tibia with the pale spot at tip smaller and more creamy-white.

♂. Palpi of normal form, but longer than proboscis by about half the length of the last segment; which is not much shorter than the penultimate. *Terminalia* (Fig. 57, a): Style straight, appearing forked at tip owing to the long straight spine together with the thumb-like projection on which it is placed being about equal to the slender distal portion; basal lobe rather small, somewhat rounded and densely hairy; paraprocts with a tooth at the base.

Distribution.—ABYSSINIA: "From Tsana through Damar Godsam" (*Degen*). KENYA: Nairobi (*Anderson, Van Someren*); Njoro (*Anderson*); east slopes of Mt. Elgon (*Neave*). UGANDA: Kigezi district (*Edwards*). BELGIAN CONGO: Marungu, Katanga (*Schwetz*). ORANGE FREE STATE: Harrismith (*Turner*). TRANSVAAL: Pretoria (*Gough*).

Unfortunately no males are available from Abyssinia, and the identity of the type

female is not quite certain. Some other records are omitted as they were based on females which are not certainly referable to this species.

Variation.—Females of the type series from Abyssinia have a more or less continuous median dark stripe on the venter; most East and South African specimens have little indication of this stripe, but may show narrow transverse apical bands on some sternites, especially 6 and 7.

Aëdes (Aëdimorphus) pachyurus Edwards.

Aëdes pachyurus Edwards, Proc. R. Ent. Soc., B, 5, p. 51 (1936).

TYPE.—♂ in B.M., Cape Peninsula.

This was described from one male which is badly denuded of scales through having been placed in alcohol; as far as can be seen the external characters resemble those of *A. dentatus*. Palpi of normal form; of same length as proboscis, terminal segment barely two-thirds as long as penultimate. *Terminalia* (Fig. 57, d) similar to those of *A. dentatus*, but coxite much broader and more hairy, basal lobe quite different, and style broader.

Distribution.—CAPE PROVINCE: Kaaïman's Gat (*H. G. Wood*).

Aëdes (Aëdimorphus) caliginosus Graham.

Culex caliginosus Graham, Ann. Mag. Nat. Hist. (8), 5, p. 268 (1910).

Ochlerotatus caliginosus Edwards, Bull. Ent. Res. 2, p. 250 (1911).

TYPES.—♂♀ in B.M., Lagos.

Much resembles *A. dentatus*, and with the hind claws toothed as in that species, but distinguishable in both sexes by having the scales on the paratergite and post-spiracular area narrow and curved, and most of the scales on *ppn* dark brown. Sternites with transverse dark apical bands. Differs from the extremely similar *A. dalzieli* in having dark apical bands to the abdominal sternites, and in that the proboscis is not distinctly pale beneath.

♂. Palpi as in *A. dentatus*. *Terminalia* (Fig. 57, c): Lobes of tergite much more prominent than in related species. Style with the long spine arising directly from the broadest point, not on a thumb-like projection. Basal lobe of coxite rather small, pointed, with few hairs.

Distribution.—NIGERIA: Lagos (*Graham*).

Aëdes (Aëdimorphus) subdentatus Edwards.

Aëdes subdentatus Edwards, Proc. R. Ent. Soc., B, 5, p. 51 (1936).

TYPES.—♂♀ in B.M., Grahamstown.

Much resembling and in various ways intermediate between *A. quasiunivittatus*, *A. dentatus* and *A. caliginosus*.

♀. *Head* as in the three allied species; proboscis entirely black above and below. *Thorax* with irregular mottling of pale scales on dorsum; pleural scales as in *A. quasiunivittatus*. *Abdomen* as in the three allied species. Venter mainly pale, with some dark scales apically on sternites 5-7, especially towards sides. *Legs*: Hind femur and tibiae as in *A. quasiunivittatus*, but hind claws toothed. Middle tibia all

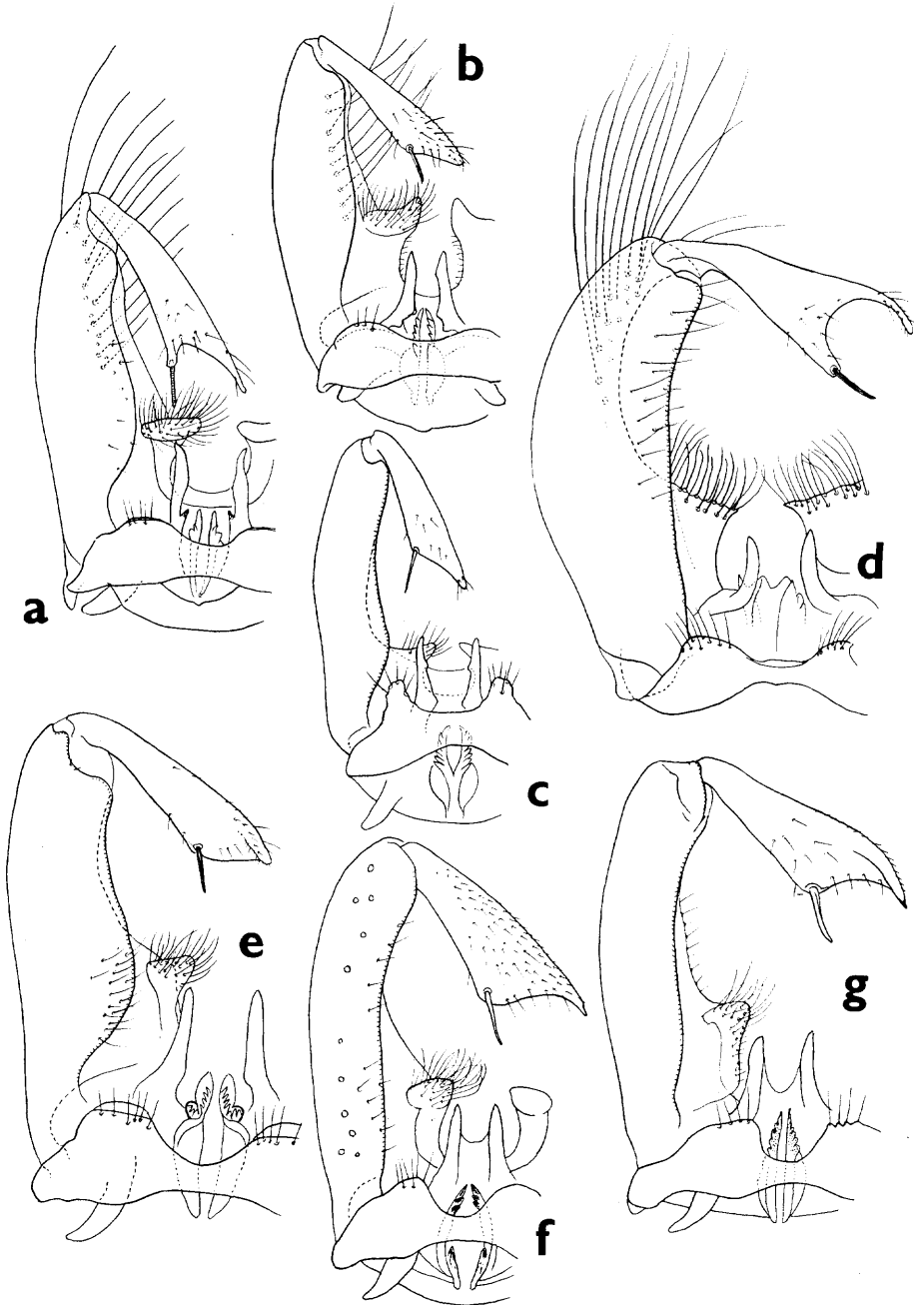


FIG. 57.—Terminalia of *Aedes* (*Aedimorphus*) spp. a. *dentatus*. b. *subdentatus*. c. *caliginosus*. d. *pachyurus*. e. *pubescens*. f. *cumminsi*. g. *cumminsi* ssp. *mediopunctatus*.

dark. One specimen shows a few white scales at base of second hind tarsal segment (somewhat as in *bevisi*).

♂. Palpi of about same length as proboscis. *Terminalia* (Fig. 57, b): Style almost as in *A. caliginosus*, but lobes of tergite less prominent and basal lobe of coxite larger and differently shaped.

Distribution.—CAPE PROVINCE: Grahamstown (*Barraud*).

Aedes (Aëdimorphus) cumminsi Theobald.

Culex cumminsi Theobald, Mon. Cul. 3, p. 214 (1903).

Ochlerotatus cumminsi Edwards, Bull. Ent. Res. 2, p. 248 (1911).

TYPE.—♀ in B.M., Bahr-el-Ghazal.

Very similar to *A. dentatus*, but average size larger and abdomen (in the typical form) unbanded.

♀. *Head* with all the decumbent scales of vertex pale, no dark patch in middle in front. *Thorax* perhaps rather lighter than in *A. dentatus*, but otherwise similar. *Abdomen* all dark above; sternites with narrow dark apical bands. *Legs* much as in *A. dentatus*; hind femur pale below on anterior surface almost or quite to tip; hind claws toothed.

♂. Resembles ♀; abdomen equally unbanded. Palpi exceeding proboscis by length of last segment, which is fully as long as the penultimate; last two segments densely hairy. *Terminalia* (Fig. 57, f) of the same type as in *A. dentatus* and *caliginosus*; style much as in the latter species but tergite and basal lobe rather different and coxite rather broader at base.

Wing-length 4.5–6 mm.

Distribution.—SUDAN: Bahr-el-Ghazal (*Cummins*); Meridi (*Ruttledge*). UGANDA: Entebbe (*Low, Moffat*); Kampala (*Fraser*); Lira (*Hopkins*). BELGIAN CONGO: Kawa, L. Albert, and Ruchuru, L. Edward (*Schwetetz*); Parc National Albert (*De Wulf*).

ssp. **holocinctus** n.

TYPE.—♂ in B.M., Gede.

Differs from the typical form in having complete and moderately broad basal pale bands on all abdominal tergites. *Terminalia* not appreciably different from those of the typical form.

Distribution.—KENYA: Gede, nr. Mombasa, 1 ♂ (*MacDonald*).

ssp. **mediopunctatus** Theobald.

Culicada mediopunctata Theobald, Mon. Cul. 5, p. 304 (1910).

Culicada fuscopalpalis Theobald, Mon. Cul. 5, p. 307 (1910).

Aedes (Aëdimorphus) cumminsi var. *mediopunctata* Edwards, Bull. Ent. Res. 15, p. 264 (1925).

? *Aedes cumminsi* var. *daruensis* Evans, Ann. Trop. Med. 19, p. 119 (1925).

TYPES.—*fuscopalpalis*, ♂ in B.M., Obuasi; *mediopunctata*, ♀ in B.M., Obuasi; *daruensis*, ♂ in Liverpool School of Tropical Medicine, Daru.

Differs from the typical form chiefly if not solely in possessing small median basal

whitish spots on the abdominal tergites in both sexes. *Terminalia* (Fig. 57, g) without tangible distinctions from the type form.

Distribution.—GOLD COAST: Obuasi (*Graham*); Sunyani (*Ingram*). SIERRA LEONE: Daru (*Blacklock*).

***Aedes* (*Aëdimorphus*) *pubescens* Edwards.**

Aedes (*Aëdimorphus*) *pubescens* Edwards, Bull. Ent. Res. 15, p. 264 (1925).

TYPE.—♂ in B.M., Sierra Leone.

Extremely similar in appearance to the typical form of *A. cummingsi*, but differs from that species and all others of the group (and perhaps of the subgenus) in possessing a patch of 12–15 or more short pale hairs in the middle of the mesepimeron towards its posterior margin, as well as numerous similar hairs on the metameron (the small piece immediately above the base of the hind coxa—not to be confused with the meron, which in *A. pubescens* is bare as usual).

♀. Head scales mostly pale; a few dark ones in middle in front. Scutum with a narrow and inconspicuous border of golden-yellow scales, remaining scales mostly dark. Subspiracular scales fewer than in related species, many of them replaced by tiny hairs. Abdomen all dark above. Hind femur more extensively dark towards tip on anterior surface than in *A. dentatus*.

♂. Resembles ♀. Palpi as in *A. cummingsi*. *Terminalia* (Fig. 57, e) much as in *A. cummingsi*, but coxite differently shaped, with a patch of short hairs towards inner tergal margin; phallosome also differing rather conspicuously.

Distribution.—SIERRA LEONE: Daru (*Simpson*). GOLD COAST: Kumasi, Obuasi and Dunkwa (*Graham*). BELGIAN CONGO: Stanleyville (*Schwetz, Mouchet*); Buta (*Mouchet*).

***Aedes* (*Aëdimorphus*) *bevisi* Edwards.**

Ochlerotatus bevisi Edwards, Bull. Ent. Res. 5, p. 275 (1915).

TYPE.—♀ in B.M., Durban.

Readily distinguished from other African species of the subgenus by having only two narrow and inconspicuous pale rings on the hind tarsi, the species being thus intermediate between the *vexans* group (with ringed tarsi) and the *dentatus* group (with dark tarsi). Further distinctive features are found in the proboscis and middle tibia.

♀. *Head* with the narrow decumbent scales mostly or all pale. Proboscis whitish beneath and at the sides except at base and tip, which are dark. Palpi rather shorter and thicker than in some related species, with some white scales at tip. *Thorax* as in *A. quasiunivittatus*. *Abdomen* blackish above, tergites 2–7 with more or less complete whitish basal bands; 6 and 7 also narrowly pale scaled on apical margin; sternites almost entirely clothed with creamy-white scales, apart from small apical lateral dark spots. *Legs* mainly dark; knee-spots very small; hind femur mostly pale in front; middle tibia dark in front, creamy-white above and behind except at base, where it is dark; hind tibia with a distinct white spot at tip; all tarsi with

narrow and inconspicuous whitish rings at bases of first two segments, otherwise dark except sometimes for a very few pale scales at bases of segments. *Wings* entirely dark (even along costa), scales narrow, bases of fork-cells almost level.

♂. Unknown.

Wing-length 3.5-4 mm.

Distribution.—NATAL: Durban (*Bevis*); Ntambanana and Umhlatusi, Zululand (*Bedford*). CAPE: "Caffraria" (*Wahlberg*).

Aedes (Aedimorphus) arabiensis Patton.

Culex arabiensis Patton (adult, not larva), J. Bombay Nat. Hist. Soc. 16, p. 663 (1905).

Culex sudanensis Theobald, Fourth Rept. Wellcome Lab., B, p. 154 (1911).

Ochlerotatus sudanensis Edwards, Bull. Ent. Res. 3, p. 20 (1912).

TYPES.—*arabiensis*, ♂ lost (?), Aden Hinterland; *sudanensis*, ♂♀ in Liverpool, Sudan (locality not stated).

Distinguished from other Ethiopian species of the subgenus by the combination of the following features: basally-ringed tarsal segments, dark-scaled wings, broadly banded abdomen, and pale posterior surface of middle tibiae. *A. arabiensis* is very closely related to the Palearctic *A. vexans* Mg., from which it differs in having the ♂ palpi rather shorter; abdominal bands in both sexes broader and not emarginate in the middle; middle tibia dark above (in all European and Central Asian females of *A. vexans* examined the middle tibia is conspicuously pale above as well as posteriorly).

♀. *Head* with almost all the narrow decumbent scales pale, also many of the erect ones. Palpi short, with some white scales at tip, but none in middle. Proboscis rather extensively pale beneath except towards base and tip. *Thorax* brownish, scutum clothed with brownish scales, which are mostly quite light in tint; scutellum with narrow whitish scales; paratergite and pleurae (including post-spiracular area) with broad flat whitish scales; pre-alar knob as usual with hairs only, no scales. *Abdomen* dark above; tergites 2-6 with broad creamy-white basal bands, 2-7 with lateral whitish patches extending most of their length, 6 and 7 with narrow pale apical bands; sternites almost entirely pale scaled. *Legs* mostly dark; femora pale beneath and with a rather heavy sprinkling of pale scales on the dark parts; tibiae usually without this sprinkling of pale scales, but middle tibia with posterior surface pale, and hind tibia with an inconspicuous pale spot at tip; first three or four segments of front and middle tarsi and all segments of hind tarsi with narrow white basal rings, usually scarcely longer than broad. Hind claws simple. *Wings* dark scaled, at most a few pale scales at base of costa and first vein; decumbent scales small; outstanding scales linear.

♂. Resembles ♀. Palpi exceeding proboscis by most of the terminal segment; two white rings on long segment, white spots at bases of last two segments. *Terminalia* (Fig. 58, c) very similar to those of *A. dentatus*; style differing slightly in shape, and basal lobe of coxite rather smaller and less hairy.

Wing-length 3-3.5 mm.

Distribution.—ADEN HINTERLAND (*Patton, Chand*). ARABIA: Jeddah (*Philby*). SUDAN: Khartoum, Kadaro and Masiol (*Sanitary Inspector*); Wad Medani (*Cameron*).

Aedes (Aëdimorphus) centropunctatus Theobald.

Culicelsa centropunctata Theobald, Ann. Trop. Med. 7, p. 599 (1913); Edwards, Bull. Ent. Res. 15, p. 261 (1925).

TYPES.—♂♀ in Liverpool, Mongalla Province and Lado District, Sudan.

Distinguished from other Ethiopian species with ringed tarsi by having the white rings mainly basal in position, but extending narrowly across the joints on to the tips of the preceding segments. Wing-scales almost all dark, as in *A. arabiensis*, but abdominal tergites with median basal pale spots and thorax mottled.

♀. *Head* with the decumbent scales all pale, erect scales dark. Palpi with patches of white scales at base and before middle, but none at tip. Proboscis all dark or with scattered pale scales only. *Thorax* dark brownish, scutum clothed mainly with dark brown scales, but with rather definite patches of white scales behind each shoulder, above each wing-root, and in front of the pre-scutellar space; scales on scutellum and around the bare space narrow and whitish. Pleural scaling as in *A. arabiensis*, post-spiracular but no pre-alar scales present. *Abdomen* dark above; tergites 2-7 with median basal white patches and with J-shaped white marks at sides (the longer arm of the J occupying lateral margin of tergite, but not extending as far as posterior margin); sternites mostly pale. Cerci normal, not abbreviated as in *A. lamborni*. *Legs* mainly dark; femora, and to a less extent tibiae also, with a slight sprinkling of pale scales; middle tibia dark all round; all tarsi with white rings at bases of first three segments and with tips of first two or three segments narrowly white; hind tarsi also with base of fourth and almost the whole of fifth segment white above (latter darker beneath). Hind claws simple. *Wings* with all the scales dark, including costal fringe.

♂. Resembles ♀. Palpi as in *A. arabiensis*. *Terminalia* (Fig. 58, b) distinctive in regard to form of style, which is blade-like, with the spine inserted a little beyond middle and at some distance from the edge; basal lobe pointed, bearing a single short bristle.

Wing-length about 4-4.5 mm.

Distribution.—GOLD COAST: Sunyani (*Ingram*). NIGERIA: Ibadan (*Kumm*). SUDAN: Menzi River, Mongalla and Acholi, Lado (*King*).

Aedes (Aëdimorphus) hirsutus Theobald.

Culex hirsutum Theobald (♀ only), Mon. Cul. 1, p. 392 (1901).

Culex transvaalensis Theobald, Mon. Cul. 3, p. 165 (1903).

Ochlerotatus hirsutus Edwards, Bull. Ent. Res. 2, p. 249 (1911), 3, p. 20 (1912), and 5, p. 277 (1915).

TYPES.—*hirsutum*, ♀ in B.M., Salisbury; *transvaalensis*, ♀ in B.M., Pretoria.

Belongs to a small group of species with basally-ringed tarsal segments and conspicuously speckled femora and tibiae; distinguished (in the ♀) from other species of this group by having the costal fringe on the distal part of the wing white, the wings being otherwise mainly dark scaled.

♀. *Head* with the decumbent scales mainly pale, a few dark ones in middle in front. Proboscis largely creamy-white both below and above, except at base and tip. Palpi about one-fifth as long as proboscis, broadly tipped with white scales and with some white scales at middle and base. *Thorax* much as in *A. centropunctatus*,

but many of the paratergal and post-spiracular scales are rather narrow and numerous flat white scales are present, mixed with the bristles, on the pre-alar knob. *Abdomen*

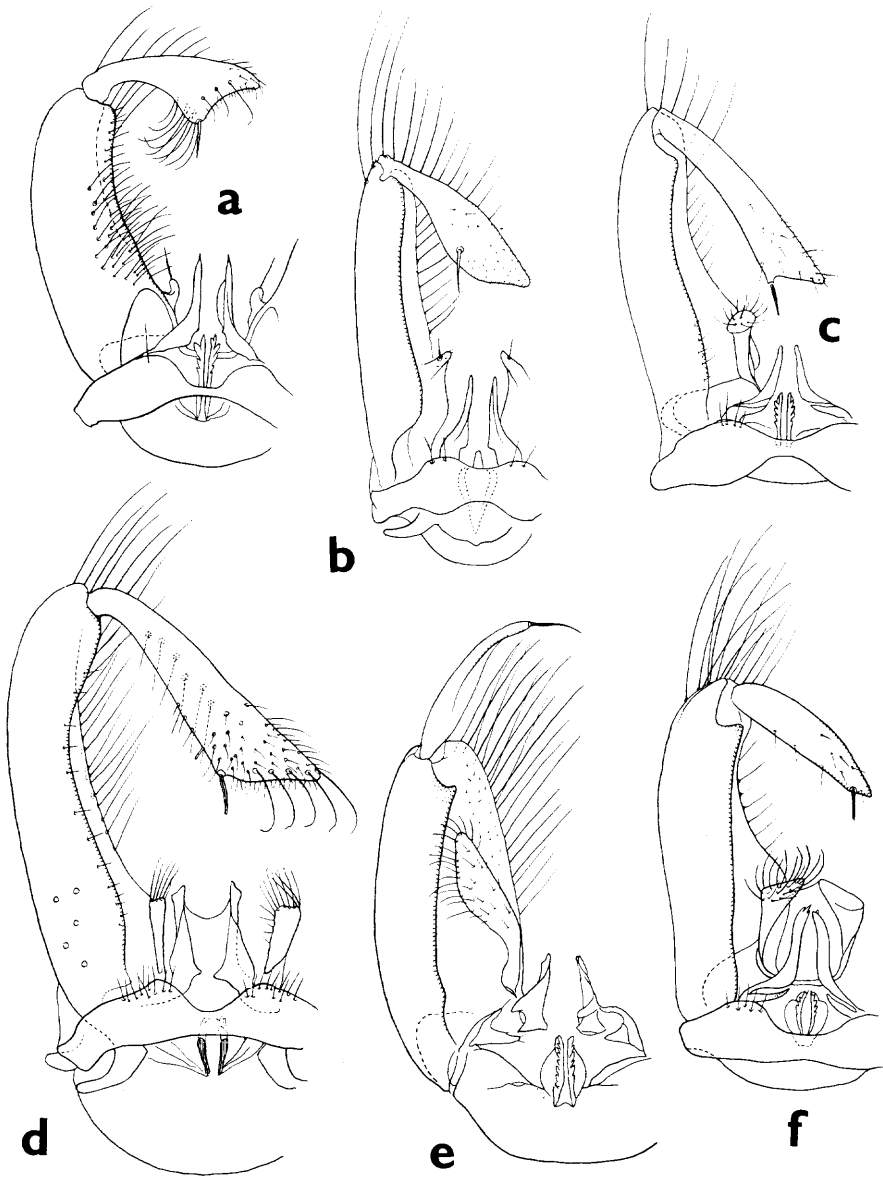


FIG. 58.—Terminalia of *Aedes* (*Aedimorphus*) spp. a. *fowleri*. b. *centropunctatus*. c. *arabiensis*. d. *durbanensis*. e. *natronius*. f. *hirsutus*.

mainly dark above; tergites 2–6 with basal white bands, on 5 and 6 usually much narrowed in middle, 7 with a pair of basal sublateral triangular white marks; tergite 6 usually and 5 occasionally with an admedian pair of creamy-white triangular

patches, other tergites without apical pale markings; lateral white marks on tergites rather irregular. *Legs*: Femur, tibia and first tarsal segment of each leg heavily sprinkled with whitish scales, so much so that the pale scales may be more numerous than the dark; knee-spots small; tibiae with narrow white basal rings and narrowly white at tip; segments 2-4 of front and middle tarsi and 2-5 of hind tarsi with white rings which are strictly confined to bases of segments, dark parts without scattered pale scales. Hind claws simple. *Wings* with a slight sprinkling of pale scales on basal half; distal half dark except that the costal fringe, and sometimes also the flat scales of the costa, is white on the area above the forked cells. Outstanding scales on forks linear and dark.

♂. Differs from ♀ in having the costal scales mainly or even entirely dark, the white fringe being sometimes distinguishable but never conspicuous; white bands of tergites 6 and 7 interrupted in middle; tergite 6 often lacking the apical pale areas. Palpi exceeding proboscis by almost the length of last segment; shaft with two white rings and scattered pale scales, last two segments broadly white at base. *Terminalia* (Fig. 58, f) with rather distinctive style, the spine being placed less than its own length from the tip on the inner margin; basal lobe rather densely hairy.

Wing-length 4-5 mm.

Distribution.—NIGERIA: Kano (*Kumm*); Gadau (*Taylor*). UGANDA: Busoga (*Hodges*); Arua (*Hopkins*). BELGIAN CONGO: Parc National Albert (*De Wulf*). SUDAN: Juba (*San. Inspector*); Delami and Jebel Deri (*Rutledge*). KENYA: Moyale (*Chell*); Kitui (*Anderson*); Nairobi (*Van Someren*). NYASALAND: Mzeze (*Lamborn*). S. RHODESIA: Salisbury (*Marshall*). NATAL: Weenen (*Thomasset*). ORANGE FREE STATE: Vaal R. (*Ingram*). TRANSVAAL: Pretoria (*Theiler*).

Var. **adenensis** nov.

Structurally identical with the typical form, and also resembling it in the white-scaled distal part of costa, but differs in colouring of abdomen; the pale basal bands of the tergites are yellowish rather than white and all the tergites have apical median patches of yellowish scales, usually occupying an extensive area; in some extremely pale specimens the abdominal scales are almost all yellowish, with only a few black ones across the middle of each tergite.

Distribution.—ADEN: Jebel Jihaf, 7100 ft., ix. 1937, 1 ♂, 8 ♀ at light (*H. Scott* and *E. B. Britton*).

Aedes (Aëdimorphus) fowleri d'Emmerez de Charmoy.

Culex fowleri d'Emmerez de Charmoy, Ann. Trop. Med. 2, p. 258 (1908).

Grabhamia nigeriensis Theobald, Mon. Cul. 5, p. 281 (1910).

Ochlerotatus nigeriensis Edwards, Bull. Ent. Res. 2, p. 250 (1911); 3, p. 20 (1912); 5, p. 277 (1915), and 11, p. 134 (1920).

Culex hirsutum Theobald (♂ only), Mon. Cul. 1, p. 392 (1901).

TYPES.—*fowleri*, ♀ in Liverpool School of Tropical Medicine, Mauritius; *nigeriensis*, ♀ in B.M. Katagum; *hirsutum*, ♂ in B.M., Salisbury.

Similar in most respects to *A. hirsutus*, differing chiefly as follows: Wings with the costal fringe entirely dark, but with much more numerous scattered flat white scales on the veins, these scales also larger, but the outstanding scales on the forks

linear and all dark as in *A. hirsutus*. White bands of abdominal tergites 5 and 6 not narrowed in middle. First tarsal segment of all legs with only a few scattered white scales, hence the basal white ring is more evident. Palpi of ♂ scarcely as long as proboscis, terminal segment much shorter than penultimate. *Terminalia* (Fig. 58, a) very distinctive; style of peculiar shape, with a tuft of long hairs accompanying the spine; coxite with a dense patch of hair on inner face, basal lobe a peculiar thumb-like projection bearing a single bristly hair.

Distribution.—SIERRA LEONE: Kissy (*Davey*). GOLD COAST: Bole (*Ingram*). GABOON: Eschiras (*Galliard*). NIGERIA: Katagum (*Dalziel*). SUDAN: Li Rangu and Mongalla (*Med. Inspector*); Medani (*Bedford*). UGANDA: Kasala (*Fraser*); Soroti (*Hopkins*). BELGIAN CONGO: Banana (*Wanson*); Ituri (*Collart*). NYASALAND: Fort Johnston (*Bury, Lamborn*). ZANZIBAR: Mnazi Moja (*Aders*). S. RHODESIA: Salisbury (*Marshall*). TRANSVAAL: Pretoria (*Bedford*). S.-W. AFRICA: Ovamboland (*Barnard*). MAURITIUS (*d'Emmerez, MacGregor*). KENYA: Stony Athi (*MacDonald*).

Aëdes (Aëdimorphus) durbanensis Theobald.

Grabhamia durbanensis Theobald, Mon. Cul. 3, p. 246 (1903).

Grabhamia ocellata Theobald, Mon. Cul. 5, p. 284 (1910).

Ochlerotatus durbanensis Edwards, Bull. Ent. Res. 2, p. 250 (1911).

TYPES.—*durbanensis*, ♀ in B.M., Durban; *ocellata*, ♂♀ in B.M., Delagoa Bay.

Similar to *A. hirsutus* and *A. nigriensis*, differing chiefly as follows: Wings with scattered white scales on costa as well as on all the other veins, but no continuous white area in costal fringe; outstanding scales broader, ligulate in shape, and many of them (on upper surface of wing) white. Abdominal tergites 2-6 with apical lateral (or sublateral) yellowish patches in addition to the white basal bands, lateral white areas more solid. Palpi of ♂ as long as proboscis or scarcely longer. *Terminalia* (Fig. 58, d): Style with a row of long curved hairs on distal margin and many more hairs on the surface, spine inserted well before tip at broadest part of style; no apical hair-tuft on coxite, basal lobe peculiar in having a regular row of hairs on its margin.

Distribution.—MOZAMBIQUE: Delagoa Bay (*Sant'Anna*). NATAL: Durban (*Christophers*). BELGIAN CONGO: Banana (*Wanson*). TRANSVAAL: Pretoria (*Bedford*). ABYSSINIA: Mt. Fantali (*Drake-Brockman*).

Confirmation is desirable of the inland records.

Aëdes (Aëdimorphus) natronius Edwards.

Aëdes (Aëdimorphus) natronius Edwards, Bull. Ent. Res. 23, p. 562 (1932).

TYPE.—♂ in B.M., Lake Maseche, Uganda.

Extremely similar to *A. durbanensis*, which it resembles in wing-scaling, in the possession of yellow apical lateral patches on the abdominal tergites, and in nearly all other respects, the only obvious difference in ornamentation being that the basal pale bands of the tergites are mainly yellow instead of white, the lateral pale patches remaining white.

♂. *Terminalia* (Fig. 58, e) differing from *A. durbanensis* and all other members

of the subgenus in the form of the style, which is tapering, bare, with a slender terminal spine as in the subgenus *Stegomyia*; basal lobe of coxite also much more like species of *Stegomyia* than other *Aëdimorphus*; phallosome and paraprocts however of the *Aëdimorphus* rather than the *Stegomyia* type, the latter without any trace of basal arm, and the former with only a very few short teeth.

Distribution.—So far as known this species is confined to the saline area in western UGANDA: L. Bogasu, R. Chirinuma and Kiborna (*McConnell*); L. Maseche and Kitoma (*Beadle*).

Aëdes (Aëdimorphus) ochraceus (Theobald) (Pl. 3, fig. 3.)

Culex ochraceus Theobald, Mon. Cul. 2, p. 103 (1901).

Mimetecculex kingii Theobald, Third Rept. Wellcome Lab. p. 258 (1908).

Ochlerotatus ochraceus Edwards, Bull. Ent. Res. 2, p. 250 (1911).

TYPES.—*ochraceus*, ♂♀ in B.M., Salisbury; *kingii*, ♂♀ in B.M., Upper White Nile.

A very distinct species on account of the conspicuously striped femora and tibiae; the only other African Culicine with somewhat similar leg-ornamentation is *Culex theileri*, which is otherwise quite different. Ornamentation of wings and abdomen also distinctive.

♀. *Head* with the decumbent scales of vertex narrow and mostly pale. Proboscis yellowish with base and tip black. Palpi brownish, about one-sixth as long as proboscis. *Thorax* with integument rather dark brown, lighter on sides, scutum with four stripes of dark brown scales separated by five yellowish stripes running the whole length, the outermost stripes occupying the margins; all scales small and narrow. Pleurae not heavily scaled; post-spiracular scales small and narrow; *ppn* rather densely covered with narrow pale scales. *Abdomen* with integument pale yellowish, clothed with pale yellowish-buff scales, tergites with more or less conspicuous sublateral black patches forming a pair of stripes which are interrupted at bases of segment; in the palest specimens these stripes are indefinite or even absent, in the latter case the abdomen is entirely clothed with yellowish scales. *Legs* mainly yellowish, femora and tibiae on anterior surface with two black stripes running the whole length (except lower stripe on hind femur) or they may be described as blackish on anterior surface, with a yellowish median stripe from base to tip, and mainly yellowish on posterior surface. Tarsi yellowish, last two or three segments darkened. *Wings* with the scales on costa and veins 2 and 4 (except tips of branches of lower fork) mainly yellowish, on veins 1, 3, 5 and 6 mainly or all black. Outstanding scales linear.

♂. Resembles ♀, but dark scales of abdomen tending to be more numerous. Palpi exceeding proboscis by length of last segment, mainly clothed with yellowish scales; last two segments subequal and densely hairy. Claws of hind legs unusual in that the inner claw is much longer than the outer. *Terminalia*: Style enlarged at tip, with a large dorsal horn adjacent to which is a group of long hairs, and a curved spine on inner margin before tip; basal lobe of coxite very small, bearing only two or three short bristly hairs; no hair-tuft on coxite.

Wing-length 3.5–5 mm.

Distribution.—GOLD COAST: Accra (*Macfie*); Volta R. (*Ingram*). NIGERIA: Katagum (*Watson*); Gadau (*Taylor*). BELGIAN CONGO: Parc National Albert (*De*

Wulf). SUDAN: Upper White Nile (*King*). UGANDA: Lira and Soroti (*Hopkins*). S. RHODESIA: Salisbury (*Marshall*). S.-W. AFRICA: Ovamboland (*Barnard*). KENYA: Wai (*Chell*); Mumias (*Neave*).

The closely related *A. pallidostratus* Theobald of India differs only in the terminalia (form of style and presence of a dense patch of soft hairs on coxite).

Subgenus **BANKSINELLA** Theobald.

Banksinella Theobald, Mon. Cul. 4, p. 468 (1907).

GENOTYPE.—*Culex luteolateralis* Theo.

Decumbent scales of vertex and all scutellar scales narrow. Proboscis rather longer than front femora. Dorso-central and acrostichal bristles present and usually numerous. No lower mesepimeral bristles. Paratergite bare in all species. Anterior claws toothed in both sexes. *Palpi* of ♂ (Fig. 59) very distinctive, with only one

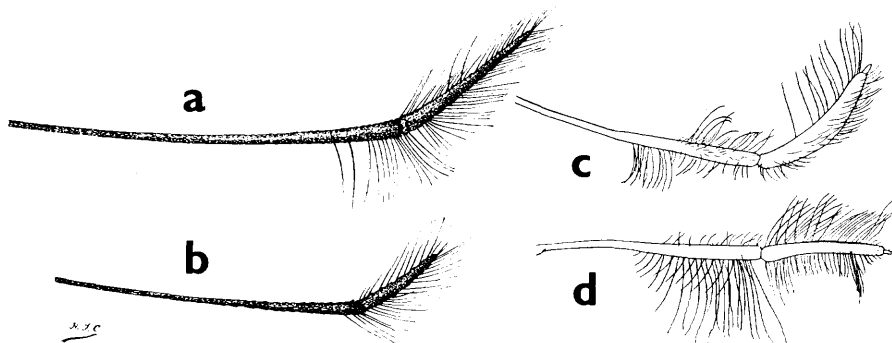


FIG. 59.—Palpi of ♂, subgenus *Banksinella*. a-c. From side. d. From above. a. *lineatopennis*. b. *palpalis*. c, d. *albicosta* (to smaller scale than others).

distinct segment beyond the shaft, this hairy and upturned, very little thickened; in one or two species a minute terminal segment is present. ♂ *Terminalia* differing from those of most other African subgenera of *Aedes* in that the coxite is uniformly chitinized, without a membranous strip on its inner face, and the style is inserted subterminally. Basal lobe represented by a short process bearing two spines. Style with long terminal spine. Phallosome as in *Aedimorphus*. ♀ *Terminalia* as in subgenus *Aedimorphus*: eighth segment small and retractile, tergite notched; cerci long; insula longer than broad and bare; post-genital plate deeply notched.

The species are all dark, with unbanded tarsi; usually the scales of the vertex and sides of scutellum are bright yellow or whitish.

The genotype and four or five related species with banded abdomen appear from the records to be specially associated with open savannah country; the remaining darker species with unbanded abdomen occur chiefly if not exclusively in forested regions. In the *lineatopennis* group it is interesting to notice the tendency to a streaky pattern so often observed in grass-haunting insects.

Several species of this subgenus are recognized as habitual blood-suckers. Kerr (1934) includes *A. lineatopennis* and *punctocostalis* among those species which definitely prefer human blood, feeding chiefly out of doors; Davis and Philip (1931) identified

only human blood in the bodies of *lineatopennis* and *palpalis*. Nieschultz, Bedford and Du Toit regard *lineatopennis* as a possible transmitter of horse-sickness, and imply that it attacks horses freely.

KEY TO SPECIES OF SUBGENUS BANKSINELLA.

♀♀.

1. Abdomen banded above 2.
Abdomen unbanded above (unless on last two segments) 7.
2. First and fifth wing-veins yellow-scaled to near tip . *luteolateralis* Theo. (p. 205).
These veins pale-scaled at most to middle of wing 3.
3. Thorax with margins of scutum broadly yellow-scaled 4.
Scales in this position white or whitish 5.
4. Venter mainly dark-scaled ; some pale scales on forked veins
lineatopennis Ludl. (p. 203).
Venter almost entirely yellow-scaled ; no pale scales on forks
circumluteolus Theo. (p. 204).
5. Costa white-scaled beyond middle *albicosta* Edw. (p. 206).
Costa all dark 6.
6. Pale scales on forked veins *albothorax* Theo. (Gambia form) (p. 205).
Scales on forked veins all dark *albothorax* Theo. (Eastern form).
7. Costa with yellow patches 8.
Costa with mixed yellow and dark scales for most of its length
flavimargo sp. n. (p. 209).
Costa all dark 9.
8. Yellow patches on distal half of costa extending over vein 1 ; hind femur nearly
all yellow *punctocostalis* Theo. (p. 206).
Yellow patches confined to costa ; hind femur with dark dorsal line
palpalis var. *maculicosta* Edw. (p. 211).
9. Thorax with margins of scutum broadly yellow-scaled ; wings with vein 1
yellow-scaled at base (but not beyond base of 2) 10.
Thorax with margins of scutum whitish scaled ; wings with a short whitish
area at base of vein 1 *ellinorae* sp. n. (p. 212).
Thorax without conspicuous pale borders ; wing-scales all dark, even at base
of vein 1 *fuscinervis* Edw. (p. 213).
10. Hind tibia with a small yellow spot at tip only 11.
Hind tibia with a yellow mark above at middle 12.
11. Head with a dark spot in middle of yellow area of vertex
(?) crassiforceps Edw. (p. 212).
Head without this dark spot *palpalis* Newst. (p. 209).
12. Proboscis with a yellow ring in middle, sometimes interrupted above
taeniarostris Theo. (p. 207).
Proboscis all dark or only yellow beneath in middle
palpalis ssp. *carteri* Edw. (p. 210) ; *monotrichus* Edw. (p. 209) ;
pogonurus Edw. (p. 211).

Aedes (Banksinella) lineatopennis Ludlow. (Pl. 3, fig. 5.)

Taeniorhynchus lineatopennis Ludlow, Can. Ent. 37, p. 133 (1905).

Banksinella lineatopennis Edwards (in part), Bull. Ent. Res. 5, p. 274 (1915).

Banksinella luteolateralis Theobald (in part), Mon. Cul. 4, p. 469 (1907), and 5, p. 403 (1910).

TYPE.—♀ in U.S.N.M. Washington, Luzon, Philippine Is.

Belongs to the savannah group of species, having the abdomen distinctly banded in both sexes ; the hind tibia is usually all dark, fifth vein mainly yellow, and the

female cerci only moderately long. The abdominal bands in the present species vary somewhat in width and distinctness, but basal creamy bands are always present on at least tergites 3-5 and usually 2-7. Diagnostic features are as follows :

♀. *Head* with the pale scales of vertex bright deep yellow in colour. Proboscis entirely black both above and below. Tori mainly or entirely black or dark brown. *Thorax* with the lateral pale bands of scutum bright deep yellow, narrowly connected on front margin ; middle area of scutum clothed with blackish scales, but yellow scales present on each side of prescutellar space, and in some specimens these are continued forwards as two narrow indistinct lines to middle of scutum or beyond ; some narrow black scales on lateral margins of scutum, especially on scutal angles and above wing-root, so that the outer edge of the yellow band forms a straight line. Pleurae with very few scales ; usually only about 6-10 scales in mesepimeral patch ; no post-spiracular scales, or at most a very few ; subspiracular scales rather narrow and pointed. *Abdomen* : Tergites with small basal and apical lateral spots, connected by a marginal stripe ; sternites mainly dark-scaled. *Legs* dark ; hind femur

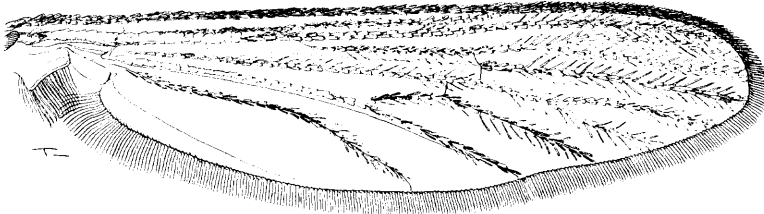


FIG. 60.—Wing of *Aedes (Banksinella) lineatopennis*.

only indistinctly lighter towards base on anterior surface ; hind tibia all dark, even at tip ; middle tibiae pale behind for their whole length, but not conspicuously so. *Wings* (Fig. 60) with the costa entirely dark ; vein 1 yellow-scaled as far as base of 2 ; vein 5 yellow-scaled as far as fork and for some distance along lower branch ; numerous whitish scales among the outstanding scales on vein 4 and on forks of 2 and 4.

♂. Resembles ♀, but yellow scales of wings much less conspicuous. Palpi (Fig. 59, a) exceeding proboscis by almost whole length of terminal segment, which is long, densely hairy along each side, and with half-a-dozen or more stiff straight bristly hairs at tip ; no obvious trace of a minute third segment ; only a few long hairs at tip of the thin shaft. *Terminalia* (Fig. 61, a) : Coxite only moderately widened on basal portion, with a moderately dense patch of hairs where it narrows, and with fairly numerous (6-10) short pointed spines on inner margin of narrow portion ; numerous long curved hairs on the apical projection. Style bare, much widened in middle, with long, straight, rather slender and somewhat pointed terminal spine.

Wing-length 3-4 mm.

Distribution.—NIGERIA : Gadau (*Taylor*). BELGIAN CONGO : Parc National Albert (*De Wulf*). KENYA : Nairobi (*Anderson*). UGANDA : Dufilé (*King*) ; Kabale (*Hopkins*). S. RHODESIA : Salisbury (*Marshall*). ANGOLA : Bihé (*Wellman*). ORANGE FREE STATE : Harrismith (*Turner*).

Other records require confirmation owing to probable confusion with *A. circumluteolus* and *A. luteolateralis*.

Specimens from India and the Philippine Is. do not show any obvious differences from those from East and South Africa.

Aëdes (Banksinella) circumluteolus Theobald.

Banksinella luteolateralis var. *circumluteola* Theobald, Entom. 41, p. 107 (1908).

TYPE.—♀ in B.M., Transvaal (*Simpson*).

Differs from *A. lineatopennis* as follows :

♀. *Head* : Tori mainly yellowish, darkened only on inner side. *Thorax* : Yellow borders of scutum rather more broadly connected on front margin ; median pair

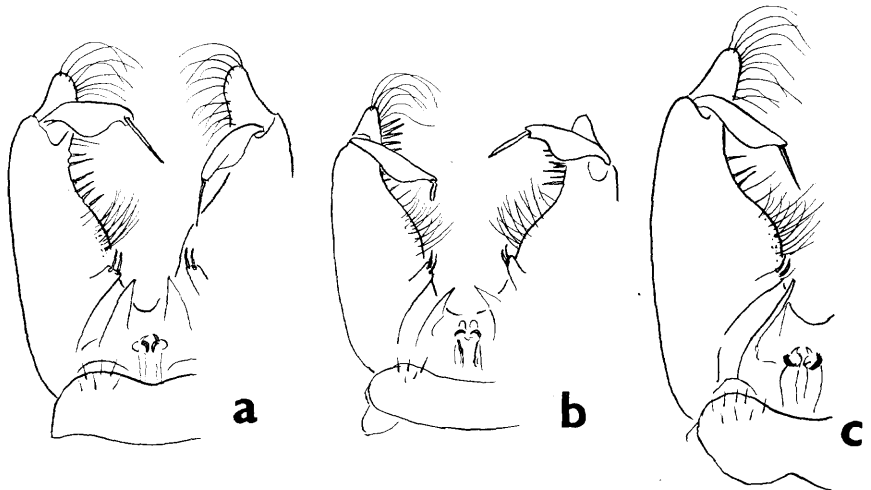


FIG. 61.—Terminalia of *Aëdes (Banksinella)*. a. *lineatopennis*. b. *circumluteola*. c. *albothorax*.

of lines seldom distinguishable, but scales on whole median area sometimes yellowish-brown, not much darker than sides. Pleurae with the patches of scales considerably larger, the mesepimeral patch for example usually comprising 20–30 or more scales ; subspiracular scales broad and blunt-ended. *Abdomen* : Sternites entirely or almost entirely clothed with pale yellowish scales. *Legs* : Hind femur clearer yellowish on basal half or more of anterior surface. Mid tibia pale above towards tip. Hind tibia pale beneath (but not at tip). *Wings* : All the outstanding scales on vein 4 and forks dark, and slightly broader than in *lineatopennis*.

♂. Venter darker than in ♀. Palpi as in *lineatopennis*. *Terminalia* (Fig. 61, b) almost as in *lineatopennis*, but the bristly spines on narrow part of coxite rather stouter and more numerous.

Wing-length 3.5–5 mm.

Distribution.—UGANDA : Entebbe (*Gowdey, Low, Hodges*) ; Mpumu and Kampala (*Fraser*) ; Fort Portal (*Edwards*). SUDAN : Wani (*King*) ; Sobat (*Balfour*) ; Meridi and Lado (*Ruttledge*). NIGERIA : Lagos (*Graham*) ; Ibi (*Pollard*) ; Olokemeji (*Golding*). BELGIAN CONGO : Stanleyville (*Schwetz, Mouchet*) ; L. Albert (*Schwetz*) ; Usumbura

(*Henrard*); Matadi (*Wanson*); Boma (*Nicolay*). NYASALAND: S.E. shore of lake (*Neave*); Fort Maguire (*Finlay*). TRANSVAAL (*Simpson*). NATAL: Durban (*Bevis*); Ntambanana, Zululand (*Bedford*).

Aëdes (*Banksinella*) *luteolateralis* Theobald.

Culex luteolateralis Theobald (type ♀ only), Mon. Cul. 2, p. 71 (1901).

Banksinella luteolateralis Edwards, Bull. Ent. Res. 5, p. 274 (1915).

Banksinella luteolateralis var. *flavinervis* Edwards (nom. nud.), Ann. Durban Mus. 1, p. 161 (1915).

Differs from *A. lineatopennis* as follows:

♀. *Abdomen*.—Tergites with small lateral pale spots confined to base, not continued along sides. *Legs*: Hind tibia with a distinct pale spot at tip on outer side. *Wings* with vein 1 yellow-scaled for almost its entire length, only the tip dark; lower branch of 5 also yellow almost to tip; other pale scales present as in *lineatopennis*. *Proboscis* sometimes indistinctly pale beneath except at tip.

♂. Palpi shorter than in *lineatopennis* and *circumluteola*, the second segment shorter, less hairy, and exceeding proboscis by scarcely half its length. *Terminalia* almost as in *lineatopennis*, but spine of style (in the two specimens examined) rather thicker and blunter.

Distribution.—NATAL: Durban (*Christophers*, *Muir*, *Bevis*).

Aëdes (*Banksinella*) *albothorax* Theobald.

Banksinella luteolateralis vars. *albothorax* and *pallida* Theobald, Mon. Cul. 4, p. 470 (1907).

TYPES.—*albothorax* and *pallida*, ♀ in B.M., Inkutu, Gambia.

Differs from *A. lineatopennis*, *circumluteolus* and *luteolateralis* in having the pale scales of head and mesonotum greyish white instead of yellow (scutum largely dark in middle as in the other species).

♀. *Head*.—Proboscis broadly pale beneath in middle (more markedly so in some specimens than in others). *Thorax*: Lateral white bands of mesonotum broadly connected in front. Pleurae with the patches of scales small; subspiraculars broad. *Abdomen*: Venter almost entirely dark. *Legs* and *wings* as in *A. circumluteola*, but the pale scales whitish instead of yellow.

♂. Resembles ♀. Palpi longer than proboscis by almost length of second segment; distal fourth of shaft gradually thickened and with long hairs; second segment stouter and rather more densely hairy than in *lineatopennis*; a small conical third segment present. *Terminalia* (Fig. 61, c) much as in *lineatopennis*, but coxite with basal portion rather broader, distal portion rather more abruptly narrowed, tuft of soft yellow hairs on the basal portion denser, spines on distal portion rather fewer.

Distribution.—SUDAN: Wadilai (*King*). BELGIAN CONGO: Kawa, L. Albert (*Schweitz*); Albertville (*Henrard*). TANGANYIKA: Dar es Salaam (*Pomeroy*). ZANZIBAR: Mnazi Moja (*Aders*). NYASALAND: Karonga (*Eldred*). GAMBIA: Inkutu, McCarthy Island (*Dutton*).

Variation.—In the East African specimens (including those from the Sudan) the wing-scales are all dark except for those on veins 1 and 5, and the scales on the median area of the scutum are all brownish. In the two females (types) from Inkutu there are

whitish scales on veins 2 and 4, including the forks, and the scutum shows a pair of narrow lines of whitish scales in the dark area.

Synonymy.—Re-examination of the two types shows that they undoubtedly belong to the same form, though the type of *albothorax* is somewhat rubbed. As the name *albothorax* was used in a specific sense in Vol. I of this Monograph I have used it here in preference to *pallida*, which was first published earlier on the same page.

Aëdes (Banksinella) albicosta Edwards.

Banksinella luteolateralis var. *albicosta* Edwards, Bull. Ent. Res. 4, p. 47 (1913).

Banksinella albicosta Edwards, Bull. Ent. Res. 5, p. 274 (1915).

Aëdes (Banksinella) albicosta Edwards, Bull. Ent. Res. 18, p. 272 (1928).

TYPE.—♀ in B.M., Wangi.

Differs from other species of the subgenus in having the mesonotal scales nearly all white, and the costal fringe on the distal third of the wing white; otherwise similar to *A. albothorax*.

♀. *Head* with scales and bristles of vertex white. Proboscis pale beneath except towards base and tip. *Thorax*: Scales in middle area of scutum only indistinctly darkened, but those on scutal angles and above wing-roots blackish as usual. Pleuræ with very few scales; no post-spiraculars. *Abdomen* with white basal bands on tergites, almost in contact with the small lateral spots. Sternites mainly dark. *Legs*: Middle tibia only indistinctly pale behind, but hind tibia pale beneath for its whole length, the pale scaling encroaching on the anterior surface especially towards tip. *Wings* with white scales on vein 1 as far as base of 2, and on 5 almost to tip of lower branch of fork; most of the outstanding scales on veins 2 and 4 and forks also white.

♂. Resembles ♀, but white costal fringe less obvious. Palpi (Fig. 59, c, d) with almost the distal half of shaft distinctly thickened and with very long dense hairs outwardly; second segment even stouter than in *A. albothorax*, densely hairy, the hairs in middle of outer side shorter; a small conical third segment present as in *A. albothorax*. *Terminalia* much as in *A. lineatopennis*, but coxite almost regularly tapering from base to insertion of style (and thus differing very conspicuously from *albothorax*); spines on distal portion numerous.

Distribution.—KENYA: Mombasa (*Radford*); Wangi (*Neave*); Malindi (*Wright, MacDonald*). ITALIAN SOMALILAND: Juba River (*Chevallier*); locality and collector not stated (per *Dr. G. Franchini*). TANGANYIKA: Dar-es-Salaam (*McHardy*).

Aëdes (Banksinella) punctocostalis Theobald.

Banksinella punctocostalis Theobald, Mon. Cul. 5, p. 407 (1910); Edwards, Bull. Ent. Res. 5, p. 273 (1915).

TYPE.—♀ in B.M., Obuasi.

Differs from all the other species of the subgenus in the yellow markings on costa and first vein, and the exceptionally pale hind femur, as well as in the post-spiracular scales.

♀. *Head* with scales in middle of vertex all bright yellow as usual. Proboscis with a median yellow band. Tori yellowish. *Thorax* with broad yellow borders to

scutum (both sides and front), the yellow scales extending to scutal angles; similar yellow scales on *ppn*, scutellum, and around prescutellar space, but median area of scutum dark. Patches of white scales on pleurae large, including a dense patch on post-spiracular area. *Abdomen* dark above; tergites 4-6 with the lateral yellow patches extending upwards in middle of each segment, 7 with a complete basal yellow band; sternites with the dark apical bands less obvious than in the other species of this group. *Legs*: Front as well as middle tibia yellow behind and at tip; hind femur yellow with a narrow black apical ring and a few scattered black scales along dorsal margin; hind tibia mainly yellow, with a narrow black ring at some distance before the tip and blackish towards the base. *Wings* with the costa extensively yellow towards base and with two yellow spots on distal half, both extending on to first vein; first vein also yellow-scaled to a little beyond base of 2 and fifth to fork or a little beyond; many yellowish scales also on stems of forks of 2 and 4.

♂. Unknown.

Distribution.—GOLD COAST: Obuasi (*Graham*). NIGERIA: Lagos (*Graham*); locality unrecorded (*Anderson*). BELGIAN CONGO: Buta (*Mouchet*).

Aedes (Banksinella) taeniarostris Theobald.

Banksinella taeniarostris Theobald, Mon. Cul. 5, p. 405 (1910); Edwards, Bull. Ent. Res. 5, p. 274 (1915).

Banksinella chrysothorax Theobald, Mon. Cul. 5, p. 404 (1910).

TYPES.—*taeniarostris*, ♀ in B.M., Obuasi; *chrysothorax*, ♂ in B.M., Obuasi.

Belongs to the "forest" group of species, in which the abdomen is unbanded above (unless on the last two or three tergites), but the sternites have dark apical bands; the hind tibia usually has a yellowish tip and often a yellow mark in the middle above; the fifth vein is mainly or entirely dark; and the female cerci are very long and slender. Diagnostic features of the present species are as follows:

♀. *Head* with scales and bristles of vertex bright yellow. Proboscis with a yellow ring in middle, complete in type but interrupted above in some specimens. Tori yellowish. *Thorax* with sides and front margin of scutum broadly covered with bright yellow scales extending to margins except for a very few dark scales on scutal angle, the outer edge of the yellow area therefore not forming a straight line as in the *lineatopennis* group. Scales in middle of scutum dark brown, but prescutellar area broadly bordered with yellow scales, and a pair of median yellow lines more or less indicated. Pleurae with quite small patches of scales, few on post-spiracular area. *Abdomen* with small basal lateral yellowish spots on tergites, those on 4-6 extending slightly up towards dorsum at middle of segments. *Legs* largely dark in front, yellowish behind; middle tibia wholly yellow behind and also at tip above; hind femur with a dark dorsal line extending the whole length and gradually broadening distally; hind tibiae yellow above from near base to beyond middle (or, in a few specimens, with the middle third yellow above) and with a yellow spot at tip. *Wings* with the costa dark, veins on distal half wholly dark scaled, vein 1 yellow-scaled almost as far as base of 2, vein 5 also yellow-scaled to near the fork or even slightly beyond.

♂. Differs from ♀ in having fewer yellow scales on wings and few or none on dorsal

surface of hind tibia; abdominal tergites 4-7 with almost complete basal yellowish bands; proboscis yellow in middle on under surface only. (The thorax in the two available specimens is much rubbed, but there appear to be dark scales in middle of scutum as in ♀.) Palpi only slightly longer than proboscis; second segment only moderately hairy and shorter than in *lineatopennis*; no trace of third segment.

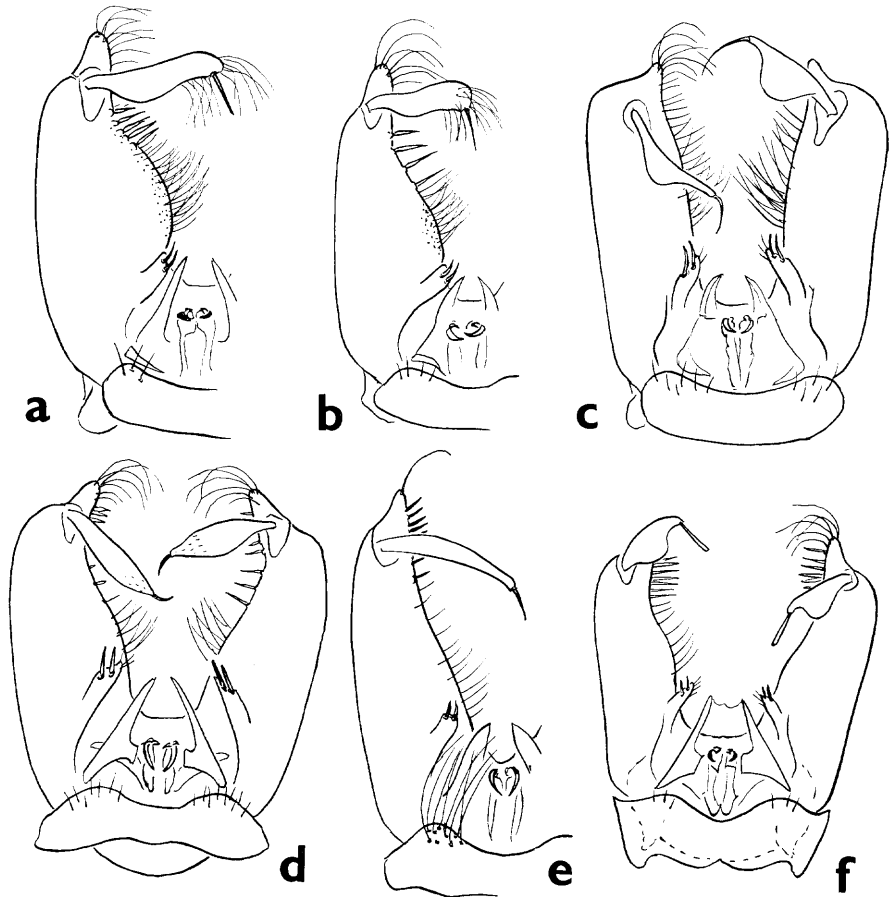


FIG. 62.—Terminalia of *Aedes* (*Banksinella*). a. *palpalis*. b. *palpalis* ssp. *carteri*. c. *taeniarostris*. d. *fuscinervis*. e. *monotrichus*. f. *bolensis*.

Terminalia (Fig. 62, c) resembling those of *lineatopennis*, but coxite less narrowed distally, without a distinct hair-patch or spines on inner margin; style greatly widened on inner side at middle, with a long, slender, curved, sharp-pointed terminal spine, but otherwise bare; terminal projection of coxite small and with only a few hairs.

Wing-length about 4.5 mm.

Distribution.—GOLD COAST: Obuasi (*Graham*). As the males and females were taken at the same place about the same time they are assumed to be conspecific. BELGIAN CONGO: Stanleyville (1 ♀, *Schwartz*).

Aedes (Banksinella) flavimargo sp. n.

TYPE.—♀ in B.M., Gede, Kenya.

Very similar to *A. taeniarostris*, the yellow ring of the proboscis being complete in all four specimens examined. Differs from *taeniarostris* (of which it is perhaps a subspecies) chiefly as follows :

♀. Post-spiracular and sub-spiracular scales rather more numerous. Middle tibia distinctly yellow at tip in front as well as above. Hind femur more extensively yellow, the dark dorsal line hardly reaching base, but more clearly defined. Hind tibia with the anterior as well as the dorsal surface mainly yellow, leaving a small blackish area a short distance before the tip. Wings with the costa largely yellow for almost the whole of its length, especially on anterior edge, though with dark scales mixed with the yellow ones ; other veins with more numerous yellow scales than in *taeniarostris*.

♂. Unknown.

Distribution.—KENYA : Gede, nr. Mombasa (*MacDonald*).

Aedes (Banksinella) monotrichus Edwards.

Aedes (Banksinella) monotrichus Edwards, Proc. R. Ent. Soc. London, B, 5, p. 52 (1936).

TYPE.—♂ in B.M., Onitsha.

Very similar to *A. taeniarostris*, differing chiefly in ♂ terminalia.

♀. Closely resembles *taeniarostris* in nearly all respects, but differs from typical specimens of that species in the following three features : Proboscis without a complete ring, being only rather inconspicuously yellow in middle beneath and at sides. Hind femur more extensively yellow, the dark dorsal line narrower, and only a small area at tip of anterior surface dark. Hind tibia with a yellow patch in middle above, not nearly reaching base. Thorax, abdomen and wings as in *taeniarostris*.

♂. Resembles ♀, but hind tibia with only a few yellow scales in middle above ; proboscis scarcely paler in middle beneath ; abdomen with the lateral yellow spots more prominent and visible dorsally on each of tergites 3-7, largest on 6 and 7 but not forming complete bands. Palpi as in *taeniarostris*. *Terminalia* (Fig. 62, e) with style slender, slightly tapering, not at all widened in middle, bare, with only moderately long terminal spine ; coxite with numerous short spines on internal margin distally, terminal projection small, with a single curved bristly hair (thus differing from all other species of the subgenus) ; no conspicuous hair-tufts on coxite, but hairs on tergite very long.

Distribution.—NIGERIA : Onitsha (*Wigglesworth*) ; Lagos (*Philip*).

Aedes (Banksinella) palpalis Newstead.

Neomelanoconion palpale Newstead, Ann. Trop. Med. 1, p. 31 (1907).

Banksinella palpalis Carter, Ann. Trop. Med. 7, p. 581 (1913) ; Edwards, Bull. Ent. Res. 5, p. 274 (1915), and Proc. R. Ent. Soc. London, B, 5, p. 51 (1936).

TYPE.—♂ in Liverpool School of Tropical Medicine, Basoko.

Differs from all the other species of the subgenus except *A. pogonurus* in the possession of a rather large clump of hairs surrounding the spine of the ♂ style.

Typical form dark, with proboscis entirely and wings and legs mainly dark; differs from *A. fuscinervis* in having the normal yellow border to scutum and some yellow scales at base of wings.

♀. *Head* with all the scales of vertex yellow. Proboscis entirely black. *Thorax* with sides of scutum broadly yellow-scaled, front border more narrowly so; some dark scales on scutal angles; middle area mostly dark brown but with a rather large patch of yellow scales surrounding the prescutellar space and sometimes with traces of a pair of yellow lines. Patches of scales on pleurae fairly large, but very few or no post-spiracular scales. *Abdomen* dark above; tergites with basal lateral yellowish patches which are visible dorsally on 6 and 7, widest at base of each segment (not towards middle as in *A. taeniarostris*). *Legs*: Middle tibia with only a narrow and indistinct pale line; hind femur with a broad dark line above, broadening further distally; hind tibia dark except for a small yellowish spot at tip. *Wings* dark-scaled except for a short length of pale yellowish scales at base of vein 1.

♂. Resembles ♀, except that abdominal tergites 5-7 have more or less complete basal pale bands. Head with some of the scales at sides of pale area of vertex broad and flat (which is not the case in ♀). Palpi (Fig. 59, b) almost as in *A. taeniarostris*, longer than proboscis by half length of second segment. *Terminalia* (Fig. 62, a): Coxite with a fairly dense patch of rather short yellow hair on inner margin of broad basal portion, and about 6 flattened spines on the narrow portion, otherwise without unusual vestiture. Style broadened on inner margin before middle, outer margin concave, tip broadly rounded, spine moderately long, straight, surrounded by a group of 15-20 hairs; terminal projection of coxite with numerous fine curved hairs; basal lobe of coxite with the usual two short spines.

Wing-length 3-4.5 mm.

Distribution.—BELGIAN CONGO: Basoko (*Newstead*). UGANDA: Nabadzidza, near Kampala (*G. H. E. Hopkins*). The series from Uganda includes both sexes; the males agree well with Carter's figure of the type, and the species is therefore re-described from this series.

ssp. **carteri** Edwards.

Banksinella palpalis Carter (in part), Ann. Trop. Med. 7, p. 581 (1913).

Aedes (*Banksinella*) *palpalis* var. *carteri* Edwards, Proc. R. Ent. Soc. London, B, 5, p. 52 (1936).

TYPE.—♂ in B.M., Lagos.

Differs from typical *A. palpalis* as described above in the following details: Proboscis yellow beneath in middle, more noticeably so in ♀ than in ♂. Middle tibia broadly yellowish behind and at tip above. Hind tibia with a yellow mark in middle above (larger in ♀ than in ♂) and more broadly yellowish at tip. Wings with vein 1 more extensively yellow-scaled at base, 5 also with some yellow scales. (Coloration therefore rather closely similar to *A. monotrichus*.) *Terminalia* (Fig. 62, b): Coxite with only three (occasionally four) flattened spines on inner margin of narrow portion; otherwise quite similar to *palpalis*.

Distribution.—NIGERIA: Lagos (*Wigglesworth, Philip*). LIBERIA: Gbonga, in dense forest (*Bequaert*). GOLD COAST: "Broomassie" [*Coomassie*?] (recorded by Carter).

Var. **maculicosta** Edwards.

Aedes (Banksinella) punctocostalis Wigglesworth, Bull. Ent. Res. 20, p. 64 (1929).

Aedes (Banksinella) palpalis var. *maculicosta* Edwards, Proc. R. Ent. Soc. London, B, 5, p. 52 (1936).

TYPE.—♀ in B.M., Lagos.

Intermediate between *A. punctocostalis* and the species allied to *A. taeniarostris*; costa with yellow markings much as in *punctocostalis*; but legs as in *taeniarostris* or *palpalis* var. *carteri*, and post-spiracular scales absent as in those species.

♀. *Head*.—Scales of vertex all yellow. Proboscis with a small yellow area in middle beneath. *Thorax*: Median dark area of scutum with rather numerous scattered yellow scales. *Legs*: Hind femur with broad dark dorsal line; middle and hind tibiae as in *taeniarostris* or *carteri*. *Wings*: Costa with numerous scattered yellow scales on basal half, a short yellow area beyond middle, and an indistinct yellowish area near tip, the middle spot extending on to subcosta but not on to first vein.

Distribution.—NIGERIA: Lagos (*Wigglesworth*).

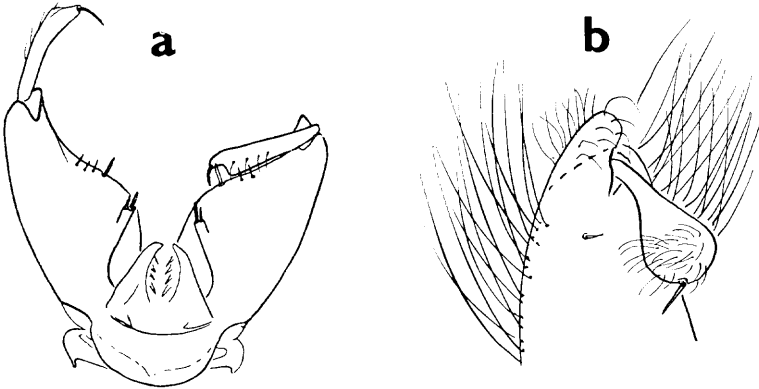


FIG. 63.—Terminalia of *Aedes (Banksinella)*. a. *crassiforceps*. b. *pogonurus*.

Aedes (Banksinella) pogonurus Edwards.

Aedes (Banksinella) pogonurus Edwards, Proc. R. Ent. Soc. London, B, 5, p. 52 (1936).

TYPE.—♂ in B.M., Stanleyville.

Very similar to several other species, but differs conspicuously in structure of ♂ terminalia, particularly in regard to the tufted coxite and shape of style.

♀. No clear distinctions can be pointed out from *taeniarostris*, *monotrichus* or *carteri*. *Head* with scales on vertex all yellow. Proboscis without a complete yellow band, but usually yellow beneath to a variable extent in middle; some specimens however have few or no yellow scales. *Thorax* with a pair of median yellow lines running whole length of scutum, these lines rather broad and distinct though not sharply defined. *Abdomen* and *legs* as in *taeniarostris* or *carteri*. *Wings* with some yellow scales at base of vein 1, but none (or only a few) at base of vein 5.

♂. The single specimen available is somewhat damaged but appears similar to females taken at the same place, except that the hind tibia has only a few yellow scales in middle above, and abdominal tergites 5–7 have complete basal yellow bands (as in ♂ of *palpalis* and ssp. *carteri*). *Terminalia* (Fig. 63, b): Coxite remarkable in

possessing rather dense tufts of long hair both above and below and extending almost the whole length of coxite ; the tuft on the tergal side larger and composed of stouter blackish hairs, the hairs of the sternal tuft paler and more slender ; style considerably widened at the tip (not in middle as in most other species), with a large tuft of hair adjacent to the rather short spine ; no distinct spines on inner margin of coxite ; sternite larger than usual.

Distribution.—BELGIAN CONGO : Stanleyville (*Schweitz*, type ♂ ; *Mouchet*, ♀).

***Aedes* (*Banksinella*) *crassiforceps* Edwards.**

Aedes (*Banksinella*) *crassiforceps* Edwards, Rev. Zool. Afr. 15, p. 352 (1927).

TYPE.—♂ in Congo Museum, Tervueren, Stanleyville.

Differs from *A. taeniarostris* as follows :

♀ (?). *Head* with a small dark spot included in the yellow area. Proboscis all blackish below as well as above. *Thorax* with more numerous scales on pleurae ; larger blackish area on scutum, the yellow borders being more narrowly connected in front. *Abdomen* with the lateral yellow spots larger but not spreading up towards dorsum. *Legs* : Hind tibia almost all dark, with only an indistinct pale spot at tip.

♂. Proboscis and hind tibia as in ♀. Palpi rather longer than in *taeniarostris*. *Terminalia* (Fig. 63, a) with coxite very much swollen on basal two-thirds, densely hairy above, about 3-4 small spines at the point of narrowing ; terminal projection very small ; style broad except for the tip, which is suddenly narrowed, terminal spine long and slender, about 4 hairs on broad portion of style, but none around spine.

Distribution.—BELGIAN CONGO : Stanleyville (*Mouchet*, type ♂) ; Yumbi (*Yale Massey*, ♀).

***Aedes* (*Banksinella*) *ellinorae* sp. n.**

TYPES.—♂♀ in B.M., Gede, Kenya.

Differs from the other species with unbanded or incompletely banded abdomen in the whitish instead of yellow border-scales of the scutum.

♀. *Head* with the pale scales creamy white, but the frontal bristles yellow as usual ; no dark scales in middle above. Proboscis creamy-white beneath on about its middle half, black at base and tip. *Thorax* : Scales in middle area of scutum black, on borders creamy-white, the pale border narrower than usual, but extending to scutal angles ; whitish scales present round pre-scutellar space. Post-spiracular scales absent or very few. *Abdomen* unbanded above but with the whitish lateral spots of tergites larger than usual, visible from above on 3-7 and nearly meeting in middle on 6 and 7 ; sternites with dark apical bands. Cerci very long as in other species of this group. *Legs* largely dark, but hind femur extensively pale, the dark dorsal line hardly reaching beyond middle ; middle and hind tibiae pale at tips, but no pale area in middle of hind tibiae. *Wings* mainly dark, including the whole of costa and vein 5, but with a short length of whitish scales at base of vein 1, usually not more than $\frac{1}{4}$ of the length of the vein.

♂. Resembles ♀. Shaft of palpi slender, with a few hairs at tip ; no small

terminal segment. Abdomen with complete basal pale bands on tergites 6 and 7. *Terminalia* rather closely resembling those of *A. fuscinervis*; the five or six spines on distal part of coxite all sharp-pointed.

Distribution.—KENYA: Gede, nr. Mombasa (*Miss Ellinor C. MacDonald*).

Aëdes (Banksinella) bolensis Edwards.

Aëdes (Banksinella) bolensis Edwards, Proc. R. Ent. Soc. London, B, 5, p. 52 (1936).

TYPE.—♂ in B.M., Bole.

Differs from all other species of the subgenus except *fuscinervis* in the thoracic scaling, and from all other species of the "forest" group (including *fuscinervis*) in the more extensively yellow-scaled first vein.

♀. Unknown.

♂. *Head* with all the narrow scales of vertex yellow. Palpi as in *taeniarostris*. *Thorax* with the scales on scutum much scantier than usual (this is not due to denudation as the specimen is almost perfect), almost all golden-yellow, but a few dark ones on scutal angles and in middle of scutum, also on *ppn*; no post-spiracular scales. *Abdomen* entirely dark, tergites apparently without lateral pale spots (but these possibly hidden owing to shrinkage). *Legs* dark; mid tibia pale behind but not above at tip; hind femur largely dark, hind tibia entirely so, even at tip. *Wings* with vein 1 yellow-scaled for the greater part of its length (far beyond base of 2); yellow scales on vein 5 almost as far as the fork. *Terminalia* (Fig. 62, f) almost as in *A. lineatopennis*, perhaps with fewer soft hairs at point of narrowing of coxite, the spines on the narrow portion longer and hairs on terminal projection fewer.

Wing-length about 2.5 mm.

Distribution.—GOLD COAST: Bole (*Ingram*). In spite of the close similarity of the terminalia it does not seem at all probable that this can be a mere variation of *A. lineatopennis*.

Aëdes (Banksinella) fuscinervis Edwards.

Banksinella fuscinervis Edwards, Bull. Ent. Res. 5, pp. 73 (1914) and 273 (1915).

TYPE.—♂ in B.M., Accra.

Differs from other species of the subgenus in the entirely dark-scaled wings and in the absence of distinct yellow borders to the scutum (in the latter respect resembling *A. bolensis*).

Differs from *A. taeniarostris* as follows:

♀. *Head* with an area of dark scales in middle above, dividing the usual yellow area into an inconspicuous V-shaped mark. Proboscis all dark. *Thorax* with scattered yellowish scales among the dark ones over most of scutum, borders only narrowly and inconspicuously covered with yellowish scales. *Legs*: Middle tibia only indistinctly pale above at tip; hind tibia entirely dark. *Wings* entirely dark-scaled, or at most with half a dozen yellowish scales at base of vein 1.

♂. Dark like ♀; lateral spots of abdominal tergites small. *Terminalia* (Fig. 62, d) with fairly numerous short spinules on inner margin distally; style very little widened in middle, terminal spine shorter (no hairs around spine).

Distribution.—GOLD COAST: Accra and Obuasi (*Graham*). LIBERIA: Du River and Paiata (*Bequaert*). NIGERIA: Lagos (*Philip*).

Subgenus **DICEROMYIA** Theobald.

Diceromyia Theobald, Fourth Rept. Wellcome Lab. p. 151 (1911).

GENOTYPE.—*D. africana* Theobald.

Decumbent scales of vertex broad, also scutellar scales (except in *A. flavicollis*); *ppn* with broad flat scales only. Proboscis about as long as front femur. Dorsocentral and acrostichal bristles strong and numerous. Lower mesepimeral bristles present (1–3). Prosternum bare as usual in *Aedes*. Anterior claws toothed in both sexes (African species). *Palpi* of ♂ about as long as proboscis, last two segments short and with few hairs. ♂ *Terminalia*: Coxite without definite basal lobes or claspettes, but remarkable in having a large apical scale-tuft. Style simple, but the spine (in African species) inserted far before the tip. Phallosome as in *Aedimorphus*. ♀ *Terminalia (furcifer)*: Eighth segment not completely retractile, its sternite with posterior margin straight; ninth tergite much smaller than usual in *Aedes*, transversely crescent-shaped, the anterior edge convex; cerci rather broad; insula as in *Aedimorphus*; post-genital plate not notched.

The African species are all rather small mosquitoes, with basal white rings on the tarsal segments. Most of them have very broad wing-scales of mixed colours, and on this account have sometimes been confused with species of *Mansonioides*. So far as is known all the species breed in tree-holes; they are not known to suck blood.

KEY TO ETHIOPIAN SPECIES OF SUBGENUS DICEROMYIA.

- | | |
|---|-----------------------------------|
| 1. Wings (at least partly) and femora speckled | 2. |
| Wings and legs not speckled | <i>fascipalpis</i> Edw. (p. 217). |
| 2. Wings speckled only anteriorly, scales mostly narrow | <i>flavicollis</i> Edw. (p. 217). |
| Wings speckled throughout, all scales broad | 3. |
| 3. Proboscis banded | 4. |
| Proboscis unbanded (merely speckled in middle) | <i>adersi</i> Edw. (p. 216). |
| 4. Abdomen speckled dorsally | <i>furcifer</i> Edw. (p. 214). |
| Abdomen not speckled | <i>taylori</i> Edw. (p. 216). |

Aedes (Diceromyia) furcifer Edwards.

Mansonia (?) *nigra* Theobald, Second Rept. Wellcome Lab. p. 80 (1906). [Preoccupied by *Taeniorhynchus (Aedes) niger* Giles, 1904.]

Mansonioides (?) *nigra* Edwards, Bull. Ent. Res. 2, p. 254 (1911).

Diceromyia africana Theobald, Fourth Rept. Wellcome Lab., B, p. 151 (1911). [Preoccupied by *Stegomyia africana* Theobald, 1901.]

Ochlerotatus (Finlaya) furcifer Edwards, Bull. Ent. Res. 4, p. 48 (1913).

TYPES.—*nigra*, ♀ (fragment) in B.M., Sudan; *africana*, ♂ in Liverpool School of Tropical Medicine, Sudan.

A small, rather stoutly built species with heavily-scaled wings and ringed tarsi, very suggestive of a small *Mansonia* or *Aedimomyia*. Differs from the two closely allied species in the banded proboscis and speckled abdomen.

♀. *Head* with a large patch of erect forked scales extending almost to front, colours mixed, most of the decumbent scales in middle narrow, but some broad ones

towards front. Proboscis with a distinct whitish ring before middle (distal margin of ring at about middle of proboscis), but few or no scattered pale scales. Palpi about one-fifth length of proboscis, rather thick, black, with two narrow white rings, one near base and one about middle, no white scales at tip. Tori and clypeus dark, former with many and latter with a few pale scales. *Thorax* dark; scutum very

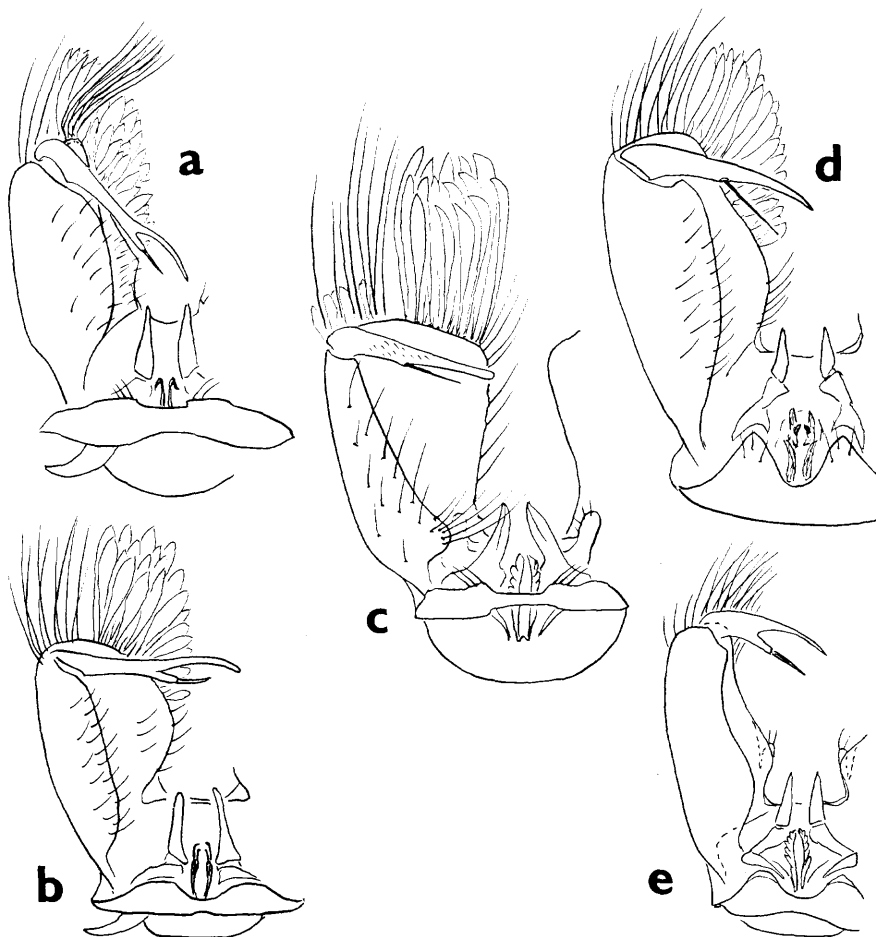


FIG. 64.—Terminalia of *Aedes* (*Diceromyia*) spp. a. *furcifer*. b. *taylori*. c. *adersi*. d. *flavicollis*. e. *fascipalpis*.

bristly, with coarse dark brown and light yellowish narrow scales irregularly mixed. Scutellum densely clothed mainly with flat scales, with a few narrow ones on middle lobe; most of the scales white but a variable number black, especially distally. Pleurae with rather large patches of large flat scales, including many post-spiraculars; *ppn* completely clothed with broad flat scales, white below, black above. *Abdomen* largely dark, tergites with very narrow irregular white bands which touch bases of segments in middle but are well removed from the base at sides; remainder of tergites with a rather heavy and irregular sprinkling of yellowish scales; tergite 8 with a

broad median white line. *Legs*: Femora with black and white scales about evenly intermixed on anterior surfaces, no clear white area at base of hind femur; tibiae black, with a fair sprinkling of whitish scales; tarsi black, each segment of each tarsus with a white ring at base, first segment also with a slight sprinkling of white scales. Claws of front and mid legs each with a small tooth. *Wings* with all the scales of upper surface large, broad, and obliquely truncate, much as in *Mansonioides* black and white ones about evenly mixed.

♂. Resembles ♀, but white band of proboscis wider, its distal edge well beyond middle of proboscis; white bands of abdomen also rather wider and less irregular. Palpi equal in length to proboscis; straight; a narrow white ring close to base, a broader one in middle, a narrow one at base of penultimate segment, and the minute terminal segment white; no hairs, but about half a dozen strong stiff bristles at tip of penultimate segment. *Terminalia* (Fig. 64, a): Coxite short and broad, with a dense multiple row of scales on inner sternal margin, these scales very long and rather dark brown in colour; at tip of coxite beyond the long scales is a slight projection bearing a pencil of very long hairs curled at their tips. Style bare, forked just beyond middle, upper prong somewhat longer than combined length of the short lower prong and the spine which it bears.

Wing-length 2.5–3 mm.

Distribution.—GOLD COAST: Accra (*Ingram*); Weshiang (*Hamilton*). NIGERIA: Kano (*Philip*). SUDAN: Nasser, Blue Nile (*Balfour*); Zalingei, Darfur Prov. (*Lynes*); Um Dona, Alleira, Jebel Deri, Zalutaya and Delami (*Rutledge*). E. TRANSVAAL: Rolle Siding (*Ingram*). UGANDA: Soroti (*Hopkins*). PORTUGUESE GUINEA: Boloma (*Sequeira*).

Aedes (Diceromyia) taylori Edwards.

Aedes (Diceromyia) taylori Edwards, Proc. R. Ent. Soc. London, B, 5, p. 55 (1936).

TYPE.—♂ in B.M., Gadau.

Closely related to *A. furcifer*; ornamentation in both sexes the same as in the last species, except that there are no (or at most extremely few) scattered yellowish scales on the abdominal tergites.

♂. *Terminalia* (Fig. 64, b) similar to those of *A. furcifer* but with well-marked specific differences: coxite more truncate at tip, without trace of a projecting lobe and lacking the pencil of curled hairs, inner margin bearing the long scales more oblique; style as in *A. furcifer*.

Distribution.—NIGERIA: Gadau (*Taylor*). TANGANYIKA: Dar-es-Salaam (*Haworth*). The single ♂ from Dar-es-Salaam agrees well with the series from Gadau; it was reared in company with females of *A. adersi*.

Aedes (Diceromyia) adersi Edwards.

Ochlerotatus (Diceromyia) adersi Edwards, Bull. Ent. Res. 7, p. 214 (1917).

TYPE.—♂ in B.M., Zanzibar.

Very similar to *A. furcifer*, differing as follows:

♀. *Head* with more numerous flat scales round eye-margins. Proboscis without

a pale ring but with numerous scattered pale scales in middle half, especially beneath. *Thorax* with all scutellar scales flat and mostly black (but rather variable in colour). *Abdomen* with practically no scattered pale scales on dorsum. *Legs* with a narrow clear white area at base of each femur in front (broadest on hind femur).

♂. Similar to ♀. Palpi as in *furcifer*. *Terminalia* (Fig. 64, c): Coxite very broadly truncate, the large scale-tuft practically apical in position and bright brownish-yellow in colour; no apical hair-pencil; style tapering to tip, not forked, with numerous minute hairs, the long, slender spine inserted on inner margin just before middle.

Distribution.—ZANZIBAR (*Aders*). TANGANYIKA: Dar-es-Salaam and Lindi (*Haworth*). KENYA: Mombasa (*McMahon*); Isiolo, Kilifi (*MacDonald*).

Aëdes (Diceromyia) flavicollis Edwards. (Pl. 3, fig. 4.)

Aëdes (Diceromyia) flavicollis Edwards, Bull. Ent. Res. 18, p. 269 (1928).

TYPE.—♂ in B.M., Lagos.

A very distinct species by the bright golden-yellow mesonotal scales and rows of small yellow spots on the tibiae. Scutellar scales narrow; wing-scaling rather distinctive.

♀. *Head* with a rather large area of decumbent narrow yellow scales and erect white scales in middle. Proboscis black, with a very narrow and incomplete white ring in middle; palpi also with narrow white ring in middle. *Thorax* with most of the scutal scales bright yellow; a pair of black patches towards front and a larger pair a little in front of scutellum. Scutellar scales all narrow and bright yellow. Pleuræ with patches of flat white scales, but scales on *ppn* and also post-spiracular scales yellow, all broad and flat. *Abdomen* black above, tergites with small lateral white marks well removed from base; tergite 8 with median white line. *Legs* black; femora with scattered yellow scales tending to form rows of tiny spots; tibiae each with 6–8 small yellow spots in a row on anterior surface and more irregular mottling on posterior surface; tarsal segments with narrow white basal rings. *Wings* with large, broad, mixed black and white scales on costa and first vein; scales on remaining veins all dark, outstanding ones rather narrow.

♂. Resembles ♀. Palpi almost as in *furcifer*. *Terminalia* (Fig. 64, d): Coxite rounded at tip, not truncate; scale-tuft as in *furcifer*, but no apical hair-pencil. Style formed much as in *adersi*, but bare.

Wing-length 2.5–3 mm.

Distribution.—NIGERIA: Lagos (*Dunn*).

Aëdes (Diceromyia) fascipalpis Edwards. (Fig. 65.)

Ochlerotatus fascipalpis Edwards, Bull. Ent. Res. 3, p. 19 (1912).

TYPE.—♀ in B.M., South Usangu District.

Differs from the other African species of the subgenus in the absence of pale speckling on the wings and legs. Might perhaps be confused with some species of *Finlaya*, but differs from any African species of that subgenus in palpal and tarsal markings.

♀. *Head* clothed mainly with broad flat scales, mainly white in middle, black at sides. Proboscis black, with or without some scattered pale scales about middle. Palpi almost one-third as long as proboscis, black, with a conspicuous white ring in middle. *Thorax* dark; scutal scales mainly creamy-white but with patches of dark brown, including three towards front and two posteriorly. Scales of scutellum and *ppn* all broad and flat, some black and some white. *Abdomen* black above, tergites with small median and lateral basal white spots; tergite 8 with a basal white band (not a median stripe as in the other species). *Legs* black; femora pale beneath and with small white knee-spots; first three segments of anterior tarsi and all segments of hind tarsi with white basal rings. *Wings* with all scales dark, those on forks almost linear.

♂. Resembles ♀, but mesonotum not so extensively white-scaled (probably variable); abdominal tergites with complete white basal bands. Palpi as long as



FIG. 65.—*Aedes (Dicromyia) fascipalpis* Edw. ♀. Head and thorax.

proboscis, black, with white rings as in the other species, but terminal segment less reduced (half as long as penultimate) and black at tip, last two segments with a few hairs. *Terminalia* (Fig. 64, e): Coxite not very broad, rounded at tip, with a small scale-tuft at tip on sternal side. Style forked at middle, bare, upper prong equal to combined lower prong and spine.

Wing-length about 2.5–3 mm.

Distribution.—TANGANYIKA: Little Ruaha River, South Usangu district (*Neave*); Lindi (*Haworth*). NYASALAND: Dowa district (*Davey*); Fort Johnston (*Lamborn*). E. TRANSVAAL: Rolle Siding (*Ingram*). S. RHODESIA: Shamva (*Leeson*).

Subgenus **DUNNIUS** Edwards.

Dunnius Edwards, Bull. Ent. Res. 21, p. 297 (1930).

GENOTYPE.—*D. argenteoventralis* var. *dunni* Evans.

Scales of vertex, scutellum, *apn*, *ppn* and paratergite broad and flat. Prosternum densely scaly. Proboscis longer than front femur. Dorso-central bristles few or absent; acrostichal and lower mesepimeral bristles absent. Anterior claws toothed. *Palpi* of ♂ as in *Stegomyia*, slender, upturned, and practically devoid of hairs. ♂

Terminalia essentially as in subgenus *Aëdimorphus*, but style with numerous spines; no definite basal lobe or claspette. ♀ *Terminalia*: Eighth segment only partly retractile, its sternite scaly, with nearly straight posterior margin; ninth tergite heart-shaped; insula as in *Aëdimorphus*; cerci rather broad; post-genital plate notched.

This subgenus resembles the Oriental genus *Armigeres* in many respects, notably in the reduction of dorso-central bristles, densely scaly prosternum, general ornamentation, and presence of many spines on the male styles. The scaly prosternum, now noted for the first time, is a feature common to all species of *Dunnius* and *Armigeres*; in some other subgenera of *Aëdes* scales are sometimes present on the upper part of the prosternum, but I have not examined any species in which the whole sclerite is scaly.

A further small point of resemblance between the two groups is that in all species of *Dunnius* and *Armigeres* that I have examined the membrane between the front coxa and the sternopleura is largely or entirely clothed with scales; this again is very unusual in other subgenera of *Aëdes*, though such scales are present in some of the more scaly species of *Ochlerotatus*.

Dunnius might therefore with almost equal propriety be included in *Armigeres* rather than in *Aëdes*; the main reasons for adopting the latter course are that in *Dunnius* the larval siphon has a well-developed pecten, which is not the case in *Armigeres*, and the tip of the proboscis is not curved downwards when at rest, nor is it laterally compressed.

KEY TO SPECIES OF SUBGENUS DUNNIUS.

- | | |
|--|--------------------------------|
| 1. All scales of scutum broadly spindle-shaped | <i>argenteoventralis</i> Theo. |
| Scales in middle of scutum quite narrow and curved | 2. |
| 2. Scutellar scales largely white | 3. |
| Scutellar scales all, or nearly all, dark | <i>kummi</i> Edw. |
| 3. From Belgian Congo | <i>albomarginatus</i> Newst. |
| From Natal and Kenya | <i>natalensis</i> Edw. |

Aëdes (*Dunnius*) *argenteoventralis* Theobald.

Dendromyia argenteoventralis Theobald, Mon. Cul. 5, p. 588 (1910).

Dendromyia affinis Theobald, Mon. Cul. 5, p. 589 (1910).

Stegomyia argenteoventralis Edwards, Bull. Ent. Res. 3, p. 12 (1912).

Aëdes (*Dunnius*) *argenteoventralis* Edwards, Bull. Ent. Res. 21, p. 297 (1930).

Types.—*argenteoventralis*, ♀ in B.M., Obuasi; *affinis*, ♀ in B.M., Obuasi.

A rather small black species, resembling others of the subgenus in having snow-white pleurae, the whole of the sides of the thorax except for a small area in front of lower half of sternopleura and part of mesepimeron being densely covered with flat white scales; abdominal tergites 1-3 white at sides, 4 and 5 with large white lateral patches, 6 and 7 with basal white bands; sternites 1-5 white, 6 and 7 black, but 7 with a narrow basal white band; hind femora with the whole of the anterior surface snow-white; hind tibia with a large white spot at tip; wings all dark. Diagnostic characters of the species are as follows:

Head with a very narrow margin of white scales around eyes, and with a conspicuous wedge-shaped white spot (somewhat variable in size and pointing backwards) at junction of eyes in front; sometimes a small white spot on nape. No

dorso-central bristles (rarely a single pre-scutellar bristle present on one side only). Scutum densely covered with broadly spindle-shaped, blackish scales; the scales down the middle directed outwards, leaving a definite line of parting, those towards the sides directed more backwards. Scales of scutellum all blackish. A large supra-alar patch of white scales. Upper scales of *ppn* black, all the white scales broad and flat. White spot at tip of hind tibia usually not much longer than tibial diameter. ♂ *Terminalia* (Fig. 66, a): Eighth segment not specially hairy; coxites with a densely hairy area at base, but without spines or distinct basal lobe; styles with a close-set row of spines.

In the types of both *argenteoventralis* and *affinis* there is a moderately broad border of white scales on front margin of scutum.

Distribution.—GOLD COAST: Obuasi (*Graham*). SIERRA LEONE: Mabang (*Gordon*). LIBERIA: Du River (*Bequaert*).

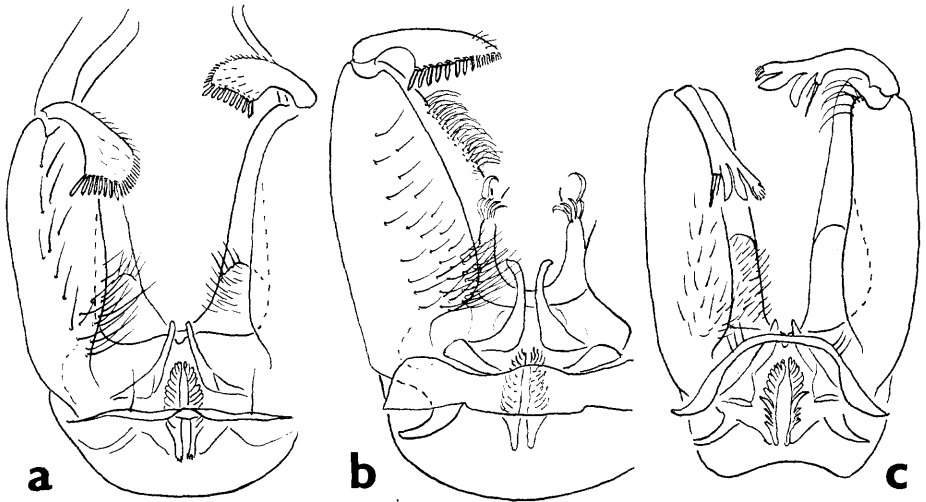


FIG. 66.—Terminalia of *Aedes (Dunnus)* spp. a. *argenteoventralis*. b. *natalensis*. c. *kummi*.

Var. **dunni** Evans.

Aedes (Armigeres) albomarginata var. *dunni* Evans, Ann. Trop. Med. 22, p. 39 (1928).

Aedes (Dunnus) argenteoventralis var. *dunni* Edwards, Bull. Ent. Res. 21, p. 297 (1930).

TYPE.—♂♀ in Liverpool, Lagos.

Differs from the typical form in having few or no white scales on front margin of scutum; terminalia identical in structure with a ♂ of the typical form from Liberia.

Distribution.—NIGERIA: Lagos (*Dunn, Philip, Graham*); Lagos and Ibadan (*Kumm*). BELGIAN CONGO: Stanleyville (1 ♀, *Schwetz*).

Aedes (Dunnus) kummi Edwards.

Aedes (Dunnus) kummi Edwards, Bull. Ent. Res. 21, p. 298 (1930).

TYPE.—♂ in B.M., Ibadan.

Differs from *A. (D.) argenteoventralis* as follows: Head without the wedge-shaped

white spot in front, though the narrow white margin to the eyes is rather more conspicuous. One pair of dorso-central bristles a little in front of middle, and one or two pairs of pre-scutellar bristles. Scutal scales browner and much narrower, those near middle line not directed outwards; white supra-alar patches less extensive; upper scales of *ppn* narrow and white. White spot at tip of hind tibia usually about twice as long as tibial diameter. ♂ *Terminalia* (Fig. 66, c): Coxite somewhat longer, style entirely different in shape.

Distribution.—NIGERIA: Ibadan (*Kummi*); Lagos (*Philip*).

Aedes (*Dunn*) *albomarginatus* Newstead.

Stegomyia albomarginata Newstead, Ann. Trop. Med. 1, p. 16 (1907); Edwards, Bull. Ent. Res. 3, p. 12 (1912).

Aedes (*Dunn*) *albomarginatus* Edwards, Bull. Ent. Res. 21, p. 299 (1930).

TYPE.—♀ in Liverpool, Kasongo, Congo.

According to information supplied by Miss Evans, Newstead's type ♀ differs from both *A. (D.) argenteoventralis* and *A. (D.) kummi* in having white scales on most of the median lobe and on the sides of the lateral lobes of the scutellum, the intervening areas having dark scales; there are also narrow whitish scales on the area in front of the scutellum. The scutum is much rubbed, but the remaining scales on the median area are quite narrow and curved, as in *A. (D.) natalensis*, which will probably prove to be conspecific.

Distribution.—BELGIAN CONGO: Kasongo, Manyema Distr. (*Dutton and Todd*); Urundi, Kitega (*Henrard*).

Aedes (*Dunn*) *natalensis* Edwards.

Aedes (*Dunn*) *natalensis* Edwards, Bull. Ent. Res. 21, p. 298 (1930).

TYPE.—♂ in B.M., Durban.

Rather closely resembling *A. (D.) kummi*, differing chiefly in having 4-5 pairs of pre-scutellar bristles, and in the structure of the ♂ abdomen. Seventh and eighth segments broad; eighth sternite deeply concave on posterior margin, which is densely hairy except in middle. *Terminalia* (Fig. 66, b): Coxites very stout, with a dense patch of short hair and narrow scales near tip on inner side, and a distinct basal lobe bearing five flattened and round-tipped bristles, one somewhat longer than the rest; style with a close-set row of spines, but quite different in shape from that of *A. argenteoventralis*.

Distribution.—NATAL: Durban (*Bevis*). KENYA: Ngumari, nr. Meru; Gede; Shimba Hills (*MacDonald*).

Specimens from Kenya (received during the printing of this volume) differ from the type male in having more extensive white scaling on the scutum, including a broadish band across the front margin, and a large triangular patch on each side, the apex of the triangle nearly reaching the middle line in some specimens; there are also three short stripes of white scales posteriorly, all extending across scutellum, the median stripe occupying much of median lobe and the lateral stripe the sides

of lateral lobes of scutellum, as noted by Miss Evans for *albomarginatus* (these stripes are also distinguishable in the type from Natal). The terminalia of the Kenya males resemble those of the type except for a small and probably inconstant difference in the shape and armature of the style.

Subgenus **SKUSEA** Theobald.

Skusea Theobald, Mon. Cul. 3, p. 291 (1903).

GENOTYPE.—*Aedes pempaensis* Theobald (E. Africa).

Decumbent scales of vertex and scutellum broad and flat. Paratergite (in *S. pempaensis*) bare. Dorso-central and acrostichal bristles present; one or more lower mesepimerals usually present (absent in ♂ of *pempaensis*). Palpi of ♂ about as long as proboscis, last two segments short, but slightly thickened and hairy (in *S. pempaensis*). Claws of ♀ all simple.

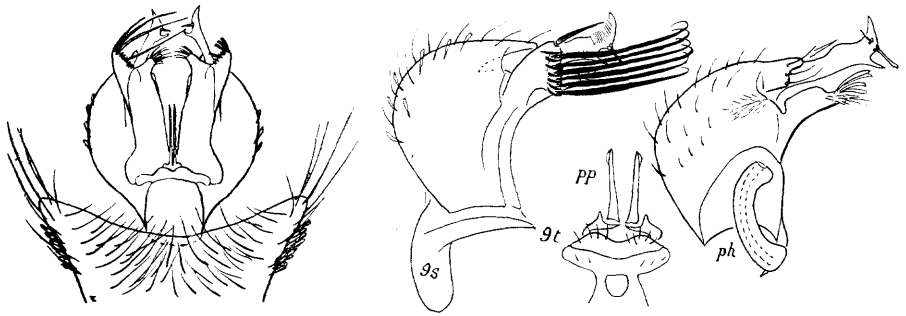


FIG. 67.—Terminalia of *Aedes (Skusea) pempaensis* Theo. Whole organ, with eighth tergite, tergal view. Coxite from inner and outer side, with phallosome (*ph.*); tergite (*qt.*) and paraprocts (*pp.*).

♂. *Terminalia* (in *pempaensis*, Fig. 67) very different from those of other African subgenera of *Aedes*. Eighth segment unusually large, the ninth unusually small; coxite short and broad, with double subapical lobe bearing a row of long bristles which protect the style, this last of peculiar shape; no definite claspette. Paraprocts very poorly developed. Phallosome a long simple tube reminiscent of that of *Anopheles*, its sides more strongly sclerotized and thus forming a pair of elongate lateral plates; no trace of teeth or processes. Parameres and basal plates apparently absent or fused with roots of coxite.

♀. *Terminalia (pempaensis)*: Eighth segment very little retractile; eighth tergite somewhat pointed, devoid of setae except at the tip (an unusual feature); eighth sternite large, with a shallow indentation on each side in addition to the median notch (somewhat as figured by Gjullin for *Aedes cinereus* Mg.); ninth tergite shield-shaped, with slight anterior emargination; insula small, transverse, with a few short setae; cerci short and broad; post-genital plate with slight notch, connected with cowl as in other *Aedes*.

The single African species of this subgenus is of obscure colouring, and shows few

of the diagnostic features of the genus *Aedes* apart from the possession of post-spiracular bristles. It is the single Ethiopian representative of a group of subgenera with numerous and diverse forms in the Oriental region.

According to Aders (1917) *A. pembraensis* is a virulent biter, and in Weti (Pemba) is one of the commonest house mosquitoes.

Aedes (Skusea) *pembraensis* Theobald.

Aedes pembraensis Theobald, Mon. Cul. 2, p. 235 (1901).

Skusea pembraensis Theobald, Mon. Cul. 3, p. 291 (1903).

Verrallina ? *pembraensis* Theobald, Mon. Cul. 5, p. 495 (1910).

Howardina ? *pembraensis* Edwards, Bull. Ent. Res. 3, p. 13 (1912).

Ochlerotatus pembraensis Edwards, Bull. Ent. Res. 5, p. 277 (1914).

Aedes (Skusea) *pembraensis* Edwards, Bull. Ent. Res. 4, p. 49 (1913), and 18, p. 271 (1928).

(?) *Stegomyia cartroni* Ventrillon, Bull. Mus. Paris, 12, p. 143 (1906); Edwards, Bull. Ent. Res. 11, p. 134 (1920).

Phagomyia mutica Enderlein, Wien. Ent. Zeit. 40, p. 28 (1923).

TYPES.—*pembraensis*, ♀ in B.M., Pemba I.; *cartroni*, ♀ in Mus. Hist. Nat., Paris, Madagascar; *mutica*, ♀ in Zool. Mus., Berlin, Patta I.

A black mosquito without special ornamentation, but fairly easily distinguished from other dark-coloured African Culicines by the complete covering of flat scales on the head and scutellum. Differs most obviously from the West African *A. nigricephalus* in the simple claws of the female.

♀. *Head* almost entirely black; small patches of white scales on sides; erect forked scales confined to a small area on nape. Proboscis slender, black. Palpi black, about one-seventh as long as proboscis. *Thorax* blackish above, pleurae more brownish. Scutum with many black bristles and narrow black scales; a few narrow white scales around pre-scutellar space; scutellar scales mostly black, but with some white ones especially on sides of mid lobe. *Ppn* lobes with narrow dark scales above, a few broader white ones below. One strong lower mesepimeral bristle. *Abdomen* black; tergites with large basal lateral white triangles; some of the basal tergites sometimes with narrow incomplete basal white bands; sternites white basally, black apically. *Legs* blackish; no knee-spots; a very narrow white ring at base of first hind tarsal segment and sometimes a very few whitish scales at base of second segment. *Wings* dark, scales narrow.

♂. Pleurae somewhat lighter than in ♀; white scales on posterior pronotal lobes more numerous; no lower mesepimeral bristle. Palpi scarcely as long as proboscis, black, with a white ring in middle of shaft and a narrow white ring at base of penultimate segment; last two segments scarcely thickened, slightly hairy; penultimate segment nearly twice as long as terminal. Anterior claws toothed. *Terminalia* (Fig. 67) of very peculiar structure, as noted in subgeneric diagnosis. Coxite with few scales and with the hairs unusually few and short.

Wing-length about 3.5 mm.

Distribution.—ZANZIBAR PROT.: Pemba I. (*O'Sullivan-Beare, McCarthy*); Zanzibar Town (*Aders*); Mafia I. (*Aders*). TANGANYIKA: Dar-es-Salaam (*Pomeroy, McKenzie, Williamson*); Gerazani, Mashimoya and Ufanga (*Scott*). KENYA: Near Siyu, Patta I. (*Neave*); Patta I. (*Voeltzkow*); Gede (*MacDonald*). MADAGASCAR: Morondava, Maintirano, and Mayotte I. (*Ventrillon*).

ERETMAPODITES Theobald.

Eretmapodites Theobald, Mon. Cul. 1, p. 280 (1901).

Eretmapodites Edwards (emendation), Bull. Ent. Res. III, p. 46 (1912).

GENOTYPE.—*E. quinquevittatus* Theobald.

This, the only mosquito genus which is confined to the Ethiopian region, has most of the diagnostic characters of the genus *Aedes*, including possession of post-spiracular bristles and of toothed claws in the female. It is separable by the very distinctive type of ornamentation, and also by the fact that the paratergites are both bare and broad; those few *Aedes* which lack scales on the paratergites have these parts narrow.

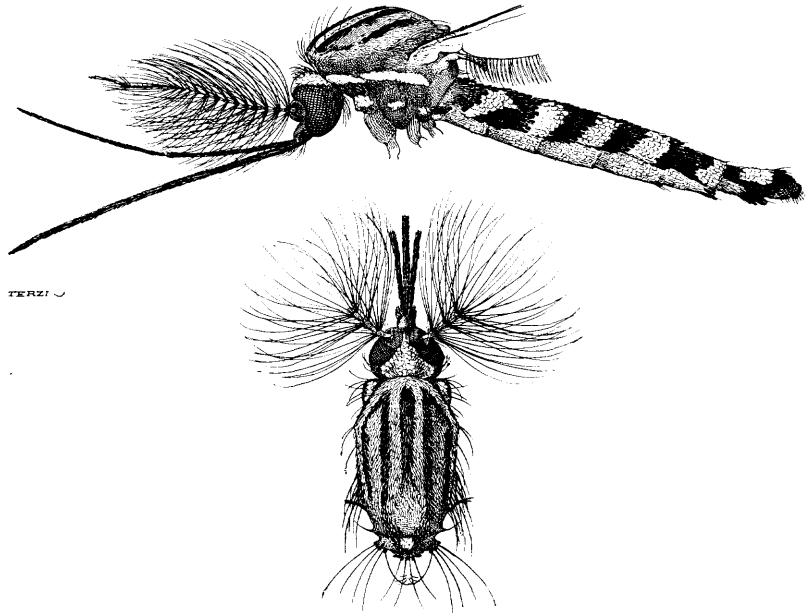


FIG. 68.—*Eretmapodites quinquevittatus* Theo. ♂. Side view of insect (legs omitted), and head and thorax from above.

The form of the male phallosome and female insula suggest some affinity with the subgenera *Stegomyia* and *Aëdimorphus*.

Head: Eyes widely separated, more so than in any *Aedes* except perhaps some few species of subgenus *Stegomyia*. Space between eyes and a broad border behind them clothed with large, flat, metallic silvery scales. Orbital bristles fairly numerous but set well back from eye-margins. Proboscis slender and rather long, tending to be curved downwards at tip in repose, rather than upwards as in *Aedes*. Palpi of ♂ nearly as long as proboscis, bare and upturned as in subgenera *Stegomyia* and *Dunnius*. Antennae in both sexes only about two-thirds as long as proboscis or even less; in ♂ plumose, with the last two segments somewhat elongate, in ♀ more hairy than usual.

Thorax: *apn* well separated, bristly in front. Dorso-central bristles usually few in number and weak; acrostichal bristles absent. Paratergite much broader than

in *Aedes* and always bare. Prosternum completely covered with flat golden-yellow scales. Pleural chaetotaxy as in *Aedes*. Postnotum in most species with a group of small bristles (not present in any other African mosquitoes). Upper margin of meron well above level of base of hind coxa (as in all African mosquito genera except *Harpagomyia*). Integument of thorax usually mainly yellowish.

Legs and wings normal ; anterior claws toothed in ♀ ; squama fringed.

Abdomen laterally compressed ; tergites black with metallic silvery markings and sternites mainly clothed with golden-yellow scales, a combination not found in any other African genus. First tergite with numerous metallic silver scales on lateral lobes. Eighth segment in ♀ not retractile ; cerci short and inconspicuous.

♂. *Terminalia* : Eighth tergite divided into two halves by a membranous area in the middle, each half usually with long, dense hair. Coxite of extremely complex structure, and varying greatly according to the species. In the *chrysogaster* group a structure arises from the base of the coxite on the sternal side which has very much the appearance of the claspette of *Ochlerotatus* or *Finlaya*, though it can hardly be homologous ; I have referred to it in the descriptions as the "arm" of the coxite. This "arm" is not present in other species of the genus, but on the other hand nearly all the species have two pairs of moveable appendages arising from the base of the coxite on or towards the tergal side ; I have referred to these as the proximal and distal claspettes. In addition to these structures the coxite usually has basal and apical lobes bearing remarkably modified hairs or scales, and sometimes in addition a large scale-tuft. Style with terminal spine and very often bearing scales and long hairs about its middle. Paraprocts pointed, without teeth apically. Phallosome divided into two crenulate or toothed plates.

♀. *Terminalia* (three species compared ; fig. 6 ♀, p, q) : Eighth segment not retractile, connecting membrane with seventh quite narrow, tergite large, almost as large as the unmodified sternite. Ninth tergite reduced to a pair of small transverse bare plates, one at the base of each cercus. Insula longer than broad but bare (as in *Aëdimorphus* and *Stegomyia*). Cerci longer than post-genital plate, scaly, obliquely placed. Basal part of post-genital plate fused to cowl, but not strongly sclerotized. No atrial plates. Spermathecae normal.

Regarding the adult habits of this genus in Uganda Hopkins writes : " One species of the *chrysogaster* group bites viciously in swamps by day and another (? the same) in forests, also by day." Newstead similarly wrote concerning *E. inornatus* and *quinquevittatus (austeni)* that they " fed viciously at five in the afternoon." *E. chrysogaster* has been successfully used for yellow-fever transmission experiments in Nigeria, but Kerr (1933) considers that it probably prefers non-human blood.

Bacot (1916) states that the eggs, unlike those of most *Aedes*, fail to survive drying.

KEY TO SPECIES OF ERETMAPODITES.

- 1. *apn* clothed with broad silvery scales 2.
- apn* with narrow yellow scales ; scutum with the yellow scales arranged in stripes 12.
- 2. Yellow and black scales of scutum more or less evenly mixed, unless on margin 3.
- Yellow scales of scutum arranged in stripes or lines 7.
- 3. Scutum with a distinct border of yellow scales . . . *chrysogaster* var. ? (p. 227).
- Scutum without such distinct border 4.

4. Proboscis all dark ; tip of hind tarsi in ♂ simple . . . *grahami* Edw. (p. 230).
 Proboscis with a pale line beneath, at least in ♂ ; tip of hind tarsi in ♂ with
 scales more or less outstanding 5.
5. Palpi of ♂ considerably shorter than proboscis ; darker species
semisimplicipes Edw. (p. 229).
 Palpi of ♂ almost as long as proboscis 6.
6. A distinct spot of silvery scales above mid coxa . . . *chrysogaster* Gr. (p. 226) ;
intermedius Edw. (p. 228).
 This marking absent *subsimplicipes* Edw. (p. 229).
7. Scutum with a median line of yellow scales running the whole length, scales
 otherwise mainly black *silvestris* Ingr. & de M. (p. 231).
 Scutum with a pair of admedian yellow lines or stripes 8.
8. Yellow lines of scutum narrow, ground colour mostly dark 9.
 Yellow lines of scutum broader 11.
9. Seventh abdominal tergite with a continuous silvery band *argyrurus* Edw. (p. 234).
 Seventh tergite with a pair of separate spots (always ?) 10.
10. Post-spiracular bristles blackish *inornatus* Newst. (p. 232).
 Post-spiracular bristles yellow *melanopus* Graham (p. 233) ;
forcipulatus Edw. ; *penicillatus* Edw. (p. 234) ; *tonsus* sp. n. (p. 235).
11. Sublateral yellow stripes of scutum produced forwards ; postnotum quite bare ;
 abdominal silvery marks normal *quinquevittatus* Theo. (p. 236).
 Sublateral yellow stripes of scutum not produced forwards ; postnotum with a
 few small hairs ; abdominal silvery marks larger than usual
draccaenae Edw. (p. 237).
12. Hind tarsi entirely dark, tips with long scale-tufts in ♂ 13.
 Hind tarsi with tips white, without scale-tufts in ♂ 14.
13. One claw of middle legs of ♂ broad and blade-like ; hind tarsal plume larger,
 with at least a few long hair-like scales at tip of third segment
oedipodius Gr. and ssp. *stanleyi* n. (p. 238).
 Both claws of middle legs of ♂ slender as usual ; hind tarsal plume smaller,
 no long hair-like scales on third segment *oedipodius* ssp. *parvipluma*
 and *wansoni* n. (p. 240).
14. Third hind tarsal segment all dark *leucopus* Gr. (p. 241).
 Third hind tarsal segment with the tip white *plioleuca* sp. n. (p. 241).

Eretmapodites chrysogaster Graham.

Eretmapodites quinquevittatus Theobald (♂ only), Mon. Cul. 1, p. 280 (1901).

Eretmapodites chrysogaster Graham, Entom. 42, p. 157 (1909) ; Graham in Theobald, Mon. Cul. 5, p. 565 (1910) ; Edwards, Ann. Mag. Nat. Hist. (8) 8, p. 68 (1911) ; Edwards, Bull. Ent. Res. 3, p. 47 (1912), and 5, p. 75 (1914).

TYPES.—*quinquevittatus*, ♂ in B.M., Sierra Leone ; *chrysogaster*, lectotype ♂ in B.M., Obuasi, Ashanti.

This belongs to a group of five closely-allied species which are distinguished from others in the genus by not having the yellow scales of the mesonotum arranged in definite lines, by the tendency to feathering at the tip of the hind tarsus of the male, and by the structure of the terminalia and the larva.

♀. *Head* with the usual large area of metallic silvery scales above in front. Proboscis with a pale line beneath, most distinct on basal half. *Thorax* : Scutum with the yellow and the black scales rather evenly mixed and usually about equal in numbers ; the yellow scales not arranged in lines, except that there is sometimes a tendency to the formation of a short median yellow line in front of scutellum ; in the typical form there is no definite yellow border to the scutum. Scutellum with the usual ornamentation. Postnotum with a small tuft of bristles as usual. Pleural

integument more or less darkened in middle, but largely yellow; a broad silvery stripe extends from *apn* to base of abdomen, but rather broadly interrupted on the sub-spiracular area; a small but quite conspicuous spot of silvery scales above middle coxa; *ppn* and post-spiracular area with narrow golden-yellow scales, some scales towards upper margin of *ppn* black. *Abdomen*: Tergite 1 with a pair of small dorsal silvery spots; 2-7 with oblique silvery lateral marks which on 3-7 are well removed from bases of segments; 8 with silvery scales. Sternites golden-yellow, 5 and 6 narrowly, 7 more broadly black on posterior border. *Legs* black; hind femur with small white knee-spot, outer surface yellow-scaled on basal two-thirds, dark dorsally to base.

♂. Proboscis more conspicuously white beneath than in ♀. Palpi only slightly shorter than proboscis (about 7 : 8). Claws of fore and mid legs rather small, simple, about half as long as fifth tarsal segment, and only slightly unequal. Hind tarsi (Fig. 69) with the scales on the last two segments rather long and suberect both above and below, forming a small paddle. *Terminalia* (Fig. 70, b): Sternite very

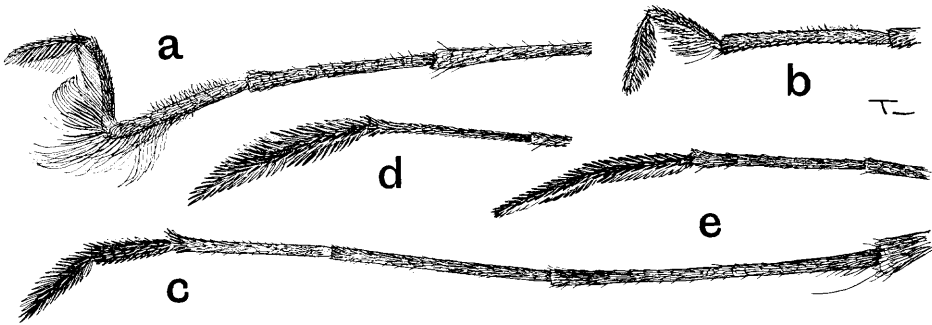


FIG. 69.—Hind tarsi of *Eretmapodites* spp. ♂. a. *oedipodius*. b. *oed. parvipluma*. c. *semisimplicipes*. d. *chrysogaster*. e. *subsimplicipes*.

large. Coxite small, with a stout basal arm ending in two long narrow blades or scales, these blades normally lying in close contact; a small hairy apical lobe; tergal flange only moderately projecting. Style slender, with a few scales and short hairs on basal half. Proximal claspette small, bearing a few short hairs only. Distal claspette broad and flat, mostly bare, but with a patch of simple hairs at its tip.

Wing-length, ♂ 3-4, ♀ 4-5.5 mm.

Distribution (as checked from examination of ♂ terminalia).—SIERRA LEONE: Freetown (*Austen*); Moyamba (*Pearson*). GOLD COAST: Obuasi (*Graham*); Kumasi (*Watt*); Aburi (*Patterson, Ingram*); Takoradi (*Pomeroy*). NIGERIA: Benin City (*Wilson*); Ibadan (*Pomeroy*); Epi (*Wigglesworth*). PRINCIPÉ I.: (*Tams*). CAMEROON: Missellele (*Zumpt*). UGANDA: Jinja (*Hopkins*). BELGIAN CONGO: Kabinda, Katanga (*Schwetz*); Kasongo (*Newstead*); Boma (*Nicolay*); Stanleyville, Tsheba, Bobendana, Lake Kivu and Mongbwalu, Ituri (*Schwetz*).

The record from Gambia (*Bathurst, Innes*) is probably correct but requires checking.

Variety?—In a series of females in the British Museum from BELGIAN CONGO (Nundu Tangany, Kivu; *Seydel*) and UGANDA (Kampala, *Hargreaves*, and Sezibwa,

Hancock), black scales predominate on the scutum except for a rather conspicuous yellow border, and the first abdominal tergite lacks the small dorsal silvery spots. When the male is discovered this form may prove to be a distinct species.

Synonymy.—Theobald's description of *E. quinquevittatus* being composite, I proposed in 1911 to restrict the name to the female described by him with striped thorax, using Graham's name *chrysogaster* for the species with feathered hind tarsi in the male. Later (1914) I divided *chrysogaster* into three "varieties" (now considered species), basing my conception of "typical" *chrysogaster* on three of the males in Graham's collection in the British Museum and overlooking the fact that the

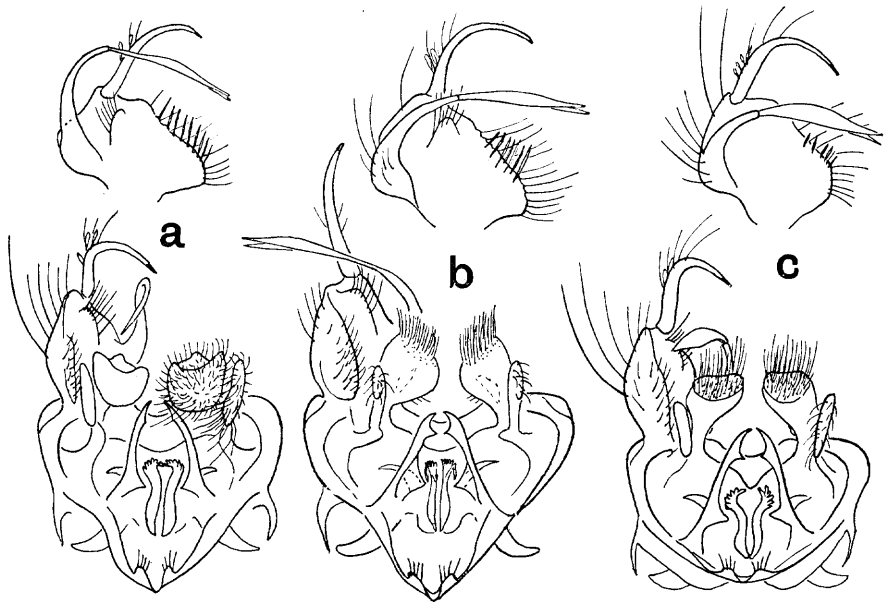


FIG. 70.—Terminalia, tergal view, with coxite shown separately from inside, of *Eretmapodites* spp. a. *intermedius*. b. *chrysogaster*. c. *subsimplicipes*.

figure given by Graham (in Theobald, 1910) clearly represented the terminalia of *semisimplicipes*. This figure was evidently prepared from a specimen which Graham retained in his possession and should perhaps have been regarded as the type of the species, but in order to avoid further confusion a lectotype has been chosen from the original series in the British Museum from Obuasi, all but one of which are *chrysogaster* in this restricted sense.

***Eretmapodites intermedius* Edwards.**

Eretmapodites intermedius Edwards, Proc. R. Ent. Soc., B, 5, p. 53 (1936).

TYPE.—♂ in B.M., Stanleyville.

Closely resembles *E. chrysogaster*, no difference in the ♀ or in ornamentation of ♂ being apparent.

♂. *Terminalia* (Fig. 70, a): Structure similar to that of *chrysogaster*, but claspettes strikingly different, the outer or proximal pair being larger, with much longer and

more numerous hairs, and the inner or distal pair differently shaped, the swollen head densely hairy all over instead of only at the tip; the pair of blades on the basal arm of the coxite if anything still more slender.

Distribution.—UGANDA: Kasala, Mpumu (*Fraser*). KENYA: Kwandizi-Itaita and Mtungi-Kihunguri (*Hopkins*). BELGIAN CONGO: Stanleyville (*Schwetzel*). TANGANYIKA: Dar-es-Salaam (*McHardy*).

This material has been recorded previously as typical *chrysogaster*, but is now treated as distinct as the hypopygial difference is definite and constant over a wide area. A long series from Stanleyville, reared from fallen leaves of *Musanga* and banana, includes numerous males of *intermedius* but only one of *chrysogaster*.

Eretmapodites subsimplicipes Edwards.

Eretmapodites chrysogaster var. *subsimplicipes* Edwards, Bull. Ent. Res. 5, p. 76 (1914), and 20, p. 329 (1929).

TYPE.—♂ in B.M., Zanzibar.

Very similar to *E. chrysogaster*, but differs in both sexes in having the spot of silvery scales above the middle coxae either entirely absent or very small, represented by at most four or five scales; also, the hind femur is more extensively yellow on the outer surface, only about the distal fifth being dark. Integument of thorax yellowish except under the patch of silvery scales in middle of pleurae.

♂. Palpi only slightly shorter than proboscis. Claws of fore and mid legs larger than in *E. chrysogaster* and much more unequal, larger claw about as long as the fifth tarsal segment. Feathering of last two segments of hind tarsi rather less conspicuous than in *E. chrysogaster*. *Terminalia* (Fig. 70, c) resembling those of *E. chrysogaster* and *intermedius*, but arm of coxite shorter, the two contiguous blades broader, and claspettes rather different in shape.

Distribution.—ZANZIBAR (*Aders*). TANGANYIKA: Lindi (*Haworth*); Dar-es-Salaam (*McHardy*). KENYA: Mombasa (*de Boer*); Kilifi (*MacDonald*). NYASALAND: Mlanje (*Neave*). ZULULAND: Umhlatusi (*Bedford*).

Eretmapodites semisimplicipes Edwards.

Eretmapodites chrysogaster var. *semisimplicipes* Edwards, Bull. Ent. Res. 5, p. 76 (1914), and 20, p. 329 (1929).

TYPE.—♂ in B.M., Akrokerri, Ashanti.

Very similar to *E. chrysogaster*, no clear distinctions in ornamentation having been discovered; in most of the available specimens the integument of the thorax is darker, often almost wholly dark brown, but this is apparently not constant.

♂. Palpi shorter than in *E. chrysogaster*, being usually only a little over three-quarters as long as proboscis. Claws not very unequal. Feathering on last two segments of hind tarsi slightly less pronounced. *Terminalia* (Fig. 71, a) differing in several respects from those of the last three species; coxite with a much more prominent tergal flange or flap; style with more numerous scales and hairs, the hairs extending almost to the tip; apical lobe of coxite smaller, with only about three hairs; arm of coxite with four contiguous blades instead of two, the blades broader;

distal claspette bearing a row of hairs at its tip and in addition a longer, slightly flattened blade; proximal claspette small, pointed, with only one or two hairs.

Distribution.—GOLD COAST: Obuasi (*Graham*); Akrokerri, Nsawam and Sunyani (*Ingram*). NIGERIA: Epi (*Wigglesworth*). BELGIAN CONGO: Bas Lomami, also 1 ♂ from Stanleyville (*Schwetz*); Numbi, above Lake Kivu, ♀ only (*Schwetz*). UGANDA: Muko, Kigezi dist. (*Gibbins*). KENYA: Kakamega (*MacDonald*).

Variation.—Males from Kakamega differ from those from West Africa and Uganda in having the palpi almost as long as the proboscis, but the terminalia are identical.

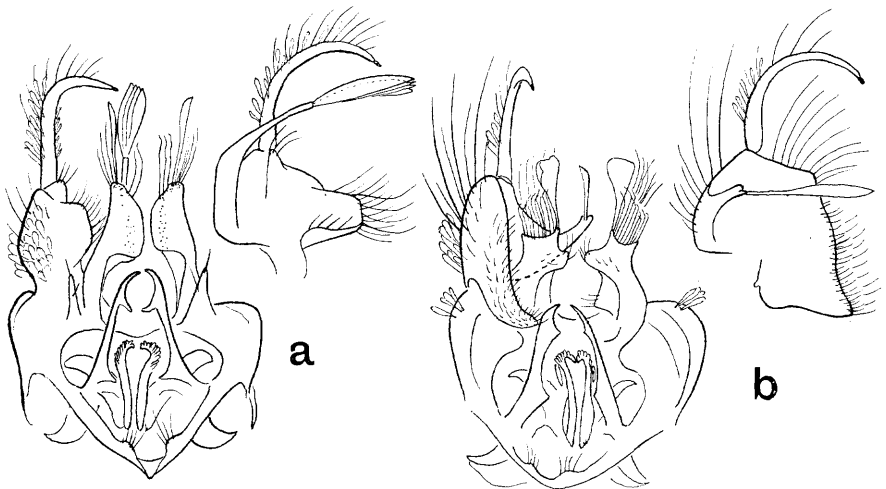


FIG. 71.—Terminalia (parts as Fig. 70) of *Eretmapodites* spp. a. *semisimplicipes*. b. *grahami*.

Eretmapodites grahami Edwards.

Eretmapodites grahami Edwards, Ann. Mag. Nat. Hist. (8), 8, p. 71 (1911), and Bull. Ent. Res. 3, p. 47 (1912).

TYPE.—♂ in B.M., Obuasi.

Very similar to *E. chrysogaster*, but the proboscis in both sexes lacks the whitish line beneath, or has it only faintly indicated.

♂. Palpi markedly shorter than proboscis (three-quarters to four-fifths). Claws of fore and mid legs moderately unequal. Last two segments of hind tarsi without any trace of feathering, all the scales small and appressed. *Terminalia* (Fig. 71, b): Coxite much extended basally on its tergal margin; a short sternal arm bearing some contiguous flattened blades much as in other species of the group. Sternite very large, bearing a few scales at corners (an unusual feature). Distal claspettes large and broad, bearing a row of hairs with bent tips, some longer fine hairs, and a broad blade. No proximal claspettes.

Distribution.—GOLD COAST: Obuasi (*Graham*). BELGIAN CONGO: Tsheba; Stanleyville (*Schwetz*). NIGERIA: Lagos (*Philip*).

Eretmapodites silvestris Ingram and de Meillon. (Pl. 3, fig. 9.)

Eretmapodites silvestris Ingram and de Meillon, S. Afr. Inst. Med. Res. 20, p. 330 (1929).

TYPE.—♀ (fragment) in B.M., Zululand.

A very distinct and isolated species, at once separated from others in the genus by the tufted hind tibia and (in the typical form) by the mesonotal ornamentation.

♀. *Head* with the usual ornamentation. Proboscis entirely black. Palpi black and unusually long, fully one-third as long as proboscis. *Thorax* with the integument yellowish, dark-brown in middle of pleurae. Scutum with a narrow median line of golden-yellow scales running the whole length, somewhat widened on front margin and in front of scutellum, also with a conspicuous border of golden-yellow scales, somewhat interrupted at scutal angle; remaining scales black, densest along lines of dorso-central bristles and tending to leave bare stripes on each side of these, especially anteriorly. Scutellum with the usual ornamentation. Postnotum with the usual tuft of bristles. Pleurae with a broad median silvery stripe which is scarcely interrupted on the subspiracular area; *apn* with silvery scales, *ppn* with narrow yellow scales as usual. *Abdomen* with the oblique silvery markings differing in shape from those of *E. chrysogaster*, arising at or close to basal lateral corners of tergites, the distal part of each mark broader and touching posterior margin of tergite in middle. *Legs* black; hind femur with small white knee-spot and extensively yellow on outer surface; hind tibia much more enlarged at tip than in species of the *chrysogaster* group, with the scales conspicuously roughened; scales at base of hind tarsus also somewhat roughened.

♂. Ornamentation as in ♀. Palpi about as long as proboscis. Anterior claws very unequal. Hind tarsi simple. *Terminalia* (Fig. 73, c): Coxite with thumb-like basal lobe bearing a few long hairs; apical lobe unmodified, but bearing three distally-flattened hairs; no scale-tufts. Style with one long hair and two short ones, no scales. Proximal claspette bearing a few long simple hairs; distal claspette stout and moderately long, bearing two bent hairs at its tip and a few simple ones.

Distribution.—ZULULAND: Eshowe (Ingram, de Meillon).

ssp. **conchobius** n.

TYPE.—♂ in B.M., Tiwi.

Differs from typical *silvestris* in both sexes as follows:—Integument of thorax clearer yellow, no darkening even in middle of pleurae beneath the silvery stripe. Median line of yellow scales on scutum either entirely lacking or represented by a short stripe in front of scutellum and a narrow line extending a short distance only from front margin; scales covering most of scutum brownish rather than black and less irregularly distributed. Hind femur with the antero-ventral yellow area less extensive, reaching little if at all beyond middle of femur instead of about $\frac{3}{4}$ of its length. *Terminalia* exactly as in typical *silvestris*.

Distribution.—KENYA: Malindi, viii.38, 1 ♂; Shimba Hills, 3 ♂, and Tiwi, 1 ♂ 2 ♀, vii.39 (MacDonald).

The specimens from Shimba Hills and Tiwi (near Mombasa) were reared from larvae found in snail-shells in forest, this being a notably different habitat from that of the type form (axils of *Dracaena* leaves).

Eretmapodites inornatus Newstead.

Eretmapodites inornatus Newstead, Ann. Trop. Med. 1, p. 12 (1907); Edwards, Ann. Mag. Nat. Hist. (8) 8, p. 69 (1911), Bull. Ent. Res. 3, p. 47 (1912), and Proc. R. Ent. Soc., B, 5, p. 53 (1936).

TYPES.—♂♀ in Liverpool, Belgian Congo.

This belongs to a group of four closely allied species which are together distinguished from others in the genus by having a conspicuous pattern of narrow yellow

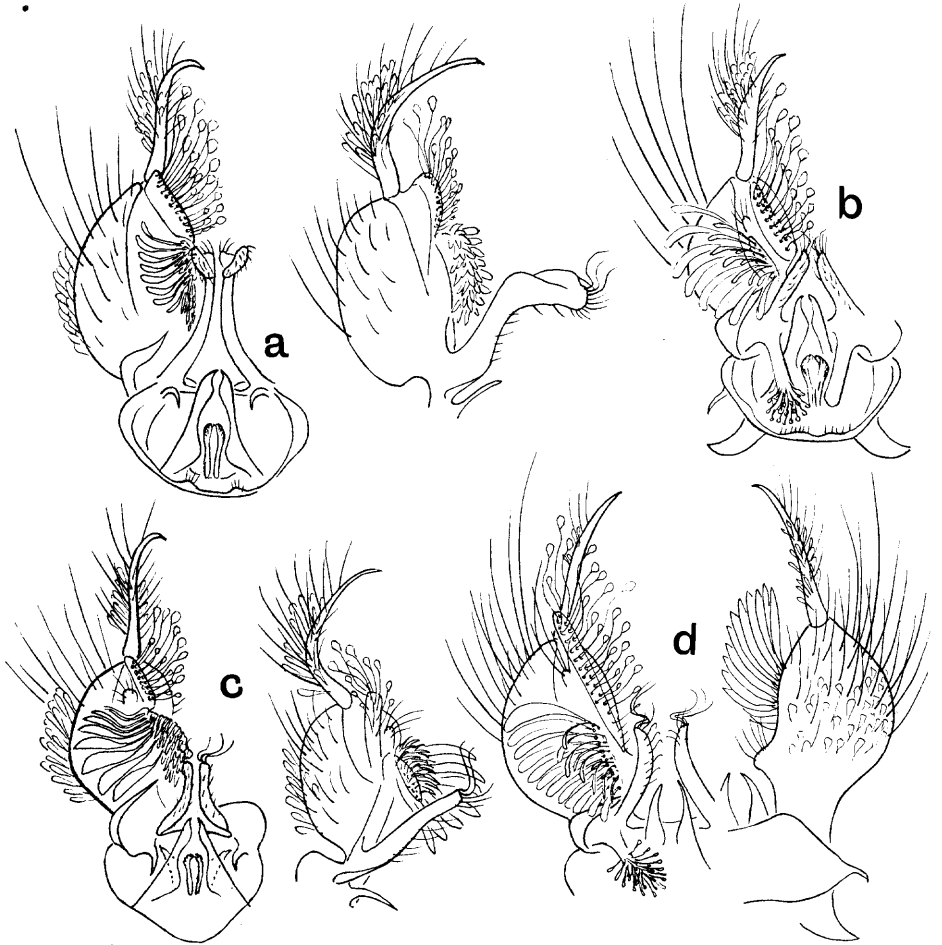


FIG. 72.—Terminalia, tergal view, with coxite in side view (a, c) or sternal view (d) of *Eretmapodites* spp. a. *forcipulatus*. b. *penicillatus*. c. *inornatus*. d. *argyrurus*.

lines on the largely dark mesonotum. The male terminalia show some peculiarities, notably the presence of a row of long, broad transparent scales on the basal lobe of the coxite. The four species, which have only recently been distinguished, differ chiefly in various details of terminalic structure.

♀. *Head* with the usual ornamentation. Proboscis all black. Palpi about one-fifth as long as proboscis. *Thorax* with integument mainly dark brown, lighter on most of pleurae. Scutum clothed mainly with narrow black scales, but with narrow

yellow scales forming a narrow border, a pair of narrow lines on anterior two-thirds, a median line on posterior third, and a pair of curved lines extending from scutal angles to near lateral lobes of scutellum. Pleuræ with the usual silvery stripe, continuous from *apn* across subspiracular area, sternopleura and mesepimeron; a rather large patch of silvery scales above mid coxa; *ppn* with narrow yellow scales below, black scales above; bristles mostly blackish, including those on *apn*, *ppn* and post-spiracular area. Postnotum dark brown, with the usual small group of bristles. *Abdomen* with silvery markings much as in *E. chrysogaster*; marks on second tergite oblique like the others, extending diagonally across tergite from base and leaving most of the lateral margin dark; tergite 7 with the pair of silvery spots widely separated in middle. *Legs* black; hind femur with the usual white knee-spot but almost entirely black on outer surface.

♂. Ornamentation as in ♀. Palpi slightly shorter than proboscis. Anterior claws very unequal. Hind tarsi simple. *Terminalia* (Fig. 72, c): Coxite with an apical lobe extending about half its length and bearing two or three irregular rows of remarkably modified hairs which have flattened, battledore-shaped tips, these hairs pale in colour, almost transparent; basal lobe large, with a mass of scales on inner side and a regular row of about six to eight large broad scales or modified hairs on outer edge; no scale-tuft on inner sternal face. Style uniformly tapering, with very numerous hairs and scales, especially about middle. Proximal claspette rudimentary, pointed, bare. Distal claspette moderately long and stout, straight, with a few bent hairs at its tip. Sternite smaller relatively to coxite than in the *chrysogaster* group. Eighth tergites with dense hairs, long outside, shorter inside.

Distribution.—BELGIAN CONGO: Coquilhatville and Lusambo (*Newstead*); river Ngangu, Bayaka district, Kwango (*Doucet*).

The colour of the post-spiracular bristles is of very doubtful value as a specific distinction; in one of the four paratypes examined they are yellowish.

Eretmapodites melanopus Graham.

Eretmapodites melanopus Graham, Entom. 42, p. 158 (1909); Graham in Theobald, Mon. Cul. 5, p. 570 (1910).

TYPE.—Lectotype ♀ in B.M., Obuasi.

This has usually been regarded as a synonym of *E. inornatus* Newst., from which it does not differ obviously in ornamentation. Graham's ♂ type was never deposited in the British Museum, and is presumably no longer in existence, so that it is now impossible to say to which, if any, of the four species into which *E. inornatus* is now divided his name *melanopus* should apply. Probably more than one species of the group occurs at Obuasi.

♀. The lectotype and one other female collected by Graham differ from paratype females of *E. inornatus* in having the silvery mark of the second abdominal segment much less oblique, extending for most of its length along the margin of the tergite; the post-spiracular bristles are yellow. Whether these are good specific distinctions or merely individual or sexual remains to be ascertained. The remaining specimen has the mark on the second segment oblique as in *E. inornatus* and in the ♂ of *E. forcipulatus*, and is perhaps not conspecific with the other two.

Distribution.—GOLD COAST: Obuasi (*Graham*).

Eretmapodites forcipulatus Edwards. (Pl. 3, fig. 8.)

Eretmapodites forcipulatus Edwards, Proc. R. Ent. Soc., B, 5, p. 53 (1936).

TYPE.—♂ in B.M., Sunyani, Ashanti.

Closely resembles *E. inornatus*; the only external distinctions (perhaps inconstant) observable in the few available specimens are that in the present species the postnotum is paler in colour and its bristles are reduced to one or two or absent; the post-spiracular hairs are yellow.

♀. Silvery marks of abdominal tergites as in *inornatus*.

♂. *Terminalia* (Fig. 72, a) similar in most respects to those of *E. inornatus*, but basal lobe of coxite smaller, its outer row of scales smaller; distal claspette longer, stouter, and bent almost at right angles beyond middle. Eighth tergites much less hairy than in *E. inornatus*, the hairs shorter.

Distribution.—GOLD COAST: Sunyani (*Ingram*), 3 ♂, 4 ♀. LIBERIA: Memeh town (*Bequaert*), 1 ♂, 1 ♀.

Eretmapodites penicillatus sp. n.

Eretmapodites melanopus (Graham ?) Edwards, Proc. R. Ent. Soc., B, 5, p. 53 (1936).

TYPE.—♂ in B.M., Ilesha.

I recorded this specimen in the paper cited as possibly the ♂ of *E. melanopus* Graham, but until more evidence is forthcoming as to the identity of Graham's species, or of the species of this group occurring at Obuasi, it is perhaps better to refer to this form under a different name.

♂. Quite similar in all external characters to *E. inornatus*, except that the post-spiracular bristles are yellow. Silvery marks of second abdominal tergite very oblique; those on seventh tergite separated. *Terminalia* (Fig. 72, b) similar in most respects to those of *E. inornatus* and *E. forcipulatus*, but differing conspicuously in having the proximal claspettes well developed, ending in a brush of hairs the tips of which are enlarged; also in having the style very noticeably enlarged in the middle instead of uniformly tapering. The coxite has a very few long narrow scales on the inner sternal margin, not forming a definite tuft; the apical lobe extends most of the length of the coxite but does not project at the tip; the basal lobe has only two or three rows of scales and about eight large scales in the outer row. Distal claspettes with simple hairs at tip. Eighth tergites with dense hairs, long outwardly, shorter and paler inwardly.

Distribution.—NIGERIA: Ilesha, 8.X.1910 (*L. E. H. Humfrey*). SIERRA LEONE: Freetown, tree-hole at Hill Station (*Evans*).

In the ♂ from Freetown the style is scarcely thickened in the middle, but the terminalia are otherwise similar, notably in having no scale-tuft on the coxite.

Eretmapodites argyrurus Edwards.

Eretmapodites argyrurus Edwards, Proc. R. Ent. Soc., B, 5, p. 53 (1936).

TYPES.—♂♀ in B.M., Lagos.

Very similar to *E. inornatus* and related species, but the available specimens of

both sexes differ in having the silvery marks of the seventh abdominal tergite confluent, forming a complete band. Further small differences (perhaps inconstant) are that there are a few flat silvery scales mixed with the narrow yellow scales on *ppn*, and a small group of silvery scales on the sternopleura below the main silvery stripe. A dark brown area in the integument of the sternopleura connecting the silvery stripe with the patch of silvery scales above mid coxa; remainder of pleurae mainly pale.

♀. Silvery mark of second abdominal tergite extending mainly along lateral margin (as in lectotype of *E. melanopus*).

♂. Silvery mark of second abdominal tergite much more oblique than in ♀. *Terminalia* (Fig. 72, d) resembling those of *E. penicillatus*, notably as regards form of proximal claspettes, but differing in various details. Style evenly tapering, not thickened in middle. Coxite with a conspicuous tuft of elongate scales on inner sternal margin; apical lobe projecting beyond end of coxite; basal lobe with about twelve large scales in the outer row. Distal claspettes with bent hairs at tips. Eighth tergites with the hairs fairly dense, but shorter than the more numerous hairs on the coxites.

Distribution.—NIGERIA: Lagos (*Connal*).

Eretmapodites tonsus sp. n.

TYPE.—♂ in B.M., Kakamega.

A species intermediate between *E. quinquevittatus* and the *E. inornatus* group; postnotum completely bare as in the former, but thoracic ornamentation apparently more resembling the latter.

♀. Unknown.

♂. *Head* with the usual ornamentation. Palpi nearly as long as proboscis. *Thorax* with the integument mainly yellow; a broad dark longitudinal stripe crossing pleurae, and a narrow vertical brown stripe on posterior edge of sternopleura, connecting the two areas of silvery scales, much as in *E. argyrurus*. Mesonotum of type considerably rubbed, but so far as can be made out the yellow stripes are narrow, as in the *inornatus* group; the sublateral yellow stripe certainly stops short at the scutal angle. Post-spiracular scales and bristles yellow. Silvery scales on *ppn* as usual. *Abdomen* black above; tergite 1 with lateral silvery stripe; 2 with an oblique silvery stripe from base nearly to posterior margin; remaining tergites each with a triangular silvery spot in middle of lateral margin. *Legs* dark; hind legs of type missing.

Terminalia (Fig. 73, b) resembling those of *E. quinquevittatus* more than those of any species of the *inornatus* group, but differing in various details. Coxite with a large scale-tuft on inner sternal margin, most of the scales broadly rounded at tips but a few of them pointed; apical lobe bearing two rows of modified hairs, about five in each row, the tips of these hairs oval or spatulate, not disc-like. Proximal claspette narrower than in *quinquevittatus*, and less densely covered with disciferous hairs; distal claspette with the usual twisted hairs at tip. Style somewhat stouter than in *quinquevittatus*, with many scales and a few hairs. Hairs of eighth tergites only moderately long and not numerous.

Distribution.—KENYA: Kakamega, trap N.5, 5.iii.36, 1 ♂ (per *E. C. MacDonald*), taken in company with *E. semisimplicipes*.

Eretmapodites quinquevittatus Theobald. (Pl. 3, fig. 6.)

Eretmapodites quinquevittatus Theobald, Mon. Cul. 1, p. 280 (1901) [♀ only]; Edwards, Ann. Mag. Nat. Hist. (8) 8, p. 67 (1911), and Bull. Ent. Res. 3, p. 47 (1912).

Eretmapodites condei Ventrillon, Arch. Parasit. 9, p. 144 (1905); Edwards, Ann. Mag. Nat. Hist. (8) 8, p. 70 (1911), and Bull. Ent. Res. 11, p. 138 (1920).

Eretmapodites austenii Theobald, Mon. Cul. 5, p. 572 (1910).

TYPES.—*quinquevittatus*, lectotype ♀ in B.M., Sierra Leone; *condei*, ♀ in Mus. Hist. Nat. Paris, Madagascar; *austenii*, ♂♀ in B.M., Sierra Leone.

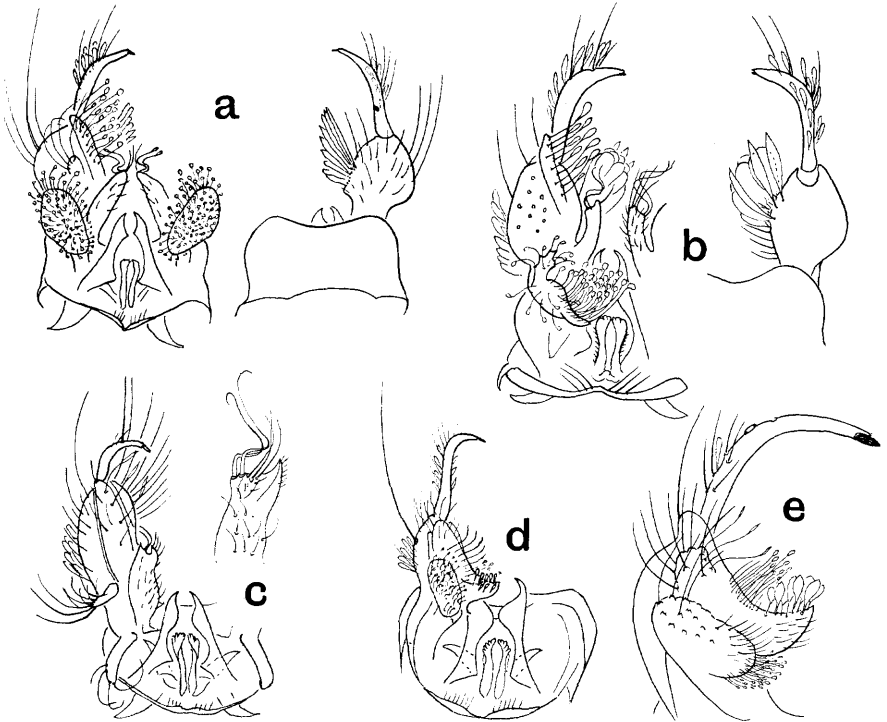


FIG. 73.—Terminalia, tergal and sternal views, of *Eretmapodites* spp. a–d. Standard scale for this genus. a. *quinquevittatus*. b. *tonsus*. c. *silvestris*. d. *dracaenae*. e. *dracaenae*, coxite in side view to larger scale.

This species is readily distinguished from most others of the genus by the markings of the scutum, which might be described as having five more or less parallel stripes of black scales on a yellow ground; of the intervening yellow stripes the sublateral pair extend well forwards instead of ending at the scutal angle as in the four following, which have a somewhat similarly striped thorax. *E. quinquevittatus* also differs from all the other species of the genus except the related *E. tonsus* in having the postnotum completely bare.

♀. *Head* with the usual ornamentation, but the patch of black scales at sides much smaller than in the *chrysogaster* group. Proboscis and palpi entirely dark.

Thorax with the integument rather bright yellow except for a small area in middle of pleurae under the silvery scales. Scutum with stripes of yellow scales arranged somewhat as in the *inornatus* group: a nearly continuous border, an admedian pair of lines on anterior two-thirds, a single median line on posterior third, and a pair of sublateral lines; all these however broader than in *E. inornatus*, so that the ground-colour appears yellow instead of black, also the sublateral yellow lines are not connected with the scutal angles but extend forwards into the humeral black patches; there are no yellow scales in the middle line dividing the central black stripe. Pleurae with the usual almost continuous silvery stripe from *apn* across mesepimeron. *Abdomen* with the silvery markings oblique and only moderately broad; tergite 1 with a pair of small dorsal silvery spots; tergite 7 usually with a complete silvery band, the black scales on its posterior margin more or less appressed; tergite 8 with silvery scales. *Legs* black, femora extensively yellow towards base.

♂. Resembles ♀. Front and middle claws very unequal, one of each pair as long as the last tarsal segment. Tip of hind tarsi unmodified. Palpi only slightly shorter than proboscis. *Terminalia* (Fig. 73, a): Coxite with a conspicuous tuft of lanceolate scales on inner sternal aspect; apical lobe bearing numerous (about 20) hairs with disc-like tips, as in the *inornatus*-group. Proximal claspettes forming large oval bodies which are densely covered with globiferous hairs somewhat like those of the apical lobes. Distal claspettes with a few bent hairs at tips. Style with numerous hairs and scales, especially about middle.

Distribution.—SIERRA LEONE: Freetown (*Austen, Smith, Bacot*). BELGIAN CONGO: Stanleyville (*Schwetz*). TANGANYIKA: Dar-es-Salaam (*Scott*); Lindi (*Haworth*). ZANZIBAR (*Aders*). S. RHODESIA: Salisbury (*Leeson*). NATAL: Durban (*Bevis*); Umhlatusi (*Bedford*). MADAGASCAR: Mayotte I. (*Ventrillon*).

The identity of West and East African specimens has been established by comparison of mounted terminalia of specimens from Freetown, Zanzibar and Lindi, all of which conform to the above description.

Eretmapodites dracaenae Edwards. (Pl. 3, fig. 7.)

Eretmapodites dracaenae Edwards, Bull. Ent. Res. 6, p. 362 (1916).

TYPE.—♂ in B.M., Freetown.

Much resembles *E. quinquevittatus*, with which it has sometimes been confused, but differs in markings of thorax and abdomen and in several other respects.

♀. Sublateral yellow stripes of scutum curving outwards to scutal angles and not continued forwards into the dark area behind shoulders as in *E. quinquevittatus*. Median black stripe of scutum usually divided by a thin line of yellow scales (but this line is apparently absent in some specimens). Postnotum with two or three small bristles apically. *Abdomen* with first tergite dark-scaled above, lacking the small pair of silvery spots; silvery markings of tergites 2-7 larger, occupying most of basal half of each tergite, but not quite confluent dorsally except on tergite 7 and sometimes on 6. Black scales on posterior margin of tergite 7 (also on sternites 6 and 7) large and conspicuously roughened. Scales on tergite 8 with a coppery tint rather than silvery.

♂. Resembles ♀. Claws and palpi as in *E. quinquevittatus*; hind tarsi unmodified. *Terminalia* (Fig. 73, d, e) small. Ninth sternite large. Coxite short, with a single long stiff hair towards outer margin; apical lobe not clearly differentiated, without modified hairs. Basal lobe bearing a number of short scales. Distal claspette very pale (difficult to distinguish except in a well-stained specimen), rather short, thick, the enlarged tip with a row of longer almost simple hairs and very numerous shorter hairs with enlarged tips. Proximal claspette absent. Style with fairly numerous scales and hairs.

Distribution.—SIERRA LEONE: Freetown (*Bacot*). GOLD COAST: Obuasi (*Graham*); Takoradi (*Pomeroy*). UGANDA: Kampala (*Hopkins*).

Uganda specimens do not differ from those from Sierra Leone.

Eretmapodites oedipodius Graham.

Eretmapodites oedipodeios Graham, Entom. 42, p. 86 (1909); Graham in Theobald, Mon. Cul. 5, p. 560 (1910).

Eretmapodites oedipodius Edwards, Bull. Ent. Res. 3, p. 48 (1912).

TYPES.—♂♀ (lectotypes) in B.M., Obuasi.

Differs from all other species of the genus in the modification of the tips of the hind tarsi of the ♂.

♀. Very similar to *E. dracaenae* in ornamentation, except for the very different scaling of *apn*; the subspiracular area is also bare, so that the pleurae appear much less obviously striped, but in compensation for the lack of silvery scales on the upper front portion of the pleurae the silvery spot on the propleura is much larger than in the other species. Median black stripe of scutum without the dividing line of yellow scales usual in *E. dracaenae*. Black scales of seventh abdominal segment not noticeably roughened.

♂. Resembles ♀ in colouring. Palpi about three-quarters as long as proboscis. Claws of front and middle legs both rather large, the smaller claw of middle legs unusually broad, blade-like; fifth mid-tarsal segment shorter than fourth, with unusually long hairs at tip. Hind tarsi with segments 3-5 remarkably modified (Fig. 69); 3 with erect or roughened scales beneath on its whole length, and with very long slender scales above on distal fourth or more; 4 slightly enlarged at base, the enlargement bearing long dark scales which on one side are nearly as long as the segment, on the other only about half as long; 5 with long scales beneath; 4 and 5 together longer than 3; 4 usually bent at a right angle with 3 and 5 with 4. *Terminalia* (Fig. 74, a): Eighth tergites with small tufts of extremely long stout yellow hairs. Sternite relatively smaller than in most of the other species and coxite larger. Style almost bare. Coxite with a rather conspicuous tuft of narrow scales on inner sternal margin and with several long hairs; apical lobe prominent, bearing only a few hairs with slightly enlarged tips; basal lobe without scales but with a row of about 6-8 long simple hairs and a second row of shorter hairs. Distal claspettes long, arched, tips somewhat swollen, with about 10 short reflexed hairs. Proximal claspettes (Fig. 74, b) short, with two simple hairs and a peculiar scale at tip.

Distribution.—GOLD COAST: Obuasi (*Graham*); Bibianaha (*Spurrell*). SIERRA LEONE: Segbwema (*Hides*).

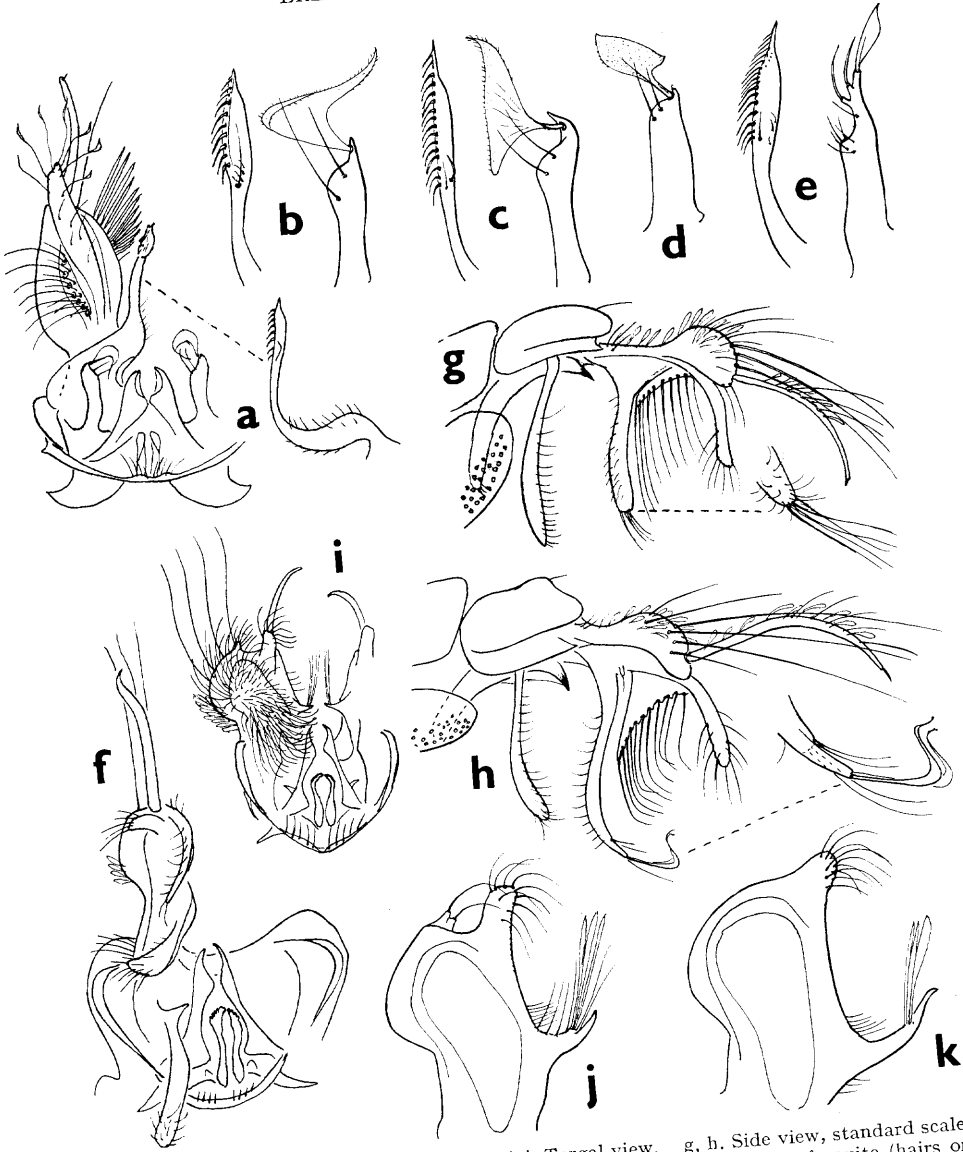


FIG. 74.—Terminalia of *Eretmapodites* spp. a, f, i. Tergal view. g, h. Side view, standard scale. b-e. Tip of distal claspette and whole proximal claspette. j, k. Outline of coxite (hairs on claspette omitted), to larger scale. a, b. *oedipodius*. c. *oe. stanleyi*. d. *oe. parvipluma*. e. *oe. wansoni*. f, g. *leucopus*. h, l. *productus*. i, j. *plioleucus*. k. *pl. brevis*.

ssp. *stanleyi* n.

TYPE.—♂ in B.M., Stanleyville.

♀. Appears indistinguishable from typical *oedipodius*.

♂. One claw of middle leg blade-like, as in typical *oedipodius*, but of rather different shape; fifth mid-tarsal segment as long as fourth. Hind tarsi much as in typical *oedipodius* except that segment 3 has few or no long scales at tip above.

Terminalia differing from those of typical *oedipodius* in several details: hairs on basal lobe of coxite much more numerous and more nearly equal in length, some narrow sharp-pointed scales in addition to the hairs; tip of distal claspette (Fig. 74, c, left) rather longer and less swollen, ending in a sharper point; proximal claspette (Fig. 74 c, right) longer with the modified scale at tip larger and differently shaped (quite similar in three mounts compared).

Locality.—BELGIAN CONGO: Stanleyville (*Mouchet, Schwetz*).

ssp. **parvipluma** n.

TYPE.—♂ in B.M., Kasuku, Uganda.

♀. Closely resembles typical *oedipodius*, except that the silvery markings of the abdomen are rather smaller.

♂. Resembles ♀. Claws of middle leg and tip of hind tarsus differing from typical *oedipodius*, but closely resembling ssp. *wansoni* (described below). *Terminalia*: Basal lobe of coxite with about a dozen hairs in all, the longest towards the base, no scales; tip of distal claspette much as in ssp. *stanleyi*; proximal claspette (Fig. 74 d) with short stout stem, the modified scale at tip broad, without a long point.

Localities.—UGANDA: Kasuku, 24. iv. 31, 1 ♂ (*Hancock*); Damba I., L. Victoria, 1 ♀ (*Carpenter*). BELGIAN CONGO: Bobendana, L. Kivu, 1 ♀ (*Schwetz*). The association of the females with the type male is conjectural.

Specimens reared by Shillito from larvae found in banana leaf axils at Fort Portal were probably of this subspecies.

A female from Shimba Hills, KENYA (*MacDonald*) has the silvery spots large and the hind tibia extensively yellow beneath; it may represent another subspecies.

ssp. **wansoni** n.

TYPE.—♂ in B.M., Matadi.

Closely resembles typical *oedipodius*, from which it differs mainly if not solely in characters of the male tarsi and terminalia.

♀. Unknown.

♂. Middle tarsi with last two segments subequal in length; one claw nearly as long as segment, simple, not flattened; second claw not much shorter but more slender, with a fine tooth. Hind tarsi with scales on segment 3 all small and appressed; scales at base of segment 4 subequal in length, the longest only half length of segment; 5 with long scales beneath as in *oedipodius*; 4 and 5 together not longer than 3, bent as in *oedipodius*. *Terminalia* very similar to those of typical *oedipodius*, differing chiefly in form of proximal claspette (Fig. 74, e, right), which bears a much smaller terminal leaf; basal lobe with few hairs as in typical *oedipodius*, but tip of distal claspette (Fig. 74, e, left) with more reflexed hairs, those towards the tip crowded.

Locality.—BELGIAN CONGO: Matadi (*Wanson*), 2 ♂ bred from larvae in banana leaves, v. 1938.

Eretmapodites leucopus Graham.

Eretmapodites leucopous Graham, Entom. 42, p. 88 (1909); Graham in Theobald, Mon. Cul. 5, p. 564 (1910); Edwards, Ann. Mag. Nat. Hist. (8) 8, p. 71 (1911), and Bull. Ent. Res. 3, p. 48 (1912).

TYPE.—♂ (lectotype) in B.M., Obuasi.

Differs from all other members of the genus except the closely-allied new species described below in its white-tipped hind tarsi.

♀. *Head, thorax* and *abdomen* practically as in *E. oedipodius*. Middle femur narrowly white at tip above, hind femur more distinctly so. Hind tarsi with the first three segments dark, with very few or no white scales at tip of third segment, last two segments pure white, the fifth fully two-thirds as long as the fourth.

♂. Ornamentation quite as in ♀; proportions of last two hind tarsal segments similar. Palpi about four-fifths as long as proboscis. Middle claws unequal, simple, the larger not much shorter than fifth tarsal segment. *Terminalia* (Fig. 74, f, g) of remarkable structure. Ninth sternite very large. Coxite narrow at base, widened distally; apical lobe forming a projecting arm with some simple hairs at its tip; basal lobe with a regular row of long simple hairs. Style very long and slender, with fairly numerous scales and several long hairs. Both proximal and distal claspettes forming long arms, the former the longer, fringed distally with fine simple hairs, latter with a few longish simple hairs at tip.

Distribution.—GOLD COAST: Obuasi (*Graham*); Akrokerri (*Ingram*). SIERRA LEONE: Freetown (*Evans*).

ssp. **productus** n.

TYPE.—♂ in B.M., Stanleyville.

♀. No apparent distinctions from typical *leucopus*.

♂. Differs from typical *leucopus* in details of terminalia (Fig. 74, h): distal claspette longer instead of shorter than proximal claspette, more drawn out to the pointed tip, and provided at the extreme tip with two long, flattened and bent setae; basal lobe more produced and pointed (structure constant in eight males examined).

Localities.—BELGIAN CONGO: Stanleyville and Bas Lomami, also Mongbwalu, Ituri (*Schwetzer*). A female from Lundu, Kwango (*Mortiaux*) may belong to this form.

Eretmapodites plioleucus sp. n.

TYPE.—♂ in B.M., Kumasi.

Closely resembles *E. leucopus* in ornamentation, but differs in both sexes in having no white scales at tip of middle femur, and hind tarsi with tip of third segment as well as whole of last two white, the fifth segment being scarcely more than half as long as the fourth.

♂. Middle claws small and equal, not half as long as fifth tarsal segment, one claw toothed. *Terminalia* (Fig. 74, i, j) entirely different from those of *E. leucopus*. Ninth sternite smaller. Coxite short, not unusually narrow at base, rather truncate at tip with a small external projection in addition to the short internal apical lobe, the

latter projecting backwards instead of downwards; basal lobe forming a short projecting pointed arm bearing three long and very slender scales and some fine hairs. Distal claspette forming a large pad which is very densely clothed with long simple hairs. Proximal claspette absent. Style short, slender, and completely bare.

Locality.—GOLD COAST: Obuasi (*Graham*), 1 ♂, 1 ♀.

ssp. **brevis** n.

TYPE.—♂ in B.M., Stanleyville.

Externally identical with the typical Gold Coast form.

♂. *Terminalia* (Fig. 74, k).—Coxite without any external process, internal apical lobe shorter than in the Gold Coast type; basal arm rather longer, bearing only the three scales, but one of these rather broader than the others; distal claspette with the hairs rather shorter and less dense; otherwise as in the Gold Coast type.

Locality.—BELGIAN CONGO: Stanleyville (*Mouchet*).

CULEX Linnaeus.

Culex Linnaeus, Syst. Nat. Ed. 10, p. 602 (1758); Dyar and Knab, Proc. Ent. Soc. Washington, 11, p. 30 (1909); Barraud and Covell, Ind. J. Med. Res. 15, p. 671 (1928); Barraud, Fauna Brit. Ind. Cul. p. 332 (1933).

GENOTYPE.—*C. pipiens* L. (Europe). (For synonymy see under subgenera.)

Two positive features distinguish adults of the genus *Culex* from all other Culicine mosquitoes: the presence of a pair of broad pulvilli beneath the claws and of an armature of teeth on the pharyngeal bar of the female. Macroscopically the general absence of any striking ornament usually characterizes species of this genus, and other characters are mainly negative, such as absence of teeth on the female claws, absence of spiracular and post-spiracular bristles and of scales on the paratergite. The male terminalia are of distinctive structure, the tuft of setae or spines on the tips of the paraprocts being found in no other genus.

Head.—Eyes usually touching for a considerable space above antennae, only rarely narrowly separated; usually also touching on lower surface of head below mouthparts. Orbital bristles in a continuous row. Proboscis (in Ethiopian species) of uniform thickness throughout in both sexes, curved forwards in repose and rarely much longer than front femur. Palpi of ♂ usually longer than proboscis, with last two segments slender, upturned, subequal in length and hairy; in a few species (subgenera *Neoculex* and *Mochthogenes*) the palpi are shorter or lack the hairs. Palpi of ♀ always short. Antennae in ♂ shorter than proboscis, plumose, with the last two segments elongate, the hairs of verticils evenly spread round the segments. Antennae of ♀ with first flagellar segment not longer than second. Vertex (with rare exceptions, in subgenera *Neoculex* and *Mochthogenes*) clothed only with narrow decumbent and forked erect scales.

Thorax.—*apn* well separated and bristly. Dorso-central bristles always present and usually strong and numerous; acrostichals also present in most species. Paratergite always narrow and bare. Several strong *ppn* bristles; no spiracular or post-spiracular. Postnotum always bare. Pleurae usually with only a few small

patches of scales (normally two on sternopleura, one on mesepimeron), sometimes quite without scales.

Legs slender, femoral and tibial bristles short and inconspicuous; hind tibia without close-set row of hairs on inner side at tip (except sometimes in subgenus *Neoculex*). Fourth tarsal segment not shortened in ♀. First hind tarsal segment rarely shorter than tibia, usually of about same length or slightly longer. Claws of front and middle legs of ♂ unequal, the larger and usually also the smaller with one tooth; hind claws of ♂ and all claws of ♀ simple. Pulvilli present, at least half as long as claws and padlike (except in subgenus *Lasiosiphon*).

Wings with scales on under surface long and narrow, also most of those on upper surface of veins 2 and 4 and end of 6; those on upper surface of 3 short and broad.

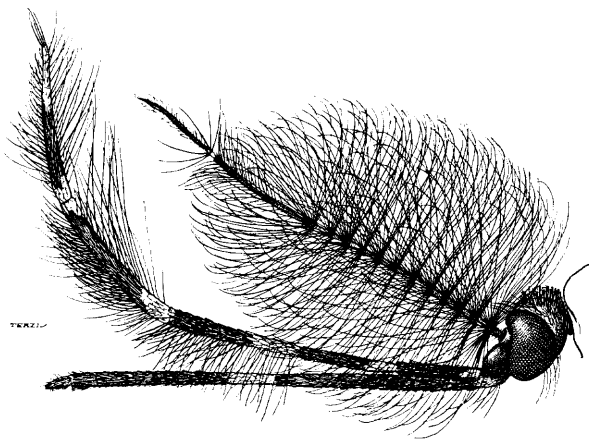


FIG. 75.—Head of ♂, *Culex (Culex) poicilipes* Theo.

Microtrichia distinct. Fork of vein 2 usually markedly longer than its stem; ending well beyond base of fork of 5. Squama fringed.

Abdomen with lateral lobes of first tergite always bare, median portion usually hairy and with only a small scaly area. Tip of abdomen in ♀ blunt, eighth segment not retractile, the tergite always visible; cerci short and broad, usually hidden.

♂. *Terminalia*.—Coxite somewhat conical, without basal lobes or claspettes, but with a subapical lobe bearing a number of modified bristles which are mostly directed tergally; membranous area on inner face of coxite extending from base to lobe. Typically the subapical lobes are divided, a proximal part bearing three stout rods, and a distal part bearing a leaf-like structure and three or four other more or less modified setae; the division of the lobe is not always obvious, but the seven or eight modified setae can be homologized in nearly all the species; for brevity they are referred to in the following descriptions by letters, *a*, *b*, and *c*, being the three proximal rods (*a* the most proximal), *d*, *e* and *f* the setae accompanying the leaf, *h* a usually simple seta which adjoins the lobe on the distal part of the coxite. Style usually sickle-shaped, articulating in a vertical plane, with a short terminal spine which is often flattened and widened distally. Paraprocts well developed, always (in African

species) with a tuft or crown of spines or short hairs at the tip. Phallosome always divided into a pair of lateral plates with variously developed teeth and processes.

♀. *Terminalia* (Fig. 6 ♀, r).—Very similar in all species examined (these including representatives of all the African subgenera and most of the main species-groups), and showing several differences from most or all other mosquito genera. Eighth segment not at all retractile, broad; sternite usually with shallow emargination. Ninth tergite narrow, with a group of hairs towards each side, bare in middle where it may be narrowed or interrupted. Insula with a tuft of about 8 stiff hairs, usually separate from the weak sigma. Cerci short, broad, blunt, obliquely set. Post-genital plate somewhat triangular, bluntly rounded or rarely indistinctly emarginate at tip, widely separated from the cowl by a membranous area, the sclerotized part setose, distal setae longer. Small atrial plates present, with a peculiar Ω -shaped or crescent-shaped plate between them on roof of atrium. Spermathecae always three in number, subequal and of moderate size, nearly always oboval in shape instead of spherical as in other genera.

Barraud and Covell (1928), who first made the discovery of the existence of pharyngeal teeth in female *Culex*, figured some strikingly different forms of these teeth among some of the Indian species, but the African species of the genus have not hitherto been examined in respect of these structures. As the pharynx teeth have proved of such great value in arriving at a natural classification of the genus *Anopheles*, it seemed very probable that equally good results might accrue from a study of the even more diverse forms of these structures in the genus *Culex*. I therefore examined the pharynx of one or more specimens of about 60 of the African species, and drawings by Miss M. Mackay of 45 of these are reproduced here. It must be admitted that no very striking results have been obtained, and the fact that some very dissimilar species have very similar pharynx-teeth makes the use of these structures in taxonomy of doubtful value; on the other hand they have in a few cases (e.g. in the group of *C. rima*) provided interesting confirmation of the distinctness of species which had previously been separated mainly on structures of the male terminalia. In all the figures only the pharyngeal bar and its lateral and ventral flanges are shown; the anterior part of the pharynx and the posterior hard palate have been dissected away in order to show the teeth more clearly in the mounts. (The general structure of the pharynx is similar to that in *Anopheles*; for an account of it see Barraud and Covell's paper and also Evans in this monograph, Vol. II).

Notes on the pharyngeal structure are here given after the diagnosis of each subgenus. Two Palaearctic subgenera of *Culex* have not as yet been found in the Ethiopian region, though it is possible they may occur in the south-eastern part of the Anglo-Egyptian Sudan or in Somaliland; these are *Barraudius* and *Lasiosiphon*. I have examined the female pharynx of the two known species of *Barraudius* and find them to be quite dissimilar; in the subgenotype (*C. pusillus* Mcq.) the teeth are few in number and are not firmly attached to the bar in the normal manner, but are free in the membrane between the mid- and post-pharynx; the second species (*C. modestus* Fic.) does not show this peculiarity, its pharynx being somewhat like that of the African *C. rubinotus*. In the single known species of *Lasiosiphon* (*C. adairi* Kirk.) the pharynx teeth lie free in the membrane as in *C. pusillus*, and are quite few and small; on the other hand the ventral papillae are unusually large.

As pointed out by Baisas (1939), who has described the pharynx of some of the Philippine *Culex*, there are normally two rows of teeth, but it is often very difficult to make out their exact nature in a mounted specimen, even when examined under a high-power objective; the structures have been drawn as well as they could be made out under a $\frac{1}{14}$ in. dry objective, but mistakes in interpretation may have been made in some cases, as it sometimes proved almost impossible to distinguish between the two rows of teeth or between teeth and ridges.

Barraud and Covell pointed out that the size of the posterior part of the buccal cavity, bearing the teeth, is not in direct relation to the size of the insect, but that some quite small species may have it as large as the large species of the subgenus *Lutzia*. This is also true of the African species, as will be evident from a comparison of the figures given in this book, which are all drawn to the same scale.

Apart from the notorious *C. fatigans*, very few species of this genus habitually attack man in Africa; most of the available evidence indicates that the majority of *Culex* prefer avian blood, while some attack reptiles and amphibia. Feeding takes place during the night.

So far as known all species of *Culex* form their eggs into rafts, which are deposited on the surface of water. The eggs cannot survive desiccation.

KEY TO ETHIOPIAN SUBGENERA OF CULEX.

MALES.

- 1. Palpi not one-fifth as long as proboscis *Mochthogenes* (p. 277).
 Palpi at least $\frac{1}{4}$ as long as proboscis, usually longer 2.
- 2. Palpi with a row of modified scales projecting obliquely downwards on distal part
 of shaft (Fig.) *Culiciomyia* (p. 270).
 Palpi without such scales 3.
- 3. Normally four or more lower mesepimeral bristles *Lutzia* (p. 246).
 Normally a single lower mesepimeral bristle, or none (very exceptionally 2-3) 4.
- 4. Phallosome with a pair of simple though often tuberculate lateral plates; tarsi
 always dark and pale scales of tergites usually apical *Neoculex* (p. 249).
 Phallosome with the lateral plates nearly always divided or toothed; tarsi
 sometimes ringed; pale scales of tergites nearly always basal *Culex* s. str. (p. 280).

FEMALES.

- 1. Normally four or more lower mesepimeral bristles *Lutzia* (p. 246).
 Normally a single lower mesepimeral bristle, or none (very exceptionally 2 or 3) 2.
- 2. Acrostichal bristles absent *Neoculex* (part); also *Culiciomyia macfieii* (p. 276).
 Acrostichal bristles present, even if quite small 3.
- 3. No lower mesepimeral bristle 4.
 1-3 lower mesepimeral bristles present 5.
- 4. Proboscis and tarsi ringed *Culex* s. str., part (p. 280).
 Proboscis and tarsi dark *Neoculex rubinotus* (p. 260).
- 5. Abdominal tergites with basal pale markings (bands or lateral spots); all
 decumbent scales of vertex, including the ocular row, quite narrow
 *Culex* s. str., part (p. ~~279~~²⁸⁰).
 Abdominal tergites with apical pale markings, or completely dark scaled 6.
- 6. All decumbent scales of vertex narrow *Neoculex* (p. 249).
 Some broadish scales on vertex, at least in a row adjoining eyes 7.
- 7. Only the scales of the ocular row broad, and these white *Culiciomyia* (p. 270).
 Usually more numerous broad scales on vertex, and these usually dark
 *Mochthogenes* (p. 277); also *Neoculex acrostichalis* (p. 268).

↳

Subgenus **LUTZIA** Theobald.

Lutzia Theobald, Mon. Cul. 3, p. 155 (1903).

Jamesia Christophers, Sci. Mem. Med. Ind. 25, p. 12 (1906).

GENOTYPES.—*Lutzia*, *L. bigoti* Theobald (S. America); *Jamesia*, *Culex fuscans* W. (Oriental Region).

Large species (the largest of the genus), with conspicuous pale mottling on anterior surfaces of femora. Lower mesepimeral hairs more numerous than usual in *Culex*, usually more than four. Palpi of ♂ normal, as in subgenus *Culex*. Cross-veins 3-4 and 4-5 close together.

♂. *Terminalia*.—Eighth tergite not deeply emarginate. Coxite without scales. Subapical lobes of coxite undivided, rods *a-c* stout and slightly hooked, setae *d-f*

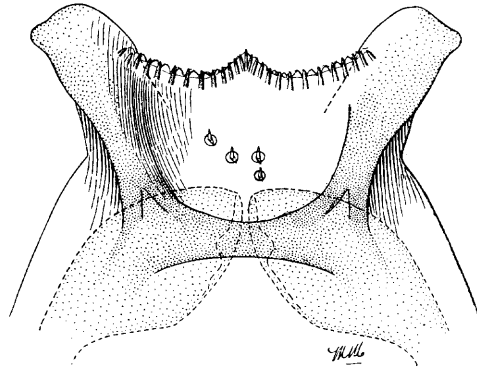


FIG. 76.—Pharyngeal teeth of *Culex (Lutzia) tigripes* Grp.

small and unmodified; leaf represented by a short stiff bristle. Paraproct with small lateral arm. Phallosome-plate with long pointed apex (ventral corner) and a close-set group of small teeth below this.

Pharynx-teeth.—In the stronger row of teeth there are about a dozen on each side, most of which are blunt, though a few of those in the middle are sharper, smaller and closer together; the teeth of the second row are short, pale, more or less triangular. The African *C. tigripes* (Fig. 76) is very like the Oriental species of the subgenus in pharynx structure. A peculiarity is the large size of the ventral flanges (shown in broken outline and stippled in the figure); with rare exceptions (as for example *C. rubinotus*) these flanges are much smaller in the species of other subgenera. Apart from this there is little to distinguish the pharynx of *Lutzia* from many species of the typical subgenus *Culex*.

The subgenus is based mainly on the modifications of the larva for predacity; there are no characters of the adult which would otherwise be regarded as sufficiently distinctive to justify the separation of the group from *Culex* s. str.

C. tigripes has not been recorded as biting man, and is rarely seen in houses, but MacGregor stated (in conversation) that it attacks goats in Mauritius.

Culex (Lutzia) tigripes Grandpré and Charmoy.

Culex tigripes Daruty de Grandpré and d'Emmerez de Charmoy, Les moustiques (1900); Theobald, Mon. Cul. 1, p. 34 (1901), and 5, p. 392 (1910); Edwards, Bull. Ent. Res. 2, p. 261 (1911).

Culex maculicrura Theobald, Mon. Cul. 2, p. 34 (1901).

Culex maculicrura var. *A. mombasaensis* Theobald, Mon. Cul. 2, p. 36 (1901).

Culex maculicrura var. *B. sierraleonis* Theobald, Mon. Cul. 1, p. 36 (1901).

Culex tigripes var. *bimaculata* Theobald, Mon. Cul. 5, p. 393 (1910).

Culex tigripes var. *fusca* Theobald, Mon. Cul. 5, p. 394 (1910); Edwards, Bull. Ent. Res. 2, p. 262 (1911); 3, p. 5, fig. 1 (1912); 11, p. 136 (1920).

Lutzia tigripes Edwards, Bull. Ent. Res. 12, p. 328 (1921), and 13, p. 83 (1923).

Types.—*tigripes*, ♂♀ cotypes (?) in B.M., Mauritius; *maculicrura*, ♀ in B.M., Durban, ♂ in B.M., B.C. Africa; *mombasaensis*, ♀ in B.M., Mombasa; *sierraleonis*, ♀ in B.M., Freetown; *bimaculata*, ♀ in B.M., Meshra el Ziraffa, Sudan; *fusca*, ♀ in B.M., Obuasi.

One of the largest species of the genus; usually distinguished very readily from any of its congeners and from most or all other African mosquitoes by the markings

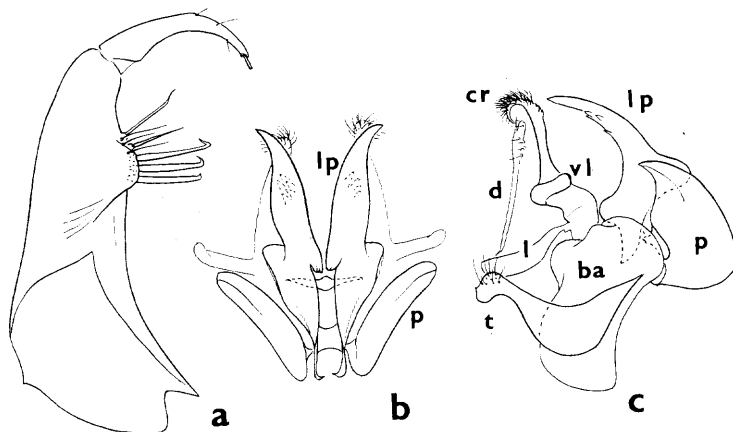


FIG. 77.—Terminalia of *Culex (Lutzia) tigripes* Grp. a. Coxite. b. Aedeagus. c. Aedeagus and proctiger in side view. Lettering as for Fig. 6. cr., crown of paraproct. vl., ventro-lateral basal arm of paraproct.

of the femora and tibiae, the only other species with somewhat similar leg-markings in the African fauna being *Culex poecilipes* and *Theobaldia longiareolata*.

♀. *Head* with most of the decumbent scales of vertex pale and all of them narrow; erect scales dark. Proboscis mainly dark-scaled, usually with a number of pale scales in middle beneath, though without a complete pale ring. Palpi about one-fifth as long as proboscis, blackish, with a variable number of whitish scales on inner side about middle. *Thorax* in most specimens with the greater part of the scutum clothed with dark brown scales, but with an ill-defined border of pale scales, and usually with pale scales forming three spots—a pair near middle of scutum and a median spot towards front margin. No post-spiracular scales, but a fairly large patch of white scales on upper part of mesepimeron. Propleura with numerous scales. Prosternum with 2-8 hairs or scales, or hairs and white scales mixed, longitudinally placed on each side of the middle line. Bristles on lower half of mesepimeron varying in number from three to ten, in a more or less regular row. *Abdomen* variable in markings, as described below under "variation." *Legs*: Front and middle femora and tibiae as seen from in front each with a row of about ten small pale spots on a dark ground, the individual spots rather irregular in shape and

sometimes with a slight tendency to coalesce; usually some scattered pale scales in addition to the spots; hind femora on outer surface with a rather indefinite mottling of light and dark scales; hind tibiae on outer side with a row of spots somewhat similar to those of the other tibiae but more or less completely united towards under-surface of tibia; tarsi devoid of pale rings though sometimes with the first segment more or less pale beneath. Wings dark-scaled; base of upper fork cell always distinctly proximal to that of the lower, fork usually about 2.5 times length of stem; *m-cu* usually about half its length proximal to *r-m*, sometimes less. *Pharyngeal teeth*, Fig. 76.

♂. Resembles ♀, but markings often tending to be less definite, e.g. on hind tibia. Palpi longer than proboscis and very hairy; a variable amount of pale scaling on outer surface of distal part of shaft; last two segments each with a conspicuous white spot at base beneath; terminal segment with the distal half pale beneath. *Terminalia* as figured (Fig. 77).

Wing-length 4–7.5 mm.

Distribution.—This species occurs commonly throughout the Ethiopian Region, from Gambia to Aden and from Khartoum to the Cape; it has also been reported from Fernando Poo, Mauritius and Madagascar.

Outside the Ethiopian Region *C. tigripes* is not known to occur, being represented by closely allied species which differ slightly in venation.

Variation.—The proboscis usually has a fairly extensive area of pale scales in the middle beneath, but very many specimens have the proboscis entirely black-scaled. So far as has been ascertained at present this variation has no geographical significance and is not correlated with variation in any other feature.

As noted in the above description there is considerable variation in regard to the markings of the abdomen, and this does seem to correspond to some extent with geographical distribution, although not in any precise manner. The following five forms can be recognized among the material in the British Museum; they can hardly be treated as separate varieties as the distinctions are too indefinite:

(1) Tergites 2–7 with narrow pale apical yellowish bands, the bands on 6 and 7 rather broader, sometimes occupying almost half the tergite; sternites all pale-scaled, unbanded. The great majority of specimens from East and South Africa belong to this form, but it is not confined to East Africa as there is a female in the British Museum from Bathurst, Gambia (*Simpson*). Most specimens of this form have the scattered pale scales on the dorsal surfaces of the femora fairly numerous and all the tarsi (but especially the hind pair) with numerous white scales at the base beneath.

(2) All tergites with blackish scales above and with white basal lateral spots (on tergite 8 a white basal band), no yellowish scales on distal margins of tergites, except occasionally a very few at extreme corners of 6 and 7; sternites all pale-scaled, unbanded. This is the usual form in West Africa; it has commonly been known as var. *fusca* Theo., but Theobald's earlier name *sierraleonis* (which I have hitherto overlooked) also applies to it; the most easterly records are Kabinda, Katanga (*Schwetz*) and Kisumu, Kenya (*Symes*). In most specimens of this form there are few or no scattered pale scales on the femora (apart from the usual spots), and the tarsi are entirely dark.

(3) Tergites as in the last, but sternites 5-7 or 4-7 with fairly well-marked dark apical bands, scarcely if at all interrupted in the middle. The type of Theobald's var. *mombasaensis* is of this form, and the British Museum also possesses similar females from Salisbury, S. Rhodesia (*Marshall*); Elizabethville, Katanga, and Mahagi Port, Lake Albert (*Schwetz*); Lueba, L. Tanganyika (*Bois*); Kasala Forest, Uganda (*Fraser*); Ibadan, Nigeria (*Leslie*).

(4) Tergites 2-4 with narrow apical bands and with pairs of ill-defined yellowish spots; 5 with a broader apical yellow band; 6-8 entirely yellow-scaled; sternites unbanded. This is Theobald's var. *bimaculata* from Meshra el Ziraffe, Sudan, still only known from the type ♀; a ♂ from Khartoum is somewhat similar.

(5) Tergites 2-5 with broad apical yellowish bands and sometimes also with narrower yellowish basal bands, 6-8 entirely or almost entirely yellow-scaled; venter pale scaled; legs (especially under sides of femora and tibiae) much paler than in the other forms; thorax also paler, so that whole insect has a "sandy" appearance. Aden Hinterland: Four females (*Patton*), and a series of 5 ♂ 3 ♀ reared from larvae found near the summit of Jebel Jihaf, 7100 ft. (*E. B. Britton*); the only form seen from this locality.

One very small specimen, typical as regards colouring, from Kisumu (*Symes*) has the upper fork-cell unusually long, fully four times as long as its stem.

Subgenus **NEOCULEX** Dyar.

Neoculex Dyar, Proc. Ent. Soc. Washington, 7, p. 45 (1905).

Eumelanomyia Theobald, Mon. Cul. 5, p. 114 (1910).

Protomelanoconion Theobald, Mon. Cul. 5, p. 462 (1910).

GENOTYPES.—*Neoculex*, *C. apicalis* Adams (as *irritans* Walk., N. America); *Eumelanomyia*, *C. albiventris* Edw. (as *E. inconspicua* Theo.); *Protomelanoconion*, *C. horridus* Edw. (as *P. fuscum* Theo.).

Small to medium-sized species, usually with pale markings of abdomen situated on posterior margins of tergites. Palpi of ♂ often normal, but tending in many species to be shortened and to lose their hair-tufts. A single lower mesepimeral bristle present or absent. Cross-veins well separated.

♂. *Terminalia*.—Eighth tergite usually deeply emarginate in middle. Coxite without scales (except in *C. pulchrithorax*); subapical lobe variously developed; rods *a-c* often bent or twisted and flattened, leaf usually distinct. Style unmodified, without subapical spiny crest. Paraproct with more or less dense hair-tuft at tip, but usually without lateral arm. Phallosome-plate simple, without strong processes, but often with numerous small teeth or tubercles scattered over the surface.

Pharynx-teeth remarkably varied, as noted below in the definitions of the species groups.

In 1932 I placed the species of this subgenus in three groups, corresponding with the three genera given above as synonyms of *Neoculex*. It now appears that the first of these includes diverse elements, and it would be better to recognize five groups amongst the African species.

Group A (*C. pulchrithorax* Edw.): Thorax with a conspicuous pattern of white lines. Palpi of ♂ bare. *Terminalia* with many peculiarities, as described below.

Pharynx-teeth (Fig. 78, *a*) not unlike those of *C. salisburyensis*, and not at all resembling either of the known species of the subgenus *Barraudius*.

Group B (*Neoculex* s. str. ; *C. salisburyensis* and related species): Thorax without obvious markings either in scales or pleural integument. Palpi of ♂ usually as long as proboscis or longer and more or less hairy (practically bare in *seyrigi*). Decumbent scales of vertex all narrow, even round eye-margins. Terminalia: *C. seyrigi* and *C. pèringueyi* are quite different from the other form species, the former showing some points of resemblance to *C. pulchrithorax*; the other species do not differ greatly in the terminalia from those of the next group, one minor point which they

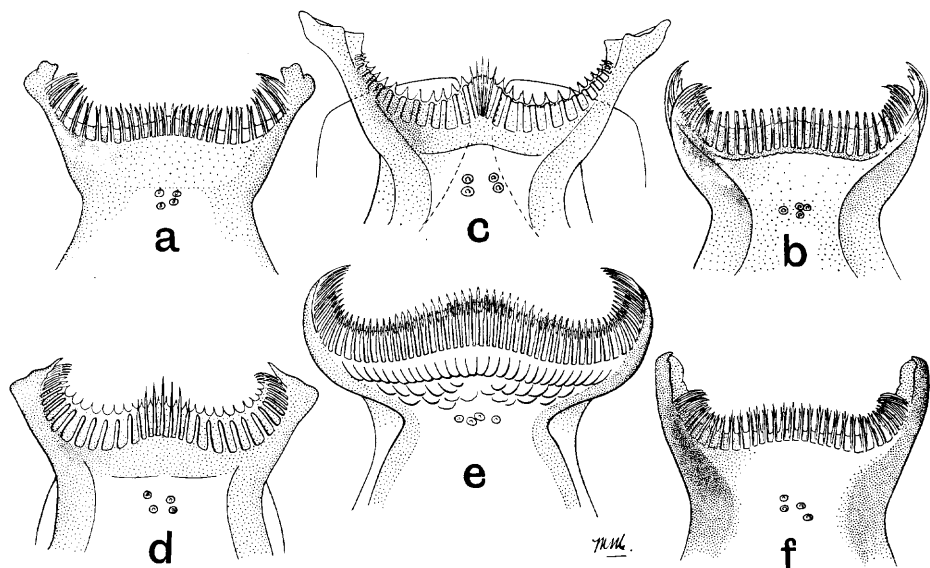


FIG. 78.—Pharyngeal teeth of *Culex* (*Neoculex*) spp. a. *pulchrithorax*. b. *pèringueyi*. c. *rubinotus*. d. *andreanus*. e. *kingianus*. f. *salisburyensis*.

have in common being the presence of only a single fine hair on the style. Pharynx-teeth (Fig. 78): *C. pèringueyi* (Fig. 78, *b*) and *salisburyensis* (Fig. 78, *f*) have the teeth of the two rows similar, slender and pointed (those of the lower row in *salisburyensis* seem to have forked tips), about ten distinct and similar teeth on each side of the middle line, apart from the hair-like ones on each side. *C. rubinotus* (Fig. 78, *c*) and *andreanus* (Fig. 78, *d*) have about the same number of teeth as in *C. salisburyensis*, but their form is quite different, those of the upper row being mostly blunt, with a few long, pointed ones in the middle, those of the lower row pointed; *C. rubinotus* has the lateral flaps unusually long and is also unique in this subgenus in having the ventral flaps large, as in *Lutzia*. *C. kingianus* (Fig. 78, *e*) is peculiar in having the part of the bar below the teeth strongly sculptured; the teeth are also more numerous than in the other species of this group, though not quite so numerous as in those of the next one.

Group C (*rima* group): Thorax without any obvious pattern above, but with

dark markings on pleural integument (usually distinct; faint only in *galliardi*). Palpi of ♂ as long as proboscis or longer and hairy at tip. Decumbent scales of vertex all narrow, even round eye-margins. Terminalia: style long, slender, sickle-shaped, with only one fine hair, tip not noticeably snout-like; *lp* tuberculate and usually more or less finger-like. Pharyngeal teeth (Fig. 79): Very numerous, about

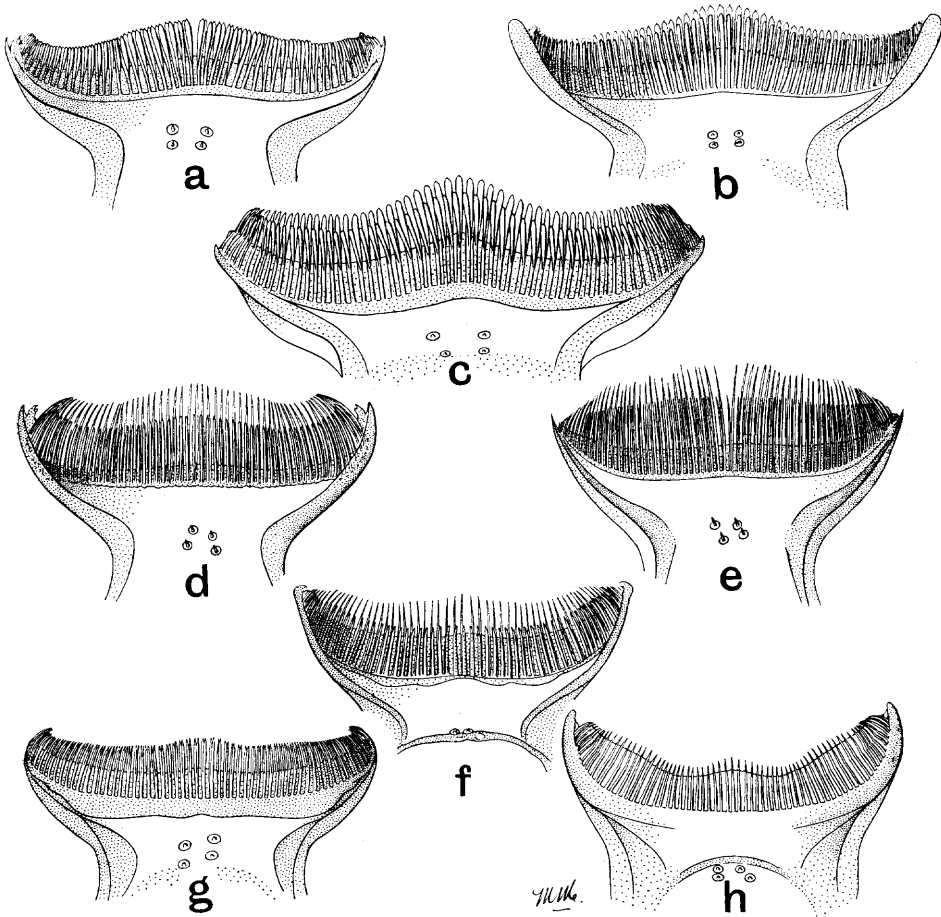


FIG. 79.—Pharyngeal teeth of *Culex (Neoculex)* spp. a. *rima*. b. *sunyaniensis*. c. *galliardi*. d. *wigglesworthi*. e. *insignis*. f. *calabarensis*. g. *subrima*. h. *albertianus*.

25 on each side of the middle line; the appearance is very different from that seen in species of Group B.

Hitherto *C. rima*, as determined by the pleural and abdominal markings, has been supposed to be an isolated but rather variable species. During the preparation of this volume I came to the conclusion that small differences which had been observed in the male terminalia were of more importance than had been supposed, and decided to recognize eight species in this group instead of a single one. The existence of more than one species had already been suspected by Hopkins on account of differences

he noted among the larvae, and it was of interest to find that the distinctions in male terminalia were associated with differences in the pharynx-teeth of the females. In *C. rima* (Fig. 79, a) and *sunyaniensis* (Fig. 79, b) the teeth of both rows are blunt, almost spatulate, and of about the same length. In *C. galliardi* (Fig. 79, c) they are similar in form but those of one row are distinctly longer than those of the other. In *C. subrima* (Fig. 79, g) the teeth of both rows are of the same length, but more slender and pointed. In *C. calabarensis* (Fig. 79, f) and *wigglesworthi* (Fig. 79, d) the teeth of one row are rather blunt, those of the other much longer and sharply pointed. In *C. insignis* (Fig. 79, e) the teeth of both rows are sharply pointed, those of one row much longer than those of the other. Finally in *C. albertianus* (Fig. 79, h; only the unique type is available) there appears to be only one row of sharp teeth. The structure in all species of this group is more clearly visible than in many others.

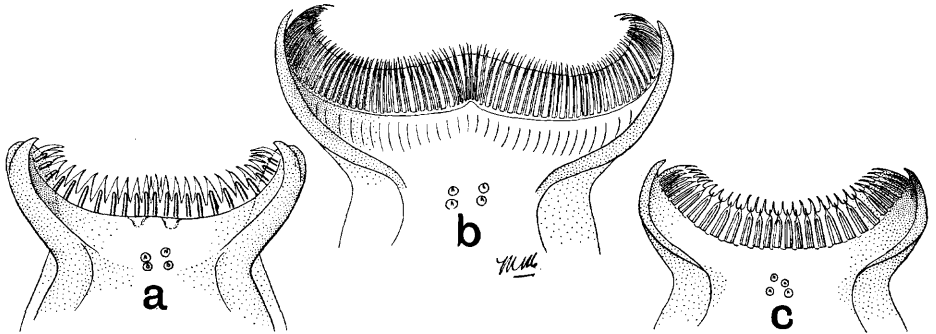


FIG. 80.—Pharyngeal teeth of *Culex* (*Neoculex*) spp. a. *albiventris*. b. *acrostichalis*. c. *horridus*.

Group D: Thorax without obvious markings either in mesonotal scales or pleural integument. Abdomen dark above, pale beneath. Palpi of ♂ scarcely as long as proboscis and quite bare. Vertex with numerous broad scales across middle in front. Terminalia: Style widened beyond middle; setae adjoining leaf peculiarly bent. Pharynx-teeth: *C. albiventris* (Fig. 80, a) has one row of blunt teeth and one of sharp pale ones, only about ten in each row on each side of the middle line. *C. acrostichalis* (Fig. 80, b) is quite different, with much more numerous long and finely-pointed teeth, and a suggestion of sculpturing on the basal part of the bar.

Group E (*Protomelanoconion*; *C. horridus* Edw.): Dull species without special ornament but with pale scales of abdominal tergites forming basal instead of apical lateral patches. Decumbent scales of vertex all narrow. Palpi of ♂ shorter than proboscis and with few or no hairs. Terminalia: Much as in Group D. Pharynx teeth: The structure is shown in Fig. 80, c; it is somewhat like that of *C. albiventris*.

No species of this subgenus has been recorded as troublesome to man, though some of the *rima* group and *C. horridus* are not infrequently found in houses. Davis and Philip found the meal of *C. rima* and *decens* to give the reactions of chicken-blood. In other parts of the world several species of *Neoculex* have been observed to attack frogs.

KEY TO ETHIOPIAN SPECIES OF NEOCULEX.

1. Thorax with a conspicuous pattern of narrow white lines *pulchrithorax* Edw. (p. 253).
- Thorax without such pattern 2.
2. Head with a rather broad band of flat scales in front 3.
- Flat scales of head confined to sides 5.
3. Acrostichal bristles present ; tergites entirely black scaled, sternites entirely white scaled *acrostichalis* sp. n. (p. 268). x
- Acrostichal bristles absent ; tergites with apical lateral white spots 4.
4. Sternite 7 black *albiventris* Edw. (p. 267). x
- Sternite 7 white like the rest *adersianus* sp. n. (p. 268). x
5. Tergites with *basal* lateral white spots ; acrostichal and lower mesepimeral bristles absent *horridus* Edw. (p. 269).
- Tergites with *apical* white spots or bands, or (rarely) entirely dark ; acrostichal bristles present 6.
6. Pleural integument uniformly coloured, light or dark 7.
- Pleurae partly dark and partly light 12.
7. Lower mesepimeral bristle absent ; abdomen all dark above *rubinotus* Theo. (p. 260).
- Lower mesepimeral bristle present 8.
8. Mesepimeron with a large patch of scales 9.
- Mesepimeron with very few or no scales 11.
9. Scales on *apn* broadish ; post-spiracular scales present 10.
- Scales on *apn* narrow ; no post-spiracular scales *salisburyensis* Theo. (p. 257).
10. Prosternum scaly *peringueyi* Edw. (p. 255).
- Prosternum bare *seyrigi* sp. n. (p. 256).
11. Brown ; decumbent scales of head whitish *kingianus* Edw. (p. 259).
- Black ; decumbent scales of head dark *andreas* Edw. (p. 258).
12. Pleurae with two dark stripes, mesepimeron more or less pale in middle 13.
- Pleurae dark above, pale below, mesepimeron all dark 16.
13. Mesonotal scales nearly all golden *albertianus* sp. n. (p. 265).
- Mesonotal scales mostly dark brown, some white ones on front margin 14.
14. Erect scales of head all, or almost all dark ; middle third of mesepimeron only indistinctly pale *rima* Theo. (p. 260) ; *subrima* sp. n. (p. 262).
- Some of the erect scales white ; middle third of mesepimeron clear yellowish 15.
15. Head with only a few of the erect scales white *insignis* Cart. and *sunyaniensis* sp. n. (p. 263).
- Head with a large patch of erect white scales *wigglesworthi* Edw. (p. 264).
16. Mesepimeron on lower part with numerous short decumbent hairs *calabarensis* sp. n. (p. 265).
- Mesepimeron with only the usual single bristly hair below *galliardii* sp. n. (p. 266).

Culex (Neoculex ?) pulchrithorax Edwards.

Pseudohowardina lineata Theobald, Entom. 45, p. 92 (1912) [preoccupied by *Culex lineatus* von Humboldt].

Culex pulchrithorax Edwards, Bull. Ent. Res. 5, p. 73 (1914), and 13, p. 85 (1922) ; Bedford, 13th and 14th Rept. Vet. Res. S. Afr. p. 979 (1928).

TYPES.—♂♀ in Vet. Res. Lab. S. Afr., Onderstepoort.

A mosquito of extremely distinctive colouring, differing from all other *Culex* in the African fauna in the ornamentation of the thorax, which consists of five white lines on a dark ground ; differs from all African species of *Aedes* which have pale lines on the thorax in its uniformly dark tarsi.

♀. *Head* with black integument, the erect scales also black ; decumbent scales

creamy-white, present only on a narrow band adjoining eyes and a median stripe, the two areas enclosed by these scales black. Palpi white-tipped. Proboscis black, with many white scales. *Thorax* (Fig. 81) with blackish integument; mesonotal bristles and scales mostly black, but with five conspicuous narrow lines of creamy-white scales—one on each side (meeting round front margin), and three others equidistant from one another and from the marginal lines, running whole length of scutum; median line forked in front of scutellum. Paratergite bare as in other *Culex*.

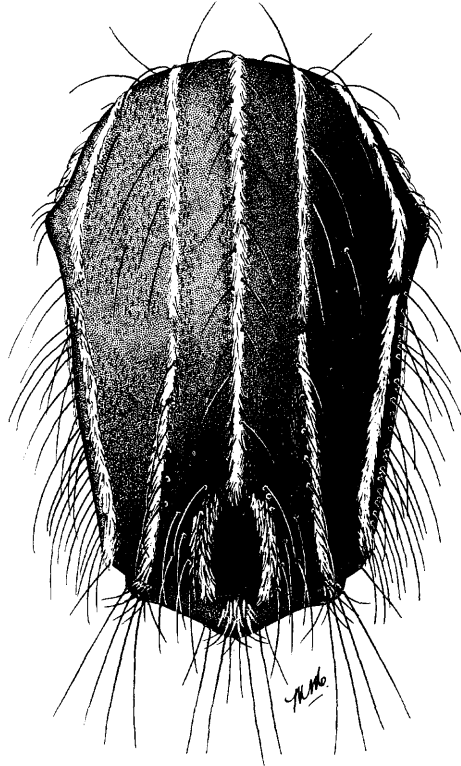


FIG. 81.—Thoracic ornamentation of *Culex* (*Neoculex*) *pulchrithorax* Edw. (Compare with *Aedes pulchrithorax*, Pl. 3, fig. 14.)

Pleurae with two longitudinal lines of white scales, one running from *apn* to pre-alar knob, the other rather broader, from propleura to upper mesepimeral hairs; no median scale-patch on mesepimeron; prosternum bare except for scales along its upper edge. One lower mesepimeral bristle. *Abdomen* dark above, tergites with narrow and incomplete apical pale bands; venter mainly pale. *Legs* mainly blackish, including all tarsi; front and middle femora each with a white line in front running whole length, tibiae less definitely lined; hind femur on outer side pale at base, with a white line on distal half. First hind tarsal segment not or scarcely shorter than tibia. *Wings* with blackish scales, except on vein *Sc*, which is white-scaled except towards tip. *Pharyngeal teeth*, Fig. 78, a.

♂. Resembles ♀. Palpi slender, hairless, of same length as proboscis, last two segments subequal in length and together two-fifths as long as proboscis.

Terminalia (Fig. 82, a).—These have not been described hitherto; they show many remarkable features. Ninth tergite very narrow and apparently quite bare. Coxite rather short and thick, with scales on its outer surface; lobe prominent, very near tip of coxite, quite undivided, bearing two very stout spines at its tip and a third much less stout spine before the tip; no leaf, but a stoutish bristle between lobe and tip of coxite. Style short and rather broad, sickle-shaped, with terminal spine. Tenth tergites strongly chitinized, bare, with a thumb-like projection at base. Paraprocts of peculiar form, with a short thumb-like projection directed outwards near tip (none at base); apical spines few in number but stout, on a projection which points inwards. Phallosome much as in the subgenus *Lutzia*, each half ending in a long finger-like bare process, and with a group of small spinules on inner side about middle.

Wing-length about 4 mm.

Distribution.—TRANSVAAL: Onderstepoort (*Bedford*). NATAL: Ulundi (*Marshall*); Van Reenen, Drakensberg (*Turner*).

The systematic position of this species is open to question. It has been placed in the subgenus *Neoculex*, and I leave it there for the present, though, as will be seen from the above description, the structure of the terminalia is by no means typical of that subgenus. The form of the coxite and style, the structures on the lobe, and the presence of scales on the outer surface of the coxite, are as in the Mediterranean subgenus *Barraudius* Edw., while the form of the phallosome resembles *Lutzia* more than it does either *Barraudius* or *Neoculex*. When the larva of *C. pulchrithorax* is discovered it may be possible to decide whether the species belongs to *Barraudius*, *Neoculex*, or to some other subgenus.

Culex (Neoculex) peringueyi Edwards.

Culex (Neoculex) peringueyi Edwards, Ann. S. Afr. Mus. 19, p. 162 (1924); de Meillon, Publ. S. Afr. Inst. Med. Res. 6, p. 353 (1935).

TYPE.—♂ in S. Afr. Mus., Cape Town.

A species without striking ornamentation, but well distinguished from others of the subgenus by the rather broad scales of the scutum and pronotal lobes, somewhat shortened ♂ palpi, and structure of terminalia. Differs from all other African *Culex* in the scaly prosternum.

♀. *Head* clothed with dark erect scales and white narrow decumbent scales, a line of these round eye-margins. Proboscis black, rather longer than usual in this genus; palpi black. *Thorax* dark brown; scutum with a mixture of light and dark scales, the former yellowish or white, broad and especially prominent laterally, two faint indistinct lines of pale scales running whole length of scutum; scutellum largely covered with broad curved white scales. An ill-defined stripe of broad white scales extending from *apn* across *ppn* and post-spiracular area on to pre-alar knob, the scales on *apn* and *ppn* mostly curved and pointed, the rest broader and blunt-tipped as usual; an elongate patch of sub-spiracular scales present; pre-alar scales separated by a small bare area from the large sternopleural patch, mesepimeron with a large

patch of flat white scales. Propleura and prosternum almost covered with flat white scales, leaving only a narrow median stripe of prosternum bare. One lower mesepimeral bristle. *Abdomen* dark above, tergites with narrow white apical bands, venter white. *Legs* largely dark; femora white beneath and with the tips rather conspicuously white. *Wings* dark-scaled. *Pharyngeal teeth*, Fig. 78, b.

♂. Resembles ♀. Palpi slender, black-scaled, about one-fourth shorter than the proboscis, almost devoid of hairs, penultimate segment rather longer than the terminal. *Terminalia* (Fig. 82, d-f): Coxite much swollen at base, with a patch of hair beneath; lobe rather deeply divided, proximal division with three long stout rods, distal division with three flattened plates, no accessory bristles; style nearly straight, with a large prominence on inner side beyond middle; ninth tergite bilobed, each lobe with only two hairs; tenth tergite unusually strongly developed and hairy; *lp* simple, pointed.

Wing-length about 4 mm.

Distribution.—CAPE PROVINCE: Cape Town (*Dawson*); Houtbay and Pinelands, Cape Town (*de Meillon*).

Culex (*Neoculex*) *seyrigi* sp. n.

TYPE.—♂ in Mus. Hist. Nat., Paris, Ambositra, Madagascar.

A species somewhat resembling *C. salisburyensis* and *C. pèringueyi* but with very different terminalia; post-spiracular scales present; male palpi long but bare.

♀. Unknown.

♂. *Head* with the erect scales short but narrow, mostly dark at sides, pale in middle; decumbent scales all whitish, flat ones confined to sides. Basal segment

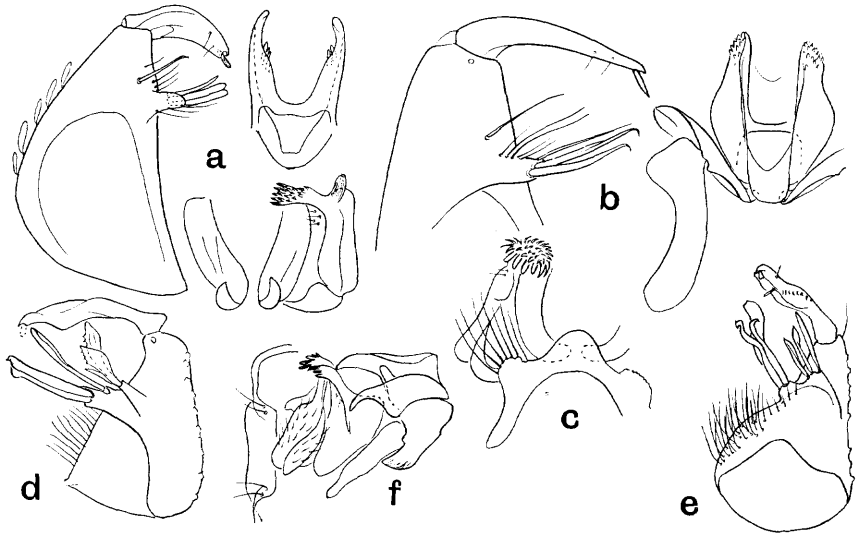


FIG. 82.—Terminalia details of *Culex* (*Neoculex*) spp. a. Coxite from inside, phallosome, and proctiger, *pulchritorax*. b. End of coxite and phallosome, and c, proctiger and ninth tergite, *seyrigi*. d, e. Coxite in two aspects, and f, basal parts, *pèringueyi* (d and e to smaller scale than standard).

of antenna brownish, with a small patch of white scales. Palpi exceeding proboscis by rather more than the long terminal segment, almost devoid of hairs. Proboscis dark. *Thorax* with the integument uniformly brownish, not very dark. Scales of scutum nearly all pale, rather larger than usual; scales on *apn* and *ppn* broadish, but nearly all definitely curved and pointed. A fairly large patch of post-spiracular but no sub-spiracular scales; some flat scales among the pre-alar hairs, but not on the whole of the pre-alar area; sternopleural scale-patches large; mesepimeron with a scale-patch in middle and one bristle below. Propleurae with numerous white scales but prosternum bare. *Abdomen* dark above, tergites 2-7 with narrow but complete creamy-white apical bands; venter almost entirely creamy, sternites with small black basal lateral patches. *Legs* mainly dark; femora pale at tips but hind tibia all dark; hind femur with dark dorsal line and distal fourth of anterior surface dark. *Wings* normal; cross-veins widely separated; wing-length about 4 mm.

Terminalia (Fig. 82, b, c).—Coxite rather short and broad, without scales as usual in this subgenus; lobe prominent, small and undivided, bearing only three strong bristles (*a-c*), *a* and *b* hooked, *c* simple and more slender; leaf absent. Style straight, rather narrow and tapering, terminal claw long and pointed. Tergite trilobed; median lobe bare, each lateral lobe with 8-10 hairs. Tenth tergites bare; paraproct without arm, one row of the spines in the tuft strong and blunt. Phallosome of the usual simple structure of this subgenus, *lp* with the tip tuberculate.

Distribution.—MADAGASCAR: Grotto 30 km. S.W. of Ambositra, 8 ♂ (*A. Seyrig*).

Culex (Neoculex) salisburyensis Theobald.

Culex salisburyensis Theobald, Mon. Cul. 2, p. 113 (1901); Edwards, Bull. Ent. Res. 2, p. 264 (1911), and 13, p. 88 (1922).

Culex bostocki Theobald, J. Econ. Biol. 1, p. 29 (1905).

Culex salisburyensis var. *amboannulatus* Theobald, Second Rept. Vet. Res. S. Afr. p. 320 (1913).

Culex (Neoculex) salisburyensis var. *capensis* de Meillon, Publ. S. Afr. Inst. Med. Res. 6, p. 354 (1935).

Types.—*salisburyensis*, ♀ in B.M., Salisbury; *bostocki*, lost, Transvaal; *amboannulatus*, ♂ in Liverpool School of Tropical Medicine, Onderstepoort.

A species without striking ornamentation, most easily distinguished from other dull-coloured species of this subgenus by the large patch of mesepimeral scales.

♀. *Head* dark above, with dark erect scales and pale decumbent scales which are uniformly distributed; clypeus and tori light brownish. Proboscis and palpi blackish, palpi very short and slightly thickened, not one-eighth as long as proboscis. *Thorax* brownish, pleural integument quite uniformly coloured; scales of scutum rather coarse, but not broad, light and dark ones irregularly mixed; *apn* and *ppn* with fairly numerous pale narrow scales; no post-spiracular or sub-spiracular scales, but a large patch of flat creamy scales on more than the basal half of mesepimeron. Propleura with flat white scales which extend also over upper third of prosternum. One lower mesepimeral bristle. *Abdomen* mainly black-scaled above, tergites with narrow white apical bands which are not infrequently more or less widely interrupted in middle, leaving small white apical lateral spots. Venter mainly or entirely pale-scaled. *Legs* black scaled, except under sides of femora; hind femora white on outer side on basal four-fifths, distal fifth black; small inconspicuous white knee-spots.

Tibiae often more or less pale beneath or behind. *Wings* dark-scaled. *Pharyngeal teeth*, Fig. 78, f.

♂. Resembles ♀; white abdominal bands often rather broader; frequently an unscaled band at base of each tergite gives the impression of a broader white band extending across two adjacent tergites (presumably as in Theobald's var. *amboannulatus*). Palpi dark, but with narrow pale rings at joints, longer than proboscis by length of last segment; last two segments subequal and very hairy, tip of shaft also conspicuously hairy. *Terminalia* (Fig. 83, a): coxite not noticeably swollen; lobe almost entire, with three long rods, a broad leaf, and three accessory flattened bristles; style bent near middle but not expanded; *lp* broad, flat and smooth.

Wing-length 3-4.5 mm.

Distribution.—CAPE PROVINCE: Schoester's River, Cape Town (*Barraud*); Houtbay, Pinelands and Palmiet River (*de Meillon*); Oudebosch (*Bedford*). TRANSVAAL:

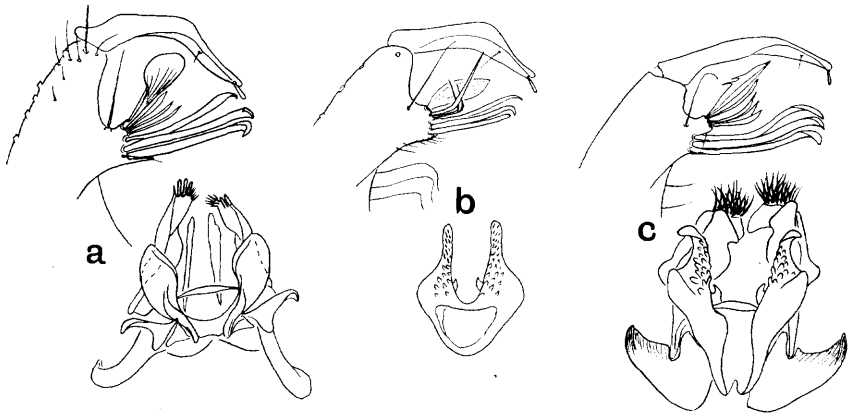


FIG. 83.—Terminalia details of *Culex* (*Neoculex*) spp. a. Lobe, style and basal parts, *salisburyensis*. b. Lobe, style and phallosome, *andreanus*. c. Lobe, style and basal parts (with parameres reflexed), *kingianus*.

Pretoria (*Theiler, Bedford*); Brits (*Ingram*). NATAL: Estcourt (*Marshall*); Weenen (*Thomasset*). ZULULAND: Eshowe (*Ingram*). S. RHODESIA: Salisbury (*Marshall*). N. RHODESIA: Chilanga (*Wood*). KENYA: Nairobi (*Anderson, Van Someren*). SUDAN: Kajo Kaji (*King*).

***Culex* (*Neoculex*) *andreanus* Edwards.**

Culex (*Neoculex*) *andreanus* Edwards, Rev. Zool. Afr. 15, p. 354 (1927).

TYPE.—Cotypes ♂♀ in B.M. and Congo Mus., Irebu.

A very black species with almost no ornamentation; it might easily be confused with the small dark species of the subgenus *Culex*, such as *C. perfuscus* Edw. Resembles *C. kingianus* in possessing a lower mesepimeral bristle but no mesepimeral scales; distinguished from that species by its much darker colour and rather longer ♂ palpi.

♀. *Head* with integument blackish, including clypeus and tori; erect scales of vertex black; decumbent scales small and narrow, nearly all dark. Proboscis and

palpi black, palpi scarcely one-eighth as long as proboscis. *Thorax* with almost uniformly blackish integument, pleurae unmarked; scales of scutum all blackish and rather small. No scales on pronotal lobes, propleura, prosternum, post-spiracular area or mesepimeron; lower mesepimeral bristle present, variable in colour (black or yellowish). *Abdomen* mainly blackish; tergites with small apical lateral whitish spots, not always easily perceptible; venter extensively dark. *Legs* mainly blackish, even the undersides of femora not conspicuously pale; hind femora extensively dark on outer side towards tip. *Wings* uniformly dark-scaled, bases of fork-cells level. *Pharyngeal teeth*, Fig. 78, d.

♂. Resembles ♀. Palpi all dark, exceeding proboscis by length of last segment; last two segments conspicuously hairy, but few or no hairs at tip of shaft. *Terminalia* (Fig. 83, b): Coxite much narrowed distally as in most species of this group, the narrow portion with a row of bent hairs beneath; lobe scarcely divided, with the usual three long rods, a fairly broad leaf and three shorter rods associated with the leaf, two of these bent in middle; style very broad in middle, outer margin almost angular; lobes of ninth tergite fairly large, each with about 10 hairs; *lp* less tubercular than in *C. kingianus*.

Wing-length about 4 mm.

Distribution.—BELGIAN CONGO: Irebu (*André*). UGANDA: Kampala (*Hopkins*). NIGERIA: Lagos (*Strachan, Connal, Philip*); Degema (*Collett*). GOLD COAST: Obuasi (*Graham*).

Culex (Neoculex) kingianus Edwards.

Culex kingianus Edwards, Bull. Ent. Res. 13, p. 86 (1922); Edwards, Rev. Zool. Afr. 15, p. 354 (1927).

TYPE.—♂ in B.M., River Menzi, Sudan.

A dull, unornamented species much resembling *C. andreanus*, but dark brown in colour rather than black; differs from *C. andreanus* in head-scaling and in the narrower style and other details of the ♂ terminalia.

♀. *Head* dark brown, including clypeus and tori; erect scales dark; decumbent scales whitish, mostly narrow, but flat scales of sides extending upwards as a narrow border to eyes almost to middle line. Proboscis and palpi black; palpi scarcely one-eighth as long as proboscis and somewhat thickened distally, as in *C. salisburyensis* and *C. andreanus*. *Thorax* dark brown, mesonotal integument somewhat shining, pleurae not or scarcely lighter than mesonotum and unmarked; scutal scales dark brown, not very small. Few or no scales on *apn* and *ppn*, none on propleura, prosternum or mesepimeron; lower mesepimeral bristle present. *Abdomen* blackish above, tergites with very inconspicuous apical lateral pale spots; venter mainly dark, sternites pale-scaled apically. *Legs* mainly blackish, but under-sides of femora white; hind femora white-scaled anteriorly on basal four-fifths. *Wings* dark-scaled; base of upper fork slightly proximal to that of lower. *Pharyngeal teeth*, Fig. 78, e.

♂. Resembles ♀. Palpi all dark, slightly longer than proboscis, last two segments hairy, penultimate segment about half as long again as the terminal; very few or no hairs at tip of shaft. *Terminalia* (Fig. 83, c): Coxite narrowed apically, but

differing from *C. andreanus* in lacking the row of bent hairs; lobe with the usual three long rods, a narrow leaf, and three shorter and rather narrower flattened blades associated with the leaf; style rather slender and sickle-shaped, not expanded outwardly; lobes of ninth tergite small, each with about four hairs; *lp* strongly tuberculate.

Wing-length 3-4 mm.

Distribution.—SUDAN: River Menzi (*King*). UGANDA: Ruwenzori foothills (*Edwards*). BELGIAN CONGO: Elisabethville (*Schwetzel*).

Culex (Neoculex) rubinotus Theobald. *E. 66*

Culex rubinotus Theobald, Second Rept. Wellcome Lab. p. 76 (1906); Edwards, Bull. Ent. Res. 13, p. 87 (1922).

TYPE.—♀ in B.M., Buala, Sudan.

Distinguished from other species of the group by the lighter mesonotum, uniformly pale pleurae, small mesonotal scales, and constant absence of lower mesepimeral bristle.

♀. *Head* with dark brownish integument; erect scales dark, decumbent scales of vertex all narrow, pale behind, darker towards front, pale round eye-margins. Palpi very short as in other species of this group. *Thorax* with mesonotal integument reddish-brown (lighter or darker), quite dull, without any gloss, scales dark brown or blackish and quite unusually small; pleurae light reddish brown, almost or quite devoid of scales; no lower mesepimeral bristle. *Abdomen* black-scaled above, tergites usually with small apical lateral pale spots, but these not always distinguishable; venter mainly clothed with creamy-white scales. *Legs* blackish; hind femur pale beneath only, anterior surface mainly dark. *Wings* dark-scaled; base of upper fork considerably proximal to that of lower. *Pharyngeal teeth*, Fig. 78, c.

♂. Resembles ♀. Palpi all dark, exceeding proboscis by more than the length of terminal segment, which is long; last two segments very hairy, some hairs present also on tip of shaft. *Terminalia*: Coxite less elongate and less narrowed apically than in related species; lobe with the usual appendages, the two or three modified bristles associated with the leaf only slightly flattened and bent; style sickle-shaped; *lp* somewhat as in *kingianus*, but shorter; tenth tergites at tip with a strong tooth outwardly, fine bristles inwardly.

Wing-length 3-4 mm.

Distribution.—SUDAN: Buala (*Balfour*); Meridi and Idris (*King*); Thar Jath (*Ruttledge*). ABYSSINIA: Lake Awusa (*Nystrum*). UGANDA: Kampala (*Fraser, Hancock, Edwards*); Fort Portal (*Gibbins*); Kabale (*Nolan*). KENYA: Nairobi (*Van Someren, Symes*); Kitale (*Edwards*). TANGANYIKA: Bukoba (*Ritchie*). BELGIAN CONGO: Kisantu (*De Wulf*), Kabare and Kisenyi, Kivu (*Schwetzel*).

Culex (Neoculex) rima Theobald. *E. 66*

Culex rima Theobald [♀ type], Mon. Cul. 2, p. 327 (1901); Edwards (in part), Bull. Ent. Res. 7, p. 226 (1917), and 13, p. 86 (1922).

Culex rima var. *koumbai* Galliard, Ann. Parasit. 9, p. 514 (1931).

TYPES.—*rima*, ♀ in B.M., Old Calabar; *koumbai*, ♂ in B.M. and Paris (École de Médecine), Port Gentil.

This species typifies a well-marked group, the members of which are distinguished from other species of the subgenus *Neoculex* in Africa by having the integument of the pleurae partly dark and partly pale. I have hitherto included all members of this group under the name *C. rima*, but now distinguish eight species in the group (see p. 251).

C. rima as here restricted may be distinguished from its allies in both sexes by the characters of the thoracic scaling, colour of mesepimeron, and dark erect scales of the head. In the male terminalia a unique feature is the presence of a group of striated scales on the outer surface of the lobe of the coxite.

♀. *Head* with dark brown integument; decumbent scales of vertex whitish and all narrow; erect scales all blackish and rather narrow. Proboscis black. Palpi black-scaled, almost one-fifth as long as proboscis and exceeding clypeus by more than twice the length of the latter, second segment fully twice as long as first. *Thorax* with integument of scutum mainly rather light brown, not at all shining, narrowly yellowish on shoulders, paratergite also yellowish; scales of scutum mostly dark brown and rather small, some white scales across anterior margin and along upper edge of *ppn*, but not extending along sides of scutum. *Pleurae* with few or no scales; ground-colour of integument light yellowish, but with two dark brown stripes which occupy most of the upper two-thirds; upper stripe broader and extending from *ppn* to upper part of mesepimeron; lower stripe extending across middle of sternopleura and lower part of mesepimeron, leaving middle third of mesepimeron more or less pale when viewed from in front or from side, though when viewed from behind the whole mesepimeron appears dark and somewhat shining. One lower mesepimeral bristle, and three or four shorter bristles in upper corner, otherwise surface of mesepimeron is bare as usual (no scales or fine hairs). Of the sternopleural hairs only about four are fairly strong and dark, two in upper corner and one or two others, the lowest standing by itself a little below the level of the lower mesepimeral bristle. Propleura with few hairs, only two or three of them strong and dark. Prosternum bare. *Abdomen* mainly black above, tergites 2-7 with small white apical lateral spots, 2-5 also in some specimens (as in the type) with some whitish scales on posterior margins, but these seldom if ever forming conspicuous bands. Venter mainly pale-scaled, some dark scales at bases of sternites. *Legs* blackish; hind femora dark above to base and also dark anteriorly on distal fourth. *Wings* dark-scaled; outstanding scales on forks rather broad and clavate; forks rather short, upper fork less than twice as long as its stem, bases nearly level. *Pharyngeal teeth*, Fig. 79, a.

♂. Resembles ♀ except that the tergites 2-5 have distinct white apical bands and the sternites are usually more extensively dark; thoracic colouring and scaling quite similar, and white lateral spots of tergites 6 and 7 small as in ♀. Palpi entirely dark, exceeding proboscis by more than the length of last segment, last two segments abruptly upturned and hairy, subequal in length; shaft with scarcely any hairs at tip.

Terminalia (Fig. 84, d).—Coxite much narrowed apically as usual in this subgenus. Lobe undivided, bearing proximally and somewhat towards its inner aspect seven appendages; three long stout rods or blades, one of which is less flattened than the other two, and has a membranous tip, this rod being rather strongly curved; three

shorter modified bristles (one of these almost a simple hair); and a rather long apically expanded blade which has a few long fine serrations on one edge (these serrations not always visible); outwardly the lobe bears a group of 4-6 broad striated scales, the ends of which are drawn out into longish points. Style rather long, tapering, sickle-shaped, narrow apically. Lobes of ninth tergite small, rounded, each with about 6 hairs of which the outer two or three are very long and directed outwardly (this being a feature common to most of the species of the *rima* group). *lp* broad at base, ending in a long finger which has a row of small tubercles along its inner edge. Paraprocts with a slight membranous lateral expansion distally.

Wing-length about 2-2.5 mm.

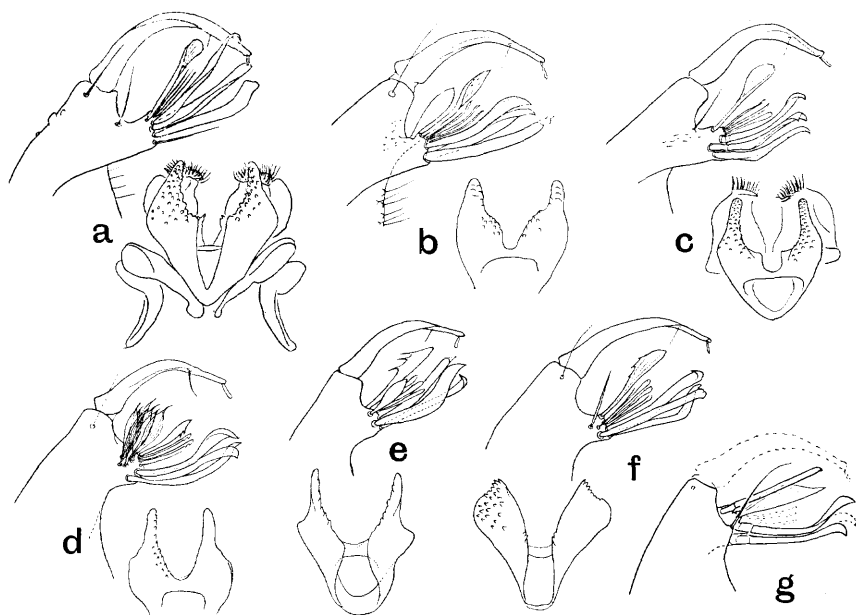


FIG. 84.—Terminalia details (lobe, style and phallosome) of *Culex* (*Neoculex*) spp. a. *sunyaniensis*. b. *insignis*. c. *calabarensis*. d. *rima*. e. *subrima*. f. *wigglesworthi*. g. *galliardi* (lobe only; damaged ♂ from Coquilhatville). Proctiger also shown in a and c.

Distribution (as checked from study of mounted terminalia).—GABOON: Port Gentil (*Galliard*). NIGERIA: Forcados (*Simpson*); Lagos (*Graham, Connal*); Onitsha (*Wigglesworth*). SIERRA LEONE: Freetown (*Allen*).

The type ♀ from Old Calabar agrees with specimens from the above localities in all the diagnostic features listed, and I therefore place *koumbai* as a synonym of *rima*. This would appear to be the commonest species of the group in West Africa; probably all East African records refer to one or other of the allied species.

***Culex* (*Neoculex*) *subrima* sp. n.** (

TYPE.—♂ in B.M., Onitsha.

Closely resembles *C. rima* externally, no definite distinctions being discernible; the white scales on front margin of scutum perhaps extend further along the sides,

and some of the erect scales of the head are pale-tipped. Colouring of mesepimeron as in *rima*.

♀. *Pharyngeal teeth*, Fig. 79, g.

♂. *Terminalia* (Fig. 84, e).—A single unstriated leaf on outer aspect of lobe of coxite; rod quite straight and perhaps more strongly chitinized; one of the two adjacent blades obviously broader than in *rima* and somewhat bent in middle. *lp* much as in *rima*, with a long, finger-like distal portion which has a row of tubercles on its inner edge; basal portion somewhat broader than in *rima*. Lobes of tergite somewhat larger than in *rima* or *insignis*, the hairs thicker, and four or five of them (instead of only two or three) very long.

Distribution.—NIGERIA: Onitsha, vi. 1928, type ♂ (*Wigglesworth*). BELGIAN CONGO: Stanleyville, viii-ix. 1928, 2 ♂ (*Schwetz*); Pawa, 28.v.38, 3 ♂ (*Radna*).

Culex (Neoculex) insignis Carter. *Eum*

Culicomyia insignis Carter, Bull. Ent. Res. 2, p. 37 (1911).

Culex insignis Edwards, Bull. Ent. Res. 2, p. 265 (1911), and 3, p. 33 (1912).

TYPE.—♀ in B.M., Entebbe.

Very similar externally to *C. rima*, but rather larger and differs in the following points: Erect scales of head somewhat broader, many of them pale-tipped and a few of them entirely whitish. White scales on shoulders rather more numerous. Dark markings of pleurae more clearly defined; middle third of mesepimeron clear yellowish from any point of view, even when viewed from behind.

♀. Palpi as in *rima*. Abdominal markings apparently variable; usually tergites 2-5 have distinct apical white bands, but these may be represented by lateral spots only. *Pharyngeal teeth*, Fig. 79, e.

♂. Apical bands of tergites 2-5 always distinct; spots on 6 and 7 small. *Terminalia* (Fig. 84, b): Lobe of coxite with the rod nearly straight, the two adjacent blades not very broad; distal blade with outer half expanded, no serrations on margin; a single unstriated leaf on outer aspect of lobe. *lp* with a small group of blunt tubercles proximally, distal portion less finger-like than in *rima*, somewhat rugose but without distinct tubercles.

Wing-length 2.5-3 mm.

Distribution (as checked from a study of mounted terminalia).—UGANDA: Entebbe (*Hodges*); Soroti (*Hopkins*). SUDAN: Tombe (*King*). NYASALAND: Fort Johnston (*Sanley*). BELGIAN CONGO: Stanleyville, 1927 and 1931 (*Schwetz*). NIGERIA: Onitsha (*Wigglesworth*). GOLD COAST: Koforidua (*Storey*). MAURITIUS (*MacGregor*). SIERRA LEONE: Pujehun (*Davey*).

Bedford's record (based on females only) from Zululand probably referred also to *C. insignis*, which according to the available material appears to be the most widely distributed species of the group.

Culex (Neoculex) sunyaniensis sp. n. *Eum*

Culex insignis Macfie and Ingram, Bull. Ent. Res. 7, p. 10 (1916).

Culex rima Edwards, Bull. Ent. Res. 13, p. 86, fig. 3, r (1922).

TYPE.—♂ in B.M., Sunyani.

Closely resembles *C. insignis* externally, but seems distinguishable by having the scales of the scutum larger and lighter brown; this difference however can only be appreciated by actual comparison of specimens. *Pharyngeal teeth*, Fig. 79, b.

♂. *Terminalia* (Fig. 84, a).—Lobe of coxite with the rod bent near tip; a simple hair instead of a leaf on external aspect of lobe. *lp* shaped much as in *insignis*, but tuberculate almost all over.

Distribution (as checked from study of mounted terminalia).—GOLD COAST: Sunyani (*Ingram*); Koforidua (*Storey*). NIGERIA: Lagos (*Connal*). SUDAN: Upper White Nile (*King*); Meridi (*Rutledge*).

Some females from Sierra Leone (*Smith, Wigglesworth*) are probably this species.

Culex (Neoculex) wigglesworthi sp. n.

TYPE.—♂ in B.M., Freetown.

Resembles *C. insignis* and *C. sunyaniensis*, and with identical pleural markings, but differs conspicuously from those species and others of the *rima* group in the ornamentation of the thorax of the ♂.

♀ (only one specimen available, perhaps not correctly associated with ♂).—Differs from *insignis* and *sunyaniensis* in having a fairly large patch of pure white erect scales on vertex (those towards back of head being black); also in having a continuous border of whitish scales all round scutum (scutal scales otherwise all dark brown). Abdomen black above, with the usual lateral white spots on tergites 2-7; venter pale-scaled. *Pharyngeal teeth*, Fig. 79, d.

♂. *Head* with the patch of white erect scales even more conspicuous than in ♀. *Thorax* with the border of yellowish scales broader than in ♀, and in addition with two fairly broad stripes of yellowish scales running whole length of scutum along the line of dorso-central bristles; the double middle stripe of scales (between the two bare lines) is mostly dark, but yellowish towards the front. *Abdomen* with the white apical bands on tergites 2-5 broader than usual in *insignis*; white apical spots on tergites 6 and 7 very large, extending about two-thirds the length of the tergite. *Terminalia* (Fig. 84, f): Coxite and its appendages much as in *sunyaniensis*, but *lp* of quite different shape, broad, without terminal projecting portion, and with numerous sharp tubercles which are directed outwards.

Distribution.—SIERRA LEONE: Freetown, vii.1928, 3 ♂, 1 ♀ (*Wigglesworth*). GOLD COAST: Koforidua, vii.1919, 1 ♂ (*Storey*). BELGIAN CONGO: Mosua, Lubutu-Walikali, 13.ix.1929, 1 ♂ (*Schwetz*).

Since the above description was printed a series of 4 ♂, 4 ♀ of this species has been received from KENYA: Shimba Hills, bred from open pool in Manoia River and from backwater in stream (*Miss E. C. MacDonald*). The females in this series are quite like the males in thoracic scaling and resemble the males of the type series in this respect; they also have complete white apical bands on abdominal tergites 2-6, those on 2-4 widened in middle, those on 5 and 6 very narrow; pharynx not examined. The males from Kenya have terminalia as in the type except that the proximal rod of the coxite-lobe is not obviously bent. As in the type there are two hairs, one of which is thickened, on the outer aspect of the coxite lobe.

Culex (Neoculex) albertianus sp. n.

TYPE.—♀ in B.M., Lake Albert.

Larger than the other species of the *rima* group, and readily distinguished from them by the golden-scaled thorax and colour of hind femur.

♀. *Head* with the decumbent scales golden as are also some of the erect scales. Palpi and proboscis black, palpi nearly one-fifth as long as proboscis. *Thorax* with mesonotal integument dark brown, almost all the scales golden-yellow, somewhat lighter towards sides. Pleural integument with dark stripes as in *insignis*, but not quite so sharply defined (yellowish parts perhaps somewhat discoloured in type). A distinct patch of flat whitish scales on upper part of sternopleura, this scale-patch being much more definite than in any other species of the group. *Abdomen* (in type) black above, tergites 2 and 3 with narrow white apical bands which are interrupted sublaterally, 4 and 5 with complete white bands, 6 with a white band interrupted in middle, 7 with apical lateral white spots. Sternites with dark basal bands. *Legs* mainly blackish, but hind femora largely yellow and yellow-scaled, dark dorsal line

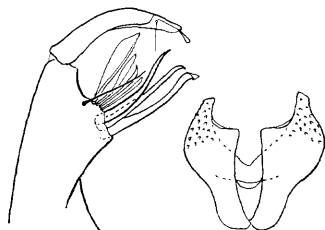


FIG. 84A.—*Culex albertianus* sp. n. ♂. Coxite and phallosome.

reaching only a little beyond middle, so that nearly the basal half of hind femur is yellow all round. *Wings* with scales on forks longer and less clavate than in other species of this group; forks also decidedly longer, upper fork almost three times as long as its stem. *Pharyngeal teeth*, Fig. 79, h.

♂. Resembles ♀ in colouring of head, thorax and legs. Abdomen with complete yellowish apical bands on tergites 2–6, a pair of spots (nearly joined) on 7. *Terminalia* (Fig. 84, a): a simple hair on outer aspect of lobe, as in *sunyaniensis* and *wigglesworthi*, but style broader, and appendages of lobe and shape of *lp* different.

Wing-length 4 mm.

Distribution.—BELGIAN CONGO: Blukwa, Lake Albert, 5100 ft., 1 ♀ (*Schwetz*).

KENYA: Kericho, in forest along river, 2 ♂ (*Miss E. C. MacDonald*).

Culex (Neoculex) calabarensis sp. n. ♂

Culex rima Edwards, Bull. Ent. Res. 13, p. 86, fig. 3, c (1922).

TYPE.—♂ in B.M., Calabar (*Simpson*).

Differs from all other species of the *rima* group, and indeed from all other African *Culex*, in having a dozen or more short decumbent pale hairs spread over most of the surface of the mesepimeron (in addition to the usual bristles). Colouring much as in *rima*, but pleural stripes less obvious, and palpi of ♀ shorter.

♀. *Head* with all the erect scales black ; decumbent scales pale, but not so white as in *rima*. Palpi only about one-eighth as long as proboscis, exceeding clypeus by scarcely one and a half times length of latter ; second of the two main segments about as long as clypeus, first shorter. *Thorax* with integument of scutum dark brown, even on shoulders ; scales dark brown except on front margin, where they are whitish. Pleural integument almost all brown on upper two-thirds, the two stripes characteristic of the *rima* group being only indistinctly separated, and the mesepimeron entirely dark ; lower third of sternopleura and meron clear yellowish. Sternopleural hairs as in *rima*. *Abdomen* entirely black scaled above ; small apical lateral white spots on tergites 3-6, but none on 2 or 7. Venter mainly pale. *Legs* with outer surface of hind femur rather more extensively yellowish-scaled than in *rima*. *Wings* as in *rima*. *Pharyngeal teeth*, Fig. 79, f.

♂. Resembles ♀, but tergites 3 and 4 with narrow apical white bands (5 and 6 with lateral apical white spots only). *Terminalia* (Fig. 84, c) much resembling those of *sunyaniensis*, especially as regards form of phallosome and presence of only a simple hair on outer aspect of lobe, differing chiefly in shape of the three long blades of lobe.

Wing-length barely 2.5 mm.

Distribution.—NIGERIA : Calabar, 1 ♂, 1 ♀, and Forcados, 1 ♀ (*Simpson*).

Culex (Neoculex) galliardi sp. n.

(?) *Culex rima* Galliard, Ann. Parasit. 9, p. 515, fig. 1 (1931).

TYPE.—♀ in B.M., Forcados.

Differs from other species of the *rima* group in having very few or no white scales on front margin of scutum, and in the more numerous sternopleural bristles. Colouring of pleural integument as in *calabarensis*, but no fine decumbent hairs on mesepimeron.

♀. *Head* dark, all the upright scales blackish, some of the decumbent scales also dark, but others pale or whitish, especially round eyes. Palpi as in *calabarensis* (definitely shorter than in *rima* and related species). *Thorax* uniformly dark above, all scutal scales dark brown, or at most 2-3 whitish scales on either side of middle line on front margin. Pleurae with the upper two-thirds nearly all dark, mesepimeron entirely so, lower third of sternopleura and meron yellowish (quite as in *calabarensis*). No scales whatever on pleurae. Sternopleural bristles more numerous than usual, 6-8 fairly strong and dark, including a row of 3-4 at about level of lower mesepimeral bristle ; anterior to the bristles are a good many short pale hairs (more numerous than usual). *Abdomen* black above ; each of tergites 2-6 with small apical lateral white spots (no such spots on 7) ; sternites mainly pale. *Legs* and *wings* as in *rima*. *Pharyngeal teeth*, Fig. 79, c.

♂. The single available specimen is not very perfect, and the terminalia were damaged in mounting. Coloration and chaetotaxy as in ♀, but tergites 2-5 with narrow white apical bands. *Terminalia* (Fig. 84, g) : Lobe of coxite bearing two (or three ?) long and somewhat flattened blades proximally, and a large leaf and a long, stout straight rod distally. Phallosome apparently much as in *sunyaniensis* and *calabarensis*.

Wing-length 2.5–3 mm.

Distribution.—NIGERIA: Forcados, 1 ♀ (*Simpson*); Onitsha, 1 ♀ (*Wigglesworth*). SIERRA LEONE: Bap, 1 ♀ (*E. Hargreaves*). BELGIAN CONGO: Coquilhatville, 1 ♂ (*Yale Massey*).

The specimen figured by Galliard from Port Gentil, Gaboon, as an unnamed variety of *C. rima*, was probably this species. Galliard shows three blades on the proximal part of the lobe of the coxite, whereas the Congo specimen appears to have only two, but the latter is probably broken.

Culex (*Neoculex*) *albiventris* Edw.

Eumelanomyia inconspicua Theobald, Mon. Cul. 5, p. 240 (1910); Edwards, Bull. Ent. Res. 3, p. 34 (1912). [Name preoccupied by *C. (Mochthogenes) inconspicuus* Theobald, 1908.]
Culex albiventris Edwards, Bull. Ent. Res. 13, p. 88 (1922).

TYPE.—♂♀ in B.M., Obuasi.

A black species with little ornamentation except for the white venter; distinguishable on close examination from all other African *Culex* except its two near

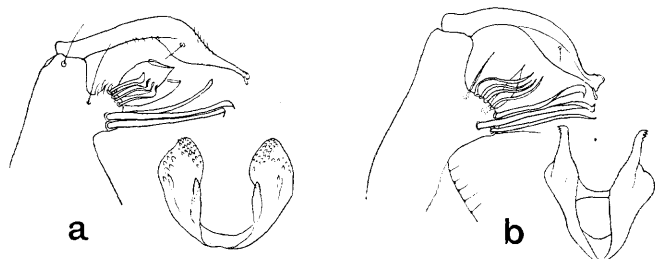


FIG. 85.—Terminalia details (lobe, style and phallosome) of *Culex* (*Neoculex*) spp. a. *albiventris*. b. *adersianus*.

allies and the two species of the subgenus *Mochthogenes* by the largely flat-scaled head. From the two allied species (described below as new) it is easily separated by the black seventh sternite (in ♀). This and the following species (*adersianus*) are also noteworthy in having no acrostichal bristles.

♀. *Head* blackish, clothed above mainly with broad but not very close-lying black scales; some pale narrow scales on nape and a narrow band of flat white scales adjoining eyes; erect scales black, not very numerous. Palpi and proboscis blackish, palpi only about one-eighth as long as proboscis. *Thorax* blackish, integument of scutum somewhat shining, pleurae scarcely lighter and unmarked; scales of scutum mostly blackish, usually some white scales on front margin, the white scales sometimes extending broadly over shoulders, though on the other hand some specimens have all the scutal scales blackish, including those on front margin. No scales on *apn*, *ppn*, or upper part of sternopleura, and at most 2–3 on upper part of mesepimeron; a patch of pale scales on propleura, extending to, but not over upper corner of prosternum. *Abdomen* black above, tergites 2–6 (but not 7) with apical lateral white patches. Sternites 1–6 pale and clothed with white scales, 7 entirely black (both integument and scales). *Legs* mainly black; hind femur white on basal half and white anteriorly almost to tip, with a dark dorsal stripe (broadening

outwards) on distal half. *Wings* dark-scaled, upper fork rather long with the outstanding scales narrow. *Pharyngeal teeth*, Fig. 80, a.

♂. Resembles ♀, but white scales of scutum often more numerous, in extreme cases almost all scutal scales whitish. Palpi slender, bare, scarcely upturned at tip, slightly shorter than proboscis; penultimate segment nearly twice as long as terminal, latter with a small tuft of bristly hairs at tip. *Terminalia* (Fig. 85, a): Coxite with a group of soft pale bent hairs ventro-laterally before lobe; lobe with three long rods, four short bristles with twisted tips and two rather broad leaves. Style swollen beyond middle, with slender tip and subapical spiny crest. *lp* broad, blunt, with numerous tubercles at tip.

Wing-length about 3 mm.

Distribution.—GOLD COAST: Obuasi and Kumasi (*Graham*); Sunyani (*Ingram*); Bibianaha (*Spurrell*); Koforidua (*Storey*). SIERRA LEONE: Daru (*Murphy*).

Culex (Neoculex) adersianus sp. n.

TYPE.—♂ in B.M., Mombasa.

Very similar to *C. albiventris*, agreeing with that species in head scaling, absence of scales on upper part of sternopleura, largely white hind femur, etc., but differs as follows:

♀. Tergite 7 with apical lateral white spots (but smaller than those on 2-6); sternite 7 clothed with white scales like 2-6.

♂. Palpi slightly shorter, about five-sixths length of proboscis. *Terminalia* (Fig. 85, b): Lobe of coxite with only one narrow leaf and one hair on external surface. Style with the extreme tip widened, no subapical spiny crest. *lp* ending in a long finger, bare except for three or four teeth at extreme tip.

Distribution.—KENYA: Mombasa, 1 ♂ (*De Boer*). ZANZIBAR: 1 ♀ (*Aders*).

Culex (Neoculex) acrostichalis sp. n.

TYPE.—♀ in B.M., Kasala.

Very like *C. albiventris* and *adersianus*, but rather larger, and differs from both species in possessing acrostichal bristles and scales on upper part of sternopleura and lacking pale spots on abdominal tergites.

♀. *Head* with a larger area of narrow scales on nape than in the two allied species, but still with a fairly wide band of broad black scales behind the white eye-margins (thus differing from the species of the subgenus *Culiciomyia*, in which the only broad flat scales of the vertex are the white ones bordering the eyes). *Thorax* with a double row of well-developed acrostichal bristles; all the scutal scales dark in all eight specimens examined. Sternopleura with a distinct patch of flat whitish scales among the bristles in upper corner, and also with a row of scales below (as in the other two species); *apn* devoid of scales, as in the other two. *Abdomen* with tergites entirely black-scaled, no white scales on posterior corners on any segment; sternites entirely white-scaled (including sternite 7). *Legs* with the dark dorsal line of hind femur longer, extending over distal two-thirds or three-fourths of femur. *Pharyngeal teeth*, Fig. 80, b.

♂. Unknown.

Wing-length about 4 mm.

Distribution.—UGANDA: Kasala, 3 ♀ bred xi. 1910–i. 1911 (*Fraser*); Kampala, 4 ♀, x. 1926 and i. 1927 (*Hancock*). SUDAN: 1 ♀, Bundle to Hierallah, iii. 1911 (*King*).

Owing to the presence of acrostichal bristles this is clearly not very closely related to *C. albiventris* in spite of the similarity in head-scaling. When the male is discovered it may be found to belong to another group or subgenus.

Culex (Neoculex) horridus Edwards. 

Protomelanoconion fusca Theobald, Mon. Cul. 5, p. 463 (1910); Edwards, Bull. Ent. Res. 2, p. 244 (1911) [*nec Culex (Trichorhynchus) fuscus* Theobald, 1908].

Cyathomyia fusca Edwards, Bull. Ent. Res. 4, p. 59 (1913).

Culex horridus Edwards, Bull. Ent. Res. 13, p. 88 (1922).

TYPE.—♂♀ in B.M., Accra.

A dull-coloured species with little ornamentation apart from the white-scaled eye-margins, but distinguishable on microscopic examination from all other African

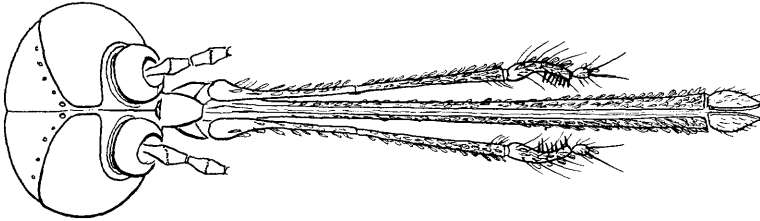


FIG. 86.—Proboscis and palpi of male, *Culex (Neoculex) horridus* Edw.

Culex by the absence of both acrostichal and lower mesepimeral bristles, as well as by the peculiar male palpi (Fig. 86).

♀. *Head* dark, clothed above with yellowish decumbent scales and darker erect scales; a moderately broad rim of pure white scales adjoining eyes above, these scales narrow and curved, not broad and flat as in *Culicomyia*. Palpi and proboscis dark. *Thorax* dark brown above, clothed with dark brown scales and bristles; the dorso-central bristles and those above wing-roots are unusually long, strong and numerous (whence the specific name), so that the entire absence of acrostichal bristles is the more noticeable. Pleurae (also *apn* and *ppn*) with the integument pale yellowish, usually rather strongly contrasting with the dark mesonotum. Numerous broad flat whitish scales on *apn* and a vertical row of flat pale scales on posterior edge of sternopleura, few or none on mesepimeron. Propleural hairs few, one of them strong, dark, bristle-like. Prosternum bare. Sternopleural bristles few in number, mostly short and pale, but one strong dark bristle opposite lower edge of mesepimeron. *Abdomen* dark brown above, tergites with small *basal* lateral white spots (thus differing from all other African species of *Neoculex*); sternites largely pale-scaled, last few tending to have dark apical bands. *Legs* dark; under-sides of femora pale, especially hind femur. *Wings* dark-scaled; outstanding scales rather long and dense, almost linear; forks moderate. *Pharyngeal teeth*, Fig. 80, c.

♂. Resembles ♀. Palpi (Fig. 86) only about three-fourths as long as proboscis;

shaft uniformly slender and without long hairs; following segment somewhat thicker, curved, with a few long hairs and with a number of short bristly hairs on the concave surface (this surface in the normal position faces inwards to the opposite palp, but usually the palpi are distorted and twisted in drying); terminal segment very short, only about a quarter as long as penultimate segment, with two or three long bristly hairs at tip. *Terminalia*: Eighth tergite not emarginate, so that ninth is not turned downwards as it is in most other *Neoculex*. Coxite without special aggregations of hairs; lobe undivided, proximally with three rods similar to those of *Culiciomyia* (the proximal one pointed), distally with a transverse row of four blunt-tipped bristles (close together and appearing almost as a single structure in side view), externally with one moderately broad leaf. Style simple, sickle-shaped, tapering. *lp* almost triangular, strongly tuberculate along inner margin.

Wing-length 2-3 mm.

Distribution.—GOLD COAST: Accra (*Graham, Macfie*). CAMEROONS: Ekona (*Zumpt*). NIGERIA: Lagos (*Connal*). BELGIAN CONGO: Stanleyville (*Schwetz, Mouchet*); Leopoldville (*Henrard*); Pawa (*Radna*). UGANDA: Kampala (*Fraser, Hopkins*). SUDAN: Nyumbe (*King*). TANGANYIKA: Dar-es-Salaam, Lindi (*Haworth*). ZANZIBAR (*Aders*). KENYA: Kalaleni (*MacDonald*). S. RHODESIA: Shamva (*Leeson*).

This species shares with the Oriental *C. brevipalpis* Giles and *C. sumatranus* Brug, two very similar species, the negative features of the absence of acrostichal and lower mesepimeral bristles; however, in the East Asian *C. hayashii* Yam. and the Indian *C. tenuipalpis* Barraud, which have similar terminalia and are also placed in the same group, these bristles are present.

Subgenus **CULICIOMYIA** Theobald.

Culiciomyia Theobald, Mon. Cul. 4, p. 227 (1907).

Neomelanoconion Theobald (*nec* Newstead), Mon. Cul. 4, p. 516 (1907).

Pectinopalpus Theobald, Ann. Mag. Nat. Hist. (8) 5, p. 375 (1910).

GENOTYPES.—*Culiciomyia*, *C. fragilis* Ludl. (as *fuscus* Theo.), Oriental Region; *Neomelanoconion* Theo., *C. nebulosus* Theo. (as *rima* Theo., ♂); *Pectinopalpus*, *C. nebulosus* Theo. (as *P. fuscus* Theo.).

Medium-sized, dark-coloured species, with at most small pale spots on abdomen. Palpi of ♂ longer than proboscis, last two segments hairy; shaft (Fig. 87) with a row of peculiar long translucent scales on distal half, directed downwards and somewhat inwards (these scales are sometimes depressed towards the palp and may then be rather difficult to see). Vertex with small flat white scales round eye-margins, usually in a single row, the remaining decumbent scales narrow. A single lower mesepimeral bristle present. Acrostichal bristles normally present (absent in *macfie*).

Terminalia: Coxite without scales, pale and rather weakly sclerotized in African species; subapical lobe with well-developed leaf. Paraprocts with a more or less dense tuft of hairs at tip, and also with some blunt spines which tend to have a comb-like arrangement; basal arm variously developed. Phallosome consisting of one pair of hooked plates.

Pharynx teeth (Fig. 88).—*C. nebulosus* and *cinereus* have a similar type of pharynx, the latter, however, differing rather obviously in that a few teeth in the middle are longer and needle-like. *C. cinerellus* and *C. macfieii* are quite different from the other two and from one another in pharyngeal structure.

Although *C. cinereus* and perhaps also *C. nebulosus* are often found abundantly in

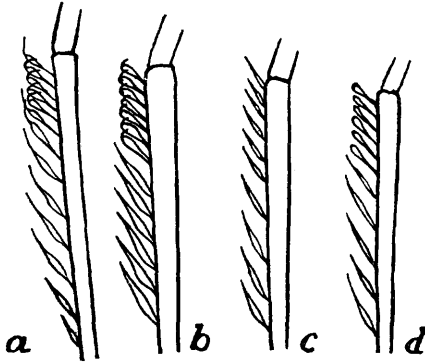


FIG. 87.—End of shaft of male palpus of *Culex (Culiciomyia)* spp., diagrammatic, to show shape of outstanding scales. a. *cinereus*. b. *nebulosus*. c. *cinerellus*. d. *semibrunneus*.

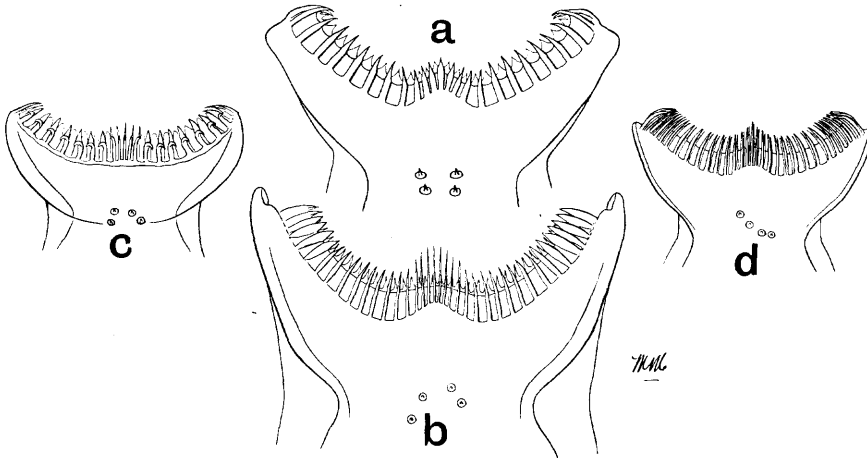


FIG. 88.—Pharyngeal teeth of *Culex (Culiciomyia)* spp. a. *nebulosus*. b. *cinereus*. c. *cinerellus*. d. *macfieii*.

houses, there is little or no evidence that they bite man. Bauer states that *C. nebulosus* could only rarely be induced to do so, and Davis and Philip found that its gut-contents gave reactions positive only for chicken-blood.

KEY TO ETHIOPIAN SPECIES OF CULICIOMYIA.

1. Abdominal tergites with basal lateral pale spots ; acrostichal bristles absent
macfieii Edw. (p. 276).
- Abdominal tergites with apical lateral pale spots, or all dark ; acrostichal bristles present 2.
2. Pleurae grey-dusted 3.
- Pleurae somewhat shining, without grey dusting and almost without scales 4.

3. Smaller (wing 3-4 mm.); mesepimeron usually without distinct scale-patch ;
 coxite of ♂ terminalia with few short hairs *nebulosus* Theo. (p. 272).
 Larger (wing 4-5 mm.); mesepimeron usually with large patch of scales ;
 coxite of ♂ terminalia with dense patch of soft pale hair
cinereus Theo. (p. 274).
4. Mesonotum greyer ; upper part of pleurae more or less darkened
cinerellus Edw. (p. 275).
 Mesonotum browner ; pleurae uniformly pale 5.
5. Proportionate lengths of last two segments of male palpi as 1 : 2·2
semibrunneus Edw. (p. 275).
 These proportions as 1 : 1·3 *subaequalis* sp. n. (p. 276).

Culex (Culiciomyia) nebulosus Theobald.

- Culex nebulosus* Theobald, Rept. Liverpool S. Trop. Med. Mem. 4, App. p. x (1901), and Mon. Cul. 2, p. 331 (1901).
 (?) *Culex invenustus* Theobald, Rept. Liverpool S. Trop. Med. Mem. 4, App. p. ix (1901), and Mon. Cul. 2, p. 330 (1901).
 (?) *Culex nigrochaetae* Theobald, Mon. Cul. 2, p. 60 (1901).
Culex cinereus Theobald (♂ type), Mon. Cul. 2, p. 58 (1901).
Culex freetownensis Theobald (♀ type), Mon. Cul. 2, p. 69 (1901).
Ncomelanoconion rima Theobald (♂), Mon. Cul. 4, p. 514 (1907).
Pectinopalpus fuscus Theobald, Ann. Mag. Nat. Hist. (8) 5, p. 375 (1910), and Mon. Cul. 5, p. 416 (1910).
Culiciomyia nebulosa Theobald, Mon. Cul. 5, p. 239 (1910); Edwards (in part), Bull. Ent. Res. 2, p. 254 (1911).
Culex (Culiciomyia) nebulosus Edwards, Bull. Ent. Res. 13, p. 89 (1922).
 TYPES.—*nebulosus*, 2 ♀ in B.M., Chumbele, Calabar; *invenustus*, ♀ lost, Degema; *nigrochaetae*, ♂♀ lost, Lagos; *cinereus*, ♂ in B.M., Freetown; *freetownensis*, ♀ in B.M., Freetown; *rима*, ♂ in B.M., Lagos; *fuscus*, ♂ in B.M., Obuasi.

A medium-sized dull-coloured species without striking characteristics apart from those distinguishing the subgenus; most readily separated from other dull-coloured species of *Culex* by the greyish mesonotum and the narrow rim of flat white scales adjacent to the eyes.

♀. *Head* dark; erect scales numerous, tips rather broad and usually pale; decumbent scales of vertex narrow and pale; scales at sides broad and flat as usual; a narrow rim of white scales continuously bordering eyes in front, these scales broad and flat, but rather small. *Palpi* and *proboscis* dark, palpi about one-sixth as long as *proboscis*. *Thorax* rather dark, especially above, both *scutum* and *pleurae* covered with frosty-grey dusting, somewhat obscured on *scutum* by coating of brown scales. *Acrostichal* bristles few and short. *Propleura* with few or no scales, *prosternum* bare. *Sternopleura* with a row of scales towards posterior margin; *mesepimeron* almost devoid of scales (a very few among the hairs near the base), ground-colour lighter than most of *thorax*, one lower *mesepimeral* bristle. *Abdomen* dark above, scales on lateral margins and posterior corners of *tergites* lighter but scarcely white; *venter* mostly pale. *Legs* dark, hind femur whitish nearly to tip outwardly, dark dorsal line usually not reaching base. *Wings* dark, scales narrow, forks rather long, relative positions of their bases somewhat variable. *Pharyngeal teeth*, Fig. 88, a.

♂. Resembles ♀. *Palpi* exceeding *proboscis* only by tip of last segment, shaft (Fig. 87, b) on distal half ventrolaterally with a row of modified transparent scales which project to form a sort of comb (these scales are perhaps moveable as they project much more in some specimens than in others), the proximal part of this comb formed of scales shaped like spear-heads, the distal part of more close-set

scales which are also broader and have fine recurved points; last segment of palp over twice as long as penultimate, both hairy. *Terminalia* (Fig. 89, a): Coxite moderately broad, with a small patch of soft pale yellow hair ventrolaterally near the lobe, and 3-5 simple hairs on the outer surface of the lobe itself; appendages of lobe comprising three rods placed close together, one shorter and pointed, the other two longer with slightly hooked tips, also one very broad leaf and one narrow leaf with two associated blunt bristles. Style bent in middle, with a membranous flange on the bend and a subapical spiny crest. *lp* ending in a finger-like process, below which is a long tooth. Paraprocts with a dense crown of hairs and spines, the spines external to the hairs and more or less in a row.

Wing-length about 3-4 mm.

Distribution.—This is one of the commonest and most widely distributed of Tropical African Culicines, but the range of the typical form may not be quite so

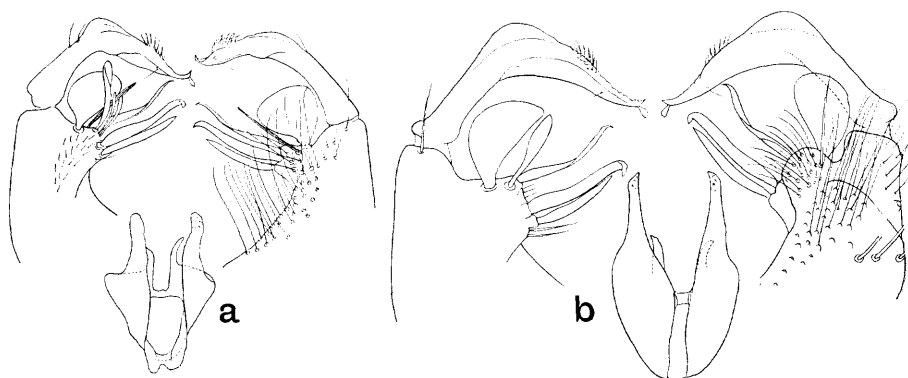


FIG. 89.—Terminalia details (end of coxite, inner and outer aspects, and phallosome) of *Culex* (*Culiciomyia*) spp. a. *nebulosus*. b. *cinereus*.

wide as has hitherto been supposed owing to confusion with nearly allied species and varieties. Typical male specimens of *nebulosus* are in the British Museum from the following localities:

SIERRA LEONE: Freetown (*Patton, Bacot*). GOLD COAST: Obuasi (*Graham*); Accra (*Macfie, Connal*); Takoradi (*Pomeroy*). NIGERIA: Lagos (*Kerr*). CAMEROONS: Missellele (*Zumpt*). SUDAN: Delami (*Ruttledge*); Khartoum (*King*). BELGIAN CONGO: Kinshasa (*Duren*); Stanleyville (*Mouchet, Schwetz*); Masua, Lubutu-Walikali (*Schwetz*); Kabinda, Katanga (*Schwetz*). UGANDA: Kampala (*Hopkins*).

I have also examined female specimens, probably of this species, from MADAGASCAR: Sohamemy, 25 km. N. of Anivorane (*Seyrig*).

Var. **pseudocinereus** Theobald.

Culex pseudocinereus Theobald, Mon. Cul. 2, p. 62 (1901).

TYPE.—♂ in B.M., Salisbury.

Closely resembles typical *nebulosus* but differs in both sexes in having much more numerous flat white scales on the mesepimeron; propleura with a large patch of

scales; lower mesepimeral bristle often accompanied by from one to three short hairs (between it and the scales).

♂. Scales in distal part of palpal comb slightly different in shape from typical *nebulosus*, being bluntly pointed but without strongly hooked tips. *Terminalia* exactly as in the typical form.

Distribution.—TANGANYIKA: Dar-es-Salaam (*Pomeroy, Haworth, MacHardy*). S. RHODESIA: Salisbury (*Marshall*). ZULULAND: Ntambanana (*Bedford*). BELGIAN CONGO: Elisabethville (*Walravens*). NYASALAND: Fort Johnston (*Lamborn*).

The records suggest that this is the East African representative of *nebulosus*.

Culex (Culiciomyia) cinereus Theobald.

Culex cinereus Theobald (♀ type), Mon. Cul. 2, p. 58 (1901).

Culex fretownensis Theobald (♂ type), Mon. Cul. 2, p. 69 (1901).

Culex (Culiciomyia) cinereus Edwards, Bull. Ent. Res. 13, p. 89 (1922).

TYPES.—*cinereus*, 2♀ in B.M., Freetown; *fretownensis*, ♂ in B.M., Freetown.

Very similar to *C. nebulosus*, but on the average decidedly larger. In the typical form of *cinereus* the mesepimeron has a large patch of flat white scales extending more than half its length (sometimes nearly its whole length); the propleura carries a large patch of scales which just extends on to the upper corner of the prosternum, and there are also more numerous white scales on the sternopleura and coxae than in *nebulosus*; abdominal tergites with rather distinct patches of white scales on posterior corners.

♀. *Pharyngeal teeth*, Fig. 88, b.

♂. Scales forming palpal comb rather differently shaped (Fig. 87, a), though not always easy to see. *Terminalia* (Fig. 89, b): Coxite stouter and with a larger ventrolateral patch of soft yellow hairs, also with about 20 short hairs in a patch on external surface of lobe; the distal one of the three rods on lobe separated from the other two; tooth at base of *lp* shorter; otherwise quite similar to *nebulosus*.

Wing-length 4–5 mm.

Distribution.—SIERRA LEONE: Freetown (*Austen*). GOLD COAST: Bole (*Ingram*); Bibianaha (*Spurrell*). NIGERIA: Lokoja (*Watson*); Gadau (*Taylor*). BELGIAN CONGO: Ruwe (*Yale, Massey*); Stanleyville (*Mouchet*).

Var. **uniformis** Theobald.

Culiciomyia uniformis Theobald, Mon. Cul. 5, p. 230 (1910).

Culex (Culiciomyia) cinereus var. *uniformis* Edwards, Bull. Ent. Res. 13, p. 89 (1922).

TYPES.—♂♀ in B.M., Obuasi.

Differs from typical *cinereus* in the almost complete absence of mesepimeral scales, the only scales on this part being a few amongst the hairs at the base; propleura also entirely devoid of scales; abdominal tergites almost entirely dark-scaled, without apical lateral white spots (this variety therefore scarcely distinguishable externally, except for its slightly larger size, from *C. nebulosus*).

♂ Palpi and terminalia quite as in typical *cinereus*.

Distribution.—GOLD COAST: Obuasi (*Graham*); Bibianaha (*Spurrell*); Koforidua (*Corson*).

Culex (Culiciomyia) cinerellus Edwards.

Culex (Culiciomyia) cinerellus Edwards, Bull. Ent. Res. 13, p. 90 (1922).

TYPE.—♂ in B.M., Kasala, Mpumu, Uganda.

Very similar to *C. nebulosus*, but on the average rather smaller, and differs in both sexes in lacking the grey dusting on the pleurae, the pleural integument being mainly pale yellowish (probably greenish in life) with the upper part more or less obviously darker. Acrostichal bristles more numerous and rather longer than in *nebulosus*. No scales on mesepimeron and very few on sternopleura and coxae. Abdominal tergites nearly all dark, with indistinct apical lateral pale spots.

♀. *Pharyngeal teeth*, Fig. 88, c.

♂. Palpi (Fig. 87, c) with all the scales in the outstanding row similar in shape, ending in long straight points, the distal scales rather close together; in all about a dozen scales in the row. *Terminalia* (Fig. 90, a): Coxite with the distal part narrower than in *nebulosus* or *cinereus*, ventrolateral hair-patch much less obvious; distal part of lobe with a narrow leaf and a slightly flattened blade. Style with much less obvious membranous flange on outer margin. *lp* ending in a longer, more slender and more curved finger-like process, without a well-marked tooth at base.

Wing-length about 2.5–3 mm.

Distribution.—SIERRA LEONE: Freetown (*Wigglesworth, Evans*). NIGERIA: Lagos (*Graham, Philip*). UGANDA: Kasala, Mpumu (*Fraser*); Kampala (*Hopkins*). SUDAN: Kapei (*King*). BELGIAN CONGO: Kwango River (*Schwetz*).

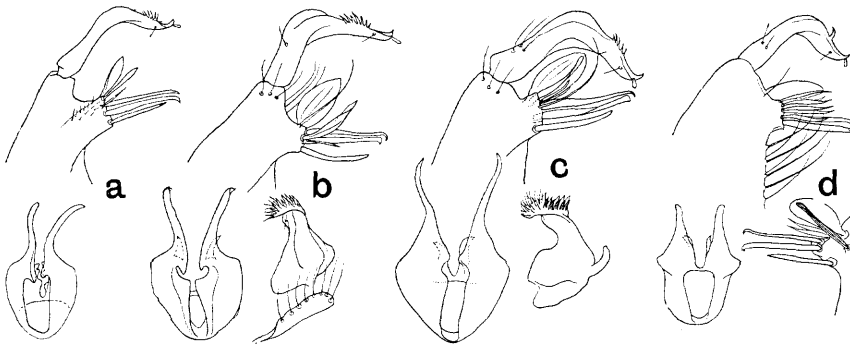


FIG. 90.—Terminalia details (end of coxite, phallosome and proctiger) of *Culex (Culiciomyia)* spp. a. *cinerellus*. b. *semibrunneus*. c. *subaequalis*. d. *macfei*.

Culex (Culiciomyia) semibrunneus Edwards.

Culex (Culiciomyia) semibrunneus Edwards, Rev. Zool. Afr. 15, p. 353 (1927).

TYPES.—♂♀ cotypes in B.M. and Congo Mus., Stanleyville.

Very similar to *C. cinerellus*, and like that species having the pleural integument slightly shining, without grey dusting, and almost devoid of scales, but the upper part of the pleurae is not darkened as it is in *cinerellus*. Scutum also with less grey dusting and appearing browner than in *nebulosus*, the scales rather coarser. Erect scales of head narrower and darker than in *nebulosus*.

♂. Differs from the other species of the subgenus in having the distal scales in

the outstanding row of the palpi round-tipped (Fig. 87, d). Last palpal segment over twice as long as penultimate, as in *nebulosus* and *cinerellus*. *Terminalia* (Fig. 90, b): Ventrolateral hair patch on coxite represented by an irregular double row of hairs with bent tips; leaf narrower than in *nebulosus* but broader than in *cinerellus*, accompanied by a long curved hair. Style as in *nebulosus* with large external flange at middle. Terminal fingers of phallosome lobes longer and more slender than in *nebulosus*, with shorter tooth at base. Paraprocts as in *nebulosus* and *cinerellus*, without any basal arm.

Wing-length 2.5–3 mm.

Distribution.—BELGIAN CONGO: Stanleyville (*Mouchet*). UGANDA: Kampala (*Hopkins*).

***Culex (Culiciomyia) subaequalis* sp. n.**

TYPE.—♂ in B.M., Uluku.

Colour, size and scaling of body as in *C. semibrunneus*.

♂. Palpi differing from those of all other African species of the subgenus in relative proportions of last two segments, the penultimate segment being three-quarters as long as terminal segment; shaft with only 6–8 outstanding scales, these widely spaced, long and rather narrow, all alike ending in long fine points. *Terminalia* (Fig. 90, c): in nearly all respects extremely similar to those of *semibrunneus*, but differing from that species as well as from the other four African *Culiciomyia* in that the paraprocts have a distinct basal arm; phallosome also slightly different.

Distribution.—BELGIAN CONGO: Uluku, Lubutu-Walikali, 2 ♂ bred 24.ix.1929, "from stony places in river" (*Schwetz*).

***Culex (Culiciomyia) macfieii* Edwards.**

Culex (Culiciomyia) macfieii Edwards, Bull. Ent. Res. 13, p. 399 (1923).

TYPE.—♂ in B.M., Ofako.

A small species resembling *C. cinerellus*, but differing from that species as well as from other African members of the subgenus in the basally-situated pale markings of the abdominal tergites and in the absence of acrostichal bristles. The female might easily be confused with species of the *decens* group of the subgenus *Culex*, especially *C. guiarti* and *philipi*, differing from the former in the bare pleurae, and from the latter in the more hairy antennae and dark shoulders.

♀. *Head* with decumbent scales pale, erect scales dark; round the eye-margins is a rim of very small flat white scales similar to those of the five related species, but in *macfieii* these scales do not quite reach the middle line. Antennae differing from those of the other species of the subgenus in being more hairy, all but the last few flagellar segments having 10–15 hairs in the whorl. *Thorax*: Integument of scutum dull dark grey, pleurae light yellowish, with a greenish tinge, with slight grey dusting; scutum, *apn* and *ppn* with dull brownish-grey scales. A few pale flat scales on sternopleura; none on mesepimeron, though there may be a few fine short hairs replacing the scales. *Abdomen* blackish-scaled dorsally, tergites 2–7 each with a

small but fairly well-marked basal lateral white spot ; sternites mostly pale-scaled, unbanded. *Legs* dark, hind femora as in the other species. *Wings* dark, outstanding scales on forks linear. *Pharyngeal teeth*, Fig. 88, d.

♂. Colouring as in ♀. Palpi equalling proboscis in length, or scarcely longer ; shaft with a row of 8-10 long, transparent, outstanding scales, each ending in a long straight point as in *cinerellus* and *subaequalis* ; terminal segment twice as long as penultimate, as in *cinerellus*, etc. *Terminalia* (Fig. 90, d) : Small and pale, weakly chitinized as in the related species ; structure very distinctive, largely on account of the unique form of the style, which has a single small recurved horn before the tip on the outer margin, replacing the spiny crest of the other species of the subgenus. Lobe of coxite bearing three rods as usual, but the proximal one well removed from the other two ; leaf rather narrow ; the usual blade or secondary leaf represented by a stout blunt spine ; on the outer aspect of the lobe is a group of 6-8 flattened hairs. Paraprocts with all the hairs in the crown slender, no basal arm. Phallosome much as in *nebulosus*.

Wing-length 2-3 mm.

Distribution.—GOLD COAST : Ofako (*Ingram and Macfie*). NIGERIA : Gadau (*Taylor*). SIERRA LEONE : Freetown (*Hicks*). UGANDA : Kampala (*Hopkins*).

Subgenus **MOCHTHOGENES** Edwards.

Mochthogenes Edwards, Bull. Ent. Res. 21, p. 305 (1930).

GENOTYPE.—*Aedes malayi* Leicester (Oriental).

Small species without conspicuous markings. Scales of vertex variable ; sometimes nearly all narrow, but more often some or all of them are broad and flat, though small. Pale scales of abdominal tergites (when present) basally situated. Palpi alike in the two sexes and quite short (hence the males might be mistaken for *Urano-taenia*). Dorso-central bristles strong and numerous, acrostichals present.

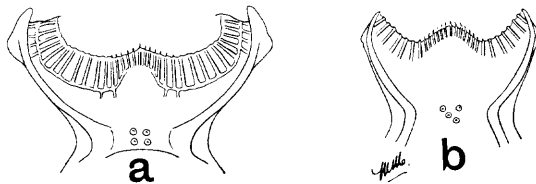


FIG. 91.—Pharyngeal teeth of *Culex (Mochthogenes)* spp. a. *inconspicuus*. b. *fimbriiceps*.

Terminalia (African species) much as in subgenus *Neoculex* ; eighth tergite deeply emarginate ; coxite without scales, subapical lobe with peculiarly twisted rods and large leaf ; style (unlike *Neoculex*) with a long process from middle of external margin ; paraproct with small apical tuft of weak hairs ; *lp* studded with small tubercles.

Pharynx teeth : The pharynx of one specimen each of two of the three African species was mounted and showed a similar and very peculiar structure ; the teeth are few and minute, but instead there seems to be a row of alternating ridges and furrows. This structure is entirely different from that of the sub-genotype (*C.*

malayi Leic.), in which, according to the figure by Barraud and Covell, the teeth are numerous, long and fine, somewhat as in *C. insignis* and related species.

No data are available regarding the adult habits of the African species of this subgenus.

Culex (Mochthogenes) inconspicuus Theobald.

Aedes inconspicuus Theobald, Entom. 41, p. 109 (1908).

Micraedes (?) *inconspicuus* Edwards, Bull. Ent. Res. 3, p. 34 (1912).

Culex inconspicuus Edwards, Bull. Ent. Res. 13, p. 88 (1922), and Ind. Journ. Med. Res. 10, p. 286 (1922).

Culex (*Micraedes*) *inconspicuus* de Meillon, S. Afr. J. Sci. 25, p. 323 (1928).

(?) *Culex nyangae* Galliard, Ann. Parasit. 9, p. 230 (1931).

TYPES.—♂♀ in B.M., Transvaal.

A small dark species devoid of ornamentation, but differing from all other African *Culex* (including the two closely allied species of the subgenus *Mochthogenes*) in the much greater area of broad flat scales on the vertex.

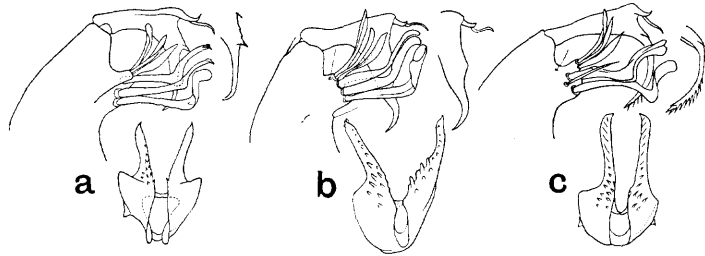


FIG. 92.—Terminalia details (end of coxite, with tip of style shown separately to right, and phallosome) of *Culex* (*Mochthogenes*) spp. a. *inconspicuus*. b. *simpliciforceps*. c. *fimbriiforceps*.

♀. *Head* dark, almost entirely clothed with broad flat scales, the only narrow decumbent scales being a very few on the nape; scales mostly dark, but often paler (scarcely whitish) towards sides and on eye-margins. Palpi rather variable in length. *Thorax* uniformly brown, pleurae often somewhat lighter than dorsum; small acrostichal bristles present as usual; scutal scales all dark; no scales on pleurae. *Abdomen* with all scales of tergites blackish (no lateral pale spots); venter usually almost as dark as dorsum. *Legs* mainly dark; hind femora only indefinitely pale beneath and extensively dark outwardly. *Wings* dark-scaled, scales on forks long, but slightly clavate; upper fork long. *Pharyngeal teeth*, Fig. 91, a.

♂. Resembles ♀. Palpi as in ♀, rather variable in length, from about one-eighth to nearly one-fifth length of proboscis. *Terminalia* (Fig. 92, a): Coxite narrowed apically as in *Neoculex*; lobe not very prominent and not divided, bearing proximally three long, bent and twisted blades and distally three shorter blades. Styles bent almost at right angles near middle, with a peculiar twisted process on outer margin at the bend; distal part smooth, tapering to a fine point and with one tooth on outer margin. Ninth tergite hardly distinguishable, entirely lacking hairs. Paraprocts with 3-4 spines and a few fine hairs at tips. Lobes of phallosome broad on basal part, ending in a finger-like process which is about as long as basal part and bears fine tubercles.

Wing-length about 2 mm.

Distribution (as checked from study of terminalia).—GOLD COAST: Accra (*Macfie*); Koforidua (*Corson*). NIGERIA: Lagos (*Graham*). BELGIAN CONGO: Stanleyville (*Mouchet, Schwetz*); Kasenyi, L. Albert (*Schwetz*). SUDAN: Meridi (*King*). UGANDA: Arua, Kampala and Jinja (*Hopkins*). TRANSVAAL (*Simpson*). S. RHODESIA: Salisbury and Shamva (*Leeson*).

Galliard's *C. nyangae*, described from the larva only from Gaboon, is probably this species, but may be one of the two allied forms. Sierra Leone females are almost certainly this species.

Culex (Mochthogenes) fimbriforceps Edwards.

Culex (Mochthogenes) fimbriforceps Edwards, Bull. Ent. Res. 26, p. 135 (1935).

TYPE.—♂ in B.M., Jinja Road, Kampala.

Differs from *C. inconspicuus* in both sexes as follows: Decumbent scales of vertex mostly narrow and pale, broad flat scales being confined to sides of head and a rather narrow band adjoining eyes (narrow scales almost reaching forward to eyes in middle). Hind femora mainly creamy-white, with a dark stripe above from tip which does not reach the middle, anterior surface white from base practically to tip.

♀. *Pharyngeal teeth*, Fig. 91, b.

♂. *Terminalia* (Fig. 92, c) similar in nearly all respects to *inconspicuus*, but slender terminal portion of style fringed on outer margin, and finger-like ends of *lp* longer than basal part.

Distribution.—UGANDA: Jinja Rd., Kampala (*Hancock*); Kasala, Mpumu (*Fraser*). BELGIAN CONGO: Stanleyville (*Mouchet*).

Culex (Mochthogenes) simpliciforceps sp. n.

TYPE.—♂ in B.M., Upper White Nile.

Differs from *C. inconspicuus* in both sexes as follows: Narrow decumbent scales on nape much more numerous, though leaving a fairly broad band of flat scales in front adjoining eyes. Hind femora more extensively pale, though dark towards tip on outer side and with a dark dorsal line nearly or quite reaching base. Scales on venter paler.

♂. *Terminalia* (Fig. 92, b): Differing in slight details; no tooth on outer margin of distal part of style (nor any fringe at tip); *lp* with basal part less abruptly broadened and with stronger and more numerous tubercles.

Distribution.—SUDAN: Bundle to Hierallah, Upper White Nile, 2 ♂, Aow River, 1 ♀, and R. Namlini, 1 ♀ (*King*). UGANDA: Arua, 1 ♂ (*Hopkins*).

This is intermediate between *C. inconspicuus* and *C. fimbriforceps*; the small differences from these others noted above appear to be constant in the series examined, and I therefore treat *simpliciforceps* as a distinct species, though further material may show that it is only a form of *inconspicuus*.

Subgenus **CULEX** Linnaeus, s. str.

Culex Linnaeus, Syst. Nat. Ed. x, p. 602 (1758).

Lasioconops Theobald, Mon. Cul. 3, p. 235 (1903).

Heptaphlebomyia Theobald, Mon. Cul. 3, p. 336 (1903).

Pseudoheptaphlebomyia Ventrillon, Bull. Mus. Paris, 11, p. 427 (1905).

Aporoculex Theobald, Mon. Cul. 4, pp. 150, 316 (1907).

Pseudoculex Theobald, Mon. Cul. 4, p. 318 (1907).

Oculeomyia Theobald, Mon. Cul. 4, p. 515 (1907).

GENOTYPES.—*Culex*, *C. pipiens* L., *Lasioconops*, *Pseudoheptaphlebomyia*, *Aporoculex* and *Pseudoculex*, *C. poecilipes* Theo. (under synonyms); *Heptaphlebomyia*, *C. univittatus* Theo. (as *simplex* Theo.); *Oculeomyia*, *C. bitaeniorhynchus* Giles (as *O. sarawaki* Theo.).

Usually medium-sized to rather large species, rarely with conspicuous ornamentation. Palpi of ♂ (Fig. 75) longer than proboscis (rarely of about the same



FIG. 93.—Terminalia of *C. invidiosus* Theo., a typical member of subgenus *Culex*. On right, coxite from inner side. On left, basal parts (phallosome and proctiger to larger scale) and in sternal view. a. Parameres, in normal position. b. The divided outer division of phallosome-plate. c. Inner division or finger of phallosome-plate. d. End of paraproct with its crown of spines. e. Basal arm of paraproct.

length or slightly shorter), last two segments about equal in length, upturned and hairy; shaft without any modified scales. Decumbent scales of vertex all narrow, no broad ones round eye-margins. Acrostichal bristles present even if small.

Terminalia (Fig. 93): Eighth tergite not very deeply emarginate. Coxite without scales; subapical lobe usually only indistinctly divided; the three proximal rods (*a-c*) always present, usually nearly straight but *b* and *c* usually slightly hooked at the tip; setae *d-f* very variable according to the species; leaf and seta *h* almost always well marked. Style simple, sickle-shaped, without spiny crest, usually with two fine hairs, terminal spine usually widened towards its end. Paraprocts with dense tufts of hairs or spines at the tip, and usually with a strong curved basal arm. Phallosome usually complicated, never in the form of a pair of tuberculate plates.

Pharynx-teeth: These vary much in the different species but are always strong, and number from 12–20 on each side of the middle line; the teeth of the lower row are often much shorter and weaker than those of the upper row, and may be difficult to see.

In 1932 I divided the species of this subgenus into two main groups, an arrangement which still appears to me a natural one in spite of the fact that no similar division can be made on larval characters. The two groups are as follows:

Group A (*bitaeniorhynchus* group): Lower mesepimeral bristle absent. Proboscis in both sexes with a well-defined pale band in middle; tarsi with narrow pale rings extending over the joints; male palpi with narrow pale rings at bases of last two segments. *Terminalia*: Appendages of lobe variable in development, setae *d-f*

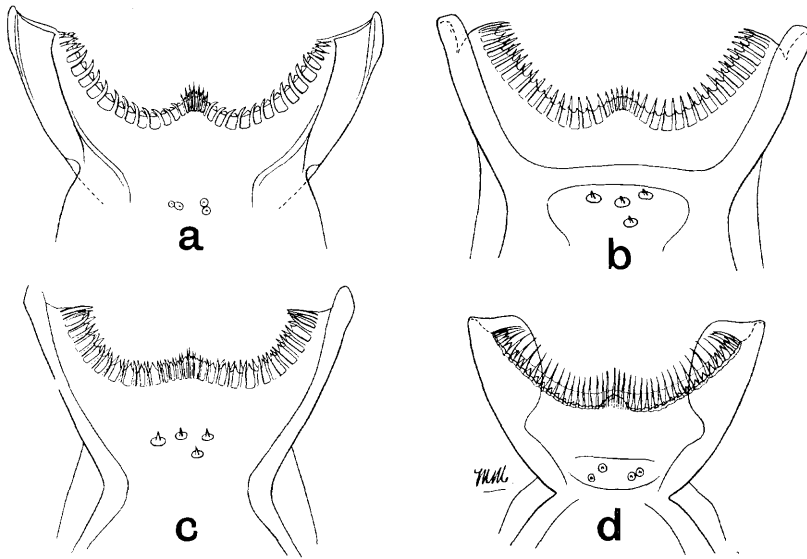


FIG. 94.—Pharyngeal teeth of *Culex* (Culex) spp. a. *poecilipes*. b. *aurantapex*. c. *annulioris*. d. *tritaeniorhynchus*.

sometimes quite unmodified and leaf either well developed or very narrow and pointed, but in either case the style is rather short and bears two fine hairs, one on the outer margin and one on the inner—a rather unusual arrangement which seems to confirm the evidence of the ornamental features as to the near relationship of the species; paraprocts with or without basal arm; phallosome usually complicated, but its inner division (median process) not finger-like.

The pharyngeal teeth of four species of this group are shown in Fig. 94; those of *C. poecilipes*, *aurantapex* and *annulioris* (Fig. 94, a–c) are not very dissimilar, but *C. tritaeniorhynchus* (Fig. 94, d) has quite a different appearance owing to all the teeth of the upper row being long, slender and pointed, those of the lower row rudimentary. This figure of *C. tritaeniorhynchus* was prepared from a West African specimen, but would serve equally well for one from the type locality, Travancore; it is of interest to note the close resemblance to Baisas' figure of *C. summosus* Dyar from the Philippine Is., thus confirming his conclusion as to the probable identity of *summosus* with *tritaeniorhynchus*.

Group B (*pipiens* group): At least one lower mesepimeral bristle present—normally only one, but in a few species there may be two or three. Proboscis without well-defined pale ring in the middle, though in some species it may be extensively pale beneath; tarsi usually entirely dark (pale rings present only in *ventrilloni*, *duttoni* and *watti*); male palpi with last two segments either entirely dark or with white line beneath but without pale rings at base. *Terminalia*: lobe always with

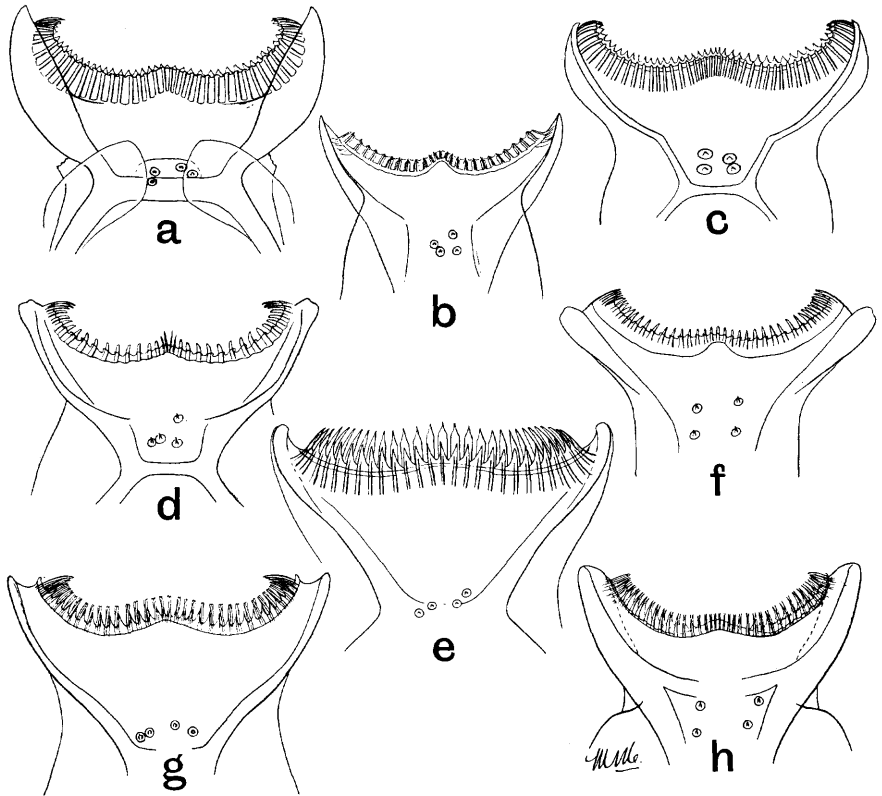


FIG. 95.—Pharyngeal teeth of *Culex* (*Culex*) spp. a. *duttoni*. b. *andersoni*. c. *laticinctus*. d. *mirificus*. e. *pipiens*. f. *vansomereni*. g. *hancocki*. h. *antennatus*.

well-developed leaf, and setae *d-f* nearly always present and obviously different from simple setae; style usually longer than in Group A, without a fine hair on external margin, but usually with two such hairs towards tip on inner margin (rarely only one); paraprocts usually with basal arm; phallosome usually complicated, its inner division (median process) usually finger-like.

This group includes the large majority of the Ethiopian species of the subgenus (46 out of 55); the number of distinct species recognized is now largely increased, owing to closer attention having been given to small details of structure of the male terminalia. Through Hopkins's work on the larvae it became clear that in some cases specific differences are greater and more clearly defined in the larval than in the adult stage, and the search for corresponding adult differences led to the discovery

of some features which had previously been overlooked but which seem to be sufficiently definite to distinguish some nearly allied species. Of these features the most obvious is the presence or absence of scales on the area of the pleurae immediately below the pre-alar knob and above the uppermost bristles of the sternopleura; these scales I have called the pre-alar scales. The taxonomic importance of the scales (when

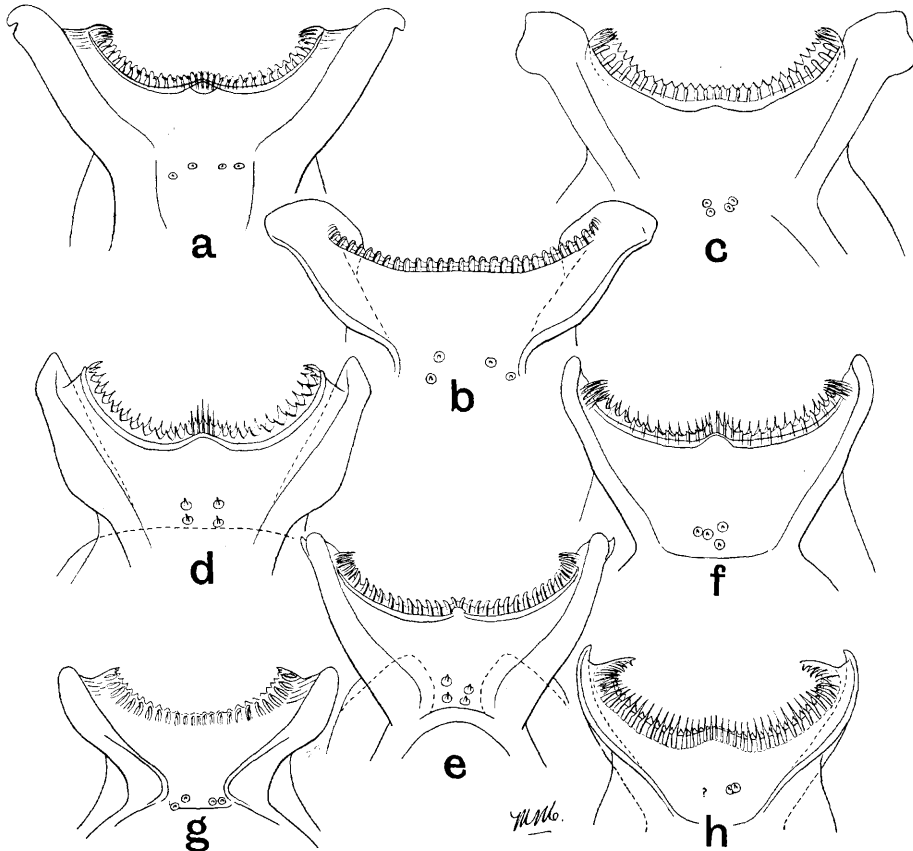


FIG. 96.—Pharyngeal teeth of *Culex (Culex)* spp. a. *perfidiosus*. b. *decens*. c. *perfuscus*. d. *guiarti*. e. *schwetzi*. f. *moucheti*. g. *ingrami*. h. *pruina*.

present) immediately behind the anterior spiracle (post-spiracular scales) has previously been noted and can be confirmed.

The division of the *pipiens* group into two series as suggested by me in 1932 is perhaps convenient. The first series (*pipiens* series) includes nearly all the larger species, in nearly all the abdominal tergites have distinct basal bands of pale scales in both sexes, and the last two segments of the male palpi have a line of white scales beneath; a good many of the species possess post-spiracular or pre-alar scales. The second series (*decens* series) comprises mostly the smaller, darker species; except in *C. decens* and *C. schwetzi* the abdominal tergites are mostly unbanded; the male palpi are entirely dark; post-spiracular and pre-alar scales are absent.

The pharyngeal teeth of sixteen species of this group are shown in figs. 95 and 96. In the *pipiens* series the teeth seem usually to be rather short and blunt; sometimes, as in *C. mirificus* (Fig. 95, d) and *vansomereni* (Fig. 95, f), they are more pointed, with a few needle-like teeth in the middle of the row; in *C. antennatus* (Fig. 95, h) all the teeth in the upper row are long and pointed, the species having a very similar pharynx to that of *C. tritaeniorhynchus*. In the *decens* series there is rather more variation. *C. perfidiosus* (Fig. 96, c) and *C. perfuscus* (Fig. 96) have a peculiar form of pharynx in which the teeth of the upper row appear to be transformed into a palisade-like row of ridges, beyond which the small teeth of the lower row project slightly; a very similar structure (not illustrated here) is seen in the otherwise dissimilar *C. argenteopunctatus*. *C. ingrami* (Fig. 96, g) and *C. pruina* (Fig. 96, h) have a rather similar type of pharynx, but *C. schwetzi* (Fig. 96, e) looks quite different (though in these three species it is difficult to make sure what is the real shape of the teeth). *C. moucheti* (Fig. 96, f) shows nothing peculiar in its pharynx-teeth, which are of much the same type as in *C. pipiens*.

Apart from *C. fatigans*, the habits of which are summarized below (p. 316), the only African species of this subgenus which has been recorded as at all troublesome is *C. thalassius*, which bites freely at night both inside and outside houses, and according to Kerr (1933) definitely prefers human blood. *C. duttoni*, *decens*, *indiviosus* and some others are sometimes found in considerable numbers in houses, but no definite evidence has been adduced to incriminate them.

KEY TO ETHIOPIAN SPECIES OF CULEX, s. STR.

1. No lower mesepimeral bristle; proboscis with a well-defined pale ring in middle; tarsi with narrow pale rings at the joints 2.
 One or more lower mesepimeral bristles present; proboscis sometimes pale beneath and at sides on middle half, but (except in *ventrillon*) without a complete and well-defined pale ring (at least in ♀) 13.
2. Femora and tibiae with rows of small pale spots anteriorly (Fig. 97, a) *poecilipes* Theo. (p. 289).
 No such rows of spots present 3.
3. Wings with numerous scattered pale scales (Fig. 99); proboscis with a pale spot at tip above (before labella) 4.
 Wings with few or no pale scales; proboscis dark at tip (though labella may be pale) 5.
4. Abdominal tergites with apical lateral yellow triangles, or tergites 6-8 all yellow *bitaeniorhynchus* Giles, var. (p. 290).
 Abdominal tergites with pale apical bands of even width *ethiopicus* Edw. (p. 291).
5. Thorax black, scutal scales nearly all black 6.
 Thorax brownish, or scutum with many pale scales 7.
6. Abdominal tergites 1-4 black, 5-8 orange *aurantapex* Edw. (p. 292).
 Tergites 5-8 with orange apical lateral spots *aurantapex* v. *jinjaensis* n. (p. 293).
7. Scutum usually with anterior half mainly pale scaled; wing-length 4-6.5 mm. 8.
 Scutum scales forming an indefinite mottled pattern, or scales all dark; wing-length 2-4 mm. 11.
8. Wings with an indistinct pale area at tip involving veins 1 and 2.1 and sometimes the costa *giganteus* Vent. (p. 296).
 Wings without pale area at tip 9.

9. Abdominal tergites with median basal and lateral apical pale triangles
annulioris Theo. (p. 293).
 Abdominal tergites otherwise marked 10.
10. Tergites with pale basal bands *annulioris* ssp. *major* Edw. (p. 295).
 Abdomen almost all dark above *annulioris* ssp. *consimilis* Newst. (p. 295).
11. Femora with numerous scattered pale scales anteriorly ; upper fork cell of wing short, its base distal to that of lower fork *sitiens* Wied. (p. 296).
 Femora with few or no scattered pale scales ; upper fork longer, its base at least slightly proximal to that of lower fork 12.

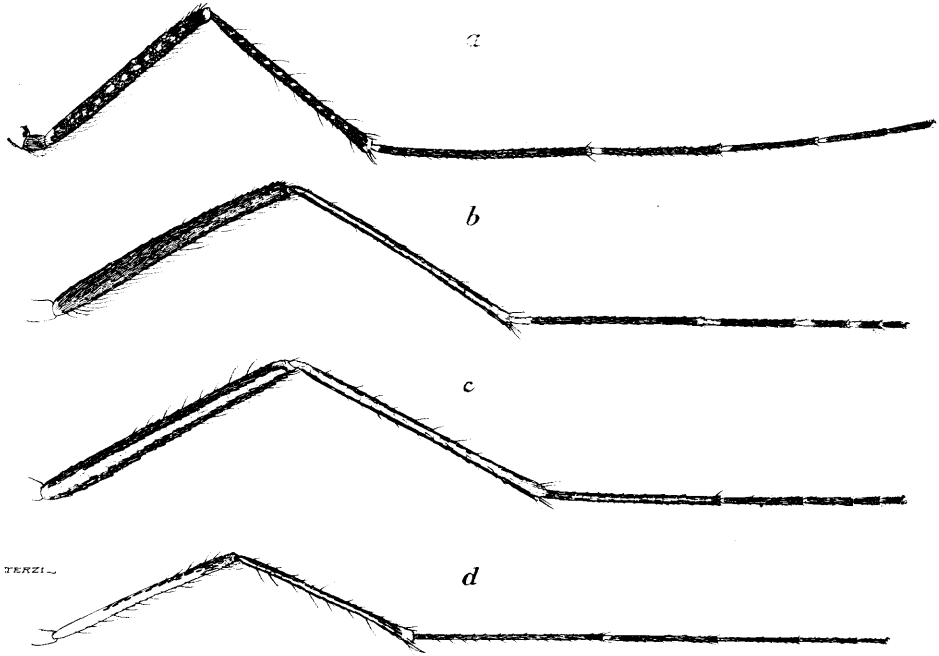


FIG. 97.—Legs of *Culex*. a. Hind leg, *poicilipes*. b. Mid leg, *duttoni*. c. Mid leg, *theileri*. d. Hind leg, *univittatus*.

12. Thorax blacker, some pale scales on front half of scutum ; pale ring of ♀ proboscis sharply defined proximally beneath *thalassius* Theo. (p. 298).
 Thorax brown, pale scales present only near scutellum ; pale ring of ♀ proboscis extended proximally beneath *tritaeniorhynchus* Giles (p. 299).
13. Tarsi, especially of hind legs, with narrow pale rings 14.
 Tarsi all dark 16.
14. Tarsal rings confined to bases of segments ; post-spiracular and pre-alar scales present *ventrilloni* Edw. (p. 300).
 Tarsal rings spreading over the joints (sometimes faint) ; pre-alar scales absent 15.
15. Middle tibia with pale anterior stripe (Fig. 97, b) ; post-spiracular scales usually present *duttoni* Theo. (p. 300).
 Middle tibia without pale anterior stripe ; no post-spiracular scales *watti* Edw. (p. 302).
16. All tibiae, and front and middle femora, with pale anterior stripes running the whole length (Fig. 97, c) ; hind tibia without pale apical spot above, but the anterior stripe reaches the tip *theileri* Theo. (p. 305).

- Femora and tibiae either unstriped, or if stripes are present on any of them, the hind tibia has a pale apical spot and the anterior stripe does not reach the tip 17.
17. Mesonotum with four spots of silvery-white scales (Fig. 104) ; small dark species with unbanded abdomen 18.
- Mesonotum without silvery spots 19.
18. Hind femur with a dark dorsal line reaching base ; pre-alar scales absent
argenteopunctatus Ventr. (p. 303).
- Hind femur entirely pale on basal fourth ; pre-alar scales present
ssp. *kingi* Theo. (p. 304).
19. Post-spiracular and pre-alar scales present (Fig. 98, a) ; tergites normally pale-banded 20.
- No post-spiracular scales 24.
20. Hind femur with anterior surface almost entirely black scaled
umbripes sp. n. (p. 321).
- Hind femur with anterior surface mainly white, at most the distal fifth all dark 21.

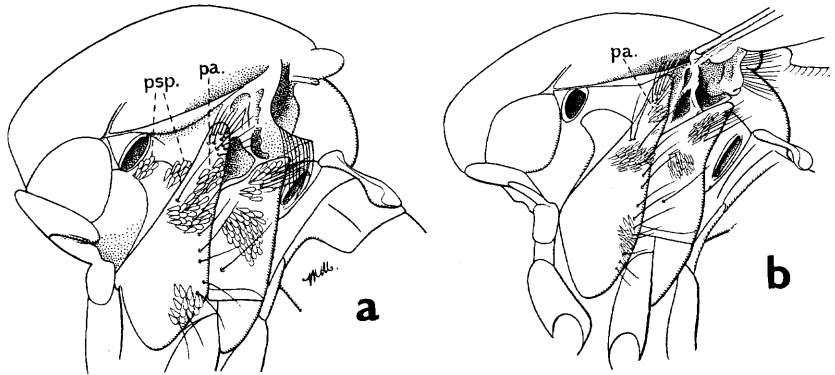


FIG. 98.—Side view of thorax of *Culex*. a. *univittatus*, with post-spiracular (*psp.*) and pre-alar scales (*pa.*) present. b. *vansomereni*, with no post-spiracular but some pre-alar scales present.

21. Hind tibia with an anterior pale stripe—often faint, and may be absent in ♂ (Fig. 97, d) ; costa in ♀ with pale scales on lower edge close to base
univittatus Theo. (p. 306).
- Hind tibia black except for the conspicuous white spot at tip ; wing-scales all dark (♂♀) 22.
22. Middle tibia with anterior pale stripe *striatipes* sp. n. (p. 311).
- Middle tibia without anterior pale stripe 23.
23. Sternites usually with dark bands ; front coxae with some dark scales ; male palpi normal *simpsoni* Theo. (p. 309).
- Sternites without dark bands ; front coxal scales all pale ; male palpi shorter and nearly bare *sinaiticus* Kirkp. (p. 311).
24. Pre-alar scales present (Fig. 98, b) 25.
- No pre-alar scales 29.
25. Tergites all dark above, sternites all pale ; hind tibia without distinct pale spot at tip *univittatus* var. *neavei* Theo. (p. 308).
- Tergites normally with pale bands ; sternites not all pale ; hind tibia with more or less distinct pale spot at tip 26.
26. Proboscis pale in middle beneath ; venter with narrow interrupted median dark stripe 27.
- Proboscis all dark 28.

27. Meron not darker than coxae; ♂ terminalia normal . . . *zombaensis* Theo. (p. 317).
 Meron darker than coxae; ♂ terminalia very abnormal . . . *mirificus* Edw. (p. 319).
28. Sternites with some dark scales but unbanded . . . *terzii* sp. n. (p. 312).
 Sternites with dark apical bands . . . *vansomereni* Edw. (p. 327).
29. Tergites with pale basal bands; antenna of ♀ normal . . . 30.
 Tergites, at least the first few, unbanded (distal tergites banded in *schwetzi*,
 but this has sub-plumose ♀ antennae) . . . 47.
30. Venter pale, unbanded; proboscis often pale beneath . . . 31.
 Sternites with dark apical bands; proboscis all dark . . . 36.
31. 2-4 lower mesepimeral bristles . . . 32.
 Only one lower mesepimeral bristle . . . 33.
32. Thorax pale; proboscis all dark . . . *laticinctus* Edw. (p. 313).
 Thorax darker; proboscis pale in middle beneath . . . *watti* Edw. (p. 302).
33. ♂ with normal coxites and hairy palpi; proboscis pale beneath in middle; pale
 spot at tip of hind tibia inconspicuous . . . 34.
 ♂ with swollen coxites and rather short and scantily haired palpi . . . 35.
34. Scutal scales reddish-brown; upper fork-cell in ♀ over three times as long as its
 stem; palpi in ♂ markedly longer than proboscis . . . *picipiens* L. (p. 314).
 Scutal scales usually more buff-tinted; upper fork-cell in ♀ barely 2.5 times as
 long as its stem; palpi in ♂ not so long . . . *fatigans* W. (p. 316).
35. Proboscis not distinctly paler beneath; pale bands of tergites broad; femora
 and hind tibia with conspicuous yellow apical spots *ninagongoensis* Edw. (p. 319).
 Proboscis pale beneath; pale bands of tergites narrower; knee-spots less
 conspicuous . . . *calurus* Edw. (p. 320).
36. Hind femur with three-quarters or more of anterior surface all dark . . . 37.
 Hind femur white-scaled below on at least basal half of anterior surface . . . 39.
37. Scales round pre-scutellar bare space dark; a median line of dark scales on
 scutum . . . *tamsi* Edw. (p. 323).
 Scales round bare space pale; no dark scales in median line of scutum . . . 38.
38. Scutum with many dark scales, especially on posterior half
andersoni Edw. (p. 324); *musarum* Edw., ♂ (p. 331).
 Scutal scales all golden-yellow . . . *hopkinsi* Edw. (p. 326).
39. Scutal scales uniform reddish-brown; small species with male palpi all dark
decens Theo. (p. 336).
 Scutal scales dark brown and yellow in varying proportions; penultimate
 segment of male palpi with a line of white scales beneath . . . 40.
40. Pale spot at tip of hind tibia less conspicuous, usually shorter than broad . . . 41.
 This spot more conspicuous, usually longer than broad . . . 42.
41. Distal half of anterior surface of hind femur dark . . . *triflatus* Edw. (p. 321).
 Distal third of anterior surface of hind femur dark . . . *tr.* ssp. *aenescens* n. (p. 323).
 Distal fourth of anterior surface of hind femur dark . . .
42. Only distal sixth of anterior surface of hind femur dark; thorax of ♀ with three
 broad stripes of pale scales; palpi of ♀ one-fourth as long as proboscis
hancocki Edw. (p. 330).
 Hind femur more extensively dark; thorax less obviously striped; palpi of
 ♀ shorter . . . 43.
43. Distal half of anterior surface of hind femur dark . . . 44.
 Distal fourth to one-third (rarely almost half) of anterior surface of hind femur
 dark . . . 45.
44. Larger; breeds in ground-pools in Abyssinia *andersoni* ssp. *abyssinicus* n. (p. 325).
 Smaller; breeds in banana-axils in Uganda . . . *musarum* Edw. (p. 331).
45. Pale scales of mesonotum tending to form a pair of spots near middle . . . 46.
 Such spots not evident . . . *toroensis* ssp. *macrophyllus* E. & G. (p. 329).
46. Larger, wing-length 4.5-5.5 mm. . . *toroensis* E. & G. (p. 329).

- Smaller, wing-length 3.5-4.5 mm. *scotti* Theo., ♂ (p. 332); *chorleyi* sp. n. (p. 330).
47. Mesepimeron with a distinct scale-patch in middle 48.
 Mesepimeron bare of scales, or almost so 63.
48. Antenna of ♀ normal, each flagellar segment with only 4-6 long hairs; knob of
 halteres usually dark 49.
 Antennae of ♀ sub-plumose, first few flagellar segments each with 10-20 long
 hairs; halteres all yellow 58.
49. Venter pale, unbanded 50.
 Sternites with dark apical bands 51.
50. Small brown species; one lower mesepimeral bristle *antennatus* Beck (p. 333).
 Larger black species; 2-5 lower mesepimeral bristles; basal antennal segment
 orange *moucheti* Evans (p. 351).
51. Hind tibia with a pale spot at tip 52.
 Hind tibia entirely dark 57.
52. Hind femur with one-fourth or more of anterior surface dark; scutum with many
 yellowish scales tending to form spots or stripes; erect scales of head yellow
 in middle 53.
 Hind femur with one-fifth or less of anterior surface dark; scutum without
 spots or stripes of pale scales; erect scales of head all or nearly all dark 55.
53. Hind femur with one-half of anterior surface dark; scutum with median
 stripe of pale scales confined to area between the bare lines
musarum Edw., ♀ (p. 331).
 Hind femur with one-fourth to one-third of anterior surface dark 54.
54. Scutum with median area of pale scales anteriorly, extending beyond the bare
 lines *scotti* Theo., ♀ (p. 332)
 Scutum with a pair of spots of pale scales about middle
ornatothoracis Theo. (p. 340).
55. Scutal scales reddish-brown *decens* Theo. (p. 336).
 Scutal scales dark brown without reddish tinge, sometimes some pale scales
 intermixed 56.
56. Hind femur with barely one-sixth of anterior surface dark
invidiosus Theo. (p. 338); *quasiguiarti* Theo. (p. 344).
 Hind femur with fully one-fifth of anterior surface dark *trifolius* Theo. (p. 339).
57. Scales round pre-scutellar space pale; hind femur with the dark area at tip on
 anterior surface longer than broad *perfuscus* Edw. (p. 340).
 Scales round pre-scutellar space dark; hind femur with the dark area at tip on
 anterior surface shorter than broad *perfidiosus* Edw. (p. 342).
58. Hind tibia with pale spot at tip; two lower mesepimeral bristles
grahami Theo. (p. 347).
 Hind tibia all dark; usually only one lower mesepimeral bristle 59.
59. Venter pale, unbanded; proboscis pale beneath *weschei* Edw. (p. 345).
 Venter with dark bands, proboscis all dark 60.
60. Tergites 3-7 or 4-7 with white basal bands, narrow in middle *schwetzi* Edw. (p. 347).
 Tergites unbanded, or at most 6 and 7 with the basal pale spots joined 61.
61. Propleura with numerous scales *guiarti* var. *sudanicus* (p. 345).
 Propleura with few scales, and sternopleural scale-patches smaller 62.
62. Scutal scales mostly dark *guiarti* Blanch. (p. 342).
 Scutal scales mostly or all pale *ingrami* Edw. (p. 346).
63. Thorax very pale, shoulders extensively so; 2-4 lower mesepimeral bristles
pruina Theo. (p. 349).
 Thorax much darker; 1-3 lower mesepimeral bristles in ♀, 1 in ♂
 (*Culicomyia*) *macfiei* Edw. (p. 276); *philipi* Edw. (p. 350).

Culex (Culex) poicilipes Theobald.

- Lasionops poicilipes* Theobald, Rept. Liverpool S. Trop. Med. Mem. 10, App. p. ix (June, 1903), and Mon. Cul. 3, p. 236 (July, 1903).
Culex quasigelidus Theobald, Mon. Cul. 3, p. 181 (July, 1903); Edwards, Bull. Ent. Res. 2, p. 258 (1911); 3, p. 29 (1912); and 11, p. 136 (1920).
Culex taeniorhynchoides Giles, J. Trop. Med. p. 369 (1904).
Taeniorhynchus tenax var. *maculipes* Theobald, First Rept. Wellcome Lab. p. 79 (1905).
Pseudoheptaphlebomyia madagascariensis Ventrillon, Bull. Mus. Paris, 11, p. 427 (1905).
Culex par Newstead, Ann. Trop. Med. 1, p. 25 (1907); Theobald, Mon. Cul. 5, p. 337 (1910).
Aporoculex punctipes Theobald, Mon. Cul. 4, p. 316 (1907).
Leucomyia quasigelida Theobald, Mon. Cul. 5, p. 315 (1910).
Culex auritaenia Enderlein, Wien. Ent. Zeit. 38, p. 49 (1921); Edwards, Bull. Ent. Res. 12, p. 78 (1921).
- TYPES.—*poicilipes*, ♀ in B.M., Bonny, S. Nigeria; *quasigelidus*, ♂♀ in B.M., Entebbe; *taeniorhynchoides*, ♀ in B.M., Benguela; *maculipes*, ♀ in B.M., Sudan; *madagascariensis*, ♀ in Paris and B.M., Tananarive; *par*, ♀ in Liverpool School of Tropical Medicine, Tshumbiri, Congo; *punctipes*, ♀ in B.M., Chinde; *auritaenia*, ♀ in Berlin and B.M., Tananarive.

This is a very distinct species, readily distinguishable from all other African *Culex* except *C. tigripes* by the rows of small pale spots on anterior surfaces of femora and tibiae, and from *C. tigripes* by the well-marked median pale ring on the proboscis.

♀. *Head* with the erect scales narrow and dark, decumbent scales of vertex narrow and pale, varying in colour from dull light brownish to almost white. Proboscis with a sharply-defined median pale yellowish ring, otherwise dark. Palpi with some white scales at tip. Tori with small white scales. *Thorax* blackish, scales of scutum mainly dark brown or blackish, in normal specimens with a transverse band of pale scales behind the middle, these scales usually golden-yellow but often paler or even white; the extent of the pale area variable, in the darkest specimens reduced to a pair of spots, in the lightest almost covering anterior two-thirds of scutum, leaving posterior third blackish. Pleurae with the three patches of flat white scales usual in this subgenus: a large area on upper part and a small patch on lower part of sternopleura, and another above middle of mesepimeron; no post-spiracular or pre-alar scales, and few or no scales among upper mesepimeral hairs. *Abdomen* mainly blackish, with variable pale markings; in the darkest specimens these markings are almost reduced to a median basal yellowish spot on tergite 2; often the abdomen is mainly dark above but with the sides of tergites 6 and 7 rather broadly yellowish; in lighter specimens all tergites may have more or less developed basal yellowish or whitish bands, and the last few tergites are more or less extensively yellow-scaled apically. *Legs* (Fig. 97, a): Front femora and tibiae blackish in front, each with a row of 7-10 small distinct yellowish spots, hind tibia with a few similar spots on distal half of outer surface. Tarsi with pale rings at the joints which are scarcely longer than wide; on joint 4-5 of hind tarsi the pale ring is scarcely noticeable. Wings with all scales dark, those on fork very narrow and long. *Pharyngeal teeth*, Fig. 94, a.

♂. Similar to ♀, but pale scales on thorax and abdomen tending to be more numerous; often a pale area on each side of proboscis at tip. Palpi (Fig. 75) with nearly the distal half of shaft as well as last two segments very hairy; five conspicuous pale rings—a narrow one before middle and a broader one beyond middle of shaft, a narrow one at base of each of last two segments, and finally one occupying about the distal half of the terminal segment. *Terminalia* (Fig. 100, a): Coxite with a small lobe bearing three subequal spines (none of them very stout), some unmodified

hairs and a well-developed, broadish leaf. Paraprocts without basal arm. Phallosome somewhat of the type of *C. annulioris*.

Wing-length 3.5–4.5 mm.

Distribution.—This is one of the commoner mosquitoes over the greater part of tropical Africa, except the more heavily forested regions. Recorded localities include shores of Lake Chad, Accra, Lake Tana, Benguela, Zululand, Madagascar, Mauritius. It extends down the Nile Valley to Alexandria, but not further into the Mediterranean region.

Variation.—The variation noted in the above description seems to be mainly individual rather than local, but it may be possible to distinguish a typical dark form and a lighter variety (*quasigelidus*), the latter distinguished especially by the whiter scales on the pale areas of the thorax and abdomen and more extensively pale mesonotum.

There does not appear to be any constant difference between Malagasy and mainland specimens.

Culex (Culex) bitaeniorhynchus Giles.

Culex bitaeniorhynchus Giles, J. Bombay Nat. Hist. Soc. 13, p. 607 (May, 1901); Edwards, Ind. J. Med. Res. 10, p. 282 (1922).

Taeniorhynchus ager Giles, Entom. 34, p. 196 (July, 1901); Theobald, Mon. Cul. 2, p. 199 (Nov., 1901).

Taeniorhynchus tenax Theobald, Mon. Cul. 2, p. 198 (Nov., 1901).

Culex aurantapex Edwards (♂, not ♀), Bull. Ent. Res. 10, p. 134 (1920).

TYPES.—*bitaeniorhynchus*, ♀ lost, N.-W. India; *ager*, ♀ lost, N.-W. India, ♂ in B.M., Madras; *tenax*, ♀ in B.M., Malay Peninsula.

Culex bitaeniorhynchus typifies a small group of species which are in most respects similar to *C. poicilipes* as described above, but lack the rows of small pale spots on the femora and tibiae; the species of this group are specially characterized by their ringed proboscis and tarsi and absence of lower mesepimeral bristle, differing from the species of the similar *sitiens* group in their larger size and tendency to pale scaling on anterior two-thirds of scutum.

In the Oriental region *C. bitaeniorhynchus* is widely distributed and subject to very great variation. The typical form, which has not as yet been found in Africa, agrees rather closely in colouring with the allied *C. ethiopicus* (which I formerly regarded as the same species). The African specimens examined and described below are blacker than usual and otherwise intermediate between some of the Oriental varieties. The species is chiefly distinguished from some of its near allies by the structure of the phallosome.

♀. *Head* dark; proboscis with a small pale area at tip (before labella) in addition to the median pale ring. *Thorax* blackish, usually almost entirely so, scutum with some yellowish scales which tend to form a pair of pale spots behind middle, but not a complete transverse band. *Abdomen* largely black, without basal bands but with apical lateral yellow spots on tergites 5–8, these spots sometimes small, sometimes larger; in some specimens tergites 6–8 are entirely yellow-scaled, as in *C. aurantapex*. *Legs* black, sprinkled with pale scales on femora and tibiae (more obviously so in some specimens than in others). *Wings* with a fairly copious

sprinkling of pale scales, though without the pepper-and-salt appearance of the typical Oriental form and of *C. ethiopicus*.

♂. Resembles ♀. *Terminalia* (Fig. 100, b, c) rather closely resembling those of the Oriental var. *tenax*; features readily distinguishing this from the allied African species are the rudimentary basal arm of the paraproct (as in *ethiopicus*), the outwardly-pointed outer division and the long reflexed tip of the inner division of the phallosome.

Distribution.—TANGANYIKA: Dar-es-Salaam (*Pomero*y). UGANDA: Jinja (*Hopkins*). SUDAN: Koshi (*Ruttledge*). KENYA: Malindi (*MacDonald*). BELGIAN CONGO: Thysville (*Schwetz*).

The specimens from Dar-es-Salaam bear a close superficial resemblance to *C. aurantapex* on account of the yellow-tipped abdomen of the female, and I erroneously recorded them as that species; those from Jinja and Koshi are mostly darker.

Culex (*Culex*) *ethiopicus* Edwards.

Culex ager var. *ethiopicus* Edwards, Bull. Ent. Res. 3, p. 30 (1912).

Culex bitaeniorhynchus var. *ethiopicus* Edwards, Bull. Ent. Res. 10, p. 135 (1920).

Taeniorhynchus tenax var. *maculipes arabiensis* Patton, J. Bombay Nat. Hist. Soc. 16, p. 623 (1905).

TYPE.—♀ in B.M., Boie.

This species, hitherto regarded as at most a variety of *C. bitaeniorhynchus*, is now treated as distinct on account of a well-marked difference in the terminalia which appears constant throughout its range in Africa. The coloration also appears to be constant.

♀. *Head*.—Proboscis narrowly pale at tip (before labella) as usual in *C. bitaeniorhynchus*. *Thorax* brownish, not very dark; scales on anterior two-thirds of scutum

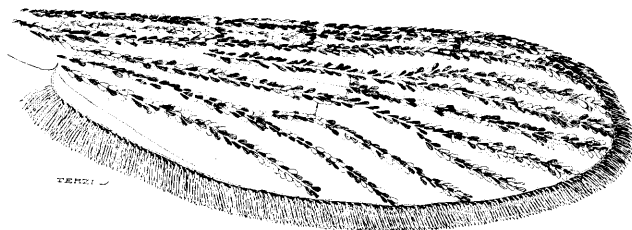


FIG. 99.—Wing of *Culex ethiopicus* Edw.

nearly all pale, contrasting with the darker scales on posterior third. *Abdomen* conspicuously banded, tergites 2-7 having uniformly wide apical creamy-yellow bands; fairly numerous scattered pale scales on the dark basal two-thirds of each tergite. *Legs* with dark and light scales about evenly mixed on anterior surfaces of femora and tibiae. *Wings* (Fig. 99) with a pepper-and-salt appearance owing to the light scales being about as numerous as the dark ones; most of the scales rather broad.

♂. Resembles ♀. *Terminalia* (Fig. 100, d): Coxite as in *bitaeniorhynchus*, rather broad and short, with a small lobe which bears only two stout and rather short-pointed spines, the third spine being a mere bristly hair and the leaf so narrow as

to be hardly distinguishable from a hair. Paraproct as in *bitaeniorhynchus*, with a rudimentary basal arm. Phallosome composed of two divisions both of which have reflexed points as in *bitaeniorhynchus*, the inner division lacking teeth but being coated with microscopic pubescence; outer division much larger and flatter than in *bitaeniorhynchus*, and inner division with much less prominent point.

Wing-length about 4 mm.

Distribution (as confirmed by male terminalia).—GOLD COAST: Bole (*Ingram*). NIGERIA: Maiduguri (*Innes*); Gadau (*Taylor*). SUDAN: Matolu and Lado (*King*); Meridi (*Ruttledge*). UGANDA: Kampala (*Hopkins*). TANGANYIKA: Dar-es-Salaam (*Pomeroy*). ZANZIBAR (*Aders*). BELGIAN CONGO: Albertville (*Henrard*); Boma

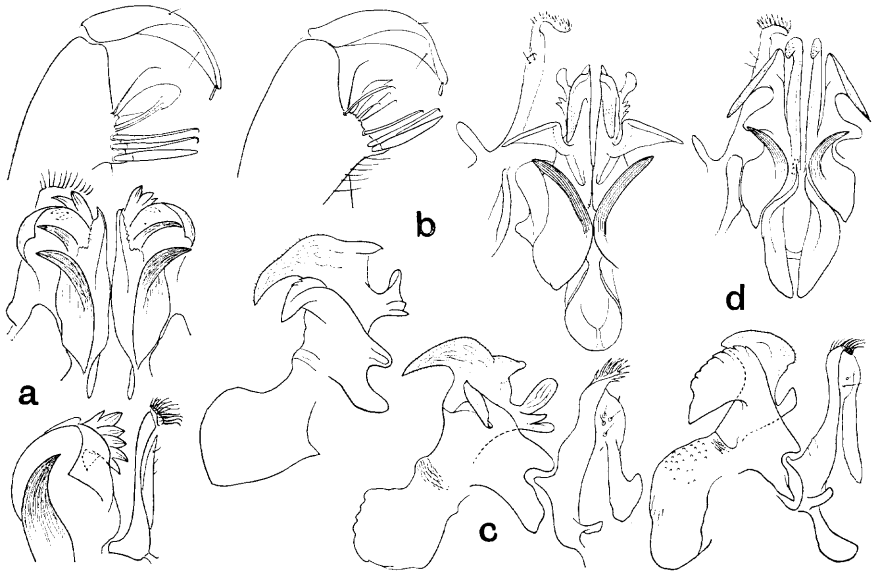


FIG. 100.—Terminalia details (lobe and style, basal parts in sternal and lateral view) of *Culex* spp. a. *poecilipes*. b. *bitaeniorhynchus* (Malindi and Dar-es-Salaam). c. *bitaeniorhynchus* (phallosome only, Jinja). d. *ethiopicus*.

(*Nicolay*); Chutes François Joseph (*Schwetz*). S. RHODESIA: Salisbury, Bindura and Myagui (*Leeson*). ADEN PROT.: Wadi Ma'adin (*Petrie*, 1939). Bedford's records of *bitaeniorhynchus* from Transvaal and Zululand presumably refer to this species.

As proved by *Petrie's* collection, *Patton's* *F. t. m. arabiensis* from Aden Hinterland was doubtless this species rather than *bitaeniorhynchus* (with which the description would also agree), but the name *arabiensis* cannot be used in place of *ethiopicus* as it was also employed by *Patton* for his *Culex arabiensis* (a species of *Aëdimorphus*).

***Culex (Culex) aurantapex* Edwards.**

Culex aurantapex Edwards (type ♀), Bull. Ent. Res. 5, p. 74 (1914).

TYPE.—♀ in B.M., Nairobi.

A very black species, much resembling the black varieties of *C. bitaeniorhynchus*,

but with almost entirely dark-scaled wings, and (as now shown) with quite different terminalia more resembling those of *C. annulioris*.

♀. *Proboscis* with the distinct median pale ring characteristic of this group of species, but with the tip entirely dark. *Thorax* black; scutum clothed with black scales and bristles and with a few scattered golden scales which do not tend to form a definite pattern. *Abdomen* with tergites 2-4 black, with a few scattered pale scales; 5-8 almost entirely orange-scaled, as are sternites 5-8. *Legs* black, with only a few scattered pale scales on femora and tibiae. *Wings* black-scaled, with a very few pale scales towards base, especially on subcostal vein. *Pharyngeal teeth*, Fig. 94, b.

♂. Resembles ♀. *Palpi* with the second pale ring (on distal half of shaft) less distinct than in *bitaeniorhynchus*, sometimes absent. *Terminalia* (Fig. 101, a, b): Coxite as in *bitaeniorhynchus*, with very narrow leaf. *Paraproct* as in *annulioris*, with long basal arm. *Phallosome* of similar type to that of *annulioris* (and therefore entirely different from that of *bitaeniorhynchus*), but differing in many details, notably in the form of the distal tooth of the outer division.

Wing-length 4.5-5.5 mm.

Distribution.—KENYA: Nairobi (*Anderson, Van Someren, Hopkins*).

Specimens recorded by me from Dar-es-Salaam (*Pomeroy*) prove to have been wrongly named and are now treated as appertaining to a variety of *C. bitaeniorhynchus*.

Var. *jinjaensis* nov.

TYPE.—♂ in B.M., Jinja.

Differs from typical *aurantapex* in being still blacker, the abdomen lacking the conspicuous orange tip; tergites 5-8 in both sexes with apical lateral yellow patches, which tend to unite to form rather irregular lateral yellow stripes on distal half of abdomen.

♂. *Terminalia* (Fig. 101, c) differing little if at all from those of the typical form.

Distribution.—UGANDA: Jinja and Kampala (*Hopkins*).

The series from Jinja was taken in company with specimens of the black variety of *bitaeniorhynchus* and also of *poecilipes* and *annulioris* var. *consimilis*, these four species all apparently occupying the same breeding-place.

Culex (*Culex*) *annulioris* Theobald.

Culex annulioris Theobald, Liverpool S. Trop. Med. Mem. 5, App. (1901), and Mon. Cul. 1, p. 371 (1901), 3, p. 163 (1903), and 5, p. 336 (1910); Edwards, Bull. Ent. Res. 2, p. 259 (1911).

Culex annulioris var. *gambiensis* Theobald, Mem. Liverpool S. Trop. Med. 10, App. p. v (1903).

TYPES.—*annulioris* ♀ in B.M., Salisbury; *gambiensis*, ♀ in B.M., Bathurst.

A variable species which might easily be confused with *C. bitaeniorhynchus* or *C. aurantapex*, but with different terminalia, and in the typical form with characteristic abdominal markings similar to those of the Oriental *C. bitaeniorhynchus* var. *ambiguus*. Wings with few or no pale scales. *Proboscis* dark at tip.

♀. *Head* as in allied species; *proboscis* with sharply-defined median pale ring but without pale scales at tip. *Thorax* brownish, scales of scutum forming a more or less mottled pattern; in many but by no means all specimens there is a yellowish or whitish transverse band behind middle, and not infrequently the anterior two-thirds

of scutum is mainly clothed with pale brownish scales. White scales on pleurae broad, fairly numerous among upper mesepimeral hairs. *Abdomen* in the typical form with large median basal and lateral apical triangles on each of tergites 2-7, the median triangles gradually decreasing and the lateral ones slightly and gradually increasing in size on the successive tergites. Dark parts of tergites with or without a slight sprinkling of pale scales. Sternites extensively dark. *Legs* in the typical form with a heavy sprinkling of pale scales on femora and tibiae, without any tendency to aggregation into spots; tarsal rings rather broader than in *bitaeniorhynchus*, nearly twice as long as broad on joints 1-2 and 2-3 of hind tarsi. *Wings* with a slight but obvious sprinkling of pale scales chiefly on costa, subcosta, first and fifth veins. *Pharyngeal teeth*, Fig. 94, c.

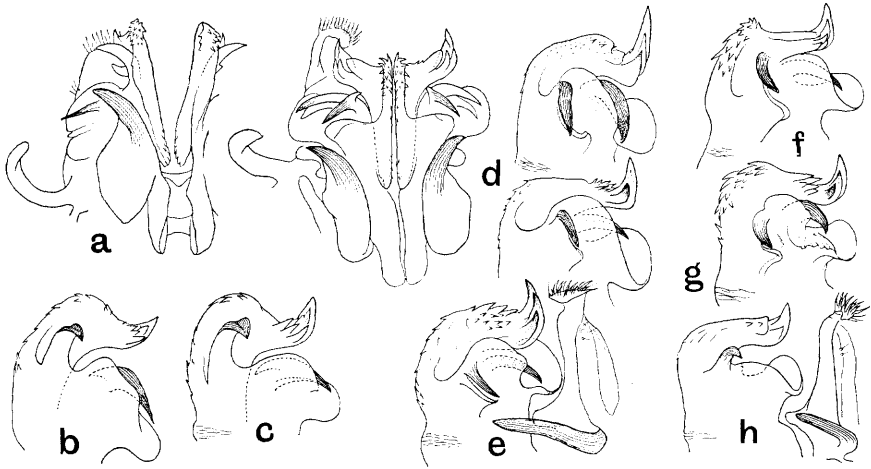


FIG. 101.—Terminalia details (basal parts in sternal view; phallosome from side) of *Culex* spp. a, b. *aurantapex*, typical form from Nairobi. c. *aurantapex* var. *jinjaensis*. d. *annulioris*, typical form. e. *annulioris*, specimen from Elizabethville. f. *annulioris* var. *major*. g. *annulioris* var. *consimilis*. h. *giganteus*. (Paraproct as well as phallosome shown in lateral view in g and h.)

♂. Resembles ♀, but as in the allied species the pale scaling of the scutum is frequently more extensive. Palpi as in *poicilipes*. *Terminalia* (Fig. 101, d, e): Coxite almost as in *bitaeniorhynchus*, but leaf distinctly broader, its greatest breadth almost half its length. Paraproct with long basal arm. Phallosome of complicated structure quite different from that of *bitaeniorhynchus* and more resembling *sitiens* or *vishnui*; in the typical form the curved posterior margin of the inner division bears only very minute spinules.

Wing-length 4-4.5 mm.

Distribution.—The typical form of this species is widely distributed and common in East and South Africa, but also spreads across to the west. Specimens have been examined at the British Museum from the following localities among others: NATAL: Durban (*Bevis*). ORANGE FREE STATE: Vaal River (*Ingram*). TRANSVAAL: Pretoria (*Theiler*). ANGOLA: Bihé (*Wellman*). NYASALAND: Fort Johnston (*Lamborn*). ZANZIBAR (*Aders*). TANGANYIKA: Dar-es-Salaam (*Pomeroy*). BELGIAN CONGO: Elisabethville (*Schwetz*); Matadi (*Wanson*). S. RHODESIA: Salisbury

(*Marshall*). UGANDA: Arua and Soroti (*Hopkins*). KENYA: Mumias (*Nair*); Nairobi (*Anderson*). ABYSSINIA: Dessie-Assab (*Raffaele*). GOLD COAST: Bole (*Ingram*).

The form described as *gambiensis* is hardly a recognizable variety, being intermediate between the type form and the usual West African variety *consimilis*. The type ♀ of *gambiensis* has median basal triangles on tergites smaller and less pointed than in typical *annulioris*, apical triangles indistinct on first few tergites, and pale scales of wings almost confined to *Sc*. Similar specimens are in the British Museum from Gold Coast (Accra), Sudan (Meridi) and Uganda (Arua).

ssp. **consimilis** Newstead.

Culex tigripes var. *consimilis* Newstead, Ann. Trop. Med. 1, p. 23 (1907); Theobald, Mon. Cul. 5, p. 393 (1910).

Culex consimilis Edwards, Bull. Ent. Res. 2, p. 259 (1911).

Culex pseudoannulioris Theobald, Mon. Cul. 5, p. 333 (1910).

Culex annulioris var. *congolensis* Evans, Ann. Trop. Med. 17, p. 91 (1923).

Culex bitaeniorhynchus var. *mayumbae* Galliard, Ann. Parasit. 9, p. 229 (1931).

TYPES.—*consimilis*, ♀ in Liverpool School of Tropical Medicine, Congo (labelled "May 28, in bush near water")*; *pseudoannulioris*, ♀ in B.M., Obuasi; *congolensis*, ♂ in Liverpool School of Tropical Medicine, Leopoldville; *mayumbae*, ♂ in B.M., Gaboon.

Differs from the typical form in having dorsal surface of abdomen almost entirely black, no basal bands or median spots on tergites,* and only small apical lateral spots, if any, on 6 and 7. Comparatively few scattered pale scales on legs. Wings entirely dark-scaled, or at most with a very few pale scales on *Sc*.

♂. *Terminalia* (Fig. 101, g): Differ slightly from typical *annulioris* in having the curved posterior edge of inner division of phallosome more strongly spinulose, otherwise quite similar.

Distribution.—This form largely replaces typical *annulioris* in West Africa. British Museum material includes specimens from the following localities: SIERRA LEONE: Freetown (*Austen*). GOLD COAST: Obuasi (*Graham*); Bole and Sunyani (*Ingram*); Kumasi (*Watt*). LIBERIA: Du River (*Bequaert*). NIGERIA: Lagos (*Graham*). GABOON: Tchibonga (*Galliard*). BELGIAN CONGO: Stanleyville (*Schwetzel*). UGANDA: Kampala and Jinja (*Hopkins*). SUDAN: R. Menzi (*King*).

ssp. **major** Edwards.

Culex annulioris var. *major* Edwards, Bull. Ent. Res. 26, p. 135 (1935).

TYPE.—♂ in B.M., Nairobi.

Considerably larger on the average than the typical form. Thorax tending to be darker; comparatively seldom with anterior third of scutum definitely pale-scaled, but pale across middle. Scales on pleurae less pure white and narrower. Abdomen with conspicuous basal bands on tergites 2-7 which, though widened in middle, do not give the impression of triangular spots; on the other hand there are

* According to the original description of *consimilis* narrow pale basal bands are present on the tergites, but in the lectotype the slight appearance of banding is merely due to the pale marginal hairs and not to pale scales. Another specimen in the Liverpool collection labelled as type of var. *consimilis* is a typical *C. poecilipes*: it is probable that this and similar specimens, having spotted legs, induced Newstead to place *consimilis* as a variety of *tigripes*, but as Newstead had confused two species I here follow the restriction of the type I made in 1911.

no lateral apical pale triangles on the tergites, or at most a few pale scales in this position. Only a moderate number of pale scales on femora and tibiae, and scarcely any on wing.

♂. *Terminalia* (Fig. 101, f) : Phallosome differing slightly from both the typical form and from ssp. *consimilis*. Coxite and paraproct as in the typical form.

Wing-length 5-6.7 mm.

Distribution.—KENYA : Nairobi (*Van Someren*). UGANDA : Kabale (*Hopkins*). BELGIAN CONGO : Blukwa, Lake Albert, Costermansville, Kabare and Walungu, Lake Kivu (*Schwetzel*).

• This subspecies is more likely to be confused with *C. duttoni* than with other forms of the *bitaeniorhynchus* group, owing to similarity in abdominal markings ; it should perhaps be treated as a distinct species. Schwetzel found it to be the predominant form of the species in the Kivu district, but at Walungu this and typical *annulioris* were both reared from larvae taken in the same breeding-place ; mounted terminalia of both forms from this batch agreed fairly closely with the figures here given (Fig. 101, d and f).

Culex (Culex) giganteus Ventrillon.

Culex giganteus Ventrillon, Bull. Mus. Paris, 12, p. 100 (1906) ; Edwards, Bull. Ent. Res. 11, p. 136 (1920).

Culex neireti Ventrillon, Bull. Mus. Paris, 12, p. 103 (1906).

TYPES.—*giganteus* and *neireti*, ♂♀ in Mus. Hist. Nat. Paris, Tananarive.

Very similar to the typical form of *C. annulioris*, of which it is perhaps the Malagasy representative, but differs as follows :

♀. Palpi extensively white-scaled in middle as well as at tip. Pleurae with more numerous broad white scales, including a rather large patch among the upper mesepimeral hairs. *Abdomen* with the pale scales yellower ; lateral marks on 5-7 extending further along sides of tergites ; sternites largely pale-scaled, with Λ -shaped dark marks. *Legs* : Pale scales on middle and hind femora tending to form a small dorsal pale spot near the tip, followed by a small dark area (the scales at extreme tip being pale) ; tarsal rings perhaps a little broader. *Wings* with very few scattered pale scales, but with a pale area at tip usually involving tip of first vein, and distal half of upper fork, sometimes also the costa.

♂. Similar to ♀ as regards markings of legs and abdomen, but pale area at wing-tip scarcely noticeable. *Terminalia* (Fig. 101, h) : Coxite much as in *bitaeniorhynchus* ; lobe without leaf. Paraproct with a moderate basal arm (much shorter than that of *annulioris*). Phallosome much as in *annulioris* but without lateral tooth near base of outer division.

Wing-length 5-6 mm.

Distribution.—MADAGASCAR : Tananarive (*Neiret*).

Culex (Culex) sitiens Wiedemann.

Culex sitiens Wiedemann, Aussereurop. Zweifl. Ins. 1, p. 543 (1828) ; Edwards, Bull. Ent. Res. 4, p. 232 (1913), and 14, p. 394 (1924) ; Edwards, Ind. J. Med. Res. 10, p. 283 (1922) ; Barraud, Ind. J. Med. Res. 11, p. 993 (1924) ; Barraud, Fauna Brit. Ind. Dipt. 5, p. 398 (1933).

Culex salus Theobald, Third Rept. Wellcome Lab., p. 256 (1909).

Culex salsus Theobald, Mon. Cul. 5, p. 338 (1910).

Culex somaliensis Neveu-Lemaire, Arch. Parasit. 10, p. 254 (1906); Edwards, Bull. Ent. Res. 2, p. 261 (1911).

(Also several Oriental and Australian synonyms.)

Types.—*sitiens*, ♀ in Vienna (probably now lost), Sumatra; *salus (salsus)*, ♂♀ in B.M., Port Sudan; *somaliensis*, ♂♀ probably lost, Djibuti.

Culex sitiens typifies a small group of species which agree with those of the *bitaeniorhynchus* group in their ringed proboscis and tarsi and absence of lower mesepimeral bristle, but differ in their smaller size, lack of any tendency to have the anterior part of mesonotum white-scaled, and in having few or no pale scales on the distal margins of the abdominal segments. The male terminalia show affinity with the *bitaeniorhynchus* group as regards the structure of the phallosome, but the lobe of the coxite approaches more closely to typical *Culex*.

The group is mainly Oriental in distribution, and two of the African species are widely distributed in the East. *C. sitiens* is most readily distinguished from the

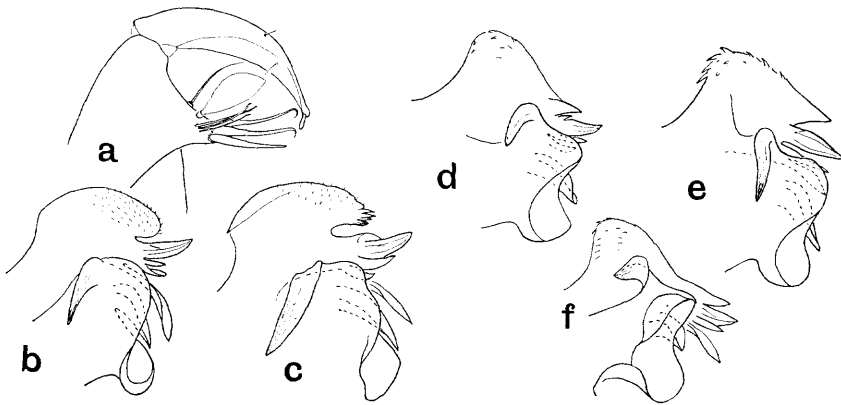


FIG. 102.—Terminalia details of *Culex* spp. a. Lobe and style, *sitiens*. b–f. Phallosome in side view. b, c. *sitiens* (b, Red Sea Coast; c, Madagascar). d–f. *thalassius* (d, Gold Coast; e, Madagascar; f, Dar-es-Salaam).

other two species occurring in Africa by its speckled femora and short upper fork cell.

♀. *Head* dark, with decumbent scales of vertex all pale, bristles and erect scales mostly dark. Palpi short, with a few white scales at tip. Proboscis dark, with a whitish ring in middle which is rather variable in width but always sharply defined and without any tendency to extend towards the base on under side. *Thorax* dark; scutum with many of the scales dark, but a variable number of pale scales present on front margin, about the middle and towards the scutellum, forming an irregular mottling. Pleurae with the usual three patches of flat white scales; no post-spiracular, pre-alar or paratergal scales, and very few or no scales among upper mesepimeral hairs. *Abdomen* blackish above, with white bands at bases of tergites, these bands of even width except on tergite 2, on which the band is somewhat widened in the middle; sternites with rather indefinite apical bands of black scales. *Legs* mainly dark; front and middle femora with a conspicuous sprinkling of pale scales on their anterior surfaces, hind femora mainly pale outwardly except at tip, all femora whitish behind; front and middle tibiae with an indistinct whitish line in front, all

whitish behind; hind tibiae indistinctly striped; tarsi with whitish rings at the joints, distinct on 1-2 and 2-3 and situated mainly on bases of segments, very narrow on 3-4 and scarcely noticeable on 4-5. *Wings* dark; scales rather shorter and broader than usual in this genus, noticeably so on forks; base of upper fork-cell slightly but almost always distinctly distal to that of lower.

♂. Resembles ♀. Palpi with two pale rings on shaft, the distal ring broad; distal half of shaft with a row of curved whitish hairs interno-ventrally, the tips of these hairs somewhat flattened but not to such an extent that they form definite scales as in the subgenus *Culiciomyia*; last two segments with narrow white rings at base, terminal segment with its tip rather broadly white (about one-sixth to one-quarter). *Terminalia* (Fig. 102, a-c): Lobe of coxite bearing a similar set of modified bristles to those found in the *pipiens* group—three stout rods, the proximal one straight, the other two with tips slightly hooked and a little longer, three flattened, blunt-tipped bristles (much shorter than the rods), a broad leaf, and a curved simple bristle. Paraproct with basal arm. Phallosome very complex, composed of two main divisions, the outer division as in the *bitaeniorhynchus* group with an outwardly-directed tooth or spine, inner division with several teeth, of which the innermost one is markedly longer and more slender than the rest.

Wing-length 2-3.5 mm.

Distribution.—In Ethiopian Region: SUDAN: Port Sudan (*King*). S. W. ARABIA: Wadi Maseila, Hadramaut (*Ingrams*); Jeddah (*Mackie, Philby*). ADEN (*Loughnan*). BRITISH SOMALILAND: Bulhar (*Drake-Brockman*). ZANZIBAR (*Aders*); Pemba (*McCarthy*). TANGANYIKA: Lindi (*Howarth*); Dar-es-Salaam (*Drake-Brockman*). MADAGASCAR: Majunga (*Lamborn*). ALDABRA I. (*Dupont*). MAURITIUS (*MacGregor*).

Outside the Ethiopian regions *C. sitiens* is widely distributed on coasts from India and Ceylon to northern Australia and Fiji.

Variation.—Specimens from Somaliland, Aden and Red Sea Coast have most of the mesonotal scales pale, at least in the ♂, and there is a very slight difference in the form of the inner division of the phallosome (Fig. 102, b) from specimens from Madagascar and Aldabra (Fig. 102, c). I have examined a male similar to the Red Sea form from Bombay, and males similar to the Madagascar form from Ceylon and Siam; Baisas (1939) has figured an Indian specimen of the latter form.

Culex (Culex) thalassius Theobald.

Culex thalassius Theobald, Rept. Liverpool S.T.M. Mem. 10, App. p. 7 (1907³), and Mon. Cul. 3, p. 168 (1903); Edwards, Bull. Ent. Res. 2, p. 261 (1911).

Culex ronaldi d'Emmerez de Charmoy, Ann. Trop. Med. 2, p. 259 (1908).

Culicelsa accraensis Theobald, Mon. Cul. 5, p. 317 (1910).

Culicelsa accraensis var. *fusca* Theobald, Mon. Cul. 5, p. 319 (1910).

Culicelsa neotaeniorhynchus Theobald, Mon. Cul. 5, p. 320 (1910).

TYPES.—*thalassius*, ♂♀ in B.M., Gambia; *ronaldi*, ♀ in Liverpool School of Tropical Medicine, Mauritius; *accraensis*, ♂♀ in B.M., Accra; *fusca*, ♀ in B.M., Accra; *neotaeniorhynchus*, ♂♀ in B.M., Delagoa Bay.

Very similar to *C. sitiens*, differing as follows:

♀. General appearance blacker; scales of mesonotum mostly dark; white bands

of abdominal tergites usually narrower and in some specimens ("var. *fusca*") not readily visible. Femora dark in front, without any sprinkling of pale scales; tibiae without pale stripes. Wings with scales on forks longer and narrower, base of upper fork slightly proximal instead of distal to that of lower.

♂. Coloration as in ♀. *Terminalia* (Fig. 102, d-f) differing slightly from *sitiens* in form of phallosome, especially in shape of inner division (compare Fig. 102, c and d).

Distribution.—This species replaces *sitiens* on the West Coast of Africa, but on the East Coast the two occur together as I have recently ascertained by a re-study of the material and the preparation of numerous mounts of terminalia. SIERRA LEONE: Freetown (*Christophers*). GOLD COAST: Accra (*Graham, Connal*); Takoradi (*Pomeroy*). PORTUGUESE GUINEA: Bolama (*Sequeira*). GAMBIA (*Dutton*). NIGERIA: Lagos (*Dalziel, Macfie*). BELGIAN CONGO: Banana (*Wanson*). MOZAMBIQUE: Delagoa Bay (*Sant 'Anna*); Chinde (*Barnard*). TANGANYIKA: Dar-es-Salaam (*Pomeroy*). ZANZIBAR (*Aders*). KENYA: Mombasa (*Shircore*). MAURITIUS (*MacGregor*).

A damaged male from MADAGASCAR (Majunga, *Lamborn*) is most probably this species, though the phallosome differs slightly (Fig. 102, e).

This species is not as yet known to occur in the Oriental region.

Culex (Culex) tritaeniorhynchus Giles.

Culex tritaeniorhynchus Giles, J. Bombay Nat. Hist. Soc. 13, p. 606 (May, 1901), and Entom. 34, p. 192 (July, 1901); Edwards, Bull. Ent. Res. 4, p. 233 (1913), and 7, p. 224 (1917); Barraud, Ind. J. Med. Res. 11, p. 995 (1924), and Fauna Brit. Ind. Dipt. 5, p. 404.

TYPE.—♀ in B.M., Travancore, S. India.

A rather more slenderly-built species than *sitiens* or *thalassius*, from one or both of which it differs as follows:

♀. Proboscis with the median pale ring tending to extend basally beneath, and usually with some more or less scattered pale scales above on basal half, sometimes giving an appearance of a second pale ring. Scales of scutum all dark brown (except near scutellum), no pale ones even on front margin. Legs dark; no scattered pale scales on femora; tarsal rings indistinct, very narrow on joints 1-2 and 2-3 of hind tarsi and often absent on 3-4 and 4-5. Wings with scales on forks long and narrow, base of upper fork markedly proximal to that of lower. *Pharyngeal teeth*, Fig. 94, d.

♂. Colouring as in ♀. Palpi with proximal pale ring on stem very narrow; last segment dark at tip, with only a very narrow pale ring at base; row of pale hairs on stem less obvious. *Terminalia*: The three shorter bristles on lobe of coxite better developed than in *sitiens* or *thalassius* and leaf perhaps larger; phallosome much as in *thalassius* but arrangement of teeth rather different.

Distribution.—GOLD COAST: Accra (*Macfie*); Weshiang (*Hamilton*); Takoradi (*Pomeroy*). NIGERIA: Lagos (*Kerr*). ZANZIBAR (*Aders*). MAURITIUS (*MacGregor*).

Also occurs in Palestine and Mesopotamia and throughout the Oriental region from India to Japan; in India it is very common and widely distributed and by no means confined to coastal regions. The fact that it is purely coastal in Africa presumably indicates recent introduction by shipping.

Culex (Culex) ventrilloni Edwards.

Culex ventrilloni Edwards, Bull. Ent. Res. 11, p. 135 (Sept., 1920).

Culex albigena Enderlein, Wien. Ent. Zeitschr. 38, p. 50 (Nov., 1920); Edwards, Bull. Ent. Res. 12, p. 78 (1921).

TYPES.—*ventrilloni*, ♀ in Mus. Hist. Nat. Paris, Madagascar; *albigena*, ♀ in Zool. Mus. Berlin, Madagascar.

Distinguished from all other Ethiopian species of *Culex* by the fact that the narrow but distinct pale rings of the tarsi are situated exclusively at the bases of the segments without involving the tips of the preceding segments.

♀. *Head* dark, erect and decumbent scales of dorsal surface mostly dark, but with a broadish median stripe and a narrow eye-border pale yellowish. Tori with a few scales. Palpi with many white scales on inner surface about middle. Proboscis with broad and fairly sharply defined median pale ring, occupying about the middle third. *Thorax* dark; scutal scales mainly dark but with diffuse spots of yellowish scales about middle and on scutal angles. Pleuræ with indications of dark mottling on integument, the post-spiracular area being especially dark; the usual areas of flat scales on sternopleura and mesepimeron; in addition a small group of post-spiracular scales, a patch of scales occupying area between upper sternopleural and pre-alar hairs, and fairly numerous scales among upper mesepimeral hairs. One lower mesepimeral bristle. *Abdomen* dark above, tergites with broadly rounded whitish basal bands; sternites with dark apical bands. *Legs* dark, without scattered pale scales; femora and tibiae with large white knee-spots; hind femora on outer surface with about the basal half pale, with a dark dorsal line reaching base; tarsi with narrow white basal rings on at least the first three segments. *Wings* dark-scaled.

Wing-length 5 mm.

♂. Resembles ♀. Terminalia with almost the same structure as in *C. simpsoni* Theo. and *C. andersoni* Theo.

Distribution.—MADAGASCAR: Tananarive (*Ventrillon*, *Neiret*).

Culex (Culex) duttoni Theobald.

Culex duttoni Theobald, Rept. Liverpool S.T.M. Mem. 4, App. p. 5 (1901); Theobald, Mon. Cul. 2, p. 318 (1901); Edwards, Bull. Ent. Res. 2, p. 259 (1911), and 13, p. 84 (1922).

Culex hirsutipalpis Theobald, Mon. Cul. 1, p. 378 (1901), and 5, p. 342 (1910).

Culex dissimilis Theobald, Mon. Cul. 1, p. 376 (1901).

Culex anarmostus Theobald, Rept. Liverpool S.T.M. Mem. 10, App. p. 6 (1902), and Mon. Cul. 3, p. 170 (1903).

Culex minutus Theobald (type ♂ only), J. Econ. Biol. 1, p. 30 (1905).

Culex bifoliata Theobald (in part), J. Econ. Biol. 1, p. 31 (1905), and Mon. Cul. 4, p. 425 (1907); Edwards, Bull. Ent. Res. 7, p. 255 (1917).

(?) *Culex condylodesmus* Grünberg, Zool. Anz. 29, p. 385 (1905); Edwards, Bull. Ent. Res. 2, p. 268 (1911).

Culex albovirgatus Graham, Ann. Mag. Nat. Hist. (8) 5, p. 264 (1910).

TYPES.—*duttoni*, ♂♀ in B.M., Duketown, Gambia; *hirsutipalpis*, ♀ in B.M., Salisbury, Rhodesia; *dissimilis*, ♂♀ in B.M., Freetown; *anarmostus*, ♀ in B.M., Freetown; *bifoliata*, cotype ♂ in B.M., Transvaal; *minutus*, ♂ in B.M., Transvaal; *condylodesmus*, ♂♀ in Zool. Mus. Berlin, Victoria, Cameroons; *albovirgatus*, ♂♀ in B.M., Lagos.

Distinguished from other Ethiopian species of *Culex* by the combination of distinctly ringed tarsi with indefinitely ringed proboscis, and the presence (normally) of from two to four lower mesepimeral bristles.

♀. *Head* with the scales mainly pale, but two large areas of dark decumbent

scales usually discernible on dorsal surface. Tori usually with a few scales. Palpi with many whitish scales about middle. Proboscis dark at base and tip, with about the middle half whitish-scaled beneath but a much less extensive area of white scales above, the broad ring formed by these scales with its proximal boundary very indefinite, though its distal boundary is clearly defined against the dark tip. *Thorax* dark; scutal scales mainly dark (except posteriorly), but with a variable and irregular mottling of pale scales. Pleurae with the usual patches of flat white scales; a few post-spiracular scales usually present, these usually rather narrow; no scale-patch between upper sternopleural and pre-alar hairs. Pleural integument with darker patches on a lighter ground. Normally two or three lower mesepimeral bristles are present, but there are often as many as four and occasionally only one. *Abdomen*

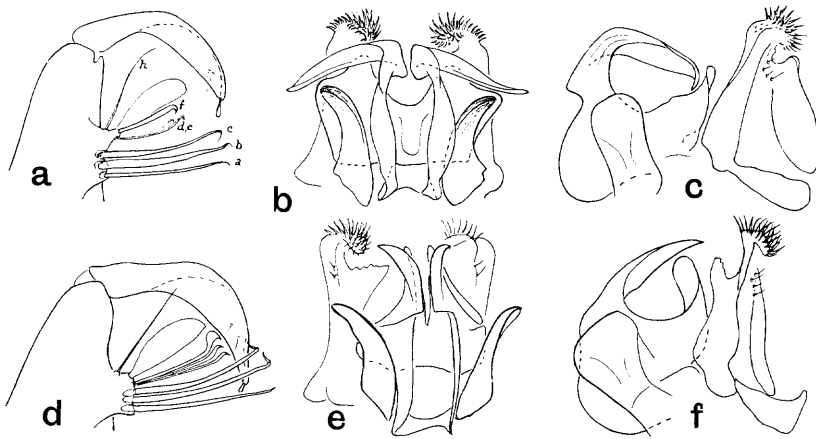


FIG. 103.—Terminalic details of *Culex* spp. a-c. *duttoni*. d-f. *watti*. a, d. Lobe and style. b, e. Phallosome and paraprocts in sternal view. c, f. The same from side.

dark above, tergites with rounded basal creamy-white bands; sternites dark-scaled on posterior corners. *Legs* mainly dark; femora without stripes and with the knee-spots small and indistinct, but tibiae each with a narrow white ring at base; middle tibia (Fig. 97, b) also with a narrow whitish stripe running almost its whole length on anterior surface, but no trace of such a stripe on hind tibia (this being one of the distinctions from *univittatus*, with which *duttoni* might sometimes be confused); tarsi (especially hind pair) with narrow but distinct whitish rings involving both sides of the joints. *Wings* dark-scaled, but a line of pale scales usually present on lower edge of costa at base. *Pharyngeal teeth*, Fig. 95, a.

♂. Proboscis with a narrow pale ring beyond middle, this ring rather clearly defined and even narrower below than above. Palpi with a narrow white ring before middle and a much broader one beyond middle of shaft; last two segments with narrow pale rings at base, penultimate segment with a short white streak beneath, terminal segment indefinitely pale at tip. Abdomen with the white bands straight, not rounded; tergites 5-7 narrowly whitish-scaled at sides for almost their whole length. *Terminalia* (Fig. 103, a-c): Lobe of coxite with the usual three rods on

proximal portion, two of these slightly hooked at tips; distal portion of lobe with three hooked bristles (one markedly stouter), all of which are markedly shorter than the rather large leaf. Style sickle-shaped. Paraprocts without basal arm. *lp* of simple structure, composed of two parts, the upper of which forms a long sickle which is bent outwards at middle.

Wing-length 3-5.5 mm.

Distribution.—This is one of the commonest species of *Culex* throughout the greater part of tropical Africa: GAMBIA. SIERRA LEONE. NIGERIA. GOLD COAST. GABOON. CAMEROONS. LIBERIA. CONGO: Throughout lowlands and in Katanga and Uvira. SUDAN: As far north as El Fasher. ABYSSINIA: Serente (*Raffaele*). UGANDA: Kampala, Jinja, Arua, Toro. KENYA: Nairobi. ZANZIBAR. NYASALAND. ANGOLA: Bihé. N. and S. RHODESIA. TRANSVAAL. MADAGASCAR: Lake Alaotra (*Sevrig*).

Variation.—Such variation as occurs appears to be mainly individual rather than local. The number of lower mesepimeral bristles may be correlated with size, as all the specimens examined with only one such bristle (including Theobald's types of *dissimilis* and *bifoliata*) are unusually small. A remarkable aberration is represented by a female from El Fasher, Sudan, which has most of the abdominal scales flavescent.

Culex (Culex) watti Edwards.

Culex watti Edwards, Bull. Ent. Res. 10, p. 135 (1920), and 13, p. 84 (1922).

Culex duttoni var. *watti*, Hopkins, Mosq. Ethiop. 1, p. 203 (1936).

TYPE.—*watti*, ♂ in B.M., Gold Coast.

This is closely related to *C. duttoni*, as shown by the structure of the male terminalia and the presence of from two to four lower mesepimeral bristles (instead of one or none as in most other African *Culex*) but shows well-marked differences in ornamentation. For a time I was inclined to treat it as a variety of *duttoni*, and it was referred to as such by Hopkins in the first volume of this work, but now, after comparing numerous mounts of the terminalia from different localities, I am satisfied that the two forms are distinct species. The distinctions from *C. duttoni* are as follows:

♀. Proboscis with the pale area of equal extent beneath but not spreading so much on to the upper surface, so that the proboscis may appear all dark from above. Pleurae with fewer scales: no post-spiracular scales present in any specimens examined and lower sternopleural scale-patch smaller; dark patches on integument more obvious, especially one occupying most of lower half of mesepimeron. Middle tibia without the pale anterior stripe. Tarsi with only faint traces of pale rings at the joints. Wings with scales all dark, even on lower edge of costa at base.

♂. Above characters much as in ♀; the narrow pale ring of proboscis distinct below, indistinct above. *Terminalia* (Fig. 103, d-f): Lobe of coxite with tips of the three proximal rods more obviously bent; the three modified bristles longer (as long as the leaf). Phallosome with the sickle-shaped upper division shorter, not bent outwards.

Distribution.—GOLD COAST: Kumasi (*Watt*). UGANDA: Kampala and Jinja (*Hopkins*). TANGANYIKA: Dar-es-Salaam (*Pomeroy*).

Culex (Culex) argenteopunctatus Ventrillon.

Heptaphlebomyia argenteopunctata Ventrillon, Arch. Parasit. 9, p. 446 (1905).

Culex argenteopunctatus Edwards (in part), Bull. Ent. Res. 3, p. 31 (1912), 11, p. 137 (1920), and 13, p. 85 (1922).

Types.—Cotypes in B.M. and Mus. Hist. Nat. Paris, Madagascar.

A small dark species, at once distinguished from all other *Culex* by having four sharply defined spots of silvery-white scales on the dark mesonotum (Fig. 104), this ornament causing a strong superficial resemblance to *Aedes argenteopunctatus* Theo.

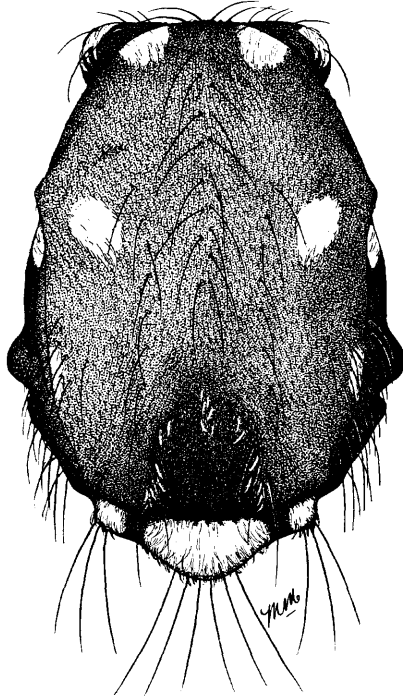


FIG. 104.—Thoracic adornment of *Culex argenteopunctatus* Ventr. (Compare *Aedes argenteopunctatus* Theo., Fig. 48.)

and related species of the subgenus *Aedimorphus*. In spite of the strikingly distinctive ornamentation, the structural characters of this species indicate that it is rather nearly related to *C. simpsoni* Theo.

♀. *Head* with dark integument; erect scales blackish; decumbent scales mostly silvery-white, a rather broad and dense border to eyes composed as usual of quite narrow scales, but these all lying parallel with the eye-margins; between this border and the area of silvery scales towards back of head are usually some yellowish-brown scales. Clypeus and tori black. Proboscis black above, pale-scaled in middle beneath. Palpi black, about one-seventh as long as proboscis. Antennal flagellum normal. *Thorax* blackish, pleurae somewhat lighter. Mesonotal scales and bristles mostly blackish, but on front margin on each side of the pair of bare lines is a spot of narrow silvery-white scales; a second pair of spots of similar scales, larger than the

anterior pair, occurs in the middle of the scutum, and there is a small group of such scales in front of each wing-root (not on the paratergite); scutellum rather densely covered with narrow silvery-white scales, but most of the scales round the bare space dark. *Apn* with a clump of silvery-white scales, some of them broadish. Post-spiracular area with a rather dense patch of silvery scales, all of which are quite narrow, like those of the scutum. Scales of rest of pleurae broad and flat as usual, forming roundish silvery-white spots, one on propleura, two (widely separated) on sternopleura, one on mesepimeron. No pre-alar scales. One lower mesepimeral bristle. *Abdomen* blackish above, the small basal lateral white spots of tergites not visible dorsally; sternites with broad dark apical bands. *Legs* mainly blackish, but middle and hind femora and hind tibiae with conspicuous silvery-white spots at tips; hind femur with dark dorsal line reaching base, anterior surface white with the distal fifth black (except for the silvery knee-spot). *Wings* entirely dark, scales on forks long and dense; upper fork about three times as long as its stem; cross-veins separated by quite twice the length of the posterior one, as in *C. simpsoni*. Halteres with dark knob. *Pharyngeal teeth* resembling those of *C. perfidiosus* or *perfuscus*.

♂. Resembles ♀. Palpi of moderate length and hairiness, exceeding proboscis by terminal segment only; mainly dark, but distal half of shaft with creamy-white scales outwardly, and penultimate segment with creamy-white scales towards base beneath. *Terminalia* (Fig. 106, d): Coxite normal, rather narrow; lobe scarcely prominent, *a-c* all equally long, slender and rather spreading, *d* and *e* absent, *f* a simple pointed spine set well back at base of lobe, leaf very long and rather narrow but widest distally, seta very long. Style simple, with only one hair on inner surface. Paraproct and phallosome very much as in *C. simpsoni*, outer division of *lp* with one large and three small teeth, inner division well developed.

Wing-length 3-4 mm.

Distribution.—MADAGASCAR: Tananarive (*Ventrillon* and others); Ihosy (*Seyrig*).

Although the species also occurs over a wide area in Tropical Africa it now appears that the mainland form is slightly different and it is described below as a separate subspecies. Specimens from the three Madagascar localities are quite similar; the male described above is a specimen collected by *Seyrig*.

ssp. **kingi** Theobald.

Heptaphlebomyia kingi Theobald, Ann. Trop. Med. 7, p. 601 (1913); Edwards, Bull. Ent. Res. 11, p. 137 (1920), and 15, p. 261 (1925).

TYPE.—♀ in Liverpool School of Tropical Medicine, Nyumbe and Alenga, Lado District, Sudan.

Differs from typical *C. argenteopunctatus* as follows:

Post-spiracular scales broad and flat, like those on the rest of pleurae. Sternopleural scales more numerous, the upper patch large and extending over the pre-alar area. Hind femur white all round on basal fourth or more. *Terminalia* exactly as in the typical form.

Distribution.—NYASALAND: Fort Johnston (*Lamborn*). S. RHODESIA: Salisbury (*Leeson*). BELGIAN CONGO: Elisabethville (*Walravens*); Kisantu (*le Wulf*); Mongobwalu (*Schwetz*); Leopoldville (*Duren*). SUDAN: Acholi and Nyumbe (*King*);

Khartoum (*Bedford*). GOLD COAST : Bole and Sunyani (*Ingram*). SIERRA LEONE : Kaballa (*Wood*) ; Bo (*Davey*).

Culex (Culex) theileri Theobald.

- Culex theileri* Theobald, Mon. Cul. 3, p. 187 (1903), and 5, p. 356 (1910) ; Edwards, Bull. Ent. Res. 2, p. 262 (1911), and Riv. Malar. 5, p. 637 (1926) ; Bedford, U.S. Afr. 13th and 14th Rept. Vet. Res. p. 971 (1928) ; Barraud, Fauna Brit. Inst. Dipt. 5, p. 414 (1933).
Culex tipuliformis Edwards (*nec* Theobald), Bull. Ent. Res. 3, p. 31 (1912), and 12, p. 339 (1921) ; Séguy, Moust. Afr. Min., p. 40 (1924) ; Kirkpatrick, Mosq. Egypt, p. 115 (1925).
Culex theileri var. *annulata* Theobald, U.S. Afr. 2nd Rept. Vet. Res., p. 321 (1913).
Culex onderstepoortensis Theobald, U.S. Afr. 1st Rept. Vet. Res., p. 262 (1911).

TYPES.—*theileri*, ♂♀ in B.M., Pretoria ; *theileri* var. *annulata* and *onderstepoortensis*, ♀♀ in Liverpool School of Tropical Medicine, Pretoria.

One of the most distinctly marked amongst the African species of *Culex* ; readily distinguished from all others in the Ethiopian fauna by the conspicuously striped femora and tibiae, the pale stripes being continuous on middle and hind legs (Fig. 97, c). Only the most strongly-marked specimens of *C. univittatus* might occasionally be mistaken for the less typically marked *C. theileri*, but these two may be distinguished at once by the hind femur.

♀. *Head* with the decumbent scales mostly pale. Palpi largely white-scaled above, especially towards tip. Proboscis largely dark on the upper surface, but usually with numerous pale scales about middle ; under surface clothed with creamy-white scales right to the tip, though in some lights the tip appears dark owing to the darkened integument. *Thorax* with integument uniformly brownish ; mesonotal scales rather variable in colour, usually dark brownish except near scutellum and on front margin, where they are paler, but not infrequently with a considerable irregular admixture of whitish scales. Pleural scaling : a small patch of flat white post-spiracular scales present ; sternopleural scales numerous, usually forming a continuous band extending from subalar knob to mid coxa, this band rarely interrupted in middle ; mesepimeron with a large patch of white scales. *Abdomen* : Tergite 2 without transverse band, but with a median longitudinal area of creamy-white scales which sometimes extends the whole length ; 3-7 with creamy-white bands which are produced posteriorly in the middle and often almost equilaterally triangular ; sternites largely or entirely pale, dark scales even if fairly numerous not forming definite bands or stripes. *Legs* : Front and middle femora and tibiae as seen from in front (Fig. 97, c) with narrow stripes of white scales bordered by dark on each side and extending the whole length, the white stripes on the front legs (but not on the middle pair) sometimes with a slight tendency to break up into spots. Hind femur with a dark dorsal stripe extending to base and with a dark antero-ventral stripe on about the distal half, the pale colour between these two stripes extending to the tip ; hind tibia with a pale anterior line running the whole length, dark above and below even at tip. *Wings* dark-scaled ; cross-veins tending to be closer together than in most *Culex*, sometimes almost in line.

♂. Resembles ♀ ; pale abdominal bands tending to be broader and sometimes less produced in middle. Palpi longer than proboscis by a little more than length of terminal segment, densely hairy ; shaft extensively pale-scaled above on distal half, last two segments white-scaled beneath at base and tip. *Terminalia* : Coxite

normal; lobe with the usual three rods (two slightly hooked), leaf moderately broad and accompanied by a narrow simple blade and two setae; paraproct with moderately long basal arm; outer division of phallosome divided into three or four teeth at tip, inner simple and finger-like, the structure somewhat as in *C. andersoni* or *C. simpsoni*.

Wing-length about 5 mm.

Distribution.—CAPE: Stellenbosch (*Lounsbury*); Cape Town (*Robertson*); Mafeking (*Ingram*); Ceres, Mossel Bay (*Turner*), etc. NATAL: Durban; Weenen (*Thomasset*). ORANGE FREE STATE: Vaal R. (*Ingram*); Bloemfontein (*Faure*). TRANSVAAL: Pretoria, Johannesburg, Brits, etc. S.-W. AFRICA: Okahandja (*Turner*). S. RHODESIA: Salisbury (*Leeson*). KENYA: Nairobi, Njoro, Laikipia (*Anderson*); Marsabit (*Chell*). ABYSSINIA: Lake Hazamaia (*Raffaele*). ERITREA: Asmara (*Raffaele*). TANGANYIKA: Kondoia-Irangi (*Zumpt*). S.-W. ARABIA: Jebel Jihaf and Sana'a (*Scott and Britton*).

Outside Africa *C. theileri* has a wide distribution, including Canary Is., Madeira, all countries bordering Mediterranean, Mesopotamia, Persia, Baluchistan, North-west India and across the Himalayan foothills to northern Assam and Burma.

The allied species *C. vagans* Wied. (*tipuliformis* Theo.) was at one time confused with *C. theileri*, but differs in many details; it lacks the ventral dark stripe on the hind femur, has no post-spiracular scales, and the pale abdominal bands are not triangularly widened.

Variation.—Apart from the variation in thoracic scaling noted above, *C. theileri* varies considerably in abdominal markings; many specimens show in addition to the basal triangular band a pair of pale spots on each tergite, and the distal portions of the tergites are sometimes largely pale-scaled. As with many other species, specimens found in desert regions tend to be much paler than the normal.

Culex (Culex) univittatus Theobald.

Culex univittatus Theobald, Mon. Cul. 2, p. 29 (1901); Edwards, Bull. Ent. Res. 2, p. 262 (1911), 3, p. 32 (1912), 5, p. 67 (1914), 11, p. 137 (1920), and 13, p. 85 (1922); Edwards, Riv. Malar. 5, p. 642 (1926); Barraud, Fauna Brit. Ind. Dipt. 5, p. 418 (1933); de Meillon, S. Afr. J. Sci. 25, p. 321 (1928).

Culex perexiguus Theobald, Mon. Cul. 3, p. 199 (1903); Edwards, Bull. Ent. Res. 12, p. 342 (1921); Séguéy, Moust. Afr. Min., p. 38 (1924); Kirkpatrick, Mosq. Egypt, p. 125 (1925); Galliard, Ann. Parasit. 5, p. 99 (1927).

Heptaphlebomyia simplex Theobald (♀), Mon. Cul. 3, p. 337 (1903).

Heptaphlebomyia montforti Ventrillon, Arch. Parasit. 9, p. 448 (1905).

Culex goughi Theobald (♀), U.S. Afr. 1st Rept. Vet. Res., p. 268 (1911).

Culex pallidocephalus Theobald (♂), First Rept. Wellcome Lab., p. 73 (1905).

TYPES.—*univittatus*, ♀ in B.M., Salisbury; *perexiguus*, ♂♀ in B.M., Palestine; *simplex*, ♀ in B.M., Salisbury; *montforti*, ♂♀ in Mus. Hist. Nat. Paris, Madagascar; *goughi*, ♀ in B.M., Pretoria; *pallidocephalus*, ♂ in B.M. (slide mount), Sennar, Blue Nile.

The typical form of this species, described below, may be recognized without much difficulty by the presence of a pale stripe on the anterior surface of the hind tibia (Fig. 97, d) and the presence of post-spiracular and pre-alar scales (Fig. 98, a). The absence of an antero-ventral dark stripe on the hind femur, as well as the pleural scaling, will distinguish the most strongly marked *C. univittatus* from *C. theileri*.

♀. *Head* with the decumbent scales mostly whitish, erect scales mostly dark, but with some paler ones in the middle. Proboscis dark above but with an extensive area of pale scales in the middle beneath. Palpi not one-sixth as long as proboscis,

dark, with some white scales towards tip. Tori usually with some small white scales. *Thorax* with integument dark; scutal scales mostly dark brown, some pale yellowish scales on margins (especially posteriorly), around the bare space, and usually forming a pair of ill-defined spots behind the middle. Pleurae with white scales; rather large patches of post-spiracular and pre-alar scales present; the two groups of scales on sternopleura well separated, not united into a band as in *C. theileri*; white scales on propleura more numerous than usual and even extending a short distance on to prosternum. One lower mesepimeral bristle as usual. *Abdomen* dark above; tergites usually with white basal bands, the posterior edges of which are rounded,



FIG. 195.—Terminalia of *Culex univittatus* Theo. On right, left coxite from inner side; on left, basal parts more enlarged.

these bands usually continuous with the white basal lateral spots, but may be disconnected and sometimes reduced to small median basal spots or rarely absent; sternites mainly clothed with creamy-white scales, sometimes entirely so, in other specimens with a median area of dark scales and dark apical lateral triangles, these markings rarely uniting to form dark apical bands. *Legs* largely dark; front and middle femora and tibiae in many specimens (but not always) with ill-defined lines of white scales extending their whole length anteriorly; hind femur with a dark dorsal line which does not always reach the base, anterior surface white except for the distal one-eighth, which is black; hind tibia with a line of whitish scales extending most of the length on the anterior surface but separate from the conspicuous white spot at tip. *Wings* mainly dark, but with a short line of cream-coloured scales on lower edge of costa at base. Seventh (anal) vein more strongly marked than in most *Culex*, and in many specimens, especially those from South Africa and Rhodesia, bearing a row of scales which may extend the whole length of the vein, though such scales are often entirely absent.

♂. Resembles ♀, but whitish stripe on hind tibia often less obvious; white abdominal bands broader. Palpi exceeding proboscis by almost the length of the last two segments, which are conspicuously hairy; penultimate segment with line of white scales beneath, extending the whole length or nearly so. *Terminalia* (Figs. 105, 117, a, b): Lobe of coxite with the three proximal rods *a-c* slender, *d* and *e* represented by fine hairs, *f* strong, very slightly enlarged and blunt at tip, leaf broad. Style slightly expanded near tip. Paraproct with long basal arm. Phallosome of simpler structure than in most species of this group, upper division consisting of one pointed shovel-shaped piece with a finger-like projection at its base.

Wing-length about 3-4 mm.

Distribution.—*C. univittatus* is common throughout a large part of the Ethiopian region with the exception of the forested areas. CAPE: Grahamstown (*Barraud*). TRANSVAAL: Pretoria. NATAL: Durban (*Christophers*). S.-W. AFRICA: Okahandja (*Turner*). ORANGE FREE STATE: Vaal River (*Ingram*). PORTUGUESE E. AFRICA: Delagoa Bay (*Pakes*). S. RHODESIA: Salisbury (*Marshall*). N.-E. RHODESIA: Luangwa Valley (*Neave*). NYASALAND: Ft. Johnston (*Bury*); Zomba (*Old*). ANGOLA: Bihé (*Wellman*); Benguela (*Massey*). ZANZIBAR (*Aders*). MAURITIUS (*McGregor*). MADAGASCAR (*Ventrillon*). KENYA: Njoro, Nairobi (*Anderson*); Moyale (*Chell*). UGANDA: Entebbe (*Wiggins*). SUDAN: Widely distributed. GOLD COAST: Bole (*Ingram*). NIGERIA: Zungeru (*Macfie*). GAMBIA: Brikama (*Simpson*). BELGIAN CONGO: Uvira, L. Tanganyika (*Schwetz*). TANGANYIKA: Kondoa-Irangi (*Zumpt*).

C. univittatus is also widely distributed throughout the Mediterranean region, from Spain and Algeria to the Punjab.

Var. *neavei* Theobald.

Culex neavei Theobald, Second Rept. Wellcome Lab. p. 76 (1906), and Mon. Cul. 4, p. 429 (1907); Edwards, Bull. Ent. Res. 5, p. 67 (1914).

Culex univittatus var. *neavei* Edwards, Bull. Ent. Res. 13, p. 85 (1922).

TYPE.—♀ in B.M., Lualas, Sudan.

A small brown mosquito with pale pleurae and venter, rather closely resembling *C. antennatus*, but possessing pre-alar scales and with the male terminalia constructed as in *C. univittatus*.

♀. *Head* with all or almost all the erect scales dark, and differing from those of *C. univittatus* in being longer and narrower, decumbent scales pale as usual. Proboscis dark above, paler beneath but not conspicuously so. Palpi dark, about one-sixth as long as proboscis. *Thorax* with integument of scutum dark brown, pleurae rather pale yellowish; scutal scales almost all dark reddish-brown, no pale scales in middle. No post-spiracular scales, but pre-alar area more or less covered with scales. Prepleural scales few. *Abdomen* all dark above, without trace of basal pale bands on tergites though with lateral basal triangular spots, similar on all tergites (not forming lateral pale stripes on 6 and 7 as in *C. antennatus*). Venter entirely yellowish, without any dark scales. *Legs* dark; no trace of pale longitudinal stripes on anterior surfaces of femora or tibiae; white spot at tip of hind tibia indistinct or absent. Hind femur dark dorsally on distal half or more, and anteriorly on about the distal sixth. *Wings* entirely dark scaled, no pale line on lower edge of costa at base. Upper fork about

2.5 times as long as its stem ; cross-veins widely separated. No scales on anal vein. Halteres with dark knob.

♂. Resembles ♀ in colouring and scaling ; abdominal tergites unbanded. Palpi with scales on underside of penultimate segment not obviously pale. *Terminalia* (Fig. 117, f) quite different from those of *C. antennatus*, but closely resembling those of *C. univittatus*, from which they only differ in having a broader leaf and appendage of the lobe more definitely enlarged at the tip.

Wing-length about 3 mm.

Distribution.—SUDAN : Lualas, Pibor (*Balfour*) ; Tomba (*King*). BELGIAN CONGO : Kinshasa (*Duren*) ; Stanleyville and Lake Albert (*Schwetz*). UGANDA : Probably common but confused with *quasiguiarti*.

Variation.—Many specimens from Lake Albert and Ruchuru (*Schwetz*) are intermediate between typical *univittatus* and the Sudanese *neavei* described above ; they have the terminalia exactly as in *neavei* and tergites unbanded, but sternites with narrow dark apical bands and hind tibia with some indications of the pale stripe ; in a short bred series (4 ♂, 3 ♀) from Ruchuru 2–4 small post-spiracular scales are present (3 ♂, 3 ♀) or absent (1 ♂).

The true status of *neavei* is uncertain ; in view of the intermediate forms just noted it is treated as a variety of *univittatus*, but further investigation is needed before this conclusion can be regarded as established. It is just possible that it may be a hybrid between *C. univittatus* and *C. antennatus*.

Culex (*Culex*) *simpsoni* Theobald.

Culex simpsoni Theobald, J. Econ. Biol. 1, p. 28 (1905), and Mon. Cul. 4, p. 441 (1907) ; Edwards, Bull. Ent. Res. 5, p. 67 (1914) (in part) ; MacGregor, Anoph. Mauritius, p. 31 (1924).
Culex richteri Ingram and de Meillon, S. Afr. Inst. Med. Res. 22, p. 72 (1927).

TYPES.—*simpsoni*, ♂♀ in B.M., Transvaal ; *richteri*, ♂ in B.M., Zululand.

A rather small species, somewhat resembling *C. univittatus*, especially in the possession of post-spiracular scales, but with thorax rather more ornate and no trace of pale stripe on hind tibia.

♀. *Head* with both the erect and the decumbent scales yellowish in middle, dark towards sides. Proboscis pale-scaled beneath in middle. Palpi with some white scales at tip, about one-sixth as long as proboscis. *Thorax* with dark integument. Scutum with dark brown and brassy-yellow scales, the latter usually forming a fairly definite pattern, consisting of a patch on each shoulder, a median stripe on the anterior half, filling the space between the bare lines but not extending further, and a pair of rather diffuse patches behind the middle ; scales on and near scutellum also pale. Post-spiracular and pre-alar scales both present, but fewer than in *C. univittatus* ; propleural scales also fewer. *Abdomen* with well-marked white basal bands on tergites ; sternites usually with distinct dark apical bands, but these sometimes reduced. *Legs* largely dark ; front and middle femora normally with the anterior surface entirely dark ; hind tibia black, with a conspicuous white spot at tip but without any trace of a pale longitudinal stripe ; hind femur largely white, with a dark dorsal line which does not always reach the base, and with about the distal fifth of anterior surface dark. *Wings* entirely dark-scaled ; cross-veins wider apart

than in most similar species, the distance between them equal to twice the length of the posterior cross-vein.

♂. Resembles ♀, but mesonotal markings often suffused and indistinct. Palpi conspicuously hairy, exceeding proboscis by rather more than the length of the last segment; penultimate segment white-scaled beneath on the basal half only; terminal segment with a few white scales at base beneath. *Terminalia* (Fig. 106, e, f): Coxite unmodified; lobe with the usual three rods not very stout, only one simple rod accompanying the rather broad and somewhat triangular leaf. Style not at all widened at tip. Paraproct with the usual long basal arm. *lp* with complex upper (outer) division and finger-like lower (inner) division as in many related species; upper division with one long tooth, three or four smaller teeth in a vertical row, and a few fine denticles.

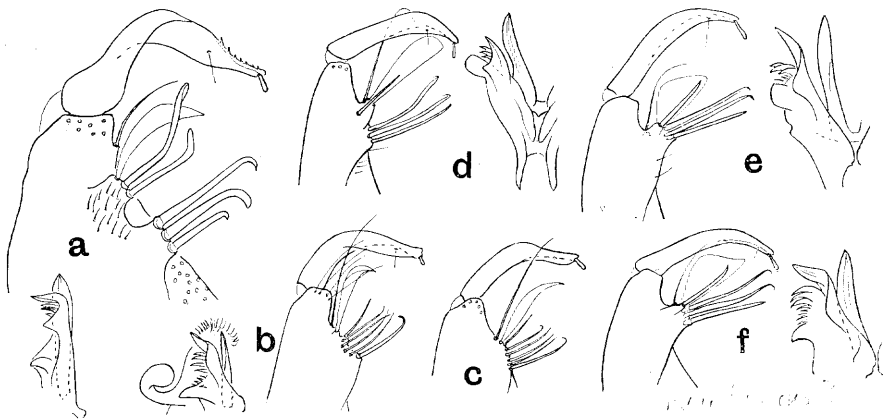


FIG. 106.—Terminalia details of *Culex* spp. a. *laticinctus*. b. *sinaiticus* (Sinai). c. *sinaiticus* (Somaliland). d. *argenteopunctatus* (Elisabethville). e. *simpsoni* (Mauritius). f. *simpsoni* (Medani, Sudan). All to standard scale.

Wing-length 3–3.5 mm.

Distribution.—CAPE: Grahamstown (Barraud). TRANSVAAL (Simpson). ZULULAND: Begamuzi River (Ingram). ZANZIBAR (Aders). TANGANYIKA: Lindi (Haworth). MAURITIUS and RODRIGUEZ (MacGregor). BELGIAN CONGO: Elisabethville (Seydel); Chutes Guillaume (Schwetz); Leopoldville (Henrard). KENYA: Masongaleni and Mtito Andei (Neave); Marsabit (Chell); Kilifi (MacDonald). S. RHODESIA: Salisbury, Shamva, Sinoia, Umtali (Leeson). SUDAN: Khartoum (San. Insp.); Medani (Bedford); Agur Mar (Ruttleledge).

Variation.—All specimens examined from Rodriguez and Mauritius show a pale line running almost the whole length of the mid femur (but not the tibia); such a pale line is absent from nearly all mainland specimens, but is indicated in one or two specimens from Kenya.

Synonymy.—The synonymy quoted above appears to be correct. Ingram and de Meillon introduced *C. richteri* as a new species on account of definite differences which they noted in the structure of the phallosome between their specimens and the one figured by me in 1914 as *C. simpsoni*; a re-study of the material, however, shows

that the latter specimen was incorrectly determined and it is now renamed *C. terzii*; the true *C. simpsoni* has the structure figured by Ingram and de Meillon. This confusion may perhaps partly account for the apparent larval variation in *C. simpsoni* noted by Hopkins.

Culex (Culex) sinaiticus Kirkpatrick.

Culex sinaiticus Kirkpatrick, Bull. Soc. Ent. Egypt, p. 383 (1924), and Mosq. Egypt, p. 122 (1925).
TYPE.—♂♀ in Dept. Agric. Cairo, Sinai.

A small species resembling *C. univittatus* and *C. simpsoni*, but paler, with shorter male palpi and different terminalia.

♀. *Head* with the scales mostly pale, erect scales rather broadly fan-shaped as in *C. simpsoni*. Proboscis pale beneath and sometimes also above in middle, dark at base and tip. Palpi largely pale-scaled (at least in typical form), about one-sixth as long as proboscis. Torus and first flagellar segment with small white scales. *Thorax* rather light brownish; scutal scales lighter still and almost uniform in tint; no obvious pattern. Patches of white scales on pleurae, including post-spiracular and pre-alar groups. *Abdomen* blackish above, tergites with conspicuous and rather broad white basal bands; venter almost entirely white-scaled. *Legs* largely dark anteriorly, pale posteriorly; conspicuous white spots at tips of all femora and tibiae; hind femur in typical specimens largely white, the dark dorsal line extending only one-fourth of its length and external surface dark for only a short distance; in a Somaliland specimen, however, the dark dorsal line extends more than half the length of the femur. Hind tibia without trace of pale anterior stripe. Scales on front coxae almost all white. *Wings* dark scaled; upper fork about 2.5 times as long as its stem; cross-veins wide apart, as in *C. simpsoni*.

♂. Resembles ♀. Palpi exceeding proboscis by length of terminal segment, but last two segments shorter than usual and with only a few short hairs, penultimate segment with line of white scales beneath. *Terminalia* (Fig. 106, b, c): Coxite rather narrow, with a group of rather long hairs at tip; lobe very little prominent and undivided, rod *a* moderately thick and hooked, *b, c, d, e* and *f* all rather slender and subequal, leaf long and narrow, the accompanying seta also very long. Basal arm of paraproct long, curved, thick at tip. Phallosome much as in *C. simpsoni*.

Wing-length 2.5–3 mm.

Distribution.—SINAI (*Kirkpatrick*). SUDAN: Jebelain, 6.vii.09, 1 ♂ (*King*); Khor Gwob (*Darling*). SOMALILAND: Las Anod, 1930 (*Maj. T. H. Twigg*). ADEN PROT.: Wadi Ma'adin (*Petrie*).

Culex (Culex) striatipes sp. n.

Culex vansomereni variety (?), Edwards, Bull. Ent. Res. 17, p. 130 (1926).

TYPE.—♂ in B.M., Nairobi.

Resembles *C. simpsoni* in most respects, but larger and different in various details; middle legs striped.

♀. *Head* with the erect scales rather short and broad (in this respect resembling those of *C. simpsoni* rather than *C. vansomereni*), mostly dark; decumbent scales pale.

Proboscis pale in middle beneath. Palpi dark, about one-sixth as long as proboscis. *Thorax* with dark integument; scutal scales mostly dark brown, some pale ones round margins but none in middle of anterior half; scutellum and area in front of it pale scaled as usual. Post-spiracular and pre-alar scales present. *Abdomen* dark above, tergites with rather broad creamy-white basal bands which are just disconnected from the basal lateral white spots; venter mostly pale-scaled, sternites with median and apicolateral areas of black scales, these areas united on sternites 6 and 7 but not forming distinct bands. *Legs* mainly dark; front and middle femora and middle tibia (but not front or hind tibia) with a line of whitish scales running the whole length of anterior surface; hind femur with anterior surface mainly white, with a dark dorsal line and only the distal fifth entirely dark, some dark scales extending a little further towards base on ventral surface; hind tibia with a conspicuous white spot at tip. *Wings* entirely dark scaled; venation as in *C. simpsoni*, the cross-veins wide apart.

♂. Resembles ♀, except that the sternites have broad black apical bands, and the white markings of tergites are continuous. Palpi as in *C. simpsoni* except that the white line extends whole length of second segment. Post-spiracular scales less numerous than in ♀, forming two small groups instead of a patch. *Terminalia* (Fig. 114, a) very much as in *C. simpsoni*, differing chiefly in having inner division of *lp* markedly shorter than outer.

Wing-length 4 mm.

Distribution.—KENYA: Nairobi, v. 1924, 1 ♂ (*Van Someren*), 13.iv.1912, 1 ♀ (*Anderson*); Mt. Elgon, 8000 ft., ii. 1935, 1 ♂ (*Edwards*).

Culex (Culex) terzii sp. n.

Culex simpsoni Edwards (*nec* Theobald), Bull. Ent. Res. 5, p. 66, fig. 3, left-hand figure (1914).

TYPE.—♂ in B.M., Salisbury.

A larger species than *C. simpsoni*; in most respects more like *C. vansomereni*, but with unbanded venter.

♀. *Head* with the erect scales pale in middle, dark at sides; decumbent scales pale. Proboscis entirely dark, scales on under surface not obviously paler in middle. Palpi dark, almost one-fifth as long as proboscis. *Thorax* with dark integument. Scutal scales mostly dark brown, some pale ones round margins, on and in front of scutellum, and in a pair of ill-defined spots behind middle. No post-spiracular scales, but a conspicuous patch of pre-alar scales present. *Abdomen* dark above, with conspicuous white basal bands on tergites. Sternites largely white scaled, some black scales present in middle towards base, and on posterior lateral corners. *Legs* mainly black; femora and tibiae without white stripes in front; hind femora with about the distal fourth of anterior surface dark (the dark area thus rather more extensive than in *C. simpsoni*); hind tibia with a conspicuous white spot at tip. *Wings* entirely dark scaled; upper fork not quite three times as long as its stem; cross-veins separated by scarcely the length of the posterior one.

♂. Resembles ♀; dark scales on sternites more numerous, but forming Λ-shaped marks instead of transverse bands. Palpi moderately hairy, exceeding proboscis by rather more than the length of the last segment, penultimate segment with white

scales beneath for its whole length. *Terminalia* (Fig. 114, b): Coxite unmodified; lobe with the three proximal rods *a-c* of about equal thickness; *d* single, moderately thick; *f* broad and almost leaf-like; leaf long, pointed, widened in middle. Style broader than in *C. simpsoni*, without fine pubescence at tip as in *C. vansomereni*. Phallosome resembling that of *C. vansomereni* but with a sharp-pointed projection on outer side of outer division.

Wing-length 4 mm.

Distribution.—S. RHODESIA: Salisbury (*Marshall, Leeson*); Bindura (*Haworth*). E. TRANSVAAL: Waterval, series of ♀ (*de Meillon*).

The specimens collected by Marshall were included by Theobald in his series of *C. univittatus*, the male being labelled "type"; this male I wrongly identified in 1914 as *C. simpsoni*, and its phallosome and paraprocts were figured for me by Mr. A. J. E. Terzi in the paper cited as being those of *C. simpsoni* (the coxite figured was, however, drawn from another specimen, correctly determined). The specimens obtained by Leeson were bred from larvae found in a tub in December, 1926, and were determined by me as *C. vansomereni*.

The species is dedicated to Mr. A. J. E. Terzi in appreciation of his skill in drawing the genitalia of this and other species of *Culex*.

Culex (Culex) laticinctus Edwards.

Culex laticinctus Edwards, J. Proc. Asiatic Soc. Bengal, 9, p. 49 (1913); Edwards, Bull. Ent. Res. 12, p. 342 (1921); Kirkpatrick, Mosq. Egypt, p. 119 (1925).

TYPE.—♂ in B.M., Tiberias, Palestine.

A medium-sized species somewhat resembling *C. pipiens*, but rather easily recognized by the light-coloured thorax, broadly banded abdomen, and bare male palpi. Differs from other species of the group in possessing two or more lower mesepimeral bristles.

♀. *Head* with erect scales long and narrow, mostly pale, decumbent scales whitish. Proboscis entirely blackish; palpi blackish and about one-fifth as long as proboscis. *Thorax* with integument of pleurae light yellowish, mesonotum not much darker; scutal scales light brown, some white ones round front margin and on and in front of scutellum. Post-spiracular and pre-alar scales absent. Two, three or even four lower mesepimeral bristles present, instead of one as in all other species of this group. *Abdomen* dark above, tergites with broad white basal bands of even width, venter entirely creamy. *Legs* largely dark, tips of femora inconspicuously pale; hind femur with most of anterior surface whitish, dark dorsal line not usually reaching base; hind tibia with conspicuous pale spot at tip. Scales on front coxae almost all white (an unusual feature). *Wings* dark scaled. Upper fork scarcely three times as long as its stem, cross-veins not very wide apart. *Pharyngeal teeth*, Fig. 95, c.

♂. Resembles ♀. Palpi very little longer than proboscis and almost devoid of hairs; penultimate segment with white scales beneath. *Terminalia* (Fig. 106, a) rather larger than usual in proportion to the size of the insect. Coxite with dense short hair ventro-laterally and rather numerous short hairs at tip; lobe divided, rods *a, b, c, e*, and *f* all about equally stout, *f* the longest and bent; leaf long, narrow and pointed. Style bent in middle, external margin at tip finely spinose. Paraproct

with moderately long basal arm. Phallosome somewhat as in *C. simpsoni*, but with fewer small teeth.

Wing-length about 4 mm.

Distribution.—SOMALILAND: Las Anod (*Maj. T. H. Twigg*). SUDAN: Gebel Totil, near Kassala (*San. Inspector*); Erkowit (*King*). ARABIA: Dharan and Hima (*Philby*); Muscat (*Barraud*); Sana'a (*Scott and Britton*).

C. laticinctus is also widely distributed in the Mediterranean region, having been found in Teneriffe, Spain, Tunis, Italy, Greece, Crete, Syria, Palestine and Egypt.

Culex (Culex) pipiens Linnaeus.

Culex pipiens Linnaeus (in part), Syst. Nat. Ed. x, p. 602 (1758); Dyar and Knab, Proc. Ent. Soc. Washington, 11, p. 30 (1909); Edwards, Bull. Ent. Res. 4, p. 53 (1913), and 17, p. 131 (1926); Marshall, Brit. Mosq. p. 243 (1938).

Heptaphlebomyia simplex Theobald (♂), Mon. Cul. 4, p. 533 (1907).

TYPES.—*pipiens*, non-existent, N. Europe; *simplex*, ♂ in B.M., Bihé, Angola.

A mosquito without striking distinctive features, but distinguishable from all but a few similar species by the following combination of characters: thorax rather uniformly reddish-brown; abdominal tergites with pale basal bands more or less indicated, sternites pale and unbanded; proboscis pale beneath; legs dark, the hind tibia with a small pale spot at tip. Further diagnostic features are the absence of post-spiracular and pre-alar scales, the very long upper forked cell in the female, and the single lower mesepimeral bristle.

♀. *Head* with the erect scales mostly dark, decumbent scales pale, those round eye-margins whitish. Proboscis dark above, pale-scaled beneath for the greater part of its length. Palpi dark, about one-seventh as long as proboscis. Antennae without scales; basal segment largely pale; flagellar segments subequal in length, each with the usual 4–6 long hairs in the whorl. *Thorax* with mesonotal integument uniformly reddish-brown, pleurae lighter in tint and without darker markings. Scutal scales almost uniformly reddish-brown in tint, those on and in front of scutellum lighter. Pleurae with the usual patches of whitish scales on sternopleura and mesepimeron; propleura with rather numerous bristles but few scales; no scales on post-spiracular or pre-alar areas. *Abdomen* dark brown above, the tergites normally with basal creamy (not white) bands which are narrowed towards each side, but these bands very often reduced to median spots which are quite disconnected from the lateral pale spots, these median spots sometimes very small or even absent. Venter mainly clothed with creamy scales, usually with some blackish scales forming a small median spot or streak on each tergite, but these marks not always obvious. *Legs* mainly dark; front coxa with a few white scales at base, otherwise dark scaled; hind femur with dark dorsal stripe from base to tip, gradually widening but not extending over whole of anterior surface till very near the tip of the femur; hind tibia with a spot of pale scales at tip, at the maximum about as long as broad but sometimes much smaller or almost absent. *Wings* dark, scales on distal half linear and dense; upper fork long, from three to four times as long as its stem; cross-veins separated by rather more than the length of the posterior one. Halteres yellow. *Pharyngeal teeth*, Fig. 95, e.

♂. Resembles ♀, but pale bands of abdominal tergites broader and always distinct

and complete. Palpi exceeding proboscis by terminal segment and about half the penultimate, clothed with long hairs from middle of shaft outwards; distal half of shaft with pale scales outwardly; penultimate segment with a line of white scales running the whole length beneath; terminal segment white scaled at base beneath. *Terminalia* (Fig. 107, a): Coxite not swollen, without special arrangement of hairs; lobe undivided, its appendages almost in one row; *a* and *b* both stout and straight, *a* as stout as *b* or slightly stouter, pointed, *b* slightly hooked, *c* much more slender, *d* and *e* hairlike, very slightly hooked, *f* rather longer, considerably stouter and more strongly hooked than *d* or *e*; leaf scarcely longer than *f* and moderately broad; seta rather flattened. Style sickle-shaped, evenly tapering, not enlarged near tip. Ninth tergite with a variable number of hairs on each lobe (a specimen from Angola has 4-5, one from Abyssinia has 14). Paraproct with basal arm always pale and rudimentary though its length is rather variable. Phallosome with the inner division broad and truncate at tip, outer division divided into two, the inner part forming a narrow sickle.

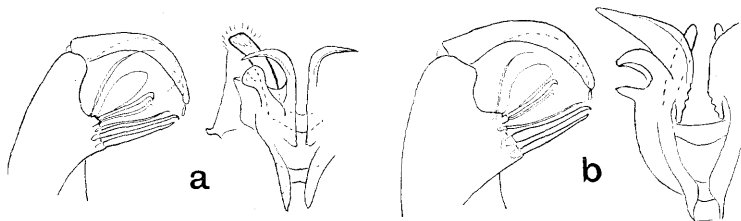


FIG. 107.—Terminalia details of *Culex* spp. a. *pipiens*. b. *fatigans*.

Wing-length 3.5-5.5 mm.

Distribution.—*C. pipiens* appears to be widely distributed and common in East and South Africa and in Madagascar, but is not known to occur in West Africa or indeed anywhere in the tropical forest regions. The following records have been confirmed by the examination of mounted male terminalia. ABYSSINIA: Doukham, 6500-7000 ft. (Scott); Addis Ababa (Skemp); Asmara (Raffaele). SUDAN: Tombe (King). KENYA: Nairobi and Njoro (Anderson); Nakuru (Symes). UGANDA: Lake Mutanda (Ford); Kabale (Hopkins). BELGIAN CONGO: Elisabethville and Kivu highlands (Schwetz). NATAL: Durban (Bevis). ANGOLA: Bihé (Wellman). MADAGASCAR: Tananarive (Neiret, Ventrillon); Antsirabe (Seyrig). MAURITIUS (MacGregor).

Variation.—As noted in the above description the pale abdominal bands of the female tend to be reduced in African specimens of *C. pipiens*, and may be practically absent; the pale spot at the tip of the hind tibia is variable in distinctness. In these respects the African form appears to differ from typical *C. pipiens* of northern Europe, which always has the abdominal bands distinct, and (as against the closely allied *C. molestus* Forskål) has a distinct tibial spot. I do not believe this variation is to be explained by supposing that *C. pipiens* and *C. molestus* occur together in Africa, because in all the African males of this species which I have examined the palpi resemble those of *C. pipiens* rather than *C. molestus*.

Culex (Culex) fatigans Wiedemann (Pl. 4.)

- Culex fatigans* Wiedemann (♂?), Aussereurop. Zweifl. Ins. 1, p. 10 (1828); Theobald, Mon. Cul. 2, p. 151 (1901); Edwards, Bull. Ent. Res. 4, p. 55 (1913), 14, p. 395 (1924), and 17, p. 131 (1926).
Culex quinquefasciatus Say of many American authors.
 (?) *Culex anxifer* Bigot, Ann. Soc. Ent. France (3), 7, p. 117 (1859).
 (?) *Culex pallidocephalus* Theobald (♀ only), First Rept. Wellcome. Lab. p. 73 (1904).
Culex cartroni Ventrillon, Bull. Mus. Paris, 11, p. 429 (1905).
Culex stoehri Theobald, Mon. Cul. 4, p. 419 (1907).
 (?) *Culex didieri* Neveu-Lemaire, Arch. Parasit. 10, p. 257 (1906).
Culex goughii Theobald (♂ only), U.S. Afr. Dept. Agric., First Rept. Vet. Res., p. 268 (1911).

TYPES.—*fatigans*, lost, East Indies; *quinquefasciatus*, lost, N. America; *anxifer*, non-existent, Madagascar; *pallidocephalus*, ♀ in B.M., Sennar, Sudan; *cartroni*, ♂ in Mus. Hist. Nat. Paris, Madagascar; *didieri*, ♀ lost, Leopoldville; *stoehri*, ♀ in B.M., B.C. Africa; *goughii*, ♂ in B.M., Transvaal.

Very closely allied and similar to *C. pipiens* but usually distinguishable without much difficulty by the points noted below.

♀. Scales of scutum usually rather coarser in appearance, and rather lighter (more buffy) in tint. Pale bands of abdominal tergites nearly always distinct, whiter and more rounded than in *C. pipiens*. Hind tibia with a rather more obvious pale area at tip; front coxa tending to have more numerous pale scales. Wing with the upper fork shorter, about 2.5 times as long as its stem; cross-veins on the average wider apart, the distance between them equal to nearly twice the length of one of them.

♂. Thorax as in ♀; abdominal bands rather broad, whiter than in *C. pipiens*. Palpi definitely shorter than in *C. pipiens*, exceeding proboscis by scarcely the length of the terminal segment; also less hairy, the shaft having only a very few hairs at its tip, these tending to project downwards rather than outwards. *Terminalia* (Fig. 107, b): Coxite, lobe, style and paraprocts almost exactly as in *C. pipiens*, but phallosome differing notably, the inner division shorter, less stout and more pointed, sickle-shaped part of outer division longer and much broader.

Distribution.—As in most parts of the tropics and subtropics, this is the common domestic *Culex* throughout tropical Africa as well as in South-West Arabia, and in the islands of the Gulf of Guinea and the Indian Ocean. It occurs as far south as Cape Town, and in the East African highlands is found up to an altitude of about 6000 ft. (at Nairobi); in the Sudan it has occurred as far north as Khartoum and Wadi Halfa as well as at Port Sudan. In West Africa *C. fatigans* may be more restricted in its distribution. Macfie and Ingram (1916, 1919) recorded it as abundant at Accra, but did not find it in Ashanti or in the Northern Territories of the Gold Coast; I have seen no specimen from Sierra Leone and failed to find any record of its occurrence in that country, though the absence of such records may be purely accidental.

Bionomics.—*C. fatigans* is almost everywhere in the tropics one of the most troublesome of domestic mosquitoes, biting, like other *Culex*, almost exclusively at night. It is rather strange, therefore, that it was not included by workers in Lagos among lists of Culicines which prefer human blood, and that Mathis (1935) found that at Dakar in the laboratory it fed exclusively on birds. This latter finding led to the suggestion that there may be biological races of the species, but later work by Galliard (1936) and Wanson and Nicolay (1937) suggests that if such different races exist they are to be found only in the laboratory. Galliard found that whereas at

first a cultivated strain of *fatigans* would attack man, guinea-pigs or fowls indiscriminately, after five or six generations the females lose their ability to feed on animals and must therefore be fed on man. Wanson and Nicolay confirmed this and, further, found that in the seventh generation the females refused to feed at all and therefore died out; they also found both human and avian blood in captured specimens, and noted that the females are more attracted to Africans than to Europeans.

At Dakar in 1935 Mathis obtained four generations between March 30 and June 30; pairing occurred in small cages but autogenesis was not observed. The females did not bite in the daytime except under conditions of prolonged fasting; the first egg-raft was laid 2-3 days after the first blood-meal, generally at night or before 8 a.m., one female usually laying four rafts. Wanson and Nicolay (1937) found that in the Congo the first blood-meal was taken 2-3 days after emergence, and the first egg-raft laid 4-5 days after the meal; the females fed repeatedly, but in the dry season no more eggs matured and the insects died after a maximum of 30 days. *C. fatigans* is said to be specially common in damp houses. No experiments have been made in Africa to establish the range of flight of *fatigans*, but Afridi and Majid (1938) in Delhi found that females travelled over three miles.

Culex (Culex) zombaensis Theobald.

Culex zombaensis Theobald, Mon. Cul. 2, p. 143 (1901).

Culex pallidocephalus Edwards (*nec* Theobald), Bull. Ent. Res. 4, p. 56 (1913), and 17, p. 131 (1926).

TYPE.—♀ in B.M., Zomba, Nyasaland.

Distinguished from nearly all other species of the *pipiens* group by the following combination of characters: Proboscis pale in middle beneath; pre-alar but no post-spiracular scales present; sternites with median longitudinal dark marks but without transverse bands.

♀. *Head* with the erect scales long and narrow, mostly dark; decumbent scales pale. Proboscis pale-scaled beneath except at base and tip, where it is dark. Palpi about one-fifth as long as proboscis, dark, with some scattered pale scales. *Thorax* with integument of mesonotum dark, pleurae for the most part pale, including meron. Scutal scales mainly dark brown, pale scales confined to margins and posterior third. No post-spiracular scales; a small patch of pre-alar scales present, not continuous with the upper sternopleural patch. *Abdomen* dark above, tergites with whitish basal bands which vary in width (in the type they are very narrow, almost obsolete). Venter mainly pale-scaled, with a more or less interrupted median dark line, sometimes reduced to a spot in the middle of each sternite; usually a few dark scales at posterior corners of sternites. *Legs* mainly dark anteriorly; middle femora and tibiae almost entirely pale posteriorly; hind femur with dark dorsal line reaching base; anterior surface whitish with the distal fourth or rather less dark; hind tibia with a yellowish spot at tip which is about as long as broad. *Wings* entirely dark scaled; lateral scales on forks linear; upper fork not quite three times as long as its stem; cross-veins separated by scarcely the length of the posterior one.

♂. Resembles ♀. Palpi exceeding proboscis by more than the length of the last segment; distal part of shaft and whole of last two densely hairy; penultimate

segment with white scales beneath at base and tip, bare in middle, terminal segment with white scales beneath at base and on distal half. *Terminalia* (Fig. 114, c): Coxite and its appendages much as in *C. vansomereni*, but *f* more leaf-like. Paraproct with the basal arm rather variable in length, but shorter than in most allied species, sometimes less than half as long as paraproct. Phallosome of peculiar form, the outer division without teeth.

Wing-length about 4.5 mm.

Distribution.—**NYASALAND**: Zomba (*Gray, Stannus*). **KENYA**: Nairobi (*Anderson, Van Someren, Hopkins*); Kabete (*Anderson*). **UGANDA**: B.M. Coll. (locality and collector not noted).

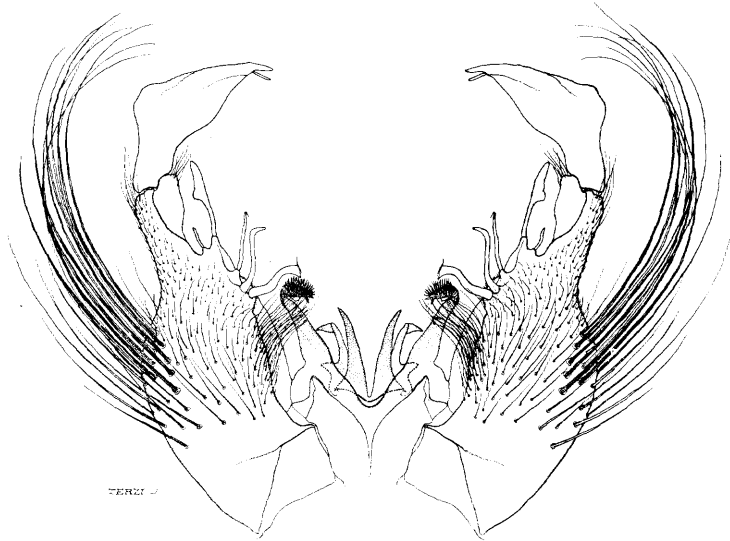


FIG. 108.—Terminalia of *Culex mirificus* Edw.

This species has been confused with *C. vansomereni* and *C. chorleyi*, and many previous records refer to one or other of those species.

Synonymy.—Re-examination of the type female of *C. pallidocephalus* shows that it has no pre-alar scales, no dark areas on the abdominal sternites, and only a small pale spot at tip of hind tibiae; it is therefore certainly not the same as the East African species I have hitherto determined as *C. pallidocephalus*, but may well be a specimen of *C. fatigans*. Of Theobald's original males of *pallidocephalus* one was mounted on a slide by him and is the only one now extant. It has the terminalia of *C. univittatus* and is either that species or *neavei*. The type female of *C. zombaensis* agrees with females redescribed here from Nairobi, and though no males have been examined from Nyasaland it is probable that the species is the same as the one here described.

Hopkins's determination of the larva of *pallidocephalus* was due to an incorrect determination made by me of specimens of *C. chorleyi* sp. n.

Culex (Culex) mirificus Edwards.

Culex mirificus Edwards, Bull. Ent. Res. 4, p. 57 (1913).

TYPE.—♂ in B.M., Njoro, Kenya.

In most respects closely resembles *C. zombaensis*, but at once distinguished from that and all other African species by the remarkable male terminalia.

♀. *Head* with the erect scales long and narrow, nearly all dark; decumbent scales pale. Proboscis mostly pale-scaled beneath. Palpi about one-sixth as long as proboscis, with some white scales at tip. *Thorax* with integument mainly dark; pleurae lighter in parts but meron usually conspicuously darker than coxae (a possible distinction from *C. zombaensis*). Scutal scales mostly dark reddish brown; very few pale scales round front margin, none in middle, but scutellum and area in front of it pale-scaled as usual. Pre-alar but no post-spiracular scales present. *Abdomen* with distinct creamy-white basal bands on tergites; venter with a median longitudinal dark line, more or less interrupted. *Legs* largely dark-scaled anteriorly, pale-scaled posteriorly, as in *C. zombaensis*; hind femur with dark dorsal line and only distal sixth of anterior surface dark; hind tibia with whitish apical spot, not very conspicuous. *Wings* entirely dark scaled; cross-veins close together. *Pharyngeal teeth*, Fig. 95, d.

♂. Resembles ♀. Palpi exceeding proboscis by scarcely the length of the terminal segment; last two segments moderately hairy, few hairs on long segment; white line beneath as usual. *Terminalia* (Fig. 108): Coxite with basal part swollen and provided with a tuft of very long curved dark hairs, part beyond lobe lengthened and cylindrical, with a tuft of short hairs at tip; lobe with five modified bristles of very different shape from usual, the one apparently representing the leaf with a long stem and broad flattened tip. Style remarkably broad. Paraproct without basal arm. Phallosome somewhat as in *C. zombaensis*, *lp* of two simple divisions, the outer one with reflexed tip.

Wing-length about 4.5–5 mm.

Distribution.—KENYA: Njoro and Nakuru, apparently confined to neighbourhood of Lake Nakuru (*Anderson, Bödeker, Symes*). Symes wrote in 1931, "This year they invaded the township and became a dreadful pest."

Culex (Culex) ninagongoensis Edwards.

Culex ninagongoensis Edwards, Rev. Zool. Afr. 16, p. 324 (1928).

TYPES.—♂♀ in B.M., Mt. Ninagongo, Kivu.

A species resembling *C. pipiens* but with broader pale bands on abdominal tergites, pale-scaled venter, shorter male palpi, and very distinctive terminalia.

♀. *Head* with the erect scales mostly yellow, some dark ones at sides, decumbent scales yellow. Proboscis in the type series paler in middle beneath, but not conspicuously so, in Uganda specimens entirely dark. Palpi dark, about one-fifth as long as proboscis. *Thorax* with brownish integument, not very dark. Scutal scales bronzy or reddish-brown, almost uniform in tint, even those on and in front of scutellum scarcely paler than the rest. Pleural scales creamy-yellowish, none on post-spiracular or pre-alar areas. *Abdomen* with dark parts of tergites brownish rather than black, pale bands yellowish rather than white, broadened laterally, at least

those on tergites 6 and 7 broader than usual and occupying more than half the tergites. Venter yellow scaled, few or no black scales present. *Legs* mainly dark brown anteriorly, yellowish posteriorly; tips of femora and of hind tibia with yellow spots, those on femora broader than usual; hind femur with dark dorsal line which gradually widens, till on the distal fifth the anterior surface is all dark. *Wings* entirely dark scaled. Upper fork very long, fully four times as long as its stem; cross-veins separated by about the length of the posterior one.

♂. Resembles ♀. Palpi very little longer than proboscis and with very few hairs, which are mostly short; last two segments each with some white scales at base beneath, but these not forming a definite line. *Terminalia* (Fig. 109, a-c): Coxite somewhat swollen, with dense but not long pale hair ventro-laterally; lobe divided, the distal part very prominent and close to tip of coxite; rods *a-c* normal, *b* not much stouter, *d* single, *f* stout and spine-like; leaf not very large; seta flattened. Style very broad. Lobes of tergite larger and more hairy than usual. Paraproct with moderate basal arm. Phallosome somewhat as in *C. andersoni*.

Wing-length 4-5 mm.

Distribution.—BELGIAN CONGO: Mt. Ninagongo, 10,000 ft. (*Bequaert*). UGANDA: Mt. Mgahinga, 8000 ft., Kigezi (*Edwards*); Bujuku Valley, 8500 ft., Ruwenzori (*Hancock*); Namwamba Valley, 8000 ft., Ruwenzori (*Gibbins*).

Culex (Culex) calurus Edwards.

Culex calurus Edwards, Bull. Ent. Res. 26, p. 136 (1935).

TYPE.—♂ in B.M., Mt. Kinangop.

A species resembling *C. pipiens* and *C. ninagongoensis* but with very distinctive terminalia.

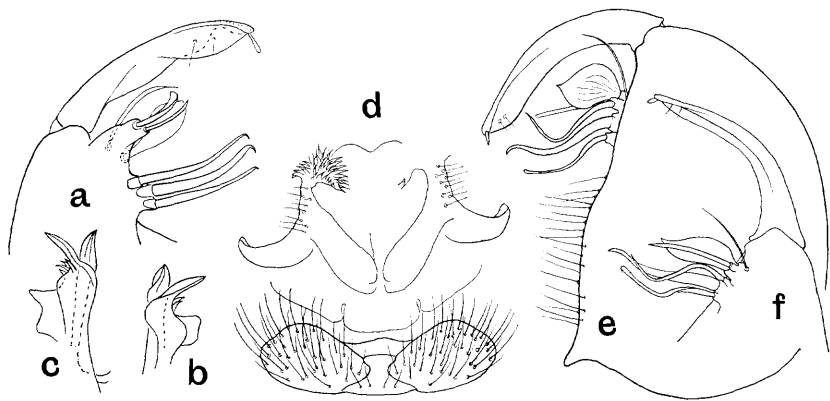


FIG. 109.—Terminalia details of *Culex* spp. a-c. *ninagongoensis* (a, b, from type ♂; c, Ruwenzori ♀). d-f. *calurus*. d. Paraproct and ninth tergite. e, f. Coxite in two aspects.

♀. Unrecognized.

♂. *Head* with the erect scales rather short but not broad, dark; decumbent scales pale. Proboscis pale scaled beneath for the greater part of its length. Palpi only very slightly longer than proboscis and only moderately hairy. *Thorax* with dark

integument, pleurae lighter posteriorly. Scutal scales nearly all dark reddish brown, pale scales almost confined to scutellum and area in front of it. Neither post-spiracular nor pre-alar scales present. *Abdomen* with basal creamy-white bands of moderate width on tergites; sternites largely pale-scaled, with an interrupted median dark stripe and apical lateral dark spots. *Legs* mainly dark but hind femur with the anterior surface mainly pale, only about the distal sixth dark; hind tibia with creamy-white spot at tip. *Wings* entirely dark-scaled; cross-veins separated by about the length of the posterior one; length about 4 mm.

Terminalia (Fig. 109, d-f): Coxite unusually large, almost semi-orbicular, but without unusual hairiness; lobe very little developed and undivided; rods *a-c* unusually sinuous, *b* much the stoutest of the three, *d* and *e* absent, *f* a long simple rod, leaf broad but pointed. Style strap-shaped. Lobes of tergite much larger and more hairy than usual. Paraprocts each with about eight hairs instead of the usual four, basal arm shorter than usual. Phallosome almost as in *C. andersoni*.

Distribution.—KENYA: Mt. Kinangop, Aberdare Mts., 8-10,000 ft. (*Edwards, Ford*).

Culex (Culex) umbripes sp. n.

TYPE.—♀ in B.M., Kundelungu Mts., Katanga.

A rather large species, resembling *C. andersoni* in its very dark legs, but differing from that and other allied species in the scaling of the head, pleurae, and venter.

♀. *Head* with the erect scales all blackish, rather long and narrow; decumbent scales mostly dark brown, but an area of pale ones on nape and a narrow pale border to the eyes. Proboscis entirely black-scaled below as well as above. Palpi dark, almost one-fourth as long as proboscis. *Thorax* with dark brown integument. Scutum more or less rubbed in the three specimens available, remaining scales mostly dark brown, some pale scales as usual round margins and on and in front of scutellum. A conspicuous patch of post-spiracular scales present, in addition to pre-alar scales; propleural scales numerous and extending on to upper corner of prosternum. *Abdomen* black above, tergites with yellowish basal bands; sternites largely pale, each with an area of black scales in middle towards base and another on each posterior corner. *Legs* largely blackish; anterior surface of hind femur clothed almost entirely with black scales, with only a short line of pale scales at base, as in *C. andersoni*; hind tibia with a conspicuous yellowish spot at tip, longer than broad. *Wings* entirely dark; scales dense and somewhat broader than usual; cross-veins wider apart than in *C. andersoni*. Length about 4.5 mm.

♂. Unknown.

Distribution.—BELGIAN CONGO: Pashie stream, Kundelungu Mts., 1700 m., Katanga, 24.ix.1925. (*Schwetzn*).

Culex (Culex) trifilatus Edwards.

Culex trifilatus Edwards, Bull. Ent. Res. 5, p. 65 (1914).

TYPE.—♂ in B.M., Kabete, Kenya.

This and the following nine species (with their subspecies) are collectively distinguished by having the proboscis (at least in the female) entirely blackish below

as well as above; the abdominal sternites with black apical bands which are produced towards the base in the middle and the hind tibia with a distinct pale spot at the tip; they further resemble one another and agree with *C. pipiens*, *C. fatigans* and other similar species in having the tarsi entirely dark, abdominal tergites with creamy-white basal bands (sometimes very narrow or interrupted in the female), male palpi with a white line on the penultimate segment beneath, and post-spiracular scales absent.



FIG. 110.—Terminalia of *Culex trifilatus* Edw. Lettering as in Fig. 93.

From the other species of this group *C. trifilatus* differs in having the pale spot at the tip of the hind tibia smaller.

♀. *Head* with the erect scales mostly yellow, a few black ones towards sides. Tori largely pale, without scales. Palpi black, about one-fifth as long as proboscis. *Thorax* with the integument dark brown, pleurae not much lighter than dorsum but with the sutures pale as usual. Scutum with small dull bronzy-brown scales, mixed with slightly paler and coarser ones which tend to form indistinct stripes or lines; scales on and near scutellum yellowish, including all those surrounding the bare space. Pleurae with the usual small groups of scales; pre-alar area bare. One lower mesepimeral bristle as usual. *Abdomen* with a well-defined but rather narrow pale yellowish basal band on each tergite, its posterior edge almost straight. *Legs*: Extreme tips of femora pale; hind tibia with a pale spot at tip (chiefly on outer side) which is not quite as long as the tibial diameter; hind femur dark to the base above,

and with nearly the distal half of the outer surface dark. *Wings* dark; upper fork not quite three times as long as its stem.

♂. Resembles ♀. Palpi exceeding proboscis by slightly more than the length of the terminal segment; last two segments moderately hairy. *Terminalia* (Figs. 110; 111, c): Lobe of coxite with rod *c* more slender and slightly shorter than *b*; *d* and *e* slender; *f* longer than *d* or *e*, much stouter, and somewhat hooked at tip; leaf broad. Style sickle-shaped. *lp* as seen in dorso-ventral view, apparently composed of three slender divisions (but the middle one of these appears plate-like in side view); lower division longer, sometimes bearing a few minute teeth.

Wing-length about 5 mm.

Distribution.—KENYA: Kabete (*Anderson*); Nairobi (*Anderson, Van Someren*). NYASALAND: Zomba (*Lamborn*). BELGIAN CONGO: Elisabethville; Ruchuru; Burkale, Kivu (*Schwetz*). N. RHODESIA: Kaomba River (*Lloyd*). S. RHODESIA: Shamwa (*Leeson*). TRANSVAAL: Pretoria (*Bedford*). CAPE: Cape Town (*Péringuey*). UGANDA: Butandiga, Mt. Elgon (*Hargreaves*).

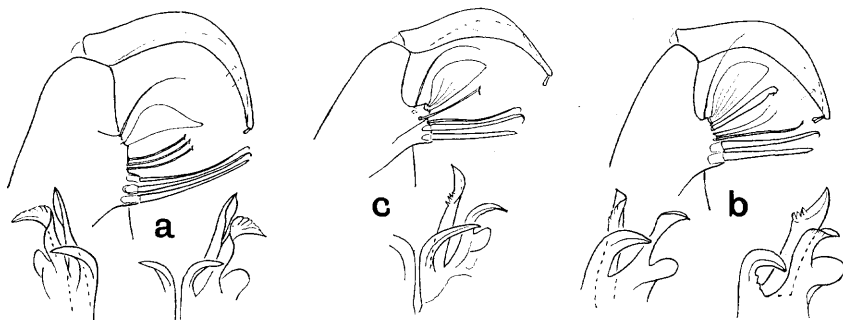


FIG. 111.—Terminalia details of *Culex* spp. a. *tamsi*. b. *trifilatus* (Elisabethville). c. *trifilatus* ssp. *aenescens* (Kameranjoka).

ssp. **aenescens** n.

Differs from typical *C. trifilatus* as follows:

Scales of scutum rather finer and with a more brassy-yellow tint. Hind femur with not more than the distal third of outer surface dark.

♂. *Terminalia* (Fig. 111, b): Lobe of coxite rather more prominent; rod *c* as long as *b*; *d* and *e* absent; *f* very slender. Phallosome as in the typical form.

Distribution.—UGANDA: Kameranjoka, Ruwenzori foothills (*Hopkins*).

The terminalia of two males studied are quite alike; the small differences from the typical form are therefore probably significant.

Culex (Culex) tamsi Edwards.

Culex tamsi Edwards, Ann. Mag. Nat. Hist. (10), 14, p. 327 (1934).

TYPE.—♂ in B.M., Sao Thomé.

Resembles *C. trifilatus* in the group characters noted above, and also in the structure of the male phallosome. Differs from *C. trifilatus* and resembles *C. andersoni* in the mainly black hind femora and the shorter and less hairy male palpi.

♀. *Head* with the erect scales yellow in middle, dark at sides ; decumbent scales golden-yellow. *Thorax* with the integument dark brown. Scales of scutum in part dark brown and in part yellow, the latter of a brighter golden tint than in *C. trifilatus* and arranged in a rather vague pattern, including a pair of admedian lines separated by a narrow median line of dark scales ; scales round front and lateral margins mainly pale, but all those around the pre-scutellar space dark brown ; scutellar scales yellow. No pre-alar scales. *Legs* : Hind femur mainly black, but white all round at base for a short distance (equal to nearly twice the length of the trochanter) and with a conspicuous white knee-spot ; hind tibia with pale spot at tip large, distinctly longer than tibial diameter. *Wings* with upper fork fully three times as long as its stem.

♂. Resembles ♀. Palpi scarcely longer than proboscis and almost bare, with few or no long hairs on last two segments. *Terminalia* (Fig. 111, a) : Coxite with the ventro-lateral surface more hairy than in *C. trifilatus* ; lobe scarcely prominent ; rods *a-c* long, closely approximated distally ; *d*, *e*, and *f* all slender and equal, scarcely hooked ; leaf well removed from the other structures, moderately broad but pointed. Style sickle-shaped, slender. Phallosome and paraprocts not differing obviously from those of *C. trifilatus*.

Wing-length about 4 mm.

Distribution.—SAO THOMÉ, 4000 ft. (*Tams*).

Culex (Culex) andersoni Edwards.

Culex andersoni Edwards, Bull. Ent. Res. 5, p. 65 (1914).

TYPE.—♂ in B.M., Kabete, Kenya.

Resembles *C. trifilatus* in the group characters noted above, but structure of male phallosome quite different. Differs from all other species of the group except *C. tamsi* in the mainly black-scaled hind femora. (Compare also *C. umbripes*.)

♀. *Head* with the erect scales yellow in middle, mostly dark at sides ; decumbent scales golden-yellow. *Thorax* with the integument dark brown ; scutal scales mainly golden-yellow on anterior half, with a pair of dark lines, but few or no dark scales in median line ; scales on posterior half mainly dark, with a pair of sublateral lines of yellow scales well marked ; scales round bare space and on scutellum yellow. No pre-alar scales. *Abdomen* with the basal pale bands of tergites straight-edged and moderately broad. *Legs* : Hind femur almost entirely black-scaled anteriorly (except for the conspicuous knee-spot), with at most a few rather scattered pale scales close to the base, posterior surface also black except on about the basal fourth ; hind tibia with a large yellowish spot at tip, longer than tibial diameter. *Wings* with upper fork fully three times as long as its stem ; cross-veins separated by about the length of one of them. *Pharyngeal teeth* (Fig. 95, b).

♂. Resembles ♀. Palpi only slightly longer than proboscis, last two segments not conspicuously hairy, but less bare than in *C. tamsi*. *Terminalia* (Figs. 112 ; 113, c) : Coxite of normal shape, not narrowed distally ; lobe scarcely prominent, rod *c* less slender than in *C. trifilatus* and as long as *b* ; *d* and *e* represented by fine simple hairs ; *f* a stout rod, very slightly hooked at tip ; *h* flattened ; leaf broad and rather rounded.

Style sickle-shaped and rather broad. Outer division of *lp* with one strong reflexed tooth and three or four small ones.

Wing-length 4–6 mm.

Distribution.—KENYA: Kabete (*Anderson*); Elgeyo Escarpment, 8000 ft. (*Harger*); Mt. Kinangop (*Edwards*); Mt. Elgon, 8500 ft. (*Edwards*); Chyulu Hills, 7–8000 ft. (*Turner*). UGANDA: Ruwenzori, Namwamba Valley, 8000 ft. (*Gibbins*); Muko and Mt. Muhavura, 7–8000 ft. (*Gibbins*). BELGIAN CONGO: Numbi, L. Kivu, 6600 ft. (*Schwetz*); Mt. Mikeno, 9500 ft. (*Bequaert*).

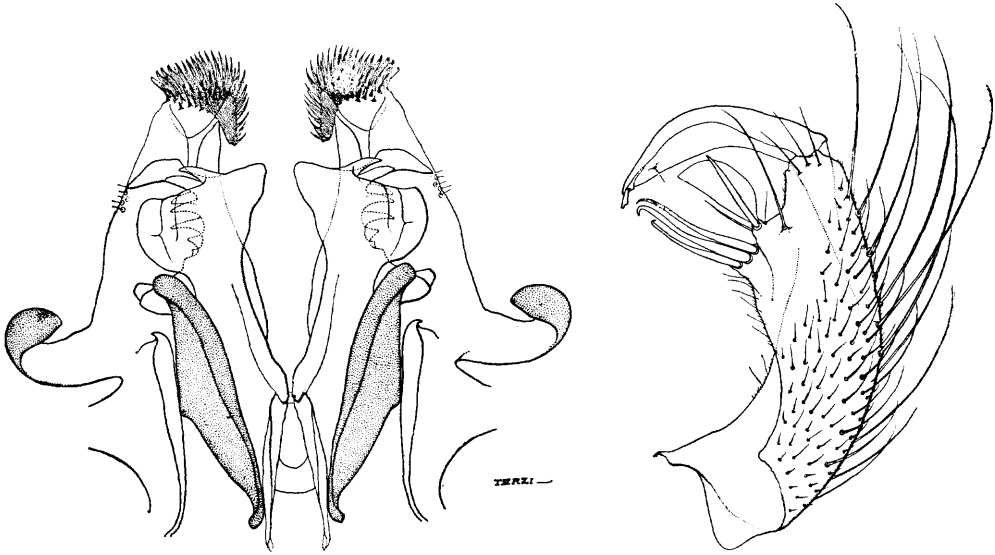


FIG. 112.—Terminalia of *Culex andersoni* Edw.

ssp. **bwambanus** n.

TYPE.—♂ in B.M., Ruwenzori.

Differs from the typical form in having nearly the basal half of anterior surface of hind femur pale-scaled below.

♂. Palpi scarcely longer than proboscis, almost hairless (but may be rubbed in type). *Terminalia* (Fig. 113, b) with lobe of coxite more prominent and style more slender than in typical form.

Distribution.—UGANDA: Bwamba Pass, 8000 ft., Ruwenzori, 1 ♂ taken flying in hollow tree-trunk, 25.vi.36 (*J. F. Shillito*).

ssp. **abyssinicus** n.

TYPE.—♂ in B.M., Addis Ababa.

Differs from typical *C. andersoni* in the colour of the scales on the hind femur, the anterior surface of which instead of being entirely dark has white scales below on the basal half or rather more; mesonotal scales darker than in the type.

♂. Palpi distinctly more hairy than in the type (though less so than in *C.*

vansomereni); also rather longer, exceeding proboscis by length of last segment. *Terminalia* (Fig. 113, a) practically as in typical *andersoni*.

Distribution.—ABYSSINIA: Addis Ababa (*Scott, Skemp, Macfie*); Koram and Dessie (*Macfie, Bevan, Raffaele*); Lake Ashangi (*Bevan*); Maji (*P. Holland*).

This form is difficult to distinguish externally from *C. vansomereni*, and some of the above specimens have been recorded under that name. It apparently replaces both *C. andersoni* and *C. vansomereni* in Northern Abyssinia and at Addis Ababa.

Culex (Culex) hopkinsi Edwards.

Culex hopkinsi Edwards, Bull. Ent. Res. 23, p. 562 (1932).

TYPE.—♂ in B.M., Kameranjoka, Ruwenzori Foothills.

Differs rather conspicuously from *C. andersoni* and related species, as well as from all other African *Culex*, in the uniformly yellow-scaled mesonotum. Group characters as noted under *C. trifilatus*.

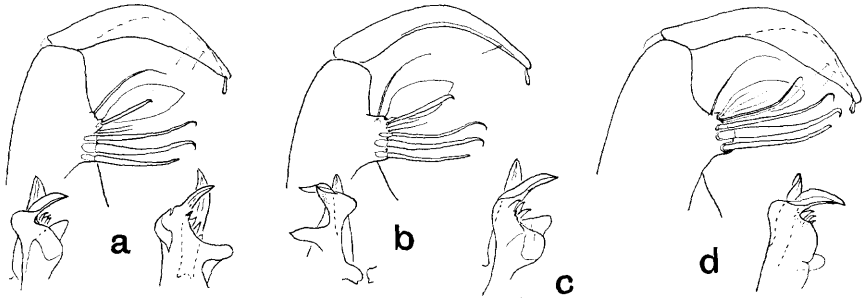


FIG. 113.—Terminalial details of *Culex* spp. a. *andersoni* subsp. *abyssinicus*. b. *andersoni* subsp. ? (Bwamba Pass, Ruwenzori). c. *andersoni* (Kabete, paratype). d. *hopkinsi*.

♀. *Head* with nearly all the scales and bristles golden-yellow, only a few dark erect scales at sides. *Tori* pale, without scales. *Thorax* with the integument mainly dark. *Scutal* scales all, or almost all, golden-yellow. No pre-alar scales. *Abdomen* with straight-edged pale basal bands on tergites; dark bands on sternites narrower and less distinct than in *C. trifilatus* or *C. andersoni*. *Legs*: Hind femora mainly blackish (except for the conspicuous knee-spot), anterior surface with at most the basal fourth white-scaled below; hind tibia with the yellow spot at tip conspicuous, longer than broad.

♂. Resembles ♀. *Palpi* conspicuously hairy, exceeding proboscis by rather more than the length of the last segment. *Terminalia* (Fig. 113, d): *Coxite* normal, unmodified; *lobe* prominent, undivided; *rod b* stouter than *a* or *c*; *f* long, slender, bent beyond middle and slightly hooked at tip; *leaf* rather large. *Style* normal. *Phallosome* much as in *C. andersoni*.

Wing-length about 4.5 mm.

Distribution.—UGANDA: Kameranjoka, Toro (*Hopkins*); Namwamba Valley, Ruwenzori, 8000 ft. (*Gibbins*).

Culex (Culex) vansomereni Edwards.

Culex vansomereni Edwards, Bull. Ent. Res. 17, p. 129 (1926).

Types.—♂ in B.M., Nairobi.

Resembles *C. trifilatus* and *C. andersoni* in the group characters noted under the former species, as well as in size and general appearance ; differs from most other

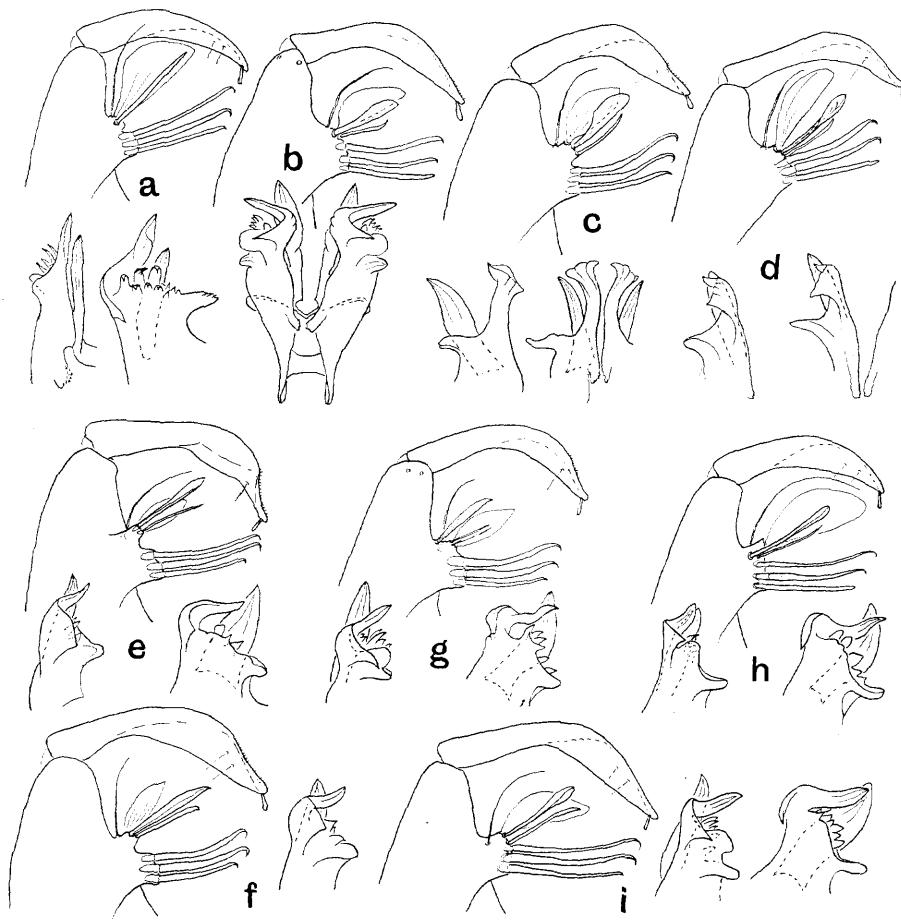


FIG. 114.—Terminalia details of *Culex* spp. a. *striatipes*. b. *terzii*. c. *zombaensis* (Nairobi). d. *chorleyi* (Masaka). e. *vansomereni* (Nairobi, type and paratype). f. *vansomereni* (Blukwa, Lake Albert, typical). g. *vansomereni* subsp. *elgonicus*. h. *macrophyllus*. i. *toroensis*.

species of the group in the presence of scales on the area immediately below the prelar knob.

♀. *Head* with both the erect and the decumbent scales yellow in middle, dark at sides. Tori largely pale, without scales. Palpi black, about one-sixth as long as proboscis. *Thorax* with the integument dark brown, including most of pleurae. Scutal scales mainly dark brown, some yellowish scales round margin and others aggregated into a more or less obvious pair of spots about the middle ; scales on

scutellum and around the bare space yellowish. No post-spiracular scales, but in almost all specimens examined a group of pre-alar scales is present (3-12 in number); in a few these scales appear to be absent but may have been denuded. *Abdomen* normally with straight-edged creamy-white basal bands on tergites, these bands rarely reduced or absent. *Legs*: Hind femur dark above to the base, anterior surface dark on the distal one-fourth to one-third. Hind tibia with a conspicuous yellowish spot at tip, longer than the tibial diameter. *Wings* with upper fork about three times as long as its stem. *Pharyngeal teeth* (Fig. 95, f).

♂. Resembles ♀. Palpi conspicuously hairy, exceeding proboscis by rather more than the length of the terminal segment. *Terminalia* (Fig. 114, e, f): Coxite not enlarged and without unusual hairiness; lobe rather prominent and rather more definitely divided into two parts than in most species of this group; rod *c* nearly as stout as *b*; *e* single, not very slender; *f* long, flattened, widened towards tip and in some positions appearing like a second leaf; leaf rather small, markedly shorter than *f* and not very broad. Style narrowed at tip, its outer margin finely pubescent (an unusual feature in this group of species). Phallosome as figured, with a variable number of small denticles at the base of the main curved tooth. Paraproct with strong basal arm as usual.

Wing-length 4-5.5 mm.

Distribution (as recently checked).—KENYA: Nairobi (*Van Someren*); Mt. Elgon, 5000-8000 ft. (*Neave, Edwards*); Aberdeen Mts., 7-8000 ft. (*Neave*). UGANDA: Kasala, Chagwe (*Fraser*); Kabale (*Hopkins*). BELGIAN CONGO: Blukwa, Lake Albert; Mongbwalu; Ruchuru, 3800 ft. (*Schwetz*); Kisenyi, Lake Kivu (*Schwetz, Seydel*). ABYSSINIA: Djem-Djem forest (*Scott*).

ssp. **draconis** Ingram and De Meillon.

Culex draconis Ingram and de Meillon, S. Afr. Inst. Med. Res. 22, p. 67 (1927).

TYPE.—♂♀ in B.M., Pietermaritzburg.

Differs from typical *vansomereni* in the more pronounced ornamentation of the scutum, the yellow scales tending to form a pair of stripes on posterior half and sometimes an indefinite pair of curved lines on anterior half. Other characters very much as in *vansomereni*, including the presence of a fair number of pre-alar scales.

♂. *Terminalia*.—Lobe of coxite undivided; leaf rather larger and as long as *f*; *lp* slightly different; all characters as in *toroensis* (see below). Tip of style finely pubescent as in *vansomereni*. Seta *h* noticeably flattened.

Distribution.—NATAL: Pietermaritzburg (*Ingram*). CAPE: Katberg (*Turner*; rubbed specimens, presumably this species).

Owing to the presence of pre-alar scales and to Hopkins' remarks on the larvae this form is retained under *C. vansomereni* as a subspecies, but it must be admitted that the distinctions from *toroensis* are not satisfactory.

ssp. **elgonicus** n.

TYPE.—♂ in B.M., Mt. Elgon.

Resembles the typical form of *C. vansomereni* in nearly all respects, including the possession of prealar scales; long, hairy ♂ palpi; and colour of scales of hind femur.

♂. *Terminalia* (Fig. 114, g; two mounts compared): Differ slightly from those of typical *vansomereni* in form of phallosome, which resembles that of ssp. *macrophyllus*; lobe of coxite with rather larger leaf, *f* less widened distally than in typical form and inserted at some distance from instead of close beside *e*; *d* also present.

Distribution.—UGANDA: Buginyanya, Mt. Elgon, 6500 ft., viii. 1929 (*Hancock*).

Culex (Culex) toroensis Edwards and Gibbins.

Culex vansomereni ssp. *toroensis* Edwards and Gibbins, Ruwenzori Exped. 1, p. 32 (1939).

TYPE.—♂ in B.M., Kisomoro, Ruwenzori.

Resembles *C. vansomereni* closely in nearly all respects, but differs constantly in having no pre-alar scales, the patch of upper sternopleural scales ending abruptly at the uppermost sternopleural bristles in all of nearly 50 specimens examined from various localities. Anterior surface of hind femur rather more extensively dark, sometimes to about half its length. Scutal scales brighter than in typical *vansomereni*, ornamentation much as in *draconis*.

♂. *Terminalia* (Fig. 114, i; about a dozen mounts compared) differing in small details from those of *C. vansomereni*: lobe of coxite not divided; leaf rather longer and more pointed, approximately equal in length to seta *f*; *lp* of slightly different shape and with about five instead of about three small denticles.

Distribution.—UGANDA: Kisomoro, Toro, 5000 ft. (*Shillito*); Namwamba Valley, Ruwenzori, 8000 ft. (*Gibbins*); Mobuku Valley, Ruwenzori, 6500 ft. (*Hancock*); Kabale (*Nolan*; ♀ only); Tororo, 4000 ft. (*Hopkins*; 1 ♂); Bugishu (*Hopkins*; larvae only). KENYA: Katamayo, Aberdare Range (*MacDonald*). BELGIAN CONGO: Numbi, 6600 ft., L. Kivu (*Schwetzel*).

The identity of this form has been established by Shillito and MacDonald, who have reared adults from isolated larvae of the type described by Hopkins on p. 210 of the first part of this monograph. In view of the well-marked larval distinctions from *C. vansomereni*, together with the constant difference in pleural scaling here pointed out, this form is now regarded as a distinct species rather than as a subspecies of *C. vansomereni*.

ssp. **macrophyllus** Edwards and Gibbins.

Culex vansomereni ssp. *macrophyllus* Edwards and Gibbins, Ruwenzori Exped. 1, p. 31 (1939).

TYPE.—♂ in B.M., Mt. Mgahinga.

Differs from *C. vansomereni* in the rather lighter but more uniform tint of the mesonotal scales, without any definite indication of a pair of pale spots or stripes behind the middle; also in the less obvious dark bands on the abdominal sternites, these bands being scarcely indicated in the female. Pre-alar scales absent, as in *C. toroensis*.

♂. *Terminalia* (Fig. 114, h; five mounts compared) very much as in typical *C. toroensis*, but with the leaf much larger, longer than seta *f*, style shorter, not narrowed at tip, and phallosome differing slightly.

Distribution.—UGANDA: Saddle between Mts. Mgahinga and Sabinio, 8000 ft. (*Edwards*).

Culex (Culex) chorleyi sp. n.

Culex pallidocephalus Hopkins (*nee* Theobald), Mosq. Ethiop. Reg. 1, p. 208 (1936).

TYPE.—♂ in B.M., Masaka.

Very similar to *C. vansomereni*; no obvious external differences are apparent, except that the available specimens are smaller (wing-length 3.5–4 mm.), and the scutal scales are often darker, more uniformly brownish. Sternites with dark apical bands and proboscis all dark, as in *C. vansomereni* and related species. Pre-alar scales absent as in *C. toroensis*.

♂. *Terminalia* (Fig. 114, d): Coxite and its appendages much as in *C. vansomereni*. Paraproct with long curved basal arm as usual. *lp* of peculiar form, its outer division without small teeth, as in *C. zombaensis*, but shorter and differently shaped, the main tooth present but short.

Distribution.—UGANDA: Kampala and Masaka (*Hopkins*). BELGIAN CONGO: Kabare and Nyagezi, L. Kivu; L. Luhondo, Ruanda; Semliki Valley (*Schwetzel*).

Culex (Culex) hancocki Edwards. (Pl. 3, fig. 13.)

Culex hancocki Edwards, Bull. Ent. Res. 21, p. 294 (1930).

TYPE.—♂ in B.M., Bulambuli, Mt. Elgon.

A rather small species with distinctive thoracic ornamentation in the female; proboscis entirely black and sternites with black apical bands as in *C. andersoni* and related species.

♀. *Head* with the scales of the median area (both erect and decumbent) pale yellowish. Tori yellowish, with a few small pale scales, clypeus blackish. Proboscis

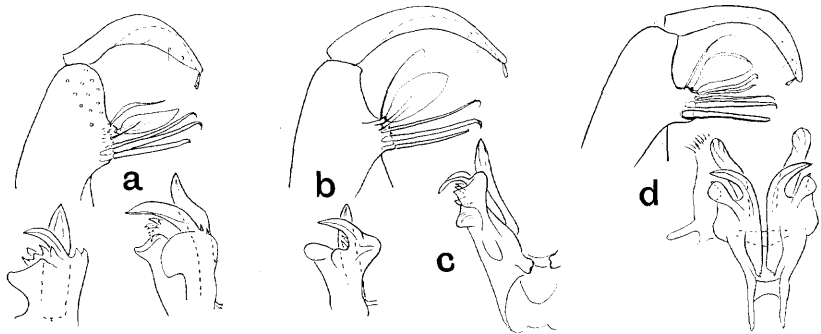


FIG. 115.—Terminalia details of *Culex* spp. a. *hancocki*. b. *musarum* (Toro). c. *musarum* (Kitale). d. *scotti*.

rather shorter and palpi longer than usual; palpi fully one-fourth as long as proboscis. *Thorax* with integument of mesonotum dark brown, pleurae mostly pale. Mesonotum strikingly ornamented with stripes of yellowish scales on a dark brown ground; a median stripe extending from front margin to middle, either just filling the area between the two bare lines or bordered on each side by a line of dark scales; a pair of stripes extending from middle back to scutellum, broadest anteriorly; lateral margins rather broadly covered with yellowish scales on anterior half, with whitish

scales on posterior half ; scales on scutellum and around the bare space pale. Pleural scales white ; no post-spiracular or pre-alar scales. *Abdomen* black above, tergites with narrow pure white basal bands, not always clearly visible. *Legs* dark ; front and middle femora pale behind and in many specimens (but not invariably) with a rather irregular line of white scales running the whole length in front ; hind femora whitish except on the distal sixth, with a dark dorsal line extending nearly to the base ; hind tibia with a conspicuous white apical spot. *Wings* with upper fork almost four times as long as its stem. Halteres yellow, knob not in the least darkened. *Pharyngeal teeth* (Fig. 95, g).

♂. Resembles ♀, but thoracic markings more suffused, and white abdominal bands broader as usual. Palpi exceeding proboscis by about the length of the last segment ; last two segments not very hairy, penultimate with a white line beneath as in other species of the *picipiens* series. *Terminalia* (Fig. 115, a) : Coxite unusually narrow, especially distally, and with the long hairs on the part beyond the lobe unusually numerous ; lobe much before tip of coxite but scarcely prominent ; the three proximal rods *a-c* normal, but *d*, *e* and *f* absent or represented by fine hairs, leaf rather narrow, seta *h* distinctly flattened. Style rather short and broad. Phallosome much as in *C. andersoni* or *C. simpsoni* ; paraproct with moderately long basal arm.

Wing-length about 4 mm.

Distribution.—UGANDA : Mt. Elgon, 9000 ft. (*Hancock, Gibbins*). KENYA : Limuru, 8000 ft. (*MacDonald and Van Someren*).

Culex (Culex) musarum Edwards.

Culex musarum Edwards, Bull. Ent. Res. 23, p. 562 (1932).

TYPE.—♂ in B.M., Fort Portal.

Allied to *C. hancocki*, and with similar but less clearly defined thoracic ornamentation ; hind femora more extensively dark and abdomen of female usually unbanded.

♀. *Head* with the decumbent scales yellow, erect scales yellow in middle, black at sides. Tori and first flagellar segment of antennae, as in *C. hancocki*, bearing a few pale scales. Palpi relatively shorter than in *C. hancocki*, scarcely one-fifth as long as proboscis. *Thorax* with similar ornamentation to that of *C. hancocki*, but the yellow scales not so bright in tint and the markings therefore less conspicuous ; the median stripe of yellowish scales just fills the area between the two bare lines. Pleural scales as in *C. hancocki*. *Abdomen* black above, with white basal lateral patches on each tergite, the lateral patches tend to extend towards middle line, especially on tergites 5-7, but rarely unite to form complete bands. Sternites with broad black apical bands. *Legs* mainly black ; front and middle femora without the white anterior line of *C. hancocki* ; hind femora with distal half or more of anterior surface black (except for the conspicuous knee-spot) ; hind tibia with a conspicuous white spot at tip.

♂. Mesonotal scales more uniform in tint, markings therefore very indefinite or absent. Abdominal tergites with distinct white basal bands. Palpi as in *C. hancocki*. *Legs* as in ♀. *Terminalia* (Fig. 115, b, c) : Coxite not specially narrow and without unusual hairs. Lobe as in *C. hancocki*, bearing only the three rods, leaf, and seta—

d and *e* absent or represented by fine hairs ; *f* absent ; leaf broader than in *C. hancocki*, seta not flattened. Style longer and more slender than in *C. hancocki*, phallosome with fewer small denticles.

Wing-length 3-4 mm.

Distribution.—UGANDA : Fort Portal (*Hargreaves, Shillito*) ; Lira and Kampala (*Hopkins*). KENYA : Limuru (*MacDonald and Van Someren*) ; Kitale (*MacDonald*). BELGIAN CONGO : Ruchuru and Lake Luhondo, Kivu (*Schwetz*).

Culex (Culex) scotti Theobald.

Culex scotti Theobald, Trans. Linn. Soc. London, 15, p. 86 (1912) ; Edwards, Bull. Ent. Res. 23, p. 562 (1932).

TYPES.—♂♀ in B.M., ♂ Mahé, ♀ Silhouette, Seychelles Is.

A species of peculiar interest owing to its annectant character ; in ornamentation it resembles *C. musarum* Edw. or *C. ornatothoracis* Theo., but the terminalia have almost the structure found in *C. pipiens* L.

♀. *Head* with erect scales mostly yellow, those towards sides dark ; decumbent scales yellowish. Proboscis blackish above, lighter beneath except towards tip (though not conspicuously pale). Palpi scarcely one-sixth as long as proboscis. Tori yellowish, without scales ; flagellum normal. *Thorax* with dark brown integument, pleurae not much lighter ; scutum with dark brown and brassy-yellow scales forming a rather conspicuous but not sharply defined pattern ; yellow scales covering margins, a broad median stripe in front more or less filling the area between the two bare lines and also extending outside these, a pair of spots behind middle more or less connected with side margins, with anterior median stripe, and with a stripe on either side of the bare space. Post-spiracular and pre-alar scales absent. *Abdomen* black above, tergites with basal lateral white spots which do not show any tendency to spread out to form bands, only those on 6 and 7 sometimes visible from above. Sternites with rather narrow black apical bands extending forwards in middle. *Legs* blackish, with small yellow knee-spots at tips of femora and a conspicuous yellow tip to hind tibia ; hind femur with distal third of anterior surface all dark and with dark dorsal line reaching base. *Wings* with upper fork over three times as long as its stem, cross-veins separated by about twice their length ; scales all dark. Halteres with blackish knob.

♂. Differs from ♀ in having complete and fairly broad creamy-white basal bands on the abdominal tergites, and also (as usual) in having the mesonotal ornamentation rather less definite, but agrees with ♀ in colouring of venter and legs. Palpi exceeding proboscis by slightly less than the length of the terminal segment, and not very hairy, the shaft with very few hairs. *Terminalia* (Fig. 115, d) in nearly all respects resembling those of *C. pipiens*, the only obvious distinctions being the following : Lobe of coxite with appendages *d* and *e* represented by a single slightly thickened hair (instead of the two more slender hairs of *pipiens*) ; paraproct with the basal arm rather better developed (though still very short as compared with most other *Culex*) ; *lp* with the sickle-shaped part of outer division rather less slender.

Wing-length about 3.5-4 mm.

Distribution.—SEYCHELLES IS. : Mahé and Silhouette (*Scott*) ; Praslin (*Dupont*).

Note.—Owing to the type male having a banded abdomen and closely resembling *C. pipiens* in terminalic structure, I supposed at one time that it was indeed a specimen of that species, associated with the females in error (by a slip I included the name *scotti* among the synonyms of *C. fatigans* instead of *C. pipiens* in my *Genera Insectorum* catalogue). Having now examined two other males of *C. scotti*, one in better condition than the type, I am satisfied that the sexes are correctly associated and that the species is quite distinct from *pipiens* in spite of the close similarity in terminalia.

Culex (Culex) antennatus Becker.

Anopheles antennatus Becker, Mitt. Zool. Mus. Berlin, 2, p. 68 (1903).

Culex laurenti Newstead, Ann. Trop. Med. 1, p. 24 (1907); Edwards, Bull. Ent. Res. 5, p. 70 (1914), and 11, p. 137 (1920); Kirkpatrick, Mosq. Egypt, p. 129 (1925); Edwards, Riv. Malar. 5, p. 645 (1926).

Culex antennatus Hopkins, Mosq. Ethiop. p. 224 (1936).

TYPES.—*antennatus*, ♂ in Zool. Mus. Berlin, Egypt; *laurenti*, ♂ in Liverpool School of Tropical Medicine, Leopoldville.

A small species without special ornamentation, but rather easily distinguished by its general brownish colour and by the broad lateral stripe of cream-coloured scales on abdominal tergites 6 and 7, and the pale-scaled venter.

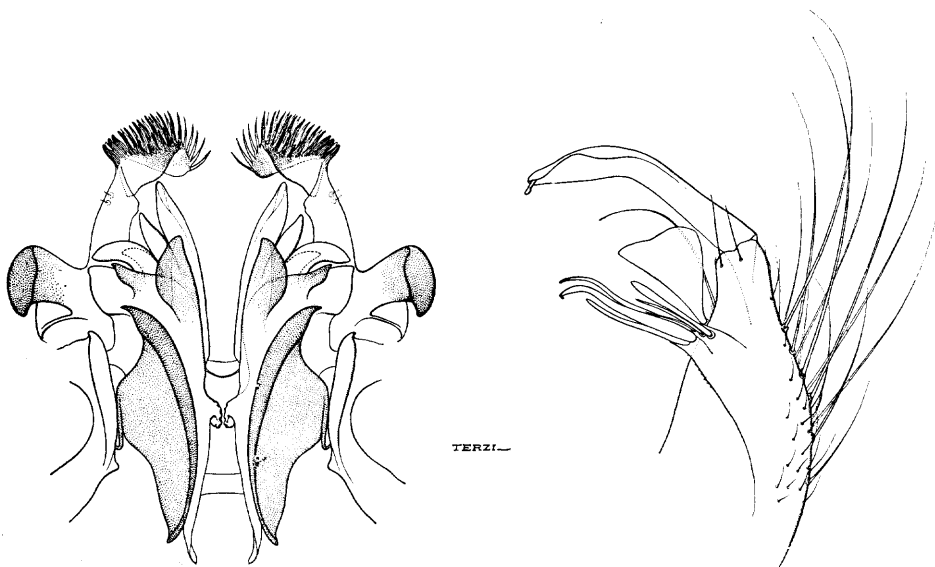


FIG. 116.—Terminalia of *Culex antennatus* Beck.

♀. *Head* with the erect scales all blackish, rather short; decumbent scales mostly pale, but some of these brownish. Proboscis dark above, usually more or less paler beneath for its whole length. Palpi about one-eighth as long as proboscis. *Thorax* with integument of mesonotum brown, of pleurae wholly pale yellowish. Scutal scales rather dark reddish brown, a very few white scales on front margin, scales on and in front of scutellum usually but not always paler than the rest. Pleurae with the usual patches of scales on sternopleura and mesepimeron, but these scales creamy

instead of white. Post-spiracular and pre-alar scales absent. Propleura with few scales (which are mostly of the colour of the integument, not white) but with numerous bristles, including several long ones on the inner part adjacent to the prosternum. *Abdomen* brownish above (not black); tergites 2-5 with small basal lateral creamy spots not visible from above, 6 and 7 with a fairly broad border of creamy scales running most or all of the length of 6 and the whole length of 7; venter uniformly creamy. *Legs* mainly dark anteriorly, pale posteriorly; front coxae with some white scales at base, otherwise dark scaled; hind femur with dark dorsal line gradually widening to the tip; hind tibia without any obvious pale spot at tip. *Wings* with brownish scales, not very dark, lateral vein-scales on distal half of wing longer than in many species and very narrow; upper fork long, almost four times as long as its stem; cross-veins separated by nearly twice the length of the posterior one. *Pharyngeal teeth* (Fig. 95, h).

♂. Resembles ♀, but abdominal sternites often with a median stripe of dark scales. Palpi exceeding proboscis by nearly the length of the last two segments, which are very hairy and have each a spot of white scales at the base beneath, penultimate segment also with a short line of whitish scales in the middle beneath, never extending the whole length. *Terminalia* (Fig. 116): Coxite unmodified, with few ventral hairs; lobe not distinctly divided, rod *b* thicker than *a* or *c*, *f* scarcely enlarged at tip and straight, leaf broad—the whole structure much as in *C. ornatothoracis*. Paraproct with the basal arm shorter and broader than usual. Phallosome with long finger-like inner division as in the *decens* and *andersoni* groups, but outer division differently toothed.

Wing-length about 3 mm.

Distribution.—BELGIAN CONGO: Leopoldville (*Newstead*); Kinshasa (*Duren*); Lake Albert (*Schwetz*). SUDAN: Lado, Azzar, Sobat, Bahr-el-Zeraf (*King*); Juba (*Med. Inspector*); Khartoum, Um Dona, Shambe Bor (*Ruttledge*); Malakal, Gambia (*L. H. H.*). UGANDA: Kampala (*Hopkins*). NIGERIA: Onitsha (*Wigglesworth*). CHAD TERR.: Fort Lamy (*Galliard*). ABYSSINIA: L. Tana (*Cheesman*). ZANZIBAR (*Aders*). MADAGASCAR: Tananarive (*Friederichs, Lamborn*); Lake Alaotra, Ihosy, Ambositra (*Seyrig*).

The species is also common in Egypt and occurs in Palestine.

Culex (Culex) quasiguiarti Theobald.

Culex quasiguiarti Theobald, Mon. Cul. 5, p. 374 (1910); Edwards, Bull. Ent. Res. 5, p. 68 (1914).
TYPES.—♂♀ in B.M., Mpumu, Uganda.

A rather small dark species with banded venter, very much resembling *C. decens* and *C. invidiosus*, but with the male terminalia quite different and constructed as in *C. univittatus*.

♀. *Head* with the erect scales nearly all dark, decumbent scales pale. Proboscis blackish, indistinctly paler beneath in middle. Palpi dark, about one-sixth as long as proboscis. *Thorax* with integument dark brown, pleurae not much paler. Scutal scales rather variable in colour, in the type almost all dark reddish-brown, in other specimens from the same region dark brown with pale scales round margins and a

tendency to form a pair of spots behind middle as in *C. univittatus*. Neither post-spiracular nor pre-alar scales present. *Abdomen* (in the typical Uganda form) dark above, without basal pale bands on tergites; sternites with well marked apical bands of black scales. *Legs* dark; no trace of pale stripes on anterior surfaces of femora or tibiae; hind tibia with a pale spot at tip which is usually about as long as broad, but may be reduced. Hind femur dark dorsally on distal half or more, and anteriorly on distal sixth. *Wings* entirely dark scaled. No scales on anal vein.

♂. Resembles ♀, but tergites with basal pale bands more or less indicated, if only by a few yellowish scales. Palpi entirely dark, no white scales beneath. *Terminalia* (Fig. 117, c, d) almost as in *C. univittatus*, the only apparent differences being that

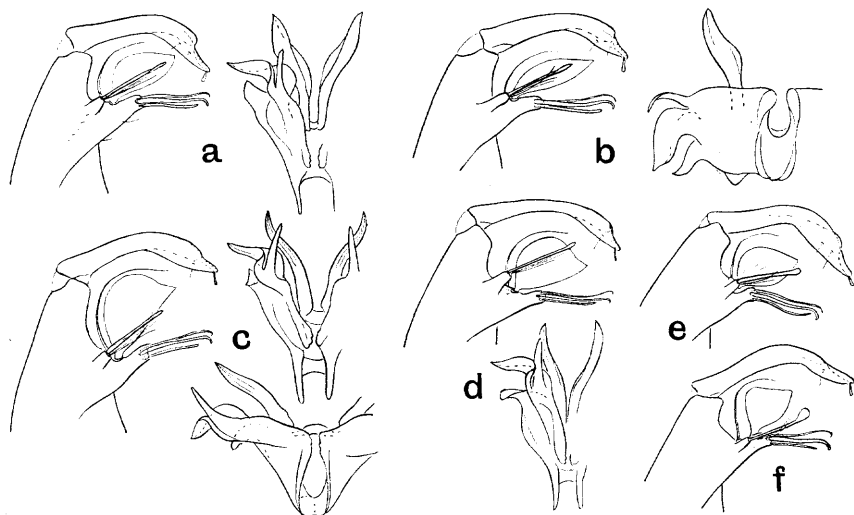


FIG. 117.—Terminalia details of *Culex* spp. a. *univittatus* (Salisbury). b. *univittatus* (Madagascar; phallosome in different position). c. *quasiguiarti* (Madagascar; phallosome in two positions). d. *quasiguiarti* (Kampala). e. *univittatus* or *neavei* (Tombe, Sudan). f. *neavei* (Stanleyville).

the leaf (when viewed at its full extent) is broader and differently shaped, and the inner division of the phallosome is rather narrower.

Wing-length about 4 mm.

Distribution.—UGANDA: Mpumu (*Bruce*); Entebbe (*Gowdey*); Chagwe (*Fraser*); Kampala (*Hopkins*). KENYA: Kisumu (*Mouat*); Nairobi (*Anderson*). BELGIAN CONGO: Kabare, Kisenyi and Nyagezi, Lake Kivu (*Schwetz*). MADAGASCAR: Lake Alaotra, Ihosy and Sahamy, 25 km. N. of Anivorane (*Seyrig*).

Probably occurs elsewhere in East or South Africa, though overlooked owing to confusion with *C. univittatus*.

Variation.—Although, as stated in the above description, the abdominal tergites of the Uganda form of this species are unbanded in the female and only indefinitely banded in the male, this is perhaps not the normal condition in other areas where *C. quasiguiarti* occurs. In the single male examined from Nairobi, and in all the specimens (11 ♂, 7 ♀) in Mons. Seyrig's collection from Madagascar, the abdominal tergites have well-marked pale bands. In other respects (notably the broad leaf and other

slight distinctions in the male terminalia) the Madagascar specimens (Fig. 117, c) agree with those from Uganda (Fig. 117, d), and it is worth noting also that typical specimens of *C. univittatus* were taken in two localities in Madagascar in association with *C. quasiguiarti*, and that in the Kivu district Schwetz found both occupying the same breeding-places, facts which tend to confirm the distinctions of the two species.

Culex (Culex) decens Theobald.

Culex decens Theobald, Rept. Liverpool S. Trop. Med. Mem. 4, App. p. 7 (1901), and Mon. Cul. 2, p. 334 (1901); Edwards, Bull. Ent. Res. 2, p. 263 (1911).

Culex masculus Theobald, Mon. Cul. 2, p. 125 (1901).

Culex minutus Theobald (in part), J. Econ. Biol. 1, p. 30 (1905).

Culex nigrocostalis Theobald, Mon. Cul. 5, p. 367 (1910).

Culex lividocostalis Graham, Ann. Mag. Nat. Hist. (8) 5, p. 269 (1910).

TYPES.—*decens*, ♂ in B.M., Bonny, Nigeria; *masculus*, ♂ in B.M., Freetown, Sierra Leone; *nigrocostalis*, ♂♀ in B.M., Accra, Gold Coast; *lividocostalis*, ♂♀ in B.M. Lagos, Nigeria.

This is one of a small group of species which are characterized by their rather small size, general dark colour without special ornamentation, and broad black bands

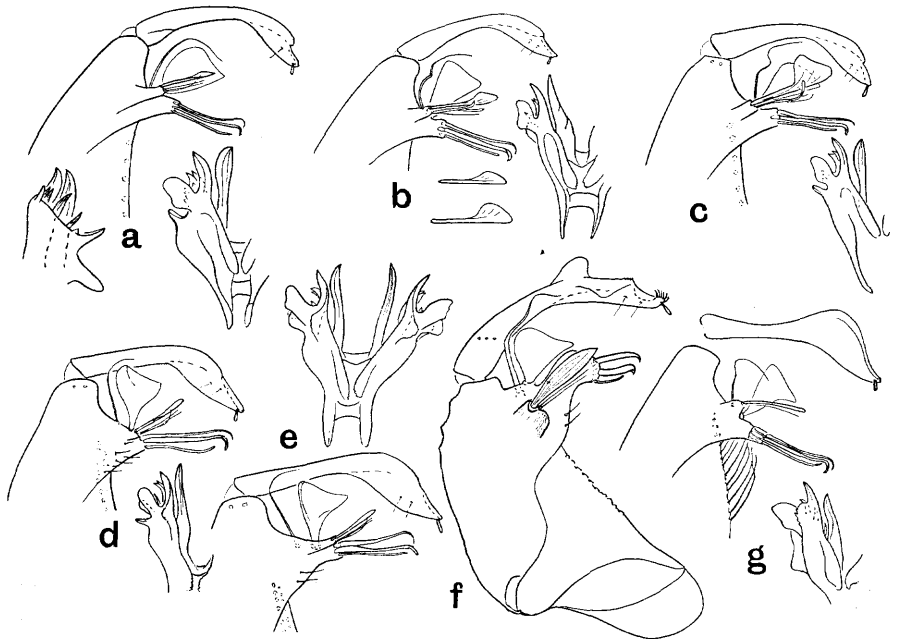


FIG. 118.—Terminalia details of *Culex* spp. a. *decens*. b. *invidiosus* (with variations in seta f). c. *invidiosus* var. *vexillatus*. d. *ornatothoracis* (type ♂). e. *ornatothoracis* (Toro). f. *perfidiosus*, whole coxite and style. g. *ornatothoracis* var. ? (Stanleyville).

on the abdominal sternites. From other species of this group *C. decens* is distinguishable by the more reddish tint of the mesonotal scales, and in the male sex by the distinct pale bands on the abdominal tergites.

♀. *Head* with the erect scales all dark, decumbent scales almost all whitish.

Proboscis dark-scaled, not obviously lighter beneath. Palpi dark, about one-seventh or one-eighth as long as proboscis. Antennae with the scape brownish, without scales; flagellum normal, segments subequal in length as usual, with not more than 6 long hairs in the whorl at the base of each segment. *Thorax* with brownish integument, pleurae mainly paler, often greenish, mesonotal scales reddish-brown, uniform in tint, only a few whitish scales on front margin, above wing-roots, and on and in front of scutellum. Pleural scales creamy-white; no post-spiracular or prealar scales. Propleurae with only a few bristles (3-4 strong and 2-3 weaker ones) but with numerous flat white scales, which cover the inner part adjacent to the prosternum. *Abdomen* dark above, tergites with large basal lateral white spots, which in many specimens are united by a narrow and rather irregular line of white scales at the base of each segment; sternites with broad dark apical bands of black scales. *Legs* largely dark; front coxa with white scales at base only, otherwise dark; hind femora with dark dorsal stripe reaching base, anterior surface whitish except on the distal sixth, where the dark dorsal stripe widens and extends over the whole anterior surface; hind tibia with a pale spot at tip, about as long as broad. *Wings* entirely dark-scaled: upper fork scarcely 2.5 times as long as its stem, its base slightly proximal to that of the lower fork; cross-veins separated by a distance equal to about twice the length of the posterior one. Halteres with dark knob. *Pharyngeal teeth* (Fig. 96, b).

♂. Resembles ♀, except that the white bands of the abdominal tergites are much better developed, always distinct and fairly broad. Palpi entirely dark, without any white scales beneath, exceeding proboscis by last segment and more than half the penultimate; last two segments hairy. *Terminalia* (Fig. 118, a): Coxite not enlarged, with a rather widely-spaced ventral row of about five hairs; lobe slightly divided, rods *a-c* of the usual form, *b* slightly stouter than the others; *f* straight, very little widened at tip, accompanied by three fine simple hairs; leaf broad; seta slender, bent in middle but not sinuous. Style widened before tip on one side. Paraproct with long basal arm. Phallosome much as in *C. andersoni* and related species; outer division with one large tooth, three or four smaller ones, and a flat lobe; inner division a long finger-like process.

Wing-length about 3-3.5 mm.

Distribution.—Close examination of numerous specimens confirms the conclusion that this species (as distinct from the related *C. invidiosus*) has a very wide distribution in tropical Africa, including the following: GOLD COAST: Accra, Bole, Kumasi, Takoradi, Wa, Yegi. NIGERIA: Bonny, Forcados, Lagos, Lokoja, Katagum, Ilorin, Shao. SIERRA LEONE: Daru, Freetown. BELGIAN CONGO: Mt. Mukulu, Katanga and Mahagi Port, Lake Albert. UGANDA: Kampala, Entebbe. KENYA: Nairobi, Mtito Andei. SUDAN: Talodi, R. Kobwa, Meridi, Yei, Zeidab. TANGANYIKA: Dar-es-Salaam. ZANZIBAR: Zanzibar I., Pemba I. TRANSVAAL.

A female from Anivorane, MADAGASCAR (*Seyrig*) is almost certainly this species.

Synonymy.—The synonymy quoted above is that previously given by me and has been confirmed by examining mounts of the terminalia of the types. In the case of *C. minutus* Theo. it was found that the original material included a mixture of species; the pinned specimen labelled type by Theobald is *C. decens*, the slide mount which he figured is *C. duttoni*, and his second slide mount is *C. pipiens*.

Culex (Culex) invidiosus Theobald.

Culex invidiosus Theobald, Mon. Cul. 2, p. 329 (1901); Edwards, Bull. Ent. Res. 2, p. 264 (1911), and 5, p. 70 (1914).

Culex euclastus Theobald, Rept. Liverp. S. Trop. Med. Mem. 10, App. p. viii (1903).

Culex chloroventer Theobald, Mon. Cul. 5, p. 373 (1910).

Culex aquilus Graham, Ann. Mag. Nat. Hist. (8) 5, p. 266 (1910).

Culex decens var. *invidiosus* Edwards, Bull. Ent. Res., 13, p. 85 (1922).

TYPES.—*invidiosus*, ♀ in Liverpool School of Tropical Medicine (or lost?), Bonny, Nigeria; *euclastus*, ♀ in B.M., Gambia; *chloroventer*, ♀ in B.M., Accra, Gold Coast (♂ type lost); *aquilus*, ♂ in Lagos, Nigeria.

Resembles *C. decens* in most respects, but mesonotal scales brown without any reddish tint, and abdominal tergites unbanded.

♀. *Head* with the erect scales mostly dark, but usually a few yellowish ones in middle. Palpi as in *C. decens*, about one-seventh as long as proboscis. *Thorax* appearing darker than in *C. decens*, the mesonotal scales being dull brown rather than reddish brown. *Abdomen* with the white scales of tergites confined to small basal lateral triangular spots. *Legs* as in *C. decens* except that the dark dorsal line of the hind femur is obsolete or absent on the basal third; pale spot at tip of hind tibia equally distinct. *Wings* as in *C. decens*, except that upper fork may be rather longer. Halteres with dark knob.

♂. Resembles ♀; abdominal tergites unbanded, the white scales confined to basal lateral spots, but those on tergites 5–7 quite large and almost meeting. Palpi as in *C. decens*. *Terminalia* (Figs. 93; 118, b) differing from those of *C. decens* in two small details: appendage *f* of the coxite-lobe is longer and more obviously enlarged at the tip (though rather variable in this respect), and seta *h* has a double instead of a simple bend in the middle. Style, paraproct and phallosome as in *C. decens*; ventral hairs on coxite also similar.

Distribution.—A scrutiny of the series in the British Museum has shown that many specimens previously determined as *C. decens* var. *invidiosus* belong to other species or to the form described below as *C. invidiosus* var. *vexillatus*. Nevertheless the true *C. invidiosus* as described above is evidently widely spread in Africa, and the following distribution may be confirmed from an examination of mounted male terminalia: GOLD COAST: Bole, Oblogo, Sunyani, Takoradi. SIERRA LEONE: Daru. NIGERIA: Lagos, Zungeru. BELGIAN CONGO: Banana. UGANDA: Kampala. SUDAN: Bundle. TANGANYIKA: Dar-es-Salaam.

Synonymy.—I have retained the name *invidiosus* for the form which I have previously so designated, but Theobald's unique original type (which should be in Liverpool) is not now traceable and I have not seen it; until recently I had taken as the type a specimen in the British Museum so labelled by Theobald, but this cannot be the original type, as it was from Degema. In any case, as both these specimens, as well as the types of *C. euclastus* and *chloroventer* are females, their identity cannot be established with absolute certainty, but I do not think there can be much doubt that some of them at least are correctly associated with the male described above. Since it has now been found that small differences exist in the male terminalia, supporting the more obvious differences in colouring, it may be more correct to treat *C. invidiosus* as a distinct species rather than as a variety of *C. decens*.

Var. **vexillatus** nov.

TYPE.—♂ in B.M., Kampala.

Closely resembles typical *C. invidiosus* as described above, no external differences apparent.

♂. *Terminalia* (Fig. 118, c): Closely resemble those of *C. invidiosus* in all respects except as regards the shape of appendage *f* of the coxite lobe; this is greatly expanded at the tip, like a small flag; seta *h* sinuous as in typical *invidiosus*.

Distribution.—NIGERIA: Ibadan (*Philip*). BELGIAN CONGO: Stanleyville, Popokabaka (*Schwet*); Leopoldville (*Henrard*). UGANDA: Kampala (*Hopkins*).

Culex (Culex) trifoliatus Edwards.

Culex trifoliatus Edwards, Bull. Ent. Res. 5, p. 70 (1914).

TYPE.—♂ in B.M., Kasala, Chagwe, Uganda.

A small species closely resembling *C. invidiosus*, but still darker.

♀. *Head* with the erect scales all dark. Palpi short, about one-sixth as long as proboscis. *Thorax* exhibiting some variation; in some specimens almost all the

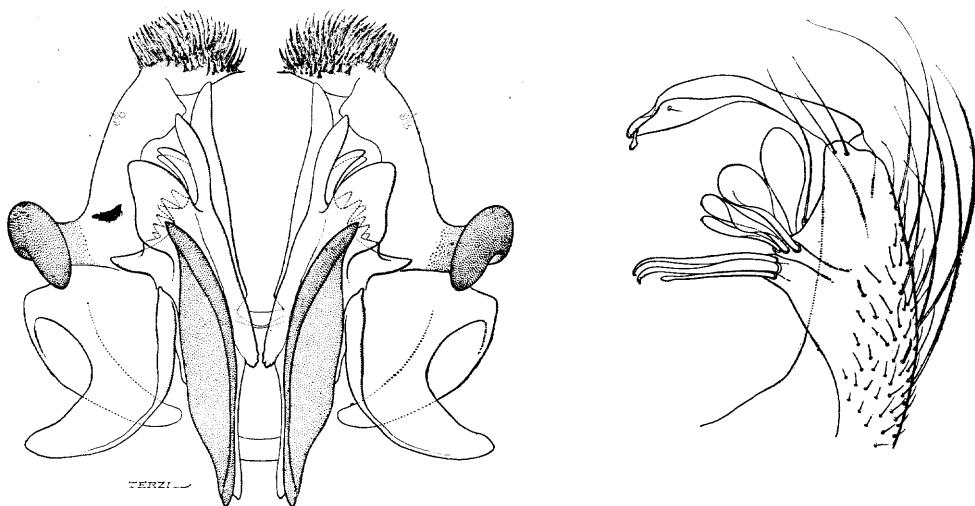


FIG. 119.—Terminalia of *Culex trifoliatus* Edw. On right, coxite from inside; on left, basal part more enlarged.

scutal scales are dark, in others pale scales are fairly numerous round the margins, and a pair of pale spots may be present behind the middle. *Abdomen* all dark above, the small white spots only visible in side view. *Legs* dark; the hind femur with the pale scales less clear white and the dark area at tip of anterior surface rather more extensive than in *C. invidiosus*, occupying about one-fifth instead of scarcely one-sixth of the length of the femur; hind tibia with distinct pale spot at top as in the related species. *Wings* as in *C. invidiosus*. Halteres with dark knob.

♂. Resembles ♀; white spots visible from above on tergites 5–7 but much smaller than in *C. invidiosus* and not extending so far along the sides of the segments. Palpi

as in related species. *Terminalia* (Fig. 119): Resemble those of *C. decens* and *C. invidiosus* as regards structure of style, paraprocts and phallosome, but differ conspicuously in appendages of lobe of coxite: *e* and *f* are leaf-like, almost as large and broad as the true leaf, and *d* is also broadened.

Distribution.—UGANDA: Kasala (*Fraser*). SUDAN: Loka, Bundle, Khor Yamba, R. Kobwa, R. Benemma, all in Mongalla Province (*King*). BELGIAN CONGO: Kisantu (*Père Greggio*); Leopoldville (*Dubois*). GOLD COAST: Obuasi (*Graham*). TANGANYIKA: Dar-es-Salaam (*Haworth*).

Culex (Culex) ornatothoracis Theobald.

Culex ornatothoracis Theobald, Mon. Cul. 5, p. 376 (1910); Edwards, Bull. Ent. Res. 2, p. 263 (1911), p. 70 (1914), and 13, p. 85 (1922).

TYPE.—♂♀ in B.M., Accra, Gold Coast.

Resembles *C. invidiosus* and related species, but differs in the scaling of the head and thorax, more extensively dark hind femur, longer ♀ palpi, and structure of ♂ terminalia.

♀. *Head* with nearly half of the erect scales yellow, those at sides dark. Palpi nearly one-fourth as long as proboscis, the second segment over three times as long as the first. *Thorax* dark; scutal scales largely dark, but very many yellowish scales round margins, and a pair of rather large spots of yellowish scales behind middle. *Abdomen* dark above, the pale basal lateral spots of tergites quite small. *Legs* dark; hind femur with dark dorsal line reaching base, on anterior surface with proximal two-thirds whitish, distal third (or almost as much) dark; hind tibia with pale spot at tip as in *C. invidiosus*. *Wings* with the forks longer than in *C. invidiosus*, upper fork over three times as long as its stem. Halteres with dark knob.

♂. Resembles ♀, but pale scales on scutum more numerous and forming a more suffused and less obvious pattern. Palpi as in related species. *Terminalia* (Fig. 118, d, e) generally similar to those of *C. decens* and *C. invidiosus*, but differing as follows: Coxite with more numerous ventral hairs set in an irregular double row; lobe less distinctly divided, leaf differently shaped; style with distal part rather broader; phallosome with a small additional flap on outer division. As in *C. decens*, *f* is only slightly enlarged towards its tip and *h* is not sinuous.

Wing-length 3.5–4.5 mm.

Distribution.—GOLD COAST: Accra and Kumasi (*Graham*). UGANDA: Mpanga Forest, Toro (*Shillito*).

A male in the British Museum from Stanleyville (*Schwartz*) may belong to this species or may represent another allied form; its terminalia (Fig. 118, g) are similar but not quite identical.

Culex (Culex) perfuscus Edwards.

Culex perfuscus Edwards, Bull. Ent. Res. 5, p. 71 (1914).

TYPE.—♂ in B.M., Port Herald, Nyasaland.

A dark species resembling *C. invidiosus* and *C. trifoliatus*, but hind femur more extensively white and hind tibia entirely black.

♀. *Head* with the erect scales all dark, decumbent scales whitish. Proboscis all

dark, palpi about one-fifth as long as proboscis. Antennae as in the *decens* group; tori darkened at least on inner side. *Thorax* dark, pleurae often green in life. Scutal scales mainly dark brown, those round margins and on and in front of scutellum creamy-white. Patches of white scales on pleurae rather larger than in *C. invidiosus*. A single lower mesepimeral bristle present as usual. Propleura with few bristles and many scales, as in the *decens* group. *Abdomen* black above, tergites with the usual basal lateral white spots, but only those on 6 and 7 visible from above. Sternites with dark apical bands, sometimes narrow. *Legs* dark, but front coxa with numerous



FIG. 120.—Terminalia of *Culex perfuscus* Edw. On right, coxite from inside; on left, basal parts more enlarged. Lettering as for Fig. 93, p. 280; note especially the rudimentary inner finger of phallosome (c).

white scales at tip as well as at base, dark-scaled in middle only; hind femur very largely white, the dark dorsal line not extending beyond the middle, and the anterior surface wholly dark for only a short distance (equal to slightly more than diameter of femur). Hind tibia entirely dark, without trace of pale spot at tip above or anteriorly. *Wings* dark-scaled; in the typical series upper fork scarcely more than twice as long as its stem and cross-veins separated by rather more than the length of the posterior one. Halteres with dark knob. *Pharyngeal teeth* (Fig. 96, c).

♂. Resembles ♀, but pale scales of mesonotum tending to be more numerous and venter more extensively dark. Palpi as in the *decens* group. *Terminalia* (Fig. 120): Coxite rather stouter than in *C. decens* or *invidiosus* and with more numerous ventral hairs (about 8–10 hairs in a rather regular row). Proximal part of lobe more prominent than in *C. decens*, forming a longish arm, distal part short; *d* and *e* rather long, slender, *f* also long and slender, not enlarged at tip; leaf very broad, distal margin rounded. Style rather more enlarged distally than in *C. decens*, with a conspicuous

rounded projection on one side near tip. Paraproct with basal arm shorter than in *C. decens*. Phallosome differing from that of the species of the *decens* group in having the inner division reduced to a small tubercle.

Wing-length 3.5–4 mm.

Distribution.—SIERRA LEONE: Kamabai (*Fraser*). GOLD COAST: Aburi (*Ingram*); Accra (*Pomeroy*). NIGERIA: Ibi (*Kumm*); Zungeru (*Macfie*). GABOON: Various localities (*Galliard*). BELGIAN CONGO: Bas Lomami (*Schwetz*); Kinshasa (*Duren*); Stanleyville (*Mouchet*); Matadi (*Wanson*); Irebu (*André*); Boma (*Nicolay*); Popokabaka (*Schwetz*); Ruchuru (*de Wulf*). SUDAN: Menzi River, Weni (*King*); Gezira (*Duncan*); Delami (*Rutledge*); Juba (*Med. Insp.*). NYASALAND: Port Herald (*Old*); Mlanje (*Neave*); Ft. Maguire (*Barclay*); Ft. Johnston (*Bury*); Cholo (*Wood*).

Variation.—The females from Bas Lomami and Aburi have the fork-cells markedly longer than in Nyasaland specimens (upper fork over three times as long as its stem) and the dark bands of sternites narrow or absent; these females have the hind tibia entirely dark as usual and are associated with typical males of *C. perfuscus*. One male from Dufile (*King*) has the anterior surface of the hind femur entirely dark, but the terminalia are typical.

Culex (Culex) perfidiosus Edwards.

Culex perfidiosus Edwards, Bull. Ent. Res. 5, p. 72 (1914).

TYPE.—♂ in B.M., Ilesha, Nigeria.

Very closely resembles *C. perfuscus*, having, as in that species, the hind tibia entirely dark, without a pale spot at tip, but distinguishable in both sexes by having the hind femur even more extensively white, with only a very short dark area at tip on anterior surface and a short dark dorsal line, and by having nearly all the mesonotal scales dark, only a few pale ones even around the pre-scutellar bare space.

♀. *Pharyngeal teeth* (Fig. 96, a).

♂. *Terminalia* (Figs. 121; 118, f) remarkably different from those of all other species of the group. Coxite rather swollen and very hairy; lobe divided into two parts, one (bearing rods *a-c*) forming a long arm, the other (bearing *d-f*) much smaller, *d* and *e* present as fine hairs, *f* a pointed blade, leaf pointed, seta *h* sinuous and unusually stout at base. Style of peculiar irregular shape and with a small crest at tip. Ninth sternite remarkably large, more than twice as long as broad (this feature distinguishing *C. perfidiosus* from all other African *Culex*). Paraprocts and phallosome practically as in *C. perfuscus*.

Distribution.—NIGERIA: Ilesha (*Mayer*); Lokoja (*Watson, Simpson*); Lagos (*Graham*). GOLD COAST: Accra (*Dalziel*); Bole (*Ingram*). BELGIAN CONGO: Stanleyville (*Mouchet*); Leopoldville (*Henrard*); Irebu (*André*). GABOON: Rimbo N'Komi (*Galliard*).

Culex (Culex) guiarti Blanchard.

Culex viridis Theobald (*nec* Robineau-Desvoidy), Mon. Cul. III, p. 212 (1903).

Culex guiarti Blanchard, Les Moustiques, p. 629 (1905); Edwards, Bull. Ent. Res. 5, p. 68 (1914), and 13, p. 85 (1922).

TYPE.—♂♀ in B.M., Busé, Uganda.

This species is one of a small group the members of which are distinguished from all other species of *Culex* in Africa except *C. macfieii* by the sub-plumose antennae of the female, and by the first flagellar segment being lengthened. *C. guiarti* is a dark species without any special ornamentation, and without a pale spot at the tip of the hind tibia. The green colour of the thorax, which suggested Theobald's specific name of *viridis* is usually noticeable in life but is not specially diagnostic of this species as it may be seen in a number of others of the genus.

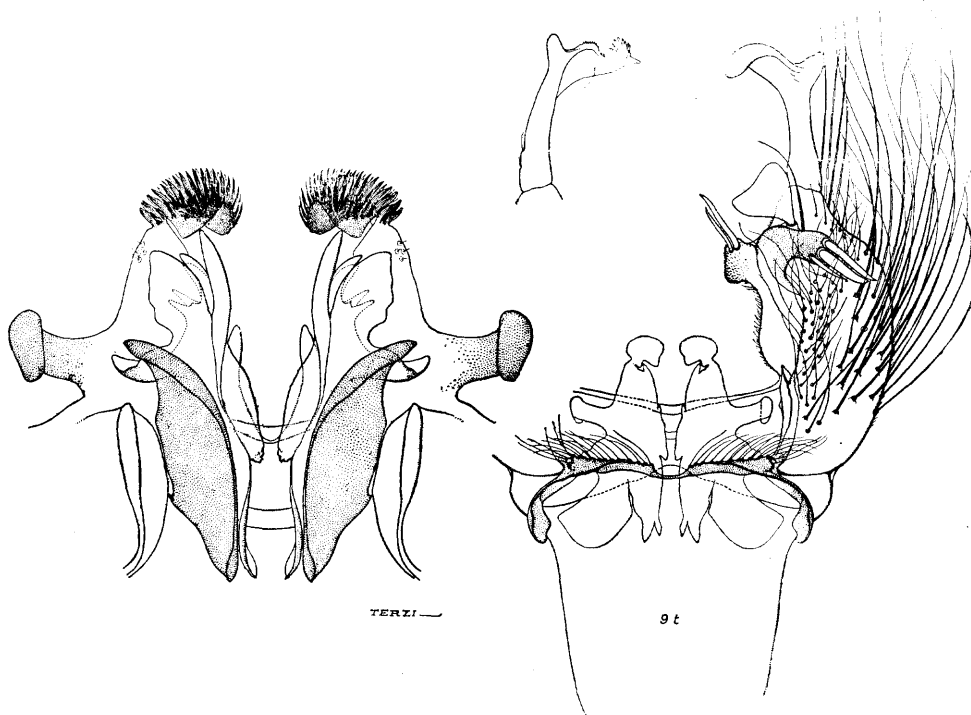


FIG. 121.—Terminalia of *Culex perfidiosus* Edw. On right, whole organ in tergal view; *qt.*, the abnormally developed ninth sternite. On left, basal parts more enlarged.

♀. *Head* with the erect scales mostly or all dark, decumbent scales whitish. Proboscis blackish below as well as above; palpi blackish, about one-sixth as long as proboscis. Antennae dark, including most of torus; first flagellar segment about twice as long as second, the next few distinctly shorter than those which follow, and each with 15–20 long hairs in the whorl. *Thorax* with integument of scutum for the most part moderately dark brownish, but with more or less extensive pale areas on shoulders and in front of scutellum; integument of pleurae almost uniformly pale, without any obvious dark stripes or spot on mesepimeron; pale parts of integument normally green (perhaps always so in life) but often fading to pale yellowish in dried specimens. Scutal scales mainly rather dark brown, pale on the pale areas, the scales rather small and fine. Pleurae with few scales; post-spiraculars and pre-alars

absent; the two small patches of sternopleural scales widely separated; few scales and bristles on propleura. A single lower mesepimeral bristle (none of the numerous specimens examined shows a second such bristle). *Abdomen* dark above, white basal lateral patches on tergites 6–7 quite small. Sternites with well marked dark apical bands. *Legs* mainly dark in front; as seen from behind (*i.e.* on posterior surface) the front and middle legs are largely pale but the femur is dark dorsally on the distal half; hind femur with dark dorsal stripe on distal half or more, anterior surface narrowly dark at tip; hind tibia wholly dark. Front coxae with some dark scales in middle. *Wings* with fork cells of moderate length, upper about 2.5 times as long as its stem; cross-veins separated by about the length of the posterior one. Halteres yellow. *Pharyngeal teeth* (Fig. 96, d).

♂. Resembles ♀. Palpi wholly dark, exceeding proboscis by the last segment and about half the penultimate, hairy as usual. *Terminalia* (Fig. 122, b, d): Coxite of

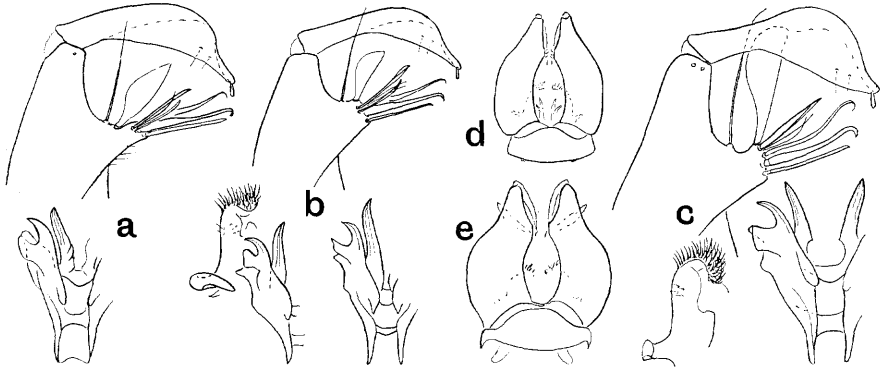


FIG. 122.—Terminalia details of *Culex* spp. a. *weschei*. b. *guiarti*. c. *grahami* (Kampala). Outline of terminalia from above. d. *guiarti*. e. *grahami* (Lagos).

the usual form, not at all swollen as seen from above; lobe undivided, *b* much stouter than *a* or *c* on its basal half, *f* slightly expanded, leaf not longer than *f* and rather narrow, *h* straight. Style moderately broad but rather suddenly narrowed at tip. Paraproct with long, curved basal arm. Phallosome with the outer division of simple structure, without small teeth; inner division extending beyond the outer.

Wing-length 3–3.5 mm.

Distribution.—Typical examples are in the British Museum from the following localities: UGANDA: Busé (*Low*); Kampala (*Hopkins*). KENYA: Nairobi (*Daniels*). BELGIAN CONGO: Kisantu (*le Wulf*); Popokabaka (*Schwetz*). TANGANYIKA: Bukoba (*MacHardy*). NIGERIA: Lagos (*Philip*). GOLD COAST: Obuasi (*Graham*); Accra (*Macfie*).

Other records require confirmation owing to possible confusion with the variety (?) described below or with *C. weschei*, but Galliard's record from Fernan Vaz is doubtless correct.

Note.—In my earlier keys to African *Culex* I distinguished *C. guiarti* as having the venter entirely whitish. This statement was based on female specimens of *C. antennatus* which I had wrongly determined as *C. guiarti*.

Var. **sudanicus** n.

TYPE.—♂ in B.M., Bole.

Intermediate between *C. guiarti* and *C. weschei*; resembles the former in having the proboscis dark below as well as above, sternites with distinct dark apical bands, and middle femur as seen from behind extensively dark dorsally on distal half, but differs as follows: Mesonotum with the integument uniformly brownish, not paler on shoulders, but scales almost all pale creamy and coarser than in *C. guiarti*. Sternopleural scales more numerous, the two patches almost joined; propleural scales and bristles also more numerous. Scales on front coxae all pale.

♂. *Terminalia* as in *C. guiarti*, the style not unusually broad.

Distribution.—GOLD COAST: Bole (*Ingram*). NIGERIA: Gadau (*Taylor*), in company with *C. weschei*.

Culex (Culex) weschei Edwards.

Culex weschei Edwards, Bull. Ent. Res. 26, p. 136 (1935).

TYPE.—♂ in B.M., Sunyani.

Very similar to *C. guiarti* structurally but much paler in colour.

♀. *Head* with most of the erect scales yellow, decumbent scales whitish. Proboscis pale-scaled beneath except at base and tip. Antennae much as in *C. guiarti*, but segments 2-4 of flagellum not obviously shorter than those which follow. *Thorax* with integument of mesonotum scarcely darker than pleurae, scales all pale buff-coloured; sternopleural scales more numerous, the two patches almost joined; propleural scales dense and the bristles also more numerous. *Abdomen* not so dark above, white patches on tergites 6 and 7 rather larger and sometimes the pairs almost meeting in middle line at base; venter entirely pale or with only a few dark scales on distal margins of sternites. *Legs* with a strong yellowish tinge on the pale parts; as seen from behind the front and middle legs appear almost wholly yellowish, only a very small dark area being visible on distal fourth of dorsal surface of middle femur; hind femur with dark dorsal stripe on distal third only, but hind tibia wholly dark as in *C. guiarti*. Front coxae with all the scales whitish. *Wings* as in *C. guiarti*.

♂. Resembles ♀. *Terminalia* (Fig. 122, a) almost as in *C. guiarti* but in both specimens examined the style is broader.

Distribution.—GOLD COAST: Sunyani (*Ingram*); Accra (*Macfie*). NIGERIA: Gadau (*Taylor*).

ssp. **gediensis** n.

TYPES.—♂♀ in B.M., Gede.

Resembles typical *C. weschei* closely in colouring and in structure of ♂ terminalia, but differs as follows: antenna of ♀ with only 10 instead of 15 hairs in each whorl; propleura in both sexes with fewer setae (about 10 in ♂ and about 6 in ♀, instead of about 20 and 15 respectively); sternopleura with fewer scales.

Distribution.—KENYA: Gede, nr. Mombasa, 6♂ 5♀ (*MacDonald*).

Culex (Culex) ingrami Edwards.

Culex ingrami Edwards, Bull. Ent. Res. 6, p. 360 (1916), and 21, p. 293 (1930).

TYPE.—♂ in B.M., Sunyani.

Very similar to *C. guiarti*, the external characters distinguishing the two species being indefinite.

♀. *Head* as in *C. guiarti*, including structure of antennae. *Thorax* differing from that of typical *C. guiarti* in that the integument is not obviously paler about the shoulders though on the other hand the mesonotal scales are all pale; in most specimens examined there is a faint and ill-defined longitudinal darker area on lower half of pleurae and a slightly darkened area surrounding the lower mesepimeral bristle, this bristle usually single as in *C. guiarti* but occasionally duplicated. Pleural scaling as in typical *C. guiarti*, the two sternopleural patches well separated and the

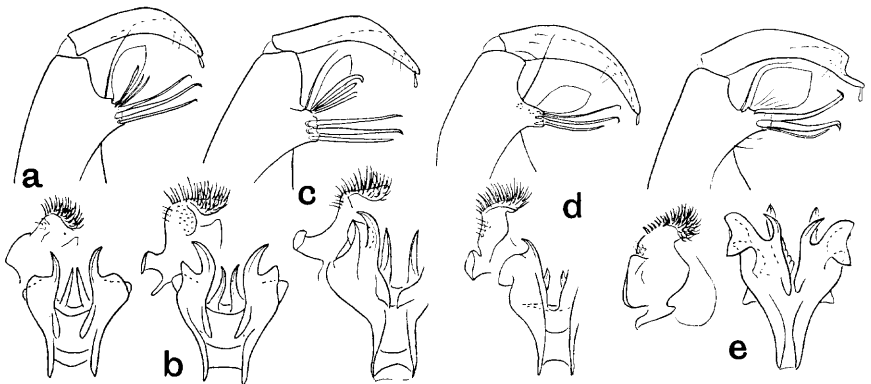


FIG. 123.—Terminalia details of *Culex* spp. a. *ingrami*. b. *ingrami* var. (Kampala). c. *schwetzi*. d. *philipi*. e. *pruina*.

propleura with few scales. *Abdomen, legs and wings* much as in *C. guiarti*. *Pharyngeal teeth* (Fig. 96, g).

♂. Resembles ♀. *Terminalia* (Fig. 123, a) differing from those of *C. guiarti* and *weschei* in having the sickle-shaped style more evenly tapering, not abruptly narrowed at the tip; arm of paraproct very short and broad, sometimes practically absent; and inner division of phallosome much shorter; lobe of coxite with leaf somewhat longer than *f*, which is shorter than in *C. guiarti*, straight and scarcely expanded.

Distribution.—GOLD COAST: Sunyani (*Ingram*). UGANDA: Kampala and Sezibwa (*Hopkins*). BELGIAN CONGO: Matadi (*Wanson*); Ruchuru (*de Wulf*).

Variation.—Hopkins has described two types of larvae appertaining to this species, the one found by Ingram at Sunyani and the other occurring commonly at Kampala. Comparison of Gold Coast and Uganda adults reveals no very obvious distinctions except that in the two Gold Coast males (Fig. 124, a) the arm of the paraproct is barely distinguishable, whereas in all the Uganda males examined (Fig. 124, b) it is definitely present though variable in length and always short. The material sent by Wanson from Matadi included both types of larvae, and on males bred from the mixed batch were found both types of paraproct. It must, however, be regarded as still uncertain whether there is any correlation between larval and adult forms; it may be that the variation in both stages is individual and continuous.

Culex (Culex) schwetzi Edwards.

Culex schwetzi Edwards, Bull. Ent. Res. 20, p. 326 (1929), and 21, p. 293 (1930).

TYPE.—♂ in B.M., Stanleyville.

Related to *C. guiarti* and *ingrami*, but paler, and readily distinguished in both sexes from these species and from the superficially similar *C. pruina* by the banded abdomen.

♀. *Head* with the erect scales mostly yellowish, decumbent scales pale. Proboscis entirely blackish. Palpi dark, about one-fifth as long as proboscis. Antennae with torus largely dark; first flagellar segment about twice as long as second, each segment on basal half of flagellum with about 16 long hairs in the whorl. *Thorax* with the integument mainly pale yellowish; scutum with three broad and confluent dark stripes, leaving more or less extensive pale areas on shoulders and in front of scutellum. All scutal scales pale and rather coarse. Pleural scales inconspicuous, few or none on propleura; no post-spiraculars or pre-alaris. Usually a single lower mesepimeral bristle present, but sometimes two and rarely three. *Abdomen* dark brown above, tergites 4-7 or 3-7 each with white basal bands which are usually somewhat narrowed in the middle. Sternites with dark apical bands. *Legs* dark, femora pale beneath and posteriorly; hind femur whitish almost to tip on anterior surface; hind tibia without pale spot. *Wings* with forks of moderate length, upper about 2.5 times as long as its stem. Halteres yellow. *Pharyngeal teeth* (Fig. 96, e).

♂. Resembles ♀. Palpi not very long, exceeding proboscis by length of terminal segment only; last two segments only moderately hairy and all dark. *Terminalia* (Fig. 123, c): Coxite normal, not swollen; lobe undivided, *d* duplicated, *e* straight, *f* hooked at tip, leaf rather narrow. Style evenly tapering. Paraproct with short flattened arm. Phallosome with simple outer division as in related species, inner division markedly shorter than outer as in *C. ingrami*.

Wing-length about 4 mm.

Distribution.—BELGIAN CONGO: Stanleyville (*Schwetzi*).

Culex (Culex) grahami Theobald.

Culex pullatus Graham (*nec* Coquillett), Ann. Mag. Nat. Hist. (8) 5, p. 265 (1910).

Culex grahami Theobald, Mon. Cui. 5, p. 628 (1910); Edwards, Bull. Ent. Res. 2, p. 264 (1911), 5, p. 69 (1914), and 13, p. 85 (1922).

TYPE.—♂♀ in B.M., Lagos.

In most respects resembles *C. guiarti* and related species, but larger, hind tibia with a pale spot at tip, and antenna of female less obviously sub-plumose.

♀. *Head* with the erect scales mostly dark, decumbent scales pale. Proboscis dark below as well as above. Palpi dark, about one-fifth as long as proboscis. Antennae with tori more or less dark on inner side, without scales; first flagellar segment nearly twice as long as second as in *C. guiarti*, first few flagellar segments each with 10-12 long hairs in the whorl instead of the usual 4-6. *Thorax* with brownish integument, pleurae lighter, but not conspicuously so, and without markings. Scutal scales mostly rather dark brown, some white ones round margins. Pleurae with the usual small patches of scales on sternopleura and mesepimeron, very few on propleura. Two lower mesepimeral bristles present in all 21 specimens examined, in a

few cases a third such bristle present on one side. *Abdomen* blackish above, tergites with the usual basal lateral white patches, those on 6 and 7 rather larger than the rest, but very rarely uniting to form complete bands; sternites with dark apical bands. *Legs* mainly dark; hind femur with anterior surfaces mainly whitish but with the distal fifth or sixth dark (the dark area therefore more extensive than in *C. guiarti*); hind tibia with distinct though not sharply defined pale spot at tip. Front coxae dark-scaled except at base. *Wings* dark; forks long, their bases practically level, upper fork over three times as long as its stem. Halteres yellow.

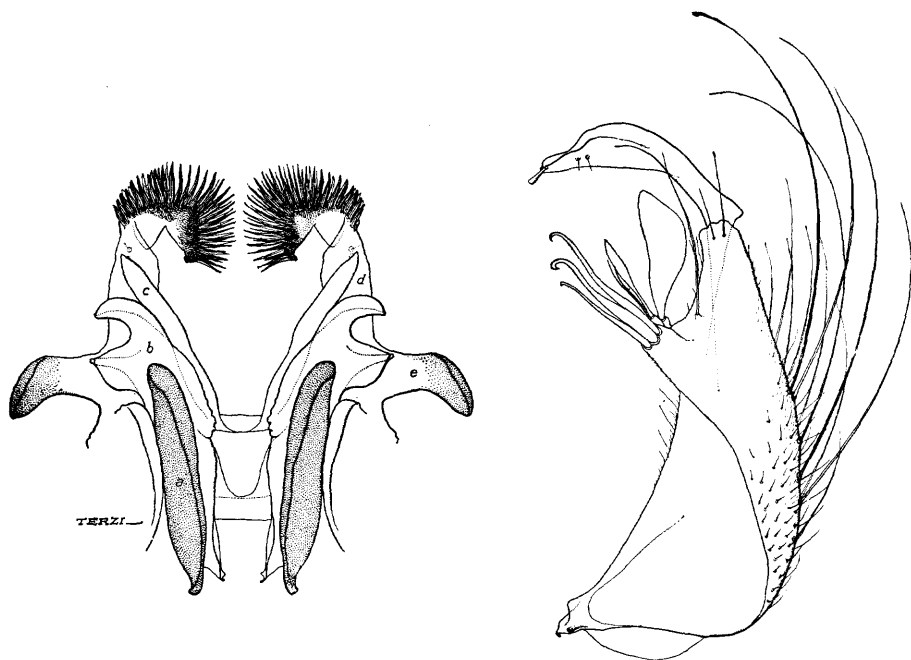


FIG. 124.—Terminalia of *Culex grahami* Theo. Parts and lettering as in Fig. 93.

♂. Resembles ♀. Palpi very long, exceeding proboscis by almost the length of the last two segments, entirely dark and conspicuously hairy. *Terminalia* (Figs. 122, c, e; 124) very much resembling those of *C. guiarti* in structure but differing as follows: Coxite as seen from above markedly more swollen on the part before the lobe; lobe with rod *c* usually somewhat bent, leaf much longer. Style very broad, broader even than that of *C. weschei*. Paraproct with shorter basal arm. Phallosome scarcely differing from that of *C. guiarti*.

Wing-length 4–5 mm.

Distribution.—Not all previous records can be trusted, because I have in the past confused this species with *C. perfuscus* and others, but the occurrence of *C. grahami* in the following localities can be confirmed: NIGERIA: Lagos (*Graham, Connal*); Ilesha (*Humfrey*); Gadau (*Taylor*). GOLD COAST: Kor Legona, Ofako and Sunyani (*Ingram*). UGANDA: Kampala (*Hopkins*). BELGIAN CONGO: Leopoldville (*Henrard*).

Culex (Culex) pruina Theobald.

Culex pruina Theobald, Rept. Liverp. S. Trop. Med. 4, App. p. 8 (1901); Edwards, Bull. Ent. Res. 2, p. 263 (1911), 3, p. 33 (1912), 5, p. 73 (1914), 13, p. 84 (1922) and 20, p. 326 (1929).

Culex pruinus Theobald, Mon. Cul. 2, p. 332 (1901).

Culex pallidothoracis Theobald, Mon. Cul. 5, p. 370 (1910).

TYPES.—*pruina* (*pruinus*), ♂♀ in B.M., Agmuni; *pallidothoracis*, ♂♀ in B.M., Obuasi.

A very distinctive species, easily told from all other African species by its general pale appearance in conjunction with the absence of mesepimeral scales, the only other African species of the restricted subgenus *Culex* in which such scales are absent being the related *C. philipi*. *C. schwetzi* Edw. is somewhat similar but possesses mesepimeral scales and has more pale bands on the abdomen.

♀. *Head* with the erect scales mostly yellowish towards front, dark towards back; decumbent scales all pale. Proboscis uniformly dark. Palpi dark, about one-fifth

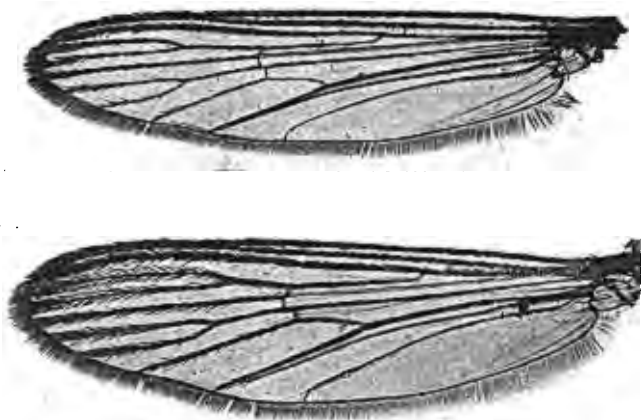


FIG. 125.—Wings of ♂ and ♀, *Culex pruina* Theo.

as long as proboscis. Antennae with torus mainly or entirely yellow, flagellum dark; all flagellar segments subequal in length and with at most six long hairs in the whorl as usual. *Thorax* with integument mainly pale yellowish (perhaps greenish in life) including whole of pleurae; scutum with three broad dark stripes which are usually more or less fused in middle, leaving extensive areas behind shoulders and in front of scutellum pale. Scutal scales all pale, also most of the bristles. Pleurae almost bare of scales; a very few in the two sternopleural groups and usually two or three among the upper mesepimeral hairs, but none in middle of mesepimeron or on propleura. Usually three lower mesepimeral bristles present, sometimes two or four. *Abdomen* dark above, tergites with the usual basal lateral white patches, which on 6 and 7 and sometimes also on 5 are large and usually meet in the middle line to form complete bands. Sternites with dark apical bands. *Legs* mainly dark; hind femur whitish on anterior surface almost to the tip; hind tibia without pale spot. *Wings* (Fig. 125) dark; fork cells long, upper over three times as long as its stem. Halteres yellow. *Pharyngeal teeth* (Fig. 96, h).

♂. Resembles ♀. Palpi very long and hairy, exceeding proboscis by almost the length of the two last segments, entirely dark. *Terminalia* (Fig. 123, e) peculiar in several respects; tergite lobes unusually large and with numerous hairs; lobe of coxite without any trace of *d*, *e*, or *f*, but *a-c* present as usual, *a* slender, *b* and *c* stout and rather bent, leaf broad; style abruptly narrowed near tip; paraproct short, the "arm" very short and broad; phallosome somewhat resembling that of *C. guiarti*.

Wing-length 4-5 mm.

Distribution.—Widely distributed and common in West Africa, but apparently not occurring in the south or east. GOLD COAST: Obuasi (*Graham*); Sunyani (*Ingram*); Kumasi (*Watt*). LIBERIA: Lenga (*Bequaert*). SIERRA LEONE: Yatea (*Wood*); Falaba (*Simpson*). CAMEROONS: Misellele (*Zumpt*). NIGERIA: Lagos (*Graham*); Agmuni (*Annett*); Oshogbo (*Mayer*). GABOON: Fernan Vaz (*Galliard*). BELGIAN CONGO: Stanleyville, Kasongo Lunda (*Schwetz*); Leopoldville (*Duren*).

Var. **eschirasi** Galliard.

Culex pruina var. *eschirasi* Galliard.

TYPE.—Cotypes in B.M. and Paris, Eschiras.

This form appears to be distinguishable from typical *C. pruina* only in the larval stage. I have examined a series of adults of the variety from the type locality, including a male reared from an isolated larva, and can find no differences either in external features or terminalic structure from the typical form.

Distribution.—GABOON: Eschiras (*Galliard*).

Culex (Culex) philipi Edwards.

Culex philipi Edwards, Bull. Ent. Res. 20, p. 327 (1929), and 21, p. 293 (1930).

TYPE.—♂ in B.M., Lagos.

Related to *C. pruina*, but smaller and darker; superficially very similar to *C. perfuscus*, from which it differs in the absence or paucity of mesepimeral scales.

♀. *Head* with all the erect scales blackish, decumbent scales pale. Antennae with basal segment largely dark, more or less yellowish above; flagellum normal, the first segment not lengthened, and each segment with the usual six long hairs in the whorl. Proboscis entirely dark below as well as above; palpi dark, about one-sixth as long as proboscis. *Thorax* with integument of scutum mostly dark, shoulders paler but not so conspicuously pale as in *C. pruina*; pleurae mainly pale, with a vaguely darker area in middle. Scutal scales mostly rather light brown, lighter on shoulders. Pleurae as in *C. pruina* with very few scales, none on propleura, post-spiracular or pre-alar areas; mesepimeron in the majority of specimens without scales, but a very small group (at most 5) present in some individuals. Usually two lower mesepimeral bristles, sometimes three and rarely only one. *Abdomen* black above, tergites with the usual white basal lateral spots, those on 6 and 7 larger and visible from above. Sternites with dark apical bands. *Legs* mainly dark; hind femur with dark dorsal line almost or quite reaching base, anterior surface white almost to the tip; hind tibia entirely black. *Wings* dark; forks of moderate length, upper about 2.5 times

as long as its stem. Halteres with dark knob (thus differing from those of all species of the *guiarti* group).

♂. Resembles ♀, but shoulders more obviously pale, and all specimens examined (about 20) with but a single lower mesepimeral bristle. Palpi entirely dark, shorter and less hairy than in *C. pruina*, exceeding proboscis by terminal segment only. *Terminalia* (Fig. 123, d) resembling those of *C. pruina* in the entire absence of appendages *d-f* of the coxite lobe, short paraprocts with rudimentary basal arm, and absence of small teeth on outer division of phallosome, but differing in having the style evenly curved and tapering, rods *a-c* all slender, and inner division of phallosome rudimentary (as in *C. perfuscus* and *perfidiosus*).

Wing-length 3.5–4 mm.

Distribution.—West African coastal area. SIERRA LEONE: Pepel (*Liverpool S.T.M.*). NIGERIA: Lagos (*Graham, Philip*). GOLD COAST: Takoradi (*Pomeroy*).

Note.—In the second reference quoted above I referred to this species a female with sub-plumose antennae (in place of the one originally described as *C. philipi*). This was an error, the specimen being *C. guiarti*.

Culex (Culex) moucheti Evans.

Culex moucheti Evans, Ann. Trop. Med. 17, p. 89 (1923); Edwards, Bull. Ent. Res. 20, p. 333 (1929).

TYPE.—♂ in Liverpool School of Tropical Medicine, Stanleyville.

A medium-sized to rather large species without striking ornament, but nevertheless easily recognized because it is the only one among the numerous dark-coloured African *Culex* having the erect scales of the head almost all orange, the tori also orange and the venter entirely pale.

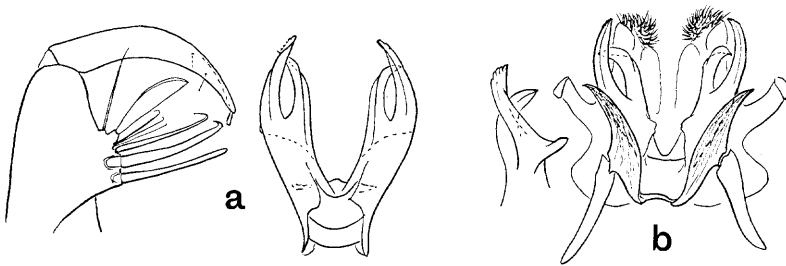


FIG. 126.—Terminalia details of *Culex moucheti* Evans. a. Specimen from Stanleyville. b. Specimen from Lubutu.

♀. *Head* with most of the erect scales orange, only those towards back of head dark brown, so that the head appears conspicuously orange under a lens in front or side view; decumbent scales white. Proboscis and palpi entirely black, palpi nearly one-fourth as long as proboscis. Antenna with basal segment entirely orange, contrasting with the blackish flagellum, and without scales; all flagellar segments subequal in length and bearing the usual half-dozen long hairs in the whorl. Clypeus blackish, in most specimens bearing a few small white scales on its distal margins (a very unusual feature). *Thorax* dull blackish above, pleurae green in life, fading

to yellowish. Scutal scales mostly very dark brown, a few white ones round front margin and on and in front of scutellum; bristles normal, the acrostichal series present as usual. Pleurae with the usual patches of flat white scales, two on sternopleura and one in middle of mesepimeron, but none on post-spiracular or pre-alar areas and few on propleura. Lower mesepimeral bristles varying in number from two to five, perhaps most frequently three. Propleural bristles few and strong. *Abdomen* black-scaled above, tergites with basal lateral white spots which are larger and visible dorsally on 6 and 7, 8 with a white band; venter entirely white-scaled. *Legs* mostly dark, but middle tibiae wholly and hind tibia largely pale posteriorly; hind femur with a black dorsal stripe from base to tip, gradually widening but allowing the white colour of the anterior surface to extend almost or quite to the tip below; hind tibia slightly paler at extreme tip but without a definite pale spot. *Wings* dark; fork cells rather long, the upper about three times as long as its stem; cross-veins separated by rather more than the length of the posterior one. Halteres scarcely darkened. *Pharyngeal teeth* (Fig. 96, f).

♂. Resembles ♀; the orange basal antennal segment conspicuous. Palpi of the normal form, moderately hairy and entirely dark, exceeding proboscis by the terminal segment and about half the penultimate. *Terminalia* (Fig. 126): Coxite of the normal form for the subgenus *Culex*, without scales; lobe undivided, with the usual eight more or less specialized bristles, *a* blunt-tipped, *b* rather stouter, *c* more slender and hooked, *d-f* all slender, short and slightly hooked, leaf narrow, seta straight. Style evenly curved and tapering. Paraproct as in typical *Culex* except that the basal arm is oblique instead of being extended more or less at right angles. Phallosome of simple structure, somewhat as in the subgenera *Barraudius* or *Lutzia*, each half divided into two prongs, the outer longer than the inner and shagreened at its tip.

Wing-length 4-5.5 mm.

Distribution.—BELGIAN CONGO: Stanleyville (*Mouchet, Schwetz*); Lubutu-Walikali (*Schwetz, Collart*). NIGERIA: Oshodi (*Connal*); Ibadan (*Fowler*). UGANDA: Fort Portal (*Hopkins*); Izahura, Bwamba (*Shillito*). CAMEROONS: Tiko (*Zumpt*).

UNIDENTIFIED SPECIES.

Culex annulitarsis Macquart.

Dipt. Exot. Suppl. 1, p. 8.

TYPE.—♀ lost (unless possibly in Paris), Mauritius.

There is almost nothing in the description except the statements that the hind tibia has a broad white ring before the tip, and the hind tarsi have the metatarsus white with a narrow black ring. No known Mauritian or other mosquito exhibits both these characters; it is not unlikely that the wording is incorrect, as the Mauritian mosquito fauna has been rather fully investigated and nothing to fit Macquart's diagnosis has been found. If he had said that the white tibial ring was *at* instead of before the tip and that the tip of the hind tarsus (instead of the hind metatarsus) was white with a narrow black ring, he would have picked out the two most salient features of *Anopheles coustani*, one of the commonest Mauritian mosquitoes.

Culex arabicus Becker.

Denkschr. k. Ak. Wiss. Wien, 71, p. 140 (1907).

TYPE.—♀ in Zool. Mus., Berlin, Sokotra.

I have previously quoted this as a synonym of *Aedes caspius*, but almost certainly wrongly, as Becker states that the claws are simple. The middle and hind tarsi are described as having the first, second and third segments with pale yellow tip, the second to fourth segments with pale yellow base; proboscis unbanded; basal bands of second and following abdominal tergites triangularly produced in middle almost to posterior margins of tergites. This description does not agree with any known African Culicine, unless it might be *Culex duttoni*; perhaps *C. arabicus* is a distinct species endemic to Sokotra.

Culex zeltneri Neveu-Lemaire.

Arch. Parasit. 10, p. 251 (1906).

TYPE.—♂♀ lost, Harrar, Abyssinia.

A species of the *C. pipiens* group; quite possibly *C. fatigans*, as the blood-sucking habits and whitish venter are mentioned.

Culex pygmaeus Neveu-Lemaire.

Arch. Parasit. 10, p. 256 (1906).

TYPE.—♂♀ lost, Imi, Ogaden, Abyssinia.

Another species of the *pipiens* group; might be small *C. fatigans*, or possibly *sinaiticus*.

Culex mundulus Grünberg.

Zool. Anz. 29, p. 388 (1905).

TYPE.—♀ in Zool. Mus., Berlin, Cameroons (no locality mentioned).

I have quoted this as a possible synonym of *C. cinereus*, but it is perhaps more likely to be one of the *C. rima* group.

Culex ataeniatus Theobald.

Culex ataeniata Theobald, U.S. Afr. Dept. Agric., First Rep. Vet. Res. p. 261 (1911).

TYPE.—♀ in Liverpool School of Tropical Medicine, Transvaal.

Described as having proboscis dark at base and apex, dull ochreous in the middle, forming a broad pale band; tarsi unbanded. I suggested in 1911 that this might be a variety of *univittatus*, and in 1932 that it might be the same as *watti*. Perhaps the former is more probable, but the type needs re-examination.

II. TAXONOMY OF CULICINE PUPAE.

The characters of Culicine pupae may be studied either in the whole pupa or in its cast skin, the latter having the advantage that it is more readily manipulated and mounted for the microscope. If preserved immediately after the eclosion of the adult, the pupal skin will not only retain all the setae and markings of the integument, but unlike the larval skin the setae retain their normal relative positions owing to the thicker and more rigid skin. Even if the specimen is mounted whole identification will usually be possible, but a little care is needed if all the features are to be displayed in the preparation. The skin should be divided into four parts. First, the whole abdomen should be carefully detached, taking care not to injure the first segment. Next the two sides of the thorax should be separated by means of needles inserted into the dorsal slit; the head-shield, with the antennal and proboscis sheaths and the two strong internal (tentorial) rods, comes away readily, and the metathorax is easily broken at its median suture. The head-shield, the two halves of the thorax, and the entire abdomen should then be mounted flat, using sufficient mountant to avoid pressing the abdominal tergites and sternites too closely together. Without dissection it is difficult to study the cephalothoracic setae, which are often important for taxonomy and probably might be used more than they have been in classification. If too little mountant is used the pressure of the coverslip will sometimes make it difficult to see which of the abdominal setae are dorsal and which ventral. Permanent preparations may be made in de Faure's gum, the dissected parts being transferred directly from water or from 70 per cent. alcohol to the slide; staining is unnecessary.

The structure of the pupae has failed to throw much fresh light on the relationships of the genera; in the main the classification which was founded mainly on adult and partly on larval characters is confirmed, but several of the genera seem even less clearly defined in the pupal than in the adult or larval stage.

An interesting point in regard to the pupae is the close correlation which is often found with the larva of the same species in the breathing apparatus: the trumpet of the pupae varies in conformity with the siphon of the larva in length and colour as well as in function (whether used at the surface or as an organ for extracting air from water-plants). Other points worth noting are the tendency to loss of the float-hairs of the first abdominal segment in those pupae which either remain below the surface (*Ficalbia*, *Taeniorhynchus*) or live in very small collections of water (*Eretmapodites*); and the tendency to develop a strong seta (possibly to function as a buffer) on the front of the cephalothorax from one or other of the several setae of that region.

CHARACTERS USED IN CLASSIFICATION OF PUPAE.

RESPIRATORY TRUMPETS.

The thoracic respiratory trumpets provide some of the most obvious means of distinguishing several of the Culicine genera in the pupal stage. Following Ingram and Macfie (1919) the trumpets can be regarded as divisible into a closed tubular

portion (*meatus*) and an open portion (*pinna*); the meatus however is often plainly divisible into a proximal *tracheoid* portion provided with numerous concentric ridges, and a distal *reticulate* portion in which the surface of the chitin is covered with a fine network. The proportionate lengths of these three parts of the trumpet are fairly constant for any one species; the ratio of the length of the meatus to that of the whole trumpet has been much used, but that of the tracheoid to the reticulate portion of the meatus or to the remainder of the trumpet, appears at least equally valuable. It should be noted that the relative length of the pinna depends partly on the obliquity of the opening and partly on the thickness of the trumpet as compared with its length; if the opening were transverse there would be no pinna, if it were horizontal to the axis of the trumpet there would be no meatus, but in two trumpets with the opening at the same angle (say 45° to the long axis) the shorter trumpet would have the longer pinna. The shape of the opening of the trumpet is of importance—whether approximately circular or oval, or (as in *Ficalbia*) quite irregular with a slit-like prolongation. In the genera *Hodgesia* and *Taeniorhynchus* the trumpet itself is of peculiar form. In a few cases the surface may be provided with small spicules, and specific differences may be found in colour, the tip being darkened or a dark ring present. Usually the inner and outer walls of the trumpet are closely adherent, but in *Harpagomyia* they are well separated.

CEPHALOTHORAX.

Although generic and specific differences undoubtedly exist in the cephalothorax, they have not been much used in classification, largely because descriptions have for the most part been drawn up from whole cast skins instead of from dissected skins

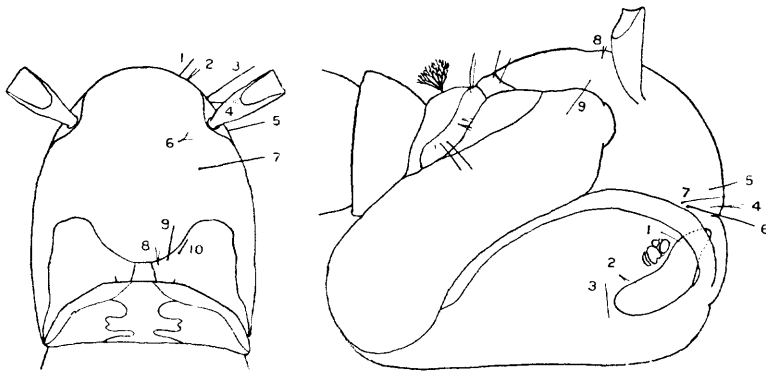


FIG. 127.—Cephalothoracic chaetotaxy of a Culicine pupa (*Aedes aegypti* L.). Side view on left, dorsal view on right. 1-3. Post-ocular setae. 4 and 5. Anterior antero-thoracic. 6 and 7 (left figure). Posterior antero-thoracic. 8 (left figure) or 6 (right figure). Dorsal seta. 9. (left figure) or 7 (right figure). Supra-alar seta. 8-10 (right figure). Postero-thoracic setae.

or whole pupae, and in the undissected skin the characters of the cephalothorax are difficult to appreciate.

The chaetotaxy of the cephalothorax was studied by Macfie (1920) in *Aedes aegypti*, and so far as known the notation he proposed is applicable also to other genera of Culicini. There are twelve pairs of setae in all (see Fig. 127): three on

the head-shield, called the *post-ocular* (upper, median and lower), four near front margin of thorax above called *antero-thoracic* (lower and upper anterior and posterior), one *dorsal* near the trumpets, one *supra-alar* at base of wing-case, and three *postero-thoracic* (internal, median and external) on metanotal plate. One or more of these setae may be large, especially one of the post-oculars (as in *Harpagomyia* and in *Culex moucheti*), or one of the antero-thoracic (as in *Uranotaenia*). The three postero-thoracic setae are sometimes designated by the letters O, P, R. The position of the dorsal seta varies in different genera.

The cephalo-thorax sometimes exhibits a distinctive colour-pattern, particularly noticeable in some species of *Ficalbia* and *Uranotaenia*. It is of interest to note that this colour-pattern is entirely special to the pupa and bears no relation to that of the adult.

The dorsal surface of the cephalothorax may bear prominent ridges; a strong median keel is sometimes very noticeable; this median keel, along which the skin splits for the emergence of the imago, may be provided with a variable number of strong transverse ribs.

ABDOMEN.

The fullest account available of the chaetotaxy of the Culicine pupal abdomen is that of Baisas (1938), who has adopted with some small modifications the system proposed by Macfie and developed by Senevet (1930) and Christophers (1933); Baisas' arguments regarding the homologies of certain hairs appear sufficiently convincing, and his terminology is therefore adopted here without further discussion and with only one change.

The dorsal setae of the abdomen (Fig. 128) are more obvious and important in classification than the ventral; the latter are usually all quite small and inconspicuous and have not as yet been found to have any noteworthy taxonomic significance. For simplification of the present account, therefore, the ventral setae are left out of consideration.

On each abdominal segment except the last there are normally eight or nine dorsal setae on each side; those on segments II-VII can be homologized without great difficulty, and are designated A, B, C, C¹, 1, 2, 3, 4, 5. In Culicines seta A is nearly always very small and somewhat removed from the posterior corner of the segment, in contrast with Anophelines where it is more or less spine-like, quite conspicuous, and placed exactly at the posterior corner; in many Culicines it may be just ventro-lateral in position rather than dorsal, and for that reason may be overlooked. Setae B and C are the two largest setae on the posterior margin of the segments, and are the most important for classification; they may be much alike on each of segments II-VII, or quite differently developed on the anterior, middle and posterior segments. Seta C¹, though always small and simple, is of interest on account of variations in its position both on different segments and in different genera of Culicini; it may be either on the posterior margin internal to C, or well removed from the posterior margin and either internal, in line with, or external to C; it is often absent from segment II. Seta 1 (formerly designated A) is usually the next largest after B and C, it is situated close to the lateral margin and usually not far from the posterior

margin of each segment. Setae 2, 3 and 4 are small and usually unimportant setae lying somewhat anterior to B and C; on several of the proximal segments 3 is usually either absent or represented by a small socket without any seta. Seta 5 is always minute and placed near the anterior border of the segment.

On segment I the setae are also eight in number on each side, but their arrangement is entirely different and they have therefore been given a different notation. The most conspicuous is usually a large tuft near the middle which has usually been spoken of as the dendritic tuft; as the nature of its branching is by no means always

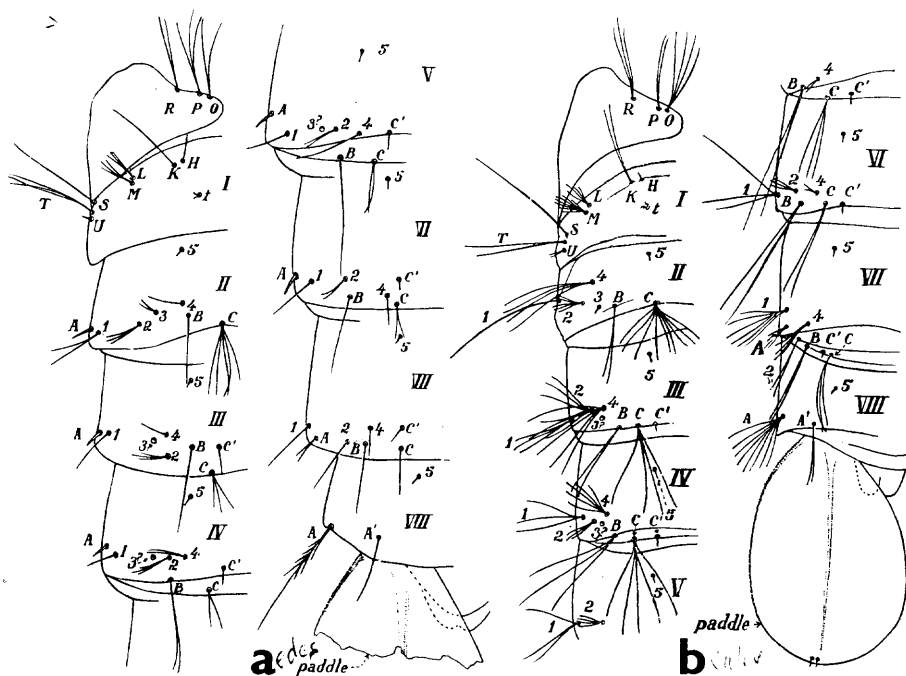


FIG. 128.—Abdominal chaetotaxy of Culicine pupae (after Baisas, 1938). a. *Aedes (Stegomyia) albopictus*. b. *Culex adela* Baisas (a species allied to *C. sitiens* and *C. tritaeniorhynchus*).

dendritic, and as many of the other abdominal setae are in the form of tufts, I prefer to call it the float-hair. It seems to be homologous with seta C of succeeding segments. The remaining setae of segment I are four near the anterior border (H, K, L, M) and three on the lateral border (S, T, U); of these K, S, and T are usually the largest, L, M and U all very small. H and K are usually close together but are widely separated in some genera or subgenera.

On segment VIII there are only three dorsal setae on each side, designated by Baisas (following Christophers) A, A¹ and 5; A usually forms a conspicuous hair or tuft on the posterior corner, though in many *Culex* it is placed further back; A¹ is on the posterior margin and usually small and simple; 5 near the base and minute. The small segment IX (or median projection of VIII) is usually bare but in *Uranotaenia* and in *Culex (Lutzia)* it bears a minute lateral seta; X (anal segment) is bare except in *Megarhinus* where it bears a pair of small setae.

Characters of taxonomic value are sometimes to be found in the markings of the abdominal integument (e.g. in *Hodgesia*) or in the sculpturing of its surface (e.g. some *Eretmapodites*).

PADDLES.

Next to the respiratory trumpets the abdominal paddles provide the most important features for classification of Culicine pupae, generic characters being found in the presence or absence of setae (paddle-hairs) at the tip of the midrib; and specific characters in the shape of the paddles, length and nature of fringe (if any), form of markings when present and thickness of midrib and external buttress. In the genera *Megarhinus*, *Harpagomyia* and *Taeniorhynchus* there is no paddle-hair, and it is also absent or rudimentary in *Ficalbia*. In *Culex* there is nearly always a very small accessory paddle-hair present, placed beside the small paddle-hair. In other genera of Culicini a single paddle-hair is present. The margin of the paddles may be quite smooth, or may be denticulate or fringed along part or the whole of its extent; the "hairs" forming the fringe may vary greatly in length even as between nearly related species, but are always mere processes from the edge of the paddle and have no articulated base.

DESCRIPTIONS OF GENERA AND SPECIES.

KEY TO GENERA.

1. Abdominal setae A-V-VI (sometimes also A-II-IV) very long, single and stout; a pair of setae on anal segment (X); paddles broad, fringed and without seta *Megarhinus* (p. 359).
 Setae A-II-VI all very short or minute; no setae on X; paddles, if fringed, have terminal seta (except in *Ficalbia splendens*) 2.
2. Trumpet divided to base into two movable leaflets—no meatus *Hodgesia* (p. 363).
 Trumpet undivided, with well-marked meatus 3.
3. Trumpet with inner wall well separated from outer wall; paddles small, pointed, with faint midrib and no seta *Harpagomyia* (p. 361).
 Trumpet with inner wall in contact with outer; paddles otherwise 4.
4. Trumpet long, with basal half or more tracheoid 5.
 Trumpet short or only moderately long; tracheoid area when present usually occupying much less than half the meatus 10.
5. Trumpet with tip highly modified for piercing; paddles narrow and notched, without seta; no float-hair 6.
 Trumpet not modified for piercing (unless in *F. pallida*) 7.
6. All abdominal setae very small and weak *Taeniorhynchus* (*Coquillettidia*) (p. 382).
 Setae B and C forming long stout bristles *Taen.* (*Mansonioides*) (p. 383).
7. Paddles very narrow, over four times as long as broad; trumpets very long, tracheoid for more than $\frac{3}{4}$ of their length *Ficalbia* (*Etorleptomyia*) (p. 379).
 Paddles not more than twice as long as broad; trumpets not so extremely long, tracheoid for not more than $\frac{2}{3}$ of their length 8.
8. Dorsal setae placed far behind trumpets; paddles fringed or strongly denticulate and often with light or dark spots *Ficalbia* (*Mimomyia*) (p. 374).
 Dorsal setae placed between or scarcely behind trumpets; paddles with margin largely smooth 69
9. All setae on VII-VIII very small and inconspicuous *Ficalbia* (*Ficalbia*) (p. 381).
 Setae A-VII-VIII forming fairly large branched tufts *Uranotaenia* (part) (p. 364).

10. On segment I setae H, K, L, M all close together and small ; float-hair a tuft of simple branches ; seta B-II-III absent ; paddle-seta as long as midrib and single *Aëdomyia* (p. 372).
 Setae H and K well apart from L and M, K almost always long ; float-hair otherwise ; B-II-III present ; paddle-seta otherwise (except *Aëdes centropunctatus*) 11.
11. Paddles with long fringe ; terminal seta set well outside midrib ; K very long and strong, float-hair reduced *Evetmapodites* (p. 403).
 Paddles without fringe (except in a few *Stegomyia*, where the fringe is shorter) ; terminal seta close to tip of midrib (rarely absent) ; float-hair almost always large and dendritic 12.
12. Paddles without seta, margin smooth and notched at tip of midrib
Culex hancocki (p. 424) and *C. moucheti* (p. 428).
 Paddles with at least a terminal seta ; margin not notched 13.
13. Paddles nearly always with small accessory seta placed beside the terminal seta and with smooth margin ; A-VII and A-VIII removed from corners of segments ; trumpet with small tracheoid area at base (chiefly beneath)
Culex (p. 409).
 Paddles with terminal seta but without accessory seta ; A-VIII (and often also A-VII) close to corners 14.
14. Segment IX (or median prominence of VIII) with a pair of minute setae ; trumpet often with a short but complete tracheoid area at base
Uranotaenia (p. 364).
 Segment IX without setae ; trumpet at most with a few parallel ridges at base beneath 15.
15. Dorsal setae set well behind trumpets 16.
 Dorsal setae set between or only slightly behind trumpets 20.
16. Paddles with absolutely smooth margin ; A-VIII rather large
Orthopodomyia (p. 374).
 Paddles with at least minute denticles on distal margin 17.
17. Setae K and C-II forming small tufts *Theobaldia (longiareolata)* (p. 373).
 Seta K single, C-II single or with few simple branches 18.
18. Seta A-II-VI often rather long and spine-like ; paddles often fringed or with rather strong denticles *Aëdes (Stegomyia)* (p. 387).
 Seta A-II-VI minute as usual ; paddles with only minute denticles 19.
19. Seta A-VIII a large tuft ; K-I very long *Aëdes (Diceromyia)* (p. 401).
 Seta A-VIII less developed ; almost all setae single *Aëdes (Dunnius)* (p. 402).
20. Setae H and K wide apart ; K small and branched, as near to L as to H
Aëdes (Banksinella) (p. 399).
 Setae H and K near together and well apart from L and M 21.
21. Seta C-III behind or even slightly outside B 22.
 Seta C-III usually well inside B ; C-II usually a small dendritic tuft
Aëdes (Aëdimorphus) (p. 392) ; *Aëdes (Skusea)* (p. 403).
22. Seta C-II simple ; paddles very broad, with smooth margin
Aëdes (Mucidus) (p. 384).
 Seta C-II usually branched ; paddles smooth or with minute denticles.
Aëdes (Ochlerotatus) (p. 386) ; *A. (Finlaya)* (p. 386) ; *A. (Steg.) vittatus* (p. 391).

MEGARHINUS R.-D.

The following characters are shared by the three African and eight Oriental species of which I have examined pupae.

Respiratory trumpet short, with simple oblique opening ; meatus entirely reticulate without any tracheoid area at base. Superior post-ocular seta long, stout, but

gradually tapering to a fine point, usually single. Dorsal seta far behind trumpets. Abdomen:—I: H and K widely separated; K, L and M about equidistant and more or less in one row; float-hair large and dendroid. On some at least of remaining segments setae A, B and C very long, single, stout and slightly plumose; on III–IV (and usually also V) C placed quite close to B and resembling it; A–VIII very small. Anal segment with a pair of small setae. Paddles very unequally divided by the midrib, outer part much larger than inner and usually produced beyond midrib, but shape of paddle varying according to the species; no paddle hair.

The very long lateral hairs on some or all of segments II to VII, though placed well back from the corners of the segments, seem undoubtedly homologous with spines A of Anophelines, this being an important distinction from Culicine genera. Baisas (1938, p. 181) states that in Megarhinini the pupal spines (setae A) "are tiny and are situated in the segments like those of the more recent and highly diversified *Culex*." Perhaps Baisas has taken the long stout setae of *Megarhinus* as "I" and the tiny branched setae which lie close to them on the lateral margin as "A," but both on account of their position and their form I conclude that their homologies are the reverse of this. On most of the segments in *Megarhinus* the long lateral setae are inserted in the narrow membrane between tergite and sternite (on VII and VIII this membrane is absent).

The close approximation of B and C on III–IV and the form of the paddles are peculiar to this genus.

***M. brevipalpis conradti* Grünb. (Fig. 129.)**

The pupa of this subspecies was described and figured by Macfie and Ingram (1923) under the name *M. brevipalpis* Theo. Their material was from the Gold Coast; I have examined entirely similar specimens from Sierra Leone, Nigeria, Congo and Uganda, and can complete the otherwise full description by an account of the setae of the first abdominal segment: H is quite short and single, shorter than in the figure; K about three times as long as H, usually split into two or three branches for more than half its length or almost to the base; but may be single; L and M small tufts rather longer than H; S extremely long, quite five times as long as K and equal in length to the longest seta on the abdomen, single and stout, sub-plumose like setae B; T resembling K in length and either split into about three branches for half or more of its length or single and end rather longer.

Further characters distinguishing the species from some others of the genus are as follows: Most of the long abdominal setae more than twice as long as the following segment. C-II a short tuft of 3–5 branches some of which may be split. C-V not much shorter than B. A-II–VII and B-VI–VII as long as any of the rest. Paddles dark with outer portion produced markedly beyond end of midrib.

***M. brevipalpis brevipalpis* Theo.**

Two specimens from Dar-es-Salaam (*Pomeroy*) resemble *M. b. conradti* in chaetotaxy, but differ in the shape of the paddles, which are more square-ended, the outer portion less definitely produced beyond end of mid-rib.

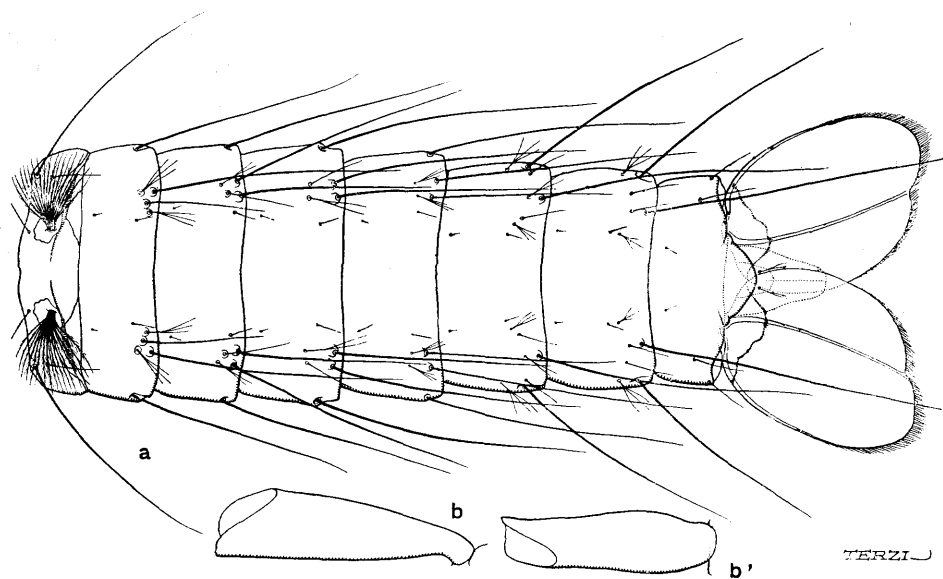


FIG. 129.—*Megarhinus brevivalpis conradti* Grüb. Pupal abdomen (a) and trumpet (b, b'). (After Macfie and Ingram, 1923.)

M. erythrurus sp. n. (p. 30).

The diagnosis below is from two pelts from Lagos.

Upper post-ocular seta long and single, but not nearly as long as in *M. b. conradti*. Segment I of abdomen with the setae very different: K single and sub-plumose, quite eight times as long as H, but not very stout; L and M with only 2-3 branches; S and T equal in length, both single, slender, and only about half as long as K. II; C double and about equal in length to the two adjacent long hairs (B and 4?), all three being about the same length as the following segment; A quite short and slender, much shorter than the segment. III-IV: A very short and slender, as on II; B and C about equal, reaching to middle of next segment but one. V: A rather strong and longer than the segment; B as III-IV but C shorter. A long and strong, reaching to end of VIII; B missing on both pelts examined, probably not much shorter than on V. VII: A minute, B quite short and inconspicuous. Paddles much paler and more square-ended than in *M. b. conradti*, fringe rather shorter.

M. aeneus Evans.

Briefly described by Evans (1926). The features mentioned are in agreement with *M. erythrurus*.

HARPAGOMYIA De Meij.

The following characters are shared by the Oriental *H. genurostris* and the African *H. taeniarostris*:

Trumpet very short, with small, almost circular opening; outer wall wholly reticulate, the thin inner wall more obviously separated from the outer wall than usual, its basal part with some annular ridges. Superior post-ocular very long, split to the base into two equally stout branches, which in most specimens

examined are closely adherent for almost their whole length, the extreme tips abruptly pointed and separated. Dorsal thoracic setae placed well behind trumpets. Abdomen:—I: H and K not far apart, K long and single, all the other setae (including S) quite small; float-hair dendritic but not large, with about 6 primary branches. II: two rather long single setae apparently representing A and B; C not quite so long, branched from beyond base. III: A rudimentary, B rather long and single, set back from hind margin and as near middle line as side; C very small, C¹ on margin beside C. IV: as III, but B on hind margin and nearer side. V and VI: as IV, but B much longer and stronger. VII: A forming a large fan-shaped tuft, placed a little distance in from the side margin and not on the corner; τ forming a small tuft; B and C small. VIII: A as VII but still larger. No setae on IX. Paddles

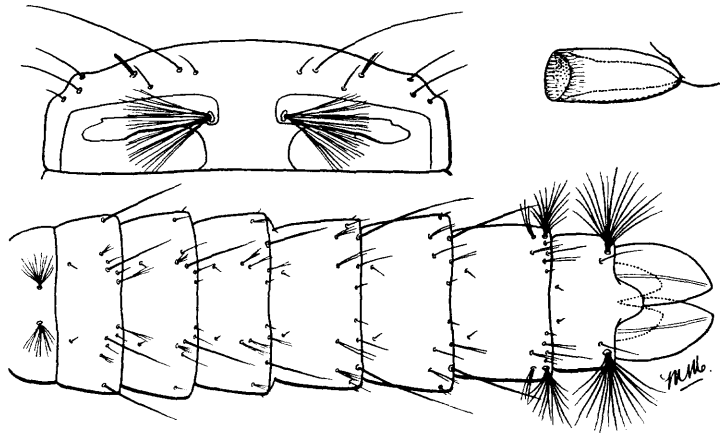


FIG. 130.—*Harpagomyia taeniarostris* Theo. Pupal abdomen (with segment I enlarged) and trumpet.

rather small, broad at base and pointed at tip, without seta, part inside midrib rather narrow.

The conspicuous tufts on the last two abdominal segments together with the form of the paddles, will sufficiently distinguish the pupa of *Harpagomyia* from those of other African genera of mosquitoes.

H. taeniarostris Theo. (Fig. 130.)

The specimen figured is a pelt from Kampala, Uganda; its features are in fair agreement with the description and figure given by de Meillon and Ingram, though they omitted some details. Among small differences from *H. genurostris* may be mentioned: Abdominal segments I–III with a diffuse dark area occupying most of their dorsal surface (in *genurostris* the dark area is more clearly defined and less in extent). Tuft I–VII with 2–3 branches instead of 5–7. External margin of paddle almost completely smooth (in *genurostris* finely denticulate for a short distance).

H. farquharsoni Edw.

According to the notes published by Evans (1929) this pupa resembles that of *H. taeniarostris*.

HODGESIA Theo.

Distinguished from all other mosquito pupae by the form of the trumpets, which are thus described by Wigglesworth (1929): "Respiratory trumpets small and of highly characteristic structure, being cleft almost to the base in the form of two leaflets. Outer leaflet four times as long as its average width, with more or less longitudinal strigulae and with numerous minute scale-like denticles on the outer surface. Inner leaflet only half the width of the outer and with a bifid tip; it has the same longitudinal or oblique strigulation, but is without the minute denticles of the outer leaflet; its anterior margin and tip are clothed with fine hairs and the posterior margin is reflected inwards away from the outer leaflet."

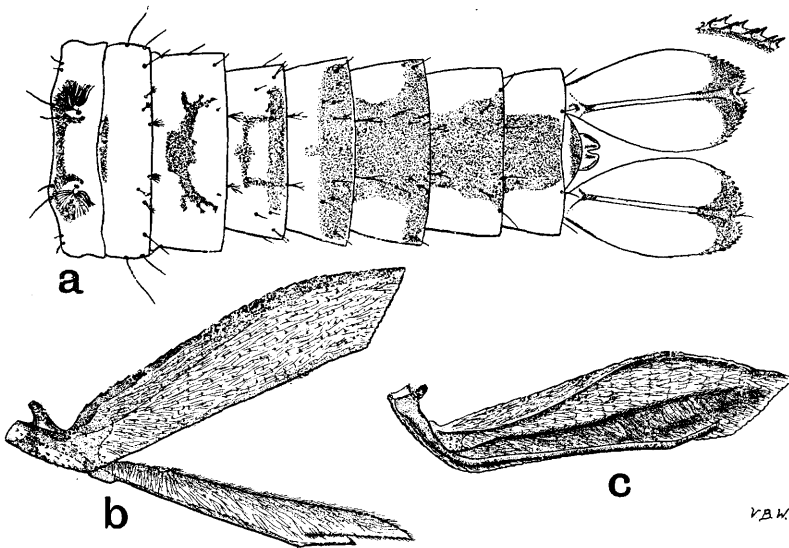


FIG. 131.—*Hodgesia nigeriae* Edw. a. Pupal abdomen. b. Right trumpet from outside with leaflets separated. c. Right trumpet from inside, leaflets opposed. (After Wigglesworth.)

Cephalothoracic and almost all the abdominal bristles small and inconspicuous. Dorsal setae inserted slightly in *front* of trumpets. Abdomen:—I: float hair large and dendritic; H and K approximated, far from L and M; K longish, S scarcely as long as K. II: 1 long and single (it is about the longest seta on the abdomen); A and B shorter; C forming a small tuft. III-VI: A a small seta well withdrawn from the posterior corner; B apparently absent. C a small tuft as in II; C¹ near margin but outside C, not inside; some of the other small setae missing on some segments; 5 not traceable at all. VII: similar to III-VI, but B present (at least in some specimens) as a very small seta, much smaller than C. VIII: A small and ventral in position, but A¹ normal; 5 absent, also there is no seta on the median projection. Paddles narrowed towards base, notched at tip, and about equally divided by the midrib, in shape thus resembling those of *Aëdomyia*; distal margin finely denticulate; paddle hair present but short.

The cephalothorax, abdomen, and paddles have a conspicuous pattern of dark pigment which differs somewhat according to the species.

H. sanguinea Theo.

In two pelts from Namanve Swamp, Kampala, many of the setae are more branched than shown in Wigglesworth's figure of *H. nigeriae*; K is triple; A-II-VII usually double or triple; A and A¹-VIII also double or triple. Paddles with the outer half distinctly more produced and pointed than in *H. nigeriae* as figured by Wigglesworth, the blackish mark at tip smaller, chiefly on outer half of paddle and not spreading up the sides. Body-pattern: Lower two thirds of wing-cases dark, but upper third pale yellowish except for a small spot; dorsum of thorax largely pale anteriorly; leg-cases wholly dark. Abdominal tergites III-V pale except for a small dark spot on each side, no median dark markings; VI and VII nearly all dark, with only a small pale area on each side at base; VIII pale. Sternites V-VII mainly dark; VIII dark in middle, pale at sides.

H. nigeriae Edw. (Fig. 131.)

Abdominal pattern and chaetotaxy as shown in Wigglesworth's figure (reproduced here); presumably the dark area on VIII is on the sternite only as in *H. sanguinea*. Cephalothorax "more or less infuscated all over."

H. psectropus Edw.

In a series of pelts and some whole pupae from Stanleyville the body-pattern is almost as in *H. sanguinea*; but there are some differences in abdominal chaetotaxy from the other two species: K triple as in *sanguinea*, but A-II-VIII single, as is A¹-VIII. Paddles as in *sanguinea*, the produced tip of outer half perhaps a little more rounded, but less so than in *nigeriae*.

URANOTAENIA L.-A.

In view of the distinctive position of the genus *Uranotaenia* on adult characters, it is somewhat surprising that it is not better defined in the pupal stage. Perhaps the readiest means of diagnosis is in the shape of the paddles, which usually have the inner part wider than the outer at the middle, though this is not obvious in some species. The dorsal thoracic setae are placed between the trumpets in most species as in most *Aedes*, not behind them as in *Megarhinus* and *Harpagomyia*, and usually in *Ficalbia* and *Culex*; however this feature again is not quite constant. In some but not all species one of the anterior cephalothoracic bristles is lengthened and thickened; this is not the superior post-ocular as in *Megarhinus* and *Harpagomyia*, but one of the antero-thoracic. The form of the trumpet varies much in different species. On the median prominence of VIII a pair of small setae or spines is present in most if not all species; these occur also in *Aedomyia* but rarely in other genera.

As in most other Culicine genera the inner wall of the trumpet is not separated from the outer (in contrast with *Harpagomyia*), and the following features are to be

noted in abdominal chaetotaxy:—I: H and K close together, but well apart from L and M, all small; S somewhat larger; float-hair usually large and dendritic. II: 1 long, markedly longer than the others. III–VI: A minute; C¹ variable in position according to the segment and species but usually well removed from margin. VIII: A very variable according to the species. Anal segment: has no setae as in other Culicine genera, but in contrast with *Megarhinus*.

U. alboabdominalis Theo.

Of this species I have examined one pupal pelt from Stanleyville. It differs from all other species except the allied *U. alba* in the form of the trumpet as described below.

Integument mainly pale, but with a few small dark clouds, chiefly on wing-cases. Respiratory trumpet more resembling species of *Ficalbia* than other *Uranotaenia*; very long and slender, with the proximal two-thirds or more tracheoid; tip flared; opening with a slit-like prolongation towards the base; on one side of the tracheoid portion are small, sharp, scattered denticles. Cephalothoracic setae and the main abdominal setae (B and C, also K and A–VII–VIII) all of similar type, with several slender branches arising from a short common stem (this stem not much thicker than the branches, but longer than in *U. balfouri*). Dorsal thoracic seta a little behind trumpets, with about five equal branches; no specially long seta in the anterothoracic series. Float-hair with about 12 slightly dendritic branches. B and C all shorter than the segments; 1 mostly single or bifid. Paddles darkened at the tip, where the spinules are rather strong; hair not distinguishable in the specimen available.

U. alba Theo. (Fig. 132.)

Of this species I have examined two pupal pelts from Kasakiro, Toro, Uganda; these belonged to the same individuals of which the larval pelts were examined by

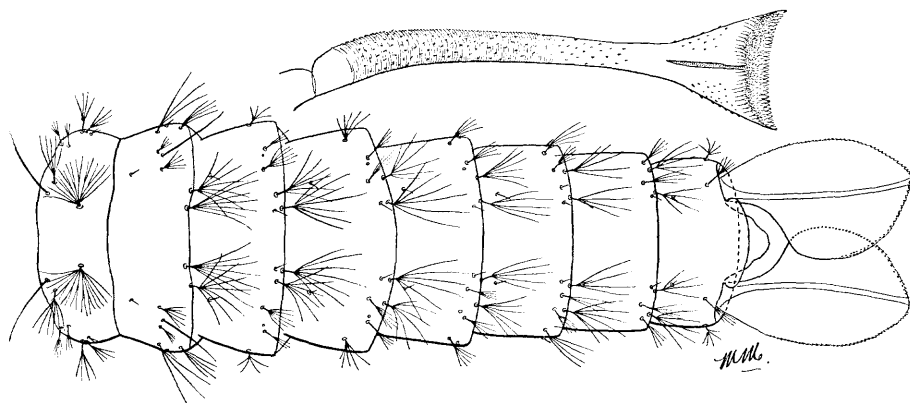


FIG. 132.—*Uranotaenia alba* Theo. Pupal abdomen and trumpet.

Hopkins. They show the following differences from the specimen of *U. alboabdominalis* examined:

Trumpet shorter, but the tip still more widely flared. Dorsal thoracic seta very

long, and rather stouter, with 3-4 branches arising from close to base, these more slender and much shorter than the main stem. Setae of series I each with several branches. Paddle entirely pale; hair at tip of midrib present but very minute, shorter than the terminal spinules.

U. bilineata Theo.

The following diagnosis is based on the description and figures given by Ingram and de Meillon of South African specimens of var. *fraseri*:

Trumpets rather more than three times as long as their greatest breadth; darkened tracheoid portion occupying about half the meatus; tip not darkened; opening oblique, ratio of meatus to total length 1:1.4. Of the antero-thoracic setae, the anterior are conspicuously branched, resembling the dorsal seta, the lower posterior is a long, slightly pectinate bristle. Abdomen:—I: float-hair large, with about 20 dendritic branches. II: 1 very long and double. III-VII: B about half as long as segments, C about as long as segments, each with 6-8 branches; I with 4-6 branches. V and VI: 2 small and branched beyond its middle, 4 rather long, branched at its tip only. VIII: A with 4-6 simple branches. Paddle pointed, distal margin spiculate, spinules longer at tip; hair very small; inner part of paddle wider than outer as usual.

U. balfouri Theo. (Fig. 133.)

The structural features of this species have been described and figured by Macfie and Ingram (1923), who also note the darkened tip of the trumpet (a rather unusual feature), but omit to describe the body-pattern. In numerous specimens which I

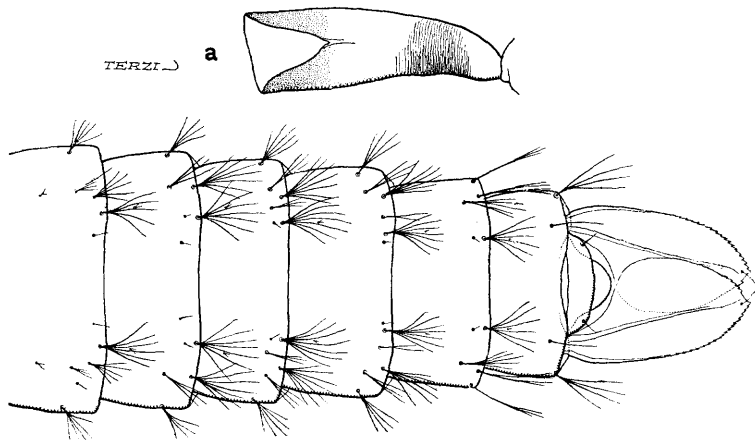


FIG. 133.—*Uranotaenia balfouri* Theo. Pupal abdomen and trumpet (a). (After Macfie and Ingram.)

have examined from the Belgian Congo and Uganda the integumental pattern appears constant; it is very distinctive and reminiscent of that of *Hodgesia*.

Head-shield and lower part of leg-cases dark brown; several small dark spots on wing cases and antennal sheaths, and a row of small dark streaks round tips of wing-cases, but thorax otherwise mainly pale, only sides of metanotum dark. Abdomen

pale towards base ; segment VI more or less darkened ; VII dark brown except for basal corners (both tergite and sternite) ; VIII with tergite pale, sternite dark in middle, pale at sides. Paddle entirely pale.

Structurally this species appears to be very similar to *U. bilineata*, but the lower-posterior antero-thoracic seta is not specially long or bristle-like, and on abdominal segments V and VI setae 2 and 4 are both branched near the base, 4 being shorter than 2 instead of longer. On I, H is simple, K short, 5-branched. Dorsal thoracic seta between the trumpets as usual.

U. candidipes Edw. (Fig. 134.)

The pupa of this species differs conspicuously from other known African *Uranotaenia* in the form of the trumpet and abdominal chaetotaxy. The following are its main features as described and figured by Ingram and de Meillon (1929). A fragmentary pelt from Costermansville agrees with this description.

Trumpets long and thin, widened slightly at the tip, rather less than the basal

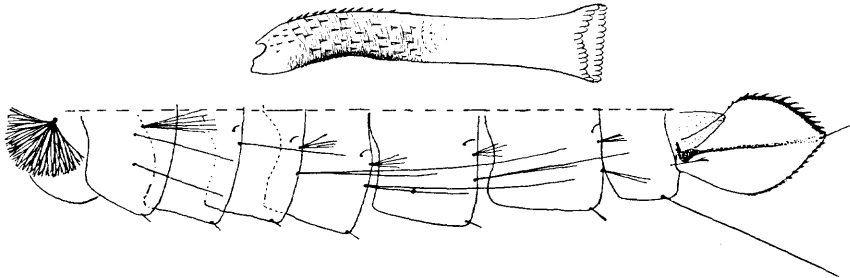


FIG. 134.—*Uranotaenia candidipes* Edw. Pupal abdomen and trumpet. (After Ingram and de Meillon.)

half tracheoid and with small surface denticles ; opening transverse and circular. Dorsal thoracic setae 4-branched nearly as long as trumpets. Float-hair dentritic, with 10 or more main branches. Setae B-III long and single, B-IV-VI very long and double, the inner branch much longer than the outer, longest on IV, from which it reaches nearly to the end of VI ; B-VII double but shorter, with branches equal ; C-IV-VII, about half length of segments 4-branched ; C¹-III-VII represented by short curved spines ; 1 and 2 III-VII small and inconspicuous ; A-VIII a long single pubescent bristle reaching beyond end of paddle. Paddle pointed inner part not much wider than outer ; inner margin with very strong black denticles, outer margin with short denticles ; seta about one-fourth length of paddle.

U. chorleyi Edw.

Three pelts from Entebbe have unfortunately all lost the trumpets, but the deeply notched paddles are sufficient to distinguish the pupa from those of other African *Uranotaenia*.

Integument pale, without markings. Antero-thoracic setae small, the lower posterior single and longer than the rest but pale. Dorsal seta larger, 4-5 branched. Abdomen :—I : H and K both shortish, H single, K triple ; S longer and single.

III–VII : B and C similar, shorter than segments, each with 4–5 branches from close to base, as in *balfouri* ; 1 double. VIII : A shorter than the segment, 2–3 branched. Paddles as broad as long and deeply notched at tip, inner part markedly broader than outer ; denticles very strong round tip ; setae about one-fifth length of paddle.

U. hopkinsi Edw.

One pupal pelt (paedotype) examined.

Integument with some diffuse dark patches on cephalothorax. Trumpets uniformly very dark brown, about three times as long as their greatest breadth, opening moderately oblique ; a short tracheoid area at base. Dorsal seta strong, with 6–8 branches, inserted immediately behind trumpets. Abdomen:—I : float-hair with about 18 primary branches, which are branched again from well beyond middle ; H single ; K a tuft of about 5 branches, but scarcely longer than H. II–III : C¹ minute and single as usual. III–VII : B and C as in *balfouri* and *chorleyi*. VIII : A 2–3 branched from near base. Paddles nearly as broad as long, very obtusely pointed at tip of midrib ; seta missing ; distal margin with fine denticles ; inner part much broader than outer as usual.

U. ornata Theo. (Fig. 135.)

This pupa is distinguished by the comparatively slight development of the abdominal setae (including A–VIII) and the broad paddles. The following description is based on a pelt from Sierra Leone and a whole pupa from Lagos.

Integument mainly pale, without definite markings, but abdominal segments I–III or I–IV dark brown in middle. Trumpet short, less than three times as long as its greatest width, narrow at base, then rapidly widened, with only a very short tracheoid area at base ; opening oblique. Antero-thoracic setae small, except the lower posterior, which is a long stout simple bristle, curved at the tip. Dorsal setae shorter than trumpet, bifid from middle. Abdomen:—I : H and K both simple, K much the longer ; float-hair dendritic, with 12–15 primary branches. II–III : C¹ forming a rather stout straight spine, double or trifid on II, single on III. IV–VII : B and C both single and pale, B rather more, C rather less than half length of segments ; C¹ slender ; 1 small and single ; A (?) on V–VII rather thick but short, well back from corners. VIII : A shorter than the segment, simple or with two or three short slender branches at base ; A¹ single ; C stout and curved outwards as usual in this genus. Paddle entirely pale, almost as broad as long, inner part markedly broader than outer ; seta short, about twice as long as the denticles of the fringe, which are equally small on inner and outer borders.

U. nigripes Theo. (Fig. 136.)

The form of seta A–VIII is sufficiently distinctive to separate the pupa of *U. nigripes* from those of other African *Uranotaenia*, and another peculiar feature is that setae B are greatly lengthened while C remains short. The three specimens I have examined include the pelt from Sierra Leone described and figured by Wigglesworth (1929).

Integument very dark, though without defined markings except for a dark area at tip of paddle. Trumpet short, narrow at base, then much widened; only a very short tracheoid area at base; opening oblique. Lower-posterior antero-thoracic seta very long (longer than any other seta on the body), stout, but finely tapering distally. Dorsal seta short and single. Float-hair large, about 20 primary branches with brush-like ends. Setae B-III-VII long, stout and single, much longer on IV and V where they are fully as long as the two succeeding segments; C short and single or

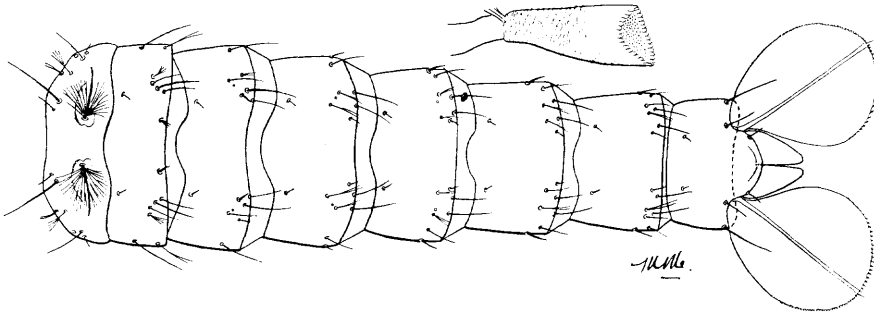


FIG. 135.—*Uranotaenia ornata* Theo. Pupal abdomen and trumpet.

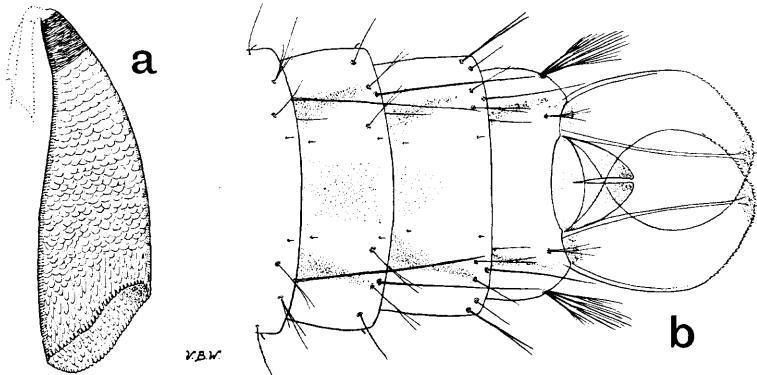


FIG. 136.—*Uranotaenia nigripes* Theo. a. Trumpet. b. End of abdomen. (After Wigglesworth.)

bifid; 1 single. VIII: A forming a large dark tuft as long as the segment, the 5 branches each divided into 2 or 3 well beyond the base, a few of these branches slightly plumose; A¹ triple; C present and curved outwards as usual. Paddles almost as broad as long but with the tip bluntly pointed; inner part not broader than outer; external buttress unusually strong for this genus; seta short, but about three times as long as the small denticles of the fringe.

U. mashonaensis Theo.

This was described and figured by Ingram and de Meillon (1927) from specimens from Zululand; a pelt from Uganda conforms with their account. Distinctive

features are the form of the trumpets and the presence of a small accessory seta on the paddle.

Integument pale, but the trumpets dark, especially at the tips. Trumpets very short; almost wholly reticulate; opening nearly transverse but its margin irregular and produced into a short point on one side. Lower posterior seta only moderately long and pale. Dorsal seta between the trumpets as usual and 4-5 branched. Abdomen:—I: H and K both simple and subequal, not very long; float-hair with about 10 primary branches, moderately dendritic. IV-VII: B and C similar, about as long as segments, mostly with 3-5 branches; 1 double. VIII: A weak shorter than segment, 4-5 branched; C as usual. Paddles much longer than broad, pointed, inner part slightly broader than outer, finely denticulate on margins on distal third, with two denticles at tip stronger and dark; the normal setae is about twice as long as the dark denticles, and to the inner side of it is a minute accessory seta.

U. fusca Theo. (Fig. 137.)

Described and figured by Macfie and Ingram (1923) from one pelt from the Gold Coast; the details noted below are taken from this description and specimen. Though without any very unusual features the pupa may be distinguished from others of the genus by the large tuft A-VIII combined with the long single setae B and C IV-V and the stout paddle-seta.

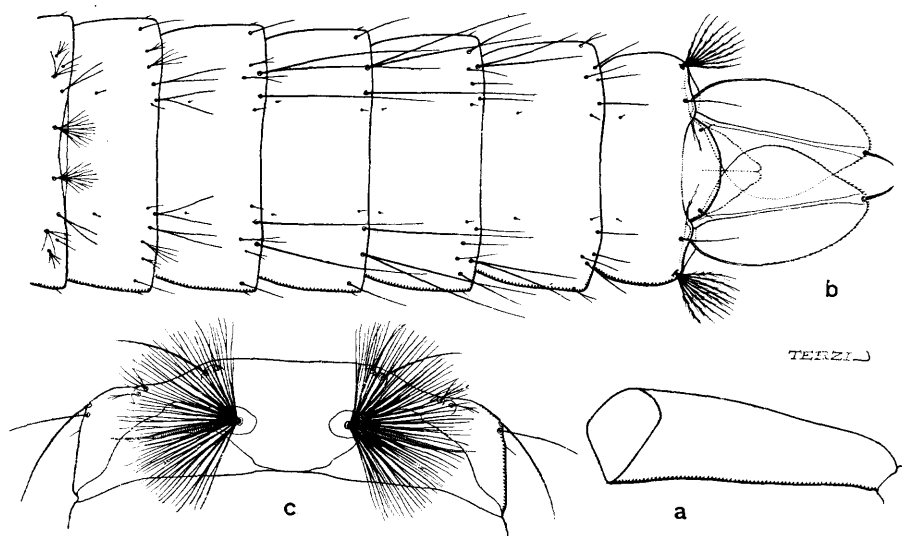


FIG. 137.—*Uranotaenia fusca* Theo. a. Trumpet. b. Abdomen. c. Segment I. (After Macfie and Ingram.)

Integument very dark, abdomen lighter than thorax. Trumpets very dark, three times as long as their greatest breadth, with a rather small opening. One antero-thoracic seta long and single, but not so very long as in *U. nigripes*. Dorsal thoracic seta 5-branched. Abdomen: Float-hair large, highly dendritic, with about 10 primary branches. II: C a many-branched tuft. III: B and C both

short, double. IV and V: B and C both equally long, reaching well beyond the end of the following segment, B double or single, C single. VI: B double and reaching across following segment, C single and shorter. VII: all setae short. VIII: A a large tuft about half as long as paddles, composed of 9 sub-plumose hairs which are occasionally branched at their tips. Paddles of the somewhat triangular shape frequent in this genus; distal half of both inner and outer margin with very small denticles; seta strong and about one-fifth length of paddle.

U. shillitonis Edw. (Fig 138.)

Of this species I have examined four pupal pelts from Kigezi, Uganda. In several respects these are very unlike other *Uranotaenia* pupae, and, as noted by Hopkins of the larvae, they bear a strong superficial resemblance to *Eretmapodites*, but the shape of the paddles and the presence of small setae on the median projection of VIII are

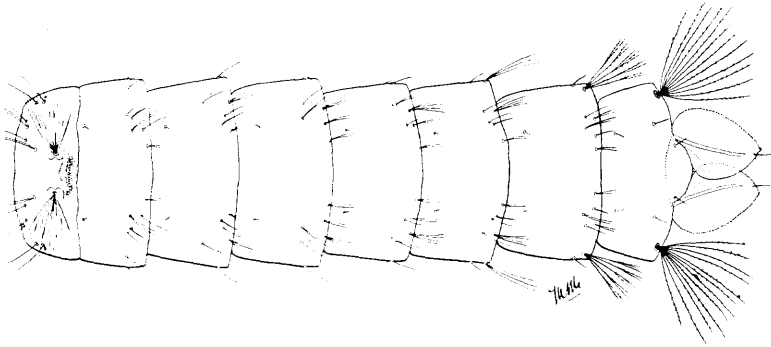


FIG. 138.—*Uranotaenia shillitonis* Edw. Pupal abdomen.

normal for *Uranotaenia*. The small paddles and large black lateral tufts of VII and VIII are particularly noticeable.

Integument almost entirely pale. Trumpets very short, barely twice as long as their greatest breadth; surface entirely reticulate; opening moderately oblique and regular. Lower posterior seta somewhat thicker than the others of the anterothoracic set but not noticeably lengthened. Dorsal seta double, inserted between the trumpets. Abdomen:—I: float-hair only moderately large, with about 10 primary branches which are split into two close to the base; many of the branches are somewhat plumose but not dendritic; H and K near together as usual, H double, K single, both about equal in length; C single and rather stout, longer than K; M, S, T, U all weak. II and III: all setae short and pale (arrangement cannot be made out in the material available). IV and V: one seta (probably B) longer than the rest and black, with 2-3 branches. VI: two setae (apparently A and B) longer than the rest and black, with 2-3 branches. VII: A forming a large black tuft, about as long as the segment, with 5 branches each of which is plumose basally and split into two or more branches from about the middle; all other setae short, pale and single. VIII: A forming a very large black tuft, extending well beyond end of paddles, with 10-15 plumose branches which may be either simple or split distally into

several as in tuft A-VII ; A¹ single, pale and weak, as is C. Paddles small, oval, about equally divided by the midrib, with outer margin finely denticulate for nearly its whole length, inner margin with a few fine denticles ; seta black, nearly half as long as paddle, single or split into two at tip.

AËDOMYIA Theo.

The following characters are common to *A. venustipes* Skuse and *A. africana* N.-L. :

Trumpet short, with large and very oblique opening, the margin of which is fringed with palisade-like areas of chitin ; a short tracheoid area at base ; inner wall

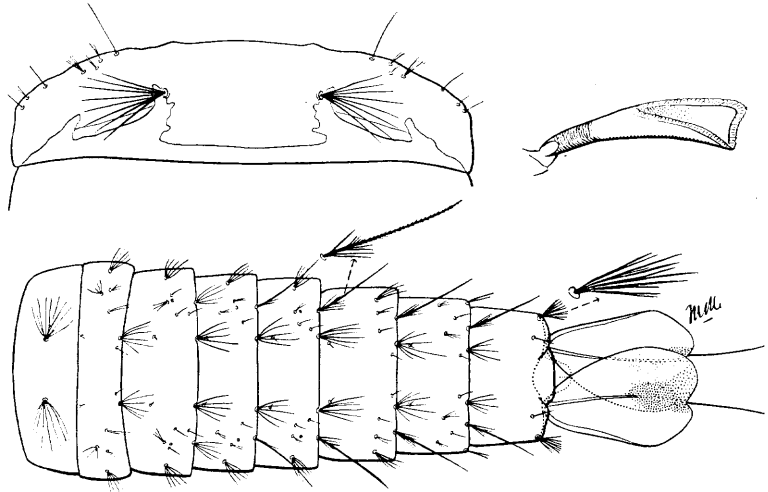


FIG. 130.—*Aëdomyia africana* N.-L. Pupal abdomen (with segment I enlarged) and trumpet.

not markedly separated from outer. Cephalothoracic setae all small and inconspicuous, including the post-ocular ; dorsal setae immediately behind the paddles. Abdomen :— I : H, K, L, M all close together and quite small, K even smaller than H, S and T larger ; float-hair fairly large but not dendritic, composed of 10 or more simple branches and thus resembling C of the following segments. II and III : 1 forming a fairly conspicuous tuft near middle of lateral margin ; B absent ; C a strong tuft of 10 or more simple branches. IV, V and VI : 1 as above ; B very long, stout and dark, with some spine-like branches of various lengths (but none very long) at or near base, main seta finely barbed ; C as above ; C¹ well removed from margin but placed to one or other side of C. VII : A present, and placed exactly on corner, divided into a few (2 or more) spine-like branches ; 1, B and C much smaller than on IV-VI, B simple and slender. VIII : A a small stout tuft with a few stiff branches. Paddles narrow at base, widened distally, with a long seta at tip of midrib, the latter dividing the paddle about equally.

Baisas (1938), in describing the pupa of Phillipine *A. venustipes*, emphasizes the presence of small spines on the posterior corners of II-VI, which very evidently

correspond with the spines (A) of *Anopheles* (*Myzomyia*). I find these spines to be present, exactly as figured by Baisas, in Indian specimens of *A. venustipes*, but they are absent in *A. africana*, no trace of a socket even being discernible in their places. Baisas also calls special attention to the presence of a pair of small spines or setae on the median prominence of VIII, such as have been noted in *Uranotaenia*; these cannot be of much importance because they are absent in Indian specimens of *A. venustipes* examined, as well as in *A. africana*.

The most distinctive features of *Aëdomyia* pupae would appear to be the form of setae B on IV–VI, which is unique. The absence of B-II and B-III is also noteworthy as these setae are also lacking in *Anopheles*, though present in other Culicine genera.

A. africana N.-L. (Fig. 139.)

Two pelts from Jinja, Uganda, and three from Entebbe, are very similar to *A. venustipes* as figured by Baisas, but differ as follows: Spines A-II–VI absent (as noted above); A-VII with 2–3 branches, A-VIII with 6–8 branches, both longer than in *A. venustipes*. Setae B differently formed, with more numerous and longer branches arising from near or at the base, and in addition usually with a few short branches arising from the main stem at some distance from the base; B-VII as strongly developed as B-VI. Setae C-VI–VII not smaller than the others of this series; C-VII with 6–8 branches. As in *A. venustipes* there is a blackish spot at the tip of the paddle, spreading across the distal fourth of the midrib.

THEOBALDIA N.-L.

Pupae of this genus exhibit no striking peculiarities, and no clearly diagnostic features by which they may be distinguished from those of *Aëdes* have yet been discovered. There are some divergencies between the different subgenera, but these need not be noted here.

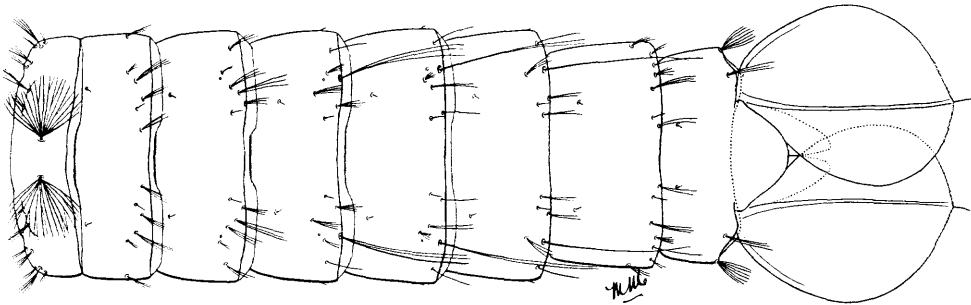


FIG. 140.—*Theobaldia longiareolata* Meq. Pupal abdomen.

T. longiareolata Macq. (Fig. 140.)

Specimens from Madeira, North Africa and Mesopotamia examined; no South African specimens are available.

Integument rather dark on dorsum of thorax. Trumpets dark at tip, short and broad, with large oblique opening; no definite tracheoid area. All the post-ocular and antero-thoracic setae small, branched. Dorsal seta triple, well behind trumpets.

O rather short, 6-branched ; P and R longer and stronger, triple. Abdomen:—I : all setae branched ; K with about 5 branches, not very long ; not much nearer to H than to L ; T rather longer than S ; float-hair large and dendritic as usual. II : C forming a small tuft, irregularly branched. III : C a small tuft, smaller than B and well inside it. IV–VI : A minute as usual ; B longer than segments and rather strong, with 1–3 branches ; C short. VII–VIII : A forming a small tuft. Paddles large and broad, pale ; midrib and external buttress well marked ; distal margin very finely spiculate ; terminal seta short and simple.

ORTHOPODOMYIA Theo.

In most or all essential features pupae of this genus resemble those of *Aedes* ; no absolutely diagnostic characters can be pointed out at present.

The pupa of the Mauritian *O. arboricollis* has not been described in detail, and no specimens are available ; the following description has been drawn up from a comparison of three Oriental species with one European and two North American, and will probably be found to apply equally well to *O. arboricollis*.

Trumpets short, unmodified, widened gradually from base, with large oblique opening, surface wholly reticulate. Post-ocular setae all small. The two upper antero-thoracic setae very small, but the lower ones large. Dorsal thoracic seta well behind the trumpets. Float-hair large and strongly dendritic, the ultimate branches long, fine, and very numerous. H and K rather close together. A–VIII forming a large tuft, A–VII also well developed. Median projection of VIII large, at least as long as broad, and lacking the small lateral setae. No setae on anal segment. Paddles broad at the base with a rather square shoulder, somewhat pointed at tip, margin absolutely smooth, no trace of denticles or fringe ; one small seta at tip of midrib.

FICALBIA Theo.

The species of this genus are so diverse in the pupal stage that it is difficult to give an adequate generic diagnosis that will apply to all of them. The trumpets vary greatly in length and form ; the thoracic and abdominal setae are very variable in development ; the float-hair may be fully developed or represented by a single small seta (Fig. 141) ; the paddles vary in shape and the paddle-seta may be present or absent, or an additional small seta may be present.

Among characters common to all known species are the following :

Trumpets with at least the basal half tracheoid (usually much more). Paddles narrow at the base, without any external shoulder.

Subgenus MIMOMYIA Theo.

The pupae of this subgenus, like the larvae, exhibit considerable structural diversity, but the following characters are found in all, and taken together make the subgenus a very easy one to recognize :

Trumpets long, with more than the proximal half tracheoid. Float-hair fully developed or reduced but always branched. Dorsal seta of thorax neither stout nor

directed forwards, usually multiple and always inserted far behind base of trumpets. Main abdominal setae sometimes forming large tufts but not conspicuously black. On segments III–VII seta C^1 is situated on the margin internal to C ; on VII setae 2 and 4 are both absent. Segment VIII is longer than is most Culicine pupae, being almost as long as broad; it has seta A very small and inconspicuous.

F. splendens pupa is remarkably different from the other species on account of the long-fringed paddles. *F. hispida*, *lacustris*, *perplexens* and *pallida*, which differ little as adults but have distinctive larvae, are equally distinct in the structure of the pupal trumpets; on the other hand *F. mimomyiaformis* and *plumosa*, in spite of their very different larvae, are very similar both as adults and pupae.

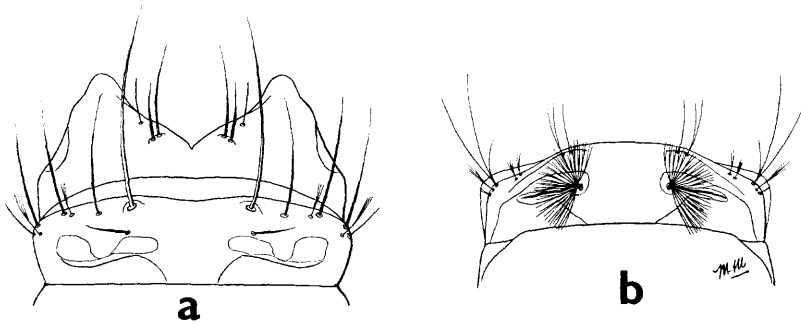


FIG. 141.—First abdominal segment of *Ficalbia*. a. Subgenus *Etorleptomyia*. b. Subgenus *Ficalbia*.

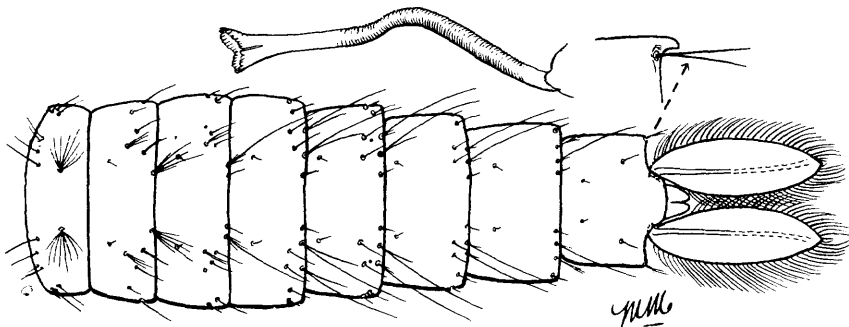


FIG. 142.—*Ficalbia (Mimomyia) splendens* Theo. Pupal abdomen and trumpet.

F. (M.) splendens Theo. (Fig. 142.)

This was briefly described by Ingram and Macfie (1917), presumably from Gold Coast specimens. The following redescription is based on two pelts from Uganda.

Integument entirely pale and unmarked except for part of the trumpets and paddles; the trumpets have the tracheoid portion and the extreme tip dark, and the paddles have the distal fourth infuscated, the remainder pale.

Trumpets very long and slender, with the proximal two-thirds tracheoid, tip widened, of the usual type in this genus, with slit-like prolongation. Dorsal seta with 4–5 branches, but not large. Abdomen:—I: float-hair small, not obviously dendritic though irregularly branched at base, with only 10–12 ultimate branches;

all other setae single; H larger than K. III and VII: B small; C long, with one or more quite short branches at base. IV-VI: B and C each with one long branch, reaching beyond end of segment, and one short branch at base. VIII: A very small, 2-3 branched. Paddles elliptical and pointed, with remarkably long and regular fringe extending whole length of external margin and almost to base on internal margin; seta present but short, only half as long as fringe.

F. (M.) hispida Theo. (Fig. 143.)

This pupa has not hitherto been described or figured. The description below is based on a comparison of two male pelts from Uganda and one from Stanleyville, definitely identified from the adult as belonging to the type form of *M. hispida*.

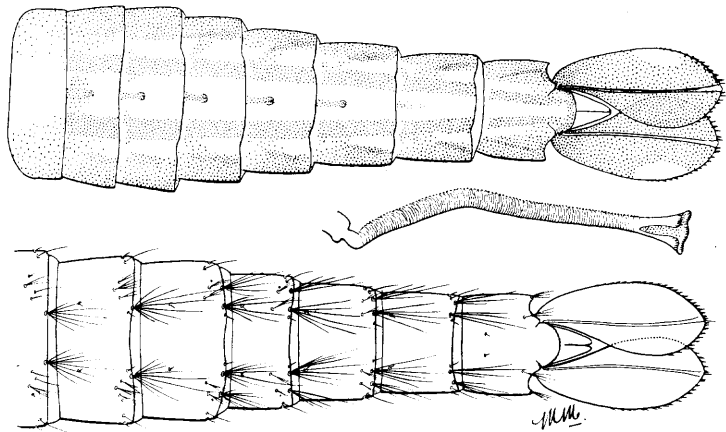


FIG. 143.—*Ficalbia (Mimomyia) hispida* Theo. Pupal abdomen (markings and chaetotaxy shown separately) and trumpet.

Body with a conspicuous pattern of dark brown markings on a yellowish ground. Dorsum of thorax with several more or less longitudinal dark streaks. Wing cases with conspicuous dark streaks following the courses of the veins. Abdomen with dark markings at sides and with a pair of well-defined dark stripes running whole length of dorsum. Paddles mainly blackish, with a large white spot on external margin beyond middle, and a smaller spot opposite this on internal margin.

Trumpets long and slender, tracheoid for more than four-fifths of their length, with a narrow dark ring immediately before the tip, leaving the extreme tip pale; opening nearly transverse with a slit-like prolongation as in *F. splendens*. Median keel behind trumpets with numerous sharp ridges. Dorsal seta with 4-5 branches. Abdomen:—I: float-hair quite large and dendritic, with 30-40 or more ultimate branches; M branched from middle, other setae all single; H much longer and stronger than K. II and III: B small, C a large tuft about as long as segment. IV-VII: B and C both large tufts resembling B-III. VIII: A¹ longer than A and triple. Paddles rather bluntly pointed, broadest towards tip, denticulate on two-thirds of outer margin and for a short distance on inner margin, denticles very strong round tip; seta present, about twice as long as apical denticles.

F. (M.) hispida var. **palustris** Theo.

In two pelts from Uganda the paddles appear to be somewhat narrower and more pointed than in the typical form, and the whitish area on the outer margin forms a broad stripe extending most of the length of the paddle; the pair of stripes in the abdomen are narrower and less dark. Other characters similar.

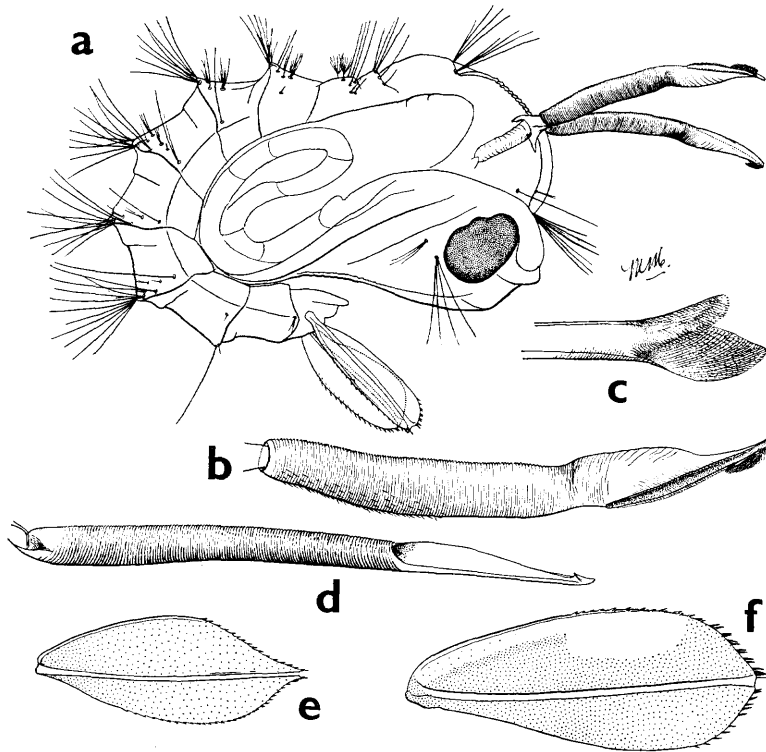


FIG. 144.—Pupal details of *Ficalbia* (*Mimomyia*) spp. a. *pallida*, side view of whole pupa. b. *pallida*, trumpet more enlarged. c. *lacustris*, tip of trumpet. d. *perplexens*, trumpet. e. *perplexens*, paddle. f. *lacustris*, paddle.

F. (M.) lacustris Edw. (Fig. 144, c, f.)

Described from five pelts from Entebbe, Kampala and Jinja, Uganda.

Integument mainly pale yellowish with a little obscure mottling on thorax and first few abdominal segments and narrow dark rings on antennal sheaths.

Trumpets with rather more than the proximal two-thirds tracheoid and dark; reticulate portion whitish, but the tip dark, of unique structure, being divided into two equal triangular flaps. Chaetotaxy much as in *F. hispida*, except that on segment I the float-hair is less developed, with only about 20 ultimate branches, and H and K are both long and strong. Paddles resembling those of *F. hispida* in shape, colour and denticulation.

F. (M.) perplexens Edw. (Fig. 144, d, e.)

Described from three pelts from Uganda.

Integument mainly dark brown, the abdomen almost wholly so and the paddles uniformly dark without pale spots; a yellowish area on anterior part of thorax and the slender tips of the trumpets white.

Trumpets tracheoid for about three-fifths of their length, the whole of the remaining portion forming a narrow spatulate structure owing to the opening being so oblique that it reaches to the end of the tracheoid part; at the tip is a small, slightly reflexed tooth. Dorsal thoracic seta single, but erect and weak. Abdominal chaetotaxy differing from *F. hispida* as follows: Float-hair small, with only about 5 slender, simple branches. Setae B-II-VII and C-IV-VII each with only 2-3 branches; A-VIII double; A¹-VIII single, shorter than A. Paddles of peculiar shape, broadest about middle, with the tip very narrow; seta absent, but apical denticles long; fine denticles present along most of inner margin.

F. pallida Edw. (Fig. 144, a, b.)

Described from one whole pupa from Lagos.

Body uniformly pale (at least in the mounted specimen); paddles somewhat darkened but uniformly so, without pale spots.

Trumpets long but rather stout, meatus wholly tracheoid; pinna with irregular concentric ridges beneath and with its margin whitish; opening very oblique, about one-third or more of the total length of the trumpet; at tip of pinna is a peculiar little blackened lobe which on one-side is strongly sclerotized with a finely serrate edge, on the other densely set with reflexed barbs. Dorsal seta 4-branched. Abdomen:—I: float-hair small, with only 7 slender simple branches; H and K both long and strong; other setae all single. II-VI: C 4-5 branched, considerably longer than the segments. IV-VI: B as long as C but 2-branched. III-VI: 1 as long as A or B but single. VIII: A triple, A¹ forked beyond middle, both about equal in length. Paddles narrow, but of almost equal breadth from near base to near tip; denticles of inner margin strong but confined to tip; seta absent.

F. (M.) mimomyiaformis Newst.

This was briefly described by Ingram and Macfie (1917); their account is supplemented below from a comparison of several pelts from Uganda, Belgian Congo and Gold Coast.

Integument of cephalothorax with extensive but irregular dark mottling; of abdomen with extensive dark markings almost obliterating the yellowish ground; these markings are most definite in form on the intermediate segments, which have a dark bar across the basal half and five dark stripes on the distal half, connected with the bar. Paddles dark, with a white spot beyond middle of outer margin.

Trumpets formed and coloured as in *F. hispida*, but rather less slender. Dorsal thoracic seta 4-branched. Abdomen:—I: float-hair moderately dendritic, with about 25-30 ultimate branches; all other setae single, H longer than K but not very long. IV-VI: B and C in the specimens examined mostly 3-4 branched (Ingram

and Macfie show these double), rather shorter than the segments; τ scarcely half length of segments, as in *F. hispida*. VII: B and C shorter, double. VIII: A double, somewhat longer than A^1 , which is simple or forked distally. Paddles rather variable in width, formed as in *F. hispida*.

The material examined probably includes specimens of both the typical form and the variety *pincerna*; it is possible that those with narrower paddles belong to the former, those with broader paddles to the latter, but this requires confirmation.

F. (M.) plumosa Theo. (Fig. 145.)

Notes on this pupa were given by Edwards (1929) and the trumpet figured. The fuller description below is from two pelts from Kampala.

Cephalothorax and abdomen mottled with light and dark, the suffused and more or less confluent dark dots and spots as extensive as the yellowish ground. Paddles

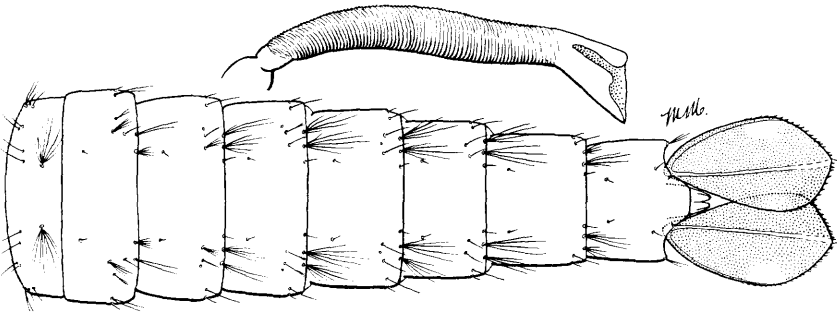


FIG. 145.—*Ficalbia (Mimomyia) plumosa* Theo. Pupal abdomen and trumpet.

dark, with a large white spot beyond middle of external margin and a smaller whitish spot opposite it on internal margin, also with a number of ill-defined yellowish dots.

Trumpets long, but shorter and stouter than the other species; proximal two-thirds tracheoid, distal third reticulate and pale; opening as in *F. splendens*, *hispida* and *mimomyiaformis*. Dorsal seta with about 8 branches. Abdomen:—I: float-hair rather small and scarcely dendritic, with about 20 branches; H and K simple, both rather short; L, M, S and T all double. III–VI: B and C with 5–8 branches, somewhat shorter than segments; τ barely half length of segments. VIII: A and A^1 about equal in length, A triple, A^1 single or with fine branches towards tip. Paddles much as in *F. hispida* or *mimomyiaformis*.

Subgenus **ETORLEPTIOMYIA** Theo.

Pupae have been obtained of all the four known species of this subgenus. In all of them the trumpets are very long, slender and flexible, tracheoid for more than three fourths of their length; the dorsal thoracic seta is placed far behind base of trumpets as in subgenus *Mimomyia*; it is stout or very stout, single and directed forwards along the surface of the thorax; the float-hair is replaced by a small single seta; the abdomen has many strong black tufts, A–VIII being a large tuft; the paddles are at least five times as long as their greatest breadth (thus differing from all other mosquito pupae) with both margins strongly denticulate and with no seta at tip. On segments IV–VI

seta C¹ is on the margin between B and C ; on VII it is internal to C as in the subgenus *Mimomyia*.

F. (E.) mediolineata Theo. (Figs. 146 ; 141, a.)

The pupa of this species has been described and figured by Macfie and Ingram (1923), who remark : " When alive it rests at the surface of the water with the two very long respirator trumpets directed forwards and either submerged with the long dorsal hairs of the second to fourth abdominal segments directed upwards

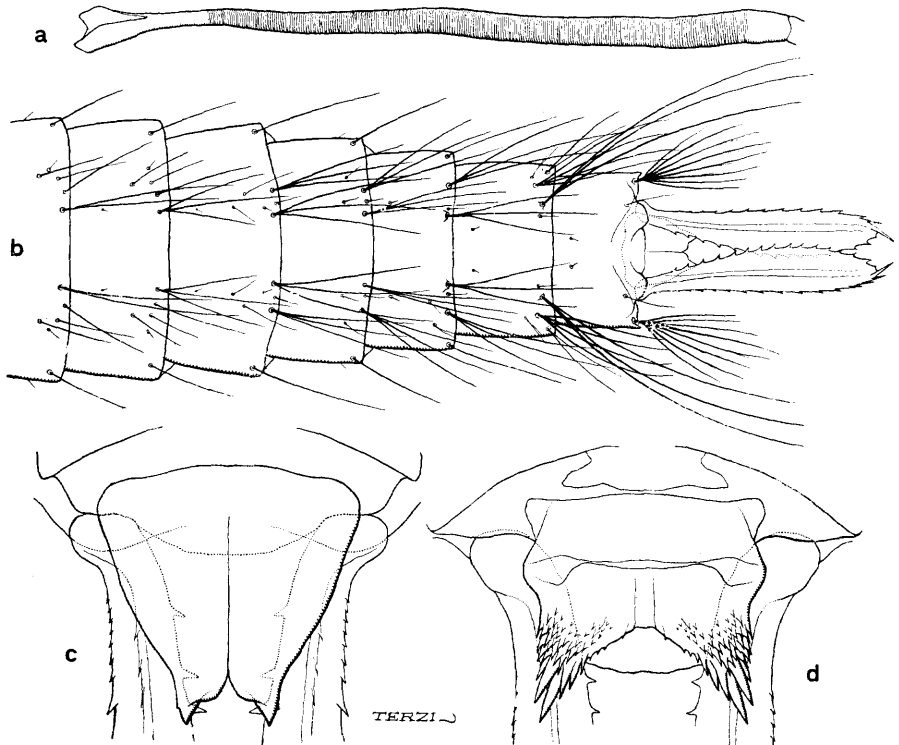


FIG. 146.—*Ficalbia (Etorleptomyia) mediolineata* Theo. a. Trumpet. b. Abdomen. c. Ninth abdominal segment of ♂. d. Same of ♀. (After Macfie and Ingram.)

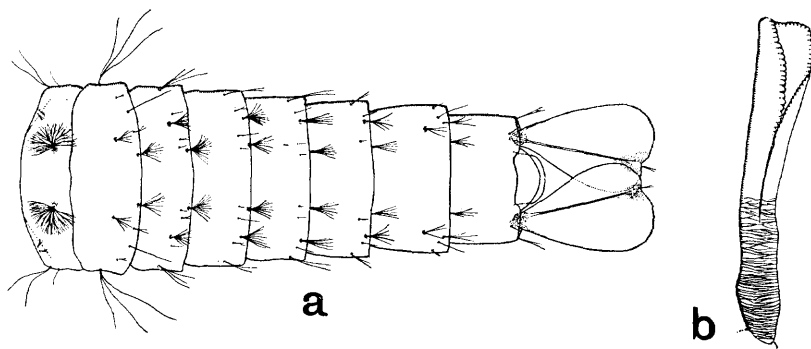
and forwards and just reaching the surface film, or with the cephalothorax slightly depressed, a fact with which should be correlated the obsolete condition of the dendritic tufts on the first abdominal segment. It is rather top-heavy owing to the length of the trumpets."

Trumpets pale at the extreme base and white at the tips ; tracheoid portion without small surface spinules. The larger abdominal setae (C-II-VII, B-IV-VII and A-VIII) form conspicuous black tufts, the rest being paler and less conspicuous. H and K rather wide apart, stout, single and directed forwards, H longer than K and pale. A-II-VI long, single. C-VII exceptionally long, reaching beyond middle of paddles. Segment X is large and shows an unusual sexual dimorphism, being strongly spinose in the female.

Subgenus **FICALBIA** s. str.

I have seen the pupa of only one species of this subgenus, the African *F. uniformis*. This differs considerably from the known pupae of the other subgenera, and the following provisional diagnosis of the subgenus *Ficalbia* is drawn up from it; the diagnosis may require modification when other species of the subgenus become known.

Trumpet moderately long, with rather less than the basal half tracheoid, and the very oblique opening extending almost half-way down the trumpet. One of the antero-thoracic setae rather long and single; dorsal seta forming a small tuft inserted immediately behind or between the trumpets. Float-hair large and dendritic. H and K close together and far from L and M. C¹-IV-VI well removed from the margin and placed almost in front of C; on VII it is external to C. All setae on VII and VIII small and inconspicuous. Paddles pear-shaped, very finely denticulate on distal part of outer margin, but with inner margin completely smooth.



YDM

FIG. 147.—*Ficalbia* (s. str.) *uniformis* Theo. a. Abdomen. b. Trumpet. (After Wigglesworth.)

F. (F.) uniformis Theo. (Figs. 147; 141, b.)

Of this species I have examined the pupal pelt described and figured by Wigglesworth (1929), and also a few whole pupae from the Gold Coast.

Colour pale green (in life), without markings. Segment I of abdomen with seta S very long and double, other setae short. On II seta 1 very long (longer than any other abdominal setae), triple. On III-VI B and C form similar small tufts, on VII they are still smaller. A-VIII short, pale, double. Paddle with infuscation round tip of midrib; seta very short and forked.

TAENIORHYNCHUS L.-A.

The specializations of the genus *Taeniorhynchus* are as striking in the pupal as in the larval stage, and moreover the pupal differences between the two African subgenera are strongly marked, more so perhaps than the larval distinctions. The two main features by which pupae of *Taeniorhynchus* differ from those of other mosquitoes are the modification of the tip of the trumpet for the purpose of piercing plant-roots, and the replacement of the float-hair of the first abdominal segment by a

minute simple seta; some species of *Ficalbia* approach *Taeniorhynchus* in one or other of these respects. Other features common to all known pupae of this genus are as follows:

All setae of the body single, most of them short, weak, pale and very inconspicuous. H and K wide apart, K much nearer to L and M than to H, the seta representing the float-hair is one of the smallest on the segment. Paddles narrow and deeply notched at the tip, without seta but with a small pocket at tip of midrib; both inner and outer margin with small denticles.

Subgenus **COQUILLETIDIA** Dyar.

The pupae of two African species and of the European *T. (C.) richiardii* are known. All of them exhibit the following structures:

Trumpet long, mainly cylindrical, but the meatus narrowed for a short distance

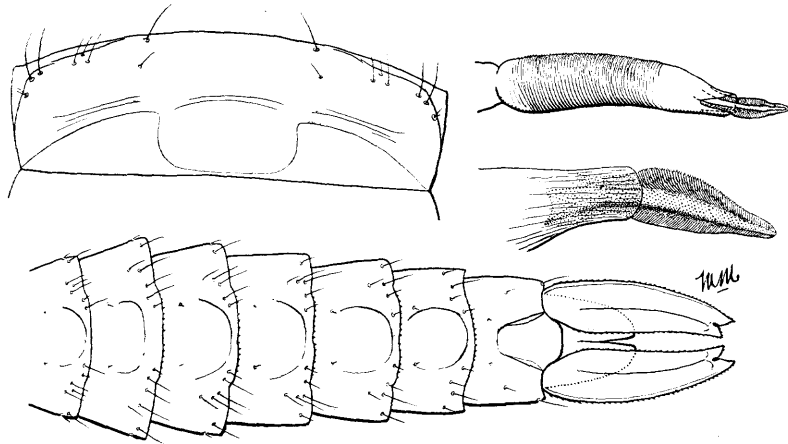


FIG. 148.—*Taeniorhynchus (Coquilletidia) aurites* Theo. Pupal abdomen (segment I enlarged) and trumpet (with tip enlarged).

before base of pinna, and at this point with a line of weakness, so that the pinna can very readily be broken off. Meatus tracheoid for the greater part of its length; pinna entire, with numerous parallel A-shaped ridges which presumably serve to hold it firmly in the plant-root after insertion, and together with the weak junction with the meatus result in the pinna being almost always broken off and left in the plant-root when the pupa rises to the surface for eclosion. Abdomen shagreened with minute points, except on more or less circular areas occupying about the middle third of each tergite, these areas being practically smooth but outlined with an irregular series of fine wrinkles; on the posterior margins of the tergites the points are a little larger and produce a finely serrated edge. All the abdominal setae, including A, B and C, minute, pale and often difficult to find.

T. (C.) aurites Theo. (Fig. 148.)

Four pelts examined from Kampala, Uganda. The integument is very pale and weak, and the paddles are very narrow, being at least three times as long as their

greatest breadth, though subject to some variation, the inner margin being somewhat concave or convex; the outer point of the paddle is rather longer than the inner. These seem to be the chief features in which it differs from the European *T. richiardii*, which has the abdominal integument dark brown and the paddles little more than twice as long as broad, with the two points at the tip equal in size. All the abdominal setae are very short and weak, setae 2 and 4 being minute or absent.

T. (C.) microannulatus Theo.

Two pelts examined, from Kampala, Uganda. The only differences noted from *T. aurites* are that the two points at the tip of the paddle are about equal in size, and the abdominal setae are rather longer, 2 and 4 being well developed on the basal segments.

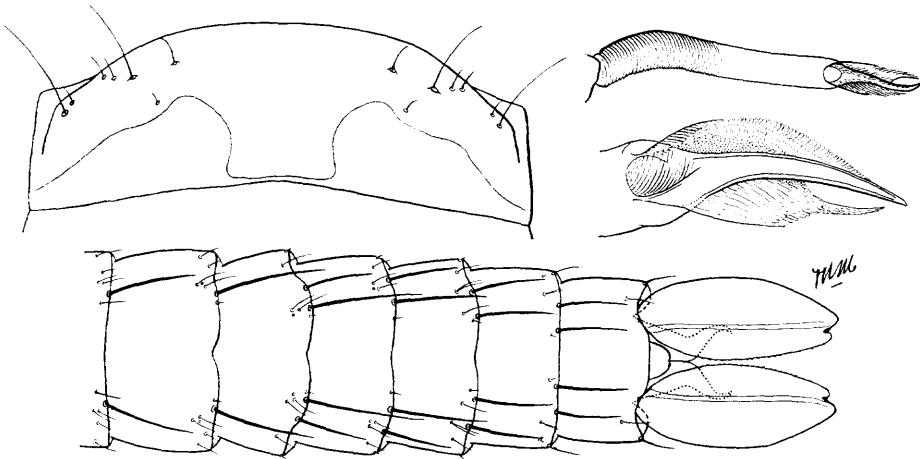


FIG. 149.—*Taeniorhynchus (Mansonioides) africanus* Theo. Pupal abdomen (segment I enlarged) and trumpet (with tip enlarged).

Subgenus **MANSONIOIDES** Theo.

The pupae of both the African species are known and are extremely similar.

Trumpets differing from those of *Coquillettidia* in having the meatus tracheoid for only about half its length, and very little narrowed distally, without any line of weakness separating it from the pinna; pinna deeply divided into two parts, one pale and very delicately feathered, the other strongly sclerotized and almost spine-like, though feathered on one side; the trumpets are apparently capable of more lateral movement than usual and can be freely inserted in and removed from the plant rootlets from which the pupa derives its air-supply, so that the pinna is never broken off. Abdomen with the basal part of each tergite coarsely reticulate, without shagreen, the distal half or more with irregular zig-zag lines having a very minute point at each angle, forming a less definite shagreen than in *Coquillettidia*, posterior margin prominent but smooth. Setae C-II-III and B and C-IV-VII forming long stout dark bristles extending to or beyond posterior margin of succeeding segments; A-VIII also fairly strong but much shorter than the other bristles; remaining setae small and obscure as in *Coquillettidia*. Paddles about twice as long as broad.

T. (M.) africanus Theo. (Fig. 149.)

Numerous pelts examined, from Gold Coast and Belgian Congo. In all the trumpets are long, with the meatus about six times as long as broad.

T. (M.) uniformis Theo.

Two pelts examined from Uganda. In both the trumpets are shorter and more bent than in *T. africanus*, the meatus only about four times as long as broad.

ÆDES Mg.

Characteristics common to most pupae of the genus *Aedes* are : Trumpets short, without definite tracheoid area at base, at most with a small area of parallel ridges beneath, this area not usually darkened. Abdomen without specially long and strong setae. Float-hair always well-developed and normally dendritic. A-II-VI usually minute ; A-VII not forming a conspicuous tuft ; A-VII and VIII at corners of segments. H and K-I close together, K long and single. Segment VIII broader than long. Paddles about equally divided by the midrib, or outer part broader ; margin more or less denticulate ; one seta at or close to tip of midrib ; no accessory seta.

As with most other genera this broad definition is subject to many exceptions ; in the subgenus *Stegomyia*, for example, setae A-II-VII are better developed than usual, and the paddles may be fringed ; in *Banksinella* setae H and K-I are widely separated. No single feature has yet been discovered which will separate all pupae of *Aedes* from all others.

Subgenus **MUCIDUS** Theo. (Fig. 150.)

The African species of this subgenus are all very similar, and have the following features in common :

Dorsal seta small, single, placed almost between the trumpets. Postero-thoracic setae R, P and O all about equal in size and single. Float-hair large and dendritic. Seta C-II single or at most double ; C-III behind B ; B-III and VI, and B and C-IV-V all long and single ; A-VIII a short, dense tuft ; C¹-III-V near margin well inside C. Paddles broad, margin almost or quite smooth ; external buttress well-marked ; seta short, exactly at tip of midrib.

A. (M.) scatophagoides Theo.

A single pelt from Accra shows the following features :

Trumpets stout, opening very oblique, ratio of meatus to whole about 1 : 1.4. Abdominal setae : H extremely short, K long and strong, eight or ten times as long as H ; C-II single, rather stout and curved ; C-III single and nearly as long as B ; B and C-V and B-VI much longer than the following segments ; A-VIII with about 12 branches, each split into several from about the middle. Paddles quite clear.

Several pupal pelts from India are similar to the African specimen except in having C-II double.

A. (M.) nigerrimus Theo. (Fig. 150, a.)

Several pupal pelts from Kampala differ as follows from *A. scatophagoides* (all have C-II single) :

Abdominal setae : H not quite so short, and K not nearly so long, only 3-5 times as long as H ; C-III sometimes double, much shorter than B ; A-VIII rather variable, branches often simple. Trumpets rather longer than in *A. scatophagoides*, but opening very oblique.

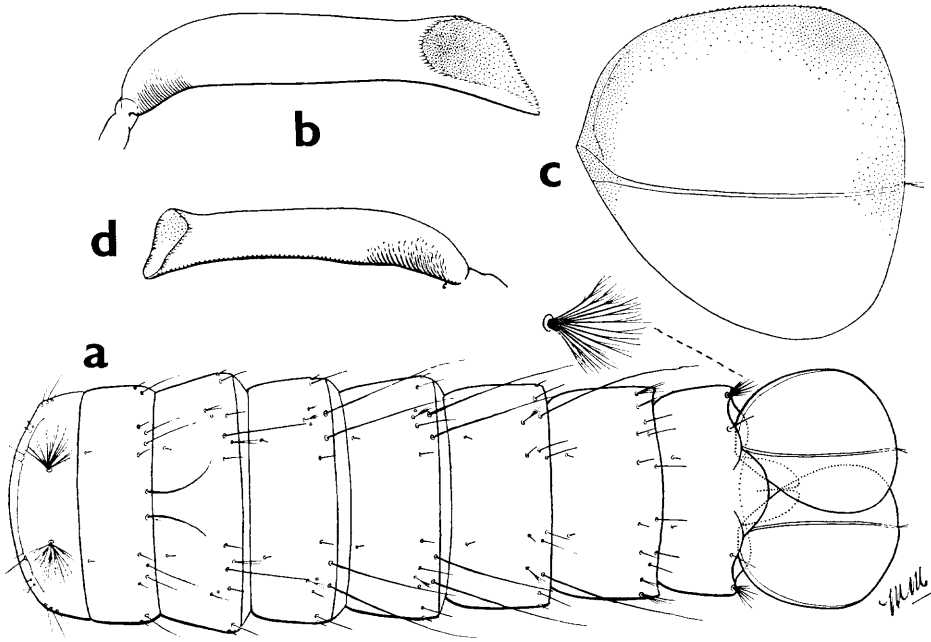


FIG. 150.—*Aedes (Mucidus)* spp. a. *nigerrimus*, pupal abdomen. b, c. *grahami*, trumpet and paddle (latter more enlarged). d. *mucidus* (?), trumpet.

A. (M.) mucidus Karsch. (?) (Fig. 150, d.)

One pupal pelt from Kampala differs from others in the series and seems to represent a distinct species, perhaps *A. mucidus*.

Trumpet longer than in the other three species, opening less oblique. C-III single, but much shorter than B. Paddles extensively infuscated along outer margin and slightly along midrib.

A. (M.) grahami Theo. (Fig. 150, b, c.)

One rather damaged pelt from Stanleyville.

Trumpets as in *A. nigerrimus*, also abdominal setae (so far as preserved), except that C-III is single. Paddles broader apically and almost square-ended, with a dark cloud at outer posterior angle.

Subgenus **OCHLEROTATUS** L.-A.

Of the three African species of this subgenus, only one has been obtained in the pupal state.

A. (O.) caspius Pall.

European specimens of this species show the following features :

Trumpets normal. None of the antero-thoracic or post-ocular setae conspicuous. Dorsal seta small, multiple, set between the trumpets. P stronger than O or R, double. Float-hair large and dendritic. H short, K not very long, S and T both longer than K, all three double. C-II a small dendritic tuft. C-III a small tuft set almost immediately behind B. C¹-III-V away from margin but internal to C. B-IV-VI as long as segment, double. A-VIII a small tuft of about 8 plumose branches. Paddle broad, margin almost smooth, midrib not very strong or dark ; seta short, double.

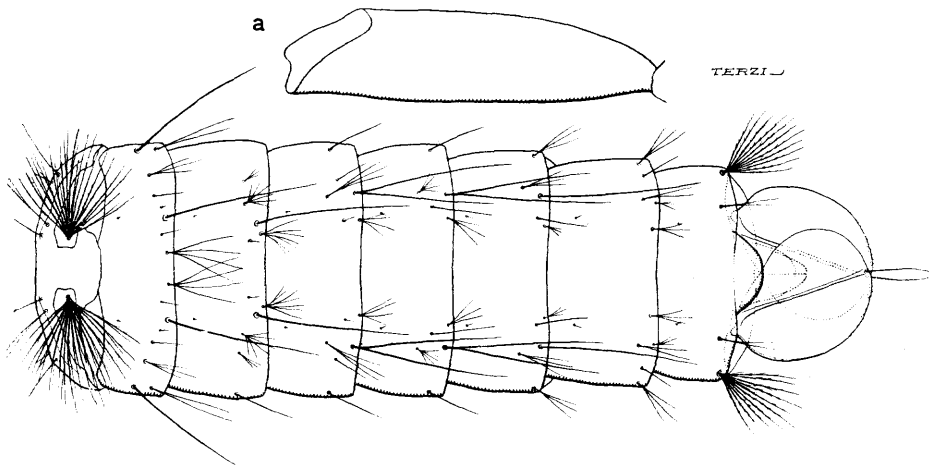


FIG. 151.—*Aedes (Finlaya) longipalpis* Theo. Pupal abdomen and trumpet (a). (After Macfie and Ingram).

Subgenus **FINLAYA** Theo.

The pupae of three African species have the following features in common :

Dorsal seta inserted between the trumpets. P longer and stronger than O or R, single. H short, K much longer and stronger, but not so long as S and T. 1-II long and single. C-III set almost immediately behind (sometimes even slightly outside) B. C¹-III-V away from margin but internal to C. Paddle with at most fine denticles on margin, midrib not very strong.

A. (F.) longipalpis Grünb. (Fig. 151.)

Four pelts examined from Lagos, agreeing in the main with the description by Macfie and Ingram (1923).

Trumpets very dark brown, almost black, differing somewhat in shape in the two

sexes according to the material available: in three males they are rather shorter and broader and with more oblique opening than in the female figured by Macfie and Ingram or in one from Lagos. Dorsal seta strong, as long as trumpets, 3-4 branched. Float-hair very large. K 2-3 branched, S and T sometimes double. C-II almost as long as segment, not dendritic, with 4-6 branches arising from base; C-III-VII with several branches. B-II-VI long, single (or sometimes double) hairs, usually longer than the segments, but rather shorter in ♂ than in ♀. A¹-VIII single or double. A-VIII more than half as long as paddle, with 10-12 branches. Paddle broad, rounded at tip with very minute denticles on distal margin external to seta; seta variable in length, from one-fourth to one-half as long as paddle.

A. (F.) ingrami Edw.

This was described by Macfie and Ingram as *A. (F.) wellmani*. A pelt from Lagos agrees with their description except in minor points.

Trumpets not nearly so dark as in *longipalpis*, also shorter and broader, with very oblique opening. Dorsal seta only half as long as the short trumpets, double. Float-hair not so large as in *longipalpis*. K, S and T all single, T much shorter than S. C-II not half as long as the segment, with at least a dozen branches, some of which are forked. B-II short, single or split from middle. B-III and VI single, shorter than following segments; B-IV and V single, as long as segment or somewhat longer. C-III-IV double, V-VII single and short. A¹-VIII long and single. A-VIII about half as long as paddle with about 6 branches. Paddles narrower than in *A. longipalpis* (1.6 × 1), with more evident denticles on posterior border, seta stouter.

A. (F.) pulchrithorax Edw.

Fourteen pelts examined from the type series from Nairobi.

Trumpets as in *ingrami*. Dorsal seta strong, almost or quite as long as trumpets, with 5-7 branches. K and T double or single, S longer and single. C-II as in *ingrami*. B-II-III single, not much shorter than segments; B-IV-VI single and longer. A-VIII about one-third as long as paddle, with about 6 (3-10) branches. Paddles shaped as in *ingrami*, but without obvious denticles on margin.

Subgenus **STEGOMYIA** Theo. (Figs. 128, a; 152.)

In all the pupae of this subgenus examined the dorsal thoracic setae are placed well behind the bases of the trumpets, instead of between them as in the subgenera *Mucidus*, *Ochlerotatus*, *Finlaya*, *Aëdimorphus* and *Skusea*. Other pupal features vary a good deal in different *Stegomyia*, but the trumpets are always short, and the abdominal setae tend to be poorly developed. Several species have a conspicuous fringe on the paddles; such a fringe is not found in any other subgenus of *Aedes*, but even here it does not approach in length that of *Eretmapodites*. The midrib of the paddles is rather unusually strong in most *Stegomyia*, and often infuscated. In many, but by no means all, species of the subgenus, seta A (II-VI) is more strongly developed than usual in Culicine pupa, and is rather spine-like on several segments, or at least on VI. Seta C-II never forms a conspicuous dendritic tuft as is so often the case in

the subgenus *Aëdimorphus*. In most species the lower posterior antero-thoracic seta is rather long, strong and single, but the lower post-ocular is small.

A. (S.) aegypti L. (Fig. 152, a.) (*S. fasciata*.)

The pupal chaetotaxy of this species was described in detail by Macfie (1920). The following appear to be the main diagnostic features :

Dorsal thoracic seta very short (much shorter than supra-alar), usually double but

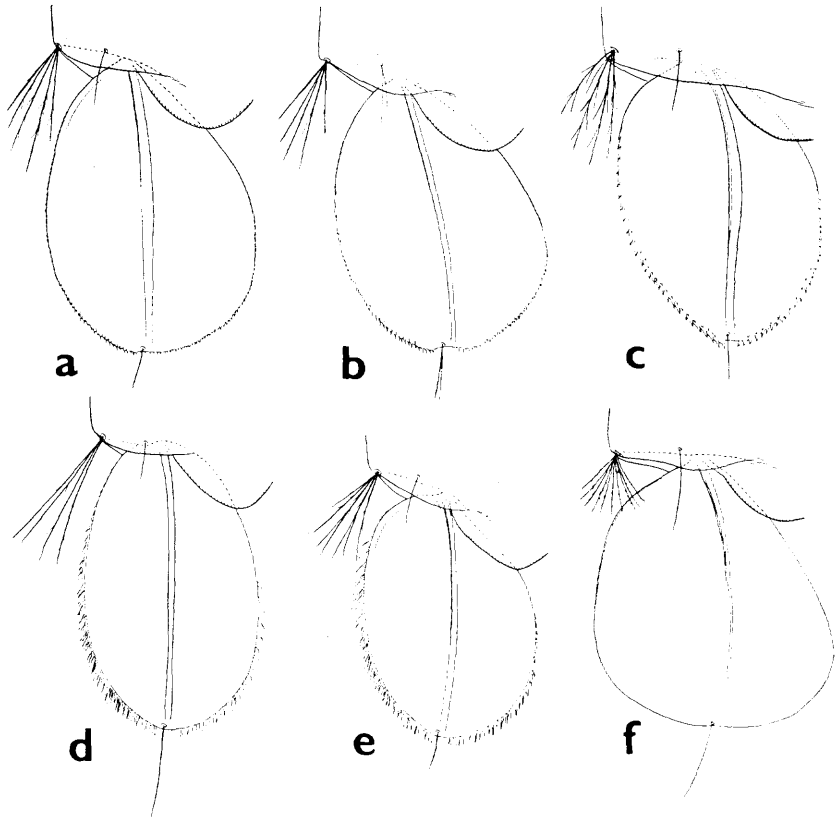


FIG. 152.—Pupal paddles, with seta A-VIII, of *Aedes (Stegomyia)* spp. a. *aegypti*. b. *simpsoni*. c. *dendrophilus*. d. *unilineatus*. e. *africanus*. f. *vittatus*.

sometimes single or triple. P markedly longer than O or R. Abdomen :—I : H, K, S and T all subequal in length and single (an unusual condition) ; K at most one-half longer than H and very little stouter. II : C short usually double or triple, occasionally single. III : C short, usually double, placed obliquely internal to B (not behind it). II–VI : A rather spine-like, well marked even on II and progressively longer on III–V, but not longer on VI than on V ; B single, not more than half as long as segments. VII : A single and strong, much longer than A–VI, other setae all short and single. VIII : A with 2–5 sub-plumose branches, reaching about to middle of paddle. Paddles oval, about 1.3×1 , with strong denticles on distal margin ; seta single, about one-fourth length of paddle.

A. (S.) simpsoni Theo. (Fig. 152, b.)

Described but not figured by Ingram and Macfie (1917). Diagnosis below based on a comparison of pelts (some damaged) from Sierra Leone, Gold Coast, Nigeria and Uganda.

Dorsal seta as in *A. aegypti*. Abdomen:—I: H rather shorter than in *aegypti*, and K considerably longer, so that it is at least twice as long as H; S and T not much longer than H, T often divided. II: C-2-4 branched. III: C-1-3 branched, placed almost behind B. II-VI: A rather spine-like, reaching about to posterior margin on III-V, but much longer on VI, where it is almost as long as on VII and black; B single or rarely double. VIII: A as in *aegypti*. Paddles rather broader than in *aegypti*, and with a rather distinct notch at tip; denticles rather stronger than in *aegypti*, but the single seta rather shorter.

One pelt from Nyasaland, determined as this species shows some differences from the rest. It has C-III with more branches and placed well inside B; A-II-V quite short and inconspicuous; paddle-seta double.

A. (S.) metallicus Edw.

Described by Ingram and Macfie (1920)*; I have examined one of their specimens, and also a rather damaged pelt from Kisumu.

Dorsal seta single. Abdominal setae rather stronger and darker than in *A. aegypti* or *simpsoni*. K much longer than H, S or T, which are about equal in length. C-III a triple seta, about half length of segment and fairly strong. A-II-V forming a slender spine, reaching beyond corner of segments IV and V; A-VI similar to V but double; A-VII much longer, not spine-like but with 2-4 sub-plumose branches; A-VIII as in the other species; B also similar. Paddles resembling those of *A. simpsoni* in being slightly notched at tip and with similar denticles (not a well-marked fringe) round distal margin.

A. (S.) dendrophilus Edw. (Fig. 152, c.)

Described and figured by Macfie and Ingram (1923); I have examined one of their specimens and also numerous pelts from Ibadan, Nigeria. The pupa differs in many respects from those of *A. aegypti*, *simpsoni* or *metallicus*.

Integument of dorsum of thorax and first few abdominal tergites mainly dark brown, remainder deep yellow; paddles more or less uniformly infuscated, with the broad midrib very dark brown.

Dorsal seta single. O small, P and R both rather long, subequal, single. K much longer than H, S or T, which are subequal. C-II with 2-4 branches. C-III single or with 2-3 branches, placed well inside B. B-II-III single, about two-thirds as long as the segments; B-IV-VII single and very short, only about one-third as long as segments. A-II-VI minute. A-VII rather long, black, sub-plumose, single or with 2-3 branches. A-VIII shorter than usual, not nearly reaching middle of paddle, with 2-8 (usually 4) branches which are usually sub-plumose. Paddles somewhat pointed, denticles (stronger than in *aegypti*) extending round most of the margin; seta simple, about one fourth as long as paddle.

* See note under *A. (S.) luteocephalus*.

A. (S.) apicoargenteus Theo.

Macfie and Ingram (1923) stated that they could find no constant differences between the pupae of this species and of *A. dendrophilus*. I have examined two pelts from Nigeria and three from Uganda determined as *A. apicoargenteus*, but these differ so much among themselves that it seems probable some are wrongly determined; in one or two of them the characters seem essentially as in *A. dendrophilus*.

A. (S.) trinidad Gil Collado.

Described and figured by Gil Collado (1936). Distinctive features indicated are:

Nearly all abdominal setae short, the longest being K, B-II and B-III. A-II-VI all similar, single, not very small; A-VII double; A-VIII 4-branched, scarcely one-fourth as long as paddle. Paddle narrow (1.8×1) neither notched nor pointed, with fine denticles on outer margin and very strong ones round distal margin; seta about one-eighth length of paddle.

A. (S.) de-boeri Edw.

The pupa was described and figured by Ingram and de Meillon (1929); as that of *A. pseudonigeria*. The salient features mentioned are:

P much longer than O or R. C-II double, as long as B. C-III single, almost beside B. B-II-VII single, about half as long as segment. A-II-VI moderately short; A-VII a single stout sub-plumose hair. Paddles infuscated basally and in region of midrib, notched at tip and with denticles round distal margin as in *A. simpsoni*.

A. (S.) contiguus Edw.

The pupa was described by Ingram and de Meillon (1929), as that of *A. poweri*. The main characters given are:

Postero-thoracic hairs all simple, P the longest. C-II double; C-III also double, internal to B. B-II-VI single, not much shorter than segments. A-II-VI short as usual; A-VII sub-plumose and single, double or triple; A-VIII reaching to or beyond middle of paddle. Paddles finely denticulate on distal border, about 1.3×1 , slightly notched at tip; midrib dark and expanded at tip; seta short, simple or apically branched.

A. (S.) bambusae Edw.

Eight pupal pelts examined, mostly in poor condition but definitely identified as this species (rather than the allied *A. angustus*) by the corresponding adults.

Dorsal seta single. K about twice as long as H. C-II double, in one specimen 4-branched. B-II-VII about half as long as segments, usually double and more or less plumose (an unusual feature distinguishing this species from most or all others of the subgenus). A-II-V quite short; A-VI rather longer and often forked or frayed at tip; A-VII with 2-4 sub-plumose branches; A-VIII with about 5 plumose branches usually very short, but sometimes longer, up to one-third length of paddle. Paddle rather narrow and somewhat pointed, infuscated at least basally, denticulate on outer margin and distally on inner margin; seta short, single or forked distally.

A. (S.) africanus Theo. (Fig. 152, d.)

The pupa of this species was described by Wesche (1910). I have examined a single pelt from Lagos, collected and determined by Dr. V. B. Wigglesworth.

Dorsal seta triple. O short and multiple, P and R equally long and single. K moderately long, not twice as long as H, which is about equal to S and T. C-II and III triple, C-III inside B. B-II and III about half as long as the segment; B-IV-VI as long as segment or nearly; B-VII shorter. A-II-VI very short and pale; A-VII a small black tuft of 2-5 branches; A-VIII nearly reaching middle of paddle, with 4-7 branches. Paddles with very dark midrib, but not otherwise infuscated; in shape rather bluntly pointed; a longish dense fringe extends along nearly the whole of the outer border and half of the inner border; seta single, nearly one-third as long as paddle.

A. (S.) luteocephalus Newst.

This was briefly described by Ingram and Macfie (1930); their fig. 3 was probably intended to represent this species and not *A. metallicus* as stated in the legend. The following diagnosis is drawn up from a comparison of four pelts from Lagos.

Dorsal seta single, sometimes double. P not much longer than O or R, O single or double. K over twice as long as H. C-II double or triple. C-III single, sometimes double, well inside B. B-II-VII single, not much shorter than the segments. A-II-VI not so short as in *africanus*, A-VI more than half as long as A-VII and fairly strong. A-VII, A-VIII and paddles as in *A. africanus*.

A. (S.) unilineatus Theo. (Fig. 152, e.)

Described and figured by Ingram and Macfie (1920). I have drawn up the diagnosis below from four of their specimens.

Dorsal seta single or double. K twice as long as H. C-II a small tuft, barely half as long as segment, with 4-8 branches, partly forked; C-III with 2-4 branches, well inside B; C-IV-VI also double or triple. B-II-VI rather over half length of segments, sometimes double on IV and V. A-II-VI moderately long and dark, A-VI sometimes double; A-VII sub-plumose, single or double; A-VIII with 2-4 branches or single. Paddles oval, neither pointed nor notched at tip, with a longish fringe as in *A. africanus*; seta single, about one-third length of paddle.

A. (S.) albopictus Skuse. (Fig. 128, a.)

Abdominal chaetotaxy figured by Baisas (1938); Indian specimens are similar.

Resembles *A. unilineatus* in most respects, but A-II-V quite small and pale, A-VI twice as long and dark, A-VII still longer and quite simple; A-VIII single or forked or with a few short branches at some distance from base. Paddle more pointed than in *unilineatus*, fringe not quite so extensive, but some of the hairs composing it longer.

A. (S.) vittatus (Bigot). (Fig. 152, f.)

Three pelts from Freetown examined. These differ considerably from other

species of the subgenus ; they agree essentially with the description given by Senevet (1936) of Algerian specimens.

Cephalothorax and wing-cases very dark, surface shagreened. Antero-thoracic setae all small. Dorsal seta small as in the other species, but placed only slightly behind bases of trumpets, single or double. P single, not much longer than O or R, which are branched. H very short, hardly a quarter as long as K. C-II a small dendritic tuft, not one-third as long as the segment ; C-III with usual irregular branches, placed on hind margin immediately behind or slightly outside B. B-IV-VI single, slender, as long as the segments or somewhat longer ; B-VII short as usual. A-II-VI very small and pale ; A-VII and VIII forming small dark sub-plumose tufts, VII with 4-6, VIII with 8-10 branches. Paddles very broad, truncate distally ; distal margin quite smooth but outer margin with a few very minute denticles ; seta single, about one-third as long as paddle.

Subgenus **AĒDIMORPHUS** Theo.

In most or all pupae of this subgenus the following features are to be found :

Dorsal seta inserted between bases of trumpets, or only slightly behind them. O and R branched ; P longer and single. Float-hair large and dendritic. H short, K long and single, but S and T often longer than K. C-II forming a tuft which may be large or small, but nearly always has at least some of its branches subdivided (dendritic). C-III usually inside B. A-II-VI minute and pale. C¹-III-V on or near margin inside C. Paddles with distinct external buttress and rather slender midrib ; margin at most with fine denticles.

A. (A.) stokesi Evans.

The pupal paddles were figured by Bacot (1916), but no full description has been published. Two pelts from Freetown and one from Lagos examined.

Back of thorax and first few abdominal segments dark ; end of abdomen and paddles pale ; trumpets dark brown with tips narrowly paler. Trumpets short, widened distally, opening large and very oblique. Dorsal seta strong, almost as long as trumpets, with three or four branches. Lower post-ocular seta long, strong, single ; lower posterior antero-thoracic also rather long, double. O branched from base, with about 8 fine branches ; R with about 3-4 branches. Abdominal integument with scarcely noticeable shagreen on second and following segments, none on first. C-II about half as long as segment, with 8-10 mostly simple branches. B single throughout, longer than segments on IV-VI. A-VIII with 4-5 branches, nearly reaching middle of paddle. Paddle oval, with a few fine denticles round distal margin ; seta about one-fourth as long, single.

A. (A.) simulans Carter.

Pupal paddle described by Bacot (1916) ; his specimen compared with four pelts from Nigeria and described below.

Resembles *A. stokesi*, but differs as follows : Post-ocular seta not so strong. Dorsal seta double (but fairly strong and as long as trumpet). O with only 2-4

branches. C-II shorter, but with more branches (15-20). Paddles infuscated, contrasting with terminal abdominal segments, seta split into 2-4 branches which may be sub-plumose ; margin smooth.

A. (A.) hopkinsi Edw.

Four pelts examined from the type series from Lira, Uganda ; all are in poor condition. Integument pale, only the trumpets dark. Trumpets nearly cylindrical, quite four times as long as their greatest breadth, opening small and not very oblique. Post-ocular and antero-thoracic setae inconspicuous. Dorsal seta weak, considerably shorter than trumpet, with about 5-8 branches arising well beyond the base. O with about 8 branches from base. C-II a short and delicate but rather dense tuft ; C-III-VII forming delicate tufts of 4-8 branches over half as long as the segments. B-IV-V mostly double and rather longer than the segments. A-VIII of 4-6 branches, not reaching one-third of paddle. Paddle rather broad, margin smooth, seta single and about one-sixth length of paddle.

A. (A.) domesticus Theo.

Two damaged pelts from Lagos differ from *A. hopkinsi* in having the dorsal seta branched from base ; B-III-V not longer than the segments ; paddle seta shorter.

A. (A.) filicis I. and de M.

Described and figured by Ingram and de Meillon (1927). One pelt from the type series examined.

Resembles *A. hopkinsi* and *domesticus* in having the integument pale, with the trumpets dark, cylindrical and rather long, with small opening. As in all the four species noted above there is no shagreen on the thorax and that on the first abdominal segment is scarcely perceptible. Lower post-ocular seta rather long, double. Dorsal seta split into about four branches well beyond the base. O split from about the middle into 6-8 branches ; R branched (4-6) from near base. C-II a fairly dense, dark, dendritic tuft, about half as long as segment. B-IV-VI double, about as long as segments. Paddle oval, moderately broad, slightly pointed, pale ; margin quite smooth ; seta single, about one-eighth as long as paddle.

A. (A.) tarsalis Newst.

Briefly described and figured by Wigglesworth (1929). The diagnosis below is made from his four pelts from Freetown. Paddle figured by Bacot (1916) as that of *O. minutus*.

Resembles *A. filicis*, but integument of back of thorax and first few abdominal segments more definitely (though suffusedly) infuscated. Dorsal seta with fewer branches (2-4) arising near base. O branched from base. Paddles with distal margin finely denticulate ; external buttress infuscated, a slight infuscation also around tip of midrib ; seta about one-sixth as long as midrib. Bacot's three pupal pelts resemble Wigglesworth's, but the dorsal seta is single ; the paddles have the external buttress but not the tip of the midrib infuscated.

A. (A.) phyllolabis Edw. (Fig. 153.)

Eighteen pelts examined from Kabwach, Kenya. The pupa is quite different from that of *A. tarsalis*, but strikingly like *A. wigglesworthi* and *A. abnormalis*.

Integument pale on sides and beneath (including coxal area), and on last three or four abdominal segments; dorsum of thorax and upper part of wing cases dark brown; abdomen with anterior part of segment I and most of II-IV dark brown, but pale in middle and at sides as in *A. wigglesworthi*; trumpet pale with the tip darkened. Most of dorsal surface of thorax shagreened; metathorax with a large-area of strong shagreening extending around seta P. Segment I with strong shagreening over most of its surface, on the dark anterior part extending below setae L and M; median posterior area of segment not chitinized except for the sharp points. Dorsal seta divided near base into 2-3 branches, these again split. O and R branched from base. Float-hair not so pale as in *wigglesworthi*; K moderately long and pale; M a small but not dense tuft; S and T shorter than K, branched.

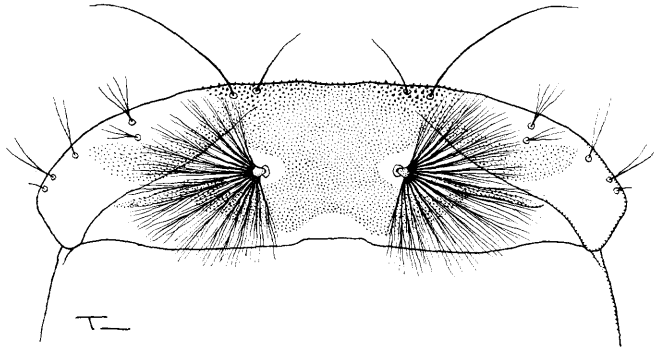


FIG. 153.—*Aedes phyllolabis* Edw. First abdominal segment of pupa.

C-II and C-III forming minute dendritic tufts extending only a short distance beyond margin of segment; C-IV-VII scarcely one-third as long as segments, pale, with 3-6 branches. B-III rather strong, single, curved outwards. B-IV-VII double, weak, not longer than segments. A-VII with 2-4, A-VIII with 4-7 branches, both very short and set near corners of segments. Paddles very broad, rounded at tip (not pointed as in *wigglesworthi* and *abnormalis*); margin quite smooth; seta fine, single, about one-seventh as long as paddle (over twice as long as in *wigglesworthi*).

The dark markings of the integument vary in extent though the pattern remains the same; in the paler specimens the abdomen has two parallel dark stripes extending along the first four segments; in the darker specimens these stripes are partly fused and the fifth segment may be darkened.

A. (A.) wigglesworthi sp. n. (p. 182). (Fig. 153A.)

Briefly described and figured by Wigglesworth (1929) from three pelts from Sapele, Nigeria. The redescription below is from the same specimens, which were wrongly determined by me as *A. abnormalis* Theo. The pupa has several striking peculiarities, of which perhaps the most noteworthy is the position of setae A-VII

and A-VIII well back from the posterior corners of the segments, as in the genus *Culex*; this alone will separate the present species from all other *Aëdimorphus*.

Integument mainly pale, but with darker patches on dorsum of thorax and wing-cases; under-side, including coxal area, pale; trumpet pale with the tip narrowly darkened; abdominal segments II-IV largely dark brown, with the sides and a median stripe pale. Much of dorsum of thorax shagreened; metathoracic plates smooth except on a small area inside seta O, which is strongly shagreened. Median area of segment I unusually pale, but strongly shagreened with sharp points, more coarsely so than remainder of abdomen; anterior chitinized part of segment also shagreened in middle, but weakly and not as far as setae L and M. Dorsal seta rather short, split to base into about 6 delicate branches. O and R each branched from base, with about 6 delicate branches. Float-hair very pale; K shorter than

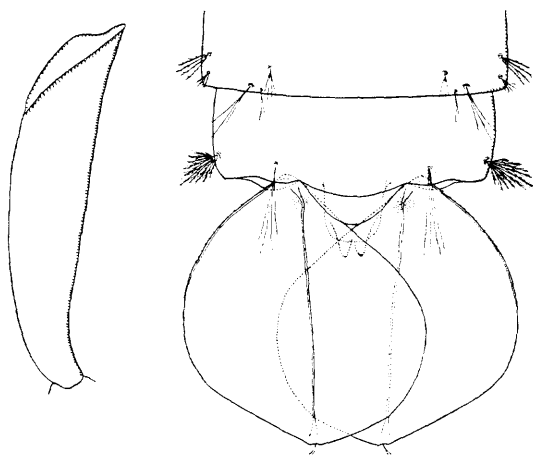


FIG. 153A.—*Aëdes (Aëdimorphus) wigglesworthi* sp. n. Tip of pupal abdomen and trumpet. (After Wigglesworth.)

usual and pale; M forming a small dense tuft; S shorter than K or T, with several branches. C-II and III multiple tufts as usual, but very small and pale; C-IV pale, reaching about to middle of segments. B-VI double as usual, IV-V longer than segments. A-VII with about 5, A-VIII with about 10 plumose branches, both quite short and placed well back from corners. Paddles entirely pale like the last three or four abdominal segments, very broad but bluntly pointed; margin smooth; seta minute, bifid.

A. (A.) abnormalis var. **kabwachensis** n. (p. 181).

Four pelts of the type series are in rather imperfect condition, but appear to agree with *A. wigglesworthi* in most respects, notably in the shagreening of the thorax and first-abdominal segment. They differ, however, in the important respect that setae A-VII and A-VIII are close to the corners of the segments, as usual in *Aëdes*. They further differ in colour: the dorsum of the thorax is not mottled; there is a conspicuous dark brown spot beneath in the region of the front coxa; and abdominal segments II-IV are slightly and uniformly suffused.

A. (A.) alboventralis Theo.

According to the description and figure of Ingram and de Meillon (1929), this pupa differs from those of *A. wigglesworthi* and *A. abnormalis* in the better development of some of the abdominal setae: C-III-VII about as long as the segments; B-III-V somewhat longer; A-VIII longer; paddle-seta one-fifth as long as paddle. As in the related species the trumpet is slightly darkened at the tip, but no mention is made of shagreening or dark markings on the integument.

A. (A.) albocephalus Theo.

Described and figured by Ingram and Macfie (1917). Four pelts examined. Integument rather pale, without obvious markings or shagreening; trumpets rather pale, but slightly darkened at tip. Dorsal seta with 3-4 branches from near base.

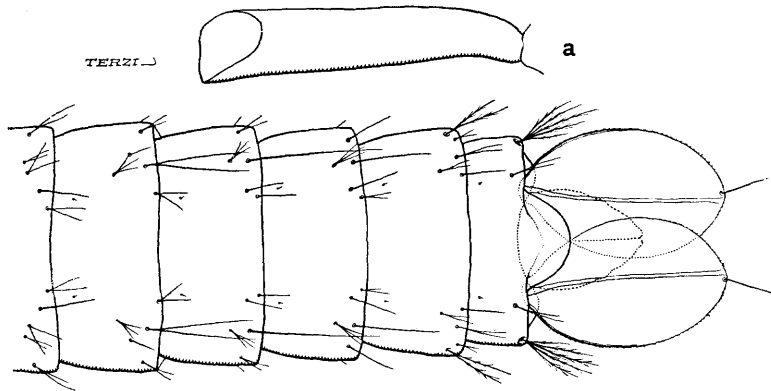


FIG. 154.—*Aedes (Aedimorphus) irritans* Theo. Pupal trumpet and abdomen. (After Macfie and Ingram.)

C-II a small dendritic tuft about one-third as long as following segment; C-III-VI with 4-2 branches, half as long as segments; C-VII single. B-III-VI not longer than segments, single or double. A-VII double; A-VIII with 3-5 branches, about one-fourth as long as paddle. Paddle oval, not very broad; margin very finely denticulate; seta single or split distally, one-fifth as long as midrib.

A. (A.) irritans Theo. (Fig. 154.)

Described and figured by Macfie and Ingram (1923). A series of pelts from Takoradi, Gold Coast, agrees with their account.

Integument of thorax and abdomen mainly dark, but paddles pale; no obvious shagreening. Trumpets rather variable, sometimes shorter and with more oblique opening than shown in figure. Dorsal seta normally with 2-3 branches, sometimes single. K and S equal, single; T branched. C-II a rather dense dendritic tuft one-third as long as segment; C-III-VI double, VII single; C-III inside B, as in all species of this subgenus described in the foregoing pages; B-III single, dark and rather stout at base, pale and tapering distally. B-IV-VI single or double, not or

scarcely longer than segments. A-VII double, A-VIII with 4-6 branches and nearly reaching middle of paddle. Paddle oval, not very broad, margin very finely denticulate, seta single, strong, nearly half as long as midrib.

A. (A.) nigricephalus Theo. (Fig. 155, a.)

No description of this pupa has been published apart from the very inadequate one of Wesché (1910). Three pelts from Lagos examined.

Resembles *A. irritans* in having integument of cephalothorax and abdomen almost wholly dark; in this species, however, the paddles are also darkened wholly or in part. No obvious shagreen. Dorsal seta 4-branched from near base. K rather short, split into 2-4 branches from near base; S and T longer. C-II a small dendritic

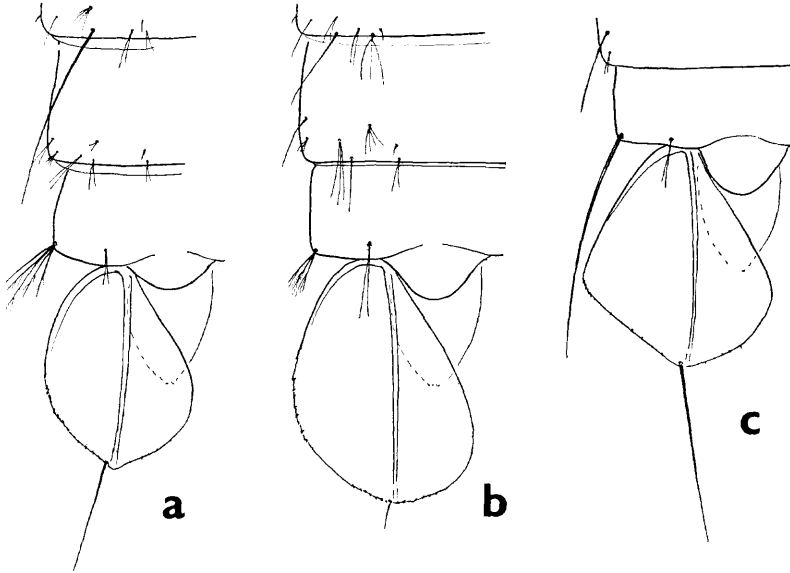


FIG. 155.—*Aedes* (*Aedimorphus*) spp. Tip of pupal abdomen. a. *nigricephalus*. b. *gibbinsi*. c. *centropunctatus*.

tuft; C-III a small tuft situated immediately behind B instead of well inside it as usual in this subgenus; C-IV-VII with 5-2 branches, not half as long as segments. B-II and III stout and black at base for a short distance, then split into 2-4 slender pale branches. B-IV-VI single, considerably longer than the segments. A-VII double; A-VIII as usual with 4-6 branches, nearly reaching middle of paddle. Paddle oval, not very broad; midrib unusually stout for a member of this subgenus and very dark; margin finely denticulate; seta strong, single, more than half as long as paddle.

A. (A.) gibbinsi Edw. (Fig. 155, b.)

Four pelts from Ruwenzori examined.

Integument mainly pale except dorsum of thorax; trumpets dark; slight shagreen on base of abdomen. Dorsal seta split irregularly into about 6 branches

from before middle. O, R, S and T also split into several branches well beyond base; O longer than P. K and P single as usual. C-II a tuft of 6-8 simple (not dendritic) branches; C-III similar, placed directly behind B; C-IV-VII with 7-2 branches, about half as long as segments; 4-II a rather conspicuous tuft, III-VII similar to C. B-III-VII double or single, about as long as segments. A-VII single, A-VIII with 3-5 (usually 3) branches, both quite short. Paddles slightly widened beyond middle, very bluntly pointed; margin very finely denticulate; seta single and about one-sixth as long as midrib.

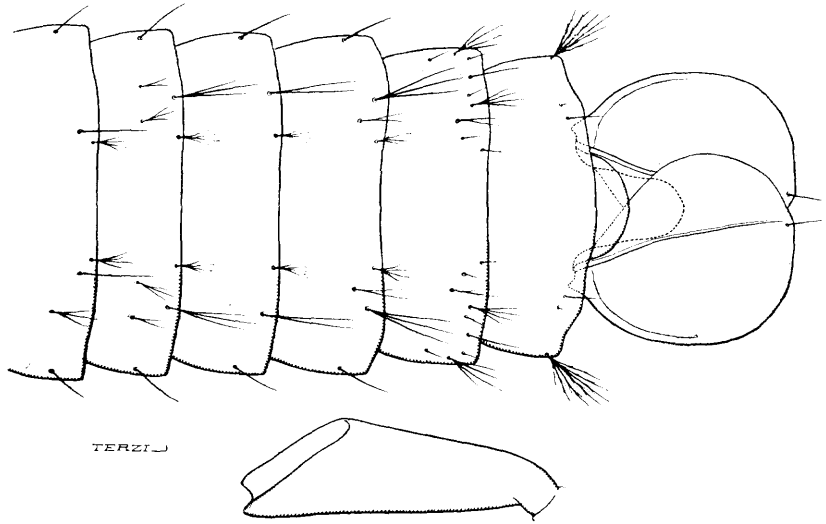


FIG. 155.—*Aedes (Aedimorphus) hirsutus* Theo. Pupal abdomen and trumpet. (After Macfie and Ingram.)

A. (A.) cumminsi Theo.

Four pelts examined from Uganda. These resemble *A. gibbinsi* except in the following points:

C-III placed somewhat inside B, not directly behind it. C-IV-VII longer, reaching well beyond middle of segments. A-VII often double or triple; A-VIII with 5-10 branches. Paddle-seta shorter, about one-tenth as long as midrib.

A. (A.) centropunctatus Theo. (Fig. 155, c.)

Pupae of this species collected by Dr. A. Ingram at Sunyani, Ashanti, have hitherto remained undescribed. The complete chaetotaxy cannot be made out in the specimens available, but the characters of the terminal abdominal segments are such as to distinguish the pupa at once from all other members of the subgenus.

Trumpets normal. Dorsal seta 4-branched from base; O also with about 4 branches from near base, shorter than P. C-II a fairly large dendritic tuft as usual; C-III with few branches, placed just inside B. B mostly single and not very long.

A-VII and A-VIII both single and perfectly smooth; A-VIII as long as the paddle.

Paddle somewhat broadly rhomboidal in shape ; margin smooth ; seta single, of the same length as the paddle itself.

A. (A.) hirsutus Theo. (Fig. 156.)

Described and figured by Macfie and Ingram (1919) from Gold Coast specimens ; numerous pelts from Lagos correspond.

Integument mainly pale, but (in unfaded specimens) the dorsum of thorax dark brown, strongly contrasting with the pale sides ; front coxal area also dark ; trumpets pale. Dorsal seta split irregularly from near base into about six branches. O a tuft of eight or more branches all arising from base ; R split about middle into 3-5 branches ; P longer. K single or double, sometimes sub-plumose. C-II a fairly large dendritic tuft ; C-III very pale and delicate, placed almost behind B ; C-III-VI similar, less than half as long as segment. B-III-VI usually double, occasionally triple or single, about as long as segments except that B-V is usually considerably longer (it is shown too short in the figure). A-VII with 3-5, A-VIII with 6-8 branches, both rather short. Paddle nearly as broad as long (1:1.2) ; margin smooth ; seta about one-eighth length of midrib.

A. (A.) fowleri d'Emm.

Described and figured by Macfie and Ingram (1923 ; as *Ochlerotatus nigeriensis* Theo.). As they point out, there appear to be no very obvious distinctions between it and *A. hirsutus*, except that setae C may be rather longer in the present species. No fresh material is available on which any other conclusion can be reached.

Subgenus **BANKSINELLA** Theo. (Fig. 157.)

Pupae of this subgenus differ from those of all other *Aedes* in the chaetotaxy of the first abdominal segment, setae H and K being rather wide apart and K forming

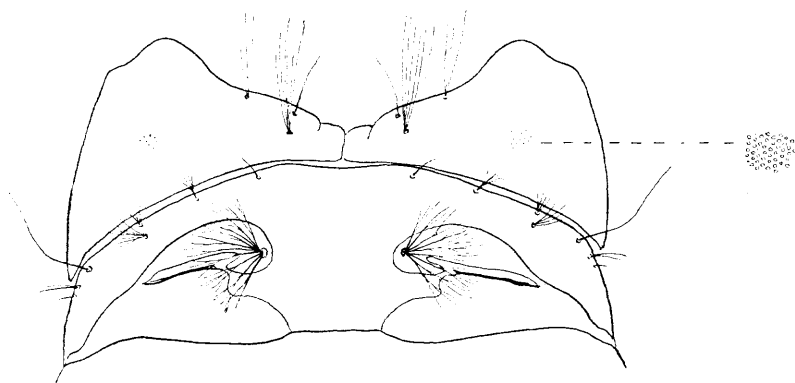


FIG. 157.—Metathorax and first abdominal segment of pupa in subgenus *Banksinella*.

a small tuft little if any larger than L or M, instead of a long single seta. There is also a difference in the metathorax, the single seta P being short and almost directly in front of (sometimes even slightly inside) the branched O, instead of longer and

well outside it. Other features apparently of subgeneric importance are: Dorsal seta small and placed almost between the trumpets. None of the abdominal setae strongly developed, but float-hair normal and C-II forming a small tuft which may be dendritic. C¹-III-V near margin of segments inside C. A-VII and VIII very small. Paddles with weak midrib and smooth margin.

A. (B.) lineatopennis Ludl.

Described and figured by Ingram and de Meillon (1927). Several pelts examined from Uganda and Kenya.

Integument mainly pale, but front coxae and tarsal sheaths more or less darkened, and a slight infuscation at tip of paddle. Trumpet mainly rather pale, with the tip darker. All abdominal setae short, the longest not exceeding the length of the following segment. C-II with 6-10 branches; C-III small, with about 5 branches almost directly behind B; C-IV-VII longer and usually triple. B-II single or forked, but slender. B-IV-VII usually double and longer than indicated by Ingram and de Meillon, on V and VI about as long as the segments. A-VII double, A-VIII with 2-4 branches, all quite simple. Paddle-seta minute.

It is possible that the East African pupae with longer setae B are the true *A. lineatopennis*, and those described by Ingram and Macfie are the allied *A. circumluteola*, but this needs confirmation.

A. (B.) palpalis Newst.

Three pelts examined from Nabadzidza, Uganda.

Integument mainly pale, tarsal sheaths darkened, but front coxae only faintly so; no trace of infuscation at tip of paddle. Trumpet wholly very dark brown, almost black; more slender than in *A. lineatopennis* and not widened distally. Seta short and stout, almost spine-like, forked from about middle. A-VII single; A-VIII rather longer than in *A. lineatopennis*, but with only two slender simple branches.

A. (B.) palpalis ssp. **carteri** n. (p. 210).

Three damaged pelts from Lagos examined. These differ rather conspicuously in colour from Uganda *palpalis*; the setae are mostly lost.

Integument largely pale, but whole of front leg-sheaths very dark brown, including coxae and femora; a brown spot in front of thorax above, and some dark mottling on all abdominal segments. Trumpet very dark as in Uganda *palpalis*. Paddles entirely pale.

A. (B.) punctocostalis Theo.

Described and figured by Wigglesworth (1929) from one damaged pelt, which I have re-examined.

Integument mainly pale, but front leg-sheaths wholly dark brown, as in *carteri*; a slight infuscation at tips of wing cases, but scarcely any on front of thorax or on abdomen, none on paddles. Trumpet rather shorter than in *palpalis*, wholly dark; the tracheoid ridges at the base are on one side only and do not pass all round as the figure suggests. Seta B-II much as in *palpalis*.

Subgenus **DICEROMYIA** Theo.

Pupae of three species of this subgenus have been described, but the available material is scanty and imperfect. The following features are common to *A. furcifer* and *A. flavicollis*, and may serve to diagnose the subgenus. Further features which may prove to be common to all the species are noted in the description of *A. flavicollis*.

Dorsal seta strong, placed behind bases of trumpets. Float-hair of rather unusual form, with a short stout stem from which arise numerous sub-plumose branches. C-II not dendritic, with only 2-4 simple branches. C¹-IV-VII placed well back from margin almost behind C. A-II-VII very small as usual. A-VIII forming a large tuft. Paddles with strong midrib but practically no external buttress; margin only minutely denticulate.

A. (D.) furcifer Edw. (Fig. 158.)

Described by Macfie and Ingram (1923) from one damaged pelt, which I have re-examined.

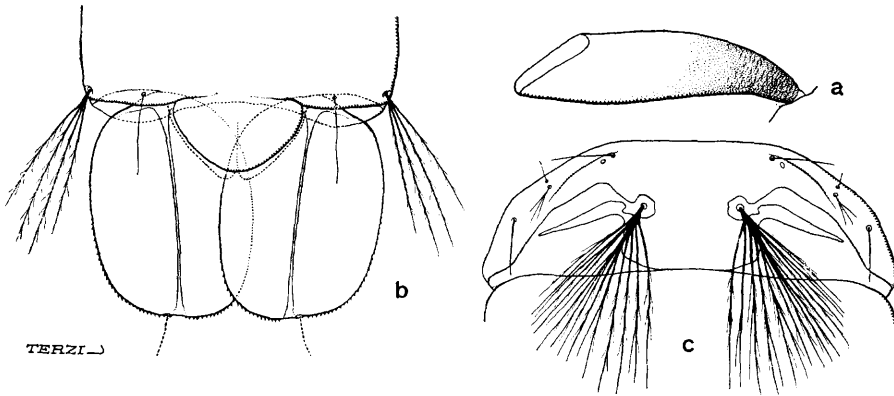


FIG. 158.—*Aëdes (Diceromyia) furcifer* Edw. Pupal details. a. Trumpet. b. Tip of abdomen. c. Segment I of abdomen. (After Macfie and Ingram.)

Trumpets rather short and narrow, somewhat contracted apically; dark at base but as usual in *Aëdes* without any definite tracheoid area. Float-hair with about 15 sub-plumose branches arising from the stout base; H quite short; M stronger than usual, with 4-5 branches from base; S and T both single and rather short (but about twice as long as H; the lengths are not quite correct and T is omitted in Macfie and Ingram's figure). C-II-IV with 3 (rarely 4) branches, V double, VI-VII single. B-III-V single, as long as segments or longer; VI-VII single and quite short. A-VII double; A-VIII with 4 branches reaching beyond middle of paddle.

A. (D.) flavicollis Edw.

Four female pelts of the type series examined; they are more or less damaged, but the damage being unequal a fairly complete description can be given.

Integument rather uniformly dark, without obvious shagreen. Trumpets very dark brown, slightly paler at tip; shape rather variable, two specimens quite like

A. furcifer, the other two somewhat stouter, contraction at the tip not obvious and opening more oblique. Lower post-ocular seta very long, strong and single; one of the antero-thoracic setae also rather long (but only half as long as the post-ocular), single or double. Dorsal seta triple, about as long as trumpets and much longer than the supra-alar. O 2-3 branched, R single, both only half as long as P, which is very long and single. Float-hair much as in *A. furcifer*, except that a few of the branches are split into two; H, S and T as in *A. furcifer*, but M rather weaker; K extremely long (ten times as long as H), single, apparently normally directed backwards as in *Eretmapodites*. C-II-IV with 2-3 branches, V-VII single. B single, on III-IV longer than the segment, on V-VI about as long as segment or rather shorter. A-VII double or triple; A-VIII with 5-7 branches, reaching well beyond middle of paddle. Paddle shaped as in *A. furcifer*; seta split to base into 7-10 branches, nearly one-third as long as paddle.

A. (D). *fasciipalis* Edw.

Described by Ingram and de Meillon (1929) from a single damaged pelt. The chief characters mentioned are:

Float-hair well-developed; "in contrast with those of *Aedes furcifer* the individual branches show fimbriated ends." A-VII triple, A-VIII with 4 branches, the longest almost as long as paddle. Paddles shaped as in the other two species; seta double, about one-quarter as long as midrib.

Subgenus **DUNNIUS** Edw.

The following features, common to two of the three species of *Dunnius*, may be regarded as defining this subgenus in the pupal stage:—None of the post-ocular or antero-thoracic setae specially strong. Dorsal seta longer than the supra-alar,

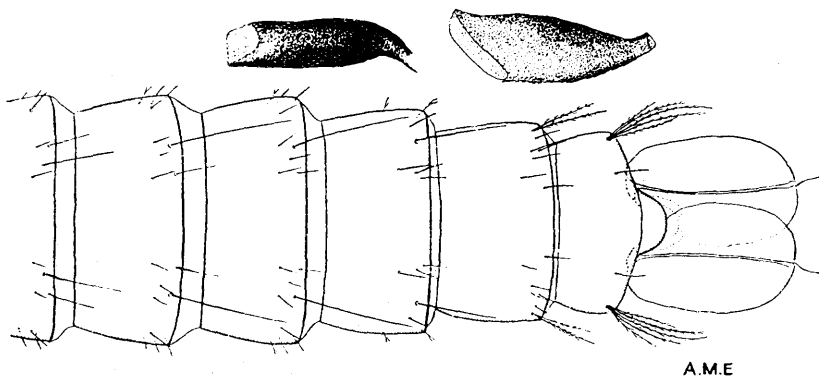


FIG. 159.—*Aedes (Dunnius) argenteoventralis* Theo. Pupal abdomen, and trumpet from above and from side. (After Evans.)

single, set well behind bases of trumpets. All the metathoracic setae single, O and P about equally long, R shorter. Most of the abdominal setae single, including the short ones. Float-hair moderately developed. H moderately long, but K longer; S and T shorter than K, both single; L also single and M with only a few branches. C-II with at most 4 simple branches. C-III well inside B. A-II-VI very small and

pale. C¹-IV-VII far back from margin and directly in front of C. A-VII and A-VIII not strongly developed. Paddles without fringe or obvious denticles on margin; midrib rather stout; no external buttress.

A. (D.) argenteoventralis var. **dunni** Evans. (Fig. 159.)

The pupa was described by Evans (1928); fourteen pelts in the British Museum from Lagos agree with her description and figure.

Integument entirely pale except for the trumpets; these very dark brown, with the tips paler. C-II usually double, occasionally single or with three branches, in one specimen with four; C-III double or single. B-II-VII single; B-IV and V rather shorter than the segments. A-VII single or with 2-3 branches (usually 2), usually simple but sometimes indistinctly plumose. A-VIII with 3-5 branches (usually 5), at least the longer branches usually distinctly plumose, but sometimes all simple. Paddles rather narrow, tip somewhat truncate; seta about one-sixth as long as paddle, usually single, occasionally split into two and then shorter.

A. (D.) kummi Edw.

Twenty-two pelts from Lagos appear to agree in every respect with the above; the branches of A-VIII are perhaps more frequently entirely simple.

Subgenus **SKUSEA** Theo.

A. (S.) pambaensis Theo.

One rather damaged pelt examined.

Trumpet normal, opening very oblique. Both the lower post-ocular and one of the antero-thoracic setae long, single or double. Dorsal seta long, triple, inserted between trumpets. Abdomen:—I: float-hair large and dendritic; K close to H, rather short, branched distally; S much longer than K, single. II: C a small dendritic tuft. III: C dendritic, placed well inside B. Seta C¹-III-V, on margin beside C; VI-VII, in front of and in line with C. Most of the main setae are missing from this pelt. Paddles with smooth margin, no denticles even on external border; seta strong (broken), at tip of midrib.

ERETMAPODITES Theo.

Pupae of this genus have a very distinctive appearance owing to the presence of very long, single, stout, black bristles on at least the first four abdominal segments, and the long-fringed paddles. In spite of this there are no important morphological distinctions from the pupae of *Aedes*. The position of K immediately behind H (in most species) is perhaps the most unusual feature, and the strong development of A-VII and A-VIII is also noteworthy. The following characters are common to all the known pupae of this genus.

Trumpet not elongate, surface entirely or almost entirely reticulate. Post-ocular and antero-thoracic setae all small and pale. Dorsal setae single, placed well behind

base of trumpets. O and P strong and single, R small and weak. Abdomen:— I (text-fig. 160): K situated directly behind H or very little to one side of it (except in *quinquevittatus*), H small, K very long, strong, black, tending to be directed backwards or outwards instead of forwards as in most other genera; L, M, S and T all

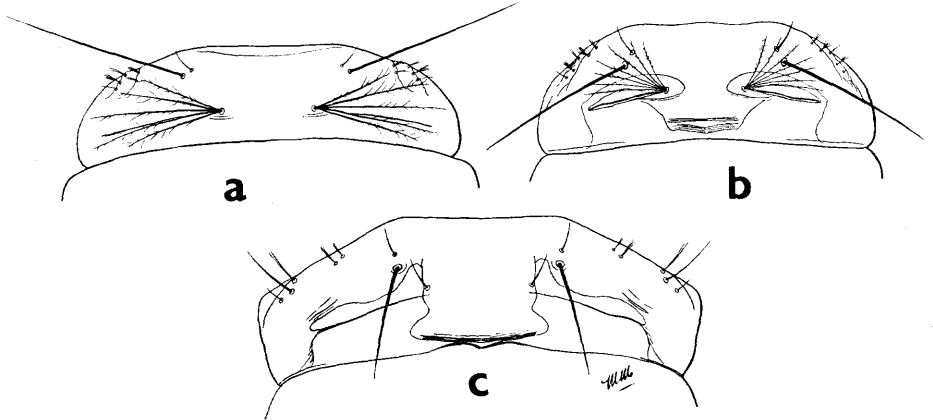


FIG. 160.—First abdominal segment of pupa in *Eretmapodites* spp. a. *quinquevittatus*. b. *oedipodius*. c. *dracaenae*.

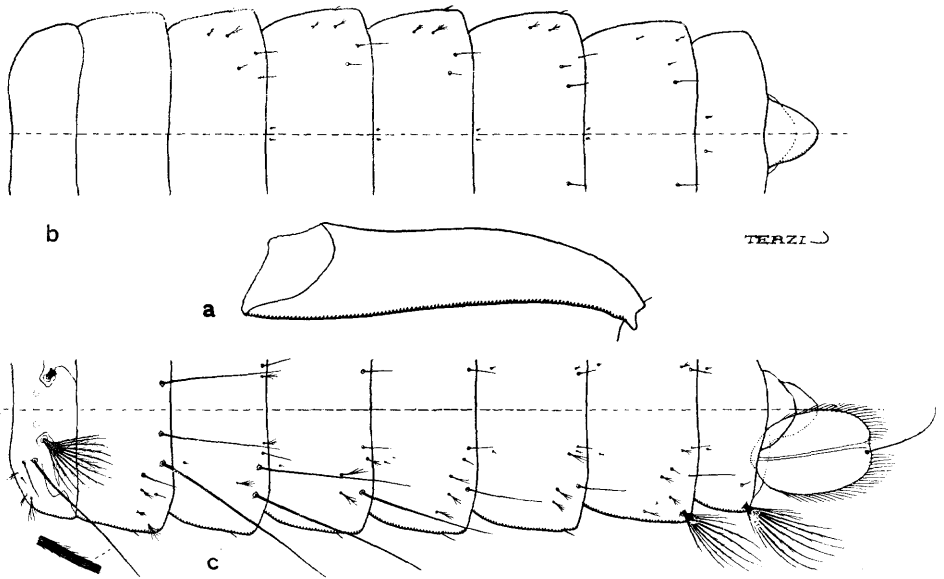


FIG. 161.—*Eretmapodites chrysogaster* Grah. a. Trumpet. b. Ventral and c, dorsal chaetotaxy. (After Macfie and Ingram.)

small and weak and usually more or less branched. II: B and C both very long, stout, single, black; remaining setae, including 1, all small and inconspicuous; seta 3 is present in addition to C¹, which lies above or external to B, so that there are 9 dorsal setae on this segment instead of 8. III: as on the previous segment two

of the setae are very long, stout, single and black, but these appear to be 1 and B, not B and C; C quite short and single; C¹ external to C; seta 3 represented by a socket only, as on succeeding segments. IV: B long, stout, single and black; 1 and C both small; C¹ close to margin external to C; V-VI: B variable in development according to the species; C¹ as IV. VII: A large, black, B small. VIII: A large, with plumose branches; A¹ small; median lobe bare. Paddles rather small, broad at base and tip, with long and almost continuous fringe; midrib strong, ending in an opening at tip of paddle; no external buttress; seta strong, often long and branched, and always well outside tip of midrib.

The float-hair is obsolete in some species, and even in those in which it is best developed it is never dendritic, but has plumose branches arising from the base.

E. chrysogaster Graham. (Fig. 161.)

This pupa was figured and rather fully described by Macfie and Ingram (1923). There is a slight error in their figure which needs correcting; on segment III setae C and C¹ are shown the wrong way round; the single seta C should be inside the branched C¹ and not *vice-versa*; also setae 5-II and 2-III are omitted from the figure. From a comparison of numerous pelts and whole pupae from Sierra Leone, Gold Coast and Uganda, I conclude that the following are the main diagnostic characters of the species:

Integument strong, without markings; the abdomen finely shagreened over nearly the whole surface; on each abdominal tergite II-VII, towards the posterior margin, is a pair of small roundish smooth areas of slightly thicker chitin (noted by Ingram and de Meillon as characteristic of this genus; but distinguishable in some other Culicine pupae).

Trumpet nearly four times as long as its width in the middle, moderately dark, but darker just before the pale tip; opening not very oblique, ratio of meatus to total length about 1:1.3. Dorsal seta rather stout. Float-hair strong and black, with about 10 branches. On II, C not very much shorter than B. Seta B: IV, black and somewhat longer than the succeeding segment; V-VII, not very dark and not or scarcely more than half as long as the segment. Seta A-VII and VIII, with about 6 (on VII sometimes fewer) strong plumose black branches and a few shorter simple ones; A-VIII nearly as long as the paddle. Paddles longer than X in ♂; seta single, about two-thirds as long as paddle or somewhat longer. Seta C¹ on most segments split into two or three.

E. intermedius Edw.

Some pelts of this species from Stanleyville, Belgian Congo (Schwetz) and Kasala, Uganda (*Fraser*) are very similar to *E. chrysogaster*, but have B-V-VII shorter, only about one-third as long as the segments, and in most cases split at the tips.

E. subsimplicipes Edw.

A rather damaged pupa from Mlanje, Nyasaland, is very similar to *E. chrysogaster* but the trumpet is rather shorter and thicker, with rather more oblique opening;

B-V-VII less than half as long as the segments and split into 2-3 branches; C¹ (where remaining) apparently single.

E. semisimplicipes Edw.

Three pelts from Lomami, Belgian Congo, are extremely similar to *E. chrysogaster*; the following differences may or may not prove to be constant: Trumpet darker (except at tip). C-II only about half or long as B. B-V-VII over half as long as segments and single as in *chrysogaster*, but black.

E. grahami Edw.

Two pelts from Stanleyville and one from Kampala have the main abdominal setae stouter than in the specimens of *E. chrysogaster* examined, B-V being distinctly longer than the segment, and the paddle-seta as long as the paddle. However three others from Kampala are quite similar to typical *chrysogaster*; whether this is due to variation or to error in determination cannot at present be decided.

E. sp. indet.

Bacot (1916) figured a pupal pelt of an *Eretmapodites* from Sierra Leone in which seta A-VII has only three branches and A-VIII is single. The other characters of this specimen are as in *E. chrysogaster*, and it may be an aberrant example of one of the species of this group.

E. silvestris I. and de M.

Two pupal pelts of this species were described and figured by Ingram and de Meillon (1927). These are now in the British Museum and may be re-diagnosed as follows:

Integument dark, especially on dorsum of thorax; shagreening of abdomen less regular than in *chrysogaster*, being finer towards sides and coarser towards base of each tergite. Trumpets shorter than in *chrysogaster*, opening oblique, ratio of meatus to whole 1:1.4. Dorsal seta rather stout. Abdomen:—I: float-hair represented by a small seta which is either single or double; K very strong, behind H as usual, subplumose (Ingram and de Meillon mistakenly thought seta K represented the float-hair). II: C not much shorter than B and a little longer than segment; C¹ simple. III: 1 and B equal, very stout, a little longer than segment. IV-VI: B black, as long as following segment or not much shorter. VII: A-3-6 branched. VIII: A large, longer than paddle, 6-9 branched. Paddles short, as broad as long, seta longer than paddle, single.

E. argyrurus Edw.

This was briefly described by Edwards (1929) as *E. inornatus* Newst. Four whole pupae from Lagos examined; in two the male terminalia of the adult are sufficiently developed for positive identification as *E. argyrurus*.

Integument paler than in *E. chrysogaster*. Trumpets much as in *E. quinquevittatus* or *silvestris*. Lower post-ocular seta strong, single and black (preserved in

one specimen only); dorsal seta not so stout as post-ocular. Postero-thoracic seta O rather small, P longer, but not so stout as abdominal setae. Abdomen: I: K stout as usual, but well outside instead of behind H; float-hair represented by a very stout seta (stouter than K), which is either single or split distally into two or three plumose branches. II-VI: all main setae similar in length and thickness, about as long as segments. VII: A 3-7 branched. VIII: A longer than paddles, 7-10 branched. Paddles rather small, longer than broad, but shorter than X in ♂; seta as long as paddle or somewhat longer, 3-7 branched.

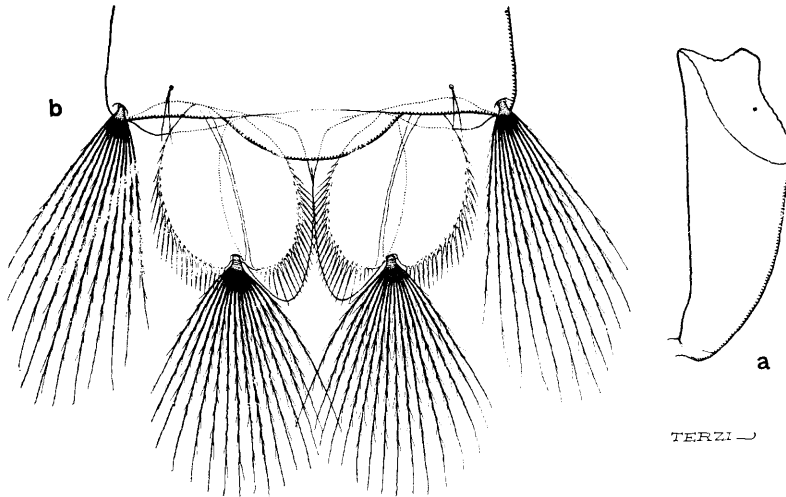


FIG. 162.—*Eretmapodites quinquevittatus* Theo. a. Trumpet. b. Tip of abdomen.

E. quinquevittatus Theo. (Figs. 160, a; 162.)

This pupa was figured and described by Bacot (1916) and Macfie and Ingram (1923); it differs not only from other species of this genus, but from all other known mosquito pupae in the small rounded paddles which bear a large tuft at their distal ends, longer than the paddle itself. The following diagnosis has been prepared from a comparison of five pelts from Sierra Leone.

Integument entirely pale, lacking the shagreen of *E. chrysogaster* and related species, and without the paired areas of stronger chitin on the abdominal tergites. Trumpets short and broad, opening more oblique than in *E. chrysogaster*. Lower post-ocular seta (not the median as suggested by Macfie and Ingram) long, stout, plumose and black, single in most cases examined but double in one (Macfie and Ingram mention 2-4 branches in Gold Coast specimens). Other post-ocular and all the antero-thoracic setae small, pale and inconspicuous. Dorsal seta single and well behind the trumpet as usual. Abdomen:—I: float-hair with only 4-7 sub-plumose branches; K well to one side instead of directly behind H; otherwise as in *chrysogaster*. II-VII: setae arranged much as in *chrysogaster*, but the long single ones weaker and none of them appreciably longer than the segments, though on the other hand B-V and VI are rather longer than in *chrysogaster*; C¹ single in all cases; A-VII with about ten plumose branches. VIII: A a very large tuft of 12-15 plumose

branches, some twice as long as the paddle ; A¹ single or double. X : longer than paddles in ♂, much shorter in ♀. Paddles very small and oval, seta forming a large tuft, much longer than the paddle, of 10-17 plumose black branches.

E. dracaenae Edw. (Fig. 160, c.)

The pupal paddles of this species were figured by Bacot (1916), and the species was included in Edwards' key (1929), but no description has been given. The following is based on five pelts from Sierra Leone, the Gold Coast and Uganda.

Integument dark, shagreened as in *E. chrysogaster*. Trumpets short and dark, opening oblique, ratio of meatus to whole about 1:1.4. Lower post-ocular seta longish and black, but simple and shorter than in *E. quinquevittatus*. Dorsal seta stout. Abdomen:—I: float-hair represented by a single small simple seta ; K long and black as usual and directly behind H. II-VII: stout black single setae as in the other species, but even those on II and III shorter than the segments ; B-V-VII only about one-third as long as segments ; smaller setae similarly arranged ; C¹ simple, as are most of the other small setae ; A-VII about as long as segment, with 2-6 (usually 4) branches. VIII: A shorter than paddles, with 4-9 branches. X: slightly shorter than paddles in ♂. Paddles smaller than in *E. chrysogaster* ; seta single, about half as long as paddle.

E. oedipodius Graham. (Fig. 160, b.)

This was briefly described by Edwards (1929) from several pelts from Stanleyville (subsp. *stanleyi*, n.) ; others from Uganda (subsp. *parvipluma*, n.) are quite similar. The pupa differs from others of the genus, except *E. leucopus*, in having seta 1 on segment II distinctly shorter and weaker than B ; also in the rather better development of seta C on most segments.

Integument rather dark ; abdomen uniformly shagreened. Trumpet very dark except at tip, over four times as long as its greatest breadth and slightly narrowed just before the tip ; opening very little oblique, ratio of meatus to whole about 1:1.1. Lower post-ocular seta long, strong and black, single ; one of the anterothoracic setae also rather strong and dark. Dorsal seta strong ; O and P similar, equal. Abdomen:—I: float-hair with 8-10 sub-plumose branches ; K below or external to H. II: C distinctly shorter than B as usual. III: 1 only about two-thirds as long as B and weaker ; C¹ usually bifid as it is on the remaining segments ; C fairly strong and dark. IV-VII: B not very stout, not or scarcely longer than the segments ; C dark, from one-third to half as long as B. VII: A with 2-7 (usually about 5) branches, C quite half as long as B. VIII: A with 2-7 branches, shorter than paddle. Paddles nearly twice as long as broad, truncate but not emarginate apically ; midrib strong, of even width to end of paddle ; seta single or with 2-4 (usually 2) branches, about two-thirds as long as paddle.

E. leucopus Graham.

A single pelt from Stanleyville shows very little difference from the series of *E. oedipodius* pupae examined. Setae B-II and III are stouter ; B-IV-VII rather longer, and C-III-VII rather shorter and less dark.

CULEX L.

The pupae of *Culex* can usually be distinguished from those of other genera of Culicine mosquitoes by the presence of a minute accessory seta situated beside the normal seta at the tip of the midrib of the paddle; this feature, which at best is sometimes difficult to appreciate, is not absolutely diagnostic because the accessory seta is absent in a few species of *Culex* with notched paddles (e.g. *nebulosus*, *moucheti*) and on the other hand it is present in one or two species of *Ficalbia*. Two other more obvious features characterize the large majority of *Culex* pupae, though again there are exceptions; the trumpets have a dark patch or band of tracheoid structure close to the base (varying in width in different species and often confined to the under-side of the trumpet); and setae A-VII and A-VIII, which usually form well-marked sub-plumose tufts, are placed well before the corners of the segments. The dorsal seta is usually if not always inserted well behind the bases of the trumpets, instead of between them as in most subgenera of *Aedes*. The paddles always have a smooth margin, without fringe or denticles.

Subgenus LUTZIA Theo.

I have examined pupae of three Oriental species in addition to the African *C. tigrripes*, and find the following characters to be common to all of them:

Trumpets short and broad, with large and very oblique opening; no true tracheoid area, but a dark patch beneath at base is marked by fine transverse ridges. Post-ocular and antero-thoracic setae all small. Dorsal seta small and single, equal to supra-alar. P, K, S and T all single and not very long. C-II a minute tuft. B-II-III single. B and C similar on segments IV-VII, with fairly numerous branches on IV and successively fewer on V-VI, usually single on VII, in no case longer than the segments. A far back from the corners on all segments, on II-VI minute, on VII and VIII forming the usual plumose tufts. The small lateral tubercle on the median projection of VIII normally bears a minute but usually fairly stout seta.* Paddles broad, notched at tip, normal seta short, accessory seta present but minute.

From this description it will be seen that there are no very obvious distinctions in the pupal stage from the subgenus *Culex*; perhaps the most definite is the position of the tiny seta A on III-VI far back from the corners of the segments, this seta being quite near the corners in those species of *Culex* (*Culex*) which I have studied carefully. Baisas (1938) has noted that seta C¹-III-VI is further from the margins of the segments in *Culex* (*Lutzia*) than in *Culex* (*Culex*).

C. (L.) tigrripes Grp. (Fig. 163.)

No description of this pupa has been published apart from the very brief one of Wesché (1910), but Baisas (1938) has indicated some of the characters of the Oriental species. *C. tigrripes* pupa should be readily distinguishable from other African species by the above subgeneric diagnosis and the accompanying figure. The notched paddle is unusual in *Culex*, but is found in a few other species (*nebulosus*, *cinereus*, *hancocki*, *musarum*).

* I cannot detect this seta on all specimens but have noted it in all species, in the same position as in the genus *Uranotaemia*. It has not been seen in other *Culex*, but may have been overlooked. Its presence in *Lutzia* was first pointed out to me by Miss M. Mackay.

Subgenus **NEOCULEX** Theo.

So few species of this subgenus have been examined in the pupal state that it would be premature to attempt a subgeneric diagnosis. There appears to be considerable variation in some important characters as between different species of the subgenus.

The pupa of the sub-genotype (*C. apicalis* Adams), as represented by Macedonian specimens in the British Museum, shows the following features: Trumpets long and slender, shaped much as in *C. macfieii* and *cinerellus*. Post-ocular and antero-thoracic setae all small. P double, not longer than O or R; K also double and only moderately

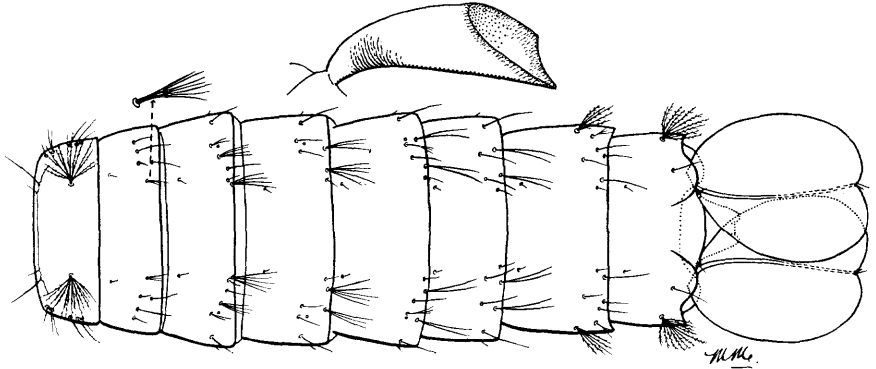


FIG. 163.—*Culex (Lutzia) tigripes* Grp. Pupal abdomen and trumpet.

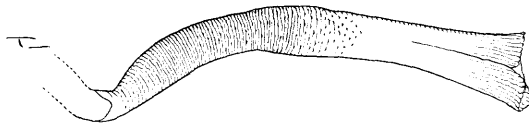


FIG. 164.—*Culex (Neoculex) rubinotus* Edw. Pupal trumpet.

long, but S very long and single, as is I-II. B-IV-VI very long, triple or double. A-VIII rather close to posterior corner of segment, again as in *C. macfieii*. Accessory paddle-seta present.

C. (N.) rubinotus Edw. (Fig. 164.)

Five pelts examined from Uganda. In the form of the trumpets and in some other respects this is one of the most distinct species of the genus.

Integument rather pale; leg-sheaths largely dark, but not at base. Trumpet long and slender, basal half dark and tracheoid, distal half mostly pale, but the tip dark and somewhat widened; aperture transverse, but with a narrow slit or furrow on one side extending back well into the pale part of the trumpet. Post-ocular and antero-thoracic setae all short. Dorsal seta with about 5 branches. P extremely long and single. K a small tuft with 4-6 branches; S very long and single (3 or 4 times as long as K), T shorter, with 3-5 branches. Seta I-II very long, single and rather stout, similar to S-I. C-II-VII forming well-marked tufts over half as long as segments, with progressively fewer branches, about 12 on II, 5 on VII. B-III

single, longer than segment, IV-V double or triple, longer than segments, VI double, about as long as segments. I-III-VI with about 5 branches. A-VII with about 3, A-VIII with 6 branches. Paddle entirely pale; midrib with tip enlarged; apparently only one seta present, this usually split into two almost to the base, but sometimes single.

C. (N.) sunyaniensis sp. n. (p. 263).

Several whole pupae from the type series examined, also three pelts (without associated adults, but apparently of the same species) from Coomassie, Ashanti.

Trumpets very long and slender, shaped much as in *C. apicalis* and *macfiei*. Dorsal seta long and double. P and K single and only moderately long (P double in one specimen), in mounted specimens each pale with a dark band near base. S and I-II very long and single. C-II a small dendritic tuft with short stout stem; C-III-V half as long as segments with about 5 branches; C-VI-VII double or single. B-IV-VI very long, reaching quite half-way across next segment but one, IV-V double, VI single. I-III-VI single. A-VII double or triple. A-VIII longer than usual and placed rather near corner of segment, with about 5 branches, longest reaching middle of paddle. Paddle nearly as broad as long, but rather pointed at tip (very unusual in *Culex*), normal seta longer and stronger than usual, twice as long as accessory seta, which is also present and somewhat longer than usual.

C. (N.) albiventris Edw.

Briefly described by Ingram and Macfie (1917) from a single specimen from Ashanti; there is one (perhaps the same) specimen, a whole pupa, in the British Museum. It may be distinguished from most other *Culex* by having the trumpets wholly very dark brown—an interesting point in view of the fact that the larva is also distinguished by its blackish siphon.

Integument dark, except paddles, which are rather pale and unmarked.

Trumpets long and narrow, but slightly and gradually widened from base to tip, aperture small but oblique, without slit-like prolongation; although the colour is uniform the sculpture of the surface is not, the basal third (except the extreme base) being tracheoid, followed by a nearly smooth area. All the cephalo-thoracic setae, including lower post-ocular, short. Seta I-II very long, single, rather stout. B-III single, rather short and stout. B-IV-V single, longer than the segments, VI also single, but rather shorter. C short and single on at least some segments. A-VII and A-VIII each with 6-8 branches. Paddle with tip of midrib enlarged; no seta visible.

C. (N.) horridus Edw.

Described by Ingram and Macfie (1917) from one pelt from Accra; three from Lagos agree with this one.

Integument mainly dark, without obvious markings. Trumpet almost entirely dark brown, slightly paler at tip, not very narrow, opening rather wide and oblique; the usual tracheoid band close to base. Lower post-ocular seta of moderate length but not conspicuous, double; all other cephalo-thoracic setae short. Dorsal seta

single. O fine and triple, P and R single but not very long. K, S and T all single, S somewhat longer than the other two. C-III-IV less than half as long as segments, with 3-5 branches, V-VII short and single. B-IV-VI double or triple and about as long as segments. I-II not very long; III-VII single. A-VII with 4-5, A-VIII with 5-7 branches. Paddles small, outer margin rather straight, no trace of accessory seta in any of the three specimens (Ingram and Macfie's phrase "paired terminal setae" refers to the seta being split into two); midrib not enlarged at tip.

Subgenus **MOCHTHOGENES** Edw.

Only one of the three African species now recognized has been examined in the pupal state. This agrees with the Oriental *C. (M.) castrensis* Edw. in having all the cephalo-thoracic setae inconspicuous; seta P double, K and S about equally long

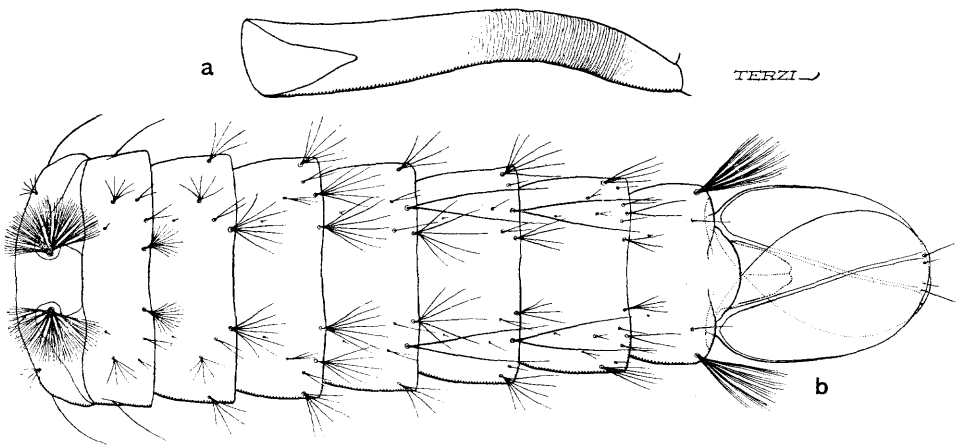


FIG. 165.—*Culex (Mochthogenes) inconspicuus* Theo. Pupal trumpet and abdomen. (After Macfie and Ingram.)

and single, T also single but shorter; paddle seta somewhat stronger than usual and accessory seta present. I have not seen the pupa of the subgenotype, *C. (M.) malayi* Leic.

C. (M.) inconspicuus Theo. (Fig. 165.)

The excellent figure given by Macfie and Ingram (1923) and reproduced here is self-explanatory, but the following additional points may be noted:

Integument mainly pale, but a dark cloud at base of wing-cases, and last two abdominal segments darker than the rest (a very unusual condition). Trumpet with the distal fourth as well as the tracheoid band darkened. Dorsal seta double.

Subgenus **CULICIOMYIA** Theo.

Wesché (1910) noted and figured the remarkably long double setae on the front of the thorax in *C. nebulosus* and *C. cinereus*, and Macfie and Ingram (1923) pointed out that these are the lower anterior setae of the antero-thoracic group. This is most unusual, for in all other known cases where one of the anterior setae is noticeably

elongate it is either the lower post-ocular or the lower posterior antero-thoracic. This peculiarity of the two species mentioned, however, is not diagnostic of the subgenus *Culiciomyia* as it is not shared by *C. macfiei* or *C. cinerellus*, nor by any of the Oriental species of which I have examined pupae. A noteworthy point about these long setae in the two African species is that they are subplumose, which is not the case with any of the cephalo-thoracic setae in any other Culicine pupa examined except *C. moucheti*.

C. (C.) nebulosus Theo.

No description has been published apart from that of Wesché (1910). Apart from the peculiarity of the long thoracic hairs, noted above, the following are the chief features of the pupa :

Trumpet very short and broad, without any obvious tracheoid area at base, and with very large opening which extends back nearly to middle of trumpet. Dorsal seta double. P single but not longer than O or R, if as long. K single, but not very long ; S single and longer, but not extremely long. C-II strongly dendritic ; C-III 4-6 branched, IV 2-4, V-VII single or double. B-IV-VII rather longer than segments and double, B-VII also double but shorter. A-VIII well back from corner. Paddles rather broad and distinctly notched at tip ; seta normal, usually single, but sometimes split distally ; accessory seta absent (in every one of ten good pupae or pelts examined).

C. (C.) cinereus Theo.

According to the figure given by Wesché (1910) the pupa of *C. cinereus* resembles that of *C. nebulosus*, but has the double setae on the front of the thorax even longer. I have seen no pupae which are unquestionably this species rather than *C. nebulosus*, so cannot point out any distinctions between the two.

C. (C.) cinerellus Edw.

According to the description by Evans (1929), the pupa of this species is much more like *C. macfiei* than *C. nebulosus*, but shows considerable difference in abdominal chaetotaxy.

Trumpets very long and slender, darker on the basal half, form as in *C. macfiei*. Cephalo-thoracic setae not described. C-III-IV with only 3-5 branches, but C-V-VII triple. B-III double, IV 4-branched, V-VII triple. A-VIII near corner of segment. Paddle slightly broader than in *macfiei* ; according to figure two equally minute setae are present at tip of midrib.

C. (C.) macfiei Edw. (Fig. 166).

The pupa, described by Macfie and Ingram (1923), is very different from that of *C. nebulosus*.

Trumpets very long and slender, entirely dark, with a broad tracheoid band near base. Antero-thoracic hair not specially long. P and K single, moderately long. S extremely long, single, resembling 1-II. C-III-IV with about 15 branches,

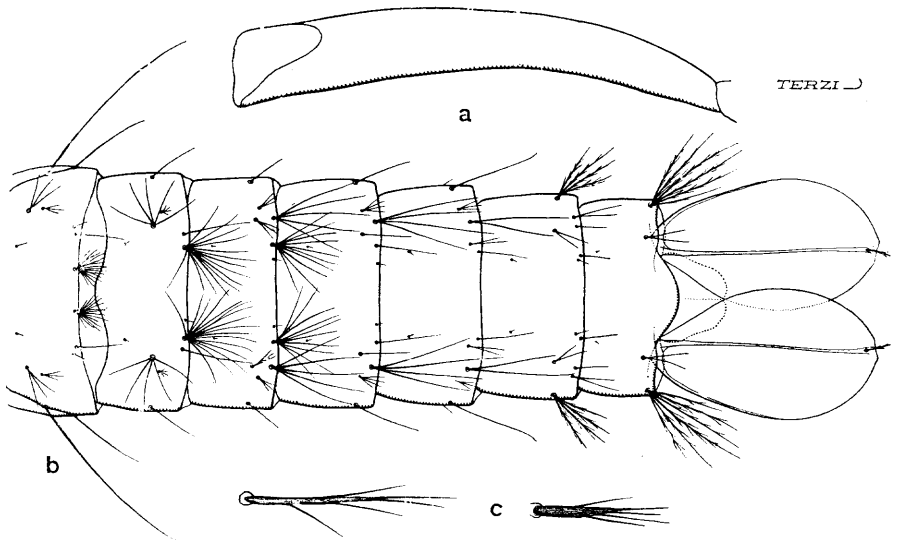


FIG. 166.—*Culex (Culiciomyia) macfieï* Edw. a. Trumpet (tracheoid area not shown). b. Abdomen. c. Variations in paddle-seta. (After Macfie and Ingram.)

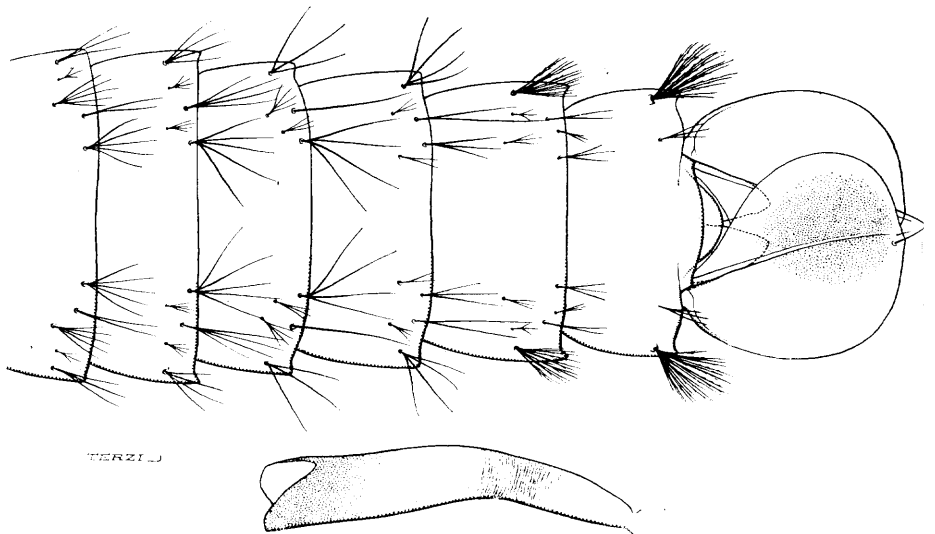


FIG. 167.—*Culex poecilipes* Theo. Pupal abdomen and trumpet. (After Macfie and Ingram.)

V-VII single. B-III single, IV-V with 4-5 branches, VI double. 1-III-VI single. A-VIII near corner of segment. Paddles long and rather narrow, rounded at end, seta small, split at tip; accessory seta absent in the single specimen examined.

Subgenus **CULEX** s. str.

Most of the more typical species of this subgenus have seta K double, S much longer than K and single, 1-II similar to S; in these respects they agree with *C. (Neoculex) apicalis*. The two groups into which the subgenus is divided on the adult character of the presence or absence of a lower mesepimeral bristle are more or less indicated also in the pupa, most of the species of the *bitaeniorhynchus* group having setae B-IV-VI somewhat shorter than the segments, while most of those in the *pipiens* group have these setae longer than the segments; in the former group pupae of the *bitaeniorhynchus* series differ from those of the *sitiens* series in the presence of dark areas on the paddles. The post-ocular and antero-thoracic setae are normally all small. Specific differences are mainly to be found in length and shape of trumpet and branching of setae 1, B and C on the various segments.

The two species of the subgenus which are most aberrant in larval structure (*C. hancocki* and *C. moucheti*) also have aberrant pupae.

C. (C.) poecilipes Theo. (Fig. 167.)

Described by Macfie and Ingram (1919) and also by Kirkpatrick (1925). The two features of partly infuscated paddles and triple setae 1 will together distinguish it from all other African *Culex* pupae.

Trumpets long and narrow, pale at base and beyond middle, dark at tip and on a rather broad tracheoid band; opening small. R weaker and shorter than O or P, but with several branches. S about twice as long as K, similar to 1-II. C-II very short, many-branched from near base. C-III-IV with about 8 branches, C-V with about 5, all nearly as long as segments. B-IV with 3-6 branches; B-V-VI double, as long as segments or somewhat longer (they are shown too short in the figure). 1-III-VI with 2-5 (usually 3) branches. A-VII with about 5, A-VIII with about 8 branches. Paddle with a large dark patch distal third to half, which includes tip of midrib and is mainly on inner part of paddle.

C. (C.) ethiopicus Edw. (p. 291). (Figs. 168, 169, b.)

Described by Ingram and Macfie (1919); six pelts from their series re-examined.

Trumpets rather short and much widened distally, opening large and oblique, ratio of meatus to whole 1 : 1.7; tracheoid area narrow and incomplete; tip not obviously dark. R only about half as long as O or P, weak and single or double. C-II longer than in *C. poecilipes* and simple or split into 2-3 branches at some distance from base. C-III with about 6 branches, but C-IV-VII only double or even single. B-IV-VI double and scarcely as long as segments. 1-II-IV single and rather short; 1-V-VI also single but much longer and rather stout. A-VII with about 4, A-VIII with about 6 branches. Paddle with a large infuscated area, chiefly on inner part of blade, where it extends almost to the base.

C. (C.) bitaeniorhynchus Gibs.

I have seen no African pupae of this species. Indian pupae of var. *ambiguus* resemble *C. ethiopicus* in many respects, but have 4-7 branches in C-III-V and 3 strong branches in B-IV-VI.

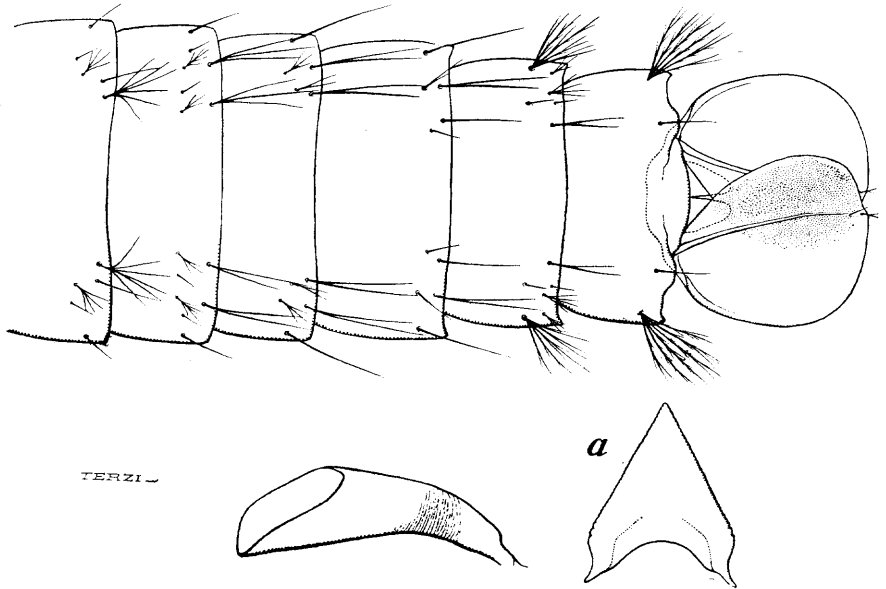


FIG. 168.—*Culex ethiopicus* Edw. Pupal abdomen and trumpet. a. Larval mentum. (After Macfie and Ingram.)

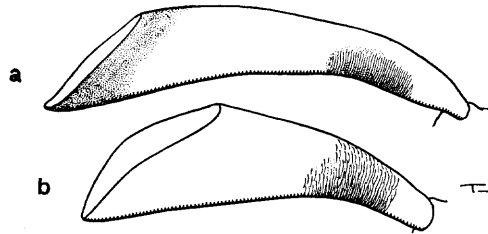


FIG. 169.—*Culex annulioris* Theo. (a) and *C. ethiopicus* Edw. b. Pupal trumpets. (After Macfie and Ingram.)

C. (C.) aurantapex Edw.

Described by Ingram and de Meillon (1927) from a single pelt from Zululand; confirmation of the identity of this is desirable, but the paedotype pelt from Nairobi is similar in most respects.

Trumpet longer than in *C. ethiopicus* (but not so long and narrow in the Nairobi pelt as figured for the Zululand specimen); tip darkened. Chaetotaxy resembling that of *C. ethiopicus* except that B-IV-VI are triple (B-VI double in Zululand specimen); A-VII 3-branched, A-VIII 4-branched. Infuscation of paddles much as in *ethiopicus*.

C. (C.) annulioris Theo. (Fig. 169, a.)

Described by Macfie and Ingram (1923) from specimens from Accra, and also by Ingram and de Meillon (1927) from South African material.

The pupal pelts examined do not show any obvious differences from *C. aurantapex*, the trumpets, paddles and chaetotaxy being the same in all the points noted.

C. (C.) sitiens Wied.

Pupae of this group of species (Fig. 128, b) all agree with those of the *bitaeniorhynchus* group in having setae B-IV-VI only moderately developed, at most very slightly longer than the segments (in contrast with most species of the *pipiens* group, which have these setae much longer); they differ in having no trace of infuscation on the paddles.

The pupae of *C. sitiens* do not appear to have been described, and I have seen no African material, but three pelts from Fiji show the following features:

Trumpet similar to that of *C. annulioris*. O a strong tuft of about 6 branches; P as long as O, 2-3 branched; R only half as long, weak, with 2-4 branches. K double as usual; S single, but not much longer than K; float-hair large, more highly branched than in *C. bitaeniorhynchus* and with large palm. C-II a short, many-branched dendritic tuft. C-III-IV with about 6 branches, C-V-VI with 3, all a little over half as long as segments. B-III-IV double or triple, rather shorter than segments; B-V-VI double, about equal to segments. I-II not very long, equal to S as usual; I-III-VI double. A-VII with 4-5, A-VIII with 10-12 branches of normal length.

A single damaged pelt from Sumatra, also determined as *C. sitiens* (though without associated adult), differs in some respects. It has the trumpet longer; seta I-II very much longer; I-III-VI with 3-4 (?) branches; B-IV with 5 branches.

C. (C.) thalassius Theo.

Described by Ingram and Macfie (1917); a series of pelts from the Gold Coast is in the British Museum.

In almost all respects the pupae of *C. thalassius* agree with the Fijian examples of *C. sitiens* described above; no distinctions likely to be of specific importance have been observed, unless they are that setae S and I-II are rather longer, and C-II rather less developed. Setae I-III-VI are usually double as in *C. sitiens*.

C. (C.) tritaeniorhynchus Giles.

Described by Ingram and Macfie (1917), also by Kirkpatrick (1925), and in more detail by Baisas (1938) under the name *C. summosus* Dyar. West African pelts examined fall in most respects well within the range of variation noted by Baisas. Many of the abdominal setae tend to be much more branched than in *C. sitiens* or *C. thalassius*, the chief distinctions of *C. tritaeniorhynchus* from the other two species being as follows:

Trumpet longer, more slender, with smaller opening, about five times as long as its greatest breadth. R as long as P or O. S and I-II much longer than K as usual. C-III-VII each with 6 or more branches (according to Baisas' table C-VI-VII

have only 1-5 branches in Philippine specimens). B-III double, but B-IV with about 6 branches, of same length as C (B-V-VI double and about equal to segments as in *sitiens*). 1-III-VI with about 5 branches. A-VII and A-VIII with about 5 and 7 branches respectively.

C. (C.) duttoni Theo. (Fig. 170.)

No description of the pupa of this species has been published apart from that of Wesché (1910). Two characters which, taken together, will distinguish it from

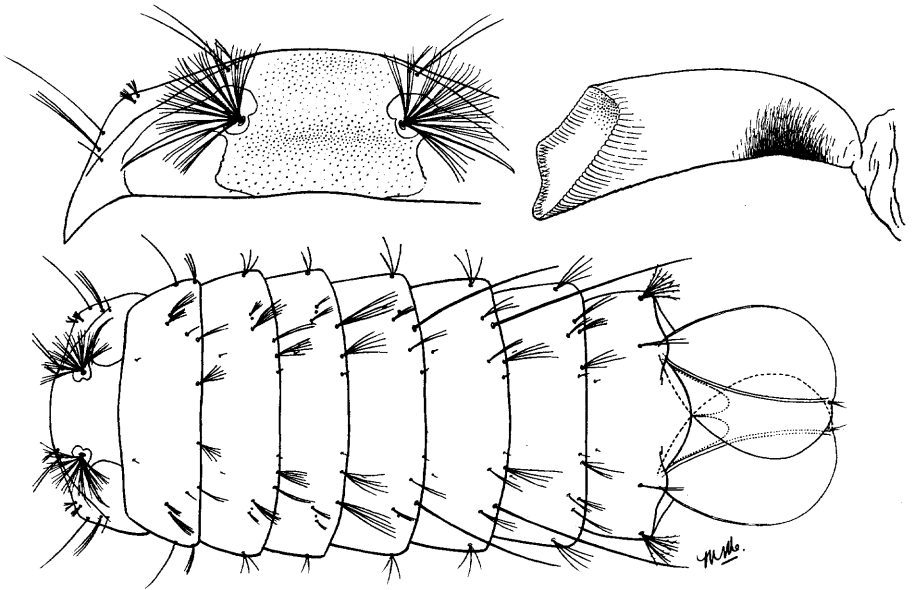


FIG. 170.—*Culex duttoni* Theo. Pupal abdomen (segment I enlarged) and trumpet.

most or all other African species of the genus are the shagreened thorax and the very long *single* setae B-V-VI; similar shagreening of the thorax is found in *C. pruina*.

Trumpets rather short and broad, similar in shape to those of *C. annulioris*. Dorsum of mesothorax behind trumpets, and middle part of metathorax densely shagreened with fine points; similar but less dense shagreening on first two abdominal segments. R as long and almost as strong as P. K double, S long and single as usual. C-II dendritic as usual, nearly half as long as segment, with short stem. C-III-IV with about 6, V-VI with about 3 branches. B-III double and rather short; B-IV with 5-6 branches, as long as segment; B-V-VI quite twice as long as segment, single, stout, often but apparently not always subplumose (an unusual condition, as already noted by Wesché). 1-III-IV single or double; 1-V-VI with 2-4 branches. A-VII with 2-5, A-VIII with about 10 branches. Paddle entirely pale; normal seta present and short as usual, but accessory seta absent (in all the nine specimens examined).

C. (C.) argenteopunctatus Ventr. (Fig. 170A.)

Not hitherto described. Three pelts examined from Bo, Sierra Leone (*Davey*). The pupa is well characterized by the great length of the trumpet and the form of seta C-II.

Integument very little darkened, without markings except that the tracheoid portion of the trumpet is rather dark. Trumpet long and slender, index about 15 (higher than in any other African *Culex*), ratio of meatus to whole about 1 : 1.07, basal $\frac{3}{8}$ tracheoid. No shagreen on thorax, O, P and R all rather short and with 3-5 branches. K also short and with 3-4 branches; S long and single. Slight shagreen but not reticulation on surface of I. C-II resembling B, both double or single and scarcely shorter than segment. B-IV-VI each double and nearly equal in length to two segments. C-III-VI delicate and rather short as usual, with 8-4 branches. A-VII-VIII pale, with 6-8 branches. Paddles normal, pale, both accessory and normal setae present.

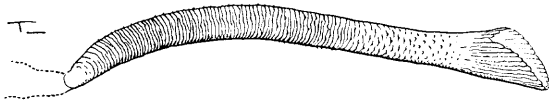


FIG. 170A.—*Culex argenteopunctatus* Ventr. Pupal trumpet.

C. (C.) theileri Theo.

Described by Kirkpatrick (1925) and also by de Meillon (1928); pelts in the British Museum from India and the Canary Is. agree fairly well with their account.

Trumpets rather short and wide, opening very oblique, reaching over one-third of the length of the trumpet; colouring as in *C. annulioris*. O and R with about 3 branches each, R not much the shorter. No shagreen on thorax. S much longer than K as usual. C-II with few dendritic branches on well-marked stem. C-III with 10-12 fine branches; C-IV-VI with 6-8. B-IV-VI each somewhat longer than the following segment (but not conspicuously so); B-IV with 3 (occasionally 4) branches, B-V and VI double, pubescent at the base. I-III-VI with 3-5 branches. A-VII with 4-5, A-VIII with 6-9 branches of the usual length. Paddles entirely pale, both normal and accessory setae present.

C. (C.) univittatus Theo.

Described by Kirkpatrick (1925) and also by de Meillon (1929) in comparison with *C. theileri*; pelts in the British Museum from Palestine and the Punjab agree.

C. univittatus pupa differs from most others of the *C. pipiens* group in having setae B and C on segments IV-VI almost equal in length, both being a little shorter than the segments, or at most of the same length; as usual B-IV has 3-4 branches, B-V and B-VI are double; C-IV-VI with 6-8 branches. In these and other respects the pupa of *C. univittatus* rather closely resembles that of *C. tritaeniorhynchus*, and I have not discovered any clear means of separating them.

C. (C.) simpsoni Theo.

Described by Ingram and de Meillon (1927) under the synonym *C. richteri*; some of their material is in the British Museum. Diagnostic features are:

Trumpets rather long, opening not very oblique, reaching at most one-quarter of the length of the trumpet (in one specimen much less), tracheoid area near base complete, broader than in many species. R as long and strong as O or P. B-IV with 4-5 branches, rather shorter than segment and similar to C. (which, however, has one or two more branches); B-V-VI double and much longer than the segments, reaching quite to middle of next segment but one. 1-III-VI with 3-5 branches. A-VII and A-VIII as usual with about 5 and about 7 branches respectively. Accessory paddle-hair present.

C. (C.) sinaiticus Kirkp.

Described and figured by Kirkpatrick (1925). The chief features mentioned are:

Trumpet about five times as long as broad. C-III-VI with 5-6 branches, the longest slightly less than length of segment. B-IV with 5 branches, about as long as segment. B-V-VI double, slightly plumose at base, fully $1\frac{1}{2}$ times as long as segment. 1-IV-VI with 4-6 branches. A-VII and A-VIII with about 5 and 7 branches respectively. Paddle-seta very minute.

C. (C.) laticinctus Edw.

Described and figured by Kirkpatrick (1925); three pelts from Palestine conform with this description.

Trumpets rather short, widened distally, opening oblique and more than one-third of the total length; tracheoid area short and incomplete. R, P and O equally long. S not very long. C-II branched almost from base. C-III-VII with only 3-5 branches, about two-thirds length of segment. B-IV-VI subplumose towards base; B-IV triple, about as long as segment or rather shorter; B-V-VI double, slightly longer than segments (Kirkpatrick says from $\frac{7}{8}$ to $1\frac{1}{4}$ times its length). 1-III-VI double or at most triple. A-VII with 3-5, A-VIII with 7-9 branches. Paddle entirely pale; seta rather longer than usual, single; no accessory seta present in any of the three pelts examined.

C. (C.) pipiens L.

Described by Kirkpatrick (1925). Specimens examined from Macedonia, Palestine and Britain are similar and show the following features:

Trumpet almost cylindrical or very little widened distally, at least 5 times as long as its greatest breadth; tracheoid area complete; tip somewhat darkened; opening oblique, nearly $\frac{1}{2}$ length of trumpet. No shagreen on thorax, and no obvious reticulation on segment I. O a strong tuft of 6-10 branches; P and R double or sometimes triple, all three equally long. Dorsal seta long, 4-branched. S and 1-II quite twice as long as K. C-II a small dendritic tuft with short, thick stem. C-III-VI with about 6-8 branches, about $\frac{2}{3}$ as long as segment. B-II-III short, double or sometimes single; B-IV with 2-5 branches, about equal to segment; B-V-VI

double, usually about $\frac{1}{3}$ longer than following segment, but may be only about as long. I-III-VI with about 4, A-VII with 5-7, A-VIII with 6-9 branches, about $\frac{1}{4}$ as long as paddle as usual. Accessory seta fully half as long as normal paddle-seta, which is almost $\frac{1}{3}$ as long as midrib.

Some pelts from Kampala, Uganda, have B-IV 5-branched, shorter than the segment (equal to C), B-V-VI scarcely longer than the segments.

C. (C.) *fatigans* Wied.

Described by Ingram and Macfie (1917).

The most obvious distinction from *C. pipiens* is in the form of the trumpet, which is shorter (at most four times as long as broad), more widened distally, and with larger opening which may extend to more than one-third of the length of the trumpet. This is another example of correlation between length of larval siphon and pupal trumpet, to which Baisas has called attention; a similar distinction is observed between *C. fatigans* and *C. pipiens* in the shorter larval siphon of the former.

The chaetotaxy of *C. fatigans* pupa is much the same as in *C. pipiens*.

C. (C.) *ninagongoensis* Edw.

Some damaged paratype pelts, one whole paratype pupa, and one good pelt from Ruwenzori examined.

Trumpet about 4-5 times as long as its greatest diameter, not much widened distally, opening not very large. Dorsal seta triple. O with about 6 branches; R single and longer than P. C-II with few branches (4-6) from about middle. C-III-IV with about 7 branches, C-V-VI with about 4, longest nearly equal to segments. B-IV triple, about as long as segment; B-V-VI double, $\frac{1}{3}$ - $\frac{1}{2}$ longer than segment; B-VII single or double, nearly as long as segment. I-III-VI double. A-VII with 2-4, A-VIII with 3-5 branches, $\frac{1}{3}$ as long as paddle. Paddle somewhat pointed at tip, but less so than in *C. tamsi*; accessory seta present.

C. (C.) *trifilatus* Edw. ssp. *aenescens* n. (p. 323).

Five pelts examined from Kameranjoka.

Trumpets long and slender, 6-8 times as long as their greatest breadth, very little widened apically, with small and not very oblique opening; tracheoid band near base short, but nearly complete. Dorsal seta double. O, P and R about equal in length; O a large tuft of about 10 branches. C-II as usual. C-III with 8-10, C-IV-VI with about 4-5 branches, the longest almost as long as segments. B-IV triple or sometimes double, slightly longer than segment (longer if double); B-V and VI double, reaching more than halfway across next segment but one. I-III double, I-IV-VI triple and longer. A-VII with 2-5, A-VIII with 5-9 branches of the usual length. Paddle with normal seta only, no accessory seta present in any of the five specimens; posterior margin rounded as usual.

C. (C.) tamsi Edw.

Four paratype pelts examined. The pupa differs in many respects from that of *C. triflatus*, to which the species seems most nearly allied by characters of the male terminalia.

Trumpets narrow at base, then much widened, about four times as long as their greatest diameter; opening oblique; ratio of meatus to whole about 1 : 1.4; base and tip dark, middle part yellowish. Dorsal seta double. O with about 5 branches, as long as P; R rather shorter and weaker. S not much longer than K. C-II much branched from base. C-III-VI with 4-6 branches, the longest about $\frac{3}{4}$ length of segments. B-IV-VI all double and reaching about halfway across next segment but one, but not very stout. I-III-VI double. A-VII with 4-5, A-VIII with 7-8 branches, about $\frac{1}{3}$ as long as paddle. Paddles much more pointed than usual in *Culex*, angle at tip of midrib only slightly obtuse (about 110°); accessory seta present.

C. (C.) andersoni Edw.

The pupal material available comprises three pelts (two with associated adults) from Mt. Elgon. The pupa is unusual in having setae B-IV-VI single, in this respect resembling *C. duttoni*, though it lacks the shagreen on the thorax.

Trumpets much as in *C. tamsi*. Dorsal seta long and single. O with 4-5 branches; R single or double, as long as P. C-II a small pencil of fine hairs, branched from base; C-III with about 6 very delicate branches, half as long as segment; C-IV-VI with 4-6 branches, two-thirds as long as segment. B-IV single or double, reaching halfway across VI; B-V-VI single, rather stout, reaching to posterior margin of VII and VIII respectively. I-III-VI double. A-VII with 3-4, A-VIII with 8-10 branches, nearly one-third as long as paddle. Both paddle-setae present and of normal length; posterior margin of paddle scarcely angled at midrib.

C. (C.) hopkinsi Edw.

Five pelts of the type series examined.

Trumpets longer and more slender than in *C. andersoni*, with opening smaller and less oblique; quite five times as long as their greatest diameter, ratio of meatus to whole about 1-1.2. Dorsal seta double. O, P and R all double and of about the same length (O 4-branched in one specimen). C-II with few (6-8) branches from near middle; C-III-VI each with 4-5 branches, not specially delicate. B-IV-VI either single or double, when double not quite so long as in *andersoni*. I-III-VI double. A-VII with 3-5, A-VIII with 5-7 branches, one-third as long as paddle. Paddle as in *andersoni*.

C. (C.) vansomereni Edw.

Six pelts of the typical form from Nairobi are described below; these are all associated with larval skins which have a complete ring of subapical spines on the siphon, the pecten with stout teeth extending beyond middle of siphon.

Trumpet rather wide, not much over four times as long as broad, with a small dark area beneath near base, but otherwise pale, tip not darkened. Dorsal seta

with 4-6 branches. O with about 6, R with about 3 branches, both as long as P. S less than twice as long as K. C-II branched from rather near base. C-III with about 8, C-IV-VI with about 4-6 branches, longest not much shorter than segments. B-IV with 3-5 branches, about as long as segment or somewhat shorter. B-V-VI double, as long as segments or slightly longer. B-VII double and about $\frac{2}{3}$ as long as VIII. 1-III-VI with 3-4 branches, longer on V and VI. A-VII with 3-5, A-VIII with 6-8 branches, nearly $\frac{1}{3}$ as long as paddle. Paddle as in *C. andersoni*.

Var. ? **draconis** Ingr. and de M.

The pupa of this form was described by Ingram and de Meillon (1927); three pelts from their series are in the British Museum. These show the following differences from typical *C. vansomereni*:

Trumpets somewhat longer, with a rather broad and complete dark ring at base, and also with the pinna darkened. Dorsal seta with 3-4 branches. B-VII usually single and about as long as VIII.

C. (C.) toroensis E. & G.

A single female pelt examined from Ruwenzori; the associated larval skin has no spines at the tip of the siphon.

Trumpet rather wide, about four times as long as its greatest breadth, with a rather broad dark band at base, chiefly beneath, pinna also dark; opening large, ratio of meatus to whole about 1-1.4. Dorsal seta long and double. O with about 4 branches, R single or double, both somewhat longer than P. C-II small, with few (4-6) branches from near base. C-III-IV with 7, C-V-VI with 4 branches, about as long as segments. B-IV-VI all double, a little longer than segments; B-VII single, somewhat shorter than segment. 1-III-VI triple or double. A-VII with 3 branches, A-VIII with 6-7, about $\frac{1}{4}$ as long as paddle. Paddle very obtusely pointed.

C. (C.) chorleyi sp. n. (330).

Five pelts examined, from Kampala and Masaka, Uganda. The pupa is quite distinct from those of *C. vansomereni* and related species, especially in its slender trumpets.

Trumpets slender and rather long, 6-8 times as long as their greatest breadth and very little widened distally; opening small; ratio of meatus to whole about 1 : 1.15; a moderately broad tracheoid band near base. Dorsal seta 4-branched, only about half as long as trumpet. O and R each with 2-3 branches, about as long as P. C-II branched from near base. C-III-IV with 7, C-V-VI with 5 branches, about $\frac{2}{3}$ length of segments. B-IV 4-branched, equal to segment; B-V-VI double, about $\frac{1}{4}$ longer than segments; B-VII double, half length of VIII. 1-III-VI with 3-4 branches. A-VII with about 5, A-VIII with about 8 branches, $\frac{1}{4}$ length of paddle. Paddle narrower than in many species of this group, oval in shape; accessory seta present and not much shorter than the normal one.

C. (C.) hancocki Edw. (Fig. 171, a.)

Four paratype pelts from Mt. Elgon examined. The pupa is very different from all others of the subgenus, though it resembles *C. moucheti* in the large tufts A-VII and A-VIII and in the deeply notched paddles without any seta; had not its identity been established by isolation it could hardly have been recognized as a true *Culex*.

Trumpets short, widened distally, with large, very oblique opening, ratio of meatus to whole about 1 : 1.7; colour mainly dark; a small tracheoid area at base beneath. Anterior setae not more conspicuous than usual. Dorsal seta single.

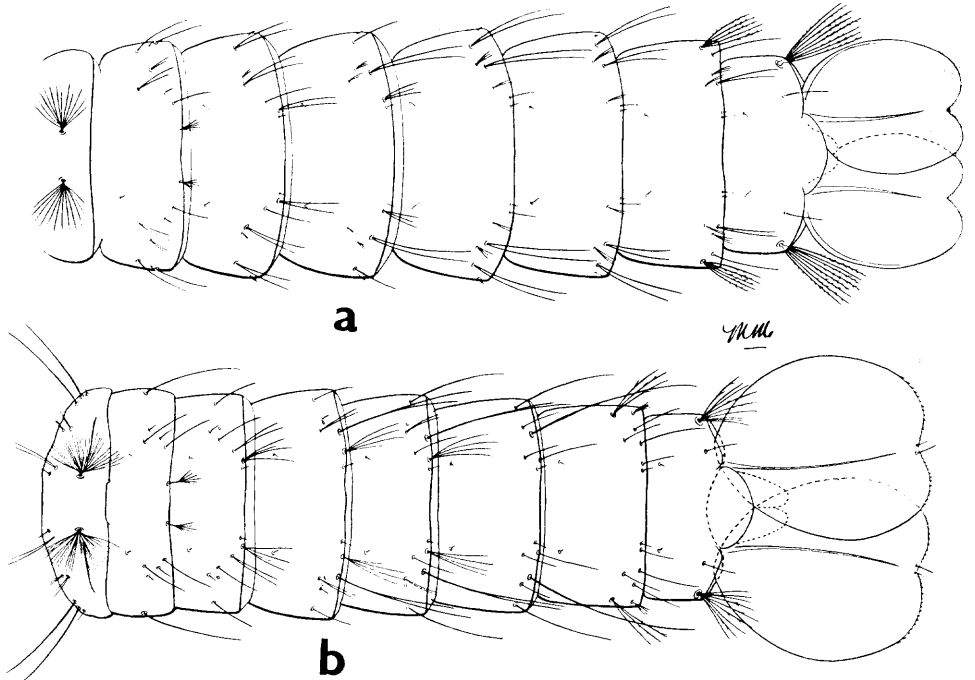


FIG. 171.—*Culex hancocki* Edw. (a) and *C. musarum* Edw. b. Pupal abdomen.

O with about 3 branches, rather shorter than P or R, which are both single. Float-hair rather smaller than usual. H (or K?) long and single, black; K (or H?) quite short, single, placed close to L and M; S and T both single but weaker and rather shorter than H. C-II a small sub-dendritic tuft, branched from near base. C-III single or double, placed almost directly behind B, which is single. C-IV with 1-3 branches, C-V-VI single, considerably shorter than segments. B-IV-VII double, about as long as segments or somewhat shorter. 1-III-VI double. A-VII with 2-5, A-VIII with 7-9 branches which are plumose but (contrary to the rule in this subgenus) few or none of them are split distally; both tufts strong and black and about $\frac{2}{3}$ length of paddle. Paddle rather short, but broad, deeply notched at tip of midrib, and without any trace of either the normal or accessory setae; margin quite smooth; midrib faint for its distal fourth.

C. (C.) musarum Edw. (Fig. 171, b.)

Five pelts examined from Fort Portal, Uganda. The pupa shows few of the peculiarities of *C. hancocki*, except that the paddles are slightly notched at tip. The very long single setae B-VI (B-V being double) are diagnostic.

Trumpet of moderate length, rather slender and dark on nearly the basal half, wide and pale on distal half; opening very oblique, ratio of meatus to whole 1 : 1.7; tip distinctly notched. Dorsal seta single and long. O 4-branched, P and R single, all about the same length. Segment I with normal sized float-hair and normal arrangement of other setae, H being short and close to K, which is single or double; S and T both single, not much longer than K. C-II a dendritic tuft with longish stem. C-III-V each with about 4 branches, about $\frac{2}{3}$ as long as segments; C-VI single or double. B-IV-V double, reaching beyond middle of next segment but one; B-VI single, reaching to end of VIII; B-VII single, about as long as segment. I-III-VI single or double. A-VII with 3-5, A-VIII with 7-11 branches, one third as long as paddle. Paddle broad, slightly notched at tip; margin with minute denticles (an unusual feature in *Culex*); midrib distinct practically to tip; both normal and accessory setae present but very short (almost equally so).

C. (C.) antennatus Beck.

Described by Kirkpatrick (1925) under the synonym *C. laurenti* Newst. Sixteen pelts from Kampala agree with this description, to which some details are added below.

Trumpet scarcely five times as long as its greatest breadth, stoutish even at base, opening moderately large but rather variable, ratio of meatus to whole 1 : 1.3-1.4; base and tip dark. No shagreen on thorax or abdomen; median area of segment I reticulate. Dorsal seta 6-branched. O, P and R with about 10, 2 and 5 branches respectively, O rather shorter than the others. C-II much branched from near base. C-III-VI with 7-10 branches, nearly as long as segments. B-IV with 5-6 branches, a little shorter than segment; B-V-VI double, slightly longer than segment. I-III-VI with about 5 branches. A-VII with 4-6, A-VIII with 7-10 branches, scarcely $\frac{1}{3}$ as long as paddle. Paddle rather narrow, rounded at tip, normal and accessory setae short and subequal.

C. (C.) decens Theo. and **C. (C.) invidiosus** Theo. (Fig. 172, b.)

Described in full detail by Macfie and Ingram (1920), who found no constant differences between them. The characters are almost the same as in *C. antennatus*, the only distinctions I have been able to find being in the length of setae B-V-VI, which extend about to the middle of VII and VIII in *C. decens* and *invidiosus*, but not much beyond VI and VII in *antennatus*; and in the smaller average number of branches in certain setae in the present species (O : 5-8; I-III-V : 2-5).

C. (C.) guiarti Bl.

Described by Ingram and Macfie (1917); three pelts from Kampala agree.

The most obvious distinctions from *C. decens* are in the form of the trumpets,

which are longer and narrower, with smaller opening; and in the form of seta C-II, which has only about 4-6 branches from near the middle, instead of 10 or more branches from close to the base.

C. (C.) ingrami Edw. (Fig. 172, a.)

Described by Macfie and Ingram (1923) from a single specimen (no longer available).

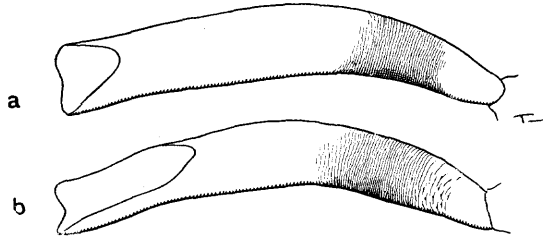


FIG. 172.—*Culex ingrami* Edw. (a) and *C. decens* Theo. b. Pupal trumpets. (After Macfie and Ingram.)

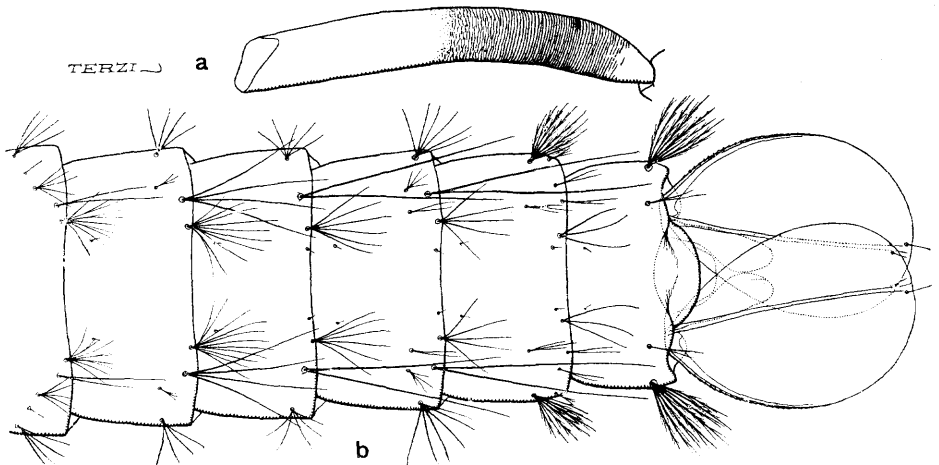


FIG. 173.—*Culex grahami* Theo. a. Trumpet. b. Abdomen. (After Macfie and Ingram.)

According to this description the pupa closely resembles those of *C. decens* and *C. guiariti*, differing in having setae B-V-VI only a little longer than the segment. The trumpet is about as in *C. guiariti*.

C. (C.) grahami Theo. (Fig. 173.)

Described by Macfie and Ingram (1923) from Gold Coast specimens. One of their pelts is still available, in addition to ten pelts from Uganda. The long trumpet with its nearly transverse aperture will distinguish the pupa from most other *Culex*. (It is noteworthy that the larva is also distinguished by its very long siphon.)

Trumpet long and cylindrical, at least seven times as long as broad (index 7 in Gold Coast specimen, but considerably greater, 10-12, in all the Uganda specimens); a rather broad tracheoid band near base, but the dark area usually shorter than shown in figure (less than half the trumpet even in the Gold Coast specimen); opening at most one-tenth the total length. No shagreen, but segment I reticulate as in *decens* and *antennatus*. O, P and R each with 1-2 branches (R sometimes triple), O shorter than P. C-II longer and darker than usual, split from near middle into 3-6 branches. C-III-IV with about 10, V-VI with about 6 branches. B-IV 4-branched, slightly longer than segment; B-V-VI double, reaching to middle of VII-VIII. 1-III-VI with 4-6 branches. A-VII with 4-6, A-VIII with 8-11 branches, about $\frac{1}{4}$ - $\frac{1}{3}$ as long as paddle. Paddle broadly oval; midrib with pocket-like enlargement at tip; only one seta visible in any of the specimens examined, this very short (shorter than terminal seta in figure) and often sunk in the pocket.

C. (C.) *pruina* Theo.

Five whole pupae examined from Sunyani, Gold Coast; identity established by dissecting male terminalia from one of them. The extensive shagreening of thorax and abdomen is much as in *duttoni*, but the abdominal setae are different, the condition of setae K and S being diagnostic.

Trumpet rather pale, curved and with a small dark patch at base beneath; tip notched; ratio of meatus to whole about 1 : 1.4. Dorsal seta with about 4 branches. Dorsum of thorax between and behind trumpets with fine dense shagreen; coarser shagreen on metathorax and on whole of segment I except the membranous areas; fine shagreen also covers much of segment II. O and R each with 4-5 branches, P rather longer and double. K, S and T all about the same length and each with 4-5 branches. Float-hair large. C-II a dense dendritic tuft, branched from base, about half as long as segment. B-II-III with 3-4 branches half as long as segments; B-IV triple, V-VI double, about as long as segments or slightly longer. 1-III-VI with 2-3 branches. A-VII with 4-5, A-VIII with 10-12 branches, plumose from middle and $\frac{1}{4}$ as long as paddle. Paddle broad, very obtusely pointed; midrib and buttress dark; terminal seta small, double; no accessory seta.

C. (C.) *philipi* Edw.

Four pelts examined from Takoradi, Gold Coast. There are no very striking features, but the condition of seta K and the shortness of B-IV-VI are noteworthy.

Trumpet much as in *C. pruina*. Dorsal seta with about 6 branches. Slight shagreening present in middle of metathorax and segment I, but none on mesothorax. O, P and R each 2-4 branched, none very long, P even slightly shorter than the others. K 4-branched; S long and single as usual. C-II short, rather strongly dendritic from base. C-III-IV with about 6, V-VI with about 4 branches, only half as long as segments. B-IV-VI double or single, all somewhat shorter than segments. 1-III-VI usually 3-branched, short. A-VII with 4-5, A-VIII with 5-8 branches, scarcely $\frac{1}{4}$ as long as paddle. Paddle broad, rounded at tip; terminal seta small.

C. (C.) moucheti Evans. (Fig. 174.)

Described and figured by Edwards (1929) from Congo material; Nigerian and Uganda specimens are similar. The pupa is almost totally different from those of all other *Culex*.

Anterior cephalothoracic setae unusually developed, two of the post-ocular, the lower-anterior and the lower-posterior antero-thoracic all forming large tufts with many sub-plumose branches. Trumpets rather short, with remarkably large opening which extends to about $\frac{3}{4}$ of its total length; no tracheoid area at base beneath.

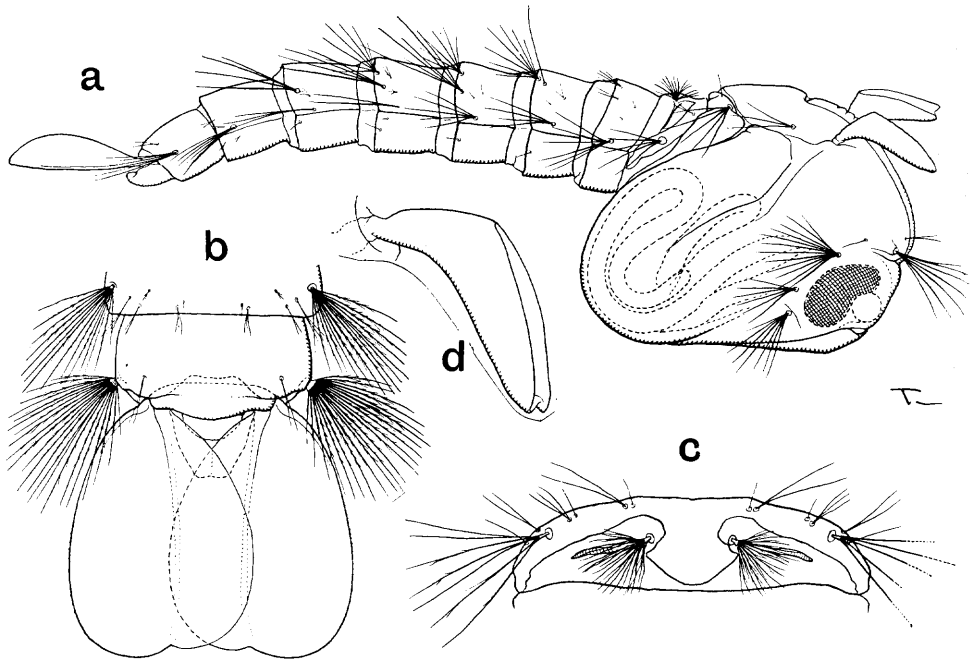


FIG. 174.—*Culex moucheti* Evans. a. Side view of whole pupa. b. Tip of abdomen with paddles. c. First abdominal segment. d. Trumpet.

Supra-alar seta rather long, 2-3 branched, but dorsal seta very small and inconspicuous, single or double, and scarcely half as long as supra-alar. No shagreen on thorax. O and P both very short, O a small tuft branched from base, P stouter, frayed distally; R a large tuft of 10 or more long plumose branches. Segment I reticulate with the setae except S normal in form and position; K double; S rather further from the side than usual, forming a large tuft of 6 or more branches; T short; float-hair stouter than usual. C-II forming the usual small dendritic tuft. C-III-IV with 10-15, C-V-VI with 5-8 branches of various lengths, the longest nearly as long as segments. B-IV-VI with 4-6 branches which are sub-plumose and longer than the segments. 1-III-VI with 3-5 branches which are at least as long as the segments and on IV and V are longer and stouter than the branches of A-VII. A-VII and A-VIII forming large tufts with about 12 and 16 branches, half as long as paddles. All the main thoracic and abdominal setae are black; the smaller ones, including B and C-VII, are pale and inconspicuous. Paddles large, broad, somewhat notched at tip, without setae.

III. CORRIGENDA AND ADDENDA

PART I.

The only important textual corrections are :

p. 8, line 18, for "Collart" read "Curran."

p. 174, line 4, for "all" read "most of."

Owing to the discovery of the composite nature of several forms which were treated as species until 1936, but are now divided, some alterations have become necessary in the nomenclature of the larvae described by Hopkins. These are indicated below, and diagnoses are added of a few larvae which have been discovered recently.

Uranotaenia fusca Theobald (**inornata** Theobald).

As *inornata* is now found to be a synonym of *fusca*, differences in the number of pecten scales are presumably due to individual variation, as suspected by Hopkins.

Uranotaenia mashonaensis Theobald.

The description was based on specimens from Toro, Uganda ; adults reared from these larvae are not now available, but were probably true *mashonaensis*. Schwetz's record refers to *nigromaculatus*, which also occurs in Uganda. Further information is needed to ascertain whether there is any difference in the breeding-places used by the two species.

Aedes (Finlaya) longipalpis Grünberg.

According to C. B. Symes (*in litt.*, 9.xi.38) the description given by Hopkins under this name was made from larvae of *A. fulgens* and not of *A. longipalpis*.

The British Museum possesses a series of whole larvae from Lagos (the type locality) and larval skins from Ibadan, Nigeria, of the true *longipalpis*. These agree in most respects with *fulgens* as described by Hopkins, but show the following well-marked differences :

Head.—Seta A simple and about as long as B ; C rather shorter and more slender than B instead of longer ; *d* placed inside and almost in transverse line with B.

Abdomen.—Siphon shorter, index 2 or less. Spines on margin of saddle much stronger than shown in figure, almost as strong as the pecten-spines though rather shorter. Pecten-teeth with pale tips and thus at first sight appearing blunt.

Aedes (Finlaya) pulchrithorax Edwards. (Fig. 175).

Larva described by MacDonald (1939). Fourteen paratype pelts in the British Museum differ in some respects from the original description ; the modified description below has been prepared from them.

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The larva is very readily distinguished from others of the genus *Aedes* by the following combination of characters: Antenna slender and very scantily spiculate; head-seta B very long and single, C double; pecten without detached teeth and comb with about 25 spines in a patch.

Length 5–6 mm. Head and siphon dark brown.

Head broader than long. Antenna long and unusually slender, uniformly dark; spicules very few, chiefly towards base; tuft usually represented by a single seta, sometimes double, position varying from just beyond middle to about $\frac{2}{3}$. Seta A shorter than antenna, with 4–6 branches; B very long (longer than whole head and about twice as long as antenna), single and slender; C usually double and rather shorter than antenna, sometimes single and then longer, placed a little inside and not far behind B; *d* very small, with several branches, well inside and behind B, the three bases forming a slightly scalene triangle (the plumosity of setae A, B and C noted in the original description is not visible in the balsam mounts). Mentum with about 13 teeth on each side, the outer 3–4 very much more widely spaced.

Abdomen.—Comb a small patch of about 25 long sharp-pointed teeth. Siphonal index about 2.5–3. Pecten composed of 20–25 close-set and regularly-spaced spines, reaching somewhat beyond middle of siphon; spines of moderate length, tips not pale, usually two strong basal denticles on each spine with sometimes a third smaller denticle. Subventral tuft just beyond end of pecten, of 4–5 branches. Saddle large, but widely interrupted ventrally as usual, with only a few minute denticles on its posterior margin; lateral seta of 4–6 branches, much shorter than saddle. Caudal setae as in related species. Gills moderately stout but rather sharply pointed; upper pair almost twice as long as saddle, lower pair $\frac{2}{3}$ as long as upper.

Breeding-places.—Tree-holes.

***Aedes* (*Aëdimorphus*) *phyllolabis* Edwards. (Fig. 176).**

The larva described by Ingram and Macfie as that of *minutus* and by Hopkins as probably *phyllolabis* remains of uncertain identity, but it now seems to be not unlikely that it may be a slight variation of *albocephalus*. The true larva of *A. phyllolabis* has been isolated by Teesdale and proves to be a remarkably distinct one; it is described below from a series of 18 pelts.

The remarkable pecten, with long pale teeth extending three-fourths of the length of the rather long siphon sufficiently distinguishes this larva from those of all other African *Aedes*. By Hopkins's key it would run to *A. hopkinsi*—a very different larva.

Head about as broad as long, mostly pale except towards neck. Antenna shorter than head, moderately stout and tapering, entirely pale and coarsely spiculate; tuft of about 5 branches placed at or just before middle of shaft; one of the subapical bristles long and rather stout, the other scarcely one-third as long; apical bristle also long. Setae A, B, C and *d* in a slightly curved line, the last three about equidistant; A with 8–12, B and C each with 5–7 plumose branches, all of much the same length and shorter than antenna; *d* very small as usual, with several irregular branches. Mentum with about 15 teeth on each side of the larger median tooth, mostly close-set.

Abdomen.—Comb a patch of about 50–60 scales which are longer than broad, and

evenly fringed all round. Siphon pale except for the narrow basal ring, evenly tapering; index 4; tracheae filling siphon. Pecten composed of unusually large spines and extending about $\frac{3}{4}$ length of siphon or even more; all spines pale, rather evenly spaced, and 35-40 in number; basal spines small as usual, but the rest long

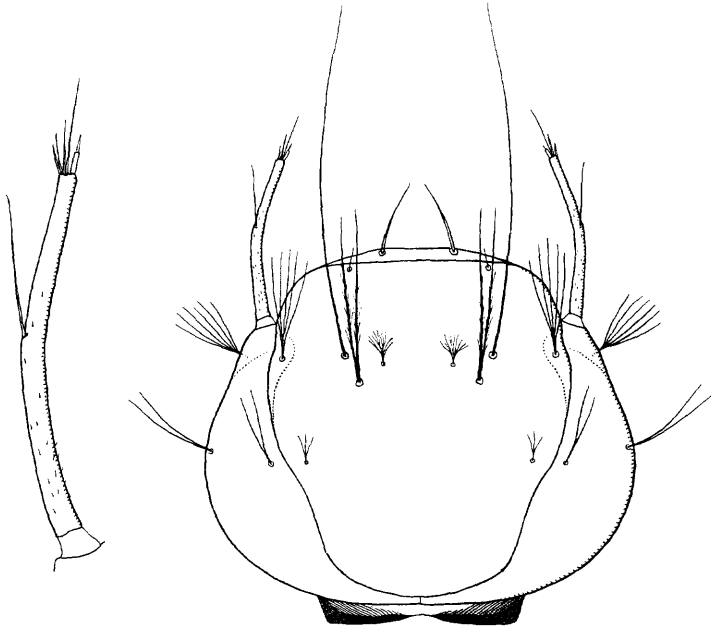


FIG. 175.—*Aedes pulchrithorax* Edw. Larval head, with antenna enlarged.

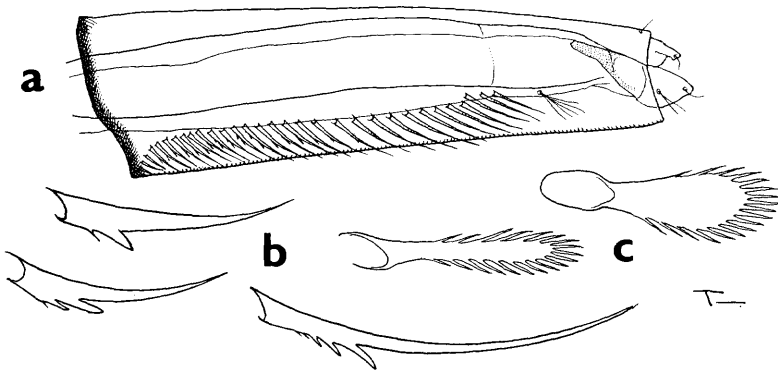


FIG. 176.—*Aedes phyllolabis* Edw. Larval details. a. Siphon. b. Pecten teeth. c. Comb scales.

and sharp-pointed; about the first 25 teeth have a rather long denticle near middle and one or two smaller ones towards base; remaining spines mostly or all simple, curved, except last one which is straight. Subventral tuft just beyond, but internal to the last pecten-spine, 5-6 branched, about half as long as diameter of siphon. Saddle large, distal margin not obviously spiculate. Upper caudal seta with about 6 branches, half as long as the single lower caudal seta. Lateral seta small and

single. Ventral brush composed of about 6 pairs of tufts, with sometimes one unpaired tuft outside the barred area. Gills long, slender, sharp-pointed, about three times as long as saddle.

Breeding-place.—Rock pool in dense forest shade.

Aëdes (Aëdimorphus) wigglesworthi sp. n. (See p. 182 of this volume.)

This larva was described by Wigglesworth as that of *A. abnormalis* and redescribed by Hopkins (p. 141) as *abnormalis* var.

Aëdes (Aëdimorphus) abnormalis Theo.

Five paratype pelts of the subspecies *kabwachensis* are very similar to those of *A. wigglesworthi* or *alboventralis* as described by Hopkins, but differ from one or other of them in the points noted below. As in *abnormalis* and *alboventralis* both the subterminal setae of the antenna are long and equal in length to the terminal seta—a point which will distinguish these larvae from many or most others of the genus.

Antenna not much longer than head, therefore resembling *alboventralis* more than *wigglesworthi*, but still more infuscated, with less than the proximal fourth pale; tuft at or only slightly beyond middle. Setae B and C longer than in *wigglesworthi*, reaching a little beyond front edge of clypeus. Mentum with 12–14 teeth on each side of the median tooth. Siphon with tip rather narrower; last two (simple) pecten spines more widely spaced; subventral tuft (when traceable at all) nearer to last pecten spine than to tip of siphon.

Breeding-place.—Rock pool in dense shade, in company with *phyllolabis* and *tarsalis*.

Eretmapodites oedipodius Gr.

Hopkins's description and figure of the larva refers to the new subspecies *parvipluma*.

Culex (Neoculex) sunyaniensis sp. n. (See p. 263).

The figure reproduced by Hopkins as *C. rima* var. *insignis* is that of the larva of the form now distinguished as *C. sunyaniensis*, but the description, if made from Uganda specimens, most probably refers to the true *C. insignis*. It remains to be shown whether there is any appreciable difference between the larvae of these two forms and others of the *rima* group.

Culex (Neoculex) albiventris Edw.

The figure and description of the larva refer to the true *C. albiventris*, but the breeding-places noted partly concern other species. Aders' record refers to *C. adersianus* and Hancock's to *C. acrostichalis*.

Culex (Culex) argenteopunctatus Ventr., ssp. **kingi** Theo. (Fig. 177).

The very distinctive larva of this species was found by Dr. T. H. Davey at Bo, Sierra Leone, in May, 1940. It is described below from four perfect pelts sent by

Dr. Davey. By Hopkins's key it would run to *C. grahami*, differing in the long, single, sublateral setae and pectinate pecten-teeth of siphon.

Head not very dark. Antennae blackened from just before the tuft; subterminal bristles close to tip, equal in length to the longer of the two terminal bristles, and about two-thirds as long as the whole antenna. Setae A, B and C plumose as usual, A 7-branched, B and C 2-branched (B single in one specimen). Mentum with the sublateral teeth unusually prominent.

Abdomen.—Long lateral setae mostly double. Comb a patch of about 15 spines with delicate fringe on basal half. Siphon with index rather variable, 8–12; it is

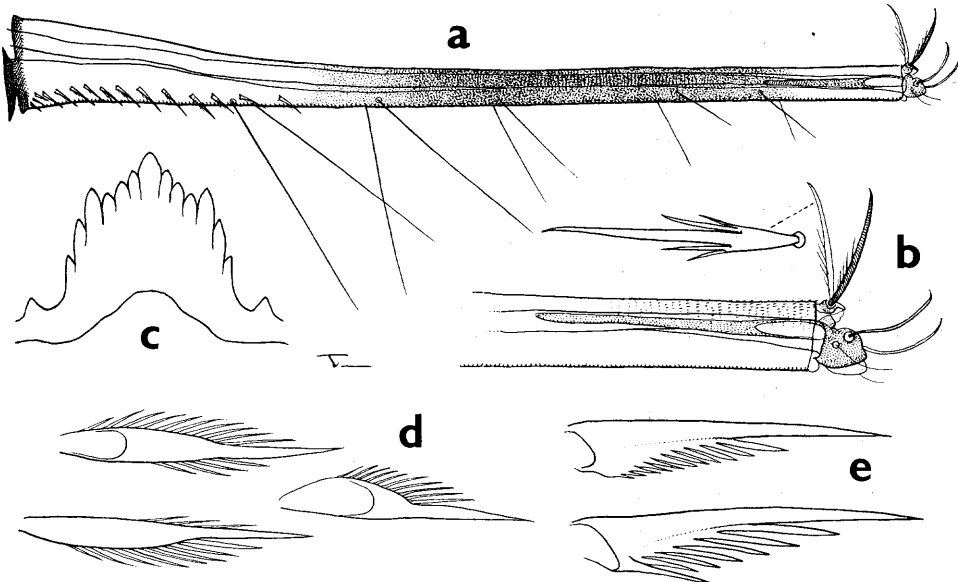


FIG. 177.—*Culex argenteopunctatus* Ventr. Larval details. a. Siphon. b. Tip of siphon enlarged. c. Mentum. d. Comb spines. e. Pecten teeth.

fairly stout on the basal fourth but has the distal $\frac{2}{3}$ or more very slender and almost parallel-sided; colour pale at base and tip but remainder very dark; spine on dorsal valves unusually long and stout, with several short branches towards base; ventral valves with the hook rather long and strong; pecten hardly reaching beyond $\frac{1}{3}$ of siphon, composed of 10–15 teeth which each have about 6–8 small fine denticles extending most of their length; subventral setae all single, not tufted, the first two pairs very long, other two or three pairs short. Anal segment short, saddle normal, uppercaudal seta double, lateral seta short, single or double; about 6 tufts in the ventral brush. Gills missing in pelts examined.

Breeding-place.—Ground pools, in company with *Anopheles brunnipes*.

Culex (*Culex*) *chorleyi* sp. n. (p. 330).

The larva described and figured by Hopkins (pp. 208–10) as *C. pallidocephalus* is that of *chorleyi*. No larvae are at present available of the related *C. zombaensis*.

Culex (Culex) toroensis Edwards and Gibbins.

This is the species whose larva was described by Hopkins (p. 210) as "*Culex* sp. indet." The identity of the larva and the small distinctions in the adult stage from *C. vansomereni* have already been mentioned in this volume.

Hopkins noted variability in the number of dorsal spines on the siphon, the Mihunga (Ruwenzori) specimens in the original series having 14-18 such spines and the Bugishu specimen only 7. It now appears that the variability is still greater than this, and affects the shape of the siphon as well as the number of spines; moreover it is individual and not local variation. In the series from Kisomoro collected by Shillito and examined by Hopkins, some larvae were almost or quite typical of the form described by Hopkins; others had the dorsal row of spines represented by a single spine; others again had no dorsal spines (but 1-2 ventral spines as in the rest). Six pelts sent by MacDonald from Katamayo show the dorsal spines varying in number from 2-9, the ventral spines from 1-3; in those with fewer spines the tip of the siphon is not markedly bent or narrowed. These specimens agree with Hopkins's description and figure in other respects, notably in length of siphon and gills, pecten and tufts of siphon (latter nearly all single, only one here and there double).

Of the type series of *toroensis* from Namwamba Valley, Ruwenzori, unfortunately only one pelt (isolation) and one whole larva were preserved. These are quite alike, and differ from the Mihunga, Kisomoro and Katamayo series as follows: Siphon without either dorsal or ventral subapical spines, its tip not abruptly narrowed, tufts mostly double (some single); gills much longer, quite three times as long as saddle. No differences could be discovered between reared adults from Kisomoro, Katamayo and Namwamba Valley, and it is therefore assumed that the two larval specimens from the last-named locality merely represent the extreme of individual variation. The waters of Western Uganda vary greatly in salt-content, and it may be that the variation in spines and gill-length is connected with this.

Culex (Culex) vansomereni Edwards.

Larvae from the type locality (Nairobi) are quite similar to others in the British Museum from Jinja and Fort Portal, Uganda; all have the siphon shorter than in *toroensis*, the subapical spines forming a complete coronet, and the subventral tufts longer than diameter of siphon (thus being longer than in *toroensis*) and with several branches.

Five paratype pelts of the subspecies *draconis* differ in several respects from the above, and approach *toroensis*; siphon longer (index about 6), its subapical spines divided into dorsal and ventral groups, and its subventral tufts double and scarcely longer than diameter of siphon.

PART II.

The following corrections should be noted:

p. 7, line 2 from bottom, omit the name *arabiensis*.

p. 46, Key: couplets 3 and 4: The character "Legs not speckled" should lead to couplet 8, and "♀ palpi with 3 pale bands" to couplet 5, instead of *vice versa*.

- p. 48, line 10, for "tiny" read "wing." Line 7, for " $\frac{1}{6}$ " read " $\frac{1}{2}$."
- p. 54, para. 40, second half, read "not more than 7 branches."
- p. 55, line 4, for "Fig. 128" read "p. 128."
- p. 76, Key. Under para. 3, for "V 1" read "V 2." Omit heading 6.
- p. 77. In two places for "(Fig. 21)" read "(Fig. 20, e)."
- p. 123. Distribution: For "Eastern" read "South-western" and for "Blukura" read "Blukwa."
- p. 178, line 9, for "*leasoni*" read "*rivulorum*."
- p. 234. Var. *seydeli*, hind tarsi. After "narrowly white at base" insert the words "and more broadly at tip, third broadly white at base."
- p. 243, line 9. After "fairly distinct" insert "fore tarsi with."
- p. 288, Abdomen: line 9, after "distally" insert "*saddle hair* always simple."
- p. 358, line 5, for "Eastern" read "Western."
- p. 359, figure of wing. A small dark spot should be indicated on vein 5 at base of fork.
- p. 362, head, line 6. After "unbranched distally" insert "post frontal hairs simple, long."
- p. 370. Group *Cellia*, larva. Read "Pleural bristles as in Group *Neocellia*, except that both long mesopleurals are simple (*pharoensis*, *squamosus*) or one of them is only sparsely feathered (*argenteolobatus*)."

The following are the chief additional data regarding Ethiopian Anophelines obtained since 1937:

A. (A.) coustani var. **tenebrosus** Dön.

A series from Kondoa-Itangi (*Zumpt*, 1938) have the third hind tarsal segment $\frac{3}{4}$ black and the fourth and fifth all white in most specimens, but in 3 out of 12 segment 5 is black, and in 2 of these segment 4 has a narrow dark ring in the middle; in all the thorax is brown. These specimens therefore approach *symesi*, but have wing-markings typical of *tenebrosus*.

A. (A.) symesi Edw.

Typical examples of this species have been taken on the shores of Lake Albert at Kasenyi (*Schwetz*, 1939) and Butiaba (*J. J. Black*, 1939).

A. (M.) theileri var. **seydeli** Edw.

Only the male of this form has been recorded. Two females from Elisabethville (*Seydel*, 1930) have the hind tarsal markings exactly as in the type male (Evans, Fig. 105, b), but the outer half of the sixth vein has two dark spots.

A. (M.) domicolus Edwards.

De Meillon and Leeson (1940) record this species from Salisbury, S. Rhodesia, (W. *Alves*) and Mufilira, N. Rhodesia (*J. S. McLean*).

A. (M.) walravensi Edw.

De Meillon and Leeson (1940) note that the differences indicated by Evans (p. 246) between Katanga and N. Rhodesian specimens are not constant. They describe larvae and pupae from N'Dola as follows :

“ LARVA (Fig. 178, b, d, e, g, i, and n).

“ *Head* : Clypeus with a central longitudinal pigmented area which runs from the posterior border of the clypeus to the anterior border of the head ; post-frontal

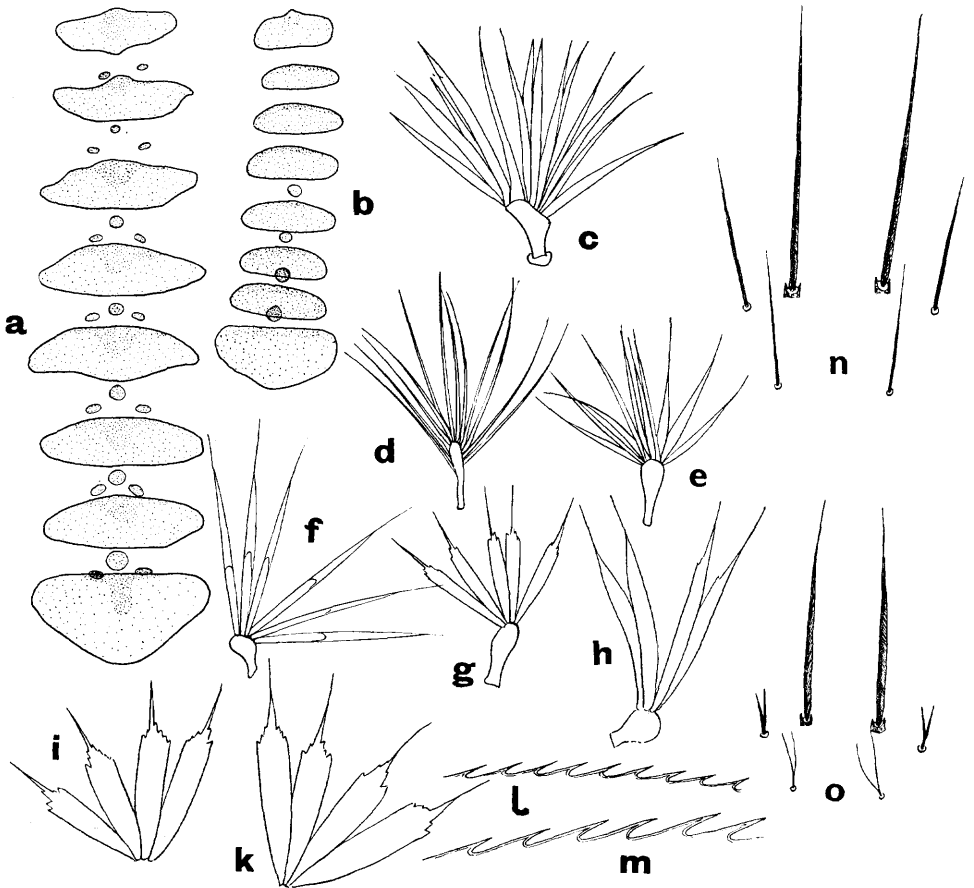


FIG. 178.—*Anopheles michaeli* de M. & L. : a. Abdominal tergal plates. c. Thoracic palmate hair. f. First abdominal palmate hair. h. Second abdominal palmate hair. k. Fourth abdominal palmate hair. m. Portion of the external border of the paddle of the pupa. n. Clypeal hairs. *Anopheles walravensi*, Edw. : b. Abdominal tergal plates. d. Thoracic palmate hair; e. First abdominal palmate hair. g. Second abdominal palmate hair. i. Fourth abdominal palmate hair. l. Portion of the external border of the paddle of the pupa. o. Clypeal hairs.

hair simple or bifid ; vertical hair simple or bifid but in one instance with three branches on one side ; inner clypeal long and simple ; outer clypeal simple, about half the length of the inner ; posterior clypeal delicate, simple, about as long as the outer ; antennae with spines sparsely scattered over the whole of the shaft ; shaft

hair small, situated near the base; apical hair with 4-5 branches. *Thorax*: Inner and middle submedian thoracic hairs well separated basally, but neither hair much expanded; both long mesothoracic bristles simple, one long prothoracic and meta-thoracic bristle feathered as in group I of Evans; palmate hair with 12-16 narrow undifferentiated leaflets, the longest of which measures about 68 μ . *Abdomen*: Palmate hairs as follows:—On segment I with about nine narrow leaflets, some simple but others showing development of a filament; II with 13-15 narrow leaflets and short poorly demarcated filaments; III-VII with 13 to 17 well-developed broad leaflets having broad serrated shoulders and short sharp filaments; the leaflets and filaments together measure about 60 μ in length and the longest filament 16 μ ; pecten with six long spines and seven short ones; lateral arms of the median plate of the scoop very poorly developed; saddle hair with three or four branches; tergal plates well developed, the width of that on segment V being very nearly equal to half the distance between the palmate hairs; a single prominent accessory tergal plate present.

“Evans suspected that the larva of this species might show affinities with those of *theileri* and *distinctus*; this, however, is not so. The larva is apparently very closely related to that of *harperi*. The simple saddle hair and closely approximated submedian thoracics of *harperi* should serve to distinguish the two.

“PUPA (Fig. 178, 1).

“*Paddles* only slightly longer than the greatest width; external border with a fringe of delicate spines which reach to the apical border, but not to the base; apical border as far as the terminal hair with delicate hairs; apical hair hooked; accessory hair delicate with 6-7 branches. *Abdomen*: Spine A on VIII long with 5-11 branches; on VII-V less than half the succeeding segment; small on IV; minute on III and II. Bristle B on VII about as long as segment VIII with 5-6 branches; on VI nearly as long as segment VII with 5-8 branches; on V about three-quarters the length of segment VI with 5-7 branches; on IV a little over half the length of segment V with 7-9 branches. Bristle C on VII longer than segment VIII, simple, split at the tip or bifid; on VI as long as or longer than segment VII with 2-4 branches; on V shorter than segment VI with 7 branches; on IV shorter than segment V with 7-9 branches. Bristle C¹ simple or with the end split into 3-4 branches. Bristle D on VII simple, longer than segment VIII; on VI simple, longer than segment VII.

“Described from material collected at Ndola, Northern Rhodesia, by Dr. R. B. Jackson.”

A. (M.) *michaeli* de Meillon and Leeson.

Anopheles michaeli de Meillon and Leeson, Bull. Ent. Res. 31, p. 63 (1940).

TYPES.—♂♀ in S. Afr. Inst. Med. Res. Johannesburg, Ndola.

The original description is as follows:

“A medium-sized species resembling *walravensi* in general appearance, but with the central portion of the mesonotum clothed with yellowish scales.

“♀. *Head*: Upright scales mainly white, but dark posteriorly; three pale bands

on the palps, the two apical ones together about equal to, or slightly longer than the intervening dark band. *Thorax*: Mesonotum densely clothed with numerous moderately broad scales which appear to be somewhat broader than in *walravensi*: unlike that species, however, only the scales on the anterior border of the mesonotum and those extending from above the wing roots are white; the rest, that is almost the whole of the central portion of the mesonotum, are distinctly yellowish. *Legs* as in *walravensi*. *Wings* (Fig. 179, a): Costa almost entirely dark and the dark areas on the wing field somewhat reduced but not as much as in *walravensi* var. *milesi*; the pale spot on the costa opposite the fork of the second vein is poorly indicated in one specimen, but distinct in another.

“♂. As in the female, but pale spot on the costa opposite the end of the fork of the second vein more distinct. *Terminalia* as described for *walravensi*.

“LARVA (Fig. 178, a, c, f, h, k, and o).

“The larva is quite distinct from that of *walravensi* as described above and presents a combination of characters different from that of any Ethiopian larva so far described.

“*Head*: Pigmentation as in *walravensi*; post-frontal hair with from 2–6 branches averaging 4 branches; vertical hair similar, these hairs are therefore on the average more branched than in *walravensi*; inner clypeals long and simple, outer very short and split into two, posterior clypeal more delicate, short and split into two; antenna as in *walravensi*. *Thorax*: Inner and middle submedian thoracics with their basal tubercles closely approximated; pleural hairs as in *walravensi*; palmate hair with about 18–20 narrow undifferentiated leaflets. *Abdomen*: Palmate hairs as follows:—On segment I with 13–15 narrow undifferentiated leaflets; II with about 14 narrow leaflets with blade and filament poorly differentiated; III–VII well developed with sloping shoulders and short sharp filaments much as in *walravensi*; pecten with seven long teeth and five short ones; lateral arms of the scoop poorly developed; saddle hair with 3–4 branches; tergal plates very well developed, on segment V at least three-quarters of the distance between the palmates; three accessory plates present on most segments.

“PUPA (Fig. 178, m).

“*Paddles* as in *walravensi* but spines along the exterior border much more pronounced. *Abdomen*: Spine A as in *walravensi* but on segments VII and VI about half as long as the succeeding segment. Bristle B on VII with 6 branches about three-quarters as long as segment VIII; on VI with 6–7 branches; on V with 8–9 branches. Bristle C on VII longer than segment VIII, simple, but in one instance split into two; on VI about as long as segment VII and simple; on V with 4–5 branches. Bristle D as in *walravensi*.

“Generally the pupa is as that of *walravensi* but the bristles show much less branching.

“The adult of this species is related to *distinctus*, *walravensi*, *walravensi* var. *milesi* and *schwetzi*. The three-banded palp serves to separate it from *schwetzi* and *distinctus* and the yellowish mesonotal scales from *walravensi* and its variety *milesi*. In *distinctus* var. *ugandae* the palp is three-banded but the broad mesonotal scaling in

michaeli should serve to separate the two. The larva and pupa are quite distinct from those of *distinctus* and its variety *ugandae* and *walravensi*; these stages have not been described in *schwezi* and *walravensi* var. *milesi*.

"The species is named in honour of Mr. Michael Viljoen, of Ndola, who drew our attention to certain larval differences among supposedly *walravensi* material.

"Described from 3 males and 3 females and their associated larval and pupal pelts obtained from specimens reared in isolation. Ndola, Northern Rhodesia (Michael Viljoen)."

A. (M.) **tchekedii** de Meillon and Leeson. (Fig. 179b).

Anopheles tchekedii de Meillon and Leeson, Bull. Ent. Res., 31, p. 64 (1940).

Types.—♀ cotypes in B.M. and L.S.H.T.M., Bechuanaland.

The original description is as follows :

"This Anopheline was taken in 1935 at Okawango Swamp, Bechuanaland, by Dr. W. A. Lamborn. He says it was 'very numerous, biting in the late afternoon, cattle being literally covered with them.' Some badly damaged specimens received at the British Museum from Dr. Lamborn in 1935, and recorded by Evans (1938) as 'probably *distinctus*,' belong to the same batch as those described below.

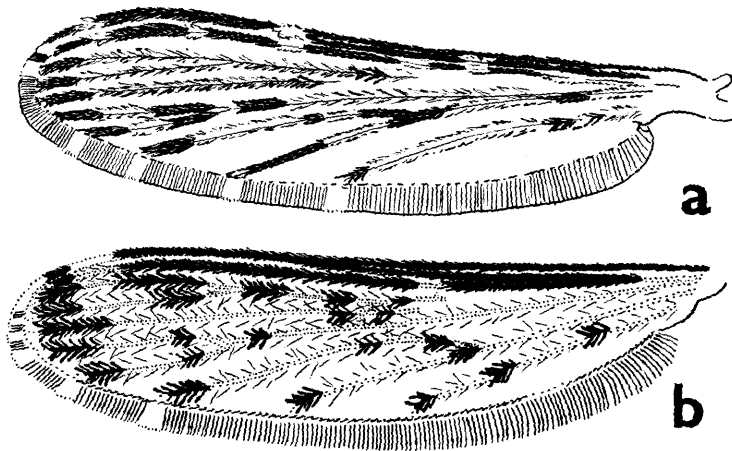


FIG. 179.—Female wings of *Anopheles michaeli* de M. & L. (a) and *A. tchekedii* de M. & L. (b).

"♀. *Head* : Upright forked scales white, except posteriorly where they are black at the sides and yellow in the middle ; in front, some white elliptical scales ; frontal tuft white. *Antennae* : A few white scales near base. *Palpi* : Three narrow pale bands ; third pale band on last segment does not extend to apex so that tip of palp is dark. *Thorax* : Integument of mesonotum grey with a narrow median longitudinal dark line expanding posteriorly into a wider dark bare prescutellar area. Fossae dark brown and without scales. Anterior half of mesonotum and middle portion of posterior half clothed with whitish, broadly elliptical scales. A narrow line of scales along the border of the grey mesonotum extends backwards to the wing roots in front of which it widens into a patch ; the scales nearest to the wing

roots are narrow curved. Some pale scales on scutellum. *Legs* dark brown, paler below. Forelegs with narrow pale rings at apices of first, second and third tarsal segments. Mid and hind legs without these pale rings. *Wings*: Pale scales creamy. Costa mainly dark with a subapical and apical pale spot. Subcosta all dark. First longitudinal vein pale at base and a pale subapical spot, remainder either all dark or with one other small pale interruption. Upper branch of second longitudinal vein either all dark or with some pale scales in the middle; lower branch pale in the middle third. Third long vein with two short dark spots near base and a longer one distally. Fourth long vein with stem mainly pale, but with a dark spot before bifurcation; upper and lower branches with a dark spot near each end. Fifth long vein, upper branch dark distally and a small dark spot on each side of the cross vein; lower branch dark distally; dark spot across bifurcation; stem mainly pale.

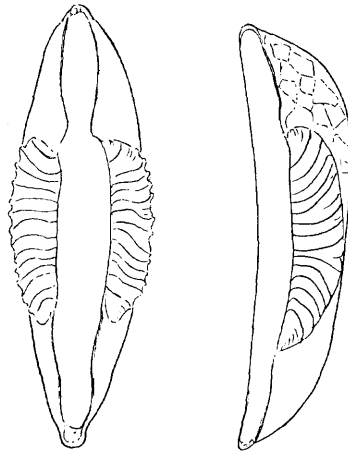


FIG. 180.—*Anopheles distinctus*, N. & C.: egg, side and dorsal view.

Sixth long vein with two or three dark spots. Fringe with pale spots at ends of veins except sixth and lower branch of fifth; some pale border scales in basal portion of wing. *Abdomen*: Cerci without scales.

“This species differs from *walravensi* and from *michaeli* in having no pale spot in the middle of the costa; from *walravensi* in having the tip of the third long vein more broadly dark, and in having no pale fringe spots at the ends of veins 5·2 and 6. From *michaeli* this species may also be distinguished by the dark tips to the palps. The mesonotal scales are broader than in typical *walravensi* (index about 2) and somewhat as in the var. *milesi*, but the latter has a much paler wing.”

A. (M.) *distinctus* Newstead and Carter.

The egg is described by de Meillon and Leeson (1940) from several batches obtained by Dr. R. B. Jackson at Ndola, N. Rhodesia. Their account (quoted below) shows that the egg, though very different from that of *theileri*, is not unlike that of *wellcomei* as described by Lewis:

“EGG (Fig. 181). Average length 0·46 mm. and width 0·12 mm. Quite unlike

that of *theileri* except in the reticulation of the lower surface, which is very feebly indicated and only seen in the very best light. Upper surface finely stippled and unbroken. Frill very poorly developed and seen only as a faint white line. Floats small, consisting of about 14 ridges each."

A. (M.) wellcomei Theo.

The male and early stages were obtained and described by Lewis (1939). His description is as follows :

"ADULT MALE. *Head* : Vertex as in female. Proboscis dark, except on labella. *Palps* : Outer surface of stem clothed mainly with flavescent scales ; a few dark scales near junction of second and third segments and at apex of third. Club white with two dark spots. Numerous long pale hairs on inner surface of fourth segment. *Thorax, wings and legs* : In general as in female. *Abdomen* : Pale brown, flavescent scales on coxites.

"*Terminalia*.—Style with hair near apex about three times as long as width of style. Harpago with apical hair less than twice length of club. Outer accessory hair curved and about half the length of the apical. Inner accessory hair less curved and slightly longer than the outer. Phallosome without leaflets.

"PUPA. During life the pupa is pale green with conspicuous brown trumpets. It resembles that of *A. distinctus* var. *ugandae* Evans except for the following points : *Spine A.* IV, slightly longer than VII. *Bristle B.* IV, 2 to 7 branches ; III, 2 to 5 branches. *Bristle C.* IV, 2 to 5 branches ; III, 2 to 8 branches. *Cephalothorax* : The row of smaller spines are as described by Evans, and are situated on the part of the pupal skin which covers the first pair of legs.

"LARVA. This resembles the larva of *A. theileri* Edwards, except for the following differences :—*Head* : Fronto-clypeal pattern absent. Length of outer clypeal hair less than $\frac{1}{3}$ to nearly $\frac{1}{2}$ inner. Post-frontal hair simple or branched. Apical hair of antenna simple or bifid. Apex of antenna with internal spicular process of shaft longer than in *A. theileri* and about equal to that of *A. distinctus* var. *ugandae*. *Thorax* : Inner shoulder hair broad and flattened, with about 22 to 28 branches. Middle shoulder hair with about 17 to 22 branches. *Abdomen* : Palmate hairs with leaflets slightly shorter than in *A. theileri*. Teeth and plate of pecten without spicules.

"The spicules, which cover much of the larval integument, are distributed as in *A. theileri*. They are especially long on the posterior lateral surface of the ninth abdominal segment between the saddle hair and the bases of the anal papillae. Here they are slightly curved and reach a length of 0.05 mm., slightly more than the diameter of the lip of the spiracle.

"EGG. The length is about 3.2 times the breadth (including floats) and about 1.7 times the length of the floats, which have about 15 chambers. The floats are separated from the frill. The latter is narrow and usually continuous from one end to the other, enclosing a narrow area. It is generally twisted, and occasionally the frill of one side joins that of the other in several places, so that the enclosed area is divided into two or three parts. The upper surface is slightly more finely granulated than the lower, which shows no distinct polygonal markings."

Lewis suggests that the early stages of *wellcomei* may have remained so long unknown "owing to the habit of the larvae and pupae of creeping up objects projecting from the water and remaining in this position for long periods, so that in nature special methods are probably required for collecting them." He points out that the characters of the larvae and pupae, and also of the eggs, definitely place *A. wellcomei* in the *distinctus* series, but that the male differs from other known males of this series in possessing a phallosome without leaflets; it also differs from both *A. distinctus* and var. *ugandae* in several larval and pupal characters.

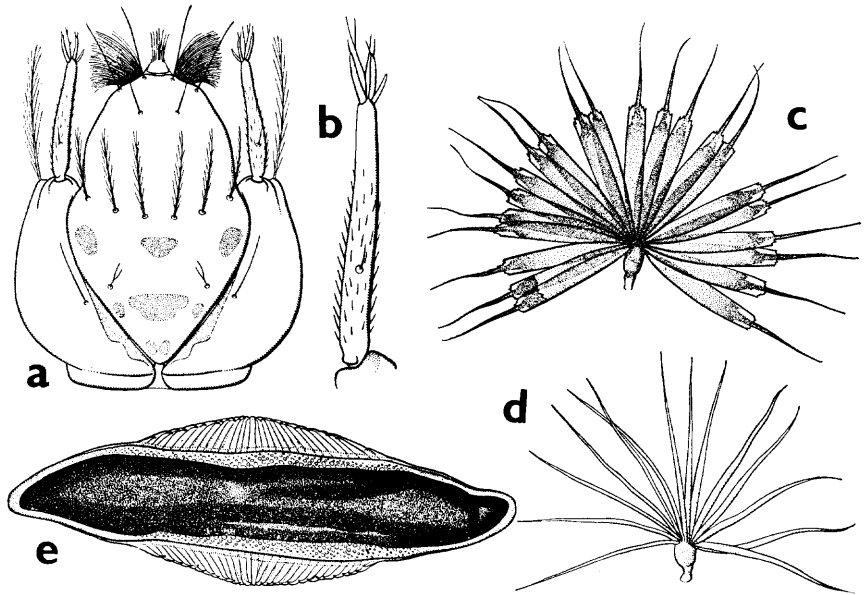


FIG. 181.—*Anopheles rupicolus* Lewis. Larval details (after Salem). a. Head. b. Antenna. c. Palmate hair of segment IV. d. Palmate hair of thorax. e. Egg.

A. (M.) rupicolus Lewis. (Fig. 182).

Probable synonyms are :

Anopheles aegypti Salem, Egypt. Univ. Fac. Med., Publ. No. 16, p. 1 (1938).

A. rhodesiensis var. *dthalisimilis* Corradetti, Riv. Parassit., 3, p. 57 (1939).

Types.—*aegypti*, ♂♀ in Cairo, Sinai; *dthalisimilis*, ♂♀ in Rome, Semien, Abyssinia.

Salem gives a full description of larva, pupa and adult; his account was written just before the publication of Lewis's, and it is obvious that both descriptions refer to the same species. Corradetti mentions some small distinctions in larva and pupa between *rupicolus* and *dthalisimilis*, but the constancy of these is questionable. His description of the adult agrees with *rupicolus*, notably as regards the palpi (dark at tip, with the two anterior pale bands indistinct, difficult to detect).

Salem describes the egg of *A. rupicolus*, and his figure is reproduced here, together with his figures of the larval head and palmate hairs.

Anopheles (Myzomyia) ruarinus Edwards.

Anopheles (Myzomyia) ruarinus Edwards, Ann. Trop. Med. Parasit., xxxiv, p. 93 (1940).

Types.—♂♀ in B.M., Salisbury.

The original description is as follows :

“ ADULT. A dark species with unspotted wings, resembling *A. rupicolus* but much larger, the wings measuring 4.5–5 mm. in length in ♀ and 3.8–4.2 mm. in ♂.

“ ♀. *Head*.—Interocular space of average width, clothed with a few dull whitish scales and pale bristles forming a very inconspicuous frontal tuft. Erect scales of vertex moderately expanded, nearly all blackish, only a few whitish scales forming an inconspicuous patch in front. Antennae devoid of scales. Palpi uniformly slender, scales dark and appressed, no trace of pale rings at joints ; index about 0.35. Mandible with about 30–35 teeth on the expanded end.

“ *Pharynx*.—Of the *Neomyzomyia* type, with 10 teeth (including a small one on each side), each with a strong denticle on each side at base and rather numerous small denticles scattered over most of the surface, the whole tooth appearing more jagged than usual. The four ventral papillae well separated. No spicules on pharyngeal ridges.

“ *Thorax*.—Integument rather shining and mainly pale-brownish, but posterior part of mesonotum often appearing dark, leaving fossae pale. No scales whatever present, unless a few slightly thickened hairs on front margin can be reckoned as scales. No definite markings of any sort. Two or three propleural bristles ; no spiraculars.

“ *Abdomen* almost entirely dark brown, devoid of scales.

“ *Legs* uniformly dark brown except for the pale yellowish coxae ; no trace of pale knee-spots.

“ *Wings* entirely dark-scaled, without any trace of pale spots even on costa in any of the numerous specimens examined, thus differing from those of *A. rupicolus*, which, as stated by Lewis, have usually two faint pale areas on the costa. Forks short, stem of upper almost as long as the cell.

“ ♂. Resembles ♀. Palpi entirely dark, with slender club.

“ *Terminalia* of the usual *Myzomyia* type, structure much as in *A. rupicolus* but two hairs present instead of one between the long terminal hair of the harpago and the club ; tip of club more rounded and scarcely curved inwards. Phallosome with five pairs of leaflets, the longest pair serrated on one edge.

“ PUPA. Four pelts examined differ markedly from the pupal pelt of the type of *A. rupicolus*, as well as from Salem's figure of the pupa of *A. aegypti*, in the shape of the paddles and some other details.

“ Paddle broadest a little beyond the middle, the outer margin then running almost straight to the somewhat pointed tip ; outer margin bare on proximal half, with longish fine fringe on distal half ; inner margin entirely bare. Midrib curved, faint but running to tip. Hooked seta placed at the tip, accessory seta far from it.

“ Spine A : VIII, more than $\frac{1}{2}$ length of segment and much branched ; VII, nearly $\frac{3}{4}$ length of segment ; VI, over $\frac{1}{2}$; V, about $\frac{1}{3}$ length of segment ; IV, very short. Hair B : IV–VII, with 3–5 branches, $\frac{1}{2}$ length of segment or not much more. Hair C : V–VII, simple and somewhat longer than segment IV, branched and about $\frac{1}{2}$ length of segment.

"LARVA. Differs notably from most or all other African anopheline larvae in having the frontal hairs simple or almost so; the larva of *A. rupicolus* has normal plumose frontal hairs and also differs in many other respects. The description below is based on a comparison of numerous whole larvae and several pelts.

"Size large; length, excluding caudal setae, 11-12.5 mm. (spirit and gum chloral specimens). Colour in life, according to collector, dark greenish-grey.

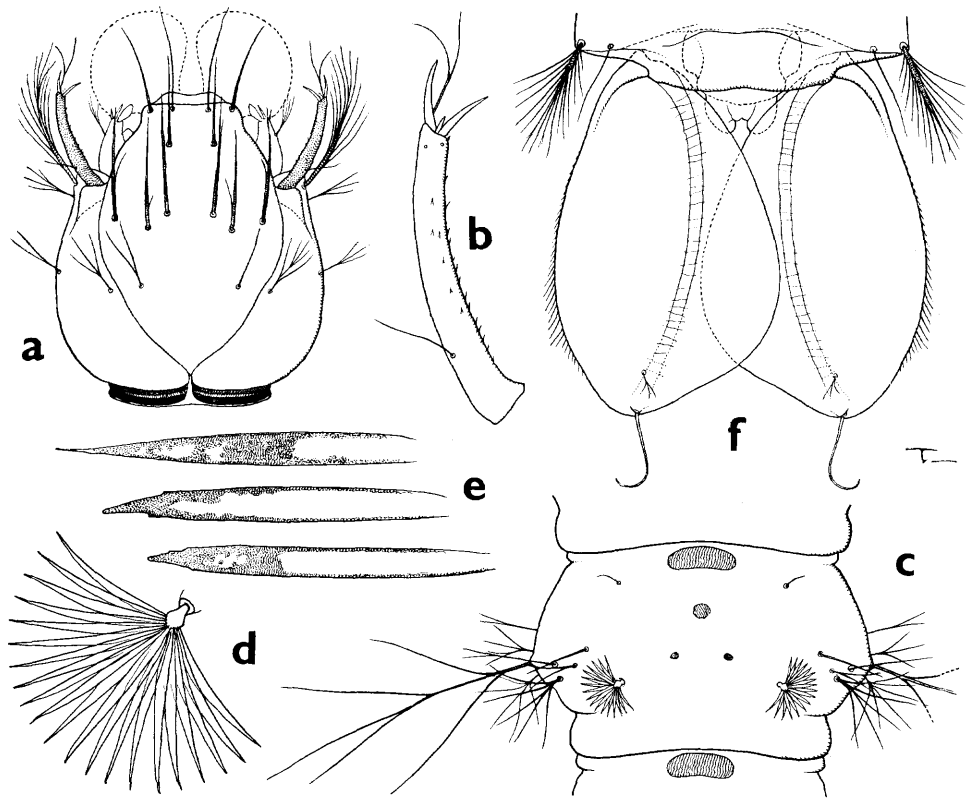


FIG. 182.—*Anopheles ruarinus* Edwards. a. Head of larva. b. Larval antenna. c. Fourth abdominal segment of larva. d. Float hair. e. Leaflets of float-hairs enlarged; normal form above, variations below. f. Pupal paddles.

"Head.—Very dark, almost black in colour, so that the usual markings are obscured (in contrast with *A. rupicolus*, which has a paler head with obvious markings). Antennae wholly blackish and rather strongly curved—two very unusual features; inner surface with small, scattered, nearly uniform spicules, outer surface almost smooth. Clypeal hairs all simple, the posterior pair about $\frac{2}{3}$ as long as the inner and somewhat stouter, relative positions normal. Frontal hairs: inner and middle usually entirely simple, sometimes with a single short branch at base; outer usually with 1-3 short branches at base but sometimes quite simple, all rather stout. Post-frontal hair simple or bifid, vertical simple or with 2-5 branches.

"Thorax.—Shoulder hairs well separated, inner and middle each with about 10

branches, inner with the chitinized base very small, scarcely visible. Palmate hair not developed, represented by a small tuft of 3-6 branches which are at most very slightly flattened. No small plates on metathorax. Pleural hairs: propleural with two long simple and one feathered; meso- and meta-pleural, one long simple and one long feathered.

"*Abdomen*.—Palmate hairs: I rudimentary, with about 6 almost hair-like leaflets; II-VII well developed, but II and VII less so than the others, all with about 18 leaflets which are usually narrowly lanceolate and sharply pointed, without trace of shoulder serrations, though in one or two specimens a slight shoulder and a few serrations are present, and in these the leaflets are shorter and less pointed, but not at all resembling those of *A. ruficolus*. Tergal plates small (relatively to the size of the larva they are much smaller than in *ruficolus*), occupying less than $\frac{1}{3}$ of the total width of the abdomen. Median accessory plates present on II-VII (very small on II) and small paired posterior accessory plates on I-VII. Pecten with only 3-4 long teeth and 6-8 short ones. Saddle hair long and simple (as is probably normally the case also in *ruficolus*, though in the type pelt it is double). Gills long, more than twice as long as saddle (in *aegypti* = *ruficolus* according to Salem they are only $\frac{3}{4}$ as long as saddle).

"EGG. Unknown.

"*Breeding-place*.—' Larvae were collected from rock pools on the top of a flat rock Kopje which is termed a "ruari" by the natives. The pools had a small amount of muddy sediment at the bottom, but few weeds. Other larvae present were *Aedes vittatus* and *Culex vansomereni*' (note by collector).

"*Distribution*.—All the material described was collected on the Ruia Estate, P. O. M'Sonneddi, Salisbury, Southern Rhodesia, in January and March, 1940, by Dr. J. Muspratt."

A. (M.) brunripes Theo.

This species has very recently been obtained in plenty by Prof. T. B. Davey at Bo, Sierra Leone. Prof. Davey has prepared a full account of its life-history, and this will shortly be published elsewhere; meanwhile the following brief notes have been drawn up from a study of material presented by Prof. Davey to the British Museum.

A. brunripes proves to have been wrongly placed in the *Neocellia* group. The pharyngeal armature of the female has the structure of Group *Myzomyia*, and the pleural hairs of the larva, though exhibiting some peculiarities, also conform with those of group *Myzomyia* in having both the long mesopleurals and one of the meta-pleurals simple.

The main diagnostic features of the larva are: all clypeal hairs simple or with very few barbs; skin not spiculate; inner shoulder-hair large with flattened stem and separate chitinous base; no distinguishable palmate hair on thorax or first abdominal segment; saddle hair with 4-7 branches; simple metapleural hair markedly shorter than the feathered one and unusually stout. The last-mentioned character is perhaps diagnostic of the species. By Evans' key it would fall either with *A. barberellus* or with *A. ardensis* and *marshalli* var. *pitchfordi*.

A. (M.) pretoriensis Theo.

This species proves to be rather widely distributed in Italian East Africa. An interesting aberration from Aden Protectorate (*Petrie*) has the last four hind tarsal segments all white except for a black patch on underside of second segment at base.

A. (M.) dancalicus Corradetti.

Anopheles (Neocellia) dancalicus Corradetti, Riv. Parassit., 3, p. 277 (1939).

TYPE.—♂♀ in Rome (Inst. of Publ. Health), Dobi Vally, Dankali, Abyssinia.

Only a preliminary diagnosis of this new species is given in the reference cited, the chief characters noted being as follows :

♀. Size small, wing 3.1 mm. Wings with 4 dark spots on anterior margin, of which the apical one is confined to the (first ?) longitudinal vein, the adjoining part of the costa being pale. Palpi with three pale bands. Femora and tibiae with sparse pale spots ; tarsi dark with small pale spots at articulations, and some pale spots at base of first segment. Numerous pale scales on dorsum of abdomen. Pharynx as in group *Neocellia*.

♂. Phallosome without leaflets.

PUPA. Spines of V-VII usually bifurcate or trifurcate, but always flattened, leaflike.

LARVA. Inner clypeals finely branched, posterior 2-3 branched. Palmate hairs rudimentary as in *A. maculipalpis*.

Breeding-place.—Saline water at 250 m. altitude.

A. dancalicus is evidently very distinct from all other African species of the genus hitherto known, but has much in common with the Indian *A. stephensi* ; from this latter the half-obsolete fourth dark wing-spot and the absence of leaflets on the phallosome appear good distinctions.

A. (M.) erythraeus Corradetti.

Anopheles (Myzomyia) erythraeus Corradetti, Riv. Parassit., 3, p. 287 (1939).

TYPE.—Larva in Rome (Inst. of Publ. Health), Ghinda, 3000 ft., Eritrea.

A full description is given, from which the following diagnostic features may be noted : All clypeal hairs simple, inner pair wide apart, posterior as long as outer. No obvious spicules on sides of thorax or abdomen. Saddle hair simple. Main tergal plates not very wide ; small paired accessory plates present. Long mesopleural bristles both simple. Chitinous bases of inner and outer shoulder hairs joined. Palmate hair narrow on thorax with about 17 branches, without serrations or shoulder. Palmate hairs II-VII well developed, with long filament.

In all the points noted above this larva resembles that of *A. d'thali*, and it is rather unfortunate that the author does not compare it with *d'thali* but with *theileri*, a species to which it appears to have much less resemblance. The most obvious point of distinction from the larva of *d'thali* would seem to be in the bases of the shoulder-hairs : fused in *erythraeus*, well separated in *d'thali*. On the dorsum of the thorax are eight small chitinous plates, four on the mesothorax (two more or less in line behind each pair of shoulder hairs), and four (closer together) on the metathorax ;

such plates have not been noted in *dthali*, and in *theileri* they are only stated to occur on the metathorax.

Breeding-place.—Edge of a half-dried torrent.

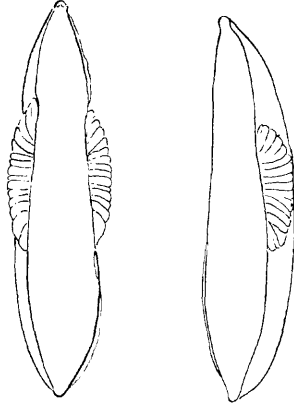


FIG. 183.—*Anopheles argenteolobatus*, Gough: egg, dorsal and half side view.

A. (M.) argenteolobatus Gough.

De Meillon and Leeson (1940) describe the egg as follows :

“EGG (Fig. 183). A long slender egg averaging 0.54 mm. in length and 0.12 in width. Very similar to that of *pharoensis*, Theo. The dorsal surface is very extensive, convex, and the whole shell is finely and evenly stippled. The frills are narrower than in *pharoensis* and the floats much shorter, each containing only 12–15 ridges. Described from two batches obtained from different females by Dr. R. B. Jackson, Ndola, N. Rhodesia.”

IV. ZOOGEOGRAPHY OF ETHIOPIAN MOSQUITOES.

COMPARISON WITH MOSQUITO FAUNAS OF ADJACENT REGIONS.

The composition of the mosquito fauna of the Ethiopian region, and its relationships with faunas of adjacent regions, are indicated in the accompanying table. Since by many zoologists the Malagasy region is regarded as distinct from the Ethiopian, the numbers of species of each subgenus occurring in Tropical and South Africa (Ethiopian Region proper) are shown separately from those of Madagascar, Mascarenes, Seychelles and adjacent islands (Malagasy Region or Subregion). For these two regions the first number given in the table is the total of distinct species known to occur, the number following in brackets being the total number of endemic species, *i. e.* those not known to occur outside the region in question. For comparison with the Ethiopian fauna it seems preferable to consider only the nearer parts of the Palaearctic and Oriental regions, leaving the Far East out of consideration, partly because of the mixture of faunas in Japan and China, and partly because the dissected areas of the Malayan and Philippine archipelagos support a great number of peculiar forms, while British India forms a continuous area more comparable with that of Tropical Africa. The third and fourth columns of the table therefore give the numbers of species at present known in the Western Palaearctic (Europe, North Africa, with Canary Is., Near East including Western Siberia and Baluchistan) and Western Oriental (British India with Burma, Ceylon, the Andaman Is., but excluding Malaya) respectively.

It will be noted at once that nearly all the genera and subgenera occurring in Africa are also found in the Oriental region; the only endemic African genus is *Eretmapodites*, and among the other genera the only African subgenera not occurring in India are *Theobaldia* (*Theomyia*), *Aedes* (*Dunnius*) and *Aedes* (*Skusea*); *Aedes* (*Banksinella*) is mainly an African subgenus, but one species has spread through the East. The similarity between the two faunas is further indicated by the fact that many of the genera and subgenera (such as *Anopheles*, *Myzomyia*, *Megarhinus*, *Uranotaenia*, *Aedes* s.l. and *Culex* s.l.) are represented in somewhat similar proportions in the two faunas. On the other hand there are noteworthy differences; several Indian genera and subgenera are unrepresented in Africa, and certain subgenera of *Aedes* and *Culex* are developed to a very unequal extent in the two regions. In Africa *Aëdimorphus* is the dominant subgenus of *Aedes*; in India it is *Finlaya*. In Africa again the subgenus *Neoculex* of *Culex* is very much better represented than in India, and the contrast in the subgenus *Culex* s. str. is more marked than would appear from the table, for whereas in Africa only 8 of the 50 species belong to the banded-proboscis group (three or four of these eight being non-endemic), in India no fewer than 20 of the 24 species belong to this group, two of the small remainder being non-endemic.

The contrast between the African and European mosquito faunas is as marked as the resemblance between those of Africa and India. Not only are numerous tropical

	Tropical and South Africa.	Madagascar and Mascarenes.	Europe, N. Africa and Near East.	India, Burma and Ceylon.
<i>Anopheles (Anopheles)</i>	6 (5)	1 (—)	9	13
„ (<i>Myzomyia</i>)	57 (50)	5 (—)	12	30
<i>Megarhinus</i>	8 (8)	—	1	6
<i>Tripteroides</i>	—	—	—	6
<i>Topomyia</i>	—	—	—	1
<i>Harpagomyia</i>	4 (4)	—	—	2
<i>Hodgesia</i>	4 (4)	—	—	2
<i>Uranotaenia</i>	22 (22)	3 (3)	1	22
<i>Aëdomyia</i>	2 (2)	—	—	1
<i>Theobaldia (Theobaldia)</i>	—	—	6	2
„ (<i>Culicella</i>)	—	—	4	—
„ (<i>Allotheobaldia</i>)	1 (—)	—	1	1
„ (<i>Theomyia</i>)	1 (1)	—	—	—
<i>Orthopodomyia</i>	—	1 (1)	1	4
<i>Ficalbia (Mimomyia)</i>	9 (9)	—	—	2
„ (<i>Etorleptomyia</i>)	1 (1)	—	—	2
„ (<i>Ficalbia</i>)	3 (3)	—	—	1
<i>Taeniorhynchus (Coquillettidia)</i>	14 (14)	1 (1)	3	3
„ (<i>Mansonioides</i>)	2 (1)	1 (—)	—	4
<i>Aëdes (Mucidus)</i>	4 (3)	—	—	2
„ (<i>Ochlerotatus</i>)	3 (—)	1 (—)	30	3
„ (<i>Finlaya</i>)	8 (8)	1 (1)	3	40
„ (<i>Christophersomyia</i>)	—	—	—	3
„ (<i>Stegomyia</i>)	24 (21)	3 (1)	3	16
„ (<i>Aëdimorphus</i>)	52 (49)	2 (—)	1	18
„ (<i>Banksinella</i>)	15 (14)	—	—	1
„ (<i>Diceromyia</i>)	5 (5)	—	—	5
„ (<i>Dunnius</i>)	4 (4)	—	—	—
„ (<i>Skusea</i>)	1 (—)	1 (—)	—	—
„ (<i>Rhinoskusea</i>)	—	—	—	1
„ (<i>Cancraëdes</i>)	—	—	—	3
„ (<i>Indusius</i>)	—	—	—	1
„ (<i>Aëdes</i>)	—	—	2	20
<i>Paraëdes</i>	—	—	—	2
<i>Armigeres</i>	—	—	—	12
<i>Heizmannia</i>	—	—	—	9
<i>Haemagogus</i>	—	—	—	2
<i>Eretmapodites</i>	18 (17)	1 (—)	—	—
<i>Culex (Lutzia)</i>	1 (—)	1 (—)	—	4
„ (<i>Barraudius</i>)	—	—	2	1
„ (<i>Lasiosiphon</i>)	—	—	1	—
„ (<i>Neoculex</i>)	18 (17)	2 (1)	7	2
„ (<i>Mochthogenes</i>)	3 (3)	—	—	5
„ (<i>Culicomyia</i>)	6 (5)	1 (—)	—	7
„ (<i>Lophoceratomyia</i>)	—	—	—	10
„ (<i>Culex</i>)	50 (33)	16 (3)	12	24
Total species	346 (301)	41 (11)	99	293
Total subgenera	29 (3)	16 (—)	18	40

genera and subgenera absent from Europe and North Africa (*Urotaenia* and *Megarhinus* being represented by a single species each) and the essentially temperate subgenera *Theobaldia* and *Culicella* absent from Tropical Africa, but the representation of the subgenera of *Aedes* is very different. Throughout the palaeartic region the dominant subgenus is *Ochlerotatus*, and this subgenus is also thoroughly well represented in North and South America and even in Australia; yet in Africa only three species of *Ochlerotatus* occur, one (*O. caspius*) being a common Palaeartic species, another (*O. caballus*) being found also in Persia, and the third (*O. fryeri*) not being a very typical member of the subgenus. On the other hand, in the Western Palaeartic there is but a single member of the subgenus *Aëdimorphus* (*A. vexans*), and only three *Stegomyia*, two of which (*S. aegypti* and *S. vittatus*) are also widely spread in Africa.

Although in its general features the Ethiopian mosquito fauna shows more resemblance to the Oriental than to the Palaeartic, there are in fact fewer species common to the Ethiopian and Oriental regions than to the Ethiopian and Palaeartic. In the former category are at most fifteen species (*Anopheles culicifacies*; *Theobaldia longiareolata*; *Taeniorhynchus uniformis*; *Aedes scatophagoides*, *aegypti*, *unilineatus*, *albopictus*, *vittatus* and *lineatopennis*; *Culex bitaeniorhynchus*, *sitiens*, *tritaeniorhynchus*, *theileri*, *univittatus* and *fatigans*), while in the latter category there are twenty (*Anopheles coustani*, *d'thali*, *rupicolus*, *turkhudi*, *multicolor*, *pharoensis*; *Theobaldia longiareolata*; *Aedes caballus*, *caspius aegypti*, *vittatus*; *Culex poicilipes*, *tritaeniorhynchus*, *theileri*, *univittatus*, *sinaiticus*, *laticinctus*, *pipiens*, *fatigans*, *antennatus*); several of these latter however do not extend further south than Somaliland. The vast majority of the species of Ethiopian mosquitoes (326 out of 357; or if the Malagasy subregion be excluded, 301 out of 346) are endemic to the region.

The mosquitoes of Madagascar and adjacent islands are still very imperfectly known and important discoveries may yet be made regarding them, but almost all evidence at present available indicates that they are essentially similar to those of the African mainland. Of the total of 41 species of mosquitoes at present known from the whole Malagasy subregion, no fewer than 29 occur also in Africa, while one more (*Aedes albopictus*) is a common Oriental species; all these may be presumed to have been recently introduced to the islands. Of the remaining eleven species which are regarded as endemic to the subregion, the majority show clear affinities with African forms, several differing only very slightly. Only one species (*Orthopodomyia arboricollis*) is clearly more related to Indian than to African forms, and there are no endemic genera or subgenera. For these reasons there appears no justification for treating Madagascar as forming a region separate from the Ethiopian when considering the zoogeography of mosquitoes.

The Ethiopian and Neotropical mosquito faunas have little in common; the groups which occur in both (*Anopheles* s. str., *Megarhinus*, *Uranotaenia*, *Aëdomyia*, *Finlaya*, *Lutzia* and *Culex* s. str.) are all of cosmopolitan or tropicopolitan distribution. None of the most characteristic South American genera and subgenera (*Nyssorhynchus*, *Goeldia*, *Trichoprosopon*, *Sabethes*, *Wyeomyia*, *Psorophora*, *Melanoconion*, etc.) have any representatives in Africa (or indeed anywhere in the Old World), and in those genera which are well represented in both regions the species are not closely related. The only African species which might possibly be regarded as of South American

origin is *Aedes caballus*, which may perhaps be allied to *A. albofasciatus* of southern South America, but this is very doubtful.

FAUNAL DIVISIONS OF AFRICA AS EXEMPLIFIED BY MOSQUITOES.

From the point of view of the zoogeographer the two most striking features of the Ethiopian Region are its isolation and its homogeneity. It is rather sharply delimited in the north from the Palaearctic and Oriental Regions by the desert belt of the Sahara and Arabia, but within the continental area of tropical and south Africa there are no well-marked and continuous physical barriers, such as high mountain chains or wide deserts, which can be recognized as clearly limiting distinct subregions. The East African highlands do indeed constitute a partial barrier between west and east, but this barrier is inoperative both to the north and to the south. Consequently very many African animals (including mosquitoes) exhibit a very wide distribution in the continent. Nevertheless there are wide faunal divergences between different sections of the area associated with differences in the prevailing type of vegetation, which in turn are mainly attributable to differences in rainfall and altitude. On this basis it is customary to recognize two main subregions of the Ethiopian Region: (1) A "western" subregion comprising the area of equatorial forest with heavy or continuous rainfall; and (2) an "eastern" subregion, comprising most of East and South Africa, where the rainfall is less (or at least less evenly distributed through the year) and the vegetation usually of the savanna type. Within these two main subregions smaller divisions can be recognized but are less clearly defined.

The fullest discussion of African zoogeography is that published by J. P. Chapin in his work on the "Birds of the Belgian Congo" (*Bull. Amer. Mus. Nat. Hist.*, **65**, 1932). Basing his conclusions on the distribution of birds in Africa, which as he points out is in its turn dependent upon the distribution of distinct types of plant associations, Chapin recognizes the following faunal areas of the Ethiopian Region (excluding the Malagasy Region, which he treats as entirely separate; and excluding also the sea coasts, which naturally have their distinctive avifauna):

I. WEST AFRICAN SUBREGION.

A. *Guinean Forest Province.*

- | | | |
|----------------------------------|---|----------------------------------|
| 1. Upper Guinea Forest District. | . | 2. Lower Guinea Forest District. |
|----------------------------------|---|----------------------------------|

B. *Guinean Savanna Province.*

- | | | |
|-----------------------------------|---|-------------------------------------|
| 3. Upper Guinea Savanna District. | . | 5. Southern Congo Savanna District. |
| 4. Ubangi-Uelle Savanna District. | . | 6. Uganda-Unyoro Savanna District. |

II. EAST AND SOUTH AFRICAN SUBREGION.

C. *Humid Montane District [Province].*

- | | | |
|-------------------------------|---|------------------------------|
| 7. Cameroon Montane District. | . | 8. Eastern Montane District. |
|-------------------------------|---|------------------------------|

D. *Sudanese Province.*

9. Sudanese Arid District. 10. Sudanese Savanna District.

E. *North-east African Province.*

11. Abyssinian Highland District. 12. Somali Arid District.

F. *Eastern and Southern Province.*

13. East African Highland District. 16. South-west Veld District.
 14. Rhodesian Highland District. 17. South-west Arid District.
 15. East African Lowland District.

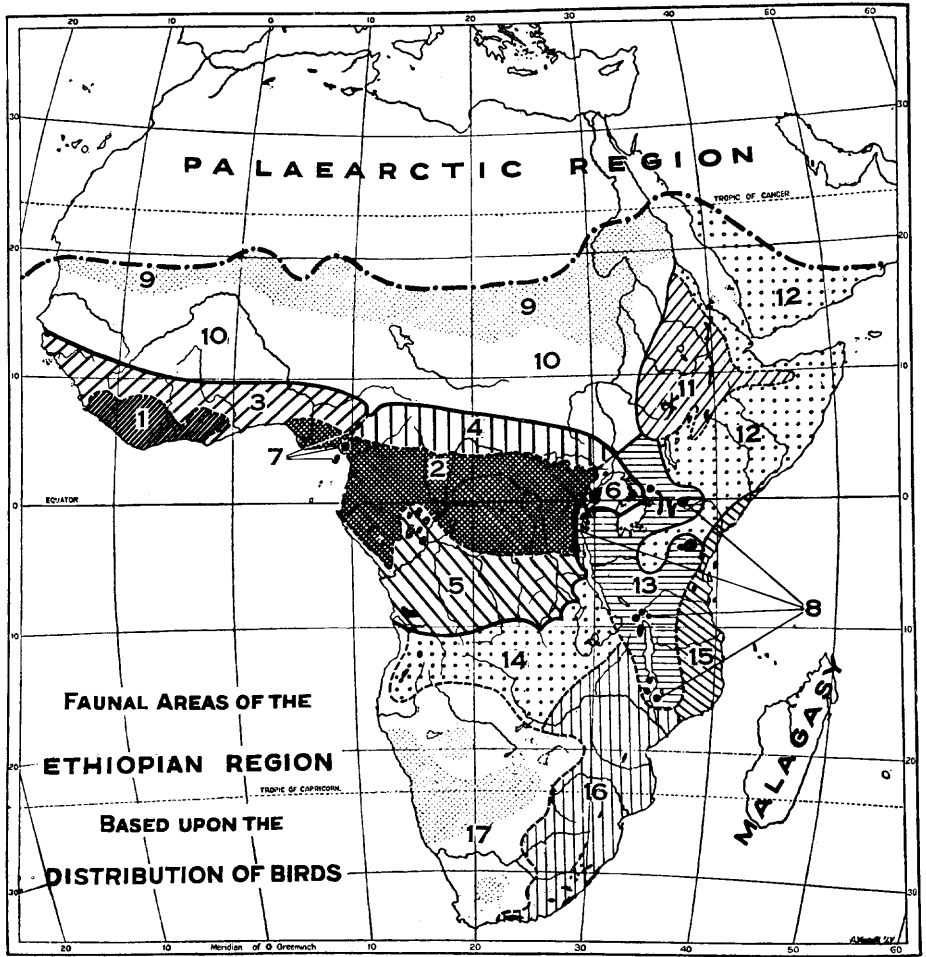


FIG. 184.

Chapin remarks that further subdivision might be made in the South African area, "especially in order to call attention to the high veld, the bush-veld, and the patches of cool forest scattered southward from Nyasaland through Gazaland to

Natal'; also that the western part of the Cape Province might perhaps be separated as a distinct district.

The map given by Chapin to indicate the boundaries of his suggested districts is reproduced in Fig. 184, and will serve as a basis for remarks on the zoogeography of African mosquitoes. We will take Chapin's six provinces in turn, and note how far the boundaries and subdivisions of each appear to be confirmed by mosquito distribution.

A. Guinean Forest Province.

This includes the equatorial forest belt, which is divided into an "upper" district embracing the forests of Sierra Leone, Liberia and Ashanti, and a "lower" district embracing the much larger forest area of Southern Nigeria, Gaboon and the northern half of the Belgian Congo, and including also as outliers the lowland forests of Uganda (below 5000 ft. altitude). The two districts are separated by an area of semi-arid country which occupies much of the Gold Coast Colony (including Accra) and extends eastwards to Lagos. Chapin mentions a number of instances in which the birds of these respective forest districts are specifically or at least subspecifically distinct.

The mosquito fauna of this forest province is very rich, and apart from more widely spread species includes a good many which are either confined to it, or at least are highly characteristic and spread only into the adjacent savanna province. Among these species are:

Anopheles obscurus, cinctus, smithi, hargreavesi, barberellus, hancocki.

Megarhinus conradti, phytophagus, aeneus.

Harpagomyia trichorostris, farquharsoni

Uranotaenia ornata.

Aedes (Finlaya) longipalpis.

A. (Stegomyia) apicoargenteus, fraseri, dendrophilus, luteocephalus.

A. (Aedimorphus) stokesi, simulans, domesticus, phyllolabis, pubescens.

A. (Banksinella) punctocostalis, taeniarostris, palpalis, fuscinervis.

A. (Dunnius) argenteoventralis.

Eretmapodites grahami, penicillatus, oedipodius, leucopus, etc.

Culex (Neoculex) andreaeus, rima, galliardi.

C. (Culex) annulioris ssp. consimilis, perfidiosus, pruina.

Although most of the above species are common to the two forest districts, there is evidence that some of them are at least subspecifically distinct in the upper and lower forests. The following may be quoted as either established or probable cases of the occurrence of representative forms in the two areas:

Upper Guinea Forests.		Lower Guinea Forests.
<i>Megarhinus phytophagus.</i>	.	<i>M. barbipes.</i>
<i>M. aeneus.</i>	.	<i>M. viridibasis.</i>
<i>Aedes (Dunnius) argenteoventralis.</i>	.	<i>A. (D.) a. dunni.</i>
<i>Eretmapodites forcipulatus.</i>	.	<i>E. inornatus.</i>
<i>E. oedipodius.</i>	.	<i>E. oe. stanleyi.</i>
<i>E. leucopus.</i>	.	<i>E. l. productus.</i>
<i>E. plioleucus.</i>	.	<i>E. p. brevis.</i>

The occurrence of many typically "western" species even as far east as Jinja shows that the lowland forests of Uganda belong to the western subregion.

The restriction of mosquitoes to the forest region is evidently largely due to their requirements or preferences regarding breeding places. The species listed above almost all breed in densely shaded forest pools and streams, rot-holes in forest trees, or (*Eretmapodites*) in fallen leaves.

B. *Guinean Savanna Province.*

This includes the less humid regions adjoining the forest province both to the north and south; the line of demarcation is vague, because isolated patches of forest occur in the savanna and fringing forests extend along the main rivers. The development of a savanna type of vegetation depends more on the distribution of rainfall through the year than on its total; a dry season of more than two months produces savannas; absence of a prolonged dry season produces forests even under a moderate total rainfall. The northern and southern parts of the savanna province are not quite continuous in the east, being separated by the Kivu highlands; moreover the northern portion is divided into three: the part west of the Cameroon highlands, including much of the Gold Coast Colony and also Lagos (Upper Guinea Savanna District); that between the Cameroon highlands and the Nile Valley (Ubangi-Uelle Savanna District); and the smaller part east of the Nile Valley (Uganda-Unyoro Savanna District) comprising the greater part of Uganda. Chapin finds well-marked differences not only between the northern and southern savannas of the Belgian Congo, but also between these districts and the Uganda savanna which includes a greater admixture of eastern forms; this last area however he regards as definitely belonging to the western subregion, the elephant-grass which is such a striking component of the vegetation being a western rather than an eastern plant.

It is difficult to recognize a distinct savanna province from the evidence supplied by mosquitoes. A great many species range from West Africa to Uganda and the Southern Sudan; some of these are forest dwellers and, as remarked above, belong properly to the Guinean forest fauna, but almost all of the remainder range also beyond the bounds of the savanna province as limited by Chapin, not only northwards into the Sudanese Province (in the northern Gold Coast, Northern Nigeria and the Nile Valley), but also to the south-east as far as Rhodesia and Nyasaland or even the Transvaal and Natal. It would seem, therefore, that as far as the mosquito fauna is concerned there is no definite distinction between the various park and grasslands classified by Chapin as Guinean savanna, Sudanese and highland, and that if a distinction is to be made between two subregions of the Ethiopian region it will be found to occur between forested and non-forested types of country. Few, if any, species of mosquitoes are restricted to the northern Guinean Savanna Province as defined by Chapin, or to any part of it.

The Southern Congo Savanna district supports much the same mosquito fauna as the rest of the savanna province, but a few species have been found in it which are not yet known to occur elsewhere. These are: *Anopheles concolor*, *dureni*, *mortiauxi*, *Aedes (Aedimorphus) yvonneae*.

Naturally the characteristic elements of the savanna mosquito fauna are those

genera and species which are adapted to life in open marshes or temporary rain-pools in grass-lands; most notable amongst these are many species of *Aedes* (subgenera *Mucidus*, *Aëdimorphus* and *Banksinella*), and also of *Taeniorhynchus* and *Ficalbia*. Some mosquitoes of the latter genera (and others) are characteristic of papyrus swamps, which, as Chapin points out, are widely distributed in the "sudd" areas of the Lualaba river and the upper Nile.

c. *Humid Montane Province.*

This includes the various isolated mountain areas of equatorial Africa. Chapin recognizes two districts: An "Eastern Montane District" which includes the high mountains of Kenya, Uganda, Tanganyika and Nyasaland, and also the Kivu highlands (but not those of Abyssinia); and a "Cameroon Montane District" which includes two highland areas in the Cameroons and also most of the islands of Fernando Po and Sao Thomé. In all these areas a rather similar type of mountain rain-forest, quite different from the lowland forest, is found, usually between the altitudes of 6000 and 8000 ft., followed at a somewhat higher altitude by bamboo forests; the development of these forests is associated with a marked change of climate—lowering of temperature and increase of rain and fog—which occurs, in the equatorial zone, at about 5000 ft. altitude. The vegetational and climatic conditions are therefore similar, and justify the treatment of these areas as forming a separate, though much dissected province.

The mosquito fauna of the East African mountains, though very much poorer in species than that of the lowlands or the surrounding table-land, is yet distinctive and interesting. As might be expected from the discontinuous nature of the environment, many of the mountain species are restricted to small areas. According to our present knowledge the following may be quoted as local endemics restricted to the areas mentioned, though some of them will probably be found to occur rather more widely when the highland mosquitoes are better known:

Mt. Kenya: *Aedes* (*Finlaya*) *embuensis*.

Aberdare Range: *Culex calurus*.

Mt. Elgon: *Culex hancocki*, *Aedes* (*Aëdimorphus*) *kapretwae*.

Kigezi district of Uganda, bamboo zone: *Aedes* (*Stegomyia*) *angustus*, *bambusae*.

Fernando Po: *Aedes* (*Aëdimorphus*) *boneti*.

Sao Thomé: *Culex tamsi*.

The last two species noted show affinities with *Aedes lamborni* and *Culex trifilatus* respectively of the East African highlands.

In addition to the more localized species there are others which are more widely dispersed but occur mainly at altitudes above 6000 ft. in this area. These include:

Anopheles garnhami.

Aedes (*Aëdimorphus*) *quasiunivittatus*, *dentatus*, *gibbinsi*, *lamborni*.

Culex (*Culex*) *andersoni*, *vansomereni*, *toroensis*, *zombaensis*, *ninagongoensis* and others.

The occurrence of numerous species of the *pipiens* series of the subgenus *Culex* suggests some connection between the mosquito fauna of the East African mountains

and the temperate north. Similar affinities have been recognized in other groups of insects and also among the plants. However, if there were any close connection with the European fauna one would have expected to find species of the subgenus *Ochlerotatus* in the alpine zones, but these do not occur; there are apparently no mosquitoes at all in the alpine and subalpine zones (11-15,000 ft.) on the equatorial mountains of Africa.

Some of the species mentioned above are perhaps better classed as pertaining to the fauna of East African highland districts, from which the montane mosquito fauna is evidently derived.

D. *Sudanese Province.*

In Chapin's classification this comprises a broad strip of country between the Guinean Savanna belt and the Sahara from the Atlantic to the Red Sea; it includes Northern Nigeria and almost the whole Anglo-Egyptian Sudan, and is divisible into a southern portion, the Sudanese Savanna District, and a northern portion, the Sudanese Arid District. A somewhat similar division of this zone into a northern and a southern portion has been recognized by naturalists working in the Anglo-Egyptian Sudan. Whitfield (1933) gives a map showing the dividing line as formed by the 400 mm. isohyet; this division is much the same as Chapin's, except that the Eritrean border region is shown as belonging to the northern district instead of the southern.

Apart from Northern Nigeria (which lies wholly within the savanna zone) and the Anglo-Egyptian Sudan, the mosquito fauna of the Sudanese province is hardly known. In the latter country the arid northern district supports very few species of mosquitoes, and some of those which occur seem to belong rather to the Palaearctic than to the Oriental region. Such are *Theobaldia longiareolata* and *Aedes caspius*, both very widely spread in the Mediterranean region.

As already remarked (p. 454), there does not appear to be any clear line of demarcation in the mosquito fauna between the Guinean savanna and the Sudan savanna. Nevertheless it is possible to point to at least one species (*Anopheles wellcomei*) which is more or less confined to the Sudanese Savanna District of Chapin, and occurs both in the southern half of the Anglo-Egyptian Sudan and in Northern Nigeria. Species so far known only from this zone in the northern part of the Gold Coast and Northern Nigeria are *Anopheles flavicosta* and *A. domicolus*.

E. *North-east African Province.*

In this Chapin includes Abyssinia, Eritrea, Somaliland, Northern Kenya and also South-west Arabia; the Abyssinian and Eritrean highlands are distinguished from the remainder of the area, which is designated the Somali Arid District. The division is certainly supported by the mosquito fauna of the area; that of the Abyssinian highlands is quite different from that of the Somali and Arabian areas and has much more affinity with that of the East African and Rhodesian highlands, which are indeed continuous with those of Abyssinia.

The mosquitoes of Eritrea and Italian Somaliland are scarcely known at all, but those of the Aden Hinterland and British Somaliland have been investigated. The

fauna is poor, and seems to include more Mediterranean than Ethiopian species, so that it might well be regarded as an extension southwards of the Mediterranean fauna *via* the Red Sea. The following species owe their inclusion in Ethiopian lists solely to their occurrence in this area :

Anopheles turkhudi, *multicolor*, *d'thali*.

Aedes (*Aëdimorphus*) *arabiensis*.

Culex sinaiticus, *laticinctus*.

In view of these records it would not be surprising if other Mediterranean mosquitoes turn up eventually in the Somali area, such as *Anopheles sergenti*, *Uranotaenia unguiculata*, *Culex* (*Barraudius*) *pusillus*, *C.* (*Lasiosiphon*) *adairi*, and *C.* (*Neoculex*) *deserticola*.

The few true Ethiopian species of this area include widespread forms such as—

Anopheles coustani, *gambiae*.

Aedes (*Stegomyia*) *aegypti*, *vittatus*.

A. (*Aëdimorphus*) *hirsutus*.

Culex (*Lutzia*) *tigrripes*.

C. (*Culex*) *univittatus*.

A few of these (notably *A. hirsutus* and *C. tigrripes*) differ slightly in this area from the usual Ethiopian forms of the species.

The island of Sokotra needs mention here. According to Forbes (1903) it is geologically quite distinct from the neighbouring mainland of Africa or Arabia, and is one of the oldest land-surfaces of the globe. Its fauna is also very distinct and includes numerous endemic species. This is confirmed by the little that is known of its mosquitoes, one of the four recorded species (*Aedes granti*) being a very distinct and isolated species not known to occur elsewhere.

f. Eastern and Southern Province.

Under this heading Chapin includes the whole of South Africa and the region east of the great lakes, dividing it into five main districts : (a) The East African Highland District, comprising the highlands of Kenya, Tanganyika and Nyasaland ; (b) the Rhodesian Highland District, comprising Northern Rhodesia and Central Angola ; (c) the East African Lowland District, comprising the coastal areas of Kenya and Tanganyika and northern Mozambique ; (d) the South-east Veld District, including all of South-east Africa south of Nyasaland ; and (e) the South-west Arid District, including South-west Africa, Bechuanaland and the western half of the Cape Province.

Among mosquitoes there are many species whose range includes not only the highland districts of East Africa and Rhodesia (in the sense noted above), but also extends southwards into Southern Rhodesia, Transvaal, Natal and even the highlands of the Cape Province. Amongst such species are :

Anopheles ardensis, *natalensis*, *longipalpis*, *leesoni*, *demeilloni*, *cinereus*.

Megarhinus brevipalpis (also in the lowlands), *lutescens*.

Uranotaenia mashonaensis, *alba*.

Taeniorhynchus fuscopennatus.

Aedes (*Aëdimorphus*) *alboventralis*, *quasiunivittatus*, *dentatus*.

Culex theileri, *triflatus*, *vansomereni*, *quasiquarti*.

A few of these also extend northwards into the Abyssinian highlands, and in addition one or two, notably *Anopheles christyi*, extend into Abyssinia, though not (so far as known at present) into Southern Rhodesia. Except for the species already mentioned as belonging to the "Humid Montane District," few species of mosquitoes are confined to the East African highlands, but examples of such may be :

Anopheles implexus, kingi, machardyi, lovettae.

Aedes (Finlaya) pulchrithorax.

Aedes (Aedimorphus) lamborni, natronius.

Culex mirificus.

The Rhodesian highland district has a number of species which are more or less peculiar to it, including the following :

Anopheles walravensi, distinctus.

Taeniorhynchus flavocinctus.

Aedes (Stegomyia) chaussieri, poweri, contiguus.

In addition there are some species (such as *Anopheles argenteolobatus* and *Culex terzii*) which range from this area southwards, though not northwards into the East African highlands.

One point that is abundantly confirmed by a study of mosquito distribution is the sharp distinction between the High Katanga and the remainder of the southern part of the Belgian Congo ; the Katanga fauna is much the same as that of Northern Rhodesia, and has far more in common with the East African and South Rhodesian highlands than with the Guinean savannas of the southern Congo. Chapin defines the High Katanga district of the Congo as limited (on the north-west) by the 3500 ft. contour, and this appears to agree with the indications given by mosquitoes.

In contrast with the continuity of the highland areas, the East African lowland district forms an isolated area separated from the western lowlands by the broad highland belt. In these circumstances it is somewhat surprising that this district does not support more endemic species. Among the few which can apparently be included in this category are the following :

Aedes (Finlaya) fulgens.

*A. (Aedimorphus) tricholabis.**

A. (Banksinella) albicosta, flavimargo, ellinorae.**

A. (Diceromyia) adersi.

*Eretmapodites subsimplicipes, silvestris ssp. conchobius.**

Culex (Neoculex) adersianus.

In addition *Aedes (Stegomyia) calceatus* and *soleatus* might perhaps be included here, though they occur also in Southern Rhodesia.

The mosquito fauna of South-West Africa (including the Cape and Bechuanaland) is imperfectly known, but certainly includes a number of species that do not occur elsewhere. Most of these are found in or near the Cape Peninsula, and include the following :

Anopheles cameroni.

Aedes (Finlaya) barnardi.

* These were discovered since the above paragraphs were written, the discovery suggesting that the mosquitoes of the East African Lowland district do, after all, form a more clearly distinct association than had hitherto seemed to be the case.

A. (Aëdimorphus) pachyurus, subdentatus.

Culex (Neoculex) péringueyi.

In view of the distinctive climate and vegetation of the Cape Peninsula it seems likely that further species may await discovery in that area. The arid area of the south-west does not, so far as known, support any endemic species, though one (*Aëdes pseudonigeria*) is only known with certainty from South-west Africa and Angola.

G. THE SEA COASTS.

As in the case of the birds, a special maritime element exists among the mosquitoes, including those species which breed mainly or exclusively in salt or brackish water. The maritime African mosquitoes fall into three categories :—

(a) Those occurring on the Atlantic coasts only :

Aëdes (Aëdimorphus) irritans, nigricephalus, punctothoracis.

Culex philipi.

(b) Those occurring on the eastern coasts only (including islands) :

Aëdes (Ochlerotatus) fryeri.

Aëdes (Skusea) pembaensis.

Culex sitiens.

(c) Those occurring on both east and west coasts :

Aëdes (Aëdimorphus) durbanensis.

Culex thalassius, tritaeniorhynchus.

Some of the species in the first two categories are strictly tropical, and may perhaps be associated especially with mangrove swamps ; those in the third category will presumably be found to occur all round the coasts of South Africa. *A. durbanensis* has also been reported from inland stations in Abyssinia and the Transvaal (though confirmation of these records is desirable).

ECOLOGICAL CLASSIFICATION.

Having discussed broadly the zoogeographical areas of Africa, Chapin in the work previously quoted turns to discuss the ecological aspects of bird distribution, and remarks :

“ The most fundamental distinction in Africa, ecologically, is that between the forest and grass-dwelling faunas. . . . We may, as a matter of convenience, delimit faunal areas and life zones, inasmuch as there are certain associations of birds often extending over large areas ; but let us not forget that the border lines of such divisions are certain, in places, to be vague or diffuse. Just as no two species of birds are exactly alike in all details of habits and food, so no two species, in the case of free-ranging continental forms, have areas of distribution which exactly coincide. The conclusion that I would draw is that each species must be studied by itself, after which it may often be included in some general scheme that will enable us to view in a not too unnatural perspective the wider aspects of bird distribution.

“ It is clear that the dispersal of birds in the Congo is not determined by impassable physical barriers, but by climate, and especially by rainfall. Climatic factors, save perhaps the cold of the mountains, act upon birds through the vegetation . . .

so the intimate connection between phytogeography and distributional ornithology is established."

All this might be said with equal truth in regard to mosquitoes, though here the fundamental factors governing distribution are rather different. The availability of suitable food for the adults may be one of the important factors, but it is one which we cannot assess because in most cases we do not know what kind (if any) of blood or other adult food is essential to the reproduction of the species. On the other hand, we do know that all mosquitoes require water in which to complete their development, and therefore an ecological classification of mosquitoes resolves itself at present into a classification of suitable breeding-waters. An outline of such a classification was given by Hopkins in the first volume of this monograph, and the subject will not be elaborated here, but the appended table of the distribution of Ethiopian mosquitoes (pp. 468-485) would be incomplete without some reference to the nature of their breeding-places, and for this purpose the following main types of breeding-place are recognized (for the most part following Hopkins's arrangement). The initial letter in brackets is that used for reference in the table :

Ground waters :

- (V) Permanent, with much vegetation but few trees (papyrus swamps, margins of lakes and rivers, etc.).
- (G) More or less permanent, but with less vegetation or none, usually open (ditches, ponds, wells, etc.).
- (T) Transitory rain or flood-water pools, usually open, with little vegetation beyond short grass.
- (F) Densely shaded pools in forest.
- (S) Edges and backwaters of streams, usually well shaded.
- (M) Maritime brackish pools and marshes.
- (K) Inland salt or alkaline areas.
- (C) Crab-holes, either in banks of streams or by sea-shore.
- (R) Small pools in rock.

Small containers, usually above ground-level :

- (H) Rot-holes in trees.
- (B) Bamboo stems, bored or cut.
- (D) Domestic utensils and other artificial containers (barrels, rain-water gutters, etc.).
- (L) Large fallen leaves, also cacao-husks, coconut-shells and snail shells.
- (A) Axils of leaves on growing plants (bananas, *Dracaena*, *Colocasia*).

PRESENT DISTRIBUTION IN RELATION TO THE PAST.

The present distribution of mosquitoes, as of any other group of animals or plants, is conditioned not only by present factors of climate, association or isolation, but also by the permanence or change of these factors in the past and by evolutionary changes in the organisms themselves. Present distribution may therefore throw light on past events, and *vice versa*, though any discussion on either aspect of the subject must be largely conjectural.

As regards the past history of the African continent, the following conclusions are now more or less agreed upon by geologists and biologists: The land surface is of ancient standing, having been for the most part continuously exposed since palaeozoic times. It may once have been connected with South America, but if so the connection broke down during or before the cretaceous; a connection with India (perhaps through Madagascar, more probably through Arabia) is more clearly indicated and may have lasted until the early tertiary. During at least the whole of the tertiary period there must have been a continuous equatorial forest belt; shifting of the poles or changes in rainfall would merely have caused this belt to alter in width or position. During the middle and later tertiary the rift valleys and most of the mountains of eastern Africa were formed; during the same period also the desiccation of north-eastern Africa and Arabia took place, and this may have had a greater influence on the fauna and flora than the earth-movements, as it may have broken the continuity which probably formerly existed between the African and Indian forests through Arabia and Baluchistan. The elevation of East Africa during the late tertiary not only separated the East African lowland area from the western forest zone, but also provided a way for the intermingling of the northern and southern savanna faunas which had till then developed separately.

The reverse side of the picture concerns the evolutionary history of mosquitoes as such. On this subject the palaeontological evidence is slight, but numerous fossils have been found in the Lower Oligocene of the Isle of Wight. These were studied by Edwards (1923), who found that they included specimens of the recent genera *Aedes* and *Culex*, and perhaps also *Taeniorhynchus* and *Megarhinus*. It appears therefore that most of the existing genera of mosquitoes were already differentiated in the early tertiary, and they may indeed be still older, as the Culicidae are a rather primitive family of Diptera, and the order as such probably arose as far back as the Triassic. There is every reason to suppose, therefore, that mosquitoes of several genera have inhabited the African forests and savannas at least throughout the Tertiary Period.

It cannot be a coincidence that the genera and subgenera common to Africa and South America (see p. 450) are those which on morphological grounds are regarded as the most primitive. The explanation seems obvious, that these groups were present in both regions before the final separation of Africa and South America in cretaceous times. If this be granted on the general evidence, it may be legitimate also to adopt the converse argument in special cases, and conclude that the presence of *Finlaya* and *Lutzia* in both Africa and South America indicates that these are to be regarded as among the most primitive subgenera of *Aedes* and *Culex* respectively, and that the great evolution of *Culex* in South America and of *Aedes* in the tropics of the Old World has taken place subsequently to the cretaceous. Christophers (1933) came to similar conclusions regarding the evolution of *Anopheles*.

The groups *Eretmapodites* and *Dunnius* of Africa appear to be represented in the Oriental region by *Heizmannia*, *Armigeres* and *Leicesteria*. All these are essentially forest mosquitoes, and the occurrence of representative genera or subgenera in the two regions indicates that evolution has been proceeding independently in the forest mosquito faunas of Africa and the east over a long period; the theory that a former continuity between the two forest areas broke down in the Eocene or Miocene periods

would be quite in accordance with mosquito distribution. In regard to *Eretmapodites*, the present wide distribution of some of the species (*chrysogaster*, *quinquevittatus*) may well be of quite recent occurrence, consequent upon the cultivation of the banana and cacao, the leaves and pods of which provide ideal breeding-places.

In *Harpagomyia*, *Hodgesia*, *Ficalbia*, *Coquillettidia*, *Mansonioides*, *Stegomyia*, *Aëdimorphus*, *Diceromyia*, *Culiciomyia* and *Mochthogenes* we have examples of tropical genera or subgenera which have no South American representatives but are common to the Ethiopian and Oriental regions, though most of the species of the two regions are different. Some of the species of these groups are forest insects, but more of them are associated with savannas or savanna woods and swamps. From these facts we may perhaps conclude that the two savanna faunas became isolated at a less distant date than did the forest faunas.

The absence of endemic species of *Ochlerotatus* in Africa (apart from the coastal *O. fryeri*, which is not a typical member of the subgenus) is of interest, and suggests that the evolution of *Ochlerotatus* took place during the period (post-Miocene) when the Ethiopian region was isolated.

In South Africa we have a few examples of species which are related to northern forms but yet show some differences; thus *Anopheles listeri* of the Cape Province is nearly related to *A. multicolor* of North Africa, and the South African form of *Theobaldia longiareolata* is rather different from the Mediterranean form. Some other species, notably *Culex pipiens* and *C. theileri*, range from the Mediterranean to the Cape without appreciable change. The explanation of this may be that northern species have invaded the south (*via* the eastern highlands) at different periods, perhaps inter-glacial and post-glacial.

The comparatively short period of separation of the east and west African lowland forest areas is evidenced by the lesser degree of differentiation of the forest mosquitoes as compared with those of the Ethiopian and Oriental regions; the distinctions between representative pairs of species (*Aedes longipalpis* and *fulgens*, or *Culex albiventris* and *adersianus*) are not great.

The occurrence of the genus *Orthopodomyia* on Mauritius, and of a distinct species of the subgenus *Finlaya* on Madagascar, is additional evidence supporting the accepted conclusion of the long separation of the Malagasy region from Africa, though the bulk of the Malagasy mosquito fauna as at present known would appear to have been derived from quite recent invasions from the African continent. Any endemic species of *Megarhinus*, *Theobaldia* or *Orthopodomyia* which may occur in Madagascar (where these genera have not yet been found) should prove of special interest.

SOURCES AND EXTENT OF OUR PRESENT KNOWLEDGE.

Under this heading a brief indication is given of the extent of our present knowledge of the mosquito fauna of the different countries of the Ethiopian Region, and of those entomologists and medical men who have contributed most to the sum of this knowledge. The countries are arranged in geographical order, as political units, from west to east and from north to south. Dates and names in brackets refer

to entries in the bibliography at the end of this volume ; dates not bracketed refer to the time of observations.

SENEGAL.—Only very few records available ; some by Dutton, 1902. *Aedes scatophagoides* is in Paris Museum from Dakar (*G. Melon*).

GAMBIA.—No complete mosquito survey. Early collections by Dutton and J. J. Simpson ; list by Simpson (1911). Additions by F. A. Innes, 1924 and 1929.

PORTUGUESE GUINEA.—A small collection submitted to me in 1932, taken by Mr. L. F. de Sequeira at Bolama, included *An. squamosus* ; *Aed. aegypti*, *irritans*, *punctothoracis*, *furcifer* ; *C. tigripes*, *nebulosus*, *thalassius*, *fatigans*.

FRENCH GUINEA.—Short list published by Joyeux (1915). A few specimens collected by Joyeux at Kankan are in Paris Museum, including *A. gambiae* ; *M. brevipalpis* ; *Aed. aegypti* ; *C. tigripes*, *duttoni*, *pipiens*.

UPPER SENEGAL AND VOLTA.—A few specimens labelled Kita are in Paris Museum, including *C. tigripes*, *duttoni*, *decens*, *univittatus*. Some Anopheline records by Joyeux, Sicé and Sautet (1939).

SIERRA LEONE.—Freetown District : Complete survey by Blacklock and A. M. Evans (Evans, 1925, 1926) ; other collections in the same area by F. Smith, 1904, H. E. Arbuckle, 1910, J. Y. Wood, 1913, A. Bacot (1916), A. D. Fraser, 1925, S. R. Christophers, 1928, E. S. Wales, 1931. Other localities (Daru, Njala, Pepel, etc.) : J. C. Murphy, 1911, E. Hargreaves, 1924–33, D. B. Blacklock, 1924, R. M. Gordon and T. H. Davey, 1931, 1939. Forest area towards Liberian border not much studied.

LIBERIA.—Few records available, apart from those of the Harvard Expedition of 1926 (Bequaert, 1930). Anophelines of Firestone Plantation studied by Barber.

IVORY COAST.—Few records available. *Aedes aegypti* has been recorded from various localities (see Kumm, 1931). *An. gambiae* and *funestus* are in Paris Museum from Angnakokro (*P. Combras*). No records from the mountains.

GOLD COAST.—The neighbourhood of Accra studied intensively by W. M. Graham and A. C. Connal, 1908–11, and A. Ingram and J. W. S. Macfie, 1911–20 ; lists by Macfie and Ingram (1916) and Ingram and Macfie (1924). Considerable collections made in Ashanti by W. M. Graham, 1906–10, H. G. F. Spurrell, 1911, and A. Ingram, 1915 ; no published list but records included in this volume. Lists of species taken in Northern Territories published by Ingram (1912, 1919) ; other records by H. F. Hamilton, 1912. Survey of Takoradi by A. W. J. Pomeroy, 1930.

DAHOMEY.—A small collection in Paris Museum, obtained by R. Gaillard, Roubaud, Séguéy and Waterlot, includes *T. africanus*, *annetti*, *maculipennis*, *C. poicilipes*, *consimilis*.

NIGERIA.—Southern Province : Intensive collecting has been done in the neighbourhood of Lagos and Ibadan by W. M. Graham, 1909 ; A. C. Connal and S. L. M. Summers-Connal, 1912–25 ; J. M. Dalziel (1920) ; L. H. Dunn (1927, 1928) ; J. A. Kerr (1933) ; H. W. Kumm (1931) ; C. B. Philip (1931) and V. B. Wigglesworth (1929). Other records by J. J. Simpson (1912) ; Oshogbo district, T. F. G. Mayer (1911).

Northern Province : Considerable collections from Katagum and other places (W. B. Johnson, 1919), Kano (H. W. Kumm, 1931), and Gadau (A. W. Taylor, 1930, 1934) ; other records by J. J. Simpson, 1911 ; F. D. Golding, 1932. Few or no records available from the central highlands.

CAMEROONS.—A small collection in the Berlin Museum from the lowlands was

reported on by K. Grünberg (1905); more extensive collections from lower slopes of Mt. Cameroon by Zumpt (1936, 1937). No mosquitoes appear to have been taken in the mountains, the fauna of which should prove of much interest.

FRENCH EQUATORIAL AFRICA.—The only considerable collection is that of H. Galliard (1931) from Gaboon. A few specimens collected by Roubaud and others at Brazzaville are in the Paris Museum.

SPANISH GUINEA.—The only record known to me is that of the type of *Toxorhynchites tessmani* Enderlein (*Megarhinus brevipalpis*).

FERNANDO PO.—Only important collection is that made by J. Gil and F. Bonet in 1935 (Gil Collado, 1936).

PRINCIPE AND SAO THOME.—Several species obtained by F. W. Urich, W. H. T. Tams, 1932 (Edwards, 1934).

BELGIAN CONGO.—Early records were collated by J. Schwetz (1927). Since then collections of mosquitoes have been made in most parts of the country, the most important being the following: Lower Congo: M. Wanson, Nicolay and others (Schouteden, 1930; Wanson, 1935). Kwango: Schwetz (1938), Mortiaux, 1938. Stanleyville: Mouchet (1926); Schwetz (1930). Leopoldville-Kinshasa: Henrard 1933, Duren (1929). Kisantu: L. De Wulf 1932. High Katanga: Schwetz (1927, 1930); Walravens, 1928; Seydel (1929). Tanganyika highlands: Schwetz (1930). Kivu, Ruanda-Urundi and Ituri highlands: Bequaert (1930) and Schwetz, 1939. Faunal list by Bequaert (1930); of Anophelines by Duren (1938). Districts not investigated are Niangara in the north and Lulua in the south. In no area has the tree-hole and plant axil fauna been fully investigated.

ANGLO-EGYPTIAN SUDAN.—Fairly complete collections have been made in most parts of the country, first by H. H. King and H. W. Bedford, more recently by D. J. Lewis, W. Ruttledge, F. G. S. Whitfield and others. Complete records of mosquito distribution in the Sudan have been kept at the Wellcome Tropical Research Laboratories, and I am indebted to Mr. Ruttledge for copies of these. Some specimens were taken on Jebel Murra and the Imatong Hills by Miss M. Steele, but further records needed from these areas.

ERITREA.—Some records published by Franchini (1928) and distribution of Anophelines given by Lega, Raffaele and Canalis (1937). Culicines not studied.

ABYSSINIA.—H. Scott (1927) reported on his collection from Central Abyssinia and C. E. Bevan (1937) gave a complete list, with localities, of mosquitoes known from Abyssinia to that date, including those taken by himself, R. E. Cheesman, J. W. S. Macfie, H. Nystrom and others. Further additions have been made by G. Raffaele (who kindly sent me his small collection of Culicines) and by Lega, Raffaele and Canalis (1937) and Corradetti (1938, 1939).

FRENCH SOMALILAND.—Neveu Lemaire (1906) lists six species; I know of no subsequent records except that of *Aedes aegypti* by Doreau, 1909.

BRITISH SOMALILAND.—R. E. Drake-Brockman (1913) recorded *Aed. aegypti*. T. H. Twigg, 1930, obtained several species in the interior (noted in this volume).

ITALIAN SOMALILAND.—Franchini (1928) recorded *Aedes albicosta*, and Zavattari (1934) lists six species: *An. gambiae*, *rhodesiensis* [*? d'thali*], *Aed. aegypti*, *vittatus*, *C. pipiens*, *theileri*. Anophelines mapped by Lega, Raffaele and Canalis (1938).

ADEN AND S.W. ARABIA.—Aden Protectorate: survey by W. S. Patton, 1905;

Anophelines studied by Christophers and Khazan Chand, 1915; further collections by H. Scott and E. B. Britton, 1936; survey now in progress by P. W. R. Petrie. Arabian Desert: some specimens taken by W. H. Ingrams and H. StJ. Philby. Jedda: collection by F. P. Mackie.

SOKOTRA.—The only records are those by Grant and Theobald (in Forbes, 1903) and by Becker (1910). The identity of two of the four species recorded by Becker requires confirmation, and it is probable that other species occur.

UGANDA.—Fairly complete mosquito surveys have now been made in most parts of the country and in all types of breeding-place. List by Hancock (1930); very many subsequent additions, largely through surveys organized by G. H. E. Hopkins, assisted by T. W. Chorley and others. Entebbe, Mengo and Busoga districts: most of the early collections by Bruce, Gowdey, Hodges, Low, Moffat and others (reported on by Theobald) were from this area; subsequent collections by A. D. Fraser, 1909-11, G. D. H. Carpenter, G. L. R. Hancock (1934), H. Hargreaves, besides Hopkins's surveys. Bugishu (Mt. Elgon): G. L. R. Hancock (Hancock and Soundy, 1929). Toro (Ruwenzori district) and Kigezi (Birunga Mts., etc.): S. A. Neave, 1911; G. L. R. Hancock (Fishlock and Hancock, 1932); J. F. Shillito, 1932-5; E. G. Gibbins; B. M. Ruwenzori Expedition (Edwards and Gibbins, 1939); E. Burton, 1936. Lira and Soroti districts: Hopkins and Hancock; J. Ford, 1934. Arua district: Hopkins. Masaka district: Hopkins and Chorley.

Areas still requiring investigation: Imatong Mts. (Sudan border); Mts. Moroto and Debasien; forests bordering lakes Albert and Edward.

KENYA.—T. J. Anderson (1924) listed the species known from the colony at that date, and V. G. L. Van Someren and H. S. De Boer (1926) surveyed the Nairobi area. Anopheline surveys carried out in various parts of the country by C. B. Symes, P. C. Garnham, J. I. Roberts, A. M. Evans and others. Complete survey of Mombasa district by Wiseman, Symes, McMahon and Teesdale (1939). Collections of Culicines from the highlands and from Kakamega made by Symes, Roberts, E. C. MacDonald, R. B. C. Van Someren, C. Teesdale, and T. H. E. Jackson. J. R. H. Chell, 1913, obtained some species in the Marsabit area. Northern arid areas, Lorian Swamp and Mt. Kenya scarcely touched.

TANGANYIKA.—Surveys of the Dar-es-Salaam area made by A. W. J. Pomeroy (1920), J. W. MacHardy (1927, 1930), R. R. Scott and R. Mackay. Records from the highlands and plateau are rather few and scattered. Dar-es-Salaam and Lindi, species taken by J. Howarth recorded through error as breeding on coconut palms (Edwards, 1923). Anophelines of Moshi and Arusha districts, Wilson (1938).

ZANZIBAR.—Rather complete collections made on Zanzibar I. by W. M. Aders (1917) and on Pemba by Dr. McCarthy.

ANGOLA.—The only considerable collection is that made by C. Wellman, 1904-5, in Benguella and Bihé, reported upon by Theobald; a few additional specimens obtained by M. Gamble at San Salvador. Probably new species await discovery both in the highlands and coastal area.

N. RHODESIA.—Mosquito fauna very little known. Collections made at Ndola by E. S. Adderley, B. de Meillon and R. B. Jackson, 1938; few other records.

NYASALAND.—Survey of Fort Johnston area chiefly due to W. A. Lamborn. Other records, mainly from the southern part of the country, by R. Bury, J. B. Davey, 1915, S. A. Neave, 1913, R. C. Wood, 1916.

S. RHODESIA.—First extensive collections by G. A. K. Marshall, 1900–01. Survey (chiefly Anophelines) by H. S. Leeson (1931). Other records by A. Cuthbertson.

MOZAMBIQUE.—No detailed information available. Small collections from Delagoa Bay by J. F. Sant'Anna, 1905, K. H. Barnard, 1913, and B. de Meillon, 1937; from interior in Paris Museum by G. Vasse, 1905, and P. Lesne, 1928 (Séguy, 1931).

S.-W. AFRICA.—Very few records. Small collection from Ovamboland by K. H. Barnard (Edwards, 1924) and from Aus and other places by R. E. Turner.

BECHUANALAND.—Very few records. Some species taken by Vernay-Lang Kalahari Expedition reported by Bedford (1935). Few by W. A. Lamborn, 1935, and R. B. Woosnam, 1909.

CAPE PROVINCE.—Mosquitoes very inadequately known. Small old collection in Stockholm Museum from "Caffraria" by J. Wahlberg. Cape Town district: L. Peringuey, K. H. Barnard and others (Edwards, 1924); de Meillon (1935). Grahamstown: P. J. Barraud, 1934. Ceres, etc.: R. E. Turner, 1933.

TRANSVAAL.—Fairly complete collections, especially from Pretoria and Onderstepoort districts. Lists and records by Bedford (1928), Ingram and de Meillon (1927, 1929), and Nieschultz, Bedford and Du Toit (1934).

ORANGE FREE STATE.—Some records by A. Ingram, 1925, and R. E. Turner, 1927. No extensive collections.

BASUTOLAND.—I am unaware of any records from this country.

NATAL.—No complete faunal list published. Early Anopheline survey by Hill and Haydon, 1907. Zululand, also Pietermaritzburg: survey by A. Ingram and B. de Meillon (1927, 1929); other records by G. A. H. Bedford, 1923. Weenen and Estcourt: G. A. K. Marshall, 1896; H. P. Thomasset, 1923–5. Durban: F. Muir, 1902; S. R. Christophers, 1899; survey by E. C. Chubb (Edwards, 1915).

MADAGASCAR.—Revised list by Edwards (1920) includes records of Ventrillon, 1904–5, and others. Some additional species found by W. A. Lamborn, 1933. Collection made by A. Seyrig, 1928, submitted by E. Séguy of Paris Museum and records included in this volume.

No systematic survey has been made, and it is probable that the faunal list will be considerably extended when the forest mosquitoes have been investigated.

COMORO IS.—Ventrillon, 1905, recorded *Aedes pemaensis* and *Eretmapodites quinquevittatus* from Mayotte I. The only additional record I have is one of *Aedes aegypti* from Grand Comoro I. (Pobeguain, 1899; Paris Mus.).

SEYCHELLES, etc.—Collections, probably fairly complete, made by Hugh Scott and J. C. F. Fryer on the Percy Sladen Expedition, 1908–9 (Theobald, 1912). Introduction of *Anopheles gambiae* to Aldabra discovered by J. T. Bradley, 1930, and recorded by Hermitte, 1931. No records from Amirante Is.

MAURITIUS.—Early collections made by Daruty de Grandpré and d'Emmerez de Charmoy, 1901, and by Sir Ronald Ross, 1908. Complete survey of the island and also of Rodriguez island by M. E. MacGregor (1924).

REUNION.—R. Blanchard (1902) lists seven species, but some determinations require confirmation. Other available records quoted by Edwards (1920). No endemic species are known, but it is probable that some exist, especially as the primitive forests are less extensively destroyed than in the case of Mauritius.

LIST OF ETHIOPIAN MOSQUITOES WITH SUMMARIZED DISTRIBUTION.

In the table which follows a complete list is given of the species, subspecies and varieties of Ethiopian mosquitoes, arranged in systematic order, with their distribution as at present known in the various countries of Africa. In tabulating the records all the British African territories have been treated separately; the Belgian and Portuguese countries and Abyssinia have also been included, but Eritrea, Italian Somaliland and some of the French territories are omitted because very few records are available at present.

For faunistic reasons it appeared desirable to adopt divisions of some of the countries when classifying the records. These divisions have not been made in any precise manner, but merely serve roughly to separate the different faunal areas included in some political units. In the case of the Gold Coast the records have been classed according to the three political divisions of the Gold Coast Colony, Ashanti and Northern Territories, the kingdom of Ashanti coinciding largely with the forested area of the whole country. For Nigeria also the political boundary has been adopted, Southern Nigeria including all the forest area and Northern Nigeria most of the savannas; here however the position is complicated by the fact that much of the collecting has been done around Lagos, which is just outside the forest area.

Records from the Belgian Congo have been classed under four headings, according to the faunistic division of the country suggested by Chapin: (*a*) North, the forest area, including Mayumba and Ituri forests; (*b*) South, the savanna area, including Leopoldville and Kabinda (Lower Katanga); (*c*) Eastern Highlands, Kivu and Ruanda-Irundi; and (*d*) High Katanga, above 3500 ft.

For the Anglo-Egyptian Sudan the dividing line adopted is the 400 mm. isohyet, as indicated by Whitfield; a large proportion of the records from the southern Sudan, however, are from rather near the Uganda border and perhaps appertain to the "Guinean" rather than to the "Sudanese" savanna, between which I have not attempted to discriminate. Records from the Baro and Pibor rivers (in this area) have not been included in the Abyssinian list, all other Abyssinian records being from the highlands.

In the case of Kenya and Tanganyika a rough division has been adopted between the coastal lowlands and the highlands. The lower Shire district of Nyasaland should probably be included in the lowland district, but no account has been taken of this. For the South African Union the main political divisions have been adopted.

In compiling the table reference has been made to numerous published lists, but wherever any of the records appeared to need confirmation (as, for example, when a species has been subdivided since the publication of the record, and no specimens are available for checking) they have been omitted. The distribution as given in the table is therefore only that which is definitely established, and future collecting will add much to our knowledge of the subject. Localities and collectors' names will be found mentioned under "Distribution" in the systematic part of this book.

In the column headed "Breeding-places," the usual type of breeding-place selected by each species is indicated, according to the classification on p. 460. The absence of a symbol in this column indicates that the species has not been bred.

	Gambia.	Sierra Leone.	Liberia.	Gold Coast.			Nigeria.		Gulf Islands.	Cameroon.	Gaboon.	Belgian Congo.				Z.	A.-E. Sudan.
				N.T.	Ashanti.	Colony.	N.	S.				North.	South.	E. Highlands.	High Katanga.		
HODGESIA																	
<i>sanguinea</i> Theo.	
<i>psectropus</i> Edw.	
<i>nigeriae</i> Edw.	..	?	×	
<i>cyptopus</i> Theo.	×	×	
URANOETAENIA																	
<i>pallidocephala</i> Theo.	×	..	×	×	..	×	
<i>philonuxia</i> Philip	×	×	×	..	×	
<i>coeruleocephala</i> Theo.	×	×	×	..	×	
<i>alboabdominalis</i> Theo.	×	×	×	..	×	
<i>alba</i> Theo.	
<i>mayeri</i> Edw.	..	×	×	..	×	×	
<i>bilineata</i> Theo.	×	
var. <i>fraseri</i> Edw.	
var. <i>connali</i> Edw.	..	×	×	×	×	×	..	×	
var. <i>obsoleta</i> Edw.	
<i>balfouri</i> Theo.	×	×	×	×	×	×	
<i>caliginosa</i> Philip	×	×	×	..	×	
<i>neireti</i> Edw.	×	×	×	..	×	
<i>chorleyi</i> Edw.	
<i>hopkinsi</i> Edw.	×	×	×	..	×	
<i>montana</i> I. & de M.	
<i>annulata</i> Theo.	×	×	×	×	
var. <i>apicotaeniata</i> Theo.	×	×	×	×	
<i>candidipes</i> Edw.	
<i>ornata</i> Theo.	..	×	×	×	..	×	×	×	..	×	
ssp. <i>musarum</i>	
<i>nigripes</i> Theo.	..	×	
<i>pandani</i> Theo.	×	×	×	..	×	
<i>nepenthes</i> Theo.	
<i>mashonaensis</i> Theo.	
<i>nigromaculata</i> n.	×	×	..	×	×	×	..	×	
<i>micromelas</i> Edw.	×	×	×	×	
<i>fusca</i> Theo.	..	×	×	
<i>shillitonis</i> Edw.	×	×	..	×	×	×	
<i>henvardi</i> Edw.	×	×	
AEDOMYIA																	
<i>africana</i> N.-L.	×	..	×	×	×	..	×	×	×	×	×	..	×	
<i>furfurca</i> End.	×	×	×	..	×	
THEOBALDIA																	
(<i>Allotheobaldia</i>)																	
<i>longiareolata</i> Mcq.	×	
(<i>Theomyia</i>)																	
<i>fraseri</i> Edw.	..	×	×	×	×	
ORTHOPODOMYIA																	
<i>arboricollis</i> d'Emm.	
FICALBIA																	
(<i>Mimomyia</i>)																	
<i>splendens</i> Theo.	×	×	..	×	..	×	×	×	×	..	×	
<i>hispida</i> Theo.	..	×	..	×	..	×	×	×	×	..	×	
var. <i>palustris</i> Theo.	×	×	×	
var. <i>sunyaniensis</i> Edw.	×	×	
<i>lacustris</i> Edw.	×	×	

REFERENCES.

Titles of papers dealing with Culicine distribution in Africa or with Culicine pupae, together with some others quoted in text. Papers dealing solely with taxonomy of Culicine adults or larvae, or solely with Anophelines, are not included, except that the more important papers on Anophelini appearing since 1937 have been noted; titles of papers on these subjects are given in Parts I and II of this work.

- ADERS, W. M. (1917). "Insects Injurious to Man and Stock in Zanzibar." Bull. Ent. Res., VII, pp. 391-401.
- ANDERSON, T. J. (1924). "Blood-sucking Insects and Their Allies in the Colony and Protectorate of Kenya." Kenya Med. Jl., suppt., 14 pp.
- BACOT, A. W. (1916). Yellow Fever Commission (West Africa). Ent. Rept.
- BAISAS, F. E. (1938). "Notes on Philippine Mosquitoes, VII." Monthly Bull. Bureau of Health P.I., XVIII, pp. 175-232.
- BARBEAU, L. G. (1930). Ann. Rep. Med. Hth. Dept. Mauritius 1928 [see Rev. Appl. Ent., XVIII, p. 261].
- BARRAUD, P. J. (1934). Fauna Brit. Ind. Culicidae. Tribes Megarhinini and Culicini.
- and COVELL, G. (1928). "The Morphology of the Buccal Cavity in Anopheline and Culicine Mosquitoes." Ind. J. Med. Res., XV, pp. 671-679.
- BAUER, J. H. (1928). "The Transmission of Yellow Fever by Mosquitoes other than *Aedes aegypti*." Amer. J. Trop. Med., VIII, pp. 261-282.
- BECKER, TH. (1910). "Dipteren aus Südarabien und von der Insel Sokotra." Denkschr. Math.-Nat. Kl. k. Akad. Wien, LXXI, 1-30 (sep.).
- BEDFORD, G. A. H. (1928). "South African Mosquitoes." S. Afr. Dept. Agric., 13th and 14th Rept. Vet. Res., pp. 883-990.
- (1935). "Scientific Results of the Vernay-Lang Kalahari Expedition, March to September, 1930. Report on the Blood-sucking Diptera." Ann. Transv. Mus., XVI, pp. 605-607.
- BEEUWKES, H., KERR, J. A., WEATHERSBEE, A. A., and TAYLOR, A. W. (1933). "Observations on the Bionomics and Comparative Prevalence of the Vectors of Yellow Fever and other Domestic Mosquitoes of West Africa." Trans. R. Soc. Trop. Med. Hyg., XXVI, pp. 425-447.
- BEQUAERT, J. (1930). "Medical and Economic Entomology." In: STRONG and others: "The African Republic of Liberia and the Belgian Congo," II, 797-1001. Harvard Univ. Press.
- BEVAN, C. E. (1937). "Notes on the Distribution and Breeding-places of Mosquitoes in Northern Abyssinia." Bull. Ent. Res., XXVIII, pp. 279-287.
- BLACKLOCK, D. B. (1925). "Notes on a Mosquito Survey at Daru, Sierra Leone." Sierra Leone: Ann. Med. and Sanit. Rept., 1924, pp. 61-68.
- BLANCHARD, R. (1902). "Note sur les moustiques de la Réunion." C.R. Soc. Biol., LIV, pp. 643-644.
- BRETT, G. A. (1938). "On the Relative Attractiveness to *Aedes aegypti* of Certain Coloured Cloths." Trans. R. Soc. Trop. Med. Hyg., XXXII, pp. 113-124.
- BOUFFARD, G. (1908). "Le *Stegomyia fasciata* au Soudan français." Bull. Soc. Path. exot., I, pp. 454-459.
- CHRISTOPHERS, S. R. (1923). "The Structure and Development of the Female Genital Organs and Female Hypopygium of the Mosquito." Ind. J. Med. Res., X, pp. 698-720.
- and BARRAUD, P. J. (1923). "Descriptive Terminology of the Male Genital Characters of Mosquitoes." Ind. J. Med. Res., X, pp. 827-835.
- CONNAL, A. C. (1925-). "Annual Reports of the Medical Research Institute." Nigeria: Ann. Med. and Sanit. Repts.
- (1931). "Report of the Laboratory Service, 1930." Ann. Med. Hlth. Rep. Nigeria, 1930, pp. 71-97.

- CORRADETTI, A. (1938). "L'anofelismo nella regione del Semien durante la stagione secca." *Bol. Soc. Ital. Biol. sper.*, XIII, pp. 114-115.
- (1938). "La malaria nella regione Uollo-Jeggiu nel periodo Luglio-Ottobre 1937." *Bol. Soc. Ital. Biol. sper.*, XIII, pp. 115-116.
- (1938). "Due specie di *Anopheles* rinvenute nella valle do Mai-Habar nell' Ottobre 1937." *Bol. Soc. Ital. Biol. sper.*, XIII, p. 117.
- (1939). "Sulla fauna anofelica della regione Amarica." *Bol. Soc. Ital. Biol. sper.*, XIV, p. 352.
- (1939). "L'anofelismo nella regione Uollo Jeggiu." *Riv. Parassit.*, III, pp. 207-219.
- DALZIEL, J. M. (1920). "Crab-holes, Trees, and Other Mosquito Sources in Lagos." *Bull. Ent. Res.*, XI, pp. 247-270.
- DAUBNEY, R., and HUDSON, J. R. (1933). "Rift Valley Fever." *E. Afr. Med. J.*, X, pp. 2-19.
- DAVIS, G. E., and PHILIP, C. B. (1931). "The Identification of the Blood-meal in West African Mosquitoes by means of the Precipitin Test. A Preliminary Report." *Amer. J. Hyg.*, XIV, pp. 130-141.
- DAVIS, N. C. (1932). "The Effects of Heat and Cold upon *Aedes (Stegomyia) aegypti*." *Amer. J. Hyg.*, XVI, pp. 177-191.
- (1933). "Transmission of Yellow Fever Virus by *Culex fatigans* Wiedemann." *Ann. Ent. Soc. Amer.*, XXVI, pp. 491-495.
- DRAKE-BROCKMANN, R. E. (1913). "Some Notes on *Stegomyia fasciata* in the Coast Towns of British Somaliland." *J. London School Trop. Med.*, II, pp. 166-169.
- DUNN, L. H. (1927). "Tree-holes and Mosquito Breeding in West Africa." *Bull. Ent. Res.*, XVIII, pp. 139-148.
- (1928). "Further Observations on Mosquito Breeding in Tree-holes and Crab-holes." *Bull. Ent. Res.*, XVIII, pp. 247-250.
- DUREN, A. N. (1929). "Contribution à l'étude des Culicides du Congo Belge." *Ann. Soc. Belg. Méd. Trop.*, IX.
- (1938). "État actuel de nos connaissances sur les anophèles du Congo Belge." *Ann. Soc. Belg. Méd. Trop.*, XVIII.
- EDWARDS, F. W., (1915). "An Annotated List of Mosquitoes Occurring at Durban, Natal." *Ann. Durban Mus.*, I, pp. 160-166.
- (1920). "Notes on the Mosquitoes of Madagascar, Mauritius and Réunion." *Bull. Ent. Res.*, XI, pp. 133-138.
- (1923). "Mosquitoes Reared by Dr. W. E. Haworth from Coconut Palms in East Africa." *Trans. R. Soc. Trop. Med. Hyg.*, XVI, pp. 498-501.
- (1923). "Oligocene Mosquitoes in the British Museum." *Quart. Journ. Geol. Soc.*, LXXIX, pp. 139-155.
- EDWARDS, F. W. (1924). "Some Mosquitoes from Ovamboland, S.W. Africa, and from the Cape Province." *Ann. S. Afr. Mus.*, XIX, pp. 159-163.
- (1926). "The Culicine Fauna of Nairobi, Kenya Colony." *Bull. Ent. Res.*, XVII, pp. 127-131.
- (1934). "The Percy Sladen and Godman Trusts Expedition to the Islands of the Gulf of Guinea, October, 1932-March, 1933.—II. Diptera Nematocera." *Ann. Mag. Nat. Hist.* (10) XIV, pp. 321-336.
- ENDERLEIN, G. (1921). "Die Culiciden Fauna Madagascars." *Wien. Ent. Zeit.*, XXXVIII, pp. 47-52.
- EVANS, A. M. (1925). "Notes on Culicidae Collected in Sierra Leone . . ." *Ann. Trop. Med.*, XIX, pp. 119-126.
- (1926). "Notes on Freetown Mosquitoes . . ." *Ann. Trop. Med.*, XX, pp. 97-106.
- (1929). "Descriptions of the Early Stages of Two Further Mosquitoes Collected in Southern Nigeria by Mr. L. H. Dunn." *Ann. Trop. Med. Parasit.*, XXIII, pp. 407-413.
- (1932). "Notes on African Mosquitoes." *Ann. Trop. Med. Parasit.*, XXVI, pp. 85-108.

- FISHLOCK, C. W. C., and HANCOCK, G. L. R. (1932). "Notes on the Flora and Fauna of Ruwenzori . . ." J. E. Afr. Nat. Hist. Soc., 44, pp. 205-229.
- FORBES, H. O. (1903). "The Natural History of Sokotra and Abd-el-Kuri." Liverpool (Free Public Museums).
- FRANCHINI, G. (1925). "Brevi note di entomologia sulla Somalia e sulla Eritrea." Pathologica, XVII, pp. 494-495.
- (1926). "Osservazioni entomologiche sulla colonie Italiana, nota II." Pathologica, XVIII, pp. 246-247.
- (1928). "Su di alcune specie di Zanzare non ancora descritte nelle nostre colonie." Arch Ital. Sci. Med. Colon., IX, pp. 458-459.
- GALLIARD, H. (1931). "Culicidés du Gabon." I-II. Ann. Parasit., IX, pp. 225-232, 514-529.
- (1936). "L'anthophilie de *Culex fatigans* au Tonkin" [and in W. Africa]. Bull. Soc. Path. exot., XXIX, pp. 517-518.
- GERRY, B. I. (1932). "Morphological Studies of the Female Genitalia of Cuban Mosquitoes." Ann. Ent. Soc. Amer., XXV, pp. 31-76.
- GIL COLLADO, J. (1936). "Culícidos de la isla de Fernando Póo recogidos por la expedición J. Gil-F. Bonet." Eos, XI, pp. 311-329.
- GJULLIN, C. M. (1937). "The Female Genitalia of the *Aedes* Mosquitoes of the Pacific Coast States." Proc. Ent. Soc. Wash., XXXIX, pp. 252-266.
- GRÜNBERG, K. (1905). "Zur Kenntnis der Culicidenfauna von Kamerun und Togo." Zool. Anz., XXIX, pp. 377-390.
- HANCOCK, G. L. R. (1930). "Some Records of Uganda Mosquitoes and the Oecological Associations of their Larvae." Bull. Soc. R. Ent. Egypte, 1930, pp. 38-56.
- (1934). "The Mosquitoes of Namanve Swamp, Uganda." J. Animal Ecol., III, pp. 204-221.
- and SOUNDY, W. W. (1929). "Notes on the Fauna and Flora of Northern Bugishu and Masaba (Elgon)." Jl. E. Afr. and Uganda Nat. Hist. Soc., 36, pp. 165-183.
- HARGREAVES, H. (1932). "Annual Reports of the Government Entomologist." Medical Ann. Rept. Dept. Agric. Uganda for 1931.
- HICKS, E. P. (1932). "The Transmission of *Wuchereria bancrofti* in Sierra Leone." Ann. Trop. Med. Parasit., XXVI, pp. 407-422.
- HINDLE, E. (1933). "Yellow Fever: Some Recent Advances." Trop. Dis. Bull., XXX, pp. 278-290.
- HOPKINS, G. H. E. (1931). "Report of the Medical Entomologist." Ann. Rep. Lab. Serv. Div. Uganda 1929, pp. 17-21; 1930, pp. 20-23.
- INGRAM, A. (1912). "Notes on the Mosquitoes Observed at Bole, Northern Territories, Gold Coast." Bull. Ent. Res., III, pp. 73-78.
- (1919). "The Domestic Breeding Mosquitoes of the Northern Territories of the Gold Coast." Bull. Ent. Res., X, pp. 47-58.
- and MACFIE, J. W. S. (1917). "Notes on Some Distinctive Points in the Pupae of West African Mosquitoes." Bull. Ent. Res., VIII, pp. 73-91.
- (1919). "The Early Stages of Some West African Mosquitoes, IV." Bull. Ent. Res., X, pp. 59-69.
- (1924). "The Mosquitoes of Accra." Ann. Trop. Med. Parasit., XVIII, pp. 263-264.
- and DE MEILLON, B. (1927). "A Mosquito Survey of Certain Parts of South Africa . . ." Part I. S. Afr. Inst. Med. Res., No. XXII, pp. 1-81.
- (1929). "A Mosquito Survey of Certain Parts of South Africa . . ." Part II. S. Afr. Inst. Med. Res., No. XXIII, pp. 83-170.
- IYENGAR, M. O. T. (1933). "Oviposition in Mosquitoes of the Sub-genus *Mansonioides*." Ind. Journ. Med. Res., XXI, pp. 101-102.
- (1935). "Eggs of *Ficalbia minima*, Theo., and Notes on Breeding Habits of Three Species of *Ficalbia*." Bull. Ent. Res., XXVI, pp. 423-425.
- JOHNSON, W. B. (1919). "Domestic Mosquitoes of the Northern Provinces of Nigeria." Bull. Ent. Res., IX, pp. 325-332.

- JOYEUX, C. (1915). "Sur quelques arthropodes récoltés en Haute-Guinée française." Bull. Soc. Path. Exot., VIII, pp. 656-659.
- SICÉ, A., and SAUTET, J. (1939). "Note préliminaire sur l'anophélisme au Soudan français." Bull. Soc. Path. exot., XXXII, pp. 616-617.
- KERR, J. A. (1932). "Studies on the Transmission of Experimental Yellow Fever by *Culex thalassius* and *Mansonia uniformis*." Ann. Trop. Med. Parasit., XXVI, pp. 119-127.
- (1933). "Studies on the Abundance, Distribution, and Feeding Habits of Some West African Mosquitoes." Bull. Ent. Res., XXIV, pp. 493-510.
- KIRKPATRICK, T. W. (1925). "The Mosquitoes of Egypt." Cairo, Govt. Press.
- KUMM, H. W. (1931). "Studies on *Aedes* Larvae in South-Western Nigeria and in the Vicinity of Kano." Bull. Ent. Res., XXII, pp. 65-74.
- (1931). "The Geographical Distribution of the Yellow Fever Vectors." Amer. J. Hyg., Monogr. Ser., 12.
- LA FACE, L. (1937). "Fauna anofelinica delle Colonie italiane." Riv. Parassit., I, No. 1 suppl.
- LEESON, H. S. (1931). "Anopheline Mosquitoes in Southern Rhodesia, 1926-1928." Mem. London Sch. Hyg. Trop. Med., IV, pp. 1-55.
- LEGA, G., RAFFAELE, G., and CANALIS, A. (1937). "Misione dell'Istituto di Malariologia nell'Africa Orientale Italiana." Riv. Malar., XVI, pp. 325-387.
- LEWIS, D. J. (1939). "The Male and Early Stages of *Anopheles wellcomei* Theobald." Ann. Trop. Med. Parasit., XXXIII, pp. 197-200.
- MACFIE, J. W. S. (1919). "The Chaetotaxy of the Pupa of *Stegomyia fasciata*." Bull. Ent. Res., X, pp. 161-172.
- and INGRAM, A. (1916). "The Domestic Mosquitoes of Accra." Bull. Ent. Res., VII, pp. 161-177.
- — (1920). "The Early Stages of West African Mosquitoes. V.—*Culex decens*, Theo. and *Culex invidiosus* Theo." Bull. Ent. Res., XI, pp. 105-112.
- — (1922). "On the Genital Armature of the Female Mosquito." Ann. Trop. Med. Parasit., XVI, pp. 157-118.
- — (1923). "The Early Stages of West African Mosquitoes. VI." Bull. Ent. Res., XIII, pp. 409-442.
- MACGREGOR, M. E. (1924). "Report on the Anophelinae of Mauritius." Colonial Office, London.
- McHARDY, J. W. (1927). "Report by the Entomologist, Medical and Sanitary Services, Tanganyika Territory." Rept. Med. Lab. Dar-es-Salaam 1926, pp. 57-74.
- (1930). "Report of Government Entomologist." Ann. Rept. Med. Lab. Dar-es-Salaam, 1928, pp. 41-52.
- MATHIS, M. (1934). "Biologie comparée, en conditions expérimentales, de quatre souches du moustique de la fièvre jaune." C.R. Soc. Biol., CXVII, pp. 878-880.
- (1935). "Sur la nutrition et la fécondité de *Stegomyia: Aedes egypti*." Bull. Soc. Path. Exot., XXVIII, pp. 231-234.
- (1935). "Biologie de *Culex fatigans* de Dakar, élevé en série au laboratoire." Bull. Soc. Path. Exot., XXVIII, pp. 577-581.
- MAYER, T. F. G. (1911). "Notes on the Blood-sucking Flies of Oshogho and Ilesha Districts, Southern Nigeria." Bull. Ent. Res., II, pp. 273-276.
- DE MEILLON, B. (1928). "Notes on Some Mosquitoes Found in South Africa. I." S. Afr. J. Sci., XXV, pp. 316-324.
- (1934). "Studies on Insects of Medical Importance in South Africa. Part I." S. Afr. Inst. Med. Res., No. XXXIII.
- (1935). "Studies on Insects of Medical Importance in South Africa. Part II." S. Afr. Inst. Med. Res., No. XXXV, pp. 323-366.
- and LEESON, H. S. (1940). "Notes on Ethiopian Anophelini." Bull. Ent. Res., XXXI, pp. 61-67.
- MOUCHET, R. (1926). "Notes sur la répartition des gîtes à moustiques de Stanleyville." Ann. Soc. belg. Méd. Trop., VI.

- NEVEU-LEMAIRE, M. (1906). "Étude des culicides africains." Arch. Parasit., X, pp. 238-288.
- NIESCHULZ, O., BEDFORD, G. A. H., and DU TOIT, R. M. (1934). "Results of a Mosquito Survey at Onderstepoort during the Summer 1931-32 in Connection with the Transmission of Horse-sickness." Onderstepoort J. Vet. Sci., III, pp. 43-77.
- — — (1934). "Investigations into the Transmission of Bluetongue in Sheep during the Season 1931-1932." Onderstepoort J., 2, pp. 509-562.
- — — (1934). "Investigation into the Transmission of Horse-sickness at Onderstepoort during the Season 1931-1932." Onderstepoort J. Vet. Sci., III, pp. 275-334.
- PATTON, W. S. (1905). "The Culicid Fauna of the Aden Hinterland, their Haunts and Habits." J. Bombay Nat. Hist. Soc., XVI, pp. 623-637.
- PHILIP, C. B. (1929). "Preliminary Report of Further Tests with Yellow Fever Transmission by Mosquitoes other than *Aedes aegypti*." Amer. J. Trop. Med., IX, pp. 267-269.
- (1930). "Studies on Transmission of Experimental Yellow Fever by Mosquitoes other than *Aedes*." Amer. J. Trop. Med., X, pp. 1-16.
- (1930). "The Experimental Transmission of Yellow Fever by Mosquitoes." Science, LXXI, pp. 614-615.
- (1931). "List of Mosquitoes Collected in Nigeria, West Africa, Incidental to Research on Yellow Fever." Proc. Ent. Soc. Washington, XXXIII, pp. 44-47.
- POMEROY, A. W. J. (1920). "The Prophylaxis of Malaria in Dar-es-Salaam, East Africa." Journ. R.A.M.C., 35, pp. 44-68.
- SCHOUTEDEN, H. (1930). "Un genre et trois espèces de Moustiques nouveaux pour la Faune congolaise." Rev. Zool. Bot. Afr., XVIII, pp. 431-433.
- SCHWETZ, J. (1927). "Synopsis des moustiques connus du Congo Belge." Rev. Zool. Afr., XV, pp. 271-319.
- (1927). "Contribution à l'étude des moustiques d'Elisabethville et de quelques autres localités du Katanga." Bull. Soc. Path. exot., XX.
- (1930). "Les moustiques de Stanleyville." Ann. Soc. Belg. Méd. Trop., X, pp. 1-41.
- (1930). "Note préliminaire sur les moustiques de quelques régions de la province orientale." Ann. Soc. Belg. Méd. Trop., X.
- (1938). "Contributions à l'étude des moustiques de quelques localités du Bas-Congo et du Kwango." Ann. Soc. Belg. Méd. Trop., XVIII.
- SÉGUY, E. (1931). "Contribution à l'étude de la faune du Mozambique. Voyage de M. P. Lesne 1928-1929. 3^e note. Diptères (1^{re} partie)." Bull. Mus. Hist. Nat. Paris (2), II, pp. 645-656.
- SCOTT, H. (1927). "Notes on the Distribution and Habits of Culicidae in Central Abyssinia." Bull. Ent. Res., XVIII, pp. 83-89.
- SENEVET, G. (1936). "Notes sur les moustiques. IV." Arch. Inst. Pasteur Alg., XIV, pp. 432-448.
- SEYDEL, C. (1929). "Contribution à l'étude des moustiques du Congo Belge. Quelques moustiques de Katanga." Rev. Zool. Bot. Afr., XVIII, pp. 28-31, 70-71.
- (1929). "Rapport entomologique pour la Province du Katanga (Année 1928)." Bull. Agric. Congo belge, XX, pp. 228-237.
- SHANNON, R. C., and DAVIS, N. C. (1930). "The Flight of *Stegomyia aegypti* (L.)." Amer. J. Trop. Med., X, pp. 151-156.
- and PUTNAM, P. (1934). "The Biology of *Stegomyia* under Laboratory Conditions." Proc. Ent. Soc. Wash., XXXVI, pp. 185-242.
- SIMPSON, J. J. (1911-14). "Entomological Research in British West Africa. 1-5." I. Gambia. II. Northern Nigeria. III. Southern Nigeria. IV. Sierra Leone V. Gold Coast. Bull. Ent. Res., II, pp. 187-239, 301-356; III, pp. 137-193; IV, pp. 151-190; V, pp. 1-36.
- SUMMERS-CONNAL, S. L. M. (1927). "On the Variations Occurring in *Aedes argenteus* in Lagos, Nigeria." Bull. Ent. Res., XVIII, pp. 5-11.

- SYMES, C. B., and ROBERTS (1936-37). "Reports of the Section of Medical Entomology." Kenya: Ann. Repts. Med. Res. Lab.
- TAYLOR, A. W. (1930). "The Domestic Mosquitoes of Gadau, Northern Nigeria, and Their Relation to Malaria and Filariasis." Ann. Trop. Med. Parasit., XXIV, pp. 425-435.
- (1934). "A Note on Mosquitoes Breeding in Tree-holes in Northern Nigeria." Bull. Ent. Res., XXV, pp. 191-193.
- THEOBALD, F. V. (1912). "Percy Sladen Trust Expedition to the Indian Ocean in 1905 . . . Culicidae." Trans. Linn. Soc. London, XV, pp. 81-94.
- TOUMANOFF, C. (1937). "Essais préliminaires d'intercroisement de *St. albopicta* Skuse avec *St. argentea* Poiret (*S. fasciata* Theob.)." Bull. Soc. Méd.-chir. Indochine, XV, pp. 964-970.
- VAN SOMEREN, V. G. L., and DE BOER, H. S. (1926). "Report on the Mosquito Breeding Areas of Nairobi." Kenya Med. J., II, pp. 275-298.
- WANSON, M. (1935). "Note sur les trous de crabes, gîtes larvaires." Ann. Soc. belg. Méd. Trop., XV.
- and NICOLAY, — (1937). "Biologie de *Culex fatigans* dans le Bas-Congo." Ann. Soc. belg. Méd. Trop., XVII, pp. 111-122.
- WESCHÉ, W. (1910). "On the Larval and Pupal Stages of West African Culicidae." Bull. Ent. Res., I, pp. 7-50.
- WHITFIELD, F. G. S. (1933). "Bionomics and Control of *Dysdercus* in the Sudan." Bull. Ent. Res., XXIV.
- (1939). "Air Transport, Insects and Disease." Bull. Ent. Res., XXX, pp. 365-442.
- WIGGLESWORTH, V. B. (1929). "The Early Stages of Some West African Mosquitoes." Bull. Ent. Res., XX, pp. 59-68.
- WILSON, D. B. (1938). "Report of the Malaria Unit, Moshi, 1936." Dar-es-Salaam.
- WISEMAN, R. H., SYMES, C. B., MCMAHON, J. C., and TEESDALE, C. (1939). "Report on a Malaria Survey of Mombasa." Nairobi, Kenya (Govt. Press).
- WOKE, P. A. (1937). "Cold-blooded Vertebrates as Hosts for *Aedes aegypti* Linn." J. Parasit., XXIII, pp. 310-311.
- ZAVATTARI, E., in TEDESCHI, C., and SCALAS, A. (1934). "Contributo alla biogeografia della malaria in Burhacaba (Benadir)." [Italian Somaliland.] Riv. Malar., XIII, pp. 104-113.
- ZUMPT, F. (1936). "Beobachtungen über Mückenbrutplätze in der Tikoebene (Kamerun)." Arch. Schiffs- u. Tropenhyg., XL, pp. 115-118.
- (1937). "Stechmücken-Studien im Pflanzungsgebiet des Kamerunberges." Der Tropenpflanzer, XL, pp. 366-383.

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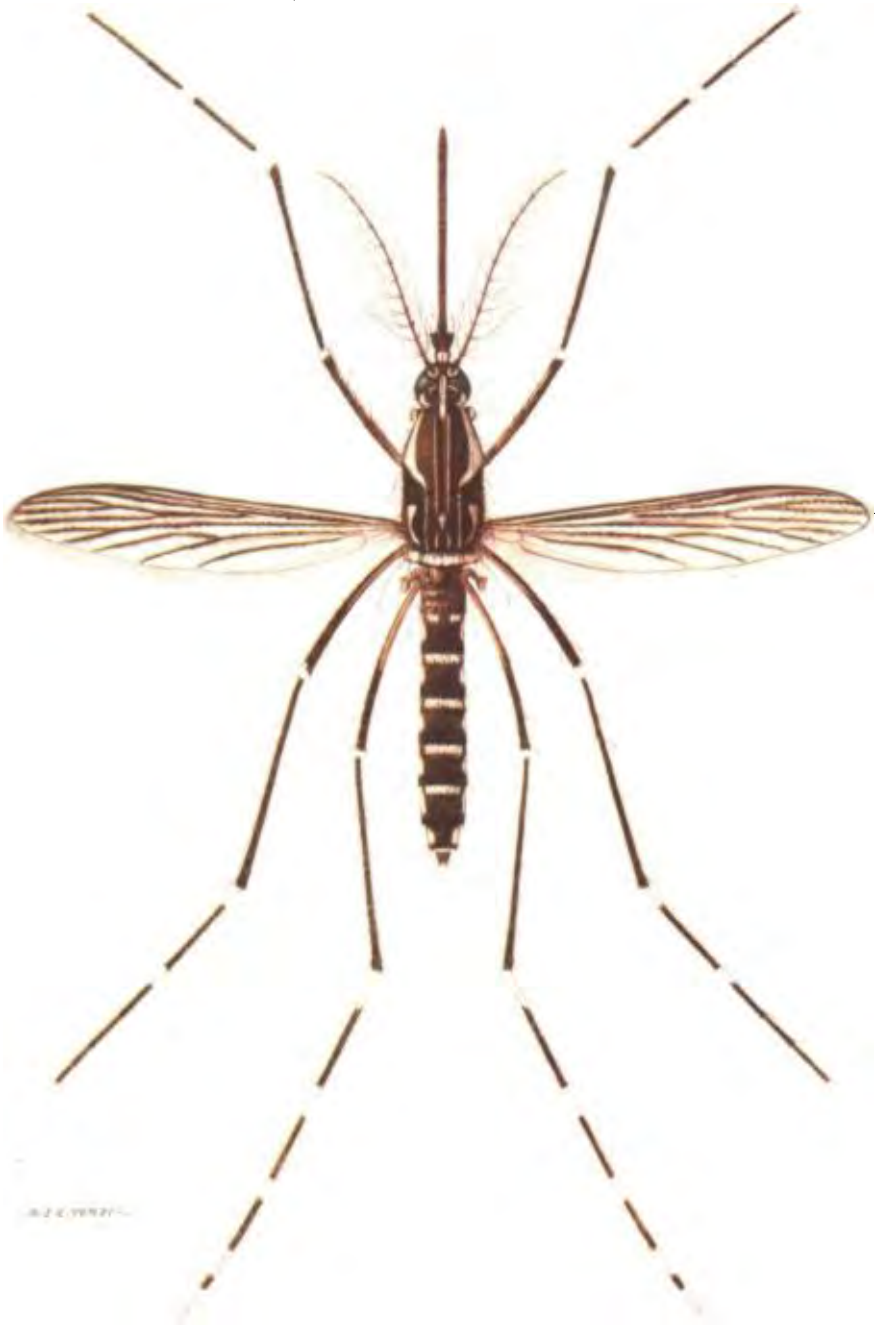
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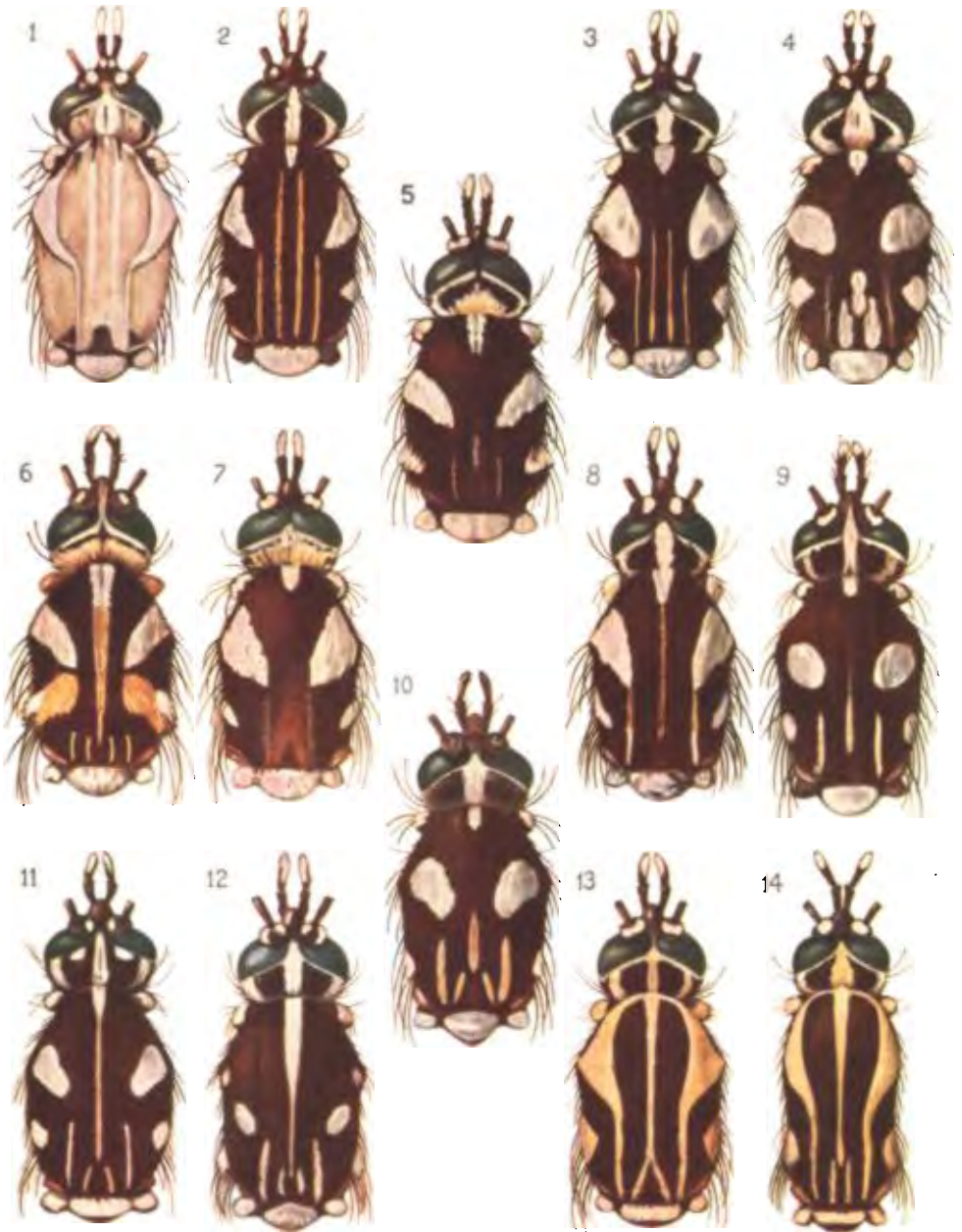


Aedes (Stegomyia) aegypti Linnaeus.

PLATE I.

Aedes (Stegomyia) aegypti L. ♀.

(Normal dark form.)

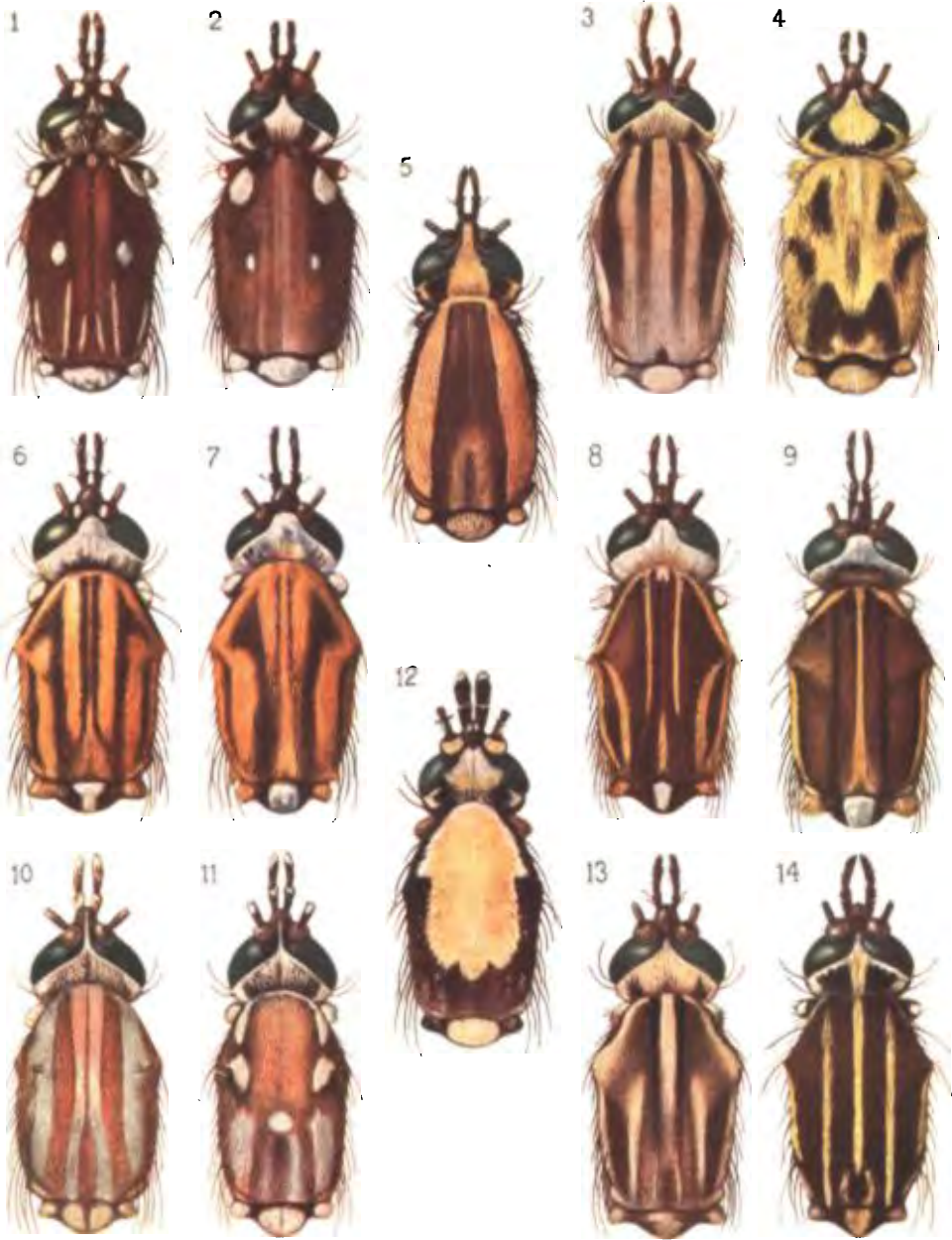


Head and thorax in *Aedes* (*Stegomyia*)

- | | |
|---|--|
| 1. <i>A. (S.) aegypti</i> Linnaeus (pale form). | 8. <i>A. (S.) masseyi</i> Edwards. |
| 2. <i>A. (S.) woodi</i> Edwards. | 9. <i>A. (S.) apicoargenteus</i> Theobald. |
| 3. <i>A. (S.) simpsoni</i> Theobald. | 10. <i>A. (S.) schwetzi</i> Edwards. |
| 4. <i>A. (S.) metallicus</i> Edwards. | 11. <i>A. (S.) howeri</i> Theobald. |
| 5. <i>A. (S.) africanus</i> Theobald. | 12. <i>A. (S.) unilineatus</i> Theobald. |
| 6. <i>A. (S.) luteocephalus</i> Newstead. | 13. <i>A. (S.) bambusae</i> Edwards. |
| 7. <i>A. (S.) chaussieri</i> Edwards. | 14. <i>A. (S.) angustus</i> Edwards. |

PLATE 2.

Thoracic markings of Ethiopian *Aedes*, subgenus *Stegomyia*. 1. *A. (S.) aegypti* L., pale form.
2. *A. (S.) woodi* Edw. 3. *A. (S.) simpsoni* Theo. 4. *A. (S.) metallicus* Edw. 5. *A. (S.) africanus* Theo.
6. *A. (S.) luteocephalus* Newst. 7. *A. (S.) chaussieri* Edw. 8. *A. (S.) masseyi* Edw. 9. *A. (S.) apicoargenteus* Theo. 10. *A. (S.) schwezi* Edw. 11. *A. (S.) contiguus* Edw. 12. *A. (S.) unilineatus* Theo. 13. *A. (S.) bambusae* Edw. 14. *A. (S.) angustus* Edw.

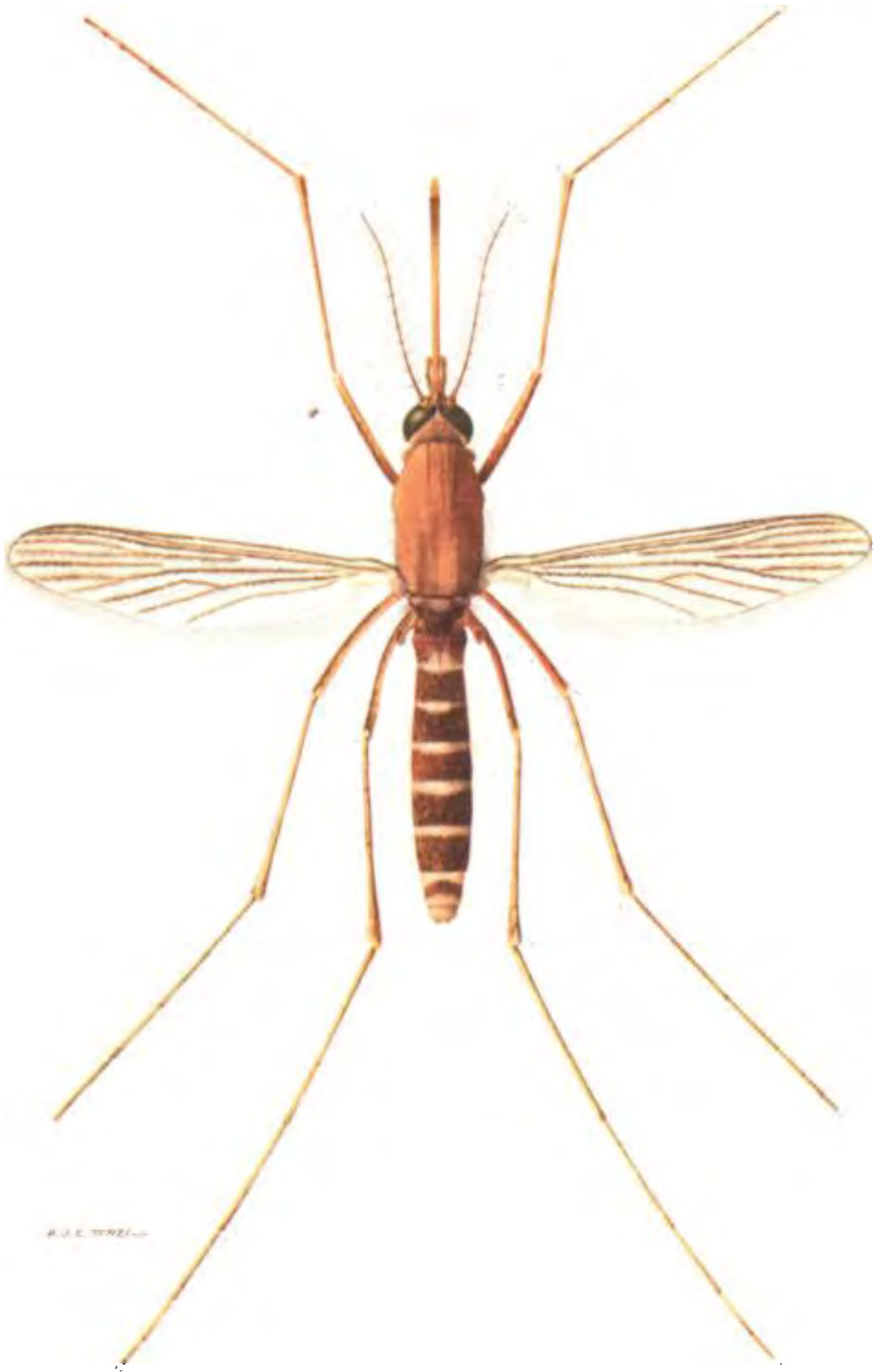


Head and thorax in

- | | |
|---|--|
| 1. <i>Aedes (Aedimorphus) capensis</i> Edwards. | 9. <i>E. silvestris</i> Ingram and de Meillon. |
| 2. <i>A. (A.) simulans</i> Newstead and Carter. | 10. <i>Taeniorhynchus (Mansonioides) uniformis</i> Theobald. |
| 3. <i>A. (A.) ochraceus</i> Theobald. | 11. <i>T. (M.) africanus</i> Theobald. |
| 4. <i>A. (Diceromyia) flavicollis</i> Edwards. | 12. <i>Aedomyia africana</i> Neveu-Lemaire. |
| 5. <i>A. (Banksinella) lineatopennis</i> Ludlow. | 13. <i>Culex (Culex) hancocki</i> Edwards. |
| 6. <i>Eretmapodites quinquevittatus</i> Theobald. | 14. <i>Aedes (Finlaya) pulchrithorax</i> Edwards. |
| 7. <i>E. dracaenae</i> Edwards. | |
| 8. <i>E. inornatus</i> Newstead. | |

PLATE 3.

Thoracic markings of Ethiopian Culicine mosquitoes. 1. *Aedes (Aedimorphus) capensis* Edw. 2. *Aedes (Aedimorphus) simulans* Newst. 3. *Aedes (Aedimorphus) ochraceus* Theo. 4. *Aedes (Dicromyia) flavicollis* Edw. 5. *Aedes (Banksinella) lineatopennis* Ludl. 6. *Eretmapodites quinquevittatus* Theo. 7. *Eretmapodites dracaenae* Edw. 8. *Eretmapodites forcipulatus* Edw. 9. *Eretmapodites silvestris* Ingr. and de M. 10. *Taeniorhynchus (Mansonioides) uniformis* Theo. 11. *Taeniorhynchus (Mansonioides) africanus* Theo. 12. *Aedomyia africana* N.-I. 13. *Culex hancocki* Edw. 14. *Aedes (Finlaya) pulchrithorax* Edw.



Culex (Culex) fatigans Wiedemann.

PLATE 4.

Culex fatigans Wied. ♀.