

Publications
of the
C.S.I.R.

Research on South African Culicini (Diptera, Culicidae).

IV. — Additional distribution records, taxonomic descriptions
and miscellaneous notes.

by

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The first part of this paper is concerned with a collection of culicine mosquitoes made in Tongaland in April and May of 1955. Tongaland is a native territory situated on the northern coastal plain of Natal and bordered on the western side by the Ubombo (or Lebombo) Mountains. The object of an expedition to this region was the isolation of viruses from man, wild and domestic animals, birds and arthropods. It was organized by Dr. K. C. Smithburn of the Rockefeller Foundation. The work on the isolation of viruses and general mammalian, entomological and ornithological aspects are being dealt with by other members of the expedition (Smithburn *et. al.* in preparation). It fell to the lot of the writer to make a complete collection of mosquitoes (totalling 38 culicine species and 6 anopheline species) caught mostly by native catchers in the Simbu and Tete pans district of the Pongola River during a period of 3-4 weeks. The records and taxonomic notes given here are supplementary to previous papers in this series, particularly part III (1955), and to my guide-book on the *Stegomyia* mosquitoes (in the press).

PART I. — TONGALAND COLLECTION.

List of culicine genera, sub-genera and species.

Species marked with an asterisk are new records for South Africa.

- ✓ *Toxorhynchites*: ✓ *brevipalpis* Theo., ✓ **lutescens* Theo.
- ✓ *Ficalbia* (*Mimomyia*): *mimomyiaformis* Newst.
- ✓ *Ficalbia* (*Etorleptiomyia*): *mediolineata* Theo.
- ✓ *Taeniorhynchus* (*Coquillettidia*): *metallicus* Theo.
- ✓ *Taeniorhynchus* (*Mansoniooides*): *africanus* Theo., ✓ *uniformis* Theo.

- √ *Aedes* (*Finlaya*): *fulgens* Edw.
- √ *Aedes* (*Stegomyia*): √ *aegypti* L., √ *metallicus* Edw., √ *calceatus* Edw., √ *heischi* van S.
- √ *Aedes* (*Aëdimorphus*): sp. nov., of the *apicoannulatus* group, √ *minutus* Theo., √ *cumminsi* ssp., √ *mediopunctatus* Theo., √ *durbanensis* Theo., √ *ochraceus* Theo.
- √ *Aedes* (*Banksinella*): √ *circumluteolus* Theo., √ *luteolateralis* Theo.
- √ *Aedes* (*Diceromyia*): *furcifer* Edw. or *taylori* Edw.
- √ *Eretmapodites*: √ *subsimplicipes* Edw., √ *silvestris* I & De M., √ *quinquevittatus* Theo.
- √ *Culex* (*Lutzia*): *tigripes* Grp & C.
- √ *Culex* (*Neoculex*): *insignis* Cart.
- √ *Culex* (*Culiciomyia*): √ *nebulosus* Theo. and var. √ *pseudocinereus* Theo.
- √ *Culex* (*Mochthogenes*): *inconspicuus* Theo.
- √ *Culex* (*Culex*): √ *poicilipes* Theo., √ *ethiopicus* Edw., √ *aurantapex* Edw., √ *annulioris* Theo., √ *theileri* Theo., √ *univittatus* Theo., √ *simpsoni* Theo., √ *pipiens* L., √ *zombaensis* Theo., √ *antennatus* Beck., √ *guiarti* Bl.
- √ **Toxorhynchites lutescens** Theobald, 1901.

Note on adult. Mr. P. F. Mattingly of the British Museum (Natural History) has kindly confirmed my determination of three males from a comparison of the terminalia of one of these with specimens from other parts of Africa. The abdominal tergites have a pronounced violet or purple sheen similar to the Nyasaland and Tanganyika specimens mentioned by Edwards (1941, p.30).

***Aedes* (*Stegomyia*) *heischi* van Someren, 1951.**

Note on adult. Two out of three female specimens collected were bred out from larvae from a tree hole. All three have a very small short line of a few pale scales in the middle of each of the middle femora (in front) which is a fine distinction between this species and *A. demeilloni*. One specimen has the white basal band on the second tarsal segment of the middle legs extending into a point beyond half (behind) and another specimen has it like this on one leg only. These features and the fact that in two cases the larvae came from tree holes suggest that they are *heischi* and not *demeilloni*. This record brings the southern distribution of *heischi* very near to the northern range of *demeilloni*, but the question as to whether the former should be regarded as a subspecies of the latter is difficult to decide.

***Aedes* (*Aëdimorphus*) *kennethi* sp.nov.**

This species belongs to the *apicoannulatus* group, of the tree-hole breeding *Aedes*, and in some features of scutal ornamentation resembles *A. teesdalei* van Someren, but the male terminalia are similar to those of *A. haworthi* Edwards. It also differs from both these species in having the whole of the scutum white, the median part being covered with narrow white scales.

Female. Head. Vertex with broadish snowy white scales in front, narrower white scales behind and yellowish erect scales on the nape; also a pair of lateral black patches behind the eye margins. Tori, clypeus, proboscis and palpi very dark brown or blackish, the latter slightly less than $\frac{1}{6}$ the length of the proboscis. Tori of type female bare, but some of the paratypes have a patch of broadish white scales on the inner sides. First flagellar segment of antennae with some short dark scales above. *Thorax.* Scutal integument darkish, pleural integument lighter on lower part. Scutum with wide lateral margins of broadish snowy-white scales from the anterior edge to the pre-scutellar bare space, being similar to *A. teesdalei*, but there is also a fairly large patch of these scales on either side of the bare space posteriorly. The whole of the rest of the scutum is covered with narrow white scales (see variation below). Scutellum: entirely covered with broad snowy-white scales as also paratergites. Anterior pronotal (*apn*) and posterior pronotal (*ppn*) with a few broad pale scales, but latter bare on some specimens. On the type there is a patch of broad yellowish scales on the pro-pleurae, two on the posterior edge of the sternopleurae and one on the upper mesepimeral area; these scales are white on some of the paratypes. Lower mesepimeral bristle absent.

Legs. Scales on front coxae mostly dark, but pale on mid and hind coxae. Femora: fore and mid mostly dark in front, the former with a pale buff stripe behind from base to near tip, the latter pale to about half behind with a pale ventral stripe and a dark dorsal stripe. Hind femora pale ventrally from base to near tip in front and behind, dark dorsally. The mid and hind femora have no pale spots at the apex, the front femora only each having a small pale apical spot behind. Tibiae: dark, middle and hind pale behind, front and middle also with small pale patches at base and tip (behind), hind very narrowly pale at tip. On some of the paratypes the white or pale tip of the hind tibia is nearly as long as the width of the tibia at the apex, but it is not as long as that of *teesdalei* or other species of the group, except perhaps *A. kapretwae* Edwards. Tarsi: first segment of front tarsi with a small spot at tip (in front), otherwise dark; middle, on holotype almost all dark, but some of the paratypes have a small white spot at tip of first segment; hind tarsi with broad apical white bands on first three segments, these being on the holotype rather less than $\frac{1}{4}$, less than $\frac{1}{2}$ and about $\frac{1}{2}$ the length of the segments; fourth and fifth segments all white; the third segment is also narrowly white at the base on the holotype and on some of the paratypes.

Abdomen. Tergites: segments 3-5 with broadish creamy basal bands and 2-7 with large creamy or white lateral patches. The holotype and one or two paratypes, have narrow complete or broken apical creamy bands on some or most of the segments; the basal pale bands are also variable, being present on segments 3-6 of some specimens, or almost entirely absent on others. Sternites: with very broad basal creamy bands.

Variation. Two female specimens were bred out from the same tree holes as the type series which have somewhat different scutal ornamentation. One

of these has mixed brown and white narrow scales on the median part of the scutum between the white lateral margins, and the other has narrow brown scales only on this area apart from some white ones on the posterior half near the bare space. Otherwise these specimens resemble the type series, except that one has no apical pale spots on the hind tibiae. These differences may be normal variation, but as the possibility of another species being present cannot be ruled out until similarly marked males have been found, I am not including them in the type series.

Male. Resembles the female in most respects, palpi slightly longer than proboscis with a small pale spot in the middle of the shaft (above). Middle tarsi usually without a pale spot at tip of first segment and abdominal tergites usually with white basal bands on segments 2-6. Two of the paratypes have the basal half of the fourth hind tarsal segment dark instead of all white.

Terminalia. Practically indistinguishable from *A. haworthi*, style slightly more swollen in the middle than the latter with one stout blunt spine and 6-8 long hairs on the edge of the projection with 1-4 short hairs on the style above them; other features also like *haworthi*.

Larva. There would appear to be very little to distinguish this larva from those of *marshalli*, *stokesi* and *capensis*. It resembles the first two in having a comb consisting of apically fringed spines, but it has been pointed out (Muspratt, 1953, p. 89) that in South Africa the comb of *capensis* may have some or nearly all of the scales so narrow at the apex that they are nearer to fringed spines. Some of the comb spines of *kennethi* are also quite short and rather difficult to distinguish from scales. The denticles of the fringe of the comb spines are usually slightly longer than those of *marshalli*. The upper caudal setae of *kennethi* are usually single or 2-branched whereas the other three species usually have these 3-4 branched, but this distinction may not always be reliable. In life the larva is palish with a pale brown head and siphon.

Head. Antennae spiculate, tuft placed beyond $\frac{1}{2}$ with 3-5 plumose branches; setae A, B, and C with 8-13, 3-6 and 5-10 plumose branches respectively, *d* with 7-13 longish branches, *e*: single or 2-branched, *f*: 3-6 branched. Mentum: 9-11 teeth on each side of the large central one arranged similarly to *apicoannulatus* (Hopkins 1952, p. 169) but with one or two fewer small teeth. *Abdomen.* Comb: a patch of 15-20 shortish pale spines, each with a fringe of longish denticles from about $\frac{1}{2}$ to apex. Usually most of the spines have the apical $\frac{1}{2}$ narrow and pointed, but there is some variation in different combs (see also above). Siphon: index about $3\frac{1}{2}$ (un-mounted larvae), subventral tuft at about $\frac{1}{2}$ with 3-6 sparsely plumose or nearly simple branches. Pecten: extending to just before $\frac{1}{2}$ of siphon with 16-25 dark spines, each usually with one fairly large basal denticle and one or two smaller ones. Anal segment: saddle like *marshalli* and *capensis*, lateral seta single or 2-branched. Ventral brush: about 8 paired or

un-paired 3 - 6 branched tufts in the barred area and 2 - 3 smaller median tufts proximal to these. Anal papillae (gills): one or two unmounted larvae had the upper pair about 3 times the length of the saddle and the lower pair rather shorter, which is nearly the same as those of *marshalli* (Muspratt, *loc. cit.*)

Described from the female holotype and 12 male and 13 female paratypes, with 5 associated larval pelts and several whole larvae. The type series was mostly bred out from larvae collected from cavities in wild fig trees (*Ficus* sp.) growing along the Pongola River. The species is named in honour of Dr. Kenneth C. Smithburn. Paratypes have been presented to the British Museum (Natural History).

***Aedes* (*Aëdimorphus*) *minutus* Theobald 1901.**

Note on adult. The male terminalia of specimens bred out from two batches of eggs obtained from gravid females appear to be quite typical. The scutal ornamentation of both sexes is rather similar to *A. filicis* particularly when the latter have the pale scales yellowish instead of white (Muspratt, 1955) but the brown scutal scales are usually darker than that species. Another distinction is found in the decumbent scales of the vertex which are mostly broad on *minutus* but narrow on *filicis*. It is recommended, however, that determinations should always be confirmed from male terminalia. The ornamentation of the scutum is as follows: A median pair of pale or yellowish patches of narrow scales at about $\frac{1}{2}$, a smaller pair on the anterior edge and two other pairs of irregular pale patches, one on the scutal angles and one in front of the wing roots; in addition to these there are usually numerous scattered pale scales. It would appear from the larva (below) that *minutus* should be included in the *argenteopunctatus* group rather than in the *tarsalis* group.

Larva. Only one larval pelt has been preserved from one of the batches bred out from eggs. It is quite different to the larva described by Hopkins (1952, p. 178), but the possibility that it might belong to another species is very small although it is not an associated pelt in the ordinary sense. Mr. P. F. Mattingly has kindly examined the pelts in the British Museum (Natural History) attributed to *minutus* and has informed me (in litt.) that he believes they may be those of *A. vittatus*. The record, therefore, of larvae of this species from S. W. Africa (De Meillon and Lavoipierre, 1944, p. 57) should probably be disregarded. The Tongaland pelt is closely allied to the larva of *Aedes argenteopunctatus* having also the characteristic bent siphon. It apparently only differs from this one in the number of branches of some of the head setae which may be variable. *Head.* Antennae strongly spiculate, tuft at about $\frac{1}{3}$ with three stout simple branches. Setae A, B, and C with 3 - 5, 2 - 3 and 3 - 4 sparsely plumose branches; *d*: minute and 2 - 3 branched, *e*: single, *f*: 3-branched. *Abdomen.* Comb 15 - 20 pale spines with a basal fringe of small denticles. Siphon: like *argenteopunctatus*, index just under 3 (un-mounted), sub-ventral tuft 4-branched, sparsely plumose and more than twice diameter of siphon. Pecten: 7 - 9 widely spaced dark spines (one beyond tuft)

the distal ones long and simple, the proximal ones shorter and with two short basal denticles. Anal segment: saddle finely spiculate, lateral seta single. Upper caudal seta: single 2-branched; lower: single. Ventral brush: 7 tufts with 3-4 branches in the barred area and 5 proximal tufts which are single or 2-branched. Anal papillae (gills): nearly 5 times length of saddle (un-mounted) and with conspicuous tracheoles. It is not known if this larva has tracheal papillae on the underside of the head like *argenteopunctatus* (Hopkins 1952, pp. 22-23) but it is very probably the case.

***Aedes (Aëdimorphus) cumminsi* ssp. *mediopunctatus* Theobald, 1910.**

Note on adult. Several specimens collected correspond to the descriptions of the sub-species in having small or medium-sized median creamy basal patches on the abdominal tergites. These are the first adult specimens I have seen and it is possible that the previous records from Reunion and Isipingo, Natal (Muspratt, 1955), which were based on larval specimens only, refer to this sub-species. One female has the basal $\frac{1}{2}$ of the proboscis speckled with pale scales.

Larva. Some larvae collected by Mr. H. E. Paterson were bred out by the writer. Judging from two associated pelts the larva appears to be as the typical form, except that the siphonal index (un-mounted) of both was over 3 and the proximal pecten spines have basal denticles on the ventral side only.

***Culex* sp. indet.**

Not on adult. Only two females of this very distinctive species have been preserved and an egg raft was obtained from a third. The larvae which hatched, however, did not reach maturity in time and did not survive the journey to Johannesburg. It is not known to which sub-genus it belongs and a description will have to await the collection of further specimens, particularly males. The species has a broad pale band in the middle of the proboscis and very narrow pale basal bands on the tarsi. An interesting character is the tarsal pulvilli, which are not of the usual pad-like form of other Ethiopian *Culex*.

PART II.*

Notes on the predators and other ecological factors affecting pool-breeding mosquito larvae.

In the course of extensive collecting tours all over South Africa I have been able to study some of the ecological factors relating to pool-breeding *Aedes* and *Culex*. Not the least important of these appears to be the presence in the more permanent pools and ponds of aquatic predators of the larvae, and it seems that it is no accident that most of the commonest *Aedes* and some

* Some preliminary notes have been given in a previous paper (Muspratt, 1955, pp. 162, 166, 174 & 177).

Culex breed only in the more temporary pools, and are thus able to pass through the aquatic stages before predators can establish themselves. Predators can be divided into four main groups: (1) Fish. (2) Dragon-fly nymphs (Odonata) and the larvae of the larger water-beetles (Dytiscidae). (3) Back-swimmers (Notonectidae) and possibly water-boatmen (Corixidae). (4) Predacious mosquito larvae (Culicidae). Only the last group are found in the more temporary pools, although back-swimmers and water-boatmen may not take very long to become established.

There is little doubt that fish of various kinds play an important part in reducing mosquito larvae particularly in the larger lakes and dams and when they are not hampered by thick weed or filamentous algae. Hopkins (1952, p. 8) discusses several species. In the southern Cape Province small fish of the genus *Galaxius* are found in the larger collections of water and in streams; I have observed them also in quite small pools and swampy areas adjoining streams. It seems that they may be responsible for the reduction of mosquito larvae as the latter are not found when they are present, except amongst thick vegetation. Mr. A. D. Harrison has informed me that these fish belong to two species, *G. punctifer* and *G. zebratus*, and that their easterly distribution is only about as far as the town of George.

Dragon-fly nymphs and large water-beetle larvae are usually only found in the more permanent ponds or swamps. Bates (1949, p. 159) mentions the controversy as to the ability of the former in reducing mosquito larvae. In the laboratory I have fed one of the larger species (Aeschnidae) for several days on mosquito larvae until it emerged, but in nature they would also prey upon many other aquatic creatures, and reduction of mosquito larvae would depend, as in the case of fish, upon the amount of vegetation and other factors. Certain culicine larvae, like those of *Culex annulioris* remain hidden in masses of filamentous algae and are probably seldom found by these predators. Hopkins (1952, p. 9) with regard to back-swimmers mentions species of *Anisops* as probably being an important check on mosquitoes. I have carried out some tests by putting two adults of an *Anisops* sp. (?*varia*) in a small aquarium and feeding them on larvae of *Aedes aegypti*. The destruction of fourth stage larvae was not as large as might be expected, each only eating from 12 to 18 in 24 hours, but when small larvae between the first and third instars were used the destruction was much greater, the average of five tests being 80 each during the same period. Although this does not prove their larvivorous efficiency under natural conditions, my own belief is that when they are numerous in pools where there is little or no vegetation, and in tanks or private swimming baths they would exterminate all the mosquito larvae.

Another very interesting predator of the third group is the little notonectid *Plea pullula* Hutch. When full grown these measure only about 3 millimetres in length and I have found them to be very abundant in certain ponds of the southern Cape Province. They will even attack and cling tenaciously to fourth stage mosquito larvae and usually are able to resist all efforts of violent wriggling that the larva makes in an endeavour to shake them off. They then insert the proboscis and suck the blood. As in the case of *Anisops*, however, the

greatest destruction is amongst the smaller larvae. In an experiment two full-grown *Plea* were put in a jam jar containing some filamentous algae and 50-100 newly hatched *Aedes aegypti* larvae were put in every two or three days according to the rate at which they were being devoured; controls were also kept as a check on the normal survival of the *aegypti*. Over a period of 3 weeks 704 larvae had been eaten. Although again this does not prove their efficacy in nature it certainly disproves the suggestion of Ward and Whipple (1918, p. 896), that this genus is not carnivorous at all. They can, however, survive on a non-carnivorous diet, as I have kept several of them alive for many weeks in a vessel containing an abundance of filamentous algae. In this case they probably live on the algal juice. In conclusion it should be noted that this is one of the few predators which can attack those mosquito larvae which lurk in filamentous algae.

There are two genera of pool-breeding predacious mosquito larvae in South Africa. These are *Aedes* spp. of the sub-genus *Mucidus*, and *Culex* (*Lutzia*) *tigripes* Grandpré and Charmoy. The latter is the most widespread and therefore the most important. Haddow (1942) notes some experiments on the number of larvae of *Anopheles gambiae* eaten by *tigripes* larvae, and Steyn and Schulz (1955, p. 1117) give a record of 43 larvae of *Aedes hirsutus* consumed by a single *tigripes* during 10 days. The species is very abundant in forest pools of the southern Cape Province and frequently brings about complete extermination of all other mosquito larvae in the pool. Mr. A. D. Harrison has informed me (in conversation) that he once collected a strain of *tigripes* in the Cape which fed on *Daphnia*, but which was reluctant to eat mosquito larvae. I could find no morphological differences in the adult specimens from the typical form.

An interesting adaptation of mosquito breeding in temporary pools which were mostly free from predators, but which were not dependent on rainfall, was found at points on the coast of the Cape Province. At three different places studied pools were formed near the sea-shore by seepage of almost pure sea-water during the high spring tides, but these became dried out during the low neap tides. When filled, the brackish pools contained very large numbers of larvae of *Aedes* (*Aedimorphus*) *albocephalus* Theobald most of which just had time to emerge as adults before the pool basins became dried out at the onset of the neap tides. Eggs had doubtless been laid on the damp mud as the pool basins were drying up during the previous neap tides. This breeding cycle is somewhat analogous to that of *Anopheles melas* in West Africa (Thomson, 1945, pp. 192-205).

A note on the prolonged viability and erratic hatching of the eggs of tree-hole breeding *Aedes*.

Attention has been drawn (Muspratt, 1955 and in the press) to the erratic hatching of the eggs of tree-hole and leaf axil breeding stegomyias, and to the hatching after 14 months of two other tree-hole breeding species of *Aedes*. Further details of the experiments leading to the latter finding may

be of interest. Several bamboo pots, filled with water, were placed in suitable situations in the Kaapmuiden and Malelane districts of the eastern Transvaal at the end of September 1953, which was the beginning of the summer rains. These were collected up more than four months later, when there was little or no water left in them. On refilling all of them yielded larvae and over 400 of these were bred out. They comprised seven species of *Aedes*: *A. aegyptii*, *A. metallicus*, *A. unilineatus*, *A. marshalli*, *A. haworthi*, *A. fascipalpis* and *A. furcifer*. The first two species were the most numerous. The emptied pots were then stored in the laboratory in Johannesburg which has a low humidity during the dry winter months. More than 12 months after they had been collected up they were again refilled with water, and four of them yielded larvae of *A. metallicus* and *A. fulgens*. It should be noted that the latter species had not appeared in the first hatching. The pots were again emptied and two months later were again refilled. This time two pots yielded a few larvae of *A. furcifer* and one of *A. metallicus*. A later test was negative.

The erratic hatching of the eggs of *fulgens* and *furcifer* may have been due to the water not having covered them, although care was taken to fill the pots right up; but in view of the erratic hatching of eggs of two leaf-axil breeding stegomyias which were deposited in test tubes (Muspratt, in the press) it would appear to be a natural phenomenon. It emphasizes the necessity for sterilizing pots which are to be used again, even if they have been dry for a considerable time. Some very interesting experiments on the hatching *Aedes* eggs have been recorded by Gillett (1955, a and b).

SUMMARY.

A list of 38 culicine species of a collection made in Tongaland, Natal, is given with notes on the taxonomy of four of these and a description of a new species of *Aedes* of the *apicoannulatus* group of *Aëdimorphus*. Notes are given on some ecological factors relating to the larvae of pool-breeding mosquitoes with particular reference to predators which include fish, dragonfly nymphs, larvae of large water-beetles, notonectids and predacious mosquito larvae. Results of experiments with some of these are included, also some observations on the prolonged viability and irregular hatching of the eggs of tree-hole breeding *Aedes*.

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Laboratory (C.S.I.R.) for the identification of some predators of mosquito larvae, and to Mrs. E. C. C. van Someren for some specimens which she kindly donated from the collection of the Division of Insect-borne Diseases, Medical Research Laboratory, Nairobi, Kenya.

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**Notes on Aedes (Diptera,
Culicidae) from Natal, with
a description of a new
species of the Subgenus
Stegomyia.**

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Notes on *Aedes* (Diptera, Culicidae) from Natal, with a Description of a New Species of the Subgenus *Stegomyia*

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The specimens described below were collected by the writer at Margate, near Port Shepstone, on the South Coast of Natal in December and January, 1949-50. The new species of *Stegomyia* is of special interest, as it is closely allied to *A. (S) simpsoni* Theobald, which is one of the proved vectors of yellow fever in East Africa. This species was very abundant in wooded valleys and ravines (dongas) of the neighbourhood and a prolific breeder in the axils of the so-called wild banana, *Strelitzia nicolai*, which appears to be its principal breeding place. *Strelitzia* is a familiar plant of this coastal area, where it is often associated with small patches of low evergreen forest, particularly in sheltered valleys. *A. simpsoni* and the new species were sometimes collected together from the axils of cultivated bananas. The preferred breeding place of *simpsoni* was, however, in the axils of *Dracæna hookeriana*. The new species was found to be a more persistent daytime biter than *simpsoni*. The morphological characters of the two species are here compared in detail.

Aedes (Stegomyia) strelitziae sp. nov.

The adults resemble *A. simpsoni* in most respects, but differ in the form of the male palpi, the marking of the hind tibiæ and first tarsal segment, and in the details of scutal ornamentation. The hind tibiæ have a conspicuous basal white streak (beneath) which makes the species easily separable from *simpsoni*. The larva is similar to that of *simpsoni* but differs chiefly in the much shorter anal papillæ (gills), the much longer antennal hair and in certain other details. The short anal papillæ made it possible to separate the living larvæ from those of *simpsoni* and other *Stegomyia* species (*A. ægypti* L.) collected from the same breeding place.

Male. Head: vertex with black scales, of which some on the nape are erect, together with two median lines of broad flat silvery-white scales, narrowly divided, and running into a narrow line of white scales round the eye margins. These join larger lateral patches of similar scales. Clypeus bare; tori with silvery-white scales on the inner and lower sides; proboscis dark. Palpi (fig. f) similar to *simpsoni* (fig. e) in having a fairly broad,

irregular band of white scales in the centre of each shaft (incomplete beneath) and a patch of white scales near the base above; also a small patch at the bases of the penultimate and terminal segments beneath; those on each penultimate segment being more distinct than in *simpsoni* and the band on the shaft is narrower. There are a few short, stout bristles of different lengths near the apices of each shaft and penultimate segments, and two or three short bristles of equal length at the apex of each palp; but the numerous long hairs or bristles which are present on the last two segments of *simpsoni* palpi are entirely absent. *Thorax*: scutal scales all narrow with a pair of large white, roughly triangular or pear-shaped patches which reach the border of the scutum. From a short distance behind the posterior angle of these a line of white scales is continued back to the posterior border of the scutum. The patch of white scales in the centre of the anterior scutal margin is about twice as long as broad and rather less wide than that of *simpsoni*. The median pair of yellow lines, consisting of long, narrow scales and running down the centre of the scutum, diverge round the anterior part of the pre-scutellar bare space. There are, however, few or no yellow scales, and no white scales, immediately in front of the scutellum. This is in contrast to *simpsoni*, in which white scales replace the yellow ones of the median lines in front of the scutellum. The median yellow lines, which are slightly narrower than those of *simpsoni*, become very narrow or broken on the anterior half of the scutum and do not quite reach the anterior white patch. In *simpsoni* from this locality the median yellow lines are usually well defined and reach the anterior white patch. Those of *strelitzia* are therefore to some extent rather more like *simpsoni* var. *lilii* Theobald. There is a fairly large patch of white scales above each wing root, and the scutellum is completely covered with broad white scales. Pleural scaling as in *simpsoni* with patches of broad flat white scales on both *apn* and *ppn*. *Legs*: front femora: all black except for a very small spot of creamy white scales on each at base beneath, and a basal white line reaching from one-third to half in front. *Simpsoni* from this locality sometimes have similar faint lines of buff scales on both sides of the front femora. Middle femora: each with a small creamy-white spot at base beneath, a white spot in front just beyond half, and a white spot at the tip, which is about as broad as long. The spot beyond half is rather smaller than on *simpsoni*. Hind femora: each with a small creamy spot at base beneath; anterior side with a creamy-white area on basal quarter followed by a creamy-white line which is confluent with a white spot or patch at half. This marking corresponds to the description of *A. (S) woodi* Edwards (Edwards, 1941, p. 133). The white spot is larger than those on the middle femora and rather rectangular on the distal side. A white spot at the tip as middle femora. Posterior side with a creamy-white area on basal quarter to one-third. Front tibiae: each with a narrow basal white band which on the male type is incomplete posteriorly. Middle tibiae: all dark. Hind tibiae: with a conspicuous cigar-shaped white basal streak reaching to nearly one-third beneath. The streak is separated from the joint at the basal end. Front tarsi: segment 1: each with a narrow basal white band (usually incomplete behind); 2: with a white band reaching

to about one third in front but shorter behind no white at all posteriorly on type specimen; 3-5 all dark with bronze gloss. Middle tarsi: 1: with a white band on basal quarter in front (less behind); 2: with a white band on basal half in front (less behind); 3-5: as front tarsi. Hind tarsi: differing from *simpsoni* in the first segment only, except that the white bands are a little shorter. Segment 1: a broad white band at base. On the type and all the paratypes this band is interrupted on the inner side by a line of long narrow dark scales which are all white on *simpsoni*; 2 and 3: with white basal bands, that on 2 being slightly shorter than on segment 1, and on 3 about the same width as 1; 4: all dark; 5: white with a black spot at tip. *Wings*: with a very small patch of short white scales at base of the costa (not present on *simpsoni*). *Abdomen*: tergites similar to *simpsoni*. Segment 1: with large lateral patches of broad silvery-white scales; 2: with a basal median white patch of a few scales (a short band or absent on some specimens) and large lateral patches; 3-6: with broad white basal bands which are well separated from the silvery-white lateral patches; these patches are roughly pear-shaped; 7: with a median basal (nearly rectangular) white patch, or a short band, or a few scales, and pear-shaped lateral patches; 8: with a large median basal white patch. Sternites: short basal white bands or patches on 3-7, and lateral white patches on 2-7, which on 7 are apical. There is also a median apical patch of a few white scales on 2. *Terminalia*: scarcely differing at all from *simpsoni*. The lobes of the ninth tergite are perhaps slightly shorter and with fewer bristles (2-4). The dorsal plates of the proctiger (tenth tergites) are darker and more pronounced, but this may be due to pigmentation only.

Female. Generally similar to the male. *Head*: with proboscis all dark, clypeus bare, etc., palpi white-tipped. Otherwise differing only in the second segments of the front and middle tarsi, which have rather more white on them, and there are sometimes a few white scales on the outer side of the fourth hind tarsal segment at the base. Claws simple in both sexes.

Pupa. Comparison with the pelts of *simpsoni* from this locality reveals only a few differences. The trumpets are similar, but the setæ of the cephalothorax and abdomen are mostly longer than *simpsoni*. Some of the pelts have a rather marked yellowish pigmentation. The abdominal setæ differ as follows: spines A on segments III and IV are stouter and on VIII, A consists of a tuft of 3-4 branches (*simpsoni* about 5), one of which is usually longer than the others and exceeds half the length of the midrib of a paddle; the branches are finely plumose and some more coarsely so near the bases. In *simpsoni* the branches are of more equal length. Setæ C of segment III are 3-5-branched (*simpsoni* single to 3-branched) and much longer and stouter. In *simpsoni* these setæ are placed behind C' which probably corresponds to the Nyasaland pelt referred to by Edwards (1941, p. 389). In *strelitzia* C' and B are almost in line (less so on the type pelt than other specimens). Other features are: dorsal seta nearly one-sixth of length of trumpet and single. L: single and M: 2-3-branched (sub-equal); H: single, shorter than T and S, and about one-quarter length of K. B on II-VII: single, those on II-V long (that on IV about half width

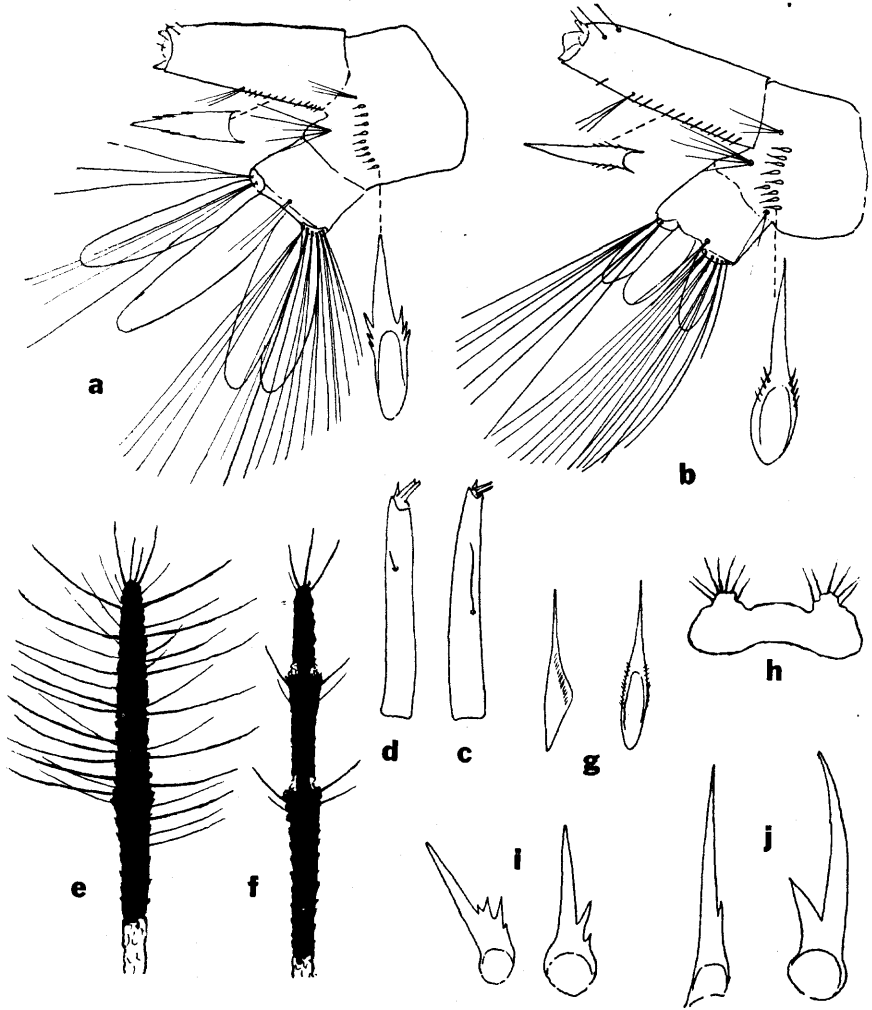


FIGURE.

A. (*S.*) *strelitziae* sp. nov: b. Terminal segments of larva. c. Larval antenna. f. Distal part of male palp from above. A. (*S.*) *simpsoni* Theo.: a. Terminal segments of larva. d. Larval antenna. e. Distal part of male palp (from above) showing lateral bristles. A. (*A.*) *bevisei* Edw.: g. Comb spines of larva (side view on left). h. Ninth tergite of male terminalia. i. Two distal close-spaced pecten spines of larva. j. Two wide-spaced pecten spines from different larvæ.

of segment). C on II and III: with 4-5 branches. C IV and V: single or 2-3-branched; C VI and VII: single. Paddles: width slightly more than length of the midrib, with denticles on distal margin. Seta: single and rather more than one-sixth length of midrib. The paddles of *strelitziae* pelts are perhaps slightly wider than those of *simpsoni* from this locality; but these *simpsoni* have wider paddles than figured by Edwards (1941, p.388).

Larva. Head: pale, antennæ smooth and usually rather darker than head. Antennæ (fig. c) differ from *simpsoni* in the much longer antennal hair which is about one-third of the length of the antenna (excluding the apical setæ and papilla). The hair is situated at about half, whereas that of *simpsoni* is more distal (fig. d). The antenna of *strelitziae* is usually slightly longer than here figured. Setæ A, B and C: simple and single; *d*: 2-3-branched and somewhat shorter than that of *simpsoni*; *e*: single; *f*: single or 2-branched. Mentum: with 11-13 teeth on each side, those at the base of the triangle being finer and closer together than in *simpsoni*. *Thorax:* spines short and straight with large bases which are usually darker than *simpsoni*. *Abdomen:* comb (fig. b) an irregular row of 7-12 (usually 8) spines which are longer than those of *simpsoni* (fig. a) and with smaller basal denticles. Siphon: paler than *simpsoni* and with rows of minute spicules; *simpsoni* has a few scattered and very minute spicules, but not in rows; the index of ten unmounted larvæ varies between 2.1 and 2.6, averaging 2.3; it is almost cylindrical on the proximal two-thirds. The siphon of *simpsoni* is rather shorter, but in larvæ from this locality it is less conical than figured by Hopkins (1936, p. 114), especially when viewed in a truly lateral position and particularly on the ventral side; the index is about 2. Subventral tuft of *strelitziae*: 3-4 simple branches, placed at about two-thirds and about two-thirds width of siphon in length. Pecten: varying from 9-17 spines, most of which have very fine denticles on each side; these denticles are placed nearer the base of the spine than *simpsoni* (see figs. a and b), but they may be absent from the proximal two or three spines. The most distal spine is separated from the others and usually placed beyond the tuft. The pair of dorsal setæ near the apex of the siphon are longer and stouter than those of *simpsoni*. Anal segment: saddle not quite complete; upper and lower caudal setæ: 4-branched; lateral seta: 2-4-branched (*simpsoni* usually single) and very minutely plumose under high-power magnification. Ventral brush: four pairs of 3-4-branched tufts. Anal papillæ: upper pair about length of saddle, lower slightly shorter; on the living larvæ they are more pointed than *simpsoni*.

Described from the male type and 15 paratypes, with associated pelts, selected from a large number of specimens, together with numerous larvæ, many of which were obtained from eggs laid by a gravid female. Paratypes have been presented to the British Museum (Natural History), London.

***Aedes* (*Aëdimorphus*) *bevisi* Edwards**

Females agree in most respects with the descriptions of Edwards (1915 and 1941). The tarsi have faint pale rings on the joints of 1-2

and 2-3 and very faint ones at the bases of 4 and sometimes on 5. On the hind legs there are creamy-white bands on the joints of the tibiae and first tarsal segments of each, which also have numerous yellow bristle-like scales on the inner side and for a short distance on each side of the joint. Most of the bristles on the middle and hind femora and tibiae are pale yellow even on the dark-scaled parts. The middle tibiae differ from the descriptions in having a small patch of creamy-white scales at the base separated from the creamy scaling on the posterior side, and the creamy scaling may extend down the posterior of tarsi 1 and 2. On one specimen the scutum has a pair of rather well-defined broad lines of brown scales passing on each side of the pre-scutellar bare space and joining large but less distinct triangular patches on the anterior half of the scutum. On another specimen the white bands of the abdominal tergites are abbreviated at the sides, so that there is only a basal median patch of whitish scales on 2-6. The brown scales on the head mentioned by Edwards (1915) are not present on my specimens.

Male: resembles the female in most respects. *Head*: palpi slightly shorter than proboscis and similar to those of *A. quasiunivittatus* Theobald and *A. dentatus* Theobald, with long hairs at the apex of the shaft and on the two distal segments. *Abdomen*: rather sparsely scaled, integument darkened at the apices of the segments and with white basal bands on tergites 2-6. *Venter*: mostly pale scaled with dark scales apically on segments 5-7. *Terminalia*: very similar to that of *A. subdentatus* Edw. (see Edwards, 1941, fig. p. 192) the only discernible differences being that the distal edge of the tergite (fig. h) curves outwards, between the lobes—in the same direction as the lobes—instead of inwards as in the other members of this group. The lobes are rather irregular in shape like *A. calignosus* Graham, but smaller than in that species; they have 6-7 bristles.

Pupa: the shape, etc., of the paddles shows affinity to *A. gibbinsi* Edwards. The integument is mainly pale, but the trumpets are dark brown and the integument is darkened on the dorsum of the cephalo-thorax and abdominal segment I. *Dorsal seta*: 4-6 rather fine branches which are about one-third the length of one of the trumpets. *Supra alar seta* single or split into 2-3 branches at about one-third. *O*: finely 4-branched just above base. *P*: single and longer than *O* and *R*. *R*: 3-4-branched at one-third. *U*: single or split into two. *T*: 2-4-branched and same length as *K*, which is single. *S*: single and twice as long as *K*. *L* and *M*: 3-4 and 5-7-branched; these are about the same lengths as *U* and *H*, the latter being single; *H* is about one-fifth the length of *K*. *A* on VII: 3-branched; on VIII: 3-4 dendritic branches, of which the longest is about half the length of the segment. *B* on II and III: single (on III about two-thirds length of segment); on IV to VI: 3-4-branched and on VII: single or 2-3-branched. *C* on II: 17-20 simple branches; on III: 4-7-branched and almost behind *B*; on IV-VII: 2-5-branched. *Paddles*: very much as figured for *A. gibbinsi* Edw. (Edwards, 1941, p. 397); width about two-thirds of length of the midrib and finely denticulate distally; seta: rather stout and one-seventh to one-eighth length of midrib.

Larva: Very similar to *A. dentatus* Theobald as described by Hopkins (1936, p. 149). Differs in head setæ B, which are 2-branched, and C, which are single or 2-branched; also in details of the pecten spines, length of the anal papillæ and tufts of the anal segment. *Head*: fairly pale, with a reticulum of fine denticles. Otherwise similar to *dentatus*, except setæ B and C. Antennæ spiculate with tuft of about 6 nearly simple branches one-third to half length of antenna; the tuft is placed at about half. Seta A: very finely plumose with 6–8 branches; B: 2-branched (simple); C: single or 2-branched (simple); *d*: very finely 3-branched; *e*: 2-branched; *f*: single or 2-branched. The placing of the head setæ is like that of *A. cummingsi* Theobald (Hopkins, 1936, fig. p. 151), except that *d* is a little further back (almost between B). *Thorax*: meso and meta pleural spines with 1–3 straight spines and several smaller spines, or denticles, around the bases of each tuft. *Abdomen*: comb a patch of 8 or 9 spines with a basal fringe of fine denticles (fig. g) apparently similar to *dentatus*; the spines tend to be in rows. Siphon as *dentatus*—finely denticulate with an index of 3·2 and 3·3 measured on two larvæ. Subventral tuft with 3 or 4 simple branches, less than half diameter of siphon and placed just beyond two-thirds. Pecten of 10–16 spines on basal half or less, placed close together (fig. i) and 1–3 larger and wider-spaced spines between these and the tuft (fig. j). Most of the close-spaced spines have one large basal denticle and one or two smaller denticles, but differ from *dentatus* in that the latter are on one side of the spine only. The larger wide-spaced spines may be almost straight, or curved, and simple or with one or two large or small denticles. Anal segment: similar to *dentatus* in having a nearly complete saddle with spicules in rows, single or 2-branched simple lateral seta (not very long), and a single lower caudal seta; but upper caudal seta with 6–7 simple branches. Ventral brush with about 7 paired, 5–9-branched, tufts on the barred area and 3 or 4 tufts proximal to it. Anal papillæ: lanceolate and one and a half times length of saddle, sub-equal.

Described from 3 males and 2 females with associated pelts, and two larvæ, all reared from eggs obtained from a gravid female. The breeding place is unknown, but probably a pool breeder as *dentatus* and *subdentatus*.

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