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A NEW SPECIES AND VARIETY OF *ANOPHELES* FROM NIGERIA, WITH
NOTES ON *ANOPHELES FLAVICOSTA* EDWARDS AND *AÆDES* (Aë.)
WENDYAE SERVICE

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Anopheles brucei sp. n.

Adults

THE following description is based on the holotype female, allotype male, and 1 male and 3 female paratypes.

Female: resembles *Anopheles demeilloni* Evans and *A. rivulorum* Leeson in many characters but differs as follows: costa of wing with two well-defined pale interruptions on basal one-fourth (fig. 1) (in a few specimens one of these two pale spots is absent (fig. 2a)), veins 3 and 5 more extensively pale scaled than in *rivulorum* and a pale fringe spot present opposite vein 6 (some specimens show more variation in the degree of pale scaling of the wings than is recorded for *demeilloni* or *rivulorum* (fig. 2b)); in the palps the two distal pale bands are broader than the narrow intervening dark band (fig. 3); mesonotum apparently lacks scales on distal half; tarsal segments without any indications of pale bands; pharyngeal armature similar to that of *demeilloni*, except that the filaments of the cones are always single, and no median tooth is present in the post-pharyngeal ridges.

Male: similar to female, but differs in having the dark fringe spot between veins 2.1 and 2.2 absent (fig. 4); allotype also differs from holotype in having only one pale spot on basal fourth of costa. Terminalia (fig. 5) similar to those of *demeilloni* in that club of harpago is distinctly bent inwards but differing as follows: none of the parabasal spines mounted on tubercles, outer accessory bristle as long as club, inner accessory bristle absent, the longest of the six pairs of phallosome leaflets is only 39 μ , and five pairs are serrated.

Pupae

Pupal pelt of male allotype similar in general chaetotaxy to that of *funestus* series (i.e. *funestus* var. *confusus*, *rivulorum* and *leesoni*), but the following differences occur: paddle fringe stops at insertion of paddle hair, which is not hooked; accessory paddle hair 3-6 branched; bristle C on segments V-VII longer than following segments; spine A less than half length of segment on segments IV and V; hair 4 on segments IV-VII is 3-4 branched and situated directly anterior to bristle C.

Larvae

The following description is from the larval pelt of the holotype and 2 paratype whole larvae.

Larvae very similar to *rivulorum*, but differ as follows: outer anterior clypeal hairs only one-third length of inner hairs; abdominal tergal plates shallower and wider than in *rivulorum*, their width exceeding the distance between the bases of the palmate hairs, width: depth ratio 4:1 (cf. 3:1 for *rivulorum*); general shape of main plates (fig. 6) quite distinct from that of *rivulorum* and, although most of the larvae possess three accessory tergal plates on abdominal segments V, VI and VII, others have only one free accessory plate on each segment.

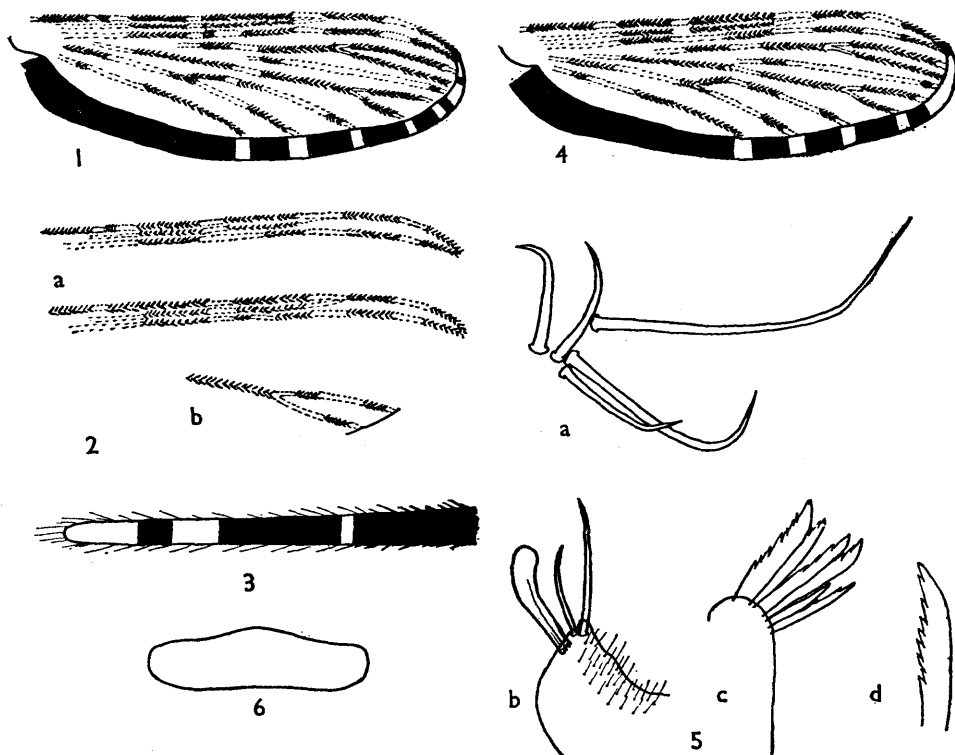
Holotype ♀, N. NIGERIA: Lokoja, viii.58, with associated larval pelt, pupal pelt lost; *allotype* ♂, same data and with associated larval and pupal pelts. *Paratypes*, 1 ♂ and 3 ♀ adults and 2 whole larvae, same data; all types in British Museum (Nat. Hist.).

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The larvae were found breeding in shady forest streams and in partially dried up river beds near Lokoja.

The species is named *brucei* after Dr. L. J. Bruce-Chwatt, O.B.E.

The early stages of *A. brucei* closely resemble those of the *funestus* series. Larvae possessing three accessory abdominal tergal plates run to *rivulorum* in the key given



FIGS. 1-6.—*Anopheles brucei* sp. n. : (1) wing of female holotype ; (2) variation in wing pattern, (a) costa, subcosta and vein 1, (b) vein 4 ; (3) female palp of adult ; (4) wing of male allotype ; (5) male terminalia, (a) parabasal spines of coxite, (b) harpago, (c) phallosome leaflets, (d) longest phallosome leaflets ; (6) main abdominal tergal plate on segment V of larva.

by De Meillon (1947); they can, however, be separated by the insertion of the following couplet.

- | | |
|---|------------------|
| Main tergal plate on segment V wider and shallower, about 4 times as wide as deep | brucei |
| 21a | |
| This plate narrower and deeper, about 3 times as wide as deep | rivulorum |

The pupae, though not agreeing in chaetotaxy with any particular member of the *funestus* series, have several characters that are shared among the different species of the group. The adults resemble those of *demeilloni* more closely than those of *rivulorum*. The eggs of *demeilloni* resemble those of *funestus* and the discovery of the present species further confirms the relatively close relationship between *demeilloni* and the *funestus* group.

It is of interest to note that larvae identified as *rivulorum* were collected from the same streams as *brucei*, and that adults bred from them were found to be typical *rivulorum*.

Anopheles hancocki var. *gilroyi* var. n.*Adults*

The following description is based on the female holotype and the male allotype.

Female: agrees in general details with *Anopheles hancocki* Edwards, and with certain characters found in its three named varieties (Adam *et al.*, 1956), but differs as follows: wing (fig. 7) with two pale spots on basal one-fourth of costa, vein 4 pale scaled at fork, and scaling of other veins appears to have several of the characters found in the varieties of *hancocki* but in a different combination; palps (fig. 8) with segment 2 dark scaled with apex narrowly white scaled, segment 3 dark with apex white scaled, and segments 4 and 5 all white; hind tarsus (fig. 9) with segments 3-5 all pale scaled.

Male: resembles female in general appearance, but scaling on vein 1 differs slightly (fig. 10), terminalia (fig. 11) similar to var. *brohieri* except that one of the harpagones has two outer accessory bristles and the dentations of the phallosome leaflets extend over the basal fourth.

Pupae

Pupal pelt of holotype agrees in all details with that of *hancocki*.

Larvae

The following description is based on the pelt of the holotype and one whole larva.

Larvae similar in general appearance to those of *hancocki*, and in some details to var. *massequini* (*vide* Hamon, 1954) and to atypical *hancocki* from Sierre Leone (Evans, 1938), but is distinguished from both *hancocki* and its varieties as follows: head pigmentation, as seen in whole larva (fig. 12), quite distinct from that of *hancocki*; inner anterior clypeal hairs tapering and attenuated to a fine point, and the outer clypeals abruptly pointed; posterior clypeals only half length of outer clypeals and not reaching bases of either the inner or outer hairs; antennae with shorter spicules than in *hancocki*; palmate hairs on abdominal segments I and II undifferentiated, though one or two leaflets may have indications of shoulders and serrations; main abdominal tergal plates pale and large, being half the depth of the segment; on segment V their width equals or very nearly equals distance between bases of palmate hairs; one free accessory plate present on segments II-VII; saddle hair split, nearer the base than in *hancocki*, into 6-7 branches; pecten (fig. 13) with the short teeth longer than in *hancocki*, the longest being more than half length of long ventral tooth.

Holotype ♀, E. NIGERIA: Itchi, near Enugu, v.58, with associated larval and pupal pelts; *allotype* ♂, data as for holotype, but with no pelts. *Paratype*, one whole larva, same data; all types in British Museum (Nat. Hist.).

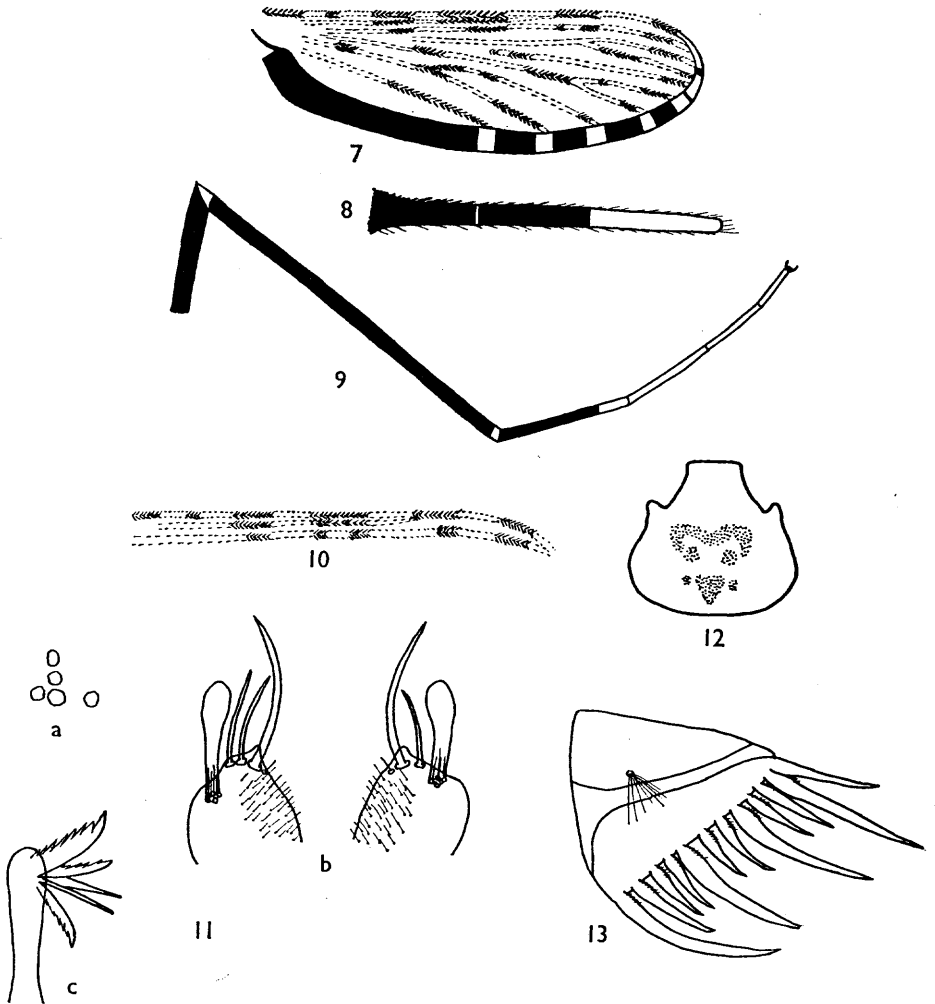
The larvae were found breeding in a swamp near the village of Itchi near Enugu, E. Nigeria.

The variety is named *gilroyi* after Dr. A. B. Gilroy, sometime malariologist in Lagos, Nigeria.

Adam *et al.* (1956) came to the conclusion that *hancocki* has three distinct varieties, var. *brohieri*, var. *seydeli* and var. *massequini*, all of which are very similar in the adult state. There is apparently no satisfactory way of distinguishing the three varieties with certainty on wing scaling alone, as this is too variable, but it seems that they can be separated on the coloration of the hind tarsus. As the differences separating this new form from *hancocki* and its varieties are no greater than those separating any of the known varieties from each other, it seems best to regard it as a variety of *hancocki* rather than as a distinct species or subspecies.

Mention is made by De Meillon (1947) of a specimen of *hancocki* from S. Nigeria which has, like *gilroyi*, the apical third of the female palps pale scaled. Through the kindness of Dr. De Meillon, the author has been able to examine the specimen concerned, and to make the following observations. In general appearance and in the coloration of the palps it is similar to *gilroyi*. The wing scaling agrees partly with *gilroyi* and partly with *hancocki*, but differs slightly from both forms as follows: the costa in the first dark area, as in *gilroyi*, has two pale spots, vein 1 in the second

dark area has no pale spot (cf. *gilroyi* (figs. 7 and 10)), in the third dark area, in common with both *hancocki* and *gilroyi*, there is a pale spot on vein 1; however, vein 1 differs from both in that the pale spot separating dark areas two and three on vein 1 is obscure and poorly developed. Vein 4 is like that of *gilroyi*, and the



FIGS. 7-13.—*Anopheles hancocki* var. *gilroyi* var. n.: (7) wing of female holotype; (8) palp of adult female; (9) hind tarsus of adult; (10) costa, subcosta and vein 1 of wing of male allotype; (11) male terminalia, (a) plan of insertion of parabasal spines into coxite, (b) harpagones, (c) phallosome and leaflets; (12) clypeal pattern of larva; (13) larval pecten.

dark fringe spot between veins 3 and 4-1, which is reduced in *gilroyi*, is absent; also missing is the dark fringe spot between veins 4-1 and 4-2. The similarity of the female palps of this specimen to those of *gilroyi*, and the fact that greater similarity is shown in its wing scaling to *gilroyi* than to the other varieties of *hancocki*, make it quite probable that the specimen is in reality var. *gilroyi*.

At Itchi in the same area in which var. *gilroyi* was found, there were larvae of the type form of *hancocki*. After pupation and emergence the adults were identified as typical *hancocki*.

Taxonomic Notes on *Anopheles flavicosta* Edwards, 1911

It is only fairly recently that the immature stages of *A. flavicosta* have been described—the larva in 1942 and the pupa in 1949. Even with the adult, which was first described in 1911, there is meagre information concerning variability, and the morphology of the terminalia seems to be imperfectly known. Below are some observations on the various stages of this species that have either been overlooked or described incorrectly.

Adults

The wings are seen to exhibit considerably more variation in the degree of light and dark scaling than is usually illustrated. The basal one-fourth of the costa may either have one very minute pale interruption, or have two pale basal spots. Area two on vein 1 may have a pre-accessory spot, and vein 2 can either show extensive pale scaling or be predominantly dark scaled, while vein 6 may either have two or three small patches of dark scales, or have the entire distal half pale scaled.

There are also differences between the appearance of the terminalia as described by Evans (1938), and that observed in the present material. The following is the description of the terminalia given by Evans (1938). "Coxites with rather dense scales. Parabasal spines normal for the group. Harpago with club rather short and broad; terminal hair *nearly twice as long as club*; inner and outer accessory hairs both present, less than half as long as terminal hair. Phallosome (in the single specimen examined) with 7 pairs of leaflets, the 3 or 4 longest pairs almost half as long as phallosome, rather narrow (even when seen at their full width), and so far as can be seen without serrations." In the present material, the terminal hair is only one and a half times as long as the club, the outer accessory bristle is one-fourth the length of the terminal hair, and the inner accessory hair is absent in all specimens except two, where it is very slender and as long as the outer hair. The phallosome is quite broad, bearing 7-9 leaflets on each side, all of which are narrow. The number having serrations varies in individual specimens, but not according to locality. In some specimens only 2-3 leaflets are simple, whereas in others 4-5 are simple.

Pupae

Mattingly (1949) described the pupal stage from a solitary pelt from Makurdi, Southern Nigeria, and suggested that it could be separated from *gambiae* and var. *melas* by the insertion of the following couplet into De Meillon's key (1947).

Meatus of trumpet less than one-fourth the length of whole; seta *C* on segments V-VII bifid or trifid **flavicosta**
46A.

Meatus of trumpet longer, about one-third length of the whole or more;
seta *C* on V-VII normally simple (one seta occasionally split)
gambiae (in part), **gambiae** var. **melas**

Examination of a series of pelts from the French Southern Cameroons, Northern Nigeria and Eastern Nigeria, shows that seta *C* is considerably more variable than formerly supposed. In the majority of specimens this seta is single on segments VI and VII and in a few pelts it is also single on segment V. Other specimens, however, show the bifid and trifid branching mentioned by Mattingly. In addition the accessory paddle hair which is stated to be 2-4 branched was, in one specimen, single.

After comparing the pupal pelts of *flavicosta* with those of *gambiae* and var. *melas*, it is suggested that the following alterations be made to the couplet.

- Meatus of trumpet less than one-fourth length of whole; seta *A* on segment VI less than half length of segment VII **flavicosta**
- 46A. Meatus of trumpet long, about one-third or more length of whole; seta *A* on segment VI half or more length of segment VII
gambiae (in part), **gambiae** var. **melas**

Larvae

The type description is given by Davey (1942), and De Meillon (1947) uses it as the basis of his account of the species. Although in both accounts the palmate hairs on abdominal segments I and II are stated to be rudimentary, no mention is made as to whether they are differentiated or whether they resemble the hair on the thorax in being shoulderless. Examination of larvae from the above localities shows that in all cases the palmate hairs on segments I and II are clearly differentiated into serrated shoulders and short terminal filaments. With the exception of two specimens, the tergal plates are seen to have a free median accessory plate on segments II and III, whereas Davey's Sierra Leone material usually had the accessory plates on these segments fused to the main plate.

Aedes (Aedimorphus) wendylae Service, 1959

As no type of this species was designated in the original description (Service, 1959), an adult ♂ in the British Museum (Nat. Hist.), with the following data: S. NIGERIA: Ikorodu, iii. 59, has been marked as a lectotype.

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