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## Keys to the West African Anophelini.

By M. W. SERVICE.

Despite the recent discovery of many new species, subspecies and varieties of *Anopheles*, the works of EVANS (1938) and DE MEILLON (1947) remain the standard references on the Anophelines of the Ethiopian geographical region. It is nevertheless useful to have shorter and simpler works on the fauna of a smaller area, and this has in the past been fulfilled to a certain extent for the West African Anophelines by the keys of LEESON (1939) and MATTINGLY (1944). Since the publication of these papers, many new species and varieties etc. have been described from West Africa, and numerous forms previously known elsewhere in Africa have been recorded from this sub-region. Taking these facts into account, together with the need for lucid and practical keys to the West African Anophelines, the present paper was prepared.

The keys in this paper are supplemented with concise descriptive notes which incorporate most of the more important variations recorded in the West African species, there must necessarily be some differences and variations in both adults and larvae that have not been included. No mention is made in this paper of the use in identification of the male terminalia or of the female pharyngeal armature; when such details are required EVANS (1938) or DE MEILLON (1947) should be consulted.

The East African representative, *A. longipalpis* s.s., of the *longipalpis-domicolus* complex is included in the present paper although it is probably absent from West Africa, since it is very difficult and sometimes impossible to distinguish it from its West African sibling form, var. *domicolus*.

HAMON (personal communication) considers that all records of *A. theileri* from West Africa are based upon misidentifications, and that most probably the species in question is the variable *hancocki* var. *brohieri*. As the evidence for the occurrence of *theileri* in this area is conflicting, it is thought advisable to include it among the West African Anophelines until its presence or absence, in West Africa is determined.

The area under consideration in this paper is not that defined as West Africa by either BANNERMAN (1930) or LEESON (1939). BANNERMAN in his "Birds of Tropical West Africa" defines as West Africa the area between the southerly limit of the Saharan vegetation and the River Congo, taking the easterly limit as about

a longitude of 20 degrees. LEESON describes mosquitoes from the area of West Africa south of the Sahara as far as the equator but gives no easterly delimitations. But the Cameroon highlands with their montane vegetation provide, at least in the south, a natural barrier. West African species are found within this area and consequently the easterly demarcation of the area under consideration in this paper is the highland of the Cameroons, i.e. about 15 degree east in longitude.

### Key to the Larvae.

(Based entirely on fourth instar specimens.)

- |   |    |   |
|---|----|---|
| 1. Inner clypeal hairs placed close together, separated by a distance less than twice the width of their bases . . . . .                            | 52 |   |
| Inner clypeal hairs widely separated, by at least twice this width . . . . .  | 2  |   |
| 2. Outer clypeal hairs with stems divided into 8 or more subequal branches on the distal half . . . . .   | 3  |   |
| Outer clypeal hairs otherwise, simple, frayed, pectinate or with a few short branches . . . . .   | 4  |   |
| 3. Pecten teeth with large easily seen spicules . . . . .   |    | <i>pharoensis</i>                             |
| Pecten teeth with much finer spicules, not visible under low power of microscope . . . . .  |    | <i>squamosus</i>                              |
| 4. Thorax and abdomen covered laterally and ventrally with numerous small spicules not arranged in belts, giving the larva a hairy appearance . . . | 5  |   |
| Sides of thorax and abdomen not covered with spicules . . . . .   | 6  |   |
| 5. Main abdominal tergal plates evenly rounded, on segment 5 no more than $\frac{2}{3}$ distance between bases of the palmate hairs . . . . .       |    | <i>wellcomei</i> (in part)                    |
| Main tergal plates slightly upturned laterally, that on segment 5 very nearly equal to the distance between the bases of the palmate hairs . . . .  |    | <i>theileri</i><br><i>wellcomei</i> (in part) |
| 6. Saddle hair plumose or with at least 5 branches . . . . .  | 43 |   |
| Saddle hair simple or with less than 5 branches . . . . .   | 7  |   |

7. One of the metapleural hairs stout,  
stiff and spine like, about  $\frac{2}{3}$  length  
of feathered one . . . . . *brunnipes* (in part)  
Metapleural hairs normal . . . . . 8
8. Fully developed abdominal palmate  
hairs undifferentiated, tassel-like . . . *maculipalpis*  
Fully developed palmate hairs  
differentiated into flattened leaflets . . . 9
9. Width of main abdominal tergal plate  
on segment 5 equal to at least  
 $\frac{3}{4}$  distance between bases of palmate  
hairs . . . . . 10  
Width of this plate not exceeding  
 $\frac{2}{3}$  this distance . . . . . 21
10. Depth of the main tergal plate on  
segment 5 equal to  $\frac{1}{2}$  or more depth  
of segment . . . . . 11  
This plate shallower, less than  $\frac{1}{2}$  of  
segment . . . . . 13
11. Saddle hair split into 3-4 branches . . . *flavicosta* (in part)  
Saddle hair simple . . . . . 12
12. Spicules present as definite bands on  
sternal surface of abdomen, tergal  
plates exceptionally wide and deep  
covering nearly all of the segments,  
usually no free accessory plates, post  
frontal hair simple or bifid . . . . . *funestus*  
No abdominal spicules, tergal plates  
shallower, 2 free accessory plates,  
post frontal hair with several  
branches . . . . . *leesoni*
13. Inner clypeal hairs split into 2 stems,  
each sub-divided into 8-12 branches . . . *cinctus* (in part)  
Inner clypeal hairs simple, pectinate,  
or frayed but not split as above . . . 14
14. Inner clypeal hairs pectinate or with  
some fraying, inner submedian hair  
greatly flattened and widely sepa-  
rated from median hair . . . . . *natalensis*  
Inner clypeal hairs simple, or at most  
with 2-3 branches, inner submedian  
hair not unduly flattened . . . . . 15
15. One of the long mesopleural hairs  
feathered . . . . . *macmahoni*  
Both long hairs simple . . . . . 16
16. Abdominal segments with at most  
1 accessory plate . . . . . 17  
Abdominal segments with 2-3 acces-  
sory plates . . . . . 18



17. Saddle hair simple, frontoclypeus  
with a pair of longitudinal pigment  
bands . . . . . *marshalli* var. *mousinhoi*  
Saddle hair split apically into about  
4 branches, frontoclypeus with a  
transverse band of pigment . . . . . *barbarellus* (in part)
18. Saddle hair simple . . . . . 19  
Saddle hair with 2-4 branches . . . . . 20
19. Width: depth ratio of main tergal  
plate on segment 5, 3 : 1 . . . . . *rivulorum*  
This width: depth ratio, 4 : 1 . . . . . *brucci*
20. Thorax with 2 metathoracic tergal  
plates . . . . . *longipalpis* var. *domicolus*  
(in part) (This is a doubtful  
character)  
Thorax with no such plates . . . . . *longipalpis*
21. Inner clypeal hairs distinctly frayed,  
pectinate or branched . . . . . 22  
Inner clypeal hairs simple or fraying  
indistinct . . . . . 29
22. Inner clypeal hairs strongly branched,  
abdominal palmate hairs with blunt  
rounded filaments . . . . . *rufipes* (in part)  
*rufipes* var. *ingrami* (in part)  
*rufipes* var. *brucechwatti*  
(in part)  
*broussesi* (in part)  
Inner clypeal hairs otherwise . . . . . 23
23. Basal spines of mesopleural hairs  
large, curved and pointed . . . . . 24  
Basal spines smaller, normal . . . . . 26
24. Inner submedian hair poorly de-  
veloped, placed on a very small  
tubercle . . . . . 25  
Inner submedian hair well developed,  
on a large basal tubercle . . . . . *squamosus* var. *cydippis* (in part)
25. Spicules usually on the small teeth of  
the pecten, larger teeth bare . . . . . *gambiae* (in part)  
Spicules on all teeth, less distinction  
between large and small teeth . . . . . *gambiae* var. *melas* (in part)
26. Full developed palmate hairs with  
blunt rounded filaments, no thoracic  
palmate hairs . . . . . *rufipes* (in part)  
*rufipes* var. *ingrami* (in part)  
*rufipes* var. *brucechwatti* (in part)  
*broussesi* (in part)  
Fully developed palmate hairs with  
sharp pointed filaments, thoracic pal-  
mate hairs present . . . . . 27

27. All the long pleural hairs simple or  
at most split into 2-3 longish branches . . . . . 28  
One of the long hairs in each group  
feathered, may be only sparsely so . . . . . *rhodesiensis* (in part)
28. Abdominal palmate hairs well differ-  
entiated, with about 12 leaflets . . . . . *smithi*  
Abdominal palmate hairs scarcely  
differentiated, with about 6 leaflets . . . . . *smithi* var. *rageaui*
29. Both mesopleural hairs simple, or  
occasionally one split into 2 branches . . . . . 30  
One at least of these hairs feathered  
or split into 3 branches . . . . . 38
30. Inner submedian hair poorly de-  
veloped, basal tubercle very small . . . . . 31  
Inner submedian hair and tubercle  
normal . . . . . 33
31. Basal spines of pleural hairs large,  
inner clypeal hairs frayed even if in-  
distinctly so . . . . . 32  
Basal spines small, inner clypeal hairs  
simple . . . . . *jebudensis*
32. Spicules present usually only on  
small pecten teeth, large teeth bare . . . . . *gambiae* (in part)  
Spicules present on all pecten teeth,  
less distinction between large and  
small teeth . . . . . *gambiae* var. *melas* (in part)
33. Basal spine of mesopleural hairs  
large, curved and sharply pointed . . . . . *squamosus* var. *cydippis* (in part)  
Basal spine smaller, normal . . . . . 34
34. Outer clypeal hairs with 3 or more  
short stiff branches . . . . . *moucheti*  
Outer clypeal hairs simple, or occa-  
sionally bifid at apex . . . . . 35
35. Saddle hair branched . . . . . *barbarellus* (in part)  
Saddle hair simple . . . . . 36
36. Several of the abdominal segments  
with at least 3 accessory plates . . . . . *d'thali*  
These segments with at most 1 acces-  
sory plate . . . . . 37
37. Outer clypeal hairs short, stiff and  
spine like . . . . . *moucheti* var. *nigeriensis*  
Outer clypeal hairs longer, more  
delicate and finely drawn out . . . . . *hargreavesi*

38. Outer clypeal hairs not branched at apex but nearer base, palmate hairs with blunt rounded filaments . . . . . *rufipes* (in part)  
*rufipes* var. *ingrami* (in part)  
*rufipes* var. *brucechwatti* (in part)  
*broussesi* (in part)
- Outer clypeal hairs simple, pectinate or branched near apex . . . . . 39
39. Both long metapleural hairs feathered 40  
One of the long hairs simple . . . . . 42
40. Inner clypeal hairs with several small branches, or frayed . . . . . 41  
Inner clypeal hairs simple . . . . . *pretoriensis*
41. Basal spines of pleural hairs large, curved and sharply pointed . . . . . *squamosus* var. *cydippis* (in part)  
Basal spines of these groups small . . . . . *rufipes* (in part)  
*rufipes* var. *ingrami* (in part)  
*rufipes* var. *brucechwatti* (in part)  
*broussesi* (in part)
42. Antennae with a group of basal spicules markedly longer than the rest, inner and outer clypeal hairs pectinate, saddle hair usually split into 2-3 branches . . . . . *rhodesiensis* (in part)  
Antennae without such a group of spicules, clypeal hairs and saddle hairs all simple . . . . . *freetownensis*
43. The simple pleural hair of meta-thorax stout, stiff and spine like, only  $\frac{2}{3}$  length of feathered one . . . . . *brunnipes* (in part)  
Metapleural hairs normal . . . . . 44
44. Abdominal segments with 1-3, sometimes 5 accessory tergal plates, inner clypeal hairs split into 2 main stems each being sub-divided into 8-12 branches . . . . . *cinctus* (in part)  
Abdominal segments with at most 3 accessory tergal plates, inner clypeal hairs otherwise . . . . . 45
45. Majority of abdominal segments with 2-3 accessory plates . . . . . 46  
These segments with only 1 accessory plate . . . . . 47

46. Abdominal palmate hairs with filaments less than  $\frac{1}{3}$  length of blades . . . *hancocki* var. *masseguini*  
 Abdominal palmate hairs with filaments more than  $\frac{1}{2}$  length of blades . . . *longipalpis* var. *domicolus* (in part) and possibly *longipalpis*
47. Inner clypeal hairs pectinate on basal  $\frac{1}{2}$ , submedian hairs greatly flattened . . . *buxtoni*  
*maliensis*  
 Inner clypeal hairs simple, submedian hairs not flattened . . . . . 48
48. Main tergal plate on abdominal segment 5 about as wide or wider than the distance separating the bases of the palmate hairs . . . . . 49  
 Width of this plate not exceeding  $\frac{3}{4}$  of this distance . . . . . 50
49. Main tergal plate on segment 5 more than 1.25 the distance between bases of palmate hairs, anterior and posterior borders of these plates almost parallel . . . . . *flavicosta* (in part)  
 This plate not exceeding the distance between the bases of the palmate hairs, anterior and posterior borders of plates curved . . . . . *hancocki* var. *brohier*  
*hancocki* var. *gilroyi*
50. Posterior clypeal hairs with short strong branches . . . . . *marshalli* (in part)  
 Posterior clypeal hairs simple . . . 51
51. Main tergal plate on abdominal segment 5 about  $\frac{1}{2}$  the distance between the bases of the palmate hairs, filaments of palmate hairs about  $\frac{1}{6}$  of blades . . . . . *hancocki*  
 Main tergal plate on segment 5 measuring about  $\frac{3}{4}$  this distance, palmate hairs with filaments longer . . . *marshalli* (in part)
52. Inner clypeal hairs branched distally . . . 53  
 Inner clypeal hairs simple . . . . 56
53. Outer clypeal hairs strongly branched . . . *implexus* (in part)  
 Outer clypeal hairs simple or bifid . . 54
54. Saddle hair simple, inner clypeal hairs densely plumose apically . . . 55  
 Saddle hair with 3-5 branches, inner clypeal hairs split into 2 stems each with 8-12 branches . . . . . *cinctus* (in part)

- A. coustani** Laveran.

**Breeding Places.** Mainly amongst naturally occurring patches of water, swamps, flooded fields, rice fields, streams, ditches, amongst aquatic and semi-aquatic vegetation.

**Outer Clypeal Hairs.** Brush like, about 10-30 branches.

*Posterior Clypeal Hairs.* Short, simple or with 2-3 branches.

*Apical Antennal Hair.* Branched, but usually shorter than paired blades.

*Shaft Hair.* Large and branched.

*Submedian Hairs.* Bases separate and poorly developed, mid hair on a weakly sclerotised base, inner hair with no real basal tubercle.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* With 9-15 undifferentiated leaflets.

*Abdominal Palmate Hairs.* Seg. I, 9-16 pale undifferentiated leaflets; seg. II, 11-18 undifferentiated leaflets; seg. III-VII, well developed, much as for *coustani*.

*Tergal Plates.* Medium size, 1 free accessory plate.

*Breeding Places.* Swamps, shaded pools, streams.

*Notes.* This species can only be separated from *coustani* by the fewer number of branches in the outer clypeal hairs, and by the possession of 12 branches in the antepalmate hair on segment 6, *coustani* has a maximum of 5 branches.

#### **A. obscurus** var. **nowlini** Evans.

EVANS (1938) gives the following differences for distinguishing the variety from the type form.

*Outer Clypeal Hairs.* Usually very short, about  $\frac{3}{4}$  length of inner hair, and simple or bifid; sometimes equal in length to those of the type form but not more than 7 branches.

*Apical Antennal Hair.* Hair considerably longer than paired blades and having more than 11 branches, all of which are simple.

*Tergal Plates.* Tend to be relatively shallower than in type form.

*Notes.* MATTINGLY (1944) in his revised key to the West African Anophelini kept it as a distinct variety, but DE MEILLON (1947) considered that the differences from the type form were only due to individual variations. Specimens from Eastern Nigeria caught together with typical *obscurus* show sufficient differentiation for its varietal status to be retained. In Nigerian specimens, *nowlini* has the outer clypeal hairs short and simple, the apical antennal hair longer than the paired blades and with 9-11 branches.

#### **A. paludis** Theobald.

No reliable characters exist for separating this species from *coustani*, breeding places much as for *coustani*.

#### **A. implexus** (Theobald).

*Inner Clypeal Hairs.* Close together but bases not touching, simple or with 2-3 branches apically.

*Outer Clypeal Hairs.* Nearly as long as inner hairs, divided into 3-9 branches.

*Posterior Clypeal Hairs.* Small and split into 2-4 branches.

*Post Frontal Hairs.* Very large, reaching just beyond bases of frontals, 10-16 branches.

*Shaft Hair.* Large and brush like, 15-20 coarse branches.

*Submedian Hairs.* Bases separate, inner hair on a very small basal tubercle, with sub-plumose branches (occasionally Nigerian specimens have simple branches), mid hair much longer, outer hair characteristically bent outwards, apex may be split.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* Rudimentary, represented by a 3-6 branched hair.

*Abdominal Palmate Hairs.* Segs. I and II represented by 6-13 simple branches; segs. III-V, long narrow shoulderless transparent leaflets, no serrations or filaments; seg. VI, either as on preceding segments or more rudimentary and hair like; seg. VII, hair like.

*Tergal Plates.* Medium size, with an irregular outline, 1 free accessory plate which may be split into two.

*Saddle Hair.* Fairly short, with 5-7 branches (occasionally Nigerian specimens have this hair single).

*Abdominal Hairs.* On segs. I-VI, hair 6 stout and plumose, arising from a distinct tubercle.

*Breeding Places.* Appears to be a typical forest and riverine breeder, in shaded streams, ditches and swamps.

### **A. cinctus** (Newstead & Carter).

*Inner Clypeal Hairs.* Close together though not touching, this distance is variable and they can be fairly wide apart, split midway or beyond into 2 stems which subdivide into 8-12 branches.

*Outer Clypeal Hairs.* Simple or bifid, very short and stumpy, close to and behind inner hairs.

*Posterior Clypeal Hairs.* Short and delicate, 2-5 branches.

*Submedian Hairs.* Bases separate, inner hair with flattened stem, fan like, on a small basal tubercle, mid hair large and slightly flattened.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* Well developed, about 20 pale undifferentiated leaflets.

*Abdominal Palmate Hairs.* Seg. I, small and pale but differentiated; segs. II-VII, well developed leaflets with very long and fine filaments, shoulders with deep spike like incisions.

*Tergal Plates.* Very shallow and curved, with an irregular outline, equalling distance between bases of palmate hairs on seg. V, usually 3 accessory plates, but may be 5.

*Saddle Hair.* Fairly short, split into 3-5 branches.

*Breeding Places.* Shaded ditches, backwaters and floodwaters, especially amongst vegetation.

### **A. jebudensis** Froud.

*Inner Clypeal Hairs.* Separated by about twice the width of their bases, simple and tapering to a fine point.

*Outer Clypeal Hairs.* About  $\frac{1}{3}$ - $\frac{1}{2}$  length of inner hairs, simple and bluntly pointed.

*Posterior Clypeal Hairs.* About  $\frac{2}{3}$  length of inner hairs, simple or with slight fraying.

*Submedian Hairs.* Bases separate, inner hair without a sclerotised base, single or with 2-3 branches, mid hair much longer and situated on a basal tubercle, 7-9 branches.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* With 6-8 narrow shoulderless leaflets.

*Abdominal Palmate Hairs.* Seg. I, rudimentary, with about 6 shoulderless narrow leaflets; seg. II, with about 12 leaflets with indications of shoulders; segs. III-VII, leaflets with short filaments that are not usually very distinct from the blades.



*Tergal Plates.* Small, oval and with an irregular outline, may be concave on posterior margin, 1 free accessory plate.

*Saddle Hair.* Long and simple.

*Breeding Places.* Small collections of exposed seepage water, in shaded ditches.

#### **A. buxtoni** Service.

*Inner Clypeal Hairs.* Widely separated, curved inwards and pectinate on basal half.

*Outer Clypeal Hairs.* Less than  $\frac{1}{3}$  length of inner hairs, feathered, with about 8 branches.

*Posterior Clypeal Hairs.* About as long as outer hairs, with 10-12 branches.

*Submedian Hairs.* Bases separated and sclerotised, both hairs are greatly flattened.

*Mesopleural Hairs.* One simple long hair, other with 4-5 branches.

*Thoracic Palmate Hairs.* Rudimentary, about 9 shoulderless leaflets.

*Abdominal Palmate Hairs.* Seg. I, undifferentiated leaflets; segs. II-VII, differentiated into about 20 broad leaflets, serrated shoulders and finely drawn out filaments.

*Tergal Plates.* Medium size, narrow, curved, with an irregular outline, 1 accessory plate.

*Saddle Hair.* Short with 10-12 simple branches.

*Breeding Places.* In semi-shaded forest streams.

#### **A. maliensis.** Bailly-Choumara & Adam.

Appears to be inseparable from *buxtoni*, found breeding in rivers.

#### **A. natalensis** (Hill & Hayden).

*Inner Clypeal Hairs.* Widely separated, pectinate and tending to curve inwards.

*Outer Clypeal Hairs.* Small and delicate with 2-4 branches,  $\frac{1}{2}$  length of outer hairs.

*Posterior Clypeal Hairs.* Small, delicate, 2-4 branched, about as long or shorter than outer hairs.

*Submedian Hairs.* Bases separated and sclerotised, well developed and greatly flattened hairs, especially the inner hair.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* Undifferentiated, about 18-22 linear leaflets.

*Abdominal Palmate Hairs.* Seg. I, differentiated as on other segments but smaller; segs. II-VII, well developed serrated shoulders, and linear filaments about  $\frac{1}{2}$  or more length of blades.

*Tergal Plates.* Large size, equalling the distance between the bases of the palmate hairs on seg. V, shallow, 1 free accessory plate.

*Saddle Hair.* Simple.

*Breeding Places.* Typically a stream breeder.

#### **A. nili** (Theobald).

*Inner Clypeal Hairs.* Close together, long and stout, tufted distally on the inner border.

*Outer Clypeal Hairs.* Simple, situated near inner hairs and in line with them, about  $\frac{1}{2}$  length of inner.

*Posterior Clypeal Hairs.* Short, simple or split into 2-3 branches.

*Submedian Hairs.* Bases separated and sclerotised, well developed hairs, inner one flattened.



*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* Well differentiated into blades and fine filaments, 15-22 leaflets.

*Abdominal Palmate Hairs.* Seg. I, differentiated but slightly smaller than on other segments; segs. II-VII, well developed with fine long filaments, may be bifid or trifid at apices, shoulders with deep incisions.

*Tergal Plates.* Moderately wide, equalling or nearly equalling the distance between the bases of the palmate hairs on seg. V, 1-3 free accessory plates.

*Saddle Hair.* Short and simple.

*Breeding Places.* Typically a stream and river breeder, found especially at edges of grassy vegetation.

*Notes.* A metathoracic tergal plate is sometimes present; and in the propleural group of hairs the posterior dorsal one is unique in being stiff, spine like and barbed.

#### **A. nili** var. **somalicus** Rivola & Holstein.

Separable from the type form by the branching of the clypeal hairs, breeding places much as for *nili*.

*Inner Clypeal Hairs.* Close together, but differing from *nili* s.s. in that the apical lateral hairs are inserted symmetrically on both sides of the main stem.

*Outer Clypeal Hairs.* As long or a little longer than inner hairs, apically with a few fine branches.

*Posterior Clypeal Hairs.* Simple, about  $\frac{1}{2}$ - $\frac{2}{3}$  length of outer hairs.

#### **A. smithi** Theobald.

*Inner Clypeal Hairs.* Widely separated, usually with a variable amount of coarse fraying towards the apices.

*Outer Clypeal Hairs.* About  $\frac{3}{4}$  length of inner hairs, fraying on basal half.

*Posterior Clypeal Hairs.* About  $\frac{3}{4}$  length of outer hairs and reaching well beyond bases of inner hairs, frayed to a variable extent, may extend entire length of hairs.

*Submedian Hairs.* Bases separate, only the mid hair with a sclerotised tubercle.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* About 11-16 broadish but undifferentiated leaflets.

*Abdominal Palmate Hairs.* Seg. I, small hair but differentiated into shoulders and filaments; segs. II-VII, fully developed, about 12 narrow blades, distinct shoulders, filaments broadish basally, but apically filamentous.

*Tergal Plates.* Very small, on seg. V width only about  $\frac{1}{3}$  distance between the bases of palmate hairs, 1 free accessory plate.

*Saddle Hair.* Long and simple.

*Breeding Places.* Shaded situations, often in rocky pools, with some vegetation.

#### **A. smithi** var. **rageaui** Mattingly & Adam.

It is very doubtful whether or not the larvae can be separated from the type form, but the key character can be used with reservation, i.e. the presence of only 6 poorly differentiated leaflets in the palmate hairs.

#### **A. rhodesiensis** Theobald.

*Inner Clypeal Hairs.* Widely separated and finely pectinate, the fraying may be very fine and scanty.

*Outer Clypeal Hairs.* About  $\frac{1}{2}$  length of inner hairs, may however be shorter than posterior hairs, usually with well defined fraying.

*Posterior Clypeal Hairs.* Simple, as long or slightly longer than outer hairs.

*Submedian Hairs.* Bases usually narrowly separated and sclerotised, occasionally fused, both hairs well developed, outer hairs according to EVANS (1938) sometimes bifid.

*Mesopleural Hairs.* One long hair simple, the other feathered, may be sparsely so.

*Thoracic Palmate Hairs.* Small, 9-11 undifferentiated leaflets.

*Abdominal Palmate Hairs.* Seg. I, 8-11 poorly developed leaflets which may or may not be differentiated; seg. II, 15-17 leaflets similar to those on segment 1; segs. III-VII, well marked serrated shoulders and filaments of about  $\frac{1}{3}$  length of blades.

*Tergal Plates.* Moderate size, width on seg. V, about  $\frac{1}{2}$  distance between bases of palmate hairs, 1 free accessory plate.

*Saddle Hair.* Simple or split into 2-3 branches.

*Breeding Places.* In rock pools, forest streams and pools, ditches and artificial containers, in exposed or shaded positions.

*Notes.* A group of spicules markedly longer than the rest is present on the basal  $\frac{1}{3}$  of the antennae.

#### **A. barbarellus** Evans.

*Inner Clypeal Hairs.* Widely separated, simple and finely tapering.

*Outer Clypeal Hairs.* Simple more than  $\frac{1}{2}$  length of inner hairs.

*Posterior Clypeal Hairs.* Simple, similar in shape and size to outer hairs.

*Submedian Hairs.* Bases fused and sclerotised, well developed hairs.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* About 10 undifferentiated leaflets.

*Abdominal Palmate Hairs.* Seg. I, about 10 leaflets with serrated shoulders; seg. II, larger than on seg. I, but not fully developed; segs. III-VII, small leaflets with deeply serrated shoulders, filaments can be  $\frac{1}{4}$  length of blades or considerably shorter.

*Tergal Plates.* Variable size, on seg. V less than  $\frac{2}{3}$  or up to  $\frac{3}{4}$  distance between the bases of the palmate hairs, 1 free accessory plate.

*Saddle Hair.* Divided into 4 branches on outer half.

*Breeding Places.* Road side ditches, springs, streams, and marshy grounds.

#### **A. brunnipes** (Theobald).

*Inner Clypeal Hairs.* Widely separated and finely pectinate, this is often difficult to see and hairs may appear simple.

*Outer Clypeal Hairs.* About  $\frac{1}{2}$  length of inner hairs, pectinate branching more definite.

*Posterior Clypeal Hairs.* Simple, slightly more than  $\frac{1}{2}$  length of outer hairs.

*Submedian Hairs.* Bases narrowly separated, inner and outer hairs well developed on sclerotised tubercles.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* Rudimentary, hair like.

*Abdominal Palmate Hairs.* Segs. I-II, a few narrow lanceolate undifferentiated leaflets; segs. III-VII, fully developed, broad leaflets with sloping serrated shoulders, short sharply pointed spine like filaments which usually have broad bases.

*Tergal Plates.* Width on seg. V slightly more than  $\frac{1}{2}$  the distance between the bases of the palmate hairs, 1 free accessory plate.

*Saddle Hair.* Fairly short with 4-6 branches.

*Breeding Places.* In partially shaded or exposed pools, slowly running water.

*Notes.* The two long metapleural hairs deeply pigmented, the shorter one about  $\frac{2}{3}$  length of the other, stout and spine like, the longer hair is pectinate. Basal spines of pleural hairs large, curved and heavily pigmented.

#### **A. d'thali** Patton.

*Inner Clypeal Hairs.* Widely separated, simple.

*Outer Clypeal Hairs.* A little more than  $\frac{1}{2}$  length of inner hairs, simple.

*Posterior Clypeal Hairs.* About as long as outer hairs, simple.

*Submedian Hairs.* Bases separate, small but sclerotised, well developed hairs.

*Mesopleural Hairs.* Both long hairs simple (specimens from Aden show one of these hairs feathered, so it is possible that this character will occur in W. Africa).

*Thoracic Palmate Hairs.* Rudimentary, with 10-15 lanceolate leaflets.

*Abdominal Palmate Hairs.* Seg. I, poorly differentiated leaflets; segs. II-VII, well developed, narrow blades and few shoulder serrations, filaments finely tapering, about  $\frac{3}{4}$  length of blades.

*Tergal Plates.* Small, on seg. V less than  $\frac{1}{2}$  distance between the bases of the palmate hairs, 3 accessory plates on segs. III-VII.

*Saddle Hair.* Long and simple.

*Breeding Places.* Seepage waters, hoof prints, rock pools and a variety of places.

#### **A. longipalpis** var. **domicolus** Edwards.

*Inner Clypeal Hairs.* Widely separated, simple or with 2-3 branches.

*Outer Clypeal Hairs.* Simple or with 2-4 branches, about  $\frac{1}{2}$  length of inner hairs.

*Posterior Clypeal Hairs.* Simple or 2-3 branched, slightly shorter than outer hairs.

*Submedian Hairs.* Well developed hairs on fused sclerotised bases.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* Well developed, with 21-26 narrow leaflets which may be differentiated into shoulders and filaments.

*Abdominal Palmate Hairs.* Seg. I, well developed with 14-16 differentiated leaflets; segs. II-VII, fully differentiated, 15-20 broad leaflets with filaments about as long as blades.

*Tergal Plates.* About equal to or a little less than the distance between the bases of the palmate hairs, 2 accessory plates on seg. I, 2-3 accessory plates on seg. II, and 3 accessory plates on segs. III-VII.

*Saddle Hair.* Fairly short, split into 2-5 branches.

*Breeding Places.* Drains, ditches, streams, especially amongst vegetation.

*Notes.* Two metathoracic tergal plates are present.

#### **A. longipalpis** (Theobald).

Possibly separable from var. *domicolus* by the absence of the metathoracic tergal plates, but this is a somewhat doubtful character (vide ADAM et al., 1956).

#### **A. funestus** Giles.

*Inner Clypeal Hairs.* Widely separated, simple.

*Outer Clypeal Hairs.* Simple,  $\frac{1}{2}$  or more length of inner hairs.

*Posterior Clypeal Hairs.* Simple, reaching beyond bases of inner hairs.

*Post Frontals.* Simple or bifid.

*Submedian Hairs.* Bases fused and sclerotised, well developed hairs.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* About 10-20 narrow undifferentiated leaflets.

*Abdominal Palmate Hairs.* Seg. I, 8-15 narrow undifferentiated leaflets, a few may have distinct shoulders; seg. II, smaller than the remainder but fully differentiated; segs. III-VII, 17-25 narrow leaflets, distinct square cut shoulders and long fine filaments of about  $\frac{1}{2}$  length of blades.

*Tergal Plates.* Very large, width on seg. V greater than the distance between the bases of the palmate hairs, their depth covers most of the segment, medium and paired accessory plates usually included on the main plate, seen as 3 dark spots. Occasionally these plates may be free.

*Saddle Hair.* Long and simple.

*Breeding Places.* Typically in shaded situations, streams, rivers, marshes, ditches, rock pools.

*Notes.* The clypeal pattern is distinctive; consisting of a transverse band of pigment just beyond the bases of the posterior clypeals and another about in line with the bases of the frontal hairs, from the latter extending from the middle is a small line of pigment expanding at the base of the head into a triangle. The ventral surface of the abdomen has transverse bands of small spicules, particularly well developed on segs. IV-VI.

#### **A. rivulorum** Leeson.

Resembles *funestus* in all details except that the post frontal hair is many branched and the tergal plates are shallower and smaller, width: depth ratio is 3 : 1, 1-3 accessory plates, sternites are without spicules. Breeding places much as for *funestus*.

#### **A. lesoni** Evans.

Greatly resembles *funestus* differing as follows:

Post frontal hair many branched as in *rivulorum*, clypeal pattern differs from both *funestus* and *rivulorum* in having a pair longitudinal pigment bands in lieu of the first transverse band. Tergal plate shallower but equal in width to distance between the bases of the palmate hairs, 2 free accessory plates, sternal spicules absent. Breeding places similar to those of *funestus*.

#### **A. brucei** Service.

Similar to *rivulorum* but differs in that the outer clypeal hairs are only  $\frac{1}{3}$  length of inner hairs, and the tergal plates are shallower and wider, width: depth ratio 4 : 1, 3 accessory plates usually present, but some specimens have only 1 plate. Breeding in shaded forest streams, and pools in partially dried up river beds.

#### **A. flavicosta** Edwards.

*Inner Clypeal Hairs.* Widely separated, simple and long.

*Outer Clypeal Hairs.* Simple, fairly stout basally, finely pointed,  $\frac{1}{2}$  length of inner hairs.

*Posterior Clypeal Hairs.* Simple and delicate, reaching just beyond bases of inner hairs.

*Submedian Hairs.* Bases close together or fused, sclerotised, well developed hairs.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* Rudimentary, about 16 undifferentiated leaflets.

*Abdominal Palmate Hairs.* Segs. I-II, rudimentary, only 3-7 leaflets but differentiated into shoulders and filaments; segs. III-VII, well defined serrated shoulders, short pointed filaments.

*Tergal Plates.* Fairly large, increasing in depth on posterior segments, width on seg. V greater than the distance between the palmate hairs, 1 accessory plate.

*Saddle Hair.* Long and split halfway into 5-8 branches, occasionally 3 branched.

*Breeding Places.* Streams, rice fields, marshes, amongst vegetation and shade.

#### **A. hargreavesi** Evans.

*Inner Clypeal Hairs.* Widely separated, long and simple.

*Outer Clypeal Hairs.* Simple, or occasionally bifid, about  $\frac{1}{2}$  length of inner hairs.

*Posterior Clypeal Hairs.* Simple and delicate, shorter than outer hairs.

*Submedian Hairs.* Bases sclerotised, may be fused or closely approximated, well developed hairs.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* About 12-16 undifferentiated leaflets.

*Abdominal Palmate Hairs.* Seg. I, poorly developed, either undifferentiated or with very slight indications of serrated shoulders; segs. II-VII, fully developed, broad leaflets with serrated shoulders and fine filaments, about  $\frac{1}{2}$  length of blades.

*Tergal Plates.* Moderate size, slightly more than twice as wide as deep, width on seg. V about  $\frac{1}{2}$  of that between the bases of the palmate hairs, 1 accessory plate.

*Saddle Hair.* Long and simple, occasionally bifid.

*Breeding Places.* In streams, ditches, marshes, often associated with *Pistia stratiotes*.

*Notes.* The "Y" shaped clypeal pattern is reminiscent of *moucheti*, and the outer clypeal hairs are sometimes short and abruptly pointed as in *moucheti* var. *nigeriensis*, for which the species is often confused.

#### **A. hancocki** Edwards.

*Inner Clypeal Hairs.* Widely separated, simple, long and finely pointed.

*Outer Clypeal Hairs.* Simple, stoutish, abruptly pointed, about  $\frac{1}{2}$  length of inner hairs.

*Posterior Clypeal Hairs.* Delicate or rather stout, simple, about equal in length to outer hairs, reaching at least to the bases of inner hairs (EVANS 1938 describes a specimen with a 3 branched hair).

*Submedian Hairs.* Well developed hairs on sclerotised bases, which are either fused or closely approximated.

*Mesopleural Hairs.* Both long hairs simple (EVANS [1938] quotes an occasional bifid hair).

*Thoracic Palmate Hairs.* Rudimentary with 10-12 simple lanceolate leaflets.

*Abdominal Palmate Hairs.* Seg. I, 9-13 leaflets with serrated shoulders and short filaments; segs. II-VII, broad leaflets, stumpy abruptly pointed filaments, about  $\frac{1}{6}$  length of blades.

*Tergal Plates.* Moderate size, width on seg. V varies from less than  $\frac{1}{2}$  to about  $\frac{5}{8}$  distance between bases of palmate hairs, 1 free accessory plate.

*Saddle Hair.* Short, split apically into 5 or more branches.

*Breeding Places.* In clean water with or without *Pistia stratiotes*, streams, pools, marshes.



*Notes.* The pecten has 3-5 long teeth, the short ones are exceptionally short and commonly only  $\frac{1}{3}$  length of long ones, this character has been used to separate the larvae from *marshalli* (EVANS, 1938), but DE MEILLON (1947) pointed out that the length of the short teeth in *marshalli* are variable.

**A. hancocki** var. *masseguini* Hamon.

Similar to type form but differs in the following characters.

*Inner Clypeal Hairs.* Simple, more abruptly pointed than in *hancocki*, resembling more the variation observed in atypical *hancocki* from Sierra Leone by EVANS (1938).

*Outer Clypeal Hairs.* Simple and stoutish.

*Posterior Clypeal Hairs.* Only reaching bases of inner hairs.

*Tergal Plates.* At least as wide as the distance between the bases of the palmate hairs, anterior third and the two lateral extremities distinctly darker, 3 accessory plates on segs. III-VI.

*Breeding Places.* Much as for *hancocki*.

**A. hancocki** var. *gilroyi* Service.

Similar in several details to the type form of *hancocki* and in other details to var. *masseguini* but can be distinguished on the following characters.

*Inner Clypeal Hairs.* Long, simple and tapering to a fine point.

*Outer Clypeal Hairs.* Simple and abruptly pointed.

*Posterior Clypeal Hairs.* Only  $\frac{1}{2}$  length of outer hairs, not reaching the bases of either the inner or outer hairs.

*Abdominal Palmate Hairs.* Segs. I-II, undifferentiated, though 1 or 2 leaflets may have indications of shoulders.

*Tergal Plates.* Fairly large, depth being  $\frac{1}{2}$  that of segment, on seg. V their width equals or very nearly equals the distance between the bases of the palmate hairs, 1 accessory plate.

*Saddle Hair.* Split nearer the base than in *hancocki*, into 6-7 branches.

*Pecten.* The short teeth are longer than in *hancocki*, the longest being more than  $\frac{1}{2}$  the length of the long teeth.

*Breeding Places.* In swamps.

**A. hancocki** var. *brohier* Edwards.

Cannot apparently be separated from var. *gilroyi*.

**A. marshalli** (Theobald).

*Inner Clypeal Hairs.* Widely separated, simple.

*Outer Clypeal Hairs.* Simple, occasionally 2-3 branched, about  $\frac{1}{2}$  or more length of inner hairs.

*Posterior Clypeal Hairs.* Simple, occasionally branched or pectinate, about as long as outer hairs.

*Submedian Hairs.* Bases sclerotised, can be fused but normally narrowly separated or even widely separated, both hairs well developed.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* Rudimentary, with about 12 narrow undifferentiated leaflets.

*Abdominal Palmate Hairs.* Seg. I, small, 11-13 leaflets with serrated shoulders and filaments; segs. II-VII, fully developed, broadish leaflets with serrated shoulders, filaments usually abruptly pointed about less than  $\frac{1}{2}$  length of blades.

*Tergal Plates.* Width on seg. V more than  $\frac{1}{2}$  distance between the bases of the palmate hairs, width: depth ratio 3 : 1.1 accessory plate.

*Saddle Hair.* Short with at least 5 branches, usually 7-8, though may be up to 11 branched.

*Breeding Places.* In fresh clear shaded waters, apparently dense shade is not tolerated, also in seepages and streams.

**A. marshalli** var. **mousinhoi** De Meillon & Pereira.

*Inner Clypeal Hairs.* Widely separated, simple.

*Outer Clypeal Hairs.* Simple, about  $\frac{1}{2}$  length of inner hairs.

*Posterior Clypeal Hairs.* Simple, about as long as outer hairs.

*Submedian Hairs.* Bases placed close together, sclerotised, well developed hairs.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* As for *marshalli*.

*Abdominal Palmate Hairs.* Seg. I, 12-14 undifferentiated lanceolate leaflets; seg. II, about 12 undifferentiated leaflets, but occasionally filaments may be distinguished from the blades; segs. III-VII, broadish leaflets with serrated shoulders and delicate filaments, sometimes as long as blade but usually shorter, never however as stumpy or as abruptly pointed as in *marshalli*.

*Tergal Plates.* Large, nearly equalling the distance between the bases of the palmate hairs on seg. V, width: depth ratio 2.5 : 1.1 accessory plate.

*Saddle Hair.* Long and simple.

*Breeding Places.* Swamps, amongst aquatic vegetation and also in slow flowing water amongst grass and reeds.

*Notes.* The clypeal pattern is similar to that of *leesoni* in possessing a pair of longitudinal pigment bands.

**A. moucheti** EVANS.

*Inner Clypeal Hairs.* Widely separated, simple and finely pointed.

*Outer Clypeal Hairs.* Only about  $\frac{1}{2}$  length of inner hairs, a number of stiff branches.

*Posterior Clypeal Hairs.* Minute and delicate, simple or bifid.

*Submedian Hairs.* Bases small and sclerotised, and closely approximated or fused.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* Numerous linear undifferentiated leaflets.

*Abdominal Palmate Hairs.* Seg. I, differentiated into fine filaments and serrated shoulders; seg. II, as on other segments but smaller; segs. III-VII, broadish blades with serrated shoulders and fine filaments measuring  $\frac{1}{2}$ - $\frac{3}{4}$  length of blades.

*Tergal Plates.* Moderate size, width about  $\frac{1}{2}$  the distance between the bases of the palmate hairs, on seg. V, width: depth ratio about 2.3 : 1.1 accessory plate.

*Saddle Hair.* Long and bifid apically.

*Breeding Places.* In rivers, streams and marshy land.

*Notes.* The clypeal pattern may be faint and hard to see, but is in the form of a "Y" as in *hargreavesi*.

**A. moucheti** var. **nigeriensis** Evans.

Only differs from the type form in having the outer clypeal hairs simple or bifid, they are blunt as in type form. Breeds in swamps. This is a rare form

and more material is needed before it can be definitely placed as a variety of *moucheti*.

#### **A. theileri** Edwards.

*Inner Clypeal Hairs.* Bases separate, simple and finely pointed.

*Outer Clypeal Hairs.* Simple, about  $\frac{1}{3}$ - $\frac{1}{2}$  length of inner hairs, usually abruptly pointed.

*Posterior Clypeal Hairs.* Simple and delicate, shorter than outer hairs.

*Submedian Hairs.* Bases fused and sclerotised, well developed hairs.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* Differentiated into narrow blades with sloping serrated shoulders, finely pointed filaments, rather smaller than fully developed abdominal hairs.

*Abdominal Palmate Hairs.* Seg. I, much as for the thoracic hair; seg. II, as on seg. I but slightly larger; segs. III-VII, broadish blades with sloping serrated shoulders and long finely pointed filaments.

*Tergal Plates.* Quite large, that on seg. V nearly equalling the distance between the bases of the palmate hairs, usually convex anteriorly and concave posteriorly, with the lateral corners upturned, 3 accessory plates.

*Saddle Hair.* Long and simple.

*Breeding Places.* Reported from streams in shady situations.

*Notes.* The larvae in common with those of *distinctus* and *wellcomei* have the ventral and lateral surfaces of the thorax and abdomen covered with spicules, not, however, arranged in belts and usually extending partially onto the dorsal surface. Like the two above species these spicules enable the larvae to crawl up vegetation and the sides of containers.

#### **A. wellcomei** Theobald.

*Inner Clypeal Hairs.* Widely separated, long and simple.

*Outer Clypeal Hairs.* Simple, stout and about  $\frac{1}{2}$  length of inner hairs.

*Posterior Clypeal Hairs.* Simple, delicate and shorter than the outer hairs.

*Submedian Hairs.* Bases large, sclerotised and fused, well developed hairs.

*Mesopleural Hairs.* Both long hairs simple.

*Thoracic Palmate Hairs.* Differentiated into sloping serrated shoulders and finely pointed filaments.

*Abdominal Palmate Hairs.* Seg. I, much as for thoracic hair but larger; seg. II, similar to that on seg. I, but nearly as large as on other segments; segs. III-VII, broad blades, serrated sloping shoulders and long fine filaments.

*Tergal Plates.* Moderately large, varying from  $\frac{1}{2}$ - $\frac{3}{4}$  distance between bases of palmate hairs, evenly rounded or similar in shape to *theileri*.

*Saddle Hair.* Long and simple.

*Breeding Places.* Swamps, marshes and small streams.

*Notes.* Abdomen and thorax with spicules as in *theileri*.

#### **A. freetownensis** Evans.

*Inner Clypeal Hairs.* Widely separated, long and simple.

*Outer Clypeal Hairs.* Simple, finely pointed about  $\frac{1}{2}$  length of inner hairs.

*Posterior Clypeal Hairs.* Simple, about equal in length to outer hairs.

*Submedian Hairs.* Bases usually fused, sclerotised, well developed hairs.

*Mesopleural Hairs.* One of the long hairs feathered.

*Thoracic Palmate Hairs.* Undifferentiated lanceolate leaflets.

*Abdominal Palmate Hairs.* Seg. I, smaller than the remainder, but with differentiated leaflets, serrated shoulders and fine filaments; segs. II-VII,



broad leaflets with rather square cut serrated shoulders and fine filaments measuring  $\frac{1}{3}$ - $\frac{1}{2}$  length of blades.

*Tergal Plates.* Small, width on seg. V less than  $\frac{1}{2}$  the distance between the bases of the palmate hairs, 1 accessory plate.

*Saddle Hair.* Simple.

*Breeding Places.* Rock pools, streams, ground pools, and marshes.

*Notes.* The lateral bristles on segs. IV-VI have compound branching, this character distinguishes it from the East African *demeilloni*.

#### *A. macmahoni* Evans.

*Inner Clypeal Hairs.* Bases separate, long and simple.

*Outer Clypeal Hairs.* Simple, slender, about  $\frac{1}{2}$  or less length of inner hairs. (ADAM et al. 1956 report instances of bifid and trifold apical branching).

*Posterior Clypeal Hairs.* Simple or split at apices into 2-3 branches, about as long as outer hairs.

*Submedian Hairs.* Bases narrowly separated (occasionally fused, ADAM et al. 1956), sclerotised bases but rather small.

*Mesopleural Hairs.* One of the long hairs feathered.

*Thoracic Palmate Hairs.* Undifferentiated lanceolate leaflets.

*Abdominal Palmate Hairs.* Seg. I, small but with well defined serrated shoulders and filaments; seg. II, as for seg. I but larger and better developed; segs. III-VII, narrow blades, serrated shoulders and filaments  $\frac{1}{2}$  or more length of blades.

*Tergal Plates.* Wide but shallow, anterior edge convex, posteriorly concave, width on seg. V  $\frac{3}{4}$  or more than the distance between the bases of the palmate hairs, 1-3 accessory plates.

*Saddle Hair.* Simple, very occasionally split apically (ADAM et al. 1956).

*Breeding Places.* In swamps.

#### *A. gambiae* Giles.

*Inner Clypeal Hairs.* Widely separated, frayed or pectinate.

*Outer Clypeal Hairs.* Simple or frayed, usually less than  $\frac{1}{2}$  length of inner hairs.

*Posterior Clypeal Hairs.* Simple or frayed, slender, shorter than outer hairs.

*Submedian Hairs.* Bases widely separated, inner hair without sclerotised basal tubercle and very small, about 5-8 branches, mid hair on a weakly sclerotised base with about 7-13 branches.

*Mesopleural Hairs.* Both long hairs simple, basal spine well developed, curved and sharply pointed.

*Thoracic Palmate Hairs.* Represented by a 2-4 branched hair, very occasionally flattened into very narrow leaflets.

*Abdominal Palmate Hairs.* Seg. I, 7-12 narrow undifferentiated leaflets; seg. II, 11-13 leaflets which may or may not be differentiated into shoulders and short filaments; segs. III-VII, about 14-18 small narrow differentiated leaflets, serrated shoulders and filaments about  $\frac{1}{2}$  length of blades.

*Tergal Plates.* Small, about  $\frac{1}{2}$  or less distance between bases of palmate hairs, 1 accessory plate.

*Saddle Hair.* Long and simple.

*Breeding Places.* In a great variety of places, pots, borrow pits, fire buckets, streams, marshes, rice fields, puddles, rock pools, usually in sunny positions.

*Notes.* The pecten teeth are clearly differentiated into long and short ones, only small teeth are constantly with spicules.

**A. gambiae** var. **melas** Theobald.

Morphologically only separable from the type by the fact that the pecten teeth are not readily separated into long and short teeth, all teeth have spicules. The larval pecten, however, is subject to variation (BRUCE CHWATT 1945), and the variety cannot always be separated from the type on this character. The two forms can usually be separated on a salinity test. Variety *melas* can withstand complete development in water containing 47.6 gm. NaCl per litre, whereas the threshold for the type form is about 11.9 gm. per litre. This variety is confined to coastal regions and usually breeds in salt or brackish waters, especially in *Avicennia* swamps. For further details see RIBBANDS (1944a, 1944b) and also BRUCE CHWATT and SERVICE (1957).

**A. rufipes** (Gough).

*Inner Clypeal Hairs.* Widely separated, usually strongly branched or pectinate on outer  $\frac{1}{2}$ , occasionally branching not so prominent, or more basal in position.

*Outer Clypeal Hairs.* Usually prominently branched on outer  $\frac{1}{2}$ , occasionally simple or bifid branching.

*Posterior Clypeal Hairs.* About as long as outer hairs, delicate and simple.

*Submedian Hairs.* Sclerotised tubercles may be fused or closely approximated, well developed hairs.

*Mesopleural Hairs.* One of the long hairs feathered.

*Thoracic Palmate Hairs.* Represented by a bifid or single hair.

*Abdominal Palmate Hairs.* Seg. I, undifferentiated linear leaflets; seg. II, as for seg. I but slightly broader; segs. III-VII, small broadish blades with well defined serrated shoulders and rounded stumpy filaments.

*Tergal Plates.* Moderate size, width on seg. V about  $\frac{1}{2}$  or more distance between bases of palmate hairs, 1 accessory plate.

*Saddle Hair.* Simple or split apically into 2 branches.

*Breeding Places.* Streams, marshes, stagnant pools, rock pools, even in running water, usually in exposed situations.

**A. rufipes** var. **ingrami** Edwards.

Not separable from type form, breeding places much as for type.

**A. rufipes** var. **brucechwatti** Hamon, Taufflieb & Dyemkouma.

Not separable from type form, breeding places most likely do not differ from those of type form.

**A. broussesi** Edwards.

Not separable from *rufipes*, breeding places probably not differing from others of this group.

**A. pretoriensis** (Theobald).

*Inner Clypeal Hairs.* Widely separated, long and simple.

*Outer Clypeal Hairs.* Simple, about  $\frac{1}{2}$  length of inner hairs.

*Posterior Clypeal Hairs.* Simple, occasionally split apically, about as long as outer hairs.

*Submedian Hairs.* Bases usually closely approximated, may be fused, sclerotised rather small tubercles, well developed hairs.

*Mesopleural Hairs.* One of the long hairs feathered.

*Thoracic Palmate Hairs.* Undifferentiated, represented by 2-7 branched hair.

*Abdominal Palmate Hairs.* Seg. I, 7-11 narrow undifferentiated leaflets; seg. II, 12-18 differentiated leaflets, but not so large or developed as on remaining

segments; segs. III-VII, fairly broad leaflets with sloping but distinctly serrated shoulders, long fine filaments measuring  $\frac{1}{2}$  or nearly entire length of blades.

*Tergal Plates.* Varying in width from less to slightly more than  $\frac{1}{2}$  of the width between bases of palmate hairs, 1 accessory plate.

*Saddle Hair.* Long and simple.

*Breeding Places.* In still or running waters, streams, rock pools, swamps, puddles.

#### **A. maculipalpis** (Giles).

*Inner Clypeal Hairs.* Widely separated, simple or frayed.

*Outer Clypeal Hairs.* Usually simple but may be bifid, about  $\frac{1}{2}$  as long as inner hairs.

*Posterior Clypeal Hairs.* Simple or occasionally bifid, about as long as outer hairs.

*Submedian Hairs.* Bases closely approximated or fused, sclerotised, well developed hairs.

*Mesopleural Hairs.* One of the long hairs feathered.

*Thoracic Palmate Hairs.* Undifferentiated, represented by a 2-5 branched hair.

*Abdominal Palmate Hairs.* Seg. I-II, hair like or with 5-9 very slightly flattened branches; segs. III-VII, undifferentiated, tassel like.

*Tergal Plates.* Moderate size, width on seg. V  $\frac{1}{2}$  or slightly more than the distance between the bases of the palmate hairs, 1 accessory plate.

*Saddle Hair.* Long and simple.

*Breeding Places.* In a variety of places including very muddy pools, hoof prints, shallow waters, usually in unshaded situations. Although according to DE MEILLON (1947) it is not regarded as a stream breeder, SYMES (1931) found it in streams, and the author finds it one of the commoner stream breeders in Kaduna, N. Nigeria. Apparently it is tolerant of the red flocculent precipitates that inhibit most anophelines, EVANS (1938) and DE MEILLON (1947).

*Notes.* The pecten is peculiar and characteristic in that it has a variable number of spicules on the body of the plate.

#### **A. pharoensis** Theobald.

*Inner Clypeal Hairs.* Widely separated, pinnate or tufted on outer half.

*Outer Clypeal Hairs.* Usually divided into 2-3 branches near base which are then subdivided into tufts of 20-45 branches.

*Posterior Clypeal Hairs.* About  $\frac{1}{2}$  or less length of inner hairs, split apically into 2-5 branches.

*Submedian Hairs.* Bases fused, large and sclerotised, well developed hairs, inner hair tends to be flattened.

*Mesopleural Hairs.* Both long hairs simple, basal spine large, curved and sharply pointed.

*Thoracic Palmate Hairs.* Undifferentiated, 10-14 narrow leaflets.

*Abdominal Palmate Hairs.* Seg. I, about 15 leaflets which are usually differentiated, but sometimes shoulders and filaments barely indicated; segs. II-VII, fully differentiated and according to DE MEILLON (1947) falling into two groups (1), leaflets narrow, index 1 : 8—1 : 10, serrations tending to be few in number often only 2-4, filaments narrow basally and finely pointed distally,  $\frac{1}{3}$ — $\frac{2}{5}$  length of blades (2), leaflets broader, index about 1 : 6—1 : 7, serrations more numerous, filaments very short and often blunt apically.

*Tergal Plates.* Moderate size, width on seg. V about equal to  $\frac{1}{2}$  distance between bases of palmate hairs, 1 accessory plate.

*Saddle Hair.* Simple.

*Breeding Places.* Usually amongst vegetation in streams or marshes.

*Notes.* The small pecten teeth have well marked spicules which are larger than those in *squamosus* or var. *cydippis*.

#### **A. squamosus** Theobald.

*Inner Clypeal Hairs.* Widely separated, usually prominently frayed on the outer  $\frac{1}{2}$ , compound branching may be present.

*Outer Clypeal Hairs.* Tufted, 8-30 branches.

*Posterior Clypeal Hairs.* Simple or split into 2-3 branches, a delicate hair.

*Mesopleural Hairs.* Both long hairs simple, basal spines exceptionally large, curved and sharply pointed.

*Submedian Hairs.* Bases fused and sclerotised, well developed hairs much as in *pharoensis*.

*Thoracic Palmate Hairs.* Undifferentiated, 10-18 narrow leaflets.

*Abdominal Palmate Hairs.* Seg. I, either as for thoracic hairs, or with well marked serrated shoulders and filaments; segs. II-VII, fully differentiated, narrow leaflets with sloping serrated shoulders and fine filaments about  $\frac{1}{2}$  length of blades, but very variable in length.

*Tergal Plates.* Moderate size, width on seg. V about  $\frac{1}{2}$  distance between bases of palmate hairs, 1 accessory plate.

*Saddle Hair.* Simple.

*Breeding Places.* Shaded waters, streams, borrow pits, marshes, ponds.

*Notes.* Spicules on the small pecten teeth inconspicuous, smaller than in *pharoensis*.

#### **A. squamosus** var. *cydippis* De Meillon.

Very similar in general details to the type form but differs as follows.

*Inner Clypeal Hairs.* Frayed, usually inconspicuously so.

*Outer Clypeal Hairs.* Simple or at most with a few branches.

*Mesopleural Hairs.* One of the long hairs usually slightly feathered, but may be simple as in type form.

*Thoracic Palmate Hairs.* Represented by a rudimentary hair.

*Abdominal Palmate Hairs.* Seg. I, undifferentiated narrow leaflets; seg. II, as on seg. I but leaflets more flattened; segs. III-VII, with short stumpy filaments, but not rounded as in *rufipes* group.

*Breeding Places.* Much as for type form.

#### **A. brumpti** Hamon & Rickenbach.

The immature stages are not yet known.

### **Key to the Adults.**

(Based mainly on females.)

1. Abdominal segments with laterally projecting tufts of scales . . . . . 41
- Abdominal segments with no such tufts . . . . . 2
2. Hind tarsi with at least the last 2 segments all pale . . . . . 3
- Hind tarsi with the last 2 segments not all pale . . . . . 17

- |  |    |  |
|--|----|--|
| 3. Legs speckled . . . . .   | 4  |  |
| Legs not speckled . . . . .  | 9  |  |
| 4. Female palps with 3 pale bands . .  | 5  |  |
| Female palps with 4 pale bands . .   | 6  |  |
| 5. Female palps usually speckled, last<br>3 segments of hind tarsi all pale . .  |    | <i>maculipalpis</i>                              |
| Female palps not speckled, only last<br>2 segments all pale . . . . .  |    | <i>pretoriensis</i> (in part)                    |
| 6. Mesonotal scales narrow . . . . .   | 8  |  |
| Mesonotal scales mainly broad . . .  | 7  |  |
| 7. Palps shaggy, mesonotal scales yellow<br>. . . . .  |    | <i>natalensis</i>                                |
| Palps smooth, mesonotal scales white   |    | <i>pretoriensis</i> (in part)                    |
| 8. Hind tarsi with last 3 segments all<br>pale . . . . .   |    | <i>maliensis</i>                                 |
| Hind tarsi with only last 2 segments<br>all pale . . . . .   |    | <i>buxtoni</i>                                   |
| 9. Palps very shaggy with usually 4 pale<br>bands, may be reduced to 2-3 bands .   | 11 |  |
| Palps not shaggy . . . . .   | 10 |  |
| 10. Distal $\frac{1}{3}$ of palps all pale . . . . .   |    | <i>hancocki</i> var. <i>gilroyi</i>              |
| Distal $\frac{1}{3}$ of palps not all pale, with<br>3 pale bands, outer 2 broad . . . . .  | 13 |  |
| 11. Hind tibia with a long pale streak at<br>apex above, at least 4 times its width,<br>hind tarsal segment 1 with a pale<br>basal ring not much shorter than this |    | <i>coustani</i>                                  |
| Hind tibia with only a small pale band<br>at apex, pale area on hind tarsal seg-<br>ment 1 correspondingly small or ab-<br>sent . . . . .                          | 12 |  |
| 12. Hind tarsal segment 3 all pale . . .   |    | <i>paludis</i>                                   |
| Hind tarsal segment 3 dark basally .   |    | <i>coustani</i> var. <i>ziemanni</i>             |
| 13. Wings with a pale spot in 3rd dark<br>area on vein 1, scales yellowish . .   | 14 |  |
| Wings without such a spot, scales<br>white . . . . .   | 16 |  |
| 14. Hind tarsal segment 3 all pale . . .   |    | <i>hancocki</i>                                  |
|  |    | <i>hancocki</i> var. <i>masseguini</i> (in part) |
|  |    | <i>hancocki</i> var. <i>brohieri</i> (in part)   |
| Hind tarsal segment 3 not all pale .   | 15 |  |
| 15. Absence of any pale spots on the<br>basal $\frac{1}{4}$ of costa . . . . .   |    | <i>theileri</i>                                  |
| Presence of 1 or 2 pale spots on the<br>basal $\frac{1}{4}$ of costa . . . . .   |    | <i>hancocki</i> var. <i>masseguini</i> (in part) |
|  |    | <i>hancocki</i> var. <i>brohieri</i> (in part)   |

16. Hind tarsal segment 3 with basal  $\frac{1}{2}$   
or more dark . . . . . *rufipes*  
Hind tarsal segments 3-5 entirely pale  
or 3 with narrow dark rings basally *rufipes* var. *ingrami*
17. Legs speckled, palps with 3 pale  
bands, occasionally 4 banded . . . *gambiae*  
*gambiae* var. *melas*  
Legs not speckled . . . . . 18
18. Wings very dark, pale spots present  
as minute spots or completely absent *smithi*  
Wings not excessively dark as above 19
19. Pale scales of wing confined to costa  
and vein 1 . . . . . 20  
Wings with other pale scaling . . . 21
20. Head scales narrow, yellowish . . . *d'thali*  
Head scales broad, white . . . . *rhodesiensis*
21. Wings with at least 1 pale spot on  
basal  $\frac{1}{2}$  of costa . . . . . 22  
Wings with no pale spots on basal  $\frac{1}{2}$   
of costa . . . . . 28
22. Palps with the apex dark . . . . 30  
Palps with the apex pale . . . . . 23
23. Palps with only the apex pale . . . *nili*  
*nili* var. *somalicus*  
Palps with at least 2 other pale bands 24
24. Wings with a pale spot in 3rd dark  
area on vein 1, sometimes fused with  
subcostal pale spot . . . . . 25  
Wings with no such spot . . . . . 33
25. Palps with the 2 distal pale bands  
broad . . . . . 26  
Palps with the subapical pale band  
narrower than the intervening dark  
band . . . . . 27
26. Mesonotal scales narrow or very  
narrow except on anterior  $\frac{1}{2}$  or less,  
outstanding wing scales long and  
narrow . . . . . *marshalli*  
*marshalli* var. *mousinhoi*  
Mesonotal scales broader, outstanding  
wing scales broader . . . . . *hargreavesi* (in part)
27. Hind tarsal segments 1-4 with distinct  
apical pale rings . . . . . *hargreavesi* (in part)  
Hind tarsal segments 2-4 without  
such pale rings, mesonotal scales  
broad . . . . . *brunnipes*

28. Palps shaggy, all dark . . . . . *obscurus*  
*obscurus* var. *nowlini*  
 Palps smooth, not all dark . . . . . 29
29. Outer  $\frac{1}{2}$  of proboscis with creamy yellow scales, distal  $\frac{1}{2}$  of palps mainly pale scaled, wing abnormally pale . . . . . *wellcomei* (in part)  
 Outer  $\frac{1}{2}$  of proboscis all or mainly dark, distal  $\frac{1}{2}$  of palps dark with pale bands, wing abnormally pale . . . . . *wellcomei* (in part)
30. Palps all dark except for a few scattered pale scales on segment 2 . . . . . *jebudensis*  
 Palps with 3 pale bands, may be indefinite . . . . . 31
31. Hind tarsal segment 4 with a broad dark band in middle, segment 5 all pale . . . . . *rufipes* var. *brucechwatti*  
 Hind tarsi otherwise . . . . . 32
32. Basal  $\frac{1}{4}$  of costa all dark . . . . . *smithi* var. *rageaui*  
 Basal  $\frac{1}{4}$  of costa with 2 pale spots . . . . . *broussesi*
33. Female palps with at least the subapical pale band narrow . . . . . 34  
 These palps with the 2 distal pale bands broad . . . . . 35
34. Hind tarsi without definite pale rings . . . . . *funestus* (in part)  
*leesoni*  
*rivulorum*  
*macmahoni*  
 Hind tarsi with definite pale rings . . . . . *longipalpis* (in part)  
 and possibly var. *domicolus*
35. Hind tarsi without definite pale rings . . . . . 36  
 Hind tarsi with pale rings on at least the first 2 segments . . . . . 38
36. Small species, 2.4-3.3 mm., vein 3 either all dark or with a pale area not greater than  $\frac{2}{3}$  its length . . . . . *funestus* (in part)  
 Larger species, vein 3 normally more extensively pale scaled . . . . . 37
37. Outstanding wing scales narrow, a pale fringe spot opposite vein 6 . . . . . *brucei*  
 Outstanding wing scales broad, no spot opposite vein 6 . . . . . *freetownensis*
38. Wings predominantly yellow, costa mainly deep yellow on outer  $\frac{1}{2}$  . . . . . *flavicosta*  
 Wings otherwise . . . . . 39







**A. obscurus** (Grünberg).

*Palps.* Shaggy, all dark.

*Hind Legs.* Dark with very small but distinct pale apical spots to all segments except tarsal seg. V, which is entirely dark.

*Wings.* Much as for *coustani*, but usually slightly darker and the basal  $\frac{1}{2}$  of vein 6 dark, a fringe spot present between veins 3 and 4.1.

**A. obscurus** var. **nowlini** Evans.

Apparently indistinguishable from the type form.

**A. paludis** Theobald.

Much as for *coustani* but differing as follows.

*Hind Legs.* Apex of tibia with a narrow pale ring; tarsal seg. I, dark basally, seg. III, entirely pale.

*Wings.* A fringe spot, sometimes indistinct, opposite vein 5.1.

**A. implexus** (Theobald).

*Palps.* Shaggy, appear knotted due to the presence of semi-erect scales, 4 pale bands and an additional dorsal patch of pale scales in front of clypeus, apex pale.

*Hind Legs.* Femur and tibia speckled; tarsal seg. I, with an indefinite line of pale scales, apex pale, seg. II,  $\frac{1}{2}$ - $\frac{2}{3}$  apex pale, segs. III-IV, all pale, seg. V, all dark or about apical  $\frac{1}{2}$  pale.

*Wings.* Pale areas tend to be yellowish.

Costa: Base pale, 3 large pale areas.

Vein 1: Pale basally, 2 pale areas of varying length, may be an accessory dark spot.

Vein 3: Base usually dark, otherwise mainly pale.

Vein 5: Pale at bifurcation.

*Abdomen:* Segs. I-VII with prominent projecting tufts of scales, sternites I-VII, with a pair of dorsal silvery spots.

**A. cinctus** (Newstead & Carter).

*Palps.* Rather shaggy especially at base, 4 narrow pale bands, apex pale.

*Hind Legs.* Femur and tibia speckled, on the tibia much of the speckling is in the form of pale bands; tarsal seg. I, 7-8 pale bands, seg. II, 3-4 pale bands, seg. III, 2-3 pale bands, seg. IV, usually mainly all pale, seg. V, all pale or narrowly dark at base.

*Wings.* Largely pale scaled, scales creamy.

1st Dark Area: Costa and vein 1 with 2 pale spots.

2nd Dark Area: Costa dark, vein 1 one pale spot.

3rd Dark Area: All dark.

Vein 3: Largely pale, only about 2 basal and 1 apical dark spots.

Vein 5: Dark at bifurcation and at end of vein 5.1.

Fringe: Pale spots opposite all veins.

*Abdomen.* Pale scales on basal borders of segs. II-VI, seg. VII, scaling mainly lateral, and with outstanding tufts of lateral dark scales.

**A. jebudensis** Froud.

*Palps.* Smooth, dark, unbanded but with a few scattered pale scales usually on seg. II, apex dark.

*Hind Legs.* Femur with scattered pale scales internally; tibia and femur with

pale apical spots; tarsi with indistinct apical bands that involve the bases of the next segments on joints II-III and III-IV, seg. V all dark.

*Wings.* Pale scales whitish.

1st Dark Area: Costa dark, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 one pale spot.

3rd Dark Area: All dark.

Vein 3: Apical  $\frac{1}{2}$  pale, distally dark and with 1 pale spot.

Vein 5: Main stem and lower branch pale but upper branch dark at bifurcation.

Fringe: Pale spot opposite all veins except vein 6.

#### **A. buxtoni** Service.

*Palps.* Rather shaggy, 4 pale bands, apex pale.

*Hind Legs.* Femur and tibia speckled, a few of them forming complete pale bands; tarsal seg. I, 3 pale spots, apex dark, seg. II, dark, seg. III, apical  $\frac{1}{2}$  pale, segs. IV-V, all pale.

*Wings.* Scales white but those on costa and vein 1 tend to be creamy.

1st Dark Area: Costa and vein 1 two pale spots, base pale.

2nd Dark Area: Costa dark, vein 1 one pale spot.

3rd Dark Area: All dark.

Vein 3: Apex dark, distal  $\frac{1}{3}$  pale, proximal  $\frac{1}{3}$  dark with 1 pale spot.

Vein 5: Stem dark, but fork cell pale at bifurcation.

Fringe: Pale spots opposite all veins except vein 6.

#### **A. maliensis** Bailly Choumara & Adam.

Very similar to *buxtoni* but differs in having the last 3 segments of the hind tarsus all pale.

#### **A. natalensis** (Hill & Hayden).

*Palps.* Rather shaggy, especially towards the base, 4 pale bands, may be a little speckling as well, apex pale.

*Hind Legs.* Femur and tibia speckled, complete pale rings may be formed, tibia with apex narrowly pale; tarsal seg. I, about 5 pale rings, apex pale, seg. II, pale apically, seg. III, about the apical  $\frac{1}{2}$ - $\frac{3}{4}$  pale, segs. IV-V, all pale.

*Wings.* Scales rather yellow except those on costa which are whiter.

1st Dark Area: Costa and vein 1 all dark.

2nd Dark Area: Costa dark, vein 1 one small pale spot.

3rd Dark Area: All dark.

Vein 3: Usually predominantly dark with 2-3 pale narrow spots and a little speckling.

Vein 5: Dark at bifurcation.

Fringe: Pale spots opposite all veins.

#### **A. nili** (Theobald).

*Palps.* Smooth, but base may tend to have semi-erect scales, dark with only apex narrowly pale.

*Hind Legs.* Femur and tibia dark with very small apical pale spots; tarsus dark.

*Wings.* Scaling mainly dark, costal pale spots may be prominent or reduced in size.

1st Dark Area: Costa dark or 1 pale spot present, vein 1 dark.

2nd Dark Area: Costa dark, vein 1 pale basally.

3rd Dark Area: All dark.

Vein 3: All dark, base and apex may be narrowly pale.

Vein 5: Pale or dark at bifurcation.

Fringe: Pale spots usually absent, indistinct, but often present opposite veins 2.1, 4.2, and 5.2, and occasionally opposite 3 and 5.1.

**A. nili** var. **somalicus** Rivola & Holstein.

Although the authors (RIVOLA & HOLSTEIN 1957) list some minor differences in wing scaling from the type form, all these differences can be found within the variations exhibited by *nili* s.s.

**A. smithi** Theobald.

*Palps.* Smooth, 3 indistinct pale bands, apex usually dark.

*Hind Legs.* All segments entirely dark except for very small pale spots at apices of femur and tibia.

*Wings.* Very dark, pale scaling greatly reduced.

Costa and vein 1 nearly all dark, but usually a small pale spot present on vein 1 at end of 1st dark area, and a pale spot on the costa just beyond middle.

Vein 3: All dark.

Vein 5: Dark at bifurcation.

Fringe: All dark.

*Notes:* This species is unusual in exhibiting sexual dimorphism in the wing scaling. In the male the wings are much lighter scaled, with the 4 dark areas on the costa usually well separated by pale interruptions, vein 1 similarly marked.

**A. smithi** var. **rageaui** Mattingly & Adam.

As is indicated in the key the females of var. *rageaui* usually have paler wings than the type form. However, it is somewhat doubtful whether or not the adults can with any degree of certainty be separated from those of the type form, as considerable variations in the amount of pale scaling occurs in both type and variety (vide MATTINGLY & ADAM 1954, and ADAM & MATTINGLY 1956).

**A. rhodesiensis** Theobald.

*Palps.* Smooth, 3 pale rather indistinct bands, apex pale, intervening dark band between the pale apical and subapical bands broad.

*Hind Legs.* All segments dark, occasionally a few paler scales present at apices.

*Wings.* The 4 main dark areas well separated by pale interruptions, all these dark areas with costa and vein 1 completely dark. Other veins dark scaled, fringe dark.

*Notes.* This species is very similar to *d'thali*, but differs in having the head scales shorter and broader, white in the middle and black at the sides of the head.

**A. barbarellus** Evans.

*Palps.* Smooth, 3 pale bands, distal 2 broad, intervening dark band narrow, apex pale.

*Hind Legs.* Femur with a very narrow pale apical spot; tibia with apical spot larger; tarsal segs. I-IV, with narrow apical pale rings, these may extend slightly onto bases of segments, seg. V, dark.

*Wings.* Pale scales usually creamy or yellowish.

1st Dark Area: Extreme base of costa sometimes pale, 2 pale spots, vein 1 pale basally.

2nd Dark Area: Costa all dark or 1 pale spot, vein 1 one pale spot.

3rd Dark Area: All dark.

Vein 3: Largely pale, dark spot at apex and 1-2 dark spots basally.

Vein 5: Dark at bifurcation.

Fringe: Pale spots opposite all veins except vein 6.

#### **A. brunnipes** (Theobald).

*Palps.* Shaggy at base, otherwise smooth, 3 pale bands, intervening dark band broad, subapical pale band narrow, apex pale.

*Hind Legs.* Apex of femur may be narrowly pale; tibia apex pale; tarsal seg. 1, may be narrowly pale, segs. II-V, all dark.

*Wings.* Pale scales white.

1st Dark Area: Costa 2-3 pale spots, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 one small pale spot.

3rd Dark Area: Costa dark, vein 1 one small pale spot.

Vein 3: Usually pale on basal  $\frac{1}{2}$  but with a dark spot, apical  $\frac{1}{2}$  dark.

Vein 5: Dark at bifurcation.

Fringe: Pale spots opposite all veins.

#### **A. d'thali** Patton.

This species is very similar to *rhodesiensis*, but can be separated from it by having long narrow yellowish scales on the head. Wings much as for *rhodesiensis*. Fringe and veins dark scaled and the 4 main dark areas separated as for this species.

#### **A. longipalpis** var. **domicolus** Edwards.

*Palps.* Smooth, 3 pale bands, apex pale, the intervening dark band narrower than the 2 distal pale bands. ADAM et al. (1956) state that this dark band can be longer than the 2 distal pale bands.

*Hind Legs.* Femur dark; tibia with apex pale; tarsal segs. with pale bands involving the apices of segs. I-IV, and the bases of segs. II-V.

*Wings.* Pale scales whitish or creamy.

1st Dark Area: Costa 1 pale spot, vein 1 pale at base.

2nd Dark Area: Costa dark, vein 1 one pale spot, or base pale.

3rd Dark Area: All dark.

Vein 3: Largely pale, apex and base dark.

Vein 5: Dark at bifurcation.

Fringe: Pale spots opposite all veins except vein 6, sometimes all pale from veins 1-4.1.

#### **A. longipalpis** (Theobald).

Very similar to var. *domicolus*, but some specimens can possibly be distinguished from it by the possession of a narrow pale subapical band on the palps. This is however a doubtful character.

#### **A. funestus** Giles.

*Palps.* Smooth, 3 pale bands, apex pale, the pale bands vary in width but usually narrow, the intervening dark band is broad.

*Hind Legs.* Femur dark; tibia with an indistinct pale spot at apex; tarsal segments dark but usually a few paler scales at joints.

*Wings.* Generally fairly dark but lighter individuals exist, and there is a series of individuals between the two extremes.

1st Dark Area: Costa dark or 1 pale spot, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 either pale basally or with a pale spot.

3rd Dark Area: All dark.

Vein 3: All dark, or with the median area pale, length of this pale area very variable.

Vein 5: Dark at bifurcation.

Fringe: Pale spots which may be indistinct opposite all veins except vein 6.

*Notes:* The next two species greatly resemble *funestus* and although they can sometimes be separated on wing scaling, it has been found (author's unpublished observations) that the degree of pale scaling on vein 3 is considerably greater than is usually quoted. They can only be separated with any degree of certainty by examination of the pharyngeal armature of the females, and genitalia of the males (DE MEILLON 1947).

#### **A. rivulorum** Leeson.

Very similar to *funestus*, and some individuals cannot be separated from this species. However, when there is a pale spot on vein 5 in addition to the one at the cross vein this species can be distinguished from *funestus*.

#### **A. lesoni** Evans.

Very similar to *funestus*. It is stated that it can usually be separated from it when a pre-accessory spot is present on vein 1 and the pale scaling on vein 3 is in the middle. However, vein 3 may be either all dark or extensively pale scaled, and *funestus* often has a pre-accessory spot. It cannot be separated from *rivulorum* on external characters.

#### **A. brucei** Service.

*Palps.* Smooth, 3 pale bands, distal 2 pale ones broad, intervening dark band narrow, apex pale.

*Hind Legs.* All segments dark.

*Wings.* Pale scales white.

1st Dark Area: Costa 2 pale spots, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 one pale spot.

3rd Dark Area: All dark.

Vein 3: Pale, dark at apex and base.

Vein 5: Dark at bifurcation.

Fringe: Pale spots present opposite all veins.

#### **A. flavicosta** Edwards.

*Palps.* Smooth, 3 pale bands, distal 2 broad and intervening dark band narrow, in extreme cases the distal  $\frac{1}{3}$  of palps may be all pale, apex pale.

*Hind Legs.* Femur narrowly pale at apex; tibia with base narrowly pale and a distinct apical spot; tarsal segs. I-IV, apices pale, seg. V, dark.

*Wings.* Pale scales yellowish, often deep yellow.

1st Dark Area: Costa 1-2 pale spots, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 pale basally or 1 pale spot.

3rd Dark Area: All dark.

Vein 3: Largely pale, 1-2 dark basal spots and occasionally a dark spot at apex.

Vein 5: Dark at bifurcation.

Fringe: Pale spots opposite veins 4.1, 4.2, 5.1, 5.2 and 6, and a large pale spot from 2.1-3.

*Notes.* Veins 2 and 6 are usually extremely pale scaled.

**A. hargreavesi** Evans.

*Palps.* Smooth, 3 pale bands, distal 2 usually broad and intervening dark band narrow, apex pale, sometimes subapical pale band narrower than dark band.

*Hind Legs.* Femur dark; tibia with apex pale; tarsal segs. I-IV, apices pale, seg. V, all dark.

*Wings.* Pale scales rather creamy white.

1st Dark Area: Costa 2 pale spots, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 one pale spot.

3rd Dark Area: Costa dark, vein 1 one pale spot.

Vein 3: Largely pale, apex and base dark.

Vein 5: Dark at bifurcation.

Fringe: Pale spots opposite all veins, that opposite vein 6 may be indistinct.

**A. hancocki** Edwards.

*Palps.* Smooth, 3 pale bands, distal 2 broad and intervening dark band narrow, apex pale.

*Hind Legs.* Femur dark; tibia narrowly pale at apex; tarsal seg. I, dark or faintly pale apically, seg. II, apex broadly pale, segs. III-V, all pale.

*Wings.* Pale scales creamy, much as in *hargreavesi*.

1st Dark Area: Costa 1 or 2 pale spots, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 one pale spot.

3rd Dark Area: Costa dark, vein 1 one pale spot.

Vein 3: Largely pale, apex dark and base with 1 or 2 very small dark spots.

Vein 5: Dark at bifurcation.

Fringe: Pale spots present opposite all veins, but that opposite vein 6 may be absent.

**A. hancocki** var. **brohieri** Edwards.

Very similar to type form and sometimes indistinguishable from it, however, when the hind tarsal seg. III has a dark band it is distinguished from *hancocki* s.s. but not from var. *masseguini*.

**A. hancocki** var. **masseguini** Hamon.

Apparently indistinguishable from var. *brohieri*.

**A. hancocki** var. **gilroyi** Service.

*Palps.* Smooth, 1 narrow pale band, distal  $\frac{1}{3}$  all pale.

*Hind Legs.* Femur dark; tibia apex narrowly pale; tarsal seg. I, apex pale, seg. II, distal  $\frac{1}{4}$  pale, segs. III-V, all pale.

*Wings.* Pale scales creamy.

1st Dark Area: Costa 2 pale spots, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 pale basally.

3rd Dark Area: Costa dark, vein 1 one pale spot.

Vein 3: Largely pale, apex and base dark.

Vein 5: Dark at bifurcation.

Fringe: Pale spots opposite all veins.

**A. marshalli** (Theobald).

*Palps.* Smooth, 3 pale bands, intervening dark band usually about as long as the 2 pale distal ones but may be slightly narrower, apex pale.

*Hind Legs.* Femur dark; tibia apex narrowly pale; tarsal segs. I-IV, small but

usually distinct apical pale bands, seg. V, all dark.

*Wings.* Pale scales either white or creamy.

1st Dark Area: Costa 2 pale spots, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 one pale spot.

3rd Dark Area: Costa dark, vein 1 one pale spot, occasionally base pale.

Vein 3: Pale area in the middle very variable, may be reduced, or the apical and basal dark parts of the veins reduced to small spots, usually, however about  $\frac{1}{3}$  length of vein pale.

Vein 5: Dark at bifurcation.

Fringe: Pale spots opposite all veins.

**A. marshalli** var. **mousinhoi** De Meillon & Pereira.

Indistinguishable from type form.

**A. moucheti** Evans.

*Palps.* Smooth, 3 pale bands, distal 2 broad and intervening dark band narrow, apex pale.

*Hind Legs.* Femur dark; tibia with small pale apical spot; tarsal segs. I-IV, small pale apical bands, seg. V, all dark.

*Wings.* Pale scales creamy or white, considerable degree of variation in the size of the pale areas.

1st Dark Area: Costa 2 pale spots, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 one pale spot.

3rd Dark Area: All dark.

Vein 3: Largely pale, apex and base dark.

Vein 5: Dark at bifurcation.

Fringe: Pale spots opposite all veins except vein 6.

**A. moucheti** var. **nigeriensis** Evans.

As mentioned in the notes on the larvae the exact status of this form is rather vague, and although EVANS (1938) states that it is separated from the type form by having the scales on the anterior part of the mesonotum narrower, this is a very doubtful character.

**A. theileri** (Edwards).

*Palps.* Smooth, 3 pale bands, distal 2 quite broad and intervening dark band narrow, apex pale.

*Hind Legs.* Femur mainly dark; tibia with apical pale spot; tarsal seg. I, a pale apical band, seg. II,  $\frac{1}{4}$  to nearly  $\frac{1}{2}$  of apex pale, seg. III, apical  $\frac{1}{2}$ - $\frac{3}{4}$  pale, segs. IV-V all pale.

*Wings.* Pale scales yellowish.

1st Dark Area: Costa usually dark, vein 1 base largely pale.

2nd Dark Area: Costa dark, vein 1 one pale spot.

3rd Dark Area: Costa dark, vein 1 one pale spot.

Vein 3: Largely pale, dark at apex and base.

Vein 5: Dark at bifurcation.

Fringe: Pale spots opposite all veins.

**A. wellcomei** Theobald.

*Palps.* Smooth, basal  $\frac{1}{3}$  dark followed by a narrow pale band and a larger area of yellow scales, a broad pale band, an area of about equal length of yellow scales and finally apex broadly pale scaled. No other West



African Anopheline has the distal  $\frac{2}{3}$  of the palps superficially pale scaled. According to HAMON (pers. comm.) some specimens have distinct dark and pale bands resembling the East African *distinctus*.

*Hind Legs.* Femur and tibia dark; tarsal segs. I-IV, pale apical bands, seg. V, dark.

*Wings.* Very light scaled, pale scales yellowish.

1st Dark Area: Costa dark, vein 1 pale with 1-2 small dark spots usually present.

2nd Dark Area: Costa dark, vein 1 largely pale much as in 1st dark area.

3rd Dark Area: All dark.

Vein 3: Largely pale, apex and base with small dark spots.

Vein 5: Dark at bifurcation or only root of 5.1 dark.

Fringe: Pale spots opposite all veins, a pale area extends from vein 6 to base of wing.

*Notes.* Rather variable in degree of pale scaling, usually no pale interruption on costa separating main dark areas 1 and 2.

#### **A. freetownensis** Evans.

*Palps.* Smooth, 3 pale bands, distal 2 broad, intervening dark band narrow, apex pale.

*Hind Legs.* All segments dark.

*Wings.* Pale scales white or yellowish.

1st Dark Area: Costa with 2 pale spots, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 pale basally or with 1 pale spot.

3rd Dark Area: All dark.

Vein 3: Pale in middle, base usually with a large dark area, apex dark.

Vein 5: Dark at bifurcation.

Fringe: Pale spots opposite all veins except vein 6.

#### **A. macmahoni** Evans.

Not really separable from *funestus*, though the wing field appears paler due to the dark areas not being so black, apparently the costa in the 1st dark area always has 1 small spot, this may be absent in *funestus*.

#### **A. gambiae** Giles.

*Palps.* Smooth, 3 pale bands, apical pale band broad, subapical one narrow, intervening dark band fairly broad. Occasionally the apical pale band is divided by a narrow dark band resulting in a 4 banded palp.

*Hind Legs.* Femur, tibia and tarsal seg. I, speckled and tibiae with a narrow pale apical band; segs. I-IV, with distinct pale apical bands, seg. V, dark.

*Wings.* Pale scales creamy, a great deal of variation in the extent of the pale scaling, and also in the size of the wings.

1st Dark Area: Costa with 2-3 pale spots, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 one pale spot or pale basally.

3rd Dark Area: Costa dark, vein 1 one pale spot or pale basally.

Vein 3: Usually largely pale with only extreme apex and base dark.

Vein 5: Pale at bifurcation.

Fringe: Pale spots opposite all veins and in addition pale spots between veins 5.2 and 6, and 6 and wing base.

*Notes.* Albino forms have occasionally been reported (EVANS 1938, HANNEY 1958).



**A. gambiae** var. **melas** Theobald.

Cannot be separated from the type though in certain areas the variety has a greater tendency to have 4 pale banded palps. The only relatively sure means of separation is on the eggs (THOMSON 1945). However, BRUCE CHWATT (1945) has found that a certain percentage of the eggs are intermediate between the two forms, and aberrant forms of *gambiae* (BRUCE CHWATT and SERVICE 1957) have been found.

**A. rufipes** (Gough).

*Palps.* Smooth, 3 pale bands, distal 2 broad and the intervening dark band usually narrow, but occasionally longer than the 2 pale bands, apex pale. Occasionally the apical pale band is subdivided by a dark band, and in other instances the apex of the palps may be very narrowly dark.

*Hind Legs.* Femur and tibia with apices pale; tarsal segs. I-II, narrow pale apical bands, seg. III, usually with about the apical  $\frac{1}{3}$ - $\frac{1}{2}$  pale, basal  $\frac{2}{3}$ - $\frac{1}{2}$  dark, sometimes a narrow pale basal ring is present, segs. IV-V, pale.

*Wings.* Pale scales white.

1st Dark Area: Costa 2 pale spots, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 two pale spots.

3rd Dark Area: All dark.

Vein 3: Largely pale, apex and base dark.

Vein 5: Pale at bifurcation.

Fringe: Pale spots opposite all veins.

**A. rufipes** var. **ingrami** Edwards.

Differs from type form in having the 3rd hind tarsal segment either entirely pale or with a narrow dark band near base. As yet no specimens have been caught with the pale apical palpal band divided, or with the apex with dark scales.

**A. rufipes** var. **brucechwatti** Hamon, Taufflieb & Dyemkouma.

Similar to type but differs as follows: The apex of the palp is largely dark, hence the pale terminal band is reduced in size. Hind tarsal segment III, with only the apical  $\frac{1}{5}$  pale and seg. IV, with a broad dark band in middle, seg. V, all pale.

**A. broussesi** Edwards.

Very similar to *rufipes* but differs from it and its varieties as follows: Palps similar to typical *rufipes* but the last segment dark. Hind tarsal segments with only faint pale apical bands on segs. I-IV, seg. V, dark or creamy.

**A. pretoriensis** (Theobald).

*Palps.* Smooth, 3 pale bands, subapical one broad but apical one broader, intervening dark band either as long as subapical band or shorter, apex pale. Several specimens have the apical band subdivided by a narrow dark band, giving a 4 banded palp.

*Hind Legs.* Femur speckled; tibia speckled and apex narrowly pale; tarsal seg. I, speckled and broadly pale apically, seg. II, apex broadly pale, seg. III, dark with a pale spot at base and distal  $\frac{1}{2}$ - $\frac{2}{3}$  pale, segs. IV-V, pale.

*Wings.* Pale scales white, considerable variation in the degree of pale scaling.

1st Dark Area: Costa 2 pale spots, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 two pale spots.

3rd Dark Area: All dark.

Vein 3: About middle  $\frac{1}{3}$  pale.

Vein 5: Dark at bifurcation.

Fringe: Pale spots opposite all veins.

*Notes.* Usually no pale interruption between the dark areas 2 and 3 on vein 1.

#### **A. maculipalpis** (Giles).

*Palps.* Smooth, speckled and with 3 pale bands, apical 2 broad, intervening dark band about as long or longer than the pale ones, apex pale. Occasionally the apical pale band divided into 2 by a narrow dark band, and speckling may be greatly reduced.

*Hind Legs.* Femur and tibia speckled the spots tending to form pale lines; tarsal seg. I, speckled, dark at apex, seg. II, apical  $\frac{1}{3}$ - $\frac{1}{2}$  pale, segs. III-V, pale.

*Wings.* Pale scales white.

1st Dark Area: Costa with 2 pale spots, vein 1 pale basally.

2nd Dark Area: Costa dark, vein 1 two pale spots.

3rd Dark Area: All dark.

Vein 3: Middle  $\frac{1}{3}$  or less pale, may be almost entirely dark.

Vein 5: Pale at bifurcation.

Fringe: Pale spots usually present opposite all veins except 2.1.

*Notes:* Usually vein 1 shows no pale interruptions separating the 2nd, 3rd, and 4th dark areas, but in paler individuals the costal spots separating these areas may be continued onto vein 1.

#### **A. pharoensis** Theobald.

*Palps.* Shaggy, 4 rather irregular pale bands and speckling, dark scales not very black, apex pale.

*Hind Legs.* Femur and tibia prominently speckled and irregular pale patches may be formed, both segments pale internally; tarsal seg. I, usually with a pale line internally, apex pale, segs. II-IV, broad pale apical bands, seg. V, all pale.

*Wings.* White or yellowish scales, wing field abnormally pale, and degree of pale scaling very variable even on costa and vein 1.

1st Dark Area: Usually basal  $\frac{1}{2}$  of costa pale with 1-2 small dark spots, vein 1 largely pale with 1-2 small dark spots.

2nd Dark Area: Costa dark, vein 1 with 3-5 pale spots, appears almost speckled.

3rd Dark Area: Costa dark, vein 1 two pale spots.

4th Dark Area: Costa dark, vein 1 one pale spot.

Vein 3: Largely pale, apex dark, base with 1-2 pale spots.

Vein 5: A small dark spot present or absent at bifurcation.

Fringe: Pale spots present opposite veins 4.1-6, a pale spot between vein 6 and base, and apex of wing broadly pale.

*Abdomen.* Outstanding tufts of lateral dark scales on segs. II-VII.

#### **A. squamosus** Theobald.

*Palps.* Shaggy, 4 pale bands and some speckling, apex pale.

*Hind Legs.* Femur prominently speckled anteriorly and pale posteriorly; tibia speckled anteriorly and pale spots forming a line, posteriorly pale; tarsal seg. I, a line of pale spots and apex broadly pale, segs. II-IV, pale apical bands, may be reduced, seg. V, all dark.

*Wings.* Scales white, wing field normal, not abnormally pale as in *pharoensis*.

1st Dark Area: Costa 2-3 pale spots, vein 1 pale basally and sometimes also 1 pale spot.

2nd Dark Area: Costa dark, vein 1 one pale spot.

3rd Dark Area: Costa dark, vein 1 one pale spot.

Vein 3: With 2-3 pale spots.

Vein 5: Dark at bifurcation.

Fringe: Either with easily seen pale spots present opposite most veins or mainly dark.

*Abdomen.* Outstanding tufts of lateral dark scales on segs. II-VII.

#### **A. squamosus** var. **cydippis** De Meillon.

Indistinguishable from type form.

#### **A. brumpti** Hamon & Rickenbach.

*Palps.* Shaggy, 3 narrow pale bands, apex pale.

*Hind Legs.* Femur dark anteriorly and yellowish posteriorly but with apex and base dark; tibia dark anteriorly and yellowish posteriorly with white scales at apex; tarsal segs. I-IV dark with pale spots at apices, seg. V, dark.

*Wings.* Entirely dark scaled except, at base of vein 1, sub base of vein V, and very small pale patches at apices of veins 1-5.1.

*Abdomen:* Outstanding tufts of lateral dark scales on segs. II-VII.

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#### Zusammenfassung.

Ein Schlüssel wird gegeben für die Bestimmung von Larven des vierten Stadiums und Weibchen von Anophelen aller Arten, Unterarten und Varietäten, welche bis jetzt in Westafrika gefunden wurden. Genauere Beschreibungen der verschiedenen Arten ergänzen den Bestimmungsschlüssel. Sowohl *Anopheles theileri* wie auch *A. longipalpis* s.s. sind bei den westafrikanischen Arten mitberücksichtigt, denn, obwohl sie hauptsächlich in Ostafrika bekannt sind, können sie eventuell auch in Westafrika vorkommen.

#### Résumé.

L'auteur donne une clé pour déterminer les larves du 4<sup>e</sup> stade et les femelles adultes de toutes les espèces, sous-espèces et variétés d'*Anopheles* existant en Afrique occidentale. Des descriptions détaillées des différentes espèces complètent la clé. *Anopheles theileri* ainsi que *A. longipalpis*, bien que plutôt connus en Afrique orientale, sont inclus dans la liste des espèces occidentales, car elles peuvent se trouver exceptionnellement aussi en Afrique occidentale.