

SYNOPSIS OF THE ANOPHELINE MOSQUITOES OF AFRICA
AND OF THE ORIENTAL REGION.

By COLONEL A. ALCOCK, C.I.E., F.R.S., I.M.S. (retired).

THIS Synopsis is intended for the convenience of medical men, my experience at the School having taught me that the method of identifying Anopheline species by attending, first and foremost, to the exact form and distribution of the scales of the body is—other grounds of criticism apart—confusing and sometimes misleading.

I would by no means ignore "scale characters," since I think that the nature of the scales, taken with the general scheme of colouring of the wings, provide the means of partition of the old genus *Anopheles* into four natural and fairly convenient subgenera, namely *Anopheles* (s. r.), *Myzorhynchus*, *Myzomyia*, and *Nyssorhynchus*.

I. Synopsis of African Species of *Anopheles*, ♀.

(a) *Wings not spotted at all* :—

1. ANOPHELES ALGERIENSIS, Theob. A brown mosquito without any banding of palpi or legs. Abdomen and scutum with hairs only. N. Africa. (Possibly identical with *A. bifurcatus*, L.)

(b) *Wings with some minute pale spots on the front edge only* :—

2. ANOPHELES SMITHI, Theob. Wings with 3 minute and obscure pale specks along the front edge and a fourth at the tip, otherwise brown-scaled. Palpi slender, dusky, with 3 narrow and obscure pale bands, one of which is subterminal. Legs brown, not banded. Abdomen and scutum with hairs only. Sierra Leone.

3. ANOPHELES RHODESIENSIS, Theob. As *smithi*, but the specks on the front edge and tip of the wing and the bands on the palpi are more distinct. Southern Africa.

(c) *Wings with streaks or spots on the front edge and fringe only* :—

4. ANOPHELES WELLCOMEI, Theob. The front edge of the wing shows as a well-defined black line with 2 yellow breaks in its distal half; the fringe is spotted; the rest of the wing is covered with yellow scales. Palpi slender,

the proximal third black, the distal two-thirds light brown, with one narrow and two broader pale bands. Legs brown with the tips of the segments yellowish but not showing as distinct bands. Abdomen and scutum with hairs only. Sudan (and Aden).

5. ANOPHELES THEILERI, Edw. (= *Pyretophorus allipes*, Theob.). As *wellemei*, but in the hind legs the 4th and 5th tarsal segments and the greater part of the 3rd also are white. Transvaal.

(d) Wings with a few black spots in the field only, none on front edge or fringe:—

6. ANOPHELES MACULIPENNIS, Meigen. Wings clad with narrow brown scales, which in four places are massed to form large black spots. Legs and palpi brown, not banded. Abdomen and scutum with scales only. A large brown species. N. Africa.

(e) Wings dappled; front edge (including tip) with not more than two pale spots (fig. A):—

7. ANOPHELES UMBROSUS, Theob. (= *Myzorrhynchus umbrosus* and *strachani*, Theob.). A large dark species, with rather shaggy black palps. Wings with broad scales mostly black, but with patches of white; front edge black with two very small whitish spots in the distal half—the proximal one sometimes wanting. Legs dark brown, the extreme tips of most of the segments lighter. Abdomen and scutum with hairs only. W. Africa (also Malay Peninsula and Borneo).

8. ANOPHELES DISTINCTUS, Newstead & Carter. (*Pyretophorus distinctus*). Palpi slender with four narrow pale bands. Scutum with narrow scales. N.E. Rhodesia.

9. ANOPHELES MAURITIANUS, Grandpré (= *Myzorrhynchus mauritanus* and *paludis*, Theob.). Palpi shaggy, black with usually four narrow white bands. Wings with broad scales, mostly black but with patches of white or yellow; front edge black with a small white spot at the tip, and usually another minute spot just beyond the middle. In the hind-legs the 3rd, 4th, and 5th tarsal segments are snow-white (sometimes the proximal end of the 3rd segment is dark = var. *paludis*). Abdomen and scutum with hairs except for a prominent tuft of scales on the sternum of the 7th abdominal segment. Widely distributed in Africa.

10. ANOPHELES AUSTENI, Theob. (*Pyretophorus austeni*). Palpi slender with 3 white bands, namely 1 narrow (proximal) and 2 broad—one of the latter being terminal. Front edge of wing black with 1 or 2 white specks near the base and 2 small white spots in the distal half. All the tarsal segments except the 5th have a white tip. Scutum with narrow scales. Angola.

(f) Wings much spotted; front edge (including tip) with at least three distinct spots or streaks, but usually broken into numerous alternate light and dark areas (figs. C, D). No scales on the abdomen, or, at most, a few on the terminal segments:—

(fi) Palpi not banded:—

11. ANOPHELES NILI, Theob. (*Myzomyia nili*). Palpi slender, dark with only the tip pallid. Wings dark-scaled with a few small light spots; the front edge black with four small whitish spots—one, at the tip of the wing, being a mere speck. Legs blackish, not banded. Abdomen and scutum with hairs only. Sudan; W. Africa.

(fii) Palpi with three light bands. Legs brown, the extreme tip of femur, tibia, and first 3 or 4 tarsal segments may be pale, but there is no distinct and conspicuous tarsal banding [No. 12 to No. 20]:—

In the three following species (No. 12 to No. 14) the tip of the palpi is brown:—

12. ANOPHELES HISPANIOLA, Theob. (*Myzomyia hispaniola*). Palpi slender, brown, with three narrow light bands, the most anterior not being terminal. Legs brown with the tip of femur and tibia pale yellow. Front edge of wing black with four yellowish breaks, not including one or two specks at proximal end. Scales of 3rd longitudinal vein mostly pale. Abdomen and scutum with hairs only. N. Africa (and Spain). Said to rest like a *Culex*.

13. ANOPHELES CHAUDOYEI, Theob. (= *Pyretophorus chadoyei* and *nigrifasciatus*, Theob.). Differs from *A. hispaniola* in having distinct scales on the scutum. N. Africa (also Cyprus and India).

14. ANOPHELES MULTICOLOR, Camboulin. Differs from *A. hispaniola* in having scales on the scutum, and from *A. chadoyei* in having chiefly dark scales on the forks of the 2nd longitudinal vein. Egypt.

In the six following species (No. 15 to No. 20) the third palp-band is terminal (tip of palpi white):—

15. ANOPHELES CULICIFACIES, Giles (= *Myzomyia culicifacies* and *Pyretophorus sergenti*, Theob.). Palpi slender, brown, with three narrow light bands, one of which is terminal. Legs brown, with tip of femur and tibia and, perhaps, of some of the tarsi paler. Front edge of wing black with four small yellow breaks. Abdomen and scutum with hairs. An Indian species which has been found in Algeria. Resting attitude said to be *Culex*-like. N. Africa (a common Indian species also).

16. ANOPHELES FUNESTUS, Giles (*Myzomyia funesta*, Theob.). Differs from *A. culicifacies* in its darker appearance, the legs being almost black throughout. Resting attitude said to be not at all *Culex*-like. A common species in Tropical Africa.

17. ANOPHELES MARSHALLI, Theob. (= *Pyrethophorus marshalli* and *pseudocostalis*, Theob.). Palpi slender, brown with three light bands—two broad (one of these terminal) and one narrow. Legs deep brown, the extreme tip of all the segments (except the 5th tarsal) pallid, but no distinct banding. Front edge of wing black with four small yellowish spots, not including 2 specks at proximal end. Scutum with narrow curved scales; abdomen with hairs. Eastern and Southern Africa.

18. ANOPHELES TRANSVAALENSIS, Carter (*Pyrethophorus transvaalensis*). Seems to differ from *A. marshalli* chiefly in having darker legs. E. and S. Africa.

19. ANOPHELES FLAVICOSTA, Edw. Differs from *A. marshalli* in having more yellow in the front edge of the wing, which may be described as being yellow with 2 black specks and 4 small black spots. N. Nigeria.

20. ANOPHELES BRUNNIPES, Theob. (*Nyssorhynchus brunnipis*). Scutum with broad, elliptical, appressed white scales. Palpi slender, black with three white bands—two narrow, and one broad (terminal). In the legs some of the segments are smudgy black or brown and others almost golden yellow, but there is no definite banding. Front edge of wing black with 4 small white spots, not including a basal speck. Angola. This species is closely related to *A. ruñipes* (No. 30), *A. maculipalpis* (No. 29), &c.

(fiii) Palpi with three or four light bands, one of which is terminal. Some at least of the legs with tarsal segments distinctly and conspicuously banded [No. 21 to No. 25]:—

[*Anopheles austeni*, Theob. (*Pyrethophorus austeni*). See No. 10. In the front edge of the wing there are 3 white spots, but one of them is a mere speck.]

21. ANOPHELES COSTALIS, Loew, Theob. (*Pyrethophorus costalis*, Theob.). Palpi slender, with 2 narrow bands and 1 broad terminal band. Legs brown with femur, tibia, and to some extent the first tarsal segment finely speckled with yellow, and the articulations of the tarsal segments banded yellow particularly in the front legs. Front edge of wing with 2 black specks and 4 black streaks, some of which sometimes tend to be confluent. Scutum with narrow scales; abdomen with hairs. One of the commonest African species.

22. ANOPHELES LONGIPALPIS, Theob. (*Myzomyia longipalpis*). Palpi slender with 3 narrow bands, one of which is terminal. Legs black, not speckled, the articulations of the tarsi of the hind-legs only banded white. Front edge of wing black with 4 small pale yellow spots. Scutum with hairs and a few narrow scales; abdomen with hairs. Proboscis particularly long. E. Africa.

23. ANOPHELES PITCHFORDI, Giles. Palpi slender with 3 bands, 1 narrow and 2 broad, one of the latter terminal. Legs dark brown with the tips of all segments, except 5th tarsal, yellowish and showing as distinct tarsal "bands." Front edge of wing black, with 2 yellow specks and 4 small yellow breaks. Scutum with narrow scales; abdomen with hairs. Southern and Eastern Africa.

24. ANOPHELES CINEREUS, Theob. (*Pyrethophorus cinereus*). Palpi slender with 4 bands, one of which is terminal. Legs black, with the tips of all segments except 5th tarsal whitish, the white tips of the tarsi of the hind-legs forming distinct bands. Front edge of wing black with 1 or 2 yellow specks and 4 yellow streaks. Scutum with broadish scales: abdomen with hairs. South and East Africa.

25. ANOPHELES ARDENSIS, Theob. (= *Pyrethophorus ardensis* and *Myzomyia pyrethophoroides*, Theob.). Palpi slender, brown, with 4 white bands, 3 of which are narrow and 1 (terminal) broadish. Legs dark brown, with femur, tibia, and 1st tarsal profusely and conspicuously banded and all the other tarsals (5th excepted) white-tipped. Front edge of wing black with 2 yellow specks and 4 yellow breaks. Abdomen and scutum with hairs. Natal.

(fiv) Palpi with three or four white bands, one of which is terminal. Legs banded; in the hind pair the 4th and 5th tarsal segments, and all or part of the 3rd segment also, are snow-white [No. 26 to No. 30]:—

N.B.—The same snow-white hind tarsi occur in *A. theileri* (No. 5), *A. mauritanus* (No. 9), and *A. implexus* (No. 31). No. 5 and No. 9 can be excluded by the colouring of the wings, and No. 31 by the laterally-projecting pencils of bristle-like scales of the abdominal segments.

26. ANOPHELES NATALENSIS, Hill & Haydon (*Myzorhynchus natalensis*). Palpi black, with 4 narrow white bands, one of which is terminal. Femora and tibiae brilliantly spotted, and first tarsal segment much banded, with yellow. In the hind-legs about half the 3rd tarsal segment is white (in addition to the 4th and 5th). Front edge of wing black with a white speck and 3 small white breaks. Scutum with hairs. Natal.

N.B.—Edwards appears to suggest that this "species" may be the same as No. 27.

27. ANOPHELES AUREOSQUAMIGER, Theob. (*Pyrethophorus aureosquamiger*). Palpi slender, black, with 4 narrow white bands, one of which is terminal. Long segments of the legs profusely spotted, and tarsi broadly banded, with white. In the hind legs all or the greater part of the 3rd tarsal segment is (in addition to the 4th and 5th segments) white. Front edge of wing black, with one speck and 4 small spots of yellowish white. Scutum with broad, elliptical, appressed scales. Transvaal.

28. ANOPHELES PRETORIENSIS, Theob. (*Nyssorhynchus pretoriensis*). Differs from *aureosquamiger* principally in having all the markings white instead of yellow; the tarsi of the middle legs not, or indistinctly, banded; and the palpi with only 3 bands (though occasionally the terminal band is subdivided). Transvaal, Natal.

29. ANOPHELES MACULIPALPIS, Giles (= *Nyssorhynchus maculipalpis* and *indensis*, Theob.). Like *pretoriensis*, but the palpi (in addition to the 3 white bands) are peppered with white scales; the profuse spotting of the femora and tibiae is more regular; and in the hind-legs all of the 3rd tarsal segment is white. Africa, Mauritius (also occurs in India).

30. ANOPHELES RUFIPES, Gough (*Nyssorhynchus pretoriensis* var. *rufipes*, Gough, and *Anopheles watsoni*, Edwards). Like *pretoriensis* without the spotting of the femora and tibiae. Tropical Africa; Transvaal.

N.B.—Nos. 27, 28, 29 and 30 form a series; No. 29 (*Anopheles maculipalpis*, Giles) was the first to be named, and Nos. 27, 28 and 30 might quite reasonably be regarded as varieties of *Anopheles maculipalpis*, Giles. *Anopheles brunneipes*, Th. (No. 20), though it has not the three terminal tarsi of the hind-legs snow-white, is very closely related to this series.

(g) Wings as in Section (f). Legs profusely banded. Abdomen with a tuft of long stiff bristle-like scales projecting laterally on either side of each of the first seven segments:—

31. ANOPHELES IMPLEXUS, Theob. (*Christya implexa*). Palpi rather shaggy, rather shorter than the proboscis, black with 4 or 5 narrow whitish cross-bands. Legs dark brown, the femur and tibia with numerous regular white cross-bands. In the hind-legs the tarsal segments from the middle of the 2nd to the middle of the 5th are snow-white. Wings spotted, two or three large yellow blotches on the anterior edge are very conspicuous. Scutum with broadish appressed scales among the hairs. Abdomen with scales on the terminal segment, and with a pair of laterally-projecting pencils of stiff narrow scales on the first seven segments. Uganda.

(h) Wings as in Section (f). Palpi and tarsi banded. Abdomen well clad with scales on every segment:—

32. ANOPHELES CHRISTYL, Newstead & Carter ("*Neocellia*" *Christyl*). Palpi shaggy, with three very narrow whitish bands and yellowish tip. Legs lightish brown, tips of all the tarsi except the 5th yellowish, forming distinct bands. Front edge of wing black, with 2 or 3 yellowish specks and 4 yellow breaks. Scutum with broadish curved scales. Plenty of scales on all the abdominal segments, those of the genital lobes being very prominent. E. Africa.

(i) Wings as in Section (f). Legs profusely banded. Abdomen well covered with scales, and also with a laterally-projecting tuft of scales on either side of every segment from the 2nd to the 7th:—

33. ANOPHELES SQUAMOSUS, Theob. ("*Cellia*" *squamosa*). Palpi shaggy, black peppered with white, and with 2 or 3 white bands and white tip, the banding variable. Legs with femur and tibia much speckled, and all the tarsi except the 5th (which is dark brown) broadly banded with white distally. Wings much spotted; front edge black with 2 white specks and 4 white spots. Scutum with broad elliptical appressed scales. A common species of the Ethiopian region.

34. ANOPHELES ARGENTEOLABATUS, Gough (= "*Cellia*" *pseudosquamosa*, Newstead & Carter). Much like *A. squamosus*, but the tarsi are not banded. Transvaal & N.E. Rhodesia.

35. ANOPHELES PHAROENSIS, Theob. ("*Cellia*" *pharoensis*). Palpi much as in *squamosus*, and variable. Legs with femur and tibia brindled or irregularly banded, the tarsi (5th excepted) broadly banded in dark brown

and white. 5th tarsal segment of the hind-legs, only, white. Wings mostly yellow, with spots and blotches of dark brown; the front edge with 2 minute dark specks and 4 dark spots. Scutum with broad appressed scales, and with a pair of conspicuous laterally-placed dark brown spots. Common in Africa (also in Palestine).

36. *ANOPHELES CINCTUS*, Newstead & Carter ("*Cellia*" *cincta*). Said to differ from *A. pharocensis* in having the alternate banding of the tarsal segments particularly regular, and the 5th tarsal segment of all the legs yellow. Must be regarded as a very doubtful "species," as it is founded on a single female specimen (from Ashanti) with the palpi broken and the front legs wanting.

37. *ANOPHELES JACOBI*, Hill & Haydon ("*Cellia*" *jacobi*). Much like *A. pharocensis*, but the 5th tarsal segment of all the legs is white-tipped, and the other tarsal segments are not banded. Natal. This also seems to be doubtfully distinct from No. 35.

II Synopsis of Oriental Species of Anopheles, ♀.

(a) Wings not spotted:—

1. *ANOPHELES AITKENI*, James (= *A. treacheri*, Leicester, *Stethomyia fragilis*, Theob., and *Neostethopheles culiciformis*, James & Liston). Palpi and legs slender, not banded. Scutum and abdomen with hairs. Darts of head extremely slender. *Stethomyia pallida*, Ludlow, from the Philippines, is probably this species.

2. *ANOPHELES BARIANENSIS*, James. Differs from *A. aitkeni* in having normal darts on the head. Punjab Himalayas.

3. *ANOPHELES IMMACULATUS*, Theob. Palpi with 3 light bands, namely 2 narrow and a broad terminal. Legs yellowish, the tarsi darker, with faint terminal bands, least inconspicuous in hind-legs. Wings with yellowish veins and pallid scales. Scutum and abdomen with hairs. E. Coast of Madras.

(b) Wings spotted. Femur of hind-legs with a conspicuous terminal ruff of outstanding scales not found in any other species (except sometimes, according to C. Strickland, in *Anopheles barbirostris*):—

4. *ANOPHELES ASIATICUS*, Theob. (= *Lophoscelomyia asiatica*). Palpi shaggy, not banded. The ruff on the hind femora consists of a proximal mass of outstanding black scales and a distal mass of outstanding white scales. Wing scales mostly dark coloured; two conspicuous yellow spots on front edge of wing. 8th abdominal segment covered with scales. Malay Peninsula.

5. *ANOPHELES WELLINGTONIANUS*, Alcock. The ruff on the hind femora consists entirely of outstanding black scales, proximal of which is a broad band of small appressed white scales. On the front edge of the wing there are two yellow spots, one of which (situated at tip) is conspicuous, the other (situated just beyond the middle) being a mere speck. No scales on 8th abdominal segment, but there may be a projecting wisp of scales on the 7th abdominal sternum. Malay Peninsula.

(c) *Wings dappled, the front edge black with only one, or two, light spots (fig. A); rather large species:—*

6. ANOPHELES LINDESAYI, Giles. Palpi slender, black, not banded. Legs black, a broad white band across middle third of hind femora much as in the nearly-related *A. wellingtonianus*. Wings spotted rather sparsely, the front edge black with one large white spot (at tip). Scutum and abdomen with hairs. Himalayas. A variety, *maculatus*, Theobald, from the Eastern Himalayas, has some additional black spots on the wing, arranged much as in *A. maculipennis*.

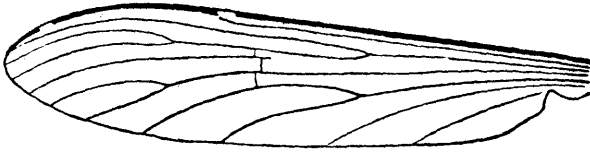
7. ANOPHELES UMBROSUS, Theob. (*Myzorhynchus umbrosus*). Palpi rather shaggy, black, not banded. Legs brown, the extreme tips of the tarsal segments paler, but not forming distinct bands. Wings mostly black scaled, the light spots few; the front edge black with a whitish spot at tip and usually a minute light spot just beyond the middle. Scutum and abdomen with hairs. Malay Peninsula and Borneo (also W. Africa).

8. ANOPHELES ALBOTENIATUS, Theob. (*Myzorhynchus alboteniatus*). Palpi shaggy, black, not banded. In the hind-legs the 5th tarsal segment is white, and there are white bands at the joints of all the other tarsal segments. Wings mostly black scaled, front edge black with two small yellow spots situated just as in *umbrosus*. Scutum and abdomen with hairs. Malay Peninsula.

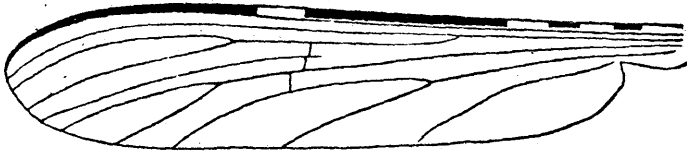
9. ANOPHELES BARBIROSTRIS, v. d. Wulp (*Myzorhynchus barbirostris*, Theobald). Palpi very shaggy, black, not banded. Legs black with the tips of the segments pale, in the hind tarsi showing as distinct white banding. Wings mostly black scaled, the light spots few; the front edge black with a whitish spot at tip and a minute and inconstant light spot beyond the middle. Scutum with hairs. Abdomen always with a projecting clump of dark scales on the 7th abdominal sternum, and usually with one or two projecting wisps of white scales on all or most of the other abdominal sterna; occasionally the abdominal sterna are covered with scales. Oriental region generally.

10. ANOPHELES BANCROFTI, Giles (= *Myzorhynchus pseudobarbirostris*, Ludlow). Agrees with *A. barbirostris* in every particular, except that the femora and tibiae are sparsely speckled with white. May reasonably be regarded as a variety of that species. Philippines (also Australia).

11. ANOPHELES SINENSIS, Wiedemann (= *Anopheles ranus*, Walker, *A. nigerrimus*, Giles, *A. pseudopictus*, Grassi, *Myzorhynchus minutus*, Theob., and *M. pediteniatus* and *separatus*, Leicester). Palpi rather shaggy, black, with 4 (sometimes 3, or even 2) narrow white bands, one of which is almost always terminal. Legs black, the tips of the segments light tawny and showing as distinct—though variable—tarsal banding. Wings black-scaled with some tawny patches; the front edge black with a small and inconstant tawny spot beyond the middle and a larger one constantly near the tip. Scutum with hairs. A prominent tuft of scales on the 7th abdominal sternum. A common and variable Oriental species which is also found in the Palearctic region, both to the north-east and north-west. *Anopheles plumiger*, Donitz, seems to be another synonym.



A



B



C



D

(d) *Wings spotted, the front edge in its proximal fourth white with two small black streaks, in its distal three-fourths black with one or two white streaks (fig. B) ; large species :—*

12. *ANOPHELES GIGAS*, Giles. Palpi slender, black, not banded, decidedly shorter than proboscis. Legs dark brown with lightish bands at the joints of all the segments. Wings mostly white-scaled with numerous black spots and streaks, two long and broad black streaks occupying the greater part of the anterior edge. Scutum and abdomen with hairs. Nilgheri Hills of S. India.

12 a. *ANOPHELES GIGAS*, var. *REFUTANS*, nov. Differs from the typical form only in having 3 or 4 *very* narrow white bands on the palpi, one of them *usually* being terminal. Hills of Ceylon.

12 b. *ANOPHELES GIGAS*, var. *SIMLENSIS*, James (*Patagiamyia simlensis*). Differs from the typical form only in having (a) 3 narrow white bands on the palpi, and (b) the bands across the inter-segmental joints of the legs broader and whiter. (The tip of the palpi is black, not white or yellowish as usually in var. *refutans*.) Western Himalayas.

13. *ANOPHELES FORMOSUS*, Ludlow. Palpi rather coarse, brown, with 3 narrow light bands, one of which is terminal. Legs brown, with yellowish knee-spots, and yellowish bands at the intertarsal articulations except the last of the front and middle legs. Wings yellowish with brown spots; front edge with 2 small and 2 large brown "spots." Scutum and abdomen with hairs. Philippine Is. .

(e) *Wings spotted, the front edge broken into numerous alternate light and dark spots or streaks (figs. C, D). Palpi banded. Scutum never bearing broad appressed scales. Abdomen usually with hairs, but never bearing many or conspicuous scales [No. 14 to No. 24] :—*

(e i.) *Legs not distinctly banded ; tip of palpi brown :—*

14. *ANOPHELES TURKHUDI*, Liston. Palpi slender with three narrow white bands and brown tip. Legs deep brown, the extreme tip of some of the segments may be paler, but there is no distinct tarsal banding. Wings dusky with yellow spots, the front edge with 2 yellow specks near base and 4 yellow spots or streaks. Scutum and abdomen with hairs. India.

15. *ANOPHELES CHAUDOYEI*, Theob. (= *Pyrethophorus chaudoyei* and *nigri-fasciatus*, Theob.). The vestiture of the scutum consists of very distinct scales, and the scales of the wings are more yellow; otherwise as *A. turkhudi*, Baluchistan (also N. Africa). James and Liston seem to have very well justified doubts whether this "species" is really distinct from *A. turkhudi*, which is the prior name.

(e ii.) *Legs not distinctly banded ; tip of palpi white :—*

16. *ANOPHELES CULICIFACIES*, Giles (*Myzomyia culicifacies* in Theobald). Palpi slender, brown, with 3 white bands, one of which, a little broader than the others, is terminal. Legs brown, the extreme tip of some of the segments

may be paler, but there is no distinct tarsal banding. Wings with yellowish and tawny spots; front edge dark with four almost equidistant and equal whitish streaks; the 3rd longitudinal vein with mainly dark scales. Scutum and abdomen with hairs. Rests like a *Culex*. India and Ceylon.

Anopheles leptomeres, Theobald, is probably a synonym of this species.

17. ANOPHELES LISTONI, Liston (*Myzomyia christophersi*, Theob.). Differs from *A. culicifacies* only in having mainly yellow scales on the 3rd longitudinal vein and the light spots or streaks on the front edge of the wing smaller.

Anopheles minimus, Theob. (*Pyretophorus minimus*), from Hongkong, described from an imperfect female, seems from the description to be identical with *A. listoni*; as also does *A. aconitus*, Dönitz.

(c iii.) *Some of the legs with distinct tarsal bands; tip of palpi white:—*

18. ANOPHELES ROSSI, Giles (*Myzomyia rossi*, Theobald, *Nyssomyzomyia rossi*, James & Liston). Palpi brown, with 3 white bands, two being narrow and the terminal one being broad. Legs brown, the long segments (5th tarsal excepted) all with a white tip, which—particularly in the case of the front legs—shows as distinct tarsal banding; under a lens the femora and tibiae sometimes look speckled or mottled. Wings yellow with dark brown spots; the front edge yellow with two fine dark brown specks proximally, and four dark brown streaks, the second of which has the shape of a squat T. Scutum with hairs. Some not very conspicuous narrow scales on the last two abdominal segments.

Very common throughout the Oriental region.

19. ANOPHELES LUDLOWI, Theob. (*Myzomyia ludlowi*, Theob., *Nyssomyzomyia ludlowi*, James & Liston). Differs from *A. rossi* chiefly in having the femora and tibiae decidedly speckled, the terminal band of the palpi narrower, and the two narrow bands more widely separated. Most authorities regard it as a distinct species. But for the fact that it is said to be a malaria-carrier in the Andamans, I should regard it as a variety of *A. rossi*. Philippines, Malay Peninsula, India.

20. ANOPHELES INDEFINATUS (*Myzomyia indefinata*). Differs from *A. rossi* in having the terminal band of the palpi narrower, and the two narrow bands more widely separated. The differences between these three species—if they are distinct species—can only be appreciated by actual comparison of specimens. (The incidence of palp-bands is, in several species of *Anopheles*, so inconstant and variable, that it does not by itself supply a definition for a species.)

21. ANOPHELES JEYPORENSIS, James (*Pyretophorus jeyporensis*). Palpi slender, dark, with 3 white bands, two being narrow and the terminal one broad. Legs almost black, the extreme tips of the segments almost white, showing as distinct though very narrow tarsal banding. Wings with white and black spots and streaks; the front edge black with two white specks and four white spots gradually increasing in size from the first to the third. Abdomen with hairs. Scutum with narrow white scales. Central and Southern India.

22. *ANOPHELES ALBROSTRIS*, Theob. (*Myzomyia albistrotris*). Basal half of proboscis black, distal half yellow. Palpi slender, the basal two-thirds dark, with a narrow, white, median band, the distal third yellow with (usually) a very narrow black median band. Legs dark brown, the tip of the first four tarsal segments light—forming distinct though narrow banding, at least in the front legs. Wings yellow with dusky spots, the front edge black with a yellow speck followed by three or four small yellow spots; all the scales of the 3rd longitudinal vein yellow. Malay Peninsula.

23. *ANOPHELES PUNCTULATUS*, Dönitz (= *Myzomyia tessellata*, Theob., and *Nyssomyzomyia punctulata*, James & Liston). Basal half and tip of proboscis black, distal half (tip excepted) light tawny or white. Palpi slender, basal half black with a narrow white band, distal half white with two very narrow dark bands (and so commonly described as having 4 white bands). Legs dark brown, the femur, tibia, and to a less extent the first tarsal segment regularly and copiously spotted light tawny, the next three tarsal segments with light tawny tips which (except in the hind-legs) involve the articulations, and in the front legs form broadish banding. Wings spotted, black and light tawny; front edge black with one or two tawny specks followed by four tawny spots. Scutum and abdomen with hairs. India, Malaya, Siam.

Anopheles thurstoni, Ludlow, from the Philippines, is probably this species.

Anopheles deceptor, Dönitz, from Sumatra, is so named on account of its deceptive (?) resemblance to *A. punctulatus* and *A. leucosphyrus*. From the description the principal difference from *A. punctulatus* appears to be in the details of the colouring of the palpi. These in the distal half are white with 2 dark rings, and in the proximal half are dark with the first segment white above. Such a difference cannot be regarded as specific.

24. *ANOPHELES LEUCOSPHYRUS*, Dönitz (= *Pyretophorus elegans*, Theob., and *Neomyzomyia elegans*, James). Proboscis black with white tip. Palpi slender with 4 white bands, the broadest of which is terminal. Legs as in *punctulatus*, but the spotting of femur &c. is white, and in the hind-legs the white band across the junction of the tibia and first tarsal segment is particularly broad. Wings much spotted; front edge black with 1 or 2 white specks followed by four white breaks. Scutum and abdomen with hairs. India, Ceylon, Sumatra.

(f) *Wings spotted, the front edge broken into numerous alternate light and dark spots or streaks (fig. D). Palpi and legs banded. Scutum with broad, elliptical, appressed scales which are usually white. There may be some scales on the abdomen, but never prominent lateral or sternal tufts:—*

25. *ANOPHELES MACCLATUS*, Theob. (= *Nyssorhynchus maculatus* and *pseudocillmori*, Theob.). Basal two-thirds of palpi black with narrow white median band, distal third white with narrow black median band; sometimes there are also white scales sprinkled among the black. Proboscis black, pale at tip. Legs dark brown; femur, tibia, and first tarsal segment speckled with white or light tawny spots; in the front legs, and usually in the middle legs also, the articulations between the tarsal segments are white; in the hind legs the

2nd tarsal segment has a white tip, the 3rd is white with a broad dark band, the 4th is white with a narrower band, and the 5th is entirely white. Wings spotted black and white: the front edge black with 2 white specks followed by 4 white spots. Scutum with broad, white, appressed scales. Abdomen with some scales among the hairs on the last two segments. Northern India, Malay Peninsula.

25 a. *ANOPHELES MACULATUS*, var. *WILLMORI*, James (= *Neocellia willmori*, James, and *Neocellia dudycoui* and *indica*, Theob.). Differs from the typical only in having scales on all the abdominal terga, and the black parts of the palpi not speckled as they sometimes are in typical *maculatus*. Punjab Himalayas, Kashmir and adjacent parts.

25 b. *ANOPHELES MACULATUS*, var. *THEOBALDI*, Giles. Like the type, except that in the hind-legs there is no dark band on the 4th tarsal segment, so that that segment is entirely white (as well as the 5th), and that the black parts of the palpi are not speckled. Peninsular India.

26. *ANOPHELES FULIGINOSUS*, Giles (= *Nyssorhynchus fuliginosus* and *nicipes*, Theob.). Palpi black with 3 white bands, two being narrow and one broad (terminal). Legs black or brown, the long joints not speckled; in the front and middle pair the apex of the first 3 tarsal segments is white; in the hind pair the last 3 tarsal segments and the distal end of the 2nd are snow-white. Wings spotted white on black; the front edge black with 4 or 5 small white spots. Scutum with broad, white, appressed scales. Abdomen with scales fairly plentiful on the last two terga. India in general; Malay Peninsula.

A. leucopus, Dünitz, seems to be a synonym of this species. *Calvertina lineata*, Ludlow, is nothing very different.

26 a. *ANOPHELES FULIGINOSUS*, var. *PHILIPPINUS*, Ludlow (*Nyssorhynchus philippinensis*, Ludlow). The broad terminal white band of the palpi is cut in two by a narrow band of dark scales, so that the palpi have four white bands. Philippines, Siam.

26 b. *ANOPHELES FULIGINOSUS*, var. *ADIEI*, James & Liston. The broad terminal white band of the palpi is cut in two by a narrow band of dark scales; in the hind-legs the 2nd tarsal segment and the proximal end of the 3rd are dark.

26 c. *ANOPHELES FULIGINOSUS*, var. *FOWLERI* (*Neocellia fowleri*, Christophers). The white spots on the front edge of the wing are larger, and scales may be present on several of the abdominal terga.

27. *ANOPHELES JAMESI*, Theob. (*Nyssorhynchus jamesi*). Differs from *A. fuliginosus*, Giles, principally in having the femur, tibia, and first tarsal segment of the legs copiously spotted with white. Peninsular India.

28. ANOPHELES MACULIPALPIS, Giles (= *Nyssorhynchus indensis*, Theob.). Differs from *A. jamei* principally in having the palpi speckled with white (in addition to the 3 white bands). Peninsular India; N.W. Himalayas (also Africa).

The above, No. 26 to No. 28, form a very nice series, *A. maculipalpis*, Giles, having the right of priority. Compare the corresponding African series (p. 168), all probably referable to *A. maculipalpis*, Giles.

Anopheles foveæ, Banks ("Pyretophorus" *foveæ*) from the Philippines, would appear to come in the same series.

29. ANOPHELES STEPHENSI, Liston (= *Neocellia stephensi*, Liston, and *Neocellia intermedia*, Rothwell). Palpi dark, with two broad white bands (one being terminal) in the distal half, and two or three white patches or narrow bands in the proximal half. Wings spotted black and yellow; the front edge with 2 small black specks followed by four black streaks, the 2nd of which is squat T-shape as in *A. rossi*. Legs dark brown; femur, tibia, and to a less extent the first tarsal segment speckled with tawny spots, the tips of all the tarsal segments except the 5th light tawny. Scutum with appressed yellowish scales. Scattered scales on all the abdominal terga except the 1st. India generally.

Anopheles rugus, Dönitz, from the Malay Archipelago, though considered by the author to be closely related to *A. rossi*, appears from the figures and description to approach *A. stephensi*.

30. ANOPHELES KARWARI, James (= *Nyssorhynchus maculatus*, Theob. *partim*). Palpi dark with 4 white bands, namely, 2 narrow followed by 2 broad, one of the latter being terminal. Legs dark brown, not speckled; in the front and middle legs the tips of the first 3 tarsi are white, in the hind legs the tips of the first 4 and the whole of the 5th are white. Wings spotted black and white; front edge with 2 white specks and 4 white spots. Scutum with broad, appressed, white scales. Scales on last 2 abdominal segments. Bombay Presidency; Malay Peninsula.

(g) Wings spotted; the front edge broken into numerous alternate dark and light spots or streaks (fig. D). Palpi and legs banded. Scutum with broad scales. Abdomen with numerous scales on all the segments, and also with regular tufts (lateral or ventral) of projecting scales:—

31. ANOPHELES PULCHERRIMUS, Theobald (*Cellia pulcherrima*). Palpi brown frosted with white, and with 4 white bands, the broadest of which is terminal. Legs brown frosted with white, the tips of all the segments white; in the front and middle legs the 4th and 5th tarsi are brown, in the hind-legs the greater part of the 2nd and the whole of the 3rd, 4th, and 5th tarsi are white. Wings spotted brown on white; the front edge with 2 black specks followed by 4 black streaks. Scutum with broad, white appressed scales. Abdomen plentifully covered with broad white scales and with a pair of laterally-projecting tufts of dark scales on each segment. N.W. India, Persia, Bombay.

32. *ANOPHELES KOCHI*, Dönitz ("Cellia" *kochi*, Theob., *Christophersia hulli*, James). Palpi described as displaying dorsally 5 broad white bands separated by 4 narrow black bands: they vary, even on opposite sides of the same individual: commonly they are dusky at base, and white and yellow in the distal three-fourths or more where there are 3 or 4 very narrow dark bands. In all the legs, the femur, tibia, and 1st tarsal segment are copiously brindled or banded: in the front legs both ends of the next 3 tarsal segments are white: in the hind-legs the distal end of the 2nd tarsal segment is white, and the next 3 segments are white with a dark band (gradually decreasing in breadth) across the middle. Wings spotted dark brown on yellow: front edge with numerous unequal, rather irregular, and not very large blackish spots. Scutum with broad white scales and narrow curved scales and hairs: a pair of dark round lateral spots are here conspicuous. Abdominal terga with hairs and scales: the sterna, from the 2nd to the 7th, each with a vertically-projecting bifid tuft of dark scales. Malay Peninsula and Islands; Assam.

33. *ANOPHELES FLAVUS*, Ludlow ("Cellia" *flava*) agrees—so far as description goes—with *A. kochi*, Dönitz, but the tufts of dark scales on the abdominal terga are stated to be lateral. Philippines.

EXPLANATION OF FIGURES.

Figs. A, B, C, D.—Diagrams of wing-patterns in the genus *Anopheles*.

SOME NOTES ON *Stegomyia fasciata* IN THE COAST TOWNS OF BRITISH SOMALILAND.

By R. E. DRAKE-BROCKMAN, M.R.C.S., L.B.C.P.

(1) Eggs.

The eggs of *Stegomyia fasciata* are about 1-1.5 mm. in length, black or dark brown in colour and slightly curved. They are of an elongated oval shape with one end somewhat more obtuse than the other, while the surface has a rough and granular appearance.

They are always laid singly and never adherent together in rafts and usually along the water-line, and always within an inch of it adherent to the sides of the receptacle.

If the atmosphere is very dry and the water evaporates rapidly the eggs soon get lelt high and dry, but this does not seem to interfere with the majority of them except during the excessive heat of the summer months, when the maximum shade temperature rises as high as 109° F.

When the larvæ emerge the eggs are all usually fractured at about the same spot, obliquely where the outer third joins the inner at the obtuse end.

It is probable that all the eggs deposited in such receptacles as jam tins and in partly broken bottles after the rains and just previous to

the hot summer, get destroyed owing to the rapid evaporation of the water and the heating of the receptacles, the species being continued by the individuals which aestivate.

(2) LARVÆ.

The larvæ emerge under favourable conditions in from 2-3 days after the eggs are deposited and pupate in about 4 or 5 days. If food is scarce the larval stage may last for three weeks or more.

They will thrive in the smallest quantity of water, a thimbleful being sufficient for half-a-dozen of them. In point of fact, where water is plentiful in any receptacle it is surprising how many larvæ will exist together and thrive without devouring each other, a not uncommon occurrence when the food supply is getting scarce.

Stegomyia larvæ will coexist in the same water with those of *Culex salus* and probably other larvæ.

They prefer rain-water although brackish well-water is also acceptable.

(3) PUPÆ.

The pupal stage lasts about 24 hours, sometimes more, sometimes less, and there is little doubt that large numbers of the pupæ die in nature as they do when bred under artificial conditions. The great heat, especially during the last fortnight in June, on the Somali coast seems to be too much for them, as I have been unable to continue breeding experiments after that date under natural conditions.

(4) IMAGO.

As soon as the perfect insect emerges from the pupal case, head first, a process which only takes a few minutes, it rests for a short time on the surface of the water until it is ready to feed; this is not before 12 hours have elapsed, as I have never got the females to come to the arm on the day of their birth.

It is at this stage that some of their non-aquatic enemies attack them, and the commonest of these is the common little red ant so ubiquitous in the Tropics.

Doubtless these same ants, together with spiders, destroy large numbers of the aestivating mosquitoes as well.

In Table I. will be found a number of experiments conducted with a view to ascertain the length of life of *Stegomyia fasciata* when unfed, fed on dates, and lastly on human blood. In Table II. will be found the time occupied by the different stages of its life-history.

EXPLANATION OF TABLE I.

Exp. 1. Fed on dates.

All the females were dead by Dec. 25th and males by Jan. 22nd.

Exp. 2. Unfed.

All the 29 mosquitoes, male and female, were dead by the fourth day.

Exp. 3. Fed on blood.

Of the five experimented with, the males all died before the third day. One female escaped, while the other died on Jan. 9th, after surviving eight days.