

REGIONWISE PICTORIAL KEYS TO THE FEMALE
INDIAN ANOPHELES.

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THE SYSTEMATICS of Indian *Anopheles* have been thoroughly dealt by Christophers (1938) and the 40 species that occur in India can be correctly determined with Puri's dichotomous table (1955). However, these and other works regarding the classification of *Anopheles* are neither easily available nor easily understood by the beginners and workers not well versed in Entomology. Also, in view of the creation of six regional co-ordinating organisations, consisting of contiguous geographic areas, under the National Malaria Eradication Programme, it is felt desirable to prepare regionwise keys to the *Anopheles* of India. Such keys, it is hoped, will facilitate training programme in each region and it will take less time to train the workers in identifying the few species in an area and also they will not be confused with the species not present in a particular region.

The six keys presented here individually cover the six regions into which the whole country has arbitrarily been divided under the National Malaria Eradication Programme. Each of these keys deals with the identification of only those species which have been recorded from the respective States comprising any particular region. The characters not easily discernible to the beginner such as distinction between narrow and broad scales, etc., have not been used in these keys. Also every character mentioned in the key is illustrated by an appropriate drawing. For convenience, both the dichotomous nature of Puri's (*loc. cit.*) key as well as the groups used by Roy (Roy and Brown, 1954) have been used.

Since the keys are meant for beginners and other field workers under the National Malaria Eradication Programme a diagram to illustrate the external characters of a mosquito, and the main differences between anopheline and culexine adults is incorporated at the beginning.

REFERENCES

Christophers, S R. (1933) The Fauna of British India, Diptera, Vol. IV, Anophelini Taylor & Francis Co., London.

Puri, I. M. (1936) Synoptic table for the identification of the Anopheline Mosquitoes of India. Health Bulletin No. 10, Fourth Edition. Manager of Publications, Delhi.

Roy, D. N. and Brown, A. W. A. (1954) Entomology Medical and Veterinary, Second Edition. Excelsior Press, Calcutta.

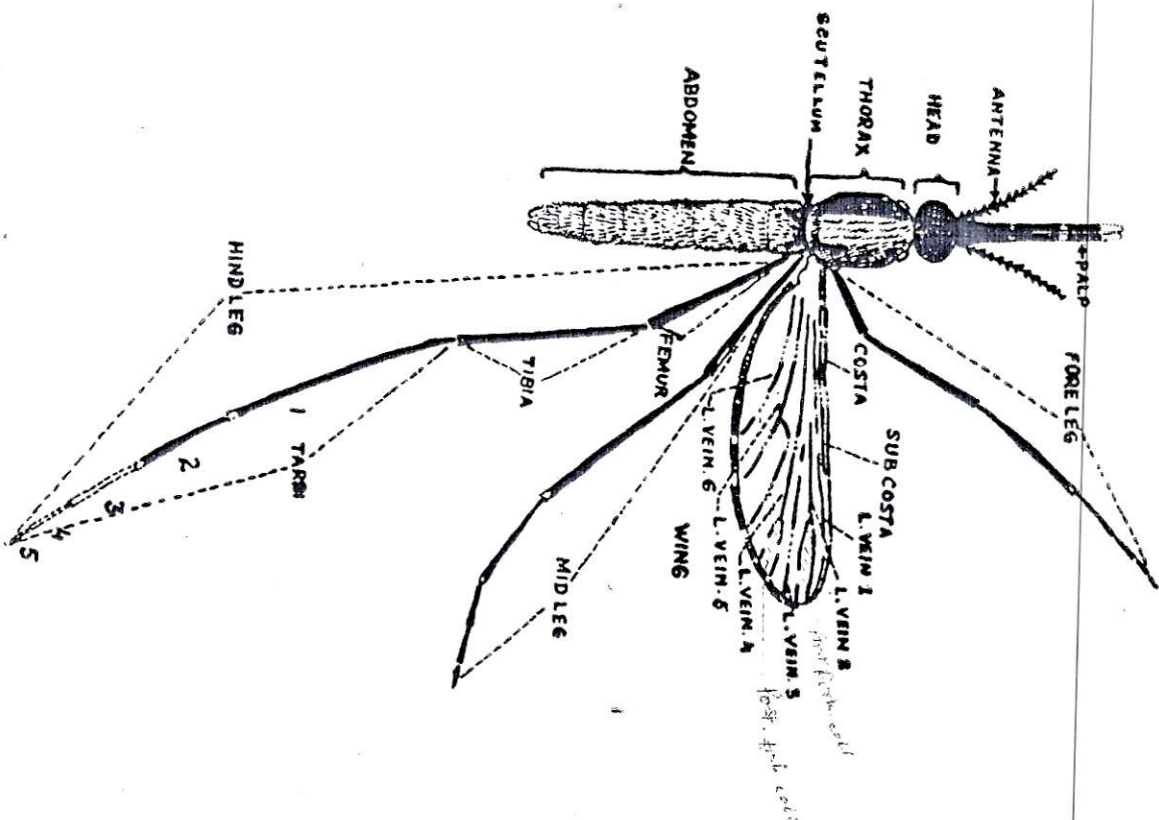
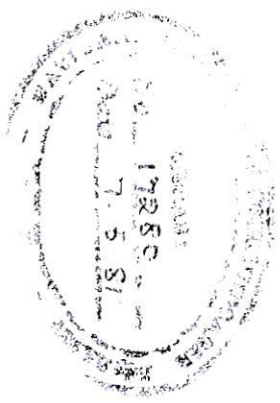
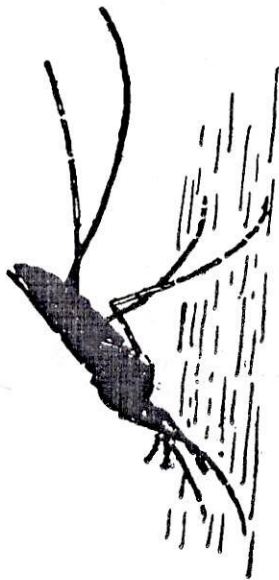


Diagram showing the external morphology of a female *Anopheles*. (Wing and legs of left side not shown).

NOTE :-Read Tarsus instead of Tarsi.

Differences between adult *Anopheles* and *Culex* mosquitoes.

1. Resting posture (live specimen).



Anopheles

The proboscis, head, and abdomen are in a straight line with the abdomen pointing away from the resting surface



Culex

The proboscis and body are not in a straight line, the abdomen being inclined towards the resting surface.



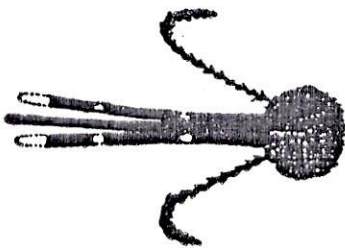
2. Wings. Generally spotted with white and dark scales.



Generally unspotted with only dark scales.

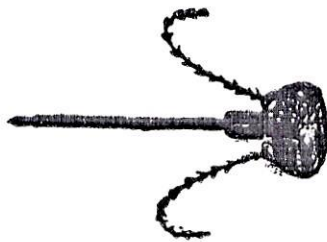
Identification of *Anophelines*

Anopheles

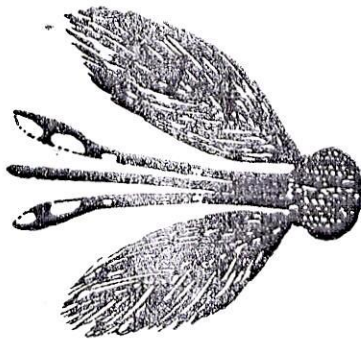


3. Palpi (Female). Palpi slender and equal to the proboscis.

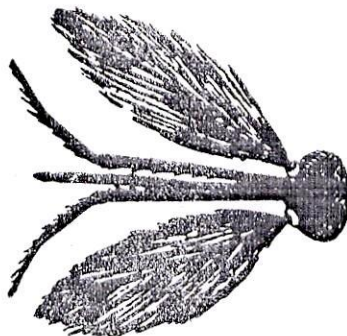
Culex



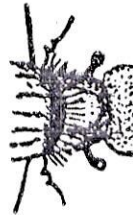
Palpi stub-like, reduced.



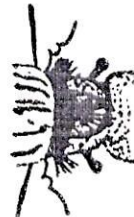
- (Male) Club-shaped at the distal ends and nearly equal to proboscis.



Pointed, bent and usually longer than the proboscis.



4. Scutellum. Half moon shaped with a uniform row of hairs along the margin.



Trilobed, with three bunches of hairs on the lobes.

Differences between adult *Anopheles* and *Culex* mosquitoes.

1. Resting posture (live specimen).



Anopheles

The proboscis, head, and abdomen are in a straight line with the abdomen pointing away from the resting surface.



Culex

The proboscis and body are not in a straight line, the abdomen being inclined towards the resting surface.

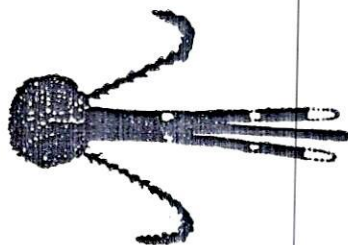


2. Wings. Generally spotted with white and dark scales.



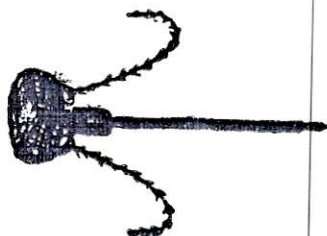
Generally unspotted with only dark scales.

Anopheles

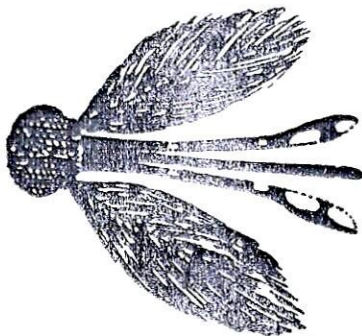


3. Palpi (Female). Palpi slender and equal to the proboscis.

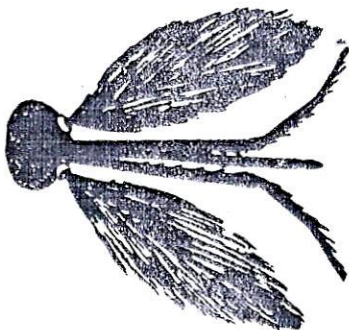
Culex



Palpi stub-like, reduced.



- (Male) Club-shaped at the distal ends and nearly equal to proboscis.



Pointed, bent and usually longer than the proboscis.



4. Scutellum. Half moon shaped with a uniform row of hairs along the margin.



Trilobed, with three bunches of hairs on the lobes.

Identification of *Anophelinae*

Anopheles



5. Abdomen. Without scales or with a few scattered scales.

Culex



With uniform rows of over-lapping flat white and dark scales.

BANGALORE REGION

States : Kerala, Madras and Mysore.

Anopheles present :

aconitus, *aikeni*, *annandalei*, *annularis*, *barbirostris*, *culiciformis*, *fuviatilis*, *gigas*, *hyrcanus*, *insulæflorum*, *jamesi*, *jeyporiensis*, *karwari*, *leucosphyrus*, *lindesayi*, *maculatus*, *majidi*, *minimus*, *moghulensis*, *pallidus*, *philippinensis*, *sintoni*, *splendidus*, *stephensi*, *subpictus*, *tessellatus*, *theobaldi*, *turkhudi*, *vagus* and *varuna*.

1. Wings completely dark...

**A. aikeni*

**A. insulæflorum*

**A. culiciformis*

**A. sintoni*



— Wings with three or less than three dark spots on costa involving vein 1.... Group A.



— Wings with four or more dark spots on costa involving vein 1. ... Group B.



Group A.

(*annandalei*, *barbirostris*, *gigas*, *hyrcanus*, *lindesayi*.)

1. Palpi all dark.... ...2



— Palpi with white bands...3



* *A. culiciformis* and *A. sintoni* can be distinguished from *aikeni* and *insulæflorum* by the presence of broad scales on the head. *A. sintoni* and *insulæflorum* are rare species and can be separated from *culiciformis* and *aikeni* respectively by the structure of male genitalia.

Group B.

2. Hind femur with white band.... *A. lindesayi*.



(*acanthus*, *annularis*, *culicifacies*, *fluviatilis*, *jamesi*, *jayporiensis*, *kervari*, *leucosphyrus*, *maculatus*, *majidi*, *minimus*, *moghulensis*, *palidus*, *philippinensis*, *splendidus*, *stephensi*, *subpictus*, *tessellatus*, *theobaldi*, *turkhudi*, *vagus* and *varuna*.)

— Hind femur without any white band... *A. barthrostis*.



1. Femur and tibia speckled.
... Sub-Group I.



3. Hind femoro-tibial joint with a prominent black and white tuft of scales...
... *A. annandalei*.



— Femur and tibia not speckled... Sub-Group II.



Sub-Group I.

(*jamesi*, *leucosphyrus*, *maculatus*, *splendidus*, *stephensi*, *tessellatus*, *theobaldi*.)

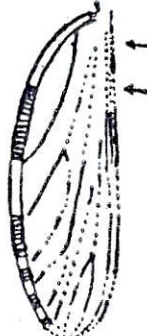
— Hind femoro-tibial joint without any such tuft ... 4



1. Tips of hind legs white... 2



4. Inner quarter of costa with white interruption...
A. gigas.



— Tips of hind legs not white... 4



2. Hind tarsi 5 and part of 4 white... *A. maculatus*.



— Inner quarter of costa completely dark...
A. hyrcanus.



— Hind tarsi 5, 4 and part of 3 white... *A. theobaldi*.



— Hind tarsi 5, 4 and 3 completely white... 3



3. Palpi speckled, apical and sub-apical white band equal ... *A. splendidus*.



— Palpi unspeckled, apical and sub-apical white band unequal... *A. jamesi*.



4. Palpi with three white bands and usually speckled ... *A. stephensi*.



— Palpi with four white bands and unspeckled.....5



5. Hind leg with broad white tibio-tarsal joint ... *A. leucosphyrus*.



— Hind leg without such white tibio-tarsal joint. ... *A. tessellatus*.



Sub-Group II.

(*aconitus*, *annularis*, *culicifacies*, *fluvialis*, *jeyporiensis*, *karwari*, *majidi*, *minimus*, *moghulensis*, *pallidus*, *philippinensis*, *subpictus*, *turkhadi*, *vagus* and *varuna*.)

1. Tips of hind legs white... ..2



— Tips of hind legs not white... ..6



2. Hind tarsi 5 and part of 4 white... ..3



— Hind tarsi 5, 4 and 3 completely white.... ..4



3. Palpi with three white bands.... *A. majidi*.



— Palpi with four white bands.... *A. karwari*.



4. Wing vein 5 mainly dark, with a dark spot at the point of bifurcation... .. *A. annularis*.



— Wing vein 5 mainly white with no dark spot at the point of bifurcation... ..5



5. Distal end of hind tarsus I picked out with white... .. *A. philippinensis*.*



— Distal end of hind tarsus I all dark.....*A. pallidus*.*



* These species can further be differentiated by the presence of broad white scales over ventral aspect of the abdominal segments. These scales extend over the last five or six segments in *pallidus* and are restricted to last 2 or 3 segments only in *philippinensis*.

6. Tarsal segments of fore legs with broad bands...7

— Tarsal segments of fore legs unbanded or with very narrow bands... ...8


7. Palpi with pre-apical dark band equal or nearly equal to the apical white band...
... ...*A. subpictus*.

— Palpi with dark pre-apical band not more than 1/2 the length of the apical white band... ...*A. vagus*.


8. Tips of the palpi black...
... ...*A. turkhudi*.

— Tips of the palpi white...9


9. Wing vein 3 mainly dark.
... ...*A. culicifacies*.

— Wing vein 3 mainly white.
... ...10


10. Apical white band on palpi equal to subapical white band... ...11

— Apical white band on palpi longer than sub-apical white band... ...13


11. Wing with a fringe spot at vein 6... ...*A. aconitus*

— Wing without a fringe spot at vein 6... ...12


12. Inner quarter of costa with white interruption on at least one wing... ...
A. minimus.

— Inner quarter of costa without any white interruption... ...*A. varuna*.


13. Inner quarter of costa with white interruption.
... ...*A. jeyporiensis*.

— Inner quarter of costa without white interruption... ...14.


14. Wing vein 6 with two dark spots, distal half being mainly dark...
... ...*A. fluvialis*.

— Wing vein 6 with three dark spots, distal half with pale interruption...
... ...*A. moghulensis*.


15. Wing vein 6 with three dark spots, distal half with pale interruption...
... ...*A. moghulensis*.



BARODA REGION

States : Gujarat, Maharashtra and Rajasthan.

Anopheles present : *acronitatus*, *aikeni*, *annularis*, *barbrosiris*, *culicifacies*, *culiciformis*, *fluvialis*, *gigas*, *hyrcanus*, *insulacolorum*, *jamesi*, *jeyporensis*, *karvuri*, *leucosphyrus*, *maculatus*, *minimus*, *moghalensis*, *multicolor**, *pallidus*, *pulcherri-*
mus, *philippinensis*, *ramsayi*, *splendidus*, *stephensi*, *subpictus*, *tessellatus*, *theobaldi*, *turkhadi*, *vagus* and *varun*.

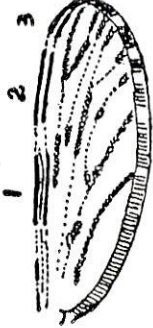
1 Wings completely dark...

- † *A. aikeni*
- † *A. insulacolorum*
- † *A. culiciformis*

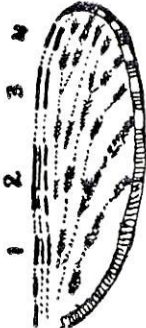


Wings with three or less than three dark spots on costa involving vein 1.....

...Group A.



Wings with four or more dark spots on costa involving vein 1.....Group B



* In India *A. multicolor* is recorded only from Kaira Distt. in Gujarat State by Viswanathan (1950) in *Malaria and its control in Bombay State*. This species is not, therefore, included in the text of this key. However, it can be identified from its closely resembling species—*A. turkhadi* by the presence of three dark spots on wing vein 6.

† *A. culiciformis* is a rare species and can be distinguished from *A. aikeni* and *insulacolorum* by the characteristic broad scales on the head. *A. aikeni* and *insulacolorum* can be separated by the structure of male genitalia.

Group A

(*barbirostris*, *gigas*, *hyrcanus*).

1. Palpi all dark... ..

... ..*A. barbirostris*.

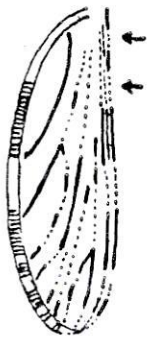


— Palpi with white bands...2



2. Inner quarter of costa with white interruption....

... ..*A. gigas*.



— Inner quarter of costa completely dark....

... ..*A. hyrcanus*.



Group B

(*acanthus*, *annularis*, *corticifacies*, *furialis*, *jamesi*, *j. pyrensis*, *karuuri*, *leucosphyrus*, *maculatus*, *minimus*, *negulensis*, *pallidus*, *pulcherrimus*, *philippinensis*, *ramsayi*, *splendatus*, *stephensi*, *subpictus*, *tessellatus*, *theobaldi*, *turkundi*, *vagus* and *varuna*.)

1. Femur and tibia speckled.

... ..Sub-Group I.



— Femur and tibia not speckled.....Sub-Group II.



Sub-Group I.

(*jamesi*, *leucosphyrus*, *maculatus*, *pulcherrimus*, *ramsayi*, *splendatus*, *stephensi*, *tessellatus*, *theobaldi*.)

Tips of hind legs white...2



Tips of hind legs not white.... ..5



Hind tarsi 5 and part of 4 white. *A. maculatus*.



Hind tarsi 5, 4 and part of 3 white.... *A. theobaldi*.



Hind tarsi 5, 4 and 3 completely white.... ..3.



3. Palpi speckled with apical and sub-apical white band equal.... *A. splendatus*.



— Palpi unspeckled, apical and sub-apical white band unequal.... ..4.



4. Dorsum of abdomen heavily clothed with white scales forming tufts.... ..*A. pulcherrimus*.
(in part)



— Dorsum of abdomen not so clothed. Last two segments covered with golden hairs and scales.... ..*A. jamesi*.



— Dorsum of abdomen not so clothed. Last two segments covered with dark scales.... *A. ramsayi*.



5. Palpi usually speckled, with three white bands.... *A. stephensi*.



— Palpi unspeckled, with four white bands.... *A. annularis*.



6. Hind leg with broad white tibio-tarsal joint.... *A. leucosphyrus*.



— Hind leg without such tibio-tarsal white joint. ... *A. tessellatus*.



Sub-Group II.

(*aconitus*, *annularis*, *culicifacies*, *fluvialis*, *jeyporiensis*, *karniari*, *minimus*, *moghalensis*, *pallidus*, *pulcherrimus*, *philippinensis*, *subpictus*, *turkhadi*, *vagus* and *varuna*.)

1. Tips of hind legs white...2



— Tips of hind legs not white.... *A. annularis*.



2. Hind tarsi 5 and part of 4 white.... *A. karniari*.



— Hind tarsi 5, 4 and 3 completely white.... *A. pulcherrimus*.



3. Dorsum of abdomen heavily clothed with white scales forming tufts.... *A. pulcherrimus*.



— Dorsum of abdomen not so clothed.... *A. annularis*.



4. Wing vein 5 mainly dark, with a dark spot at the point of bifurcation.... *A. annularis*.



— Wing vein 5 mainly white, with no dark spot at the point of bifurcation.... *A. annularis*.



5. Distal end of hind tarsi I picked out with white.... *A. philippinensis*.*



— Distal end of hind tarsi I all dark.... *A. pallidus*.*



6. Tarsal segments of forelegs with broad bands.... *A. annularis*.



— Tarsal segments of forelegs unbanded or with narrow bands.... *A. annularis*.



* These species can further be differentiated by the presence of broad white scales over ventral aspect of the abdominal segments. These scales extend over the last five or six segments in *pallidus* and are restricted to last 2 or 3 segments only in *philippinensis*.

7. Palpi with dark pre-apical band equal or nearly equal to the apical white band...
...*A. subpictus*.



11. Wing with fringe spot at vein 6...
...*A. acutus*.



— Palpi with dark pre-apical band not more than 1/2 the length of the apical white band...
...*A. vagus*.



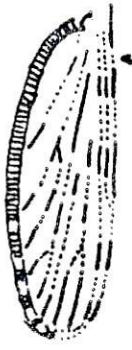
— Wing without a fringe spot at vein 6...
...12



8. Tips of the palpi black...
...*A. turkadi*.



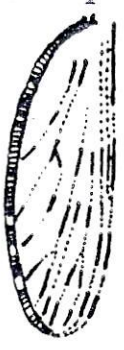
12. Inner quarter of costa with white interruption at least on one wing...
...*A. minimus*.



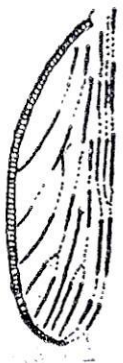
— Tips of the palpi white...9



— Inner quarter of costa without white interruption...
...*A. narva*.



9. Wing vein 3 mainly dark.
...*A. cuticifacies*.



13. Inner quarter of costa with white interruption.
...*A. jeyporensis*.



— Wing vein 3 mainly white.
...10



— Inner quarter of costa without white interruption...
...14



10. Apical white band on palpi equal to sub-apical white band...
...11



— Apical white band on palpi longer than sub-apical white band...
...13



14. Wing vein 6 with two dark spots, distal half being mainly dark...
...*A. fluviatilis*.



— Wing vein 6 with 3 dark spots, distal half with pale interruption...
...*A. moghensis*.



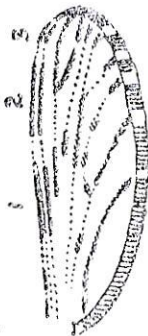
CUTTACK REGION

States : Bihar and Orissa.

Anopheles present : *aconitus*, *aikeni*, *annularis*, *barbirostris*, *culicifacies*, *fluvialilis*, *hyrcanus*, *jamesi*, *jeyporiensis*, *maculatus*, *majidi*, *minimus*, *mogkulensis*, *pallidus*, *philippinensis*, *karuvari*, *ramsayi*, *splendidus*, *stephensi*, *subpictus*, *sundaicus*, *tessellatus*, *theobaldi*, *vagus* and *varuna*.



1. Wings completely dark. ...
... .. *A. aikeni*.



— Wings with three or less than three dark areas on costa involving vein 1.
... .. Group A.



— Wings with four or more dark areas on costa involving vein 1. ... Group B.

Group A.

(*barbirostris*, *hyrcanus*)



1. Palpi all dark. ...
... .. *A. barbirostris*.



— Palpi with some white bands. ... *A. hyrcanus*.

Group B.

(*aconius*, *annularis*, *culicifacies*, *fluvialis*, *jamesi*, *jeyporiensis*, *maculatus*, *mejidi*, *minimus*, *moghulensis*, *pallidus*, *philippinensis*, *karwari*, *ramsayi*, *splendidus*, *stephensi*, *subpictus*, *sundicus*, *tessellatus*, *theobaldi*, *vagus* and *varuna*.)

Anophelines of Cuttack Region

3. Palpi speckled, apical and sub-apical white bands equal.... *A. splendidus*.



I. Femur and tibia speckled
... Sub-Group I



— Palpi unspeckled, apical and sub-apical white bands unequal.... *A. jamesi*.



— Femur and tibia not speckled.... Sub-Group II



4. Dorsum of 7th and 8th abdominal segments covered with golden hairs and scales.... *A. ramsayi*.



(*jamesi*, *maculatus*, *ramsayi*, *splendidus*, *stephensi*, *sundicus*, *tessellatus*, *theobaldi*.)

Sub-Group I

— Dorsum of 7th and 8th abdominal segments covered with dark scales only.... *A. ramsayi*.



1. Tips of hind legs white... 2



5. Palpi with three white bands.... *A. theobaldi*.



— Tips of hind legs not white... 5



— Palpi with four white bands.... *A. tessellatus*.



2. Hind tarsi 5 and part of 4 white.... *A. maculatus*.



— Hind tarsi 5, 4 and part of 3 white.... *A. theobaldi*.



1. Palpi usually speckled, the apical and sub-apical white bands equal.... *A. stephensi*.



— Hind tarsi 5, 4 and 3 completely white.... 3



— Palpi unspeckled, the apical and sub-apical white bands unequal.... *A. sundicus*.



Sub-Group II

(*aconitus*, *annularis*, *culicifacies*, *fluvialis*, *jeyporiensis*, *karwari*, *majidi*, *minimus*, *moghalensis*, *pallidus*, *philippinensis*, *subpictus*, *vagus* and *varuna*).

1. Tips of hind legs white...2



— Tips of hind legs not white... ..6



2. Hind tarsi 5 and part of 4 white... ..3



— Hind tarsi 5, 4 and 3 completely white... ..4



3- Palpi with three white bands... ..*A. majidi*.



— Palpi with four white bands... ..*A. karwari*.



4. Wing vein 5 mainly dark, with a dark spot at the point of bifurcation... ..*A. annularis*.



— Wing vein 5 mainly white, without a dark spot at the point of bifurcation... ..5



Anophelines of Cutback Region

Distal end of hind tarsus I picked out with white... ..*A. philippinensis* *



Distal end of hind tarsus I all dark... ..*A. pallidus* *



6. Tarsal segments of forelegs with broad white bands... ..7



Tarsal segments of forelegs unbanded or with very narrow bands... ..8



7. Palpi with dark pre-apical band equal or nearly equal to the apical white band... ..*A. subpictus*.



— Palpi with dark pre-apical band not more than 1/2 the length of the apical white band... ..*A. vagus*.



8. Wing vein 3 mainly dark... ..*A. culicifacies*.



— Wing vein 3 mainly white... ..9



* These species can further be differentiated by the presence of broad white scales over ventral aspect of the abdominal segments. These scales extend over the last five or six segments in *pallidus* and are restricted to last 2 or 3 segments only in *philippinensis*.

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Anophelines of Cutlack Region

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9. Palpi with apical white band equal to sub-apical white band... ..10



— Palpi with apical white band longer than sub-apical white band... ..12



10 Wing with a fringe spot at vein 6... ..*A. aconitus*.



— Wing without a fringe spot at vein 6... ..11.



11. Inner quarter of costa with white interruption at least on one wing... ..*A. minimus*.



— Inner quarter of costa without any white interruption... ..*A. varuna*.



12. Inner quarter of costa with some white interruption... ..*A. jeyporiensis*.



— Inner quarter of costa without white interruption13



13. Wing vein 6 with two dark spots, distal half mainly dark... ..*A. fluviatilis*.



— Wing vein 6 with three dark spots distal half with pale interruption... ..*A. moghulensis*.



DELHI REGION

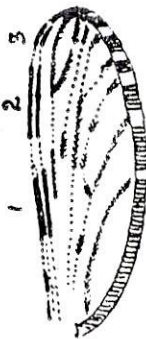
States : Delhi, Himachal Pradesh, Jammu & Kashmir, Punjab and Uttar Pradesh.

Anopheles *aconitus*, *annularis*, *barbirostris*, *barianensis*, *culicifacies*, *d'thali*, *fluvialis*, *gigas*, *hyrcanus*, *jamesi*, *jeyporiensis*, *lindesayi*, *maculatus*, *majidi*, *minimus*, *moghulensis*, *pallidus*, *pinjarensis*, *pulcherrimus*, *splendidus*, *stephensi*, *subpictus*, *tessellatus*, *theobaldi*, *turkhudi*, *vagus* and *varuna*.

1. Wings completely dark ...
**A. barianensis*.
**A. pinjarensis*.



Wings with three or less than three dark spots on costa involving vein 1 ...
... ..Group A.



Wings with four or more dark spots on costa involving vein 1 ...
... ..Group B



Group A.

(*barbirostris*, *gigas*, *hyrcanus* and *lindesayi*.)

1 Palpi all dark 2



Palpi with white bands...3



* These are rare species. *A. barianensis* can be differentiated from *pinjarensis* by the presence of a pale spot on the vertex.

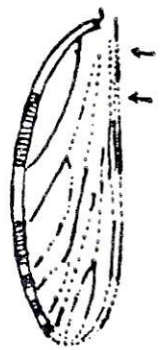
2. Hind femur with a white band ... *A. lindesayi*.



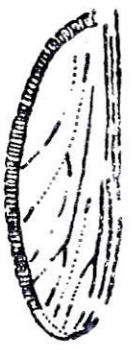
— Hind femur without any white band ... *A. barthrosensis*.



3. Inner quarter of costa with white interruptions ... *A. gigas*.



— Inner quarter of costa completely dark ... *A. hyrcanus*.



Group B.

(*aconius*, *annularis*, *cuticifacies*, *d'ibali*, *fluviatilis*, *jamesi*, *jeyporensis*, *maculatus*, *magidi*, *minimus*, *moghulensis*, *pallidus*, *pulcherimus*, *splendidus*, *stephensi*, *subpicus*, *tessellatus*, *theobaldi*, *turkhadi*, *vagus*, and *varuna*).

1. Femur and tibia speckled ... Sub-Group I



— Femur and tibia not speckled ... Sub Group II



Sub-Group I

(*jamesi*, *maculatus*, *pulcherimus*, *splendidus*, *stephensi*, *tessellatus* and *theobaldi*).

1. Tips of hind legs white...2



— Tips of hind legs not white... 5



2. Hind tarsi 5 and part of 4 white... *A. maculatus*.



3. Hind tarsi 5, 4 and part of 3 white... *A. theobaldi*.



— Hind tarsi 5, 4 and 3 completely white... 3.



3. Palpi speckled with apical and sub-apical white bands equal... *A. splendidus*.



Palpi unspeckled, apical and sub-apical white bands unequal... 4.



4. Dorsum of abdomen heavily clothed with white scales, forming tufts... *A. pulcherimus*. (in part)



Dorsum of abdomen not so clothed. Last two segments covered with golden hairs and scales... *A. jayusi*.



5. Palpi with three white bands and usually speckled *A. stephensi*.



— Palpi with four white bands and unspeckled *A. tessellatus*.



Sub-Group II

(*aconitus*, *annularis*, *culicifacies*, *d'hali*, *fluvialis*, *jeyporiensis*, *majidi*, *minimus*, *moghulensis*, *pallidus*, *pulcherrimus*, *subpictus*, *turkhudi*, *vagus* and *varuna*.)

1. Tips of hind legs white...2



— Tips of hind legs not white... .. 5



2. Hind tarsi 5 and part of 4 white ... *A. majidi*.



— Hind tarsi 5, 4 and 3 completely white ... 3



3. Dorsum of abdomen heavily clothed with white scales, forming tufts *A. pulcherrimus*.



— Dorsum of abdomen not so clothed 4



4. Wing vein 5 mainly dark with dark spot at the point of bifurcation *A. annularis*.



— Wing vein 5 mainly white, without a dark spot at the point of bifurcation *A. pallidus*.



5. Tarsal segments of fore-legs with broad bands ... 6



— Tarsal segments of fore-legs unbanded or with very narrow bands ... 7



6. Palpi with dark pre-apical band equal or nearly equal to the apical white band... .. *A. subpictus*.



Palpi with dark pre-apical band not more than 1/2 the length of apical white band... .. *A. vagus*.



7. Tips of the palpi black ...8



— Tips of the palpi white ...9



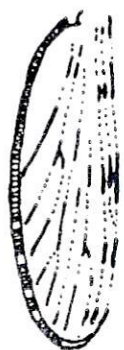
8. Spotting of wing confined to costa and vein 1 only...
... .. *A. d'thali*.*



12. Inner quarter of costa with white interruption at least on one wing...
... .. *A. minimus*.



— White spots present on other veins besides costa and vein 1 of the wing ...
... .. *A. turkhadi*.*



Inner quarter of costa without white interruption...
... .. *A. paruna*



9. Wing vein 3 mainly dark...
... .. *A. culicifacies*.



13. Inner quarter of costa with white interruption.
... .. *A. jaypuriensis*.



— Wing vein 3 mainly white.
... .. 10



Inner quarter of costa without white interruption...
... .. 14



10. Apical white band on palpi equal to sub-apical white band...
... .. 11



— Apical white band on palpi longer than sub-apical white band...
... .. 13



14. Wing vein 6 with two dark apota, distal half mainly dark...
... .. *A. fluviatilis*.



11. Wing with a fringe spot at vein 6...
... .. *A. aconius*.



Wing vein 6 with 3 dark apota, distal half with pale interruption...
... .. *A. moghulensis*.



— Wing without a fringe spot at vein 6...
... .. 12



* *A. d'thali* is a rare species, small in size and with a shiny thorax white. *A. turkhadi* is a large mosquito with dull thorax.

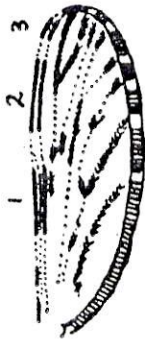
HYDERABAD REGION

States : Andhra and Madhya Pradesh.

Anopheles *aconitus*, *aikeni*, *annularis*, *barbirostris*, *culicifacies*,
fluvialis, *gigas*, *hyrcanus*, *jamesi*, *jeyporiensis*,
karuuri, *lindesayi*, *maculatus*, *majidi*, *minimus*,
moghulensis, *pallidus*, *philippinensis*, *ramsayi*, *splendi-*
dus, *stephensi*, *subpictus*, *sundaicus*, *tessellatus*,
theobaldi, *turkhudi*, *vagus* and *varuna*.



1 Wings completely dark ...
... *A. aikeni*.



Wings with three or less
than three dark spots on
costa involving vein I.
... Group A.



Wings with four or more
dark spots on costa involv-
ing vein I ... Group B.

Group A.

(*barbirostris*, *gigas*, *hyrcanus*, *lindesayi*).



1 Palpi all dark ... 2



Palpi with white bands ... 3

Sub-Group I

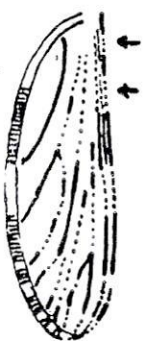
2. Hind femur with white band ... *A. lindesayi*.



— Hind femur without any white band ... *A. barbirostris*.



3. Inner quarter of costa with white interruption ... *A. gigas*.



— Inner quarter of costa completely dark ... *A. hyrcanus*.



Group B.

(*aconitus*, *annularis*, *calicifacies*, *flaviventris*, *jamesi*, *jeyporensis*, *karnari*, *maculatus*, *majidi*, *minimus*, *moghulensis*, *pallidus*, *philippinensis*, *ramsayi*, *splendidus*, *stephensi*, *subpictus*, *sundanicus*, *tessellatus*, *theobaldi*, *turkadi*, *vagus* and *varuna*.)

1. Femur and tibia speckled.



... Sub-Group I.

— Femur and tibia not speckled ... Sub-Group II.



(*jamesi*, *maculatus*, *ramsayi*, *splendidus*, *stephensi*, *sundanicus*, *tessellatus*, *theobaldi*.)

1. Tip of the hind legs white ... 2



Tip of the hind legs not white ... 5



Hind tarsi 5 and part of 4 white ... *A. maculatus*.



Hind tarsi 5, 4 and part of 3 white ... *A. theobaldi*.



Hind tarsi 5, 4 and 3 completely white ... 3



1. Palpi speckled with apical and sub apical white bands equal ... *A. splendidus*.



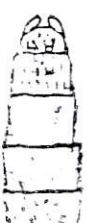
Palpi unspeckled, apical and sub apical white bands unequal ... 4



1. Forearm of 7th and 8th abdominal segments covered with golden hairs and golden ... *A. jamesi*.



Forearm of 7th and 8th abdominal segments covered with dark scales ... *A. ramsayi*.



5. Palpi with three white bands 6



— Palpi with four white bands..... *A. tessellatus*



6. Palpi usually speckled, the apical and subapical white bands equal... *A. stephensi*.



— Palpi unspeckled, the apical and sub-apical white bands unequal... *A. sondaicus*.



Sub-Group II.

(*aconitus*, *annularis*, *culicifacies*, *fluvialis*, *jeyporiensis*, *karwari*, *majidi*, *minimus*, *moghulensis*, *pallidus*, *philippinensis*, *subpictus*, *turkhudi*, *vagus* and *varuna*.)

1. Tips of hind legs white ...2



— Tips of hind legs not white 6



2. Hind tarsi 5 and part of 4 white... .. 3



— Hind tarsi 5, 4 and 3 completely white... .. 4



3. Palpi with three white bands... .. *A. majidi*



— Palpi with four white bands *A. karwari*.



4. Wing vein 5 mainly dark, with a dark spot at the point of bifurcation... .. *A. annularis*.



— Wing vein 5 mainly white with no dark spot at the point of bifurcation... .. 5



5. Distal end of hind tarsus I picked out with white... .. *A. philippinensis*.*



— Distal end of hind tarsus I all dark..... *A. pallidus*.*



6. Tarsal segments of forelegs with broad white bands... .. 7



— Tarsal segments of forelegs unbanded or with very narrow bands.... .. 8



7. Palpi with dark pre-apical band equal or nearly equal to the apical white band... .. *A. subpictus*.



— Palpi with dark pre-apical band not more than 1/2 the length of the apical white band.... .. *A. vagus*.



* These species can further be differentiated by the presence of broad white scales over ventral aspect of the abdominal segments. These scales extend over the last five or six segments in *pallidus* and are restricted to last 2 or 3 segments only in *philippinensis*.

8. Tips of the palpi black ...
... *A. turkachi*.



— Tips of the palpi white...9



9. Wing vein 3 mainly dark...
... *A. cuticifacies*.



— Wing vein 3 mainly white... 10



10. Palpi with apical white band equal to sub-apical white band... 11



— Palpi with apical white band longer than sub-apical white band... 13



11. Wing with a fringe spot at vein 6... *A. aconitius*.



— Wing without a fringe spot at vein 6... 12.



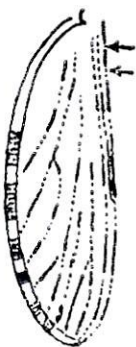
12. Inner quarter of costa with white interruption at least on one wing...
... *A. minimus*.



— Inner quarter of costa without any white interruption... *A. varuna*.



13. Inner quarter of costa with white interruption...
... *A. jeyporensis*.



— Inner quarter of costa without white interruption... 14



14. Wing vein 6 with two dark spots, distal half mainly dark...
... *A. fluviatilis*.



Wing vein 6 with three dark spots distal half with pale interruption...



SHILLONG REGION

States : Andamans & Nicobars, Assam, Manipur, North East Frontier Agency, Tripura and West Bengal.

Anopheles *aconitus*, *aikeni*, *annandalei*, *annularis*, *barbirostris*, *culicifacies*, *fluvialis*, *gigas*, *hyrcanus*, *insulaciformum*, *jamesi*, *jeyporiensis*, *karuvari*, *kochi*, *leucosphyrus*, *lindesayi*, *maculatus*, *majidi*, *minimus*, *pallidus*, *philippinensis*, *ramsayi*, *splendidus*, *stephensi*, *subpictus*, *sundaicus*, *tessellatus*, *theobaldi*, *turkhudi*, *umbrosus*, *vagus* and *varuna*.



1. Wings completely dark ...
A. aikeni.*
A. insulaciformum.*



— Wings with three or less than three dark spots on costa involving vein I.
... .. Group A.



— Wings with four or more dark spots on costa involving vein I ... Group B.

Group A.

(*annandalei*, *barbirostris*, *gigas*, *hyrcanus*, *lindesayi* and *umbrosus*)



1. Palpi all dark2



— Palpi with white bands...4

* *A. insulaciformum* is a rare species and can be separated from *aikeni* on the basis of the structure of male genitalia.

2. Hind femur with white band ... *A. lindesayi*.



— Hind femur without any white band ... 3



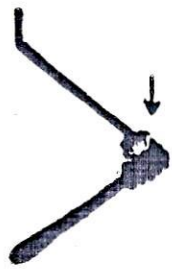
3. Inner quarter of costa with scattered white scales present. Ventral tuft of black scales on 7th abdominal segment... *A. latirostris*.



— Inner quarter of costa without scattered white scales. No Ventral tuft of scales on 7th abdominal segment... *A. umbrosus*.



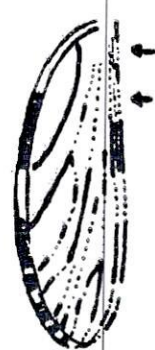
4. Hind femoro-tibial joint with a prominent tuft of black and white scales... *A. annulata*.



— Hind femoro-tibial joint without any such tuft...



5. Inner quarter of costa with white interruption ... *A. gijas*.



— Inner quarter of costa completely dark... *A. hyrcanus*.



Group B.

(*acutus*, *annularis*, *calicifacies*, *fluvialis*, *jamesi*, *jeykensis*, *karwari*, *kochi*, *leucosphyrus*, *maculatus*, *majidi*, *minimus*, *pellidus*, *philippinensis*, *ramsayi*, *splendidus*, *stephensi*, *subpictus*, *sundaticus*, *tesellatus*, *theobaldi*, *turkudi*, *vagus* and *varuna*).

1. Femur and tibia speckled. ... Sub-Group I.



— Femur and tibia not speckled... Sub-Group II.



Sub-Group I

(*jamesi*, *kochi*, *leucosphyrus*, *maculatus*, *ramsayi*, *splendidus*, *stephensi*, *sundaticus*, *tesellatus*, *theobaldi*.)

1. Tips of the hind legs white ... 2



— Tips of the hind legs not white ... 5



2. Half of hind tarsus 5 white.

Ventral tufts of scales present on each abdominal segment... ..*A. kochi*.



— Hind tarsi 5 and part of 4 white*A. maculatus*.



— Hind tarsi 5, 4 and part of 3 white*A. theobaldi*.



— Hind tarsi 5, 4 and 3 completely white.3



3. Palpi speckled with apical and sub-apical white bands equal*A. splendidus*.



— Palpi unspeckled, apical and sub-apical white bands unequal4



4. Dorsum of 7th and 8th abdominal segments covered with golden hairs and scales*A. jamesi*.



— Dorsum of 7th and 8th abdominal segments with dark scales only... ..*A. ramsayi*.



5. Palpi with three white bands6



— Palpi with four white bands... ..7



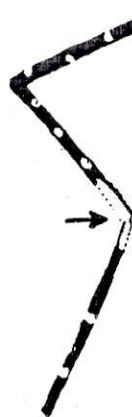
6. Palpi usually speckled, the apical and sub-apical white bands equal... ..*A. stephensi*.



— Palpi unspeckled, the apical and sub-apical white bands unequal... ..*A. sundanicus*.



7. Hind leg with broad white tibio-tarsal joint... ..*A. leucosphyrus*.



— Hind leg without such white tibio-tarsal joint... ..*A. tessellatus*.



Sub-Group II.

(*aconitus*, *annularis*, *culicifacies*, *fluvialis*, *jeyporiensis*, *karuari*, *majidi*, *minimus*, *pallidus*, *philippinensis*, *subpictus*, *turkhudi*, *vagus* and *varuna*.)

1. Tips of hind legs white ...2



— Tips of hind legs not white6



2. Hind tarsi 5 and part of 4 white... ..3



— Hind tarsi 5, 4 and 3 completely white... ..4



3. Palpi with three white bands... ...*A. majidi*



— Palpi with four white bands
... ...*A. karwari*.



4. Wing vein 5 mainly dark, with a dark spot at the point of bifurcation... ...*A. annularis*.



— Wing vein 5 mainly white with no dark spot at the point of bifurcation... ...5



5. Distal end of hind tarsus I picked out with white... ...*A. philippinensis*.*



— Distal end of hind tarsus I all dark...*A. pallidus*.*



6. Tarsal segments of forelegs with broad white bands... ...*A. 7*



— Tarsal segments of forelegs unbanded or with very narrow bands... ...*A. 8*



* These species can further be differentiated by the presence of broad white scales over ventral aspect of the abdominal segments. These scales extend over the last five or six segments in *pallidus* and are restricted to last 2 or 3 segments only in *philippinensis*.

7. Palpi with dark pre-apical band equal or nearly equal to the apical white band... ...*A. subpictus*.



— Palpi with dark pre-apical band not more than 1/2 the length of the apical white band... ...*A. vagus*.



8. Tips of the palpi black*A. turkhadi*.



— Tips of the palpi white...9



9. Wing vein 3 mainly dark... ...*A. cuticifacies*.



— Wing vein 3 mainly white... ...*A. 10*



10. Palpi with apical white band equal to sub-apical white band... ...*A. 11*



— Palpi with apical white band longer than sub-apical white band... ...*A. 13*



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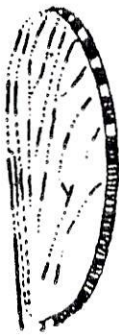
11. Wing with a fringe spot at vein 6... ..*A. aconitus*.



-- Wing without a fringe spot at vein 6... ..12.



12. Inner quarter of costa with a white interruption at least on one wing... ..*A. minimus*.



-- Inner quarter of costa without any white interruption... ..*A. varuna*.



13. Inner quarter of costa with white interruption... ..*A. jeyporiensis*.



-- Inner quarter of costa without white interruption... ..*A. fluvialis*.

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