

OUTLINE FOR THE DETERMINATION OF MALARIAL MOSQUITOES IN ETHIOPIA

PART II—ANOPHELINE LARVAE

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The accompanying key constitutes Part II of the series of pictorial keys designed for quick determination of anophelines in the Ethiopian Empire. As in "Part I—Adult Female Anophelines" (Verrone, 1962) identifying characters have been diagrammed from specimens, nearly all of which were collected within the Empire and are presently preserved in the Headquarters of the Ethiopian Malaria Eradication Service, Addis Ababa. Larval characters of the other recorded species, not collected by the Service, have been taken from the literature (Evans, 1938; De Meillon, 1947). Outstanding identifying features mentioned in the diagram captions are emphasized with arrows to facilitate rapid use of the key.

Thirty-four anopheline species (Table 1) are included in the key. *A. amutus* de Burca, 1943, *A. erythraeus* Corradetti, 1939 and *A. gingeroi* Corradetti and Archetti, 1947 have been excluded because of insufficient information confirming the existence of these species in Ethiopia. *A. cinereus* Theobald, 1901 and *A. turkhuudi* Liston, 1901 have been grouped together. In most specimens however, the larvae of *A. cinereus* can be separated from those of *A. turkhuudi* by the long attenuated filaments extending from the palmate hair leaflets. On *A. turkhuudi* the filaments, if present, are rather short and blunt. The key is preceded by an anopheline larva diagram showing structures and hairs used in identifying the specimens.

The Ethiopian Empire exhibits highly diversified climatic conditions—from the

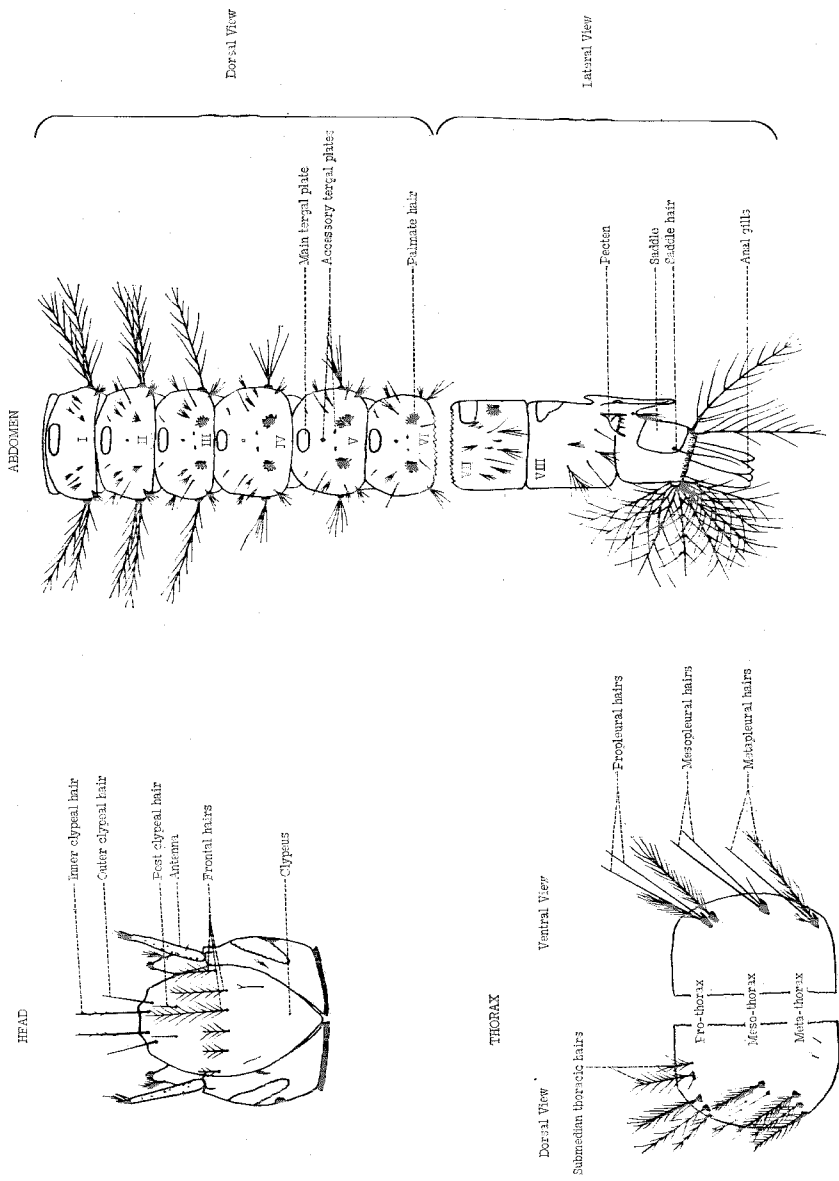
plateau area in the center of the country (average elevation 7,000 feet above sea level) to the Great Rift Valley lakes in south central Ethiopia (average elevation 5,000 feet above sea level) to the Danaki depression surrounding Lake Assale in the northeast (—380 feet below sea level). Temporary streams abound throughout the land, especially during the "long rains" from June through September. Major water areas in the Empire are shown on the map in Plate V.

Appreciation is expressed to the Ethiopian Malaria Eradication Service personnel, to the Ministry of Public Health and to U.S.A.I.D. coworkers for their help in making the paper more complete and to the Surveying and Mapping Division of the Ministry of Public Works and Communications for supplying information of the Ethiopian water areas.

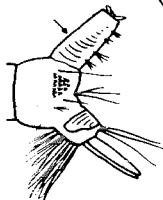
TABLE 1.—Indexed list of Anopheline species by plates in the key.

- A. adenensis* * Christophers, 1924—Plate IV(a)
- A. ardensis* * (Theobald, 1905)—Plate V
- A. christyi* (Newstead and Carter, 1911)—Plate III
- A. cinereus* Theobald, 1901—Plate III
- A. coustani* Laveran, 1900—Plate I
- A. dunalicus* Corradetti, 1939—Plate III
- A. demicilloni* Evans, 1933—Plate III
- A. d'thali* Patton, 1905—Plate IV(a)
- A. funestus* Giles, 1900—Plate II
- A. gambiae* Giles, 1902—Plate IV(a)
- A. gurnhami* Edwards, 1930—Plate III
- A. harperi* Evans, 1936—Plate IV(a)
- A. implexus* * (Theobald, 1903)—Plate I
- A. kingi* Christophers, 1923—Plate V
- A. lesoni* * Evans, 1931—Plate II
- A. longipalpis* (Theobald, 1903)—Plate II
- A. macmahoni* Evans, 1936—Plate II
- A. maculipalpis* * Giles, 1902—Plate III
- A. marshalli* (Theobald, 1903)—Plate II

¹United States Agency for International Development/Ethiopia.

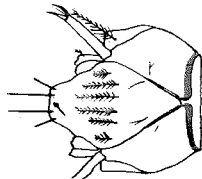


Terminal segment with siphon

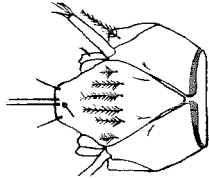


Non-Anopheleline

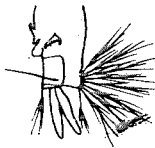
Inner clypeal hairs with bases well separated



Inner clypeal hairs with bases close together



Terminal segment with no siphon



Outer clypeal hairs simple



Outer clypeal hairs branched



Outer clypeal hairs branched



Outer clypeal hairs simple



See Plate II

Outer clypeal hairs with more than five branches



Outer clypeal hairs with less than five branches



Leaflets of typical palmate hair shouldered



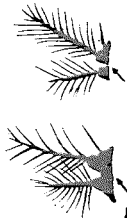
Leaflets of typical palmate hair unshouldered



Submedian thoracic hairs with bases well separated



Submedian thoracic hairs with bases fused or narrowly separated



Anopheles nuttallensis

Anopheles costans;
Anopheles paludis
Anopheles obscurus

Anopheles implicatus

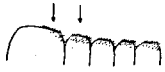
Anopheles willi

See Plate V

See Plate IV (b)

VENTRAL SIDE OF ABDOMINAL

and abdominal lined
with small spicules



= *Anopheles willcoxi*
= *Anopheles theileri*

Main tergal plate on
abdominal segment V
at least one-half as
deep as the segment



Main tergal plate on
abdominal segment V
at least three-fourths
width of segment



or



Main tergal plate on
abdominal segment V
less than three-fourths
width of segment



See Plate III

= *Anopheles marshallsi*
= *Anopheles seydeli*

Saddle hair simple or
with less than five
branches



Saddle hair with at
least five branches



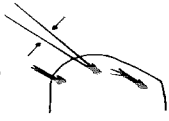
= *Anopheles funestus*

Ventral side of abdominal
segments without rows
of small spicules



= *Anopheles leesonii*

Both long mesopleural
hairs simple



Saddle hair simple



= *Anopheles risulorum*

Saddle hair with
three branches



= *Anopheles longipennis*
(in part)

One long mesopleural hair
with less than four branches



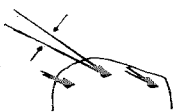
= *Anopheles longipennis*
(in part)

One long mesopleural hair
with many branches



= *Anopheles macdonaldi*

Both long mesopleural hairs simple



See Plate IV (a)

One long mesopleural hair branched



At least one long mesopleural hair feathered



Both long mesopleural hairs feathered



Spicules on antenna all about same length



Spicules on internal basal one-third of antenna much longer than the rest



Bases of submedian thoracic hairs well separated



Bases of submedian thoracic hairs fused



Anopheles cinereus
Anopheles irakli

Leaflets of typical palmate hair unbordered



Leaflets of typical palmate hair bordered



Anopheles rhodesiensis
Anopheles rusticus

Anopheles maculipennis

Posterior clypeal hairs about three-fourths length of inner clypeal hairs



= *Anopheles draxilloni*

Posterior clypeal hairs not more than one-half length of inner clypeal hairs



= *Anopheles garhawi*

Main tergal plates evenly rounded



= *Anopheles pretoriensis*

Main tergal plates unevenly rounded



= *Anopheles christyi*

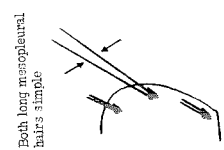
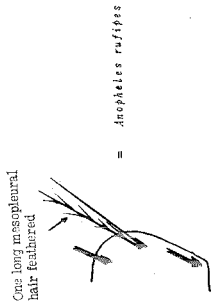


Plate IV (b)

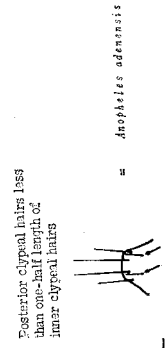
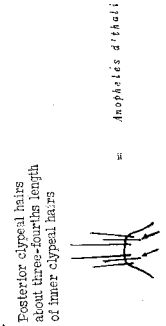
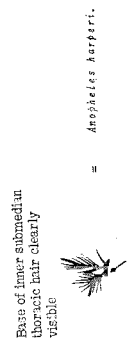
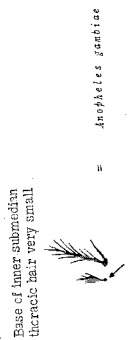
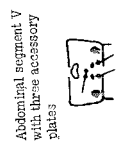
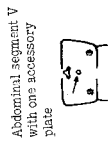
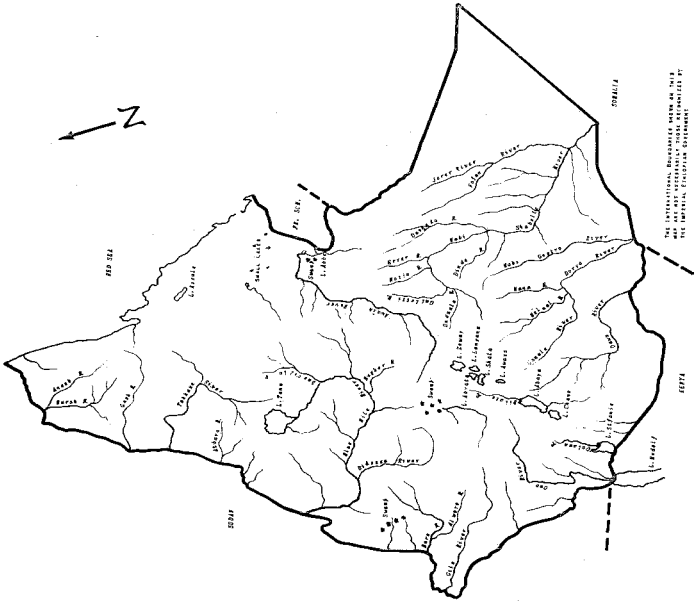


Plate IV (a)



ETHIOPIA SHOWING MAJOR WATER AREAS



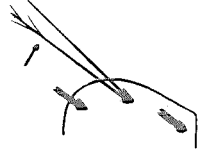
THE INTERNATIONAL BOUNDARIES SHOWN ON THIS MAP ARE NOT NECESSARILY THOSE AGREED UPON BY THE INTERNATIONAL FRONTIER COMMISSION

Saddle hair simple or with less than five branches



Anopheles ardensis (in part)

One long mesopleural hair with several branches at apex

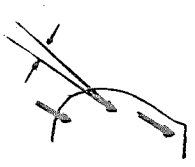


Anopheles kingi

Saddle hair with five or more branches



Both long mesopleural hairs simple



Anopheles ardensis (in part)

- l. natalensis* * (Hill and Hayden, 1907)—Plate I
l. nili (Theobald, 1904)—Plate I
l. obscurus * (Grunberg, 1905)—Plate I
l. paludis Theobald, 1900—Plate I
l. pharoensis Theobald, 1901—Plate IV(b)
l. pretoriensis (Theobald, 1903)—Plate III
l. rhodesiensis Theobald, 1901—Plate III
l. rivulorum Leeson, 1935—Plate II
l. rufipes (Gough, 1910)—Plate IV(b)
l. ruficollis Lewis, 1937—Plate III
l. seydeli * Edwards, 1929—Plate II
l. squamosus Theobald, 1901—Plate IV(b)
l. theileri Edwards, 1912—Plate II
l. turkhuji Liston, 1901—Plate III
l. wellcomei * Theobald, 1904—Plate II

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VERRONE, G. A. 1962. Outline for the determination of malarial mosquitoes in Ethiopia. I—Adult female anophelines. Mosquito News 22(1):37-49.

* Not seen by the writer.

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