A REVIEW OF THE MOSQUITO LARVAE OF FRANCE
II. THE GENUS *AEDES*

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INTRODUCTION. This paper is the second in a series that is concerned with the identification of the larvae of the mosquitoes known to occur within the geographical boundaries of France. The first paper (Hedeen, 1958) dealt with the genera *Culiseta, Mansonia, Orthopodomyia,* and *Uranotaenia.* A generic key for the mosquitoes found in the country was presented, and the writer gratefully acknowledged the contributions made to this work by his colleagues, both American and French. He wishes to take this opportunity to reiterate his previous statement of thanks to these individuals.

In France there are by far more species in the genus *Aedes* than in any other genus. Due to the fact that the mosquito fauna of the entire European region has not been studied in detail for many years, the modern study of such a large group is very difficult. Many of the species are gradually being synonymized with previously described forms, and a more general realization of the concept of "the species complex" is coming into existence. This is especially true in the cases of the genera *Aedes* and *Culex.* Because of the large number of species of *Aedes* that occur in the country, it was decided to eliminate distributional data which were compiled by the U. S. Army Medical Service during the period of 1953 to 1956 and by other workers. The individuals interested in these data may consult the general references given in the bibliographies of this and the first paper previously cited.

The main objective, therefore, of this particular paper is to present a systematic list of the mosquitoes of the genus *Aedes* reported to occur in France and to give a key by which the fourth instar larvae of these species may be identified. In the preparation of the key it was not possible to examine specimens of a few of the species which were included. In these instances key characteristics were obtained from a study of as many of the previously published descriptions of the species as were possible to secure.

THE PRESENT STUDY. The genus *Aedes* is represented in France by approximately twenty-six species. Twenty-four have been definitely reported, and two are considered by the writer as likely to be present, although not reported at the date of this writing. Several species or varieties described by previous workers have been grouped together as the *Aedes pulchritarsis* complex. It is quite possible that the species included by this writer in the complex will be eventually synonymized with *A. pulchritarsis,* or will be definitely established as independent species when a more detailed study of the group is undertaken. For a detailed discussion of the *pulchritarsis* complex the interested worker is referred to the paper by Aitken (1954, pp. 475–477).

The following species of *Aedes* are considered in this paper. The symbol (*) indicates that larval specimens of that species which had been collected in France were not available for study.

A. Subgenus *Ochlerotatus*
1. *pulchritarsis* (Rondani, 1872)
   a. *berlandi* Seguy, 1921 (*)
   b. *praeteritus* Seguy, 1923 (*)
   c. *longitubus* Cambournac, 1948
   d. *heracleensis* Callot, 1944 (*)
2. *rusticus* (Rossi, 1790)
3. *refiki* Medjid, 1928
4. *excrucians* (Walker, 1856) (*)
5. *flavescens* (Muller, 1764)
6. *diantacus* Howard, Dyar, and Knab, 1917

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7. *punctor* (Kirby, 1837)
8. *mariae* (Ed. & Et. Sergent, 1903)
9. *annulipes* (Meigen, 1830)
10. *cantans* (Meigen, 1818)
11. *detritus* (Haliday, 1833)
12. *caspius* (Pallas, 1771)
13. *dorsalis* (Meigen, 1830)
14. *leucomelas* (Meigen, 1804) (*)
15. *communis* (DeGeer, 1776)
16. *pullatus* (Coquillett, 1904)
17. *sticticus* (Meigen, 1838)
18. *nigrinus* (Eckstein, 1918)
19. *cataphylla* Dyar, 1928 (*)
20. *nigripes* (Zetterstedt, 1838) (*)

B. Subgenus *Stegomyia*.
1. *aegypti* (L., 1762)
2. *vittatus* (Bigot, 1861)

C. Subgenus *Finlaya*
1. *echinus* Edwards, 1920 (*)
2. *geniculatus* (Olivier, 1791)

D. Subgenus *Aedes*
1. *cinereus* Meigen, 1818

E. Subgenus *Aedimorphus*
1. *vexans* (Meigen, 1830)

The two species of this genus previously mentioned as not being recorded from France at this time but which are considered likely to occur belong to the subgenus *Ochlerotatus*. They are *leucomelas* (Meigen) and *cataphylla* Dyar. The distribution of *leucomelas* in Europe is compiled by Natvig, 1948. He records it from England, Denmark, Norway, Finland, Sweden, Germany, Austria, Hungary, Poland, and the U.S.S.R. Clavero (1946) reports *leucomelas* from Madrid, Spain. The distribution of *cataphylla* is also compiled by Natvig. He lists this species as occurring in all of the Scandinavian countries, the U.S.S.R., Poland, Hungary, Germany, and probably Austria. Clavero (1946) reports it from Mariana (Cuenca), Spain. Because of the broad distribution of these species from widely scattered areas which are adjacent to the geographical boundaries of France it is considered by the writer that these two species are probably present in the country.

The inclusion of *A.* (*O.*) *nigripes* as a

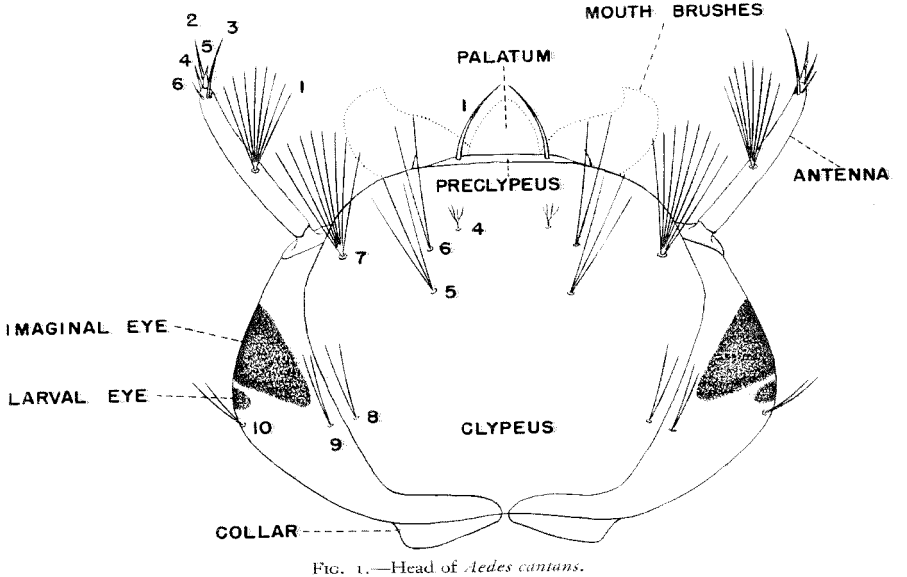

FIG. 1.—Head of *Aedes cantans*.

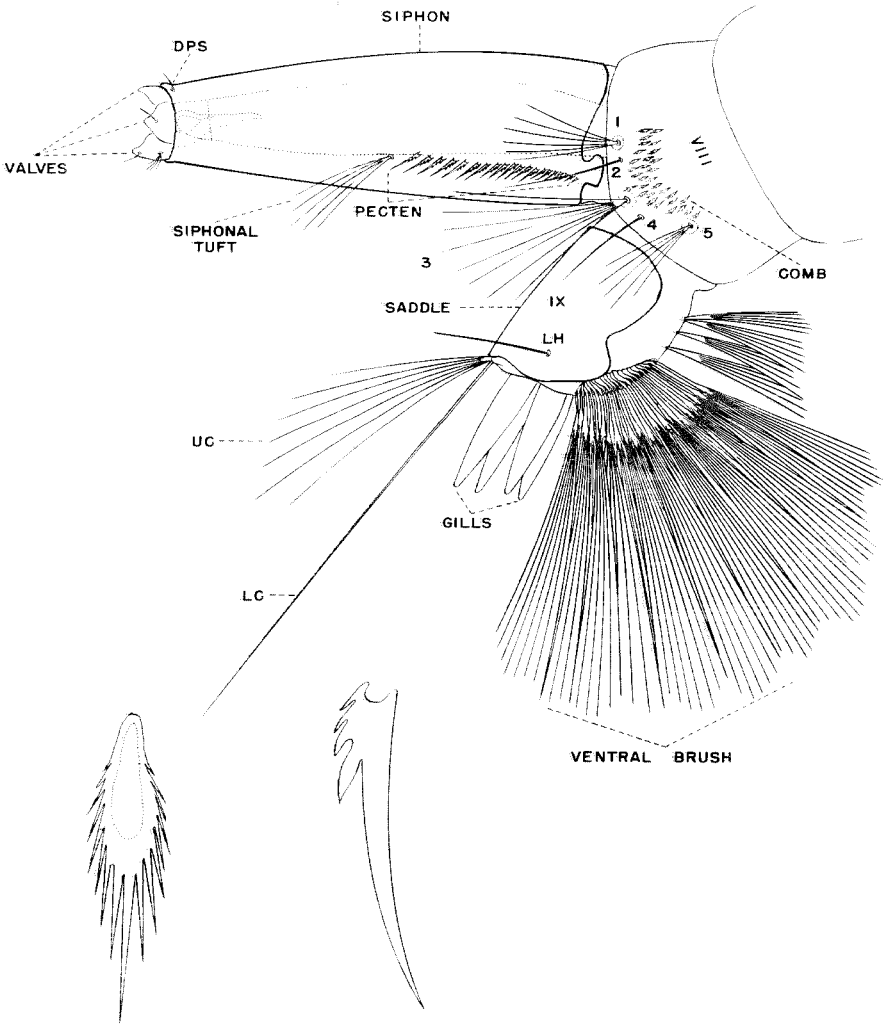

FIG. 2.—Terminal segments of *Aedes cantans*. DPS, dorsal preapical spine. UC, upper caudal. LC, lower caudal. LH, lateral hair of anal segment.

species occurring in France is based on information contained in Seguy (1923, p. 137) and from a personal conversation with Seguy (1955). Seguy includes this species among those listed for the country on the basis of four female specimens in the Paris museum. These specimens are labeled, "Fbl. Juin 69." Edwards (1921) and Natvig (1948) comment that some mistake probably has been made in regard to these specimens. They believe that the labels are incorrect or that the original labels were changed. Seguy, however, remarks that "Fbl." is a common abbreviation for Fountainbleau and that there is little possibility that the labels are incorrect. This writer prefers to adhere to the view of Seguy, and thus includes *nigripes* in the list of *Aedes* occurring in the country.

GENUS *Aedes*

KEY TO FOURTH INSTAR LARVAE

(The morphological features used in this key are labeled in Figures 1 and 2. Variable species are included in the key at several places so that specimens with any of the observed variations may be identified.)

1. Antennal hair (1) single; shaft of antenna not spinose 2
— Antennal hair double or multiple; shaft of antenna with numerous spines and spicules scattered over its surface 4
2. Individual comb scale with a large median spine and several stout submedian spines; length of anal gills usually 2.5 to 4 times greater than length of anal plate, all being of approximately equal size ..... *aegypti*
— Individual comb scale with a large median spine and very small submedian spines; anal gills usually not more than 2x the length of anal plate, two being distinctly smaller than the others 3
3. Pecten extending past middle of siphon; abdominal tufts composed of very long and stout hairs ..... *echinus*
— Pecten not extending past middle of siphon; abdominal tufts composed of shorter and much more slender hairs ..... *geniculatus*
4. Antennal hair (1) two- or three-branched; shaft of antenna usually unspiculated, but sometimes with a few small spines and spicules scattered over its surface 5
— Antennal hair (1) usually much more than two- or three-branched; shaft of antenna more or less uniformly spiculate 6
5. Siphon short, no more than 1.5 to 2 times as long as wide; most distal pecten teeth more widely spaced; subventral tuft inserted within the pecten ..... *vittatus*
— Siphon long, 4 or more times as long as wide; distal pecten teeth not detached; subventral tuft inserted beyond the pecten ..... *pulchritarsis* "complex"
6. Distal few pecten teeth obviously detached or more widely spaced than basal teeth ... 7
— Distal few pecten teeth not obviously detached or more widely spaced than basal teeth 16
7. Anal plate completely surrounding the anal segment ..... *nigripes*
— Anal segment not completely surrounding the anal segment 8
8. Siphon with several hairs along its dorsal surface 9
— Siphon without hairs along its dorsal surface 10
9. Large subventral tuft of siphon inserted within the pecten; anal gills usually not more or less reticulate ..... *rusticus*
— Large subventral tuft of siphon inserted beyond the pecten; anal gills usually presenting a reticulated appearance ..... *refiki*
10. Comb of eighth abdominal segment arranged in a triangular patch 11
— Comb of eighth abdominal segment arranged in an irregular single or double row 14
11. Subventral tuft of siphon inserted within the pecten ..... *calaphylla*
— Subventral tuft of siphon inserted beyond the pecten 12
12. Some comb scales with the submedian spines as long or almost as long as the median spine ..... *caspius*
— All comb scales with a median spine much longer than the submedian spines 13
13. Hair of ventral siphonal valve stout and curved; siphon evenly tapering from base to apex; anal gills usually longer than anal plate ..... *excrucians*
— Hair of ventral siphonal valve slender; siphon distinctly tapering from middle to apex; anal gills usually shorter than anal plate ..... *flavescens*
14. Antennae longer than head ..... *diantaeus*
— Antennae not longer than head 15
15. Upper (5), lower (6), and preantennal (7) head hairs inserted in a line ..... *cinereus*
— Upper (5), lower (6), and preantennal (7) head hairs not inserted in a line ... *vexans*
16. Anal plate completely surrounding the anal segment ..... *punctor*
— Anal plate not completely surrounding the anal segment 17
17. Length of the anal gills less than the length of the anal plate 18
— Length of anal gills greater than the length of the anal plate 25

18. All comb scales with a single outstanding median spine much larger than the submedian spines 19
— Some or all comb scales without a single outstanding median spine much larger than the submedian spines 22
19. Siphon almost as wide distally as basally ..... *mariae*
— Siphon distinctly tapering to apex 20
20. Siphon 3.2 to 4 times as long as broad; lateral hair of the anal segment 1.3 to 1.5 times the length of the anal plate; comb scales varying in number from 20 to 35.. *flavescens*
— Siphon 2.3 to 3.0 times as long as broad; lateral hair of the anal segment 0.6 to 1.0 times the length of the anal plate; comb scales varying in number from 28 to 45.. 21
21. Number of comb scales 31 to 45 ....*annulipes*
— Number of comb scales 28 to 38 .....*cantans*
22. All comb scales uniformly blunt-ended.. *detritus*
— Median and submedian spines of some individual comb scales distinctly larger than median and submedian spines of other individual comb scales 23
23. Subventral tuft inserted beyond middle of siphon .....*caspius*
— Subventral tuft inserted before middle of siphon, rarely inserted at middle 24
24. Anal gills usually globular in shape and no more than one-third (⅓) as long as anal plate; upper and lower head hairs (5 & 6) usually single, either upper or lower not infrequently double .....*dorsalis*
— Anal gills usually distinctly tapering to apex and no more than one-half (½) as long as anal plate; upper and lower head hairs (5 & 6) always single .....*leucomelas*
25. All comb scales without an outstanding median spine 26
— All comb scales with an outstanding median spine 27
26. Upper and lower head hairs (5 & 6) single .....*communis*
— Upper and lower head hairs (5 & 6) double or multiple .....*pullatus*
27. Ventral brush with no more than three pre-cratal tufts 28
— Ventral brush with more than three pre-cratal tufts 29
28. Upper and lower head hairs (5 & 6) almost always double or multiple; comb scales numbering 18–27 (average, 21).. *sticticus*
— Upper and lower head hairs (5 & 6) almost always single; comb scales numbering less than 18 (average, 11) .....*nigrinus*
29. Number of comb scales varying between 31 and 45 .....*annulipes*
— Number of comb scales varying between 28 and 38 .....*cantans*

SUMMARY. This paper is the second in a series concerned with the identification of the larvae of the mosquitoes of France. The genus *Aedes* is considered in this paper, and a key for the identification of the species is included. Several previously described species are grouped into the *pulchritarsis* complex, and consideration is given to species that are considered likely to occur in the country but which have not been reported at this writing.

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