

PSYCHE

VOL. XLVI

DECEMBER, 1939

No. 4

A KEY TO THE MOSQUITOES OF MASSACHUSETTS

BY GEORGE S. TULLOCH, Chief Entomologist¹

Massachusetts Department of Public Health
Boston, Massachusetts

During the summer of 1939 the Department of Public Health of the State of Massachusetts conducted a state-wide mosquito survey with the cooperation of the Works Projects Administration. This survey was one phase in the program of a study of the general problem of encephalitis. It was initiated following an outbreak of encephalitis in man in 1938 which was traced to the eastern virus of equine encephalomyelitis. The identification of biting mosquitoes was made by using a key compiled by Tulloch (1930) which was taken from Dyar (1922) and Matheson (1929) and modified to include those species reported from New England. The present key is a revision of the earlier one which has been enlarged to include the non-biting as well as the biting mosquitoes and is based on the examination of over 100,000 specimens. Although this key is restricted to the species which may be found in Massachusetts it is sufficiently inclusive for use in any of the New England states. It is accompanied by illustrations of many of the characters of taxonomic importance and by a summary of the species of Culicidæ which have been taken in Massachusetts.

¹Grateful acknowledgment is made to the following for assistance: Dr. R. F. Feemster, Director, Division of Communicable Diseases, Massachusetts Department of Public Health; Dr. V. A. Getting, Technical Director, Massachusetts Mosquito Survey; Prof. J. C. Bequaert, Consulting Entomologist; V. A. Bell, R. P. Holdsworth, Jr., C. E. Elliott, Dr. B. W. Parker, Dr. J. W. Hawkins, G. C. Tower, H. D. Rose, and R. O. Bohm, Entomologists and to Mr. J. Milano for preparation of the plates.

The material for this key has been modified from the works of many authors, notably Smith (1903), Headlee (1921), Dyar (1922, 1928), Dyar and Shannon (1924), Matheson (1925, 1929), Bradley (1936), Edwards (1932), Johannsen (1903, 1923, 1934), Marshall (1938) and King, Bradley and McNeel (1939).

Mosquitoes are small two-winged insects belonging to the order Diptera, family Culicidæ. The Culicidæ are separated from all other Diptera by a characteristic wing venation which is outlined by Edwards (1932) as follows: Subcosta (Sc) long and reaching costa; radius 4-branched, R_{2+3} forked, R_{4+5} simple, no cross vein connecting R_1 and R_2 ; media two branched; cross veins r-m and m-cu both present; cubitus forked; anal vein long and reaching wing margin; axillary vein absent or very faint (Fig. 5). There is no other single character which separates the family from other Diptera. Other common family characters are (1) the small or rudimentary first antennal segment and the more or less enlarged second segment, (2) the completely divided pronotum, the posterior divisions of which appear to form part of the pleuræ. These characters, however, are not distinctive since they are shared by one or more families of Diptera.

The larvæ of the Culicidæ are distinguished from all other dipterous larvæ by the presence of a complete head capsule and of only one pair of functional spiracles situated dorsally on the eighth abdominal segment opening free to the surface (Fig. 19) or into an air tube or by the presence of a complete head capsule and air sacs in the thorax and seventh abdominal segment (Fig. 17) (*Chaoborus*).

KEY TO SUBFAMILIES OF CULICIDÆ

Adults

1. Antennal flagellum 14 segmented; vein Sc ending above or before base of Rs (Fig. 5). Mouthparts short, wings without scales: *Dixiniæ*
 Antennal flagellum 13 segmented; vein Sc ending much beyond base of Rs. Wings with scales at least on fringe 2
2. Mouthparts short, palpi incurved; scales almost confined to wing fringe: *Chaoboriniæ*
 Mouthparts modified to form a long proboscis, palpi not incurved; wing veins and legs scaly: *Culiciniæ*

Larvæ

1. Thorax narrow with distinct segmentation; prolegs on the first 2 abdominal segments; tracheæ ending in a pair of discs on eighth abdominal segment (Fig. 21) : *Dixinæ*
 Thorax distinctly broader than abdomen, without distinct segmentation, paired prolegs lacking..... 2
2. Antennæ prehensile, with long and strong apical spines (Fig. 17) : *Chaoborinæ*
 Antennæ not prehensile (Fig. 8) : *Culicinæ*

Subfamily Dixinæ

This group is represented by the single genus *Dixa*.

KEY TO THE GENUS DIXA

Adults

1. Tips of hind tibiæ noticeably enlarged, deep black, sharply contrasting with the remainder of the member; wing veins with clouded margins; proboscis black, halteres yellowish, scutellum fuscous testaceous; terminal clasper segment tapering, mesal process of the basal segment simple, elongate:..... *clavata*
 Tips of hind tibiæ not so sharply differentiated..... 2
2. Petiole of R_{2+3} (measured on a straight line from its base to base of fork) less than $\frac{3}{8}$ as long as R_3 ; proboscis, scutellum, and knob of the halteres yellow; crossvein of wing very feebly clouded, r-m crossvein slightly distad of the base of R_{4+5} : *terna*
 Wing with other characters..... 3
3. Wing with one distinct spot..... 4
 Wing spot very indistinct or wanting..... 5
4. Petiole of R_{2+3} and R_3 subequal in length; proboscis and scutellum blackish: *centralis*
 Petiole shorter; proboscis and scutellum yellowish:
 *notata*
5. Dorsum of the thorax as well as the upper part of the pleura black; proboscis, halteres and scutellum dark: *fusca*
 Dorsum of the thorax yellowish with thoracic darker

- stripes which may be more or less confluent; palpi dark6
6. First tarsal joint of fore leg about $\frac{2}{3}$ as long as the tibia:*cornuta*
 First tarsal joint of fore leg about $\frac{3}{4}$ as long as the tibia7
7. Apical segment of the clasper of the male fully as broad beyond the middle as at the base; Sc ends about opposite the base of Rs; distance between the crossveins measured on the media usually not exceeding $\frac{1}{2}$ the length of the m-cu crossvein:*modesta*
 Apical segment of the clasper of the male tapering; Sc ends distinctly proximad of the base of Rs; distance between the crossveins about equal to the length of the m-cu crossvein:*similis*

Larvæ

Only two of the species given in the key above are known in the larval stage, *D. modesta* Joh. and *D. cornuta* (Joh.) which may be separated by using the key by Johannsen (1934).

Subfamily Chaoborinæ

KEY TO GENERA

Adults

1. Clypeus small and nearly bare; R_1 ending far from tip of R_2 :*Corethrella*
 Clypeus larger and very hairy; R_1 ending close to tip of R_2 2
2. First tarsal segment much shorter than second:.....*Mochlonyx*
 First tarsal segment longer than second3
3. Clypeus as long as head; claws larger and toothed:.....*Eucorethra*
 Clypeus shorter than head; claws small and simple:.....*Chaoborus*

Larvæ

1. Eighth abdominal segment with an elongate single dorsal respiratory siphon or air tube2

KEY TO THE GENUS MOCHLONYX

Adults

1. Wing vestiture entirely pale yellow.....2
Wing vestiture black and yellow:*cinctipes*
2. Scutellar setæ numerous, arranged in two or three irregular rows:*karnerensis*
Scutellar setæ sparse, arranged in a single row:
.....*fuliginosus*

*Larvæ**

1. Clypeal and frontal spines barbed from base to a little beyond middle:*karnerensis*
These spines with long barbs beyond middle:*cinctipes*
- * The larva of *M. fuliginosus* is unknown.

The following genera of the Chaoborinæ are represented by single species: *Corethrella brakeleyi* Coquillett and *Eucorethra underwoodi* Underwood.

Subfamily Culicinæ

KEY TO GENERA

Adults

1. Postnotum with a median tuft of setæ located near the posterior margin (Fig. 2):*Wyeomyia*
Postnotum without a tuft of setæ.....2
2. Wings with the second marginal cell not half as long as its petiole (Fig. 5):*Uranotænia*
Wings with the second marginal cell more than half as long as its petiole.....3
3. Scutellum rounded or crescent-shaped with an even fringe of marginal setæ (Fig. 3):*Anopheles*
Scutellum distinctly trilobed (Fig. 4) with marginal setæ aggregated on the lobes4
4. Spiracular bristles present (Fig. 2).....5
Spiracular bristles absent.....6
5. Post-spiracular bristles present (Fig. 2); abdomen of female with the eighth segment wholly retractile:.....
.....*Psorophora*
Post-spiracular bristles absent; cross veins of wings

- tending to lie in line, or mesonotum with bare areas devoid of scales or both: *Theobaldia*
6. Pronotal bristles only two stout setæ (Fig. 2) ; proboscis with black and white scales so arranged as to form longitudinal striæ; mesonotum with six longitudinal lines of white scales: *Orthopodomysia*
 Pronotal bristles more than two, generally a prominent row; proboscis without longitudinal striæ; mesonotum without six longitudinal lines of white scales.....7
7. Wings with scales distinctly large and broad; first joint of all tarsi with broad median rings; all of the other tarsal joints black with basal half white scaled:
 *Mansonia*
 Wings with scales normal; tarsi not as above.....8
8. Post-spiracular bristles present; female usually with the abdomen pointed and the cerci exerted or tarsi with white rings on both ends of joints: *Aedes*
 Post-spiracular bristles absent; female with a blunt abdomen; tarsi without white rings involving both ends of joints: *Culex*

Larvæ

1. Eighth segment of abdomen provided with a distinct, elongate respiratory or air tube (Fig. 8)2
 Eighth segment of abdomen without a distinct, elongate respiratory or air tube (Fig. 9) : *Anopheles*
2. Air tube without a pecten (Fig. 12)3
 Air tube with a pecten (Fig. 8)5
3. Air tube about twice as long as wide, the apical portion sharply attenuated and provided with saw-like teeth dorsally for penetrating into plant tissues (Fig. 12); larva found attached to the roots of certain aquatic plants: *Mansonia*
 Air tube about three times as long as wide, tapering more or less uniformly to the apex.....4
4. Air tube with many short single hairs; larva found in the water of the pitcher plant: *Wyeomyia*
 Air tube without scattered single hairs but with a large pair of hair tufts before the middle; abdomen

- with dorsal chitinous plates on the sixth, seventh and eighth segments: *Orthopodomyia*
5. Head elongate, elliptical; head hairs single, stout like heavy spines: *Uranotænia*
 Head nearly circular or transverse; head hairs not like heavy spines 6
6. Air tube with several pairs of ventral tufts: *Culex*
 Air tube with a single pair of ventral tufts or with a single pair of tufts and a median ventral row of 10 to 12 unpaired tufts or without any paired ventral tufts 7
7. Air tube with the paired hair tufts placed close to the base between the pecten rows: *Theobaldia*
 Air tube with the paired hair tufts placed near or beyond the middle 8
8. Anal segment ringed by the dorsal plate, with tufts of the ventral brush piercing the ring: *Psorophora*
 Anal segment not ringed by the dorsal plate, or if ringed, the tufts of the ventral brush posterior to the ring: *Aedes*

KEY TO THE GENUS *Aedes**Adults*

1. Proboscis of female ringed with white (Fig. 1) 2
 Proboscis of female not ringed with white 3
2. Abdomen with a pale longitudinal dorsal stripe (Fig. 1); wings with black and white scales: *solicitans*
 Abdomen without a pale longitudinal dorsal stripe; wings with black scales: *tæniorhynchus*
3. Tarsi with white rings on at least some of the segments (Fig. 1) 4
 Tarsi without white rings 11
4. White tarsal rings involving both ends of segments 5
 White tarsal rings basal only 7
5. Wings scales markedly bicolored: *dorsalis*
 Wings scales uniformly dark, or nearly so 6
6. Mesonotum uniformly reddish brown, or nearly so:
 *canadensis*
 Mesonotum pale with a broad dark medium stripe; abdomen rather bluntly rounded: *atropalpus*

7. Tarsi with pale broad rings especially on hind legs; wings scales bicolored 8
 Tarsi with narrow rings; wing scales uniformly dark or nearly so 10
8. Lower mesepimeral bristles absent: *excrucians*
 Lower mesepimeral bristles present (Fig. 2) 9
9. With three to five lower mesepimeral bristles; mesonotum bronzy-brown on the disc, the scales on the antescutellar space, lateral margins and a sub-dorsal line each side of the disc whitish: *stimulans*
 With two lower mesepimeral bristles; mesonotum with a broad median stripe of yellowish brown scales, the anterior edge, the sides of the disc and antescutellar space with yellowish white to white scales: *fitchii*
10. Last two abdominal segments nearly entirely white scaled, venter entirely yellowish white: *cantator*
 Last two abdominal segments with apical and basal bands; venter with each segment with a median black spot or stripe which may be joined to lateral black spots forming a Y: *vexans*
11. Lower mesepimeral bristles absent 12
 Lower mesepimeral bristles present 17
12. Mesonotum with silvery scales 13
 Mesonotum without silvery scales 15
13. Mesonotum silvery on the sides with a dark brown median stripe which widens behind the middle and which is divided by the antescutellar space, the antescutellar space is margined by silvery scales:
 *triseriatus*
 Mesonotum with a medium silvery stripe reaching scutellum or entirely silvered 14
14. Mesonotum with a broad well-defined median silvery stripe: *atlanticus*
 Mesonotum with a narrower poorly defined or diffuse median stripe; mesonotum of male entirely silvery; a very small blackish species: *dupreei*
15. Abdomen with a continuous lateral white line; mesonotum uniformly colored with golden-brown scales, paler about the antescutellar space: *cinereus*
 Abdomen without a continuous lateral white line; me-

- sonotum with a median dark band.....16
16. Mesonotum with two yellow or yellowish-white stripes separated by a narrow, dark brown median band; sides dark brown to black:*trivittatus*
 Mesonotum with the golden brown median stripe slightly constricted at the middle; with two short sublateral stripes posteriorly:*hirsuteron*
 Mesonotum with the median band widening posteriorly; apical margins of abdominal segments with fine long brownish hairs:*aurifer*
17. With one to three small mesepimeral bristles; mesonotum with brownish-yellow scales uniformly distributed:*intrudens*
 With three or more stout mesepimeral bristles; mesonotum with a median stripe or paired brown median lines18
18. Mesonotum with paired brown median lines.....19
 Mesonotum with a median brown stripe.....20
19. Mesonotum yellow or bronzy with a pair of black median lines, often joined into a median stripe; legs deep black:*diantæus*
 Mesonotum with paired median lines separated by a broad golden brown line:*impiger*
 Mesonotum with paired median lines separated by a narrow yellow line; sides grayish:*communis*
20. Mesonotum with the median band laterally expanded near the middle:*trichurus*
 Mesonotum with the median band only slightly darker than the lateral margins:*punctor**
*implacabilis**

*There are no satisfactory characters with which to separate these species. In *A. punctor* the median band of the mesonotum may in some cases have a middle line of slightly paler scales. The last abdominal segment of *A. implacabilis* is usually pale scaled whereas in *punctor* it has a V-shaped dark area.

Larvæ

1. Air tube with tuft within pecten.....2
 Air tube with tuft beyond pecten.....3

- | | | |
|-----|--|---------------------|
| 2. | Air tube with several dorsal hair tufts, anal gills normal: | <i>trichurus</i> |
| | Air tube without several dorsal hair tufts, anal gills large and inflated: | <i>atropalpus</i> |
| 3. | Pecten with detached teeth outwardly (Fig. 15)..... | 4 |
| | Pecten without detached teeth outwardly (Fig. 16)..... | 9 |
| 4. | Antennæ enlarged basally: | <i>aurifer</i> |
| | Antennæ not enlarged basally..... | 5 |
| 5. | Antennæ as long as head: | <i>diantæus</i> |
| | Antennæ not as long as head..... | 6 |
| 6. | Both pairs of head hairs (Fig. 8) double: | <i>excrucians</i> |
| | Both pairs of head hairs not double..... | 7 |
| 7. | Lateral abdominal hairs (Fig. 8) single beyond second segment | 8 |
| | Lateral abdominal hairs not single beyond second segment: | <i>vexans</i> |
| 8. | Air tube 2½ to 3 times as long as wide, tuft on air tube large: | <i>intrudens</i> |
| | Air tube 3½ to 4 times as long as wide, tuft on air tube small, located on outer third of tube: | <i>cinereus</i> |
| 9. | Comb scales in a single or in an irregular single row..... | 10 |
| | Comb scales in a triangle..... | 13 |
| 10. | Anal segment ringed by plate..... | 11 |
| | Anal segment not ringed by plate: | <i>triseriatus</i> |
| 11. | Air tube five times as long as wide: | <i>dupreei</i> |
| | Air tube 2 to 3½ times as long as wide..... | 12 |
| 12. | Dorsal brush of anal segment consisting of two pairs of long hairs: | <i>implacabilis</i> |
| | Dorsal brush of anal segment consisting of a pair of long hairs and a pair of dorsal tufts: | <i>atlanticus</i> |
| 13. | Anal segment ringed by plate..... | 14 |
| | Anal segment not ringed by plate..... | 17 |
| 14. | Upper and lower head hairs double: | <i>punctor</i> |
| | Upper and lower head hairs single..... | 15 |
| 15. | Anal gills at least as long as anal segment: | <i>trivittatus</i> |
| | Anal gills shorter than anal segment..... | 16 |
| 16. | Lateral abdominal hairs double on segments two to five; scale of comb with a stout apical spine: | <i>sollicitans</i> |

- Lateral abdominal hairs triple on segments three to five;
 scale of comb with a fringe of spines of approximately
 equal length: *tæniorhynchus*
17. Air tube at least four times as long as wide: *fitchii*
 Air tube three times or less as long as wide..... 18
18. Head hairs single..... 19
 Head hairs double or multiple..... 21
19. Anal gills at least as long as anal segment..... 20
 Anal gills much shorter than anal segment: *dorsalis*
20. Scale of comb with broad apex bearing four to seven
 stout spines: *communis*
 Scale of comb with single stout spine: *impiger*
21. Both pairs of dorsal head hairs multiple..... 22
 Both pairs of dorsal head hairs not multiple..... 23
22. Anal gills budlike; found in salt water: *cantator*
 Anal gills well developed: *canadensis*
23. Lower head hairs double, upper triple:..... *hirsuteron*
 Lower head hairs single, upper double: *stimulans*

KEY TO THE GENUS THEOBALDIA

Adults

1. Tarsi with poorly defined yellowish white rings at both
 ends of some of the joints: *morsitans*
 Tarsi without rings on any of the joints..... 2
2. Scales of the wings mixed, black or brown and white
 especially along the costal margin; proboscis with
 intermixed black and white scales: *inornata*
 Scales of the wings all brown or black..... 3
3. Mesonotum brown marked with yellowish lines or spots;
 wings with some of the scales slightly aggregated
 along the third vein; a large species: *impatiens*
 Mesonotum entirely reddish brown; wing scales normal;
 each abdominal segment with an apical row of coarse
 yellow hairs; a small species (4 mm.): *melanura*

Larvæ

1. Pecten produced into long hairs on outer half (Fig. 13)
 2
 Pecten not produced into long hairs on outer half..... 3

- Apical segment of the palpus white-tipped; anal vein entirely dark without spots: *walkeri*
3. Costal margin of wing with two white or yellowish-white spots, a large one beyond the middle and a small one at the apical end: *punctipennis*
 Costal margin of wing without white or yellowish-white spots 4
4. Fringe at apex of wing with a distinct light yellow to coppery spot: *maculipennis*
 Fringe at apex of wing without a distinct light yellow to coppery spot 5
5. Wing with dark scales uniformly distributed: *barberi*
 Wing with the dark scales definitely aggregated to form dark spots at the base of the radical sector, at cross-veins r-m and m-cu, at fork of R_2 and R_3 and at fork of M_{1+2} and M_{3+4} : *quadrinaculatus*

Larvæ

1. Abdomen with plumose lateral hairs (Fig. 9) on first six segments; head hairs simple: *barberi*
 Abdomen with plumose lateral hairs on first three segments; head hairs plumose 2
2. Abdominal segments 4 and 5 with two conspicuous tufted hairs (Fig. 11) (hair 0 and the antepalmate or hair 2) anterior to the palmate tuft, these hairs usually approximately equal in size and with four to nine branches; fresh water form: *crucians*
 Abdominal segments 4 and 5 with but one conspicuous hair (antepalmate or hair 2) anterior to the palmate tuft, this hair may be single or with two or three branches 3
3. Abdomen with the palmate tufts on segments 3 to 7 inclusive, of similar form but those on segments 3 and 7 distinctly smaller than the others; posterior clypeal hairs (Fig. 10) long and usually single; tubercles of inner anterior clypeal hairs (Fig. 10) wide or close; brackish water form: *crucians*
 Abdomen with the palmate tufts on segment 3 approximately equal in size to those on the succeeding segments 4

4. Tubercles of inner anterior clypeal hairs separated by at least the width of one of these tubercles; antepalpmate hairs on segments 4 and 5 usually single; palmate tufts on segment 2 usually well developed:
 *quadrimaculatus*
 Tubercles of inner anterior clypeal hairs so close together that another tubercle of similar size could not be placed between them..... 5
5. Inner anterior clypeal hairs not minutely feathered toward tip; antepalpmate hairs of abdominal segments 4 and 5 usually double or multiple..... 6
 Inner anterior clypeal hairs minutely feathered toward tip; antepalpmate hairs of abdominal segments 4 and 5 usually single: *walkeri*
6. Antepalpmate hairs of abdominal segments 4 and 5 usually with 2 branches, rarely 1 or 3; posterior clypeal hairs usually with 2 branches from near base; inner anterior clypeal hairs single, unbranched:
 *punctipennis*
 Antepalpmate hairs of abdominal segments 4 and 5 usually with 3 branches, rarely with 2 or 4; posterior clypeal hairs usually long with apical branching; inner anterior clypeal hairs unbranched or with 2 or 3 branches beyond middle: *maculipennis*

KEY TO THE GENUS CULEX

Adults

1. Abdominal segments with transverse apical white bands: *apicalis*
 Abdominal segments with basal white bands or none: 2
2. Abdominal segments with basal white bands..... 3
 Abdominal segments without basal white bands:
 *salinarius*
3. Basal white band of the second abdominal segment triangularly produced medianly: *pipiens*
 Basal white band of the second abdominal segment transverse: *territans*

Larvæ

1. Antenna with the tuft at or before the middle..... *territans*
 Antenna with the tuft beyond the middle..... 2

2. Both upper and lower head hairs multiple.....3
 Both upper and lower head hairs not multiple, usually single but with all variations between the complete single and complete double condition, rarely with one or two head hairs triple:*apicalis*
3. Air tube long and slender, about seven times as long as broad, slightly expanded before the apex; subdorsal hairs on segments three to six multiple: ...*salinarius*
 Air tube not over five times as long as wide tapering uniformly toward the apex; subdorsal hairs double on segments three to six:*pipiens*

The following genera of Culicinae are represented by single species; *Mansonia perturbans* (Walker), *Orthopodomyia signifera* (Coquillett), *Uranotænia sapphirina* (Osten Sacken), *Wyeomyia smithii* (Coquillett).

SUMMARY OF SPECIES OF CULICIDAE REPORTED FROM MASSACHUSETTS

The following species of mosquitoes were reported by Johnson (1925):

Subfamily Dixinae

- Dixa centralis* Loew
D. clavata Loew
D. cornuta Johannsen
D. modesta Johannsen
D. notata Loew

Subfamily Chaoborinae

- Mochlonyx cinctipes* Coquillett as *Corethra cinctipes* Coquillett
M. karnerensis Felt as *Corethra culiciformis* (DeGeer)
M. fuliginosus Felt as *Corethra fuliginosus* Felt.
Chaoborus albipes (Johannsen)
C. americanus Johannsen as *C. crystallina* DeGeer
C. albatius Johnson
C. punctipennis Say
C. trivittatus Loew

Subfamily Culicinae

- Wyeomyia smithii* (Coquillett)

- Culex apicalis* Adams as *C. testaceus* Van der Wulp
C. territans Walker
C. salinarius Coquillett
Theobaldia melanura (Coquillett) as *Culex melanurus*
 (Coquillett)
T. morsitans (Theobald) as *Culiseta dyari* (Coquillett)
T. inornata (Williston) as *Culiseta inornatus* (Williston)
Mansonia perturbans (Walker) as *Taeniorhynchus perturbans* (Walker)
Psorophora ciliata (Fabricius)
P. posticata (Wiedemann) as *P. sayi* Dyar and Knab
Aedes trivittatus (Coquillett)
A. aurifer (Coquillett)
A. punctor (Kirby)
A. intrudens Dyar
A. hirsuteron (Theobald)
A. communis (DeGeer) as *A. lazarensis* (Felt and Young)
A. dorsalis (Meigen)
A. canadensis (Theobald)
A. stimulans (Walker)
A. cantator (Coquillett)
A. fitchii (Felt and Young)
A. trichurus (Dyar) as *A. cineroborealis* Felt and Young
A. atropalpus (Coquillett)
A. excrucians (Walker)
A. taeniorhynchus (Wiedemann)
A. sollicitans (Walker)
A. triseriatus (Say)
A. vexans (Meigen)
A. cinereus (Meigen)
A. impiger (Walker)
Uranotænia sapphirina (Osten Sacken)
Anopheles punctipennis (Say)
A. quadrimaculatus (Say)
A. maculipennis (Meigen)
A. walkeri (Theobald)

In 1930 one additional Culicine was reported by Tulloch:

Aedes implacabilis (Walker) or *Aedes abserratus* (Felt and Young)

Several species new to Massachusetts have been recovered during the present survey. They are as follows:

Subfamily Chaoborinæ

Eucorethra underwoodi Underwood—Yarmouth, July 27, 1939, Armstrong

Corethrella brakeleyi Coquillett—Taunton, July 20, 1939, Collector M. W. Chambers

Subfamily Culicinæ

Psorophora columbiæ Dyar and Knab—Northampton, July 18, 1939, Collector W. J. Neunier

Orthopodomyia signifera (Coquillett)—Sudbury, August 28, 1939, Collector W. J. Normandin

Anopheles crucians Wiedemann—Orleans, August 29, 1939, Collector J. L. Drew

LITERATURE CITED

- Bradley, G. H., 1936. On the identification of mosquito larvæ of the genus *Anopheles* occurring in the United States (Diptera, Culicidæ). *South. Med. Jour.* 29: 859-861 illus.
- Dyar, Harrison G., 1922. The mosquitoes of the United States. *U. S. Natl. Mus. Proc.* 62, art. 1, 119 pp.
- 1928. The mosquitoes of the Americas. *Carnegie Inst. Wash. Pub.* 337, 616 pp. illus.
- Dyar, Harrison G. and Shannon, Raymond C., 1924. The American Chaoborinæ. *Ins. Ins. Mens.* 12: 201-216.
- Edwards, F. W., 1932. *Diptera, Fam. Culicidæ.* 258 pp. illus. Bruxelles. In Wytzman, P., *Genera Insectorum*, fasc. 194.
- Headlee, Thomas J., 1921. The mosquitoes of New Jersey and their control. *N. J. Agr. Exp. Sta. Bull.* 348. 229 pp. illus.
- Johannsen, O. A., 1903. Aquatic insects in New York State. *N. Y. State Mus. Bull.* 68, part 6: 328-441. illus.
- 1923. North American Dixidæ. *Psyche* 30: 52-58. illus.
- 1934. Aquatic Diptera, Part 1. Nematocera, exclusive of Chironomidæ and Ceratopogonidæ. *Cornell Univ. Agr. Exp. Sta. Memoir* 164. 71 pp. illus.
- Johnson, Charles W., 1925. *Fauna of New England* 15, List of the Diptera or two-winged insects. *Boston Soc. of Nat. Hist.* 7. 326 pp. illus.
- King, W. V., Bradley, G. H., and McNeel, T. E., 1939. The mosquitoes of the southeastern States. *U. S. Dept. Agr. Misc. Pub.* 336. 90 pp. illus.
- Marshall, J. E., 1938. *The British Mosquitoes.* 341 pp. illus. William Clowes and Sons, Ltd. London and Beccles.

- Matheson, Robert, 1925. Notes on Chaoborinæ (Diptera, Culicidæ).
Can. Ent. 57: 159-160.
- 1929. A handbook of the mosquitoes of North America. 268 pp.
illus. Springfield, Ill. and Baltimore, Md.
- Smith, John B., 1904. Report of the New Jersey State Agricultural
Experiment Station upon the mosquitoes occurring within the
state, their habits, life history, etc. 482 pp. illus. Trenton.
- Tulloch, George S., 1930. A key to the biting mosquitoes of New Eng-
land. Psyche 37: 234-244. illus.

EXPLANATION OF PLATES

PLATE 4

1. Female mosquito (after John B. Smith).

PLATE 5

2. Side view of thorax showing bristle areas.
3. Dorsal view of crescent-shaped scutellum.
4. Dorsal view of trilobed scutellum.
5. Generalized wing of a mosquito.
6. Tarsus with toothed claws.
7. Tarsus with simple claws.

PLATE 6

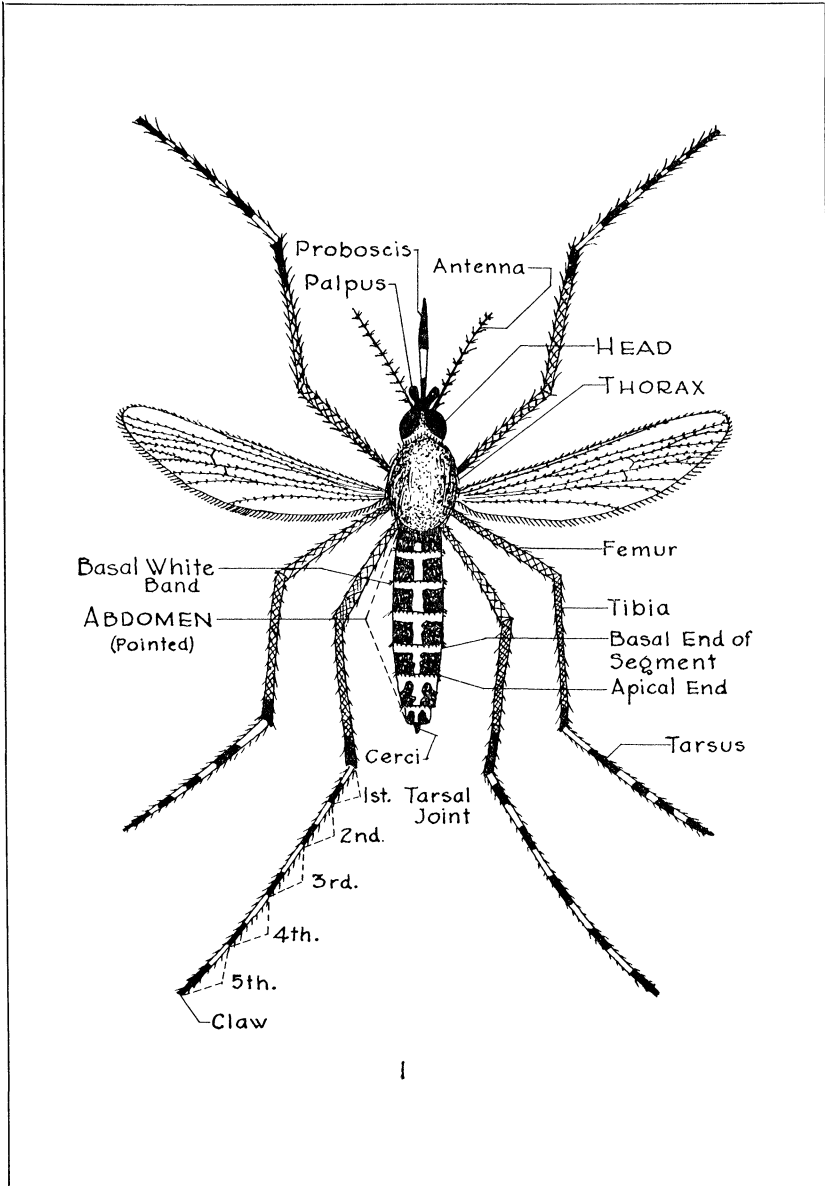
8. Larva of *Aedes* (after Marshall).
9. Larva of *Anopheles* (after Marshall).

PLATE 7

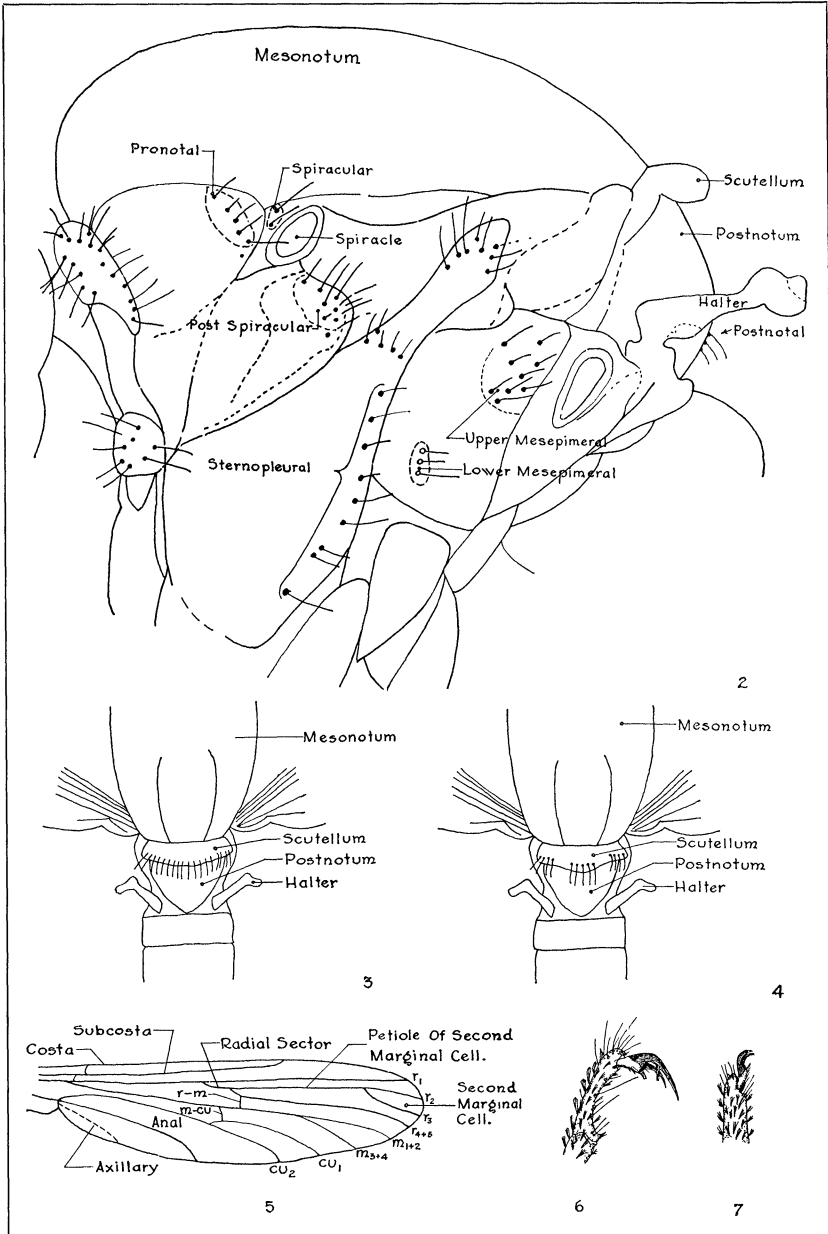
10. Head of *Anopheles* larva (after Marshall).
11. Dorsal view of segments 4 and 5 of *Anopheles* larva.
12. Air tube sharply attenuated without a pecten.
13. Air tube with some of the pecten teeth produced into long hairs.
14. Air tube fusiform with small tuft (after Dyar).
15. Air tube with pecten teeth detached outwardly.
16. Air tube with pecten teeth not detached outwardly.

PLATE 8

17. Larva of *Chaoborus* (after Johannsen).
18. Larva of *Mochlonyx* (after Johannsen).
19. Larva of *Eucorethra* (after Johannsen).
20. Larva of *Corethrella* (after Johannsen).
21. Larva of *Dixa* (after Johannsen).



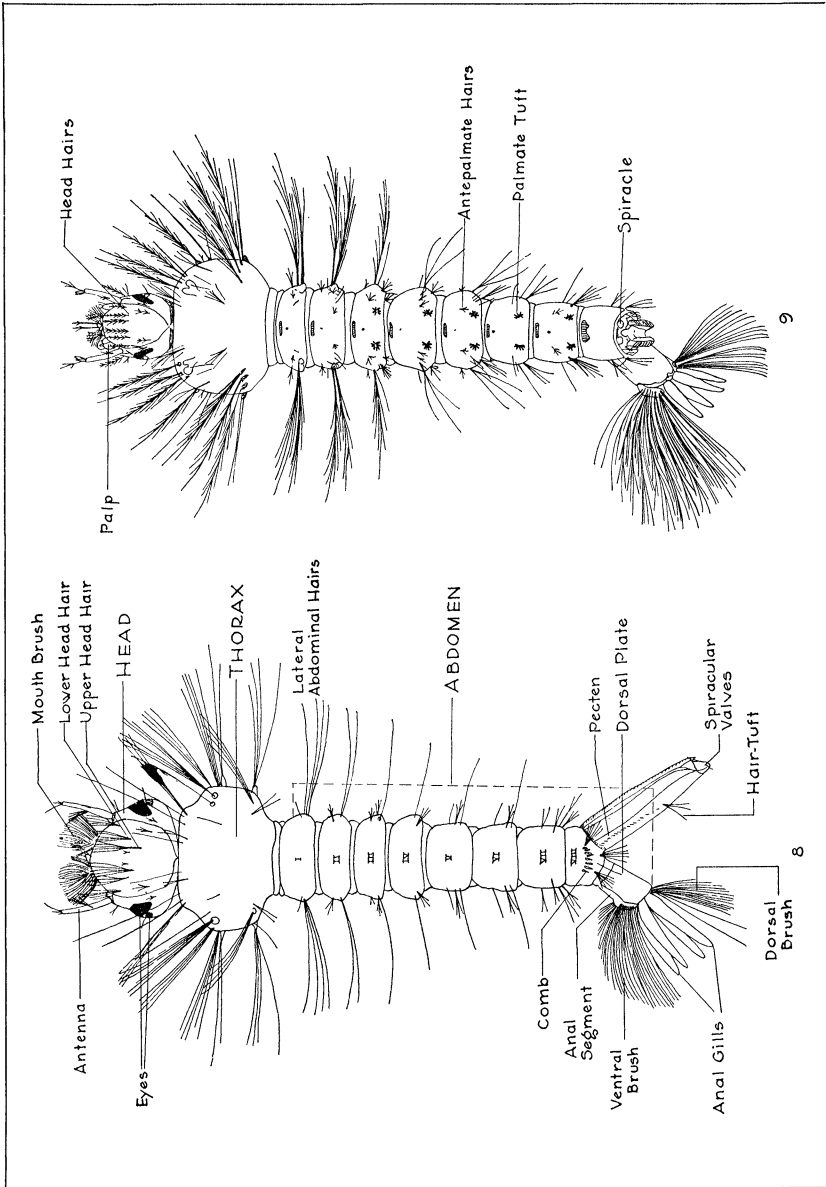
Tulloch — Mosquitoes of Massachusetts.



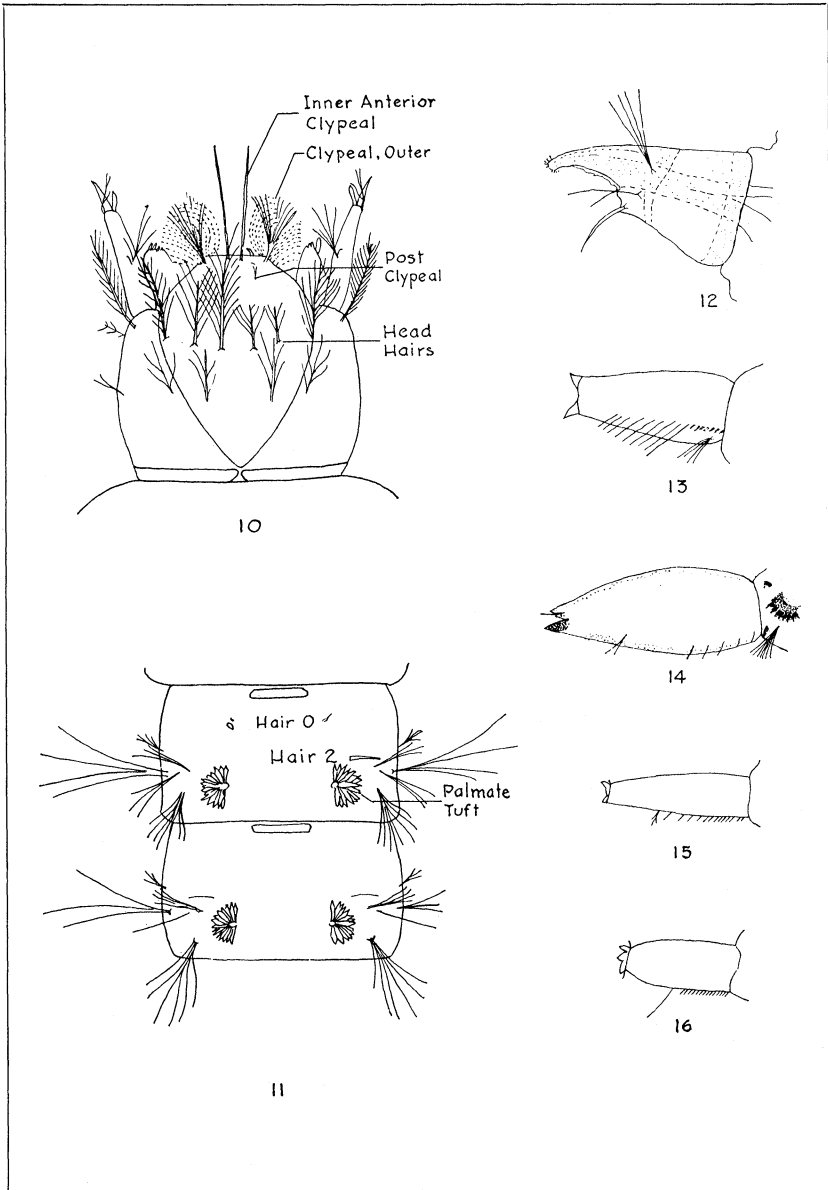
Tulloch — Mosquitoes of Massachusetts.

Psyche, 1939

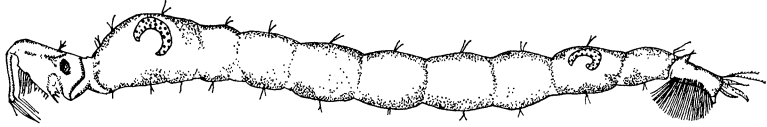
VOL. 46, PLATE VI.



Tulloch — Mosquitoes of Massachusetts.



Tulloch — Mosquitoes of Massachusetts.



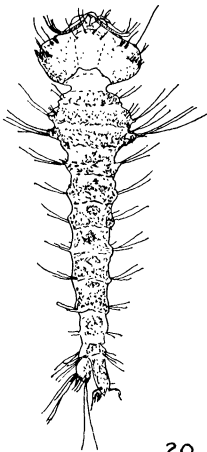
17



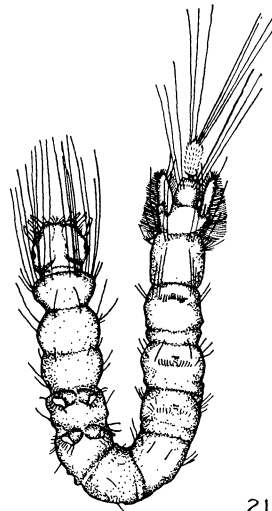
18



19



20



21



Hindawi

Submit your manuscripts at
<http://www.hindawi.com>

