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BULLETIN OF THE CALIFORNIA INSECT SURVEY
VOLUME 1 NO. 2

THE MOSQUITOES OF CALIFORNIA

BY
S. B. FREIBORN and R. M. SCHART
(Division of Entomology and Parasitology, University of California)

UNIVERSITY OF CALIFORNIA PRESS
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THE MOSQUITOES OF CALIFORNIA

The first general publication on the mosquitoes of California was by Quayle (1906). In the same year Dyar and Knab, dismayed by the confused jumbling of genera and species in Theobald's writings, proposed an independent classification based on larval characters and the thesis that well-defined differences apparent in the larvae should be reflected in the adults. They illustrated their hypothesis by the German proverb that "Wer A sagt muss auch B sagen." Their contribution brought order out of confusion and their later monograph written with Howard laid the foundation for the systematic study of mosquitoes in the United States.

In 1926 Freeborn published re-descriptions, keys, and ecological notes on the 30 species of mosquitoes then known to occur in the state. In 1941 Reeves presented a paper on California mosquitoes, and a key which included one additional species was mimeographed and distributed. As a wartime contribution, Freeborn and Brookman (1943) published an identification guide to Pacific Coast mosquitoes.

Since the last complete treatment of the species of California, several new ones have been described, and reexamination of existing collections has disclosed species not previously reported. Conversely in one instance — that of *Aedes impiger* — a check of the specimens on which the only existing state records were based has revealed them to belong to species other than *impiger*. In addition, it is now possible to segregate accurately the component species of some of the hitherto baffling complexes, such as that of *Culex apicalis*, *territans* and *boharti*.

The records of these changes are, in some instances, already published in various entomological journals, but to date they have not been collected for ready reference nor incorporated into existing keys. New records and synonymy since Freeborn (1926) are cited in the present paper, but older synonymy which is recorded in that work is not repeated here.

We realize full well that our records of distribution are incomplete. Unless otherwise stated, we have included only records for which we have been able to see the actual specimens personally. Existing published records of well-qualified investigators are not always trustworthy, largely because of nomenclatorial changes caused by a more complete understanding of the mosquito fauna. For instance, records of *Anopheles maculipennis* might be either *occidentalis* or *freeborni* and *Culex api-*

calis might be *apicalis*, *territans* or *boharti*. In the case of the *Culex pipiens* — *quinquefasciatus* complex, our distribution records are based primarily on material of which we have examined male genitalia. Furthermore, the county records of common species, such as *C. tarsalis* and *C. incidens*, note only token occurrences and are repeated within a county only when there are significant ecological variations in the county, such as elevation or a distinction between coastal and inland distribution. It is hoped that collectors will aid in filling in the existing gaps by submitting specimens to either the California Insect Survey — University of California, Davis or Berkeley — or to the Bureau of Vector Control, State Department of Public Health, Milvia Street, Berkeley.

No group of insects of comparable size in the world has received so much attention as the mosquitoes and no area of the world of comparable size has had its mosquitoes studied so thoroughly as California. The latter statement is true only because of the pioneering work of Quayle, Herms, and Gray and scores of workers who followed them. In addition, the Mosquito Abatement Districts, whose accomplishments and programs are now checked by entomological findings, have added significantly to our fund of information. By the same token, the cooperative research program of the Hooper Foundation for Medical Research of the University of California and the U.S. Public Health Service on the transmission of the encephalitides has accumulated substantial amounts of taxonomic and ecological information. Also the Bureau of Vector Control of the State Department of Public Health and its assigned personnel from the U.S. Public Health Service has been an unusually potent force in the study of all phases of mosquito life. Despite the fact that this bulletin contains considerable original taxonomic material and represents a vast expenditure of time in the collection of field material and the checking of collection records, the authors present it chiefly as a compilation of the work of others in the agencies mentioned above, all of whom have cooperated with the enthusiasm that should be typical of all fields of biological research.

Although we have been aided in a very substantial manner by scores of individuals, special acknowledgment should be made to Alan Stone and Willis Wirth of the U.S. National Museum, R.L. Usinger and W.C. Reeves of the University of California, Bernard Brookman of the U.S. Public Health Service, and Ernestine Thurman of the California State Bureau of Vector Control.

Keys to California Mosquitoes

Genera of Mosquitoes Based on Adults¹

1. Scutellum rounded posteriorly and with marginal hairs arranged in an unbroken line; abdomen without scales; females with palpi about as long as proboscis. *Anopheles* (p.26)
Scutellum trilobed posteriorly and with bristles in three groups; abdomen with evident scales; females with short palpi. 2
2. Second marginal cell (bounded by branches of first fork vein) less than half as long as its petiole. *Uranotaenia* (p.50)
Second marginal cell at least as long as its petiole. 3
3. Fourth fore tarsal segment about as long as wide; mesonotum marked with longitudinal white lines. *Orthopodomyia* (p.50)
Fourth fore tarsal segment much longer than wide 4
4. First segment of hind tarsus with a median pale ring; wing scales mixed dark and white. 5
First segment of hind tarsus without a median pale ring. 6
5. Spiracular and postspiracular bristles present; abdominal tergites with many pale apical scales, frequently forming a triangle. *Psorophora* (p.50)
Spiracular and postspiracular bristles absent; abdominal tergites with laterobasal pale spots *Mansonia* (p.51)
6. Postspiracular bristles present; spiracular bristles absent; female abdomen pointed at tip *Aedes* (p.27)
Postspiracular bristles absent; female abdomen blunt at tip 7
7. Spiracular bristles present, yellowish; mostly large mosquitoes. *Culiseta* (p.30)
Spiracular bristles absent; medium to small mosquitoes. *Culex* (p.31)

Genera of Mosquitoes Based on Fourth Stage Larvae

1. Eighth abdominal segment without a respiratory siphon *Anopheles* (p.27)
Eighth abdominal segment with a respiratory siphon. 2
2. Siphon without a pecten 3
Siphon with a pecten. 4

¹The characters used in this key and the one following are not all generic in the broad sense and will not necessarily hold for species outside of California.

3. Distal half of siphon adapted for piercing underwater plant tissue (fig. 11) *Mansonia* (p.51)
Siphon not adapted for piercing plant tissue (fig. 10) *Orthopodomyia* (p.50)
4. Upper head hair with slender branches, lower head hair single and coarse *Uranotaenia* (p.50)
Upper and lower head hairs not as above 5
5. Siphon with a pair of large basoventral hair tufts (fig. 9). *Culiseta* (p.31)
Siphon without a pair of large basoventral hair tufts. 6
6. Siphon with three or more pairs of ventrally located hair tufts (inserted below the lateral line) *Culex* (p.32)
Siphon with one or rarely two pairs of ventrally located hair tufts. 7
7. Tufts of ventral brush not inserted in saddle. *Aedes* (p.29)
Tufts of ventral brush inserted in saddle which completely rings anal segment *Psorophora* (p.50)

Adult Females of *Anopheles*

1. Wing scales unicolorous but clumped to produce dark spots 2
Wing with patches of pale scales. 3
2. Fringe scales of wing uniformly dark. *freeborni* (p.34)
Fringe scales at wing tip whitish to bronzy *occidentalis* (p.36)
3. Palpus banded *pseudopunctipennis franciscanus* (p.36)
Palpus entirely dark scaled *punctipennis* (p.38)

Males of *Anopheles* Based on Genitalia²

1. Claspette with inconspicuous bristles on subapical lobe and 2 long slender ones on apical lobe, ninth tergite without well-developed lobes *pseudopunctipennis franciscanus* (p.36)
Claspette with two stout setae on subapical lobe and one on apical lobe which is usually associated with a smaller internal seta and

²Males are more satisfactorily separated by the wing pattern (see above).

Fourth Larval Stage of *Anopheles*

- ⁵No reliable characters are known for separation of the fourth stage larvae of these two species. Ordinarily, in *freeborni* the antennal tuft is inserted beyond the basal one fourth of the shaft and in *punctipennis* usually at or before the basal one fourth. Also, in *freeborni* the frontal hairs are customarily associated with 3 or 5 spots, whereas in *punctipennis* (from California) these hairs are usually inserted in a transverse dark band (figs. 5, 6).

12. Palpus not much longer than twice greatest diameter of torus; mesonotum with slender or only slightly broadened scales between spiracle and mid-line of mesonotum. *cataphylla* (p.40)
Palpus much longer than twice greatest diameter of torus; mesonotum with a large patch of pale broadened curved scales centered midway between spiracle and mid-line of mesonotum. *bicristatus* (p.39)
13. Vertex with a submedian black scale spot; basal pale bands of abdominal tergites forming lateral spots which join into a continuous lateral line. *cinereus* (p.40)
Vertex without a definite submedian black scale spot; abdomen usually without a continuous lateral line. 14
14. Base of costa with a long pale spot; subspiracular area with 2 scale spots, one directly below spiracle; upright vertex scales golden *pullatus* (p.45)
Base of costa without a long pale spot; hypostigial spot of scales absent 15
15. Supra-alar bristles black; upright forked vertex scales mixed pale and dark; mesonotum with scaling diffuse or forming a median line and submedian lines which are largely fused with lateral areas, mesonotal scales golden to creamy. *communis* (p.41)
Supra-alar bristles not black; upright forked vertex scales pale, straw colored 16
16. Supra-alar bristles straw colored; abdominal tergal bands not markedly incised to form an inverted V on tergites V and VI; mesonotum usually with middle one third brownish yellow and side more golden *hexodontus* (p.45)
Supra-alar bristles amber to brown; abdominal tergal bands markedly widened laterally and forming an inverted V on tergites V and VI; mesonotum with a narrow median pale line (often indistinct) flanked by wider coppery lines, sides light straw colored. *sticticus* (p.47)
3. Filament (distal portion) of claspette short, not blade-like. *bicristatus* (p.39)
Filament of claspette blade-like (figs. 18-29) 4
4. Basal lobe of basistyle with bristles which are nearly equal in size or grading from small to large, but without a single bristle distinguished by its greater size 5
Basal lobe of basistyle with a single stout bristle or spine distinguished by its greater size, sometimes with smaller spines in addition to slender bristles 8
5. Apical lobe of basistyle present, claspette filament with a sharp angle on convex side (fig. 27)⁶. *increpitus* (p.43)
Apical lobe of basistyle undeveloped 6
6. Claspette filament with a retrorse projection (fig. 29) *taeniorhynchus* (p.47)
Claspette filament without a retrorse projection 7
7. Basal lobe of basistyle a dense clump of long, stout, apically curved bristles of which longer ones are about 4 times as long as tooth of dististyle (fig. 18). *varipalpus* (p.47)
Basal lobe of basistyle a small clump of slender, nearly straight bristles of which longer ones are about 2½ to 3 times as long as tooth of dististyle (fig. 24) *nigromaculis* (p.44)
8. Basal lobe of basistyle with one or two unusually stout bristles in addition to long stout one 9
Basal lobe of basistyle without differentiated bristles other than a long stout one 10
9. Basal lobe of basistyle with one short stout bristle, a long curved one and a dense group of slender bristles; apical lobe of basistyle with a group of blade-like setae; claspette stem not sharply angled near middle (figs. 2, 22) *dorsalis* (p.41)
Basal lobe of basistyle with two stout inner bristles close together and a long outer spine with a few inconspicuous bristles in between; apical lobe of basistyle with bristles of varying length; claspette stem sharply angled near middle (fig. 23). *pullatus* (p.45)

Males of *Aedes* Based on Genitalia

1. Claspette absent, or fused to basistyle and without a filament 2
Claspette present, attached at base only . . . 3
2. Dististyle unequally bifurcate near base, longer branch equally bifurcate at apex *cinereus* (p.40)
Dististyle broad, flattened, not bifurcate, apex blunt with tooth borne at inner apical fourths. *vexans* (p.49)
10. Claspette filament with a sharp angle near base of concave edge 11
Claspette filament without sharp angle near base of concave edge 12
11. Claspette filament only a little wider at basal

⁶In mounting genitalia of male *Aedes*, one of the claspettes should be removed and mounted on its side. Otherwise its shape will be difficult or impossible to determine.

- #### Fourth Larval Stage of *Aedes*

- ⁹
- Sclerotized part only, excluding apical valves.

11. Pentad hair 2 located obliquely ventral to hair 1 and about on a line between 3 and 1; typical comb scale slender and with a row of bristles across rounded or truncate apex; gills large, usually about as long as siphon; hair d large and multiple; treeholes (fig. 16) *varipalpus* (p.47)
 Pentad hair 2 located directly posterior or dorsoposterior to 1; gills much shorter than siphon; head hair d minute 12

12. Siphon tube about 4 times as long as its greatest diameter; terminal pecten tooth almost as long as apical diameter of siphon tube; upper head hair with 3 or more branches (usually 4), lower with 2 or more (usually 3); Sierran meadow or tule-filled pools (fig. 13) *fitchii* (p.43)

Siphon tube less than 3 times as long as its greatest diameter; terminal pecten tooth about $\frac{1}{2}$ as long as apical diameter of siphon tube; upper and lower head hairs single to triple (upper usually double or triple, lower usually double); brackish coastal marshes *squamiger* (p.46)

13. Anal segment about $\frac{7}{8}$ ringed by saddle; lower head hair single or double, upper usually with 2 or more branches; shaded river overflow pools *sticticus* (p.47)
 Anal segment $\frac{1}{2}$ to $\frac{4}{7}$ ringed by saddle . . 14

14. Upper head hair with 5 or more branches, lower with 3 or more; Sierran meadows
 *pullatus* (p.45)
 Upper head hair with fewer than 5 branches, lower with fewer than 3. 15

15. Dorsal microsetae toward apex of saddle well developed, more than twice as long as those toward base of saddle and longer than diameter of setal ring at base of lateral hair of anal segment; head hairs with 2 to 4 branches or sometimes all single (especially in N. E. Calif.); siphon tuft inserted before middle of siphon tube; mostly in flooded grassy pools, common in the Sierras, less so at lower elevations down to sea level *increpitus* (p.43)

Dorsal microsetae toward apex of saddle weakly developed, less than twice as long as those toward base of saddle and about as long as diameter of the setal ring of lateral hair 16

16. Dorsal preapical spine of siphon inserted less than its length from apical margin of siphon tube; siphon tuft often inserted at or beyond middle of inner surface of siphon tube; gills usually short but sometimes longer than anal segment; upper and lower head hairs usually single, sometimes double or upper rarely

triple; irrigated pastures, brackish marshes, flooded meadows, mostly in full sun (fig. 4) *dorsalis* (p.41)

Dorsal preapical spine of siphon inserted at least its length from apical margin of siphon tube; siphon tuft inserted before middle of inner surface of siphon tube; gills longer than anal segment, sometimes twice as long; upper and lower head hairs almost invariably single; shaded Sierran pools, usually with pine needles *communis* (p.41)

Adult Females of *Culiseta*

- Hind tarsus with pale basal bands; wing with distinct scale spots 2
 Hind tarsus unbanded; wing without distinct scale spots 3
- Hind tarsal bands narrow, that of segment II covering about $\frac{1}{10}$ of segment; cross veins unscaled *incidens* (p.51)
 Hind tarsal bands broad, that of segment II covering $\frac{1}{4}$ to $\frac{1}{3}$ of segment; cross veins scaled *maccrackenae* (p.54)
- Wing speckled with pale scales, costa with pale scales near base; mid-femur speckled with pale scales in front; dorsum of abdomen brownish, with yellowish basal bands which may cover most of segment . . . *inornata* (p.53)
 Wing dark scaled, costa dark near base; mid-femur dark scaled in front; dorsum of abdomen black with whitish basal bands *impatiens* (p.51)

Males of *Culiseta* Based on Genitalia

- Dististyle about 8 times as long as its median diameter; lobes of ninth tergite with many short stout spines *inornata* (p.53)
 Dististyle 10 or more times as long as its median diameter; lobes of ninth tergite with many slender bristles 2
- Basal lobe of basistyle with only a single, rather slender, differentiated bristle; a long row of short spines across apex of eighth segment ventrally. . . *impatiens* (p.51)
 Basal lobe of basistyle with 2 or 3 stout spines 3
- Eighth segment ventrally with a median apical clump of 3 to 8 tooth-like spines
 *incidens* (p.51)
 Eighth segment ventrally with a single median apical tooth-like spine. . *maccrackenae* (p.54)

Fourth Stage Larvae of *Culiseta*

1. Saddle with a conspicuous group of dorsal bristles at apex; submedian mesonotal hair (fig. 3) strongly developed, with 3 or more branches and about as long as antenna
 *maccrackenae* (p.54)
 Saddle without dorsal bristles at apex; submedian mesonotal hair (hair 1) weak, single, considerably shorter than antenna 2
2. Upper head hair similar to lower head hair in length and number of branches
 *impatiens* (p.51)
 Upper head hair shorter than lower and with more branches 3
3. Lateral hair of anal segment about as long as or longer than saddle; head hair d more strongly developed than head hair e and often with 3 or more branches (fig. 9). *inornata* (p.53)
 Lateral hair of anal segment considerably shorter than saddle; head hair d about equal in size to hair e and usually double
 *incidens* (p.51)

Adult Females of *Culex*

1. Tarsi with pale bands 2
 Tarsi unbanded 5
2. Proboscis completely encircled by a white band near the middle 3
 Proboscis dark above 4
3. Outer surfaces of femora and tibiae with white scales arranged in a narrow line or in a row of spots; venter of abdominal segments with an inverted black V; mesonotum typically with a line of white scales around front margin back to angle above spiracle, in supra-alar area, and on either side of prescutellar area
 *tarsalis* (p.59)
 Outer surfaces of femora and tibiae without white lines or rows of spots, venter of abdominal segments with median black spots; mesonotum without definite white lines
 *stigmatosoma* (p.58)
4. Proboscis with a definite median pale area beneath; tarsal bands distinct and whitish
 *thriambus* (p.61)
 Proboscis without a definite median pale area beneath; tarsal bands rather indistinct and with a brownish-yellow tint. *restuans* (p.58)
5. Abdominal segments II to IV all dark as seen from above 6
 Abdominal segments II to IV with bands or lateral spots as seen from above 7
6. Vertex with a row of broad appressed scales forming a narrow border back of eyes
 *anips* (p.54)
 Vertex without a row of broad appressed scales behind eyes *reevesi* (p.58)
7. Pale markings of abdominal tergites apical . . 8
 Pale markings of abdominal tergites basal . . 10
8. Ventral pale stripe of hind femur ending shortly before apex; palpus about 3 times as long as flagellar segment IV as seen in lateral view *apicalis* (p.55)
 Ventral pale stripe of hind femur complete; palpus about 2 times as long as flagellar segment IV as seen in lateral view 9
9. Pale scales of vertex ashy white; abdominal segment V of unengorged dried specimens about 1.3 times as broad as long. *terrilians* (p.61)
 Pale scales of vertex with a yellowish tinge; abdominal segment V of unengorged dried specimens 1.5 to 1.7 times as broad as long
 *boharti* (p.55)
10. Mesonotal integument brownish red; bands on abdominal tergites II to V narrow and with indistinct outlines *erythrothorax* (p.56)
 Mesonotal integument brown or dark brown, not conspicuously reddish; abdominal tergites II to V with rather broad and definite bands 11
11. Bands of abdominal tergites III and IV connected with lateral spots; mesonotal integument usually reddish brown *picipiens* (p.56)
 Bands of abdominal tergites not connected with lateral spots; mesonotal integument usually dark brown *quinquefasciatus* (p.57)

Males of *Culex* Based on Genitalia

1. Paraproct (10th sternite) crowned with a single row of teeth of which the outer are peg-like, blunt 2
 Paraproct crowned with a clump of many bristles 6
2. Subapical lobe of basistyle deeply divided, bearing several hooked rods and a broad leaf; dististyle tipped with a curved horn and crested with a clump of fine bristles
 *anips* (p.54)
 Subapical lobe of basistyle not divided, not bearing a leaf, dististyle not crested . . . 3
3. Mesosome lobes not bridged, broad and toothed apically (fig. 38). *apicalis* (p.55)
 Mesosome lobes connected by a sclerotized bridge 4

4. Mesosome lobes broad apically but without teeth (fig. 36); dististyle strongly narrowed on apical one third. *reevesi* (p.58)
Mesosome lobes toothed apically; dististyle narrowing rather gradually toward apex. . . 5
5. Mesosome lobes strongly narrowed and heavily sclerotized apically, bridge stout (fig. 39); dististyle membrane not divided into lobes toward apex. *boharti* (p.55)
Mesosome lobes broad and not unusually sclerotized apically, bridge narrow (fig. 37); dististyle membrane divided into lobes toward apex¹⁰ *territans* (p.61)
6. Paraproct with basal arm at most weakly developed 7
Paraproct with a well developed curving basal arm 8
7. Median process of mesosome stout toward apex and usually blunt or slanted apically, ventral cornu proportionately smaller than in *quinquefasciatus* (fig. 41). . . *pipiens* (p.56)
Median process of mesosome slender toward apex, pointed, straight or curved near tip; ventral cornu very large (fig. 40) *quinquefasciatus* (p.57)
8. Median process of mesosome with several stout teeth bordered by a group of close-set slender ones on inner side of ventral cornu 9
Median process of mesosome not separated from ventral cornu by a group of close-set slender teeth 10
9. Subapical lobe of basistyle (starting basally) with 3 rods (basal one pointed), a short and slender hooked spine, a leaf, and a long slender spine (figs. 44, 48) *stigmatosoma* (p.58)
Subapical lobe of basistyle with 3 rods (basal one blunt), no hooked spine, a leaf, and a slender spine (figs. 45, 49). *thriambus* (p.61)
10. Median process with about 5 teeth, one of which is very long and slender, matching long external process; subapical lobe of basistyle with 3 rods (basal 2 stout), a spine (slightly hooked), a narrow leaf, and a slender bristle (figs. 43, 47). *tarsalis* (p.59)
Median process without several teeth of which one is long and matches external process; subapical lobe of basistyle with 3 rods, slender and hooked club, broad leaf, and bristle 11

¹⁰ Sometimes these lobes can be seen only with careful focusing and light adjustment.

11. Median process of mesosome with 7 to 12 short and stout teeth; external process large, very stout in basal three fourths; basal process well developed thumb-like (fig. 46) *erythrothorax* (p.56)
Median process of mesosome with a single tooth surpassed by stout external process; basal process weakly developed (fig. 42) *restuans* (p.58)

Fourth Larval Stage of *Culex*

1. Siphon hairs mostly single 2
Siphon hairs double or multiple 3
2. Antennal tuft inserted at apical one third of shaft; lateral abdominal hairs of segments III and IV double (fig. 31). *thriambus* (p.61)
Antennal tuft inserted slightly before middle of shaft; lateral abdominal hairs of segments III and IV single . . . *restuans* (p.58)
3. Lower head hair with 3 or more branches, upper with 4 or more branches 4
Lower head hair single or double, upper single to triple 7
4. Siphon with ventral tufts only (fig. 32) . . . *tarsalis* (p.59)
Siphon with subapical tuft lateral or sub-lateral 5
5. Dorsal microsetae toward apex of saddle conspicuously enlarged as compared with those at dorsal middle; lateral hairs of abdominal segments III and IV usually triple (fig. 33) *stigmatosoma* (p.58)
Dorsal microsetae toward apex of saddle about as large as those at middle; lateral hairs of abdominal segments III and IV usually double 6
6. Siphon tube 6 to 7 times as long as its basal diameter and bearing 5 or 6 pairs of tufts (fig. 30) *erythrothorax* (p.56)
Siphon tube a little more than 4 (*pipiens*) to a little less than 4 (*quinquefasciatus*) times as long as its basal diameter and bearing 4 pairs of tufts *pipiens* (p.56)
quinquefasciatus (p.57)
7. Siphon with 2 dorsal tufts; lateral hair of anal segment small and with more than 4 branches; upper head hair short and double, lower long and single *anips* (p.54)
Siphon without dorsal tufts; lateral hair of anal segment with fewer than 5 branches . . 8
8. Siphon tube 7 to 9 times as long as its basal diameter which is about 2 times the apical diameter; upper head hair double or triple,

- lower double or rarely single; siphon tufts relatively short (fig. 35). *apicalis* (p.55)
 Siphon tube slightly to considerably less than 7 times its basal diameter which is distinctly less than 2 times the apical diameter; siphon tufts often 1/3 to 1/2 as long as siphon 9
9. Lower head hair double, upper triple
 *reevesi* (p.58)
 Lower head hair single, upper usually double10
10. Abdominal segment IV much paler than III or
- V;¹¹ spicules near dorsal apex of saddle relatively slender; upper head hair double or rarely triple (fig. 34).
 *boharti* (p.55)
 Abdominal segments rather evenly pigmented; spicules near dorsal apex of saddle becoming coarse; upper head hair double or rarely single¹². *territans* (p.61)

¹¹Best seen in living specimens.

¹²Applies to California material only. In many other sections of North America both upper and lower head hairs are predominantly single.

Discussion of Species

Genus *Anopheles* Meigen

The complicated relationships of the California *Anopheles* have been discussed in detail by Aitken (1940a, 1945) and Freeborn (1949). Members of the so-called "Maculipennis Complex" are here treated as full species for the sake of convenience although it is recognized that they are allopatric and might equally well be considered as geographical races.

Anopheles freeborni Aitken

Anopheles maculipennis freeborni Aitken, 1939. Pan-Pac. Ent. 15: 192. Holotype ♂, allotype ♀ (CAS), Davis, California.

Discussion:

The western malaria carrier is an adaptation to a warm, semi-arid climate of alternating rainy and dry seasons. Its range is the arid west limited on the east by the continental divide. It occurs commonly everywhere in California where water is available, except in the cool coastal belt inhabited by *occidentalis* and above the digger pine belt in the Sierra. It breeds in sunlit pools where algae or emergent vegetation are present. Hoofprints that meet these specifications are suitable breeding places. It seldom breeds in water contaminated with sewage, and will desert pools that become heavily loaded with organic material.

The adult with its wings marked with four indistinct dark concentrations of scales is easily separated from any other California anopheline except *A. occidentalis* which bears an apical wing fringe spot. Its larvae are indistinguishable from *A. punctipennis* by any constant set of characters.

California records:

ALAMEDA CO.: Niles Canyon, ♂, VI-4-17 (C.I.S.).

BUTTE CO.: Gridley, ♀, V-31-16 (W. B. Herms, C.I.S.); Honcut, ♀, VI-30-16 (W. B. Herms, C.I.S.); Oroville, ♂♀, VI-30-16 (W. B. Herms, C.I.S.); Durham, ♂♀, V-29-16 (W. B. Herms, C.I.S.); Biggs, ♂♀, V-29-16 (W. B. Herms, C.I.S.); Wyandotte, ♀, VII-1-16 (W. B. Herms, C.I.S.); Nelson, ♀, V-29-16 (W. B. Herms, C.I.S.); Enterprise, ♀, VI-3-16 (W. B. Herms, C.I.S.); Chico, ♀, V-25-16 (C.I.S.).

COLUSA CO.: Colusa, ♀, V-20-16 (W. B. Herms, C.I.S.); Macy, ♀, V-17-16 (W. B. Herms, C.I.S.); Arbuckle, ♂♀, V-16-16 (W. B. Herms, C.I.S.); Maxwell, ♂, V-17-16 (W. B. Herms, C.I.S.); Berlin, ♂♀, V-17-16 (W. B. Herms, C.I.S.); Princeton, ♀, V-22-16 (W. B. Herms, C.I.S.); Williams, ♀, V-17-16 (W. B. Herms, C.I.S.).

CONTRA COSTA CO.: Clyde, VI-15-19 (C.I.S.).

DEL NORTE CO.: Wonderland Park, ♀, VII-19-37 (T. Aitken, C.I.S.).

ELDORADO CO.: Placerville, ♂, VII-15-17 (W. B. Herms, C.I.S.); Coloma, ♀, VII-15-16 (W. B. Herms, C.I.S.).

FRESNO CO.: Fowler, ♀, VI-10-19 (C.I.S.); Laton, ♂♀, VI-10-19 (C.I.S.); Fresno, ♀, IX-16-17 (C.I.S.); Helm, ♂♀, VII-25-19 (C.I.S.).

GLENN CO.: Artois, ♂♀, V-18-16 (C.I.S.); St. John, ♂♀, (C.I.S.); Orland, ♀, V-20-16 (W. B. Herms, C.I.S.); Hamilton City, ♀, V-20-16 (W. B. Herms, C.I.S.); Willows, ♂♀, V-18-16 (W. B. Herms, C.I.S.); Fruto, ♀, (W. B. Herms, C.I.S.).

HUMBOLDT CO.: Fortuna, ♀, VII-19-37 (T. Aitken, C.I.S.).

INYO CO.: Lone Pine, ♀, VI-3-38 (T. Aitken, C.I.S.); Bishop, ♀, VI-5-38 (T. Aitken, C.I.S.).

KERN CO.: Bakersfield, ♂♀, VII-27-19 (C.I.S.); McKittrick, ♀, VI-25-19 (C.I.S.).

KINGS CO.: Hanford, ♂, VI-10-19 (C.I.S.); Lemoore, ♀, VI-10-19 (C.I.S.); Armona, ♀, VIII-3-39 (S. Dommes, C.I.S.); Stratford, ♂, VII-25-19 (C.I.S.).

LAKE CO.: Lower Lake, ♂♀, VII-29-16 (C.I.S.); Finley, ♀, VII-29-48, (W. W. Wirth, C.I.S.); Upper Lake, ♀, VII-29-48, (W. W. Wirth, C.I.S.); Middleton, ♀, VIII-17-48, (W. W. Wirth, C.I.S.).

LASSEN CO.: Willow Creek, ♂♀, VI-17-16 (W. B. Herms, C.I.S.); Lassen National Park, ♀, V-7-39 (J. W. Johnson, C.I.S.); Johnstonville, ♀, VI-17-16 (W. B. Herms, C.I.S.).

MADERA CO.: Madera, ♂, VII-24-19 (W. B. Herms, C.I.S.); Minturn, ♀, IX-29-17 (C.I.S.); Borden, ♂♀, IX-29-17 (C.I.S.).

MARIN CO.: Point Reyes Station, ♀, VIII-13-37 (T. Aitken, C.I.S.).

MENDOCINO CO.: Willeys, ♂, VII-22-37 (T. Aitken, C.I.S.).

MERCED CO.: Hopeton, ♂♀, VI-7-19 (C.I.S.); Merced, ♂♀, VII-23-19 (C.I.S.); Snelling, ♂♀, VI-7-19 (C.I.S.); Los Banos, ♂, IX-28-17 (C.I.S.); Planada, ♀, 1-28-40 (R. Rose, C.I.S.); Atwater, ♂♀, IX-28-17 (C.I.S.).

MODOC CO.: Hackamore, ♀, VI-13-40 (J. W.

Johnson, C.I.S.); Alturas, ♂♀, VI-15-16 (W. B. Herms, C.I.S.); Likely, ♂♀, VI-15-16 (W. B. Herms, C.I.S.).

MONO CO.: Coleville, ♂♀, V-28-39 (T. Aitken, C.I.S.).

MONTEREY CO.: Carmel, ♀, VIII-11-37 (T. Aitken, C.I.S.).

NAPA CO.: Pope Valley, ♀, VIII-17-48, (W. W. Wirth, C.I.S.); Monticello, ♀, XII-9-47 (R. M. Bohart, U.C.D.).

NEVADA CO.: Glenbrook, ♀, VII-29-16 (C.I.S.); Grass Valley, ♀, VII-7-16 (W. B. Herms, C.I.S.); Truckee, ♀, VII-?-48, (R. Coleman, C.I.S.).

ORANGE CO.: Santa Ana, ♀, VII-22-17 (C.I.S.); Peters Cyn., ♀, V-5-49 (R. M. Bohart, U.C.D.).

PLACER CO.: Auburn, ♀, VII-7-16 (W. B. Herms, C.I.S.).

PLUMAS CO.: Blairsden, ♀, VII-4-16 (W. B. Herms, C.I.S.); Quincy, ♀, VII-16-49 (P. D. Hurd, C.I.S.); Crescent, ♂♀, 10-30-47 (R. M. Bohart, U.C.D.).

RIVERSIDE CO.: San Jacinto, ♂♀, VII-19-19 (C.I.S.); Soboba Springs, ♀, VI-2-17 (E. P. Van Duzee, C.I.S.); Temecula, ♀, V-27-17 (C.I.S.).

SACRAMENTO CO.: Live Oak, ♀, V-29-16 (W. B. Herms, C.I.S.); Galt, ♀, VII-18-19 (C.I.S.); Natoma, ♀, VI-18-16 (W. B. Herms, C.I.S.); Sacramento, ♂♀, VI-30-16 (W. B. Herms, C.I.S.); Arno, ♂♀, VII-15-17 (C.I.S.).

SAN BENITO CO.: Tres Pinos, ♂♀, VII-19-17 (C.I.S.); Hollister, ♂, VII-18-17 (C.I.S.); San Juan, ♂, VII-18-17 (C.I.S.); Dunnville, ♀, VII-7-40 (T. Aitken, C.I.S.); Willow Creek, ♀, VI-30-48 (W. W. Wirth, C.I.S.).

SAN BERNARDINO CO.: Redlands, VII-7-19 (C.I.S.).

SAN DIEGO CO.: Bernardo, ♀, VII-27-17 (C.I.S.); Guijome Lake, ♂♀, V-7-49 (R. M. Bohart, U.C.D.).

SAN JOAQUIN CO.: Holt, ♀, VII-17-19 (C.I.S.); Tracy, ♂♀, VII-25-17 (C.I.S.); Stockton, ♂, VII-19-19 (C.I.S.); Ripon, ♀, III-17-41 (W. C. Reeves, C.I.S.); Woods Lake, ♂♀, VI-22-37 (T. Aitken, C.I.S.).

SAN LUIS OBISPO CO.: San Luis Obispo, ♀, IX-2-19 (C.I.S.); Santa Margarita, ♀, VII-20-17 (C.I.S.); Simmier, ♀, VI-25-19 (C.I.S.); Pismo Beach, ♀, VI-24-48 (W. W. Wirth, C.I.S.).

SAN MATEO CO.: Sharp Park, ♀, VIII-10-37 (T. Aitken, C.I.S.).

SANTA BARBARA CO.: Santa Barbara, ♀, VII-21-17 (C.I.S.); San Antonio Creek, ♀, VI-23-48 (W. W. Wirth, C.I.S.); Cuyama River, ♀, VIII-21-48 (W. W. Wirth, C.I.S.); Buellton, ♀, VI-23-48 (W. W. Wirth, C.I.S.); Lompoc, ♂, VIII-24-48 (W. W. Wirth, C.I.S.).

SANTA CLARA CO.: Gilroy, ♀, VIII-17-17

(C.I.S.); Milpitas, ♂, VII-18-17 (C.I.S.); Santa Clara, ♂♀, VII-3-19 (C.I.S.); Pacheco Creek, ♂, VI-30-48 (W. W. Wirth, C.I.S.).

SANTA CRUZ CO.: Twin Lakes, ♀, VIII-10-37 (T. Aitken, C.I.S.).

SHASTA CO.: Hot Creek, ♀, V-27-39 (W. C. Reeves, C.I.S.); Palo Cedro, ♀, VI-5-16 (W. B. Herms, C.I.S.); Redding, ♂♀, VI-4-16 (W. B. Herms, C.I.S.); Pit River, ♀, V-10-50 (R. M. Bohart, U.C.D.).

SIERRA CO.: Sierraville, ♀, VI-19-16 (W. B. Herms, C.I.S.).

SISKIYOU CO.: Gazelle, ♀, VIII-25-40 (T. Aitken, C.I.S.); Hornbrook, ♀, VI-12-16 (W. B. Herms, C.I.S.); 6-Mile Creek, ♂, VII-2-39 (F. D. Horn, C.I.S.); Yreka, ♂♀, VI-10-16 (W. B. Herms, C.I.S.); Grass Lake, ♀, VI-26-39 (T. Aitken, C.I.S.); Montague, ♀, VI-11-16 (W. B. Herms, C.I.S.); Weed, ♂♀, VI-10-16 (W. B. Herms, C.I.S.).

SOLANO CO.: Mare Island, ♀, V-8-47 (R. M. Bohart, U.C.D.); Vacaville, ♂♀, III-24-47 (R. M. Bohart, U.C.D.); Dixon, ♀, IV-23-47 (R. M. Bohart, U.C.D.).

SONOMA CO.: Sebastopol, ♂♀, VII-28-16 (C.I.S.); Sonoma, ♂, VIII-2-48 (W. W. Wirth, C.I.S.).

STANISLAUS CO.: Ceres, ♂♀, IX-28-17 (C.I.S.); Modesto, ♂, IX-28-17 (C.I.S.); Oakdale, ♀, VII-16-19 (C.I.S.).

SUTTER CO.: Sutter City, ♀, V-30-16 (W. B. Herms, C.I.S.); Berg, ♀, V-30-16 (W. B. Herms, C.I.S.).

TEHAMA CO.: Vina, ♀, VI-18-17 (T. Aitken, C.I.S.); Los Molinos, ♂♀, V-24-16 (C.I.S.); Corning, ♂♀, V-24-16 (C.I.S.); Red Bluff, ♀, V-24-16 (C.I.S.); Tehama, ♀, V-24-16 (C.I.S.).

TRINITY CO.: Hayfork, ♂, VII-8-16 (W. B. Herms, C.I.S.).

TULARE CO.: Goshen, ♂, VII-28-19 (C.I.S.); E. Loma, ♀, V-30-16 (W. B. Herms, C.I.S.); Visalia, ♂♀, VII-25-19 (C.I.S.); Klink, ♀, VII-26-19 (C.I.S.); Exeter, ♀, VI-11-19 (C.I.S.); Dinuba, ♀, VI-12-19 (C.I.S.).

VENTURA CO.: Ventura, ♂♀, VII-21-17 (C.I.S.); Oxnard, ♂♀, VII-3-19 (C.I.S.); Camarillo, ♂♀, VII-21-17 (C.I.S.); Lake McGrath, ♀, VIII-25-48 (W. W. Wirth, C.I.S.).

YOLO CO.: Knights Landing, ♂♀, V-15-16 (W. B. Herms, C.I.S.); Dunnigan, ♂, V-16-16 (W. B. Herms, C.I.S.); Woodland, ♀, X-18-39 (T. Aitken, C.I.S.); Rough and Ready, ♂♀, VII-17-19 (C.I.S.); Clarksburg, ♂♀, IX-1-20 (C.I.S.); Davis, ♂♀, VIII-22-46 (R. M. Bohart, U.C.D.); Putah Canyon, ♀, VIII-22-46 (R. M. Bohart, U.C.D.); Capay, ♀, III-13-50 (R. Bohart, J. Fowler, U.C.D.).

YUBA CO.: Marysville, ♂♀, V-29-16 (W. B. Herms, C.I.S.); Wheatland, ♀, VI-30-16 (W. B. Herms, C.I.S.).

Anopheles occidentalis Dyar and Knab

Anopheles maculipennis var. *occidentalis* Dyar and Knab, 1906, Proc. Biol. Soc. Wash. 19:159. Type ♀ (USNM), Stanford University, Santa Clara Co., Calif.

Discussion:

This is the American species nearest to the European *maculipennis*. It occurs from Alaska eastward through Canada, dipping into the northern tier of states. It extends southward in a narrow strip along the California coast and into Baja California. The adult is differentiated by a spot in the apical wing fringe that varies from coppery bronze through straw yellow to startlingly silvery white. Otherwise it resembles *A. freeborni* except that it is likely to be more robust and have much darker and more pronounced markings. The larvae cannot be distinguished with certainty from *freeborni* and *punctipennis* but the singleness of hair "2" on abdominal segment IV is a fairly constant character.

It breeds in the same sort of situations as does *A. freeborni* except that it will tolerate more shade.

California records:

HUMBOLT CO.: Beatrice, ♀, VIII-6-16 (C.I.S.); Eureka, ♂♀, VII-21-37 (T. Aitken, C.I.S.); Fernbridge, ♂♀, VIII-13-48 (W. W. Wirth, C.I.S.); Mad River Beach, ♂♀, VIII-12-48 (W. W. Wirth, C.I.S.).

MARIN CO.: Ignacio, ♂♀, VII-27-16 (W. B. Herms, C.I.S.); Point Reyes Station, ♀, VII-9-39 (T. Aitken, C.I.S.).

MENDOCINO CO.: Garcia River, ♀, VII-30-48 (W. W. Wirth, C.I.S.).

MONTEREY CO.: Castroville, ♂♀, VIII-11-37 (T. Aitken, C.I.S.); Carmel River, ♂, VIII-11-37 (T. Aitken, C.I.S.); Monterey, ♂♀, X-22-37 (T. Aitken, C.I.S.); Salinas, ♀, VIII-16-17 (C.I.S.); Prewitt Creek, ♀, IX-25-38 (T. Aitken, C.I.S.).

ORANGE CO.: Laguna Beach, ♀, IV-2-48 (J. G. Shanafelt, O.C.D.); San Juan Capistrano, ♂, IV-1-48 (J. G. Shanafelt, O.C.D.).

SAN BENITO CO.: San Juan, ♂♀, VII-18-17 (C.I.S.); Dunnville, ♀, VII-7-40 (T. Aitken, C.I.S.); Ausaymas School, ♂, VI-27-40 (S. Dommes, C.I.S.).

SAN FRANCISCO CO.: San Francisco, ♂♀, IX-18-47 (R. M. Bohart, U.C.D.).

SAN LUIS OBISPO CO.: San Luis Obispo, ♂♀, IX-2-19; Pismo Beach, ♂♀, VI-24-48 (W. W. Wirth, C.I.S.).

SAN MATEO CO.: Sharp Park, ♀, VIII-10-37 (T. Aitken, C.I.S.).

SANTA BARBARA CO.: Lompoc, ♀, VIII-24-48 (W. W. Wirth, C.I.S.); San Antonio Creek, ♂, VI-23-48 (W. W. Wirth, C.I.S.).

SANTA CLARA CO.: Saratoga, ♀, VIII-15-17 (C.I.S.); Stanford Univ., ♀, X-16-39 (T. Aitken, C.I.S.); Milpitas, ♀, VII-18-17 (C.I.S.); Gilroy, ♀, VII-2-48 (W. W. Wirth, C.I.S.); San Francisquito Creek, ♀, VII-6-17 (C.I.S.).

SANTA CRUZ CO.: Santa Cruz, ♀, VIII-16-17 (C.I.S.); Pajaro River, Watsonville, ♂, VIII-11-37 (T. Aitken, C.I.S.).

SONOMA CO.: Valley Ford, ♂♀, VII-7-39 (T. Aitken, C.I.S.); Petaluma, ♀, VII-27-16 (W. B. Herms, C.I.S.); Bodega, ♂, VII-9-39 (T. Aitken, C.I.S.); Duncan Mills, ♀, IX-2-48 (W. W. Wirth, C.I.S.).

VENTURA CO.: Ventura, ♀, VII-21-17 (C.I.S.).

Anopheles pseudopunctipennis franciscanus
McCracken

Anopheles franciscanus McCracken, 1904. Ent. News 15:12. Types not designated, Stanford University, Santa Clara Co., Calif.

Discussion:

To be consistent with our treatment of *occidentalis* and *freeborni* this subspecies should be treated as a separate species. However there are so many variants of *pseudopunctipennis* which range from the southern Nearctic far into the southern Neotropical Region that it was thought best to retain the trinomial to preserve the relationships until more work had been done on this complex.

It ranges throughout the southwestern states west of the 100th Meridian. It occurs throughout California except at the higher snow-covered elevations. Its favorite breeding location is a shallow pool at the edge of a receding stream which includes abundant growth of green algae in the fullest sunlight. It has been recorded from artificial containers, from brackish water and from other unexpected places but never from water surfaces that were not bathed in sunlight.

It shares the pale wing markings with *A. punctipennis* but its white-banded palpi separate it from the latter. The larvae can be separated from all other California

anophelines by the bare outer clypeal hairs. Males are readily separated from the other species except *A. punctipennis* by the pale wing markings. From the latter species it differs in having pale spots in the posterior fringe of the wing.

California records:

- ALAMEDA CO.: Sunol, ♀, XI-11-38 (T. Aitken, C.I.S.); Sunol, ♂, IV-5-39 (T. Aitken, C.I.S.); Niles, ♀, VII-18-17 (C.I.S.); Pleasanton, ♀, VII-31-19 (C.I.S.).
- ALPINE CO.: Lake Alpine, ♀, IX-11-38 (T. Aitken, C.I.S.).
- AMADOR CO.: Volcano, ♂, VIII-12-39 (T. Aitken, C.I.S.); Drytown, ♂♀, VII-16-16 (W. B. Herms, C.I.S.).
- BUTTE CO.: Oroville, ♂♀, VI-30-16 (W. B. Herms, C.I.S.).
- CALAVERAS CO.: Angels Camp, ♀, VIII-7-37 (T. Aitken, C.I.S.); San Andreas, ♂♀, VII-18-16 (W. B. Herms, C.I.S.).
- COLUSA CO.: Macy, ♀, V-17-16 (W. B. Herms, C.I.S.); Williams, ♂♀, V-14-49 (R. M. Bohart, U.C.D.).
- CONTRA COSTA CO.: St. Mary's College, ♂, VII-14-37 (T. Aitken, D. E. Howell, C.I.S.).
- DEL NORTE CO.: Wonderland Park, ♂, VII-19-37 (T. Aitken, C.I.S.).
- FRESNO CO.: Academy, ♀, VII-24-19 (W. B. Herms, C.I.S.); Centerville, ♀, VII-24-19 (W. B. Herms, C.I.S.).
- GLENN CO.: Willows, ♂♀, V-18-16 (W. B. Herms, C.I.S.); Artois, ♂♀, V-18-16 (C.I.S.); Orland, ♀, (C.I.S.).
- HUMBOLDT CO.: Stone, ♀, VIII-1-16 (C.I.S.); Fernbridge, ♀, VII-21-37 (T. Aitken, C.I.S.).
- INYO CO.: Little Lake, ♀, VI-1-38 (T. Aitken, C.I.S.).
- KERN CO.: Bakersfield, ♂, I-22-44 (W. C. Reeves, C.I.S.); Walker Pass, ♂♀, VI-6-38 (T. Aitken, C.I.S.); McKittrick, ♀, VI-20-19 (C.I.S.).
- KINGS CO.: Hanford, ♂♀, VII-25-19 (C.I.S.).
- LAKE CO.: Middletown, ♂, VIII-17-48, (W. W. Wirth, C.I.S.); Finley, ♀, VII-29-48 (C.I.S.); Upper Lake, ♀, VII-29-48 (C.I.S.).
- LOS ANGELES CO.: Glendora, ♀, VII-28-17 (C.I.S.); Los Angeles Terminal, ♂, IX-29-17 (C.I.S.).
- MADERA CO.: Minturn, ♀, IX-29-17 (C.I.S.); Borden, ♂♀, IX-29-17 (C.I.S.).
- MARIN CO.: San Rafael, ♂♀, VII-27-16 (W. B. Herms, C.I.S.); Ignacio, ♀, VII-27-16 (W. B. Herms, C.I.S.).
- MARIPOSA CO.: Hornitos, ♂♀, VI-17-19 (C.I.S.); Coulterville, ♂♀, VII-4-38 (T. Aitken, C.I.S.); Bagby, ♂♀, VII-4-38 (T. Aitken, C.I.S.); Mariposa, ♂♀, VI-6-19 (C.I.S.).
- MENDOCINO CO.: Hopland, ♂♀, VII-28-16 (C.I.S.); Lanes River Flat, ♂♀, VII-22-37 (T. Aitken, C.I.S.); Ukiah, ♂♀, VIII-3-16 (W. B. Herms, C.I.S.); Willits, ♀, VIII-3-16 (W. B. Herms, C.I.S.); Garcia River, ♂, VII-30-48, (W. W. Wirth, C.I.S.); Navarro River, ♂, VII-19-49 (R. M. Bohart, U.C.D.); Yorkville, ♂, VII-19-49 (R. M. Bohart, U.C.D.).
- MERCED CO.: Merced Falls, ♀, VI-7-19 (C.I.S.); Hopeton, ♀, VI-7-19 (C.I.S.); Merced, ♂♀, VII-24-19 (W. B. Herms, C.I.S.); Los Banos, ♂♀, VIII-17-17 (C.I.S.).
- MONTEREY CO.: King City, ♀, VII-19-17 (C.I.S.); Little Sur River, ♂♀, IX-19-37 (T. Aitken, C.I.S.); Monterey, ♂♀, VIII-12-39 (M. Cazier, C.I.S.); Aromas, ♂, VIII-15-37 (T. Aitken, C.I.S.); Carmel, ♀, VII-7-38 (T. Aitken, C.I.S.); Carmel River, ♂, VIII-11-37 (T. Aitken, C.I.S.); Salinas, ♂, VIII-16-17 (C.I.S.).
- NAPA CO.: Napa, ♂♀, VIII-2-16 (W. B. Herms, C.I.S.); Pope Valley, ♂, VIII-17-48 (W. W. Wirth, C.I.S.); Conn Lake, ♀, IX-14-46 (R. M. Bohart, U.C.D.); Monticello, ♂♀, X-8-47 (R. M. Bohart, U.C.D.); Putah Cyn., ♂♀, IX-14-46 (R. M. Bohart, U.C.D.).
- NEVADA CO.: Glenbrook, ♂, VII-29-16 (C.I.S.); Grass Valley, ♂, VII-7-16 (W. B. Herms, C.I.S.).
- ORANGE CO.: Santa Ana, ♀, VII-22-17 (C.I.S.); San Juan Capistrano, ♂♀, VII-22-17 (C.I.S.).
- PLACER CO.: Coon Creek, ♂, VII-3-39 (T. Aitken, C.I.S.); Loomis, ♂, VI-8-39 (T. Aitken, C.I.S.); Auburn, ♂♀, VII-7-16 (W. B. Herms, C.I.S.).
- RIVERSIDE CO.: Elsinore, ♂, VII-27-17 (C.I.S.); San Jacinto, ♂♀, VII-9-19 (C.I.S.); Riverside, ♂♀, II-17-40 (W. C. Reeves, C.I.S.); Temecula, ♂♀, 5-27-17 (C.I.S.).
- SACRAMENTO CO.: Arno, ♂♀, VII-15-17 (C.I.S.); Galt, ♂♀, VII-15-17 (C.I.S.); Sacramento, ♂, VI-28-16 (W. B. Herms, C.I.S.); Natoma, ♂, VI-20-16 (W. B. Herms, C.I.S.).
- SAN BENITO CO.: San Juan, ♂♀, VII-18-17 (C.I.S.); Hollister, ♀, VII-18-17 (C.I.S.); Tres Pinos, ♂♀, VII-18-17 (C.I.S.); Ausaymas School, ♀, VII-27-40 (S. Donnes, C.I.S.); Pinnacles, ♀, VII-19-17 (C.I.S.); Willow Creek, ♀, VI-30-48 (W. W. Wirth, C.I.S.).
- SAN BERNARDINO CO.: Ontario, ♀, VII-28-17 (C.I.S.); San Bernardino, ♂♀, VII-8-19 (C.I.S.); Redlands, ♂♀, VII-7-19 (C.I.S.).
- SAN DIEGO CO.: Barret, ♂♀, VI-10-17 (C.I.S.); Lemon Grove, ♀, VI-10-17 (C.I.S.);

Nestor, ♀, VI-9-17 (C.I.S.); Bonsall, ♀, VII-27-17 (C.I.S.); Escondido, ♂, VII-27-17 (C.I.S.); Encinitas, ♀, VII-23-17 (C.I.S.); San Diego Country Club, ♂, VII-24-17 (C.I.S.); San Diego Mission, ♂, VII-24-17 (C.I.S.); Balboa Park, ♂, VII-25-17 (C.I.S.); Bernardo, ♂, VII-27-17 (C.I.S.); Murphy Cyn., ♀, V-8-49 (R. M. Bohart, U.C.D.).

SAN JOAQUIN CO.: Stockton, ♂, VIII-27-17 (C.I.S.); Holt Grammar School, ♀, VII-17-19 (C.I.S.); Tracy, ♀, VIII-25-17 (C.I.S.).

SAN LUIS OBISPO CO.: Santa Margarita, ♀, VII-20-17 (C.I.S.); San Luis Obispo, ♂, VII-20-17 (C.I.S.); Simmler, ♂, VI-25-19 (C.I.S.); Atascadero, ♂, VII-2-19 (C.I.S.); Pismo Beach, ♀, VI-24-48 (W. W. Wirth, C.I.S.).

SAN MATEO CO.: Coloma, ♀, VII-15-16 (W. B. Herms, C.I.S.).

SANTA BARBARA CO.: Las Cruces, ♂, VII-21-17 (C.I.S.); Santa Barbara, ♂, VII-21-17 (C.I.S.); Goleta, ♂, VII-2-19 (C.I.S.); Carpinteria, ♂, VII-21-17 (C.I.S.); Buellton, ♂, VI-23-48 (W. W. Wirth, C.I.S.); Lompoc, ♀, VIII-24-48 (C.I.S.).

SANTA CLARA CO.: Milpitas, ♀, VII-18-17 (C.I.S.); Coyote, ♂, X-22-37 (T. Aitken, C.I.S.); Mayfield, ♂, VIII-11-17 (C.I.S.); Gilroy, ♀, VIII-17-17 (C.I.S.).

SANTA CRUZ CO.: Watsonville, ♂, VIII-11-37 (T. Aitken, C.I.S.).

SHASTA CO.: Redding, ♂, VI-19-37 (T. Aitken, C.I.S.); Millville, ♂, VI-5-16 (W. B. Herms, C.I.S.); Cottonwood, ♀, V-7-16 (W. B. Herms, C.I.S.).

SISKIYOU CO.: Lower Lake, ♀, VII-29-16 (C.I.S.); Little Shasta, ♂, VII-24-40 (T. Aitken, C.I.S.); Gazelle, ♂, VII-25-40 (T. Aitken, C.I.S.); Yreka, ♀, VII-22-48 (W. W. Wirth, C.I.S.).

SOLANO CO.: Wyandotte, ♂, VII-1-16 (W. B. Herms, C.I.S.).

SONOMA CO.: Healdsburg, ♂, VII-28-16 (C.I.S.); Bodega State Park, ♂, VIII-14-37 (T. Aitken, C.I.S.); Santa Rosa, ♂, VIII-2-16 (W. B. Herms, C.I.S.); Petaluma, ♀, VII-27-16 (W. B. Herms, C.I.S.); Geyersville, ♀, VII-28-48 (W. W. Wirth, C.I.S.).

STANISLAUS CO.: Modesto, ♂, VII-25-17 (C.I.S.); La Grange, ♂, IX-29-17 (C.I.S.).

SUTTER CO.: Robbins, ♂, VII-3-39 (T. Aitken, C.I.S.).

TEHAMA CO.: Corning, ♀, V-23-16 (C.I.S.).

TRINITY CO.: Hayfork, ♀, VII-8-16 (W. B. Herms, C.I.S.); Weaverville, ♂, VII-8-16 (W. B. Herms, C.I.S.).

TULARE CO.: Tulare, ♂, VII-27-19 (C.I.S.); Terra Bella, ♂, VI-11-19 (C.I.S.); Visalia, ♀,

VI-12-19 (C.I.S.); Woodlake, ♂, VII-26-19 (C.I.S.); Lemon Cove, ♀, VII-26-19 (C.I.S.); Klink, ♂, VII-26-19 (C.I.S.); Springville, ♂, VII-26-19 (C.I.S.); Farmersville, ♂, V-11-39 (T. Aitken, C.I.S.).

TUOLUMNE CO.: Lyon's Dam, ♂, VIII-7-37 (T. Aitken, C.I.S.); Sonora, ♀, VII-9-16 (W. B. Herms, C.I.S.); Tuolumne, ♂, VII-18-16 (W. B. Herms, C.I.S.).

VENTURA CO.: Ventura, ♂, VII-3-19 (C.I.S.); Oxnard, ♀, VII-3-19 (C.I.S.); Santa Paula, ♀, VII-3-19 (C.I.S.); Camarillo, ♀, VII-21-17 (C.I.S.); Wheeler's Springs, ♀, VI-16-48 (W. W. Wirth, C.I.S.).

YOLO CO.: Winters, ♂, VIII-1-16 (C.I.S.); Davis, ♂, XI-6-37 (T. Aitken, C.I.S.); Woodland, ♂, X-18-39 (T. Aitken, C.I.S.); Putah Cyn., ♂, IX-10-48 (R. M. Bohart, U.C.D.).

YUBA CO.: Wheatland, ♂, VI-30-16 (W. B. Herms, C.I.S.); Marysville, ♀, X-15-43 (N. Hardman, C. I. S.).

Anopheles punctipennis (Say)

Culex punctipennis Say, 1823. Jour. Acad. Nat. Sci. Phila. 3:9. Types not designated, eastern United States.

Discussion:

Although this species has been recorded from every state in the Union except Nevada, Arizona, and Utah, its distribution in California is somewhat limited. It is not adapted to semi-arid conditions. It has not been taken south of the Tehachapi Mountains and is restricted to the central valley and the north coast.

It primarily chooses cool, shaded, woodland creek pools although it is not averse to sunlight if the water is deep enough to be cool. It is often found in pools that are favorable to the growth of *Lemna* but is not so dependent on algae and grosser emergent vegetation as the other anophelines. It bites readily out-of-doors but is seldom taken in houses.

Orange or yellow markings on the wings in addition to solid black palpi separate the adults, but there is no stable character to separate its larvae from those of *freeborni*.

California records:

ALAMEDA CO.: Sunol, ♀, X-25-38 (T. Aitken, C.I.S.); Pleasanton, ♂, I-1-39 (T. Aitken, C.I.S.); Niles, ♀, VII-18-17 (C.I.S.).

BUTTE CO.: Oroville, ♀, VII-3-16 (W. B.

Herms, C.I.S.); Chico, ♂♀, V-25-16 (C.I.S.).

CALAVERAS CO.: San Andreas, ♂, VII-15-16 (W. B. Herms, C.I.S.).

CONTRA COSTA CO.: Walnut Creek, ♂, V-24-38 (T. Aitken, C.I.S.).

DEL NORTE CO.: Crescent City, ♀, VII-20-37 (T. Aitken, C.I.S.).

ELDORADO CO.: Placerville, ♂♀, VII-15-16 (W. B. Herms, C.I.S.); Diamond Springs, ♀, VII-16-16 (W. B. Herms, C.I.S.).

FRESNO CO.: Sanger, ♀, VII-24-19 (W. B. Herms, C.I.S.); Centerville, ♀, VII-24-19 (W. B. Herms, C.I.S.).

HUMBOLDT CO.: Lane's Redwood, ♀, VII-21-37 (T. Aitken, C.I.S.); Ferndale, ♀, VII-21-37 (T. Aitken, C.I.S.); Van Duzen River, ♂♀, VIII-11-48 (W. W. Wirth, C.I.S.); Fortuna, ♀, VIII-11-48 (W. W. Wirth, C.I.S.).

INYO CO.: Lone Pine, ♀, VI-1-38 (T. Aitken, C.I.S.).

KERN CO.: Kernville, ♀, III-15-41 (T. Aitken, C.I.S.).

KINGS CO.: Hanford, ♀, VI-10-19 (C.I.S.); Lemoore, ♀, VII-19-47 (W. W. Wirth, C.I.S.).

LAKE CO.: Upper Lake, ♀, V-14-47 (R. M. Bohart, U.C.D.).

LASSEN CO.: Pit River, ♀, VI-2-39 (W. C. Reeves, C.I.S.).

MARIN CO.: Point Reyes Station, ♂♀, III-3-38 (T. Aitken, C.I.S.); Ignacio, ♂♀, VII-27-16 (W. B. Herms, C.I.S.); San Rafael, ♀, VII-27-16 (W. B. Herms, C.I.S.).

MENDOCINO CO.: Ukiah, ♀, VIII-12-16 (W. B. Herms, C.I.S.); Garcia River, ♀, VII-30-48 (W. W. Wirth, C.I.S.).

MERCED CO.: Merced, ♀, IX-28-17 (C.I.S.); Hopeton, ♀, VI-17-19 (C.I.S.); Snelling, ♀, VI-7-19 (C.I.S.).

MONTEREY CO.: Carmel, ♀, VII-7-38 (T. Aitken, C.I.S.); Torre Cyn., IX-25-38 (T. Aitken, C.I.S.).

NAPA CO.: Napa, ♀, VIII-2-16 (W. B. Herms, C.I.S.); Aetna Springs, ♂, VII-28-40 (T. Aitken, C.I.S.); Conn Lake, ♂♀, IX-14-46 (R. M. Bohart, U.C.D.); Monticello, ♂♀, X-8-47 (R. M. Bohart, U.C.D.).

NEVADA CO.: Grass Valley, ♀, VII-6-16 (W. B. Herms, C.I.S.); Glenbrook, ♀, VII-29-16 (C.I.S.); Lake Vera, ♀, 2500 ft. VI-1-50 (Harvey Magy, B.V.C.).

PLACER CO.: Auburn, ♂♀, VII-7-16 (W. B. Herms, C.I.S.); Weimar, ♀, V-13-39 (E. Reinke, C.I.S.); Colfax, ♀, VII-6-16 (W. B. Herms, C.I.S.); Newcastle, ♀, VII-7-17 (C.I.S.).

PLUMAS CO.: Quincy, ♀, VI-15-40 (M. Cazier, T. Aitken, C.I.S.).

SACRAMENTO CO.: Arno, ♀, VII-15-17 (C.I.S.); Galt, ♀, VII-15-17 (C.I.S.).

SAN JOAQUIN CO.: Stockton, ♂♀, VI-22-37 (T. Aitken, C.I.S.); Woodbridge, ♀, VII-18-19 (C.I.S.).

SAN MATEO CO.: San Francisco, 15 mi. S., ♂♀, X-2-42 (T. Aarons, P. Galindo, C.I.S.); Stanford Univ., ♀, XI-29-39 (T. Aitken, C.I.S.).

SANTA CLARA CO.: Mayfield, ♂♀, VIII-11-17 (C.I.S.); Los Gatos, ♂♀, VII-15-17 (C.I.S.); Uvas Creek, ♂♀, VII-7-48 (W. W. Wirth, C.I.S.); Gilroy, ♀, VII-2-48 (W. W. Wirth, C.I.S.); San Francisquito Creek, ♂♀, V-28-37 (T. Aitken, C.I.S.).

SANTA CRUZ CO.: Santa Cruz, ♂, VIII-16-17 (C.I.S.).

SHASTA CO.: Palo Cedro, ♀, VI-15-16 (W. B. Herms, C.I.S.); Redding, ♀, VI-3-16 (W. B. Herms, C.I.S.); Millville, ♀, VI-5-16 (W. B. Herms, C.I.S.); Cottonwood, ♀, V-7-16 (W. B. Herms, C.I.S.); Castle Crags, ♀, VI-24-21 (W. B. Herms, C.I.S.); Burney, ♀, V-23-49 (R. M. Bohart, U.C.D.).

SISKIYOU CO.: Hornbrook, ♀, VI-12-16 (W. B. Herms, C.I.S.).

SOLANO CO.: Vacaville, ♀, V-10-16 (W. B. Herms, C.I.S.); Wyandotte, ♀, VII-1-16 (W. B. Herms, C.I.S.); Green Valley, ♂♀, VIII-29-46 (R. M. Bohart, H. E. Cott, U.C.D.).

SONOMA CO.: Valley Ford, ♀, VIII-13-37 (T. Aitken, C.I.S.); Geyserville, ♀, VII-28-48 (W. W. Wirth, C.I.S.).

SUTTER CO.: Berg, ♀, V-30-16 (W. B. Herms, C.I.S.).

TEHAMA CO.: Ped Bluff, ♀, V-24-16 (C.I.S.); Vina, ♂♀, VI-10-20 (S. B. Freeborn, C.I.S.); Corning, ♀, V-23-16 (C.I.S.); Los Molinos, ♀, V-24-16 (C.I.S.).

TRINITY CO.: Hayfork, ♂♀, VIII-8-16 (W. B. Herms, C.I.S.); Weaverville, ♂♀, VIII-9-49 (R. M. Bohart, U.C.D.).

TULARE CO.: Visalia, ♂♀, VI-11-18 (C.I.S.); Lemon Cove, ♀, V-25-39 (T. Aitken, C.I.S.); Tulare, ♀, VI-11-19 (C.I.S.); Exeter, ♂♀, VI-11-19 (C.I.S.).

TUOLUMNE CO.: Tuolumne, ♀, VII-18-16 (W. B. Herms, C.I.S.); Sonora, ♀, VIII-19-16 (W. B. Herms, C.I.S.); Soulsbyville, ♀, VII-19-16 (W. B. Herms, C.I.S.).

YOLO CO.: Winters, ♀, VIII-1-16 (C.I.S.).

Genus *Aedes* Meigen

Aedes bicristatus E. Thurman and Winkler¹³

Aedes bicristatus E. Thurman and Winkler, 1950. Proc. Ent. Soc. Wash. 52:237-50. Types (USNM), holotype not designated, near Kelseyville, Lake Co., Calif.

¹³This name first appeared in the "Mosquito Buzz", a mimeographed, joint new sheet of the California Mosquito Control Association and the California State Bureau of Vector Control (Anonymous, 1950).

Discussion:

This is the first new species of California *Aedes* to be described from California since the days of H. G. Dyar. In all probability it is endemic but has been overlooked because of its localized distribution in the coast range and the early season breeding habits of the larvae. The latter were first found by Eric Winkler in Lake County in flooded meadows. Somewhat rubbed females of what appear to be the same species have been taken biting near Glen Ellen, Sonoma Co., March 10, 1937 (N. W. Frazier); Petrified Forest, Sonoma Co., March 16, 1947 (R. M. Bohart); and Filoli Estate (Woodside), San Mateo Co., May 5, 1950 (R. Thomas, J. Haskins of 3-cities M.A.D.). A doubt as to the identification of these specimens will remain until larvae are collected in the same localities.

The species belongs to the *A. rusticus* (Rossi) group of Edwards, which includes several Palearctic species and *A. trichurus* Dyar of North America. Characteristic of the group are the accessory siphon tufts in the larvae and the peculiar, stout claspette filament of the male.

California records:

LAKE CO.: Lakeport, ♂♀, larvae, IV-1-50 (E. Winkler, B.V.C.).

Aedes cataphylla Dyar

Aedes cataphylla Dyar, 1916. Ins. Ins. Mens. 4:86. Type ♀, (USNM), Fallen Leaf Lake, Eldorado Co., Calif.

Discussion:

This species was originally described from a restricted area on the Sierra crest of California from Yosemite to Tahoe. Subsequent descriptions of other species from northern Canada, Alaska (*prodotes*) and north and central Europe (*rostochiensis*) have been declared synonymous so its range is enormously extended. It is very facultative in its breeding spots; grassy swales or temporary pine-needle pools in full sunlight or dense shade are utilized. However, it is most often found in open meadows. The term "gray-backs" applied by Dyar describes a ready field identification, as its brownish aspect seems to be dusted with gray on the wings as well as on the mesonotum. This characteristic separates it easily from *ventrovittis* but may be checked by the characters given in dichotomy 11 of the key.

The larvae are the only mountain *Aedes* that have detached pecten teeth distad of the hair tuft.

California records:

ALPINE CO.: Carson Pass, ♂♀, VI-10-47 (R. M. Bohart, U.C.D.); Faith Valley, ♂♀, V-28-49 (L. W. Isaak, U.C.D.); Hope Valley, ♀, VI-1-47 (R. M. Bohart, U.C.D.); Luther Pass, 7,500 ft., larvae, V-28-49 (L. W. Isaak, U.C.D.).

ELDORADO CO.: Meyers, ♀, V-27-39, (P. C. Ting, M. A. Cazier, J. A. Downes, T. Aitken, C.I.S.); Lake Tahoe, ♀, V-21-48 (R. M. Bohart, U.C.D.); Little Truckee River, ♂, VI-1-47 (R. M. Bohart, U.C.D.).

MARIPOSA CO.: Yosemite, ♀, VII-24-36 (W. B. Herms, C.I.S.).

MONO CO.: Sonora Pass, larvae, VI-10-47 (R. M. Bohart, U.C.D.).

SHASTA CO.: Hall Flat, Lassen Natl. Park, ♀, V-7-39 (J. W. Johnson, C.I.S.).

Aedes cinereus Meigen

Aedes cinereus Meigen, 1818, Syst. Besch. Zweifl. Ins. 1:13. Types not designated, Europe.

Discussion:

This ubiquitous species is widely distributed over the northern Palearctic Region. In California it has been found from Yosemite northward along the high Sierra where it breeds in all sorts of small pools either in the shade or in the open, but seems to have a penchant for wooded swamps dotted with hummocks of *Bryanthus*. The adults seem to prefer walking to flying and have some difficulty in piercing the human skin. The males have the short palpi characteristic of the subgenus *Aedes*. The adults have tarsi and costa all black scaled but with the basal abdominal pale bands expanding at the sides to form a continuous lateral line. The larvae have the same key characters as *vexans* except that the lower head hairs have at least four branches and generally more. According to Bohart (1950a), the subspecies name *hemiteus* Dyar should probably be applied to Californian specimens of this species, based on their generally dark body color.

California records:

ALPINE CO.: Hope Valley, ♂♀, VI-1-47 (R. M. Bohart, U.C.D.).

ELDORADO CO.: Little Truckee River, ♂, VI-1-47 (R. M. Bohart, U.C.D.); Fallen Leaf Lake, ♂♀, VI-12-50 (R. M. Bohart, U.C.D.).

MARIPOSA CO.: Yosemite, ♀, V-?-40 (T.

Aitken, C.I.S.).

MODOC CO.: Dismal Swamp, ♂♀, VII-15-48 (A. Coleman, C.I.S.).

Aedes communis (De Geer)

Culex communis De Geer, 1776, Mem. Hist. Ins. 6:316. Types not designated, Europe.

Discussion:

Dyar originally described the California variant of this Holarctic species as *tahoensis*. Freeborn reduced *tahoensis* to the status of a trinomial of *communis* and later Dyar placed it in synonymy with *communis*. It is strictly a snow-pool type, breeding at elevations as low as 6,500 feet in Tuolumne County and 4,300 feet in Shasta County. The larvae are found in shallow depressions of temporary nature as indicated by the bottom covering of fallen leaves or pine needles. It is a shade-loving mosquito and a vicious biter in heavily shaded areas in the daytime and everywhere at dusk.

Previously the females were separated from *hexodontus* by having the lateral aspects of the mesonotum gray whereas they are yellowish in *hexodontus*. This is still useful in typically marked specimens but the characters such as the supra-alar bristles and the upright forked vertex scales used in dichotomy 14 of the key are much more reliable. The larvae are separated from *hexodontus* by having an anal saddle that only partly encircles the segment and comb scales in a patch instead of a row.

California records:

ALPINE CO.: Woodfords, ♀, VI-20-19 (C.I.S.); Carson Pass, ♂♀, VI-10-47 (R. M. Bohart, U.C.D.); Ebbetts Pass, ♀, VII-13-48 (R. M. Bohart, U.C.D.); Faith Valley, ♂♀, VII-12-48 (R. M. Bohart, U.C.D.); Blue Lake, ♂♀, VII-12-48 (R. M. Bohart, U.C.D.); Hope Valley, ♀, VI-1-48 (R. M. Bohart, U.C.D.); Lake Alpine, larvae, VI-12-48 (R. Coleman, U.C.D.).

CALAVERAS CO.: Camp Wolfboro - N. Fr. Stanislaus R., ♀, V-29-39 (N. Hardman, C.I.S.).

EIDORADO CO.: Meyers, ♀, V-27-39 (P. C. Ting, M. A. Cazier, J. A. Downes, T. Aitken, C.I.S.); Echo Summit, ♀, VII-14-16 (C.I.S.); Lake Tahoe, ♂♀, VII-23-48 (R. M. Bohart, U.C.D.); Little Truckee River, ♂, VI-1-47 (R. M. Bohart, U.C.D.); Camp Sacramento, 6,800 ft., larvae, IV-17-47 (R. M. Bohart, U.C.D.); Celio Ranch, 6,500 ft., larvae, IV-28-50 (R. M. Bohart, U.C.D.); Fallen Leaf Lake, ♂♀, larvae, VI-13-50

(R. M. Bohart, U.C.D.); Echo Lake, 7,200 ft., ♀, VII-11-50 (J. Fowler, S.Y.A.D.).

MARIPOSA CO.: Yosemite, ♀, VIII-1-36 (W. B. Herms, C.I.S.).

NEVADA CO.: Soda Springs, larvae, VI-11-48 (R. Coleman, U.C.D.).

PLACER CO.: Emigrant Gap, 5,500 ft., ♂♀, IV-29-47 (R. M. Bohart, U.C.D.); Hampshire Rocks Camp, 6,000 ft., ♂♀, IV-29-47 (R. M. Bohart, U.C.D.); Cisco Grove, 5,000 ft., larvae, IV-29-47 (R. M. Bohart, U.C.D.).

PLUMAS CO.: Bucks Lake, ♀, VI-23-49 (P. D. Hurd, C.I.S.); Canyon Dam, 5,000 ft., larvae, IV-30-47 (R. M. Bohart, U.C.D.); Greenville, 5,000 ft., larvae, V-8-48 (R. M. Bohart, U.C.D.); Gold Lake, 6,500 ft., ♂♀, VII-15-49 (R. M. Bohart, U.C.D.).

SHASTA CO.: Hatchet Mt., 4,350 ft., ♂♀, larvae, V-10-50 (R. M. Bohart, U.C.D.); Lake Eiler, ♀, VII-9-47 (R. L. Usinger, C.I.S.); Summit Lake, ♀, VII-2-47 (R. L. Usinger, C.I.S.); Lassen Park, ♀, VII-18-49 (C. I. Smith, C.I.S.).

SIERRA CO.: Gold Lake, ♀, VI-16-40 (M. Cazier, T. Aitken, C.I.S.); Sierra City, ♀, VI-16-40 (M. Cazier, T. Aitken, C.I.S.); Calpine, ♂♀, IV-29-47 (R. M. Bohart, U.C.D.).

TUOLUMNE CO.: Dardanelle, 7,500 ft., ♂♀, larvae, VI-10-48 (R. M. Bohart, U.C.D.); Strawberry, 6,500 ft., ♂♀, VI-10-48 (R. M. Bohart).

Aedes dorsalis Meigen

Culex dorsalis Meigen, 1830. Syst. Besch. Zweifl. Ins. 6:242. Type, ♀, near Berlin, Germany.

Discussion:

This is a versatile species of Holarctic distribution originally described from near Berlin, Germany. Synonyms have been described from North Dakota, New York, and many other spots. A close relative of which it, too, may be a synonym, *Aedes caspius*, ranges from central Asia eastward to the Scandinavian peninsula. In California *dorsalis* has been reported from nearly every county.

It breeds in salt marshes from Monterey north following the appearance of *squamiger* seasonally and is replaced by *taeniorhynchus* in the salt marshes south of Monterey. Inland it occurs the length of the state, breeding in open, sunny pools that are subject to intermittent flooding. It is particularly a denizen of the cattle ranges which it follows along the east slope of the Sierra to elevations over 7,000 feet.

Aedes nigromaculis, which was first reported from California in 1937, is rapidly replacing *dorsalis* as the preëminent flood-water species in irrigated pastures and waste-water pools of the central valley.

The adults are extremely variable in coloration, ranging from dark brown to almost whitish straw color and the individual striping pattern appears in several different arrangements. Despite this, they can be separated by the fact that the hind tarsi are banded on both ends of the segments and that the wing scales are bicolored.

The larvae resemble very closely those of *squamiger*. However, the fact that the lateral hair of the anal segment is shorter than the saddle appears to be a satisfactory differentiation for *dorsalis* (Bohart, 1948b).

California records:

ALAMEDA CO.: Irvington, ♀, VIII-11-38 (T. Aitken, C.I.S.); Berkeley, ♀, VIII-10-05 (C.I.S.); Oakland, ♀, V-12-17 (C.I.S.); Emeryville, ♀, V-12-17 (C.I.S.); Albany, ♀, III-16-21 (C.I.S.).

BUTTE CO.: Durham, ♂♀, VI-7-39 (T. Aitken, C.I.S.); Biggs, ♀, V-29-16 (W. B. Herms, C.I.S.); Gridley, ♀, VI-7-39 (T. Aitken, C.I.S.).

COLUSA CO.: Colusa, ♂, XI-3-39 (T. Aitken, C.I.S.); Princeton, ♀, V-22-16 (W. B. Herms, C.I.S.).

CONTRA COSTA CO.: Pinole, ♂♀, III-28-39 (R. W. Burgess, C.I.S.); Antioch, ♂♀, IV-9-49 (D. J. Gould, L. W. Quate, C.I.S.).

ELDORADO CO.: Clarksville, ♀, VI-20-46 (W. Middlekauff, C.I.S.).

HUMBOLT CO.: Freshwater, ♀, VI-20-39 (T. Aitken, C.I.S.); Eureka, ♀, VII-21-37 (T. Aitken, C.I.S.).

IMPERIAL CO.: Fort Yuma, ♀, II-?-48 (R. Coleman, C.I.S.).

INYO CO.: Independence, ♀, VI-23-19 (C.I.S.); Bishop, ♂♀, VI-23-19 (C.I.S.); Owens Valley, ♀, V-11-38 (T. Aitken, C.I.S.); Lone Pine, ♀, VI-1-37 (J. W. Johnson, C.I.S.); Big Pine, ♀, V-18-47 (R. M. Bohart, C.I.S.).

KERN CO.: Bakersfield, ♂♀, III-14-39 (F. L. Hayes, C.I.S.); Buttonwillow, ♀, VI-25-19 (C.I.S.).

KINGS CO.: Hanford, ♂♀ VIII-31-49 (R. M. Bohart, U.C.D.).

LASSEN CO.: Susanville, ♀, VI-15-16 (W. B. Herms, C.I.S.); Amadee, ♀, VII-4-47 (R. L. Usinger, C.I.S.).

MARIN CO.: Corte Madera, ♀, VII-27-16 (W. B. Herms, C.I.S.); Black Point, ♀, III-17-48 (R. M. Bohart, U.C.D.); Mt. Tamalpais, ♀, VII-7-48 (R. M.

Bohart, U.C.D.); Bolinas, ♀, IV-25-47 (R. M. Bohart, U.C.D.); Bodega Bay, ♂, I-24-50 (R. M. Bohart, U.C.D.).

MERCED CO.: Merced, ♀, III-10-40 (S. Dommes, C.I.S.); Hatfield Ranch, ♀, XI-6-38 (E. Reinke, C.I.S.); Dos Palos, ♀, VII-?-48 (E. A. Smith, Merced A.D.).

MODOC CO.: Alturas, ♀, VIII-24-40 (T. Aitken, C.I.S.); Middle Lake, Cedarville, ♀, V-24-49 (R. M. Bohart, U.C.D.); Goose Lake, ♂, V-24-49 (R. M. Bohart, U.C.D.).

MONO CO.: Bridgeport, 6,500 ft., ♀, VI-21-19 (C.I.S.); Casa Diablo, 7,500 ft., ♂♀, larvae, V-20-47 (R. M. Bohart, U.C.D.).

ORANGE CO.: Stanton, ♂♀, III-19-48 (J. G. Shanafelt, O.C.D.); Los Alamitos, ♂♀, IV-10-48 (J. G. Shanafelt, O.C.D.); Cypress, ♀, IV-1-49 (J. G. Shanafelt, O.C.D.); Santa Ana, ♂♀, VI-26-48 (J. G. Shanafelt, O.C.D.).

PLUMAS CO.: Quincy, ♀, VI-30-49 (P. D. Hurd, C.I.S.).

SAN JOAQUIN CO.: Tracy, ♀, III-17-41 (W. C. Reeves, C.I.S.); Union Island, ♀, VIII-8-37 (T. Aitken, C.I.S.).

SAN LUIS OBISPO CO.: Morro Bay State Park, ♀, VIII-20-48 (W. Wirth, C.I.S.).

SAN MATEO CO.: Burlingame, II-27-07 (C.I.S.); Millbrae, ♀, II-28-07 (C.I.S.).

SANTA CLARA CO.: Palo Alto, ♀, V-24-37 (T. Aitken, C.I.S.); Santa Clara, ♀, VII-1-09 (C.I.S.).

SHASTA CO.: Pit River, ♂♀, V-10-50 (R. M. Bohart, U.C.D.); Burney, ♂, VI-9-41 (C. D. Michener, C.I.S.); McArthur, ♂♀, larvae, VII-18-50 (H. Magy, R. Bohart, U.C.D.).

SISKIYOU CO.: Macdoel, ♂, VII-21-48 (W. Wirth, C.I.S.); Tule Lake, ♀, VII-18-48 (W. Wirth, C.I.S.).

SOLANO CO.: Mare Island, ♀, VII-14-16 (W. B. Herms, C.I.S.); Suisun, ♀, VII-14-16 (W. B. Herms, C.I.S.); Dixon, ♂♀, VI-27-49 (R. M. Bohart, U.C.D.); Grizzly Island, ♀, V-14-48 (B. Stevens, U.C.D.); Sears Pt. Rd., ♂♀, III-7-50 (E. Mezger, Solano A.D.).

SONOMA CO.: Ross, ♀, VII-27-16 (W. B. Herms, C.I.S.); Petaluma, eggs, larvae, V-24-50 (E. Mezger, Solano A.D.).

STANISLAUS CO.: Turlock, ♂♀, VII-29-19 (C.I.S.); Oakdale, ♀, VII-16-19 (C.I.S.); Denair, ♀, III-19-38 (P. Harvey, C.I.S.).

SUTTER CO.: Loma, ♀, VI-6-39 (T. Aitken, C.I.S.).

TEHAMA CO.: Vina, ♂♀, V-24-16 (C.I.S.); Tehama, ♀, (C.I.S.); Red Bluff, ♀, V-24-16 (C.I.S.); Los Molinos, ♂♀, V-7-39 (T. Aitken, C.I.S.).

TULARE CO.: Woodlake, ♂♀, V-25-39 (T. Aitken, C.I.S.); Goshen, ♂♀, 7-28-19 (C.I.S.).

VENTURA CO.: Hueneme, ♀, VIII-25-48 (W. Wirth, C.I.S.).

YOLO CO.: Davis, ♀, III-22-40 (W. C. Reeves, C.I.S.).

YUBA CO.: Marysville, ♀, VI-6-39 (T. Aitken, C.I.S.).

Aedes flavescens (Mueller)

Culex flavescens Mueller, 1764. Fauna Ins. Fried., p.87. 4 ♀♀ cotypes (Hope Collection, Oxford), without data..

Discussion:

This species has also been known as *lutescens* (Fabricius) and *fletcheri* (Coquillett). It has a Holarctic distribution and on this continent it has been found in Alaska, Canada, and the United States south to Illinois, Iowa, North Dakota, Wyoming, Utah, and California. The adults are easily recognized by their large size and yellowish aspect. The larvae breed in meadows and the females bite readily.

As far as the authors are aware, the species has been taken only once in California by Aitken (1939a), as recorded below. Several subsequent efforts to find it near Glenburn have been fruitless.

California records:

SHASTA CO.: Warm Springs (near Glenburn), ♀, VI-20-37 (T. Aitken, C.I.S.).

Aedes fitchii (Felt and Young)

Culex fitchii Felt and Young, 1904. Science (n.s.) 20:312. Type, ♀, Karner, N. Y.

Discussion:

This was previously known as *palustris* or *fitchii palustris*, being separated from *fitchii* by characters of the male genitalia. The Rocky Mountain race, *fitchii mimesis*, apparently integrates all these varieties and argues against the use of trinomials.

In California it occurs from Tuolumne County, where it breeds at elevations of 6,500 to 9,000 feet, north at gradually lower elevations to Shasta County at 4,000 feet, reaching the lowlands in Oregon and extending northward into Alaska as well

as transcontinentally across Canada to New England. The larvae breed under varying conditions but are found especially in meadows or tule pools near by. In Shasta County the larvae occur in flooded meadows with *increpitus*, *vexans*, and *dorsalis*.

Its adult is easily confused with that of *increpitus*, which has the same type of basal white bands widening laterally. However, the pale wing scales are very largely confined to the anterior portion of the wing in *increpitus*, whereas, in *fitchii* although it has a predominance of pale wing scales on the first five veins, there is an ample sprinkling of them on the more posterior veins. The larvae can be distinguished from co-breeders by the long (4 x 1), evenly tapered siphon and the long lateral hair of the anal saddle.

California records:

ELDORADO CO.: Little Truckee River, 6,500 ft., ♂♀, larvae, IV-28-50 (R. M. Bohart, U.C.D.); Echo Lake, 7,200 ft., ♂♀, larvae, VII-11-50 (J. Fowler, S.Y.A.D.).

PLUMAS CO.: Quincy, ♀, VII-9-49 (P. D. Hurd, C.I.S.).

SHASTA CO.: Pit River, 4,000 ft., ♂, larvae, V-10-50 (R. M. Bohart, U.C.D.); Glenburn, ♀, V-7-38 (E. Reinke, C.I.S.).

SIERRA CO.: Yuba Pass, 6,700 ft., ♂♀, VI-11-48 (F. E. Ehrenferd, C.I.S.); Sierraville, 5,000 ft., ♂♀, larvae, IV-29-47 (R. M. Bohart, U.C.D.); Gold Lake, ♀, VII-15-49 (R. M. Bohart, U.C.D.).

TEHAMA CO.: Vina, ♀, V-19-21 (C.I.S.).

Aedes increpitus Dyar

Aedes increpitus Dyar, 1916. Ins. Ins. Mens. 4:87. Type, ♂ (USNM), Fallen Leaf Lake, Eldorado Co., Calif.

Discussion:

This species ranges from the Rocky Mountains west and as far south as Arizona and southern California. It is a common Sierran mosquito in California at moderate elevations (4,000 to 8,000 feet), and is the only so-called "snow" *Aedes* to breed practically at sea level. It also is present in the Coast Range and recently has been taken repeatedly throughout the central valleys in overflowed areas.

It appears to be single-brooded and has much the same larval habits as *sticticus* but is not so addicted to shade. The adults have bright white basal bands on the hind tarsi; the basal white

abdominal bands widen to lateral spots that appear to be brighter white than the bands; and the pale wing scales are confined to the front part of the wings. Its larvae have an evenly spaced pecten and the saddle does not encircle the anal segment. When the head hairs are single, as often occurs in Modoc and Lassen counties, larvae may be confused with *communis*, but the relatively long microsetae at the distal end of the anal saddle will differentiate *inreptus*.

California records:

ALAMEDA CO.: Alameda, ♀, I-25-41 (W. C. Reeves, C.I.S.); Berkeley, ♀, IV-23-49 (D. J. Gould, C.I.S.).

ALPINE CO.: Hope Valley, ♀, VII-18-48 (L. W. Quate, C.I.S.).

COLUSA CO.: Arbuckle, ♀, V-16-16 (W. B. Herms, C.I.S.).

ELDORADO CO.: Little Truckee River, 6,500 ft., ♂♀, larvae, IV-28-50 (R. M. Bohart, U.C.D.).

HUMBOLDT CO.: Mad River Beach, ♀, VIII-14-48 (W. Wirth, C.I.S.); Arcata, ♀, VI-26-48 (R. Coleman, C.I.S.).

LASSEN CO.: Susanville, ♀, VI-6-16 (W. B. Herms, C.I.S.).

LOS ANGELES CO.: Long Beach, ♀, III-15-39 (R. W. Burgess, C.I.S.).

MARIPOSA CO.: Yosemite Valley, ♀, VI-24-37 (T. Aitken, C.I.S.); Mirror Lake, ♀, VII-20-36 (W. B. Herms, C.I.S.).

MODOC CO.: Hackamore, ♀, V-30-38 (D. Furman, C.I.S.); Alturas, 4,500 ft., ♂♀, larvae, (R. M. Bohart, U.C.D.).

MONTEREY CO.: Pacific Grove, ♂♀, II-18-42 (R. Peters, C.I.S.).

NEVADA CO.: Lake Vera, ♀, 2,500 ft., VI-1-50 (Harvey Magy, B.V.C.); Nevada City, ♀, IV-1-43 (R. Potts, C.I.S.).

PLACER CO.: Lake Tahoe, ♀, VII-12-17 (C.I.S.); Baxters, ♂♀, larvae, IV-29-47 (R. M. Bohart, U.C.D.); Cisco Grove, ♂, larvae, IV-29-47 (R. M. Bohart, U.C.D.); Emigrant Gap, ♂, larvae, IV-29-47 (R. M. Bohart, U.C.D.).

PLUMAS CO.: Spring Garden, ♀, VI-15-40 (M. Cazier, T. Aitken, C.I.S.); Greenville, ♂♀, larvae, V-1-47 (R. M. Bohart, U.C.D.); Chester, ♂, larvae, IV-30-47 (R. M. Bohart, U.C.D.).

SACRAMENTO CO.: Fair Oaks, ♀, IV-21-50 (P. Gallagher, C.I.S.).

SAN LUIS OBISPO CO.: Black Lake Cyn., ♀, VIII-19-48 (W. Wirth, C.I.S.).

SAN MATEO CO.: Woodside, ♀, VI-11-40 (C. M. Wheeler, C.I.S.).

SANTA BARBARA CO.: Buellton, ♀, VI-23-48 (W. Wirth, C.I.S.).

SANTA CLARA CO.: Stanford Univ., ♂♀, III-29-41 (T. Aitken, C.I.S.).

SANTA CRUZ CO.: Big Trees, ♀, V-1-43 (Sanchez, C.I.S.).

SHASTA CO.: Hatchet Mt., ♂♀, larvae, V-10-50 (R. M. Bohart, U.C.D.); Glenburn, ♀, V-7-38 (E. Reinke, C.I.S.); Manzanita Lake, ♀, VI-4-40 (S. Donnes, C.I.S.).

SIERRA CO.: Loyalton, ♀, VI-19-16 (C.I.S.); Weber Lake, ♀, VI-17-40 (M. Cazier, T. Aitken, C.I.S.); Calpine, ♂♀, larvae, V-8-48 (R. M. Bohart, U.C.D.); Sierraville, ♂, larvae, IV-30-47 (R. M. Bohart, U.C.D.).

SOLANO CO.: Cordelia, ♂♀, larvae, IV-2-49 (E. Mezger, U.C.D.).

SONOMA CO.: Bohemian Grove, ♀, V-29-39 (H. F. Gray, C.I.S.); Petrified Forest, 1,000 ft., ♂♀, larvae, IV-4-49 (R. M. Bohart, U.C.D.).

STANISLAUS CO.: Denair, ♂, III-19-38 (P. Harvey, C.I.S.).

YOLO CO.: Knights Landing, ♀, V-24-50 (S. F. Bailey and J. Fowler, S.Y.A.D.).

Aedes nigromaculis (Ludlow)

Grabhamia nigromaculis Ludlow, 1907. Geo. Wash. Univ. Bul. 5:85. Cotype ♀♀ (USNM), Fort Keogh, Montana; Fort Lincoln, N. D.

Discussion:

This species, which has been known for a long time in the arid sections of the western plains from Manitoba to Texas and the intermountain country, was first taken in California in 1937 by Aitken (1939a). By 1940 its spread had been impressive (Aitken, 1940b) and now occurs over most of the state at the lower elevations. It competes with fresh-water *dorsalis* and is rapidly replacing it in open sunlit pools of waste and intermittent water. Its competition with *dorsalis* is aided by the fact that its eggs will hatch from 2 to 6 days after oviposition while those of *dorsalis* may be delayed for months. This produces a cumulative seasonal effect that results in overpowering numbers of *nigromaculis*. Its original home in the arid sections of the western plains probably produced only one or at most two or three broods per year. Introduced into an environment of permanent pastures and abundant waste irrigation water its biotic potential knows no bounds.

The adults sometimes have an indication of a white band on the proboscis, which is less pronounced than in *taeniorhynchus*. However, the latter is a southern saltmarsh breeder with white-

tipped palpi while *nigromaculis* has the palpi entirely black-scaled. It can be separated from its co-breeder, *dorsalis*, by having white basal tarsal bands—those of the latter being yellowish and present on both base and apex of the segment. Its larvae can be separated from *dorsalis* by the detached pecten teeth and from *vexans* by its anal saddle which completely rings the segment.

California records:

BUTTE CO.: Chico, ♀, IX-25-46 (S. F. Bailey, U.C.D.).

FRESNO CO.: Fresno, ♀, X-6-39 (R. Burgess, C.I.S.); Sanger, ♂, IV-25-49 (R. E. Hyckman, C.I.S.).

KERN CO.: Greenfield, ♀, IV-28-39 (T. Aitken, C.I.S.); Bakersfield, ♀, VII-23-46 (C.I.S.).

KINGS CO.: Corcoran, ♀, VIII-22-47 (W. Wirth, C.I.S.); Hanford, ♀, VII-8-47 (W. Wirth, C.I.S.).

LASSEN CO.: Nubieber, 4,100 ft., ♀, larvae, V-23-49 (R. M. Bohart, U.C.D.).

MERCED CO.: Dos Palos, ♀, VIII-5-47 (W. W. Wirth, C.I.S.); Snelling, ♀, VIII-5-48 (R. M. Bohart, U.C.D.).

MODOC CO.: Alturas, ♀, VII-13-48 (W. W. Wirth, C.I.S.).

PLACER CO.: Penryn, ♀, IV-1-47 (R. M. Bohart, U.C.D.).

SAN JOAQUIN CO.: Manteca, ♀, VIII-3-49 (D. C. Thurman, C.I.S.).

SAN LUIS OBISPO CO.: Alamos Creek, ♀, VIII-21-48 (W. W. Wirth, C.I.S.).

SHASTA CO.: Warm Springs, ♀, VI-20-37 (T. Aitken, C.I.S.); Anderson, ♀, VI-19-37 (T. Aitken, C.I.S.); Cassel, ♀, VIII-25-40 (T. Aitken, C.I.S.); McArthur, ♂♀, larvae, VII-18-50 (H. Magy and R. Bohart, U.C.D.).

SISKIYOU CO.: Dorris, ♀, VIII-?-48 (R. Coleman, C.I.S.).

STANISLAUS CO.: Modesto, ♀, VIII-10-40 (T. Aitken, C.I.S.).

TEHAMA CO.: Los Molinos, ♀, X-11-39 (S. Dommes, C.I.S.).

TULARE CO.: Lemon Cove, ♀, V-11-39 (T. Aitken, C.I.S.); Kings River, ♀, VII-18-40 (S. Dommes, C.I.S.); Yettam, ♂♀, larvae, VIII-30-49 (R. M. Bohart, U.C.D.).

YOLO CO.: Davis, ♂♀, larvae, IV-19-48 (R. M. Bohart, U.C.D.).

YUBA CO.: Marysville, ♀, X-17-39 (T. Aitken, C.I.S.).

Aedes pullatus (Coquillett)

Culex pullatus Coquillett, 1904. Proc. Ent. Soc.

Wash. 6:168. Type ♀ (USNM), Kaslo, B. C.

Discussion:

This is a widespread species of the "snow" mosquito type occurring in Europe, Alaska, Canada, and in the United States from the Rockies west. In California it is apparently rare and has been known only from Tuolumne Meadows, Tuolumne County, where it was collected by P. T. Johnson, June 27, 1949 (Johnson and Thurman, 1950) and from the two localities cited below.

Adult females of *pullatus* bite freely and the larvae are found in shaded or open pools of various types. The adults somewhat resemble *hexodontus* but the subspiracular scaling of *pullatus* is characteristic. The larvae are the only mountain *Aedes* with a simple pecten row and many-branched head hairs.

California records:

MONO CO.: E. Sonora Pass, 9,500 ft., ♀, larvae, VI-10-47 (R. M. Bohart, U.C.D.).

TUOLUMNE CO.: W. Sonora Pass, 9,500 ft., ♂♀, larvae, VI-10-47 (R. M. Bohart, U.C.D.).

Aedes hexodontus Dyar

Aedes hexodontus Dyar, 1916. Ins. Ins. Mens. 4:83. Type ♀ (USNM), Fallen Leaf Lake, Eldorado Co., Calif.

Discussion:

This mosquito belongs to the *punctator* Kirby complex which has a Holarctic distribution, and until the geographical races of *punctator* have been more carefully evaluated it seems best to treat the Californian representative as a separate species. At present it appears that *hexodontus*, characterized by the diffuse scaling of the female mesonotum and the larval comb of 5 to 7 teeth, occurs in the Pacific Coast states, in Utah, and in Wyoming.

The larvae breed in all types of small pools along the Sierra crest from Yosemite to Shasta County. Unlike many of the black-legged snow mosquitoes, some of the eggs hatch as soon as the snow melts, but there is also a delayed hatching and larvae may be found long after the snow has completely disappeared. It flies with *communis* from which it may be distinguished tentatively by the yellowish aspect of the lateral areas of the mesonotum. However, the distinctive characters of dichotomy 14 of the key should be utilized as

the coloration factor is often confusing. Its larvae are separated from all the other mountain *Aedes* by having the anal segment encircled by the saddle.

California records:

ALPINE CO.: Woodfords, ♀, VI-26-19 (C.I.S.); Carson Pass, 8,600 ft., ♂♀, larvae, VI-10-47 (R. M. Bohart, U.C.D.); Winnemucca Lake, 9,300 ft., ♂♀, larvae, VII-14-48 (R. M. Bohart, U.C.D.); Ebbetts Pass, 8,800 ft., ♂♀, larvae, VII-13-48 (R. M. Bohart, U.C.D.); Blue Lake, 8,500 ft., ♂♀, larvae, VII-12-48 (R. M. Bohart, U.C.D.); Hope Valley, 7,000 ft., ♀, larvae, VI-1-47 (R. M. Bohart, U.C.D.).

AMADOR CO.: Silver Lake, 8,000 ft., ♀, larvae, VI-10-47 (R. M. Bohart, U.C.D.).

ELDORADO CO.: Camp Sacramento, 6,700 ft., ♂♀, larvae, IV-28-50 (R. M. Bohart, U.C.D.); Tallac, ♀, VI-20-16 (C.I.S.) Little Truckee River, 6,500 ft., ♂♀, larvae, VI-1-47 (R. M. Bohart, U.C.D.); Echo Lake, 7,200 ft., ♂♀, pupae, VII-11-50 (J. Fowler, S.Y.A.D.); Luther Pass, 7,000 ft., ♂♀, larvae, V-21-48 (R. M. Bohart, U.C.D.).

MARIPOSA CO.: Yosemite, ♀, VIII-3-36 (W. B. Herms, C.I.S.).

MONO CO.: E. Sonora Pass, 9,500 ft., ♂♀, larvae, VI-10-47 (R. M. Bohart, U.C.D.).

PLACER CO.: Hampshire Rocks Camp, 6,700 ft., ♂♀, larvae, IV-29-47 (R. M. Bohart, U.C.D.); Emigrant Gap, 6,000 ft., ♂♀, larvae, IV-29-47 (R. M. Bohart, U.C.D.).

PLUMAS CO.: Bucks Lake, ♀, VI-23-49 (P. D. Hurd, C.I.S.); Chester, 4,700 ft., ♂♀, larva, IV-30-47 (R. M. Bohart, U.C.D.); Greenville, 5,000 ft., ♂♀, larvae, IV-30-47 (R. M. Bohart, U.C.D.).

SHASTA CO.: Hatchet Mt., 4,300 ft., ♂♀, larvae, V-10-50 (R. M. Bohart, U.C.D.); Lassen Park, ♀, VII-18-49 (C. L. Smith, C.I.S.).

SIERRA CO.: Calpine, 5,500 ft., ♂♀, larvae, IV-29-47 (R. M. Bohart, U.C.D.); Yuba Pass, 6,000 ft., ♀, larvae, V-1-47 (R. M. Bohart, U.C.D.); Gold Lake, 7,300 ft., ♂♀, larvae, VI-12-50 (R. Bohart, L. Isaak, R. Bechtel).

TUOLUMNE CO.: Sonora Pass, 9,500 ft., ♂♀, larvae, VI-10-47, (R. M. Bohart, U.C.D.).

Aedes squamiger (Coquillett)

Culex squamiger Coquillett, 1902. Proc. U.S. Nat. Mus. 25:85. 4 ♀♀ cotypes (USNM), Stanford University and San Lorenzo, Calif.

Discussion:

This salt-marsh species overlaps with *dorsalis* in the San Francisco Bay area and extends from Sonoma County south into Baja California to overlap in its southern range with *taeniorhynchus* while *dorsalis* extends northward up the coast.

Squamiger is restricted to salt-water breeding but adult females migrate long distances inland, particularly along wooded stream beds. It is a vicious daytime biter.

It is distinguished from its co-breeders in the salt marshes by its grayish and black coloring whereas *taeniorhynchus* is dark brown and *dorsalis* light brown to almost straw colored. In the coast foothills, migrating females might be confused with *increpitus* but the fact that both dark and pale scales are evenly scattered over the wings and the individual wing scales are broadly swollen should serve to differentiate *squamiger*.

Its larvae are separated from *taeniorhynchus* by having the anal segment only partly encircled by the saddle and from *dorsalis*, which they closely resemble, by having the lateral hair of the anal segment as long as or longer than the saddle (Bohart, 1948b).

California records:

ALAMEDA CO.: Oakland, ♂♀, V-23-17 (C.I.S.); Alameda, ♀, V-23-17 (C.I.S.); Berkeley, ♂♀, V-22-17 (C.I.S.); Emeryville, ♀, V-22-17 (C.I.S.); Albany, ♀, IV-22-17 (C.I.S.); Piedmont, ♂♀, V-21-17 (C.I.S.); Fruitvale, ♀, V-24-17 (C.I.S.); Fitchburg, ♂, V-14-17 (C.I.S.); Elmhurst, ♀, V-24-17 (C.I.S.); Castro Valley, ♀, IV-3-2 (C.I.S.).

CONTRA COSTA CO.: Antioch, ♀, IV-9-49 (D. J. Gould, C.I.S.); Jewel Lake, ♀, VII-48 (W. W. Wirth, C.I.S.).

LOS ANGELES CO.: Long Beach, ♂, III-13-39 (R. W. Burgess, C.I.S.).

MARIN CO.: Black Point, ♂♀, larvae III-5-48 (R. M. Bohart, U.C.D.); Bolinas, ♀, larvae, IV-25-47 (R. M. Bohart, U.C.D.); Tomales Bay, larvae, I-24-50 (R. Bohart, E. Mezger, U.C.D.); Inverness, ♂♀, larvae, I-5-50 (P. Jones, J. Walker, T. Aarons, E. Mezger, R. Bohart, U.C.D.).

MONTEREY CO.: Castroville, ♀, VIII-11-37 (T. Aitken, C.I.S.).

NAPA CO.: Napa, ♀, IV-11-37 (N. W. Frazier, C.I.S.).

ORANGE CO.: Costa Mesa, ♀, IV-21-48 (J. G. Shanafelt, O.C.D.); Cypress, ♀, V-5-48 (J. G. Shanafelt, O.C.D.) Los Alamitos, ♀, IX-15-49

(J. G. Shanafelt, O.C.D.); Seal Beach, ♀, VI-29-46 (J. G. Shanafelt, O.C.D.); Sunset Beach, ♂♀, VI-29-46 (J. G. Shanafelt, O.C.D.); Balsa Chica Lease, ♂♀, IV-25-49 (J. G. Shanafelt, O.C.D.).

RIVERSIDE CO.: Riverside, ♀, V-6-41 (R. F. Peters, C.I.S.).

SAN BENITO CO.: San Juan Bautista, ♀, VI-30-48 (W. W. Wirth, C.I.S.).

SAN MATEO CO.: Burlingame, ♀, VI-10-08 (C.I.S.); Millbrae, ♂, III-20-08 (C.I.S.); Crystal Springs Rd., ♀, V-26-37 (T. Aitken, C.I.S.).

SANTA CLARA CO.: Stanford Univ., ♀, III-29-41 (T. Aitken, C.I.S.).

SOLANO CO.: Mare Island, ♂, VII-14-16 (W. B. Herms, C.I.S.).

SONOMA CO.: Sonoma, ♀, III-28-37 (N. W. Frazier, C.I.S.); Petaluma, ♂♀, larvae, IV-7-50 (R. Bohart, E. Mezger, U.C.D.); Bodega Bay, ♂♀, larvae, I-24-50 (R. Bohart, E. Mezger, U.C.D.).

VENTURA CO.: Oxnard, ♀, VII-3-19 (C.I.S.).

Aedes sticticus (Meigen)

Culex sticticus Meigen, 1838. Syst. Besch. Zweifl. Ins. 7:1. Type ♀, Europe.

Discussion:

This mosquito has had a varied taxonomic career in the United States. It was known to occur in the western states including Oregon as *A. aldrichi* for many years but was first taken in California in the Sacramento Valley in 1941 (Reeves, 1941). At that time it was considered to be synonymous with the European form, *lateralis* (Meigen), and was so called for many years. Later reviewers have revived the opinion of Edwards that the name *lateralis* was preempted by Theobald for *geniculatus* and hence *sticticus* should be used. Inasmuch as *sticticus* has a good type which agrees with the mosquito under discussion it seems to be an opportunity to get rid of *lateralis* whose type is missing and which has been assigned to so many apparently different mosquitoes.

The species has spread throughout the Sacramento Valley and as far south in the San Joaquin as the Kings River. It shares the breeding places of *vexans* in wooded water courses but seems to prefer comparatively large bodies of flood water rather than the small detached pools favored by *vexans*.

It is separated from its co-breeder, *vexans*, by its all black tarsi. Its larvae may be separ-

ated from *vexans* by the relatively small anal saddle.

California records:

SAN JOAQUIN CO.: Ripon, ♂, III-17-41 (T. Aitken, W. C. Reeves, C.I.S.).

YOLO CO.: Woodland, ♂♀, larvae, VII-29-48 (R. M. Bohart, U.C.D.); Knights Landing, ♀, V-24-50 (S. F. Bailey, J. Fowler, S.Y.A.D.).

Aedes taeniorhynchus (Wiedemann)

Culex taeniorhynchus Wiedemann, 1821. Dipt. Exot., p. 43. Type ♀, Mexico.

Discussion:

This is the southern salt marsh mosquito which replaces *dorsalis* along the coast south of Monterey. It is a coastal species extending from Peru to southern California on the Pacific and from the Guianas to Connecticut on the Atlantic. It will occasionally breed in fresh water adjacent to salt marshes, but does not invade inland bodies of fresh water as does *dorsalis*.

It is the only California *Aedes* with a pronounced white band on its proboscis. *Aedes nigromaculis*, which sometimes has a concentration of pale scales midway on its proboscis, can be differentiated because its palpus is solid black, that of *taeniorhynchus* being tipped with white scales. Its larvae are easily separated from its co-breeder, *squamiger*, by having the anal segment completely ringed by the saddle.

California records:

ORANGE CO.: Sunset Beach, ♂♀, V-18-48 (J. G. Shanafelt, C.I.S.); Seal Beach, ♂♀, VII-19-48 (J. G. Shanafelt, C.I.S.).

VENTURA CO.: Hueneme, ♂♀, VI-20-48 (W. W. Wirth, C.I.S.); Lake McGrath, ♀, VII-25-48 (W. W. Wirth, C.I.S.).

Aedes varipalpus (Coquillett)

Culex varipalpus Coquillett, 1902. Can. Ent. 34:292. Type ♀ (USNM), Williams, Ariz.

Discussion:

This tree-hole mosquito is restricted to the Pacific Coast states, Arizona, and British Columbia. It is becoming more and more important, as residences and subdivisions are being developed in wooded areas adjacent to our metropolitan areas. Under crowded breeding conditions the adults may be so small that they can pass through

ordinary fly screens, but fortunately they are not so addicted to biting in-doors as outside. The larvae are restricted ordinarily to tree holes but have been taken in rain barrels that contained a heavy sediment of decaying leaves.

Adults are easily identified as small, dark mosquitoes with brilliant white bands on both base and apex of the tarsal segments. The larvae have the largest gills of any California species.

California records:

ALAMEDA CO.: Berkeley, ♀, IV-10-34 (T. Aitken, C.I.S.); Sunol, ♂♀, V-19-39 (T. Aitken, C.I.S.).

AMADOR CO.: Jackson, ♀, IV-?-48 (C.I.S.).

BUTTE CO.: Enterprise, ♂, VI-3-16 (W. B. Herms, C.I.S.); Oroville, ♀, V-7-21 (C.I.S.).

CALAVERAS CO.: Camp Wolfboro, ♀, VI-20-39 (C.I.S.).

DEL NORTE CO.: Smith River, ♂♀, VII-20-37 (T. Aitken, C.I.S.).

ELDORADO CO.: Snowline Camp, ♀, VI-21-48 (L. W. Quate, C.I.S.); Camino, ♀, VI-23-48 (J. W. MacSwain, C.I.S.); Lake Tahoe, 6,500 ft., ♀, VIII-14-48 (R. M. Bohart, U.C.D.); Echo Lake, 7,200 ft., ♀, VII-11-50 (J. Fowler, S.Y.A.D.).

HUMBOLT CO.: Fort Seward, ♀, V-31-35 (E. O. Essig, C.I.S.); Prairie Creek, ♂♀, VIII-10-48 (W. W. Wirth, C.I.S.); Arcata, ♀, VI-26-48 (R. Coleman, C.I.S.).

KERN CO.: Bakersfield, ♀, VII-20-46 (C.I.S.).

KINGS CO.: Lemoore, ♀, VI-10-19 (C.I.S.).

LOS ANGELES CO.: Los Angeles, ♀, IX-31-17 (C.I.S.); Long Beach, ♀, X-6-17 (C.I.S.).

MADERA CO.: Bass Lake, ♀, V-30-42 (E. G. Linsley, C.I.S.).

MARIN CO.: San Rafael, ♀, VII-27-16 (W. B. Herms, C.I.S.); Mt. Tamalpais, ♀, VII-7-48 (R. M. Bohart, U.C.D.).

MARIPOSA CO.: Yosemite, ♂♀, VI-24-37 (T. Aitken, C.I.S.); Miama Ranger Sta., ♀, V-27-42 (A. J. Walz, C.I.S.).

MENDOCINO CO.: Willits, ♂, IV-8-39 (R. Craig, C.I.S.); Hopland, ♀, VII-30-48 (W. W. Wirth, C.I.S.).

MERCED CO.: Merced, ♂, IV-12-48 (M.C.A.D.).

MODOC CO.: Alturas, ♀, VII-18-48 (W. W. Wirth, C.I.S.).

MONTEREY CO.: Big Sur, ♀, VIII-11-37 (T. Aitken, C.I.S.).

NEVADA CO.: Lake Vera, ♀, 2,500 ft., VI-1-50 (Harvey Magy, B.V.C.); Chicago Park, 2,500 ft., ♀, VII-26-50 (S. F. Bailey, U.C.D.).

ORANGE CO.: Santa Ana, ♂♀, II-2-49 (J. G.

Shanafelt, O.C.D.); Irvine Park, ♀, IV-24-49 (J. G. Shanafelt, O.C.D.).

PLUMAS CO.: Keddie, ♀, VI-15-40 (M. Cazier, T. Aitken, C.I.S.); Spring Garden, ♀, VI-15-40 (M. Cazier, T. Aitken, C.I.S.); Quincy, ♀, VI-22-49 (P. D. Hurd, C.I.S.).

RIVERSIDE CO.: Riverside, ♀, V-17-40 (W. C. Reeves, C.I.S.); Two Trees, ♀, II-17-40 (W. C. Reeves, C.I.S.).

SACRAMENTO CO.: Sacramento, ♂♀, IV-12-48 (R. M. Bohart, U.C.D.).

SAN BERNARDINO CO.: Redlands, ♂, I-25-41 (W. C. Reeves, C.I.S.).

SAN LUIS OBISPO CO.: Santa Margarita, ♀, VIII-20-48 (W. W. Wirth, C.I.S.).

SANTA BARBARA CO.: Buellton, ♀, VIII-24-48 (W. W. Wirth, C.I.S.).

SANTA CLARA CO.: San Jose, ♂, IV-9-38 (T. Aitken, C.I.S.); Palo Alto, ♂♀, V-24-37 (T. Aitken, C.I.S.); Los Gatos, ♀, V-23-37 (T. Aitken, C.I.S.); Llagus Cr., ♀, VII-7-48 (W. W. Wirth, C.I.S.).

SHASTA CO.: Cottonwood, ♀, V-17-16 (W. B. Herms, C.I.S.); Redding, ♂, VI-15-16 (W. B. Herms, C.I.S.); Shingletown, ♂♀, VI-4-41 (C. D. Michener, C.I.S.).

SISKIYOU CO.: So. Fork Sacramento River, ♀, VII-22-48 (R. Coleman, C.I.S.).

SOLANO CO.: Benicia, ♀, III-22-40 (W. C. Reeves, C.I.S.).

SONOMA CO.: Reclamation, ♂, (W. C. Reeves, C.I.S.); Sonoma, ♀, IX-3-49 (W. W. Wirth, C.I.S.); Geyserville, ♀, VII-28-48 (W. W. Wirth, C.I.S.); Petaluma, ♀, VIII-2-48 (W. W. Wirth, C.I.S.).

TEHAMA CO.: Tehama, ♀, V-24-16 (C.I.S.); Vina, ♀, V-15-21 (C.I.S.).

TULARE CO.: Heather Lake, Sequoia Natl. Park, ♂♀, VIII-9-47 (W. W. Wirth, C.I.S.); Camp Nielsen, ♂, VII-17-47 (W. W. Wirth, C.I.S.); Visalia, ♂, VI-30-47 (W. W. Wirth, C.I.S.); Lemon Cove, ♀, V-25-39 (T. Aitken, C.I.S.).

VENTURA CO.: Piru Canyon, ♀, VI-17-48 (W. W. Wirth, C.I.S.).

YOLO CO.: Davis, ♀, III-20-40 (W. C. Reeves, C.I.S.); Winslow, ♀, V-18-16 (W. B. Herms, C.I.S.); Letter Box, ♂, VII-3-16 (W. B. Herms, C.I.S.); Blarney, ♀, VI-7-39 (W. C. Reeves, C.I.S.); Knights Landing, ♀, V-24-50 (S. F. Bailey and J. Fowler, S.Y.A.D.); Elkhorn Ferry, ♂♀, IV-7-50 (R. M. Bohart, U.C.D.); Winters, ♂♀, IV-14-49 (J. Fowler, U.C.D.); Woodland, ♀, IV-49 (J. Fowler, U.C.D.).

Aedes ventrovittis Dyar

Aedes ventrovittis Dyar, 1916. Ins. Ins. Mens. 4:84. Type ♀ (USNM), Fallen Leaf Lake, Eldorado Co., Calif.

Discussion:

This is the "little black mosquito" of the High Sierra. Its range is reported to extend north into Washington but we have seen specimens from California only. At the latitude of Yosemite it breeds at elevations of 7,000 to over 10,000 feet right up to the permanent snow line. The larvae are active in pools with frozen edges and surrounded by snow banks. Larval development is rapid, considering the surroundings, and the adults are all on the wing by the time the adjacent snow banks have melted.

The male, originally described by Dyar as *fisheri*, is all black with long hairs replacing the mesonotal scales. The most characteristic feature for field recognition of the female, other than small size, is the metallic plum-colored sheen of the black scales of the dorsal abdomen. The identification can be checked by noting the dark tarsi, the numerous white scales on the anterior part of the wings and finally the all black palpi which separate it from *cataphylla*. The larva is the only mountain *Aedes* with single head hairs and a siphon tuft inserted beyond displaced pecten teeth.

California records:

ALPINE CO.: Woodfords, ♀, V-20-19 (C.I.S.); Winnemucca Lake, 9,200 ft., ♂♀, larvae, VII-14-48 (R. M. Bohart, U.C.D.); Ebbetts Pass, ♂♀, VII-13-48 (R. M. Bohart, U.C.D.); Blue Lake, 8,500 ft., ♂♀, larvae, VII-12-48 (R. M. Bohart, U.C.D.).

ELDORADO CO.: Wrights Lake, ♀, VII-2-48 (K. W. Tucker, C.I.S.); Lake Tahoe, ♀, VII-4-48 (R. M. Bohart, U.C.D.).

MARIPOSA CO.: Yosemite, ♀, VII-23-36 (W. B. Herms, C.I.S.).

MONO CO.: E. Sonora Pass, 9,500 ft., ♀, larvae, VI-10-47 (R. M. Bohart, U.C.D.).

NEVADA CO.: Donner Lake, ♀, VI-19-36 (M. A. Embury, C.I.S.).

PLACER CO.: Summit, ♀, VI-20-19 (C.I.S.).

PLUMAS CO.: Bucks Lake, ♀, VI-23-49 (P. D. Hurd, C.I.S.).

SHASTA CO.: Kings Cr. Meadow, ♀, VII-2-47 (R. L. Usinger, C.I.S.).

SIERRA CO.: Weber Lake, ♀, V-17-40 (M. Cazier, T. Aitken, C.I.S.). Gold Lake, ♀,

VII-4-16 (W. B. Herms, C.I.S.).

TUOLUMNE CO.: Tioga Pass, ♀, VI-22-19 (C.I.S.); Saddlebag Lake, ♀, VII-25-48 (R. Coleman, U.C.D.); Sonora Pass, 9,500 ft., ♂♀, larvae, VI-22-49 (R. M. Bohart, U.C.D.). Tuolumne Meadows, ♀, VII-22-36 (W. B. Herms, C.I.S.).

Aedes vexans (Meigen)

Culex vexans Meigen, 1820. Syst. Besch. Zweifl. Ins. 6:241. Types not designated, Germany.

Discussion:

This species occurs throughout the Palearctic, Nearctic, and Oriental regions, and in the northern part of Australasia. It is widespread in California, where it is primarily a flood-water species in woodland water courses. However, it is occasionally found in open pasture land in intermittent pools along with *nigromaculis* and *dorsalis*. Its habitat is entirely different from its eastern representatives, which breed in great numbers in open sunny marshes and in rain-filled road ruts. It is a vicious biter out-of-doors and has been observed to maintain directional migrations in overwhelming numbers.

Its basal tarsal bands, which are sometimes a dark bronze color, may be overlooked. This character, however, and the basal abdominal white bands sharply indented in the middle separate the adults of this species. The larvae occur frequently with those of *sticticus* but can be distinguished by the detached pecten teeth.

California records:

ALAMEDA CO.: Centerville, ♀, VII-24-19 (W. B. Herms, C.I.S.).

BUTTE CO.: Durham, ♀, VI-18-37 (T. Aitken, C.I.S.); Chico, ♀, IX-25-46 (S. F. Bailey, U.C.D.).

CONTRA COSTA CO.: Walnut Creek, ♀, VI-15-19 (C.I.S.).

FRESNO CO.: Fresno, ♀, VI-12-19 (C.I.S.); Reedley, ♀, V-25-39 (T. Aitken, C.I.S.); Minkler, ♀, VI-12-19 (C.I.S.).

IMPERIAL CO.: Calexico, ♀, VI-11-17 (C.I.S.); Brawley, ♀, VI-11-17 (C.I.S.).

KERN CO.: Bakersfield, ♀, VI-25-19 (C.I.S.); Conner, ♀, VII-27-19 (C.I.S.).

KINGS CO.: Hanford, ♀, VI-10-19 (C.I.S.); Lemoore, ♀, VI-10-19 (C.I.S.).

LASSEN CO.: Susanville, ♀, VI-6-16 (W. B. Herms, C.I.S.); Johstonville, ♀, VI-17-16 (W. B. Herms, C.I.S.).

MERCED CO.: Livingston, ♀, VII-20-48 (M.C.A.D.); Stevenson, ♂, VII-20-48 (M.C.A.D.);

Snelling, ♀, IX-17-48 (M.C.A.D.).

MODOC CO.: Alturas, ♂♀, VII-18-48 (R. Coleman, C.I.S.).

MONO CO.: Coleville, ♀, VI-21-19 (C.I.S.).

PLUMAS CO.: Quincy, ♀, VII-3-49 (P. D. Hurd, C.I.S.).

RIVERSIDE CO.: Coachella, ♀, VII-10-50 (R. Bohart, L. Isaak, U.C.D.).

SAN JOAQUIN CO.: Ripon, ♂, III-17-41 (W. C. Reeves, T. Aitken, C.I.S.); Tracy, ♀, VII-31-19 (C.I.S.); Woodbridge, ♀, VII-18-19 (C.I.S.); Stockton, ♀, VI-22-37 (T. Aitken, C.I.S.).

SHASTA CO.: Pit River, ♂♀, larvae, V-10-50 (R. M. Bohart, U.C.D.).

SOLANO CO.: Suisun, ♀, VII-31-16 (W. B. Herms, C.I.S.).

TULARE CO.: Visalia, ♀, VI-12-19 (C.I.S.); Tulare, ♀, VI-11-19 (C.I.S.); Exeter, ♀, VI-11-19 (C.I.S.); Klink, ♂, VI-26-19 (C.I.S.).

YOLO CO.: Knights Landing, ♀, V-24-50 (S. F. Bailey and J. Fowler, S.Y.A.D.); Elkhorn Ferry, ♂♀, larvae, IV-30-48 (R. M. Bohart, U.C.D.).

YUBA CO.: Marysville, ♀, X-18-39 (T. Aitken, C.I.S.).

Genus *Psorophora* Robinson-Desvoidy

Psorophora confinnis (Lynch Arribalzaga)

Taeniorhynchus confinnis Lynch Arribalzaga, 1891. Rev. Mus. de la Plata 2:149. Type ♀, Chaco in Formosa, Argentina.

Discussion:

The species has been reported from South America, Central America, and the United States as far north as Massachusetts, Nebraska, and Colorado. In California it has been found only in the southeastern corner of the state where it is often a severe pest, particularly in alfalfa-growing sections. The history of its recorded occurrence in California is given by Aitken (1940).

The larvae breed in irrigation overflow pools and the adults are attracted to lights.

California records:

IMPERIAL CO.: Holtville, ♂♀, VIII-1-37 (T. Aitken, C.I.S.); El Centro, ♂♀, VII-1-38 (B. Schiller, C.I.S.); Fort Yuma, ♂♀, X-?-48 (R. Coleman, C.I.S.).

RIVERSIDE CO.: Palm Springs, ♂♀, IX-4-12 (P. Galindo, C.I.S.); Blythe, ♂♀, VIII-21-47 (J. W. MacSwain, C.I.S.).

Genus *Orthopodomyia* Theobald

Orthopodomyia californica R. Bohart

Orthopodomyia californica R. Bohart, 1950. Ann. Ent. Soc. Amer. 43:399. Type ♀ (USNM), Elkhorn Ferry, Yolo Co., Calif.

Discussion:

This species has been collected only in California, where it has previously been called *O. signifera* (Coquillett). It differs from *signifera* in the adult by having the white ring over tarsal joint II to III covering equal areas on II and III. The larva of the California species has a much longer siphon tuft than its eastern allies and the tuft is inserted closer to the center of the siphon tube (fig. 10).

The larval habits have been discussed by Reeves (1941b) and Bohart (1950b).

The larvae are found in tree holes, usually cottonwood, and frequently in water of high pH. Judging by the small number of collections the species is rare. Specimens presumably of this species but not seen by the authors have been reported from Nice, Lake County (A. W. Lindquist) and Benicia, Solano County. The females have not been observed feeding.

California records:

FRESNO CO.: Clovis, ♀, X-13-50 (A. L. Paden, B.V.C.).

KERN CO.: Bakersfield, larvae, V-17-48 (E. Hill, W. C. Reeves collection).

KINGS CO.: Hanford, ♀, VII-8-47 (W. W. Wirth, C.I.S.).

RIVERSIDE CO.: Riverside, ♂♀, IV-3-40 (W. C. Reeves, C.I.S.); Box Springs, ♂, VII-10-41 (W. C. Reeves, C.I.S.).

SAN BERNARDINO CO.: Redlands, ♂♀, VI-21-41 (W. C. Reeves, C.I.S.).

YOLO CO.: Elkhorn Ferry, ♂♀, larvae, IV-7-50 (R. M. Bohart, U.C.D.).

Genus *Uranotaenia* Lynch Arribalzaga

Uranotaenia anhydor Dyar

Uranotaenia anhydor Dyar, 1907. Proc. U.S. Nat. Mus. 32:128. Type, larva (USNM), Sweetwater Junction, San Diego Co., Calif.

Discussion:

No collections of this species have been made by the authors. It seems to be rare and restricted

in this state to San Diego County where the larvae may be found in association with tules, *Lemna*, and *Anopheles* in drying river pools. Specimens which are apparently *anhydor* have been taken recently in Baja California by W. C. Reeves and Bernard Brookman, and in Nevada near Death Valley, California, by C. B. Philip.¹⁴

The adults are small mosquitoes with short palpi in both sexes. The mesonotum has patches of pale violet scales over the wings and in front of the scutellum. A microphotograph of the terminal larval segments was published by Seaman (1945).

California records:

SAN DIEGO CO.: Camp Kearney, ♀, V-?-18; Sweetwater Junction, larva,¹⁵ (Dyar and Caudell, U.S.N.M.); Old Town (San Diego), ♂♀, larva, pupa, V-1-16 (H. G. Dyar, U.S.N.M.); Bonsall, larva, IX-15-44 (E. A. Seaman, U.C.D.).

Genus *Mansonia* Blanchard

Mansonia perturbans (Walker)

Culex perturbans Walker, 1856. Ins. Saund, Dipt., p. 428. Type ♀, United States.

Discussion:

This species occurs in many parts of the United States and Canada, and also in Mexico and Europe. It was first recorded from California by Reeves (1941). Its distribution is localized in this state but it can be a severe pest near its breeding areas. As far as the authors are aware, the only larvae taken in California were attached to the roots of tules in Rockwell Pond near Selma, Fresno County. The collectors were W. W. Wirth and R. Dow who made their discovery in June, 1947.

The adults are identified by their very broad wing scales, banded beak, and pale basal abdominal bands; the larvae by their peculiar siphon (fig. 11) and long antennae. Records indicated by an asterisk are from Reeves (1941).

California records:

FRESNO CO.: Fresno, ♀, IX-20-41 (W. Van Herrick, C.I.S.).

*KERN CO.: Bakersfield, VII-28-19.

MERCED CO.: Snelling, ♀ VIII-31-49 (R. Bohart, L. Isaak, U.C.D.).

PLACER CO.: Lander, ♀, 7-9-17 (C.I.S.).

*SAN JOAQUIN CO.: Galt, VII-15-17.

¹⁴Females taken at lights.

¹⁵This and the following records are taken from the literature.

Genus *Culiseta* Felt (-Theobaldia Auct.)

Culiseta impatiens (Walker)

Culex impatiens Walker, 1848. List Dipt. British Mus. 1:5. Type ♀, St. Martin's Falls, Albany River, Hudson Bay, Canada.

Discussion:

Although this species extends across the continent in southern Canada, it is rare in the United States. We have no bred material that can be associated with larvae although Dyar's specimens from Fallen Leaf Lake, Eldorado County, were bred from larvae collected locally. Dr. Alan Stone has verified these specimens and we have seen females from the three localities given below.

California records:

MARIPOSA CO.: Yosemite Valley, ♀, IV-23-50 (P. T. Johnson, D. C. Thurman, B.V.C.).

MONO CO.: Mono Lake, ♀, VI-22-19 (C.I.S.).

SHASTA CO.: Manzanita Lake, Lassen Natl. Park, ♀, VI-10-41 (T. Aitken, C.I.S.).

Culiseta incidens (Thomson)

Culex incidens Thomson, 1868. Kongl. Sven. Freg. Eugenies Resa 6 (Dipt.):443. Type ♀, California.

Discussion:

This species shares with *Culex tarsalis* the reputation of being California's most widely distributed mosquito species. It occurs in North America from the Rocky Mountains west and north to Alaska. It breeds from below sea level to elevations of at least 9,500 feet; in brackish water on the coast to spring water and snow pools in the mountains; in discarded auto casings as well as hoof prints, rain barrels and reservoirs.

There is some indication that its biting habits are controlled by a division into physiological strains. In some areas they are extremely bothersome while at other points they can be induced to bite human beings only with the greatest difficulty. It shares the banded tarsi and spotted wings with *macrackenae* but is distinguished by having its cross veins unscaled. The larvae can be separated in the field by looking with a hand lens for the short lateral hair of the anal segment and the single submedian mesonotal hair. Taxonomic characters of the larvae of California *Culiseta* are discussed by Thurman and Johnson (1950).

California records:

ALAMEDA CO.: Oakland, ♀, X-20-40 (Kelly and Galindo, U.C.D.).

ALPINE CO.: Winnemucca Lake, 9,200 ft., ♂♀, larvae, VII-20-48 (R. M. Bohart, U.C.D.); Hope Valley, 7,000 ft., ♂, larvae, VI-1-47 (R. M. Bohart, U.C.D.); Markleeville, 5,500 ft., ♀, VIII-5-38 (T. Aitken, C.I.S.); Ebbetts Pass, 8,800 ft., ♂♀, IX-5-38 (T. Aitken, C.I.S.); Woodfords, ♀, IX-5-38 (T. Aitken, C.I.S.).

AMADOR CO.: Amador, ♂♀, larvae, XI-13-46 (R. M. Bohart, U.C.D.).

BUTTE CO.: Oroville, ♀, VII-3-16 (W. B. Herms, C.I.S.).

CALAVERAS CO.: San Andreas, ♀, XII-18-16 (W. B. Herms, C.I.S.).

COLUSA CO.: Colusa, ♂♀, V-22-16 (W. B. Herms, C.I.S.).

CONTRA COSTA CO.: Martinez, ♀, III-24-17 (C.I.S.).

DEL NORTE CO.: Smith River, ♀, VII-19-37 (T. Aitken, C.I.S.).

EL DORADO CO.: Little Truckee River, 6,500 ft., ♂, larvae, VI-1-47 (R. M. Bohart, U.C.D.); Placerville, ♀, VII-15-16 (W. B. Herms, C.I.S.); Snowline, ♀, VI-22-48 (L. W. Quate, C.I.S.).

FRESNO CO.: Florence Lake, ♀, VII-?-13 (C. D. Michener, C.I.S.).

GLENN CO.: Hamilton City, ♀, V-20-16 (W. B. Herms, C.I.S.).

HUMBOLDT CO.: Carlotta, ♂, VIII-6-16 (W. B. Herms, C.I.S.).

INYO CO.: Westgard Pass, 6,000 ft., ♀, larvae, VI-18-47 (R. M. Bohart, U.C.D.).

KERN CO.: Bakersfield, ♀, VII-22-46 (C.I.S.).

KINGS CO.: Hanford, ♀, VI-10-19 (C.I.S.).

LAKE CO.: Lakeport, ♀, VII-29-16 (C.I.S.).

LASSEN CO.: Susanville, ♀, VI-16-16 (W. B. Herms, C.I.S.).

LOS ANGELES CO.: Los Angeles, ♀, VII-15-19 (C.I.S.).

MARIN CO.: Ignacio, ♀, VII-27-16 (W. B. Herms, C.I.S.).

MARIPOSA CO.: Yosemite Park, ♂, VI-24-37 (T. Aitken, C.I.S.).

MENDOCINO CO.: Van Damme State Park, ♀, larvae, VIII-19-49 (R. M. Bohart, U.C.D.).

MERCED CO.: Los Banos, ♂♀, VII-1-48 (E. S. Meyers, M.C.A.D.).

MODOC CO.: Rush Creek, ♂♀, VII-6-1938 (D. Furman, C.I.S.).

MONO CO.: Leavitt Meadows, 6,500 ft., ♂, larvae, VI-10-47 (R. M. Bohart, U.C.D.).

MONTEREY CO.: Santa Rita, ♂, VII-31-19 (C.I.S.).

NAPA CO.: Napa, ♀, VIII-2-16 (W. B. Herms, C.I.S.).

NEVADA CO.: San Juan, ♂, (W. B. Herms, C.I.S.); Grass Valley, 2,500 ft., ♂♀, VII-6-16 (W. B. Herms, C.I.S.); Weber Lake, 7,000 ft., ♂♀, larvae, VIII-25-46 (R. M. Bohart, U.C.D.); Glenbrook, ♀, VII-29-16 (C.I.S.).

ORANGE CO.: Huntington Beach, ♂♀, IV-9-49 (J. G. Shanafelt, O.C.D.).

PLACER CO.: Penryn, 1,000 ft., ♂♀, larvae, IV-2-47 (R. M. Bohart, U.C.D.).

PLUMAS CO.: Canyon Dam, 5,500 ft., ♂♀, larvae, IV-30-47 (R. M. Bohart, U.C.D.); Quincy, 3,400 ft., ♂, XI-6-38 (T. Aitken, C.I.S.).

RIVERSIDE CO.: Palm Springs, ♂♀, larvae, III-20-48 (W. McNeil, U.C.D.).

SACRAMENTO CO.: Sacramento, ♀, VI-29-16 (W. B. Herms, C.I.S.).

SAN BENITO CO.: San Juan Bautista, ♀, VI-30-48 (W. W. Wirth, C.I.S.).

SAN DIEGO CO.: San Diego, ♀, VII-25-17 (C.I.S.).

SAN JOAQUIN CO.: Waterloo, ♀, VII-17-19 (C.I.S.).

SAN LUIS OBISPO CO.: Santa Margarita, ♂♀, VII-2-19 (C.I.S.).

SAN MATEO CO.: Colma, ♂♀, VIII-15-17 (C.I.S.).

SANTA CLARA CO.: Mayfield, ♀, VIII-11-17 (C.I.S.).

SANTA BARBARA CO.: Orcutt, ♂♀, VII-2-19 (C.I.S.).

SANTA CRUZ CO.: Big Basin, ♂, V-29-37 (T. Aitken, C.I.S.).

SHASTA CO.: Redding, ♂, VI-5-16 (W. B. Herms, C.I.S.); Castle Crags, ♀, VI-24-21 (W. B. Herms, C.I.S.); Hatchet Mt., 4,350 ft., ♂♀, larvae, V-10-50 (R. Bohart, W. Wall, U.C.D.); Doomtown, ♀, IV-18-39 (H. W. Jorgensen, C.I.S.).

SIERRA CO.: Sierraville, ♀, VI-19-16 (W. B. Herms, C.I.S.); Loyalton, ♀, VI-19-16 (W. B. Herms, C.I.S.).

SISKIYOU CO.: Yreka, ♂♀, VI-12-16 (W. B. Herms, C.I.S.); Hornbrook, ♀, VI-12-16 (W. B. Herms, C.I.S.); Weed, ♂♀, VI-10-16 (W. B. Herms, C.I.S.).

SOLANO CO.: Green Valley, ♂♀, IV-26-47 (R. M. Bohart, U.C.D.).

SONOMA CO.: Petaluma, ♀, VII-27-16 (W. B. Herms, C.I.S.).

SUTTER CO.: Live Oak, ♀, V-29-16 (W. B. Herms, C.I.S.).

TEHAMA CO.: Corning, ♂♀, V-23-16 (C.I.S.).

TRINITY CO.: Weaverville, ♂♀, larvae, VIII-9-49 (R. M. Bohart, U.C.D.).

TULARE CO.: Porterville, ♀, VI-11-19 (C.I.S.).

TUOLUMNE CO.: Sonora Pass, 9,500 ft., ♂, larvae, VI-22-49 (R. M. Bohart, U.C.D.); Sonora, ♂, VII-19-16 (W. B. Herms, C.I.S.); Tuolumne, ♂, VII-19-16 (W. B. Herms, C.I.S.).
 VENTURA CO.: Montalvo, ♂, VII-3-19 (C.I.S.).
 YOLO CO.: Davis, ♂♀, larvae, VIII-16-46 (R. M. Bohart, U.C.D.).

Culiseta inornata (Williston)

Culex inornatus Williston, 1893, U.S. Dept. Agr. Div. Ornith. Mam. N. Amer. Fauna 7:253. Type ♀ (USNM), Argus Mountains, Inyo Co., Calif.

Discussion:

This species occurs throughout North America from southern Canada to northern Mexico. In California it has been reported from almost every county but is more common in the southern part of the state. The larvae occur in the same areas as *incidens* but not often in the same pools as they are less partial to shade and cool water and more tolerant of salinity and alkali. The females will take human blood and occasionally may become pests.

Its broad, unspotted wings and unbanded tarsi separate it from all its congeners except the rare *impatiens* which has dark wing scales, whereas a few pale scales, particularly at the base of the costa, are present in *inornata*. The larvae differ from those of *incidens* by the strong lateral hair of the anal segment, from those of *maccrackenae* by the single submedian mesonotal hair, and from those of *impatiens* by the unequal length of the head hairs.

California records:

ALAMEDA CO.: Castro Valley, ♀, IV-3-21 (C.I.S.); Berkeley, ♀, I-10-40 (J. Johnson, C.I.S.).
 ALPINE CO.: Carson Pass, 8,600 ft., ♂, IX-5-38 (T. Aitken, C.I.S.).
 CONTRA COSTA CO.: Point Richmond, ♀, I-4-47 (R. E. Beer, C.I.S.); Antioch, ♀, IV-9-49 (D. J. Gould, C.I.S.).
 EL DORADO CO.: Snowline, ♀, VII-4-48 (W. W. Wirth, C.I.S.).
 FRESNO CO.: Fresno, ♂♀, III-13-40 (S. Dommes, C.I.S.); Sanger, ♀, X-24-47 (R. Coleman, C.I.S.).
 HUMBOLT CO.: Eureka, ♀, VII-22-37 (T. Aitken, C.I.S.); Arcata, ♂♀, IV-48 (W. W. Wirth, C.I.S.).
 IMPERIAL CO.: Calexico, ♀, III-?-48

(C.I.S.); Fort Yuma, ♀, II-?-48 (R. Coleman, C.I.S.).

INYO CO.: Panamint Valley, ♀, III-12-41 (T. Aitken, U.C.D.); Bishop, ♀, VI-4-38 (T. Aitken, C.I.S.); Death Valley, ♂♀, III-14-41 (T. Aitken, C.I.S.); Pine Creek Road, ♀, VI-7-48 (W. W. Wirth, C.I.S.).

KERN CO.: Bakersfield, ♂, IV-4-39 (F. L. Hayes, C.I.S.).

LAKE CO.: Loch Lomond Resort, ♀, X-4-47 (T. D. Thatcher, C.I.S.).

LASSEN CO.: Standish, ♀, VI-17-16 (W. B. Herms, C.I.S.); Johnsonville, ♀, VI-17-16 (W. B. Herms, C.I.S.); Susanville, ♀, VI-6-16 (W. B. Herms, C.I.S.).

MARIN CO.: Black Point, ♂♀, larvae, V-8-47 (R. M. Bohart, U.C.D.).

MENDOCINO CO.: Garcia River, ♀, VII-30-48 (W. W. Wirth, C.I.S.).

MERCED CO.: Merced, ♀, III-13-40 (S. Dommes, C.I.S.); Le Grande, ♀, VI-12-19 (C.I.S.); Tanner Island Bridge, ♀, VII-13-48 (H. R. Greenfield, M.C.A.D.); Dos Palos, ♀, VI-2-48 (J. De Mercado, M.C.A.D.); Snelling, ♀, VII-?-48 (M.C.A.D.); San Joaquin River, ♀, VI-11-48 (J. De Mercado, M.C.A.D.).

MODOC CO.: Hackamore, ♀, V-30-38 (D. Furman, U.C.D.); Likely, ♀, VI-15-16 (W. B. Herms, C.I.S.); Alturas, ♀, VI-15-16 (W. B. Herms, C.I.S.); Rush Creek, ♀, VII-6-38 (D. Furman, C.I.S.); Cedarville, ♀, VII-17-48 (W. W. Wirth, C.I.S.); Stronghold, ♀, VII-17-48 (W. W. Wirth, C.I.S.).

MONO CO.: Bridgeport, ♂♀, larvae, V-20-47 (R. M. Bohart, U.C.D.); Coleville, ♀, VI-21-19 (C.I.S.).

MONTEREY CO.: Carmel, ♀, VIII-11-37 (T. Aitken, C.I.S.); Castroville, ♀, VIII-27-48 (W. W. Wirth, C.I.S.).

NAPA CO.: Pope Valley, ♀, VIII-17-48 (W. W. Wirth, C.I.S.).

ORANGE CO.: Peters Dam, ♂♀, larvae, V-5-49 (R. M. Bohart, U.C.D.).

PLUMAS CO.: Canyon Dam, ♀, IV-30-47 (R. M. Bohart, U.C.D.); Chester, ♂, IV-30-47 (R. M. Bohart, U.C.D.).

SAN BENITO CO.: San Juan, ♀, VII-1-19 (C.I.S.).

SAN BERNARDINO CO.: Townes Pass, ♀, XII-30-39 (G. Bohart, C.I.S.); Newbury, ♂, IV-16-38 (T. Aitken, C.I.S.); Needles, ♀, II-18-15 (M. C. Van Duzee, C.I.S.).

SAN DIEGO CO.: Julian, ♂, V-8-49 (R. M. Bohart, U.C.D.).

SAN JOAQUIN CO.: Tracy, ♀, XII-17-38 (C.I.S.); Holt, ♀, VII-17-19 (C.I.S.); Lodi, ♀, II-25-07 (C.I.S.).

SAN LUIS OBISPO CO.: Simmier, ♀, VI-25-19 (C.I.S.); San Luis Obispo, ♀, VIII-22-48 (W. W. Wirth, C.I.S.).

SANTA BARBARA CO.: Carpinteria, ♂, VII-21-17 (C.I.S.); San Antonio Creek, ♀, VI-23-48 (W. W. Wirth, C.I.S.); Orcutt, ♀, VIII-22-48 (W. W. Wirth, C.I.S.).

SANTA CLARA CO.: Alum Rock Park, ♂, VII-8-48 (W. W. Wirth, C.I.S.).

SHASTA CO.: Pit River, ♂, larvae, V-10-50 (R. M. Bohart, U.C.D.); Clenburn, ♂♀, larvae, V-10-50 (R. M. Bohart, U.C.D.).

SIERRA CO.: Loyalton, ♀, VI-19-16 (W. B. Herms, C.I.S.); Sierraville, ♀, VI-19-16 (W. B. Herms, C.I.S.).

SISKIYOU CO.: Montague, ♀, VI-11-16 (W. B. Herms, C.I.S.); Yreka, ♀, VII-20-48 (W. W. Wirth, C.I.S.).

SOLANO CO.: Lixon, ♂♀, larvae, IV-23-47 (R. M. Bohart, U.C.D.); Green Valley, ♀, larvae, IV-26-47 (R. M. Bohart, U.C.D.); Ryer Island, ♀, IV-12-49 (C.I.S.).

SONOMA CO.: Bodega Bay, ♂, larvae, I-24-50 (R. M. Bohart, U.C.D.); Sonoma, ♀, VIII-2-48 (W. W. Wirth, C.I.S.).

STANISLAUS CO.: Denair, ♂, III-22-38 (D. Harvey, C.I.S.).

TEHAMA CO.: W. Corning, ♀, V-23-16 (C.I.S.); Red Bluff, ♀, V-24-16 (C.I.S.); Vina, ♀, (C.I.S.).

TRINITY CO.: Mad River Beach, ♂♀, VIII-12-48 (W. W. Wirth, C.I.S.).

VENTURA CO.: Revolon Slough, ♀, VI-18-48 (W. W. Wirth, C.I.S.).

YOLO CO.: Davis, ♂, larvae, IX-24-46 (R. M. Bohart, U.C.D.); Woodland, ♂, III-21-48 (U.C.D.).

YUBA CO.: Browns Valley, ♂, III-22-40 (S. Dommes, C.I.S.).

Culiseta maccrackeneae Dyar and Knab

Culiseta maccrackeneae Dyar and Knab, 1906. Proc. Biol. Soc. Wash. 19:133. 1 ♂ and 4 ♀♀ cotypes (USNM), Stanford University, Eureka and San Francisco, Calif.

Discussion:

This species ranges from northern California to Mexico and Costa Rica. It is fairly widespread in California but never occurs in large numbers. It prefers to breed in cool, clear pools in deep shade, and is not dependent on vegetation or floatage as the larvae spend much of their time as bottom feeders. The females bite man readily, but their rarity makes them of little consequence.

The heavily scaled crossveins of the adult together with the distinct white tarsal bands, and the multiple submedian mesonotal hair are diagnostic.

California records:

ALAMEDA CO.: Sunol, ♂, VI-6-40 (W. C. heeves, C.I.S.); Berkeley, (light trap in Strawberry Canyon), ♀, XI-?-48 (W. W. Wirth, C.I.S.).

HUMBOLDT CO.: Arcata, ♀, VI-26-48 (W. W. Wirth, C.I.S.); Fortuna, ♀, VIII-13-48 (W. W. Wirth, C.I.S.); Mad River Beach, ♀, VIII-14-48 (W. W. Wirth, C.I.S.).

INYO CO.: Lone Pine, ♂♀, VI-3-38 (T. Aitken, C.I.S.).

KERN CO.: Bakersfield, ♀, VII-28-19 (W. B. Herms, C.I.S.).

MARIN CO.: Pt. Reyes Station, ♀, VII-9-39 (T. Aitken, C.I.S.).

MENDOCINO CO.: Garcia River, ♂♀, VII-30-48 (W. W. Wirth, C.I.S.).

MERCED CO.: Snelling, ♀, IV-23-50 (M.C.A.D.).

MONTEREY CO.: Castroville, ♂♀, VIII-27-48 (W. W. Wirth, C.I.S.); Cachagua Creek, ♀, VII-1-48 (W. W. Wirth, C.I.S.).

SACRAMENTO CO.: Folsom, ♂♀, larvae, III-27-50 (J. Fowler, S.Y.A.D.).

SAN DIEGO CO.: Bonsall, ♂♀, larvae, V-7-49 (R. M. Bohart, U.C.D.).

SAN LUIS OBISPO CO.: Morro Bay, ♀, VIII-3-37 (T. Aitken, C.I.S.); Black Lake Canyon, ♀, VIII-19-48 (W. W. Wirth, C.I.S.); San Luis Obispo, ♀, VIII-21-48 (W. W. Wirth, C.I.S.).

SANTA BARBARA CO.: Las Cruces, ♂, VII-21-17 (C.I.S.); Santa Barbara, ♀, VII-21-17 (C.I.S.); Buellton, ♂, VI-23-48 (W. W. Wirth, C.I.S.); Orcutt, ♀, VI-22-48 (W. W. Wirth, C.I.S.).

SANTA CRUZ CO.: Santa Cruz, ♀, VII-8-48 (W. W. Wirth, C.I.S.).

SOLANO CO.: Green Valley, ♂♀, larvae, VI-8-49 (R. M. Bohart, U.C.D.).

SONOMA CO.: Sonoma, ♂, VIII-2-48 (W. W. Wirth, C.I.S.); Petaluma, ♀, VIII-2-48 (W. W. Wirth, C.I.S.).

TEHAMA CO.: Vina, ♀, VI-2-21 (C.I.S.).

VENTURA CO.: Fillmore, ♀, VI-17-48 (W. W. Wirth, C.I.S.); Wheeler Springs, ♂, VI-16-48 (W. W. Wirth, C.I.S.).

Genus *Culex* Linnaeus

Culex anips Dyar

Culex anips Dyar, 1916. Ins. Ins. Mens. 4:48. Type ♀ (USNM), San Diego River, San Diego Co., Calif.

Discussion:

This rare mosquito has not been taken in California since its original capture and description by Dyar in 1916. Its habitat was a deep pool surrounded by tules at the mouth of the San Diego River. Recently, however, Heeves and Brookman have taken it together with *C. erythrothorax*, *C. reevesi* and *U. anhydor* in a stagnant, tule-filled, stream pool near the ocean in Baja California.

Culex apicalis Adams

Culex apicalis Adams, 1903. Kans. Univ. Sc. Bul. 2:26. Two ♀ cotypes (UK), Oak Creek Canyon, Arizona.

Discussion:

This interesting mosquito is a common inhabitant of woodland pools. Although it has been recorded erroneously from a much wider range (see discussion under *territans*), it is known only from California, Arizona, and Baja California, where it occurs at elevations below 5,000 feet. The females are not able to bite human beings although they sometimes try. The only observed hosts have been frogs but other cold-blooded animals may also serve in this capacity.

The adult females are distinguished from all other apically banded California species by the relatively long palpi (see dichotomy 8, page 21, line 1). The larva is characterized by its very long (7x1) tapered breathing tube.

California records:

- BUTTE CO.: Chico, ♀, (B. Portman, U.C.D.).
 KERN CO.: Kern River Canyon, ♂♀, VIII-26-47 (B. Brookman, U.C.D.).
 MERCED CO.: Pacheco Pass, ♀, XII-14-47 (M.C.A.D.).
 MARIN CO.: Pt. Reyes Station, ♂♀, VIII-26-50 (R. M. Bohart, U.C.D.).
 MONTEREY CO.: Cachagua Creek, ♂♀, VII-1-48 (W. W. Wirth, C.I.S.); Big Sur River, ♂♀, larvae, VIII-30-50 (R. M. Bohart, R. Bechtel, U.C.D.).
 NAPA CO.: Monticello, ♂♀, larvae, X-8-47 (R. M. Bohart, U.C.D.); Conn Lake, ♂♀, larvae, IX-14-46 (R. M. Bohart, U.C.D.); Mt. St. Helena, ♀, larvae, IX-14-46 (R. M. Bohart, U.C.D.).
 ORANGE CO.: Lake Henshaw, ♀, V-14-49 (J. G. Shanafelt, O.C.D.); Corona del Mar, ♀, III-22-48 (J. G. Shanafelt, O.C.D.); Laguna Beach, ♀, VIII-29-48 (J. G. Shanafelt, O.C.D.); San Clemente, ♂♀, III-12-49 (D. W. Best, O.C.D.); San Juan Capistrano, ♀, I-21-49 (D. W. Best, O.C.D.).

PLACER CO.: Auburn, ♂♀, VIII-26-43 (C.I.S.).

SAN BENITO CO.: Pinnacles National Monument, ♂♀, larvae, V-26-50 (R. M. Bohart, U.C.D.).

SAN BERNARDINO CO.: San Bernardino, larva, VIII-30-44 (W. W. Farrar, U.C.D.).

SAN DIEGO CO.: Bonsall, larvae, V-7-49 (R. M. Bohart, U.C.D.); Mt. Palomar, ♂, IX-21-44 (U.C.D.).

SAN JOAQUIN CO.: Tracy, ♀, XII-16-38 (I. Aitken, U.C.D.).

SAN LUIS OBISPO CO.: Edna, ♂, VIII-21-48 (W. W. Wirth, C.I.S.).

SANTA CLARA CO.: Alum Rock Park, ♀, larvae, V-27-50 (R. M. Bohart, U.C.D.); Uvas Creek, ♂♀, VII-7-48 (W. W. Wirth, C.I.S.).

SOLANO CO.: Green Valley, ♂♀, larvae, VIII-24-46 (R. M. Bohart, U.C.D.).

SONOMA CO.: Sonoma, ♀, IX-3-48 (W. W. Wirth, C.I.S.).

TRINITY CO.: Weaverville, ♂♀, larvae, VIII-9-49 (R. M. Bohart, U.C.D.).

TULARE CO.: Elderwood, ♀, VII-18-47 (W. W. Wirth, C.I.S.).

TUOLUMNE CO.: Sonora, 1,800 ft., larvae, IX-12-47 (R. M. Bohart, U.C.D.).

VENTURA CO.: Upper Ojai Valley, ♀, VI-16-48 (W. W. Wirth, C.I.S.).

Culex boharti Brookman and Reeves

Culex boharti Brookman and Heeves, 1950. Pan-Pac. Ent. 26:159. Type, ♂, (USNM), Monticello, Napa Co., Calif.

Discussion:

This species was originally named *Culex reevesi* (R. Bohart, 1948), but the name was antedated while still in press by *Culex reevesi* Wirth, a closely related species, also from California. The resulting homonymy was straightened out by Brookman and Reeves (1950). *C. boharti* ranges throughout the state in the lowlands and foothills but is usually uncommon. Previous records from Plumas County, Lake Tahoe, and Yosemite Valley (Bohart, above citation) refer to *C. territans*.

The adults are shy and are not known to bite man. The larvae prefer partially sunlit creek pools with an abundant growth of aquatic vegetation. They have a distinctly spotted appearance in life, which character they share with *reevesi*, but differ from the latter primarily by having the lower head hair single.

California records:

MARIN CO.: Pt. Reyes Station, ♀, larvae,

VIII-26-50 (R. M. Bohart, U.C.D.).

MERCED CO.: Merced Falls, ♂♀, larvae, IX-11-47 (R. M. Bohart, U.C.D.); Snelling, ♂♀, larvae, IX-11-47 (R. M. Bohart, U.C.D.).

MONTEREY CO.: Big Sur River, larvae, VIII-30-50 (R. Bohart, R. Bechtel, U.C.D.).

NAPA CO.: Monticello, ♂♀, larvae, X-8-47 (R. M. Bohart, U.C.D.); Conn Lake, ♀, larvae, IX-14-46 (R. M. Bohart, U.C.D.).

NEVADA CO.: Lake Vera, ♀, 2,500 ft., VI-1-50 (Harvey Magy, B.V.C.).

SAN DIEGO CO.: San Diego, ♀, IV-23-16 (H. G. Dyar, U.C.D.).

SAN LUIS OBISPO CO.: San Luis Obispo, ♀, VIII-26-48 (W. W. Wirth, C.I.S.).

SANTA CRUZ CO.: Santa Cruz, ♂♀, VII-8-48 (W. W. Wirth, C.I.S.).

SHASTA CO.: Gibson, larvae, VIII-9-49 (R. Bohart, L. Isaak).

SOLANO CO.: Green Valley, ♂♀, larvae, IX-12-46 (R. M. Bohart, U.C.D.).

TRINITY CO.: Weaverville, ♂♀, larvae, VIII-9-49 (R. M. Bohart, U.C.D.).

TULARE CO.: Visalia, ♂, VII-18-47 (W. W. Wirth, C.I.S.).

TUOLUMNE CO.: Sonora, 1,800 ft., ♂, larvae, IX-12-47 (R. M. Bohart, U.C.D.).

YOLO CO.: Zamora, larvae, VI-15-50 (J. Fowler, S.Y.A.D.).

YUBA CO.: Marysville, larvae, VIII-?-48 (H. Herms, Sutter Yuba M.A.D.).

a bright specimen of *pipiens* but its hair-like mesonotal scales and its yellowish and indistinct abdominal bands in place of the discreet white ones of *pipiens* distinguish it rather easily. Its larvae have a long siphon as in *apicalis* but the head hairs are multiple.

California records:

COLUSA CO.: Williams, ♀, IX-7-50 (J. N. Belkin, U.C.L.A.).

FRESNO CO.: Selma, ♀, VI-?-48 (T. Raley, C.I.S.).

MERCED CO.: Snelling, ♂♀, larvae, VIII-5-48 (R. M. Bohart, U.C.D.).

ORANGE CO.: Los Alamitos, ♂, VIII-27-48 (J. G. Shanafelt, O.C.D.); San Juan Capistrano, ♀, IX-16-49 (J. G. Shanafelt, O.C.D.).

RIVERSIDE CO.: Riverside, ♀, XII-27-40 (W. C. Reeves, C.I.S.).

SACRAMENTO CO.: Rio Linda, ♀, VIII-14-50 (J. Fowler, S.Y.A.D.).

SAN LUIS OBISPO CO.: Black Lake Canyon, ♂♀, VI-22-48 (W. W. Wirth, C.I.S.).

SANTA CRUZ CO.: Santa Cruz, ♂♀, larvae, VIII-30-50 (R. Bohart, R. Bechtel, U.C.D.).

VENTURA CO.: Lake McGrath, ♂♀, VIII-25-48 (W. W. Wirth, C.I.S.).

YOLO CO.: Zamora, ♀, VI-15-50 (J. Fowler, S.Y.A.D.).

Culex pipiens Linnaeus

Culex pipiens Linnaeus, 1758. Syst. Nat. 10th Ed., p. 602. Type ♀, Europe.

Discussion:

This widely distributed mosquito is the northern representative of the *pipiens* - *quinquefasciatus* complex that is worldwide in distribution. The fact that the two forms interbreed in captivity and wherever they occur in the same area in nature has led Farid (1949) and Sundararaman (1949) to the conclusion that we are dealing with a single species which has a northern and southern subspecies. However, the two forms are treated as full species in the present work as a matter of convenience. The picture is further complicated by the physiological variant of *pipiens* known as *pipiens molestus* which is an ardent biter of human beings. According to the specimens we have examined, *pipiens* in California does not occur south of San Joaquin County except along the coast, where it extends as far as San Diego.

The larvae will breed in practically any

Culex erythrothorax Dyar

Culex erythrothorax Dyar, 1907. Proc. U.S. Nat. Mus. 32:124. 80 cotype ♂♂♀♀ (USNM), Gardena, Sweetwater Junction, Guadalupe, and Salinas, Calif.

Discussion:

For many years it was thought that this species was restricted to California. However, it has been shown that *C. federalis* described from Mexico City and its California variant, *C. badgeri* from Bakersfield, are synonyms of *erythrothorax*, and D. M. Rees has found it in Idaho, Nevada and Utah. It is rare in northern California but is more frequently taken in the southern part of the state. It prefers large tule pools and, while normally occurring in relatively small numbers, it has been taken in great abundance in tule swamps where red-winged blackbirds have congregated for nesting. It apparently prefers avian blood but will bite human beings readily if its breeding area is invaded. The adult might be confused with

accumulation of non-saline water including that found in artificial containers. Highly polluted sources seem to be favored as do areas adjacent to human habitations.

The adults are separated from *erythrothorax* by having normal shaped scales on the mesonotum and from *quinquefasciatus* by the fact that its habitus is reddish brown instead of grayish brown and that the abdominal bands of tergites III and IV are connected to the lateral spots. The larva is difficult to separate from *quinquefasciatus*. However, if the subdorsal hairs on abdominal segments III and IV are double it may be either, but when these hairs are single the resulting adult is generally *quinquefasciatus*. Also, the siphon of *pipiens* is usually more slender than that of its relative.

California records:

ALAMEDA CO.: Oakland, ♂*¹⁶, X-25-41 (W. C. Reeves, C.I.S.).
 COLUSA CO.: Colusa, ♀, V-20-16 (W. B. Herms, C.I.S.).
 LOS ANGELES CO.: Long Beach, ♂*, X-6-17 (C.I.S.).
 ORANGE CO.: Laguna Beach, ♂*♀, VII-20-21 (C. T. Dodds, C.I.S.).
 SACRAMENTO CO.: Fair Oaks, ♂*♀, larvae, X-48 (R. McQueen, U.C.D.).
 SAN DIEGO CO.: San Diego (Balboa Park), ♂*♀, VII-25-17 (C.I.S.); San Diego (Emerson School), ♂*♀, VI-9-17 (C.I.S.).
 SAN JOAQUIN CO.: Stockton, ♂*, VIII-25-17 (C.I.S.); Tracy, ♀, XII-16-38 (T. Aitken, C.I.S.).
 SANTA CLARA CO.: Alum Rock Park, ♂*, VII-8-48 (W. W. Wirth, C.I.S.).
 SANTA CRUZ CO.: Santa Cruz, ♂*, VII-8-48 (W. W. Wirth, C.I.S.).
 SOLANO CO.: Allendale, ♂*♀, larvae, VIII-22-49 (E. Mezger, Solano Co., M.A.D.).
 SONOMA CO.: Healdsburg, ♂*, VII-28-16 (C.I.S.).
 YOLO CO.: Davis, ♂*♀, larvae, VI-29-47 (R. M. Bohart, U.C.D.); Woodland, ♀, V-10-48 (U.C.D.).

Culex quinquefasciatus Say

Culex quinquefasciatus Say, 1823. Jour. Acad. Nat. Sci. Phila. 3:10. Type ♀ (nonexistent), Mississippi River, United States.

¹⁶The presence of an asterisk in this and the following species indicates that the identification has been verified by examination of male genitalia.

Discussion:

This is the *C. fatigans* Wiedemann of British culicidologists who ascribe Say's species to some unknown anopheline with a banded abdomen because he referred to its vestiture as composed of "cinereous hair."

In 1916-17 no authenticated specimens had been recognized north of the Imperial Valley in California. In 1924 a clear-cut specimen was taken in Bakersfield and by 1926 it was evident that considerable northward migration had taken place. In 1943, pure cultures of *quinquefasciatus* females were taken as far north as Modesto. For the distribution picture of this species and *pipiens* we have relied mainly on records verified by an examination of male genitalia. The results indicate an extension of *quinquefasciatus* northward in the central valley as far as San Joaquin County and the colonization of *pipiens* to the south in localized areas along the coast where it may have been introduced by commerce.

The habits of the adults and larvae are generally similar to those of *pipiens*. However, *quinquefasciatus* occurs even more frequently in artificial containers of all sizes and is said to be a dominant sewer farm species whereas its northern relative is not.

California records:

FRESNO CO.: Kingsburg, ♂*♀, VII-28-19 (C.I.S.); Fresno, ♂*, X-20-39 (T. Aitken, C.I.S.); Centerville, ♂*, VII-24-19 (C.I.S.); Reedley, ♂*, X-14-49 (R. Coleman, C.I.S.); Sanger, ♂*, X-24-47 (R. Coleman, C.I.S.); Clovis, ♀, X-19-47 (R. Coleman, C.I.S.).
 IMPERIAL CO.: El Centro, ♂*♀, IX-28-37 (B. Schiller, C.I.S.); Fort Yuma, ♂*, II-?-48 (R. Coleman, C.I.S.).
 KERN CO.: Bakersfield, ♂*♀, V-1-39 (F. L. Hayes, C.I.S.).
 KINGS CO.: Hanford, ♂*♀, VI-10-19 (C.I.S.).
 LOS ANGELES CO.: Lankershim, ♂*♀, VII-6-19 (C.I.S.).
 MADERA CO.: Borden, ♂*♀, IX-29-17 (C.I.S.); Madera, ♀, VII-24-19 (W. B. Herms).
 MERCED CO.: Livingston, ♂*♀, IX-28-17 (C.I.S.); Hatfield Ranch, ♂*♀, VI-8-38 (T. Aitken, C.I.S.); Mercer, ♀, IX-28-17 (C.I.S.).
 ORANGE CO.: Huntington Beach, ♂*♀, IX-28-49 (J. G. Shanafelt, O.C.D.); Cypress, ♂*, IX-20-49 (J. G. Shanafelt, O.C.D.); San Juan Capistrano, ♂*, I-21-49 (D. W. Best, O.C.D.); Costa Mesa, ♂*, X-6-49 (D. Head, O.C.D.); Laguna Beach, ♂*, IX-28-49 (J. G. Shanafelt, O.C.D.); Buena Park, ♂*, X-4-49 (J. G. Shanafelt, O.C.D.);

Los Alamitos, ♂*, VIII-6-48 (J. G. Shanafelt, O.C.D.).

RIVERSIDE CO.: Riverside, ♂*♀, II-17-40 (W. C. Reeves, C.I.S.).

SAN BERNARDINO CO.: Redlands, ♂*♀, VIII-14-40 (W. C. Reeves, C.I.S.).

SAN JOAQUIN CO.: Turlock, ♂*♀, IX-28-17 (C.I.S.); Linden, ♀, III-8-46 (C.I.S.).

SAN LUIS OBISPO CO.: San Luis Obispo, ♀, VIII-22-48 (W. W. Wirth, C.I.S.); Pismo Beach, ♀, VIII-19-48 (W. W. Wirth, C.I.S.).

SANTA BARBARA CO.: Lompoc, ♂*♀, VIII-24-48 (W. W. Wirth, C.I.S.); San Antonio Creek, ♀, VI-23-48 (W. W. Wirth, C.I.S.).

STANISLAUS CO.: Turlock, ♂*, IX-28-12 (C.I.S.).

TULARE CO.: Exeter, ♂*♀, VI-11-19 (C.I.S.); Visalia, ♂*♀, larvae, VIII-31-49 (R. M. Bohart, U.C.D.).

VENTURA CO.: Revolon Slough, ♀, VI-18-48 (W. W. Wirth, C.I.S.).

Culex reevesi Wirth

Culex reevesi (Galindo MS) Wirth, 1948. Univ. Calif. Syllabus Series, Ent. 133, p. 230. Type not designated.

Discussion:

The name of this species, taken from a manuscript by Pedro Galindo, was unintentionally validated by W. W. Wirth. The locality given by Wirth is the California Coast from Point Reyes, Marin County to San Diego, San Diego County. Galindo's "type series" was from Del Monte, Monterey County. A recent discovery of this species in Lower California was made by Brookman and Reeves, thus extending the distribution.

The female is similar to that of *boharti* but the male genitalia with smooth mesosome lobes are diagnostic. These were nicely figured by Galindo in his unpublished manuscript. The larvae are spotted like those of *boharti* but have the lower head hairs double. They are found in tule-filled stream pools.

California record:

MONTEREY CO.: Monterey, ♂, X-19-39 (T. Aitken, C.I.S.).

Culex restuans Theobald

Culex restuans Theobald, 1901. Mon. Culic. 2:142.

Type ♀, Toronto, Ontario.

Discussion:

This species, which is widely distributed east of the Rockies, was recorded from the Lake Tahoe area in 1921 by Dyar. It was subsequently rediscovered by Aitken who identified 2 specimens collected in Riverside, Riverside County, by W. C. Reeves. It is apparently rare in California.

The adults in addition to the characters given in the key usually have a pair of whitish spots on the fore part of the mesonotum in line with the spiracles. California material is atypical in having small but fairly distinct tarsal bands. Occasional eastern specimens show a tendency in this direction, however. The larvae seem to prefer relatively foul water in small depressions, such as hoofprints. The centrally located antennal tuft of the larva is unique.

California records:

ORANGE CO.: Peters Canyon, ♂♀, larvae, V-5-49 (R. M. Bohart, J. G. Shanafelt, U.C.D.).

SAN DIEGO CO.: Murphy Canyon, larva, X-23-44 (E. A. Seaman, U.C.D.).

SAN LUIS OBISPO CO.: San Luis Obispo, ♂♀, VIII-26-48 (W. W. Wirth, C.I.S.).

Culex stigmatosoma Dyar

Culex stigmatosoma Dyar, 1907. Proc. U.S. Nat. Mus. 32:123. Type ♀ (USNM), locality California or Oregon (data not given on specimen).

Discussion:

This species is known from Oregon, California, Utah, and south through Texas to Mexico and South America. It is one of the commonest and most widespread California species, thus rivaling *Culex tarsalis* and *Culiseta incidens*. The females have not been observed to bite man as far as we are aware, although they can be induced to take blood from chickens and guinea pigs in the laboratory. Nevertheless, precipitin tests on 114 specimens from Kern County showed 5 positive for human blood, 18 for horse blood, and 43 for bovine blood (Hammon, Reeves and Galindo, 1945).

Contrary to the habits of *tarsalis*, larvae of this species tolerate water polluted by sewage or decaying food. In the Sacramento Valley this is the dominant species in sewer farms, breeding in uncounted swarms. However, all other types of non-saline water in ground pools and artificial

containers are acceptable for breeding.

California records (only token localities given):

- ALAMEDA CO.: Berkeley, ♀, I-29-40 (W. C. Reeves, C.I.S.).
- AMADOR CO.: Jackson, ♂♀, VII-17-16 (W. B. Herms, C.I.S.).
- BUTTE CO.: Gridley, ♂, VI-7-39 (T. Aitken, C.I.S.).
- CALAVERAS CO.: San Andreas, ♀, VII-18-16 (W. B. Herms, C.I.S.).
- COLUSA CO.: Colusa, ♂, V-22-16 (W. B. Herms, C.I.S.).
- CONTRA COSTA CO.: Concord, ♂♀, VI-15-19 (C.I.S.).
- ELDORADO CO.: Diamond Springs, ♀, VII-16-16 (W. B. Herms, C.I.S.).
- FRESNO CO.: Academy, ♂♀, VII-24-19 (W. B. Herms, C.I.S.).
- GLENN CO.: Williams, ♀, V-18-16 (W. B. Herms, C.I.S.).
- HUMBOLDT CO.: Fortuna, ♂, VIII-13-48 (W. W. Wirth, C.I.S.).
- KERN CO.: Bakersfield, ♀, IV-12-39 (F. L. Hayes, C.I.S.).
- KINGS CO.: Lemoore, ♀, VII-19-47 (W. W. Wirth, C.I.S.).
- LAKE CO.: Lower Lake, ♂, VII-29-16 (C.I.S.).
- LOS ANGELES CO.: Lankershim, ♂♀, VII-6-19 (C.I.S.).
- MADERA CO.: Borden, ♂♀, IX-28-17 (C.I.S.).
- MARIN CO.: Ignacio, ♂♀, VII-27-16 (W. B. Herms, C.I.S.).
- MARIPOSA CO.: Mariposa, ♂♀, VI-6-19 (C.I.S.).
- MENDOCINO CO.: Ukiah, ♂, VIII-12-16 (W. B. Herms, C.I.S.).
- MERCED CO.: Planada, ♀, I-28-40 (R. Rose, C.I.S.).
- MONTEREY CO.: Spreckels, ♀, X-25-39 (R. Peters, C.I.S.).
- NAPA CO.: Napa, ♂♀, VIII-2-16 (W. B. Herms, C.I.S.).
- NEVADA CO.: San Juan, ♀, VI-5-16 (W. B. Herms, C.I.S.).
- ORANGE CO.: Buena Park, ♂♀, X-4-49 (J. G. Shanafelt, O.C.D.).
- PLACER CO.: Auburn, ♂♀, VII-7-16 (W. B. Herms, C.I.S.).
- RIVERSIDE CO.: Riverside, ♂♀, II-17-40 (W. C. Reeves, C.I.S.).
- SACRAMENTO CO.: Galt, ♂♀, VII-15-17 (C.I.S.).
- SAN BENITO CO.: Asayumas School, ♀, VI-27-40 (S. Dormes, C.I.S.).
- SAN BERNARDINO CO.: San Bernardino, ♂, VII-9-19 (C.I.S.).
- SAN DIEGO CO.: Escondido, ♂♀, VII-27-17 (C.I.S.).

- SAN JOAQUIN CO.: Tracy, ♂♀, VII-31-19 (C.I.S.).
- SAN LUIS OBISPO.: Atascadero, ♀, VII-2-19 (C.I.S.).
- SAN MATEO CO.: Beresford, ♂♀, VII-15-17 (C.I.S.).
- SANTA BARBARA CO.: Santa Barbara, ♀, VII-2-19 (C.I.S.).
- SANTA CLARA CO.: Milpitas, ♂, VII-18-17 (C.I.S.).
- SANTA CRUZ CO.: Watsonville, ♀, VIII-16-17 (C.I.S.).
- SHASTA CO.: Redding, ♀, VI-5-16 (W. B. Herms, C.I.S.).
- SISKIYOU CO.: Yreka, ♂, VII-20-48 (W. W. Wirth, C.I.S.).
- SOLANO CO.: Mare Island, ♂♀, VII-14-16 (W. B. Herms, C.I.S.).
- SONOMA CO.: El Verano, ♂♀, VII-27-16 (W. B. Herms, C.I.S.).
- STANISLAUS CO.: Oakdale, ♀, VII-16-19 (C.I.S.).
- SUTTER CO.: Loma, ♀, VI-6-39 (T. Aitken, C.I.S.).
- TEHAMA CO.: Vina, ♀, V-15-2 (C.I.S.).
- TRINITY CO.: Weaverville, ♀, larvae, VIII-9-49 (R. M. Bohart, U.C.D.).
- TULARE CO.: Tulare, ♂♀, VII-28-19 (C.I.S.).
- TUOLUMNE CO.: Lyons Dam, ♂, VIII-7-37 (T. Aitken, C.I.S.).
- VENTURA CO.: Santa Paula, ♂♀, VII-3-19 (C.I.S.).
- YOLO CO.: Davis, ♂♀, larvae, VII-27-46 (R. M. Bohart, U.C.D.).

Culex tarsalis Coquillett

Culex tarsalis Coquillett, 1896. Can. Ent. 28:43. Type ♂ (USNM), Argus Mts., Inyo Co., Calif.

Discussion:

This is the most ubiquitous mosquito in California and unfortunately it is also the most efficient vector of encephalitis. It is widespread in the United States west of the Mississippi River and extends into Canada and Mexico. The larvae are found in the same type of pools that are frequented by *Anopheles freeborni* except that they are not dependent on floatage, algae or emergent vegetation. Toward the end of the summer it may be found in water that has become foul with organic material but we have rarely taken it in sewage-polluted sources. Rice fields and roadside irrigation run-off provide ideal larval habitats.

Its median white-banded proboscis separates

it from all the members of the genus in California except *stigmatosoma*. From the latter it can be distinguished by a solid or dotted white line, one scale wide, down the outer side of the femur and tibia. Ventrally it has an inverted black V on each abdominal segment while *stigmatosoma* has a median dark spot. Its larvae have all the siphon tufts inserted in a row ventrad of the lateral line of the siphon.

California records (only token records given):

- ALAMEDA CO.: Berkeley, ♀, III-1-07 (H. J. Quayle, C.I.S.).
- ALPINE CO.: Faith Valley, 7,500 ft., ♂♀, larvae, III-12-48 (R. M. Bohart, U.C.D.).
- AMADOR CO.: Jackson, ♀, VII-17-16 (W. B. Herms, C.I.S.).
- BUTTE CO.: Enterprise, ♀, VI-3-16 (W. B. Herms, C.I.S.).
- CALAVERAS CO.: San Andreas, ♂, VII-15-16 (W. B. Herms, C.I.S.).
- COLUSA CO.: Maxwell, ♀, V-17-16 (W. B. Herms, C.I.S.).
- CONTRA COSTA CO.: Byron, ♂♀, VIII-17-17 (C.I.S.).
- DEL NORTE CO.: Smith River, ♀, VII-20-37 (T. Aitken, C.I.S.).
- EL DORADO CO.: Placerville, ♂♀, VII-15-16 (W. B. Herms, C.I.S.); Echo Lake, 7,200 ft., ♂♀, larvae, VII-11-50 (J. Fowler, S.Y.A.D.).
- FRESNO CO.: Helm, ♀, VII-25-19 (U.C.D.).
- GLENN CO.: Willows, ♂, VIII-10-16 (W. B. Herms, C.I.S.).
- HUMBOLT CO.: Eureka, VII-22-37 (T. Aitken, C.I.S.).
- IMPERIAL CO.: Holtville, ♀, V-13-39 (T. Aitken, C.I.S.).
- INYO CO.: Bishop, ♀, VI-23-19 (C.I.S.).
- KERN CO.: Bakersfield, ♂, VII-28-19 (C.I.S.).
- LAKE CO.: Upper Lake, ♂♀, larvae, V-14-47 (R. M. Bohart, U.C.D.).
- LASSEN CO.: Susanville, ♀, VI-5-16 (W. B. Herms, C.I.S.).
- LOS ANGELES CO.: Los Angeles, ♂♀, VII-5-19 (C.I.S.).
- MADERA CO.: Madera, ♀, VI-12-19 (C.I.S.).
- MARIN CO.: San Rafael, ♀, V-?-05 (C.I.S.).
- MARIPOSA CO.: Glen Aulin, ♂, VII-20-21 (C.I.S.).
- MENDOCINO CO.: Ukiah, ♀, VIII-3-16 (W. B. Herms, C.I.S.).
- MERCED CO.: Merced Falls, ♂, larvae, IX-11-47 (R. M. Bohart, U.C.D.).
- MODOC CO.: Rush Creek, ♂♀, VI-6-38 (D. Furman, C.I.S.).
- MONO CO.: Bridgeport, 6,400 ft., ♂♀, larvae, V-20-47 (R. M. Bohart, U.C.D.); June Lake, 8,500 ft., larvae, VI-29-49 (L. W. Isaak, U.C.D.).
- MONTEREY CO.: Castroville, ♀, VIII-11-37 (T. Aitken, C.I.S.).
- NAPA CO.: Napa, ♂♀, VIII-2-16 (W. B. Herms, C.I.S.).
- NEVADA CO.: Grass Valley, 2,500 ft., ♂, VII-16-16 (W. B. Herms, C.I.S.); Truckee, 5,800 ft., ♂♀, VII-?-48 (R. Coleman, C.I.S.).
- ORANGE CO.: Peters Canyon, ♂♀, larvae, V-5-49 (R. M. Bohart, U.C.D.).
- PLACER CO.: Colfax, ♀, VII-6-16 (W. B. Herms, C.I.S.).
- PLUMAS CO.: Blairsden, ♀, VII-4-16 (W. B. Herms, C.I.S.).
- RIVERSIDE CO.: Riverside, ♀, IV-17-40 (W. V. Reeves, C.I.S.).
- SACRAMENTO CO.: Galt, ♂♀, VII-18-19 (C.I.S.).
- SAN BENITO CO.: Tres Pinos, ♀, VII-19-17 (C.I.S.).
- SAN BERNARDINO CO.: San Bernardino, ♂♀, VII-9-19 (C.I.S.).
- SAN DIEGO CO.: Roseville, ♂, VI-30-16 (W. B. Herms, C.I.S.).
- SAN FRANCISCO CO.: San Francisco, ♂♀, larvae, IX-17-47 (R. M. Bohart, U.C.D.).
- SAN JOAQUIN CO.: Stockton, ♀, IX-25-17 (C.I.S.).
- SAN LUIS OBISPO CO.: Santa Margarita, ♀, VI-25-19 (C.I.S.).
- SAN MATEO CO.: Beresford, ♂♀, VIII-15-17 (C.I.S.).
- SANTA BARBARA CO.: Orcutt, ♂, VII-2-19 (C.I.S.).
- SANTA CLARA CO.: San Jose, ♂♀, VII-1-19 (C.I.S.).
- SANTA CRUZ CO.: Santa Cruz, ♀, VIII-16-17 (C.I.S.).
- SHASTA CO.: Redding, ♀, VI-V-16 (W. B. Herms, C.I.S.).
- SIERRA CO.: Loyalton, ♀, VI-19-16 (W. B. Herms, C.I.S.).
- SISKIYOU CO.: Hornbrook, ♂, VI-12-16 (W. B. Herms, C.I.S.).
- SOLANO CO.: Mare Island, ♂♀, VII-14-66 (W. B. Herms, C.I.S.).
- STANISLAUS CO.: Newman, ♀, VIII-17-17 (C.I.S.).
- TEHAMA CO.: Corning, ♀, V-23-16 (C.I.S.).
- TRINITY CO.: Hayfork, ♂, VII-8-16 (W. B. Herms, C.I.S.).
- TULARE CO.: Lemon Cove, ♂♀, V-25-39 (T. Aitken, C.I.S.).
- TUOLUMNE CO.: Tuolumne, ♂♀, VII-19-16 (W. B. Herms, C.I.S.).
- VENTURA CO.: Ventura, ♂♀, VII-3-19 (C.I.S.).

YOLO CO.: Davis, ♂♀, larvae, VII-16-46 (R. M. Bohart, U.C.D.).

Culex territans Walker

Culex territans Walker, 1856. Insecta Saundersiana, Dipt., 1:428. Type ♀, United States.

Discussion:

This species has been confused previously with *restuans* and *apicalis*. The involved synonymy has been discussed by Bohart (1948a). Part of the difficulty stems from the fact that the supposed type of *territans* in the British Museum of Natural History agrees with neither the description nor the locality given by Walker. Therefore, it seems likely that the true type is no longer in existence and the name should be applied to the commonest and most widespread species of the subgenus *Neoculex*, of which it is the type.

The range of *territans* includes eastern Europe, Alaska, Canada, and most of the United States. In California it appears in the northern counties at low altitudes and follows south along the Sierras at moderate elevations.

Its habits are much the same as *apicalis* and *boharti*, and larvae of all three species have been taken in a single pool by R. M. Bohart in Trinity County where they were readily distinguished with the unaided eye, *apicalis* by its needle-like siphon and *boharti* by its conspicuous spotting.

California records:

ELDORADO CO.: Lake Tahoe, 6,250 ft., ♀, VII-?-? (H. G. Dyar, U.S.N.M.).

HUMBOLDT CO.: Van Duzen River, ♀, VIII-11-48 (W. W. Wirth, C.I.S.); Fortuna, ♂♀, VIII-13-48 (W. W. Wirth, C.I.S.); Mad River Beach, ♀, VIII-12-48 (W. W. Wirth, C.I.S.); Fernbridge, ♀, VIII-13-48 (W. W. Wirth, C.I.S.).

MARIPOSA CO.: Yosemite, 4,000 ft., ♂, V-15-16 (H. G. Dyar, U.C.D.).

PLUMAS CO.: Blairsdan, 4,500 ft., ♂♀, larvae, VI-12-50 (R. M. Bohart, U.C.D.); Canyondam, 5,000 ft., ♀, larvae, IV-30-47 (R. M. Bohart, U.C.D.).

TRINITY: Weaverville, 2,100 ft., ♂♀, larvae, VIII-9-49 (R. M. Bohart, U.C.D.).

Culex thriambus Dyar

Culex thriambus Dyar, 1921. Ins. Ins. Mens.,

9:33. 1 ♂ and 2 ♀♀ cotypes (USNM), Kerrville, Texas.

Discussion:

This species, originally described from Texas, was recorded from California by Galindo and Kelley (1943). In addition to the counties given below the above authors listed Butte, San Luis Obispo, Madera, Tulare, Kern and Riverside.

The larvae are particularly to be found in leaf-filled rock pools along streams. The feeding habits of the adults are unknown.

California records:

MERCED CO.: Merced Falls, ♂♀, larvae, IX-11-47 (R. M. Bohart, U.C.D.); Snelling, ♂♀, larvae, VIII-9-48 (R. M. Bohart, U.C.D.).

NAPA CO.: Monticello, ♂♀, larvae, X-27-48 (R. M. Bohart, U.C.D.).

ORANGE CO.: Peters Canyon, larvae, IV-23-50 (R. M. Bohart, U.C.D.).

SAN DIEGO CO.: Chollas Canyon, larva, VIII-?-44 (E. A. Seaman, U.C.D.).

SHASTA CO.: Gibson, larvae, VIII-9-49 (R. M. Bohart, L. W. Isaak, U.C.D.).

Explanation of Symbols Used in Source of Distribution Records

- B.V.C. - - - Bureau of Vector Control, State Dept. of Public Health.
- C.I.S. - - - California Insect Survey, University of California, Berkeley.
- M.C.A.D. - - - Merced County Mosquito Abatement District.
- O.C.D. - - - Orange County Mosquito Abatement District.
- Solano A.D. - Solano County Mosquito Abatement District.
- Sutter-Yuba M.A.D. - Sutter-Yuba Mosquito Abatement District.
- S.Y.A.D. - - - Sacramento-Yolo Mosquito Abatement District.
- U.C.D. - - - University of California, Davis.
- U.C.L.A. - - - University of California, Los Angeles.
- U.S.N.M. - - - U. S. National Museum.



Explanation of Table I

County records which have been verified by examination of specimens are marked with an X. Records which there is no reason to doubt but which have not been so verified are marked with a dot. Most of the latter were taken from a compilation made in 1948 by Harvey I. Magy of the State Department of Public Health, Bureau of Vector Control. They were drawn from the literature and from records of various agencies dealing with mosquito control. Some of the dots represent records accumulated since 1948 by E. B. Thurman of the Bureau of Vector Control.

Table I. County Records of California Mosquitoes

[illegible]

COUNTIES	Ae. bicristatus	cataphylla	cinereus	communis	dorsalis	fitchii	flavescens	hexodontus	increditus	nigromaculis	pullatus	squamiger	sticticus	taeniorhynchus	varipalpus	vexans	ventrovittis	freeborni	occidentalis	franciscanus	punctipennis	Culex anips	apicalis	boharti	erythrothorax	quinquefasciatus	pipiens	reevesi	restuans	stigmatosoma	tarsalis	terrilians	thriambus	Culiseta impatiens	incidens	inornata	macracrackenae	Mansonia perturbans	Orthopodomyia californica	Psorophora confinnis	Uranotaenia anhydor			
Orange				x						x	x			x	x				x	x	x	.	x		x		x		x	x	x		x	x										
Placer	.	.	x		x			x	x	x							x	x		x	x		x							x	x			x										
Plumas			.	x	x	.		x	x						x	x	x	x		.	x								.	x	x			x	x									
Riverside				.								x	.	x	x		x		x	.					x	x				x	x		.	x	.	.		x	x					
Sacramento				.					x	.					x	.		x		x	x				x		x			x	x		.	.	x	.	x	.						
San Benito				.								x						x	x	x			x	.						x	x				x	x	.							
San Bernardino				.											x	.		x		x			x	.	x					x	x				.	x	.			x				
San Diego							x		x		.	x	x	.	x		x	x	x	x	x	x	x	x	x	x					x		
San Francisco								x				.	.	.								
San Joaquin				x						x			x	.	x			x		x	x		x	.	x	x				x	x				x	x	.	.						
San Luis Obispo				x					x	x					x			x	x	x	.			x	x	x				x	x	x				x	x	x						
San Mateo				x					x		x		.						x	x	x			.						x	x					x	.	.						
Santa Barbara									x				.	x				x	x	x				.						x	x					x	x	x						
Santa Clara				x					x		x		x					x	x	x	x		x				x			x	x					x	x	.						
Santa Cruz				.					x						x	x	x			x	x	x				x	x					x	.	x						
Shasta	x	.	x	x	x	x	x	x	x	x					x	x	x	x	x					x						x	x				x	.	x	x						
Sierra	.		x	.	x				x	x								x	x										.		x					x	x							
Siskiyou				x						x					x			x		x	x									x	x					x	x							
Solano				x					x	.	x				x	x		x	.	x	x			x	x		x			x	x		.			x	x	x						
Sonoma				x					x	.	x				x			x	x	x	x			x						x						x	x	x						
Stanislaus				x					x	x				.	.	.	x		x	.				.							x	x		.	.	x	.	.						
Sutter				x							x		x	x			.						x						x								
Tehama				x						x					x	.		x		x	x									x	x					x	x	x						
Trinity																		x		x	x			x	x					x	x	x				x	x							
Tulare				x				.	x						x	x		x		x	x			x	x	x		x			x	x		.		x	.	.						
Tuolumne	.		x					x			x		.		x					x	x			x	x					x	x		.			x								
Ventura				x								x		x	x			x	x	x			x		x					x	x					x	x	x						
Yolo				x					x	x	.	x		x	x			x		x	x			x	x	x		x			x	x				x	x	.	.	x				
Yuba				x						x		.	x					x		x	.			x					.		.				.	x	.	.						

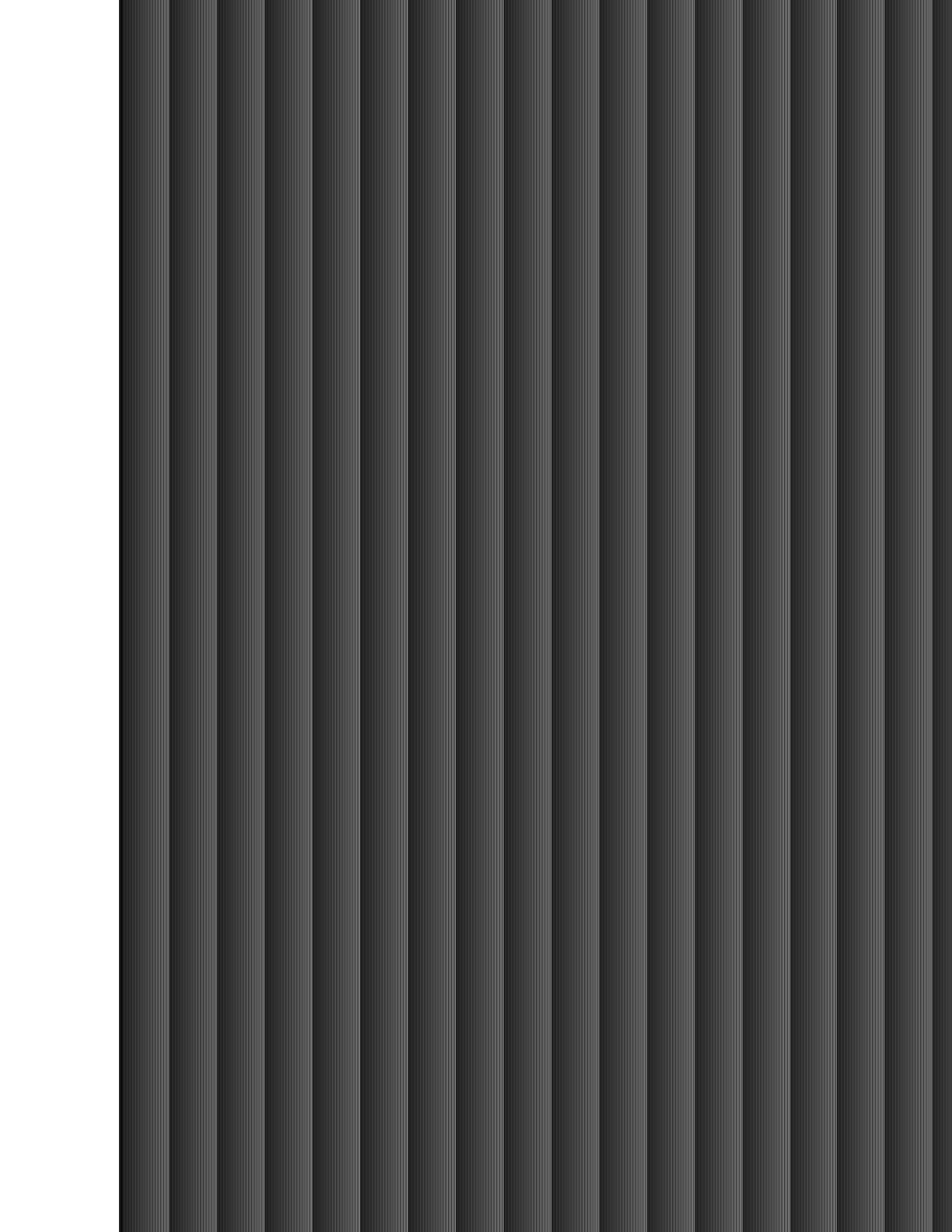


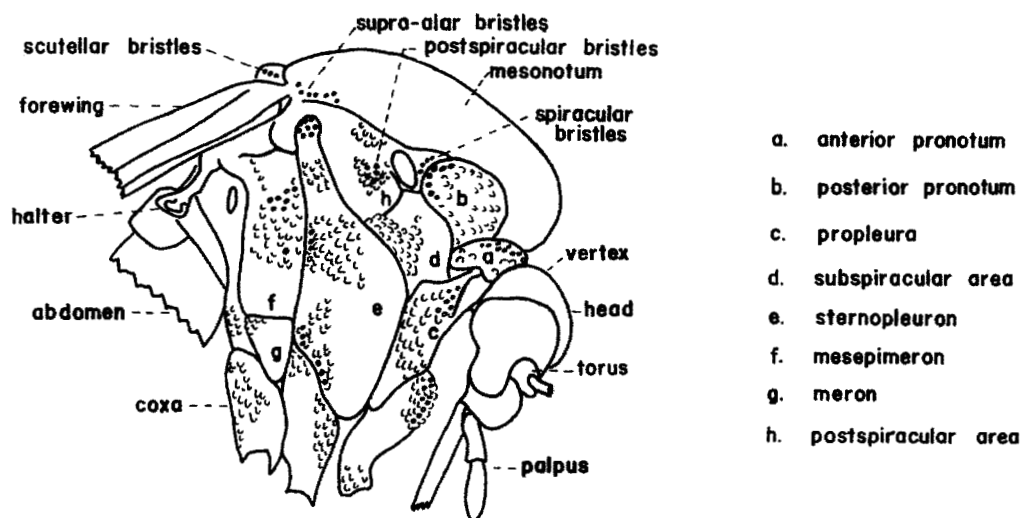
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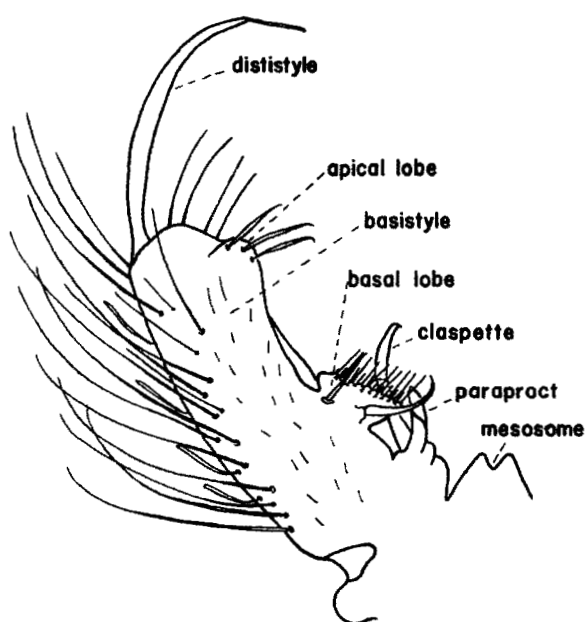
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Plates



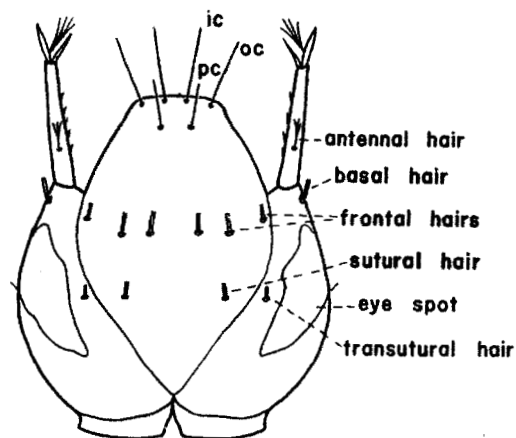


1. Adult ♀ mosquito



2. ♂ genitalia of *Aedes dorsalis* (left, ventral)

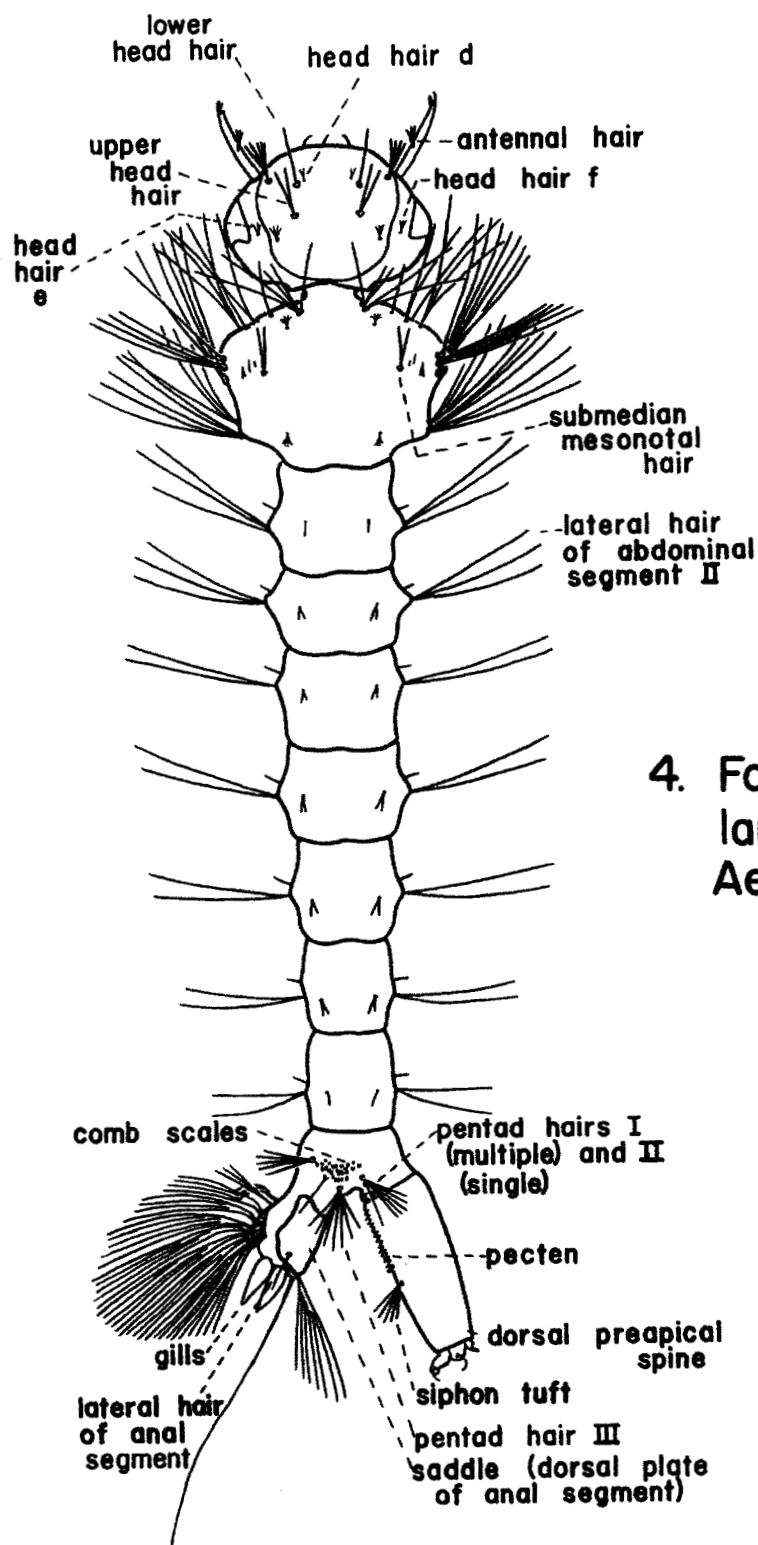
ic. inner clypeal hair
oc. outer clypeal hair
pc. postclypeal hair



3. Head of *Anopheles* larva

PLATE 2

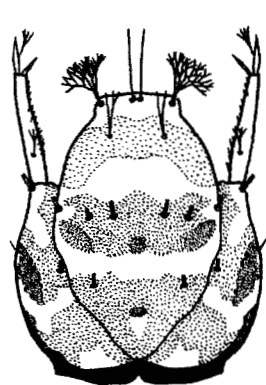
- Fig. 1. Adult ♀ mosquito showing important sclerites and bristles.
Fig. 2. Genitalia of ♂ *Aedes dorsalis* in left ventral view.
Fig. 3. Head of *Anopheles* larva showing important bristles of dorsal surface.



4. Fourth stage larva of *Aedes dorsalis*

PLATE 3

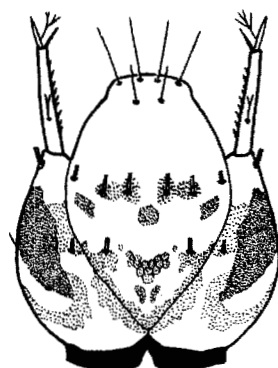
Fig. 4. Mature larva of *Aedes dorsalis* outlining key structures (abdomen beyond seventh segment shown in lateral view).



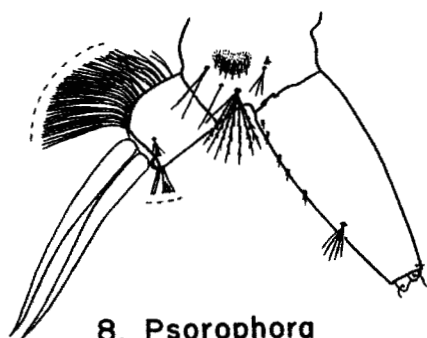
5. *Anopheles punctipennis*



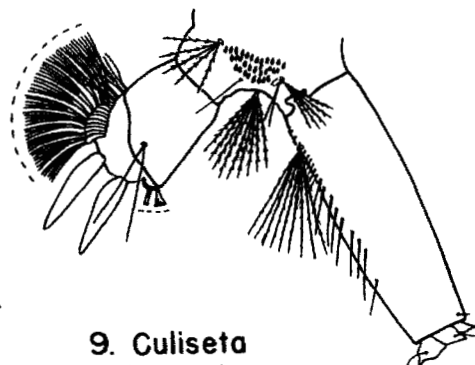
6. *Anopheles freeborni*



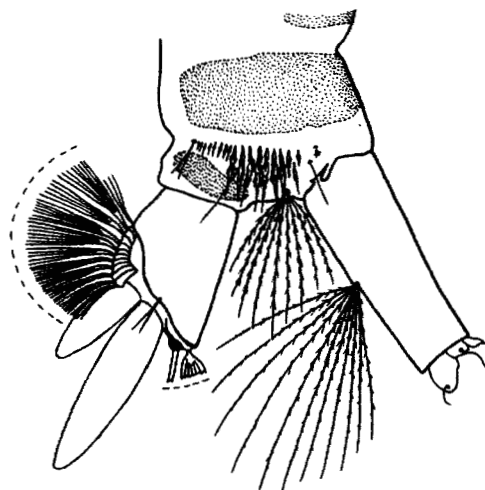
7. *Anoph. pseudo. franciscanus*



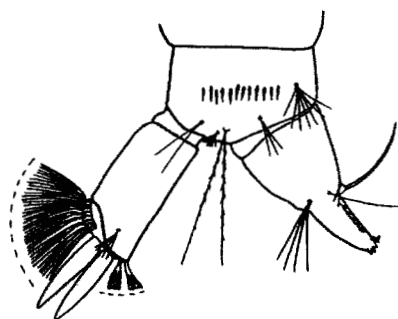
8. *Psorophora confinnis*



9. *Culiseta inornata*



10. *Orthopodomyia californica*

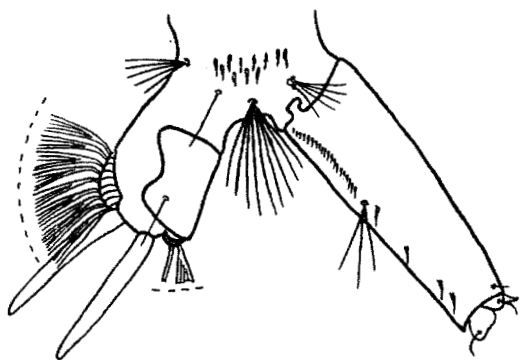


11. *Mansonia perturbans*

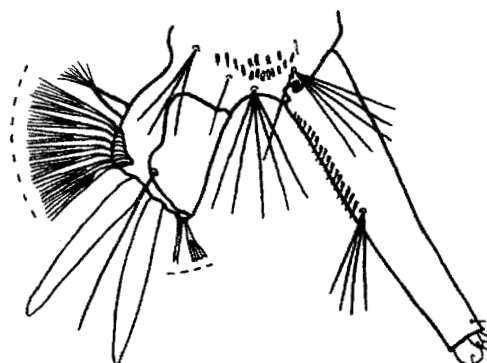
PLATE 4

Figs. 5-7. Dorsal view of head of mature *Anopheles* larvae.

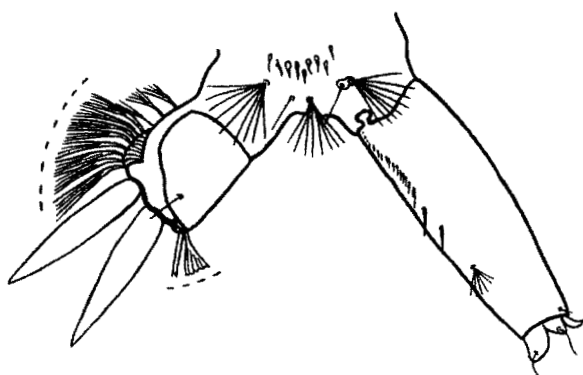
Figs. 8-11. Lateral view of eighth and following abdominal segments of mature larvae of *Psorophora*, *Culiseta*, *Orthopodomyia*, and *Mansonia*.



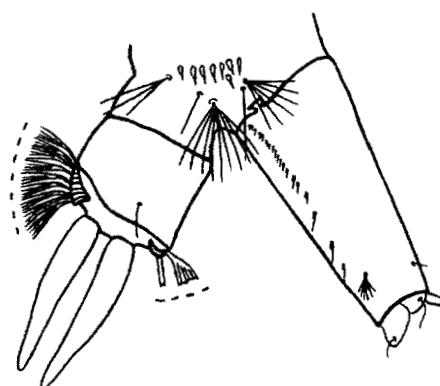
12. *Aedes cataphylla*



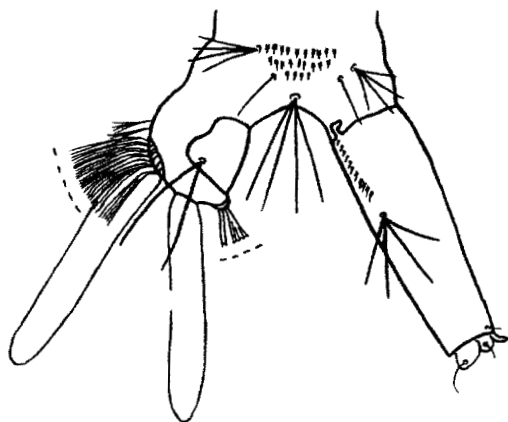
13. *Aedes fitchii*



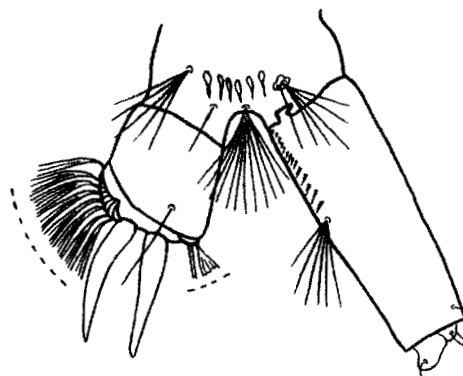
14. *Aedes vexans*



15. *Aedes nigromaculis*



16. *Aedes varipalpus*



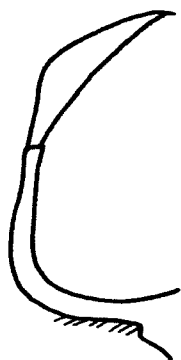
17. *Aedes hexodontus*

PLATE 5

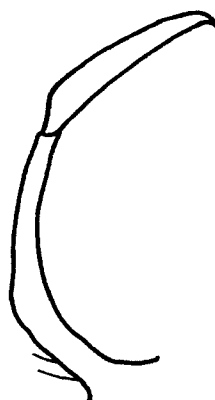
Figs. 12-17. Lateral view of eighth and following abdominal segments of mature larvae of *Aedes*.



18. *Aedes*
varipalpus



19. *Aedes*
cataphylla



20. *Aedes*
communis



21. *Aedes*
hexodontus



22. *Aedes*
dorsalis



23. *Aedes*
pullatus



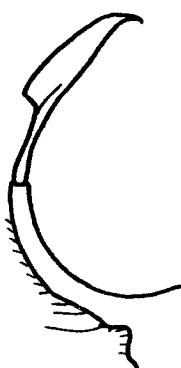
24. *Aedes*
nigromaculis



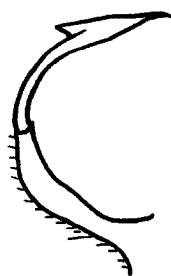
25. *Aedes*
flavescens



26. *Aedes*
ventrovittis



27. *Aedes*
increpitus



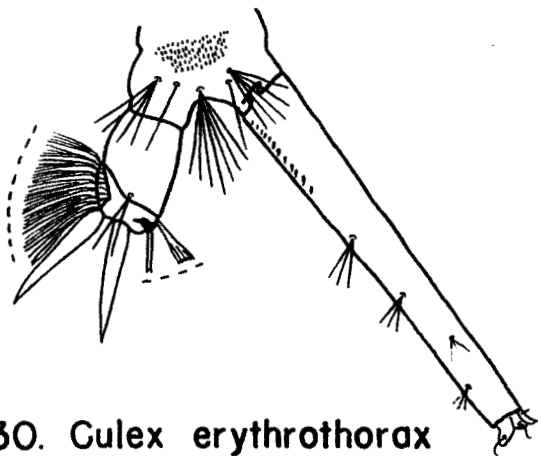
28. *Aedes*
squamiger



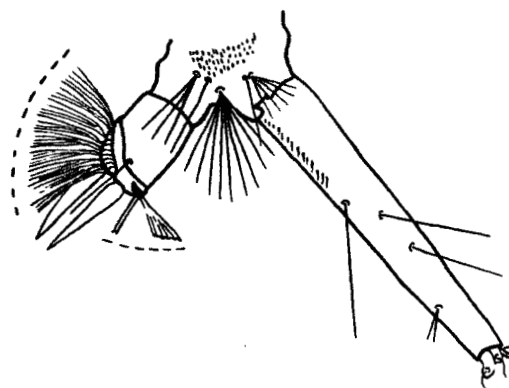
29. *Aedes*
taeniorhynchus

PLATE 6

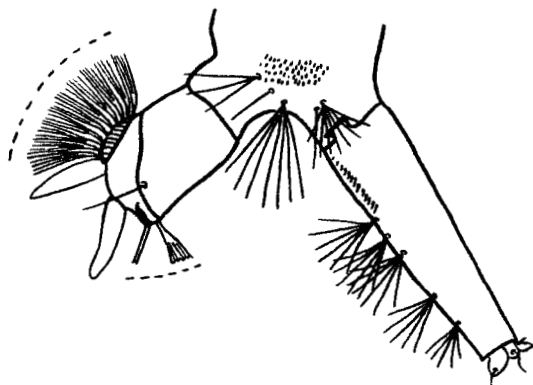
Figs. 18-29. Side view of claspette of ♂ *Aedes*.



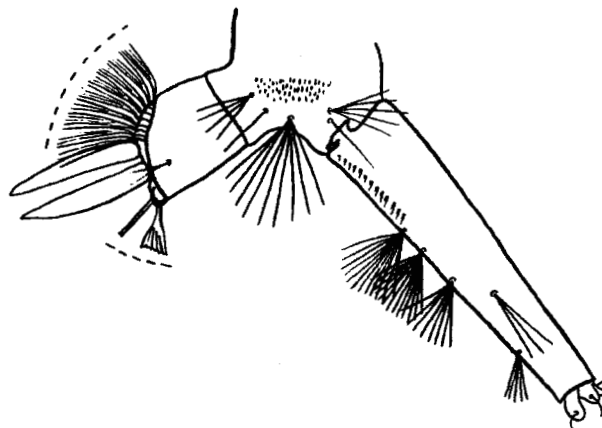
30. *Culex erythrothorax*



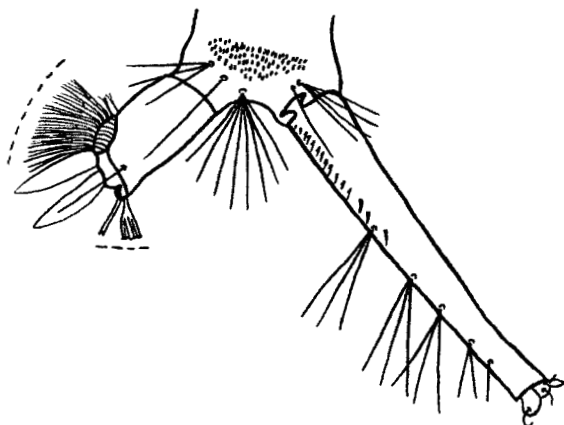
31. *Culex thriambus*



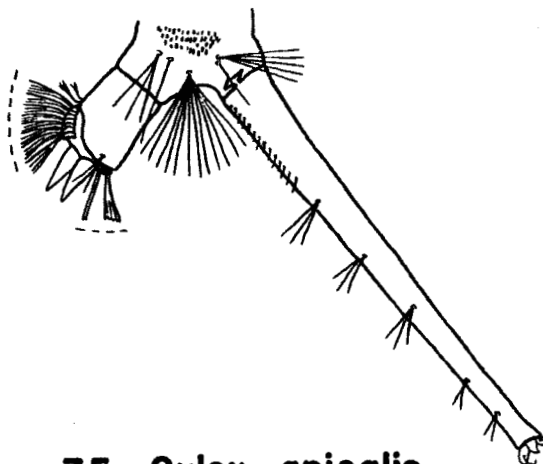
32. *Culex tarsalis*



33. *Culex stigmatosoma*



34. *Culex boharti*



35. *Culex apicalis*

PLATE 7

Figs. 30-35. Lateral view of eighth and following abdominal segments of mature larvae of *Culex*.

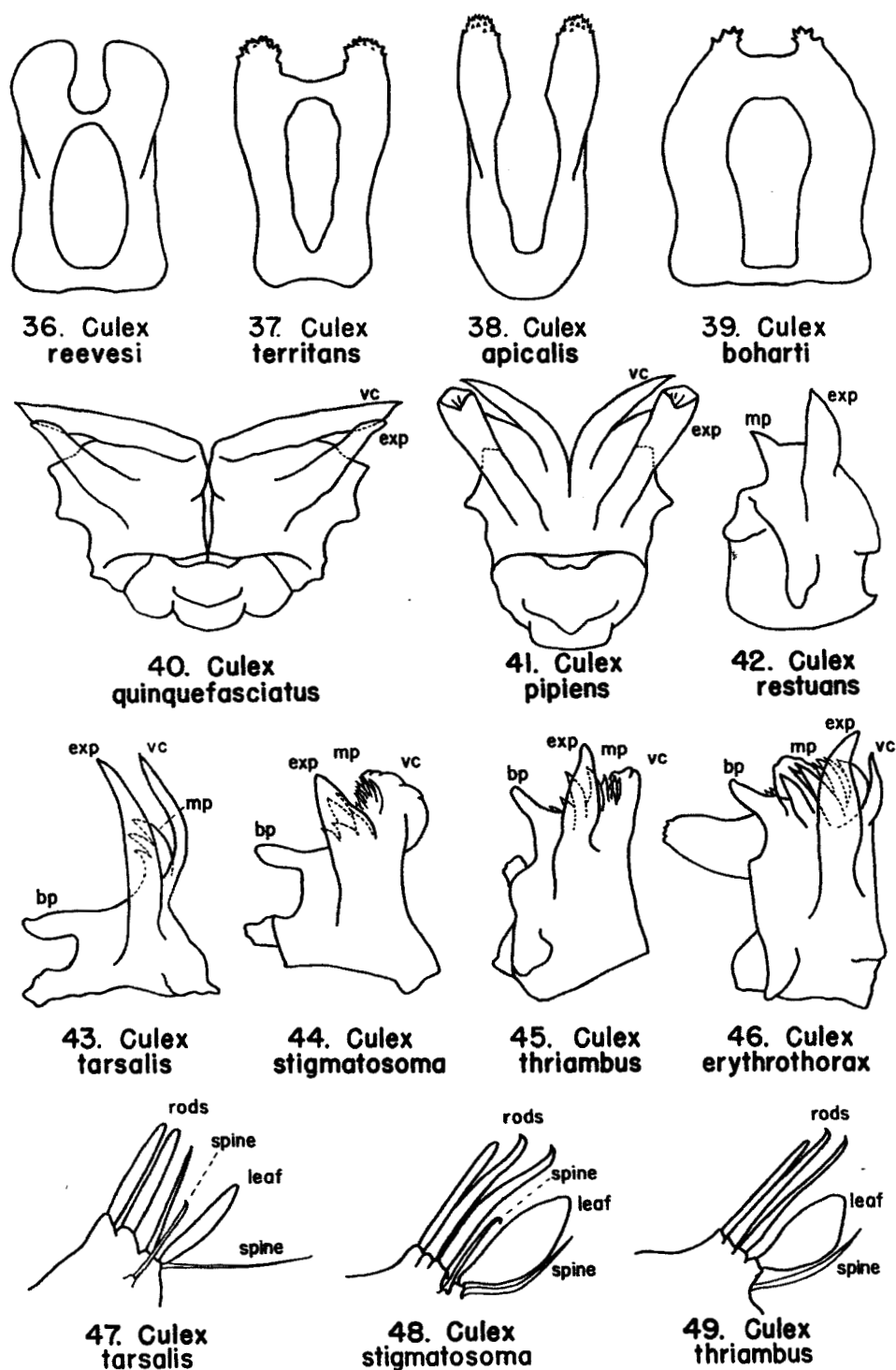


PLATE 8

Figs. 36-39. Ventral view of mesosoma of *Culex* (subgenus *Neoculex*).
 Figs. 40-41. Slightly flattened ventral view of mesosoma of *Culex quinquefasciatus* and *Culex pipiens*.
 Figs. 42-46. Left mesosoma plate of *Culex* (subgenus *Culex*) in dissected, flattened view.
 Figs. 47-49. Ventral view of apical lobe of left basistyle in ♂ genitalia of *Culex* (subgenus *Culex*).

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