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THE MOSQUITOES OF NEVADA

By
H. C. CHAPMAN



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water rights from the Colorado River, and the development of dry farms which utilize water from deep wells in arid valleys, may increase this acreage by several hundred thousand in the next decade or so.

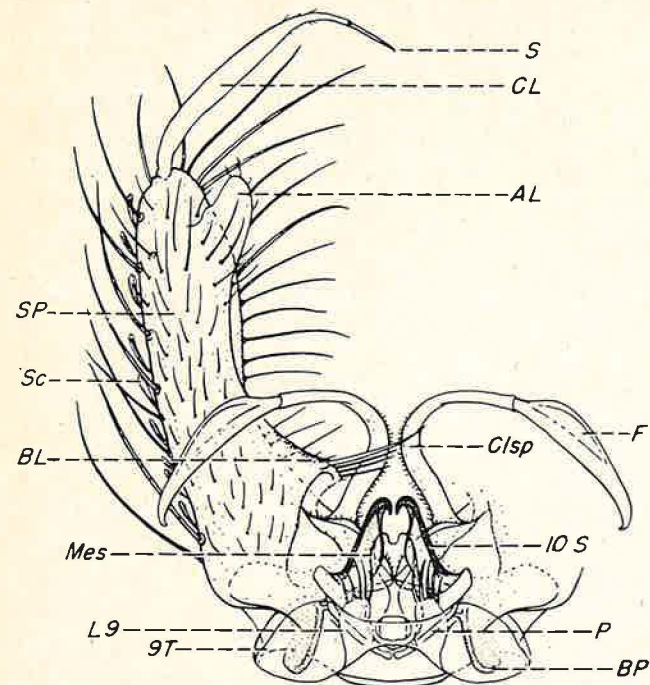


FIGURE 4. Male genitalia of *Aedes*, dorsal view, showing parts: *SP*, sidepiece; *Sc*, scale; *BL*, basal lobe; *Mes*, mesosome; *L9*, lobe of ninth tergite; *9T*, ninth tergite; *S*, spine of clasper; *CL*, clasper; *AL*, apical lobe; *F*, filament of claspette; *Clsp*, claspette; *10S*, tenth sternite; *P*, paramere; *BP*, basal plate.

At present there is only one organized mosquito abatement district in the State although fogging and spraying operations are conducted by some urban and military agencies. The formation of abatement districts is inevitable and only awaits a larger population which can better support the cost, several consecutive years

of normal or above normal snow pack in the various mountain ranges, or an epidemic caused by mosquitoes. The clamor for mosquito control in most areas presently appears to be subsiding, probably owing to the 3 successive years of drought (1959-61). Eventually the persons responsible for the production of these major biting pests will have to be approached with educational and source reduction programs.

The elevation of Nevada ranges from approximately 1,000 feet to slightly over 13,000 feet, with the mean elevation in the principal valleys ranging from 4,000-5,000 feet in most of the central and northern counties. The climate is known for its cloudless days and the great range of temperatures from day to night due to elevation and the proximity of mountains. Temperatures range from many degrees below zero in the winter to above 115°F. in the summer. Most of the precipitation (except in the southern portion of the State) occurs as snow in the winter. Direct mosquito production as a result of rains is very infrequent.

The major source of information on the biology and ecology of the mosquito species as it occurs within the State, was given in various papers by Chapman (1959a, 1959b, 1960, 1961a, 1961b, 1961c, 1962a, 1962b, 1962c, and 1963). Prior to these studies very little was known of the distribution, seasonal occurrence, abundance, and importance of the mosquito fauna of Nevada. Major emphasis is placed on the presentation of such information in this bulletin although keys for identification are also included. Illustrations 1-5 are given as an aid in the utilization of the keys. Persons interested in thorough treatments of taxonomy, survey methods, literature, control procedure, repellents, and facets of biology such as hibernation, mating, colonization, oviposition, etc., should refer to such excellent bulletins as Barr (1958), Stage *et al.* (1952), King *et al.* (1960), Freeborn and Bohart (1951), Gjullin *et al.* (1961), Nielsen and Rees (1961), and the book by Carpenter and LaCasse (1955).

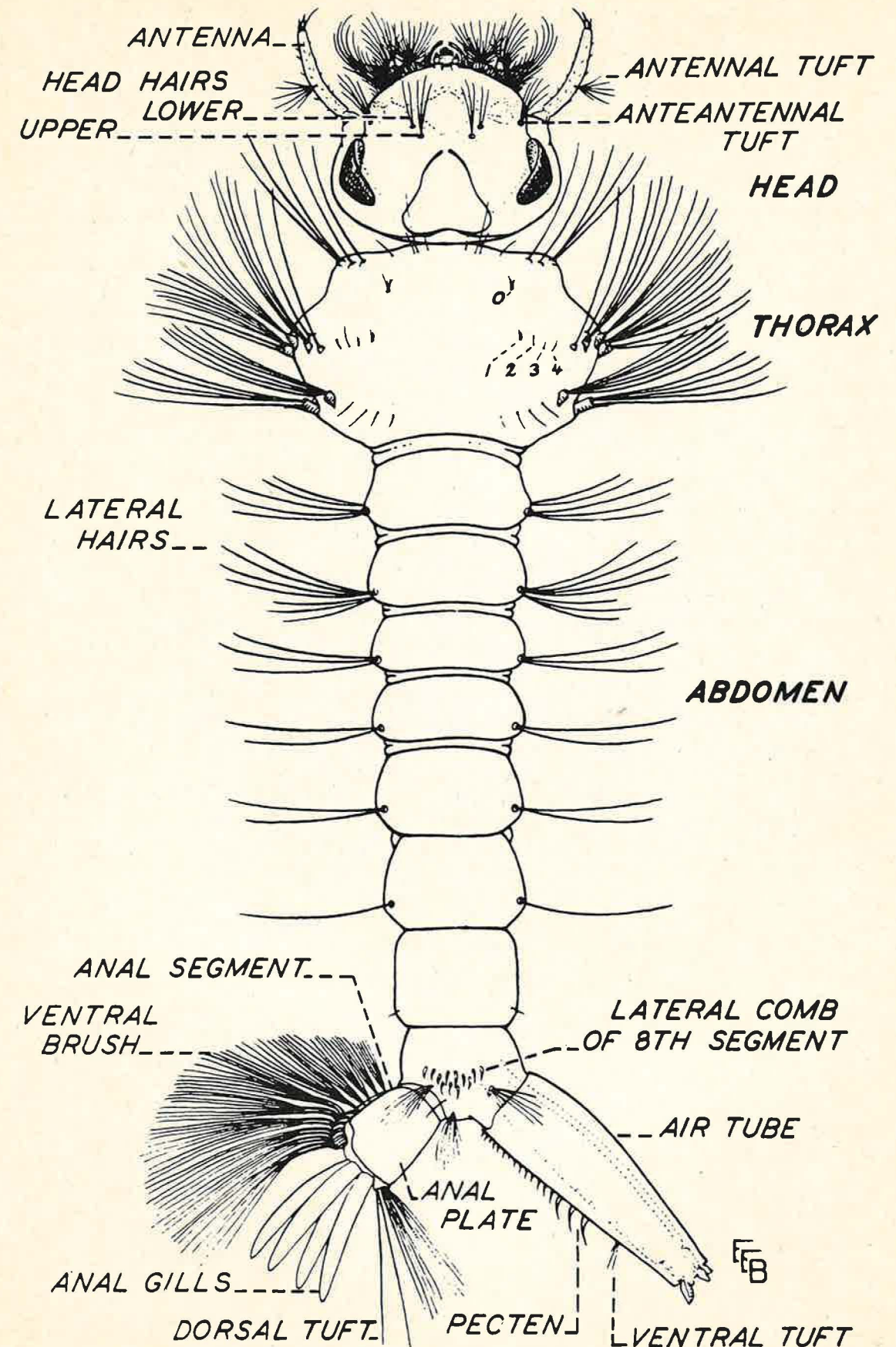


FIGURE 5. Larval characters used in identifying mosquito larvae.

KEYS TO NEVADA MOSQUITOES

KEY TO GENERA BASED ON ADULTS

1. Scutellum rounded posteriorly with marginal setae evenly distributed; male and female palpi nearly as long as proboscis.....*Anopheles*
Scutellum trilobed posteriorly with marginal setae on lobes only;
female palpi much shorter than proboscis..... 2
2. Second marginal cell less than half as long as its petiole.....*Uranotaenia*
Second marginal cell at least as long as its petiole..... 3
3. Postspiracular bristles present; female abdomen with tip pointed..... 4
Postspiracular bristles absent; female abdomen with tip blunt..... 5
4. Spiracular bristles present.....*Psorophora*
Spiracular bristles absent.....*Aedes*
5. Spiracular bristles present; tuft of setae present at subcostal base on
ventral side of wings.....*Culiseta*
Spiracular bristles absent; tuft of setae absent on base of subcosta
on ventral side of wings.....*Culex*

KEY TO GENERA BASED ON FOURTH INSTAR LARVAE

1. Eighth abdominal segment without a dorsal siphon.....*Anopheles*
Eighth abdominal segment with a dorsal siphon..... 2
2. Head longer than wide; both upper and lower frontal head hairs
spinelike.....*Uranotaenia*
Head at least as wide as long; both upper and lower frontal head
hairs slender..... 3
3. Pair of siphonal tufts inserted near base of siphon.....*Culiseta*
Pair of siphonal tufts absent near base of siphon..... 4
4. Siphon with several to many pairs of tufts or single hairs.....*Culex*
Siphon with a single pair of hair tufts..... 5
5. Anal segment completely ringed by saddle and tufts of ventral brush
inserted on midventral line of saddle.....*Psorophora*
Anal segment, if completely ringed by saddle, with tufts of ventral
brush not inserted on midventral line of saddle.....*Aedes*

KEY TO ADULT FEMALES OF *Aedes*

1. Hind tarsal segment with white rings..... 2
Hind tarsal segments without white rings..... 9
2. Hind tarsal segments ringed basally and apically..... 3
Hind tarsal segment ringed basally only..... 6
3. Abdominal segments with a median longitudinal stripe or partially
to completely concolorous..... 4
Abdominal segments with distinct lateral
basal bands only*sierrensis* (Ludlow)
4. Vein 3 of wing mostly white scaled.....*campestris* D. & K.
Vein 3 of wing mostly dark scaled..... 5
5. Anal vein of wing mostly black scaled.....*melanimon* Dyar
Anal vein of wing mostly white scaled.....*dorsalis* (Meigen)

6. Hind tarsal segments with broad basal rings..... 7
 Hind tarsal segments with narrow basal rings; abdominal segments with inverted V-shaped notches in basal bands..... *vexans* (Meigen)
7. Abdominal segments with a median longitudinal band; proboscis often with white ring; hypostigmal patch of scales present..... *nigromaculis* (Ludlow)
 Abdominal segments without a median longitudinal band; proboscis never with a white ring; hypostigmal patch of scales absent..... 8
8. Wing with pale scales confined almost entirely to anterior portion; torus without or with a few inconspicuous scales on dorsal surface..... *inreptus* Dyar
 Wing with pale scales generally scattered over surface; torus with a conspicuous patch of white scales on dorsal surface..... *fitchii* (Felt & Young)
9. Wing scales distinctly bicolored..... *spencerii idahoensis* (Theobald)
 Wing scales not distinctly bicolored..... 10
10. Abdominal segments with a median longitudinal stripe; wings with many scattered pale scales..... *niphadopsis* D. & K.
 Abdomen without a median longitudinal stripe; wings with only dark scales or with a white patch of scales at base of costa or with scattered pale scales on anterior veins..... 11
11. Lower mesepimeral bristles absent..... *cinereus* Meigen
 Lower mesepimeral bristles present..... 12
12. Hypostigmal spot of scales present..... 13
 Hypostigmal spot of scales absent..... 14
13. Postcoxal scale patch present; wing with scattered white scales on costa, subcosta, and radius..... *cataphylla* Dyar
 Postcoxal scale patch absent, wing scales dark except for basal spot on costa..... *pullatus* (Coq.)
14. Postcoxal scale patch present; supraalar bristles straw colored..... 15
 Postcoxal scale patch absent; supraalar bristles dark..... *communis communis* (DeGeer)
communis nevadensis C. & B.
15. Proboscis yellow-gray scaled on ventral surface..... *schizopinax* Dyar
 Proboscis dark scaled on ventral surface..... *hexodontus* Dyar

KEY TO ADULT MALES OF *Aedes* BASED ON GENITALIA

1. Dististyle inserted before apex of basistyle..... *cinereus* Meigen
 Dististyle inserted at apex of basistyle..... 2
2. Claspette stem without filament; dististyle claw subapical..... *vexans* (Meigen)
 Claspette stem with filament; dististyle claw apical..... 3
3. Basistyle without a distinct apical lobe..... 4
 Basistyle with a distinct apical lobe..... 5
4. Basal lobe of basistyle large, elongate, bearing a dense basal clump of long rather strong apically curved setae..... *sierrensis* (Ludlow)
 Basal lobe of basistyle, small rounded, and clothed with slender, nearly straight setae..... *nigromaculis* (Ludlow)
5. Claspette filament with a sharp angular projection near middle of convex side..... *inreptus* Dyar

- Claspette filament without an angular projection on convex side near base or middle..... 6
6. Basal lobe of basistyle with one or two stout spines plus a normal long stout dorsal spine..... 7
 Basal lobe of basistyle without stout spines other than a normal long stout dorsal spine (this spine often followed by progressively weaker spines or setae)..... 9
7. Basal lobe of basistyle with two strong inner spines situated close together and a long stout outer spine; claspette stem sharply angular near middle..... *pullatus* (Coq.)
 Basal lobe of basistyle with one short stout spine, a long curved spine, and dense group of slender setae; claspette stem not angular near middle..... 8
8. Apical lobe of basistyle prominent and almost bare dorsally..... *melanimon* Dyar
 Apical lobe of basistyle inconspicuous with numerous dorsal setae..... *dorsalis* (Meigen)
9. Claspette filament ligulate and not expanded on convex side, little if any broader at middle than distal end of claspette stem..... *campestris* D. & K.
 Claspette filament not ligulate but expanded on convex side, broader at middle than distal end of claspette stem..... 10
10. Claspette filament with sharp angle or notch near base of concave side..... 11
 Claspette filament without sharp angle or notch near base of concave side..... 12
11. Apical lobe of basistyle clothed with normal rather straight setae; claspette filament less than twice as wide at basal one-third as apical diameter of claspette stem..... *fitchii* (Felt & Young)
 Apical lobe of basistyle clothed with short broadened recurved setae; claspette filament expanded at basal one-third to about twice apical diameter of claspette stem..... *spencerii idahoensis* (Theobald)
12. Apical lobe of basistyle with few to many straight setae on inner surface.... 13
 Apical lobe of basistyle with many short broadened curved setae on inner surface..... 15
13. Apical lobe of basistyle with many setae *communis communis* (DeGeer)
communis nevadensis C. & B.
 Apical lobe of basistyle with only a few setae..... 14
14. Lobes of ninth tergite with 3-5 stout spines..... *cataphylla* Dyar
 Lobes of ninth tergite with 7-9 stout spines..... *niphadopsis* D. & K.
15. Claspette stem pilose to near apex..... *schizopinax* Dyar
 Claspette stem glabrous on distal one-third to one-half..... *hexodontus* Dyar

KEY TO THE FOURTH INSTAR LARVAE OF *Aedes*

1. Anal segment completely ringed by saddle..... 2
 Anal segment not completely ringed by saddle..... 3
2. Distal pecten teeth detached..... *nigromaculis* (Ludlow)
 Distal pecten teeth not detached..... *hexodontus* Dyar
3. Distal pecten teeth detached..... 4
 Distal pecten teeth not detached..... 9
4. Siphonal tuft inserted within pecten..... *cataphylla* Dyar
 Siphonal tuft inserted beyond pecten..... 5

5. Upper frontal, lower frontal, and preantennal head hairs inserted in a straight line.....*cinereus* Meigen
Upper frontal, lower frontal, and preantennal head hairs not inserted in a straight line..... 6
6. Pentad hair 2 of eighth segment located in a straight line between pentad hairs 1 and 3.....*vexans* (Meigen)
Pentad hair 2 of eighth segment not located in a straight line between pentad hairs 1 and 3..... 7
7. Pecten extending to less than one-half of siphon
..... (in part) *niphadopsis* D. & K.
Pecten extending to more than one-half of siphon..... 8
8. Thorax and abdomen spiculate; comb scales arranged in a double row.....*spencerii idahoensis* (Theobald)
Thorax and abdomen not spiculate; comb scales arranged in a patch of three or more rows..... (in part) *campestris* D. & K.
9. Antennal hair small and usually single.....*sierrensis* (Ludlow)
Antennal hair double or multiple..... 10
10. Siphon slender, four times or more its greatest diameter; apical pecten teeth nearly as long as apical diameter of siphon
.....*fitchii* (Felt and Young)
Siphon stouter and less than four times its greatest diameter; apical pecten teeth not more than half as long as the apical diameter of siphon..... 11
11. Individual comb scale with lateral spinules weak; not more than half as long as strong median spine..... 12
Individual comb scale rounded apically and fringed with subequal spinules, or with lateral spinules at least two-thirds as long as median spine..... 14
12. Pecten extending about one-fourth the length of siphon; comb scales in single to double row..... (in part) *niphadopsis* D. & K.
Pecten extending about one-third or more the length of siphon; comb scales in a patch..... 13
13. Upper frontal head hair three to five branched; mesothoracic hair 1 very long.....*schizopinax* Dyar
Upper frontal head hair usually single, rarely double; mesothoracic hair 1 very short.....*communis nevadensis* C. & B.
14. Upper and lower frontal head hairs multiple.....*pullatus* (Coq.)
Upper and lower frontal head hairs single to triple..... 15
15. Siphonal tuft usually inserted before the middle of siphon..... 16
Siphonal tuft usually inserted beyond middle of siphon..... 17
16. Spicules well developed toward apex of saddle, more than twice as long as those at base; anal gills white.....*increpitus* Dyar
Spicules weakly developed toward apex of saddle, less than twice as long as those at base; anal gills speckled with dark
.....*communis communis* (DeGeer)
17. Pecten extending about three-fourths the length of siphon
..... (in part) *campestris* D. & K.
Pecten extending less than half the length of siphon..... 18
18. Mesothoracic hair 1 several times as long as 2, and at least twice as long as 4.....*dorsalis* (Meigen)
Mesothoracic hair 1 similar in length to 2 and shorter than 4
.....*melanimon* Dyar

Aedes campestris Dyar and Knab

Aedes campestris Dyar and Knab, 1907, J. N. Y. Ent. Soc. 15:213.

Ecological notes—Larvae were collected as early as February 5, but the main breeding occurred in March and April. Habitats were alkaline pools, ponds, and lake margins in the valleys. This species was collected only once from an irrigated field. Companion species were *Aedes niphadopsis*, *A. dorsalis*, and *Culiseta inornata*. In a 2-year study of 108 suspected breeding sites, *campestris* was found in 61 of the samples and the dominant species in only 21 samples. The water of these samples possessed a pH that ranged from 7.1–9.1 with a mean of 7.9 and the total soluble salts ranged from 1,250 p.p.m.–30,720 p.p.m., with a mean of 10,352 p.p.m. The species showed a lesser tolerance to total soluble salts than *A. niphadopsis*.

Aedes campestris is generally univoltine in the State but actually is multivoltine since up to 95 percent of the eggs obtained from some females of the spring brood hatched after a week of "conditioning." A second brood was only noted one time during this 3-year study. Biting adults were noted from April to July. The species is a distinct pest of man and animals in the vicinity of its breeding areas. The paucity and remoteness of its aquatic habitats keep this species from being an important pest. Autogeny was observed from one field population in the laboratory.

Taxonomic notes—The pecten which extends about three-fifths the length of the siphon, several teeth of which are usually slightly detached, plus the usual triple branching of the upper frontal head hairs, easily separate the larvae from its breeding companions *dorsalis* and *niphadopsis*. Females are separated from *dorsalis* and *melanimon* by the predominant light scaling of vein 3 of the wing and the shape of the tarsal claw.

Nevada Records

CHURCHILL COUNTY: *Fallon*, larvae, III–5–59; larvae, III–6–59; ♀, VI–3–59 (R. W. Lauderdale); adult, VII–3–53 (Richards *et al.* 1956); *Big Soda Lake*, adult, IV–24–51 (Richards *et al.* 1956); *Hazen*, larvae, II–5–60; ♀, ♂, larvae, IV–13–60.

DOUGLAS COUNTY: *Genoa*, larvae, II–25–60.

ELKO COUNTY: *Halleck*, ♀, V–27–60; larvae, V–14–61.

EUREKA COUNTY: *Eureka*, larvae, V–3–60; ♀, VII–22–60.

LYON COUNTY: *Lahonton Reservoir*, larvae, III–10–59; larvae, IV–7–59; *Wabuska*, III–21–60.

MINERAL COUNTY: *Schurz*, larvae, IV–11–53 (Richards *et al.* 1956).

NYE COUNTY: 1948, (Richards *et al.* 1956).

WASHOE COUNTY: *Gerlach*, larvae, II–24–60;

larvae, XII–9–60; larvae, IV–11–61; *Reno*, larvae, III–9–60.

WHITE PINE COUNTY: *Baker*, adult, V–9–39 (Richards *et al.* 1956).

Aedes cataphylla Dyar

Aedes cataphylla Dyar, 1916, Ins. Ins. Mens. 4:86.

Ecological notes—This single brooded snow-water *Aedes* was collected as larvae on several occasions in the Sierra Nevada Mountains near Lake Tahoe in open meadow pools at elevations ranging from 6,400–7,000 feet. It is one of the first snow-water mosquitoes to emerge as adults. Companion species were *Aedes hexodontus*, *A. increpitus*, and *A. fitchii*. Biting adults were noted in June and August, but it apparently is not an important species because of its limited numbers.

Taxonomic notes—*Aedes cataphylla* is the only species in the State in which the larvae have the siphonal tuft inserted within the pecten. Females are separated from their congeners in the black-legged group by the possession of scattered pale scales on the costa, subcosta, and radial veins of the wing.

Nevada Records

CLARK COUNTY: *Bunkerville*, ♀, IV–15–59 (R. W. Lauderdale).

DOUGLAS COUNTY: *Spooner Summit*, larvae, III–27–59; larvae, IV–7–60, 7,000 feet; *Glenbrook*, adult, VI–5–16 (Dyar 1917); larvae, IV–18–60, 6,400 feet; *Lake Tahoe*, larvae, IV–20–60, 6,700 feet.

EUREKA COUNTY: *Pine Creek* (Palisade), larvae, IV–19–53 (Richards *et al.* 1956).

LANDER COUNTY: *Kingston Canyon*, ♀, IV–21–59, 6,300 feet (R. C. Bechtel).

ORMSBY COUNTY: *Carson City*, adult, VII–2–53 (Richards *et al.* 1956).

WASHOE COUNTY: *Mt. Rose*, ♀, VIII–24–58, 8,200 feet.

Aedes cinereus Meigen

Aedes cinereus Meigen, 1818, Syst. Besch. Zweifl. Ins. 1:13.

Ecological notes—This species was considered a snow mosquito in California by Bohart (1950). Our larval collections indicate it occurs in late spring in open roadside ditches and meadow pools in the foothills. It apparently has only a single yearly brood although *cinereus* is a multivoltine species in many states. Associated species were *Aedes spencerii idahoensis*, *A. dorsalis*, *A. vexans*, and *A. increpitus*. No biting was observed and *cinereus* is not an important species in the State.

Taxonomic notes—Larvae are easily separated from *vexans* and *spencerii idahoensis* by having the upper and lower frontal and preantennal head hairs in a straight line. Females lack the lower mesepimeral bristles and the pale basolateral spots of the abdomen appear to form a continuous lateral line.

Nevada Records

ELKO COUNTY: *Lamoille*, larvae, VI-4-58 (R. C. Bechtel); larvae, VI-2-59; larvae, V-5-60; larvae, V-15-61, 6,000 feet; *Owyhee*, ♀, VIII-19-56 (USPHS).

LANDER COUNTY: *Battle Mountain*, adult, VIII-4-53 (Richards *et al.* 1956).

Aedes communis communis (DeGeer)

Culex communis DeGeer, 1776, Mem. des Ins. 6:316.

Ecological notes—The aquatic stages are fairly common in the Sierra Nevada Mountains, especially around Lake Tahoe, at elevations from 5,800-7,800 feet. Larvae were observed from March-June depending on the elevation and snow pack. Larval habitats were shaded, overflow pools adjacent to streams and seldom used, shaded stream beds. Larvae were never collected from unshaded areas. Associated species were *A. hexodontus* and *A. increpitus*, and when in the same pool with these species, *c. communis* larvae often pupated several weeks sooner. Autogeny was observed from one population in the laboratory. Biting females were often collected in June in shaded pine and aspen situations.

Taxonomic notes—Larvae of this species possess comb scales with subequal spinules and thus are easily separated from the subspecies *c. nevadensis*. They are often confused with larvae of *increpitus* but *c. communis* larvae possess speckled anal gills, a shorter siphon, and lack large spicules on the apex of the saddle. The black supraalar bristles and mixed black and yellow forked hairs on the vertex plus the absence of the postcoxal scale patch separate both *c. communis* and its subspecies from *A. hexodontus*.

Nevada Records

DOUGLAS COUNTY: *Spooner Summit*, larvae, III-19-59; larvae, IV-7-60, 7,100 feet; *Glenbrook*, larvae, IV-24-59; larvae, III-22-60; ♀, VI-6-60, 6,300 feet.

ORMSBY COUNTY: *Lake Tahoe*, larvae, IV-18-60, 6,500 feet; *Marlette Lake*, larvae, VI-8-60, 7,600 feet.

WASHOE COUNTY: *Lake Tahoe*, larvae, IV-9-59; larvae, IV-18-60, 6,300 feet; *Mt. Rose*, larvae, IV-21-59, 7,800 feet; ♀, VI-18-60, 8,100 feet; *Sun-down*, larvae, IV-28-60, 5,800 feet.

Aedes communis nevadensis Chapman and Barr

Aedes communis nevadensis Chapman and Barr, 1964, Mosquito News. 24(4):439-47.

Ecological notes—Larvae were collected in both open and shaded pools in the Ruby Mountains (Eastern Nevada) in May-June at elevations from 7,200-8,700 feet. Favorite habitats were open overflow pools adjacent to streams and open meadow pools resulting from snow melt. Associated species were *Aedes increpitus*, *A. pullatus*, and *A. hexodontus*, and when in the same pool with these species, *c. nevadensis* was always the first to emerge. Biting adults were extremely annoying in late June at elevations of 8,000-9,500 feet and constitute a problem in this recreational area.

Taxonomic notes—The combination of thornlike comb scales, generally single upper frontal head hairs, and speckled anal gills, easily separate these larvae from other snow-water *Aedes*. Adults are inseparable from those of *c. communis*.

Nevada Records

ELKO COUNTY: *Lamoille Canyon*, larvae, VI-4-58 (R. C. Bechtel); larvae, V-20-59, 7,200 feet; larvae, VI-2-59, 7,200-8,500 feet; larvae, V-26-60, 7,200-8,500 feet; ♀, VI-22-60, 8,000-9,500 feet.

Aedes dorsalis (Meigen)

Culex dorsalis Meigen, 1830, Syst. Besch. Zweifl. Ins. 6:242.

Ecological notes—The aquatic stages of this very common species were noted every month of the year. The December and January records are unusual and occurred in the vicinity of hot springs. Large populations of *dorsalis* larvae were noted in a great variety of habitats ranging from irrigated fields to highly alkaline seep areas. Chapman (1960) found that breeding occurred in waters that possessed a maximum pH and total soluble salts of 10.1 and 106,176 p.p.m., respectively. The species tolerated a much higher alkalinity than its co-breeders *A. melanimon* and *A. nigromaculis*. The aquatic cycle of *dorsalis* can be completed in a minimum of 6 days in the warmer months. This time interval is extended to about 3 weeks to a month in the spring, which almost insures larval stranding from other than lake margins, sloughs, and very poorly irrigated situations. It probably is Statewide in distribution and was associated most often with *A. melanimon*, *A. nigromaculis*, *Culex tarsalis*, and *Culiseta inornata* in the summer and *A. campestris* and *A. niphadopsis* in the early spring. Biting *dorsalis* adults were observed from April to November. It is one of the most pestiferous

species in many areas of the State. Autogeny was observed from two field populations in the laboratory.

Taxonomic notes—The long 1- to 4-branched mesothoracic hair 1 and the evenly spaced pecten teeth differentiate it from its larval congeners. The dark scaling of vein 3, the pale scaling of the anal vein, and the shape of the tarsal claws, separate it from related adults.

Nevada Records

CHURCHILL COUNTY: *Fallon*, larvae, ♀, VII-7-58; larvae, ♀, VIII-15-58; larvae, ♀, IX-9-58; larvae, X-28-58; larvae, XI-5-58; larvae, II-26-59; larvae, III-31-59; larvae, ♀, IV-7-59; larvae, ♀, V-13-59; larvae, ♀, VI-5-59; larvae, ♀, VII-16-59; larvae, XI-10-59; *Hazen*, larvae, II-5-60; ♀, VI-13-60; *Soda Lake*, larvae, II-10-60.

CLARK COUNTY: *Bunkerville*, larvae, VI-11-58; (R. C. Bechtel); larvae, IV-15-59; *Overton*, ♀, V-9-58 (R. C. Bechtel); ♀, VI-23-59; *Glendale*, adult, IV-20-53 (Richards *et al.* 1956); *Mesquite*, ♀, IV-14-58 (R. W. Lauderdale); ♀, IX-26-57; *Moapa*, larvae, ♀, VII-21-60.

DOUGLAS COUNTY: *Minden City*, ♀, VIII-5-58; ♀, V-27-58; ♀, IX-10-57; larvae, IV-6-60; adult, VI-30-53 (Richards *et al.* 1956); *Genoa*, larvae, IV-6-60.

ELKO COUNTY: *Midas*, ♀, IX-12-57 (R. C. Bechtel); *Carlin*, ♀, VI-3-58 (R. C. Bechtel); *Lamoille*, larvae, ♀, VI-4-58 (R. C. Bechtel); larvae, VI-2-59; *Owyhee*, larvae, ♀, VIII-19-56 (USPHS); *Elko*, larvae, VI-26-53 (Richards *et al.* 1956); *Deeth*, larvae, V-27-60; *Wilkins*, ♀, VI-23-60.

EUREKA COUNTY: *Beowawe*, ♀, VI-21-58 (R. C. Bechtel); *Dunphy*, adult, VIII-22-53 (Richards *et al.* 1956); *Palisade*, ♀, V-5-60; *Eureka*, larvae, V-3-60; larvae, ♀, VII-22-60.

HUMBOLDT COUNTY: *Winnemucca*, ♀, VI-18-59; larvae, ♀, VII-8-59; *Golconda*, larvae, III-30-60; larvae, V-5-60.

LANDER COUNTY: *Battle Mt.*, adult, VI-21-53 (Richards *et al.* 1956); *Austin*, larvae, III-31-60.

LINCOLN COUNTY: *Caliente*, ♀, VII-21-58 (R. C. Bechtel); adult, VII-30-53 (Richards *et al.* 1956); *Panaca*, ♀, V-8-58 (R. C. Bechtel); *Alamo*, larvae, VI-22-59; larvae, IV-20-53 (Richards *et al.* 1956).

LYON COUNTY: *Dayton*, larvae, ♀, V-13-59; *Fernley*, larvae, VIII-15-58; larvae, III-10-59; larvae, V-13-59; larvae, XI-14-60; *Hazen*, larvae, ♀, VII-13-59; *Lahontan Reservoir*, larvae, III-10-59; *Wabuska*, larvae, III-21-60.

MINERAL COUNTY; *Schurz*, adult, VII-23-53 (Richards *et al.* 1956); larvae, V-16-60.

NYE COUNTY: *Gabbs*, larvae, VII-13-61.

ORMSBY COUNTY: *Carson City*, adult, VII-2-53 (Richards *et al.* 1956); ♀, larvae, V-10-60.

PERSHING COUNTY: *Lovelock*, larvae, V-29-58 (R. C. Bechtel); larvae, V-26-60; ♀, VI-5-59 (R. W. Lauderdale); adult, VII-21-53 (Richards *et al.* 1956); adults, VII-30-53 (Richards *et al.* 1956); *Rye Patch Dam*, ♀, VI-24-60.

STOREY COUNTY: *Virginia City* (6-mile canyon), larvae, IV-4-60, 4,600 feet; larvae, ♀, VII-8-60.

WASHOE COUNTY: *Reno*, larvae, ♀, VIII-13-58; larvae, ♀, IX-2-58; larvae, X-9-58; ♀, X-28-59; larvae, III-9-59; larvae, IV-22-59; larvae, ♀, V-28-59; larvae, ♀, VI-11-59; larvae, VII-27-59; *Gerlach*, ♀, VII-7-59; larvae, II-24-60; larvae, I-24-61; larvae, XII-9-60; *Sparks*, larvae, XI-3-58; larvae, III-9-59; ♀, X-22-59; *Wadsworth*, larvae, IV-16-59; larvae, VIII-7-59.

Aedes fitchii (Felt and Young)

Culex fitchii Felt and Young, 1904, Science (n.s.) 20:312.

Ecological notes—Large larval populations of this single brooded snow-water *Aedes* were noted from April through June in the Sierra Nevada Mountains in open meadow pools, open meadow ponds, and open marshy lake margins at elevations of 6,300-8,700 feet. Collections were also made in the Eastern part of the State from shaded meadow pools and roadside ditches in the foothills of the Ruby Mountains and in open overflow pools along the Humboldt River at elevations of 5,000-6,000 feet. *Aedes hexodontus*, *A. increpitus*, *A. spencerii idahoensis*, and *A. schizopinax* were associated species. In any given pool with one or more of these species, *fitchii* larvae were usually the last to mature. Biting adults were observed in partially shaded woods in June and July, but the species is probably only important in localized areas adjacent to breeding areas.

Taxonomic notes—The long slender siphon is distinctive to *fitchii* larvae whereas the abundantly scattered pale scales on the wing will usually separate adults from *increpitus*. *Aedes fitchii* females also usually have a T-shaped patch of pale scales on the dorsal aspect of the first abdominal segment.

Nevada Records

ELKO COUNTY: *Lamoille*, larvae, VI-4-58 (R. C. Bechtel); larvae, V-26-60; *Owyhee*, ♀, VIII-19-56 (USPHS); *Carlin*, adult, IV-9-53 (Richards *et al.* 1956); *Jiggs*, larvae, V-26-60; *Deeth*, larvae, V-27-60; *Wilkins*, ♀, VI-23-60; *Halleck*, larvae, V-15-61.

EUREKA: [*Pine Creek (Palisade)*], adult, VI-19-63 (Richards *et al.* 1956).

DOUGLAS COUNTY: *Spooner Summit*, larvae, III-19-59; larvae IV-7-60, 7,100 feet; *Lake Tahoe*, larvae, III-29-59; larvae, IV-20-60, 6,700 feet; *Glenbrook*, larvae, IV-24-59, 6,300 feet; larvae, IV-18-60, 6,400 feet.

HUMBOLDT COUNTY: *Paradise Valley*, adult, VIII-11-53 (Richards *et al.* 1956).

WASHOE COUNTY: *Hunter Lake*, larvae, VI-12-59, 8,700 feet; ♀, VII-23-59, 8,500 feet.

Aedes hexodontus Dyar

Aedes hexodontus Dyar, 1916, Ins. Ins. Mens. 4:83.

Ecological notes—This is the most common species encountered as larvae at moderate to higher elevations (6,300–10,000 feet) and was often the sole larval occupant of many open and partially shaded meadow pools, ponds, and marshy lake margins from March through June in both the Sierra Nevada and Ruby Mountains. It is single brooded and was associated with all of the other species of snow-water *Aedes*. Biting adults were observed in June and July and *hexodontus* is one of the major pest species in mountainous areas.

Taxonomic notes—The complete encircling of the anal segment by the saddle is diagnostic in separating larvae of this species from other snow-water *Aedes*. The adults are most easily confused with *communis* but *hexodontus* adults have the supraalar bristles and upright forked vertex scales straw-colored and possess a postcoxal scale patch.

Nevada Records

DOUGLAS COUNTY: *Spooner Summit*, larvae, III-19-59; larvae, IV-7-60, 6,700 feet; *Glenbrook*, larvae, IV-24-59; larvae, IV-18-60, 6,300 feet; *State-line*, larvae, III-29-60, 6,400 feet.

ELKO COUNTY: *Lamoille Canyon*, larvae, VI-2-59; larvae, V-26-60, 8,000–8,700 feet; larvae, VI-22-60, 8,500 feet.

ORMSBY COUNTY: *Lake Tahoe*, larvae, III-16-59, 6,300 feet; larvae, IV-7-60, 6,700 feet; *Marlette Lake*, larvae, VI-8-60, 7,600 feet.

WASHOE COUNTY: *Mt. Rose*, larvae, IV-21-59, 7,800–8,000 feet; larvae, V-25-59, 7,500–8,700 feet; larvae, VI-30-59, 9,500 feet; larvae, V-20-60, 7,500–8,700 feet; *Hunter Lake*, larvae, ♀, VI-11-59, 8,200–8,700 feet; ♀, VII-23-59, 8,200 feet; *Marlette Lake*, larvae, VI-8-60, 8,000 feet.

Aedes increpitus Dyar

Aedes increpitus Dyar, 1916, Ins. Ins. Mens. 4:87.

Ecological notes—Larval collections of this single brooded snow-water species were made from February

to June, principally in the Sierra Nevada and Ruby Mountains at elevations ranging from 4,300–8,200 feet. Habitats were open and shaded meadow pools and ponds in the mountains, and open roadside ditches and open and shaded pond and pool margins in foothill areas. While this was the most common snow-water *Aedes* noted at lower elevations in the foothills and valleys, it was never collected from irrigated fields. It was found associated with *A. cinereus*, *A. dorsalis*, *A. spencerii idahoensis*, *A. communis*, *A. fitchii*, *A. hexodontus*, *A. pullatus*, and *A. schizopinax*. Biting *increpitus* were commonly observed from June to August. It is one of the principal biting pests in the foothill and resort areas at higher elevations.

Taxonomic notes—Larvae of *increpitus* are separated from other snow-water species by the creamy, almost transparent anal gills and from other allied species by the large spicules on the apex of the anal saddle. Females resemble *fitchii* but have few or no pale scales on the inner surface of the torus, whereas the inner surface of the torus of *fitchii* has a conspicuous patch of pale scales.

Nevada Records

DOUGLAS COUNTY: *Lake Tahoe*, larvae, III-4-59, 6,300 feet; adult, VII-31-53 (Richards *et al.* 1956); *Glenbrook*, larvae, IV-9-59; larvae, III-22-60; ♀, VI-6-60, 6,300 feet; adult, VIII-25-15 (Dyar 1922); *Minden City*, adult, VII-25-53 (Richards *et al.* 1956); *Gardnerville*, larvae, IV-29-59, 6,500 feet; *Stateline*, larvae, III-29-60.

ELKO COUNTY: *Lamoille Canyon*, larvae, VI-2-59, 7,500 feet; *Lamoille*, larvae, V-5-60; *Ruby Lake*, larvae, V-4-60; *Deeth*, larvae, V-27-60; *Jiggs*, larvae, V-26-60.

LYON COUNTY: *Dayton*, ♀, VII-15-58; larvae, III-20-59, 4,500 feet; larvae, IV-7-59; larvae, III-7-60; larvae, II-10-61.

ORMSBY COUNTY: *Marlette Lake*, larvae, VI-8-60, 7,600 feet; *Lake Tahoe*, larvae, III-4-59, 6,300 feet; larvae, IV-18-60, 6,500 feet.

STOREY COUNTY: *Virginia City*, larvae, III-18-60, 4,700 feet.

WASHOE COUNTY: *Washoe Valley*, larvae, III-19-59, 4,300 feet; *Lake Tahoe*, larvae, IV-9-59, 6,300 feet; *Mt. Rose*, larvae, IV-21-59, 7,500 feet; ♀, VIII-26-58, 7,500 feet; ♀, VI-18-60, 8,100 feet; *Hunter Lake*, larvae, VI-21-59, 8,200 feet.

Aedes melanimon Dyar

Aedes melanimon Dyar, 1924, Ins. Ins. Mens. 12:126.

Ecological notes—This recently resurrected species (Barr 1955, Richards 1956, Bohart 1956) was one of

the most common species dipped throughout most of the State. Larvae are less tolerant of alkaline conditions than *dorsalis* but were collected in waters possessing a maximum pH and total soluble salts of 9.2 and 39,424 p.p.m., respectively (Chapman 1960). *Aedes melanimon* breeds extensively in sloughs, roadside ditches, potholes, and irrigated fields. The aquatic cycle is completed in 6–7 days during the warmest summer months, and as many as 13 broods of it and *dorsalis* were produced adjacent to an irrigated field during a season. While *melanimon* larvae were collected as early as January 24 and as late as December 9, general breeding was never evident until early April. Associated species were *A. dorsalis*, *A. nigromaculis*, *A. vexans*, and *Culex tarsalis*.

Throughout much of the State biting adults are generally much less pestiferous than *dorsalis* and *nigromaculis*, especially when in the company of these two species. *Aedes melanimon* appears to be the major biting pest only along the Humboldt River and in the Yerington area. Both *dorsalis* and *nigromaculis* are absent or present only in insignificant numbers in these areas. *Aedes melanimon* was often the dominant larval species in the Fallon area, Reno-Sparks area, and Minden-Gardnerville area, but invariably the majority of biting adults were always *nigromaculis* and *dorsalis*. Autogeny was observed in the laboratory from one field population.

Taxonomic notes—The short multiple mesothoracic hair 1 and the usually single prothoracic hair 1 separate *melanimon* larvae from *dorsalis*. The nonvariable, characteristic scutal pattern, definite median longitudinal abdominal band, and the prevalence of dark scales on the anal vein separate the female from *dorsalis* and *campestris*.

Nevada Records

CLARK COUNTY: *Bunkerville*, larvae, VI-11-59 (R. C. Bechtel).

CHURCHILL COUNTY: *Fallon*, larvae, VIII-12-58; larvae, IX-9-58; larvae, X-14-58; larvae, XI-21-58; larvae, IV-23-59; larvae, ♀, V-13-59; larvae, IV-5-60; larvae, VI-18-59; larvae, VII-13-59; larvae, XI-3-59.

DOUGLAS COUNTY: *Minden City*, larvae, V-27-58 (R. C. Bechtel); adult, VI-27-53 (Richards *et al.* 1956).

ELKO COUNTY: *Lamoille Canyon*, ♀, VI-18-58 (R. C. Bechtel), 7,300 feet; *Carlin*, ♀, VI-3-58 (R. C. Bechtel); larvae, V-5-60; *Ruby Valley*, ♀, VIII-28-57 (R. C. Bechtel); adult, VII-29-53 (Richards *et al.* 1956); *Midas*, ♀, IX-12-57 (R. C. Bechtel); *Elko*, adult, VI-26-53 (Richards *et al.* 1956); *Owyhee*, ♀, VIII-19-56 (USPHS); *Deeth*, larvae, V-27-50.

EUREKA COUNTY: *Beowawe*, ♀, VI-21-58 (R. C. Bechtel); *Dunphy*, adult, VIII-22-53 (Richards *et al.* 1956).

HUMBOLDT COUNTY: *Golconda*, larvae, ♀, VI-3-58 (R. C. Bechtel); *Winnemucca*, larvae, VI-3-59; larvae, ♀, VII-8-59; ♀, larvae, V-27-60; *Paradise Valley*, adult, VIII-11-53 (Richards *et al.* 1956).

LANDER COUNTY: *Battle Mt.*, ♀, VI-23-60; adult, VII-2-53 (Richards *et al.* 1956).

LYON COUNTY: *Dayton*, larvae, V-13-59; larvae, ♀, V-21-59; larvae, IV-4-60; *Fernley*, larvae, VII-29-58; larvae, VIII-17-59; *Yerington*, larvae, ♀, VIII-17-59; larvae, IX-16-59; larvae, V-24-60; *Smith*, adult, VII-7-53 (Richards *et al.* 1956).

MINERAL COUNTY: *Schurz*, larvae, V-16-60.

ORMSBY COUNTY: *Brunswick Canyon*, adult, VII-26-53 (Richards *et al.* 1956); *Carson City*, larvae, V-20-60.

PERSHING COUNTY: *Lovelock*, larvae, V-29-58 (R. C. Bechtel); ♀, VI-5-58 (R. C. Bechtel); adult, VIII-10-53 (Richards *et al.* 1956).

STOREY COUNTY: IV-13-60; ♀, VII-8-60. (Truckee River).

WASHOE COUNTY: *Reno*, larvae, VII-29-58; larvae, ♀, VIII-21-58; larvae, IX-19-58; larvae, X-8-58; larvae, IV-22-59; larvae, V-28-59; larvae, ♀, VI-11-59, larvae, IV-8-60; *Sparks*, larvae, XI-2-59; *Wadsworth*, larvae, IV-16-59; larvae, V-27-59; larvae, VI-21-60; *Gerlach*, larvae, II-24-60; larvae, XII-9-60; larvae, I-24-61.

Aedes nigromaculis (Ludlow)

Grabhamia nigromaculis Ludlow, 1907, Geo. Wash. Univ. Bull 5:85.

Ecological notes—This is one of the most important, voracious, and persistent biting pest species in many areas of the State. It apparently is widely distributed over much of the State although the writer failed to collect it in the south (Clark County) and along the Humboldt River, especially in Humboldt County, where considerable collecting was done. Breeding was observed from April to latter October and was most prevalent in irrigated fields and adjacent to them in roadside ditches and potholes. Chapman (1960) reported it as tolerating a maximum pH and total soluble salts of 9.2 and 2,624 p.p.m., respectively, which was much lower than the results obtained for *melanimon* and *dorsalis*. Innumerable broods of *nigromaculis* are produced during the irrigation season with the number dependent only on the number of floodings. The aquatic cycle can be completed in a minimum of 5 days during the summer. Associated species were *A. dorsalis*, *A. melanimon*,

A. vexans, *Culex tarsalis*, and *Culiseta inornata*. Autogeny was observed in the laboratory from one field population.

Taxonomic notes—The complete encircling of the anal segment by the saddle separates the larvae from other valley *Aedes*. The broad basal banding on the hind tarsal segments, median longitudinal abdominal band, and usual banded proboscis separate it from other related *Aedes* females.

In addition to the records presented below, Richards *et al.* (1956) reported it common and widespread in Lander and Pershing Counties.

Nevada Records

CHURCHILL COUNTY: *Fallon*, larvae, ♀, VII-7-58; larvae, ♀, IX-2-58; larvae, ♀, X-28-58; larvae, IV-23-59; larvae, ♀, V-13-59; larvae, VI-5-59; ♀, X-21-59.

DOUGLAS COUNTY: *Genoa*, ♀, IX-10-57 (R. C. Bechtel); *Minden City*, ♀, ♂, larvae, V-27-58 (R. C. Bechtel); ♀, VIII-5-58.

EUREKA COUNTY: *Eureka*, ♀, VII-22-60.

ELKO COUNTY: *Owyhee*, ♀, larvae, VIII-19-56 (USPHS).

LYON COUNTY: *Fernley*, larvae, VIII-4-59; *Yerington*, larvae, ♀, IX-16-59.

ORMSBY COUNTY: *Carson City*, ♀, VIII-5-58.

MINERAL COUNTY: *Schurz*, larvae, V-16-60.

NYE COUNTY: *Pahrump*, ♀, IX-22-59 (R. C. Bechtel); *Gabbs*, ♀, VII-13-61.

WASHOE COUNTY: *Reno*, larvae, ♀, VIII-13-58; larvae, ♀, IX-8-58; larvae, X-9-58; larvae, ♀, VI-11-59; larvae, VII-7-59; larvae, IV-8-60; *Sparks*, larvae, X-8-58; ♀, X-22-59; *Wadsworth*, larvae, IV-16-59; larvae, IV-21-60; *Empire*, ♀, VII-7-59.

Aedes niphadopsis Dyar and Knab

Aedes niphadopsis Dyar and Knab, 1918, Ins. Ins. Mens. 5:166.

Ecological notes—Larvae were observed as early as January 13, which makes this species one of the earliest occurring *Aedes* in the State. While fourth-instar larvae were observed January 20 and 24, general breeding occurs from February to mid-April, with the length of the aquatic stages about 4 to 6 weeks. Aquatic habitats were usually open highly alkaline pools, ponds, seep areas, and lake margins in the valleys. In a 2-year study of 108 potential breeding sites, *niphadopsis* larvae were present in 103 of the samples and the dominant species in 78. The water from these positive samples possessed a mean pH of 7.9, ranging from 7.1-9.3 and the total

soluble salts ranged from 1,250-49,350 p.p.m., with a mean of 11,781 p.p.m. It tolerates a higher alkalinity than *campestris*. Invariably the aquatic stages of *niphadopsis* mature several weeks before those of *campestris* which is probably a reflection of the lower hatching threshold of *niphadopsis* eggs. Companion species were *A. campestris*, *A. dorsalis*, and *Culiseta inornata*.

Aedes niphadopsis is univoltine and larvae were never observed except in early spring, although slight hatching of some eggs was obtained in the laboratory in October from those eggs deposited by females in May. Adults are generally on the wing in early March-May. Very little biting activity was noted from this species during 3 years of observation, even though tremendous numbers of adults emerged and were often present in the vegetation. Autogeny was observed in three field populations of *niphadopsis* and is probably not uncommon.

Taxonomic notes—The pecten teeth which occupy about one-fourth of the siphon, often with one or more teeth detached, separate it from companion larvae of *campestris* and *dorsalis*. The mixed pale and dark wing scales, longitudinal banding of the abdomen, and lack of tarsal bands separate *niphadopsis* adults from other valley breeding *Aedes*.

Nevada Records

CHURCHILL COUNTY: *Fallon*, larvae, III-5-59; larvae, ♀, III-31-59; larvae, II-5-60; *Soda Lake*, larvae, III-12-59; *Hazen*, larvae, II-5-60; larvae, I-13-61.

DOUGLAS COUNTY: *Genoa*, larvae, II-25-60.

ESMERALDA COUNTY: *Coaldale*, adults, V-8-39 (Richards *et al.* 1956).

LYON COUNTY: *Lahonton Reservoir*, larvae, III-10-59; larvae, II-10-60; *Wabuska*, larvae, II-23-60; *Fernley*, larvae, III-16-60.

WASHOE COUNTY: *Gerlach*, larvae, II-24-60; larvae, I-24-61; larvae, IV-11-61; *Winnemucca Lake*, larvae, II-24-60; *Reno*, ♀, IV-13-61.

Aedes pullatus (Coq.)

Culex pullatus Coquillett, 1904, Proc. Ent. Soc. Wash. 6:168.

Ecological notes—Large larval populations were observed only in the Ruby Mountains at elevations from 7,200-10,000 feet where habitats were open and shaded meadow pools, usually adjacent to streams. This single-brooded snow-water *Aedes* was usually collected with *A. hexodontus*, *A. increpitus*, and *A. communis nevadensis*. Biting adults were observed in June and July. It is one of the principal pest species in this outdoor mecca.

Taxonomic notes—Multiple head hairs, the long single mesothoracic hair 1, and the comb scales with subequal spinules separate *pullatus* larvae from *schizopinax*, the only other Nevadan snow-water *Aedes* with possible multiple head hairs. The dorsal markings of the scutum and the possession of a hypostigial spot of scales separate it from other black-legged *Aedes* adults.

Nevada Records

ELKO COUNTY: *Lamoille Canyon*, larvae, VI-4-58 (R. C. Bechtel), 7,200 feet; larvae, V-20-59, 7,200 feet; larvae, VI-2-59, 7,200-8,700 feet; larvae, V-5-60; larvae, V-26-60, 7,200-8,300 feet; ♀, larvae, VI-22-60, 8,000-8,800 feet.

Aedes schizopinax Dyar

Aedes schizopinax Dyar, 1929, Proc. U.S. Natl. Mus. 75(23):1.

Ecological notes—While this once rare species was initially reported from the State in the Sierra Nevada Mountains, more recent collections indicate it to be much more widespread in distribution (Chapman 1959a, 1961b). The aquatic stages of this one-brooded snow-water *Aedes* were noted in the foothills of the Calico Mountains in western Nevada and in eastern Nevada in the Schell Creek Range, Toiyabe Range, and adjacent to the foothills of the Ruby Mountains. Habitats were open meadow pools and marshy lake margins at elevations from 5,000-8,700 feet. Associated larvae were *A. hexodontus*, *A. increpitus*, and *A. fitchii*. *A. schizopinax* is not an important biting pest, since no adult activity was ever observed during many visits to areas which had produced substantial numbers of larvae. Nothing has been reported in the literature on the habits of the adults. Caged females did feed on the writer in the laboratory and undoubtedly do so in the field. Autogeny was observed from one field population in the laboratory.

Taxonomic notes—The very long-branched mesothoracic hair 1, comb scales with a strong median spine, and the long lateral hair of the anal segment separate the larvae from those of *pullatus*. The presence of yellow or grey scales on the underside of the proboscis, and the usual dorsal pale scaling of the last abdominal segment separate it from other black-legged *Aedes* females.

Nevada Records

DOUGLAS COUNTY: *Genoa*, larvae, II-25-60.

ELKO COUNTY: *Ruby Lake*, larvae, V-4-60, 5,100 feet; larvae, V-26-60.

LANDER COUNTY: *Kingston Canyon*, larvae, V-3-60, 7,000 feet.

WASHOE COUNTY: *Mt. Rose*, (*Thomas Creek*),

larvae, IV-21-59; larvae, IV-11-60, 6,000 feet; *Hunter Lake*, larvae, VI-11-59, 8,200-8,700 feet; *Gerlach* (21 miles north), larvae, pupae, IV-11-61.

WHITE PINE COUNTY: *Ely*, larvae, V-3-60, 6,000 feet.

Aedes sierrensis (Ludlow)

Taeniorhynchus sierrensis Ludlow, 1905, Canad. Ent. 37:231.

Ecological notes—Larvae were collected for the first time in the State from treeholes in quaking aspen and black cottonwood at elevations of 6,500 and 7,500 feet in the Sierra Nevada Mountains. Because of the general paucity of rainfall in Nevada, breeding of this species is probably restricted to mountainous situations where a single brood usually results in early spring from snow melt in tree holes. Additional breeding may occur with adequate summer precipitation. Adults emerge in May and June but are of little importance because of the paucity of breeding sites. Biting adults were observed in a wooded area in July and September at 6,700 feet.

Taxonomic notes—The small, usually single, antennal hair and very long anal gills are distinctive to *sierrensis* larvae. Adults are easily identified by the bright white bands on the base and apex of the hind tarsi and the white tipped palpi.

Nevada Records

DOUGLAS COUNTY: *Glenbrook*, adult, VIII-25-15 (Dyar 1922).

ORMSBY COUNTY: *Carson City*, adult, VII-2-53 (Richards *et al.* 1956).

WASHOE COUNTY: *Mt. Rose* (*Thomas Creek*), larvae, IV-19-60, 6,500 and 7,500 feet; larvae IX-13-60, 6,500 feet; *Lake Tahoe* (*Marlette Creek*), ♀, VII-12-60, 6,700 feet; ♀, IX-13-60.

Aedes spencerii idahoensis (Theobald)

Grabhamia spencerii var. *idahoensis* Theobald, 1903. Mon. Culic. 3:250.

Ecological notes—Sparse to large numbers of larvae were noted in early summer in the foothills of the Ruby Mountains and adjacent to the Humboldt River in open roadside ditches and meadow pools. Associated species were *A. increpitus*, *A. cinereus*, *A. melanimon*, *A. dorsalis*, *A. fitchii*, and *A. vexans*. *Aedes idahoensis* apparently has a single generation each year and is generally of limited importance although unpublished records of the United States Public Health Service indicated it to be one of the prevalent biting species during an August

survey of the Owyhee Indian Reservation. The writer also observed biting adults in May and June in eastern and north-central Nevada.

Taxonomic notes—The spiculation of the thorax and abdomen of the larvae separate it from other species whereas the bicolored wing scales of the female are diagnostic in separating it from the other *Aedes* with unbanded legs.

Nevada Records

EUREKA COUNTY: *Beowawe*, ♀, VI-21-58 (R. C. Bechtel).

LANDER COUNTY: *Battle Mountain*, adult, VII-21-53 (Richards *et al.* 1956).

HUMBOLDT COUNTY: *Golconda*, ♀, V-25-62; *Winnemucca*, ♀, VI-13-62.

Aedes vexans (Meigen)

Culex vexans Meigen, 1830, Syst. Besch. Zweifl. Ins. 6:241.

Ecological notes—The aquatic stages of this species were observed from April to November, usually in roadside ditches and potholes and sloughs. While it has a general Statewide distribution in the valleys, it has not adapted to breeding in irrigated fields as have its many-brooded companion species *dorsalis*, *melanimon*, and *nigromaculis*. *Aedes vexans* larvae were noted in pastures only on several occasions during the 3 years of observation. Potential breeding areas adjacent to rivers might be important but owing to low runoff from the mountains, no such habitats were flooded during our observations.

Attacks from adults of this species are undoubtedly often over-shadowed by the tremendous numbers of biting *dorsalis* and *nigromaculis*. The few times *vexans* was a fairly abundant pest was when it was in the company of *melanimon*.

Taxonomic notes—The arrangement of the pentad hairs on the eighth abdominal segment is diagnostic in separating it from all *Aedes* larvae possessing detached pecten except *cinereus*. The upper, lower, and pre-antennal head hairs of *vexans* are not arranged in a straight line as they are in *cinereus*. The notched basal pale bands on the abdominal segments and very narrow basal tarsal bands easily separate *vexans* adults from adults of other related species.

Richards *et al.* (1956) reported *vexans* additionally from Douglas, Lander, and Pershing Counties.

Nevada Records

CHURCHILL COUNTY: *Fallon*, larvae, X-28-58; larvae, VII-29-59; larvae, VIII-19-59; larvae, IX-8-59; larvae, XI-3-59.

CLARK COUNTY: *Overton*, ♀, V-9-58 (R. C. Bechtel); *Mesquite*, ♀, IX-26-57 (R. C. Bechtel); *Bunkerville*, ♀, V-10-58 (R. C. Bechtel); *Moapa*, larvae, VII-21-60.

ELKO COUNTY: *Carlin*, ♀, VI-3-58 (R. C. Bechtel); *Lamoille*, larvae, VI-2-59; *Deeth*, larvae, V-27-60.

EUREKA COUNTY: *Beowawe*, ♀, VI-21-58 (R. C. Bechtel).

HUMBOLDT COUNTY: *Winnemucca*, ♀, larvae, VI-18-59; *Golconda*, ♀, VI-3-58 (R. C. Bechtel); larvae, V-5-60.

LINCOLN COUNTY: *Caliente*, ♀, VII-20-58 (R. C. Bechtel).

LYON COUNTY: *Dayton*, larvae, V-13-59; larvae, IV-4-60; *Yerington*, larvae, VIII-17-59; larvae, V-24-60.

MINERAL COUNTY: *Schurz*, larvae, V-16-60.

WASHOE COUNTY: *Wadsworth*, larvae, IV-16-59; larvae, V-19-59; larvae, IX-4-59; larvae, IV-21-60.

KEY TO ADULT FEMALES OF *CULEX*

1. Proboscis completely encircled with distinct pale band..... 2
Proboscis not completely encircled with distinct pale band..... 3
2. Anterior surface of fore femur and tibia with a line of white scales or spots.....*tarsalis* (Coq.)
Anterior surface of fore femur and tibia without a line of white scales or spots.....*peus* Speiser
3. Abdominal segments with basal lateral scaling..... 4
Abdominal segments with apical lateral scaling..... 5
4. Hind tarsal segments ringed; thorax dark.....*thriambus* Dyar
Hind tarsal segments not ringed; thorax reddish.....*erythrothorax* Dyar
5. Ventral pale stripe of hind femur ending shortly before apex; palpi about 3 times as long as flagellar segment 4.....*apicalis* Adams
Ventral pale stripe of hind femur complete; palpi about 2 times as long as flagellar segment 4..... 6
6. Pale scales of vertex ashy white; abdominal segment 5 of unengorged dried specimens about 1.3 times as broad as long.....*territans* Walker
Pale scales of vertex with yellowish tinge; abdominal segment 5 of unengorged specimens about 1.5 to 1.7 times as broad as long.....*boharti* Brookman & Reeves

KEY TO ADULT MALES OF *CULEX* BASED ON GENITALIA

1. Tenth sternite crowned apically with single comblike row of blunt teeth..... 2
Tenth sternite crowned apically with a dense tuft of spines or bristles..... 4
2. Phallosome plates not connected subapically by a sclerotized bridge.....*apicalis* Adams
Phallosome plates connected subapically by a sclerotized bridge..... 3
3. Phallosome strongly narrowed and heavily sclerotized apically; subapical bridge stout.....*boharti* Brookman & Reeves
Phallosome broadly rounded apically, usually not heavily sclerotized; subapical bridge narrow.....*territans* Walker
4. Leaflike filament of subapical lobe narrow; crown of tenth sternite with blunt outer spines.....*tarsalis* (Coq.).
Leaflike filament of subapical lobe rather broad; crown of tenth sternite either with all spines pointed or with outer spines blunt..... 5
5. Subapical lobe of basistyle with only 5 appendages.....*thriambus* Dyar
Subapical lobe of basistyle with 6 appendages..... 6
6. Each plate of phallosome with about 4 stout pointed teeth adjacent to a group of compact slender teeth which arise from inner side of ventral arm.....*peus* Speiser
Each plate of phallosome with about 7 to 12 strong teeth, without teeth on inner side of ventral arm.....*erythrothorax* Dyar

KEY TO FOURTH INSTAR LARVAE OF *CULEX*

1. Upper frontal head hairs single to triple; lower frontal head hairs single to double..... 2
Upper and lower frontal head hairs triple to multiple..... 4
2. Siphon 7 times or more its greatest diameter with the basal diameter about twice its apical diameter; siphonal tufts relatively short.....*apicalis* Adams
Siphon less than 7 times its greatest diameter with the basal diameter much less than twice its apical diameter; siphonal tufts 1/3 to 1/2 as long as siphon..... 3
3. Abdominal segment 4 much paler than 3 and 5; spicules relatively slender near dorsal apex of saddle.....*boharti* Brookman & Reeves
Abdominal segments evenly pigmented; spicules becoming coarse near dorsal apex of saddle.....*territans* Walker
4. Siphonal tufts all inserted in a straight line.....*tarsalis* Coq.
One or more of siphonal tufts inserted laterally out of line..... 5
5. Siphonal hairs mostly single.....*thriambus* Dyar
Siphonal hairs double to multiple..... 6
6. Siphon 6 to 7 times as long as greatest diameter; spicules not much larger toward apex of saddle than at dorsal middle.....*erythrothorax* Dyar
Siphon 4 to 5 times as long as greatest diameter; spicules much larger toward apex of saddle than at dorsal middle.....*peus* Speiser

Culex apicalis Adams

Culex apicalis Adams, 1903, Kans. Univ. Sc. Bull. 2:26.

Ecological notes—This mosquito, previously known in our country from California, Arizona, Texas, and Utah, was recently reported from the State (Chapman 1961b). The aquatic stages of *apicalis* in the State appear to be restricted to water emanating from fresh water springs in such habitats as open and shaded pools, streams, roadside ditches, and the immediate area of the springs. It was commonly collected from midsummer until November at elevations of 4,700–6,400 feet in the foothills and mountainous areas of the Sierra Nevada Mountains. Companion species were *Culex boharti*, *C. erythrothorax*, *C. peus*, *Culiseta incidens*, and *C. inornata*. Adult females are supposed to feed only on cold blooded animals and therefore are of no economic importance.

Taxonomic notes—The very long, thin siphon (7 x 1) is diagnostic in the larvae whereas the long palpi differentiate it from other *Neoculex* females. While larvae of *apicalis* and *territans* are easily separated by eye in the West, the characters used in keys to differentiate these species, i.e., the length and shape of the siphon and relative length of siphonal hairs to length of siphon, are not tenable on a nationwide basis. The writer has collected *territans* larvae from Florida that possess the above mentioned characters supposedly indigenous to *apicalis*.

Nevada Records

DOUGLAS COUNTY: *Glenbrook*, larvae, VIII–6–59, 6,400 feet; *Stateline*, larvae, VIII–6–59, 6,300 feet; *Gardnerville*, larvae, X–24–60, 5,000 feet.

LYON COUNTY: *Silver City*, larvae, VIII–26–59, 5,000 feet; larvae, XI–12–59, 4,700 feet; *Dayton*, larvae, XI–17–60.

WASHOE COUNTY: *Mt. Rose*, larvae, IX–10–59, 5,500–6,000 feet; larvae, X–13–59, 5,000 feet; *Verdi*, larvae, VII–28–61.

Culex boharti Brookman and Reeves

Culex boharti Brookman and Reeves, 1950, Pan-Pac. Ent. 26:159.

Ecological notes—Larvae were noted in the foothills of both the Sierra Nevada and Ruby Mountains as well as in the Lake Tahoe area. It has a much wider distribution in the State than the other *Neoculex* species. *Culex boharti* was usually collected in habitats fed by fresh-water springs such as open and shaded pools and streams. Companion species were *Culex apicalis* and *Culiseta incidens*. Adults of *boharti* are not known to bite man and are both rare and unimportant.

Taxonomic notes—The spotted appearance (less pigmentation of the fourth abdominal segment) of larvae appears to be a stable character for separation from other *Neoculex* in the State. The use of this character on a countrywide basis is untenable since the writer has collected series of *territans* larvae from Michigan and Georgia which show the absence of spiculation of the fourth abdominal segment. Females of *boharti* are separated from *territans* only by the characters used in the key.

Nevada Records

ELKO COUNTY: *Lamoille*, larvae, VI–2–59.

LYON COUNTY: *Silver City*, larvae, V–21–59, 5,000 feet; larvae, VIII–26–59, 5,000 feet.

ORMSBY COUNTY: *Lake Tahoe*, larvae, VI–13–60, 6,700 feet.

WASHOE COUNTY: *Lake Tahoe*, larvae, VI–13–60, 6,700 feet; *Mt. Rose*, larvae, IX–10–59, 5,000 feet; larvae, X–13–59, 4,600 feet; *Verdi*, larvae, V–6–59; larvae, VII–17–53 (Richards *et al.* 1956).

Culex erythrothorax Dyar

Culex erythrothorax Dyar, 1907, Proc. U.S. Natl. Mus. 32:124.

Ecological notes—Many biological and ecological observations on this species were reported by Chapman (1959b, 1962b). It overwinters in the State, principally as larvae. While larvae were collected every month but August, the main overwintering brood usually begins in September and October, overwinters as second to fourth instar larvae, and adults emerge in March and April. Open permanent ponds and springs with three-square (*Scirpus olneyi* Gray) and the common tule in the valleys are the preferred habitats. Associated species were *C. tarsalis*, *Anopheles freeborni*, and *Culiseta inornata*. Biting adults were noted in February, May, October, and November. It is possible that some of the few females which emerge in early November overwinter as adults. Females bite throughout the daytime but are relatively unimportant because of the general paucity of breeding areas.

A colony was carried through 9 generations by the writer and autogeny was observed from one field population in the laboratory.

Taxonomic notes—The multiple head hairs, long siphon (6 or 7 x 1), and short siphonal hairs are diagnostic in the larval stage as is the reddish thorax in the adults.

Nevada Records

CHURCHILL COUNTY: *Fallon*, larvae, XII–30–58; larvae, I–16–59; larvae II–2–59; larvae, III–5–59;

larvae, IV-7-59; larvae, ♀, V-13-59; larvae, VI-18-59; larvae, IX-22-59; larvae, X-15-59; ♀, X-21-59; larvae, XI-3-59; larvae, XII-1-59.

DOUGLAS COUNTY: *Genoa*, larvae, XII-12-60.

LYON COUNTY: *Smith*, adult, VIII-14-53 (Richards *et al.* 1956); *Yerington*, larvae, IX-16-59; *Silver City*, larvae, XI-12-59, 5,000 feet; *Fernley*, larvae, X-28-58; larvae, I-16-59; larvae, II-5-59; larvae, III-5-59; larvae, IV-16-59; larvae, ♀, V-13-59; larvae, XI-12-59.

MINERAL COUNTY: *Walker Lake*, larvae, XII-7-59; larvae, I-15-60; *Schurz*, larvae, II-23-60; *Mina*, larvae, III-2-60; larvae, II-6-61.

NYE COUNTY: *Beatty*, larvae, VI-24-59; ♀, larvae, II-6-61; *Ash Meadows*, larvae, ♀, VII-19-60; ♀, larvae, II-8-61.

ORMSBY COUNTY: *Carson City*, larvae, II-12-60; larvae, X-21-60.

WASHOE COUNTY: *Reno*, larvae, X-8-58; larvae, ♀, XI-3-58; XII-2-58; larvae, I-5-59; larvae, II-5-59; larvae, ♀, IX-16-59; *Gerlach*, larvae, II-24-60; larvae, XII-9-60.

Culex peus Speiser

Culex peus Speiser, 1904, Insekten-börse, 21:148.

Ecological notes—Larvae were noted from May to November, usually in the valleys; but collections were made at elevations up to 6,400 feet in the Lake Tahoe area. Habitats included seep ponds and potholes, roadside ditches, sewage disposal plants, and water barrels. It was especially abundant in polluted situations and was never collected in the eastern or southern parts of the State. *Culex tarsalis*, *Culiseta inornata*, and *C. incidens* were associated species. Very little is known of the adult biting habits of *peus* and no biting was ever observed.

Taxonomic notes—The presence of multiple head hairs, very evident spicules on the apex of the anal saddle, and all siphonal hairs not inserted in a straight line, separate it from larvae of *erythrothorax* and *tarsalis*. The pale banding of the proboscis and the absence of the spotted line on the fore femur and tibia are diagnostic in the adults.

Nevada Records

CHURCHILL COUNTY: *Fallon*, larvae, IX-18-58; larvae, X-28-58; larvae, XI-5-58; larvae, XI-1-60.

DOUGLAS COUNTY: *Stateline*, larvae, VIII-6-59, 6,400 feet.

LYON COUNTY: *Yerington*, larvae, IX-16-59;

Dayton, larvae, XI-17-60; adult, IX-11-53 (Richards *et al.* 1956).

WASHOE COUNTY: *Reno*, larvae, IX-4-58; larvae, VII-8-60; larvae, X-23-60; *Washoe Valley*, ♀, VIII-27-58; *Verdi*, larvae, V-6-59.

Culex tarsalis Coquillett

Culex tarsalis Coquillett, 1896, Can. Ent. 28:43.

Ecological notes—This ubiquitous species was found breeding in every county and in almost every conceivable habitat from artificial containers to mountain meadow pools up to 9,500 feet in elevation. It was commonly collected adjacent to hot springs but seems to prefer alkaline seep areas, permanent and temporary pools, irrigation drain ditches, and tail-end water from irrigation. Breeding extends from April to early December with a peak in August or September. In midsummer adults can emerge from irrigated fields which contain water for a minimum of 10 days. Companion species were *Culiseta inornata*, *C. incidens*, *Anopheles freeborni*, *A. p. franciscanus*, and the *Aedes* spp. produced by irrigations. *Culex tarsalis* overwinters as a nulliparous female and was commonly observed in cellars and damp, abandoned mines (Chapman 1961c). It is a fairly important night-biting pest in improperly screened houses; no daytime biting was observed. This species is the principal vector in the West of Western encephalitis virus.

More than 25 percent of a field population was observed to be autogenous in the laboratory.

Taxonomic notes—Larvae are easily differentiated from other species by the multiple head hairs and siphonal tufts inserted in a straight line. The spotted line of the fore femur and tibia plus the V-shaped mark of the ventral abdominal segments are diagnostic in the adults.

Richards *et al.* (1956) reported it from every county except Esmeralda, Eureka, and Humboldt.

Nevada Records

CHURCHILL COUNTY: *Fallon*, larvae, VII-7-58; larvae, VIII-7-58; larvae, IX-9-58; larvae, X-14-58; larvae, XI-25-58; larvae, IV-16-59; larvae, V-13-59; larvae, VI-18-59; larvae, XI-10-59; larvae, XII-1-59.

CLARK COUNTY: *Bunkerville*, larvae, IV-15-59 (R. C. Bechtel); *Henderson*, VI-10-59 (R. C. Bechtel); *Moapa*, larvae, VI-22-59; *Overton*, larvae, IV-16-59 (R. C. Bechtel); larvae, VI-23-59.

DOUGLAS COUNTY: *Minden City*, larvae, VII-5-58; larvae, IV-29-59; larvae, X-30-58; *Lake Tahoe*, larvae, IX-1-58; *Stateline*, larvae, VIII-6-59, 6,400 feet; *Genoa*, larvae, IV-6-60.

ELKO COUNTY: *Lamoille*, larvae, VI-22-60; *Owyhee*, larvae, ♀, VIII-19-56 (USPHS); *Carlin*, larvae, V-5-60; *Deeth*, larvae, V-27-60; *Wells*, larvae, V-27-60; *Wilkins*, larvae, VI-23-60.

ESMERALDA COUNTY: *Lida*, larvae, VII-19-60.

EUREKA COUNTY: *Palisade*, larvae, V-5-60; *Dunphy*, larvae, VI-23-60; *Eureka*, larvae, VII-22-60.

HUMBOLDT COUNTY: *Golconda*, larvae, VI-3-59; larvae, VII-8-59; larvae, V-5-60; *McDermitt*, larvae, VII-21-59; *Winnemucca*, larvae, VI-19-59; larvae, VII-7-59.

LANDER COUNTY: *Austin*, larvae, VII-22-60; *Battle Mountain*, larvae, V-27-60.

LINCOLN COUNTY: *Alamo*, larvae, IV-15-59 (R. C. Bechtel); *Caliente*, larvae, VI-22-59; *Crystal Springs*, larvae, VI-22-59; *Panaca*, larvae, V-8-59 (R. C. Bechtel).

LYON COUNTY: *Dayton*, larvae, IX-16-58; larvae, V-13-59; *Fernley*, larvae, IX-18-58; larvae, X-14-58; larvae, XI-18-59; larvae, XII-1-59; *Silver City*, ♀, X-30-59; ♀, XI-19-59; ♀, XII-4-59; *Yerington*, larvae, IX-16-59.

MINERAL COUNTY: *Walker Lake*, larvae, XII-7-59.

NYE COUNTY: *Beatty*, larvae, VI-8-59; larvae, VI-24-59; *Ash Meadows*, larvae, VII-19-60; *Gabbs*, larvae, VII-13-61.

ORMSBY COUNTY: *Carson City*, larvae, VIII-5-58; larvae, IV-28-60; *Lake Tahoe*, larvae, X-10-58, 6,400 feet; *Spooner Summit*, larvae, VIII-6-59, 6,200 feet; *Brunswick Canyon*, larvae, V-13-60.

PERSHING COUNTY: *Rabbithole*, larvae, VII-7-59.

STOREY COUNTY: *Virginia City*, larvae, VIII-6-59; larvae, IV-29-60.

WASHOE COUNTY: *Empire*, larvae, VIII-7-59; *Gerlach*, larvae, VII-7-59; *Pyramid Lake*, larvae, VII-7-59; larvae, VIII-21-59; *Mt. Rose*, larvae, VIII-26-58, 7,500 feet; larvae, VI-30-59, 9,500 feet; *Lake Tahoe*, larvae, VII-11-59; *Hunter Lake*, larvae, VII-23-59, 8,500 feet; *Reno*, larvae, VII-2-58; larvae, ♀, ♂, VIII-14-58; larvae, X-15-58; *Washoe Valley*, larvae, VII-30-58; ♀, VII-30-58; ♀, ♂, VIII-27-58; larvae, XI-21-58; *Steamboat Springs*, larvae, V-11-59; larvae, IX-5-59; ♀, XI-12-59; ♀, XII-4-59; *Verdi*, larvae, V-6-59; *Wadsworth*, larvae, IV-30-59; larvae, V-27-59.

WHITE PINE COUNTY: *Sacramento Pass*, larvae, VII-20-60, 7,100 feet; *Ely*, larvae, VII-20-60.

Culex territans Walker

Culex territans Walker, 1856, Insecta Saundersiana, Dipt., 1:428.

Ecological notes—Larval populations were noted only in the Sierra Nevada Mountains adjacent to Lake Tahoe except for a recent collection in the Ruby Mountains (Nielsen *et al.* 1963). Habitats were the margins of permanent ponds and pools with the aquatic stages probably present from late spring until October. Companion species were *C. tarsalis* and *Anopheles freeborni*. *Culex territans* is not thought to feed on warm-blooded animals.

Taxonomic notes—The even pigmentation of the abdominal segments and shorter siphon (less than 7 x 1) separate the larvae whereas the adult female is separated from *boharti* only by the characters used in the key.

Nevada Records

DOUGLAS COUNTY: *Lake Tahoe*, larvae, IX-1-58, 6,300 feet.

ELKO COUNTY: *Lamoille Canyon*, larvae, VIII-24-62, 8,700 feet (Nielsen).

ORMSBY COUNTY: *Lake Tahoe*, larvae, X-10-58, 6,500 feet; larvae, VII-11-59, 6,500 feet; larvae, VIII-6-59.

WASHOE COUNTY: *Lake Tahoe*, larvae, VII-4-59, 6,300 feet.

Culex thriambus Dyar

Culex thriambus Dyar, 1921, Ins. Ins. Mens. 9:33.

Ecological notes—This species is apparently restricted to the southern part of the State where the larvae were noted only in shaded fresh water springs. Companion species were *Culiseta inornata* and *Culex tarsalis*. The adult biting habits of *thriambus* are not known, although landing adult females were observed. It is a rare species and of no importance.

Taxonomic notes—The usually single siphonal hairs differentiate it from other larvae in the State. The banded tarsal segments with the absence of a pale ring completely encircling the proboscis is diagnostic in the adults.

Nevada Records

CLARK COUNTY: *Cactus Springs*, larvae, ♀, VI-24-59; larvae, VII-22-53 (Richards *et al.* 1956).

LINCOLN COUNTY: *Crystal Springs*, larvae, VI-22-59.

KEY TO ADULT FEMALES OF *ANOPHELES*

1. Wings with pale areas or scales
*pseudopunctipennis franciscanus* McCracken
 Wings with only dark areas.....*freeborni* Aitken

KEY TO ADULT MALES OF *ANOPHELES* BASED ON GENITALIA

1. Leaflets of phallosome extremely delicate and hard to discern
*pseudopunctipennis franciscanus* McCracken
 Leaflets of phallosome very distinct.....*freeborni* Aitken

KEY TO FOURTH INSTAR LARVAE OF *ANOPHELES*

1. Outer clypeal hair 3 simple.....*pseudopunctipennis franciscanus* McCracken
 Outer clypeal hair 3 feathered.....*freeborni* Aitken

Anopheles pseudopunctipennis franciscanus McCracken

Anopheles franciscanus McCracken, 1904, Ent. News 15:12.

Ecological notes—This species occurs the full length of the State, although it probably is more common in the southern portion. The aquatic stages are found from early spring until November in open springs and open spring-fed pools and seep areas, generally adjacent to the foothills. Larvae were collected up to 5,495 feet in elevation. Large larval populations were observed once in portions of the Carson River in October when the River began to dry up and form pools. Companion species were *Culiseta inornata*, *Culex tarsalis*, and *Anopheles freeborni*. Females of *franciscanus* were often observed overwintering in damp, abandoned mines from October to March. Only several attacks were noted from this species and it probably is of little importance because of the general scarcity of breeding habitats.

Taxonomic notes—The simple outer clypeals of the larvae and the presence of pale scales or pale areas in the wing of the adult, easily separate it from *freeborni*.

Nevada Records

CLARK COUNTY: *Moapa*, larvae, VI-22-59; *Overton*, larvae, VI-23-59; *Mt. Springs Summit*, larvae, VIII-6-59, 5,495 feet (R. C. Bechtel); *Indian Springs*, adults, V-26-40 (Richards *et al.* 1956); *Tule Springs*, adult, V-24-40 (Richards *et al.* 1956); *Arden*, larvae, VII-20-60.

DOUGLAS COUNTY: *Gardnerville* (Carson River), larvae, X-24-60.

LINCOLN COUNTY: *Caliente*, larvae, VI-22-59.

LYON COUNTY: *Dayton*, ♀, X-13-59; larvae, X-9-53 (Richards *et al.* 1956); *Dayton* (Carson River), larvae, X-17-60; *Silver City*, ♀, ♂, X-30-59, 5,000 feet.

NYE COUNTY: *Beatty*, larvae, VII-23-53 (Richards *et al.* 1956); *Springdale*, larvae, VII-9-60.

ORMSBY COUNTY: *Brunswick Canyon*, larvae, X-21-60.

STOREY COUNTY: *Virginia City*, ♀, XII-11-59.

WASHOE COUNTY: *Pyramid Lake*, larvae, VII-7-59; larvae, VIII-21-59; *Steamboat Springs*, ♀, XII-4-59.

Anopheles freeborni Aitken

Anopheles maculipennis freeborni Aitken, 1939, Pan-Pac. Ent. 15:192.

Ecological notes—Larvae were noted from early April to November in open permanent-water situations

such as lake and stream margins, seep areas, ponds, and fresh water springs. This species was the common carrier of malaria in the West and it is distributed throughout the State at lower elevations. It was also collected in the Lake Tahoe area at 6,400 feet in elevation. Associated species were *Culex tarsalis*, *C. erythrothorax*, *Culiseta inornata*, and *Anopheles pseudopunctipennis franciscanus*. Females of *freeborni* were observed in damp, abandoned mines throughout the winter months. With the tremendous decrease of malaria in the United States, the importance of this species is confined to a pest role, in which it is usually of limited importance.

Taxonomic notes—The feathered outer clypeals of the larvae and the absence of pale areas or scales in the wing of the adults are diagnostic.

In addition to some of the counties listed below, Richards *et al.* (1956) reported it from Lander.

Nevada Records

CLARK COUNTY: *Overton*, larvae, VI-23-59.

CHURCHILL COUNTY: *Fallon*, larvae, VIII-28-58; larvae, IX-18-58; ♀, II-26-59; ♀, I-31-59; ♀, VIII-2-59; *Hazen*, larvae, IV-13-60; ♀, III-31-61.

DOUGLAS COUNTY: *Minden City*, larvae, VIII-5-58; larvae, IV-21-59; *Gardnerville*, larvae, X-24-60.

HUMBOLDT COUNTY: *McDermitt*, larvae, VII-21-59.

LINCOLN COUNTY: *Alamo*, larvae, IV-15-59 (R. C. Bechtel); ♀, VII-21-59 (R. C. Bechtel); *Caliente*, ♀, VII-21-58 (R. C. Bechtel); larvae, VI-22-59; *Crystal Springs*, larvae, VI-22-59; *Pahrnagat Valley*, larvae, VI-22-59.

ELKO COUNTY: *Deeth*, larvae, V-27-60; *Owyhee*, ♀, VIII-19-56 (USPHS).

EUREKA COUNTY: *Palisade*, larvae, V-5-60.

LYON COUNTY: *Fernley*, larvae, V-21-58 (R. C. Bechtel); larvae, IX-18-58; larvae, X-14-58; *Dayton*, larvae, IX-16-58; larvae, IV-7-59; larvae, V-21-59; ♀, III-20-59; *Silver City*, larvae, V-21-59.

MINERAL COUNTY: *Schurz*, larvae, VII-26-60.

NYE COUNTY: *Beatty*, larvae, VI-24-59; ♀, II-24-61; *Pahrump*, larvae, VI-9-59 (R. C. Bechtel); *Springdale*, larvae, VII-19-60; *Ash Meadows*, larvae, VII-19-60.

ORMSBY COUNTY: *Lake Tahoe*, larvae, X-10-58, 6,400 feet; larvae, VIII-6-59, 6,400 feet; *Spooner Summit*, larvae, VIII-6-59, 6,200 feet; *Brunswick Canyon*, larvae, V-13-60.

PERSHING COUNTY: *Lovelock*, larvae, V-29-58 (R. C. Bechtel).

STOREY COUNTY: *Virginia City*, ♀, XII-11-59; larvae, VII-8-60.

WASHOE COUNTY: *Reno*, larvae, VII-15-58; larvae, VIII-13-58; ♀, VIII-18-58; larvae, X-15-58; *Sparks*, larvae, XI-4-58; *Washoe Valley*, larvae, VII-30-58; *Verdi*, larvae, V-6-59; *Steamboat Springs*, larvae, V-11-59; ♀, XI-12-59; ♀, XII-4-59.

KEY TO ADULT FEMALES OF *CULISETA*

1. Wing without distinct wing spots..... 2
Wing with distinct wing spots.....*incidens* (Thomson)
2. Costal vein of wing with mixed dark and pale scales; dorsal aspect of fore femur with an abundance of pale scales.....*inornata* (Williston)
Costal vein of wing dark scaled; dorsal aspect of fore femur with few or no pale scales.....*impatiens* (Walker)

KEY TO ADULT MALES OF *CULISETA* BASED ON GENITALIA

1. Lobes of ninth tergite bluntly rounded, very dark, and bearing many short stout spines.....*inornata* (Williston)
Lobes of ninth tergite slightly elevated, lightly sclerotized, and bearing long slender setae..... 2
2. Median apical margin of eighth tergite with a long row of about 30-40 stout short spines.....*impatiens* (Walker)
Eighth tergite with one stout median apical spine or median apical clump of several spines.....*incidens* (Thomson)

KEY TO THE FOURTH INSTAR LARVAE OF *CULISETA*

1. Upper and lower frontal head hairs with branches similar in size and number.....*impatiens* (Walker)
Lower frontal head hairs with fewer branches and longer than the upper frontal head hairs..... 2
2. Lateral hair of anal segment as long or longer than saddle; prothoracic hair 1 usually single and longer than head; post-clypeal hair three or more branched and easy to discern.....*inornata* (Williston)
Lateral hair of anal segment considerably shorter than saddle; prothoracic hair 1 usually double or more and much shorter than head; post-clypeal hair usually double, small, and very difficult to discern.....*incidens* (Thomson)

Culiseta impatiens (Walker)

Culex impatiens Walker, 1848, List Dipt. Brit. Mus. 1:5.

Ecological notes—Larvae of this rare, apparently one-brooded species, were noted in the Ruby Mountains in shaded pools in May and June at an elevation of 7,200 feet. Egg rafts were collected in early and latter June in shaded pools adjacent to a mountain stream. Associated species were *Aedes pullatus* and *A. increpitus*. *Culiseta impatiens* probably overwinters as adult females and is of little importance. No biting was observed.

Taxonomic notes—Similar length and number of branches of the upper and lower frontal head hairs are diagnostic in the larvae. The absence of pale scales or dark clumps of scales on the wing differentiates the adults from other species.

Nevada Records

ELKO COUNTY: *Lamoille Canyon*, larvae, V-20-59 (R. C. Bechtel); egg raft, VI-2-59, 7,200 feet; larvae, egg rafts, VI-22-60, 7,200 feet; *Harrison Pass*, larvae, VII-29-53 (Richards *et al.* 1956).

Culiseta incidens (Thomson)

Culex incidens Thomson, 1869, Kingl. Sven. Freg. Eug. Resa 6 (Dipt.):443.

Ecological notes—The aquatic stages were observed from April to October in a variety of habitats which included a basement sump hole, fresh-water springs, seeps, open and shaded mountain springs, and meadow pools up to 9,500 feet in elevation. Larval populations were most abundant in latter June following the termination of snow-water *Aedes* breeding and again in late fall, especially in overflow pools adjacent to mountain springs. Companion species were *C. inornata*, *Culex tarsalis*, and *C. apicalis*. Adults of *incidens* were often noted resting under culverts and bridges in the daytime during the summer in the foothills and mountains. It overwinters as an adult female and is probably of limited importance as a pest of man. Biting was observed only in June on several occasions in the mountains (6,300 and 8,100 feet). Autogeny was observed in one field population in the laboratory.

Taxonomic notes—The lower frontal head hairs are longer and fewer in number than the upper frontal head hairs, which separates *incidens* larvae from *impatiens*. The prothoracic hair 1 of *incidens* larvae is usually at least double and shorter than the head which will separate it from *inornata*. The black clumps of scales in the wings are diagnostic in the adults.

Nevada Records

DOUGLAS COUNTY: *Minden City*, larvae, IV-29-59; *Glenbrook*, larvae, VIII-6-59, 6,400 feet; ♀, VI-6-60, 6,300 feet; *Stateline*, larvae, VIII-6-59; *Spooner Lake*, larvae, VI-8-60, 7,000 feet.

ESMERALDA COUNTY: *Dyer*, larvae, VII-19-60, 6,500-7,000 feet.

ELKO COUNTY: *Wilkins*, larvae, VI-23-60.

HUMBOLDT COUNTY: *Orvada*, larvae, VII-21-59.

LINCOLN COUNTY: *Caliente*, larvae, VI-22-59.

LYON COUNTY: *Silver City*, larvae, V-21-59; *Fort Churchill*, larvae, V-24-60; *Wabuska*, larvae, VII-8-60.

ORMSBY COUNTY: *Lake Tahoe*, larvae, VI-13-60; *Marlette Lake*, larvae, VI-8-60, 7,500-8,300 feet; *Carson City*, larvae, ♀, ♂, VII-12-60.

STOREY COUNTY: *Virginia City*, larvae, IV-29-60.

WASHOE COUNTY: *Washoe Valley*, ♀, ♂, VIII-5-58; ♀, ♂, VIII-27-58; *Reno*, larvae, VIII-5-58; larvae, VI-6-59; *Mt. Rose*, larvae, VIII-26-58, 7,800 feet; larvae, VI-30-59, 9,500 feet; larvae, IX-10-59; ♀, VI-18-60, 8,100 feet; *Hunter Lake*, larvae, VII-23-59, 8,500 feet; *Lake Tahoe*, larvae, VII-4-59, 6,300 feet; *Pyramid Lake*, larvae, VII-7-59; *Verdi*, larvae, X-7-58; *Empire*, larvae, VII-7-59; *Marlette Lake*, larvae, VI-8-60, 8,000 feet.

WHITE PINE COUNTY: *Preston*, larvae, VI-16-59 (R. W. Lauderdale).

Culiseta inornata (Williston)

Culex inornatus Williston, 1893, U.S. Dept. Agr. Div. Ornith. Man. N. Amer. Fauna. 7:253.

Ecological notes—This is one of the most common and widespread species in the State since all its stages were observed every month of the year and it is known from every county. Large larval populations are present throughout the summer, which is contrary to reported observations in California and most other States. Larval populations and egg rafts encased in ice were noted in the winter. This species utilizes a tremendous variety of habitats but probably reaches its optimum numbers in alkaline situations. Habitats included irrigated fields; artificial containers; alkaline seeps, sinks, and lakes; ditches; ponds; and, rarely, in mountain meadow pools up to 8,500 feet in elevation. Companion species were *Culiseta incidens*, *Culex tarsalis*, *C. erythrothorax*, *Anopheles freeborni*, *Aedes dorsalis*, *A. niphadopsis*, and *A. campestris*. Throughout the year males and

females were observed resting in vegetation adjacent to their aquatic sites. Since only several biting attacks were noted from *inornata*, the species is probably only important as a biting pest of cattle.

Taxonomic notes—The very long and single prothoracic hair 1 of the larvae and the presence of scattered pale scales on the wings of the adults are diagnostic.

Richards *et al.* (1956) reported it from every county but Esmeralda, Humboldt, Mineral, and Storey.

Nevada Records

CLARK COUNTY: *Bunkerville*, larvae, IV-15-59 (R. C. Bechtel); *Cactus Springs*, larvae, VI-24-59; larvae, II-7-61; *Overton*, larvae, IV-16-59 (R. C. Bechtel); ♀, X-9-59 (R. C. Bechtel); larvae, II-7-61; *Moapa*, larvae, VII-21-60.

CHURCHILL COUNTY: *Fallon*, larvae, VIII-28-58; larvae, IX-29-58; larvae, X-28-58; larvae, XI-25-58; larvae, XII-30-58; larvae, I-16-59; larvae, II-26-59; larvae, III-20-59; larvae, IV-16-59; larvae, V-19-59.

DOUGLAS COUNTY: *Minden City*, larvae, VI-6-58; larvae, IV-29-59; *Genoa*, larvae, IV-6-60.

ELKO COUNTY: *Carlin*, ♀, VI-3-58 (R. C. Bechtel); larvae, V-5-60; *Owyhee*, ♀, larvae, VIII-19-56 (USPHS); *Wilkins*, larvae, VI-23-60; *Jiggs*, larvae, V-4-60; *Wells*, larvae, V-27-60; *Deeth*, larvae, V-27-60.

EUREKA COUNTY: *Palisade*, larvae, ♀, ♂, V-5-60.

HUMBOLDT COUNTY: *Golconda*, larvae, VI-3-58 (R. C. Bechtel); *McDermitt*, larvae, VII-21-59; *Winnemucca*, larvae, VI-18-59; larvae, VII-7-59.

LANDER COUNTY: *Kingston Canyon*, larvae, V-3-60; *Battle Mountain*, larvae, V-27-60; *Austin*, larvae, VII-19-60.

LINCOLN COUNTY: *Panaca*, ♀, V-8-58 (R. C. Bechtel).

LYON COUNTY: *Fernley*, larvae, IX-29-58; larvae, X-14-58; larvae, II-17-59; *Lahonton Reservoir*, larvae, III-10-59; *Dayton*, larvae, XII-30-59; larvae, V-13-59; *Yerington*, ♀, IX-24-56 (USPHS); *Silver City*, larvae, III-18-60.

MINERAL COUNTY: *Schurz*, larvae, II-23-60; *Mina*, larvae, III-2-60; *Walker Lake*, larvae, ♀, ♂, V-16-60.

PERSHING COUNTY: *Lovelock*, larvae, V-26-60.

NYE COUNTY: *Beatty*, larvae, VI-8-59; *Pahrump*, ♀, X-5-59; *Springdale*, larvae, II-6-61; *Gabbs*, larvae, VII-13-61.

ORMSBY COUNTY: *Carson City*, larvae, II-12-

60; larvae, IV-28-60; *Brunswick Canyon*, larvae, V-13-60.

STOREY COUNTY: *Six Mile Canyon*, larvae, III-15-60; *Gold Hill*, larvae, IV-4-60.

WASHOE COUNTY: *Lake Tahoe*, larvae, VII-4-59, 6,300 feet; *Pyramid Lake*, larvae, VII-7-59; *Empire*, larvae, VII-7-59; *Hunter Lake*, larvae, VII-23-59, 8,500 feet; *Verdi*, larvae, V-6-59; *Wadsworth*, larvae, IV-30-59; *Steamboat Springs*, larvae, V-11-59; *Reno*, ♀, VIII-14-58; larvae, IX-5-58; *Mt. Rose*, larvae, VIII-24-59, 7,500 feet; ♀, VIII-26-58, 7,800 feet; ♀, VI-18-60, 8,100 feet; *Washoe Valley*, ♀, ♂, VII-1-58; *Gerlach*, larvae, II-24-60; larvae, I-24-61.

WHITE PINE COUNTY: *Ely*, larvae, V-3-60; larvae, VII-22-60; *McGill*, larvae, V-4-60; *Sacramento Pass*, larvae, VII-22-60, 7,100 feet.

ESMERALDA COUNTY: *Dyer*, larvae, VII-19-60; *Lida*, larvae, VII-19-60.

Psorophora confinnis (Lynch Arribálzaga)

Taeniorhynchus confinnis Lynch Arribálzaga, 1891. Rev. Mus. de la Plata, 2:149.

Ecological notes—This species was only recently reported from the southern portion of the State (Chapman 1961a). It is an unwelcome addition to the insect fauna because of its severe biting habits in other irrigated areas of the country. Substantial numbers of second- to fourth-instar larvae were collected from several drain ditches adjacent to an alfalfa field. Associated species were *Aedes dorsalis* and *A. vexans*. No adult activity of *confinnis* was noted. The distribution and importance of this many-brooded species in the State are unknown.

Taxonomic notes—The inflated siphon of the larvae and the presence of a pointed abdomen and spiracular bristles in the females delimit it from other species.

Nevada Records

CLARK COUNTY: *Moapa*, larvae, VII-21-60.

Uranotaenia anhydor Dyar

Uranotaenia anhydor Dyar, 1907, Proc. U.S. Natl. Mus. 32:128.

Ecological notes—Larvae have been collected only once in the State. The habitat was a depression adjacent to a fresh-water spring in the Amargosa Desert. Three-square was the principal vegetation. This multivoltine mosquito is probably restricted to this isolated area which contains many springs and adjacent swampy

areas. Associated species were *Culex tarsalis*, *C. erythrothorax*, *Anopheles freeborni*, and *Chrysops latifrons* Brennan. *Uranotaenia anhydor* is of no importance because of its rarity and unknown feeding habits.

Taxonomic notes—The elongate, dark head and spinelike upper and lower frontal head hairs delimit

it from other larvae, whereas the relative length of the second marginal cell to its petiole is diagnostic in the adult.

Nevada Records

NYE COUNTY: *Ash Meadows (Amargosa Desert)*, larvae, VII-19-60; *Ash Meadows (Fairbanks Springs)*, ♀, VIII-21-49 (C. B. Philip).

HABITAT ASSOCIATIONS OF SPECIES

The general distribution and species association in broad ecological habitats are given in Table 1. The species are also categorized as to whether they are one or many brooded within the State.

TABLE 1. DISTRIBUTION OF MOSQUITOES IN BROAD ECOLOGICAL HABITATS

Habitats	SPECIES ASSOCIATION	
	Univoltine ¹	Multivoltine
Irrigation areas.....	<i>Aedes cinereus</i> <i>spencerii idahoensis</i>	<i>Aedes dorsalis</i> <i>melanimon</i> <i>nigromaculis</i> <i>vexans</i> <i>Culex tarsalis</i> <i>Psorophora confinnis</i>
Alkaline areas.....	<i>Aedes campestris</i> <i>niphadopsis</i>	<i>Aedes dorsalis</i> <i>Culex tarsalis</i> <i>Culiseta inornata</i>
Snow melt in mountains.....	<i>Aedes cataphylla</i> <i>communis communis</i> <i>communis nevadensis</i> <i>increditus</i> <i>hexodontus</i> <i>fitchii</i> <i>pullatus</i> <i>schizopinax</i> <i>Culiseta impatiens</i>	<i>Culiseta incidens</i>
Permanent ponds and streams.....		<i>Anopheles freeborni</i> <i>Culiseta inornata</i> <i>incidens</i> <i>Culex erythrothorax</i> <i>peus</i> <i>tarsalis</i> <i>territans</i>
Fresh water springs.....		<i>Anopheles p. franciscanus</i> <i>Culiseta incidens</i> <i>Culex apicalis</i> <i>boharti</i> <i>erythrothorax</i> <i>thriambus</i> <i>Uranotaenia anhydor</i>
Artificial containers.....		<i>Culiseta incidens</i> <i>Culex peus</i> <i>tarsalis</i>
Treeholes.....	<i>Aedes sierrensis</i>	

¹Species such as *Aedes cinereus*, *A. campestris*, and *A. sierrensis* are actually multivoltine species but are generally univoltine in Nevada because of climatological and ecological factors.

COUNTY DISTRIBUTION AND RELATIVE IMPORTANCE

The county distribution of the species and their relative importance are given in Table 2. The most important species in the State are *Aedes nigromaculis*, *A. dorsalis*, *A. melanimon*, *A. vexans*, *Culex tarsalis*, *Culiseta inornata*, and *Anopheles freeborni*. The first two species, *Aedes nigromaculis* and *A. dorsalis*, are generally the most pestiferous; but in some localities one or the other may be absent and *Aedes melanimon* and *A. vexans* then predominate. Most of the more important species are also the most widely distributed.

Culiseta inornata and *Culex tarsalis* are known from every county and *Aedes dorsalis* and *Anopheles freeborni* from 15 of the 17 counties. The complete distribution of many of these species remains to be learned since relatively few surveys were made in some counties, especially Esmeralda and White Pine. Exhaustive surveys in counties adjacent to adjoining states should yield many more species. The writer collected all species previously reported from Nevada. Unless otherwise stipulated, the collections reported herein were made by the writer.

TABLE 2. DISTRIBUTION AND RELATIVE IMPORTANCE OF NEVADA MOSQUITOES

Species	Churchill	Clark	Douglas	Elko	Esmeralda	Eureka	Humboldt	Lander	Lincoln	Lyon	Mineral	Nye	Ormsby	Pershing	Storey	Washoe	White Pine	Relative Importance ¹
<i>Aedes campestris</i>	X	...	X	X	...	X	...	...	...	X	X	X	...	...	...	X	X	2
<i>cataphylla</i>.....	...	X	X	...	...	X	...	X	...	...	...	...	X	...	...	X	...	2
<i>cinereus</i>.....	...	...	...	X	...	...	...	X	...	...	...	...	...	...	...	...	...	4
<i>communis communis</i>....	...	...	X	...	...	...	...	...	...	...	...	...	X	...	...	X	...	2
<i>communis nevadensis</i>...	...	...	...	X	...	...	...	...	...	...	...	...	...	...	...	...	...	2
<i>dorsalis</i>	X	X	X	X	...	X	X	X	X	X	X	X	X	X	X	X	...	1
<i>fitchii</i>.....	...	...	X	X	...	X	X	...	...	...	...	...	...	...	...	X	...	2
<i>hexodontus</i>.....	...	...	X	X	...	...	...	...	...	...	...	...	X	...	...	X	...	2
<i>s. idahoensis</i>.....	...	...	...	X	...	X	X	X	...	...	...	...	...	...	...	...	...	2
<i>increpitus</i>.....	...	...	X	X	...	...	...	...	...	X	...	...	X	...	X	X	...	2
<i>melanimon</i>	X	X	X	X	...	X	X	X	...	X	X	...	X	X	X	X	...	1
<i>nigromaculis</i>	X	...	X	X	...	X	...	X	...	X	X	X	X	X	...	X	...	1
<i>niphadopsis</i>	X	...	X	...	X	X	...	...	...	X	...	...	...	...	...	X	...	2
<i>pullatus</i>.....	...	...	...	X	...	...	...	...	...	...	...	...	...	...	...	...	...	2
<i>schizopinax</i>.....	...	...	X	X	...	...	...	X	...	...	...	...	...	...	...	X	X	2
<i>sierrensis</i>.....	...	...	X	...	...	...	...	...	...	...	...	...	X	...	...	X	...	4
<i>vexans</i>	X	X	X	X	...	X	X	X	X	X	X	...	...	X	...	X	...	1
<i>Culex apicalis</i>.....	...	...	X	...	...	...	...	...	...	X	...	...	...	...	...	X	...	3
<i>boharti</i>.....	...	...	...	X	...	...	...	...	...	X	...	...	X	...	...	X	...	3
<i>erythrothorax</i>	X	...	X	...	...	...	...	...	...	X	X	X	X	...	...	X	...	2
<i>peus</i>	X	...	X	...	...	...	...	...	...	X	...	...	...	...	...	X	...	3
<i>tarsalis</i>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1
<i>territans</i>.....	...	...	X	...	...	...	...	...	...	...	...	...	X	...	...	X	...	3
<i>thriambus</i>.....	...	X	...	...	...	...	...	...	X	...	...	...	...	...	...	...	...	4
<i>Anopheles p. franciscanus</i>	...	X	X	...	...	...	...	...	X	X	...	X	X	...	X	X	...	1
<i>freeborni</i>	X	X	X	X	...	X	X	X	X	X	X	X	X	X	X	X	...	1
<i>Culiseta impatiens</i>.....	...	...	...	X	...	...	...	...	...	...	...	...	...	...	...	...	...	4
<i>incidens</i>.....	...	...	X	X	X	...	X	...	X	X	...	...	X	...	X	X	X	3
<i>inornata</i>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1
<i>Psorophora confinnis</i>.....	...	X	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
<i>Uranotaenia anhydor</i>.....	...	...	...	...	...	...	...	...	...	...	...	X	...	...	...	...	...	4

¹(1) Important pest species or known disease vector. (2) Abundant and annoying locally, restricted ecological habitat. (3) Fairly common but of no importance because of biting habits. (4) Rare.

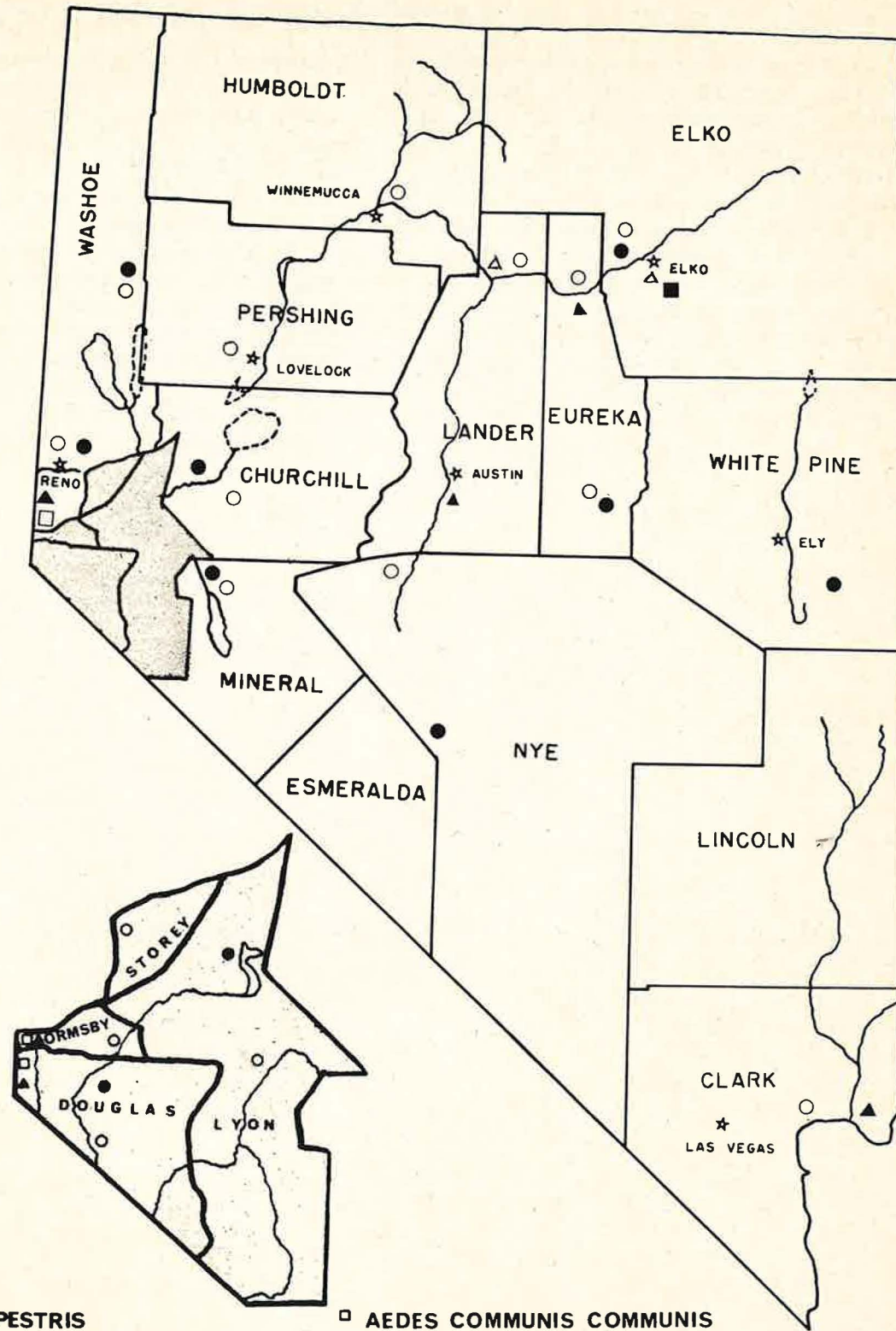
BIOLOGICAL, CHEMICAL, AND ENVIRONMENTAL CONTROL OF MOSQUITOES

The influence of aquatic predators on larvae of *Aedes* spp. is generally of little consequence; whereas it is often much more pronounced in those species of *Culex*, *Culiseta*, and *Anopheles* that occupy water of a more permanent nature. Minnows are probably the most important predators, followed by planaria and adults, larvae, nymphs, and naiads of various insects. Several species of planaria have been observed at times to decimate larval populations both in poorly irrigated situations and in mountainous areas.

Species of Microsporidia of the Genus *Thelohania* have been found infecting fourth-instar larvae of *Culex tarsalis*, *Culiseta inornata*, *C. incidens*, *Aedes cinereus*, *A. melanimon*, and *A. dorsalis*. The infection rates within the populations appeared to be very low.

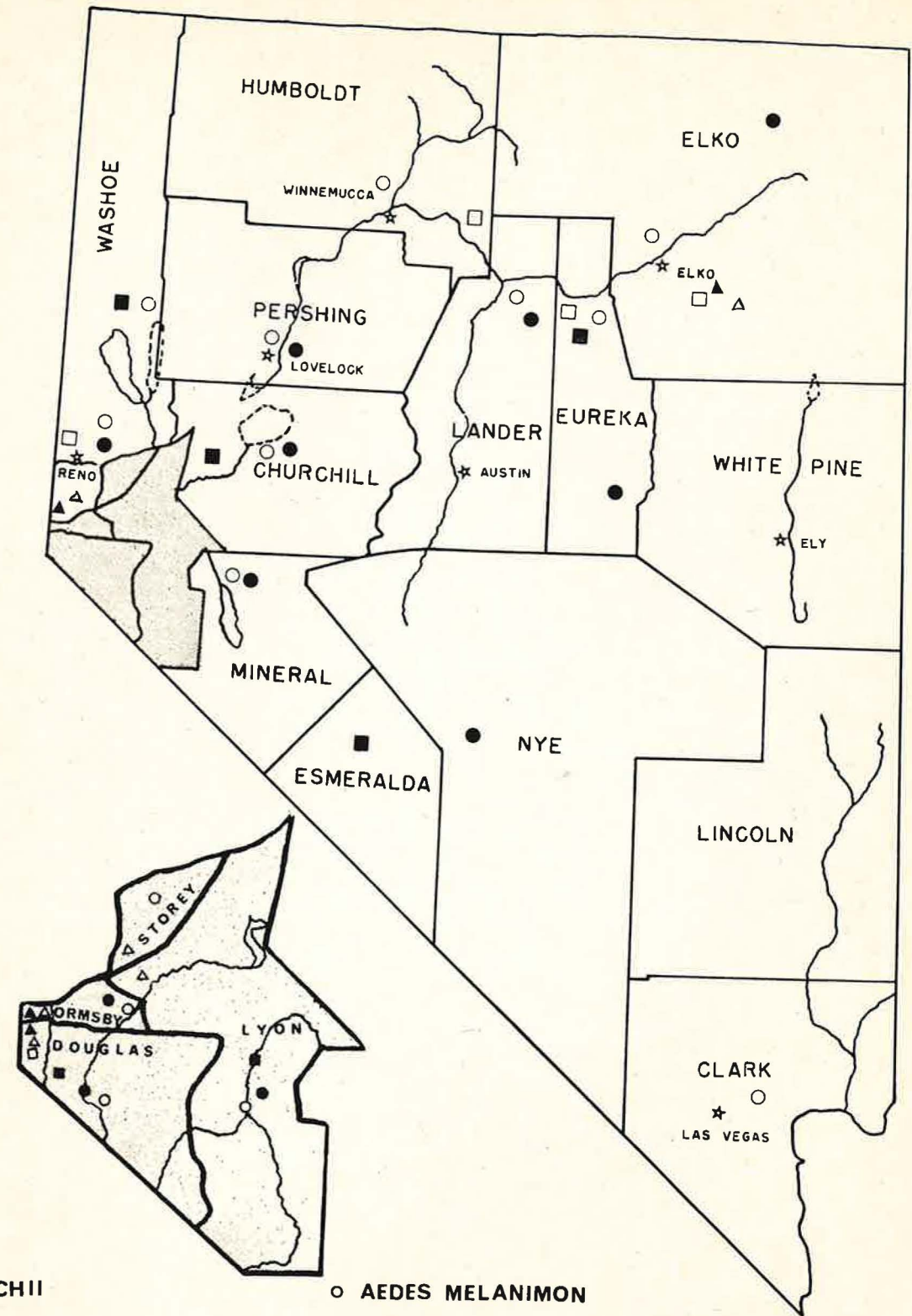
Insecticides presently recommended, either as larvicides or adulticides, will control mosquitoes in Nevada. Recent bioassay tests conducted with a number of materials, including DDT, against larvae of the more important species, indicated all were effective (Chapman 1962c). Hence, mosquito resistance to insecticides is presently not a problem.

Environmental methods of control such as ditching, filling, grading, improvements in irrigation systems which supply, apply, and then eliminate tail end water, undoubtedly offer the greatest possibility of curtailing the production of large numbers of mosquitoes. Such permanent control measures are generally referred to as "source reduction." Stranding of the aquatic stages is probably the greatest single enemy of mosquito populations.



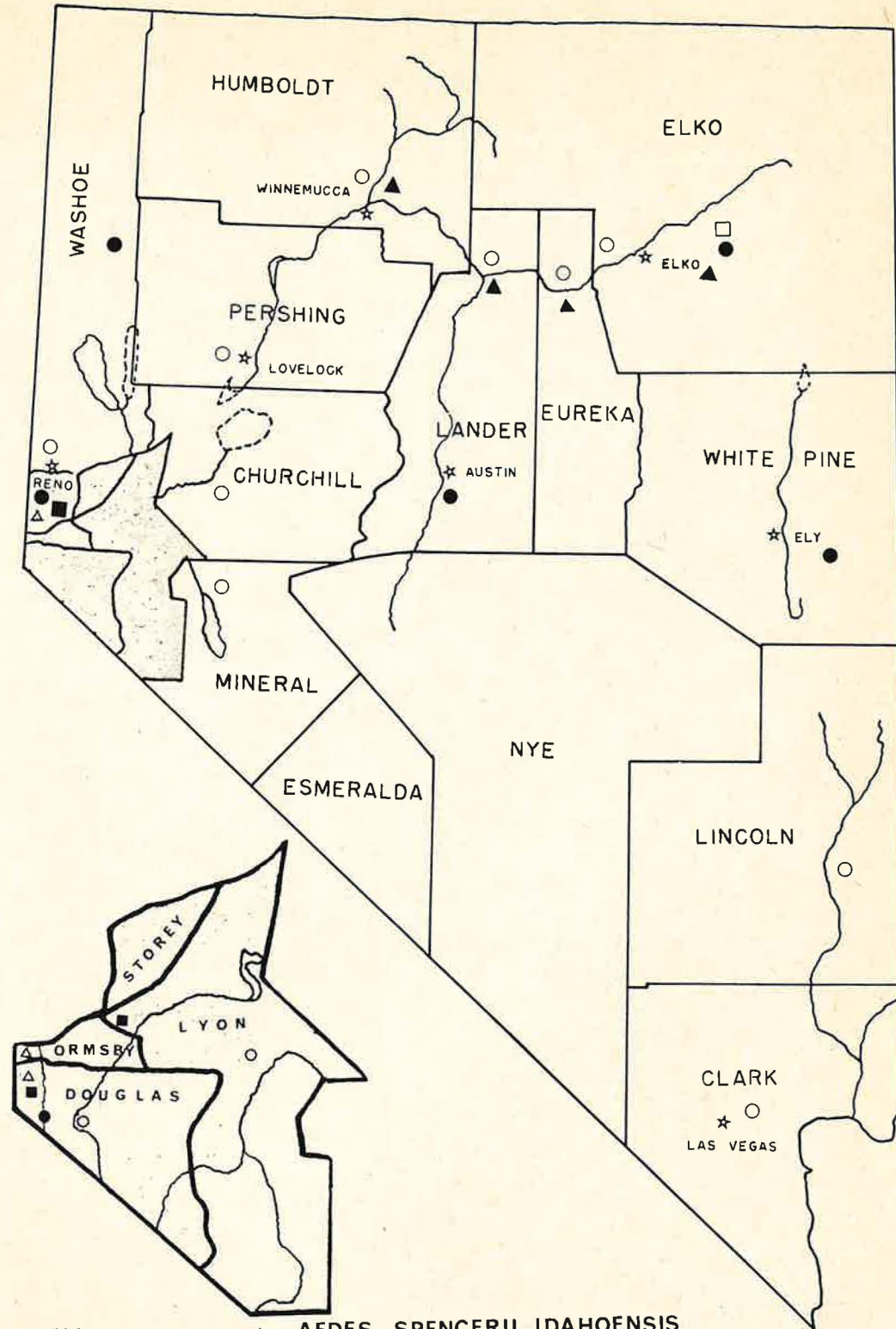
- **AEDES CAMPESTRIS**
- ▲ **AEDES CATAPHYLLA**
- △ **AEDES CINEREUS**
- ◻ **AEDES COMMUNIS COMMUNIS**
- **AEDES COMMUNIS NEVADENSIS**
- **AEDES DORSALIS**

MAP 1. Distribution of *A. campestris*, *A. cataphylla*, *A. cinereus*, *A. communis communis*, *A. communis nevadensis*, and *A. dorsalis* in Nevada.



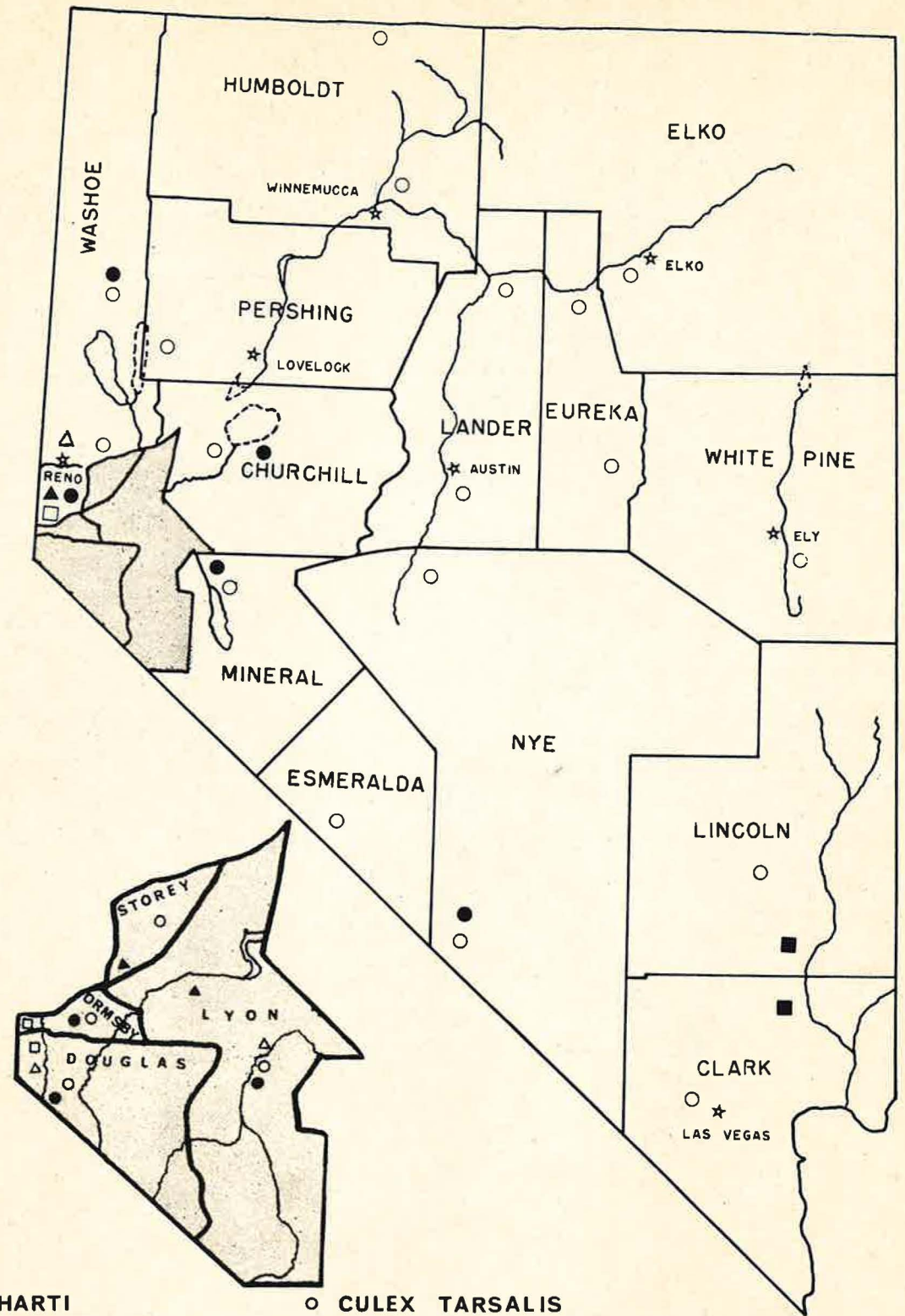
- ◻ **AEDES FITCHII**
- ▲ **AEDES HEXODONTUS**
- △ **AEDES INCREPITUS**
- **AEDES MELANIMON**
- **AEDES NIGROMACULIS**
- **AEDES NIPHADOPSIS**

MAP 2. Distribution of *Aedes fitchii*, *A. hexodontus*, *A. increpitus*, *A. melanimon*, *A. nigromaculis*, and *A. niphadopsis* in Nevada.



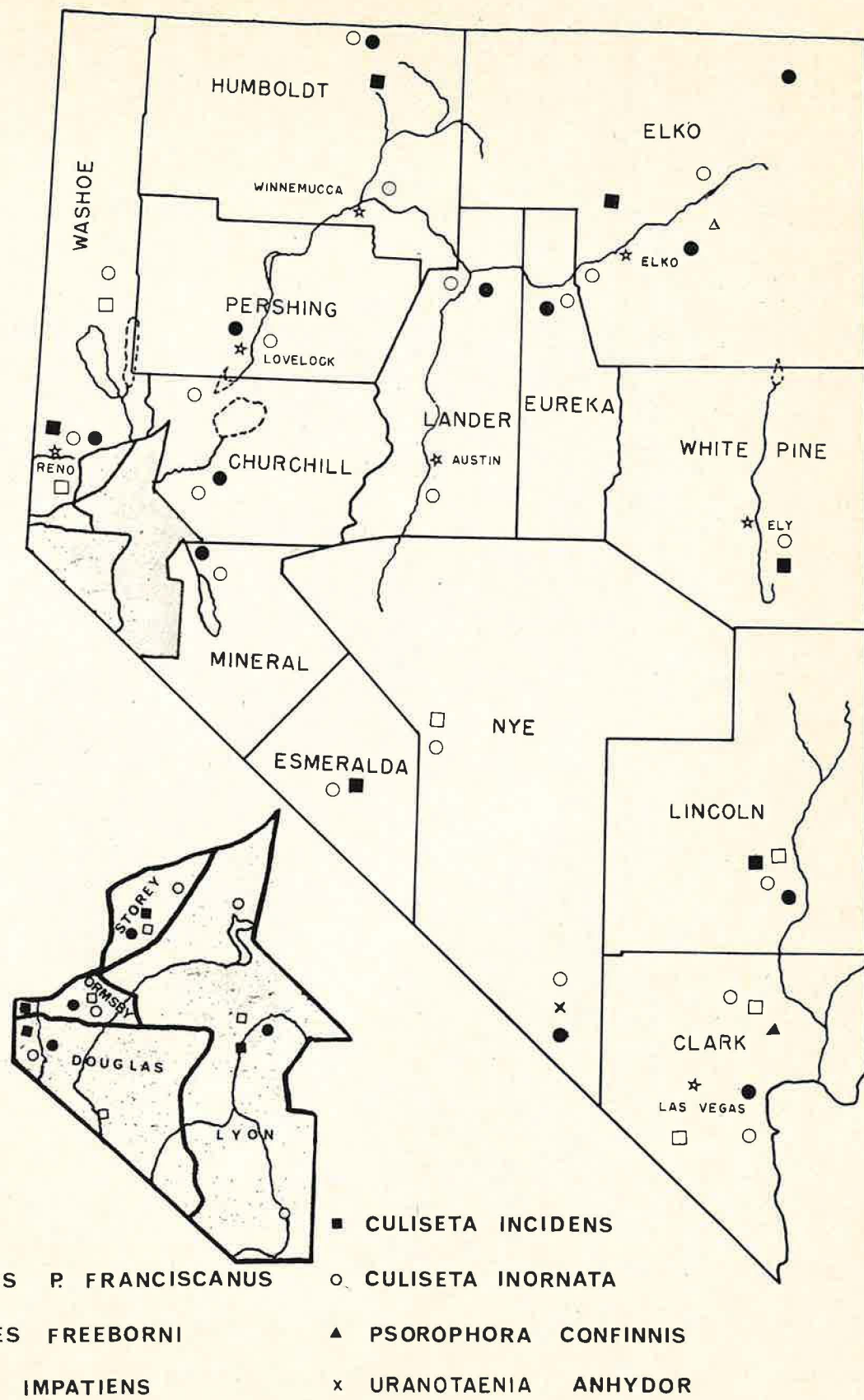
- ◻ Aedes pullatus
- Aedes schizopinax
- △ Aedes sierrensis
- ▲ Aedes spencerii idahoensis
- Aedes vexans
- Culex apicalis

MAP 3. Distribution of *Aedes pullatus*, *A. schizopinax*, *A. sierrensis*, *A. spencerii idahoensis*, *A. vexans*, and *Culex apicalis* in Nevada.



- ▲ Culex boharti
- Culex erythrothorax
- △ Culex peus
- Culex tarsalis
- ◻ Culex territans
- Culex thriambus

MAP 4. Distribution of *Culex boharti*, *C. erythrothorax*, *C. peus*, *C. tarsalis*, *C. territans*, and *C. thriambus* in Nevada.



- ANOPHELES P. FRANCISCANUS
- ANOPHELES FREEBORNI
- △ CULISETA IMPATIENS
- CULISETA INCIDENS
- CULISETA INORNATA
- ▲ PSOROPHORA CONFINNIS
- × URANOETAENIA ANHYDOR

MAP 5. Distribution of *Anopheles pseudopunctipennis franciscanus*, *A. freeborni*, *Culiseta impatiens*, *C. incidens*, *C. inornata*, *Psorophora confinnis*, and *Uranotaenia anhydor* in Nevada.

REFERENCES CITED

BARR, A. R., 1955. The resurrection of *Aedes melanimon* Dyar. Mosquito News 15(3):170-2.

....., 1958. The mosquitoes of Minnesota. Minn. Agr. Exp. Stat. Bull. 228:1-154.

BOHART, R. M., 1950. Observations on the snow mosquitoes of California. Pan-Pacific Ent. 26(3):111-18.

....., 1956. Identification and distribution of *Aedes melanimon* and *Aedes dorsalis* in California. Proc. and Papers 24th Ann. Confer. California Mosquito Control Assoc., pp. 81-83.

CARPENTER, S. J., and LACASSE, W. J., 1955. Mosquitoes of North America. Univ. Calif. Press. 360 pp.

CHAPMAN, H. C., 1959a. A list of Nevada mosquitoes, with five new records. Mosquito News 19(3):155-6.

....., 1959b. Overwintering larval populations of *Culex erythrorhax* in Nevada. Mosquito News 19(4):244-6.

....., 1960. Observations on *Aedes melanimon* Dyar and *A. dorsalis* (Meigen) in Nevada. Ann. Ent. Soc. Amer. 53(6): 706-8.

....., 1961a. Additional records and observations on Nevada mosquitoes. Mosquito News 21(2):136-8.

....., 1961b. Observations on the snow-water mosquitoes of Nevada. Mosquito News 21(2):88-92.

....., 1961c. Abandoned mines as overwintering sites for mosquitoes, especially *Culex tarsalis* Coq. in Nevada. Mosquito News 21(4):324-7.

....., 1962a. A survey for autogeny in some Nevadan mosquitoes. Mosquito News 22(2):134-6.

....., 1962b. The bio-ecology of *Culex erythrorhax* Dyar. Mosquito News 22(2):130-34.

....., 1962c. Laboratory evaluation of materials as larvicides against mosquitoes in Nevada. Mosquito News 22(1):24-6.

....., 1963. Observations on *Aedes niphadopsis* D. & K. and *campestris* D. & K. in Nevada. Pan-Pac. Ent. 39(2):109-14.

....., and BARR, A. R., 1964. *Aedes communis nevadensis*, a New Subspecies of Mosquito from Western North America (Diptera: Culicidae). Mosquito News 24(4):439-47.

DYAR, H. G., 1917. The mosquitoes of the mountains of California. Ins. Ins. Mens. 5:11-21.

....., 1922. The mosquitoes of the United States. Proc. U.S. Nat. Mus. 62:1-119.

FREEBORN, S. B. and BOHART, R. M., 1951. The mosquitoes of California Bull. Calif. Insect Survey 1(2):25-78.

GJULLIN, C. M., SAILER, R. I., STONE, A., and TRAVIS, B. V., 1961. The mosquitoes of Alaska. U.S. Dept. Agr. Handbook 182:1-98.

KING, W. V., BRADLEY, G. H., SMITH, C. N., and McDUFFIE, W. C., 1960. Mosquitoes of the southeastern United States. U.S. Dept. Agr. Handbook 173:1-188.

NIELSEN, L. T., and REES, D. M., 1961. An identification guide to the mosquitoes of Utah. Univ. Utah Bio. Series 12(3):1-63.

....., LINAM, J. H., and REES, D. M., 1963. New distribution records for mosquitoes in the Rocky Mountain States. Proc. N. J. Mosq. Exterm. Assoc. 50: 424-28.

RICHARDS, C. S., 1956. *Aedes melanimon* Dyar and related species. Canad. Ent. 88(6):261-9.

....., NIELSEN, L. T., and REES, D. M., 1956. Mosquito records from the Great Basin and the drainage of the lower Colorado River. Mosquito News 16(1):10-17.

STAGE, H. H., GJULLIN, C. M., and YATES, W. W., 1952. Mosquitoes of the Northwestern States. U.S. Dept. Agr. Handbook 46:1-95.

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