

UNIVERSITY OF UTAH BIOLOGICAL SERIES

Vol. XII

June, 1961

No. 3

AN IDENTIFICATION GUIDE TO THE MOSQUITOES OF UTAH

BY

LEWIS T. NIELSEN and DON M. REES

Department of Zoology and Entomology



Published by

UNIVERSITY OF UTAH
SALT LAKE CITY, UTAH

UNIVERSITY OF UTAH BIOLOGICAL SERIES

Editors: WILLIAM H. BEHLE, *Chairman*; SEVILLE FLOWERS, MARGARET
SCHELL, RICHARD W. VAN NORMAN, ROBERT K. VICKERY

Volume 12, No. 3, pp. 63, figures 1-57

Submitted by editors — June 8, 1961

Issued June, 1961

Price, \$2.00

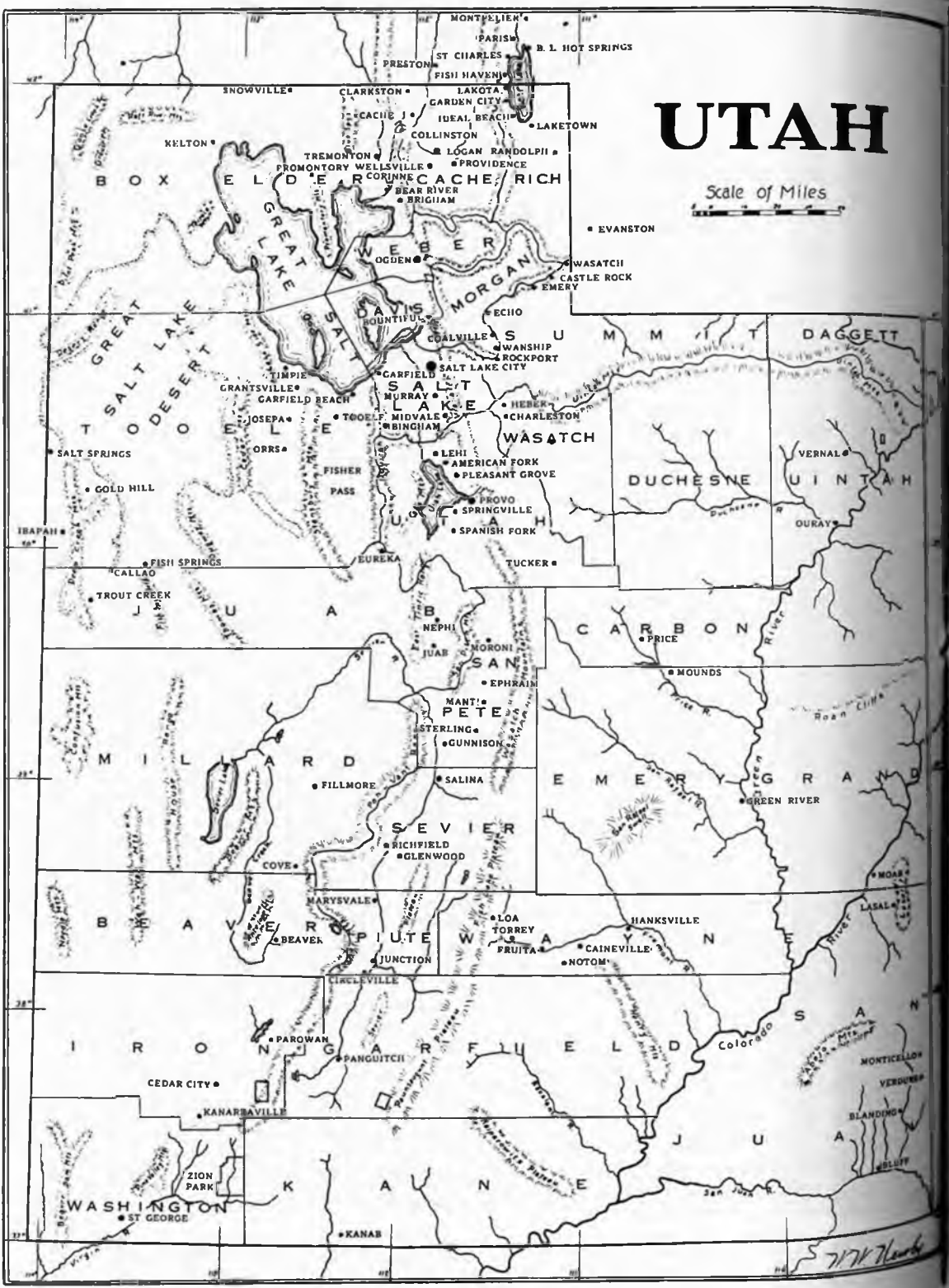


CONTENTS

MAP	iv
INTRODUCTION	v
Acknowledgments	v
TAXONOMIC TREATMENT	1
Table I—List of Utah Mosquitoes, Their Systematic Position and Relative Abundance	2
Keys to the genera of Utah mosquitoes	4
Adult females	4
Fourth instar larvae	4
Keys to the Anopheles species	9
<i>Anopheles</i>	9
<i>earlei</i>	9
<i>franciscans</i>	11
<i>freeborni</i>	11
Keys to mountain <i>Aedes</i> species	12
Keys to valley and plains <i>Aedes</i> species	15
<i>Aedes atropalpus</i>	20
<i>campestris</i>	20
<i>cataphylla</i>	21
<i>cinereus</i>	21
<i>communis</i>	22
<i>dorsalis</i>	23
<i>excrucians</i>	23
<i>fitchii</i>	24
<i>flavescens</i>	25
<i>hexodontus</i>	25
<i>impiger</i>	26
<i>implicatus</i>	27
<i>increpitus</i>	27
<i>intrudens</i>	28
<i>melanimon</i>	28
<i>nigromaculis</i>	29
<i>niphadopsis</i>	30
<i>pullatus</i>	30
<i>schizopinax</i>	31
<i>spencerii</i>	32
<i>sticticus</i>	32
<i>varipalpus</i>	33
<i>vexans</i>	33
<i>Mansonia perturbans</i>	34
<i>Psorophora signipennis</i>	34
Keys to the <i>Culex</i> species	44
<i>Culex apicalis</i>	46
<i>erythrothorax</i>	46
<i>pipiens</i>	46
<i>quinque fasciatus</i>	47
<i>restuans</i>	47
<i>salinarius</i>	48
<i>tarsalis</i>	48
<i>territans</i>	49
Keys to the <i>Culiseta</i> species	54
<i>Culiseta impatiens</i>	55
<i>incidens</i>	55
<i>inornata</i>	56
<i>minnesotae</i>	56
SELECTED REFERENCES	57

UTAH

Scale of Miles
0 10 20 30 40 50



57777

INTRODUCTION

The first detailed report on the mosquito fauna of Utah was published by Rees (1943). In this bulletin Rees reported the occurrence in the state of 31 species, representing 4 genera, and discussed their biology, distribution, life history and importance.

Subsequent publications by Rees (1944), Rees and Nielsen (1951, 1955), Nielsen and Rees (1959) and Richards *et al.* (1956) have added to the knowledge of the mosquito fauna of this state.

A total of 45 species has been reported in the literature as occurring in Utah. Of this number five are records which the authors consider invalid or of uncertain status. These are discussed by Nielsen and Rees (1959).

At present the known Utah mosquito fauna consists of 40 species, representing 6 genera. A list of the Utah species with their relative abundance is presented in Table I.

The primary purpose of the present work is to provide an up-to-date identification guide to the mosquitoes of Utah. The emphasis in preparing this guide has been taxonomic and every effort has been made to utilize the most useful characters known to the authors. A selected list of references containing information of value to anyone interested in the identification of Utah mosquito species is included in the bibliography.

In addition to the taxonomic treatment a brief discussion of the biology and known distribution has been included for each species. An attempt has been made to provide in a few concise statements the seasonal, geographic and altitudinal distribution as well as notes on behavior and the relative importance of each species in regard to its nuisance or health importance. Collection records list only the counties in which each species has been collected. A map of Utah showing the location of the 29 counties of the state has been included for reference.

No attempt has been made to include information on collecting, rearing or preservation of material. This information is contained in readily accessible references.

Acknowledgments

The authors are indebted to numerous individuals who have contributed to this investigation. It is regrettable that all cannot be mentioned by name.

A. D. Hess, H. D. Pratt, F. C. Harmston and others of the Public Health Service have been most cooperative in supplying specimens and information of value to this investigation. We are particularly indebted to F. C. Harmston who in addition to adding many valuable specimens to the University of Utah collection of mosquitoes has contributed important information pertaining to the identification of the *Culex* species of the state.

We are obligated to G. C. Collett, J. E. Graham, and J. H. Linam of the Salt Lake, South Salt Lake and Magna Mosquito Abatement Districts and to members of the boards of trustees of these districts for access to their mosquito collections and records. Other mosquito abatement districts in the state have also provided useful material and information about the mosquitoes of the state.

Thanks are extended to D. E. Beck of Brigham Young University and G. F. Knowlton of Utah State University for valuable information and collection records.

The authors are also greatly indebted to B. C. Ho for help in the preparation of the drawings used in this bulletin.

To those mentioned and to all students and other associates who have assisted in any way we extend our sincere thanks and appreciation.

Finally, acknowledgment is made to the University of Utah Research Fund which has greatly aided this study by making funds available for the purchase of equipment and for travel to collect specimens.

TAXONOMIC TREATMENT

No effort has been made to make this a work for the layman or to simplify any of the presentation unless it contributes to the identification of Utah mosquito species. It is, therefore, essential that anyone using this bulletin be thoroughly familiar with the structures used in the identification of all mosquito stages. Although structures needed in the use of the keys are figured herein, a few comments regarding some of the characters are necessary. The identification of the females of the dark-legged *Aedes* species has been particularly difficult in the past but a number of additional reliable characters are now known which are of great value.

(1) The *tarsal claws* (See Vockeroth, 1950, 1954 and Figs. 27, 39) are very useful and are probably distinctive for almost every *Aedes* species, although they have been used in this guide for only a few species. A magnification of at least 60x is generally needed for examining mounted or unmounted claws. Great care should be taken to insure that the claws are examined exactly from a lateral angle; slight changes in the angle will distort the true claw shape.

(2) The *post-coxal scale patch* (See Knight, 1951, Vockeroth, 1954b and Fig. 13) although not a specific character is extremely useful in separating groups of dark-legged *Aedes* species. This scale patch is found in the membranous area between the anterior coxa and the sternopleuron; the patch never covers the entire membranous area but when present is conspicuous and covers most of the upper or dorsal portion. Care should be taken not to confuse an occasional scale that may have fallen into this area as an indication of the presence of the patch.

(3) The *hypostigmal scale patch* (See Fig. 13) is also useful in separating groups of *Aedes* and is sometimes of specific value. This patch is distinctive and found immediately below the mesothoracic spiracle. Care must be taken not to confuse this patch with the scales on the postpronotum or those in the area of the postspiracular bristles. Scales from these areas may sometimes become dislodged and appear in the area below the spiracle. Careful examination will determine whether the scales below the spiracle actually arise from the area.

(4) The *scaling on the sternopleuron* and the *mesepimeron* (See Fig. 13). The extent of the scale patches on these two sclerites is of great value in identifying species and separating groups of species. Scaling on the posterior portions of the sternopleuron and on the dorsal portions of the mesepimeron occur on all Utah *Aedes*. On some species these scales remain confined in these portions; in other species the scaling extends to the upper anterior angle of the sternopleuron and/or the scaling on the mesepimeron extends to its ventral margin, at least anteriorly. Even on rubbed specimens these scale patches usually persist with sufficient scales to determine their extent.

(5) The *arrangement and abundance of postpronotal setae* (See Vockeroth, 1954b and Fig. 13) are of specific value in separating *A. impiger* from all other Utah *Aedes* mosquitoes. In *impiger* setae are scattered over the entire posterior half to two-thirds of the sclerite; as many as 25-40 setae may be present; in other Utah *Aedes* the postpronotal setae are confined to a single or double row on the extreme posterior margin of the segment; usually with only 10-15 present.

(6) The *scaling on the probasisternum* (See Beckel, 1954 and Fig. 14) is very useful in separating certain species. This is the region directly under the head and between the fore coxae. The sclerite is directed in ventro-posterior position. In most *Aedes* species this structure is devoid of scales, at least on its posterior portions; in other species it is moderately to densely

covered with pale scales. As many *Aedes* species have scales in the depressions on either side of the probasisternum and often on the anterior-most portions this character must be studied in a favorable position with a strong light and preferably a magnification of at least 40-60x.

Other characters of the females are largely self explanatory and with the help of the accompanying figures should present no unusual difficulties.

Larval characters also are largely recognizable with the help of the figures and descriptions. *Larval chaetotaxy* has assumed more importance in identification and it is recommended that the mosquito worker become thoroughly familiar with the terminology employed in this bulletin (see Figs. 8-11) which is based on the work of Belkin (1950) and the information contained in Carpenter and La Casse (1955). The number of branches and size of the setae on the prothorax and mesothorax is particularly useful in species identification in the genus *Aedes* and *Culiseta*. An excellent paper on the latter genus in regard to larval chaetotaxy has been presented by Thurman and Johnson (1950). For the genus *Anopheles* the larvae of Utah species can be distinguished by the numbers and branches of certain setal hairs of the head. The *siphonal index*, which is the value obtained by dividing the length of the siphon by its basal diameter is another very useful character to distinguish species.

The male genitalia are perhaps the most difficult structures to use for the novice in mosquito identification. However, once the structures and terminology have been carefully learned these structures will provide some of the most reliable specific differences. (See Fig. 16).

In order to simplify the identification of the Utah species of the genus *Aedes*, which contains 23 of the 40 species of mosquitoes occurring in the state two complete sets of keys have been provided; one set to identify the mountain species which occur at elevations above 6500-7000 ft.; the other to identify the valley species which normally occur below 6500 ft. If the species is known to occur in both mountains and valleys it has been included in both sets of keys.

TABLE I

LIST OF UTAH MOSQUITOES, THEIR SYSTEMATIC POSITION AND RELATIVE ABUNDANCE

Genus ANOPHELES Meigen	
Subgenus <i>Anopheles</i> Meigen	
<i>Anopheles earlei</i> Vargas	Rare
<i>Anopheles franciscanus</i> McCracken	Uncommon
<i>Anopheles freeborni</i> Aitken	Abundant
Genus AEDES Meigen	
Subgenus <i>Aedes</i> Meigen	
<i>Aedes cinereus</i> Meigen	Uncommon
Subgenus <i>Aedimorphus</i> Theobald	
<i>Aedes vexans</i> (Meigen)	Abundant
Subgenus <i>Ochlerotatus</i> Lynch Arribálzaga	
<i>Aedes campestris</i> Dyar and Knab	Common
<i>Aedes cataphylla</i> Dyar	Common
<i>Aedes communis</i> (De Geer)	Common
<i>Aedes dorsalis</i> (Meigen)	Very Abundant
<i>Aedes excrucians</i> (Walker)	Uncommon
<i>Aedes fitchii</i> (Felt and Young)	Common
<i>Aedes flavescens</i> (Müller)	Rare
<i>Aedes hexadontus</i> (Dyar)	Common

<i>Aedes impiger</i> (Walker).....	Uncommon
<i>Aedes implicatus</i> Vockeroth	Uncommon
<i>Aedes increpitus</i> Dyar	Abundant
<i>Aedes intrudens</i> Dyar	Rare
<i>Aedes melanimon</i> Dyar	Uncommon
<i>Aedes nigromaculis</i> (Ludlow)	Common
<i>Aedes niphadopsis</i> Dyar and Knab	Common
<i>Aedes pullatus</i> (Coquillett)	Abundant
<i>Aedes schizopimax</i> Dyar.....	Uncommon
<i>Aedes spencerii</i> (Theobald)	Common
<i>Aedes sticticus</i> (Meigen)	Uncommon

Subgenus *Finlaya* Theobald

<i>Aedes atropalpus</i> (Coquillett)	Rare
<i>Aedes varipalpus</i> (Coquillett)	Rare

Genus CULEX Linnaeus

Subgenus *Culex* Linnaeus

<i>Culex erythrothorax</i> Dyar	Common
<i>Culex pipiens</i> Linnaeus	Abundant
<i>Culex quinquefasciatus</i> Say	Uncommon
<i>Culex restuans</i> Theobald	Rare
<i>Culex salinarius</i> Coquillett	Uncommon
<i>Culex tarsalis</i> Coquillett	Very Abundant

Subgenus *Neoculex* Dyar

<i>Culex apicalis</i> Adams	Rare
<i>Culex territans</i> (Walker)	Rare

Genus CULISETA Felt

Subgenus *Culicella* Felt

<i>Culiseta minnesotae</i> Barr.....	Rare
--------------------------------------	------

Subgenus *Culiseta* Felt

<i>Culiseta impatiens</i> (Walker)	Uncommon
<i>Culiseta incidens</i> (Thomson)	Abundant
<i>Culiseta inornata</i> (Williston)	Very Abundant

Genus MANSONIA Blanchard

Subgenus *Coquillettidia* Dyar

<i>Mansonia perturbans</i> (Walker)	Rare
---	------

Genus PSOROPHORA Robineau-Desvoidy

Subgenus *Grahamia* Theobald

<i>Psorophora signipennis</i> (Coquillett)	Rare
--	------

Keys to the GENERA of Utah Mosquitoes

Adult Females

1. Palpi of female over half as long as proboscis (Fig. 1);
scutellum rounded (Fig. 3) *Anopheles*, p. 9
- Palpi of female less than one-half as long as proboscis (Fig. 2);
scutellum trilobed (Fig. 4) 2
2. Spiracular bristles present (Fig. 5) 3
- Spiracular bristles absent 4
3. Base of subcosta on under side of wing without tuft of setae;
postspiracular bristles present (Fig. 5); tip of abdomen pointed
(Fig. 6) *Psorophora*, p. 34
- Psorophora signipennis*. Only species of this genus known to
occur in Utah; a gray species having costal vein and wing
fringe with alternating groups of white and dark scales.
- Base of subcosta on under side of wing with distinct tuft of setae;
postspiracular bristles absent; tip of abdomen blunt (Fig. 7) *Culiseta*, p. 54
4. Postspiracular bristles present; abdomen generally pointed *Aedes*, p. 12
- Postspiracular bristles absent; abdomen generally blunt 5
5. Wing scales narrow; dark in color *Culex*, p. 44
- Wing scales very broad, brown and white intermixed *Mansonia*, p. 34
- Mansonia perturbans*. Only species of this genus known to occur
in Utah. Tarsi with basal white bands and segment 1 of
hind tarsus with median white ring.

Fourth Instar Larva

1. Eighth abdominal segment without siphon (Fig. 8B) *Anopheles*, p. 9
- Eighth abdominal segment with a distinct siphon (Fig. 10) 2
2. Siphon short, about twice as long as broad; apex sharply pointed,
adapted for piercing the underwater tissues of aquatic
plants. (Fig. 44) *Mansonia perturbans*, p. 34
- Siphon elongate, more than twice as long as broad, apex not
adapted for piercing underwater tissues of aquatic plants 3
3. A pair of conspicuous setal tufts inserted at base of siphon
between pecten. (Fig. 11) *Culiseta*, p. 54
- Basal siphonal setal tufts absent 4
4. Siphon usually four or more times as long as basal diameter;
several pairs of setal tufts or single hairs inserted
distally to the pecten teeth. (Fig. 52) *Culex*, p. 44
- Siphon usually less than four times as long as wide with one pair of
siphonal setal tufts inserted near the middle of the tube 5
5. Anal segment completely ringed by the anal plate and pierced
along the midventral line by tufts of the ventral brush; siphon
moderately inflated with minute pair of siphonal tufts
inserted near distal third of tube *Psorophora signipennis*, p. 34
- Anal segment usually not completely ringed by the anal plate;
if ringed not pierced along the midventral line by several tufts
of the ventral brush; siphon not inflated *Aedes*, p. 12

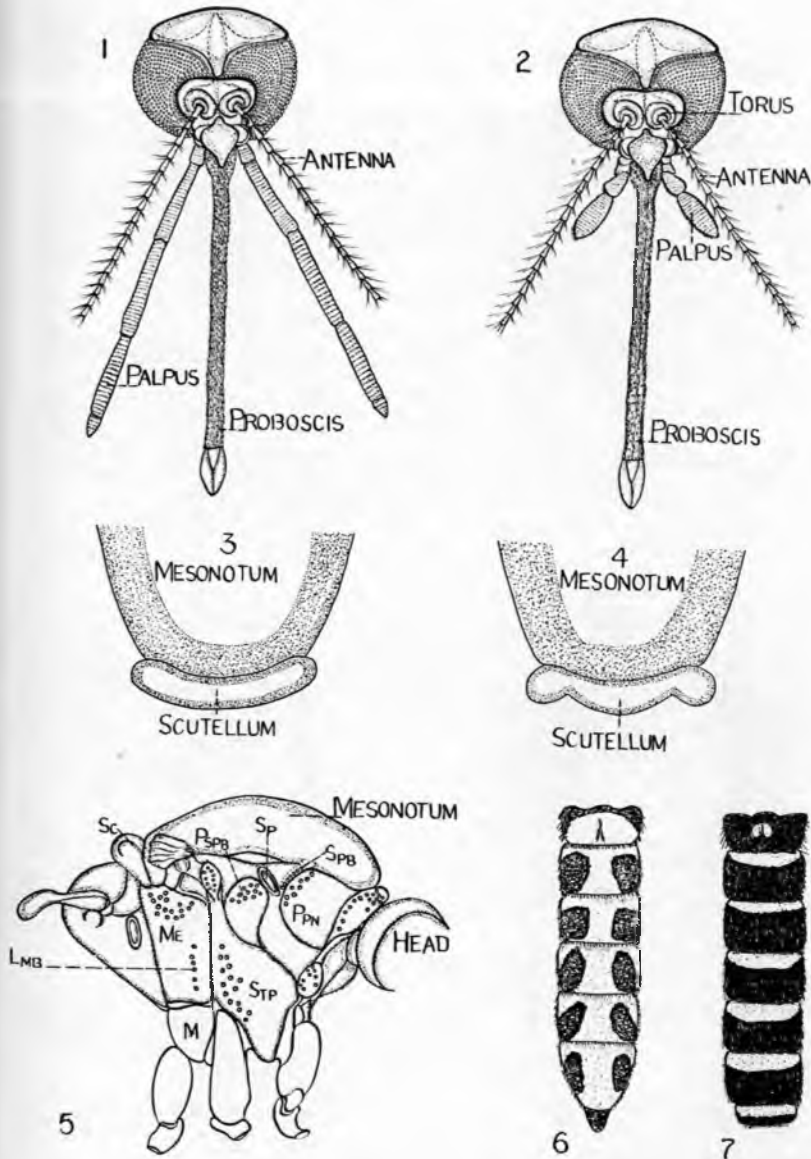


Fig. 1. Anopheline head

Fig. 2. Culicine head

Fig. 3. Anopheline scutellum

Fig. 4. Culicine scutellum

Fig. 5. Lateral view of thorax. Lmb, lower mesepimeral bristles; Me, mesepimeron; M, meron; Ppn, postpronotum; PspB, postspiracular bristles; Sc, scutellum; Sp, spiracle; SpB, spiracular bristles; Stp, sternopleuron

Fig. 6. Abdomen pointed

Fig. 7. Abdomen blunt

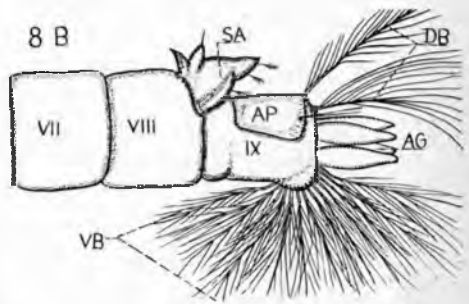
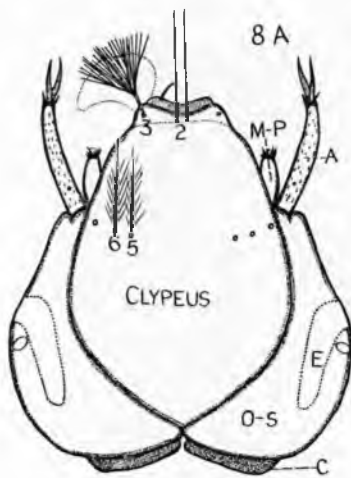


Fig. 8A. Head of *Anopheles* larva, dorsal view, A, antenna; C, collar; E, eye; M-P, maxillary palpus; O-S, ocular sclerite; 2, inner clypeal hairs; 3, outer clypeal hair; 5, inner frontal hair; 6, middle frontal hair. B, Lateral view of terminal segment of *Anopheles* larva. AG, anal gills; AP, anal plate; DB, dorsal brush; SA, spiracular apparatus; VB, ventral brush.

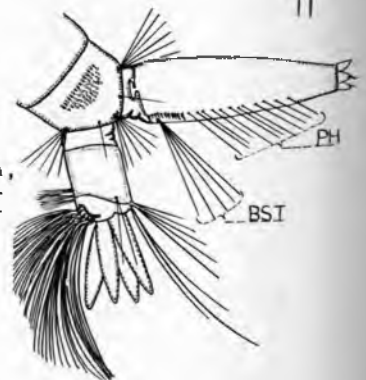
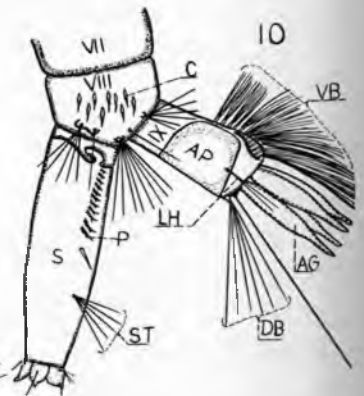
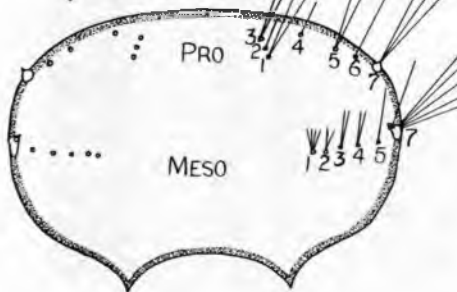
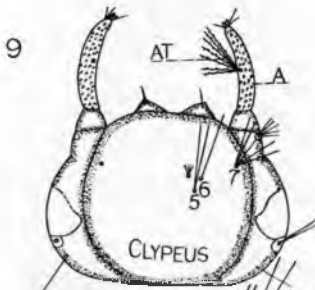


Fig. 9. Head and thorax of culicine larva, dorsal aspect. A, antenna; AT, antennal setal tuft; Head hairs: 5, upper frontal hair; 6, lower frontal hair; 7, preantennal hair. Thorax, PRO, prothorax; MESO, mesothorax; Nos. 1-3, shoulder hairs; Nos. 4-7, dorsal hairs; MESO, mesothorax; Nos. 1-7, dorsal hairs.

Fig. 10. Terminal segments VII, VIII and IX of *Aedes* larva. AG, anal gills; AP, anal plate; C, comb scales; DB, dorsal brush; LH, lateral hair of anal plate; P, pecten; S, siphon; ST, siphonal setal tuft; VB, ventral brush.

Fig. 11. Terminal segments of *Gulliseta* larva. BSI, basal siphon tuft; PH, pecten hairs.

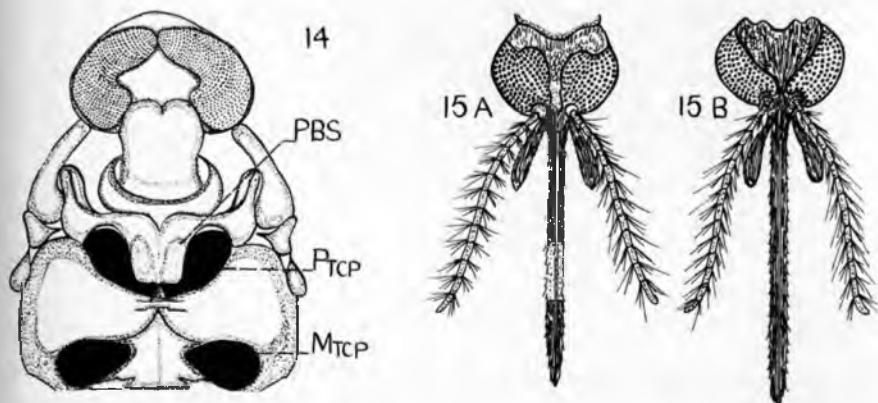
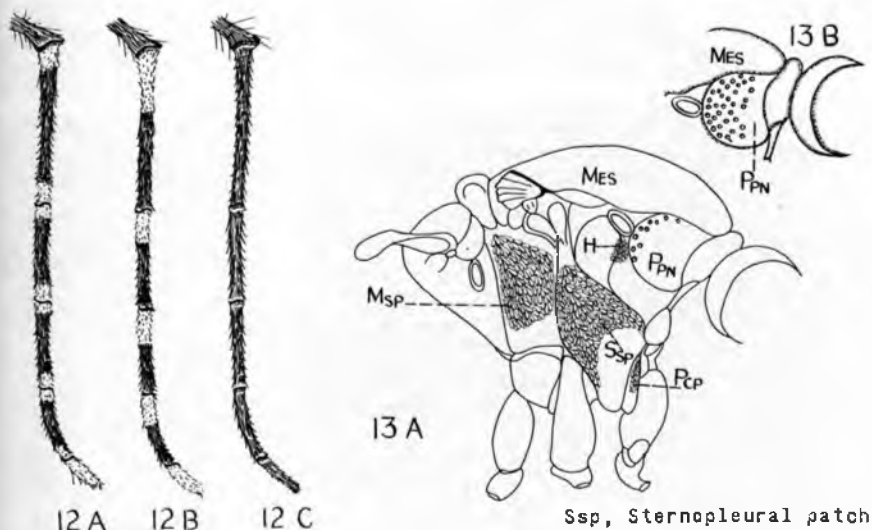


Fig. 12. Tarsi. A, basal and apical white bands; B, basal white bands; C, without white bands

Fig. 13A. Lateral view of thorax showing scaling. H, hypostigmal scale patch; Mes, mesonotum; Msp, mesepimeral scale patch; Pcp, post-coxal scale patch; Ppn, postpronotum showing setal position. B, postpronotum of *Aedes impiger* Dyar showing setal position. Mes, mesonotum; Ppn, postpronotum

Fig. 14. Ventral view of *Aedes* prothorax and mesothorax. Mtcp, mesothoracic coxal pits; PBS, probasisternum; Ptcp, prothoracic coxal pits

Fig. 15A. White banded proboscis. B, unbanded proboscis

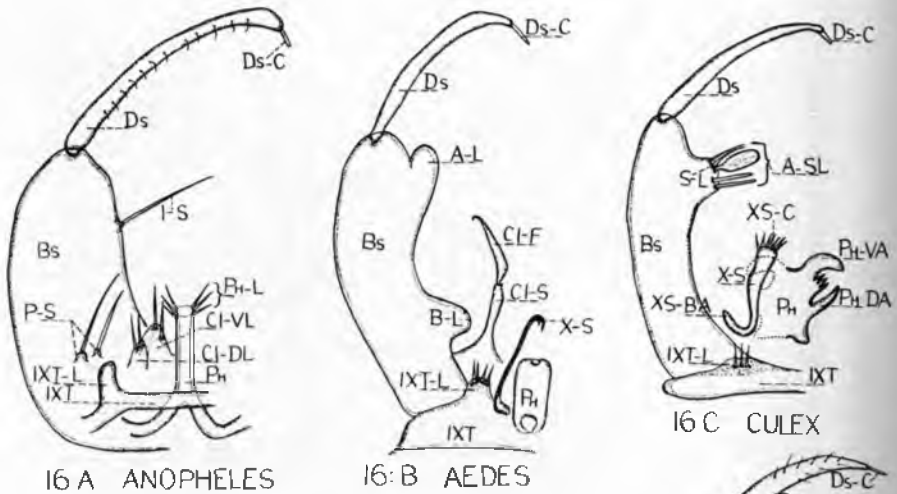


Fig. 16. Male genitalia. A, Anopheles; B, Aedes; C, Culex; D, Culiseta. A-L, apical lobe; A-SL, appendages, subapical lobe; B-L, basal lobe; Bs, basistyle; Cl-DL, claspette dorsal lobe; Cl-F, claspette filament; Cl-S, claspette stem; Cl-VL, claspette ventral lobe; Ds, dististyle; Ds-C, dististyle claw; I-S, internal spine; P-S, parabasal spines; Ph, phallosome; Ph-DA, phallosome, dorsal arm; Ph-L, phallosome leaflets; Ph-VA, phallosome, ventral arm; S-L, subapical lobe; IX-L, ninth tergite; IX-L-L, ninth tergite lobe; X-S, tenth sternite; X-S-C, tenth sternite crown; X-S-BA, tenth sternite basal arm.

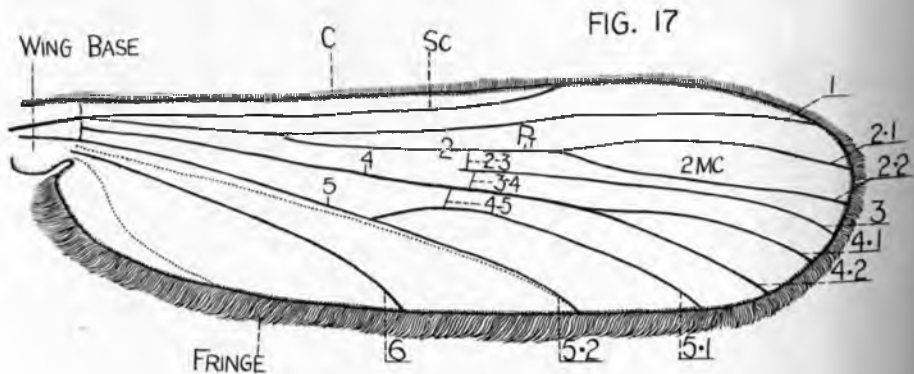
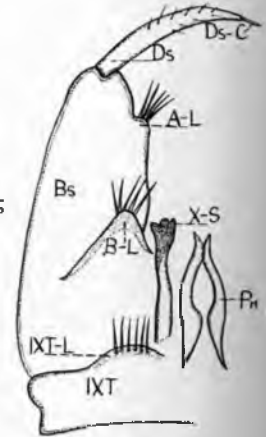


Fig. 17. Wing of mosquito. C, costal vein; Sc, subcostal vein; Pt, petiole of vein 2; 2MC, second marginal cell; 1, 2, 2.1, 2.2, 3, 4, 4.1, 4.2, 5, 5.1, 5.2, 6, longitudinal veins and branches; 2-3, 3-4, 4-5, cross veins.

Keys to the *Anopheles* Species of Utah

Adult Females

1. Wings with contrasting areas of dark and white scales;
palpi with narrow white rings *Anopheles franciscanus*, p. 11
Wings entirely dark scaled, with or without a silver or copper colored
spot on fringe of apex of wing; palpi without narrow white rings 2
2. Wing with a silver or copper colored spot on fringe
at apex of wing *Anopheles earlei*, p. 9
Wing without a silver or copper colored spot on fringe
at apex of wing *Anopheles freeborni*, p. 11

Male Genitalia (Fig. 16A)

1. Leaflets of phallosome greatly reduced, difficult to discern;
lobes of ninth tergite short, stout, about as long
as broad *Anopheles franciscanus*, p. 11
Leaflets of phallosome distinctly developed; lobes of ninth tergite
at least twice as long as broad 2
2. Lobes of ninth tergite broad, about twice as long as broad and
somewhat expanded at apex *Anopheles earlei*, p. 9
Lobes of ninth tergite narrow, at least three times as long as broad,
not expanded at apex *Anopheles freeborni*, p. 11

Fourth Instar Larva (Fig. 8)

1. Outer clypeal hair single *Anopheles franciscanus*, p. 11
Outer clypeal hair many branched, feathery-like 2
2. Inner clypeal hair single, unforked on distal half *Anopheles freeborni*, p. 11
Inner clypeal hair single, but forked on distal half
into 2-5 branches *Anopheles earlei*, p. 9

ANOPHELES SPECIES ACCOUNTS

Anopheles (Anopheles) earlei Vargas (Fig. 18)*Female:*

The female of this species is characterized by having a silver or copper colored spot on fringe at apex of wing. Wing otherwise entirely dark scaled.

Male Genitalia:

Very similar to *A. freeborni*, but distinguishable by the characters noted in the key.

Fourth Instar Larva:

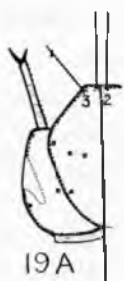
Similar to *A. freeborni*, but differs in having the inner clypeal hair single, but forked on distal half into 2-5 branches; inner clypeal hairs separated by about the width of one of the basal tubercles.

BIOLOGY AND DISTRIBUTION

Larvae have been collected in two localities, near Callao in JUAB County, 4400 ft., and near Woodruff in RICH County, 6400 ft. Both collections were made in May from cold fresh water springs. Larvae were associated with *A. freeborni*. Females have been taken during May resting in a culvert at the head of Chalk Creek, 7200 feet, in SUMMIT County. *Anopheles earlei* is not known to be a vector of malaria in nature.



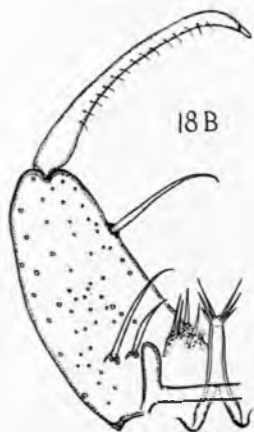
18A



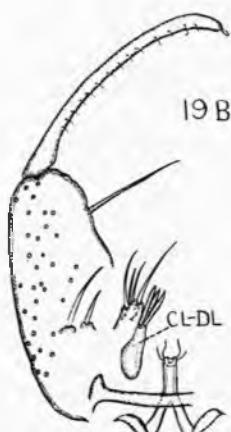
19A



20A



18B



19B



20B

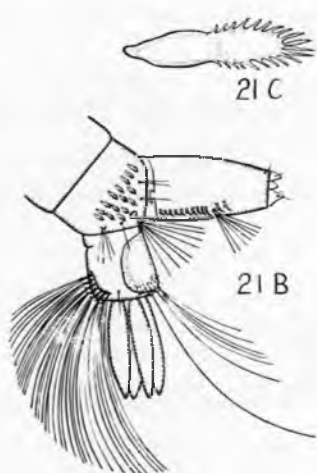
FIG. 18 AN. EARLEI

19. AN. FRANCISCANUS

20. AN. FREEBORNI



21A



21B



21C



21D

FIG. 21 A. ATROPALPUS

Figs. 18-20. Anopheles species. A. head. B. Male genitalia; 21. Aedes atropalpus. A. Larva, head and thorax. B. Larva, terminal segments. C. Pecten tooth. D. Male genitalia.

Anopheles (Anopheles) franciscanus McCracken (Fig. 19)*Female:*

Palpi with three narrow white rings. Mesonotum with broad frosted median longitudinal stripe; stripe clothed with narrow pale scales and hairs. Wings conspicuously marked with contrasting areas of dark and white scales.

Male Genitalia:

Distinguished from other Utah *Anopheles* species by the characters noted in the key.

Fourth Instar Larva:

Readily distinguished from *A. earlei* and *A. freeborni* by the outer clypeal hair which is single instead of many branched.

BIOLOGY AND DISTRIBUTION

This species is widely distributed in WASHINGTON County at elevations below 4000 ft. The larvae are usually found in spring fed or small algal covered pools left in stream beds after spring run-off and are often in association with *A. freeborni*. Larvae have also been taken at Fish Springs in JUAB County, 4310 ft. Adults have been collected resting in various out buildings. The species appears to prefer large mammals and rarely attacks man.

Anopheles (Anopheles) freeborni Aitken (Fig. 20)*Female:*

The female of this common *Anopheles* species can be distinguished from other Utah species by the wing which is entirely dark scaled and without a silver or copper colored spot on fringe at the apex of the wing.

Male Genitalia:

Very similar to *A. earlei*, but distinguishable by the characters noted in the key.

Fourth Instar Larva:

Similar to *A. earlei* in having the outer clypeal hair many branched, but differs in the inner clypeal hair which is single and unforked beyond the middle; inner clypeal hairs closely set, separated by less than the width of one of the basal tubercles.

BIOLOGY AND DISTRIBUTION

This is the principal vector of malaria in western United States and is widely distributed in Utah. Larvae prefer clear fresh water pools exposed to sunlight. They are present principally from April until September below 7000 ft. Adults occur most abundantly during the summer months, but may be taken as hibernating adults during the winter months. The species has not survived well in areas of intensive mosquito control, but in other areas may constitute a source of annoyance and a potential source of disease transmission. County records: BOX ELDER, CACHE, DAVIS, DUCHESNE, EMERY, GRAND, JUAB, RICH, SALT LAKE, SUMMIT, TOOELE, UTAH, WASATCH, WASHINGTON, WEBER.

Key to the Mountain *Aedes* Mosquitoes

This key is intended to identify those *Aedes* species which normally occur in mountainous areas above 6,500 ft. elevation.

Adult Females

1. Tarsal segments with basal white rings on some or all of the segments. (Fig. 12B) 2
 Tarsal segments without white rings. (Fig. 12C) 4
2. Tarsal claw with main claw sharply bent beyond tooth; tooth about two-thirds the length of main claw, slender, of almost equal thickness throughout length. (Fig. 27E) *Aedes excrucians*, p. 23
 Tarsal claw with main claw evenly rounded beyond tooth; tooth conspicuously thicker at base than at apex. 3
3. Torus (Fig. 2) with white scales restricted to a few on mesal surface or absent; wings with white scales limited almost entirely to anterior margin of wing between costa and vein 1; basal white abdominal bands not expanded mesally *Aedes increpitus*, p. 27
 Torus with conspicuous white scaling on dorsal and mesal surfaces; wings with white scales scattered over all wing veins (rarely wing scales almost entirely dark); basal white abdominal bands usually expanded mesally, sometimes forming a distinct median longitudinal stripe *Aedes fitchii*, p. 24
4. Post-coxal scale patch present. (Fig. 13A) 5
 Post-coxal scale patch absent 8
5. Hypostigmal scale patch present (Fig. 13A); white scales scattered along costa, subcosta and often vein 1 to near wing tip *Aedes cataphylla*, p. 21
 Hypostigmal scale patch absent; white scales on wing restricted to patch at base of costa 6
6. Postpronotum with numerous setae arising from the surface of the posterior half of the sclerite (Fig. 13B); lower mesepimeral bristles usually 6 or more *Aedes impiger*, p. 26
 Postpronotum with only a single or double row of setae arising along the posterior margin (Fig. 13A); lower mesepimeral bristles usually less than 4 7
7. Scale patch on sternopleuron extends to upper anterior margin (Fig. 13A); probasisternum with many scales on posterior portion. (Fig. 14) *Aedes hexodontus*, p. 25
 Scale patch on sternopleuron does not extend to upper anterior margin; probasisternum not scaled on posterior portion *Aedes implicatus*, p. 27
8. Conspicuous hypostigmal scale patch present, usually yellowish in color; pleural scales yellow or burnished in color *Aedes pullatus*, p. 30
 Conspicuous hypostigmal scale patch lacking (inconspicuous patch of few scales sometimes in *A. intrudens*); Pleural scales white 9
9. Scale patch on sternopleuron reaches upper anterior border; scale patch on mesepimeron extends to ventral border; scutellar bristles and bristles above wing base dark brown or black *Aedes communis*, p. 22
 Scale patch on sternopleuron does not reach upper anterior border; scale patch on mesepimeron does not reach ventral border; scutellar bristles and bristles above wing base yellow or golden 10
10. Abdomen without basal white bands; a patch of dark brown scales on anterior surface of fore coxa; a very small species *Aedes cinereus*, p. 21
 Abdomen with conspicuous basal white bands; dark brown scales absent on anterior surface of fore coxa *Aedes intrudens*, p. 28

Male Genitalia (Fig. 16B)

1. Dististyle bifurcate and arising subapically from the basistyle *Aedes cinereus*, p. 21
Dististyle not bifurcate and arising from apex of basistyle 2
2. Basal lobe indistinct, represented by a flattened rugose area covered with short setae borne on minute tubercles; basal lobe without dorsal spines 3
Basal lobe prominent, not as above; with dorsal spine 4
3. Flattened rugose area large, extending to base of apical lobe; apical lobe large rounded; claspette filament distinctly shorter than stem *Aedes excrucians*, p. 23
Flattened rugose area small, not extending above middle of basistyle; apical lobe small, bluntly pointed; claspette filament almost as long as stem *Aedes increpitus*, p. 27
4. Basal lobe with a single long spine arising from dorsal margin and a pair of shorter closely set spines arising from ventral margin; claspette stem with a distinct thickened angulate or elbowed mesal projection 5
Basal lobe with a single dorsal spine; claspette stem without mesal projection 6
5. Basistyle with a dense tuft of setae arising from ventral surface at apex; claspette filament angularly expanded on upper margin near middle; setae present on dorsal surface of apical lobe *Aedes intrudens*, p. 28
Basistyle without dense tuft of setae at apex; claspette filament not angularly expanded on upper margin; setae absent on dorsal surface of apical lobe *Aedes pullatus*, p. 30
6. Apical lobe large, low, broadly rounded, covered with many short, stout curved setae; basal lobe large, broadly expanded basally and narrowed apically; claspette filament distinctly shorter than stem, sickle-shaped, rounded on upper margin *Aedes hexodontus*, p. 25
Apical lobe not as above; basal lobe not as above; claspette filament shorter or equal in length to stem; if shorter, not sickle-shaped 7
7. Claspette filament nearly equal in length to claspette stem and broadly expanded or angulated on upper surface, never with double ridge on upper surface; claspette stem strongly curved and usually directed dorsally 8
Claspette filament distinctly shorter than claspette stem, not broadly expanded on upper surface, with or without double ridge on upper surface; claspette stem moderately curved, usually directed laterally or mesally 10
8. Apical lobe, small, rounded, near apex of basistyle; basistyle stout, about twice as long as width at level of basal lobe *Aedes impiger*, p. 26
Apical lobe long, narrow, finger-like; basistyle narrow, over two and one-half times as long as width at level of basal lobe 9
9. Conspicuous cluster of long setae present at base of apical lobe *Aedes implicatus*, p. 27
Conspicuous cluster of long setae absent at base of apical lobe *Aedes cataphylla*, p. 21
10. Claspette stems lyre-shaped becoming approximate distally; filament shorter than stem, expanded at base and tapering to a narrow point; basal lobe large, triangular and densely covered with long setae *Aedes fitchii*, p. 24
Claspette stems not lyre-shaped; filament not expanded on both margins; filament with a double ridge on upper side and evenly rounded dorsally basal lobe conical, not densely covered with long setae *Aedes communis*, p. 22

Fourth Instar Larvae (Figs. 9-10)

1. Anal segment completely ringed by the anal plate; comb scales 5-8 in number, each terminating in a large strongly curved spine *Aedes hexodontus*, p. 25
 Anal segment not ringed by the anal plate; comb scales more than 8 in number, with or without terminal spine 2
2. Siphonal index about 4.5; thoracic and abdominal hairs conspicuously long and well developed 3
 Siphonal index not more than 3.5; thoracic and abdominal hairs not unusually long 4
3. Pecten with 1-3 more widely spaced distal teeth; mesothoracic hair No. 1 very short, multiple *Aedes excrucians*, p. 23
 Pecten with all teeth evenly spaced; mesothoracic hair No. 1 very long, 1-3 branched *Aedes fitchii*, p. 24
4. Siphon tube with 3-5 more widely spaced pecten teeth extending distally beyond siphonal tuft to near apex of siphon; upper and lower frontal head hairs single *Aedes cataphylla*, p. 21
 Siphon tube with pecten teeth inserted before siphonal tuft; head hairs variable 5
5. Pecten with at least two more widely spaced distal teeth 6
 Pecten with all teeth evenly spaced 7
6. Upper and lower head hairs widely separated; siphonal tuft of several long setae; ventral margin of anal plate conspicuously incised posteriorly *Aedes intrudens*, p. 28
 Upper and lower head hairs closely approximate; siphonal tuft of several very short setae; ventral margin of anal plate not conspicuously incised *Aedes cinereus*, p. 21
7. Upper and lower head hairs both multiple; mesothorax hair No. 5, double *Aedes pullatus*, p. 30
 Upper and lower head hairs both single or with one or both double; Mesothoracic hair No. 5, single 8
8. Comb scales less than 15, each terminating in a stout apical spine about equal in length to scale base; anal gills very long, at least three to four times the length of the anal segment *Aedes impiger*, p. 26
 Comb scales more than 20, without stout apical spine; anal gills less than three times the length of the anal segment 9
9. Upper head hairs double. Lower head hairs single or double (highly variable, hairs may vary from single to triple with any combination occurring); prothoracic hair No. 3 usually double or triple; lateral abdominal hairs usually all double; dorsal and ventral abdominal hairs double or triple *Aedes increpitus*, p. 27
 Upper and lower head hairs usually both single, rarely double; prothoracic hair No. 3 usually single, rarely double; lateral abdominal hairs not all double; dorsal and ventral abdominal hairs usually single or double 10
10. Comb scales in a small triangular patch of about 25 scales; prothoracic hair No. 1 single, hair No. 5 double, rarely single; dorsal and ventral abdominal hairs usually all single *Aedes implicatus*, p. 27
 Comb scales in a large triangular patch of about 35-60 scales; prothoracic hair No. 1, double or triple, hair No. 5, triple or multiple, dorsal and ventral abdominal hairs single or double *Aedes communis*, p. 22

Key to the Valleys and Plains *Aedes* Mosquitoes

This key is provided for the identification of *Aedes* species which normally occur in the valleys and plains areas at elevations below 6,500 ft.

Adult Female

1. Tarsal segments with distinct white bands (Fig. 12A, B) 2
Tarsal segments without white bands (Fig. 12C) 12
2. Tarsal segments with both basal and apical white bands (apical bands sometimes very narrow) 3
Tarsal segments with basal white bands only (Fig. 12B) 7
3. Wing scales dark except at base of costa; dorsum of abdomen with basal white bands on each segment (Fig. 7), but lacking patches of median white scales on apical parts of segments 4
Wing scales intermixed dark and white over most of wing veins; dorsum of abdomen with considerable numbers of white scales on both basal and apical portions of segments; often a distinct median dorsal longitudinal stripe of white scales extending length of abdomen (Fig. 6); entire dorsum of abdomen may be white scaled 5
4. Palpi with conspicuous group of white scales at tip; scutellum with broad white scales *Aedes varipalpus*, p. 33
Palpi with dark scales, lacking a white tip; scutellum with narrow yellowish scales *Aedes atropalpus*, p. 20
5. Wing scales dark and white, intermixed without definite pattern, white scales predominating; mesonotum with broad undivided median band of brown scales; dorsum of abdomen with small lateral patches of dark scales or entirely pale scaled *Aedes campestris*, p. 20
Wing scales dark and white, arranged in definite patterns with black scales always predominating on third vein, the forks of fourth and fifth veins; mesonotum with median brown band of variable width, often divided into two or three narrow bands; dorsum of abdomen usually with conspicuous lateral patches of dark scales, rarely mostly pale scaled 6
6. Costal vein mostly dark scaled; sixth vein with dark and white scales; dorsum of abdomen with rather narrow median longitudinal stripe of white scales; large lateral patches of dark scales present on each abdominal tergite; median mesonotal band broad..... *Aedes melanimon*, p. 28
Costal vein with white scales predominating; sixth vein usually entirely white scaled; dorsum of abdomen with broad median longitudinal stripe of white scales; lateral patches of dark scales usually reduced in size, often obliterated by white scales on posterior segments; median mesonotal band variable in width *Aedes dorsalis*, p. 23
7. Tarsal segments with narrow basal white bands; basal white bands on dorsum of abdomen indented mesally; mesonotum uniformly clothed with narrow brown scales, without distinct stripes or lines *Aedes vexans*, p. 33
Tarsal segments with broad basal white bands; basal white bands on dorsum of abdomen without median indentation; mesonotum with dorsal stripes or lines 8
8. Proboscis with white band of scales near middle (Fig. 15A); dorsum of abdomen with distinct median longitudinal stripe of white scales (in part) *Aedes nigromaculis*, p. 29
Proboscis without median white band of scales (Fig. 15B); dorsum of abdomen with or without distinct median longitudinal stripe of white scales 9
9. Hypostigmal scale patch present; scale patch on sternopleuron reaches upper anterior margin. (Fig. 13A) 10
Hypostigmal scale patch absent; scale patch on sternopleuron does not usually reach upper anterior margin 11

10. Dorsum of abdomen entirely covered with yellowish scales; probasisternum not scaled on posterior portion; palpi dark with pale scales intermixed; a large yellowish species *Aedes flavescens*, p. 25
Abdominal tergites of abdomen with basal bands of white scales which extend mesally to apex of segment forming a conspicuous median longitudinal stripe of white scales, each tergite with lateral patches of dark scales (Fig. 6); probasisternum with pale scales on posterior portion; palpi dark scaled, rarely with a few pale scales (in part) *Aedes nigromaculis*, p. 29
11. Torus (Fig. 2) with white scales restricted to a few on mesal surface or absent; wings dark scaled with scattered white scales limited to anterior margin of wing between 1st longitudinal and costal veins *Aedes increpitus*, p. 27
Torus with conspicuous white scaling on mesal and dorsal surfaces; wings dark scaled with few to many white scales scattered over most wing veins (rarely wing scales all dark, with patch of white scales at base of costa); basal white bands on abdominal tergites often expanded mesally, particularly on proximal segments *Aedes fitchii*, p. 24
12. Mesonotum uniformly covered with fine golden-brown scales, without pale scales; abdomen dark brown scaled on dorsum with white scales occurring on extreme lateral margins of each segment; wing scales entirely dark; a small species *Aedes cinereus*, p. 21
Mesonotum with pale scales, at least on margins or in prescutellar space; dorsum of abdomen with basal bands of white scales on each segment; wing with pale scales present, at least a few at base of costa 13
13. Wing veins alternating black and white scaled with costa and veins 1, 3 and 5 predominantly dark scaled, remaining veins white scaled *Aedes spencerii*, p. 32
Wing veins not alternating black and white scaled, pattern variable, dark scales predominating or with white scales more abundant on anterior veins or restricted to base of costa 14
14. Post-coxal scale patch absent; lower mesepimeral setae absent; wing scales dark, a few white scales usually present at extreme base of costa *Aedes sticticus*, p. 32
Post-coxal scale patch present; lower mesepimeral setae present; wing scales variable 15
15. Hypostigmal scale patch absent 16
Hypostigmal scale patch present 17
16. Scales on sternopleuron extend to upper anterior margin; mesepimeral scale patch extends to anterior ventral margin; probasisternum scaled on ventral portion *Aedes schizopinax*, p. 31
Scales do not extend to upper anterior margin of sternopleuron; scale patch on mesepimeron does not extend to ventral margin; ventral portion of probasisternum not scaled *Aedes implicatus*, p. 27
17. Wings with many white scales on anterior veins; basal white bands on dorsum of abdomen broad, with white scales scattered on apical half of each segment and forming a median longitudinal stripe *Aedes niphadopsis*, p. 30
Wings with a few white scales scattered on costa, subcosta and 1st vein; conspicuous basal white bands present on dorsum of abdomen but without white scales on apical portions of segments or median longitudinal stripe *Aedes cataphylla*, p. 21

Male Genitalia (Fig. 16B)

1. Dististyle bifurcate and arising sub-apically from the basistyle *Aedes cinereus*, p. 21
Dististyle not bifurcate and arising from the apex of the basistyle 2
2. Claspette stem crowned with a dense tuft of setae, filament absent; dististyle broad, flattened, a stout claw arising near tip gives apex a distinct bifurcate appearance *Aedes vexans*, p. 33
Claspette with distinct filament; dististyle with claw arising at apex, apex not bifurcated 3

3. Apical lobe of basistyle absent 4
 Apical lobe of basistyle present 6
4. Basal lobe of basistyle large, elongate, bearing numerous long curved bristles with one of the dorsal bristles stouter than the rest *Aedes varipalpus*, p. 33
 Basal lobe of basistyle small, rounded, clothed with slender, nearly straight setae 5
5. Lobes of ninth tergite inconspicuous, without setae; dististyle almost without setae, of nearly equal width throughout *Aedes atropalpus*, p. 20
 Lobes of ninth tergite small, with short spine-like setae; dististyle with many short setae, distinctly broadened before middle *Aedes nigromaculis*, p. 29
6. Basal lobe of basistyle a small, slightly raised, rugose area bearing setae, but lacking a distinctly enlarged dorsal spine *Aedes increpitus*, p. 27
 Basal lobe of basistyle well developed, bearing setae and one or more distinctly enlarged dorsal spines 7
7. Basal lobe with numerous setae and a group of well developed dorsal spines of comparable size, one slightly stouter than the rest; claspette filament about the length of claspette stem, strap-shaped, about equal width for entire length *Aedes campestris*, p. 20
 Basal lobe with numerous setae and with either one or two distinctly enlarged dorsal spines 8
8. Basal lobe of basistyle bearing a stout short dorsal spine, a long recurved stout dorsal spine and a dense group of slender setae 9
 Basal lobe of basistyle with one long stout dorsal spine and numerous weaker spines or setae 10
9. Claspette filament with a short shank and becoming angularly expanded before the middle; filament shorter than nearly straight claspette stem; apical lobe small, bearing numerous dorsal setae *Aedes dorsalis*, p. 23
 Claspette filament with long shank and becoming angularly expanded near middle; filament longer than curved claspette stem; apical lobe prominent, nearly bare of setae dorsally *Aedes melanimon*, p. 28
10. Basal lobe of basistyle represented by a large raised rugose area covered with fine setae and extending to near the base of the apical lobe *Aedes flavescens*, p. 25
 Basal lobe of basistyle triangular, conical or bluntly rounded, not reaching beyond basal two-fifths of the basistyle 11
11. Basal lobe short conical, rather small; apical lobe narrow, finger-like bearing a few short slender setae 12
 Basal lobe large, broad or triangular; apical lobe large thumb-like or broadly rounded bearing moderate to short setae which are often stout and recurved 14
12. A prominent cluster of long setae arising from the base of apical lobe *Aedes implicatus*, p. 27
 Without conspicuous cluster of long setae arising from base of apical lobe 13
13. Claspette stem slender, strongly curved and directed dorsally; lobes of ninth tergite bearing 3-5 stout spines *Aedes cataphylla*, p. 21
 Claspette stem slender, relatively straight on basal two-thirds, strongly curved on apical third; lobes of ninth tergite bearing a cluster of 7-9 stout spines *Aedes niphadopsis*, p. 30
14. Claspette stems with apices closely approximate, and giving conspicuous lyre-shape appearance; apical lobe prominent, thumb-like and clothed with moderately long, curved setae *Aedes fitchii*, p. 24
 Claspette stems with apices well separated, without conspicuous lyre-shape appearance; apical lobe large, broadly rounded, clothed with short, stout, curved or recurved setae 15

15. Claspette stem clothed with many fine setae to within about the width of stem from the point of filament attachment; without dense cluster of long setae directly adjacent to dorsal spine *Aedes schizopinax*, p. 31
 Claspette stem without fine setae on distal third or one-half except for 1-3 small setae inserted near apex; with dense cluster of long setae directly adjacent to dorsal spine 16
16. Claspette stem with large, rounded outer lobe at base ... *Aedes spencerii*, p. 32
 Claspette stem with basal outer lobe narrow and bluntly pointed *Aedes sticticus*, p. 32

Fourth Instar Larvae (Figs 9 and 10)

1. Anal segment completely ringed by the anal plate ... *Aedes nigromaculis*, p. 29
 Anal segment not ringed by anal plate 2
2. Pecten with one to several more widely spaced distal teeth, often extending beyond middle of siphon 3
 Pecten with evenly spaced pecten teeth, usually not extending beyond middle of the siphon 10
3. Pecten extending distally to well beyond the insertion of the siphonal tuft 4
 Pecten ending at or before the insertion of the siphonal tuft 5
4. Comb scales with conspicuous median apical spine; siphonal index 3.0 to 3.5 *Aedes cataphylla*, p. 21
 Comb scales evenly fringed with small spines at apex; siphonal index 1.5 to 2.0 *Aedes atropalpus*, p. 20
5. Upper and lower frontal head hairs both single (occasionally one member or pair may be double, rarely both pairs double) 6
 Upper frontal head hairs usually with at least 3 branches (rarely double); lower frontal head hairs with one or more branches 7
6. Pecten extending about two-thirds the length of the siphon; anal plate extending to near mid-ventral line *Aedes spencerii*, p. 32
 Pecten restricted to basal one-fourth or one-third of siphon; anal plate extending ventrally about half way down the sides of the anal segment *Aedes niphadopsis*, p. 30
7. Lower frontal head hairs inserted very close to upper frontal head hairs in an antero-lateral position; insertions of upper and lower frontal head hairs and pre-antennal tuft forming an almost straight line *Aedes cinereus*, p. 21
 Lower frontal head hairs inserted anteriorly to and widely separated from upper frontal head hairs; head hairs not inserted in line with the preantennal tuft 8
8. Anal plate extending to near mid-ventral line; comb of less than fifteen thorn-like scales arranged in a single or irregular double row *Aedes vexans*, p. 33
 Anal plate extending ventrally not more than two-thirds down the sides of the anal segment; comb of more than fifteen scales arranged in a triangular patch 9
9. Comb scales with conspicuous median spine; mesothoracic hair No. 1, 2-3 branched, conspicuously shorter than prothoracic hair No. 1 which is usually single; a large, robust larva (in part) *Aedes flavescens*, p. 25
 Comb scales fringed apically without conspicuous median spine; mesothoracic hair No. 1, 2-3 branched, long, about equal in length to prothoracic hair No. 1 which is usually double (in part) *Aedes campestris*, p. 20
10. Upper and lower frontal head hairs with less than three branches, uppers usually single or double, lowers usually single 11
 Upper frontal head hairs with three or more branches; lower frontal head hairs single to multiple 15

11. Antenna short, smooth, about one-half as long as head; antennal tuft of one or two hairs; anal gills stout, bluntly rounded at apex, 3-4 times the length of anal plate *Aedes varipalpus*, p. 33
 Antenna spinose, more than one-half as long as head; antennal tuft multiple; anal gills slender and pointed or bud-like, less than 3 times the length of anal plate 12
12. Pecten extending to middle of the siphon; upper and lower head hairs usually both single; anal plate not conspicuously spiculate posteriorly .. 13
 Pecten extending to about basal third of siphon, never to middle; upper head hairs usually single or double; lower head hairs usually single; anal plate spiculate (microsetae well developed posteriorly) 14
13. Mesothoracic hair No. 1 usually double, about as long as prothoracic hair No. 1 which is usually double *Aedes dorsalis*, p. 23
 Mesothoracic hair No. 1 usually double or triple, very much shorter than prothoracic hair No. 1 which is usually single *Aedes melanimon*, p. 28
14. Prothoracic hairs Nos. 1 and 3 usually single; upper and lower frontal head hairs usually both single; dorsal and ventral abdominal hairs usually single *Aedes implicatus*, p. 27
 Prothoracic hairs Nos. 1 and 3 usually double; upper frontal head hairs usually double; lowers single; dorsal and ventral abdominal hairs usually double or triple *Aedes increpitus*, p. 27
15. Siphonal index about 4.5; siphon usually conspicuously tapered on distal half; thoracic and abdominal setae extremely long and well developed; siphonal tuft about twice as long as diameter of siphon at point of insertion of tuft *Aedes fitchii*, p. 24
 Siphonal index 2.5 to 4.0; siphon not conspicuously tapered on distal half; thoracic and abdominal setae not extremely long; siphonal tuft distinctly less than twice as long as diameter of siphon at point of tuft insertion 16
16. Siphonal index about 3.5 to 4.0; prothoracic hair No. 1 single and very long, about three time as long as prothoracic hair No. 2 (in part) *Aedes flavescens*, p. 25
 Siphonal index about 2.5 to 3.0; prothoracic hair No. 1 with one or more branches, but not more than twice as long as prothoracic hair No. 2 .. 17
17. Pecten of siphon extending about three-fifths the length of the siphon with the last 2-3 distal teeth distinctly stouter and longer than the rest; comb scales fringed apically without a distinct median spine; anal gills usually bud-like or much shorter than anal plate (in part) *Aedes campestris*, p. 20
 Pecten of siphon ending at or before the middle of the siphon with distal siphon teeth not distinctly stouter and longer than the rest; comb scales with a distinct median apical spine; anal gills not bud-like, often longer than anal plate 18
18. Prothoracic hair No. 1 long, 3-5 branched, Nos. 2 and 3 about as long as No. 1, No. 5 double or triple; mesothoracic hair No. 1, 3-4 branched almost as long as the prothoracic hairs *Aedes schizopimar*, p. 31
 Prothoracic hair No. 1 usually single, Nos. 2 and 3 distinctly shorter than No. 1, No. 5 usually single; mesothoracic hair No. 1 minute, 2-3 branched *Aedes sticticus*, p. 32

AEDES SPECIES ACCOUNTS

Aedes (Finlaya) atropalpus (Coquillet) (Fig. 21, p. 10)

Female:

Tarsal segments banded basally and apically with white scales. Palpi entirely dark scaled. Wings scales narrow, dark except for white patch at base of costa. Mesonotum clothed with fine pale yellow scales; a slightly darker median stripe may be present. Scutellum and post pronotum with narrow yellowish scales. Abdominal tergites dark scaled with basal bands of white scales.

Male genitalia:

See key characters.

Fourth Instar Larva:

Upper and lower frontal head hairs single. Siphonal index 1.5-2.0; pecten extending to near tip of siphon, with several distal teeth more widely spaced; siphonal tuft inserted near middle of tube, within pecten. Comb scales more than 20, not spine-like.

BIOLOGY AND DISTRIBUTION

A multi-brooded species. The larvae occur in sandstone rock holes filled by precipitation or stream overflow, at elevations below 4,500 ft. Both larvae and adults have been collected from early April until mid-September in desert regions of southeastern Utah. The females may be very annoying in localized areas. County records: GRAND.

Aedes (Ochlerotatus) campestris Dyar and Knab (Fig. 22)

Female:

Tarsi banded basally and apically with white scales. Wing veins usually predominately white scaled with a few to many dark scales scattered uniformly over wing veins. Mesonotum white or yellowish-white scaled with broad median stripe of brown scales, about one-third the width of mesonotum, and conspicuous antero-lateral patches of brown scales. Abdominal tergites pale scaled except for small lateral patches of dark scales on segment two to five; dorsum of abdomen often entirely pale scaled.

Male Genitalia:

Apical lobe small with numerous dorsal setae. Basal lobe conical, not constricted at base, with numerous setae and a group of well-developed spines of comparable size along dorsal margin; one spine slightly stouter and longer than the rest. Claspette filament about equal in length to curved claspette stem; filament strap-shaped without angular expansion.

Fourth Instar Larva:

Upper frontal head hairs triple, often double. Lower frontal head hairs single, rarely double. Mesothoracic hair No. 1, long, 3 branched. Siphonal index about 3.0; pecten extending about three-fifths the length of the siphon with one to two distal teeth more widely spaced, sometimes pecten teeth evenly spaced, but with last two distal teeth stouter and longer than the rest; siphon often expanded distally to the end of the pecten, then tapering abruptly to the end of the tube; siphon tuft large, about equal in length to the distance from the point of insertion to the tip of the siphon. Comb scales about 25 in triangular patch; each scale fringed apically with several subequal spines. Anal gills bud-like.

BIOLOGY AND DISTRIBUTION

A single-brooded species. The larvae occur from March until early June in pools formed from snow melt or irrigation waste water at elevations below 7000 ft. Adults emerge from April to mid-June and may persist until late August. This species may be a severe nuisance in localized areas in late spring and early summer. County records: BOX ELDER, CACHE, DAVIS, DUCHESNE, JUAB, MILLARD, RICH, SALT LAKE, SANPETE, SEVIER, SUMMIT, TOOELE, UTAH, WEBER.

Aedes (Ochlerotatus) cataphylla Dyar (Fig. 23)

Female:

Tarsi without bands. Wings mostly dark scaled with a patch of white scales at base of costa and few to many white scales scattered along costa, subcosta and often vein 1. Mesonotum covered with dark brown and gray scales; a pair of medium longitudinal stripes of dark brown scales present; stripes often poorly defined. Post-coxal scale patch present. Scale patch on sternopleuron extending to near, but not usually reaching upper anterior border. Scale patch on mesepimeron usually extends to anterior ventral border. Conspicuous hypostigmal scale patch present. Abdominal tergites with basal white bands.

Male Genitalia:

Apical lobe narrow, finger-like with a few short setae at apex; without a conspicuous closely set group of long setae at base. Basal lobe bluntly conical bearing numerous setae and a long dorsal spine. Claspette stem slender, strongly curved and directed dorsally; filament at least two-thirds the length of stem, broadly expanded at basal third and tapering to a recurved point. Lobes of ninth tergite bearing 3-5 stout spines.

Fourth Instar Larva:

Upper and lower frontal head hairs single, rarely one or both pairs double. Siphonal index about 3.0-3.5; pecten extending to near apex of siphon with 4-5 distal teeth more widely spaced; siphonal tuft inserted near middle of tube within pecten. Comb scales about 20-25, each scale thorn-like, with a prominent terminal spine.

BIOLOGY AND DISTRIBUTION

A single brooded species. Larvae occur principally in open snow-melt pools in montane and subalpine areas above 7,000 ft., but may be found at lower elevations in mountain valleys or foothill areas. Larvae have been taken as early as late February in Skull Valley, Tooele County, at 4,500 ft. elevation. At elevations above 7,000 ft. larvae usually occur from mid-May until mid-June. Adults are on the wing from late March until late July, rarely early August. The adults are strong fliers and may become a severe nuisance in areas where they occur. County records: DUCHESNE, EMERY, GRAND, KANE, SALT LAKE, SANPETE, SEVIER, SUMMIT, TOOELE, UTAH, WASATCH.

Aedes (Aedes) cinereus Meigen (Fig. 24)

Female:

Small brown species with unbanded legs. Mesonotum uniformly dark brown scaled; coxae of forelegs with patch of dark scales on anterior surface. Abdominal tergites dark brown scaled with pale scales usually occurring only on lateral margins of each segment, rarely forming narrow basal white bands.

Male:

Palpi short as in the female. Distinctive characters of the genitalia are noted in the key.

Larva:

Upper and lower frontal head hairs multiple, closely set and inserted in an almost straight line with the preantennal tuft. Siphonal index about 4.0; pecten with two or three more widely spaced distal teeth; siphon tuft very short, less than the width of the siphon at point of insertion, arising near distal third of tube. Comb of about 12 thorn-like scales. Anal plate extending about two thirds down the sides of the anal segment.

BIOLOGY AND DISTRIBUTION

A single brooded species. The larvae occur principally during April and May in woodland or stream overflow pools in the lower mountain valleys at elevations between 4200 to 6500 ft. The adults emerge during May and early June, but are short-lived and rarely persist after July. The species is uncommon, but the females are sometimes annoying in localized wooded areas. County records: CACHE, MORGAN, SALT LAKE, SUMMIT, UTAH, WASATCH, WEBER.

Aedes (Ochlerotatus) communis (De Geer) (Fig. 25)*Female:*

Tarsi without bands. Wings dark scaled with a patch of white scales at base of costa. Mesonotum with paired median longitudinal dark brown stripes, sparsely covered with narrow yellowish scales; each stripe bordered mesally and laterally by a line of golden-yellow scales; rest of mesonotal scales gray or grayish-brown; median stripes do not contrast sharply with rest of mesonotum, and are sometimes diffuse. Post-coxal scale patch absent. Scale patch on sternopleuron extends to upper anterior border. Scale patch on mesepimeron extends to anterior ventral border. Hypostigmal scale patch absent. Abdominal tergites with basal white bands.

Male Genitalia:

Apical lobe well developed, bulbous, arising near apex of basistyle, with prominent group of short setae on apical ventral surface. Basal lobe conical, not strongly raised, with short setae, a marginal row of about 12 long setae and a long, slender dorsal spine. Claspette stem with apical half more slender and directed mesally; filament about one-half the length of claspette stem, narrowly expanded with a double-winged upper surface.

Fourth Instar Larva:

Upper and lower frontal head hairs usually single. Prothoracic hair No. 1 long, double or triple. Siphonal index about 2.5-3.0; pecten of evenly spaced teeth followed by tuft of long setae situated about at middle of tube. Comb scales in a large triangular patch of about 40-60 scales; each scale terminated apically with 1-3 stouter, longer spines, but not appearing thorn-like, arrangement of spines variable; some specimens having some scales fringed apically with several subequal spines.

BIOLOGY AND DISTRIBUTION

A single brooded species. The larvae occur from mid-May until late July at elevations above 7,000 ft. A definite preference is shown for shaded or partially shaded forest pools. Adults emerge from early June until late July. Females remain in forested areas and rarely fly far from the breeding sites. This is a common species in Utah and one of the most annoying pests in mountainous areas. County records: DAGGETT, DUCHESNE, GRAND, SALT LAKE, SANPETE, SUMMIT, UINTAH, UTAH, WASATCH.

Aedes (Ochlerotatus) dorsalis (Meigen) (Fig. 26)*Female:*

Tarsi banded basally and apically with white scales. Wings with white and dark scales; costa predominately white scaled; dark scales predominating on veins 3 and forks of 4 and 5; white scales more abundant than dark on other veins; vein 6 usually without dark scales. Mesonotum gray or yellow scaled with median longitudinal stripe of golden-brown scales; median stripe variable in width, usually divided into three narrow stripes or a single narrow stripe, sometimes only faintly visible. Abdominal tergites mostly white scaled with pairs of lateral dark scaled patches of variable size on segments II to VI, sometimes dark patches almost entirely obliterated by white scales, particularly on posterior segments.

Male Genitalia:

Apical lobe small with numerous dorsal setae. Basal lobe prominent, constricted basally and expanded apically bearing a short stout outer spine well separated from a long, stout, recurved mesal spine. Claspette filament with a short shank, becoming angularly expanded before the middle of filament; filament shorter than the nearly straight claspette stem.

Fourth Instar Larva:

Upper and lower frontal head hairs usually single, sometimes one or both double. Prothoracic hair No. 1 usually double. Mesothoracic hair No. 1 long, usually double. Siphonal index 2.5 to 3.0; pecten of evenly spaced teeth extending to middle of siphon. Comb scales about 20-25, each scale fringed apically with subequal spinules. Anal gills usually bud-like; in fresh water they may be nearly as long as anal segment.

BIOLOGY AND DISTRIBUTION

A multi-brooded species. The larvae appear in February or March and broods continue to occur until freezing weather in October or early November. Larvae are produced principally in pools formed from irrigation waste water at elevations below 7,000 ft. Adults are on the wing from March until November. Under favorable conditions as many as ten successive broods may occur during a single season. The species occurs in all counties of the state and is one of the most abundant and annoying pests; females often migrate several miles from emergence sites.

Aedes (Ochlerotatus) excrucians (Walker) (Fig. 27)*Female:*

Tarsi with broad basal white bands. Wings mostly dark scaled with pale scales scattered over wing veins. Mesonotum covered with brown and white scales, pattern variable, usually with broad, often divided, median longitudinal stripe of golden-brown scales. Hypostigmal scale patch absent. Tarsal claw distinctive; main claw long, strongly bent beyond base of tooth; tooth slender from base to apex, about two-thirds the length and approximately parallel to the main claw. Abdominal tergites with pale basal bands, with few to many pale scales scattered on the apices of most of the segments, more numerous of posterior segments.

Male Genitalia:

Apical lobe large, rounded, with many short setae on mesal surface. Basal lobe a large flattened rugose area extending to base of apical lobe, covered with many short setae arising from small tubercles. Claspette stem long, slender, curved mesally; filament about one-half as long as stem, angularly expanded near base on upper side and tapering to a strongly recurved tip.

Fourth Instar Larva:

Upper frontal head hairs usually triple, often double. Lower frontal head hairs double, rarely single or triple. Prothoracic hairs Nos. 1 and 5 long, usually single, rarely double. Mesothoracic hair No. 1 very short, multiple. Siphonal index about 4.5; siphon usually strongly tapered on distal half; pecten extending to about middle of tube with 1-3 more widely spaced distal teeth; siphonal tuft multiple, hairs considerably longer than basal diameter of siphon. Comb of 20-30 scales, individual scale with a long thorn-like terminal spine.

BIOLOGY AND DISTRIBUTION

A single brooded species occurring only in the Uinta Mountains of Utah at elevations above 8,000 ft. Larvae are present from late June until mid-July, usually developing in subalpine pools in open meadows. Adults are on the wing from late June until mid-August. The females are a nuisance in both forested and open areas. County records: DAGGETT, DUCHESNE, SUMMIT, UINTAH, WASATCH.

Aedes (Ochlerotatus) fitchii (Felt and Young) (Fig. 28)*Female:*

Tarsi with broad, basal white bands. Wings mostly dark scaled, usually with a scattering of pale scales over wing veins; in some specimens pale scales restricted to a patch at base of costa. Torus of antenna usually with a conspicuous cluster of white scales on mesal and dorsal surfaces. Mesonotal pattern variable, with golden-brown and white scales, usually with a broad, often divided, median longitudinal stripe of golden-brown scales. Hypostigmal scale patch absent. Abdominal tergites with basal white bands; bands usually wider mesally, sometimes not extending to lateral margins of segments; apices of segments often with white scales, sometimes forming a broken median longitudinal stripe on some or all segments.

Male Genitalia:

Apical lobe large, rounded, bearing moderately long setae on mesal and apical surfaces. Basal lobe large, triangular, projecting mesally; surface densely covered with short fine setae; a long stout spine arising from dorsal margin. Claspette stems lyre-shaped with distal portions closely approximate; filament shorter than stem, expanded basally, and tapered to a recurved point.

Fourth Instar Larva:

Upper frontal head hairs 3-5 branched. Lower frontal head hairs triple, often double. Prothoracic hair No. 1 very long, 3-4 branched. Mesothoracic hair No. 1, about as long as prothoracic hairs, 1-3 branched. Siphonal index about 4.5; siphon conspicuously tapered on distal half; pecten of large evenly spaced teeth ending before middle of tube; siphon tuft of several very long setae inserted at middle of tube. Comb of 12-30 scales, individual scales with a long, stout spine.

BIOLOGY AND DISTRIBUTION

A single brooded species. This species is one of the most ubiquitous in Utah. Larvae develop in a wide variety of pools, most frequently being found in valleys at elevations between 4,500 to 6,000 ft., but extending in some mountainous areas to 9,500 ft. Larvae usually appear from late April to early June. Adults emerge from early May until late June. Females will bite day or night, but rarely are sufficiently abundant to constitute an annoyance. County records: CACHE, DAVIS, DUCHESNE, EMERY, MORGAN, RICH, SALT LAKE, SANPETE, SEVIER, SUMMIT, TOOELE, UTAH, WASATCH, WASHINGTON, WEBER.

Aedes (Ochlerotatus) flavescens (Müller) (Fig. 29)*Female:*

A large yellowish species. Tarsal segments with broad basal white bands. Palpi with some pale scales. Mesonotum clothed with narrow yellowish scales on the sides and broad median stripe of narrow dark brown scales. Hypostigmal scale patch present. Wing scales pale and dark intermixed. Dorsum of abdomen entirely covered with pale yellowish scales.

Male Genitalia:

Apical lobe broad, rounded with numerous setae. Basal lobe with a stout dorsal spine associated with several long setae and represented by a rugose area covered with fine setae which extends to near the base of apical lobe.

Fourth Instar Larva:

Large, robust larva. Upper and lower frontal head hairs long, 3-4 branched; lower frontals sometimes double. Prothoracic hair No. 1, single, long, about three times as long as Nos. 2 and 3. Mesothoracic hair No. 1, short, 2-3 branched. Siphonal index 3.5 to 4.0; siphon not strongly tapered at apex; pecten with 1 or 2 distal teeth slightly more widely spaced, often all pecten teeth evenly spaced; siphon tuft well developed with 5-7 setae about as long as width of siphon at point of insertion. Comb scales usually 20-30, each scale with a well-developed median spine.

BIOLOGY AND DISTRIBUTION

A single brooded species. The larvae occur principally in rather deep temporary or semi-permanent pools, drains or barrow pits, in valleys and plains areas from late April until mid-June at elevations of 4,200 to 6,500 ft. The adults emerge during May and June; females may persist until late August. The species is a severe biter, but is too rare in Utah to be an important pest species. County records: CACHE, RICH, SALT LAKE, UTAH.

Aedes (Ochlerotatus) hexodontus Dyar (Fig. 30)*Female:*

Tarsi without bands. Wings dark scaled with conspicuous patch of pale scales at base of costa. Mesonotum clothed with brown scales; median area with paired longitudinal stripes, usually appearing only slightly darker than surrounding scales; median stripes often very poorly defined. Post-coxal scale patch present. Scale patch on sternopleuron extends to upper anterior border. Scale patch on mesepimeron extends to ventral border. Probasis sternum covered with pale scales posteriorly. Hypostigmal scale patch absent. Abdomen with basal white bands.

Male Genitalia:

Apical lobe large, broadly rounded, covered with many short, stout curved setae. Basal lobe large, broadly expanded basally with numerous setae arising from conspicuous tubercles and a long stout dorsal spine. Claspette stem short, stout; filament shorter than stem, sickle-shaped.

Fourth Instar Larva:

Upper and lower frontal head hairs usually double. Siphonal index about 2.5-3.0; pecten of evenly spaced teeth extending slightly beyond basal third of siphon. Comb scales 5-8, each scale with a long stout curved terminal spine. Anal plate completely encircling the anal segment.

BIOLOGY AND DISTRIBUTION

Aedes hexodontus is a single-brooded mountain species. The larvae occur from mid-May until mid-July in open snow-melt pools at elevations from 7,000 to 11,000 ft. The adults emerge from early June until mid-July, generally disappearing by the first of August. This species is widely distributed in Utah and is one of the most annoying pests in mountainous areas of the state. County records: DAGGETT, DUCHESNE, EMERY, GRAND, SALT LAKE, SAN JUAN, SANPETE, SUMMIT, UINTAH, WASATCH, WASHINGTON.

Aedes (Ochlerotatus) impiger (Walker) (Fig. 31)*Female:*

A small dark, hairy species with unbanded tarsi. Wings dark scaled with patch of pale scales at base of costa. Post-coxal scale patch present. Scale patch on sternopleuron does not extend to the upper anterior border. Scale patch on mesepimeron usually separated from ventral margin; lower mesepimeral bristles usually more than six. Hypostigmal scale patch absent. Setae on postpronotum numerous, extending over entire posterior half of sclerite. Abdomen with basal white bands.

Male Genitalia:

Apical lobe small, rounded, covered with a few short setae; arising near tip of basistyle. Basal lobe prominent, narrowly conical, with numerous setae including a stout dorsal seta followed ventrally by a row of long setae nearly equal in size to the dorsal seta; mesal margins of basal lobes closely approximate, with long setae of both lobes intermingling. Claspette stem strongly curved; filament almost as long as stem, angularly expanded near base and tapering to a narrow recurved tip.

Fourth Instar Larva:

Upper and lower frontal head hairs single. Prothoracic hairs 1, 2 and 3 usually single. Siphonal index about 3.0; pecten of evenly spaced teeth extending to about basal third of siphon. Comb scales 8-14, each scale with a long, stout apical spine. Anal gills extremely long, usually about four times the length of the anal segment.

BIOLOGY AND DISTRIBUTION

A single-brooded mountain species. The larvae occur from late June until mid-July in small grassy subalpine or alpine tundra pools at elevations above 10,000 ft. The adults emerge during July, but are short-lived and rarely persist into August. In Utah this species has been collected only in the Uinta Mountains where the females become very annoying in some subalpine and alpine-tundra areas. County records: DUCHESNE, SUMMIT, UINTAH.

Aedes (Ochlerotatus) implicatus Vockeroth (Fig. 32)**Female:**

Tarsi without bands. Wings dark scaled with a small patch of white scales at base of costa. Mesonotum usually with a distinct pair of narrow median longitudinal dark brown stripes, each stripe bordered mesally by a narrow row of light brown scales; antero-lateral regions of mesonotum mostly white scaled. Post-coxal scale patch present. Scale patch on sternopleuron extending about half way to anterior margin. Scale patch on mesepimeron usually separated from ventral margin. Hypostigmal scale patch usually absent; when present usually consisting of only a few scales. Abdominal tergites with basal white bands.

Male Genitalia:

As in *Aedes cataphylla* but with apical lobe more conspicuously finger-like, and with prominent cluster of long setae arising from dorsal base of apical lobe.

Fourth Instar Larva:

Upper and lower frontal head hairs single, uppers sometimes double. Prothoracic hairs Nos. 1, 2 and 3 usually single. Siphonal index 2.5 to 3.0; pecten of evenly spaced teeth, extending to about basal third of tube; siphon tuft inserted before middle of tube. Comb scales about 20-25; individual scales fringed with small spines, terminal spine slightly longer and stouter, not thorn-like. Anal gills about equal to length of anal segment.

BIOLOGY AND DISTRIBUTION

A single brooded species. Larvae occur from early April until June and are found principally in grassy pools situated in or near willow growth in mountain valleys at elevations from 6,000-9,000 ft. Adults emerge from late April until mid-June, but are not long-lived and rarely persist after mid-July. The species is not a common or important pest species in Utah. County records: SALT LAKE, WASATCH, SUMMIT.

Aedes (Ochlerotatus) increpitus Dyar (Fig. 33)**Female:**

Tarsi with broad basal white bands. Wings with mostly dark scales; white scales scattered along costa, subcosta and vein 1, rare on other veins. Torus of antenna with white scales restricted to a few on mesal surface or absent. Mesonotum golden-brown and white scaled with a broad single or divided median longitudinal stripe of golden-brown scales. Hypostigmal scale patch absent. Meron usually with a patch of 6 or more white scales. Abdominal tergites with basal bands of white scales, bands usually wider at lateral margins; apices of some posterior segments may occasionally have a few white scales.

Male Genitalia:

Apical lobe narrow, thumb-like, with a few short setae on mesal surface. Basal lobe represented by a small slightly raised rugose area covered with many short setae; rugose area well separated from base of apical lobe. Claspette stem slender, curved; filament almost as long as stem, angularly expanded near middle and tapering to a recurved tip.

Fourth Instar Larva:

Upper and lower frontal head hairs extremely variable; upper head hairs usually double, often triple, sometimes single; lower head hairs usually single, often double. Prothoracic hairs No. 1 usually double, long; No. 3 double or

triple, short. Siphonal index 3.0-3.5; pecten of evenly spaced teeth extending to or slightly beyond basal third of tube; siphonal tuft of several long setae inserted before the middle of the tube. Comb of 25-30 scales, each scale rounded apically with small subequal spines. Anal plate with coarse spicules on posterior surface. Anal gills about equal to the length of the anal segment, never bud-like.

BIOLOGY AND DISTRIBUTION

A single brooded species. Larvae occur principally in valley and canyon areas in pools formed from stream overflow or melted snow. Immature stages may occur from March until late May usually at elevations from 4,000 to 7,000 ft. In the southern part of the state the species readily invades mountain valleys up to 8,000 ft. Adults emerge from mid-April until early June, but rarely persist beyond mid-July. The species is widespread and abundant and is an important pest in late spring and early summer. County records: DAVIS, MORGAN, RICH, SALT LAKE, SANPETE, SAN JUAN, SUMMIT, UTAH, WASHINGTON, WEBER.

Aedes (Ochlerotatus) intrudens Dyar (Fig. 34)

Female:

Tarsi without bands. Wings dark scaled, rarely with a few pale scales at wing base. Mesonotum uniformly covered with brown scales. Post-coxal scale patch absent. Scale patch on sternopleuron does not extend to the upper anterior border. Scale patch on mesepimeron distinctly separated from the ventral margin. Abdomen with basal white bands.

Male Genitalia:

Apical lobe well developed, rounded with dorsal setae. Basal lobe with single, long curved dorsal spine and two shorter spines arising from two closely set tubercles on ventral margin. Claspette stem with a strongly angled mesal projection bearing a short seta. Dense tuft of setae arising near apex of basistyle and directed posteriorly.

Fourth Instar Larva:

Upper and lower frontal head hairs both multiple, not closely set together. Siphonal index about 3.0; pecten with 2-3 more widely spaced distal teeth; siphon tuft of long setae, about equal in length to width of tube at point of insertion, arising near most distal pecten tooth; comb scales of 12-16 thorn-like scales. Ventral margin of anal plate with conspicuous notch.

BIOLOGY AND DISTRIBUTION

A single brooded mountain species. The larvae occur from early June until early July at elevations between 8,000 to 10,500 ft. The adults emerge from mid-June to mid-July and remain until early August. The females are persistent biters and readily enter dwellings to feed. The species is rare in Utah and has been collected only in the Uinta Mountains. County records: DAGGETT, DUCHESNE, SUMMIT, UINTAH.

Aedes (Ochlerotatus) melanimon Dyar (Fig. 35)

Female:

Tarsi banded basally and apically with white scales. Wings mostly dark scaled with white scales intermixed: costa predominately dark scaled; veins 1, 3, 5 and forks of 4 with dark scales predominating; vein 6 with white and dark scales intermixed. Mesonotum with broad median stripe and conspicuous antero-lateral patches of dark brown scales, intervening areas white or yellow scaled. Abdominal tergites with dark scaled areas predominating on

all except first segment and sometimes the seventh; white scales forming a narrow median longitudinal stripe from second through seventh tergite and narrowly surrounding the areas of dark scales.

Male Genitalia:

Apical lobe prominent, nearly bare of setae dorsally. Basal lobe shelf-like, not constricted at base, bearing a short stout spine which is inserted closely to a long, stout recurved mesal spine. Claspette filament with a long shank, becoming angularly expanded near middle of filament; filament longer than the curved claspette stem.

Fourth Instar Larvae:

Upper and lower frontal head hairs usually single, sometimes one or both double. Prothoracic hair No. 1 usually single. Mesothoracic hair No. 1 very short, double. Siphonal index 2.5 to 3.0; pecten of evenly spaced teeth extending to middle of tube. Comb about 18-25 scales, each scale with a small median terminal spine and smaller lateral spines. Anal gills usually bud-like.

BIOLOGY AND DISTRIBUTION

A multi-brooded species. *Aedes melanimon* closely resembles *A. dorsalis* morphologically in all stages. Little is known concerning its biology. Larval and adult collections have been made from May until September at elevations below 7,000 ft. This species seems to prefer fresher water for larval development than *dorsalis* and has been taken in stream overflow pools as well as irrigated pastures. The species is relatively common in southeastern Utah, but is rare elsewhere. County records: DUCHESNE, GRAND, SALT LAKE, SAN JUAN, UTAH.

Aedes (Ochlerotatus) nigromaculis (Ludlow) (Fig. 36)

Female:

Tarsi with broad basal white bands, contrasting strongly with dark leg scales. Palpi dark scaled. Proboscis ringed with white near middle; sometimes white ring absent or greatly reduced. Wing veins sprinkled with light and dark scales. Mesonotum of golden-yellowish scales, with a broad median longitudinal stripe of dark brown scales. Post-coxal scale patch present. Hypostigmal scale patch present. Abdominal tergites, each with a pair of lateral patches of dark scales; dark patches surrounded with pale scales; sixth and seventh tergites sometimes pale scaled; median longitudinal stripe of pale scales present.

Male Genitalia:

Apical lobe absent. Basal lobe small, with many fine setae. Claspette filament slender and curved, about equal to the length of the claspette stem.

Fourth Instar Larva:

Antenna very short, about one-third the length of head. Upper and lower frontal head hairs usually single; one or both pairs may be double. Siphonal index about 2.5; pecten extending at least two-thirds the length of the siphon with 2-4 distal teeth more widely spaced; siphon tuft very small, multiple; comb of 8-14 thorn-like scales. Anal plate completely encircling anal segment.

BIOLOGY AND DISTRIBUTION

A multi-brooded species. Larvae occur from April until late September usually at elevations below 5,500 ft, and are found principally in pools produced by irrigation flood water. Adults emerge from May until late September and may persist until mid-October. The females are strong fliers and bite persistently.

This species is a severe nuisance in some parts of the state. County records: BOX ELDER, CACHE, DAGGETT, DAVIS, GRAND, MORGAN, SALT LAKE, SAN JUAN, SEVIER, TOOELE, UTAH, WEBER.

Aedes (Ochlerotatus) niphadopsis Dyar and Knab (Fig. 37)

Female:

Tarsi without bands. Wings conspicuously bicolored on anterior wing veins; costa, subcosta, vein 1, 2 and stem of vein 4 before crossvein with many rather broad white scales; other veins mostly or entirely dark scaled. Mesonotum covered with brown and white scales; median longitudinal area with a pair of brown stripes, sometimes diffuse or indistinct; white scales predominating on sides of mesonotum. Post-coxal scale patch present. Pleuron with many broad white scales. Conspicuous hypostigmal scale patch present. Abdominal tergites with broad basal white bands and a well developed median longitudinal stripe of white scales; seventh, eighth and sometimes sixth tergite entirely white scaled.

Male Genitalia:

Apical lobe prominent, rounded with a few setae at apex. Basal lobe conical bearing short setae, several long setae and a long dorsal spine. Claspette stem slender, curved strongly on distal third; filament at least two-thirds the length of the stem, broadly expanded at basal third and tapering to a recurved point. Lobes of ninth tergite bearing a cluster 7-9 stout spines.

Fourth Instar Larva:

Upper and lower frontal head hairs usually single. Siphonal index 3.0 to 3.5; pecten with usually less than 12 teeth which extend only to basal third or fourth of tube; generally with one or two distal teeth more widely spaced; siphon tuft long, multiple, inserted before middle of siphon; comb of about 7-12 scales; each scale with distinct terminal spine. Anal gills very short, bud-like.

BIOLOGY AND DISTRIBUTION

A single-brooded species. Larvae usually appear in February or March; development is slow with adults emerging in late April and early May. Larval habitats are mostly confined to the valleys and plains in the Great Basin areas of the state at elevations below 5,000 ft. Adults reach greatest numbers in May and early June and disappear during late June. Both males and females are strong fliers, often migrating several miles into foothill areas where mating generally occurs near the mouth of canyons. This species is one of the most annoying vernal pests in the plains and foothill areas of western and northern Utah. County records: BOX ELDER, CACHE, DAVIS, JUAB, MILLARD, RICH, SALT LAKE, SANPETE, TOOELE, UTAH, WEBER.

Aedes (Ochlerotatus) pullatus (Coquillett) (Fig. 38)

Female:

Tarsi without bands. Wings dark scaled with long patch of pale yellowish scales at base of costa. Conspicuous yellowish scaled hypostigmal scale patch present. Scale patch on sternopleuron extends to near upper anterior margin. Scale patch on mesepimeron usually extends to anterior ventral margin. Post-coxal scale patch absent. Pleural scale patches yellowish. Abdomen with basal white bands.

Male Genitalia:

Apical lobe without dorsal setae. Basal lobe with single, long curved dorsal spine and two shorter spines arising from two closely set tubercles on the ventral margin. Claspette stem strongly bent mesally near the middle. Without conspicuous tuft of setae arising near the apex of the basistyle.

Fourth Instar Larva:

Upper and lower frontal head hairs both multiple. Mesothoracic hair No. 5 double. Siphonal index about 3.5; pecten of evenly spaced teeth extending just beyond basal third of siphon; siphonal tuft large, multiple, inserted near middle of tube. Comb scales in large patch of about 40-60 scales. Individual scale fringed apically, not spine-like.

BIOLOGY AND DISTRIBUTION

A single-brooded mountain species. The larvae occur from early May until mid-July in snow water pools at elevations between 6,500 to 10,500 ft. The adults emerge from early June until late July but do not persist beyond mid-August. This is one of the most abundant and annoying species in the mountains of Utah. County records: BOX ELDER, CACHE, DAGGETT, DUCHESNE, EMERY, GARFIELD, GRAND, MORGAN, RICH, SALT LAKE, SAN JUAN, SANPETE, SEVIER, SUMMIT, UINTAH, UTAH, WASATCH, WAYNE, WEBER.

Aedes (Ochlerotatus) schizopinax Dyar (Fig. 39)*Female:*

Tarsi without bands. Wings mostly dark scaled with variable sized patches of white scales on upper and lower wing surfaces at base of costa and vein 1; pale scales usually present along subcostal area on both surfaces of wing. Proboscis grayish scaled on ventral surface. Mesonotum covered with yellowish or brownish-gray scales, with a pair of narrow median longitudinal stripes of slightly darker scales; stripes usually not contrasting strongly, often poorly defined. Post-coxal scale patch present. Scale patch on sternopleuron extending to upper anterior border. Scale patch on mesepimeron extending to ventral border. Hypostigmal scale patch absent. Probasisternum scaled on posterior portion. Tarsal claw distinctive (Fig. 39E); tooth very small, about one-sixth the length of entire claw and rather bluntly pointed. Abdominal tergites with broad basal white bands.

Male Genitalia:

Apical lobe well developed bearing short, stout setae. Basal lobe large, shelf-like, covered with numerous setae on prominent tubercles and with a stout dorsal spine. Claspette filament sickle-shaped, about as long as claspette stem; stem short and pilose to within about the width of the stem from the point of the filament attachment.

Fourth Instar Larva:

Upper frontal head hairs 3-5 branched. Lower frontal head hairs double, or triple. Upper and lower frontal head hairs very coarse in appearance. Thoracic setae conspicuously developed; prothoracic hair No. 1 long, 3-5 branched; No. 2, long, single; No. 3 long, 2-3 branched; mesothoracic hair No. 1 long, 3-4 branched. Siphonal index about 3.0; pecten of evenly spaced teeth extending slightly beyond basal third of siphon; siphonal tuft long, multiple, inserted near middle of tube. Comb of about 40 scales; individual scale with a thorn-like terminal spine.

BIOLOGY AND DISTRIBUTION

A single-brooded species. Larvae generally occur from early March until late May in mountain valleys at elevations below 7,000 ft. Larval habitats are usually in relatively small pools usually containing algal growth or organic matter. Adults emerge during April and May. Females have been taken in light trap collections, but have not been collected attacking man or animals. County records: CACHE, KANE, MORGAN, SUMMIT, TOOELE, WASATCH.

Aedes (Ochlerotatus) spencerii (Theobald)¹ (Fig. 40)*Female:*

Tarsi without bands. Wings alternately dark and white scaled; costa, veins 1, 3 and 5 dark scaled, other veins white scaled. Mesonotum gray scaled with a broad single or divided median longitudinal stripe of brown scales. Post-coxal scale patch present. Scale patch on sternopleuron extending to upper anterior margin. Scale patch on mesepimeron extending to ventral margin. Hypostigmal scale patch absent. Abdominal tergites with basal white bands and with few to many white scales on apices of most segments; a medium longitudinal stripe of white scales often present.

Male Genitalia:

Apical lobe large, rounded, clothed with many short, stout setae. Basal lobe large, constricted basally and expanded apically, bearing many setae and a stout dorsal spine; a dense cluster of long, fine setae associated with dorsal spine. Claspette filament about two-thirds as long as stem; expanded basally and tapering to a recurved tip. Claspette stem with a large rounded outer lobe at base.

Fourth Instar Larva:

Antenna short, about one-half as long as head. Upper and lower frontal head hairs usually single, often one or more double. Integument of thorax and abdomen spiculate (use 60-100x magnification). Prothoracic hairs Nos. 1, 2, 3, and 5 usually single. Siphonal index about 2.5 to 3.0; pecten extending about two-thirds the length of the siphon with 2-3 distal teeth more widely spaced; siphonal tuft of several short setae. Comb of about 12-25 scales, each scale with a terminal spine of moderate length. Anal plate extending to near mid-ventral line.

BIOLOGY AND DISTRIBUTION

A single-brooded species. Larvae usually occur from early April until late May in open pools in mountain valleys at elevations below 6,500 ft. Adults emerge from late April until early June, but rarely persist beyond mid-July. The females are strong fliers and extremely persistent biters. This is an important pest species in late spring in localized areas from central Utah north. County records CACHE, DAGGETT, DUCHESNE, MILLARD, MORGAN, RICH, SALT LAKE, SANPETE, SUMMIT, UTAH, WASATCH.

Aedes (Ochlerotatus) sticticus (Meigen) (Fig. 41)*Female:*

Tarsi without bands. Wings dark scaled, with a few white scales at base of costa. Mesonotum grayish or yellowish-gray scaled with a broad single or divided median longitudinal stripe of brown scales. Post-coxal scale patch absent. Scale patch on sternopleuron extends to upper anterior border. Scale patch on mesepimeron does not extend to ventral border; lower mesepimeral bristles absent. Hypostigmal scale patch absent. Abdominal tergites with basal white bands which become broadened on lateral margins of segments.

Male Genitalia:

Almost indistinguishable from *Aedes spencerii*. *Aedes sticticus* differs in having the outer lobe of the claspette stem smaller, narrower and bluntly pointed and in the dorsal spine of the basal lobe which is somewhat stouter at the base and straighter than in *spencerii*.

¹ Utah specimens of this species would fit generally the descriptions of *Aedes idahoensis* (Theobald). The authors are of the opinion that *A. idahoensis* is not a valid species, but a variety or subspecies of *A. spencerii*. See Nielsen and Rees (1959). Therefore the prior name is used.

Fourth Instar Larva:

Upper frontal head hairs 2-4 branched. Lower frontal head hairs double, rarely single or triple. Prothoracic hairs Nos. 1, 2 and 5 usually single; No. 3 single or double. Siphonal index 2.5 to 3.0; pecten of evenly spaced teeth extending to near middle of tube; siphonal tuft of several short setae. Comb of about 20-30 scales; individual scale with a small thorn-like terminal spine. Anal plate extending to near mid-ventral line.

BIOLOGY AND DISTRIBUTION

A single-brooded species. Larvae occur from early April until about mid-May appearing principally in overflow pools along streams at elevations below 6,500 ft. Adults emerge during April and May and persist until about mid-July. Females become annoying pests in localized areas and readily enter dwellings to obtain blood feedings. County records DAGGETT, MORGAN, SUMMIT, UTAH, WASATCH.

Aedes (Finlaya) varipalpus (Coquillett) (Fig. 42)

Female:

Tarsal segments with broad basal and narrow apical bands of brilliant white scales. Palpi dark scaled with conspicuous apical tuft of white scales. Wing scales dark except for white patch at base of costa. Mesonotum with median stripe of yellow or golden, curved, rather coarse scales. Scutellum, post pronotum and pleuron with broad white scales. Abdominal tergites dark scaled with basal bands of white scales.

Male Genitalia:

See key characters and Fig. 42.

Fourth Instar Larva:

Antennae short, glabrous; antennal tuft of one, rarely two hairs. Upper and lower frontal head hairs single or double, usually uppers single, lowers double. Siphonal index 2.5 to 3.0; pecten of evenly spaced teeth, restricted to lower third or fourth of siphon; siphonal tuft of 3-5 long hairs. Comb scales usually less than 15; individual scales long, fringed apically. Anal gills long, 3 to 4 times the length of anal plate, bluntly round at apex.

BIOLOGY AND DISTRIBUTION

This western tree hole mosquito has been collected in Utah only in Zions National Park. Larvae have been collected from mid-March until October in treeholes of the Cottonwood, *Populus fremonti* S. Wats, growing along the Virgin River. Adults have been taken only in May and June. The number of generations per year is unknown. Females readily attack man, but the species is unimportant as a pest in Utah. County records: WASHINGTON.

Aedes (Aedimorphus) vexans (Meigen) (Fig. 43)

Female:

Tarsi with very narrow white bands. Mesonotum clothed uniformly with narrow brown scales. White scales on sternopleuron confined to patch on posterior half of sclerite. White scales confined to dorsal two thirds of mesepimeron. Basal white bands on dorsal abdominal segments conspicuously indented mesally.

Male Genitalia:

See key characters and Fig. 43.

Fourth Instar Larva:

Upper frontal head hairs multiple. Lower frontal head hairs double or triple; upper and lower frontals not inserted in line with preantennal tuft. Siphonal index 3.0 to 3.5; pecten with 1-3 more widely spaced distal teeth; siphon tuft very short, less than width of siphon at point of insertion, arising near distal third of tube. Comb scales thorn-shaped, less than 15 in number. Anal plate extending to near mid-ventral line.

BIOLOGY AND DISTRIBUTION

A multi-brooded species. Larvae occur principally in overflow pools near streams in the lower river valleys, but commonly appear in pools created by irrigation water. Larvae may be encountered from March until early October and adults from April until October. *Aedes vexans* is an important pest mosquito in Utah and is widely distributed. County records: BOX ELDER, CACHE, CARBON, DAGGETT, DAVIS, DUCHESNE, EMERY, GRAND, JUAB, MORGAN, RICH, SALT LAKE, SAN JUAN, SANPETE, SEVIER, SUMMIT, UTAH, WASATCH, WEBER.

Mansonia (Coquillettia) perturbans Walker (Fig. 44)*Female:*

Tarsi banded; first tarsal segment with a dark ring on apical third or fourth, rest of segment mostly white scaled; segments 2-5 with basal half white scaled, apical half dark scaled. Wings scales very broad, with a white and dark scales intermixed. Proboscis with a very broad median ring of white scales. Mesonotum clothed sparsely with narrow yellow and dark brown scales. Abdominal tergites mostly dark scaled, with white scales forming basolateral patches on each segment; patches sometimes joined narrowly across base of segment; white scales also scattered on apices of segments.

Male Genitalia:

Dististyle curved, flattened, expanded near apex, ending in a short stout claw. Apical lobe absent. Basal lobe represented by a flat triangular flap terminating in dark, thick, truncate rod and short, stout spine. Claspette absent. Phallosomes heavily chitinized, opened dorsally and ventrally with two median rows of short, stout dark teeth; teeth directed latero-ventrally.

Fourth Instar Larva:

Antenna more than twice as long as head, narrowed apically, with large multiple tuft arising on basal third. Siphon short, stout pointed and heavily sclerotized apically; adapted for piercing plant tissues.

BIOLOGY AND DISTRIBUTION

Larvae and pupae of this species are unique in that they attach themselves to the roots and stems of aquatic plants by a modified siphon tube or respiratory trumpets; respiration occurs through plant tissues. No larvae have been collected in Utah, but males and biting females have been collected in July and August. The species is known only from collections in mountain valleys of northern Utah at elevations below 5,000 ft. County records: CACHE, UTAH, WEBER.

Psorophora (Grabhamia) signipennis (Coquillett) (Fig. 45)*Female:*

Tarsi banded; first segment of hind tarsi with dark ring of scales sub-basally and apically; segments 2-5 with broad basal band of pale scales and dark ringed apically; fore and mid-tarsi marked similarly to hind tarsi. Pro-

boscis with very broad median whitish-yellow band. Wings with broad white and dark scales; costa with two dark scaled apical spots separated by white scales; remaining veins intermixed with white and dark scales; fringe of wing alternately dark and pale scaled. Mesonotum clothed with narrow yellowish or brownish scales. Abdominal tergites primarily white scaled, speckled or spotted with dark scales.

Male Genitalia:

Apical and basal lobes absent. Dististyle expanded near middle, curved at tip, terminating in a short stout claw. Claspette stem curved, expanded apically; apical part attached to basistyle and bearing five or six setae. Ninth tergite with a pair of broadly rounded lobes, each bearing a few setae.

Fourth Instar Larva:

Upper and lower frontal head hairs usually single. Siphonal index 3.0; tube inflated medially; pecten of 6 or less teeth on basal third of siphon; distal teeth longer; siphonal tuft minute, inserted at apical third of tube. Comb of about 6 scales; individual scale with a long central terminal spine and a pair of stout subapical spines. Anal segment completely ringed by anal plate; anal plate pierced ventrally by several setal tufts of the ventral brush.

BIOLOGY AND DISTRIBUTION

This species has been collected in the Great Salt Lake desert at Dugway, Utah, elevation 4,300 ft.; larvae were collected in September in a small grassy transient pool produced by waste water from a boiler room; biting females were collected in the vicinity during August and September. Biting females also have been taken near Wellington, in eastern Utah; elevation 5,500 ft. County records: CARBON, TOOELE.

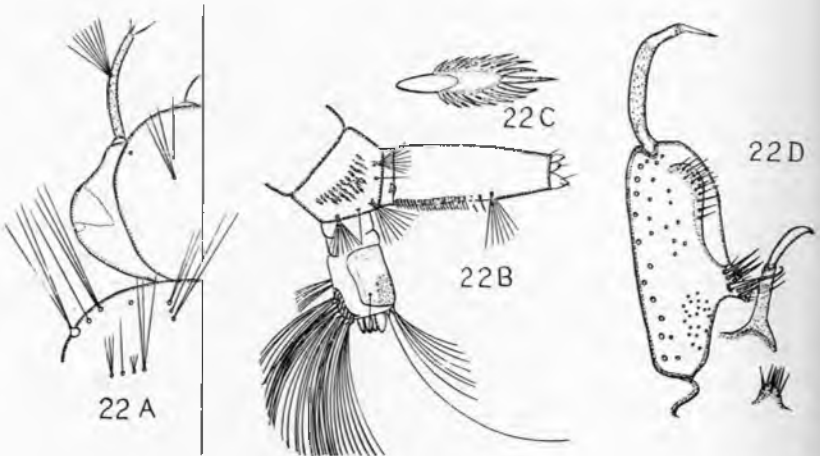


FIG. 22 A. CAMPESTRIS

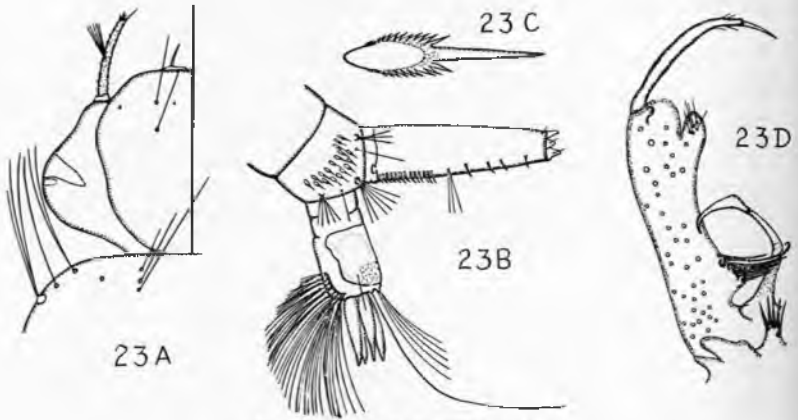
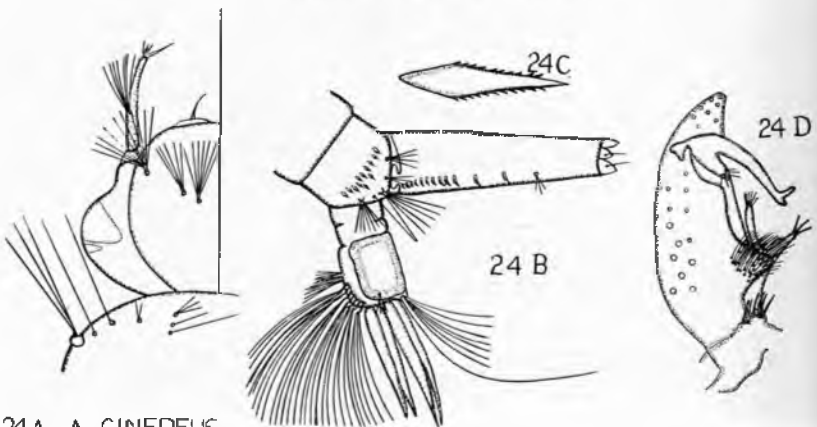


FIG. 23 A. CATAPHYLLA



24A A. CINEREUS

Figs. 22-24. *Aedes* species. A. Larva, head and thorax. B. Larva, terminal segments. C. Pecten tooth. D. Male genitalia.

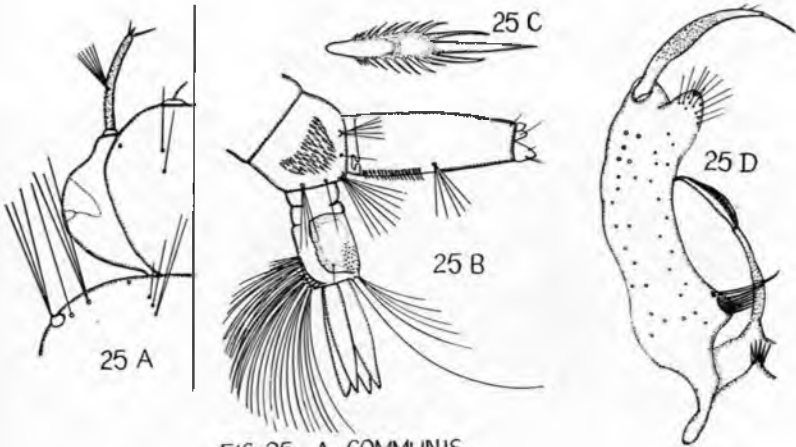


FIG.25 A. COMMUNIS

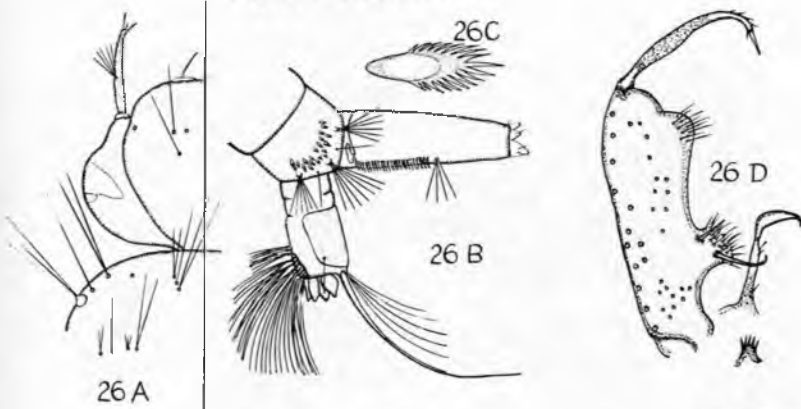


FIG.26 A. DORSALIS

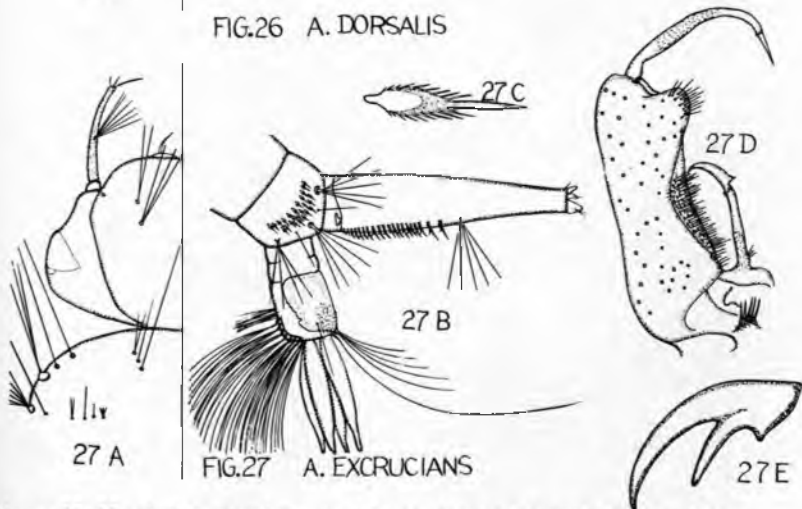


FIG.27 A. EXCRUCIANS

Figs. 25-27. *Aedes* species. A. Larva, head and thorax. B. Larva, terminal segments. C. Pecten tooth. D. Male genitalia. E. Tarsal claw.

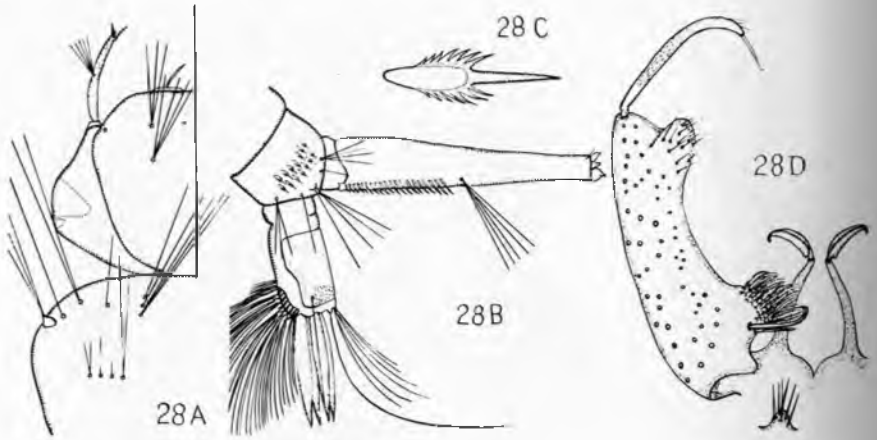


FIG. 28 A. FITCHII

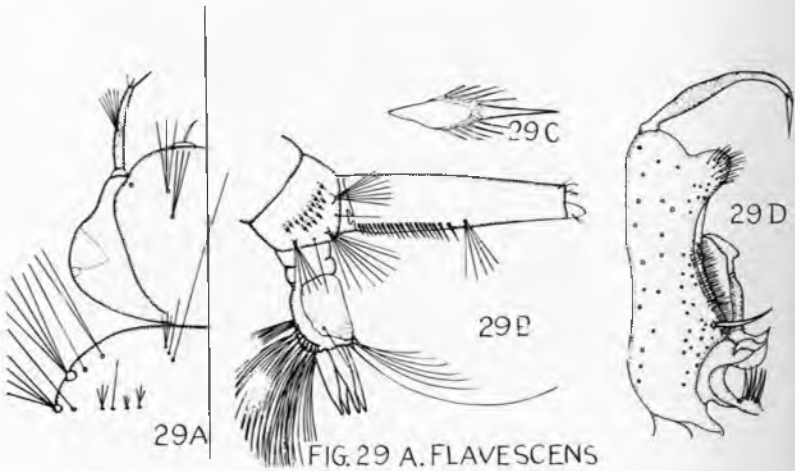


FIG. 29 A. FLAVESCENS

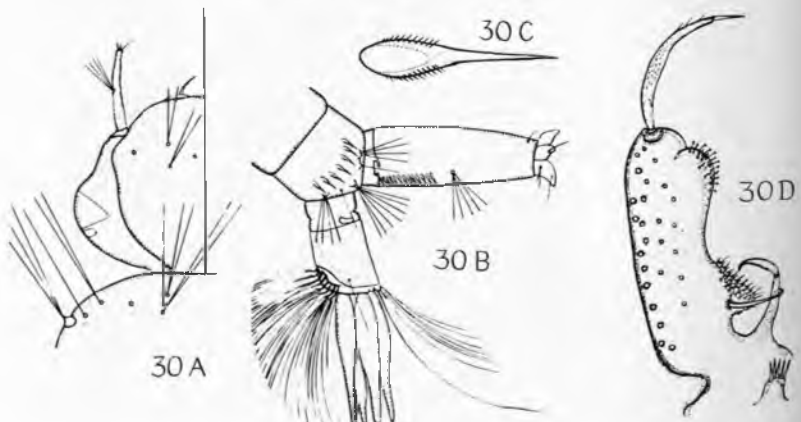


FIG. 30 A. HEXODONTUS

Figs. 28-30. *Aedes* species. A. Larva, head and thorax. B. Larva, terminal segments. C. Pecten tooth. D. Male genitalia.

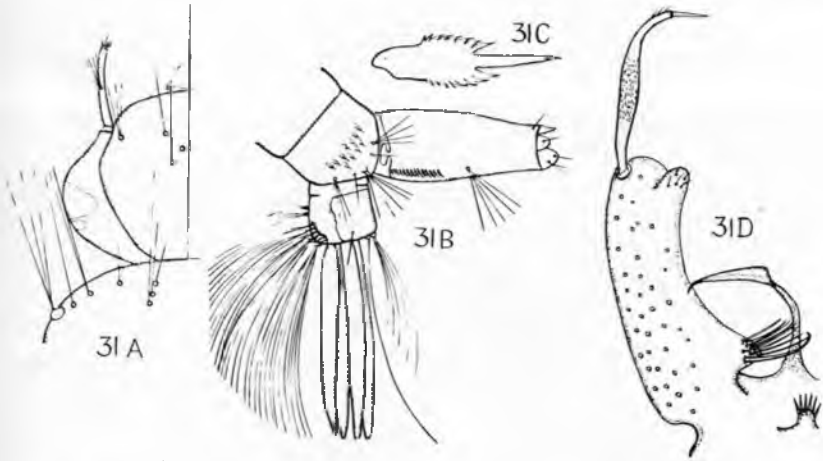


FIG. 31 A. *IMPIGER*

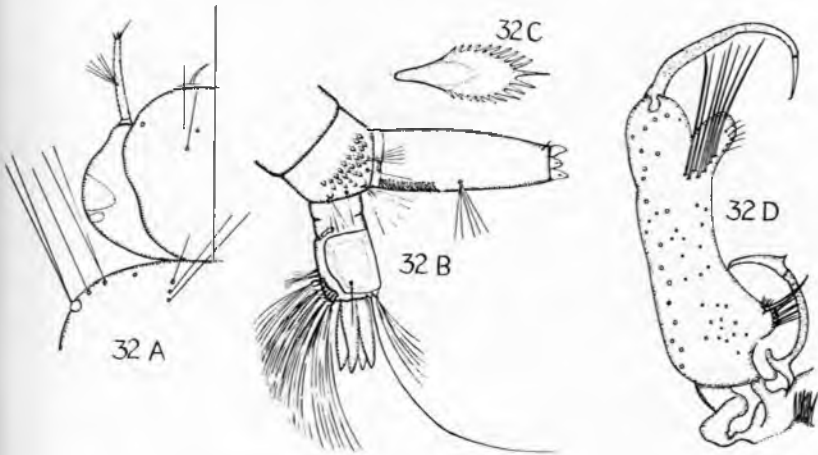
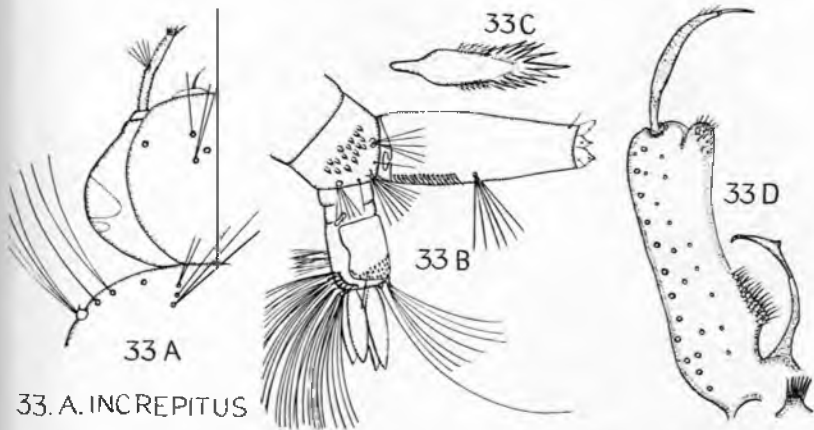
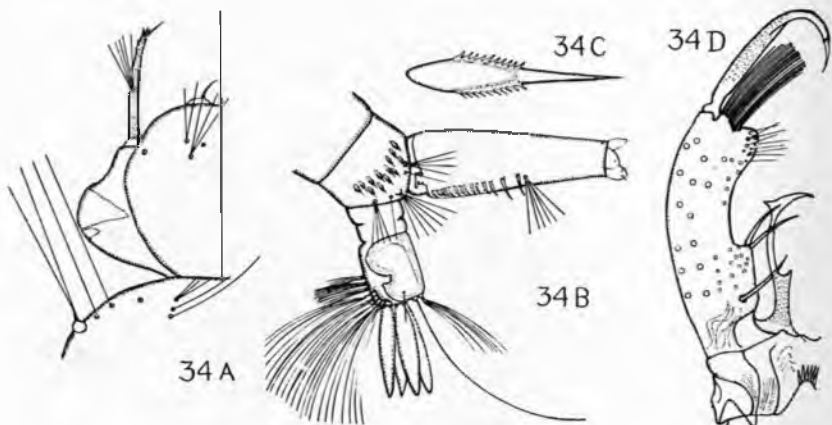


FIG. 32 A. *IMPLICATUS*



33. A. *INCREPITUS*

Figs. 31-33. *Aedes* species. A. Larva, head and thorax. B. Larva, terminal segments. C. Pecten tooth. D. male genitalia.



34 A

34 C

34 D

34 B

FIG. 34 A. INTRUDENS

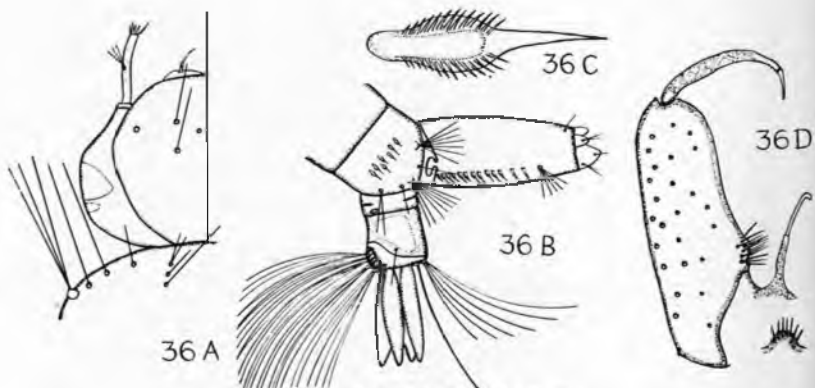


35 A

35 C

35 D

FIG. 35 A. MELANIMON



36 A

36 C

36 D

36 B

FIG. 36 A. NIGROMACULIS

Figs. 34-36. Aedes species. A. Larva, head and thorax. B. Larva, terminal segments. (For A. melanimon see Fig. 26B). C. Pecten tooth. D. Male genitalia.

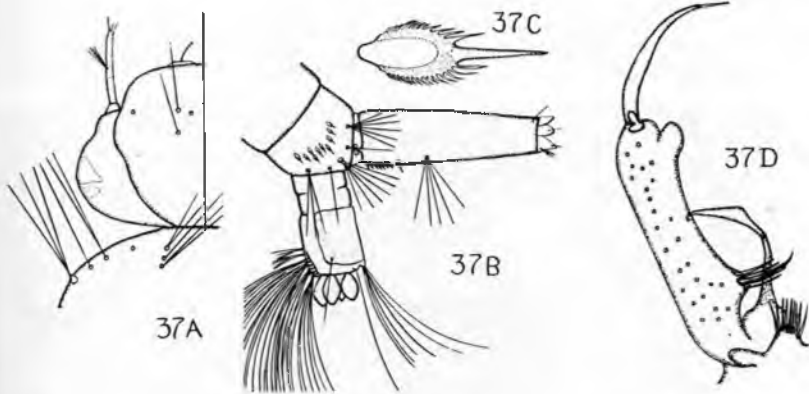


FIG. 37 *A. NIPHADOPSIS*

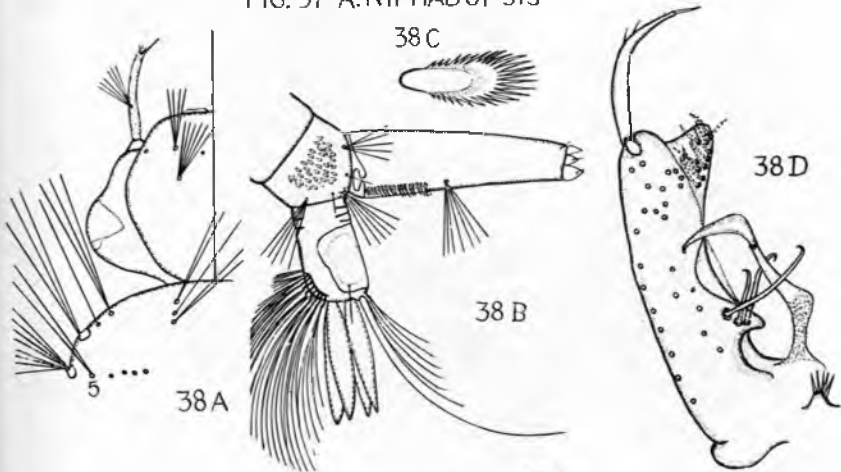


FIG. 38 *A. PULLATUS*

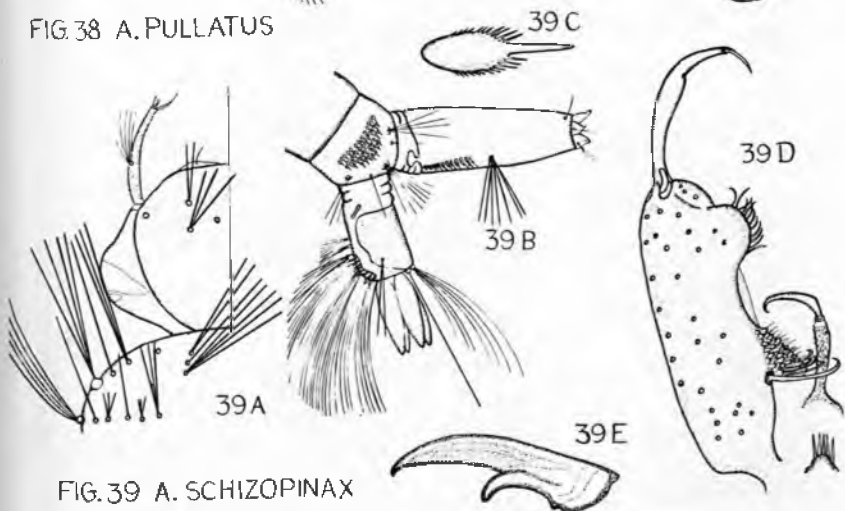
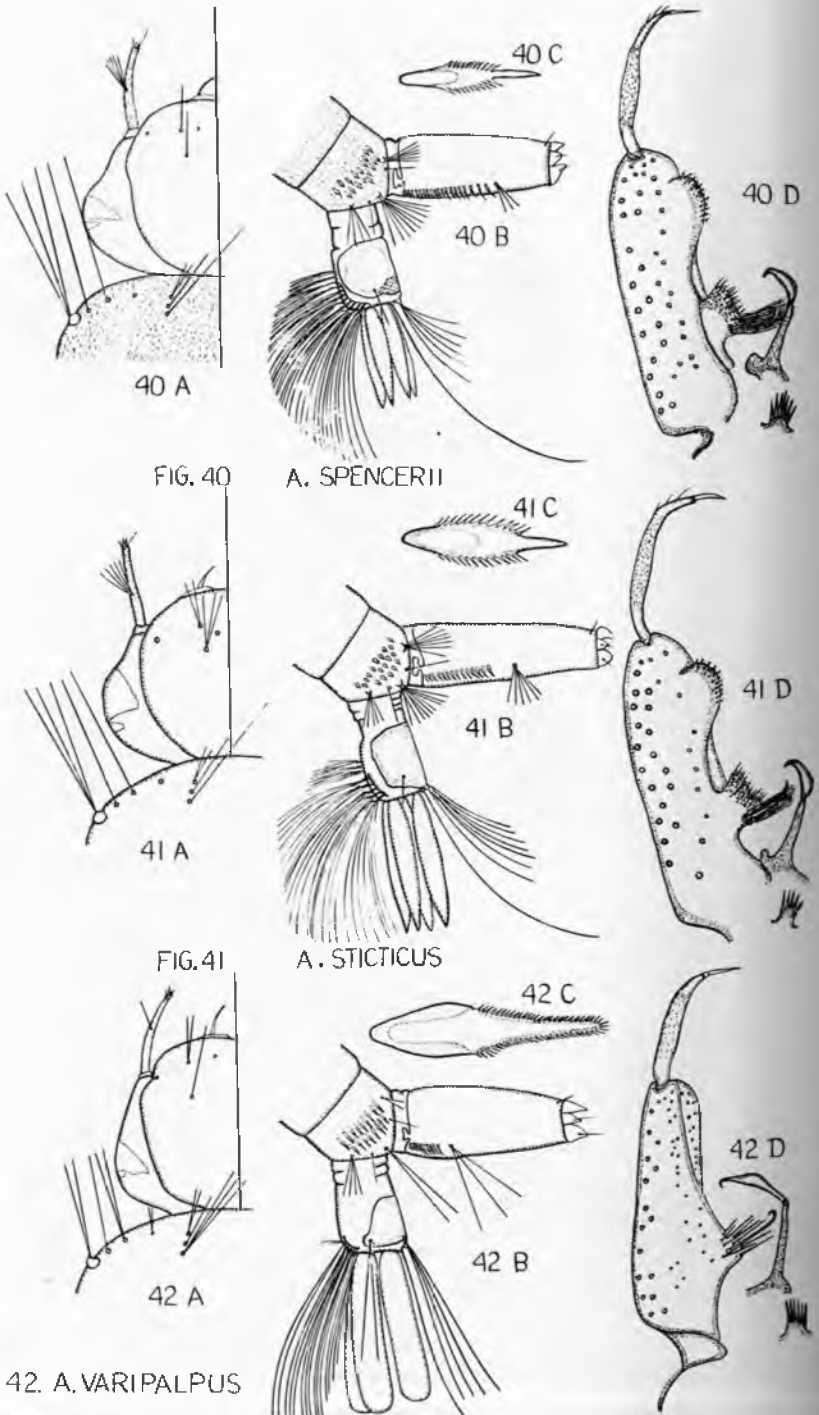


FIG. 39 *A. SCHIZOPINAX*

Figs. 37-39. *Aedes* species. A. Larva, head and thorax. B. Larva, terminal segments. C. Pecten tooth. D. Male genitalia. E. tarsal claw.



Figs. 40-42. *Aedes* species. A. Larva, head and thorax. B. Larva, terminal segments. C. Pecten tooth. D. Male genitalia.

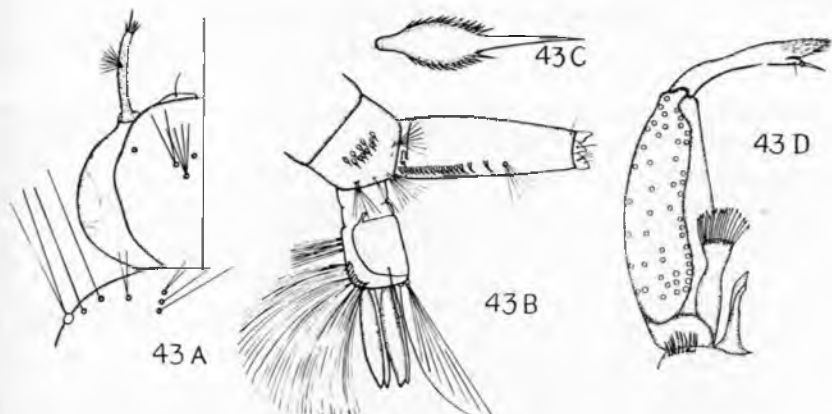


FIG. 43 A. VEXANS

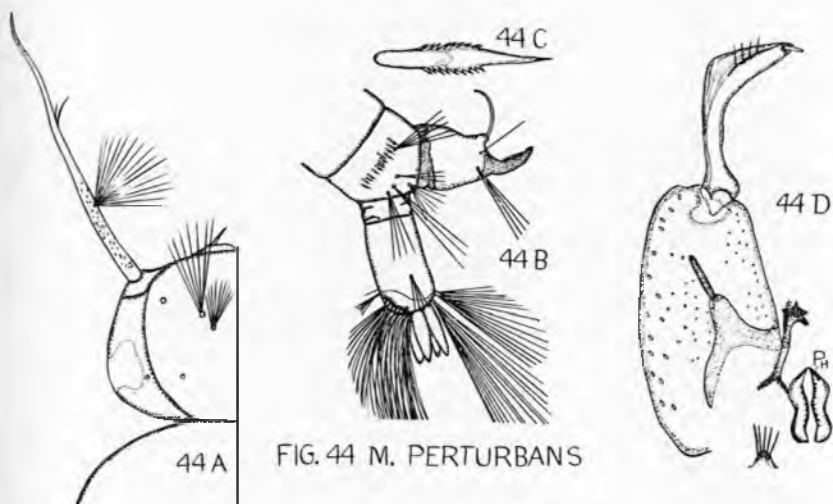


FIG. 44 M. PERTURBANS

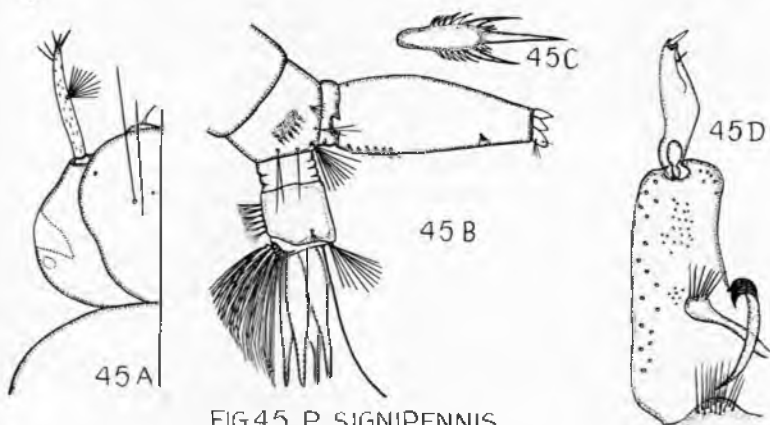


FIG. 45 P. SIGNIPENNIS

Figs. 43. *Aedes vexans*; 44. *Mansonia perturbans*; 45. *Psorophora signipennis*. A. Larva, head and thorax. B. Larva, terminal segments. C. Pecten tooth. D. Male genitalia.

Keys to the Culex Species of Utah

Adult Females

1. Tarsi with basal and apical white bands (Fig. 12A); proboscis with median white ring (Fig. 15A) *Culex tarsalis*, p. 48
Tarsi unbanded, proboscis without white ring 2
2. Abdominal tergites with apical pale bands and/or lateral apical pale scale patches 3
Abdominal tergites with pale or white bands and/or lateral patches on bases of at least segments II to VI 4
3. Pale posterior stripe of hind femur ending shortly before the apex; palpi about three times as long as the fourth flagellar segment of the antenna *Culex apicalis*, p. 46
Pale posterior stripe of hind femur extending to the apex; palpi about twice as long as the fourth flagellar segment of the antenna *Culex territans*, p. 49
4. Thoracic and coxal integument bright reddish-brown; mesonotum clothed with narrow hair-like golden-brown scales *Culex erythrothorax*, p. 46
Thoracic and coxal integument brown or dark brown, never bright reddish-brown; mesonotum clothed with narrow curved scales 5
5. Abdominal white bands rather broad and usually distinctly rounded on posterior median margin; bands constricted laterally and narrowly joined or entirely disconnected from the lateral white patches of scales; scales on mesonotum rather coarse 6
Abdominal pale bands narrow or indistinct or limited to lateral patches; scales on mesonotum fine 7
6. Second marginal cell about five times as long as petiole of vein 2, as measured between cross vein 2-3 and forking of veins 2.1 and 2.2 *Culex pipiens*, p. 46
Second marginal cell about three times or less as long as petiole of vein 2, as measured between cross vein 2-3 and forking of veins 2.1 and 2.2 *Culex quinquefasciatus*, p. 47
7. A pair of small pale scaled mesonotal spots present and located just posteriorly to the center of the mesonotum with one on either side of the mid line; abdominal pale bands of white or yellowish-white scales, usually not distinctly rounded on median posterior margin and broadly joined to the lateral scale patches; pale bands sometimes very narrow *Culex restuans*, p. 47
Pale spots on mesonotum lacking; abdominal pale bands usually narrow, sometimes reduced or indistinct, of dingy yellow scales and joined to lateral patches; apices of some of the segments may have pale scales; tergites VII and VIII often entirely covered with dingy yellow scales *Culex salinarius*, p. 48

Male Genitalia

(modified from Carpenter and La Casse, 1955)

1. Tenth sternite crowned with a single row of blunt teeth 2
Tenth sternite crowned with a dense tuft of bristle-like spines 3
2. Plates of phallosome joined at base and also connected by a narrow sclerotized bridge subapically *Culex territans*, p. 49
Plates of phallosome connected at base, with a very narrow membranous subapical bridge *Culex apicalis*, p. 46
3. Subapical lobe of basistyle with eight or more appendages; basal arm of tenth sternite represented by a short protuberance, never long and curved 4
Subapical lobe of basistyle with five or six appendages; basal arm of tenth sternite long and curved 5

- 4. Dorsal arm of phallosome pointed or narrowly rounded apically, directed posteriorly and crossing over the ventral arm nearly at right angles to its broadly wing-like outward extension *Culex quinquefasciatus*, p. 47
- Dorsal arm of phallosome truncate or bluntly rounded apically directed posterolaterally and obliquely crossing over the narrower wing-like lateral extension of the ventral arm *Culex pipiens*, p. 46
- 5. Leaf-like filament of subapical lobe narrow, club-like; crown of tenth sternite with outer spines blunt *Culex tarsalis*, p. 48
- Leaf-like filament of subapical lobe rather broad; crown of tenth sternite with all spines pointed 6
- 6. Each plate of phallosome with a single, pointed outcurved apical claw with 2-3 small lateral teeth at its base *Culex restuans*, p. 47
- Each plate of phallosome with three or more strong teeth or denticles..... 7
- 7. Dorsal arm of phallosome bent medially at a right angle; the most apical tooth (AT) on the phallosome straight, conical and very small in comparison with adjacent teeth *Culex salinarius*, p. 48
- Dorsal arm of phallosome nearly straight; the most apical tooth (AT) on phallosome bent, pointed about same size or larger than adjacent teeth *Culex erythrothorax*, p. 46

Fourth Instar Larvae

- 1. Antenna of nearly uniform shape with antennal tuft inserted near the middle; siphonal tufts represented by 3 pairs of irregularly placed single hairs and a distal tuft of 2-3 branches *Culex restuans*, p. 47
- Antenna not uniformly shaped; antennal tuft inserted in a constriction at distal third with antennal shaft narrowed beyond; siphonal tufts variable in number, but not represented by single hairs 2
- 2. Upper and lower frontal head hairs of more than 3 branches 3
- Upper frontal head hairs 1-3 branched; lower frontal head hairs single or double 6
- 3. Siphon with five pairs of multiple siphonal tufts inserted more or less in a straight line, siphonal index about 5.0 to 5.5 *Culex tarsalis*, p. 48
- Siphon with four to five pairs of multiple siphon tufts with one or more pairs inserted laterally out of line; siphonal index usually less than 5.0 or more than 6.0 4
- 4. Siphonal index about 4.0 (if siphon is expanded basally probably *C. quinquefasciatus*); lower frontal head hairs usually with five or more branches *Culex pipiens*, p. 46
- *Culex quinquefasciatus*, p. 47
- Siphonal index about 5.5-7.0; lower frontal head hairs usually with 3-4 branches 5
- 5. Siphon with five pair of siphon tufts, of which the third and fourth are usually inserted laterally; comb scales usually more than 65; siphonal index about 6.0 to 7.0 *Culex erythrothorax*, p. 46
- Siphon with four or five pairs of siphon tufts, of which usually, only the next to last is inserted out of line; comb scales usually 35-60; siphonal index about 5.5 to 6.0 *Culex salinarius*, p. 48
- 6. Siphonal index 7.0 to 9.0 with apical diameter of siphon distinctly narrower than the basal diameter; siphonal tufts short, with basal tufts about one-sixth to one-seventh the length of siphon; upper frontal head hair triple or double *Culex apicalis*, p. 46
- Siphonal index less than 7.0, with apical diameter only slightly narrower than the basal diameter; siphonal tufts long, with basal tufts one-third to one-fourth the length of the siphon; upper frontal head hairs single, sometimes double *Culex territans*, p. 49

CULEX SPECIES ACCOUNTS

Culex (Neoculex) apicalis Adams (Fig. 46)

Female:

The apical white bands on the abdominal tergites which join apical triangular patches of white scales laterally distinguishes this species from all Utah *Culex* except *territans*. The characters provided in the key distinguish these two species.

Male Genitalia:

See key characters and Fig. 46.

Fourth Instar Larva:

Similar to *Culex territans*. Separable by the characters noted in the key. In addition Bohart (1948) reported the thorax of *apicalis* to be densely covered with microsetae, the thorax of *territans* only moderately so. This character requires a 100x magnification to be observed.

BIOLOGY AND DISTRIBUTION

This species was originally reported by Nielsen and Rees (1951) from a larva collected at Kamas in SUMMIT County. That larva is now known to be *territans*. The only valid records of *apicalis* in Utah are from Lake Canyon, Colorado River, SAN JUAN County. A series of larvae were taken along the stream bed in a small sandstone depression, elevation 3,350 ft.

Culex (Culex) erythrothorax Dyar (Fig. 47)

Female:

The bright reddish-brown coloring of the thoracic and coxal integument is distinctive. Mesonotum clothed with narrow hair-like golden-brown scales. Abdominal tergites II to V with narrow, indistinct yellow basal bands.

Male Genitalia:

See key characters and Fig. 47.

Fourth Instar Larva:

The larvae closely resemble those of *Culex salinarius*. Differences not noted in the key but reported in the literature are as follows: the diameter of the proximal siphon tuft in *salinarius* as long, or longer, than the basal diameter of the siphon; in *erythrothorax* this tuft is shorter than basal diameter of siphon.

BIOLOGY AND DISTRIBUTION

This species is abundant in the valleys of northern Utah. Larvae may be found during all months of the year apparently serving as an overwintering stage. Large permanent swamps containing considerable vegetation appear to be preferred for larval development. Adults are especially abundant during August and September. The females are vicious biters and may be a severe nuisance if their haunts are invaded. County records: BOX ELDER, CACHE, DAVIS, JUAB, SALT LAKE, UTAH, WASHINGTON, WEBER.

Culex (Culex) pipiens Linnaeus (Fig. 48)

Female:

Thoracic integument brown to dark brown. Mesonotum clothed with narrow curved golden-brown scales which are coarser than those of any other Utah *Culex* species except *C. quinquefasciatus*. Abdominal tergites have broad basal bands and lateral patches of white scales. The species very closely resembles *quinquefasciatus*, which also conforms to the characters noted

above. The most reliable difference is the wing character provided in the keys. Another less reliable difference exists in the basal white bands on abdominal tergites III, IV and sometimes V. In *pipiens* these bands are usually continuous with the lateral patches of white scales. In *quinquefasciatus* these bands are usually broken and disconnected with these patches near the lateral margins.

Male Genitalia:

See key characters and Fig. 48.

Fourth Instar Larva:

Upper and lower frontal head hairs multiple. Siphonal index about 4.0; pecten followed by four pairs of siphonal tufts with the subapical tuft inserted laterally out of line with the others. The larva of *pipiens* can not generally be separated with certainty from that of *quinquefasciatus*. The siphon of the latter species is often expanded on the basal half and tapered distally, while that of *pipiens* is usually more slender and evenly tapered. Variations occur, however, which overlap both species.

BIOLOGY AND DISTRIBUTION

This species follows *C. tarsalis* as the most abundant and widespread *Culex* species in the state. Larvae are extremely ubiquitous and are found in a great variety of small natural sources and artificial water containers in valley areas, particularly in or adjacent to human habitations. Adults will readily enter dwellings and although their presence often constitutes an annoyance the females rarely attempt to bite. County records: BOX ELDER, CACHE, DAVIS, SALT LAKE, UTAH, WASHINGTON, WEBER.

Culex (Culex) quinquefasciatus Say (Fig. 49)

Female:

Similar to *C. pipiens*. See discussion of that species.

Male Genitalia:

See key characters and Fig. 49.

Fourth Instar Larva:

Similar to *C. pipiens*. See discussion of that species.

BIOLOGY AND DISTRIBUTION

An uncommon species in Utah, known only from adults collected at Salt Lake City in SALT LAKE County, 4,300 ft. and St. George, WASHINGTON County, 2,760 ft. Due to the ease with which this species is confused with *C. pipiens* it is probable that it is much more widely distributed in the state than the records would indicate. Nothing is known concerning the habits of this species in Utah. There is some evidence that the species may occasionally intergrade with *pipiens* in the Salt Lake City area.

Culex (Culex) restuans Theobald (Fig. 50)

Female:

Closely resembles *C. pipiens* and *C. quinquefasciatus*. Can generally be distinguished by the characters provided in the key.

Male Genitalia:

The characters presented in the key are distinctive. See Fig. 50.

Fourth Instar Larva:

Readily distinguished by the characters provided in the key. See Fig. 50.

BIOLOGY AND DISTRIBUTION

A very rare species. The only valid records for the state were males taken at Roosevelt in DUCHESNE County. Nothing is known of the habits of the larvae or adults in Utah.

Culex (Culex) salinarius Coquillett (Fig. 51)*Female:*

Mesonotal integument brown, clothed with fine curved golden-brown scales. This species can usually be distinguished by the key characters.

Male Genitalia:

See key characters and Fig. 51.

Fourth Instar Larva:

Closely resembles *C. erythrothorax*. Differences are stated under species account of *erythrothorax*.

BIOLOGY AND DISTRIBUTION

This species is rather widespread in the valleys of northern Utah, but is not abundant. Larvae occur in a wide variety of situations in fresh or polluted waters, often of an artificial nature. Relatively small pools appear to be preferred. Females bite readily and will enter dwellings, but are not of pest importance in the state. County records: BOX ELDER, CACHE, SALT LAKE, UTAH, WASHINGTON.

Culex (Culex) tarsalis Coquillett (Fig. 52)*Female:*

The only *Culex* species in Utah with white banded proboscis and tarsi. Other distinctive characters are the narrow line of white scales on the femora and tibiae and the V-shaped markings of dark scales on the ventral surface of each abdominal segment.

Male Genitalia:

The characters denoted in the key are distinctive. See Fig. 52.

Fourth Instar Larva:

Upper and lower frontal head hairs multiple. Siphonal index about 5.0 to 5.5; pecten followed by 5 pairs of multiple siphonal tufts inserted in a straight or nearly straight line; proximal tufts longer; distal tuft much shorter than the rest and inserted near end of siphon.

BIOLOGY AND DISTRIBUTION

This species is the chief vector of the western equine encephalitis (WEE) virus and is one of the most widely distributed species in Utah. Larvae are found from spring until fall in an extremely wide variety of habitats at elevations up to 9,000 ft. Adult populations usually reach their maximum in August. Females bite readily at dusk and after dark and because of their abundance and disease significance constitute the most important species in the state. County records: All counties.

Culex (Neoculex) territans Walker (Fig. 53)*Female:*

See comments under *Culex apicalis*.

Male Genitalia:

See key characters and Fig. 53.

Fourth Instar Larva:

Similar to *Culex apicalis*. See key characters and discussion of that species.

BIOLOGY AND DISTRIBUTION

A rare species in Utah. Larvae have been collected only in valleys in the northern part of the state in small permanent fresh water pools. They are commonly associated with *Anopheles* larvae. Adults are not known to feed on man and have not been collected in Utah. County records: SUMMIT, WEBER.

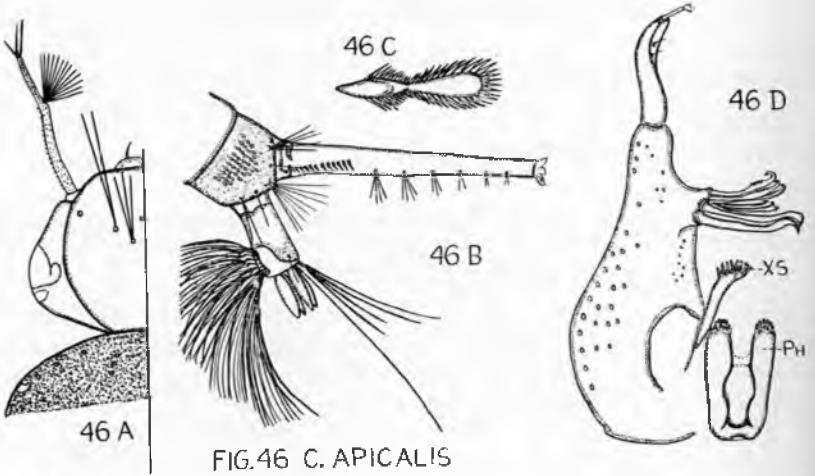


FIG. 46 C. APICALIS

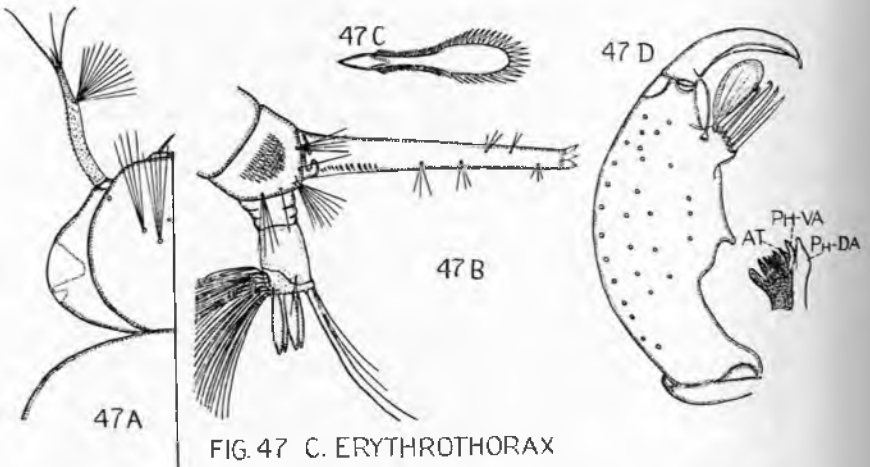


FIG. 47 C. ERYTHROTHORAX

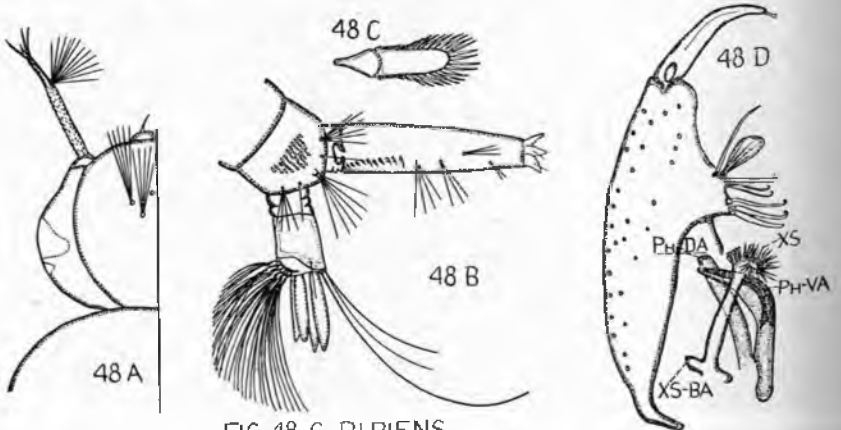


FIG. 48 C. PIFIENS

Figs. 46-48. Culex species. A. Larva, head and thorax. B. Larva, terminal segments. C. Pecten tooth. D. Male genitalia.

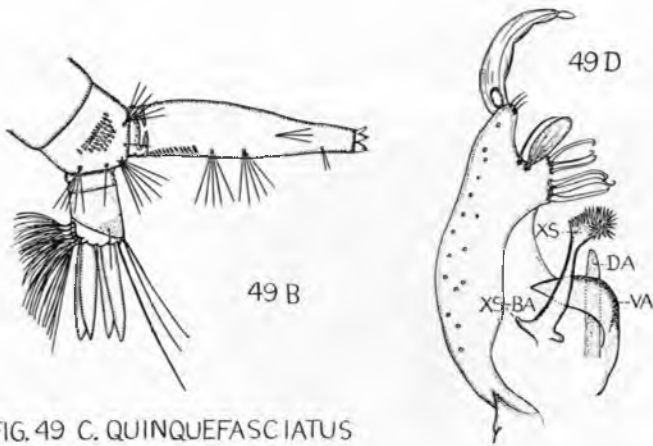


FIG. 49 C. QUINQUEFASCIATUS

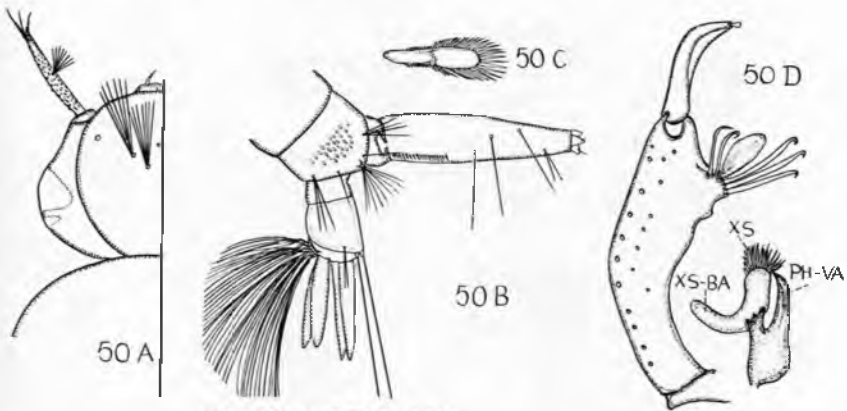


FIG. 50 C. RESTUANS

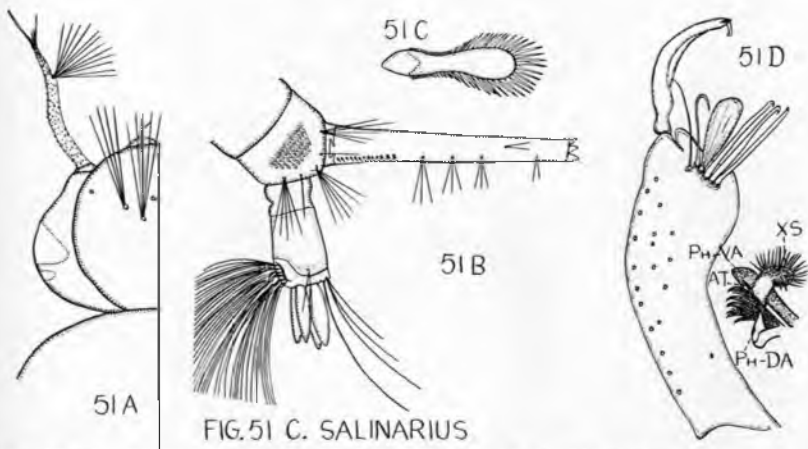


FIG. 51 C. SALINARIUS

Figs. 49-51. *Culex* species. A. Larva, head and thorax (For *C. quinquefasciatus* see Fig. 48A). B. Larva, terminal segments. C. Pecten tooth. D. Male genitalia.

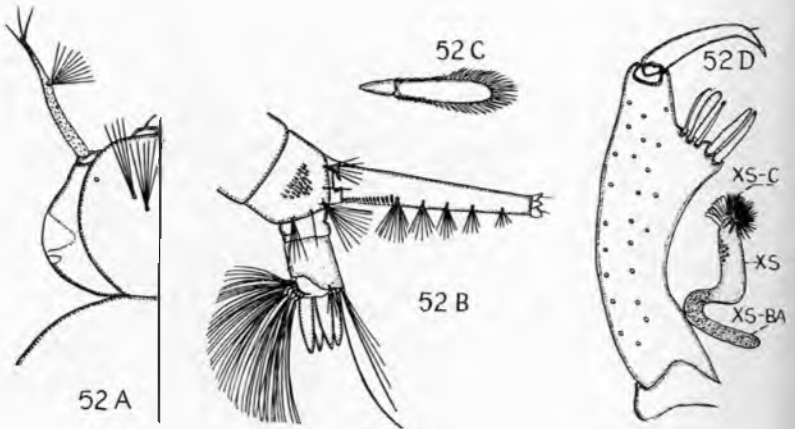


FIG. 52 C. TARSALIS

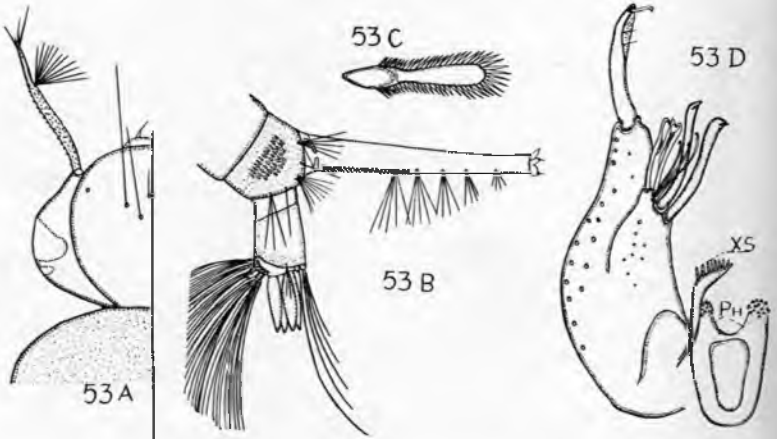


FIG. 53 C. TERRITANS

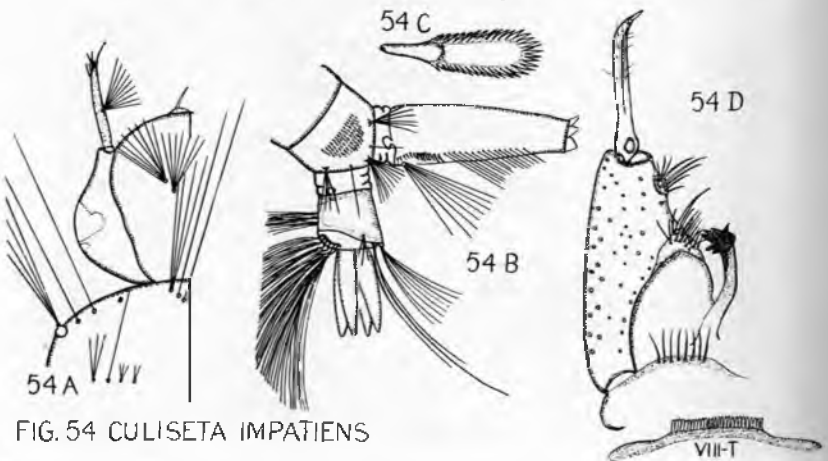


FIG. 54 CULISETA IMPATIENS

Figs. 52-53. *Gulex* species; 54. *Culiseta impatiens*. A. Larva, head and thorax. B. Larva, terminal segments. G. Pecten tooth. D. Male genitalia.

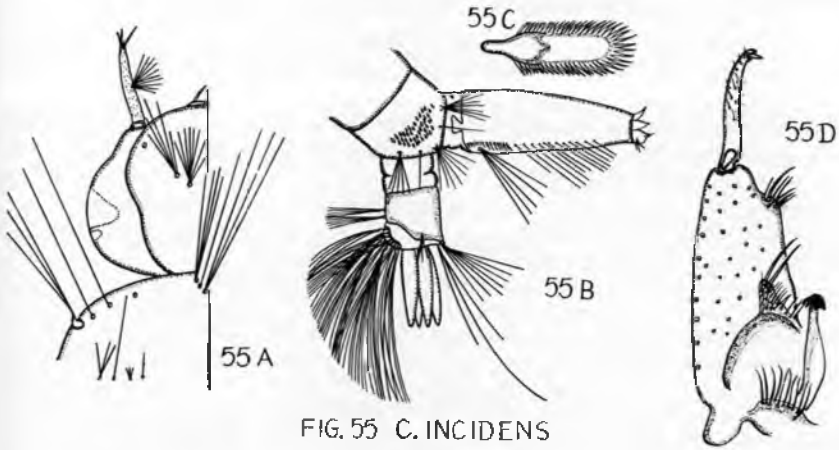


FIG. 55 *C. INCIDENS*

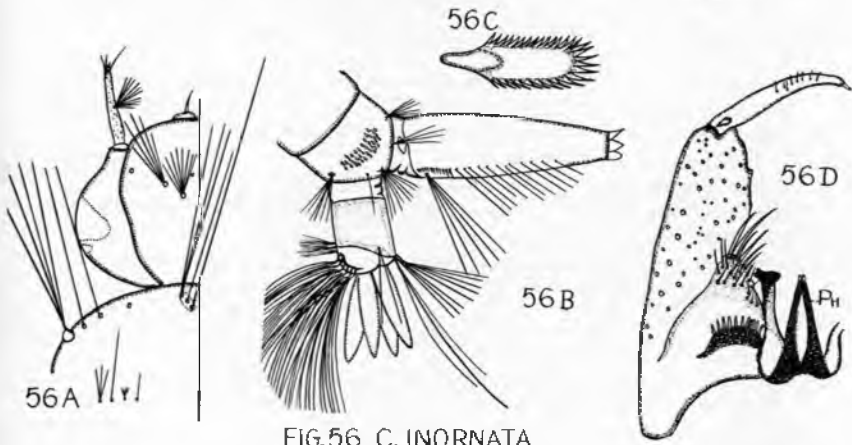


FIG. 56 *C. INORNATA*

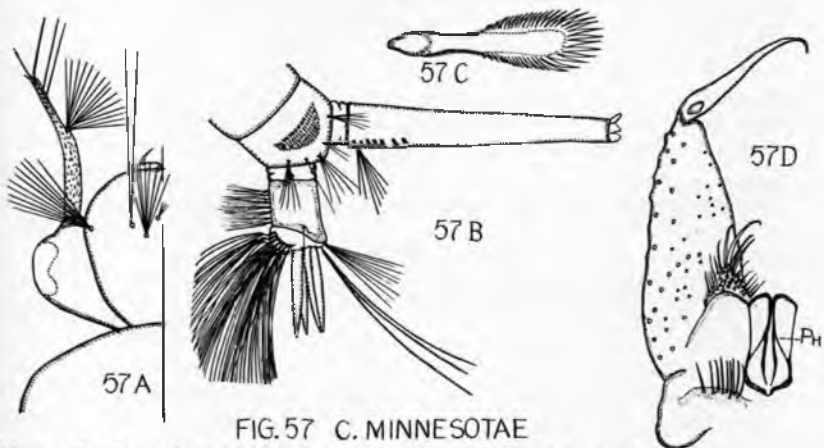


FIG. 57 *C. MINNESOTAE*

Figs. 55-57. *Culiseta* species. A. Larva, head and thorax. B. Larva, terminal segments. C. Pecten tooth. D. Male genitalia.

Keys to the *Culiseta* Species of Utah

Adult Females

1. Tarsi with narrow rings of white or pale scales on some or all segments 2
Tarsi without rings of white or pale scales 3
2. Wings with conspicuous spots of dark scales; abdominal tergites with basal white bands only *Culiseta incidens*, p. 55
Wings without conspicuous spotting; abdominal tergites with basal and apical bands of pale scales *Culiseta minnesotae*, p. 56
3. Wings with numerous pale scales on costa, subcosta and vein 1; abdominal tergites with broad basal bands of pale scales, which widen laterally to cover most of segments *Culiseta inornata*, p. 56
Wings entirely dark scaled; abdominal tergites with rather narrow even basal white bands *Culiseta impatiens*, p. 55

Male Genitalia

1. Lobes of ninth tergite prominent, rounded and darkly sclerotized, each bearing many short stout spines *Culiseta inornata*, p. 56
Lobes of ninth tergite slightly elevated, lightly sclerotized and bearing rather long slender setae 2
2. Eighth tergite with a long transverse row or 30 or more short stout spines along median posterior margin *Culiseta impatiens*, p. 55
Eighth tergite with a cluster of several short spines or long setae on the posterior median lobe 3
3. Basistyle with a small apical lobe; eighth tergite with a cluster of several short, stout spines on the posterior median lobe *Culiseta incidens*, p. 55
Basistyle without apical lobe; eighth tergite with a cluster of long slender spines on the posterior median lobe *Culiseta minnesotae*, p. 56

Fourth Instar Larva

1. Siphon long, slender, about six times as long as the basal diameter; pecten not followed by a row of long hairs *Culiseta minnesotae*, p. 56
Siphon short, stout, about three times or less times as long as the basal diameter; pecten followed by a row of long hairs 2
2. Upper and lower frontal head hairs multiple, fan shaped with branches similar in number and length; comb scales exceeding 60 in number; mesothoracic hair No. 1 very short, usually double or triple *Culiseta impatiens*, p. 55
Upper frontal head hairs fan shaped, with more branches and shorter than lower frontal head hairs; comb scales usually less than 50 in number; mesothoracic hair No. 1 usually single 3
3. Lateral hair of anal plate strongly developed, as long or longer than anal plate, usually double; prothoracic hair No. 1 usually single and longer than the head *Culiseta inornata*, p. 56
Lateral hair of anal plate fine, considerably shorter than anal plate, usually triple, sometimes double or 4-branched; prothoracic hair No. 1 usually double or triple, shorter than the head *Culiseta incidens*, p. 55

CULISETA SPECIES ACCOUNTS

Culiseta (Culiseta) impatiens (Walker) (Fig. 54, p. 52)

Female:

A large dark brown species with unbanded dark scaled tarsi. Wings are entirely dark scaled with faint spots produced by denser scaling at base of vein 3 and fork of vein 4. Abdominal tergites with basal white bands.

Male Genitalia:

The characters noted in the key are sufficient to distinguish *impatiens* from other Utah *Culiseta* species. See Fig. 54.

Fourth Instar Larva:

Upper and lower frontal head hairs multiple, fan-shaped, similar in length and number of branches. Mesothoracic hair No. 3 at least 5-6 times as long as mesothoracic hair No. 1 which is usually 2-3 branched and very short; this character in *impatiens* differs from both *C. incidens* and *C. inornata*; in the two latter species mesothoracic hair No. 1 is single, 2-3 times longer than *impatiens*, and about one-fourth as long as mesothoracic hair No. 3. Lateral hair of anal plate shorter than the saddle, 2-4 branched. Comb in a large triangular patch of more than 60 scales.

BIOLOGY AND DISTRIBUTION

This species is confined principally to mountainous regions of the state generally above 7,000 feet. The species is common in the Uinta Mountains, but rather rare elsewhere. Larvae have been collected throughout the summer in small shaded or partially shaded pools, often containing considerable vegetation and organic matter. Adult females emerge from hibernation very early, often while the ground is still snow covered. They readily attack man during daylight hours in forested areas and will enter dwellings. County records: BOX ELDER, DAGGETT, DUCHESNE, SAN JUAN, SUMMIT, UINTAH, WASATCH.

Culiseta (Culiseta) incidens (Thomson) (Fig. 55)

Female:

A large brown species readily distinguishable from the other Utah species of *Culiseta* by the wings which are entirely dark scaled with conspicuous spots of dark scales on veins 2, 4, 5.1 and 6 and by the narrow white basal bands on at least some of the tarsal segments.

Male Genitalia:

The characters noted in the key are sufficient to distinguish *incidens* from other Utah *Culiseta* species. See Fig. 55.

Fourth Instar Larva:

Closely resembles *C. inornata*. See discussion of that species.

BIOLOGY AND DISTRIBUTION

A widespread Utah species with the greatest altitudinal range of any Utah mosquito species, 2700 to 10,500 ft. Larvae are found in a wide variety of situations, but tend to show a preference for cleaner, less polluted waters, and tolerate more shade than *inornata*. This is the dominant mosquito species of the desert regions of southern and southeastern Utah. Larvae occur in almost all situations where water remains sufficiently long for larval development; pools in deep sandstone depressions and stream beds being typical situations. Adults will readily attack man, but the females are rather timid feeders. County records: probably occurs in all counties. Known from 19 counties in the state.

Culiseta (Culiseta) inornata (Williston) (Fig. 56)*Female:*

This large tan to brownish species with unbanded legs can readily be distinguished by the following characters: Proboscis and legs speckled with many pale scales. Wings without spots; with numerous pale scales on costa, subcosta and vein 1. Abdominal tergites with basal bands of pale scales which widen on the sides to cover the entire segment.

Male Genitalia:

The prominent, heavily sclerotized bluntly rounded lobes of the ninth tergite each bearing many short, stout spines are distinctive. The phallosome also is longer, narrower and more heavily sclerotized than in other species of *Culiseta*.

Fourth Instar Larva:

Closely resembles *C. incidens*, but differs in the heavy lateral hair of the anal plate which is at least as long as the anal plate and usually double; in *incidens* the lateral hair is fine, considerably shorter than the anal plate and usually 3-4 branched. Prothracic hair No. 1 in *inornata* is usually single and extends beyond the anterior margin of the head; in *incidens* this hair is double or triple and shorter, not extending to the anterior margin of the head. Another difference which is generally reliable and can be used as a field character is in the color of the head and siphon; in *inornata* these structures are usually tan to medium brown in color; in *incidens* dark brown to black. Comb scales in both species are usually less than 50 with *inornata* averaging between 30-45, *incidens* between 40-50.

BIOLOGY AND DISTRIBUTION

A common Utah species which has been collected in 23 counties. Larvae are found in a wide variety of permanent and semi-permanent waters, generally showing a preference for brackish or polluted waters in direct sunlight or partial shade. Larvae have been collected during the winter from pools covered with ice and may possibly, like the females, survive through the winter. The species has a great altitudinal range, having been collected from 2700 to over 9000 ft. Adult females occasionally attack man, but seem to prefer larger mammals.

Culiseta (Culiseta) minnesotae Barr (Fig. 57)*Female:*

A moderately large species with narrow pale rings on the tarsi. Wing unspotted, dark scaled, a few pale scales may be present on costa. Abdominal tergites with basal and apical bands of pale scales.

Male Genitalia:

The character noted in the key will distinguish this species. See Fig. 57.

Fourth Instar Larva:

Antenna almost as long as head, curved. Siphonal index about 6.0 to 7.0; pecten of a few teeth confined to basal fourth of siphon, not followed by a row of long setal hairs.

BIOLOGY AND DISTRIBUTION

A rare species in Utah. Larvae have been collected in April in a pool formed by a flowing well in Weber Canyon, MORGAN County, 4500 feet. Adult males and females were taken in August at Huntsville, WEBER County, 4920 feet. Nothing is known concerning the habits of the adults.

SELECTED REFERENCES

- AITKEN, T. H. G. 1945. Studies on the anopheline complex of western North America. Univ. Calif. Publ. Ent., 7:273-364.
- BARR, A. R. 1957. A new species of *Culiseta* (Diptera: Culicidae) from North America. Proc. Ent. Soc. Wash., 59:163-167.
- BARR, A. R. 1958. The mosquitoes of Minnesota. Tech. Bull. 228. Univ. Minn. Agr. Exp. Sta. 154 pp.
- BECKEL, W. E. 1954. The identification of adult female *Aedes* mosquitoes (Diptera: Culicidae) of the black-legged group taken in the field at Churchill, Manitoba. Can. Jour. Zool., 32:324-330.
- BELKIN, J. N. 1950. A revised nomenclature for the chaetotaxy of the mosquito larva (Diptera: Culicidae). Amer. Mid. Nat., 44:678-698.
- BELKIN, J. N. and W. McDONALD. 1957. A new species of *Aedes* (*Ochlerotatus*) from treeholes in southern Arizona and a discussion of the *varipalpus* complex (Diptera: Culicidae). Ann. Ent. Soc. Amer., 50:179-91.
- BOHART, R. N. 1948. The subgenus *Neoculex* in America north of Mexico (Diptera: Culicidae). Ann. Ent. Soc. Amer., 41:330-345.
- California Mosquito Control Assoc., The Ent. Committee. 1959. A field guide to the common mosquitoes of California. 27 pp.
- CARPENTER, S. J., W. W. MIDDLEKAUFF, and R. W. CHAMBERLAIN. 1946. The mosquitoes of the southern United States east of Oklahoma and Texas. Amer. Mid. Nat. Mon. No. 3, 292 pp.
- CARPENTER, S. J. and W. J. LA CASSE. 1955. Mosquitoes of North America north of Mexico. Univ. of Calif. Press. Berkeley and Los Angeles. 360 pp.
- DYAR, H. G. 1928. The mosquitoes of the Americas. Carnegie Inst. Wash., Pub. 387:616 pp.
- FREEBORN, S. B., and R. M. BOHART. 1951. The mosquitoes of California. Bull. Calif. Insect Survey, 1:25-78.
- GJULLIN, C. M. 1946. A key to the *Aedes* females of America north of Mexico (Diptera: Culicidae). Proc. Ent. Soc. Wash. 48:215-236
- GJULLIN, C. M., R. I. SAILER, A. STONE, and B. V. TRAVIS. 1961. The mosquitoes of Alaska. Agr. Handbook No. 182, Agr. Res. Serv., USDA, 98 pp.
- KNIGHT, K. L. 1951. The *Aedes* (*Ochlerotatus*) *punctator* subgroup in North America. (Diptera: Culicidae). Ann. Ent. Soc. Amer., 44:87.
- MATHESON, R. 1944. A handbook of the mosquitoes of North America. Ithaca, N.Y., Comstock Pub. Assoc., 314 pp.
- NIELSEN, L. T. and D. M. REES. 1959. The mosquitoes of Utah — A revised list. Mosq. News., 19:45-47.
- PRICE, R. D. 1958. A description of the larva and pupa of *Culiseta* (*Culicella*) *minnesotae* Barr (Diptera: Culicidae). Jour. Kansas Ent. Soc., 31:47-53.
- REES, D. M. 1943. The mosquitoes of Utah. Bull. Univ. Utah, Biol. Series, 33:1-99.
- REES, D. M. 1944. A new mosquito record from Utah. Pan. Pac. Ent. 20:19.
- REES, D. M., and L. T. NIELSEN. 1951. Four new mosquito records from Utah. Pan. Pac. Ent., 27:11-12.
- REES, D. M., and L. T. NIELSEN. 1955. Additional mosquito records from Utah. Pan. Pac. Ent. 31:31-33.
- REMPEL, J. G. 1950. A guide to the mosquito larvae of western Canada. Can. Jour. Res. D, 28:207-248.
- REMPEL, J. G. 1953. The mosquitoes of Saskatchewan. Can. Jour. Zool., 31:433-509.
- RICHARDS, C. S. 1956. *Aedes melanimon* Dyar and related species. Can. Ent. 88:261-296.

- RICHARDS, C. S., L. T. NIELSEN, and D. M. REES. 1956. Mosquito records from the Great Basin and drainage of the lower Colorado River. *Mosq. News*, 16:10-17
- STAGE, H. H., C. M. GJULLIN, and W. W. YATES. 1952. Mosquitoes of the northwestern states. U.S. Dept. Agr. Handbook 46:1-95.
- THURMAN, E. B., and P. T. JOHNSON. 1950. The taxonomic characters of the larvae of the genus *Culiseta* Felt, 1904 in California (Diptera: Culicidae). *Pan. Pac. Ent.*, 26:179-187.
- VOCKEROTH, J. R. 1950. Specific characters in tarsal claws of some species of *Aedes* (Diptera: Culicidae). *Can. Ent.*, 82:160-162.
- VOCKEROTH, J. R. 1954a. Notes on Northern species of *Aedes* with descriptions of two new species (Diptera: Culicidae). *Can. Ent.*, 86:109-116.
- VOCKEROTH, J. R. 1954b. Notes on the identities and distributions of *Aedes* species of northern Canada with a key to the females (Diptera: Culicidae). *Can. Ent.*, 86:241-255.
- YAMAGUTI, S and W. J. LA CASSE. 1951. Mosquito fauna of North America, Parts I-IV. Office of the Surgeon, Hq. Japan Logistical Command, 629 pp.

BIOLOGICAL SERIES

Offered for the first time by the University of Utah Press is this series of Biological Papers published from 1929 to 1961. Limited supply. All issues are paper bound. Twenty per cent discount offered on amalgamated orders of 20 different titles.

Volume 1

- No. 1 **A Descriptive Catalog of the Mollusca of Utah**
RALPH V. CHAMBERLIN AND DAVID T. JONES *213 pages, 1929, \$1.25*
- No. 2 **A New Rattlesnake from Utah**
A. M. WOODBURY *1929, out of print*
- No. 3 **Mollusca from the Henry Mountains and Some Neighboring Points in Utah**
RALPH V. CHAMBERLIN AND ELMER BERRY *7 pages, 1930, \$.30*
- No. 4 **A Descriptive Catalog of the Reptiles of Utah**
ANGUS M. WOODBURY *140 pages, 1931, \$1.00*
- No. 5 **Records of Birds in Central and Southeastern Utah**
J. S. STANFORD *10 pages, 1931, \$.20*
- No. 6 **Life in Other Worlds: A Study in the History of Opinion**
RALPH V. CHAMBERLIN *1932, out of print*

Volume 2

- No. 1 **North American Spiders of the Genera *Cybaeus* and *Cybaeina***
RALPH V. CHAMBERLIN AND WILTON IVIE *43 pages, 1932, \$.35*
- No. 2 **Spiders of the Raft River Mountains of Utah**
RALPH V. CHAMBERLIN AND WILTON IVIE *1933, out of print*
- No. 3 **A New Genus in the Family Agelenidae**
RALPH V. CHAMBERLIN AND WILTON IVIE *7 pages, 1933, \$.30*
- No. 4 **A New Genus of Theridiid Spiders in which the Male Develops Only One Palpus**
RALPH V. CHAMBERLIN AND WILTON IVIE *1934, out of print*
- No. 5 **On the Early Development of *Stagnicola kingi* (Meek), the Utah Ribbed Snail**
EDWARD LOWRANCE *21 pages, 1934, \$.35*
- No. 6 **Observations on a Mosquito Flight in Salt Lake City**
DON M. REES *1935, out of print*
- No. 7 **Histological Aspects of Metamorphosis of *Ambystoma tigrinum* (Green)**
IRA ROCKWOOD TELFORD *15 pages, 1935, \$.35*
- No. 8 **Miscellaneous New American Spiders**
RALPH V. CHAMBERLIN AND WILTON IVIE *1935, out of print*

Volume 3

- No. 1 **The Black Widow Spider and Its Varieties in the United States**
RALPH V. CHAMBERLIN AND WILTON IVIE *1935, out of print*
- No. 2 **Some New Spiders from Florida**
WILTON IVIE AND W. M. BARROWS *24 pages, 1935, \$.50*

- No. 3 **A Quantitative Study of the Bottom Fauna in Some Utah Streams Variously Affected by Erosion**
JAMES W. MOFFETT *1936, out of print*
- No. 4 **A New Gopher from Antelope Island, Great Salt Lake, Utah**
STEPHEN D. DURRANT *4 pages, 1936, \$.15*
- No. 5 **New Spiders from Mexico and Panama**
RALPH V. CHAMBERLIN AND WILTON IVIE *1936, out of print*
- No. 6 **A Comparative Study of Certain Goblet Cells**
DAVID T. JONES *15 pages, 1937, \$.35*
- No. 7 **Two Genera of Trap-door Spiders from California**
RALPH V. CHAMBERLIN *11 pages, 1937, \$.35*
- No. 8 **Two New Gophers from Utah**
STEPHEN D. DURRANT *7 pages, 1937, \$.15*
- No. 9 **Origin of Mosquito Producing Waters in the Vicinity of Salt Lake City, Utah**
DON M. REES *14 pages, 1939, \$.20*
- No. 10 **A New Pocket Gopher of the *Thomomys quadratus* Group from the Northern Great Basin Region**
STEPHEN D. DURRANT *1939, out of print*

Volume 4

- No. 1 **The Uredinales or Rusts of Utah**
A. O. GARRETT *1937, out of print*
- No. 2 **The Ustilaginales or Smuts of Utah**
A. O. GARRETT *1939, out of print*
- No. 3 **A New Violet from Utah**
W. P. COTTAM *8 pages, 1939, \$.15*
- No. 4 **A New Polygonum from Garfield County, Utah**
J. F. BRECKLE AND WALTER P. COTTAM *7 pages, 1940, \$.15*
- No. 5 **New and Extended Ranges for Utah Plants**
WALTER P. COTTAM, A. O. GARRETT AND BERTRAND F. HARRISON *1940, out of print*
- No. 6 **Ferns of Utah**
SEVILLE FLOWERS *87 pages, 1944, \$1.25*

Volume 5

- No. 1 **New Tarantulas from the Southwestern States**
RALPH V. CHAMBERLIN AND WILTON IVIE *1939, out of print*
- No. 2 **On a Collection of Chilopods from the East Indies**
RALPH V. CHAMBERLIN *19 pages, 1939, \$.30*
- No. 3 **On Some Diplopods of the Family Fontariidae**
RALPH V. CHAMBERLIN *19 pages, 1939, \$.30*
- No. 4 **A New Pocket Gopher from the Oquirrh Mountains, Utah**
STEPHEN D. DURRANT *6 pages, 1939, \$.15*
- No. 5 **The Termite Problem in Utah**
DON M. REES AND ARDEN R. GAUFIN *1939, out of print*
- No. 6 **On a Diplopod Collection from Barro Colorado Island, Panama**
RALPH V. CHAMBERLIN *16 pages, 1940, \$.30*

- No. 7 **New Genera and Species of North American Paraiulidae**
RALPH V. CHAMBERLIN *39 pages, 1940, \$.50*
- No. 8 **New American Tarantulas of the Family Aviculariidae**
RALPH V. CHAMBERLIN *1940, out of print*
- No. 9 **Agelenid Spiders of the Genus *Cicurina***
RALPH V. CHAMBERLIN AND WILTON IVIE *108 pages, 1940, \$1.00*

Volume 6

- No. 1. **A Study of the Great Basin Land Snail, *Oreohelix strigosa depressa* (Cockerell)**
DAVID T. JONES *43 pages, 1940, \$.75*
- No. 2 **A Preliminary List of the Ants of Utah**
DON M. REES AND A. W. GRUNDMANN *1940, out of print*
- No. 3 **Spiders Collected by L. W. Saylor and Others, Mostly in California**
RALPH V. CHAMBERLIN AND WILTON IVIE *49 pages, 1941, \$.70*
- No. 4 **New American Millipeds**
RALPH V. CHAMBERLIN *39 pages, 1941, \$.50*
- No. 5 **New Western Millipeds**
RALPH V. CHAMBERLIN *23 pages, 1941, \$.40*
- No. 6 **New Genera and Species of American Lithobiid Centipeds**
RALPH V. CHAMBERLIN *23 pages, 1941, \$.40*
- No. 7 **New Species and Records of American Terrestrial Isopods**
STANLEY AND DOROTHEA MULAİK *22 pages, 1942, \$.50*
- No. 8 **New Southern Millipeds**
RALPH V. CHAMBERLIN *19 pages, 1942, \$.30*
- No. 9 **New Records of Mollusca**
JACK P. WOOLSTENHULME *14 pages, 1942, \$.25*

Volume 7

- No. 1 **A Hundred New Species of American Spiders**
RALPH V. CHAMBERLIN AND WILTON IVIE *117 pages, 1942, \$1.00*
- No. 2 **On Centipeds and Millipeds from Mexican Caves**
RALPH V. CHAMBERLIN *19 pages, 1942, \$.30*
- No. 3 **On Mexican Centipeds**
RALPH V. CHAMBERLIN *55 pages, 1943, \$.60*
- No. 4 **The Mosquitoes of Utah**
DON M. REES *1943, out of print*
- No. 5 **Birds of Pine Valley Mountain Region, Southwestern Utah**
WILLIAM H. BEHLE *1943, out of print*
- No. 6 **New Genera and Species of North American Linyphiid Spiders**
RALPH V. CHAMBERLIN AND WILTON IVIE *39 pages, 1943, \$.60*

Volume 8

- No. 1 **New Texas Terrestrial Isopods with Notes on Other Species**
STANLEY AND DOROTHEA MULAİK *15 pages, 1943, \$.50*
- No. 2 **On Some Genera and Species of American Millipeds**
RALPH V. CHAMBERLIN *20 pages, 1943, \$.30*
- No. 3 **On Mexican Millipeds**
RALPH V. CHAMBERLIN *103 pages, 1943, \$1.30*
- No. 4 **Two Protozoans from Great Salt Lake**
DAVID T. JONES *11 pages, 1944, \$.15*
- No. 5 **Spiders of the Georgia Region of North America**
RALPH V. CHAMBERLIN AND WILTON IVIE *267 pages, 1944, \$4.50*
- No. 6 **New Mites in the Family Caeculidae**
STANLEY MULAİK *23 pages, 1945, \$.50*

Volume 9

- No. 1 **Birds of the Navajo Country**
ANGUS M. WOODBURY AND HENRY NORRIS RUSSELL, JR. *1945, out of print*
- No. 2 **The Genera and Species of the Tridenchthoniidae (Dithidae), a Family of the Arachnid Order Chelonethida**
JOSEPH C. CHAMBERLIN AND RALPH V. CHAMBERLIN *67 pages, 1945, \$1.25*
- No. 3 **The Distribution and Taxonomy of Kangaroo Rats (Genus Dipodomys) of Utah**
STEPHEN D. DURRANT AND HENRY W. SETZER *1945, out of print*
- No. 4 **Some Erigonid Spiders of the Genera Eulaira and Diplocentria**
RALPH V. CHAMBERLIN AND WILTON IVIE *19 pages, 1945, \$.50*
- No. 5 **On Several New American Spiders**
RALPH V. CHAMBERLIN AND WILTON IVIE *15 pages, 1946, \$.50*
- No. 6 **The Genera and Species of the Hyidae, a Family of the Arachnid Order Chlonethida**
JOSEPH C. CHAMBERLIN *16 pages, 1946, \$.50*
- No. 7 **A Comparative Study of the Urinogenital Systems of an Oviparous and Two Ovoviviparous Species of the Lizard Genus Sceloporus**
DOROTHEA DEMUTH MULAİK *24 pages, 1946, \$.70*
- No. 8 **Property Rights of Animals**
NETTIE BRADFORD *68 pages, 1946, \$1.15*

Volume 10

- No. 1 **Researches in Dendrochronology**
A. E. DOUGLASS *19 pages, 1946, \$.40*
- No. 2 **Color-banding California Gulls at Great Salt Lake, Utah**
ANGUS M. WOODBURY, WILLIAM H. BEHLE AND JOHN W. SUGDEN *1946, out of print*
- No. 3 **The Spiders of Alaska**
RALPH V. CHAMBERLIN AND WILTON IVIE *103 pages, 1947, \$2.00*
- No. 4 **The Vachoniidae, A New Family of False Scorpions Represented by Two New Species from Caves in Yucatan**
JOSEPH C. CHAMBERLIN *15 pages, 1947, \$.50*

- No. 5 **A Summary of the Known North American Amaurobiidae**
RALPH V. CHAMBERLIN *31 pages, 1947, \$.50*
- No. 6 **The Genera of North American Dictynidae**
RALPH V. CHAMBERLIN *31 pages, 1948, \$.60*
- No. 7 **The Great Basin with Emphasis on Glacial and Post-glacial Times**
I. Geological Background by ELIOT BLACKWELDER
II. Zoological Evidence by CARL L. HUBBS AND ROBERT R. MILLER
III. Climatic Changes and Pre-white Man by ERNST ANTEVS
191 pages, 1948, \$2.00

Volume 11

- No. 1 **Check List of Recent Utah Mollusca**
RALPH V. CHAMBERLIN AND ERNEST J. ROSCOE *16 pages, 1948, \$.20*
- No. 2 **Annotated Check List of the Birds of Utah**
ANGUS M. WOODBURY, CLARENCE COTTAM AND JOHN W. SUGDEN *1949, out of print*
- No. 3 **Speciation in Rodents of the Colorado River Drainage of Eastern Utah**
KEITH R. KELSON *132 pages, 1951, \$1.50*
- No. 4 **The Birds of the Deep Creek Mountains of Central Western Utah**
WILLIAM H. BEHLE *34 pages, 1955, \$1.00*
- No. 5 **New Millipeds from Peru and Adjacent Parts**
RALPH V. CHAMBERLIN *47 pages, 1955, \$1.25*
- No. 6 **The Birds of the Raft River Mountains, Northwestern Utah**
WILLIAM H. BEHLE *40 pages, 1958, \$1.50*
- No. 7 **Birds of the Kanab Area and Adjacent High Plateaus of Southern Utah**
WILLIAM H. BEHLE, JOHN B. BUSHMAN AND CLIFTON M. GREENHALGH
92 pages, 1958, \$2.00

Volume 12

- No. 1 **The Birds of Southeastern Utah**
WILLIAM H. BEHLE *56 pages, 1960, \$1.75*
- No. 2 **The Hepaticae of Utah**
SEVILLE FLOWERS *106 pages, 1961, \$3.00*