BULLETIN OF
THE CALIFORNIA INSECT SURVEY
VOLUME 18

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Exclusive of Subfamilies Muscinae and Stomoxyinae

BY
H. C. HUCKETT

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BERKELEY · LOS ANGELES · LONDON

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VOLUME 18

Approved for publication September 21, 1973

Issued May 2, 1975

UNIVERSITY OF CALIFORNIA PRESS
BERKELEY AND LOS ANGELES

UNIVERSITY OF CALIFORNIA PRESS, LTD.
LONDON, ENGLAND

ISBN: 0-520-09508-1
LIBRARY OF CONGRESS CATALOG CARD NUMBER: 73-620214

Printed by Offset in the United States of America

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INTRODUCTION

The following review of the Muscidae of California was carried on concurrently with the recent survey of the family Anthomyiidae (Bull. Calif. Insect Surv., Vol. 12), to which the Muscidae are closely linked. The richness of the muscid fauna in California was much in evidence as indicated by the abundance of material made available for study. Eldridge and James (1957) have already discussed the species belonging to the subfamilies Muscinae and Stomoxyinae.

The writer wishes to acknowledge his indebtedness to those in charge of these collections for assistance and cooperation, without which this survey would have been inordinately curtailed. The names of institutions and individuals that have permitted the use of their material in this manner have been referred to in the text by abbreviations already explained in the survey series dealing with the Anthomyiidae of California (Huckett, 1971).

It was originally planned to treat collection data for the muscids in the same form as was done for the Anthomyiidae (see Bull. Calif. Insect Surv. 12:2). However, it was decided to present the data more briefly for this volume, as follows. For species with about 30 records or fewer, full data are given, sometimes supplemented by a map. For species with more records, no raw data are given. A statement summarizing biogeographical and seasonal patterns and usually a map of localities are provided. (Sometimes reference to a map of a related species with similar distribution suffices.) All maps and the seasonal geographical summaries in this bulletin have been prepared by J. A. Powell, University of California, Berkeley. The original data from specimens representing those species for which data are not given in the text are on file with the California Insect Survey, University of California, Berkeley, and can be made available on request.

The name Muscidae for the family as here treated supplants in part the name Anthomyiidae *sens. lat.* (Aldrich, 1905; Stein, 1907, 1919; Malloch, 1918, 1920) and is restricted to those species that are mentioned in which the wing vein 1st A + Cu_2 (sixth long vein) in the imago or adult is ob-

solescent or disappears before reaching the wing margin, as distinct from its continuity in the family Anthomyiidae (Roback, 1951; Hennig, 1965; Stone *et al.*, 1965). In this sense the family Muscidae is strictly limited as apart from its adoption to include both categories (Curran, 1934; Séguy, 1937; Malloch, 1921 as Muscaridae; Van Emden 1941; Ringdahl, 1954; Huckett, 1965). Cole and Schlinger (1969), in their comprehensive treatise on the flies of western North America, have classified the various scatophagid, anthomyiid, and muscid aggregates under the names Scatophagidae, Anthomyiidae, and Muscidae respectively, retaining the latter name for the concept of the family as adopted in large measure by Aldrich (1905) and Williston (1908), and in a more restricted sense by Brues, Melander, and Carpenter (1954). The Anthomyiidae and Muscidae may both be separated from the remaining families of Muscoidea by the absence of hypopleural bristles.

The present survey of the Muscidae records the presence of 36 genera, 7 subgenera, and 24♂♂ species and subspecies. Species included in keys and text that are not recognized as occurring in California have been marked with an asterisk. These have been mentioned because they may be found later to occur within the state.

BIOLOGY

With few exceptions, the life histories of the numerous species comprising the family, as here delimited, are little known. Few, if any, have become commercially harmful to agricultural crops in California. Certain species, notably in the adult stage, may be considered on occasion to be a nuisance to man and beast by their annoying attention, *e.g.*, *Hydrotaea meteorica* (Linnaeus), *Fannia benjamini* Malloch, whilst others are a hazard to public health due to their breeding under conditions unsanitary to man and for being vectors of pathogenic organisms, *e.g.*, *Fannia scalaris* (Fabricius), *F. canicularis* (Linnaeus), *Muscina stabulans* (Fallén).

Adults of the subfamily Coenosiinae are generally regarded as inhabitants of grasses and related plants, and they may be taken by sweeping the grasses, sedges, and herbage found in the locality, particularly that surrounding ponds and lakes, in swamps or along coasts. Adults are known to be predaceous on nematocerous flies or even larger Diptera as in the case of *Coenosia tigrina* (Fabricius). Larvae are recorded as living in humid soil in such areas, feeding on organic matter, or are zoophagous.

Adults of the genera *Lispe*, *Lispoides*, *Spilogona*, and *Limnophora* are regarded as riparian in their proclivities, frequenting rocks and vegetation beside streams, lakes, ponds, and rivers. A few are known to inhabit locations along the coast. In many instances adults have been found to be predaceous on nematocerous flies, and the larvae to be aquatic or semiaquatic, living in moss and algae and pupating in the watery subsoil or shallows. The genus *Gymnodia* in contrast is mainly coprophagous; the adults frequent poultry yards and the excrement of animals and man for purposes of oviposition and larval nourishment.

Species belonging to the subfamily Mydaeinae commonly occur in fields and woodlands where humidity is sustained and in habitats that range from lowlands to boreal in nature. Adults are known to occur on the trunks and foliage of shrubs and trees where they feed on the sap or on the exudation from aphids, on the developing flowers, or on the forest floor whilst seeking sites for oviposition. Larvae are recorded as saprophagous, having been reared from fungi, rotting wood, or decomposed vegetation, and as being coprophagous, developing in the later instars to become zoophagous. The larvae of *Myospila meditabunda* (Fabricius) have been reared from the dung of sheep, horses, and cattle, and from the feces of human beings.

Adults of the Fanniinae are often seen hovering or dancing under branches or the shade of trees, in garden or woods. They are known to feed on the sap of plants and the exudation of aphid colonies, and are frequently met with on the flowers of Compositae and Umbelliferae. Adults of *Fannia benjamini* have been known, on occasion, to cause considerable annoyance to human beings by persistent-

ly flying around the face seeking to alight to feed on perspiration and the secretions of eyes, ears, lips, and nostrils. Adults of *F. canicularis* are recorded as frequenting buildings for domestic animals and for human habitation. Larvae breed in a wide variety of habitats and media, including several species of fungi and the decay and litter on the forest floor, from plant and animal matter as old stumps and trunks of fallen trees, from dead insects, dead snails and vertebrates, the detritus from nests of birds and certain rodents and squirrels, and the decaying organic matter in nests of wasps and bees. Larvae also breed on the excrement and manure of domestic animals, from the excreta found in cesspools and latrines, and from human feces. Larvae of *Fannia scalaris* and *F. canicularis* have been recognized as incidentally involved in cases of myiasis in man.

The habits of the Phaoniinae also vary and differ widely. Adults of certain species of *Hydrotaea* are known to possess the hovering or dancing flight of certain species of *Fannia*, and also to be an annoyance to man and cattle in their attempts to alight on the face for nourishment. Larvae have bred on manure, feces of domestic animals (herbivores) and man, and nests of birds and of squirrels. They are regarded as saprophytic and zoophagous. Larvae of *Hydrotaea meteorica* are recorded as being incidentally involved in cases of myiasis in man and dysentery in children. Adults of the genus *Ophyra* frequent dumps containing animal or vegetable refuse to oviposit. The larvae breed in such locations and are considered to be scavengers. Larvae of *O. leucostoma* (Wiedemann) have also been reared from corpses and the dung of animals, from cesspools, dead grasshoppers, and the nests of birds, and the larvae of *O. aenescens* (Wiedemann) from decaying meat. Species belonging to the genera *Pogonomyia*, *Eupogonomyia*, *Lasiops*, and *Pseudophaonia* are mainly alpine or boreo-alpine in their distribution. Adults are met with on the foliage of conifers and on the blossoms of the various alpine flora. Adults of *Alloeostylus diaphanus* (Wiedemann) are recorded also as occurring on the trunks of trees and on the droppings of animals. The larvae of *Pseudophaonia* are regarded as coprophagous. Adults of *Dendrophaonia* are found often on tree trunks, and are known to feed on the exuding sap. Larvae have been bred from loose bark and the decayed trunks of trees; also in the case of *D. querceti* (Bouché) from the dung of horses, excrement of humans, and from the nests of hornets, bats and various birds. Adults belonging to the genus *Phaonia sens. str.* are mostly inhabitants of forests and woods, being seen frequently on trunks of trees, on forest litter, the blossoms of flowers and shrubs, and occasionally beside beds of moss. Larvae have been bred from fungi, *Boletus*, *Armillaria*, *Polyporus*, droppings of animals, decayed or rotting wood, and the bark of fallen or standing trees. In the last group mentioned, larvae belonging to the *harti*-group have been found to be predaceous on other insects, including larvae of *Dendroctonus monticolae* Hopkins, and are regarded as capable of subsisting also on the sap of trees. The species *P. tipulivora* Malloch has been reared from a tipulid pupa found in Maryland, and several European species belonging to the genus have been recorded as probably carnivorous in the larval stage. The genus *Muscina*, as exemplified by the species *M. assimilis* (Fallén) and *M. stabulans*, are in part saprophagous, coprophagous, and zoophagus, larvae having been bred from a wide variety of media, notably decomposing vegetable and animal matter in dumps and field, and from animal excrement. Adults of *stabulans* are known to frequent buildings for animals and man to gain shelter, for purposes of oviposition, and in search of food and are thus capable of becoming agents for the transfer and the incidence of disease in man, including intestinal myiases.

SYSTEMATIC TREATMENT

KEY TO SUBFAMILIES OF MUSCIDAE IN CALIFORNIA

1. Anal vein 2nd *A* (seventh long vein) curved around apex of vein *Cu.*$_2$ + 1st *A* (sixth long vein), and so directed as to cross or meet the course of *Cu.*$_2$ + 1st *A* if extended to wing margin . . Fanniinae

   Anal vein not so curved nor directed across the course of vein *Cu.*$_2$ + 1st *A* 2

2. Vein *Cu.*$_2$ + 1st *A* (sixth long vein) continuous or traceable to wing margin . . . . . Family Anthomyiidae

   Vein *Cu.*$_2$ + 1st *A* not continuous nor traceable to wing margin 3

3. Pteropleura with a loose assemblage of hairs near center above the caudal sternopleural bristle, palpi conspicuously dilated, frons in both sexes about one third maximum width of head and without cruciate bristles . Lispinae

   Pteropleura without hairs, or if present the palpi not conspicuously dilated and/or frons in male not one third width of head 4

4. One pair of presutural dorsocentral bristles present, frons in both sexes similarly broad and similarly bristled, and with one pair of recurrent paraorbital bristles, lower stigmatal bristle usually curved downward (fig. 15), if two pairs of presutural dorsocentral bristles present the anterior pair shorter than half the length of posterior pair . Coenosiinae p. p.

   Two or more pairs of presutural dorsocentral bristles present, anterior pair more than half the length of posterior pair 5

5. Sternopleural bristles typically arranged in form of an equilateral triangle, or nearly so . . . . . Coenosiinae p. p.

   Sternopleural bristles not arrnaged as an equilateral triangle 6

6. Proboscis strongly chitinized and stout basad, tapering and slender as if for piercing, labellum atrophied, arista plumose above and bare or nearly so below . . . . . Stomoxyinae

   Proboscis not formed as above, labellum functional and expanded, arista of nearly similar character above and below 7

7. Lower scale of calyptrae enlarged mesad so as to impinge at base of scutellum, caudal margin transverse (exception *Pararicia pabulorum* Fallén) . . Muscinae

   Lower scale of calyptrae not enlarged so as to impinge at base of scutellum, caudal margin usually semicircular . 8

8. Hind tibia withoug posterodorsal bristles, or if present usually restricted to proximal half of tibia (exception *Helina spuria* Malloch) 9

   Hind tibia with one or more posterodorsal bristles, usually not restricted to proximal half of tibia (exception *Hydrotaea armipes* Fallén) . Phaoniinae

9. Prealar bristle and cruciate bristles

absent, abdominal marks when present usually subtriangular, trapezoidal, subquadrate or arcuate, not as only paired spotlike marks or a median stripe . . . . . Limnophorinae
Species without the above combination of characters . . . . . Mydaeinae

Subfamily COENOSIINAE

KEY TO GENERA AND SUBGENERA IN CALIFORNIA

1. Aristal hairs pectinate, longer than width of third antennal segment, profrons with hairs . . . . *Pentacricia* Stein
Aristal hairs shorter than width of third antennal segment, profrons without hairs 2
2. Mesonotum with one pair of presutural dorsocentral bristles, if a second pair is indicated such bristles are scarcely longer than one-third the length of the stronger pair 3
Mesonotum with two pairs of presutural dorsocentral bristles, the shorter being more than half the length of the longer pair 7
3. Frontal vitta at a level with the anterior ocellus as wide or wider than its length from anterior ocellus to anterior margin, mid tibia with an anteroventral bristle . . . *Schoenomyza* Haliday
Frontal vitta longer than wide, or if as wide as long mid tibia without an anteroventral bristle 4
4. Hind femur with a preapical bristle on posterior plane or surface, fig. 19 . *Neodexiopsis* Malloch
Hind femur without a preapical posterior bristle (fig. 20) 5
5. Hind tibia with two adjacent bristles at middle, situated respectively on anterior and anterodorsal surfaces, middle sector of anteroventral surface without a bristle, fore tibia with a strong apical mid ventral bristle . . *Coenosia* Meigen
Hind tibia without a lengthy anterior bristle adjacent mid anterodorsal, usually with an anteroventral bristle . 6
6. Lower calyptral scale usually much larger than the upper and protruding around the margin of the upper scale (exception *L. maculiventris*) . . . . . *Limosia* Robineau-Desvoidy
Lower calyptral scale not much larger than the upper, at most not reaching beyond the tips of hairs on margin of upper scale . . . . . *Hoplogaster* Rondani
7. Fore femur with an extensive series of posteroventral bristles, mesonotum with one or two pairs of presutural dorsocentral bristles as long as the posterior notopleural, eyes hemispherical in outline, narrower ventrad than at middle, costal cell normal, subcosta uniting with costa proximad of a point on costa opposite *r-m* cross-vein 8
Fore femur with only one or two distal postroventral bristles, mesonotum with weak presutural dorsocentral bristles, shorter than the posterior notopleural bristle, eyes oblong in outline, the width well maintained ventrad, costal cell enlarged, humeral cross-vein longer than *r-m* cross-vein and subcosta uniting with costa at a point opposite *r-m* cross-vein . . . . *Atherigona* Rondani
8. Arista thickened throughout the proximal third, dorsum of second antennal segment markedly depressed or flattened proximad . . . . . *Tetramerinx* Berg
Aristal swelling confined to base, second antennal segment not depressed on dorsum, normal 9
9. Frons with 2 pairs of recurrent paraorbital bristles, the anterior pair set about half way between the verticals and the anterior parafrontal bristles, with usually 2 pairs of incurving parafrontals (fig. 3.) . . . . . *Lispocephala* Robineau-Desvoidy
Frons with or without recurrent paraorbital bristles, when present the anterior or only pair present set near a level with the anterior ocellus or much nearer to the verticals than to the anterior pair of parafrontals, with 3 or 4 pairs of incurving parafrontal bristles (fig. 6.) 10
10. Hind tibia with usually one anteroventral bristle, seldom none, and with one anterodorsal . . . . *Macrorchis* Rondani
Hind tibia with usually 2 or more anteroventral and/or 2 or more anterodorsal bristles 11
11. Frontal vitta at a level with anterior ocellus as wide in both sexes as the distance between the first pair of dorsocentral bristles, frontal triangle densely silvery in the male and witish pruinescent in the female, extending cephalad to the base of antennae . . . . . *Limnospila* Schnabl*
Frontal vitta so, narrower in both sexes than the distance between the first pair of dorsocentral bristles, frontal triangle not silvery nor whitish pruinescent and does not extend to the base of antennae . . . . *Pseudocoenosia* Stein

Genus Schoenomyza Haliday

Schoenomyza Haliday, 1833, Entomol. Mag., 1:166.
Type-species: *Sciomyza fasciata* Meigen, by subsequent designation of Westwood 1840 (= *Ochtiphila litorella* Fallén 1823)

The genus *Schoenomyza* includes a few diminutive dark gray or brown species of acalyptrate semblance. The flies occur chiefly on grasses

and herbage common to swamps, around ponds and lakes, and along the seashore. The frons of the adult is usually as broad as long, wider in *dorsalis* and *litorella*, with 1 or 2 pairs of parafrontal bristles in addition to the paraorbital pair, antennae porrect, mid tibia with an anteroventral bristle, hind metatarsus with a weak basal bristle on the ventral surface.

KEY TO MALES OF SCHOENOMYZA IN CALIFORNIA

1. Palpi dull yellow, frons brown . . . . *aurifrons* Malloch*
   Palpi fuscous or blackish 2
2. Parafrontals with a pair of bristles opposite base of antennae, as in female; frons without whitish pruinescence . 3
   Parafrontals without bristles opposite base of antennae, frons with whitish pruinescence 4
3. Frons, face and parafacials deep golden brown or ochreous, interfrontalia seen from above reddish on cephalic half . *lispina* (Thomson)
   Frons, face and parafacials deep seal or blackish brown, frons seen from above evenly blackish . . . . *nigriceps* Huckett
4. Antennae largely luteous and pruinescent, frontal wedge narrow, lanceolate, (fig. 1), face basically yellow to bronzy, entirely or mostly so . . *dorsalis* var. *sulfuriceps* Malloch
   Antennae mainly darkened (exclusive of pruinescence), face usually deeply tinged, golden yellow to orange . . . 5
5. Frontal wedge, seen from above, usually broad and well etched (fig. 2) . . . *dorsalis* Loew
   Frontal wedge, seen from above, short and restricted caudad, or largely obscured by whitish pruinescence . . . *litorella* (Fallén)

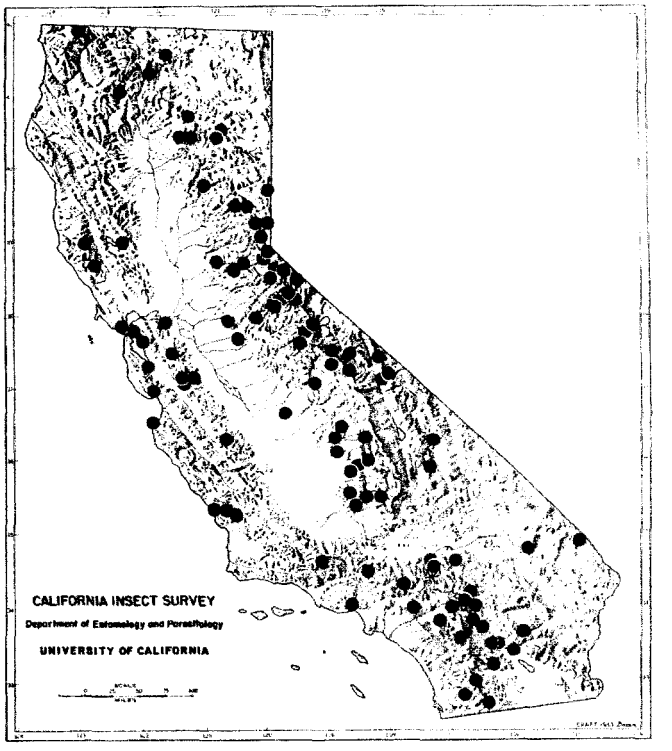
Schoenomyza dorsalis Loew

(Fig. 2; map 1)

Schoenomyza dorsalis Loew, 1872, Berl. Entomol. Z., 16: 95.

Type: ♂, District of Columbia.[1]

Geographic range.--Widely distributed in continental North America, reaching its northern range in central Alaska, the Yukon and Mackenzie River Basin, eastward across the provinces from British Columbia and Alberta to Quebec and southern Labrador, thence southward to include the states in the northeast, in the Great Lakes region and along the northern tier, southward along the Atlantic coast to Florida, in the southern states from Louisiana, and on the Pacific coast from Washington to California



Map 1. California distribution of *Schoenomyza dorsalis* Loew.

California records (map 1).--Throughout the mountainous parts of the state and along Transition Zone coastal areas. Absent in the more austral portions of the Central Valley and both high and low deserts.

Schoenomyza dorsalis is on the wing nearly throughout the year near the coast, with records for every month from one station or another in southern California. In central coastal counties and northward the activity season encompasses at least March to October, while in the Coast Ranges and Sierra Nevada the flight period is shorter, restricted to the summer months at high elevations. The species has wide ecological tolerance, ranging from the edge of the Colorado Desert and through much of the Mojave Desert to near 12,000 feet in the southern Sierra Nevada.

The male of *S. dorsalis* has the face deeply tinged, usually a golden yellow to orange as in the male of *S. litorella*, from which it usually may be distinguished by a broad dark V-shaped frontal wedge separating the whitish areas on the frons, (fig. 2).

1. Absence of institution citation in parentheses following citation of the type signifies that the location of the type specimen is unknown

The females of the two species are not readily distinguished from one another.

Schoenomyza dorsalis var. sulfuriceps Malloch
(Figs. 1, 37, 46, 52)

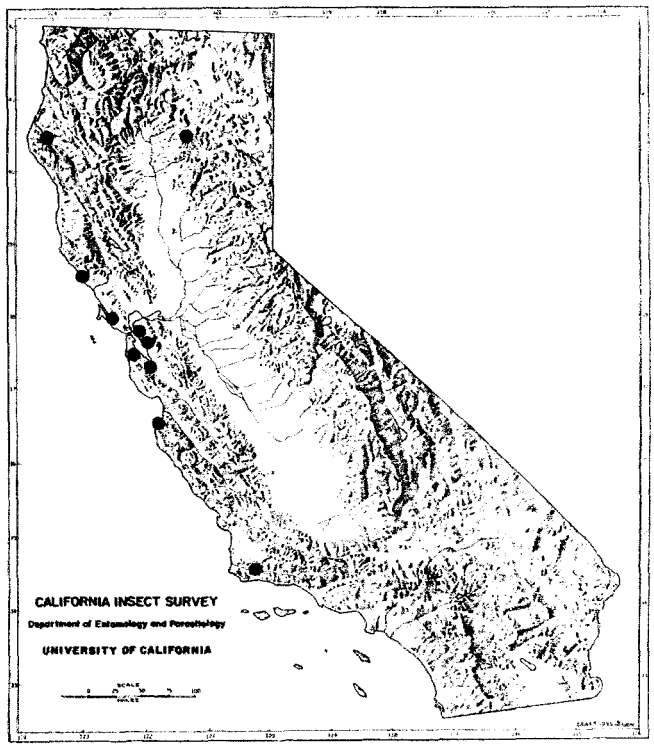
Schoenomyza dorsalis sulfuriceps Malloch, 1918, Trans. Am. Entomol. Soc., 44: 288.
Holotype: ♂, Berkeley Hills, California (ANSP).
Geographic range.--Alberta, British Columbia, California, Idaho, Montana, Nevada, Oregon, Washington, Wyoming.

The variety *sulfuriceps* of *S. dorsalis* is evidently the most widely distributed representative of the genus in California. Over one thousand specimens were assigned to the taxon of which 349 were males. Specimens were recorded from approximately 195 localities in 39 counties. The adult male may be distinguished from its relatives by the marrower median frontal wedge separating, or nearly so, the lateral whitish areas of frons (fig. 1), and by the largely luteous or reddish yellow silvery antennae. The females are with difficulty separable from those of *S. litorella* and *S. dorsalis*. In both sexes of *S. sulfuriceps* the face is typically paler than in the latter two forms.

Schoenomyza lispina (Thomson)

Ochtiphila lispina Thomson, 1869, *In* K. Svenska Vetenskaps-Akademien, Kongliga svenska fregatten Eugenies resa omkring jorden. Pt. 2. Zoologie. [Sec.] I: Insekter, p. 599.
Schoenomyza convexifrons Malloch, 1918, Trans. Am. Entomol. Soc. 44: 287.
Schoenomyza flaviceps Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 105.
Type: ♂, California (MNH Stockholm).
Geographic range.--S.E. Alaska, British Columbia, California, Oregon, Washington.
California records.--HUMBOLDT CO.: Eureka, 1 ♀, VII-15-35 (R. H. Beamer, UK). MARIN CO.: Bolinas, 1 ♀, V-6-51 (E. I. Schlinger, CIS). MONO CO.: Sardine Creek, 8,500 ft. 1 ♀, VI-28-51 (A. T. McClay, UCD). MONTEREY CO.: Pacific Grove, 1 ♀, X-7-06 (J. C. Bradley, CU). Point Pinos, Pacific Grove, V-24-52 (P. H. Arnaud, CAS). ORANGE CO.: Sunset Beach, 1 ♂, VI-12-48 (A. L. Melander, USNM). SAN MATEO CO.: Millbrae, 2 ♂, 1 ♀, III-20-08, type series of *convexifrons*, (ANSP; IllNHS). SANTA CLARA CO.: Leland Stanford University, 1 ♂, Lot 72 (USNM).

Males of *S. lispina* and *S. nigriceps* are without whitish pruinescence on the frons, and possess a pair of parafrontal bristles opposite the base of antennae, thus differing essentially from the males of *S. dorsalis* and *S. litorella*. In *S. lispina* the frons and face of the male are mainly ochreous to deep golden brown; in the female the interfrontalia has a blaze of whitish or pale olive gray.



Map 2. California distribution of *Schoenomyza litorella* (Fallén).

Schoenomyza nigriceps Huckett

Schoenomyza nigriceps Huckett, 1966, Proc. Calif. Acad. Sci., ser 4, 34: 278.
Holotype: ♂, Humboldt or Siskiyou County, California (CAS).
Geographical range and *California record.*
--Same locality as holotype, 2 ♂, May or June 1911, Oldenberg Collection (CAS).
The male of *S. nigriceps* differs from that of *S. lispina* in having the frons and face entirely blackish or deep seal brown. The above two specimens including the holotype are on the same mount.

Schoenomyza litorella (Fallén)
(Map 2)

Ochtiphila litorella Fallén, 1823, Monographia Muscidum Sveciae. Phytomyzides et Ochtidiae Sveciae p. 10.
Schoenomyza dorsalis partita Malloch, 1918, Trans. Am. Entomol. Soc., 44: 289.

Type: ♀, Southern Sweden.

Geographic range.--Holarctic; in The Nearctic: Alaska, Alberta, British Columbia, California, Colorado, Idaho, Manitoba, Montana, Northwest Territories, New York, Oregon, Quebec, Saskatchewan, Utah, Washington.

California records.--ALAMEDA CO.: Berkeley Hills, 1 ♂, IV-11-08, type of *dorsalis partita*, (ANSP). CONTRA COSTA CO.: Point Molate, Richmond, 3 ♀, II-11-64, 1 ♂, 2 ♀, II-27-64 (J. Powell, CIS). HUMBOLDT CO.: 3.5 mi. S. of Scotia, 1 ♂, 3 ♀, VI-10-65 (T. W. Fisher, UCR). MARIN CO.: Lagunitas Canyon, 1 ♂, 1 ♀, III=29-08, paratypes of *dorsalis partita* (IllNHS). MONTEREY CO.: Asilomar, 1 ♂, IX-1-45, 1 ♀, X-2-46, 1 ♂, 3 ♀, VIII-4-50 (A. L. Melander, USNM). SAN MATEO CO.: Millbrae, 1 ♀, III-20-08. SANTA BARBARA CO.: Santa Ynez River, 1 ♂, 1 ♀, VI-23-65 (M. E. Irwin, UCR). SANTA CLARA CO.: Palo Alto. 1 ♂, VIII-3-94 (R. W. Doane, CU). SHASTA CO.: 3 mi. SE. of Mt. Lassen, 2 ♂, VII-8-55 (J. W. MacSwain, CIS). SONOMA CO.: 4 mi. W. of Plantation, 1 ♂, V-8-58 (D. Burdick, CIS).

In the male of *S. litorella* the pruinescence on interfrontalia is undivided along the median plane, the short wedge if present being reduced to a small area not extending to the cephalic half of interfrontalia. The antennae are mainly darkened (exclusive of pruinescence) and the face is deeply tinged as in the male of *S. dorsalis*.

Genus Coenosia Meigen

Coenosia Meigen, 1826, Syst. Beschr., 5: 210.

Type-species: *Musca tigrina* Fabricius, by subsequent designation of Westwood, 1840.

The genus *Coenosia* may be distinguished from other genera belonging to the *Coenosiinae* by possession of the following combination of characters: One pair of presutural dorsocentral bristles, one pair of recurrent paraorbital bristles, mid tibia without an anteroventral bristle, lower stigmatal bristle curved downward (fig. 15), frontal vitta longer than wide. Within the genus are included the subgenera *Coenosia* Meigen *sens. str.*, *Limosia* Robineau-Desvoidy, *Hoplogaster* Rondani, *Neodexiopsis* Malloch.

The habits of these species are little known. Larvae are cited as being zoophagous or scavengers, and are recorded as living in damp locations rich in humus or organic matter (Malloch, 1917: 35). Adults of certain species, e. g. *Coenosia tigrina*, *C. humilis*, are known to be predaceous on smaller diptera (Evans, 1930; Hobby, 1931; 1934; Van Emden, 1940:94).

Subgenus Coenosia Meigen

Coenosia Meigen *sensu* Westwood, 1840, Introd. mod. Class. Ins., 2 Synopsis p. 143.

Caricea Robineau-Desvoidy, 1830, [Paris] Inst. de France, [Cl. des] Sci. Math. et Phys., Acad. Roy. des Sci., Mem. présentés par divers Savans [ser. 2], 2: 530.

Hind tibia with two adjacent bristles near middle, situated respectively on anterior and anterdorsal surfaces and without an anteroventral bristle exclusive of the apical, hind metatarsus with a weak bristle at the base of ventral surface, fore tibia with an apical mid ventral bristle, hind femur without a preapical posterior bristle.

KEY TO SPECIES OF COENOSIA (COENOSIA) IN CALIFORNIA

Mid and hind femora entirely blackish, scutellum without setulae on lateral declivities adjacent to basal pair of bristles, hind tibia with 1 strong bristle at apex of anteroventral surface . . . *humilis* Meigen

Mid and hind femora broadly yellowish on distal third, scutellum with setulae on lateral declivities adjacent the basal pair of bristles, hind tibia with 2 strong bristles at apex of anteroventral to ventral surface . . . . . *tigrina* (Fabricius)

Coenosia (Coenosia) humilis Meigen

(Map 3)

Coenosia humilis Meigen, 1826, Syst. Beschr., 5:220.

Anthomyza nana Zetterstedt, 1845, Diptera Scand., 4: 1716.

Type: ♂, Germany ? (MNH Paris).

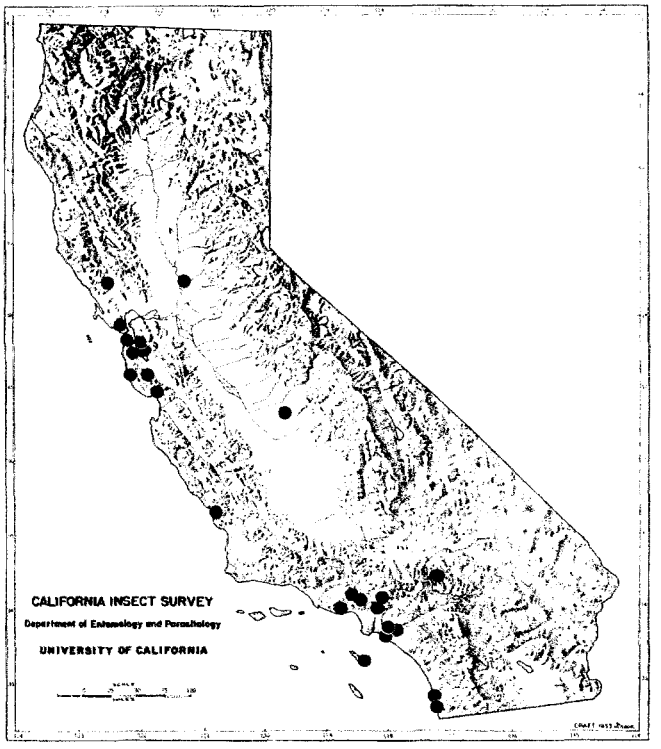
Geographic range.--Holarctic; in the Nearctic this species occurs in the north temperate region of North America, and to the east from the provinces of Ontario and Quebec southward to New England, New Jersey, and the states of the Great Lakes region; in the west from Idaho, Utah, and Colorado in the Rocky Mountains, and from Washington to California on the Pacific Coast.

California records (map 3).--Restricted to coastal areas and inland valleys at low elevations. Lack of records from the north coast counties probably is an artifact of collecting effort.

Adults of *Coenosia humilis* have been taken from February to November in coastal parts of both central and southern California and only during the summer months in the Central Valley.

Coenosia (Coenosia) tigrina (Fabricius)

Musca tigrina Fabricius, 1775, Syst. Entomol., p. 779.



Map 3. California distribution of *Coenosia humilis* Meigen.

Coenosia sexmaculata Walker, 1849, List Dipt.Br. Mus., 4: 970.

Type: Sex not indicated England (locality unknown).

Geographic range.--Holarctic; in the Nearctic: Alberta, British Columbia, California, Connecticut, Idaho, Massachusetts, Maine, Michigan, Montana, New York, Ontario, Quebec, Oregon, Washington.

California records.--This species was recorded from 109 localities in 39 counties, with a distribution broader but similar to that of *Coenosia aliena* (map 4). *C. tigrina* was represented in the collections by 93 male and 258 female specimens.

In southern California *Coenosia tigrina* has been rarely collected and apparently is restricted to the mountains. Northward it occurs along the coast, flying from February to September in the San Francisco Bay area, but has been taken only during the summer months along the north coast. In the Central Valley adults are active from late March through summer, while the activity season is shortened in the mountains, May till September in Siskiyou County, and June till August in higher parts of the Sierra Nevada. Curiously, the latest records, for October, are from inland arid stations with pronounced winter seasons, in Inyo and Modoc Counties.

Subgenus Limosia Robineau-Desvoidy

Limosia Robineau-Desvoidy, 1830, [Paris] Inst. de France, [Cl. des] Sci. Math. et Phys., Acad. Roy. des Sci. Mém. présentés par divers Savans [ser. 2], 2: 535.

Macrocoenosia Malloch, 1920, Trans. Am. Entomol. Soc., 46: 162.

Type-species: *Limosia campestris* Robineau-Desvoidy, by subsequent designation of Coquillett, 1901.

Having the characters possessed by the genus *Coenosia*, but lacking the posterior preapical bristle on hind femur, as is present in *Neodexiopsis*; without a strong mid-ventral apical bristle on fore tibia, as is present in *Coenosia sens. str.*; and having in most species a larger more conspicuously extended lower calyptral scale than in *Hoplogaster*.

KEYS TO SPECIES OF COENOSIA (LIMOSIA) IN CALIFORNIA

Males

1. All femora black, except possibly at apices and occasionally at base . . . 2
   Mid and hind femora entirely fulvous, or partly so on proximal half 6
2. Knobs of halteres black, calyptrae browned, frons and parafacials entirely brownish black . *effulgens* Huckett
   Knobs of halteres yellow, calyptrae not browned 3
3. Mid femur with a preapical anterior bristle, fore tibia with a preapical posterodorsal 4
   Mid femur without anterior preapical bristle, fore tibia with preapical posterodorsal weak or absent 5
4. Tibiae infuscated . . . . *fraterna* Malloch
   Tibiae yellow . . . . . *nigrescens* Stein
5. Mid and hind femora broadly yellowish on apical region, extending on mid femur to include the preapical posterior bristles, abdominal bristles weak . . . . . *aliena* Malloch
   Mid and hind femora narrowly yellowish at apex, not extending on mid femur to include the posterior preapical bristles, abdominal bristles strong . *alticola* Malloch
6. Hind tibia with a profuse series of fine longish bristles and setulae on anterior and dorsal surfaces, fore femur bristleless on posterodorsal and posteroventral surfaces, mid femur without preapical posterior bristles, hind femur without series of anterodorsal or anteroventral bristles . . . . . *tausa* Huckett
   Hind tibia not profusely bristled on anterior and dorsal surfaces, fore femur with posterodorsal and posteroventral bristles, mid femur with preapical posterior bristles, hind femur with a series of anterodorsal

and anteroventral bristles 7
7. Mid femur with a preapical anterior bristle 8
Mid femur without preapical anterior bristle 13
8. Hind tibia with a lengthy slender preapical posterodorsal bristle . . . . . *conforma occidentalis* Huckett
Hind tibia with preapical posterodorsal bristle weak or absent, not longer than apical diameter of tibia 9
9. Sternum 5 with lengthy slender bristles, third antennal segment about twice as long as wide, distance from apex to oral margin about equal to its width . 10
Sternum 5 weakly and sparsely setulose, without slender bristles, third antennal segment longer than twice its width, distance from apex to oral margin less than its width at middle of segment . . . . . *atrata* Walker
10. Processes of sternum 5 usually dull along inner (ventral) border, abdomen slender, hypopygium not protruded . . . . . *rubrina* Huckett
Processes shining along inner (ventral) border, abdomen not slender, hypopygium knobby 11
11. Processes with several long bristles from base to apex that are directed ventrad, third antennal segment mainly grayish black 12
Processes sparsely bristled, the longer restricted to apical region, third antennal segment usually mainly yellowish . . . . . *bonita* Huckett
12. Fore coxae and all femora fulvous . . . *rufibasis* Stein
Fore coxae grayish black, fore femora partly blackish, mid and hind femora infuscated on distal half . . . . . *rufibasis* var. *strigifemur* Stein
13. Fore and hind tibiae and usually mid tibiae without bristles near middle of tibia . . . . . *nudipes* Stein
Fore and/or mid and hind tibiae, each with 1 or more bristles near middle of tibia 14
14. Abdomen with basal segments yellowish or whitish testaceous 15
Abdomen with basal segments gray or blackish, concolorous with thorax . . 17
15. Hind tibia with preapical mid dorsal and anterodorsal bristles situated on about the same transverse plane . . *frisoni* Malloch
Hind tibia with preapical mid dorsal situated on a transverse plane distinctly basad of preapical anterodorsal bristle 16
16. Abdomen without dorsal marks, anterior pair of ocellar bristles usually robust . . . . . *albibasis* Stein
Abdomen with paired dorsal marks, anterior pair of ocellar bristles not robust . . . . . *perspicua* Huckett
17. Hind tibiae, at least, fuscous 18
Hind tibiae fulvous 19
18. Frons entirely silvery pruinescent, at middle wider than one third maximum diameter of head as seen from above . *argentata* Coquillett
Frons velvety black, at middle not wider than one third maximum diameter of head as seen from above . . . *anthracina* Malloch
19. Hind tibia with mid anterodorsal and preapical mid dorsal bristles each about as long as three-fourths length of hind tibia, mid anteroventral and preapical anterodorsal bristles each about as long as hind metatarsus, and with a series of fine shorter anterodorsal bristles, mid tibia with mid anterior bristle longer than mid metatarsus . . *pilosissima* Stein
Hind tibia with shorter anteroventral, anterodorsal, preapical mid dorsal and preapical anterodorsal bristles, and without a series of fine shorter anterodorsal bristles 20
20. Abdomen and thorax without marks . . . 21
Abdomen usually with paired marks, seldom entirely obscured 22
21 Basal scutellar bristles short, not as long as half length of apical bristles, third antennal segment entirely lemon yellow, anterior ocellar bristles each not longer than width of interfrontalia . . . . *fontana* Huckett
Basal scutellar bristles much longer than half length of apical bristles, third antennal segment partly grayish tinged, anterior ocellar bristles each longer than width of interfrontalia . *candida* Huckett
22. Palpi yellow, and third antennal segment basically so, occasionally tinged, setulae on anterior surface of humeral callosities stiffened, pronotal pair of dorsocentral setae spinulose (fig. 10) .23
Palpi fuscous, setulae on anterior surface of humeral callosities not stiffened, and pronotal pair of dorsocentral setae nonspinulose . . . *incisurata* van der Wulp
23. Hind tibia with mid anterodorsal and preapical mid dorsal bristles together as long as hind tibia, hind femur with the longer anteroventral, anterodorsal and posteroventral bristles as long as hind metatarsus . . . . . *argenticeps* Malloch
Hind tibia with mid anterodorsal and preapical mid dorsal bristles together shorter than hind tibia 24
24. Abdomen with a pair of lengthy rather elongated marks on terga 3 and 4, lower calyptral scale reduced in size . . . . . *maculiventris* Huckett

Abdomen with a pair of short compact marks on terga 3 and 4 (sometimes obscured), broadly separated across dorsum, membrane of lower calyptral scales well extended beyond margins of upper . . . . . *oregonensis* Malloch

Females

1. All femora black, except possibly at apices and occasionally at base . . . 2
   Mid and hind femora at least largely or partly yellowish on proximal half 7
2. Knobs of halteres blackish . . . . . *effulgens* Huckett
   Knobs of halteres yellow 3
3. Mid femur with a preapical bristle on anterior surface 4
   Mid femur without preapical bristle on anterior surface 5
4. Tibiae extensively infuscated, or fuscous . . . . . *fraterna* Malloch
   Tibiae yellow . . . . . *nigrescens* Stein
5. Frontal vitta seen from behind velvety black, parafrontals brown, fore and mid tibiae fuscous or blackish . . . . . *anthracina* Malloch
   Frontal vitta seen from behind not velvety black, parafrontals grayish, fore and mid tibiae yellowish . 6
6. Mid femur with yellowish apical region extending to include preapical posterior bristles . . . . . *aliena* Malloch
   Mid femur with yellowish apical region not extending to preapical posterior bristles . . . . . *alticola* Malloch
7. Hind tibia with 2 anteroventral and abnormally longer semierect setulae and short bristles on anterior and dorsal surfaces . . . . . *tausa* Huckett
   Hind tibia with 1 anteroventral and normally short appressed setulae on distal and proximal halves of anterior and dorsal surfaces of tibia . . . 8
8. Mid femur with a preapical bristle on anterior surface 9
   Mid femur without preapical bristle on anterior surface 14
9. Hind tibia usually with a slender preapical posterodorsal bristle, discal bristles on terga 4 and 5 weak . . . *conforma occidentalis* Huckett
   Hind tibia with preapical posterodorsal bristle absent or setulose, discal bristles on terga 4 and 5 robust 10
10. Third antennal segment entirely grayish black 11
    Third antennal segment yellowish at base 13
11. Third antennal segment longer than twice its width, distance from apex to oral margin less than its width at middle of segment . . . . . *atrata* Walker
    Third antennal segment about twice as long as mid width, distance from apex to oral margin about equal to its width 12
12. Fore coxae and mid and hind femora fulvous . . . . . *rufibasis* Stein
    Fore coxae grayish black, mid and hind femora infuscated on distal half . . *rufibasis* var. *strigifemur* Stein
13. Abdomen usually with small roundish spots . . . . . *rubrina* Huckett
    Abdomen usually with spots of uneven density . . . . . *bonita* Huckett
14. Hind tibia with preapical mid dorsal and preapical anterodorsal bristles on about the same transverse plane . . *frisoni* Malloch
    Hind tibia with preapical mid dorsal bristle set on transverse plane distinctly basad of preapical anterodorsal 15
15. Anterior surface of humeral callosities with stiffened setulae, pronotal pair of dorsocentral setae spinulose (fig. 10) 16
    Anterior surface of humeral callosities with setulae not stiffened, pronotal pair of dorsocentral setae nonspinulose (fig. 9) . . . . . *incisurata* van der Wulp
16. All tibiae yellowish brown, darker than yellowish parts of mid and hind femora . *argentata* Coquillett
    Tibiae yellow, not darker than yellowish parts of femora 17
17. Third antennal segment and palpi entirely yellow, basal pair of scutellar bristles about half as long as apical bristles, abdomen whitish gray, unmarked . . . . . *fontana* Huckett
    Third antennal segment and/or palpi partly or entirely blackish, basal pair of scutellar bristles longer than half length of apical bristles, abdomen usually with marks 18
18. Tergum 5 with paired marks weak, faded or absent 19
    Tergum 5 with well marked paired spots . 22
19. Fore femur mostly infuscated on dorsal and ventral halves . . . *pilosissima* Stein
    Fore femur usually mostly yellow, infuscation at most confined to dorsal half 20
20. Third antennal segment yellowish at basal region 21
    Third antennal segment blackish at basal region . . . . . *candida* Huckett
21. Mesonotum and scutellum browned on dorsum, abdomen with large patchlike marks on terga 3 and/or 4 . *nudipes* Stein
    Mesonotum and scutellum mostly grayish or lightly infuscated on dorsum, abdomen with or without restricted spotlike marks on terga 3 and/or 4 . . . . *albibasis* Stein
22. Lower calyptral scale large, broadly extended 23

Lower calyptral scale reduced or restricted, narrowly extended 24

23. Mid and hind femora infuscated on distal half . . . . . *oregonensis* Malloch
Mid and hind femora mostly fulvous on distal half, occasionally with a rufous scar or streak along dorsum . . . *argenticeps* Malloch

24. Anterior pair of ocellar bristles longer than caudal pair . . *maculiventris* Huckett
Anterior pair of ocellar bristles weak, not longer than caudal pair . . . . . *perspicua* Huckett

Coenosia (Limosia) albibasis Stein

(Figs. 10, 26)

Coenosia albibasis Stein. 1920. Arch. Naturgesch., (1918) Abt. A 84 (9): 95.

Syntypes: ♂♂, Roche Harbor, Anacortes, Mt. Constitution and Friday Harbor, Washington (USNM).

Geographic range.--British Columbia, California, Oregon, Washington.

California records.--FRESNO CO.: Huntington Lake, 6 ♀, VII-27-19 (E. P. Van Duzee, CAS). HUMBOLDT CO.: 1 ♂, IV-1911 (Nunenmacher, HCH). INYO CO.: Bishop, 1 ♂, VII-28-40 (L. J. Lipovsky, UK). Lone Pine, 1 ♀, VII-28-40 (L.J. Lipovsky, UK). MONO CO.: Mammoth Lakes, 1 ♂, 1 ♀, VII-29-40 (R. H. Beamer, UK). SAN FRANCISCO CO.: San Francisco, 1 ♀, V-13-15, 1 ♀, VIII-7-19 (E. P. Van Duzee, CAS). SAN MATEO CO.: San Gregorio, 1 ♀, VIII-22-53 (P. H. Arnaud, HCH). TUOLUMNE CO.: Dardanelles, 1 ♀, VII-13-51 (W. H. Lange, UCD).

Males of *C. albibasis* and *C. perspicua*, unlike the females, have the basal segments of the abdomen largely testaceous. The male of *C. albibasis* has no distinct abdominal marks, and in both sexes the anterior pair of ocellar bristles is usually lengthy, thus differing from *C. perspicua*.

Coenosia (Limosia) aliena Malloch

(Map 4)

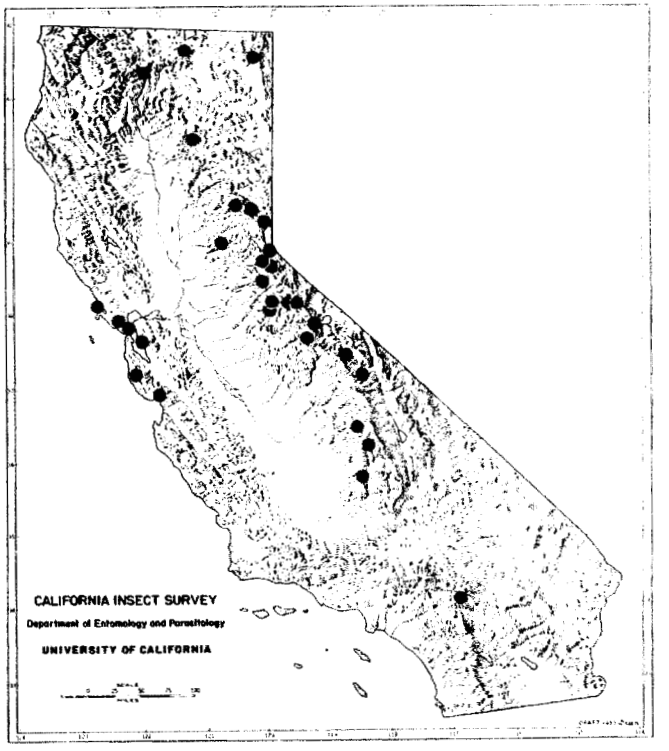
Coenosia aliena Malloch, 1921, Entomol. News, 32: 134.

Holotype: ♀, Gallatin County, Montana (IllNHS).

Geographic range.--Alaska, Alberta, British Columbia, California, Colorado, Idaho, Montana, Northwest Territories, Oregon, Utah, Washington, Wyoming, Yukon Territory.

California records (map 4).--Restricted to the Cascade, Sierra Nevada and San Bernadino Mountains and the coastal area around the San Francisco Bay according to available records, which represented about 50 localities in 19 counties.

Coenosia aliena has a rather short flight season, during the warmer months, from April to September near the coast and June to September in the Sierra Nevada. However, it has been taken only in October in Modoc County (two records) and in September in the San Bernardino Mountains (three records).



Map 4. California distribution of *Coenosia aliena* Malloch.

The species *C. aliena* and *C. alticola* have all femora largely black and tibiae fulvous, and in this respect differ from similar species by having no preapical bristle on anterior surface of mid femur. The species *C. aliena* differs from *C. alticola* in having a more extensive yellowish apical region on mid femur, so as to include the preapical pair of bristles.

Coenosia (Limosia) alticola Malloch

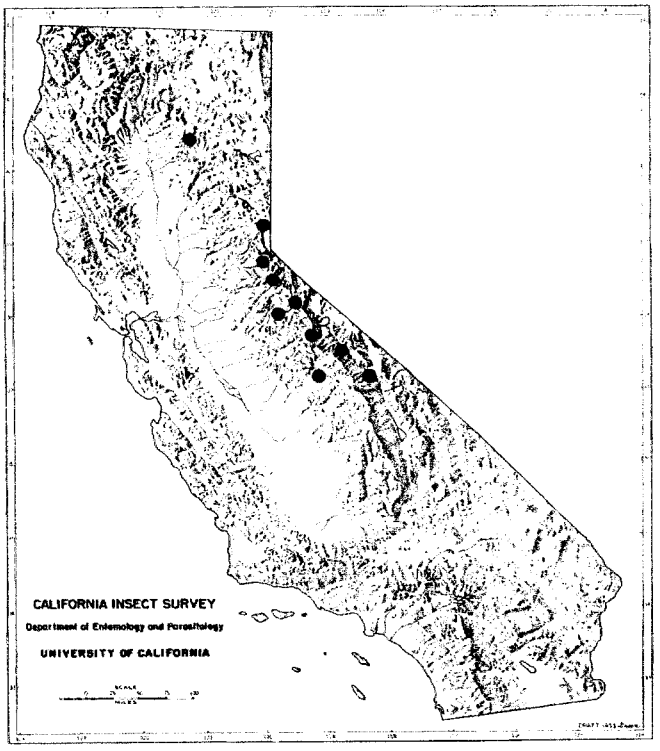
(Map 5)

Coenosia alticola Malloch, 1919, Proc. Calif. Acad. Sci., ser. 4 9: 303.

Holotype: ♂, Huntington Lake, California (CAS).

Geographic range.--California, Oregon, Utah.

California records.--ALPINE CO.: Hope Valley, 1 ♂, IX-11-38 (M. A. Casier, AMNH). EL DORADO CO.:



Map 5. California distribution of *Coenosia alticola* Malloch.

Fallen Leaf, 6,500 ft. 1 ♀, VII-13-61 (J. G. Chillcott, CNC). Grass Lake, Luther Pass, 3 ♂, VII-24-55 (E. I. Schlinger, UCD). FRESNO CO.: Huntington Lake, 7,000 ft. 1 ♂, VII-9-19, holotype, 1 ♀, VII-29-19 (E. P. Van Duzee, CAS). INYO CO.: Bishop, 1 ♂, 1 ♀, VII-28-40 (R. H. Beamer, UK). MONO CO.: Convict Creek, 1 ♀, VI-6-48 (W. W. Wirth, USNM). McKay Creek, Sonora Pass, 1 ♂, VIII-18-60 (C. A. Toschi, CIS). Sardine Creek, 8,500 ft. 1 ♂, VI-28-51, 2 ♂, 8 ♀, VII-3-18-51 (A. T. McClay, UCD). NEVADA CO.: Boca, 1 ♀, VI-23-61 (F. D. Parker, UCD). Sagehen Creek, near Hobart Mills, 2 ♀, VII-15-64, in malaise trap, 1 ♀, same date, by sweeping (M. E. Irwin, UCR). Sagehen, near Hobart Mills, 1 ♀, VII-16-54 (G. A. Schaefers, CIS). SHASTA CO.: Echo Lake, Shasta Range, 1 ♂, 1 ♀,VIII-29-11 (A. Kusche, HCH). Summit Lake, Lassen National Park,1 ♀, VII-23-50 (L. W. Quate, CDA). TUOLUMNE CO.: Leland Meadow, 2 ♂, 1 ♀, VIII-5-60 (A. S. Menke, UCD; E. Jessen, CIS); 1 ♀, VIII-21-60 (C. A. Toschi, CIS). Pinecrest, 1 ♀, VIII-3-48 (P. H. Arnaud, CAS). Sonora Pass, 9,624 ft. 1 ♀, VIII-20-60 (A. S. Menke, UCD). Strawberry 1 ♀, VII-4-51, 1 ♂, 1 ♀, VII-15-51 (A. T. McClay, UCD), 1 ♀, VII-8-57 (W. T. Crites, UCD). Yosemite 3,880-4,000 ft. 2 ♀, VI-17-31 (CIS).

The species *C. alticola* differs from *C. aliena*, with which it has been compared, in possessing a more robust habitus. The male has stronger bristling, more conspicuous, bulging hypopygium and stronger lengthy processes.

Coenosia (Limosia) anthracina Malloch

Coenosia anthracina Malloch, 1921, Entomol. News, 32: 134.

Holotype: ♀, Gallatin County, Montana (IllNHS).

Geographic range.--Alaska, Alberta, Arizona, British Columbia, California, Colorado, Idaho, Labrador, Montana, Nevada, Northwest Territories, Quebec, Utah, Washington, Wyoming, Yukon Territories.

California records.--NEVADA CO.: Sagehen Creek near Hobart Mills, 1 ♀, VII-7-64, 1 ♂, 1 ♀, VII-9-64, 5 ♀, VII-15-64, 1 ♂, 1 ♀, VII-16-64, in malaise trap (M. E. Irwin, UCR). TUOLUMNE CO.: Sonora Pass, 4 ♀, VIII-21-59 (D. D. Linsdale, J. Powell, CIS), 2 ♀, VIII-13-60 (W. A. Steffan, CIS).

The species *C. anthracina* resembles *Hoplogaster flavibasis* Huckett* in the coloration of the legs, but differs from the latter in having a larger lower calyptral scale, and in its darker shiny appearance. In the male of *C. anthracina* the marks on the abdomen are lacking or obscured. In both sexes the frontal vitta is deep velvety black, the tibiae largely infuscated. All femora are entirely blackish in the female, but yellow on the proximal region of mid and hind pairs in the male.

Coenosia (Limosia) argentata Coquillett

Coenosia argentata Coquillett, 1904, Invert. Pacifica, 1:33.

Coenosia argenticolor Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84: 96.

Holotype: ♂, Stanford University, California (USNM).

Geographic range.--California, Oregon, Washington.

California records.--ALAMEDA CO.: Berkeley, 1 ♀, X-25-17 (J. C. Bradley, CAS); 1 ♀, IX-19-36 (C. A. Hamsher, UCD). CONTRA COSTA CO.: Moraga Valley, 2 ♀, IV-4-20 (E. P. Van Duzee, CAS). 2 mi. W. of Pittsburg, 1 ♀, IX-19-57 (J. A. Powell, CIS). HUMBOLDT CO.: Trinidad, 1 ♂, IX-18-34 (A. L. Melander, USNM). INYO CO.: Bishop, 1 ♂, 1 ♀, V-20-51 (E. I. Schlinger, UCD). MONTEREY CO.: Monterey, 2 ♂, VII-31-96, type of *argenticolor*, (ZMUB). SACRAMENTO CO.: Sacramento, 1 ♂, IV-16-56 (S. M. Fidel, UCD). SAN FRANCISCO CO.: San Francisco, 1 ♀, IV-11-14, 3 ♂, V-12-15, 2 ♂, VIII-1-15, 1 ♂, IV-11-19, 1 ♀, X-20-19 (E. P. Van Duzee, CAS). SAN MATEO CO.: Halfmoon Bay, 8 ♀, IV-12-20 (E. P. Van Duzee, CAS). Junipero Serra Park, 1 ♂, IV-4-64 (P. H. Arnaud, CAS). SANTA CLARA CO.: Palo Alto, 1 ♀, IX-22-94, 1 ♂, X-26-94 (R. W. Doane, CU), 2 ♀, III-28-95, 2 ♀, VII-22-95 (CU). Stanford University, 1 ♂, type of *C. argentata*,

(USNM). SANTA CRUZ CO.: Santa Cruz, 1 ♂, VI-3-19 (E. P. Van Duzee, CAS), 1 ♀, VII-17-40 (B. Brookman, CAS). COUNTY UNKNOWN: ?Scotland, 2 ♂, IX-19-43 (A. L. Melander, USNM).

The male of *C. argentata* may be distinguished from those of allied species by the dense silvery broad frons. The female, as in the male, has tibiae brownish tinged, being darker than the yellow part of femora, and the broad frons usually has a whitish sheen.

Coenosia (Limosia) argenticeps Malloch

(Map 6)

Coenosia argenticeps Malloch, 1920, Trans Am. Entomol. Soc., 46: 166.

Holotype: ♂, Gallatin County, Montana (USNM).

Geographic range.--Alberta, California, Colorado, Oregon, Utah, Washington, Wyoming.

California records.--ALPINE CO.: Hope Valley, 1 ♀, VII-9-48 (K. W. Tucker, CIS). INYO CO.: Big Pine, 1 ♀, VI-17-29 (E. P. Van Duzee, CAS). MONO CO.: Leavitt Meadow, 7,200 ft. 1 ♀, VIII-14-63, flight trap (H. B. Leech, CAS). NEVADA CO.: Donner Pass, 1 ♀, VIII-3-62 (A. G. Raske, CIS). Sagehen Creek, near Hobart Mills, 1 ♀, VII-15-64, in malaise trap (M. E. Irwin, UCR). SIERRA CO.: Webber Lake, 1 ♀, VII-3-64 (C. N. Slobodchikoff, CAS). TULARE CO.: Alta Meadow, Sequoia National Park, 9,000 ft. 1 ♂, VII-19-07 (J. C. Bradley, CU). Sequoia National Park, 1 ♀, VIII-6-40 (D. E. Hardy, UK). Three-Rivers, Giant Forest, 800-6,500 ft. 1 ♂, VII-16-07 (J. C. Bradley, CU). TUOLUMNE CO.: Kennedy Meadow, 1 ♀, VII-9-51 (A. T. McClay, UCD). TUOLUMNE-MARIPOSA CO.: Yosemite National Park, 1 ♀, VIII-1-40 (R. H. Beamer, UK).

The species *C. argenticeps* and *C. oregonensis* closely resemble one another, but the males of *C. argenticeps* have longer bristles on the hind legs, as indicated in the keys. The females have the distal halves of mid and hind femora more extensively fulvous.

Coenosia (Limosia) atrata Walker

Coenosia atrata Walker, 1852, Insect. Saundersiana, p. 369.

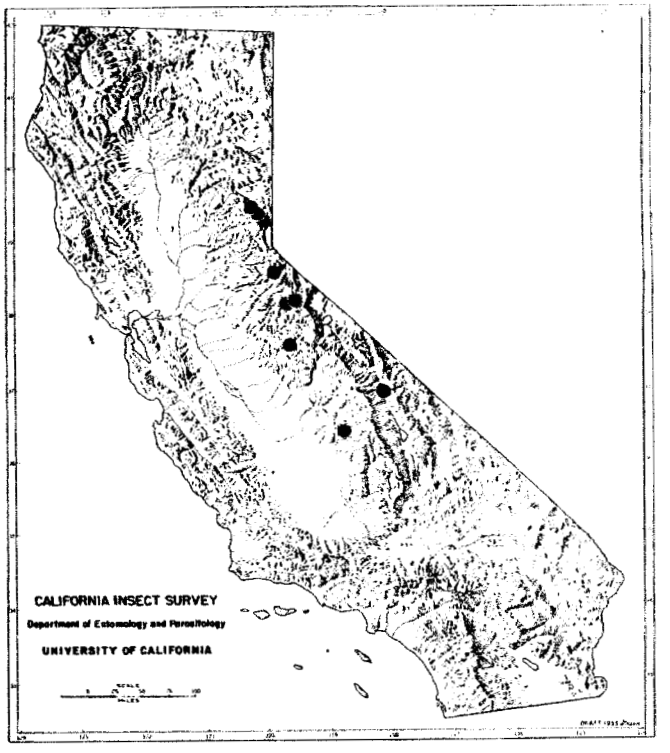
Coenosia canescens Stein, 1898, Berl. Entomol. Z., (1897) 42: 265.

Type: ♀, U. S. (BMNH).

Geographic range.--Widely distributed in temperate regions of North America.

California record.--RIVERSIDE CO.: Riverside, 1 ♂, II-24-35 (A. L. Melander, USNM).

The Riverside specimen has hind tibiae slightly tinged, otherwise agreeing with typical specimens of the common Nearctic species *C. atrata* Walker. The absence of additional records in the collection is notable.



Map 6. California distribution of *Coenosia argenticeps* Malloch.

Coenosia (Limosia) bonita Huckett

(Fig. 36; map 7)

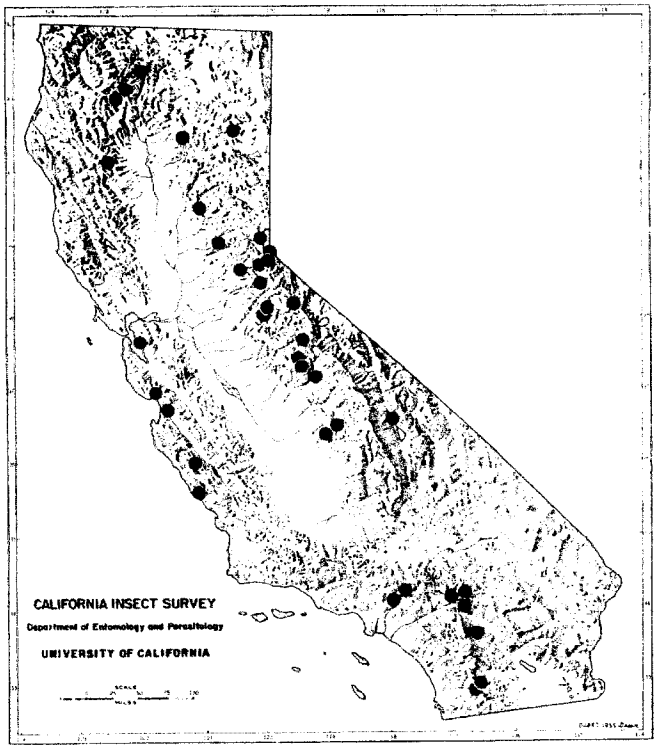
Coenosia (Limosia) bonita Huckett, 1934, Trans. Am. Entomol. Soc., 60: 179.

Holotype: ♂, Cuyamaca Mountains, California (CU).

Geographic range.--California, Idaho, Nevada, Oregon, Utah, Washington.

California records (map 7).--This species shows a circum-valley and Peninsular Range distribution that is characteristic of many native insects that live in Transition and boreal zones. The flies have been collected almost exclusively during July and August, and into September in the San Bernardino Mountains. There is one record for early June in Yosemite and one for November from Trinity County (Rush Creek Campground).

The species *C. bonita* is allied to *C. rubrina* and *C. rufibasis*, all having a preapical bristle on anterior surface of mid femur and a strong apical posteroventral on mid tibia (fig. 25). In *C.*



Map 7. California distribution of *Coenosia bonita* Huckett.

bonita and *C. rubrina* the third antennal segment is mainly yellowish in the male and yellowish at base in the female, in *C. rufibasis* entirely grayish black. The male of *C. bonita* may be distinguished from that of *C. rubrina* by the stouter, knobby hypopygium (fig. 36), and the shiny inner (ventral) border of processes. The females of the two species are scarcely distinguishable from one another, but usually spots on the abdomen of *C. bonita* are of uneven density and stronger than in *C. rubrina*.

Coenosia (Limosia) candida Huckett

Coenosia (Limosia) candida Huckett, 1934, Trans. Am. Entomol. Soc., 60: 185.

Holotype: ♂, Ilwaco, Washington (USNM).

Geographic range.--California, Oregon, Washington.

California record.--HUMBOLDT CO.: Samoa Beach and dunes, 1 ♂, VI-28-07 (J. C. Bradley, CU).

The males of *C. candida* and *C. fontana* have thorax and abdomen mainly whitish or pale gray and without any marking, all coxae and femora entirely yellow, thus differing from males of related species. *C. candida* may be distinguished from *C. fontana*, in both sexes, by the longer pair of bristles at base of scutellum and the longer pair of anterior ocellar bristles.

Coenosia (Limosia) conforma occidentalis Huckett

Coenosia (Limosia) conforma occidentalis Huckett, 1966, Pan-Pac. Entomol., 42: 35.

Holotype: ♂, Dollar Lake Trail, San Bernardino Mountains, California (CAS).

Geographic range.--SE. Alaska, California, Washington.

California records.--MADERA CO.: Biledo Meadow, 1 ♀, VII-27-46 (H. Chandler, CIS). NEVADA CO.: Sagehen, near Hobart Mills, 1 ♂, VII-2-54 (J. C. Downey, UCD). Sagehen Creek near Hobart Mills, 1 ♀, VII-6-64, 1 ♂, 2 ♀, VII-7-64, 1 ♂, 1 ♀, VII-9-64, 1 ♀, VII-10-64, 2 ♂, 4 ♀, VII-15-64, 1 ♀, VII-16-64, in malaise trap (M. E. Irwin, UCR). PLACER CO.: Carnelian Bay, Lake Tahoe, 1 ♀, VI-17-58 (R. M. Bohart, UCD). RIVERSIDE CO.: Deep Canyon, 1 ♀, IX-2-64 (P. A. Rauch, UCR). SAN BERNARDINO CO.: Dollar Lake Trail, San Bernardino Mountains, 1 ♂, VII-10-56, type (G. I. Stage, CIS). Santa Ana River, South Forks Meadow, 1 ♀, VI-25-48 (A. L. Melander, USNM). SIERRA CO.: 5 mi. E. of Webber Lake, 1 ♂, VII-30-55 (E. A. Kurtz, UCD). SISKIYOU CO.: Summit Lake, Marble Mountains, 1 ♀, VIII-23-62 (E. Mezger, UCD).

The females of the subspecies *C. occidentalis* differ from *C. conforma** in having a black patch along dorsum of fore femora, or as in the male holotype the fore femora may be extensively black in this sex. In the closely allied taxa *C. conforma* and *C. compressa** the fore femora are yellow.

Coenosia (Limosia) effulgens Huckett

(Map 8)

Coenosia (Limosia) effulgens Huckett, 1934, Trans. Am. Entomol. Soc., 60: 151.

Holotype: ♂, Alta Meadow, Sequoia National Park, California (USNM).

Geographic range.--California, Oregon, Washington.

California records.--ALPINE CO.: 2 mi. N. of Blue Lakes, 9,000 ft. 2 ♀, VII-17-60 (A. S. Menke, UCD). Carson Pass, 1 ♀,, VI-29-57 (J. Powell, CIS). Ebbetts Pass, 1 ♀, VII-22-57 (E. Mezger, UCD). Forestdale Meadow, 2 ♀, VII-17-60 (C. G. Moore, R. E. Rice, UCD). AMADOR CO.: 4 mi. N. of Silver Lake, 7 ♀, VII-25-55 (J. C. Downey, E. I. Schlinger, UCD). EL DORADO CO.: Echo Lake, 7,500 ft. 4 ♀, VII-23-55 (J. C. Downey, UCD), 1 ♀, VII-13-61 (J. G. Chillcott, CNC). Pacific, 1 ♀, VIII-9-40 (R. H. Beamer, UK). FRESNO CO.: Marie Lake, 10,500 ft. 1 ♀, VIII-30-52 (E. I. Schlinger, UCD). INYO CO.: Bishop, 1 ♀, VII-28-40 (R. H. Beamer, UK). Ruby Lake, 11, 250 ft. 1 ♂, 2 ♀, VIII-13-57

Coenosia (Limosia) fontana Huckett

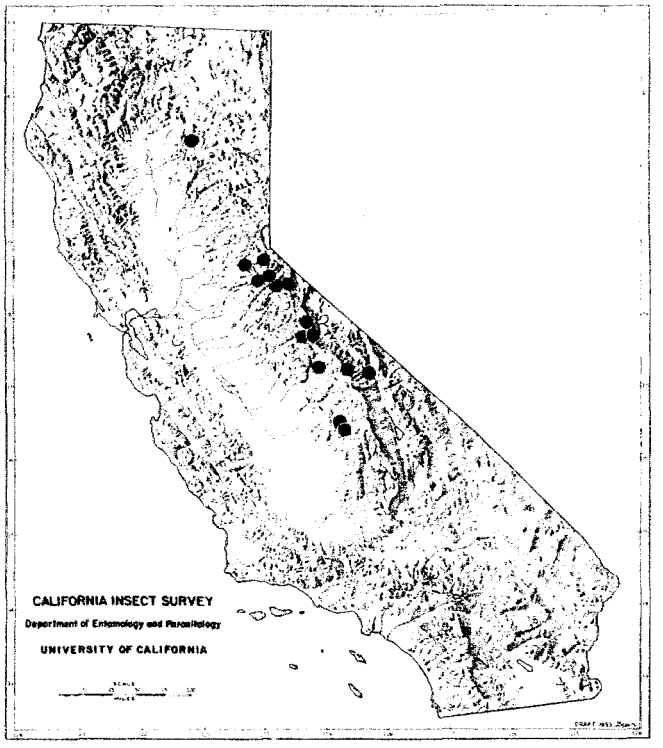
Coenosia [Limosia] fontana Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 278.

Holotype: ♂, Victorville, San Bernardino County, California (CNC).

Geographic range.--California, Utah.

California records.--INYO CO.: Deep Springs, 1♀, X-13-51, allotype (E. L. Kessel, CAS). Saratoga Springs, Death Valley, 1♀, V-30-53 (USNM). SAN BERNARDINO CO.: Victorville, 1♂, V-20-55, type (W.R. Richards, CNC).

The species C. *fontana* may be distinguished from similar forms by the weak basal scutellar and anterior pair of ocellar bristles. In the holotype the head capsule, except for the occiput, is notably dull golden yellow, and in both sexes the entire third antennal segment and palpi are yellow.



Map 8. California distribution of *Coenosia effulgens* Huckett.

(D. D. Linsdale, J. Powell, CIS). MARIPOSA CO.: Yosemite National Park, Glacier Point Road, 1 ♂, 1 ♀, VII-1-47, 1 ♀, VII-6-47 (A. L. Melander, USNM); Porcupine Flat, 5 ♀, VIII-2-62 (R. and K. Dreisbach, CU). MONO CO.: 1 mi. S. of Saddleback Lake, 9 ♀, VII-15-61 (G. I. Stage, CIS). SHASTA CO.: 3 mi. SE. of Mt. Lassen, 1 ♀, VII-8-55 (J. W. Mac Swain, CIS). TULARE CO.: Alta Meadow, Sequoia National Park, 9,000 ft. 1 ♂, 1 ♀, VII-19-07, type series (J. C. Bradley, USNM); 1 ♀, same date, (J. C. Bradley, CAS). Giant Forest, Sequoia National Park, 1 ♀, VII-28-29 (R. H. Beamer, UK). Siberian Outpost, 9,500-10,550 ft. 3 ♀, VII-31-15 (USNM). TUOLUMNE CO.: Ellery Lake, Tioga Pass, 8,400 ft. 1 ♂, 4 ♀, VII-3-27 (J. M. Aldrich, USNM). Tioga Pass, 2 ♂, VII-31-40 (R. H. Beamer, UK). Tuolumne Meadows, Yosemite National Park, 1 ♀, VII-5-27 (J. M. Aldrich, USNM); 2 ♀, VIII-1-40 (R. H. Beamer, UK). TUOLUMNE-MARIPOSA CO.: Yosemite National Park, 2 ♂, 2 ♀, VIII-1-40 (D. E. Hardy, UK).

The species *C. effulgens* has knobs of halteres black, margins of calyptrae browned, and interfrontalia a sooty black.

Coenosia (Limosia) fraterna Malloch

Coenosia fraterna Malloch, 1918, Trans. Am. Entomol. Soc., 44: 282.

Holotype: ♂, Millbrae, San Mateo County, California (ANSP).

Geographic range.--Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Saskatchewan, Texas, Utah, Wyoming.

California records.--This species has a distribution similar to that of *C. bonita* (map 7), but has been less well collected, having been represented in the material examined by about 40 localities in 21 counties. It has been taken up to 9,000 feet in the southern Sierra Nevada.

The flight period of *C. fraterna* is restricted to the warmer months but appears to extend somewhat longer than in related species, with records from March to September in the San Francisco Bay area and at scattered stations inland, from March (Oroville) to October (Milton, Calveras County, and Palmdale).

The species *C. fraterna* and *C. nigrescens* are closely related. In *C. fraterna* the tibiae are infuscated, in *C. nigrescens* yellow. Both have all femora black and thereby differ from the allied species *C. atrata* that has mid and hind femora at least partly yellow.

Coenosia (Limosia) frisoni Malloch

Coenosia frisoni Malloch, 1920, Trans. Am. Entomol. Soc., 46: 165.

Holotype: ♂, Cottonwood Grove, Urbana Illinois (IllNHS).

Geographic range.--Alberta, British Columbia, California, Illinois, Manitoba, Northwest Territories, Oregon, Quebec, Utah, Wyoming

California records.--NEVADA CO.: Sagehen Creek, near Hobart Mills, 1 ♂, VII-6-64, 3 ♂, 1 ♀, VII-7-64, 1 ♀, VII-9-64, 4 ♂, 9 ♀, VII-15-64, 2 ♂, VII-16-64, all in malaise trap, 1 ♂, VII-15-64 (M. E. Irwin, UCR).

The male of *C. frisoni* has basal region of abdomen yellowish testaceous, and in both sexes the preapical anterodorsal and mid dorsal bristles of hind tibia are situated on about the same transverse plane.

Coenosia (Limosia) incisurata van der Wulp

Coenosia incisurata van der Wulp, 1869, Tijdschr. Entomol., 12:86.

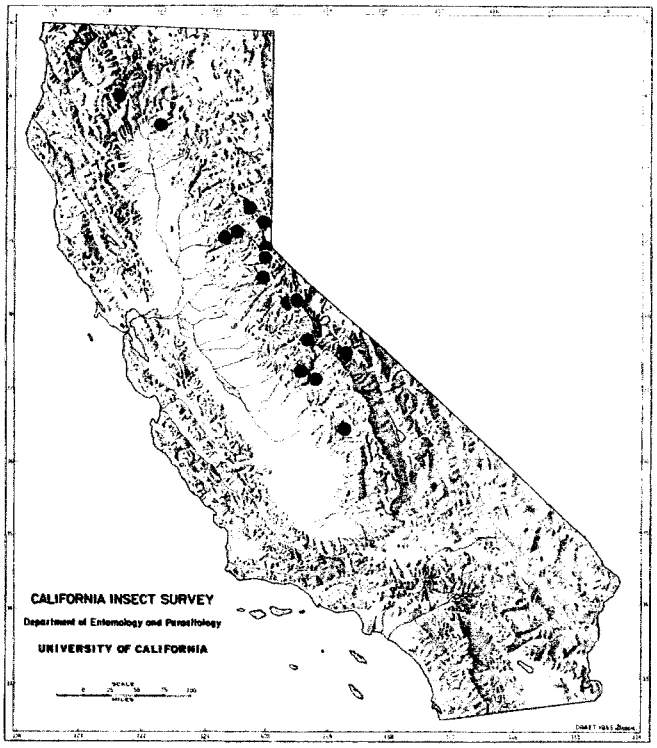
Coenosia flavicoxa Stein, 1898, Berl. Entomol. Z., (1897) 42: 271.

Type: ♀, Wisconsin (MNH Leiden).

Geographic range.--In most of the provinces and states of North America exclusive of the southern tiers, from which as yet no records are available (also in Manchuria).

California record.--HUMBOLDT CO.: Samoa Beach and dunes, 1 ♂, VI-28-07 (J. C. Bradley).

C. incisurata differs from allied taxa in having



Map 9. California distribution of *Coenosia maculiventris* Huckett.

the anterior setulae on humeral callosities and the pronotal pair of dorsocentral setulae on mesonotum normal, not stiffened or stumpy as in *oregonensis*, *argenticeps* and related species. Abdominal spots in *C. incisurata* are yellowish brown, not blackish.

Coenosia (Limosia) maculiventris Huckett

Coenosia (Limosia) maculiventris Huckett, 1934, Trans. Am. Entomol. Soc., 60:187.

Holotype: ♂, Ilwaco, Washington (USNM).

Geographic range.--California, Washington.

California records.--AMADOR CO.: 4 mi. N. of Silver Lake, 1 ♂, 1 ♀, VII-25-55 (E. I. Schlinger, UCD). EL DORADO CO.: Echo Lake, 1 ♂, VII-23-55 (E. I. Schlinger, UCD). Fallen Leaf, 6,500 ft. 1 ♂, VII-16-17 (USNM). FRESNO CO.: Dinkey Creek, 1 ♀, VIII-8-56 (R. O. Schuster, CIS). MADERA CO.: San Joaquin Experiment Station, 1 ♂, II-22-53 (P. D. Hurd, CIS). Madera County, 1 ♂, 1 ♀, VII-27-46, on *Ceanothus* (T. O. Thatcher, CIS). MONO CO.: Leavitt Meadow, 7,200 ft. 1 ♂, 1 ♀, VII-6-51 (A. T. McClay, UCD); 4 ♀, VIII-13-63, 2 ♀, VIII-14-63, flight trap (H. B. Leech, CAS). 1 mi. W. of Tom's Place, 1 ♂, VIII-13-57 (D. D. Linsdale, CIS). NEVADA CO.: near Hobart Mills, 1 ♂, X-11-52 (J. C. Hall, UCD). Sagehen Creek, near Hobart Mills, 1 ♂, VII-15-64, in malaise trap (M. E. Irwin, UCR). PLACER CO.: Cisco, 1 ♀, VII-28-54 (J. C. Downey, UCD). Dutch Flat, 1 ♂, V-20-52 (A. T. McClay, UCD). SHASTA CO.: Moose Camp, 1 ♂, VI-19-54 (E. I. Schlinger, UCD). SIERRA CO.: Yuba Pass, 1 ♀, IX-3-56 (E. Mezger). TRINITY CO.: Trinity River Camp, 1 ♂, VII-18-53 (A. T. McClay, UCD). TULARE CO.: Alta Meadow, 9,000 ft. Sequoia National Park, 1 ♂, VII-19-07 (J. C. Bradley, CU). Sequoia National Park, 6,200 ft. 1 ♂, VI-6-35 (A. L. Melander, USNM). Three-Rivers, Giant Forest, 800-6,500 ft. 1 ♂, VII-16-07 (J. C. Bradley, CU). TUOLUMNE CO.: Sonora Pass, 8,000 ft. 1 ♂, VII-21-51 (W. C. Bentinck, CIS). TUOLUMNE-MARIPOSA CO.: Yosemite National Park, 1 ♂, VIII-1-40 (R. H. Beamer, UK).

The species *C. maculiventris* differs from its closest relatives in having the lower calyptral scale reduced in size, slightly tapering and protruding beyond margin of the upper. The female in these respects accords with that of *C perspicua*, from which it differs in the longer, stronger pair of anterior ocellar bristles

Coenosia (Limosia) nigrescens Stein

Coenosia nigrescens Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 98.

Syntypes: ♂♂ ♀♀, Montreal, Province of Quebec; Colorado.

Geographic range.--Occurs in nearly all provinces and states of North America, exclusive of the southern tiers, from which as yet no records are available. Also present in southern Yukon Territory and the Mackenzie River Basin, Northwest Territories.

California records.--CALAVERAS CO.: Milton, 1 ♀, X-21-17 (J. C. Bradley, CU). FRESNO CO.: Academy, 1 ♂, 3 ♀, VI-21-56 (R. O. Schuster, CIS). Bluffs, Fresno, 1 ♂, V-13-23 (M. E. Phillips, HCH). Lost Lake, 1 mi. W. of Friant, 3 ♂, 7 ♀, VII-1-56 (R. O. Schuster, CIS). INYO CO.: Bishop, 1 ♀, VII-28-40 (D. E. Hardy, UK). KERN CO.: Onyx, 4 ♀, VII-23-40 (R. H. Beamer, UK). RIVERSIDE CO.: Riverside, 1 ♂, II-20-59, ex sod, emerged III-10-59 (L. D. Anderson, UCR). SACRAMENTO CO.: Sacramento, 1 ♀, III-25-31 (H. H. Keifer, CDA), 1 ♀, VI-17-35 (Wilson, CDA). TULARE CO.: Lemoncove, 1 ♂, 1 ♀, VII-26-29 (R. H. Beamer, UK).

The species *C. nigrescens* is akin to *C. fraterna*, differing mainly in the yellowish color of the tibiae.

Coenosia (Limosia) nudipes Stein

Coenosia nudipes Stein, 1920, Arch. Naturgesch., (1918) Abt. A. 84 (9): 99.

Syntypes: ♂♂, Friday Harbor and Guemes Island, Washington (ZMUB).

Geographic range.--California, Washington.

California records.--HUMBOLDT CO.: Dyerville, 5 ♂, VI-20-35 (A. L. Melander, USNM). Orick, 1 ♂, 1 ♀, VI-21-35 (A. L. Melander, USNM); 1 ♀, VIII-3-50 (L. W. Quate, CDA).

The male of *C. nudipes* is without bristles near middle of fore and hind tibiae, but not always so on mid tibiae, thereby differing essentially from *C. albibasis* with which it is closely related. The female has normal mid tibial bristling, and may not readily be distinguished from that of *C. albibasis*.

Coenosia (Limosia) oregonensis Malloch

Coenosia oregonensis Malloch, 1919, Proc. Calif. Acad. Sci., ser. 4 9: 254.

Holotype: ♂, Corvallis, Oregon (CAS).

Geographic range.--Alaska, British Columbia, California, Montana, Northwest Territories, Oregon, Washington.

California records.--ALPINE CO.: Ebbetts Pass, 1 ♂, VIII-24-57, 1 ♀, VIII-23-59 (E. Mezger, UCD). EL DORADO CO.: Lake Fontanilis, 8,500 ft. 1 ♀, VIII-21-55 (E. I. Schlinger, UCD). MONO CO.: Leavitt Meadow, 7,200 ft. 3 ♀, VIII-13-14-63, flight trap (H. B. Leech, CAS). near Naval Research Station, 10,150 ft., N. Fork of Crooked Creek, 3 mi. N. of Inyo County, 1 ♀, VIII-20-63, flight trap (H. B. Leech, CAS). Virginia Lakes, 9,750 ft. 10 ♀, VIII-17-63 (H. B. Leech, CAS). SACRAMENTO CO.: Sacramento, 1 ♂, IV-16-56 (S. M. Fidel, UCD).

The species *C. oregonensis* and *C. argenticeps* are closely related, the male of the former having shorter bristles on mid and hind femora and tibiae than in the male of *C. argenticeps*. The female of *C. oregonensis* differs from that of *C. argenticeps* in having mid and hind femora extensively infuscated on distal half. In both species the lower calyptral scale is fully extended beyond margin of upper.

Coenosia (Limosia) perspicua Huckett

Coenosia (Limosia) perspicua Huckett, 1934, Trans. Am. Entomol. Soc., 60: 176.

Holotype: ♂, Kern Lake to Rock Creek, Tulare County, California (USNM).

Geographic range.--California, Montana.

California records.--KERN-TULARE CO.: Kern Lake to Rock Creek, 6,250-7,000 ft. 1 ♂, VII-27-VIII-1-15, type USNM). MONO CO.: Leavitt Meadow, 7,200 ft. 1 ♂, VIII-13-63, flight trap (H. B. Leech, CAS). Virginia Lakes, 9,750 ft. 8 ♂, VIII-17-63 (H. B. Leech, CAS).

The male of *C. perspicua*, unlike the female, has basal abdominal segments testaceous, as is the case of *C. albibasis* and *C. nudipes*. It may be separated from the male of *C. albibasis* by the presence of distinct spots on the abdomen, and in both sexes by the usually weaker pair of anterior ocellar bristles.

Coenosia (Limosia) pilosissima Stein

Coenosia pilosissima Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 100.

Coenosia longispinosa Malloch, 1920, Trans. Am. Entomol. Soc., 46: 166.

Syntypes: ♂♂, Collins, Idaho (USNM), Mount Constitution, Washington and Pine Lake, California (ZMUB).

Geographic range.--Alaska, Alberta, British Columbia, California, Idaho, Montana, Oklahoma, Oregon, Utah, Washington, Wyoming.

California records.--CONTRA COSTA CO.: Wild Cat Canyon, San Pablo, 1 ♂, X-16-06 (J. C. Bradley, CU). FRESNO CO.: Auberry, 1 ♂, IV-12-52 (R. Craig, CIS). MARIN CO.: Indian Beach, 1 ♂, V-15-58 (C. A. Toschi, CIS). 1.5 mi. NW. of Olema, 1 ♂, VI-10-62 (C. A. Toschi, CIS. MENDOCINO CO.: Ukiah, 1 ♂, III-31-31 (C. C. Wilson, USNM). SAN BERNARDINO CO.: Boulder Bay, Big Bear Lake, 1 ♂, IX-20-65 (R. E. Orth, UCR). SAN DIEGO CO.: Pine Lake, 1 ♂, no date, type series, (ZMUB). SANTA CLARA CO.: Stanford University, 1 ♂, X-9-52 (P. H. Arnaud, UCD).

The unusually long curling bristles on all femora and tibiae, and particularly those of the hind legs, should serve to distinguish the male of *C. pilosissima* from those of its nearest relatives. The female is scarcely distinguishable from that of *C. oregonensis*.

Coenosia (Limosia) rubrina Huckett

(Figs. 9, 25, 35)

Coenosia (Limosia) rubrina Huckett, 1934, Trans. Am. Entomol. Soc., 60: 194.

Holotype: ♂, Cuyamaca Mountains, San Diego County, California (HCH).

Geographic range.--California.

California records.--FRESNO CO.: Mono Hot Springs, 1 ♂, VIII-8-56 (R. O. Schuster,CIS). Shaver Lake, 1 ♂, VII-1919 (CAS). MADERA CO.: Sugar Pine, 1 ♂, 3 ♀, VII-18-46 (H. Chandler, CAS). NEVADA CO.: Sagehen Creek, near Hobart Mills, 1 ♂, VII-18-62 (M. E. Irwin, UCD). PLUMAS CO.: 4 mi. W. of Quincy, 1 ♂, VI-25-49 (F. Morishita, CIS). SAN BERNARDINO CO.: Mt. Home Canyon, 3 ♀, IX-20-22 (F. R. Cole, CAS). Victorville, 1 ♀, V-5-56 (J. Powell, CIS). SAN DIEGO CO.: Cuyamaca Mountains, 1 ♂, VIII-16-14, holotype (J. C. Bradley, CU). SAN MATEO CO.: Belmont, 1 ♂, VII-15-61 (R. O. Schuster, UCD). Cor-

te de Madera Creek, near Portola, 1 ♂, X-28-53 (P. H. Arnaud, CAS). SANTA CLARA CO.: Stanford University, 1 ♀, XI-19-52, 1 ♂, 2 ♀, X-18-53 (P. H. Arnaud, CAS).

The species *C. rubrina* is related to *C. bonita*, and *C. rufibasis*, and from *C. bonita*, which it most closely resembles, the male may be distinguished by the weak accentuation of the hypopygium as viewed in profile (fig. 35), and by the dull ventral border (inner margin) of the processes. The female of *C. rubrina* usually has weaker or smaller spots on the abdomen than in the female of *C. bonita*.

Coenosia (Limosia) rufibasis Stein

(Fig. 20)

Coenosia rufibasis Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 101.

Type: ♂, Washington (ZMUB).

Geographic range.--British Columbia, California, Idaho, Oregon, Washington.

California records.--ALAMEDA CO.: Oakland, 1 ♀, VII-1937 (E. S. Ross, CAS). Hills back of Oakland, 1 ♀, VIII-19-51 (W. C. Bentinck, CIS). CONTRA COSTA CO.: Point San Pablo, Richmond, 1 ♀. VI-3-64 (P. Rude, CIS). FRESNO CO.: Huntington Lake, 7,000 ft. 1 ♀, VII-14-19 (E. P. Van Duzee, CAS). Shaver Lake, 2 ♀, VII-1919 (CAS). MARIN CO.: Alpine Dam, 2 ♀, VIII-27-53 (A. D. Telford, UCD). MONTEREY CO.: Monterey, 3 ♂, 3 ♀, VIII-10-38 (L. W. Hepner, J. Russell, R. I. Sailer, UK). NEVADA CO.: Prosser Creek 6,300 ft., near Hobart Mills, 1 ♀, VII-13-61 (J. G. Chillcott, CNC). Sagehen, near Hobart Mills. 1 ♀, VIII-24-56 (J. M. Linsley, CIS). Sagehen Creek, near Hobart Mills, 1 ♂, VII-7-64, 1 ♀, VII-7-64, 1 ♀, VII-10-64, in malaise trap (M. E. Irwin, UCR). PLUMAS CO.: 4 mi. W. of Quincy, 1 ♂, VI-21-49, 2 ♀, VII-19-49 (H. A. Hunt, UCD). RIVERSIDE CO.: Idyllwild, 1 ♂, IX-5-64 (E. I. Schlinger, UCR). SAN BERNARDINO CO.: Redlands, 1 ♀, 1913 (CAS). SAN MATEO CO.: Redwood City, 1 ♀, X-14-50 (P. H. Arnaud, CAS). San Gregorio, 1 ♀, VIII-22-53 (P. H. Arnaud, HCH). SANTA CLARA CO.: Palo Alto, 1 ♀, IX-30-06 (J. C. Bradley, CU). Stanford University, 1 ♀, IX-28-53, 2 ♀, X-18-53 (P. H. Arnaud, CAS; HCH). SONOMA CO.: Freestone, 1 ♀, IX-7-50 (H. H. Keifer, CDA). Mesa Grande, Russian River, 1 ♀, IX-30-06 (J. C. Bradley, CU). Occidental, 1 ♀, VIII-16-38 (J. Russell, UK).

The species *C. rufibasis* has the third antennal segment mainly grayish black, and thereby differs from *C. bonita* and *C. rubrina*, which usually have the third antennal segment more or less yellowish in the male and yellowish at base in the female. The processes of the male in *C. rufibasis* have several long bristles from base to apex that are directed ventrad.

Coenosia (Limosia) rufibasis var. strigifemur Stein

Coenosia strigifemur Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 103.

Type: ♂, Mt. Constitution, Orcas Island, Washington (ZMUB).

Geographic range.--British Columbia, California, Oregon, Washington.

California records.--MARIN CO.: Muir Woods, 1 ♀, VI-21-47 (A. L. Melander, USNM). MONTEREY CO.: Big Sur, 1 ♀, IX-4-45 (A. L. Melander, USNM). Monterey, 2 ♀, VIII-10-38 (R. I. Sailer, HCH).

The variety *strigifemur* has the fore coxae grayish black and mid and hind femora infuscated on distal half, whereas in *C. rufibasis* of Stein the fore coxae and distal halves of mid and hind femora are all yellowish.

Coenosia (Limosia) tausa Huckett

Coenosia (Limosia) tausa Huckett, 1934, Trans. Am. Entomol. Soc., 60: 156.

Holotype: ♂, Friday Harbor, Washington (USNM).

Geographic range.--California, Washington.

California records.--MARIN CO.: 7 mi. W. of Fairfax, 1 ♂, VI-23-51 (W. C. Bentinck, CIS). Inverness, 1 ♀, VII-12-62 (C. A. Toschi, CIS). SAN MATEO CO.: Corte de Madera Creek, near Portola, 1 ♀, X-28-53 (P. H. Arnaud, CAS). SANTA CRUZ CO: Santa Cruz Mountains, 1 ♀, VIII-13-38 (L. W. Hepner, UK).

The male of *C. tausa* is notable for the profuse clothing of slender setulae on the anterior and dorsal surfaces of hind tibia, the sparse bristling of the femora, and the strong apical posteroventral bristle on mid tibia. The mid anterodorsal, preapical mid dorsal and anterodorsal bristles on the hind tibia are all long and finely drawn as in *C. pilosissima*. The female of *C. tausa* has 2 anteroventral bristles on the hind tibia, as in the male, but the setulae on anterior and dorsal surfaces of hind tibia, although lengthy, are much shorter than in the male and the fore tibia of the female has a longish mid posterior bristle.

Subgenus Hoplogaster Rondani

Hoplogaster Rondani, 1856, Dipt. Ital., Prodr. I p. 98.

Type-species: *Musca mollicula* Fallén, by original designation.

The subgenus *Hoplogaster* is closely related to the subgenus *Limosia*, from which it usually may be separated by the weaker, smaller development of the lower calyptral scale, the outer margin failing to extend, or only slightly so, beyond the margin of the upper scale.

KEYS TO SPECIES OF COENOSIA (HOPLOGASTER) IN CALIFORNIA[2]

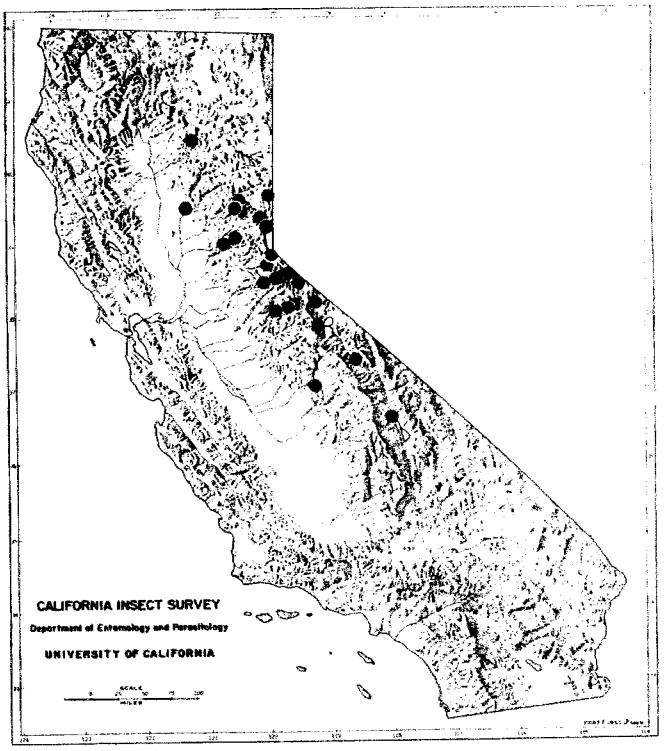
Males

1. All femora entirely blackish 2
   Mid and hind femora partly or entirely yellow 3
2. Hind tibia with short mid posterodorsal bristle, mid femur with lengthy mid anteroventral bristle . . . . . *californica* Malloch
   Hind tibia without mid posterodorsal bristle, and mid femur without longish mid anteroventral. *nigritella* Huckett
3. Mid and hind femora yellow on proximal half, blackened on distal half, hind tibiae fuscous . . . *flavibasis* Huckett*
   Mid and hind femora yellow, infuscation if present restricted to dorsum, hind tibiae yellow 4
4. Mid femur with anterior preapical bristle, anal segment of hypopygium subglobose, knoblike . . . . . *minor* Huckett
   Mid femur without anterior preapical bristle, anal segment not subglobose . 5
5. Third antennal segment mainly blackish, mid tibia without mid anterior bristle, abdomen not arcuate viewed laterad . . . . . *flavidipalpis* Huckett
   Third antennal segment mainly yellow, at most grayish tinged, mid tibia with mid anterior bristle, abdomen arcuate, curved downward on caudal region . . . *C. (Limosia) maculiventris* Huckett

Females

1. All femora black except at apices 2
   Mid and hind femora at least largely yellow 5
2. Tibiae partly or entirely blackish or fuscous 3
   Tibiae yellow . . . . *flavidipalpis* Huckett
3. Hind tibia with short mid posterodorsal bristle, tibiae narrowly reddish at base . . . . . *californica* Malloch
   Hind tibia without short mid posterodorsal bristle 4
4. Tibiae entirely blackish . . . . . *nigritella* Huckett
   Tibiae broadly yellowish proximad . . . . *flavibasis* Huckett
5. Mid femur with anterior preapical bristle, palpi yellow . . . . . *minor* Huckett
   Mid femur without anterior preapical bristle, palpi fuscous . . . . . *C. (Limosia) maculiventris* Huckett

2. In *Coenosia (Limosia) maculiventris* Huckett, the lower calyptral scale is reduced in size compared to other members of *Limosia*, and thus this species is included in keys to both subgenera as an aid in its identification.



Map 10. California distribution of *Coenosia californica* Malloch.

Coenosia (Hoplogaster) californica Malloch

(Map 10)

Coenosia parvisquama Malloch, 1919, Proc. Calif. Acad. Sci., ser. 4 9:304. name preoc.

Hoplogaster californica Malloch, 1920, Trans. Amer. Entomol. Soc., 46: 194. new name.

Hoplogaster californiensis Malloch, 1921, Ent. News, 32: 205.

Holotype: ♀, Huntington Lake, Fresno County, California (CAS).

Geographic range.--Arizona, California, Colorado, Nevada, New Mexico, Oregon.

California records. (map 10).--This species has been taken only in the Sierra Nevada portion of the state, from Mt. Lassen south to Bridgeport, primarily at moderate elevations, up to about 9,600 feet at Sonora Pass. The adults have been recorded in late March at Oroville, and in October at Sagehen

Creek north of Truckee, but nearly all records are for the summer months.

The species *C. californica* and *C. nigritella* have legs largely blackish. The former differs from the latter in having a bristle near middle of anteroventral surface of midfemur and near middle of posterodorsal surface of hind tibia.

Coenosia (Hoplogaster) flavidipalpis Huckett

Coenosia (Hoplogaster) flavidipalpis Huckett, 1934, Trans. Am. Entomol. Soc., 60:95.

Holotype: ♂, Salmon Arm, British Columbia (CNC).

Geographic range.--Alaska, Alberta, British Columbia, California, Montana, Oregon, Yukon Territory.

California records.--ELDORADO CO.: Fallen Leaf, 6,500 ft. 1 ♀, VII-16-17 (USNM). Lake Tahoe, 1 ♀, VIII-11-40 (R. H. Beamer, HCH). Riverton, 1 ♂, VIII-17-53 (E. I. Schlinger, UCD). FRESNO CO.: Mono Hot Springs, 1 ♀, VIII-8-56 (CIS). INYO CO.: Deep Spring, 1 ♂, VII-16-53 (E. I. Schlinger, UCD). Goodale Creek, N. of Lone Pine, 1 ♂, 1 ♀, IV-3-53 (H. B. Leech, CAS). LASSEN CO.: Bridge Creek Camp, 1 ♀, VII-12-54 (J. C. Downey, UCD). MONO CO.: Cottonwood Creek, 9,300 ft. 1 ♂, VII-10-61 (G. I. Stage, CIS). Leavitt Meadow 7,200 ft. 1 ♀, VIII-13-63, flight trap (H. B. Leech, CAS). Sardine Creek, 8,500 ft. 1 ♀, VI-28-51 (S. G. Watkins, UCD). NEVADA CO.: near Hobart Mills, 1 ♀, VI-20-64 (M. E. Irwin, UCR). Prosser Creek, 6,300 ft. near Hobart Mills, 1 ♀, VII-13-61 (B. H. Poole, CNC). Sagehen Creek, near Hobart Mills, 1 ♀, VII-15-64, sweeping (M. E. Irwin, UCR). PLUMAS CO.: Keddie, 1 ♀, VI-26-49 (C. I. Smith, UCD). RIVERSIDE CO.: Hemet Lake, 1 ♀, V-19-65 (T. W. Fisher, UCR). SAN BERNARDINO CO.: Barton Store, San Bernardino Mountains, 1 ♂, VII-4-46 (A. L. Melander, USNM). Big Bear Lake, San Bernardino Mountains, 1 ♀, VII-6-42 (A. L. Melander, USNM). Lake Arrowhead, 1 ♀, VII-9-56 (E. G. Linsley, CIS). SHASTA CO.: Cassel, 1 ♂, VII-15-55 (E. I. Schlinger, UCD). SIERRA CO.: Yuba Pass, 2 ♀, VII-7-64 (M. E. Irwin, UCR). SISKIYOU CO.: Mt. Shasta City, 4 ♂, 1 ♀, VIII-13-58, 3 ♀, VIII-22-58, at light (J. Powell, CIS). TRINITY CO.: Trinity River Camp, 5 ♂, 5 ♀, VII-13-53 (A. T. McClay, UCD) TUOLUMNE CO.: Strawberry, 1 ♀, VI-25-51 (A. T. McClay, UCD); 1 ♂, VII-20-51 (W. C. Bentinck, CIS); 1 ♀, VI-29-57 (D. L. Flaherty, UCR). VENTURA CO.: Lockwood Creek, near Stauffer P. O., 1 ♂, 4 ♀, V-5-59 (J. R. Powers, G. I. Stage, CIS), 1 ♂, V-7-59 (J. Powell, CIS). Mt. Pinos, 7,500 ft. 1 ♂, V-8-59 (G. I. Stage, CIS).

The diminutive species *C. flavidipalpis* has no preapical anterior bristle on mid femur, and in the male is without a mid anterodorsal bristle on mid tibia. The tibiae are yellow and the third antennal segment mostly or entirely black. The femora of the female of *C flavidipalpis*, unlike the male, are largely black and the palpi fuscous.

Coenosia (Hoplogaster) minor Huckett

Coenosia (Hoplogaster) minor Huckett, 1965, Mem. Entomol. Soc. Can., 42 p. 175.

Holotype: ♂, Valdez, Alaska (USNM).

Geographic range.--Alaska, California, Labrador, Manitoba, Newfoundland, Northwest Territories, Quebec, Yukon Territory.

California record.--MONO CO.: Leavitt Meadow, 1 ♂, VII-6-51 (A. T. McClay, UCD).

The male of *C. minor* has a prominent hypopygium, with the anal segment knoblike or subglobose. In both sexes the palpi and all coxae, femora and tibiae are mainly yellow except for a fuscous streak along the dorsum of femora. The mid femur has a preapical bristle on anterior surface.

Coenosia (Hoplogaster) nigritella Huckett

Coenosia (Hoplogaster) nigritella Huckett, 1934, Trans. Am. Entomol Soc., 60: 93.

Holotype: ♂, Aneroid Lake, Blue Mountains, Oregon (HCH).

Geographic range.--California, Oregon, Washington.

California records.-- ALPINE CO.: 2 mi. N. of Blue Lake, 9,000 ft. 1 ♀, VII-17-60 (A. S. Menke, UCD). INYO CO.: Ruby Lake, 11,250 ft. 1 ♀, VIII-13-57 (J. Powell, CIS). SHASTA CO.: 3 mi. SE. of Mt. Lassen, 1 ♀, VII-8-55 (J. W. MacSwain, CIS).

The species *C. nigritella* has blackish legs as in *C. californica*, but is much smaller and has weaker bristling on the abdomen. The lower calyptral scale is not as exposed beyond margin of the upper as is the case with *C. californica*. Other differences between the two species have been mentioned in remarks concerning the latter species.

Subgenus Neodexiopsis Malloch

Neodexiopsis Malloch, 1920, Trans. Am. Entomol. Soc. 46:162

Type-species: *Dexiopsis basalis* Stein (monobasic).

The subgenus *Neodexiopsis* may be distinguished from *Limosia* and *Hoplogaster* by the presence of a preapical bristle on the posterior surface of hind femur, (fig. 19).

KEYS TO SPECIES OF COENOSIA (NEODEXIOPSIS) IN CALIFORNIA

Males

1. Wings with a digitate or thumblike extension of anal margin, abdomen with a shiny black scar laterad along the anterior border of tergum 4 2
   Wings with rounded anal margin, without a digitate extension, abdomen without a black shiny scar laterad along anterior border of tergum 4 4
2. Anal projection of wing longer than its base, third antennal segment yellowish basad . . . . . *arizona* Snyder
   Anal projection of wing diminutive, scarcely longer than its base, third antennal segment grayish black . . . 3
3. Palpi yellow . . . . . *ovata* Stein
   Palpi brown or fuscous . . . . . *ovata* var.
4. Third antennal segment yellow, hind tibia normally without a mid posterodorsal bristle . . . . . *hilaris* Huckett
   Third antennal segment mainly blackish or gray 5
5. Hind tibia with 1 or 2 posterodorsal bristles, mid and hind femora largely or entirely fulvous 6
   Hind tibia without posterodorsal bristles, all femora extensively blackish . *occidentis* Stein
6. Hind tibia with 2 anterodorsal and 2 posterodorsal bristles, processes with dense long bristles . . . . . *setilamina* Huckett
   Hind tibia with 1 anterodorsal and 1 posterodorsal bristle, processes with sparse weak bristles 7
7. Hind tibia without mid anteroventral bristle, palpi yellowish or light amber . . . . . *pectoralis* Huckett
   Hind tibia with mid anteroventral bristle 8
8. Abdomen usually testaceous basad, cheek as high as length of profrons, third antennal segment shorter than 3 times its width . . . . . *basalis* (Stein)*
   Abdomen usually gray-black basad, concolorous, cheek narrower than length of profrons, third antennal segment 3 times as long as its maximum width . *simplex* Stein

Females

1. Hind tibia with 1 or 2 posterodorsal bristles 2
   Hind tibia without posterodorsal bristles 5
2. Hind tibia with 2 anterodorsal and 2 posterodorsal bristles, mid tibia with 2 bristles on anterior and posterior surfaces respectively. *setilamina* Huckett
   Hind tibia with 1 anterodorsal and 1 posterodorsal bristle, mid tibia with 1 bristle on anterior and posterior surfaces respectively 3
3. Hind tibia without a mid anteroventral bristle, palpi yellow or light amber . *pectoralis* Huckett
   Hind tibia with a mid anteroventral bristle, palpi partly or entirely fuscous or brown 4
4. Cheek less in height than length of profrons, third antennal segment 3 times as long as its maximum width . . . . *simplex* Stein
   Cheek as high as length of profrons, third antennal segment shorter than 3 times its width . . . *basalis* (Stein)*
5. Mid and hind femora largely blackish, distance from apex of antennae to oral margin less than width of third antennal segment . . . . . *occidentis* Stein
   Mid and hind femora largely fulvous, distance from apex of antennae to oral margin fully equal to width of third antennal segment 6
6. Third antennal segment yellowish basad . 7
   Third antennal segment blackish . . . *ovata* Stein
7. Palpi brown, abdomen with weak spots . *hilaris* Huckett
   Palpi yellow, abdomen with strong spots . *arizona* Snyder

Coenosia (Neodexiopsis) arizona Snyder

Neodexiopsis arizona Snyder, 1958, Am. Mus. Novit., No. 1892 p. 25.

Holotype: ♂, Tucson, Arizona (USNM).

Geographic range.--California, Arizona, Washington.

California records.--IMPERIAL CO.: Potholes, 1 ♂, IV-8-23 (E. P. Van Duzee, CAS). INYO CO.: Deep Springs, 1 ♀, X-13-51 (E. L. Kessel, CAS). Little Lake, 1 ♀, VI-7-29 (E. P. Van Duzee, CAS). Owens River, 1 ♀, no date (CAS). KERN CO.: Onyx, 2 ♀, IV-25-50 (E. I. Schlinger, UCD). ORANGE CO.: San Juan Creek, 1 ♀, VII-14-65 (R. Orth, UCR). RIVERSIDE CO.: 4 mi. W. of Aguanga, 1 ♂, 4 ♀, IV-24-51 (E. I. Schlinger, UCD). Coachella, 1 ♂, V-21-28 (E. C. Van Dyke, CAS). Hemet Reservoir, San Juan Mountains, 1 ♀, VI-14-40 (C. D. Michener, CIS). Indio, 1 ♀, III-6-55 (W. R. Richards, CNC). Palm Springs, 1 ♂, I-17-53, 2 ♀, I-19-53 (P. H. Arnaud, CAS). Temecula, 1 ♂, IV-4-49 (W. W. Wirth, USNM); 3 ♀, IV-24-51 (E. I. Schlinger, UCD); 1 ♂, VI-29-65 (R. Orth, UCR). SACRAMENTO CO.: Sacramento, 1 ♀, V-4-30 (H. H. Keifer, CDA). SAN BERNARDINO CO.: Morongo, 1 ♂, IX-28-44 (A. L.Melander, USNM). Morongo Valley, 1 ♀, V-20-51 (E. I. Schlinger, UCD). Redlands, 1 ♂, 1 ♀, V-25-35 (A. L. Melander, USNM). Victorville, 1 ♀, IV-28-56 (J. Powell, CIS); 2 ♀, V-5-56 (B. J. Adelson, CIS). SAN DIEGO CO.: San Diego, 1 ♀, V-8-13 (E. P. Van Duzee, CAS). Warner Springs, 1 ♀, VIII-30-51 (E. I. Schlinger, UCD). San Diego County, 1 ♂, V-25-50, at trap (CDA). SAN FRANCISCO CO.: Lake Merced, 1 ♀, V-7-27 (C. L. Fox,

CAS). SANTA CRUZ CO.: Santa Cruz, 1 ♀, VII-17-40 (B. Brookman, CAS).

The species *C. arizona* is closely related to *C. ovata*, from which it differs in having the third antennal segment yellowish basad, by the longer more constricted anal projection at wing margin in the male, and by the yellowish palpi in the female.

Coenosia (Neodexiopsis) hilaris Huckett

Coenosia (Neodexiopsis) hilaris Huckett, 1966, Proc. Calif. Acad. Sci., ser 4 34: 279.

Holotype: ♂, Sunnyside Canyon, West side of Huachuca Mountains, Cochise County, Arizona (CAS).

Geographic range.--Arizona, California.

California records.--INYO CO.: Deep Springs Lake, 1 ♀, VI-14-60 (H. K. Court, UCD). Owens River, 1 ♀, no date (CAS). SAN BERNARDINO CO.: Victorville, 2 ♂, 1 ♀, V-2-53 (G. A. Marsh, R. O. Schuster, UCD); 1 ♀, V-20-55 (W. R. Richards, CNC).

The male of *C. hilaris* has abdomen yellowish testaceous basad as in the males of *C. pectoralis* and in certain male specimens of *C. basalis* (Stein)* From both of the latter the male of *C. hilaris* differs in having the third antennal segment mainly yellow and shorter, the hind tibia typically without a mid posterodorsal bristle. The female of *C. hilaris* has the third antennal segment partly yellowish as in *C. arizona*, from which it differs in having the palpi brown.

Coenosia (Neodexiopsis) occidentis Stein

(Map 12)

Coenosia tibialis Stein, 1898, Berl, Entomol. Z., (1897) 42: 275. name preoc.

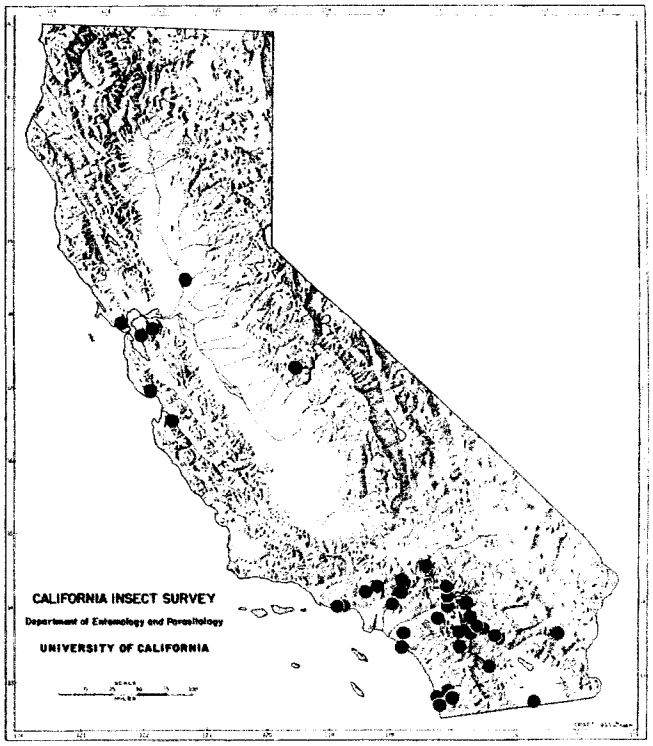
Coenosia occidentis Stein, 1901, Z. Syst. Hymenopt. Dipt., I (4): 203; Huckett, 1972, Entomol. News, 83: 170.

Coenosia rufitibia Stein, 1919, Arch Naturgesch., (1917) Abt. A 83 (1): 161. new name.

Type: ♂, U. S. (BMNH).

Geographic range.--California, Connecticut, District of Columbia, Florida, Georgia, Illinois, Indiana, Louisiana, Maryland, Michigan, North Carolina, New York, Ohio, Pennsylvania.

California records.--LOS ANGELES CO.: Glendale, 2 ♂, X-8-51 (W. M. Schlinger, CIS). Los Angeles, 1 ♂, V-21-15 (M. C. Van Duzee, CAS). ORANGE CO.: Laguna Canyon, 1 ♀, XII-22-62 (M. E. Irwin, UCD). Orange County, 1 ♀, VII-14-29 (P. W. Oman, UK). RIVERSIDE CO.: Indio, 2 ♂, III-6-55 (W. R. Richards,



Map 11. California distribution of *Coenosia ovata* Stein.

CNC). Riverside, 1 ♀, X-7-34, 1 ♂, II-3-35 (A. L. Melander, USNM). Thousand Palms, 1 ♂, III-8-55 (W. R. Richards, CNC). Thousand Palms Oasis, 1 ♂, 1 ♀, III-17-55 (W. R. Richards, CNC). Upper Deep Canyon, 1 ♀, III-19-65 (M. E. Irwin, UCR). Whitewater, Fish Hatchery 1 ♀, I-16-53 (P. H. Arnaud, CAS). Willis Palms Oasis, 1 ♀, IV-3-55 (W. R. Richards, CNC). SAN DIEGO CO.: Balboa Park, San Diego, 1 ♂, XII-3-55 (P. H. Arnaud, CAS). SANTA BARBARA CO.: Canada del Puerto Creek, Santa Cruz Island, 1 ♂, VII-23-63 (T. Fisher, UCR). VENTURA CO.: Foster Park, 1 ♀, VI-25-59 (R. D. Gehring, CIS).

The species *C. occidentis* is related to *C. ovata*, from which it may readily be distinguished by the extensively black femora and the notably lengthened antennae. The male of *C. occidentis* has no thumblike anal extension at wing margin, as is present in the males of *C. ovata* and *C. arizona*.

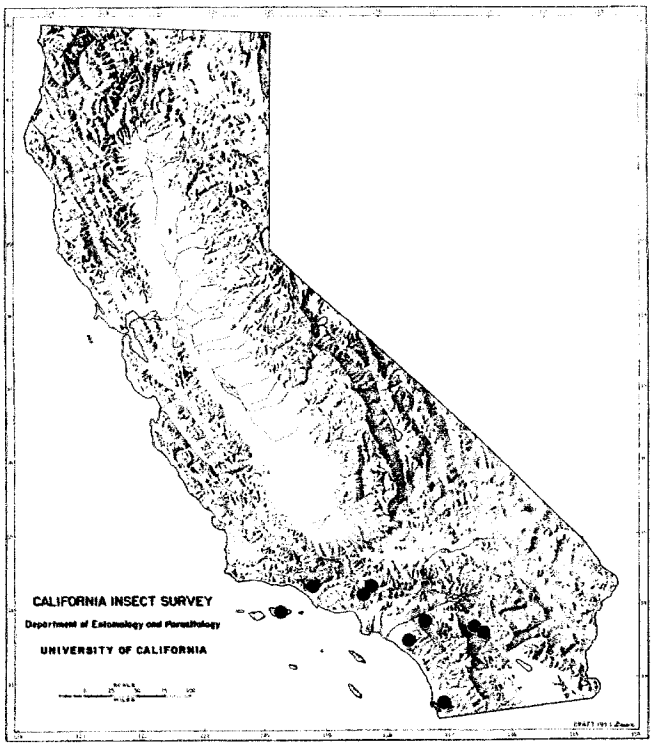
Coenosia (Neodexiopsis) ovata Stein

(Fig. 19; map 11)

Coenosia ovata Stein, 1898, Berl. Entomol. Z., (1897) 42: 263.

Syntypes: ♂♂ ♀♀, Tifton, Georgia; Algonquin, Illinois (FMNH, USNM).

Geographic range.--Widely distributed, reaching its northern limits in the southern parts of the provinces, and southward to include many eastern, cen-



Map 12. California distribution of *Coenosia occidentis* Stein.

tral and western states, as far as Florida in the East, the Gulf States in the South, and westerly in New Mexico, Arizona, and California.

California records (map 11).--Despite its widespread distribution elsewhere, *Coenosia ovata* has been collected in California only along the coast and at austral, primarily low elevation stations inland.

This species evidently is tolerant of winter conditions in the adult stage, having been taken throughout the year in the coastal counties and during midwinter in Coachella and Imperial valleys.

Records are available from about 50 localities in 13 counties.

The species *C. ovata* differs from *C. arizona* in having the third antennal segment entirely grayish black, in the male by the smaller, reduced anal projection of the wing-margin. In both sexes of *C. ovata* the palpi may be yellow or brown, the latter being more usual in specimens recorded from California.

Coenosia (Neodexiopsis) pectoralis Huckett

Coenosia (Neodexiopsis) pectoralis Huckett, 1934, Trans. Am. Entomol. Soc., 60:76

Holotype: ♀, Santa Catalina Mountains, Arizona (ANSP).

Geographic range.--Arizona, British Columbia, California, Colorado, New Mexico, Utah.

California records.--LOS ANGELES CO.: Santa Monica Mountains, 1 ♂, VII-3-50 (HCH). MARIN CO.: Mill Valley, 1 ♀, VII-3-33 (H. H. Keifer, CDA). PLACER CO.: Cisco, 1 ♀, VI-15-51 (E. I. Schlinger, UCD). Colfax, 1 ♀, IX-10-52 (P. H. Arnaud, HCH). SAN BERNARDINO CO.: East Highlands, 1 ♀, I-7-14 (CAS). Redlands, 3 ♂, 3 ♀, XII-1914 (CAS). SANTA CLARA CO.: Stanford University, 1 ♂, VII-30-53 (P. H. Arnaud, CAS). TUOLUMNE CO.: Leland Meadow, 1 ♀, VIII-5-60 (A. S. Menke, UCD).

The species *C. pectoralis* is related to *C. simplex* and *C. basalis* (Stein)*, from both of which it may be separated by the absence of mid anteroventral bristle on the hind tibia. The palpi in both sexes of *C. pectoralis* are yellowish or light amber. In the above specimens from California the anterior setulae on humeral callosities are not as robust as in specimens from Arizona and New Mexico, including the above type.

Coenosia (Neodexiopsis) setilamina Huckett

Coenosia (Neodexiopsis) setilamina Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 280.

Holotype: ♂, Bijou, El Dorado County, California (CAS).

Geographic range.--California, Oregon, Utah.

California records.--EL DORADO CO.: Bijou, 1 ♂, VI-24-53 (P. H. Arnaud, CAS). INYO CO.: North Lake, 1 ♂, 1 ♀, VI-30-61 (J. S. Buckett, UCD).

The species *C. setilamina* is rather aberrant and differs from its congeners in having two bristles respectively on the anterodorsal and posterodorsal surfaces of mid and/or hind tibiae. The male has a dense series of long bristles on the entire inner (ventral) border of the abdominal processes.

Coenosia (Neodexiopsis) simplex Stein

Coenosia simplex Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 102.

Type: ♂, Corvallis, Oregon (ZMUB).

Geographic range..--California, Oregon, Utah.

California records.--INYO CO.: Lone Pine, 1 ♀, VII-28-40 (R. H. Beamer, UK). LAKE CO.: Seigler Springs, 1 ♂, IX-7-57 (P. H. Arnaud, HCH). MARIN CO.: N. end of Golden Gate Bridge, 1 ♀, IV-12-53 (H. B. Leech, CAS). MONO CO.: Mono Lake, 1 ♂, VI-7-48 (W. W. Wirth, USNM). RIVERSIDE CO.: Deep Canyon, 3 ♂, V-17-63, 1 ♂, 2 ♀, V-30-63 (E. I. Schlinger, UCR). Palm Canyon, 1 ♀, XII-25-52 (P.

H. Arnaud, CAS). Upper Deep Canyon at Horsethief Creek, 3,400 ft. 2 ♀, VI-11-65 (M. E. Irwin, UCR). Willis Palms Oasis, Thousand Palms, 3 ♂, 4 ♀, III-8-55, 1 ♀, III-16-55 (W. R. Richards, CNC), 2 ♂, 1 ♀, III-18-55 (W. R. M. Mason, CNC), 1 ♀, IV-5-55 (W. R. Richards, CNC). SAN BERNARDINO CO.: Victorville, 1 ♂, 1 ♀, IV-28-56 (J. Powell, CIS). SAN DIEGO CO.: Campo, 1 ♀, VII-17-40 (B. Brookman, CAS). SANTA CRUZ CO.: Santa Cruz, 1 ♀, VII-17-40 (B. Brookman, CAS).

The species *C. simplex* possesses a mid posterodorsal bristle on hind tibia, as in *C. pectoralis* and *C. basalis* (Stein)*. From *C. pectoralis* it may be distinguished by the presence of a mid anteroventral bristle on hind tibia, and from *C. basalis* by the narrower cheeks and longer antennae. The female of *C. simplex* may or may not have a pair of spots on terga 3 and/or 4.

Genus Atherigona Rondani

Atherigona Rondani, 1856, Dipt. Ital., Prodr., I: 97.

Type-species: *Coenosia varia* Meigen, by original designation.

The genus *Atherigona* as represented in California is marked by the possession of two pairs of weak inconspicuous presutural dorsocentral bristles that are shorter than the posterior notopleural, fore femur with the posteroventral bristles restricted to distal third and with a shallow dorsal concavity distad in the male, costal cell enlarged due to the slight convexity of costa and in that the subcostal vein unites with costa at a point nearly opposite the *r-m* cross-vein, eyes nearly oblong in outline due to its width being fully maintained on the lower half, abdomen in males short and stout. In the subgenus *Acritochaeta* Grimshaw the hypopygium is not trifoliate at apex of the genital style or stalk.

Larvae of *Atherigona orientalis* are known to breed in decaying fruit and vegetation, assuming the role of scavengers. (Malloch, 1932:201; Ramachandra Rao, 1925: 123-125).

Subgenus Acritochaeta Grimshaw

Acritochaeta Grimshaw, 1901, Fauna Hawaiiensis, Pt. I, Dipt., p. 41.

Type-species: *Acritochaeta pulvinata* Grimshaw monobasic = *orientalis* Schiner.

Atherigona (Acritochaeta) orientalis Schiner

Atherigona orientalis Schiner, 1868, Reise der österreichischen Fregatte Novara. Zool., Vol. 2, Abt. I, [Sect.] B. Wein. p. 295.

Coenosia excisa Thomson, 1869, *In* K. Svenska Vetenskaps-Akademien, Kongliga svenska fregatten Eugenies resa omkring jorden. pt. 2. Zoologie, [Sec] I: Insekter, p. 560.

Acritochaeta pulvinata Grimshaw, 1901, Fauna Hawaiiensis, I: 42.

Atherigona varia Malloch (not Meigen). 1921 Entomol. News, 32: 107.

Type: ♀, Tellnschong, Nicobar Islands [India] (MNH Vienna).

Geographic range.--California, Florida, Georgia, Texas, also tropics and subtropics of both New and Old World.

California records.--RIVERSIDE CO.: Deep Canyon, 3 ♂, 4 ♀, X-9-63, 2 ♂, 1 ♀, at light (E. I. Schlinger, M. E. Irwin, UCR). SAN DIEGO CO.: Borrego Springs, 2 ♀, X-10-65, 2 ♀, X-26-65 (S. E. Haseltine, BVC). 2 mi. E., 3 mi. N. of Borrego Springs, 2 ♀, XI-9-65 (S. E. Haseltine, BVC).

Genus Macrorchis Rondani

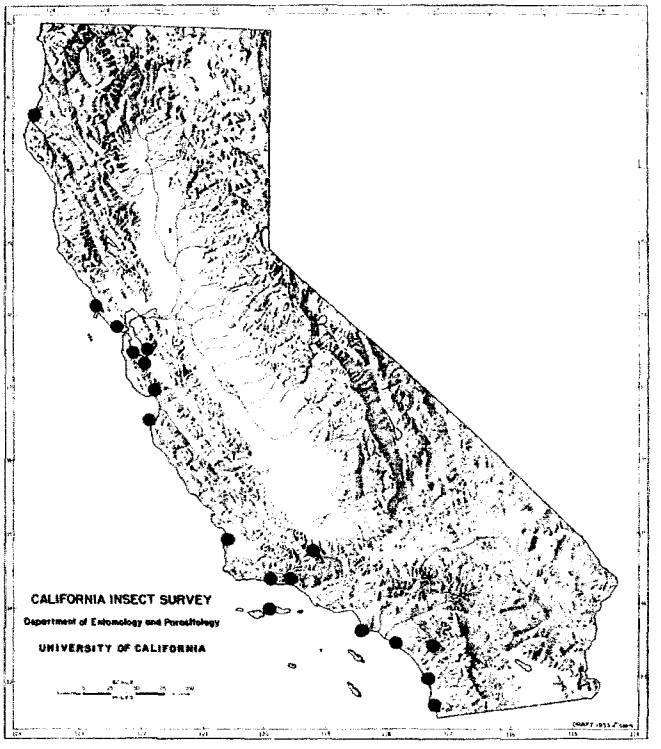
Macrorchis Rondani, 1877, Dipt. Ital., Prodr., VI p. 280.

Type-species: *Musca meditata* Fallén (monobasic).

The genus *Macrorchis* is related to *Coenosia sens. lat.*, the adults having one pair of recurrent paraorbital bristles, the lower prostigmatal bristle above fore coxae curved downward, and the hind tibia with one long anterodorsal bristle. The genus differs from *Coenosia* in having 2 pairs of presutural dorsocentral bristles, the shorter pair being at least half as long as the longer. Little is known of the habits of the larvae. Hennig (1961:509) mentions that the European species *meditata* is recorded as having been introduced into New Zealand from soil containing bulbs from Holland.

KEY TO SPECIES OF MACRORCHIS IN CALIFORNIA

1. Fore femora black. . *majuscula* (Coquillett)
   Fore femora partly or entirely fulvous . 2
2. Fore femora entirely fulvous . . . . . *ausoba* (Walker)*
   Fore femora partly blackened on dorsal region *alone* (Walker)*



Map 13. California distribution of *Macrorchis majuscula* (Coquillett).

Macrorchis majuscula (Coquillett)

(Map 13)

Coenosia majuscula Coquillett, 1904, Invert. Pacifica, Dipt., 1: 34.

Holotype: ♂, Stanford University, California (USNM).

Geographic range.--California, Washington.

California records.--ALAMEDA CO.: Newark, 1 ♂, VI-27-39 (G. F. Knowlton, USU). HUMBOLDT CO.: Samoa Beach and dunes, 1 ♂, 1 ♀, VI-18-07 (J. C. Bradley, CU). KERN CO.: Mill Potrero, 1 ♀, VII-6-59 (J. L. Bath, UCR). LOS ANGELES CO.: Palos Verdes, 1 ♂, 1 ♀, VII-15-45 (A. L. Melander, USNM). MARIN CO.: Bolinas, 1 ♂, VI-5-49 (R. E. Ryckman, USNM). McClure's Beach, 1 ♀, VII-29-61 (C. A. Toschi, CIS). MONTEREY CO.: Asilomar, 1 ♀, IX-1-45, 3 ♀, IX-3-45 (A. L. Melander, USNM). Monterey, 1 ♂, VII-23-96 (W. M. Wheeler, CAS). Pacific Grove, 1 ♂, V-7-06 (J. C. Bradley, CU). ORANGE CO.: Laguna Beach, 1 ♂, VIII-18-43 (A. L. Melander, USNM). RIVERSIDE CO.: Temecula, 1 ♂, IV-24-51 (E. I. Schlinger, UCD). SAN DIEGO CO.: Silver Strand, 1 ♂, IV-25-53 (A. M. Barnes, BVC). Solano Beach, 2 ♂, 6 ♀, VI-19-63 (J. D. Birchim, JDB; D. Wustner, P. D. Hurd, CIS); 4 ♂, 7 ♀, VI-23-63 (T. Bolton, I. H. Pogojeff, UCD); 2 ♀, VI-24-63 (D. Wustner, CIS). SAN LUIS OBISPO CO.: Oso Flaco Lake, 1 ♀, VII-13-59 (A. E. Menke, UCD). SAN MATEO CO.: Redwood City, 1 ♀, IV-19-06 (J. C. Bradley, CU). SANTA BARBARA CO.: Carpinteria, 2 ♂, 1 ♀, VIII-6-50, 5 ♀, VIII-11-50 (A. L. Melander, USNM). Christi Ranch, Santa Cruz Id., 1 ♂, IX-14-64 (E. I. Schlinger, UCR). Goleta, 1 ♀, VI-22-59 (P. E. Paige). Muir Beach, 2 ♂, 6 ♀, VIII-6-50 (A. L. Melander, USNM). SANTA CLARA CO.: Salt Marshes, Palo Alto, 2 ♀, IV-20-06 (J. C. Bradley, ZMUB). Stanford University, 1 ♂, no date, type (USNM). Santa Clara County, 1 ♀, no date (Baker, USNM). SANTA CRUZ CO.: Santa Cruz, 1 ♂, IX-1-53 (P. H. Arnaud, CAS).

The species *M. majuscula* has 2 pairs of presutural dorsocentral bristles, otherwise it bears a resemblance to *Coenosia tigrina*, notably in the bristling of the hind tibiae.

Genus Pseudocoenosia Stein

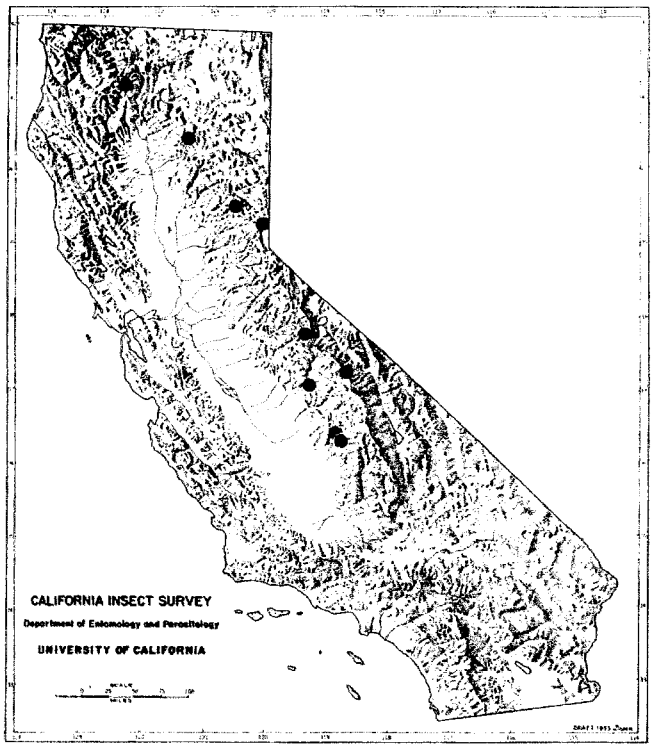
Pseudocoenosia Stein, 1916, Arch. Naturgesch., (1915) Abt. A 81 (10): 113, 220.

Type-species: *Aricia longicauda* Zetterstedt, by subsequent designation of Karl, 1928 (= *Anthomyza solitaria* Zetterstedt, 1838).

The genus *Pseudocoenosia* comprises a group of rather aberrant species, and falls rather arbitrarily near *Macrorchis* in its relationships. The male frons is narrow, narrower than in the female, the interfrontalia in both sexes is at most scarcely wider at middle than the parafrontals there situated, the recurrent paraorbital bristles may be absent in the male or, as in the female, with 1 or 2 pairs, the caudal pair of ocellar bristles is short and fine, and directed forward (fig. 6), the arista is nonthickened on proximal half, the lower prostigmatal bristle is curved upward or forward, the mid femur has a preapical bristle on the anterior or anterodorsal surface, and the hind tibia possesses a robust bristle near the middle of anterodorsal surface, much as in *Coenosia*.

KEY TO SPECIES OF PSEUDOCOENOSIA IN CALIFORNIA

1. Hind tibia with a lengthy preapical posterodorsal bristle, longer than apical diameter of tibia . *nigropolita* (Malloch)
   Hind tibia with preapical posterodorsal bristle fine and setulose, shorter than apical diameter of tibia 2
2. Hind tibia with a well-developed apical ventral to posteroventral bristle, aristal hairs not longer than basal diameter of arista . *brevicauda* Huckett*
   Hind tibia with apical posteroventral bristle weak or setulose, aristal hairs longer than basal diameter of arista . . . . . *solitaria* (Zetterstedt)



Map 14. California distribution of *Pseudocoenosia nigropolita* (Malloch).

Pseudocoenosia nigropolita (Malloch)

(Fig. 6; map 14)

Dialyta nigropolita Malloch, 1919, Proc. Calif. Acad. Sci., ser. 4 9: 302.

Pseudocoenosia nigriventris Huckett, 1936, J. N.Y. Entomol Soc., 44: 206.

Holotype: ♂, Huntington Lake, California (CAS).

Geographic range.--California, Washington.

California records.--FRESNO CO.: Huntington Lake, 7,000 ft. 2 ♀, VII-7-19, paratypes of *P. nigropolita* (E. P. Van Duzee, USNM), 1 ♂, 1 ♀, VII-9-19, types of *P. nigropolita* (E. P. Van Duzee, CAS). INYO CO.: Ruby Lake, 11,250 ft., 1 ♀, VIII-13-57 (J. Powell, CIS). NEVADA CO.: Prosser Creek, 6,300 ft. near Hobart Mills, 1 ♂, VII-13-61 (J. G. Chillcott, CNC). Sagehen, near Hobart Mills, 5 ♂, 3 ♀, VII-2-54 (R. C. Blaylock, J. C. Downey, UCD); 1 ♀, VII-21-54 (J. A. Powell, CIS), 1 ♂, 2 ♀, VII-4-62 (C. A. Toschi, CIS). Sagehen Creek, near Hobart Mills, 1 ♂, VII-13-61 (J. G. Chillcott, CNC). SHASTA CO.: Summit Lake, Lassen National Park, 1 ♂, VII-23-50 (L. W. Quate, CIS). SIERRA CO.: 5 mi. E. of Webber Lake, 1 ♂, VII-30-55 (E. A. Kurtz, UCD). TRINITY CO.: Scott Mtn., 5,350 ft. 1 ♀, VII-14-49 (A. T. McClay, UCD). TULARE CO.: Alta Meadow, 1 ♂, VIII-24-17 (CU). Rattlesnake Creek, 9,000 ft. 1 ♂, 1 ♀, VIII-2-15, types of *P. nigriventris* (ANSP). TUOLUMNE CO.: Tuolumne Meadows, 1 ♂, VII-1-40 (R. H. Beamer, HCH).

The species *P. nigropolita* may be separated from its congeners by its notably black shining abdomen, concolorous with femora. The hind tibia has a longish preapical posterodorsal bristle.

Pseudocoenosia solitaria (Zetterstedt)

Anthomyza solitaria Zetterstedt, 1838, Ins. Lapp., p. 677.

Aricia longicauda Zetterstedt, 1860, Dipt. Scand., 14: 6230.

Type: ♂, Lycksele Lappmark.

Geographic range.--Holarctic; in the Nearctic Alaska, Alberta, California, Colorado, Labrador, Manitoba, Montana, South Dakota, Utah, Wyoming, Yukon Territory.

California record.--TUOLUMNE CO.: Sonora Pass, 1 ♀, VIII-21-59 (D. D. Linsdale, CIS).

The male of *P. solitaria* differs from that of *P. nigropolita* in having weak paired marks on the abdomen, with or without a median dorsal stripe, and in the tapering outline of the hypopygium. In both sexes the preapical posterodorsal bristle of the hind tibia is weak, setulose.

Genus Tetramerinx Berg

Tetrachaeta Stein, 1898, Berl. Entomol. Z., (1897) 42: 254. name preoc.

Phyllogaster Stein, 1898, Berl. Entomol.Z., (1897) 42: 256. name preoc. Gistl, 1834.

Tetramerinx Berg, 1898, Commun. Mus. Nac. Buenos Aires, I: 17. new name for *Tetrachaeta* Stein.

Parasteinia Cockerell, 1905, Can. Entomol., 37: 361. new name.

Type-species: *Tetrachaeta unica* Stein (monobasic).

The genus *Tetramerinx* has two pairs of presutural dorsocentral bristles and the lower prostigmatal bristle dorsad of fore coxa is curved upward. The genus may be distinguished from its relatives by the peculiar conformation of the second antennal segment, which, proximad on its dorsal surface is flattened or depressed, by the lengthened thickening of the arista on its proximal half, and in the comparatively robust caudal pair of ocellar bristles, that are directed outward. The habitats of the various species are evidently in the rough herbage and vegetation on marshes and dunes along the coast and in the vicinity of lakes and ponds.

KEY TO SPECIES OF TETRAMERINX

IN CALIFORNIA

1. Abdomen with spots laterad on terga 3 and 4, and with a blackish dorsocentral stripe or series of marks . . 2
   Abdomen without dorsal spots laterad . 3
2. Tibiae black, hind tibia with a long robust apical posteroventral bristle, arista pubescent . . . *longispina* (Malloch)
   Tibiae reddish, hind tibia with at most a fine weak apical posteroventral bristle, arista nude . . . . . *rufitibia* Stein
3. Height of cheek about equal to half height of eye . . . . . *inermis* (Stein)
   Height of cheek less than half height of eye 4
4. Tibiae blackish, usually 4 pairs of postsutural dorsocentral bristles present 5
   Tibiae fulvous, usually 3 pairs of postsutural dorsocentral bristles present . . . . . *littoralis* (Malloch)
5. Mid tibia with an anterior bristle, hind tibia with 3 or 4 anterodorsal bristles, ovipositor with subanal recurrent spinules . . . . . *unica* Stein
   Mid tibia without an anterior bristle, hind tibia with 2 anterodorsal bristles, ovipositor without subanal recurrent spinules. *albinepennis* (Huckett)

Tetramerinx albinepennis (Huckett) N. COMB.

Phyllogaster albinepennis Huckett, Proc. Calif. Acad. Sci., ser. 4 34: 282.

Holotype: ♀, Thousand Palms, Riverside County, California (CNC).

Geographic range.--California.

California records.--IMPERIAL CO.: Obsidian Buttes, 1 ♀, III-26-59 (C. A. Toschi, CIS). RIVERSIDE CO.: Hunter's Spring, 1 ♀, V-10-52 (CIS). Thousand Palms, 1 ♀, III-13-55, type (J. E. H. Martin, CNC), 1 ♀, III-18-55 (W. R. M. Mason, CNC). SAN BERNARDINO CO.: Trona, 1 ♀, IV-25-37, Creosote bush (F. B. Foley, CAS). SANTA BARBARA CO.: Goleta, 1 ♂, VI-22-59 (R. W. Spore, UCR). SANTA CRUZ CO.: 4.4 mi. S. of Boulder Creek, 1 ♀, IV-10-65 (M. E. Irwin, UCR).

The species *T. albinepennis* possesses the habitus of *T. unica*, from which it may be distinguished by the absence of an anterior bristle on mid tibia, the presence of 2 anterodorsal bristles on hind tibia, and by the absence of recurrent spinules on the subanal sclerite of the ovipositor.

Tetramerinx inermis (Stein) N. COMB.

Phyllogaster inermis Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 58.

Syntypes: ♂ ♀♀, Dewatto and Friday Harbor, Washington; Stanford University, California (ZMUB, USNM).

Geographic range.--California, Oregon, Washington, Baja California.

California records.--ORANGE CO.: Sunset Beach, 1 ♀, VI-12-48 (A. L. Melander, USNM). SAN DIEGO CO.: Palm City, 1 ♂, 3 ♀, VII-19-40 (R. H. Beamer, D. E. Hardy, L. C. Kuitert, UK). Solana Beach, 1 ♀, VI-19-63 (J. Powell, CIS). SAN LUIS OBISPO CO.: Morro Bay, 1 ♂, 1 ♀, VIII-29-45 (A. L. Melander, USNM). SANTA BARBARA CO.: Goleta, 1 ♂, VI-22-59 (R. W. Spore, UCR). SANTA CLARA CO.: Stanford University, 1 ♀, Oct. 190-, syntype (USNM).

The species *T. inermis* may be distinguished from associated taxa having in common 4 pairs of postsutural dorsocentral bristles and being without paired abdominal spots, by the high cheeks and complete series of well developed anteroventral bristles on hind femur. The female, as in *T. albinepennis*, is without recurrent spinules on the subanal plate of ovipositor.

Tetramerinx littoralis (Malloch) N. COMB.

Phyllogaster littoralis Malloch, 1917, Can. Entomol., 49:228.

Holotype: ♂, Grand Tower, Illinois (IllNHS).

Geographic range.--Alberta, California, Colorado, Idaho, Illinois, Indiana, Kansas, Michigan, Nebraska, New Jersey, New York, Pennsylvania, Quebec, South Dakota, Texas, Utah, Wyoming.

California record.--INYO CO.: Olancha, 1 ♀, V-20-37 (N. W. Frazier, AMNH).

The species *T. littoralis* is dull whitish gray, and is densely and evenly dusted. The mesonotum is without stripes and the abdomen is without distinct marks. The tibiae are reddish yellow. There are usually 3 pairs of postsutural dorsocentral bristles present, and in both sexes there frequently occurs on the under surface of the wing one or more widely spaced setulae on the proximal sector of vein R_{4+5}. The female has recurrent spinules on the subanal plate of ovipositor.

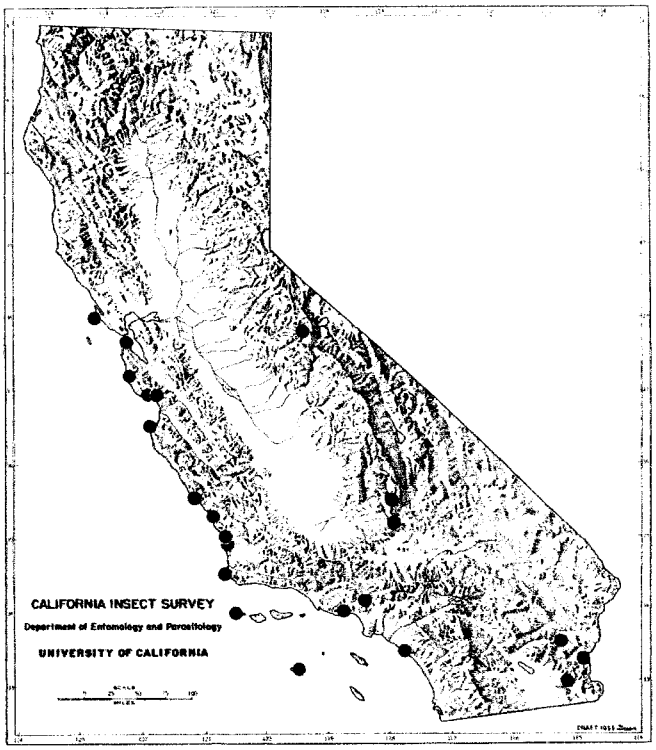
Tetramerinx longispina (Malloch)

Phyllogaster longispina Malloch, 1923, Calif. Acad. Sci. Proc., ser. 4 12: 426.

Holotype: ♂, Gonzales Bay, Baja California (CAS).

Geographic range.--California, Baja California.

California record.--ORANGE CO.: Sunset Beach, 1 ♀, VI-12-48 (A. L. Melander, USNM).



Map 15. California distribution of *Tetramerinx rufitibia* Stein.

The species *T. longispina* may readily be recognized by the strong bristles on the hind tibia, including the preapicals and apical posteroventral. The tibiae are black, and the abdomen has paired spots and a dorsocentral vitta that may be quite faint.

Tetramerinx rufitibia Stein

(Map 15)

Tetramerinx rufitibia Stein, 1911, Arch. Naturgesch., Abt. A 77 (1): 144.

Tetramerinx californiensis Malloch, 1918, Trans. Am. Entomol. Soc., 44: 274.

Syntypes: ♂ ♀♀, Arica and Tacna, Chile; Mollendo, Peru.

Geographic range.--California, Florida, Oregon, Bahama Islands, South America.

California records (map 15).--The peculiarly disjunct distribution in the Americas may be related to the habitat occupied by *T. rufitibia;* in California this species is restricted to beach and desert sand dune localities, occurring in a disjunct distribution along the immediate coast and in the deserts. There is one exceptional record from 10,000 feet in Tuolumne County which may be considered of possible air-borne derivation.

The adults are active throughout the year along the coast, having been taken in every month, but there are records for only April and October in the desert, suggesting that emergence there may be in response to rainfall.

T. rufitibia as represented in California has 3 or 4 pairs of postsutural dorsocentral bristles. The height of eyes and cheeks varies in relation to one another, the taller the eyes the shorter the cheek, and vice versa. The tibiae are reddish, the abdomen has paired spots and a dorsocentral stripe.

Tetramerinx unica (Stein)

Tetrachaeta unica Stein, 1898, Berl. Entomol. Z., (1897) 42: 254.

Syntypes: ♂ ♀, Horse Neck Beach, Bristol, Massachusetts (FMNH).

Geographic range.--Occurs in the south temperate region of North America; in the east from Virginia to its northern range in southern Quebec, Ontario and in Michigan; in the west, from Texas, Kansas northward to South Dakota, and in the Rocky Mountain region from Colorado, Utah, to Alberta; in the southwest from Arizona and Nevada, and on the Pacific coast from southern California to British Columbia.

California records.--*Tetramerinx unica* has an austral distribution in the State, similar to that of *Lispe nasoni* (map 16), but less extensive, occurring east of the Sierra Nevada in the Owens Valley and at 10,000 feet in the White Mountains, southward in the Mojave Desert, northward through the Central Valley to Lake County, and on the coast on Santa Cruz Island and at Santa Cruz and Berkeley. There is one anomalous record from 9,000 feet in Alpine County (2 miles N. of Blue Lakes).

Records for this species indicate a flight period at various times of year, from March to October, there being too few records from any one area to define voltinism precisely.

The species *T. unica* and *T. albinepennis* possess the same pale gray habitus, both having 4 pairs of postsutural dorsocentral bristles, the tibiae black and hind femur with a weak series of anteroventral bristles. The species differs from *T. albinepennis* by having an anterior bristle on proximal half of mid tibia, 3 or 4 anterodorsal bristles on hind tibia, and recurrent spinules on the subanal plate of ovipositor.

Genus Lispocephala Pokorny

Lispocephala Pokorny, 1893, K.-k. Zool.-Bot. Gessel. Wien, Verhandl. 43 (Abhandl.): 532.

Type-species: *Anthomyia alma* Meigen, by original designation.

The genus *Lispocephala* has 2 pairs of presutural dorsocentral bristles, the frons equally broad in male and female and with 2 pairs of recurrent paraorbital bristles. The anterior pair of paraorbital bristles is robust and set about midway between the anterior pair of parafrontals and inner pair of vertical bristles, fig. 3. The caudal pair of ocellar bristles is directed outward and the lower stigmatal bristle curved downward.

KEYS TO SPECIES OF LISPOCEPHALA IN CALIFORNIA

Males

1. Scutellum densely and widely spotted at basal angles, cross-veins usually clouded . . . . . *alma* (Meigen)
   Scutellum at most with a limited brownish mark at basal angles, cross-veins clear 2
2. Mid tibia with a mid anterior bristle and a close series of slender anteroventral setulae on prosimal half, mid femur with a close series of slender posterior bristles on distal half . . *setipes* Malloch
   Mid tibia and mid femur without the foregoing characters 3
3. Processes of sternum 5 sharply tapering and slightly curved distad, pronglike 4
   Processes broadly maintained distad and blunt at apex 5
4. Third antennal segment mainly grayblack, one or more tibiae infuscated or tinged . . . . . *acuticauda* Huckett
   Third antennal segment extensively yellowish, tibiae fulvous . *nearctica* Huckett
5. Hind tarsal segments 2 to 4 widened and foreshortened, densely setose, dissimilar to mid tarsal segments 2 to 4, segment 1 of hind tarsus longer than segments 2 to 4 . *brevitarsis* Malloch
   Hind tarsal segments 2 to 4 not widened nor foreshortened, segment 1 shorter than segments 2 to 4 . . . . . *erythrocera* (Robineau-Desvoidy)

Females

1. Scutellum densely and widely spotted at basal angles, cross-veins usually clouded . . . . . *alma* (Meigen)
   Scutellum unmarked, or at most with a limited brown marking at basal angles, cross-veins clear 2
2. Mid tibia with a mid anterior bristle . *setipes* Malloch
   Mid tibia without mid anterior bristle . 3
3. Aristal hairs shorter than half width of third antennal segment, the latter yellowish, tinged distad, frontal triangle pale gray . . . . . *nearctica* Huckett
   Aristal hairs as long as half width of third antennal segment, the latter mainly blackish tinged distad, frontal triangle brownish 4
4. Hind tibia usually without mid anteroventral bristle . . . *brevitarsis* Malloch
   Hind tibia usually with mid anteroventral bristle . . . . . *erythrocera* (Robineau-Desvoidy)

Lispocephala acuticauda Huckett

Lispocephala acuticauda Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 282.

Holotype: ♂, Ruby Lake, Inyo County, California. (CAS).

Geographic range.--California.

California records.--INYO CO.: Ruby Lake, 1 ♂, VIII-13-57, holotype (J. Powell, CIS), 1 ♂, same locality and data as holotype, (D. D. Linsdale, CIS).

The male of *L. acuticauda* has the processes of sternum 5 sharply tapering and slightly curved distad, pronglike as in *L. nearctica*, from which it differs in having the tibiae fuscous and third antennal segment mainly grayish black.

Lispocephala alma (Meigen)

Anthomyia alma Meigen, 1826, Syst. Beschr., 5:188.

Type: ♀, locality not stated.

Geographic range.--Widely distributed throughout the north temperate region of North America, reaching northward to central Alaska, the Yukon and Mackenzie River Basin, thence eastward to Labrador, Newfoundland and the New England states, across the northern tier of American states to as far south as Tennessee, Utah and California.

California records.--LOS ANGELES CO.: Big Pines, 1 ♂, 1 ♀, VIII-2-44 (A. L. Melander, USNM). Mountains near Claremont, 1 ♀, no date (Baker, USNM). MONO CO.: Sardine Creek, 8,500 ft. 1 ♂, 1 ♀, VI-28-51 (A. T. McClay, UCD). NEVADA CO.: Sagehen Creek, near Hobart Mills, 1 ♀, VII-7-64, 2 ♀, VII-15-64, in malaise trap (M. E. Irwin, UCR). SAN BERNARDINO CO.: Baldy Grade Falls, San Gabriel Mountains, 1 ♀, X-25-35 (A. J. Basinger, CAS). SHASTA CO.: 3 mi. SE. of Mt. Lassen 1 ♀, VII-8-55 (J. W. MacSwain, CIS). TUOLUMNE CO.: Pinecrest, 1 ♀, VII-9-47 (P. H. Arnaud, CAS).

The species *L. alma* may usually be separated from its congeners by the brown marking at basal angles of scutellum and the brown spots at base of mesonotal macrochaetae. In the male the bristles along ventral margin of tergum 5 are notably strong. The cross-veins are not invariably clouded.

Lispocephala brevitarsis Malloch

Lispocephala brevitarsis Malloch, 1935, Ann. Mag. Nat. Hist., ser. 10 16: 570.

Holotype: ♂, Aklavik, Northwest Territories (USNM).

Geographic range.--Alaska, Alberta, British Columbia, California, Colorado, Labrador, Manitoba, Northwest Territories, Quebec, Yukon Territory.

California records.--ALAMEDA CO.: Alvarado, 1 ♀, II-28-37 (R. C. Dickson, UCR). MARIN CO.: 1.5 mi. NW. of Olema, 1 ♀, VI-10-62 (C. A. Toschi, CIS). PLUMAS CO.: 8 mi. NW of Chester, 1 ♀, VIII-17-58 (J. Powell, CIS). SAN FRANCISCO CO.: San Francisco, 2 ♂, 2 ♀, II-25-26 (M. C. Van Duzee, CAS). SANTA CLARA CO.: 1 ♂, no date (Baker, USNM). SANTA CRUZ CO.: Santa Cruz, 1 ♂, 5 ♀, VII-17-40 (B. Brookman, CAS). SHASTA CO.: 9 mi. W. of Hat Creek P. O., 1 ♀, VII-3-55 (K. Bowers, UCR). TUOLUMNE CO.: Sonora Pass, 1 ♂, 1 ♀, VIII-21-59 (D. D. Linsdale, CIS).

The male of *L. brevitarsis* may readily be distinguished by the shortening of the dilated hind tarsal segments 2 to 4. The female usually is without an anteroventral bristle near the middle of hind tibia.

Lispocephala erythrocera (Robineau-Desvoidy)

(Figs. 3, 15)

Caricea erythrocera Robineau-Desvoidy. 1830, [Paris] Inst. de France, [cl. des] Sci. Math. et Phys., Acad. Roy. des Sci., Mém. présentés par divers Savans [ser. 2], 2: 534.

Coenosia intacta Walker, 1861, Trans. Entomol. Soc. Lond., (1860) 5: 318. name preoc.

Types: sex not indicated, Saint Sauveur and Paris (location unknown).

Geographic range.--Holarctic; widely distributed throughout the provinces and in many of the states of North America, reaching northward to central Alaska, Yukon Territory and Mackenzie River Basin, thence eastward to Labrador and Newfoundland, southward to as far as Florida, Louisiana, and westerly through Kansas, Colorado, Utah, and California.

California records.--ALAMEDA CO.: Alvarado, 4 ♂, 1 ♀, IV-12-31 (E. P. Van Duzee, CAS). Emery[ville], 1 ♀, VIII-25-21 (C. T. Dodds, CIS). COLUSA CO.: Colusa, 1 ♀, VIII-15-55 (R. O. Schuster, CIS). FRESNO CO.: Firebaugh, 1 ♂, IV-22-48 (R. F. Smith, CIS). INYO CO.: Cartago, 2 mi. N., 1 ♂, VII-15-53 (E. I.Schlinger, UCD). Bishop 1 ♀, VII-28-40 (R. H. Beamer, UK). Ruby Lake, 11,250 ft., 1 ♂, VIII-13-57 (D. D. Linsdale, CIS). KINGS CO.: McClure, 2 ♀, III-6-53 (J. C. Hall, UCD). LAKE CO.: Anderson Spring, 1 ♀, XI-25-60 (J. S. Buckett, UCD). LASSEN CO.: Summit Camp, 1 ♀, VI-28-49 (J. W. MacSwain, CIS). LOS ANGELES CO.: Rio Hondo, Montebello, 1 ♀, IV-27-61 (E. C. Bay, UCR). MODOC CO.: Lake City, 1 ♂, 1 ♀, X-11-52 (E. I. Schlinger, J. Hall, UCD). MONO CO.: 1 mi. W. of Tom's Place, 2 ♀, VIII-13-57 (D. D. Linsdale, CIS). White Mountains, 10,150 ft. 3 mi. N. of Inyo County, 2 ♂, VIII-20-63, flight trap (H. B. Leech, CAS). NAPA CO.: Knoxville, 8 ♂, 5 ♀, X-26-52 (J. C. Hall, UCD). SACRAMENTO CO.: Andrus Island, 1 ♂, IV-1931 (CDA). Elk Grove, 1 ♀, IV-18-52 (E. C. Carlson, UCD). Florin, 1 ♂, X-9-28 (H. H. Keifer, CDA). SAN BERNARDINO CO.: Colton, 1 ♀, VII-5-51 (J. C. Hall, UCD). Fawnskin, 1 ♀, VII-29-61 (G. C. Eickwort, MSUM). Victorville, 5 ♂, 7 ♀, IV-28-56 (J. Powell, CIS), 2 ♂, 1 ♀, V-5-56 (M. Wasbauer, CIS). SAN LUIS OBISPO CO.: Oso Flaco Lake, 1 ♀, VI-15-65 (R. Orth, UCR). TUOLUMNE CO.: Yosemite, 7,000 ft. 1 ♂, V-20-34 (O. Bryant, USNM). YOLO CO.: Davis, 1 ♂, IX-30-48 (UCD), 1 ♂, V-14-52 (E. I. Schlinger, UCD), 1 ♂, 2 ♀, III-21-53 (J. C. Hall, UCD). Putah Canyon, 1 ♂, 1 ♀, XI-6-54 (W. H. Lange, UCD). Winters, 1 ♂, VIII-6-29 (R. H. Beamer, UK). Woodland, 1 ♀, III-1-49 (J. Fowler, UCD).

The species *L. erythrocera* is closely related to *L. brevitarsis*, from which it differs in having slender, normal hind tarsi in the male, and a mid anteroventral bristle on hind tibia in the female.

Lispocephala nearctica Huckett

Lispocephala rubricornis Malloch (not Zetterstedt), 1935, Ann. Mag. Nat. Hist., ser. 10 16: 567.

Lispocephala nearactica Huckett, 1965, Mem. Entomol. Soc. Can. 42 p. 182.

Holotype: ♂, Aklavik, Northwest Territories, (USNM).

Geographic range.--Alberta, California, Northwest Territories.

California record.--NEVADA CO.: Sagehen Creek, near Hobart Mills, 1 ♂, VII-6-64, 1 ♀, VII-7-64, in malaise trap (M. E. Irwin, UCR).

The species *L. nearctica* and *L. acuticauda* are closely allied, the former differing from the latter in having the third antennal segment mainly yellowish, being slightly tinged distad, and the tibiae fulvous, without trace of infuscation.

Lispocephala setipes Malloch

Lispocephala setipes Malloch, 1935, Ann. Mag. Nat. Hist., ser 10 16: 567.

Holotype: ♂, Grass Lake, near Tahoe, California (USNM).

Geographic range.--California, Nevada, Oregon.

California records.--AMADOR CO.: 4 mi. N. of Silver Lake, 1 ♀, VII-25-55 (E. I. Schlinger, UCD). EL DORADO CO.: Garden Valley, 1 ♀, IV-3-52 (E. I. Schlinger, UCD). Grass Lake, Luther Pass, 3 ♀, VII-24-55 (J. C. Downey, E. I. Schlinger, UCD). FRESNO CO.: Mono Hot Springs, 1 ♀, VIII-8-56 (R. O.

Schuster, CIS). MODOC CO.: Cedar Pass, 1 ♀, VI-29-55 (K. Bowers, UCR). Eagle Park Meadows, 7,050 ft. 1 ♂, VI-1-31 (CIS). MONO CO.: Sardine Creek, 8,500 ft. 7 ♀, VI-28-51 (E. I. Silver, UCLA; S. G. Watkins, UCD); 3 ♀, VII-11-18-51 (A. T. McClay, UCD). NEVADA CO.: Sagehen Creek, 6,500 ft. near Hobart Mills, 1 ♀, VII-13-61 (J. G. Chillcott, CNC). Truckee, 1 ♀, VI-22-43 (P. H. Arnaud, CAS). PLACER CO.: Grass Lake, near Tahoe, 7,000 ft. 1 ♂, 2 ♀, VII-15-17, types (J. M. Aldrich, USNM). PLUMAS CO.: Buck's Lake, 1 ♀, VII-1-49 (P. D. Hurd, CIS). Clio, 1 ♂, VII-9-16 (H. G. Dyar, USNM). RIVERSIDE CO.: Hemet Reservoir, San Jacinto Mountains, 2 ♂, 1 ♀, VI-14-40 (C. D. Michener, CIS). Herkey Creek, San Jacinto Mountains, 1 ♀, VI-10-40, 1 ♀, VI-14-50 (C. D. Michener, CIS). 5 mi. W. of Sage, 1 ♂, VII-3-63 (E. I. Schlinger, UCR). SAN BERNARDINO CO.: Bear Valley, 1 ♀, VI-6-14 (R. S. Woglum, CIS). Boulder Bay, Big Bear Lake, 1 ♂, 1 ♀, VII-8-65, 1 ♂, IX-20-65 (R. E. Orth, UCR). Jenks Lake, 1 ♂, VIII-18-50 (A. L. Melander, USNM). Santa Ana River, South Fork(s), 2 ♂, VII-29-42, 1 ♂, 1 ♀, VII-31-42, 2 ♂, VI-19-45 (A. L. Melander, USNM). SAN DIEGO CO.: Laguna Mountains, 1 ♀, VII-6-29 (R. H. Beamer, UK). SANTA CRUZ CO.: Santa Cruz, 1 ♀, VII-17-40 (B. Brookman, CAS). SHASTA CO.: Old Station, 1 ♂, 1 ♀, VI-22-55 (E. E. Lindquist, CIS). SIERRA CO.: 1 mi. W. of Sierraville, 1 ♀, VIII-3-65 (T. W. Fisher, R. Orth, UCR). Yuba Pass, 1 ♂, 1 ♀, VIII-20-53 (E. I. Schlinger, UCD). SISKIYOU CO.: Mt. Shasta City, 1 ♀, VII-13-58 (J. Powell, CIS). Sugar Creek, Etna, 1 ♀, VII-16-39 (F. D. Horn, CAS). TULARE CO.: Johnsondale, 1 ♂, IV-27-64 (J. Doyen, CIS). TUOLUMNE CO.: Harden Lake, 7,575 ft. 1 ♂, 1907 (HCH). Tuolumne Meadows, 1 ♀, VII-9-46 (T. O. Thatcher, CIS). Yosemite, 7,000 ft. 2 ♂, 1 ♀, V-20-34 (O. Bryant, USNM). TUOLUMNE-MARIPOSA CO.: Yosemite National Park, 1 ♀, VIII-1-40 (D. E. Hardy, UK).

The species *L. setipes* may be distinguished from allied taxa by having a mid anterior bristle on mid tibia. In addition the mid tibia of the male has a dense series of anteroventral setulae on proximal half.

Genus Pentacricia Stein

Pentacricia Stein, 1898, Berl. Entomol. Z., (1897) 42: 249.

Type-species: *Pentacricia aldrichii* Stein (monobasic).

The Nearctic genus *Pentacricia* and its sole species *P. aldrichii* may be distinguished readily from among the *Coenosiinae* of North America by the plumose arista and the hairs on dorsal half of parafacials.

Pentacricia aldrichii Stein

Pentacricia aldrichii Stein, 1898, Berl. Entomol Z., (1897) 42: 249.

Syntypes: ♂♂ ♀, Tifton, Georgia; Algonquin, Illinois; Kansas (FMNH, USNM).

Geographic range.--Widely distributed in the north temperate region of North America, reaching its northern limits in the provinces of Alberta, Ontario, and the state of Maine, from thence southward along the Atlantic border from New York to Florida, in the central states from North Dakota and Michigan to Kansas; westward in Wyoming, Utah, and Nevada, and on the Pacific coast from Washington to California.

California records.--CALAVERAS CO.: Milton, 1 ♂, X-21-17 (J. C. Bradley, CU). FRESNO CO.: Fresno, 1 ♂, XI-12-22 (M. E. Phillips, HCH). SAN DIEGO CO.: Desert edge, 1 ♂, IV-17-15 (M. C. Van Duzee, CAS). SANTA CRUZ CO.: Capitola, 1 ♂, 1 ♀, VI-7-12-40 (M. T. and H. B. James, USU). SHASTA CO.: Cassel, 1 ♀, VII-15-55 (E. I. Schlinger, UCD). SIERRA CO.: 1 mi. W. of Sierraville, 1 ♀, VIII-3-65 (T. W. Fisher, R. Orth, UCR). YOLO CO.: Winters, 1 ♂, XI-3-52 (W. H. Lange, UCD).

Subfamily LISPINAE

Genus Lispe Latreille

Lispe Latreille, 1796, Précis des caractères génériques des insectes, p. 168; Snyder, 1954, Am. Mus. Novit., No 1675 pp. 1-40.

Type-species: *Musca tentaculata* De Geer, by subsequent designation of Latreille, 1802.

The subfamily Lispinae is represented in North America by the single genus *Lispe* Latreille. Adults possess the following diagnostic characters: Pteropleura with several hairs posteriorly, palpi abruptly or gradually dilated, parafacials rarely without a few or several short setulae or hairs. The frons in both sexes is similarly broad and bristled and is without cruciate bristles; the arista is plumose. The flies are commonly found on the herbage and grasses near lakes and ponds and along the margins of rivers, and are known to feed on small nematocerous diptera and aquatic larvae (Lamborn, 1920: 279; Séguy, 1923: 187; Hobby, 1934: 185; Cuthbertson, 1937: 23). Larvae of *Lispe* are aquatic or semi-aquatic (Johannsen, 1935: 42), and have been known to be zoophagous (Williams, 1939: 114-115).

KEYS TO SPECIES OF LISPE IN CALIFORNIA

Males

1. Mid tibia without mid anterodorsal bristle, sternum 5 with a lengthy median caudal process, fore metatarsus with an apical prolongation overlapping segment 2, scutellum with fine ventral

hairs at apex 2
Mid tibia with a mid anterodorsal bristle, sternum 5 without a lengthy medial process directed caudad, fore metatarsus without a slender apical prolongation, scutellum hairless on ventral border at apex 3

2. Fore metatarsal prolongation longer than the basal part of metatarsus . . . . . *tentaculata* (De Geer)
Fore metatarsal prolongation shorter than the basal part of metatarsus . . . . . *patellata* Aldrich

3. Second mid tarsal segment much shorter than the third, mid tibia with 2 posterior bristles . . . . . *sordida* Aldrich
Second mid tarsal segment as long or longer than the third, mid tibia with 1 posterior bristle 4

4. Hypopygium sooty black and with a chalk-white dorsal mark, palpi broadly and abruptly dilated 8
Hypopygium not thus marked, palpi gradually widening from base to apex 5

5. Mid tibia with an anteroventral bristle . 6
Mid tibia without mid anteroventral bristle 7

6. Tibiae blackish, concolorous with femora . *polita* Coquillett
Tibiae fulvous . . . . . *cotidiana* Snyder

7. Mesonotum with 4 pairs of postsutural dorsocentral bristles . . . . *nasoni* Stein
Mesonotum with 3 pairs of postsutural dorsocentral bristles. *neouliginosa* Snyder

8. Fourth mid tarsal segment with an apical spine or spur on posterior surface, as long as segment 5 (fig. 28.) 9
Fourth mid tarsal segment without a longish apical spine on posterior surface . 10

9. Vibrissae weak or absent, nondifferentiated from adjacent bristling . . . . *probohemica* Speiser
Vibrissae well developed, longer than maximum width of palpus . .*argentea* Snyder

10. Vibrissae weak or absent, nondifferentiated from adjacent bristling 11
Vibrissae well developed and as long as maximum width of palpus 13

11. Palpi nigrescent, dark brown or blackish, parafacials with a broad dark transverse band opposite base of antennae, the ventral margin reaching a level opposite apical half of second antennal segment . . . . . *palposa* (Walker)*
Palpi reddish brown or paler, parafacials with a narrow linear dark band at base of antennae, restricted to a level opposite basal half of second antennal segment, or such a marking absent . . . 12

12. Hind tarsal segments 2 to 5 attenuated and foreshortened, the fifth inconspicuously haired near apex of posterior surface (fig. 30a.) . . . *brevipes* Aldrich
Hind tarsal segments 2 to 5 normal and undiminished, the fifth segment not small and having longish preapical hairs on posterior surface (fig. 30b.) . *jamesi* Snyder

13. Sternum 5 not notched, with a short stubby subdivided median process directed caudad (fig. 53). *desertorum* Huckett
Sternum 5 with a caudal notch or indentation 14

14. Palpi purplish, sternum 5 with a weak shallow median notch (fig. 54), hind femur with a few short posteroventral bristles . . . . . *approximata* Huckett
Palpi yellowish or ochreous, sternum 5 deeply notched, hind femur with dense long posteroventral bristles . . . . . *salina* Aldrich

Females

1. Mid tibia without a mid anterodorsal bristle, scutellum with fine ventral hairs at apex 2
Mid tibia with a mid anterodorsal bristle, scutellum without fine ventral hairs at apex 3

2. Mid and/or hind tibiae more or less fulvous, or if both darkened at least largely reddish tinged on ventral surface, knees pallid . *tentaculata* (De Geer)
Mid and hind tibiae largely black, knees fulvous . . . . . *patellata* Aldrich

3. Mid tibia usually with 2 posterior bristles, fore tibia with a mid postero-posteroventral bristle . . *sordida* Aldrich
Mid tibia with 1 posterior bristle . . . 4

4. Hind tibia with mid anteroventral bristle, palpi gradually widening from base to apex 5
Hind tibia without mid anteroventral bristle, palpi broadly and abruptly dialated 8

5. Mid tibia with a mid anteroventral bristle 6
Mid tibia without mid anteroventral bristle 7

6. Tibiae blackish . . . . . *polita* Coquillett
Tibiae fulvous . . . . . *cotidiana* Snyder

7. Four pairs of postsutural dorsocentral bristles . . . . . *nasoni* Stein
Three pairs of postsutural dorsocentral bristles . . . . . *neouliginosa* Snyder

8. Palpi nigrescent or purplish 9
Palpi yellow to partly reddish brown . . 10

9. Parafacials with a dark transverse band opposite the base of antennae and with hairs on dorsal and ventral halves . . *palposa* (Walker)*
Parafacials silvery opposite the base of antennae, nonbanded thereat, and without hairs on dorsal half . . . . . *approximata* Huckett

10. Presutural region of mesonotum, seen from in front, with interserial stripes between the planes of acrostical and dorsocentral bristles, and continuing caudad to postsutural region; with a median postsutural vitta that ends cephalad at transverse suture. *salina* Aldrich

Mesonotum stripeless, or if present are along planes of acrostical and/or dorsocentral bristles 11

11. Parafacials with a narrow dark transverse band opposite base of antennae . 12
Parafacials silvery at base of antennae, nonbanded thereat 13

12. Hind femur with a proximal series of longish bristles continued to middle of posteroventral surface, tergum 5 without divergent marking *brevipes* Aldrich
Hind femur with longish posteroventral bristles restricted to basal region, tergum 5 with a V-shaped marking, in shape diverging caudad . . . *jamesi* Snyder

13. Hind femur with anteroventral bristles longer than maximum height of femur, posteroventral bristles longer than half height of femur where situated, abdomen with lateral marking . . . . . *probohemica* Speiser *argentea* Snyder
Hind femur with anteroventral bristles not longer than maximum height of femur, posteroventral bristles about equal to half height of femur where situated, abdomen unmarked . . . . . *desertorum* Huckett

Lispe approximata Huckett

(Fig. 54)

Lispe approximata Huckett, 1966, Proc. Calif. Acad. Sci., Ser. 4 34: 283.

Holotype: ♂, Salt marshes, Palo Alto, California (CAS).

Geographic range.--California, Oregon.

California records.--SANTA CLARA CO.: Salt marshes, Palo Alto, 1 ♂, V-23-21, holotype (CAS).

The species *L. approximata* has palpi purplish, and differs from *L. palposa* in having well developed vibrissae and being without a dark transverse band on profrons opposite the second antennal segment; from *L. sordida* in having no mid posterior bristle on fore tibia, nor a mid anteroventral bristle on hind tibia.

Lispe argentea Snyder

Lispe argentea Snyder, 1954, Am. Mus. Novit., No. 1675 p. 27.

Holotype: ♂, San Joaquin River, Newman, California (USNM).

Geographic range.--California.

California records.--LAKE CO.: Lake Pillsbury, 1 ♂, VII-1-51 (W. C. Bentinck, CIS). SAN JOAQUIN CO.: Stockton, 1 ♂, VIII-19-19 (E. P. Van Duzee, MCZ). STANISLAUS CO.: Newman, San Joaquin River, 2 ♂, VI-16-24, type series (J. M. Aldrich, USNM; AMNH).

The species *L. argentea* is closely related to *L. probohemica*, from which it differs in having well-developed vibrissae in the male.

Lispe brevipes Aldrich

(Figs. 29, 30)

Lispa brevipes Aldrich, 1913, J. N. Y. Entomol. Soc., 21: 137.

Neotype: ♂, Moscow, Idaho, *teste* Snyder 1954 (USNM).

Geographic range.--California, Colorado, Idaho, Indiana, Manitoba, Nevada, Oregon, Washington, Wisconsin.

California record.--PLACER CO.: Lakeside, Tahoe, 4 ♂, VI-19-27 (J. M. Aldrich, USNM).

The species *L. brevipes* and *L. jamesi* closely resemble one another. The male of *L. brevipes* may be separated from that of *L. jamesi* by the short, attenuated or dwindling distal segments of the hind tarsus, with weak hairs, fig. 29; in the female by the absence of a divergent mark on tergum 5 caudally directed, and by the longer proximal series of posteroventral bristles on hind femur, that continues to middle of that surface.

Lispe cotidiana Snyder

Lispe cotidiana Snyder, 1954, Am. Mus. Novit., No. 1675 p. 22.

Holotype: ♂, Suffield, Alberta (AMNH).

Geographic range.--Widely distributed in the north temperate region of North America, attaining its northern limits in central Alaska, the Yukon and Mackenzie River Basin as far as Aklavik, thence from Alberta eastward across the provinces and northern tiers of states to Quebec, southern Labrador and New England; in the Rocky Mountain region from Idaho to New Mexico, and on the Pacific coast from British Columbia to California. Also in central Asia.

California records.--SAN BERNARDINO CO.: Big Bear Lake, 1 ♀, VIII-24-53 (E. I. Schlinger, UCD). SIERRA CO.: 1 mi. W. of Sierraville, 7 ♂, 8 ♀, VIII-3-65 (T. W. Fisher, R. Orth, UCR). SISKIYOU CO.: Shasta River, 1.3 mi. E. of Grenada, 1 ♀, VIII-6-65 (T. W. Fisher, R. Orth, UCR).

The species of *L. cotidiana* and *L. polita* have a mid anteroventral bristle on mid tibia, thereby differing from their congeners. In *L. cotidiana* the tibiae are fulvous, in *L. polita* blackish.

Lispe desertorum Huckett

(Fig. 53)

Lispe desertorum Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 284.

Holotype: ♂, Potholes, Imperial County, California (CAS).

Geographic range.--California.

California records.--IMPERIAL CO.: Potholes, 1 ♂, IV-12-23, holotype (E. P. Van Duzee, CAS). SAN BERNARDINO CO.: Needles, 1 ♀, II-18-15 (M. C. Van Duzee, CAS).

This small whitish gray species may be distinguished in the male from its nearest relatives in the *palposa*-group by the small medial stumpy process on caudal margin of sternum 5, the latter not notched (fig. 53); in the female by the short anteroventral and posteroventral bristles on the hind femur, and by the unmarked abdomen.

Lispe jamesi Snyder

(Fig. 30)

Lispe jamesi Snyder, 1954, Am. Mus. Novit., No. 1675 p. 33.

Holotype: ♂, Neskowin, Oregon (WSU).

Geographic range.--Alaska, California, Oregon, Washington.

California records.--MARIN CO.: 6 mi. W. of Inverness, 1 ♂, 2 ♀, VII-28-62 (M. E. Irwin, L. A. Stange, UCD). MODOC CO.: Cedar Pass, 1 ♀, VI-29-55 (R. D. Browning, UCD). SANTA CRUZ CO.: Santa Cruz, 1 ♀, VI-15-17-50 (M. T. James).

The male of *L. jamesi* has weak or undeveloped vibrissae, as in the male of *palposa*, but differs from the latter in the paler color of the palpi and by the narrower dark transverse band on the profrons; from the male of *L. brevipes* by the more robust hind tarsal segments (fig. 30b). The female of *L. jamesi*, as in the male, has paler palpi and narrower profrontal bands than in the female of *L. palposa*. It differs from the female of *L. brevipes* in having a caudally divergent V-shaped mark on tergum 5, and the posteroventral bristles on hind femur are restricted to the basal region.

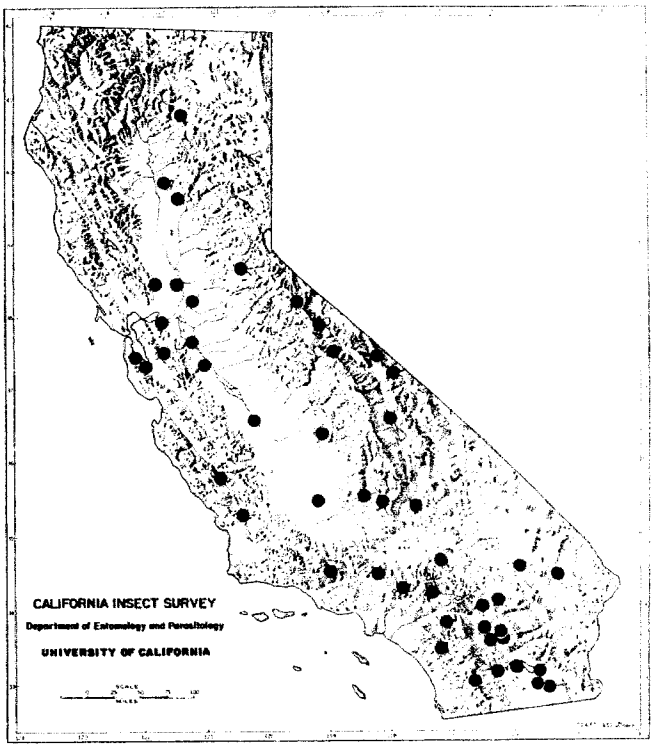
Lispe nasoni Stein

(Map 16)

Lispa nasoni Stein, 1898, Berl. Entomol. Z., (1897) 42: 280.

Syntypes: ♂♂ ♀♀, Algonquin, Illinois; Georgia, South Dakota (FMNH).

Geographic range.--Widely distributed in continental North America, reaching northward to central Alaska and eastward throughout the provinces from Alberta to Quebec, southward to include many of the states in various regions, reaching as far as Florida and the Bahama Islands in the East, the Gulf States to the South, and Arizona and California in the West.



Map 16. California distribution of *Lispe nasoni* Stein.

California records (map 16).--This species has an austral distribution, occurring in the Great Basin, both deserts, the Central Valley, and interior valleys of the Coast Range. There is one record at Pollock Pines in the central Sierra Nevada. The flight period is prolonged, from March to October in the south and April to October in the north, without disjunct generations shown by available records. Specimens were available from more than 60 localities representing 26 counties.

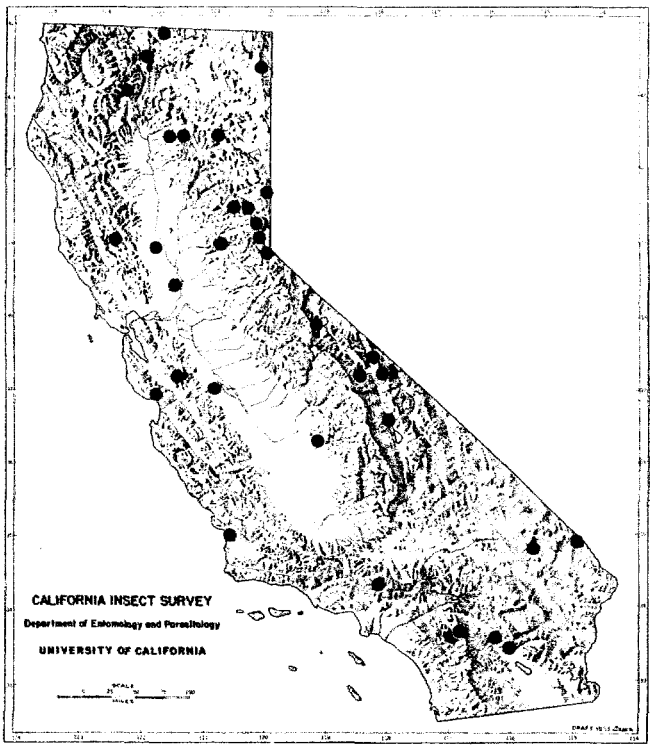
The species *L. nasoni* may be distinguished from its congeners by the presence of 4 pairs of postsutural dorsocentral bristles, the two anterior pairs being short, and scarcely much longer than half length of the two posterior pairs.

Lispe neouliginosa Snyder

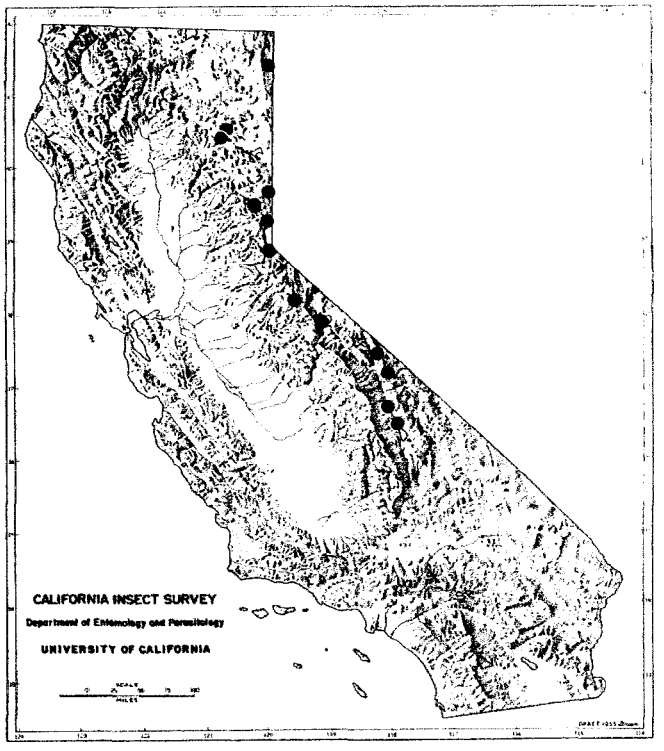
(Map 17)

Lispe neouliginosa Snyder, 1954, Amer. Mus. Novit., No. 1675 p. 24.

Holotype: ♂, Lone Pine, Inyo County, California (AMNH).



Map 17. California distribution of *Lispe neouliginosa* Snyder.



Map 18. California distribution of *Lispe polita* Coquillett.

Geographic range.--Arizona, California, Idaho, New Mexico, Nevada, Ontario, Oregon, Saskatchewan, Utah, Washington.

California records (map 17).--This species has a distribution similar to that of *Lispe nasoni*, occurring primarily in drier, interior valleys, although records for *L. neouliginosa* are mostly from more northern areas. The flight period is correspondingly shorter, with captures from April or May to August in most areas. However, there are two records for November in the Colorado Desert.

The species *L. neouliginosa* is related to *L. nasoni*, both having the palpi gradually widening from base to apex, the mid tibia without and hind tibia with a mid anteroventral bristle. In males of both species the hypopygium is concolorous with abdomen. *L. neouliginosa* differs from *L. nasoni* in having 3 pairs of postsutural dorsocentral bristles.

Lispe patellata Aldrich

Lispa patellata Aldrich, 1913, J. N. Y. Entomol. Soc., 21: 140.

Syntypes: ♂♂, Moscow, Idaho (USNM, MCZ).

Geographic range.--California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, Wyoming.

California records.--INYO CO.: near Mono Pass, 12,000 ft. 1 ♀, VIII-19-56 (C. D. MacNeill, CIS). Upper Rock Creek, 10,000 ft. NW. Inyo County, 1 ♀, VIII-14-63 (M. J. Tauber, C. A. Toschi, CIS). MONO CO.: Leavitt Meadow, 7,200 ft. 1 ♂, 2 ♀, VIII-13-63, flight trap (H. B. Leech, CAS). White Mountains, 10,150 ft. 3 mi. N. of Inyo County, 1 ♂, 2 ♀, VIII-20-63, flight trap (H. B. Leech, CAS).

The species *L. patellata* is closely related to *L. tentaculata*, the male differing from that of *L. tentaculata* by having a shorter prolongation on fore metatarsus. The female of *L. patellata* has mid and hind tibiae black, and fulvous at base and at apex.

Lispe polita Coquillett

(Map 18)

Lispe polita Coquillett, 1904, Invert. Pacifica, Dipt. 1:34.

Type: ♂, Ormsby County, Nevada (USNM).

Geographic range.--Alberta, California, Colorado, Idaho, Nevada, Oregon, South Dakota, Utah, Wyoming.

California records.--EL DORADO CO.: Lake Tahoe,

1 ♂, 1 ♀, VIII-11-40 (R. H. Beamer, UK). INYO CO.: Deep Springs, 1 ♂, VII-16-53 (E. I. Schlinger, UCD). Independence, 1 ♀, IX-1-63 (J. D. Birchim, JDB). Lone Pine, 1 ♀, VII-11-37 (C. L. Johnston). LASSEN CO.: Bridge Creek Camp, 1 ♂, VII-9-49 (R. C. Bechtel, UCD). Hallelujah Junction, 2 ♀, VI-27-49 (B. Keh, BVC); 8 ♂, 5 ♀, VI-27-49 (D. Cox, C. I. Smith, UCD); 5 ♂, 6 ♀, VII-4-49 (E. L. Atkinson, P. D. Hurd, CIS; A. S. Deal, UCD). Summit Camp, 8 ♂, 2 ♀, VI-28-49 (E. L. Atkinson, W. H. Wade, CIS; A. S. Deal, E. I. Schlinger, UCD). MODOC CO.: 15 mi. E. of Cedarville, 1 ♀, VII-3-35 (J. Schuh, OSU). MONO CO.: Blanco's Corral, 10,000 ft. White Mountains, 3 ♂, 1 ♀, VI-20-53 (J. W. MacSwain, CIS). Cottonwood Creek, 1 ♂, VII-14-53 (H. Nakakihara, UCR). Crooked Creek, 9,000 ft. White Mountains, 1 ♂, VI-20-53 (J. W. MacSwain, CIS). Mono Lake, 1 ♂, VI-23-37 (J. H. Mitchell, AMNH). Sardine Creek, 1 ♀, VI-28-51, 1 ♀, VII-12-51 (A. T. McClay, UCD). NEVADA CO.: Floriston, E. of Truckee, 1 ♂, VI-4-40 (M. T. and H. D. James, WSU). SIERRA CO.: 1 mi. W. of Sierraville, 3 ♂, 4 ♀, VIII-3-65 (T. W. Fisher, R. Orth, UCR).

The species *L. polita* is allied to *L. cotidiana*, but differs markedly in its blackish shiny appearance and blackish tibiae.

Lispe probohemica Speiser

(Fig. 28)

Lispa spinipes Aldrich, 1913, J. N. Y. Entomol. Soc., 21: 136. name preoc.

Lispa probohemica Speiser, 1914, Zool. Anz., 44: 93.

Syntypes: 2 ♂ 1 ♀, Lake Elsinore, Riverside, County, California; Lewiston, Idaho (USNM).

Geographic range.--Holarctic; in the Nearctic: Arizona, California, Idaho, Kansas, Mississippi, New Mexico, Oregon, Texas, Washington.

California records.--INYO CO.: Big Pine, 1 ♀, VI-16-29 (E. P. Van Duzee, CAS). MONTEREY CO.: Bradley, 1 ♂, V-23-20 (E. P. Van Duzee, CAS). RIVERSIDE CO.: Elsinore Lake, 1 ♂, VIII-2-11, syntype of *spinipes* (J. M. Aldrich, USNM), 1 ♂, V-25-44 (A. L. Melander, USNM). STANISLAUS CO.: 5 mi. NE. of Crows Landing, 3 ♂, VII-23-60 (W. A. Steffan, CIS). YOLO CO.: Davis, 1 ♂, IV-23-52 (E. I. Schlinger, UCD).

Males of *L. probohemica* and *L. argentea* have a lengthy apical spine or spur on posterior surface of fourth mid tarsal segment (fig. 28). The male of *L. probohemica* differs from that of *L. argentea* in having the vibrissae absent or weak and scarcely differentiated from the adjacent bristling. The females of both species have well developed vibrissae, and are hardly to be distinguished from one another.

Lispe salina Aldrich

Lispa salina Aldrich, 1913, J. N. Y. Entomol. Soc., 21: 134.

Syntypes: ♂♂ ♀♀, Great Salt Lake, Utah; Pyramid and Walker Lakes, Nevada; Borax Lake, California (USNM), also 1 ♂, Walker Lake, Nevada, and 3 ♀, Borax Lake, California (MCZ).

Geographic range.--Alberta, California, Colorado, Manitoba, Northwest Territories, Nebraska, Nevada, Oregon, Saskatchewan, Utah, Washington.

California records.--HUMBOLDT CO.: Orick, 3 ♀, IX-18-34 (A. L. Melander, USNM). INYO CO.: Klondike Lake, 1 ♀, VII-18-53 (W. D. McLennan, UCD). LAKE CO.: Borax Lake, 1 ♂, 4 ♀, VIII-8-11, syntypes (J. M. Aldrich, MCZ; USNM); 1 ♀, VIII-6-62 (G. Grodhaus, BVC). Lower Lake, Borax Lake, 6 ♂, 5 ♀, V-14-22 (E. P. Van Duzee, CAS). MONO CO.: Black Lake, 1 ♀, VIII-10-62 (L. A. Stange, UCD). Topaz Lake, 1 ♀, VII-17-51 (A. T. McClay, UCD). RIVERSIDE CO.: Lake Elsinore, 3 ♂, XI-21-34, 1 ♀, V-10-50 (A. L. Melander, USNM). SISKIYOU CO.: Salt Lake, 1 ♂, 1 ♀, VIII-20-32 (J. E. Davis, OSU).

The male of *L. salina* may be distinguished from those of related species by the dense series of long posteroventral bristles on proximal half of hind femur; the female by the striping on the thorax, which when viewed from in front has interserial stripes between the respective series of acrostical and dorsocentral bristles, and a median vitta restricted to the postsutural region.

Lispe sordida Aldrich

Lispa sordida Aldrich, 1913, J. N. Y. Entomol. Soc., 21: 132.

Syntypes: ♂♂ ♀♀, Box Elder Lake, Brigham City, Utah (USNM, MCZ).

Geographic range.--California, Colorado, Idaho, New Mexico, Oregon, Utah, Washington, Wyoming.

California records.--ALAMEDA CO.: Oakland, 1 ♀, VIII-15-49 (L. W. Quate, CIS). CONTRA COSTA CO.: Antioch, 2 ♀, IV-20-50 (P. D. Hurd, CIS). FRESNO CO.: Fresno Slough, Mendota, 1 ♂, VI-8-65 (P. Yost, UCR). IMPERIAL CO.: Foot of Mountains, W. of Salton Sea beach, 1 ♂, VII-23-52 (H. B. Leech, CAS). KERN CO.: Wasco, 1 ♀, VII-27-51 (L. W. Isaak, UCD). LOS ANGELES CO.: Santa Monica Mountains, 3 ♂, 8 ♀, VII-6-49 (UCLA). RIVERSIDE CO.: Deep Canyon, 1 ♀, V-16-63, at light (E. I. Schlinger, UCR), 2 ♀, V-30-64, at light (M. E. Irwin, UCR). Lake Elsinore, 1 ♂, VIII-2-11 (J. M. Aldrich, HCH); 1 ♀, XI-21-34 (A. L. Melander, USNM). Temecula, 1 ♂, 1 ♀, VI-7-45 (A. L. Melander, USNM). SAN DIEGO CO.: Solana Beach, 1 ♂, VI-19-63 (J. D. Birchim, JDB). SAN JOAQUIN CO.: Tracy, 6 ♂, 2 ♀, VI-1-51 (J. W. MacSwain, CIS). SISKIYOU CO.: Gazelle, 1 ♀, IX-11-50 (A. T. McClay, UCD). SOLANO CO.: Lake Dalwigk, 1 ♂, X-27-61, 2 ♂, VIII-13-62 (R. E. Doty, BVC). TUOLUMNE CO.: Saddlebag Lake, Yosemite Nstional Park, 1 ♀, VIII-2-36 (CIS).

The species *L. sordida* may be distinguished from those in the *palposa*-group by the presence of a mid posterior brirtle on fore tibia, a mid anteroventral bristle on hind tibia, and 2 posterior bristles on mid tibia. The male of *L. sordida* has the second mid tarsal segment shorter than the third.

Lispe tentaculata (De Geer)

Musca tentaculata De Geer, 1776, Mémoires pour servir a l'histoire des Insectes. 6: 86.

Eriphia acela Walker, 1849, List Dipt. Br. Mus., 4: 962.

Type: Sweden.

Geographic range.--Holarctic; widely distributed in continental North America, reaching northward to southern Alaska, central Yukon Territory and Great Slave Lake Region, thence eastward across the provinces to Quebec, Labrador and New England states, southward occurring in several states of various regions to as far as South Carolina in the East, Oklahoma, Arkansas and Texas in the South, and Arizona and California in the West.

California records.--The species *L. tentaculata* is widely distributed in California, being recorded from 43 counties and approximately 226 localities. It occupies a broad ecological range similar to that of *Schoenomyza dorsalis* (map 1). A total of 779 specimens of *L. tentaculata* were examined, comprising 336 males and 443 females.

The flight period of *Lispe tentaculata* is extended in areas of moderate climate, with records available for every month except December in cismontane southern California and from February till October in central coastal counties. Inland, the activity period is more limited than other widespread muscids in California, with no records in the Central Valley or mountains earlier than May and few later than August. The species ranges from the margins of both deserts to above 10,000 feet in the southern Sierra Nevada.

The species *L. tentaculata* is closely related to *L. patellata* and *L. sociabilis* Loew*, the three differing from their congeners in normally lacking a mid anterodorsal bristle on mid tibia, and a preapical anterodorsal on hind tibia, or the latter bristle if differentiated being weak or setulose. The male of *L. tentaculata* may be distinguished by the long distal prolongation on the fore metatarsus, which in length exceeds that part of the metatarsus forming the basal or proximal portion of the segment. The females of *L. tentaculata* may be separated from those of *L. patellata* by having the tibiae more or less fulvous, or if largely darkened at least with a trace of reddish tinge on ventral surface of mid and hind tibiae.

Subfamily LIMNOPHORINAE

KEY TO GENERA OF LIMNOPHORINAE IN CALIFORNIA

1. Vein R_{4+5} with setulae near base on upper and under surfaces of wing, prosternum usually with a few marginal hairs 2
   Vein R_{4+5} without setulae near base on upper and under surfaces of wing, prosternum bare 4
2. Frons in both sexes similarly broad and bristled, eyes in male separated thereat by a distance greater than that between first pair of dorsocentral bristles 3
   Frons in male narrower and dissimilar in bristling to that of female . . . . . *Limnophora* Robineau-Desvoidy
3. Vein M_{1+2} broadly curved cephalad at apical region, arista thickened on proximal third, mid coxa with a short spinular apical bristle mesad . . . . . *Bucephalomyia* Malloch
   Vein M_{1+2} not curved cephalad at apical region, arista slender on proximal third, mid coxa without spinular apical bristle . *Pseudolimnophora* Strobl
4. Profrons haired . . . . . *Lispoides* Malloch
   Profrons without hairs 5
5. First abdominal sternum with stiffish setulae, hind tibia with preapical anterodorsal bristle absent . . . . . *Gymnodia* Robineau-Desvoidy
   First abdominal sternum bare or with weak setulae, hind tibia with preapical anterodorsal bristle present . . *Spilogona* Schnabl

Genus Lispoides Malloch

Lispoides Malloch, 1920, Trans. Am. Entomol. Soc., 46: 146.

Type-species: *Limnophora aequifrons* Stein, by original designation.

The genus *Lispoides* Malloch as represented by the species *L. aequifrons* (Stein) may be separated from related genera by the presence of hairs on the profrons. The frons and interfrontalia in the male are moderately wide throughout, and with parafrontal bristles arranged as in the female. The prosternum is bare, the first abdominal sternum setulose, and vein R_{4+5} without setulae near base. The species is widely distributed in North America. Adults may commonly be collected on the rocks in streams or nearby. The immature stages are aquatic

or semiaquatic, and have been described and illustrated by Johannsen (1935: 41).

Lispoides aequifrons (Stein)

Limnophora aequifrons Stein, 1898, Berl. Entomol. Z., (1897) 42: 205.

Syntypes: ♂ ♀, Moscow, Idaho, and Custer, South Dakota (FMNH).

Geographic range.--In the West from southern Alaska and Alberta south to California, Arizona and New Mexico; in the East from Quebec and New England, and states bordering the Great Lakes to along the Atlantic littoral as far as Georgia.

California records.--Lispoides aequifrons flies throughout the year in coastal southern California and from February till October in one or another of the central coastal counties. In the interior valleys the season is nearly as prolonged, with records for February in Yolo County and March at Oroville and as late as October in both Modoc and Inyo Counties. The species has been taken during the summer months at high elevations, above 9,000 feet in the central Sierra Nevada and 10,000 feet in the White Mountains.

The species is widespread, with a distribution similar to that of *Schoenomyza dorsalis* (map 1), having been recorded from 41 counties and approximately 166 localities based on an examination of 602 specimens, of which 276 were males and 326 females.

Genus Spilogona Schnabl

Limnophora (Spilogona) Schnabl, 1911, Dtsch. Entomol. Z., No. 6 p. 92.

Type-species: *Aricia carbonella* Zetterstedt (monobasic).

The genus *Spilogona* differs from *Limnophora* in the absence of hairs or setulae on prosternum and at base of vein R_{4+5}, and in the presence of the preapical anterodorsal bristle on hind tibia; from *Lispoides* in the absence of hairs on the profrons. Little is known of the habits of the species. Adults occur in moist terrain, on rocks and herbage in watery or swampy conditions, near streams and lakes, or along the seashore. Larvae and puparium of *S. torreyae*,* have been found in streams in New York, and have been described and illustrated by Johannsen (1935: 41).

KEYS TO SPECIES OF SPILOGONA IN CALIFORNIA

Males

1. Thorax normally with 4 pairs of postsutural dorsocentral bristles 2
   Thorax normally with 3 pairs of postsutural dorsocentral bristles 13
2. Mid tibia with 1 or 2 ventral bristles, epistoma extended cephalad to a level slightly beyond tip of profrons . . . *pseudodispar* (Frey)
   Mid tibia without mid ventral bristles, epistoma not extended cephalad to a level with tip of profrons 3
3. Abdomen almost entirely blackish or deep seal brown, or entirely so, marks absent 4
   Abdomen with darker dorsal marks . . . 5
4. Squamae browned, knobs of halteres purple . . . . . *concolor* (Stein)
   Squamae yellowish tinged, knobs of halteres yellow . *churchillensis* Huckett
5. Presutural acrosticals coarser than adjacent setulae, being bristly . . . 6
   Presutural acrosticals fine and slender, similar to adjacent setulae 8
6. Interfrontalia obscured caudad by the contiguous parafrontals, maximum height of eye nearly equal to length of fore tibia . *argentiventris* (Malloch)
   Interfrontalia continuous caudad, separating the parafrontals 7
7. Thorax blackish, mid tibia with an anterodorsal bristle, hind femur with full series of anteroventral bristles . . *tetrachaeta* (Malloch)
   Thorax gray, mid tibia without anterodorsal bristle, hind femur with anteroventral bristles restricted to distal half of femur . . . . . *cretans* Huckett
8. Interfrontalia evenly broad throughout, about as wide as length of third antennal segment, marks on terga 3 and 4 fused across dorsum and extended along posterior borders to venter, vibrissal angle coarsely setulose . . . *nobilis* (Stein)
   Interfrontalia much narrower caudad or entirely obscured thereat, marks on tergum 4, if present, not fused across dorsum 9
9. Abdomen densely whitish pruinescent on dorsum and without marks on tergum 4 . *leucogaster* (Zetterstedt)
   Abdomen not densely whitish pruinescent and/or with paired marks on tergum 4 . 10
10. Hind femur with proximal posteroventral bristles, the longer nearly equal to height of femur where situated . . . 11
    Hind femur without proximal posteroventral bristles, or if present setulose and not longer than half height of femur where situated 12
11. Scutellum with preapical hairs or setulae on upper border of declivities, haustellum dull, mesonotum and scutellum black . *obscuripennis* (Stein)
    Scutellum without preapical setulae on upper border of declivities, haustellum polished, mesonotum and scutellum gray and with brown markings . . . . . *tundrarum* Huckett

12. Mesopleural series of bristles with a fine slender bristle on predorsal interspatial locus (fig. 13). . . . . *imitatrix* (Malloch)
Mesopleural series of bristles with predorsal interspatial locus bare, bristleless . . . . . *sororcula* (Zetterstedt)
13. Squamae browned . . . . . *anthrax* (Bigot)
Squamae whitish or yellowish tinged . . 14
14. Narrower part of frons as wide or wider than twice breadth of third antennal segment, inner pair of vertical bristles about as long as first pair of dorsocentral bristles 15
Narrower part of frons less than twice width of third antennal segment, inner pair of verticals shorter and weaker than first pair of dorsocentral bristles 17
15. Hind femur with slender posteroventral bristles, mesonotum and scutellum drab and with brown stripes and basal marks respectively, third antennal segment slender, longer than twice its width and much narrower than length of profrons in profile . *acuticornis* (Malloch)
Hind femur with or without a few short setulose posteroventral bristles, mesonotum and scutellum evenly pale gray and whitish, third antennal segment not longer than twice its width, and as wide as length of profrons in profile 16
16. Mid femur with a stout prebasal ventral bristle, frons at middle about as wide as distance between first pair of dorsocentral bristles, dorsal marks on abdomen brownish and not evanescent . . *disparata* Huckett
Mid femur without a stout prebasal ventral bristle, frons at middle slightly wider than half distance between first pair of dorsocentral bristles, dorsal marks on abdomen weakly grayish and evanescent . . . . . *cana* Huckett
17. Haustellum largely dullish, mid femur with 1 or 2 stoud erect posteroventral bristles, arista pubescent, the longer hairs fully equal to twice basal diameter of arista 18
Haustellum entirely polished, mid femur with normally developed posteroventral bristles, not spinose, aristal hairs scarcely longer than basal diameter of arista . . . . . *magnipunctata* (Malloch)
18. Blackish species, the basal sclerites of hypopygium shiny and black, wings densely infuscated basad. *bisetosa* Huckett
Grayish species, basal sclerites of hypopygium filmed with grayish pollen and are nonshiny, wings lightly tinged basad . . *bisetosa* var. *pruinella* Huckett

Females

1. Thorax normally with 4 pairs of postsutural dorsocentral bristles 2
Thorax normally with 3 pairs of postsutural dorsocentral bristles 14
2. Frontal triangle polished and glossy . 3
Frontal triangle dull and pruinescent . 5
3. Mesonotum, scutellum and abdomen black and glossy, parafrontals shiny . . . . *leucogaster* (Zetterstedt)
Mesonotum and scutellum brownish, nonglossy, parafrontals dull 4
4. Abdomen without dorsal marks, knobs of halteres purple, mesopleural interspatial bristle present .*concolor* (Stein)
Abdomen with weak dorsal marks, knobs of halteres yellow, mesopleural interspatial bristle absent . . . . . *obscuripennis* var.
5. Mid tibia with 1 or 2 ventral bristles, epistoma extended cephalad to a level slightly beyond tip of profrons . . . *pseudodispar* (Frey)
Mid tibia without ventral or anteroventral bristles, epistoma not extended cephalad to a level with tip of profrons 6
6. Presutural acrosticals coarser than adjacent setulae, bristly 7
Presutural acrosticals fine, slender, similar to adjacent setulae 9
7. Hind femur with anteroventral bristles on proximal half, mid tibia with 1 or 2 anterodorsal bristles . . . . . *tetrachaeta* (Malloch)
Hind femur without anteroventral bristles on proximal half, mid tibia without anterodorsal bristle 8
8. Maximum height of eye nearly equal to length of fore tibia, cheek scarcely as high as width of third antennal segment, vibrissal angle with weak or slender setulae .*argentiventris* (Malloch)
Maximum height of eye much shorter than length of fore tibia, cheek as high or higher than width of third antennal segment, setulae at base of vibrissae coarsened . . . . . *cretans* Huckett
9. Haustellum polished, scutellum without preapical hairs on upper border of declivities 10
Haustellum dull, scutellum with preapical setulae or hairs on upper border of declivities . . . . *obscuripennis* (Stein)
10. Abdomen entirely deep seal brown, without dorsal marks, notopleural depression with setulae .*churchillensis* Huckett
Abdomen with dorsal marks, or if without marks not entirely dark brown 11
11. Profrons about equal in length to half diameter of eye immediately caudad, narrower part of parafacials as wide as breadth of third antennal segment, vibrissal angle coarsely setulose along border, subanal plate of ovipositor with recurrent spinules . *nobilis* (Stein)
Profrons not equal in length to half

diameter of eye immediately caudad, border of vibrissal angle with fine setulae, subanal plate of ovipositor without recurrent spinules 12

12. Mesopleural series of bristles with a slender predorsal interspatial bristle (fig 13) . . . . . *imitatrix* (Malloch)
Mesopleural series of bristles with predorsal interspatial locus bare, bristleless 13

13. Hind femur with proximal posteroventral bristles, abdominal marks on terga 3 and 4 restricted to dorsum . . . . . *tundrarum* Huckett
Hind femur without proximal posteroventral bristles, or if present fine and setulose, abdominal marks extended ventrad along caudal margins of terga 3 and 4 . . *sororcula* (Zetterstedt)

14. Haustellum mainly dull, ovipositor with recurrent spinules on subanal sclerite .15
Haustellum entirely polished, ovipositor without recurrent spinules on subanal sclerite 17

15. Mid femur with 1 or 2 longish posteroventral bristles on proximal third, scutellum with weak preapical bristles on dorsum, third antennal segment barely longer than twice its maximum width, blunt at apex 16
Mid femur with or without 1 or 2 weak posteroventral bristles on proximal third, scutellum without a weak pair of preapical bristles on dorsum, third antennal segment nearly 3 times as long as wide, tapering and becoming pointed at apex of outer (dorsal) margin . . . . . *acuticornis* (Malloch)

16. Abdomen shiny, lustrous, dark gray, with extended marks on tergum 4 . . . . *bisetosa* Huckett
Abdomen dullish, mainly pale gray, with restricted marks on tergum 4 . . . . . *bisetosa* var. *pruinella* Huckett

17. Calyptrae whitish or slightly yellowish tinged . . . . *magnipunctata* (Malloch)
Calyptrae notably yellowish. *anthrax* (Bigot)

Spilogona acuticornis (Malloch)

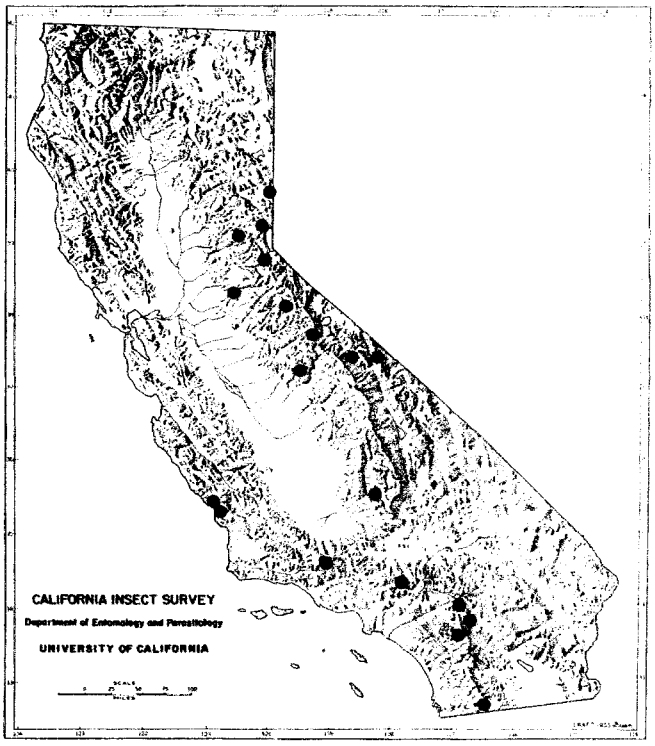
(Map 19)

Limnophora acuticornis Malloch, 1920, Trans. Am. Entomol. Soc., 46: 147.

Holotype: ♂, Swarthmore, Pennsylvania (ANSP).

Geographic range.--Occurs in the north temperate region of North America, to the north from central Alaska, Yukon Territory, Alberta, Manitoba, and northern tiers of states, eastward to Quebec, Nova Scotia, and northeastern America; in the Rocky Mountain region from Idaho to Colorado, and on the Pacific coast from Washington to California, in the southwest in Nevada.

California records.--AMADOR CO.: Volcano, 1 ♂, V-5-57 (W. T. Crites, UCD). EL DORADO CO.: Grass Lake, Luther Pass, 1 ♀, VII-24-55 (E. I. Schlinger, UCD). KERN CO.: Onyx, 1 ♂, VII-23-40 (D. E. Hardy, UK). LASSEN CO.: Hallelujah Junction 1 ♀, VII-12-54 (R. C. Blaylock, UCD), 1 ♀, VII-26-59 (A. E. Menke, UCD); 1 ♀, VI-22-64 (C. N. Slobodchikoff, CAS). LOS ANGELES CO.: Big Pines, 3 ♂, 1 ♀, VI-29-48 (A. L. Melander, USNM). MADERA CO.: Coarsegold, 2 ♀, V-12-42 (E. G. Linsley, CIS). MONO CO.: Cottonwood Creek, 9,300 ft. 1 ♀, VII-10-61 (H. V. Daly, CIS). Crooked Creek Laboratory, 10,150 ft. White Mountains, 3 airline mi. N. of Inyo County, 1 ♂, VI-18-61 (J. Powell, CIS). 4 mi. SW. of Tom's Place 1 ♂, VII-13-61 (H. V. Daly, CIS). NEVADA CO.: Prosser Creek, 6,300 ft. near Hobart Mills, 1 ♀, VII-13-61 (J. G. Chillcott, CNC). Sagehen Creek, near Hobart Mills, 4 ♀, VII-15-64, in malaise trap (M. E. Irwin, UCR). PLACER CO.: Cisco, 1 ♂, VI-5-40 (M. T. and H. B. James, WSU). RIVERSIDE CO.: Deep Canyon, 1 ♀, IX-2-64 (P. A. Rauch, UCR). Hemet Reservoir, San Jacinto Mountains, 2 ♂, V-22-40 (C. D. Michener, CIS). SAN BERNARDINO CO.: Mt. Home Canyon, San Bernardino Mountains, 2 ♀, 1924, 1 ♀, VI-8-24 (J. M. Aldrich, USNM). SAN DIEGO CO.: Campo, 1 ♂, VII-18-40 (D. E. Hardy, UK). SAN LUIS OBISPO CO.: Harmony, 1 ♂, IX-25-38 (M. A. Cazier, CIS). Morro Dunes, 1 ♂, VI-9-45 (A. L. Melander, USNM). TUOLUMNE CO.: Dardanelles, 1 ♀, VII-2-57 (D. L. Flaherty, UCR). Tuolumne Meadows, 1 ♀, VIII-19-55 (J. W. MacSwain, CIS). VENTURA CO.: Lockwood Creek, near Stauffer P. O., 2 ♂, 2 ♀, V-5-59 (C. W. O'Brien, C. I. Stage, CIS), 1 ♂, V-7-59 (J. Powell, CIS).



Map 19. California distribution of *Spilogona acuticornis* (Malloch).

The male of *S. acuticornis* may be recognized by the broad separation of the eyes across the frons, the frontal bristling similar to the female, including a robust pair of anterior ocellar bristles. The antennae in both sexes are usually slender and tapering to a point at apex of outer (dorsal) margin, and are inserted on the head opposite a wide, rather projecting profrons. The male has lengthy posteroventral bristles on hind femur, the female with recurrent spinules on subanal plate of ovipositor, and in both sexes there are 3 pairs of postsutural dorsocentral bristles. The nearest relative is the boreal species *S. surda* (Zetterstedt)*.

Spilogona anthrax (Bigot)

Limnophora anthrax Bigot, 1885, Ann. Soc. Entomol. Fr., (1884) ser. 6 4: 274.

Limnophora squamosa Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 53.

Type: ♂, Mexico (University Museum, Oxford).

Geographic range.--Alaska, British Columbia, California, Colorado, Idaho, Montana, Northwest Territories, New York, Oregon, Washington. Also from Mexico.

California record.--MONO CO.: 1 ♀, VII-16-34, at 9,500 ft. (G. E. Bohart, CAS).

The male of *S. anthrax* has calyptral scales browned, resembling *S. concolor* in this respect, but otherwise differing in marking and bristling. The female of *anthrax* closely resembles the smaller female specimens of *S. magnipunctata*, from which it differs in the denser yellowish tinge to the calyptrae.

Spilogona argentiventris (Malloch)

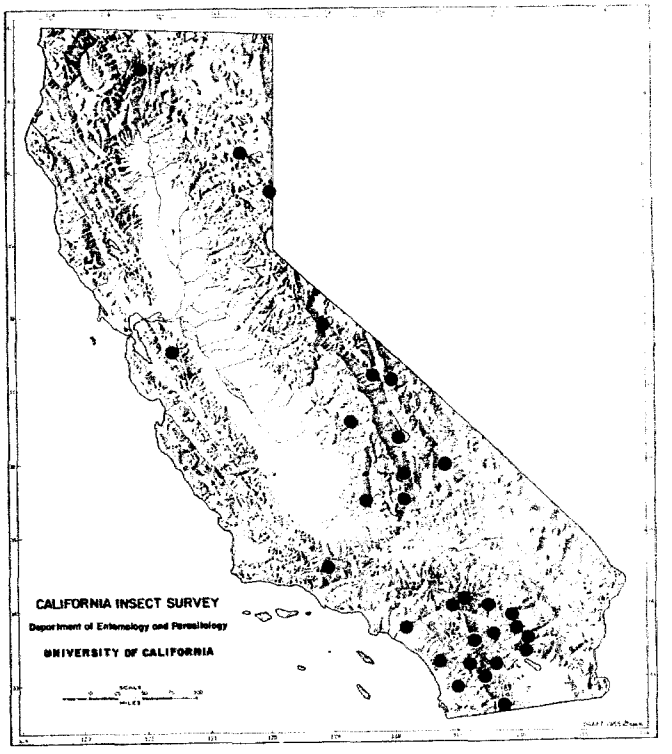
(Map 20)

Limnophora argentiventris Malloch, 1920, Trans. Am. Entomol. Soc., 46: 149.

Limnophora (Spilogona) argentiventris occidentalis Huckett, 1932, J. N. Y. Entomol. Soc., 40: 150.

Holotype: ♂, Gallatin County, Montana (USNM).

Geographic range.--Widely distributed in the western half of North America, from South Dakota, Nebraska, Iowa, Kansas, westward to the Pacific coast, reaching its northern limits in central Alaska and the Great Slave Lake region, in the Rocky Mountain range from Alberta and Montana to Utah, Colorado and New Mexico, in the southwest from Nevada and Arizona, and on the Pacific coast from British Columbia to southern California.



Map 20. California distribution of *Spilogona argentiventris* (Malloch).

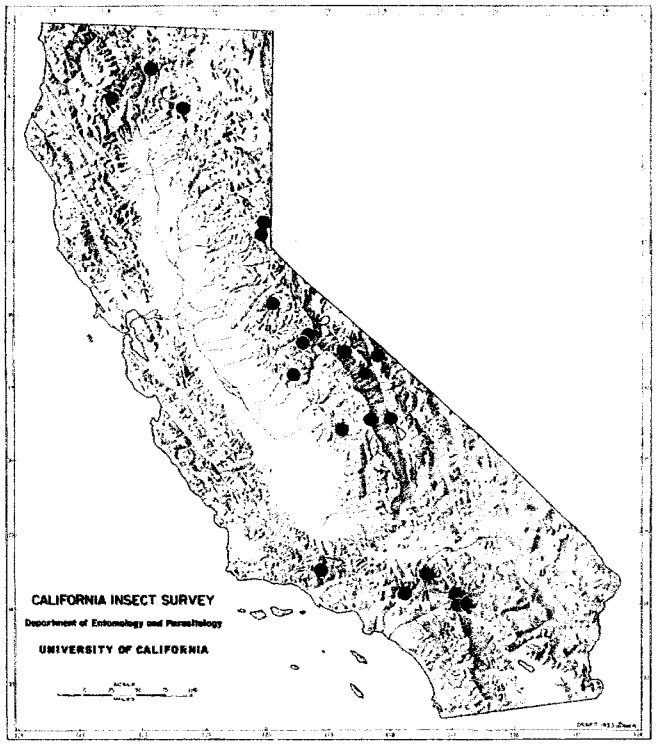
California records (map 20).--Despite its broad Nearctic distribution, *Spilogona argentiventris* is distinctly austral in California, occurring in the Great Basin, the margins of both deserts, and along the east side of the central Coast Range (Tesla, Alameda County). The species has a long flight period, from March to October, according to the scattered records, which represent about 40 localities in 13 counties.

The small species *S. argentiventris* is notable for the large eyes which restrict the male frons to small proportions, and the parafacials and cheeks in both sexes to sublineal dimensions when viewed in profile. The species is among the few that have the acrosticals of a bristly nature and in two closely separated series. The abdomen of the male when viewed from behind is densely white pruinescent, and in the female a drab gray, with usually, in both sexes, 2 pairs of smallish marks, and with or without a faint dorsocentral stripe.

Spilogona bisetosa Huckett

(Map 21)

Limnophora (Spilogona) bisetosa Huckett, 1932, J. N. Y. Entomol. Soc., 40: 300.



Map 21. California distribution of *Spilogona bisetosa* Huckett.

Holotype: ♂, Marshfield, Oregon (USNM).

Geographic range.--California, Colorado, Idaho, Oregon, Utah, Washington, Wyoming.

California records (map 21).--The essentially boreal distribution of this insect in California is represented primarily by drier, inland or rain-shadow sites. Collections of adults have been made from May to September in the San Bernardino Mountains and Transverse Range, and primarily from June to August elsewhere.

Specimens of *S. bisetosa* were collected in 12 counties and approximately 19 localities, based on an examination of 19 males and 12 females.

S. bisetosa is allied to the European species *S. litorea* (Fallén)*, being notable for the longish pubescence of the arista. The present species differs in being darker and more shiny, in the male having the basal sclerite of hypopygium shiny black, and wings densely infuscated basad, in the female by having the abdomen dark gray and with marks more extended. In both sexes of *S. bisetosa* the mid femur has 1 or 2 strong posteroventral bristles.

Spilogona bisetosa var. pruinella Huckett

Limnophora (Spilogona) bisetosa pruinella Huckett, 1932, J. N. Y. Entomol. Soc., 40: 302.

Holotype: ♂, Mt. Home Canyon, San Bernardino Mountains, California (USNM).

Geographic range.--California, Colorado, Idaho, Utah, Washington, Wyoming.

The variety *pruinella*, which in habitus approaches more closely that of *S. litorea**, is a paler, pollinose, opaque form of *bisetosa*, having scutellum and abdomen extensively dull gray or cinereous and markings restricted, the wings lightly infuscated basad, and the basal sclerite of hypopygium in the male lightly dusted.

Spilogona cana Huckett

Limnophora (Spilogona) cana Huckett, 1932, J. N. Y. Entomol. Soc., 40: 299.

Holotype: ♂, Mt. Adams, Washington (USNM).

Geographic range.--California, Oregon, Washington, Wyoming.

California record.--MONO CO.: Virginia Lakes, 9,750 ft. 1 ♂, VIII-17-63 (H. B. Leech, CAS).

The male of *S. cana* has thorax and abdomen extensively whitish gray, the former unmarked and the latter with weak paired grayish marks. The frons is moderately broad and the frontal vitta but little narrower caudad than at anterior margin, the frontal bristling is continuous to vertex and the verticals robust. The haustellum is polished.

Spilogona churchillensis Huckett

Spilogona churchillensis Huckett, 1965, Mem. Entomol. Soc, Can., 42 p. 213.

Holotype: ♂, Churchill, Manitoba (CNC).

Geographic range.--California, Manitoba.

California records.--MONO CO.: Blanco's Corral, 10,000 ft. White Mountains, 3 ♂, 3 ♀, VII-14-53 (D. D. Linsdale, CIS). Crooked Creek Laboratory, 10,150 ft. White Mountains, 3 airline mi. N. of Inyo County, 3 ♂, VI-18-61, 1 ♂, VI-21-61 (J. Powell, CIS).

The species *S. churchillensis* has the abdomen entirely deep seal brown and without dorsal marks. It differs from *S. concolor* in having the knobs of halteres yellowish, and further in the male by the nonbrownish squamae and in the female by the dull frontal triangle.

Spilogona concolor (Stein)

Limnophora concolor Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 55.

Syntypes: ♂♂, Marshall Pass, Colorado; Hunters Creek, Wyoming (USNM).

Geographic range.--Alaska, Alberta, California, Colorado, Idaho, Manitoba, Montana, Northwest Territories, Utah, Washington, Wyoming.

California records.--LASSEN CO.: Hallelujah Junction, 1 ♀, VII-12-54 (R. C. Blaylock, UCD). MONO CO.: Crooked Creek Laboratory, 10,150 ft. White Mountains, 1 ♂, VI-26-61 (G. I. Stage, CIS), 3 ♂, 8 ♀, VII-19-61, 1 ♀, VII-21-61 (H. V. Daly, CIS). Sardine Creek, 8,500 ft. 3 ♂, 2 ♀, VI-28-51 (C. A. Downing, A. T. McClay, UCD). Sonora Pass, 1 ♂, VIII-13-60 (W. A. Steffan, CIS).

The species *S. concolor* is related to *S. leucogaster* and *S. obscuripennis*, all having 4 pairs of postsutural dorsocentral bristles. In *S. concolor* the thorax and abdomen are entirely blackish and unmarked, the mesonotum in the female being brownish dusted and dull, and the abdomen black and shiny. In addition the knobs of halteres are purplish in both sexes of *concolor*, the calyptral scales brownish infuscated in the male and the frontal triangle polished in the female.

Spilogona cretans Huckett

Limnophora (Spilogona) cretans Huckett, 1932, J. N. Y. Entomol. Soc., 40: 151.

Holotype: ♂. Chin, Alberta (CNC).

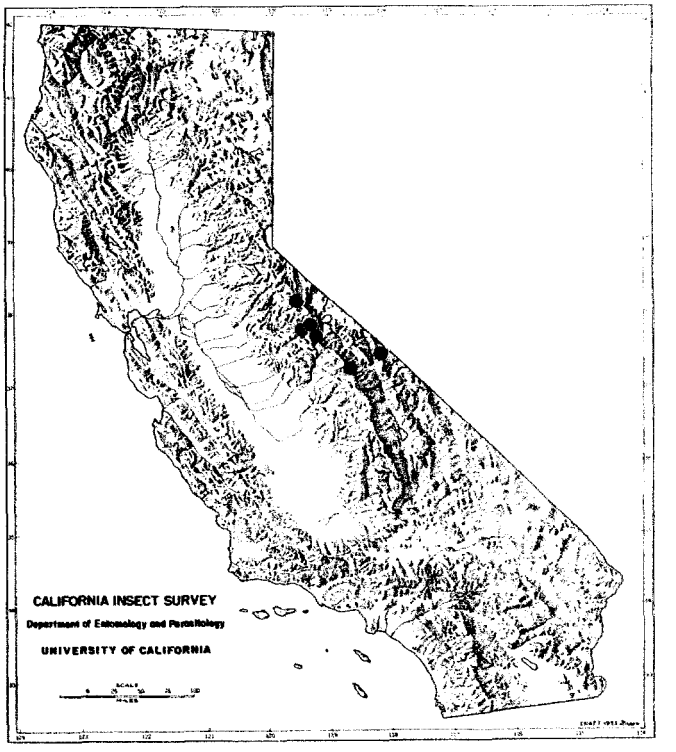
Geographic range.--Alberta, California, Colorado, Nevada, Wyoming.

California records.--INYO CO.: Deep Springs, 1 ♂, 1 ♀, VII-16-53 (E. I. Schlinger, UCD; H. Nakakihara, UCR). Owens Lake, 1 ♀, V-20-37 (CAS). KERN CO.: Onyx, 1 ♂, IV-25-50 (E. I. Schlinger, UCD).

S. cretans may be linked with *S. argentiventris* and *S. tetrachaeta* in having the short acrosticals bristly, coarser than the adjacent setulae. In *S. cretans* the eyes are relatively smaller in area than in *S. argentiventris*, and thereby the frons in the male and the cheeks in both sexes become less conspicuously restricted. From *S. tetrachaeta* the species *cretans* may be distinguished by the paler, grayish thorax and abdomen, the absence of an anterodorsal bristle on mid tibia, and by the incomplete or partial series of anteroventral bristles on hind femur.

Spilogona disparata Huckett

Spilogona disparata Huckett, 1967, Pan-Pac. Entomol., 43: 55.



Map 22. California distribution of *Spilogona imitatrix* (Malloch).

Holotype: ♂, Sagehen Creek, Nevada County, California (UCR).

Geographic range and *California record.*--NEVADA CO.: Sagehen Creek, near Hobart Mills, 1 ♂, VII-15-64, in malaise trap, holotype (M. E. Irwin, UCR).

The male of *S. disparata* has a wide frons with femalelike bristling, 3 pairs of postsutural dorsocentral bristles, the abdomen subconical, slender, and with paired brownish marks restricted to dorsum, the mid femur with a strong prebasal bristle on ventral surface.

Spilogona imitatrix (Malloch)

(Map 22)

Melanochelia imitatrix Malloch, 1921, Can. Entomol., 53: 64; Frison, 1927, Ill. Nat. Hist. Surv. Bull., 16 Art. 4 p. 204.

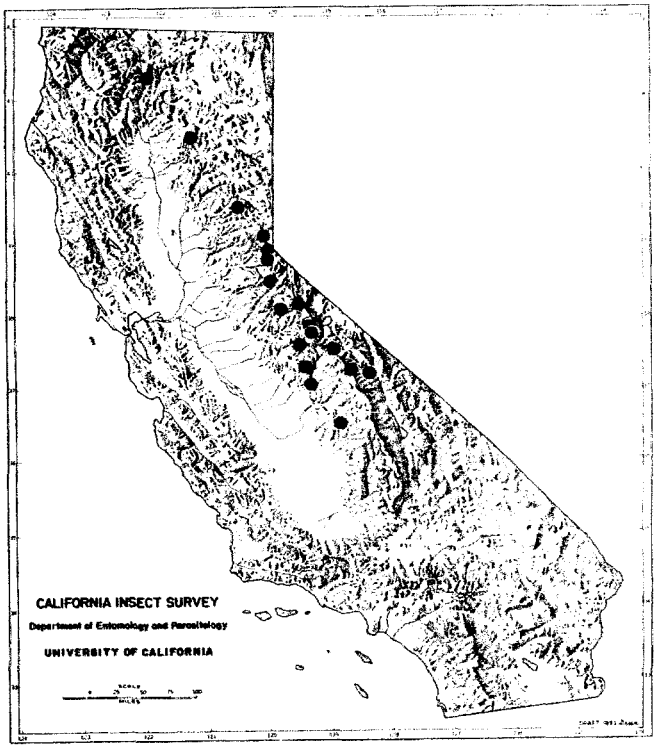
Holotype: ♂, Nain, Labrador (IllNHS).

Geographic range.--Alaska, Alberta, California, Colorado, Labrador, Manitoba, Northwest Territories, Quebec, Utah, Yukon Territory and Commander Islands (also in northern Europe).

California records.--INYO CO.: Mono Pass, 2 ♀, VIII-13-57 (D. D. Linsdale, CIS). near Mono Pass,

12,000 ft. NW. Inyo County, 1 ♀, VIII-11-63 (M. J. Tauber, C. A. Toschi, CIS). Ruby Lake, 11,250 ft., 1 ♂, 2 ♀, VIII-13-57 (D. D. Linsdale, J. Powell, CIS). MONO CO.: White Mountains, 10,150 ft. 3 mi. N. of Inyo County, 1 ♀, VIII-20-63, flight trap (H. B. Leech, CAS). TUOLUMNE CO.: Ellery Lake, Tioga Pass, 9,400 ft. 1 ♂, VII-3-27 (J. M. Aldrich, USNM). Sonora Pass, 2 ♀, VIII-21-59 (D. D. Linsdale, CIS). Tuolumne Meadows, 8,600 ft. 2 ♀, VIII-15-16 (G. R. Pilate, USNM). Tuolumne Meadows, Soda Springs, 8,600 ft. 2 ♀, VIII-8-16 (G. R. Pilate, USNM).

The high montane species *S. imitatrix* is one of the few species of *Spilogona* known at present to occur in California that has a slender predorsal bristle in the mesopleural series, where otherwise that particular area or locus immediately below the dorsal bristle in the series remains bare (fig. 13). The male has strong erect posteroventral bristles on the mid femur, the wings densely infuscated basad, abdominal terga 1+2 mostly blackish and tergum 3 with a pair of large quadrate, narrowly divided marks. In both sexes there is no posterior bristle on the fore tibia, usually no anterodorsal bristle on the mid tibia, and no distinct posteroventral bristles on the hind femur.



Map 23. California distribution of *Spilogona magnipunctata* (Malloch).

Spilogona leucogaster (Zetterstedt)

Anthomyza leucogaster Zetterstedt, 1838, Ins. Lapp., p. 674.

Eriphia biquadrata Walker, 1849, List Dipt. Br. Mus., 4: 963.

Sphenomyia kincaidi Aldrich, 1919, Proc. Entomol. Soc. Wash., 21: 108.

Limnophora nitidifrons Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 50.

Sphenomyia banffi Seamans, 1926, Can. Entomol., 58: 175.

Type: ♂, Torne Lappmark, Sweden.

Geographic range.--Alaska, Alberta, British Columbia, California, Idaho, Labrador, Manitoba, Michigan, Northwest Territories, Ontario, Oregon, Quebec, Saskatchewan, Utah, Washington, Wyoming, Yukon Territory.

California records.--NEVADA CO.: Sagehen Creek, near Hobart Mills, 1 ♀, VII-15-64, in malaise trap (M. E. Irwin, UCR). SAN BERNARDINO CO.: Baldwin Lake, 6,500 ft. 6 ♂, 3 ♀, V-13-55 (W. R. M. Mason, CNC). Big Bear Lake, 1 ♀, VII-26-32 (R. H. Beamer, UK). Boulder Bay, Big Bear Lake, 1 ♀, VII-8-65, 5 ♂, 1 ♀, VIII-30-65, 1 ♂, IX-20-65 (R. E. Orth, UCR).

The male of *S. leucogaster* has a densely whitish gray abdomen, and with only a pair of subquadrate marks on tergum 3. In both sexes the mesonotum is black, shiny and unmarked, and the halteres with yellow to yellowish brown knobs. The female has the frontal triangle polished, the parafrontals shiny, and the abdomen glossy black.

Spilogona magnipunctata (Malloch)

(Map 23)

Limnophora magnipunctata Malloch, 1919, Proc. Calif. Acad. Sci., ser. 4 9: 301.

Limnophora fumosa Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 48.

Holotype: ♂, Huntington Lake, California (CAS).

Geographic range.--Alaska, Alberta, British Columbia, California, Colorado, Labrador, Montana, New Hampshire, Oregon, Quebec, Utah, Washington, Wyoming.

California records (map 23).--This is a strictly Sierran species, having been recorded from Mt. Shasta (Panther Meadow) south to Sequoia National Park (Alta Meadow), primarily at elevations between 7,000 and 10,000 feet, although there is one record from Bishop (4,100 feet) and one from Ruby Lake (11,250 feet) in the northwest corner of Inyo County. The 33 collections available in this survey were made between late June and early August.

S. magnipunctata has three pairs of postsutural

dorsocentral bristles, a polished haustellum, large paired marks on abdomen, and an arista with weak pubescence, resembling in these respects the species *S. anthrax*. From the latter the male of *S. magnipunctata* differs in having the calyptrae whitish or yellowish tinged. The female of the two species are not so readily distinguishable, both having slender setulae on the subanal plate of the ovipositor. Specimens of *S. magnipunctata* vary in length from 4 to 6 mm.

Spilogona nobilis (Stein)

Limnophora nobilis Stein, 1898, Berl. Entomol. Z., (1897) 42: 207.

Type: ♂, Fort Wrangell, Southeast Alaska (USNM).

Geographic range.--Alaska, British Columbia, California, Oregon, Washington.

California records.--CONTRA COSTA CO.: Antioch, 1 ♀, V-8-50 (P. D. Hurd, CIS). HUMBOLDT CO.: Orick, 1 ♂, 1 ♀, IX-18-34 (A. L. Melander, USNM). MARIN CO.: Corte Madera, 1 ♂, IV-16-53 (H. L. Mathis, UCD). Mill Valley, 1 ♀, VIII-22-52 (P. H. Arnaud, CAS). Point Reyes Station, 2 ♀, X-2-57 (S. M. Fidel, UCD). Stinson Beach, 1 ♂, V-6-51 (E. I. Schlinger, UCD); 2 ♂, 2 ♀, VI-2-51 (W. C. Bentinck, CIS), 1 ♂, III-19-62 (C. A. Toschi, CIS). Tomales, 1 ♀, VI-11-60 (S. M. Fidel, UCD). MARIPOSA CO.: Glacier Point Road, Yosemite National Park, 1 ♀, VII-1-47 (A. L. Melander, USNM). SAN LUIS OBISPO CO.: Morro Bay, 1 ♀, VIII-29-45 (A. L. Melander, USNM). SAN MATEO CO.: Redwood City, 1 ♂, 1 ♀, VI-3-51, 1 ♂, IX-14-52 (P. D. Arnaud, CAS).

The male of *S. nobilis* has a broad opaque black frontal vitta and large trapezoidal patches on dorsum of terga 3 and 4 that extend ventrad along the caudal borders of terga. In both sexes the parafacials and cheeks are broadly maintained, the vibrissal angle prominent and with coarse setulae.

Spilogona obscuripennis (Stein)

Limnophora obscuripennis Stein, 1916, Arch. Naturgesch., (1915) Abt. A 81 (10): 93.

Type: ♂, Kantalahti, Lapland (ZMUB) *teste* Hennig.

Geographic range.--Alaska, Alberta, California, Colorado, Labrador, Quebec, Yukon Territory.

California records.--NEVADA CO.: Sagehen Creek, near Hobart Mills, 3 ♂, 2 ♀, VII-7-64, 2 ♂, VII-9-64, 1 ♀, VII-10-64, 3 ♂, 3 ♀, VII-15-64, 4 ♂, 4 ♀, VII-16-64, in malaise trap, and of which 1 ♀, VII-7, 1 ♀, VII-10, 1 ♀, VII-15, 2 ♀, VII-16-64 have frontal triangle partly shining as if abraded (M. E. Irwin, UCR). TUOLUMNE CO.: Sonora Pass, 1 ♂, VIII-21-59 (D. D. Linsdale, CIS).

The dark species *S. obscuripennis*, with infuscated wings in the male, differs from similar taxa in having the haustellum lightly dusted and partly dull. The male has a full series of longish anteroventral bristles and a few equally long posteroventrals on the hind femur. In both sexes the scutellum has a few preapical hairs on upper border of declivities. The female has the abdomen shiny and with obscure dark marks or patches, the ovipositor with recurrent spinules on the subanal plate, and the hind femur with anteroventral bristles restricted to the distal half, and with short posteroventral bristles.

Spilogona pseudodispar (Frey)

Limnophora pseudodispar Frey, 1915, Ross. Akad. Nauk Petrograd. Zap. Fiz.-Mat. Otd.(Acad. des Sci. de Russie, Mém., Cl. Phys.-Math.) ser. 8, 29 (10): 24.

Limnophora spinitibia Ringdahl, 1918, Entomol. Tidskr., 39: 151.

Type: ♂, Lena estuary, Siberia (Leningrad Mus.) *teste* Hennig.

Geographic range.--Alaska, Birtish Columbia, California, Manitoba, Northwest Territories, Quebec, Yukon Territory, and Baffin Island.

California record.--FRESNO CO.: Marie Lake, 10,500 ft. 1 ♀, VIII-30-52 (E. I. Schlinger, UCD).

S. pseudodispar has the epistoma extended to a level beyond the tip of profrons as viewed in profile, and the mid tibia with 1 or 2 ventral to posteroventral bristles near middle of tibia.

Spilogona sororcula (Zetterstedt)

Aricia sororcula Zetterstedt, 1845, Dipt. Scand., 4: 1459.

Limnophora zetterstedtii Ringdahl, 1918, Entomol. Tidskr., 39: 173.

Limnophora (Spilogona) fuscomarginata Huckett, 1932, J. N. Y. Entomol. Soc., 40: 290.

Types: ♂ ♀, Scandinavia (Zool. Inst., Lund).

Geographic range.--Alaska, Alberta, British Columbia, California, Colorado, Manitoba, Northwest Territories, Quebec, Washington, Wyoming, Yukon Territory.

California record.--MONO CO.: Virginia Lakes, 9,750 ft. 2 ♀, VIII-17-63 (H. B. Leech, CAS).

The species *S. sorocula* differs from those taxa of similar habitus and character in having an antero-

dorsal bristle on mid tibia. In both sexes of *S. sororcula* there are usually expansive marks on the abdomen, and in the female slender setulae on subanal plate of the ovipositor.

Spilogona tetrachaeta (Malloch)

Limnophora tetrachaeta Malloch, 1920, Trans. Am. Entomol. Soc., 46: 153.

Holotype: ♂, Blitzen River, Oregon (IllNHS).

Geographic range.--Alberta, California, Colorado, Montana, Oregon, Wyoming.

California record.--TULARE CO.: Giant Forest, Sequoia National Park, 1 ♂, 1 ♀, VII-28-29 (R. H. Beamer, UK).

The species *S. tetrachaeta* has legs strongly bristled, and may be distinguished from kindred forms having acrosticals of a bristly nature by the presence of 1 or 2 anterodorsal bristles on the mid tibia, and by the full series of robust anteroventral bristles on the hind femur.

Spilogona tundrarum Huckett

Spilogona tundrarum Huckett, 1965, Mem. Entomol. Soc. Can., 42 p. 234.

Holotype: ♂, Naknek, Alaska (CNC).

Geographic range.--Alaska, Alberta, California, Colorado.

California record.--MONO CO.: Leavitt Meadow, 7,200 ft. 1 ♀, VIII-13-63, flight trap (H. B. Leech, CAS).

The species *S. tundrarum* is closely allied to *S. rufitarsis* (Stein)*, from which it differs in having the tibiae and tarsi blackish, and the frons in the male narrower.

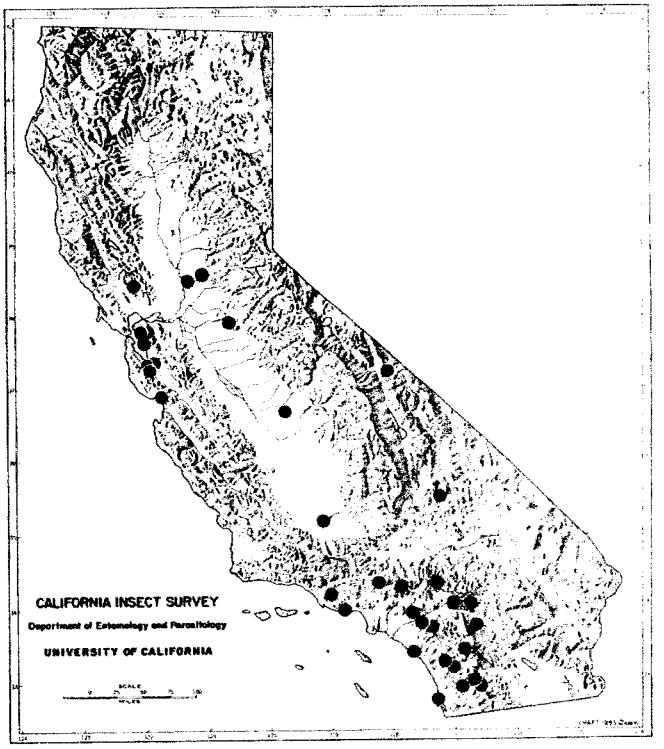
Genus Gymnodia Robineau-Desvoidy

Gymnodia Robineau-Desvoidy, 1863, Hist. Nat. Dipt. env. Paris, 2: 635.

Eulimnophora Malloch, 1920, Trans. Am. Entomol. Soc., 46: 145.

Type-species: *Gymnodia pratensis* Robineau-Desvoidy, monobasic (= *Anthomyia polystigma* Meigen, 1826).

The genus *Gymnodia* Robineau-Desvoidy may be distinguished from *Limnophora* by the absence of setulae at the base of vein R_{4+5} and of hairs along the lateral margins of prosternum, the proboscis is stocky and labellum unrestricted; from *Spilogona* by the absence of the preapical anterodorsal bristle on hind tibia, and by the presence of a fringe of stiffish setulae on sternum 1 of the abdomen. The adults commonly inhabit filth and manure for purposes of oviposition, and the larvae have been bred from excrement of animals and man. (Howard, 1900: 582, Séguy, 1937: 258, Hennig, 1952: 385.)



Map 24. California distribution of *Gymnodia arcuata* (Stein).

KEY TO SPECIES OF GYMNODIA IN CALIFORNIA

Hind femur with entire series of anteroventral bristles, those on proximal half much shorter and weaker, smaller species, 3 to 3,75 mm.. *cilifera* (Malloch)

Hind femur with anteroventral series of bristles confined to distal half, larger species, 4.5 to 5.75 mm. . . . . *arcuata* (Stein)

Gymnodia arcuata (Stein)

(Map 24)

Limnophora arcuata Stein, 1898, Berl. Entomol. Z., (1897) 42: 201.

Syntypes: ♂♂ ♀♀, Tifton, Georgia (FMNH, MCZ).

Geographic range.--Occurs widely in the eastern half of North America, from Florida, Georgia, eastern Tennessee, northward to Kentucky, West Virginia, the region of the Great Lakes, South and North Da-

kota; in the south from Texas and Louisiana, northward in Oklahoma and Kansas; in the southwest from New Mexico, Arizona and southern California. Also from Mexico.

California records (map 24).--*Gymnodia arcuata* is primarily cismontane in California, although there are scattered records from the margins of both deserts and in the White Mountains (Silver Canyon). Adults have been taken throughout the year in coastal southern California, from March to November in the San Francisco Bay area, and from May to October in the Central Valley.

The species was recorded from about 40 localities during the present survey, representing 16 counties.

Among specimens examined, adults were reared from dog manure at El Cerrito, Contra Costa County, and from cull peaches at Fresno.

Gymnodia cilifera (Malloch)

Eulimnophora cilifera Malloch, 1920, Trans. Am. Entomol. Soc., 46: 145.

Holotype: ♂, Waukegan, Illinois (IllNHS).

Geographic range.--Arizona, California, Florida, Georgia, Illinois, Kansas, Missouri, New Mexico, Ohio, Oklahoma, Pennsylvania, South Carolina, Texas, Virginia.

California records.--RIVERSIDE CO.: Riverside, 1 ♀, III-20-35 (A. L. Melander, USNM). SAN DIEGO CO.: Borrego Springs, 7♂, IV-27-65, 1 ♂, VII-5-65, 1 ♀, VII-7-65, 1 ♀, VI-15-67 (S. E. Haseltine, BVC). 2 mi. E., 3 mi. N. of Borrego Springs, 2 ♀, XI-9-65 (S. E. Haseltine, BVC). SANTA CLARA CO.: Alum Rock Park, 1 ♂, VII-14-62 (J. M. Ross, BVC).

The diminutive species *G. cilifera* may be separated from the larger species *arcuata* in that the anteroventral bristles of the hind femur are continued to base of femur in a distinctive series as fine, much shorter bristles.

Genus Limnophora Robineau-Desvoidy

Limnophora Robineau-Desvoidy, 1830, [Paris] Inst. de France, [Cl. des] Sci. Math. et Phys., Acad. Roy. des Sci., Mém. présentés par divers Savans [ser. 2], 2: 517.

Type-species: *Limnophora palustris* Robineau-Desvoidy, by subsequent designation of Coquillett, 1910.

The genus *Limnophora*, in common with *Bucephalomyia* and *Pseudolimnophora*, has the wing vein R_{4+5} with a few setulae at base, the prosternum with marginal hairs, and the hind tibia with the preapical anterodorsal bristle lacking. *Limnophora* differs from the two latter segregates in having the frons of the male narrower than in the female, and with dissimilar bristling. Adults are known to frequent the courses of rivers, streams and their banks, the shores of lakes and ponds. Larvae are aquatic or semiaquatic, and are found to pupate in the submerged shallow debris. Larvae and puparia of *Limnophora discreta* have been described and illustrated by Marchand (1923: 58) and Johannsen (1935:42).

KEY TO SPECIES OF LIMNOPHORA IN CALIFORNIA

1. Wing vein M_{1+2} more distinctly curved at apex than vein R_{4+5} 2
   Wing vein M_{1+2} not more distinctly curved at apex than vein R_{4+5} 4
2. Mesonotum with 3 pairs of postsutural dorsocentral bristles, acrosticals in 2 series and lacking interserial setulae . . . . . *invada* Huckett
   Mesonotum with 4 pairs of postsutural bristles, acrosticals with several interserial setulae 3
3. Anterior intraalar bristle absent or setulose . . . . . *corvina* (Giglio-Tos)
   Anterior intraalar bristle well developed . . . . . *narona* (Walker)
4. Hind femur in male with a decided or slight prebasal bulge or thickening on ventral region (fig. 21), female similar to that of *discreta* . . . . . *incrassata* Malloch
   Hind femur in male with no prebasal bulge or thickening on ventral region (fig. 22), female pale gray, with or without mesonotal stripe, mid tibia without anterodorsal bristle . . . *discreta* Stein

Limnophora corvina (Giglio-Tos)

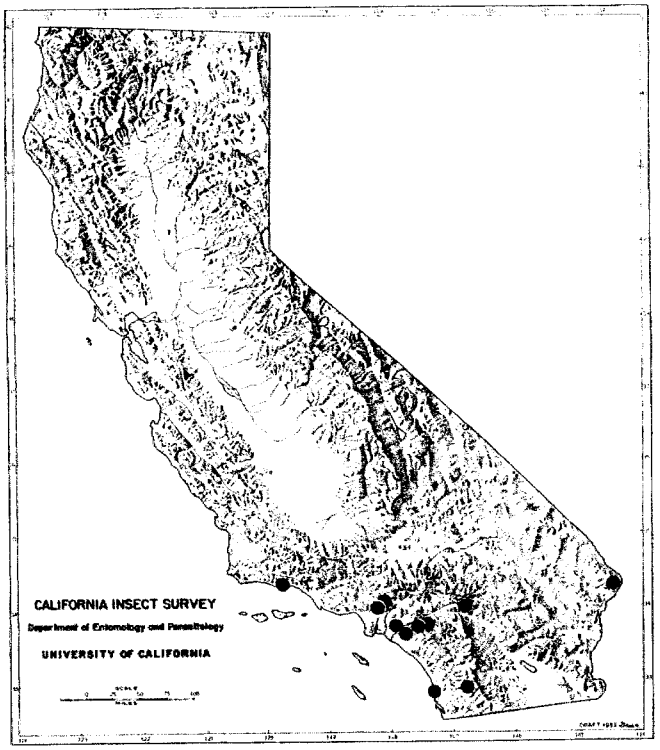
(Map 25)

Leucomelina corvina Giglio-Tos, 1893 [Turin Univ.] Mus. Zool. ed Anat. Comp., Bol. 8 (147): 7; 1895, Ditteri del Messico. Pt. 4, p. 19.

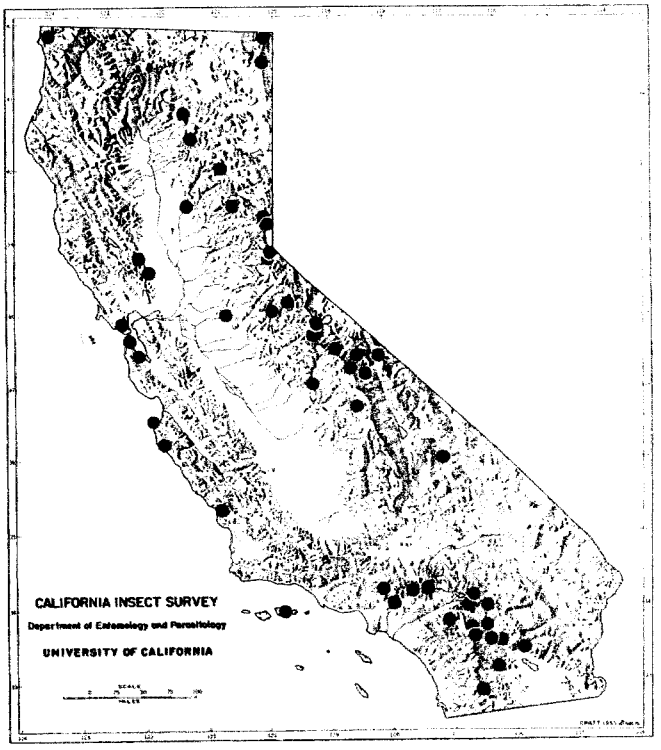
Type: ♂, Mexico (ZMU Turin).

Geographic range.--California, South Carolina, and Mexico.

California records.--LOS ANGELES CO.: Downey, 1 ♂, 1 ♀, XI-27-33 (A. J. Basinger, CAS). Pico, Rio Hondo River, 1 ♂, V-24- (C. H. Martin, HCH). Whittier, 3 ♂, VII-26-23 (A. J. Basinger, CIS). ORANGE CO.: Brea, 1 ♂, VIII-25-23 (A. J. Basinger, CIS). Peters Canyon, 2 ♂, VIII-30-55 (R. M. Bohart, UCD). RIVERSIDE CO.: Corona, 1 ♀, XI-1-35 (A. J. Basinger, CAS). Riverside, 1 ♀, VI-20-34 (A. J. Basinger, CAS), 1 ♂, 1 ♀, X-25-36 (E. P. Van Duzee, CAS); 1 ♂, X-15-34, 1 ♀, XI-29-34, 1 ♂, II-22-35, 2 ♂, VII-9-40, 4 ♂, V-25-42 (A. L. Melander, USNM); 1 ♂, IV-26-65 (L. L. Lewallen, UCR). SAN BERNARDINO CO.: Jenks Lake, 1 ♂, IX-7-50 (A. L. Melander, USNM). 1 mi. W. of Parker Dam, 1 ♂, II-23-51 (C. D. MacNeill, P. A. Adams, CIS). ?Scotland, 1 ♂, IX-19-43 (A. L.



Map 25. California distribution of *Limnophora corvina* (Giglio-Tos).



Map 26. California distribution of *Limnophora discreta* Stein.

Melander, USNM). SAN DIEGO CO.: Alpine 1 ♂, 1 ♀, VII-9-29 (R. H. Beamer, HCH). La Jolla, 1 ♂, VII-5-35, 2 ♂, 3 ♀, IX-29-34 (A. J. Basinger, CAS; HCH). SANTA BARBARA CO.: Goleta, 1 ♂, VI-27-59 (J. L. Bath, UCR).

The species *L. corvina* is akin to *L. narona*, from which it may be separated by the absence or setulose nature of the anterior intraalar bristle.

Limnophora discreta Stein

(Figs. 22, 39, 48, 55; map 26)

Limnophora discreta Stein, 1898, Berl. Entomol. Z., (1897) 42: 204.

Syntypes: ♂ ♀, Algonquin, Illinois (FMNH).

Geographic range.--Widely distributed in continental North America, reaching northward to Alaska and the Yukon Territory, thence eastward to include most of the provinces and northern states as far as Quebec and the New England region. In the East, occurs in Florida, and in the West in most of the Rocky Mountain and Pacific coast states to as far south as New Mexico, Arizona and California.

California records (Map 26).--This species has a circum-valley distribution in California that is characteristic for widespread boreal Nearctic insects. It occurs throughout Transition and boreal zones up to timberline, having been taken near sea level along the central coast and the margins of the Sacramento Valley (Putah Creek), up to 11,250 feet at Ruby Lake in northwest Inyo County, and from the moist north coast (Smith River, Del Norte County) to the margins of the low deserts (Coachella Valley, Borrego).

The flies are on wing almost throughout the year at low elevations, having been collected in early February in Marin County and as late as November in the Sacramento Valley and at Palm Springs. Elsewhere inland the flight period is shorter, from April in the deserts and May at Bishop to September in the Sierra Nevada and October in Modoc County.

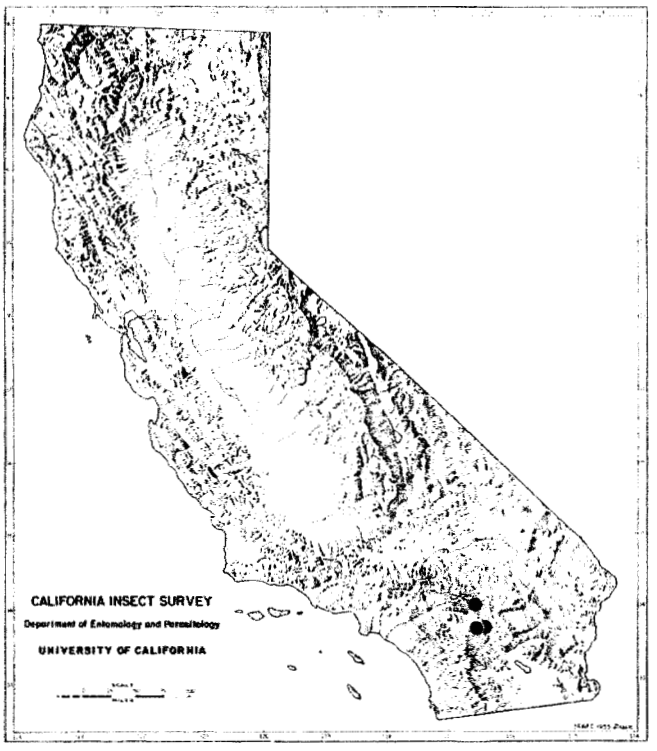
The species *L. discreta* and *L. incrassata* are very similar in habitus, and in the female can only be distinguished apart with difficulty. In the male of *L. discreta* the ventral surface of hind femur as viewed in profile is evenly aligned or sloping proximad to extreme base (fig. 22), and is without an abrupt prebasal thickening or bulge as in the male of *L. incrassata*.

Limnophora incrassata Malloch

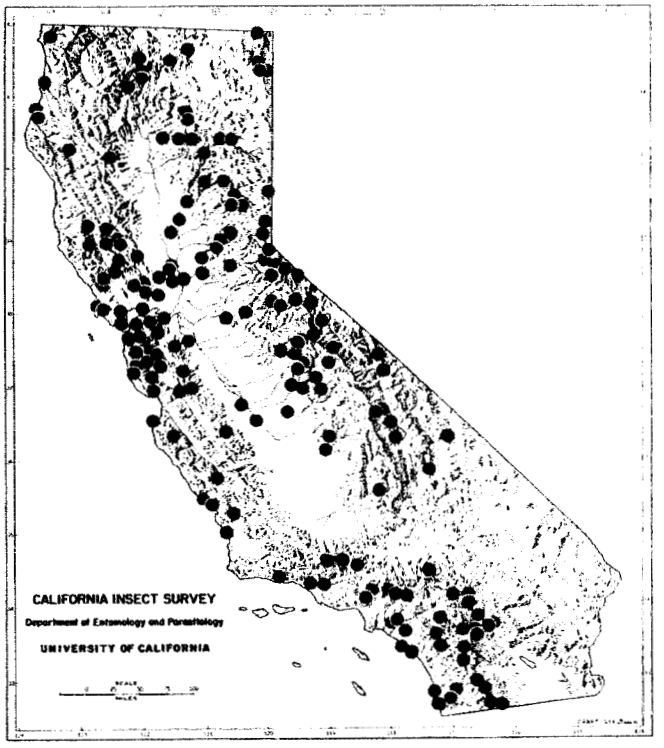
(Fig. 21, 40)

Limnophora incrassata Malloch, 1919, Proc. Calif. Acad. Sci., ser. 4 9: 299.

Holotype: ♂, Huntington Lake, California (CAS).



Map 27. California distribution of *Limnophora invada* Huckett.



Map 28. California distribution of *Limnophora narona* (Walker).

Geographic range.--Alaska, California, Colorado, Montana, Oregon, Washington, Wyoming.

California records.--FRESNO CO.: Cascada, 5,000 ft. 2 ♀, VII-29-19, paratypes (E. P. Van Duzee, CAS, USNM). Huntington Lake, 7,000 ft. 1 ♂, 1 ♀, VII-28-19, types (Mrs. E. P. Van Duzee, CAS); 1 ♂, 1 ♀, same data as types, paratypes (USNM). GLENN CO.: Stony Creek, near Hamilton City, 1 ♀, VIII-11-53 (E. I. Schlinger, UCD). INYO CO.: Lone Pine Creek, 8,250 ft. 1 ♂, VII-7-61, (D. R. Miller, UCD). LASSEN CO.: Susan River Camp, 1 ♂, VII-10-49 (E. L. Atkinson, CIS). LOS ANGELES CO.: 1 ♂, April (HCH). MONO CO.: Devil's Postpile National Monument, 1 ♂, 1 ♀, VII-29-54 (J. C. Downey, UCD). TULARE CO.: Giant Forest, 1 ♂, VII-14-23 (C. L. Fox, CAS). TUOLUMNE CO.: Chipmunk Flat, 1 ♀, VIII-9-60 (A. S. Menke, UCD).

L. incrassata closely resembles *L. discreta*, from which it may be separated in the male by a prebasal bulge or thickening on ventral region of hind femora, as viewed in profile (fig. 21).

Limnophora invada Huckett

(Map 27)

Limnophora invada Huckett, 1966, Proc. Calif. Acad. Sci., Ser. 4 34: 285.

Holotype: ♂, Palm Springs, Riverside County, California (CAS).

Geographic range.--California.

California records.--RIVERSIDE CO.: Palm Springs, 2 ♀, XII-25-52 (P. H. Arnaud, CAS), 1 ♂, 1 ♀, I-12-53, types (P. H. Arnaud, CAS). Thousand Palms, 1 ♂, 4 ♀, III-18-55 (D. F. Hardwick, CNC), 1 ♂, IV-25-55 (W. R. M. Mason, CNC). Thousand Palms Oasis, Thousand Palms, 4 ♀, III-10-55, 1 ♂, III-18-55 (W. R. M. Mason, CNC). Willis Palms Oasis, Thousand Palms, 1 ♂, 2 ♀, III-8-55 (W. R. Richards, CNC). SAN BERNARDINO CO.: Morongo, 1 ♂, IX-26-44 (A. L. Melander, USNM).

The species *L. invada* has vein M_{1+2} curved forward at apex as in *L. corvina* and *L. narona*, from both of which it differs in having 3 pairs of postsutural dorsocentral bristles, and interserial setulae sparse or absent between the two series of acrostical bristles.

Limnophora narona (Walker)

(Map 28)

Anthomyia narona Walker, 1849, List. Dipt. Br. Mus., 4: 945.

Anthomyia prominula Thomson, 1869, *In* K. Svenska Vetenskaps-Akademien, Kongliga svenska fregatten Eugenies resa omkring jorden. Pt. 2. Zoologie. [Sec.] I: Insekter, p. 550.

Homalomyia dentata Bigot, 1885, Ann. Soc. Entomol. Fr., (1884) 4: 284.

Limnophora cyrtoneurina Stein, 1898, Berl. Entomol. Z., (1897) 42: 203.

Types: ♂♂, Florida (BMNH).

Geographic range.--Widely distributed in the temperate regions of North America, reaching its northern limits in southern parts of the provinces and throughout the northern states from Washington to New England, thence southward across the continent to as far as Georgia and Florida in the East, the Gulf states in the South, Rocky Mountain and Pacific states in the West, including New Mexico, Arizona, and California. Also recorded from the Bahama Islands, Bermuda, and Mexico.

California records (map 28).--*Limnophora narona* is one of the most ecologically tolerant insects thus far recorded in California, occurring from sea level on the coast and in the margins of the low desert to timberline above 9,000 feet in the central Sierra Nevada and above 10,000 feet in the White Mountains. Adults are active throughout the year all along the coast and in the Sacramento Valley and have been collected in January in Death Valley and as late as mid-November in the San Joaquin Valley. At higher elevations the flight period probably lasts through the frost-free period, with records from May till September or October in most areas.

The species *L. narona* is recorded from 50 counties in California and approximately 309 localities, a survey based on an examination of 906 specimens, of which 530 were males and 376 females.

The species has vein M_{1+2} curved forward at apex, 4 pairs of postsutural dorsocentral bristles and 2 pairs of intraalar bristles.

Genus Pseudolimnophora Strobl

Pseudolimnophora Strobl, 1893, K.-k. Zool.-Bot. Gessell, Wien, Verhandl. 43 (Abhandl.): 272.

Type-species: *Musca triangula* Fallén, by subsequent designation of Coquillett, 1901.

The genus *Pseudolimnophora* has the frons similarly broad and bristled in both sexes, as in *Bucephalomyia*, thereby differing from the allied genus *Limnophora*. The genus *Pseudolimnophora* differs from *Bucephalomyia* in having the arista slender and unthickened on proximal third, and the vein M_{1+2} straight to wing margin.

Pseudolimnophora nigripes (Robineau-Desvoidy)

Limosia nigripes Robineau-Desvoidy, 1830, [Paris] Inst. de France, [Cl. des] Sci. Math. et Phys., Acad. Roy. des Sci., Mém. présentés par divers Savans [ser. 2], 2: 541.

Types: ♂ ♀, Saint-Sauveur, France.

Geographic range.--Alaska, Alberta, British Columbia, California, Labrador, Manitoba, Northwest Territories, Ontario, Quebec, South Dakota, Washington, Yukon Territory, Greenland.

California records.--TUOLUMNE CO.: Sonora Pass, 9,624 feet. 2 ♂, VII-17-53 (E. I. Schlinger, UCD), 1 ♂, VII-29-54 (W. H. Lange, UCD).

Genus Bucephalomyia Malloch

Bucephalomyia Malloch, 1918, Trans. Am. Entomol. Soc., 44: 273.

Type-species: *Tetramerinx femorata* Malloch (monobasic).

The genus *Bucephalomyia* is allied to *Pseudolimnophora* in having the frons similarly broad and bristled in both sexes. It differs from the latter genus in having the apical region of vein M_{1+2} broadly curved cephalad, and the arista thickened on proximal third.

Bucephalomyia femorata (Malloch)

Tetramerinx femorata Malloch, 1913, Proc. U. S. Natl. Mus., 45: 603.

Holotype: ♂, Los Angeles, California (USNM).

Geographic range.--Arizona, California, New Mexico, Baja California.

California records.--ALAMEDA CO.: Arroyo Mocho, 17 mi. S. of Livermore, 1 ♀, V-30-63 (J. M. Ross, BVC). BUTTE CO.: Oroville, 1 ♂, VII-23-26 (H. H. Keifer, CAS). CONTRA COSTA CO.: Danville, 1 ♂, VI-20-51 (F. X. Williams, CAS) LOS ANGELES CO.: Big Dalton Canyon, 13 ♂, 14 ♀ VII-19-23-52 (M. T. McClay, UCD); 1 ♂, 1 ♀, VI-20-65 (M. E. Irwin, UC R). Big Tujunga Canyon, 1 ♂, VII-19-52 (R. X. Schick, UCLA). Monrovia, 1 ♀, III-2-30 (HCH). Santa Monica Mountains, 1 ♂, VII-3-50 (UCLA). Tanbark Flat, 1 ♂, VII-15-56 (E. I. Schlinger, UCD). NAPA CO.: Calistoga, 1 ♀, V-12-60 (T. M. Street, BVC). RIVERSIDE CO.: Banning, 1 ♀, VII-25-59 (J. L. Bath, UCR). Deep Canyon, 1 ♀, V-17-63, 1 ♂, V-30-63, at light (E. I. Schlinger, UCR). Massacre Canyon, 1 ♀, V-4-65 (M. E. Irwin, UCR). Palm Canyon, 1 ♂, 1 ♀, IV-6-63 (R. L. Macdonald, UCD). Upper Deep Canyon near Horsethief Creek, 3,400 ft. 2 ♂, VI-11-65 (E. I. Schlinger, H. Ewing, UCR). SAN BERNARDINO CO.: Santa Ana River, South Fork, 2 ♂, VII-29-42, 2 ♂, VII-31-42 (A. L. Melander, USNM). SAN DIEGO CO.: 1.9 mi. SE. of Laguna Junction, 3,900 ft. 2 ♀, VII-23-65 (R. E. Somerby, UCR). San Diego, 1 ♀, VII-4-29, 2 ♂, 1 ♀, VII-7-29 (P. W. Oman, UK). near San Vicente Res[ervoir], 1 ♀, VI-10-65 (J. C. Hall, UCR). SANTA BARBARA CO.: Canon del Refugio, 1 ♂, 4 ♀, VI-25-59 (A. E. Menke, UCD). Santa Ynez Mountains, 2 ♀, VI-24-59 (F. D. Parker, UCD). TULARE CO.: Three Rivers, 1 ♀, IV-17-59 (H. R. Moffitt, UCR). VENTURA CO.: Foster Park, 1 ♀, VII-1-59 (M. Bruck, UCD).

The species *B. femorata* has a short spinular apical bristle mesad on mid coxa, and, in the male, 2 stubby spines at apex of hind coxa and a fasciculus of short spines at base of the ventral surface of hind femur.

Subfamily MYDAEINAE

KEY TO GENERA OF MYDAEINAE IN CALIFORNIA

1. Basal node to veins R_{2+3} and R_{4+5} with setulae on upper and under surfaces of wing 2
   Basal node to veins R_{2+3} and R_{4+5} bare, or with setulae only on under surface of wing 4
2. Vein M_{1+2} curved forward at apical region, thereby narrowing the opening to cell R_5 at wing margin . *Myospila Rondani*
   Vein M_{1+2} not curved forward at apical region 3
3. Profrons and cheek in profile broad, as wide as or wider than breadth of third antennal segment. *Xenomydaea* Malloch
   Profrons and/or cheek in profile not as wide as breadth of third antennal segment . . . . . *Mydaea* Robineau-Desvoidy
4. Hypopleura with hairs below the spiracle and on ventral margin of delivities of scutellum . . . . . *Quadrularia* Huckett
   Hypopleura bare, or if with hairs the declivities of scutellum are bare ventrad 5
5. Prealar bristle absent, weak or setulose, abdomen without paired marks; arista subplumose; legs weakly and sparsely bristled; upper region of head evenly flattish across both frons and eyes, parafacials largely obscured from view by anterior margin of eye when the head is viewed in profile; ovipositor short, stubby and upturned . . *Hebecnema* Schnabl
   Species not having the above combination of characters . . . . . *Helina* Robineau-Desvoidy

Genus Helina Robineau-Desvoidy

Helina Robineau-Desvoidy, 1830, [Paris] Inst. de France [Cl. des] Sci. Math. et Phys., Acad. Roy. des Sci., Mém. présentés par divers Savans [ser. 2], 2: 493.

Type-species: *Helina euphemioidea* Robineau-Desvoidy by subsequent designation of Coquillett, 1901 (= *Anthomyia pertusa* Meigen, 1826).

Species belonging to the genus *Helina* lack setulae on the upper surface of the basal node of veins R_{2+3} and R_{4+5}. For species known at present to occur in California both upper and lower surfaces are bare at this juncture of the veins. The hypopleura is bare, or if with hairs the scutellum is without hairs on the ventral border of declivities. The eyes of males are not closely nor extensively approximated on the frons; the thorax is four-striped.

Adults with few exceptions are woodland flies, occurring on flowers and foliage, branches and trunks of trees and shrubs. One species, *Helina punctata* (Robineau-Desvoidy)*, is commonly mentioned as frequenting human habitation (Séguy, 1923: 247). The habits of larvae are little known. Certain European species have been bred from rotting wood or timber, decaying vegetation, birds' nests, animal feces, and the larvae are in nature believed to be predatory, commensal, or zoophagous (Keilin, 1917: 393; Séguy, 1923: 240, 245, 246; 1929: 71).

KEYS TO SPECIES OF HELINA IN CALIFORNIA

Males

1. Scutellum with hairs on ventral border of declivities 2
   Scutellum hairless on ventral border of declivities 3
2. Hind tibia with a series of slender bristles on posterior-posteroventral surface, sternopleural bristles arranged 1: 2, prealar bristle long . . . . . *basalis* (Zetterstedt)
   Hind tibia bristleless on posteroventral surface, sternopleural bristles arranged 2: 2, prealar bristle short . *cinerella* (Wulp)
3. Mid tibia with a posterior tubercle or nodule, mid femur with a loose clump of short bristles near middle of anteroventral surface . *fulvisquama* (Zetterstedt)
   Mid tibia with no nodular excrescence on posterior surface 4
4. Prealar bristle four-fifths as long as anterior notopleural bristle 5
   Prealar bristle shorter than four-fifths length of anterior notopleural bristle, or is absent 8
5. Frons at middle as wide as length of third antennal segment and is bristled as in the female sex . . *spinosa* (Walker)
   Frons narrower caudad than length of third antennal segment and is not bristled as in female 6
6. Margin of the lower calyptral scale dark brown, abdomen shining black . . . . . *nigripennis* (Walker)
   Margin of the lower calyptral scale pale or yellowish 7
7. Hind femur with a full series of long anteroventral bristles, prosternum and hypopleura hairless . . . . . *obscurata* (Zetterstedt)

Hind femur with short, fine anteroventral bristles on proximal half, prosternum with marginal hairs, hypopleura with setulae on upper border cephalad of the spiracle . . . . . *rothi* Ringdahl

8. Eyes densely haired 9
Eyes sparsely or finely haired, or bare .14

9. Mesonotum with 1 or 2 pairs of well developed presutural acrostical bristles . . . . . *orbitaseta* (Stein)
Mesonotum without well developed presutural acrostical bristles 10

10. Hind tibia with extensive series of lengthy slender anteroventral and posterior-posteroventral bristles 11
Hind tibia with 3 to 6 short anteroventral bristles 12

11. Mid femur with 1 or more long bristles at base of posterior surface, mid tibia with an irregular series of diverse bristles on posterior surface, normally 4 pairs of postsutural dorsocentral bristles present . . . . . *pectinata* (Johannsen)
Mid femur without posterior bristles at base, mid tibia with an even series of 3 or 4 posterior bristles, normally 3 pairs of postsutural dorsocentral bristles present. . . . . *multiseriata* Malloch (in part)

12. Hind femur with a full series of longish anteroventral bristles and a proximal series of equally long fine slender posteroventral bristles 13
Hind femur with the longish anteroventral bristles confined to distal half and without long posteroventral bristles on proximal half . . . . . *marguerita* Snyder

13. Narrower part of frons as wide as width of third antennal segment, basal region of wings blackish infuscated . . . . . *bohemani* (Ringdahl)
Narrower part of frons less in width than width of third antennal segment, basal region of wings not blackish infuscated . . . . .*rufitibia* (Stein)

14. Mid tibia with 1 or 2 ventral-posteroventral bristles . . . . . *bispinosa* Malloch
Mid tibia without mid ventral bristle . 15

15. Hind tibia with an extensive series of fine slender posterior-posteroventral bristles, the longer bristles about twice as long as the width of tibia where situated 16
Hind tibia without such long posterior-posteroventral bristles 23

16. Frons at middle wider than the distance between first pair of dorsocentral bristles, interfrontalia broad throughout, as wide as the length of third antennal segment . . . . . *platykarenos* Huckett
Frons at middle much marrower than the distance between first pair of dorsocentral bristles, interfrontalia at middle much narrower than the length of third antennal segment 17

17. Longer aristal hairs nearly as long or longer than half width of third antennal segment 18
Longer aristal hairs scarcely longer than the basal diameter of arista 22

18. Mid femur with a short preapical anterodorsal bristle 19
Mid femur without a preapical anterodorsal bristle . . . . . *multiseriata* Malloch (in part)

19. Hind femur with several longish slender ventral-posteroventral bristles, hind tibia with usually 1, seldom 2, anterodorsal bristles, and a series of slender long anterodorsal setulae 20
Hind femur without longish ventral-posteroventral bristles, hind tibia with 2 or 3 anterodorsal bristles, and without a series of slender anterodorsal setulae . . . . . *polychaeta* Huckett

20. Four pairs of postsutural dorsocentral bristles present, hind femur with the longer posteroventral bristles on proximal half, wings and calyptrae brownish tinged . . . . . *ute* Snyder
Three pairs of postsutural dorsocentral bristles present, hind femur with the longer posteroventral bristles on distal half, membrane of wings and calyptrae clear or partly yellowish tinged. 21

21. Palpi mainly fuscous or brown, fore tibia without a mid posterior bristle. . . . *keremeosa* Snyder
Palpi mainly yellow or fulvous, at most the apex fuscous, fore tibia with a mid posterior bristle . . *villihumilis* Snyder

22. Hind tibia with an extensive series of fine slender anterior-anteroventral bristles, hind femur without fine posteroventrals, *m-cu* cross-vein unevenly clouded, becoming blotchy or spotted at ends . . . . . *cothurnata* (Rondani)
Hind tibia with a series of normal, short anteroventral bristles, hind femur with a diffuse series of fine bristles on basal region of posteroventral surface, *m-cu* cross-vein evenly clouded . . . . *maculipennis* (Zetterstedt)

23. Hind tibia with 1 or 2 bristles on proximal third of posterodorsal surface . 24
Hind tibia without posterodorsal bristles on proximal third 26

24. Mid femur with long posteroventral bristles extending distad to the preapical third, hind femur with a full series of long anteroventral bristles, tibiae black . . . . . *nigrita* Malloch
Mid femur with longer posteroventral bristles restricted to the proximal half, hind femur with anteroventral bristles on proximal half mostly shorter than maximum height of femur . . . 25

25. Lower (ventral) anterior sternopleural bristle robust, hind femur without proximal posteroventral bristles, usually 4 pairs of postsutural dorsocentral bris-

tles present, tibiae rufous or fuscous . *duplicata* (Meigen)
Lower anterior sternopleural bristle absent or weak, hind femur with short posteroventral bristles proximad, usually 3 pairs of postsutural dorsocentral bristles present, tibiae fulvous . *spuria* Malloch

26. Mid and hind femora black except on apical region . . . . . *humilis* var.
Mid and hind femora fulvous 27
27. Thorax gray-black, including humeral callosities and scutellum, hind tibia with a fringe of fine posteroventral setulae along distal half and usually with only 1 mid anterodorsal bristle . . . . . *procedens* (Walker)
Thorax with scutellum and/or humeral callosities partly or entirely yellowish or reddish, hind tibia without a fringe of fine posteroventral setulae on distal half, and usually with more than 1 anterodorsal bristle 28
28. Wings usually with cross-veins clouded, usually with 4 pairs of postsutural dorsocentral bristles present 29
Wings with cross-veins unclouded, usually 3 pairs of postsutural dorsocentral bristles present 30
29. Thorax fulvous, at most with dark median vitta on mesonotum . . . . . *troene* var. *fulviventris* (Bigot)
Thorax not entirely fulvous, exclusive of median vitta . . . . . *troene* (Walker)
30. Thorax mainly fulvous, abdomen by contrast gray-black, the two colors sharply delimited at union of thorax and abdomen . . . . . *bicolorata* (Malloch)
Thorax and abdomen mainly gray-black, not sharply differentiated in contrasting colors at point of union . *humilis* (Stein)

Females

1. Scutellum with hairs on ventral surface . 2
Scutellum without hairs on ventral surface 3
2. Legs black, prealar bristle long . . . *basalis* (Zetterstedt)
One or more tibiae more or less fulvous, prealar bristle short . . *cinerella* (Wulp)
3. Prealar bristle long 4
Prealar bristle short or absent 8
4. Aristal hairs as long or longer than half the width of third antennal segment, sternopleural bristles arranged 2:2 . 5
Aristal hairs scarcely longer than the basal diameter of arista, sternopleurals 1:2 . . . *fulvisquama* (Zetterstedt)
5. Hind femur with a full series of longish anteroventral bristles, prosternum and the upper border of hypopleura cephalad of the spiracle hairless 6
Hind femur with longish anteroventral bristles confined to distal half, prosternum and upper border of hypopleura with hairs . . . . . *rothi* Ringdahl
6. Mesopleural series of bristles without a predorsal interspatial bristle (fig. 14) . . . . . *spinosa* (Walker)
Mesopleural series with a predorsal interspatial bristle (fig. 13) 7
7. Abdomen black and shiny, with scant pruinescence, knobs of halteres usually largely darkened . . *nigripennis* (Walker)
Abdomen with dense grayish pruinescence, knobs of halteres mainly yellow . . . *obscurata* (Zetterstedt)
8. Mid tibia with a mid ventral-posteroventral bristle . . . *bispinosa* Malloch
Mid tibia without a mid ventral bristle . 9
9. Mid femur without a preapical anterior bristle, or if present setulose . . . 10
Mid femur with a preapical anterior bristle present 15
10. Mesonotum with 1 or 2 pairs of well-developed presutural acrostical bristles . *orbitaseta* (Stein)
Mesonotum without well-developed presutural acrostical bristles 11
11. Hind femur with a full series of anteroventral bristles 12
Hind femur with longish anteroventral bristles confined to distal half . . 13
12. Mid tibia with anterodorsal bristle(s) . *bohemani* (Ringdahl)
Mid tibia without an anterodorsal bristle . . . . . *rufitibia* (Stein)
13. Legs black, at most hind tibiae rufous tinged, calyptrae densely yellowish . *marguerita* Snyder
Femora and tibiae mostly fulvous, calyptrae not densely yellowish 14
14. Cross-veins clear, postsutural dorsocentral bristles usually 3 pairs . . . . *multiseriata* Malloch
Cross-veins clouded, postsutural dorsocentral bristles usually 4 pairs . . *pectinata* (Johannsen)
15. Hind tibia with 1 or 2 short posterodorsal bristles on proximal half 16
Hind tibia without posterodorsal bristles on proximal half 18
16. Hind femur with a full series of anteroventral bristles 17
Hind femur with anteroventral bristles restricted to distal half of femur . *duplicata* (Meigen)
17. Mid and hind femora and tibiae blackish . *nigrita* Malloch
Mid and hind femora mostly or entirely fulvous, tibiae fulvous . . *spuria* Malloch
18. Mid and hind femora mostly or entirely fulvous 19
Mid and hind femora mostly fuscous or blackish 27
19. Scutellum entirely gray-black . . . . . *procedens* (Walker)
Scutellum partly or entirely yellowish or reddish 20
20. Thorax entirely fulvous, abdomen by con-

trast gray-black, the two colors sharply delimited at union of thorax and abdomen . . . . . *bicolorata* (Malloch)

Thorax and abdomen not sharply differentiated in contrasting colors at point of union, or if so abdomen usually spotted and 4 pairs of postsutural dorsocentral bristles present 21

21. Four pairs of postsutural dorsocentral bristles usually present 22

Three pairs of postsutural dorsocentral bristles usually present 24

22. Palpi brown, hind femur with anteroventral bristles on proximal half, longer aristal hairs fully as long as half the width of third antennal segment . . . *ute* Snyder

Palpi yellow, hind femur with anteroventral bristles restricted to distal half, aristal hairs shorter than half the width of third antennal segment . . . 23

23. Thorax fulvous, with or without a median vitta on mesonotum . . . . . *troene* var. *fulviventris* (Bigot)

Thorax not entirely fulvous, exclusive of median vitta . . . . . *troene* (Walker)

24. Sternopleural bristles arranged 2:2, hind femur with 1 or 2 anteroventral bristles on proximal third 25

Sternopleural bristles 1:2, hind femur without anteroventral bristles on proximal third . . . . . *humilis* (Stein)

25. Hind tibia with 2 anterodorsal bristles . *platykarenos* Huckett

Hind tibia with 1 anterodorsal bristle . 26

26. Humeral callosities concolorous with mesonotum, palpi rufous brown, or infuscated, partly or entirely so . . . . . *keremeosa* Snyder

Humeral callosities partly or mostly yellowish, palpi mostly yellow except at apex . . . . . *villihumilis* Snyder

27. Calyptrae densely yellowish, aristal hairs as long as width of third antennal segment, eyes with hairs. *marguerita* Snyder

Calyptrae pale, aristal hairs not longer than half width of third antennal segment, eyes bare 28

28. Third antennal segment about as long as distance between oral vibrissae, *m-cu* cross-vein evenly clouded . . . . . *maculipennis* (Zetterstedt)

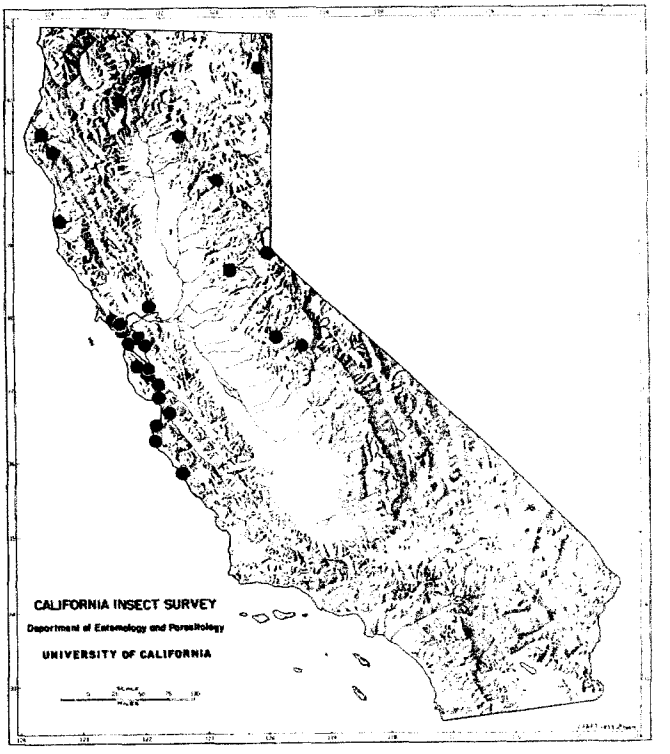
Third antennal segment shorter than distance between oral vibrissae, *m-cu* cross vein unevenly clouded, becoming blotchy or spotted at ends . . *cothurnata* (Rondani)

Helina basalis (Zetterstedt)

Anthomyza basalis Zetterstedt, 1838, Ins. Lapp., p. 663.

Aricia flavisquama Zetterstedt, 1849, Dipt. Scand., 8: 3287.

Mydaea flavocalptrata Stein, 1920, May. Arch. Naturgesch., (1918) Abt. A 84 (9): 31.



Map 29. California distribution of *Helina bicolorata* (Malloch).

Helina hylemyioides Malloch, 1920, June. Trans. Am. Entomol. Soc., 46: 137.

Type: ♂, Lycksele Lappmark (Zool. Inst., Lund).

Geographic range.--Alaska, Alberta, British Columbia, California, Colorado, Labrador, Manitoba, Montana, New Mexico, Northwest Territories, Nevada, Oregon, Quebec, Utah, Washington. Also Kamchatka Peninsula.

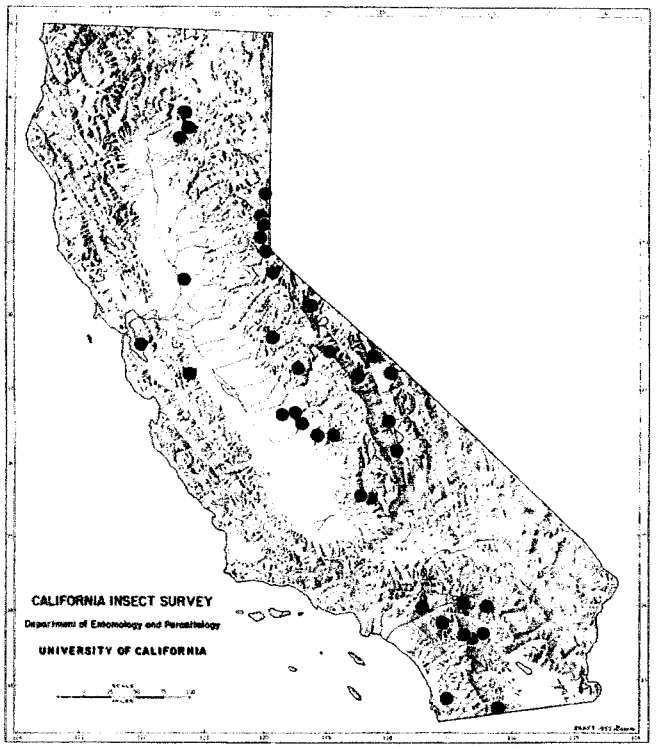
California records.--LASSEN CO.: Susan River Camp, 1 ♀, VII-9-49 (A. T. McClay, UCD). NEVADA CO.: Sagehen Creek, near Hobart Mills, 1 ♂, VII-7-64, 1 ♂, VII-9-64, 1 ♀, VII-15-64, 1 ♂, VII-16-64, in malaise trap (M. E. Irwin, UCR). TUOLUMNE CO,: Tuolumne Meadows, 1 ♀, VIII-1-40 (R. H. Beamer, UK).

The species *H. basalis* and *H. cinerella* have one or more hairs on the ventral margins of declivities of scutellum. The former species may be separated from the latter by the long prealar bristle and the presence of only one anterior sternopleural bristle.

Helina bicolorata (Malloch)

(Map 29)

Aricia bicolorata Malloch, 1919, Proc. Calif. Acad. Sci., ser. 4, 9: 253.



Map 30. California distribution of *Helina bispinosa* Malloch.

Mydaea aperta Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 28.

Holotype: ♂, Hood River, Oregon (CAS).

Geographic range.--British Columbia, California, Oregon, Washington.

California records (map 29).--This western boreal species follows the Vancouveran Province along the coast southward to southern Monterey County and ranges into the central Sierra Nevada at moderate elevations (3,000 to 6,000 feet). The flies are active through the warmer months, from April to September in the San Francisco Bay area and June to August further north and in the mountains.

The species *H. bicolorata* may be distinguished from its congeners by the sharply contrasting colors of thorax and abdomen at their point of union, the thorax fulvous, the abdomen gray-black. Certain specimens of *H. troene* var. *fulviventris*, developing a similar condition, may usually be separated owing to the presence of 4 pairs of postsutural dorsocentral bristles and/or paired spots on the abdomen.

Helina bispinosa Malloch

(Map 30)

Helina bispinosa Malloch, 1920, Trans. Am. Entomol. Soc., 46: 142.

Holotype: ♂, Waukegan, Illinois (IllNHS).

Geographic range.--British Columbia, California, Colorado, Idaho, Illinois, Manitoba, Montana, New Mexico, Nevada, Oregon, Utah, Washington, Wyoming.

California records (Map 30).--*Helina bispinosa* occurs in semiarid places throughout much of interior California, on both sides of the Sierra Nevada, in the Central Valley, and its adjacent canyons, and in the southern California mountains and desert margins. Most flight records are for June and July, particularly at higher elevations, but the species may exhibit two generations, in spring and fall, at low elevations. There are records from March to November in the Central Valley, April to September along the central coast, and July to October in southern California.

The species *H. bispinosa* and the northern taxon *H. setifer* Huckett* have one or two ventral bristles near middle of mid tibia. *H. bispinosa* differs from *H. setifer* in having an anterodorsal bristle on mid tibia and fulvous tibiae.

Helina bohemani (Ringdahl)

Mydaea bohemani Ringdahl, 1916, Entomol. Tidskr., 37: 235.

Type: ♂, Lule Lappmark (NHM Stockholm).

Geographic range.--Alaska, California, Colorado, Utah, Yukon Territory.

California record.--NEVADA CO.: Sagehen, near Hobart Mills, 1 ♀, VII-4-62 (J. Powell, CIS).

The species *H. bohemani* is allied to *H. rufitibia*, from which the male may be distinguished by the wider frons and the blackish infuscation on basal region of wings; the female by the presence of 1 or 2 anterodorsal bristles on mid tibia and the blackish mid and hind femora on the proximal two thirds.

Helina cinerella (van der Wulp)

(Map 31)

Aricia cinerella van der Wulp, 1867, Tijdschr. Entomol., 10: 150.

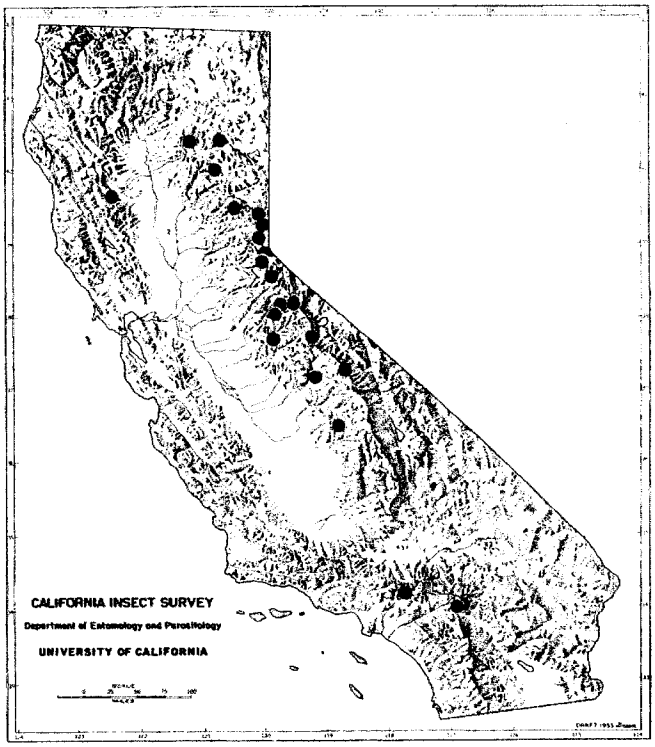
Aricia van-der-wulpi Schnabl, 1888, Hor. Soc. Ent. Ross., 22: 387.

Aricia brevis Stein *p.p.*, 1898, Berl. Entomol. Z., (1897) 42: 180.

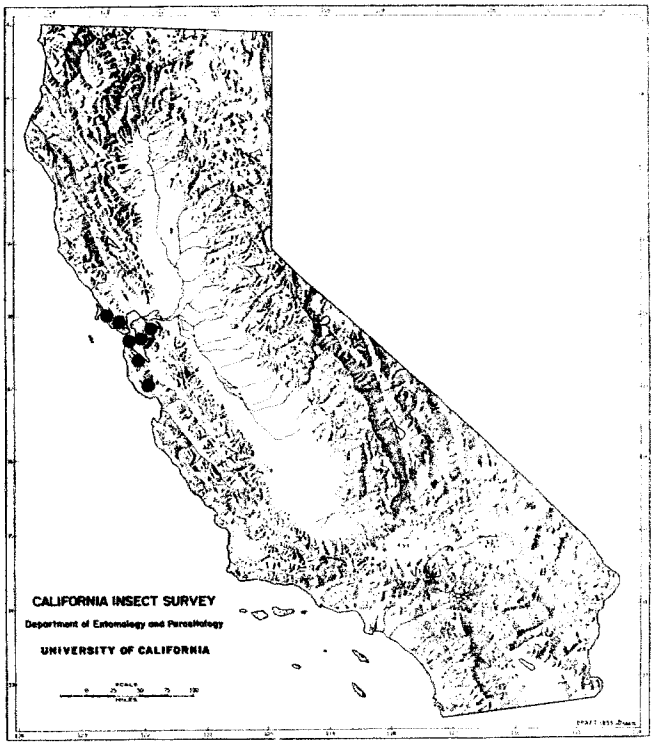
Helina aldrichi Snyder, 1949, Bull. Am. Mus. Nat. Hist., 94: 122.

Type: ♂, Wisconsin (MNH Leiden).

Geographic range.--Widely distributed in the north temperate region of continental North Ameri-



Map 31. California distribution of *Helina cinerella* (van der Wulp).



Map 32. California distribution of *Helina cothurnata* (Rondani).

ca, reaching its northern limits in central Alaska, the Yukon, the upper region of the Mackenzie River Basin, and in the provinces from Manitoba eastward to southern Quebec and Labrador, thence southward to the states bordering the Great Lakes; in the west, along the Rocky Mountains from British Columbia and Alberta to Colorado and Utah, and on the Pacific coast from Washington to California, and inland in Nevada.

California records (map 31).--This is a boreal species which ranges southward into California along the north Coast Range and Sierra Nevada at moderate to high elevations (mostly 6,000 to 8,000 feet, up to 11,250 feet at Ruby Lake in northwest Inyo County), and into the San Bernardino Mountains of southern California. Flight records are during the summer, June to August in the Sierra Nevada, May to July in the San Bernardino Mountains.

The species *H. cinerella*, as in *H. basalis*, typically has hairs on ventral margin of declivities of scutellum. The former differs from *H. basalis* in having a shorter prealar bristle, not as long as the anterior notopleural, and by the presence of 2 anterior sternopleural bristles. The species may have 3 or 4 pairs of postsutural dorsocentral bristles, and exhibits considerable variation in the extent to which the mid and hind femora may be blackened. In many of the female specimens there is a posterior bristle near middle of the hind tibia, and seemingly the ventral hairs of the scutellum may be lacking.

Helina cothurnata (Rondani)

(Map 32)

Spilogaster cothurnata Rondani, 1866, Atti Soc. Ital. Sci. Nat., 9: 116.

Type: ♂, near Parma, Italy.

Geographic range.--Alaska, British Columbia, California, Idaho, Indiana, New Hampshire, Northwest Territories, New York, Washington.

California records.--ALAMEDA CO.: Berkeley, 1 ♀, III-25-51 (P. D. Hurd, CIS). Oakland Hills, near Mills College, 1 ♀, III-22-59 (C. D. MacNeill, CAS). CONTRA COSTA CO.: Orinda Cross Road, 1 ♂, 1 ♀, III-4-49 (E. G. Linsley, CIS). MARIN CO.: Inverness, 2 ♀, II-13-61, 1 ♀, III-4-61, 1 ♀, III-25-62 (C. A. Toschi, CIS); 1 ♀, IV-4-63 (P. H. Arnaud, CAS). Mill Valley, 1 ♀, II-22-53 (H. B. Leech, CAS), 1 ♀, IV-5-6-65 (P. H. Arnaud, CAS). SAN FRANCISCO CO.: San Francisco, 1 ♀, III-30-19 (E. P. Van Duzee, CAS), 2 ♀, III-25-64 (P. H. Arnaud, CAS). SAN MATEO CO.: Redwood City, 1 ♀, II-1-53, 6 ♂, II-8-53, 1 ♂, II-9-53 (P. H. Arnaud, CAS). SANTA CRUZ CO.: 15 mi. N. of Santa Cruz, 2 ♂, II-3-62 (C. A. Toschi, CIS).

The species *H. cothurnata* is related to *H. maculipennis*, both species having the femora black, hind tibia normally with only 1 mid anterodorsal bristle, and the aristal hairs only slightly longer than the basal diameter of arista. The male of *H. cothurnata* differs from that of *H. maculipennis* in the absence of posteroventral bristles on the hind femur and by the presence of numerous long slender anteroventral bristles on the hind tibia. In the female of *H. cothurnata* the third antennal segment is shorter than in the female of *H. maculipennis*, and the infuscation blotchy at ends of *m-cu* cross-vein.

Helina duplicata (Meigen)

Anthomyia duplicata Meigen, 1826, Syst. Beschr., 5: 92.

Types: ♂ ♀, locality not stated (Germany?).

Geographic range.--Widely distributed in the north temperate region of continental North America, attaining its northernmost limits in central Alaska, the northern reaches of the Yukon, Northwest Territories, and Quebec, thence from British Columbia, Alberta, and Saskatchewan eastward to as far as southern Labrador, the northeastern states, and the region of the Great Lakes; in the west, along the Rocky Mountains from Idaho to Colorado, and on the Pacific coast from Washington to California, and inland in Nevada. Also from Kamchatka Peninsula.

California records.--ALAMEDA CO.: Berkeley, 2 ♂, IX-9-36 (C. A. Hamsher, UCD). MONO CO.: Sardine Creek, 8,500 ft. 1 ♂, 1 ♀, VII-11-51 (A. T. Mc Clay, UCD). MONTEREY CO.: Big Sur, 1 ♀, V-21-36 (C. A. Hamsher, UCD). NAPA CO.: Mt. St. Helena, 1 ♂, V-15-51 (E. I. Schlinger, UCD). SANTA CLARA CO.: Los Gatos, 1 ♀, II-29-36 (C. A. Hamsher, UCD).

The species *H. duplicata* has a short posterodorsal bristle on proximal third of the hind tibia, and thereby becomes associated with *H. nigrita* and *H. spuria*. From both these species *H. duplicata* differs in having no posteroventral bristles on the hind femur, and the anteroventral bristles in the male are much weaker on the proximal than on the distal half, being absent thereat in the female. Smith (1954: 222) in England has bred the species from among several larvae found under moss.

Helina fulvisquama (Zetterstedt)

Aricia fulvisquama Zetterstedt, 1845, Diptera Scandinaviae, 4: 1491.

Helina tuberculata Malloch, 1919, Can. Entomol., 51: 277.

Type: ♂, Lule Lappmark (MNH Stockholm) *teste* Stein.

Geographic range.--Alaska, Alberta, British Columbia, California, Colorado, Labrador, New Hampshire, Northwest Territories, Quebec, South Dakota, Utah, Washington, Wyoming, Yukon Territory and Commander Islands.

California record.--TUOLUMNE-MARIPOSA CO.: Yosemite National Park, 1 ♀, VIII-1-40 (L. J. Lipovsky, UK).

The male of *H. fulvisquama* may readily be recognized by characters given in the key. In both sexes of this robust species the prealar bristle is long, the aristal hairs not longer than the basal diameter of arista, and only one anterior sternopleural bristle is present.

Helina humilis (Stein)

Mydaea humilis Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 32.

Type: ♂, Guemes Island, Washington (ZMUB).

Geographic range.--Arizona, British Columbia, California, Colorado, Oregon, Washington, Wyoming.

California records.--MARIN CO.: Point Reyes, 1 ♂, V-15-37, variant (R. C. Dickson, HCH); 1 ♀, III-3-52 (W. W. Middlekauff, CIS). Redwood Creek, 1 ♂, V-17-08 (E. C. Van Dyke, HCH). MODOC CO.: Cedar Pass, 1 ♂, VI-29-55 (J. R. Jessen, UCD). MONTEREY CO.: Asilomar, 1 ♀, IX-1-45 (A. L. Melander, USNM). SANTA CRUZ CO.: Soquel, 1 ♂, VI-18-20-50 (M. T. James, WSU).

H. humilis has the scutellum in male varying from partly reddish or yellowing to entirely concolorous with the blackish mesonotum. The palpi in both sexes are rufous or partly to entirely fuscous, the mid and hind femora entirely fulvous, and the mesonotum usually with 3 pairs of postsutural dorsocentral bristles. I have a male from Point Reyes that varies from 24 typical male specimens of *H. humilis* before me in having 4 pairs of postsutural dorsocentral bristles, the mid and hind femora black except on apical region, and the interfrontalia uninterrupted caudad. The scutellum is entirely darkened.

Helina keremeosa Snyder

Helina keremeosa Snyder, 1949, Bull. Am. Mus. Nat. Hist., 94 p. 156.

Holotype: ♂, Keremeos, British Columbia (CNC).

Geographic range.--British Columbia, California.

California record.--MONO CO.: White Mountains, 10,150 ft. 3 mi. N. of Inyo County, 9 ♂, 3 ♀, VIII-19-20-63, flight trap (H. B. Leech, CAS).

The species *H. keremeosa* is related to *H. villihumilis*, having in the male a series of strong anteroventral bristles restricted to distal half of hind femur and an opposite series of much finer posteroventrals which terminates opposite the proximal bristles of the anteroventral series, and whose bristles gradually become longer distad. The hind tibiae have a profuse series of slender bristles on ventral surfaces, the bristles becoming shorter distad, 1 or 2 median anterodorsal bristles and a series of slender anterodorsal setulae. In the above series of males the mid and hind femora vary from being largely fulvous to blackish on proximal two thirds. The female differs from that of *villihumilis* in having the humeral callosities concolorous with the mesonotum and the palpi more extensively darkened.

Helina maculipennis (Zetterstedt)

Aricia maculipennis Zetterstedt, 1845, Dipt. Scand., 4: 1475.

Aricia poeciloptera Malloch, 1918, Trans. Am. Entomol. Soc., 44: 271. name preoc.

Helina neopoeciloptera Malloch, 1920, Trans. Am. Entomol. Soc., 46: 139. new name.

Types: ♂ ♀, Dalecarlia and Lule Lappmark (MNH Stockholm, Zool. Inst., Lund).

Geographic range.--Alaska, Alberta, British Columbia, California, Labrador, Manitoba, Maine, Massachusetts, Michigan, Montana, New Hampshire, New Mexico, Ontario, Quebec, Wisconsin. Also the Kamchatka Peninsula.

California records.--CONTRA COSTA CO.: Orinda Cross Road, 1 ♂, 1 ♀, III-4-49 (E. G. Linsley, CIS). SONOMA CO.: Boyes Spring, 1 ♀, III-25-37 (N. W. Frazier, CIS).

The male of *H. maculipennis* differs from that of *H. cothurnata* in having fine posteroventral bristles near the base of hind femur and normal short anteroventral bristles on the hind tibia. The female has a longer third antennal segment than the female of *H. cothurnata*, and a more even band of infuscation along *m-cu* cross-vein.

Helina marguerita Snyder

Helina marguerita Snyder, 1949, Bull. Am. Mus. Nat. Hist., 94 p. 137.

Holotype: ♂, Preston, Washington (HCH).

Geographic range.--California, Labrador, Northwest Territories, Ontario, Quebec, Washington, Yukon Territory.

California record.--MARIN CO.: Inverness, 1 ♂, III-15-59 (C. W. O'Brien, CIS), 1 ♀, III-25-62 (C. A. Toschi, CIS); 1 ♂, IV-4-63 (P. H. Arnaud, CAS).

H. marguerita may be linked to *H. bohemani* and *H. rufitibia*, from which it differs in having much weaker anteroventral and posteroventral bristles on proximal half of hind femur.

Helina multiseriata Malloch

Helina multiseriata Malloch, 1922, Bull. Brooklyn Entomol. Soc., 17: 95.

Holotype: ♂, Pullman, Washington (Stanford Univ.).

Geographic range.--Alberta, British Columbia, California, Colorado, Idaho, Montana, Oregon, Utah, Washington, Wyoming.

California records.--ELDORADO CO.: Echo Lake, 1 ♀, VII-11-53 (W. W. Middlekauff, CIS). INYO CO.: Rock Creek, 1 ♀, VI-22-37 (J. H. Mitchell, AMNH). LASSEN CO.: Hallelujah Junction, 1 ♀, VII-12-54 (J. A. Powell, CIS). MARIPOSA CO.: Village, Yosemite National Park, 1 ♀, VIII-3-62 (R. R. Dreisbach, HCH). MONO CO.: Leavitt Meadow, 7,200 ft. 10 ♂, 7 ♀, VIII-13-63, flight trap (H. B. Leech, CAS). The Hot Springs, 2.5 mi. S. of Bridgeport, 4 ♂, 7 ♀, VIII-15-16-63, flight trap (H. B. Leech, CAS). Virginia Lakes, 9,750 ft. 1 ♂, VIII-17-63 (H. B. Leech, CAS). MONTEREY CO.: Carmel, 1 ♀, VII-8-32 (L. S. Slevin, CAS), 1 ♀, VII-7-38 (T. G. H. Aitken, CAS). Pfeiffer Big Sur State Park, 1 ♀, VI-19-49 (P. H. Arnaud, CAS). TUOLUMNE CO.: Strawberry, 1 ♂, VII-17-53 (E. I. Schlinger, UCD), 1 ♀, VIII-13-60 (D. Q. Cavagnaro, UCD).

H. multiseriata has the eyes sparsely haired and mid femur without a preapical anterior bristle, or if present setulose. It differs from allied species in having 3 pairs of postsutural dorsocentral bristles, and from the male of *H. pectinata* in the absence of basal posterior bristles on mid femur.

Helina nigripennis (Walker)

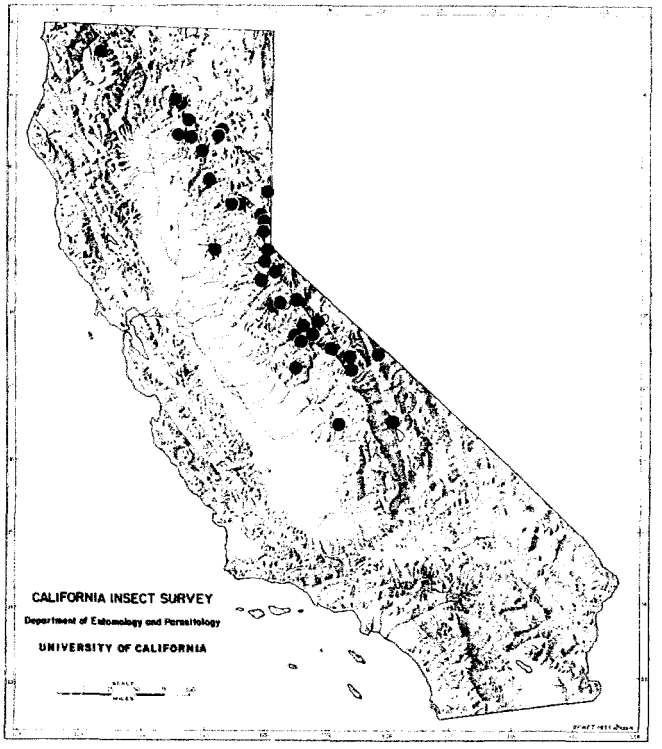
(Fig. 13; map 33)

Anthomyia nigripennis Walker, 1849, List Dipt. Br. Mus., 4: 929.

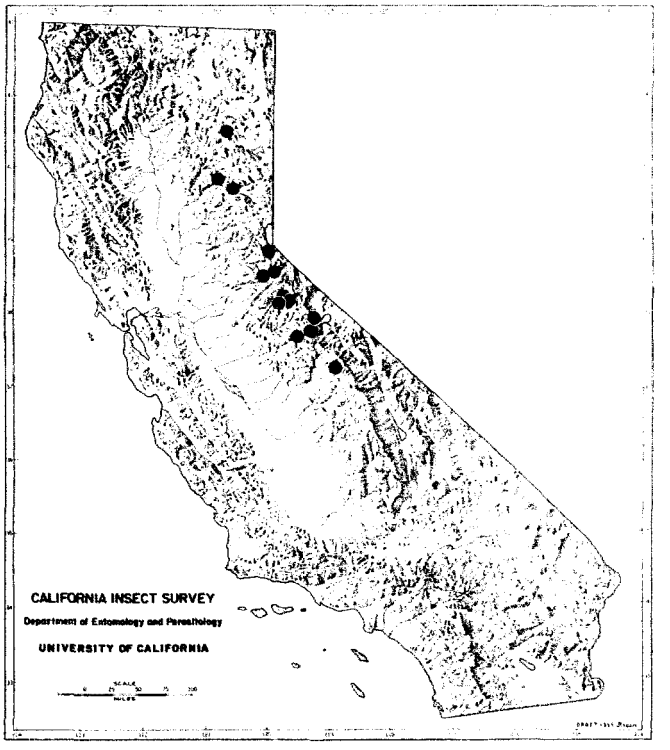
Aricia nitida Stein, 1898, Berl. Entomol. Z., (1897) 42: 185.

Spilogaster crepuscularis Stein, 1898, Berl, Entomol. Z., (1897) 42: 201.

Type: ♂, St. Martin's Falls, Albany River, Ontario (BMNH).



Map 33. California distribution of *Helina nigripennis* (Walker).



Map 34. California distribution of *Helina nigrita* Malloch.

Geographic range.--Widely distributed in the north temperate region of North America, occurring in southern Alaska, in British Columbia, Alberta, and eastward in Manitoba, Ontario, Quebec, and Newfoundland, southward in Michigan and Massachusetts; in the west from the Rocky Mountain states of Idaho and Montana to Utah and Colorado, and from the mountainous regions of Washington to California, and inland in Nevada.

California records (map 33).--Although *Helina nigripennis* exhibits a rather broad ecologic distribution, from Transition Zone foothills to above 11,000 feet in the Sierra Nevada and into the Great Basin in Lassen County and the edge of the Mojave desert in Inyo County, its range in the state is restricted to the Cascade-Sierra Nevada chain. The flies have been collected only during mid June to late August.

The present survey is based on about 50 records in 16 counties.

The male of *H. nigripennis* may readily be distinguished from among its congeners by the brownish upper calyptral scale and whitish lower with dark brown margin. In both sexes the abdomen is shiny black, with scant pruinescence, the mesopleural series of bristles with a slender predorsal interspatial (fig. 13), and the knobs of halteres usually blackish in the male and darkened in the female.

Helina nigrita Malloch

(Figs. 38, 47, 56; map 34)

Helina nigrita Malloch, 1920, Trans. Amer. Entomol. Soc., 46: 139.

Holotype: ♂, Monida, Montana (IllNHS).

Geographic range.--Alberta, California, Colorado, Manitoba, Montana, North Dakota, New Mexico, Saskatchewan.

California records.--ALPINE CO.: Hope Valley, 1 ♀, VII-18-48 (L. W. Quate, CIS); 1 ♂, VI-7-52 (R. M. Bohart, UCD). AMADOR CO.: 4 mi. N. of Silver Lake, 3 ♀, VII-25-55 (J. C. Downey, UCD). EL DORADO CO.: Bijou, Lake Tahoe, 1 ♀, VI-27-29 (E. P. Van Duzee, CAS). Grass Lake, 3 ♀, VII-5-62 (M. E. Irwin, UCD). Grass Lake, Luther Pass, 1 ♀, VII-24-55 (J. C. Downey, UCD). Wright's Lake, 3 ♂, VII-2-48 (D. Carter, K. W. Tucker, CIS). FRESNO CO.: Pioneer Basin, 10-11,000 ft. 1 ♂, VIII-19-53 (E. I. Schlinger, UCD). LASSEN CO.: Summit Camp, 1 ♀, VI-28-49 (H. A. Hunt, UCD). MARIPOSA CO.: Porcupine Flat, 2 ♂, 1 ♀, VIII-2-62 (R. and K. Dreisbach, HCH). MONO CO.: 1 mi. S. of Saddlebag Lake, 3 ♂, 5 ♀, VII-15-61 (D. R. Miller, UCD; G. I. Stage, CIS; J. S. Buckett, CAS). Sardine Creek, 8,500 ft. 7 ♂, 10 ♀, VI-28-51 (C. A. Downing, A. T. McClay, E. I. Silver, S. M. Kappos, UCD), 1 ♂, VII-6-51 (A. T. McClay, UCD). PLUMAS CO.: Bucks Lake, 5 ♂, 1 ♀, VII-1-49 (E. I. Schlinger, W. H. Wade, UCD). Johnsville, 1 ♀, VI-28-64 (M. E. Irwin, UCR). TUOLUMNE CO.: Bumble Bee,

1 ♀, VI-25-51 (A. T. McClay, UCD). Dardanelles, 3 ♂, 1 ♀, VI-26-51 (A. T. McClay, UCD). 7 mi. NE. of Dardanelles, 1 ♂, VI-7-60 (W. A. Steffan, CIS). Gaylor Lakes, 10,500 ft. Yosemite National Park, 1 ♀, VII-8-46 (H. P. Chandler, CAS). Mt. Conness, 1 ♂, 1 ♀, VII-23-36, 1 ♂, 1 ♀, VII-25-36, base of mountain, 1 ♂, VII-29-36 (CIS). Sonora Pass, 1 ♀, VII-26-62 (C. D. MacNeill, D. C. Rentz, M. R. Lundgren, CAS); 1 ♂, VIII-10-63 (C. A. Toschi, CIS). Tilden Lake, Yosemite National Park, 1 ♀, VII-29-18 (CIS). Tioga Pass, 1 ♂, 1 ♀, VII-8-46 (H. P. Chandler, CAS); 2 ♀, VII-31-40 (L. P. Lipovsky, UK). Tolumne Meadows, 8,600 ft. 1 ♀, VIII-15-16 (G. R. Pilate, USNM). Youngs Lakes, Yosemite, 1 ♀, VII-23-36 (CIS).

The species *H. nigrita* has 1 or 2 short posterodorsal bristles on the proximal third of hind tibia, and thereby may be associated with *H. duplicata* and *H. spuria*, from both of which it may be separated by the blackish tibiae, and full series of longish anteroventral bristles on hind femur. The mid tibia of the male of *H. nigrita* has 3 lengthy posterior bristles and a long preapical postero-posterodorsal. In both sexes the prealar bristle is quite short.

Helina obscurata (Meigen)

Anthomyia obscurata Meigen, 1826, Syst. Beschr., 5: 89.

Helina nasoni Malloch, 1920, Trans. Am. Entomol. Soc., 46: 138.

Type: ♂, locality not stated, Germany?

Geographic range.--Widely distributed in the boreal regions of continental North America, reaching northerly to central Alaska, the Yukon and Mackenzie River Basin as far as Aklavik, thence eastward across the provinces to Quebec and Labrador, southward to New Brunswick and the states bordering the Great Lakes; in the west, across the Rocky Mountains from British Columbia and Alberta to Utah and Colorado, and on the Pacific coast from Washington to California.

California records.--ALPINE CO.: Hope Valley, 1 ♂, VI-7-52 (R. M. Bohart, HCH). DEL NORTE CO.: Smith River, 1 ♂, VII-25-32 (J. M. Aldrich, USNM). HUMBOLDT CO.: 1 mi. N. of Samoa, 1 ♀, VIII-20-62 (R. Doty, BVC). MONO CO.: Sardine Creek, 8,500 ft. 5 ♂, 5 ♀, VII-6-18-51 (A. T. McClay, UCD).

The species *H. obscurata* has a full series of long anteroventral bristles on the hind femur, and a predorsal interspatial bristle in the mesopleural series, thereby agreeing with *H. nigripennis*, from which it differs in having the calyptrae of the male pale, nonbrowned, the abdomen of the female with distinct and extensive pruinescence, and in both sexes the knobs of the halteres paler.

Helina orbitaseta (Stein)

Aricia orbitaseta Stein, 1898, Berl. Entomol. Z., (1897) 42: 186.

Type: ♀, Moscow, Idaho (FMNH).

Geographic range.--Arizona, California, Idaho, Missouri, Utah, Washington.

California records.--HUMBOLDT CO.: 1 mi. N. of Samoa, 1 ♀, VIII-20-62 (R. Doty, BVC). MONO CO.: Leavitt Meadow, 7,200 ft. 2 ♂, 1 ♀, VIII-13-63, flight trap (H. B. Leech, CAS). SAN BERNARDINO CO.: Fawnskin, 9 ♂, 4 ♀, VII-29-61, 1 ♂, VII-30-61 (G. C. Eickwort, MSUM). SAN DIEGO CO.: Laguna Mountains, 1 ♂, VII-6-29 (R. H. Beamer, UK). SHASTA CO.: Hat Creek, 1 ♀, V-29-52 (G. Pronin, CAS). SISKIYOU CO.: Mt. Shasta City, 1 ♀, VIII-26-58 (J. Powell, CIS). TUOLUMNE CO.: Saucer Meadows, 2 ♀, X-13-63 (R. E. Doty, BVC). Yosemite, 3,880-4,000 ft. 1 ♂, 1 ♀, V-26-31 (E. O. Essig, CIS).

The species *H. orbitaseta* may be distinguished from allied species characterized by having dense hairs on the eyes of the male and by the absence of a preapical anterior bristle on mid femur of the female, by the presence in *H. orbitaseta* of 1 or 2 pairs of well-developed presutural acrostical bristles.

Helina pectinata (Johannsen)

Aricia brevis Stein *p. p.*, 1898, Berl. Entomol. Z., (1897) 42: 180.

Mydaea (Spilaria) pectinata Johannsen, 1916, Trans. Am. Entomol. Soc., 42: 392.

Mydaea biseriata Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 29.

Helina mimetica Malloch, 1920, Trans. Am. Entomol. Soc., 46: 142.

Holotype: ♂, Ithaca, New York (CU).

Geographic range.--Alberta, Arkansas, Arizona, British Columbia, California, Colorado, Maine, Minnesota, Montana, New Hampshire, New Mexico, New York, Ontario, Quebec, South Dakota.

California records.--LOS ANGELES CO.: Camp Baldy, 1 ♂, VII-11-50 (W. O. Marshall, UCD). MONTEREY CO.: Carmel, 1 ♀, VI-15-28 (L. S. Slevin, CAS).

The male of *H. pectinata* may be distinguished from those of its relatives by the presence of one or more strong bristles at the base of the posterior surface of mid femur. The female of *H. pectinata* has a restricted series of anteroventral bristles on distal half of the hind femur as in the female of *H. multiseriata*, from which it differs in having normally 4 pairs of postsutural dorsocentral bristles and a distinct clouding of the cross-veins.

Helina platykarenos Huckett

Helina platykarenos Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 286.

Holotype: ♂, Leavitt Meadow, Mono County, California (CAS).

Geographic range.--California.

California records.--MONO CO.: Leavitt Meadow, 7,200 ft. 1 ♂, 1 ♀, VIII-13-63, at flight trap, type series (H. B. Leech, CAS). The Hot Springs, 2.5 mi. S. of Bridgeport, 1 ♂, 7 ♀, VIII-15-63, at flight trap (H. B. Leech, CAS). SAN LUIS OBISPO CO.: Morro Dunes, 1 ♀, IX-6-45 (A. L. Melander, USNM).

The species *H. platykarenos* has the frons in the male broad and bristled as in the female, as in the case of *H. spinosa*. The legs of *H. platykarenos* are fulvous, and the female may be separated from those of similar habitus by the presence of 2 anterodorsal bristles on the hind tibia.

Helina polychaeta Huckett

Helina polychaeta Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 288.

Holotype: ♂, Leavitt Meadow, Mono County, California (CAS).

Geographic range and *California record.*--MONO CO.: Leavitt Meadow, 7,200 ft. 1 ♂, VIII-12-63, at flight trap, holotype (H. B. Leech, CAS).

The male of *H. polychaeta* closely resembles that of *H. obscurinervis* (Stein)*, a species whose record from California and Oregon I have been unable to verify. The male of *H. polychaeta* differs from the male of *H. obscurinervis* in having a longer series of longer bristles on the posteroventral surface of hind tibia.

Helina procedens (Walker)

(Map 35)

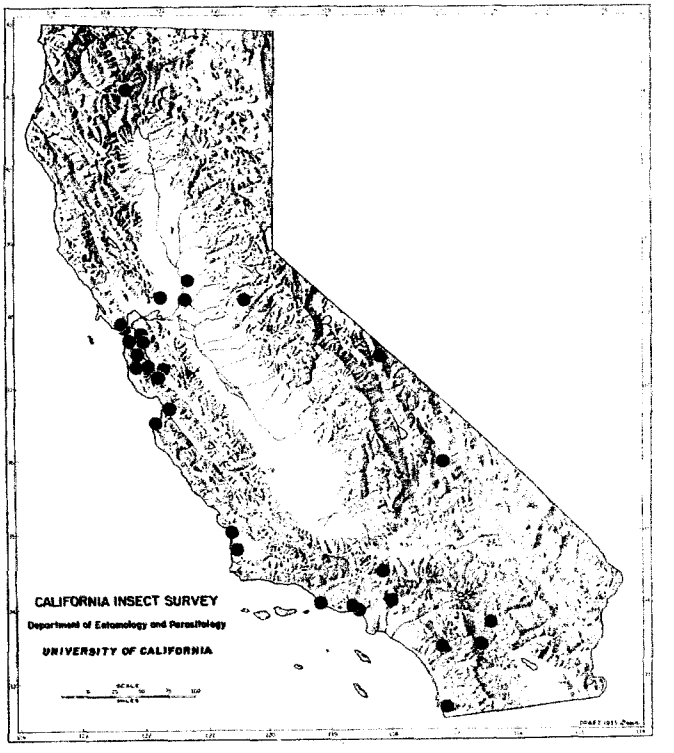
Aricia procedens Walker, 1861, Trans. Entomol. Soc. London, 5: 315.

Spilogaster uniseta Stein, 1898, Berl. Entomol. Z., (1897) 42: 192.

Type: ♀, Mexico (BMNH).

Geographic range.--Occurring in the eastern half of North America, from North Carolina northward along the Atlantic littoral to the New England states, reaching its northern range in the provinces of Ontario and Quebec, and in the states bordering the Great Lakes; in western North America, from Arizona and California northward to Washington, and in the Rocky Mountain region from New Mexico, Utah and Colorado to Montana, Alberta and British Columbia. Also from Mexico.

California records (map 35).--This species has distribution in California, occurring along the coastal plain and desert margins and in the Sacramento Valley, with isolated records in the Trinity Mountains (Carrville) and White Mountains. There are no records for the Sierra Nevada or Coast Ranges, including the dry inner valleys. The seasonal activity is also unusual in that the flies are active throughout the year in the central coastal area and Sacramento Valley, with many records for nearly every month. In southern California adults have been taken from March to October, while the isolated mountain records represent summer months.



Map 35. California distribution of *Helina procedens* (Walker).

This survey is based on about 50 localities in 19 counties.

The species *H. procedens* has the thorax entirely gray-black, including humeral callosities and scutellum, thereby differing from allied species. There is usually present only 1 bristle near middle of the anterodorsal surface of hind tibia, and in the male a fringe of fine posteroventral setulae on the distal half of tibia.

Helina rothi Ringdahl

Mydaea marmorata Stein (not Zetterstedt), 1916, Arch. Naturgesch., (1915) Abt. A 81 (10): 64.

Helina marmorata Malloch (not Zetterstedt), 1921, Can. Entomol. , 53: 104.

Helina rothi Ringdahl, 1939, Opusc. Entomol., 4: 150. new name for *marmorata* of authors.

Type: ♂, Kittila, Finland (ZMUB) *teste* Hennig.

Geographic range.--Widely distributed in north temperate region of continental North America, reaching as far north as central Alaska and the Yukon, and extending eastward to Manitoba and the provinces of Ontario, Quebec, Labrador and New Brunswick, thence southward in New England, the states bordering the Great Lakes, and in South Dakota; in the west, from the Rocky Mountain region of Alberta to Colorado, and on the Pacific coast from British Columbia to California.

California records.--ALPINE CO.: Hope Valley, 1 ♂, VII-9-48 (C. Chan, UCD). EL DORADO CO.: Echo, 1 ♂, VIII-10-40 (R. H. Beamer, UK). Echo Lake, 7,400 ft. 1 ♀, VII-15-62 (W. W. Middlekauff. CIS). Luther Pass, 1 ♂, VII-6-59 (P. H. Arnaud, CAS). LASSEN CO.: Susan River Camp, 1 ♂, VII-10-49 (A. T. McClay, UCD). MARIPOSA CO.: Glacier Point Road, Yosemite National Park, 1 ♂, 1 ♀, VII-1-47 (A. L. Melander, USNM). MONO CO.: Sardine Creek, 8,500 ft. 1 ♂, VII-11-51 (D. P. Lawfer, UCD), 1 ♂, VII-29-54 (J. C. Downey, UCD). 4 mi. SW. of Tom's Place, 1 ♀, VII-13-61 (H. V. Daly, CIS). MONTEREY CO.: Monterey, 1 ♂, VIII-10-38 (R. I. Sailer, UK). NEVADA CO.: Sagehen Creek, near Hobart Mills, 3 ♀, VII-7-64, 2 ♀, VII-9-64, 1 ♀, VII-10-64, 1 ♂, 8 ♀, VII-15-64, all in malaise trap (M. E. Irwin, UCR). SIERRA CO.: Webber Lake, 6,780 ft. 1 ♂, VII-4-65 (P. H. Arnaud, CAS). TULARE CO.: Giant Forest, Sequoia National Park, 1 ♀, VII-28-29 (R. H. Beamer, UK). TUOLUMNE CO.: Tioga Pass, 1 ♂, VII-31-40 (L. J. Lipovsky, UK). Tuolumne Meadows, 8,600 ft. 1 ♂, 1 ♀, VIII-8-16, at Soda Springs; 2 ♂, 5 ♀, VIII-15-16 (G. R. Pilate, USNM).

The robust black species *H. rothi* may be separated from its congeners by the presence of hairs on the prosternum and setulae on the upper border of the hypopleura cephalad of the spiracle.

Helina rufitibia (Stein)

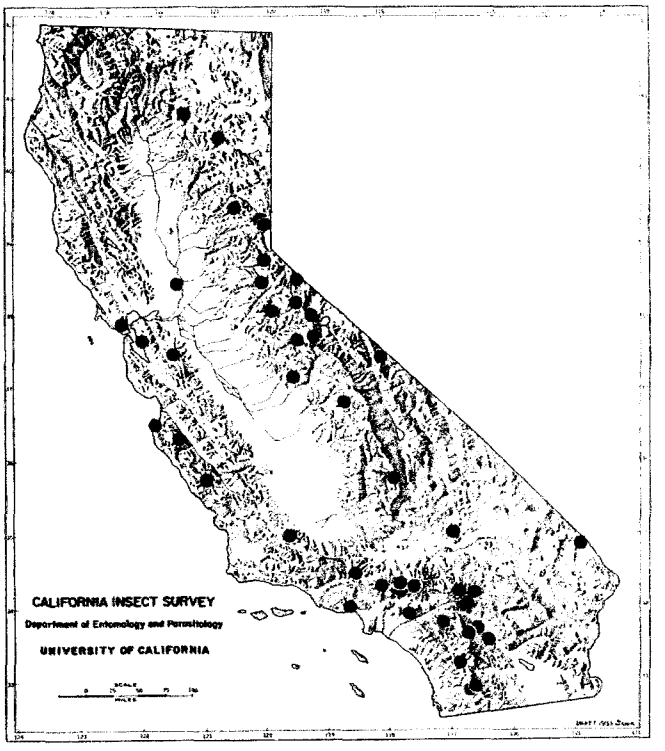
(Map 36)

Aricia rufitibia Stein, 1898, Berl. Entomol. Z., (1897) 42: 181.

Syntypes: ♂♂ ♀♀, Algonquin, Illinois; Lawrence, Kansas; Tifton, Georgia; Philadelphia, Pennsylvania (FMNH, USNM, MCZ).

Geographic range.--Widely distributed in the temperate region of North America, reaching its northern limits in the provinces and bordering states, from Washington and Alberta to the Great Lakes Region, New England and Quebec, from thence southward to include most of the Atlantic states as far as Georgia in the East, the Gulf States in the South, the Rocky Mountain and Pacific states in the West to as far as New Mexico, Arizona and southern California.

California records (map 36).--The widespread occurrence of *Helina rufitibia* in the State is largely represented by Transition Zone and montane localities with intrusions into desert margins in canyons and along river systems into the Sacramento Valley (Davis) and the Mojave Desert (Needles). Absence of collections from the north coast and mountains may be due to lack of sampling.



Map 36. California distribution of *Helina rufitibia* (Stein).

The adults are active throughout the year in southern California, there being records for nearly every month in the Riverside-Palm Springs area, and the few records for the central coast indicate the same pattern. Inland the flies have been collected from March in the foothills and on the east side of the Sierra Nevada, through the summer at higher elevations, where the species ranges up to 9,000-10,000 feet in the central Sierra Nevada and White Mountains. There are two records for December at Needles.

This survey is based on records from more than 50 localities in 20 counties.

Helina spinosa (Walker)

(Fig. 14)

Anthomyia spinosa Walker, 1849, List Dipt. Br. Mus., 4: 926.

Aricia latifrontata Malloch, 1918, Trans. Am. Entomol. Soc., 44: 270.

Types: ♂ ♀, St. Martin's Falls, Albany River, Ontario (BMNH).

Geographic range.--Alaska, Alberta, British Columbia, California, Colorado, Idaho, Labrador,

Manitoba, Montana, New Mexico, Northwest Territory, Ontario, Oregon, Quebec, Saskatchewan, Utah, Washington, Wyoming, Yukon Territory.

California records.--EL DORADO CO.: Lake Tahoe, 1 ♀, VIII-11-40 (L. J. Lipovsky, UK). Luther Pass, Grass Lake, 1 ♂, VII-24-55 (J. C. Downey, UCD). LASSEN CO.: Bridge Creek Camp, 1 ♂, VII-9-49 (E. L. Atkinson, CIS). Summit Camp, 1 ♀, VI-28-49 (W. H. Wade, CIS). MONO CO.: Sardine Creek, 8,500 ft. 1 ♂, VII-11-51 (R. W. Morgan, UCD), 3 ♂, 4 ♀, VII-12-18-51 (A. T. McClay, UCD). 4 mi. SW. of Tom's Place, 1 ♂, VII-13-61 (J. S. Buckett, CAS). NEVADA CO.: Prosser Creek, 6,300 ft. near Hobart Mills, 1 ♂, VII-13-61 (J. G. Chillcott, CNC). Sagehen Creek, 6,500 ft. near Hobart Mills, 1 ♀, VII-13-61 (B. H. Poole, CNC); 1 ♀, VII-15-64, in malaise trap (M. E. Irwin, UCR). PLUMAS CO.: Buck's Lake, 1 ♂, VII-1-49 (W. H. Wade, CIS). SAN BERNARDINO CO.: Barton Flats, 2 ♂, VIII-3-42 (A. L. Melander, USNM). Upper Santa Ana River, South Forks Meadow, 1 ♂, VI-25-48 (J. L. Sperry, USNM). SAN DIEGO CO.: Pine Lake, 1 ♀, no date (Johnson, USNM). SHASTA CO.: Summit Lake, 1 ♂, VII-2-47 (T. F. Leigh, CIS). SIERRA CO.: Smith Mill, 15 mi. SE. of Sierraville, 2 ♀, VII-4-60 (F. D. Parker, UCD). TULARE CO.: Giant Forest, Sequoia National Park, 1 ♀, VII-28-29 (P. W. Oman, UK). TUOLUMNE CO.: Glacier Point, Yosemite National Park, 1 ♂, VII-26-53 (A. and H. Dietrich, HCH). Leland Meadow, 1 ♂, VIII-5-60 (A. S. Menke, UCD). Pinecrest, 1 ♂, 2 ♀, VII-12-47, 1 ♂, 2 ♀, VII-25-47, 1 ♀, VIII-4-47, 1 ♂, VII-17-48 (P. H. Arnaud, CAS); 2 ♂, 1 ♀, VII-3-51 (C. A. Downing, UCD). Tuolumne Meadows, 8,600 ft. 1 ♀, VIII-15-16 (G. R. Pilate, USNM).

The robust black species *H. spinosa* has the frons in the male moderately broad, and bristled after the pattern of the female. The female may be distinguished from those of *H. nigripennis* and *H. obscurata* by the absence of a predorsal interspatial bristle in the mesopleural series, the locus thereat bare (fig. 14).

Helina spuria Malloch

Helina spuria Malloch, 1920, Trans. Am. Entomol. Soc., 46: 144.

Holotype: ♂, San Luis Obispo, California (CAS).

Geographic range.--California, Colorado, Oregon.

California records.--LOS ANGELES CO.: Santa Monica Mountains, 1 ♂, VII-3-50 (UCLA). RIVERSIDE CO.: Riverside, 1 ♀, III-17-35 (A. L. Melander, USNM). SAN BERNARDINO CO.: Mt. Home Canyon, San Bernardino Mountains, 1 ♂, V-13-47 (A. L. Melander, USNM). SAN DIEGO CO.: Pine Valley, 1 ♀, IV-24-20 (E. P. Van Duzee, CAS). SAN LUIS OBISPO CO.: San Luis Obispo, 1 ♂, IV-24-19, type (E. P. Van Duzee, CAS). SANTA CRUZ CO.: Santa Cruz, 1 ♂, III-25- (R. Latta, HCH). YOLO CO.: Rumsey, 1 ♂, III-31-56 (E. A. Kurtz, UCD).

The species *H. spuria* has 2 or 3 widely spaced posterodorsal bristles on hind tibia, the series extending to the proximal third, and thereby the species for diagnostic purposes may be associated with *H. duplicata*. It differs from the latter in having a full series of anteroventral and 1 or 2 proximal posteroventral bristles on the hind femur. In both sexes the tibiae are fulvous. The species is closely related to *H. nigribasis* (Stein)*.

Helina troene (Walker)

Anthomyia troene Walker, 1849, List Dipt. Br. Mus., 4: 936.

Anthomyia lysinoe Walker, 1849, List Dipt. Br. Mus., 4: 938.

Spilogaster amoeba Stein, 1898, Berl, Entomol. Z., (1897) 42: 190.

Spilogaster pubiceps Stein, 1898, Berl, Entomol. Z., (1897) 42: 194.

Type: ♀, Nova Scotia (BMNH).

Geographic range.--Widely distributed in the temperate region of North America, reaching its northern limits in the provinces and bordering states, from British Columbia and Washington eastward to the Great Lakes Region, the Maritime Provinces, Newfoundland and Quebec, thence southward through New England and along the Atlantic coast to as far as South Carolina and Georgia in the East, occurring in Kentucky and Oklahoma in the South, the Rocky Mountain and Pacific states in the West, attaining its southern limits in New Mexico, Arizona and southern California.

California records.--Helina troene is widespread through inland valleys of the coast ranges from Humboldt to San Diego County, in the margins of the Central Valley and the deserts, and throughout the Sierra Nevada, mostly at moderate elevations but with occasional records ranging to 9,000-10,000 feet.

A complete seasonal picture is not available for *Helina troene*, but evidently this species is not active during winter to the extent that are other ubiquitous muscids in California. With the exception of a few March collections in the Sacramento Valley, there are no records for January, February, or March and very few later than mid-November. In most low to moderate elevation areas the flies are active from April till October or November, even in the interior northern counties. At high elevations (to 8,000-9,000 feet) records are for July and August.

A total of 194 specimens were recognized as belonging to typical *troene*, comprising 94 males and 100 females, and were recorded from 34 counties and approximately 90 localities. I have assigned to typical *troene* those specimens that possessed a darker thorax than in *H. fulviventris*, as indicated by areas of grayish suffusion in the chitin to more marked and extensive darkening in color. Specimens

having the thorax and abdomen wholly darkened or grayish but for a yellowish tinge on the scutellum may be separated from associated taxa of similar aspect by the presence of usually 2 anterodorsal bristles on the hind tibia and 4 pairs of postsutural dorsocentral bristles on the mesonotum.

Helina troene var. fulviventris (Bigot)

Spilogaster fulviventris Bigot, 1885, Ann. Soc. Entomol. Fr., (1884) ser. 6, 4: 291.

Mydaea varia Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 36.

Type: ♂, California (University Museum, Oxford).

Geographic range.--British Columbia, California, Nevada, Oregon, Washington.

California records.-- A total number of 136 specimens were recognized as belonging to the variety *fulviventris*, comprising 52 males and 84 females, and were recorded from 34 counties and approximately 73 localities.

The species *H. troene* (Walker) is one of the more numerous and widely distributed components of *Helina* in California, among which are specimens in both sexes that have the thorax fulvous, entirely so except occasionally for the presence of a darkened median strip on the mesonotum. The abdomen is more variable in its coloration, and may be quite gray. I have regarded the varietal name *fulviventris* (Bigot) as applicable to these specimens with a fulvous thorax. They may be separated from *H. bicolorata* by the slightly shorter aristal hairs, usually clouded cross-veins, the partly to entirely yellowish abdomen, and by the presence not uncommonly of 4 pairs of postsutural dorsocentral bristles on the thorax.

Helina ute Snyder

Helina ute Snyder, 1949, Bull. Am. Mus. Nat. Hist., 94: 155.

Holotype: ♂, Card Canyon of Logan Canyon, Utah (AMNH).

Geographic range.--California, Utah.

California records.--MODOC CO.: Lily Lake, 7 mi E. Pine Creek, 1 ♂, VII-11-57 (J. Powell, CIS). SISKIYOU CO.: McBride Springs Campground, Mt. Shasta, 1 ♂, VIII-5-63 (P. H. Arnaud, CAS).

The male of *H. ute* may be separated from those of its allies possessing lengthy ventral bristles on the hind tibia, by the longer posteroventral bristles on the hind femur being situated on the proximal rather than the distal half, and by the brownish tinge to the wings and calyptrae. The female, as in the male, has 4 pairs of postsutural dorsocentral bristles and the palpi fuscous.

Helina villihumilis Snyder

Helina villihumilis Snyder, 1949, Bull. Am. Mus. Nat. Hist., 94: 156.

Holotype: ♂, Lane's Redwood Camp, Humboldt County, California (USNM).

Geographic range.--British Columbia, California.

California records.--HUMBOLDT CO.: Lane's Redwood Camp, 1 ♂, no date, type (J. M. Aldrich, USNM). LAKE CO.: Soda Bay, 1 ♂, VII-25-58, at light trap (R. E. Dolphin, UCR). LOS ANGELES CO.: San[ta] Mon[ica] Mountains, 1 ♀, V-14-33 (CAS); 1 ♀, VII-3-50 (HCH). SISKIYOU CO.: Hamburg, 1 ♂, V-1951 (D. W. Robinson, CDA).

The species *H. villihumilis* is allied to *H. keremeosa*, from which it differs in having the palpi mainly yellow. The fore tibia in both sexes has a mid posterior bristle, and the humeral callosities of the female are partly or mostly yellowish.

Genus Quadrularia Huckett

Quadrula Pandellé, 1898, Rev. Entomol. Fr.,17:51. name preoc. Rafinesque 1820.

Spilaria Malloch, 1921, Ann Mag. Nat. Hist., ser. 9 8: 226. name preoc. Schnabl 1911.

Quadrularia Huckett, 1965, Mem. Entomol. Soc. Can., 42 p. 262. new name.

Type-species: *Anthomyza annosa* Zetterstedt, by designation Coquillett, 1901.

The genus *Quadrularia* differs from *Helina* in having hairs on the hypopleura adjacent the anteroventral border of spiracle, and on the ventral margin of declivities of scutellum. The species have several hairs at base of the posterior notopleural bristle.

Adults possess habits similar to those of *Helina*, being most conspicuous on the blossoms and foliage of flowers, shrubs and trees, of the roadsides, fields and woods. Little is recorded concerning habits of the larvae.

KEY TO SPECIES OF QUADRULARIA IN CALIFORNIA

1. Hairs on the hypopleura restricted to anteroventral border of spiracle, not descending in series across the hypopleura,

scutellum with hairs on the ventral margin of declivities discontinued toward apical half . . . . . *annosa* (Zetterstedt)

Hairs on the hypopleura descending ventrad in lineal series across the hypopleura, hairs of the ventral margin of scutellar declivities present on apical and basal halves 2

2. Narrower part of the frons in male wider than maximum length of second antennal segment, female whitish gray and with wings hyaline . . . . . *punctata* (Stein)

Narrower part of the frons in male not wider than maximum length of second antennal segment, female brownish gray and wings tinged basad . . . . . *laetifica* (Robineau-Desvoidy)

Quadrularia annosa (Zetterstedt)

Anthomyza annosa Zetterstedt, 1838, Ins. Lapp., p. 663.

Aricia multisetosa Strobl, 1898, Naturwiss. Ver. Steirmark Mitt. (1897) 34: 238.

Type: ♀, Torne Lappmark (Zool. Inst., Lund).

Geographic range.--Alaska, Alberta, Arizona, California, Colorado, Idaho, Labrador, Manitoba, Maine, New Hampshire, New Mexico, New York, Oregon, Quebec, Utah, Vermont, Washington, Wyoming.

California records.--MODOC CO.: Lily Lake, 7 mi. E. Pine Creek, 5 ♂, IX-24-63 (J. E. Brooks, A. M. Barnes, BVC). MONO CO.: Leavitt Meadow, 7,200 ft. 1 ♂, 1 ♀, VIII-13-63, flight trap (H. B. Leech, CAS). PLACER CO.: Tahoe City, 1 ♂, no date (H. G. Dyar, USNM). TUOLUMNE CO.: Emigrant Lake, 1 ♂, IX-10-62 (T. M. Street, BVC). Pinecrest, 1 ♂, VIII-16-48 (P. H. Arnaud, CAS).

The species *Q. annosa* differs from *Q. laetifica* and *Q. punctata* in having hairs on the ventral border of declivities of scutellum restricted to basal half, hairs on the hypopleura restricted to anteroventral border of spiracle, bristles on the apical third of posteroventral surface of hind femur in the male not longer than the respective bristles thereat on mid femur.

Quadrularia laetifica (Robineau-Desvoidy)

Musca lucorum Fallén, 1823, Monographia Muscidum Sveciae, Muscides, p. 55. name preoc.

Mydaea laetifica Robineau-Desvoidy, 1830, [Paris] Inst. de France, [Cl. des] Sci. Math. et Phys., Acad. Roy. des Sci., Mém. présentés par divers Savans [ser. 2], 2: 500.

Anthomyia pylone Walker, 1849, List Dipt. Br. Mus., 4: 928.

Anthomyia solita Walker, 1852, Ins. Saund., 1: 354.

Anthomyia incerta Walker, 1852, Ins. Saund., 1: 354.

Types: ♂ ♀, Paris.

Geographic range.--Widely distributed in continental North America, reaching northward as far as Central Alaska, the Yukon and Northwest Territories, northern Quebec, thence to Labrador, Newfoundland and the Maritime Provinces, southward across the continent to as far as North Carolina and Tennessee in the East, Kansas, Colorado and Utah in the West, New Mexico, Arizona and southern California in the Southwest.

California records.--This species is widely distributed in Transition and Boreal Zone regions of California, being recorded from approximately 135 localities in 39 counties. Records indicate that *Quadrularia laetifica* does not occur on the coastal plain in southern California, and flight data generally show a longer activity period in coastal areas to the north, with collections in every month in the Monterey or San Francisco Bay areas. In the mountains of southern California, the Coast Range and the Sierra Nevada the flies are on the wing from May or June to September or October. The species ranges up to timberline at 10,000 feet in the central Sierra Nevada and in the White Mountains.

During this survey 325 specimens were examined, of which 168 were males.

The species is closely allied to *Q. punctata*, from which it usually may be separated by its darker cast, with wings tinged proximad. In the male the calyptrae are usually yellowish and the eyes separated at narrower part of the frons by a distance less than in *Q. punctata*.

Quadrularia punctata (Stein)

Aricia punctata Stein, 1898, Berl. Entomol. Z., (1897) 42: 182.

Syntypes: ♂♂ ♀♀, "Colorado" and Fort Collins, Colorado; South Dakota (FMNH, USNM, MCZ).

Geographic range.--Alberta, Arizona, British Columbia, California, Colorado, Idaho, New Mexico, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington.

California records.--EL DORADO CO.: Echo Lake, 2 ♂, VIII-10-52 (S. B. Freeborn, UCD). TUOLUMNE CO: Lake Eleanor, 1 ♀, VII-2-51 (A. T. McClay, UCD).

The species *Q. punctata* has a whitish gray cast, with wings clear proximad and calyptrae whitish. The eyes of the male are more widely separated at the narrower part of the frons than in males of *Q. laetifica*.

Genus Hebecnema Schnabl

Hebecnema Schnabl, 1889, Hor. Soc. Entomol. Ross., 23: 331.

Xenaricia Malloch, 1918, Trans. Am. Entomol. Soc., 44: 272.

Type-species: *Anthomyia umbratica* Meigen, by subsequent desigantion of Coquillett, 1901.

The male in *Hebecnema* has the eyes large and flattened across dorsum as viewed from in front. As a result the frons is severely restricted by the approximation of the eyes, the cheeks constricted caudad by the intrusion of the eyes ventrad, the parafacials linear. The legs are slender and in both sexes weakly and sparsely bristled.

Adults are often found in moist and densely shaded surroundings in parks, woods and forest. The habits of larvae are little known, and are based chiefly on rearings of *umbratica* from droppings of cows. (Séguy, 1950: 385; Hennig, 1956: 143).

KEY TO SPECIES OF HEBECNEMA IN CALIFORNIA

1. Mid and hind femora and all tibiae fulvous or yellow 2
   Mid and hind femora blackish, tibiae not fulvous 3
2. Scutellum fulvous . . . . . *fulva* (Bigot)
   Scutellum blackish . . *nigricolor* (Fallén)*
3. Knobs of halteres browned, dark purple or blackish . . . . . *vespertina* (Fallén)
   Knobs of halteres mainly yellow or partly reddish tinged 4
4. Eyes haired, sparsely so in female; male abdomen subovate, densely pearly-gray, in female speckly and more or less pruinescent . . . *umbratica* (Meigen)
   Eyes bare; abdomen in male subconical, thinly pruinescent, in female mainly glossy and devoid of pruinescence . . . *affinis* Malloch

Hebecnema affinis Malloch

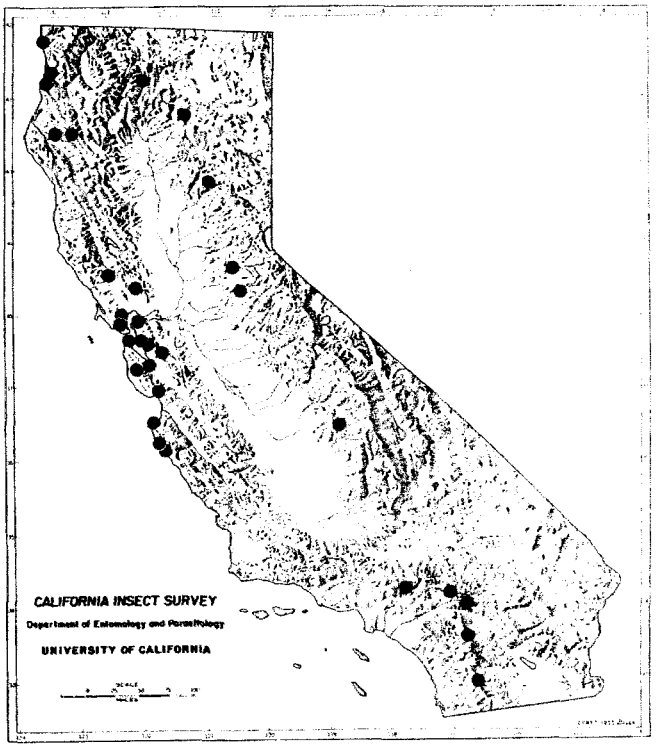
Hebecnema affinis Malloch, 1921, Can. Entomol., 53: 214.

Holotype: ♂, Rutland, Vermont (Boston Univ. 1964).

Geographic range.--Europe; Alaska, Alberta, California, Maine, Massachusetts, Michigan, New Hampshire, New York, Oregon, Quebec, Washington, Yukon Territory.

California records.--MARIN CO.: Stinson Beach, 1 ♀, VIII-15-38 (R. H. Beamer, UK). SONOMA CO.: Camp Meeker, 1 ♀, VII-8-60 (H. H. Keifer, CDA).

The species *H. affinis* may be linked to *umbratica*, from which it differs in having the eyes hairless. The abdomen of the male is blackish, subconical and more thinly pruinescent than in *H. umbratica*, in the female smooth and largely devoid of pruinescence.



Map 37. California distribution of *Hebecnema fulva* (Bigot).

Hebecnema fulva (Bigot)

(Map 37)

Spilogaster fulva Bigot, 1885, Ann. Soc. Entomol. Fr. (1884) ser. 6 4: 289.

Type: ♀, Washington Territory (University Mus., Oxford).

Geographic range.--Alaska, British Columbia, California, Idaho, Nova Scotia, Ohio, Oregon, Washington.

California records (map 37).--This species shows a characteristic circum-valley distribution and is apparently restricted to Transition Zone situations, occurring in the mountains only up to about 6,000 feet. The adults have been collected from mid Januar to mid November in the central coast area and from June to November in other regions.

Records are available from about 45 localities ir 22 counties.

The species *H. fulva* has the legs fulvous, and typically also the thorax and abdomen. But I find cc siderable variation in this regard concerning the thc ax and abdomen, both of which may be considerably infuscated or blackish. The palpi may be partly or entirely yellow or infuscated.

Hebecnema umbratica (Meigen)

Anthomyia umbratica Meigen, 1826, Syst. Beschr., 5: 88.

Type: ♂, locality not stated, Germany? (location unknown).

Geographic range.--The species occurs in the temperate region of continental North America, from southern Alaska to northern California, and from the Dakotas to Oklahoma in the West, thence easterly in Ontario and states located in the Great Lakes Region to as far as Quebec and New England in the North, southward to include most of the states bordering the Atlantic littoral to as far as Georgia and Tennessee in the South.

California record.--DEL NORTE CO.: Smith River, 2 ♂, VII-8-30 (J. M. Aldrich, USNM).

The species *H. umbratica* has the eyes distinctly haired in the male and more sparingly so in the female. The abdomen of the male is subovate and pale grayish pruinescent. The female is with difficulty differentiated from that of *H. affinis*. The species has been bred from cow dung (Laurence, 1953: 282).

Hebecnema vespertina (Fallén)

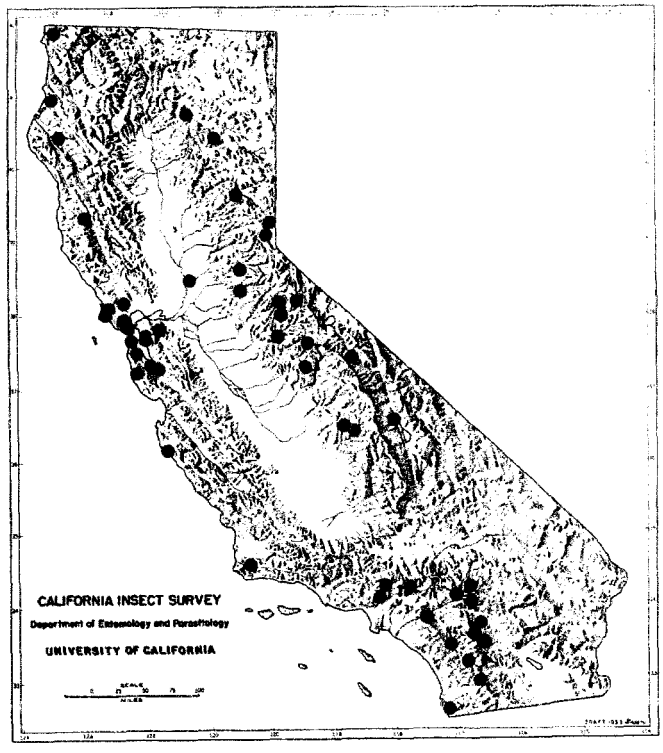
(Map 38)

Musca vespertina Fallén, 1823, Monographia Muscidum Sveciae, Muscides, p. 58.

Types: ♂ ♀, Southern Sweden.

Geographic range.--Of wide occurrence in the temperate region of continental North America, reaching as far north as central Alaska and Yukon Territory, southwestern border of the Northwest Territories, northern Manitoba, central Quebec, and southern Labrador in the east. Southward across the continent to include most of the states in New England and Great Lakes Region, from thence to as far south as North Carolina, Georgia, and Kansas. In the west from Alberta, Idaho, and Washington to Arizona and California in the southwest.

California records (map 38).--*Hebecnema vespertina* displays a similar distribution in Transition Zone areas to that of *H. fulva*, but the present species ranges somewhat more broadly, into Upper Sonoran situations along riparian intrusions into the Central Valley and in canyons adjacent to both deserts. Like *H. fulva*, *H. vespertina* evidently does not live much above 6,000 feet in montane areas. The flies have been collected in every month except December and January in the San Francisco Bay area, and from May to August in other parts of northern California and the Sierra Nevada. In southern California the species flies in the mountains from May to September and has not been taken in coastal areas with the exception of two records at San Diego in March and April more than 50 years ago.



Map 38. California distribution of *Hebecnema vespertina* (Fallén).

The species *H. vespertina* may be distinguished from its allies by the darkened, often purplish black knobs of the halteres.

Genus Myospila Rondani

Myospila Rondani, 1856, Dipt. Ital., Prodr., I: 91.

Type-species: *Musca meditabunda* Fabricius, by original designation.

The genus is represented in North America by the single taxon *M. meditabunda* (Fabricius). Characters proposed for the recognition of the species are applicable for delimiting the genus, and may be found in the remarks pertaining to *M. meditabunda*. Larvae of the species have been bred from human feces, the dung of domestic animals, vegetable decomposition, and are regarded in their later instars as eventually carniverous in habit (Howard, 1900: 576; 1901: 44; Séguy, 1923: 347; Thomsen and Hammer, 1936: 579; Hennig, 1956: 116; Coffey, 1966: 217). The immature stages and their biology have been recorded and illustrated by Keilin (1917: 388); Stork (1936: 103); and Thomson (1937: 308).

Myospila meditabunda (Fabricius)

Musca meditabunda Fabricius, 1781, Species insectorum exhibentes eorum differentias specificas, synonyma, auctorum, loca natalia, metamorphosin. 2: 444.

Cyrtoneura quadrisetosa Thomson, 1869, *In* K. Svenska Vetenskaps-Akademiens, Kongliga svenska fregatten Eugenies resa omkring jorden. Pt. 2. Zoologie. [Sec.] I: Insekter, p. 549.

Curtonevra anthomydea Bigot, 1887, Bull. Soc. Zool. Fr., 12: 614.

Curtonevra nigriceps Bigot, 1887, Bull. Soc. Zool. Fr., 12: 615.

Types: Sex not indicated, Copenhagen, Denmark, Italy (Kiel Mus.).

Geographic range.--Widely distributed in continental North America, reaching as far north as central Alaska, the Yukon and Northwest Territories, eastward to Quebec, Labrador and the New England States, westward across the continent to include most of the provinces, northern and western states, and extending as far south as North Carolina, Georgia and Tennessee in the East, Kansas, Oklahoma and Texas in the South, New Mexico, Arizona and southern California in the Southwest.

California records.--This species occurs throughout much of the state from the north coast to the desert margins. Adults of *Myospila meditabunda* have been recorded from April to December in cismontane southern California and February to November in the San Francisco Bay area. Elsewhere the season is generally shorter, but the flies have been collected in January in the Owen's Valley and in February in the San Joaquin and Sacramento Valleys. The species apparently does not range up to timberline, with records to about 8,500 feet in the Sierra Nevada and 10,000 feet in the White Mountains, and flight records are restricted to the summer months in all the mountain and northern areas.

The species *M. meditabunda* is recorded from 46 counties in California, and from approximately 182 localities. The survey was based on an examination of 428 specimens, of which 249 were males and 179 females. Adults may be distinguished from other California *Mydaeinae* by the forward curvature of vein $M._{1+2}$ at apex, thus narrowing the opening to cell $R._5$ at wing margin. The basal node of veins $R._{2+3}$ and $R._{4+5}$ has setulae on upper and under surfaces of wing. The female has cruciate bristles on the frons. Larvae may be regarded as predators and scavengers inhabiting the droppings of domestic animals in the field (Mohr, 1934:5,6).

Genus Mydaea Robineau-Desvoidy

Mydaea Robineau-Desvoidy, 1830, [Paris] Inst. de France, [Cl. des] Sci. Math. et Phys., Acad. Roy. des Sci., Mém. présentés par divers Savans [ser. 2], 2: 479.

Opsolasia Coquillett, 1910, Proc. U. S. Natl. Mus., 37: 580.

Type-species: *Mydaea scutellaris* Robineau-Desvoidy, by subsequent designation of Coquillett, 1901 (= *Musca pagana* Fabricius, 1794).

The genus *Mydaea* has the base of wing veins $R._{2+3}$ and $R._{4+5}$ setulose on upper and under surfaces, vein $M._{1+2}$ is not curved forward at apex and the frons of the female is without cruciate bristles. The profrons and cheeks are not broadly prominent, as is the case in *Xenomydaea*. Adults occur in common with other species of the subfamily on blossoms and foliage of flowers, shrubs and trees, in fields and woodland. Certain species are known to visit fresh droppings of birds and cattle for purposes of oviposition and selfnourishment. The larvae have been bred from cow dung, and in their later instars are believed to be zoophagous and canabalistic (Keilin, 1917: 396-398; Laurence, 1953: 282; Hennig, 1956: 120, 136). Other species have been reared from certain fungi (Keilin, 1917: 398; Ringdahl, 1924: 43; Niblett, 1955: xxxix; Hennig, 1956: 125, 134).

KEY TO SPECIES OF MYDAEA IN CALIFORNIA

1. Legs blackish . . . . . *obscurella* Malloch
   All tibiae, at least, fulvous 2
2. Aristal hairs shorter than width of third antennal segment . . *furtiva* Stein
   Aristal hairs as long as width of third antennal segment . . . *pilifera* Huckett

Mydaea furtiva Stein

Mydaea furtiva Stein, 1920 May, Arch. Naturgesch., (1918) Abt. A 84 (9): 32.

Mydaea persimilis Malloch, 1920 June, Trans. Am. Entomol. Soc., 46: 134.

Type: ♀, Mt. Constitution, Orcas Island, Washington (ZMUB).

Geographic range.--Alaska, Alberta, British Columbia, California, Connecticut, Idaho, Labrador, Massachusetts, Michigan, New Hampshire, New York, Northwest Territories, Oregon, Quebec, Vermont, Washington.

California records.--DEL NORTE CO.: Smith River, 2 ♂, 1 ♀, VII-8-30 (J. M. Aldrich, USNM). EL DORADO CO.: Echo Lake, 7,400 ft. 1 ♀, VII-26-22 (E. O. Essig, CIS).

The species *M. furtiva* differs from species of *Mydaea* with fulvous tibiae in having the aristal hairs as long to only slightly longer than the basal diameter of arista.

Mydaea obscurella Malloch

Mydaea obscurella Malloch, 1921, Can. Entomol., 53: 10.

Lectotype: ♀, Priest Lake, Idaho, IX-3-19 (A. L. Melander) (USNM).

Geographic range.--Alaska, British Columbia, California, Connecticut, Idaho, Michigan, Northwest Territories, Ontario, Oregon, Quebec, Tennessee, Yukon Territory (also in northern Europe).

California records.--ALAMEDA CO.: Strawberry Canyon, Berkeley Hills, 1 ♂, III-25-58 (J. A. Powell, CIS). CONTRA COSTA CO.: El Cerrito, 2 ♂, IX-5-64, 1 ♂, 2 ♀, IX-8-64 (D. D. Linsdale, BVC). MARIN CO.: Inverness, 1 ♀, IV-4-63 (P. H. Arnaud, CAS). Mill Valley, 1 ♂, V-16-26 (E. P. Van Duzee, CAS); 1 ♂, VIII-23-55, at light trap (H. L. Mathis, UCD). SAN FRANCISCO CO.: San Francisco, 1 ♂, VI-28-61 (J. Deweese, CIS); 2 ♀, V-19-63, 3 ♂, 2 ♀, III-19-64, 1 ♀, IV-6-64, at flight trap (P. H. Arnaud, CAS). SAN MATEO CO.: La Honda Road, Skyline Boulevard, 1 ♂, VIII-16-52 (P. H. Arnaud, CAS). Memorial Park, 1 ♂. 1 ♀, VII-19-64 (P. H. Arnaud, CAS). TUOLUMNE CO.: Sonora Pass, 1 ♂, VIII-21-59 (D. D. Linsdale, CIS).

The species *M. obscurella* has the legs black, aristal hairs slightly longer than half the width of third antennal segment, and the calyptrae distinctly yellowish. The series of parafrontal bristles in the male are continued caudad to a level opposite the apex of the ocellar triangle. The fore tibia of the female usually has a mid posterior bristle.

Mydaea pilifera Huckett

(Fig. 16)

Mydaea pilifera Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 289.

Holotype: ♂, Saddleback Mountain, Lincoln County, Oregon (CAS).

Geographic range.--Alberta, California, Oregon, Washington.

California records.--DEL NORTE CO.: Rowdy Creek, Smith River, 1 ♂, VII-11-30 (J. M. Aldrich, USNM). HUMBOLDT CO.: Fort Seward, 1 ♀, V-25-35 (E. O. Essig, CAS). MARIN CO.: Inverness, 1 ♀, IV-4-63 (P. H. Arnaud, CAS). Mill Valley, 1 ♀, IX-11-45 (E. L. Kessel, CAS); 1 ♀, X-8-54 (H. L. Mathis, UCD); 1 ♂, IV-5-6-65 (P. H. Arnaud, CAS). Ross, 1 ♂, V-25-55 (H. L. Mathis, UCD).

The species *M. pilifera* has the tibiae fulvous, the longer hairs of arista as long as width of third antennal segment, the prealar bristle longer than the posterior notopleural bristle. The hind femur of the male has a full series of anteroventral bristles, which on the proximal half consists of fine slender bristles, that are as long as the height of femur where situated, and also an extensive series of fine short posteroventral bristles.

Genus Xenomydaea Malloch

Xenomydaea Malloch, 1920, Trans. Am. Entomol. Soc., 46: 144.

Type-species: *Xenomydaea buccata* Malloch, by original designation (= *Mydaea otiosa* Stein).

The genus *Xenomydaea* is closely related to *Mydaea*, from which it may be separated by the more prominent development of the profrons, parafacials and cheeks, notably in the buccal region. Little has been recorded concerning the habits of adults and larvae.

KEYS TO SPECIES OF XENOMYDAEA IN CALIFORNIA

Males

1. Margins of calyptrae dark brown . . . . *fuscomarginata* (Malloch)
   Margins of calyptrae not dark brown . . 2
2. Eyes separated at narrower part of frons by a distance nearly equal to the length of third antennal segment . . 3
   Eyes separated at narrower part of frons by a distance not wider than the breadth of third antennal segment . . 5
3. Tibiae fulvous, abdomen with paired dorsal marks on the terga . . *otiosa* (Stein)
   One or more tibiae blackish, or rufous to yellowish brown, abdomen without paired marks 4
4. Cross-veins clouded, fore and mid tibiae without a mid ventral-posteroventral bristle . . . . . *maculipennis* Huckett
   Cross-veins unclouded, fore and/or mid tibiae with a mid ventral-posteroventral bristle . . . . . *nudiseta* (Stein)
5. Fore and mid tibiae with a mid ventral-posteroventral bristle, mesonotum and abdomen with yellowish pruinescence 6
   Fore and mid tibiae without a mid ventral-posteroventral bristle, mesonotum and abdomen with whitish pruinescence . . *hirtiventris* (Malloch)
6. Tibiae fulvous, mid and hind femora broadly so on distal third, calyptrae yellowish . . . . . *armatipes armatipes* (Malloch)
   Tibiae rufous, mid and hind femora blackish except ventrad on distal third, calyptrae yellowish brown . . . . . *armatipes fuscipes* Huckett

Females

1. Fore and mid tibiae with a mid ventral-posteroventral bristle 2
   Fore and mid tibiae without a mid ventral-posteroventral bristle 3
2. Tibiae fulvous, mid and hind femora fulvous on distal half or entirely so, calyptrae yellowish tinged . . . . . *armatipes armatipes* (Malloch)
   Tibiae rufous, all femora black except at apex and ventrad on distal third, calyptrae brownish tinged . . . . . *armatipes fuscipes* Huckett
3. Margins of calyptrae dark brown, knobs of halteres dark purple, wing veins evenly dark brown throughout . . . . . *fuscomarginata* (Malloch)
   Margins of calyptrae yellowish, knobs of halteres mainly yellowish or light brown, wing veins paler basad, yellowish brown 4
4. Legs blackish to rufous, sternopleural bristles 1:2 . . . *hirtiventris* (Malloch)
   Mid and hind femora and all tibiae mainly fulvous, sternopleural bristles 2:2 . *otiosa* (Stein)

Xenomydaea armatipes armatipes (Malloch)

(Map 39)

Mydaea armata Malloch, 1920, Trans. Am. Entomol. Soc., 46: 135. name preoc. Stein, 1918.

Mydaea armatipes Malloch, 1921, Can. Entomol., 53: 10. new name.

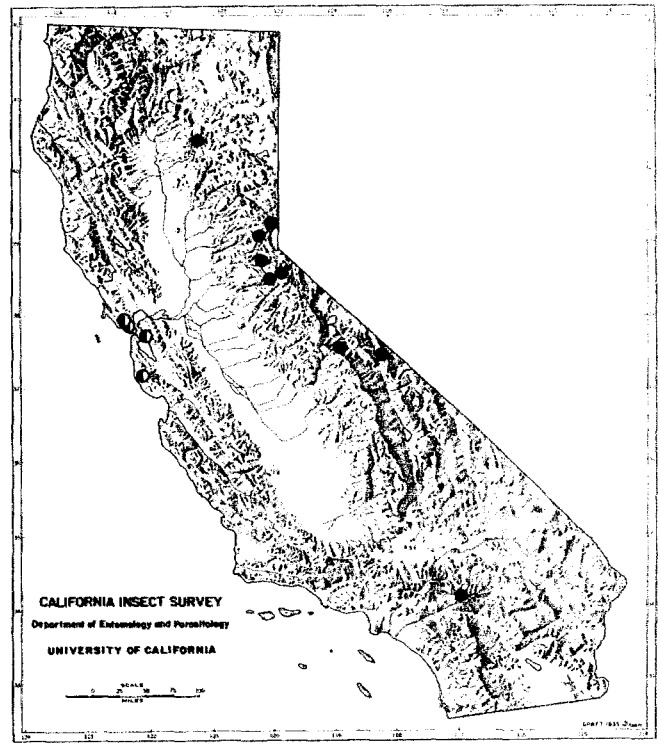
Mydaea armipes Malloch, 1921, Can. Entomol., 53: 10.

Holotype: ♀, Gallatin County, Montana (IllNHS).

Geographic range.--Alberta, Arizona, British Columbia, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, Wyoming, Yukon Territory.

California records.--ALPINE CO.: Hope Valley, 1 ♀, VII-18-48 (S. A. Sher, CIS). AMADOR CO.: 4 mi. N. of Silver Lake, 1 ♀, VII-25-55 (J. C. Downey, UCD). EL DORADO CO.: Strawberry, 1 ♂, X-17-53, 1 ♀, X-18-53 (L. E. Campos, UCD). MONO CO.: Blanco's Corral, 10,000 ft. White Mountains, 1 ♂, VI-30-58 (J. W. MacSwain, CIS). Mammoth Lake, 1 ♀, VII-12-33 (CAS). NEVADA CO.: Sagehen Creek, near Hobart Mills, 1 ♀, VII-6-64, in malaise trap (M. E. Irwin, UCR). PLACER CO.: Sugar Bowl Lodge, 1 ♀, VII-26-51 (CAS). SAN BERNARDINO CO.: Slushy Meadow, San Bernardino Mountains, 1 ♀, IX-20-65 (R. E. Orth, UCR). SHASTA CO.: Kings Creek Meadow, Lassen National Park, 1 ♂, VII-22-50 (L. W. Quate, CDA); 1 ♂, VII-23-50 (P. H. Arnaud, CAS). Lassen Park Trail, 1 ♂, VII-14-47 (T. F. Leigh, CIS).

The species *X. armatipes* has the eyes of the male narrowly separated on the frons, and in both sexes may be distinguished from allied taxa by the presence of a ventral to postero-ventral bristle near the middle of fore and mid tibiae respectively. The subspecies *armatipes* has the tibiae fulvous and calyptrae yellowish in distinction to those of *fuscipes*.



Map 39. California distribution of *Xenomydaea armatipes armatipes* (Malloch), black symbols, and *X. a. fuscipes* Huckett, black and white symbols.

Xenomydaea armatipes fuscipes Huckett

(Map 39)

Xenomydaea armatipes fuscipes Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 290.

Holotype: ♂, Mill Valley, Marin County, California (CAS).

Geographic range and *California records.*--ALAMEDA CO.: Berkeley, 1 ♀, IV-23-35 (G. E. and R. M. Bohart, CAS). MARIN CO.: Copper Mine Gulch, 1 ♀, III-4-61 (R. Brown, CAS). Mill Valley, 1 ♂, III-16-19, type (E. P. Van Duzee, CAS). SAN MATEO CO.: Memorial Park, 1 ♀, VII-19-64 (P. H. Arnaud, CAS).

The subspecies *fuscipes* has the femora largely blackish, the tibiae infuscated to a greater or less degree, and the calyptrae brownish, thus differing from the subspecies *armatipes*.

Xenomydaea fuscomarginata (Malloch)

Helina fuscomarginata Malloch, 1919, Proc. Calif. Acad. Sci., ser. 4 9: 298.

Mydaea pulla Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 35.

Holotype: ♀, San Francisco, California (CAS).

Geographic range and *California records*.-- SAN DIEGO CO.: Descanso Ranger Station, 1 ♀, III-27-61 (P. D. Hurd, CIS). SAN FRANCISCO CO.: San Francisco, 1 ♀, IV-15-19, type (E. P. Van Duzee, CAS), 3 ♀, III-25-64 (P. H. Arnaud, CAS). SAN MATEO CO.: Junipero Serra Park, 1 ♂, IV-4-64 (P. H. Arnaud, CAS). SANTA CLARA CO.: Palo Alto, 1 ♀, III-25-95, syntype of *X. pulla* (Johannsen, ZMUB). San Jose, 1 ♀, IV-2-03, syntype of *X. pulla* (Johannsen, ZMUB). Stanford University, 1 ♂, II-6-56 (P. H. Arnaud, HCH); 2 ♂, 1 ♀, II-22-06, type series of *X. pulla* Stein (J. M. Aldrich, USNM; ZMUB). SANTA CRUZ CO.: Mt. Hermon, 1 ♂, III-13-43 (K. Frick, CIS).

The species *X. fuscomarginata* differs from its congeners in having the margins of upper and lower calyptral scales dark brown, and the knobs of halteres dark purple.

Xenomydaea hirtiventris (Malloch)

Mydaea hirtiventris Malloch, 1920, Ohio J. Sci., 20: 269.

Holotype: ♂, Katmai, Alaska (OSUM).

Geographic range.--Alaska, California, Washington.

California records.--MONO CO.: Mammoth Lake, 1 ♂, VII-12-33 (CAS). PLACER CO.: Lakeside, Tahoe, 1 ♂, VI-30-27 (J. M. Aldrich. USNM). TULARE CO.: Mineral King, 1 ♀, VII-23-35 (G. Heid, CAS).

The species *X. hirtiventris* is allied to *X. armatipes*, having the darkened legs of the subspecies *fuscipes*. It differs markedly in appearance however from the species *X. armatipes* by having the thorax and abdomen black and with a bluish or whitish gray pruinescence, and further the fore and mid tibiae have no mid ventral bristle.

Xenomydaea maculipennis Huckett

Xenomydaea maculipennis Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 290.

Holotype and only record, 1 ♂, Beverly Glen, Los Angeles County, California, II-22-52 (CAS).

The male of *X. maculipennis* has a broad frons, black legs, dark purple knobs on halteres, clouded cross-veins, and whitish calyptrae.

Xenomydaea nudiseta (Stein)

Mydaea nudiseta Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 33.

Syntypes: ♂♂, Moscow, Idaho (ZMUB, USNM).

Geographic range.--California, Idaho, Washington.

California record.--MONO CO.: Sonora Pass, 9-10,000 ft. 1 ♂, VII-10-57 (J. M. Burns, CIS).

The male of *X. nudiseta* is akin to that of *X. rufinervis* (Pokorny)*, from which it differs in having a wider frons, cheeks broadening caudad, third antennal segment shorter than twice its width, the wings brownish tinged basad, and calyptrae whitish with a trace of a yellowish tinge.

Xenomydaea otiosa (Stein)

Mydaea otiosa Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 34.

Mydaea buccata Malloch, 1920, Trans Am. Entomol. Soc., 46: 144.

Syntypes: ♂ ♀, San Jose, California; Troy, Idaho (ZMUB).

Geographic range.--Alaska, British Columbia, California, Colorado, Idaho, Montana, New Hampshire, Oregon, Utah, Washington, Yukon Territory.

California records.--ALAMEDA CO.: Berkeley, 1 ♂, V-1-20 (A. J. Basinger, CAS). EL DORADO CO.: Echo Lake, 7,400 ft. 1 ♀, VI-26-52, 1 ♀, VII-6-61, 1 ♂, VII-8-61 (W. W. Middlekauff, CIS); 1 ♀, VIII-10-52 (S. B. Freeborn, UCD). LOS ANGELES CO.: Tanbark Flat, 1 ♂, VII-12-50 (J. C. Hall, UCD). MADERA CO.: San Joaquin Experiment R(anch), 1 ♂, III-24-53 (H. E. Childs, CIS). MONO CO.: Leavitt Meadow, 7,200 ft. 1 ♀, VIII-13-63, flight trap (H. B. Leech, CAS). SANTA CLARA CO.: San Jose, 1 ♂, IV-2-03. SIERRA CO.: Webber Lake, 1 ♂, VII-2-59 (J. M. Linsley, CIS). 5 mi. E. of Webber Lake, 1 ♀, VII-30-55 (E. A. Kurtz, UCD). TULARE CO.: Ash Mountain, Sequoia National Park, 1 ♀, IV-26-51 (E. I. Schlinger, UCD). 5 mi. NE. of Springville, 1 ♂, V-14-63 (S. W. Earnshaw, CIS).

The species *X. otiosa* may be distinguished from its relatives by the moderately broad frons and interfrontalia in the male, the mid and hind femora fulvous, or only partly so in the male, the tibiae fulvous, two anterior bristles on the sternopleura, and the abdomen in male with paired dorsal marks.

Subfamily FANNIINAE

KEY TO GENERA OF FANNIINAE IN CALIFORNIA

1. Hind tibia with a bristle set on mid dorsal plane near middle of tibia, mid tibiae with an anterodorsal bristle, cruciate bristles absent, larvae dorsoventrally flattish and with feathery mar-

ginal projections (Tribe Fanniini) . . 2
Hind tibia without a bristle set on mid dorsal plane near middle of tibia, mid tibia without an anterodorsal bristle, cruciate setae present in both sexes, the larvae not described (Tribe Azeliini). *Azelia* Robineau-Desvoidy

2. Second pair of presutural dorsocentral bristles set at a greater distance from an extended plane of the mesonotal transverse suture than is the first pair of postsutural dorsocentral bristles (fig. 7) . . . . . *Euryomma* Stein
Second pair of presutural and first pair of postsutural dorsocentral bristles set about equidistant from an extended plane of the mesonotal transverse suture, or the former closer thereto (fig. 8) 3

3. Subgenal sclerite of head upwardly extended on buccal region (jowls) and bearing several fine setulae, oral margin flexed forward, abdomen in male spatulate in outline, first visible segment (terga 1+2) longer than second or third (tergum 3 or 4). *Coelomyia* Haliday
Subgenal sclerite restricted to the ventral aspect of head, oral margin not notably curved forward, or if so the abdomen in male not spatulate and terga 1+2 not longer than tergum 3 or 4 . *Fannia* Robineau-Desvoidy

Tribe FANNIINI

Genus Fannia Robineau-Desvoidy

Fannia Robineau-Desvoidy, 1830, [Paris] Inst. de France [Cl. des] Sci. Math. et Phys., Acad. Roy. des Sci., Mém. présentés par divers Savans [ser. 2], 2: 567.

Homalomyia Bouché, 1834, Naturgeschichte der Insekten, besonders in Hinsicht ihre ersten Züstande als Larven und Puppen, p. 89.

Steinomyia Malloch, 1912, Proc. U. S. Natl. Mus., 43: 656.

Type-species: *Fannia saltatrix* Robineau-Desvoidy, monobasic (= *Musca scalaris* Fabricius 1794).

Adults of the genus *Fannia* Robineau-Desvoidy in common with those of *Euryomma* Stein and *Coelomyia* Haliday possess a bristle on mid dorsal plane near middle of hind tibia, and anal vein 2nd *A* is typically so curved around the short vein $Cu._2$ + 1st *A* as to intersect the course of the latter if extended. In *Fannia* the oral margin of the face is not notably curved forward, the subgenal sclerite of the head not upwardly extended so as to overlap the buccal region, and terga 1+2 of the male abdomen is not longer than tergum 3 or 4, as is the case in the genus *Coelomyia.*

KEYS TO SPECIES OF FANNIA IN CALIFORNIA

Males

1. Mid coxae spined 2
Mid coxae spineless 7
2. Sternopleura with a ventral spine 3
Sternopleura without a ventral spine . . . 6
3. Abdomen pellucid yellow at base . . . . . *pellucida* (Stein)
Abdomen not pellucid yellow at base . . . 4
4. Narrower part of the frons less in width than the length of second antennal segment, abdomen without a linear dorsocentral stripe . . . . . *vesparia* (Meade)
Narrower part of the frons as wide as the length of second antennal segment, abdomen with a linear dorsocentral stripe . 5
5. Longer anteroventral bristles of hind tibia average shorter than maximum height of hind femur, gonostyli each one-pronged at apex, and at base bluntly protruded laterad of the cerci (fig. 41) . . . *fuscula* (Fallén)
Longer anteroventral bristles of hind tibia average as long as maximum height of hind femur, gonostyli each two-pronged at apex, and at base curved across apex of cerci as slender sharp stylets (fig. 42). *americana* Malloch
6. Mid tibia with a tubercular callosity on distal half of ventral surface, fore coxae without an apical spine on posterior surface, fore tibia without a fascicle of hairs . . . . . *scalaris* (Fabricius)
Mid tibia without a ventral tubercular callosity, fore coxae with a spine near apex of posterior surface, fore tibia with a fascicle of hairs on distal half of posteroventral surface . . . . . *manicata* (Meigen)
7. Abdomen with 3 marks on terga 3 and 4 respectively 8
Abdomen without 3 marks on terga 3 and 4 respectively 14
8. Tibiae, palpi and second antennal segment yellow 9
Tibiae, palpi and second antennal segment blackish 13
9. Hind femur with a few lengthy anteroventral bristles on middle third, as long as height of femur where situated, with 1 robust preapical anteroventral . . . . . *conspicua* Malloch
Hind femur without lengthy anteroventral bristles on middle third, with 2 or more robust anteroventrals on distal third 10
10. Third antennal segment black, mesonotum and scutellum extensively brown, abdomen usually grayish black basad, hind femur with a clump of slender

posteroventral bristles on a swelling situated one third length of femur from apex . . . . . *benjamini* Malloch

Third antennal segment fulvous or reddish basad, abdomen profusely reddish testaceous basad 11

11. Hind femur with 4 anteroventral bristles on distal third . . . . *operta* Chillcott

Hind femur with 2 strong and with or without 1 weak anteroventral bristle on distal third 12

12. Hind femur with a tight cluster of posteroventral bristles at preapical third . . . . . *tescorum* Chillcott

Hind femur with the cluster of posteroventral bristles in a loose series extending from preapical third to near middle of femur . . *arizonensis* Chillcott

13. Hind tibia with extensive series of long slender anteroventral and posteroventral bristles . . . *pusio* (Wiedemann)

Hind tibia with 1 or 2 short anteroventral bristles and without posteroventrals . . . . . *femoralis* (Stein)

14. Mid metatarsus with a basal thorn or fasciculus on ventral surface (fig. 27) 15

Mid metatarsus without basal thorn or fasciculus on ventral surface 18

15. Fore tibia with 3 or 4 posteroventral bristles on distal third, mid tibia with a small nodular excrescence on proximal half of posteroventral surface . *spathiophora* Malloch*

Fore tibia without posteroventral bristles on distal half, mid tibia without a nodular excrescence on proximal half of posteroventral surface 16

16. Hypopygium enlarged, bulbous, maximum width about equal to distance between caudal pair of postsutural dorsocentral bristles . . . . *sequoiae* Chillcott

Hypopygium not prominently enlarged, maximum width less than distance between caudal pair of postsutural dorsocentral bristles 17

17. Hind femur with a posteroventral series of slender setulae on proximal half (fig. 23) . . . . . *flavibasis* (Stein)*

Hind femur mostly bare or with a few scant setulae on proximal half of posteroventral surface . *flavitibia* Stein

18. Abdomen at least partly yellow or reddish 19

Abdomen not yellow, nor partly so . . . 22

19. Scutellum yellowish on apical region . . *penepretiosa* Chillcott

Scutellum entirely blackish 20

20. Tibiae entirely yellow or fulvous, hind tibia without a series of coarse anterodorsal setulae 21

Tibiae blackish or fuscous, at most paler basad, hind tibia with a series of coarse anterodorsal setulae . . . . . *canicularis* (Linnaeus)

21. Hind tibia with 4 to 6 anteroventral and posteroventral bristles respectively, mid femur with 2 strong anteroventral bristles on middle third, hind femur without a series of setulose posteroventral bristles . *ochrogaster* (Thomson)

Hind tibia with 1 or 2 anteroventral bristles on distal half, mid femur with a series of several similar anteroventral bristles on middle third, hind femur with a series of setulose posteroventral bristles . . . . . *binotata* Chillcott

22. Hind tibia with a extensive series of longish posterior or posteroventral bristles 23

Hind tibia without an extensive series of longish posterior or posteroventral bristles 25

23. Tibiae blackish 24

One or more tibiae fulvous . . . . . *oregonensis* Chillcott

24. Mid tibia with a ventral callosity on middle third, mesonotum and scutellum black, mesonotum without stripes . . *coracina* (Loew)

Mid tibia without a ventral callosity, mesonotum and scutellum gray, mesonotum with stripes. *incisurata* (Zetterstedt)

25. Abdomen truncate at apex, hypopygium greatly enlarged, sternum 5 produced caudad as a median semierect process or appendage, glossy and tapering to a blunt apex . . *glaucescens* (Zetterstedt)*

Abdomen tapering caudad, hypopygium not enlarged, sternum 5 notched and subdivided caudad 26

26. Hind tibia with preapical mid dorsal bristle usually absent, mid femur with 2 or 3 stout spinelike anteroventral bristles on middle third . . *sociella* (Zetterstedt)*

Hind tibia with preapical mid dorsal bristle present 27

27. Hind coxae with setulae on inner border of caudal surface 28

Hind coxae without setulae on inner border of caudal surface 32

28. Palpi shortened, about half as long as third antennal segment, mid tibia with 2 anterodorsal bristles . . . . *trigonifera* Chillcott

Palpi slender, longer than half length of third antennal segment, mid tibia usually with 1 anterodorsal bristle . 29

29. Hind tibiae at least fulvous to rufous, hind femur with several posteroventral bristles as long or longer than height of femur, narrower part of interfrontalia usually as wide as breadth of third antennal segment . . . . . *tibialis* Malloch

Tibiae mainly blackish or fuscous, hind femur with posteroventral bristles shorter than height of femur, or setu-

lose 30
30. Hind tibia usually with 1 anteroventral and without coarse short anterodorsal setae in addition to the longer anterodorsal bristle, legs stout. *laevis* (Stein)
Hind tibia usually with 2 or 3 anteroventrals and with coarse anterodorsal setae in addition to the longer anterodorsal bristle, legs not stout . . . 31
31. Mesonotum and scutellum viewed from in front entirely deep seal brown, stripes obscured . . . . . *nidicola* Malloch*
Mesonotum and scutellum not entirely dark brown, mesonotum with stripes evident . . . . . *canicularis* var.
32. Hind femur with longish preapical posteroventral bristles 33
Hind femur bristleless on preapical region of posteroventral surface . . . 36
33. Mid tibia usually with 2 anterodorsal and 2 posterodorsal bristles, abdomen jet black, shiny, with sparse grayish pruinescence, wings yellowish basad . *lucida* Chillcott
Mid tibia usually with 1 anterodorsal and 1 posterodorsal bristle, abdomen with denser pruinescence 34
34. Hind tibia with 2 or more anteroventral bristles, sternum 1 of abdomen with several setulae, hind femur with semierect short posteroventral bristles on proximal half . . . . *elongata* Chillcott
Hind tibia with 1 anteroventral bristle, sternum 1 with few setulae or almost bare, hind femur with or without a few weak setulae on proximal half of posteroventral surface 35
35. Mid and hind tibiae blackish at base . *postica* (Stein)*
Mid and hind tibiae reddish at base . *brevicauda* Chillcott
36. Eyes in profile occupying nearly the whole head, parafacials largely obscured from view, buccal region reduced to lineal dimensions . . *immaculata* Malloch
Parafacials in profile not obliterated from view, buccal region broader than wider part of palpi . . . *serena* (Fallén)

Females

1. Hind coxae with one or more setulae on inner border of caudal surface . . . 2
Hind coxae without setulae on inner border of caudal surface 23
2. Abdomen with 3 marks on terga 3 and 4 respectively 3
Abdomen without 3 marks on terga 3 and 4 respectively 6
3. Arista brown at base, third antennal segment entirely or largely blackish, at most reddish basad on inner or inward surface. . . . . *benjamini* Malloch
Arista fulvous at base, third antennal segment broadly reddish or fulvous on basal half of inner and outer surfaces .4
4. Abdomen more or less flecked throughout with reddish testaceous areas . . . . *arizonensis* Chillcott *tescorum* Chillcott
Abdomen evenly grayish or nearly so . . 5
5. Mid and hind femora mainly fulvous . . *conspicua* Malloch
Mid and hind femora mainly infuscated . *operta* Chillcott
6. Mid and hind tibiae fulvous 7
Mid and hind tibiae more or less fuscous or largely black 12
7. Frons at vertex less in width than half its total length 8
Frons at vertex wider than half its total length 11
8. Abdomen grayish black 9
Abdomen partly reddish or yellowish . . 10
9. Basal posteroventral bristle on mid femur longer than half height of femur, sternum 8 of ovipositor absent . . . *americana* Malloch
Basal posteroventral bristle on mid femur setulose or not longer than half height of femur, sternum 8 of ovipositor present . . . . . *fuscula* (Fallén)
10. Hind tibia with 3 or more anteroventral bristles . . . . . *pellucida* (Stein)
Hind tibia with 1 anteroventral bristle . *binotata* Chillcott
11. Gray species, mid and hind femora usually fulvous, parafacials serially haired on dorsal half . . . *tibialis* Malloch
Blackish species, mid and hind femora usually infuscated, parafacials with a few scanty hairs . *oregonensis* Chillcott
12. Mid tibia with 1 long and 1 short anterodorsal, 2 posterodorsal bristles, palpi shortened and with lengthy apical setae . *trigonifera* Chillcott
Mid tibia with 1 anterodorsal bristle, palpi not shortened, normal 13
13. Ocellar triangle extended to middle of interfrontalia, abdomen glossy black . 14
Ocellar triangle not extended to middle of frons, or if so abdomen gray . . . 15
14. Frons at vertex narrower than distance between first pair of dorsocentral bristles . . . . . *pusio* (Wiedemann)
Frons at vertex as wide as distance between first pair of dorsocentral bristles . . . . . *femoralis* (Stein)
15. Prealar bristle bristlelike, outstanding, usually nearer to the notopleural suture 16
Prealar bristle absent or as setulae nearer to base of the supraalar bristle 18
16. Hind tibia with 2 or 3 anteroventral bristles . . . . . *oregonensis* Chillcott
Hind tibia with 1 anteroventral bristle .17
17. Thorax and abdomen black and shiny . . *glaucescens* (Zetterstedt)*
Thorax and abdomen densely gray . . . . *laevis* (Stein)

18. Mid tibia with an anteroventral bristle . . . . . *coracina* (Loew)
Mid tibia without an anteroventral bristle 19
19. Parafacials with minute hairs opposite the length of third antennal segment, mesonotum with a median stripe and along planes of dorsocentral bristles . 20
Parafacials bare opposite the third antennal segment, stripes or streaks when evident on mesonotum situated between the series of acrostical and dorsocentral bristles 21
20. Abdomen with trace of yellowish or reddish basad . . . . *canicularis* (Linnaeus)
Abdomen entirely grayish black . . . . *canicularis* var.
21. Parafrontals and mesonotum grayish . . 22
Parafrontals dark gray or drab, mesonotum black . . . . . *manicata* (Meigen)
22. Mid femur typically with a lengthy slender bristle at base of the ventral surface . . . . *scalaris* (Fabricius)
Mid femur with a fine short bristle at base of the ventral surface . . . . . *incisurata* (Zetterstedt)
23. Apical region of scutellum yellowish on dorsum and lateral declivities . . *penepretiosa* Chillcott
Scutellum entirely grayish black, or if partly yellowish testaceous on dorsum the declivities dark or grayish black 24
24. Abdomen largely or basically yellow, occasionally blackened, all coxae, femora and tibiae yellow . . . . . *ochrogaster* (Thomson)
Abdomen grayish or blackish 25
25. Palpi broadly spatulate, wider than palpal hairs . . . . . *spathiophora* Malloch*
Palpi gradually and narrowly spatulate, or mostly slender 26
26. Lower calyptral scale transversely narrow, or striplike, caudal margin truncate (fig. 17) 27
Lower calyptral scale lobate, outer margin semicircular (fig. 18) 29
27. Hind tibia with 2 anterodorsal bristles . *sociella* (Zetterstedt)*
Hind tibia with 1 anterodorsal bristle . 28
28. Parafrontals jet black, as highly polished as the haustellum . . . . . *immaculata* Malloch
Parafrontals shiny and with trace of pruinescence when viewed from behind . . *serena* (Fallén)
29. Mid tibia with 1 or more ventral bristles, parafrontals broad, black and glossy, interfrontalia linear . *lucida* Chillcott
Mid tibia without a ventral bristle . . 30
30. Hind tibia with 2 or 3 anteroventral bristles . . . . . *elongata* Chillcott
Hind tibia with 1 anteroventral bristle .31
31. Mid and hind tibiae blackish at base, parafrontals highly shining, ocellar callosity shiny . . . . *postica* (Stein)*
Mid and hind tibiae yellowish or reddish basad 32
32. Sternum 8 of ovipositor formed as a pair of glossy swellings . *sequoiae* Chillcott
Sternum 8 normal, nonswollen . . . . . *flavitibia* (Stein) *brevicauda* Chillcott

Fannia americana Malloch

(Fig. 42)

Fannia americana Malloch, 1927, Entomol. News, 38: 176.

Holotype: ♂, Pimmit Run, Virginia (USNM).

Geographic range.--Occurs in the eastern half of North America, in Georgia and eastern Tennessee, northward along the Atlantic coast to New England, the Maritime Provinces, and southern Quebec, and westward to Ontario and the states bordering the Great Lakes, from New York to Minnesota; in the west is found in Kansas and California.

California records.--MARIN CO.: 2 mi. S. of Olema, 1 ♂, III-27-61 (D. Q. Cavagnaro, UCD). Also Redwood Canyon, Marin County; Glen, Ivy, Riverside County (Chillcott 1961: 75).

The species *F. americana* closely resembles *F. fuscula* (Fallén), from which it may be distinguished in the male by the longer anteroventral bristles on hind tibia, and by the structure and conformation of the gonostyli and cerci (fig. 42); in the female by the longer basal posteroventral bristle on mid femur, and by the absence of sternal sclerite 8 of ovipositor. The larvae are recorded as feeding in a nest of *Bombus sandersoni* Franklin found in West Virginia (Chillcott, 1965: 643).

Fannia arizonensis Chillcott

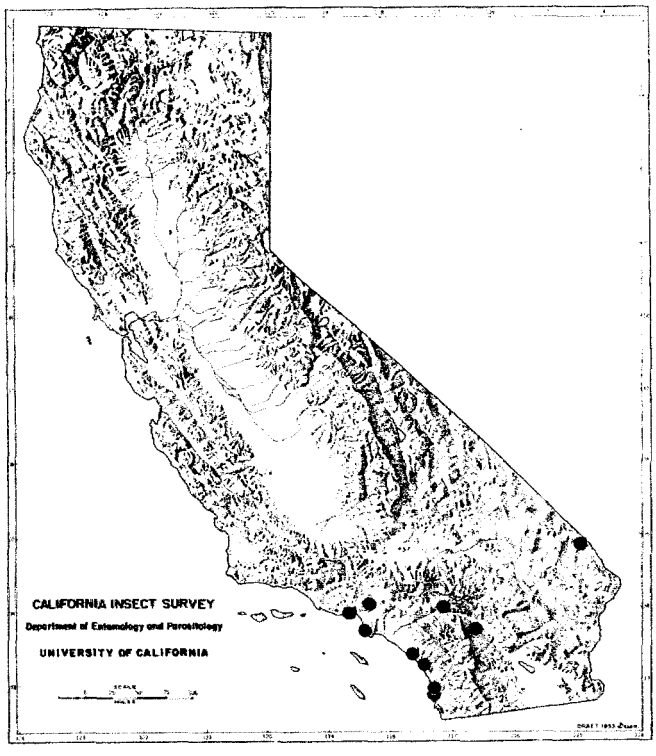
(Map 40)

Fannia arizonensis Chillcott, 1961, Can. Entomol., (1960) 92 Suppl. 14 p. 160.

Holotype: ♂, Tempe, Arizona (USNM).

Geographic range.--California, Arizona.

California records.--LOS ANGELES CO.: Glendale, 1 ♂, X-8-57 (W. M. Schlinger, UCD). Pacific Palisades, 5 ♀, IX-17-20-51, 1 ♂, IX-21-22-51, 1 ♀, IX-30-51, 1 ♀, X-2-51. ORANGE CO.: San Clemente, 3 ♂, 5 ♀, VI-5-45 (A. L. Melander, USNM). RIVERSIDE CO.: Chino Canyon, near Palm Springs, 2 ♀, IV-20-60 (J. Powell, CIS). SAN BERNARDINO CO.: Needles, 1 ♀, XII-5-21 (J. A. Kusche, CAS). South Fork, Upper Santa Ana River, 1 ♀, VII-31-42 (A. L. Melander, USNM). SAN DIEGO CO.: 1 mi. E. of Del Mar, 1 ♂, VII-17-63 (E. I. Schlinger, UCR). La Jolla, 4 ♀, VI-17-18-63 (P. D. Hurd, CIS). Oceanside, 1 ♂, IX-1-58 (P. H. Arnaud, CAS). Valerie, 1 ♀, V-2-45 (A. L. Melander, USNM).



Map 40. California distribution of *Fannia arizonensis* Chillcott.

The male of *F. arizonensis* resembles that of *F. tescorum* in hind femoral bristling, having 2 strong preapical anteroventral bristles. It differs from the latter in that the posteroventral bristles on the preapical third of hind femur are not set tightly together at that position, but tend to disperse serially toward the middle of the posteroventral surface. The females of *F. arizonensis* and *F. tescorum* are not readily distinguishable from one another.

Fannia benjamini Malloch

Fannia benjamini Malloch, 1913, Proc. U.S. Natl. Mus., 44: 625.

Holotype: ♂, Mountains near Claremont, California (USNM).

Geographic range.--Arizona, Arkansas, California, Colorado, Idaho, Nevada, New Mexico, Texas, Utah, Wyoming.

California records.--*Fannia benjamini* occupies a range similar to that of *F. canicularis* (map 41), but *benjamini* is more widely distributed in mountainous parts of California. Adults fly throughout the year in cismontane southern California, but to the north the activity season is much shorter, beginning in March in the San Joaquin Valley and arid parts of the inner Coast Range, and in April in the San Francisco Bay area, and lasting until September or October in most areas. Generally, this species is ecologically more restricted than most of the other of the state's widespread muscids, ranging only to the canyons at the margins of both the deserts and the Great Basin on the east side of the Sierra Nevada, while in the mountains it occurs mostly at low to moderate elevations, with one record at timberline in the southern Sierra Nevada. The species *F. benjamini* is recorded from 31 counties and approximately 155 localities, based on an examination of 516 specimens, of which 13 were males, 503 as females.

The male has a tight cluster of posteroventral bristles on a slight swelling situated one third length of femur from its apex. Both sexes may usually be separated from allied taxa by having the third antennal segment entirely black or nearly so, and the arista browned at base. The species, probably the female, is known to be annoying to man by attempting persistently to alight on the face (Malloch, 1913: 626), and in particular the region of the eyes, ears, nostrils and lips. The association of females with Tabanid flies on horses has been shown by Garcia and Radovsky (1962: 1110-1116) to be associated incidentally with the opportunity thus provided of feeding on the horse's blood.

Fannia binotata Chillcott

Fannia binotata Chillcott, 1961, Can. Entomol., (1960) 92 Suppl. 14 p. 203.

Holotype: ♂, Atlacomulco, Mexico (UK).

Geographic range.--California, Oregon, Mexico.

California records.--ALAMEDA CO.: Berkeley Hills, 3 ♀, V-19-59, 1 ♀, VI-29-59, *ex Bombus* nest (R. W. Thorp, HCH).

The species *F. binotata* has the tibiae fulvous and the abdomen largely or partly reddish or yellow, the mid coxae spineless and hind coxae haired on the inner caudal surface, the parafacials with a notable series of setulae. The female has a relatively narrow frons, being narrower at vertex than half its length. The species has been reared from nests of *Bombus vosnesenskii* and *B. occidentalis nigroscutatus* found in California and of *B. formosus* Smith in Mexico (Chillcott, 1965: 645).

Fannia brevicauda Chillcott

(Fig. 18)

Fannia brevicauda Chillcott, 1961, Can. Entomol., (1960) 92 Suppl. 14 p. 106.

Holotype: ♂, Bishop, California (UK).

Geographic range.--Alberta, British Columbia, California, Montana, Nevada, Utah, Washington, Wyoming.

California records.--HUMBOLDT CO.: Dyerville, 1 ♀, VI-20-35 (A. L. Melander, USNM). INYO CO.: Bishop, 1 ♂, 1 ♀, VII-28-40, types, (D. E. Hardy, UK). Lone Pine, 1 ♂, VII-28-40 (D. E. Hardy, UK). MONO CO.: 1 mi. W. of Tom's Place, 1 ♂, VIII-13-57 (D. D. Linsdale, CIS). Mono Lake, 1 ♂, VII-31-40 (D. E. Hardy, UK). SAN BERNARDINO CO.: Victorville, 1 ♂, VIII-1915 (C. H. Kennedy, HCH).

The small species *F. brevicauda* is related to *F. postica* (Stein)*, from which it differs in having the mid and hind tibiae reddish at base, and 3 series of postsutural acrosticals. Occasional male specimens of *F. brevicauda* have a weak fasciculus at base of the ventral surface of mid metatarsus, and from males possessing this character occurring in California the male of *F. brevicauda* may be separated by the presence of 4 or more anteroventral bristles on the distal half of hind femur. The female of *F. brevicauda* closely resembles females of *F. flavitibia* possessing darkened or blackish tibiae.

Fannia canicularis (Linnaeus)

(Fig. 8; map 41)

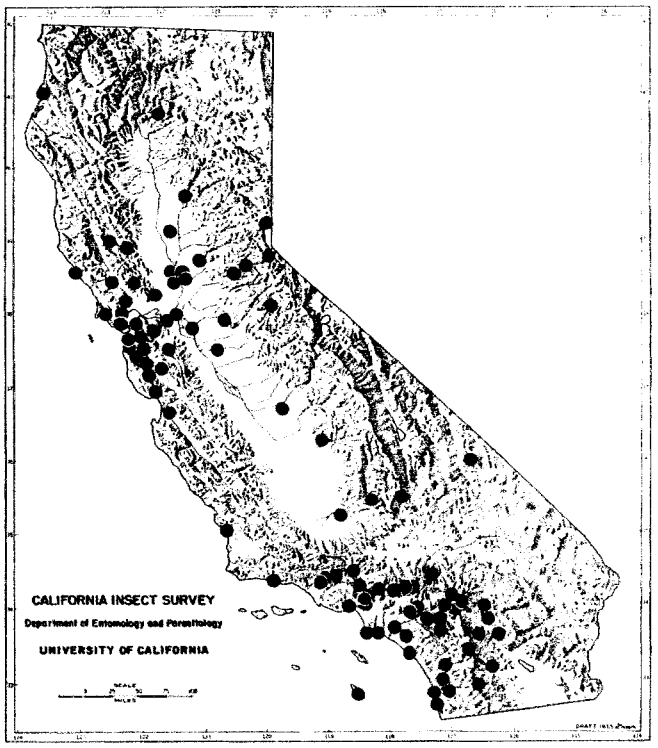
Musca canicularis Linnaeus, 1761, Fauna svecica sistens animalia Sveciae regni. Ed. 2. p. 454.

Anthomyia isura Walker, 1849, List Dipt. Br. Mus., 4: 952.

Type: unknown.

Geographic range.--Cosmopolitan.

California records (map 41).--Widespread in Upper Sonoran and Transition Zone situations throughout California; the species has been rarely collected above 6,000-7,000 feet and north of the Sierra Nevada in the State. Adults of *Fannia canicularis* are active throughout the year in coastal areas from the San Francisco Bay area southward. There are only scattered records northward on the coast, but inland the flies have been taken from January to October around Davis, as early as February in the San Joaquin Valley, and as late as November in the foothills at the north end of the Sacramento Valley and October at Shoshone in the northern Mojave. This species is ecologically less widespread than most of the other abundant California muscids, ranging only to the margins of both high and low deserts and the Great Basin, and



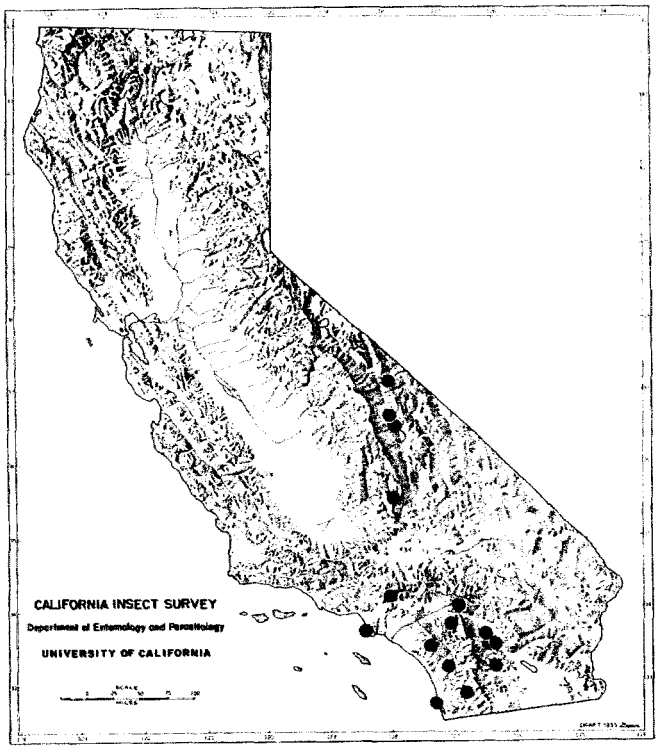
Map 41. California distribution of *Fannia canicularis* (Linnaeus).

up to only moderate elevations in the Sierra Nevada, where collection records are for the summer months.

The present survey reveals the presence of the species in 37 counties and approximately 133 localities, based on an examination of 600 specimens, of which 417 were males and 183 females. The species is closely allied to *F. nidicola* Malloch*, (from New York and Europe) which in the male has the mesonotum and scutellum largely dark brown and striping absent or obscured.

Adults of *F. canicularis* have been bred from a wide variety of media or hosts, that include the excrement of man and domestic animals. Flies are frequently found in human and animal dwellings, and on this account are regarded as a hazard to the normal health of human beings. Larvae have been present incidentally in cases involving myiasis in vertebrates (Howard, 1900: 582; Hewitt, 1912: 162-168; Séguy, 1923: 269; 1950: 364; James, 1948: 129-130; Hennig, 1955: 34-35; Chillcott, 1961: 190-192). Diagnostic characters for the identification of the larvae are furnished by Hennig (1955: 10-12) and Chillcott (1961: 52, 287).

The species is also widely represented in a



Map 42. California distribution of *Fannia conspicua* Malloch.

variety of the adult having the abdomen entirely gray-black, without trace of the yellowish marking that occurs in more typical specimens. The female thus characterized is scarcely distinguishable from that of *nidicola* Malloch*. Records of such specimens were obtained from localities in the following counties: Alameda, Colusa, Contra Costa, Los Angeles, Napa, Nevada, Orange, Riverside, Sacramento, San Bernardino, San Diego, Santa Cruz, Shasta, Solano, Tulare, Yolo and Yuba County.

Fannia conspicua Malloch

(Map 42)

Fannia conspicua Malloch, 1913, Proc. U. S. Natl. Mus., 44: 624.

Holotype: ♂, Williams, Arizona (USNM).

Geographic range.--Arizona, California, Gulf of Mexico.

California records.--INYO CO.: Cedar Flat, Westgard Pass, 7,310 ft. 7 ♀, VIII-21-63, "nuisance fly, stays around one's face" (H. B. Leech, CAS). Independence, 1 ♀, VI-11-37 (A. E. Meier, CAS). 7.3 mi. W. of Lone Pine, 1 ♂, VII-11-65 (Ballmer and Bath, UCR). KERN CO.: Walker Pass, 4 ♀, IX-26-57 (E. I. Schlinger, UCD). LOS ANGELES CO.: Azusa Canyon, 3 ♀, IX-18-44 (A. L. Melander, USNM). Palos Verdes Estates, 1 ♀, IV-29-49 (E. G. Meyers, CIS). RIVERSIDE CO.: Deep Canyon, 1 ♀, XI-11-63, 5 ♀, XII-17-63,(E. I. Schlinger, UCR). El Cariso Camp, Ortega Highway, 1 ♀, X-19-44 (A. L. Melander, USNM). San Timoteo Canyon, 1 ♀, IX-19-64 (P. A. Rauch, UCR). Summit, Upper Palm Canyon, 14 mi. SE. of Keen Camp, 1 ♀, VII-8-64 (E. I. Schlinger, UCR). Upper Palm Canyon and Highway 71, 1 ♀, VII-7-64 (P. A. Rauch, UCR). SAN BERNARDINO CO.: South Fork, Upper Santa Ana River, 2 ♀, VII-31-42 (A. L. Melander, USNM). Upper Santa Ana River, 1 ♀, VI-30-49, 1 ♂, VII-9-50 (A. L. Melander, USNM); 1 ♀, VII-28-47 (H. G. and J. L. Sperry, USNM). SAN DIEGO CO.: Borrego Desert, Palm Canyon, 1 ♀, XI-10-45 (A. L. Melander, USNM). Borrego Desert, Tubb Canyon, 2 ♀, XI-9-45 (A. L. Melander, USNM). Borrego Springs, 1 ♀, XI-23-65 (S. E. Haseltine, BVC). 5 mi. S. of Borrego Springs, 1 ♂, IV-20-65, 1 ♀, V-11-65, 2 ♀, V-25-65, 1 ♂, VI-1-65, 1 ♀, XI-23-65 (S. E. Haseltine, BVC). Cuyamaca State Park, 1 ♀, VII-9-52 (R. X. Schick, UCLA). Rincon, 1 ♀, XII-7-35 (A. J. Basinger, CAS). San Diego, 1 ♀, V-16-21 (CAS).

The male of *F. conspicua* has a few longish bristles near the middle of the anteroventral surface of hind femur and one preapical anteroventral, thereby differing from the femoral bristling in males of allied species known to occur in California. The female resembles that of *F. operta*, differing in having the mid and hind femora mainly fulvous.

Fannia coracina (Loew)

Homalomyia coracina Loew, 1873, Berl. Entomol. Z., 17: 47.

Type: ♂, Herkulesbad, "*Pannonia inferiori*" (ZMUB).

Geographic range.--California, Connecticut, Minnesota, Ontario, Quebec, Vermont.

California records.--SAN MATEO CO.: La Honda, 1 ♂, III-8-64 (P. H. Arnaud, CAS). SANTA CLARA CO.: Stanford University, 1 ♂, X-7-05 (J. M. Aldrich, USNM).

The male of *F. coracina* has the mesonotum and scutellum black and the mesonotum without stripes. In both sexes the prealar bristles are setulose and set nearer to the base of the supraalar bristle than to the notopleural suture. From species thus bristled the male of *coracina* differs in having a ventral callosity or tubercle nearer the middle third of the mid tibia, and in being without spines on mid coxa; the female by the presence of an anteroventral bristle on the mid tibia. The

larvae have been bred from the nest of wasps (Collart, 1933: 6).

Fannia elongata Chillcott

Fannia elongata Chillcott, 1961, Can. Entomol., (1960) 92 Suppl. 14 p. 149.

Holotype: ♂, Stanford University, California (USNM).

Geographic range.--California.

California records.--CONTRA COSTA CO.: Moraga Valley, 1 ♀, IV-4-20 (E. P. Van Duzee, CAS). LOS ANGELES CO.: Santa Monica Mountains, 1 ♂, VII-3-50 (UCLA). MARIN CO.: Black Point, 1 ♂, IV-14-54, paratype (A. D. Telford). Woodacre, 2 ♂, III-31-49, 3 ♂, IV-1-49,(CIS; HCH). SAN BENITO CO.: 5 mi. W. of San Juan Bautista, 1 ♀, IV-6-60 (T. R. Haig, UCD). SAN MATEO CO.: Junipero Serra Park, 4 ♂, 2 ♀, IV-4-64 (P. H. Arnaud, CAS). Redwood City, 1 ♂, II-8-53 (P. H. Arnaud, CAS). San Andreas Lake, 1 ♂, II-5-60 (C. A. Toschi, CIS).

The species *F. elongata* superficially resembles *F. canicularis* var., differing essentially in having a firm prealar bristle, in lacking caudal hairs on inner border of hind coxae, and is without a series of coarse anterodorsal setulae on the hind tibia. In the male of *elongata* the mesonotum is blackish, brown in female, and in both sexes has striping between the respective series of acrostical and dorsocentral bristles. The hind femur of the male has a longer series of firmer anteroventral and posteroventral bristles than in the male of *canicularis* var., and the parafacials of the female are without a series of hairs.

Fannia femoralis (Stein)

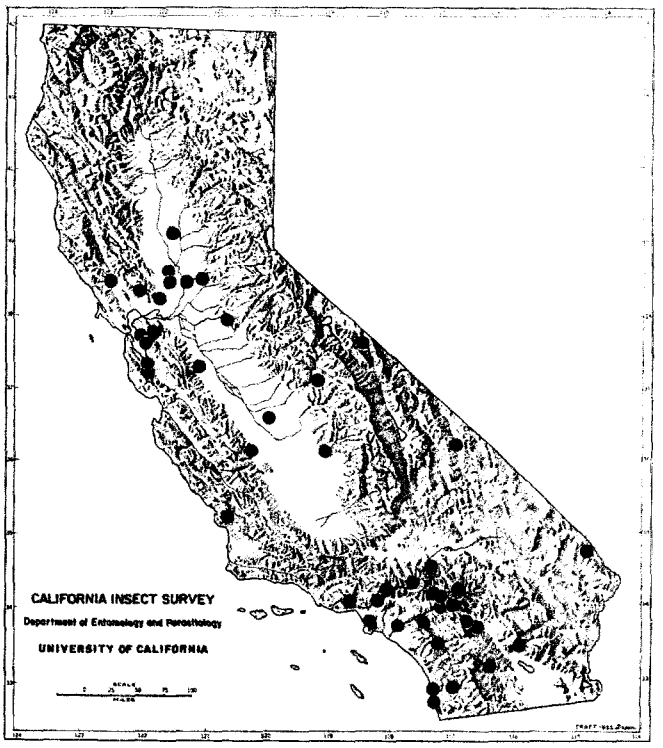
(Map 43)

Homalomyia femoralis Stein, 1898, Berl. Entomol. Z., (1897) 42: 282.
Syntypes: ♂♂, Opelousas, Louisiana (FMNH).

Geographic range.--Alabama, Arizona, California, Georgia, Illinois, Kansas, Louisiana, Montana, New Mexico, North Carolina, Tennessee, Texas, Utah, West Virginia, Mexico.

California records (map 43).--This species has an austral distribution, ranging from the inner arid valleys of the central Coast Range and The Sacramento Valley to the margins of the deserts and on the Colorado River (Needles). The adults have been taken throughout the year in southern California, with many winter records in the desert. Northward the active flight season is restricted, from May to October or November according to available records.

The survey is based on specimens from about 40 localities in 17 counties.



Map 43. California distribution of *Fannia femoralis* (Stein).

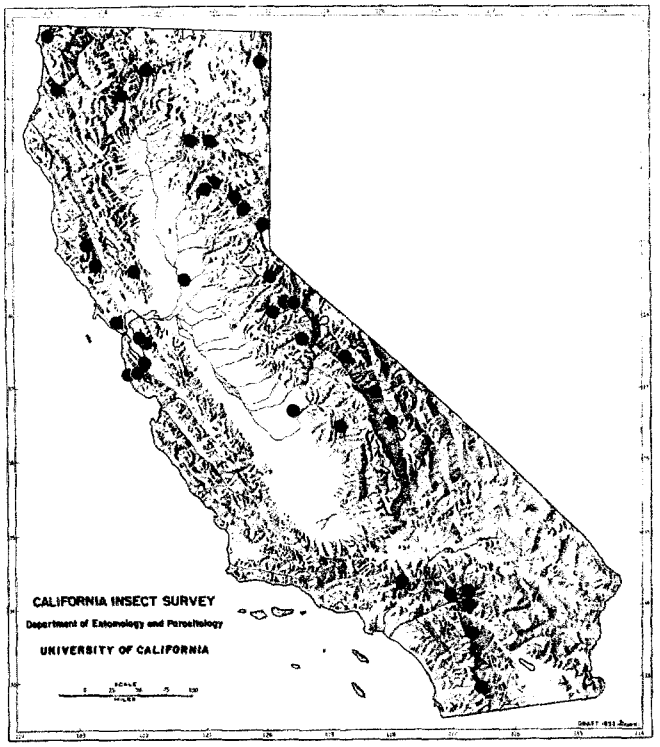
The species *F. femoralis* belongs to the *F. pusio*-group within the genus, having the abdomen trimaculate in the male. The group differs from the *F. benjamini*-group in having the legs black, and in the female is without marks on the abdomen, and without an anteroventral bristle on mid tibia, and has fine hairs on the parafacials. The male of *F. femoralis* differs from that of *F. pusio* in having only 1 or 2 short anteroventral bristles and being without posteroventrals on the hind tibia; in the female by the wider frons at the vertex of the head.

The species has been reared from chicken manure and human excrement, and adults are recorded as attracted to the carcass of a dead cat for purposes of oviposition. One female specimen before me has the notation "to rancid chicken guts." Larval characters of *femoralis* and *pusio* have been figured for diagnostic purposes by Chillcott (1961: 286).

Fannia flavitibia Stein

(Figs. 24, 27; map 44)

Fannia flavitibia Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 42.



Map 44. California distribution of *Fannia flavitibia* Stein.

Fannia minuta Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 44.

Syntypes: ♂♂ ♀♀, Moscow, Idaho (ZMUB).

Geographic range.--Alaska, British Columbia, Idaho, Nevada, Oregon, Utah.

California records (map 44).--This species occupies an essentially circum-valley distribution, primarily at low to moderate elevations, with riparian intrusions into Upper Sonoran habitats in the Central Valley. There are two records in the Sierra Nevada near timberline (Carson Pass, Sonora Pass). The flight season is short relative to many muscids, from May to October near the coast and mainly during the summer months inland. There is one record for April in the Sierra Nevada (Ash Mountain, Sequoia) and one record for November in Trinity County (Rush Creek).

Records are available from about 50 localities in 28 counties.

The species *F. flavitibia* has the femora black and the tibiae varying from fuscous to yellowish. The male has a small but distinct fasciculus at the base of the ventral surface of mid metatarsus, 2 preapical anteroventral and several slender preapical posteroventral bristles on the hind femur, proximad of which the posteroventral surface is bare, or nearly so (fig. 24). In *F. flavibasis* (Stein)*, a closely related species, the hind femur of the male has a continuous series of short posteroventral setulae on proximal half (fig. 23). The female of *F. flavitibia* closely resembles that of *F. brevicauda*, from which it may be separated usually by the paler tibiae and grayish mesonotum.

Fannia fuscula (Fallén)

(Fig. 41)

Musca fuscula Fallén, 1825, Monographia Muscidum Sveciae, Muscides, p. 86.

Homalomyia tetracantha Loew, 1872, Berl. Entomol. Z., 16: 93.

Type: ♂, Skåne.

Geographic range.--Widely distributed in the north temperate region of continental North America, reaching north as far as central Alaska, Yukon Territory, and Mackenzie River Basin, thence eastward across the provinces from British Columbia to Nova Scotia and New England states, southward in the east as far as North Carolina and Tennessee, westward to include many of the northern states from the Great Lakes Region to the Rocky Mountains, Colorado and states bordering the Pacific Ocean.

California records.--MARIN CO.: Mill Valley, 1 ♂, IV-5-6-65 (P. H. Arnaud, CAS). SACRAMENTO CO.: Sacramento, 1 ♂, VI-19-40 (WSU). Also Smith River, Del Norte County; Lagunitas Canyon, Marin County (Chillcott, 1961: 74).

The species *F. fuscula* and *F. americana* are closely related, the male of the former having slightly shorter anteroventral bristles on the hind tibia and a difference in the structure of the gonostyli and cerci (fig. 41). The sternopleura in the male of both species has a ventral spine. The female of *F. fuscula* differs from that of *F. americana* in having the sternal sclerite of segment 8 of the ovipositor present, and in having a weaker posteroventral bristle at the base of mid femur. The species has been recovered from nests of wasps and bumble bees (Séguy, 1923: 270), and adults have been attracted to baits of beef liver, excrement (Gill, 1955: 652), and the carcass of a squirrel (Chillcott, 1961: 238).

Fannia immaculata Malloch

Fannia nigra Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 43. name preoc. Malloch, 1912.

Fannia canadensis Malloch, 1924, Ann. Mag. Nat. Hist ser. 9 13: 423.

Fannia immaculata Malloch, 1924, Ann. Mag. Nat. Hist., ser. 9 13: 424: Chillcott, 1961, Can. Entomol., (1960) 92 Suppl. 14 p. 169.

Syntypes: ♂♂ ♀♀, Montreal, Canada (Dtsch. Entomol. Inst., Berlin).

Geographic range.--Alberta, Connecticut, Illinois, Indiana, Massachusetts, Maine, Michigan, Minnesota, New Hampshire, Nova Scotia, New York, Ohio, Ontario, Pennsylvania, Quebec, South Dakota.

California record.--PLUMAS CO.: Bucks Lake, 1 ♂, VII-1-49 (W. H. Wade, CIS).

The species *F. immaculata* is closely related to *F. serena*, from which it may be separated by the larger eyes in the male, occupying nearly the whole surface of the head as viewed in profile, and in the female by the jet black glossy parafrontals, possessing a polish resembling that of the haustellum.

Fannia incisurata (Zetterstedt)

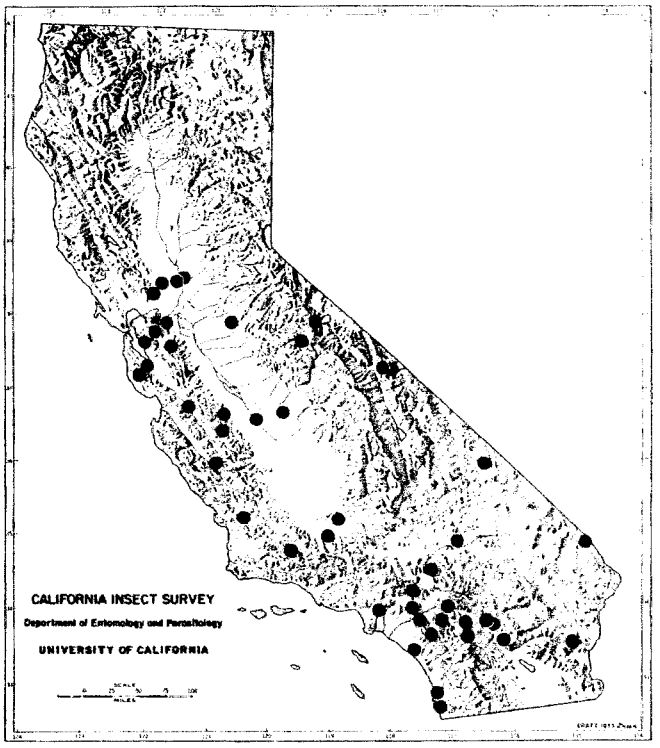
Anthomyza incisurata Zetterstedt, 1838, Ins. Lapp., p. 679.

Type: ♂, Torne Lappmark (Zool. Inst., Lund).

Geographic range.--Occurring in the provinces and northern states, from British Columbia and Washington eastward across the continent to Quebec, New England, and the Great Lakes Region, thence southward to as far as the District of Columbia, also in Colorado and California.

California record.--SAN FRANCISCO CO.: Goat Island,[Yerba Buena Is.], San Francisco Bay, 1 ♀, IX-8-17 (C. D. Duncan, CAS).

The male of *F. incisurata* resembles that of *F. scalaris* in bristling, but differing notably in having no spines on mid coxa and no tubercle on mid tibia The female is scarcely distinguishable from that of *F. scalaris*, and the present single record based on a female specimen may be accepted with some hesitancy. The biology of the species has been recorded by Lesne (1921: 56), and the larval characters indicated for diagnostic purposes by Hennig (1955: 11-12), and Chillcott (1961: 52, 288). Larvae have been bred from nests of the European titmouse, and with *F. manicata* from nests of wasps, with *scalaris* from cesspools and human excrement, and from cadavers (Séguy, 1923: 271, 1929: 71, 1950: 380, 386; James, 1948: 128-129).



Map 45. California distribution of *Fannia laevis* (Stein).

Fannia laevis (Stein)

(Map 45)

Homalomyia laevis Stein, 1898, Berl. Entomol. Z., (1897) 42: 174.

Syntypes: ♂♂ ♀♀, Horse Neck Beach, Massachusetts (FMNH).

Geographic range.--Occurring mainly in the temperate region of western North America, in the southwestern states of California, Nevada, Utah, Arizona, New Mexico, and Texas, in the Rocky Mountain states from Colorado northward to Idaho, Washington, and the provinces of Alberta and British Columbia; in the east is recorded from Pennsylvania, New York, Massachusetts, and southern Quebec. Also from Mexico.

California records (map 45).--Throughout inland valleys from Scaramento southward, primarily in austral zones, on both sides of the Sierra Nevada, in the Mojave Desert, and the Coachella Valley. Apparently lacking from the Imperial Valley. This species apparently flies primarily during the cooler months, with records available throughout the year except in July and August in both the Central Valley and the desert. In the central Coast Range *Fannia laevis* has been collected from February to May and September to November. There are scattered records for July in cismontane southern California and east of the Sierra Nevada.

The species *F. laevis* and *F. tibialis* have many characters in common. Both are distinctly grayish, more evenly and densely so in females, and with 3 mesonotal stripes. In males the frons is moderately broad and has a narrow uninterrupted interfrontalia; in females the parafacials have a series of hairs. In *F. laevis* the tibiae are black, thereby differing from *F. tibialis*, the femora relatively stout and tibiae short, and the hind tibia with only one anteroventral bristle.

Fannia lucida Chillcott

Fannia lucida Chillcott, 1961, Can. Entomol., (1960) 92 Suppl. 14 p. 129.

Holotype: ♂, Rockglen, Saskatchewan (CNC).

Geographic range.--Alaska, Alberta, British Columbia, California, Iowa, Minnesota, Montana, New York, Quebec, Saskatchewan, Washington.

California record.--SHASTA CO.: Cassel, 1 ♂, VII-15-55 (E. I. Schlinger, UCD).

The species *F. lucida* may be recognized by its jet black shiny appearance, with the markings obscure or absent, and the pruinescence sparse. In both sexes the mid tibia has 2 anterodorsal, 2 posterodorsal, and in the female 1 or more anteroventral bristles; in the male the hind femur has a series of lengthy posteroventral bristles throughout the proximal three fourths. In the female, the parafrontals are broad, black, and glossy, and separated by a linear interfrontalia. The species belongs to the *F. carbonaria*-group within the genus.

Fannia manicata (Meigen)

Anthomyia manicata Meigen, 1826, Syst. Beschr., 5: 140.

Anthomyia uxama Walker, 1849, List Dipt. Br. Mus., 4: 948.

Anthomyia acra Walker, 1849, List Dipt. Br. Mus., 4: 951.

Types: ♂ ♀, locality not stated (MNH Paris).

Geographic range.--Widely distributed in the north temperate region of North America, reaching as far north as central Alaska, Yukon Territory and Mackenzie River Basin, thence eastward across the provinces from British Columbia to Quebec, Labrador and southern Greenland; southward to include Nova Scotia, New England and states comprising the northern tiers from the Great Lakes region to the Rocky Mountains, extending to Utah and Colorado; in the east the Atlantic states to as far as Georgia and Tennessee, and in the west, the Pacific states.

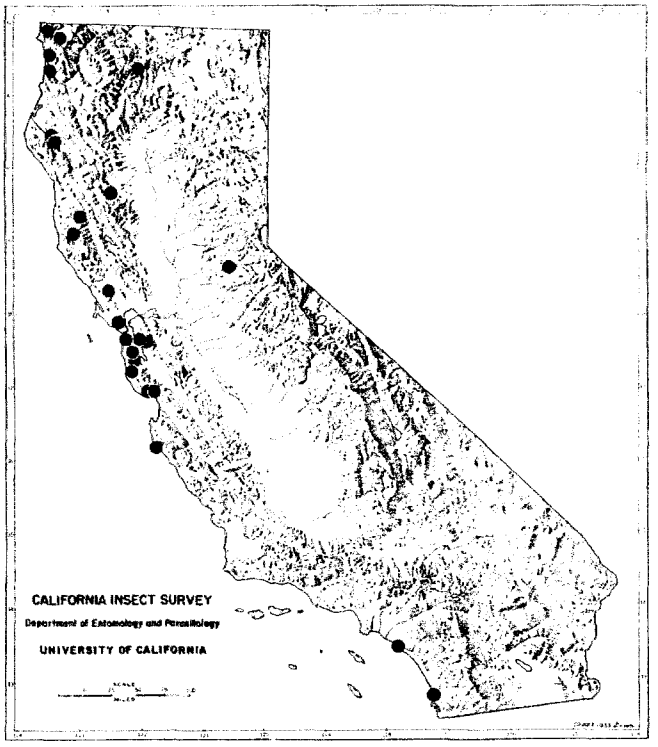
California records.--ALAMEDA CO.: Hills back of Oakland, 1 ♀, XI-10-50 (W. C. Bentinck, CIS). Strawberry Canyon, Berkeley Hills, 1 ♀, IV-10-54 (J. Powell, CIS). AMADOR CO.: Silver Lake, 1 ♀, VII-29-33 (D. B. Mackie, CAS). EL DORADO CO.: Echo Lake, 1 ♀, VII-2-53 (W. W. Middlekauff, CIS). Meeks Bay, 2 ♂, VI-21-63 (D. D. Linsdale, BVC). LASSEN CO.: S. end of Eagle Lake, 1 ♀, VIII-26-63 (H. B. Leech, CAS). LOS ANGELES CO.: Big Pines, 1 ♀, V-23-45 (A. L. Melander, USNM). MARIN CO.: Mill Valley, 1 ♀, XI-3-50 (H. B. Leech, CAS). RIVERSIDE CO.: Fuller Mill Creek, 1 ♀, III-20-65 (M. E. Irwin, UCR). SAN BERNARDINO CO.: Lake Arrowhead, 1 ♀, VII-13-63 (E. I. Schlinger, UCR). SAN DIEGO CO.: Julian, 1 ♂, V-5-45 (A. L. Melander, USNM). SISKIYOU CO.: Mt. Shasta City, 2 ♀, VI-22-58 (J. Powell, CIS). SONOMA CO.: Santa Rosa, 3 ♂, 1 ♀, V-15-29, *ex* brood combs (CDA); 1 ♂, 1 ♀, I-25-64 (J. D. Birchim, JDB). Sonoma County, 3 ♂, 7 ♀, V-20-29 *ex* brood comb (D. E. Bremner, CDA). TRINITY CO.: Scott Mountain, 5,358 ft. 1 ♂, VI-4-51 (M. F. McClay, UCD). TUOLUMNE CO.: Bumble Bee, 1 ♂, 15 ♀, VII-8-51 (T. R. Haig, UCD). Strawberry, 1 ♀, VI-19-51 (A. T. Mc Clay, UCD); 1 ♀, IV-16-57 (D. D. Linsdale, CIS); 1 ♀, VI-21-57 (A. E. Pritchard, CIS). Yosemite, 3,880 -4,000 ft. 1 ♀, V-19-31 (CIS). Also Idyllwild, San Jacinto Mts., Riverside County; Morgan Hill, Santa Clara County; Gold Lake, Sierra County; Yosemite National Park (Chillcott, 1961: 71).

The male of *F. manicata* may readily be recognized by the preapical cluster of flattish hairs on the posteroventral surface of fore tibia. The female may be linked to those of *F. incisurata* and *F. scalaris*, from which *F. manicata* may be separated by the absence of a weak anterodorsal bristle on the distal half of fore tibia, by the darker gray parafrontals and blackish mesonotum. Adults are reported to be attracted to baits of decomposing animal tissue (Gill, 1955: 652; Hennig, 1955: 61). Larvae have been reared from species of *Polyporus*, *Boletus*, *Armillaria* (Stein, 1895: 42; Donisthorpe, 1922: 189), from refuse containing decayed vegetable and animal matter, from nests of *Vespa vulgaris* and other *Hymenoptera* (Séguy, 1923: 271; 1937: 161), and along with *F. scalaris* are reported to be present incidentally in cases involving intestinal myiasis in man (Lampa, 1887).

Fannia ochrogaster (Thomson)

(Map 46)

Anthomyia ochrogaster Thomson, 1869, *In* K. Svenska Vetenskaps-Akademiens, Kongliga svenska fregatten Eugenies resa omkring jorden. Pt. 2 Zoolo-



Map 46. California distribution of *Fannia ochrogaster* (Thomson).

gie. Sec. I: Insekter, p. 557.

Fannia splendida Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 45.

Type: ♀, California (MNH Stockholm).

Geographic range.--British Columbia, California, Colorado, Idaho, Montana, Oregon, Washington.

California records (map 46).--This is essentially a coastal species, with one record from Mt. Shasta (Squaw Creek), one from the Yollo Bolly Range (Plaskett Meadows), and three collections from the vicinity of Camino, El Dorado County. Along the coast the flight period is restricted to the warmer months, from June to September in the north, May to October in the San Francisco Bay region. The two records in southern California are for February (Laguna Beach) and December (La Jolla).

The survey of *F. ochrogaster* is based on about 40 records in 14 counties.

The slender species *F. ochrogaster* has the abdomen and legs mainly yellow, the abdomen sometimes blackened, the hind coxae without the caudal hairs on inner border. The male has 2 notably strong anteroventral bristles on the middle third of mid femur, and a series of several slender bristles on the distal half of anteroventral and posteroventral surfaces of hind tibia.

Fannia operta Chillcott

Fannia operta Chillcott, 1961, Can. Entomol., (1960) 92 Suppl. 14 p. 160.

Holotype: ♂, The Gavilan, California (UCD).

Geographic range and *California records.*--RIVERSIDE CO.: Indian Wells, 1 ♀, VI-28-52 (E. M. Evans, UCD). The Gavilan, 1 ♂, 4 ♀, V-17-51, type series (E. I. Schlinger, UCD).

The male of *F. operta* may be separated from those of *F. arizonensis* and *F. tescorum* of the *F. benjamini*-group by the presence of 4 strong preapical anteroventral bristles on the hind femur. The female closely resembles that of *F. conspicua*, both having 2 preapical anteroventral bristles on the hind femur. In *F. operta* the mid and hind femora in both sexes are usually and mainly infuscated.

Fannia oregonensis Chillcott

Fannia oregonensis Chillcott, 1961, Can. Entomol., (1960) 92 Suppl. 14 p. 83.

Holotype: ♂, Hood River, Oregon (CNC).

Geographic range.--Alberta, Arizona, California, Idaho, New York, Oregon, Washington, Yukon Territory.

California record.--TUOLUMNE CO.: Bumble Bee, 7 ♀, VII-8-51 (T. R. Haig, UCD; HCH).

The species *F. oregonensis* varies considerably in the extent to which legs are darkened or infuscated. The series of females from Bumble Bee has the femora brownish black and one or more tibiae rufous, or obscurely reddish. The male has 3 to 5 anteroventral bristles on the hind tibia, 2 or 3 in the female, and in contrast to the female possesses a series of longish anterodorsal setae and several lengthy posterior bristles on the hind tibia.

Fannia pellucida (Stein)

Homalomyia pellucida Stein, 1898, Berl. Entomol. Z., (1897) 42: 283.

Syntypes: ♂ ♀, Tifton, Georgia (FMNH).

Geographic range.--Arizona, California, Georgia, Maryland, New Mexico, New York, North Carolina, Pennsylvania, Washington.

California records.--RIVERSIDE CO.: Marion Mountain Camp, San Jacinto Mountains, 1 ♂, VII-1-52 (W. V. Garner, CIS). SAN BERNARDINO CO.: Big Bear Lake, 7,000 ft. 2 ♀, IX-14-34 (A. J. Basinger, HCH). Forest Home, Falls, 1 ♀, XI-4-34 (A. J. Ba-

singer, CAS). Mt. Home Canyon, 2 ♂, IX-20-22 (F. R. Cole, CAS). South Fork, Upper Santa Ana River, 1 ♀, VIII-2-42 (A. L. Melander, USNM). SAN MATEO CO.: Huddart Park, 1 ♀, X-1-63 (R. P. Maynard, BVC). Ladera, Alpine Road, 1 ♀, X-18-63 (R. P. Maynard, BVC). TRINITY CO.: 5 mi. W. of Peanut, 1 ♀, V-15-63 (J. E. Brooks, BVC). TUOLUMNE CO.: Bumble Bee, 2 ♂, VII-8-51 (T. R. Haig, UCD).

The male of *F. pellucida* has a lengthy spine on the ventral surface of the sternopleura and a short hooked spine on the mid coxa. The abdomen is reddish testaceous on the cephalic half. The female has a moderately narrow frons, its width at vertex being less than half its length, the abdomen partly or mostly reddish and the hind tibia with 3 or more anteroventral bristles.

Fannia penepretiosa Chillcott

Fannia penepretiosa Chillcott, 1961, Can. Entomol., (1960) 92 Suppl. 14 p. 144.

Holotype: ♂, Laniel, Quebec Province (CNC).

Geographic range.--Alaska, British Columbia, California, Maine, Minnesota, New York, North Carolina, Ontario, Quebec.

California record.--TUOLUMNE-MARIPOSA CO.: Yosemite National Park, 1 ♀, VIII-1-40 (D. E. Hardy, UK).

F. penepretiosa lacks the caudal hairs on the inner border of hind coxae, and from such may be distinguished by having the apical region of scutellum extensively yellowish, in this respect resembling the european species *F. pretiosa* (Schiner)*.

Fannia pusio (Wiedemann)

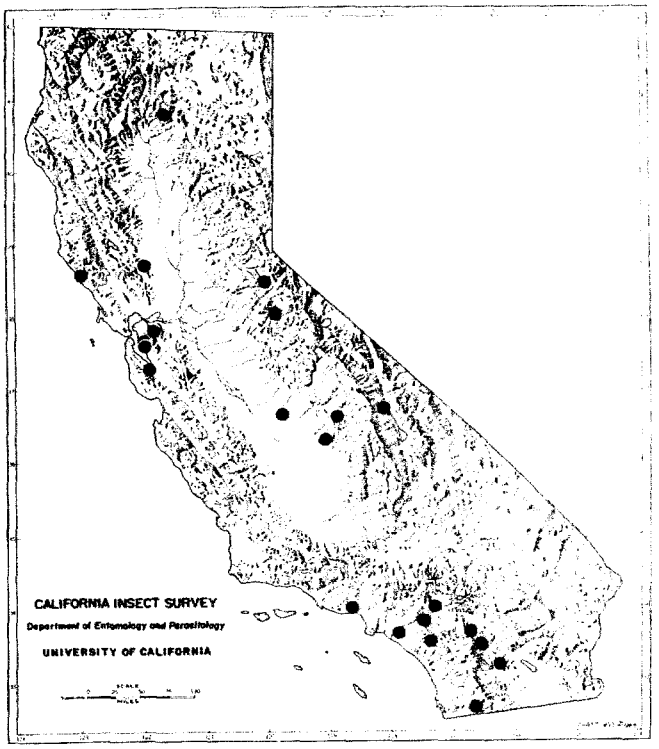
Anthomyia pusio Wiedemann, 1830, Aussereurop. Zweifl. Ins., 2: 437.

Types: ♂ ♀, South America (Zool. Mus., Copenhagen).

Geographic range.--Alabama, Arizona, California, District of Columbia, Florida, Georgia, Louisiana, Maryland, Mississippi, New Jersey, New York, Oklahoma, Texas, Bermuda.

California records.--FRESNO CO.: Fresno, 1 ♀, VI-26-61 (D. J. Womeldorf, BVC); 2 ♀, IX-13-63, 2 ♂, XI-11-63 (J. D. Walsh, BVC). NAPA CO.: 5 mi. N. of Napa, 1 ♀, VII-27-59 (T. M. Street, BVC). SACRAMENTO CO.: Sacramento, 1 ♀, VI-1-29 (H. H. Keifer, CDA). SAN DIEGO CO.: 2 mi. NE of Lakeside, 2 ♀, III-29-61 (P. D. Hurd, W. A. Steffan, CIS). SONOMA CO.: 1 ♀, V-20-29, *ex* brood combs (D. E. Bremner, CDA).

The male of *F. pusio* differs from those of its allies belonging to the *F. pusio*-group by having an extensive series of long anteroventral and posteroventral bristles on the hind tibia. The female differs from that of *F. femoralis* by having the frons narrower at vertex than the distance between the first pair of dorsocentral bristles.



Map 47. California distribution of *Fannia scalaris* (Fabricius).

The species is recorded as having been reared from a wide variety of material or hosts, that include chicken manure, decaying vegetables and fungi, dead insects, molluscs, fish, and snakes (Chillcott, 1961: 213).

Fannia scalaris (Fabricius)

(Map 47)

Musca scalaris Fabricius, 1794, Entomologia systematica emendata et aucta, 4: 332.

Steinomyia steini Malloch, 1912, Proc. U.S. Natl. Mus., 43: 657.

Type: ♂, Copenhagen (Zool. Mus., Copenhagen).

Geographic range.--Recorded in the west as far north as central Alaska and the Mackenzie River Basin, southward in British Columbia, Alberta to states bordering the Pacific Ocean and adjacent the Rocky Mountains, to as far as southern California, Arizona, New Mexico, and Kansas; in the east as far north as northern Quebec, thence southward to include Ontario and states bordering

the Great Lakes, the Atlantic littoral from Maine to as far south as Georgia and Tennessee.

California records.--ALAMEDA CO.: Emeryville, 10 ♂, 1 ♀, IV-2-62 (J. M. Ross, BVC). Oakland, 1 ♂, VII-7-49 (L. W. Quate, CIS). Russell City, 2 ♂, VI-26-61 (D. D. Linsdale, BVC). AMADOR CO.: Silver Lake, 1 ♀, VII-29-33 (D. B. Mackie, CAS). CONTRA COSTA CO.: Danville, 1 ♂, 2 ♀, XII-27-28-51, 2 ♀, I-2-52, 2 ♀, I-6-7-52, 3 ♀, I-10-52, 3 ♂, I-13-52, 3 ♀, I-17-18-52, 1 ♂, I-22-52, 2 ♀, I-24-52, *ex* ground nest of *Vespula* pen. (F. X. Williams, CAS). Mt. Diablo, summit 1 ♂, X-6-51 (R. S. Beal, CIS). FRESNO CO.: Fresno, 1 ♂, VIII-1-22 (M. E. Philips, HCH); 1 ♂, III-29-23 (USNM). FRESNO-TULARE CO.: General Grant Grove, Sequoia National Park, 1 ♀, VI-7-23 (M. E. Phillips, HCH). INYO CO.: Independence, 1 ♂, XII-14-63 (J. D. Birchim, JDB). LOS ANGELES CO.: Santa Monica Mountains, 1 ♀, VII-3-50 (HCH). ORANGE CO.: "Orange Co.", 1 ♂, VII-14-29 (P. W. Oman, UK). RIVERSIDE CO.: El Cariso Camp, Ortega Highway, 1 ♂, V-26-44 (A. L. Melander, USNM). Pinon Flat, San Jacinto Mountains, 1 ♂, V-27-39 (B. Brookman, CAS). Riverside, 1 ♂, III-24-33, 1 ♂, V-4-34 (A. J. Basinger, CAS). San Andreas Canyon, 2 ♂, IV-21-51 (E. I. Schlinger, UCD). SAN BERNARDINO CO.: Redlands, 1 ♀, 1913 (CAS). SAN DIEGO CO.: Borrego, Palm Canyon, 2 ♂, 1 ♀, V-3-45 (A. L. Melander, USNM). Campo, 1 ♂, VII-18-40 (R. H. Beamer, UK). SANTA CLARA CO.: Mountain View, 2 ♂, VI-11-41 (K. Frick, CIS). SHASTA CO.: Round Mountain, 1 ♂, XI-13-31. SONOMA CO.: Stewarts Point, 1 ♀, III-31-49, reared from nest of red tree-mouse (W. W. Middlekauff, CIS). TULARE CO.: Woodlake, 1 ♂, IV-14-47 (N. W. Frazier, CIS). TUOLUMNE CO.: Strawberry, 1 ♀, VI-21-56 (G. I. Stage, CIS); 1 ♀, VI-21-57 (A. E. Pritchard, CIS). YOLO CO.: Capay Valley, 1 ♀, X-29-20 (E. C. Van Dyke, CAS).

The male of *F. scalaris* like that of *F. coracina*, has a ventral tubercle on the distal region of mid tibia, but differs notably in having 3 spines on the mid coxa. The female of *F. scalaris* is quite similar to that of *F. incisurata*, and may usually be separated from the latter by a longer stronger posteroventral bristle at the base of mid femur.

The habits of larvae of *F. scalaris* have been summarized by James (1948: 127-128), Hennig (1955), and Chillcott (1961). The larvae are recorded as inhabiting decaying animal and vegetable matter, including fungi (Hennig, 1955: 82; Chillcott, 1961: 63); dung of pigs, calves, and horses (Thomsen and Hammer, 1936: 582); cesspools, human excreta, and cadavers (Howard, 1900: 582; Hewitt, 1914: 168; Lesne, 1921: 13, 56; Séguy, 1946: 138, 1950: 380); as incidental to cases involving intestinal myiasis (Lampa, 1887: 5-20; Hewitt, 1912: 171-173); and as bred from certain moths and molluscs, from nests of certain wasps and several birds (Séguy, 1925: 135, 1929: 71, 1935: 159, 1946: 121, 1950: 349; Hennig, 1955: 82-83). The larvae of *F. scalaris* have been described by Séguy (1923: 269, 273), de Wilde (1935: 74, figs. 64-67), and keyed and illustrated for diagnostic purposes by Hennig (1955: 10-12) and Chillcott (1961: 52, 283).

Fannia sequoiae Chillcott

Fannia sequoiae Chillcott, 1961, Can. Entomol., (1960) 92 Suppl. 14 p. 112.

Holotype: ♂, Sequoia National Park, California (UK).

Geographic range.--British Columbia, California.

California records.--TULARE CO.: Sequoia National Park, 1 ♂, 1 ♀, VIII-6-40, types (L. C. Kuitert, UK); 1 ♂, VIII-6-40 (R. H. Beamer, HCH). TUOLUMNE-MARIPOSA CO.: Yosemite National Park, 1 ♂, VIII-1-40, paratype (D. E. Hardy, UK).

The species *F. sequoiae* is related to *F. flavitibia*, from which it may be distinguished in the male by the enlarged bulbous hypopygium, and in the female by a pair of glossy swollen nodules on sternum 8 of the ovipositor.

Fannia serena (Fallén)

(Fig. 17)

Musca serena Fallén, 1825, Monographia Muscidum Sveciae, Muscides, p. 76.

Types: ♂ ♀, Southern Sweden.

Geographic range.--Alaska, Alberta, British Columbia, California, Colorado, Idaho, Montana, Oregon, Utah, Washington, Wyoming, Yukon Territory.

California records.--DEL NORTE CO.: Smith River, 5 ♀, VII-8-30 (J. M. Aldrich, USNM, CNC). MENDOCINO CO.: Fort Bragg, 1 ♂, VI-15-48 (H. B. Leech, CAS). NEVADA CO.: Sagehen Creek, 6,500 ft. near Hobart Mills, 1 ♀, VII-13-61 (J. G. Chillcott, CNC). Also Sequoia National Park, Tulare County (Chillcott, 1961: 168).

The species *F. serena* is closely related to *F. immaculata*, both having the lower calyptral scale narrow and striplike, not lobate, and in the male by having no slender preapical posteroventral bristles on the hind femur. The male of *F. serena* differs from that of *F. immaculata* in that the parafacials are not obscured from view by the eye when seen in profile, and the cheeks and buccal region are not so restricted. The female differs from that of *F. immaculata* in having the parafron-

tals less glossy and, in part, with a trace of pruinescence.

Fannia tescorum Chillcott

Fannia tescorum Chillcott, 1961, Can. Entomol., (1960) 92 Suppl. 14 p. 161.

Holotype: ♂, Alamogordo, New Mexico (ANSP).

Geographic range.--Arizona, California, New Mexico.

California record.--SAN DIEGO CO.: La Jolla, 1 ♂, 2 ♀, VI-20-63 (J. D. Birchim, HCH).

The male of *F. tescorum* has a tight cluster of posteroventral bristles at the preapical third of hind femur, resembling *F. benjamini* in this respect. The species is closely allied to *F. arizonensis*, and in the female can scarcely be differentiated.

Fannia tibialis Malloch

Fannia tibialis Malloch, 1913, Proc. U.S. Natl. Mus., 44: 461.

Holotype: ♂, Kaslo, British Columbia (USNM).

Geographic range.--Alaska, Alberta, British Columbia, California, Idaho, Montana, Northwest Territories, Oregon, Saskatchewan, Utah, Washington, Wyoming.

California records.--INYO CO.: Ruby Lake, 11,250 ft., 2 ♂, VIII-13-57 (D. D. Linsdale, CIS). LOS ANGELES CO.: Green Valley, 1 ♀, VII-26-44 (A. L. Melander, USNM). MONO CO.: Sardine Creek, 8,500 ft. 1 ♂, VI-28-51 (E. L. Silver, HCH). TUOLUMNE CO.: Conness Glacier, Yosemite National Park, 1 ♀, VII-30-36.

The male of *F. tibialis* may be linked to that of *F. laevis*, from which it differs in having one or more tibiae fulvous or rufous, the hind femur with longer posteroventral bristles, and in both sexes the hind tibia with 2 or 3 anteroventral bristles. In the female of *F. tibialis* the mid and hind femora and all tibiae are usually fulvous.

Fannia trigonifera Chillcott

Fannia trigonifera Chillcott, 1961, Can. Entomol., (1960) 92 Suppl. 14 p. 137.

Holotype: ♂, Monterey, California (UK).

Geographic range.--California, Washington.

California records.--CONTRA COSTA CO.: Walnut Creek, foot of Shell Ridge, 1 ♂, IX-22-62, attr. fluorescent 15-watt white light after 12 midnight (J. Powell, CIS). EL DORADO CO.: Pacific, 1 ♀, VIII-9-40 (D. E. Hardy, UK). LAKE CO.: Lower Lake, 1 ♂, IX-5-58, at light trap (R. E. Dolphin, UCD). LOS ANGELES CO.: Glendale, 1 ♂, X-8-51 (W. M. Schlinger, UCD). MARIN CO.: Inverness, 1 ♀, VIII-19-62 (C. A. Toschi, CIS). Muir Woods, 1 ♀, VIII-30-08 (J. C. Bradley, CU). MONTEREY CO.: Monterey, 1 ♂, VIII-10-38, type (R. I. Sailer, UK). SAN BERNARDINO CO.: Mill Creek Canyon, 1 ♀, IX-21-23 (E. P. Van Duzee, CAS). SANTA CLARA CO.: Morgan Hill, 1 ♂, IX-6-39 (R. K. Johnston). SANTA CRUZ CO.: Highland District, 1 ♂, VIII-16-58 (S. M. Fidel, UCR). SISKIYOU CO.: Mt. Shasta City, 1 ♀, VIII-26-58 (J. Powell, CIS).

The species *F. trigonifera* is allied to *F. minutipalpis* (Stein)* and related taxa. It may be distinguished from species known to occur in California that possess hairs on the inner border of the caudal surface of hind coxae by the short palpi, about equal to half the length of the third antennal segment, and by the presence of 2 anterodorsal bristles on the mid tibia.

Fannia vesparia (Meade)

Homalomyia vesparia Meade, 1891, Entomol. Mon. Mag., 27 (2): 42.

Type: ♂, Chester, England.

Geographic range and *California record.*--TULARE CO.: Alta Meadow, 1 ♂, VIII-24-17 (CU).

The male of *F. vesparia* has spines on mid coxa and a ventral spine on the sternopleura. It differs from the male of *F. pellucida* by having the abdomen nonyellowish basad, and from males of *F. fuscula* and *F. americana* by having the narrower part of the frons less in width than the length of the second antennal segment. The species has been taken in Europe in nests of *Vespa germanica* and *V. vulgaris* (Hennig, 1955: 93; Chillcott, 1961: 78).

Genus Euryomma Stein

Euryomma Stein, 1899, Entomol. Nachr., 25: 19.

Type-species: *Euryomma hispaniense* Stein, original designation, (= *Anthomyia peregrinum* Meigen, 1826).

As in *Fannia*; from which the genus *Euryomma* differs by having the first pair of presutural dorsocentral bristles weak, shorter than half the length of the second pair, the latter set near midway the length of the presutural region of thorax, and at a greater distance than the first pair of postsutural dorsocentral bristles from a line depicting the course of the transverse suture, when normally present (fig 7). Larvae are recorded as probably saprophagous, living in decomposed

vegetable matter (Séguy, 1937: 180; Hennig, 1955: 15), and in the refuse deposits of ant colonies (Chillcott, 1958: 725).

KEY TO SPECIES OF EURYOMMA IN CALIFORNIA

Third antennal segment black, occasionally reddish at extreme base of the inner surface, fore tibia with a weak anterodorsal bristle, humeral callosities grayish . . . . . *peregrinum* (Meigen)
Third antennal segment fulvous basad, fore tibia without an anterodorsal bristle, humeral callosities yellowish . . . *americanum* Chillcott

Euryomma americanum Chillcott

Euryomma americanum Chillcott, 1961, Can. Entomol., (1960) 92 Suppl. 14 p. 226.

Holotype: ♂, Santa Clara County, California (USNM).

Geographic range.--California.

California records.--CONTRA COSTA CO.: Antioch, 1 ♀, VII-1937 (E. S. Ross, CAS). MONTEREY CO.: Monterey, 1 ♂, 1 ♀, IX-25-34 (A. L. Melander, USNM). ORANGE CO.: Corona Del Mar. 1 ♂, 2 ♀, VI-5-45 (A. L. Melander, USNM). RIVERSIDE CO.: Salton Sea, State Park, 2 ♀, V-21-66, 2 ♀, XI-28-66 (L. D. Moore, BVC). SAN LUIS OBISPO CO.: 4 ♀, IX-1-45 (A. L. Melander, USNM). SANTA CLARA CO.: 2 ♂, 2 ♀, type series (Baker, USNM; CNC).

Euryomma peregrinum (Meigen)

(Fig. 7)

Anthomyia peregrinum Meigen, 1826, Syst. Beschr., 5: 187.

Anthomyia communis Walker, 1852, Ins. Saund. I p. 366.

Type: ♀, Saloon of American ship at Hamburg, Germany.

Geographic range.--Alabama, British Columbia, California, District of Columbia, Illinois, Maryland, Pennsylvania, Quebec, Virginia, southern Greenland and worldwide.

California records.--ALAMEDA CO.: Berkeley, 2 ♀, IX-1957 (T. Aarons, BVC). LOS ANGELES CO.: Long Beach, 2 ♂, 3 ♀, III-25-49 (CIS); 1 ♀, VIII-26-50 (O. Meyer, BVC). Los Angeles County, 3 ♀, III-7-15 (M. C. Van Duzee, CAS). ORANGE CO.: Laguna Beach, 1 ♀, VII-16-45 (A. L. Melander, USNM). SAN DIEGO CO.: La Jolla, 1 ♀, XII-29-34 (A. L. Melander, USNM); 1 ♀, VII-10-63 (J. D. Birchim, JDB). Santee, 2 ♀, IV-10-64 (E. Perry, BVC).

Genus Coelomyia Haliday

Coelomyia Haliday, 1840, *In* Westwood, Introd. Mod. Class. Ins., 2 Synopsis p. 143.

Type-species: *Coelomyia mollissima* Haliday, monobasic.

The genus *Coelomyia* differs from *Fannia* and *Euryomma* in having the oral margin of the face notably curved forward, the subgenal sclerite of the head extended dorsad to overlap the buccal region (jowls) of the cheek, the male abdomen spatulate basad and the connate terga 1+2 longer than tergum 3 or 4.

KEY TO SPECIES OF COELOMYIA IN CALIFORNIA

Proboscis fleshy, thickened proximad, vibrissal angle not protruded cephalad to a level beyond the tip of profrons . . . . . *subpellucens* (Zetterstedt)
Proboscis nonfleshy, vibrissal angle protruded cephalad to a level beyond the tip of profrons . *mollissima* Haliday*

Coelomyia subpellucens (Zetterstedt)

Aricia subpellucens Zetterstedt, 1845, Dipt. Scand., 4: 1561.

Homalomyia flavivaria Coquillett, 1900, Proc. Wash. Acad. Sci., 2: 446.

Types: ♂♂ ♀♀, Boreal Scandinavia (Zool. Inst., Lund).

Geographic range.--Alaska, Alberta, British Columbia, California, Idaho, Labrador, Maine, Maryland, Michigan, New Brunswick, New Hampshire, North Carolina, Northwest Territories, Oregon, Quebec, Tennessee, Washington, Wyoming, Yukon Territory.

California records.--[COUNTY UNKNOWN; San Francisco Co.?]: Merced Lake, 1 ♀, VI-23-24 (H. G. Dyar, CNC). Also Mesa Grande, Sonoma County (Chillcott, 1961: 237).

The abdomen of *C. subpellucens* is normally partly pellucid yellow or reddish, but not invariably so.

Tribe Azeliini

Genus Azelia Robineau-Desvoidy

Azelia Robineau-Desvoicy, 1830, [Paris] Inst. de France [Cl. des] Sci. Math. et Phys., Acad. Roy. des Sci., Mém présentés par divers Savans [ser. 2] 2: 592.

Type-species: *Azelia florea* Robineau-Desvoidy, designation of Rondani, 1866 (= *Anthomyia triquetra* Wiedemann, 1817).

Hind tibia without a bristle set on mid dorsal plane near middle of the tibia, as is present in the tribe *Fanniini*, mid tibia without an antero-

Map 48. California distribution of *Azelia cilipes* Haliday.

dorsal bristle, the male with cruciate setulae and the female with cruciate bristles.

KEY TO MALES OF AZELIA IN CALIFORNIA

Hind tibia with the longer anterodorsal bristles fully as long as the preapical mid dorsal bristle . *cilipes* Haliday
Hind tibia with the longer anterodorsal bristles shorter than the preapical mid dorsal bristle . . . . . *aequa* Stein

Azelia aequa Stein

Azelia aequa Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 46.

Type: ♂, Mt. Constitution, Orcas Island, Washington (ZMUB).

Geographic range.--California, Washington.

California records.--HUMBOLDT CO.: Prairie Creek, 1 ♂, XI-13-59 (E. L. Kessel, CAS). MONTEREY CO.: Big Sur, 1 ♂, IX-5-45 (A. L. Melander, USNM).

The males of *A. aequa* and *A. cilipes* have paired spots on the abdominal terga, are without a preapical mid dorsal bristle on mid tibia, and have an extensive series of anterodorsal bristles on the hind tibia. In *A. aequa* the anterodorsal bristles on the hind tibia are shorter than the preapical mid dorsal bristle.

Azelia cilipes Haliday

(Map 48)

Azelia cilipes Haliday, 1839, Ann. Mag. Nat. Hist., (1838) 2: 185.

Trichopticus maculiventris Malloch, 1918, Trans. Am. Entomol. Soc., 44: 276.

Fannia pretiosina Curran, 1930, Bull. Am. Mus. Nat. Hist., 61: 86.

Types: ♂ ♀, locality not stated, probably Holywood, Ireland (location unknown).

Geographic range.--Alaska, Alberta, Arizona, British Columbia, California, Colorado, Georgia, Idaho, Illinois, Massachusetts, Maine, Michigan, Montana, North Carolina, New Hampshire, New York, Ohio, Oregon, Pennsylvania, Quebec, Tennessee, Utah, Vermont, Washington.

California records.--ALAMEDA CO.: Berkeley, 2 ♀, IX-19-36 (C. A. Hamsher, UCD). DEL NORTE CO.: Rowdy Creek, Smith River, 1 ♂, VII-11-30 (J. M. Aldrich, USNM). MARIN CO.: 7 mi. W. of Fairfax, 1 ♀, VI-23-51 (W. C. Bentinck, CIS). Mill Valley, 1 ♂, X-8-54 (H. L. Mathis, UCD). Muir Woods, 1 ♂, VIII-30-08 (J. C. Bradley, CU). SAN MATEO CO.: Memorial Park, 1 ♀, VII-12-53 (P. H. Arnaud, CAS). SONOMA CO.: 4 mi. W. of Plantation, 1 ♂, IV-3-56 (D. J. Burdick, CIS).

The male of *A. cilipes* differs from that of *A. aequa* in having the anterodorsal bristles on the hind tibia fully as long as the preapical mid dorsal bristle. Larvae of *cilipes* are recorded as living in cow dung (Hammer, 1941: 184).

Subfamily PHAONIINAE

KEY TO GENERA AND SUBGENERA OF PHAONIINAE IN CALIFORNIA

1. Hind coxae with setulae on caudal surface . 2
   Hind coxae without setulae on caudal surface 3
2. Thorax and abdomen mainly fulvous, hind tibia in male with a strong apical spur on ventral surface . . . . . *Alloeostylus* Schnabl
   Thorax and abdomen blackish or grayish . *Lasiops* Meigen
3. Fore femur in the male with a distinct impression or concavity on the preapical region of the ventral surface . *Hydrotaea* Robineau-Desvoidy
   Fore femur in the male without a concavity or impression on the preapical region of the ventral surface; all females 4

4. Pteropleura with hairs . . . . . *Pseudophaonia* Malloch
   Pteropleura without hairs 5
5. Eyes nearly as high as the length of fore tibia, propleura densely villous, the female with the frontal triangle extended to anterior region of the interfrontalia . . . .*Ophyra* Robineau-Desvoidy
   Species not having the above combination of characters 6
6. Hind tibia with a single posterodorsal bristle (seldom 2) on the distal half (calcar), fig. 34, or set nearer the middle of tibia (exception *Hydrotaea armipes* (Fallén) ♀), and with or without one or more shorter, weak posterodorsals proximad (fig. 33) 7
   Hind tibia with a series of 3 or more posterodorsal bristles of normal intergraded length and distribution (fig. 32), the subgenal sclerite upwardly extended on the buccal region, restricting the bare cheek or genal sclerite (fig. 5) 14
7. Hind tibia with a robust apical posteroventral bristle, comparable to the apical anteroventral 8
   Hind tibia without a robust apical posteroventral bristle 9
8. Prealar bristle absent or setulose, eyes bare . . . . . *Dialyta* Rondani*
   Prealar bristle present, bristlelike, eyes with hairs . . . *Plexiopsis* Huckett
9. All males; females with the lower part of the head between the eye margin and ventral border broad as viewed in profile, eye not protruded to a level ventrad of the oral vibrissa, or if so the lower calyptral scale extended broadly beyond the margin of upper scale 10
   No males; females with the lower part of the head below the eye margin narrow and restricted, the eye extended ventrad to a level below that of the oral vibrissa as viewed in profile, exception *Hydrotaea lasiophthalma* Malloch ♀, lower calyptral scale usually extended narrowly beyond the margin of upper . . . . *Hydrotaea* Robineau-Desvoidy
10. Cheek with 1 or 2 strong upcurved buccal bristles, female with anterior pair of paraorbital bristles strong and proclinate . . *Dendrophaonia* Malloch
    Cheek without notably strong upcurved buccal bristles, female with anterior pair of paraorbital bristles not strong, or absent. 11
11. Anterior intraalar bristle situated on the same transverse plane as the supraalar bristle, or slightly cephalad thereof (fig. 11) 12
    Anterior intraalar bristle situated on a transverse level more or less caudad of the supraalar bristle (fig. 12) . . *Muscina* Robineau-Desvoidy
12. Vein $M._{1+2}$ conspicuously curved forward on the apical region . *Bigotomyia* Malloch
    Vein $M._{1+2}$ at most inconspicuously curved forward on the apical region . . 13
13. Arista with hairs not longer than the basal diameter of arista, tibiae sparsely and weakly bristled, hind femur of male featured by a series of closely set slender bristles on the distal third of anteroventral and/or posteroventral surfaces. (*L. alaskensis* ♂ unknown). . . . . *Lophosceles* Ringdahl
    Aristal hairs usually longer than the basal diameter of arista, and the tibiae seldom weakly bristled, hind femur of male not thus bristled . . . . *Phaonia* Robineau-Desvoidy
14. Prealar bristle long . . *Pogonomyia* Rondani
    Prealar bristle short or absent . . . . *Eupogonomyia* Malloch

Genus Hydrotaea Robineau-Desvoidy

Hydrotaea Robineau-Desvoidy, 1830, [Paris] Inst. de France, [Cl. des] Sci. Math. et Phys., Acad. Roy. des Sci., Mém. présentés par Savans [ser. 2], 2: 509.

Achaetina Malloch, 1918, Proc. Biol. Soc. Wash., 31: 67.

Type-species: *Musca meteorica* Linnaeus, designation of Curtis, 1839.

The genus *Hydrotaea* may be distinguished from other *Phaoniinae* in California by the presence in the males of a concavity on the preapical region of the ventral surface on fore femur. Adjoining the depression there are usually one or two pronglike processes or marginal callosities. The eyes in both sexes, except in *H. lasiophthalma*, extend ventrad to below a level with the vibrissa, thus restricting the cheeks thereat to very narrow dimensions. The female may further be separated from those of similar habitus that are at present known to occur in California by the following combination of characters: 4 pairs of postsutural dorsocentral bristles, prealar bristle short, abdomen with discal bristles on tergum 5, mid tibia without anteroventral bristle, hind tibia with usually a single posterodorsal bristle, none such in *H. armipes*.

KEYS TO SPECIES OF HYDROTAEA IN CALIFORNIA

Males

1. Hind femur spined on ventral surface . 2
   Hind femur spineless on ventral surface 7
2. Hind tibia with a stout spine near the middle of ventral surface, curved at

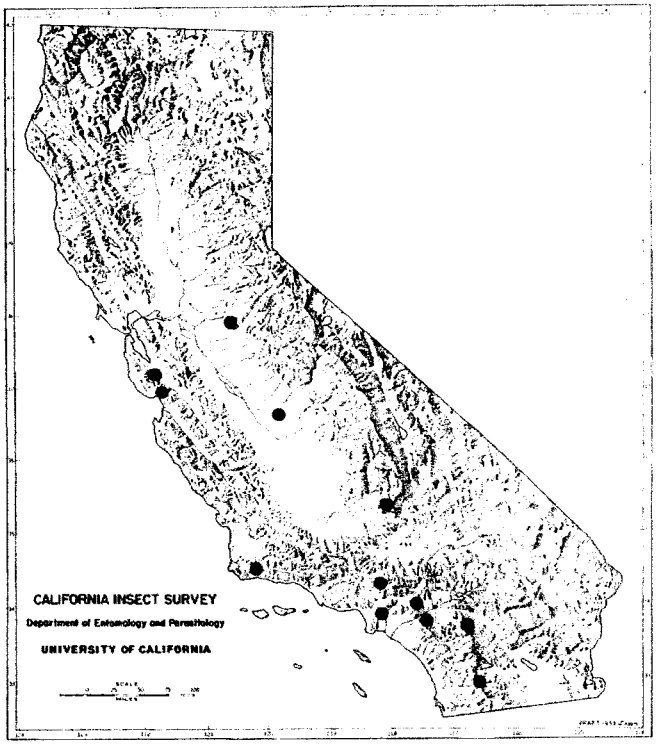
tip . . . . . *scambus* (Zetterstedt)
Hind tibia spineless on ventral surface . 3
3. Hind femur spined near the middle of ventral surface . . . . *armipes* (Fallén)
Hind femur spined on the prebasal region of ventral surface 4
4. Knobs of halteres yellow or brownish . *acuta* Stein
Knobs of halteres black 5
5. Mid tibia with a mid anterodorsal bristle, hind tibia with 2 or more posterodorsals and numerous posterior-posteroventral bristles, much longer than maximum diameter of tibia . . . . . *lasiophthalma* Malloch
Mid tibia without a mid anterodorsal bristle, hind tibia with 1 posterodorsal, and posteroventral bristles, if present, scarcely longer than maximum diameter of tibia 6
6. Eyes hairy, distal half of ventral surface of mid tibia with several bristles, hind tibia with a loose isolated cluster of setulae and 1 or 2 adjacent stiffish setae on the ventral surface, situated about two fifths length of tibia from its apex (fig. 31) . . . . *occulta* (Meigen)
Eyes mainly bare, distal half of ventral surface of mid tibia bristleless, hind tibia uniformly densely setulose on distal half of the ventral surface, terminating proximad in one or more stiffish setae . . . . . *basdeni* Collin
7. Vein $M._{1+2}$ more distinctly curved than vein $R._{4+5}$ near wing margin 8
Vein $M._{1+2}$ not more distinctly curved than vein $R._{4+5}$ near wing margin . . 9a
8. Hind tibia tufted at apex of ventral surface, hind femur without posteroventral bristles . . . . *cristata* Malloch
Hind tibia without a tuft at apex of the ventral surface, hind femur with fine posteroventral bristles 9
9. Narrower width of frons about equal to breadth of third antennal segment, mid coxa with erect stiffish bristles on caudal surface . . . *palaestrica* (Meigen)
Narrower width of frons slightly less than width of third antennal segment, mid coxa with nonstiffened bristles on caudal surface . . . . *houghi* Malloch
9a. Mid metatarsus with a shallow impression along greater part of anteroventral surface, and with a preapical series of erect posteroventral setulae; mid tibia with an extensive series of fine setulae on anterior surface, and of longer setae posteriorly . . . . . *tuberculata* Rondani
Mid metatarsus normal in structure and vestiture 10
10. Wing membrane with a patch of minute hairs on under surface near *m-cu* cross-vein, mid tarsal segment 4 with a posterior fringe of fine hairs . . *militaris* (Meigen)*
Wing membrane without a patch of fine hairs on under surface, mid tarsal segment 4 without fringe 11
11. Profrons and parafrontals polished, glossy 12
Profrons and parafrontals pruinescent . 13
12. Hind femur with a series of posteroventral bristles, hind tibia with several short fine anteroventrals . *pilipes* Stein
Hind femur without posteroventral bristles, hind tibia with a series of long slender anteroventral bristles . *depressa* Huckett
13. Fore femur with 2 sharp pronglike ventral processes (fig. 18a), hind tibia with 1 or 2 short anteroventrals and is bristleless on posterior or posteroventral surface . . *meteorica* (Linnaeus)
Fore femur with weak processes on posteroventral surface, hind tibia with extensive series of long bristles on anteroventral and ventrad on posterior surfaces . . . . . *pilitibia* Stein

Females

1. Mid tibia with a bristle near middle of ventral or posteroventral surface . 2
Mid tibia without a bristle near middle of ventral or posteroventral surface . 3
2. Mid tibia with the ventral bristle usually situated slightly distad of the middle of tibia, hind femur with posteroventral bristles, profrons polished, glossy . . . . . *militaris* (Meigen)*
Mid tibia with the ventral bristle usually situated slightly proximad of the middle of tibia, hind femur without posteroventral bristles, profrons thinly grayish pruinescent . . . . . *scambus* (Zetterstedt)
3. Profrons polished and glossy 4
Profrons pruinescent, thinly so in *scambus*, not polished 10
4. Eyes extensively haired, narrower part of parafacials as wide as three fourths breadth of third antennal segment . *lasiophthalma* Malloch
Eyes bare or very sparsely haired, narrower part of parafacials less than half width of third antennal segment . . 5
5. Hind femur with 1 or 2 posteroventral bristles as long as height of femur where situated, hind tibia usually with 2 posterodorsal bristles . . . . . *militaris* (Meigen)*
Hind femur without posteroventral bristles, or if present much shorter than height of femur where situated 6
6. Knobs of halteres yellow . . . . *acuta* Stein
Knobs of halteres black 7
7. Parafrontals polished, glossy 7a
Parafrontals dull, unpolished 9
7a. Presutural acrosticals strong, bristlelike, the two rows rather close together 8

Presutural acrosticals weak, or if bristly the two such rows wide apart . *tuberculata* Rondani

8. Tergum 5 glossy, undulled . . *pilipes* Stein
   Tergum 5 not glossy, dulled. *depressa* Huckett
9. Knees narrowly reddish tinged, eyes bare . . . . . *basdeni* Collin
   Knees concolorous with remainder of legs, blackish, eyes usually with a trace of minute hairs on ventral region . . . . *occulta* (Meigen)
10. Vein $M._{1+2}$ curved cephalad near wing margin, thus narrowing opening to cell $R._5$, presutural acrosticals strong, bristle-like, comparable to postsutural caudal pair 11
    Vein $M._{1+2}$ not curved cephalad on approaching wing margin so as to reduce the opening to cell $R._5$, presutural acrosticals finer and weaker than postsutural caudal pair 13
11. Sternopleura with a well developed bristle immediately below and slightly caudad of the polished area, ocellar triangle largely pollinose . . . . . *palaestrica* (Meigen)
    Sternopleura without a well developed bristle immediately below and slightly caudad of the polished area, ocellar triangle partly or largely glossy, shining where adjoining the anterior half of ocellar callosity 12
12. Marginal bristles on caudal surface of mid coxa weak, not longer than the posteroventral bristles of mid femur, the latter bristles extending in series to middle of femur . . . . *houghi* Malloch
    Inner, mesal bristles on caudal surface of mid coxa longer and coarser, stiffish, mid femur with a few weak bristles restricted to basal region of posteroventral surface . . . . . *cristata* Malloch
13. Mid tibia with an anterodorsal bristle . 14
    Mid tibia without anterodorsal bristle . 15
14. Eyes distinctly haired, narrower part of parafacials as wide as three fourths width of third antennal segment . . . *lasiophthalma* Malloch
    Eyes bare or nearly so, narrower part of parafacials less than half width of third antennal segment . . *pilitibia* Stein
15. Hind tibia without a median posterodorsal bristle . . . . . *armipes* (Fallén)
    Hind tibia with a median posterodorsal bristle 16
16. Hind tibia with a slender apical posteroventral bristle, hind femur with anteroventral bristles restricted to distal half. . . . *scambus* (Zetterstedt)
    Hind tibia without a slender apical posteroventral bristle, hind femur with at least a few fine short anteroventral bristles on proximal half . . 17
17. Abdomen of grayish cast, paler than legs, sternum 2 of abdomen dull, unpolished . *meteorica* (Linnaeus)



Map 49. California distribution of *Hydrotaea acuta* Stein.

Abdomen blackish, a darker cast than the brownish legs, sternum 2 glossy. . *pilitibia* Stein

Hydrotaea acuta Stein

(Map 49)

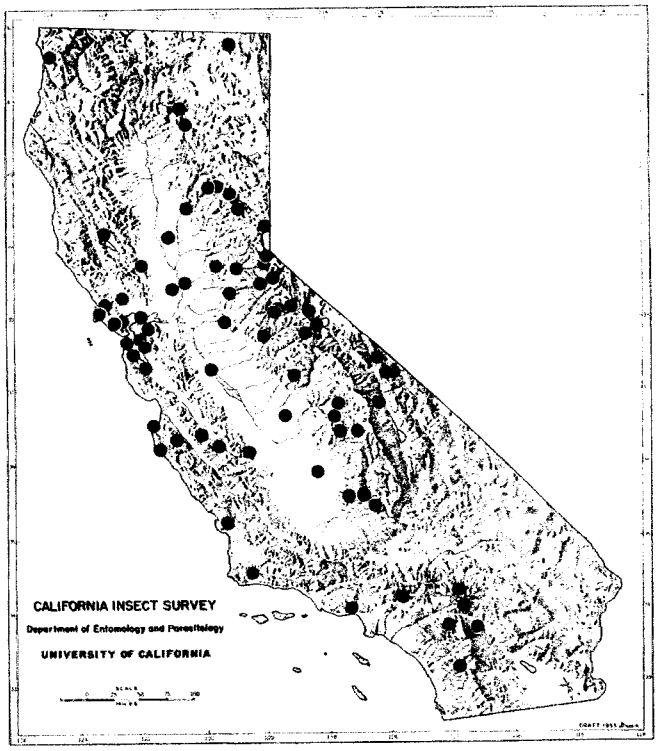
Hydrotaea acuta Stein, 1898, Berl. Entomol. Z., (1897) 42: 167.

Hydrotaea dissimilis Aldrich, 1926, Proc. U.S. Natl. Mus., 69: 5.

Syntypes: ♂♂ ♀♀, Tifton, Georgia (FMNH, ZMUB, MCZ).

Geographic range.--Arizona, California, Florida, Georgia, Nevada.

California records.--CALAVERAS CO.: Milton, 2 ♂, 1 ♀, X-21-17 (J. C. Bradley, CAS; HCH). FRESNO CO.: Fresno, 1 ♂, 1 ♀, VI-26-61, at egg bait (D. J. Wormeldorf, BVC). KERN CO.: 16 mi. S. of Weldon, 1 ♀, IV-26-64 (P. Rude, CIS). LOS ANGELES CO.: Big Dalton Dam, 1 ♀, VII-13-50 (W. C. Bentinck, CIS). Downey, 1 ♀, XII-31-63 (D. Rohe, BVC). RIVERSIDE CO.: Riverside, 1 ♀, III-30-33, 1 ♀, IV-12-33 (A. J. Basinger, CAS). San Jacinto Mountains, 3 ♀, VII-21-29 (R. H. Beamer, UK). SAN BERNARDINO CO.: Upland, 1 ♂, 1 ♀, V-25-, *ex* dead cat, types of *dissimilis* Aldrich, (J. F. Illingworth, USNM). SAN DIEGO CO.: Borrego Springs, 1 ♂, 1 ♀, IV-20-65, 2 ♂, VI-22-65, 1 ♀, X-4-65, 1 ♀, XII-7-65 (S. E. Haseltine, BVC). Cuyamaca Mountains, 1 ♂, VIII-16-14 (J. C. Bradley, CAS). Rincon, 1 ♂, XII-7-35, 1 ♀, XII-13-35 (A. J. Basinger, CAS). San Diego County,



Map 50. California distribution of *Hydrotaea armipes* (Fallén).

2 ♀, VII-7-29 (P. W. Oman, UK). SANTA BARBARA CO.: Gaviota Pass, 1 ♂, VI-16-63 (H. L. Griffin, CIS). SANTA CLARA CO.: 1 ♀, no date (Baker, USNM). SANTA CRUZ CO.: Santa Cruz Mountains, 1 ♀, IV-18-95 (CAS).

The species *H. acuta* is related to *H. occulta* and *H. basdeni*, from which it differs in having the knobs of halteres yellowish to yellowish brown. The male of *H. acuta* has the eyes hairless in distinction to *H. occulta*, and the mid tibia with several slender bristles on ventral surface as apart from the male of *H. basdeni*.

Hydrotaea armipes (Fallén)

(Map 50)

Musca armipes Fallén, 1825, Monographia Muscidum Sveciae, Muscides, p. 75.

Types: ♂ ♀, Southern Sweden.

Geographic range.--Widely distributed in the temperate region of continental North America, attaining its northern range in the provinces of British Columbia, Alberta, Manitoba, southern Quebec, and Labrador, southward in New England, the states bordering the Great Lakes, from New York to Minnesota, in New Jersey, Virginia, and North Carolina; in the west, from Nebraska and Kansas, and in the region of the Rocky Mountains from Idaho to New Mexico, from the southwest in Nevada and Arizona, and on the Pacific coast from Washington to southern California.

California records (map 50).--This species occurs throughout the State from sea level at the coast through Transition and Upper Sonoran Zone regions to the margins of the deserts. Probably the adults are active throughout most of the year in various warmer parts of the state, as they have been collected from January to September in cismontane southern California, in January in the Owens Valley, and from February to October in the San Francisco Bay area and the Sacramento Valley, and as late as October in the San Joaquin. However, records are too scattered to give a complete picture. In the mountains *Hydrotaea armipes* has been collected from April in the foothills through the summer at moderate elevations, ranging up to 8,500 feet in the central Sierra Nevada and above 10,000 feet in the White Mountains.

The species *A. armipes* is recorded from 40 counties and 93 localities, based on an examination of 147 specimens, of which 39 were males and 108 females.

Adults, along with those of *Fannia benjamini*, have been found to associate with tabanids for the purpose of feeding on the blood of horses from preexisting wounds (Garcia and Radovsky, 1962: 1115). Larvae of *H. armipes* are coprophagous and seemingly zoophagous (Portschinsky, 1910: 76-77; Keilin, 1917: 404). They have been bred from manure and feces of domestic animals, chiefly of cattle and horses (Howard, 1901: 44; Séguy, 1923: 287; Thomsen and Hammer, 1936: 572-574, 581; Coffey, 1966: 216).

The adults may readily be distinguished from similar taxa in the genus by the absence of a median posterodorsal bristle on the hind tibia. The male has a ventral spine near the middle of hind femur, and a loose tuft of slender setae on the proximal half of the ventral surface of hind tibia.

Hydrotaea basdeni Collin

Hydrotaea basdeni Collin, 1939, Entomol Mon. Mag., 75: 135-136.

Type: ♂, Bix, Oxfordshire (Coll. E. B. BAsden).

Geographic range.--California, Iowa, Maryland, Michigan, New Brunswick, New York, Ohio, Ontario, Quebec.

California record.--LAKE CO.: Clear Lake, Highlands, 1 ♂, VIII-22-58, at light trap (R. E. Dolphin, UCD).

The species *H. basdeni* may be linked to *H. occulta* from which the males differ in having the eyes nearly hairless, and the mid and hind tibiae without the pronounced bristling present in the males of

occulta. The females of the two species are not readily separated from each other; in *H. basdeni* the knees are narrowly reddish tinged.

Larvae are probably scavengers in nests of birds, having been bred from the nest of an owl in Oxfordshire, England (Collin 1939: 136), of a starling in Maryland (Huckett, 1954: 330), and found in the nest of a falcon, *Falco tinnunculus* L., in Berlin (Hennig, 1962: 712).

Hydrotaea cristata Malloch

Hydrotaea cristata Malloch, 1918, Bull. Brooklyn Entomol. Soc., 13: 93.

Holotype: ♂, New Bedford, Massachusetts (Ill-NHS).

Geographic range.--Alaska, Alberta, British Columbia, California, Colorado, Kansas, Labrador, Manitoba, Massachusetts, Maine, Montana, New Mexico, Nova Scotia, Northwest Territory, New York, Nebraska, Newfoundland, Ontario, Oregon, Quebec, Utah, Wyoming, Yukon Territory.

California records.--ELDORADO CO.: Echo, 1 ♀ VIII-10-40 (E. E. Kenaga, UK). MODOC CO.: Lily Lake, 7 mi. E. Pine Creek, 1 ♂, IX-24-63 (J. E. Brooks, A. M. Barnes, BVC).

The species *H. cristata* is allied to *H. houghi* and *H. dentipes* (Fabr.)*, from both of which the male differs in having no posteroventral bristles on the hind femur. In both sexes of *cristata* the caudal bristles on mid coxa are stiffish and coarsened mesad.

Hydrotaea depressa Huckett

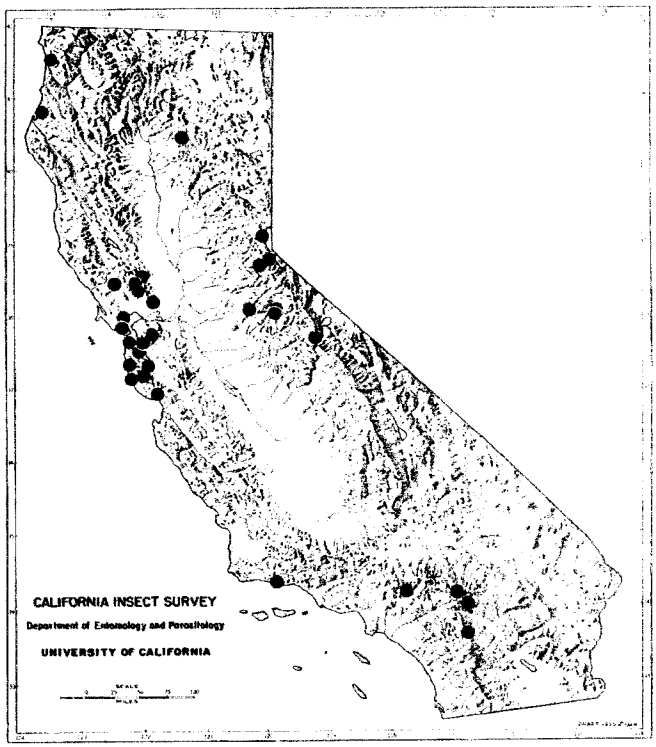
Hydrotaea depressa Huckett, 1954, Ann. Entomol. Soc. Am., 47: 327.

Holotype: ♂, Pinecrest, Tuolumne County, California (CAS).

Geographic range.--Alberta, California, Idaho.

California record.--TUOLUMNE CO.: Pinecrest, 1 ♂, VIII-11-48, holotype (P. H. Arnaud, CAS).

The species *H. depressa* may be associated with *H. pilipes* Stein, both having the parafrontals and profrons largely polished. In the male of *H. depressa* the hind femur is without posteroventral bristles, and the hind tibia has a series of longer anteroventral bristles. In the female of *depressa* the fifth tergum is dull, not glossy as in *pilipes*.



Map 51. California distribution of *Hydrotaea houghi* Malloch.

Hydrotaea houghi Malloch

(Map 51)

Hydrotaea houghi Malloch, 1916, Bull. Brooklyn Entomol. Soc., 11: 110.

Hydrotaea dentipes caerulescens Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 41.

Lectotype: ♂, Homer, Illinois (IllNHS).

Geographic range.--Widely distributed in continental North America, reaching northward to southern Alaska and eastward from British Columbia to Newfoundland, the Maritime provinces, and New England states, southward across the continent to include the states bordering the Great Lakes, the northern tiers and those central; in the east the Atlantic states to as far south as Florida; in the south the Gulf and adjoining states, and in the southwest New Mexico, Arizona, and southern California. The species also occurs in Hawaii.

California records (map 51).--The distribution in California is restricted to a fairly narrow circum-valley range associated with Transition and Canadian Zone habitats. The species occurs up to about 6,500 feet in the Sierra Nevada and 7,000 feet in the San Bernardino Mountains. Adults are active commonly from February to September in the San Francisco Bay area, and there is one record in November (Redwood City). In the mountains collections have been made from May till July and Septem-

ber in southern California. Altogether the species has been recorded from about 40 localities in 20 counties.

H. houghi belongs to the *H. dentipes*-group, and is related to *H. cristata*, from which the male differs in having a series of posteroventral bristles on the hind femur, and is without a crest or tuft at the apex of the ventral surface of the hind tibia. The female of *H. houghi* has a more extended series of posteroventral bristles on the proximal half of mid femur than in *H. cristata*, and lacks the inner stiffish caudal setae on the mid coxa that are present in both sexes of *H. cristata*.

Hydrotaea lasiophthalma Malloch

Hydrotaea lasiophthalma Malloch, 1919, Proc. Calif. Acad. Sci. ser., 4 9: 297.

Holotype: ♂, Fallen Leaf Lake, near Lake Tahoe, California (CAS).

Geographic range.--Alberta, California, Colorado.

California record.--ELDORADO CO.: Fallen Leaf Lake, near Lake Tahoe, 1 ♂, VII-15-15, type (E. C. Van Dyke, CAS).

H. lasiophthalma has eyes distinctly haired and parafacials evenly broad throughout. The male has a ventral spine on the proximal third of hind femur, and numerous long slender bristles on the anterior aspect and distal half of the posterior surface of the hind tibia, including 2 or 3 posterodorsal bristles.

Hydrotaea meteorica (Linnaeus)

(Fig. 18a)

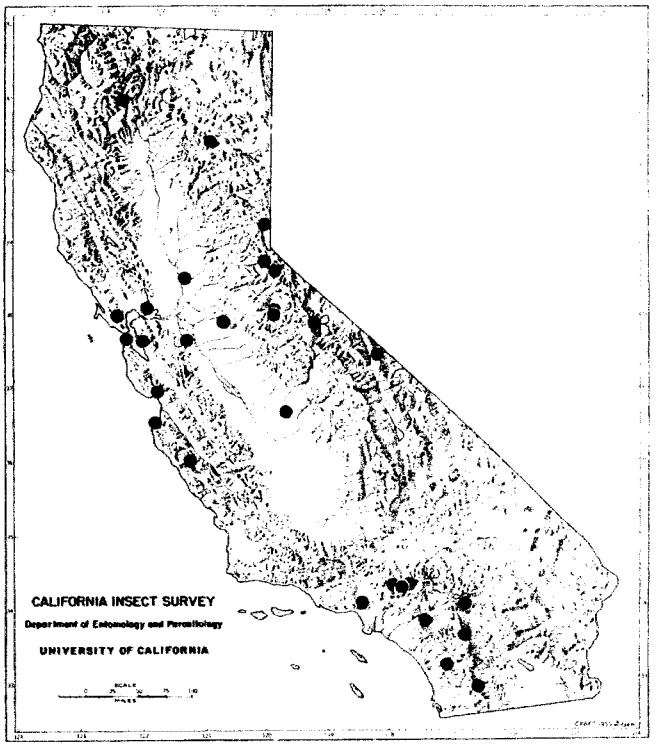
Musca meteorica Linnaeus, 1758, Systema naturae per regna tria naturae. Ed. 10 I: 597.

Type: unknown.

Geographic range.--Widely distributed in the western provinces and states of North America, occurring from British Columbia to Saskatchewan, in the region of the Rocky Mountains from Montana and Idaho to Utah, Colorado, Kansas and New Mexico, and on the Pacific coast from Washington to California, and in Arizona; in the east, occurring in the region of the Great Lakes from Michigan to Minnesota, and in the northeastern states from New York to Maine.

California records.--MARIPOSA CO.: Yosemite, 1 ♀, V-14-16 (H. G. Dyar, USNM). MONO CO.: Mill Creek, 1 ♀, IX-6-58 (E. I. Schlinger, UCD).

The male of *H. meteorica* may be distinguished from those of related species by the presence of two sharp prongs on the ventral surface of fore femur (fig. 18a). The female has the abdomen gray, as in *armipes*, from which it may be separated by the presence of a posterodorsal bristle on hind tibia.



Map 52. California distribution of *Hydrotaea occulta* (Meigen).

H. meteorica is recorded commonly as breeding in decomposing vegetation and the droppings of cows and other herbivores; adults, under favorable atmospheric conditions, are a nuisance to man and beast by their persistent attention (Linnaeus, 1758: 597; Schiner, 1862: 616; Taschenberg, 1880: 118; Knab, 1916: 2-3; Keilin, 1917: 405; Séguy, 1923: 291).

Hydrotaea occulta (Meigen)

(Fig. 31; map 52)

Anthomyia occulta Meigen, 1826, Syst. Beschr., 5: 133.

Anthomyia idyla Walker, 1849, List Dipt. Br. Mus., 4: 948.

Eriphia lata Walker, 1849, List Dipt. Br. Mus., 4: 963.

Type: ♂, locality not stated (MNH Paris).

Geographic range.--Widely distributed in continental North America, reaching as far north as central Alaska, Yukon and Northwest Territories, northern Quebec; from British Columbia eastward to Labrador and New England states, southward to states bordering the Great Lakes Region, Maryland, and Georgia; in the west the Rocky Mountain states from Montana south to New Mexico, and on the Pacific coast from Washington to California.

California records (map 52).--The scattered records indicate that *Hydrotaea occulta* has a broad distribution in California similar to that of *H. armipes* (Map 50), from the coast through Upper Sonoran inland valleys to moderate elevations in the Sierra Nevada. The flies are active from February to October in the San Francisco Bay area and Sacramento Valley and have been recorded from April to October in southern California. Sierran and northern collections are from the summer months. This species has been recorded from about 35 localities in 20 counties in material examined for the present survey.

H. occulta is related to *H. basdeni* and *H. acuta*, the male differing from those of the latter two in having the eyes distinctly haired and the hind tibia with a loose clump of slender bristles on the ventral surface, set about two-fifths length of tibia from its apex (fig. 31). The female of *H. occulta* differs from that of *H. acuta* in having the knobs of halteres black, not yellowish, and from that of *H. basdeni* in having the knees of tibiae nonreddish. Larvae of *H. occulta* are recorded by Hennig (1962: 713, 734) as having been reared in a variety of media, including compost and fungi belonging to *Boletus* and *Armillaria*.

Hydrotaea palaestrica (Meigen)

Anthomyia palaestrica Meigen, 1826, Syst. Beschr., 5: 135.

Type: ♂, locality not stated.

Geographic range.--Alberta, Arizona, British Columbia, California, Colorado, Manitoba, Montana, New Mexico, Nova Scotia, Oregon, Utah, Washington, Wyoming.

California records.--ALAMEDA CO.: Berkeley, 1 ♂, III-28-20 (A. J. Basinger, CAS). MONTEREY CO.: Asilomar, 1 ♂, IX-1-45 (A. L. Melander, USNM). Pfeiffer Big Sur State Park, 1 ♀, VI-19-49 (P. H. Arnaud, HCH). SAN MATEO CO.: San Bruno Mountains, 1 ♂, III-14-62 (J. Powell, CIS). SANTA CRUZ CO.: Mt. Hermon, 1 ♀, III-13-43 (K. Frick, CIS).

H. palaestrica belongs to the *H. dentipes*-group. The male has the frons wider caudad than in related males, the mid tibia with longer anterodorsal bristles, and the mid coxa with upright lengthy stiffish bristles on the caudal surface, as is notable in the male of *H. cristata*. The hind tibia has no crest or tuft at apex of the ventral surface. The female of *H. palaestrica* has the frontal triangle largely pollinose and the abdomen dull gray pruinescent. The sternopleuron possesses a well developed bristle immediately below and slightly caudad of its polished area.

Hydrotaea pilipes Stein

Hydrotaea pilipes Stein, 1903, K.-k. Zool.-Bot. Gesell. Wien, Verhandl. 53: 312.

Hydrotaea orbitalis Aldrich, 1918, Can. Entomol., 50: 311.

Type: ♂, Akkas, Finland (Zool. Mus. Helsinki ?) *cit.* Hennig, 1962.

Geographic range.--Alaska, Alberta, California, Idaho, Michigan, New Hampshire, South Dakota, also Kamchatka Peninsula.

California record.--SAN BERNARDINO CO.: South Fork, Santa Ana River, San Bernardino Mountains, 1 ♀, VIII-2-42 (A. L. Melander, USNM).

H. pilipes has the parafrontals, profrons, pleural sclerites, and in the female, the frontal triangle and fifth abdominal tergum, all extensively polished. The male is without a ventral spine on hind femur, and has a series of fine antero- and posteroventral bristles on hind tibia; the female has an anterodorsal bristle on mid tibia, and in both sexes the knobs of halteres are black.

Hydrotaea pilitibia Stein

Hydrotaea pilitibia Stein, 1916, Arch. Naturgesch., (1915) Abt. A 81 (10): 73.

Hydrotaea abdominalis Aldrich, 1926, Proc. U.S. Natl. Mus., 69: 6.

Syntypes: ♂ ♀♀, Jämtland, Sweden (ZMUB).

Geographic range.--Alaska, Alberta, British Columbia, California, Colorado, Idaho, Michigan, North Carolina, Northwest Territories, Oregon, Quebec, Tennessee, Washington, Wyoming, Yukon Territory.

California records.--EL DORADO CO.: Pollock Pines, 1 ♀, IX-9-52 (P. H. Arnaud, CAS). MARIPOSA CO.: Yosemite, 1 ♀, V-16-16 (H. G. Dyar, USNM). SANTA CLARA CO.: Palo Alto, 1 ♂, X-9-94 (HCH). SISKIYOU CO.: Castle Lake, 1 ♀, VIII-29-58 (J. Powell, CIS). TULARE CO.: Giant Forest, Sequoia National Park, 1 ♀, VII-28-29 (R. H. Beamer, UK). TUOLUMNE CO.: 7 mi. NE of Dardanelles, 1 ♀, VI-7-60 (W. A. Steffan, CIS).

The male of *H. pilitibia*, as in *H. armipes* and *H. militaris**, has strong blunt bristles on the proximal half of the ventral surface of mid femur and near the base of the same surface on fore femur; the hind femur is without a ventral spine, and the wings without a patch of minute hairs on the under surface as is present in the male of *H. militaris*. The hind femur and hind tibia in the male of *H. pilitibia* have an extensive series of long anteroventral bristles and a shorter series of finer posteroventrals. The female has the profrons dull, pruinescent, the hind femur with a few weak anteroventral bristles proximad, and in both sexes the second abdominal sternum glossy.

Hydrotaea scambus (Zetterstedt)

(Map 53)

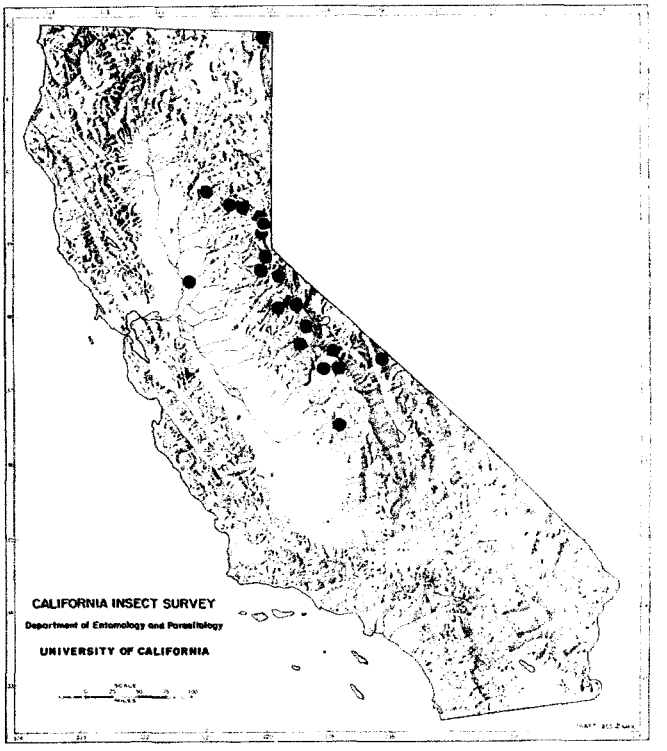
Anthomyza scambus Zetterstedt, 1838, Ins. Lapp., p. 668.

Type: ♂, Lycksele Lappmark, Sweden (Zool. Inst. Lund).

Geographic range.--Widely distributed in the north temperate region of continental North America, reaching its northern limits in Central Alaska, Yukon Territory, and the upper Mackenzie River Basin, eastward in central Manitoba, Ontario, Quebec, and Newfoundland, and along the southern border of the provinces and in the northern tier of states from British Columbia and Alberta to New Brunswick and Maine; in the west along the Rocky Mountain range from Idaho and Montana to Colorado, Utah, and New Mexico, and on the Pacific coast from Washington to California, in the southwest from Nevada and Arizona.

California records (map 53).--This boreal species ranges into California in the Warner, Sierra Nevada, and White Mountains, occurring from moderate elevations (Yosemite Valley) to timberline at 10,000 feet (Sonora Pass, Pioneer Basin, Tioga Pass). A single specimen record labelled "Sacramento Co." in August, 1929, is in need of confirmation. This survey is based on 56 specimens, of which only 3 are males, representing about 33 localities in 14 counties, all collected in June, July, or August.

The male of *H. scambus* may be recognized readily by the bowed or curved appearance of the hind femora and hind tibiae, by the long ventral spine near the middle of hind tibia, that is curved at apex. In both sexes there is usually a posteroventral or ventral bristle near the middle of mid tibia. In the female the profrons is thinly pruinescent, the hind femur without posteroventral bristles, and the anteroventrals restricted to the distal half of femur, the hind tibia with a slender apical posteroventral bristle.



Map 53. California distribution of *Hydrotaea scambus* (Zetterstedt).

Hydrotaea tuberculata Rondani

Hydrotaea tuberculata Rondani, 1866, Atti, Soc. Ital. Sci. Nat., 9: 79.

Hydrotaea metatarsata Stein, 1898, Berl. Entomol. Z., (1897) 42: 166.

Type: ♂, Piedmont Department, Italy (Mus. Florence).

Geographic range.--Widely distributed in the north temperate zone of North America, occurring in the east from Quebec, New Brunswick and northeastern states southward as far as Maryland and West Virginia; in the region of the Great Lakes and westerly to South Dakota and Manitoba; in the west from British Columbia and Alberta to Idaho and California, also in New Mexico.

California record.--YUBA CO.: Browns Valley, S. F.R.S.. 1 ♂, 5 ♀, April, 1972, reared from cow dung (R. W. Merritt, CIS).

The male of *H. tuberculata* may be readily recognized by the shallow depression along the anteroventral surface of the mid metatarsus, and by a preapical series of erect setulae on posteroventral surface. The mid tibia has a series of fine setulae and long slender setae, respectively on the anterior and posterior surface. The female has the profrons, parafrontals, and ocellar triangle shiny, and

may be distinguished from similar females by the weaker presutural acrosticals.

Adults of *H. tuberculata* in conjunction with the chloropid *Hippeletes pallipes* (Loew) have been recorded in New York as feeding on the blood of cows, issuing from the feeding punctures made by several species of *Tabanus* and *Chrysops*, and were considered a nuisance to cows when they swarmed around the head. (Tashiro and Schwardt, 1953). The species, under the name *H. metatarsata*, has been captured on human feces (Howard, 1900).

The larvae of *H. tuberculata* are coprophagous, and are cited as zoophagous, having been reared from the droppings of cows (Hammer, 1941: 255; Laurence, 1953).

Genus Ophyra Robineau-Desvoidy

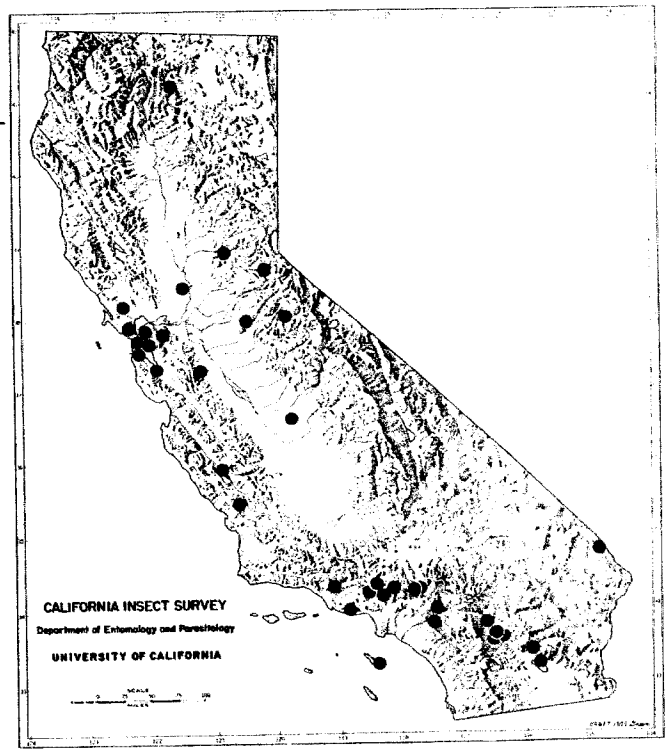
Ophyra Robineau-Desvoidy, 1830, [Paris] Inst. de France [Cl. des] Sci. Math. et Phys., Acad. Roy. des Sci., Mém. présentés par divers Savans [ser. 2], 2: 516.

Type-species *Ophyra nitida* Robineau-Desvoidy, designation Rondani 1866, = *Anthomyia leucostoma* Wiedemann 1817.

Black, shiny compact species, related to *Hydrotaea*, from which the males of *Ophyra* differ in having no concavity on the ventral surface of fore femur, the eyes nearly as high as the length of fore tibia, the propleura villous, and the frontal triangle of the female extended cephalad to the anterior half of the interfrontalia. The larvae are recorded as breeding in decomposing vegetable and animal matter, animal excrement and nests of birds.

KEY TO SPECIES OF OPHYRA IN CALIFORNIA

1. Palip yellow or rufous 2
   Palpi black, hind tibiae conspicuously curved in male . . *leucostoma* (Wiedemann)
2. Parafrontals and profrons lightly pollinose, concolorous with the parafacials, hind tibia in male with an extensive series of long slender anteroventral and posteroventral bristles. . *obscurifrons* Sabrosky
   Parafrontals and profrons black and glossy, not concolorous with the parafacials, hind tibia of male with 2 or 3 short anteroventral bristles and without posteroventrals . . *aenescens* (Wiedemann)



Map 54. California distribution of *Ophyra aenescens* (Weidemann).

Ophyra aenescens (Wiedemann)

(Map 54)

Anthomyia aenescens Wiedemann, 1830, Aussereuropäische Zweiflügelige Insekten, 2: 435.

Type: ♂, New Orleans, Louisiana.

Geographic range.--Alabama, Arizona, California, Florida, Georgia, Illinois, Louisiana, North Carolina, New Jersey, New York, Ohio, Oregon, Pennsylvania, also Baja California, Bermuda, Caribbean and Pacific Islands, South America.

California records (map 54).--*Ophyra aenescens* displays an austral distribution in California, ranging from Transition Zone situations along the central coast and at moderate elevations (to about 5,000 feet) in the central Sierra Nevada, to Upper and Lower Sonoran Zone stations in the Central Valley, Coachella, and Imperial Valleys and on the Colorado River at Needles. The flies are active throughout the year at inland places in southern California and have been collected in every month except December and January in the San Francisco Bay area. Records from the mountains range from May to September. This survey is based on specimens from about 40 localities in 22 counties.

The species *O. aenescens* has palpi fulvous, and differs from *O. obscurifrons* in having parafrontals and profrons glossy and polished; in the male by

having 2 or 3 short anteroventral bristles on the hind tibia.

Oliviera (1941: 346-347), observing the habits of adults on the seashore at Mangaratiba, southern Brazil, concluded that the larvae bred on decaying animal debris washed up on the beach by the sea, and he has drawn attention to the fact that adults were frequently found in slaughterhouses devoted to the processing of animal products. Sabrosky (1949: 428) has recorded adults of *O. aenescens* from Hawaii that were reared from larvae in rotten meat. Johnson and Venard (1957: 21-26), commenting on the biology of the species in Ohio, reported its presence in all stages throughout the year, and that experimentally none were capable of withstanding freezing temperatures. It was claimed that survival of adults during the winter months may possibly be associated with their habit of remaining on and secluding themselves in fermenting garbage.

Ophyra leucostoma (Wiedemann)

(Map 55)

Anthomyia leucostoma Wiedemann, 1817, Zool. Mag., 1: 82.

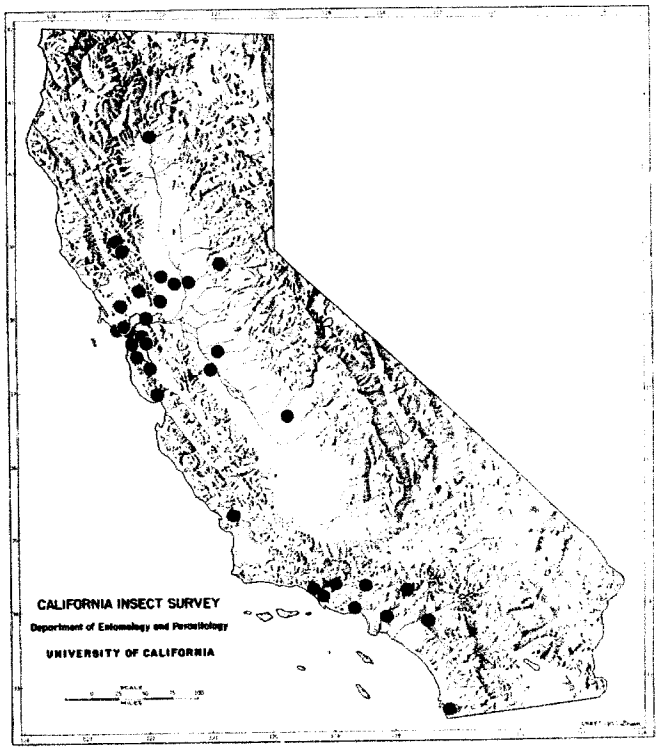
Anthomyia opalia Walker, 1849, List Dipt. Br. Mus., 4: 956.

Types: ♂ ♀, Holstein, Germany.

Geographic range.--Widely distributed in continental North America, northerly reaching the southern areas of the provinces from British Columbia to Newfoundland, thence southward across the continent; in the east the Maritime Provinces and New England states, and those bordering the Great Lakes and Atlantic Ocean to as far south as Florida, Alabama, Oklahoma, and Texas; in the west the central and Rocky Mountain states to as far as Kansas, Colorado, and Utah, and in the southwest Arizona and California.

California records (map 55).--This species occupies a coastal and valley distribution, occurring in austral situations in the Central Valley but evidently not into the deserts. The flight period is prolonged, but does not extend through the winter as in many other muscids. Adults have been recorded from March to September in the San Francisco Bay area, April to October in the Central Valley, and March to December in southern California. Records represent about 45 localities in 22 counties.

O. leucostoma has black palpi, and in the male the hind tibiae bowed, and the calyptrae browned. Larvae have been recorded as present in human corpses on disinterment (Motter, 1898: 223), in the body of a dead rat (Séguy, 1923: 279), in the cesspools and excreta of human habitation (Lesne, 1923: 162), in the droppings of cattle (Howard, 1901: 44), in pig dung (Thomsen and Hammer, 1936: 581), and in the excrement of mink and chickens (Coffey, 1966: 216), and in nests of swallows and the house sparrow (Séguy, 1937: 307). The larvae are regarded as carnivorous, feeding on the insect inhabitants of the media.



Map 55. California distribution of *Ophyra leucostoma* (Weidemann).

Ophyra obscurifrons Sabrosky

Ophyra obscurifrons Sabrosky, 1949, Proc. Hawaii. Entomol. Soc., (1948) 13: 430.

Holotype: ♂, Tsinan, Shantung, China (USNM).

Geographic range.--California, China, Okinawa.

California records.--FRESNO CO.: Fresno, 1 ♂, X-9-22 (M. E. Phillips, USNM). RIVERSIDE CO.: Riverside, 1 ♂, IV-26-55 (L. L. Lewallen, UCR).

The above specimens of *O. obscurifrons* have the palpi paler than in the holotype, being fulvous or yellow, otherwise possessing the common distinguishing characters mentioned in the key.

Genus Pogonomyia Rondani

Pogonomyia Rondani, 1871, Boll. Soc. Entomol. Ital., (1870) 2: 336.

Type-species: *Pogonomyia alpicola* Rondani, monobasic.

Species belonging to the genus *Pogonomyia* occur mainly at the higher altitudes in mountainous terrain. Larvae are recorded as inhabiting locations rich in humus. Adults are of medium size, 4 to 7 mm. in length, wholly black and often shiny; the knobs of halteres are black and the lower scale of the calyptrae slightly extended beyond the margin of the upper. The hind tibiae have 3 or more posterodorsal bristles of gradual intergraded length and even distribution (fig. 32); the cheeks are greatly restricted by the upward extension of the subgenal sclerite, the latter being raised slightly or puffy and is profusely bristled; the parafacials are broad, the frons relatively long and the face and antennae short, the oral margin is curved forward, and the arista is minutely haired (figs. 4, 5). The prealar bristle is long. In the male the eyes are closely approximated at the narrower part of the frons; the parafrontal bristles are well maintained in length caudad, and extend in series to a level with the frontal triangle; the abdomen is conical, the hypopygium small; the hind tibia has a slight callus or excrescence, or a chitinous projection at the apex of the ventral surface. In the female the anterior pair of paraorbital bristles are proclinate.

KEYS TO SPECIES OF POGONOMYIA IN CALIFORNIA

Males

1. Mid femur with an extensive series of slender apically directed anteroventral bristles, from prebasal to preapical fourth . 2
   Mid femur without such an extensive series of anteroventral bristles 3
2. Mid femur with long posteroventral bristles restricted to distal half, by contrast weakly setulose on proximal half, abdomen partly pruinescent on dorsum. . *minor* Malloch
   Mid femur with long posteroventral bristles extended in series to prebasal region, abdomen entirely black, without pruinescence . . . . . *profrontalis* Huckett
3. Mid femur with long anteroventral bristles on distal half, the longer fully as long as the arista, abdomen partly pruinescent . . . . . *santamonicae* Huckett
   Mid femur with weak or slender anteroventral bristles on distal half, usually not as long as the arista, abdomen devoid of pruinescence 4
4. Wings extensively infuscated and blackish basad . . . . . *amnicola* Huckett
   Wings pale, mainly grayish tinged and slightly infuscated basad . *rivalis* Huckett

Females

1. Profrons partly or mostly shiny 2
   Profrons dull, entirely pruinescent, mid femur with a well developed anteroventral bristle on distal half . . . . . *rivalis* Huckett
2. Longer aristal hairs slightly longer than the basal diameter of the third aristal segment, (fig. 4a), mid femur usually with weak or slender anteroventral bristles on distal half . . . . *amnicola* Huckett
   Longer aristal hairs about equal in length to the basal diameter of the third aristal segment, fig. 4b, mid femur with a well developed anteroventral bristle on distal half 3
3. Profrons dulled along the margin of the eye, the pruinescence uninterrupted thereby . . . . . *minor* Malloch
   Profrons notably bare and polished, tenuously so to eye margin and interrupting the pruinescence thereby 4
4. Mesonotum viewed from in front with trace of brownish pollen and a median dark stripe . . . . . *santamonicae* Huckett
   Mesonotum jet black and shiny, without median stripe . . . . *profrontalis* Huckett

Pogonomyia amnicola Huckett

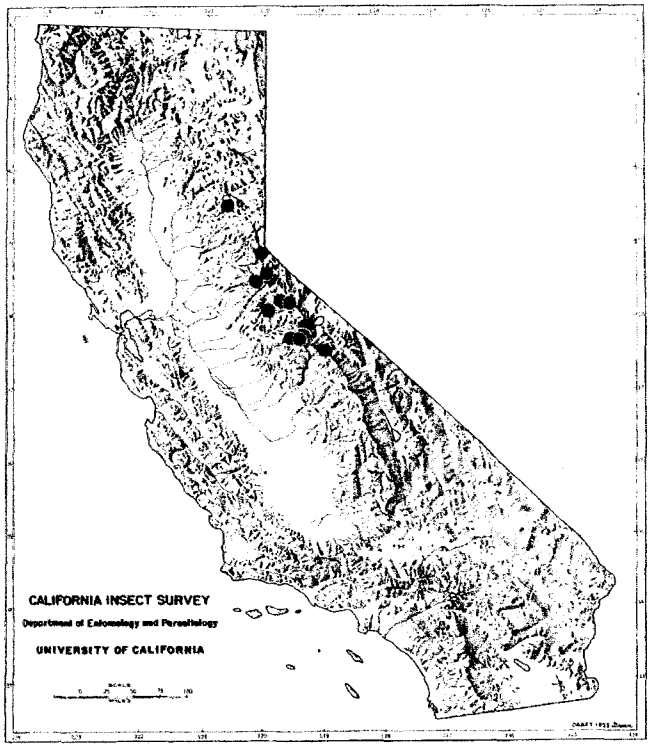
(Figs. 4a, 5, 43, 57; map 56)

Pogonomyia amnicola Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4, 34: 291.

Holotype: ♂, Sardine Creek, Mono County, California (UCB).

Geographic range.--California.

California records.--ALPINE CO.: Hope Valley, 1 ♂, 1 ♀, VIII-1-35 (H. H. Keifer, CDA); 2 ♀, VII-9-48 (D. Carter, S. A. Sher, CIS). Winnemucca Lake, 1 ♀, VI-30-59, 1 ♂, VII-30-59 (R. M. Bohart, UCD). Woods Lake, 1 ♀, VII-16-60 (C. G. Moore, UCD). AMADOR CO.: 4 mi. N. of Silver Lake, 1 ♂, 6 ♀, VII-25-55 (J. C. Downey, UCD). EL DORADO CO.: Angora Park, Tahoe, 1 ♂, VII-26-15 (E. P. Van Duzee, CAS). Echo Lake, 2 ♂, VII-23-55 (E. I. Schlinger, J. C. Downey, UCD). Grass Lake, Luther Pass, 1 ♀, VII-24-55 (J. C. Downey, UCD). Luther Pass, 2 ♂, 5 ♀, VII-6-59 (P. H. Arnaud, CAS). MARIPOSA-TUOLUMNE CO.: Glacier Point Road, Yosemite National Park, 7 ♂, 1 ♀, VII-1-47 (A. L. Melander, USNM). MONO CO.: 2 mi. W. of Leavitt Meadow, 1 ♀, VI-16-61 (C. A. Toschi, CIS). Mammoth Lake, 1 ♂, VII-



Map 56. California distribution of *Pogonomyia amnicola* Huckett.

12-33 (CAS). 1 mi. S. of Saddlebag Lake. 2 ♂, 3 ♀, VII-15-61 (D. R. Miller, UCD; G. I. Stage, CIS). Sardine Creek, 8,600 ft. 44 ♂, 17 ♀, VI-28-51, type series (C. A. Downing, J. W. McSwain, CIS; S. M. Kappos, D. P. Lawfer, A. T. McClay, R. W. Morgan, UCD); 1 ♂, 3 ♀, VII-6-51, 1 ♂, 1 ♀, VII-11-51, 1 ♂, 4 ♀, VII-12-51, 1 ♂, VII-18-51 (A. T. McClay, UCD). SIERRA CO.: 5 mi. E. of Webber Lake, 2 ♀, VII-29-30-55 (R. W. Bushing, E. A. Kurtz, UCD). TUOLUMNE CO.: Conness Glacier, Yosemite National Park, 1 ♀, VII-30-36 (E. C. Hendie, CIS). Porcupine Flat, Yosemite National Park, 2 ♂, VIII-2-62 (R. and K. Dietrich, HCH). Sonora Pass, 9,624 ft. 1 ♂, VII-17-53 (R. M. Bohart, UCD). vicinity of Sonora Peak, 1 ♂, VI-23-60 (D. C. Rentz, CAS). Strawberry, 1 ♂, VII-15-51 (A. T. McClay, UCD). Tuolumne Meadow, Yosemite National Park, 1 ♀, VII-22-36 (E. C. Hendie, CIS).

Males of *P. amnicola* closely resemble those of *P. rivalis*, differing more notably in that the wings of *P. amnicola* are more densely infuscated, being blackish basad. Males of both species differ from that of *P. similis* Malloch*, by having the abdomen uniformly black and shiny, without a dorsocentral stripe, and the mid femur with a series of longish posteroventral bristles on the middle half. The female of *P. amnicola* differs from that of *P. rivalis* by having the profrons partly polished and the mid femur usually with weak or slender anteroventral bristles on distal half.

Pogonomyia minor Malloch

Pogonomyia minor Malloch, 1918, Trans. Am. Entomol. Soc., 44: 280.

Holotype: ♂, Beulah, New Mexico (ANSP).

Geographic range.--Alberta, British Columbia, California, Colorado, New Mexico, Oregon, Saskatchewan, Wyoming.

California records.--ALPINE CO.: Hope Valley, 3 ♂, VI-29-57 (J. Powell, CIS). NEVADA CO.: Truckee, 1 ♂, VI-26-43 (P. H. Arnaud, CAS). SIERRA CO.: Webber Lake, 6,780 ft. 4 ♂, 4 ♀, VII-2-59 (J. M. Linsley, CIS); 1 ♂, VII-3-64 (M. E. Irwin, UCR); 2 ♂, VII-3-65 (P. H. Arnaud, CAS).

Males of *P. minor* Malloch and *P. profrontalis* have a series of long anteroventral bristles on the mid femur, extending from near the prebasal region to the preapical fourth of the femur. The male of *P. minor* differs from that of *P. profrontalis* in having the abdomen partly pruinescent on the dorsum, and mid femur with the series of long posteroventral bristles restricted to the distal half. In the female of *P. minor* the polished extent of the profrons is discontinued before reaching the margin of the eye due to the pruinescence dulling the surface.

Pogonomyia profrontalis Huckett

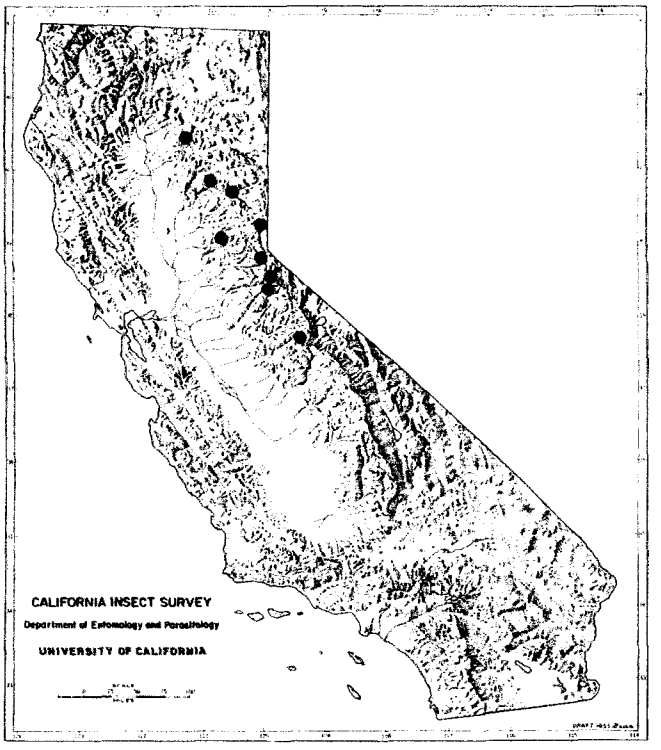
(Fig. 44, 50, 58; map 57)

Pogonomyia profrontalis Huckett, 1966, Proc. Calif. Acad. Sci., ser 4 34: 293.

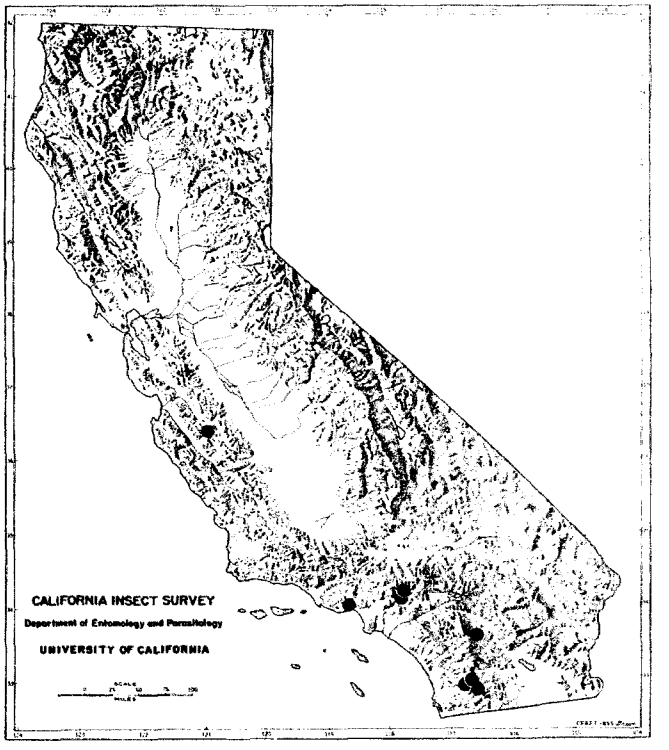
Holotype: ♂, Big Spring, Shasta County, California (UCB).

Geographic range.--California.

California records.--ALPINE CO.: 1.5 mi. SW. of Alpine Lodge, 1 ♀, VI-21-62 (C. D. MacNeill, CAS). Hope Valley, 5 ♀, VI-7-52 (R. M. Bohart, UCD). Winnemucca Lake, 1 ♂, VI-25-50, 1 ♀, VII-30-59 (R. M. Bohart, UCD). EL DORADO CO.: Wright's Lake, 4 ♂, 6 ♀, VII-2-48 (R. C. Bynum, J. W. MacSwain, K. W. Tucker, CIS; D. Carter, UCD). MARIPOSA-TUOLUMNE CO.: Glacier Point Road, Yosemite National Park, 1 ♀, VII-6-47 (A. L. Melander, USNM). NEVADA CO.: Truckee, 1 ♂, VI-10-53 (A. D. Telford, UCD). PLACER CO.: Baxter, 5 ♂, 6 ♀, V-20-52 (A. T. McClay, UCD). Dutch Flat, 1 ♀, V-13-56 (H. R. Moffitt, UCD). PLUMAS CO.: Bucks Lake, 1 ♂, VI-23-49 (J. W. MacSwain, CIS). 10 mi. S. of Johnsville, 2 ♂, 1 ♀, VI-12-61 (J. S. Buckett, UCD). SHASTA CO.: Big Spring, 1 ♂, 1 ♀, V-23-41, types (E. G. Linsley, CIS).



Map 57. California distribution of *Pogonomyia profrontalis* Huckett.



Map 58. California distribution of *Pogonomyia santamonicae* Huckett.

The male of *P. profrontalis* differs from that of *P. minor* in having the abdomen entirely black and shiny, without pruinescence, and the long posteroventral bristles on mid femur extended in series to the prebasal region. Females of *P. profrontalis* and *P. santamonicae* have the profrons notably bare and polished, and as thus tenuously extended to eye margin. In *P. profrontalis* the mesonotum of the female is jet black and shiny, with no indication of a median stripe.

Pogonomyia rivalis Huckett

Pogonomyia rivalis Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 293.

Holotype: ♂, Sardine Creek, Mono County, California (UCD).

Geographic range.--California.

California records.--EL DORADO CO.: Angora Lake, Tahoe, 1 ♂, VII-26-15 (E. P. Van Duzee, CAS). MONO CO.: 1 mi. S. of Saddlebag Lake, 1 ♀, VII-15-61 (D. R. Miller, UCD). Sardine Creek, 8,500 ft. 7 ♂, 22 ♀, VI-22-51, type series (D. P. Lawfer, S. M. Kappos, A. T. McClay, R. W. Morgan, UCD; C. A. Downing, J. W. MacSwain, CIS).

The male of *P. rivalis* may be separated from that of *P. amnicola* by the paler grayish wings and weaker infuscation basad. The female of *P. rivalis* has the profrons entirely pruinescent, and the mid femur with a well developed anteroventral bristle on distal half.

Pogonomyia santamonicae Huckett

(Figs. 4b, 45, 51, 59; map 58)

Pogonomyia santamonicae Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4, 34: 294.

Holotype: ♂, Santa Monica Mountains, Los Angeles County, California (CAS).

Geographic range.--California.

California records.--LOS ANGELES CO.: Claremont, 1 ♂, 2 ♀, no date (Baker, USNM). Mountains near Claremont, no date (Baker, USNM). Santa Monica Mountains, 2 ♂, 1 ♀, VII-3-50, type series (CAS; UCLA). RIVERSIDE CO.: Keen Camp, 1 ♂, V-18-51 (E. I. Schlinger, CIS). SAN BENITO CO.: 2 mi. W. of Junction of Cienega and Lime Kiln Roads, 1 ♂, III-30-63 (D. C. Rentz, CAS). SAN DIEGO CO.: Cuyamaca, 5 ♂, 4 ♀, V-7-48 (A. L. Melander, USNM). Cuyamaca Lake, 4,600 ft. 3 ♂, IV-21-55 (W. R. M. Mason, W. R. Richards, CNC). Descanso, 1 ♂, III-30-61 (P. D. Hurd, CIS). 1 mi. N. of Mt. Laguna Junction, 2 ♂, III-26-61 (W. A. Steffan, CIS). Pine Valley, 1 ♂, IV-24-20 (E. P. Van Duzee, CAS).

The male of *P. santamonicae* may be distinguished from those of *P. amnicola* and *P. profrontalis* by the brownish pruinescence and dorsocentral marking on the abdomen, and the female of *P. santamonicae* from those of the two latter species by the brownish dust and weak median stripe on the mesonotum. The mid femur of the male of *P. santamonicae* has long anteroventral bristles on the distal half, and the profrons of the female is notably polished in extent, as in *P. profrontalis*.

Genus Eupogonomyia Malloch

Eupogonomyia Malloch, 1921, Proc. Calif. Acad. Sci., ser. 4 11: 178-180.

Type-species: *Eupogonomyia pribilofensis* Malloch, original designation.

The genus *Eupogonomyia* possesses many of the diagnostic characters attributed to *Pogonomyia* Rondani. The prealar bristle in *Eupogonomyia* may be absent or present as a weak short bristle.

KEY TO FEMALES OF EUPOGONOMYIA IN CALIFORNIA

Oral margin extended cephalad to a level beyond tip of profrons, prealar bristle absent. . . . . *E.* species

Oral margin not extended cephalad to a level beyond tip of profrons, prealar bristle present. . . *neoborealis* (Snyder)

Eupogonomyia neoborealis (Snyder)

Aricia borealis Malloch, 1919, Rep. Can. Arct. Exped. 1913-18, 3: Insects, Pt. C. Diptera, pp. 64c-65c ♂. name preoc. Zetterstedt, 1845.

Helina neoborealis Snyder, 1949, Bull. Am. Mus. Nat. Hist., 94: 122. new name for *Aricia borealis* Malloch.

Holotype: ♂, Bernard Harbor, Northwest Territories (CNC).

Geographic range.--Alaska, California, Colorado, Northwest Territories.

California records.--INYO CO.: Upper Rock Creek, 10,000 ft. NW. Inyo County, 1 ♂, VIII-14-63 (C. A. Toschi, CIS). White Mountains, 1 ♀, VII-24-36 (E. C. Hendie, CIS). MADERA CO.: Garnet Lake, 1 ♀, VIII-9-52 (HCH). TUOLUMNE CO.: 5 mi. W. of Sonora Pass, 1 ♀, VII-21-56 (J. Powell, CIS).

E. neoborealis may usually be separated from its nearest relatives by the presence of a short prealar bristle, fine sensory hairs on the anteroventral and posteroventral surfaces of the fore metatarsus, and by the less conspicuous extension of the vibrissal angle cephalad. The mid femur of the male has no conspicuous ventral bristling.

Eupogonomyia species

Geographic range and *California records*.--INYO CO.: Mono Pass, 2 ♀, VIII-13-57 (D. D. Linsdale, CIS). near Mono Pass, 12,000 ft. NW. Inyo County, 1 ♀, VIII-11-63 (C. A. Toschi, CIS). MONO CO.: Mt. Bancroft Laboratory, 12,500 ft. White Mountains, 2 ♀, VII-5-61 (J. Powell, CIS). White Mountains, 2 ♀, VII-21-53 (D. D. Linsdale, CIS).

Without the male I can only record the presence of the species, unnamed, as indicated by the female.

Genus Lasiops Meigen

Lasiops Meigen, 1838, Syst. Beschr., 7: 323.

Trichopticus Schnabl, 1889, Horae Soc. Entomol. Ross., 23: 342.

Type-species: *Anthomyia semicinerea* Wiedemann, designation of Karl, 1928.[3]

The genus *Lasiops* has setulose hairs on the caudal surface of the hind coxae. Many of the males are notable for the peculiarities in their femoral and/or tibial armature as compared to that of the female. Several of the species occur in mountainous terrain. Adults are found to frequent the blossoms of upland flowering plants, as the *Umbelliferae* and *Scrophulariaceae*. Larvae of *Lasiops sens. str.* are recorded as breeding in locations rich in humus. Those of the segregate *Alloeostylus* are known to be coprophagous, and in the later instars zoophagous (Séguy 1923: 302, 311; 1950: 386).

KEYS TO SPECIES OF LASIOPS IN CALIFORNIA

Males

1. Yellow species, palpi, femora and tibiae fulvous, abdomen partly or entirely so . *diaphanus* (Wiedemann)

   Blackish species, palpi, abdomen, femora and tibiae blackish 2

3. I hold that Coquillett (1901) was in error when by a process of elimination he dismissed the claims of *Anthomyia apicalis* Meigen, the first in a series of 5 nominal species available for purposes of type designation in the Genus *Lasiops* Meigen, and that it left the species *Musca hirticeps* Fallén, the fourth in the series, as the type-species, a Hydrotaea. *Anthomyia apicalis* Meigen has been accepted by authors as a synonym of *Anthomyia semicinerea* Weidemann, following Schiner's (1862, Faun. Austr. I: 619) early indication that the two forms were probably conspecific and belonged to the genus *Lasiops* Meigen.

2. Fore tibia with stout spines on posterior or posteroventral surface 3
   Fore tibia spineless on posterior or posteroventral surface 5
3. Fore tibia with spines in single series . *fimbriatus* (Coquillett)
   Fore tibia with spines not in single series 4
4. Fore tibia with 4 or 5 spines, arranged 2: 2 or 3 . . . . *septentrionalis* (Stein)
   Fore tibia with 3 spines, arranged 2: 1 . *spiniger* (Stein)*
5. Interfrontalia continuous caudad, separating the parafrontals, hind femur and hind tibia not profusely bristled . . . . . *furcatus* (Stein)
   Interfrontalia obscured caudad and parafrontals thereat contiguous, hind femur and hind tibia profusely bristled . *medius* (Stein)

Females

1. Thorax and abdomen partly or entirely yellow . . . . . *diaphanus* (Wiedemann)
   Thorax and abdomen blackish 2
2. Mid tibia with a robust posteroventral bristle near middle of tibia, and normally with 3 pairs of postsutural dorsocentral bristles . . *furcatus* (Stein)
   Mid tibia without a robust mid posteroventral bristle, and normally with 4 pairs of postsutural dorsocentral bristles 3
3. Fore and/or mid tibiae with fine bristly hairs on the ventral surface . . . . . *medius* (Stein)
   Fore and mid tibiae without fine bristly hairs on the ventral surface . . . . . *fimbriatus* (Coquillett) *septentrionalis* (Stein) and *spiniger* (Stein)*

Subgenus Lasiops Meigen

Lasiops (Lasiops) fimbriatus (Coquillett)

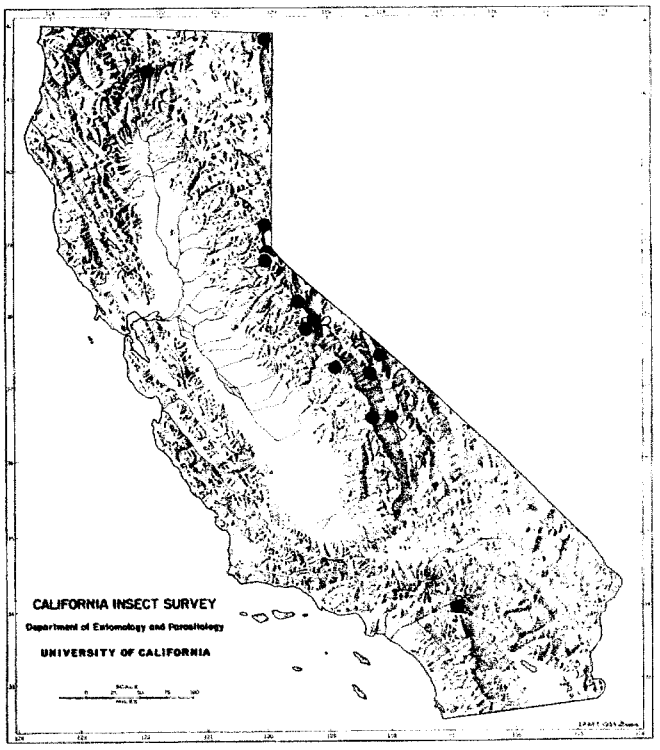
(Map 59)

Phaonia fimbriata Coquillett, 1904, Invert. Pacif., Dipt.1: 35.

Holotype: ♂, Ormsby County, Nevada (USNM).

Geographic range.--California, Nevada.

California records.--EL DORADO CO.: Echo Lake, 7,400 ft. 1 ♂, VII-7-54, 1 ♂, VII-16-55 (W. W. Middlekauff, CIS); 1 ♂, VII-23-55 (J. C. Downey, UCD); 1 ♂, VI-17-59 (W. W. Middlekauff, CIS); 1 ♂, VII-13-61 (J. G. Chillcott, CNC). Fallen Leaf Lake, 6,500 ft. 1 ♂, VII-13-61 (B. H. Poole, CNC). Grass Lake, Luther Pass, 1 ♂, VII-24-55 (J. C. Downey, UCD). FRESNO CO.: Pioneer Basin, 11,000-11,500 ft. 1 ♀, VIII-19-56, 1 ♀, X-6-63 (E. I. Schlinger, UCD; UCR). INYO CO.: Bishop, 2 ♂, VII-28-40 (R. H. Beamer, UK). Lone Pine, 3 ♂, 2 ♀, VII-28-40 (R. H. Beamer, L. J. Lipovsky, UK). Lone Pine Creek, 10,250 ft. 2 ♂, VII-7-61 (H. V. Daly, CIS). MODOC CO.: Lily Lake, 7 mi. E. of Pine Creek, 1 ♀, VII-11-57 (J. Powell, CIS). MONO CO.: Cottonwood Creek, 9,300 ft. 1 ♂, VII-10-61 (J. S. Buckett, UCD). McKay Creek, Sonora Pass, 2 ♀, VIII-18-60 (E. Jessen, CIS). Virginia Lakes, 9,750 ft. 1 ♂, 2 ♀, VIII-17-63 (H. B. Leech, CAS). NEVADA CO.: Sagehen, near Hobart Mills, 1 ♂, VI-25-54 (R. H. Goodwin, CIS). Sagehen Creek, near Hobart Mills, 1 ♂, VII-7-64, 1 ♂, VII-9-64, 1 ♀, VII-10-64, 1 ♂, 3 ♀, VII-15-64, in malaise trap (M. E. Irwin, UCR). SAN BERNARDINO CO.: Upper Santa Ana River, 1 ♂, VIII-3-47 (A. L. Melander, US NM). SISKIYOU CO.: Panther Meadows, Mt. Shasta, 1 ♂, VIII-4-63 (P. H. Arnaud, CAS). TUOLUMNE CO.: Sentinel Dome, Yosemite National Park, 8,117 ft. 1 ♂, VII-3-46 (H. Chandler, CAS).



Map 59. California distribution of *Lasiops fimbriatus* (Coquillett).

The male of *L. fimbriatus* has 3 or more spines on the fore tibia, arranged in a single series, thereby differing from the males of *L. septentrionalis* and *L. spiniger* Stein*. Females of the three taxa are not readily separated from one another for diagnostic purposes.

Lasiops (Lasiops) furcatus (Stein)

Trichopticus furcatus Stein, 1916, Arch. Naturgesch., (1915) Abt. A 81 (10): 40.

Trichopticus melanderi Malloch, 1920, Trans. Am. Entomol. Soc., 46: 159.

Syntypes: ♂ ♀, Cusiano, Italo-Austrian Alps (ZMUB).

Geographic range.--Alberta, British Columbia, California, Colorado, Montana, New Hampshire, Ontario, Washington, Wyoming.

California records.--INYO CO.: Ruby Lake, 11,250 ft., 4 ♂, 6 ♀, VIII-13-57 (D. D. Linsdale, J. Powell, CIS). MADERA CO.: Lyell Canyon, 1 ♀, VIII-8-35 (E. C. Zimmerman, CAS). TUOLUMNE CO.: Sonora Pass, 1 ♂, VIII-21-59 (J. Powell, CIS). 2 mi. W. of Sonora Pass, 1 ♀, VIII-21-59 (G. I. Stage, CIS). Tuolumne Meadows, 9,000 ft. 2 ♂, 1 ♀, VIII-16-16 (G. R. Pilate, USNM).

The species *L. furcatus* normally has 3 pairs of postsutural dorsocentral bristles, and a mid posteroventral bristle on the mid tibia. The hind tibiae of the male are without the profuse bristling on the hind tibiae of males of *L. medius*, *L. septentrionalis* and *L. fimbriatus*.

Lasiops (Lasiops) medius (Stein)

(Map 60)

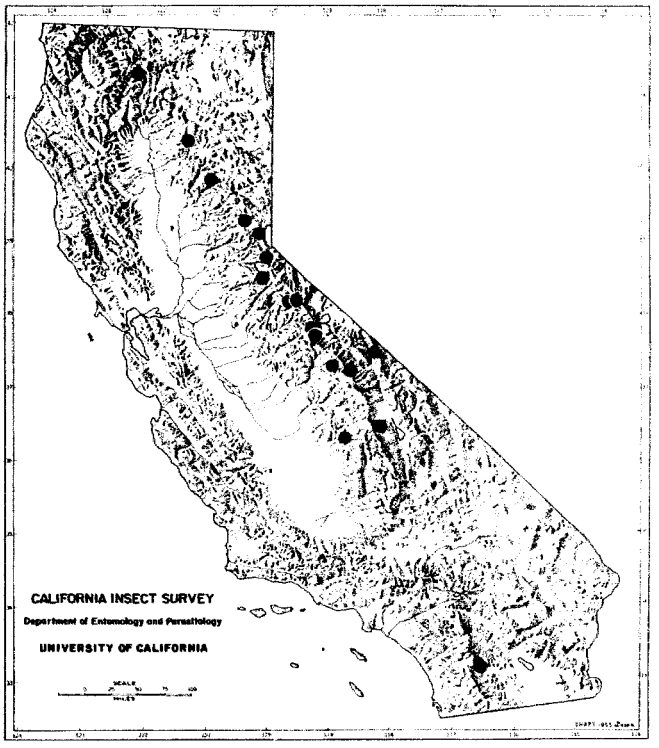
Trichopticus medius Stein, 1920 May, Arch. Naturgesch., (1918) Abt. A 84 (9): 19.

Trichopticus brevitarsis Malloch, 1920 June, Trans. Am. Entomol. Soc., 46: 161.

Syntypes: ♂♂, Rabbit Ear and Marshall Passes, Colorado (USNM).

Geographic range.--Alaska, Alberta, British Columbia, California, Colorado, Nebraska, Washington, Wyoming.

California records.--AMADOR CO.: 4 mi. N. of Silver Lake, 1 ♀, VII-25-55 (J. C. Downey, UCD). EL DORADO CO.: Echo Lake, 1 ♂, VII-7-54 (W. W. Middlekauff, CIS). FRESNO CO.: Pioneer Basin, 10-11,000 ft. 2 ♀, VIII-19-56 (E. I. Schlinger, UCD). INYO CO.: Lone Pine Creek, 8,250 ft. 1 ♀, VII-7-61 (G. I. Stage, CIS). Ruby Lake, 11,250 ft., 16 ♂, 3 ♀, VIII-13-57 (D. D. Linsdale, J. Powell, CIS). MONO CO.: Cottonwood Creek, 2 ♂, VII-14-53 (W. D. McLeitan, UCD); H. Nakakihara, UCR). Leavitt Meadow, 7,200 ft. 2 ♀, VIII-13-63, flight trap (H. B. Leech, CAS). Sonora Pass, 1 ♂, VIII-13-60 (J. F. Lawrence, CIS). NEVADA CO.: Jackson Lake 1 ♀, VII-15-61 (L. A. Stange, UCD). PLACER CO.: Cathedral Lake, Tahoe, 1 ♀, VII-6-15 (CIS). PLUMAS CO.: Bucks Lake, 1 ♂, VII-1-49 (B. Keh, BVC). SAN DIEGO CO.: Borrego Valley, 1 ♀, IV-18-57 (E. I. Schlinger, UCD). SHASTA CO.: 3 mi. SE. of Mt. Lassen, 1 ♂, VII-19-55 (J. W. MacSwain, CIS). SISKIYOU CO.: Castle Lake, 1 ♂, VII-22-58, variant (J. Powell, CIS). TULARE CO.: Mineral King, 1 ♂, VIII-2-35 (G. E. Bohart, CAS). TUOLUMNE CO.: Chipmunk Flat, 3 ♀, VIII-9-60 (A. S. Menke, UCD). Sonora Pass, 9,624 ft. 2 ♀, VII-29-30-54 (J. C. Downey, UCD); 1 ♀, VIII-10-57, 1 ♀, VIII-21-59 (D. D. Linsdale, CIS). Tioga Pass, 1 ♂, VII-8-46 (CAS). Tuolumne Meadows, Soda Springs, 8,600 ft. 2 ♂, VIII-8-16 (G. R. Pilate, USNM).



Map 60. California distribution of *Lasiops medius* (Stein).

The species *L. medius* is closely related to *L. villicrura* (Coquillett)*, from which it differs in the male by having the posteroventral setulae on fore tibia and fore tarsus shorter and less shaggy, and the series more restricted.

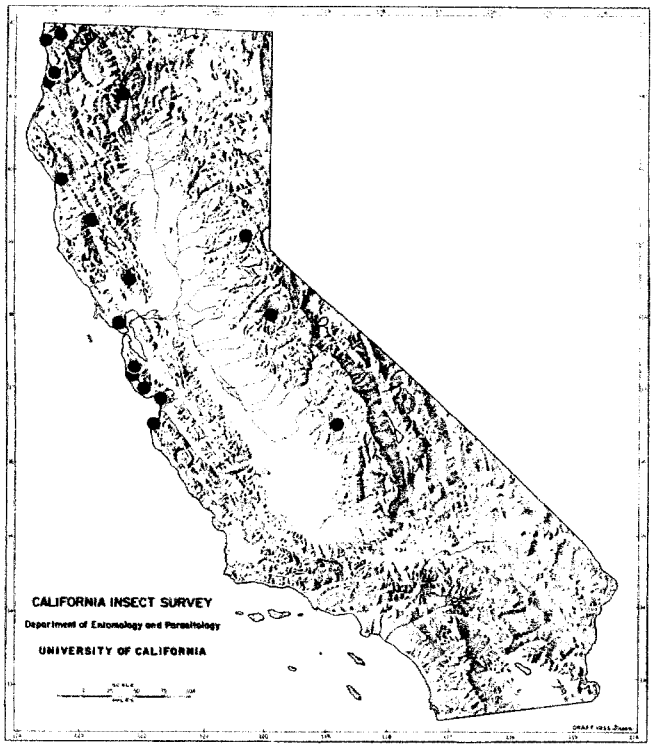
Lasiops (Lasiops) septentrionalis (Stein)

Aricia septentrionalis Stein, 1898, Berl. Entomol. Z., (1897) 42: 184.

Type: ♂, Fort Wrangell, Alaska (FMNH).

Geographic range.--Widely distributed across the north temperate region of continental North America, reaching its northern limits in central Alaska and the Mackenzie River Basin as far north as Aklavik, thence eastward in northern Manitoba to Quebec, Labrador, and Newfoundland; southward in the northeastern states from Maine to New York; in the west, along the Rocky Mountain range from British Columbia and Alberta to Colorado, Utah, and New Mexico, on the Pacific coast from Washington to California, and in Arizona. Also the Commander Islands, Kamchatka Peninsula.

California records.--ALPINE CO.: 1.5 mi. NE. of Red Lake, 1 ♀, VII-25-55 (J. C. Downey, UCD). MONO CO.: Leavitt Meadow, 2 ♀, VIII-13-63, flight trap (H. B. Leech, CAS). Sardine Creek, 1 ♀, VII-29-54 (J. C. Downey, UCD). PLACER CO.: Alpine Creek, Tahoe, 1 ♀, VII-7-15 (E. P. Van Duzee, CIS). TULARE CO.: Giant Forest, Sequoia National Park, 1



Map 61. California distribution of *Lasiops diaphanus* (Weidemann).

♀, VIII-20-17 (J. C. Bradley, HCH). Siberian Outpost, 9,500 ft. 1 ♀, VII-31-15 (HCH). TUOLUMNE CO.: Tilden, Yosemite National Park, 1 ♀, VII-30-38 (CIS). Tuolumne Meadows, Soda Springs, 8,600 ft. 1 ♂, 6 ♀, VIII-8-16 (G. R. Pilate, USNM). Tuolumne Meadows, 1 ♂, 1 ♀, VIII-15-16 (G. R. Pilate, USNM).

The male of *L. septentrionalis* has spines on fore tibia arranged in 2 series, of which 2 spines are on the posterior surface and 2 or 3 on the posteroventral. The male of *L. spiniger** usually has 2 spines on the posterior surface of the fore tibia and 1 on the posteroventral.

Subgenus Alloeostylus Schnabl

Alloeostylus Schnabl, 1888, Entomol. Nachr., 14: 49.

Type-species: *Alloeostylus sudeticus* Schnabl, monobasic.

Lasiops (Alloeostylus) diaphanus (Wiedemann)

(Map 61)

Anthomyia diaphana Wiedemann, 1817, Zool. Mag., 1: 81.

Anthomyia signia Walker, 1849, List Dipt. Br. Mus., 4: 939.

Anthomyia geldria Walker, 1849, List Dipt. Br. Mus., 4: 940.

Phaonia inepta Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 10.

Type: sex not indicated, Holstein (location unknown).

Geographic range.--Alaska, Alberta, British Columbia, California, Connecticut, Idaho, Manitoba, Maine, Michigan, Montana, North Carolina, Northwest Territories, New York, Newfoundland, Ontario, Oregon, Quebec, South Carolina, Washington, Wisconsin, Wyoming.

California records.--DEL NORTE CO.: Crescent City, 1 ♀, VII-1-51 (M. F. McClay, UCD). Patrick Creek, 1 ♀, XI-14-59 (E. L. Kessel, CAS). EL DORADO CO.: Black Bird Camp 1 ♂, V-27-51 (H. L. McKenzie, CDA). Strawberry, 1 ♂, X-17-53 (L. E. Campos, UCD). HUMBOLDT CO.: Orick, 1 ♂, VI-21-35 (A. L. Melander, USNM). Prairie Creek, 1 ♂, VII-3-54 (UCD). Willow Creek, 1 ♀, VI-20-67, (R. E. Doty, BVC). MARIN CO.: Mill Valley, 2 ♂, IV-21-26 (M. C. Van Duzee, CAS); 1 ♀, XI-16-52 (H. B. Leech, CAS). Ross, 1 ♀, V-20-53 (H. L. Mathis, UCD). MENDOCINO CO.: Piercy, 1 ♂, VII-26-55 (W. C. Bentinck, CIS). Ryan Creek, 1 ♀, VI-1-52 (R. Craig, CIS). MONTEREY CO.: Carmel, 1 ♀, VI-29-21 (L. S. Slevin, CAS). NAPA CO.: Mt. St. Helena, 1 ♀, V-12-26 (M. C. Van Duzee, CAS). PLACER CO.: Sugar Bowl Lodge, 1 ♂, VII-26-51 (CAS). SAN MATEO CO.: Memorial Park, 1 ♂, VII-19-64 (P. H. Arnaud, CAS). Portola State Park, 1 ♂, V-7-50 (F. X. Williams, CAS). SANTA CRUZ CO.: Aptos Creek, 1 ♂, V-13-61 (C. Slobodchikoff, CIS). Ben Lomond, 1 ♀, V-17-31 (E. C. Van Dyke, CAS). Brookdale, 1 ♂, 1 ♀, V-1-53 (A. E. Gray). SONOMA CO.: Mesa Grande, 1 ♂, VII-11-08 (F. E. Blaisdell, CAS). TRINITY CO.: Eagle Creek, 1 ♂, VI-2-51 (A. T. McClay, UCD). TULARE CO.: Giant Forest, Sequoia National Park, 1 ♂, VIII-22-17 (J. C. Bradley, CU).

A. diaphanus may readily be recognised by the fulvous thorax, palpi, and legs (exclusive of the tarsi). The abdomen also is entirely or extensively fulvous. The hind tibia of the male has a pronounced strong apical thorn on the ventral surface, and the mid tibia in both sexes has one or more posteroventral bristles. The female type of *Phaonia inepta* Stein I regard as an aberrant specimen of *L. diaphanus*, having a mid posteroventral bristle on only one of the two mid tibiae, and a single hair on the caudal surface of only one of the two hind coxae, vestiges that indicate the specimen's relationship.

Genus Plexiopsis Huckett

Plexiopsis Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 295.

Type-species: *Plexiopsis insolens* Huckett, monobasic.

Related to *Dendrophaonia* Malloch, from which *Plexiopsis* may be separated by the robust apical posteroventral bristle on the hind tibia, the absence of a stout upturned buccal bristle, and in the female in being without an anterior pair of proclinate paraorbital bristles. From *Dialyta* Rondani* the genus differs in having hairs on the eyes and prealar bristles on the mesonotum. The antennae are not set high on the head in relation to the eyes.

Plexiopsis insolens Huckett

Plexiopsis insolens Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 295-296.

Holotype: ♂, Elkhorn Ferry, Yolo County, California (UCD).

Geographic range.--California, Oregon.

California records.--MARIN CO.: Lagunitas, 1 ♀, IV-26-24 (E. P. Van Duzee, CAS). MODOC CO.: Cedar Pass, 1 ♂, VII-8-46 (P. D. Hurd, R. F. Smith, CIS); 1 ♂, VI-29-55 (J. W. MacSwain, CIS). SACRAMENTO CO.: Elk Grove, 1 ♀, IV-18-52 (E. C. Carlson, UCD). YOLO CO.: Davis, 1 ♂, V-5-53 (E. C. Carlson, UCD). Elkhorn Ferry, 2 ♂, 1 ♀, IV-16-52, type series (E. I. Schlinger, UCD).

The species *P. insolens* has a robust apical posteroventral bristle on the hind tibia, the eyes sparsely haired, the frons in the male moderately broad and bristled as in the female, the cruciate bristles absent in both sexes. The female is without an anterior pair of proclinate paraorbital bristles, and has the abdomen entirely black, glossy and without marking.

Genus Dendrophaonia Malloch

Dendrophaonia Malloch, 1923, Trans. Am. Entomol. Soc., 48: 237.

Type-species: *Spilogaster hilariformis* Stein, original designation, (=*Spilogaster scabra* Giglio-Tos, 1893).

The genus *Dendrophaonia* has a distinctive posterodorsal bristle on the hind tibia, the calcar, proximad of which may be one or two much shorter posterodorsal bristles. The genus may be separated from *Phaonia* and its relatives by the presence of one or two stout upcurved bristles on the buccal margin of cheeks, and in the female by the presence of a strong proclinate pair of anterior paraorbital bristles. Males of *Dendrophaonia* have the parafrontal series continued caudad as upright bristles to a level with the apex of the frontal triangle. So far as is known adults are commonly seen alighting on tree trunks, and larvae have been obtained from decayed parts of trees, or in the debris from birds' nests.

KEY TO SPECIES OF DENDROPHAONIA IN CALIFORNIA

Male with a spinelike bristle near the middle of the ventral surface of hind femur; female with a dorsocentral stripe on abdomen . . . . . *querceti* (Bouché)

Male without a spinelike bristle near the middle of the ventral surface of hind femur; female without a dorsocentral stripe on abdomen . . . . . *scabra* (Giglio-Tos)

Dendrophaonia querceti (Bouché)

Anthomyia querceti Bouché, 1834, Naturgeschichte der Insekten, besonders in Hinsicht ihre ersten Zustände als Larven und Puppen, p. 82.

Types: ♂ ♀, probably Berlin, bred from decayed oak-wood (location unknown).

Geographic range.--Alberta, California, Colorado, Georgia, Illinois, Manitoba, Maryland, Maine, Michigan, Minnesota, New Hampshire, New Jersey, New York, Quebec, Texas, Washington, Wisconsin.

California records.--CONTRA COSTA CO.: Danville, 2 ♂, I-15-17-52, 7 ♀, I-20-30-52, 1 ♂, 2 ♀, II-2-3-52, all *ex* ground nest debris of *Vespula pennsylvanica* (F. X. Williams, CAS). LAKE CO.: Soda Bay, 1 ♂, VII-25-58, at light trap (R. E. Dolphin, UCR). NEVADA CO.: Sagehen Creek, near Hobart Mills, 1 ♀, VII-15-64, in malaise trap (M. E. Irwin, UCR). PLUMAS CO.: 8 mi. NW. of Chester, 1 ♀, VIII-18-56 (E. E. Lindquist, CIS). TUOLUMNE CO.: Strawberry, 1 ♀, VI-19-51 (A. T. McClay, UCD).

The male of *D. querceti* has a strong spinelike posteroventral bristle near the middle of hind femur, which is absent in males of *D. scabra* and *D. marguerita* Snyder*. In *D. scabra* and *D. querceti* the aristal hairs are longer, being as long as half the width of third antennal segment, and in the males the caudal pair of bristles on the parafrontals is stronger than in *D. marguerita**. The female of *D. querceti* differs from that of *D. scabra* in having a median marking on the abdomen.

Larvae of *D. querceti* have been bred from a wide variety of media, decayed wood of oak, cankerous wounds of elm, the powdered remains of pear, from horse dung and the excrement of humans, from

nests of hornets, bats, and numerous species of birds, including hawks, owl, chickadees, and starling (Hennig, 1962: 753).

Dendrophaonia scabra (Giglio-Tos)

Spilogaster scabra Giglio-Tos, 1893, [Turin Univ.] Boll. Mus. Zool. Anat. Comp., 8 (147): 9.

Spilogaster hilariformis Stein, 1898, Berl. Entomol. Z., (1897) 42: 196.

Syntypes: ♂♂ ♀♀, Mexico (Zool. Mus., Turin) *teste* Snyder.

Geographic range.--Occurs in Mexico, along the Gulf coast from Texas to Florida and inland in Oklahoma and Tennessee, thence northward on the Atlantic coast from Georgia to Connecticut, and from the southern states bordering the Great Lakes; in the west occurring in Missouri and Colorado, and on the Pacific coast from California to Washington.

California records.--ALAMEDA CO.: Albany, 3 ♀, V-15-62 (R. Doty, BVC). FRESNO CO.: Fresno, 8 ♂, X-13-22, 1 ♀, X-17-22, 2 ♀, X-28-22, 1 ♀, XI-24-22 (M. E. Phillips, HCH). LOS ANGELES CO.: Los Angeles, 1 ♀, VIII-19-16 (V. Duran, HCH). Los Angeles County, 1 ♂, III-17-34 (UCLA). SACRAMENTO CO.: Fair Oaks, 3 ♂, 3 ♀, XII-17-37, 1 ♂, XII-31-37, *ex* beet pulp (Spurlock, CDA). SAN BERNARDINO CO.: Fontana, 1 ♂, I-8-53 (P. H. Arnaud, CAS). SAN DIEGO CO.: La Jolla, 1 ♂, XII-29-34 (A. L. Melander, USNM). TULARE CO.: Porterville, 1 ♂, 1 ♀, IX-13-63 (J. D. Walsh, BVC). Visalia, 2 ♂, V-29-62 (D. Womeldorf, BVC). TUOLUMNE CO.: Lyons Dam, 1 ♂, VIII-7-37 (M. A. Cazier, AMNH).

The species *D. scabra* varies considerably in the color of the legs, from blackish to reddish or fulvous, in part or entirely. Normally there are 3 pairs of postsutural dorsocentral bristles present. The male of *D. scabra* is without a strong posteroventral bristle on the hind femur, such as is present in males of *D. querceti*, and the female of *D. scabra* has a dull pale gray abdomen, without a median stripe. Malloch (1923: 238) reared the species from a much decayed tree stump, and gives a brief description of the puparium.

Genus Phaonia Robineau-Desvoidy

Phaonia Robineau-Desvoidy, 1830, [Paris] Inst. de France, [Cl. des] Sci. Math. et Phys., Acad. Roy. des Sci., Mém. présentés par divers Savans [ser. 2], 2: 482.

Type-species: *Phaonia viarum* Robineau-Desvoidy, designation Coquillett 1901, = *Musca erratica* Fallén not Linnaeus.

The genus *Phaonia*, as is represented in California and except for *P. deleta* (Stein), is characterised as possessing a single posterodorsal bristle, exclusive of preapical, on the distal half of hind tibia, as is present in *Dialyta* and *Plexiopsis*. In *P. deleta* there may or may not be more than one strong posterodorsal bristle on the distal half of the hind tibia. The head in *Phaonia* is without a strong upturned bristle on the ventral margin of the buccal region of cheek and is without a well-developed anterior pair of proclinate paraorbital bristles in the female, as are present in *Dendrophaonia*. Wing vein M_{1+2} is not conspicuously curved forward near wing margin as is distinctly so in *Bigotomyia*. The anterior intraalar bristle is in an alignment transversally with the supraalar bristle or cephalad of it, as distinct from *Muscina* (fig. 11).

Adults of *Phaonia* frequent flowers of many woodland and alpine plants including catkins of willow, the sap and trunks of trees, and the forest floor and undergrowth. Females of certain species have been seen to seek moist beds of moss as if for purposes of ovi- or laviposition.

Little is known of larval habits. What few larvae have been observed or studied are recorded as predaceous on larvae of other insects inhabiting the same media (Keilin, 1917: 362-388; Malloch, 1923: 253, 267; Hall, 1937: 216; Séguy, 1937: 329).

Subgenus Phaonia Robineau-Desvoidy

KEYS TO SPECIES OF PHAONIA IN CALIFORNIA

Males

1. Thorax, abdomen and legs black, hypopleura usually with hairs on upper border 2
   Tibiae partly or entirely reddish, brownish or fulvous, if darker the hypopleura usually without hairs on upper border 4
2. Mesonotum with 1 or more pairs of presutural acrostical bristles, fore tibia with ventral setulae fine and shorter than maximum diameter of tibia . 3
   Mesonotum with presutural acrostical bristles absent or setulose, fore tibia with 1 or more stiffish setae on ventral surface, longer than maximum width of tibia . . . . . *rugia* (Walker)
3. Margins of calyptrae dark brown, usually 4 pairs of postsutural dorsocentral bristles present . . . . . *caerulescens* (Stein)
   Margins of calyptrae yellowish, usually

3 pairs of postsutural dorsocentral bristles present . . . *versicolor* Stein*

4. Thorax largely or entirely yellow or fulvous, coxae, femora and tibiae entirely so 5
Thorax mainly grayish, brownish or blackish 8

5. Palpi fuscous, third antennal segment entirely grayish brown or fuscous . . *nigricauda* Malloch
Palpi mainly yellow, third antennal segment not entirely grayish brown . . . 6

6. Aristal hairs as long or longer than width of third antennal segment, parafrontals contiguous caudad, shortest distance between eyes scarcely exceeding diameter of anterior ocellus . . *fuscicauda* Malloch
Aristal hairs slightly shorter than width of third antennal segment, shortest distance between eyes not less than distance between posterior ocelli inclusive 7

7. Interfrontalia and occiput yellowish, pallid . . . . . *pallidosa* Huckett
Interfrontalia reddish or ochreous, sometimes darker caudad, occiput partly grayish black . . . . . *flava* Stein

8. Hind tibia with the calcar bristle weak, not longer than width of tibia where situated 9
Hind tibia with the calcar bristle robust, longer than width of tibia where situated 11

9. Third antennal segment longer than palpus, aristal hairs scarcely longer than basal diameter of arista . . . . *antennalis* Huckett
Third antennal segment not longer than palpus, aristal hairs as long or longer than half width of third antennal segment 10

10. Hind femur with a comblike series of coarse posteroventral setulae on distal third, mesonotum with 2 pairs of robust presutural acrostical bristles, frons with a brownish sheen . . . . . *sobriana* Huckett
Hind femur with slender posteroventral setulae on distal third, mesonotum with 3 pairs of slender weak presutural acrostical bristles, frons with whitish sheen . . . . . *reclusa* Huckett

11. Mesonotum with well developed presutural acrostical bristles 17
Mesonotum with presutural acrostical bristles absent or fine and slender, setulose 12

12. Hind tibia with a series of long slender posteroventral bristles, hind femur with a few ventral bristles near middle of femur adjacent the anteroventrals, with a series of much weaker posteroventrals on distal half, bristleless proximad on anteroventral and posteroventral surfaces . . . . . *deleta* (Stein)
Hind tibia without a series of long posteroventral bristles, hind femur otherwise bristled 13

13. Eyes bare or nearly so, 3 pairs of postsutural dorsocentral bristles, interfrontalia throughout as wide as breadth of third antennal segment . . . . . *coriatlanis* Huckett
Eyes hairy, 4 pairs of postsutural dorsocentral bristles, interfrontalia obscured at middle or narrower than width of third antennal segment . . . 14

14. Palpi fulvous, third antennal segment yellowish basad 15
Palpi fuscous, third antennal segment entirely blackish 16

15. Hind femur with posteroventral bristles, fore metatarsus with short inconspicuous posteroventral sensory hairs, excepting those at base . . . *quieta* Stein
Hind femur without posteroventral bristles, fore metatarsus with 1 or 2 long fine posteroventral sensory hairs in addition to any at base . . *perfida* Stein

16. Fore femur partly or entirely fulvous, mid and hind femora entirely fulvous . *errans* (Meigen)
Fore femur largely blackish and mid femur partly to entirely so . . . . . *errans* var. *luteva* (Walker)

17. Head, thorax, abdomen and legs entirely black except the hind tibiae and extreme apices of femora, which are reddish brown . . . . . *reversa* Huckett
Males without the foregoing combination of characters 18

18. Interfrontalia throughout as wide or wider than breadth of third antennal segment, parafrontal bristles well developed caudad to a level near or opposite the anterior ocellus 19
Interfrontalia obscured or narrower at middle than width of third antennal segment, parafrontal bristles discontinued before reaching a level near anterior ocellus, or are much weaker caudad . . 21

19. Palpi fulvous, third antennal segment fulvous basad 20
Palpi fuscous apicad, third antennal segment entirely blackish. *limbinervis* Stein

20. Mid and hind femora partly blackish . . *texensis texensis* Malloch
Mid and hind femora fulvous . . . . . *texensis flavofemorata* Malloch

21. Scutellum blackish, concolorous with mesonotum 22
Scutellum partly or largely yellowish or fulvous 24

22. Mid and hind femora mainly blackish or fuscous, cross-veins clouded, hypopleura with a few hairs cephalad of spiracle . *brevispina* Malloch
Mid and hind femora mainly fulvous, cross-veins clear, hypopleura without hairs cephalad of spiracle 23

23. Thorax and abdomen black, prealar bristle weak, short or absent . *parviceps* Malloch
Thorax and abdomen brownish or grayish, prealar bristle moderately lengthy . *reflecta* Huckett
24. Posterior notopleural bristle with hairs at base, interfrontalia linear and uninterrupted caudad, separating the parafrontals, hypopleura with one or more hairs near anteroventral margin of spiracle . *striata* (Stein)
Posterior notopleural bristle without hairs at base, interfrontalia largely obliterated by the contiguous parafrontals, hypopleura usually without hairs . *neglecta* Huckett

Females

1. Thorax, abdomen and legs black, hypopleura usually with hairs on upper border . . 2
Tibiae partly or entirely reddish, brownish or fulvous, if darker or blackish the hypopleura usually without hairs on upper border 4
2. Presutural acrostical bristles present, fore tibia with evenly fine setulae on ventral surface, shorter than maximum width of tibia 3
Presutural acrostical bristles absent or setulose, fore tibia with 1 or more stiffish setae on ventral surface, longer than maximum width of tibia . . *rugia* (Walker)
3 Margins of calyptrae dark brown, usually 4 pairs of postsutural dorsocentral bristles present. . . *caerulescens* (Stein)
Margins of caluptrae yellowish or pale, usually 3 pairs of postsutural dorsocentral bristles present. *versicolor* Stein*
4. Thorax largely or entirely yellow or fulvous, coxae, femora and tibiae entirely so 5
Thorax mainly grayish, brownish or black . 8
5. Frons, occiput and antennae yellow, third antennal segment sometimes clouded . . *pallidosa* Huckett
Frons at least partly darkened, fuscous or reddish, occiput partly or entirely grayish black 6
6. Aristal hairs as long or longer than width of third antennal segment, fore tibia without posterior bristle . . . . . *fuscicauda* Malloch
Aristal hairs slightly shorter than width of third antennal segment, fore tibia usually with a posterior bristle . . . 7
7. Palpi typically brownish, third antennal segment largely infuscated or brownish . *nigricauda* Malloch
Palpi pale yellow, third antennal segment usually yellowish on proximal half . . *flava* Stein
8. Mesonotum with well developed or bristle-like presutural acrostical bristles . . 14
Mesonotum with presutural acrostical bristles absent or setulose 9
9. Third antennal segment yellowish basad . 10
Third antennal segment entirely blackish. 13
10. Hind femur with posteroventral bristles on proximal half, fore metatarsus with short close-cropped posteroventral sensory hairs 11
Hind femur without posteroventral bristles, fore metatarsus with 1 or 2 long and conspicuous posteroventral sensory hairs . *perfida* Stein
11. Palpi fuscous, scutellum concolorous with mesonotum, 3 pairs of postsutural dorsocentral bristles usually present . *coriatlanis* Huckett
Palpi fulvous, scutellum fulvous or reddish, 4 pairs of postsutural dorsocentral bristles usually present 12
12. Fore tibia with a mid posteroventral bristle, mid tibia with an anterodorsal, hind tibia usually with a posterodorsal bristle proximad of calcar, node or base of vein R_{4+5} without setulae on under surface . . . . . *deleta* (Stein)
Fore, mid and hind tibiae without the respective bristles as above, node and/or base of vein R_{4+5} with 1 or more setulae on under surface. *quieta* Stein
13. Fore femur partly or entirely fulvous, mid and hind femora entirely fulvous . *errans* (Meigen)
Fore femur largely blackish and mid femur partly so. *errans* var. *luteva* (Walker)
14. Abdomen with paired spotlike marks on tergum 3 or 4, or on both, tergum 5 reddish on caudal border 15
Abdomen without paired spotlike marks on terga 3 and 4, tergum 5 not reddish on caudal border 17
15. Palpi fuscous at least on distal half . *limbinervis* Stein
Palpi fulvous 16
16. Mid and hind femora at least partly blackish . . . . *texensis texensis* Malloch
Mid and hind femora fulvous . . . . . *texensis flavofemorata* Malloch
17. Third antennal segment longer than palpus, aristal hairs about as long as basal diameter of arista . . . . . *antennalis* Huckett
Third antennal segment not longer than palpus, longer aristal hairs nearly or about as long as width of third antennal segment 18
18. Mid and hind femora largely infuscated or blackish, wings hyaline 19
Mid and hind femora largely or entirely fulvous 20
19. Hind tibia with the calcar bristle much longer than width of tibia where situated, *m-cu* cross-veins evenly clouded . . . . . *brevispina* Malloch
Hind tibia with the calcar bristle not longer than width of tibia where situated, *m-cu* cross-veins unevenly cloud-

ed, becoming blotchy or spotted at ends . *sobriana* Huckett

20. Scutellum yellowish or reddish apicad . 21
    Scutellum not yellowish or reddish apicad 22
21. Posterior notopleural bristle with 1 or more hairs at base, 4 pairs of postsutural dorsocentral bristles present . *striata* (Stein)
    Posterior notopleural bristle without hairs at base, 3 pairs of postsutural dorsocentral bristles present . . . . *neglecta* Huckett
22. Thorax and abdomen black, prealar bristle weak, short . . . . *parviceps* Malloch
    Thorax and abdomen brownish, prealar bristle nearly or about as long as the posterior notopleural bristle. *reflecta* Huckett

Phaonia (Phaonia) antennalis Huckett

Phaonia antennalis Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 296.

Holotype: ♂, Bryson, Monterey County, California (CAS).

Geographic range.--California.

California records.--MONTEREY CO.: Bradley, 3 ♀, V-17-20 (E. P. Van Duzee, CAS). Bryson, 1 ♂, V-17-20, type (E. P. Van Duzee, CAS). RIVERSIDE CO.: Upper Deep Canyon at Horsethief Creek, 3,400 ft. 1 ♂, VI-11-65 (E. I. Schlinger, UCR). SAN BERNARDINO CO.: Redlands, 1 ♂, XII-14- (CAS).

The species *P. antennalis* is related to *P. harti* Malloch* and associated species, in which the mesonotum has well-developed presutural acrostical bristles, and from these *P. antennalis* differs in the long antennae and minutely haired arista. In the type series of *P. antennalis* the calcar bristle on hind tibia is scarcely longer than the width of tibia where situated. In the male specimen from Upper Deep Canyon the eyes are distinctly haired.

Phaonia (Phaonia) brevispina Malloch

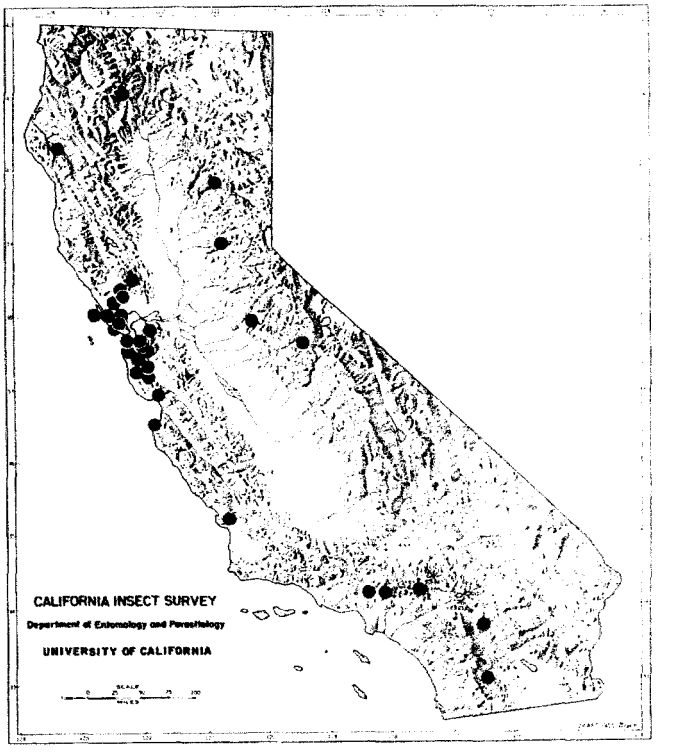
Phaonia brevispina Malloch, 1923, Trans. Am. Entomol. Soc., 48: 269.

Holotype: ♂, Urbana, Illinois (IllNHS).

Geographic range.--California, Connecticut, Idaho, Illinois, New Hampshire, Ohio, Oregon, Pennsylvania, Virginia, Washington.

California records.--SANTA CLARA CO.: Palo Alto, 1 ♀, VII-23-56 (BVC). TUOLUMNE CO.: Pinecrest, 1 ♀, III-21-57 (H. Ruckes, CIS).

The species *P. brevispina* may be linked to *P. sobriana* and *P. harti* Malloch*. From *P. sobriana* it may be separated by the stronger calcar bristle on hind tibia and the more evenly infuscated *m-cu* cross-vein.



Map 62. California distribution of *Phaonia caerulescens* (Stein).

Phaonia (Phaonia) caerulescens (Stein)

(Map 62)

Aricia caerulescens Stein, 1898, Berl. Entomol. Z., (1897) 42: 187.

Holotype: ♀, Moscow, Idaho (FMNH).

Geographic range.--Alberta, California, Idaho, Oregon, Utah, Washington.

California records (map 62).--This species shows a restricted range in California, associated with Transition Zone situations, extending from the central coast to moderate elevations in the foothills of the Sierra Nevada (3,000-4,000 feet), and the canyons on the east side of the Peninsular Ranges in Riverside and San Diego counties.

P. caerulescens is one of the few muscids in California which fly only during spring. The flies have been recorded from late January to May and are commonly collected in February and March in the San Francisco Bay area; adults have been taken only during February and March in southern California (often at 3,000 feet in February), and from April to June in the Sierra Nevada and northward.

As with many early spring insects, *P. caerulescens* is disproportionately selected by collectors, having been recorded from about 50 localities in

20 counties despite its flight season.

The robust species *P. caerulescens* has legs entirely black and the hypopleura usually with hairs on upper border. Adults may readily be recognized by the dark brown margins to the calyptrae.

Phaonia (Phaonia) coriatlanis Huckett

Phaonia coriatlanis Huckett, 1966, Proc. Calif. Acad. Sci., Ser. 4 34 (3): 297.

Holotype: ♂, Cuyamaca Lake, San Diego County, California (CNC).

Geographic range.--California.

California records.--LOS ANGELES CO.: Alpine Inn, Mt. Lowe, 5,000 ft. 1 ♀, VI-12-24 (J. M. Aldrich, USNM). MONO CO.: Leavitt Meadows, 7,200 ft. 1 ♀, VIII-13-63 variant, at flight trap (H. B. Leech, CAS). SAN BERNARDINO CO.: Mt. Home Canyon, San Bernardino Mountains, 1 ♀, VI-8-24 (J. M. Aldrich, USNM). SAN DIEGO CO.: Cuyamaca Lake, 1 ♂, IV-21-55, type (W. R. M. Mason, CNC). SAN MATEO CO.: San Bruno Mountains, 2 ♂, III-19-20-63 (P. H. Arnaud, CAS).

P. coriatlanis has the eyes bare or nearly so, the presutural acrosticals fine and setulose, 3 pairs of postsutural dorsocentral bristles. The male has the interfrontalia uninterrupted and well maintained caudad, and in both sexes the scutellum concolorous with the mesonotum and the palpi fuscous. The third antennal segment is usually reddish basad, though there is little evidence of this in the type specimen.

Phaonia (Phaonia) deleta (Stein)

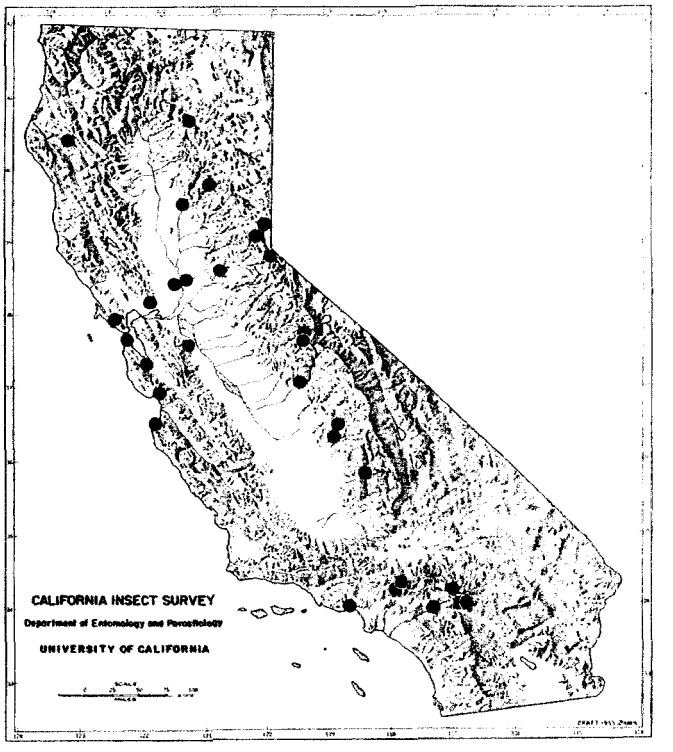
Aricia deleta Stein, 1898, Berl. Entomol. Z., (1897) 42: 178.

Syntypes: ♂ ♀, Algonquin, Illinois (FMNH); Bucks County, Pennsylvania (MCZ).

Geographic range.--California, Connecticut, Illinois, Indiana, Iowa, Massachusetts, Michigan, New Hampshire, Northwest Territories, New York, Ontario, Pennsylvania, Quebec, Texas, Vermont, Wisconsin.

California record.--MENDOCINO CO.: Willits, 1 ♂, V-30-55 (J. C. Downey, UCD).

P. deleta and *P. quieta* both have in common the palpi and basal region of third antennal segment fulvous, the scutellum partly or mostly reddish or fulvous, and 4 pairs of postsutural dorsocentral bristles. The male of *P. deleta* is notable for a series of long slender posteroventral bristles on the hind tibia, and for the presence of ventral bristles on hind femur opposite the proximal bristles in the anteroventral series. The hind tibia in both sexes may or may not have more than one well developed posterodorsal bristle.



Map 63. California distribution of *Phaonia errans* (Meigen), including the variety *luteva* (Walker).

Phaonia (Phaonia) errans (Meigen)

(Map 63)

Anthomyia errans Meigen, 1826, Syst. Beschr., 5: 112.

Phaonia errans completa Malloch, 1923, Trans. Am. Entomol. Soc., 48: 258.

Type: ♀, locality not stated (MNH Paris).

Geographic range.--Widely distributed in temperate and boreal regions of North America, reaching as far north as central Alaska and Mackenzie River Delta, the provinces from British Columbia eastward to central Quebec, Labrador and the New England states, thence southward as far as New Jersey and Ohio in the east, Colorado, and New Mexico in the Rocky Mountain states, Washington, Oregon and California in the west.

California records (map 63).--*Phaonia errans* is widespread but poorly recorded in the State, occurring in Transition and Upper Sonoran Zone areas along the coast, in the Central Valley and in the mountains to moderate elevations. The adults are active from February to October in the central

coastal area and have been collected in November in San Diego, but records are too scattered to define the voltinism accurately. In the Sierra Nevada, where the species ranges up to about 6,500 feet, collections are from May to August.

Adults have been taken at fermented syrup bait at Davis and at flowers of *Arctostaphylos*, *Prunus*, and *Salix* in the Sierran foothills during the spring.

The species *P. errans* has haired eyes and 4 pairs of postsutural dorsocentral bristles, acrosticals setulose, and differs from its nearest relatives in having the third antennal segment entirely blackish and palpi fuscous. Typical *P. errans* has the fore femora partly blackish to entirely fulvous and mid and hind pairs mainly fulvous or entirely so.

Phaonia (Phaonia) errans var. luteva (Walker)

(Map 63)

Anthomyia luteva Walker, 1849, List Dipt. Br. Mus., 4: 934.

Hyetodesia varipes Coquillett, 1900, Proc. Wash. Acad. Sci., 2:441.

Type: ♀, Nova Scotia (BMNH).

Geographic range.--Alaska, California, Connecticut, Michigan, Nova Scotia, Ontario, Quebec, Washington.

California records (map 63).--This form occurs along with the typical morph, at various times of the year. The two forms have been recorded from about 40 localities in 24 counties, with *P. luteva* accounting for about two-thirds of the records.

The variety *P. luteva* differs from typical *P. errans* in having the fore femora largely blackish and mid and hind femora partly to entirely so.

Phaonia (Phaonia) flava Stein

(Map 64)

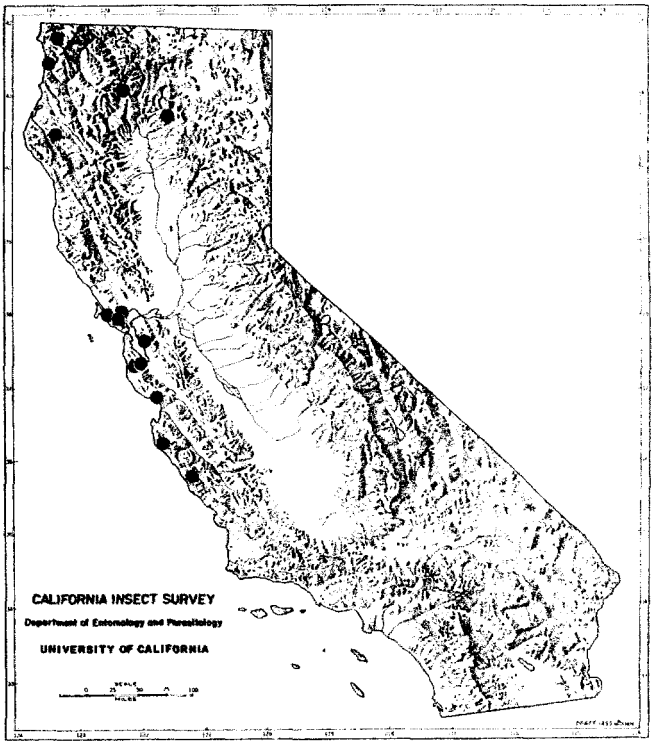
Phaonia flava Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 6.

Syntypes: ♂♂ ♀♀, Friday Harbor, Guemes Island, Bellingham, and Lynden, Washington (ZMUB).

Lectotype: ♂, Friday Harbor, Washington, V-28-06 (ZMUB).

Geographic range.--British Columbia, California, Oregon, Washington.

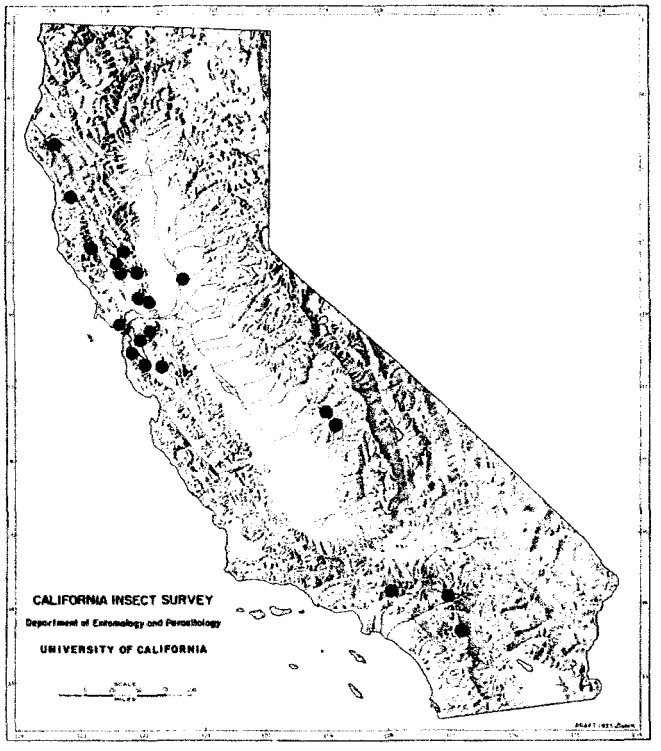
California records.--ALAMEDA CO.: Berkeley, 1 ♂, IV-29-34 (CAS); 1 ♂, V-20-41 (T. Aitken, CAS). DEL NORTE CO.: Gasquet, 1 ♀, IX-18-34 (A. L. Melander, USNM). Patrick Creek, 1 ♀, XI-14-59 (E. L. Kessel, CAS). HUMBOLDT CO.: Dyerville, 1 ♀, VI-20-35 (A. L. Melander, USNM). MARIN CO.: Fairfax, 1 ♀, VI-3-53, 1 ♂, 1 ♀, VI-11-53, 2 ♀, VI-15-53, 2 ♂, VI-22-53 (H. L. Mathis, UCD). Inverness, 1 mi. SE., 1 ♂, 1 ♀, V-30-58 (J. A. Chemsak, CIS). Mill Valley, 1 ♀, V-23-53 (H. L. Mathis, UCD). Novato, 1 ♂, VI-3-63 (D. C. Rentz, CAS). MONTEREY CO.: Big Sur, 1 ♀, IX-5-45 (A. L. Melander, USNM). Redwood Gulch, near Salmon Creek, 1 ♀, VIII-7-62 (UCR). SAN MATEO CO.: Corte de Madera Creek, near Portola, 1 ♀, X-28-53 (P. H. Arnaud, CAS). SANTA CLARA CO.: Palo Alto, 1 ♀, IV-29-06, type series (ZMUB); 1 ♂, VI-3-15 (M. C. Van Duzee, USNM). Stanford University, 2 ♀, X-21-05, type series (ZMUB; USNM). SANTA CRUZ CO.: Capitola, 1 ♀, VI-7-12-40 (M. T. and H. B. James, USNM). SHASTA CO.: Moose Camp, 1 ♂, VI-19-54, variant (E. I. Schlinger, UCD). TRINITY CO.: Coffee Creek Ranger Station, 1 ♀, VII-14-55 (J. R. Jessen, UCD).



Map 64. California distribution of *Phaonia flava* Stein.

As stated by Malloch (1923: 274) Stein's records under *P. flava* represent a mixed series of at least two species, namely *P. flava* and *P. nigricauda* Malloch. The following records of Stein I have credited to *P. nigricauda*, Blue Lake, Felton, Mesa Grande, Santa Cruz. I have not seen the syntypes from Guemes Island. The localities Stanford University, Palo Alto, Friday Harbor, Bellingham, and Lynden belong to *P. flava*.

The frons of the male in *P. flava* apparently varies considerably in width, the interfrontalia being mainly exposed to largely obscured. The male



Map 65. California distribution of *Phaonia fuscicauda* Malloch.

specimen from Shasta County has the third antennal segment entirely yellow, and not partly so as in other specimens.

Phaonia (Phaonia) fuscicauda Malloch

(Map 65)

Phaonia fuscicauda Malloch, 1918, Trans. Am. Entomol. Soc., 44: 269.

Phaonia fuscinervis Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 7.

Holotype: ♂, Berkeley Hills, California (ANSP).

Geographic range.--California, Oregon, Washington.

California records.--ALAMEDA CO.: Berkeley Hills, 1 ♂, IV-20-08, type (ANSP). Berkeley Hills, Tilden Park, 1 ♀, VIII-2-58 (J. R. Powers, CIS). Brooklyn, 1 ♂, VII-11 (Osten Saken, USNM). CONTRA COSTA CO.: Orinda, 1 ♂, V-23-54 (R. H. Goodwin, CIS). FRESNO CO.: Pinehurst, 1 ♂, 1 ♀, VI-5-23 (M. E. Phillips, USNM). HUMBOLDT CO.: Dyerville, 1 ♀, VI-20-35 (A. L. Melander, USNM). LAKE CO.: Anderson Springs, 1 ♀, VII-22-51 (W. R. Bauer, CIS). CAche Creek, Lower Lake, 3 ♂, V-10-26 (M. C. Van Dyke, CAS). North Fork Cache Creek, Highway 20, 4 ♂, 1 ♀, IV-30-54 (R. C. Bechtel, UCD), 2 ♂, 2 ♀, V-14-61 (M. E. Irwin, UCD), 8 ♂, 1 ♀, V-17-61 (F. D. Parker, UCD), 1 ♂, V-19-61 (J. S. Buckett, UCD). LOS ANGELES CO.: Monrovia Canyon, 1 ♀, VII-26-31 (C. H. and D. Martin, HCH). MARIN CO.: Lagunitas, 1 ♂, IV-28-40 (E. S. Ross, CAS). Paradise Cove, 1 ♀, VII-14-46 (E. L. Kessel, CAS). MENDOCINO CO.: Ash Creek, U. S. Highway 101, 3 ♂, VI-29-51 (W. C. Bentinck, CIS). 5 mi. E. of Hopland, 1 ♂, 2 ♀, V-28-50 (L. W. Quate, CIS). Lierly's, 1 ♀, IX-21-19 (J. MacElliard, CAS). NAPA CO.: Mt. St. Helena, 3 ♀, VII-28-40 (B. Brookman, CAS). 8 mi. NW of Napa, 1 ♂, V-17-58 (R. Augustine, CIS). Samuel Springs, 1 ♂, 2 ♀, V-30-53 (E. I. Schlinger, UCD). RIVERSIDE CO.: Strawberry Creek at Highway 79, 1 ♀, VII-29-64 (M. E. Irwin, UCR). SACRAMENTO CO.: Sacramento, 1 ♀, IV-20-59 (C. H. Laton, UCD). SAN BERNARDINO CO.: Crestline, 1 ♀, VII-4-42 (A. L. Melander, USNM). SAN MATEO CO.: Belmont, 1 ♀, VII-15-61 (R. O. Schuster, UCD). SANTA CLARA CO.: Alum Rock Park, 1 ♂, 2 ♀, VII-14-62 (J. M. Ross, BVC). Palo Alto, 1 ♂, 1 ♀, V-21-37 (T. G. H. Aitken, CAS). Stevens Creek, 2 ♂, 6 ♀, VII-23-40 (B. Brookman, CAS). SOLANO CO.: Green Valley, 1 ♂, VI-19-53 (E. I. Schlinger, UCD). Solano County, 1 ♂, VI-9-33 (CAS). TULARE CO.: Giant Forest, Sequoia National Park, 2 ♀, VIII-22-17 (R. C. Shannon, HCH).

The reddish yellow species *P. fuscicauda* may be distinguished from those of fulvous or yellowish color and with yellowish palpi by the longer aristal hairs, and in the male by the closer approximation of the eyes at the narrowest part of the frons.

Phaonia (Phaonia) limbinervis Stein

(Fig. 34; map 66)

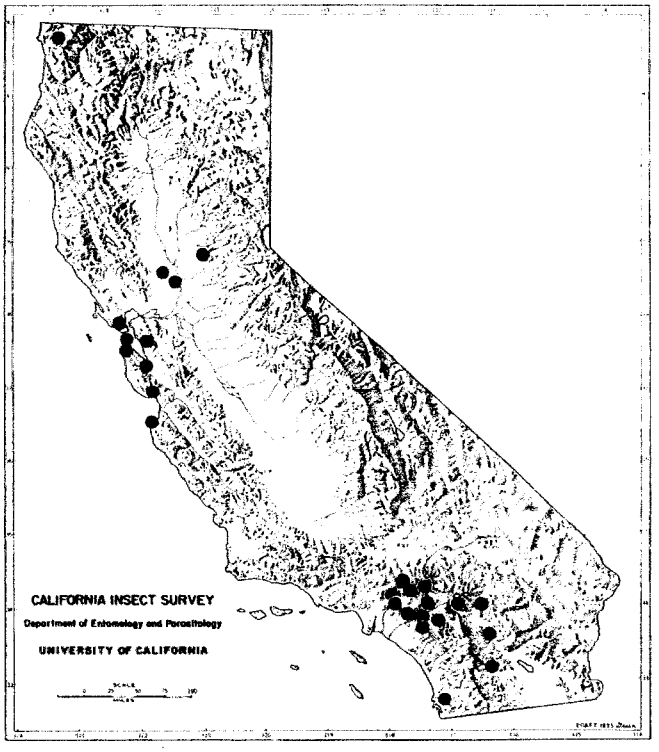
Phaonia limbinervis Stein, 1918, Budapest Magyar Nemzeti Muz., Ann. Hist. Nat. 16: 208.

Holotype: ♂, Oaxaca, Mexico (Bezzi Coll., Turin) *teste* Stein.

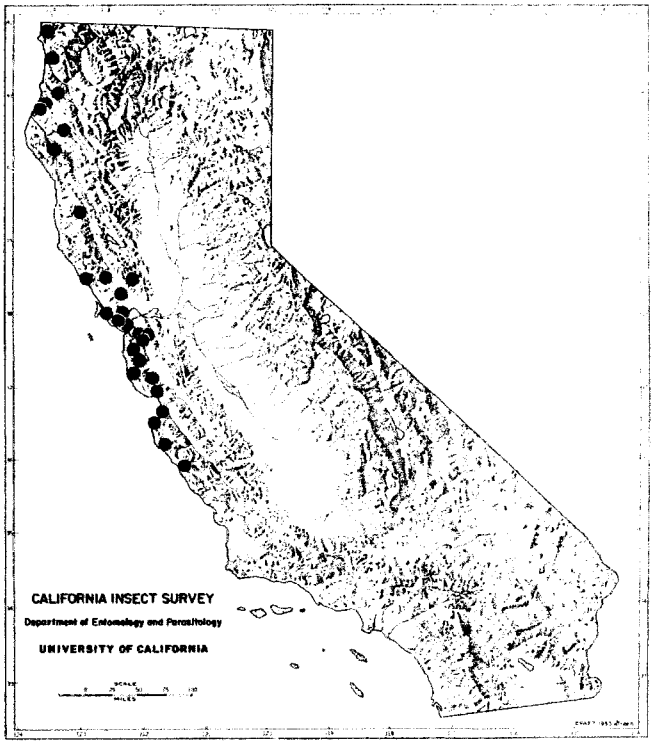
Geographic range.--Arizona, California, New Mexico, Oregon, also Mexico.

California records (map 66).--*Phaonia limbinervis* displays an unusual distribution in California, ranging along coastal Transition and Upper Sonoran Zone areas, with intrusions into the Sacramento Valley and canyons at the edge of the Colorado Desert (Palm Desert, Borrego). A single specimen record in Del Norte County (Gasquet, IX-18-34) is anomalous for this southwestern Nearctic species. The adults probably are active throughout the year, possibly in association with man's activities. There are records for every month except January in the San Francisco Bay area, and for January at Davis, and for every month except December in southern California.

Adults have been taken at baits and garbage and have been reared from drying rotten pear peelings at Mill Valley and from pear leaves in Sacramento County among material examined for the present survey. The flies were recorded from about 40 localities in 15 counties.



Map 67. California distribution of *Phaonia nigricauda* Malloch.



Map 66. California distribution of *Phaonia limbinervis* Stein.

The species *P. limbinervis* is allied to *P. texensis*, the males having the interfrontalia moderately broad throughout, and the parafrontal bristles nearly evenly developed and in series to opposite the ocellar triangle. In both sexes the mesonotum has well developed presutural acrostical bristles and the abdomen with paired brownish spots on one or more of the terga. *P. limbinervis* differs from *P. texensis* in having the third antennal segment entirely blackish, and the palpi fuscous on distal half.

Phaonia (Phaonia) neglecta Huckett

Phaonia neglecta Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 299.

Holotype: ♂, Giant Forest, Sequoia National Park, California (HCH).

Geographic range.--Alberta, California, Colorado, Oregon, Washington.

California records.--ELDORADO CO.: Echo, 1 ♀, VIII-10-40 (L. J. Lipovsky, HCH). LOS ANGELES CO.: Big Pines, 1 ♀, VI-29-48 (A. L. Melander, USNM). NEVADA CO.: Sagehen Creek, near Hobart Mills, 1 ♀, VII-15-64, in malaise trap (M. E. Irwin, UCR). TULARE CO.: Giant Forest, Sequoia National Park, 1 ♂, VII-28-29, type (P. W. Oman, HCH).

The species *P. neglecta* is allied to *P. striata*, both having presutural acrostical bristles on the mesonotum and the scutellum partly reddish or fulvous. *P. neglecta* differs from *P. striata* in the absence of hairs at the base of the posterior notopleural bristle, and in the male by the interrupted interfrontalia.

Phaonia (Phaonia) nigricauda Malloch

(Map 67)

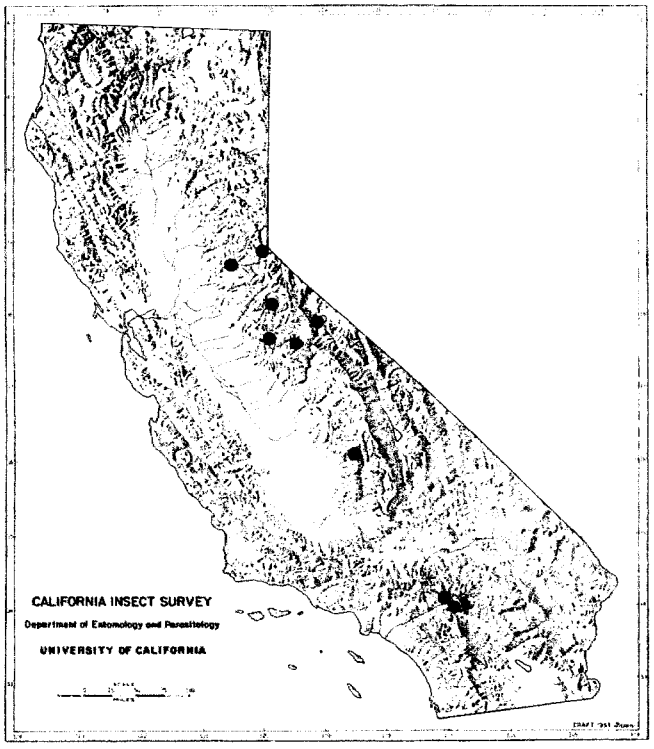
Phaonia nigricauda Malloch, 1918, Trans. Am. Entomol. Soc., 44: 268.

Phaonia flava Stein *p. p.* 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 6.

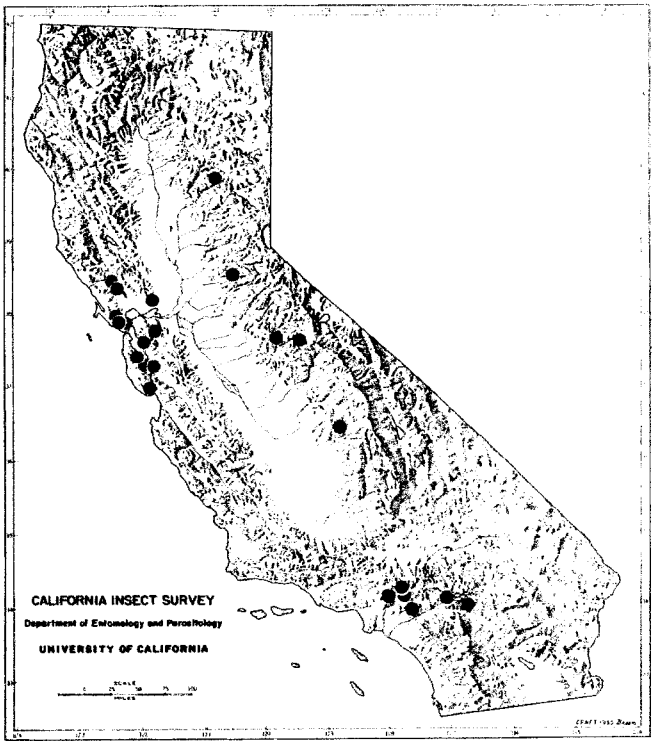
Holotype: ♂, Redwood Canyon, Marin County, California (ANSP).

Geographic range.--California.

California records (map 67).--This species occupies a narrow Vancouveran Province range along the coastal Transition Zone from the Oregon border to Kirk Creek in southern Monterey County. Most collections have been made in redwood canyons, while others are from similar, mesic habitats. The flight period encompasses April to October, but



Map 68. California distribution of *Phaonia pallidosa* Huckett.



Map 69. California distribution of *Phaonia parviceps* Malloch.

there are few records from any one area.

The survey recorded specimens from about 40 localities in 12 counties.

The species *P. nigricauda* differs from its allies *P. pallidosa* and *P. flava* by having the third antennal segment largely to entirely grayish brown or fuscous and the palpi typically brownish.

Phaonia (Phaonia) pallidosa Huckett

(Map 68)

Dialyta pallida Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 22. name preoc. Fabricius 1794.

Phaonia pallidosa Huckett, 1965, Catal. Dipt. N. Am., U.S. Dep. Agr. Handb. 276, p. 907.

Type: ♂, Juliaetta, Idaho (ZMUB).

Geographic range.--British Columbia, California, Idaho, Oregon, Washington.

California records.--EL DORADO CO.: 3 mi. S. of Camino, 1 ♂, 3 ♀, VI-23-48 (J. W. MacSwain, CIS). Fallen Leaf Lake, 1 ♀, VIII-1931 (O. H. Swezey, CAS). MARIPOSA CO.: Mirror Lake, 4,096 ft. 3 ♂, 1 ♀, V-20-31 (E. O. Essig, CIS). Yosemite, 2 ♂, VI-10-35, 3 ♂, 2 ♀, VI-14-35 (A. L. Melander, USNM). MONO CO.: Mono Lake, 2 ♀, VII-23-11 (USNM). SAN BERNARDINO CO.: Crestline, 1 ♂, VI-4-47 (A. L. Melander, USNM). Oak Glen, 1 ♂, 1 ♀, VII-2-45 (A. L. Melander, USNM). Santa Ana River, South Forks, 1 ♀, VI-19-45 (A. L. Melander, USNM). Upper Santa Ana River, 1 ♂, VII-16-46, 1 ♀, VIII-17-46 (J. L. Sperry, USNM), 1 ♀, VII-13-50 (A. L. Melander, USNM). Upper Santa Ana River, Lost Creek, 1 ♂, VII-16-46 (J. L. Sperry, USNM). SHASTA CO.: (No locality) 1 ♀, VI-26-31 (J. A. Kusche, CAS). TULARE CO.: Camp Nelson, 1 ♀, VI-24-50 (L. W. Quate, CIS). TUOLUMNE CO.: Pinecrest, 1 ♂, VIII-4-48 (P. D. Hurd, J. W. MacSwain, CIS). Yosemite, 3,880-4,000 ft. 1 ♂, VI-8-31 (F. R. Platt, CAS).

The yellow species *P. pallidosa* (= *pallida* Stein) possesses the appearance of a *Dialyta** in the conformation of the head and in the absence of a prealar bristle. From *P. flava* and *P. nigricauda* the species differs in having the entire head and appendages mainly yellow, the third antennal segment occasionally being slightly tinged.

Phaonia (Phaonia) parviceps Malloch

(Fig. 11; map 69)

Phaonia parviceps Malloch, 1918, Trans. Am. Entomol. Soc., 44: 267.

Phaonia caesia Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 4.

Holotype: ♀, Yosemite Valley, California (ANSP).

Geographic range.--California, Oregon.

California records (map 69).--This species occupies a restricted range in the State, associated with Transition Zone areas along the central coast and at moderate elevations in the Sierra Nevada (3,000-4,000 feet) and mountains of southern California. The adults have been collected from April to October in the San Francisco Bay area and May to August in the Sierra Nevada. There are 10 records from the San Gabriel and San Bernardino Mountains, all in July.

The bluish black species *P. parviceps* may be separated from associated taxa having well-developed presutural acrostical bristles and 3 pairs of postsutural dorsocentral bristles, by the fulvous legs, excepting tarsi, the black thorax and abdomen, and the weak prealar bristles.

Phaonia (Phaonia) perfida Stein

Phaonia perfida Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 13.

Type: ♂, no locality (ZMUB).

Geographic range.--California, Utah.

California record.--MARIPOSA CO.: Yosemite, 1 ♀, VI-1926 (E. O. Essig, CIS).

P. perfida may be compared with *P. quieta* and *P. deleta*, from which it differs by the absence of posteroventral bristles on the hind femur, and in the presence of slender posteroventral sensory hairs on the fore metatarsus exclusive of those at apex and at base. In *P. perfida* the parafrontals are contiguous at middle of the male frons, the palpi, scutellum, femora, tibiae, and proximal region of the third antennal segment yellowish or fulvous, tarsi fuscous, acrosticals fine and setulose, and the notopleural depression and upper border of the hypopleura have a few hairs. I have seen Stein's type-specimen of *P. perfida*.

Phaonia (Phaonia) quieta Stein

Phaonia quieta Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 14.

Syntypes: ♂♂ ♀♀, Friday Harbor, Washington (ZMUB).

Geographic range.--California, Michigan, Oregon, Utah, Washington.

California records.--MARIPOSA CO.: Village, Yosemite National Park, 1 ♂, 1 ♀, VIII-3-62 (R. R. Dreisbach, HCH). Yosemite Valley, 1 ♀, VII-3-21 (E. C. Van Dyke, CAS). MENDOCINO CO.: Mendocino National Forest, 1 ♂, VIII-26-58 (R. Tappin, UCD). NEVADA CO.: Nevada City, 1 ♀, VII-19-63 (R. M. Brown, CAS). SANTA CRUZ CO.: Loma Prieta, 1 ♀. VIII-10-54 (BVC). SHASTA CO.: Hat Creek, 1 ♂, 1 ♀, VII-8-52, 1 ♀, VII-12-52, 2 ♀, VII-16-52, 1 ♀, VIII-11-52, 1 ♂, VIII-18-52 (G. Pronin, CAS); 1 ♀, VIII-11-56 (H. Ruckes, CIS). SISKIYOU CO.: McBride Springs Campground, 1 ♂, 1 ♀, VIII-5-63 (P. H. Arnaud, CAS). SONOMA CO.: 1 ♂, 1 ♀, VII-6 (Osten Sacken, MCZ).

The species *P. quieta* is allied to *P. errans*, from which it differs in having the palpi and basal region of third antennal segment yellowish, and the sensory hairs short on the posteroventral surface of fore metatarsus.

Phaonia (Phaonia) reclusa Huckett

Phaonia reclusa Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 300.

Holotype: ♂, Upper Santa Ana River, San Bernardino County, California (USNM).

Geographic range.--California.

California record.--SAN BERNARDINO CO.: holotype locality, 1 ♂, V-12-47 (John Sperry, USNM).

The males of *P. reclusa* and *P. sobriana* have a weak short calcar bristle on the hind tibia, as in *P. antennalis*, but differ from the latter by having a shorter antennae and longer aristal hairs. The male of *reclusa* lacks the comblike series of short coarse posteroventral bristles on the hind femur common to males of *P. sobriana* and *P. limbinervis*, and possesses weaker presutural acrostical bristles. The knobs of the halteres in the type-specimen of *P. reclusa* are purple.

Phaonia (Phaonia) reflecta Huckett

Phaonia reflecta Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 301.

Holotype: ♂, Fairfax, Washington (CAS).

Geographic range.--California, Washington.

California records.--NAPA CO.: Mount St. Helena, 1 ♀, VII-28-40 (B. Brookman, CAS). RIVERSIDE CO.: Fuller Mill Creek, San Jacinto Mountains, 2 ♂, VII-28-65, variant (P. Rauch, UCR). TUOLUMNE CO.: Lyon's Dam, 1 ♀, VII-8-37 (T. G. H. Aitken, CAS).

The species *P. reflecta* runs in the keys to the same couplet with *P. parviceps*, from which it differs in its nonblack, brownish aspect, fulvous second antennal segment and in the well developed

prealar bristle. The presutural region of the mesonotum has a broad median vitta, on the margins of which are two widely separated series of acrostical bristles. The scutellum as viewed from behind has a well marked reflective fascia on the declivities. The femora and tibiae, except for the fore femora of the male, are fulvous as in *P. parviceps*. The above males from Fuller Mill Creek have the third antennal segment and palpi more widely yellowish, the abdomen more whitish gray than in the type-specimen, and have 3 pairs of postsutural dorsocentral bristles.

Phaonia (Phaonia) reversa Huckett

Phaonia reversa Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 303.

Holotype and only record.-- ♂, Mono Pass, Inyo County, California, VIII-13-57 (D. D. Linsdale, CIS) (UCB).

The blackish male of *P. reversa* may be separated from its congeners by the blackish legs but for the hind tibiae being yellowish or reddish brown. The hypopleura has no hairs on the upper border, but possesses a few along the anteroventral border of the spiracle. The species is evidently related to *P. brevispina*, differing in having the eyes more densely haired and the posterior notopleural bristle with hairs at base. The abdomen of the type is without the usual lateral processes on sternum 5. Points of similarity between the male of *P. reversa* and the species *P. uniseriata* Malloch*, known only in the female sex, should not be overlooked.

Phaonia (Phaonia) rugia (Walker)

Anthomyia rugia Walker, 1849, List Dipt. Br. Mus., 4: 923.

Aricia brunneinervis Stein, 1898, Berl. Entomol. Z., (1897) 42: 183.

Phaonia incerta Malloch, 1923, Trans. Am. Entomol. Soc., 48: 250.

Type: ♂, St. Martin's Falls, Albany River, Ontario (BMNH).

Geographic range.--Alaska, Alberta, California, Colorado, Idaho, Labrador, Manitoba, Montana, Northwest Territories, Ontario, Oregon, Quebec, Utah, Washington, Wyoming, Yukon Territory.

California records.--CONTRA COSTA CO.: Martinez, 1 ♀, IX-3-46 (H. E. Cott, UCD). MONO CO.: Sardine Creek, 1 ♀, VI-28-51 (A. T. McClay, UCD).

The species *P. rugia*, *P. caerulescens*, and *P. versicolor* Stein* typically possess hairs on the upper border of the hypopleura, and have the head, thorax, abdomen and legs black. In *P. rugia* the presutural acrosticals are setulose or fine, and the fore tibia has one or more bristly setae on the ventral surface.

Phaonia (Phaonia) sobriana Huckett

Phaonia sobriana Huckett, 1966, Proc. Calif. Acad. Sci., ser. 4 34: 304.

Holotype: ♂, Mather, Tuolumne County, California (UCB).

Geographic range.--California.

California records.--COLUSA CO.: Colusa, 1 ♂. IV-29-57 (W. H. Lange, UCD). TUOLUMNE CO.: Mather, 1 ♂, 1 ♀, VIII-1950 (A. Sokoloff, CIS).

The species *P. sobriana* may be linked to *P. brevispina* and *P. harti* Malloch*, from which it differs in having a much shorter, weak calcar bristle on the hind tibia, and the clouding of the *m-cu* cross-vein dense, and blotchy or spotlike at ends of the cross-vein.

Phaonia (Phaonia) striata (Stein)

Aricia striata Stein, 1898, Berl. Entomol. Z., (1897) 42: 179.

Syntypes: ♂♂ ♀, Moscow, Idaho (FMNH, ZMUB).

Geographic range.--California, Idaho, Washington.

California records.--LOS ANGELES CO.: Pacific Palisades, 1 ♀, IX-19-51, 1 ♀, IX-28-51 (UCLA). Santa Monica Mountains, 4 ♂, 7 ♀, VII-6-49, 5 ♂, 9 ♀, VII-3-50 (UCLA). SAN BERNARDINO CO.: Deep Creek, Mojave River, 1 ♂. VIII-14-36 (A. J. Basinger, CAS). Snow Crest Camp, 1 ♀, VII-17-52 (A. T. McClay, HCH). SAN DIEGO CO.: Ramona, 1 ♀, VII-9-52 (R. X. Schick, UCLA). SANTA CLARA CO.: Stevens Creek, 1 ♂, VII-23-40 (B. Brookman, CAS).

The species *P. striata* and *P. neglecta* are closely allied, the former differing from the latter in having hairs at the base of the posterior notopleural bristle and in usually having 4 pairs of postsutural dorsocentral bristles. In the male of *P. striata* the interfrontalia is uninterrupted caudad, and in the female the cruciate bristles are well developed. In both species the presutural acrosticals are bristlelike and the scutellum partly reddish.

Phaonia (Phaonia) texensis Malloch

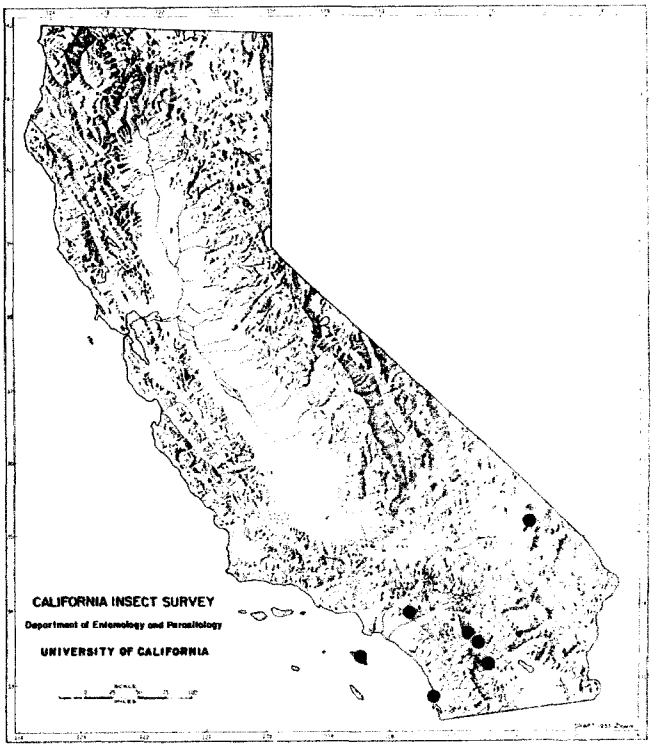
Phaonia texensis Malloch, 1923, Trans. Am. Entomol. Soc., 48: 271.

Holotype: ♂, Brownsville, Texas (IllNHS).

Geographic range.--California, Arizona, Texas, Florida.

California records.--LOS ANGELES CO.: Pebbly Beach, Santa Catalina Is., 1 ♀, IV-2-38 (W. P. Cockerell, CAS). "Los Angeles Co." 1 ♀, no date (USNM). RIVERSIDE CO.: Coyote Creek, 1 ♂, II-1-63, 1 ♀, X-15-63 (E. I. Schlinger, UCR). Deep Canyon, 1 ♂, XI-11-63, at light (E. I. Schlinger, UCR). SAN BERNARDINO CO.: Barstow, 1 ♂, IV-10-64 (J. C. Poll, BVC). 12 mi. SE. of Ivanpah, 1 ♂, V-1-56 (J. Powell, CIS). Verdemont, 1 ♂, III-25-47 (A. L. Melander, USNM). SAN DIEGO CO.: Anza St. Park, 1 ♀, III-31-53 (A.& H. Dietrich, HCH). Borrego, 1 ♀, IV-8-50 (L. W. Quate, CIS). 5 mi. S. Borrego Spr., 1 ♂, I-19-65, 1 ♂, I-26-65 (D. D. Linsdale, BVC); 2 ♀, X-26-65 (S. E. Haseltine, BVC). 3 mi. E. Borrego Spr., 1 ♂, 1 ♀, III-23-65 (S. E. Haseltine, BVC). 3 mi. W., 2 mi. S. Borrego Spr., 1 ♀, II-16-65, 1 ♂, IV-20-65, 1 ♂, X-11-65 (S. E. Haseltine, BVC). La Jolla, 2 ♀, III-7-14 (E. P. Van Duzee, CAS).

The species *Phaonia texensis* is allied to *P. limbinervis*, from which it differs in having the palpi fulvous. In the typical form of *P. texensis* the mid and hind femora are at least partly blackish.



Map 70. California distribution of *Phaonia texensis flavofemorata* Malloch.

Phaonia (Phaonia) texensis var. flavofemorata Malloch

(Map 70)

Phaonia texensis flavofemorata Malloch, 1923, Trans. Am. Entomol. Soc., 48: 271.

Holotype: ♂, Florida (USNM).

Geographic range.--California, Arizona, Texas, Florida.

In this variety the mid and hind femora are fulvous.

Subgenus Lophosceles Ringdahl

Lophosceles Ringdahl, 1922, Entomol. Tidskr., 43:3.

Type-species: *Musca mutata* Fallén, original designation.

The subgenus *Lophosceles* comprises a group of smaller species, 4 to 5.5 mm in length, related to *Phaonia*, and having the aristal hairs not longer than the basal diameter of arista, the tibiae sparsely bristled, the hind femora in the male featured by a series of closely set slender bristles on the apical third of anteroventral or posteroventral surface, or on both. Females have a wide interfrontalia and no cruciate bristles, the parafrontals are narrow and are without proclinate paraorbital bristles, or if so are weak, the parafacials for the greater part are slim, receding ventrad, the lower calyptral scale is moderately extended beyond margin of the upper, and vein R_{4+5} ends at apex of the wing.

Phaonia (Lophosceles) alaskensis Malloch

Phaonia alaskensis Malloch, 1923, Trans. Am. Entomol. Soc., 48: 272.

Holotype: ♀, Muir's Inlet, Alaska (ANSP).

Geographic range.--Alaska, British Columbia, California, Northwest Territories.

California record.--NEVADA CO.: Sagehen Creek, near Hobart Mills, 2 ♀, VII-15-64, in malaise trap (M. E. Irwin, UCR).

The above specimens from Sagehen Creek vary from the type series in having the second antennal segment blackish, concolorous with the third. The male of *P. alaskensis*, so far as I am aware, is unknown.

Genus Bigotomyia Malloch

Bigotomyia Malloch, 1921, Ann. Mag. Nat. Hist., 7: 173.

Type-species: *Spilogaster trispila* Bigot, original designation.

The genus *Bigotomyia* is closely allied to *Phaonia*, from which it differs in having cell $R._5$ of the wings constricted at its opening on the wing margin, due to a marked curvature at apex of vein $M._{1+2}$.

KEY TO SPECIES OF BIGOTOMYIA IN CALIFORNIA

Abdomen with dark reflections or checkering laterad on dorsum, sternum 1 with hairs, opening to cell $R._5$ about equal to half the length of *m-cu* cross-vein . *californiensis* Malloch

Abdomen with lateral reflections pallid or absent, sternum 1 bare, opening to cell $R._5$ at wing margin wider than half the length of *m-cu* cross-vein. *houghii* (Stein)

Bigotomyia californiensis Malloch

(Map 71)

Bigotomyia californiensis Malloch, 1923, Trans. Am. Entomol. Soc., 48: 236.

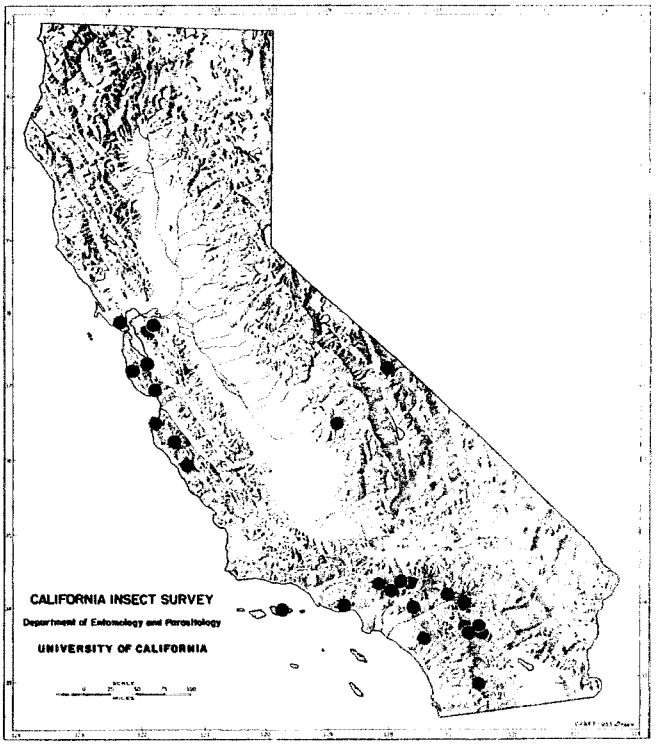
Holotype: ♂, San Antonio Canyon, San Bernardino County, California (OSUM).

Geographic range.--Arizona, California.

California records (map 71).--The austral distribution of this southwestern Nearctic species is reflected in its unusual range in California, in Upper Sonoran and Transition Zone areas of the Peninsular Range and Coast Range north to Marin County and in the southern Sierra Nevada and White Mountains.

In southern California the species ranges up to 7,000 feet in the mountains, and the adults have been taken from March in the foothills to Spetember and in December and January around Palm Springs. On the coast *B. californiensis* may fly the year around, as there are records for nearly every month except December in the Monterey Bay area.

The species *B. californiensis* is recorded from 13 counties and approximately 52 localities, based on an examination of 171 specimens, of which 80 were males and 91 females. I find that in several specimens the basal node to the veins $R._{2+3}$ and $R._{4+5}$ may be hairless on the upper surface.



Map 71. California distribution of *Bigotomyia californiensis* Malloch.

Bigotomyia houghii (Stein)

Aricia houghii Stein, 1898, Berl. Entomol. Z., (1897) 42: 177.

Phaonia inculta Stein, 1920, Arch. Naturgesch., (1918) Abt. A 84 (9): 8.

Syntypes: ♂ ♀♀, London, Ontario (FMNH).

Geographic range.--In the west *B. houghii* occurs in the privinces of British Columbia and Alberta and the states of Washington, Oregon, Idaho, Montana, and Wyoming; in the east throughout the northeastern states from New Jersey to Maine, and northward into southern Quebec; in the region of the Great Lakes and westward to as far as South Dakota. Also recorded from the south in Florida and Oklahoma, and from the southwest to southern California.

California record.--SAN DEIGO CO.: Borrego, 1 ♂, XII-16-45 (J. and G. Sperry, USNM).

Genus Pseudophaonia Malloch

Pseudophaonia Malloch, 1918, Proc. Biol. Soc. Wash., 31: 66.

Type-species: *Aricia orichalcea* Stein, original designation.

The genus *Pseudophaonia* may be associated with *Phaonia* Robineau-Desvoidy as evidenced by the presence of a distinct calcar bristle on the hind tibia. It is more closely related to the

Palaearctic genus *Polietes* Rondani*, both having numerous hairs on the pteropleura and thus differing from *Phaonia*. In *Pseudophaonia* the propleura, prosternum and hypopleura are hairless, and the females have two pairs of proclinate paraorbital bristles. Adults are recorded as frequenting the droppings of animals (Ringdahl, 1954: 26).

KEY TO SPECIES OF PSEUDOPHAONIA IN CALIFORNIA

Abdomen with golden pruinescence on tergum 5. . . . . *orichalceoides* Huckett
Abdomen with whitish gray pruinescence on tergum 5. . . *griseocaerulea* Malloch*

Pseudophaonia orichalceoides Huckett

Aricia orichalcea Stein, 1898, Berl. Entomol. Z., (1897) 42: 183. name preocc. Zetterstedt, 1849.

Pseudophaonia orichalceoides Huckett, 1965, Mem. Entomol. Soc. Can., 42 p. 322. new name.

Type: ♂, Craig's Mount,[4] Idaho (FMNH).

Geographic range.--Alberta, California, Colorado, Idaho, Massachusetts, Maine, Michigan, New Hampshire, New York, Quebec, Vermont, Washington.

California records.--SHASTA CO.: Old Station, 1 ♀, VI-22-55 (D. L. Dahlsten, UCD). TUOLUMNE CO.: Leland Meadow, 1 ♂, VII-16-57 (J. W. MacSwain, CIS). Sonora Pass, 9,624 ft. 1 ♀, VII-12-51 (E. I. Schlinger, UCD).

The male of *P. orichalceoides* has 3 strong apical spines or spurs on the ventral surface of the hind tibia.

Genus Muscina Robineau-Desvoidy

Muscina Robineau-Desvoidy, 1830, [Paris] Inst. France, [Cl. des] Sci. Math. et Phys., Acad. Roy. des Sci., Mém. présentés par divers Savans [ser. 2], 2: 406.

Type-species: *Musca stabulans* Fallén, designation by Coquillett, 1910.

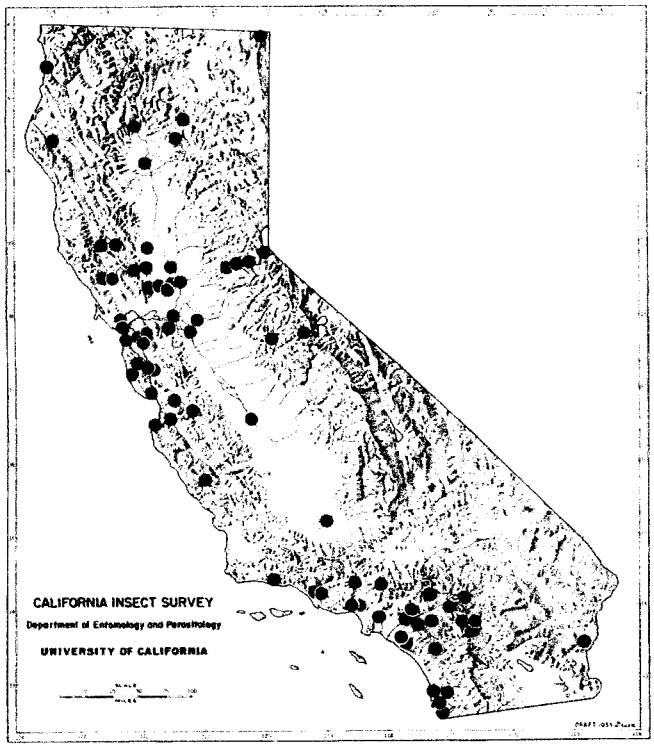
The genus *Muscina* has a calcar bristle on the hind tibia as in *Phaonia* and related genera, from which *Muscina* differs in having the anterior intraalar bristle set transversely slightly caudad of the supraalar bristle as viewed laterad (fig. 12). Vein $M._{1+2}$ is curved forward on the apical region and the arista is plumose, as in *Bigotomyia;* but *Muscina* differs from the latter in having the basal node to veins $R._{2+3}$ and $R._{4+5}$ without hairs on the upper and under surfaces. The pteropleura is hairless in distinction to *Pseudophaonia*; the buccal margins of the cheeks are without strong upturned bristles, and the female is without a pair of proclinate paraorbital bristles, as are present in *Dendrophaonia*. The larvae of *Muscina* have been bred from decayed animal and vegetable matter, human excrement, fungi, and are regarded as parasites or predators on the immature stages of certain other insects, see below.

KEY TO SPECIES OF MUSCINA IN CALIFORNIA

1. Tibiae fulvous 2
   Tibiae fuscous or blackish 3
2. Hairs of mesothoracic spiracle yellowish, second antennal segment fulvous, male with parafrontals contiguous caudad . *fulvacrura* Snyder
   Hairs of mesothoracic spiracle brownish to black, second antennal segment partly grayish tinged, male with parafrontals narrowly separated caudad . *stabulans* (Fallén)
3. Third antennal segment partly or entirely reddish 4
   Third antennal segment black 6
4. Second antennal segment fulvous, lateral declivities of scutellum without setulae at ventral margin . . . . . *dorsilinea* (van der Wulp)
   Second antennal segment mainly fuscous, lateral declivities of scutellum with fine setulae at ventral margin . 5
5. Lower calyptral scale broadly expanded mesocaudad, subtruncate, and extending at base to base of scutellum . . *Pararicia pascuorum* (Meigen)
   Lower calyptral scale not extended broadly mesocaudad, and at base not extended to base of scutellum . . . *Pararicia pabulorum* (Fallén)*
6. Margins of calyptrae pale, yellowish to pale brown . . . . . *assimilis* (Fallén)
   Margins of calyptrae dark or seal-brown . *flukei* Snyder

I have included the species *Pararicia pascuorum* (Meigen) and *P. pabulorum* (Fallén) in the above key since the taxon *Pararicia*, connecting the Muscinae with the Phaoniinae, was not discussed in the treatment of the Muscinae of California by Eldridge and James (1957), and since the two species have been classed by many authors as belonging to the genus *Muscina*.

4. More recently changed to Craigmont.



Map 72. California distribution of *Muscina assimilis* (Fallén).

The California records of *Pararicia pascuorum* (Meigen) are based on a consignment of specimens from the Bureau of Vector Control. The series, 7 males and 7 females, were reared from the carcasses of three woodrats (*Neotoma fuscipes*) by P. Eddy, in the vicinity of Garin Wood at Hayward, Alameda County, the adults emerging respectively on June 13, 3 ♂, 2 ♀; June 16, 4 ♀; September 9, 1972, 4 ♂, 1 ♀. Also included with the material was 1 ♀ from Los Angeles, taken on May 18, 1964.

Muscina assimilis (Fallén)

(Fig. 12; map 72)

Musca assimilis Fallén, 1823, Monographia Muscidum Sveciae, Muscides, p. 56.

Anthomyia omole Walker, 1849, List Dipt. Br. Mus., 4: 930.

Anthomyia similis Walker, 1849, List Dipt. Br. Mus., 4: 930.

Anthomyia nigra Walker, 1849, List Dipt. Br. Mus., 4: 931.

Type: ♀, Southern Sweden.

Geographic range.--Widely distributed in continental North America, reaching to the north as far as northern Alaska, Yukon Territory, and Mackenzie River Basin, thence eastward to northern Manitoba, central Quebec and Labrador, southward to include most of the provinces and states, to as far south as Georgia, Oklahoma, New Mexico, Arizona, and southern California. Also the Kamchatka Peninsula.

California records (map 72).--Widespread through much of the State's lower elevation areas except in the deserts. *M. assimilis* probably flies throughout the year in areas of California with moderate winters, but there are incomplete data to give a full seasonal picture. In the San Francisco Bay area and in the Sacramento Valley adults have been collected in every month except December, and in cismontane southern California from January to October. The species evidently is more austral than other widespread muscids in California, occurring primarily in the foothills to moderate elevations, with a few scattered summer records for boreal situations in the Warner Mountains and central Sierra Nevada.

Specimens of *M. assimilis* were recorded from 33 counties and approximately 88 localities, and were represented by 157 males and 200 females.

Both *M. assimilis* and *M. flukei* have the antennae and legs blackish, thus at least partly differing from their congeners; the scutellum and palpi may be entirely blackish, partly reddish testaceous, or rufous. In *M. assimilis* the margins of the calyptrae are pale, varying from yellowish to pale brown.

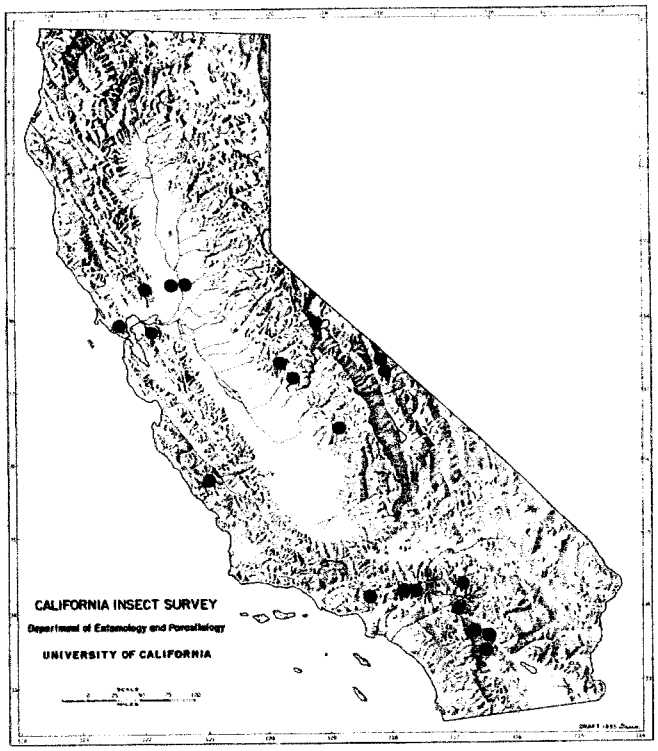
The biology and habits of *M. assimilis* have been noted briefly by Keilin (1917: 405-407). Adults have been observed in outdoor privies, on animal excrement and carrion (Howard, 1900: 576; Gill, 1955: 653; Coffey, 1966: 216). Larvae have been reared from decaying vegetables and various fungi, from mushroon beds, dead insects and molluscs (Keilin, 1917: 406; Séguy, 1923: 352; Thomas, 1939: 30; Hennig, 1962: 762), and in feeding habits may be regarded as partly carnivorous and omnivorous.

Muscina dorsilinea (van der Wulp)

(Map 73)

Clinopera dorsilinea van der Wulp, 1896, Biolog. Centr.-Amer., Dipt. 2: 308.

Muscina aurantiaca Hough, 1889, Biol. Bull., 1: 25.



Map 73. California distribution of *Muscina dorsilinea* (van der Wulp).

Type: ♀, Amula, Guerrero, Mexico (Univ. Amsterdam Coll.) *teste* Snyder.

Geographic range.--Alabama, California, Florida, Georgia, New Mexico, South Dakota, Wyoming.

California records.--CONTRA COSTA CO.: 3 mi. E. of Clayton, 1 ♂, V-4-53 (P. H. Arnaud, CAS). INYO CO.: Silver Canyon, White Mountains, 1 ♂, V-10-26 (J. O. Martin, CAS). LOS ANGELES CO.: Mountains near Claremont, 1 ♀, no date (Baker, USNM). MADERA CO.: Chilkott Lake, 1 ♂, VII-23-46 (H. P. Chandler, CAS). MARIN CO.: Cypress Ridge [nr. Woodacre], 1 ♀, IV-11-20 (A. J. Basinger, CAS). MARIPOSA CO.: Miami Ranger Station, 1 ♂, V-18-42 (CIS). MONO CO.: Mono, 1 ♀, VII-13-50, 1 ♂, VIII-20-50, both at banana trap (A. Sokoloff, USNM). White Mountains, 10,150 ft. 3 mi. N of Inyo County, 1 ♂, VIII-20-63, flight trap (H. B. Leech, CAS). MONTEREY CO.: Bryson, 1 ♂, V-20-20 (E. P. Van Duzee, CAS). NAPA CO.: Monticello, 1 ♀, IV-8-51 (M. F. McClay, UCD). RIVERSIDE CO.: Deep Canyon, 1 ♂, XI-12-63 (E. I. Schlinger, UCR). Indio area, 2 ♀, II-3-49 (E. G. Meyers, BVC). Mt. Home Spring, 6,400 ft. Santa Rosa Mountain, 1 ♀, IX-10-64 (E. I. Schlinger, UCR). Upper Deep Canyon, 1 ♀, III-19-65 (M. E. Irwin, UCR). SACRAMENTO CO.: Sacramento, 2 ♀, IX-13-29, *ex Boletus* sp. (Mackie, USNM). SAN BERNARDINO CO.: Baldy Grade Falls, San Gabriel Mountains, 2 ♂, 2 ♀, X-25-35 (A. J. Basinger, CAS). Bear Valley, 1 ♀, IX-1-36 (A. J. Basinger, CAS). 16 mi. N. of Lucerne, 1 ♀, IV-15-64 (D. D. Linsdale, BVC). TULARE CO.: Woodlake, 1 ♀, III-22-47 (W. Frazier, CIS). YOLO CO.: Davis, 1 ♀, III-5-53, at fish meal-fermented syrup baits, 1 ♀, III-6-53, at fermented syrup bait (E. C. Carlson, UCD).

The species *M. dorsilinea* has the third antennal segment partly or mostly reddish and the palpi fulvous, as in *M. stabulans*, from which it may be distinguished by the fuscous tibiae, fulvous second antennal segment, and in the male by the contiguous parafrontals on the caudal half of the frons.

Muscina flukei Snyder

Muscina (Muscina) flukei Snyder, 1955, Ann. Entomol. Soc. Am., 48: 446.

Holotype: ♂, Cameron Pass, Colorado (AMNH).

Geographic range.--Alberta, British Columbia, California, Colorado, Montana, Nevada.

California records.--EL DORADO CO.: Strawberry, 1 ♂, VII-28-50 (M. E. Gardner, USNM). TUOLUMNE CO.: Kennedy Meadows, 1 ♀, VIII-16-62 (U. K. Gogia, CIS).

M. flukei differs from *M. assimilis* in having the margins of calyptrae dark brown.

Muscina fulvacrura Snyder

Muscina (Muscina) fulvacrura Snyder, 1955, Ann. Entomol. Soc. Am., 48: 449.

Holotype: ♂, Mill Creek, Walla Walla, Washington (USNM).

Geographic range.--California, Colorado, Washington, Wyoming.

California record.--INYO CO.: Independence, 1 ♂, X-8-63 (J. D. Birchim, HCH).

M. fulvacrura may be distinguished from its congeners by the pallid, yellowish peritreme of the mesothoracic spiracle. The antennae, palpi, mid and hind femora, and all tibiae are fulvous.

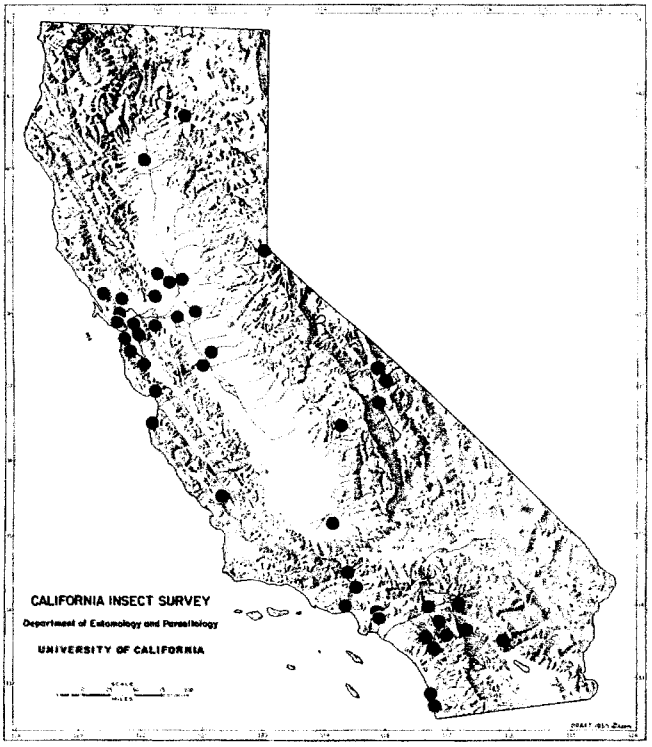
Muscina stabulans (Fallén)

(Map 74)

Musca stabulans Fallén, 1823, Monographia Muscidum Sveciae, Muscides, p. 52.

Types: ♂ ♀, Sweden.

Geographic range.--The species is widely distributed throughout the more temperate regions of North America, including most of the provinces and states; in the north from Alaska to Newfoundland, in the south from Georgia to California. Specimens have also been taken at Fairbanks and Point Barrow in Alaska, Coral Harbor in the Northwest Territories, and in the Kamchatka Peninsula.



Map 74. California distribution of *Muscina stabulans* (Fallén).

California records (map 74).--*Muscina stabulans* occurs broadly through lower elevation portion of the State, in association with Transition and Upper Sonoran Zone situations near the coast, in the Central Valley, and east of the Sierra Nevada to the margins of the desert in southern California (Coachella Valley). It is generally lacking from mountain areas, although there is a single specimen record from Meek's Bay at Lake Tahoe.

The adults are active throughout the warmer months, having been taken the year around on the central coast, and from February to October in the Sacramento Valley. Records elsewhere are mostly from April to July but probably are too scattered to allow conclusions. There are single specimens from Independence taken in January, and from Downey, Los Angeles County, in December.

The records for the present survey represent about 60 localities in 24 counties.

The species *M. stabulans* has the tibiae fulvous, the second antennal segment partly grayish tinged, and the parafrontals of the male separated caudad, thereby differing in one or more respects from *M. dorsilinea* and *M. fulvacrura*. Its biology and role in pathogenesis have been summarised by Keilin (1917: 415-421), James (1948: 135-137), and Hennig (1962-1963: 768-769). Adults are known to frequent buildings for animal and human habitation in search of food, shelter, and for oviposition. The flies are commonly found in the presence of tainted food or decomposing organic matter. Larvae have been bred from blemished or partly decayed fruits and vegetables, various fungi, animal dung, human excreta, carrion, nests of starlings, sparrows, swallows, and from dead snails and earthworms. They have been recorded as parasites or predators on a wide variety of insects in the immature stages, belonging to the orders Lepidoptera, Hymenoptera, Orthoptera, Diptera and Coleoptera (Howard, 1900: 574-576; Séguy, 1923: 354, 1932: 22; Thomsen and Hammer, 1936: 597; Winfield, 1961: 170; Hennig, 1963: 769; Coffey, 1966: 216.

LITERATURE CITED

Aldrich, J. M.

1905. A catalogue of North American Diptera. Misc. Collect. Smithson. Inst., 46. No. 1444 pp. 1-680.

Brues, C. T., Melander, A. L., and F. M. Carpenter

1954. Classification of insects: (Revised ed.). Harvard University, Bull. Mus. Comp. Zool., 108: 1-917, 1219 figs.

Chillcott, J. G.

1958. Two new species of *Euryomma* Stein (Muscidae: Diptera) from Panama. Can. Entomol., 90: 725-731, 21 figs.

1961. A revision of the nearctic species of Fanniinae (Diptera: Muscidae). Can. Entomol., (1960) 92 Suppl. 14 pp. 1-295, 289 figs.

1965. New species and stages of nearctic Fannia R.-D. (Diptera: Muscidae) associated with nests of Hymenoptera. Can. Entomol., 97: 640-647, 18 figs.

Coffey, M. D.

1966. Studies on the association of flies (Diptera) with dung in southeastern Washington. Ann Entomol. Soc. Am., 59 (1): 207-218.

Cole, F. M., and E. I. Schlinger

1969. The flies of Western North America. Univ. California Press, xi-693 pp. illus.

Collart, A.

1933. Diptères élevés des nids de Guepês. Bull. Mus. R. Hist. Nat. Belg., 9: 1-8.

Collin, J. E.

1939. On various new or little known British Diptera, including several species bred from nests of birds and mammals. Entomol. Mon. Mag., 75: 134-154, 7 figs.

Coquillett, D. W.

1901. Types of anthomyid genera. J. N.Y. Entomol. Soc., 9: 134-146.

Curran, C. H.

1934. The families and genera of North American Diptera. 512 pp., 235 figs., 2 pls.

Cuthbertson, A.

1937. Biological notes on some Diptera of southern Rhodesia. Trans. Rhod. Sci. Assoc., 35: 16-34.

De Wilde, B. De Vos

1935. Contribution à l'étude des larves de Diptères Cyclorrhaphes, plus spécialement des larves d'Anthomyides. 125 pp, 23 pls.

Donisthorpe, H.

1922. Notes on a few species of Diptera bred from the larval stage. Entomol. Rec. 34: 189.

Eldridge, B. F., and M. T. James

1957. The typical muscid flies of California (Diptera: Muscidae, Muscinae). Bull. Calif. Insect Surv. 6: 1-17, 3 pls.

Emden, F. I. van

1940. Ruwenzori Expedition 1934-5, Vol. 2 No. 4 Muscidae: B.-Coenosiinae, pp. 91-255, 82 figs.

1941. Keys to the Muscidae of the Ethiopian region. Scatophaginae, Anthomyiinae, Lispinae, Fanniinae. Bull. Entomol. Res., 32 Part 3 pp. 251-275.

Evans, A. M.

1930. Observations on the predacious habits and prey of *Coenosia humilis* Meig. (Anthomyiidae). Trans. R. Entomol. Soc. Lond., 78 Part II pp. 325-329.

Falcoz, L.

1921. Matériaux pour l'étude de la faune pholéophile. lre note: Diptères, avec la description d'une espèce nouvelle de *Sphaerocera* Latr. Bull. Soc. Entomol. Fr., pp. 137-142.

Garcia, R., and F. J. Radovsky

1962. Haematophagy by two non-biting muscid flies and its relationship to tabanid feeding. Can. Entomol., 94: 1110-1116, 2 figs.

Gill, G. D.

1955. Filth flies of central Alaska. J. Econ. Entomol., 48 (6): 648-653.

Hall, D. G.

1937. New muscoid flies (Diptera) in the United States National Museum. Proc. U. S. Natl. Mus., 84: 201-216.

Hammer, O.

1941. Biological and ecological investigations on flies associated with pasturing cattle and their excrement. Vidensk. Medd. Dan. Naturhist. Foren. Kbh., Bd. 105 pp. 141-393, 50 figs.

Hennig, W.

1952. Die Larvenformen der Dipteren, 3 Teil 628 pp., 338 figs., 21 pls.

1955-1966. *In* Lindner, Die Fliegen der palaearktischen Region. Bd. 7 63b Muscidae. (1955) pp. 1-96. (1956) pp. 97-144. (1961) pp. 481-528. (1962) pp. 673-768. (1963) pp. 769-816. 63a Anthomyiidae (1966) pp. 1-96.

1965. Vorarbeiten zu einem phylogenetischen System der Muscidae (Diptera: Cyclorrhapha). Stuttg. Beitr. Naturkd., Nr. 141 pp. 1-100.

Hewitt, C. G.

1912. *Fannia (Homalomyia) canicularis* Linn. and *F. scalaris* Fab. An account of the bionomics and the larvae of the flies and their relation to myiasis of the intestinal and urinary tracts. Parasitology, 5 (3); 161-174, 7 figs.

1914. The House-Fly, *Musca domestica* Linn. Its structure, habits, development, relation to disease, and control. University Press, Cambridge.

Hobby, B. M.

1931. The prey of *Coenosia tigrina* F., and other species of the genus. Proc. R. Entomol. Soc. Lond., 6: 13-15.

1934. Notes on predacious anthomyiidae and cordyluridae (Dipt.). Entomol. Mon. Mag., 70: 185-190, 2 figs.

Howard, L. O.

1900. A contribution to the study of the insect fauna of human excrement. Proc. Wash. Acad. Sci., 2: 541-604.

1901. On some diptera bred from cow-manure. Can. Entomol., 33: 42-44.

Huckett, H. C.

1954. A review of the North American species belonging to the genus Hydrotaea Robineau-Desvoidy (Diptera, Muscidae). Ann. Entomol. Soc. Am., 47 (2): 316-342.

1965. The Muscidae of Northern Canada, Alaska, and Greenland (Diptera). Mem. Entomol. Soc. Can., No. 42 369 pp., 280 figs.

1971. The Anthomyiidae of California. Exclusive of the subfamily Scatophaginae (Diptera). Bull. Calif. Insect Surv., 12: 1-121, 111 figs.

James, M. T.

1948. The flies that cause myiasis in man. U. S. Dep. Agric., Misc. Publ. 631. 175 pp., 98 figs.

Johannsen, O. A.

1935. Aquatic Diptera. Part II. Orthorrhapha-Brachycera and Cyclorrhapha. N. Y. (Cornell) Agric. Exp. Stn., Mem. 177 pp. 1-62, 12 pls.

Johnson, W. T., and C. E. Venard

1957. Observations on the biology and morphology of *Ophyra aenescens* (Diptera: Muscidae). Ohio J. Sci., 57(1): 21-26, 11 figs., 1 pl.

Keilin, D.

1917. Recherches sur les Anthomyides à larves carnivores. Parasitology, 9 (3): 325-450, 12 pls.

Knab, F.

1916. Four european diptera established in America. Insecutor Inscitiae Menstruus, 4 (1-3): 1-4.

Lamborn, W. A.

1920. The habits of a dipteron predaceous on mosquitos in Nyasaland. Bull. Entomol. Res., 11: 279-281.

Lampa, S.

1887. Om fluglarvers förekomst i tarmkanalen hos menniskan. Entomol. Tidskr., 8: 5-20.

Laurence, B. R.

1953. Some Diptera bred from cow dung. Entomol. Mon. Mag., 89: 281-282.

Lesne, P.

1921. La Faune entomologique des fosses d' aisances de la région parisienne. Les Fannia scatophages. Bull. Mus. Natl. Hist. Nat. Paris, 27: 53-58.

1923. La faune entomologique des fosses d' aisances et des excréments humains. Bull. Mus. Natl. Hist. Nat. Paris, 29 (2): 161-167.

Linnaeus, C. von

1758. Systema naturae....Ed. 10, Vol. 1, 824 pp.

Malloch, J. R.

1913. Notes on some American Diptera of the genus Fannia, with descriptions of new species. Proc. U. S. Natl. Mus., 44: 621-631, 1 pl.

1917. A key to the North American genera of Coenosiinae (Diptera, Anthomyiidae). Bull. Brooklyn Entomol. Soc., 12 (2): 35-37.

1918. Diptera from the southwestern United States. Paper IV. Anthomyiidae. Trans. Am. Entomol. Soc., 44: 263-319, 1 pl.

1920. Descriptions of new North American Anthomyiidae (Diptera). Trans. Am. Entomol. Soc., 46: 133-196, 3 pls.

1921. Exotic Muscaridae (Diptera) I. Ann. Mag. Nat. Hist., ser. 9 7:161.

1923. Flies of the anthomyiid genus Phaonia Robineau-Desvoidy and related genera, known to occur in North America. Trans. Am. Entomol. Soc., 48: 227-282.

1932. Muscidae of the Marquesas Islands. Pac. Entomol. Surv. Publ., I Art. 21 pp. 193-203.

Marchand, W.

1923. The larval stages of *Limnophora discreta* Stein (Diptera, Anthomyidae). Bull. Brooklyn Entomol. Soc., 18: 58-62.

Mohr, C. O.

1934. A study of the succession, relative numbers, and biologies of bucoprophilous insects. An abstract of a thesis. 6 pp. Urbana, Illinois.

Motter, M. G.

1898. A contribution to the study of the fauna of the grave. J. N.Y. Entomol. Soc., 6: 201-231.

Niblett, M.

1955. Diptera bred from fungi. Entomol. Mon. Mag., 91 (1907): xxxix.

Oliviera, S. J. de

1941. Sôbre *Ophyra aenescens* (Wiedemann, 1830) (Diptera: Anthomyidae). Arq. Zool. Estado São Paulo, 2 Art. 15 pp. 341-355, 3 pls.

Portschinsky, I. A.

1910. Recherches biologiques sur le *Stomoxys calcitrans* L., et biologie comparée des mouches coprophages. Publ. Entomol. Bureau, Russian Dept. of Land Administr. and Agric., Vol. 8 no. 8 90 pp. (in Russian)

Ramachandra Rao, R. S. Y.

1925. A short note on the habits and food plants of some of the Indian species of *Atherigona* described by Mr. Malloch. Mem. Dep. Agric. India. Entomol. Ser. 8 (11): 123-125.

Ringdahl, O.

1924. Översikt av de hittills i vårt land funna arterna tillhörande släktena Mydaea R. D. och Helina R. D. (Muscidae). Entomol. Tidskr., 45: 39-66.

1954. Svensk Insektfauna. XI Muscidae hafte 1, pp. 1-91, 121 figs.

Roback, S. S.

1951. A classification of the muscoid calyptrate Diptera. Ann. Entomol. Soc. Am., 44: 327-361, 2 figs., 7 pls.

Sabrosky, C. W.

1949. The muscid genus *Ophyra* in the Pacific Region (Diptera). Proc. Hawaii. Entomol. Soc., 13 (3): 423-432, 12 figs.

Schiner, J. R.

1862. Fauna Austriaca, Die Fliegen, I: 674 pp.

Séguy, E.

1923. Faune de France. No. 6 Diptères Anthomyides, 393 pp.

1925. Etudes sur les anthomyides. Encyclopédie entomologique, sér. B Diptera I: 125-136.

1929. Etude sur les Diptères à larves commensales ou parasites des oiseaux de l'europe occidentale. Encyclopédie entomologique, sér. B Diptera 5 fasc. 2 pp. 63-82, 27 figs.

1932. Etude sur les Diptères parasites ou predateurs des sauterelles. Encyclopédie entomologique, sér. B. Diptera 6: 11-40.

1935. Notes biologiques et systematiques sur les Diptères. Encyclopédie entomologique, sér. B Diptera 8: 155-172, 4 figs.

1937. *In* Wytsman, Genera insectorum. Diptera, Fam. Muscidae. Fasc. 205 604 pp., 9 pls.

1946 Notes biologiques et taxonomiques sur les Diptères. Encyclopédie entomologique, sér. B. Diptera 10: 105-150.

1950. La Biologie des Diptères. Encyclopédie entomologique, sér. A 26: 609 pp., 225 figs., 10 pls.

Smith, K. G. V.

1954. Breeding records of two British Muscidae (Diptera). Entomol. Mon. Mag., 90: 222.

Stein, P.

1895. Die Anthomyidengruppe Homalomyia nebst ihren Gattungen und Arten. Berl. Entomol. Z., 40: 1-141.

1907. *In* Katalog der Palãarktischen Dipteren, Bd. 3 637 pp.

1919. Die Anthomyidengattungen der Welt, analytisch bearbeitet, nebst einem kritisch-systematischen Verzeichniss aller ausser-europäischen Arten. Arch. Naturgesch., (1917) 83 A (1): 85-178.

Stone, A., C. W. Sabrosky et al.

1965. A catalogue of the Diptera of America North of Mexico. U. S. Dep. Agric., Agric. Handbk. 276 1696 pp.

Stork, M. N.

1936. A contribution to the knowledge of the puparia of Anthomyidae. Tijdschr. Entomol., 79: 94-168, 35 figs.

Taschenberg, E. L.

1880. Praktische Insekten-Kunde. IV: 99-136, figs. 26-33.

Tashiro, H. and H. H. Schwardt

1953. Biological studies of horse flies in New York. J. Econ. Entomol., 46: 813-822, 4 figs., 6 tabs.

Thomas, C. A.

1939. The animals associated with edible fungi. J. N.Y. Entomol. Soc., 47: 11-37.

Thomsen, M., and O. Hammer

1936. The breeding media of some common flies. Bull. Entomol. Res., 27 (4): 572-574, 580-582.

Thomson, R. L. M.

1937. Observations on the biology and larvae of the Anthomyidae. Parasitology, 29 No. 3 pp. 273-358, 157 figs.

Williams, F. X.

1939. Biological studies in Hawaiian water-loving insects. Part III. Diptera or true flies. A. Ephydridae and Anthomyiidae. Proc. Hawaii. Entomol. Soc., (1938) 10: 85-119, 1 fig., 9 pls.

Williston, S. W.

1908. Manual of North American Diptera. Ed. 3, 405 pp. 163 figs. New Haven, Connecticut.

Winfield, A. L.

1961. [Larvae of *Muscina stabulans* as predators on larvae of cabbage stem weevil, *Ceuthorhynchus quadridens* Panzer.] Entomol. Mon. Mag., 97: 170.

PLATES

Fig. 1 *Schoenomyza dorsalis sulfuriceps* Malloch ♂, showing weak or narrow frontal wedge on interfrontalia.

Fig. 2 *Schoenomyza dorsalis* Loew ♂, showing broad dark frontal wedge on interfrontalia.

Fig. 3 *Lispocephala erythrocera* (Robineau-Desvoicy) ♂, with anterior pair of paraorbital bristles set midway on parafrontals.

Fig. 4*a* *Pogonomyia amnicola* Huckett ♀, showing aristal hairing.

Fig. 4*b* *Pogonomyia santamonicae* Huckett ♀, showing aristal hairing.

Fig. 5 *Pogonomyia amnicola* Huckett ♂, profile of male head.

Fig. 6 *Pseudocoenosia nigropolita* (Malloch) ♂, with paraorbital bristles set caudad on parafrontals.

Fig. 7 *Euryomma peregrinum* (Meigen), with second pair of presutural dorsocentral bristles set near midway on presutural region of mesonotum.

Fig. 8 *Fannia canicularis* (Linnaeus), with second pair of presutural dorsocentral bristles set caudad of midway on presutural region of mesonotum.

Fig. 9 *Coenosia (Limosia) rubrina* Huckett ♀, showing nonspinular nature of setulae on anterior surface of humeral callosities, and of anterior setae on planes of acrostical and dorsocentral bristles.

Fig. 10 *Coenosia (Limosia) albibasis* Stein ♀, showing spinular nature of setulae on anterior surface of humeral callosities, and of anterior setae on acrostical and dorsocentral planes.

Fig. 11 *Phaonia parviceps* Malloch, diagram showing first intraalar bristle (ia) set on a transverse plane cephalad of supraalar bristle (sa).

Fig. 12 *Muscina assimilis* Fallén, diagram showing first intraalar bristle (ia) set on a transverse plane caudad of supraalar bristle (sa).

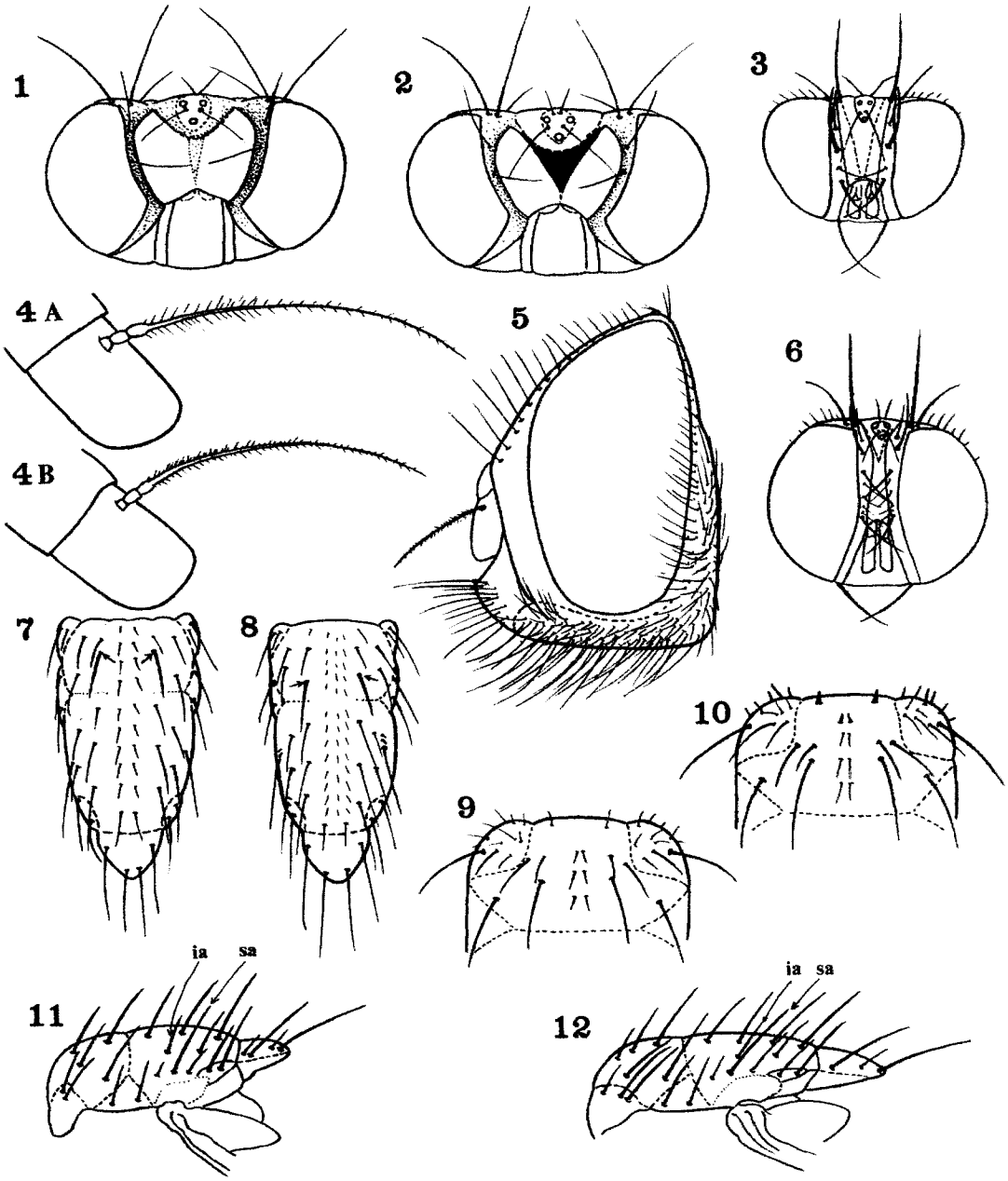

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Fig. 13 *Helina nigripennis* (Walker) ♀, with predorsal interspatial bristle present in mesopleural series.

Fig. 14 *Helina spinosa* (Walker) ♀, with predorsal interspatial bristle absent in mesopleural series.

Fig. 15 *Lispocephala erythrocera* (Robineau-Desvoidy), with lower (ventral) stigmatal bristle sloping downward, on anteroventral region of mesopleuron.

Fig. 16 *Mydaea pilifera* Huckett ♀, with hairs on anteroventral angle of hypopleuron adjacent hind coxa, (a) enlarged.

Fig. 17 *Fannia serena* (Fallén), with truncated lower calyptral scale.

Fig. 18 *Fannia brevicauda* Chillcott, with lobate lower calyptral scale.

Fig. 18a *Hydrotaea meteorica* (Linnaeus) ♂, posterior view of preapical prongs of fore femur.

Fig. 19 *Coenosia (Neodexiopsis) ovata* Stein ♀, with preapical posterior bristle present on hind femur.

Fig. 20 *Coenosia (Limosia) rufibasis* Stein ♀, with preapical posterior bristle absent on hind femur.

Fig. 21 *Limnophora incrassata* Malloch ♂, with prebasal ventral bulge on hind femur.

Fig. 22 *Limnophora discreta* Stein ♂, with prebasal ventral bulge absent on hind femur.

Fig. 23 *Fannia flavibasis* Stein ♂, with series of posteroventral setulae present on hind femur.

Fig. 24 *Fannia flavitibia* Stein ♂, with series of posteroventral setulae lacking on hind femur.

Fig. 25 *Coenosia (Limosia) rubrina* Huckett, with apical posteroventral bristle robust on mid tibia.

Fig. 26 *Coenosia (Limosia) albibasis* Stein, with apical posteroventral bristle weak or short on mid tibia.

Fig. 27 *Fannia flavitibia* Stein ♂, showing ventral surface upward and with basal fasciculus on mid metatarsus.

Fig. 28 *Lispe probohemica* Speiser ♂, dorsal view of mid tarsus.

Fig. 29 *Lispe brevipes* Aldrich ♂, dorsal view of hind tarsus.

Fig. 30 Segment 5 of hind tarsus in male of *Lispe brevipes* Aldrich (a), and in male of *Lispe jamesi* Snyder (b).

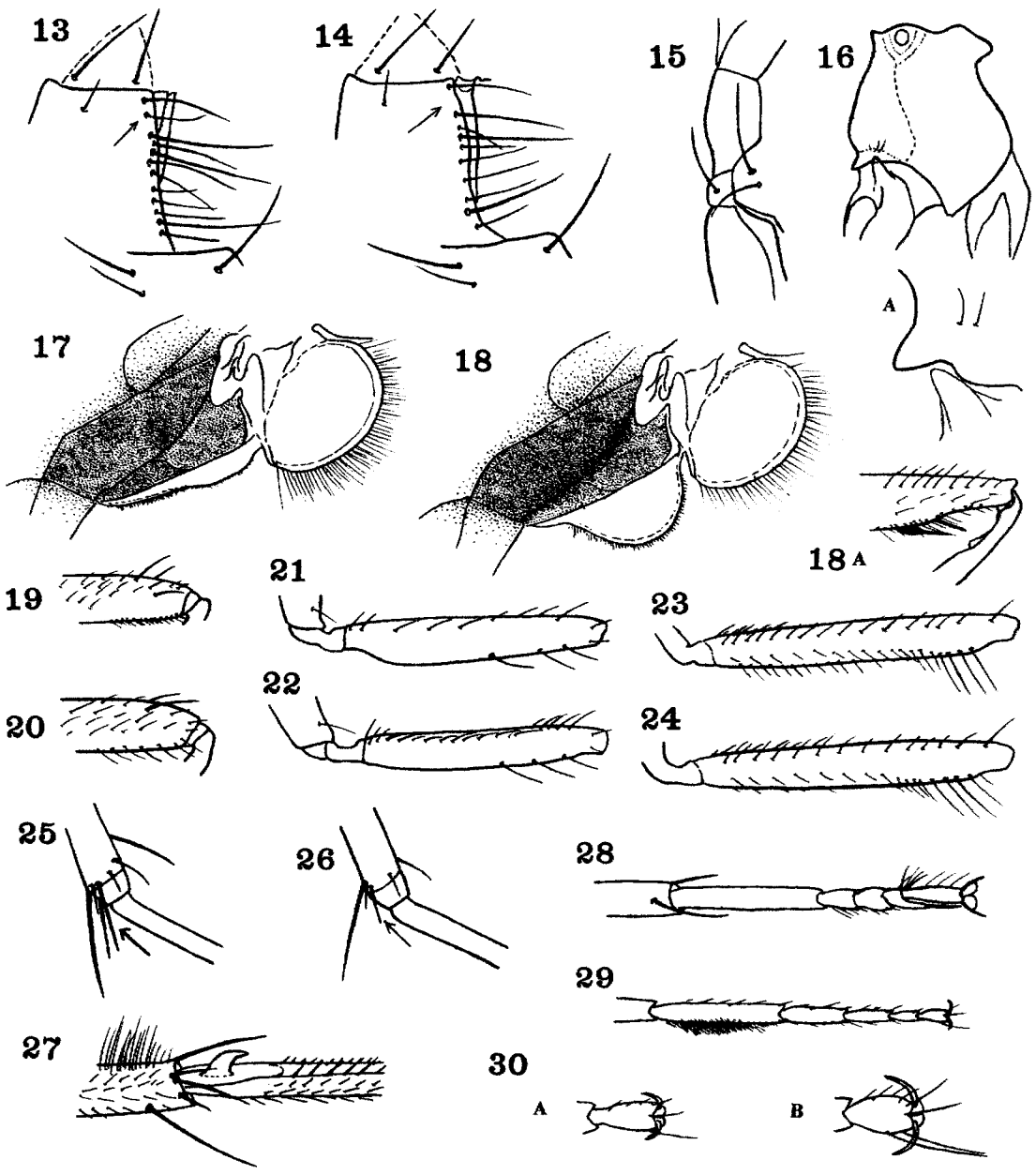
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Fig. 31 *Hydrotaea occulta* (Meigen), posterior view of male hind tibia

Fig. 32 *Pogonomyia similis* Malloch, with 3 or 4 lengthy posterodorsal bristles on hind tibia.

Fig. 33 *Phaonia rugia* (Walker), with 2 or 3 short weak posterodorsal bristles and long calcar bristle on hind tibia.

Fig. 34 *Phaonia limbinervis* (Stein), with calcar bristle only on posterodorsal surface of hind tibia.

Fig. 35 *Coenosia (Limosia) rubrina* Huckett, lateral profile of hypopygium.

Fig. 36 *Coenosia (Limosia) bonita* Huckett, lateral profile of hypopygium.

Dorsal or caudal aspect of male copulatory appendages.

Fig. 37 *Schoenomyza dorsalis sulfuriceps* Malloch.

Fig. 38 *Helina nigrita* Malloch, (a) apical region of cerci enlarged.

Fig. 39 *Limnophora discreta* Stein.

Fig. 40 *Limnophora incrassata* Malloch, cerci.

Dorsal or caudal aspect of male copulatory appendates.

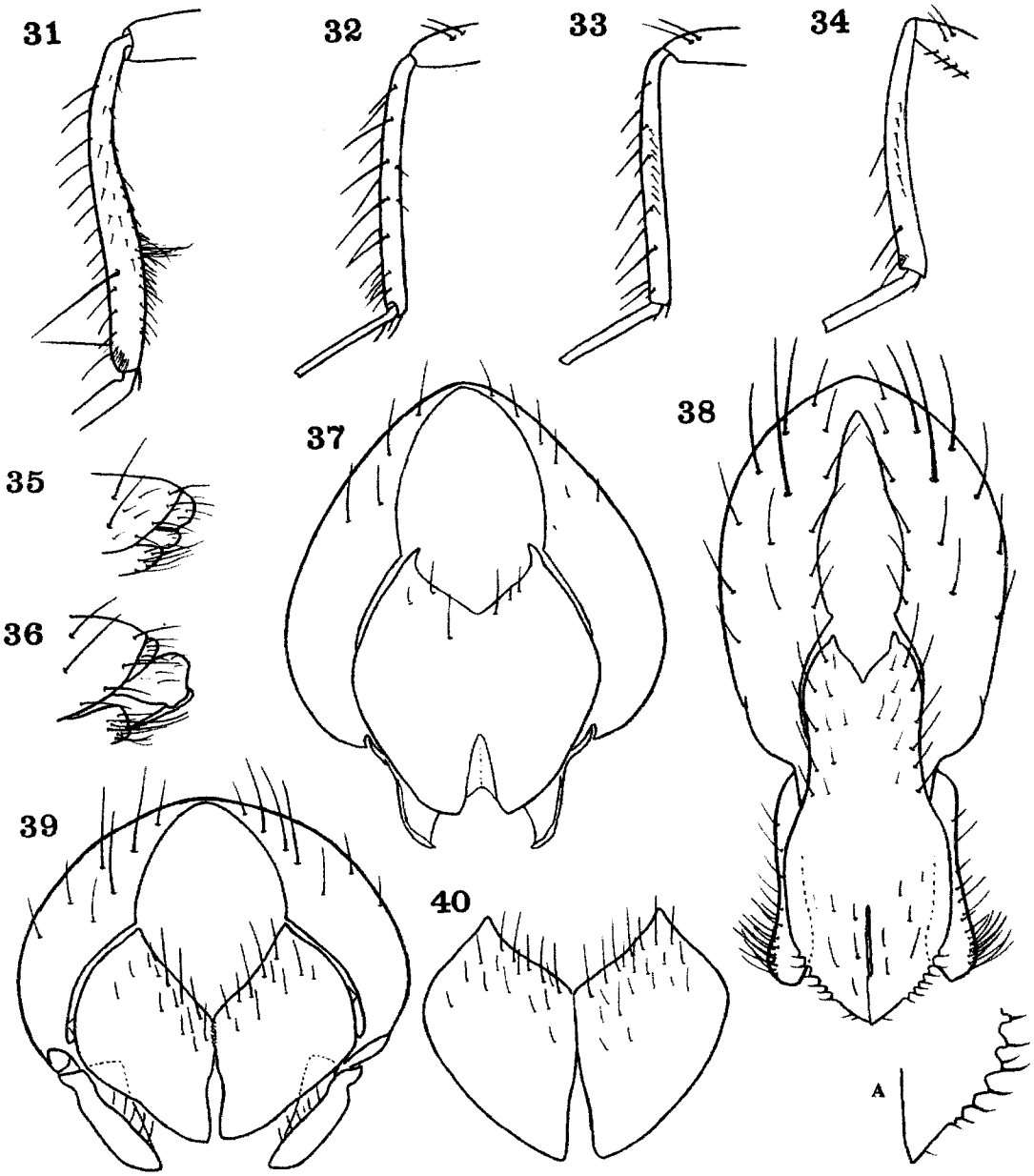
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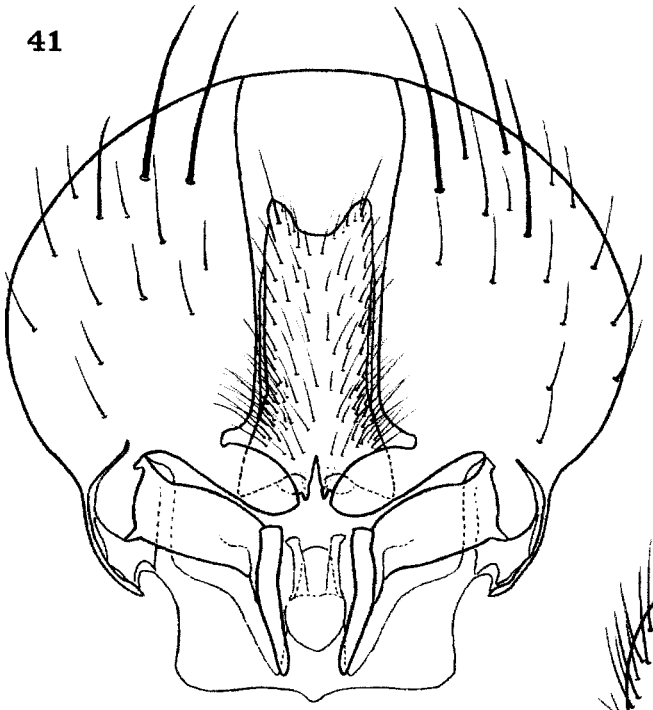
Fig. 41 *Fannia fuscula* (Fallén)
Fig. 42 *Fannia americana* Malloch.
Fig. 43 *Pogonomyia amnicola* Huckett.
Fig. 44 *Pogonomyia profrontalis* Huckett, cerci.
Fig. 45 *Pogonomyia santamonicae* Huckett, cerci.
Lateral aspect of male copulatory appendages.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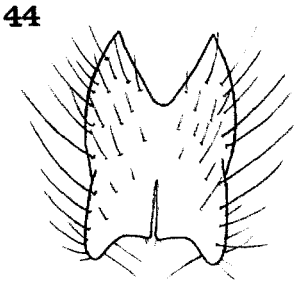
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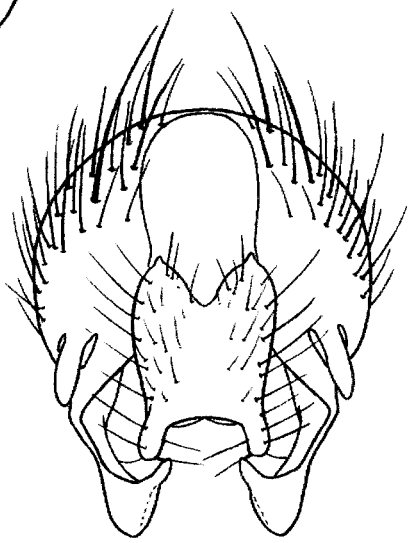
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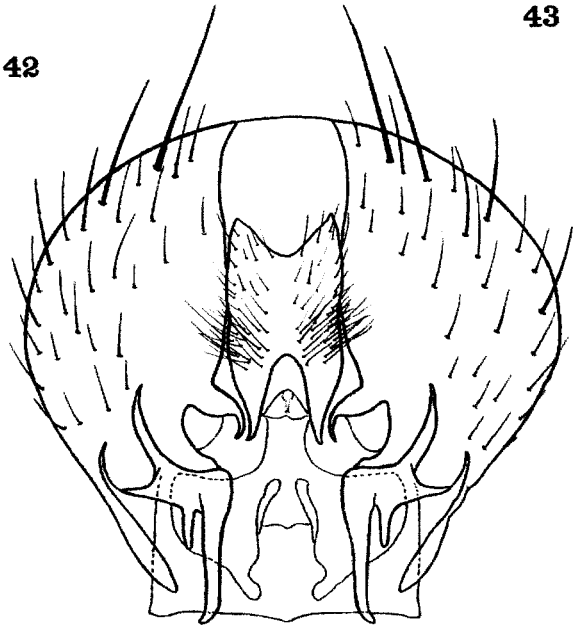
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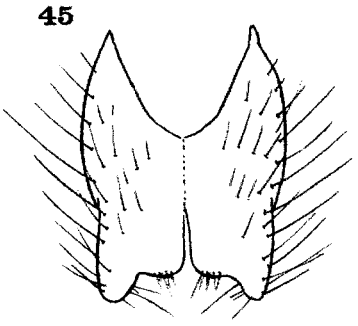
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Fig. 46 *Schoenomyza dorsalis sulfuriceps* Malloch.

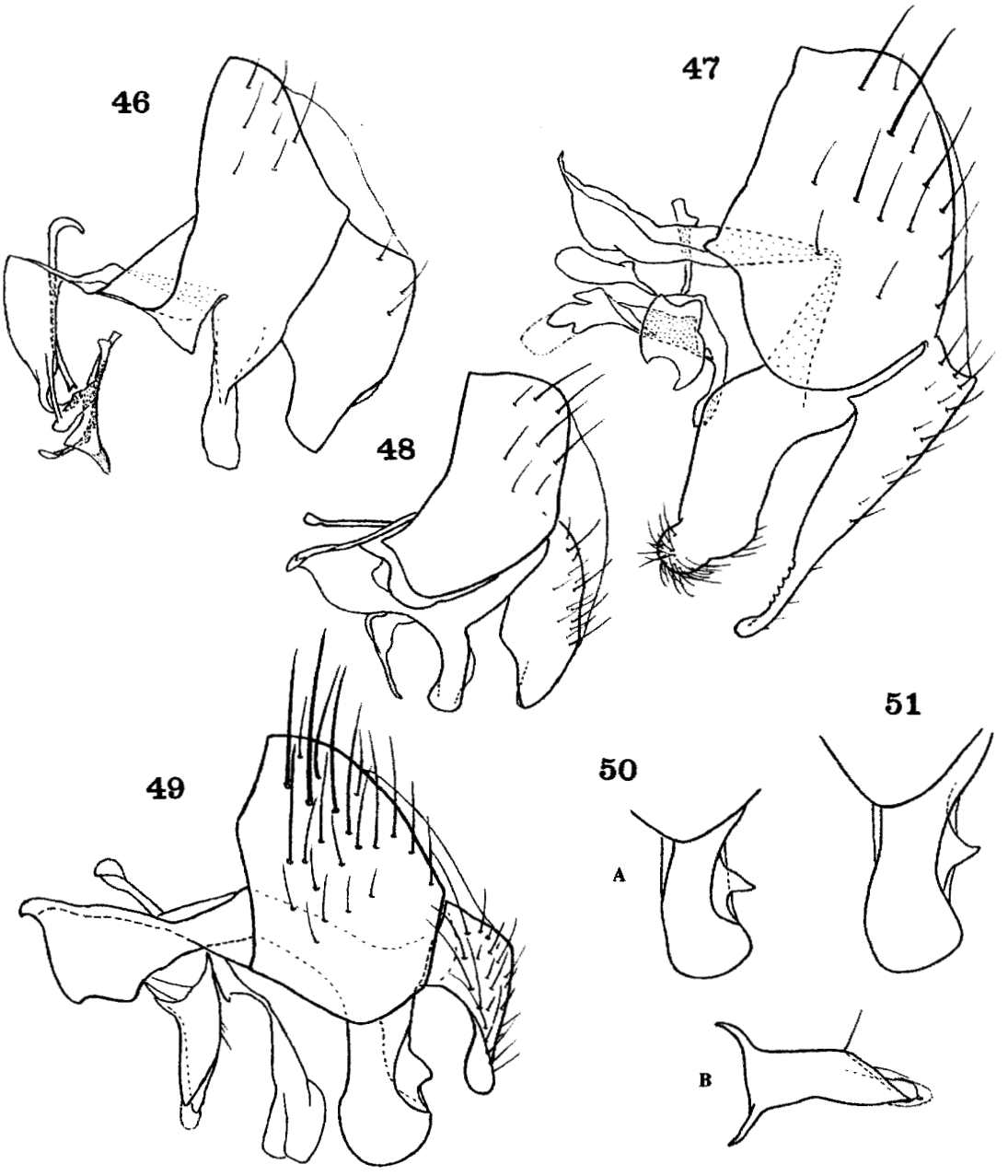
Fig. 47 *Helina nigrita* Malloch.

Fig. 48 *Limnophora discreta* Stein.

Fig. 49 *Pogonomyia amnicola* Huckett.

Fig. 50 *Pogonomyia profrontalis* Huckett, (a) gonostylus, (b) paramere.

Fig. 51 *Pogonomyia santamonicae* Huckett, gonostylus.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Ventral aspect of sternum 5 of male abdomen.

Fig. 52 *Schoenomyza dorsalis sulfuriceps* Malloch.

Fig. 53 *Lispe desertorum* Huckett, dried specimen.

Fig. 54 *Lispe approximata* Huckett, dried specimen.

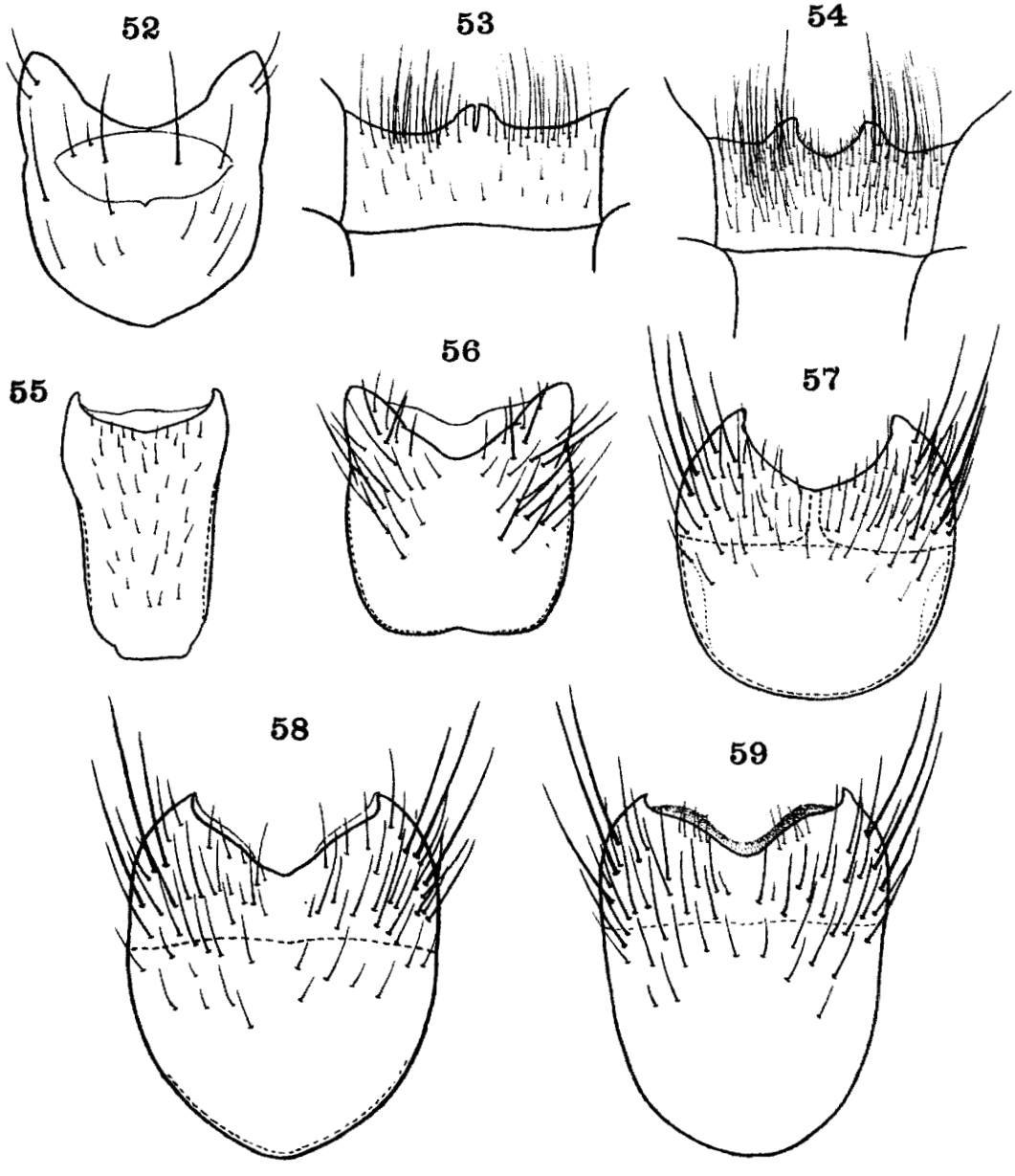
Fig. 55 *Limnophora discreta* Stein.

Fig. 56 *Helina nigrita* Malloch.

Fig. 57 *Pogonomyia amnicola* Huckett.

Fig. 58 *Pogonomyia profrontalis* Huckett.

Fig. 59 *Pogonomyia santamonicae* Huckett.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Subgenera, genera, and higher groups

(Names cited in synonymy are in italics)