The Marsh Flies of California

(Diptera: Sciomyzidae)

by T. W. Fisher and R. E. Orth

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The drawings were prepared by R. E. Orth and the microphotography was done by M. E. Badgley.

Sources of Material

This survey is based on approximately 24,000 specimens examined by one or both authors, including, when possible, confirmatory examination of specimens recorded in the literature. The literature search relating to this paper terminated January 31, 1982. The assistance and cooperation of individuals and institutions as indicated by the following codes are gratefully acknowledged. Superscript indicates the number of California species for which an institution is a type depository. In the text, material collected by the authors is indicated by F&O.

AMNH[2]	American Museum of Natural History, New York
ANSP[3]	Academy of Natural Sciences, Philadelphia
BMNH[2]	British Museum of Natural History, London
CAS[6]	California Academy of Sciences, San Francisco (P. H. Arnaud, Jr.)
CDFA	California Department of Food and Agriculture, Sacramento (M. Wasbauer)
CNC[2]	Canadian National Collection, Ottawa
CU[1]	Cornell University, Ithaca, New York (C. O. Berg)
KSU	Kent State University, Kent, Ohio (B. A. Foote)
LACM	Los Angeles County Museum of Natural History, Los Angeles, California (C. L. Hogue, R. J. Snelling)
MCZ[6]	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts
MNHNP[2]	Museum National d'Histoire Naturelle, Paris, France
NHMV[1]	Naturhistorisches Museum, Vienna, Austria
NRS[4]	Naturhistoriska Riksmuseet, Stockholm, Sweden
OSDA	Oregon State Department of Agriculture, Salem
OSU	Oregon State University, Corvallis (P. Oman, Jack Lattin)
PADA	Pennsylvania Department of Agriculture, Harrisburg (K. R. Valley)
UCB	University of California, Berkeley (J. A. Powell, E. I. Schlinger)
UCD	University of California, Davis (R. O. Schuster)
UCR	University of California, Riverside (S. Frommer)
UI[1]	University of Idaho, Moscow (W. F. Barr)
UK[1]	University of Kansas, Manhattan (G. W. Byers)
USNM[15]	U.S. National Museum of Natural History (L. V. Knutson, G. C. Steyskal)
WSU	Washington State University, Pullman (W. J. Turner)
ZMUH[1]	Zoological Museum, University of Helsinki, Finland
ZMB[1]	Zoologisches Museum, Berlin, Germany

INTRODUCTION

A preliminary survey of Sciomyzidae in California by Fisher (1966) listed 31 species plus 10 taxa suspected of being undescribed. This bulletin compiles available information on the taxonomy, biology and geographical distribution of 49 species in 13 genera of sciomyzid flies known in California and on 4 forms of *Dictya montana*. Also treated are 5 species from Oregon as reported by Fisher and Orth (1975b), 2 from Nevada, and 1 from Arizona, which because of their proximity may be ultimately found in the state. The text also includes comments on the ecology and habitats of sciomyzids, their potential as biological control agents of snail intermediate hosts of certain man- and animal-attacking trematodes, development of the malacophagous habit in Diptera with particular reference to the Sciomyzidae and their mollusk hosts, and collection and preparation methods.

Worldwide there are approximately 600 described species of marsh flies. Steyskal (1965b) lists 144 species in 21 genera in North America north of Mexico. Currently about 167 species are recognized and 23 are Holarctic. Of the 49 species listed for California, 10 are Holarctic, and only one—*Sepedon bifida* Steyskal—is restricted to California and adjacent Baja California, Norte, Mexico. Table 1 lists genera and numbers of species in North America. Knutson et al. (1976) lists 74 species in 23 genera from the poorly collected Americas south of the U.S.A. An excellent summary of studies involving the Sciomyzidae worldwide is that by Berg and Knutson (1978).

Commonly known as marsh, or swale, flies and in older entomological literature as Tetanoceridae or Tetanoceratidae, members of the family Sciomyzidae occur in lakes (margins), ponds, swamps, marshes, vernal pools, wet pasture or mesic habitats where the larvae are obligate feeders on mollusks.

Our study of this group of insects began in 1962 as part of University of California Agricultural Experiment Station research project #2037, now titled "Biological Control of Non-Marine Mollusks."

Adults of these rather slow-flying Diptera are seen resting on emergent rushes or grasses along the margins of flowing or standing fresh water. They often perch with the head directed downward, and with their enlarged hind legs and habit of sitting with the head held higher than the tip of the abdomen, present a grasshopper-like aspect. Adults of the less hygrophilous, or mesic marsh flies, such as certain species of *Limnia* and *Tetanocera*, are commonly found many meters from free water. Pinned specimens representing 12 genera found in California (*Renocera* not shown) are shown in Plate 1.

Adults of the family Sciomyzidae are distinguished from other acalyptrate Diptera by the following characters: oral vibrissae absent, post vertical bristles diverging, costa entire, subcosta complete, one or more tibiae with preapical bristles. Plates 4-6 further identify these and other characters commonly used to identify marsh flies. Body length within the family ranges from 2 to 12 mm. Body color may be pale yellowish-brown, to gray to black.

According to Hennig (1973:55), the Sciomyzidae together with the Dryomyzidae, Heleomyzidae, Sepsidae, Rhopalomeridae, and Coleopidae comprise the superfamily Sciomyzoidea of the acalyptrate Diptera. The suprageneric classification of the Sciomyzidae by Steyskal (1965a) recognizes the subfamilies Salticellinae, Phaeomyiinae, Huttonininae, Helosciomyzinae,* and Sciomyzinae. Only the Sciomyzinae occur in North America, with both of its tribes represented as shown in Table 1.

*These ant-killing sciomyzoids were removed from the family Sciomyzidae by Barnes (1980).

TABLE 1. SCIOMYZIDAE IN AMERICA NORTH OF MEXICO

	Total number of species	Species occurring in Calif.
SCIOMYZINI		
Atrichomelina	1	1
Colobaea	1	0
Oidematops	1	0
Pherbellia	32 (7)*	11 (3)
Pteromicra	14 (3)	2 (1)
Sciomyza	4 (2)	2 (1)
	53 (12)	16 (5)
TETANOCERINI		
Antichaeta	8	4
Dictya	22	4
Dictyacium	2	1
Elgiva	2 (1)	2
Euthycera	2	0
Hedria	1	0
Hoplodictya	5	1
Limnia	17	4
Pherbecta	1	0
Poecilographa	1	0
Renocera	6	1
Sepedomerus	1	0
Sepedon	18	6
Tetanocera	29 (10)	10 (5)
Trypetoptera	1	0
	116 (11)	33 (5)
Total Species	169 (23)	49 (10)

*Number of Holarctic species shown in parenthesis ( ).

Boyes et al. (1969, 1972) summarized cytological (karyological) and morphological features of larvae and adults which characterize the primitive Sciomyzini and the derived Tetanocerini. The presence of a highly specialized sperm pump, or "cochleate vesicle," prompted Steyskal and Knutson (1975) to conclude that Ethiopian, Oriental, and Australasian *Sepedon* and certain related genera are the most highly evolved of all Sciomyzidae. Table 2 presents a generalized morphological comparison of the two tribes. Species of *Renocera* and *Antichaeta* show intermediate characteristics in the pharyngeal sclerite. Plate 7 depicts characteristics of immature Sciomyzini and Tetanocerini.

Keys to the immature stages of many species of Sciomyzidae include those published by Neff and Berg (1962, *Hoplodictya*; 1966, *Sepedon*); Bratt et al. (1969, *Pherbellia*); Foote (1959, *Sciomyza*; 1961a, *Tetanocera*); Kaczynski et al. (1969, *Perilimnia* and South American *Shannonia*); Knutson (1966, *Antichaeta*).

According to a list compiled by L. V. Knutson (correspondence) more than 40 entomologists worldwide are currently involved in sciomyzid studies.

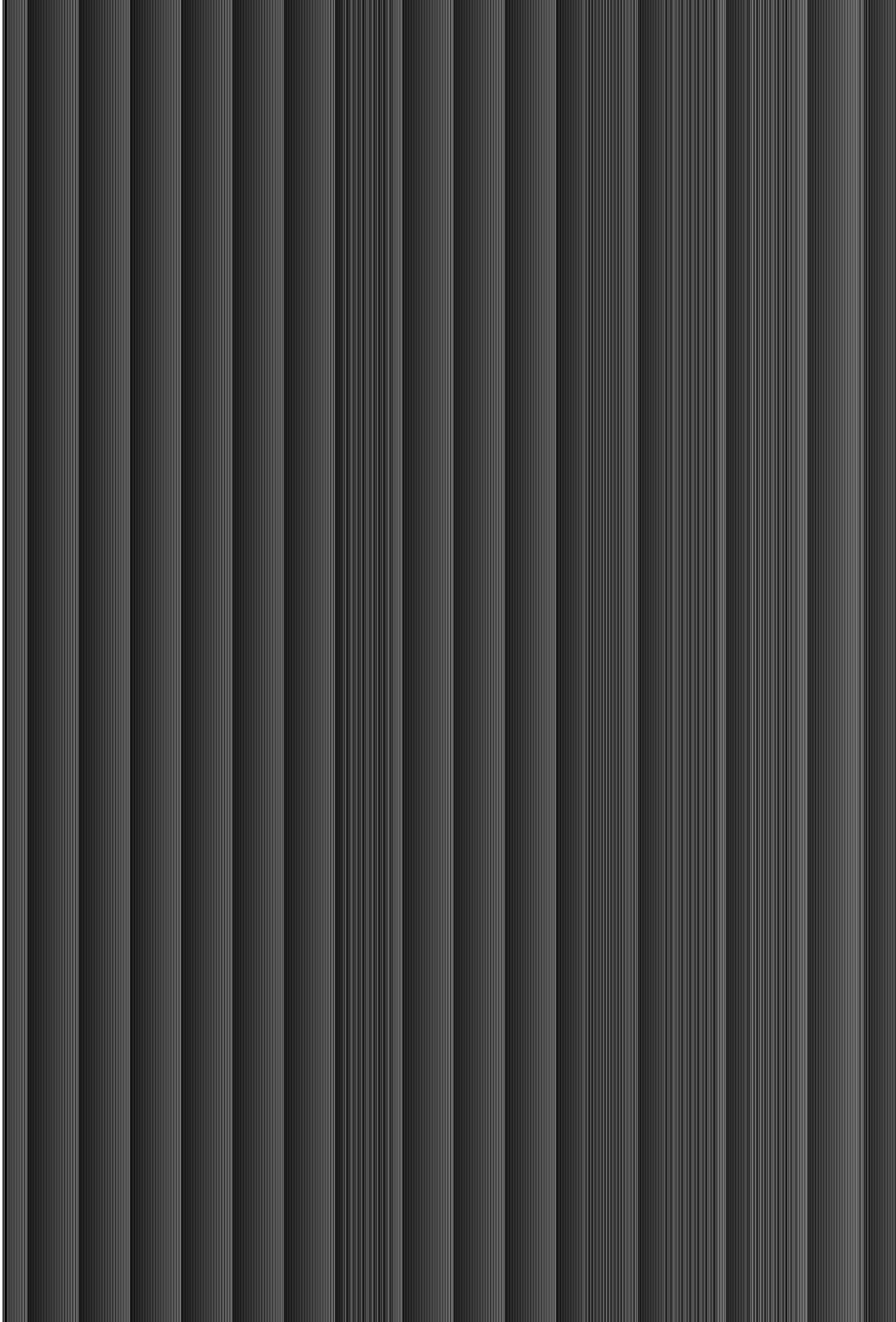
By way of perspective from an approximate total of 300 papers by 102 authors on all aspects of the Sciomyzidae, 38% and 37% of the papers are concerned with Nearctic or Palearctic species respectively, followed by Ethiopian with 7%, and Neotropical, Australian, and Oriental with 6% each.

TABLE 2. GENERALIZED MORPHOLOGICAL COMPARISONS OF TRIBES SCIOMYZINI AND TETANOCERINI AS BASED ON NORTH AMERICAN SPECIES.

ADULT	*Sciomyzini*	*Tetanocerini*
Head	not greatly modified	greatly modified
Chaetotaxy	poorly differentiated	well differentiated
Midfrontal stripes	poorly developed	well developed
Male postabdomen	strongly asymmetrical; with 2 pairs surstyli	symmetrical; one pair surstyli well developed
LARVA		
Integument		
pigmentation	absent	present*
spinule patches	present	absent
Accessory Teeth	absent	present
Pharyngeal Sclerite		
anterodorsal bridge	present	absent
window in dorsal cornua	present	absent
indentation between cornuae	deep	shallow

*Absent in terrestrial species.

The leading American taxonomic specialists on the Sciomyzidae worldwide are L. V. Knutson and G. C. Steyskal, Systematic Entomology Laboratory, U.S. Department of Agriculture, c/o U.S. National Museum of Natural History. American specialists active in certain subgroups include B. A. Foote, Department of Biological Sciences, Kent State University, Kent, Ohio; T. W. Fisher and R. E. Orth, mainly western North American species; K. R. Valley, Pennsylvania Department of Agriculture, Harrisburg, PA, New World *Dictya*. Specialists active in Palearctic species are K. Elberg, Institute of Zoology and Botany, Academy of Sciences, Tartu, Estonian S.S.R.; R. Rozkošný, Department of Biology of Animals and Man, J. E. Purkyne University, Brno, Czechoslovakia, and A. Freidberg, Tel Aviv University, Israel.



BIOLOGY

Biologies of more than 200 of the approximately 600 named sciomyzid species worldwide are partially to well known. Among the detailed studies which have been published are those by Berg (1962), Bratt et al. (1969), Fisher and Orth (1964), Foote (1959, 1963, 1971, 1973, 1976, 1977), Foote et al. (1960), Kaczynski et al. (1969), Knutson (1966, 1970a, b, 1973), Knutson and Abercrombie (1977), Knutson and Berg (1963, 1964, 1971), Knutson et al. (1965, 1967, 1970, 1975), Knutson and Valley (1978), Neff and Berg (1961, 1962, 1966),Rozkošný (1967), Rozkošný and Knutson (1970), Trelka and Berg (1977), Trelka and Foote (1970).

Sciomyzid larvae progress through three instars and are obligate feeders on a wide variety of terrestrial and freshwater pulmonate snails plus certain prosobranchs (Hydrobiidae) and pelecypods (Sphaeriidae). Puparia may be formed within the shell of the host, may be free floating with upturned posterior spiracular tubes, or may be formed in nearby moist litter.

Most Tetanocerini behave as overt predators, and while developing each larva kills and consumes several snails. However, some aquatic larvae and most of the terrestrial larvae of Tetanocerini and most species of Sciomyzini exhibit restrictive host selection, and some properly may be termed parasitoid in habit since development is completed on a single host individual. As reported by Knutson et al. (1967) larvae of certain species of *Pherbellia* and *Colobaea* excrete a calcareous septum prior to pupating and seal themselves within the shell of the host snail. Larvae of many sciomyzid species may feed saprophagously, and larvae of some species change feeding habits from selective to less selective as the stadia change. For example, females of *Antichaeta* oviposit on egg clusters of their succineid snail hosts, and the first instar maggots feed on the developing snail embryos. The second and third instar larvae feed on juveniles or adults of Succineidae and other snails. As reported by Foote et al. (1960) *Atrichomelina pubera* (Loew) is a versatile feeder. Depending on circumstances, its larvae may exhibit parasitoid, predatory, and saprophagous capabilities in response to available food and intensity of intraspecific competition. Larvae of species which attack terrestrial mollusks typically lack float hairs and tend to exhibit greater host specificity than aquatic larvae. Nearly all sciomyzid larvae, when feeding, maintain air contact through the caudal spiracles, but, as reported by Foote (1971, 1976) the larvae of *Hedria mixta* Steyskal and *Renocera* (3 spp.) have the unusual habit of descending below the water surface in order to prey on submerged snails, and sphaeriid clams, respectively. The latter are attacked by *Knutsonia lineata* (Fallén) in Europe according to Knutson (1970b). This habit also has been reported in *Dictya* spp. by Valley and Berg (1977). Fisher and Orth (1969b) reported that *Dictya fontinalis* F&0 could not complete development on *Physa*, a pulmonate snail, but did so when first instar maggots fed on hydrobiid snails in the genera *Fontelicella*, *Lithoglyphus*, or *Tryonia*. Fascinating restrictive host associations also were reported by Foote (1976) for three species of *Renocera* (aquatic Tetanocerini) that prey on submerged sphaeriid clams, and Foote (1977) published the first biology on *Oidematops* (Sciomyzini), which is restricted to its host land snail, *Stenotrema*. Species of *Tetanocera* (terrestrial Tetanocerini) which feed on limacid slugs were reported by Foote (1963), Knutson et al. (1965), Knutson (1970b), Trelka and Foote (1970), Trelka and Berg (1977).

Such diversity of life style, obligate feeding habit, and habitat selection, evidence remarkable degrees of adaptive radiation and provide reason enough for continued study in this already intensively worked insect family.

EVOLUTION OF MALACOPHAGY

The fossil record has not revealed when the actual connection between sciomyzid flies and their mollusk hosts occurred. The stage was set over a very long geologic time span for this relationship to evolve, because the first land snails appear in Devonian deposits of the Paleozoic Era, 350 million years ago. Subsequently, certain of the pulmonate gastropods entered the freshwater habitat and became the ancestral stock from which modern freshwater pulmonate snails evolved. The earliest evidence of modern insects appears in Permian deposits of the late Paleozoic Era, or 215 million years ago. Berg and Knutson (1978:250) "regard the species of fossil 'Sciomyzidae' described in *Sciomyza* and *Tetanocera* from the Oligocene and Miocene of Western Europe and Western North America by early authors [such as Cockerell (1909)] as species inquirende. Hennig (1965, 1969) described six species of Sciomyzidae from Baltic Amber [lower Oligocene] in considerable detail. . . ." Thus, considering the time span involved, it seems reasonable to presume that malacophagy was in place by the early Cenozoic Era, or 60 million years ago, and probably occurred before that during the Cretaceous period of the late Mesozoic Era which was characterized by great swamps and cooling climates.

The phenomenon of malacophagy in Diptera has been considered by several entomologists. Schmitz (1917) made one of the first attempts to deal with biological relationships between flies and snails. Other workers such as Bequaert (1925) and Johnson (1929) suspected that certain snails were actually killed by sarcophagid fly larvae, and even earlier Keilin (1919)—based on his masterful study of the calliphorid, *Melinda cognata*—proposed a system for classifying Diptera associated with gastropod mollusks. Lundbeck (1923) reared 26 species of sciomyzid flies from puparia, 3 of which were found in snail shells, and illustrated the puparia of *Colobaea bifasciella* Fallén and *Ctenulus pectoralis* Zetterstedt within the shells of their respective aquatic snail hosts *Lymnaea* [=*Fossaria*] *truncatula* and *Planorbis vortex*. Seguy (1950:459-461) presumed that Diptera oviposited only on sick or dead mollusks although his Fig. 195 illustrated certain tetanocerid parasitoids of European snails. Mercier (1921) provided the first clue that a sciomyzid fly, *Salticella fasciata* Meigen, probably was a parasitoid of a land snail, *Helix pisana*. It was Berg (1953), however, who first conclusively demonstrated that sciomyzid fly larvae—six species in five genera of his initial study—were capable of attacking, killing, and consuming several species of fresh water snails. Berg (1964b), basing his opinion on 143 species reared at Cornell University, hypothesized that the Sciomyzidae probably evolved from a general scavenger similar in habit to *Atrichomelina pubera* (Loew), which gradually developed the habit of feeding on stranded still living snails in moist situations. Divergence then may have given rise to both the aquatic predators and terrestrial parasitoids. Rozkošný (1967), reporting on the dipterous fauna of central Europe, stated that apart from the general malacophagous family Sciomyzidae (51 species verified) there are only 10 malacophagous larvae in four other families—Chironomidae (2), Calliphoridae (2), Sarcophagidae (5), and Tachinidae (1). Trelka and Foote (1970:893) suggest a possible evolution of those species of *Tetanocera* which feed on slugs beginning with feeding on hygrophilous snails, gradually shifting to slugs in the same moist habitat, then shifting (as in *T. clara* Loew) to slug species found mainly in more mesic habitats.

BIOLOGICAL CONTROL OF VECTOR SNAILS

In their review of problems associated with the biological control of medically important snails, Bay et al. (1976) correctly cited the continuing lack of interdisciplinary communication and cooperation among qualified experts on biological control methods and specialists on trematodes and snails as the main reason for the paucity of research effort applied to date in this important field.

The potential use of sciomyzid flies for biological control of snail vectors of trematode-caused diseases was recognized by Berg (1953, 1964a), Berg et al. (1955), and Neff (1964). Boray (1964) abandoned his project on use of sciomyzid flies to control *Lymnaea tomentosa*, the snail vector of livestock liverfluke in Australia. His findings indicated that the main predator fly, *Dichaetophora hendeli* Kertész, could not dominate so ecologically diverse a host. Lynch (1965) reported that in the Mt. Lofty Ranges and the Murray Lakes regions of South Australia, *Dichaetophora biroi* (Kertész) was considered to be a major predator of *L. tomentosa*. He agreed with Boray's findings and reported this

fly was effective in reducing localized populations of pulmonate snails during periods of receding water levels, but was ineffective in standing or slowly flowing water six inches or more in depth. Fontana (1972), in another Australian study, concluded that the larvae of *D. biroi* do not discriminate between healthy or infected *L. tomentosa* and that infected snails are not more vulnerable than non-infected snails to predation by larvae of *D. biroi*.

Berg (1971, 1973) reviewed literature pertaining to biological control of snail-borne diseases and decried the lack of interest in exploring non-chemical means of vector control. A non-technical treatment of the potential of sciomyzid flies in the biological control of snail-borne diseases is that by Knutson (1976).

So far the few attempts in the field to utilize these flies as biological control agents of snails which serve as intermediate hosts of human schistosomes or livestock liverflukes have met with inconclusive results. One of the more encouraging reports was by Davis (1974) who stated that "in the state of Hawaii on the islands of Hawaii, Maui, and Oahu, slaughterhouse records indicate a downward trend in the percentage of infested livers between 1966 and 1972 and this strongly suggests that the established sciomyzids *Sepedon macropus* [= *Sepedomerus macropus* (Walker)] and *S. sauteri* Hendel [= *Sepedon aenescens* Wiedemann] [initially released in 1959 and 1967, respectively], may be exerting considerable pressure on liverfluke snails." [Our annotations in brackets.] Berg and Knutson (1978:253) state that H. K. Nakao in correspondence (November 18, 1976) reported a similar decline on Kauai between 1972 and 1976.

ECOLOGICAL CONSIDERATIONS

Laboratory and field studies on population dynamics operating in predator-prey relationships of certain aquatic Sciomyzidae, mainly with *Sepedon f. fuscipennis* Loew, and snails have been published by Eckblad and Berg (1972), and Eckblad (1973). Their studies indicated that since snails in the genus *Lymnaea* spend more time at the surface, they are more likely to be attacked by the typically surface feeding sciomyzid larvae than are species of snails which typically remain submerged. It was further shown that the presence of small juvenile snails is critical to the survival and development of first instar sciomyzid larvae in those species studied. Beaver (1972; 1974a, b) studied comparative biologies and inter- and intraspecific competition of several species of British Sciomyzidae. Geckler (1971) in a laboratory study reported that larvae of *Sepedon tenuicornis* Cresson consumed 8.1 ± 2.5 aquatic snails (*Helisoma anceps*) of varying sizes with an approximate volume of 544 ± 256mm^3 before pupation. Capture-recapture studies by Arnold (1976) with *Sepedon f. fuscipennis* at Cornell University showed that adults can overwinter and that diapause is triggered by diminishing day length in the fall.

In Thailand a study by Bhuangprakone and Areekul (1973) involved feeding tests in which nine species of aquatic snails were offered to larvae of *Sepedon plumbella* Wiedemann. These authors, without published supporting data, stated, "Outbreaks of the diseases (fascioliases) occur in areas where the insect has not been found."

In the rice paddy ecosystem of Japan, Nagatomi and Kushigamachi (1965), Nishida and Torii (1970), Momoi et al. (1975), and Yano (1975) observed that the eggs of *Sepedon sauteri* Hendel [= *aenescens* Wiedemann] served as alternate hosts for *Trichogramma* spp., which parasitize eggs of rice stem borers, very serious pests of rice.

NATURAL ENEMIES OF SCIOMYZIDAE

Exposed eggs and puparia are especially vulnerable to attack. Aquatic larvae are subject to attack from a wide range of predators including *Hydra*, planaria, Hemiptera, Odonata, Coleoptera, and fish (particularly *Gambusia*), and the slow moving or flying adults are easily seized by toads, frogs, spiders, Odonata, robber flies, etc.

The list of parasitic insects which emerge from sciomyzid puparia is substantial, and most are polyphagous. Five families of parasitic Hymenoptera (Braconidae, Diapriidae, Ichneumonidae, Pteromalidae, Trichogrammatidae) are collectively noted by Foote et al. (1960), Neff and Berg (1966), Bratt et al. (1969), and Knutson and Abercrombie (1977). Recorded genera include Braconidae: *Aphaereta*, *Aspilota*, *Phaenocerpa*; Ichneumonidae: *Atractodes*, *Eriplanus*, *Mastrus* (?), *Mesoleptus*, *Phygadeuon*; Pteromalidae: *Eupteromalus*, *Spalangia*; Diapriidae: *Phaenopria*; Trichogrammatidae: *Trichogramma*. Neff and Berg (1966), also report virus and bacterial diseases of *Sepedon* puparia, and hymenopterous predators of puparia and adult flies.

Eggs and larvae of most species of marsh flies were rarely encountered in the field in California. The eggs of *Sepedon pacifica* Cresson are easily observed but of the several hundred we have seen and removed to the laboratory for observation, none was parasitized. In 1963-64, we reared an undescribed uniparental ichneumonid wasp, *Phygadeuon* sp., from puparia of *S. pacifica* collected at Vail Lake, Riverside Co., and several successive all-female generations were cultured on house fly puparia in the laboratory.

Detailed biologies of two diapriid wasps, *Trichopria popei* (Muesebeck) which attacks pupae of aquatic Sciomyzidae, and *T. atrichomelinae* Muesebeck which attacks pupae of terrestrial Sciomyzidae, were published by O'Neill (1973).

MOLLUSK HOSTS OF MARSH FLIES

There appears to be an abundance of host mollusks in California which might serve as food for larvae of sciomyzid flies. A check list of California freshwater mollusks by Taylor (1981) contains 91 "described forms." According to Roth (1972) California has a rather large endemic fauna of terrestrial mollusks of which 127 species, largely because of their restricted numbers or locations, may eventually be considered endangered. In addition, Hanna (1966) lists 36 terrestrial and 5 freshwater mollusk species as introductions into western North America.

Our field notes are replete with "associated" species of flies and snails, but accurate linkages are yet to be learned for most California species. Shells of snails commonly encountered in California are shown in Plate 2.

The excellent and detailed host records cited by Berg, Bratt, Eckblad, Foote, Knutson, and Neff were, in most instances, to the species level, but since virtually all of these are eastern U.S. (i.e., east of the Rocky Mountains) we elected to cite only their genera in our Table 3.

The listing of mollusk genera only, as in Table 1 of Foote (1977), appears to offer reasonably accurate representation of natural host associations, since it is doubtful that any sciomyzid larvae are species specific in nature.

In our Table 3 the term "probable host" refers to mollusks known to be associated in nature with these flies and which in laboratory feeding tests appear to be selected by the larvae. These include mollusks suspected of being natural hosts such as those observed with sciomyzid eggs attached to the shell or body, or whose empty shells contained sciomyzid puparia. The remainder are known hosts, or those observed in nature actually being fed upon by sciomyzid larvae. Their names are not followed by any qualifying initials in the table. Natural host associations are lacking for 19 of the California species of marsh flies. Certain of these have been reared in the laboratory by Berg's students at Cornell University on snail genera represented in California and are followed by "L" in Table 3.

In general, sciomyzid larvae do not successfully attack mature land or freshwater snails in excess of 20 mm width or length. However, juveniles of these snails are subject to attack, especially by second or third instar sciomyzid larvae. The critical importance of eggs and early juveniles of certain mollusks to the development of newly hatched sciomyzid larvae was mentioned earlier.

By no means intended as a complete list, the following references will provide a general background on North American non-marine Mollusca. Those which contain treatment of certain species found in California are followed by an asterisk (*): Bequaert and Miller (1973)*, Burch (1960; 1962; 1975a, b*), Harman and Berg (1971)*, Hanna (1966), Malek (1962), Patterson (1971), Taylor (1966, 1970, 1975, 1981)*.

Mollusk Behavior

With the possible exception of coastal northern California, habitats and periods of activity of most native land snails are closely synchronized with California's irregular rainfall which must occur in sufficient quantity to soak into the ground (as at the base of boulders or rock slides) deep enough to reach and consequently activate dormant snails. Therefore, these mollusks are not likely targets of attack by sciomyzid flies. Certain snails such as species of *Vespericola* occur in damp habitats along desert canyon streams and possibly could be hosts to certain mesic oriented sciomyzids in the genera *Limnia* and *Tetanocera*.

Succineid (amber) snails are very common throughout the state and seasonally can be extremely abundant on wet mud banks of flowing or standing water. The tetanocerine genus *Antichaeta* contains several species known to attack amber snails and their eggs in nature.

TABLE 3. SCIOMYZIDAE FOUND IN CALIFORNIA AND THEIR KNOWN OR PROBABLE MOLLUSK HOSTS IN NATURE

SCIOMYZINI		
Atrichomelina pubera	*Aplexa* NC	Foote et al., 1960
	Helisoma	
	Physa	
	Lymnaea	
	Gyraulus	
	Physa virgata	F&O
	Planorbella tenuis	
Pherbellia californica	NI	
Pherbellia griseola	*Lymnaea palustris*	Bratt et al., 1969
Pherbellia idahoensis	*Helisoma* P	Bratt et al., 1969
	Lymnaea P	
	Physa	
	Planorbella tenuis	F&O
	Lymnaea palustris	
	Physa virgata	
Pherbellia melanderi	NI	
Pherbellia nana nana	*Gyraulus*	Bratt et al., 1969
	Lymnaea	
	Physa	
Pherbellia oregona	NI	
Pherbellia parallela	*Lymnaea*	Bratt et al., 1969
	Physa	
	Physa virgata	F&O
Pherbellia schoenherri maculata	*Catinella*	Bratt et al., 1969
	Oxyloma	
	Succinea	
Pherbellia subtilis	*Lymnaea*	Bratt et al., 1969
Pherbellia trabeculata	*Helisoma*	Bratt et al., 1969
	Physa	
	Planorbula NC	
	Planorbella tenuis	F&O
	Succinea californiensis	
Pherbellia vitalis	*Helisoma*	Bratt et al., 1969
	Lymnaea	
	Physa	
	Planobula NC	
Pteromicra pectorosa	NI	
Pteromicra sisklyouensis	NI	
Sciomyza simplex	*Lymnaea*	
	Oxyloma	Foote, 1959
Sciomyza varia	*Lymnaea*	Knutson, 1962
TETANOCERINI		
Antichaeta borealis	*Oxyloma* (eggs)	Robinson and Foote, 1978
Antichaeta robiginosa	NI	
Antichaeta testacea	*Oxyloma* (eggs) P	Fisher and Orth, 1964
	Succinea P	
Antichaeta vernalis	NI	F&O
Dictya fontinalis	*Lithoglyphus turbiniformis* P	F&O
Dictya incisa	NI	
Dictya montana	*Lymnaea palustris*	F&O
	Physa virgata	

TABLE 3. SCIOMYZIDAE FOUND IN CALIFORNIA AND THEIR KNOWN OR PROBABLE MOLLUSK HOSTS IN NATURE

Dictya texensis	*Physa virgata*	F&O
Dictyacium firmum	NI	
Elgiva connexa	NI	
Elgiva solicita	Lymnaeidae	Knutson and Berg, 1964
	Physidae	
	Planorbidae	
Hoplodictya acuticornis	*Succinea*	Fisher & Orth, 1972b
Limnia boscii	NI	
Limnia inopa	NI	
Limnia pubescens	NI	
Limnia severa	NI	
Renocera brevis	*Pisidium*	Foote, 1976
	Sphaerium	
Sepedon bifida	*Helisoma*	Neff and Berg, 1966
	Physa	
	Lymnaea palustris	F&O
	Planorbella tenuis	
Sepedon borealis	*Lymnaea* P	Neff and Berg, 1966
	Physa P	
Sepedon capellei	NI	F&O
Sepedon fuscipennis fuscipennis	*Helisoma*	Berg, 1953
	Lymnaea	
	Lymnaea palustris	Eckblad and Berg, 1972
	Physa integra NC	
Sepedon pacifica	*Planorbella tenuis*	F&O
	Physa virgata	
	Lymnaea palustris	
Sepedon spinipes americana	*Helisoma*	Neff and Berg, 1966
	Physa	
Tetanocera ferruginea	*Helisoma*	Foote, 1961a
	Lymnaea palustris	
Tetanocera latifibula	*Physa* L	Foote, 1961a
Tetanocera loewi	*Helisoma* L	Foote, 1961a
	Lymnaea palustris L	
	Physa L	
Tetanocera mesopora	NI	
Tetanocera obtusifibula	*Lymnaea* L	Foote, 1961a
Tetanocera plebeia	*Deroceras laeve*	Trelka and Foote, 1970
	Deroceras reticulatum	
	Oxyloma	
Tetanocera plumosa	*Helisoma* L	Foote, 1961a
	Lymnaea palustris L	
	Physa L	
Tetanocera robusta	*Gyraulus* L	Foote, 1961a
	Helisoma L	
	Lymnaea L	
	Physa L	
Tetanocera soror	*Physa* L	Foote, 1961a
Tetanocera vicina	*Gyraulus* L	Foote, 1961a
	Lymnaea L	

NOTE: F&O = Fisher & Orth, unpublished rearings; L = Laboratory records only; NC = does not occur in California; NI = no information; P = probable hosts.

Although we have no direct proof, it is probable that *Tetanocera plebeia* Loew attacks slugs in California as it does in the eastern U.S. and Europe.

Behavior of aquatic snails is governed by various aspects of their free water habitats. Water and substrate temperatures appear to be parameters that override other physical factors such as light and chemistry within broad limits.

At the onset of winter in fairly stable bodies of water falling temperatures cause aquatic snails to become inactive. Those remaining exposed on the surface of the substrate become easy prey for immigrating water fowl, but that segment of the population which has become attached to submerged rocks, limbs, etc., below the mud line is safe from attack. In the spring with rising water and bottom mud temperatures these snails become active and form the source of the extremely rapid build up of the snail population commonly witnessed early in the year after water fowl have emigrated.

In seasonally wet streams, ponds, or farm reservoirs, etc., the fantastic ecological diversity of snails is demonstrated. To survive the snails must cope with not only seasonal drying but with scouring and flooding during heavier than usual periods of precipitation. As a body of water begins to recede, many snails burrow deep into the mud, probably secrete epiphragms as the soil dries further, and remain inactive until the ground is again flooded and the rising water and substrate temperatures reach approximately 50°F. In this situation mechanisms which trigger auto-exhumation may include widely fluctuating temperatures in the shallow water, or changing total salts content of the water.

By burrowing deep the snails are assured of at least some moisture for the later summer and fall months, and at that depth will also be protected from mild scouring during the winter months. This interpretation probably is accurate in streams of low gradient which collect silt. We have dug 18" into several dried out stream beds where we knew high populations existed as indicated by the presence of exposed shells, and our knowledge of the site, and have unearthed very few snails. At the Santa Ana River in Riverside, *Planorbella* [= *Helisoma*] has been observed in the act of emerging from the mud bottom following rain. Yet digging in that spot earlier revealed no snails. Even such seemingly safe habitats can be totally scoured out during periods of heavy runoff, and the habitat may be many years rebuilding.

SCIOMYZID FLY HABITATS IN CALIFORNIA

The classification of aquatic plant habitats proposed by Mason (1957: 2-5) could serve as a model for categorizing sciomyzid fly habitats. However, two problems are inherent in nearly all interpretations of sciomyzid habitat designations. (1) The diurnal movement of adult flies may place them many meters from their oviposition sites or host mollusks. (2) General designations such as lake, stream, meadow, etc., can be misleading, because it is the more narrowly defined subhabitat that is of specific interest.

In general, grassy banks of streams or lakes, sedge meadows with substantial growth of *Eleocharis* spp. or *Juncus* spp. are indicators of potentially good collecting sites for sciomyzid flies. The presence of easily discernible aquatic or terrestrial mollusks does not guarantee good fly collecting. Conversely, the apparent absence of mollusks does not preclude the presence of sciomyzids. These circumstances could reflect host/predator population fluctuations, or merely that the flies had moved to more amenable resting areas during the heat of the day.

In nearly all California lake situations two areas stand out as most productive of adult Sciomyzidae: (1) banks of streams where they flow into the lake, and (2) below the foot of the dam where seepage or outflow may create a permanent marsh-like habitat. In these situations, *Typha*, *Scirpus*, *Eleocharis*, *Hydrocotyl*, and cress afford resting places for adult flies. The submerged portions of such emergent vegetation along with aquatic plants such as *Myriophyllum*, *Chara*, *Potomogeton*, tape grasses, as well as benthic objects provide substrates for aquatic snails. Along the lake shore, embayments may afford protection from wind induced wave action, thus permitting aquatic snails to adhere to submerged rocks, fallen limbs, rushes, close to the shore.

The banks of rivers and canals did not prove to be good collecting sites. Overflow areas may become marsh or pond habitats of fair stability and the upper reaches and tributaries may offer good meadow or stream bank habitats.

Stream habitats are highly variable in California. Beds of many streams, or sections thereof, are dry during the summer and fall months. This is often true of streams below 2,500 feet elevation in southern California and below 1,500 feet in the eastern

foothills of the Central Valley. Above 4,000 feet elevation, or latitudes north of 36°, substantial volume of water may flow the year around.

Seeps and springs can create habitats that are suitable for some aquatic snails, e.g., *Physa*, *Lymnaea*, and hydrobiids, as well as terrestrial species. The same type of habitat can occur in or along thin trickles of water that emanate from such spring areas. The fringes of such areas may be classed as mesic since free water is not in evidence.

Mountain meadow habitats can be the result of agricultural or forest management practices, or may represent natural undisturbed situations. Large expanses of alpine sedge meadows early in the season are not highly productive of flies; yet as they dry out in late summer and fall, the green "islands" that remain can offer extremely productive collecting.

Of necessity much of the sampling occurred in roadside ditches and along streams, or stream beds, over which roads passed. Near urban areas and in areas of heavy crop agriculture, we learned not to expect great success in collecting sciomyzid flies, even if the habitats looked right and mollusks were present. We suspect the lack of flies in these cases was due to insecticides used for mosquito or nuisance insect abatement and/or presence of insecticides in run-off water from crop areas.

Examples of some of the more productive sites are shown in Table 4. Also indicated is the number of Sciomyzini and Tetanocerini recorded from each site. Photos of certain of these plus other sites can be seen in Plate 3.

COLLECTION AND PREPARATION METHODS

Flies

Our most used sampling method involved aerial sweep nets. The contents were emptied into a holding bag. Large bits of debris, large insects, and especially spiders were disposed of, and the bag lightly sprinkled with water and placed in a chilled picnic ice chest pending preparation the evening of the same day.

A gasoline-powered D-Vac* suction collector was used, particularly if the nets turned up some interesting material, or if the nets did not yield material we had reason to think should have been in a particular site. If the vegetation was wet from dew or rain the D-Vac was the only collecting method to yield undamaged flies. The D-Vac was especially useful in situations where it was difficult to swing a net, such as short vegetation (especially when windy) and dense rushes, or grasses beneath low branches of shrubs or trees. It was common practice with two people collecting for both the D-Vac and the net to be used simultaneously. In this event, the sweep net was frequently everted into the D-Vac while it was still running.

The malaise trap was tried, but the return in sciomyzids was not encouraging. These flies are rarely taken in light traps.

The wearing of hip boots proved to be the most practical way to thoroughly sample most sites. They permitted one to concentrate more on where the net was swinging than on where to step, and were a convenience when kneeling in shallow water or mud when searching for mollusks and immature sciomyzids.

Preparation of flies consisted of placing two or three bags of field collected material loosely within a 10" x 25" plastic bag. Approximately 5 ml of ethyl acetate were poured on the muslin collar of one of the bags and the plastic bag sealed shut for approximately 15 minutes to kill the insects. Placing the plastic bag over a lamp shade or in the sun for a few minutes greatly speeded the action of the fumigant. The material was then sorted in small lots under a dissecting microscope, and sciomyzid flies were pinned and placed in Schmitt boxes with detailed head labels per site.

Mollusks

Land snails and slugs were collected in the sample area during a hands-and-knees search, turning over debris, shallowly buried rocks, etc. In early morning collections mollusks were sometimes on damp vegetation and fell into the sweep net. Shells of commonly collected snails are shown in Plate 2.

Preparation of terrestrial mollusks involved first drowning them in water—usually overnight. Adding approximately 5% alcohol greatly speeded the narcotizing process. It is important to exclude an air pocket from the killing jar. Mollusks can then be placed in 10% formaldehyde for a few hours before transferring to 70% alcohol. To be properly prepared, the foot should be nearly fully extended.

*Manufactured by D-Vac Co., P.O. Box 2095, Riverside, CA 92506.

TABLE 4. SCIOMYZIDAE OF CALIFORNIA: SPECIES COLLECTED AT SELECTED SITES IN REPRESENTATIVE BIOTYPES.[1-4]

	Coastal[1]			Interm.[2]			G.Bas.[3]			Montane[4]		
	*N**	*C**	*S**	*N*	*C*	*S*	*N*	*C*	*S*	*N*	*C*	*S*
SCIOMYZINI												
Atrichomelina pubera		X	X	X	X	X	X		X	X	X	
Pherbellia griseola[5,6]												
idahoensis				X			X					
melanderi[5]							X					
nana nana	X	X	X	X		X	X		X	X	X	
subtilis				X					X	X		X
oregona	X											
parallela	X	X	X	X	X	X	X	X	X	X		
propages				X								
schoenherri maculata							X			X		
trabeculata			X						X			
vitalis		X	X	X	X	X	X	X	X			X
Pteromicra pectorosa[5]	X											
siskiyouensis							X					
Sciomyza simplex							X					
varia		X		X			X					
TETANOCERINI												
Antichaeta borealis[5,6]												
robiginosa				X			X	X				
testacea			X			X	X		X	X	X	
vernalis				X								
Dictya fontinalis										X		
incisa[5,6]												
montana "A"				X			X			X	X	
"Alturas"							X					
"intermed."					X							
"so. Cal."	X		X			X		X	X			
texensis			X			X			X			X
Dictyacium firmum[5,6]												
Elgiva connexa							X				X	

TABLE 4. SCIOMYZIDAE OF CALIFORNIA: SPECIES COLLECTED AT SELECTED SITES IN REPRESENTATIVE BIOTYPES.[1-4]

	Coastal[1]			Interm.[2]			G.Bas.[3]			Montane[4]		
	*N**	*C**	*S**	*N*	*C*	*S*	*N*	*C*	*S*	*N*	*C*	*S*
solicita							X					
Hoplodictya acuticornis	X		X		X	X	X	X	X		X	
Limnia boscii[5,6]												
inopa											X	
pubescens[6]												
severa	X	X		X						X	X	
Renocera brevis[5,6]												
Sepedon bifida			X			X			X			X
borealis							X			X		
capellei							X	X		X	X	
f. fuscipennis[5,6]												
pacifica		X	X	X	X	X	X	X	X		X	X
spinipes americana[5,6]												
Tetanocera ferruginea							X					
latifibula							X					
loewi[5]	X											
mesopora							X					
obtusifibula	X	X		X								
plebeia	X											
plumosa				X			X	X	X	X	X	X
robusta	X						X					
soror										X		
vicina							X					
Numbers of species/forms collected: Sciomyzini	4	4	5	8	3	4	10	2	6	5	2	2
Tetanocerini	7	3	6	7	3	6	16	6	7	8	9	4
Total	11	7	11	15	6	10	26	8	13	13	11	6

NOTES TO TABLE 4:

1. Coastal influence:
   N = Del Norte County./ Crescent City, 15 m (50 feet) elev.
   C = Sonoma Co.; Valley Ford, 30 m (100 feet) elev.
   S = Orange Co./ San Juan Cr., 76 m (250 feet) elev.
2. Intermediate climate:
   N = Mendocino Co.; 2 mi N/Willits, 405 m (1,330 feet) elev.
   C = Kern Co.; Lake Isabella, 808 m (2,650 feet) elev.
   S = Riverside Co.; Santa Ana Riv., Riverside, 259 m (850 feet) elev.
3. Great Basic influence:
   N = Modoc Co.; Alturas, 1,311 m (4,300 feet) elev.
   C = Inyo Co.; Deep Springs Lake, 1524 m (5,000 feet) elev.
   S = Riverside Co.; Lake Hemet, 1,372 m (4,500 feet) elev.
4. Montane influence:
   N = Nevada Co.; Boca Springs, 1829 m (6,000 feet) elev.
   C = Alpine Co.; Heenan Lake, 2,134 m (7,000 feet) elev.
   S = San Bernardino Co.; Cienega Seca, 2,362 m (7,750 feet) elev.
5. Highly restricted distribution. Collected at only one locality, or at 2-4 localities within a 5-10 mile radius.
6. Not collected at the 12 localities used in this Table.

*N = northern counties; C = central counties; S = southern counties.

Aquatic mollusks were gathered in two ways: (1) hand picking from the substrate, or (2) vigorously dunking bunches of submerged plants to which mollusks were adhering in and out of a pail full of water. The plants and debris were removed and the water slowly poured from the bucket, leaving the snails in a compact group which could be later sorted to species or poured en masse into a jar. The relaxing of aquatic snails is accomplished by adding small amounts of propylene phenoxytol or menthol crystals to water in the collecting jar. Our results varied from poor to very good. When the snails were thought to be narcotized, either a little formaldehyde was added to the jar or the water was poured off and replaced with 70% alcohol. With isolated populations of mollusks malacologists want the collecting site described to the exact quarter section.

Other than the fact we were looking specifically for sciomyzid flies, a reason why we appear to be the major, sometimes sole, collectors of the rare species is that we made use of the D-Vac collector.

Much of the sciomyzid material from California other than ours was collected by staff and students from UCB, UCD, and UCR. A major contributor was Dr. Paul Arnaud, CAS.

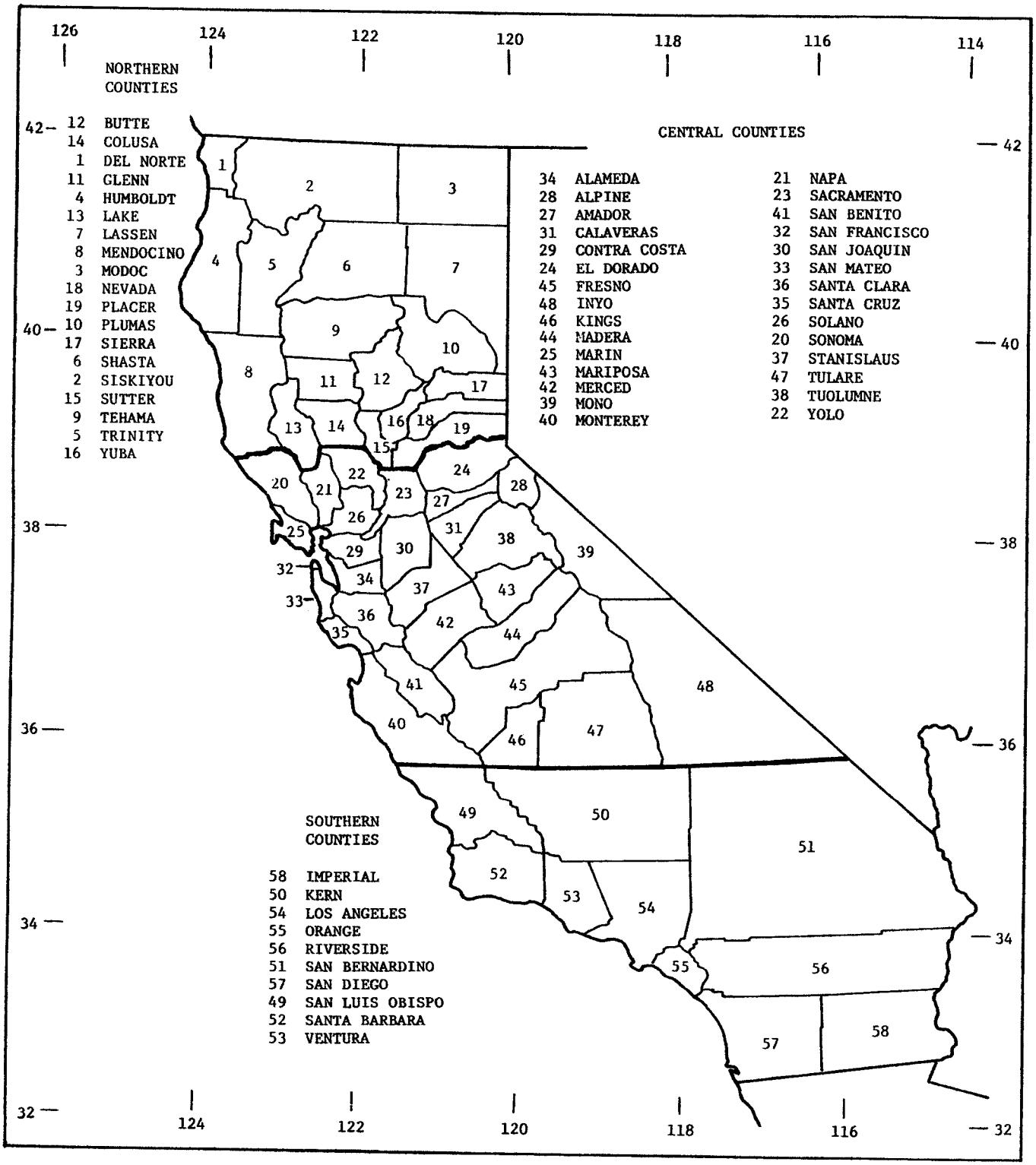
TAXONOMY

Introduction

Early in the study G. C. Steyskal expressed the opinion that the area of California north of 39° latitude would likely yield material of greater interest in terms of new or rare species. He was right. We then arbitrarily designated counties lying roughly between 39-42° as Northern counties, those between 36-39° as Central counties, and those between 32-36° as Southern counties.

Map 1 shows the counties included in each area. Table 5 indicates the total number of species recorded per county. The Great Basin eco-climate is loosely interpreted. Perhaps "influence" is a more accurate word. Common sagebrush (*Artemisia tridentata* Nutt.) was present.

In southern California we were able to make monthly collections at four localities between 1962 and 1966. These localities were: (1) Santa Ana River, Riverside; (2) Lake Hemet; (3) San Juan Creek, 3 miles east of San Juan Capistrano; and (4) Big Bear Lake (Boulder Bay). During the course of study the character of these sites was drastically altered by periods of excessive cold, drought, or precipitation, such that year to year comparisons could not be interpreted with confidence. Collections in central and northern counties occurred mainly during the summer. Monthly collections in a few of those localities could be highly desirable in



Map 1. California Counties.

TABLE 5.
SCIOMYZIDAE OF CALIFORNIA:
Numbers of species and forms
recorded per county,
and dominant eco-climate
in areas sampled.

Northern counties (39-42° approx.)	c*	i	m	gb
30 Siskiyou			x	
29 Modoc			x	x
29 Shasta		x	x	
24 Plumas			x	
22 Mendocino	x	x		
19 Nevada			x	x
19 Sierra			x	x
18 Lassen			x	x
14 Placer		x	x	
13 Del Norte	x			
10 Humboldt	x			
9 Butte		x		
7 Tehama		x	x	
7 Trinity			x	
6 Glenn		x		
5 Colusa		x		
5 Lake		x		
4 Yuba		x		
0 Sutter		x		

Central counties (36-39° approx.)	c	i	m	gb
21 Mono			x	x
18 Inyo		x	x	x
16 Alpine			x	
13 Tulare		x	x	
12 Marin	x			
12 Santa Clara	x	x		
11 El Dorado		x	x	
11 Fresno		x	x	
11 Sonoma	x	x		
10 Monterey	x	x		
9 Tuolumne			x	
8 Amador			x	
7 Alameda	x	x		
7 Sacramento		x		
7 Merced		x		
6 Yolo		x		
5 Calaveras		x	x	
5 Contra Costa	x	x		
5 Mariposa		x	x	
5 San Francisco	x			
5 San Mateo	x			
4 Napa		x		
4 Stanislaus		x		
3 Santa Cruz	x			
2 Madera		x	x	
2 Solano	x	x		
1 San Benito		x		
1 San Joaquin		x		
0 Kings		x		

Southern counties (32-36° approx.)	c	i	m	gb
13 Riverside		x	x	
13 San Bernardino		x	x	
11 Orange	x			
10 San Diego	x	x		
9 Los Angeles	x			
9 San Luis Obispo	x	x		
8 Kern		x	x	
8 Santa Barbara	x	x		
4 Ventura	x	x		
3 Imperial		x		

*c = coastal; i = interior; m = montane; gb = Great Basin.

TABLE 6. SCIOMYZIDAE OF CALIFORNIA:
Summary of collection data to September 1977.

	Number of Counties Recorded				Day collected		Years		Elevation (meters)	
	Northern 39-42° (19)	Central 36-39° (29)	Southern 32-36° (10)	Total (58)	Earliest	Latest	Spanned		Low	High
SCIOMYZINI										
Atrichomelina pubera	13	14	7	34	19-II	7-XII	1914	1974	3	2164
Pherbellia californica	5	2	0	7	31-III	4-VIII	1947	1968	2	1494
Pherbellia griseola	1	0	0	1	16-VI	8-VIII	1968	1976	1262	–
Pherbellia idahoensis	8	2	0	10	23-IV	9-IX	1947	1974	76	1561
Pherbellia melanderi	1	0	0	1	9-VI	–	1966	–	1311	1463
Pherbellia nana nana	19	20	8	48	10-III	22-XII	1896	1976	3	2134
Pherbellia oregona	2	0	0	2	10-VI	5-VIII	1965	1969	3	15
Pherbellia parallela	12	12	10	34	14-I	27-XII	1921	1976	3	2329
P. schoenherri maculata	6	3	0	9	26-IV	22-IX	1966	1976	1067	2789
Pherbellia subtilis	2	3	2	7	16-III	12-VII	1966	1970	2	2408
Pherbellia trabeculata	0	0	4	4	13-II	13-IX	1962	1968	61	2057
Pherbellia vitalis	9	13	6	28	25-II	21-IX	1908	1975	−55	2362
Pteromicra pectorosa	1	0	0	1	11-VI	–	1966	–	15	–
Pteromicra siskiyouensis	3	0	0	3	6-VI	6-VIII	1965	1973	808	1561
Sciomyza simplex	2	1	0	3	9-VI	21-IX	1965	1974	1219	1561
Sciomyza varia	1	2	0	3	25-V	23-VIII	1966	1969	30	1920
TETANOCERINI										
Antichaeta borealis	1	0	0	1	10-VII	–	1968	–	1414	–
Antichaeta robiginosa	3	3	0	6	17-I	10-VII	1963	1974	146	1524
Antichaeta testacea	7	7	6	20	27-I	15-XI	1954	1974	8	2134
Antichaeta vernalis	2	0	0	2	23-IV	8-VI	1966	1968	405	1494
Dictya fontinalis	4	1	0	5	22-IV	22-IX	1951	1974	30	1798
Dictya incisa	0	0	1	1	24-IV	–	1935	–	305	–
Dictya montana "A"	15	13	0	28	3-II	20-X	1937	1976	6	2621
D. montana "Alturas"	5	0	0	5	8-VI	21-IX	1955	1974	933	1494
D. montana "intermed"	7	13	2	22	10-III	15-X	1948	1974	9	1387
D. montana "so. Cal."	3	10	10	23	1-I	31-XII	1910	1975	−58	2530
Dictya texensis	0	0	6	6	8-I	27-XII	1957	1976	−55	2362
Dictyacium firmum	1	0	0	1	24-VI	1-VIII	1973	1976	1219	–
Elgiva connexa	1	2	0	3	6-VI	24-VIII	1965	1972	1311	2164
Elgiva solicita	6	1	0	7	6-VI	22-IX	1965	1974	15	1561
Hoplodictya acuticornis	9	14	7	28	9-I	27-XII	1908	1974	3	1646
Limnia boscii	0	1	0	1	11-VII	7-IX	1967	1968	1295	–
Limnia inopa	8	12	0	20	15-V	6-XI	1935	1973	305	2377
Limnia pubescens	2	0	0	2	17-VI	31-VII	1913	1976	809	1219
Limnia severa	10	10	1	21	15-V	7-IX	1918	1975	2	2743
Renocera brevis	1	0	0	1	20-VII	–	1966	–	1250	–
Sepedon bifida	4	7	9	20	14-I	27-XII	1917	1975	3	2362
Sepedon borealis	8	6	0	14	7-VI	22-IX	1918	1976	930	2377
Sepedon capellei	9	5	1	14	14-IV	16-X	1922	1976	73	2682
Sepedon f. fuscipennis	2	0	0	2	8-VI	22-IX	1966	1967	1067	1506
Sepedon pacifica	16	22	9	47	16-I	13-XI	1907	1976	3	3048

TABLE 6. SCIOMYZIDAE OF CALIFORNIA:
Summary of collection data to September 1977.

	Number of Counties Recorded				Day collected		Years Spanned		Elevation (meters)	
	Northern 39-42° (19)	Central 36-39° (29)	Southern 32-36° (10)	Total (58)	Earliest	Latest			Low	High
S. spinipes americana	1	0	0	1	9-VII	22-IX	1966	1968	1506	–
Tetanocera ferruginea	2	1	0	3	10-VI	21-IX	1966	1974	1219	1875
Tetanocera latifibula	7	1	0	8	7-VI	21-IX	1949	1974	1334	1783
Tetanocera loewi	1	0	0	1	11-VI	5-VIII	1966	1968	18	–
Tetanocera mesopora	6	0	0	6	9-VI	21-IX	1949	1972	1067	1561
Tetanocera obtusifibula	8	3	0	11	16-V	30-IX	1918	1975	2	1524
Tetanocera plebeia	7	1	0	8	8-VI	12-IX	1910	1976	3	1524
Tetanocera plumosa	14	14	2	30	1-V	4-X	1930	1976	152	2743
Tetanocera robusta	3	0	0	3	9-VI	21-IX	1966	1975	9	1768
Tetanocera soror	5	2	0	7	9-VI	3-VIII	1948	1976	1219	1920
Tetanocera vicina	8	0	0	9	8-VI	21-IX	1947	1975	808	1768
Total number of Sciomyzini	15	10	6							
Tetanocerini	33	22	10							
	48	32	16							

order to better understand seasonal activity of marsh flies and their mollusk hosts. Warm springs areas such as Hot Creek (Mono Co.), Bishop (Inyo Co.), around Alturas (Modoc Co.), all in areas typically of cold, sub-freezing winters, would be of great interest.

Table 6 indicates extremes of collection data from all of the material we examined as well as certain records from the literature and specialists in correspondence.

Our keys to genera and species are designed as aids to identification rather than as indicators of natural classification.

Certain species found in the western U.S. are included in keys by Cresson (1920), Melander (1920), Foote (1961c), and Cole (1969).

In the narrative for each species is given the original name; publication containing original description; type locality; sex of holotype; depository; synonymy; geographic range and California records. Under "Remarks" are summarized only the results of our efforts which is thus intended to indicate the comparative abundance of the species, general habitat notes, etc. "Discussion" attempts to interpret or expand on certain facts mentioned in "Remarks."

KEY TO THE AMERICAN GENERA OF SCIOMYZIDAE NORTH OF MEXICO

1. Propleuron with a strong bristle above base of fore coxa, if bristle inconspicuous, first segment of fore tarsus whitish contrasting with remaining segments. SCIOMYZINI 2
   Propleuron without strong bristle above base of fore coxa; first segment of fore tarsus not strongly contrasting with remaining segments. TETANOCERINI 7
2. Fore tibia with 2 preapical bristles 3
   Fore tibia with 1 preapical bristle 4
3. Aristal hairs long, black; face without a central protuberance in upper half. (Holarctic) ..... *Sciomyza* Fallén
   Aristal hairs dense, short, white; face with a central protuberance in upper half. (Nearctic). ..... *Oidematops* Cresson
4. Vein a_1 not attaining wing margin; body length under 2.5 mm. (Holarctic) ..... *Colobaea* Zetterstedt
   Vein a_1 attaining wing margin; body length usually over 2.5 mm 5
5. Propleural bristle fine and thin; center of propleuron, nearly entire mesopleuron and sternopleuron, and center of pteropleuron with fine longish hairs; fore coxa without bristles.

(Nearctic and Neotropical) .... *Atrichomelina* Cresson

Propleural bristle long and stout; 1 or more of the above pleural regions without fine hairs; fore coxa with at least 1 bristle 6

6. Predominately shining black species; frons usually entirely shining. (Holarctic) .... *Pteromicra* Lioy

Species of yellow, brown, or gray color, never shining black; frons not wholly shining. (Cosmopolitan) ..... *Pherbellia* Robineau-Desvoidy

7. Vallar bristles present 8

Vallar bristles absent 11

8. Arista with sparse blackish hairs 9

Arista with whitish hairs. (Holarctic) .... *Limnia* Robineau-Desvoidy

9. Nearly entire front between the orbitals convex and glossy; 3 dorsocentrals; body yellow with large black spots. (Nearctic) .... *Poecilographa* Melander

A large part of front dull; 1 or 2 dorsocentrals 10

10. Midfrontal stripe pruinose; prosternum with hairs. (Holarctic) ..... *Trypetoptera* Hendel

Midfrontal stripe shining; prosternum bare. (Nearctic) ..... *Pherbecta* Steyskal

11. Ocellar bristle absent; postocellar bristle well-developed or lacking 12

Ocellar bristle present; postocellar bristle well-developed 14

12. Postocellar bristle well-developed; midfemur with one or more distinctly larger anterior setae near midlength of femur 13

Postocellar bristle absent; midfemur without distinctly larger anterior setae near midlength of femur. (Nearctic and Neotropical) .... *Sepedomerus* Steyskal

13. Frons with 2 fronto-orbital bristles; posterior crossvein bisinuate. (Nearctic) ..... *Hedria* Steyskal

Frons with only 1 fronto-orbital bristle; posterior crossvein arcuate. (Cosmopolitan) .... *Sepedon* Latreille

14. Hind tibia with 2 strong preapical bristles. (Holarctic) ..... *Antichaeta* Haliday

Hind tibia with only 1 strong preapical bristle 15

15. Second antennal segment less than 1/3 length of third segment. (Holarctic) ..... *Renocera* Hendel

Second antennal segment at least 1/2 length of third segment 16

16. Arista with long blackish hairs 17

Arista with whitish hairs 19

17. Wing mostly hyaline, may have some spots or bands; body uniformly yellowish to reddish brown; mesopleuron bare; face without central black spot. (Holarctic) ..... *Tetanocera* Duméril

Wing not mostly hyaline, heavily marked with blackish reticulations 18

18. One fronto-orbital bristle; face with central black spot. (Holarctic and Neotropical) .... *Dictya* Meigen

Two fronto-orbital bristles; face without central black spot. (Nearctic and Neotropical) .... *Hoplodictya* Cresson

19. Aristal hairs long, plumose; wing densely reticulate. (Holarctic) ..... *Euthycera* Latreille

Aristal hairs moderately short or pubescent; wing densely reticulate or streaked with dark shadings 20

20. Face with central protuberance in upper half; aristal hairs moderately short, plumose; wing densely reticulate. (Nearctic) .... *Dictyacium* Steyskal

Face without central protuberance in upper half; aristal hairs minute or pubescent, not plumose; wing not reticulate, but streaked with dark shadings. (Holarctic) ..... *Elgiva* Meigen

TRIBE SCIOMYZINI

Genus *Atrichomelina* Cresson, 1920:40

Atrichomelina Cresson, 1920 .....

The single species, *A. pubera* (Loew), may be characterized as follows. Propleural bristle hairlike; fore basitarsus white and other tarsal segments black; fore coxa without bristles; all thoracic pleurites haired but without bristles. Widespread throughout California. Male terminalia as in Plate 8, Figs. 1, 2.

Atrichomelina pubera (Loew)
Map 2; Plate 8, Figs. 1, 2

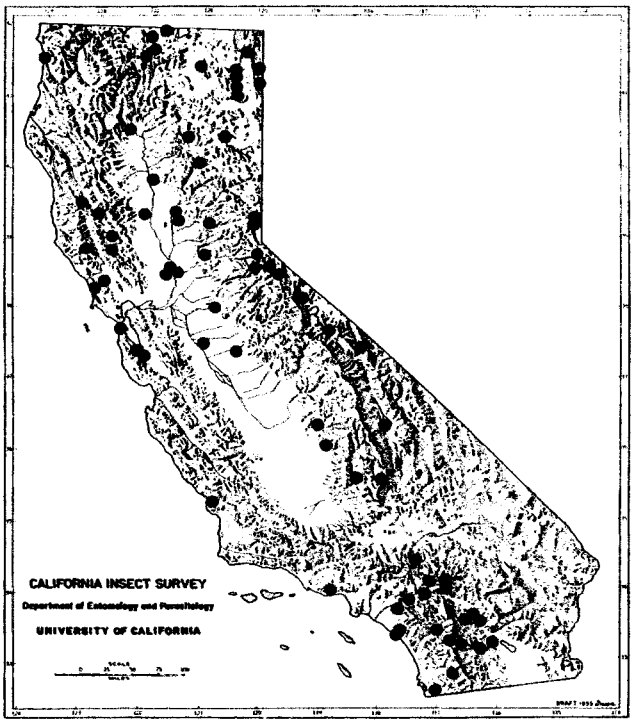
Sciomyza pubera Loew, 1862:106-107; Middle States; holotype m, MCZ no. 13208.

Atrichomelina pubera; Cresson, 1920:40 (runs to *Achaetomelina* in key, p. 30).

Geographic range: CANADA: Alberta to Quebec. MEXICO: Distrito Federal and Chiapis. USA: coast to coast.

California records (Map 2): widespread, recorded in 34 counties.

Remarks: We examined material from 10 of the 35 states where the species has been reported. In California we collected 414 m, 622 f which often were in drying habitats with stranded yet living planorbid, physid, and/or lymnaeid snails. Adult habitus as shown in Plate 1, Fig. 1. Head profile as in Plate 5, Fig. 1.



Map 2. California distribution of *Atrichomelina pubera* (Loew)

Genus *Pherbellia* Robineau-Desvoidy, 1830:695

Pherbellia Robineau-Desvoidy, 1830 .....

1. Frons with median stripe extending 2/3 or more of the distance from anterior ocellus to frontal margin 2
   Frons without distinct median stripe or with one less than 2/3 as long as distance from ocellus to frontal margin 3
2. Mesopleuron bare; 2 parafrontal bristles; wing cells with single rows of blackish spots. Male terminalia as in Plate 11, Figs. 2, 3 .... *P. schoenherri maculata* (Cresson)
   Mesopleuron setulose; 1 parafrontal bristle; wing cells not spotted. Male terminalia as in Plate 10, Figs. 5, 6 ..... *P. parallela* (Walker)
3. Mesopleuron with setulae along posterior margin (*P. fuscipes* group)
   A. Aristal hairs short. Wing length: 5 males, 4.6-4.9 mm, average 4.9; 5 females, 4.6-5.2 mm, average 4.9. Shasta Co. Male terminalia as in Plate 8, Figs. 5, 6..... *P.* griseola (Fallén)
   B. Aristal hairs long plumose. Wing length: 10 males, 5.1-6.0 mm, average 5.7; 10 females, 5.6-6.8 mm, average 6.2. Male terminalia as in Plate 9, Figs. 1, 2 ..... *P. idahoensis* Steyskal
   C. Aristal hairs moderately long. Wing length: 8 males, 4.6-5.6 mm, average 5.2; 8 females, 4.9-5.9 mm, average 5.4. Male terminalia as in Plate 9, Figs. 3, 4 ..... *P. melanderi* Steyskal
   D. Aristal hairs medium length. Wing length: 5 males, 4.6-5.0 mm, average 4.9; 5 females, 4.6-5.2 mm, average 4.9. Humboldt and Del Norte Co.; Pacific Coast. Male terminalia as in Plate 10, Figs. 3, 4 ..... *P. oregona* Steyskal
   Mesopleuron entirely bare 4
4. Wing distinctly patterned; apical part of wing darkened with crossbands 5
   Wing not patterned, at most anterior margin and crossveins clouded.....6
5. Cell R_3 with 3 to 7 crossbars; 1st section of 4th vein with a stump vein posteriorly; blackish orbito-antennal spot well developed. Male terminalia as in Plate 12, Figs. 1, 2 .... *P. trabeculata* (Loew)
   Cell R_3 without crossbars (preapical) crossband only, vein M without stump vein; orbito-antennal spot not well developed. Male terminalia as in Plate 10, Figs. 1, 2 .... *P. nana nana* (Fallén)
6. Vein R_1 distinctly surpassing level of *ta*; arista bare, at most minutely pubescent. Male terminalia as in Plate 11, Figs. 4-6 .... *P. subtilis* Orth & Steyskal
   Vein R_1 not surpassing level of *ta*; arista with short blackish hairs.....7
7. Pteropleuron with a cluster of moderate sized bristles; upper edge of sternopleuron with several short hairs and 2 or 3 much longer and stronger bristles. Male terminalia as in Plate 11, Fig. 1.....*P. californica* Orth
   Pteropleuron with several small bristles and 2 longer and heavier bristles; upper edge of sternopleuron with short hairs only.....8
8. Orbito-antennal spot well developed; fore femur, tibia, and tarsus blackish; anterior margin of frons not cinereous. Male terminalia as in Plate 12, Figs. 3, 4 .....*P. vitalis* (Cresson)
   Orbito-antennal spot lacking; fore femur, tibia and tarsus yellowish to brownish; anterior margin of frons bright cinereous. Not yet discovered in California. Known from Ormsby County, Nevada, adjacent to the California-Nevada border. Male terminalia as in Plate 8, Figs. 3, 4.... ..... *P. argyra* Verbeke

Pherbellia californica Orth
Map 3; Plate 11, Fig. 1

Pherbellia californica Orth, 1982:23-37; Willits, Mendocino Co., California; holotype m., USNM.
Pherbellia propages Steyskal, 1966:37-38, in part.

Geographic range: USA: north of 38° latitude, California, Oregon, Washington.

California records (Map 3): EL DORADO CO.: Echo Lake. HUMBOLDT CO.: Orick. MARIN CO.: Bolinas, San Quentin Point, Tomales. MENDOCINO CO.: 7 mi (11.3 km) north Hopland, Ukiah, Willits. PLUMAS CO.: Crescent Mills, Rock Creek. SHASTA CO.: Anderson. SISKIYOU CO.: Fort Jones.

Map 3. California distribution of *Pherbellia californica* Orth

Remarks: We examined material from California and Oregon. In California we collected 102 f, 224 m. The largest numbers came from 2 mi (3.2 km) north of Willits, and 7 mi (11.3 km) north of Hopland. *P. propages* occurs east of 105° longitude.

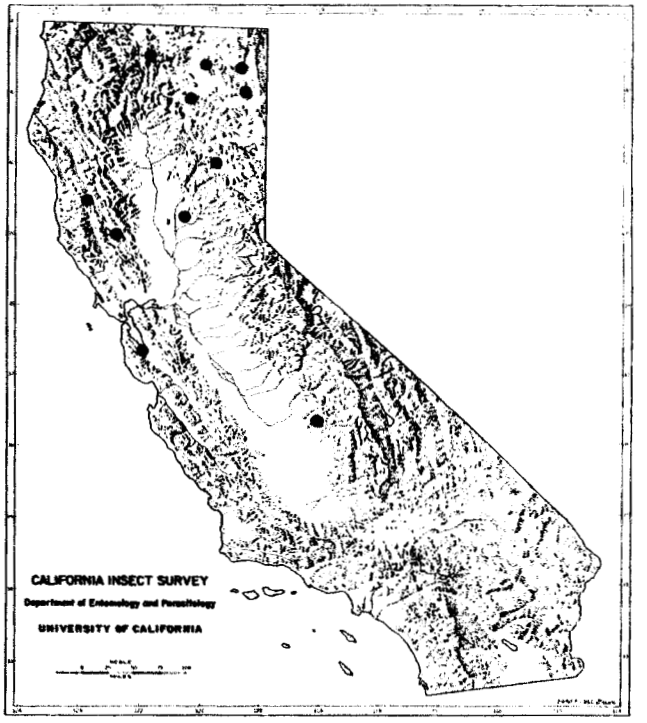
Pherbellia griseola (Fallén)
Map 5; Plate 8, Figs. 5, 6

Sciomyza griseola Fallén, 1820:14; Scandinavia; cotypes m, f, NRS no. 401/66, slides no. 6126-128.
Sciomyza fuscipes Macquart, 1835:407; Elberg and Rozkošný 1978:51.

Melina griseola; Melander, 1920:314.
Pherbellia griseola; Steyskal, 1954c:55; 1961:411 (redescribed).

Geographic range: EUROPE. CANADA and USA: widespread north of 40° latitude.

California records (Map 5): SHASTA CO.: 2 mi (3.2 km) south of Pondosa (Little Bear Flat), 4140 feet (1262 m) elevation, VI-16-1969, VI-24-1976, VII-8-1970, VII-25-1972, VIII-1-1973, VIII-8-1968 (F&O).



Map 4. California distribution of *Pherbellia idahoensis* Steyskal

Remarks: We examined material from California and Oregon. In California we collected 30 m, 29 f at Little Bear Flat in shaded mesic grassy areas on the east side of the meadow. *P. griseola*, *P. idahoensis*, *P. melanderi*, and *P. oregona* are in the *P. fuscipes* group of Steyskal (1961), and can be separated with certainty only by examination of male terminalia. Head profile as in Plate 5, Fig. 3.

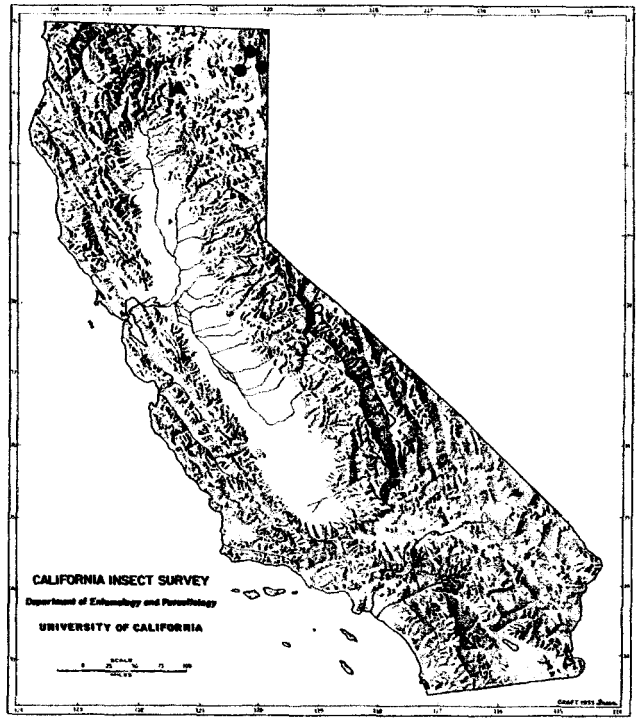
Pherbellia idahoensis Steyskal
Map 4; Plate 9, Figs. 1, 2

Pherbellia idahoensis Steyskal, 1961:411; Moscow, Latah Co., Idaho; holotype m, USNM.

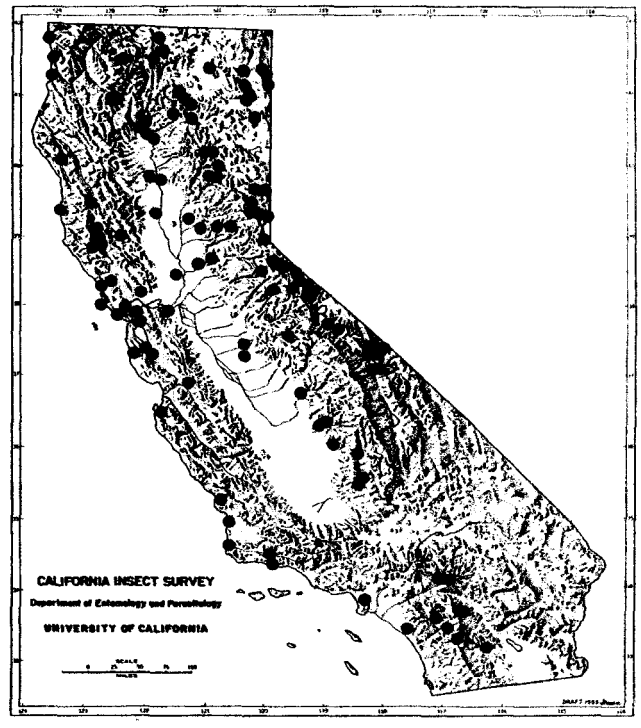
Geographic range: CANADA: southern British Columbia. USA: California north of 36° latitude, Idaho, Oregon, Montana, Utah, Washington.

California records (Map 4): BUTTE CO.: Honcut. LAKE CO.: Clear Lake Oaks. LASSEN CO.: Smith Flat Reservoir. MENDOCINO CO.: Willits. MODOC CO.: Alturas, Hackamore Reservoir. PLUMAS CO.: Crescent Mills. SANTA CLARA CO.: Stanford Lake. SHASTA CO.: Fall River Mills. SISKIYOU CO.: Grass Lake. TULARE CO.: Woodlake.

Remarks: With the exception of a single specimen from Silver Creek State Park, Klamath Co., Oregon, we examined material only from California



Map 5. California distribution of *Pherbellia melanderi* Steyskal ●; and *Pherbellia griseola* (Fallén) ▲



Map 6. California distribution of *Pherbellia nana nana* (Fallén)

where we collected 47 f, 46 m. Most of the specimens were from Grass Lake, Siskiyou Co.

This is the largest *Pherbellia* in California and was collected by sweeping aquatic vegetation emerging from shallow water along shores of lakes or ponds.

Pherbellia melanderi Steyskal
Map 5; Plate 9, Figs. 3, 4

Pherbellia melanderi Steyskal, 1963:117; Three Forks, Gallatin Co., Montana; holotype m, USNM.

Geographic range: USA: California, Colorado, Montana, Oregon, Utah.

California records (Map 5): MODOC CO.: Alturas, Cedarville, Davis Creek, VI-9,10-1966 (F&O).

Remarks: We examined material from California, Colorado, Oregon, and Utah. In California we collected 5 f, 6 m. Visits to the Modoc Co. sites and others in that general area later in the summer and later in other summers in other years yielded no flies of this species. Therefore we think *P. melanderi* is an early season species. Adults superficially resemble *P. griseola*, being of same coloration, but are slightly larger.

Pherbellia nana nana (Fallén)
Map 6; Plate 10, Figs. 1, 2

Sciomyza nana Fallén, 1820:15; Scandinavia, cotypes m, f, NRS.
Melina (*Graphomyzina*) *nana*; Cresson, 1920:47.
Pherbellia nana; Steyskal, 1956:73.
Pherbellia (*Chetocera*) *nana nana*; Elberg, 1978:208.

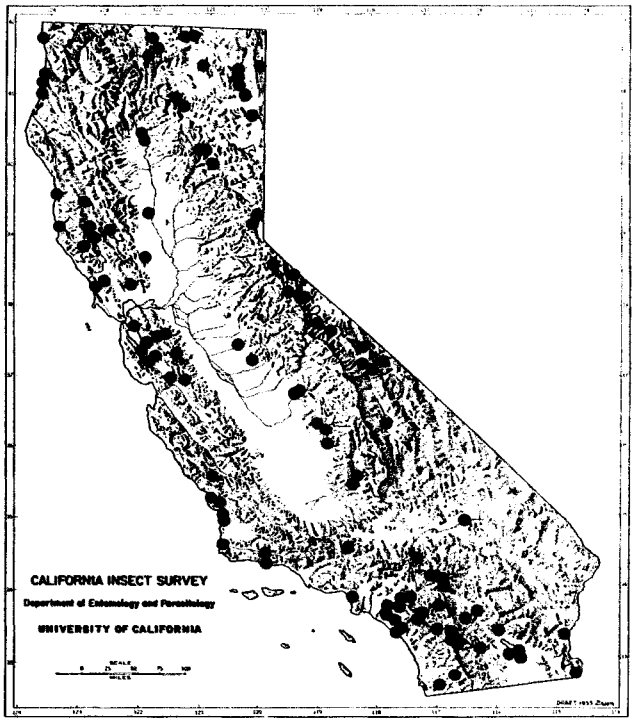
Geographic range: EUROPE. ASIA. MEXICO: Distrito Federal. NORTH AMERICA: Alaska, British Columbia to Quebec, south to Florida, west through Texas to California and Oregon.

California records (Map 6): widespread, in all but the deserts, recorded from 48 counties.

Remarks: We examined material from 10 of the 41 states and provinces where it has been reported. In California we collected 555 f, 869 m.

Discussion: This is the most ubiquitous sciomyzid fly in North America. An Asian subspecies *P. n. reticulata* (Thomson, 1868), was designated by Elberg (1978:208). Further study may justify additional subspecific assignment(s) of North American material.

Map 7. California distribution of *Pherbellia oregona* Steyskal



Map 8. California distribution of *Pherbellia parallela* (Walker)

Pherbellia oregona Steyskal
Map 7; Plate 10, Figs. 3, 4

Pherbellia oregona Steyskal, 1961:411-412; Forest Grove, Washington Co., Oregon; holotype m, UI.

Geographic range: USA: California, Oregon, Washington.

California records (Map 7): DEL NORTE CO.: Crescent City, 50 feet (15 m) elevation, VI-11-1965, VI-11-1966, VIII-5-1968 (F&O). High Prairie Creek, Hwy 101, 20 feet (6 m) elevation, VIII-5-1968 (F&O). HUMBOLDT CO.: Little River State Beach, sea level, VI-10-1965 (F&O). 1 mi (1.6 km) south of Orick, VI-11-1965 (F&O). Samoa Dunes, VI-10-1969 (J. Powell, CIS).

Remarks: We examined material from California and Oregon. In California we collected 4 f, 8 m. In our 6 collections *P. oregona* occurred with 7 other species of marsh flies, comprising approximately 6% of the total.

Pherbellia parallela (Walker)
Map 8, Plate 10, Figs. 5, 6

Sciomyza parallela (Walker) 1853a (1852):401; USA; holotype m, BMNH.
Sciomyza humilis Loew, 1876:330.
Pherbellia humilis; Steyskal, 1963:122.
Pherbellia parallela; Knutson, 1981:336.

Geographic range: Nearctic to Neotropical. CANADA. COSTA RICA. MEXICO. USA: widespread coast to coast.

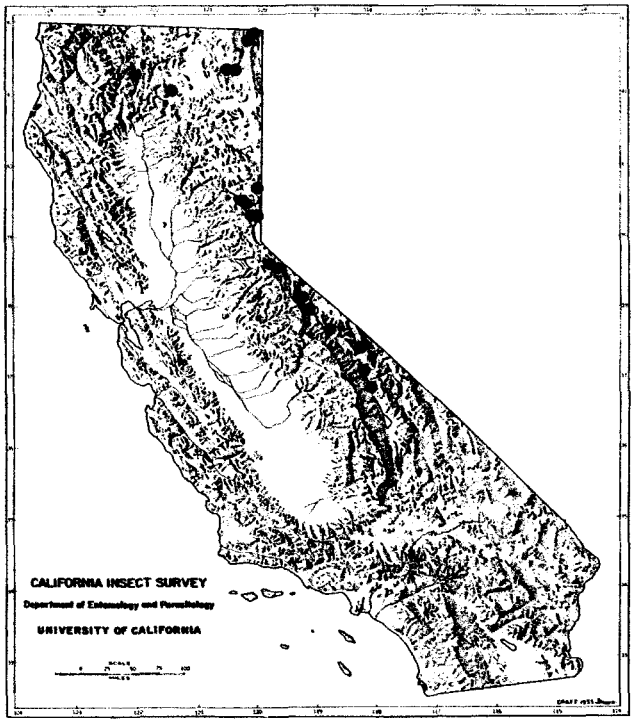
California records (Map 8): widespread, recorded from 34 counties.

Remarks: We examined material from 11 of the 32 states and provinces where it has been reported. In California we collected 828 f, 1315 m. Largest numbers were collected along margins of lakes, reservoirs, ponds. Adult habitus as shown in Plate 1, Fig. 2.

Pherbellia schoenherri maculata (Cresson)
Map 9; Plate 11, Figs. 2, 3

Musca punctata Fabricius, 1794:347, preocc. Poda 1761.
Sciomyza schoenherri Fallén, 1826:13.
Sciomyza monilis Meigen, 1830:17.
Pherbellia vernalis Robineau-Desvoidy, 1830:696.
Melina (Graphomyzina) maculata Cresson, 1920:48; Illinois; holotype m, ANSP no. 6222.
Melina schoenherri; Melander, 1920:316.
Pherbellia schoenherri; Steyskal, 1949:177.
Pherbellia schoenherri maculata; Steyskal, 1965b:686.
Pherbellia punctata; Elberg and Rozkošný, 1978:51 (in part).
Pherbellia schoenherri; Rozkošný, 1981:179.

Geographic range: NORTH AMERICA: Coast to coast north of 37° latitude to Alaska and Yukon, east to Newfoundland.



Map 9. California distribution of *Pherbellia schoenherri maculata* (Cresson)

California records (Map 9): ALPINE CO.: Hope Valley, Woodfords. INYO CO.: 12 mi (19.2 km) west of Big Pine, Onion Valley. LASSEN CO.: 2 mi (3.2 km) west of Hallelujah Junction, Clear Creek. MODOC CO.: Alturas, Lily Lake 7 mi (11.2 km) east of Pine Creek. MONO CO.: Bridgeport Lake Dam, Hot Creek, Mono Lake, Upper Fish Slough. NEVADA CO.: Boca Spring, Hobart Mills. SHASTA CO.: Pondosa (Little Bear Flat). SIERRA CO.: Sattley, Sierraville. SISKIYOU CO.: Mt. Shasta (town). TULARE CO.: 9000 feet (2743 m) elevation (no locality named).

Pherbellia s. maculata is Nearctic; *P. s. schoenherri* is Palaearctic.

Remarks: This species has been reported from 30 states and provinces. We examined material from California, Nevada, Oregon, and Utah. In California we collected 81 f, 120 m, mainly in the eastern portion of the state.

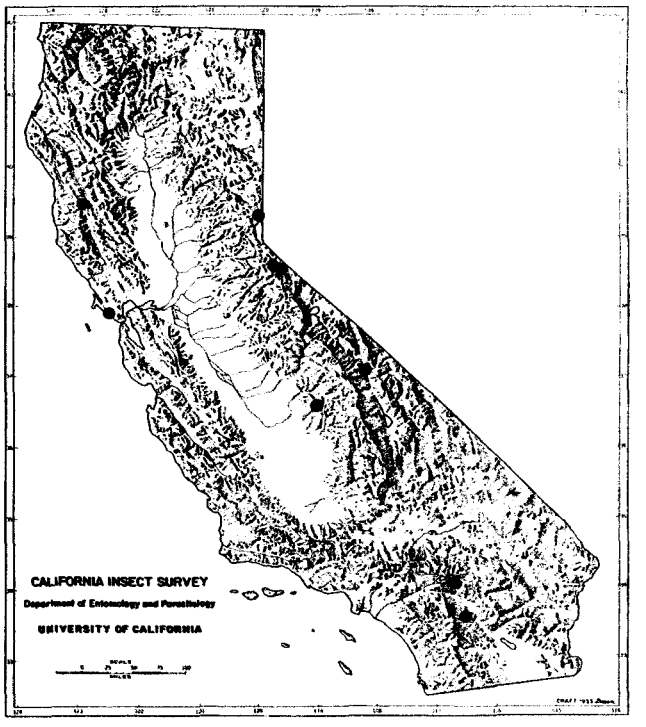
Pherbellia subtilis Orth and Steyskal
Map 10; Plate 11, Figs. 4-6

Pherbellia subtilis Orth and Steyskal, 1980:284, in Orth *et al.*, 1980; Willits, Mendocino Co., California; holotype m, allotype, USNM no. 75550.

Pherbellia obscura; Bratt, et al., 1969:73 (in part); (not Ringdahl, 1948).

Pherbellia ventralis; Steyskal, 1965b:687, (not Fallén, 1820); Palaearctic.

Geographic range: widespread in western North America north of 33° latitude, not Alaska.



Map 10. California distribution of *Pherbellia subtilis* Orth and Steyskal

California records (Map 10): ALPINE CO.: Hope Valley, Woodfords. FRESNO CO.: Sequoia Lake. INYO CO.: Big Pine. MARIN CO.: Bolinas. MENDOCINO CO.: Willits. NEVADA CO.: Boca Spring. RIVERSIDE CO.: Lake Hemet. SAN BERNARDINO CO.: Little Cienega Seca.

Remarks: We examined material from 7 of the 16 states and provinces where the species has been reported. In California we collected 29 f, 49 m by sweeping vegetation along fresh flowing springs and streams.

Pherbellia trabeculata (Loew)
Map 11; Plate 12, Figs. 1, 2

Sciomyza trabeculata Loew, 1872:100; Texas; holotype m, MCZ no. 13210.

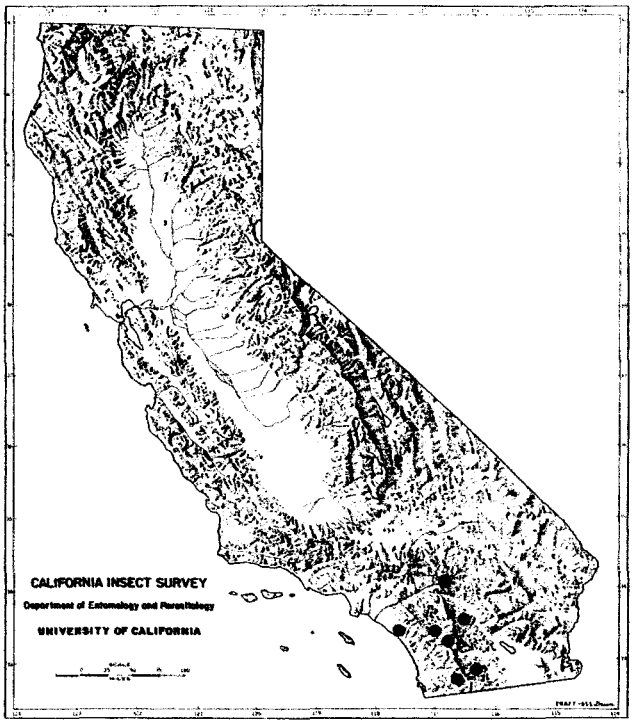
Sciomyza strigata Malloch, 1914:324 (not Wulp, 1897).

Melina trabeculata; Melander, 1920:315.

Pherbellia trabeculata; Steyskal, 1965b:687.

Geographic range: NORTH AMERICA: south of approximately 34° latitude, California to Texas, south through Mexico (including Baja California) into Guatemala.

California records (Map 11): ORANGE CO.: San Juan Capistrano (San Juan Creek). RIVERSIDE CO.: Lake Hemet, Vail Lake. SAN BERNARDINO CO.: Big Bear Lake (Boulder Bay). SAN DIEGO CO.: Palomar Mountain (Doane Pond), Laguna (Mt. presumed), Alpine (Sacatara).



Map 11. California distribution of *Pherbellia trabeculata* (Loew)

Remarks: We examined material from 7 of the 12 states in the U.S. and Mexico where the species has been reported. In California we collected 110 f, 132 m.

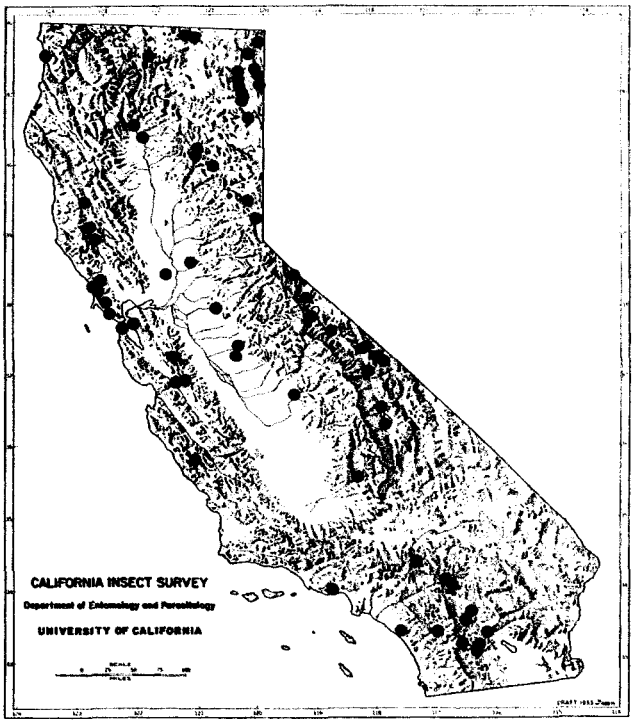
Pherbellia vitalis (Cresson)
Map 12; Plate 12, Figs. 3, 4

Melina vitalis Cresson, 1920:43; Berkeley Hills, Alameda Co., California; holotype m, ANSP no. 6221.
Melina palustris Melander, 1920:315.
Pherbellia vitalis; Steyskal, 1956:73.

Geographic range: NORTH AMERICA: Alaska, east to Quebec, south to New Jersey, west through New Mexico to southern California.

California records (Map 12): widespread, in all but the deserts, recorded in 28 counties.

Remarks: We examined material from 8 of the 27 states where the species has been reported. In California we collected 389 f, 779 m.



Map 12. California distribution of *Pherbellia vitalis* (Cresson)

Genus *Pteromicra* Lioy, 1864:1012

Pteromicra Lioy, 1864.....
1. Frontovertex shining yellowish to brown; face sub-shining yellowish brown; thoracic pleura yellowish to dark brown; fore femur of female almost entirely black; fore femur of male with distal half blackened. Male terminalia as in Plate 12, Fig. 5-7.....*P. pectorosa* (Hendel)

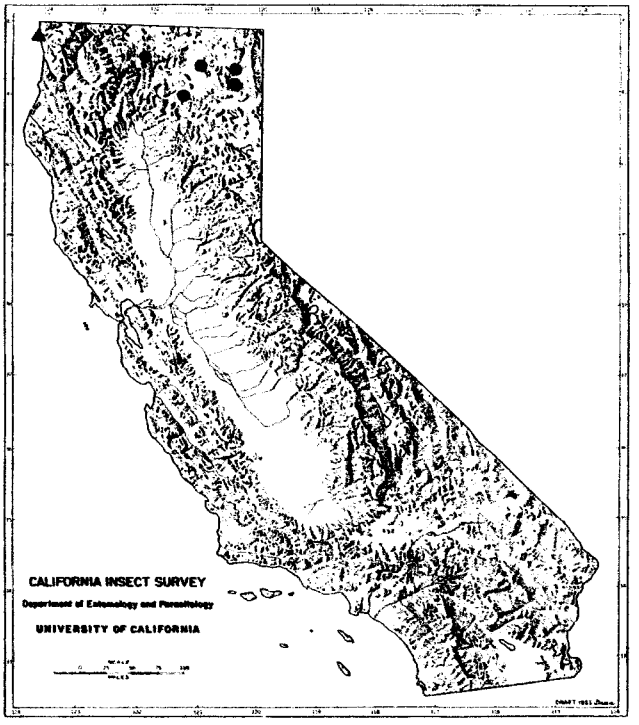
Frontovertex shining black, bordered anteriorly by a yellowish margin; face shining black, tinged with brown; thoracic pleura blackish; distal third of fore femur black. Male terminalia as in Plate 13, Figs. 1-3 ....*P. siskiyouensis* Fisher & Orth

Pteromicra pectorosa (Hendel)
Map 13; Plate 12, Figs. 5-7

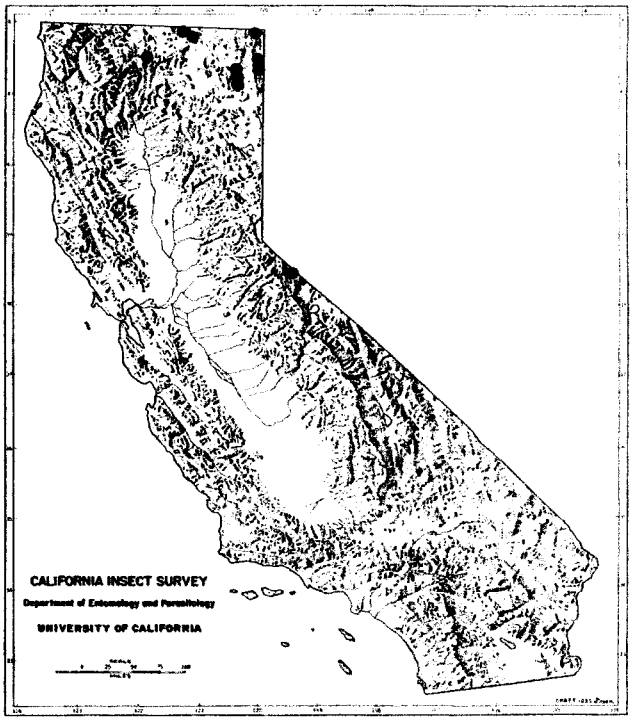
Dichrochira pectorosa Hendel, 1902:61; Berlin, Germany; cotypes m, f, NHMV.
Pteromicra pectorosa; Kertesz, 1915:116; Rozkošný and Knutson, 1970:1439; lectotype m.

Geographic range: EUROPE. NORTH AMERICA: north of 41° latitude; Pacific coast to New York.

California record (Map 13): DEL NORTE CO.: 1 to 3 mi (1.6-4.8 km) north of Crescent City, 50 feet (16 m) elevation, VI-11-1966 (F&O).



Map 13. California distribution of *Pteromicra siskiyouensis* Fisher and Orth •; and *Pteromicra pectorosa* (Hendel) ▲



Map 14. California distribution of *Sciomyza simplex* Fallén

Remarks: We examined material from 8 states and provinces. In California we collected 3 f, 2 m on one of several collection attempts in the Crescent City area.

Pteromicra siskiyouensis Fisher and Orth
Map 13; Plate 13, Figs. 1-3

Pteromicra siskiyouensis Fisher and Orth, 1966:307; Grass Lake, Siskiyou Co., California; holotype m, allotype; CAS no. 10168.

Pteromicra nigrimana; Steyskal, 1954a:265 (in part); 1965b:687 (not Meigen, 1830); Palearctic.

Geographic range: CANADA: Alberta, British Columbia. USA: California, Idaho, Montana, Oregon, Washington, Wyoming.

California records (Map 13): MODOC CO.: Alturas, 4300 feet (1311 m) elevation, Hackamore Reservoir, 4650 feet (1417 m) elevation, VI-10-1966 (F&O); Likely (Pit River), 4400 feet (1341 m) elevation VI-6-1967 (F&O). SHASTA CO.: Hat Creek, Hwy 299, 2650 feet (808 m) elevation, VI-26-1973. SISKIYOU CO.: Grass Lake, SE shore, 5122 feet (1561 m) elevation, VI-10-1966, VI-17-1970, VIII-6-1965 (F&O).

Remarks: We examined material from all of the states and provinces given above. In California we collected 120 f, 96 m. Approximately 95% were collected at Grass Lake in a shallow marsh with abundant emergent vegetation on the south side of the highway near the east end of the lake. Adult habitus as shown in Plate 1, Fig. 3. Head profile as in Plate 5, Fig. 4.

Genus *Sciomyza* Fallén, 1820:11

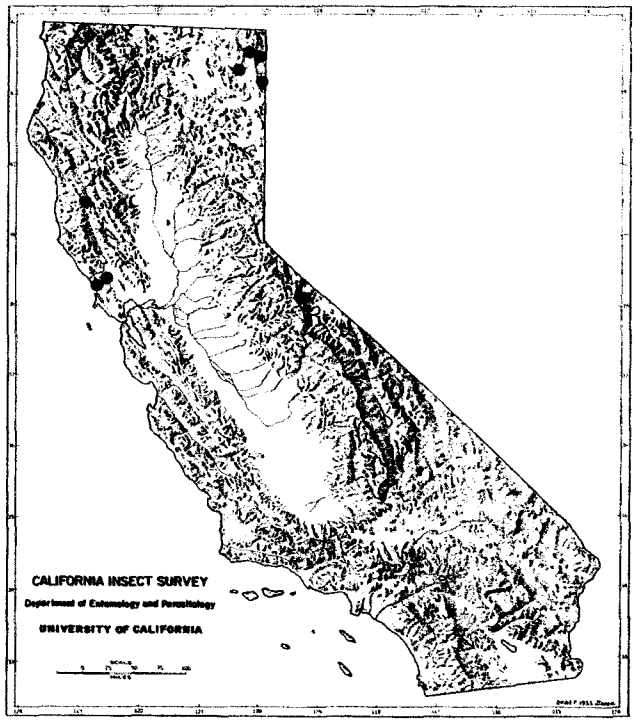
Sciomyza Fallén, 1820.....

1. Mesopleuron with bristles and hairs near the posterior edge; pteropleuron with 3-6 strong bristles in addition to fine bristles; fore femur testaceous. Male terminalia as in Plate 13, Figs. 4, 5 ..... *S. simplex* Fallén

   Mesopleuron bare; pteropleuron with 1-2 strong bristles in addition to fine bristles; fore femur entirely black in females; black in distal half in males. Male terminalia as in Plate 13, Figs. 6, 7 ..... *S. varia* (Coquillett)

Sciomyza simplex Fallén
Map 14; Plate 13, Figs. 4, 5

Sciomyza simplex Fallén, 1820:12; Sweden, "Scania, Oelandia"; cotypes m, f, NRS.



Map 15. California distribution of *Sciomyza varia* (Coquillett)

Geographic range: EUROPE. NORTH AMERICA: Alaska to Manitoba, southward to Michigan, westward to Arizona and California.

California records (Map 14): MODOC CO.: Alturas, Cedarville, Hackamore Reservoir, Lake City, Likely (Pit River), Snag Lake [near Lily Lake, 7 mi (11.2 km) east of Pine Creek], Tulelake. MONO CO.: Topaz (Village). SISKIYOU CO.: Grass Lake, 6 mi (9.6 km) northwest of Tulelake.

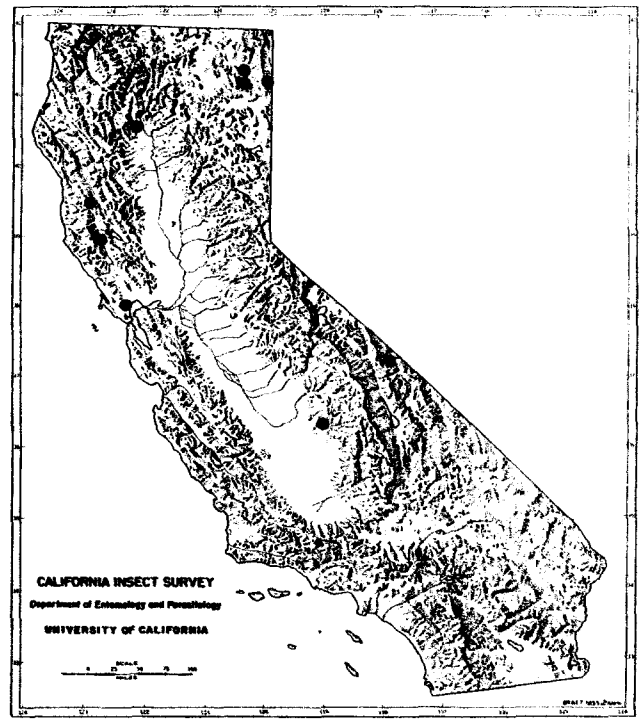
Remarks: We examined material from Arizona, California, Colorado, Idaho, Oregon, and Utah. In California we collected 43 f, 59 m, approximately 60% were from the Alturas area. Adult habitus as shown in Plate 1, Fig. 4. Head profile as in Plate 5, Fig. 2.

Sciomyza varia (Coquillett)
Map 15; Plate 13, Figs. 6, 7

Bischofia varia Coquillett, 1904:12; Riguad, Quebec, Canada; holotype m, MCZ.
Pteromicra inermis Steyskal, 1956:76.
Sciomyza varia; Steyskal, 1973:83.

Geographic range: CANADA: Alberta, Ontario, Quebec. USA: California, Michigan, New York, South Dakota, Utah.

California records (Map 15): MENDOCINO CO.: 3.5 mi (5.6 km) north of Willits. MODOC CO.: Alturas, Davis Creek, Eagleville, Lake City. MONO CO.: Bridgeport Lake Dam. SONOMA CO.: Sebastopol, Valley Ford.



Map 16. California distribution of *Antichaeta robiginosa* Melander

Remarks: We examined material from California and Utah. In California we collected 3 f, 12 m. Never were more than 1 or 2 specimens taken per collection. Neither species of *Sciomyza* has been collected south of 38° latitude in California, nor has *simplex* been collected coastally. The species are sympatric in Modoc Co.

TRIBE TETANOCERINI

Genus *Antichaeta* Haliday, 1838:187

Antichaeta Haliday, 1838 .....
1. Thoracic dorsum mostly testaceous 2
   Thoracic dorsum mostly cinereous blue 3
2. Third antennal segment blackish on apical half; longest aristal hairs usually less than 0.1 mm; distal portion of foretibia and entire tarsus black in female, infuscated in male. Male terminalia as in Plate 14, Figs. 1-6....*A. borealis* Foote
   Third antennal segment lightly tinged with black on apical half; longest aristal hairs usually greater than 0.1 mm; foretibia and entire tarsus infuscated in female and male. Male

terminalia as in Plate 15, Figs. 4-9 .... *A. testacea* Melander

3. Third antennal segment usually tinged with black on apical half, occasionally only lightly tinged with brown; aristal hairs, long, sparse, longest hairs more than 0.12 mm; sides of thorax whitish-pruinose to testaceous. Male terminalia as in Plate 14, Figs. 7-9; Plate 15, Figs. 1-3 ..... *A. robiginosa* Melander

Third antennal segment at most lightly tinged with brown; aristal hairs, short, longest hairs less than 0.07 mm; sides of thorax of female mostly pruinose-cinereous blue, usually less pronounced in male. Male terminalia as in Plate 16, Figs. 1-6 ..... *A. vernalis* Fisher & Orth

Antichaeta borealis Foote
Map 18; Plate 14, Figs. 1-6

Antichaeta borealis Foote, 1961b:161; 8 mi (12.9 km) north of Sandpoint, Bonner Co., Idaho; holotype m, CU.

Geographic range: USA: California, Idaho, Montana, New York, Ohio.

California record (Map 18): Modoc Co.: 3 mi (4.8 km) north of Eagleville, 4640 feet (1414 m) elevation; VII-10-1968 (F&O).

Remarks: We examined material from California, Montana, and Ohio. The only known specimen from California is a female from an unshaded boggy gently sloping pasture.

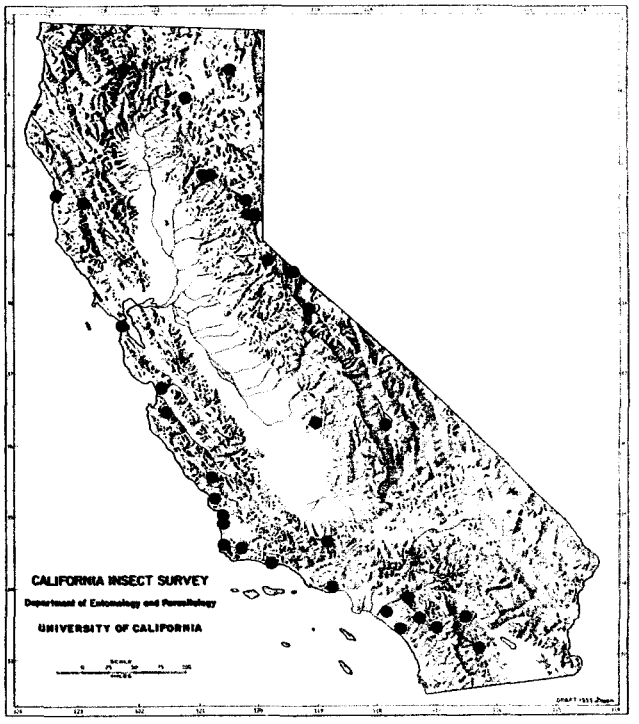
Antichaeta robiginosa Melander
Map 16; Plate 14, Figs. 7-9; Plate 15, Figs. 1-3

Antichaeta robiginosa Melander, 1920:317; Three Forks, Gallatin Co., Montana; holotype f, USNM. Fisher and Orth, 1971a:36 (redescribed).

Geographic range: USA: California, Montana, Oregon, Washington.

California records (Map 16): Inyo Co.: Buckhorn Springs, 5000 feet (1524 m) elevation, IV-26-1966 (F&O). Marin Co.: Novato, 40 feet (12 m) elevation, I-17-1963 (P. H. Arnaud). Mendocino Co.: Hopland, 600 feet (183 m) elevation, V-25-1967, V-12-1966 (F&O); Willits, 1400 feet (427 m) elevation, VI-12-1966 (F&O). Modoc Co.: Alturas, Eagleville, Likely, Willow Ranch, 4300-4700 feet (1311-1433 m) elevation, VI-6 to VII-10, 1966-1974 (F&O). Shasta Co.: Redding, 480 feet (168 m) elevation, V-24-1967 (F&O). Tulare Co.: Woodlake, 550 feet (168 m) elevation, V-24-1947 (N. W. Frazier).

Remarks: We examined material from California and Oregon. In California we collected a total of 5 f, 10 m in partially shaded to unshaded grassy meadows with flowing water present. We suspect succineid snails (eggs) are the primary host.



Map 17. California distribution of *Antichaeta testacea* Melander

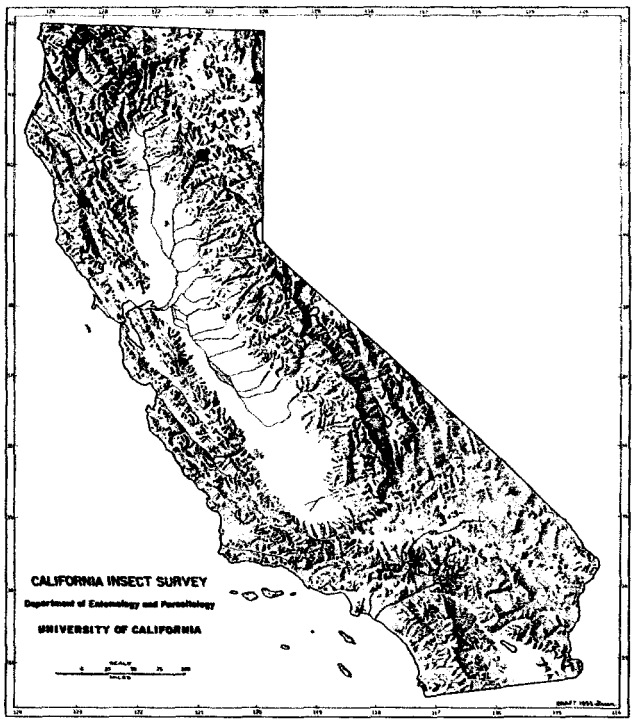
Antichaeta testacea Melander
Map 17; Plate 15, Figs. 4-9

Antichaeta testacea Melander, 1920:318; Gallatin Co., Montana; holotype m, USNM.

Geographic range: Mexico: Baja California Norte. USA: California, Idaho, Montana, New Mexico, Oregon, South Dakota, Utah.

California records (Map 17): widespread, 20 counties.

Remarks: We examined material from California, Oregon, and New Mexico. In California we collected 123 f, 188 m. Biology reported by Fisher and Orth (1964); eggs are deposited on egg masses of mainly succineid snails; first instar larvae feed on snail embryos; summer pupal diapause at Riverside. Collected in open to partially shaded stream and meadow habitats. Adult habitus as shown in Plate 1, Fig. 5. Head profile as in Plate 5, Fig. 5.



Map 18. California distribution of *Antichaeta vernalis* Fisher and Orth •; and *Antichaeta borealis* Foote ▲

Antichaeta vernalis Fisher and Orth
Map 18; Plate 16, Figs. 1-6

Antichaeta vernalis Fisher and Orth, 1971a:38; 2 mi (3.2 km) north of Willits, Mendocino Co., California; holotype m, allotype, CAS no. 10208.

Geographic range: USA: California, Idaho, Oregon, Washington.

California records (Map 18): MENDOCINO CO.: 2 mi (3.2 km) north of Willits, 1330 feet (404 m) elevation, IV-23,24-1968 (F&O). PLUMAS CO.: Rock Creek at Hwy 36, 4900 feet (1494 m) elevation, VI-8-1966 (F&O).

Remarks: We examined material from California and Oregon. In California we collected 3 f, 2 m. The collection site 2 mi north of Willits was a narrow weed-choked ditch with flowing water, and a nearby large pasture.

Genus *Dictya* Meigen, 1803:277

Dictya Meigen, 1803.....

1. Second antennal segment shining on outer upper half or more, longer than high; large, deep black parafrontal spots present..... .....abnormis group (Steyskal, 1954b)

   Ventral process of hypandrium short and straight, with obliquely truncate tip; ventral process of epandrium with short broad lobe; surstylus in ventral view with lateral bulge and blunt tip. Wing length: 15 males, 4.15-4.7 mm, average 4.41; 11 females, 5.05-5.55 mm, average 5.23. Wing length data on *D. matthewsi*, from Steyskal (1960:36). Not yet discovered in California. Known from Parker, Arizona (Valley and Berg 1977:41). Plate 18, Figs. 5-8.....*D. matthewsi* Steyskal

   Second antennal segment wholly pruinose, not longer than high; parafrontal spots small or lacking; typical group (Steyskal, 1954b).....2

2. Ventral process of hypandrium with a preterminal point.....3

   Ventral process of hypandrium without a preterminal point.....4

3. Ventral process of hypandrium short and strongly bent; preterminal point small. Wing length: 10 males, 4.4-5.0 mm, average 4.7; 10 females, 5.2-5.9 mm, average 5.6. Male and female terminalia as in Plate 18, Figs. 1-4....*D. incisa* Curran

   Ventral process of hypandrium not strongly bent; preterminal point large. Wing length: 10 males, 4.6-5.2 mm, average 5.0; 10 females, 5.3-5.9 mm, average 5.7. Not yet discovered in California. Known from Arizona, Nevada, and Oregon. Male and female terminalia as in Plate 17, Figs. 1-4.....*D. expansa* Steyskal

4. Surstylus with dorsal tip blunted; ventral process of hypandrium robust and long. Wing length: 10 males, 4.4-5.1 mm, average 4.9; 10 females, 5.2-6.0 mm, average 5.6. Found in southern California. Male and female terminalia as in Plate 20, Figs. 5-8..... .....*D. texensis* Curran

   Surstylus with dorsal tip angulate; ventral process of hypandrium not robust and of moderate length. Found statewide or in northern California.....5

5. Terminal portion of ventral process of hypandrium flattened. Wing length: 10 males, 5.1-5.6 mm, average 5.3; 10 females, 6.0-6.7 mm, average 6.2. Found in northern California. Male and female terminalia as in Plate 17, Figs. 5-8.....*D. fontinalis* Fisher & Orth

   Terminal portion of ventral process of hypandrium not flattened or only very slightly so. Occurs statewide.....*D. montana* Steyskal

Forms of *D. montana* Steyskal indicated as follows.

A. Male and female terminalia as in Plate 19, Figs. 1-4. Wing length: 10 males, 4.6-5.3 mm, average 5.0; 10 females, 5.6-6.3 mm, average 5.9.....*D. montana* "A"

B. Male and female terminalia as in Plate 19, Figs. 5-8. Wing length: 10 males, 3.9-4.4 mm,

average 4.2; 10 females, 4.4-5.2 mm, average 4.8.....*D. montana* "Alturas"

C. Male and female terminalia as in Plate 20, Figs. 1-4. Wing length: 10 males, 4.5-5.2 mm, average 4.9; 10 females, 4.9-6.1 mm, average 5.6 .....*D. montana* "so. Cal."

D. Male and female Terminalia composite of "so. Cal." and "A." No illustrations. Wing length: 10 males, 4.5-5.2 mm, average 4.9; 10 females, 5.5-6.0 mm, average 5.8..... .....*Dictya montana* "intermed."

Dictya fontinalis Fisher and Orth
Map 19; Plate 17, Figs. 5-8

Dictya fontinalis Fisher and Orth, 1969b:222; Boca Spring, Nevada Co., California; holotype m, allotype; CAS NO. 10207.

Geographic range: USA: California, Nevada, Oregon, Washington.

California records (Map 19): MARIN CO.: Inverness, IV-22,24,26-1951 (P. D. Ashlock, CDA). MENDOCINO CO.: 14 mi (22.5 km) west of Willits, VI-30-1951 (W. C. Bentinck). NEVADA CO.: Boca Spring, 5900 feet (1798 m) elevation, IX-22-1966 (F&O); Nevada City, 2500 feet (762 m) elevation, VI-13-1965 (T. W. Fisher). SHASTA CO.: Cassel, VII-5-1955 (J. W. MacSwain). TRINITY CO.: Waldorff Ranch, near Big Bar, VII-3-1964 (J. C. Borden).

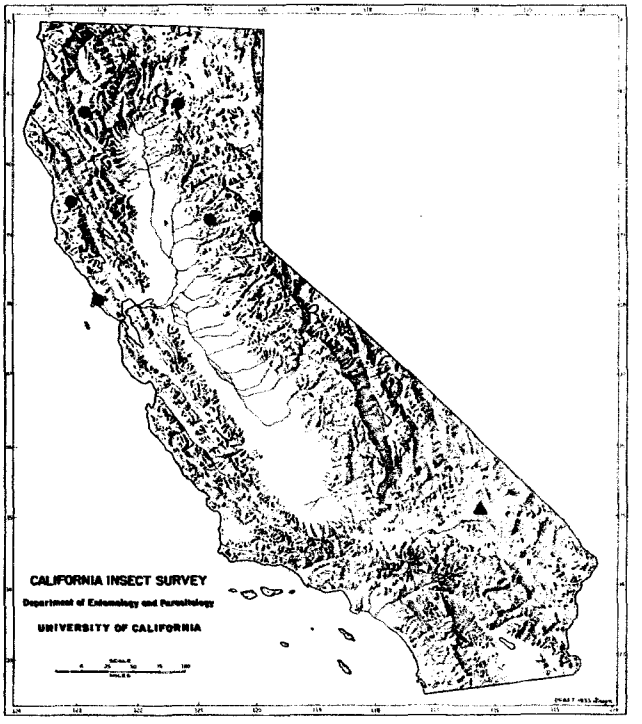
Remarks: We examined material from all four states. In California we collected 27 f, 59 m. The Boca Spring and Nevada City sites were flowing spring areas in meadows. Biology by Fisher and Orth (1969b). The natural host of first instar larvae is presumed to be *Lithoglyphus turbiniformis* (Tryon, 1865) (Hydrobiidae), an operculate prosobranch mollusk which appears to be restricted to flowing fresh shallow (<10 cm) water. However, sphaeriid clams were also present at the type locality and may also be attacked.

Dictya incisa Curran
Map 19; Plate 18, Figs. 1-4

Dictya incisa Curran, 1932:6; Great Zuni River, Arizona; holotype m, AMNH. Steyskal, 1954b:530 (redescribed).

Geographic range: MEXICO: Nuevo Leon, Sonora (Hermosillo, Imuris). USA: Arizona, California, Kansas, Nevada, New Mexico, Utah, Washington.

California record (Map 19): SAN BERNARDINO CO.: Baker, IV-24-1935 (A. L. Melander).



Map 19. California distribution of *Dictya fontinalis* Fisher and Orth •; and *Dictya incisa* Curran ▲

Remarks: We have examined material from Sonora and New Mexico. The California record was provided by Dr. Karl Valley (PADA) who examined Melander's single male specimen in the USNM collection. We have twice collected sciomyzid flies at Afton Junction where the Mojave River surfaces about 30 mi (48 km) west of Baker, but the only *Dictya* taken was *montana*, form "so. Cal."

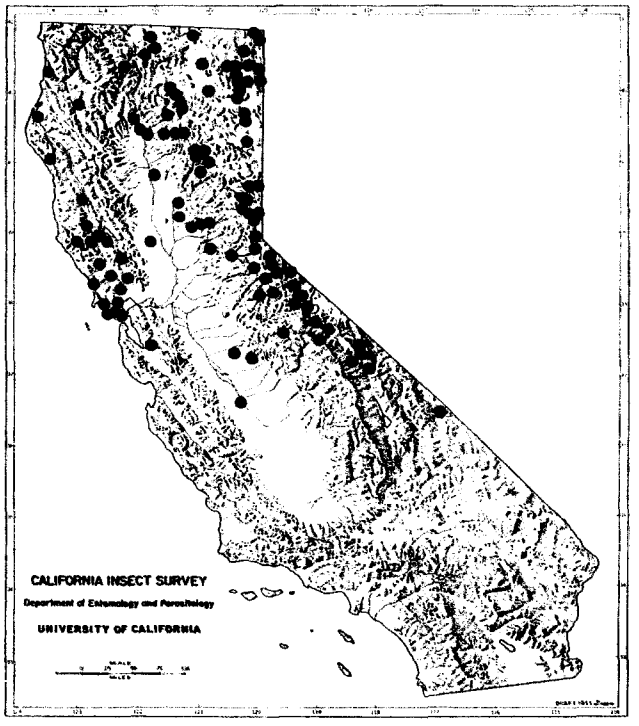
Dictya montana Steyskal
Maps 20-23; Plates 19, 20

Dictya montana Steyskal, 1954b:534; Paradise Cove, Marin Co., California; holotype m, allotype, CAS #11999.

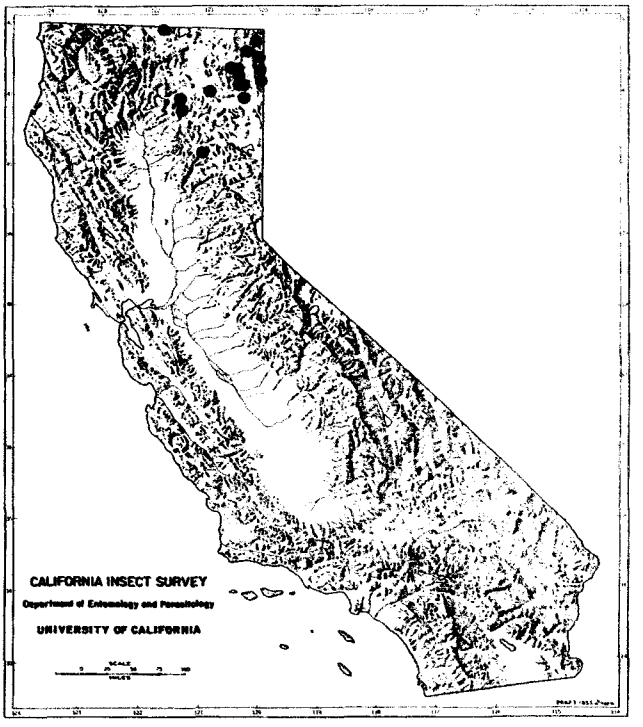
Geographic range: CANADA: Alberta, British Columbia, Saskatchewan. MEXICO: Baja California. USA: Arizona, California, Colorado, Idaho, Nevada, Oregon, Utah, Washington.

California records (Maps 20-23): The species is recorded from 55 of the 58 counties.

Remarks: We examined material from all of the above listed states and provinces, and over 4000 specimens from California. Adult habitus as shown in Plate 1, Fig. 6. Head profile as in Plate 5, Fig. 6.



Map 20. California distribution of *Dictya montana* Steyskal, clinal form "A"



Map 21. California distribution of *Dictya montana* Steyskal, clinal form "Alturas"

Discussion: We consider *D. montana* a polytypic species which can be segregated into four forms by differences in size, male and female terminalia, and often by patterns of distribution. The forms are referred to as "A", "Alturas", "Intermediate (Intermed.)", and "southern California (so. Cal.)". In the laboratory reciprocal cross breeding occurs, being of limited to good success depending on the combinations attempted, as reported by Fisher and Orth (1969b). Knowing this, we hesitate to create discreet species or subspecies designations for each form. All four forms are known to occur in Oregon. In addition, we have seen form "so. Cal." from Nevada, Washington, and Baja California Norte, and form "Alturas" from Colorado, Idaho, Nevada, and Utah.

Morphological criteria: Main check points on the male postabdomen are the protuberance on the ventral margin of the epandrium and the ventral process of the hypandrium. Females usually can be distinguished by the nature of the concave posterior margin of abdominal sternite VIII, and by male association.

FORM "A"
Map 20; Plate 19, Figs. 1-4

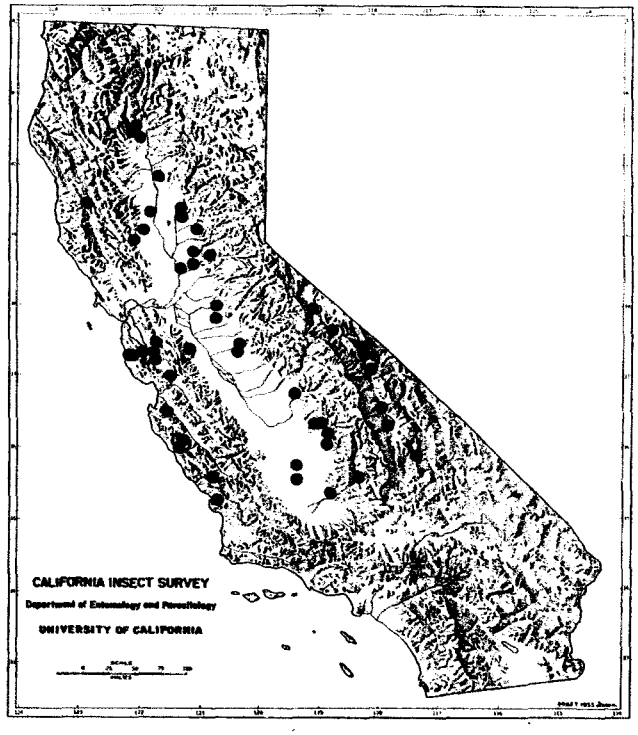
California records: widespread north of 36° latitude in 28 northern and central counties.

Remarks: "A" does not occur in southern California. It is the only form of *D. montana* we have seen in the area of Lake Tahoe for 100 mi (161 km) to the north, 50 mi (80 km) to the west, 80 mi (129 km) to the south, and to the east and north of Lake Tahoe in southern Washoe Co., Nevada. 324 f, 643 m, or 30% of the *D. montana* we collected, were assigned to form "A."

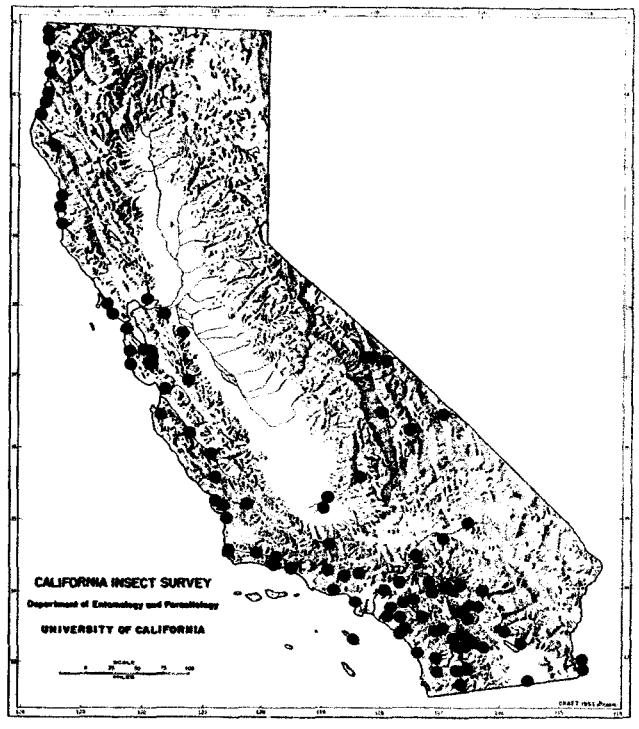
FORM "Alturas"
Map 21; Plate 19, Figs. 5-8

California records: north of 40° latitude in 5 counties in the northeastern part of the state.

Remarks: This form co-exists with "A," but not with forms "Intermed." and "so. Cal.". "Alturas" is the smallest of the four forms and superficially may therefore be confused with *D. umbroides* Curran, a typically boreal species. 38 f, 90 m, or 4% of *D. montana* we collected, were assigned to form "Alturas."



Map 22. California distribution of *Dictya montana* Steyskal, clinal form "Intermediate"



Map 23. California distribution of *Dictya montana* Steyskal, clinal form "southern California"

Valley and Berg (1977) show *D. umbroides* at Goose Lake, Oregon. Following exchange of material, drawings, and correspondence, Dr. Valley concurs in assignment of that material to *D. montana* form "Alturas."

FORM "Intermediate"
Map 22; not figured

California records: widespread in 22 counties mainly in interior of the Great Central Valley especially approaching foothills of Sierra Nevada.

Remarks: "Intermediate" is a form in which the male genitalia are subtly different from either "A" or "so. Cal.". It is the most common form in the Great Central Valley where in the north (Sacramento Valley) it tends towards "A" and in the south (San Joaquin Valley) towards "so. Cal.". "Intermediate" also occurs in the Owens Valley (Inyo Co.) and in coastal valleys from San Luis Obispo northward to Mendocino Co. Not montane. This form is nearly allopatric to form "A," occupying an essentially Upper Sonoran ecological area.

110 f, 256 m, or 11% of *D. montana* we collected, were assigned to form "Intermediate."

FORM "so. Cal."
Map 23; Plate 20, Figs. 1-4

California records (Map 23): widespread in 23 counties, mainly deserts and coastal areas.

Remarks: Form "so. Cal." is the only form of *D. montana* south of the Tehachapi Mountains. "A" and "so. Cal." co-exist at Orick (Humboldt Co.), Olema-Bolinas area (Marin Co.), Bishop (Inyo Co.), and Furnace Creek in Death Valley (Inyo Co.). It also has been collected on Santa Catalina Island, 450 feet (137 m) elevation, VIII-25-1964 (D. W. Ricker, UCR).

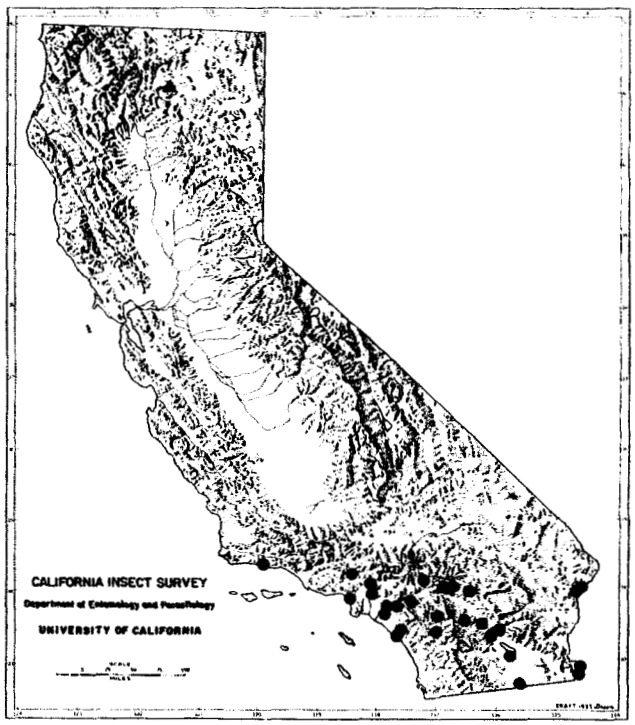
577 f, 1201 m, or 55% of the *D. montana* we collected, were assigned to form "so. Cal.".

Dictya texensis Curran
Map 24; Plate 20, Figs. 5-8

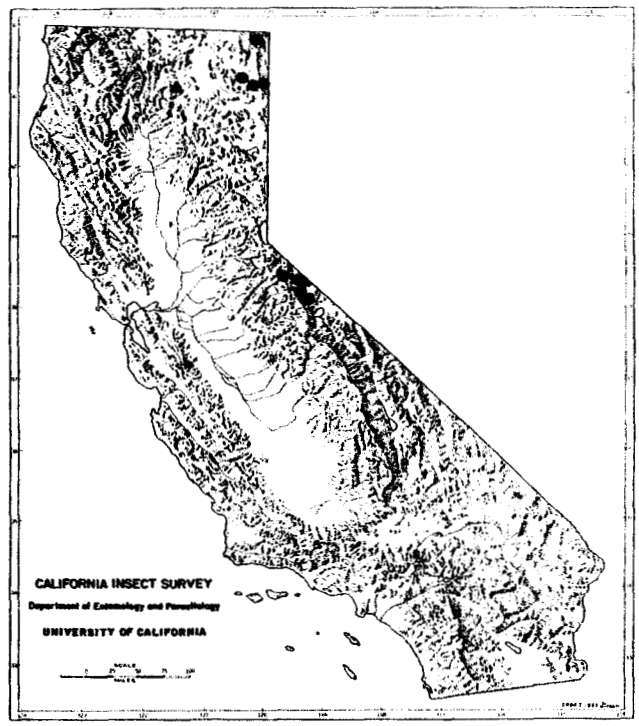
Dictya texensis Curran, 1932:6; Texas; holotype m, AMNH.

Geographic range: MEXICO: Tamaulipas. USA: widespread, coast to coast.

California records (Map 24): IMPERIAL CO.: Calexico, Heise Springs, Colorado River (Imperial Dam, Laguna Dam, Palo Verde, Ripley, Sportsman's Paradise). LOS ANGELES CO.: Big Tujunga Canyon, Los Angeles International Airport, Montebello, San Gabriel River (Whittier Narrows). ORANGE CO.:



Map 24. California distribution of *Dictya texensis* Curran •; and *Renocera brevis* (Cresson) ▲



Map 25. California distribution of *Elgiva connexa* (Steyskal) •; and *Dictyacium firmum* Steyskal ▲

Sand Canyon Reservoir, San Juan Capistrano (San Juan Creek), U.C at Irvine. RIVERSIDE CO.: Corona, Indio, Lake Hemet, Mecca, Pedley, Oasis, Riverside (Santa Ana River), Temecula, Vail Lake. SAN BERNARDINO CO.: Little Cienega Seca, Jenks Lake, Lake Gregory, Morongo Valley. SANTA BARBARA CO.: Goleta (Atascadero Creek).

Remarks: We examined material from 9 of the 29 states where it has been reported. In California this species occurs south of the Transverse Ranges usually below 1500 feet (457 m) elevation where it often occurs with *D. montana* form "so. Cal.", but usually in numbers approximating 20% or less of the *D. montana* population at a given site.

We collected 78 f, 197 m of *D. texensis* in California. This species has not been reported from San Diego County.

Genus *Dictyacium* Steyskal, 1956: 78

Dictyacium Steyskal, 1956.....

Only one species, *D. firmum* Steyskal, occurs in California. It may be characterized as follows: Face with a black central protuberance; parafrontal and orbito-antennal spots large and black; aristal hairs white, moderately short plumose; mesonotum and abdomen with numerous brown spots; wings densely reticulate. In California known only from Bartle, Siskiyou Co. Male terminalia as in Plate 21, Figs. 1-3.

Dictyacium firmum Steyskal
Map 25, Plate 21, Figs. 1-3

Dictyacium firmum Steyskal, 1956: 79; Waskesiu Lake, Saskatchewan, Canada; holotype m, allotype, CNC.

Geographic range: CANADA: Manitoba, Ontario, Saskatchewan. USA: California, Colorado, Idaho, Michigan, Nebraska, West Virginia.

California record (Map 25): SISKIYOU CO.: Bartle (McIntosh Ranch), 4000 feet (1219 m) elevation, VI-27-1973, VII-31-1973, VIII-1-1973, VI-24-1976 (F&O).

Remarks: Discovery in California of this species was unexpected and constitutes a significant range extension. We collected 22 specimens in an open to shaded sedge meadow near a beaver pond on the McIntosh Ranch, about 1 mi (1.6 km) east of Bartle. The largest number was taken in 1973. Unsuccessful attempts were made on VI-24,25-1974 and VI-25-1975. The next specimen, a single male, was taken in 1976. Adult habitus as shown in Plate 1, Fig. 7. Head profile as in Plate 6, Fig. 1.

Discussion: The Bartle area is noted for its several unique species of insects and accordingly is frequented by collectors. We have not seen *D. firmum* from California in collections other than ours. Unless it was an atypically early warming summer, we feel this species has a short flight period which probably peaks from mid-July to mid-August at Bartle.

Genus *Elgiva* Meigen, 1838:365

Elgiva Meigen, 1838 .....

1. Wing without brownish spot around apex of vein R_3 fore femur with small to moderately developed bristles on the ventral surface. Male terminalia as in Plate 21, Figs. 4-5 .... *E. connexa* Steyskal

   Wing with brownish spot around apex of vein R_3; fore femur with well-developed bristles on the ventral surface. Male terminalia as in Plate 21, Figs. 6-9 ..... *E. solicita* (Harris)

Elgiva connexa (Steyskal)
Map 25; Plate 21, figs. 4, 5

Hedroneura connexa Steyskal, 1954c:60; Matanuska Valley, Alaska; holotype m, allotype, USNM no. 51609.
Elgiva connexa Steyskal, 1965b:690.

Geographic range: western NORTH AMERICA north of 37° latitude. Alaska to Ontario, south to Colorado, west to eastern California.

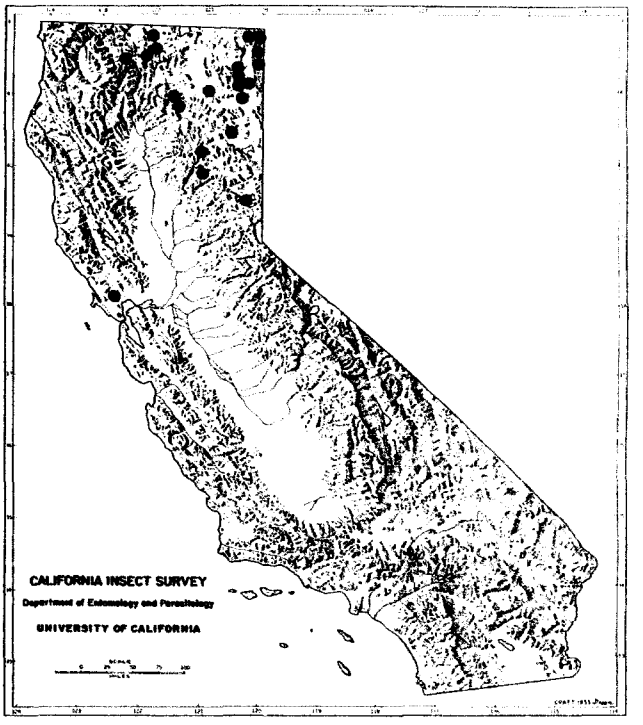
California records (Map 25): ALPINE CO.: Heenan Lake. MODOC CO.: Alturas, Eagleville, Likely, Willow Ranch. MONO CO.: Bridgeport, Coleville, Topaz.

Remarks: We examined material from 11 of the 18 states and provinces where it has been reported. In California we collected 23 f, 37 m. Open to partially shaded boggy pastures in the Topaz area yielded most of the specimens. Adult habitus as shown in Plate 1, Fig. 8. Head profile as in Plate 6, Fig. 2.

Elgiva solicita (Harris)
Map 26; Plate 21, Figs. 6-9

Musca solicitus Harris, 1780:116. Europe. BMNH ?.
Musca rufa Panzer, 1798:17*. (Primary homonym).
Tetanocera lineata Day, 1881:88; Steyskal, 1965b:690 (Primary homonym).
Elgiva sundewalli Kloet and hincks, 1945:391.

*Current consensus of American and European specialists is that Panzer's type specimen has been lost.



Map 26. California distribution of *Elgiva solicita* (Harris)

Hedroneura rufa; Steyskal, 1954c:62; 1965b:690.
Elgiva solicita; Rozkošný, 1981:180.

Geographic range: EUROPE. NORTH AMERICA: north of 37° latitude.

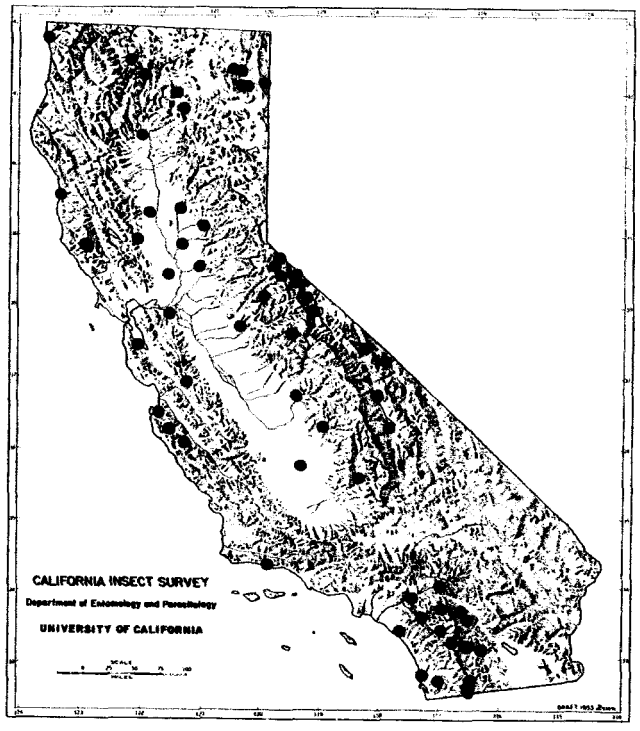
California records (Map 26): LASSEN CO.: Bieber, Madeline, Smith Flat Reservoir, Susanville. MODOC CO.: Alturas, Cedarville, Fort Bidwell, Lake City, Hackamore Reservoir, Likely, Willow Ranch. PLUMAS CO.: Chester, Quincy. SHASTA CO.: Cassell, Cayton, Hat Creek (Hwy 299). SIERRA CO.: Sierraville. SISKIYOU CO.: Bray, Grass Lake, Grenada, Meiss Lake. SONOMA CO.: Petaluma.

Remarks: We examined material from 13 states and provinces. In California we collected 110 f, 95 m. Approximately 75% of our material came from the Alturas area. Occurrence in the Coast Range area is represented by a single female labeled Petaluma, VI-14-1966 (D. Loukonen, CDFA).

Genus *Hoplodictya* Cresson, 1920:67

Hoplodictya Cresson, 1920 .....

Only one species, *Hoplodictya acuticornis* (Wulp) occurs in California. It may be characterized as follows. Vallar bristles absent; well-developed ocellar and post-ocellar bristles; face immaculate; second antennal segment at least one-half length of third



Map 27. California distribution of *Hoplodictya acuticornis* (Wulp)

segment; arista with black hairs; wing heavily marked with blackish spots and reticulations; one strong pre-apical bristle on hind tibia; body brownish with black to brownish spots and elongate markings; widespread throughout California.

Hoplodictya acuticornis (Wulp)
Map 27, Plate 22, Figs. 1, 2

Tetanocera acuticornis Wulp, 1897:358; "N. Sonora," cotype series, BMNH.

Hoplodictya spinicornis; Cresson, 1920; Steyskal, 1965b (in part) (not Loew, 1866).

Hoplodictya acuticornis; Fisher and Orth, 1972b:178; lectotype m, BMNH (redescribed; the authors believe that the type was collected in Cochise Co. or Graham Co., Arizona).

Geographic range: CANADA: British Columbia, Ontario. USA: Nebraska, Illinois, and Texas west to Pacific coast.

California records (Map 27): widespread, 28 counties.

Remarks: We examined material from 13 of the 17 states and provinces where it has been reported. In California we collected 268 f, 710 m.

H. acuticornis is associated with hygrophilous terrestrial snails in the family Succineidae (amber snails). Adult habitus as shown in Plate 1, Fig. 9. Head profile as in Plate 6, Fig. 3.

Genus *Limnia* Robineau-Desvoidy, 1830:684

Limnia Robineau-Desvoidy, 1830 .....

1. Brown cell R_1 of wing with clear spots extending to costal margin; prosternum with hairs.....2
   Brown cell R_1 of wing without clear spots extending to costal margin; prosternum without hairs.....3
2. Male terminalia as in Plate 22, Figs. 3-6 .....*L. boscii* (Robineau-Desvoidy)
   Male terminalia as in Plate 23, Figs. 3-6. Not yet discovered in California. Known from southern Oregon, Idaho, New Mexico and Utah.....*L. sandovalensis* Fisher & Orth
3. Second antennal segment with 4 or more strong bristles on the anterior dorsal edge; frons approximately as wide as long; prescutellar bristles approximately 1/2 to 2/3 as long as scutellum. Male terminalia as in Plate 23, Figs. 1, 2.....*L. pubescens* (Day)
   Second antennal segment with 2 strong bristles on the anterior dorsal edge 4
4. Frons approximately as wide as long; prescutellar bristles as long as scutellum. Male terminalia as in Plate 23, Figs. 7, 8 ....*L. severa* Cresson
   Frons distinctly longer than wide; prescutellar bristles variable, generally vestigial to 1/2 length of scutellum. Widespread north of 36° latitude. Male terminalia as in Plate 22, Figs. 7-9.....*L. inopa* (Adams)

Limnia boscii (Robineau-Desvoidy)
Map 29; Plate 22, Figs. 3-6

Pherbina boscii Robineau-Desvoidy, 1830:690; Carolines; mutilated holotype in MNHNP.

Tetanocera combinata Loew, 1859:295.

Limnia inopa; of authors, e.g., Steyskal, 1965b (not Adams, 1904).

Limnia combinata; Cresson, 1920:75.

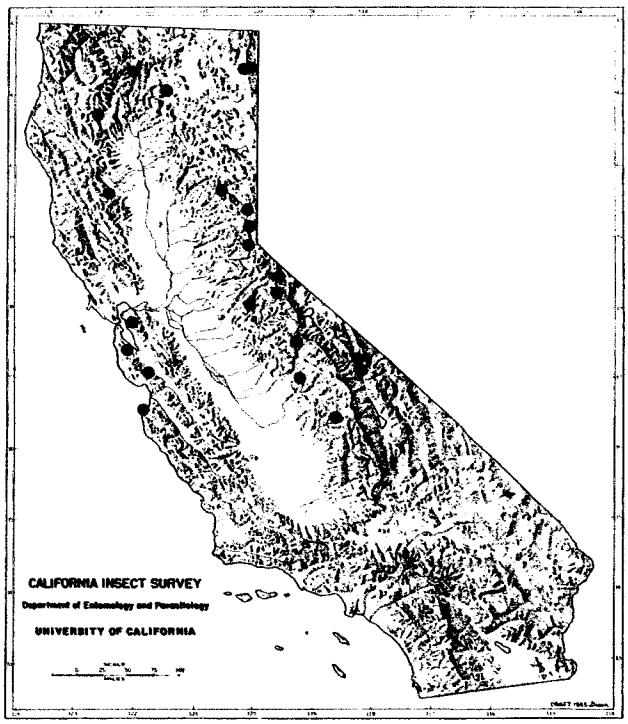
Limnia boscii; Steyskal, 1965b:691; Fisher and Orth, 1975a:125; Steyskal et al., 1978:9 (redescribed).

Geographic range: NORTH AMERICA: Kansas northward and eastward to Atlantic coast; also Utah and California.

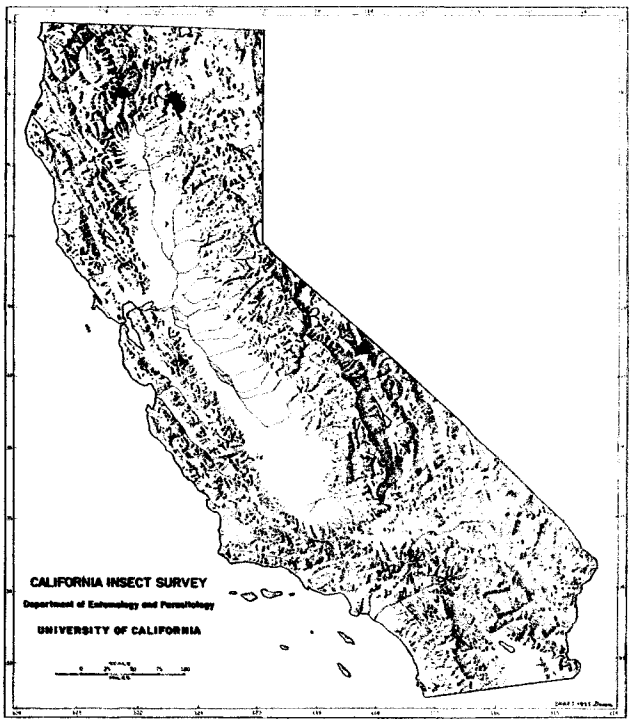
California record (Map 29): MONO CO.: Upper Fish Slough [10 mi (16 km) north of Bishop], 4250 feet (1295 m) elevation, 1 m IX-7-1967 (F&O), 1 f VII-11-1968.

Remarks: We examined material from 10 states.

Discussion: Most of the localities recorded for *L. boscii* lie east of 100° longitude. The habitat at Upper Fish Slough is a permanent open- to lightly-shaded freshwater marsh which is fed by large



Map 28. California distribution of *Limnia inopa* (Adams)



Map 29. California distribution of *Limnia pubescens* (Day) •; and Limnia boscii (Robineau-Desvoidy) ▲

flowing springs of cool water. Nearby low dry hills define the marsh on the east and west. A portion of the marsh south of the collection area has been set aside as a refuge of the Desert Pup Fish. Until recently sheep were seasonally allowed to graze this area. Creation of the refuge and elimination of sheep should enhance the stability of this habitat.

Limnia inopa (Adams)
Map 28, Plate 22, Figs. 7-9

Tetanocera inopa Adams, 1904:448; Washington Territory; holotype m, UK.

Limnia costalis var. *brevicostalis* Melander, 1920:323.

Limnia brevicostalis; Steyskal, 1965b:691.

Limnia boscii; in part, of authors, i.e., Steyskal, 1965b (not Robineau-Desvoidy, 1830).

Limnia inopa; Fisher and Orth, 1975a:123 (redescribed); Steyskal et al., 1978:14.

Geographic range: CANADA: Alberta, British Columbia. USA: California, Idaho, Montana, Oregon, Washington.

California records (Map 28): north of 36° latitude in 20 central and northern counties.

Remarks: We examined material from 5 states and provinces. In California we collected 28 f, 37 m. This species was not collected prior to mid-summer in northern counties. Usually collected in shaded grassy areas close to springs or streams.

Limnia pubescens (Day)
Map 29; Plate 23, Figs. 1, 2

Tetanocera pubescens Day, 1881:86; Washington Territory; m and f cotypes; CNC.

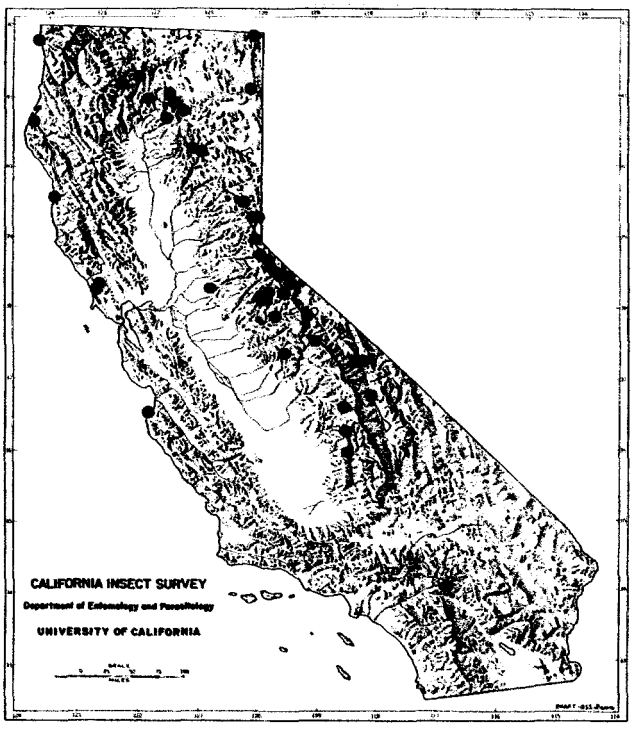
Limnia pubescens; Cresson, 1920:77; Fisher & Orth, 1975a:125; Steyskal et al., 1978:24,28.

Geographic range: CANADA: British Columbia. USA: California, Idaho, Oregon, Washington.

California records (Map 29): SHASTA CO.: Cayton (Valley), 3050 feet (930 m) elevation, VI-21-1972 to VI-24-1976, VI-26-1974, VI-27-1973, VII-25-1972, VIII-1-1973 (F&O); Hat Creek at Hwy 299, 2650 (808 m) elevation, VI-21-1972, VI-26-1973, VI-26-1974, VII-8-1970, VII-25-1972 (F&O); Hat Creek (Hwy 89) 3260 feet (994 m) elevation, VII-25-1972 (F&O). SISKIYOU CO.: Bartle (McIntosh Ranch), 4000 feet (1219 m) elevation, VII-31-1973 (F&O). TRINITY CO.: Carrville, VI-17/VII-2-1913 (E. C. Van Dyke, CAS).

Remarks: We examined material from California, Oregon, and Washington. In California we collected 33 f, 59 m.

In the Cayton and Bartle areas we collected adult *L. pubescens* in four discrete colonies which



Map 30. California distribution of *Limnia severa* Cresson

occupied several square meters of drier appearing sub-habitats within the surrounding larger moist to wet typical sciomyzid habitats.

Limnia severa Cresson
Map 30; Plate 23, Figs. 7, 8

Limnia unguicornis var. *severa* Cresson, 1920:80; Cayton, Shasta Co., California; holotype m, CAS.
Limnia saratogensis var. *severa*; Melander, 1920:324.
Limnia saratogensis var. *armipes* Melander, 1920:324.
Limnia armipes; Steyskal, 1965b:691.
Limnia severa; Steyskal, 1965b:692; Fisher and Orth, 1971b:164; 1975a:694 (redescribed); Steyskal et al., 1978:30.

Geographic range: CANADA: British Columbia. USA: Arizona, California, Nevada, Oregon, Washington.

California records (Map 30): 20 northern and central counties, occurring to sea level in north coastal counties, otherwise montane.

Remarks: We examined material from 4 states and provinces. In California we collected 253 f, 390 m.

The southernmost record is Barton Flats at 6200 feet (1890 m) elevation in the San Bernardino Mountains. We saw a single specimen taken there by Melander in 1942, and we collected a single male in 1972 in a partly shaded marsh near the Melanders' former summer cabin. Adult habitus as shown in Plate 1, Fig. 10. Head profile as in Plate 6, Fig. 4.

Genus *Renocera* Hendel, 1900:333

Renocera Hendel, 1900.....

Only one species, *Renocera brevis* (Cresson), occurs in California. It may be characterized as follows. Humeral bristle present; prosternum with setae; one fronto-orbital bristle. In California known only from Bartle, Siskiyou Co. (1 specimen). Male terminalia as in Plate 23, Fig. 9.

Renocera brevis (Cresson)
Map 24; Plate 23, Fig. 9

Chaetomacera brevis Cresson, 1920:58; New York; holotype m, USNM.
Renocera cyathiformis Melander, 1920:319; Foote, 1976:122.
Renocera bergi Steyskal, 1954c:64; 1965b:692.
Renocera brevis; Steyskal, 1965b:692; Foote, 1976:122.

Geographic range: USA: Alaska, California, Colorado, Idaho, Michigan, New Mexico, New York, Oregon, Washington.

California record (Map 24): SISKIYOU CO.: 1 mi (1.6 km) northwest of Bartle, 4100 feet (1250 m) elevation, VII-20-1966 (P. Rude, UCB).

Remarks: We examined material from California, New Mexico, and Oregon. The California record is a single male. Head profile as in Plate 6, Fig. 5.

Discussion: We have not collected *R. brevis* on several attempts in the Bartle area, including Rude's "1 mi NW" locality. Larvae of all known species of this genus are obligate feeders on fingernail clams. Therefore when attempting to collect *Renocera*, stabile waters became first priority areas of search.

Genus *Sepedon* Latreille, 1804:196

Sepedon Latreille, 1804.....

1. Supraspiracular convexity of metathorax without black hairs; medifacies without fine black hairs. Male terminalia as in Plate 25, Figs. 3-5. .....*S. fuscipennis fuscipennis* Loew
   Supraspiracular convexity of metathorax with black hairs; medifacies with or without fine black hairs.....2
2. Medifacies without fine black hairs; legs yellowish; frons with parafrontal black spots. Male

terminalia as in Plate 26, Figs. 1-3 ..... *S. spinipes americana* Steyskal

Medifacies with fine black hairs 3

3. Robust species; wing length from 7.0 to 8.9 mm; second antennal segment distinctly compressed. Male terminalia as in Plate 25, Figs. 6-10 ..... *S. pacifica* Cresson

Small species; wing length from 3.6 to 5.5 mm; second antennal segment slender, less compressed 4

4. Hind femur of both sexes simple; hind tibia more or less evenly arcuate; abdomen frequently almost black with bluish reflections. Male terminalia as in Plate 24, Figs. 4, 5 ..... *S. borealis* Steyskal

Hind femur of male emarginate ventrally; hind femur of female simple; hind tibia distinctly more curved in distal third, abdomen brown, with little more than a trace of bluish reflection 5

5. Frons with no more than a trace of parafrontal black spots. Male terminalia as in Plate 24, Figs. 1-3 ..... *S. bifida* Steyskal

Frons with distinct parafrontal black spots 6

6. Frons with large parafrontal and orbito-antennal velvety black spots. Not yet discovered in California. Known from Prospect, Jackson Co., Oregon, approximately 50 miles north of California-Oregon border. Male terminalia as in Plate 25, Figs. 1, 2 ..... *S. cascadensis* Fisher & Orth

Frons with small parafrontal and orbito-antennal blackish spots. Male and female terminalia as in Plate 24, Figs. 6-10 ..... *S. capellei* Fisher & Orth

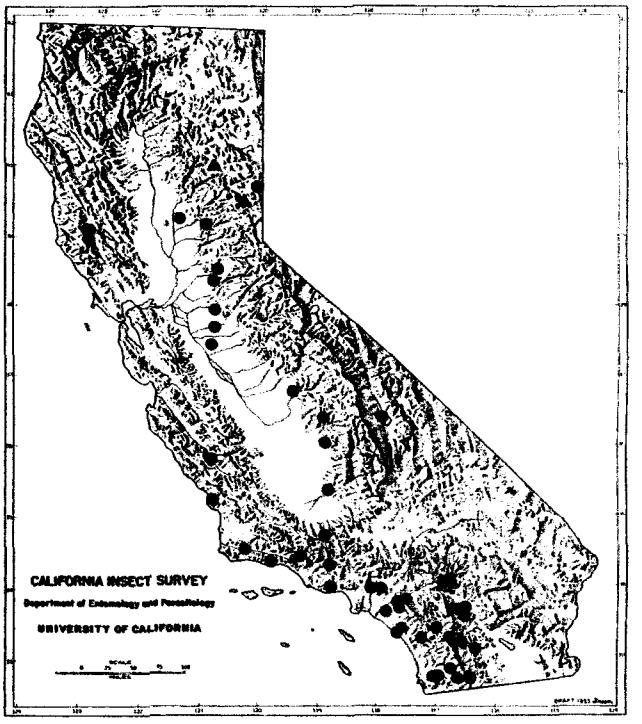
Sepedon bifida Steyskal
Map 31; Plate 24, Figs. 1-3

Sepedon bifida Steyskal, 1951:280; Tejon Canyon, Kern Co., California; holotype m, allotype, CAS.

Geographic range: MEXICO: Baja California Norte (San Vincente, Santo Domingo). USA: California.

California records (Map 31): widespread in central and southern counties. No records north of 40° latitude.

Remarks: In California we collected 548 f, 1143 m. The species is especially abundant along banks of streams or ponds choked with emergent aquatic vegetation such as water cress, brass buttons, water monkey flower, spike rush. Below 1500 feet (457 m) adults are active in all months. Commonly taken in the Transverse Ranges, and the Great Central Valley. Head profile as in Plate 6, Fig. 6.



Map 31. California distribution of *Sepedon bifida* Steyskal ●; and *Sepedon fuscipennis fuscipennis* Loew ▲

Sepedon borealis Steyskal
Map 32; Plate 24, Figs. 4, 5

Sepedon borealis Steyskal, 1951:283; Yale, Idaho; holotype m, allotype, USNM no. 60906.

Geographic range: NORTH AMERICA: transcontinental, north of 37° latitude.

California records (Map 32): eastern montane areas north of 36° latitude.

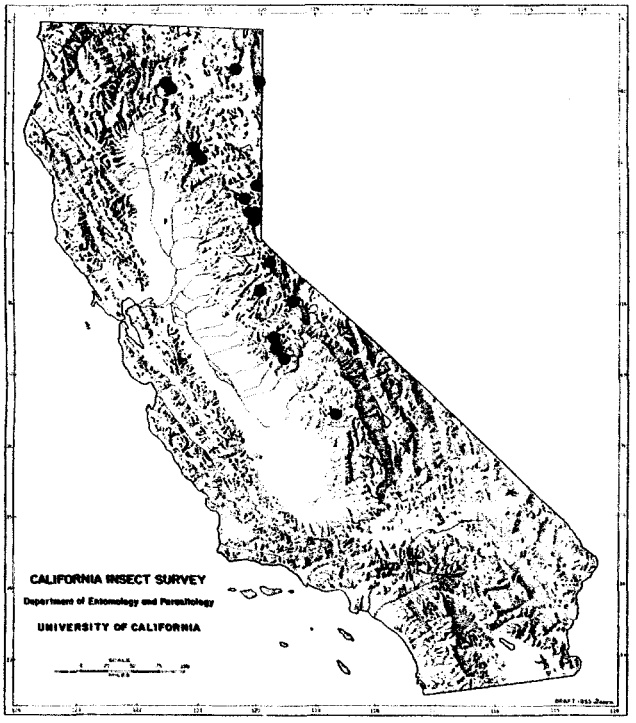
Remarks: We examined material from 11 of the 28 states and provinces where the species has been reported. In California we collected 54 f, 92 m mainly in wet alpine meadows.

This species is dark brown (nearly black), the darkest of the *Sepedon* species in California, and the smallest.

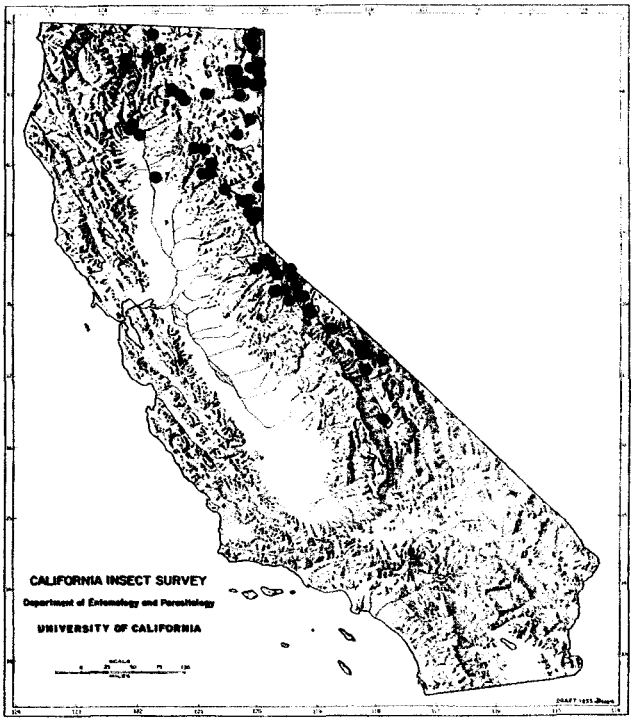
Sepedon capellei Fisher and Orth
Map 33; Plate 24, Figs. 6-10

Sepedon capellei Fisher and Orth, 1969a:157; Bishop, Inyo Co., California; holotype m, allotype, CAS no. 10166.

Geographic range: USA: California, Idaho, Nevada, Oregon, Utah, Washington.



Map 32. California distribution of *Sepedon borealis* Steyskal



Map 33. California distribution of *Sepedon capellei* Fisher and Orth

California records (Map 33): widespread in eastern and northern California usually in montane areas over 3000 feet (914 m) elevation and north of 36° latitude.

Remarks: We examined material from the 6 states. In California we collected 466 f, 791 m, mostly in open alpine meadows. Not spotted on the map was one female tentatively determined as this species from Mint Canyon, San Gabriel Mountains, Los Angeles Co., California, VII-1-1965 (W. E. Simmonds, collector).

Sepedon fuscipennis fuscipennis Loew
Map 31; Plate 25, Figs. 3-5

Sepedon fuscipennis Loew, 1859:299; Washington, D.C.; cotypes m, f, MCZ.
Sepedon f. fuscipennis; Steyskal, 1951 (1950):290.

Geographic range: NORTH AMERICA: widespread north of 36° latitude.

California records (Map 31): PLUMAS CO.: 0.5 mi (0.8 km) south of Crescent Mills, 3500 feet (1067 m) elevation, VI-8-1966 (F&O). SIERRA CO.: 2 to 3.5 mi (3.2 to 5.6 km) west of Sierraville, 4940 feet (1506 m) elevation, VIII-23-1967, IX-22-1966 (F&O).

Remarks: We examined material from 26 of the 38 states and provinces where the species has been reported. In California we collected 3 f, 11 m. One was from Crescent Mills, the remainder from Sierraville.

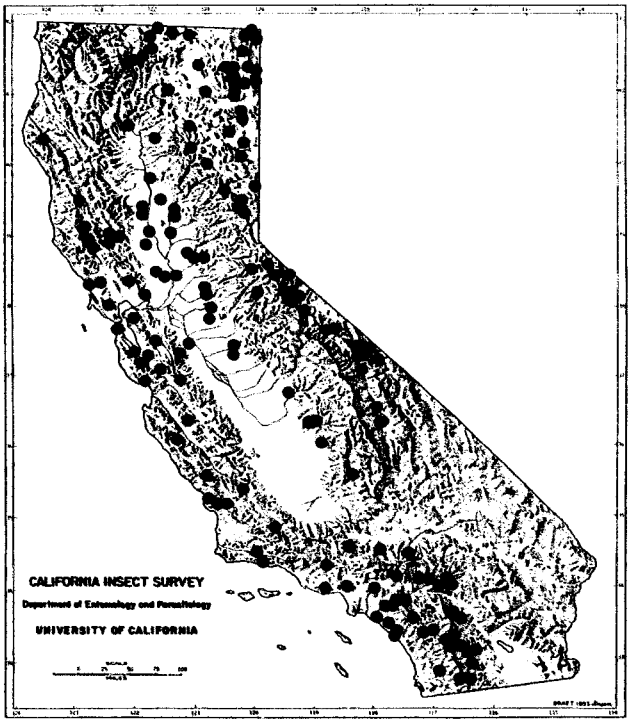
Discussion: Terminalia and row of long hairs on hind tibia appear to be uniform in *S. f. fuscipennis* throughout its range except in southeastern U.S. We have seen specimens from several localities in that area with terminalia unlike those illustrated by Steyskal (1951, Fig. 10), for his *S. f. floridensis* which occurs in Louisiana and Florida.

Sepedon pacifica Cresson
Map 34; Plate 25, Figs. 6-10

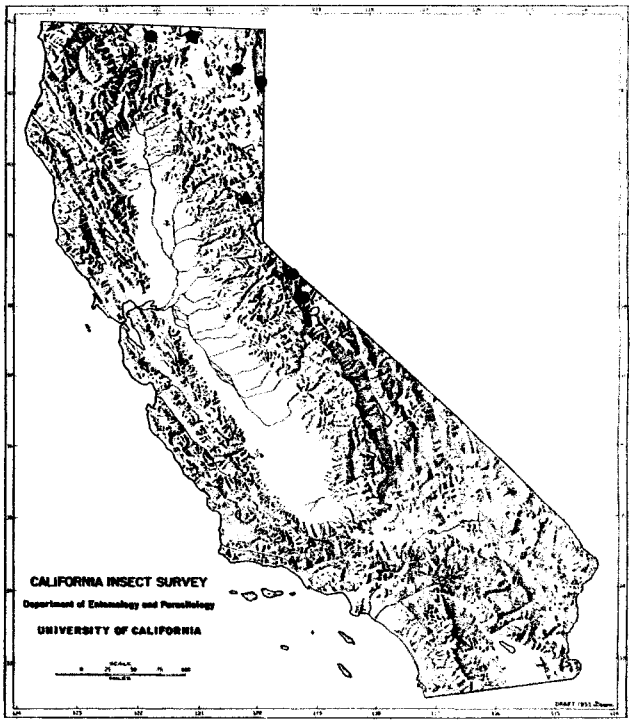
Sepedon pacifica Cresson, 1914:457; Redwood Canyon, Marin Co., California; holotype m, ANSP no. 6076; Fisher and Orth 1972a:8 (redescribed).
Sepedon praemiosa; in part, of authors, e.g., Steyskal 1951:279; 1965b:693 (not Giglio-Tos, 1893).

Geographic range: CANADA: British Columbia, Saskatchewan. MEXICO: Baja California Norte. USA: Washington to North Dakota, south to Iowa, west to southern California.

California records (Map 34): widespread, records from all but 5 counties.



Map 34. California distribution of *Sepedon pacifica* Cresson



Map 35. California distribution of *Tetanocera ferruginea* (Fallén) •; and *Sepedon spinipes americana* Steyskal ▲

Remarks: We examined material from 15 states and provinces. In California we collected 1679 f, 1921 m. Adults collected in all months in southern California. No records from the deserts except along the western margins. Adult habitus as shown in Plate 1, Fig. 11.

Discussion: The Colorado desert apparently functions as a natural barrier to separate *S. pacifica* from *S. praemiosa* which occurs in eastern Arizona. The two species overlap in Colorado and Utah.

Black parafrontal spots occur in a low percent of specimens seen from Ravendale, Smith Flat Reservoir (Lassen Co.), 2 mi (3.2 km) west of Bridgeport (Mono Co.), Indian Tom Lake (Siskiyou Co.), and Strawberry (Tuolumne Co.).

Sepedon spinipes americana Steyskal
Map 35; Plate 26, Figs. 1-3

Sepedon spinipes Scopoli, 1763:342. Vienna. Palearctic.
Sepedon spinipes americana Steyskal, 1951(1950):277; Hamburg, Livingston Co., Michigan; holotype m, USNM.

Geographic range: NORTH AMERICA: Coast to coast north of 39° latitude.

California records (Map 35): SIERRA CO.: 1.6-3.5 mi (2.6-5.6 km) west of Sierraville; 4940 feet (1506 m) elevation, VII-9-1968, VII-18-1967, VII-23-1967, IX-22-1966 (F&O).

Remarks: We examined material from 6 of the 21 states and provinces where the species has been reported. In California we collected 15 f, 11 m in open unshaded boggy alpine sedge meadows.

Genus *Tetanocera* Duméril, 1800:439

Tetanocera Duméril, 1800 .....

1. Posterior surface of middle femur with more than one bristle toward apex, usually three; prosternum with setae. Male and female terminalia as in Plate 30, Figs. 1-4 ..... *T. robusta* Loew

   Posterior surface of middle femur without bristles or with but a single bristle near apex; prosternum bare 2
2. Posterior surface of middle femur with a single bristle near apex 3

   Posterior surface of middle femur without bristles near the apex 8
3. Parafacial hairs extending well above midpoint between lower margin of eye and base of antennal socket; aristal hairs dense 4

   Parafacial hairs not reaching midpoint between lower margin of eye and base of antennal socket; aristal hairs sparse to dense 5

4. Vein M with one or more stump veins. Male and female terminalia as in Plate 31, Figs. 5-8 ..... *T. vicina* Macquart
   Vein M usually lacking stump veins. Male and female terminalia as in Plate 29, Figs. 6-9 ..... *T. plumosa* Loew
5. Aristal hairs especially dense and black; third antennal segment usually blackish at insertion of arista; orbito-antennal spot usually large and black. Male and female terminalia as in Plate 28, Figs. 6-8; Plate 29, Fig. 1 ..... *T. obtusifibula* Melander
   Aristal hairs moderately dense to sparse; third antennal segment not blackish at insertion of arista; orbito-antennal spot not particularly large 6
6. Bristles on posterior surface of fore femur usually at least as long as width of femur. Male and female terminalia as in Plate 28, Figs. 2-5 ..... *T. mesopora* Steyskal
   Bristles on posterior surface of fore femur short; about one-half width of femur 7
7. Orbito-antennal spot brownish. Male and female terminalia as in Plate 27, Figs. 8-10; Plate 28, Fig. 1 ..... *T.* loewi Steyskal
   Orbito-antennal spot blackish. Male and female terminalia as in Plate 27, Figs. 4-7 ..... *T. latifibula* Frey
8. Hind femur with posterodorsal bristle opposite or nearly opposite to apical anterodorsal bristle (*T. plebeia* will sometimes fit this description). Vein M with stump veins. Not yet discovered in California. Known from Klamath Falls, Klamath Co., Oregon; approximately 20 miles north of California-Oregon border. Terminalia as in Plate 30, Figs. 5-7 ..... *T. rotundicornis* Loew
   Hind femur usually without posterodorsal bristle 9
9. Midfrontal stripe broadly triangular. Not yet discovered in California. Known from Camp Sherman, Jefferson Co., Oregon (central Oregon). Terminalia as in Plate 27, Figs. 1-3. ..... *T. fuscinervis* Zetterstedt (syn. *unicolor* Loew)
   Midfrontal stripe more or less parallel sided 10
10. Midfrontal stripe broad; cell AM with dark cloud; medifacies of female shining. Male and female terminalia as in Plate 29, Figs. 2-5 ..... *T. plebeia* Loew
    Midfrontal stripe narrow to moderately wide; cell AM without dark cloud; medifacies of female not shining 11
11. Aristal hairs dense; orbito-antennal spot black. Male and female terminalia as in Plate 31, Figs. 1-4 ..... *T. soror* Melander
    Aristal hairs sparse; orbito-antennal spot at most faint and not black 12
12. Hairs of anterior front at least as long as the diameter of an ocellus; second segment of arista blackish. Male and female terminalia as in Plate 26, Figs. 6-9 ..... *T. ferruginea* Fallén
    Hairs of interior front shorter than the diameter of an ocellus; second segment of arista yellowish to brownish. Not yet discovered in California. Known from Reedsport, Douglas Co., Oregon (approximately 120 miles north of California-Oregon border). Terminalia as in Plate 26, Figs. 4, 5 ..... *T. bergi* Steyskal

Tetanocera ferruginea Fallén
Map 35; Plate 26, Figs. 6-9

Tetanocera ferruginea Fallén, 1820: 9; Scandinavia; cotypes m, f; NRS; Melander, 1920: 327, Pl. XXX; Steyskal, 1954c: 67.
Tetanocera triangularis Loew, 1861: 344; 1862: 122; Steyskal, 1965b: 694.
Chaetomacera ferruginea; Cresson, 1920: 64.
Tetanocera huronensis Steyskal, 1938: 6; 1954c: 67.

Geographic range: EUROPE. NORTH AMERICA: widespread north of 35° latitude.

California records (Map 35): eastern California north of 38° latitude. MODOC CO.: Alturas, Eagleville, Tulelake. MONO CO.: Bridgeport, Topaz. SISKIYOU CO.: Meiss Lake.

Remarks: We examined material from 6 of the 21 states and provinces where the species has been reported. In California we collected 17 f, 18 m in open to partially shaded sedge meadows.

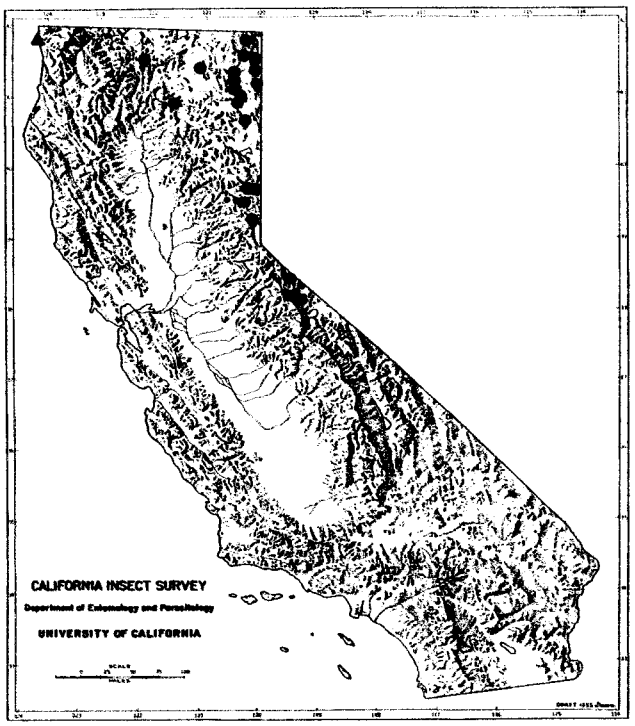
Tetanocera latifibula Frey
Map 36; Plate 27, Figs. 4-7

Tetanocera latifibula Frey, 1924: 51; Europe; cotypes m, f series; ZMUH; Steyskal, 1965b: 694.
Tetanocera hespera Steyskal, 1959: 71; 1965b: 694.

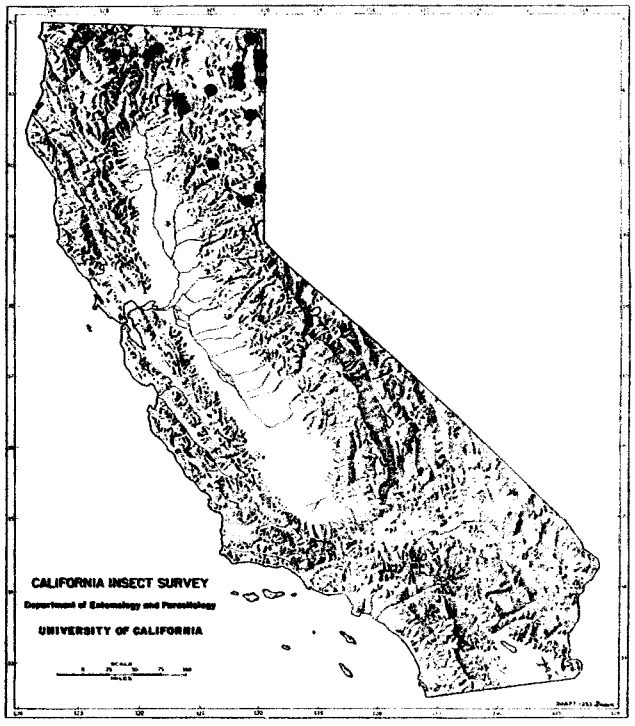
Geographic range: EUROPE. ASIA (SIBERIA). Western NORTH AMERICA: north of 35° latitude.

California records (Map 36): mainly near the eastern boundary of the state north of 38° latitude.

Remarks: We examined material from 10 of the 14 states and provinces where the species has been reported. In California we collected 110 f, 226 m, mainly in open unshaded or sparsely shaded grassy meadows and marshes.



Map 36. California distribution of *Tetanocera latifibula* Frey ●; and *Tetanocera loewi* Steyskal ▲



Map 37. California distribution of *Tetanocera mesopora* Steyskal

Tetanocera loewi Steyskal
Map 36; Plate 27, Figs. 8-10; Plate 28, Fig. 1

Tetanocera loewi Steyskal, 1959:68; Deerfield Township, Lapeer Co., Michigan; holotype m, allotype, USNM.

Geographic range: CANADA: British Columbia, Ontario. USA: California, Indiana, Michigan, Minnesota, New York, Ohio, Oregon, Washington, Wisconsin.

California records (Map 36): DEL NORTE CO.: 3 mi (4.8 km) north of Crescent City, VI-11-1965, VI-11-1966, VIII-5-1968 (F&O).

Remarks: We examined material from California, Oregon, and Washington. In California this species occurs north of 40° latitude. We collected a total of 11 f, 15 m by sweeping low grasses and other low growing plants in drying depressions beneath tall sparse shade along Lake Earl Drive north of Crescent City.

Tetanocera mesopora Steyskal
Map 37; Plate 28, Figs. 2-5

Tetanocera mesopora Steyskal, 1959:70; Walden, Colorado; holotype m, allotype, USNM.

Geographic range: NORTH AMERICA: north of 39° latitude; California to Northwest Territories, east to Newfoundland, south to Illinois, west to California.

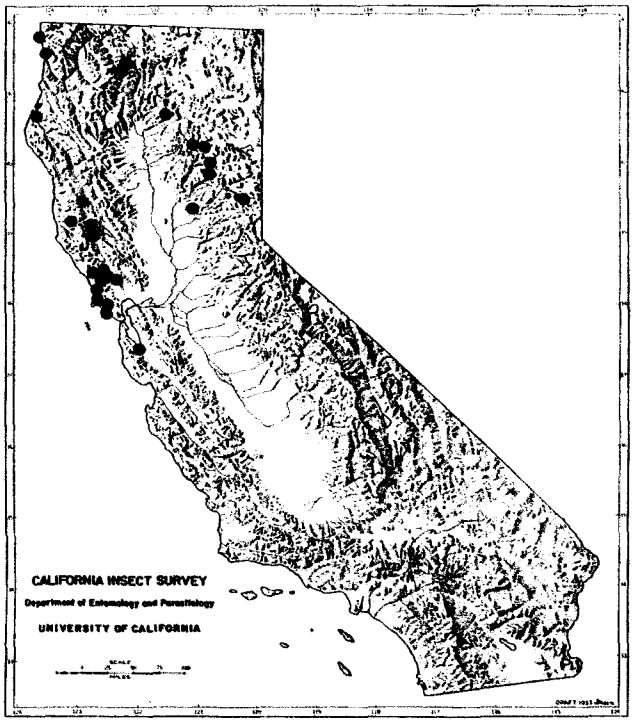
California records (Map 37): LASSEN CO.: Bieber, Hallelujah Junction (Long Valley Creek), Ravendale. MODOC CO.: Alturas, Cedarville, Eagleville, Lake City, Likely, Fort Bidwell, Willow Ranch. PLUMAS CO.: Crescent Mills. SHASTA CO.: Cassell, Cayton, Hat Creek (Hwy 299). SIERRA CO.: Sierraville. SISKIYOU CO.: Bray, Fort Jones, Grass Lake.

Remarks: We examined material from 13 of the 23 states and provinces where this species is known to occur. In California we collected 81 f, 88 m from 1965 to 1970. Approximately 30% were collected in the Likely-Alturas area of Modoc Co. in ditches containing water and abundant emergent vegetation along (old) Hwy 395, elevation approximately 4400 feet (1341 m) elevation.

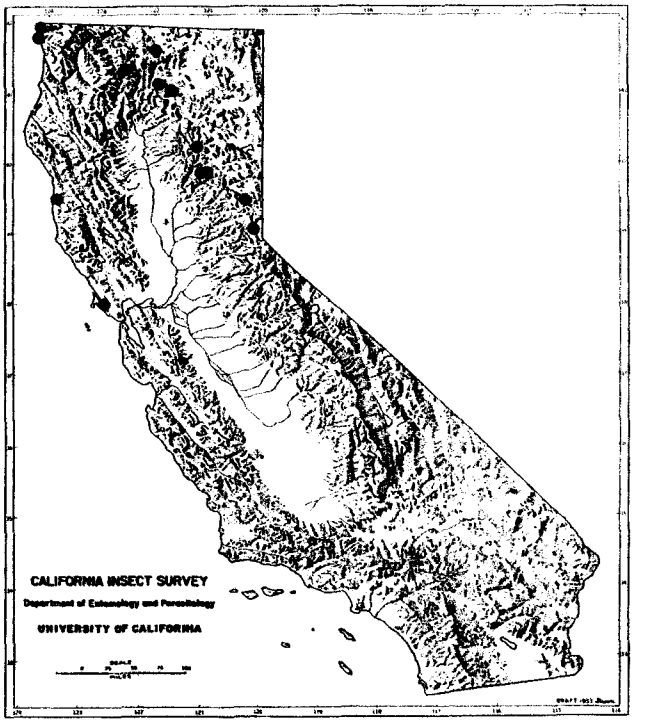
Tetanocera obtusifibula Melander
Map 38; Plate 28, Figs. 6-8; Plate 29, Fig. 1

Tetanocera obtusifibula Melander, 1920:328; Mt. Constitution (Orcas Island), Washington; holotype m, USNM.

Geographic range: CANADA: British Columbia, Quebec(?). USA: California, Idaho, Oregon, Washington.



Map 38. California distribution of *Tetanocera obtusifibula* Melander



Map 39. California distribution of *Tetanocera plebeia* Loew

California records (Map 38): north of 37° latitude fairly widespread coastally from San Francisco Bay area northward. Not in Sacramento Valley or extreme northeastern part of state.

Remarks: We examined material from California, Oregon, Washington. In California we collected 36 f, 55 m from 1966 to 1975. Usually 1-4 specimens were collected per stop. The largest single collections were taken 2 mi (3.2 km) north of Bolinas, Marin Co., IX-12-1967, 13 feet (4 m) elevation, around clumps of *Juncus* in a drying meadow, and 0.5 mi (0.8 km) south of Crescent Mills, Plumas Co., 3500 feet (1067 m) elevation, VI-8-1966, in a drying shaded ditch along Hwy 89.

Tetanocera plebeia Loew
Map 39; Plate 29, Figs. 2-5

Tetanocera plebeia Loew, 1862:120. Middle states (D.C. area); holotype m, MCZ no. 13220.

Geographic range: EUROPE. NORTH AMERICA: north of 37° latitude from California to North Carolina, including Alaska.

California records (Map 39): DEL NORTE CO.: Crescent City, Smith River. MARIN CO.: Olema. MENDOCINO CO.: Inglenook Fen, 5 mi (8 km) north Fort Bragg. PLACER CO.: Tahoe (City?). PLUMAS CO.: Chester, Quincy. SHASTA CO.: Cayton (Valley), 2 mi (3.2 km) south of Pondosa. SIERRA CO.: Sattley. SISKIYOU CO.: Bartle, Bray, Gazelle.

Remarks: We examined material from 11 of the 39 states and provinces where this species has been reported. In California we collected 27 f, 31 m from 1965 to 1975.

Discussion: *Tetanocera plebeia* was collected mainly in rather mesic situations a few meters from free water. We presume its larvae attack slugs in California, as in the eastern U.S.

Tetanocera plumosa Loew
Map 40; Plate 29, Figs. 6-9

Tetanocera plumosa Loew, 1847:201; Alaska; holotype f, MCZ no. 13221.

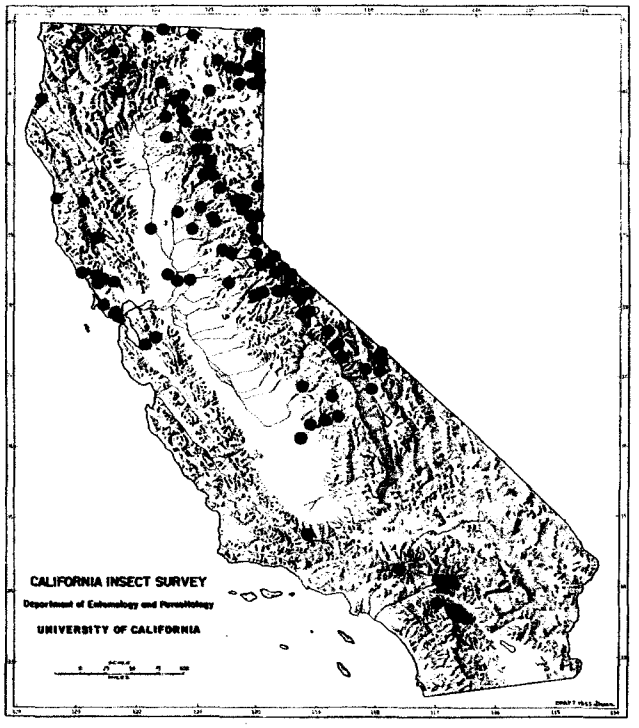
Tetanocera nanciae Brimley, 1925:75; Steyskal 1965b:694; 1965c:445.

Tetanocera plumifera Steyskal, 1965c:445; Wulp, 1897:359.

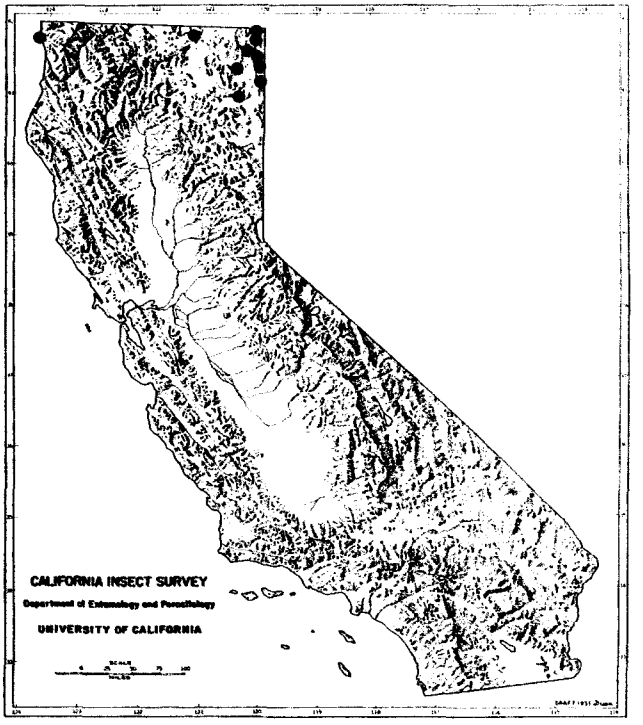
Geographic range: NORTH AMERICA: widespread north of 36° latitude.

California records (Map 40): widespread in 30 counties including the Great Central Valley.

Remarks: We examined material from 17 of the 37 states and provinces where this species has been reported. In California we collected 382 f, 585 m



Map 40. California distribution of *Tetanocera plumosa* Loew



Map 41. California distribution of *Tetanocera robusta* Loew

mostly at elevations in excess of 4000 feet (1219 m). Adult habitus as shown in Plate 1, Fig. 12. Head profile as in Plate 6, Fig. 7. South of 36° wing may exhibit stump veins.

Tetanocera robusta Loew
Map 41; Plate 30, Figs. 1-4

Tetanocera robusta Loew, 1847:197; Europe; cotypes m, f; ZMB. Frey 1924:47; K. C. V. Smith, 1957:70, lectotype m.
Tetanocera papillifera Melander 1920:329; Steyskal, 1965b:694.

Geographic range: EUROPE. NORTH AMERICA: north of 37° latitude, from northern California to Newfoundland.

California records (Map 41): DEL NORTE CO.: Crescent City. LASSEN CO.: Madeline. MODOC CO.: Alturas, Cedarville, Davis Creek, Eagleville, Fandango Pass, Fort Bidwell, Lake City, Likely, Lily Lake [7 mi (11.2 km) east of Pine Creek], Tulelake.

Remarks: We examined material from 10 of the 20 states and provinces where the species has been reported. In California we collected 24 f, 28 m from 41° latitude northward.

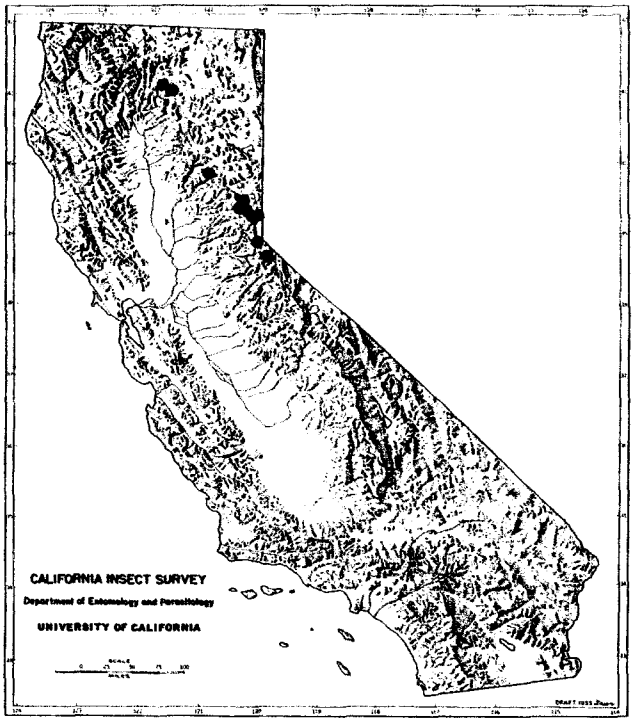
Tetanocera soror Melander
Map 42; Plate 31, Figs. 1-4

Tetanocera soror Melander, 1920:328; Mica, Washington; holotype m, USNM.

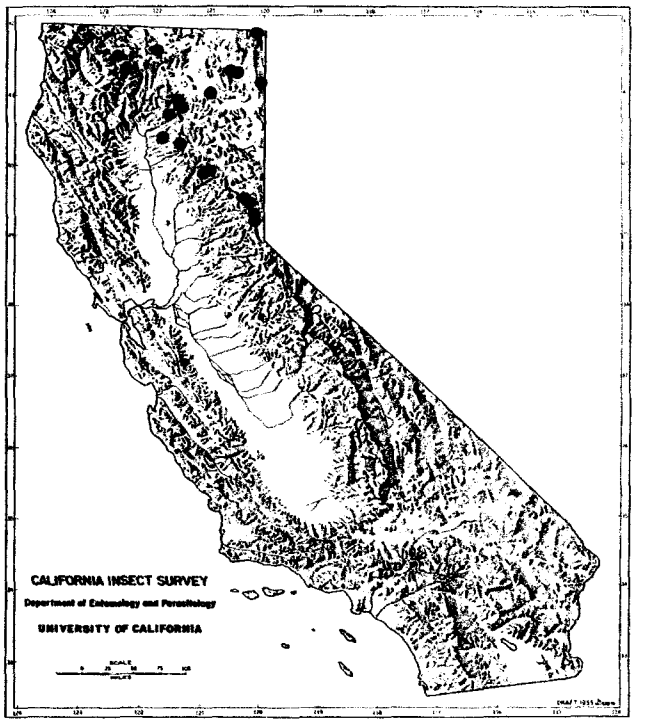
Geographic range: CANADA: Alberta. USA: California, Idaho, Montana, Nevada, Oregon, Washington.

California records (Map 42): ALPINE CO.: Hope Valley. EL DORADO CO.: Fallen Leaf Lake Road. NEVADA CO.: Boca, Boca Spring, Hobart Mills, Sagehen Creek. PLUMAS CO.: Quincy. SHASTA CO.: 2 mi (3.2 km) south of Pondosa. SIERRA CO.: Independence Lake, Sattley, Webber Lake. SISKIYOU CO.: Bartle.

Remarks: We examined material from California and Oregon. In California we collected 96 f, 100 m over 50% of which came from 2 mi (3.2 km) south of Pondosa (Little Bear Flat), 4140 feet (1262 m) elevation, and about 20% from the Bartle area (McIntosh Ranch), 4000 feet (1219 m) elevation.



Map 42. California distribution of *Tetanocera soror* Melander



Map 43. California distribution of *Tetanocera vicina* Macquart

Tetanocera vicina Macquart
Map 43; Plate 31, Figs. 5-8

Tetanocera vicina Macquart, 1843 (1842):337; Philadelphia, Pennsylvania; holotype f, MNHNP.

Geographic range: EUROPE. NORTH AMERICA: widespread north of 36° latitude, California to North Carolina.

California records (Map 43): LASSEN CO.: Bieber. MODOC CO.: Alturas, Eagleville, Lily Lake [7 mi (11.2 km) east of Pine Creek]. NEVADA CO.: Sagehen Creek. PLACER CO.: Martis Creek. PLUMAS CO.: Quincy. SHASTA CO.: Cayton, Hat Creek, Hatchet Mountain Summit, Pondosa (Little Bear Flat), Shingletown. SIERRA CO.: Sattley, Sierraville. SISKIYOU CO.: Bray, Fort Jones, Gazelle, Grass Lake.

Remarks: We examined material from 10 of the 34 states and provinces where the species has been reported. In California we collected 38 f, 36 m north of 39°. This species has been confused with *T. plumosa* which also may have stump veins in the wing.

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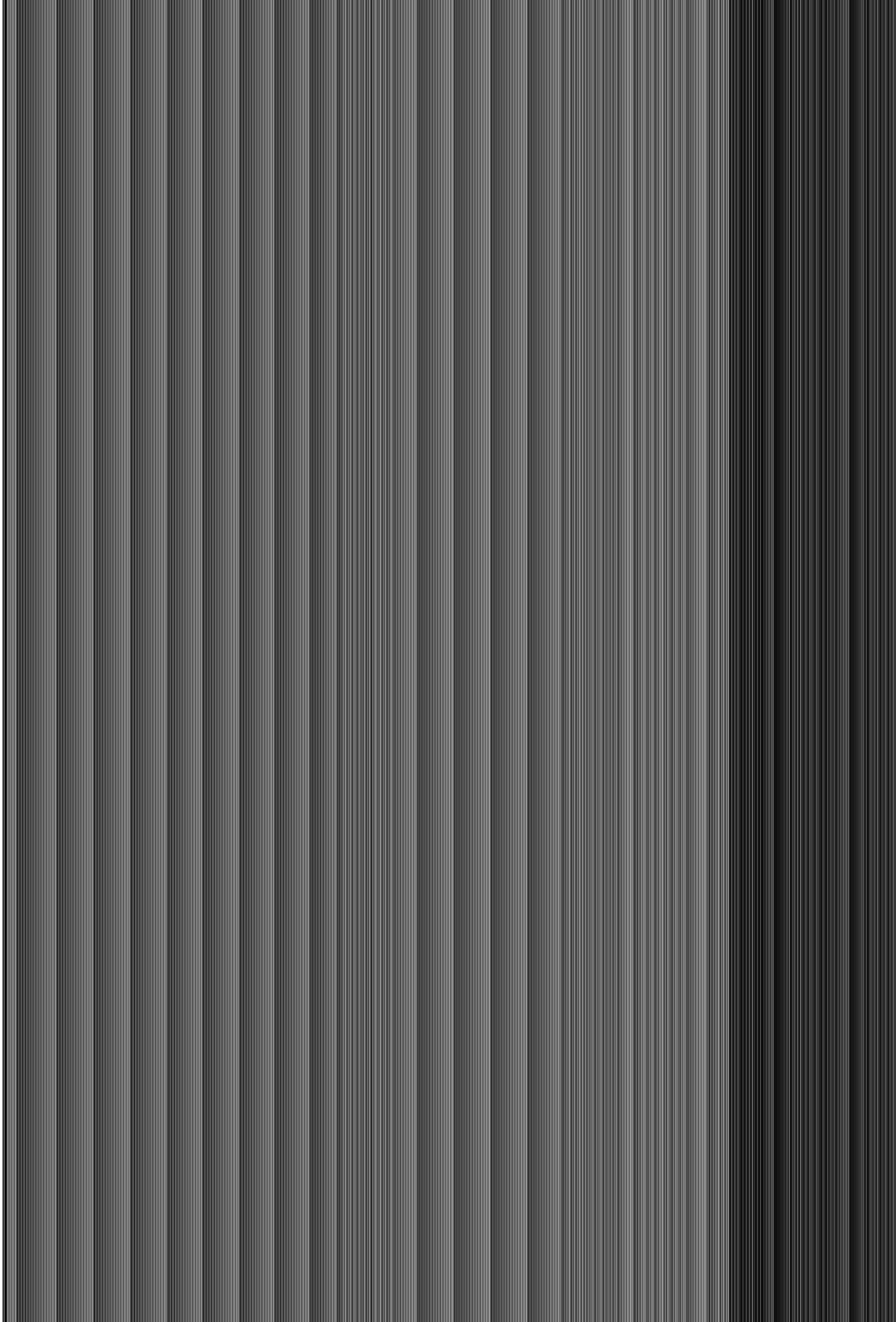

PLATES

PLATE 1: Adult males of California sciomyzine genera.

Figs. 1-4, Sciomyzini. Figs. 5-12, Tetanocerini. Index = 2 mm. Fig. 1. *Atrichomelina pubera* (Loew). California; San Bernardino Co.; Lake Gregory; 4520 feet (1378 m) elevation; X-6-1962 (T. W. Fisher). Fig. 2. *Pherbellia parallela* (Walker). California; San Diego Co.; Loveland Reservoir; 1355 feet (413 m) elevation; VI-22-1964 (T. W. Fisher & R. E. Orth). Fig. 3. *Pteromicra siskiyouensis* Fisher and Orth. California; Siskiyou Co.; Grass Lake, Hwy 97; 5122 feet (1561 m) elevation; VI-17-1969 (R. E. Orth). Fig. 4. *Sciomyza simplex* Fallén. California; Modoc Co.; 2 mi (3.2 km) south of Alturas; 4300 feet (1311 m) elevation; VI-10-1966 (T. W. Fisher and R. E. Orth). Fig. 5. *Antichaeta testacea* Melander. California; Mono Co.; 2 mi (3.2 km) north of Topaz; 5000 feet (1524 m) elevation; VII-11-1966 (T. W. Fisher & R. E. Orth). Fig. 6. *Dictya montana* Steyskal. California; Humboldt Co.; 2 mi (3.2 km) south of Orick; 10 feet (3 m) elevation; VI-12-1966 (T. W. Fisher & R. E. Orth). Fig. 7. *Dictyacium firmum* Steyskal. California; Siskiyou Co.; Bartle, Hwy. 89; 4000 feet (1219 m) elevation; VIII-1-1973 (T. W. Fisher & R. E. Orth). Fig. 8. *Elgiva connexa* (Steyskal). California; Mono Co.; 3.1 mi (5 km) north of Topaz; 5200 feet (1585 m) elevation; VI-22-1972 (T. W. Fisher & R. E. Orth). Fig. 9. *Hoplodictya acuticornis* (Wulp). California; San Diego Co.; Doane Pond, Palomar State Park; 4646 feet (1416 m) elevation; IX-14-1965 (T. W. Fisher & R. E. Orth). Fig. 10. *Limnia severa* Cresson. California; Shasta Co.; Cayton, 1 mi (1.6 km) east of Hwy. 89; 3050 feet (930 m) elevation; VI-16-1969 (R. E. Orth). Fig. 11. *Sepedon pacifica* Cresson. California; Inyo Co.; 5 mi (8 km) north of Lone Pine; 3800 feet (1158 m) elevation; V-17-1966 (T. W. Fisher & R. E. Orth). Fig. 12. *Tetanocera plumosa* Loew. California; Alpine Co.; 0.5 mi (0.8km) west of Heenan Lake; 7000 feet (2134m) elevation; VII-20-1967 (R. E. Orth).

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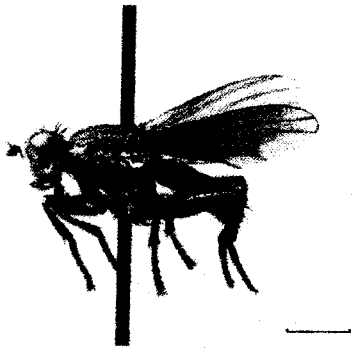

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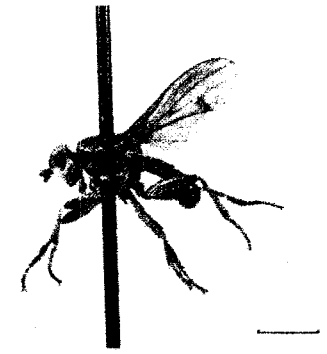

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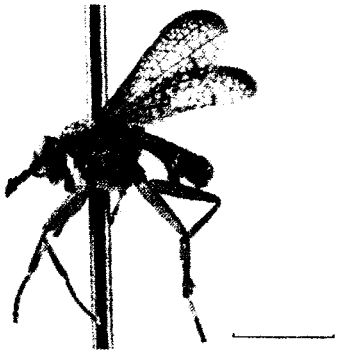

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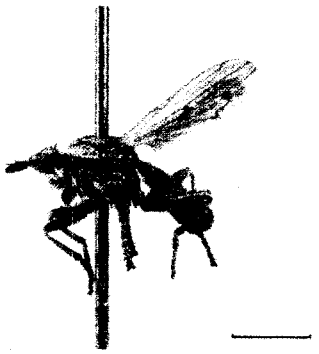

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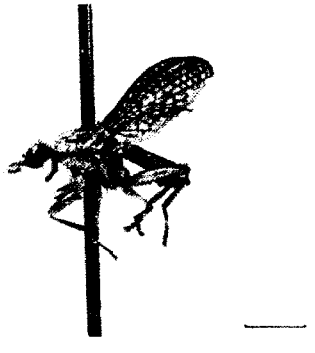

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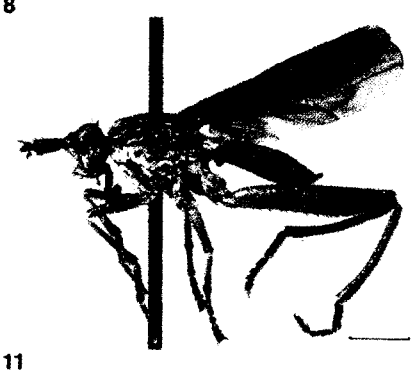

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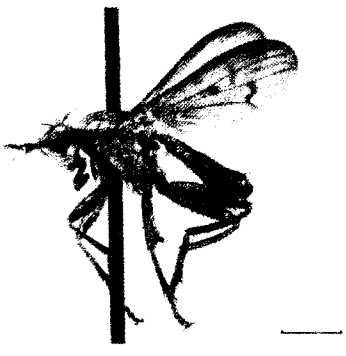

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PLATE 2: Freshwater and hygrophilous terrestrial snails found in California.

Fig. 1. L-R. *Lymnaea stagnalis appressa* Say, 1821. Modoc Co.; Likely, canal on Van Lon Ranch; IX-21-1966. *Radix auricularia* (Linnaeus, 1758). San Bernardino Co.; Big Bear Lake; VI-26-1963. *Lymnaea* (*Stagnicola*) *palustris*-group. Riverside Co.; Riverside, Santa Ana River; IX-5-1962. *Planorbella* (*Pierosoma*) *tenuis* Dunker, 1850. Riverside Co.; Norco, Silver Lakes; IX-26-1962.

Fig. 2. L-R. *Physa virgata* Gould, 1855. Riverside Co.; Rancho California, Temecula Creek; VI-29-1965. *Pseudosuccinea columella* (Say, 1817). Riverside Co.; Norco, Silver Lakes; IX-26-1962. *Oxyloma sillimani* (Bland, 1865). Riverside Co.; Riverside, Santa Ana River; IX-5-1962. *Succinea californiensis* Fischer and Crosse, 1878. Riverside Co.; Rancho California, Vail Lake; VI-29-1965.

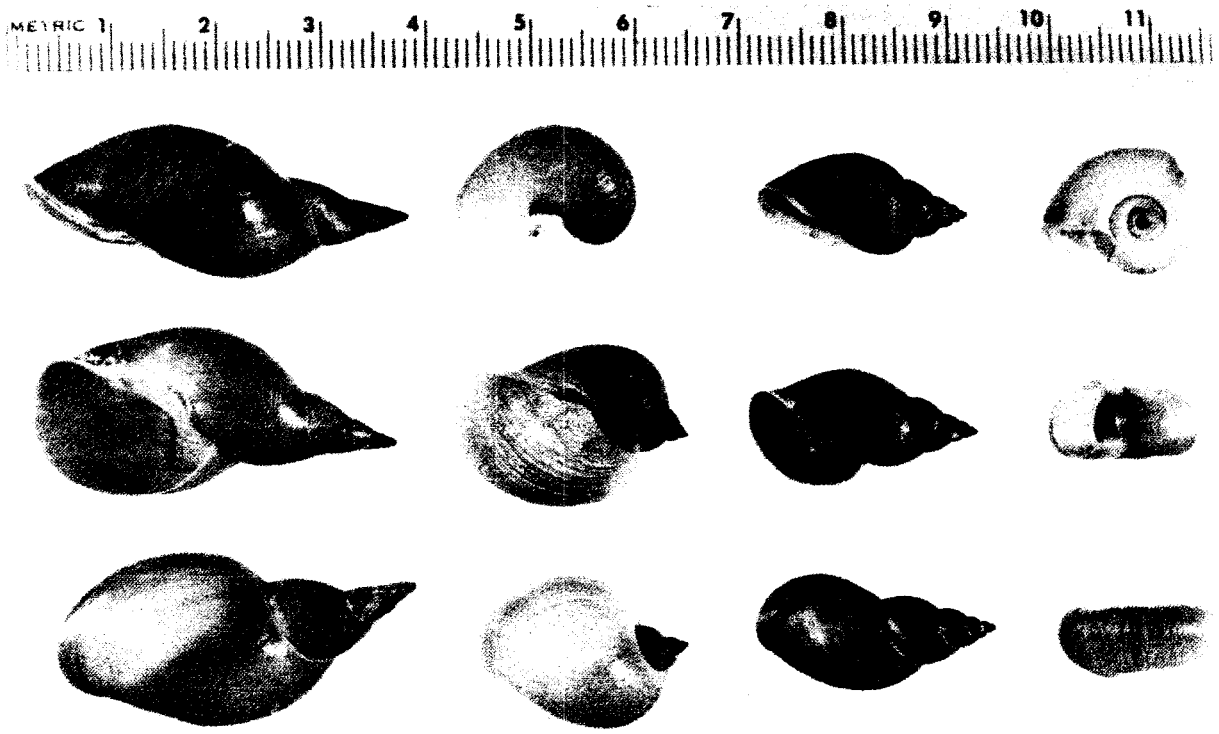

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PLATE 3: California collecting sites.

Fig. 1. Lake shore. Modoc Co.; Lily Lake, 8 mi (12.9 km) east of Hwy 395; 6700 feet (2042 m) elevation; 1968. Fig. 2. Marsh. San Bernardino Co.; Barton Flats, marsh adjacent to South Fork of Santa Ana River; 6200 feet (1890 m) elevation; 1969. Fig. 3. Flowing spring. Nevada Co.; Boca Spring; 5900 feet (1798 m) elevation; 1966. Fig. 4. Mesic. Siskiyou Co.; Bartle, McIntosh Ranch; 4000 feet (1219 m) elevation; 1973. Fig. 5. Wet pasture. Mendocino Co.; 2 mi (3.2 km) north of Willits; 1330 feet (405 m) elevation; 1969. Fig. 6. Stream. Orange Co.; San Juan Creek; 200 feet (61 m) elevation; 1964.

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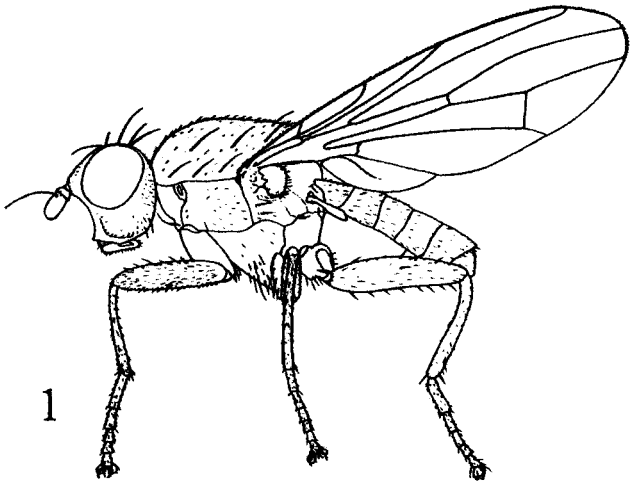
PLATE 4: Characters used in the identification of adult Sciomyzidae.

Fig. 1. *Pherbellia parallela* (Walker), 1852. Male. Side view. Napa Co.; 0.5 mi (0.8 km) east of Yountville; 110 feet (34 m) elevation; VII-9-1965 (T. W. Fisher). Fig. 2. *Pherbellia griseola* (Fallén), 1820. Frontal view. Shasta Co.; 2 mi (3.2 km) south of Pondosa, Hwy 89; 4140 feet (1262 m) elevation; VI-16-1969 (R. E. Orth). fob, fronto-orbital bristles (parafrontals); iv, inner vertical bristle; ob, ocellar bristle; ov, outer vertical bristle; pv, postvertical bristles. Fig. 3. *Tetanocera vicina* (Macquart), 1843. Wing. Shasta Co.; 1 mi (1.6 km) west of Hatchet Mountain Summit; 4200 feet (1280 m) elevation; VII-8-1970 (F&O). $a_{1,2}$ = anal veins 1 and 2; C = costa; cell AM = apical media cell; cell cu = cubital cell; cell dc = discal cell; cell R_{1-5} = radial cells 1-5; cu = cubital vein; M = media vein; R_{1-5} = radial veins 1-5; Sc = subcosta; smp = stump vein; ta = radio-medial crossvein; tp = medial crossvein. Fig. 4. *Sciomyza simplex* (Fallén), 1820. Fore tibia and tarsus. Siskiyou Co.; Grass Lake, Hwy 97; 5122 feet (1561 m) elevation; VI-10-1966 (F&O). pa, preapical bristles; tb, tibia. Fig. 5. *Pherbellia parallela* (Walker), 1852. Antero-lateral view of thorax. Santa Clara Co.; Llagas Creek; 280 feet (85 m) elevation; IV-25-1968 (F&O). cx_1, fore coxa; n, notum; pl_1, propleura; pl_2, mesopleura; ppb, preapical bristle. Fig. 6. *Limnia pubescens* (Day), 1881. Female. Postero-lateral view of thorax. Shasta Co.; Hat Creek, Hwy 299; 2650 feet (808 m) elevation; VI-21-1972 (F&O). pt, pteropleura; ssc, supraspiracular convexity; vb, valar bristle. Fig. 7. *Sepedon capellei* Fisher and Orth, 1969. Male. Hind leg. Nevada; Douglas Co.; Hwy 395, 2 mi (3.2 km) north of junction with Hwy 3, 5500 feet (1676 m) elevation; V-4-1972 (R. E. Orth). cx_3, hind coxa; fm, femur; tb, tibia. Fig. 8. *Antichaeta testacea* Melander, 1920. Hind tibia and tarsus. Mendocino Co.; Ten Mile River, 0.5 mi (0.8 km) east of Hwy 1; 5 feet (1.5 m) elevation; VI-12-1966 (F&O). pa, preapical bristles; tb, tibia.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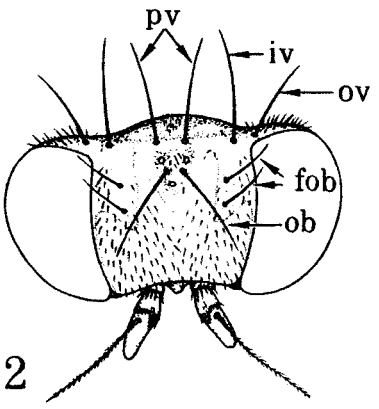
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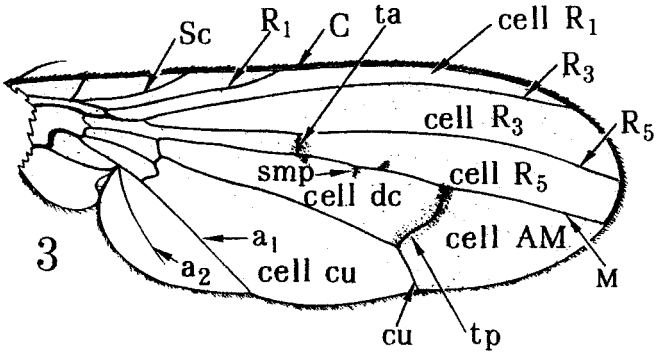
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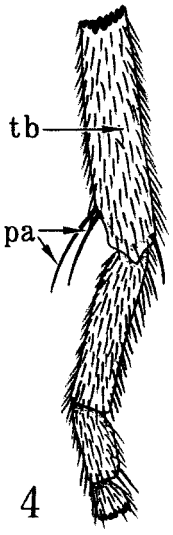
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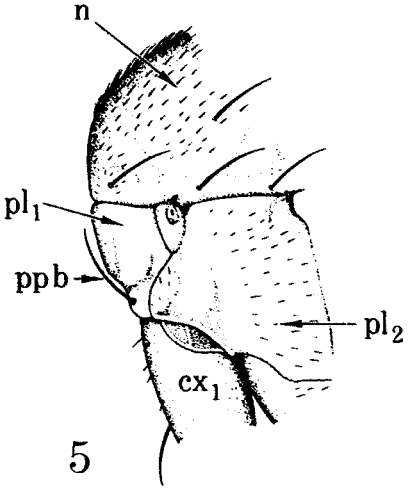
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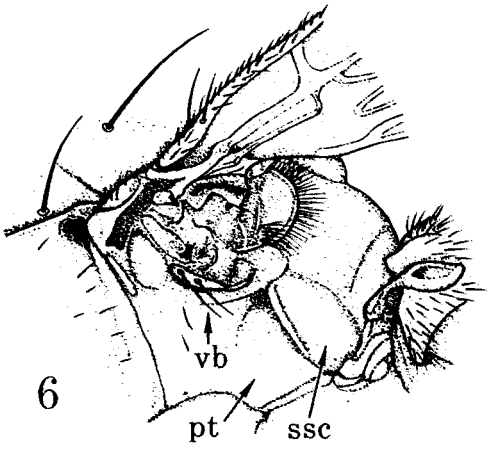
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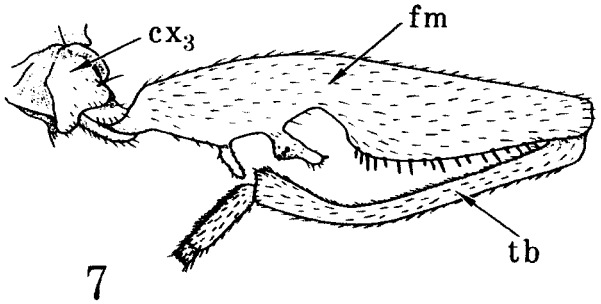
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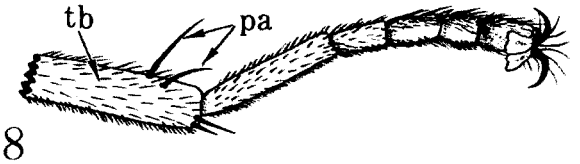
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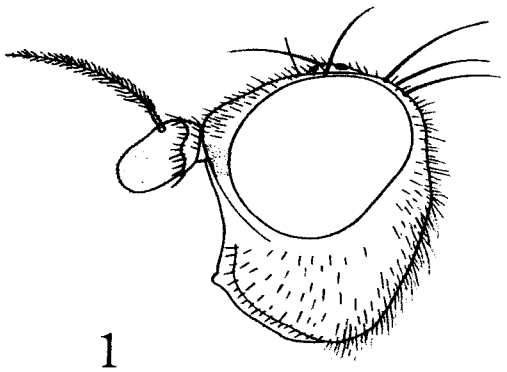
PLATE 5: Head profiles representative of sciomyzine genera found in California.

Figs. 1-4, Sciomyzini; Figs. 5-13, Tetanocerini. Fig. 1. *Atrichomelina pubera* (Loew), 1862. Male. Siskiyou Co.; Grass Lake, 5122 feet (1561 m) elevation; VIII-6-1965 (F&O). Fig. 2. *Sciomyza simplex* Fallén, 1820. Male. Modoc Co.; 2 mi (3.2 km) south of Alturas, 4300 feet (1311 m) elevation; VII-23-1967 (F&O). Fig. 3. *Pherbellia griseola* (Fallén), 1820. Male. Oregon; Klamath Co.; Klamath Game Refuge, 4540 feet (1384 m) elevation; VII-7-1968 (F&O). Fig. 4. *Pteromicra siskiyouensis* Fisher and Orth, 1966. Male. Siskiyou Co.; Grass Lake, 5122 feet (1561 m) elevation; VI-17-1969 (R. E. Orth). Fig. 5. *Antichaeta testacea* Melander, 1920. Female. Oregon; Josephine Co.; 0.5 mi (0.8 km) south of Cave Junction, 1200 feet (366 m) elevation; VI-21-1969 (R. E. Orth). Fig. 6. *Dictya montana* Steyskal, 1954. Male. Nevada; Churchill Co.; 9 mi (14.4 km) southeast of Fallon; 4000 feet (1219 m) elevation; VII-24-1972 (F&O).



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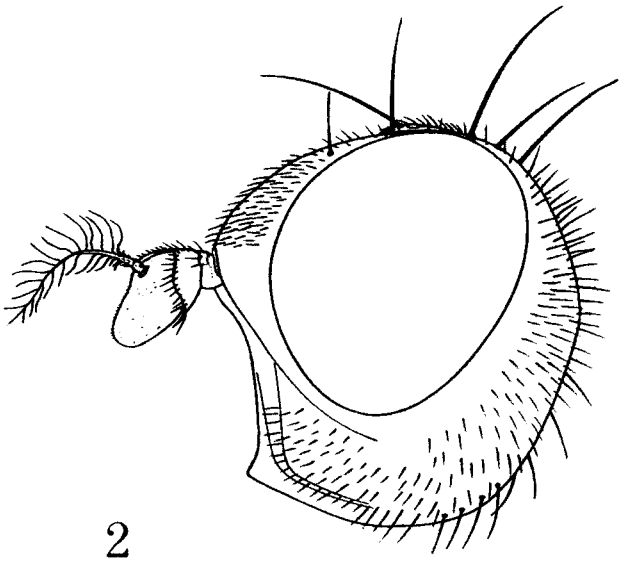

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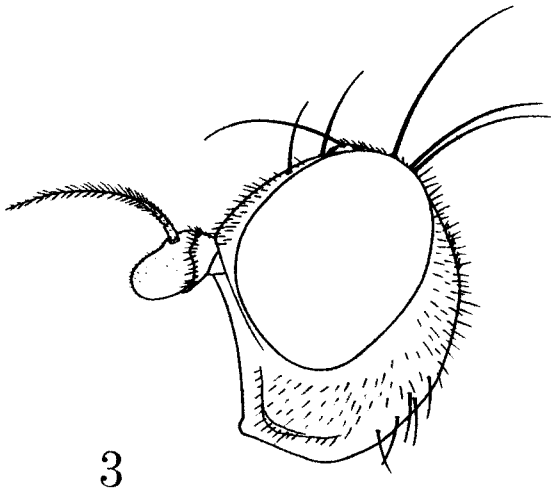

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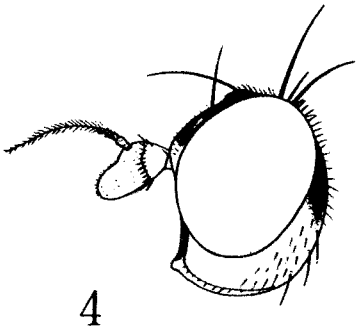

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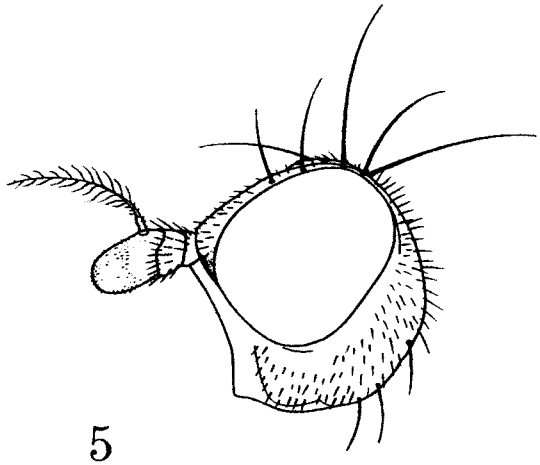

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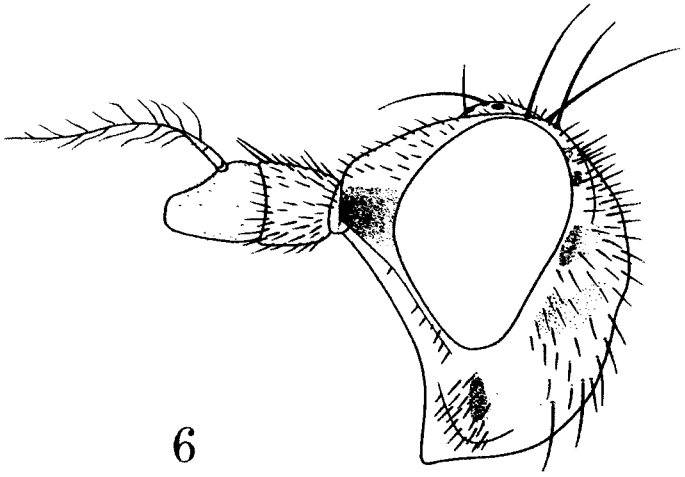

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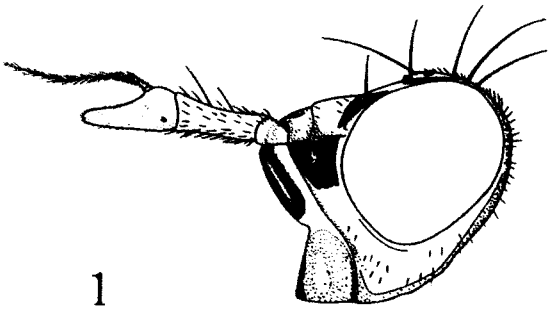
PLATE 6: Head profiles representative of sciomyzine genera found in California.

Fig. 1. *Dictyacium firmum* Steyskal, 1956. Male. Siskiyou Co.; Bartle; 4000 feet (1219 m) elevation; VII-31-1973 (F&O). Fig. 2. *Elgiva connexa* (Steyskal), 1954. Male. Modoc Co.; 3 mi (4.8 km) north of Eagleville; 4640 feet (1414 m) elevation; VII-10-1968 (F&O). Fig. 3. *Hoplodictya acuticornis* (Wulp), 1897. Male. Nevada; Douglas Co.; Hwy 395, 2 mi (3.2 km) north of junction with Hwy 3, 5500 feet (1676 m) elevation; V-4-1972 (R. E. Orth). Fig. 4. *Limnia severa* Cresson, 1920. Male. Oregon; Jackson Co.; north of Eagle Point, 1330 feet (405 m) elevation; VI-19-1972 (F&O). Fig. 5. *Renocera brevis* (Cresson), 1920. Male. Oregon; Clackamas Co.; Mt. Hood Natl. Forest; 3380 feet (1030 m) elevation; VI-18-1969 (R. E. Orth). Fig. 6. *Sepedon bifida* Steyskal, 1951. Male. Amador Co.; Drytown; 700 feet (213 m) elevation; IX-9-1968 (R. E. Orth). Fig. 7. *Tetanocera plumosa* Loew, 1847. Male. San Bernardino Co.; Barton Flats; 6200 feet (1890 m) elevation; VII-9-1969 (F&O).



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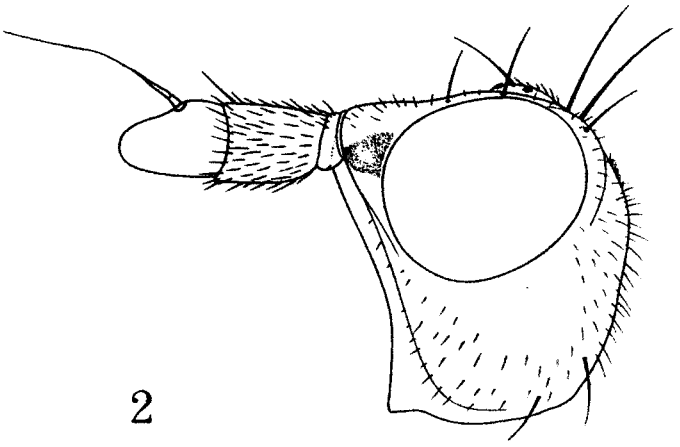

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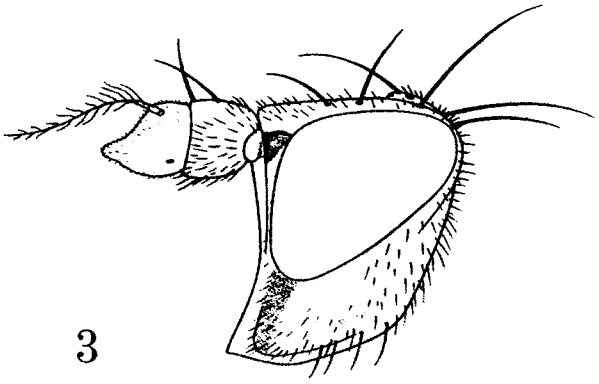

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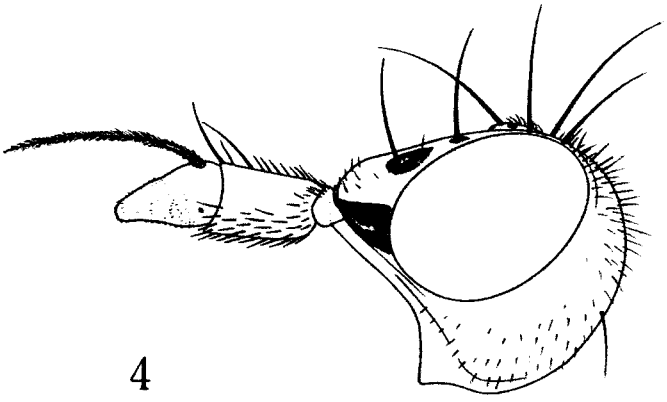

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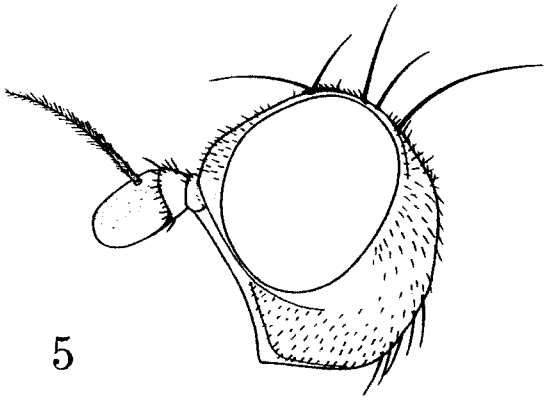

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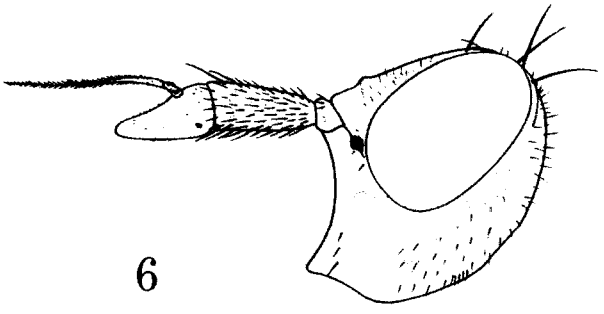

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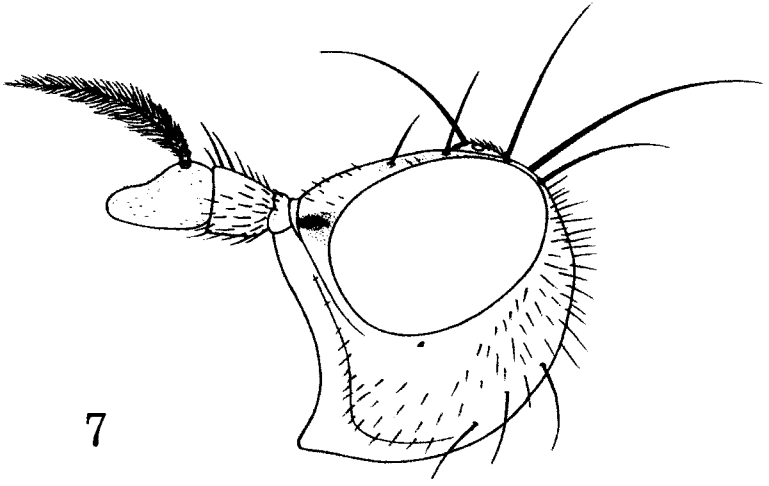

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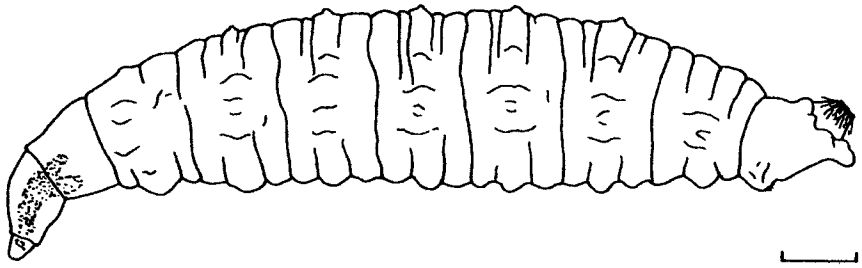
PLATE 7: Characters used in the identification of larval Sciomyzidae.

Figs. 1-3. *Dictya montana* Steyskal, 1954. TETANOCERINI. Laboratory reared third instar larva. Fig. 1. Lateral view. Fig. 2. Cephalopharyngeal skeleton. dc, dorsal cornua; pi, pharyngeal indentation; vc, ventral cornua. Fig. 3. Posterior spiracular disc. fh, float hairs.

Figs. 4-6. *Pherbellia parallela* (Walker), 1852. SCIOMYZINI. Laboratory reared third instar larva. Fig. 4. Lateral view. sp, spinule patch. Fig. 5. Cephalopharyngeal skeleton. dw, dorsal "window"; vw, ventral "window". Fig. 6. Posterior spiracular disc.



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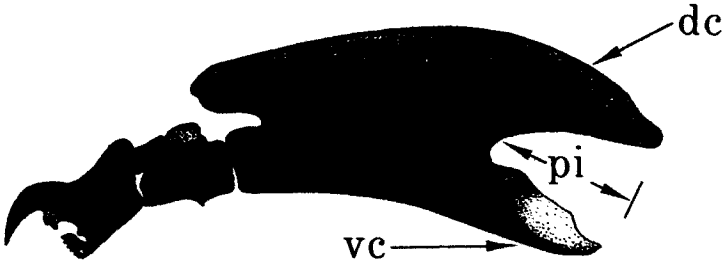

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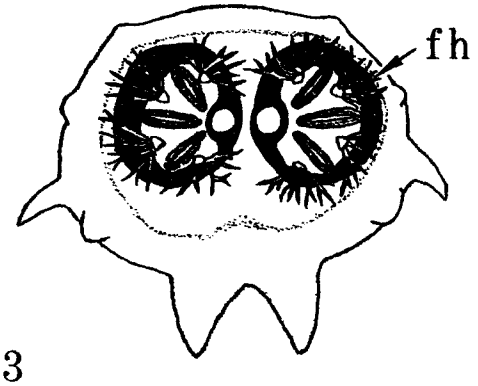

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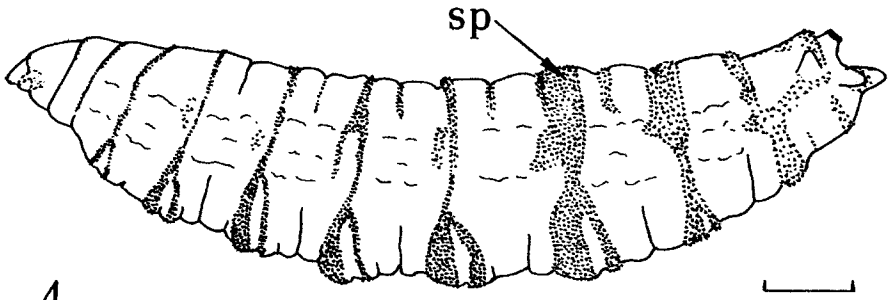

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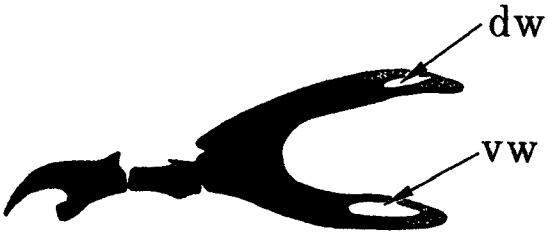

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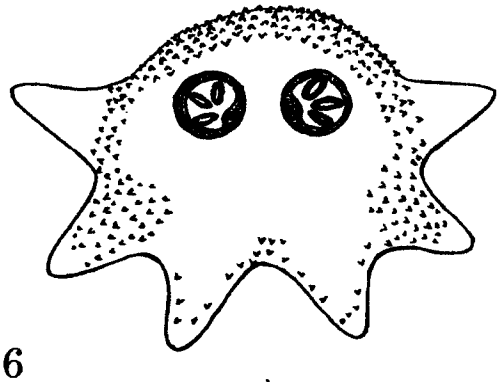

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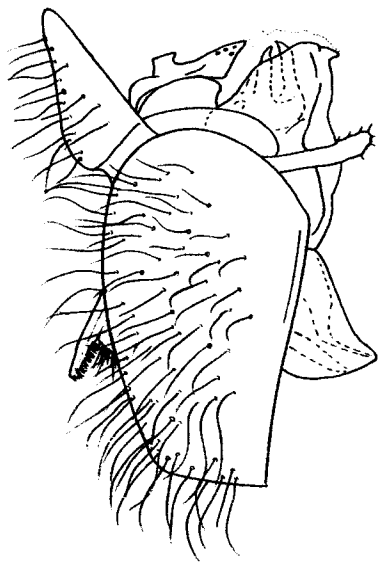
PLATE 8: Terminalia of Sciomyzidae found in or near California.

Figs. 1 and 2. *Atrichomelina pubera* (Loew), 1862. Male. California; Siskiyou Co.; Grass Lake; 5122 feet (1561 m) elevation; VI-10-1965 (F&O). Postabdomen, inverted. Fig. 1. Sinistral view. Fig. 2. Posterior view.

Figs. 3 and 4. *Pherbellia argyra* Verbeke, 1967. Male. Canada; N.W.T.; Hay-River; IX-10-1932 (O. Bryant). Postabdomen, inverted. Fig. 3. Sinistral view. Fig. 4. Posterior view.

Figs. 5 and 6. *Pherbellia griseola* (Fallén), 1820. Male. California; Shasta Co.; 2 mi (3.2 km) south of Pondosa, Hwy 89; 4140 feet (1262 m) elevation; VI-16-1969 (R. E. Orth). Postabdomen, inverted. Fig. 5. Sinistral view. Fig. 6. Posterior view.



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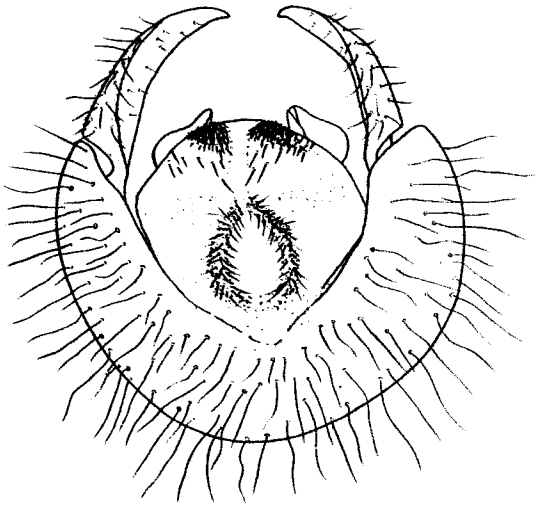

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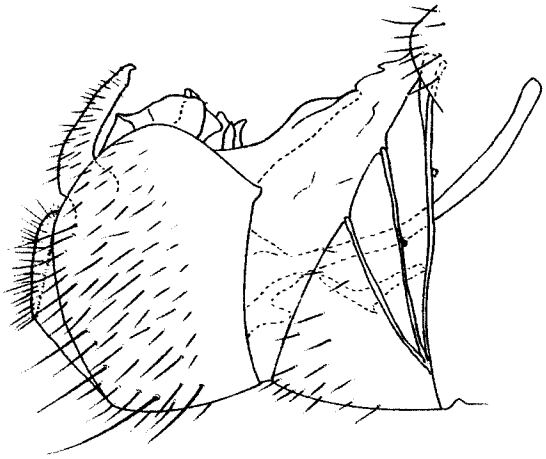

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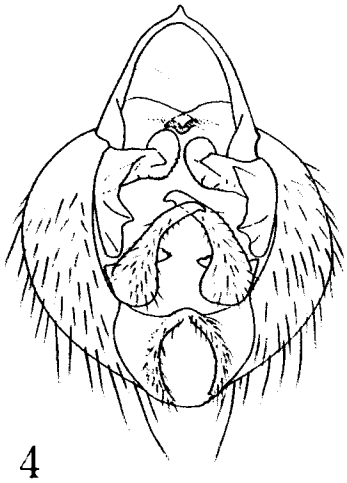

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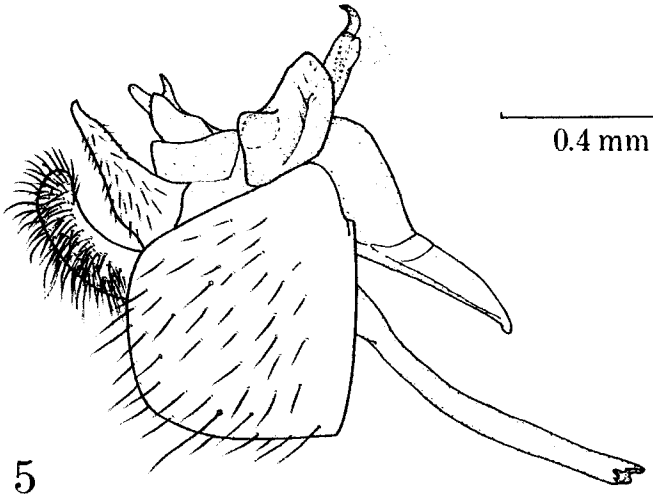

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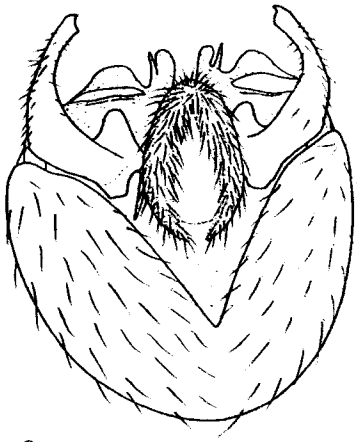

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PLATE 9: Terminalia of Sciomyzidae found in or near California.

Figs. 1 and 2. *Pherbellia idahoensis* Steyskal, 1961. Male. California; Santa Clara Co.; Stanford Lake, Stanford University campus; 250 feet (76 m) elevation; VI-8-1965 (T. W. Fisher). Postabdomen, inverted. Fig. 1. Sinistral view. Fig. 2. Posterior view.

Figs. 3 and 4. *Pherbellia melanderi* Steyskal, 1963. Male. California; Modoc Co.; 2 mi (3.2 km) south of Alturas; 4350 feet (1326 m) elevation; VI-10-1966 (F&O). Postabdomen, inverted. Fig. 3. Sinistral view. Fig. 4. Posterior view.

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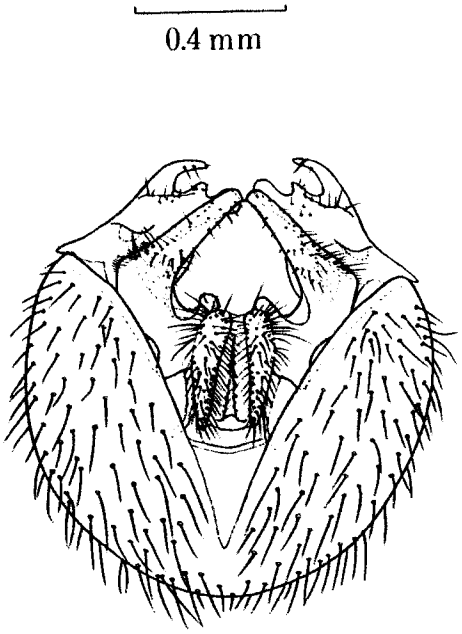

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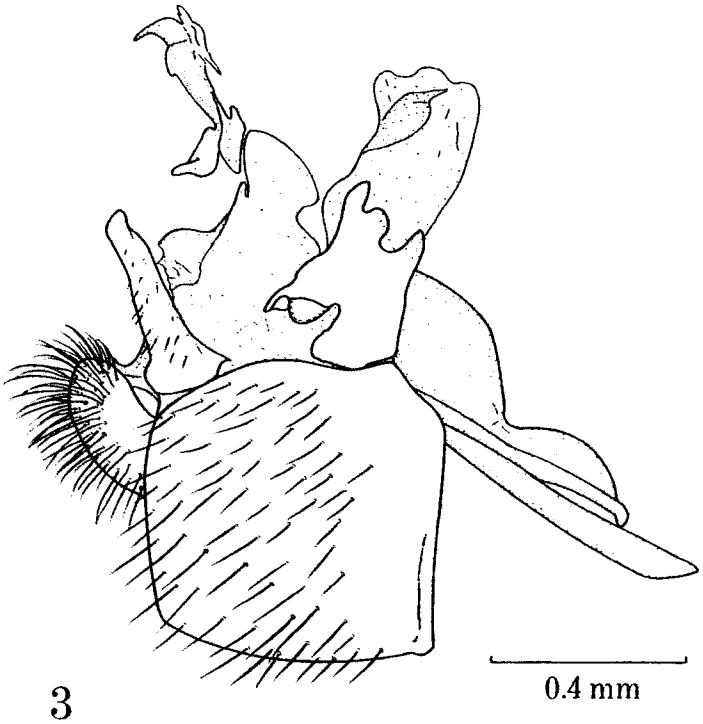

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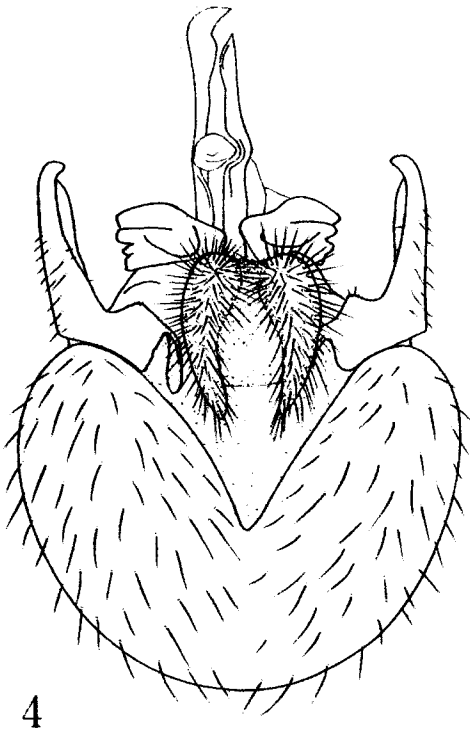

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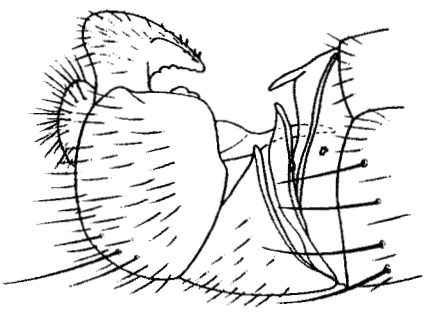
PLATE 10: Terminalia of Sciomyzidae found in or near California.

Figs. 1 and 2. *Pherbellia nana nana* (Fallén), 1820. Male. California; Mendocino Co.; 3 mi (4.8 km) north of Willits, Outlet Creek; 1350 feet (411 m) elevation; VI-21-1969 (R. E. Orth). Postabdomen, inverted. Fig. 1. Sinistral view. Fig. 2. Posterior view.

Figs. 3 and 4. *Pherbellia oregona* Steyskal, 1961. Male. California; Del Norte Co.; 3 mi (4.8 km) north of Crescent City; 40 feet (12 m) elevation; VI-11-1966 (F&O). Postabdomen, inverted. Fig. 3. Sinistral view. Fig. 4. Posterior view.

Figs. 5 and 6. *Pherbellia parallela* (Walker), 1852. Male. California; Mono Co.; Fish Slough; 4200 feet (1280 m) elevation; V-23-1968 (F&O). Postabdomen, inverted. Fig. 5. Sinistral view. Fig. 6. Posterior view.



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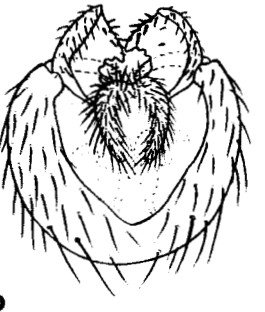

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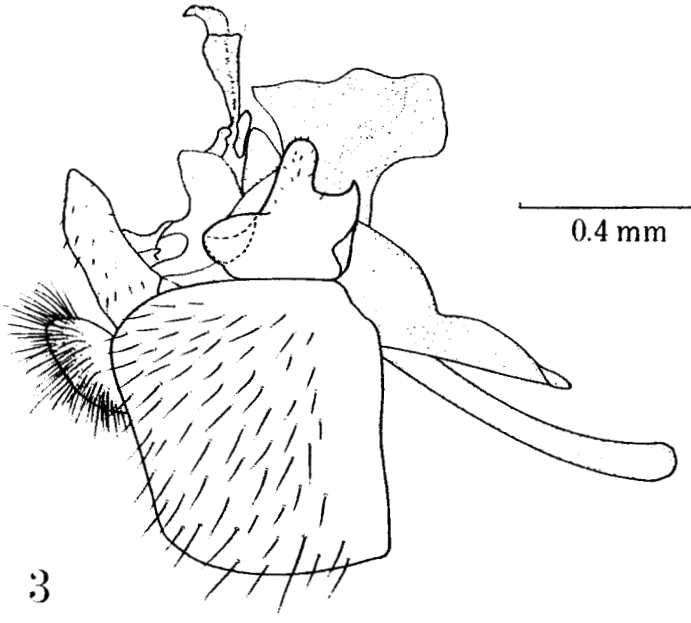

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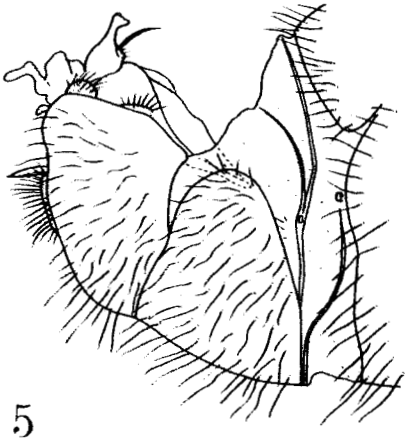

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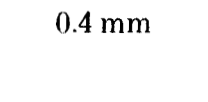

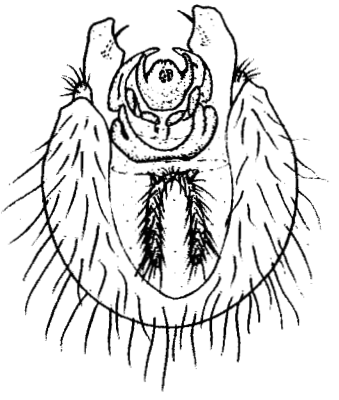

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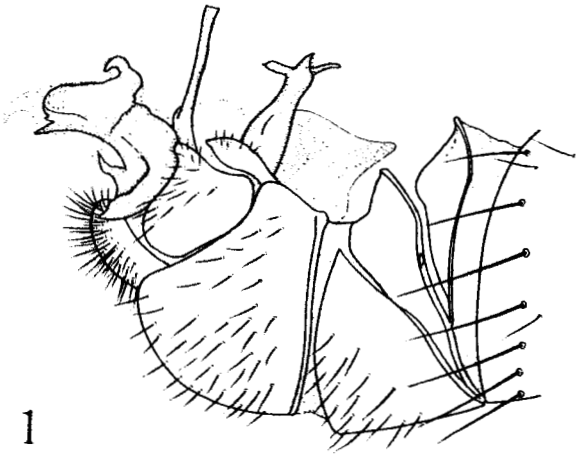
PLATE 11: Terminalia of Sciomyzidae found in or near California.

Fig. 1. *Pherbellia californica* Orth, 1982. Male. California; Mendocino Co.; 2 mi (3.2 km) north of Willits; 1380 feet (421 m) elevation; V-24-1967 (F&O). Postabdomen, inverted. Sinistral view.

Figs. 2 and 3. *Pherbellia schoenherri maculata* (Cresson), 1920. Male. California; Modoc Co.; 8.3 mi (13 km) west of Alturas; 4300 feet (1300 m) elevation; VII-19-1967 (R. E. Orth). Postabdomen, inverted. Fig. 2. Sinistral view. Fig. 3. Posterior view.

Figs. 4-6. *Pherbellia subtilis* Orth and Steyskal, 1980. Male. California; San Bernardino Co.; Little Cienega Seca; 7700 feet (2347 m) elevation; VI-16-1968 (F&O). Postabdomen, inverted. Fig. 4. Sinistral view. Fig. 5. Posterior view. Fig. 6. Ventral view.



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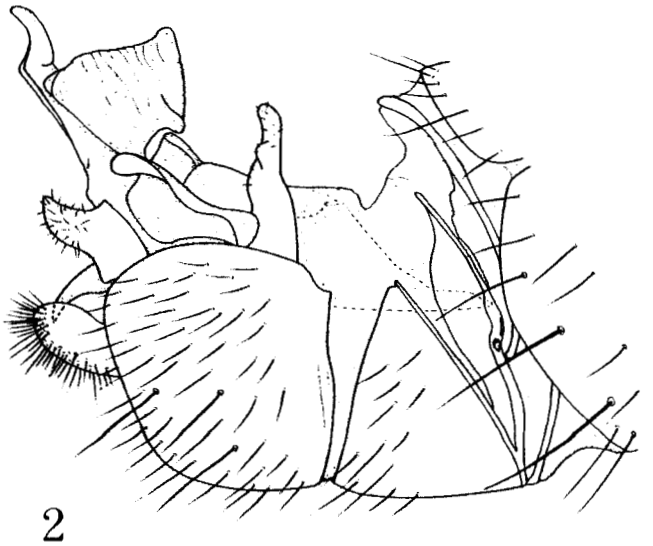

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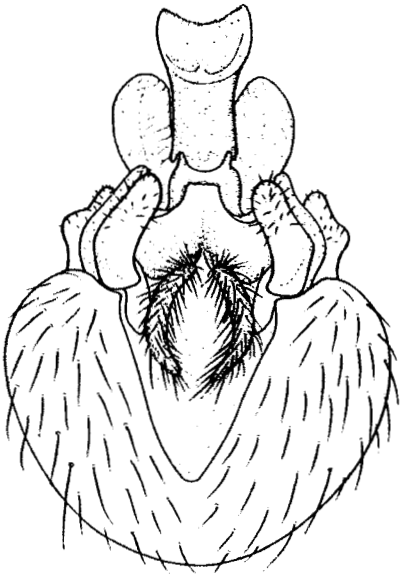

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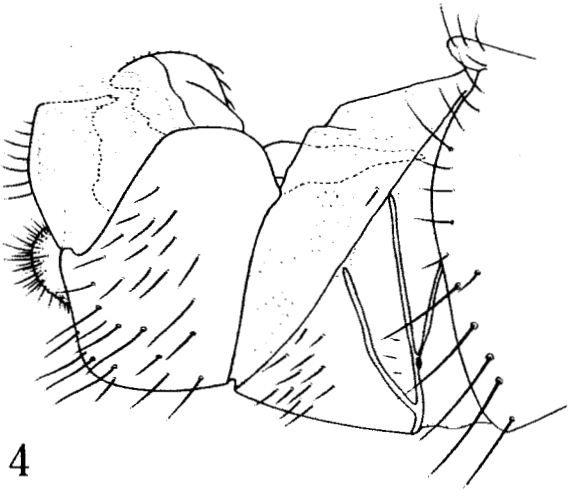

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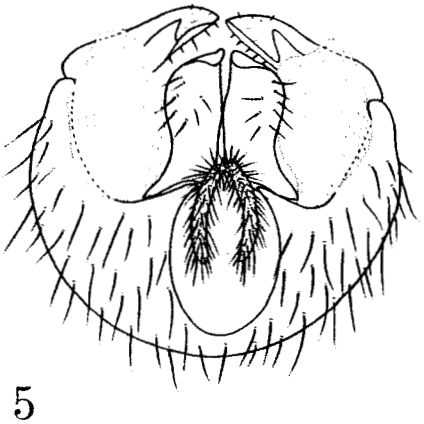

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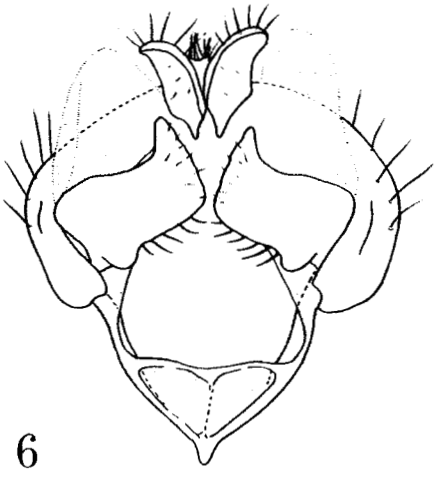

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PLATE 12: Terminalia of Sciomyzidae found in or near California.

Figs. 1 and 2. *Pherbellia trabeculata* (Loew), 1872. Male. California; Riverside Co.; Lake Hemet; 4500 feet (1372 m) elevation; VI-25-1968 (F&O). Postabdomen, inverted. Fig. 1. Sinistral view. Fig. 2. Posterior view.

Figs. 3 and 4. *Pherbellia vitalis* (Cresson), 1920. Male. California; Riverside Co.; Rancho California, Vail Lake; 1400 feet (427 m) elevation; V-25-1965 (F&O). Postabdomen, inverted. Fig. 3. Sinistral view. Fig. 4. Posterior view.

Figs. 5-7. *Pteromicra pectorosa* (Hendel), 1902. California; Del Norte Co.; 3 mi (4.8 km) north of Crescent City; 40 feet (12 m) elevation; VI-11-1966 (F&O). Postabdomen, inverted. Fig. 5. Male. Sinistral view. Fig. 6. Male. Posterior view. Fig. 7. Female. Ventral view.

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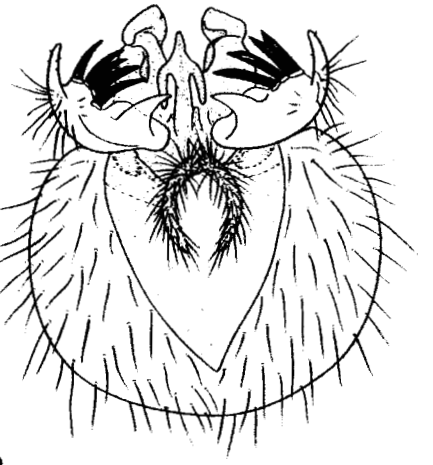

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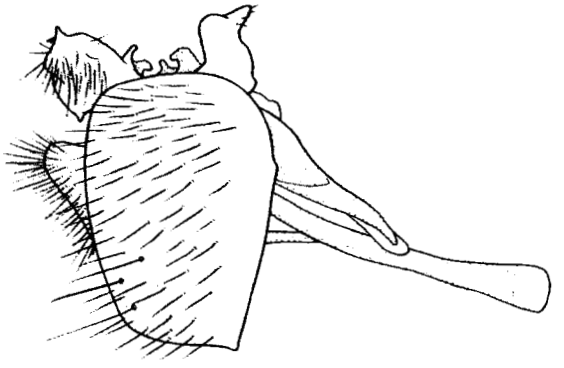

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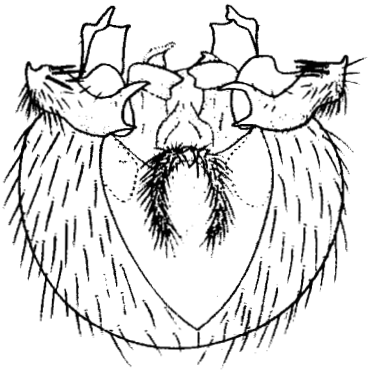

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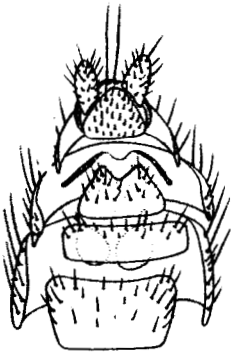

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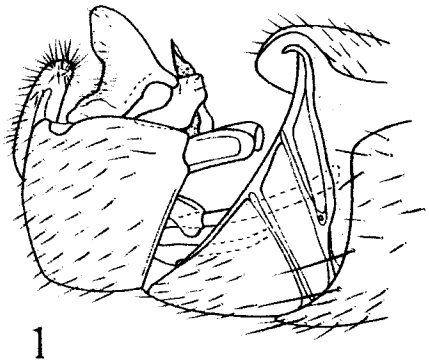
PLATE 13: Terminalia of Sciomyzidae found in or near California.

Figs. 1-3. *Pteromicra siskiyouensis* Fisher and Orth, 1966. California; Siskiyou Co.; Grass Lake; 5122 feet (1561 m) elevation; VIII-6-1965 (F&O). Postabdomen, inverted. Fig. 1. Male. Sinistral view. Fig. 2. Male. Posterior view. Fig. 3. Female. Ventral view.

Figs. 4 and 5. *Sciomyza simplex* Fallén, 1820. Male. California; Modoc Co.; Likely, north of Pit River; 4400 feet (1341 m) elevation; VIII-23-1967 (F&O). Postabdomen, inverted. Fig. 4. Sinistral view. Fig. 5. Posterior view.

Figs. 6 and 7. *Sciomyza varia* (Coquillett), 1904. Male. California; Modoc Co.; 1 mi (1.6 km) south of Alturas; 4300 feet (1311 m) elevation; VII-19-1967 (R. E. Orth). Postabdomen, inverted. Fig. 6. Sinistral view. Fig. 7. Posterior view.



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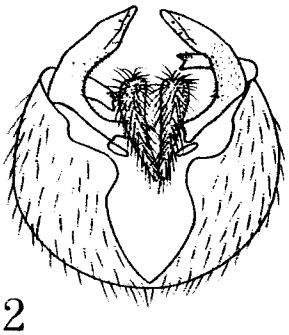

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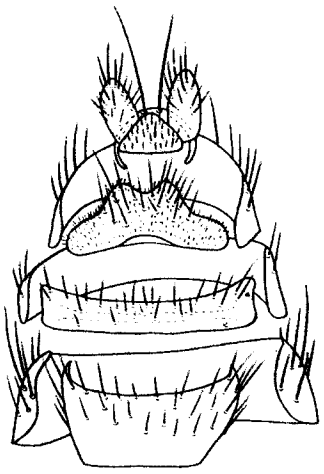

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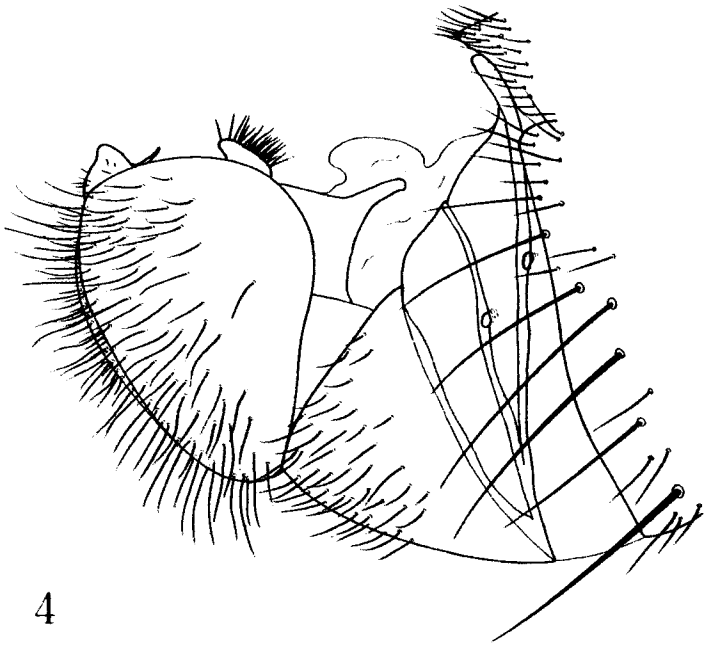

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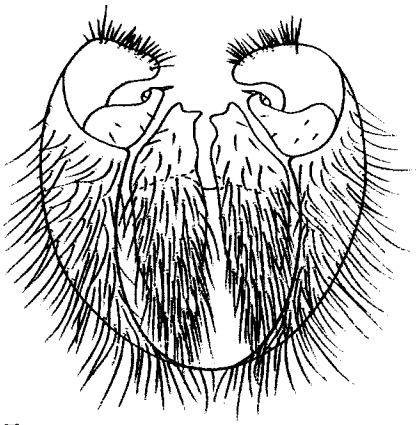

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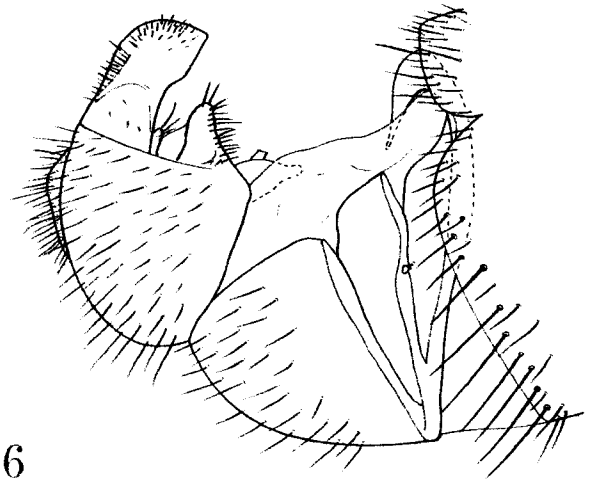

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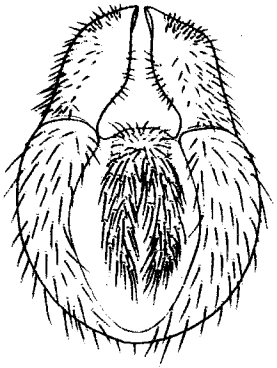

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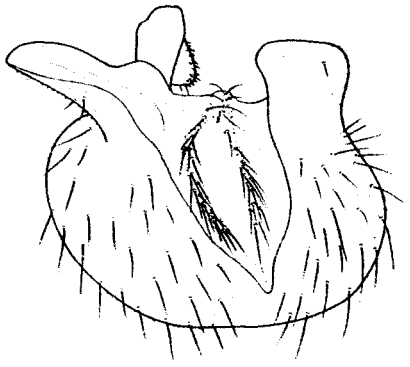
PLATE 14: Terminalia of Sciomyzidae found in or near California.

Figs. 1-6. *Antichaeta borealis* Foote, 1961. Figs. 1-4. Male. Ohio; 4.5 mi (7.2 km) east of Kent; IV-16-1968 (B. A. Foote). Postabdomen, inverted. Fig. 1. Posterior view. Fig. 2. Sinistral view. Fig. 3. Dextral view. Fig. 4. Fifth ventrite. Figs. 5 and 6. Female. California; Modoc Co.; 3 mi (4.8 km) north of Eagleville; 4640 feet (1414 m) elevation; VII-10-1968 (F&O). Fig. 5. Antenna. Fig. 6. Ventral view of terminalia.

Figs. 7-9. *Antichaeta robiginosa* Melander, 1920. Male. California; Shasta Co.; 5 mi (8 km) northwest of Anderson; 480 feet (146 m) elevation; V-24-1967 (F&O). Postabdomen, inverted. Fig. 7. Posterior view. Fig. 8. Sinistral view; as, anterior surstylus. Fig. 9. Dextral view.



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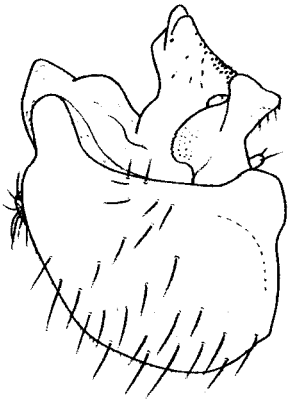

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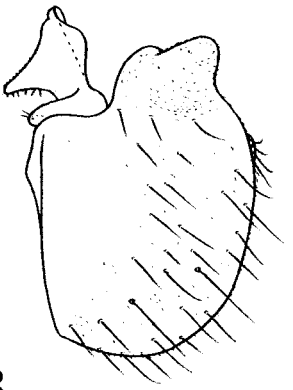

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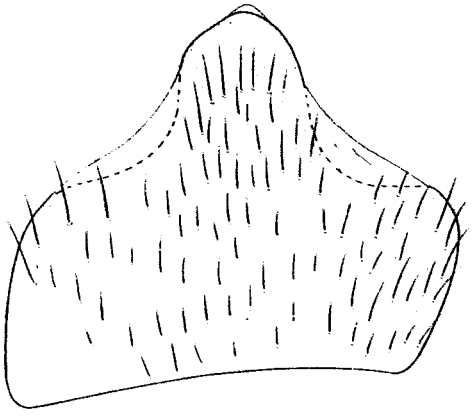

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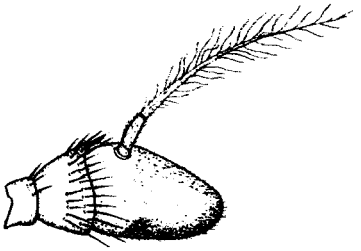

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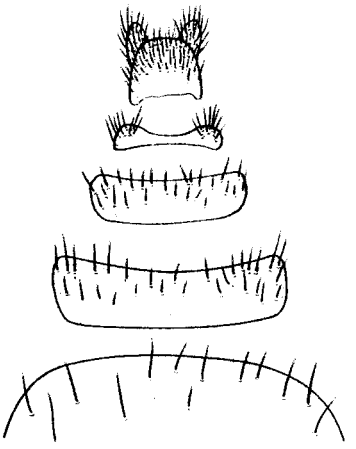

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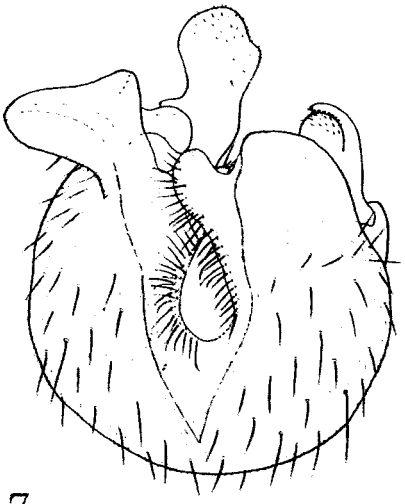

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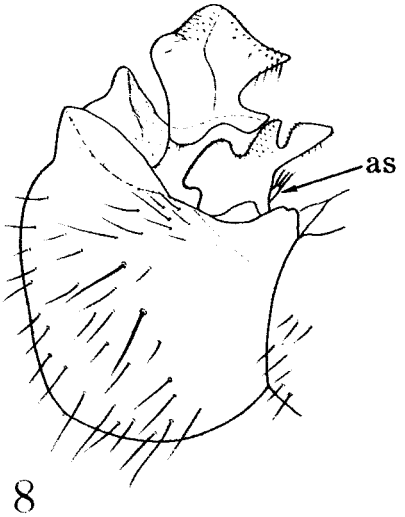

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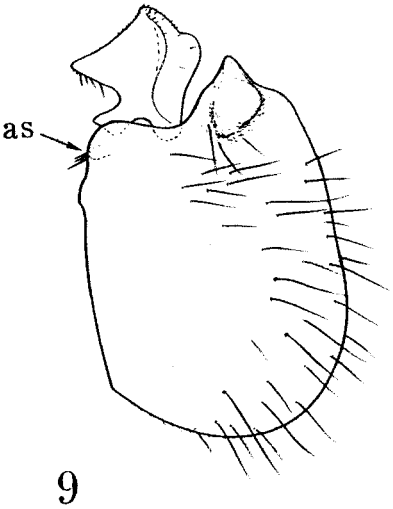

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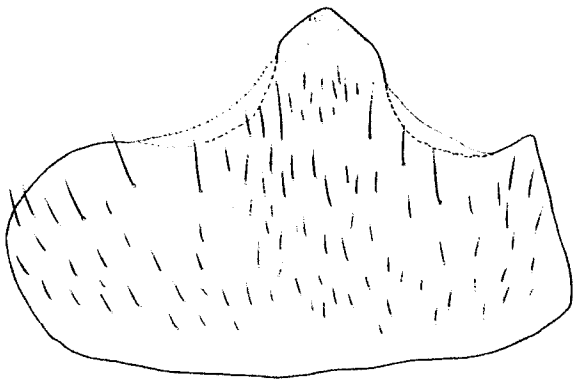
PLATE 15: Terminalia of Sciomyzidae found in or near California.

Figs. 1-3. *Antichaeta robiginosa* Melander, 1920. Fig. 1. Male. California; Shasta Co.; 5 mi (8 km) northwest of Anderson; 480 feet (146 m) elevation; V-24-1967 (F&O). Fifth ventrite. Fig. 2. Male. California; Mendocino Co.; 2 mi (3.2 km) north of Willits; 1330 feet (405 m) elevation; VI-12-1966 (R. E. Orth). Antenna. Fig. 3. Female. California; Modoc Co.; 2 mi (3.2 km) south of Alturas; 4300 feet (1311 m) elevation; VI-6-1967 (F&O). Ventral view of terminalia.

Figs. 4-9. *Antichaeta testacea* Melander, 1920. Figs. 4-7. Male. California; Riverside Co.; Rancho California, Vail Lake; 1400 feet (427 m) elevation; IV-21-1966 (T. W. Fisher). Postabdomen, inverted. Fig. 4. Posterior view. Fig. 5. Sinistral view. Fig. 6. Dextral view. Fig. 7. Fifth ventrite. Fig. 8. Female. California; San Luis Obispo Co.; San Luisito Creek; 3 mi (4.8 km) southeast of Morro Bay; 75 feet (23 m) elevation; VII-29-1964 (T. W. Fisher). Antenna. Fig. 9. Female. California; Riverside Co.; Lake Hemet; 4500 feet (1372 m) elevation; IV-14-1966 (F&O). Ventral view of terminalia.



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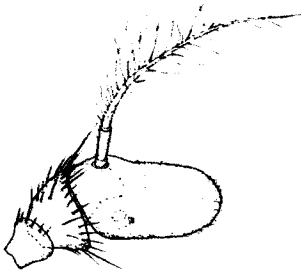

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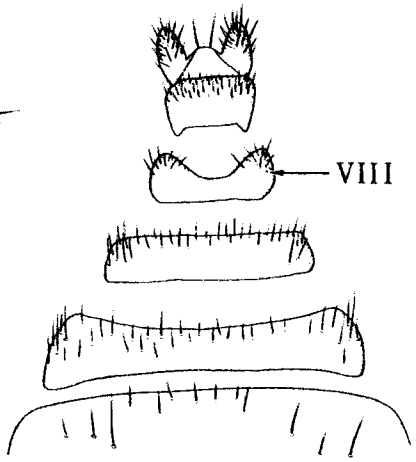

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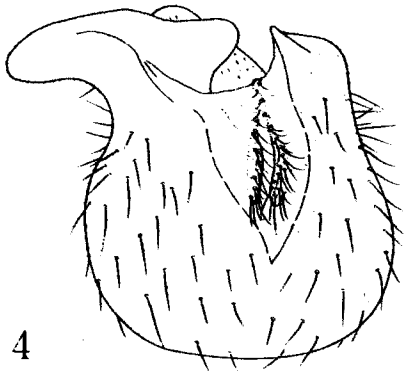

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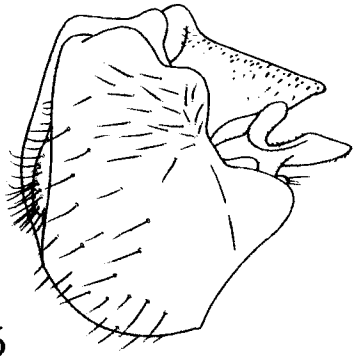

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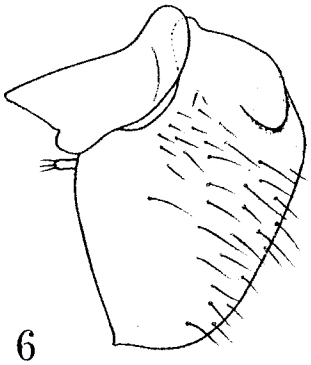

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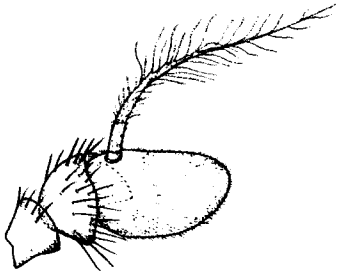

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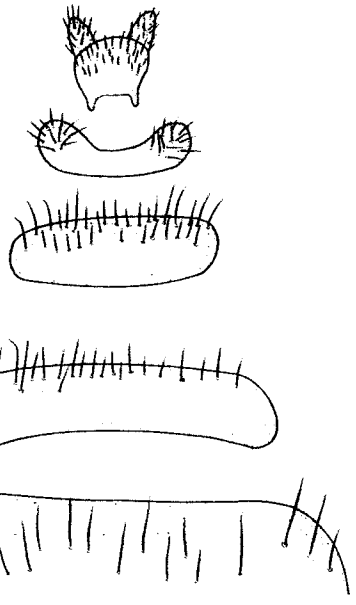

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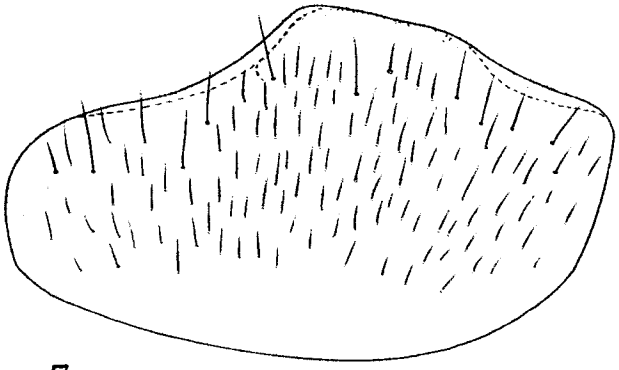

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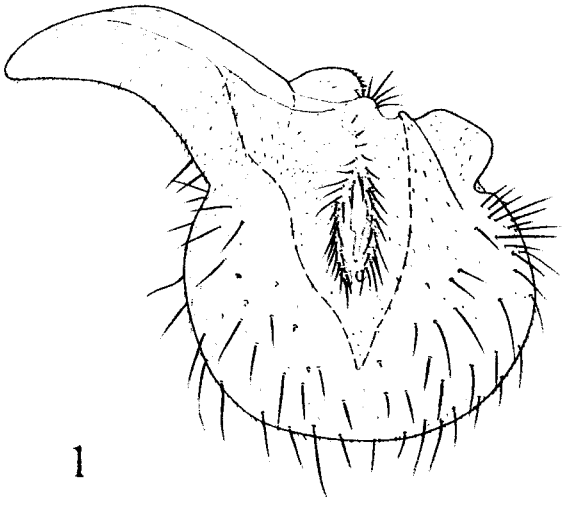
PLATE 16: Terminalia of Sciomyzidae found in or near California.

Figs. 1-6. *Antichaeta vernalis* Fisher and Orth, 1971. California; Mendocino Co.; 2 mi (3.2 km) north of Willits; 1330 feet (405 m) elevation. Figs. 1-3. Male. Postabdomen, inverted. IV-23-1969 (F&O). Fig. 1. Posterior view. Fig. 2. Sinistral view. Fig. 3. Dextral view. Fig. 4. Female. Antenna. IV-11-1967 (F&O). Figs. 5 and 6. IV-23-1969 (F&O). Fig. 5. Male. Fifth ventrite. Fig. 6. Female. Ventral view of terminalia.



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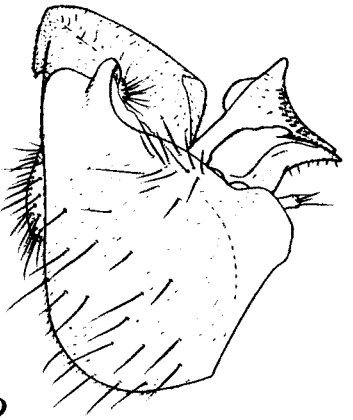

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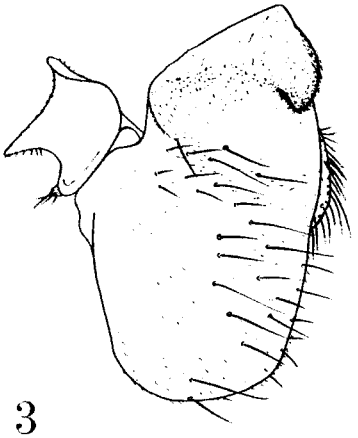

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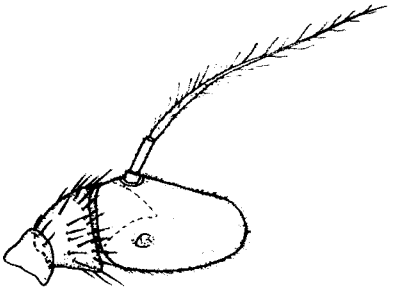

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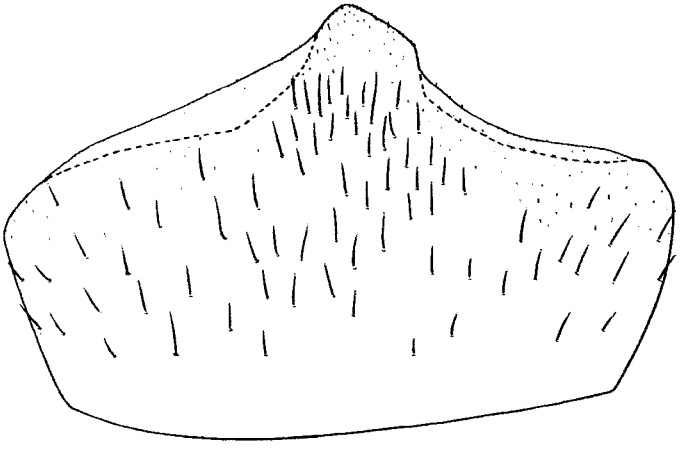

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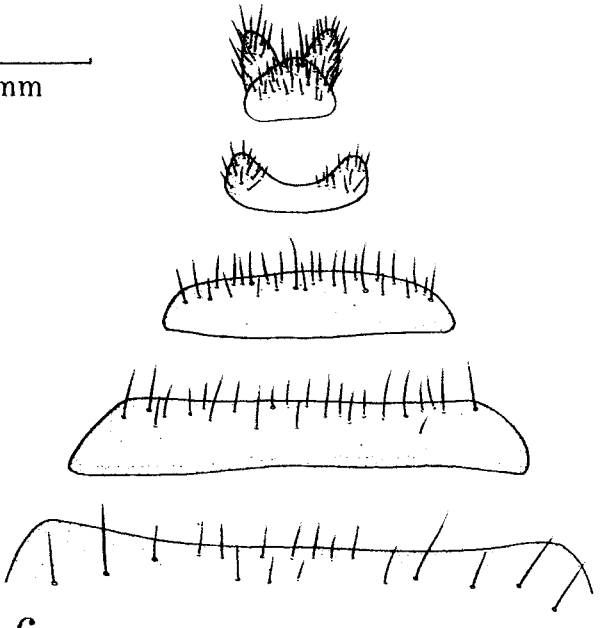

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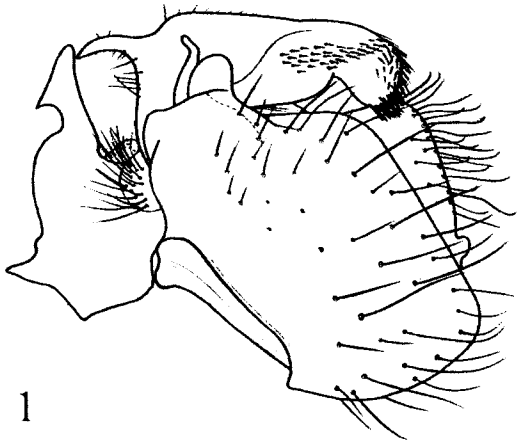
PLATE 17: Terminalia of Sciomyzidae found in or near California.

Figs. 1-4. *Dictya expansa* Steyskal, 1938. Kansas; Montgomery Co.; 2 mi (3.2 km) northwest of Liberty; IV/14-19/1963 (N. & B. Marston). Figs. 1 and 2. Male. Postabdomen, inverted. Fig. 1. Dextral view. Fig. 2. Anterior view of hypandrium. Figs. 3 and 4. Female. Fig. 3. Internal view of sternites VII and VIII to show apodemes. Fig. 4. Sternites VI-X.

Figs. 5-8. *Dictya fontinalis* Fisher and Orth, 1969. Figs. 5 and 7. Male. California; Nevada Co.; Boca Spring; 5900 feet (1798 m) elevation; VI-7-1966 (F&O), Postabdomen, inverted. Fig. 5. Dextral view; ep, epandrium; hy, hypandrium; ss, surstylus. Fig. 7. anterior view of hypandrium. Figs. 6 and 8. Female. California; Shasta Co.; Cassel; 3150 feet (960 m) elevation; VII-5-1955 (J. W. MacSwain, UCB). Fig. 6. Internal view of sternites VII and VIII to show apodemes. Fig. 8. sternites VI-X.



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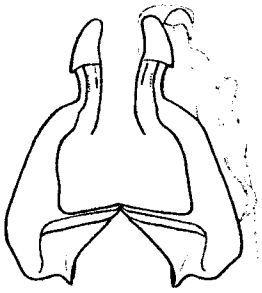

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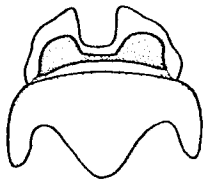

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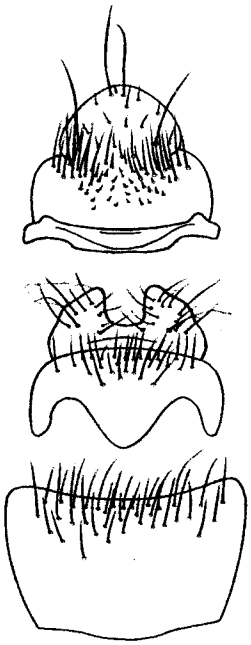

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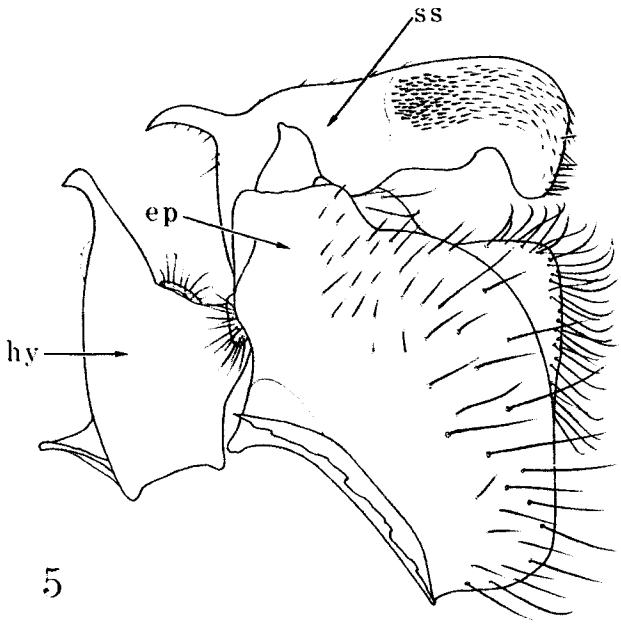

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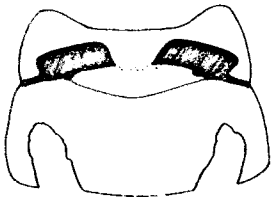

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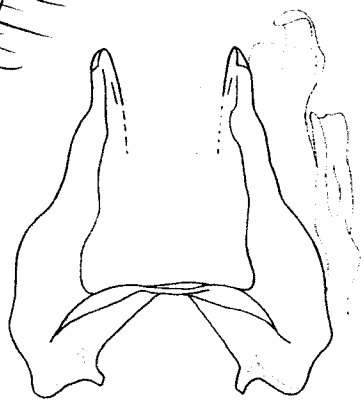

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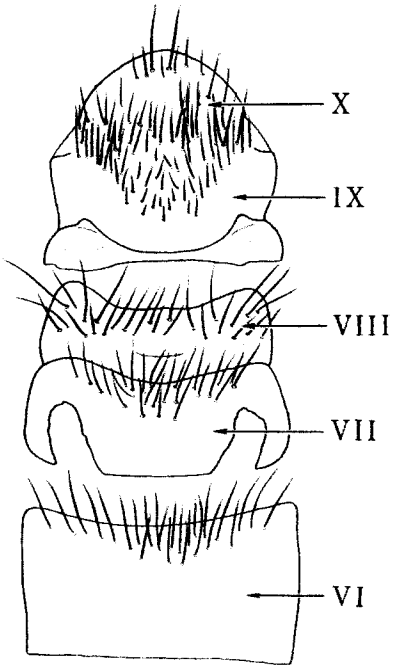
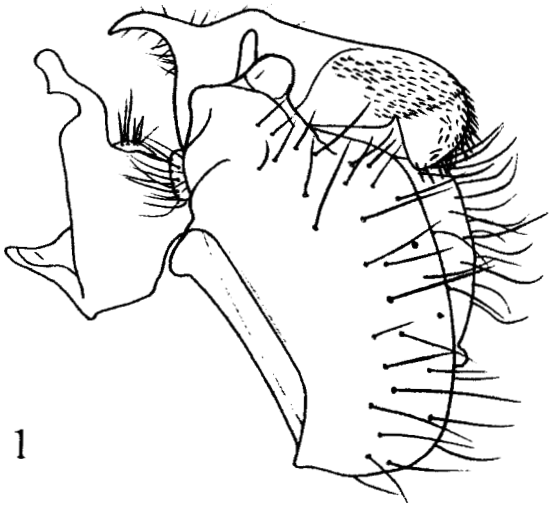


8

PLATE 18: Terminalia of Sciomyzidae found in or near California.

Figs. 1-4 *Dictya incisa* Curran, 1932. Figs. 1 and 2. Male. Mexico; Sonora; 1 mi (1.6 km) north of Imuris; V-11-1953 (E. I. Schlinger & R. C. Bechtel, UCB). Postabdomen, inverted. Fig. 1. Dextral view. Fig. 2. Anterior view of hypandrium. Figs. 3 and 4. Female. Arizona; Cochise Co.; 5 mi (8 km) west of Portal; 5400 feet (1646 m) elevation; VIII-7-1958 (P. Opler). Fig. 3. Internal view of sternites VII and VIII to show apodemes. Fig. 4. Sternites VI-X.

Figs. 5-8. *Dictya matthewsi* Steyskal, 1960. Figs. 5 and 6. Male. Arizona; Cochise Co.; 5 mi (8 km) west of Portal; 5400 feet (1646 m) elevation; VIII-7-1958 (P. Opler). Postabdomen, inverted. Fig. 5. Dextral view. Fig. 6. Anterior view of hypandrium. Figs. 7 and 8. Female. Mexico; 2 mi (3.2 km) northwest of Puebla; IV-25-1953 (R. C. Bechtel & E. I. Schlinger, UCB). Fig. 7. Internal view of sternites VII and VIII to show apodemes. Fig. 8. Sternites VI-X.



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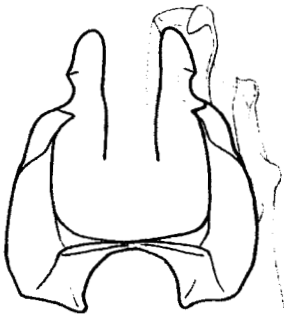

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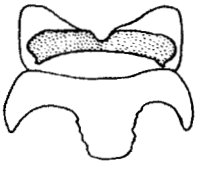

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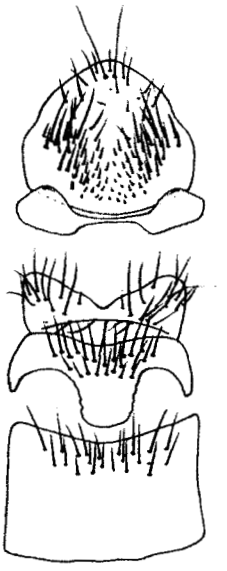

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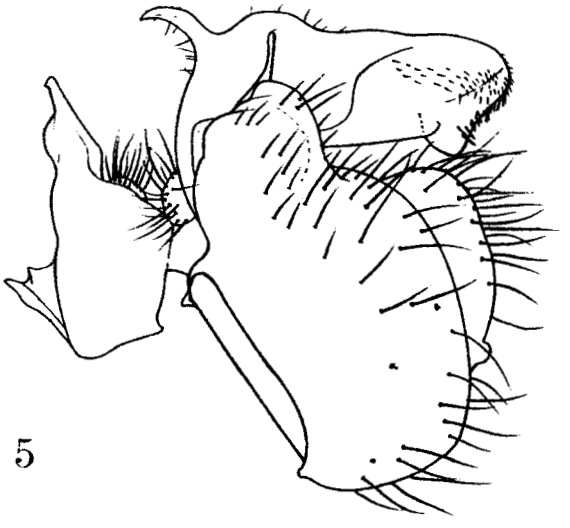

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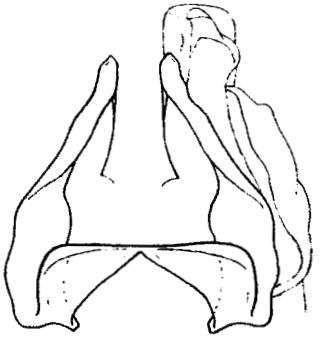

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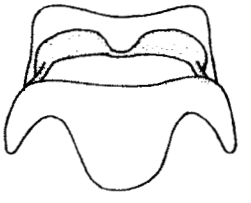

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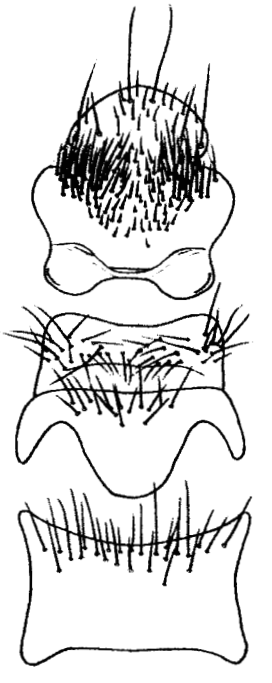


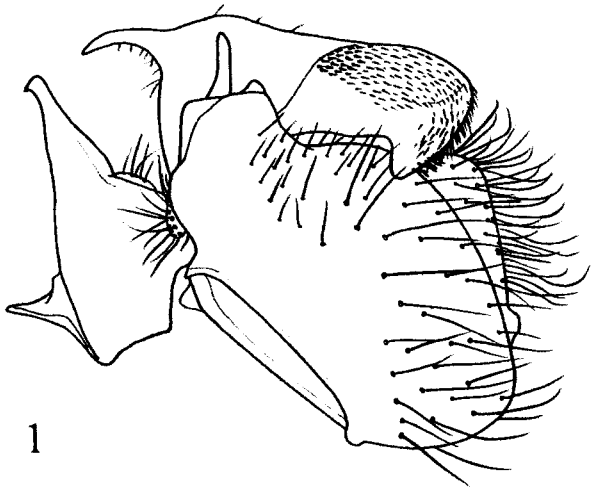
8

0.4 mm

PLATE 19: Terminalia of Sciomyzidae found in or near California.

Figs. 1-8. *Dictya montana* Steyskal, 1954. Figs. 1-4. Form "A". Figs. 1 and 2. Male. California; Mendocino Co.; Ukiah; 590 feet (180 m) elevation; IV-7-1964 (T. W. Fisher). Postabdomen, inverted. Fig. 1. Dextral view. Fig. 2. Anterior view of hypandrium. Figs. 3 and 4. Female. California; Lassen Co.; 2 mi (3.2 km) west of Hallelujah Junction; 4800 feet (1463 m) elevation; VI-27-1949 (D. Cox). Fig. 3. Internal view of sternites VII and VIII to show apodemes. Fig. 4. Sternites VI-X.

Figs. 5-8. Form "Alturas". California; Modoc Co.; 1 mi (1.6 km) south of Alturas; 4300 feet (1311 m) elevation; IX-21-1966 (F&O). Postabdomen, inverted. Fig. 5. Male. Dextral view. Fig. 6. Male. Anterior view of hypandrium. Fig. 7. Female. Internal view of sternites VII and VIII to show apodemes. Fig. 8. Female. Sternites VI-X.



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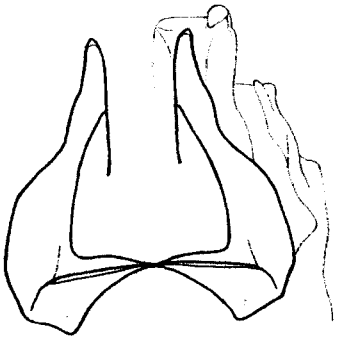

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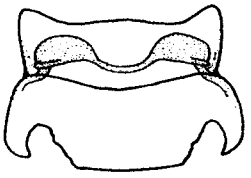

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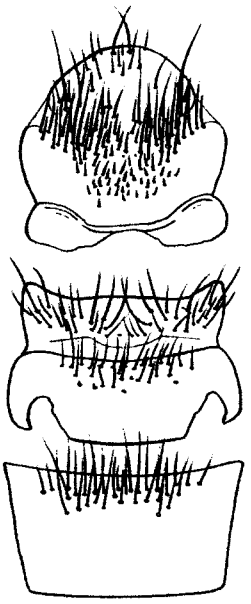

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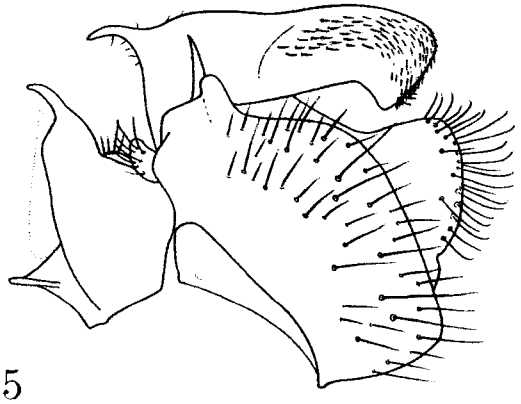

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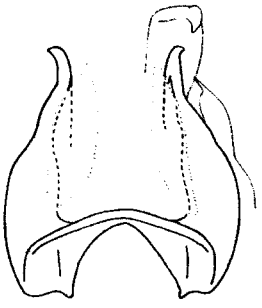

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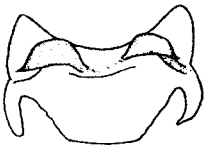

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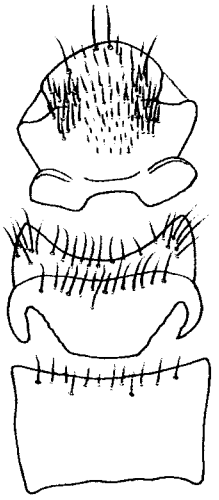


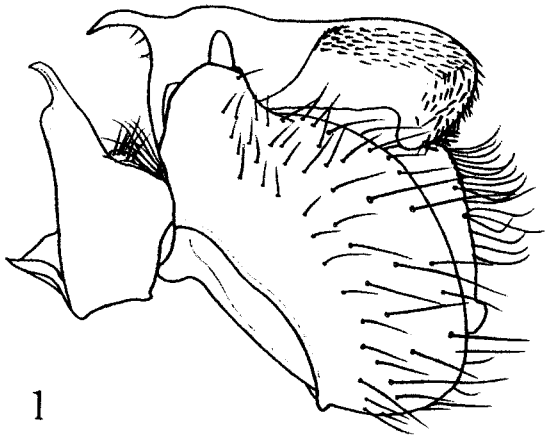
8

0.4 mm

PLATE 20: Terminalia of Sciomyzidae found in or near California.

Figs. 1-4. *Dictya montana* Steyskal, 1954. Form "so. Cal.". Figs. 1 and 2. Male. California; Orange Co.; San Juan Creek; 200 feet (61 m) elevation; XII-27-1962 (R. E. Orth). Postabdomen, inverted. Fig. 1. Dextral view. Fig. 2. Anterior view of hypandrium. Figs. 3 and 4. Female. California; San Diego Co.; Scissors Crossing; 2280 feet (695 m) elevation; IV-5-1966 (T. W. Fisher). Fig. 3. Internal view of sternites VII and VIII to show apodemes. Fig. 4. Sternites VI-X.

Figs. 5-8. *Dictya texensis* Curran, 1932. Figs. 5 and 6. Male. California; Riverside Co.; 2 mi (3.2 km) southeast of Oasis; −180 feet (−55 m) elevation; III-23-1967 (F&O). Postabdomen, inverted. Fig. 5. Dextral view. Fig. 6. Anterior view of hypandrium. Figs. 7 and 8. Female. Arizona; Phoenix, El Canto Park; XII-6-1962 (T. W. Fisher). Fig. 7. Internal view of sternites VII and VIII to show apodemes. Fig. 8. Sternites VI-X.



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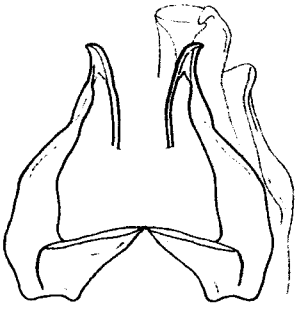

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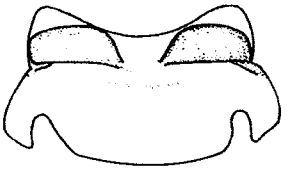

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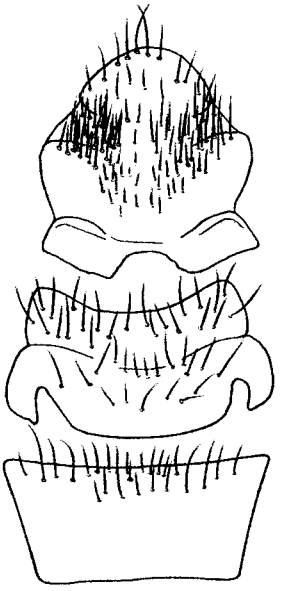

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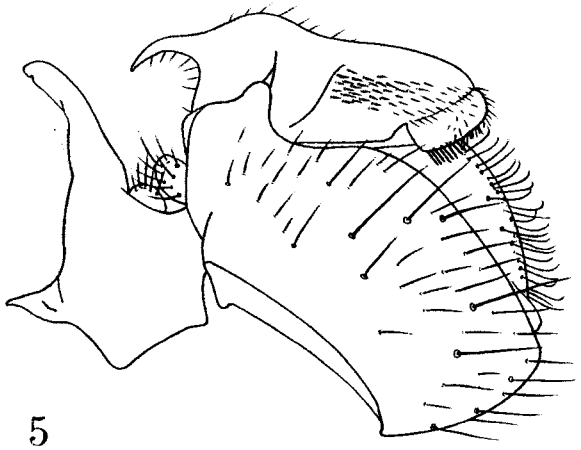
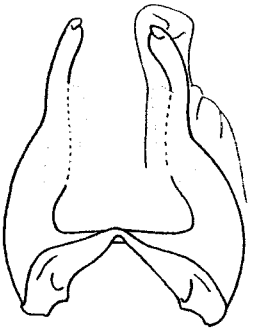


5

0.4 mm



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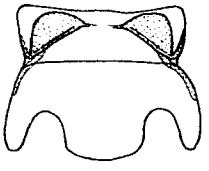

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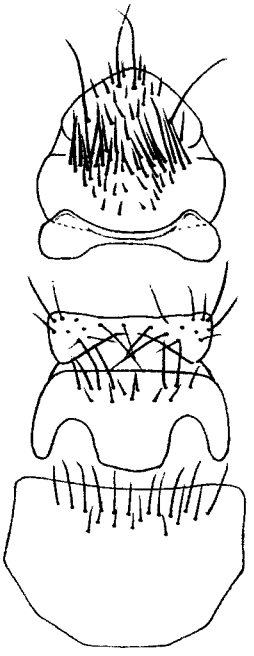


8

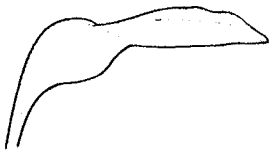
PLATE 21: Terminalia of Sciomyzidae found in or near California.

Figs. 1-3. *Dictyacium firmum* Steyskal, 1956. Male. California; Siskiyou Co.; Bartle, McIntosh Ranch; 4000 feet (1219 m) elevation; VII-23-1973 (F&O). Postabdomen, inverted. Fig. 1. Sinistral view. Fig. 2. Protandrium. Fig. 3. Abdominal sterna.

Figs. 4 and 5. *Elgiva connexa* (Steyskal), 1954. Male. California; Modoc Co.; 3 mi (4.8 km) north of Eagleville; 4600 feet (1402 m) elevation; VII-24-1967 (F&O). Postabdomen, inverted. Fig. 4. Sinistral view. Fig. 5. Posterior view.

Figs. 6-9. *Elgiva solicita* (Harris), 1780. Male. California; Sierra Co.; 3.5 mi (5.6 km) northwest of Sierraville; 4900 feet (1494 m) elevation; IX-22-1966 (F&O). Postabdomen, inverted. Fig. 6. Sinistral view. Fig. 7. Hypandrium, sinistral view. Fig. 8. Hypandrium, dextral view. Fig. 9. Posterior view.

1



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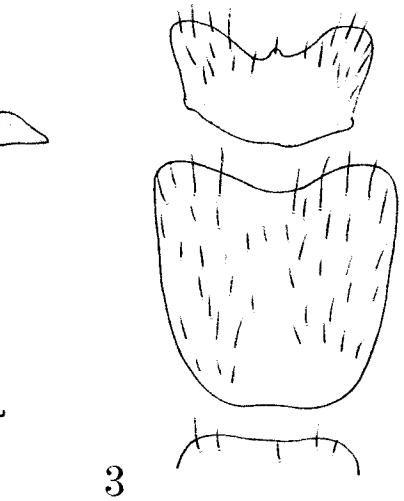

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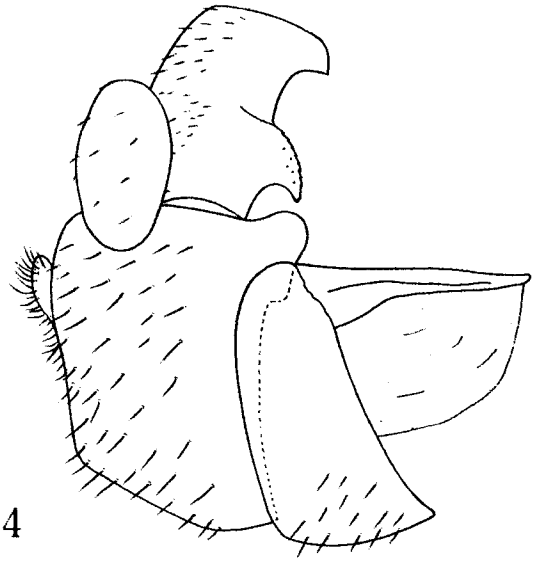

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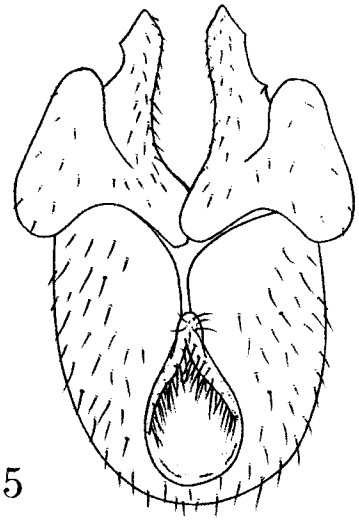

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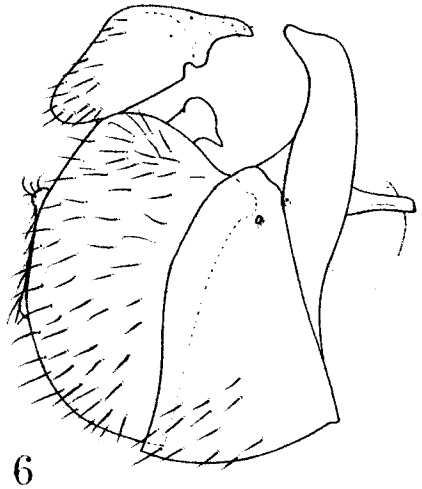

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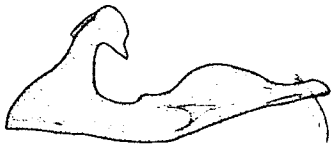

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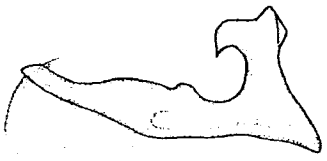

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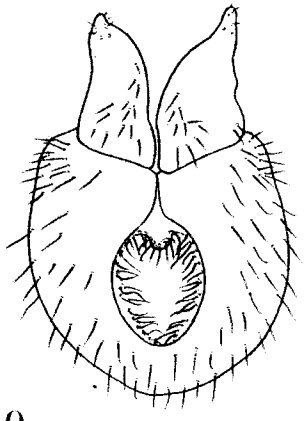


9

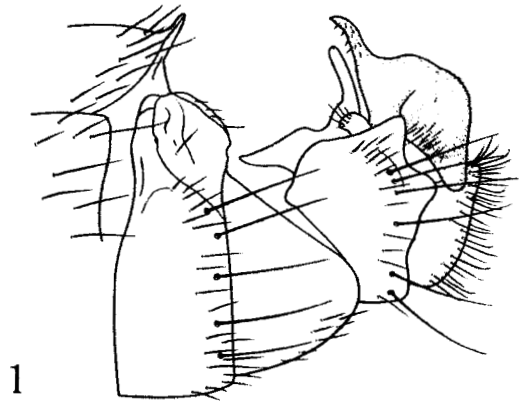
0.4 mm

PLATE 22: Terminalia of Sciomyzidae found in or near California.

Figs. 1 and 2. *Hoplodictya acuticornis* (Wulp), 1897. Fig. 1. Male. California; Orange Co.; San Juan Creek; 200 feet (61 m) elevation; VIII-24-1965 (R. E. Orth). Postabdomen, inverted, dextral view. Fig. 2. Female. California; Riverside Co.; Santa Ana River, Riverside; 820 feet (250 m) elevation; III-8-1963 (F&O). Ventral view of terminalia.

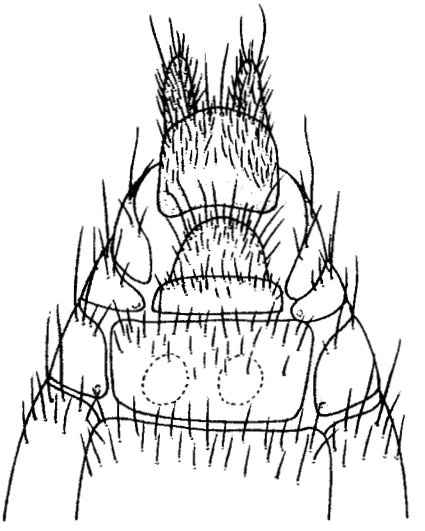
Figs. 3-6. *Limnia boscii* (Robineau-Desvoidy), 1830. Male. California; Mono Co.; Fish Slough, 10 mi (16 km) north of Bishop; 4250 feet (1295 m) elevation; IX-7-1967 (F&O). Postabdomen, inverted. Fig. 3. Sinistral view. Fig. 4. Protandrium (terminal process), dextral view. Fig. 5. Protandrium, anterior view; VI, sixth sternite. Fig. 6. Prosternum; ant, anterior; po, posterior.

Figs. 7-9. *Limnia inopa* (Adams), 1904. Male. Fig. 7. California; Alpine Co.; Heenan Lake; 7000 feet (2134 m) elevation; VI-13-1966 (F&O). Postabdomen, inverted. Sinistral view. Figs. 8 and 9. California; Modoc Co.; Cedar Pass Campground; 5800 feet (1768 m) elevation; VIII-8-1968 (F&O). Fig. 8. Protandrium, anterior view. Fig. 9. Abdominal sterna.



1

0.4 mm



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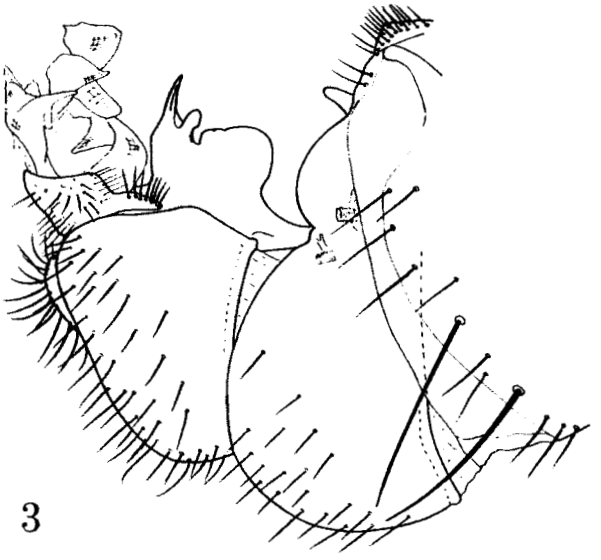

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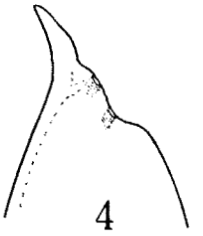

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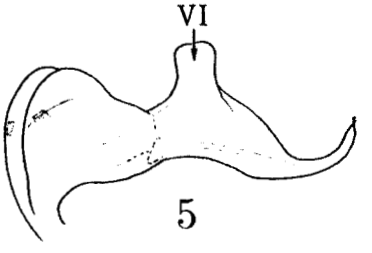

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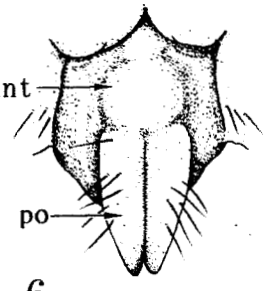

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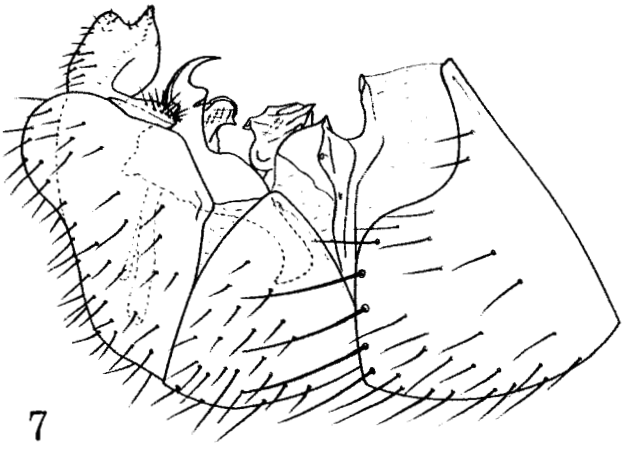

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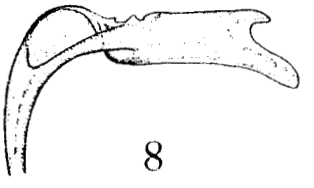

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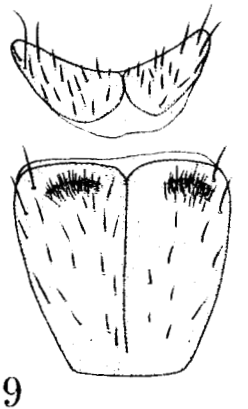


9

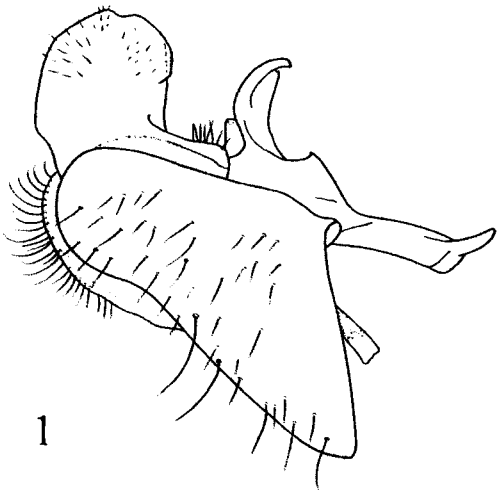
PLATE 23: Terminalia of Sciomyzidae found in or near California.

Figs. 1 and 2. *Limnia pubescens* (Day), 1881. Male. Oregon; Jackson Co.; Touvelle State Park; 8 mi (12.9 km) north of Medford; 1350 feet (411 m) elevation; V-21-1960 (D. R. Smith). Postabdomen, inverted. Fig. 1. Sinistral view. Fig. 2. Protandrium, anterior view.

Figs. 3-6. *Limnia sandovalensis* Fisher and Orth, 1978. Male. New Mexico; Sandoval Co.; East Fork Jemez River, Las Conchas Campground; 8300 feet (2530 m) elevation; VIII-13-1967 (R. E. Orth). Postabdomen, inverted. Fig. 3. Sinistral view. Fig. 4. Protandrium, anterior view. Fig. 5. Protandrium (terminal process), dextral view. Fig. 6. Prosternum.

Figs. 7 and 8. *Limnia severa* Cresson, 1920. Male. California; Inyo Co.; Lake Sabrina; 9000 feet (2743 m) elevation; IX-6-1967 (F&O). Postabdomen, inverted. Fig. 7. Protandrium, anterior view. Fig. 8. Sinistral view.

Fig. 9. *Renocera brevis* (Cresson), 1920. Male. Oregon; Clackamus Co.; 0.5 mi (0.8km) west of Government Camp; 3600 feet (1097m) elevation; VII-9-1970 (F&O). Postabdomen, inverted, sinistral view.



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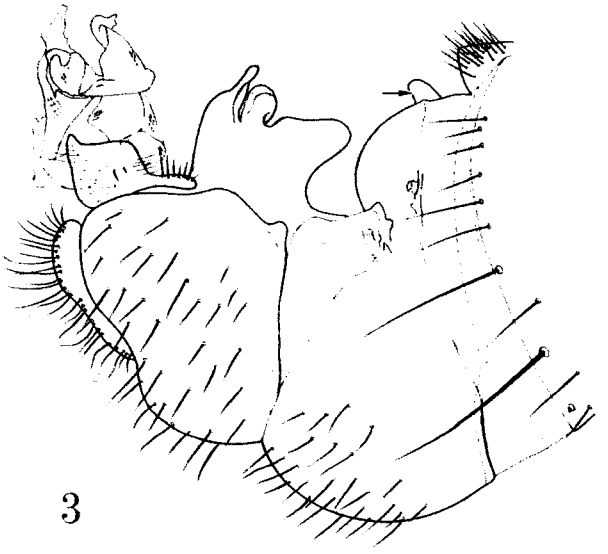

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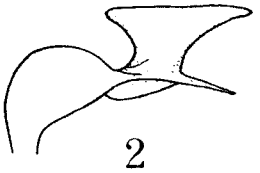

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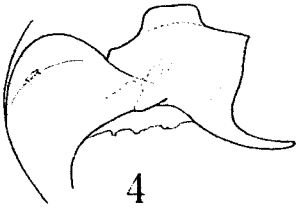

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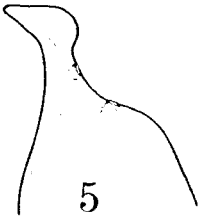

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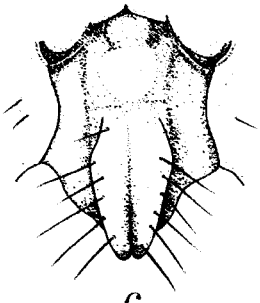

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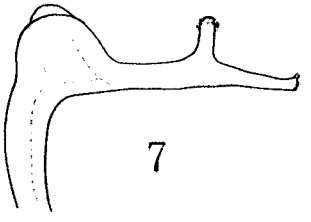

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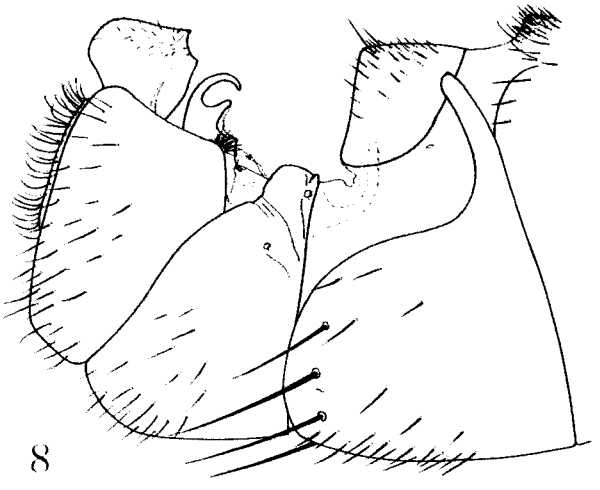

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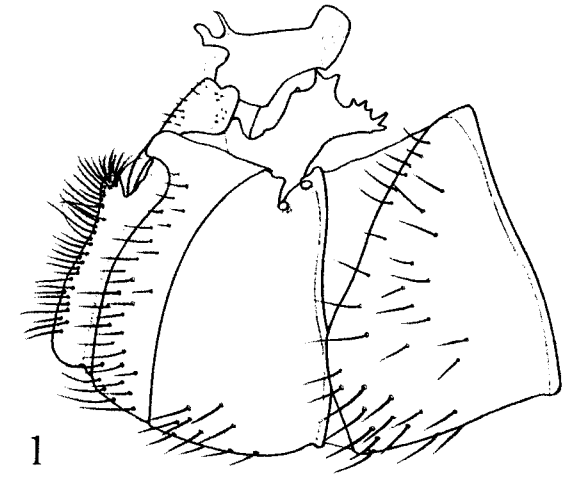
PLATE 24: Terminalia of Sciomyzidae found in or near California.

Figs. 1-3. *Sepedon bifida* Steyskal, 1951. Male. California; Riverside Co.; Lake Hemet; 4500 feet (1372 m) elevation; IV-22-1965 (T. W. Fisher). Fig. 1. Postabdomen, inverted, sinistral view. Fig. 2. Postabdomen, ventral view. Fig. 3. Hind femur and tibia, sinistral view.

Figs. 4 and 5. *Sepedon borealis* Steyskal, 1951. Male. California; Nevada Co.; Boca Spring; 5900 feet (1798 m) elevation; VIII-3-1965 (F&O). Fig. 4. Postabdomen, inverted, sinistral view. Fig. 5. Postabdomen, ventral view.

Figs. 6-10. *Sepedon capellei* Fisher and Orth, 1969. California; Inyo Co.; 2.5 mi (4 km) west of Bishop; 4250 feet (1295 m) elevation; VIII-1-1965 (F&O). Figs. 6-9. Male. Fig. 6. Postabdomen, inverted, sinistral view. Fig. 7, Postabdomen, ventral view. Fig. 8. Hind femur and tibia, sinistral view. Fig. 9. Aedeagus, sinistral view. Fig. 10. Female. Ventral view of terminalia.



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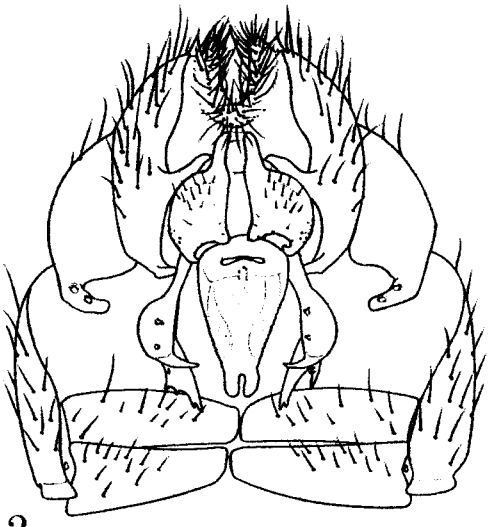

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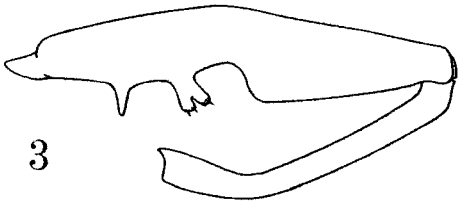

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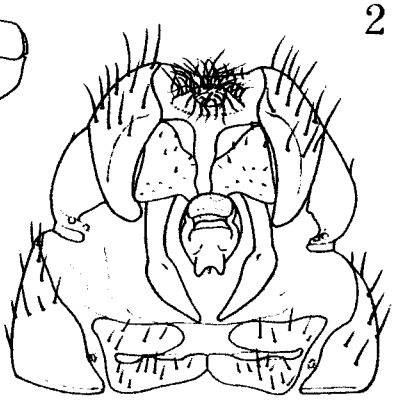

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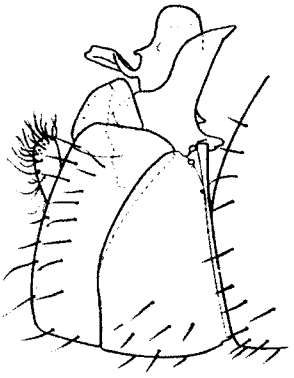

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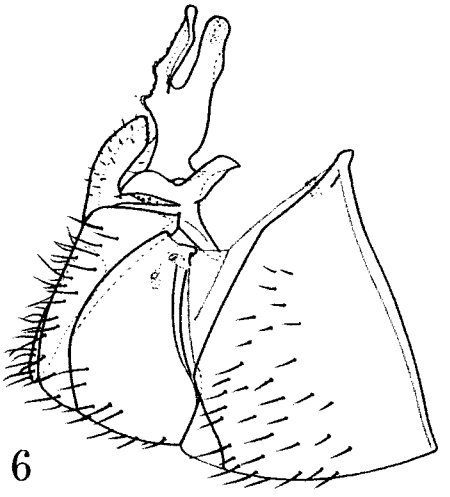

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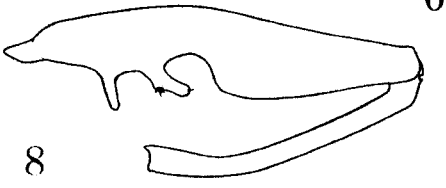

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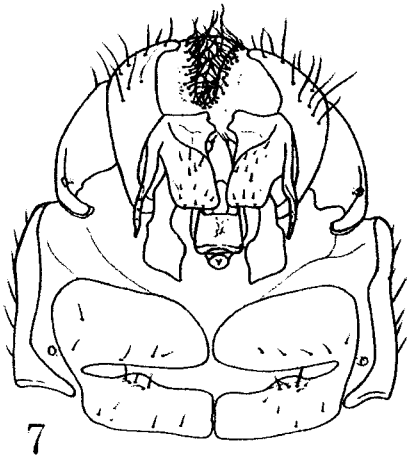

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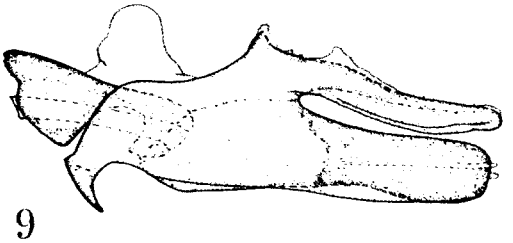

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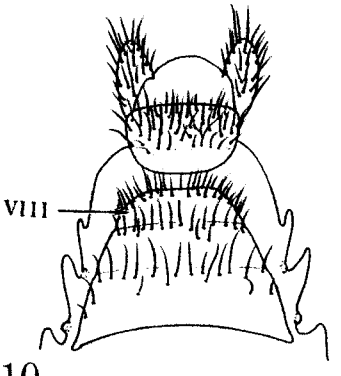

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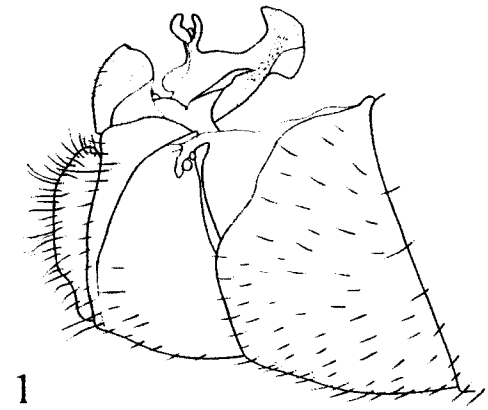
PLATE 25: Terminalia of Sciomyzidae found in or near California.

Figs. 1 and 2. *Sepedon cascadensis* Fisher and Orth, 1974. Male. Oregon; Hood River Co.; 0.5 mi (0.8 km) south of Sherwood Campground, Mt. Hood National Forest; 3180 feet (969 m) elevation; VI-18-1969 (F&O). Fig. 1. Postabdomen, inverted, sinistral view. Fig. 2. Hind femur and tibia, sinistral view.

Figs. 3-5. *Sepedon fuscipennis fuscipennis* Loew, 1859. Figs. 3 and 4. Male. California; Sierra Co.; 2 mi (3.2 km) west of Sierraville; 4940 feet (1506 m) elevation; VIII-23-1967 (F&O). Postabdomen, inverted. Fig. 3. Sinistral view. Fig. 4. Posterior view. Fig. 5. Female. Oregon; Klamath Co.; Klamath Game Refuge; 4540 feet (1384 m) elevation; VIII-7-1968 (F&O). Ventral view of terminalia.

Figs. 6-10. *Sepedon pacifica* Cresson, 1914. Male. Fig. 6. Colorado; Fort Collins; IV-16-1958 (N. Marston). Postabdomen, inverted, sinistral view. Figs. 7-10. California; San Diego Co.; Doane Pond, Palomar State Park; 4646 feet (1416 m) elevation; IX-14-1965 (F&O). Fig. 7. Aedeagus, sinistral view. Fig. 8. Aedeagus, oblique anterior view from direction of arrow in Fig. 7. Fig. 9. Hypandrium, sinistral view. Fig. 10. Hypandrium, viewed from direction of arrow in Fig. 9.



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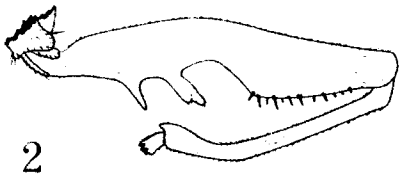

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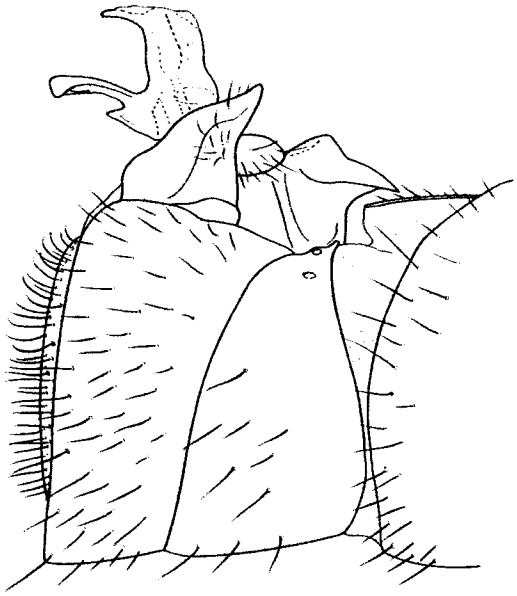

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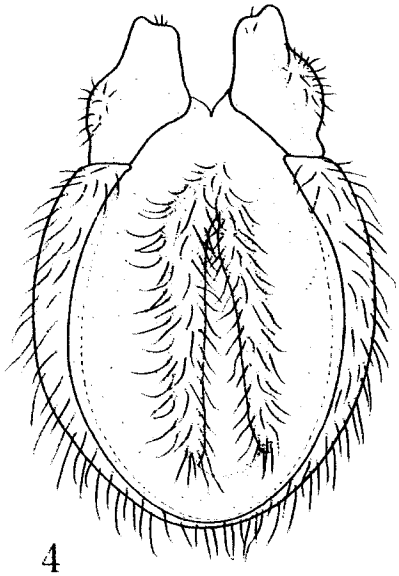

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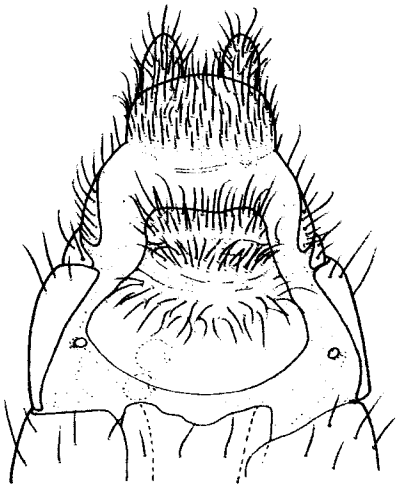

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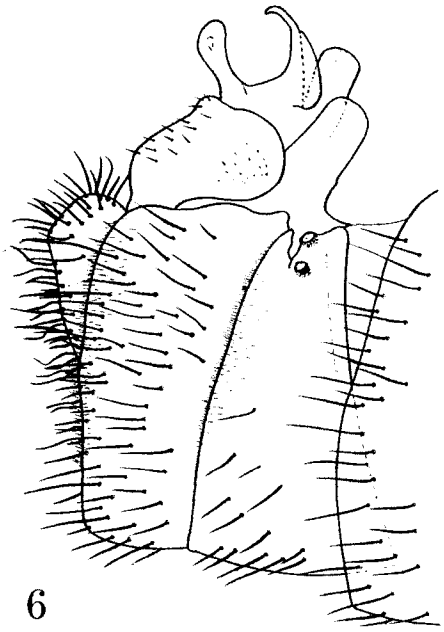

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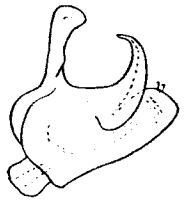

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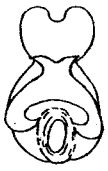

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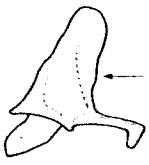

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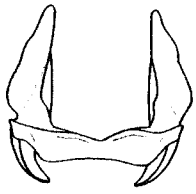

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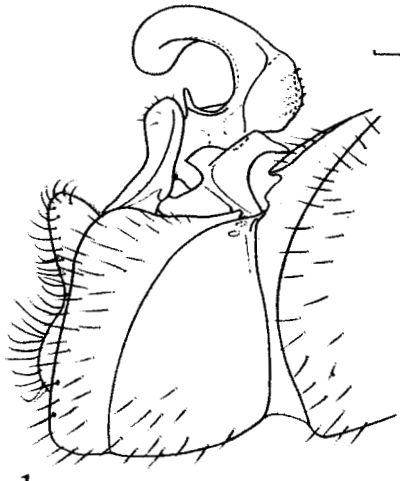
PLATE 26: Terminalia of Sciomyzidae found in or near California.

Figs. 1-3. *Sepedon spinipes americana* Steyskal, 1951. California; Sierra Co.; 2 mi (3.2 km) west of Sierraville; 4940 feet (1506 m) elevation; VIII-23-1967 (F&O). Figs. 1 and 2. Male. Postabdomen, inverted. Fig. 1. Sinistral view. Fig. 2. Posterior view. Fig. 3. Female. Ventral view of terminalia.

Figs. 4 and 5. *Tetanocera bergi* Steyskal, 1954. Male. Oregon; Douglas Co.; 7 mi (11 km) east of Reedsport, Umpqua River; 20 feet (6.1 m) elevation; VIII-6-1968 (F&O). Postabdomen, inverted. Fig. 4. Sinistral view. Fig. 5. Posterior view.

Figs. 6-9. *Tetanocera ferruginea* Fallén, 1823. Figs. 6, 7 and 9. Male. California; Modoc Co.; 2 mi (3.2 km) south of Alturas; 4300 feet (1311 m) elevation; VI-10-1966 (F&O). Postabdomen, inverted. Fig. 6. Sinistral view. Fig. 7. Posterior view. Fig. 9. Protandrium, anterior view. Fig. 8. Female. California; Modoc Co.; 5 mi SE Tulelake; 4000 feet (1219 m) elevation; VI-10-1966 (F&O). Ventral view of terminalia.



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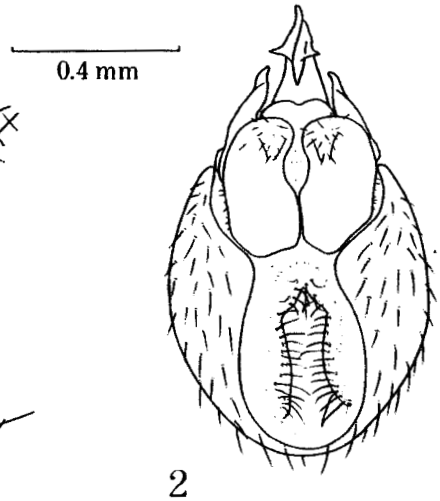

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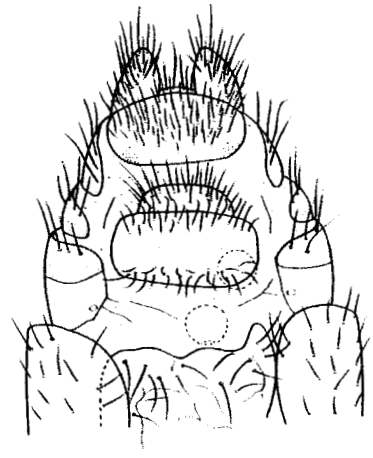

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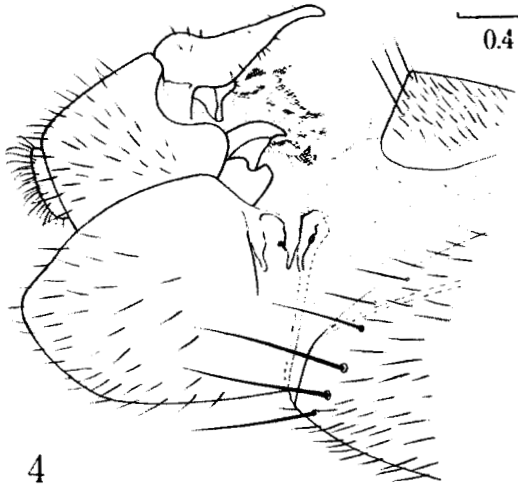

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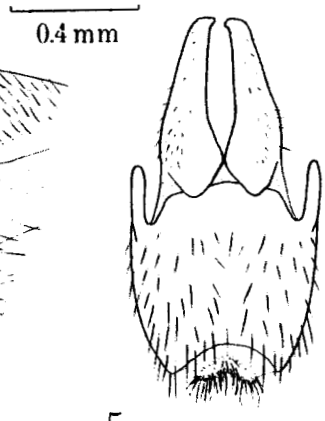

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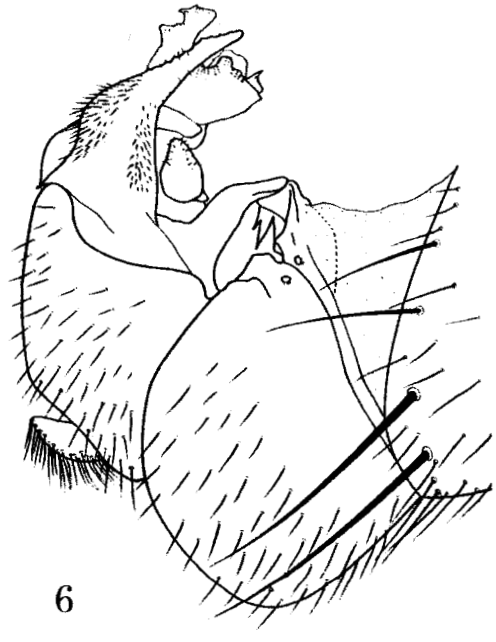

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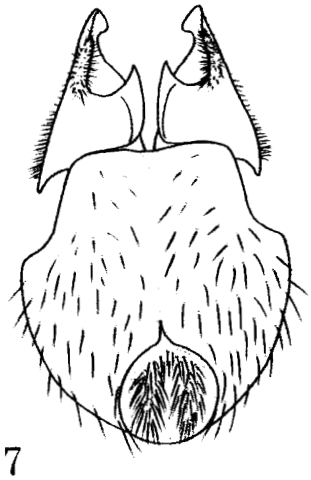

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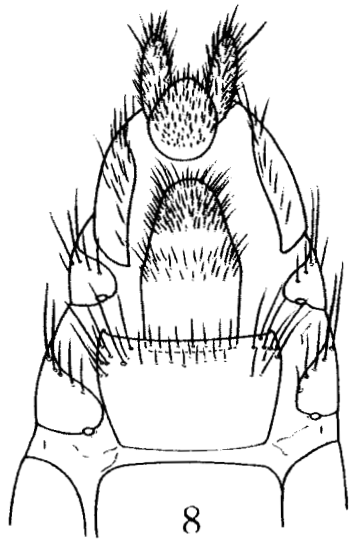

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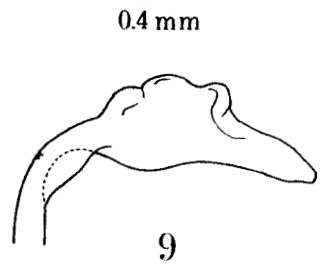

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PLATE 27: Terminalia of Sciomyzidae found in or near California.

Figs. 1-3. *Tetanocera fuscinervis* (Zetterstedt), 1838. Male. Oregon; Hood River Co.; 0.5 mi (0.8 km) south of Sherwood Campground, Mt. Hood National Forest; 3180 feet (969 m) elevation; VI-18-1969 (R. E. Orth). Postabdomen, inverted. Fig. 1. Sinistral view. Fig. 2. Protandrium, anterior view. Fig. 3. Posterior view.

Figs. 4-7. *Tetanocera latifibula* Frey, 1924. Figs. 4 and 5. Male. California; Modoc Co.; 2 mi (33.2 km) south of Alturas; 4300 feet (1311 m) elevation; VIII-5-1965 (F&O). Postabdomen, inverted. Fig. 4. Sinistral view. Fig. 5. Posterior view. Figs. 6 and 7. California; Modoc Co.; Hackamore Reservoir; 4600 feet (1402 m) elevation; VI-10-1966 (F&O). Fig. 6. Male. Protandrium, anterior view. Fig. 7. Female. Ventral view of terminalia.

Figs. 8-10. *Tetanocera loewi* Steyskal, 1959. Male. California; Del Norte Co.; 3 mi (4.8 km) north of Crescent City; 50 feet (15 m) elevation; VI-14-1965 (R. E. Orth). Postabdomen, inverted. Fig. 8. Sinistral view. Fig. 9. Posterior view. Fig. 10. Protandrium, anterior view.

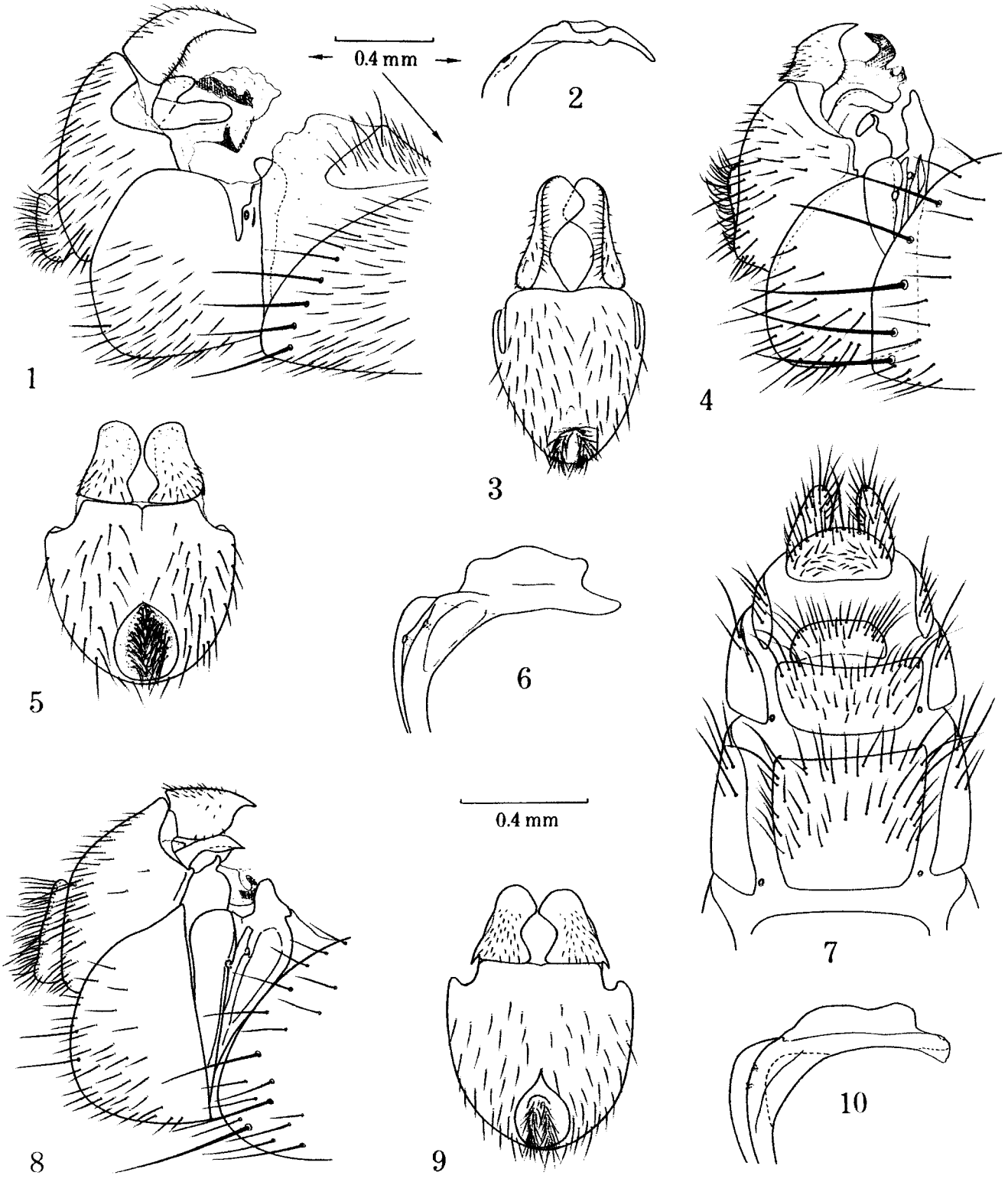
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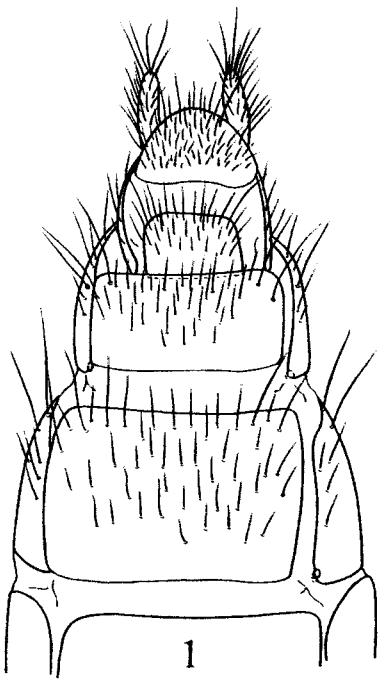
PLATE 28: Terminalia of Sciomyzidae found in or near California.

Fig. 1. *Tetanocera loewi* Steyskal, 1959. Female. California; Del Norte Co.; 3 mi (4.8 km) north of Crescent City; 50 feet (15 m) elevation; VI-14-1965 (F&O). Ventral view of terminalia.

Figs. 2-5. *Tetanocera mesopora* Steyskal, 1959. California; Plumas Co.; 0.5 mi (0.8 km) south of Crescent Mills; 3500 feet (1067 m) elevation; VI-8-1966 (F&O). Figs. 2-4. Male. Postabdomen, inverted. Fig. 2. Sinistral view. Fig. 3. Posterior view. Fig. 4. Protandrium, anterior view. Fig. 5. Female. Ventral view of terminalia.

Figs. 6-8. *Tetanocera obtusifibula* Melander, 1920. Male. California; Plumas Co.; 0.5 mi (0.8 km) south of Crescent Mills; 3500 feet (1067 m) elevation; VI-8-1966 (F&O). Postabdomen, inverted. Fig. 6. Posterior view. Fig. 7. Protandrium, anterior view. Fig. 8. Sinistral view.



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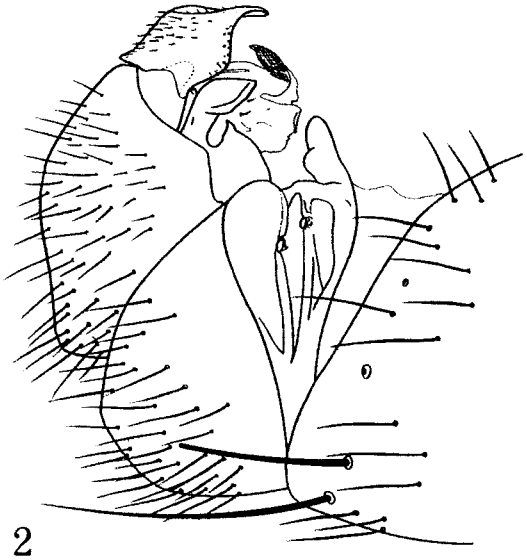

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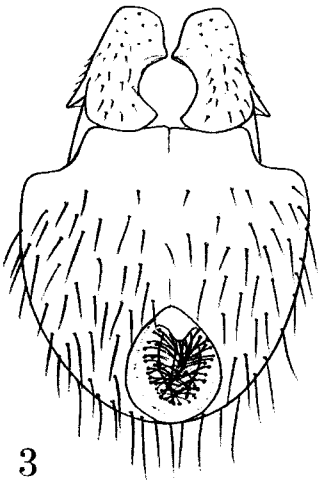

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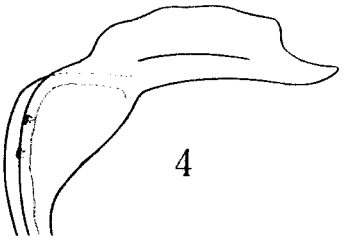

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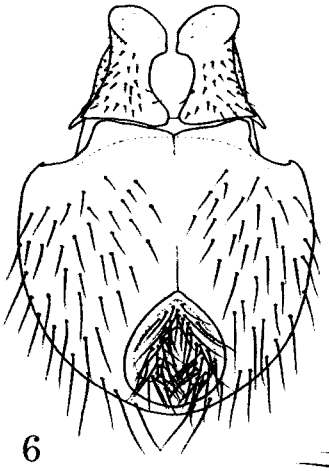

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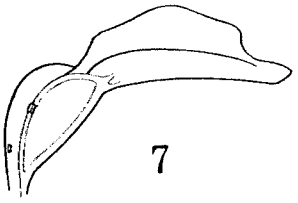

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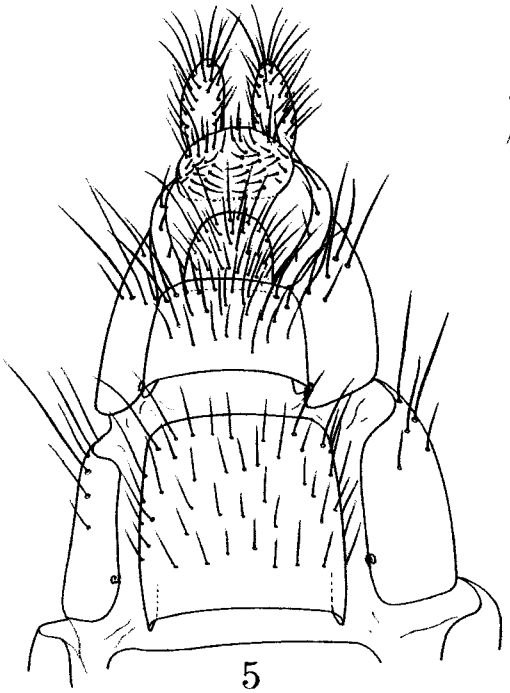

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PLATE 29: Terminalia of Sciomyzidae found in or near California.

Fig. 1. *Tetanocera obtusifibula* Melander, 1920. Female. California; Plumas Co.; 0.5 mi (0.8 km) south of Crescent Mills; 3500 feet (1067 m) elevation; VI-8-1966 (F&O). Ventral view of terminalia.

Figs. 2-5. *Tetanocera plebeia* Loew, 1862. California; Plumas Co.; Meadow Valley, Schneider Creek; 3800 feet (1158 m) elevation; VI-8-1966 (F&O). Figs. 2-4. Male. Postabdomen, inverted. Fig. 2. Sinistral view. Fig. 3. Posterior view. Fig. 4. Protandrium, anterior view. Fig. 5. Female. California; Sierra Co.; northwest of Sattley, Turner Ranch; 5000 feet (1524 m) elevation; VII-9-1968 (F&O). Ventral view of terminalia.

Figs. 6-9. *Tetanocera plumosa* Loew, 1847. Figs. 6-8. Male. California; San Bernardino Co.; Little Cienega Seca; 7750 feet (2362 m) elevation; VII-9-1969 (F&O). Postabdomen, inverted. Fig. 6. Sinistral view. Fig. 7. Posterior view. Fig. 8. Protandrium, anterior view. Fig. 9. Female. California; San Bernardino Co.; Barton Flats, Seven Oaks Road; 6200 feet (1890 m) elevation; VII-23-1969 (R. E. Orth). Ventral view of terminalia.

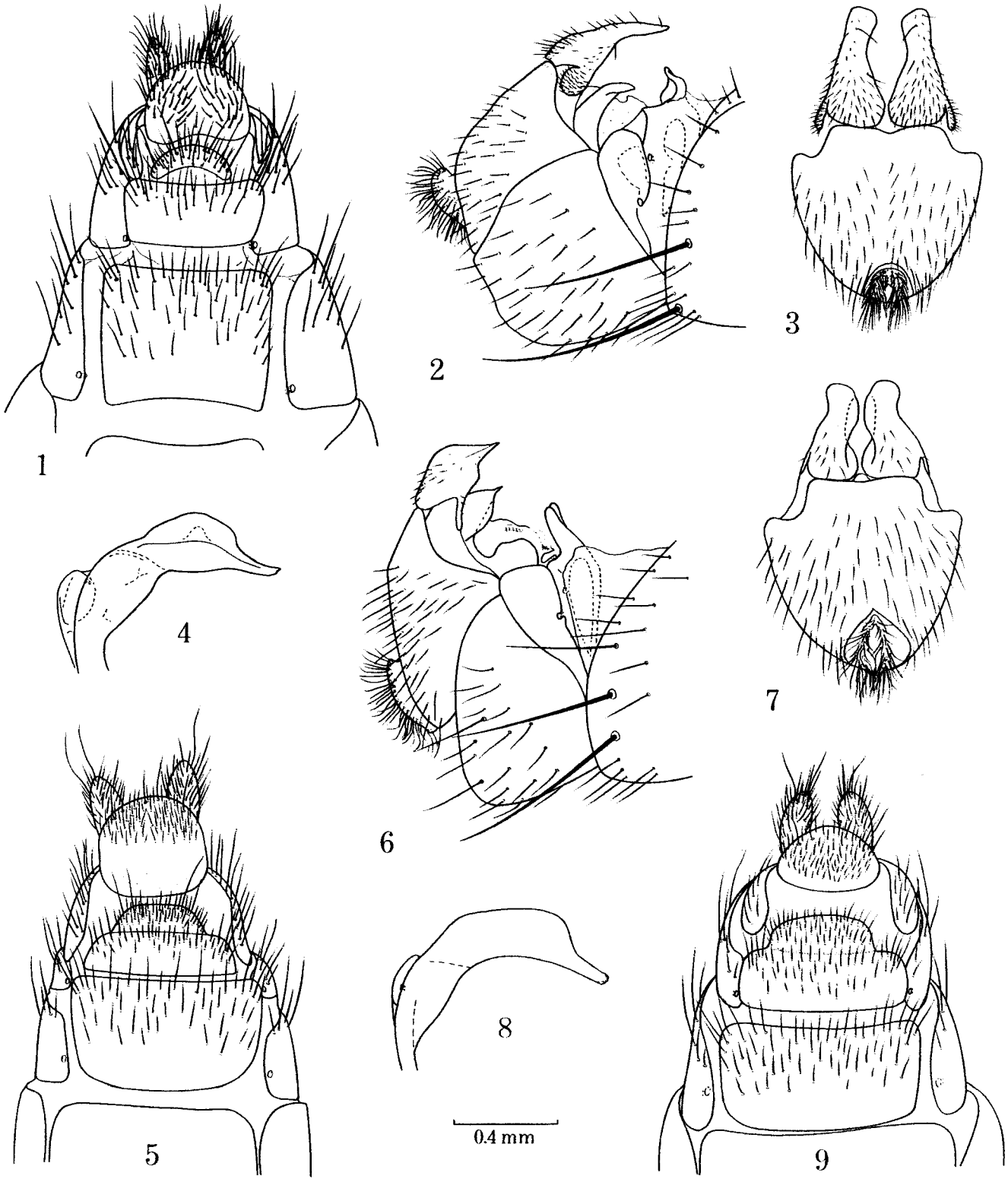
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PLATE 30: Terminalia of Sciomyzidae found in or near California.

Figs. 1-4. *Tetanocera robusta* Loew, 1847. Figs. 1, 3, and 4. Male. California; Del Norte Co.; Crescent City; 30 feet (9 m) elevation; VI-11-1966 (F&O). Postabdomen, inverted. Fig. 1. Sinistral view. Fig. 3. Posterior view. Fig. 4. Protandrium, anterior view. Fig. 2. Female. California; Modoc Co.; 4 mi (6.4 km) south of Davis Creek; 4800 feet (1463 m) elevation; VI-9-1966 (F&O). Ventral view of terminalia.

Figs. 5-7. *Tetanocera rotundicornis* Loew, 1861. Male. Nebraska; Lincoln Co.; 2 mi (3.2 km) east of North Platte; 2800 feet (853 m) elevation; VII-24-1970 (F&O). Postabdomen, inverted. Fig. 5. Sinistral view. Fig. 6. Posterior view. Fig. 7. Protandrium, anterior view.

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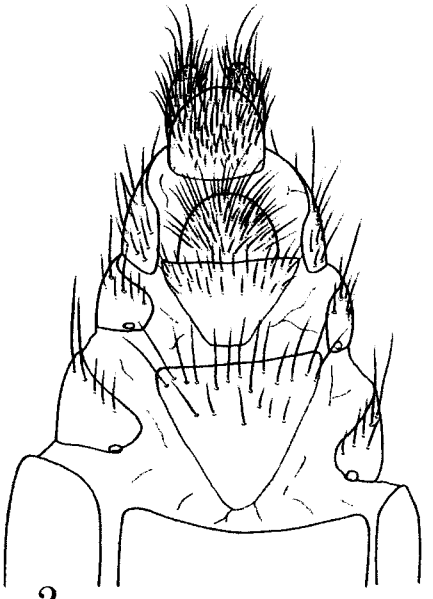

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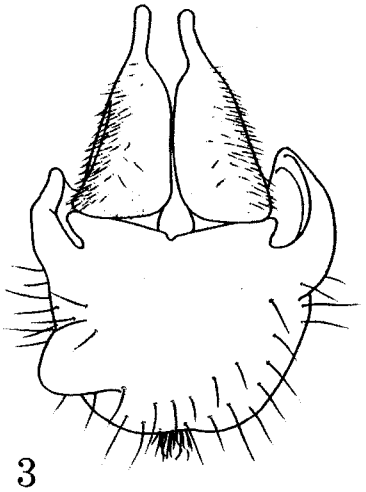

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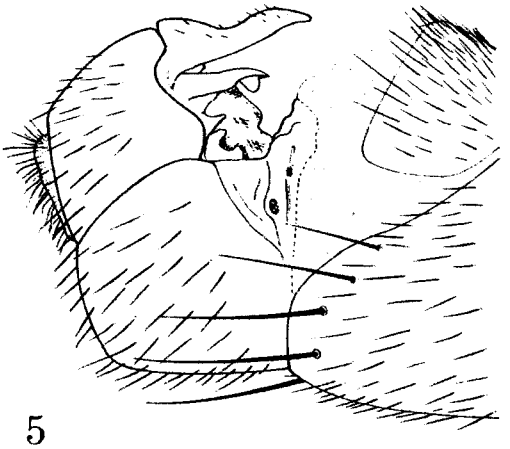

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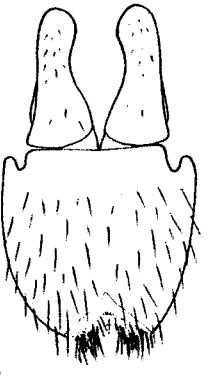

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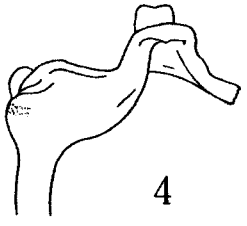

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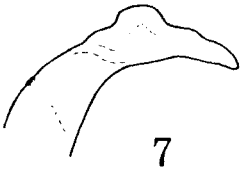

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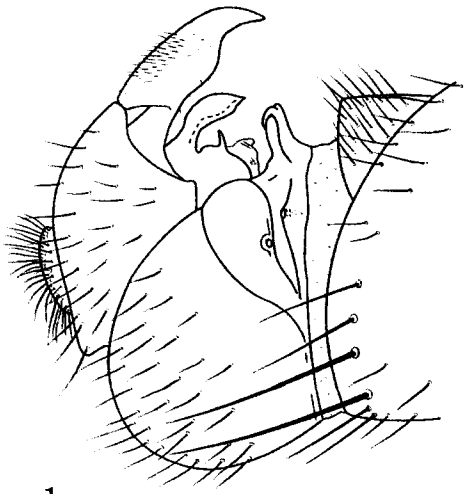
PLATE 31: Terminalia of Sciomyzidae found in or near California.

Figs. 1-4. *Tetanocera soror* Melander, 1920. Figs. 1-3. Male. California; Shasta Co.; 2 mi (3.2 km) south of Pondosa, Little Bear Flat; 4140 feet (1262 m) elevation; VIII-8-1968 (F&O). Postabdomen, inverted. Fig. 1. Sinistral view. Fig. 2. Posterior view. Fig. 3. Protandrium, anterior view. Fig. 4. Female. Oregon; Wasco Co.; Hwy 26, 1 mi (1.6 km) south of Hwy 216 junction; Mt. Hood National Forest; 3200 feet (975 m) elevation; VI-20-1969 (F&O). Ventral view of terminalia.

Figs. 5-8. *Tetanocera vicina* Macquart, 1843. Figs. 5-7. Male. California; Plumas Co.; Meadow Valley, Schneider Creek; 3800 feet (1158 m) elevation; VI-8-1966 (F&O). Postabdomen, inverted. Fig. 5. Sinistral view. Fig. 6. Posterior view. Fig. 7. Protandrium, anterior view. Fig. 8. Female. California; Siskiyou Co.; 15 mi (24 km) southwest of Gazelle; 4180 feet (1274 m) elevation; VI-11-1966 (F&O). Ventral view of terminalia.



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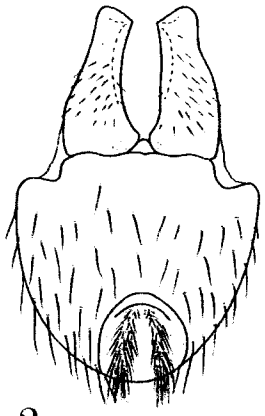

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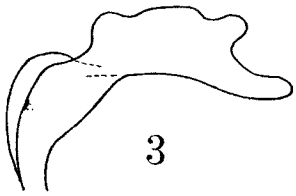

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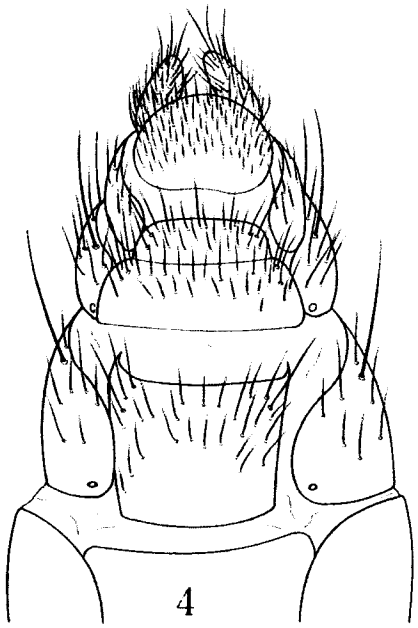

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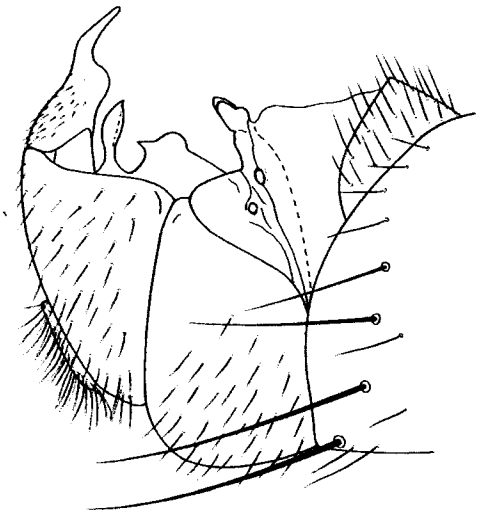

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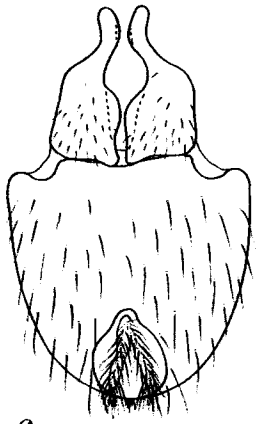

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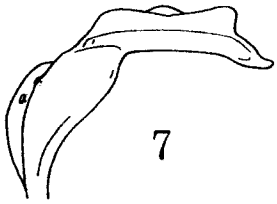

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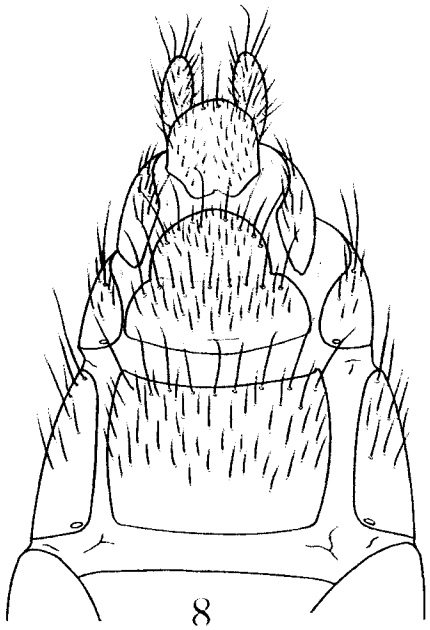

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