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THE GALL MIDGES OF CALIFORNIA

Diptera: Itonididae (Cecidomyiidae)

BY

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The Gall Midges of California

Diptera: Itonididae (Cecidomyiidae)

The present summary of the gall midges known from California is a preliminary account, since our knowledge of these insects is scant. It is hoped, however, that by bringing the California records of the group together, further biological investigations will be encouraged.

A list of the gall midge fauna of western North America was published by Felt (1912) in which 28 species were recorded from California. Seventy-nine species are recorded at present, but at least several hundred probably occur in the state. Those species known from Oregon and Arizona are also included in this bulletin because they probably occur in California. A number of species described from Utah, Colorado, New Mexico, and elsewhere may occur also along the Pacific coast.

Most of our knowledge of gall midges in the far West is based on miscellaneous rearings or very small collections of adults. However, the early work of P. H. Timberlake in rearing the makers of a number of galls is worthy of special mention.

It will be noted that members of the subfamily

Lestremiinae are distinguishable morphologically. The larvae of these midges are saprophagous or fungivorous, and their adult classification is on a sound taxonomic basis. Members of the itonidine tribe *Porricondyliini* have similar feeding habits, but their classification is in a state of chaos.

The other itonidines feed for the most part on higher living plants. Their specific classification has been largely based on a knowledge of the host and the type of gall formed. However, host specificity cannot always be taken for granted, because Jensen (1946) recently showed that *Contarinia lycopersici* Felt may attack the flowers of seven different genera of plants in five different families. A great deal of biological and taxonomic work is needed before the classification of the plant feeders can be considered to be on a sound basis.

The larvae of certain genera and species of itonidines are predaceous on mites and insects. Although the classification of these midges is largely based on morphological characters, it can be regarded as only preliminary.

Key to Subfamilies

Adults

- | | |
|---|---------------------|
| 1. Tarsus with proximal segment longer than second segment | <i>Lestremiinae</i> |
| Tarsus with proximal segment much shorter than second segment | <i>Itonidinae</i> |

Larvae

- | | |
|---|---------------------|
| 1. Anus circular and located terminally on last segment | <i>Lestremiinae</i> |
| Anus longitudinal and located on venter of last segment | <i>Itonidinae</i> |

Subfamily *Lestremiinae*

The larvae of *Lestremiinae* midges are saprophagous or fungivorous. They have been found in such habitats as the soil, decaying wood, leaf litter, manure, and mushrooms. Three tribes are known from the western United States.

Key to Tribes

- | | | |
|----|--|---------------------|
| 1. | Wing with vein M_{1+2} forked | 2 |
| | Wing with vein M_{1+2} simple | <i>Micromyini</i> |
| 2. | Wing with vein M_{3+4} arising from M ; ocelli three | <i>Catotrichini</i> |
| | Wing with vein M_{3+4} free; ocelli two or none | <i>Lestremiini</i> |

Tribe Catotrichini

The tribe Catotrichini is the most generalized of the Itonididae. It is based on a single genus.

Genus *Catotricha* Edwards

Only three species are known in the genus *Catotricha*. Two of these are North American, one occurring on the west coast.

Catotricha subobsoleta (Alexander)

Catotricha subobsoleta Alexander, 1924, Insec. Inscit. Mens., 12: 82. Type ♂, Longmire Springs, Washington.

This species was previously known from Washington and Oregon (Pritchard, 1948). A single female was collected at Oakland, February 4, 1952 (W. C. Bentinck).

The female, previously unknown, resembles the male closely. There are 14 flagellar segments, each slender, with a slight distal neck, and irregularly clothed with short setae. Two sclerotized spermathecae are present.

Tribe Lestremiini

Nine genera are recognized in the tribe Lestremiini, and most contain only several known species. However, many of the species are holarctic or cosmopolitan in distribution, and further collecting should increase the California list.

Key to Genera

Males¹

- | | | |
|----|--|---------------------|
| 1. | Antenna with 16 segments | 2 |
| | Antenna with 10 to 12 segments | <i>Anarete</i> |
| 2. | Flagellum with two crenulate whorls on each segment | 3 |
| | Flagellum with a single crenulate whorl on each segment | 4 |
| 3. | Flagellum with digitate sensory processes on each proximal segment | <i>Anaretella</i> |
| | Flagellum with sensory spines only on each proximal segment | <i>Lestremia</i> |
| 4. | Wing with R_1 terminating beyond level of end of M_{3+4} | <i>Gongromastix</i> |
| | Wing with R_1 terminating just proximal to level of end of Cu | <i>Allarete</i> |

Females²

- | | | |
|----|--|-------------------|
| 1. | Flagellum with sensory spines only near the distal end of each segment | 2 |
| | Flagellum with digitate sensory processes distally on each segment | <i>Anaretella</i> |
| 2. | Flagellum with segments parallel sided, each with the distal stem differentiated | <i>Lestremia</i> |
| | Flagellum with segments obovate, and distal stems scarcely evident | 3 |
| 3. | Wing with medial fork parallel sided medially | 4 |
| | Wing with medial fork gradually divergent from origin | <i>Anarete</i> |
| 4. | Ovipositor with penultimate segment of lamella twice as long as terminal segment | <i>Pararete</i> |
| | Ovipositor with last two segments of lamella subequal in length | <i>Allarete</i> |

¹The male of *Pararete* is unknown.

²The female of *Gongromastix* is unknown.

Genus *Lestremia* Macquart

Three species of *Lestremia* are known in North America. Two of these are holarctic, but the third is known only from the eastern United States.

Key to Species

Males

1. Distiforceps with two teeth distally *cinerea*
 Distiforceps with a spine distally *leucophaea*

Females

1. Flagellum with stem of third segment broader than long *cinerea*
 Flagellum with stem of third segment longer than broad *leucophaea*

Lestremia cinerea Macquart

Lestremia cinerea Macq., 1826, Insect. Dipt. Nord.

Fr., pt. 1, Tipul., p. 173. Type from France.

The distiforceps of the aedeagus are distinctive in that each bears two teeth terminally.

L. cinerea is common in Europe and North America, the adults being found principally in the shade of trees and on windows. Pritchard (1951) recorded collections from the San Francisco Bay region where the adults are found mostly during the fall and spring after rains.

New records of this species from California include: 1♂, 6♀♀, Willits, February 5 and 25, 1952 (W. C. Bentineck); 1♂, Niles, February 7, 1952 (W. C. Bentineck); 2♀♀, Drake's Beach, December 9, 1951 (C. D. MacNeill); 1♀, Walnut Creek, November 27, 1951 (D. G. Denning).

Lestremia leucophaea (Meigen)

Sciara leucophaea Meigen, 1818, Syst. Besch.

bekann. eur. zweifl. Insekt., 1:288. Type from Europe.

The male genitalia are distinctive in that the distiforceps bear a single spine distally, and the basiforceps have no proximoventral lobe.

L. leucophaea is of frequent occurrence in Europe and across the northern United States. A single female has been collected in California: Berkeley, February 15, 1952 (W. C. Bentineck).

Genus *Anaretella* Enderlein

There are two widespread species of *Anaretella* that are known from the Pacific coast. A third North American species is known only from the state of Washington. Only the female of *A. defecta* is known for certain.

The male distiforceps taper distally in the two species listed here; they are broadly expanded distally in the species known only from Washington.

Key to Species

Males

1. Basiforceps with a setose enlargement inside near distal end *spiraeina*
 Basiforceps without a setose enlargement *defecta*

Anaretella defecta (Winnertz)

Lestremia defecta Winnertz, 1870, Verh. zool.-bot.

Ges. Wien, 20: 33. Type from Germany.

A. defecta is found frequently in Europe and North America. Pritchard (1951) recorded this species from the San Francisco Bay area.

Anaretella spiraeina (Felt)

Catocha spiraeina Felt, 1907, Bull. N. Y. State Mus., 110: 102. Albany, New York.

A. spiraeina is known from scattered localities in North America and Europe. The first record of this species from California is from Oakland, February 24, 1952 (W. C. Bentinck).

Allarete barberi (Felt)

Lestremia barberi Felt, 1908, Bull. N. Y. State Mus., 124: 310. Type ♀, Las Vegas, New Mexico.

Females of this species were recorded from Burney Falls, California (Pritchard, 1951). The male is unknown.

Genus *Gongromastix* Enderlein

This genus may be recognized by having R_5 very long, reaching the level of the end of M_2 . The female is unknown.

One species is known from the western states.

Gongromastix epista Pritchard

Gongromastix epista Pritchard, 1951, Univ. Calif. Publ. Ent., 8: 253. Holotype male, American River, Washington.

The occurrence of this species in California is based on a single male collected on the car window at Santa Cruz, November 18, 1947 (A. E. Pritchard).

Genus *Allarete* Pritchard

Females belonging to the genus *Allarete* are sometimes collected at lights. The only specimen that has been reared was from cow manure. One of the two known species occurs in California, and it may be recognized by having the fork of the medial vein only twice as long as the stem.

Genus *Pararete* Pritchard

The genus *Pararete* was based on a species that is known only by the female. It would be very desirable to find a male for complete characterization of the genus.

Pararete elongata (Felt)

Lestremia elongata Felt, 1908, Bull. N. Y. State Mus., 124: 310, Type ♀, Argus Mountains, California.

The single known specimen was collected in May, 1891.

Genus *Anarete* Haliday

Adults of the genus *Anarete* differ from others of the tribe Lestremiini in that they may be collected in much drier habitats, and the males may form large swarms. Nothing is known of the larval habits.

Nine species are known from North America. The males are very similar, and the females are even more difficult to determine.

Key to Species

Males

- | | | |
|----|--|-----------------|
| 1. | Wings whitish | 2 |
| | Wings pale brownish or grayish | 3 |
| 2. | Claw acuminate distally | <i>johnsoni</i> |
| | Claw with a denticulate expansion distally | <i>buscki</i> |
| 3. | Claw with a small lateral tooth near tip | <i>anepsia</i> |
| | Claw simple | 4 |
| 4. | Empodium much longer than claws | <i>rubra</i> |
| | Empodium approximately as long as claws | <i>corni</i> |

Anarete johnsoni (Felt)

Microcerata johnsoni Felt, 1908, Bull. N. Y. State Mus., 124: 310. Type ♂, Philadelphia, Penn-

sylvania.

A. johnsoni may be recognized by having the wings white, the claw of the male acuminate distally, and the distiforceps of the male without a

setose swelling on the inner side.

This is a very common species throughout the United States, and it also occurs in Europe. Pritchard (1951) recorded collections from the San Francisco Bay region.

Anarete buscki (Felt)

Microcerata buscki Felt, 1915, Proc. U. S. Natl. Mus., 48: 198. Type ♂, Baracoa, Cuba.

The distal, denticulate expansion of the male claw is distinctive.

This species has been recorded from Cuba, Puerto Rico, and Minnesota. The new record of two ♂♂ from Molino Basin, Santa Rita Mts., Arizona, November 5, 1951 (C. D. MacNeill), at light, indicates that the distribution is very wide, probably including California.

Anarete rubra Kieffer

Anarete rubra Kieffer, 1906, Ann. Soc. Sci. Bruxelles, 30: 33. Types ♂ and ♀, Germany.

A. rubra may be recognized by having the wings brownish, the male empodium much longer than the claws, and the male flagellum with the distal segments subglobular.

This species is known in California from Crescent City (Pritchard, 1951).

Anarete corni (Felt)

Micromyia corni Felt, 1907, Bull. N. Y. State Mus., 110: 102. Type ♂, Albany, New York.

A. corni may be recognized by having brownish

wings, four palpal segments, and the male empodium approximately as long as the claws.

This species is known from across the northern United States and from Europe. It occurs in Oregon and Washington and should be found in northern California.

Anarete anepsia Pritchard

Anarete anepsia Pritchard, 1951, Univ. Calif. Publ. Ent., 8: 264. Type ♂, Orinda, California.

A. anepsia may be recognized by having a small tooth near the end of the claw of the male.

Two collections have been made of this species in California: Tilden Regional Park near Orinda, and San Antonio Valley near Livermore.

Tribe Micromyini

Adults of micromyine midges resemble those belonging to the Lestremiini in that they are collected most commonly in shaded, damp localities, particularly after rains in the fall and spring in California. Larvae may be found commonly in decaying plant material in these localities, and a taxonomic study of the immature stages is needed.

Fifteen genera are recognized in the tribe Micromyini, all but two being known from North America. Four additional genera have been proposed on larval characters alone. A number of species have been collected that are undescribed, and the California fauna has been very inadequately sampled and studied.

Key to Genera

Males

- | | |
|---|---------------------------------------|
| 1. Wing with vein R_1 at least three times as long as R_s | 2 |
| Wing with vein R_1 not more than twice as long as R_s | 3 |
| 2. Flagellum with platelike sensory processes distally on proximal segments | <i>Campylomyza</i> |
| Flagellum with sensory spines only at distal ends of proximal segments | <i>Cordylomyia</i> ³ |
| 3. Genital rod present | 4 |
| Genital rod absent | 5 |
| 4. Distiforceps with a terminal spine or cusp | <i>Tetraxyphus</i> , <i>Polyardis</i> |
| Distiforceps without a terminal spine | <i>Bryomyia</i> ³ |
| 5. Flagellum with 12 segments, the stems long | 6 |
| Flagellum with 8 to 10 segments, the stems short | <i>Mycophila</i> |
| 6. Costa ending well beyond R_5 | <i>Aprius</i> ³ |
| Costa ending at or slightly beyond R_5 | <i>Peromyia</i> ³ |

³ These genera have been collected in California, but the species are undescribed.

Females

- | | | |
|----|---|---------------------------------|
| 1. | Wing with vein R_1 at least three times as long as R_s | 2 |
| | Wing with vein R_1 not more than twice as long as R_s | 3 |
| 2. | Flagellum with a sensory collar distally on each segment | <i>Campylomyza</i> |
| | Flagellum with sensory spines only near distal end of each segment | <i>Cordylomyia</i> ⁴ |
| 3. | Costa reaching more than halfway of distance between ends of R_5 and M | 4 |
| | Costa ending abruptly at tip of R_5 or reaching slightly beyond | <i>Peromyia</i> ⁴ |
| 4. | Spermathecae two | 5 |
| | Spermatheca one | 7 |
| 5. | Flagellum with two platelike sensory processes distally on each segment | <i>Mycophila</i> |
| | Flagellum with four or more platelike sensory processes distally on each segment or
with awl-like or rodlike sensory processes | 6 |
| 6. | Empodium as long as claws | <i>Polyardis</i> |
| | Empodium rudimentary or not more than one-half as long as claws | <i>Aprionus</i> ⁴ |
| 7. | Flagellum with two slender or digitate sensory processes distally on each segment | <i>Bryomyia</i> ⁴ |
| | Flagellum with four disclike sensory processes distally on each segment | <i>Tetraxyphus</i> |

Genus *Campylomyza* Meigen

Adults of *Campylomyza* are often found on windows, as well as in agricultural areas. The males are known to swarm. Records, as well as observations in California, indicate that the larvae are found principally in the soil.

Key to Species

Males

- | | | |
|----|--|-----------------|
| 1. | Tegmen with lamellate loops dorsodistally; distiforceps with inner, distal end somewhat produced | <i>fusca</i> |
| | Tegmen with an anteriorly directed pair of angulations mediolaterally; distiforceps without extension of inner, distal end | <i>flavipes</i> |

Females

- | | | |
|----|--|-----------------|
| 1. | Ovipositor with a small, geminate, median plate ventrally in ninth segment | <i>fusca</i> |
| | Ovipositor without a median plate in ninth segment | <i>flavipes</i> |

⁴ These genera have been collected in California, but the species are undescribed.

Campylomyza flavipes Meigen

Campylomyza flavipes Meigen, 1818, System Beschr. Bekann. Eur. Zweifl. Insekt., 1: 101. Type ♀, from Europe.

C. flavipes is found frequently in North America and Europe. The only California collection is from Calistoga, April 13, 1947 (A. E. Pritchard).

Campylomyza fusca Winnertz

Campylomyza fusca Winnertz, 1870, Verh. zool.-bot. Ges. Wien, 20: 12. Type ♂, from Europe.
C. fusca is common in both North America and

Europe. The first collection from California is from Santa Cruz, April 15, 1947 (A. E. Pritchard).

Genus *Tetraxyphus* Kieffer

Tetraxyphus has page priority over *Xylopriona*, and the revised international rules of zoological nomenclature make page priority mandatory.

The genus is heterogeneous, and a review is needed in connection with *Polyardis* and *Monardia*. The males are all similar, but the females differ markedly. Two species that have been assigned to the generic concept are known from the western states.

Key to Species

- | | |
|------------------------------------|--------------|
| 1. Palpus four segmented | ater |
| Palpus three segmented | toxicodendri |

Tetraxyphus ater (Meigen)

Campylomyza ater Meigen, 1804, Klassif. 1, p. 40. Type ♂, Germany.

Edwards (1938) adopted Meigen's name for this species, and he redescribed it adequately. The four palpal segments together with the broad but tapering sensory plates on the flagellum will separate *ater* from related species of *Tetraxyphus*.

The first record from North America is 1 ♂, Oakland, California, November 11, 1951 (W. C. Bentinck).

Tetraxyphus toxicodendri (Felt), new combination

Campylomyza toxicodendri Felt, 1907, Bull. N. Y. State Mus., 110: 98. Type ♀, Albany, New York.

T. toxicodendri differs from related species by having only three palpal segments. The male is

distinctive among the tribe because the distiforceps each bear a strong distal spine that is one-half as long as the segment.

This species appears to be widespread in North America and Europe. Several specimens were reared from cow dung in Illinois.

The following collections are the first from California: 1 ♀, Berkeley, February 19, 1947 (A. E. Pritchard), on window; and 1 ♂, 1 ♀, San Francisco, December 27, 1948 (A. E. Pritchard), in greenhouse; 3 ♂♂, 5 ♀♀, January 21, 1952 (J. W. MacSwain), reared from horse dung.

Genus *Polyardis* Pritchard

Two species of the holarctic genus *Polyardis* are here recognized from the western United States. Several other species are known from eastern North America.

Key to Species

- | | |
|--|------------|
| 1. Palpus with four segments | monothea |
| Palpus with three segments | kasloensis |

Polyardis kasloensis (Felt)

Campylomyza kasloensis Felt, 1908, Bull. N. Y.

State Mus., 124: 314. Type ♀, Kaslo, British Columbia.

P. kasloensis has been previously known from

a single female from western Canada. The male is distinctive in having 14 flagellar segments. The tegmen of the aedeagus is also distinctive in that it is long and narrows strongly on the distal half to form a sclerotized, angulate apex.

California records are as follows: 4 ♀♀, Berkeley, February 14, March 4, and April 4, 1947 (A. E. Pritchard) on window; 2 ♂♂, Orinda, March 3, and April 6, 1947 (A. E. Pritchard); and 1 ♂, Walnut Creek, April 6, 1947 (A. E. Pritchard).

Polyardis monotheca (Edwards)

Monardia monotheca Edwards, 1938, Proc. Roy. Ent. Soc. Lond., 7 (ser. B): 241. Type ♀, from England.

Monotheca differs from all other species of *Polyardis* by having four palpal segments. It has

previously been known from North America only from a female collected in British Columbia, Canada.

California records are as follows: 3 ♂♂, 2 ♀♀, Berkeley, February 14, March 4, and March 10, 1947 (A. E. Pritchard), on window; 1 ♀ Lagunitas, April 27, 1947 (A. E. Pritchard); 1 ♀, Orinda, March 3, 1947 (A. E. Pritchard).

Genus *Mycophila* Felt

The genus *Mycophila* differs from most other micromyine midges in that its members are paedogenic, the mature larvae giving birth to larvae of the next generation when conditions are favorable.

Four species are known of which two have been found in California. These two are distinctive in having the empodium one-half as long as the claws.

Key to Species Females

1. Flagellum with seven segments, the seventh compound *fungicola*
- Flagellum with nine segments, the ninth compound *barnesi*

Mycophila barnesi Edwards

Mycophila barnesi Edwards, 1938, Proc. Roy. Ent. Soc. Lond. (ser. B), 7: 254. Type ♂, Litchworth, England.

M. barnesi has been known only from the type series from England, collected on windows and reared from mushrooms and manure.

The occurrence of this species in California is based on 1 ♂, 1 ♀ reared January 27–February 4, 1947 (A. E. Pritchard), from larvae found on paper flowerpots in a nursery near Half Moon Bay.

Mycophila fungicola Felt

Mycophila fungicola Felt, 1911, Jour. N. Y. Ent. Soc., 19: 33. Lectotype ♂, San Rafael, Cali-

fornia.

This species, the genotype, is known from a male and female reared in September, 1897, from mushrooms in Marin County.

Subfamily Itonidinae

The subfamily Itonidinae is very large, containing more than 400 genera that are still considered valid. The more generalized members are saprophytic, and certain of the more specialized species are fungivorous. Some species are predaceous or even parasitic on mites or insects. However, most of the species feed on higher, living plants and often produce characteristic galls. A few are inquilines in these galls or the galls of other insects.

Key to Tribes

1. Wing with R_s absent 2
- Wing with R_s present *Porricondylini*

2. Antenna with flagellar segments of male cylindrical, without long distal stems 3
 Antenna with flagellar segments of male with long distal stems 4
3. Wing with costa setose; vein R_5 well removed from costa and reaching
 distal end of wing *Asphondyliini*
 Wing with costa clothed with scales; vein R_5 approximate to costa and
 joining it before end of wing *Lasiopterini*
4. Flagellum of male with only a proximal node on each segment *Oligotrophini*
 Flagellum of male with each segment binodose 5
5. Flagellum of male with nodes subequal, the distal node of each segment
 with a single circumfilum *Contariniini*
 Flagellum of male with the nodes unequal, the distal node of each segment
 having two circumfili *Itonidini*

Tribe Porricondylini

The larvae of species belonging to the tribe Porricondylini are saprophagous or fungivorous. Adults are found in well-shaded, damp woodlands.

A number of undetermined specimens have been taken along the coastal area of California during

the winter rains, but no species has been recorded from the state. Only four species are recorded from the West, two from Arizona and two from Oregon (each being described from a single specimen). Each species represents a separate genus that may be distinguished by the following key.

Key to Genera

1. R_s appearing as a cross vein 2
 R_s appearing continuous with R_5 *Porricondyla*
2. Flagellum with circumfila; spermathecae absent 3
 Flagellum with horseshoe-shaped sensoria; spermathecae present *Winnertzia*
3. Wings broad; M_{1+2} present *Hormosomyia*
 Wings long and narrow; M_{1+2} absent *Colpodia*

Genus *Winnertzia* Rondani

Thirteen species of *Winnertzia* have been described from North America of which all but two were based on a single individual. No attempt has been made to associate sexes, and it is impossible to make determinations from the literature.

An unidentified species has been collected at Berkeley. The only published record from the West is from Arizona.

Winnertzia arizonensis Felt

Winnertzia arizonensis Felt, 1908, Bull. N. Y. State Mus., 124: 421. Type ♀, Williams, Arizona.

This species is known only from the type female.

Genus *Hormosomyia* Felt

The genus *Hormosomyia* is based on a single species.

Hormosomyia oregonensis Felt

Hormosomyia oregonensis Felt, 1919, Ent. News, 30: 220. Type ♂, Forest Grove Oregon.

This very interesting species is known from a single male from Oregon. It should occur in California.

Genus *Colpodia* Winnertz

Nineteen North American species have been proposed in the genus *Colpodia*, each based on a single specimen. Accurate identification is impossible

from the descriptions. A number of specimens of *Colpodia* have been taken near Berkeley.

Colpodia colei Felt

Colpodia colei Felt, 1919, Ent. News, 30: 223. Type ♂, Forest Grove, Oregon.
The species is known from a single male.

Genus *Porricondyla* Rondani

A large number of species have been described in the genus *Porricondyla*, and a revision of the group is needed before identifications can be made. A single species has been recorded from the West.

Porricondyla barberi Felt

Porricondyla barberi Felt, 1908, Bull. N. Y. State Mus., 124: 418. Type ♂, Williams, Arizona.
This species is known only from the type male.

Tribe Asphondyliini

Asphondyliine midges may be recognized by the long, threadlike antennae. The adults are often large and heavy-bodied, and the long, needlelike, protrusible ovipositor is characteristic of California genera.

The larvae are plant feeders, breeding primarily in the buds or fruits of a wide variety of plants, and they produce monophthalmous galls.

Key to Genera

- | | |
|--|--------------------|
| 1. Palpus with 4 segments | <i>Schizomyia</i> |
| Palpus with less than 4 segments | <i>Asphondylia</i> |

Genus *Schizomyia* Kieffer

In addition to having a fourth palpal segment, *Schizomyia* may be distinguished from *Asphondylia* by the characteristic hypopygium and ovipositor.

Schizomyia is world-wide in distribution. Eleven species have been described from North America, of which one is from the West. Several undescribed species have been reared in California.

Schizomyia macrofila (Felt)

Asphondylia macrofila Felt, 1907. N. Spp. Cecid. II, p. 16. Types ♂ and ♀, Los Angeles and Alameda, California.

This species is apparently common on *Amsinckia lycopsoides* along the California coast, the galls causing distorted flower heads. Adults emerge in May, and it is a question where they oviposit since *Amsinckia* nearly disappears at this time on the San Francisco peninsula.

Genus *Asphondylia* Loew

Asphondylia is a very large cosmopolitan genus. A number of species have been described from North America that may be grouped according to

whether they have one, two, or three palpal segments. Otherwise, their identification is based primarily on the host and the gall.

Asphondylia adenostema Felt

Asphondylia adenostoma Felt, 1916, Jour. N. Y. Ent. Soc., 24: 177. Type ♀, Laurel Canyon near Hollywood, California.

This midge was reared in June, 1912, from an apparently normal seed of *Adenostoma fasciculatum*.

Asphondylia arizonensis Felt

Asphondylia arizonensis Felt, 1907, N. Spp. Cecid. II, p. 13. Types ♂ and ♀, Fort Grant, Arizona.

A. arizonensis was described as producing fruitlike galls on prickly pear cactus, *Opuntia* sp. Later, Felt (1916) recorded adults as being reared in March, 1886, from cactus seed pods at Los Angeles, California, and he also recorded the species from Colorado.

Asphondylia artemisiae Felt

Asphondylia artemisiae Felt, 1908, Bull. N. Y. State Mus., 124: 377. Type ♀, Fort Grant, Arizona.

This species was described from adults reared from woolly bud galls on *Artemisia* sp. Felt (1916) stated that the types were reared in July, 1882, from galls received from Ft. Grant, Arizona.

Asphondylia auripila Felt

Asphondylia auripila Felt, 1907, N. Spp. Cecid., II, p. 14. Types ♂ and ♀, Tucson, Arizona.

A. auripila was originally reared from an undescribed type of gall on *Larrea divaricata*. The *Larrea* of the Mojave Desert is considered by some botanists to differ from that in South America, and they refer to it as *L. tridentata*. A study of the several gall midges on this host is needed.

Asphondylia bea Felt

Asphondylia bea Felt, 1925, Pomona Jour. Ent. Zool., 17: 19. Types ♂ and ♀, Claremont, California.

A. bea produces inconspicuous flower galls in the floral head of *Senecio douglasii*. The types were reared in December and January. According to Needham (1925) there appears to be a continuous succession of broods throughout the year.

Asphondylia brevicauda Felt

Asphondylia brevicauda Felt, 1907, N. Spp. Cecid., II, p. 14. Type ♀, Fort Yuma, Arizona.

A. brevicauda is known from a single female collected at Fort Yuma, Arizona. The adult resembles *A. auripila* and differs from all other members of the genus by having the palpus one segmented. The type was described as differing from *auripila* by being smaller, but it is probably a synonym of that species.

Asphondylia ceanothi Felt

Asphondylia ceanothi Felt, 1908, Bull. N. Y. State Mus., 124: 377. Type ♀, Oakland, California.

A. ceanothi was described from a female reared in June, 1888, from a large, rather loose bud gall on *Ceanothus* (identified as *C. velutinus*) from Oakland. Felt subsequently (1934) identified as this species midges reared in July, 1933, from a flower bud gall on *Ceanothus cuneatus*, in Lake County, California.

Asphondylia diplaci Felt

Asphondylia diplaci Felt, 1912, Jour. N. Y. State

Ent. Soc., 20: 151. Type ♂, Puente Hills near Whittier, California

This species was reared in October, 1911, from a cabbagelike, woolly, bud gall on *Diplacus longiflorus*. It has not since been recognized.

Asphondylia dondiae Felt

Asphondylia dondiae Felt, 1918, Jour. Econ. Ent., 11: 381. Type ♂, Point Fermin, California.

This species is known from a single male reared in April, 1918, from a globose, sessile, leaf deformation of sea blite, *Dondia* or *Sueda multiflora*. *Sueda multiflora* is a Chilean plant, and the California host is probably *Sueda californica pubescens*.

Asphondylia enceliae Felt

Asphondylia enceliae Felt, 1912, Jour. N. Y. Ent. Soc., 20: 152. Type ♀, Puente Hills near Whittier, California.

A. enceliae is known only from the original females reared in February, 1911, from bud galls on *Encelia californica*.

Asphondylia garryae Felt

Asphondylia garryae Felt, 1934, Pomona Jour. Ent. Zool., 26: 34. Types ♂ and ♀, Mt. Konocti, Lake County, California.

The types were reared in May, 1933, from a bud gall on *Garrya fremontii*.

Asphondylia integrifoliae Felt

Asphondylia integrifoliae Felt, 1908, Bull. N. Y. State Mus. 124: 376. Type ♀, Los Angeles County, California.

The type was reared in April, 1886, from a subglobular flower gall of *Rhus integrifolia*. Felt (1916) regarded as conspecific specimens that were reared in June, 1914, from distorted flower buds of *Rhus trilobata*, near Salt Lake City, Utah.

Asphondylia opuntiae Felt

Asphondylia opuntiae Felt, 1908, Bull. N. Y. State Mus., 124: 377. Type of unknown sex, Sinton, Texas.

Felt (1940) indicated that *A. opuntiae* differs

from *A. arizonensis* in that it breeds in swollen leaves of *Opuntia* cactus rather than in swollen fruit.

Felt (1916) indicated that the type of *opuntiae* was from Texas, and he further recorded it from Colorado, Arizona, and from Los Angeles, California (reared in April, 1908); an infested "lobe" of the plant was illustrated. The adult of *A. opuntiae* was regarded as being very similar to *A. arizonensis*, and it is probable that the two are synonymous.

Asphondylia photinae Pritchard

Asphondylia photinae Pritchard, 1952, Pan-Pac. Ent., 28: 16. Holotype ♂, Palo Alto, California.

The type series was reared from distorted fruit of toyon, *Photinia arbutifolia*. Adults emerge in April and May.

Asphondylia websteri Felt

Asphondylia websteri Felt, 1917, Jour. Econ. Ent., 10: 562. Types ♂ and ♀, Tempe, Arizona.

Webster (1912) gave an account of this species. Larvae cause the seed pods of alfalfa to be-

come enlarged and distorted, and they are sometimes a localized pest in Arizona and New Mexico.

Tribe Lasiopterini

Members of the tribe Lasiopterini are stocky and densely covered with scales that often form a distinctive color pattern. Unfortunately, most of the scales and their coloration are lost in slide preparation, and a part of each series reared should be pinned on *minuten nadeln*.

Larvae of the lasiopterine midges are plant feeders.

Three genera have been recognized from the Pacific coast states, but it is probable that only one of these is valid. The palpal characters used by Felt to separate *Lasioptera* and *Asteromyia* are admitted by the describer of the latter genus to intergrade, although the gall-making habits of the two proposed genera have general differences. The venational characters that were defined to separate *Neolasioptera* and *Lasioptera* are not always recognizable among the types of the species described and assigned to the two genera by Felt. The present article, however, is not revisional, and no new generic synonymy is proposed. It is merely pointed out that the distinctions of the following key will probably not prove to be valid.

Key to Genera

- | | |
|--|----------------------|
| 1. Palpus with three or four segments | 2 |
| Palpus with one segment | <i>Asteromyia</i> |
| 2. Vein M_{3+4} indistinct or absent | <i>Lasioptera</i> |
| Vein M_{3+4} present | <i>Neolasioptera</i> |

Genus *Lasioptera* Meigen

Larvae of the genus *Lasioptera* feed characteristically in the stems of herbaceous and woody plants, producing more or less nodular swellings. There is usually a single generation annually, the pupal stage occurring in the gall and the adults emerging in the spring or early summer.

The genus *Lasioptera*, including related genera of doubtful validity, contains more than 150 species described from North America. Their identification is not possible from the descriptions of their coloration and the few morphological characters that have been considered. However, each species is believed to be host specific, and names

are often available for reared material.

Six species have been described from California, and five are known from Arizona. An undescribed species was reared by E. S. Ross from grass at Santa Cruz, and a number of specimens have been taken by sweeping near Berkeley.

Lasioptera arizonensis Felt

Lasioptera arizonensis Felt, 1908, Bull. N. Y. State Mus., 124: 325. Type ♂, Oracle, Arizona.

L. arizonensis was described from a male reared in May, 1889, from the stems of *Senecio ari-*

zonensis. There is no plant named *S. arizonensis*, the reference probably being to *S. arizonicus*.

species of oak, and it is known only from the types.

Lasioptera cassiae Felt

Lasioptera cassiae Felt, 1909, Jour. Econ. Ent., 2: 287. Cotypes ♂ and ♀, Fort Huachuca, Arizona.

This species is known only from the type series, reared in May, 1883, from stem galls of the sensitive plant referred to as *Cassia nictitans*. The host identification was erroneous (being an eastern species), and it probably represents *C. leptadenia*.

Lasioptera diplaci Felt

Lasioptera diplaci Felt, 1912, Jour. N. Y. Ent. Soc., 20: 151. Type ♂, Whittier, California.

L. diplaci is known only from the two type males, reared from stem galls on *Diplacus longiflorus*.

Lasioptera howardi Felt

Lasioptera howardi Felt, 1921, Bull. Brook. Ent. Soc., 15: 94. Type ♀, Mount Diablo, California.

L. howardi was described from specimens reared from "scrub" oak on Mt. Diablo and also from Martinez, California, in 1883. Sixty-eight years later, there are no further records of this species.

Lasioptera lupini Felt

Lasioptera lupini Felt, 1908, Bull. N. Y. State Mus., 124: 326. Type ♀, California.

The only known specimen of this species was reared from an undescribed gall on lupine. A stem gall occurs on *Lupinus arboreus* in the San Francisco Bay area, and it is probably the work of this species. Adults have not been reared, however.

Lasioptera querciflorae Felt

Lasioptera querciflorae Felt, 1908, Bull. N. Y. State Mus., 124: 325. Type ♀, Fort Grant, Arizona.

This species was reared in June, 1882, from larvae feeding on the flowers of an undetermined

Lasioptera spinulae Felt

Lasioptera spinulae Felt, 1908, Bull. N. Y. State Mus., 124: 325. Types ♂ and ♀, Fort Huachuca, Arizona.

L. spinulae is known only from the types reared in June, 1883, from stem galls on an unknown host.

Lasioptera tibialis Felt

Lasioptera tibialis Felt, 1914, Insec. Insc. Menst., 2: 119. Types ♂ and ♀, La Jolla, California.

This species is known only from the types that were reared in April, 1914, from stem galls of *Pentstemon antirrhinoides*.

Lasioptera verbenae Felt

Lasioptera verbenae Felt, 1912, Jour. N. Y. Ent. Soc., 20: 150. Types ♂ and ♀, Whittier, Calif.

This species is known only from the types reared in November, 1910, from flower stem galls of *Verbena prostrata*, at Whittier, California.

Genus *Neolasioptera* Felt

The genus *Neolasioptera* was differentiated from *Lasioptera* on a basis of having M_{3+4} present and Cu_1 absent. The distinction is so difficult to appreciate that many of Felt's types do not appear to correspond with the generic distinction, and European workers have not accepted it for the palaearctic species.

The only species from the western United States that were ascribed to this genus by Felt are the following:

Neolasioptera hirsuta Felt

Neolasioptera hirsuta Felt, 1908, Bull. N. Y. State Mus., 124: 331. Type ♀, Fort Huachuca, Arizona.

N. hirsuta was described from a specimen that was reared in May, 1883, from a stem gall on an unknown host. It has not since been recognized.

Neolasioptera trimera Felt

Neolasioptera trimera Felt, 1911, Jour. Econ. Ent., 4: 484. Type ♀, Fort Grant, Arizona.

The single female was reared from a stem gall on sunflower.

Neolasioptera mimuli Felt

Neolasioptera mimuli Felt, 1908, Bull. N. Y. State Mus., 124: 332. Type ♀, Alameda, California.

This species is known from a single female reared from the stem of *Mimulus aurantiacus* in November, 1885.

Genus *Asteromyia* Felt

Asteromyia is distinguished from *Lasioptera* by having one or two (rarely three) palpal segments rather than three or four. The distinction is scarcely worthy of generic consideration. However, the larval habits of *Asteromyia* differ from those of *Lasioptera* in a general way inasmuch as they usually form leaf blisters rather than stem galls.

Asteromyia grindeliae (Felt)

Asteromyia grindeliae Felt, 1912, Jour. N. Y. Ent. Soc., 20: 149. Type ♂, Santa Barbara, California.

A. grindeliae was originally known from a male reared in July, 1911, from a blister leaf gall on *Grindelia robusta* at Santa Barbara. It was later (Felt, 1916) recorded on a basis of adults bred in October, 1915, from similar galls on *Grindelia cuneifolia* at Millbrae. Variations were noted between adults from the two collections.

Tribe Oligotrophini

Oligotrophine midges may be recognized by having R_s absent and the flagellar segments of the male each with only a proximal node and a distal stem. The group has been divided into two tribes by Felt and certain other workers on a basis of whether the claw is simple or else bears a proximo-ventral tooth (the latter being the Dasineurini). Certain genera, however, have a tooth only on the anterior legs, and its development may vary considerably.

Except for the genus *Coccidomyia*, all the members of the Oligotrophini feed on higher living plants.

Key to Genera

- | | |
|---|-----------------------|
| 1. Claws on all legs simple | 2 |
| Claws on leg I, and usually II and III, with a proximal tooth | 5 |
| 2. Palpus four-segmented | 3 |
| Palpus with one or two segments | 4 |
| 3. R_5 reaching tip of wing | <i>Phytophaga</i> |
| R_5 reaching costa well before tip of wing | <i>Janetiella</i> |
| 4. Ovipositor slender; male with distiforceps plump | <i>Rhopalomyia</i> |
| Ovipositor broadly triangular; male with distiforceps slender except proximally | <i>Walshomyia</i> |
| 5. Palpus four-segmented | 6 |
| Palpus two-segmented | 8 |
| 6. R_5 reaching tip of wing | <i>Rhabdophaga</i> |
| R_5 reaching costa well before tip of wing | 7 |
| 7. Wing membrane with macrotrichiae slender | <i>Dasineura</i> |
| Wing membrane with scales | <i>Phaenolauthia</i> |
| 8. Antenna 18-segmented | <i>Diarthronomyia</i> |
| Antenna 12-segmented | <i>Coccidomyia</i> |

Genus *Phytophaga* Rondani

The genus *Phytophaga* originally included two species, *salicina* (accredited to Degeer) and *cere-*

alis Rondani of which the first is the type of the genus (not *cerealis* which is generally regarded as a synonym of *destructor* Say). *Salicina* is regarded by European workers as belonging to either the

genus *Rhabdophaga* or *Dasineura*. At any rate it appears that the American usage of *Phytophaga* is in error, and that the generic name *Mayetiola* should be employed for these species as it is for similar species in Europe. However, no generic change is proposed in this review of the several species known from California.

Phytophaga californica (Felt)

Mayetiola californica Felt, 1908, Bull. N. Y. State Mus., 124: 370. Types ♂ and ♀, Alameda County, California.

P. californica is known only from the type specimens reared in February from an undescribed gall on currant, *Ribes menziesii* (Felt, 1916).

Phytophaga destructor (Say)

Cecidomyia destructor Say, 1817, Jour. Phil. Acad. Nat. Sci., 1: 45. Types ♂ and ♀, northern and middle states.

The status of the Hessian fly in California was summarized by Packard (1928). It has been known from California since 1879, and it also occurs in Oregon and Washington. This pest is only of localized importance in the far West.

Wade (1934) presented an extensive, annotated bibliography of *P. destructor*, more than 1,200 references being included.

Phytophaga occidentalis Felt

Phytophaga occidentalis Felt, 1926, Pomona Jour. Ent. Zool., 18: 79. Types ♂ and ♀, Berkeley, California.

The types of *P. occidentalis* were reared in February, 1925, from unenlarged branches of *Salix* sp.

Phytophaga tetradyia Felt

Phytophaga tetradyia Felt, 1925, Pomona Jour. Ent. Zool., 17: 15. Types ♂ and ♀, Claremont, California.

Types were reared in March, 1925, from a woolly, polythamous bud gall on *Tetradyia comosa*.

Genus *Janetiella* Kieffer

Janetiella closely resembles *Phytophaga* except that vein R_5 unites with the anterior margin of the wing. A single species from western North America was provisionally referred to this genus.

Janetiella siskiyou Felt

Janetiella siskiyou Felt, 1917, Jour. N. Y. Ent. Soc., 25: 194. Type ♀, 1 mile north of Siskiyou National Forest, along south fork of Coquille River, Oregon.

The seeds of *Chamaecyparis lawsoniana* were reported to be deformed by larvae of this species, pupation occurring in cocoons on the sides of the seeds. One female was reared in January, 1917.

Genus *Rhopalomyia* Rübsaamen

Rhopalomyia resembles *Phytophaga* except that only one or two palpal segments are present. The ovipositor is slender and extensile.

Members of the genus feed on higher, living plants, usually producing galls of the flower buds. Ten species have been described that are from California or probably so.

There are a large number of species of *Rhopalomyia* described from North America, and their classification has been based primarily on the number of antennal segments, which is variable. The number of palpal segments and the relative lengths of the node and the stem of the flagellar segments are the only other morphological characters of importance that have received consideration. The host relationships are of paramount importance for identification at the present.

Rhopalomyia baccharis Felt

Rhopalomyia baccharis Felt, 1908, Bull. N. Y. State Mus., 124: 364. Types ♂ and ♀, from undisclosed locality.

R. baccharis was originally reared from stem galls of *Baccharis pilularis*, in December, 1885. Stem galls on this host are common on the prostrate form of this plant in the sand dunes of the San Francisco peninsula.

Rhopalomyia bigelovioides Felt

Rhopalomyia bigelovioides Felt, 1908, Bull. N. Y. State Mus., 124: 366. Types ♂ and ♀, Los

Angeles, California.

The galls from which the types were reared in February, were reported to be deformed seeds of *Bigelovia* sp., later identified (Felt, 1917) as (*Bigelovia graveolens*) = *Chrysothamnus nauseosus*.

Rhopalomyia californica Felt

Rhopalomyia californica Felt, 1908, Bull. N. Y. State Mus., 124: 364. Types ♂ and ♀, Alameda County, California.

Felt (1916) reported that the types had been reared in February, 1904, from *Baccharis* sp.; also from Alameda Co., in September, presumably 1885, and in April, 1886 (from flowers) of *B. pilularis*. Felt (1940) considered this species to form flower bud or leaf galls, single or clustered, on *Baccharis pilularis*. The galls are common in the San Francisco Bay region.

Rhopalomyia cruziana Felt

Rhopalomyia cruziana Felt, 1908, Bull. N. Y. State Mus., 124: 366. Type ♂, Santa Cruz Mountains, California.

This species is known only from specimens reared before May, 1890, from flower galls on *Solidago* sp.

Rhopalomyia enceliae Felt

Rhopalomyia enceliae Felt, 1916, Jour. N. Y. Ent. Soc., 24: 183. Type ♀♀, from unspecified locality.

R. enceliae types were reared in April, 1913, from globose, thick-walled bud galls that sometimes were confluent and distorting the stem. The host, *Encelia* sp., was mentioned by Felt (1940).

Rhopalomyia ericameriae Felt

Rhopalomyia ericameriae Felt, 1916, Jour. N. Y. Ent. Soc., 24: 190. Types ♂ and ♀, Puente Hills near Whittier, California.

R. ericameriae was originally reared in April, 1913, from a small rosette gall on *Ericameria palmeri*. It has not since been recognized.

Rhopalomyia erigerontis Felt

Rhopalomyia erigerontis Felt, 1916, Jour. N. Y.

Ent. Soc., 24: 189. Type ♂, Whittier, California.

R. erigerontis is known only from the specimen reared in April, 1913, from a gall on a plant provisionally identified as *Erigeron fragilis*.

Rhopalomyia grindeliae Felt

Rhopalomyia grindeliae Felt, 1916, Jour. N. Y. Ent. Soc., 24: 186. Types ♂ and ♀, Millbrae, California.

R. grindeliae is known only from the types that were reared in October, 1915, from apparently unmodified flower heads of tarweed, *Grindelia cuneifolia*.

Rhopalomyia lonicera Felt

Rhopalomyia lonicera Felt, 1925, Pomona Jour. Ent. Zool., 17: 15. Type ♂, Claremont, California.

The type was reared in February, 1925, from an irregular bud gall on *Lonicera subspicata*.

Rhopalomyia salviae Felt

Rhopalomyia salviae Felt, 1916, Jour. N. Y. Ent. Soc., 24: 184. Types ♂ and ♀, Puente Hills near Whittier, California.

R. salviae forms conical leaf galls. The types were from *Salvia californica* and *S. nivea*, the adults being reared in May, 1912. Felt (1916) also recorded rearings in January from Alpine, California. Similar galls are common on *Salvia mellifera*, on Mount Diablo.

Rhopalomyia truncata Felt

Rhopalomyia truncata Felt, 1908, Bull. N. Y. State Mus., 124: 365. Type ♂, Los Angeles, California.

A single male, collected at Los Angeles, California, was made the type of this species.

Genus *Walshomyia* Felt

The genus *Walshomyia* resembles *Rhopalomyia* except that the male and female genitalia are distinctive.

A single species is known in the genus.

Walshomyia juniperina Felt

Walshomyia juniperina Felt, 1908, Bull. N. Y. State Mus., 124: 360. Types ♂ and ♀, New Indria, California.

This unique species has been known only from types reared in June, 1884, from the fruit of *Juniperus californica*. Several specimens were reared from Gavilan, Riverside County, in May, 1939 (P. H. Timberlake).

Genus *Rhabdophaga* Westwood

Members of the genus *Rhabdophaga* are characteristic of willow, particularly in the eastern United States. Their identification is very difficult at the present, and the western species are mostly unidentified.

Some species of *Rhabdophaga* occur on hosts other than willow, and the genus resembles *Phytophaga* except for having the claw unidentate.

The classification of the North American species of *Rhabdophaga* that was presented by Felt (1915) is based on the number of antennal segments which is admittedly variable, the comparative length of the flagellar stems of the male, and the termination of vein R_5 . The biological observations of the midges and their individual hosts and galls are of more significance for identification at the present.

Rhabdophaga californica Felt

Rhabdophaga californica Felt, 1908, Bull. N. Y. State Mus., 124: 353. Type ♂, Santa Clara County, California.

R. californica is known from a single male collected in June. Nothing is known of its host or life history.

Rhabdophaga elymi Felt

Rhabdophaga elymi Felt, 1909, Jour. Econ. Ent., 2: 289. Type ♀, Alameda, California.

R. elymi is known only from a single female reared in January, 1891, from (*Elymus americanus*) = *Elymus glaucus*.

Rhabdophaga essigi Felt

Rhabdophaga essigi Felt, 1926, Pomona Jour. Ent. Zool., 18: 79. Types ♂ and ♀, Alviso, California.

The types of this species were reared in February, 1925, from nearly normal willow buds.

Rhabdophaga occidentalis Felt

Rhabdophaga occidentalis Felt, 1908, Bull. N. Y. State Mus., 124: 353. Type ♂, Santa Clara County, California

The single male of *R. occidentalis* was collected in June. Nothing is known of its biology.

Genus *Dasineura* Rondani

Rondani's original spelling *Dasineura* was later emended to *Dasyneura*, and the latter spelling is prevalent in most of the literature. The original name is here used because Rondani clearly wished it to be spelled that way and because the emendation has not been submitted to the International Commission of Zoological Nomenclature.

The genus contains a very large number of species, most of which produce leaf galls. Some, however, feed in the buds or seeds. Their classification in North America has been based primarily on the number of antennal segments, which varies, and the shape of the flagellar segments. Identification must be based on reared material.

Dasineura californica Felt

Dasyneura californica Felt, 1908, Bull. N. Y. State Mus. 124: 347. Type ♀ from Alameda, California.

D. californica was originally reared in February, 1886, from an undescribed type of bud gall on willow, *Salix californica*. This species has not since been recognized.

Dasineura leguminicola (Lintner)

Cecidomyia leguminicola Lintner, 1879, Canad. Ent., 2: 121. Described from larvae from New York.

D. leguminicola was originally recognized as a serious pest of red clover throughout the northern part of the eastern United States and eastern Canada. The larvae feed within the flowers and prevent the development of seeds. Mature larvae drop to the ground and pupate in the soil. There are two or three generations annually. Barnes (1946) has summarized the biological data on this midge.

The clover-seed midge is recorded from British Columbia, Washington, and Oregon in the West, but

it is not yet known from California.

Dasineura lupini Felt

Dasineura lupini Felt, 1916, Ent. News, 27: 413.

Types ♂ and ♀, Buena Vista Park, San Francisco, California.

D. lupini was originally reared in May from an irregularly fusiform, polythalmous, presumably stem gall on a large, perennial species of lupine. A bud gall is common on *Lupinus arboreus* along the San Francisco peninsula.

Genus *Phaenolauthia* Kieffer

Edwards (1937) showed that *Lasiopteryx* as determined by Felt (not *Lasiopteryx* Stephens) is the same as *Phaenolauthia*. At least in the type of the genus, the anterior claws only are bifid.

Members of this small genus are believed to be either gall makers or inquiline. A single species is known from the West.

Phaenolauthia arizonensis (Felt), new combination

Lasiopteryx arizonensis Felt, 1916, Bull. N. Y. State Mus., 175: 195. Types ♂ and ♀, Prescott, Arizona.

This species is known only from adults reared in April, 1911, from *Phylloxera* galls on wild-grape leaves; and from adults collected in August, 1910.

Genus *Diarthronomyia* Felt

Diarthronomyia contains several species of gall-making midges of which one is of economic importance. Four species have been recognized in California, their identification being based on the host.

Diarthronomyia californica Felt

Diarthronomyia californica Felt, 1912, Pomona Jour. Ent. Zool., 4: 732. Types ♂ and ♀, Claremont, California.

The types of *D. californica* were reared in March, 1912, from brownish or reddish subconical galls on the underside of the narrow leaves of *Artemisia californica*.

Diarthronomyia chrysanthemi Ahlberg

Diarthronomyia chrysanthemi Ahlberg, 1939, Ent. Tijdskr., 60: 274. No types designated.

The chrysanthemum gall midge was known for many years as *D. hypogaea* Löw. Ahlberg showed that Felt erred in this identification.

D. chrysanthemi makes small bullet-shaped galls on the leaves and stems of cultivated chrysanthemum. Essig (1916) studied their biology in California. Greenhouse infestations in San Francisco and Los Angeles and outdoor infestations in the extensive commercial fields of San Mateo and Santa Clara counties have been common. This midge was considered a very serious pest until chemicals were recently developed that give excellent control.

Diarthronomyia floccosa Felt

Diarthronomyia floccosa Felt, 1916, Jour. N. Y. Ent. Soc., 24: 195. Type ♀, Ridge between Mill Valley and Muir Woods, Marin County, California.

The type female was reared in November, 1912, from large, woolly, lateral, bud galls on *Artemisia californica*. Felt also noted that a similar gall was found at Santa Barbara, California.

Diarthronomyia occidentalis Felt

Diarthronomyia occidentalis Felt, 1912, Jour. N. Y. Ent. Soc., 24: 194. Types ♂ and ♀, Sweet Water Dam, San Diego County, California.

Specimens were originally reared in September, 1912, from small, oval, grayish galls on the leaves of *Artemisia heterophylla* and also from flower buds on this host taken in the Puente Hills near Whittier, California. Felt further considered as being produced by this species blackish galls on the underside of leaves of *A. tridentata* at Salt Lake City, Utah.

Genus *Coccidomyia* Felt

Coccidomyia contains two species, both North American and both predaceous on members of the Coccoidea. One species is known from the West.

Coccidomyia erii Felt

Coccidomyia erii Felt, 1912, Jour. N. Y. Ent. Soc.,

20: 147. Types ♂ and ♀, Casitas Pass road near Carpinteria, California.

Adults were reared in November, 1911, from larvae, presumably predaceous on the mealybug (*Erium lichtensioides*) = *Amonostherium lichtensioides* (Cockerell), infesting *Artemisia californica*.

Tribe Contariniini

On a basis of cytological studies, White

(1950) showed that this group is worthy of tribal recognition. The tribal name was originally proposed by Enderlein (1936).

Members of the Contariniini feed on higher living plants, fungi, mites, and insects. It is noteworthy that the genus *Contarinia* is not known in the West. This genus contains such well-known pests as the sorghum midge, the grape-blossom midge, and the pear midge.

Key to Genera

- | | | |
|----|--|----------------------|
| 1. | Palpus four segmented | 2 |
| | Palpus three segmented | <i>Zeuxidiplosis</i> |
| 2. | Costa of wing with scales; pedicel of antenna with a proximodorsal tooth | <i>Endaphis</i> |
| | Costa of wing setose; pedicel of antenna without tooth | <i>Thecodiplosis</i> |

Genus *Thecodiplosis* Kieffer

The generic name *Thecodiplosis* was employed by Felt for those species allied to but not congeneric with *Contarinia*. Most, if not all, species that he assigned to this genus belong elsewhere. Their proper disposition can be made only in connection with revisional studies.

Two Western species have been provisionally assigned to this genus.

Thecodiplosis pini-radiatae (Snow and Mills)

Diplosis pini-radiatae Snow and Mills, 1900, Ent. News, 11: 489. Types ♂ and ♀, Palo Alto, California.

The larvae of *T. pini-radiatae* cause Monterey pine needles to be stunted and swollen proximally, and the species is sometimes regarded as a serious pest. *Pinus tuberculatus*, *P. muricata*, *P. sabina*, *P. coulteri*, and *P. sylvestris* are also reported as hosts. The midge is common in the San Francisco Bay region.

Snow and Mills noted that the adults emerge from about the middle of January until the first of March. Eggs are laid between the scales of terminal buds. The egg stage lasts about two weeks, and the larva feeds in the needle for ten or eleven months. The pupal stage is formed, according to Snow and Mills, usually in a cocoon within the deformed buds, and it lasts three or four weeks; however, Compere (1915) found the pupal stage to occur in the soil.

Thecodiplosis zauschneriae Felt

Thecodiplosis zauschneriae Felt, 1912, Jour. N. Y. Ent. Soc., 20: 152. Types ♂ and ♀, Puente Hills near Whittier, California.

This species is known only from the types reared in December, 1910, from rosette galls on *Zauschneria californica*.

Genus *Endaphis* Kieffer

The type of the genus *Endaphis* is a European species that parasitizes aphids. An American *Endaphis* is known from Arizona that was reared from eriophyid galls; and another species was reared from mite leaf galls in Peru. A fourth species was reared from dactylopiid scales in Ceylon.

Endaphis americana Felt

Endaphis americana Felt, 1911, Ent. News, 22: 129. Type ♀, Prescott, Arizona.

The only known female of this species was reared in September, 1910, from galls of (*Eriophyes fraxiniflorae* = *Aceria fraxiniflorae* on *Fraxinus velutina*). The species undoubtedly occurs in California.

Genus *Zeuxidiplosis* Kieffer

The genus *Zeuxidiplosis* contains a single spe-

cies that forms budlike leaf galls on certain members of the genus *Hypericum*. It is native to Europe.

Zeuxidiplosis giardi (Kieffer)

Diplosis giardi Kieffer, 1896, Bull. Soc. Ent. France, p. 383. Types from France.

Specimens imported from Germany were reared in the insectary at Albany, California, and they were released by J. K. Holloway in the spring of 1950, in northern California, as an aid in control of Klamath weed, *Hypericum perforatum*. According to Holloway, in litt., the midges are established in the field.

Tribe Itonidini

The tribe Itonidini is very large, and it is diverse in biological habits. Included species may be predators, fungus feeders, or gall makers. The binodulate flagellar segment, with the distal node long and bearing two circumfila, of the male is characteristic, but females are difficult to distinguish from the contariniines and oligotrophines. The male terminalia have been used more than elsewhere in the subfamily for the recognition of genera and species, and this sex is necessary for identification.

The genus *Lestodiplosis*, a very large and common genus of predaceous midges, is unrecorded from California.

Key to Genera

- | | |
|--|------------------------|
| 1. Legs with all claws toothed | 2 |
| Legs with posterior claws simple, at least | 5 |
| 2. Flagellum with distal node of each segment subdivided | 3 |
| Flagellum with distal node of each segment entire | 4 |
| 3. Basiforceps each with a strong angulation proximally on inside | <i>Youngomyia</i> |
| Basiforceps without angular projection | <i>Cleodiplosis</i> |
| 4. Claw sharply curved at right angle | <i>Thomasiniana</i> |
| Claw evenly and shallowly curved | <i>Dicrodiplosis</i> |
| 5. Claws of anterior legs toothed | 6 |
| Claws of anterior legs simple | 7 |
| 6. Claw sharply curved at nearly right angle | <i>Clinodiplosis</i> |
| Claw evenly and shallowly curved | <i>Mycodiplosis</i> |
| 8. Wing with R_5 reaching apex | 9 |
| Wing with R_5 uniting with costa well before tip of wing | <i>Arthrocnodax</i> |
| 9. Flagellum with several circumfilar loops of each segment much longer than others | <i>Aphidoletes</i> |
| Flagellum with the circumfilar loops all similar in length | 10 |
| 10. Palpus with four segments | 11 |
| Palpus with one segment | <i>Monarthropalpus</i> |
| 11. Flagellum with nodes short and broad and bearing about 20 short circumfilar loops. | <i>Retinodiplosis</i> |
| Flagellum with nodes slender and bearing comparatively few circumfilar loops | <i>Itonida</i> |

Genus *Youngomyia* Felt

Two members of the genus *Youngomyia* have been reared from blossoms in the eastern United States. The only species known from California produces leaf galls.

Youngomyia quercina Felt

Youngomyia quercina Felt, 1911, Jour. Econ. Ent., 4: 551. Type ♂, Donner, California.

The only known adult was reared in June, 1886, from a subglobular gall on the underside of young leaves of "*Quercus pumila*." The host was obviously misidentified and probably refers to *Quercus fraxinifolia*.

Genus *Cleodiplosis* Felt

The genus *Cleodiplosis* has been known from a single species that is predaceous on whiteflies in Panama. A second species is here transferred to the genus.

Cleodiplosis koebelei (Felt), new combination

Silvestrina koebelei Felt, 1932, Pan-Pac. Ent., 8: 167. Types ♂ and ♀, Sydney, New South Wales (at Riverside, California).

Koebelei cannot belong to the genus *Silvestrina*, because a cotype studied in the U. S. National museum has the claws strongly bent and each with a long proximal tooth.

The larvae of *C. koebelei* were found feeding on the citrophilus mealybug, *Pseudococcus gahani* Green. According to Harry S. Smith (in Felt, 1932) this species was introduced and became established in California. Specimens were obtained from Stanley E. Flanders, collected in Riverside, November, 1947, feeding on *Pseudococcus adonidum* (Linnaeus).

Genus *Dicrodiplosis* Kieffer

The European genus *Dicrodiplosis*, known only from the female, has been employed by Felt for a small number of North American species that are allied to *Thomasiniana*. Felt's generic concept is heterogeneous, inasmuch as he included both gall makers and predators. One of the species is known from western North America.

Dicrodiplosis californica Felt

Dicrodiplosis californica Felt, 1912, Jour. N. Y. Ent. Soc., 20: 244. Types ♂ and ♀, Riverside, California.

Adults of this species were reared in 1893, from *Pseudococcus* mealybugs on *Solanum*.

Genus *Thomasiniana* Strand

Thomasiniana was proposed as a new name for the preoccupied *Thomasia* that was used for many years as a genus of gall midges.

The type of the genus *Thomasiniana* is a European pest of roses and related fruit trees. The species described from California was referred to this genus very provisionally.

Thomasiniana californica (Felt), new combination

Thomasia californica Felt, 1914, Jour. N. Y. Ent. Soc., 22: 132. Type ♀, Lake Tahoe, California.

The species is known only by a female reared in August, 1913, from larvae producing midrib galls on the leaflets of *Symphoricarpos*. Similar

galls are common in Marin County and San Mateo County, California, the midges obviously having a single generation annually.

Genus *Clinodiplosis* Kieffer

Most of the species that have been assigned to *Clinodiplosis* have been regarded as inquilines in the galls of itonidids, cynipids, or caterpillars. Larvae of the only species known from the West are found in galls formed by a rust.

Clinodiplosis pucciniae Pritchard

Clinodiplosis pucciniae Pritchard, 1948, Pan-Pac. Ent., 24: 29. Holotype ♂, Palo Alto, California.

This species was reared in March, 1947, from larvae feeding on *Puccinia* rust on *Baccharis pilularis*.

Genus *Mycodiplosis* Rübsaamen

The genus *Mycodiplosis*, as utilized by Felt, is heterogeneous. The type of the genus feeds on fungus; but the only species from California that has been referred to the genus feeds on spider mites. However, Felt's generic reference must be retained until revisional studies are undertaken.

Mycodiplosis acarivora (Felt)

Cecidomyia acarivora Felt, 1907, Ent. News, 18: 242. Types ♂ and ♀, Chula Vista, California.

M. acarivora was reared from larvae found feeding on the spider mites (*Tetranychus mytilospidus*, misidentified) = *Metatetranychus citri* (McGregor), and *Tetranychus sexmaculatus* Riley on lemon.

Genus *Arthrocnodax* Rübsaamen

Arthrocnodax contains a number of species whose larvae are predaceous on spider mites, eriophyids, and probably other mites. Only two species are known from California.

Arthrocnodax occidentalis Felt

Arthrocnodax occidentalis Felt, 1912, Jour. Econ.

Ent., 5: 402. Type ♂, Berkeley, California.

This species is known from a single specimen reared in July, 1912, from larvae preying on a spider mite, *Tetranychus* sp.

Arthrocnodax apiphila Felt

Arthrocnodax apiphila Felt, 1907, N. spp. Cecid. II, p. 20. Type ♂, California

Adults of this species were reared from debris and excrement in the bottom of a beehive, and from brood comb affected by American foul brood from Tulare County. The comb was decaying and heavily infested with fungus mites (Acaridae).

Felt (1921) also considered as *A. apiphila* adult midges reared from a twig infested with *Pulvinaria* and a breeding jar containing the forest tent caterpillar, at Tacoma, Washington. Others were reared from a jar containing *Viburnum* leaves infested with an eriophyd.

Genus *Retinodiplosis* Kieffer

Members of the genus *Retinodiplosis* breed characteristically in the resinous exudate of pine trees in North America. Several species have been described from the eastern states and one from California.

Retinodiplosis resinicoloides (Williams)

Cecidomyia resinicoloides Williams, 1919, Ent. News, 20: 2. Types ♂ and ♀, Palo Alto, California.

Adults were observed by F. X. Williams in March and April, 1907, there being a single generation annually. The larvae live gregariously in masses of pitch on Monterey pine. Pupation occurs in a cocoon that protrudes from the exudate.

Genus *Itonida* Meigen

Before 1900, a large number of the gall midges

were assigned to the familiar generic names *Cecidomyia* and *Diplosis* that are now considered synonyms of *Itonida*. However, *Itonida* is still rather heterogeneous, and it includes those midges that do not fall into better defined genera. Two species have been described from the West.

Itonida hopkinsi Felt

Itonida hopkinsi Felt, 1911, Jour. Econ. Ent., 4: 554. Type ♀, San Francisco, California.

This species is known from a single female that was reared from scolytid burrows in *Pinus attenuata*. The generic reference of the midge is obviously provisional.

Itonida citrulli Felt

Itonida citrulli Felt, 1935, Bull. Brook, Ent. Soc., 30: 79. Types ♂ and ♀, Tuscon, Arizona.

I. citrulli, an Arizona species that is not yet known from California, is regarded as an important localized pest of watermelon. The larvae infest the tips of the vines causing them to curl and die.

Genus *Monarthropalpus* Rübsaamen

The genus *Monarthropalpus* includes a single species.

Monarthropalpus buxi (Laboulbène)

Itonida buxi Laboulbène, 1873, Ann. Soc. Ent. France (ser 5), 3: 321. Types ♂ and ♀, Paris, France.

The larvae of *M. buxi* make blisterlike leaf galls on the leaves of ornamental boxwood, *Buxus sempervirens*, and the pupae are formed in the galls. There is a single generation annually, the adults emerging in April in the San Joaquin Valley (Harry S. Smith, 1915). An infestation was found by the writer in 1949, in a nursery at Hayward, California. This midge is sometimes a serious pest, but it is seldom encountered in California.

Host List of Phytophagous Gall Midges

Host	Larval habitat	Midge
	PINACEAE	
<i>Pinus radiata</i>	pitch exudate	<i>Retinodiplosis resinicoloides</i>
<i>Pinus</i> spp.	needle swelling	<i>Thecodiplosis pini-radiatae</i>
	CUPRESSACEAE	
<i>Chamaecyparis lawsoniana</i>	fruit	<i>Janetiella siskiyou</i>
<i>Juniperus californica</i>	fruit	<i>Walshomyia juniperina</i>
	GRAMINEAE	
<i>Elymus glaucus</i>	undescribed	<i>Rhabdophaga elymi</i>
Wheat, barley, rye	stems	<i>Phytophaga destructor</i>
	SALICACEAE	
<i>Salix californica</i>	bud gall	<i>Dasineura californica</i>
<i>Salix</i> sp.	nearly normal bud	<i>Rhabdophaga essigi</i>
	FAGACEAE	
<i>Quercus fraxinifolia</i>	globular leaf gall	<i>Youngomyia quercina</i>
<i>Quercus</i> sp.	flowers	<i>Lasioptera querciflorae</i>
<i>Quercus</i> sp.	undescribed	<i>Lasioptera howardi</i>
	CHENOPODIACEAE	
<i>Sueda californica</i>	globular leaf gall	<i>Asphondylia dondiae</i>
	SAXIFRAGACEAE	
<i>Ribes menziesii</i>	undescribed	<i>Phytophaga californica</i>
	ROSACEAE	
<i>Adenostoma fasciculatum</i>	seed	<i>Asphondylia adenostoma</i>
<i>Photinia arbutifolia</i>	fruit	<i>Asphondylia photiniae</i>
	LEGUMINOSAE	
<i>Cassia leptadenia</i>	stem gall	<i>Lasioptera cassiae</i>
<i>Lupinus</i> sp.	stem gall	<i>Lasioptera lupini</i>
<i>Lupinus</i> spp.	probably bud gall	<i>Dasineura lupini</i>
<i>Trifolium pratense</i>	flower head	<i>Dasineura leguminicola</i>
<i>Medicago sativa</i>	distorted seed pods	<i>Asphondylia websteri</i>
	ZYGOPHYLLACEAE	
<i>Larrea tridentata</i>	undescribed	<i>Asphondylia auripila</i>
	BUXACEAE	
<i>Buxus sempervirens</i>	blister leaf gall	<i>Monarthropalpus buxi</i>
	ANACARDIACEAE	
<i>Rhus integrifolia</i>	flower gall	<i>Asphondylia integrifolia</i>
	RHAMNACEAE	
<i>Ceanothus</i> spp.	bud gall	<i>Asphondylia ceanothi</i>
	HYPERICACEAE	
<i>Hypericum</i> spp.	budlike leaf gall	<i>Zeuxidiplosis giardi</i>

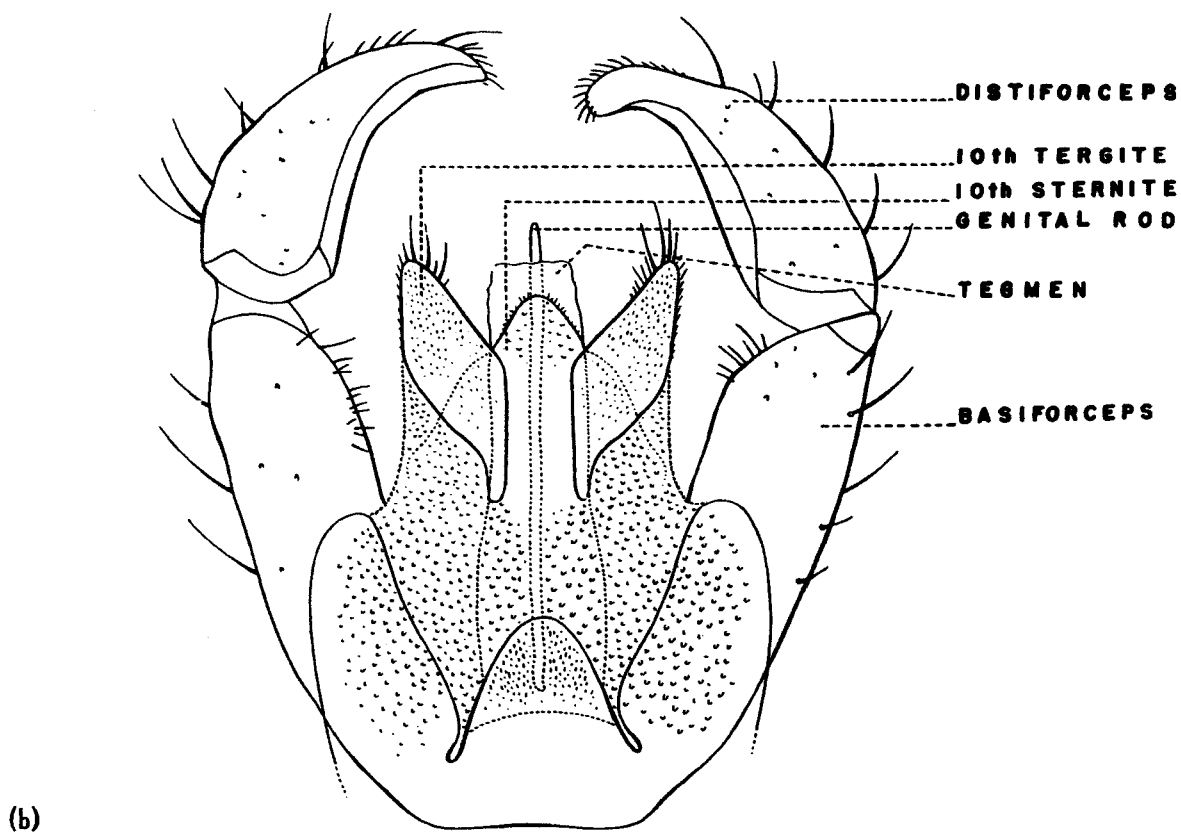
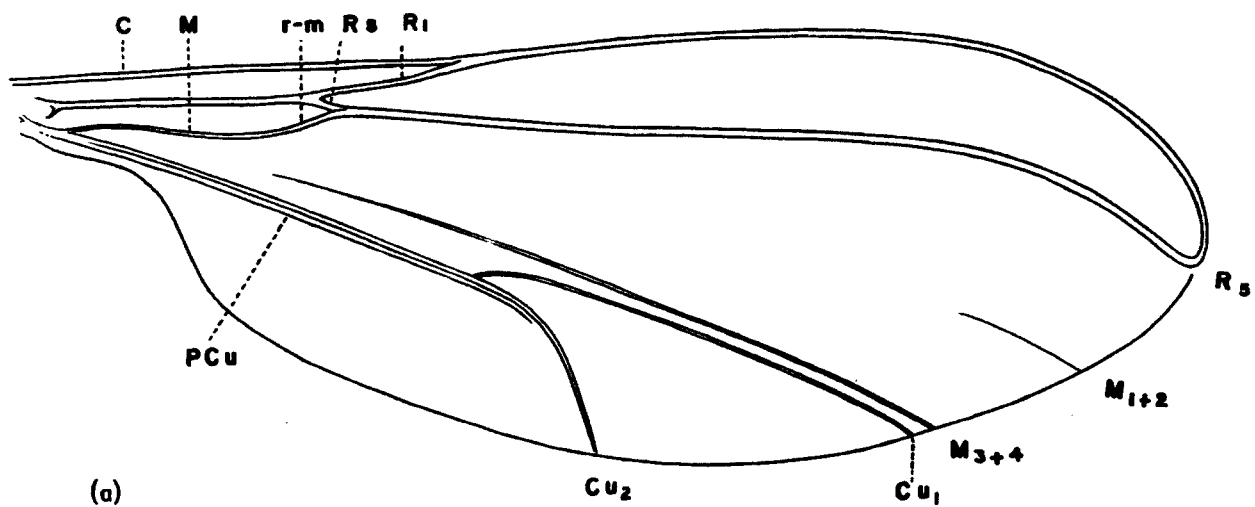
Host	Larval habitat	Midge
	CACTACEAE	
<i>Opuntia</i> spp.	fruit	<i>Asphondylia arizonensis</i>
<i>Opuntia</i> spp.	leaves	<i>Asphondylia opuntiae</i>
	ONAGRACEAE	
<i>Zauschneria californica</i>	rosette gall	<i>Thecodiplosis zauschneriae</i>
	CUCURBITACEAE	
<i>Cucumis melo</i>	deformed tips	<i>Itonida citrulli</i>
	GARRYACEAE	
<i>Garrya fremontii</i>	bud gall	<i>Asphondylia garryae</i>
	BORAGINACEAE	
<i>Amsinckia lycopoides</i>	flower gall	<i>Schizomyia macrofila</i>
	VERBENACEAE	
<i>Verbena prostrata</i>	stem gall	<i>Lasioptera verbenae</i>
	LABIATAE	
<i>Salvia</i> spp.	conical leaf gall	<i>Rhopalomyia salviae</i>
	SCROPHULARIACEAE	
<i>Pentstemon antirrhinoides</i>	stem gall	<i>Lasioptera tibialis</i>
<i>Diplacus longiflorus</i>	woolly bud gall	<i>Asphondylia diplaci</i>
<i>Diplacus longiflorus</i>	flower head	<i>Lasioptera diplaci</i>
<i>Mimulus aurantiacus</i>	stem	<i>Neolasioptera mimuli</i>
	CAPRIFOLIACEAE	
<i>Lonicera subspicata</i>	bud gall	<i>Rhopalomyia loniceræ</i>
<i>Symphoricarpos</i> sp.	midrib leaf gall	<i>Thomasiniana californica</i>
	COMPOSITAE	
<i>Grindelia cuneifolia</i>	flower head	<i>Rhopalomyia grindeliae</i>
<i>Grindelia robusta</i>	blister leaf gall	<i>Asteromyia grindeliae</i>
<i>Ericameria palmeri</i>	rosette gall	<i>Rhopalomyia ericameriae</i>
<i>Chrysothamnus nauseosus</i>	deformed seed	<i>Rhopalomyia bigelovioides</i>
<i>Solidago</i> sp.	flower gall	<i>Rhopalomyia cruziana</i>
<i>Erigeron fragilis</i>	undescribed	<i>Rhopalomyia erigerontis</i>
<i>Baccharis pilularis</i>	bud or leaf gall	<i>Rhopalomyia californica</i>
<i>Baccharis pilularis</i>	stem gall	<i>Rhopalomyia baccharis</i>
<i>Encelia</i> sp.	bud gall	<i>Phopalomyia enceliae</i>
<i>Chrysanthemum</i> spp.	conical leaf gall	<i>Diarthronomyia chrysanthemi</i>
<i>Artemisia californica</i>	conical leaf gall	<i>Diarthronomyia californica</i>
<i>Artemisia californica</i>	woolly bud gall	<i>Diarthronomyia floccosa</i>
<i>Artemisia</i> spp.	oval leaf gall	<i>Diarthronomyia occidentalis</i>
<i>Artemisia</i> sp.	woolly bud gall	<i>Asphondylia artemisiae</i>
<i>Senecio arizonicus</i>	stem gall	<i>Lasioptera arizonensis</i>
<i>Senecio douglasii</i>	flower head	<i>Asphondylia bea</i>
<i>Tetradymia comosa</i>	bud gall	<i>Phytophaga tetradymia</i>

Host List of Zoöphagous Gall Midges

Family of apparent host	Apparent host	Midge
ACARINA		
Tetranychidae	<i>Metatetranychus citri</i>	<i>Mycodiplosis acarivora</i>
	<i>Tetranychus sexmaculatus</i>	<i>Mycodiplosis acarivora</i>
	<i>Tetranychus</i> sp.	<i>Arthrocnodax occidentalis</i>
Eriophyidae	<i>Aceria fraxiniflorae</i>	<i>Endaphis americana</i>
Acaridae	undetermined	<i>Arthrocnodax apiphila</i>
INSECTA		
Pseudococcidae	<i>Pseudococcus</i> spp.	<i>Dicrodiplosis californica</i>
	<i>Pseudococcus</i> spp.	<i>Cleodiplosis koebelei</i>
	<i>Amonostherium lichtensioides</i>	<i>Coccidomyia erii</i>

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Explanation of Plate 40

- a. Wing venation of a porticondyline midge.
 b. Male genitalia of a lestremiine midge.