Revision of the genus *Melanagromyza* in California, with descriptions of three new species (Diptera: Agromyzidae)

LI SHI\(^1\,\,^2\) & STEPHEN D. GAIMARI\(^2\)

\(^1\) College of Agronomy, Inner Mongolia Agricultural University, Hohhot 010019, China. E-mail: lirui2003@imau.edu.cn

\(^2\) Plant Pest Diagnostics Branch, California Department of Food and Agriculture, 3294 Meadowview Road, Sacramento, CA 95832-1448, USA. Email: stephen.gaimari@cdfa.ca.gov

Magnolia Press
Auckland, New Zealand

Accepted by D. Bickel: 22 Apr. 2014; published: 20 Aug. 2015

Licensed under a Creative Commons Attribution License http://creativecommons.org/licenses/by/3.0
Abstract

The 27 Californian species of the genus Melanagromyza Hendel (Diptera: Agromyzidae) are reviewed, including descriptions of three new species (Melanagromyza californiana sp. nov., M. chemsaki sp. nov. and M. gonzalesina sp. nov.) and the first record for one species (Melanagromyza martini Spencer) for California and the USA. All species in California are described or redescribed, with illustrations and photographs, and a key to the species is presented. Maps for the species in California, along with host distributions, are provided, with comments on biology and host plants.

Key words: Diptera, Agromyzidae, new species, California

Introduction

The agromyzids are phytophagous flies that can be potential pests of agricultural crops and bioresources. Although most species in the family are leaf miners, the species of the genus Melanagromyza Hendel (Diptera: Agromyzidae: Agromyzinae) are internal feeders in roots, stems, pods, seeds and flower heads (Spencer 1990). Most agromyzid research has focused on several other economically important genera such as Phytomyza Falén,
Phytobia Lioy and Liriomyza Mik rather than Melanagromyza, in part because of the comparative difficulty in rearing due to the more cryptic feeding habits in comparison with mostly leaf mining genera. Therefore, relatively few data are available about host plants and their economic impact, and more extensive work on this genus in the Nearctic Region has been lacking. The present work revises this genus for California, with discussion of biology, host plants and their distributions. As a resource for identifying species of this genus in California, this work seeks to improve on the resources provided by Spencer (1981) and Spencer & Steyskal (1986), by describing new species, redescribing the previously described species, recording one species new to California and the USA, providing a key to species, illustrating the male genitalia for all species, and adding clear diagnostic characters to recognize and separate species based on study of the type specimens and additional materials.

The genus Melanagromyza is one of the largest genera of the subfamily Agromyzinae, being distributed worldwide with more than 380 species. Of these, about 160 are known from the New World, including 73 in the Nearctic Region. Among the Nearctic species, 37 are known in the USA, 27 of which occur in California (see Appendix for list).

Melanagromyza belongs to the Ophiomyia genus group (Dempenwolf 2005), which was recently redefined by Lonsdale (2014). In that work, Lonsdale (2014) proposed several generic synonymies and described one new genus, leaving the Ophiomyia genus group to include Euhexomyza Lonsdale, Melanagromyza, Ophiomyia Braschnikow and Tropicomyia Spencer. Lonsdale (2014) further discussed the historical context of this group and its consituent genera and synonyms. With very limited sampling of Melanagromyza species, Scheffer et al. (2007) found the genus to be monophyletic relative to the other genera of Agromyzinae, but there is still much research necessary to assess the monophyly of the whole genus and to establish phylogenetic relationships among species, and among agromyzine genera.

The genus Melanagromyza is similar to other Agromyzinae, but can be distinguished based on characteristics presented in Lonsdale (2014). Generally, they can be separated from other agromyzine genera by the following characteristics: the halteres are black (white in Agromyza); the mesonotum has two pairs of strong dc except for several species with a presutural dc or with 3–4 pairs of postsutural dc (there are generally at least 3 pairs of dc in Agromyza); the prsc are absent (always present in Agromyza and in some Japanagromyza); the mesonotum and abdomen are often shiny metallic black, blue, green or coppery (generally dark in Ophiomyia, except for a few species); the facial keel is narrow, usually not raised from the base of the antenna, but if raised and widely dividing the antennal bases (Fig. 248), then no spherical bulbous process is present (the facial keel is wide, raised and forms a spherical bulbous process between the bases of the antenna in Ophiomyia, except for a few of species having a narrow flattened facial keel that can only be separated from the species of Melanagromyza by examination of the male genitalia); the fronto-orbital setae are in 2–4 rows (usually a single row in Ophiomyia, except for a few species with 2–3 rows); the eyes are usually pilose dorsally; the fronto-orbital plate is wide at the middle with a larger distance between the anterior two ori than ors in some species (usually with the same distance between ori and ors in Ophiomyia); the vibrissal fasciculus is absent and there is rarely (e.g., in Melanagromyza buccalis Spencer) a vibrissal angle (most species of Ophiomyia have a vibrissal fasciculus and a distinct vibrissal angle); the gena is often highest at the middle (the gena is usually distinctly highest near the anterior angle in Ophiomyia); the mid tibia usually has 2 postero medial setae (often 0–1 postero medial setae in Ophiomyia); in the male genitalia, the basiphallus is short and U- or V-shaped (circular in few species) and the distiphallus is symmetrical (in Ophiomyiza, the basiphallus is elongate and asymetrically U- or V-shaped, and the distiphallus is usually asymmetrical (except symmetrical in five species of the Ophiomyia jacintensis species group)).

Although much about their host plants is unknown, host plant use for many species appears to be generally restricted to a single plant family or tribe, rather than displaying polyphagy, so data regarding host plants may be important for assessing sister-species relationships and lineages (Boucher 2010; Braun et al. 2009; Gaimari et al. 2004; Spencer 1966a, 1973a, 1981, 1990), although Lonsdale (2014) suggested that among Agromyzinae, particular feeding categories (e.g., leaf mining, stem mining/boring, gall forming) likely occurred independently multiple times. Across the species of Melanagromyza in California, the majority of reported host plants are members of the Asteraceae, although some species also attack Apiaceae, Boraginaceae, Cucurbitaceae, Fabaceae, Salicaceae, Scrophulariaceae, and/or Urticaceae. Some species have been collected in association with (but not reared from) plant species in the Hydrangeaceae, Rosaceae and/or Rutaceae, so their statuses as host plants are not known.

The 27 Californian species of Melanagromyza are described or redescribed, illustrated and photographed, and
a key to separate the species is presented. Distribution maps are provided for each species, along with the distributions of the host plant or potential host plant species. Three species, *M. californiana* sp. nov., *M. chemsaki* sp. nov. and *M. gonzalesina* sp. nov. from California are described as new to science, and *M. martini* Spencer, is recorded from California (and the USA) for the first time.

Although a few species have particular external characteristics that easily separate them from other species, most species require study of male genitalia (Spencer 1966a, 1981; Spencer & Steyskal, 1986). Components of the phallic complex are sometimes weakly sclerotized, and the connection points of different structures are not always clear. It is also sometimes difficult to interpret which structure is upper or lower, and structures illustrated by different authors are sometimes labeled and interpreted differently. Some external characteristics are slightly variable among specimens of a given species. For example, the number and position of *dc* on the mesonotum can be important characters to separate species of *Melanagromyza*, but this number can occasionally vary among specimens of the same species, and should only be used to diagnose or define species together with other morphological characters. For species with similar male genitalia, and with morphological variation externally in adults, the original descriptions and rough figures of male genitalia are often inadequate without having studied the type specimens, which we are trying to remedy in this publication. Regarding identification of females, for species that are externally very similar, more diagnostic characters of the female terminalia need to be studied, possibly including the length and structures of the ovipositor sheath.

**Material and methods**

General terminology follows Cumming & Wood (2009), Spencer & Steyskal (1986) and Lonsdale (2011). Genitalia preparations (except those type specimens described by Spencer) were made by removing and macerating the abdomen in hot potassium hydroxide (10% solution) for 5–10 min, then washing in deionized water with a few drops of glacial acetic acid. After examination, they were transferred to glycerin and stored in a microvial on the pin below the specimen. Specimens were examined or deposited in the following collections:

Natural History Museum, London, United Kingdom (BMNH)
California Academy of Sciences, San Francisco, California, USA (CAS)
Canadian National Collection of Insects, Arachnids & Nematodes, Ottawa, Ontario, Canada (CNC)
California State Collection of Arthropods, California Department of Food and Agriculture, Sacramento, California, USA (CSCA)
Essig Museum of Entomology, University of California, Berkeley, California, USA (EMEC)
Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA (MCZ)
Bohart Museum of Entomology, University of California, Davis, California, USA (UCD)

The following abbreviations for setae are used: anepst—anepisternal, acr—acrostichal, dc—dorsocentral, kepst—katepisternal, ori—inferior fronto-orbital, ors—superior fronto-orbital.

The measurements of length are as follows (Fig. 1). Height of frons: distance from anterior margin of frons to vertex. Width of frons: distance between the inner eye margins. Width of eye: distance from inner margin of frons to the furthest lateral point. Width of fronto-orbital plate: the largest distance between dorsal margin of eye and inner margin of fronto-orbital plate. Width of lunule: the largest distance along ventral margin in anterior view. Height of gena: distance from the ventral margin of eye to ventral margin of gena. Highest point of gena: the greatest height.

The following ratio is used. Costal ratio: proportion of distances along the costa from the 2nd (between R₁ and R₂+₃), 3rd (between R₂+₃ and R₄+₅) and 4th (between R₄+₅ and M₁+₂) sections.

New illustrations were made from holotypes and paratypes that were dissected and fixed on hard cards by Spencer, or from our own dissections of type and non-type materials. New illustrations were made whenever possible, but parts of the phallus and sperm pumps were sometimes fixed in bad postures, so the illustrations from Spencer (1981) and Spencer & Steyskal (1986) were used. Several illustrations were also provided by Owen Lonsdale (CNC).
Maps of species distributions include the distributions for their putative or known host plants, with data provided by the participants of the Consortium of California Herbaria (http://ucjeps.berkeley.edu/consortium/). These data represent databased specimens of the Consortium, and may not reflect comprehensive distributional information for cultivated plants. Most plant species that are cultivated (e.g., carrots) are mostly recorded in the database by specimens of their wild counterparts (e.g., Queen Anne’s lace). The Consortium of California Herbaria, the Jepson eFlora (http://ucjeps.berkeley.edu/UM.html), which parallels the Jepson Manual, Second Edition), and CalFlora (2011) were the sources for all information about these host plants in California, and is summarized in the "Biology/Host plants" section for each species. The inclusion of host-plant distributions on the maps, and further information about these plants, are provided as a guide for the potential distribution of these agromyzids in California with respect to the range and habitats of their known or potential host plants, recognizing the fact that many of these species may have additional plant species in their host range, and that many of the agromyzid species do not necessarily follow the entire range of their host plant. This information may also be useful with respect to the potential distributions of these Melanagromyza species outside of California. Note, multiple common names are listed for individual plant species (separated by a slash, “/”) when they are so indicated in the resources above. Information about host plants for all species was taken from the label data of the specimens, as well as from the literature (primarily Spencer’s works). All new distributional records are indicated by an asterisk (*).

**Key to the California species of Melanagromyza**

1. Wing with costa terminating between R and M(Fig. 251) .......................... M. tripiniosa Spencer
   - Wing with costa extending to M(Fig. 251) ........................................... 2
2. Mesonotum with presutural dc ................................................................. 3
   - Mesonotum without presutural dc ....................................................... 4
3. Mesonotum with 1+3–4 dc (Fig. 199); r-m at or close to apical 1/3 of discal cell (Fig. 201); frons with 6–7 ori inclinate (Fig. 197); basiphallus U-shaped with arms diverging apically (Fig. 202); distiphallus broad basally and narrow at apical 1/3 point without subapical concavity or pointed tips (Figs 204, 205) .......................... M. quadristosa Spencer
   - Mesonotum with 1+2 dc (Fig. 239); r-m at middle of discal cell (Fig. 240); frons with 4–5 ori inclinate (Fig. 237); basiphallus V-shaped; distiphallus broad at apical 1/3, narrowing subapically with two pointed tips (Figs 243, 244) .......................... M. tripinella Spencer
4. Mesonotum with 0+3–4 dc ................................................................. 5
   - Mesonotum with 0+2 dc ................................................................. 7
5. Calypter margin and fringe blackish brown (Fig. 207) .................................. M. sagehenensis Spencer
   - Calypter margin and fringe white to pale yellow ..................................... 6
6. Frons not projecting above eye (Fig. 95); fronto-orbital plate with 2 ori (Fig. 94); facial keel not raised (Fig. 94); basiphallus trapezoid-shapes (minus the longer base) with lateral arms diverging apically (Fig. 101); distiphallus with two pairs of triangular dorsal processes (Fig. 102) .......................... M. gonzalesina sp. nov.
   - Frons distinctly projecting above eye (Fig. 215); fronto-orbital plate with 4–5 ori (Fig. 216); facial keel raised, separating bases of antennae; basiphallus U-shaped and with tips of lateral arms slightly curved inward; distiphallus without dorsal processes (Figs 221, 222) .......................... M. scorpiulareae Spencer
7. Lunule extending posteriorly to ocellar triangle; frons, lunule, ocellar triangle, fronto-orbital plate entirely brilliantly shining (Fig. 291); basiphallus V-shaped, broadly triangular (Fig. 297) with 1–2 concavities and teeth (Fig. 298); distiphallus very long, broad basally and narrow apically with pointed apex (Fig. 298) .......................... M. viridis (Frost)
   - Lunule not extending posteriorly to ocellar triangle; frons, lunule, ocellar triangle, fronto-orbital plate not brilliantly shining simultaneously, often only one of them brilliantly shining, or slightly shining or dark; basiphallus U-shaped or with flattened base; distiphallus various, but not as above ........................................... 8
8. Frons distinctly projecting above eye (e.g., Fig. 125); parafacial broad and rounded under lowest margin of eye (e.g., Fig. 261) ........................................... 9
   - Frons not projecting above eye (e.g., Fig. 44), if slightly projecting above eye, then parafacial thin, or indistinguishable ........................................... 16
9. Calypters with margin and fringe white or pale yellow .................................. 10
   - Calypters with margin and fringe gray, brown or black .................................. 12
10. Gena about 1/3 height of eye (Fig. 134); mesonotum weakly shining, acr in 6 rows; mid tibia with 1 strong posterior seta ........................................... M. martini Spencer
   - Gena about 1/5–1/4 height of eye; mesonotum with brilliantly greenish sheen, acr in 8–10 rows; mid tibia with 2 strong posterior setae ........................................... 11
11. Ocellar triangle extending to anterior ors (Fig. 260); eye bare; r-m at middle of discal cell (Fig. 263); basiphallus subcircular, distiphallus broadened from base to apex (Fig. 267) .......................... M. urticella Spencer
   - Ocellar triangle extending to second or (Fig. 55); eye pilose; r-m slightly or distinctly beyond middle of discal cell (Fig. 58); basiphallus nearly U-shaped, distiphallus constricted subbasally and narrowing apically (Figs 60, 61) .......................... M. cirsiiophila Spencer
12. Facial keel broad and raised, separating antennal bases (Fig. 124) .......................................................... 13
- Facial keel thin, not raised .................................................. 14
13. Gena about 1/3 height of eye (Fig. 125); fronto-orbital plate with 6 ori (Figs 124, 125); fronto-orbital setae in 3–4 rows, erect or reclinate except for several irregularly inclinate or proclinate; mid tibia with 1–2 posterior setae; distiphallus with a pair of narrow apically-tapering processes with undulating lateral margins (Fig. 130) .................................. *M. marinensis* Spencer
- Gena about 1/6 height of eye (Fig. 187); fronto-orbital plate with 4–5 ori (Fig. 188); fronto-orbital setae in 2 rows, inner row proclinate and outer row reclinate; mid tibia without posterior setae; distiphallus blunt and rounded apically, with processes thick and bluntly rounded (Fig. 193) .......................................................... *M. palensis* Spencer
14. Fronto-orbital setae sparse, in 2 rows, inner row inclinate and outer row reclinate except on anterior margin; ocellar triangle extending to anterior margin of frons (close to third ori) (Fig. 116); distiphallus with large posterodorsal extension (Fig. 122) .......................................................... *M. maligna* Spencer
- Fronto-orbital setae dense, in 3 rows, mostly reclinate or proclinate; ocellar triangle extending to posterior ori or anterior oris; distiphallus without a large posterodorsal extension ........................................ 15
15. Gena about 1/6 height of eye (Fig. 187); fronto-orbital plate with 4–5 ori (Fig. 24); eye bare; highest point of gena slightly behind middle of eye (Figs 22, 23); basiphallus subcircular, and with narrow upper margin; distiphallus narrow on apical 1/2 with two pairs of small pointed processes (Fig. 29) .......................................................... *M. malevolai* Spencer
- Gena about 1/7–1/6 height of eye (Fig. 193); eye pilose; highest point of gena at middle (Fig. 106); basiphallus U-shaped; distiphallus with a small subbasal tooth present and apical membranous section slightly curved (Figs 112, 113) .................................................. *M. minima* Malloch
16. Calypter with margin and fringe gray, brown or black .............................................................................. 17
- Calypter with margin and fringe white or pale yellow .............................................................................. 18
17. Fronto-orbital plate nearly 1/4 width of frons and distinctly wider at middle, with 3–4 ori (Fig. 43); wing with r-m at middle of discal cell (Fig. 47); distiphallus laterally with a medially-directed pair of pointed triangular processes (Fig. 51), and membranous apex turned down (Fig. 52) .......................................................... *M. chemsaki* sp. nov.
- Fronto-orbital plate nearly and not widened at middle, with 2 ori (Fig. 145); wing with r-m beyond middle of discal cell; distiphallus lacking medially-directed processes, and apex not turned down .............................................. 19
18. Mid tibia with 2 strong posterior setae; phallus with a long gap between basiphallus and distiphallus (Figs 152, 153); female ovipositor sheath distinctly elongated, slender columnar (Fig. 149) .......................................................... *M. minimoides* Spencer
- Mid tibia with 1 strong posterior seta; phallus with a short gap between basiphallus and distiphallus (Figs 163, 164); female ovipositor sheath elongated, moderately, trapziform .................................................. *M. minimoides* Spencer
19. Facial keel slightly broadened, raised and separating antennal bases (Fig. 168) .............................................. 20
- Facial keel thin, not raised .................................................. 21
20. Fronto-orbital plate with 2 ori, anterior ori widely separated from posterior ori; fronto-orbital plate narrow on anterior 1/2 without dense setae (Fig. 168); distiphallus broad (Figs 173, 174) .......................................................... *M. maguerai* Spencer
- Fronto-orbital plate with 3 ori (Fig. 176), equally spaced; fronto-orbital plate with anterior margin broad and with dense setae (Figs 176, 177); distiphallus slender (Figs 183, 184) .......................................................... *M. osofalcensis* Spencer
21. Frons along dorsal eye margin distinctly rounded (Fig. 274); fronto-orbital setae in 3–4 dense rows; fronto-orbital plate distinctly broad at middle, about 1/4–1/3 width of frons (Figs 272, 273) .......................................................... *M. splendida* Frick
- Frons along dorsal eye margin sloping distinctly or slightly (Figs 12, 14); fronto-orbital setae in 2–3 rows; fronto-orbital plate slightly or not widened at middle, at most 1/4 width of frons .......................................................... *M. splendida* Frick
22. Arista entirely bare; proportional distance between setae in the oris series from anterior to posterior 4:5:1.5:1 (Figs 225–228); surstylus without distinctly long and rough apical spines (Fig. 231); distiphallus with a pointed triangular process subapically (Figs 233, 234) .......................................................... *M. virens* Loew
- Arista with microscopic setae; proportional distance between setae in the oris series from anterior to posterior 2.9:1.7:1 (Fig. 272, 273, 278); surstylus with several distinctly elongated and rough apical spines in addition to other dense short spines (Fig. 284) .......................................................... *M. virens* Loew
23. Gena protruding forward on anterior margin, highest point of gena near anterior margin (Figs 12, 14); distiphallus with a pair of triangular dorsal processes (Fig. 20, arrow) and a pair of tiny median teeth (Fig. 19, arrow) .......................................................... *M. bucaulis* Spencer
- Gena not protruding forward on anterior margin, highest point of gena at middle or slightly behind middle; distiphallus lacking triangular dorsal processes and tiny median teeth .......................................................... *M. bucaulis* Spencer
24. Fronto-orbital plate not wide at middle (Fig. 74); highest point of gena at or slightly behind middle, about 1/4–1/3 height of eye (Figs 72, 73); distiphallus short, subequal in length and width, with medial section broadest and apical section short and semi-circular (Fig. 82) .......................................................... *M. gibsonii* Malloch
- Fronto-orbital plate slightly widened at middle (Fig. 87); highest point of gena at middle, about 1/7–1/4 height of eye; distiphallus longer than wide, with medial and apical sections longer than wide .......................................................... *M. gibsonii* Malloch
25. Gena about 1/7–1/6 height of eye (Fig. 86); distiphallus with medial section broad and parallel-sided (Fig. 90) .......................................................................................................................... *M. gnaphali Spencer
- Gena broad, about 1/5–1/4 height of eye (Fig. 33); distiphallus tapering distally (Figs 39, 68) .................................................. 26
26. Mid tibia with 1 strong posterior seta; surstylus with short rough spines in more than 3 rows (Fig. 37); hypandrium with a pair of triangular processes on inner margin of lateral arms (Fig. 38); distiphallus truncate apically with a small pointed process near upper middle section (Figs 39, 40) .......................................................... *M. caniforma* sp. nov.
- Mid tibia with 2 strong posterior setae; surstylus with 2 strong apical spines and thinner setae in 2 rows (Fig. 67); hypandrium without pointed triangular processes; distiphallus rounded apically, with two slender spine-like projections (Figs 68, 69) .......................................................................................................................... *M. corrallensis* Spencer
Melanagromyza Hendel


Limnoagromyza Malloch, 1920: 147. Type species Limnoagromyza diantarhoe Malloch, 1920, by original designation. Frick, 1952: 376 (syn.)

California species:

Melanagromyza buccalis Spencer, 1969
(Figs 11–21, Map 4)


Diagnosis. Frons not projecting above eye, about 1.8 times as wide as eye; 2–3 ori inclinate; fronto-orbital plate very slightly shining, about 1/4 width of frons; fronto-orbital setulae in 2–3 irregular rows, single inner row inclinate and two outer rows reclinate. Gena about 1/5 height of eye, protruding forward on anterior margin. Mesonotum and scutellum shiny green or bluish green. Calypter white, margin pale yellow and fringe white. Mid tibia with 1 strong posterior seta. Abdomen with brilliant greenish sheen, to slightly coppery.

Redescription. MALE. Body length 1.9–2.0 mm, wing length 2.1–2.2 mm. FEMALE. Body length 1.9–2.4 mm, wing length 2.0–2.5 mm.

Head (Figs 12–14) black. Frons dark, not projecting above eye, 1.25 times as wide as long, about 1.8 times as wide as eye; 2–3 ori inclinate, 2 ors reclinate, orl and ors strong, proportional distance between setae in the orl-ors series from anterior to posterior 2:2:1:1; fronto-orbital plate very slightly shining, blackish brown and anterior margin brown, about 1/4 width of frons; fronto-orbital setulae in 2–3 irregular rows, single inner row inclinate and two outer rows reclinate; ocellar triangle slightly broad and shining, extending to posteriormost orl; oc strong, as long as ors; postocular setae strong. Lunule grayish brown, 1.4 times as wide as high. Gena brown to blackish brown, about 1/5 height of eye, protruding forward on anterior margin (Figs 12, 14). Eye pilose. Antenna blackish brown, 1st flagellomere short ovate with long setulae, and arista bare. Proboscis pale brown, palpus black.

Thorax (Fig. 11) black. Mesonotum and scutellum with brownish pruinosity, with greenish or bluish green sheen. Mesonotum with 0+2 dc, acr in 8 irregular rows. 1 strong anepst with 2 long setulae and sparse short setulae, 1 kepst with 2 short setulae. Calypter white, margin pale yellow and fringe white. Fore tibia without posterior setae and mid tibia with 1 strong posterior seta. Wing (Fig. 15) with costa extending to M 1+2; costal ratio 4.3:1.3:1; r-m beyond middle of discal cell; ultimate and penultimate sections of M 1+2 in proportion of 1.7:1; ultimate and penultimate sections of CuA 1 in proportion of 1:1.4. Halter blackish brown.

Abdomen (Fig. 11) black with brilliant greenish sheen, slightly coppery. Male genitalia (Figs 16–21): epandrium with a wide posterodistal concavity and small inner posteromedial spines; surstylus short and broad, with dense short spines in more than 2 rows; hypandrium slender Y-shaped with long hypandrial apodeme; basiphallicus U-shaped with ends pointed; distiphallus with a pair of triangular dorsal processes (Fig. 20, arrow) and a pair of tiny median teeth (Fig. 19) and two pairs of pointed processes; ejaculatory apodeme variably fan-shaped, asymmetrical or symmetrical, with stem long.

Non-type material. CALIFORNIA: Alpine Co., 1 female (CSCA), Woodfords, 38°46’39.66″N 119°49’18.64″W, 28.VII.1930, H.H. Keifer; Humboldt Co., 1 female (CSCA), Korbel, 40°52’14.00″N 123°57’26.00″W, 17.VI.1960, T.R. Haig; Imperial Co., 1 male (EMEC), 17 mi. NW Glamis, 32°59’36.64″N 115°03’55.08″W, 1.IV.1978, J. Powell (No. 7803, reared from Legume); Inyo Co., 1 female (EMEC), 3 mi. N Lone Pine, 36°37.104’N 118°04.129’W, 8.VII.1961, G.I. Schlinger; Lassen Co., 2 males, 1 female (EMEC), S. Ravendale, Secret Cr. 13 mi., 40°35’59.32″N 120°14’40.72″W, ex. Salix, 5.VI.1970, P.A. Rude; Marin Co., 2 males, 1 female (CSCA), San Rafael, 37°58’24.73″N 122°31’51.91″W, 5.X.1941, ex. on leaf of Hydrangea, B. Fehlman; 4 males (CSCA), Santa
Venetia, 37°59′54.72″N 122°31′30.91″W, 5.X.1941, ex. *Citrus*, B. Wiard; **Mendocino Co.**, 1 male (EMEC, No. 215549, male genitalia No. 4815), Inglenook Fen area, 39°30′41.40″N 123°46′24.32″W, 2.VIII.1972, el. 30–50′, E.I. Schlinger; 1 male (EMEC, No. 220541), Inglenook Fen, 4 mi. N. Fort. Bragg, 39°26′06.54″N 123°48′28.49″W, 27.VII.1975, M.E. Buegler and E.I. Schlinger; 1 male (UCD), Ukiah, 39°09′06.62″N 123°12′28.02″W, ex. Lawn grass, 7.X.1941, R.M. Bohart; **Mono Co.**, 1 male (EMEC, male genitalia No. 4723), Cottonwood Creek 9300′, 40°22′46.36″N 122°16′45.51″W, 10.VII.1961, H.V. Daly; 1 male (EMEC, male genitalia No. 4698), White Mts., Crooked Creek, 9000 ft, 40°28′46.44″N 122°19′19.83″W, 20.VI.1953, J.W. MacSwain; 1 male (EMEC), Sonora Pass, 37°58′32.98″N 120°20′38.53″W, 13.VIII.1960, W.A. Steffan; **Monterey Co.**, 1 female (CSCA), Salinas, 36°40′39.85″N 121°39′19.80″W, 27.VII.1962, ex. *Dahlia* [collector not given]; **Orange Co.**, 1 male (EMEC, male genitalia No. 4699), Anaheim, 33°50′07.05″N 117°54′52.24″W, 28.VI.1957, C.A. Toschi; 1 female (CSCA), Anaheim, 33°50′07.05″N 117°54′52.24″W, ex. Japanese Beetle trap, 4.VIII.1938, C.E. Norland; **Sacramento Co.**, 1 female (CSCA), Sacramento, 38°34′53.66″N 121°29′39.84″W, 30.IX.1968, in swimming pool, F.L. Blanc; 1 male, 2 females (CSCA), American River, 38°35′56.35″N 121°21′51.03″W, 20.IX.1966, R.A. Belmont; 1 female (CSCA), Sacramento, 38°34′53.66″N 121°29′39.84″W, 17.VIII.1930, H.H. Keifer; 1 female (CSCA), Sacramento, 38°34′53.66″N 121°29′39.84″W, 8.VI.1930, H.H. Keifer; 3 females (CSCA), Sacramento, 38°34′53.66″N 121°29′39.84″W, 16.IX.1933, H.H. Keifer; 2 females (CSCA), Sacramento, 38°34′53.66″N 121°29′39.84″W, 14.VII.1930, H.H. Keifer; 1 male, 1 female (CSCA), Sacramento, 38°34′53.66″N 121°29′39.84″W, 17.VI.1935, Wilson; **San Diego Co.**, 2 females (CSCA), Borrego St. Park, 33°15′28.01″N 116°24′24.32″W, 28.III.1977, M. Wasbauer and J. Slansky; **San Luis Obispo Co.**, 2 males, Montana de Oro St. Pk. Dunes 3 mi. SW Los Osos, 35°19′21.08″N 120°49′52.79″W, 16–17.VIII.1983, Malaise trap 10A-4P, M. Wasbauer & P. Adams; **Solano Co.**, 1 female (CSCA), L. Berryessa, 0.85 mi., SW Monticello Dam, 500m, 38°30′47.79″N 121°29′39.84″W, ex. vegetation along shoreline, 4.VI.2002, S.D. Gaimari; 1 male (CSCA), Col. Vallejo, 38°06′14.71″N 122°15′23.89″W, 28.XI.1941, H. Ward; **Sonoma Co.**, 3 males, 3 females (CSCA), Santa Rosa, 38°26′25.68″N 122°42′51.95″W, 9.VIII.1962, ex. Rose, W. Ward collector; **Stanislaus Co.**, 1 male (UCD), Modesto, 37°38′20.75″N 120°59′48.76″W, ex. resting on *Chrysanthemum*, 30.X.1948, W.H. Lange; **Trinity Co.**, 2 males (EMEC), Mountain Meadow Ranch, head Coffee Creek, 5100′, 41°05′20.55″N 122°42′27.83″W, 8–10.VI.1969, J. Powell; **Yolo Co.**, 8 males, 6 females (UCD), Davis, 38°32′41.66″N 121°44′25.86″W, 14.VI.1953, E.I. Schlinger; 2 males (UCD), Davis, 38°32′41.66″N 121°44′25.86″W, 14.VI.1953, E.I. Schlinger; 2 males (UCD), Davis, 38°32′41.66″N 121°44′25.86″W, 14.VI.1953, A.T. McClay; 1 female (UCD), Davis, 38°32′41.66″N 121°44′25.86″W, 11.VIII.1955, E.A. Kurtz; 1 female (UCD), Davis, 38°32′41.66″N 121°44′25.86″W, 19.VII.1939 [collector not given]; 1 female (UCD), Davis, 11.VI.1964, C.R. Kovacic; 1 male (UCD), Davis, 38°32′41.66″N 121°44′25.86″W, 15.VII.1962, R.O. Schuster. **MISSOURI**: **Boone Co.**, 1 male (CSCA), Columbia, ex. Malaise trap, 20.VII.1970, F.D. Parker collector; 1 female (CSCA), Columbia, 10.VI.1949, [collector not given].

**Biology/Host plants.** This species has been reared from an unknown legume in California. It has also been collected in association with Sierra willow / mountain willow, *Salix westwoodiae* A. Heller (Salicaceae), and other *Salix* species, and seems to be a likely host, although Spencer (1981) and Spencer & Steyskal (1986) speculated that it could attack species of *Arnica* (Asteraceae) or other asters found nearby to willows. See Map 4 for the California distribution of *M. buccalis* and the potential host *Salix westwoodiae*. This plant species is native to California, being found in alpine and subalpine meadows, along streams and talus at elevations between 1600–3800 m through much of northern California, to western Canada, Montana, Wyoming and New Mexico. The plant is known from the Klamath, North Coast and High Sierra Ranges, the High Sierra Nevada, Modoc Plateau, and White and Inyo Mountains. In addition, *M. buccalis* has been collected in association with species of *Chrysanthemum* (Asteraceae), *Citrus* (Rutaceae), *Dahlia* (Asteraceae), *Hydrangea* (Hydrangeaceae) and *Rosa* (Rosaceae).


**Remarks.** The male genitalia of the species has two distinct characters to separate it from other species of the genus: distiphallus with a pair of triangular dorsal processes in lateral view, and a pair of tiny median teeth in ventral view.

Another important characteristic is the gena protruding forward on the anterior margin, but occasionally this
can be confused with some species of the genus *Ophiomyia* which have 1 strong vibrissa and a narrow, but not raised, facial keel. However, in most of cases, the *Ophiomyia* species have a narrower orbital plate, orbital setae in a single row, and the frons along the dorsal eye margin sloping sharply in lateral view. Also, in *Ophiomyia*, the clypeus is truncate apically and is often narrow and parallel-sided (Lonsdale, 2014).

**Melangaromyza burgessi** (Malloch, 1913)
(Figs 22–31, Map 1)

*Agromyza burgessi* Malloch, 1913: 323. Type locality: USA. Massachusetts: Essex Co., Beverly. HT ♀, USNM.


*Melangaromyza malefica* Spencer, 1981: 46. Type locality: USA. California: San Diego Co., La Mesa. HT ♀, CAS. Spencer & Steyskal, 1986: 244 (syn.).

**Diagnosis.** Frons about 1.5 times as wide as eye, and slightly projecting forward; 4–6 *ori* inclinate and 2 *ors* reclinate; fronto-orbital plate shining, about 1/4–1/6 width of frons, anterior margin broad with dense setulae; fronto-orbital setulae in 3 rows, reclinate; ocellar triangle slightly shining on posterior 2/3 and extending between posteriormost *ori* and anterior *ors*. Parafacial broad. Gena about 2/5 eye height, highest point located slightly beyond middle. Eye and arista bare. Mesonotum with slightly greenish or bluish greenish sheen in posterior view. Calypter whitish gray, margin blackish brown and fringe brown. Mid tibia with 2 strong posterior setae. Abdomen slightly greenish, sometimes bluish green or with coppery sheen.

**Redescription.** MALE. Body length 2.7–2.8 mm, wing length 2.7–2.8 mm. FEMALE. Body length 2.9 mm, wing length 3.3 mm (Holotype).

Head (Fig. 24) brown. Frons dark, nearly as wide as long, 1.5 times as wide as eye, and slightly projecting forward beyond eye margin; 4–6 *ori* and 2 *ors*, strong, subequal in length; proportional distance between setae in the *ori*-ORS series from anterior to posterior subequal; fronto-orbital plate blackish brown (Holotype female: black before third *ori* and reddish brown after third *ori*), shining, about 1/4–1/6 height of frons, and anterior margin slightly widened; fronto-orbital setulae in 3 rows, reclinate except anterior margin with few inclinate or proclinate, and anterior margin broad with dense setulae; ocellar triangle brown, slightly shining on posterior 2/3, and extending between posteriormost *ori* and anterior *ors*; oC strong, shorter than *ori* and *ors*; postocellar setae strong. Lunule brownish gray, 1.6 times as wide as high, semicircular. Parafacial black, about 1/7 eye height, broad. Gena brown to blackish brown, about 2/5 height of eye, and highest point located slightly posterior to middle of eye. Eye bare. Antenna brown, 1st flagellomere short ovate, and arista bare. Proboscis yellowish brown, palpus brown or black.

Thorax (Figs 22, 23, 25) black. Mesonotum and scutellum with brownish pruinosity and slightly greenish or bluish green sheen in posterior view. Mesonotum with 0+2 dc, acr in 10 irregular rows. 1 strong *anepest* with 2 long setulae and 4–5 short setulae, 1 strong *kepest* with 1 long setula and 1–2 short setulae. Calypter whitish gray, margin blackish brown and fringe brown. Mid tibia with 2 strong posterior setae. Wing (Fig. 26) with costa extending to M1+2; costal ratio 3.7:1.2:1; r-m slightly beyond middle of discal cell; ultimate and penultimate sections of M1+2 in proportion of 1:1.1; ultimate and penultimate sections of CuA1 in proportion of 1:1.3. Halter blackish brown.

Abdomen (Figs 22, 23) black (Holotype female: reddish brown) with slightly greenish, bluish green or coppery sheen. Male genitalia (Figs 27–31): epandrium with a pair of large triangular subapical spines; surstyli with a wide apical concavity, long apical setae and sparse short spines; hypandriumY-shaped with short and blunt hypandrial apodeme; basiphallus subcircular, ventral margin narrower; distiphallus narrow on apical 1/2 with two pairs of small pointed processes; ejaculatory apodeme asymmetrical with long stem.


**Biology/Host plants:** Unknown.

**Distribution.** USA (California (Map 1) [San Diego Co., San Luis Obispo Co., Santa Clara Co., Ventura Co.], Colorado, Illinois, Indiana, Kansas, Massachusetts, Michigan, New York, North Dakota).

**Remarks.** The species is one of two species of the genus *Melanagromyza* in California with a subcircular basiphallus, the other being *M. urticella*. While *M. urticella* has a brilliant green sheen on the mesonotum and a
brilliant greenish, bluish, bluish green or coppery green sheen on the abdomen, the sheen is considerably more subdued in *M. burgessi*. In addition, the calypter is gray, brown or black on the margin and fringe in *M. burgessi*, while white or pale yellow in *M. urticella*.

**Melanagromyza californiana** sp. nov.  
(Figs 32–41, Map 2)

**Diagnosis.** Male. Frons with 2 *ori* inclinate and 2 *ors* reclinate, with large distance between 2 *ori*, about 4–5 times wider than distance between posterior *ori* and anterior *ors*; fronto-orbital plate slightly widened at middle and moderately shining, about 1/5–1/4 width of frons; fronto-orbital setulae in 2 rows on anterior 1/3, and 3 rows on posterior 2/3, single inner row inclinate or proclinate and 1–2 outer rows reclinate; ocellar triangle shining, extending to anterior *ors*. Gena about 1/5–1/4 height of eye, highest point located at middle of eye. Mesonotum and scutellum with bluish green sheen, with gray pruinosity. Calypter white, margin and fringe pale brownish yellow. Mid tibia with 1 strong posterior seta. Abdomen with bluish green to coppery sheen.

**Description.** MALE. Body length 2.0 mm, wing length 2.2 mm.

Head (Figs 33, 34) black. Frons dark with fronto-orbital plate and ocellar triangle shining, with anterior margin narrow, pale orange yellow, and slightly projecting forward beyond eye margin (Fig. 33); 1.1–1.3 times wider than long, as wide as eye; 2 *ori* inclinate, far apart, about 4–5 times farther than distance between posterior *ori* and anterior *ors*; 2 *ors*, with anterior *ors* slightly inclinate, posterior *ors* reclinate, erect; fronto-orbital plate slightly widened at middle and moderately shining, about 1/5–1/4 width of frons; fronto-orbital setulae in 2 rows on anterior 1/3 and 3 rows on posterior 2/3, inner single row inclinate or proclinate and outer 1–2 rows reclinate; ocellar triangle shining, extending to anterior *ors*. Facial keel narrow and not raised. Lunule with whitish gray pruinosity, 1.2 times as wide as high. Gena brown, about 1/5–1/4 height of eye, highest point located at middle. Eye pilose on dorsal margin. Antenna black, arista brown and bare. Proboscis yellowish brown, palpus brown to black.

Thorax (Figs 32, 35) black. Mesonotum and scutellum with sparse gray pruinosity and a weak greenish sheen. Mesonotum with 0+2 *dc*, *acr* in 10 rows. 1 strong *anept* with 2 long setulae, 1 strong *kepst* with 4–5 short setulae. Calypter white, margin and fringe pale brownish yellow. Mid tibia with 1 strong posterior seta. Wing (Fig. 36) with costa extending to M$_{1+2}$; costal ratio 4.9:1.6:1; *r*-m slightly beyond middle of discal cell; ultimate and penultimate sections of CuA, in proportion of 1:1.6. Halter blackish brown.

Abdomen black, with slightly bluish green to coppery sheen. Male genitalia (Figs 37–41): epandrium with a wide postero-distal concavity; surstylus with short spines in more than 3 rows; hypandrium Y-shaped with long curved hypandrial apodeme and a pair of triangular processes on inner margin (Fig. 38); basiphallus short U-shaped with two small basal processes; distiphallus widest subbasally with a slight constriction before a shallow bulge; ejaculatory apodeme broad and fan-shaped with short stem.

FEMALE. Unknown.


**Biology/Host plants:** Unknown.

**Distribution.** USA (California (Map 2) [Modoc Co.]).

**Remarks.** The new species is similar to *Melanagromyza corralensis* Spencer in the following characters: the frons has a large distance between the anterior and posterior *ori*, the fronto-orbital plate is slightly widened medially, being about 1/5–1/4 the width of the frons; the facial keel is narrow and not raised; the gena is about 1/5–1/4 the height of the eye; the calypter is white; the distiphallus has a lateral concavity. But it can be separated from *M. corralensis* by the following characters: the mid tibia has 1 strong posterior seta, the surstylus has more than 3 rows; the hypandrium has a pair of triangular processes on the inner surface of the arms; the basiphallus is short and U-shaped with small apical teeth; the distiphallus has a small triangular dorsolateral process; the ejaculatory apodeme is broad and fan-shaped with a short stem. In *M. corralensis*, the mid tibia has 2 strong posterior setae; the surstylus has 2 strong apical spines and thinner setulae in 2 rows; the hypandrium has no pointed triangular processes; the basiphallus is long and U-shaped; the distiphallus has two pointed spines; the ejaculatory apodeme is narrowly fan-shaped with long stem.

**Etymology.** The new species is named after the type locality California.
FIGURES 32–36. Melanagromyza californiana sp. nov. Holotype male (CSCA). 32. habitus, lateral view; 33, 34. head, lateral and anterior view; 35. thorax, dorsal view; 36. wing.
FIGURES 37–41. Melanagromyza californiana sp. nov. Holotype male (CSCA). 37. epandrial complex, lateral view; 38. hypandrium and postgonite, ventral view; 39. phallic complex, ventral view; 40. phallic complex, lateral view; 41. sperm pump. Scale 0.1 mm.
Melanagromyza chemsaki sp. nov.
(Figs 42–53, Map 1)

**Diagnosis.** Frons not projecting above eye, with 3–4 ori inclinate and 2 ors reclinate; fronto-orbital plate about 1/4 width of frons, not broad at middle, slightly shining; fronto-orbital setulae in 2 rows, inner row procline and outer row reclinate; ocellar triangle weakly shining. Gena about 1/5 height of eye, highest point located at middle. Mesonotum and scutellum with slightly bluish sheen. Calypter gray, margin and fringe blackish brown. Mid tibia with 2–3 strong posterior setae. Wing with r-m at middle of discal cell. Abdomen blackish brown with slightly greenish sheen.

**Description.** MALE. Body length 2.0 mm, wing length 2.4 mm.

Head (Figs 43–45) mostly blackish brown. Frons dark brown, not projecting above eye, as wide as eye; 3–4 ori inclinate and 2 ors reclinate; proportional distance between setae in the ori-ors series from anterior to posterior subequal; ori subequal in length, slightly shorter than ors; fronto-orbital plate about 1/4 width of frons, not broad at middle, slightly shining; fronto-orbital setulae in 2 rows, inner row procline and outer row reclinate; ocellar triangle slightly shining, extending to posteriormost ori. Facial keel not raised. Lunule as high as wide, grayish brown. Gena yellowish brown, about 1/5 height of eye, highest point located at middle of eye. Eye pilose. Antenna black, 1st flagellomere short ovate; arista brown, with microscopic setulae. Proboscis yellowish brown, and palpus black.

Thorax (Figs 42, 46) blackish brown. Mesonotum and scutellum with brown pruinosity and slightly bluish sheen. Mesonotum with 0+2 dc, with an additional long seta near posterior dc (Fig. 46), acr in 8 irregular rows. 1 strong anepst with 2 long setae, 1 strong kepst with 2 short setulae. Calypter gray, margin and fringe blackish brown. Mid tibia with 2–3 strong posterior setae. Wing (Fig. 47) with costa extending to M1+2; costal ratio 4.7:1.3:1; r-m at middle of discal cell; ultimate and penultimate sections of M1+2 in proportion of 1.7:1; ultimate and penultimate sections of CuA, in proportion of 1:1.6. Halter blackish brown.

Abdomen blackish brown with slightly greenish sheen. Male genitalia (Figs 48–53): epandrium broad apically with two pairs of pointed triangular processes; surstylus with small spines in 2–3 rows; hypanidrid Y-shaped with long hypandrid apodeme, narrow apically; basiphallus U-shaped, with apices convergent, slender; basiphallus and distiphallus overlapping; distiphallus with a small basal incision, a pair of slight mediad constrictions and pointed triangular lateral processes medially, and triangular apically with membranous apical section turned ventrally; ejaculatory apodeme narrow fan-shaped with a round apical process, and with stem long.

FEMALE. Unknown.


**Biology/Host plants:** Unknown.

**Distribution.** USA (California (Map 1) [Mendocino Co.]).

**Remarks.** The new species is similar to Melanagromyza erechtitidis Spencer, 1966b from Florida, in the following characters: frons not projecting above the eye; fronto-orbital setulae are in 2 rows; the fronto-orbital plate, ocellar triangle, and mesonotum are weakly shining; the gena is about 1/5 the height of the eye, with the highest point located at middle of the eye; the calypter is gray, with the margin and fringe blackish brown or black. But it can be separated from the latter by the frons having 3–4 strong ori and the r-m crossvein being at the middle of the discal cell. In Melanagromyza erechtitidis, the frons has 2 weak ori and the r-m crossvein is beyond the middle of the discal cell (Spencer, 1966b).

**Etymology.** The new species is named after the collector of the type specimen, the late John A. Chemsak.
FIGURES 42–47. Melanagromyza chemsaki sp. nov. Holotype male (EMEC). 42. habitus, lateral view; 43, 44. head, dorsal and lateral view; 45. gena with long marginal setulae, lateral view; 46. thorax, dorsal view; 47. wing. Abbreviations: ap sctl s—apical scutellar setae, dc—dorsocentral setae, vb—vibrissa.
FIGURES 48–53. *Melanagromyza chemsaki* sp. nov. Holotype male (EMEC). 48, 49. epandrial complex, lateral and ventral view; 50. hypandrium and postgonite, ventral view; 51, 52. phallic complex, ventral and lateral view; 53. sperm pump. Scale 0.1 mm.
Melanagromyza cirsiophila Spencer, 1981
(Figs 54–61, Map 5)


**Diagnosis.** Frons distinctly projecting above eye, 1.6 times as wide as eye; 2–3 ori inclinate and 2 ors reclinate; frono-orbital plate slightly shining, about 1/6 width of frons; fronto-orbital setulae erect or reclinate in 2 rows; ocellar triangle moderately shining, nearly extending to posterior ori. Gena about 1/5 height of eye, highest point located at middle. Mesonotum and scutellum with brownish pruinosity and very slight greenish sheen. Mesonotum with 0+2 dc, acr in 8 rows. Calypter white, margin and fringe white or pale yellow. Mid tibia with 2 strong posterior setae. Abdomen black with greenish and coppery sheen.

**Redescription.** MALE. Wing length 2.5 mm. FEMALE. Body length 2.5 mm, wing length 2.7–2.8 mm.

Head (Figs 55, 56) mostly blackish brown. Frons distinctly projecting above eye (Fig. 56), 1.2 times as wide as long, 1.6 times as wide as eye; 2–3 ori inclinate and 2 ors reclinate, ors slightly longer than ori, both of ori and ors strong; proportional distance between setae in the ori-ors series from anterior to posterior subequal, except 2 ors closer together; frono-orbital plate slightly shining (anterior margin in female broader than that in male), about 1/6 width of frons; fronto-orbital setulae erect or reclinate in 2 rows; ocellar triangle black, slightly or distinctly shining medially and nearly extending to posterior ori (close to anterior margin); acr short, stronger than ori and ors; postocular setae strong. Lunule grayish brown, 1.3 times as wide as high. Parafacial black, thin under eye (in female). Gena blackish brown, about 1/5 height of eye, highest point located at middle. Eye pilose. Antenna black, 1st flagellomere short ovate, arista bare. Proboscis yellowish brown, palpus black.

Thorax (Figs 54, 57) black. Mesonotum and scutellum with brownish pruinosity and very slight greenish sheen. Mesonotum with 0+2 dc, acr in 8 rows. 1 strong anepst with 2 long setae and 1 strong kepst with 2 long setae. Calypter white, margin and fringe white or pale yellow. Fore tibia without strong posterior seta and mid tibia with 2 strong posterior setae. Wing (Fig. 58) with costa extending to M_{1,2}; costal ratio 4:1:1; r-m slightly or distinctly beyond middle of discal cell; ultimate and penultimate sections of M_{1,2} in proportion of 1:2:1; ultimate and penultimate sections of CuA_{1} in proportion of 1:1:6. Halter with stem pale brown and knob brownish black.

Abdomen black with greenish and coppery sheen. Male genitalia (Figs 59–61): enpandrium broad with a wide subapical triangular process and wide concavity below; surstylus with long apical setae and sparse short spines in a triangular patch; basiphallus nearly U-shaped, with lateral arms straight, pointed and diverging; distiphallus broad and incised basally and tapering apically, with a pair of large subbasal constrictions (Fig. 60).

**Type material.** Paratype: CALIFORNIA: Los Angeles Co., 1 female (UCD, No. 1199), Glendale, 34°08′33.03″N 118°15′18.27″W, ex. reared Thistle (with pupa), VI.1953, E.I. Schlinger.


**Biology/Host plants.** Larvae of this species are internal stem borers on Cirsium thistle / peregrine thistle, Cirsium cymosum (Greene) J. T. Howell (Asteraceae) and Musk thistle / nodding plumeless thistle, Carduus nutans L. (Asteraceae). See Map 5 for the California distribution of M. cirsiophila and the potential host plants Carduus nutans and Cirsium cymosum. The plant Carduus nutans L., which is native to Europe, is naturalized in California, being found in pasture lands, disturbed areas, and along roadsides at elevations below 2100 m throughout much of California. The plant is known from the Klamath Ranges, Cascade Range, northern Sierra Nevada, South Coast, San Bernardino Mountains, Modoc Plateau and Mojave Desert. The plant Cirsium cymosum (Greene) J. T. Howell is native to California, including two varieties. The Gray-green thistle, C. cymosum var. canovirens (Ryd.) J. D. Keil, is found in Sagebrush scrubland, grassland, woodland and open forest at elevations between 1350–2300 m throughout northern California, including the Modoc Plateau, and to Oregon, Montana and Wyoming. The Peregrine thistle, C. cymosum var. cymosum (Greene) J. T. Howell, is found in scrubland, woodland, open forest, meadows, and occasionally on serpentine, at elevations between 100–2100 m throughout northern California, to southern Oregon and northern Nevada, and from the Klamath Ranges, North Coast Ranges, Cascade Range, North and South of Sierra Nevada, San Francisco Bay Area and North of the Inner South Coast Ranges.
REVISION OF THE GENUS *MELANAGROMYZA* IN CALIFORNIA

Zootaxa 4005 (1) © 2015 Magnolia Press · 25

**FIGURES 59–61.** *Melanagromyza cirsiphiia* Spencer, 1981. Male. 59. epandrial complex, posterolateral view (Non-type, CNC); 60, 61. phallic complex, ventral and lateral view, from original figures in Spencer (1981), reproduced in Spencer & Steyskal (1986). Scale 0.1 mm.

**Distribution.** USA (California (Map 5) [Los Angeles Co., Modoc Co.], Colorado, Nebraska), Costa Rica.

**Melanagromyza corralensis** Spencer, 1981

(Figs 62–70, Map 6)


**Diagnosis.** Frons not projecting above eye, 1.6 times as wide as eye; 2 *ori* inclinate and 2 *ors* reclinate, a large distance between 2 *ori*, fronto-orbital plate slightly wide at middle, moderately shining, about 1/4 width of frons; fronto-orbital setulae in 2 rows, outer row erect or reclinate and inner row proclinate; ocellar triangle moderately greenish shining, extending to posterior *ori*. Gena about 1/5–1/4 height of eye, highest point located at middle. Eye pilose. Arista with microscopic setulae. Mesonotum with slightly greenish sheen, 0+2 *dc*. Calypter white, margin pale yellow and fringe white. Mid tibia with 2 strong posterior setae. Wing with costa extending to *M*₁₊₂. Abdomen blackish brown, with greenish sheen.

**Redescription.** MALE. Wing length 2.4 mm (Holotype).

Head (Figs. 63, 64) blackish brown. Frons not projecting above eye (Fig. 63), 1.1 times as wide as long, and 1.6 times as wide as eye; 2 *ori* inclinate and 2 *ors* reclinate, anterior *ori* shorter than posterior *ori*, posterior *ori* slightly shorter than *ors*; a large distance between 2 *ori*, proportional distance between setae in the *ori*-*ors* series from anterior to posterior 3.3:1.3:1; fronto-orbital plate slightly widened at middle, moderately shining, about 1/4 width of frons; fronto-orbital setulae in 2 rows, outer row erect or reclinate and inner row proclinate; ocellar triangle moderately greenish shining, extending to posterior *ori*; *oc* strong, shorter than *ors*; postocular setae strong. Lunule 0.13 mm high, 1.3 times as wide as high. Facial keel narrow, not raised. Gena about 1/5–1/4 height of eye, highest point located at middle. Eye pilose. Antennal 1st flagellomere short ovate, arista with microscopic setulae. Proboscis pale brown, palpus blackish brown.
Thorax (Figs 62, 65) black. Mesonotum and scutellum with brownish pruinosity and slightly greenish sheen. Mesonotum with 0+2 dc, acr in 8–10 irregular rows. 1 strong anepst with 2 long setulae; 1 strong kepst with 1 long setula. Calypter white, margin pale yellow and fringe white. Fore tibia without posterior setae, mid tibia with 2 strong posterior setae. Wing (Fig. 66) with costa extending to M₁₂; costal ratio 4:1:1; r-m beyond middle of discal cell; ultimate and penultimate sections of M₁₂ in proportion of 1.4:1; ultimate and penultimate sections of CuA₁ in proportion of 1:1.7. Halter blackish brown.

Abdomen blackish brown, with greenish sheen (greenish sheen more intense than on mesonotum (Spencer, 1981)). Male genitalia (Figs 67–70): epandrium broad with a wide subapical triangular process and wide concavity below; surstylus with 2 strong apical spines and thinner setulae in 2 distal rows; basiphallus U-shaped, arms narrow, slightly diverging and curved ventrally; distiphallus with narrow basal sections and slightly truncate basal margin (Fig. 68), and with a pair of slender spine-like projections (Fig. 69); ejaculatory apodeme slender, fan-shaped and asymmetrical.

FEMALE. Unknown.

Type material. Holotype male (USNM, male genitalia No. 4879): CALIFORNIA, Los Angeles Co., Corral Canyon, 32°43′09.20″N 116°37′43.07″W, ex. caught in copula, on Artemisia douglasii [sic], 13.IV.1977, [collector not given].
Biology/Host plants. The only known potential host for this species is Mugwort / Douglas' sagewort, Artemisia douglasiana Besser (Asteraceae), from which adults have been collected. See Map 6 for the California distribution of M. corralensis and potential host plant Artemisia douglasiana. This plant species is native to California, common in open to shady areas, often being found in drainages at elevations lower than 2200 m throughout California, to Washington, Idaho, and to Mexico (Baja California). The plant is known from the California Floristic Province, Modoc Plateau and Northeast of Sierra Nevada.

Distribution. USA (California (Map 6) [Los Angeles Co.]).

Melanagromyza gibsoni (Malloch, 1915)

Agromyza gibsoni Malloch, 1915: 106. Type locality: USA. Arizona: Maricopa Co., Tempe. HT ♀, USNM.


Diagnosis. Frons about 1.3 times as wide as eye, 2–3 ori inclinate and 2 ors reclinate; proportional distance between setae in the ori-ors series from anterior to posterior 2:3:2:1 (3:3:1 if only 2 ori); fronto-orbital plate moderately shining, about 1/5 frons width, not broader at middle; fronto-orbital setae in 2 rows, reclinate; ocellar triangle moderately shining, reaching level of 2nd ori or between 2 ori. Gena broad, about 1/4–1/3 height of eye, highest point located at middle or slightly before middle. Eye densely pilose on dorsal margin. Arista bare. Mesonotum with greenish or bluish green sheen. Calypter white, margin and fringe white. Mid tibia with 1 strong posterior seta. Abdomen with blackish brown, greenish or bluish green sheen.

Redescription. MALE. Body length 1.4–1.8 mm, wing length 1.9–2.2 mm. FEMALE. Body length 1.7–2.0 mm, wing length 2.1–2.3 mm.

Head (Figs 72–74) blackish brown. Frons as long as wide, 1.3 times as wide as eye; 2–3 ori inclinate and 2 ors reclinate, ori shorter than ors and proportional distance between setae in the ori-ors series from anterior to posterior 2:3:2:1 (3:3:1 if only 2 ori); fronto-orbital plate moderately shining, about 1/5 frons width, not broader at middle; fronto-orbital setae in 2 rows, reclinate; ocellar triangle blackish brown, moderately shining, extending to 2nd ori or between 2 ori; oc strong, shorter than posterior ors; postocellar setae strong. Lunule brownish gray, 0.12 mm high, semicircular. Facial keel not raised. Gena broad, about 1/4–1/3 height of eye, highest point located at middle or slightly before middle. Eye densely pilose on dorsal margin. Antenna blackish brown, 1st flagellomere short ovate, arista brown, bare. Proboscs yellowish brown and palpus blackish brown.

Thorax (Figs 71, 75–77) black. Mesonotum and scutellum with greenish or bluish green sheen (Figs 75, 76), with sparse brownish gray puinosity. Mesonotum with 0+2 dc, acr in 8 irregular rows. 1 strong anepst and 1 strong kepst each with 1 long setula and sparse short setulae. Calypter white, margin and fringe white. Fore tibia without strong posterior setae, mid tibia with 1 strong posterior seta. Wing (Fig. 78) with costa extending to M1+2; costal ratio 5:1; r-m nearly at apical 1/3 point of discal cell; ultimate and penultimate sections of M1+2 in proportion of 1.8:1; ultimate and penultimate sections of CuA1 in proportion of 1:1.2. Halter blackish brown.

Abdomen (Fig. 71) blackish brown, with greenish or bluish green sheen. Male genitalia (Figs 79–84): epandrium with a distinct posterodistal concavity; surstylus with sparse short spines; hypandrium Y-shaped with pointed hypandrial apodeme; basiphallus U-shaped with arms curved outwards; distiphallus broad mediadially, semicircular apically; ejaculatory and fan-shaped with long stem.

Non-type material. CALIFORNIA: Colusa Co., 1 male (UCD), Grimes, W. 3 mi., 39°04′27.62″N 121°46′23.87″W, 6.IX.1971, W.R. Cothran; Fresno Co., 1 male (EMEC), Parker ranch, 8 mi SW Selma, 36°34′14.82″N 119°43′06.10″W, 3.V.1951, K.S. Hagen; Imperial Co., 2 males (EMEC), 17 mi. NW Glamis, 32°59′36.64″N 115°03′55.08″W, 1.IV.1978, J. Powell (No. 7803, emerged 3.V., reared from legume); 1 female (UCD), Algodones Dunes, Coachella Canal Rd., 11.3 km NW Hwy 78, 18.1 km NW Glamis, 32°51′37.22″N 115°03′55.08″W, 3.VI.2008, Museum survey team bowl in dunes, Malaise 2008AL61; 3 males (CSCA), 3 mi. NW Glamis, 32°59′36.64″N 115°03′55.08″W, ex. Malaise trap 8A-7P, 8–13.IV.1973, M.S. & J.S.Wasbauer; Kings Co., 1 female (EMEC), 3 mi. W. Hardwick, Marshall Rch., 36°24′05.65″N 119°43′06.10″W, ex. sweeping from Alfalfa (Medicago sativa), 11.IX.1957, R.E. Smith & K.S. Hagen; Merced Co., 1 male (EMEC), 2.5 mi. N. Ballico, Jones' ranch, 37°27′39.79″N 120°45′58.81″W, 1.III.1951, K.S. Hagen; Sacramento Co., 1 female (UCD),
FIGURES 71–78. Melanagromyza gibsoni (Malloch, 1915). Male (Non-type, EMEC and CSCA). 71. habitus, lateral view; 72–74. head, lateral and dorsal view; 75–77. thorax, dorsal and lateral view; 78. wing.
FIGURES 79–84. Melanagromyza gibsoni (Malloch, 1915). Male (79–81, 84: Non-type, EMEC). 79, 80. epandrial complex, lateral and ventral view; 81. hypandrium and postgonite, ventral view; 82, 83. phallic complex, ventral and lateral view, from original figures in Spencer (1981), reproduced in Spencer & Steyskal (1986); 84. sperm pump. Scale 0.1 mm.

37°32′57.75″N 121°11′56.77″W, 12.XII.1957, ex. sweeping from Alfalfa (*Medicago sativa*), 11.IX.1957, R.E. Smith & K.S. Hagen; **Tulare Co.**, 1 male, 7 females (CSCA), Tulare, 37°32′57.75″N 121°11′56.77″W, ex. swept from Alfalfa (*Medicago sativa*), 28.IX.1973, Thomas; **Yolo Co.**, 1 male (UCD), Woodland, W. 3 mi., 38°40′42.66″N 121°46′23.87″W, 30.VI.1972, W.R. Cothran & S.R. Sims; 1 male, 2 females (UCD), Woodland, S. W. 1 mi., 38°40′42.66″N 121°46′23.87″W, 30.VI.1972, W.R. Cothran & S.R. Sims; 2 males, 2 females (UCD), Woodland, 38°40′42.66″N 121°46′23.87″W, 28–30.VIII.1953, A.T. McClay; 1 female (UCD), Woodland, 38°40′42.66″N 121°46′23.87″W, 1.IX.1953, A.T. McClay; 1 female (UCD), Davis, 38°32′41.66″N 121°44′25.86″W, 26.VII.1970, [collector not given].

**Biology/Host plants.** Larvae of this species are internal stem borers on alfalfa, *Medicago sativa* L. (Fabaceae) (Spencer & Steyskal, 1986; Spencer, 1990). In California, it has been reared from alfalfa and from an unknown legume. See Map 7 for the California distribution of *M. gibsoni* and host plant *Medicago sativa*. This plant species, which is native to Eurasia, is naturalized in California, being found in the disturbed and agricultural areas at elevations lower than 2450 m throughout California, and is widely cultivated in the United States. The plant is known from the California Floristic Province, Great Basin Floristic Province, and Desert Mountains (Panamint Range).

**Distribution.** USA (California (Map 7) [Colusa Co.*, Fresno Co.*, Imperial Co., Kings Co., Merced Co.*, Sacramento Co.*, San Bernardino Co.*, San Diego Co.*, Stanislaus Co., Tulare Co., Yolo Co.], Arizona, Colorado, Texas), Chile.

**Melanagromyza gnaphalii** Spencer, 1981

(Figs 85–91, Map 8)


**Diagnosis.** Frons not projecting above eye, 1.4 times as wide as eye; 2–3 *ori* inclinate, and 2 *ors* (likely reclinate); fronto-orbital plate weakly shining, slightly broader at middle, about 1/4 width of frons; fronto-orbital setulae in 2 rows, inner row proclinate or inclinate and outer row reclinate; ocellar triangle slender, extending to posteriormost *ori*, slightly bluish green shining. Gena about 1/6 height of eye, highest point located at middle. Eye pilose. Arista bare. Mesonotum with slightly greenish sheen, 0+2 *dc*. Calypter white, margin pale yellow and fringe white. Mid tibia with 2 strong posterior setae. Abdomen blackish brown, with greenish sheen.

**Redescription.** MALE. Wing length 2.1 mm (Holotype).

Head (Figs 86, 87) blackish brown. Frons dark, not projecting above eye (Fig. 86), slightly wider than long, 1.4 times as wide as eye; 2–3 *ori* inclinate and 2 *ors* (likely reclinate, but all broken off); proportional distance between setae in the *ori-ors* series from anterior to posterior subequal, except 2 *ors* closer together; fronto-orbital plate weakly shining, slightly broader at middle, about 1/4 width of frons; fronto-orbital setulae in 2 rows, inner row procline or inclinate and outer row reclinate; ocellar triangle slender, extending to posteriormost *ori*, slightly bluish green shining; *oc* strong, nearly as long as anterior *ori*; postocellar setae missing. Lunule brownish gray, 0.18 mm high, 1.3 times as wide as high. Gena narrow, about 1/6 height of eye, highest point located at middle. Eye pilose. Antenna brownish gray, 1st flagellomere short ovate with long setulae, and arista bare. Proboscis yellowish brown, palpus black.

Thorax (Figs 85, 88) blackish brown. Mesonotum and scutellum with brownish pruinosity and slight greenish sheen. Mesonotum with 0+2 *dc, acr* in 8 irregular rows. 1 strong *anepst* with 1 long setula, 1 *kepst* with 2–3 short setulae. Calypter white, margin pale yellow and fringe white. Fore tibia without posterior setae and mid tibia with 2 strong posterior setae. Wing (Fig. 89) with costa extending to *M*1+2; costal ratio 5:1.5:1; *r-m* beyond middle of discal cell; ultimate and penultimate sections of *M*1+2 in proportion of 1.5:1; ultimate and penultimate sections of *CuA*1 in proportion of 1:1.5. Halter brown.

Abdomen blackish brown, with greenish sheen. Male genitalia (90, 91): basiphallus U-shaped with lateral arms slightly extending outward; distiphallus with a tiny basal incision, median section broad, apical section narrow with curved apex.
FIGURES 85–89. *Melanagromyza gnaphalii* Spencer, 1981. Holotype male (CAS). 85. habitus, lateral view; 86, 87. head, lateral and dorsal view; 88. thorax, lateral view; 89. wing.

Type material. Holotype male (CAS Type No. 13945, male genitalia No. 4701, damaged): CALIFORNIA: Santa Cruz Co., Aptos, 36°58′36.19″N 121°53′54.00″W, ex. larva, Gnaphalium leucocephalum Nutt. Lot No. 146-224, IX.1948, K.E. Frick.

Biology/Host plants. Larvae of this species are internal stem borers on White rabbit-tobacco / white cudweed, Pseudognaphalium leucocephalum (A. Gray) Anderb. (Asteraceae) and Canadian horseweed, Erigeron canadensis L. (Asteraceae) (Spencer, 1981; Spencer & Steyskal, 1986; Spencer, 1990), both of which are native to California. See Map 8 for the California distribution of M. gnaphalii and host plants Erigeron canadensis and Pseudognaphalium leucocephalum. The plant Erigeron canadensis L. is found in disturbed places at elevations lower than 2300 m throughout California, north to British Columbia, through much of North America, Central America and is introduced elsewhere. The plant Pseudognaphalium leucocephalum (A. Gray) Anderb. is found in the sandy or gravelly benches, and dry stream and canyon bottoms at elevations below 500 m throughout California, to Arizona, New Mexico, and Mexico, and is known from the South Coast, San Bernardino Mountains and Peninsular Ranges.

Distribution. USA (California (Map 8) [Riverside Co., Santa Cruz Co.]).

Melanagromyza gonzalesina sp. nov.
(Figs 92–103, Map 3)

Diagnosis. Frons with 2 ori inclinate and crossed, and 2 ors reclinate; proportional distance between setae in the ori-ors series from anterior to posterior 5:1.5:1; fronto-orbital plate slightly shining, about 1/4–1/3 width of frons, broader at middle; fronto-orbital setulae in 2 rows, inner row proclinate and outer row reclinate. Gena about 1/5–1/4 height of eye, highest point located near anterior margin. Eye pilose. Mesonotum and scutellum with slightly greenish sheen. Mesonotum with 0+3 dc. Calypter white to pale yellow, mid tibiae with 2 strong posterior setae. Abdomen blackish brown with distinct greenish sheen.
Redescription. MALE. Body length 1.9–2.1 mm, wing length 2.3–2.4 mm. FEMALE. Body length 2.0 mm, wing length 2.5 mm.
Head (Figs 93–95) black. Frons brown to blackish brown, 1.2 times longer than wide, about 1.5 times as wide as eye; 2 ori inclinate and crossed, 2 ors reclinate; proportional distance between setae in the ori-ors series from anterior to posterior 5:1.5:1; fronto-orbital plate slightly shining, about 1/4–1/3 width of frons, slightly broader at middle (Figs 93, 94); fronto-orbital setulae in 2 rows, inner row procline and outer row reclinate; ocellar triangle slightly bluish shining, extending to posterior ori. Lunule grayish brown, 0.08 mm high, 1.5 times as wide as high. Gena brown, about 1/5–1/4 height of eye, highest point located near anterior margin. Eye pilose. Antenna blackish 1+2 setae. Wing (Fig. 97) with costa extending to M kepst slightly bluish shining, extending to posterior middle (Figs 93, 94); fronto-orbital setulae in 2 rows, inner row procline and outer row reclinate; ocellar triangle anterior to posterior 5:1.5:1; fronto-orbital plate slightly shining, about 1/4–1/3 width of frons, slightly broader at 1+2 penultimate sections of M dc. Calypter gray, margin and fringe brown. Mid tibia with 2 strong posterior setae. Wing (Fig. 97) with costa extending to M1,3; costal ratio 3.7:1:1; r-m at middle of discal cell; ultimate and penultimate sections of M1,3 in proportion of 1.3:1; ultimate and penultimate sections of CuA1 in proportion of 1:1.8. Halter blackish brown.

Abdomen blackish brown, with greenish sheen. Male genitalia (Figs 98–103): epandrium broad with straight apical margin and a distinct posterodistal concavity; surstylus with sparse short spines along apical margin, several posterior spines stronger; hypandrium with short hypandrial apodeme; basiphallus U-shaped, arms divergent, with ends tapered; distiphallus curved apically with two pairs of triangular dorsal processes (Fig. 102); ejaculatory apodeme narrow and fan-shaped with long stem.

**Type material.** Holotype male (CSCA): CALIFORNIA: Monterey Co., Gonzales, 36°30′23.86″N 121°26′39.77″W, ex swept vegetation, 12.III.1980, L. Oliver. Paratypes: Alameda Co., 1 male (CSCA), Dublin, 37°42′07.75″N 121°56′08.85″W, 30.X.1954, J.C. Downey; Monterey Co., 2 males, 1 female (CSCA), same data as holotype

**Biology/Host plants:** Unknown.

**Distribution.** USA (California (Map 3) [Alameda Co., Monterey Co.]).

**Remarks.** The new species is easily separated from other Nearctic *Melanagromyza*, with the following combination of characters: frons not projecting above eye, fronto-orbital plate with 2 ori and 2 ors, with proportional distance between setae in the ori-ors series from anterior to posterior 5:1.5:1; mesonotum with 0+3 dc (distance between transverse suture and anteriormost dc, and transverse suture and scutoscutellar suture in proportion of 1:4); basiphallus U-shaped with arms strongly diverging; distiphallus curved apically, and with two pairs of triangular dorsal processes.

**Etymology.** The new species is named after the type locality Gonzales, in Monterey County, California.

*Melanagromyza malevola* Spencer, 1981

(Figs 104–114, Map 2)


**Diagnosis.** Frons about 1.75 times as wide as eye; 3 ori inclinate with anteriormost ori crossed, and 2 ors reclinate, proportional distance between setae in the ori-ors series subequal; fronto-orbital plate not shining, about 1/5 width of frons, anterior margin broad with dense setulae; fronto-orbital setulae in 3 rows; ocellar triangle slightly shining and extending to anterior ors. Gena about 1/3 height of eye, highest point located at middle. Mesonotum with very slight greenish sheen, 0+2 dc. Calypter gray, margin and fringe brown. Mid tibia with 2 strong posterior setae. Abdomen black with slight greenish sheen.

**Redescription.** MALE. Wing length 2.6 mm (Holotype).

Head (Figs 105, 106) mostly blackish brown. Frons dark brown with anterior margin black, projecting above eye (Fig. 106), 1.2 times as wide as long, 1.75 times as wide as eye; 3 ori inclinate and 2 ors reclinate, ori and ors strong with anterior ors slightly longer than posterior ors and other ori; proportional distance between setae in the ori-ors series subequal; fronto-orbital plate dark, not shining and brownish yellow along inner margin, about 1/5 width of frons; fronto-orbital setulae in 3 rows, procline except anterior margin with a few inclinate, and anterior margin of frons with dense setulae; ocellar triangle slightly shining and only extending to anterior ors; oc strong, as
FIGURES 109–114. Melanagromyza malevola Spencer, 1981. Holotype male (CAS). 109, 110. epandrial complex, lateral and ventral view; 111. hypandrium and postgonite, ventral view; 112, 113. phallic complex, ventral and lateral view; 114. sperm pump. Scale 0.1 mm.
long as ori and posterior ors; postocellar setae strong. Lunule grayish brown, 0.15 mm high, slightly higher than wide. Parafacial black, thin under eye. Gena yellowish brown, about 1/3 height of eye, highest point located at middle. 1 strong vibrissa. Eye pilose. Antenna black, 1st flagellomere short ovate and arista bare. Proboscis yellowish brown, palpus black.

Thorax (Figs 104, 107) black. Mesonotum and scutellum with brownish pruinosity and slight greenish sheen. Mesonotum with 0+2 dc, acr in 8 irregular rows. 1 strong anepst and 1 strong kepst, each with 1 long setula. Calypter gray, margin and fringe brown. Fore tibia without strong posterior seta and mid tibia with 2 strong posterior setae. Wing (Fig. 108) with costa extending to M₁+₂; costal ratio 3:1:1; r-m at or slightly beyond middle of discal cell; ultimate and penultimate sections of M₁+₂ in proportion of 1.6:1; ultimate and penultimate sections of CuA₁ in proportion of 1:1.4. Halter blackish brown.

Abdomen black with slightly greenish sheen. Male genitalia (Figs 109–114): epandrium with a small apical concavity; surstylius with short spines in 2–3 rows and 4–5 long setulae anteriorly; hypandrium V-shaped, with very short hypandrial apodeme; basiphallus U-shaped, basal section thick and lateral arms short, slightly incurved; distiphallus with a small subbasal tooth present, and apical membranous section slightly curved; ejaculatory apodeme broad and asymmetrical with long stem.

FEMALE. Unknown.


Non-type material. CALIFORNIA: Siskiyou Co., 1 male (EMEC), Ash Creek Rar. Sta., 9 mi E McCloud, 41°15′32.08″N 122°05′08.13″W, elevation 3500 ft, ex. flight trap, 7–9.VI.1974, L. Green.

Biology/Host plants: Unknown.

Distribution. USA (California (Map 2) [Alameda Co., Siskiyou Co., Tulare Co., Ventura Co.]).

Melanagromyza maligna Spencer, 1981
(Figs 115–122, Map 1)


Diagnosis. Frons distinctly projecting above eye, about 1.9 times as wide as eye; 3 ori inclinate and 2 ors reclinate (anterior one slightly inclinate); fronto-orbital plate slightly shining, about 1/4 width of frons; fronto-orbital setulae in 2 rows, inner row inclinate and outer row erect or reclinate; ocellar triangle broad, weakly shining, extending to anterior margin of frons. Gena broad, about 1/3 height of eye, highest point located at middle. Eye pilose. Arista microscopic pubescent. Mesonotum with brownish pruinosity, scarcely shining; 0+2 dc. Calypter gray, margin black and fringe blackish brown. Mid tibia with 2 weak posterior setae. Abdomen blackish brown with slight greenish sheen.

Redescription. MALE. Wing length 2.2 mm (Holotype).

Head (Figs 115, 116) blackish brown. Frons distinctly projecting above eye (Fig. 115), with 1.3 times as wide as long, 1.9 times as wide as eye; 3 ori inclinate and 2 ors reclinate (anterior one slightly inclinate), anterior ori very short (about 1/2 length of third ori), fourth ori slightly shorter than anterior ors; proportional distance between setae in the ori-ors series from anterior to posterior 2.5:1.3:1.3:1; fronto-orbital plate slightly shining, about 1/4 width of frons; fronto-orbital setulae in 2 rows, inner row inclinate (reclinate in Spencer, 1981) and outer row reclinate except anterior margin with a few erect; ocellar triangle broad, sides parallel on posterior half, almost extending to anterior margin of frons, at most very slightly shining on median area; oc strong, nearly as long as anterior ors; postocellar setae strong. Lunule brownish gray, broad and slightly bulging, and 0.18 mm high, 1.2 times as wide as high. Parafacial brownish black, about 1/6 height of eye. Gena broad, about 1/3 eye height, highest point located at middle. Eye pilose. Antenna blackish brown, 1st flagellomere short ovate, and arista microscopic pubescent. Proboscis yellowish brown, palpus blackish brown.
Thorax (Figs 115, 117) blackish brown. Mesonotum and scutellum with brownish pruinosity, scarcely shining. Mesonotum with 0+2 dc, acr in 8 irregular rows. 1 strong anepst and 1 strong kepst each with 1 long setula. Calypter gray, margin black and fringe blackish brown. Fore tibia without posterior setae and mid tibia with 2 weak posterior setae. Wing (Fig. 118) with costa extending to M₁+₂; costal ratio 5:1.5:1; r-m nearly at apical 1/3 of distal cell; ultimate and penultimate sections of M₁+₂ in proportion of 1.7:1; ultimate and penultimate sections of Cu₁ in proportion of 1:1.2. Halter blackish brown.
Abdomen blackish brown with slight greenish sheen. Male genitalia (Figs 119–122): surstylus with dense short spines and 3 long apical setulae; hypandrium nearly V-shaped, with short broad hypandrial apodeme; basiphallus U-shaped with lateral arms narrower apically and slightly curved; distiphallus with a large posterodorsal extension.

**Type material.** Holotype male (CAS Type No. 14068, male genitalia No. 4719): CALIFORNIA: Marin Co., Fort Cronchite, 37°49′57.13″N 122°31°57.59″W, 3.III.1962, C.A. Toschi.

**Biology/Host plants:** Unknown.

**Distribution.** USA (California (Map 1) [Marin Co.]).

*Melanagromyza marinensis* Spencer, 1981

(Figs 123–132, Map 9)


**Diagnosis.** Frons distinctly projecting above eye, about 1.9 times as wide as eye; 6 ori inclinate and 2 ors reclinate; fronto-orbital plate dark in male, yellowish or blackish brown and slightly shining in female, and anterior margin with dense setulae, about 1/5 width of frons; fronto-orbital setulae in 3–4 rows, erect or reclinate except for several irregular inclinate or proclinate; ocellar triangle dark and broad, extending to anterior margin of frons in male, while slightly shining and small in female. Facial keel slightly raised, dividing bases of antennae; parafacial black with sparse white pruinosity on upper margin in male and yellowish brown in female. Gena about 1/3 height of eye, highest point located at middle. Eye pilose. Arista bare. Mesonotum with slightly greenish sheen in male and more coppery sheen in female. Mesonotum with 0+2 dc. Calypter gray, margin black and fringe blackish brown. Mid tibia with 1 strong posterior setae in male and 1–2 strong posterior setae in female. Abdomen black with slightly greenish sheen in male.

**Redescription.** MALE. Body length 3.2–3.4 mm, wing length 3.4–3.7 mm (body length 2.5 mm and wing length 2.7 mm from one specimen in CSCA). FEMALE. Body length 3.4–4.3 mm, wing length 3.8–4.3 mm.

Head (Figs 124, 125) black. Frons distinctly projecting above eye, 1.25 times as wide as long, 1.9 times as wide as eye, and dark in male and brown except black anterior margin in female; 6 ori inclinate (posteriormost *ori* slightly erect) and 2 *ors* reclinate, *ori* and *ors* with almost same length; fronto-orbital plate dark in male, yellowish or blackish brown and slightly shining in female, anterior margin with dense setulae, about 1/5 width of frons; fronto-orbital setulae in 3–4 rows, erect or reclinate except for several irregular inclinate or proclinate; ocellar triangle dark, broad, extending to anterior margin of frons in male, while slightly shining and small in female; *oc* strong, slightly shorter than anterior *ors*; postocellar setae strong. Lunule brown, 0.2 mm high, 1.4 times as wide as high. Facial keel slightly raised (Fig. 124), dividing bases of antennae; parafacial (Fig. 125) black with sparse white pruinosity on upper margin in male and yellowish brown in female, about 1/8 eye height. Gena blackish brown in male and brown in female, broad with marginal setulae, about 1/3 height of eye, highest point located at middle. Eye pilose. Antenna blackish brown, 1st flagellomere short ovate, and arista bare. Proboscis yellowish brown, palpus blackish brown.

Thorax (Figs 123, 126) black. Mesonotum and scutellum with brownish pruinosity, and with slightly greenish sheen in male and more coppery sheen in female. Mesonotum with 0+2 *dc, acr* in 10 irregular rows. 1 strong *anepst* with several short setulae in 3 rows and 1 *kepst* with 2 long setulae and 2–3 short setulae in female and 2 long setulae and a few of short setulae in male. Calypter gray, margin black and fringe blackish brown. Fore tibia without posterior setae and mid tibia with one strong posterior seta in male and 1–2 strong posterior setae in female. Wing (Fig. 127) with costa extending to M1+2; costal ratio 6:1.3:1; r-m at or slightly beyond middle of discal cell; ultimate and penultimate sections of M1+2 in proportion of 1.4:1; ultimate and penultimate sections of CuA1 in proportion of 1:1.7. Halter black.

Abdomen black with slight greenish sheen in male. Male genitalia (Figs 128–132): surstylus with dense short spines in 3–4 rows; hypandrium Y-shaped with narrow hypandrial apodeme; basiphallus U-shaped, arms relatively broad; distiphallus with middle section broad, apical section narrow and tapering with an undulating lateral margin; ejaculatory apodeme narrow and fan-shaped, slightly curved, with long stem.
FIGURES 128–132. *Melanagromyza marinensis* Spencer, 1981. Holotype male (CAS). 128. epandrial complex, posterolateral view; 129. hypandrium and postgonite, ventral view (non-type male, UCD); 130, 131. phallic complex, ventral and lateral view, from original figures in Spencer (1981), reproduced in Spencer & Steyskal (1986); 132. sperm pump (non-type male, UCD). Scale 0.1 mm.

Non-type material. UTAH: Salt Lake Co., 1 male (UCD), Lambs Cyn., 11.VI.1955, J.C. Downey.

Biology/Host plants. Larvae of this species are internal stem borers on Cirsium occidentale and likely other Cirsium species (Spencer, 1981; Spencer & Steyskal, 1986; Spencer, 1990). In California, it has been collected in association with the thistle Cirsium occidentale (Nutt.) Jeps. See Map 9 for the California distribution of M. marinensis and host plant Cirsium occidentale. This plant species is native to California, including 7 varieties as follows. California thistle, C. occidentale var. californicum (A. Gray) D. J. Keil & C. E. Turner, is found in the open forest and in disturbed sites at elevations lower than 2300 m, and is known from Sierra Nevada, and the central and southern South Coast Ranges and Southwestern California. Snowy thistle, C. occidentale var. candidissimum (Greene) J.F. Macbr., is found in disturbed places, scrublands and open woodlands at elevations lower than 1900 m throughout California, to southern Oregon, southwestern Idaho, western Nevada, and is known from the Klamath Ranges, North Coast Ranges, Cascade Range, northern Sierra Nevada, central part of the Central Coast (Carmel Highlands), and Modoc Plateau. Compact cobwebby thistle, C. occidentale var. compactum Hoover, is found in the bluffs at elevations lower than 50 m, and is known from the Central Coast (northern San Luis Obispo and Monterey Counties). Coulter's thistle, C. occidentale var. coulteri (Harv. & A. Gray) Jeps., is found in the grasslands, dunes, oak woodlands and scrub at elevations lower than 700 m, and is known from the Central Coast, South Coast and Channel Islands. Cuesta ridge thistle, C. occidentale var. lucianum D. J. Keil, is found in the chaparral, woodlands or forest openings, and often on serpentine, at elevations between 500–750 m, and is known from the southern Outer South Coast Ranges (southern Santa Lucia Range, San Luis Obispo Co.), Cobwebby thistle, C. occidentale var. occidentale is found in the grasslands, coastal dunes, oak woodlands and scrublands, often in disturbed areas at elevations lower than 200 m, and is known from the southern North Coast, western Central Western California, and western Southwestern California regions. Venus thistle, C. occidentale var. venustum (Greene) Jeps., is found in disturbed areas, grasslands, and woodlands at elevations lower than 3600 m, and is known from the North Coast Ranges, northern High Sierra Nevada, southern Sierra Nevada, Sacramento Valley, San Francisco Bay Area, South Coast Ranges, western Transverse Ranges, White and Inyo Mountains and western Mojave Desert.

Distribution. USA (California (Map 9) [Marin Co., Monterey Co., Santa Cruz Co., Trinity Co.], Utah*).

Melanagromyza martini Spencer, 1969
(Figs 133–143, Map 10)


Diagnosis. Frons slightly projecting above eye, 1.7 times as wide as eye; 3 ori inclinate and 2 ors reclinate; fronto- orbital plate slightly shining, about 1/5 width of frons; fronto-orbital setulae in 2 rows, erect or reclinate; ocellar triangle broad, extending to anterior margin of frons, weakly shining. Gena about 1/3 eye height, highest point located at middle. Eye pilose. Arista microscopic pubescent. Mesonotum with weakly greenish sheen, 0+2 dc. Calypter and fringe white, margin pale yellow. Mid tibia with 1 strong posterior seta. Abdomen brownish black with coppery and greenish sheen.

Redescription. MALE. Body length 2.4–2.5 mm, wing length 2.5–2.7 mm. FEMALE. Body length 2.7 mm, wing length 2.8 mm.

Head (Figs 134, 135) brownish black (yellowish brown in female). Frons slightly projecting above eye, 1.25 times as wide as long, 1.7 times as wide as eye; 3 ori inclinate and 2 ors reclinate, ors slightly longer than ori; proportional distance between setae in the ori-ors series from anterior to posterior 2.2:2:1.5:1; fronto-orbital plate slightly shining, about 1/5 width of frons; fronto-orbital setulae erect or reclinate in 2 rows and inner margin slightly brownish yellow; ocellar triangle plate broad, extending to anterior margin of frons, only shining at middle;
FIGURES 138–143. *Melanagromyza martini* Spencer, 1969. Paratype male (CNC). 138. epandrium, surstylus and hypandrium, lateral view; 139. epandrial complex, ventral view; 140. hypandrium and postgonite, ventral view (partly broken); 141, 142. phallic complex, ventral and lateral view, from original figures in Spencer (1969), reproduced in Spencer & Steyskal (1986); 143. sperm pump (Non-type male, CNC). Scale 0.1 mm.
oc strong, slightly shorter than ori; postocular setae strong. Lunule grayish brown, 0.12 mm high, 2.3 times as wide as high, semicircular. Parafacial about 1/12 eye height. Gena yellowish brown, about 1/3 height of eye, highest point located at middle. Eye pilose. Antenna black, 1st flagellomere short ovate, and arista microscopic pubescent. Proboscis yellowish brown, palpus black.

Thorax (Figs 133, 136) blackish brown (yellowish brown in female). Mesonotum and scutellum with brownish pruinosity and very weak greenish sheen. Mesonotum with 0+2 dc, acr in 6 irregular rows. 1 anepst with a few of short setulae and 1 kepst with 1 long setula. Calypter and fringe white, margin pale yellow. Fore tibia without strong posterior seta and mid tibia with 1 strong posterior seta. Wing (Fig. 137) with costa extending to M1+2; costal ratio 4.5:1:1; r-m nearly at apical 1/3 of discal cell; ultimate and penultimate sections of M1+2 in proportion of 1.3:1; ultimate and penultimate sections of CuA1 in proportion of 1:1.7. Halter with stem pale brown and knob brown.

Abdomen (Fig 133) brownish black (yellowish brown in female) with coppery and greenish sheen. Male genitalia (Figs 138–143): surstylus with dense short spines apically and several long apical setulae anteriorly; hypandrium V-shaped; basiphallus U-shaped, basal and lateral arms narrow with ventral curve at apex; distiphallus with middle section broad, ovate subapically; ejaculatory apodeme fan-shaped, with long stem.


**Biology/Host plants.** Larvae are internal stem borers on at least two subspecies of *Urtica dioica* L. (*Urticaceae*) (Spencer, 1969; Spencer, 1990). In California, this species has been reared from Hoary nettle / stinging nettle, *Urtica dioica* subsp. *holosericea* (Nutt.) Thorne and from American stinging nettle, *Urtica dioica* subsp. *gracilis* (Aiton) Seland. In Alberta, Canada, it was collected while ovipositing on the latter subspecies (Spencer, 1969). See Map 10 for the California distribution of *M. martini* and host plant *Urtica dioica* subsp. *holosericea*. This plant species is native to California, being found in the meadows, seeps, springs, margins of marshes, streams, lakes, moist areas in chaparral and coastal scrub at elevations lower than 3370 m throughout California, and in other parts of the western United States and in northern Mexico. The plant is known from the California Floristic Province (except but expected in the North Coast and Sierra Nevada Foothills), Great Basin Floristic Province, and Mojave Desert (uncommon). The other subspecies, *gracilis*, is known from evergreen forests and moist or riparian areas below 2200 m elevation (most records from lower elevations), in a strip along the west coast of California, within the North Coast and northern Central Coast regions, the San Joaquin Valley delta, and the Klamath Ranges.

**Distribution.** USA (California (Map 10) [Siskiyou Co.*]), Canada (Alberta, British Columbia, Ontario, Saskatchewan). This represents the first record for the USA and California.

**Remarks.** One of the male paratypes (male genitalia No. 1509) has a few of characters which are different from other examined specimens: body color deep black; only 2 ori and 2 ors, and a large distance between 2 ori; fronto-orbital plate becoming broad on posterior 1/2, about 1/4 width of frons; fronto-orbital setulae in 2 rows, with inner row inclinate or proclinate and outer row reclinate. These seem to represent variation in this species, although currently known only from this paratype.

**Melanagromyza minima** (Malloch, 1913)
(Figs 144–155, Map 2)

*Agromyza minima* Malloch, 1913: 328. Type locality: Trinidad. HT ♂, USNM.


*Melanagromyza longicaudalis* Spencer, 1963: 316. Type locality: Jamaica. HT ♀, BMNH. Spencer, 1966b: 12 (syn.).
FIGURES 150–155. *Melanagromyza minima* (Malloch, 1913). Holotype male (USNM). 150. epandrial complex, lateral view; 151. epandrial complex, posterior view, and hypandrium, ventral view; 152–154. phallic complex, ventral and lateral view, 154 from original figure in Spencer (1986); 155. sperm pump. Scale 0.1 mm.
**Diagnosis.** Frons not projecting above eye, anterior margin narrow and posterior margin broad; 2 ori weak, inclinate and 2 ors reclinate, proportional distance between setae in the ori-ors series from anterior to posterior subequal; fronto-orbital plate slightly shining, about 1/6 width of frons; fronto-orbital setulae in 2 sparse rows, reclinate except for a few proclinate on anterior margin; ocellar triangle slightly shining, extending between ori. Facial keel very thin and not raised. Gena about 1/8–1/7 height of eye, highest point located at middle. Eye pilose. Arista bare. Mesonotum with greenish sheen in posterior view, 0+2 dc. Calypter gray, margin and fringe blackish brown. Mid tibia with 2 strong posterior setae. Abdomen blackish brown with greenish sheen.

**Redescription.** MALE. Wing length 1.75 mm (Holotype).

Head (Figs 145, 146) blackish brown. Frons not projecting above eye (Fig. 146), anterior margin slightly narrower than posterior margin; 1.25 times as long as wide, and slightly wider than eye; 2 ori weak, inclinate and 2 ors reclinate, ori shorter than ors, proportional distance between setae in the ori-ors series from anterior to posterior subequal; fronto-orbital plate pale brown, slightly shining and not projecting forward, about 1/6 width of frons; fronto-orbital setulae in 2 sparse rows, reclinate except for a few proclinate on anterior margin; ocellar triangle slightly shining, extending between ori; oc strong, slightly longer than ori; postocellar setae strong. Lunule with narrow anterior margin and broad posterior margin, 0.16 mm high, 1.25 times as wide as high. Facial keel very thin and not raised. Gena brown, about 1/7 height of eye, highest point located at middle. Eye pilose (bare in Spencer, 1981). Antennal 1st flagellomere short ovate and arista bare. Proboscis brownish yellow, palpus black.

Thorax (Figs 144, 147) blackish brown. Mesonotum and scutellum with brownish pruinosity and greenish sheen. Mesonotum 0+2 dc, acr in 8 rows. 1 strong anepst and 1 kepst. Calypter gray, margin and fringe blackish brown. Fore tibia without posterior setae and mid tibia with 2 strong posterior setae. Wing (Fig. 148) with costa extending to M1+2; costal ratio 4:1:1; r-m beyond middle of discal cell; ultimate and penultimate sections of M1+2 in proportion of 1.4:1; ultimate and penultimate sections of CuA1, in proportion of 1:1.7. Halter blackish brown.

Abdomen (Fig. 149) blackish brown with greenish sheen. Female (Fig. 149) with long bar-like ovipositor. Male genitalia (Figs 150–155): epandrium broad, with pair of large inner teeth posteromedially; surstylius with broad cluster of short spines on much of inner surface; hypandrium slender Y-shaped with long hypandrial apodeme; basiphallus U-shaped with lateral arms incurved and pointed apically, a very large gap between basiphallus and distiphallus; distiphallus with a pair of subapical constrictions and medial section undulating and curved apically; ejaculatory apodeme fan-shaped.


**Non-type material.** CALIFORNIA: San Diego Co., 1 female (EMEC), 6 mi. E., Banner, 33°04′06.91″N 116°32′47.68″W, 26.VI, 1963, H.L. Griffin (identified by Spencer, 1978).

**Biology/Host plants:** Larvae of this species feed and pupariate within seed heads of the Asteraceae species _Wedelia fruticosa_ Jacq., _Wedelia triflora_ (L.) Pruski, _Wedelia paludosa_ DC, and _Chromolaena odorata_ (L.) R.M. King & H. Rob. (Spencer & Steyskal, 1973; Spencer, 1981; Spencer, 1990), as well as _Bidens gardneri_ Baker, _Viguiera arenaria_ Baker, and _Viguiera robusta_ Gardn. (Braun _et al._, 2008), and likely other asters (Spencer & Steyskal, 1986). None of these plant species occurs in California. Spencer (1973a) comments that the female ovipositor is specially elongated for oviposition deep within the immature seed heads.

**Distribution.** USA (California (Map 2) [Los Angeles Co., San Diego Co.], Florida, Mississippi), Antigua, Costa Rica, Dominican Republic, Guadalupe, Guatemala, Jamaica, Mexico, Puerto Rico, Panama, Peru, Trinidad, Venezuela.

_Melanagromyza minimoides_ Spencer, 1966

(Figs 156–166, Maps 10, 11)


_Melanagromyza radicicola_ Steyskal, 1980: 40. Type locality: USA. Maryland. HT ♂, USNM. Spencer & Steyskal, 1986: 246; Spencer, 1990: 397 (syn.).
FIGURES 160–166. *Melanagromyza minimoides* Spencer, 1966b. Non-type male (CSCA). 160, 161. epandrial complex, lateral and ventral view; 162. hypandrium and postgonite, ventral view; 163–165. phallic complex, ventral and lateral view, 165 a,b,c from original figures in Spencer (1986) for comparison; 166. sperm pump. Scale 0.1 mm.
**Diagnosis.** Frons not projecting above eye, as wide as eye; 2 or inclination and 2 ors reclinate, proportional distance between setae in the ori-ors series from anterior to posterior subequal; fronto-orbital plate slightly shining, about 1/7 width of frons; fronto-orbital setulae in 2 sparse rows, inner row inclinate and outer row reclinate; ocellar triangle slightly shining, extending between 2 or. Facial keel very thin and not raised. Gena about 1/6 height of eye, highest point located beyond middle. Mesonotum with greenish sheen, 0+2 dc, acr in 8 rows. Calypteral gray, margin and fringe blackish brown. Mid tibia with 2 strong posterior setae. Abdomen blackish brown with greenish or coppery sheen.

**Redescription.** MALE. Body length 1.5–1.7 mm, wing length 1.6–1.9 mm. FEMALE. Body length 1.4–1.9 mm, wing length 1.6–2.0 mm.

Head (Figs 156, 157) blackish brown. Frons dark, not projecting above eye, nearly as wide as long, as wide as eye; 2 ori inclinate and 2 ors reclinate, ori shorter than ors, proportional distance between setae in the ori-ors series from anterior to posterior subequal (or slightly larger distance between 2 ori in some specimens, see Steyskal, 1980: fig. 7D) (Fig. 157); fronto-orbital plate slightly shining and not projecting forward, about 1/7 width of frons; fronto-orbital setulae in 2 sparse rows, inner row inclinate and outer row reclinate, but a few procline on anterior margin; ocellar triangle slightly shining, extending between anterior ori and posterior or; oc strong, slightly longer than ori; postocellar setae strong. Lunule 0.12 mm high, 1.2 times as wide as high. Facial keel very thin and not raised. Gena brown, about 1/6 height of eye, highest point located beyond middle. Eye bare. Antennal 1st flagellomere short ovate and arista bare. Proboscis brown, palpus black.

Thorax (Figs 156, 158) black. Mesonotum and scutellum with brownish pruinosity and greenish sheen. Mesonotum with 0+2 dc, acr in 8 rows. 1 strong anepst, 1 strong kepst. Calypteral gray, margin and fringe blackish brown. Fore tibia without posterior setae and mid tibia with 2 strong posterior setae. Wing (Fig. 159) with costa extending to M₁; costal ratio 3:1:1; r-m beyond middle of discal cell; ultimate and penultimate sections of M₁, in proportion of 1.6:1; ultimate and penultimate sections of CuA₁ in proportion of 1:1.7. Halter blackish brown.

Abdomen blackish brown with greenish or coppery sheen. Male genitalia (Figs 160–166): surstylus with sparse short spines except apical 1–2 spines stronger and with several long setulae posteriorly; hypandrial apodeme tapering apically; basiphallus nearly V-shaped, with lateral arms narrow apically, a small gap between basiphallus and distiphallus; distiphallus with a basal incision and membranous sections curved; ejaculatory apodeme narrow fan-shaped, with long stem.


**Biology/Host plants.** This is one of the apparently few oligophagous species of Melanagromyza, feeding on several plant families, and several tribes within Asteraceae. Larvae feed and pupariate within seed heads of numerous asters (Spencer & Stegmaier, 1973; Spencer, 1981; Spencer & Steyskal, 1986; Spencer, 1990; Zerbino, 2001; Braun et al., 2008; Vallederes et al., 2011), and possibly as internal root feeders on Ùrtila (Spencer & Steyskal, 1986; Spencer, 1990). In California, this species has been reared from: Buffalo gourd / Calabazilla / Missouri gourd, Cucurbita foetidissima Kunth (Cucurbitaceae); common sunflower, Helianthus annuus L. (Asteraceae); from seed heads of Golden crownbeard, Verbesina encelioides (Cav.) Benth. & Hook. f. ex A. Gray (Asteraceae); and from Hoary nettle, Ùrtila dioica subsp. holosericea. See Maps 10 and 11 for the California
distribution of *M. minimoides* and host plants *Cucurbita foetidissima*, *Helianthus annuus* and *Verbesina enceloides* (Map 11) and *Urtica dioica* subsp. *holosericea* (Map 10). The plant *Cucurbita foetidissima* is native to California, being found in sandy, gravelly habitats at elevations lower than 1300 m throughout California, and to Nebraska, Missouri, Texas and Mexico, and is known from the Great Central Valley, Central Western California, Southwestern California, and Desert regions. The plant *Helianthus annuus* is native to California, being found in the disturbed areas, scrub, grasslands and many other habitats at elevations lower than 2000 m throughout California, and to eastern North America. The plant *Verbesina enceloides* subsp. *exariculata* (B. L. Rob. & Greeen.) J. R. Coleman, which is native Arizona to Great Plains and Mexico, is naturalized in disturbed areas and fields, and along roadsides, at elevations below 300 m throughout California, to much of western North America, and is known from the San Joaquin Valley, southern Central Coast and South Coast Ranges, and South Coast and Sonoran Desert regions. For details on *Urtica dioica* subsp. *holosericea*, see "Biology/Host plants" section for *M. martini*. In Florida and elsewhere, hosts also include other Asteraceae, such as *Symphyotrichum simmondsii* (Small) G.L. Nesom, *Borrichia frutescens* (L.) DC., *Helenium nudiflorum* Raf., *Melanthera deltoidea* Michx., *Rudbeckia laciniata* L., and *Verbesina virginica* L. var. *laciniata* (Poir.) A. Gray (Spencer & Stegmaier, 1973), as well as *Bidens gardneri* Baker and *Tilesia baccata* (L.) Pruski (Braun et al., 2008), and species of the aster genera *Heliopsis* and *Viguiera* (Spencer, 1990).

**Distribution.** USA (California (Maps 10, 11) [Los Angeles Co.*, San Diego Co.*], Arkansas, Florida, Maryland, Ohio, Texas), Argentina, Bolivia, Dominican Republic, Guadalupe, Mexico, Venezuela, Uruguay.

**Remarks.** The species is very similar to *Melanagromyza minima*, but these two species can be separated by the number of posterior setae on the mid tibia, the length of the female ovipositor sheath, and the distance between the basiphallus and distiphallus (see the key).

**Melanagromyza muguensis** Spencer, 1981

(Figs 167–174, Map 3)


**Diagnosis.** Frons not projecting above eye, 1.3 times as wide as eye; 2 *ori* inclinate and 2 *ors* reclinate, 2 *ori* widely separated; fronto-orbital plate slightly shining and inner margin brownish yellow on anterior 1/2, and about 1/5 width of frons; fronto-orbital setulae in 2 rows, inner row procline or incline and outer row erect or reclinate; ocellar triangle slightly bluish green shining at middle, nearly extending to anterior margin of frons. Facial keel slightly raised, divided bases of antennae. Gena about 1/4 height of eye, highest point located at middle. Eye pilose. Arista bare. Mesonotum with blackish greenish sheen, 0+2 dc. Calypter white, margin and fringe pale yellow. Mid tibia with 2 strong posterior setae. Abdomen blackish brown with greenish sheen.

**Redescription.** MALE. Wing length 2.1 mm (Holotype).

Head (Figs 168, 169) brown. Frons brownish black, not projecting above eye, nearly as wide as long, 1.3 times as wide as eye; 2 *ori* inclinate, widely separated, anterior *ori* shorter than posterior; 2 *ors* reclinate, longer than posterior *ori*; proportional distance between setae in the *ori*-*ors* series from anterior to posterior 5.3:1:1.7; fronto-orbital plate slightly shining, inner margin brownish yellow and becoming narrower on anterior 1/2 (Fig. 168), about 1/5 width of frons; fronto-orbital setulae in 2 rows, inner row procline or incline and outer row erect or reclinate; ocellar triangle slightly bluish green shining at middle, nearly extending to anterior margin; oc strong, slightly longer than *ori*; postocellar setae strong. Lunule 0.15 mm high, 1.2 times as wide as high. Facial keel slightly raised, divided bases of antennae. Gena brown, about 1/4 height of eye, highest point located at middle. Eye pilose. Antennal 1st flagellomere short ovate and arista bare. Proboscis brown, palpus black.

Thorax (Figs 167, 170) blackish brown. Mesonotum and scutellum with brownish pruinosity and blackish green sheen. Mesonotum with 0+2 dc, acr in 6 rows (the pin goes through, so it is not clear to count). 1 strong *anept* with 2–3 long setulae, 1 strong *kept* with 1 long setula. Calypter white, margin and fringe pale yellow. Fore tibia without posterior setae and mid tibia with 2 strong posterior setae (not very clear to count). Wing (Fig. 171) with costa extending to *M*1/2; costal ratio 3.3:1:1; *r-m* beyond middle of discal cell; ultimate and penultimate sections of *M*1/2 in proportion of 1.7:1; ultimate and penultimate sections of *CuA*1 in proportion of 1:1.5. Halter blackish brown.
Abdomen blackish brown with greenish sheen. Male genitalia (Figs 172–174): surstylus with sparse irregular short spines; hypandrium Y-shaped with narrow hypandrial apodeme; basiphallus U-shaped with a pair of basal processes and lateral arms wide, slightly narrow; distiphallus with narrow at apex and two pairs of triangular processes.

**Type material.** Holotype male (USNM, male genitalia No. 4880): CALIFORNIA: Ventura Co., Point Mugu State Park, 34°07’42.69″N 119°00’37.09″W, 2.IV.1977, K.A. Spencer.
**Biology/Host plants:** Unknown.

**Distribution.** USA (California (Map 3) [Ventura Co.], Oregon).

*Melanagromyza osoflacensis* Spencer, 1981
(Figs 175–185, Map 3)


**Diagnosis.** Frons slightly projecting above eye, 1.5 times as wide as eye; 3 *ori* inclinate and convergent and 2 *ors* reclinate, proportional distance between setae in the *ori-ors* series from anterior to posterior 1:1.2:2:1.5; fronto-orbital plate brilliantly shining, anterior margin broad, about 1/6 width of frons; fronto-orbital setulae in 2 rows; ocellar triangle broad, slightly greenish or bluish green shining, extending to anterior margin of frons. Gena about 1/5 height of eye, highest point located at middle. Eye pilose. Arista with microscopic setulae. Mesonotum with slightly greenish sheen, 0+2 *dc*. Calypter white, fringe white and margin pale yellow. Mid tibia with 1 strong posterior seta. Abdomen black with slightly greenish sheen.

**Redescription.** **MALE.** Wing length 2.0 mm (Holotype), 2.5 mm (Non-type).

Head (Figs 177–179) black. Frons dark, slightly projecting above eye, 1.2 times as wide as long, 1.5 times as wide as eye; 3 *ori* inclinate and convergent, 2 *ors* reclinate, *ori* slightly shorter than *ors*, proportional distance between setae in the *ori-ors* series from anterior to posterior 1:1.2:2:1.5; fronto-orbital plate brilliantly shining, anterior margin broad, yellowish brown (broad yellow area on anterior margin in a male specimen from UCD) with dense setulae, about 1/6 width of frons; fronto-orbital setulae in 2 rows, reclinate (inner row sparse, inclinate and outer row slightly dense, proclinate in a male specimen from UCD) except a few proclinate or inclinate on anterior margin; ocellar triangle broad, slightly greenish or bluish green shining, extending to anterior margin of frons; *oc* strong, as long as *ori*; postocellar setae strong. Lunule brownish gray, 0.18 mm high, slightly higher than wide. Gena blackish brown, about 1/5 height of eye, highest point located at middle. Eye pilose. Antenna blackish brown, 1st flagellomere short ovate with long setulae, and arista slightly microscopic pubescent. Proboscis yellowish brown, palpus black.

Thorax (Figs 175, 176) black. Mesonotum and scutellum with brownish pruinosity and slight greenish sheen. Mesonotum with 0+2 *dc, acr* in 6 irregular rows. 1 strong *anepst* with 1 long setula, 1 strong *kepst* with 2 long setulae. Calypter white, fringe white and margin pale yellow (Holotype specimen, Fig. 175) to blackish brown (in a male specimen from UCD, Fig. 176). Fore tibia without posterior setae and mid tibia with 1 strong posterior seta. Wing (Fig. 180) with costa extending to *M*1+2; costal ratio 5:1.5:1; *r*-m slightly beyond middle of discal cell; ultimate and penultimate sections of *M*1+2 in proportion of 1.5:1; ultimate and penultimate sections of *CuA*1 in proportion of 1:1.5. Halter blackish brown.

Abdomen black with slight greenish sheen. Male genitalia (Figs 181–185): epandrium with a large apical concavity; surstylist with dense short spines and 2–3 long apical setulae; hypandrium Y-shaped with short hypandrial apodeme; basiphallus U-shaped; distiphallus broad basally and narrow in apical half with two pairs of triangular processes; ejaculatory apodeme broad and fan-shaped.

FEMALE. Unknown.

**Type material.** Holotype male (CAS Type No. 14069, male genitalia No. 4708): CALIFORNIA: San Luis Obispo Co., Oso Flaco Lake, 5 miles S. of Oceano, 35°01′46.34″N 120°37′19.22″W, 27.IV.1968, J. Powell.

**Non-type material.** CALIFORNIA: Kern Co., 1 male (EMEC), Woody, 1 mi E, 35°42′10.02″N 120°49′50.89″W, 3.V.1964, P. Rude.

**Biology/Host plants:** Unknown.

**Distribution.** USA (California (Map 3) [Kern Co., San Luis Obispo Co.]).
FIGURES 175–180. Melanagromyza osoflacensis Spencer, 1981. Holotype male (CAS): 175. habitus, lateral view; 176. habitus, lateral view (Paratype male, UCD); 177–179. head, dorsal and lateral view (178 Paratype male, UCD); 180. wing.
FIGURES 181–185. Melanagromyza osoflacensis Spencer, 1981. Holotype male (CAS): 181. epandrial complex, posterior view; 182. hypandrium, ventral view; 183, 184. phallic complex, ventral and lateral view; 185. sperm pump. Scale 0.1 mm. (Figures 182–184 provided by Owen Lonsdale, CNC).

Melanagromyza palaensis Spencer, 1981
(Figs 186–195, Map 1)

**Diagnosis.** Frons distinctly projecting above eye, 1.5 times as wide as eye; 4 ori inclinate and 2 ors reclinate, proportional distance between setae in the ori-ors series from anterior to posterior subequal; fronto-orbital plate brilliantly shining and not wide at middle, about 1/4 width of frons; fronto-orbital setulae in 2 rows, inner row proclinate and outer row reclinate; ocellar triangle slightly greenish shining at middle, extending to posterior most ori. Facial keel raised, dividing bases of antennae. Gena about 1/5 height of eye, highest point located at middle. Mesonotum with greenish sheen, 0+2 dc, acr in 6–8 rows. Calypter gray, margin and fringe blackish brown. Abdomen black with bluish green or greenish sheen.

**Redescription.** MALE. Wing length 1.75 mm.

Head (Figs 187, 188) black. Frons dark, distinctly projecting above eye, nearly as wide as long, and 1.5 times as wide as eye; 4 ori inclinate, ori shorter than ors; 2 ors reclinate, longer than posterior ori; proportional distance between setae in the ori-ors series from anterior to posterior subequal; fronto-orbital plate brilliantly shining and not wide at middle, about 1/4 width of frons; fronto-orbital setulae in 2 rows, inner row proclinate and outer row reclinate; ocellar triangle slightly greenish shining at middle, extending to posteriormost ori; oc strong, nearly as long as ors; postocellar setae strong. Lunule 0.14 mm high, slightly higher than wide. Facial keel raised, dividing bases of antennae. Gena about 1/5 height of eye, highest point located at middle. Eye pilose. Antennal 1st flagellomere short ovate and arista bare. Proboscis yellowish brown, palpus black.

Thorax (Figs 186, 189) black. Mesonotum and scutellum with grayish pruinosity and greenish sheen. Mesonotum 0+2 dc, acr in 6–8 rows. 1 strong anepst and 1 strong kepst with 1 long setula. Calypter gray, margin and fringe blackish brown. Fore and mid tibia without posterior setae. Wing (Fig. 190) with costa extending to M1+2; costal ratio 4.5:1:1; r-m beyond middle of discal cell; ultimate and penultimate sections of M1+2 in proportion of 1.6:1; ultimate and penultimate sections of CuA, in proportion of 1:1.7. Halter black.

Abdomen black with bluish greenish or greenish sheen. Male genitalia (Figs 191–195): epandrium with an apical concavity; surstylus with short spines in 3 irregular rows and 3 long apical setulae; hypandrium Y-shaped with a wide hypandrial apodeme; basiphallus wide U-shaped, with lateral arms incurved and narrow apically; distiphallus blunt and rounded apically, with a short narrow distomedial tube; ejaculatory apodeme broad and fan-shaped, with small lateral concavities.

FEMALE. Unknown.

**Type material.** Holotype male (USNM, male genitalia No. 4726): CALIFORNIA: San Diego Co., 4 miles N. of Pala, 33°21′37.11″N 117°04′9.51″W, 17.IV.1977, K.A. Spencer.

**Biology/Host plants.** Unknown.

**Distribution.** USA (California (Map 1) [San Diego Co.]).

**Remarks.** Adding to the list of types from Spencer (1981) sold to the USNM discussed in Lonsdale (2011), the holotype of this species was noted as deposited in CAS, but is property of USNM.

*Melanagromyza quadrisetosa* Spencer, 1981

(Figs 196–206, Map 2)


**Diagnosis.** Frons distinctly projecting above eye, 1.9 times as wide as eye; 6–7 ori inclinate and 2 ors reclinate, ori and ors long; fronto-orbital plate with broad anterior margin and dense setulae, about 1/4 width of frons; fronto-orbital setulae in 3 rows; ocellar triangle dark, broad, extending to anterior margin of frons. Facial keel raised, dividing bases of antennae; parafacial sparse grayish pruinosum. Gena broad, about 1/3 eye height, highest point located at middle. Eye pilose. Arista bare. Mesonotum with slightly coppery sheen. Mesonotum with 1+3–4 dc, acr in 8 irregular rows. Calypter pale yellow, margin and fringe yellowish brown. Mid tibia with 2 strong posterior setae. Abdomen black with greenish or bluish green sheen in male and brown, coppery or greenish sheen in female.

**Redescription.** MALE. Wing length 3.5 mm (Holotype). FEMALE. Body length 4.2 mm, wing length 3.9 mm.

Head (Figs 197, 198) brownish black. Frons dark black, distinctly projecting above eye (Fig. 198), 1.2 times as wide as long, 1.9 times as wide as eye; 6–7 ori inclinate and 2 ors, ori and ors strong, subequal in length; proportional distance between setae in the ori-ors series from anterior to posterior subequal, except
FIGURES 202–206. Melanagromyza quadrisetosa Spencer, 1981. Holotype male (CAS). 202. epandrial complex, lateral view; 203. hypandrium, ventral view (partly broken); 204, 205. phallic complex, ventral and lateral view, from original figures in Spencer (1981), reproduced in Spencer & Steyskal (1986); 206. sperm pump. Scale 0.1 mm.
slightly wider gap between posterior ori and anterior ors; fronto-orbital plate dark brown, anterior margin broad with dense setulae, about 1/4 width of frons; fronto-orbital setulae in 3 rows, two inner rows procline or inclinate and single outer row near eye margin reclinate except anterior margin with a few erect or procline (all rows erect or procline in one female specimen, EMEC); ocellar triangle dark, broad, extending to anterior margin of frons; oc strong, slightly shorter than anterior ors; postocellar setae strong. Lunule brown, slightly bulging, 0.2 mm high, 1.4 times as wide as high. Facial keel raised, dividing bases of antennae; parafacial brownish black with sparse grayish pruinosity, about 1/11 height of eye. Gena blackish brown, broad, about 1/3 height of eye, highest point located at middle. Eye pilose. Antenna blackish brown, 1st flagellomere short ovate, and arista bare. Proboscis yellowish brown, palpus blackish brown.

Thorax (Figs 196, 199, 200) black. Mesonotum and scutellum with slightly coppery sheen and brownish pruinosity. Mesonotum with 1+3–4 dc (Figs 199, 200), acr in 8 irregular rows. Anepesternum with whitish gray pruinosity. 1 strong anepst with 3 long setulae, 1 kepst with 2–3 long setulae. Calypter pale yellow, margin and fringe yellowish brown in male, and calypter white, margin yellowish brown and fringe brownish yellow in female. Fore tibia without posterior setae and mid tibia with 2 strong posterior setae. Wing (Fig. 201) with costa extending to M₁+2; costal ratio 4:1.2:1; r-m nearly at basal 2/3 point of discal cell; ultimate and penultimate sections of M₁+2 in proportion of 1.1:1; ultimate and penultimate sections of CuA₁ in proportion of 1:1.5. Halter blackish brown.

Abdomen black, with greenish or bluish green sheen in male, and brown, coppery or greenish sheen in female. Male genitalia (Figs 202–206): epandrium broad, slightly concave on apical margin; surstylus with short dense apical spines; hypandrium Y-shaped with long hypandrial apodeme; basiphallus U-shaped, relatively long, with lateral arms diverging; distiphallus broad medially and gradually tapering; ejaculatory apodeme long and fan-shaped.


**Biology/Host plants.** Unknown.

**Distribution.** USA (California (Map 2) [Marin Co.]).

**Melanagromyza sagehenensis** Spencer, 1981

(Figs 207–214, Map 13)


**Diagnosis.** Frons slightly projecting above eye, about 1.8 times as wide as eye; 3 ori, strong and inclinate; 2 ors, reclinate; proportional distance between setae in the ori-ors series from anterior to posterior 2.5:1:2:1; fronto-orbital plate slightly shining, about 1/4–1/3 width of frons; fronto-orbital setulae in 2 irregular rows, reclinate except a few procline on anterior margin; ocellar triangle small and slightly shining, extending to posterior ors. Facial keel raised, dividing bases of antennae. Gena about 1/4–1/3 height of eye, highest point located slightly before middle. Eye and arista bare. Mesonotum with slightly greenish sheen, 0+3–4 dc (female with 4 strong dc and male with 3 dc, anteriormost dc weak), acr in 6–8 irregular rows (female in 6 rows and male in 8 rows). Calypter gray, margin and fringe blackish brown. Mid tibia with 1 strong posterior seta. Abdomen blackish brown, with coppery and greenish sheen.

**Redescription.** MALE. Body length 1.7 mm, wing length 1.9 mm. FEMALE. Body length 2.0 mm, wing length 2.1 mm.

Head (Figs 208, 209) black. Frons dark, slightly projecting above eye, wider than long, about 1.8 times as wide as eye; 3 ori, nearly equal length, strong and inclinate; 2 ors, reclinate and anterior ors slightly longer than ori; proportional distance between setae in the ori-ors series from anterior to posterior 2.5:1:2:1; fronto-orbital plate slightly shining, about 1/4 width of frons; fronto-orbital setulae in 2 irregular rows, reclinate except a few procline on anterior margin; ocellar triangle small, only extending to posterior ors, and slightly shining; oc strong, nearly as long as ori, postocellar setae strong, divergent. Lunule brown, 0.12 mm high, as long as wide and semicircular. Facial keel raised, dividing bases of antennae. Parafacial black and slightly broad, as long as 1/8

Thorax (Figs 207, 210) black. Mesonotum and scutellum with slight greenish sheen. Mesonotum with 0+3–4 dc (female with 4 strong dc and male with 3 dc, anteriormost dc weak), acr in 6–8 irregular rows (female in 6 rows and male in 8 rows). 1 strong anepst with 2–3 long setulae, 1 strong kepst with 1–2 long setulae. Calypter gray, margin and fringe blackish brown. Fore tibia without strong posterior seta and mid tibia with 1 strong posterior seta (this character is not in good condition in two specimens). Wing (Fig. 211) with costa extending to M1+2; costal ratio 2.7:1:1; r-m slightly beyond middle of discal cell; ultimate and penultimate sections of M1+2 in proportion of 2.2:1; ultimate and penultimate sections of CuA1 in proportion of 1:1. Halter blackish brown.

Abdomen blackish brown, with coppery and greenish sheen. Male genitalia (Figs 212–214): sus stylus with sparse short spines, extending in 1–3 rows from distal margin of surstylus to anterodistal margin of epandrium, and with several long setulae; hypandrium Y-shaped, with long hypandrial apodeme; basiphallus semicircular and narrow at apices; distiphallus narrow in apical half, and with central concavity.


Type material. Paratypes: CALIFORNIA: Amador Co., 1 male (UCD, type number 1198#), 4 miles North of Silver Lake, 38°39′35.00″N 120°06′56.24″W, 25.VII.1955, E.I. Schlinger; Nevada Co., 1 female (UCD), Sagehen Creek, 39°27′09.43″N 120°36′08.11″W, 19.VI.1974, B. Villegas (no head).

Biology/Host plants. This is the only species of Melanagromyza known to feed on Rosaceae (Spencer, 1990), with larvae feeding as internal stem borers in Sticky cinquefoil, Drymocallis glandulosa (Lindl.) Rydb. (Rosaceae)
(Spencer & Steyskal, 1986; Spencer, 1990). See Map 13 for the California distribution of *M. sagehensis* and host plant *Drymocallis glandulosa*. This plant species is native to California, including four varieties, as follows. *Drymocallis glandulosa* var. *glandulosa* is found in shady or moist areas at elevations between 400–2000 m throughout northern California, and to British Columbia, Montana, Arizona, and is known from the Klamath Ranges, North Coast Ranges, Cascade Range, Sierra Nevada, Sacramento Valley (Sutter Buttes), Transverse Ranges, Peninsular Ranges and Modoc Plateau. *Drymocallis glandulosa* var. *reflexa* (Greene) Ertter is found in shady or moist areas at elevations between 450–2600 m throughout California, and to southern Oregon, western Nevada, and Mexico (northern Baja California), and is known from the Klamath Ranges, High North Coast Ranges, High Cascade Range, High Sierra Nevada, San Gabriel Mountains, San Bernardino Mountains and Peninsular Ranges. *Drymocallis glandulosa* var. *viscida* (Parish) Ertter is found in open areas under pines and along streams at elevations between 1100–2500 m in California, being known from the Transverse Ranges and Peninsular Ranges. *Drymocallis glandulosa* var. *wrangelliana* (Fisch. & Avé-Lall.) Ertter is found in openings in coastal scrub areas, and shady or moist areas at elevations below 1000 m throughout California, and to southwestern Oregon, and northern Baja California, and is known from the North Coast, Outer North Coast Ranges, Central Western California and South Coast.

**Distribution.** USA (California (Map 13) [Amador Co., Nevada Co.], Montana).

Melanagromyza scrophulariae Spencer, 1981
(Figs 215–223, Map 14)


**Diagnosis.** Frons distinctly projecting above eye, 2.3 times as wide as eye, anterior margin slightly narrower; 4–5 *ori*, strong and inclinate; 2 *ors*, reclinate; fronto-orbital plate shining, about 1/4 frons width; fronto-orbital setulae in 2 rows, outer row reclinate and inner row inclinate; ocellar triangle broad, extending to anterior margin of frons, slightly shining. Facial keel raised, dividing bases of antennae. Gena about 1/3–1/2 height of eye, highest point located slightly before middle. 1 strong vibrissa and a row of short setulae along peristomal margin. Mesonotum with slight greenish sheen, 0+3–4 *dc* (if with 4 *dc*, anterior 2 *dc* weaker). Calypter white or pale yellow, margin and fringe yellowish brown. Mid tibia without strong posterior seta. Abdomen blackish brown with distinctly coppery and greenish sheen.

**Redescription.** MALE. Body length 2.0–2.7 mm, wing length 2.3–3.0 mm. FEMALE. Body length 2.5–3.0 mm, wing length 2.8–3.2 mm.

Head (Figs 215, 216) black. Frons dark brown, with distinctly projecting above eye (Fig. 222), slightly wider than long, 2.3 times as wide as eye, anterior margin slightly narrow and black; 4–5 *ori*, subequal in length, strong and inclinate; 2 *ors*, reclinate and slightly longer than *ori*; proportional distance between setae in the *ori-ors* series from anterior to posterior subequal; fronto-orbital plate shining, about 1/4 width of frons, and anterior margin broad, yellowish brown, reddish brown or brown, and inner margin distinctly brown; fronto-orbital setulae black in 2 rows, outer row reclinate and inner row inclinate; ocellar triangle broad, extending to anterior margin of frons, black and slightly shining; *oc* strong, nearly as long as *ori*, postocellar setae strong, divergent. Lunule brown, 0.20 mm high, slightly wider than high. Facial keel raised, dividing bases of antennae. Parafacial black and slightly broad, about 1/5 height of eye. Gena brownish yellow to yellowish brown, about 1/3–1/2 height of eye, highest point located slightly before middle. 1 strong vibrissa and a row of short setae on peristomal margin. Eye bare. Antenna blackish brown, 1st flagellomere short ovate and arista with microscopic setulae. Proboscis brownish yellow, palpus black.

Thorax (Figs 215, 217) black. Mesonotum and scutellum with dense brown pruinosity and slight greenish sheen. Mesonotum with 0+3–4 *dc* (if with 4 *dc*, anterior 2 *dc* weaker) (Fig. 217), *acr* in 6–8 irregular rows. 1 *anepest* with 2–3 long setulae, 1 *kepest* with 1 long setula. Calypter white or pale yellow, margin and fringe yellowish brown. Fore and mid tibia without strong posterior seta. Wing (Fig. 218) with costa extending to *M*<sub>1+2</sub>; costal ratio 4:1:3:1; *r*-m at or slightly beyond middle of discal cell; ultimate and penultimate sections of *M*<sub>1+2</sub> in proportion of 1.4:1; ultimate and penultimate sections of *CuA*<sub>1</sub> in proportion of 1:1.6. Halter blackish brown.
Abdomen (Fig. 215) blackish brown, with distinctly coppery and greenish sheen. Male genitalia (Figs 219–223): epandrium very broad with long setulae along apical margin; surstylus with sparse short spines on anterior
ventral corner, and long apical setulae; basiphallus U-shaped, narrow and slightly curved inward apically; distiphallus broad mediately and apical projection; ejaculatory apodeme broad and fan-shaped. Cercus long with tiny teeth.

**Type material.** Paratypes: CALIFORNIA: Alameda Co., 1 male (EMEC), Berkeley Hills, 37°53′32.33″N 122°16′05.61″W, 26.III.1954, R.F. Smith & E.G. Linsley; Contra Costa Co., 2 females (EMEC), Richmond, Pt. Molate, 37°56′47.73″N 122°25′18.90″W, 27.III.1964, J.A. Powell; Marin Co., 1 male (EMEC), Fort Cronchite, 37°49′57.13″N 122°31′57.59″W, 3.III.1962, C.A. Toschi; San Francisco Co., 4 males, 3 females (EMEC), Strawberry Hill, 37°46′07.11″N 122°28′31.14″, 17.III.1961, J. Powell; San Mateo Co., 1 male (EMEC), 37°33′46.77″N 122°19′31.89″, 29.IV.1949, R.S. Beal.

**Non-type material.** CALIFORNIA: Mendocino Co., 9 males, 6 females (CSCA), Inglewood Fen & dunes, 39°30′41.40″N 123°46′24.32″W, 6.III.1975, J. Powell; Monterey Co., 1 female (CSCA), Big Creek Reserve 7 mi. N. Lucia, 36°22′46.86″N 121°33′44.79″, 21.III.1981, J.B. Whitfield; San Mateo Co., 1 female (CSCA), San Bruno Mts., 37°33′46.77″N 122°19′31.89″, 23.II.1967, W.W. Middlekauff & D.C. Rentz.

**Biography/Host plants.** Larvae of this species are internal stem borers in California figwort, *Scrophularia californica* Cham. & Schltdl. (Scrophulariaceae) (Spencer, 1981; Spencer & Steyskal, 1986; Spencer, 1990). See Map 14 for the California distribution of *M. scrophulariae* and host plant *Scrophularia californica*. This plant species is native to California, being found in damp places, chaparral, and along the roadsides at elevations lower than 2500 m throughout California, and to British Columbia and Arizona. The plant is known from the California Floristic Province.


*Melanagromyza splendida* Frick, 1953
(Figs 1–3, 4, 7, 8, 10, 224–235, Maps 16, 17)


**Diagnosis.** Frons not projecting above eye, 1.2 times as wide as eye; 2 ori inclinate and widely separated, and 2 ors reclinate; proportional distance between setae in the ori-ors series from anterior to posterior 4.5:1.5:1; fronto-orbital plate slightly shining and wider at middle, about 1/4–1/3 width of frons; fronto-orbital setulae in 3 rows, inner row proclinate, and two outer rows reclinate; ocellar triangle slightly shining, extending to posterior ori. Gena about 1/6 height of eye, highest point located at middle. Mesonotum and scutellum with greenish sheen, 0+2 dc, acr in 8 rows. Calypter white, margin and fringe white. Mid tibia with 2 strong posterior setae. Abdomen blackish brown with coppery and greenish sheen.

**Redescription.** MALE. Body length 1.7–2.2 mm, wing length 1.8–2.4 mm (Holotype 2.4 mm). FEMALE. Body length 1.9–2.3 mm, wing length 2.3–2.6 mm.

Head (Figs 1–4, 225–228) mostly blackish brown. Frons dark brown, not projecting above eye, nearly as wide as long, 1.2 times as wide as eye; 2 ori inclinate and widely separated, and 2 ors reclinate; proportional distance between setae in the ori-ors series from anterior to posterior 4.5:1.5:1; fronto-orbital plate slightly shining, wider at middle, about 1/4–1/3 width of frons; fronto-orbital setulae (Figs 1, 3) in 3 rows, inner single row proclinate, and two outer rows reclinate; ocellar triangle slightly shining, extending to posterior ori; oc strongly, nearly as long as ors; postocellar setae strong. Lunule 0.10 mm high, 2.0 times as wide as high. Facial keel narrow and not raised. Gena about 1/6 height of eye, highest point located at middle. Eye pilose (Figs 1, 2), pile as long as fronto-orbital setulae. Antennal 1st flagellomere short ovate and arista bare. Proboscis yellowish brown, palpus black.

Thorax (Figs 7, 8, 224, 229) blackish brown. Mesonotum and scutellum with greenish sheen. Mesonotum with 0+2 dc, acr in 8 rows (Fig. 7). 1 anepst with 2–4 long setulae and 1 kepst with a long setula (Fig. 8). Calypter white, margin and fringe white. Fore tibia without posterior setae, mid tibia with 2 strong posterior setae (Fig. 10). Wing (Fig. 230) with costa extending to M1; costal ratio 1.1 mm: 0.3 mm: 0.25 mm; r-m nearly at apical 1/3 point or just between middle point and apical 1/3 point; ultimate and penultimate sections of M1 in proportion of 1.0 mm: 0.6 mm; ultimate and penultimate sections of CuA, in proportion of 0.5 mm: 0.6 mm. Halter blackish brown.
FIGURES 224–230. Melanagromyza splendida Frick, 1953. Non-type male (CSCA): 224. habitus, lateral view; 225–228. head, dorsal and lateral view, 225 Holotype male, USNM; 229. thorax, lateral view (Holotype male, USNM); 230. wing (Holotype male, USNM).
FIGURES 231–235. *Melanagromyza splendida* Frick, 1953. Holotype male (USNM). 231. epandrial complex, lateral view; 232. hypandrium, ventral view; 233, 234. phallic complex, ventral and lateral view; 235. sperm pump. Scale 0.1 mm. (Figures 232–234 provided by Owen Lonsdale, CNC).
Abdomen blackish brown, with coppery and greenish sheen. Male genitalia (Figs 231–235): surstylus relatively narrow with dense short spines in 3 rows; hypandrium Y-shaped with short hypandrial apodeme; basiphallus U-shaped, with arms diverging; distiphallus with broad basal section, middle section with a pair of lateral projections, apical section narrow and with a pointed triangular subapical process; ejaculatory apodeme fan-shaped with long stem.

Type material. Holotype male (USNM, male genitalia deposited in microvial), Hawaii: Kamuela, ex Celery, 5.XII.1950, [collector not given]. Paratypes: Hawaii: 1 male (CAS), Glenwood, VIII.1951, ex: rotten lettuce, K.E. Frick; 1 female (CAS), Kurtistown, ToHo, 23.VII.1941, Celery (Apium graveolens L.), S. Takei.


Biological/Host plants. This species has a wide host range (Spencer, 1990), and is one of the apparently few oligophagous species of Melanagromyza, feeding on several plant families, and several tribes within Asteraceae. Larvae are internal borers in stems and at the bases or midribs of large leaves of various asters (Spencer, 1969; Spencer, 1973a; Spencer & Stegmaier, 1973; Spencer, 1990), pupariating internally (Spencer, 1973a; Spencer, 1981). In California, this species has been reared from: Helianthus annuus, and is associated with a Rhizopus stem disease in this plant (Mathew et al., 2015); Guayule, Parthenium argentatum A. Gray (Asteraceae) (only as the cultivated plants, no general distribution records in California); and cultivated zinnias, Zinia sp. (Asteraceae). It has also been collected in association with Common ragweed / annual ragweed, Ambrosia artemisiifolia L. (Asteraceae); Celery / wild celery, Apium graveolens L. (Apiaceae); African or French marigold / Aztec marigold, Tagetes erecta L. (Asteraceae); Common beggarticks / hairy beggarticks, Bidens pilosa L. (Asteraceae); Calabaza / field pumpkin, Cucurbita pepo L.; Carrot / Queen Anne’s lace, Daucus carota L. (Apiaceae); and Fire wheel / blanket flower / Indian blanket, Gaillardia pulchella Foug. (Asteraceae). Outside of California, this species has been reared from Flaveria linearis Lag. (Asteraceae) in Jamaica and Erechites hieraciifolia (L.) DC. var. hieraciifolia in Florida (Spencer & Stegmaier, 1973). See Maps 16 and 17 for the California distribution of M. splendida and host plants Ambrosia artemisiifolia, Apium graveolens, Tagetes erecta (Map 16), Bidens pilosa, Cucurbita pepo, Daucus carota and Gaillardia pulchella (Map 17). The plant H. annuus species is native to California (see Map 11 for plant distribution), with details provided in the "Biological/Host plants" section for M. minimoides. Artemesia artemisiifolia, which is native to the eastern United States, is naturalized in California, being found in disturbed sites at elevations lower than 1050 m throughout California, to Alaska, Canada, and in much of the world, and is known from the Klamath Ranges, Cascade Range foothills, northern and central Sierra Nevada, Sacramento Valley, Outer South Coast Ranges, South Coast and Peninsular Ranges. The plant A. graveolens is native to Eurasia, and is naturalized in California, being found in wet areas at elevations lower than 1000 m throughout California, to many temperate zones worldwide, cultivated and naturalized widely. The plant T.
erecta which is native to Mexico, is a waif in California, being found in disturbed habitats at elevations below 1000 m, and is known from Central Western California and Southwestern California. The plant B. pilosa is naturalized in California, being found in disturbed areas at elevations below 750 m throughout California, and to subtropical and tropical areas worldwide, and is known from the Central Western California and Southwestern California. The plant C. pepo var. pepo is naturalized in California, being found in sandy areas at elevations below 100 m, and is known from the South Coast (Ventura Co.), and is cultivated worldwide. The plant D. carota, which is native to Europe, is naturalized in California, being found in disturbed areas and along roadsides at elevations below 1650 m throughout California, and through to eastern North America, and is known from the California Floristic Province and East of Sierra Nevada. The carrot cultivar is also widely cultivated. The plant G. pulchella, which is native to Texas and nearby states, is a waif in California, being found in disturbed sites at elevations lower than 1000 m, and known from the Sierra Nevada Foothills, San Francisco Bay Area, Southwestern California and Modoc Plateau. The host plant Erechtites hieracifolia is introduced to California, and inhabits the disturbed coastal areas of the North and Central Coasts. The known host Flaveria linearis does not occur in California, but one species of Flaveria, the introduced F. trinervia (Spreng.) C. Mohr, occurs on the southern coast. In addition, M. splendida has been collected in association with the aster genera Lactuca and Xanthium. Spencer (1973a) considers this species a potential pest, as it has been reported doing serious damage to celery plantings on Hawaii, and feeds on carrots in Mexico (Spencer, 1973a).


### Melanagromyza trispinella Spencer, 1981


**Diagnosis.** Frons distinctly projecting above eye, 2.1 times as wide as eye; 4–5 *ori* inclinate and 2 *ors* reclinate, *ori* and *ors* strong and long, closely associated; fronto-orbital plate about 1/4 width of frons; fronto-orbital setae in 2–3 rows, proclinate; ocellar triangle weakly shining, extending to anterior margin of frons. Facial keel raised, dividing bases of antennae. Gena about 1/3 eye height, highest point located at middle. Mesonotum with slightly coppery and greenish sheen, 1+2 *dc*. Calypter white, margin and fringe brown. Mid tibia with 1 strong posterior seta. Abdomen black with greenish or coppery sheen.

**Redescription.** MALE. Wing length 2.6 mm (Holotype).

Head (Figs 237, 238) blackish brown. Frons dark black, distinctly projecting above eye (Fig. 238), 1.1 times as wide as long, 2.1 times as wide as eye; 4–5 *ori* inclinate and 2 *ors* reclinate, *ori* and *ors* strong and long, length subequal, closely associated; proportional distance between setae in the *ori-ors* series from anterior to posterior 2:2:1.5:1.5:1:1; fronto-orbital plate brown near inner margin, anterior margin slightly yellowish brown, about 1/4 width of frons; fronto-orbital setae in 2–3 rows proclinate; ocellar triangle dark, weakly shining at middle, extending to anterior margin of frons; *oc* strong, nearly as long as *ors*; postocellar setae strong. Lunule grayish brown and bulging, 0.15 mm high 2.0 times as wide as high. Facial keel raised, dividing bases of antennae (Fig. 237); parafacial brownish black, about 1/10 height of eye. Gena blackish brown, broad, about 1/3 height of eye, highest point located at middle. Eye pilose. Antenna blackish brown, 1st flagellomere short ovate, and arista bare. Proboscis yellowish brown, palpus blackish brown.

Thorax (Figs 236, 239) black. Mesonotum and scutellum with brownish gray pruinosity and slightly coppery and greenish sheen. Mesonotum with 1+2 *dc* (presutural *dc* at anterior edge of suture) (Fig. 239), *acr* in 6 rows. 1 strong *anepest* and 1 strong *kepest* with 1–2 long setae. Calypter white, margin and fringe brown. Fore tibia without posterior seta, mid tibia with 1 strong posterior seta. Wing (Fig. 240) with costa extending to M1+2; costal ratio 4:1.3:1; *r-m* at middle of discal cell; ultimate and penultimate sections of M1+2 in proportion of 1.4:1; ultimate and penultimate sections of CuA, in proportion of 1:1.6. Halter blackish brown.
Abdomen black, with greenish or coppery sheen. Male genitalia (Figs 241–245): surstylus with sparse short spines in a triangular patch, and several long apical spines and setulae; hypandrium Y-shaped, with narrow hypandrial apodeme; basiphallus V-shaped with subapical tooth; distiphallus broad, narrowing subapically, with two pointed tips; ejaculatory apodeme fan-shaped, with long stem.

FIGURES 241–245. Melanagromyza trispinella Spencer, 1981. Holotype male (UCD). 241. epandrial complex, posteroventral view; 242. hypandrium, ventral view; 243, 244. phallic complex, ventral and lateral view, from original figures in Spencer (1981), reproduced in Spencer & Steyskal (1986); 245. sperm pump. Scale 0.1 mm.

Biology/Host plants. Unknown.

Distribution. USA (California (Map 3) [Solano Co., Yolo Co.]).

Melanagromyza trispinosa Spencer, 1981
(Figs 246–258, Map 12)


Diagnosis. Frons distinctly projecting above eye, 2.3 times as wide as eye; 3–4 ori, strong and inclinate; and 2 ors reclinate; proportional distance between setae in the ori-ors series from anterior to posterior 3:3:2:1:1; fronto-orbital plate about 1/5 width of frons, inner margin slightly brown; fronto-orbital setulae in 2 rows, outer row reclinate and inner row proclinate; ocellar triangle dark, extending to anterior ors. Facial keel raised, dividing bases of antennae. Gena about 1/3–1/2 height of eye, highest point located at middle. Mesonotum with distinct greenish sheen, 0–1+2–3 dc. Calypter white, margin and fringe pale yellow. Mid tibia with 1 strong posterior seta. Abdomen with brilliant coppersy and greenish sheen.

Redescription. MALE. Body length 2.4–2.8 mm, wing length 2.5–2.9 mm. FEMALE. Body length 2.6–3.0 mm, wing length 2.7–3.1 mm.

Head (Figs 246–248) black. Frons dark, distinctly projecting above eye, slightly wider than long, 2.3 times as wide as eye; 3–4 ori strong and inclinate, subequal in length; 2 ors reclinate and nearly as long as ori; proportional distance between setae in the ori-ors series from anterior to posterior 3:3:2:1:1; fronto-orbital plate dark and inner margin slightly brown (two specimens slightly shining on apical half), about 1/5 frons width; fronto-orbital setulae in 2 rows, outer row reclinate (partly proclinate) and inner row procline; ocellar triangle dark, only extending to anterior ors; oc strong, nearly as long as ori, postocellar setae strong, divergent. Lunule brown, narrow semicircular, 0.10 mm high, wider than high. Facial keel raised, dividing bases of antennae. Parafacial black and slightly broad, about 1/6 height of eye. Gena brown, about 1/3–1/2 height of eye, highest point located at middle. Epistoma high and raised. 1 strong vibrissa and a row of short setae along peristomal margin. Eye bare. Antenna blackish brown, 1st flagellomere short ovate and slightly narrower apically, arista with microscopic pubescence. Proboscis brown, palpus black with 1–2 long apical setulae.

Thorax (Figs 249, 250) black. Mesonotum and scutellum with dense brown pruinosity and distinct greenish sheen. Mesonotum with 0–1+2–3 dc (if 1+3 dc, presutural dc weak), acr in 6–8 irregular rows. 1 strong anepst with 1–2 long setulae, 1 strong kepst with 1 long setula. Calypter white, margin and fringe pale yellow. Fore tibia without strong posterior seta and mid tibia with 1 strong posterior seta. Wing (Fig. 251) with costa extending between R4+5 and M1+2; costal ratio 3.2:1.2:1; r-m slightly or distinctly beyond middle of discal cell; ultimate and penultimate sections of M1+2 in proportion of 1.5:1; ultimate and penultimate sections of CuA1 in proportion of 1:1.3. Halter black.

Abdomen blackish brown, with brilliant coppersy and greenish sheen. Male genitalia (Figs 252–258): epandrium with an apical concavity; surstylus with sparse short spines, dense spines on anterior ventral corner and several spines stronger at apex; hypandrium Y-shaped, with thinner hypandrial apodeme; basiphallus U-shaped with arms narrower at apex; distiphallus narrow and tapering gradually, with subbasal undulating margin; ejaculatory apodeme symmetrical, fan-shaped, with smooth margin (Fig. 258b) or with few small marginal incisions (Fig. 258a).

FIGURES 252–258. *Melanagromyza trispinosa* Spencer, 1981. Paratype male (EMEC). 252, 253, epandrial complex, lateral and ventral view; 254, 255, hypandrium, ventral and lateral view; 256, 257, phallic complex, ventral and lateral view, from original figures in Spencer (1981), reproduced in Spencer & Steyskal (1986); 258. sperm pump, a=paratype male (EMEC), b=non-type male (EMEC). Scale 0.1 mm.

**Biology/Host plants.** This species has been collected in association with Rusty popcornflower / Foothill snowdrops, *Plagiobothrys nothofulvus* (A. Gray) A. Gray (Boraginaceae). See Map 12 for the California distribution of *M. trispinosa* and host plant *Plagiobothrys nothofulvus*. This plant species is native to California, being found in open woodlands and grasslands at elevations lower than 1550 m throughout California, and to Washington and Mexico. The plant is known from the California Floristic Province.

**Distribution.** USA (California (Map 12) [Contra Costa Co., Kern Co., Los Angeles Co., Monterey Co., San Diego Co.*, Santa Barbara Co., Yolo Co.]).

*Melanagromyza urticella* Spencer, 1981

(Figs 259–269, Map 10)


**Diagnosis.** Frons projecting above eye, 1.6 times as wide as eye; 3–4 ori (one non-type specimen with 5–6 ori) inclinate and 2 ors reclinate; proportional distance between setae in the ori-ors series from anterior to posterior subequal; fronto-orbital plate with anterior margin slightly broader, brilliantly shining on basal 2/3, about 1/5 width of frons; fronto-orbital setulae in 2–3 irregular rows, reclinate except a few procline on anterior margin; ocellar triangle slightly shining, extending to anterior ors. Gena about 1/5–1/4 height of eye, highest point located at middle. Mesonotum and scutellum with brilliant greenish sheen. Mesonotum with 0+2 dc. Calypter white, margin and fringe pale yellow. Mid tibiae with 2 strong posterior setae. Abdomen with brilliant greenish, bluish, bluish green or coppery green sheen.

**Redescription.** MALE. Body length 2.5–2.7 mm, wing length 2.7–2.9 mm. FEMALE. Body length 2.6–3.0 mm, wing length 2.7–3.3 mm.

Head (Figs 260–262) black. Frons dark black, projecting above eye, with 1.25 times as wide as long, 1.6 times as wide as eye; 3–4 ori (one non-type specimen with 5–6 ori) inclinate and 2 ors reclinate, both ori and ors strong, with ors slightly longer; proportional distance between setae in the ori-ors series from anterior to posterior subequal; fronto-orbital plate black or brown, anterior margin slightly broader, brilliantly shining on basal 2/3, about 1/5 width of frons; fronto-orbital setulae in 2–3 irregular rows, reclinate except a few procline on anterior margin; ocellar triangle slightly shining, extending to anterior ors; gena 1/5–1/4 height of eye, highest point located at middle. Mesonotum and scutellum with brilliant greenish sheen. Mesonotum with 0+2 dc. Calypter white, margin and fringe pale yellow. Mid tibiae with 2 strong posterior setae. Abdomen with brilliant greenish, bluish, bluish green or coppery green sheen.

Thorax (Fig. 259) black. Mesonotum and scutellum with brilliant greenish sheen. Mesonotum with 0+2 dc, acr in 10 irregular rows. 1 anepst with 2 long setulae, 1 strong kepst with 1 long setula. Calypter white, margin and fringe pale yellow. Fore tibia without strong posterior seta and mid tibiae with 2 strong posterior setae. Wing (Fig. 263) with costa extending to M1+2; costal ratio 4.3:1.3:1; r-m at middle of discal cell; ultimate and penultimate sections of M1+2 in proportion of 1:2:1; ultimate and penultimate sections of CuA1 in proportion of 1:1.4. Halter with stem pale brown and knob brownish black.
FIGURES 264–269. *Melanagromyza urticella* Spencer, 1981. Paratype male (EMEC). 264, 265. epandrial complex, lateral and ventral view; 266. hypandrium, ventral view; 267, 268. phallic complex, ventral and lateral view, from original figures in Spencer (1981), reproduced in Spencer & Steyskal (1986); 269. sperm pump (a, b from different specimens). Scale 0.1 mm.
Abdomen (Fig. 259) brown to black with brilliant greenish, bluish, bluish green, or coppery green sheen. Male genitalia (Figs 264–269): epididymis with straight posterior margin and a small concavity, and several strong spines in a transverse line posterovertrally; surstyli with dense short spines apically in a few irregular rows; hypandrium Y-shaped; basiphallus subcircular, and distiphallus broadened from base to apex; ejaculatory apodeme subtriangular, fan-shaped and asymmetrical.

**Type material.** Paratypes: **CALIFORNIA:** Fresno Co., 3 females (EMEC), Firebaugh, 36°51′31.82″N 120°27′21.63″W, 22.IV.1948, R.F. Smith; Riverside Co., 3 males, 7 females (EMEC), Temecula, 1 mi. S., 33°29′37.10″N 117°08′54.11″W, 11.IV.1965, J. Powell; Santa Barbara Co., 1 male (EMEC), Sta. Cruz, Id., Prisoner’s Harbor Creek, 36°58′26.82″N 122°01′50.87″W, 7.VI.1966, R.L. Langston.

**Non-type material.** **CALIFORNIA:** Santa Barbara Co., 1 male (CSCA), Santa Cruz Island, Canada del Puerto, 36°58′26.82″N 122°01′50.87″W, 20.VI.1967, R.O. Schuster; 1 male (UCD), Santa Cruz Island, Canada del Puerto, 34°01′23.54″N 119°45′56.76″W, 20.VI.1967, R.O. Schuster.

**Biology/Host plants.** Larvae of this species are internal stem borers on *Urtica* (Spencer, 1981; Spencer & Steyskal, 1986; Spencer, 1990). In California, this species has been collected in association with Hoary nettle / stinging nettle, *Urtica dioica* subsp. *holosericea*. See Map 10 for the California distribution of *M. urticella* and host plant *Urtica dioica* subsp. *holosericea*. For details on this plant, see "Biology/Host plants" section for *M. martini*.

**Distribution.** USA (California (Map 10) [Alameda Co., Fresno Co., Los Angeles Co., Riverside Co., San Barbara Co., San Luis Obispo Co., Stanislaus Co.]).

**Remarks.** One nontype male specimen (CSCA) has 5–6 ori, but the male genitalia are the same as the paratypes.

The species is one of two species of the genus *Melanagromyza* in California with a subcircular basiphallus, the other being *M. burgessi*. While *M. burgessi* is black with a slightly slightly greenish or bluish green sheen on the mesonotum in posterior view, and a slightly greenish, bluish green or coppery sheen on the abdomen, in *M. urticella* the mesonotum has a brilliant green sheen, and the abdomen has a brilliantly greenish, bluish green or coppery green sheen. In addition, the calypter is white or pale yellow in *M. urticella*, while in gray, brown or black in *M. burgessi*.

**Melanagromyza virens** (Loew, 1869)

(Figs 270–289, Map 15)


**Diagnosis.** Frons about 1.1 times as wide as eye; 2 ori inclinate and 2 ors reclinate; anterior ori widely separated from posterior ori, proportional distance between setae in the ori-ors series from anterior to posterior 2.9:1.7:1; fronto-orbital plate slightly shining, and about 1/4–1/3 width of frons; fronto-orbital setulae in 3–4 dense irregular rows, single outer row reclinate and 2–3 inner rows proclinate; ocellar triangle broad, extending to posterior ori, moderately shining. Gena about 1/5–1/7 height of eye, highest point located at middle. Mesonotum with moderately greenish sheen, 0+2 dc, and acr in 8 irregular rows. Calypter white, margin pale yellow and fringe white. Mid tibia with 2 strong posterior setae. Abdomen with distinctly greenish sheen.

**Redescription.** FEMALE. Body length 2.5 mm (Lectotype, Fig. 271), 3.1 mm (Paralectotype, Fig. 277); wing length 2.9 mm (Lectotype), 3.2 mm (Paralectotype). MALE. Body length 2.3 mm, wing length 2.5 mm (Non-type, EMEC)

Head (Figs 272–279) blackish brown. Frons bulging anteriorly; as long as wide, 1.1 times as wide as eye; 2 ori inclinate and 2 ors reclinate; anterior ori widely separated from posterior ori, proportional distance between setae in the ori-ors series from anterior to posterior 2.9:1.7:1; fronto-orbital plate slightly shining, as long as 1/4–1/3 width of frons; fronto-orbital setulae in 3–4 dense irregular rows, single outer row reclinate and inner 2–3 rows proclinate; ocellar triangle broad, extending to posterior ori, moderately shining; oc strong, as long as ori. Lunule grayish brown, 0.15 mm high, 1.3 times as wide as high. Gena yellowish brown, about 1/5–1/7 height. *Melanagromyza virens* (Loew, 1869) in California with a subcircular basiphallus, the other being *M. burgessi*. While *M. burgessi* is black with a slightly slightly greenish or bluish green sheen on the mesonotum in posterior view, and a slightly greenish, bluish green or coppery sheen on the abdomen, in *M. urticella* the mesonotum has a brilliant green sheen, and the abdomen has a brilliantly greenish, bluish green or coppery green sheen. In addition, the calypter is white or pale yellow in *M. urticella*, while in gray, brown or black in *M. burgessi*.
FIGURES 270–276. Melanagromyza virens (Loew, 1869). Lectotype female (MCZ): 270. habitus, lateral view (non-type, CNC); 271. habitus, lateral view; 272–274, head, dorsal and lateral view (273, 274, non type, CNC); 275–276. wing (276, non-type male, EMEC).
FIGURES 277–283. Melanagromyza virens (Loew, 1869). Paralectotype female (MCZ). 277. habitus, lateral view; 278, 279. head, dorsal and lateral view; 280. hind tibia; 281. wing; 282. label, Paralectotype (as Syntype); 283. label, Lectotype.
FIGURES 284–289. *Melanagromyza virens* (Loew, 1869). Non-type male (CNC). 284. epandrial complex and hypandrium, lateral view; 285. surstylus, lateral view, from original figure in Spencer & Steyskal (1986), for comparison; 286. hypandrium, ventral view; 287, 288. phallic complex, ventral and lateral view; 289. sperm pump. Scale 0.1 mm. (Figures 286–288 provided by Owen Lonsdale, CNC).
of eye, highest point located at middle. Eye pilose. Antenna blackish brown, 1st flagellomere short ovate and arista with microscopic setulae. Proboscis yellowish brown, palpus black.

Thorax (Figs 273, 274, 277) blackish brown. Mesonotum and scutellum with brownish gray pruinosity and moderately greenish sheen. Mesonotum with 0=2 dc; acr in 8 irregular rows. 1 strong anepst and 1 strong kepst, each with additional 2–3 long setulæ. Calypter white, margin pale yellow and fringe white. Fore tibia without strong posterior seta, mid tibia with 2 strong posterior setae. Wing with costa extending to M1+2; costal ratio 4:7:1:7:1; r-m at middle of discal cell (Lectotype female, Fig. 275; 1 male in EMEC, Fig. 276; other non-types) or between middle and apical 1/3 of discal cell (Paralectotype female, Fig. 281; other non-types); ultimate and penultimate sections of M1+2 in proportion of 1.5:1; ultimate and penultimate sections of CuA1 in proportion of 1:1.6. Halter brown.

Abdomen (Figs 270, 271, 277) blackish brown, with distinctly greenish sheen (distinctly bluish green sheen in Paralectotype female, Fig. 277). Male genitalia (Figs 284–289): epandrium broad with long pointed process (short or long, its length being variable in individuals) on posterior margin; surstylus with several distinctly longer, thicker apical spines (Fig. 284), in addition to few irregular rows of short spines along distal margin; hypandrium Y-shaped with very narrow hypandrial apodeme; basiphallus very wide basally and slightly diverging apically; distiphallus with central process and apical membranous section slightly curved; ejaculatory apodeme fan-shaped with long stem.

Type material. Lectotype female (MCZ, No. 15703): USA: PENNSYLVANIA: Penn., Loew coll., virens m. (Agromyza virens Loew, 1869: 46. des. K.E. Frick, 1957: 200) [labels, Fig. 283]. Paralectotype female (MCZ, No. 15703): Loew coll. (Agromyza virens Loew, 1869: 46. Not “Paratype” (Frick, 1957: 200) teste Woodley, 1981) [labels, Fig. 282].


Biology/Host plants. Larvae are internal stem borers of species in the Asteraceae genera Heterotheca and Eupatorium (Spencer, 1969; Spencer, 1990), pupariating in the stem (Spencer & Stegmaier, 1973). The only known host for this species in California is camphorweed, Heterotheca subaxillaris (Lam.) Britton & Rusby, and although not specified on the label, the only subspecies present in California is H. subaxillaris subsp. latifolia (Buckley) Semple. See Map 15 for the California distribution of M. viridis and host plant Heterotheca subaxillaris subsp. latifolia. The plant species is native to California, being found in disturbed sandy soils and along roadsides at elevations below 1150 m throughout California, and through the southern United States and northern Mexico. The plant is known from the Tehachapi Mountain Area, South Coast and eastern Sonoran Desert. Another aster species, Eupatorium capillifolium (Lam.) Small, is a known host (Spencer & Stegmaier, 1973; Spencer & Steyskal, 1986), but does not occur in California.

Distribution. USA (California (Map 15) [Contra Costa Co.*], District of Columbia, Florida, Illinois, Massachusetts, Pennsylvania, South Carolina, Canada (British Columbia, Quebec, Ontario).

Remarks. Spencer & Stegmaier (1973) noted that “the orbits may be broader and the orbital setulæ longer and more numerous in the male than in the female… In view of this sexual dimorphism a reliable identification of individual caught females may be problematic”, and indicated that several instances in the literature (e.g., Malloch (1913), as noted by Frick (1959)) may be the result of misidentifications, so most host plants mentioned in the literature need to be confirmed again except for Eupatorium capillifolium and Heterotheca subaxillaris.

Melanagromyza viridis (Frost, 1931)
(Figs 5, 6, 9, 290–299, Maps 18–19)

Agromyza viridis Frost, 1931: 277. Type locality: California: Kern Co.: Bakersfield. HT ♀, USNM.

FIGURES 290–293. Melanagromyza viridis (Frost, 1931). Holotype female (USNM). 290. habitus, lateral view; 291. head, dorsal view; 292. thorax, lateral view; 293. wing.
FIGURES 294–299. *Melanagromyza viridis* (Frost, 1931). Non-type male (CSCA). 294, 295. epandrial complex, lateral and ventral view; 296. hypandrium, ventral view; 297, 298. phallic complex, ventral and lateral view, from original figures in Spencer (1981), reproduced in Spencer & Steyskal (1986); 299. sperm pump. Scale 0.1 mm.
Diagnosis. Frons not projecting above eye, 1.1 times as wide as eye; 2 ori inclinate and 2 ors reclinate; anterior ori widely separated from posterior ori, proportional distance between setae in the ori-ors series from anterior to posterior 3.6:2:1; fronto-orbital plate brilliantly shining and not widened at middle, about 1/5 width of frons; fronto-orbital setae in 2 irregular rows, inner row inclinate and outer row reclinate; ocellar triangle brilliantly shining. Gena about 1/6 height of eye, highest point located slightly before middle. Mesonotum and scutellum with greenish sheen. Mesonotum with 0+2 dc, acr in 8 irregular rows. Calypter white, margin and fringe white. Mid tibia with 1 strong posterior seta. Abdomen with brilliantly greenish sheen.

Redescription. MALE. Body length 1.5–2.1 mm, wing length 1.7–2.3 mm (Non-type). FEMALE. Body length 2.1–2.5 mm (Non-type) and 2.2 mm (Holotype), wing length 2.1–2.5 mm (Non-type) and 2.5 mm (Holotype).

Head (Figs 5, 6, 290, 291) brown. Frons blackish brown, not projecting above eye, nearly 1.2 times as wide as long, and 1.1 times as wide as eye; 2 ori inclinate and 2 ors reclinate, anterior ori widely separated from posterior ori, proportional distance between setae in the ori-ors series from anterior to posterior 3.6:2:1; fronto-orbital plate brilliantly shining and not widened at middle, about 1/5 width of frons; fronto-orbital setae in 2 irregular rows, inner row inclinate, and outer row reclinate; ocellar triangle brilliantly shining; oc strong, nearly as long as ors; postocellar setae strong. Lunule (Figs 6, 291) brown shining, with a pair of brownish black median stripes, 0.20 mm high, slightly higher than wide, extending upward to ocellar triangle. Facial keel narrow and not raised. Gena about 1/6 height of eye, highest point located slightly before middle. 1 strong vibrissa. Eye pilose. Antennal 1st flagellant mere short ovate and aristate bare. Proboscis brownish yellow, palpus black.

Thorax (Figs 290, 292) blackish brown. Mesonotum and scutellum with greenish sheen. Mesonotum with 0+2 dc, acr in 8 irregular rows. 1 strong anepst with 2 long setae and 1 strong kepst with 1 long setula. Calypter white, margin and fringe white. Fore tibia without posterior setae, mid tibia with 1 strong posterior seta (Fig. 9). Wing (Fig. 293) with costa extending to M1+2 margin and fringe white. Fore tibia without posterior setae, mid tibia with 1 strong posterior seta. Abdomen with brilliantly green sheen.

Type material. Holotype female (USNM, No. 62964): CALIFORNIA: Kern Co., Bakersfield, 35°22′23.85″N 119°01′07.36″W, 23.IX.1930, reared from Zinnia.

Non-type material. CALIFORNIA: Colusa Co., 3 males (CSCA, No. 31976), 39°11′16.97″N 121°59′43.74″W, 18.IX.1931, H.H. Keifer, ex. reared from Zinnia on 28.IX.1931; Kern Co., 1 male (CSCA, No. 30732), Bakersfield, 35°22′23.85″N 119°01′07.36″W, 24.IX.1930, [collector not given], ex. reared from Zinnia; Imperial Co., 3 males, 2 females (UCD), Algodones Dunes, Wash Road, 10.4 km se. Glamis, 32°55.4′N 114°57.5′W, 24–28.III.2008, Bohart Museum survey team, ex. Malaise trap in sand bowl, 2008AL36; 3 males, 4 females (UCD), Algodones Dunes, Buttercup Region, 1.6 km ese Gordon’s @ Hwy.8, 32°45.5′N 114°57.5′W, 24–28.III.2008, Bohart Museum survey team, ex. Malaise trap in creosote, 2008AL33; 4 males, 3 females (UCD), Algodones Dunes, Niland-Glamis Rd., 7.4 km n. Hwy 78, 33°00′40.93″N 115°28′24.08″W, 16.II.1975, M.S. & J.S. Wasbauer, ex. on Parthenium argentatum, Malaise 2008AL54; 12 males, 3 females (UCD), Algodones Dunes, Osborne Overlook, 5.7 km wsw Glamis, 32°59′N 115°08′W, 29.IV–2.V.2008, S.L. Heydon & K. Lorenzen, ex. microphyll forest, Malaise 2008AL54; 121°59′43.74″W, 18.IX.1931, H.H. Keifer, ex. reared from Zinnia.
REVISION OF THE GENUS MELANAGROMYZA IN CALIFORNIA

Zootaxa 4005 (1) © 2015 Magnolia Press
**Biology/Host plants.** Larvae of this species feed within flower and seed heads of various asters (Spencer, 1981; Spencer & Steamaier, 1973; Spencer & Steyskal, 1986; Spencer, 1990), and also may feed on species of Boraginaceae. In California, this species has been reared from: flower heads of desert sunflower / hairy desert sunflower, *Geraea canescens* Torr. & A. Gray (Asteraceae); Guayule, *Parthenium argentatum* (both of the former only as the cultivated plants, no general distribution records in California); flower heads of *Verbesina encelioides*; and from cultivated zinnias, *Zinnia*. It has also been collected in association with Pot-marigold, *Calendula officinalis* L. (Asteraceae); Common sowthistle, *Sonchus oleraceus* L. (Asteraceae); fanleaf tiquila / fanleaf crinklemat, *Tiquilia plicata* (Torr.) A. T. Richardson (Boraginaceae); Brittlebrush, *Encelia farinosa* Torr. (Asteraceae); and Distan phacelia, *Phacelia distans* Benth. (Boraginaceae). See Maps 18 and 19 for the California distribution of *M. viridis* and host plants *Calendula officinalis, Sonchus oleraceus, Tiquilia plicata* (Map 18), *Encelia farinosa, Geraea canescens and Phacelia distans* (Map 19). See Map 11 for the distribution of host plant *Verbesina encelioides*, and the "Biology/Host plants" section for *Melanomyza minimoides* for discussion of the plant species. The plant *C. officinalis* is naturalized to California, being found in disturbed areas at elevations below 500 m, and is known from the Central Coast, San Francisco Bay Area, Outer South Coast Ranges, South Coast and San Bernardino Mountains. The plant *S. oleraceus*, which is native to Europe, is naturalized to California, being found in disturbed places at elevations below 2500 m throughout California, and much of North America. The plant *T. plicata* is native to California, being found in dune areas and sandy gravel flats at elevations below 1100 m throughout California, and to western Arizona, southern Nevada, and northern Mexico, and is known from the Desert region. The plant *E. farinosa* is native to California, being found in the Coastal scrub and stony desert hillsides at elevations below 1500 m throughout California, and to southwestern Utah and northwestern Mexico, and is known from the eastern part of the South Coast region, and the adjacent Peninsular Ranges and Desert region. The plant *G. canescens* is native to California, being found in sandy desert soils at elevations below 1300 m throughout California, and to southwestern Utah, western Arizona and northern Mexico, and is known from the Desert region. The plant *P. distans* is native to California, being found in clay to rocky soils and slopes at elevations below 2700 m throughout California, and to southern Nevada and northern Mexico, and is known from the southern North Coast Ranges, the northern and southern Sierra Nevada Foothills, the southern High Sierra Nevada, Sacramento Valley (Sutter Buttes), San Joaquin Valley, Central Western California, Southwestern California, East of Sierra Nevada and Desert. Outside of California, it has also been reared from flower heads of *Bidens ferulifolia* (Jacq.) DC, and from species of *Tithonia* (Asteraceae).


**Remarks.** The holotype is female, but Spencer & Stegmaier (1973) incorrectly referred to it as male. The species is easily separated from other Californian species by the distinctive lunule and the highly shining frons and fronto-orbital plates.

**Acknowledgements**

The first author appreciates her two advisors, Dr. Lynn Kimsey and the second author, for giving her the postdoctoral research opportunity for studying at the University of California (Davis) and working in the California Department of Food and Agriculture (CDFA, Sacramento), and also to the team at CDFA (Ms. M. O’Donnell, Ms. J. Airoso, Ms. D. Woods, Ms. M. Randolph, Mr. T. Manos, Mr. S. Kinnee, Mr. O. Sage, Dr. M. Hauser, Dr. R. Garrison, Dr. M. Epstein, Dr. S. Winterton, Dr. G. Watson, Dr. P. Kerr, Dr. A. Rung, Dr. N.V. Ellenrieder, Dr. A. Cline and the late Dr. C. Bellamy) for their generous help and strong support. The authors sincerely thank Dr. Owen Lonsdale (Canada), Dr. M. von Tschirnhaus (Germany), Dr. M. Sasakawa (Japan), Dr. B. Merz (Switzerland), Dr. X. L. Chen (IOZCAS) for providing good advice and important literature, and Dr. F. Hrusa (CDFA, Sacramento) for providing helpful information on host plants. The authors also express their sincere thanks to the following people for making loans of type specimens and non-type research materials from their respective collections: Dr. N. Penny & V. Lee (CAS), Drs. B. J. Sinclair & O. Lonsdale (CNC), Drs. C. Barr & W. Shepard (EMEC), Dr. P. Perkins (MCZ), Dr. L. Kimsey (UCD), Drs. A. Norrbom, T. Dikow & D. Furth (USNM).
The authors are especially thankful to Dr. Owen Lonsdale, for providing and giving us permission to use his excellent illustrations of *Melanagromyza burgessi* (Figs 28–30), *M. osoflacensis* (Figs 182–184), *M. splendida* (Figs 232–234) and *M. virens* (Figs 286–288), and for his helpful review of an earlier draft of the manuscript. The figures reproduced from Spencer (1986) are in the public domain, as products of the USDA-ARS. The research was supported by grants to the second author through the USDA Specialty Crop Block Grant Program (SCB-08008), and the National Science Foundation (DBI-0956327). Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of NSF or USDA.

References


Frick, K.E. (1952) A generic revision of the family Agromyzidae (Diptera) with a catalogue of New World species. University of California Publications in Entomology, 8, 339–452.


References


Frick, K.E. (1952) A generic revision of the family Agromyzidae (Diptera) with a catalogue of New World species. University of California Publications in Entomology, 8, 339–452.


References
Appendix

Californian species list of the genus *Melanagromyza*

3. *Melanagromyza californiana* sp. nov. **Nearctic**: USA (California).
4. *Melanagromyza chemsaki* sp. nov. **Nearctic**: USA (California).
9. *Melanagromyza gonzalesina* sp. nov. **Nearctic**: USA (California).
14. *Melanagromyza minimoides* Spencer, 1966b. **Nearctic**: USA (Arkansas, California, Florida, Maryland, Ohio, Texas). **Neotropical**: Argentina, Bolivia, Dominican Republic, Guadalupe, Guatemala, Jamaica, Mexico, Panama, Peru, Puerto Rico, Trinidad, Venezuela.
15. *Melanagromyza minimoides* Spencer, 1966b. **Nearctic**: USA (Arkansas, California, Florida, Maryland, Ohio, Texas). **Neotropical**: Argentina, Bolivia, Dominican Republic, Guadalupe, Guatemala, Jamaica, Mexico, Panama, Peru, Puerto Rico, Trinidad, Venezuela.
26. *Melanagromyza virens* (Loew, 1869). **Nearctic**: Canada (British Columbia, Quebec, Ontario), USA (California, Florida, Pennsylvania, South Carolina).