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The *Liriomyza* (Diptera: Schizophora: Agromyzidae) of Canada & Alaska

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Abstract

The *Liriomyza* (Diptera: Agromyzidae) of Canada and Alaska is revised, with species keyed and illustrated, and new host and geographic records provided. Eighty one species are recognized, including 24 new to science: *L. agrios*, *L. albispina*, *L. anatolis*, *L. aphila*, *L. apilaca*, *L. aquapolis*, *L. arenarium*, *L. atrassimilis*, *L. bicolumbis*, *L. charada*, *L. cracentis*, *L. elevaster*, *L. emaciata*, *L. fumeola*, *L. gibsoni*, *L. griffithsi*, *L. hilairensis*, *L. limopsis*, *L. mesocanadensis*, *L. pilicornis*, *L. pistilla*, *L. rigaudensis*, *L. taraxanox*, *L. taraxanuda*, *L. tryssos*. Ten species known from the United States are recorded as new to Canada: *L. artemisiae* Spencer, *L. assimilis* (Malloch), *L. baccharidis* Spencer, *L. helianthi* Spencer, *L. merga* Lonsdale, *L. minor* Spencer, *L. sabaziae* Spencer, *L. temperata* Spencer, *L. violivora* (Spencer) and *L. virgo* (Zetterstedt). Palaearctic species new to North America include *L. wachtli* Hendel and *L. flaveola* (Fallén); while the latter species has been recorded in North America before, all previous records represent misidentifications. Hosts are recorded for the first time for *L. balcanicoides* Sehgal, *L. minor* Spencer, *L. orilliensis* Spencer and *L. socialis* Spencer. *Galiomyza* Spencer syn. nov. is included as a junior synonym of *Liriomyza* Mik, resulting in six new combinations.

Key words: revision, Nearctic, new species, synonymy, *Galiomyza*

Introduction

The present study revises the genus *Liriomyza* Mik (Agromyzidae) in Canada and Alaska, recognizing 81 species, 24 of which are described here as new. Species previously known from the United States, but newly recorded in Canada, are: *L. artemisiae* Spencer, *L. assimilis* (Malloch), *L. baccharidis* Spencer, *L. helianthi* Spencer, *L. merga* Lonsdale, *L. minor* Spencer, *L. sabaziae* Spencer, *L. temperata* Spencer, *L. violivora* (Spencer) and *L. virgo* (Zetterstedt). The Canadian *L. undulata* Spencer is recorded for the first time in the United States. The Palaearctic *L.wachtli* Hendel is newly recorded in North America, and the Palaearctic *L. flaveola* (Fallén) is recharacterized and verified as occurring in Canada and Alaska, with all previous records representing misidentifications.

Investigations of the Canadian *Liriomyza* began with several isolated species descriptions in treatments of the family otherwise focused on the United States (Curran 1931; Malloch 1913); these were later summarized in family-level catalogues and reviews by Frick (1952, 1959). The first works entirely dedicated to the Canadian

fauna began with Sehgal's brief review of Albertan Agromyzidae in 1968, where three common grass-feeding *Liriomyza* were described. This was followed a year later by Spencer's 1969 revision of the Canadian Agromyzidae, including the description of 19 new *Liriomyza* species (15 of which are still considered valid), and by Sehgal's second treatment of the Albertan Agromyzidae (1971), this time being a full review of the province's agromyzid fauna with the description of six new *Liriomyza* species.

Since publication of the above works, the status of several *Liriomyza* species has been reevaluated. *Liriomyza melampyga* (Loew), *L. viciae* Spencer and *L. conspicua* Sehgal were transferred to *Phytoliriomyza* (Spencer & Steyskal, 1986; Spencer, 1990). *Praspedomyza galiivora* Spencer, *Metopomyza bellissima* Spencer and *Haplomyza togata* (Melander) were transferred to *Liriomyza* (Steyskal 1980; Spencer 1981; Spencer & Martinez 1987). *Liriomyza arcticola* Spencer and *L. kenti* Spencer were treated as junior synonyms of *L. virgo* and *L. equiseti* (respectively), and *L. millefolii* Hering and *L. pilosa* Spencer were treated as junior synonyms of *L. ptarmicae* (Spencer 1976, 1981).

Host genera were listed for the five most polyphagous and agriculturally significant Nearctic *Liriomyza* in Lonsdale's (2011) Californian revision,—*L. brassicae* (Riley), *L. huidobrensis* (Blanchard), *L. langei* Frick, *L. sativae* Blanchard and *L. trifolii* (Burgess). All of these species occur in Canada with the exception of *L. langei* (western United States and Hawaii) and the lengthy list of host genera presented in that study will not be repeated here.

Despite this history of collection and study, it is certain that more taxa and much more distributional and life history data remain to be discovered, supported by the facts that a large portion of the known Canadian *Liriomyza* is described here as new, and many Canadian species are still known from single localities or even single specimens, often in the absence of host data. It is hoped that the present revision will facilitate easier and more confident identification of these minute and often morphologically similar species, and stimulate others to collect agromyzids, which are still surprisingly little-known despite their diversity and agricultural and ecological significance. This will of course also subsequently aid in the prevention and suppression of pest outbreaks, the monitoring and control of actual and potential pest species, and the recognition of invasive alien species as they arrive via international trade or other means.

Specific questions that should be addressed in future studies, and discussed in more detail below, regard morphological variation in some species that may indicate the presence of cryptic taxa. These species include *Liriomyza brassicae*, *L. cracentis*, *L. eupatorii* (Kaltenbach), *L. flaveola*, *L. helianthi*, *L. sativae*, *L. taraxaci* Hering and *L. temperata* Spencer. In most cases, differences within species are slight, but recent studies of Agromyzidae suggest that within many lineages, even the smallest discernable differences could be indicative of separate specific status (see Lonsdale & Scheffer (2011), for example). *Liriomyza sativae*, conversely, exhibits a relatively wide range of variation in external morphology and host preference, contrasting very conservative genitalic morphology, and initial studies are suggestive that these differences are revealing of cryptic species (Scheffer & Lewis 2005). As such, the status of these specimens should be verified with the study of additional material and the analysis of molecular data sets as they become available.

Synonymy of *Galiomyza*

Galiomyza was described by Spencer (1981) in his treatment of the Californian Agromyzidae, and designated as its type species the Palaearctic *Agromyza morio* Brischke (by original designation), which has been reared from *Asperula*, *Galium*, *Rubia* and *Sherardia* (Spencer, 1990). The status of this genus may have been subsequently doubted by Spencer, as he transferred *G. galiivora* to *Liriomyza* five years later (Spencer & Martinez, 1987) and excluded *Galiomyza* from his genus key in the Manual of Nearctic Diptera (Spencer, 1987), although it was to appear again in later publications, including Spencer (1990).

Dempewolf (2001) noted that there were no significant differences between larvae of *Galiomyza* and *Liriomyza*, and considered *Galiomyza* to be rendered paraphyletic by *Liriomyza*. The latter results were reinforced by the findings of Scheffer *et al*. (2007), who supported *Galiomyza* as being at least the sister-group to *Liriomyza*, although only one species (*G. violivora*) was included in their study.

Galiomyza was recently discussed by Lonsdale (2011), who noted that its species can be partially characterized by having a surstylus that is reduced and/or fused to the epandrium, although this state is also seen in a number of

other lineages elsewhere in the subfamily, including some within *Liriomyza*. Species are also darkly pigmented (as in Fig. 7), but this is also true of many *Liriomyza* and species in related genera. This colour character may have been especially key to previous concepts of the genus, as the combination of dark colouration and varied "atypical" genitalia have regularly lumped clearly non-related taxa into *Galiomyza*, as evidenced by review of the terminalia of *G. morio* (Fig. 28), *L. galiivora* (Figs 7, 132–135) and *G. violivora* (Figs 136–142), to name a few. Some *Galiomyza* also have stout black processes on the surstylus and epandrium (see Lonsdale (2011: figs 10, 11)), but these are not found in the type species, and similar structures are seen in some *Liriomyza*, including *L. blechi* Spencer. In total, these states are autapomorphic, inconsistent within the genus or shared with *Liriomyza*, and do not support *Galiomyza* as a lineage separate from *Liriomyza*. This is of significance if genus-level groups in the Agromyzidae are to be both monophyletic and defined by phylogenetically informative characters.

In his discussion of *Liriomyza*, Lonsdale (2011) evaluated previous hypotheses delimiting the genus (not reiterated here), including important ones presented by Zlobin (1996), who emphasized male genitalic characters, and Tschirnhaus (1972), who discovered a stridulatory organ on the male abdominal membrane (subsequently found to be present in only a subset of species, albeit a large one). He noted that the only derived, phylogenetically informative character found in all *Liriomyza* was a character listed by Zlobin (1996): an ejaculatory duct that was "dilated before the mesophallus past the phallophorus". As this character is also found in *Galiomyza*, Lonsdale (2011) suggested that the two genera be united. Since the publication of that work, additional species of *Liriomyza* and *Galiomyza* have been examined, and it has become apparent that the apically dilated ejaculatory duct of *Liriomyza* and *Galiomyza* is also brown pigmented in all species. While the precise relationships between *Galiomyza* and *Liriomyza* species are still uncertain, this character of an apically swollen and pigmented ejaculatory duct is here considered a unique and consistent enough synapomorphy to formally include the polyphyletic *Galiomyza* **syn. nov.** as a junior synonym of *Liriomyza*. It is significant to recognize that the duct is pigmented, because the transitional state of a dilated but unpigmented duct is present in other putatively related taxa, including *Haplopeodes*, *Metopomyza*, *Selachops* and some *Phytoliriomyza*. Unfortunately the broader *Liriomyza* redefined here is characterized by a male genitalic feature impractical for rapid diagnosis, but phylogenetic analyses in the Phytomyzinae are ongoing in order to expand on this and other hypotheses. Additional monophyletic lineages useful for genus-level groupings that are associated with practical external diagnostic characters will hopefully be identified.

An imperfect, albeit useful character for diagnosis of the genus is colouration. Almost all species of *Liriomyza* have a dark or mostly dark notum with the shoulders and a wide central stripe on the scutellum contrastingly yellow. This character, however, is obscured in some species that are heavily pigmented, including those of the former *Galiomyza* discussed above, as well as in very pale species. Similar patterns also occur in species of other genera, including some that are indistinguishable from *Liriomyza* externally, including *Haplopeodes* and some *Phytoliriomyza* (eg. *P. melampyga* and *P. felti* (Malloch)).

Listed under their original combinations, the following species presently treated as *Galiomyza* are here combined (or recombined) as *Liriomyza*: *Galiomyza australis* Spencer, 1982 **comb. nov.** (Neotropical—host unknown); *Agromyza beckeri* Strobl, 1909 (Palaearctic—*Viola*); *Praspedomyza flaviantennata* Spencer, 1966 **comb. nov.** (Neotropical—host unknown); *Agromyza morio* Brischke, 1881 (Palaearctic—*Asperula*, *Galium*, *Rubia*, *Sherardia*); *Galiomyza richardii* Esposito & Prado, 1993 **comb. nov.** (Neotropical—*Zantedeschia*); *Galiomyza takadai* Sasakawa, 1993 **comb. nov.** (Palaearctic—*Rubia*); *Liriomyza takakoae* Sasakawa, 1954 (Palaearctic—*Viola*); *Galiomyza turneri* Spencer, 1981 **comb. nov.** (Nearctic—host unknown); *Galiomyza violivora* Spencer, 1986 **comb. nov.** (Nearctic—*Viola*); *Liriomyza violiphaga* Hendel, 1932 (Palaearctic—*Viola*); *Galiomyza vockerothi* Spencer, 1986 (Nearctic—host unknown).

Materials and methods

Material was examined from, or deposited in the following collections: Natural History Museum, London, United Kingdom (BMNH); Bernice P. Bishop Museum, Honolulu, Hawaii, USA (BPBM); California Academy of Sciences, San Francisco, California, USA (CASC); Canadian National Collection of Insects, Arachnids & Nematodes, Ottawa, Ontario, Canada (CNC); University of Guelph Insect Collection, Guelph, Ontario, Canada (DEBU); University of California, Essig Museum of Entomology, Berkeley, California, USA (EMEC); Lyman

Entomological Museum, Ste-Anne-de-Bellevue, Quebec, Canada (LEM); Museu de la Plata, Buenos Aries, Argentina (MLPA); Naturhistorische Museum, Vienna, Austria (NMW); Naturhistoriska riksmuseet, Stockholm, Sweden (NHRS); Royal Ontario Museum, Toronto, Ontario, Canada (ROM); Royal BC Museum, Vancouver, British Columbia, Canada (RBCM); University of British Columbia, Vancouver, Spencer Entomological Museum, British Columbia, Canada (UBCZ); University of Delaware, Newark, Delaware, USA (UDCC); United States National Museum of Natural History, Washington, D.C., USA (USNM); Russian Academy of Sciences, Zoological Institute, St. Petersburg, Russia (ZIL); Museum für Naturkunde der Humboldt-Universität, Berlin, Germany (ZMHU).

The holotypes of all new Canadian species described in Curran (1931), Sehgal (1968, 1971), Spencer (1969) and the present study are deposited in the CNC, including those Spencer noted as being in his personal collection.

Some male genitalia were prepared by macerating the abdomen in hot potassium hydroxide (10% solution) for approximately five to ten minutes, followed by washing in glacial acetic acid and deionized water. Later in the study, specimens were prepared by maceration in hot Lactic Acid followed by washing in demineralized water. Despite extensive neutralizing and washing of abdomens treated with potassium hydroxide, it is now apparent after several years of storage, the abdomen will continue to dissolve even if only minute amounts of the chemical remain Potassium hydroxide is therefore never recommended for use in dissection. Genitalia are stored in glycerin in microvials pinned with the specimen. All new host or provincial records are indicated by an asterisk in the descriptions below. Host plant classification was taken from the Integrated Taxonomic Information System (ITIS 2009). Biological data are taken from the original descriptions unless otherwise indicated. Terminology follows that in Lonsdale (2011), with the basal bulb and *pileus ejaculatorius* of the ejaculatory apodeme here treated as the sperm pump. Following Zlobin (2002), the surstylus of the *L. flaveola* group is considered lost, with the functional analogue treated as an elaboration of the epandrium. Genitalic figures are grouped according to similarity for ease of comparison to facilitate identifications.

Key to the *Liriomyza* of Canada and Alaska

1 . Thorax entirely brown, with scutellum, postpronotum and notopleuron slightly paler (Fig. 7). . . . . ***L. galiivora* (Spencer)**

\- Thorax yellow in part, with yellow stripe on postpronotum and notopleuron that may extend along entire margin of scutum, and with distinct central yellow stripe on scutellum (reduced in some species) (Figs 1–6, 8–11) 2

2 . Scutum yellow immediately in front of scutellum; yellow region either present as a narrow line across entire posterior margin, or as a large spot (Figs 20–24) 3

\- Posterior margin of scutum brown, at least in centrally along scutellum (Figs 25–27) 16

3 . Brown central region of scutum with deep yellow emargination in front of scutellum (Figs 1, 20–23) 4

\- Posterior margin of scutum only narrowly separated from brown central region by narrow yellow stripe (Fig. 24) 11

4 . First flagellomere with distinct angle on anterodorsal margin (Fig. 14). Acrostichal setulae in 2–3 sparse, scattered rows. Posterolateral corner of frons with dark brown spot reaching eye margin. Katepisternal seta usually touching or enclosed by brown ventral region. Distiphallus with narrow basal bowl and one pair of short, clear apical tubules (Figs 44, 45). Paraphallus absent. (*Phytoliriomyza conspicua* will also key out here). . . . . ***L. angulicornis* (Malloch)**

\- First flagellomere rounded (as in Fig. 17). Acrostichal setulae in 4 rows. Posterolateral corner of frons usually yellow, sometimes with brown spot. Katepisternal seta surrounded by yellow. If phallus as described above, then paraphallus present and basal bowl of distiphallus narrower and with lateromedial constriction. 5

5 . Four rows of acrostichal setulae. Anepisternum entirely yellow. Brown spot on scutum with one pair of short, broad, truncated posterolateral extension that are often bifid (Figs 1, 21). Clypeus yellow 6

\- Two rows of acrostichal setulae. Anepisternum usually with brown anteroventral spot (as in Figs 2, 8). Marking(s) on scutum not as above. Clypeus usually brown 7

6 . Eye sparsely short-haired. Posteromedial setulae on scutum inclinate. Mid tibia with two small posteromedial setae. Length of ultimate section of vein CuA_1 divided by penultimate section 1.3–1.4. Eye height divided by gena height 5.3–7.0. Only three well-developed dorsocentral setae, with third seta from back reduced. Tibiae light brown. Surstylus with dark, elongate, apical point; narrowed to an anterodistal point (Fig. 29). Epandrium yellow; posterodistal margin with dark bar on inner face. Hypophallus pocket-like (Figs 30, 31). Apex of phallus bifid with tubules spinulose on inner surface . . . . . ***L. blechi* Spencer**

\- Eye bare. Posteromedial setulae on scutum reclinate. Mid tibia without posteromedial setae. Length of ultimate section of vein CuA_1 divided by penultimate section 2.0–2.3. Eye height divided by gena height 4.6–4.8. Four well-developed dorsocentrals, with anterior two pairs subequal. Scutum usually dark with margins yellow. Tibiae yellow. Surstylus sometimes with dark apical spines; narrow, posterodistally twisted (Figs 33, 34). Epandrium brown; posterodistal margin produced into small dark spine. Hypophallus and end of basiphallus rod-like (Figs 35, 36). Apex of phallus cup-like . . . . . ***L. philadelphivora* Spencer**

7 . Eye 2.3–3.2 times higher than gena. Calypter margin white. Wing veins yellow. Scutum with distinct stripes that are sometimes fused at transverse suture. Femora entirely yellow. Tibiae paler ventrally 8

- Eye 4.1–4.8 times higher than gena. Calypter margin grey to brown. Wing veins brown. Brown region of scutum with yellow posteromedial emargination only. At least hind femur with narrow dorsobasal spot. Tibiae paler at base or apex, not ventrally 10

8 . One ori, 2 ors. Wing length 2.1mm. Clypeus yellow. Pattern on scutum subshining and fading to orange postsuturally; without one additional pair of narrow posterolateral stripes. Scutellum entirely yellow. Anepisternum and anepimeron entirely yellow. Distiphallus with broad basal bowl and one pair of long apical tubules (Figs 54, 55). Ejaculatory apodeme large and dark with ends of sperm pump produced and thick (Fig. 53) . . . . . ***L. alaskensis*** **Spencer**

- 3 ori, 1 ors. Wing length 1.6mm or less. Clypeus brown. Pattern on scutum grey pruinose and not faded postsuturally; with one pair of very narrow posterolateral stripes (Fig. 20). Scutellum brown laterally. Anepisternum and anepimeron with anteroventral markings. Distiphallus small, short, without long apical tubules. Ejaculatory apodeme relatively small with sclerite on sperm pump indistinct. (Note: *Phytoliriomyza melampyga* will also key out here, but preabdominal tergites entirely yellow or with narrow dorsal stripe completely divided medially by yellow line). 9

9 . Wing length 1.3–1.6mm. Vein dm-cu present. Setae yellow. Distiphallus cup-shaped and almost clear (Figs 243, 244). Mesophallus small, fused to base of distiphallus. Paraphallus separate from mesophallus, narrow, weakly sclerotized. Distal blade of ejaculatory apodeme broad, well-sclerotized (Fig. 242). . . . . ***L. borealis*** **(Malloch)**

- Wing length 1.1–1.2mm. Vein dm-cu absent. Setae black. Distiphallus divided medially into two short, narrow, pigmented cups (Figs 324, 325). Mesophallus larger, darker, separate from distiphallus. Paraphallus partially fused to mesophallus, small, rounded, basally sclerotized. Blade of ejaculatory apodeme reduced, clear (Fig. 323) . . . . . ***L. tryssos*** **spec. nov.**

10 . Brown region on scutum reaching posterior margin on either side of scutellum in male, and almost reaching posterior margin in female. Posterolateral corner of frons sometimes with brown spot on posterior margin. Femora brown basally and sometimes with dorsal streaking. Tibiae brown with fore and mid tibiae paler towards base. Abdomen brown medially with yellow posteromedial emargination on tergites 1–4. Distiphallus with narrow basal bowl and one pair of short, clear apical tubules. . . . . ***L. assimilis*** **(Malloch)**

- Posterior margin of scutum always yellow. Posterolateral corner of frons entirely yellow. Femora yellow with base of hind femur brown. Tibiae light brown. Abdominal tergites brown medially. Male unknown . . . . . ***L. ranunculoides*** **Spencer**

11 . Ventral 2/3 of anepisternum brown. Katepisternal seta enclosed by brown. Coxae brown. Femora brown with apices yellow. Eye 7.2 times higher than gena. Distiphallus with short, subconical basal bowl and one pair of dorsally arched ventral bands; ventral suture along distiphallus and mesophallus flared medially forming narrow plate (Figs 213, 214) . . . . . ***L. arctii*** **Spencer** (in part)

- Anepisternum entirely yellow or with anteroventral spot. Katepisternal seta surrounded by yellow. Coxae yellow with base sometimes brown. Femora yellow. Eye 2.5–5.8 times higher than gena. Distiphallus variable, but not as above. 12

12 . Wing length 2.0–2.7mm. Clypeus usually yellow 13

- Wing length 1.3–1.5mm. Clypeus brown 15

13 . 1 ori, sometimes with setula-like second pair present. Hairs along distal margin of first flagellomere as long as width of base of arista. Anepisternum yellow. Tibiae yellow with hind tibiae brownish (except base). Length of ultimate section of vein CuA_1 divided by penultimate section 2.9. Mesophallus dark, cylindrical and longer than basiphallus (Fig/ 182). Distiphallus short with base dorsoventrally compressed . . . . . ***L. orilliensis*** **Spencer**

- 2 ori. Hairs on first flagellomere very short. Anepisternum sometimes with anteroventral spot. Tibiae brown. Length of ultimate section of vein CuA_1 divided by penultimate section 1.7–2.4. Mesophallus and distiphallus relatively pale, fused, pipe-shaped 14

14 . Abdomen partially brown (at least epandrium). Wing length 2.4–2.7mm. Surstylus vestigial. Mesophallus darkest at base. Apical bowl of distiphallus not much wider than stem (seen ventrally) (Figs 123, 124) . . . . . ***L. montana*** **Sehgal** (in part)

- Abdomen yellow, including epandrium (sometimes with yellowish markings), sometimes with narrow, faint stripe on tergites 2–5. Wing length 2.1–2.3mm. Surstylus nearly absent, but with distinct leaf-like terminal seta. Mesophallus darker apically. Apical bowl of distiphallus nearly twice width of stem (seen ventrally) (Figs 98, 99) . . . . . ***L. anatolis*** **spec. nov.**

15 . Calypter margin brown. Setae black and wing veins brown. Scutum dark, shining. Coxae yellow. Eye 5.8 times higher than gena. Length of ultimate section of vein CuA_1 divided by penultimate section: 4.4. Surstylus with two spines. Paraphallus small, narrow, directed ventrally and positioned laterally on phallus (Figs 257, 258). Distiphallus with spines restricted to inner-distal margin. . . . . ***L. cracentis*** **spec. nov.**

- Calypter margin white. Setae and wing veins yellow. Scutum grey pruinose. Coxae brown on basal 1/3–1/2. Eye 2.5–3.1 times higher than gena. Length of ultimate section of vein CuA_1 divided by penultimate section: 2.7–2.9. Surstylus with one spine (Fig. 208). Paraphallus as long as distiphallus, directed distally, and positioned ventrally on phallus (Figs 206, 207). Distiphallus with minute spines on inner surface on distal half . . . . . ***L. agrios*** **spec. nov.**

16 . Abdomen entirely yellow or dark with lateral margin of tergites yellow, with yellow margin broad and easily viewed dorsally on tergites 1–3 (Fig. 9). If lateral margin of tergites only narrowly yellow, then antenna entirely yellow and legs dark with knees yellow. Posterolateral corner of frons usually dark with yellowish spot around base of vertical setae. Wing length usually 2.0–3.0mm, rarely as small as 1.5mm. Distiphallus with curved basal stalk and apical bowl (as in Figs 108, 124) l. 17

- If abdomen pale laterally, then yellow margins only becoming wider posteriorly (Figs 2, 3). Remaining characters variable, but wing length usually less than 2.0–2.3mm and legs usually much paler (rarely entirely dark with only knees yellow). Posterolateral corner of frons variable, but rarely with yellowish spot surrounding base of verticals. Distiphallus various, but never as above 23

17 . Frons entirely yellow around bases of vertical setae. Femora predominantly to entirely yellow. Anepisternum with narrow anteroventral spot; anepimeron with reduced mottling anteriorly. Surstylus absent 18

- Frons always at least with brown spot in posterolateral corner of frons lateral to base of vertical seta; if almost entirely yellow,

then hind femur with dorsal subapical spot. Femora never entirely yellow; usually entirely brown with apex yellow, but sometimes also yellow distoventrally or only with base of femora brown. Anepisternum usually predominantly brown, but sometimes with long anteroventral stripe; anepimeron with anterior and posterior mottling. Surstylus sometimes present. Only males can be identified further 19

18 . Femora entirely yellow. Clypeus yellow. Apical bowl of distiphallus barely wider than stem; mesophallus darkest at base; distiphallus only slightly bent at base . . . . . ***L. montana*** **Sehgal** (in part)

- Femora brown at base, with light streaking on for femur and with dorsal subapical spot on hind femur. Clypeus brown. Apical bowl of distiphallus approximately twice width of stem; mesophallus darkest at point of attachment to hypophallus; distiphallus perpendicular to mesophallus . . . . . ***L. mesocanadensis*** **spec. nov.**

19 . Apical bowl of distiphallus very large, considerable longer and thicker than basal stem (Fig. 105). Wing length usually large (2.7–3.7mm), but some males rarely as small as 1.5mm 20

- Apical bowl of distiphallus small, never much longer than basal stem (Fig. 114). Wing length 2.0–2.9mm 21

20 . Seen laterally, apical bowl of distiphallus wider than long, darkly pigmented and with internal process clearly projecting; spines inside bowl arranged around rim; distiphallus not flanked by scaled membrane (Fig. 105). Surstylus weakly-sclerotized and almost vestigial, narrow and without setae (Fig. 104). Basiphallus with weak, flat extensions past swollen postion of ejaculatory duct. Somatic pigment often with black tint. Acrostichal setulae often extending to posterior dorsocentral seta. First flagellomere uncommonly with brown pigment dorsally, usually with orange tint . . . . . ***L. cordillerana*** **Sehgal**

- Seen laterally, apical bowl of distiphallus as long, or longer than wide, weakly pigmented and with internal process not, or barely projecting; spines inside bowl arranged diagonally; base of distiphallus often flanked by scaled, sclerotized membrane (Fig. 108). Surstylus relatively well-developed with long apical seta (Fig. 110). Basiphallus unsclerotized past swollen postion of ejaculatory duct excluding small, floating rod-like distal sclerite. Somatic pigment brown to dark brown. Acrostichal setulae ending anterior to posterior dorsocentral seta. First flagellomere usually yellow basally with brown apical infuscation . . . . . ***L. septentrionalis*** **Sehgal**

21 . Only dorsomedial margin of katepisternum yellow. Face partially brown. Surstylus long, narrow and posteriorly curved (Fig. 125). Basal stem of distiphallus stem shorter than mesophallus (Fig. 127). Seen ventrally, apical bowl of distiphallus approximately twice width of narrow stem (Fig. 126) . . . . . ***L. fumeola*** **spec. nov.**

- Dorsal margin of katepisternum yellow to base of seta. Face yellow. Surstylus vestigial. Stem of distiphallus stem as long as mesophallus. Apical bown of distiphallus much narrower than twice width of stem. 22

22 . Clypeus yellow to brown. Femora brown basally, at least on hind leg. Anepisternum yellow with brown, oblique anteroventral stripe. Apical bown of distiphallus small—seen ventrally, not much wider than stem; medioventral suture broadly separated by narrow, weakly-sclerotized bar; mesophallus much darker than distiphallus (Figs 123, 124). Basiphallus with narrow finger-like extensions apically (Fig. 122) . . . . . ***L. montana*** **Sehgal** (in part)

- Clypeus dark brown. Femora brown with apices and distoventral surface of fore femur yellow. Ventral 2/3 of anepisternum brown. Apical bown of distiphallus relatively large—seen ventrally, approximately three times width of stem; medial-ventral suture suture of distiphallus only separated apically, with intervening sclerite darkly banded laterally; mesophallus not darker than distiphallus (Figs 112, 114). Basiphallus with flared, flat, apical plate-like extensions (Figs 112, 115, 119) . . . . . ***L. flaveola*** **(Fallén)**

23 . Base of both vertical setae surrounded by yellow. 24

- Base of at least outer vertical seta touching (or rarely, surrounded by) brown lateral spot, although brown spot sometimes fading to light brown towards seta base (Figs. 15, 27). 60

24 . Calypter margin and hairs bright white. Scutum covered with a relatively dense grayish pruinosity. Orbital plate and parafacial slightly to strongly projecting. Two rows of acrostichal setulae 25

- Calypter margin brown to brownish, hairs sometimes paler, but never white; sometimes appearing greyish to brownish when viewed on its edge, but never pure white. Scutum dark; shining to dusted with pruinosity, but never dense. Orbital plate and parafacial not strongly projecting. Usually four rows of acrostical setulae, sometimes two 31

25 . First flagellomere with long apical hairs and distal 2/3 orange. Eye usually more than four times higher than gena (3.8–4.4). Distiphallus pale, cup-like and square in outline (ventral view) (Fig. 296) . . . . . ***L. rigaudensis*** **spec. nov.**

- First flagellomere entirely yellow, uncommonly with longer apical hairs (some *L. aquapolis*). Eye four times higher than gena at most. Distiphallus not as above. 26

26 . Posterolateral corner of frons without brown spot extending to posterior margin of eye. Basal bowl of distiphallus strongly angled dorsally so as to be in contact with mesophallus along length; distal tubules pointed distally with outer surface partially (Figs 80, 81) . . . . . ***L. aquapolis*** **spec. nov.** (SK ♂)

- Posterolateral corner of frons with spot extending from back of head to eye. Basal bowl of distiphallus open towards apex, not angled dorsally; if present, apical tubules entirely unpigmented laterally 27

27 . Wing length 1.6–1.7mm. Epistoma absent. Length of ultimate section of vein CuA_1 divided by penultimate section 2.9–4.7. Basiphallus with flat, dark distolateral extensions (=paraphalli) (Figs 196, 199, 203). Distiphallus directed dorsally, small, separate from mesophallus 28

- Wing length usually 1.8–2.5mm. Small, but distinct epistoma sometimes present. Length of ultimate section of vein CuA_1 divided by penultimate section 1.6–2.7. Basiphallus not extended past mesophallus as above. Distiphallus directed distally, very large, fused to mesophallus, and pale (Figs 54, 88) 29

28 . Femora entirely yellow. Left margin of basiphallus weakly sclerotized (Fig. 196). Paraphallus nearly as long as mesophallus (Fig. 195). Distiphallus + mesophallus approximately 1/2 length of basiphallus. . . . . ***L. lima*** **(Melander)**

- Femora entirely yellow or with faint dorsobasal spots and streaking on dorsum of fore femur. Left distal margin of basiphallus well-sclerotized, produced as a point (Fig. 203). Paraphallus half length of mesophallus (Fig. 202). Distiphallus + mesophallus

approximately 2/3 length of basiphallus . . . . . ***L. togata* (Melander)** (in part)

29 . Femora with distinct, sometimes with ovate dorsobasal spot. Fore tibia brown (Fig. 6). Pigment on notum distinctly brown with relatively light dusting of pruinosity. Distiphallus large and bulbous with deep bowl, and short apical tubules (Figs 54, 55) . . . . . ***L. smilacinae* Spencer** (in part)

- Femora entirely yellow or with faint basal spot. Fore tibia yellow or with brownish tint. Pigment on notum largely obscured by grey pruinosity. Distiphallus slender with smaller basal bowl and long, narrow apical tubules. 30

30 . Femora entirely yellow. Fore tibia yellow; mid tibia brownish dorsally on basal 2/3; hind tibia brownish on basal 2/3, exclusing base, with dorsum darker. Brown dorsal stripe on abdomen with narrow yellow line medially, sometimes widening to separate distinctly separate spots on tergites 2, 4 and 5. Seen ventrally, basal "bowl" of distiphallus constricted medially to produce two collar-like ridges; without ventrobasal lobes (Figs 85, 86). . . . . ***L. bicolumbis* spec. nov.**

- Femora sometimes with faint spot at base. Fore tibia sometimes brownish; mid tibia brownish (sometimes paler at base and apex); hind tibia dark brown medially. Brown dorsal markings on abdomen undivided medially. Seen ventrally, base of distiphallus with simple basal "bowl" with one pair of anteroventral lobes (Figs 88, 89) . . . . . ***L. merga* Lonsdale**

31 . Two rows of acrostichal setulae, rarely three. Scutum usually with dusting of greyish pruinosity. Anterior ori usually not much shorter than posterior ori, but sometimes reduced to absent 32

- Four rows of acrostichal setulae. Scutum usually shining to subshining, sometimes with grey pruinosity. Anterior ori often reduced to absent 47

32 . Femora entirely yellow, rarely faintly brown dorsobasally. Clypeus yellow to brown. Usually only three fronto-orbital setae. Anepisternum with small anteroventral spot that is faint to well-developed 33

- Femora brown dorsobasally (sometimes faint) and at least fore femur usually with brown dorsal streaking (femora sometimes entirely or mostly yellow in *L. trifolii*). Clypeus brown. Four fronto-orbital setae. Anepisternum with distinct anteroventral spot 39

33 . Vein dm-cu sometimes absent. First flagellomere sometimes with anterodorsal angulate. Posterolateral corner of frons entirely yellow. Parafacial and orbital plate pronounced. Basiphallus with pronounced distolateral extension (Fig. 203). Distiphallus narrow, dark and globular (Fig. 202). . . . . ***L. togata* (Melander)** (in part)

- Vein dm-cu always present. First flagellomere ovate. Posterolateral corner of frons usually with brown spot. Parafacial and orbital plate not noticably produced. Basiphallus not extending past mesophallus. Distiphallus usually with wide basal bowl surrounding base of one pair of tubules (tubules short and indistinct in *L. fricki*, but *L. lathryi* with broad and very short distiphallus) 34

34 . Clypeus entirely yellow. One ors. Distiphallus with apical tubules very elongate, doubly sinuate and arching over hypandrium (Fig. 42). . . . . ***L. undulata* Spencer** (in part)

- Clypeus brown with midpoint sometimes yellow (some USA *L. smilacinae* with clypeus entirely yellow). One or two ors. Distiphallus with apical tubules variable in length, but never doubly sinuate as above 35

35 . Frons entirely yellow excluding ocellar tubercle. Basal bowl of distiphallus smaller, approximately twice width of mesophallus; tubules of distiphallus narrow and straight with small dorsobasal "hook" (Fig. 82) . . . . . ***L. balcanicoides* Sehgal**

- Frons with ocellar tubercle and spot in posterolateral corner of frons lateral to vertical setae brown. Basal bowl of distiphallus large, several times wider than mesophallus; if tubules elongate, without small dorsobasal "hook". 36

36 . Wing length 1.8–2.2mm. Surstylus tapering apically (Fig. 57). Bowl of distiphallus open apically and approximately as long as wide; tubules wide and twice length of basal bowl (Figs 58, 59). Paraphallus distinct . . . . . ***L. smilacinae* Spencer** (in part)

- Wing length 1.3–1.8mm. Surstylus broadly rounded apically (Fig. 68). Distiphallus angled backwards with bowl open dorsally; bowl shallow, much wider than long 37

37 . Bowl of distiphallus smaller, very short, wide; inner surface smooth (Figs 144–146). Eye approximately 6.5 times higher than gena . . . . . ***L. lathryi* Sehgal** (Manitoba)

- Bowl of distiphallus large, broad and conspicuous; inner surface minutely spinulose. Eye not more than 5.0 times higher than gena 38

38 . Eye height divided by gena height 4.4–5.0. Surstylus with single apical spine (Fig. 68). Distiphallus with one pair of long, narrow tubules (Figs 69, 70). . . . . ***L. bifurcata* Sehgal** (in part)

- Eye height divided by gena height 3.0–4.2, sometimes up to 5.1 in Canadian specimens. Surstylus with one large and one small subapical spine (Fig. 72); relatively broad and rounded apically. Distiphallus with one pair of short apical tubules, wider than long (Figs 73, 74) . . . . . ***L. fricki* Spencer** (in part)

39 . First flagellomere becoming brown anterodorsally (sometimes entire surface at least lightly infuscated with brown pigment), often becoming black towards anterior and dorsal surfaces. Femora with basal and subapical spots (larger and darker on fore femur) that are sometimes united. Mesophallus dark and subcylindrical. Distiphallus small and shallow, barely encompassing one pair of fringed apical processes (as in Figs 144–146) . . . . . ***L. nares* Boucher & Wheeler**

- First flagellomere entirely yellow or evenly infuscated on distal 1/3–2/3. Femora with dorsal streaking, at least on fore leg. Mesophallus pale and fused to distiphallus or dark and cylindrical. Distiphallus various, but never as broad and shallow as above, being proportionately longer 40

40 . Distiphallus pale, cup-shaped, not much larger than mesophallus, which is short and pale. Ejaculatory apodeme very small. Eye 2.1–3.0 times higher than gena, and only fore femur ever with dorsal streaking. First flagellomere sometimes with slight anterodorsal angle (Fig. 12). Two ors. Posterior margin of tergites 2–6 widely yellow and often with yellow medial line or posteromedial notch in brown spot. . . . . ***L. trifolii* (Burgess)** (in part)

- Distiphallus darker, short to elongate. Ejaculatory apodeme large and well-developed. Eye usually 3.0–5.2 times higher than gena; if as above (*L. atrassimilis*—uncommonly encountered in BC), femora with pronounced dorsal streaking. First flagellomere almost always ovate. One or two ors. Posterior margin of tergites 5 and 6 sometimes yellow, and without yellow

posteromedial notch. Only males can be identified further 41

41 . Distiphallus short, small; tubules barely emerging from within base. Mesophallus dark, cylindrical, separate from distiphallus; as long or longer than distiphallus (Fig. 176) 42

- Distphallus with small to very large basal bowl; tubules large, projecting from basal section, usually elongate (shorter in *L. fricki*). Mesophallus not dark and cylindrical, usually fused to distiphallus; much smaller than distiphallus (Fig. 73). 43

42 . Stripes on anspisternum and fore femur relatively dark, distinct. Distiphallus triangular in outline (seen ventrally and laterally) (Figs 149, 150). Mesophallus short, as long as distiphallus. Left distal margin of basiphallus well-sclerotized . . . . . ***L. elevaster* sp. n.** (in part)

- Stripes on anspisternum and fore femur relatively weak, faded. Seen ventrally, distiphallus broad and cup-shaped in outline; seen laterally, narrowed at base and bulging dorsoapically (Figs 175, 176). Mesophallus longer than distiphallus. Left distal margin of basiphallus weakly-sclerotized to membranous . . . . . ***L. taraxaci* Hering** (in part)

43 . Basal bowl of distiphallus long (i.e. width in profile), subequal to length of basiphallus; strongly angled dorsally. Wing length usually less than 1.8mm, but sometimes as large as 2.0mm. Femora yellow, sometimes with very faint dorsal streaking . . . 44

- Length of basal bowl of distiphallus much less than length of basiphallus; bowl usually open apically (slightly tilted dorsally in *L. atrassimilis*). Wing length 1.8–2.2mm. Femora uusally heavily pigmented (*L. undulata* with paler femora as above) 45

44 . Eye height divided by gena height: 4.4–5.0. Surstylus with one subapical spine (Fig. 68). Distiphallus with one pair of very long, narrow apical tubules (Figs 69, 70) . . . . . ***L. bifurcata* Sehgal** (in part)

- Eye height divided by gena height: 3.0–4.2 (rarely up to 5.1). Surstylus with one large and one small subapical spine (Fig. 72). Distiphallus with one pair of short, wide apical tubules (Figs 73, 74) . . . . . ***L. fricki* Spencer** (in part)

45 . Clypeus entirely yellow. Anepisternum with small, faded anteroventral spot. Distiphallus with apical tubules very elongate, doubly sinuate and arching over apex of hypandrium (Fig. 42) . . . . . ***L. undulata* Spencer** (in part)

- Clypeus dark brown. Anepisternum with pigment more extensive, at least forming dark subtriangular spot. Distiphallus with tubules short and relatively straight 46

46 . First flagellomere with orange tint and sometimes distal 1/3 infuscated. Anepisternum with a clavate stripe. Fore femur with dorsal streaks. Distiphallus slightly angled dorsally, basal bowl shorter than mesophallus; with ventral attachment to mesophallus; tubules almost entirely membranous (Figs 51, 52). Mesophallus extensively fused to distiphallus, sinuate, not constricted apically . . . . . ***L. atrassimilis* spec. nov.**

- First flagellomere yellow. Anepisternum with subtriangular anteroventral spot. Fore femur with mottling covering most of dorsal surface. Distiphallus pointed apically, basal bowl longer than mesophallus; with basal attachment to mesophallus; tubules with relatively distinct sclerotized regions laterally and ventrally (Figs 65, 66). Mesophallus faintly attached to distiphallus, straight, tapered apically . . . . . ***L. wachtli* Hendel**

47 . Usually two to three rows of acrostichal setulae, but sometimes four scattered rows. First flagellomere sometimes with slight anterodorsal angle (Fig.). Posterior margin of tergites 2–6 widely yellow and often with yellow medial line or posteromedial emargination. Length of ultimate section of vein CuA_1 divided by penultimate section 1.7–3.1. Eye 2.1–3.0 times higher than gena. Mesophallus and distiphallus fused, narrow, small and clear; without paired internal fringed structures (Figs 309, 310). Epandrium rounded ventrally, not produced. Ejaculatory apodeme small and atrophied (Fig. 307) . . . . . ***L. trifolii* (Burgess)** (in part)

- Four rows of acrostichal setulae. First flagellomere always rounded. Tergites 2–6 sometimes narrowly yellow along posterior margin, but usually only pronounced on tergite 6 and sometimes tergite 5, never with yellow posteromedial line or emargination. Eye height and length of ultimate section of vein CuA_1 variable. Shape of phallus variable, but always with distinct paired internal fringed structures; excluding *L. cracentis*, mesophallus dark, narrow and cylindrical, inner surface of epandrium flanked by dark narrow sclerite with apical spine, and epandrium at least slightly produced ventrally. Ejaculatory apodeme usually large and well-developed 48

48 . Femora entirely yellow. Tibiae yellow, at most with mid and hind tibiae faintly brownish 49

- Femora brown basally, at least on dorsum, and at least fore femur with dorsal markings. All tibiae brown, at least dorsomedially. NOTE: Some *L. taraxaci* with pigment on fore tibia nearly indistinct, and some American *L. ptarmicae* with femora entirely yellow, but only *L. ptarmicae* has the venter of the epandrium strongly produced to a point (Fig. 189) 52

49 . Anepisternum with large anteroventral spot. Katepisternal seta with brown spot posterior to socket, or base entirely enclosed by brown. Wing length 1.8–2.0mm. Surstylus with one spine and narrowing apically (Fig. 148). Mesophallus dark, narrow, cylindrical and not longer than distiphallus (Figs 144–146). . . . . ***L. lathryi* Sehgal** (in part)

- Anepisternum with small, faint anteroventral spot. Base of katepisternal seta surrounded by yellow. Wing length 1.6–1.8mm (1.9–2.1mm in some *L. taraxaci*). If surstylus with one spine, then surstylus narrowest at base. Mesophallus, if dark, narrow and cylindrical, then distinctly longer than distiphallus 50

50 . First flagellomere small and rounded with short hairs (Figs 17, 18). Posterolateral corner of frons entirely yellow. Anterior ori as strong as posterior ori. Surstylus with two spines (Fig. 256). Mesophallus short and pale. Distiphallus narrow, hollow and cup-like (Fig. 259). . . . . ***L. cracentis* spec. nov. (**Type 2♂)

- First flagellomere sometimes longer than high and with long apical hairs (Fig. 19) or large, circular and covered with long hairs. Posterolateral corner of frons with brown spot. Anterior ori reduced to absent. Surstylus with one spine. Mesophallus long, narrow and dark. Distiphallus directed dorsally and apically widened, enclosing one pair of fringed processes. 51

51 . Ventral margin of epandrium strongly produced, subtriangular (Fig. 189). Mesophallus+distiphallus directed dorsally; distiphallus more slender, not abruptly widened on distal half (Figs 190, 191). Basiphallus with large sclerotized plate on right distal surface. Paraphallus separate and distinct . . . . . ***L. ptarmicae* De Meijere** (in part)

- Ventral margin of epandrium very shallowly produced (Fig. 169). Mesophallus+distiphallus directed apically; distiphallus abruptly widened on distal half (Figs 175, 176). Basiphallus membranous on right distal surface. Paraphallus indistinct, fused

to distal margin of basiphallus. . . . . ***L. taraxaci*** **Hering** (in part)

52. Clypeus thickened, particularly along anterior margin, which is nearly half height of first flagellomere. Paraphallus emerging ventrobasally from mesophallus, flattened dorsoventrally, directed distolaterally (Figs 198, 199) . . . . . ***L. limopsis*** **spec. nov.** (in part)

- Clypeus narrow and band-like along length, or at least not as above. Mesophallus variable, but not as above 53 53 . Face light brown. Orbital plate with narrow brown infuscation along inner margin of eye in Quebec specimens. Femora streaked dorsally. First flagellomere clothed in very short hairs. Anepisternum mostly brown with dorsum yellow, sometimes with yellow posterodorsal emargination extending to venter of segment, separating large anterior spot from narrow posterior stripe. Distiphallus strongly narrowed basally, ventroapically with large bi- or trilobed plate (Figs 160, 161) . . . . . ***L. taraxanox*** **spec. nov.**

- Face and orbital plate entirely yellow. Orbital plate always yellow. Femora yellow, sometimes with dorsal streaking on fore femur. First flagellomere sometimes with hairs longer than width of arista base. Anepisternum usually mostly yellow with narrow brown anteroventral stripe. Mesophallus not as above, usually much longer than distiphallus. Distiphallus not as above 54

54 . Clypeus yellow laterally. Mesophallus small, not longer than distiphallus, and narrowest at base (Figs 158, 159) . . . . . ***L. apilaca*** **spec. nov.**

- Clypeus entirely brown. Mesophallus longer; distiphallus only as long if similarly enlarged or lengthened 55

55 . Posterior margin to posterior half of anepimeron sometimes brown. Distiphallus shorter than dark, cylindrical mesophallus; base usually not much narrower than apex (seen ventrally) 56

- Posterior half of anepimeron entirely yellow. Distiphallus as long as, or longer than mesophallus; much widened apically (seen ventrally) 57

56 . First flagellomere yellow. Dorsum of anepisternum with broad yellow region. Anatergite yellow with brown mottling; anatergite brown posteroventrally; anatergite with distinct yellow posterodorsal region. Femora yellow with base narrowly brown and sometimes with very narrow, limited brown dorsal markings (usually restricted to fore leg). Distiphallus at least as long as wide; ventral suture mostly closed, except for exposed distoventral plate (Figs 170–178) . . . . . ***L. taraxaci*** **Hering** (in part)

- First flagellomere brownish with dorsum darker. Brown markings on anepisternum large, leaving narrow yellow dorsal margin and posterior submarginal brownish stripe. Anepimeron katatergite and anatergite brown with very limited yello mottling on anepimeron and yellowish posterodirsal region on anatergite. Femora with broad brown base and extensive brown dorsal markings. Distiphallus broad, much shorter than wide; ventral suture broadly split; without discreet distoventral plate (Figs 162, 163) . . . . . ***L. taraxanuda*** **spec. nov.**

57 . First flagellomere sometimes brownish along distal margin. Vein dm-cu sometimes absent. Ventral margin of epandrium strongly produced and pointed (Fig. 189). Mesophallus angled dorsally (Figs 190, 191) . . . ***L. ptarmicae*** **De Meijere** (in part)

- First flagellomere entirely yellow. Vein dm-cu always present. Ventral margin of epandrium broadly rounded, not produced. Mesophallus directed distally 58

58 . Distiphallus entirely divided into one pair of short, dark tubules (Figs 339, 340). Mesophallus short, with small projecting ventral carina; widely separated from sclerotized section of ejaculatory duct . . . . . ***L. hilairensis*** **spec. nov.** (pale male)

- Distiphallus with single cup-like base enclosing one pair of fringed tubules. Mesophallus longer than wide, without ventral carina; adjacent to sclerotized section of duct 59

59 . Dark bar along inner-lateral surface of epandrium undivided (Fig. 151). Distiphallus narrower and smaller, with apical cup enclosing paired fringed structures; triangular in outline (viewed both ventrally and laterally) (Figs 149, 150) . . . . . ***L. elevaster*** **sp. n.** (in part)

- Dark bar along inner-lateral surface of epandrium with additional, floating spine ventrally (Fig. 184). Distiphallus large and wide, with paired apical fringed structures not enclosed by outer wall (Figs 184–186). . . . . ***L. veluta*** **Spencer**

60 . Anepisternum yellow on dorsal 1/5 or less 61

- Anepisternum yellow on dorsal 1/4 or more (Figs 8, 11) 85

61 . First flagellomere entirely dark brown to brown, sometimes with basal margin paler; some female *L. eboni* with segment more widely yellow basally, but becoming black towards anterodorsal corner. Scutum brownish to brown above wing base. Femora brown, sometimes with knees and limited streaking yellow. 62

- First flagellomere entirely yellow, with small spot, or at most with distal 2/3 infuscated; in questionable cases, segment never with long, dense hairs. Scutum almost always with complete yellow lateral stripe, but sometimes brown behind transverse suture. Femora sometimes predominantly dark as above, but usually yellow with bases and dorsal streaking brown 72

62 . Epistoma large. Five ori, one ors. Surstylus and epandrium densely spinulose (Figs 341, 342). Phallus large and bifid with haired basiphallus, hypophallus and subapical collar (Figs 343, 346) . . . . . ***L. quadrisetosa*** **(Malloch)**

- Epistoma very narrow. One to three ori, two ors. Phallus not as above. Surstylus and epandrium not spined as above 63

63 . Face brown. Entire antenna dark brown; scape and pedicel yellow in some *L. violivora*. Palpus dark brown. Venter of gena with dark brown line. At least four fronto-orbitals present. 64

- Face yellow. Scape and pedicel yellow. Palpus light brown to yellow. Venter of gena with faint brownish line. Sometimes only three fronto-orbitals present, at least on one side of frons 66

64. Antenna brownish to dark brown, sometimes with pigment irregular. Eye only margined by brown along orbital plate. Dorsal margin of anepisternum sometimes yellow. Surstylus without spine. Distiphallus bifid; pale and slender (Figs 136, 137) . . . . . ***L. violivora*** **(Spencer)**

- Antenna entirely and evenly dark brown with pedicel sometimes paler. Eye surrounded by brown ring. Anepisternum entirely dark. Surstylus with single spine. Distiphallus entire, undivided; stout and very dark 65

65 . Legs dark with apex of fore femur yellow. Four fronto-orbitals. Brown lateral stripe on orbital plate barely extending to base of fronto-orbitals (Fig. 27). Parafacial and orbital plate barely visible laterally. Distiphallus with one pair of narrow distoventral plates (Figs 247, 248). Paraphallus narrow, leaf-shaped, and extending laterally from point of fusion medially on distiphallus .

. . . . . ***L. baptisiae* (Frost)**

- Legs entirely dark brown (Fig. 10). Sometimes more than four fronto-orbitals present. Brown lateral stripe on orbital plate enclosing base of fronto-orbitals. Parafacial and orbital plate distinctly projecting. Distiphallus without distoventral plates (Figs 249, 251, 252). Paraphallus narrow, pale, not fused to distiphallus or directed ventrally . . . . . ***L . bellissima* (Spencer)**

66 . Three fronto-orbitals, sometimes four. Palpus light brown. First flagellomere entirely brown, with longer apical hairs, and usually slightly elongate; some females with segment becoming black towards anterodorsal corner. Mesophallus dark, narrow and cylindrical; distiphallus only as long as mesophallus, directed dorsally, and strongly widened apically to enclose paired fringed processes (Fig. 143) . . . . . ***L. eboni* Spencer**

- Four fronto-orbitals, sometimes with one ori reduced to absent on one side (rarely both). Palpus yellow. First flagellomere variable in shape, but not as above, and rarely with entire segment brown (*L. emaciata*, *L. helianthi* from Mt. Kobau, some *L. minor*). If mesophallus dark, narrow and cylindrical (*L. minor*), then distiphallus not as above and considerably shorter than mesophallus 67

67 . First flagellomere covered with long hairs and either widest subapically or large and circular. Orbital plate yellow and sometimes projecting anteriorly. Posterolateral corner of frons dark to base of outer vertical seta. Mesophallus dark, cylindrical and much longer than distiphallus. Distiphallus with small distoventral plate and base compressed dorsoventrally (Figs 180, 181). Surstylus with sides parallel (Fig. 179) . . . . . ***L. minor* Spencer** (in part)

- First flagellomere small and ovate with hairs short. Orbital plate sometimes partially brown laterally, never strongly produced beyond eye margin. Posterolateral corner of fronsalmost always dark to base of inner vertical seta. Mesophallus pale and short. Distiphallus bifid or with large apical cup. Surstylus narrowing apically 68

68 . Vein dm-cu absent 69

- Vein dm-cu present 70

69 . Eye 5.0–5.8 times higher than gena. Dorsal 1/5 of anepisternum yellow and dorsal margin of katepisternum yellow to below level of seta. Femora yellow with dorsal mottling. Seen ventrally, distiphallus subquadrate and separate from mesophallus; with numerous minute spinules along inner surface and with one pair of faint fringed processes; mesophallus with very small, shallow carina (Figs 237, 238) . . . . . ***L. gibsoni* spec. nov.**

- Eye 3.5–3.6 times higher than gena. Dorsal margin of anepisternum and katepisternum brown or narrowly yellow. Femora brown with apex and distoventral surface yellow. Distiphallus small and cup-like, extensively fused to mesophallus; with small ventral sclerotized mounds on inner surface; mesophallus with pronounced ventral carina (Figs 228, 229) . . . . . ***L. emaciata* spec. nov.**

70 . Wing length 1.9–2.7mm. Length of ultimate section of vein CuA_1 divided by penultimate section 1.5–2.5. Scutum with small brown spot in lateral yellow stripe posteriorly. Distiphallus separate from mesophallus and composed of two short, separate tubules (Figs 335, 336). Ejaculatory apodeme small and atrophied (Fig. 334) . . . . . ***L. huidobrensis* (Blanchard)** (in part)

- Wing length 1.3–1.6mm. Length of ultimate section of vein CuA_1 divided by penultimate section 2.7–4.7. Scutum with complete lateral yellow band. Distiphallus cup-shaped and fused to mesophallus. Ejaculatory apodeme large and well-developed 71

71 . Scutum yellow above wing base. Femora brown basally, fore femur with strong dorsal striations, and mid and hid femora with weak dorsal mottling. Length of ultimate section of vein CuA_1 divided by penultimate section 2.7–3.7. Distiphallus broad, cup-shaped, twice as wide as mesophallus (Figs 240, 241) . . . . . ***L. artemisiae* Spencer**

- Scutum dark brown above wing base. Femora brown with yellowish mottling. Length of ultimate section of vein CuA_1 divided by penultimate section 4.7. Distiphallus not much wider than mesophallus, slender (Figs 283, 284) . . . . . ***L. helianthi* Spencer** (Mt. Kobau, BC male)

72 . Face brown to light brown. Surstylus C-shaped (Fig. 223). Distiphallus dark and cylindrical with medial constriction (Figs 221, 222) . . . . . ***L. baccharidis* Spencer** (in part)

- Face yellow. Surstylus sinple, without enlarged basal lobe, Distiphallus variable, but not as above 73

74 . Femora entirely yellow or with bases brown; never with dorsal streaking. 75

- Femora with dorsal streaking or almost entirely brown 77

75 . First flagellomere produced into strong point anterodorsally and often relatively large. Lateral margin of orbital plate sometimes narrowly brown in males. Surstylus atrophied, but with long, curved distal seta (Fig. 130). Basiphallus with sculpturing along inner surface, convoluting dilated distal section of ejaculatory duct. Mesophallus clear and bifid, meeting broad, C-shaped, strongly toothed distiphallus (Figs 128, 129). . . . . ***L. sylvatica* Sehgal**

- First flagellomere usually ovate, slightly pointed in most *L. virgo*. Orbital plate usually broadly brown, with stripe tapering anteriorly, and base of fronto-orbitals surrounded by brown spot or touching brown stripe; if entirely yellow then first flagellomere with orange tint and anterior fronto-orbital reduced to absent. Surstylus discreet and with small, dark distal spine. Basiphallus not sculptured as above. Mesophallus and distiphallus not as above 76

76 . Scutum with complete lateral yellow stripe, sometimes with basal brown spot. Anspisternum yellow dorsally and katatergite yellow medially. Katepisternum yellow along dorsal margin. Surstylus with one spine (Fig. 93). Distiphallus composed of one pair of long, clear, partially separated tubules (Figs 91, 92). . . . . ***L. virgo* (Zetterstedt)** (in part)

- Scutum entirely brown postsuturally. Anepisternum and katatergite entirely brown. Katepisternum brown dorsomedially. Surstylus with two spines. Distiphallus small and cup-shaped (Figs 285–287) . . . . . ***L. peleensis* Spencer**

77 . Distiphallus short and completely divided to base. Entire dorsal margin of katepisternum usually yellow. Wing length 1.7–2.7mm 78

- Distiphallus sometimes short, but always undivided, at least basally; sometimes with basal bowl-shaped structure where tubules meet. Only dorsomedial margin of katepisternum usually yellow. Wing length 1.4–2.1mm 80

78 . First flagellomere yellow, becoming a deeper yellow apically, sometimes with narrow infuscation around base of arista. Orbital

plate brown laterally with stripe narrowing to level of anterior ori. Wing length 1.7mm. Each branch of distiphallus as wide as long, and very broadly cup-shaped with tapered base (Figs 327, 328) . . . . . ***L. edmontonensis* Spencer**

- First flagellomere sometimes entirely yellow, but often orange on distal 2/3 with distal margin infuscated apically. Orbital plate usually only brown to base of posterior ors, but sometimes to level of posterior ori. Wing length 1.8–2.7mm. Each branch of distiphallus much narrower than long, with broader, more truncated base. 79

79 . Two to three rows of acrostichal setulae, rarely four; usually sparsely arranged. Wing length 1.9–2.7mm. Eye 2.5–4.3 times higher than gena. Ventral margin of gena usually with complete faint brownish band, but sometimes variably faded. Femora usually predominantly brown with knee and distoventral surface yellow, at least on fore leg, but sometimes predominantly yellow. Surstylus with one spine (Fig. 333). Paraphallus narrow, indistinct. Mesophallus and basiphallus separated by broad membranous space (Figs 335, 336). . . . . ***L. huidobrensis* (Blanchard)** (in part)

- Four rows of acrostichal setulae. Wing length 1.8–2.3mm. Eye 2.8–3.2 times higher than gena. Only posteroventral margin of gena with narrow brownish stripe. Femora predominantly yellow with base and light dorsal mottling brown (Fig. 11). Surstylus with two spines (Fig. 330). Paraphallus triangular with apex dark; basiphallus and mesophallus nearly touching (Figs 331, 332).. . . . . ***L. trifoliearum* Spencer** (in part)

80 . Four rows of acrostichal setulae. At least four fronto-orbitals present. Eye 4.4–5.8 times higher than gena. Lateral margin of orbital plate sometimes brown. Distiphallus small and cup-shaped; apical, basal and ventral surfaces better-sclerotized, forming weak C-shape in profile (Figs 305, 306). . . . . ***L. sativae* Blanchard** (in part)

- Two to four rows of acrostichal setulae. Four or fewer fronto-orbitals. Eye 3.0–4.7 times higher than gena. Orbital plate entirely yellow or almost entirely brown with stripe reaching base of fronto-orbitals. Distiphallus variable, never as above 81

81 . Orbital plate dark along lateral margin to level of anterior ori, with stripe extending to reach base of ors and posterior ori. First flagellomere entirely yellow, at least in male. Wing length 1.3–1.6mm. Four rows of acrostichal setulae. Distiphallus small and cup-like; mesophallus very pale (Fig. 282) . . . . . ***L. helianthi* Spencer** (some eastern specimens)

- Orbital plate entirely yellow. First flagellomere usually extensively infuscated, or with narrow stripe emerging from base of arista. Wing length 1.6–2.1mm. Two to four rows of acrostichal setulae. Distiphallus usually with broad basal bowl and one pair of short to long distimedial tubules; if smaller with short tubules (*L. minor*), mesophallus dark and cylindrical 82

82 . Two or three ori, one ors. Scutum lightly dusted with pruinosity. Male first flagellomere yellow with light outer streak running ventrally from base of arista, but sometimes as below. Wing length 1.9–2.1mm. Distiphallus with long, S-shaped apical tubules; dilated distal section of ejaculatory duct only gradually swollen medially (Figs 38, 39). . . . . ***L. nordica* Spencer**

- One or two ori, two ors (*L. minor* rarely with three ori and one ors, but otherwise not as above). Scutum subshining. First flagellomere always broadly infuscated with basal 1/3–2/3 yellow; some *L. minor* with pigment very faint. Wing length 1.6–1.9mm. If evident, distiphallus tubules wide and short; dilated distal section of ejaculatory duct short and bulbous 83

83 . First flagellomere with long marginal hairs. Distiphallus small and globular; tubules barely evident, atrophied (Figs 180, 181). Mesophallus dark and cylindrical . . . . . ***L. minor* Spencer** (in part)

- First flagellomere with short, barely noticable hairs. Distiphallus with broad basal bowl and short apical tubules. Mesophallus short and relatively pale. 84

84 . First flagellomere infuscated along anterior margin to base of arista. Orbital plate light yellow. Femora yellow with base and dorsal streaking brown. Basal bowl of distiphallus longer than wide with posterobasal surface reaching base of mesophallus, heavily spinulose along inner surface; apical tubules broad (Figs 73, 74) . . . . . ***L. fricki* Spencer** (some western specimens)

- First flagellomere infuscated on distal 2/3, with inner surface sometimes only infuscated on distal 1/3. Orbital plate not paler than centre of frons. Femora brown with apices yellow. Basal bowl of distiphallus as long as wide, with inner-marginal spinules; apical tubules narrow with apex slightly expanded (Figs 61–63) . . . . . ***L. socialis* Spencer**

85 . Femora entirely yellow, sometimes with only scraper or base of hind femur indistinctly pigmented; orbital plate entirely yellow or with very narrow brown line along lateral margin 86

- Femora variably patterned, at least with faint dorsobasal marking on fore femur; questionable material sometimes with most of orbital plate brown (polymorphic species key both ways) 102

86 . Scutum with light to heavy dusting of greyish pruinosity. Two to three rows of achrostichal setulae, sometimes with four sparse rows of setulae behind transverse suture. Distiphallus with one pair of apical tubules 87

- Scutum shining to subshining. Four to five rows of acrostichal setulae. Distiphallus short and undivided. Only males can be identified further 91

87 . First flagellomere relatively large and with long marginal hairs. Tibiae yellow basally and/or ventrally. Basal bowl of distiphallus directed dorsally; base of tubules without ventromedial plate 88

- First flagellomere small, ovate and short-haired. Tibiae evenly brown. Basal bowl of distiphallus opening apically (not angled upwards); tubules covered basally by ventral plate 89

88 . Brown posterolateral spot on frons reaching outer vertical seta. Apical tubules of distiphallus straight, as long as basiphallus+mesophallus (Figs 80, 81) . . . . . ***L. aquapolis* spec. nov.** (QC ♂)

- Brown posterolateral spot on frons larger, reaching inner vertical seta. Apical tubules S-shaped, much longer than remainder of phallus (Fig. 40) . . . . . ***L. sinuata* Sehgal**

89 . Clypeus yellow. Distiphallus with pale basal bowl; apical tubules separated from bilobed ventrobasal plate (Figs 95, 96). Mesophallus with long ventromedial process . . . . . ***L. equiseti* De Meijere**

- Clypeus dark brown. Distiphallus with dark basal bowl, apical tubules fused to ventrobasal plate (may only be evident as suture on tubule surface) (Figs 58, 77). Mesophallus not produced ventrally 90

90 . Wing length 2.6mm Calypter margin and hairs yellow. Acrostichal setulae in 4 rows. Distiphallus bowl narrow and shallow; apical tubules as long as basiphallus+mesophallus (Figs 76, 77). . . . . ***L. aphila* spec. nov.**

- Wing length 1.8–2.2mm. Calypter margin and hairs brown to grey. Acrostichal setulae in 0–2 rows. Distiphallus bowl large

and bulbous; apical tubules relatively short (Figs 58, 59) . . . . . ***L. smilacinae* Spencer** (in part)

91 . Surstylus with one spine. Distiphallus pale and cup-shaped (as in Fig. 269), or short, dark and strongly bilobed with narrow cylindrical stem (=mesophallus) (*L. lathryi*, Fig. 144). Ejaculatory apodeme usually reduced 92

\- Surstylus with two spines. Distiphallus usually dark and fused to mesophallus, pale and cup-like. Ejaculatory apodeme usually relatively large 97

92 . Tibiae yellow with hind tibia brownish dorsally. Tarsi light brown, becoming yellow to base. Mesophallus dark and narrow, with length at least twice width. Distiphallus short, dark and broad, directed dorsally and with one pair of large, distinct whorled internal tubules (Figs 144–146) . . . . . ***L. lathryi* Sehgal** (in part)

\- Tibiae light brown to brown. Tarsi light brown to brown. Mesophallus pale and not much longer than wide. Distiphallus pale, cup-shaped, directed distally and enclosing one pair of relatively indistinct structures 93

93 . Abdomen with narrow yellow dorsomedial stripe. Anepimeron yellow on posterior half. Paraphallus ill-defined, striated and widening distally. Distiphallus widest subbasally (Figs 210, 211) . . . . . ***L. albispina* spec. nov.**

\- Dorsal abdominal stripe not divided medially. Anepimeron with brown pigment posteriorly. Paraphallus smooth and either subrectangular or widening distally. Distiphallus either widest apically cup-shaped, large and globose (some *L. smilacinae*) 94

94 . Relatively pale: region between verticals yellow, anepisternum yellow with small anteroventral spot (Fig. 6), femora entirely yellow. Distiphallus very large and globose with one pair of apical tubules emerging from basal bowl (Figs 58, 59) . . . . . ***L. smilacinae* Spencer** (some AB specimens)

\- Relatively dark, rarely with above combination of characters. Distiphallus small and narrow, not much wider than remainder of phallus; small narrow tubules concealed within cup of distiphallus 95

95 . Wing length 1.7–2.2mm. Eye height divided by gena height 3.0–4.4. Distiphallus relatively large and broad (seen ventrally), with base wide and truncated (Figs 265, 267, 269) . . . . . ***L. eupatorii* (Kaltenbach)** (in part)

\- Wing length 1.1–1.6mm. Eye height divided by gena height 4.0–5.8. Distiphallus (seen ventrally), relatively small, with base gradually narrowed 96

96 . Mesophallus fused to distiphallus, which is narrow with wider apical chamber (Figs 279–284). Paraphallus rubrectangular and usually much broader apically. Ejaculatory apodeme with blade and sclerotization on sperm pump relatively large and dark (Fig. 278) . . . . . ***L. helianthi* Spencer** (in part)

\- Mesophallus separate from distiphallus, which is cup-shaped and with apical, basal and ventral surfaces more heavily sclerotized (Figs 305, 306). Paraphallus small and narrow. Ejaculatory apodeme with blade and sclerite on sperm pump small and weakly-sclerotized (Fig. 303) . . . . . ***L. sativae* Blanchard** (in part)

97 . Mesophallus separate from pale, cup-shaped distiphallus; mesophallus with margins of ventral suture produced into pale carina. Wing length 1.8–2.2mm. Spines on surstylus relatively long 98

\- Mesophallus fused to distiphallus, forming relatively long, dark cylinder with basal or submedial constriction; mesophallus without ventral carina. Wing length usually 1.2–1.8mm, rarely up to 2.0mm. Spines on surstylus usually short 100

98 . Anepisternum with small anteroventral spot. Anepimeron yellow on posterior half. Distiphallus relatively narrow and gracile (Figs 262, 263). Basiphallus elongate. Paraphallus broad apically. Distal margin of ejaculatory apodeme dark . . . . . ***L. cracentis* spec. nov. (**Type 3♂)

\- Stripe on anepisternum elongate, reaching posterior margin, or covering most of sclerite. Anepimeron with brown posterior spot or predominantly brown. Distiphallus and mesophallus relatively stout and broad. Basiphallus short. Paraphallus narrow or absent. Distal margin of ejaculatory apodeme pale 99

99 . Posteroventral corner of frons brown to base of outer vertical seta. Anepisternum with anteroventral stripe. Katepisternal seta surrounded by yellow. Eye 6.7–8.0 times higher than gena. Surstylus spines medial to basal (Figs 314, 318). Seen ventrally, base of distiphallus wide and truncated and sides parallel; mesophallus bulging laterally (Figs 316, 317) . . . . . ***L. temperata* Spencer**

\- Posteroventral corner of frons brown to base of inner vertical seta. Anepisternum with anteroventral stripe or only yellow on dorsal ¼. Katepisternal seta sometimes touching or surrounded by brown. Eye 4.2–5.4 times higher than gena. Surstylus spines subapical (Fig. 302). Seen ventrally, base of distiphallus narrow and rounded and sides diverging; mesophallus narrow (Figs 300, 301) . . . . . ***L. sabaziae* Spencer**

100 . Distiphallus relatively large, stout and clavate (Figs 293, 294). Paraphallus closely held to distiphallus, directed distoventrally . . . . . ***L. pistilla* spec. nov.**

\- Distiphallus relatively narrow and cylindrical with submedial constriction. Paraphallus clearly separated from distiphallus and directed ventrally 101

101 . Eye height divided by gena height 2.9–5.0. Surstylus usually with one long subapical and one small basal spine (Fig. 227). Distiphallus straight, narrow along length and clear apically (Figs 225, 226) . . . . . ***L. brassicae* (Riley)** (in part)

\- Eye height divided by gena height 4.1–5.3. Surstylus with two small subapical spines (Fig. 219). Distiphallus with clear apical chamber that is angled dorsally and with one pair of dark distal bands (Figs 218, 218) . . . . . ***L. asclepiadis* Spencer**

102 . First flagellomere with brown pigment on anterior margin 103

\- First flagellomere entirely yellow, at most brownish around base of arista 107

103 . First flagellomere often relatively large and highest at or past midpoint; usually covered with long hairs equal to width of arista base; segment entirely infuscated with basal margin yellow. Inner surface of epandrium with one pair of dark bars with distal spine. Distiphallus with base stem-like, compressed dorsoventrally (as in Fig. 181) 104

\- First flagellomere small and ovate; hairs short; at least basal 1/3 of segment yellow. No dark bar present along inner surface of epandrium. Distiphallus without basal "stem" 105

104 . First flagellomere circular (Figs 4, 15). Anterior ori as long as posterior ori. Orbital plate with light brownish tint along margin of eye and around base of fronto-orbitals. Posterolateral corner of frons dark to base of inner vertical seta. Mesophallus short

and stout; with one pair of long leaf-like plates. Distiphallus relatively broad, slightly longer than mesophallus and without ventromedial plate (Figs 153, 154) . . . . . ***L. pilicornis* spec. nov.**

- First flagellomere, if enlarged, broadly rounded, highest subapically. Anterior ori often reduced to absent, at least on one side of frons. Orbital plate entirely yellow. Posterolateral corner of frons dark to base of outer vertical seta. Mesophallus dark, cylindrical and much longer than wide; without leaf-like plates. Distiphallus narrow, approximately half length of mesophallus and with small medial distoventral plate (Fig. 180, 181) . . . . . ***L. minor* Spencer** (in part)

105 . Femora usually only brown dorsobasally, but sometimes also with light dorsoapical mottling. Distiphallus undivided, cup-shaped and with relatively broad, truncated base (Figs 265–270). Ejaculatory apodeme well-developed (Fig. 264) . . . . . ***L. eupatorii* (Kaltenbach)** (in part)

- Femora usually with extensive dorsal mottling in addition to brown base. Distiphallus composed of one pair of short, separate tubules that are barely longerthan wide. Ejaculatory apodeme small and atrophied 106

106 . Two to three rows of acrostichal setulae, rarely four; usually sparsely arranged. Wing length 1.9–2.7mm. Eye 2.5–4.3 times higher than gena. Ventral margin of gena usually with complete faint brownish band, but sometimes variably faded. Surstylus with one spine (Fig. 333). Paraphallus narrow, indistinct. Mesophallus and basiphallus separated by broad membranous space (Figs 335, 336) . . . . . ***L. huidobrensis* (Blanchard)** (in part)

- Four rows of acrostichal setulae. Wing length 1.8–2.3mm. Eye 2.8–3.2 times higher than gena. Only posteroventral margin of gena with narrow brownish stripe. Femora predominantly yellow with base and light dorsal mottling brown (Fig. 11). Surstylus with two spines (Fig. 330). Paraphallus triangular with apex dark. Mesophallus and basiphallus nearly touching (Figs 331, 332) . . . . . ***L. trifoliearum* Spencer** (in part)

107 . Vein dm-cu absent. Mesophallus pale and fused to base of distiphallus, forming long stem with small apical chamber enclosing one pair of fringed structures (Figs 288–290) . . . . . ***L. singula* Spencer**

- Vein dm-cu present. Phallus variable, but not as above 108

108 . One reclinate ors (at least on one side), two to three inclinate ori. Fore femur with light to pronounced single brown dorsal striation. Mesophallus and distiphallus both short, narrow and dark, directed dorsally; paraphalli appearing as one pair of flat plates diverging distolaterally from base of mesophallus (Figs 198, 199) . . . . . ***L. limopsis* spec. nov.** (in part)

- Two reclinate ors, two to three inclinate ori. Fore femur either brown basally or with variable dorsal streaking or mottling. Paraphallus not as above 109

109 . Mid and hind femora with brown regions past base; sometimes almost entirely brown. Only males past this point 110

- Only fore femur with brown markings past base 116

110 . Surstylus with one spine. Paraphallus present 111

- Surstylus with two spines. Paraphallus usually absent (present in *L. charada*) 114

111 . Distiphallus more than twice width of mesophallus; wider than long, much widened apically and inner surface with many strong, apically directed spinules (Figs 233, 234). Mesophallus strongly produced ventrobasally as carina . . . . . ***L. arenarium* spec. nov.**

- Distiphallus less than twice width of mesophallus; shape not as above; inner surface without conspicuous spinules. Mesophallus not produced as carina 112

112 . Eye height divided by gena height 2.8–3.2. Wing length 1.3–1.8mm. Distiphallus undivided and separate from mesophallus with fringed tubules enclosed; apical, basal and ventral surfaces more well-sclerotized, forming weak C-shape in profile (Figs 305, 306) . . . . . ***L. sativae* Blanchard** (in part)

- Eye height divided by gena height 5.5–6.4. Wing length 1.6–2.0mm. Mesophallus fused to distiphallus, forming dark, medially constricted cylinder 113

113 . Yellow portion of scutum and scutellum separate. Femora yellow with base and dorsal mottling on fore femur brown. Paraphallus widest apically. Distiphallus with paired apical fringed structures enclosed (Figs 279–284). . . . . ***L. helianthi* Spencer** (in part)

- Yellow portion of scutum and scutellum confluent. Femora mostly dark brown with apices and light mottling on fore femur yellow. Paraphallus widest basally. Distiphallus with paired apical fringed structures exposed (Figs 213, 214) . . . . . ***L. arctii* Spencer** (in part)

114 . Femora usually only with dorsal and lateral mottling (Fig. 11), but occasionally brown with knees yellow. Distiphallus bifid, flanked by triangular, apically sclerotized paraphalli (Figs 331, 332) . . . . . ***L. trifoliearum* Spencer** (in part)

- Femora yellow with base and sometimes light dorsal mottling on fore femur brown. Distiphallus not divided and paraphallus not triangular 115

115 . Wing length 2.4–2.6mm. Fore femur only brown at base. Ocellar spot restricted to tubercle with brownish connection to back of head. Female orbital plate entirely yellow. Abdomen mostly yellow with brown to light brown dorsomedial markings on tergites 1–5. Paraphallus present. Distiphallus with ventral suture thick and dark distally, inner-distal margin heavily spinulose; mesophallus with ventral suture broadly opened (Figs 252, 253) . . . . . ***L. charada* sp. n.**

- Wing length 1.6–2.1mm. Fore femur sometimes with brown dorsal mottling. Ocellar spot large, extending around ocelli onto back of head. Female with margin of orbital plate narrowly brown. Abdomen dark dorsally with margin of tergites yellow. Paraphallus absent. Distiphallus with ventral suture narrow along length, with few inconspicuous spinules on inner-distal margin; mesophallus with ventral suture closed (Figs 271, 272) . . . . . ***L. griffithsi* sp. n.**

116 . Orbital plate with brown lateral stripe reaching base of fronto-otbitals 117

- Orbital plate entirely yellow; rarely with faint spots at base of fronto-orbitals. Only males past this point 118

117 . First flagellomere entirely yellow and often pointed. Ventral ¾ of anepisternum brown. Distiphallus composed of two elongate, clear tubules (Figs 91, 92) . . . . . ***L. virgo* (Zetterstedt)** (in part)

- Distal half of first flagellomere orange and rounded. Ventral 2/3 of anepisternum brown with dorsal margin faded and irregular.

Distiphallus cup-shaped and undivided (Figs 265–270) . . . . . ***L. eupatorii*** **(Kaltenbach)** (in part)

118 . Distiphallus fused to mesophallus, forming black, medially-constricted cylinder (Figs 225, 226). Ejaculatory apodeme with very large, dark blade (Figs 224). Surstylus with two spines (Fig. 227) . . . . . ***L. brassicae*** **(Riley)** (in part)

- Distiphallus usually separate from mesophallus (fused in *L. helianthi*), pale and cup-shaped. Ejaculatory apodeme never as large or dark as above. Surstylus usually with one spine (two spines in *L. senecionivora and L. helenii*) 119

119 . Surstylus with two spines. Katepisternum with brown region immediately behind seta 120

- Surstylus with one spine. Katepisternum various, often yellow posterior to seta. 122

120 . Fore femur with dorsal mottling. Distiphallus entirely divided into one pair of short, dark tubules (Figs 339, 340). Mesophallus short, with small projecting ventral carina; widely separated from sclerotized section of ejaculatory duct . . . . . ***L. hilairensis*** **spec. nov.** (dark male)

- Fore femur yellow past base. Distiphallus undivided, paler and cup-like. Mesophallus longer than wide, without ventral carina; adjacent to sclerotized section of duct 121

121 . Paraphallus well-developed. Mesophallus without pronounced ventral carina; mesophallus longer than wide. Distiphallus (seen ventrally) gradually wideneing from base to midpoint (Figs 275, 276) . . . . . ***L. helenii*** **Spencer**

- Paraphallus absent. Mesophallus with large carina along ventral suture; mesophallus length not exceeding width. Distiphallus (seen ventrally) abruptly widened at base (Figs 311–313) . . . . . ***L. senecionivora*** **Sehgal**

122 . Wing length 1.7–2.2mm. Space between vertical setae usually dark brown. Distiphallus (seen ventrally) relatively broad with base truncated (Figs 265, 267, 269) . . . . . ***L. eupatorii*** **(Kaltenbach)** (in part)

- Wing length 1.1–1.8mm. Space between vertical setae paler than region lateral to outer seta. Distiphallus not as above . . 123

123 . Distiphallus very large and broad with wide apical tubules; darker mesophallus much smaller by comparison (Figs 58, 59) . . . . . ***L. smilacinae*** **Spencer** (male ex *Maianthemum canadense*)

- Distiphallus (seen ventrally) relatively small and narrow with base gradually tapering 124

124 . Margin of calypter yellow. Scutum grey pruinose. Three irregular rows of acrostichal setulae. Distiphallus with basal bowl and long apical tubules (Figs 76, 77) . . . . . ***L. aquapolis*** **spec. nov.** (AB ♂)

- Margin of calypter grey to brown. Scutum subshining. Four rows of acrostichal setulae. Distiphallus small and cup-shaped, without long apical tubules 125

125 . Mesophallus separate from distiphallus. Distiphallus with apical, basal and ventral surfaces more well-sclerotized, forming weak C-shape in profile (Figs 305, 306). Paraphallus narrow. Ejaculatory apodeme atrophied (Fig. 303) . . . . . ***L. sativae*** **Blanchard** (in part)

- Mesophallus fused to distiphallus. Distiphallus narrow with broader apical chamber (Figs 279–284). Paraphallus relatively broad and flat, usually becoming wider ventrally. Ejaculatory apodeme with blade, stem and sclerite on sperm pump well-developed (Fig. 278) . . . . . ***L. helianthi*** **Spencer** (in part)

Species descriptions (alphabetical order)

Unless otherwise specified, all *Liriomyza* species described below are characterized as follows: orbial plate and parafacial not projecting; first flagellomere small and ovate with short pubescence (ie. not long-haired); arista pubescent; epistoma very narrow to absent; setae and setulae black; postpronotum yellow with small dark anteromedial spot, notopleuron yellow with dark narrow sublateral stripe and scutellum yellow with lateral corner brown (Figs 1–6, 8–11); four dorsocentrals, decreasing in length anteriorly, anterior seta presutural; acrostichal setulae entirely reclinate; tibiae without posteromedial setae; surstylus small, directed inwards; epandrium with small anteroventral spine on inner margin; basiphallus sclerotized along dorsal and left lateral surfaces, and with small membranous to lightly sclerotized lobe on left apical margin; apical section of ejaculatory duct swollen, elongate and pigmented; ejaculatory apodeme with transverse sclerite on sperm pump; oviscape dark brown and heavily sclerotized.

Liriomyza agrios **spec. nov.**

Figs 24, 205–208

Wing length 1.3mm (♂), approximately 1.5mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.7–2.9. Eye height divided by gena height: 2.5–3.1. Scutum with dusting of grey pruinosity. Narrow ring around eye forming distinct cheek.

Chaetotaxy: Three ori, one ors. Acrostichal setulae in four rows.

Colouration: (Fig. 24) Calypter margin white. Setae and wing veins yellow. Head yellow with back of head and ocellar tubercle dark brown (with brownish connection to dark region on back of head); clypeus brown; small brown spot on posterior margin of frons behind eye. Scutum with complete yellow stripe laterally and posterior margin with narrow yellow stripe; lateral corner of scutellum with brown spot. Katatergite darker posteroventrally

and with yellow dorsomedial region; anatergite brown with posterodorsal region broadly yellow; mediotergite dark brown. Anepisternum with narrow pale vertical stripe anteroventrally and with narrow ventral stripe along posterior margin; anepimeron with brown anterior stripe and posterior margin brown; meron brown with dorsum yellow; katepisternum brown on ventral 2/3 (not including seta base). Legs yellow with basal 1/3 of fore and mid coxae brown, basal half of hind coxa brown, mid tibia brownish dorsomedially, hind tibia brown with ends narrowly yellow, and tarsi yellow with distal tarsomeres brown (distal one, two and three segments on fore leg, mid and hind legs, respectively); female more darkly pigmented on distal tarsomeres, fore tibia brownish, and mid and hind tibiae darker. Abdomen yellow with one pair of small, wide spots on tergite 1, tergite 2 brown with centre yellow, tergites 3–5 with narrowing stripe, and tergite 6 with anteromedial margin brown.

Genitalia: (Figs 205–208) Surstylus with one subapical spine. Basiphallus sclerotized along left lateral and most of dorsal surfaces. Swollen distal section of ejaculatory duct nearly spherical. Hypophalus well-developed with long apical hairs. Paraphallus long, parallel to distiphallus and with stout base and pointed apex. Mesophallus wall thickest ventrally; mesophallus and distiphallus with complete ventral suture. Distiphallus slightly wider than mesophallus, length more than twice length, base slightly tapered and distal half with minute spinules on inner surface. Ejaculatory apodeme dark, relatively small, and with minute striations along distal margin; sclerite on sperm pump fused to sclerotized base of duct.

Etymology. The specific epithet is Greek for "living in the fields".

Host. Unknown.

Range. Canada. MB.

Holotype: Canada. MB: 5mi SW Shilo, 11.vii.1958, swept from open prairie, J.G. Chillcott (1♂, CNC).

Paratype: Canada. MB: Same collection as holotype (1♀, CNC).

Comments. *Liriomyza agrios* is a very small, narrow yellow species with little pigment on the frons, a white calypter, yellow setae and wing veins, and a pale, faded posterior margin on the scutum. The hypophallus is dark with a subbasal constriction, the distiphallus is narrow with minute internal spinules, and the mesophallus is short, broad and fused to the dark paraphalli, which are especially distinctive, being positioned ventrally and parallel to the mesophallus.

Liriomyza alaskensis **Spencer**

Figs 53–55

Liriomyza alaskensis Spencer 1969: 166.

Wing length 2.1mm (♂). Female paratype (USNM) not examined. Length of ultimate section of vein CuA_1 divided by penultimate section: 1.8. Eye height divided by gena height: 2.5. Scutum subshining. Narrow, but pronounced ring around eye.

Chaetotaxy: One ori, two ors. Acrostichal setulae in two rows. Setae relatively short and setulae reduced laterally and posteriorly on thorax and posteriorly on orbital plate.

Colouration: Calypter margin white. Wing veins yellow. Head yellow with back of head brown dorsally (excluding margin) and ocellar tubercle brown. Notum yellow with one pair of long anteromedial stripe fused at anterior margin and one pair of narrower floating lateromedial stripes; stripes brown presuturally, becoming brownish-orange posteriorly. Katatergite brown posteroventrally; anatergite brown with dorsum yellow; mediotergite dark brown. Pleuron yellow with most of meron brown and ventral 2/3 of katepisternum brown. Legs yellow with base of coxae narrowly brown, tibiae brown dorsally (anterior legs paler) and tarsi light brown; non-type with dorsal streak on fore femur. Abdomen yellow with sides of epandrium brown.

Genitalia: (Figs 53–55) Surstylus and epandrium similar to those of *L. sativae*. Basiphallus sclerotized along dorsal and left lateral surfaces, triangular lobe on left-distal margin. Hypophallus well-developed. Paraphallus absent. Mesophallus thickly sclerotized dorsally, fused to base of distiphallus. Distiphallus with broad, shallow, ventrally divided bowl with minute spines along inner surface; with one pair of relatively broad, apically widened tubules, each with long, narrow ventral process basally connected to wider lateral plate, and one dorsal sclerotized patch produced as a point at base. Ejaculatory apodeme large, dark and stout with blade semi-circular, medially striated and marginally thicker; base of duct and sclerite on sperm pump well sclerotized, with lateral margin of sclerite darker, thicker and laterally produced.

Host. Unknown.

Range. USA. AK.

Holotype: USA. AK: King Salmon, Naknek, R. Alaska, 10.viii.1952, J.B. Hartley, Type No. 10407 (1♂, CNC).

Additional material examined. USA. AK: Naknek, 21.vii.1952, J.B. Hartley (1♂, CNC).

Comments. *Liriomyza alaskensis* is an easily recognized, predominantly yellow species with an entirely pale clypeus, antenna, frons (excluding ocellar tubercle), wing veins, calypter, scutellum, anepisternum, anepimeron and femora, with two pairs of brownish-orange stripes on the scutum. Other distinguishing features include absence of the anterior ori and two sparse rows of acrostichal setulae, as well as the basal bowl of the distiphallus and the unique dorsoventrally divided apical tubules on the phallus. The smaller, similarly coloured *L. borealis* has three ori, a dark clypeus, a slightly different notal pattern (see comments for *L. borealis*) and a small, pale, cup-shaped distiphallus (Figs 243, 244).

***Liriomyza albispina* spec. nov.**

Figs 209–212

Wing length 2.0mm (♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 2.6. Eye height divided by gena height: 3.6. Scutum subshining.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin brown. Head yellow with ocellar tubercle, back of head and clypeus dark brown; posterolateral corner of frons dark brown, becoming paler brown around bases of vertical setae; ventral margin of gena with light brown line. Lateral margin of scutum with complete yellow stripe. Anepisternum with short line on posteromedial margin and short ventromedial stripe brown; anepimeron with brown markings on anterior half; most of meron brown; katepisternum brown on ventral ¾, not including base of seta. Legs yellow with basal 1/3 of fore coxa and basal half of mid coxa brown, hind coxa light brown, hind femur brown dorsobasally, fore tibia light brown with yellow mottling, mid tibia light brown, hind tibia brown, and tarsi brown (paler to base and on anterior legs). Abdomen yellow with epandrium and one pair of wide spots on tergites 1–6 (fused anteriorly on tergite 6) brown.

Genitalia: (Figs 209–212) Surstylus with one subapical spine. Ejaculatory duct with subbasal attachment to swollen distal section. Hypophallus well-developed. Paraphallus ill-defined, widest apically and with dark striations. Mesophallus widest medially, slightly longer than wide, produced posteroventrally and partially fused to distiphallus; mesophallus and distiphallus with complete ventral suture. Distiphallus thick-walled posterodorsally, widest subbasally and with narrow chamber on apical 2/5 enclosing basal and inner-marginal spines. Ejaculatory apodeme with short, narrow stem, and broad, marginally striated, basally darker and abruptly widened blade; sclerite on sperm pump weakly pigmented ventrally.

Etymology. The specific epithet compounds the Latin for "white" (*albus*) and backbone (*spina*), referring to the pale dorsomedial stripe on the abdomen.

Host. Unknown.

Range. Canada. ON.

Holotype: Canada. ON: Essex Co., Pelee I., Stone Road Alvar FON Res., 41°45′20″N, 32°37′54″W, prairie, yellow pans, 8–9.vi.2002, Paiero & Buck (1♂, DEBU).

Comments. The male genitalia of *Liriomyza albispina* are most diagnostic in that the blade of the ejaculatory apodeme is abruptly widened basally, the paraphallus is dark, ridged, ill-defined and slightly widened apically, and while the mesophallus and distiphallus are dark and partially fused (typical of *L brassicae* and a number of other species), the division is still very evident. The distiphallus is also bulging laterally near the base and the apical chamber is relatively large and empty, and the surstylus is narrow with a single subapical spine. The pale, narrow dorsomedial stripe on the abdomen is also unusual for a species of *Liriomyza*, although this is also seen in some *L. trifolii* and *L. assimilis*, and in an incomplete state in some representatives of other species.

***Liriomyza anatolis* spec. nov.**
Figs 98–101

Wing length 2.1–2.3mm (♂), 2.3mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.9–2.4. Eye height divided by gena height: 4.1–5.0. Scutum subshining.

Chaetotaxy: Two ori, two ors; one female with one ori on left side. Acrostichal setulae in four rows.

Colouration: Calypter margin brown. Head yellow with ocellar tubercle and back of head brown (brown spot far or close to eye margin, but if close, yellow intervening space sometimes brownish); posterolateral corner of frons sometimes brown lateral to vertical setae (ON). Scutum with complete lateral yellow stripe laterally and with narrow yellow stripe along posterior margin; scutellum with lateral corner brown. Katatergite brown ventrally; anatergite brown posteroventrally and ventrally; mediotergite dark brown. Anepisternum with small, faint to distinct anteroventral spot; anepimeron with small anteromedial streak; meron mostly brown; katepisternum brown on ventral ¾, excluding posteromedial margin and base of seta. Legs yellow with base of hind coxa and sometimes base of fore coxa brown, tibiae light brown (hind tibia sometimes darker medially), and tarsi light brown with apical segments darker. Abdomen yellow, with females and sometimes males with narrow, ill-defined stripe on tergites 2–5.

Variation: Male from Middle Sackville, NB, with abdomen yellow excluding faint paired spots on tergites 1–5, and single anteromedial spot on tergite 6.

Genitalia: (Figs 98–101) Surstylus-like process of epandrium small and triangular with anterior margin sclerotized and apex with small, leaf-like seta; true surstylus absent. Epandrium without spine. Phallophorus angled ventrally at apex and with two narrow points of fusion to basiphallus. Basiphallus sclerotized along left lateral and dorsal margins, with lateral margins thickened and dark, with left margin produced anteriorly as weak spine. Paraphallus absent. Hypophallus small, fused to small ventromedial extension of distiphallus. Mesophallus darkest subbasally. Distiphallus sharply bent near base; with complete, undivided ventral suture; apical bowl small, slightly more than twice width of stem, with one pair of dark internal processes and row of several large, inwardly directed spines.

Etymology. The specific epithet refers to the mostly eastern distribution of this species compared to its western relatives (Gr. *anatole*—"sunrise, east").

Host. Unknown.

Range. Canada. NB, NS, ON, QC.

Holotype: Canada. NS: S Harbour Bch., J.R. Vockeroth, mixed dry mesophytic woods, 29.vi.1983 (1♂, CNC).

Paratypes: Canada. NB: Kouchibouguac N.P., 12.vii.1977, J.F. McAlpine (1♂, CNC), Kouchibouguac, 6.vii.1977, J.F. McAlpine (1♂, CNC), Kouchibouguac N.P., 27.vi.1977, D.M. Wood (1♂, CNC), Glebe Road, Chamcook, 26.vi.1965, G.E. Shewell (1♀, USNM), Middle Sackville, 45°55.4′N, 64°21.4′W, sweep vegetation along old rail line, 19.vii.2002, J. Forrest & T. Wheeler (1♂, LEM), **NS:** S Harbour Bch., J.R. Vockeroth, mixed dry mesophytic woods, 29.vi.1983 (2♂, CNC; 1♂, USNM), CBHNt Pk., Middle Head, spruce poplarwood with *Ranunculus*, J.R. Vockeroth, 24.vi.1983 (1♂, CNC), 6.vii.1983 (1♂, CNC), Pictou Co., Melmerby Beach, 29–30.vi.1996, B. Sinclair, poplar/spruce edge (2♂ 1♀, LEM), Cape Breton Island, St. Ann, 46°12.4′N, 60°37.4′W, swp vegetation along path in open boreal forest, 22.vii.2002, J. Forrest & T. Wheeler (3♀, LEM), **ON:** Midland, J.G. Chillcott, 2.v.1959, swampy woods balsam poplar (1♀, CNC), 26.v.1959, swampy wood (1♀, CNC), Hamilton, RBC, 12.vi.1982, A.M. Sch[?] (1♀, DEBU), **QC:** Hudson, Parc Lévy Macdonald, 45°27′N, 74°09′W, sweep near stream, 3.vi.2000, S.E. Brooks (1♀, LEM), Knowlton, Bolton Pass, 800′, 5.vi.1963, J.R. Vockeroth (1♂, CNC), Mt. St. Hilaire, 500–700′, 4.vi.1963, J.R. Vockeroth (1♂, CNC).

Comments. In North America, the phallus of *Liriomyza anatolis* is most similar to that of *L. flaveola* (Figs 112–121) in having a relatively small, abruptly widened apical bowl on the distiphallus, although the bowl of *L. anatolis* is more produced and broadly rounded apically (fully enclosing the dark internal processes), and the inner marginal spines are fewer and larger. Furthermore, the stem of the distiphallus is narrower, the hypophallus is much smaller, and the surstylus has a single small, scale-like apical seta with a medial groove. Externally, the species is much paler than most related taxa, having the clypeus, femora and posterior margin of the scutum entirely yellow, and the frons, anepisternum and anepimeron are almost entirely devoid of brown pigment.

The Palaearctic *Liriomyza khekhtsirica* Zlobin also has a similar phallus and the posterior margin of the scutum

and most of the scutellum is yellow. This Old World species, however, has a slightly smaller body size (wing length 1.9mm), the gena is broader, the tibiae are yellow, the "surstylus" is absent, the mesophallus is narrower and more strongly sinuate, and the basiphallus is more produced apically.

Liriomyza angulicornis (Malloch)

Figs 14, 22, 43–46

Agromyza angulicornis Malloch 1918: 79.
Liriomyza angulicornis. Hendel 1931–36: 208; Frick 1952a: 401, 1959: 401; Spencer 1969: 166, 1976: 230; Spencer & Steyskal 1986: 109.
Liriomyza angularis Hendel 1920: 140. Syn. Frick (1952a) [not explicit].
Liriomza troglochinae Hendel 1931–36: 253. Syn. Spencer (1969).

Wing length 1.9–2.2mm (♂), 2.2–2.4mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.4–3.2. Eye height divided by gena height: 2.6–3.2. Scutum with greyish to brownish pruinosity. First flagellomere with sharp anterodorsal point (Fig. 14).

Chaetotaxy: Two ori, two ors (sometimes three ors on one side). Acrostichal setulae relatively sparse and in two to three scattered rows; setulae absent lateral to dorsocentral rows postsuturally.

Colouration: (Fig. 22) Calypter margin brown. Head yellow with ocellar tubercle, clypeus and back of head dark brown; first flagellomere dark yellow; posterolateral corner of frons dark lateral to base of vertical setae, not touching the seta base; venter of gena with narrow brownish line that is sometimes broader posteriorly. Lateral margin of scutum with complete yellow stripe; posterior margin of central brown spot yellow with deep yellow notch in front of scutellum (longer than wide and pointed or bifid); lateral corner of scutellum brown. Katatergite brown along margins posteriorly; anatergite paler dorsally, metanotum dark brown. Posteromedial margin of anepisternum with narrow brown line and with oblique anteroventral spot that is larger in female; male meron with limited mottling, including large posterior spot, female darker with spots large; meron brown with dorsum yellow; katepisternum brown ventral to seta or mostly brown with dorsal margin yellow, including deep posteromedial emargination. Legs yellow with fore coxa brown basally, mid coxa mottled brown, hind coxa brown, base of femora broadly to indistinctly brown, male sometimes with dorsal mottling on fore femur, female with dorsal mottling on all femora with pigment darker on anterior legs, tibiae and tarsi brown. Abdomen dark brown with posterior margin of tergites yellow; sometimes tergites 2–5 with yellow anteromedial spot.

Genitalia: (Figs 43–46) Surstylus narrow with one small apical spine. Epandrium with ventral margin slightly produced. Basiphallus sclerotized along anterodorsal and left lateral surfaces. Paraphalli very narrow, short and connected dorsally. Hypophallus pale. Mesophallus thick dorsally and distoventrally, recessed ventromedially, with ventral suture, fused to distiphallus. Distiphallus with narrow, broad, shallow basal bowl with slightly thicker distal rim that is confluent with one pair of clear apical tubules that are slightly sclerotized towards base and as long as mesophallus. Ejaculatory apodeme large and well-developed with dark, distomedially annulated stem, and broad, marginally striated blade; base of duct and sclerite on sperm pump lightly sclerotized, with lateral margin of sclerite broadly rounded and marginally pigmented.

Host. Juncaginaceae—*Triglochin maritima* L., *T. palustris* L. (Spencer & Steyskal 1986).

Range. Canada. AB*, BC*, MB, NB*, NL, NT*, ON*, QC*, SK. **USA:** IL. Europe.

Holotype [*angulicornis*]: USA. IL: Waukegan, shore of Lake Michigan, 25.viii.1917, J.R. Malloch (1♂, USNM).

Holotype [*angularis*]: Germany. "Germ." (1♂, NMW). [Not examined]

Syntypes [*triglochinae*]: Denmark. Amager Is. (?♂ ?♀, ZMHU). [Not examined]

Additional material examined. Canada. AB: Spruce Grove, near Edmonton, 53˚34′N, 113˚49′W, 8–10.viii.1976, larva on *Triglochin maritima*, emerged 12.viii–8.ix.1976, 11–24.v.1977, G.C.D. Griffiths, E306 (3♂ 1♀[most with puparia], UASM; 1♂ 1♀[with puparia], CNC), High Prairie, 17.vii.1961, A.R. Brooks (1♀, CNC), **BC:** Atlin, 2200', B.A. Gibbard, 21.vi.1955 (1♀, CNC), 7.vii.1955 (1♀, CNC), 11.vii.1955 (1♀, CNC), 20.vii.1955 (1♂ 1♀, CNC), 22.vii.1955 (1♀, CNC), 26.vii.1955 (1♂, CNC), Oliver, 14.v.1959, E.E. MacDougall (1♂ CNC), Vancouver, Point Grey, 5.vii.1953, J.R. Vockeroth (1♂, CNC), **MB:** Churchill, 28.vii.1949, L.A. Miller (1♀, CNC), Churchill, J.G. Chillcott, 17.viii.1952, pipeline, rock ridge (1♀, CNC), 30.vii.1952, south of tracks

(1♀, CNC), Fort Churchill, J.G. Chillcott, 19.vi.1952, *Salix*-crucifer marshland (1♂, CNC), 20.vi.1952, S.E. tundra beyond airstrip, spruce bush at E end of airstrip / fairly marshy grassland (2♂, CNC), 4.vii.1952, grassy marsh, some heath areas (1♂, CNC), 4.vii.1952, hummock and grassy marsh well in open (1♀, CNC), 9.vii.1952, birch marsh (1♀, CNC), 11.vii.1952, bush S and within of spray target area (1♂ 2♀, CNC), 16.vii.1952, nr hwy tracks, willow marsh (1♂ 2♀, CNC), 18.vii.1952, L. Isabelle, S end tundra (1♀, CNC), 23.vii.1952, Bustby[?] Airport embankment (1♂, CNC), 1.viii.1952, grass marshes in willow along shore L. Isabelle (2♂, CNC), 5.viii.1952, wet marshy tundra E end of runway (1♂, CNC), 6.viii.1952, OHR, mile 507 (7♂ 1♀, CNC), 12.viii.1952, OHR, mile 507 (1♀, CNC), Hudson Bay Hy., mile 505, J.G. Chillcott, 13.vi.1952, dry stream bed by sandy flats (2♀, CNC), 24.vii.1952, nr river, grassy meadow clearing (1♀, CNC), 16.vii.1952, nr bush in willow marsh (4♀, CNC), Farnworth L., nr. Churchill, J.G. Chillcott, 12.vi.1952, spruce bush, lichen based (1♀, CNC), 14.vii.1952 (2♀, CNC), Eastern Cr. Nr. Churchill, J.G. Chillcott, 9.vii.1952, birch marsh (1♀, CNC), 25.vi.1955, stream edge of main creek, Ninette, 30.v.1958, J.F. McAlpine, Typha slough community, sedge meadows (1♂, CNC), **NB:** Kouchibouguac N.P., 30.vi.1977, J.R. Vockeroth (2♂ 3♀, CNC), **NT:** Hodgeson Lk., Norman Wells, 4.vii.1969, G.E. Shewell (2♀, CNC), **ON:** Manitoulin I., Carter Bay, 45°36′23″N, 82°08′27″W, dunes, wet depression, sweep, 24.vi.2003, M. Buck (1♀, DEBU), Kenora Dist., Kiruna Lake, 54°30′N, 84°55′W, Malaise trap in muskeg, 17–18.vii.1981, E. Fuller (1♀, ROM), **QC:** Gaspé, ca. 15km W Petit-Cap, sweep vegetation in peat bog, 8.viii.2001, H. Varady-Szabo (1♀, LEM), Gaspesie, l'Anse-au-Griffon, swp veg at marsh, nr road, 48°55′59″N, 64°18′24″W, 17.viii.2006, V. Dion (1♂, LEM), **SK:** Eaglehill Creek, 18.v.1939, A.R. Brooks.

Comments. *Liriomyza angulicornis* is a relatively large species with a yellow emargination in front of the scutellum, sharp, contrasting colouration, and a pointed first flagellomere. While readily identified among other *Liriomyza*, it can easily be mistaken for *Phytoliriomyza conspicua* (Sehgal), which was treated as *Liriomyza* until recombined by Spencer & Steyskal (1986). *Phytoliriomyza conspicua* differs as follows: emargination in front of scutellum quadrate or rounded (never pointed), the wing is 2.4–3.6mm long, the abdominal tergites are broadly yellow posteriorly (never medially), there are 5–6 rows of acrostichal setulae, the base of the vertical setae touch brown pigment, the lateral margin of the frons is sometimes brown, the femora are entirely yellow, the eye is 3.3–9.4 times higher than the gena, the length of the ultimate section of vein M is 1.3–1.9 times longer than the penultimate section, the posterior margin of the surstylus and epandrium are densely covered with spines and the phallus is very unusual.

***Liriomyza aphila* spec. nov.**
Figs 75–77

Wing length 2.6mm (♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 1.8. Eye height divided by gena height approximately 3.3. Epistoma small. Scutum with light pruinosity. *Chaetotaxy*: Two ori (third ori present on right side), two ors. Acrostichal setulae in four rows.

Colouration: Calypter yellow. Head yellow with ocellar triangle, clypeus (centre yellow) and back of head (excluding venter) dark brown; posterolateral corner of frons dark brown along posterior margin, fading to eye margin and inner vertical seta. Scutum with complete lateral yellow band; scutellum only with small brown lateral spot; mediotergite and posteroventral margin of katatergite dark brown; anatergite dark, becoming yellow dorsally. Pleuron yellow with oblique anteroventral band on anepisternum (interrumped posteromedially), anepimeron with posterior 1/3 and anterior mottling brown, and ventral 2/3 of meron and katepisternum (not including seta base) brown. Legs yellow with base of fore coxa, basal half of mid coxa and most of hind coxa brown, fore tibia brownish dorsally, mid and hind tibiae brown dorsally excluding base and apex with medial brown band (darker on hind leg), and tarsi light brown with base paler. Abdomen dark brown.

Genitalia: (Figs 75–77) Surstylus tapering apically, with one subapical spine. Basiphallus sclerotized along left lateral, dorsoapical and right distomarginal surfaces. Paraphallus widening apically, strongly sclerotized along straight apical and posterior margins. Hypophallus well-developed. Mesophallus dark, shallowly carinate ventrally, fused to base of distiphallus. Distiphallus with dark basal bowl that is shallowest ventrolaterally and wrinkled dorsally, and with row of inner-marginal spinules; apical tubules straight, weakly fused, as long as basiphallus+mesophallus, and weakly sclerotized along ventral 2/5 and along dorsobasal depression (enclosed laterally by membrane). Ejaculatory apodeme well-developed, similar to that of *L. aquapolis*.

Etymology. The specific name for the species, represented by a single specimen, is derived from the Greek for "friendless" (*aphilos*).

Host. Unknown.

Range. Canada. QC.

Holotype: Canada. QC: Roundtop Mt., Sutton, 1300′, 5.vi.1963, J.R. Vockeroth (1♂, CNC).

Comments. *Liriomyza aphila* is similar in appearance to the Albertan *L. balcanicoides*, which has a similar straight phallus (Fig. 82), but the new species has a deep ventrolateral emargination of the basal bowl of the distiphallus, the apical tubules are larger and better sclerotized basally, and the paraphallus widens apically. Externally, the tibiae are more widely brown dorsally and the vertical setae are on brown. The western *L. merga* Lonsdale is also clearly related, but the basal bowl of distiphallus paler (Figs 88, 89), narrower and with the base rounder, the calypter is white, one ori and/or ors is reduced to absent, both verticals are on yellow, the femoral base and scraper are brown, and the abdomen is yellow laterally.

***Liriomyza apilaca* spec. nov.**
Figs 158, 159

Wing length 1.8–1.9mm(♂♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.7–3.6. Eye height divided by gena height: 3.3–3.9. Scutum subshining. First flagellomere with long marginal hairs (longer than width of arista).

Chaetotaxy: One ori, two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin brown. Head yellow with ocellar tubercle dark brown; back of head (except venter) dark brown with extension reaching posterior margin of eye; vertical setae surrounded by yellow; clypeus yellow with centre brown. Scutum with complete yellow lateral stripe. Katatergite narrowly brown along anterior margin and posteroventrally; anatergite brown with posterodorsal corner yellow; mediotergite dark brown. Anepisternum with large brown anteroventral spot; anepimeron with posterior margin and anterior mottling brown; meron brown with dorsum yellow; katepisternum brown on ventral 3/4, not including base of seta. Legs mostly yellow with base of fore coxa and basal half for mid and hind coxae brown, fore femur brown basally and with faint dorsal streaking, mid and hind femora brown dorsobasally, fore and mid tibiae light brown dorsally with base yellow, hind tibia brown dorsally, tarsi brown with basal segments paler. Abdominal tergites 1–6 with broad dark brown dorsal stripe; tergite 2 with medial yellow line; epandrium and surstylus brown.

Genitalia: (Figs 158, 159) As described for *L. taraxanox* (Figs 160, 161) except as follows: swollen section of ejaculatory duct larger and apically tapered; hypophallus strongly atrophied; mesophallus as long as distiphallus and narrowest at base; distiphallus slightly larger, deflexed, with base more broadly rounded (seen ventrally), ventral suture not thick-walled, and distoventral plate emerging from within suture narrower, not lobed.

Etymology. The specific epithet is derived from the name of the type locality: "summit, peak" (*apiculus* L.), "lake" (*lacus* L.).

Hosts. Unknown.

Range. Canada: AB, BC.

Holotype: Canada. BC: Summit Lake, Mi392 Alaska Hwy., R.E. Leech, 4200′, 19–21.vii.1959 (1♂, CNC).

Paratypes: Canada. AB: Kananaskis, For. Exp. Sta. Seebe, 3.vii.1968, H.J. Teskey (1♂, CNC), Jasper National Park, highway 16 / 93A junction, thinned out lodgepole pine stand, valley basin, 52.867˚N, 118.0766˚W, 1060m, 11.vii.2012, B. Sharp, BIOUG03709-G12 (1♂, CNC), **BC:** Summit Lake, Mi392 Alaska Hwy., R.E. Leech, 4700′, 7.vii.1959 (2♂ 2♀, CNC), 4500′, 8.vii.1979 (2♂, CNC), 4500′, 11–14.vii.1959 (1♂, CNC), 4500′, 17–19.vii.1959 (1♂, CNC), 4200′, 31.vii.1959 (2♂, CNC), Yoho N.P., Emerald Lake Trls., lake perimeter, 51.4429˚N, 116.5417˚W, 1307m, 22.vii.2010, BIOBus 2010, 10BBCDIP-1483 (1♂, CNC).

Comments. *Liriomyza apilaca* is allied to *L. taraxaci* and *L. taraxanox* on the basis of a number of features including yellow space around the base of the verticals and a characteristic distiphallus at the end of a black, cylindrical mesophallus. *Liriomyza apilaca* differs in having a very long-haired first flagellomere, a yellow face, limited brown streaking on the fore femur and a very small mesophallus that is as long as the distiphallus and narrowest basally.

***Liriomyza aquapolis* spec. nov.**
Figs 78–81

Wing length 1.7mm (♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 2.7–3.4. Eye height divided by gena height: 3.0–3.5. Scutum grey pruinose. Parafacial and orbital plate slightly projecting. Anterodorsal margin of first flagellomere angulate, and anterior margin with slightly longer hairs.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in three irregular, sparse rows.

Colouration: Calypter margin yellow. Head yellow with ocellar tubercle, clypeus, back of head and posterolateral corner of frons to base of outer vertical seta dark brown; region between bases of vertical setae dark yellow. Scutum with complete yellow lateral stripe. Scutellum brown laterally. Katatergite light brown with posteroventral corner darker; anatergite brown with posterodorsal corner yellowish; mediotergite dark brown. Anepisternum with oblique ventral stripe and narrow line along posterior margin; anepimeron and meron mostly brown; katepisternum brown on ventral 3/4, not including base of seta. Legs yellow with base of coxae dark brown, hind coxa light brown, femora brown dorsobasally, fore femur with light dorsal striations, fore and mid tibiae brownish with mid tibia slightly darker, hind tibia brown, and tarsi brown (paler on anterior legs). Abdomen brown with lateral margin yellow.

Genitalia: (Figs 78–81) Surstylus tapering apically with one apical spine. Swollen distal section of ejaculatory duct with broad bulbous base. Paraphallus slightly wider apically, clear, and ill-defined basally. Mesophallus short, dark, fused to distiphallus and with minute transverse ventrobasal fossa; mesophallus and distiphallus with complete, strongly produced ventral suture forming carina. Distiphallus with shallow basal bowl that is minutely spinulose on inner surface, strongly angled dorsally and with one pair of long, clear, straight apical tubules. Ejaculatory apodeme well-developed with stem relatively short and blade clear marginally and with several medial annulations; sclerite on sperm pump wide, with ends thickened and truncated.

Variation: QC paratypes differs as follows: wing length 1.4–1.5mm; length of ultimate section of vein CuA_1 divided by penultimate section 1.9–2.3; eye height divided by gena height 6.4; femora entirely yellow; tibiae brown with base yellowish; calypter margin and hairs brownish-grey; tubules of distiphallus straighter and becoming slightly narrower and sclerotized apically; swollen section of ejaculatory duct slightly longer. SK male differs as follows: two rows of acrostichal setulae; first flagellomere ovate; base of both vertical surrounded by yellow with orangish region between them anteriorly; fore femur yellow at base, but still with light brown dorsal striations.

Etymology. The specific epithet, referring to the collection locality, compounds the Latin for "water" (*aqua*) and the Greek for "town" (*polis*).

Host. Unknown.

Range. Canada. AB, QC, SK.

Holotype: Canada. AB: Townsite, Waterton Lk. N.P., 8.vii.1980, H.J. Teskey (1♂, CNC).

Paratype: Canada. QC: Beechgrove, 29.vi.1962, 45º39′, 76º8′, J.R. Vockeroth (2♂, CNC), **SK:** Cypress Prov Pk, east boundary (49˚40.2′N, 109˚27.5′W), sweep meadow near mixed forest, 10.vii.2000, V. Crecco & T.A. Wheeler (1♂, LEM).

Comments. The male genitalia of *Liriomyza aquapolis* reveal a close relationship with *L. angulicornis*, *L. aphila*, *L. assimilis*, *L. balcanicoides*, *L. sinuata* and *L. undulata*, in that the distiphallus is slightly angled dorsally, the dark mesophallus has a produced ventral suture with a minute basal fossa, the paraphallus is clear, the anterodorsal margin of the basiphallus is straight and thickened, the swollen section of the ejaculatory duct is bulbous and rounded and the surstylus is strongly tapered with an apical spine. The tubules of the distiphallus of *L. angulicornis* (Figs 43–46) and *L. assimilis* (Figs 47–50) also are also similarly straight (not sinuate), although much shorter, but neither of these species have a strongly produced carina on the mesophallus, an annulated blade on the ejaculatory apodeme, or a thickly sclerotized ventrobasal wall on the mesophallus before the fossa. The phallus is most similar to that of *L. balcanicoides* (Fig. 82), although this species is paler around the base of the fronto-orbitals, the mesophallus has no carina and the dorsal base of the tubules of the distiphallus has a small hook. Despite the variant external appearance of the *L. aquapolis* types, the uniform structure of the male genitalia presently supports the boundaries of this species, although this should be tested following the collection of additional material.

Externally, *Liriomyza aquapolis* is most similar to *L. sinuata* in having a brown posterolateral spot on the frons

that reaches the base of the vertical setae (base of outer vertical in *L. aquapolis* and base of inner vertical in *L. sinuata*), three rows of acrostichal setulae (only found in some *L. sinuata*), and long hairs on the anterior margin of the first flagellomere. *Liriomyza aquapolis* differs in having pigmented femora, a relatively small first flagellomere and the holotype has a yellow calypter.

***Liriomyza arctii* Spencer**

Figs 213–216

Liriomyza arctii Spencer 1969: 167. Spencer & Steyskal 1986: 285.

Wing length 2.0mm (♂). Female unknown (see below). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.3. Eye height divided by gena height: 7.2. Scutum shining.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four to five scattered rows.

Colouration: Calypter margin brown. Head yellow with first flagellomere deeper in colour, back of head, clypeus and ocellar tubercle dark brown, and gena venter with light brown line; face largely obscured in holotype, likely brownish medially. Scutum brown with lateral margin, excluding posterior corner, yellow, and and posterior margin with irregular yellow stripe that is narrowest medially and with one pair of small recessed emarginations laterally; lateral corner of scutellum brown. Katatergite brown posteroventrally; anatergite brown with dorsum yellow; mediotergite dark brown. Pleuron brown with dorsal 1/3 of anepisternum yellow and posteromedial section light brown, anepimeron with yellow mottling, dorsal ¼ of katepisternum (not including seta base) and dorsal margin of meron yellow. Brownish fore coxa darker on basal 2/3, mid coxa brown with apex yellow, hind coxa brown; remainder of legs brown with ends of femora yellow (faded on mid and hind legs) and bark parts of femora sometimes with faint yellow streaking, and tarsi becoming paler to base. Abdomen brown with lateral margin of tergites yellow.

Genitalia: (Non-type male illustrated; Figs 213–216) Surstylus with single subapical spine. Hypophallus slightly compressed laterally and without apical hairs. Paraphallus narrow, tapering apically. Mesophallus thickly sclerotized laterally and dorsally, with narrow ventral carina along suture and dorsally fused to distiphallus; mesophallus and distiphallus with complete ventral suture. Distiphallus slightly longer than wide, widest and darkest at middle, and paired apical fringes structures not enclosed laterally or dorsally. Base of ejaculatory duct lightly sclerotized, continuous with well-developed ventral to lateral sclerite of sperm pump; stem of ejaculatory apodeme narrow and dark with medial and lateral furrow, and blade large with subapical striations.

Variation: Female tentatively allied to this species based on colouration, but additional females confirmed by dissection of associated males ideally required for determination, as differences in external morphology are notable: wing length 2.5mm; length of ultimate section of vein CuA_1 divided by penultimate section 2.1; eye height divided by gena height 5.3; face and ventral line on gena dark brown; posterolateral corner of frons dark brown to base on inner vertical; brown scutal spot nearly attaining posterior margin; anepisternum dark brown with dorsal 1/5 yellow; katepisternum dark brown with dorsomedial margin yellow; legs dark brown with tarsi paler and only apex of fore femur yellow; only lateral margin of tergites 3–6 yellow.

Non-type males from ON as described for holotype, except as follows: wing length 1.7–2.0mm; length of ultimate section of vein CuA_1 divided by penultimate section: 2.0–2.2; eye height divided by gena height: 6.4; face brownish dorsmedially, becoming darker to midline, but sometimes more evenly brown or also dark ventrolaterally; brown disc on scutum narrowly connecting to posterior margin medially.

Host. Asteraceae—*Arctium minus* Bernh.

Range. Canada. ON. **USA.** MN, WN.

Holotype: Canada. ON: Ottawa, Green Valley Motel area, em. 20.vii.1967, ex. Leaf mine on *Actium minus*, leg. 6.vii.1967, K.A. Spencer, Type No. 16119 (1♂ [with puparium], CNC).

Additional material examined. Canada. ON: Ottawa, 8.viii.1989, J.R. Vockeroth, sweep over bare path in *Acer* wood (1♂, CNC), Ottawa, J.R. Vockeroth, 6.vii.1963 (1♂, CNC), 13.vii.1963 (2♂, CNC), Hilton Falls Cons. Area, 43°30′N, 79°58′W, 25.vii.2015, O. Lonsdale, CNC461980 (1♂, CNC), Ottawa, Constance Bay, 2.vi.2013, O. Lonsdale, CNC358522 (1♀, CNC).

Comments. The phallus of *Liriomyza arctii* is distinct in having small ventrolateral lobes below the point of

attachment between the mesophallus and the distiphallus, and an unusual distiphallus with a dark, tapered base and one pair of dorsally arched bands emerging from the ventrodistal margin. Externally, the predominantly dark femora are characteristic, and the posterior margin of the scutum is also either entirely yellow or the dark scutal disc narrowly reaches the posterior margin in front of the scutellum.

***Liriomyza arenarium* spec. nov.**
Figs 232–234

Wing length 1.7–1.8mm (♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section 4.0. Eye height divided by gena height: 4.0–4.2. Scutum subshining.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin brown. Head yellow with ocellar triangle, clypeus and back of head dark brown; first flagellomere slightly darker; posterolateral corner of frons dark to base of outer vertical seta, paler to base of inner vertical; venter of gena with narrow light line that becomes darker anteriorly. Scutum with complete yellow stripe laterally. Lateral corner of scutellum brown. Katatergite brown posteroventrally; anatergite brown lateral to scutellum with posterodorsal region yellow; mediotergite dark brown. Anepisternum with broad brown stripe on ventral half that widens anteriorly; anepimeron with extensive brown mottling; meron brown with dorsum yellow; katepisternum brown on ventral ¾, not including base of seta. Legs yellow with basal 1/3 of fore coxa, basal half of mid coxa and all of hind coxa brown, femora with base and faint dorsomedial streaking brown (mostly restricted to scraper on hind leg), tibiae brown with venter paler and pigment on anterior legs weaker, and tarsi brown with base paler. Abdomen with broad brown stripe that narrows to tergite 6; epandrium and surstylus dark brown.

Genitalia: (Figs 232–234) Surstylus with one large subapical spine. Basiphallus sclerotized along left lateral and dorsal surfaces. Swollen distal section of ejaculatory duct relatively long and slender. Hypophallus well-developed. Paraphallus subrectangular and ill-defined basally. Mesophallus short, partially fused to distiphallus; with ventral suture produced into large carina and continuing onto distiphallus. Distiphallus with narrow clear basal stem, and short, cup-like apical section that is subquadrate with base narrower, spinulose on inner surface (most heavily spinulose ventrally) and enclosing one pair of fringed inner processes.

Variation: Male from BC differs as follows: anatergite entirely dark brown; streaking on femora darker, more extensive; tibiae and tarsi dark brown, not paler ventrally; distiphallus with constriction at basal 1/3.

Etymology. The specific epithet is derived from the Latin for "sand" (*arena*), referring to the Saskatchewan locality.

Host. Unknown.

Range. Canada. BC, NT, SK.

Holotype: Canada. NT: Norman Wells, 8.viii.1969, G.E. Shewell (1♂, CNC).

Paratype: Canada. BC: Mt. Kobau, 49˚05.376′N, 119˚37.834′W, 23.v.2005, fallow field, Goulet & Boudreault, sweep (1♂, CNC), **SK:** Gt. Sand Hills, 27.v.1955, 50°8′, 109°16′, J.R. Vockeroth (1♂ [mostly broken with mid legs missing], CNC).

Comments. In the holotype (paratype illustrated), the base of distiphallus is of the same approximate width as it is near the apex of the segment, somewhat resembling *Liriomyza rigaudensis*. In this latter species, however, the calypter is white, the paraphallus is dark while the entire distiphallus is evenly pale, while in *L. arenarium*, the calypter margin is brown, the distal section of the distiphallus is dark while the paraphalli are without pigment. Furthermore, the distiphallus of *L. rigaudensis* is smaller and more box-like, with its width less than half that of the mesophallus, not more than twice its width, as in *L. arenarium*.

See comments for *Liriomyza gibsoni*.

***Liriomyza artemisiae* Spencer**
Figs 239–241

Liriomyza artemisiae Spencer 1981: 213. Spencer & Steyskal 1986: 117; Lonsdale 2011: 22.
Liriomyza similis Spencer 1981: 272. Spencer & Steyskal 1986: 120. Syn. Lonsdale (2011)

Wing length 1.4–1.5mm (♂), 1.3–1.6mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.7–3.7. Eye height divided by gena height: 3.1–5.0. Scutum subshining. Specimens from California with vein dm-cu sometimes atrophied (Spencer, 1981)

Chaetotaxy: Two ori (anterior seta sometimes slightly reduced), two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin grey. First flagellomere brown infuscated with basal margin yellow; lateral margin of frons sometimes with very faint stripe that may reach base of ors, or less commonly, base of ori; ocellar triangle, back of head and clypeus dark brown; ventral margin of gena with narrow brownish line. Scutum with complete yellow lateral stripe. Scutellum yellow with lateral corner dark. Katatergite yellow; anatergite brown, becoming yellow dorsally; mediotergite dark brown. Anepisternum brown on ventral 2/3 (dorsal margin irregular) or with posterior margin and broad oblique stripe brown; anepimeron brown with yellow mottling; meron brown with dorsum yellow; katepisternum brown on ventral ¾ (not including base of seta). Legs yellow with base of coxae brown, femora brown basally, fore femur with strong dorsal striations, mid and hind femora with weak dorsal mottling, and tibiae and tarsi dark brown. Abdomen dark brown.

Genitalia: (Figs 239–241) Surstylus rounded, with one subapical spine, setulose and slightly narrowed apically. Basiphallus with left ventroapical margin produced and lightly pigmented. Paraphallus narrow and relatively dark. Hypophallus narrow, ill-defined and weakly haired apically. Swollen apical section of ejaculatory duct short, stout and spindle-shaped. Mesophallus short, dark, narrow and fused to distiphallus. Distiphallus bell-shaped with open suture that joins in front of, and extends past mesophallus; with inwardly-directed hairs on inner-distal surface, enclosing one pair of haired inner processes. Sclerite on sperm pump broad, truncated and darker along lateral margin; blade of ejaculatory apodeme becoming paler apically and with transverse submarginal stripe.

Variation: Darker specimens—including all Canadian material—differ as follows: pigment on antenna and frons darker; anepisternum and katepisternum brown with dorsal margin yellow, enclosing base of katepisternal seta; legs brown with fore coxa yellowish apically, fore femur yellow apically (and sometimes anteroventrally), and mid and hind femora sometimes yellow apically; distiphallus slightly broader, paler on basal half, with apical and inner fringes of hairs better defined; hypophallus more developed.

Host. Asteraceae—*Artemisia* sp., *A. douglasiana* Besser (Spencer, 1981), and likely other *Artemisia* spp. (Lonsdale, 2011).

Range. Canada. AB*, BC*. **USA.** CA, CO, MT, WY.

Holotype [*artemisiae*]: USA. CA: Ventura Co., Point Mugu S.P., caught on *Artemisis douglasiana*, 1.iv.1977, K.A. Spencer (1♂, USNM).

Holotype [*similis*]: USA. CA: Alpine Co., Hope Valley, 8.viii.1948, sweeping, Lot 91–30, K.E. Frick, Type No. 13941 (1♂, CASC).

Additional material examined. Canada. AB: Townsite Waterton Lk. N.P., 8.vii.1980, H.J. Teskey (1♂, CNC), Banff, 4500′, 28.vii.1967, J.R. Vockeroth (1♂, CNC), **BC:** Terrace, 31.vi.1960, J.G. Chillcott (1♂, CNC), Terrace, 31.vi.1960, R.J. Pilfrey (1♂, CNC). **USA. CA:** Hemet Lake, 500′, 13.vi.1961, J.G. Chillott (1♂, CNC), Palm Desert, 2000′, 4.iv.1955, W.R. Richards (1♀, CNC), Eldorado Co., Echo Lake, 7500′, 13.vii.1961, J.G. Chillcott (1♂, CNC), **CO:** Doolittle ranch, 9800′, Mt. Evans, 25.vii.1961, W.R.M. Mason (1♀, CNC).

Comments. *Liriomyza artemisiae* is a relatively small, dark western North American species with a brown first flagellomere (excluding the yellow base) and a pale cup-shaped phallus. The species is here newly recorded for Canada.

***Liriomyza asclepiadis* Spencer**

Figs 217–219

Liriomyza asclepiadis Spencer 1969: 169. Spencer & Steyskal 1986: 130.

Wing length 1.6–2.0mm (♂), 1.7–1.9mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.0–3.2. Eye height divided by gena height: 4.1–5.3. Scutum subshining.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four to five irregular rows.

Colouration: Calypter margin brown. Head yellow with ocellar triangle, clypeus, back of head and posterolateral corner of frons to base of inner vertical seta dark brown, sometimes with region between base of

verticals paler; parafacial, orbital plate and cheek forming shallow, but distinct ring. Lateral margin of scutum with complete yellow stripe. Lateral corner of scutellum brown. Katatergite brown posteroventrally; anatergite brown, sometimes with dorsum yellow; mediotergite dark brown. Anepisternum with posteromedial margin brown and with broad, oblique anteroventral stripe that narrows posteriorly; anepimeron with posterior margin and anterior mottling brown; meron brown with dorsum yellow; katepisternum brown on ventral 2/3, not including base of seta. Legs yellow with basal half of coxae brown, hind femur sometimes narrowly brown dorsobasally, tibiae brown and tarsi brown with base paler; pigment paler on anterior legs. Abdomen brown with tergites yellow laterally.

Genitalia: (Figs 217–219) Surstylus small, apically tapering and with two small, closely spaced apical spines. Phallophorus band-like ventrally. Basiphallus sclerotized along dorsal and left-lateral surfaces. Swollen apical section of ejaculatory duct narrowing distally. Paraphallus small and narrow. Hypophallus well-developed. Mesophallus dark and confluent with distiphallus dorsally; mesophallus and distiphallus with complete ventral suture. Distiphallus with dark, slightly flattened base and broader, thicker, dorsally angled apical chamber with ventral surface and apical ring more heavily sclerotized; with one pair of short fringed structures emerging from chamber. Ejaculatory apodeme with stem and base of blade darkest, blade large and semicircular with dark apical striations that become thicker and consolidated marginally.

Hosts. Asclepiadaceae—*Asclepias* sp., *A. incarnata* L., *A. speciose* Torr., *A. syriaca* L.

Range. Canada. ON, QC. **USA.** ID, MA*, MN [empty leaf mines on *A. ovalifolia*], NH, NY.

Holotype: Canada. QC: Perkin's Mills, em. 2.vii.1967 from mines on *Asclepias incarnata*, leg. 18.vii.1967, K.A. Spencer, Type No. 10409 (1♂[with puparium], CNC).

Paratypes examined: Canada. ON: Ottawa, em. 1.vii.1962, reared from *Asclepias* 100.I.'63, C.D. Miller (1♀ [with puparium], CNC), **QC:** Hull, em. 7.vii.1962, reared from *Asclepias*107.si69, C.D. Miller (1♂, CNC), Hull, em. 7.vii.1962, reared from *asclepias*105.s_2'67, C.D. Miller (1♂, CNC), Hull, em. 7.viii.1962, reared from *asclepias*103.o_5'65, C.D. Miller (1♀, CNC).

Additional material examined. Canada. ON: Ottawa, 18.vii.1989, J.R. Vockeroth, reared from milkweed (1♂, CNC). **USA. MA:** Franklin Co., Orange, 42°33'41.02"N 72°17'58.48"W, 11.viii.2016, C.S. Eiseman, *Asclepias incarnata* em. 26–29.viii.2016 , #CSE2952, CNC638897 (1♂, CNC).

Comments. The phallus of *Liriomyza asclepiadis* is distinctive and must be examined for confident identification, as it may be mistaken for other taxa including the eastern *L. pistilla* (Figs 291–294; reared from *Melampyrum*) and the relatively common *L. brassicae* (Figs 224–227), which is not known from *Asclepias*. Viewed ventrally, the phallus resembles that of *L. brassicae* except that it is wider distally and with a large, clear, apical chamber that is angled dorsally and enclosed by one pair of narrow, curved sclerites. *Liriomyza trifolii* (Figs 307–310) and *L. peleensis* (Figs 285–287) are also known from *Asclepias*, but the vertical setae of the former are entirely surrounded by yellow basally, and the latter is much darker on the thorax.

***Liriomyza assimilis* (Malloch)**

Figs 23, 47–50

Agromyza assimilis Malloch 1918: 80.
Liriomyza assimilis. Frick 1952a: 402, 1959: 401. Spencer & Steyskal 1986: 111.

Wing length 1.5–1.8mm (♂), 1.9mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.6–4.5. Eye height divided by gena height: 4.1–4.8. Scutum with grey pruinosity. Parafacial and orbital plate slightly projecting.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in two rows.

Colouration: (Fig. 23) Calypter margin brown. Head yellow with ocellar triangle, clypeus and back of head dark brown; posterodorsal margin of head behind eye sometimes with brownish spot not touching base of vertical setae. Scutum brown with complete yellow lateral stripe and large, rounded spot on posterior margin in front of scutellum. Scutellum brown in lateral corner. Katatergite brown posteroventrally; anatergite brown with dorsum yellow; mediotergite dark brown. Anepisternum with narrow, light brown line along posteromedial margin and with narrow, oblique, light brown stripe medially; anepimeron with light brown mottling; meron brown with dorsum yellow; katepisternum brown on ventral 2/3 (not including base of seta). Legs yellow with base of coxae

brown, femora with base brown and sometimes with dorsal streaking streaking that can be paler on fore leg, tibiae brown (anterior legs paler) with fore tibia yellow to base and mid tibia slightly yellower to base, and tarsi brown. Abdomen brown with wide yellow posteromedial stripe on tergites 1–4 that becomes larger on posterior tergites; epandrium yellow dorsomedially.

Genitalia: (Figs 47–50) Surstylus narrowing apically and with one subapical spine. Basiphallus sclerotized along left lateral and dorsoapical surfaces, with lateral-distal margins produces as rounded, membranous lobes. Hypophallus well-developed. Paraphallus weakly-sclerotized, narrowing to base. Mesophallus subcylindrical, thicker dorsally and with produced ventral suture forming carina and enclosing minute fossa. Distiphallus with short basal stem that is somewhat confluent with mesophallus, narrow basal bowl that has a slight ventrolateral constriction, and one pair of entirely separate apical tubules that are slightly sclerotized towards base and approximately as long as remainder of distiphallus plus mesophallus. Ejaculatory apodeme with long, dark stem and narrow blade that has thick longitudinal bands, small apical striations and thick marginal sclerite on sperm pump broad with lateral margin thickened.

Hosts. Asteraceae—*Helianthus* sp., *Lindheimera texana* A. Gray & Engelm. (Spencer & Steyskal, 1986).

Range. Canada. MB*, ON*, QC*. **USA.** IL, PA, TX.

Holotype: USA. IL: Freeport, 4.vii.1917, J.R. Malloch (1♂, USNM). [Not examined]

Material examined: Canada. MB: Shilo, 5mi SW, 11.vii.1958, J.G. Chillcott, floodplain community nr tamarack bog (1♂, CNC), Aweme, 22.v.1917, N. Criddle (1♀, CNC), **ON:** Metcalf, 2mi N, 6.x.1982, B.E. Cooper (1♂, CNC), Marmora, 15.viii.1952, J.F. McAlpine (1♂, CNC), Dufferin Co., Mono Cliffs P.P., Spillway Trail, 44°02′53″N, 80°04′35″W, yellow pans, 19.v.2003, M. Buck (1♂, DEBU), Mono Cliffs P.P., 44°03′N, 80°04′W, yellow pans, 31.viii.2002, M. Buck (2♀, DEBU), Mono Cliffs P.P., Spillway Trail, 44°02′53″N, 80°04′35″W, yellow pans, 19.v.2003, M. Buck (1♂ 1♀, DEBU), **QC:** Gatineau Pk., Harrington Lk., 31.v.1954, R. McCondochie (1♀, CNC), Breckenridge, 3.vi.1959, C.H. Mann (1♂, CNC).

Comments. The yellow subtriangular emargination on the scutum differentiates *Liriomyza assimilis* from most other Canadian *Liriomyza* with a largely yellow frons, reduced rows of acrostichals and grey pruinosity on the thorax. A similar marking is seen in the slightly larger and darker *L. angulicornis*, which sometimes also has yellow medial spots on the abdomen, but in this species the first flagellomere is pointed and the entire posterior margin of the scutum is yellow. Highly similar male terminalia are seen in the darker *L.atrassimilis* (Figs 51, 52), a newly described species discussed below that is likely the sister to *L. assimilis*.

Liriomyza assimilis is here newly recorded for Canada.

***Liriomyza atrassimilis* spec. nov.**
Figs 51, 52

Wing length 2.1–2.2mm (♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 2.8–3.1. Eye height divided by gena height: 2.3–3.1. Scutum with dusting of grey pruinosity. First flagellomere angulate in male collected 21.vii.1959.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in approximately two to three irregular rows.

Colouration: Calypter margin brown. Head yellow with ocellar triangle, clypeus and back of head dark brown; first flagellomere with orange tint and sometimes distal 1/3 infuscated; posterolateral corner of frons sometimes with brownish mottling on posterior margin (not touching base of outer vertical seta) and brownish spot in front of inner vertical on eye margin; venter of gena with pale line. Scutum with complete lateral yellow stripe. Scutellum yellow with lateral corner brown. Katatergite brown posteroventrally; anatergite brown with posterodorsal corner yellow; mediotergite dark brown. Anepisternum yellow with ill-defined clavate stripe in ventral half; anepimeron yellow with brown mottling; meron mostly brown; katepisternum brown on ventral 2/3, not including seta base. Legs yellow with base of coxae brown, femora with dark dorsal streaking, tibiae brown (darker on posterior legs) and tarsi brown. Abdomen brown with wide yellow posteromedial emargination on tergites 1–4 that become larger on posterior tergites; epandrium yellow dorsomedially.

Genitalia: (Figs 51, 52) As described for *L. assimilis* (Figs 47–50) except as follows: paraphallus more discreet; mesophallus narrower, no carina; distiphallus broader and with distal tubules fused; stalk of ejaculatory apodeme slightly thicker.

Etymology. The specific epithet compounds "*atra*" (L. black) with the name of this taxon's putative sister species, *L. assimilis*, indicating its phylogenetic affinity and relative appearance.

Host. Unknown.

Range. Canada. BC.

Holotype: Canada. BC: Summit Lake, Mi392 Alaska Hwy., 7.vii.1959, 4700′, R.E. Leech (1♂, CNC).

Paratypes: Canada. BC: Same collection as holotype (2♂, CNC), 21.vii.1959, 4200′ (1♂, CNC), 11–14.vii.1959, 4500′ (1♂, CNC).

Comments. *Liriomyza atrassimilis*, as suggested by the name, is highly similar in appearance to *L. assimilis*, particularly with regards to the colour of the frons and abdomen, as well as the structure of the male genitalia (Figs 47–50), but the wing of this new species is larger, the gena is higher, the first flagellomere has an orange tint with the distal 1/3 infuscated, the posterior margin of the scutum is brown (not with a deep yellow emargination in front of the scutellum), the femora are more darkly streaked and the male genitalia differ as noted above.

***Liriomyza baccharidis* Spencer**

Figs 220–223

Liriomyza baccharidis Spencer 1963: 354. Spencer 1981: 216, 1984: 15; Spencer & Steyskal 1986: 124; Lonsdale 2011: 25.

Wing length 1.8–2.2mm(♂), 2.2–2.5mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.5–2.7. Eye height divided by gena height: 4.0–5.3. Scutum shining. Epistoma small.

Chaetotaxy: Two ori (sometimes three on one side), two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin grey. Head yellow with back of head, ocellar tubercle, stripe on ventral margin of gena, clypeus and posterolateral frons to base of inner vertical seta dark brown; first flagellomere dark yellow; face brown; lateral margin of orbital plate with narrow brown line. Scutum with lateral yellow stripe sometimes brownish or mottled behind wing base. Scutellum yellow with lateral corner dark. Metanotum dark with posterodorsal corner of anatergite yellowish. Pleuron dark with dorsomedial margin of katepisternum and anterodorsal to entire dorsal margin of anepisternum yellow. Coxae brown with yellow mottling; basal ¼ or less of femora brown, but dorsobasal half sometimes mottled; tibiae and tarsi dark brown. Abdomen dark brown.

Genitalia: (Figs 220–223) Surstylus C-shaped, with apex and prominent basal lobe with one apical spine each. Basiphallus with left lateral and mid-dorsal surfaces sclerotized; left anterolateral margin strongly produced, lightly pigmented and apically truncated. Paraphallus dark, thick and curved. Hypophallus relatively short with subapical hairs. Swollen apical section of ejaculatory duct pale, narrow and only slightly narrowed apically. Distiphallus (including fused mesophallus) dark and cylindrical with slight subbasal constriction when seen ventrally; more strongly constricted basally when seen laterally and with ventrobasal surface weakly-sclerotized; with complete ventral suture and enclosed apical chamber (appearing paler) enclosing very short fringed structure. Sclerite on sperm pump darker laterally; stem of ejaculatory apodeme narrow; duct pigmented basally; blade broad with medial annulations and darker apical margin.

Variation: Darker males differ as follows: scape and surrounding lunule brownish; dark lateral margin of orbital plate sometimes extending to surround base of ors, or base of fronto-orbitals surrounded by narrow brown spot; mid and hind femora with light dorsal mottling; anepisternum and coxae entirely dark.

Hosts. Asteraceae—*Artemisia douglasiana*, *Baccharis douglasii* DC, *B. floribunda* Kunth, *B. pilularis* DC, *Baccharis* sp., *Conyza Canadensis* (L.) Cronquist, *Conyza* sp.[?]. Specimens, possibly adults, collected from *Cornus sericea* L. ssp. *occidentalis* (Torr. & A. Gray) Fosberg [=*C. californica*] (Spencer 1981, 1984, 1990).

Range. Canada. BC*. **USA.** AZ, CA, ID, WA, WN. Colombia. Venezuela. Likely present throughout Central America (Spencer, 1981).

Holotype: Colombia. Tequendama Falls, nr. Bogotá, bred ex. leaf mine on *Baccharis floribunda* H.B.& K., 26.xii.1958, K.A. Spencer (1♂, BMNH). [Not examined]

Additional material examined. Canada. BC: Kinbasket Lake, BC Hydro drawdown study, Cooper, Beauchesne & Assoc. Ltd., Malaise trap, 12.vi.2010 (4♂, CNC), Cultus Lake, vii.1948, H.R. Foxlee (1?, CNC), Robson, ix.1948, H.R. Foxlee (1♂, CNC), Summerland, 1.x.1931, A.N. Gartrell (1♂, CNC), Salmon Arm, 5.vi.1990, A. Borkent (1♂, CNC), Pr. Rupert, 4.vi.1960, R. Pilfrey (1♀, CNC), N end of Thetis Lake Langford, 48°28′N, 123°28′W, Malaise trap, Gary Oak/arbutus forest, "ix.1997 [month?]" (1♂, LEM), Robson, 4.ix.1967, H.R. Foxlee (1♀, UBCZ).

Comments. *Liriomyza baccharidis* is one of the few North American *Liriomyza* with a brown face and an entirely yellow antenna (excluding the arista), readily distinguishing it from congeners, including *L. brassicae* (Figs 224–227), which has a similar phallus. Other species with a dark face are predominantly to entirely brown on the first flagellomere, and sometimes also on the scape and pedicel. The C-shaped surstylus is also unique, having a large, basal, inwardly directed lobe.

Liriomyza balcanicoides **Sehgal**
Fig. 82

Liriomyza balcanicoides Sehgal 1971: 330.

Wing length 1.6mm (♂♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.4. Eye height divided by gena height approximately 3.3. Scutum with light greyish pruinosity.

Chaetotaxy: Two ori (reduced on one side and absent on the other), two ors. Acrostichal setulae in two rows.

Colouration: Calypter margin brown. Head yellow with ocellar triangle, clypeus and back of head dark brown. Lateral margin of scutum with complete yellow stripe. Scutellum brown in lateral corner. Katatergite brown in posteroventral corner; anatergite dark brown with dorsum yellow; mediotergite dark brown. Anepisternum with short brown stripe in anteroventral corner; anepimeron with brown markings on anterior half; meron brown with dorsum yellow; katepisternum brown on ventral 2/3 (not including base of seta). Legs yellow with base of coxae brown, and tibiae and tarsi brown with tarsi becoming paler to base; hind femur possibly with faint dorsobasal infuscation. Abdomen yellow with one pair of approximate dorsal sopts and one pair of small posterolateral spots, tergites 2–6 with broad, posteriorly narrowing stripe divided medially on tergite 2, and epandrium and surstylus dark brown.

Genitalia: (Fig. 82) Surstylus with one subapical spine. Basiphallus with left lateral and dorsoapical surfaces sclerotized; margin of basiphallus not produced. Swollen apical section of ejaculatory duct gradually wideneing to midpoint. Paraphallus very small and narrow. Hypophallus well-developed. Mesophallus approximately as long as wide, fused to base of distiphallus. Distiphallus with basal bowl that is minutely spinulose along inner-distal margin; with one pair of long, clear apical tubules that are as long as basiphallus and have small dorsobasal hook-like process. Ejaculatory apodeme with dark, thick stem and large, semicircular blade.

Host. Primulaceae—*Androsace septentrionalis* L.*

Range. Canada. AB.

Holotype: Canada. AB: St. Albert, nr. Edmonton, 18.vi.1967, V.K. Sehgal, Type No.12068 (1♂, CNC).

Additional material examined. CANADA. AB: Shore of Cooking L., 53˚26–27′N, 113˚00–01′W, 30.vi.1979, larva from *Androsace septentrionalis*, emerged 18–21.vii.1979, G.C.D. Griffiths, E376 (7♂15♀[with puparia], UASM; 3♂ 3♀[with puparia], CNC).

Comments. *Liriomyza balcanicoides* is known from the Albertan holotype and a large series reared by Griffiths from *Androsace septentrionalis*, also near Edmonton. It can only be reliably distinguished from similar pale species with reduced rows of acrostichals through male genitalic dissection—the distiphallus is composed one pair of narrow, straight tubules with a minute dorsobasal "hook" that emerge from a small basal bowl.

Liriomyza baptisiae **(Frost)**
Figs 27, 245–248

Agromyza baptisiae Frost 1931: 275.
Liriomyza baptisiae. Frick 1952a: 402, 1959: 402; Spencer 1969: 169, 1981: 218; Sehgal 1971: 331; Spencer & Steyskal 1986: 115; Scheffer *et al.* 2007: 772; Lonsdale 2011: 27.

Wing length 1.6–1.9mm (♂), 2.2mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.7–2.5. Eye height divided by gena height: 3.2–5.5. Scutum shining. Parafacial and orbital plate slightly projecting.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four rows.

Colouration: (Fig. 27) Calypter margin grey. Base colour of head varies from light yellow to light brown; back of head, ocellar tubercle, posterolateral corner of frons (encompassing base of both vertical setae), clypeus, palpus and entire antenna dark brown; lateral margin of frons brown with stripe extending onto parafacial, sometimes encompassing base of fronto-orbitals; face brown; gena dirty to light yellow; eye surrounded by narrow to relatively wide brown ring. Scutum dark with lateral margin yellow presuturally (brown spot on postpronotum relatively large), region above wing base yellowish. Scutellum yellow with lateral corner dark. Metanotum dark brown. Pleuron dark with posterodorsal margin of katepisternum yellowish. Legs dark brown with apex of fore femur yellow and sometimes apex of mid and hind femora yellowish. Abdomen dark brown.

Genitalia: (Figs 245–248) Surstylus slightly tapered apically and with single apical spine. Basiphallus curved subapically and sclerotized along dorsal and left lateral margins. Paraphallus possibly homologous with one pair of petal-shaped lobes that are fused medially to each other and distiphallus. Hypophallus prominent with long hairs along medial and apical margins. Mesophallus not evident. Distiphallus large, dark, slightly tapering basally (seen ventrally), with one pair of narrow elongate-oval apicoventral plates and one pair of short fringed structures in apical chamber; one pair of very fine, diverging apical filaments (not illustrated). Ejaculatory apodeme with sclerite on sperm pump dark; stem nearly absent; base broad; blade large and dark, becoming paler apically except for dark marginal stripe; base of duct dark with pigment confluent with base of stem and lateromedial margin of sclerite on sperm pump.

Hosts. Fabaceae—*Lupinus latifolius* Lindl. ex J. Agardh, *Lupinus argenteus* Pursh ssp. *argenteus* var. *laxiflorus* (Douglas ex Lindl.) Dorn, *L. pratensis* A. Heller, *Lupinus* sp., *Baptisia tinctoria* (L.) R. Br., *Thermopsis rhombifolia* (Nutt. ex Pursh) Nutt. ex Richardson*.

Range. Canada. AB, BC, MB*, SK. **USA.** AK*, CA, CO, MO, PA, WA, WN.

Holotype: USA. PA: Arendtsville, 1.viii.1927, S.W. Frost, *Baptisa tincticoria*. Type No. 62962 (1♂, USNM).

Additional material examined. Canada. AB: Scotford Sandhills, 5 miles west of Bruderheim, 11.vii.1971, larva on *Thermopsis rhombifolia*, emerged 31.vii.1971, G.C.D. Griffiths, E100 (2♂[with puparia], UASM), Blairmore, 26.vi.1966, K.A. Spencer (1♂, CNC), Red Deer River, NW Dinosaur P.P., 50°50.5'N, 111°36.5′W, 6–9.vii.1997, Malaise trap, J.E. O'Hara (3♂ 2♀, LEM), S of Onefour, (49˚00.7′N, 110˚26.6′W), Malaise tp., 14–16.vii.1997, J.E. O'Hara (1♂ 2♀, LEM), **BC:** Victoria, 20.v.1919, W. Downes (1♀, CNC), Mt. Revelstoke, 22.vii.1952, 6000′, G.J. Spencer (1♀, CNC), Vancouver, Pt. Grey, 20.v.1973, J.R. Vockeroth (1♂, CNC), Squamish, Diamond Head Trail, 3200', 28.viii.1953, G.J. Spencer (1♂, CNC), King Salmon L., 1750'–2000′, dry burnt ridge, 15.vii.1960, 58°43′, 132°54′, R. Pilfrey (1♂, CNC), **MB:** Aweme, 27.v.1918, N. Criddle (1♀, CNC), **SK:** Ogema, 16.vi.1916, N. Criddle (1♂, CNC), Cypress Hills Prov. Pk. East boundary, (49˚40.2′N, 109˚27.5′W), sweep meadow near mixed forest, 10.vii.2000, V. Crecco & T.A. Wheeler (2♂, LEM). **USA. AK:** Lower Tonsina, 28.vi.1953, W.C.F. coll. (1♂, USNM), **CA:** Santa Clara Co., Del Puerto Rd. (Rd. 130), 28.v.1992, J. Skevington (1♂, DEBU), **CO:** Boulder, 5400′, 10.vi.1961, B.H. Poole (1♂, CNC), Mt. Vernon Cn. Nr Golden, 31.vii.1961, 7200′, C.H. Mann (1♀, CNC), Doolittle Ranch, 9800′, Mt. Evans, 22.vii.1961, J.G. Chillcott (1♀, CNC).

Comments. *Liriomyza baptisiae* and *L. bellissima*, diagnosed in the above key, stand out from Canadian congeners by having an entirely dark brown antenna, a brown face, a brown palpus and a dark, clavate distiphallus. A similar phallus is also seen in *L. pistilla* (Figs 291–294), but this is a much paler species not easily confused for these taxa.

***Liriomyza bellissima* (Spencer)**

Figs 10, 249–251

Metopomyza bellissima Spencer 1969: 196.
Liriomyza bellissima. Spencer 1981: 221; Spencer & Steyskal 1986: 115; Lonsdale 2011: 31.

Wing length 1.9–2.3mm (♂),2.5–2.8mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.7–2.0. Eye height divided by gena height: 2.6–3.9. Scutum subshining.

Chaetotaxy: Two or three ori (sometimes also with one or two well-developed orbital setulae), two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin dark brown. Head yellow with ocellar tubercle, antenna, clypeus, ventral margin of gena, palpus, face and posterolateral and lateral regions of frons (enclosing base of fronto-orbitals) dark brown;

eye surrounded by narrow to relatively wide brown ring sometimes broken posteriorly. Scutum dark with lateral margin yellow presuturally. Scutellum yellow with lateral corner dark. Metanotum dark brown with katatergite and posterodorsal margin of anatergite yellowish. Pleuron, legs and abdomen dark brown.

Genitalia: (Figs 249–251) Surstylus with single subapical spine. Paraphallus absent. Hypophallus with small bulbous base and numerous long medial and apical hairs. Mesophallus not evident. Distiphallus large and thick (length nearly twice width), very dark and with shallow apical chamber enclosing oner pair of short fringed structures; apex with very faint membranous, haired extension. Ejaculatory apodeme darkest apically on stem, becoming paler in annulations along length of blade; apical margin with minute longitudinal striations.

Host. Unknown.

Range. Canada. AB*, BC, YT*. **USA.** CA, NV, WN.

Holotype: Canada. BC: Atlin, 2200′, 23.vi.1955, H. Huckel, Type No. 10419 (1♂, CNC).

Paratypes examined: Canada. BC: Rayston, 7.vi.1955, J.R. McGillis (1♀, CNC) [not listed in original publication], Bevan, 18.vi.1956, G.E. Shewell (2♂, CNC), 3mi NE of Telegraph Creek, 1.vii.1960, R.J. Pilfrey, burned over area, yarrow, stone crop (1♀, CNC).

Additional material examined. Canada. AB: Townsite Waterton Lk. N.P., 8.vii.1980, H.J. Teskey (1♂, CNC), Writing-on-Stone P.P., Willow N, 26.iv–7.v.1990, D. McCorquodale (1♀, DEBU), S of Onefour, (49˚00.7′N, 110˚26.6′W), Malaise tp., 14–16.vii.1997, J.E. O'Hara (2♀, LEM), **BC:** 3mi NE of Telegraph Creek, 1.vii.1960, R.J. Pilfrey, "Lir. lupini, K.A. Spencer det. 1967", paratype (1♂, CNC), Robson, "11.v.194", H.R. Foxlee, "Lir. lupini, K.A. Spencer det. 1967", paratype (1♀, CNC), 3.viii.1947 [1♀, CNC], 13.vi.1948 (1♀, CNC), Mt. Revelstoke, G.J. Spencer, 11.viii.1952, 5400′ (1♂, CNC), 15.viii.1952, 5800′ (1♂, CNC), 25.vii.1952, 6000′ (2♂ 1♀, CNC), NE of Telegraph Creek, 1.vii.1960, R.J. Pilfrey, burned over area, yarrow, stone crop (1♂, CNC), King Salmon L., 15.vii.1960, 58°43′, 132°54′, 1750′, R. Pilfrey, dry burnt ridge (3♀, CNC), Princeton, 13.vii.1975, H.J. Teskey (1♀, CNC), Mt. Kobau, 49˚05.376′N, 119˚37.834′W, 23.v.2005, fallow field, Goulet & Boudreault, sweep (1♂, CNC), Pt. Grey, Vancouver, 20.v.1973, J.R. Vockeroth (1♀, CNC), Cathedral P.P., Glacier Lake, 7.vii.1986, R. Cannings (1♂, RBCM), Vaseux L., hills to E, 6.vi.1983, R.A. Cannings (1♂, RBCM), Robson, 26.vii.1958, H.R. Foxlee (1♂, UBCZ), **YT:** Ross River, 132°30′, 61°56′, 3000′, 20.vi.1960, J.E.H. Martin (1♂, CNC), Kluane National Park, 60˚40′39″N, 137˚46′51.48″W, 625m, 13.vii.2006, Goulet & Boudreault, sweeping (1♂, CNC).

Comments. See comments for *Liriomyza baptisiae.*

***Liriomyza bicolumbis* spec. nov.**
Figs 83–86

Wing length 2.1mm(♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 2.7. Eye height divided by gena height: 1.7. Well-developed ring around eye, with orbital plate and parafacial pronounced. Scutum covered with light grey pruinosity.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in two sparse rows anteriorly [specimens in poor condition with most setae and setulae missing from notum].

Colouration: Calypter margin and hairs yellowish-white. Base colour of body whitish-yellow (likely an artifact of preservation). Head mostly pale with ocellar triangle dark brown (light brown at posterior margin of frons), dorsal margin of clypeus narrowly brown, and most of back of head dark brown above foramen with small extension barely reaching margin of eye lateral to verticals (surrounded by yellow). Scutum with complete yellow lateral stripe; spot on postpronotum not connected to dark medial region. Katatergite brown anteroventrally; anatergite brown with posterodorsal region yellow; mediotergite brown. Anepisternum with small, elongate anteroventral spot; anepimeron with limited brown mottling anteriorly and posteriorly; meron brown with dorsal margin yellow; katepisternum brown on ventral 2/3 (not including base of seta). Legs pale yellow in base colour with tibiae and tarsi slightly darker, basal margin of fore and hind coxae brown; mid coxa brown on outer-basal half, mid tibia faintly brownish dorsally on basal 2/3, hind tibia light brown on basal 2/3, excluding base, with dorsum darker. Abdominal tergites with medial brown stripe and wide yellow lateral margins; stripe with narrow medial yellow line on tergite 2 and with anterior and posterior yellow medial spots on tergites 4 and 5; epandrium and surstylus brown.

Genitalia: (Figs 83–86) Surstylus tapering apically, with one subapical spine. Basiphallus T-shaped. Hypophallus narrow, well-developed with three apical hairs. Paraphallus tapered to base. Mesophallus subcylindrical with dorsal surface thick and dark, lateral surface weaker and with distoventral surface nearly unsclerotized; ventral suture slightly produced, distal margin sclerotized, with narrow basal projection. Distiphallus with one pair of apical tubules that are lightly sclerotized on basal half (slightly more sclerotized on ventral surface) and have a dark dorsal-subbasal spur; base of distiphallus bowl-like with inner surface minutely textured (strongly spinulose laterally), and with strong medial constriction laterally and ventrally, producing two collar-like ridges; bowl-like base of distiphallus strongly produced dorsoapically, with one pair of short, closely spaced triangular points adjacent to spurs on tubules.

Etymology. The specific epithet compounds refers to the diagnostic base of the distiphallus, where the bowl-like base is constricted medially to produce two "collars" (L. *columbar*).

Host. Unknown.

Range. Canada. AB.

Holotype: Canada. AB: Waterton Lakes N.P., Highway 6 east of Chief Mountain, montane forest, fir/lodgepole pine stand with aspen/birch understory, 49.0649˚N, 113.7791˚W, 1569m, BIOBus 2012 27.vi.2012, BIOUG04742-D07 (1♂, CNC).

Paratype: Canada. AB: same data as holotype, BIOUG0472-H06 (1♂, CNC).

Comments. *Liriomyza bicolumbis* is closely allied to the Californian *L. tubula* Spencer (see Lonsdale (2011: figs 229–231) based on highly similar phallic and external morphology. Hosts for both species are unknown. The new species can be differentiated by a strong medial constriction on the bowl-like base of the distiphallus, which is also produced dorsoapically into a two-pronged plate that adjoins the dark "spurs" on the apical tubules. Externally, the acrostichal setulae appear to be reduced in number (the notum is in poor shape in both type specimens), and there is reduced pigmentation on the antenna, clypeus, frons, femora and tibiae.

Liriomyza bifurcata **Sehgal**

Figs 67–70

Liriomyza bifurcata Sehgal 1971: 331.

Wing length 1.4–1.5mm (♂), 1.5–1.6mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.4–3.4. Eye height divided by gena height: 4.4–5.0. Scutum dusted with greyish pruinosity.

Chaetotaxy: Two ori, one or two ors. Acrostichal setulae in two rows.

Colouration: Calypter margin brown. Head with ocellar triangle, clypeus and back of head dark brown; posterolateral corner of frons brown, base of vertical setae surrounded by yellow, holotype with posterior margin of eye anterior to vertical setae brown. Lateral margin of scutum with complete yellow stripe. Scutellum yellow with lateral corner brown. Katatergite brown posteroventrally; anatergite brown with dorsum yellow; mediotergite dark brown. Anepisternum with brown anteroventral spot; anepimeron with yellow anterior marking, holotype with posterior margin also brown; meron brown with dorsum yellow; katepisternum brown on ventral 2/3 (not including base of seta). Legs yellow with base of coxae brown, male fore femur sometimes with faint dorsal subapical mottling, tibiae brown with venter paler and anterior legs less strongly pigmented to entirely yellow, and tarsi brown (becoming paler to base). Abdomen brown, yellow laterally on tergites and posteriorly on tergites 5 and 6, epandrium and surstylus dark brown.

Genitalia: (Figs 67–70) Surstylus with weak transverse striations and one subapical spine. Basiphallus sclerotized along left lateral and dorsal surfaces, and with membranous projections on right and left distal margins confluent with ill-defined paraphalli. Hypophallus well-developed with short apical hairs. Swollen distal portion of ejaculatory duct short. Mesophallus dark, narrow, cylindrical and confluent with distiphallus. Distiphallus large and dark with broad basal bowl that is minutely spinulose along inner-distal margin and with one pair of broad inner fringes from which one pair of long, narrow, clear tubules emerge. Ejaculatory apodeme well-developed with dark stem and marginally sclerotized blade; sclerite on sperm pump narrow and dark, with lateral margin rounded and thickened.

Host. Unknown.

Range. Canada. AB, ON*, QC*.

Holotype: Canada. AB: Edmonton, White Mud Creek, 29.vi.1966, V.K. Sehgal, Type No. 12069 (1♂, CNC).

Additional material examined. Canada. ON: St. Lawrence Is. N.P., Grenadier I. Centre, 10.vi.1975, G.T. Hall (1♂, CNC), Iroquois Falls, 30.vi.1987, J.R. Vockeroth (2♂, CNC), Mer Bleu Bog, Ottawa, 14.vi.1980, K.N. Barber (1♂, DEBU), **QC:** Harrington Lk., Gatineau Pk., 30.v.1954, W.R. Richards (2♂, CNC), Ste-Anne-de-Bellevue, Stoneycroft Pond, 45°25.8′N, 73°56.4′W, sweeping grass, 13.vi.2000, H. Varady-Szabo (4♂, LEM), J. Forrest (6♂ 4♀, LEM), 7.vi.2000, J. Forrest (2♂, LEM), 20.vi.2000, J. Forrest (3♂, LEM), 11.viii.2000, J. Forrest (1♂, LEM), 7.vi.2000, H. Varady-Szabo (3♂, LEM), Ste-Anne-de-Bellevue, Stoneycroft, 45°25.8′N, 73°56.4′W, sweep *Solidago*, 18.viii.2000, T.A. Wheeler (1♂, LEM).

Comments. *Liriomyza bifurcata* is here recorded for the first time in eastern Canada, with new Ontario and Quebec occurrences. The phallus is characteristic in that the base is very broad, ovate and internally spinulose, similar to that of *L. fricki* (Figs 73, 74), but there is one pair of long, curved, clear apical tubules.

***Liriomyza blechi* Spencer**

Figs 1, 21, 29–32

Liriomyza blechi Spencer In Spencer & Stegmaier 1973: 98. Spencer & Steyskal 1986: 285; Carvalho-Filho *et al.* 2016: 450.

Description. Wing length 2.0–2.1mm (♂), 1.9–2.3mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.3–1.4. Eye height divided by gena height: 5.3–7.0. Eye with small, scattered hairs.

Chaetotaxy: Two ori (anterior seta small), two ors. Acrostichal setulae in four rows; posteromedial setulae inclinate. Third dorsocentral from back reduced to absent. Mid tibia with two small posteromedial setae.

Colouration: (Figs 1, 21) Calypter dark. Head yellow with ocellar tubercle, back of head above foramen and posterior margin of frons lateral to vertical setae brown; clypeus sometimes brown. Scutum very shiny and yellow with dark medial stripe on anterior 2/3, one pair of lateral presutural spots and one pair of postsutural bifid stripes; markings usually fused medially, and (south of Canada) sometimes forming large spot nearly reaching lateral and posterior margins. Scutellum yellow, sometimes with lateral corner brown. Metatotum yellow with mediotergite dark brown and venter of katatergite and anatergite brown. Pleuron and legs yellow with faint triangular spot on katepisternum; southern specimens sometimes with spot more distinct and meron with small spot. Abdomen mostly yellow, sometimes with faint dorsal stripe narrowing to tergite 5 or 6.

Genitalia: (Figs 29–32) Epandrium large with sides broadly rounded; posterodistal corner with wide, elongate bar on inner surface. Surstylus subtriangular with apex elongate and dark. Hypophallus broad, faintly sclerotized, lateral margin thicker and folded, with small, weak medial plate with small apical hairs; basomedial region elaborated into one pair of thick folds that meet medially. Basiphallus with dorsal plate fused to phallophorus. Mesophallus indistinct, possibly evident as basal stem of distiphallus and sclerotized ventromedial folds, the latter of which may also be modified paraphalli. Distiphallus perpendicular to basiphallus; length approximately twice width; consisting of two broad, fused lobes that slightly widen apically; inner surface minutely spinulose on distal half. Ejaculatory apodeme very large, broadly rounded and pale with sperm pump heavily sclerotized with flat lateral extensions.

Hosts. Acanthaceae—*Blechum pyramidatum* (Lam.) Urb. Boraginaceae—*Heliotropium*. Loganiaceae—*Spigelia.* Plantaginaceae—*Plantago*. Verbenaceae—*Lippia* (Spencer & Steyskal 1986).

IL and FL specimens have been collected from “elm leaves” and *Digitaria*, which would be unusual rearing records, and are possibly incidental adult associations.

Range. Canada: AB*, NL*, ON, QC*. **USA:** DE*, FL, GA*, IA*, ID*, IL*, MD*, MI*, MS, NY*, OH*, PA*, SC*, SD*, TX, VA*, WV*. Bermuda*. Bolivia*. Brazil. Dominica*. Dominican Republic. Guadeloupe. Martinique.

Holotype: USA. FL: Dade Co., Miami, 11.vii.1963, ex. leaf mine on *Blechum pyramidatum* (HT ♂, USNM).

Paratypes examined: USA. FL: Homestead, 13.x.1968, on *Blechum*, K.A. Spencer, Type No. 16464 (2♀, CNC).

Additional material examined. USA. DE: Dover, 6.vi.1953, light trap, [illegible] coll. (1♀, UDCC), New Castle Co., Newark, C.E. Tw[label cut], 6.ix.2003, I. Johnson, sweeping (1♂, UDCC), **FL:** “Lisc. Bay”, Mrs.

Slosson (1♂, USNM), Miami, 24.ix.1963, ex. *Digitaria sanguinalis*, K.A. Spencer (2♂ 1♀ [same pin], CNC), **GA:** Pine Mtn, 1mi N, 26.vii.1957, J.G. Chillcott (1♀, CNC), **IA:** Ames, 10.vii.1947, A.R. Brooks (2♀, CNC), **ID:** Winona Lake, 14.viii.1915, reared from Plantain, issued 7.ix.1915, det J.M. Aldrich (1♀, USNM), Lafayette, J.M. Aldrich, 6.vii.1915 (1♀, USNM), "viii-1" (1♀, USNM), 16.vii.1912 (1♂ 1♀, USNM), 10.vii.1915 (1♀, USNM), "June [illegible] 1913" (1♂, USNM), "vii-30" (1♂, USNM), 31.v.1915 (1♀, USNM), "6-6" (1♂, USNM), "vi-7" (2♂, USNM), "6-27" (1?, USNM), "vi-25" (1♂, USNM), **IL:** Champaign, 25.v.1957, J.F. McAlpine, elm leaves (2♂, CNC), Champaign, J.F. McAlpine, 6.v.1953 (3♀, CNC), 12.v.1953 (1♂, CNC), **MD:** Cabin John, 24.v.1931, J.M. Aldrich (1♂ 1♀, USNM), Colesville, W.W. Wirth, 28.v.1977 (1♀, USNM), 21.v.1977 (1♀, USNM), 11.vii.1974 (1♂, USNM), 24.vii.1974 (2♂ 1♀, USNM), 29.vii.1974 (1♂, USNM), 11.vii.1974 (1♂, USNM), 1.viii.1976 (2♀, USNM), Colesville, Malaise trap, W.W. Wirth, 13.viii.1977 (3♂ 3♀, USNM), 4.ix.1977 (1♀, USNM), 5.viii.1975 (1♂, USNM), 5.vii.1976 (1♀, USNM), 3.viii.1975 (1♂, USNM), 20.vii.1975 (1♀, USNM), 14.vi.1975 (1♀, USNM), 3.viii.1978 (2♀, USNM), 26.vi.1977 (2♂ 2♀, USNM), Mg. Co., 4mi SW of Ashton, 24.vi.1981, Malaise trap, G.F. & J.F. Heel (1♂, USNM), **MI:** E Lansing, C. Sabrosky, 27.viii.1936 (1♀, USNM), 2.x.1941 (1♀, USNM), Wayne Co., Grosse Ile., 24.vii.1961, G. Steyskal (1♂, USNM), Monroe, 11.vi.1950, G. Steyskal (1♀, USNM), **MS:** Washington Co., Leland, 14.vi.1979, reared from *Plantago*, K.E. Frick (1♂ 1♀ 1puparium, USNM), **NY:** Slide Mt., 25.viii.1935, 4200', H.K. Townes (1♀, USNM), **OH:** Lorain Co., Vermillion River, Hill Hollow C.P., 41°22.9′N, 82°19.0′W, 22.ix.1976, B.A. Steinly (1♀, USNM), **PA:** Chester Co., Oxford, 127 W Locust, 26."iix".1998, RLS, Malaise trap, "26-iix, 5-ix" (1♀, UDCC), **SC:** Greenville, 15.x.1916, A.H. Sturtevant (1♂, USNM), Beaufort Co., Friff Island (1♂, USNM), **SD:** Elk Point, C.N. Ainslie (3♀, USNM), **TX:** San Antonio, 29.iii.1908, bred Plantago media, "br. 4/17/08", C.R. jones (6♂ 3♀ 1?, USNM), San Antonio, 29.iii.1908, bred Plantago media, root, "W145-I.2, iv.5.09" (1♀, USNM). Mexia, Ft. Parker St. Park, Oak (1♀, USNM), Austin, "5-11.0", A.L. Melander (1♂, USNM), Welder Wildlife Res. Nr Sinton, 19–23.iii.1965, J.G. Chillcott (1♂ 2♀, CNC), **VA:** Chain Bridge, 20.viii.1922, J.R. Malloch (1♂, USNM), Northhampton Co., Kiptopeke, 4–6.x.1984, W.E. Steiner et al., Malaise trap, dunes between cliff and beach (1♂, USNM), Falls Church, 15.vii.1964, W.W. Wirth (1♀, USNM), 30.vii.1960, light trap (1♀, USNM), Luray, 24.vi.1933, A.L. Melander (1♀, USNM), Shenandoah, Big Meadows, 3 .vii.1939, A.L. melander (1♂, USNM), **WV:** Morgan Co., nr. Great Cacapon, 3.vii.1983, G.F. & J.F. Hevel (1♀, USNM). No locality data: 4310 (1♀, USNM), "Reared from Planton", emerged 26.vi.1912, J.J. Davis (4♂ 1♀, USNM), 4310, br. 7.vii.1888 (1♀, USNM).

Comments. The notal pattern of Canadian *Liriomyza blechi* is characteristic, usually having one pair of dark, bifid posterolateral stripes on the scutum. A similar pattern is seen in some *L. philadelphivora*, but this species has very different male genitalia (including a unique surstylus), a longer third dorsocentral, yellow tibiae, a dark epandrium, and different dimensions of the gena and wing veins (see key). *Liriomyza blechi* is also unique among Canadian *Liriomyza* in its sparsely haired eyes, inclinate posteromedial acrostichal setulae and posteromedial setae on the mid tibia.

Numerous USNM specimens identified as "*Liriomyza sorosis"* by Frick, Spencer and Steyskal have been examined, but these were likely identified prior to 1973, when Spencer & Stegmaier (1973) noted that the concept of this species should be restricted to the St. Vincent type series deposited in the BMNH. Although the BMNH types have not been examined, *L. blechi* is apparently only separable on the basis of male genitalic characters: the tubules of the distiphallus are cylindrical (not laterally carinate), the hypophallus is large (shorter in *L. sorosis*, but still very wide) and the male cercus has a long apical seta. The latter character appears to be problematic, however, as the apical setae are relatively short in material examined; it is longer in specimens examined of *L. marginalis*, but in this species, the mesophallus and distiphallus are quire well-segmented, not fused, as also shown in the original species description; this character is therefore either variable, or was assigned to this species by mistake.

Liriomyza borealis **(Malloch)**

Figs 20, 242–244

Agromyza borealis Malloch 1913: 280. Malloch 1918: 78; Frost 1924: 40 [misidentification *Phytoliriomyza melampyga* (Loew)].

Liriomyza borealis. Frick 1952a: 402, 1959: 402; Shewell 1953: 467; Spencer 1969: 170.

Wing length 1.3mm(♂), 1.3–1.6mm(♀). Length of ultimate section of vein CuA_1 divided by penultimate section:

1.9–3.5. Eye height divided by gena height: 2.3–4.0. Scutum covered with grey pruinosity. Parafacial and orbtal plate projecting.

Chaetotaxy: Three ori, one ors. Acrostichal setulae in two sparse rows.

Colouration: (Fig. 20) Calypter margin yellow. Setae and wing veins yellow. Head yellow with ocellar tubercle and back of head brown; clypeus brown to light brown. Scutum yellow with thick anteromedial stripe reaching halfway between first and second dorsocentral setae, one pair of lateromedial stripes that taper posteriorly and fuse with medial stripe at suture, and one pair of narrow, floating posterolateral stripes. Lateral corner of scutellum with brown spot. Katatergite brown ventrally; anatergite brown with posterodorsal corner yellow; mediotergite dark brown. Anepisternum with small, oblique anteroventral stripe; anepimeron with brown anterior mottling; meron brown with dorsum yellow; katepisternum brown along posterior margin and on ventral 2/3 (not incuding base of seta). Legs yellow with base of coxae brown, fore tibia brownish dorsomedially, mid tibia light brown dorsally, hind coxae brown dorsally, and tarsi brown (paler to base); Onefour specimens with pale dorsal streaking on fore femur. Abdomen yellow with thick anteromedial band on tergites 1–6 (1–4 in male with band on tergite 1 divided medially), becoming narrower on posterior tergites; sometimes with narrow yellow posteromedial emargination on tergites; epandrium brown.

Genitalia: (Figs 242–244) Surstylus with long subapical spine. Swollen section of ejaculatory duct barely constricted apically. Paraphallus very narrow. Hypophallus well-developed with apical hairs relatively short. Mesophallus very short (particularly dorsum), dark and fused to distiphallus; mesophallus and distiphallus with complete ventral suture. Distiphallus broad, cup-shaped and almost clear, with base and inner submarginal spines slightly darker. Ejaculatory apodeme well-developed with base of blade and transverse submarginal striations dark.

Host. Unknown.

Range. Canada. AB*, BC, SK*. **USA.** CO*.

Holotype: Canada. BC: Bear Lake, "20.7.03", A.N. Caudell, Type No. 15560 (1♀, USNM). [Not examined]
Additional material examined. Canada. AB: Onefour, 2.viii.1980, sweeping, G. Gibson (1♂ 4♀, DEBU), **SK:** Landing, 22.vii.1956, O. Peck (2♀, CNC). **USA. CO:** Boulder, 5mi S, 5800′, 16.vi.1961, C.H. Mann (2♀, CNC).

Comments. The yellow, vittate *Liriomyza alaskensis* is similar in appearance to *L. borealis*, although the latter has only a single medial stripe on the scutum, the lateral stripes are fused to the medial stripe at the transverse suture, there is an additional pair of stripes posteriorly, the clypeus, scutellum, anepisternum and anepimeron have brown markings, the wing is smaller and there are three ori and one ors. *Phytoliriomyza melampyga* is also similar in appearance and can be identified as *L. borealis* using the above key, but *P. melampyga* differs in having the pregenitalic tergites entirely yellow (small, pale anteromedial spots are sometimes present on tergites 2–4 in Canadian specimens), the calypter margin is brown, there are four rows of acrostichal setulae, the wing is 2.0–2.5mm long, the male phallus is very long, narrow and pale, and the surstylus and epandrium each have a dark row of spines.

***Liriomyza brassicae* (Riley)**

Figs 224–227

Phytomyza diminuta. Nomen dubium. Walker 1858: 233. Syn. Frick (1952).
Oscinis brassicae Riley 1884: 322.
Agromyza pascuum Meigen 1830. Misidentification. Melander 1913: 258; Frick 1952a: 402.
Liriomyza cruciferarum Hering 1927: 461. Frick 1952a: 402 [tentative synonymy, not maintained here].
Liriomyza brassicae. Frick 1952a: 402, 1957: 68, 1959: 402, Spencer 1963: 356, 1969: 170; Spencer & Steyskal 1986: 127; Scheffer *et al.* 2007: 772; Lonsdale 2011: 33.
Agromyza diminuta Walker. Misidentification, in part. Coquillett 1898: 78.
Phytomyza mitis Curran 1931: 97. Frick 1952a: 427, 1959: 402. Syn. Spencer (1967[?]) [not explicit].
Liriomyza hawaiiensis Frick 1952b: 513. Syn. Spencer (1963).
Liriomyza bulnesiae Spencer 1963: 360. Syn. Spencer & Stegmaier (1973).
Liriomyza ornephila Garg 1971: 241. Syn. Sasakawa (1977).

Description. Wing length 1.2–1.6mm (♂), 1.7–1.8mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.5–3.5. Eye height divided by gena height: 2.9–5.0. Scutum shining.

Chaetotaxy: Two or rarely three ori, two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin grey. Lateral margin of frons sometimes with narrow brown margin, varying in

strength from indistinct (common) to reaching base of fronto-orbitals; posterolateral corner of frons brown to base of inner or outer vertical seta, sometimes light brown between bases of setae; remainder of head light yellow with back of head and ocellar triangle brown. Scutum dark brown with complete lateral yellow stripe. Scutellum yellow with lateral corner brown. Katatergite yellow with posteroventral margin brown; anatergite light brown with dorsum yellow; mediotergite dark brown. Anepisternum usually with most of ventral margin brown, although sometimes also with posterior margin broadly pigmented or only with small anteroventral spot; anepimeron mottled; meron brown with dorsal 1/3 yellow; katepisternum with large brown triangular spot (not enclosing seta). Legs yellow with tibiae, tarsi and base of fore coxa brown (fore and mid legs paler, particularly towards apex); sometimes base of femora (often only dorsally) and scraper on hind femur brown; uncommonly with brown streaking on fore femur, but if present, then lateral margin of frons narrowly brown, dark line present between base of vertical setae and hind coxa brown. Abdomen brown with lateral and sometimes posterior margin of tergites 2–4 yellow; tergite 2 sometimes with yellowish mottling and tergites 2–4 sometimes with narrow medial dividing yellow line, and tergite 4 often nearly divided medially into two pairs of spots; tergite 5 and sometimes 6 yellow with large brown medial spot; epandrium with yellow dorsal mottling.

Genitalia: (Figs 224–227) Surstylus small and lobate with long apical spine and smaller ventromedial spine, widely spaced. Basiphallus with left lateral and dorsoapical surfaces sclerotized. Hypophallus small, narrow, curved anteriorly and with few apical hairs. Paraphallus narrow or slightly expanded distally. Distiphallus and mesophallus fused, narrow, cylindrical, dark, with small, pale apical chamber; gradual constriction at point of fusion between distiphallus and mesophallus. Ejaculatory apodeme dark and broad, with corners pronounced, width equal to length and stalk narrow.

Hosts. Host use by *L. brassicae* is discussed in Lonsdale (2011). Recorded from wild *Allaria* (Brassicaceae) [previously considered *Sisymbrium*] in Wisconsin.

Range. Widespread in Nearctic, Oriental and Australasian Regions. Africa. Europe. Canary Islands. Japan.

Holotype [*brassicae*]: USA. MO: St. Louis, 30.iv.1876 (1♀, USNM).

Holotype [*bulnesiae*]: Venezuela. Caracas, Botanical Gardens, caught on *Bulnesia arborea* Engl. (Zygophyllaceae), 5.xii.1958, K.A. Spencer (1♂, BMNH). [Not examined]

Syntypes [*cruciferarum*]: Canary Islands. La Palma: Santa Cruz (2?, ZMHU) [Not examined]

Holotype [*hawaiiensis*]: USA. HI: Oahu, Honolulu, 1.i.1947, E.C. Zimmerman, ex. leaf of *Cleone* (1♀, BPBM).

Holotype [*mitis*]: Canada. MB: Aweme, 20.vii.1929, R.H. Handford, Type No. 3407 (1♂, CNC).

Paratypes examined [*mitis*]: Canada. MB: Same collection as holotype (1♀[same pin as holotype], CNC), Aweme, R.H. Handford, 3.ix.1929 (2♂, CNC), 12.vii.1929 (1♂, CNC), 26.vii.1930, host: *Erysimum parviflorum* (1♂, CNC).

Holotype [*ornephila*]: India. Uttar Pradesh, Pithoragarh (1♀, depository not given). [Not examined]

Additional material examined. Canada. AB: Elkwater L., 21.vii.1956, O. Peck (1♂, CNC), Writing-on-stone P.P., Sand N, 10–20.ix.1990, M. Klassen (1♂, DEBU), Kananaskis Field Stn, 51°01′49″N, 115°02′01″W, Malaise trap in aspen, 3–10.ix.1998, S. Bouchard (2♂, LEM), Malaise trap, 13–23.ix.1998, M.A.P. Whittaker (4♂ 1♀, LEM), Kananaskis, For. Exp. Sta., Seebe, 3.vii.1968, H.J. Teskey (1♂, CNC), Red Deer River, NW Dinosaur P.P., 50°50.5′N, 111°36.5′W, 6–9.vii.1997, Malaise trap, J.E. O'Hara (1♂ 1♀, LEM), 15km NE Onefour, Sage Creek, (49˚09.0′N, 110˚15.1′W), sweep sedges near creek, 10.vii.2000, V. Crecco & T.A. Wheeler (1♂, LEM), S of Onefour, (49˚00.7′N, 110˚26.6′W), Malaise tp., 14–16.vii.1997, J.E. O'Hara (1♂, LEM), **MB:** Aweme, 31.v.1918, N. Criddle (1♀, CNC), Ninette, 13.v.1958, J.F. McAlpine (1♂, CNC), 5mi SW Shilo, 22.vii.1958, J.F. McAlpine (1♂, CNC), Brandon, 3.viii.1958, J.G. Chillcott (1♂, CNC), **ON:** Cambridge, 27.viii.1979, K. Barber (1♂, DEBU), Ottawa, leaf mine in *Brassica*, 9.vii.1964 (2♀, CNC), 27.vii.1964 (2♂ 1♀[with puparia], CNC), 5.viii.1964 (1♀[with puparium], CNC), 10.viii.1964 (1♂[with puparium], CNC), 24.viii.1964 (1♂[with puparium], CNC), 26.viii.1964 (1♀[with puparium], CNC), Ottawa, 9.viii.1953, J.F. McAlpine, tansy (1♂ 1♀ 1?, CNC), Ottawa, J.R. Vockeroth, 26.vii.1959 (1♂, CNC), 18.viii.1983 (1♂, CNC), Ottawa, J.R. Vockeroth, damp second growth *Acer-Betula* wood, 14.viii.1989 (1♂, CNC), 9.vii.1991 (1♂, CNC), 12.vii.1994 (1♂, CNC), 7.viii.2000 (1♀, CNC), 16.viii.2003 (1♂, CNC), St. Lawrence Is. Nat. park, Thwartway Is., W. Reid, 20.vii.1976 (1♀, CNC), 25.vii.1976 (1♀, CNC), Grand Bend, G.E. Shewell, 10.vii.1939 (2♂ 1♀, CNC), 14.vii.1939 (1♀, CNC), Vineland Sta., 22.viii.1928, Putnam, leaf miner in rape (2♂ 4♀, CNC), Orillia, 18.vi.1927, C.H. Curran (1♀, CNC), Simcoe, 24.vi.1939 (1♂, CNC), Simcoe, 14.vi.1939, G.E. Shewell (1♀, CNC), Fitzroy Harb., 11.vii.1938, G.E. Shewell

(1♀, CNC), Mer Bleue, 2.vii.1938, G.E. Shewell (1♀, CNC), Marmora, 6.viii.1952, J.F. McAlpine (1♂, CNC), Lambton Co., Pinery P.P., Ausable R. nr store, small shore Salix, 26.vi.1977, D. Maddison (1♂, ROM), Pinery P.P., Ausable R. & rd. to Burley Beach, willows and dogwood on shore, 5.vii.1977, W. Maddison (1♂, ROM), James Bay Rte. km603.1, 53°43′28″N, 77°43′10″W, boggy spruce, yellow pans, 10–14.vii.2001, M.&B. Buck (1♀, DEBU), Wylde Lk. Bog, 8km E Arthur, 28.vii–5.viii.1987, sedge meadow hummock, D. Blades (1♂, DEBU), Waterloo Reg., Blair, RARE, Resource House, 43°22′53″N, 80°21′28”W, 7.vii.2006, M.D. Bergeron (1♂, DEBU), **QC:** Whale R., 8.viii.1949, J.R. Vockeroth, leaf mine in *Arabis arenicola* (9♂ 10♀ 1? [with puparia], CNC), Wakefield, G.E. Shewell, 9.vii.1946 (1♀, CNC), 26.vi.1946 (1♀, CNC), Lac Brule, 25.vii.1947, O. Peck, swept from *Rosa rugosa* (1♀, CNC), Abbotford, 21.ix.1937, G. Shewell (1♀, CNC), Laniel, 3.vii.1944, A.R. Brooks (4♀, CNC), Gatineau Park, 8.vi.1964, J.F. McAlpine (1♂, CNC), Ste-Anne-de-Bellevue, Stoneycroft Pond, 45°25.8′N, 73°56.4′W, sweep meadow, 5.vii.1999, M. Pollet (1♂, LEM), sweeping grass, 18.viii.2000, J. Forrest (1♂, LEM), sweeping grass, 4.viii.2000, J. Forrest (1♂, LEM), Pointe Fortune Conservation Area, 45°34′N, 74°23′W, sweep, 7.vii.1999, S.E. Brooks (1♂, LEM), **SK:** White Fox, 11.vii.1944, O. Peck (1♀, CNC), Saskatoon, viii.1918, King (1♀, CNC), Indian Head, K. Stewart, 27.vii.1929 (1♂, CNC), 7.viii.1929 (2♂ 1♀, CNC), 23.viii.1929 (1♂, CNC), 4.x.1929 (1♂, CNC), 6.x.1929 (1♂, CNC), Val Marie, 49°15′, 107°44′, 9.vi.1955, J.R. Vockeroth (1♂, CNC). **Australia.** Brisbane, 22.i.1961, mine *Tropaeolum*, K.A. Spencer (1♀[with puparium], CNC). **Japan.** Bonin Island: Chichi Jima, Omura ‘Camp beach’, 2–25.vi.1958, F.M. Snyder (1♀, CNC). **Malaysia.** Kenting Highlands, “4.12.75”, on *Tropaeolum*, K.A. Spencer (1♂ 1♀, CNC). **New Caledonia.** Dumbea, 100m, 7.ix.1972, J.F. McAlpine (1♀, CNC). **New Zealand.** Nelson, em.12.i.1975, mine *Tropaeolum* 31.xii.1974, K.A. Spencer (1♀[with puparium], CNC). **Senegal.** Dakar, 20.viii.1957, *Brassica* 2.viii.1957, K.A. Spencer (3♂[with puparium], CNC), Dakar, 18.viii.1957, *Brassica* 2.viii.1957, K.A. Spencer (1♀[with puparium], CNC), Dakar, 16.viii.1957, *Brassica* 2.viii.1957, K.A. Spencer (1?[with puparium], CNC). **Singapore.** Em. 9.ii.60, mine *Cleome graveolens* 29.i.60 (1♂[with puparium], CNC). **Thailand.** Kanahanaburi, 28.xii.1949, C. Butalobol (1♂, CNC). **Trinidad:** Curepe, leafminer on cabbage, vii.1971 (3♂ 3♀, CNC). **USA. CA:** Victorville, 24.v.1955, W.R.M. Mason (1♂, CNC), **CO:** Mt. Evans, Timberline, 11700’, 29.vii.1961, C.H. Mann (1♂, CNC), Hoosier Pass, 12000′, 8.viii.1961, C.H. Mann (1♂, CNC), **IL:** Champaign Co., M.W. Shackleford, 15.vi.1925 (1♀, CNC), 20.v.1925 (1♀, CNC), 28.vi.1925 (1♂, CNC), **IO:** Ames, 22.v.1928, G.S. Walley (1♀, CNC), **MN:** Olmstead Co., C.N. Ainslie, cabbage leaf miner (3♂ 4♀, CNC), **NC:** Highlands, 3800′, 22.v1957, J.R. Vockeroth (1♂, CNC), **NY:** L.I. Veg. Res. Fm., Riverhead, 3–9.vii.1938 (1♂, CNC), 1–7.viii.1938 (1♂, CNC), 7–20.viii.1938, at light (3♂, CNC), **WI:** Dane Co., Cross Plains, 17.v.2012, ex garlic mustard (*Allaria petiolata*), I. Loser (1♂, CNC). **Country unknown.** “Lorenco Marques, “9.10.1971”, ex. *Brassica oleracea*, “(O. Almeida)” (1♀ 1♂[same pin], CNC). Kanahanaburi

Comments. *Liriomyza brassicae* is widespread globally in agricultural settings, particularly around brassicaceous crops. It is quite regularly reared from *Brassica*, on which it can be a significant pest if occurring in large enough numbers, and is sometimes reared from *Pisum* (Spencer 1973). Specimens are often paler than most *L. sativae* (Figs 303–306), which is also a common pest on many agricultural crops worldwide, but the morphology of the two often overlap and the male terminalia should be examined for confident identification.

***Liriomyza charada* spec. nov.**
Figs 252–255

Wing length 2.4–2.5mm (♂), 2.6 (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.2–28. Eye height divided by gena height: 3.8–8.6. Scutum subshining. First flagellomere short, apical margin and with slightly longer hairs.

Chaetotaxy: Two ori, two ors; female with 3 ori on right side. Acrostichal setulae in four rows.

Colouration: Calypter margin brown. Head yellow with clypeus, ocellar tubercle and back of head dark brown; space behind tubercle light brown; posterolateral corner of frons brown to level of inner vertical or slightly beyond. Scutum dark brown with complete lateral yellow stripe. Scutellum yellow with narrow brown lateral stripe (barely reaching base of lateral seta in holotype, and much reduced in paratypes). Katatergite brownish anteriorly (holotype only) and brown posteroventrally; anatergite and mediotergite dark brown with dorsum of anatergite yellowish. Anepisternum with broad irregular brown marking on ventral ¾; anepimeron mostly yellow with brown anterior mottling (holotype also with brownish posterior spot); meron brown with dorsum yellow; katepisternum brown on ventral 2/3 (not including base of seta) with posterolateral and posterodorsal margin brownish. Legs mostly yellow

with basal 1/3 of fore coxa, basal half of mid coxa and most of hind coxa brown, femora with base brown (reduced, but not absent in paratypes), tibiae brown (paler on anterior leg and darker on posterior) and tarsi brown. Male abdomen yellow with broad dorsomedial stripe on tergites 1–5 and epandrium brown; female abdomen yellow, brownish posteromedially on tergite 1 and anteromedially on tergite 2, slightly brownish anteromedially on tergites 3 and 4, brown anteromedially on tergite 5, dark brown dorsally on tergite 6 (possibly an artifact), and with minute light brown spots at base of dorsal setae.

Genitalia: (Figs 252–255) Surstylus with two posteromedial spines. Phallophorus band-like ventrally. Basiphallus sclerotized along left lateral and dorsoapical surfaces. Hypophallus well-developed. Paraphallus short, subrectangular and slightly broader apically. Mesophallus longer than wide, broadest near base, thickened dorsally and with raised, open ventral suture that is closed along venter of distiphallus. Distiphallus slightly longer than mesophallus, cup-shaped, with thickened walls ventrally and basally; sides subparallel with basal 1/3 narrowed; slightly compressed dorsoventrally; inner surface along distilateral margin with tuft of inwardly directed spines. Ejaculatory apodeme with long, pale stem and blade that is darkest basally and with dark apical mottling; sclerite on sperm pump relatively large and well-sclerotized.

Etymology. The specific epithet is Greek for "mountain stream", referring to the holotype collection site.

Host. Caprifoliaceae—*Viburnum edule* (Michx.) Raf.

Range. Canada. AB, BC.

Holotype: Canada. BC: Kleanza Creek, 14mi E Terrace, 17.vi.1960, J.G. Chillcott (1♂, CNC).

Paratypes: Canada. AB: Jasper National Park, 1 mile S Geikie, 5000′, 2.ix.1973, larva on *Viburnum edule*, emerged 21[♂]–23[♀].v.1974, G.C.D. Griffiths, J105 (1♂ [with puparium], UASM; 1♀ [with puparium], CNC).

Comments. *Liriomyza charada* differs from most other Canadian *Liriomyza* primarily in the shape and pigmentation of the distiphallus, which is cup-shaped, thickly sclerotized basally and ventrally, and has numerous long, narrow spines along the inner-distal margin (directed basally). The mesophallus is dark dorsally with the ventral carina strongly produced and open, and the surstylus has one pair of medial spines.

Liriomyza cordillerana **Sehgal**

Figs 104–106

Liriomyza cordillerana Sehgal 1968: 69. Spencer 1969: 173; Sehgal 1971: 332; Zlobin 1997: 103.

Wing length 2.8–3.0mm (♂), 3.2–3.7mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.5–2.1. Eye height divided by gena height: 3.7–5.0. Scutum subshining.

Chaetotaxy: Two or three ori, two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin dark brown. Head yellow with ocellar triangle, posterior margin of frons, clypeus and back of head dark brown; posterolateral corner of frons dark to space between vertical setae and paler brown to base of inner vertical, sometimes with marking extending as a stripe along lateral margin of orbital plate brown to level of anterior ors; dorsal margin of first flagellomere sometimes infuscated, darkest to base of arista, and distal 1/3 sometimes orange; venter of gena with light brown line. Lateral margin of scutum with complete yellow stripe. Scutellum brown in lateral corner. Metanotum dark brown with posterodorsal corner of anatergite yellow and dorsum of katatergite sometimes yellow. Pleuron brown with dorsal 1/5–1/4 of anepisternum yellow, anepimeron brown spotted, dorsum of meron yellow and dorsal or dorsomedial margin of katepisternum yellow. Legs dark brown with coxae fading to yellow ventrally, apices of femora yellow and sometimes anteroventral surface of fore femur yellow. Abdomen dark with lateral margin of tergites yellow, with yellow margin broad and easily viewed dorsally on tergites 1–3. Pigment often with black tint.

Genitalia: (Figs 104–106) Surstylus-like process of epandrium small, bare and weakly sclerotized; process and epandrium without spine. True surstylus absent. Basiphallus bent ventrally (along with swollen section of ejaculatory duct), well sclerotized dorsally and dorsolaterally, and with narrow, irregular anterolateral extensions. Hypophallus well-developed and fused to long mesophallus. Distiphallus with dark basal stem fused to, and nearly as long as mesophallus; apical bowl very large, dark, slightly wider than high and exposing apex of dark medial processes. Ejaculatory apodeme as described for *L. septentrionalis*.

Host. Poaceae—*Deschampsia cespitosa* (L.) P. Beauv. (Sehgal 1971).

Range. Canada. AB, BC, QC*. **USA.** AK*, CA, ID*, OR, WA. **Mexico** (Nuevo León).

Holotype: Canada. AB: Banff, 3.ix.1966, V.K. Sehgal, Type No. 12055 (1♂, CNC).

Paratypes examined: Canada. AB: Same collection as holotype (1♀[allotype], CNC), Banff, 3.ix.1966, V.K. Sehgal (2♂, CNC), Blairmore, 4.ix.1966, V.K. Sehgal (2♂, CNC), Waterton N.P., 6.ix.1966, V.K. Sehgal (5♂, CNC).

Additional material examined. Canada. AB: Sulfur Mt., 7200′, Banff, 28.vii.1967, J.R. Vockeroth (2♂, CNC), Sunwapta Pass, Banff-Jasper Hwy, 6600′, J.R. McGillis, 5.vii.1955 (1♂, CNC), 6.vii.1955 (1♀, CNC), 6km W Lake Louise, 31.v.1992, A. Borkent (2♀, CNC), Jasper, 25.vii.1928, J. McDunnough (6♂ 1♀, CNC), Banff, O. Bryant, 24.vii.1925 (1♂, USNM), 6.vi.1928 (4♀, USNM), 25.vi.1928 (1♂, USNM), 12.vii.1928 (5♂ 3♀, USNM), 16.vii.1928 (1♂ 1♀, USNM), 26.vii.1928 (1♂, USNM), 9.viii.1928 (4♂ 1♀, USNM), 28.ix.1928 (1♂, USNM), **BC:** Vancouver Island, Bamberton Park, 8–9.v.1968, woodland, G.C.D. Griffiths (1♂, UASM), Summit Lake, Mi392 Alaska Hwy, 31.vii.1959, 4200′, R.E. Leech (1♀, CNC), Atlin, 2.viii.1955, B.A. Gibbard (1♀, CNC), Bevan, 18.vi.1965, R. Coyles (1♀, CNC), Trinity Valley, 21.v.1959, L.A. Kelton (2♀, CNC), 21km SE Vernon, 5.v.1990, A. Borkent (1♂ 3♀, CNC), 6.5km NW Enderby, 6.v.1992, A. Borkent (2♂, CNC), 6km NW Enderby, A. Borkent, 28.v.1990 (♀, CNC), 5.v.1992 (1♀, CNC), 6km E Salmon Arm, 4.v.1990, A. Borkent (1♀, CNC), 8km E Sicamous, 1.vi.1992, A. Borkent (1♀, CNC), 11km NE Nakup, 3.ix.1991, A. Borkent (1♂, CNC), Hixon, 21.vi.1976, E. Dyer (1♂ 2♀ 1?, CNC), Bowser, R. Coyles, 30.v.1955 (2♂ 5♀, CNC), 31.v.1955 (2♂, CNC), 28.v.1955 (1♀, CNC), Cultus L., 27.x.1938, J.K. Jakob (1♂, CNC), Cultus Lake, 4–10.vii.1948, H.R. Foxlee (2♂, CNC), 50mi SW of Terrace, 9.vii.1960, J.G. Chillcott (1♀, CNC), 13km NW of Brookmere, Coldwater River, W bank, nr Juliet off Hwy 5, 49°44′15″N, 121°00′30″W, 22.vii.2004, el. 1020m, C.J. Borkent (1♂ 3♀, LEM), Hector, 15.vii.1928, O. Bryant (1♂, USNM), Great Divide, 30.vii.1935, A.L. Melander (1♂, USNM), Victoria, Ten-mile Point, 15.vi.1987, R.A. Cannings (1♂, RBCM), Terrace, Ferry Island, 8.vi.1985, R.A. Cannings (1♀, RBCM), Metchosin, Camas Hill, 27.ii.1988, C.S. Guppy (2♀, RBCM), Satuma Island, Taylor Point, 48°45.8′N, 123°08′W, 10.v.2004, el. 20m, C.J. Borkent (1♀, RBCM), Satuma Island, Narvaez Bay, 48°46.8′N, 123°06.7′W, 12.v.2004, el. 20m, C.J. Borkent (1♂ 7♀, RBCM), McCauley Island, nr creek mouth, Malaise trap, 22.vii.2005, C. Copley (1♀, RBCM), Lynn, CK, 31.x.1926, "Permanent loan from Vancouver City Museum" (1♂ 1♀, UBCZ), Langley Pr., 23.iv.1940, K. Graham (2♂ 5♀, UBCZ), Penticton, Ellis Cr. Dam no 4, 1375m, 24.vi.1983, S.G. Cannings (1♂, UBCZ), Vancouver, Univ. campus, 20.v.1961, S. Lanko (1♀, UBCZ), Bowen Isl., 19.iv.1961, G.J. Spencer (1♀, UBCZ), Robson, H.R. Foxlee, 27.v.1956 (1♂, UBCZ), 17.vi.1956 (1♀, UBCZ), 27.ix.1956 (1♂, UBCZ), 22.vii.1968 (1♀, UBCZ), 30.ix.1958 (1♀, UBCZ), 12.x.1958 (1♀, UBCZ), 22.x.1958 (1♀, UBCZ), 23.x.1958 (1♂, UBCZ), 27.x.1958 (2♂ 1♀, UBCZ), 7.vii.1959 (1♀, UBCZ), 2.vii.1964 (1♀, UBCZ), 18.ix.1965 (1♂, UBCZ), 8.iv.1966 (1♂, UBCZ), 5.vii.1966 (1♀, UBCZ), 7.ix.1966 (1♂, UBCZ), 2.x.1966 (1♀, UBCZ), 6.x.1966 (1♂, UBCZ), 9.x.1966 (1♂ 2♀, UBCZ), 25.x.1966 (1♂ 1♀, UBCZ), 13.viii.1967 (1♂, UBCZ), 14.viii.1967 (1♂, UBCZ), 16.ix.1967 (1♂, UBCZ), 22.ix.1967 (2♂, UBCZ), 12.v.1968 (1♂, UBCZ), 14.v.1968 (1♂, UBCZ), 19.v.1968 (1♂, UBCZ), 12.v.1968 (1♂, UBCZ), 4.vi.1968 (1♀, UBCZ), 12.vi.1968 (1♂, UBCZ), 17.vi.1968 (1♀, UBCZ), 18.vi.1968 (1♂, UBCZ), 24.vi.1968 (1♂, UBCZ), 26.vi.1968 (1♀, UBCZ), 3.vii.1968 (1♀, UBCZ), 5.vii.1968 (1♂, UBCZ), 9.vii.1968 (1♀, UBCZ), 18.vii.1968 (1♀, UBCZ), 7.ix.1968 (1♂, UBCZ), 31.viii.1968 (1♂, UBCZ), 12.v.1969 (1♂, UBCZ), 11.vi.1969 (1♂, UBCZ), 30.vi.1969 (1♀, UBCZ), 2.vii.1969 (1♂, UBCZ), 11.ix.1969 (1♂, UBCZ), 22.ix.1969 (1♀, UBCZ), 24.ix.1969 (1♂ 1♀, UBCZ), 25.ix.1969 (2♀, UBCZ), 27.ix.1969 (1♂ 1♀, UBCZ), 4.x.1969 (1♂ 3♀, UBCZ), 5.x.1969 (2♂, UBCZ), 22.x.1969 (1♂ 1♀, UBCZ), 1.xi.1969 (1♂, UBCZ), 3.xi.1969 (1♂, UBCZ), 27.ix.1969 (1♀, UBCZ), 3.vi.1970 (1♀, UBCZ), 11.v.1970 (1♀, UBCZ), Chilliwack Lake Road, 800m, 49˚06′N, 121˚36′W, 20.vi.2000, roadside vegetation, sweep, Goulet & Gillespie (2♂, CNC), Manning Provincial Park, Strawberry Flats, 49˚04′00″N, 120˚53′00″, 1651m, 9.vi.2005, Boudreault & Goulet, CNC315769 (1♂, CNC), **QC:** Gatineau Pk., Lac Mousseau, 9.vi.1980, Davies & Rickey (1♂, CNC). **USA. AK:** Chowiet Island (Aleutian), 56˚02′5.82″N, 156˚44′25.14″W, sweeping, prairie meadow, 10.vii.2009, Goulet & Boudreault (2♂, CNC), **ID:** Viola, J.M. Aldrich (1♂, USNM), **OR:** Forest Grove, "12/29.39", M.M. Reeher (1♂, USNM).

Comments. The unusual abdominal pattern and dark pleuron and legs will easily mistake *Liriomyza cordillerana* for *L. septentrionalis* (Figs 107–111), which is also found in abundance in North America. *Liriomyza cordillerana*, however, is more darkly pigmented, the scutum is usually slightly more matt, the acrostichal setulae extend to the first dorsocentral (not anterior to it) and the first flagellomere is less frequently infuscated. The only way to confidently distinguish the two species, however, is to examine the male genitalia, as the distiphallus of *L. cordillerana* is darker with a broader, shallower apical bowl.

The structure of the phallus confirms the identity of the Quebec male, significantly expanding the known distribution of this species. Zlobin (1997) had discovered *Liriomyza cordillerana* in California, Oregon and Washington, which was overlooked by Lonsdale (2011) in his revision of the Californian *Liriomyza*.

***Liriomyza cracentis* spec. nov.**
Figs 256–263

Wing length 1.4mm (♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 4.4. Eye height divided by gena height: 5.8. Scutum shining.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin grey. Head yellow with posterolateral corner of frons, not including base of vertical setae, brown; ocellar triangle, back of head and clypeus brown. Lateral margin of scutum with complete yellow stripe; posterior margin yellow, (thinly between dorsocentral rows) with two pairs of small yellow notches laterally. Lateral corner of scutellum brown. Katatergite brown on posterior margin; anatergite brown on ventral half; mediotergite dark brown. Anepisternum with very small anteroventral spot; anepimeron entirely yellow; meron light brown with dorsum yellow; ventral 2/3 of katepisternum brown, not including base of seta. Legs yellow with tibiae brown, becoming paler to base with pigment on anterior legs weaker, and tarsi light brown with base paler. Abdominal tergites yellow laterally.

Genitalia: (Figs 256–258) Surstylus with two large spines, one apical, one medial. Phallophorus with narrow, elongate dorsal extension. Basiphallus sclerotized along left lateral and dorsal surfaces and with left distal margin produced into long, weakly sclerotized point. Hypophallus well-developed. Paraphallus very narrow. Mesophallus short and thickly sclerotized dorsally; mesophallus and distiphallus with complete ventral suture. Distiphallus clear, cup-like, hollow, slightly widened apically, not much wider than mesophallus but over twice as long, and with several minute, inwardly directed spinules apically.

Variation—"Type 2" males (Fig. 259) differs as follows: wing length 1.8mm; length of ultimate section of vein CuA_1 divided by penultimate section 2.8; eye height divided by gena height approximately 4.2; posterolateral corner of frons entirely yellow; notal pattern similar, but posteromedial margin of scutum brown; tibiae light brown with venter paler and anterior legs lighter; phallus stouter, larger and more heavily sclerotized, with distiphallus slightly higher and wider.

Variation—"Type 3" males (Figs 260–263) differs as follows: wing length 2.0mm; length of ultimate section of vein CuA_1 divided by penultimate section 2.0; eye height divided by gena height 5.2; scutum shining; left side of frons with three ori; posterolateral corner of frons brown to base of outer vertical seta and light brown to base of inner vertical; spot on anepisternum slightly larger. Genitalia as for Type 2 male, but spines of surstylus closer to each other (dorsal spine hidden behind ventral one when viewed ventrally), paraphallus very broad and sickle-shaped, basiphallus longer than wide, and distiphallus narrow and slightly compressed dorsobasally.

Etymology. The specific epithet is Latin for "slender, graceful", in reference to the diagnostic narrow, cup-shaped distiphallus.

Host. Unknown. Possibly *Eutrochium maculatum* (L.) E.E. Lamont (Asteraceae).

Range. Canada. ON[?], QC.

Holotype: Canada. QC: Hull, 15.vii.1960, C.O. Miller, diptera on Euperomum maculata (1♂[with leaf], CNC).

Additional material examined [Type 2]: Canada. ON: Wellington Co., Guelph, 22.v–7.vi.1981, pan traps, K.N. Barber (1♂, DEBU), Guelph, 22.v–7.vi.1981, pan traps, K. Barber (1♂, DEBU).

Additional material examined [Type 3]: Canada. QC: Terrasse-Vaudreuil, Molson Nature Reserve, 45°23.57′N, 73°58.81′W, sweep path in forest, 1.vii.1999, T.A. Wheeler (1♂, LEM).

Comments. Of the three males available, the Hull male was designated as the type for *Liriomyza cracentis* because of its particularly long and slender distiphallus, which is quite distinct and almost certainly unique in the genus. The other males have a similarly slender distiphallus, particularly the type 2 male, but the state is not as distinct as in the type. One pair of spines on each surstylus also readily aid in differentiation from other *Liriomyza* with a similar small, pale phallus.

The two non-type males described above slightly vary in morphology from the holotype, but they are both

tentatively treated as conspecific because they all have a complete or nearly complete yellow line along the posterior margin of the scutum, the head and thorax are relatively pale (Type 3 male more extensively brown in the posterolateral corner of frons and on anepisternum), the legs are relatively pale, the scutum is shining (state indeterminate in Type 2 male), the length of ultimate section of vein CuA_1 divided by the penultimate are similar, and the collection localities are relatively close together. There are also two spines on the surstylus, the left distolateral extension of the basiphallus is pronounced, the basiphallus is carinate ventrally, and the distiphallus is relatively gracile and cylindrical.

The Type 3 male is similar in appearance to *Liriomyza specifica* Spencer, but the spines on the surstylus of this Californian species are both offset and visible ventrally, the swollen section of the ejaculatory duct is shorter and rounder,the mesophallus bulges laterally, and the distiphallus is slightly constricted medially and with no visible spinules on the inner-distal margin.

Liriomyza eboni **Spencer**

Fig. 143

Liriomyza eboni Spencer 1969: 173. Sehgal 1971: 333.

Wing length 1.5mm (♂), 1.6–1.7(♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.5–2.8. Eye height divided by gena height: 3.1–3.8. Scutum nearly shining. First flagellomere longer than high, with apex narrowed and long-haired.

Chaetotaxy: One ors, two ori (one AB male with 3 ori). Acrostichal setulae in two rows.

Colouration: Calypter margin brown. Head yellow with first flagellomere brown, lateral margin of orbital plate brown with extensions to bases of fronto-orbitals, palpus light brown, and ocellar triangle, clypeus and back of head dark brown. Lateral margin of scutum yellow presuturally and brownish postsuturally with brown posterolateral spot. Lateral corner of scutellum brown. Metanotum brown with dorsal 2/3 of katatergite paler. Pleuron brown with dorsal margin of anepisternum yellow and posterodorsal corner paler, anepimeron mottled with yellow and dorsomedial margin of katepisternum light brown. Legs brown with distal half of coxae fading to yellow and apices of femora yellow (only narrowly yellowish on female mid and hind legs). Abdomen brown.

Genitalia: (Fig. 143) Surstylus, epandrium and ejaculatory apodeme similar to those of *L. taraxaci*. Basiphallus sclerotized along dorsal and left lateral surfaces. Hypophallus well-developed. Paraphallus absent. Mesophallus longer than wide, approximately as long as swollen section of ejaculatory duct. Distiphallus slightly longer than mesophallus, with short, narrow basal "stem" and broad, shallow, bilobed apical chamber that is sharply directed dorsally and enclosing paired fringed structures.

Host. Unknown.

Range. Canada. AB.

Holotype: Canada. AB: S. Alta, Blairmore, 26.vi.1966, K.A. Spencer, Type No. 16127 (1♂, CNC).

Additional material examined. Canada. AB: 10mi E Osoyoos, 30.vii.1980, G. Gibson, sweeping *Pinus ponderosa* forest meadow (2♀, DEBU), Writing-on-stone P.P., Sage S, 24–30.viii.1990, M. Klassen (1♂, DEBU),

Comments. See comments for *Liriomyza lathryi*.

Liriomyza edmontonensis **Spencer**

Figs 326–328

Liriomyza edmontonensis Spencer 1969: 174. Sehgal 1971: 333.

Wing length 1.7mm (♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 2.2. Eye height divided by gena height: 3.2. Scutum subshining. Orbital plate slightly projecting.

Chaetotaxy: Two ori, two ors; posterior ori absent on right side of holotype. Acrostichal setulae in four rows.

Colouration: Calypter margin grey. Head yellow with ocellar tubercle, clypeus and back of head dark brown; first flagellomere deeper yellow apically, holotype with faint, narrow infuscation round base of arista; posterior

margin of eye dark brown dorsally with stripe reaching posterior margin of frons and base of inner vertical seta with space between verticals paler brown; orbital plate brown, with lateral stripe narrowing to a point anterior to fronto-orbitals; venter of gena with light brown line that becomes darker posteriorly. Lateral corner of scutellum brown. Metanotum brown with mediotergite darker. Anepisternum brown with broad, irregular dorsal yellow region sometimes reducing brown area to wide ventral stripe; anepimeron mostly brown; meron brown with dorsum yellow; katepisternum brown with yellow dorsal stripe that sometimes encompasses base of seta. Legs yellow with base of fore coxa and basal half of mid and hind coxae brown, femora brown with faint dorsal streaking and anteroventral surface yellow, tibiae brown and tarsi brown with base paler. Abdominal colour unknown.

Genitalia: (Figs 326–328) Surstylus with two subapical spines (one sometimes missing on one side). Epandrium flat along distal margin. Basiphallus sclerotized along left lateral and dorsoapical surfaces. Swollen distal section of ejaculatory duct not narrowed apically. Hypophallus well-developed. Paraphallus dark and narrow. Mesophallus cylindrical, not much longer than wide, and separated from basiphallus and dark section of ejaculatory duct by long membranous section. Distiphallus short and bifid, each branch wider than mesophallus, with strongly tapered base and ring of inwardly-directed spines and curved enclosed fringed process. Ejaculatory apodeme relatively small; blade emerging from gradually widening stalk, pale, with minute transverse striations and dark distal margin.

Host. Unknown.

Range. Canada. AB, BC.

Holotype: Canada. AB: Edmonton, Univ. Campus, 8.vi.1966, Type No. 10410 (1♂, CNC).

Paratype examined: Canada. BC: Chilcotin, 18.vi.1920, E.R. Buckell (1♂, CNC).

Comments. The morphology of the male phallus reveals *Liriomyza edmontonensis* to be a relative of *L. hilairensis* (Figs 337–340) and the polyphagous, and often pestiferous species *L. langei*, *L. huidobrensis* (Figs 333–336), *L. strigata* (Meigen) and *L. bryoniae* (Kalt.)—the distiphallus is split between one pair of short, entirely divided cup-like tubules, the basiphallus is widely separated from the short mesophallus by a long membranous space and the paraphalli are very narrow. It is most similar in appearance to its New World counterparts, although slightly paler, but each branch of the distiphallus is relatively wide and cup-like with the base strongly tapered, not narrower and subcylindrical with a truncated base.

***Liriomyza elevaster* sp. n.**
Figs 149–152

Wing length 1.6–1.8mm(♂), 1.8mm(♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.5–3.3. Eye height divided by gena height: 2.9–3.6. Orbital plate, parafacial and cheek forming shallow ring around eye. Scutum subshining, often with slight greyish to brownish pruinosity.

Chaetotaxy: Two ori (sometimes one on one side), two ors. Acrostichal setulae in two rows (four irregular rows in one Yukon male).

Colouration: Calypter margin brown. Head yellow with clypeus, ocellar tubercle and back of head dark brown, with brownish connection between back of head and tubercle; posterolateral margin of frons brown, with marking not touching base of verticals or eye; first flagellomere deep yellow. Scutum with complete lateral yellow stripe. Katatergite brown posterolaterally; anatergite brown with posterodorsal corner yellow; mediotergite dark brown. Pleuron yellow with large anteroventral stripe on anatergite, anepimeron with some anterior mottling, meron brown with dorsum yellow, and ventral 2/3 of katepisternum brown (not touching seta base). Legs yellow with basal 1/3 of fore and mid coxae brown, hind coxa brownish with basal half darker, femora with dark brown base, fore femur with extensive dorsal mottling, mid and hind femora with small, faint subapical spot, scraper dark brown, tibiae brown dorsally excluding base (tibiae darker on posterior legs), and tarsi brown. Male abdomen yellow with wide dorsal stripe tapering to a large spot on tergite 5, terminalia dark brown; female abdomen dark dorsally to ovipositor.

Genitalia: (Figs 149–152) Surstylus dark, broadly rounded, with small subapical spine posteriorly and with long apical setae; with posterobasal margin produced into broad, dark lobe with spine. Phallophorus cylindrical. Basiphallus narrowly sclerotized along left lateral surface, broadly sclerotized along left lateral and dorsal surfaces

apically; left distal margin produced into dark, sclerotized lobe. Mesophallus dark, cylindrical, with ventral suture continuing onto distiphallus; width approximately half length. Distiphallus slightly shorter than mesophallus, cup-shaped with walls relatively thick, enclosing one pair of small fringed tubules, gradually widening from narrow base, widest subapically. Ejaculatory apodeme large and well-developed with marginal striations; sclerite on sperm pump wide, continuing onto base of duct.

Etymology. The specific epithet compounds the Latin for "raised" (*elevatus*), referring to the mountainous regions the specimens were collected in, and the host genus, *Aster*. It is treated as a noun in apposition.

Host. Asteraceae—*Aster alpinus* L.

Range. Canada. AB, BC, YT.

Holotype: Canada. AB: 11 miles N Jasper, Jasper National Park, 3500–3800′, 30.viii.1973, larva on *Aster alpinus*, emerged 3.vi.1974, G.C.D. Griffiths, J76 (1♂[with puparium], UASM).

Paratypes: Canada. AB: 11 miles N Jasper, Jasper National Park, 3500–3800′, 30.viii.1973, larva on *Aster alpinus*, emerged 17.vi.1974, G.C.D. Griffiths, J76 (1♀[with puparium], UASM), Wildhorse Creek, 51˚39′N, 115˚21′W, 4900′, 15–17.vii.1976, larva on *Aster alpinus*, emerged 4.viii.1976, G.C.D. Griffiths, Y4 (1♂[with puparium], UASM), **BC:** Summit Lake / Stone mountain, near Alaska Hwy. mile 392, 4–8.viii.1970, larva on *Aster alpinus*, emerged 19–25.v.1971, G.C.D. Griffiths, R13 and R27 (1♂ 2♀[with puparia], UASM; 1♂ 1♀[with puparia], CNC), **YT:** Klondike Hwy., 15km S Carmacks, Bushy Mt., (61˚58.2′N, 136˚12.2′W), pan trap on SW facing grass slope, 8–15.vii.1998, S. Boucher (1♂, LEM), (61˚58′N, 136˚12′W), 16–24.vi.1997 (2♂, LEM), Klondike Hwy., 26.3km S Carmacks, (61˚53′N, 136˚07′W), sweep on SW facing grass slope, 15.vi.1997, T.A. Wheeler (1♂, LEM).

Comments. *Liriomyza elevaster* belongs to the widespread lineage defined by a dark, cylindrical mesophallus and an additional dark bar-like sclerite within the epandrium at the base of the surstylus. This group also includes *L. taraxaci* (Figs 168–178), *L. togata* (Figs 201–204) and *L. minor* (Figs 179–181), but none of these have the left lateral margin of the basiphallus produced into a small, dark rounded lobe, the mesophallus is longer, and the distiphallus is differently proportioned. These other species can be further differentiated by a ventral suture of the distiphallus that is interrupted/separated apically by a small, shield-like process, and usually four rows of acrostichal setulae. Other species with a similar distiphallus and a short mesophallus, such as *L. apilaca* (Figs 158, 159) and *L. taraxanox* (Figs 160, 161), differ externally, and have the ventral suture of the distiphallus divided apically by a projecting sclerite that is ovate to heart-shaped.

***Liriomyza emaciata* sp. n.**
Figs 228–231

Wing length approximately 1.4–1.6mm (♂). Female unknown. Vein dm-cu absent. Eye height divided by gena height: 3.5–3.6. Scutum subshining. First flagellomere small and with slightly longer hairs along anterior margin.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four rows.

Colouration: Head yellow with back of head, occiput, ventral line on gena and clypeus dark brown; ocellar spot broad and triangular, contiguous with spot on back of head; posterolateral corner of frons dark brown to base of inner vertical, continuing anteriorly as narrow line along margin of eye to level of anterior ori; first flagellomere light brown; face with brown tint. Scutum dark brown with lateral margin yellow anterior to transverse suture, brownish to brown behind wing base. Pleuron dark brown with dorsal margin of katepisternum sometimes yellowish. Legs yellow with coxae dark brown with apex of fore coxa yellowish, fore femur brown with apex and venter on distal 2/3 yellow, mid and hind femora as for fore femur but venter only yellow apically, tibiae and tarsi dark brown. Abdomen dark brown.

Genitalia: (Figs 228–231) Surstylus with one large subapical spine. Ejaculatory duct gradually widening to elongate swollen section. Basiphallus sclerotized along left lateral and dorsomedial to distal surfaces. Hypophallus laterally compressed and with several short apical hairs. Paraphallus directed distoventrally, scimar-like. Mesophallus dark (mostly base and dorsum), strongly bulging lateromedially, slightly angled dorsally and fused to distiphallus; with very long, narrow ventrobasal carina projecting from base. Distiphallus relatively small and cup-like, with moderate pigmentation, enclosing one pair of small weak processes, inner-ventral surface minutely textured. Ejaculatory apodeme with well-developed stem and broad blade that is mostly pale excluding dark margin; sclerite on sperm pump broad and well sclerotized, particularly along lateral margin.

Variation: One male with femora brown excluding yellow apex, anepisternum yellowish dorsally, first flagellomere dark brown, and orbital plate brown behind posterior ors; wings broken, missing.

Etymology. The specific epithet is Latin for "waste away", in reference to atrophy of vein dm-cu.

Host. Unknown.

Range. Canada: BC.

Holotype: CANADA. BC: Mt. Kobau, 49˚05.376′N, 119˚37.834′W, 23.v.2005, fallow field, Goulet & Boudreault, sweep (1♂, CNC).

Paratypes: CANADA. BC: Same data as holotype (3♂, CNC).

Comments. *Liriomyza emaciata* is known from a single collecting event in southern British Coloumbia at Mt. Kobau. It is an unusually dark species on the thorax and legs, and the male genitalia are notable in having a laterally compressed hypophallus, a small, dark cup-like distiphallus, and a dark mesophallus that is strongly bulging lateromedially and has a long, projecting ventrobasal carina.

***Liriomyza equiseti* De Meijere**

Figs 94–97

Liriomyza equiseti De Meijere 1924: 124. Spencer 1972: 58, 1976: 249, 1990: 6; Lonsdale 2011: 43.
Liriomyza kenti Spencer 1969: 176. Sehgal 1971: 334. Syn. Spencer (1990).

Wing length 1.6–1.8mm (♂♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.9–2.3. Eye height divided by gena height: 3.2–3.7. Scutum heavily dusted but not grey. Parafacial and orbital plate slightly projecting. First flagellomere relatively large, not subquadrate, as stated by Spencer (1969).

Chaetotaxy: Two ori, two ors. Acrostichal setulae in two to three sparse irregular rows.

Colouration: Calypter margin grey. Head (including clypeus) light yellow with back of head and ocellar triangle dark brown, and posterolateral corner of frons dark brown to base of outer vertical seta and dark brown to yellowish to base of inner vertical seta. Scutum with complete lateral yellow stripe. Scutellum yellow with lateral corner brown. Katatergite yellow; anatergite brown with dorsum becoming yellow; mediotergite dark brown. Anepisternum with small brown anteroventral stripe; anepimeron yellow with brown mottling; meron brown with dorsum yellow; katepisternum brown on ventral 2/3 (not including base of seta). Legs yellow with base of coxae, tibiae and tarsi brown. Epandrium and dorsum of pregenitalic abdomen brown.

Genitalia: (Figs 94–97) Surstylus with setae and one spine apically. Basiphallus with left lateral and anterodorsal surfaces sclerotized. Swollen apical section of ejaculatory duct broad and short. Paraphallus absent. Hypophallus with broad membranous base and long hairs. Mesophallus tapering apically, fused to distiphallus and with narrow and strongly projecting, slightly curved ventrobasal process. Distiphallus with broad, pale, bowl-like base and long, clear distal tubules that become darker basally; tubules bent dorsally at midpoint, abruptly separated on inner-basal margin and shielded ventrally by short bilobed plate. Ejaculatory apodeme with sclerite on sperm pump broad with ends truncated and thick; blade pale with pointed corners and faint apical striations.

Host. Equisetaceae—*Equisetum arvense* L.

Range. USA. AK*, CA. **Canada.** AB, BC, MB*, NT*, ON*, QC*, YT*. Europe.

Syntypes [*equiseti*]: Netherlands. Haarlem, "Stengelmine an Equisetum arvense" (type information unknown). [Not examined]

Holotype [*kenti*]: Canada. BC: Prince George, 18.vi.1966, K.A. Spencer, Type No. 16128 (1♂, CNC).

Paratype examined [*kenti*]: Canada. AB: Jasper, 19.vi.1966, [illegible], K.A. Spencer (1♂, CNC).

Additional material examined. Canada. AB: Athabasca, 30.v.1961, A.R. Brooks (1♂, CNC), Banff N.P., Storm Mountain, low alpine dry slope, adjacent to train track and Bow River, 1455m, BIOBus, 20.vi.2012, BIOUG03507-F01, BIOUG03526-A12, BIOUG03497-B12 (3♂, CNC), **BC:** Kinbasket Lake, BC Hydro drawdown study, Cooper, Beauchesne & Assoc. Ltd., Malaise trap, 12.vi.2010 (5♂ 2♀, CNC), Malaise trap, 21.vi.2010 (1♂, CNC), pan trap, 29.vii.2010 (2♂, CNC), **MB:** 20km E Anola, Brokenhead R., (49˚53.1′N, 96˚22′W), sweep along river edge, 10.vi.1999, T.A. Wheeler (1♂, LEM), **NT:** Muskox, 64°45'N, 108°10'W, 5.vi.1953, J.G. Chillcott (1♂, CNC), Yellowknife, Rd. nr. Stock Lake, 16.vi.1966, G.E. Shewell (1♂, CNC), Norman Wells, 23.vi.1969, G.E. Shewell (1♂, CNC), **ON:** Thornhill, 30.v.1964, J.R. Vockeroth (1♂, CNC), **QC:** Port Ryerse, 1.vi.1956, 42°45′, 80°15′, J.R. Vockeroth (1♂, CNC), **YT:** North Fork Crossing, Mi43, Peel Pit Rd., 3500′, 4.vii.1962, P.J. Skitsko (1♂, CNC). **USA. AK:** Chilkat Peninsula near Haines, 28–30.vi.1968, larva on

Equisetum arvense, emerged 13.ix.1968, G.C.D. Griffiths, H14 (1♂[with puparium], UASM), Fairbanks, 13.vi.1952, J.B. Hartley (1♂, CNC).

Comments. *Liriomyza equiseti* was originally described from Europe on its host plant, the field horsetail, but it is also widespread in North America, although uncommonly encountered. Unlike most other pale species with a grey pruinose scutum and few acrostichal setulae, the outer vertical seta touches the lateral brown spot, and the male genitalia are unmistakable—the distiphallus has a broad, smooth, shallow bowl basally and one pair of long clear apical tubules that are shielded ventrally by a small bilobed plate, the mesophallus has a long ventral carina and the paraphalli are absent.

Liriomyza eupatorii (Kaltenbach)

Figs 17, 26, 264–270

Agromyza eupatorii Kaltenbach 1874: 320.
Liriomyza eupatorii. Hendel 1920: 143, 1931: 217; Frick 1959: 404; Spencer 1969: 174, 1976: 245 [syn. *orbitella*, designation of *orbitella* lectotype], 1981: 230; Sehgal 1971: 333; Spencer & Steyskal 1986: 129; Lonsdale 2011: 46.
Liriomyza orbitella Hendel 1931–1936: 236. Syn. Spencer (1976).

Description. Wing length 1.7–2.2mm (♂), 1.9–2.0mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.0–2.7. Eye height divided by gena height: 3.0–4.4.

Chaetotaxy: (Fig. 17) Two ori (sometimes three on one side), two ors. Acrostichal setulae in four irregular rows.

Colouration: (Fig.26) As described for *L. sativae* except as follows: lateral margin of frons brown (not encosing fronto-orbitals) if first flagellomere brownish on distal margin; only base of hind femur sometimes brown dorsally, or in western North America, femora brown basally and with light dorsoapical mottling (rarely with more extensive pigmentation), but less commonly with only basal markings or entirely yellow; yellow posterolateral spots on scutum sometimes large and distinct; anepisternum dark along anteroventral and ventral margins, sometimes with spot reaching base of anepisternal seta.

Genitalia: (Figs 264, 269, 270) Epandrium and surstylus as for *L. sativae*. Basiphallus sclerotized along dorsoapical, left lateral and part of right lateral surfaces. Paraphallus narrow. Hypophallus small, narrow and strongly curved. Mesophallus half width of distiphallus; mesophallus and distiphallus with complete ventral suture. Distiphallus broadly bell-shaped with sides slightly converging apically and basal margin thick and truncated. Ejaculatory apodeme with stalk narrow and blade broad with dark distal margin.

Variation: See comments section.

Hosts. Asteraceae—*Baccharis halimifolia**, *Eupatorium*, *Galeopsis*, *Lapsana*, *Solidago*, *Symphyotrichum chilense* (Nees) G.L. Nesom var. *chilense* (Benavent-Corai *et al*., 2005), *Xanthium strumarium* L. (Lonsdale 2011), *Symphyotrichum puniceum* (L.) Á. Löve & D. Löve var. *puniceum** [=*Aster puniceus*]. Possibly *Callistephus* (Asteraceae). The BC record below lists "raspberry" as the host for the specimen, but because *L. eupatorii* has never previously been found on Rosaceae, including this important specialty crop, it is likely that the association is incorrect.

Range. Canada: AB, BC*, MB*, NB*, NS*, ON, QC, SK*. **USA:** CA, DE*, GA, MA*, MI*, MS, MT, NC, PA*, SC, TN, VA, WA, WN*, WV*. Europe.

Syntypes [*eupatorii*]: Austria [not given]. [Lost]

Lectotype [*orbitella*]: Finland. Esbo (1♂, NMW).

Additional material examined. Canada. AB: Elk Island National Park, 4.viii.1971, larva on *Aster puniceus*, emerged 19.viii.1971, G.C.D. Griffiths, E129 (1♂[with puparium], UASM), Elkwater L., O. Peck, 20.vii.1956 (1♂, CNC), 21.vii.1956 (2♂, CNC), Kananaskis Sheep River P.P., Sandy McNabb camp, 50°38.27′N, 114°31.7′W, sweep open forest and grasses, 28.vi.2003, S. Boucher (1♂, LEM), Kananaskis, Sheep River P.P., Blue Rock cmpgrnd, 50°36.6'N, 114°43.4'W, sweep, 29.vii.2003, V. Dion (1♀, LEM), **BC:** Huntingdon, 8.viii.1957, N.V. Tonks, host: raspberry (1♂, CNC), 6mi W Terrace, Gagnon Rd., 13.vii.1960, G.E. Shewell (1♂, CNC), Robson, 26.vi.1969, H.R. Foxlee (1♂, UBCZ), **MB:** Kouchibouguac N.P., J.F. McAlpine, 9.vii.1977 (2♂, CNC), 12.vii.1977 (1♀, CNC), 13.vii.1977 (1♂, CNC), Kouchibouguac N.P., Hanley & Cooper, 22.v.1977 (1♀, CNC), 23.v.1977 (1♂ 2♀, CNC), **NB:** St. Andrews, 24.vii.1978, S.A. Marshall (1♂, DEBU), Chamcook, Glebe Road,

28.vi.1965, G.E. Shewell (1♂, CNC), **NS:** CBHNt Pk., Pleasant Bay, 11.vi.1984 (1♂, CNC), CBHNt Pk., North Mt. bog, 400m, 3.vi.1984, B.E. Cooper (1♂, CNC), CBHNt Pk., Mackenzie Mtn. 400m, 31.v.1984, birch & fir, B.E. Cooper (1♂, CNC), **ON:** Algonquin P.P., Swan Lk. Stn., 45°29′15″N, 78°43′20″W, Scott Lk. Survey, Malaise trap, shore or sphagnum and/or leatherleaf, 12–16.vii.1993 (1♂, DEBU), 19–28.vi.1993 (2♀, DEBU), 3–14.vi.1993 (5♀, DEBU), 1–10.vii.1994 (1♂ 4♀, DEBU), 7–14.vi.1994 (3♂ 10♀ 1?, DEBU), 23–30.vi.1994 (2♀, DEBU), 18–31.vii.1994 (1♀, DEBU), 15.viii.1994 (1♀, DEBU), Belwood, 19.vi.1972, D.H. Pengelly (2♂, DEBU), Mountsberg Cons. Area, mixed forest, 15.viii.1993, D.C. Caloren (1♂, DEBU), Wainfleet Bog, 8km S Welland, 14–20.vi.1988, A. Stirling (1♂, DEBU), Mer Bleue, 5mi E Ottawa, Malaise trap, D.D. Munroe, 14.viii.1966 (1♂, CNC), 16.viii.1966 (1♂, CNC), Ottawa, Dow's swamp, 5.vii.1947, W.R.M. Mason (1♂, CNC), Ottawa, J.R. Vockeroth, 9.vi.1958 (1♂, CNC), 22.vi.1963 (1♂, CNC), Ottawa, Green V. M[?], 17.vii.1967, K.A. Spencer (1♂ 1♀, CNC), Port Ryerse, 1.vi.1956, 42°45′, 80°15′, J.R. Vockeroth (1♂, CNC), 2mi N Metcalfe, 28.vi.1962, B.E. Cooper (1♂, CNC), 7mi E Griffith, 10.vii.1983, B.E. Cooper (1♂, CNC), Go Home Bay, 8mi W of Bala, 28.v.1959, J.G. Chillcott (1♂, CNC), Brighton, 7.vi.1954, J.C. Martin (1♂, CNC), Midland, 12.v.1959, J.G. Chillcott (1♂, CNC), Marmora, 5.vii.1952, J.R. Vockeroth (1♂, CNC), Essex Co., Windsor, Ojibway Prairie, sweeps, 16.vi.2001, S.A. Marshall (1♂, DEBU), Windsor, Ojibway Prairie, burnt savannah, yellow pans, 15–19.vi.2001, S. Paiero (1♂, DEBU), Windsor, ~1.5km S Ojibway Prairie, forest-prairie edge, Malaise, 30.vi–17.vii.2001, P. Pratt (1♀, DEBU), Windsor, ~1.5km S Ojibway Prairie, forest-prairie edge, Malaise,15.v–1.vi.2001, S. Paiero (1♂, DEBU), Windsor, ~1.5km S Ojibway Prairie, 5–12.vi.2001, private prairie, Malaise, S. Paiero (1♂, DEBU), Wellington Co., Guelph, U of G Arboretum (south), 15.v.1993, D.C. Caloren (2♂ 4♀, DEBU), Guelph, U of G Arboretum (south), Malaise trap at edge of of pine forest / orchard, 3–7.vii.1993, D.C. Caloren (1♂, DEBU), Guelph, 8.vi.1991, U of G Arboretum, sweep net, M. Montes-Castillo (2♂ 2♀, DEBU), Guelph, vii.1965, C.J. Edwards (1♂, DEBU), Wellington Co., Smith Property Trail nr. Arkell, 43°32'55"N 80°11'0"W, 23.vi.2015, O. Lonsdale, CNC441123, CNC441127, CNC441136, CNC441142 (2♂ 2♀, CNC), Bruce Co., Devil's Monument, 30.v.2000, forest, sweep, J.J. Dombroskie (1♂, DEBU), trail to Devil's Monument, 30.v.2000, through forest, sweep, C.S. Onodera (1♂, DEBU), Dorcas Bay Dunes, Malaise, S.A. Marshall, 2–25.viii.1999 (1♂, DEBU), 25.viii–1.ix.1999 (1♀, DEBU), Algoma Distr., Hilton Beach, 46°15′N, 83°53′W, 5.vii.1992, edge of hardwood forest & field, Malaise, J.E. Swann (1♂, DEBU), Kent Co., Rondeau P.P., South Point Trail, nr. east parking lot, 42°15′42″N, 81°50′49″W, *Typha* stand, Mal., 29.v–10.vi.2003, S.A. Marshall (2♂, DEBU), Rondeau P.P., South Point Trail, nr. east parking lot, 42°15′42″N, 81°50′49″W, savannah, Mal., 16–29.vii.2003, S.A. Marshall (1♀, DEBU), Rondeau P.P., South Point Trail, east parking lot, 42°15′42″N, 81°50′49″W, oak savannah, 10.vi.2003, S.A. Marshall (6♂ 2♀, DEBU), Bruce Pen. N.P., Dorcas Bay, Singing Sands, 45°11′N, 81°35'W, swp shore, 2.vii.2001, M. Pollet (5♂, LEM), Bruce Co., 5km N Dyer's Bay, waterfall at mouth of marble bedded lake, 2.vii.2001, M. Pollet (3♂, LEM), Sudbury, Twin Forks Park, sweep along Junction Creek, 6.vii.2001, J. Forrest (1♂, LEM), Baptiste Lake, 45°10′N, 78°00′W, sweep at edge of forest, 23.vii.2000, J. Forrest (1♂ 1♀, LEM), Wellington Co., Guelph, Stone Rd. E, R.A. Cannings, 4.vii.1992 (1♂, RBCM), 5.vii.1992 (1♂, RBCM), Baptiste Lake, (45°10′N, 78°00′W), sweep old railway line, clearings in forest, 15.vii.2001, J. Forrest (2♂, LEM), **QC:** Laniel, 3.vii.1914, A.R. Brooks (1♂, CNC), Gatineau Pk., Harrington Lk., 7.vi.1954, W.R. Richards (1♂, CNC), Mt. Oxford, 1200′, 5.vi.1963, J.R. Vockeroth (1♂, CNC), James Bay Rte. km204.5, 50°58′59″N, 77°38′02″W,, black spruce/sphagnum, Malaise, 7–16.vii.2001, M.&B. Buck (6♂ 5♀, DEBU), James Bay Reg., Chisasibi Rd. km78.9, 53°42′42″N, 77°53′03″W, sphagnum bog, yellow pans, 11–14.vii.2001, M.&B. Buck (1♂, DEBU), James Bay Rte. km307, Pontax II River, 51°43′31″N, 77°25′27″W, open black spruce, yellow pans, 8–16.vii.2001, M.&B. Buck (1♂, DEBU), Fortillon N.P., Grande-Grave, 48°46′N, 64°12′W, swp path in forest, 16.viii.2001, H. Varady-Szabo (5♂, LEM), Hudson, Parc Lévy MacDonald, 45°27′N, 74°09′W, sweep nr stream, 6.viii.2000, S.E. Brooks (1♂, LEM), Pointe Fortune Cons. Area, 45°34'N, 74°23'W, sweep, 7.vii.1999, S.E. Brooks (1♂ 1♀, LEM), Lac St-Francois Nat. Wildl. Area, marais Fraser, 45°02.40′N, 74°28.03′W, *Carex* meadow, sweeping, 05.vii.1999, F. Beaulieu (1♂, LEM), Ste-Anne-de-Bellevue, Stoneycroft Pond, 45°25.8′N, 73°56.4′W, sweeping grass, 26.vii.2000, J. Forrest (1♂, LEM), Ste-Anne-de-Bellevue, Morgan Arboretum, 15.vii.2008, C. Borkent (1♂, LEM), **SK:** Saskatoon, 13.v.1949, A.R. Brooks (1♂, CNC). **England.** Chippenham Fen, Camb. Em. 23.vii.1954, Eup. Cann., "8.7.1954", K.A. Spencer (1♂, CNC). **Germany.** Mine aus *Eupatorium cannabium*, Crossen a.O, 10.x.1934, No. 3877, Hering: Z, coll. Hypon, M. Hering (1♂, CNC). **USA. DE:** New Castle Co., Newark, viii.1990, C. Bartlett (1♂, USNM), **GA:** Robun Co., Addie Branch, E. Fork Chattooga River, 2400', 1.viii.1957, J.G. Chillcott (1♀, USNM), **GA:** Rabun Co., Rabun Bald, 3000′, 14.vii.1957, J.G. Chillcott (2♀, CNC), Rabun

Bald, 4600', 9.viii.1957, J.G. Chillcott (1♀, CNC), Rabun Bald, 4700′, 16.vii.1957, J.G. Chillcott, "top" (1♂, CNC), **MI:** Mio, 29.v.1937, H. Milliron (3♂ 3♀, USNM), Shelby, 12.vi.1938, C.W. Sabrosky (2♀, USNM), Emmet Co., Carp L., 16.vii.1938, C.W. Sabrosky (1♀, USNM), Lapeer Co., 30–31.v.1937, C. Sabrosky (12♀, USNM), **NC:** Highlands, 3800', 12.v.1957, J.R. Vockeroth (1♂, CNC), Highlands, 3800′, 17.viii.1957, J.G. Chillcott (1♂, CNC), **PA:** Union Co., Lewisburg, 26.viii.1981, J.R. Vockeroth (1♂, CNC), **SC:** Aiken, 12.vi.1957, J.R. Vockeroth (1♂, CNC), **TN:** East Ridge, O. Peck, 6.v.1952 (2♂ 2♀ 1?, CNC), 9.v.1952 (3♀, CNC), **VA:** Brush Mt., 2800', Blacksburg, 27.v.1962, J.G. Chillcott (1♂ 1♀, CNC), Shenandoah Co., Mt. Jackson, 25.v.1962, J.G. Chillcott (1♀, CNC), Hawksbill, Shenendoah N.P., 3600–4050′, J.G. Chillcott, 7.vi.1962, J.R. Vockeroth (1♀, CNC), **WN:** Yakima Co., Donald, 25.v.1949, ex. larva *Asclepias*, Torr. Lot No. 210-1 (1♂, USNM), **WV:** Jefferson Co., Shenandoah Jct., abandoned orchard, on apple tree, 17.v.1984, C.R. Loerch[?] (1♂, USNM), Pendleton Co., Spruce Knob, summit, 4.vii.1983, G.F. & J.F. Hevel (1♀, USNM).

Comments. While *Liriomyza eupatorii* is relatively variable in external colouration, it is slight differences of the male phallus that might be indicative of the presence of additional cryptic species. Two males most likely to represent such a novel species are from Elkwater Lake (20.vii.1956, O. Peck) and Saskatoon. Not only is the gena much shallower (eye 5.0–5.6 times higher) and the distal half of first flagellomere orange in the Elkwater male, but the orbital plate is brownish laterally, extending to the base of the posterior three fronto-orbital setae. The phallus differs in that the mesophallus is narrow and the distiphallus is almost entirely transparent and with the enclosed paired processes emerging from the dorsal (not basal) wall (Figs 267, 268). Apart from these, a minority of males from across the geographic range of this species have a more slender distiphallus base (i.e. not as broad or abruptly truncated) (Figs 265, 266), a yellow orbit, entirely yellow femora and a more shallow gena, but the separate specific status of these specimens is more questionable.

Liriomyza eupatorii is most likely to be mistaken for *L. sativae*, which is very similar in external appearance and genitalic morphology, but the wing is larger, the distiphallus is longer and wider (ventral view), and it is more likely to be encountered in areas less affected by human development and agriculture.

***Liriomyza flaveola* (Fallén)**

Figs 112–121

Agromyza flaveola Fallén 1823: 6.
Liriomyza blanda Meigen 1830: 187. Syn. Martinez in Spencer & Martinez (1987).
Liriomyza albicornis Meigen 1838: 401. Syn. Martinez in Spencer & Martinez (1987).
Agromyza variegata Meigen. Misidentification. Meigen 1838: 402.
Liriomyza flaveola. Hendel 1920: 142, 1931–36: 219; Frick 1952a: 403; Spencer 1976: 246; Zlobin 2002: 156; Černý 2013: 218.

Wing length 1.9–2.4mm (♂), 2.2–2.6mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.7–2.6. Eye height divided by gena height: 4.2–4.8. Scutum subshining.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin brown. Head yellow with ocellar triangle, back of head and clypeus dark brown; posterolateral corner of frons dark brown to space between vertical setae or base of inner vertical; distal 2/3 of first flagellomere darker yellow and most males and some females with infuscation around outer and basal margins of base of arista; venter of gena with light brown line. Lateral margin of scutum with complete yellow stripe; scutellum brown in lateral corner. Katatergite brown posteroventrally; anatergite brown with dorsum yellow; mediotergite dark brown. Ventral 2/3 of anepisternum brown, sometimes with brown region more extensive on anterior half; anepimeron with brown spots that are sometimes paler posteriorly; meron brown with dorsum yellow; katepisternum brown ventral to base of seta. Basal 1/3 of fore coxa, basal half of mid coxa and most of hind coxa brown; remainder of legs brown with base of fore tibia, apices of femora and distoventral surface of fore femur yellow; distoventral surface of mid and hind femora sometimes also yellow. Abdomen broadly yellow laterally, especially on tergites 1–3.

Genitalia: (Figs 115–118) Epandrium without spine. Surstylus-like process weakly sclerotized, small and without setae or spines. True surstylus absent. Basiphallus dorsally fused to phallophorus, thickly sclerotized laterally, and with one pair of long, flat anterolateral extensions. Hypophallus large, well-developed and fused to

mesophallus and with apical tuft of long hairs. Mesophallus fused to distiphallus, cylindrical. Basal stem of distiphallus as long as, and perpendicular to mesophallus; apical bowl nearly as long as stem and with inner surface lined with relatively large spines, with one pair of dark, medial, protruding processes, and with small anteroventral plate not emerging from between ventral suture.

Variation—North America: (Figs 119–121) Males from BC and most males from AK larger than those described above (wing length 2.8–2.9mm), and further differ as follows: base of inner vertical surrounded by yellow; first flagellomere entirely yellow (ie. without infuscation around arista base); distiphallus narrower (seen laterally) with point of attachment between stem and bowl narrower; seen ventrally, apical bowl more tapered towards stem, darker, and with paired strips on medial anteroventral plate darker and strongly diverging. Females, currently unknown, are expected to be inseparable from females of the related species *L. septentrionalis* and *L. cordillerana*. Male from Big Delta, AK, with wing length 2.3mm, femora yellow with limited streaking, remainder of legs paler and katepisternal seta broadly surrounded by yellow.

Variation—Europe: (Figs 112–114) Wing length 1.9–2.6mm (♂), 2.6–2.8mm (♀); length of ultimate section of vein CuA_1 divided by penultimate section: 1.9–2.3; eye height divided by gena height: 4.7–5.6; 1 or 3 ori sometime present on one side of head; katepisternum sometimes brown to base of seta; anepisternum with narrow to relatively broad brown oblique stripe anteroventrally; legs brown with venter of fore and mid coxae yellow, and apices of femora yellow; if fore tibia with light yellow mottling, then femora yellow distoventrally and katatergite and anatergite yellower; hypophallus slightly larger; apical bowl of distiphallus rounder in ventral view, slightly larger, and with medial anteroventral plate desclerotized and not strongly protruding.

Host. Poaceae—*Avena*, *Bromus*, *Dactylis*, *Holcus*, *Hordeum*, *Milium*, *Poa* (Benavent-Corai *et al.* 2005).

Range. Canada. AB*, BC*, NL*, NS*, NT*, ON*, SK*, YT* (all previous Nearctic records misidentifications). **USA.** AK*. Widespread in Palaearctic (Černý, 2013): Andorra, Austria, Belarus, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, India, Ireland, Italy, Japan, Kuril Islands, Latvia, Lithuania, Monaco, Netherlands, North Korea, Norway, Poland, Portugal, Republic of Montenegro, Russia, Slovakia, Spain, Sweden, Switzerland, Turkey, United Kingdom, Uzbekistan.

Syntypes: Sweden. (?♂ ?♀, NHRS). [Not examined]

Additional material examined. Austria. Tirol: Zwieselstein, 1400m, 24.viii.1953, J.R. Vockeroth (1♂ 2♀, CNC), Obergurgl, 1950m, J.R. Vockeroth, 20.vii.1953 (1♀, CNC), 18.viii.1953 (1♂, CNC), Igls, 900m, J.R. Vockeroth, 28.vi.1953 (1♀, CNC), 7.vii.1953 (1♀, CNC), 12.ix.1953 (1♀, CNC). **Canada. AB:** Banff, 12.vii.1928, Bow River, 4500′, O. Bryant (1♂, USNM), **BC:** Summit Lake, Mi392 Alaska Hwy, 4200′, R.E. Leech, 21.vii.1959 (1♂, CNC), 31.vii.1959 (1♂, CNC), Terrace, C.H. Mann, 10.vi.1960 (2♂ 2♀, CNC), 16.vi.1960 (1♂, CNC), 21.vi.1960 (1♂, CNC), Terrace, 23.vi.1960, W.W. Moss, 220′ (1♂, CNC), Atlin, 2200′, 3.viii.1955, B.A. Gibbard (1♂, CNC), **NL:** 2km N L'Anse Au Clair, 29.vi.1983, in hilltop scrub (1♂, CNC), **NS:** S Harbour Bch., 24.vi.1983, J.R. Vockeroth (1♂, CNC), CBHNt Pk., Middle Head, spruce poplar wood with *Ranunculus*, J.R. Vockeroth, 24.vi.1983 (4♂ 1♀, CNC), 6.vii.1983 (1♂, CNC), CBHNt Pk., Middle Head, 24.vi.1983, mixed dry mesophytic wood, J.R. Vockeroth (1♂, CNC), **NT:** Tuktoyaktok, 69°26.322′N, 133°01.171′W, *Salix* meadow, MT, 16–18.vii.2010, Goulet & Boudreault (1♂, CNC), **ON:** Iroquois Falls, 26.vi.1987, J.R. Vockeroth (1♂, CNC), Iroquois Falls, 29.vi.1987, swept along small cold mossy stream, J.R. Vockeroth (1♂ 1♀, CNC), **SK:** Hudson Bay, 15.ix.1959, J.R. Vockeroth (1♂, CNC), **YT:** Alaska Hwy. Slims R. delta along Sheep Cr. Rd. km1706, 60°59′N, 138°34′W, Malaise trap, 10–12.vi.1979, ROM Fld. Pty. (1♂, ROM). **England.** Hampstead, K.A. Spencer, 9.vi.1964 (1♀, CNC), 6.vi.1955 (1♀, CNC), Oxford, 13.v.1953, J.R. Vockeroth (1♀, CNC), Slindon, Sx., 18.vii.1951, G.E. Shewell (1♀, CNC), Yorkshire, 1889, A.J. Chitty (2♀, CNC), Newcastle-u-Lyme Staffs, J.R. Vockeroth, 3.vi.1960 (2♂ 2♀, CNC), 6.vi.1960 (3♀, CNC), Devon: Dawlish Warren, 25.viii.1960, J.R. Vockeroth (2♀, CNC), Heathfield, J.R. Vockeroth, 2.ix.1960 (2♀, CNC), 7.ix.1960 (2♀, CNC), Clennon Valley, Paignton, J.R. Vockeroth, 8.viii.1960 (2♀, CNC), 28.viii.1960 (1♂ 4♀, CNC), Haytor, Dartmoor, 1300′, J.R. Vockeroth, 22.vi.1960 (1♀, CNC), 9.ix.1960 (3♂ 3♀, CNC), Torquay, J.R. Vockeroth, 25.vi.1960 (3♀, CNC), 22.viii.1960 (1♀, CNC), Sussex: Middleton on Sea, 22.vi.1941 (1♀, CNC), Slindon, 18.vii.1951, G.E. Shewell (1♀, CNC). **Ireland.** Cork Co., nr. Baudon, 25.vii.1970, K.A. Spencer (1♀, CNC). **Sweden.** Lappland: Abisko, J.R. Vockeroth, 12.viii.1951 (1♀, CNC), 20.viii.1951 (3♀, CNC), Skåne: Kullaberg, H. Anderson, 2.viii.1969 (1♂, CNC), 11–15.viii.1957 (1♀, CNC), Tjörnarp, 22.vi.1941, T. Nyholm (1♀, CNC), Ringsjön, 26.ix.1963, Gräsmark, H. Andersson 1735 (1♂, CNC). **USA. AK:** Big Delta, 18.vi.1951, W.R.M. Mason (1♂, CNC), Unalakleet, 7.vii.1961, B.S. Heming (1♂, CNC).

Comments. The European representatives of *Liriomyza flaveola* examined are mostly uniform in appearance, contrasting the Nearctic material examined, which vary significantly in colour pattern and exhibit slight differences in phallic morphology. These Nearctic specimens may constitute one or more separate species, at least in part, and boundaries should be re-evaluated when additional data are available.

While many Nearctic *Liriomyza* identified as *L. flaveola* have been found in collections and sometimes reported in the literature, almost all specimens examined by the author have proven to be *L. septentrionalis*. USNM specimens of *L. flaveola* also contained two individuals of *L. cordillerana* from Oregon and Idaho, one *L. sativae* from California and one *Phytoliriomyza conspicua* from Saskatchewan; ten females from Alaska, California, Idaho, Pennsylvania, Utah and Washington could not be confidently identified. *Liriomyza septentrionalis* can be distinguished from Nearctic *L. flaveola* by having a darker anepisternum and a characteristic distiphallus with a very large apical bowl, but European *L. flaveola* also have dark legs with narrowly yellow knees. Frick (1952) reportedly reared *L. flaveola* from *Hordeum murinum*, *Lolium multiflorum* and *Bromeus carinatus* in California, but these were also likely rearings of *L. septentrionalis*, which is extremely abundant in that state.

Frick's uncertain synonymy of *Liriomyza pictella* with *L. flaveola* is not followed here, following Spencer (1981) and Lonsdale (2011), who restricted known *L. pictella* to the Californian holotype. Spencer (1965) also clarified the identity of *A. scutellata* Fallén, considered an uncertain synonym of *L. flaveola* by Frick (1952), treating it as a junior synonym of *Metopomyza flavoscutellaris* Fallén.

Liriomyza fricki **Spencer**

Figs 3, 18, 71–74

Liriomyza fricki Spencer 1965: 35. Spencer 1969: 175; Sehgal 1971: 333; Spencer & Steyskal 1986: 136; Scheffer *et al.* 2007: 772; Lonsdale 2011: 49.

Description. Wing length 1.3–2.0mm (♂), 1.4–1.8mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.7–3.5. Eye height divided by gena height: 3.0–4.2, sometimes up to 5.1 in Canadian specimens. Scutum lightly dusted with pruinosity.

Chaetotaxy: (Fig. 18) Two ori (anterior seta small to absent), two ors. Acrostichal setulae in two rows (sometimes three anteriorly).

Colouration: (Fig. 3) Calypter margin brownish. Head yellow with posterolateral margin of frons lateral to (and not touching) vertical setae yellow to brown, back of head brown dorsally, ocellar tubercle brown and clypeus brown to light brown with centre yellow. Scutum with complete lateral yellow stripe broadly overlapping margin of scutellum. Scutellum yellow with lateral corner brown. Katatergite yellow; anatergite sometimes brownish ventrally; mediotergite dark brown. Pleuron yellow with large spot on katepisternum and meron, and with small (sometimes very faint to indistinct) anteroventral spot on anepisternum and anepimeron; anepimeron sometimes brown mottled. Legs yellow with fore tibia and tarsi brownish, mid and hind tarsi brown, and mid and hind tibiae brown at base, apex and on dorsal surface; material from western United States with tibiae yellow with dorsum faintly brown (paler to entirely yellow on anterior legs) and tarsi only brownish on distal three segments; femora of Canadian specimens sometimes with pale dorsal streaking or with brown dorsobasal spot. Abdomen yellow with dorsum, epandrium and surstylus brown.

Genitalia: (Figs 71–74) Surstylus darkly pigmented with one large and one small subapical spine. Inner surface of epandrium with one pair of dark bars with apical spine. Basiphallus broadly sclerotized along left lateral and dorsal surfaces. Swollen apical section of ejaculatory duct short, wide and narrowed apically. Hypophallus relatively short with long apical hairs. Paraphallus absent. Mesophallus narrow, cylindrical and fused to distiphallus; mesophallus and distiphallus with ventral suture. Distiphallus large, weakly-pigmented, bowl-shaped with minute internal reticulations and spinules, angled dorsally, slightly bilobed, elongate, and with one pair of short, wide membranous tubules. Ejaculatory apodeme well-developed and dark with base of duct lightly sclerotized, stem narrow and blade large and thickened along margin; sclerite on sperm pump broad, dark, with thick margin.

Variation: Specimens from Kananaskis (AB, YT) with genitalia nearly identical (surstylus with two strong spines, not one, and mesophallus slightly longer), but differing externally as follows: wing length 1.6–1.8mm (♂), 1.8–1.9mm (♀); length of ultimate section of vein CuA_1 divided by penultimate section: 2.2–2.9; eye height

divided by gena height: 3.9–4.7; usually four, but sometimes two or three rows of acrostichal setulae; anterior ori absent to nearly as long as posterior ori; first flagellomere light brown with orange tint, fading to yellow on basal 1/3 of outer surface and basal 1/3–2/3 of inner surface, and some females with dark region only orange to dark yellow; apical margin of first flagellomere truncated in darker specimens; orbital plate pale yellow; posterolateral corner of frons dark brown to base of outer vertical seta and light brown to dark yellow to base of inner vertical; scutum subshining; scutum sometimes brownish above wing base, katatergite light brown with posteroventral corner brown; pleuron brown with dorsal margin and sometimes much of posterodorsal corner of anepisternum yellow, and katepisternum yellow along dorsomedial margin; basal half of fore coxa brownish with base darker, most of mid and hind coxae brown, base of femora brown, fore femur with brown streaking (including one particularly distinct dorsolateral stripe), mid and hind femora with extensive light brown streaking and mottling, tibiae brownish with dorsum darker and tarsi brown with base paler; abdomen brown. Two males from YT and material from SK as above, but more similar to pale specimens in having two rows acrostichal setulae, one ors, grey pruinose scutum, brown posterolateral spot on frons ending at base of outer vertical seta and pigment on anepisternum paler.

Hosts. Fabaceae—*Caragana pubescens* (uncertain record; Spencer, 1969), *Lathyrus*, *Medicago*, *Melilotus*, *Oxytropis sericea* Nutt.*, *Trifolium*, *Vicia* (Spencer 1969; Sehgal 1971).

Range. Canada: AB, BC*, MB*, NB*, NS*, NT*, ON, PE*, QC, SK*, YT*. **USA:** CA, MA*, MD, MI*, MN*, WA, WI, WY*.

Holotype: USA. WA: Benton Co., Prosser (1♂, location unknown).

Paratypes examined: USA. WI: Yakima Co., Buena, ex. larva *Trifolium hybridum*, lot No., 207-1, K.E. Frick, 19.vii.1950 (1♂, USNM), 10.vi.1950 (2♂, CASC), Benton Co., Prosser, ex. larva *Vicia rosa*, 18.vii.1950, Lot. No. 227-1, K.E. Frick (1♂, USNM).

Additional material examined. Canada. AB: George Lake, near Busby, 1.vi.1973, larva on *Trifolium repens*, emerged 21–22.vi.1973, G.C.D. Griffiths, G2 (3♂ 3♀[with puparia], UASM), Jasper, 19.vi.1966, K.A. Spencer (1♀ [paratype of *L. socialis*], CNC), Morrin, "5/6.19[?]9", G.F. Manson (1♂, CNC), Elk Is. Park, [illegible], 20.vi.1966, K.A. Spencer, "mine *Lathyrus ochroleucus* 2.6.66" (1♀[with puparium], CNC), Gilchrist Ranch, Aden., 28.vi.1956, O. Peck (1♂, CNC), Scandia, 11.vii.1956, O. Peck (1♂, CNC), 4km SE Grimshaw, 13.vii.1997, sweep vegetation at edge of wheat field, S. Boucher (4♂, LEM), sweep margin of agricultural field, T.A. Wheeler (1♂, LEM), Kananaskis, Sheep River P.P., Sandy McNabb camp, 50°38.27′N, 114°31.7′W, swp open forest and grasses, 28.vii.2003, S. Boucher (4♂ 4♀, LEM), V. Dion (6♀, LEM), Kananaskis, Sheep River P.P., Blue Rock cmpgrnd, 50°36.6′N, 114°13.4′W, sweep, 29.vii.2003, S. Boucher (1♂, LEM), Kananaskis, Sheep River Prov. Pk., 7km W Sandy McNabb campgrnd, (50˚38.9′N, 114˚37′W), swp open forest and field, 28.vii.2003, S. Boucher (1♂, LEM), Kanaskis Counrty, swp vegetation near roadside near Bow Valley Campground, 51°04.777′N, 115°03.813′W, 27.vii.2003, V. Dion (1♂ 1♀, LEM), Dunvegan, 55°55.39′N, 118°35.74′W, sweep south facing grass slope at duck, 19.vii.2003, S. Boucher (1♂ 1♀, LEM), Kluskin Hill, 55°15.540′N, 118°30.620′W, swp vegetation in badlands, 21.vii.2003, S. Boucher (4♂, LEM), **BC:** Summit Lake / Stone Mountain, near Alaska Hwy. mile 392, 8.viii.1970, larva on *Oxytropis sericea*, emerged 18.v.1971, G.C.D. Griffiths, R20 (1♂[with puparium], UASM), Vancouver, Point Grey, 19.vii.1973, J.R. Vockeroth (2♂, CNC), Summit Lake, Mi392 Alaska Hwy, 7.vii.1959, 4700′, R.E. Leech (1♂, CNC), Vernon, 21.viii.1931, R.D. Bird (1♂ 2♀, CNC), Robson, 30.vi.1969, H.R. Foxlee (1♂, UBCZ), Kinbasket Lake, BC Hydro drawdown study, Cooper, Beauchesne & Assoc. Ltd., Malaise trap, 4–5.viii.2009 (1♂, CNC), 12.vi.2010 (1♂, CNC), McQueen Lake, 10mi N Kamloops, 18.vi.1973, H.J. Teskey (1♂, CNC), Terrace, Spring Creek, 11.vi.1960, C.H. Mann (1♀, CNC), Summerland, 5.vi.1959, R.E. Leech (4♂, CNC), **MB:** 9mi N Forrest, 29.vii.1958, R.L. Hurley (1♂, CNC), near LaSalle La Barriere Park, (49˚43.2′N, 97˚110.7′W), sweep in oak savanna near river, 15.vi.1999, J. Perusse (6♂, LEM), 1km E Stuartburn, (49˚08′N, 96˚44.7′W), sweep vegetation along roadside, 12.vi.1999, V. Crecco (1♂, LEM), 5km N Gardenton Tallgrass Prairie Preserve, (49˚10.71′N, 96˚40.76′W), sweep in tallgrass prairie, 17.viii.1999, T.A. Wheeler (1♀, LEM), 20.vi.1999 (1♂, LEM), 14.vi.1999 (1♂, LEM), 12.vi.1999, J. Perusse (1♂, LEM), NE Glenboro, Spruce Woods Prov. Pk., 7.vii.1992, T.A. Wheeler, swept along path in shortgrass prairie (1♀, LEM), W of Winnipeg, Beaudry Prov. Pk., Assiniboine R., 8.vii.1992, T.A. Wheeler, swp. vegetation at river edge (1♂, LEM), **NB:** Kouchibouguac N.P., 23.v.1977, Hanley & Cooper (1♂, CNC), **NS:** Lockeport, J.R. Vockeroth, 18.vii.1958 (1♂, CNC), 24.vii.1958 (1♂, CNC), **NT:** Norman Wells, 8.viii.1969, G.E. Shewell (2♂, CNC), **ON:** Ottawa, J.R. Vockeroth, 25.vii.1959 (1♂, CNC), 2.vii.1958 (1♀, CNC), Ottawa, 19.vii.1954, W.R.M. Mason (1♂,

CNC), Ottawa, 25.vi.1951, C.E.F., O. Peck (2♂ 1♀, CNC), Arkell, 7.vi.1960, D.H. Pengelly (1♀, DEBU), Bradford, 21.v.1958, D.H. Pengelly (1♂, DEBU), St. Catherines, 11.vii.1982, L.B. Carlson (1♀, DEBU), Milton, 21.v.1976, J.M. Cumming (1♂, DEBU), Bell's Corner, C.D. Miller, reared from *Trifolium repens*, em. 31.viii.1962 (1♂, CNC), em. 4.ix.1962 (1♀, CNC), St. Lawrence Is. N.P., Grenadier I. Centre, 10.vi.1975, G.T. Hall (1♂, CNC), Marmora, 30.iv.1952, J.F. McAlpine (1♂, CNC), Normandale, 26.v.1956, 42°42′, 80°19′, J.R. Vockeroth (1♂, CNC), Metcalfe, B.E. Cooper, 14.v.1983 (1♀, CNC), 25.ix.1982 (1♂, CNC), 2mi N Metcalfe, 22.vii.1982, B.E. Cooper (2♂, CNC), Port Severn, 3mi N, 18.v.1959, black spruce bog, J.G. Chillcott (1♂, CNC), Bruce Co., Bruce Pen. N.P., Singing Sands, fen, pan #6, 31.v–8.vi.2000, C.S. Onodera (1♀, DEBU), Baptiste Lake, 45°10′N, 78°00′W, sweep near lake shore, 25.vii.2000, J. Forrest (1♀, LEM), Ottawa, Mer Blue Bog, 25.viii.1979, S.A. Marshall (1♂, DEBU), Mer Bleu Bog, Ottawa, 14.vi.1980, K.N. Barber (1♂, DEBU), Mer Bleue, 19.v.1978, H. Goulet (1♂, CNC), **PE:** Charlottetown, col. from Trapper & Century pea fields, L.S. Thompson (1♂, CNC), Charlottetown, vii.1970, L.S. Thompson (1♀, CNC), **QC:** Ste Foy, L.J. Jobin, reared from leaf mine on *Trifolium repens* Cv. Indino, L.J. Jobin, 20.vii.1962 (1♂, CNC), 1.ix.1962 (1♂[with puparium], CNC), 3.ix.1962 (1♀, CNC), 4.ix.1962 (1♀, CNC), Ste-Anne-de-Bellevue, Stoneycroft Pond, 45°25.8′N, 73°56.4′W, sweeping grass, 13.vi.2000, H. Varady-Szabo (1♂, LEM), 7.vi.2000, H. Varady-Szabo (2♂, LEM), 13.vi.2000, J. Forrest (1♂ 1♀, LEM), 1.vi.2000, J. Forrest (4♂, LEM), 7.vi.2000, J. Forrest (3♂, LEM), 4.viii.2000, J. Forrest (3♂ 5♀, LEM), 11.viii.2000, J. Forrest (2♂, LEM), 26.vii.2000, J. Forrest (2♂ 2♀, LEM), 19.vii.2000, J. Forrest (4♂, LEM), sweep grass, 20.vii.2004, S. Boucher (2♂ 1?, LEM), sweep grass at S end of pond, 12.v.1998, J. Savage (3♂, LEM), sweep grasses at pond, 3.ix.2000, T.A. Wheeler (2♂ 1♀, LEM), sweep grasses near pond, 6.vi.2003, S. Boucher (2♂ 1?, LEM), sweeping grass, 6.v.1999, V. Crecco, J. Savage & T. Wheeler (1♂, LEM), Forillon N.P., Anse Saint-Georges, 48°46′N, 64°12′W, sweep at roadside, 16.viii.2001, H . Varady-Szabo (1♂, LEM), Mont Rigaud, sweep open area at base of hill, 18.viii.2005, J. Mlynarek (4♂ 1♀, LEM), A. Grégoire Taillefer (1♀, LEM), sweep grassy area at base of hill, H. Varady-Szabo (7♂, LEM), Gaspesie, Parc Forillon, Plage de Penouille, 48°51′20.9″N, 64°24′45.3″W, sweep along trail, 15.viii.2006, S. Boucher (1♂, LEM), Gaspesie, Parc Forillon, Secteur Nord, route du banc, sweep near marsh, 48°50′59″N, 64°12′31″W, 18.viii.2006, S. Boucher (7♂, LEM), Iles de la Madeleine, Ile de la Grande Entrée, Chemin Pealey, 47°32.96′N, 61°32.64′W, sweep field at road, 9.viii.2004, V. Dion (1♀, LEM), sweep grasses in parking lot at beach (2♂, LEM), Iles de la Madeleine, L'Ile-du-Havre-Aubert, Chemin d'en haut, 47˚14.181′N, 61˚51.302′W, 29m, sweep open slope, 18.viii.2011, S. Boucher (1♂, LEM), Notre-Dame-de-l'Ile-Perrot, Pointe du Moulin, sweep vegetation, 8.v.2001, J. Savage (1♂, LEM), Fairy Lk. Crk., 30.v.1965 (1♂, CNC), Lac St-Francois Nat. Wild. Area, marais Fraser, (45˚02.40′N, 74˚28.03′W), carex meadow, sweep F2a(1), 12.viii.1999, F. Beaulieu (2♂, LEM), **SK:** S of Moosomin Pipestone Creek, 50˚01′57.96"N, 101˚40′36.60″W, 570m, prairie habitat, 2.vi.2007, Goulet, Boudreault & Fernandez, CNC315651, CNC315606, CNC316648, CNC315617, CNC315622, CNC315619 (4♂ 2♀, CNC), 8km W Ogema, (49˚33.2′N, 105˚01.4′W), sweep dry prairie along roadside, 9.vii.2000, V. Crecco & T.A. Wheeler (2♂, LEM). **USA. CA:** Glenn Co., Maxwell, 1.viii.1953, R.F. Smith, Ladino clover (2♂ 3♀, EMEC), **MA:** Woods Hole, vii.1923, A.H. Sturtevant (1♂, USNM), **MD:** Montgomery Co., Bethseda, 6.vii.1970, G. Steyskal (2♂, USNM), **MI:** Marquette Co., ne/ne T52N-R27W S31, Emgd: 22.vi.2001, Surv: R.J. Priest, reared ex *Lathyrus japonicas*, Recv: 11.vi.2001, Lot: RJP1126.2 (1♂, LEM), Marquette Co., se/sw T52N-R28W S24, Emgd: 10.iii.2003, Surv: R.J. Priest, reared ex *Lathyrus japonicas*, Recv: 23.ix.2002, Lot: RJP1348.1(1♂, LEM), **MN:** Crookston, 21.v.1960, river valley, W.W. Moss (1♂, CNC), **WY:** Teton Co., Togwotee Pass, 17.vii.1951, J.G. Chillcott (1♂, CNC).

Additional material examined (dark): Canada. AB: Kananaskis, Sheep River P.P., Sandy McNabb camp, 50°38.27′N, 114°31.7′W, swp open forest and grasses, 28.vii.2003, S. Boucher (19♂ 9♀, LEM), V. Dion (9♂ 11♀, LEM), Kananaskis, Sheep River P.P., Big Horn Rest Area, 7km W Sandy McNabb camp, 50°38.9′N, 114°37′W, sweep open forest/field, 28.vii.2003, V. Dion (1♂ 1♀, LEM), **YT:** Klondike Hwy at Minto Landing, sweep grass in open meadow, 9.vi.1997, T.A. Wheeler (2♂, LEM).

Comments. The bulbous, internally spinulose distiphallus without elongate apical tubules is characteristic of this species, and while a similar phallus is seen in *L. socialis*, the basal bowl of the distiphallus is much narrower and is not so enlarged and swollen dosrobasally that it nearly exceeds the base of the mesophallus. Some American miners on *Lupinus* (Fabaceae) have a similar phallus (see Lonsdale (2011)), but the distiphallus of these are smooth and generally paler, the surstylus has two pronounced spines, and they are more darkly pigmented.

The location of the holotype is currently unknown, and is not deposited in either the USNM or the Frost Entomological Museum.

***Liriomyza fumeola* spec. nov.**
Figs 125–127

Wing length 2.1–2.3mm (♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 2.1–2.2. Eye height divided by gena height: 3.3–3.6. Scutum subshining.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin brown. Head yellow with face brownish (sutures brown), and ocellar tubercle, clypeus and back of head dark brown; posterolateral corner of frons light brown to base of inner vertical seta, becoming paler medially and with very dark line between base of setae. Scutum with complete lateral yellow stripe. Scutellum brown laterally. Metanotum dark brown with dorsum of katatergite and posterodorsal corner of anatergite yellowish. Pleuron dark brown with dorsal 1/5 of anepisternum and dorsomedial margin of katepisternum yellow. Legs dark brown with apices of coxae and femora yellow. Abdomen broadly yellow laterally, particularly on anterior tergites.

Genitalia: (Figs 125–127) Surstylus-like process reduced to pale, posteriorly directed, pointed bar without spine. True surstylus absent. Epandrium without spine. Phallophorus cylindrical, bent and slightly elongate with narrow membranous ventromedial finger. Basiphallus well sclerotized along left lateral and dorsoapical surfaces, but also with right lateral margin and paired basal extensions fused to phallophorus. Swollen distal section of ejaculatory duct small and narrow. Paraphallus absent. Hypophallus short, with long apical hairs, fused to narrow extension of mesophallus. Mesophallus relatively narrow and elongate, fused to distiphallus at an angle, darkest basally. Distiphallus shorter than mesophallus with complete ventral suture separated by narrow plate apically; apical cup small, twice width of stem, with inner-distal ring of short spines, enclosing paired fringed structures. Ejaculatory apodeme very large and dark with lateral margin of sclerite on sperm pump produced as dark rod.

Etymology. The specific epithet (L. *fumis*—"smoke") reflects the dark colour of this species compared to paler relatives such as *L. flaveola*.

Host. Unknown, likely grasses.

Range. Canada. BC.

Holotype: USA. BC: Summit L., Mi392, 4500′, Alaska Hwy, 2–4.vii.1959, E.E. MacDougall (1♂, CNC).

Paratypes: USA. BC: Summit L., Mi392, 5000′, Alaska Hwy, 6.vii.1959, R.E. Leech (1♂, CNC), E.E. MacDougall (1♂, CNC).

Comments. *Liriomyza fumeola* is a darkly pigmented species with a brown face that appears most closely allied to the Palaearctic *L. aculeolata* Zlobin and *L. infuscata* Hering, which has a highly similar phallus and is similarly dark. The latter two differ in having a partially infuscated first flagellomere, a broader surstylus with a terminal scale, a broader apical bowl of the distiphallus and a prominent projection of the basiphallus on the left distal margin. *Liriomyza europaea* Zlobin is also similar in colour and phallic structure, with minor differences, but the face is yellow.

The new species *Liriomyza fumeola*, *L. mesocanadensis* (Figs 102–103) and *L. anatolis* (Figs 98–101) are relatives of the North American species *L. septentrionalis* (Figs 107–111), *L. cordillerana* (Figs 104–106), *L. montana* (Figs 122–124), *L. flaveola* (Holarctic; Figs 112–121) and *L. graminacea* Spencer (California, Colorado; Lonsdale, 2011: figs 112–115), a diverse clade of grass-feeders in the *L. flaveola* species group that can be diagnosed externally by a relatively large body size, a yellow spot or halo around the base of the vertical setae (most pigment on the frons is lost in *L. anatolis*) and an abdomen that is broadly yellow laterally, with the yellow margin pronounced on tergites 1–3 and clearly visible dorsally. Most species are also heavily pigmented with characteristically dark legs with apically yellow femora, although *L. graminaceae* and some *L. septentrionalis* are relatively pale, and *L. montana* and *L. anatolis* are much paler. The unusual *L. abnormis* Spencer (California; Lonsdale 2011: figs 15–18) and *L. sylvatica* (Canada; Figs 128–131) also belong to this group, but they do not share the external diagnostic colour characters of the other species, and the phallus of each is heavily modified.

The group, most thoroughly treated by Zlobin (2002) in his revision of the Palaearctic fauna, is better defined when considering the male genitalia, as the surstylus is absent (sometimes replaced by ventral production of the epandrium), there are no dark spines on the surstylus or epandrium (a long seta or a scale-like process is sometimes present on the surstylus), the ejaculatory apodeme is large and dark, the sides of the sclerite on the sperm pump are heavily sclerotized and produced laterally as a pair of pointed domes, the phallus is downturned, producing deformation along the distal section of the ejaculatory duct, the basiphallus is semi-circular in cross-section and

often produced anterolaterally, the hypophallus is large and fused to an extension of the mesophallus, the fused mesophallus+distiphallus consist of a curved basal stem and a wider apical bowl with a row of inner-marginal spines.

In the Nearctic, these species are most diverse in western North America, particularly towards the north. *Liriomyza septentrionalis* ranges into Nevada and Colorado to Alberta and Alaska, and while it is one of the most abundant agromyzids in California, it is encountered with less frequency within Canada where *L. cordillerana* (Pacific northwest) is more commonly encountered. *Liriomyza graminaceae* Spencer (California, Colorado), *L. montana* (western North America, Ontario, Quebec), *L. mesocanadensis* (Alberta), *L. fumeola* (Alaska) and the related *L. abnormis* (California) are also entirely to predominantly western in distribution. *Liriomyza flaveola* is found in the northwest, but smaller, paler representatives also occur east into Ontario, Nova Scotia and Newfoundland. Specimens of *L. montana* have also been collected in Ontario, an outlier of *L. cordillerana* was collected in Quebec and the unusual *L. sylvatica* occurs from Quebec to Alberta and the Yukon. *Liriomyza anatolis* is the only species restricted to eastern North America, collected in Ontario to the maritime provinces.

***Liriomyza galiivora* (Spencer)**
Figs 7, 132–135

Praspedomyza galiivora Spencer 1969: 199.
Galiomyza galiivora. Spencer 1981: 291; Spencer & Steyskal 1986: 137.
Liriomyza galiivora. Spencer & Martinez 1987: 261 (attrib. to Tschinhaus); Spencer 1987: 877, 1990: 235.

Description. Wing length 1.5–1.9mm (♂), 1.8–1.9mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.7–5.0. Eye height divided by gena height: 3.2–9.3. Scutum shining.

Chaetotaxy: Two ori (one ori in Point Pelee specimen), two ors; sometimes appearing as three ori and one ors. Acrostichal setulae in four rows.

Colouration: (Fig. 7) Calypter margin and hairs dark. Body brown with first flagellomere yellow; halter white; scutellum, postpronotum and notopleuron slightly paler.

Genitalia: (Figs 132–135) Epandrium relatively long and tapered ventrally, with one posteromedial and one apical tubercle. Surstylus small, subtriangular, and with two spines. Basiphallus largely membranous with dorsum lightly sclerotized. Hypophallus broad, flat and lightly sclerotized. Distiphallus composed of narrow stem fused to similarly narrow mesophallus, with broad interfolding cup-like apex with smaller, bilobed (each lobe sclerotized medially), mostly membranous distal section. Ejaculatory apodeme with dark, gradually tapering stalk and smooth, pale blade; sclerite of sperm pump with dark rounded lateral extensions continuous with sclerotized base of duct and base of ejaculatory apodeme.

Hosts. Probably numerous *Galium* (Rubiaceae) species, although currently only known from *G. boreale* L., *G. circaezans Michx. var. circaezans* (Michx.) Kuntze [=*G. rotundifolium*], *G. triflorum* Michx. and *G. rubioides* L. (Spencer 1969; Spencer & Steyskal 1986).

Range. USA: AK*, MD*, MN, WV*. **Canada:** AB, BC, ON*, QC (puparium and reared braconid parasitoid). Germany (genitalia slide only).

Holotype: Canada. AB: White Mud Cr., nr. Edmonton, 23.vi.1966, ex. *Galium boreale*, Type No. 10421 (1♂, CNC).

Paratypes examined: Canada. AB: White Mud Cr., nr. Edmonton, 23.vi.1966 (1♂, CNC), Cypress Hills, 25.vi.1966, K.A. Spencer (1♀, CNC), Edmonton, 24.v.1946, E.H. Strickland (1♀, CNC), **BC:** Robson, 13.viii.1949, H.R. Foxlee (1♂, CNC), Cultus Lake, 15.vii.1948, H.R. Foxlee (1♀, CNC).

Material examined: CANADA. AB: Edmonton, White Mud Creek, 4.ix.1968, larva on *Galium boreale*, emerged 16.ix.[year not given] (1♂, UASM), Scotford Sandhills, 5 miles west of Bruderheim, 12.vii.1973, larve on *Galium triflorum*, emerged 28.v.1974,

G.C.D. Griffiths, E190 (1♀[with puparium], UASM), emerged 16.v.1974 (1♀[with puparium], UASM), **BC:** Kinbasket Lake, BC Hydro drawdown study, Cooper, Beauchesne & Assoc. Ltd., Malaise trap, 27–28.vi.2009 (1♀, CNC), Yoho N.P., Emerald Lake Trls. Avalanche cleared meadow, 51.4427˚N, 116.5421˚W, 1310m, 24.vii.2010, BIOBus, 10BBCDIP-3458 (1♂, CNC), **ON:** Metcalfe, B.E. Cooper, MT, 17.vi.1993 (2♂, CNC), 22.ix.1993 (1♂, CNC), Essex Co., Point Pelee N.P., Visitor Centre, Malaise & pans, 5–26.ix.2000, O. Lonsdale (1♀, DEBU), Kent

Co., Rondeau P.P., South Point Trail, nr. east parking lot, 42°15′42″N, 81°50′49″W, savanna, Mal., 29.vii–14.viii.2003, Paiero & Marshall (1♀, DEBU), Elizabethtown, 4452 Rowsome Rd, 44.6213˚N, 76.273˚W, 120m, J. Sones, 14.v.2010, 10JSROW-0720 (1♂, CNC), 22.v.2010, 10JSROW-1381 (1♂, CNC). **USA. AK:** Harding Lake, near Fairbanks, 11.vii.1968, larva on *Galium boreale*, emerged 28.v.1969, G.C.D. Griffiths, F7 (1♀[with puparium], UASM), **MD:** Bethseda, 7.v.1983, G. C. Steyskal (1♂, USNM), **WV:** Parkersburg, 21.vi.1970, G. Steyskal (1♂, USNM).

Comments. *Liriomyza galiivora* stands apart from other Canadian *Liriomyza* in being entirely brown with only the antenna yellow. The male terminalia are also highly derived, and it is the only Nearctic *Liriomyza* known to feed on *Galium*.

***Liriomyza gibsoni* spec. nov.**
Figs 235–238

Wing length 1.4mm (♂), 1.6mm (♀). Vein dm-cu absent. Eye height divided by gena height: 5.0–5.8. Scutum shining.

Chaetotaxy: Two ori (anterior ori sometimes reduced to absent in male), two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin light brown. Head yellow with ocellar tubercle, clypeus and back of head dark brown; posterolateral corner of frons dark brown to base of outer vertical seta and light brown to base of inner vertical; lateral margin of orbital plate with light brownish infuscation; first flagellomere light brown, becoming yellow to base; venter of gena with light brown stripe. Scutum with complete lateral yellow stripe. Scutellum yellow with lateral corner brown. Katatergite light brown with posteroventral corner brown; anatergite brown with dorsum yellow; mediotergite dark brown. Pleuron brown with dorsal 1/5 of anepisternum yellow, anepimeron with paler mottling and katepisternum yellow on dorsal ¾, not including base of seta. Legs yellow with basal 1/3 of fore coxa brown, most of mid and hind coxae brown, base of femora brown, fore and mid femora with light dorsomedial mottling, most of hind femur lightly pigmented with apex yellow, tibiae brown (lighter ventrally and on anterior legs) and tarsi brown (paler to base). Abdomen brown.

Genitalia: (Figs 235–238) Surstylus with one long subapical spine. Paraphallus narrow. Mesophallus narrow, as long as high and with dorsum thicker; mesophallus and distiphallus partially fused, with complete ventral suture. Distiphallus pale, cup-shaped, outline nearly square in ventral view, inner surface spinulose laterally, enclosing one pair of small processes. Ejaculatory apodeme with narrow stem gradually widening into paler, almost semicircular blade with dark marginal striations; sclerite on sperm pump broad, weakly sclerotized laterally.

Etymology. This species is named after the collector, Gary Gibson.

Host. Unknown.

Range. Canada. AB.

Holotype: Canada. AB: 5mi W Writing-on-Stone P.P., Milk River Valley, 15.vii.1990, sweeping, G. Gibson (1♂, DEBU).

Paratypes: Canada. AB: Same collection as holotype (1♀, DEBU; 1♂, CNC).

Comments. While *Liriomyza gibsoni* is predominantly brown in colouration—including most of the hind femur—the pigment is relatively pale, producing little colour contrast. It also has a small first flagellomere that is mostly light brown, and vein dm-cu is absent. The phallus is characteristic in that the distiphallus is internally spinulose and subquadrate in outline when viewed ventrally. The distiphallus of the eastern *Liriomyza rigaudensis* (Quebec; Figs 296, 297) is similarly subquadrate and the external genitalia are nearly identical, but the distiphallus is darker, smaller, more constricted medially and the inner surface is smooth, the mesophallus and basiphallus are longer and narrower, and the paraphallus is wider. *Liriomyza rigaudensis* is also much paler and grey pruinose externally with a yellow calypter margin and only two rows of acrostichal setulae.

Liriomyza arenarium also has similar external terminalia and a subquadrate ventral outline to the distiphallus (Figs 232–234), but the distiphallus of this species is widened apically (particularly in lateral view) with the inner surface more spinulose ventromedially and the ventral carina on the mesophallus is longer and thicker. While similar to *L. gibsoni* externally, the orbital plate and first flagellomere are entirely yellow, the wing is slightly longer (1.8mm, not 1.4–1.6mm), vein dm-cu is present and the hind femur is only lightly streaked dorsally. Also

similar in genitalic structure to *L. arenarium* is the Californian *L. californiensis* Spencer (See Lonsdale (2011: figs 69–71)), which has brown femora with yellow mottling, a brown posterolateral stripe on the frons sometimes reaching the anterior ori, a posterolaterally brownish scutum, and a longer mesophallus with a shorter ventrobasal carina. Host plants are unknown for these four species that are likely related.

***Liriomyza griffithsi* sp. n.**
Figs 271, 272

Wing length 1.6mm (♂), 1.9–2.1mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.9–2.6. Eye height divided by gena height: 3.8–5.8. Parafacial, orbital plate and cheek slightly pronounced, forming shallow ring. Face with shallow epistoma. Male head collapsed.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in three to four irregular rows. Scutum shining to slightly subshining.

Colouration: Calypter margin and hairs dark brown. Head yellow with large spot around ocellar tubercle, back of head and clypeus dark brown; posterolateral corner of frons dark brown to base of inner vertical seta; female with inner margin of orbital plate lightly pigmented (wider posteriorly) to level of posterior ori; antenna deep yellow; venter of gena with brownish line becoming darker anteriorly. Scutum with complete lateral yellow stripe. Scutellum yellow with wide lateral brown stripe. Metanotum dark brown, male with anatergite paler with dorsomedial margin yellowish and katatergite yellow with lateral and ventral margins brown. Anepisternum brown with dorsal ¼ yellow excluding posteromedial mottling; anepimeron mostly dark brown, entirely brown in female; meron dark brown with dorsum yellow in male; katepisternum brown at least to level of seta and with dark spot posterodorsal to seta. Legs yellow with coxae dark brown (excluding apex), base of femora dark brown, male fore femur with light dorsal mottling, tibiae and tarsi dark brown. Abdomen dark brown, sometimes with narrow yellow stripe along lateral and posterolateral margins.

Genitalia: (Figs 271, 272) Surstylus with two subapical spines. Basiphallus sclerotized along left lateral margin and dorsum of apical margin. Paraphallus absent. Hypophallus well-developed. Mesophallus slender, as long as distiphallus but half its width, with slightly produced ventral carina. Distiphallus small, cup-shaped and with small, pointed inner-distal processes; gradually widening to distal half, more thickly sclerotized on basal and dorsal surfaces, slightly compressed dorsoventrally. Ejaculatory apodeme missing from dissection.

Etymology. The specific epithet honours Graham Griffiths and his immense contributions to research on the Canadian Agromyzidae, including his publications and his large collection of reared material from western Canada and Alaska.

Range. Canada. AB.

Host. Asteraceae—*Cirsium flodmanii* (Rydb.) Arthur.

Holotype: Canada. AB: Lister Lake Natural Area, 53˚22′N, 112˚32′W, 27.vii.1995, larva on *Cirsium flodmanii*, emerged 26.viii.1995, G.C.D. Griffiths, L1 (1♂ [with puparium], UASM),

Paratypes: Canada. AB: same data as holotype, emerged 17.viii–7.x.1995 (2♀[with puparia], UASM; 1♀[with puparium], CNC).

Comments. *Liriomyza griffithsi* is a relatively dark species that still has the most of the dorsal ¼ of the anepisternum yellow (with some additional posteromedial mottling) and a complete lateral yellow stripe on the scutum. The base of the femora are brown and the male has some additional dorsal mottling on the fore femur, the coxae are mostly brown, the brown marking on the katepisternum reaches or exceeds the seta base. Also relatively unusual for a species of *Liriomyza*, the female has the inner margin of the orbital plate brown past the ors and the metanotum, anepimeron and meron are entirely dark brown. The male terminalia are also highly similar to those of *L. helenii* (Figs 273–276), but the paraphalli are absent.

Other Nearctic *Liriomyza* on *Cirsium* are *Liriomyza trifolii*, which has the frons yellow around the base of the vertical setae, *L. huidobrensis*, which has brown pigment on the first flagellomere and a short, split distiphallus (Figs 335, 336), and *L. sabaziae*, which has a slightly paler body including a mostly yellow anepisternum and a yellow female orbital plate.

***Liriomyza helenii* Spencer**
Figs 273–276

Liriomyza helenii Spencer 1981: 239. Spencer & Steyskal 1986: 122; Lonsdale 2011: 54.

Wing length 1.8–2.0mm (♂), 2.0mm (♀). Length of ultimate section of vein CuA1 divided by penultimate section: 2.0–3.8. Eye height divided by gena height: 2.8–4.0. Scutum lightly dusted. First flagellomere relatively large with dorsal margin nearly straight. Parafacial and orbital plate slightly pronounced laterally, continuing ventrally as slight "cheek" on gena.

Chaetotaxy: Two ori, two ors; holotype with three ori (reduced right side). Acrostichal setulae in four rows.

Colouration: Calypter margin and hairs brownish-grey. Head yellow with first flagellomere darker, ocellar tubercle, back of head, clypeus and posterolateral region of frons to inner vertical seta (paler between verticals) dark brown; ventral margin of gena with faint stripe (sometimes darker anteriorly). Scutum with complete lateral yellow stripe. Scutellum with lateral corner brown. Katatergite yellow; anatergite brown with posterodorsal corner yellow; mediotergite dark brown. Anepimeron with extensive anterior and posterior streaking; anepisternum with large anteroventral spot or with ventral 2/3 brown; meron brown with dorsal margin yellow; katepisternum brown on ventral 3/5 to level of seta. Base of fore and mid coxae brown and basal half of hind coxa brown; base of femora narrowly brown and fore femur sometimes with light dorsal mottling; holotype with fore and hind femora distinctly streaked dorsally; tibiae and tarsi dark brown; with distinct dorsal subapical spots on mid and hind femora ifotherwise paler.

Genitalia—California: (Lonsdale, 2011: figs 116–119) Surstylus with two subapical spines. Basiphallus elongate and slightly curved with dorsum of left lateral surface lightly sclerotized. Paraphallus short, dark and directed apically (not ventrally). Hypophallus well-developed and with hairs possibly fused. Mesophallus short, with slight lateral compression. Distiphallus short, cup-like, not much longer than mesophallus, more heavily sclerotized on ventral and basal walls, with complete ventral suture interspaced by narrow plate, narrowed at base (pronounced when seen laterally), and with pale, haired inner-ventral processes. Ejaculatory apodeme with sclerite on sperm pump broadly rounded and darker at ends; venter of pump and basal section of duct lightly pigmented; stem long and dark, and blade small and subtriangular with distomedial margin narrowly darkened.

Variation: (Figs 273–276) Canadian specimens coloured similarly to paler Californian male: anepisternum with large triangular anteroventral marking and posteromedial line, katepisternum brown on ventral 2/3 and with small marking behind seta base (which is surrounded by yellow), posteroventral margin of katatergite brown. One male with three ori on right side. Paraphallus broader, angled slightly towards venter, and with irregular margins; distiphallus (in ventral view) with base more gradually extending to midpoint. Ejaculatory apodeme with dark, irregular medial rib.

Range. Canada. AB*. **USA.** CA.

Host. Asteraceae—*Hymenoxys hoopesii* (A. Gray) Bierner, *Gaillardia aristata* Pursh*.

Holotype, USA. California: Mono Co., Summit Sonora Pass, 28.viii.1948, ex. mines on *Helenium hoopesii*, Lot 113-1, K.E. Frick (1♂, CASC).

Additional material examined. Canada. AB: Kananaskis Valley E Barrier Lake, 7–8.ix.1976, larva on *Gaillardia aristata*, emerged 13–16.v.1977, G.C.D. Griffiths, K28 (2♂,[with puparia], UASM).

Comments. The newly recognized Albertan males are here tentatively treated as *Liriomyza helenii*, which was previously known only from Mono County, California on *Hymenoxys hoopesii*. The specimens were collected considerably further north than the type locality, however, and there are subtle differences in the male terminalia, making this identification somewhat uncertain. While the host genus of these Canadian males within the Asteraceae is also novel, the occurrence of multiple host species within plant families or genera (in this case, the same tribe—Helenieae) is now appearing to be more common than previously considered, and does not in itself suggest that these males should be provided separate specific status.

***Liriomyza helianthi* Spencer**
Figs 277–284

Liriomyza helianthi Spencer 1981: 240. Spencer & Steyskal 1986: 289; Lonsdale 2011: 56.
Liriomyza virginica Spencer In Spencer & Steyskal 1986: 297. Syn. Lonsdale (2011).

Description. Wing length 1.3–1.5mm (♂), 1.5–1.6mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.1–3.7. Eye height divided by gena height: 4.0–5.3. Scutum subshining.

Chaetotaxy: Two ori, two ors (rarely three). Acrostichal setulae in four rows.

Colouration: Calypter margin grey. Head light yellow with ocellar tubercle, back of head, clypeus and posterolateral region of frons to inner vertical seta (paler between verticals) dark brown. Scutum dark with complete lateral yellow stripe. Scutellum yellow with lateral corner brown. Katatergite yellow and anatergite brown with posterodorsal corner yellow; mediotergite dark brown. Anepimeron mostly brown, anepisternum with variable brown striping on ventral half, meron brown with dorsal margin yellow and katepisternum brown on ventral ¾ (yellow around base of seta). Tibiae, tarsi and base of coxae brown, with tarsi and sometimes tibiae becoming paler basally; femora sometimes with very small, weak basal spot. Abdomen brown, tergites narrowly yellow posteriorly and broadly yellow laterally.

Genitalia: (Figs 277–280) Surstylus with single subapical spine. Basiphallus sclerotized along left lateral and most of dorsal surfaces. Paraphallus large and well-defined, becoming broader distally and sometimes strongly clavate; sometimes not strongly widened apically and base of distiphallus slightly thicker. Hypophallus well-developed. Mesophallus short and slightly wider and darker than distiphallus base; completely fused to distiphallus. Distiphallus with complete ventral suture widening apically; gradually widening in ventral view, with broad apical chamber enclosing paired fringed structures; distiphallus straight to slightly sinuate in profile and with relative dimensions and amount of pigment slightly variable between specimens (eg. Fig. 282). Ejaculatory apodeme large, dark and well-developed; stem narrow at base and blade broad; sperm pump with sclerotized bar broad, thick and wide at ends.

Variation: Some material darker than "typical" specimens described above. Sometimes with yellow lateral stripe on scutum entirely brown to mottled postsuturally; sometimes lateral margin of frons brown (sometimes also including base of ors), femora striated or darker apically (at least on fore femur), and pleuron darker, sometimes with only dorsal margin of anepisternum, katepisternum and katatergite yellow; abdomen sometimes entirely brown. Of these darker specimens, some with orbital plate dark to level of posterior or anterior ori, with stripe extending to touch base of ors and posterior ori, first flagellomere with longer apical hairs, streaking on fore femur and base of femora very light brown; face brownish ventrally and medially in Terrace, BC male.

ON male from Almonte with terminalia relatively large, abdomen with faint yellowish dorsomedial line, paraphallus relatively broad and dark, and distiphallus narrow with only distal half abruptly widened.

Male from Shilo, MB (Fig. 281) and one male from Kananaskis, AB differ as follows: scutum with greyish pruinosity; head with light brown spots at base of vertical and fronto-orbital setae and at base of orbital setulae; first flagellomere relatively large and with orange tint on distal 2/3; base of femora brown and with dorsal streaking on fore femur; base of fore and mid tibiae yellow; katepisternal seta surrounded by yellow; paraphallus with sides nearly parallel to slightly converging.

Males from Mt. Kobau and Kinbasket Lake, BC (Figs 283, 284) especially dark, differing as follows: wing length 1.6mm; length of ultimate section of vein CuA_1 divided by penultimate section 4.7; first flagellomere evenly brown; four well-developed fronto-orbitals with small additional ori anteriorly; orbital plate brown laterally with stripe narrowing anteriorly and extending to encompass base of each fronto-orbital; face light brown ventrally and medially (also seen in paler male from Terrace, BC); prementum brown and labellum brownish basally; venter of gena with dark brown line; lateral margin of scutum dark brown postsuturally, yellowish-brown above wing base; anepisternum and katepisternum dark brown with narrow yellowish dorsomedial stripe; basal half of fore coxa dark brown and remaining coxae more extensively darkened; femora dark brown with yellowish mottling in one male, but otherwise mostly yellow with extensive brownish mottling dorsally that becomes darker towards base; tibiae and tarsi dark brown; distolateral margin of evenly narrow paraphallus and left distal margin of basiphallus thicker; dorsal and ventral surfaces of distiphallus better sclerotized and ventral suture slightly raised as shallow, irregular carina; ejaculatory apodeme as for *L. emaciata*.

Hosts. Asteraceae—*Artemisia biennis* Willd.*, *Helianthus annuus* L., *Xanthium strumarium* L. (Spencer & Steyskal, 1986), *Ambrosia psilostacha* DC (Lonsdale 2011). Also "Nasturtium", which during the time of

collection in Hemmingford, QC would have included species that are now treated as *Rorippa amphibia* (L.), *R. sylvestris* (L.) Besser and *Neobeckia aquatica* (Eaton) Greene (G. Mitrow, pers. comm.), any of which would be a new host record for *L. helianthi*.

Range. Canada. AB*, BC*, MB*, NB*, NS*, ON*, QC*, SK*. **USA.** CA, CO*, MD*, NM, OR, VA, WA.

Holotype [*helianthi*]: USA. CA: Stanislaus Co., Patterson, 27.ix.1948, swept on *Helianthus annuus*, Lot 162-1, K.E. Frick (1♂, CASC).

Holotype [*virginica*]: USA. VA: Patrick Co., Vesta, 2800ft, 30.v.1962, J.R. Vockeroth (1♂, CNC).

Paratypes examined [*helianthi*]: USA. CA: Stanislaus Co., Patterson, sweeping *Helianthus annuus* L., Lot No. 162-1, K.E. Frick, 24.ix.1948 (2♀, CASC), 6.ix.1948 (1♀, CASC), 20.ix.1948 (1♀, CASC).

Additional material examined. Canada. AB: Edmonton, White Mud Creek, 23–28.vii.1975, larva on *Artemisia biennis*, emerged 11–16.viii.1975, G.C.D. Griffiths, E272 (1♂ 1♀[with puparia], UASM), Kananaskis, Sheep River P.P., Sandy McNabb camp, 50°38.27′N, 114°31.7′W, 28.vii.2003, S. Boucher, swp open forest and grasses (1♂, LEM), swp open forest and field (1♂, LEM), Kananaskis, Sheep River P.P., 7km W Sandy McNabb camp, 50°38.9'N, 114°37'W, swp open forest and field, 28.vii.2003, S. Boucher (1♂, LEM), 10km NW Whitecourt, Hwy 32 at Sakwatamau River, (54˚10′N, 115˚42′W), sweep vegetation at river edge, 15.vii.1997, T.A. Wheeler (1♂, LEM), **BC:** 10mi E Osoyoos, 30.vii.1980, G. Gibson, sweeping *Pinus ponderosa* forest meadow (1♂, DEBU), Kinbasket Lake, BC Hydro drawdown study, Cooper, Beauchesne & Assoc. Ltd., Malaise trap, 12.vi.2010 (1♂, CNC); Mt Kobau, 49˚05.376′N, 119˚37.834′W, 23.v.2005, fallow field, Goulet & Boudreault, sweep (2♂, CNC), Terrace, 4.vii.1960, J.G. Chillcott, swept off carcass (1♂, CNC), **MB:** 5mi SW Shilo, 22.vii.1958, J.G. Chillcott (1♂, CNC), Treesbank, 23.vi.1915, N. Criddle (1♂, CNC), **NB:** Kouchibouguac N.P., 20.v.1977, B. Cooper (1♂, CNC), Kouchibouguac N.P., Hanley&Cooper, 22.v.1977 (2♂ 1♀, CNC), 23.v.1977 (3♂ 1♀, CNC), Doakstown picnic area, 46°32.7′N, 66°09.5′W, swp along small stream on steep hillside, 17.vii.2002, J. Forrest & T. Wheeler (1♂ 1♀, LEM), **NS:** CBHNt Pk., Pleasant Bay, 6.vi.1984 (2♂, CNC), **ON:** 7mi E Griffith, 26.vii.1982, B.E. Cooper (1♂, CNC), Pr. Edward Co., Outlet Beach, 18.vii.1965, J.R. Vockeroth (1♂, CNC), Almonte, Burni Lands, 45°15.5′N, 76°9.1′W, sweep vegetation in alvar, 14.vi.2007, J. Mlynarek (1♂, LEM), **QC:** Hemmingford, T. Armstrong, mine in *Nasturtium*, 4.viii.1926 (1♂ 1♀, CNC), 5.viii.1926 (1♀, CNC), Gaspesie, Parc Forillon, Plage de Penouille, 48°51'20.9"N, 64°24'45.3"W, sweep along trail, 16.viii.2006, V. Dion (1♂, LEM), Pointe-des-Cascades, swp along soulange canal, 7.ix.2002, S. Boucher (2♂, LEM), Mont-St-Bruno, (45˚32.894′N, 73˚18.595′W), sweep open slope and forest, 7.vii.2011, S. Boucher (1♂, LEM), **SK:** Cypress Hills Prov Pk. East boundary, (49˚40.2′M, 109˚27.5′W), sweep meadow near mixed forest, 10.vii.2000, V. Crecco & T.A. Wheeler (1♂, LEM). **USA. CO:** State Bridge nr Bond, 7000′, 24–25.vi.1961, C.H. Mann (1♂, CNC), **MD:** Montgomery Co., Bethseda, 7.vii.1970, G. Steyskal (1♂, USNM).

Comments. Most males of *Liriomyza helianthi* are easily identified by a paraphallus that strongly widens distally, but those Canadian males with a narrower paraphallus may be more difficult to diagnose. Externally similar species, including *L. sativae* (Figs 303–306), *L. brassicae* (Figs 224–227) and *L. eupatorii* (Figs 264–270), can be differentiated by not having a dark mesophallus that is extensively fused to a narrow pale distiphallus with a rounded, slightly wider apical chamber. Canadian species with similar male genitalia include *L. singula* (Figs 288–290), *L. rigaudensis* (Figs 295–298) and *L. gibsoni* (Figs 235–238), but the distiphallus of the latter two are subquadrate in ventral view, *L. rigaudensis* has the calypter margin and the region surrounding the base of the vertical setae yellow, and the scutum is grey pruinose with two rows of acrostichal setulae; *L. gibsoni* has no vein dm-cu, the lateral margin of the orbital plate and the first flagellomere are infuscated, and only the dorsal margin of the anepisternum is yellow; *L. singula* has a narrower, paler distiphallus, the katepisternal seta touches brown and vein dm-cu is absent.

Liriomyza helianthi is newly recorded in Canada, found from Nova Scotia and New Brunswick to British Columbia.

***Liriomyza hilairensis* sp. n.**

Figs 337–340

Wing length 1.9mm (♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 2.0. Eye height divided by gena height: 3.6. Scutum subshining. Orbital and parafacial slightly raised and cheek slightly evident.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four irregular rows.

Colouration: Calypter margin brownish. Head yellow with ocellar tubercle and clypeus dark brown; posterolateral corner of frons to base of outer vertical dark brown, pale brown to base of inner vertical; back of head dark brown with venter yellow. Scutum with complete yellow lateral stripe. Scutellum with lateral brown stripe. Katatergite yellow with posteroventral corner brown; anatergite brown with posterodorsal corner yellow; mediotergite dark brown. Anepisternum yellow with well-developed oblique medial stripe (faded dorsally) and narrow brownish stripe along posterior margin; anepimeron yellow with brown mottling (narrowly on posterior margin); meron brown with dorsum yellow; katepisternum with large brown ventral region nearly reaching base of seta. Legs mostly yellow; base of fore and mid coxae brown, hind coxa brownish; fore femur with stripe on basal 2/3 of dorsal surface (narrowing apically); mid and hind femora brown dorsobasally; fore tibia light brown with venter paler; mid tibia brown with venter, base and apex paler; hind tibia dark brown with base paler; tarsi brown. Abdomen brown with lateral margin of tergites, surstylus and cerci yellow.

Genitalia: (Figs 337–340) Surstylus with two subapical spines. Basiphallus lightly sclerotized along left lateral surface and partially on distal surface apically; apex of basiphallus and sclerotized section of duct widely spaced from mesophallus. Paraphallus weakly sclerotized, barely evident. Hypophallus well-developed, held far from shaft of phallus. Mesophallus slightly longer than wide, with ventral surface shorter and with short but pronounced carina. Distiphallus slightly longer than mesophallus and completely divided into one pair of small, pigmented cup-shaped structures with narrowed base and spinulose inner structures. Ejaculatory apodeme small but well-developed, with blade marginally dark and tapering to narrow base; sperm pump with broad sclerite thicker at lateral margins.

Variation. Male from Stoneycroft Pond differs as follows: length of ultimate section of vein CuA_1 divided by penultimate section 2.4; eye height divided by gena height 3.9; scutum slightly more shining; colour slightly paler with posterior margin of anepimeron yellow and markings on femora faint, and base of both vertical setae surrounded by yellow.

Host. Unknown.

Range. Canada: QC.

Holotype: Canada. QC: Mont St. Hilaire, (45˚32′N, 73˚09′W), 25.v.2001, T.A. Wheeler (1♂, LEM).

Paratype: Canada. QC: Ste-Anne-de-Bellevue, Stoneycroft Pond, (45˚ 25.8′N, 73˚56.4′W), sweep meadow, 5.vii.1999, M. Pollett (1♂, LEM).

Comments. The two Quebec males described here are relatively different in external colouration, but the genitalia are essentially identical. Male genitalic morphology clearly places them within the *Liriomyza strigata* group, but components of the phallus—essential for diagnosis and delineation of species within this group—vary in enough aspects to exclude the possibility that they are members of a described species. The relatively broad, robust tubules of the distiphallus and the short mesophallus with a short ventromedial carina are especially important, as is the presence of two small spines on the surstylus (not one).

***Liriomyza huidobrensis* (Blanchard)**

Figs 333–336

Agromyza huidobrensis Blanchard 1926: 10.
Liriomyza cucumifoliae Blanchard 1938: 352. Syn. Spencer (1973).
Liriomyza decora Blanchard 1954: 31. Spencer 1963: 359 (as syn. *bryoniae* (Kalt.)). Syn. Spencer (1973).
Liriomyza langei Frick. Misidentification. Frick 1951: 81.
Liriomyza bryoniae (Kaltenbach). Misidentification. Spencer 1963: 359.
Liriomyza dianthi Frick. Misidentification. Frick 1958: 1.
Liriomyza huidobrensis. Blanchard 1938: 356; Frick 1952a: 403; Spencer 1973: 215, 1981: 241; Spencer & Steyskal 1986: 119 (in part); Scheffer *et al.* 2007: 772; Lonsdale 2011: 58; Scheffer *et al.* 2014: 1959.

Wing length 1.9–2.6mm (♂) [usually 2.3–2.6 in darker males and 1.9–2.2 in paler males], 2.1–2.7mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.5–2.5. Eye height divided by gena height: 2.5–4.3. Scutum shining to subshining. Vein dm-cu rarely broken.

Chaetotaxy: Two ori (anterior seta rarely reduced), two ors. Acrostichal setulae usually in two to three sparse rows, but less commonly more closely spaced and with up to four rows, especially in darker specimens.

Colouration: Calypter margin brown. Head yellow with back of head, ocellar triangle, clypeus and posterolateral corner of frons to base of outer vertical seta dark brown; region from base of outer vertical to inner vertical brown to yellow; venter of gena with light brown line; distal half to distal 2/3 of first flagellomere orange to infuscated with margin darker. Scutum with yellow lateral stripe, posterolateral corner of scutum with small spot. Scutellum brown laterally. Katatergite brownish posteroventrally; anatergite brown with dorsum yellow; mediotergite dark brown. Pleuron yellow with broad brown anteroventral stripe on anepisternum that sometimes includes much of ventral 2/3; anepimeron yellow with light to extensive mottling; most of meron brown; katepisternum brown below seta (sometimes touching seta) and sometimes behind seta base. Legs yellow with base of fore and mid coxae mottled brown, hind coxa brown on basal half or entirely brown, femora brown at base, fore and mid femora with light dorsal mottling, hind femur with heavier streaking, tibiae brown with posterior legs darker and tarsi brown. Abdomen dark brown, sometimes yellowish medially on second tergite.

Variation: Paler specimens are typical of most males and a minority of females outside of Chile and those populations introduced into western North America. Darker specimens differ as follows: pigment more black instead of brown; basal 2/3 to basal margin of first flagellomere yellow; posterolateral corner of frons dark brown to base of inner vertical; orbital plate brown to base of posterior ors or level of posterior ori; dorsal 1/6–1/4 of anepisternum yellow; anepimeron and metanotum darker; katepisternum yellow to level of seta base or above, with only dorsomedial suture pale; mottling on femora wider and contiguous with basal spot; coxae more extensively brown with mid coxa entirely dark; legs rarely brown with knees and distoventral surface of femora yellow. Intermediates between pale and dark colour "types" uncommon for females.

Variation—QC male: This pale male differs externally as follows: wing length 1.9mm; length of ultimate section of vein CuA_1 divided by penultimate section 2.3; eye height divided by gena height 4.8; scutum subshining; four rows of acrostichal setulae; frons only brown on ocellar tubercle and lateral to vertical setae; first flagellomere dark yellow; scutum with complete yellow lateral stripe; katatergite only brown posteroventrally; anepisternum with one pair of small anteroventral spots; anepisternum with single brown spot anteriorly; katepisternum brown below level of seta (not including seta base); legs yellow with basal margin of coxae brown, tibiae brown (pigment on anterior legs paler) and tarsi brown (paler to base); abdomen yellow laterally, with only large anteromedial spot on tergite 6. Not included in above key.

Genitalia: (Figs 333–336) Surstylus with one subapical spine. Basiphallus relatively short and separated from pigmented section of duct by membranous region. Swollen distal section of ejaculatory duct usually parallel-sided and not bulging ventrobasally, and with distal margin slightly separated from base of hypophallus. Hypophallus well-developed. Paraphallus short, narrow and weakly sclerotized. Mesophallus slightly longer than wide, abbreviated ventrally, with complete ventral suture, well sclerotized dorsally and dorsolaterally. Distiphallus with two short, narrow, separate sclerotized cups that are slightly narrowed basally and with inner marginal row of short spinules (directed basally). Ejaculatory apodeme small, with relatively broad, rounded blade that is weakly to very strongly sclerotized and with distal margin dark.

Hosts. Host genera are listed in Lonsdale (2011).

Range. USA. CA [likely absent from state based on survey reported in Scheffer *et al.* (2014), suggesting possible misidentifications of 6 specimens reported in Lonsdale (2011)]. **Canada.** AB, BC, NS, ON, QC* [unknown if populations established, possibly restricted to greenhouses]. Updated global distribution from Lonsdale (2011) and EPPO (2014): Afrotropical Region—Comoros, Kenya, Mauritius, Réunion, Seychelles, South Africa, Tanzania, Zambia, Zimbabwe. Australian Region—Australia (intercepted only), Easter Island, Guam. Neotropical Region—Argentina, Belize, Brazil (Goiás, Minas Gerais, São Paulo), Chile (widespread, inc. Juan Fernandez Isl.), Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, French Guiana, Guadeloupe (not established), Guatemala, Honduras, Mexico (Mexico State?), Nicaragua, Panama, Peru, Uruguay, Venezuela. Oriental Region—China (Fujian, Guangdong, Yunnan), India (Uttar Pradesh), Indonesia (Java, Sulawesi, Sumatra), Malaysia, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam. Presence in Cambodia uncertain—intercepted on exports. Palaearctic Region—Arabian Peninsula, Austria, Belgium, Bulgaria, China (Gansu, Guizhou, Hebei, Hubei, Neimenggu, Shaanxi, Shandong, Sichuan, Xinjiang), Crete, Croatia, Cyprus, Czech Republic, Democratic People's Republic of Korea, Finland, France, Germany, Greece, Hungary, Israel, Italy, Japan, Jordan, Lebanon, Malta, Montenegro, Morocco, Syria, Poland, Portugal, Serbia, Spain, Sweden (intercepted only), Switzerland, Turkey. Eradicated from Denmark, Ireland, Lithuania, Norway, United Kingdom.

Syntypes [*huidobrensis*]: **ARGENTINA.** Buenos Aries [not given], ex. *Cineraria* (?f♀, MLPA). [Not examined]

Syntypes [*cucumifoliae*]: **ARGENTINA.** Buenos Aires, ex. melon (?♀, MLPA). [Not examined]

Syntypes [*decora*]: **ARGENTINA.** Buenos Aires, ex. Fava bean (2♀, MLPA). [Not examined]

Additional material examined. Canada. QC: Ste-Anne-de-Bellevue, Stoneycroft Pond, 45°25.8′N, 73°56.4′W, sweep meadow, 5.vii.1999, M. Pollet (1♂, LEM). Also see Lonsdale (2011).

Comments. *Liriomyza huidobrensis* is uncommonly encountered in Canada outside of greenhouses as it is poorly adapted to overwintering (MacDonald & Walter 1993) and does not have the ability to survive the climate unprotected (Martin *et al.* 2005). More commonly encountered (at least outside of southern Ontario) is the widespread and similarly pigmented *L. trifoliearum*, which also attacks agricultural crops of Fabaceae and Solanaceae, but has never been considered a pest. An additional spine on the surstylus and a pair of triangular wing-like paraphalli lateral to the distiphallus most confidently diagnoses *L. trifoliearum* (Figs 329–332).

Liriomyza lathryi Sehgal

Figs 144–148

Liriomyza lathryi Sehgal 1971: 334. Spencer & Steyskal 1986: 289.

Wing length 1.8–2.3mm (♂), 1.9mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.3–2.9. Eye height divided by gena height: 3.6–5.2 (approximately 6.5 in MB male). Scutum dusted with light pruinosity.

Chaetotaxy: Two ori (anterior seta reduced to absent in AB and MB specimens), two ors. Acrostichal setulae in four rows, often scattered; only two rows in male from Whitemouth, MB.

Colouration: Calypter margin grey. Head yellow with ocellar triangle, clypeus and back of head dark brown; posterolateral corner of frons dark brown lateral to vertical setae. Scutum with complete lateral yellow stripe. Lateral corner of scutum with brown spot. Katatergite brown ventrally, darkest posteriorly; anatergite brown with posterodorsal corner yellow; mediotergite dark brown. Anepisternum with brown posteromedial line and large or relatively small anteroventral spot; meron with narrow streaks on anterior half and on posterior margin; meron brown with dorsum yellow; katepisternum brown on ventral ¾, sometimes extending posteriorly to enclose base of seta and/or producing small spot behind seta base. Legs yellow with base of coxae brown, hind tibia brownish dorsally and on distal 1/5, and tarsi light brown (yellower to base). Abdomen narrowly yellow laterally.

Genitalia: (Figs 144–148) Epandrium with inner surface flanked by one pair of dark, apically toothed bars. Surstylus darkly pigmented and with one subapical spine. Basiphallus with left lateral and dorsal surfaces sclerotized; left and right distal margins produced into pale, paired arms that nearly meet ventral to mesophallus. Paraphallus absent (possibly fused to basiphallus). Hypophallus well-developed. Swollen distal section of ejaculatory duct strongly tapering apically. Mesophallus narrow, approximately as long as swollen portion of duct. Distiphallus as long as mesophallus or longer, abruptly angled dorsally, very shallow, nearly bilobed around base of partially exposed fringed processes, with ventral suture broadly separated by plate. Ejaculatory apodeme well-developed with blade large, and basally and marginally darker.

Host. Fabaceae—*Lathyrus ochroleucus* Hook., *L. venosus* Muhl. ex Willd., *Vicia Americana* Muhl. ex Willd.*.

Range. Canada. AB, MB*, ON*. **USA.** AR.

Holotype: Canada. AB: Edmonton, White Mud Creek, 4.ix.1967–7.ii.1969, V.K. Sehgal, Type No. 12070 (1♂, CNC).

Paratypes examined: Canada. AB: Elk Island Park nr. Edmonton, V.K. Sehgal, 31.vii.1966 (2♂, CNC), 2.viii.1966 (1♂, CNC).

Additional material examined. Canada. AB: Kananaskis, Sheep River P.P., Sandy McNabb camp, 50°38.27′N, 114°31.7′W, swp open forest and grasses, 28.vii.2003, S. Boucher (1♂, LEM), Edmonton, White Mud Creek, 31.vii.1975, larva on *Lathyrus ochroleucus*, emerged 15.v–14.vi.1976, G.C.D. Griffiths, E276 (7♂ 4♀[with puparia], UASM; 2♂ 2♀[with puparia], CNC), Edmonton, White Mud Creek, 4.ix.1968, larva on *Vicia americana*, emerged 8–17.vi.1969, G.C.D. Griffiths, E276, "Liriomyza lathryi n. sp. Det. V.K. Sehgal" (1♂[with puparia], UASM), Scotford Sandhills, 5 miles west of Bruderheim, 25.vi.1973, larva on *Lathyrus ochroleucus*, emerged 6–

7.vi.1974, G.C.D. Griffiths, E178 (1♂ 1♀[with puparia], CNC), Elk Island National Park, 4.viii.1971, larva on *Lathyrus venosus*, emerged 26.viii.1971, G.C.D. Griffiths, E104A (1♀[with puparium], UASM), **ON:** Finland, 21.vii.1960, S.M. Clark (1♂, CNC), **MB:** Int. Peace Gardens, Turtle Mtn. For. Res., 7.viii.1958, J.G. Chillcott (1♂, CNC), Whitemouth, 10.vii.1958, J.G. Chilcott (1♂ 1♀, CNC).

Comments. The short, narrow mesophallus and the wide, shallow and bilobed and dorsally angled distiphallus are characteristic of *Liriomyza lathryi*. The CNC Ontario specimen is unusual in having the brown posterolateral spot on the frons nearly reaching the base of the inner vertical, as most specimens have the base of both setae on yellow ground.

Liriomyza lathryi, *L. nares* and the western *L. eboni* (Fig. 143) appear to form a natural group, having virtually identical male terminalia and similar small wing sizes. The latter two species have two rows of acrostichal setulae, a reduced to absent anterior ori, and darker colouration—*L. nares* has dorsally spotted and streaked femora and a mostly dark first flagellomere, and *L. eboni* has brown femora with yellow apices, an entirely brown first flagellomere, a predominantly brown orbital plate, anepisternum and katepisternum, and the postsutural scutum is brownish to brown laterally

Liriomyza lima **(Melander)**

Figs 195, 196

Agromyza lima Melander 1913: 265.
Liriomyza lima. Frick 1952a: 404, 1957: 203, 1959: 406; Spencer 1969: 176; Sehgal 1971: 335; Spencer & Steyskal 1986: 134.
Agromyza holti Malloch 1924: 191. Syn. Frick (1957).
Liriomyza holti. Frick 1952a: 403, 1957: 203.

Wing length 1.4–1.6mm (♂), 1.9mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 3.0–4.7. Eye height divided by gena height: 3.1–3.3. Scutum covered with greyish pruinosity. Cheek, parafacial and orbital plate pronounced. First flagellomere ovate, sometimes slightly straight along distal margin.

Chaetotaxy: Two ori, one ors. Acrostichal setulae in two rows; setulae absent lateral to dorsocentral rows postsuturally.

Colouration: Calypter margin white. Wing veins yellow. Head yellow with ocellar tubercle and back of head dark brown; clypeus light brown to brown, sometimes with midpoint yellow. Lateral margin of scutum with complete yellow stripe. Lateral corner of scutellum brown. Katatergite brown posteroventrally; anatergite brown with posterodorsal region yellow; mediotergite dark brown. Anepisternum with faint, broad anteroventral spot; anepimeron with anterior markings; meron brown with dorsum yellow; katepisternum with ventral 2/3 and spot behind seta base brown. Legs yellow with base of coxae brown, sometimes with hind coxa light brown, fore and mid tibiae brownish with fore leg paler, hind tibia brown with base and apex narrowly yellow, tarsi brownish with base paler. Abdomen yellow dorsally with broad stripe on tergite 1, two spots on tergite 2, tergites 3–5 with broad anterior band, tergite 6 with brown anteromedial spot and epandrium brown.

Genitalia: (Figs 195, 196) Surstylus narrowing apically and with one or two small subapical spines. Epandrium slightly produced ventrally; inner surface flanked by one pair of short, dark bars with terminal spine. Basiphallus sclerotized along left lateral and dorsal surfaces, with distolateral margins weakly sclerotized, but relatively prodiced on left side, without darker, better sclerotized region. Hypophallus small. Paraphallus flat, small, subrectangular, and directed laterally from base of mesophallus; nearly as long as mesophallus. Mesophallus narrow, slightly longer than distiphallus and approximately half width, dark and widest on basal half. Distiphallus pale and cup-shaped with ventral suture (thickened margins), slight medial constriction, and one pair of fringed processes enclosed in apical chamber. Ejaculatory apodeme similar to that of *L. togata*.

Host. Unknown.

Range. Canada. AB, MB*, NB*, SK*. **USA.** ID, MT, NY*, SD.

Lectotype [*lima*]: USA. ID: Moscow Mtn., 6.vii.1912, A.L. Melander (1♂, USNM).

Holotype [*holti*]: USA. SD: Ardmore, 13.viii.1915, E.G. Holt (1♀, USNM).

Additional material examined. Canada. AB: Bilby, 1.vi.1924, O. Bryant (1♂, USNM), Lancaster Park, 28.vii.1963, J.R. Vockeroth (1♀, CNC), Kluskin Hill, 55˚15.540′N, 118˚30.620′W, swp vegetation in badlands, 21.vii.2003, S. Boucher (1♂, LEM), **MB:** 5km N Gardenton Tallgrass Prairie Preserve, (49˚10.71′N, 96˚40.76′W),

sweep in tallgrass prairie, 17.viii.1999, V. Crecco (1♂, LEM), T.A. Wheeler (1♀, LEM), 17.vi.1999, T.A. Wheeler (1♂, LEM), 20.vi.1999, S. Boucher (2♂, LEM), 12.vi.1999, T.A. Wheeler (1♀, LEM), 12.viii.1999, T.A. Wheeler (1♂, LEM), 4km N Gardenton Tallgrass Prairie Preserve, (49°10.29′N, 96°40.40′W), sweep in tallgrass prairie, 17.vi.1999, J. Perusse (1♀, LEM), **NB:** Kouchibouguac N.P., D.B. Lyons, 7.vi.1978 (1♂, CNC), 27.vii.1978 (1♀, CNC), **NS:** Sable Island, West end, 11.vii.1967, D.M. Wood (2♂, CNC), **SK:** 5km S Maple Creek, (49°50.7′N, 109°29′W), sweep dry roadside prairie, 10.vii.2000, V. Crecco & T.A. Wheeler (1♂, LEM). **USA. NY:** Whiteface Mt., 19.vii.1962, 4600′–4872′, J.R. Vockeroth (2♂ 1♀, CNC).

Comments. *Liriomyza lima* was previously differentiated from *L. togata* (Figs 201–204) by having vein dm-cu present and the calypter margin and hairs entirely white, although the analysis of a number of new specimens has broadened the concept of *L. togata* to make this method of diagnosis untenable. Lonsdale (2011) first noted that vein dm-cu was sometimes present in *L. togata*, and it is now apparent that the calypter hairs and sometimes the calypter margin itself is sometimes be pale grey to yellow or even whitish. Both species also appear to have either one or two spines on the surstylus. Aside from those darker *L. togata* with markings on the femora or a greyish to brownish calypter margin and hairs, differentiation is now best made through examination of the shape of the phallus, with *L. lima* having a longer basiphallus and paraphallus, and a slightly smaller distiphallus.

***Liriomyza limopsis* spec. nov.**
Figs 197–200

Wing length 1.6–2.1mm (♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 2.3–2.6. Eye height divided by gena height: 4.9–5.7. Scutum glossy to subshining. Clypeus dark with anterior margin broad (not narrow and band-like), reaching a width of nearly half height of first flagellomere.

Chaetotaxy: Two ori, one ors (at least on one side), sometimes with anterior ori reduced or with additional ori on one or both sides. Acrostichal setulae in four to six rows.

Colouration: Calypter margin brown. Head yellow with ocellar triangle, clypeus and back of head dark brown; posterolateral corner of frons dark brown with vertical setae either entirely surrounded by yellow, with brown pigment surrounding but not touching area around base of verticals, or with brownish pigment meeting base of setae; venter of gena with brownish line that fades anteriorly. Yellow lateral stripe on scutum sometimes light brown to brown above wing base. Scutellum brown in lateral corner. Katatergite narrowly to broadly brown in posterolateral corner; anatergite brown with posterodorsal corner paler; mediotergite dark brown. Anepisternum brown on ventral 2/3 (dorsal margin of spot irregular), to having small posteroventral spot and clavate, oblique anteroventral stripe; anepimeron with small brown markings anteriorly; meron brown with dorsum yellow; katepisternum brown on ventral 2/3, not including seta base. Legs yellow with fore coxa brown basally, mid and hind coxae mostly light brown with base darker, fore femur with single dark to faded dorsal stripe (largely absent in NY male) and sometimes with base brown, tibiae brown and tarsi brown with base paler. Abdomen brown.

Genitalia: (Figs 197–200) Surstylus slightly narrowing apically and with two widely spaced spines. Inner surface of epandrium with dark bar with terminal spine Basiphallus sclerotized along left lateral, dorsoapical and right apical margins; left lateral margin produced into long, pointed, ventrally sclerotized band; right lateral margin with long, dark lobe that is round and clear apically. Hypophallus supported by membranous sheet produced from basiphallus, with hairs surrounded by, and separate from flat, Y-shaped sclerotized region. Paraphallus flat, weakly pigmented, subrectangular, fused to ventromedial surface of mesophallus; directed distolaterally (not laterally). Mesophallus with length approximately twice width, subcylindrical, with one pair of shallow, flared ventrolateral carinae and slight dorsal curve. Distiphallus approximately as long as wide, slightly compressed dorsoventrally, especially on basal half, with ventral suture bordered by thick beaded margin, with one pair of short sclerotized inner processes in apical chamber. Darker specimens with brown lines surrounding base of verticals (not including holotype) sometimes with phallus slightly more gracile with paraphallus somewhat narrowed.

Etymology. The specific epithet reflects the morphological similarity between this species and its western relative *L. lima*.

Host. Asteraceae—*Eurybia divaricata* (L.) G.L. Nesom, *Oclemena acuminata* (Michx.) Greene.

Range. Canada. NS, ON, QC. **USA.** MA, NY.

Holotype: Canada: NS: CBHNt Pk., Mackenzie Mtn., 400m, birch & fir, B.E. Cooper, 7.vi.1984 (1♂, CNC).

Paratypes: Canada. NS: CBHNt Pk., Mackenzie Mtn., 400m, birch & fir, B.E. Cooper, 31.v.1984 (1♂, CNC; 2♂, USNM), 1.vi.1984 (1♂, CNC), 2.vi.1984 (4♂, CNC), 6.vi.1984 (4♂, CNC), 7.vi.1984 (4♂, CNC), 9.vi.1984 (2♂, CNC), CBHNt. Pk., North Mt., 400m, damp sphagnum fen, J.R. Vockeroth (1♂, CNC), Cp. Breton Highland N.P., North Mt., 400m, 1.vii.1983, bog pan tp., J. Vockeroth (1♂, DEBU), **ON:** Metcalfe, 27.v.1982, B.E. Cooper (1♂, CNC), **QC:** Mt. St. Hilare, 500–700′, 3.vi.1964, J.R. Vockeroth (1♂, CNC), Saint Alphonse, Malaise trap, 2–16.v.1987, F. Génier (1♂, LEM). **USA. MA:** Franklin Co., Northfield, King Philip's Hill, 30.v.2015, C.S. Eiseman, *Eurybia divaricata* em. 17.vi.2015 , #CSE1610, CNC564672 (1♂, CNC), **NY:** Essex Co., Upper Jay by Ausable R., E branch, 2.vi.2012, em. 23.vi.2012, C.S. Eiseman, ex *Oclemena acuminata* (1♂, CNC).

Additional material examined. USA. **MA**: Hampshire Co., Pelham, Butter Hill, 25.vi.2014, C.S. Eiseman, ex. *Eurybia divaricata*, em. 10.vii.2014 , #CSE1168, CNC384891 (1♀[damaged], CNC).

Comments. Although external morphology would suggest otherwise, the male terminalia of *Liriomyza limopsis* reveal a close phylogenetic relationship to *L. lima* (Figs 195, 196) and *L. togata* (Figs 201–204)—the basiphallus is arched ventrally and strongly produced on each side, and there is one pair of flat leaf-like paraphalli that emerge ventrobasally from the mesophallus. *Liriomyza limopsis* differs from these other two species in having the right lateral extension of the basiphallus produced as a rounded lobe, the mesophallus is flared laterally as carinae, the paraphalli are pale and angled distally, and the distiphallus is slightly wider basally (seen ventrally). Externally, it differs in having a subshining scutum, an unusually thickened clypeus, shallow gena, a posterolateral spot on the frons that sometimes encompasses the vertical setae, a brown calypter margin (brownish in some *L. togata*), at least four rows of acrostichal setulae and a darker thorax and legs (similarly dark in some *L. togata*).

Liriomyza merga **Lonsdale**

Figs 87–89

Liriomyza merga Lonsdale 2011: 68.

Wing length USA: 1.8–1.9mm (♂), 2.3–2.5mm (♀); Canada: 1.9–2.1 (♂), 2.3–2.6mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.3–3.0 (USA), 1.6–2.1 (Canada). Eye height divided by gena height: 2.1–3.4 (USA), 1.6–2.4 (Canada). Scutum lightly dusted with pruinosity. Parafacial, orbital plate and narrow cheek pronounced.

Chaetotaxy: Two ori (anterior ori sometimes reduced on one side), one or two ors. Acrostichal setulae in up to four rows, often three or two.

Colouration: Calypter margin and hairs yellow to white. Head light yellow with first flagellomere lemon yellow, clypeus yellow to brown, back of head and ocellar tubercle brown and posterolateral corner of frons with pale spot lateral to outer vertical seta. Scutum with complete yellow lateral stripe. Scutellum brown laterally. Katatergite brown ventrally; anatergite brown with dorsum yellow; mediotergite dark brown. Anepisternum with small oblique anteroventral stripe; anepimeron with mottling and posterior margin brown; meron brown with dorsal margin yellow; ventral ¾ of katepisternum (not including base of seta) and spot behind seta brown. Legs yellow with base of coxae brown (widest on hind coxa), base of femora narrowly brown (widest on hind femur and sometimes vestigial on fore femur), hind femur with streaking along scraper, fore tibia sometimes brownish, mid tibia brownish (sometimes paler at base and apex), hind tibia dark brown medially, and tarsi brownish (paler to base). Abdomen brown with posterior margin of tergites narrowly yellow and lateral margin broadly yellow.

Genitalia: (Figs 87–89) Surstylus narrowed apically and with one subapical spine. Swollen distal section of duct relatively short with base bulbous. Paraphallus rod-shaped, fused to basiphallus on right side. Hypophallus well-developed, base ill-defined. Mesophallus narrowed apically, approximately as long as high and partially fused to distiphallus. Distiphallus with relatively narrow bowl-like base that is minutely and sparsely spinulose on inner surface and produced as bifid lobe ventrally; with one pair of long, clear apical tubules with basolateral striations wrapping around base. Ejaculatory apodeme with stem well-developed and blade broad, sometimes semicircular and with distal margin dark medially; sperm pump with wide, dark sclerite with ends thickened and slightly projecting.

Host. Unknown; BC adults(?) collected on *Rubus* (Rosaceae).

Range. Canada. BC*. **USA.** CA, MT, UT, WA.

Holotype: USA. WA: Mt. Rainier, Paradise Park, viii.1917, A.L. Melander (1♂, USNM).

Additional material examined. Canada. BC: Manning Pk., 6400ft., 29.vi.1973, H.J. Teskey (1♂, CNC), 32mi SW of Terrace, BC, 6.vi.1960, W.W. Moss, on Rubus species (2♂ 2♀, CNC).

Comments. Previously known from a number of western states, *Liriomyza merga* is here recorded for the first time in Canada.

***Liriomyza mesocanadensis* spec. nov.**
Figs 102, 103

Wing length 2.3–2.9mm (♂), 3.1–3.4mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.9–2.3. Eye height divided by gena height: 4.2–5.0. Scutum subshining.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin brown. Head yellow with ocellar tubercle, back of head and clypeus brown, and posterolateral corner of frons brownish on margin behind vertical setae and on margin of eye anterior to verticals. Scutum with lateral yellow stripes relatively wide and nearly meeting along posterior margin. Scutellum brown laterally. Katatergite and anatergite brown posteroventrally; mediotergite dark brown. Pleuron yellow with small oblique stripe on anepisternum, reduced mottling on anterior half of anepimeron, most of meron brown, and ventral 2/3 of katepisternum brown. Legs yellow with base of coxae brown, hind coxa mostly otherwise light brown, base of femora brown, fore femur with narrow dorsal streak, hind femur with dorsal subapical spot, tibiae brown (paler ventrally and on anterior legs) and tarsi brown; female with spot on hind femur darker and larger, sometimes forming complete dorsal stripe. Abdomen with epandrium and narrow dorsal stripe on and pregenitalic tergites brown; sometimes with pigment faded and with spot on tergite 2 divided medially.

Genitalia: (Figs 102, 103) Surstylus-like process of epandrium and epandrial spine absent (similar to *L. montana*). Phallus similar to that of *L. flaveola* (Figs 112–121), with phallophorus elongate and fused to basiphallus dorsally, which is downturned, and sclerotized dorsally and apically, except distal section of ejaculatory duct particularly swollen ventrally, anterolateral margin of basiphallus extending lateral to distiphallus as one pair of narrow, weakly sclerotized bands, mesophallus darker at point of fusion with hypophallus, distiphallus relatively short and with relatively short, broad and abruptly widened apical bowl, sperm pump with sclerite dark and strongly produced at ends, venter well-sclerotized and blending into dark, narrow duct; blade of ejaculatory apodeme broad and dark.

Etymology. The specific epithet denotes this species' known distribution.

Host. Unknown.

Range. Canada. AB.

Holotype: Canada. AB: Kananaskis, Sheep River P.P., Blue Rock cmpgrnd, 50°36.6′N, 114°43.4′W, sweep, 29.vii.2003, S. Boucher (1♂, LEM).

Paratypes: Canada. AB: Kananaskis, Sheep River P.P., Blue Rock cmpgrnd, 50°36.6′N, 114°43.4′W, sweep, 29.vii.2003, S. Boucher (4♂ 2♀, LEM; 2♂ 2♀, CNC), sweep open woods near camp site, 28.vii.2003, V. Dion (3♀, LEM), Kananaskis, Sheep River P.P., Sandy McNabb camp, 50°38.25′N, 114°31.9′W, swp open forest and grasses, 28.vii.2003, S. Boucher (1♀, LEM).

Comments. *Liriomyza mesocanadensis* is allied to the *L. flaveola* group on the basis of numerous external and male genitalic synapomorphies (see comments for *L. flaveola*), and differs from other species in its relatively large size and pale colouration with a dark spot on the hind femur. Similar colouration is seen in *L. montana* (also known from Alberta), but the posterolateral corner of frons of that species is slightly darker, the femora are paler (sometimes with the base and a weak dorsal stripe on the fore femur brown), and the spot on the anepisternum is much longer. The distiphallus+mesophallus of *L. montana* is also longer, narrower and less curved, and the apical bowl is much narrower, smaller and paler.

***Liriomyza minor* Spencer**
Figs 16, 179–181

Liriomyza minor Spencer 1981: 250. Spencer & Steyskal 1986: 120; Lonsdale 2011: 70.

Wing length 1.6–1.7mm (♂), 1.7mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.3–2.7. Eye height divided by gena height: 2.9–3.7. Scutum lightly pruinose to subshining. First flagellomere relatively large, broadly ovate to highest subapically, covered with very long hairs.

Chaetotaxy: (Fig. 16) Two ori (sometimes only one on one side, uncommonly both), two ors (anterior ors sometimes inclinate); uncommonly with three ori and one ors. Acrostichal setulae in four rows.

Colouration: Calypter margin grey to brown. First flagellomere brownish-orange, sometimes with basal margin yellow; ocellar triangle, clypeus, back of head and posterolateral corner of frons to base of outer vertical seta dark brown. Lateral margin of scutum yellow presuturally and slightly yellowish above wing base. Scutellum yellow with lateral corner brown. Katatergite yellowish; anatergite yellowish to light brown dorsally; mediotergite dark brown. Pleuron dark brown with dorsal margin of anepisternum, meron and katepisternum yellow; anepisternum sometimes yellowish posteriorly on dorsal 1/3 or with broad oblique brown stripe. Legs dark brown with distal 2/3 of fore coxa, distal ½ of mid coxa, and base and often partial venter of fore tibia yellow; femora variably dark brown, sometimes only yellow from apex to distal 1/3 (wider on fore femur), but often also yellow on distoventral surface and with additional yellow streaking (especially on fore leg). Abdomen sometimes paler laterally.

Genitalia: (Figs 179–181) Surstylus darkly pigmented, narrow along length, broadly rounded apically and with one subapical spine. Inner-ventral margin of epandrium with dark ventral plate. Basiphallus sclerotized along left lateral and distal half of dorsal margins. Swollen apical section of duct short, not much longer than wide. Paraphallus narrow and dark, fused to margin of membrane supporting haired hypophallus. Mesophallus dark, cylindrical, narrowed medially, nearly as long as basiphallus and separate from distiphallus. Distiphallus short, enclosing one pair of small fringed processes; bell-shaped in ventral view with shallow longitudinal suture separated by broad distoventral plate; basal half narrow and stem-like in lateral view. Sclerite of sperm pump thickly sclerotized and truncated at ends; stem well-developed and blade abruptly widened before midpoint, pointed at corners, with dark apical margin, numerous perpendicular striations, and with several abrupt gradations in pigment near base.

Variation: BC specimens with flagellomere apparently less swollen and with hairs slightly shorter (possible artifact of preservation); brownish dorsomedial vertical stripe on face; anepisternum very narrowly yellow dorsally to entirely brown; dorsum of femora more extensively brown but apex still entirely yellow; genitalia as above.

Hosts. Asteraceae—*Agoseris aurantiaca* (Hook.) Greene*.

Range. Canada. AB*, BC*. **USA.** CA.

Holotype: USA. CA: Alpine Co., Hope Valley, 5.viii.1948, sweeping, Lot 91–12, K.E. Frick, Type No. 13940 (1♂, CASC).

Paratypes examined: USA. CA: Alpine Co., Hope Valley, sweeping, K.E. Frick, 7.viii.1948, Lot No. 91–20 (2♂, CASC), 8.viii.1948, Lot No. 91–30 (1♀, CASC).

Additional material examined. AB. Bog at sourse of Swan River, Swan Hills, 4300′, 54˚45′N, 115˚52′W, 15.viii.1975, larva on *Agoseris aurantiaca*, emerged 6–18.v.1976, G.C.D. Griffiths, SW22 (1♂ 2♀[with puparia], UASM; 1♀[with puparium], CNC), 5mi W, Writing-on-Stone P.P., Milk River Valley, 15.vii.1980, sweeping, G. Gibson (1♂, DEBU), Kananaskis, Sheep River P.P., Sandy McNabb camp, 50°38.27′N, 114°31.7′W, swp open forest and grasses, 28.vii.2003, V. Dion (1♀, LEM), Kananaskis, Sheep River P.P., Blue Rock cmpgrnd, 50°36.6’N, 114°43.4’W, sweep, 29.vii.2003, V. Dion (1♀, LEM), **BC:** QCI, Graham Is., nr. Tieil, bog, FIT, pan, 10–19.vii.1988, S.A. Marshall (2♂ 1♀, DEBU).

Comments. *Liriomyza minor* differs from most Canadian congeners with a similar phallus in having an apically widened, predominantly light brown and densely long-haired first flagellomere. This character is also seen in some western *L. ptarmicae* (Figs 187–194), but this species differs in having the vertical setae on yellow ground (although in darker specimens the brown lateral spot is quite close to the base of the outer seta), the epandrium is not produced to a long point, and mesophallus is pointed dorsally and is nearly as long as the basiphallus.

***Liriomyza montana* Sehgal**

Figs 122–124

Liriomyza montana Sehgal 1968: 67. Spencer 1969: 179; Sehgal 1971: 336; Lonsdale 2011: 74.

Wing length 2.0–2.7mm (♂), 2.4–2.5mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.8–2.4. Eye height divided by gena height: 3.2–5.8. Scutum shining.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin grey. Head light yellow with first flagellomere yellow, ocellar tubercle and back of head brown, clypeus yellow or slightly brownish, and posterolateral region of frons brown excluding yellow spot around base of vertical setae (sometimes brownish around base of inner vertical), uncommonly yellow around base of verticals and with margin of eye entirely yellow. Scutum dark brown with complete yellow lateral stripe that sometimes extends partially or completely along posterior margin; posterolateral yellow region sometimes expanding to include base of posterior intra-alar. Scutellum yellow with lateral corner brown. Katatergite yellow; anatergite brown, becoming yellow dorsally; mediotergite dark brown. Anepisternum yellow with faint to broad oblique stripe and sometimes posteroventral margin brown; anepimeron with faint to distinct mottling; meron brown with dorsal and sometimes anterior margins yellow; katepisternum brown on ventral ¾ (not encompassing base of seta) or with large triangular ventral spot. Legs yellow with base of coxae brown, base of femora sometimes brownish (sometimes only dorsally and/or with pigment faded on fore and mid legs), scraper on hind femur sometimes brown, fore tibia brownish (paler to base), mid tibia similar but slightly darker, hind tibia brown (sometimes yellow at base and apex), and tarsi brown, becoming paler to base; Canadian material with brownish striations on femora. Abdomen brown with posterior margin of tergites narrowly yellow, lateral margins broadly yellow, and epandrium paler.

Variation: Some males from AB differ as follows: wing length relatively large (2.4–2.7mm); clypeus dark brown; posterior margin of scutum with very narrow yellow line (similar to *L. anatolis*); anepimeron sometimes entirely yellow on posterior half; only mid and hind femora brown dorsobasally; tibiae yellow with dorsum brownish (darker on hind tibia); epandrium orange with sides brown.

Genitalia: (Figs 122–124) True surstylus, surstylus-like process of epandrium and epandrial spine absent. Basiphallus fused to phallophorus dorsally at two points and with lateral margins and dorsum sclerotized. Swollen distal section of ejaculatory duct with ventral curve. Paraphallus absent. Hypophallus surrounded ventrally by broad membranous lobe; with long fringe of hairs; fused to process of mesophallus. Mesophallus fused to distiphallus (strongest dorsally), meeting distiphallus at an oblique angle. Distiphallus long, strongly angled dorsally, with ventral sulcus separated by narrow plate apically, stem approximately twice length of mesophallus and with slight medial bend; with small apical cup surrounding narrow, dark paired medial processes; ON males with bowl slightly enlarged, similar to that of *L. flaveola* (Figs 112–121), but otherwise similar to western males. Sperm pump widely sclerotized with ends dome-like with long apical process; base of stem broad, extending into blade gradually; base of duct broad and sclerotized; blade long and narrow with light marginal sclerotizations.

Host. Unknown, likely Poaceae. Type series swept from open grass (Sehgal, 1968)

Range. Canada. AB, BC*, ON*, QC*, NL[?]*, NS*, SK*, YT*. **USA.** CA.

Holotype. Canada. AB: Jasper, 17.vi.1966, V.K. Sehgal, Type No. 12054 (1♂, CNC).

Paratypes examined. Canada. AB: Same collection as holotype (3♂ 1♀[allotype], CNC), Jasper 18.vi.1966 (1♀, CNC) [not conspecific, species unknown], Banff, 28.vi.1966, V.K. Sehgal (1♂, CNC).

Additional material examined. Canada. AB: Lundbreck Falls Prov. Rec. Area, 3km W Lundbreck, 49˚35′6″N, 114˚12′10″W, 1150m, Malaise, 8–11.vii.2009, J.H. Kits (1♂ 1♀, DEBU), Kananaskis, For. Exp. Sta. Seebe, 17.vi.1968, H.J. Teskey (1♂, CNC), Kananaskis, For. Exp. Sta. Seebe, 31.vii.1968, H.J. Teskey (1♂, CNC), Onefour, 2.vi.1956, O. Peck (1♂, CNC), Jasper N.P., Cottonwood Slough 52.8922˚N, 118.0912˚W, 1128m, 25.vi.2010, BIOBus, 10BBCDIP-0861 (1♂, CNC), Banff N.P., Storm Mountain, low alpine steep dry slope, adjacent to train track and Bow River, 51.2817˚N, 115.9441˚W, 1462m, 28.vii.2012, BIOBus, BIOUG04208-E07 (1♀, CNC), Kananaskis, Sheep River Prov. Pk., 7km W Sandy McNabb campgrnd, (50˚38.9′N, 114˚37′W), swp open forest and field, 29.vii.2003, S. Boucher (1♂, LEM), **BC:** Robson, H.R. Foxlee, 7.vii.1952[?] (1♂, UBCZ), 1.viii.1952 (1♂, CNC), 22.v.1965 (1♂, UBCZ), 7.ix.1966 (1♂, UBCZ), 17.vii.1968 (1♂, UBCZ), 22.vii.1968 (2♂ 1♀, UBCZ), 27.vii.1968 (1♂, UBCZ), 4.vi.1969 (1♂, UBCZ), 30.v.1970 (1♀, UBCZ), **ON:** Dufferin Co., Mono Cliffs P.P., small cold spring, 4.vi.2006, S.A. Marshall (1♂, DEBU), Wellington Co., Guelph, meadow, 6.vi.2002, O. Lonsdale (1♂, DEBU), **QC:** Ste-Anne-de-Bellevue, Stoneycroft Pond, (45˚25.8′N, 73˚56.4′W), Malaise trap, 26.v.–1.vi.1999, S.E. Brooks (1♀, LEM), Ile Bonaventure, (48˚30′N, 64˚10′W), 3km from Cote de Perce, sweep grass, 28.vii.2000, H. Varady-Szabo (1♀, LEM), **NL:** Deer Lake, vii.1976, N.L.H. Krauss (2♀, USNM), **NS:**

Pictou Co., Meimerby Beach, 29–30.vi.1996, B. Sinclair, poplar/spruce edge (1♀, LEM), **SK:** Saskatoon, 450–480mtr., 15.vi.1972, N.L.H. Krauss (1♂ 1♀, USNM), **YT:** Whitehorse, Robert Service C.G., (60˚42.1′N, 135˚02.7′W), sweep grass and sedges along Yukon R., 27.vi.1997, T.A. Wheeler (1♂, LEM).

Comments. *Liriomyza montana* and *L. anatolis* are very pale Nearctic representatives of the *Liriomyza flaveola* group that have the region around the base of the verticals and the posterior margin of the scutum yellow. *Liriomyza anatolis* can be differentiated by having a much paler, narrower dorsal stripe on the abdomen, an entirely yellow epandrium, a surstylus with a terminal scale, an apically darkened mesophallus and a shorter distiphallus with a broader apical bowl (Figs 98–101). When compared side-by-side with *L. montana*, the phallus of *L. anatolis* is also much darker, thicker and more robust in appearance overall.

Liriomyza nares Boucher & Wheeler

Liriomyza nares Boucher & Wheeler 2001: 598.

Wing length 1.3mm (wing crumpled, possibly 1.5mm) (♂). Length of ultimate section of vein CuA_1 divided by penultimate section: 4.7. Eye height divided by gena height: 4.4. Scutum with dusting of grey, slightly iridescent pruinosity.

Chaetotaxy: Two ori (anterior ori strongly reduced to absent, absent in holotype), two ors. Acrostichal setulae in two rows.

Colouration: Calypter margin grey to slightly yellowish. Head light yellow in ground colour; first flagellomere brown anterodorsally, becoming black towards anterior and dorsal surfaces; clypeus, ocellar tubercle and back of head brown; posterolateral corner of frons yellow and eye margin not touching brown pigment. Pleuron light yellow with large anteroventral spot on anepisternum, anepimeron with extensive brown mottling, meron brown with yellow dorsum and katepisternum brown with dorsal ¼ (including seta base) yellow. Legs yellow with base of coxae brown, femora with small dorsobasal and larger dorsal subapical spots that are larger, darker and united to basal spot by dorsal streaks on fore and hind legs; tibiae brown with anterior legs paler, venter paler to yellowish; tarsi brown. Abdominal tergites, sternite 8, epandrium and surstylus brown.

Genitalia: Not illustrated—holotype distiphallus broken off of holotype and cannot be located in vial. Ontario males as described for *L. lathryi* (Figs 144–148).

Variation: ON specimens vary as follows: Wing length 1.5–1.6mm (♂), 1.5–1.7mm (♀); length of ultimate section of vein CuA_1 divided by penultimate section 3.4–3.8; eye height divided by gena height 3.3–4.5; first flagellomere sometimes with entire surface lightly infuscated with brown pigment, otherwise as above; femora with small dorsobasal and larger dorsal subapical spots (larger and darker on fore femur) that are sometimes united as a single streak, most often on fore femur; sometimes with yellowish medial band on fore tibia that is sometimes also faintly present on mid and hind tibiae.

Host. Unknown.

Range. Canada. ON*, YT.

Holotype: Canada. YT: 4km E Carcross, slope above Nares Lake, (60˚10.1′N, 134˚, 38.7W), pan trap on south facing grass slope, 13–20.vii.1998, S. Boucher (1♂, LEM).

Additional material examined. Canada. ON: Pancake Bay P.P., 46˚57.74′N, 84˚42.63′W, 7.viii.2004, K.N. Barber, sweeps, beach grasses (1♂, DEBU), Bruce Co., Inverhuron P.P., back dunes, 44°17’50”N, 81°35’27”W, Malaise, S.A. Marshall, 15–28.vi.2003 (1♀, DEBU), 28.vi–8.vii.2003 (1♂ 2♀, DEBU), Inverhuron P.P., back dunes, 44°17’50”N, 81°35’27”W, YPT, 15.vi.2003, M. Buck (1♂ 1♀, DEBU), Inverhuron P.P., front dunes, 44°17’33”N, 81°35’28”W, YPT, 6.vi.2003, M. Buck (1♂, DEBU), Thunder Bay Distr., Mouth of Pic River, N side, 48°36’N, 86°18’W, dunes / *Arctostaphylos*, yellow pans, 19–22.vii.2001, M.&B. Buck (2♀, DEBU), Thunder Bay Distr., Pukaskwa N.P., Beach Trail, 29–30.vii.2003, dunes, yellow pans, S.M. Paiero (1♂ 1♀, DEBU).

Comments. While the male genitalia of this species are virtually identical to those of *Liriomyza lathryi* (Figs 144–148), there are enough external differences to maintain *L. nares* as a distinct species, although the boundaries of these species should be re-examined following the collection of additional material. *Liriomyza nares* is slightly smaller than *L. lathryi*, the anterior ori is strongly reduced or even absent, the base of the vertical setae and margin of the eye are entirely yellow, the femora and first flagellomere are darker, the discal cell is smaller and there are fewer rows of acrostichal setulae (although some *L. lathryi* have only two rows).

The Ontario records greatly extend the known range of this species, which is likely even more widespread.

Liriomyza nordica Spencer
Figs 37–39

Liriomyza nordica Spencer 1969: 179. Sehgal 1971: 336.

Wing length 1.9–2.1mm (♂), 2.0–2.1mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.2–3.1. Eye height divided by gena height: 2.4–4.0. Scutum lightly dusted with pruinosity.

Chaetotaxy: Two ori, one ors (anterior ors reduced or appearing as weak ori); three ori in NT and ON specimens. Acrostichal setulae in two to three rows in male and four in female.

Colouration: Calypter margin grey. Head yellow with back of head, ocellar triangle and clypeus dark brown; male first flagellomere infuscated on distal 2/3, and with faint to indistinct narrow outer-dorsal line beginning in front of arista base; posterolateral corner of frons dark brown to base of outer vertical seta and light brown to inner vertical; base of fronto-orbitals and orbital setulae surrounded by small faint spot; venter of gena with light brown line that is darkest posteriorly. Lateral yellow stripe on scutum brownish postsuturally and with brown posterior spot. Scutellum brown laterally. Metanotum brown with anatergite yellow dorsally and mediotergite dark brown. Pleuron brown with dorsal margin of anepisternum yellow (dorsal ¼ light brown in holotype), and dorsomedial margin of katepisternum yellow. Legs brown with fore and mid coxae yellow apically and femora irregularly brown with apices and anteroventral surfaces yellow (most widely yellow on fore leg). Abdomen brown.

Genitalia: (Figs 37–39) Surstylus with base lobate posteriorly and apex narrow with one spine. Basiphallus sclerotized along left lateral and dorsoapical surfaces. Swollen section of ejaculatory duct widest medially and gradually narrowing at both ends. Hypophallus well-developed. Paraphallus wider apically, weakly sclerotized. Mesophallus slightly longer than wide, widest subbasally, with widened ventral suture, fused to distiphallus. Distiphallus with broad, deep basal bowl that is narrow and recessed ventrally, and with ring of narrow spinules along inner-distal margin; with one pair of apical, basally-sclerotized tubules that arch backwards over bowl in an S-curve (more strongly curved at base on ON male). Ejaculatory apodeme well-developed with long, dark stem and wide blade with dark margin; sclerite of sperm pump wide with dark, truncated ends.

Host. Unknown.

Range. Canada. AB, BC*, NT*, ON*, YT*. **USA.** AK.

Holotype: USA. AK: King Salmon, Naknek R., 6.vii.1952, W.R. Mason, Type No. 10411 (1♂, CNC).

Additional material examined. Canada. BC: Pr. Rupert, 4.vi.1960, W.W. Moss (1♂, CNC), **NT:** Yellowknife, Rd. nr. Stock Lake, 16.vi.1966, G.E. Shewell (1♂ 1♀, CNC), Aklavik, 28.vi.1956, E.F. Cashman (1♂, CNC), Tuktoyaktok, 69°26.322′N, 133°01.171′W, *Salix* meadow, MT, 16–18.vii.2010, Goulet & Boudreault (2♂, CNC), **ON:** Guelph arboretum, 11.v.1986, K. Fry (1♂, DEBU), Wyevale, 17.v.1959, J.G. Chillcott (1♂, CNC), **YT:** North Fork Pass, Ogilvie Mts., 4100′, 20.vi.1962, R.E. Leech (1♂ 1♀, CNC), North Fork Crossing Mi43, Peel Plt. Rd., 3500′, 3.vii.1962, P.J. Skitsko (1♂, CNC), 4.vii.1962 (3♂, CNC), 2.vii.1962, R.E. Leech (1♂, CNC). **USA. AK:** Port Althorp, 5.vi.1921, J.M. Aldrich (1♂, USNM).

Comments. The irregular basal bowl of the distiphallus and the elongate S-shaped distal tubules are characteristic of *Liriomyza nordica*, which is also darker than most *Liriomyza*. The pleuron is predominantly brown with the dorsomedial margin of the katepisternum and the dorsal 1/5–1/4 of the anepisternum yellow, the lateral stripe on the scutum brownish to brown postsuturally, and the orbital plate lightly mottled.

Most specimens have been collected in Alaska and northern Canada, but the Ontario male, which varies only slightly in morphology, represents a significant geographical outlier indicating a much broader Canadian distribution.

Liriomyza orilliensis Spencer
Fig. 182

Liriomyza orilliensis Spencer 1969: 179.

Wing length 2.0–2.1mm (♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 2.1–2.9. Eye height divided by gena height: 4.8–6.5. Scutum subshining. First flagellomere relatively large and circular with marginal hairs long.

Chaetotaxy: One ori, two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin grey. Head yellow with ocellar triangle and back of head brown, with yellowish spot immediately behind ocelli; posterolateral corner of frons with small faint spot; clypeus faintly brownish laterally. Lateral margin of scutum with complete yellow stripe that is very narrow behind suture; posterior margin yellow, with one pair of shallow yellow emarginations posterolaterally reaching base of posterior dorsocentral. Scutellum with small to indistinct brown spot in lateral corner. Metanotum yellow with anatergite brown ventrally and mediotergite dark brown. Pleuron yellow with meron brown excluding dorsum and ventral 2/3 of katepisternum brown. Legs yellow with base of hind coxa brown, hind tibia brown (excluding base) and tarsi light brown, becoming yellow to base). Abdomen yellow with terminalia and broad dorsal stripe brown, tapering to a large spot on tergite 5.

Genitalia: (Fig. 182) Surstylus with one spine, positioned at posterior corner of distal margin (not medially); relatively broad with distal margin straight. Epandrium slightly produced as point apically. Phallophorus elongate and widened apically. Basiphallus sclerotized dorsally and along left lateral surface; distolateral margins produced as large clear lobe with paraphalli fused to base. Swollen section of ejaculatory duct small. Hypophallus reduced to long hairs. Mesophallus narrow, as long as basiphallus. Distiphallus short and broad, with slight dorsoventral compression on basal "stem", complete ventral suture and apical cup enclosing paired fringed processes.

Variation: AB male differs as follows: yellowish spot not present behind ocelli; additional setula-like ori present anteriorly; posteroventral margin of katatergite brown; yellow posterior margin on scutum without narrow extensions to base of posterior dorsocentral; very small, faint brownish spot on anepisternum.

Host. Asteraceae—*Taraxacum* sp.*

Range. Canada. AB*, ON.

Holotype: Canada. ON: Orillia, 18.vii.1923, C.H. Curran, Type No. 10412 (1♂, CNC).

Additional material examined. Canada. AB: Elk Island National Park, 7.viii.1971, larva on *Taraxacum* sp., emerged 20.v.1972, G.C.D. Griffiths, E136 (1♂[with puparium], UASM).

Comments. *Liriomyza orilliensis* was previously known only from the southern Ontario holotype male, but an additional specimen from Alberta is here discovered, considerably expanding its known range. The terminalia are identical to the type, which is characterized by a particularly elongate mesophallus. ernally, there is a yellow stripe along the posterior margin of the scutum, the vertical setae are surrounded by yellow at their base, and anepisternum, anepimeron, clypeus and katatergite are entirely yellow. The yellow line along the posterior margin of the scutum is quite narrow medially and may be missed, in which case it would be misidentified as *L. taraxaci* (Figs 168–178), which can otherwise be differentiated by markings of the anepisternum, a wider spot on the scutellum and a shorter mesophallus.

***Liriomyza peleensis* Spencer**

Figs 285–287

Liriomyza peleensis Spencer 1969: 180.

Wing length 1.7–1.9mm (♂), 1.6mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.5–3.0. Eye height divided by gena height: 4.8–5.1. Scutum shining.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four to five irregular rows.

Colouration: Calypter margin brown. Head yellow with ocellar triangle, clypeus and back of head dark brown; posterolateral corner of frons dark brown and with posterior margin to ocellar triangle brown; orbital plate broadly brown laterally, with stripe becoming narrower to level of anterior ori, and with large spot around base of fronto-orbitals; venter of gena with light brown line. Scutum brown with notopleuron and postpronotum yellow. Scutellum brown laterally. Metanotum brown. Pleuron brown with dorsomedial margin of katepisternum yellow. Legs yellow with basal half of fore coxa brown, mid and hind coxae light brown with darker markings, femora brown dorsobasally, tibiae brown with base of fore tibia yellowish, and tarsi brown. Abdomen brown.

Genitalia: (Figs 285–287)Surstylus with two subapical spines. Basiphallus sclerotized along dorsal and left lateral surfaces. Swollen distal section of ejaculatory duct not narrowing apically. Hypophallus well-developed. Paraphallus narrow and slightly dilated apically. Mesophallus fused to distiphallus, which is only slightly wider than mesophallus. Distiphallus short with clear apical chamber enclosing one pair of arched sclerotized bars.

Host. Asclepiadaceae—*Asclepias incarnata* L.

Range. Canada. ON.

Holotype: Canada. ON: Pelee, em. 31.vii.1967, mine *Asclepias*, 16.vii.1967, K.A. Spencer, Type No. 10413 (1♂[with part of puparium], CNC).

Paratypes: Canada. ON: Same collection as holotype (1♀, CNC), Pelee, em. 30.vii.1967, mine *Asclepias*, 16.vii.1967, K.A. Spencer (1♂[with puparium], CNC).

Comments. *Liriomyza peleensis* is characteristically dark with the postsutural scutum, metanotum, much of the orbital plate and the abdomen brown. The surstylus has two spines and the mesophallus, like the distiphallus to which it is extensively fused, is narrow and weakly pigmented. The distiphallus appears to have an apical chamber bound by dorsally arching bands, similar to that seen in *L. asclepiadis* (Figs 217–219; also known from *Asclepias*), but this species is paler exernally and has a darker distiphallus. The phallus of *L. singula* (Figs 288–290) is also similar, but the distiphallus is stouter and the surstylus has only one spine.

Liriomyza philadelphivora Spencer

Figs 33–36

Liriomyza philadelphivora Spencer 1969: 182. Spencer & Steyskal 1986: 291; Scheffer *et al.* 2007: 772.

Description. Wing length 1.8–2.0mm (♂), 2.0–2.3mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.0–2.3. Eye height divided by gena height: 4.6–4.8. Notum shining to subshining.

Chaetotaxy: Two ori (three on left side in holotype), two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin dark. Head yellow, with back of head (excluding margin) brown, and small medial spot on ocellar tubercle brown with stripes extending to inner margin of ocelli. Scutum dark brown with lateral margins yellow and posterior margin yellow, including large subquadrate region anterior to scutellum; posterolateral margin of brown spot with one pair of rounded extensions on each side, suggesting underlying vittate pattern similar to that seen in *L. blechi*. Scutellum and metanotum yellow with mediotergite brown. Pleuron yellow with ventral half of katepisternum and meron dark brown. Legs yellow with brownish tint on mid and hind tibiae (darker on hind leg). Abdomen yellow with epandrium and ill-defined dorsomedial stripe brown.

Genitalia: (Figs 33–36) Surstylus with three dorsal setae and no spine; produced ventrally into long, pointed, outwardly curved process. Basiphallus sclerotized on dorsal and left lateral surfaces, with left distal margin produced past distiphallus as strong lobe. Hypophallus linear, narrow and pointed. Mesophallus narrow, dark, slightly longer than high or wide, with sides of ventral suture produced as irregular carina. Distiphallus cup-like, pale (darker laterally), widest medially and slightly compressed dorsoventrally.

Hosts. Hydrangraceae—*Philadelphus* spp.

Range. USA: DC, NY. **Canada:** ON.

Holotype: Canada. ON: Ottawa, em. 4.vii.1962 ex. *Philadelphus*, Type No. 10414 (1♂, CNC).

Paratypes examined: Canada. ON: Ottawa, 2.vi.1955, G. Lewis, reared leaves of mock orange, em. 16.vi.1855, J.F. McAlpine (1♂ 1♀[with puparia], CNC), Ottawa, em. 9.vii.1962, C.D. Miller, host: *Philadelphus* (1♂[with puparium], CNC), Ottawa, C.E.Farm, 11.vii.1967, K.A. Spencer (1♂, CNC).

Additional material examined. Canada. ON: Ottawa, 2.vi.1955, G. Lewis, reared ex. leaves of mock orange, em. 16.vi.1955, J.F. McAlpine (2♂[with puparium], CNC), Ottawa, em. 9.vii.1962, C.D. Miller, host: *Philadelphus* (1♂, CNC), Ottawa, J.R. Vockeroth, leaf mine in *Philadelphus coronarius*, em. 6.vii.1959 (1♀[with puparium], CNC), 12.vii.1959 (1♀[with puparium], CNC), 13.vii.1959 (1♀[with puparium], CNC), em 16.vii.1959 (6♂ 3♀[with puparia], CNC), em. 18.vii.1959 (5♂[with puparia], CNC).

Comments. *Liriomyza philadelphivora* has a distinct notal pattern also seen in *L. blechi* (Figs 29–32), with a large brown spot on the scutum that is produced posterolaterally as two pairs of narrow stripes, but the third dorsocentral of the former species is longer, the tibiae are yellow and the epandrium is brown. The surstylus is also unique in the genus, being pointed, strongly curled and without spines.

***Liriomyza pilicornis* spec. nov.**
Figs 4, 15, 153–157

Wing length 1.6–1.9mm (♂), 1.6–2.0mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.4–2.6; 3.1–3.8 in reared AB material. Eye height divided by gena height: 3.7–4.1. Scutum subshining. Narrow, but distinct ring around eye when viewed laterally. First flagellomere relatively large, circular and distal half covered with hairs approximately as wide as arista base; slightly smaller and somewhat subquadrate in female.

Chaetotaxy: (Fig. 15) Two ori, two ors; female sometimes with anterior ori missing from one side. Acrostichal setulae in four rows.

Colouration: (Fig. 4) Calypter margin brown. Head yellow with ocellar triangle, clypeus and back of head dark brown; first flagellomere light brown or slightly darker with basal margin yellow; orbital plate narrowly brownish along lateral margin and with brownish spot around base of fronto-orbitals; posterolateral corner of frons brown to inner vertical or space between vertical setae with spot at base of inner vertical, venter of gena with brownish line that fades anteriorly. Scutum with complete yellow stripe laterally. Lateral corner of scutellum brown. Katatergite largely brown with anterodorsal region yellow; anatergite brown with posterodorsal corner yellow; mediotergite dark brown. Ventral 2/3 of anepisternum brown with dorsal margin of spot irregular (MA male with brown oblique stripe); anepimeron and meron largely brown; katepisternum brown below level of seta and with faded spot behind seta. Legs yellow with coxae brown basally (more extensive on mid and hind legs), femora light brown basally, fore femur with light dorsal striations, fore tibia brownish and mid tibia brown, both with base yellowish, hind tibia darker brown and tarsi brown with base paler. Abdomen brown with tergites yellow laterally.

Genitalia: (Figs 153–157) Surstylus with single subapical spine. Epandrium with ventral margin strongly produced; inner surface flanked by one pair of dark bars with small terminal spine. Basiphallus sclerotized along dorsal and anterolateral surfaces, the latter of which continue as pointed, weakly sclerotized lobes. Hypophallus absent. Paraphallus narrow and flattened. Mesophallus short, dark and especially widened subbasally; venter shielded by one pair of long, flat leaf-like plates; mesophallus and distiphallus with complete ventral suture that is slightly produced ventroapically. Distiphallus short, broad, cup-like, with short basal stem and one pair of short, internal fringed processes and one pair of ventromedial bars. Ejaculatory apodeme with short stem, base of duct sclerotized, and with broad, pale blade with transverse medial and longitudinal marginal striations that sometimes fuse towards ill-defined margin; sclerite of sperm pump relatively narrow and dark with margins thick and produced laterally.

Etymology. The specific epithet refers to the hairy (L. *pilus*) first flagellomere (L. *cornu*—"horn").

Host. Santalaceae—*Comandra umbellata* (L.) Nutt., *Geocaulon lividum* (Richardson) Fernald.

Range. Canada. AB, BC, MB, NS, ON, QC. **USA.** AK, MA.

Holotype: Canada. NS: Nr. Lk. of Islands, Cape Breton N.P., 18.vi.1983, A. Borkent (1♂, CNC).

Material examined: Canada. AB: Scotford Sandhills, 5 miles west of Bruderheim, 20.vi.1971, larva on *Comandra pallida*, emerged 20–30.v.1972, G.C.D. Griffiths, E57 (2♂ 2♀[with puparia], UASM; 2♀[with puparia], CNC), **BC:** 35km NW Fraser on Klondike Hwy, Tutshi Lake, sweep grasses beside road, 3.vi.1997, T.A. Wheeler (1♂, LEM), **MB:** Fort Churchill, J.G. Chillcott, 17.vi.1952 (1♂, CNC), 21.vi.1952 (1♂, CNC), **ON:** Manitoulin I., Carter Bay, 45°36'23"N, 82°08'27"W, dunes, white pans, 24–27.vi.2003, Buck & Paiero (1♀, DEBU), **QC:** James Bay Rte. km398.8, 52°21′25″N, 77°06′25″W, boggy black spruce, white pans, 8–15.vii.2001, M.&B. Buck (1♂, DEBU), James Bay Rte. km133.7, 50°29′52″N, 77°25′11″W, black spruce/sphagnum, yellow pans, 7–16.vii.2001, M.&B. Buck (1♂, DEBU), James Bay Rte. km570.3, 53°29′39″N, 77°37′15″W, black spruce nr. lake shore, Malaise, 9–15.vii.2001, M.&B. Buck (1♀, DEBU), James Bay Rte. km603.1, 53°43′28″N, 77°43′10″W, boggy spruce, yellow pans, 10–14.vii.2001, M.&B. Buck (1♀, DEBU). **USA. AK:** Harding Lake / Salcha River, 29–30.vii.1968, larvae on *Geocaulon lividum*, emerged 12, 22.v.1969, G.C.D. Griffiths, F25 (1♂ 1♀[with puparia], UASM), **MA:** Hampshire Co., Belchertown, Scarborough Brook Conserv. Area, 8.vi.2013, em. 26.vi.2013, ex. *Comandra umbellata*, C.S. Eiseman, #CSE611 (1♂, CNC), em. 2014?, CNC564680 (1♀, CNC).

Additional material examined : USA. MA: Hampshire Co., Belchertown, Scarborough Brook C.A., 8.vi.2013, C.S. Eiseman, *Comandra umbellata* em. 2014? , #CSE1649, CNC564679 (1unemerged from puparium, CNC).

Comments. *Liriomyza pilicornis* is an uncommonly encountered species occurring from Manitoba to Nova Scotia that is best diagnosed by the male genitalia. The posteroventral margin of the epandrium is produced and

triangular, the single apical spine on the surstylus is not strongly differentiated, there is one pair of paraphalli fused to the mesophallus basally, there is one pair of elongate ventrolateral plates emerging from the mesophallus, the mesophallus is short, stout and with flat lateral extensions and a transverse ventromedial fossa, the distiphallus is broad, globular and of a unique shape, and the ejaculatory apodeme is large with a dark, ragged distal margin,. Externally, it has a large, circular, hairy and light brown first flagellomere and faint spots at the base of the fronto-orbitals. This highly atypical species is likely allied to those species with an elongate, cylindrical mesophallus, such as *L. taraxaci* (Figs 170–178), revealed by the paired bars along the inner-lateral surface of the epandrium, the darker, apically produced surstylus, the shape of the distiphallus in profile and the large, hairy first flagellomere.

***Liriomyza pistilla* spec. nov.**
Figs 5, 291–294

Description. Wing length 1.4–1.8mm (♂), 1.8mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 3.0–4.2. Eye height divided by gena height: 5.5–7.4. Scutum subshining.

Chaetotaxy: Two ori (holotype with additiomal anterior hair-like ori on one side); two ors. Acrostichal setulae in four rows.

Colouration: (Fig. 5) Calypter margin brown. Head yellow with ocellar triangle, clypeus and back of head dark brown; posterolateral corner of frons dark brown to base of outer vertical seta and light to dark brown to inner vertical; excluding ON specimens, base of fronto-orbitals surrounded by light to dark brown spot (sometimes very faint) and lateral margin of eye brownish. Lateral yellow stripe complete. Lateral corner of scutellum brown. Katatergite brownish to yellow, becoming brown posteriorly; anatergite brown with dorsum yellow; mediotergite dark brown. Ventral 2/3 of anepisternum brown with deep yellowish posterodorsal emargination; anepimeron brown with yellow mottling; meron brown with dorsum yellow; katepisternum yellow at and above level of seta base. Legs yellow with base of fore and mid coxae widely brown, hind coxa brown (sometimes only at base), base of femora brown (sometimes very narrowly), fore femur sometimes with faint dorsal streak (never present in ON or MA specimens), scraper brown, and tibiae and tarsi brown with base of mid tibia sometimes paler. Abdomen brown with lateral margin of tergites yellow.

Genitalia: (Figs 291–294) Epandrium slightly produced posteroventrally. Surstylus with two subapical spines. Basiphallus sclerotized along left lateral and anterodorsal surfaces. Hypophallus narrow with few apical hairs. Paraphallus narrow, flat, angled anteroventrally and closely held to base of distiphallus. Mesophallus not visible, fully fused to base of distiphallus. Distiphallus stout, dark and clavate with complete ventral suture, and with small apical chamber enclosing paired fringed structures. Ejaculatory apodeme with short stem and large blade that is dark medially and marginally with apical striations; base of duct and sperm pump venter sclerotized with lateral margins of pump produced and thickly sclerotized. Paler ON males sometimes with inward-facing spines along inner-distal margin of distiphallus.

Variation: NS males differ as follows: lateral stripe on scutum is brownish postsuturally; orbital plate partially pigmented; base of femora brown; fore femur streaked dorsally and coxae brown; membranous distolateral margin of basiphallus more produced; base of distiphallus slightly longer and clearer, and apical chamber slightly larger. BC males sometimes with posterolateral spot on frons along margin of orbital plate as far as anterolateral margin of frons, and sometimes with broad extensions enclosing base of fronto-orbitals.

Etymology. The specific epithet is derived from the Latin for “a club-shaped pounder used in a mortar” (*pistillum*), referring to the shape of the phallus.

Host. Scrophulariaceae—*Melampyrum lineare* Desr.

Range. Canada: AB, BC, NS, ON, QC. **USA:** MA, NC.

Holotype: USA. NC: Wayah Bald, 13.vii.1957, C.J. Durden (1♂, CNC).

Paratypes: CANADA. AB: Opal Sandhills near Redwater, 29.vii.1973, larva on *Melampyrum lineare*, emerged 14–30.vi.1974, G.C.D. Griffiths, G26 (6♂ 4♀[with puparia], UASM), **BC:** Kinbasket Lake, BC Hydro drawdown study, Cooper, Beauchesne & Assoc. Ltd., Malaise trap, 13.vi.2008 (22♂, CNC; 2♂, LEM; 2♂, USNM), 21.vi.2008 (6♂, CNC), 27–28.vi.2008 (1♂, CNC), 18.vii.2008 (1♂, CNC), 12–13.vii.2009 (3♂, CNC), 29–30.vii.2009 (1♂, CNC), 12.vi.2010 (3♂, CNC), 20km SW Williams Lake, 29.vi.1992, A. Borkent (1♂, CNC), **ON:** One Sided Lake, 1.vii.1960, S.M. Clark (1♂, CNC), Thunder Bay Distr., Neys P.P., Dune Trail, 48°46′52″N,

86°36′53″W, 7–19.vi.2002, M. Buck, Malaise (6♂, DEBU), white pans (1♀, DEBU), yellow pans (2♂, DEBU), Essex Co., Windsor, ~1.5km S Ojibway Prairie, forest-prairie edge, Malaise, 15.v–1.vi.2001, S.M. Paiero (1♂, DEBU), **QC:** Gatineau Park, Luskville creek, YPT, 30.v–1.vi.2011, L. Masner (4♂ 1♀, CNC), **NS:** Nr. Lk. of Islands, Cape Breton N.P., 18.vi.1983, A. Borkent (2♂, CNC). **USA. MA:** Franklin Co., Sunderland, Mt. Toby, 27.vi.2014, ex. *Melampyrum lineare*, em. by 15.vii.2014, C.S. Eiseman, #CSE1183, CNC384842-384844 (3♂, CNC), Hampshire Co., Pelham, Butter Hill Wildlife Sanctuary, 2.vi.2015, C.S. Eiseman, *Melampyrum lineare* em. 20–23.vi.2015 , #CSE1635, CNC564685-564689 (3♂,2♀, CNC), Nantucket Co., Nantucket, Masquetuck, 11.iv.2013, ex *Melampyrum lineare*, em. 26–30.vi.2013, C.S. Eiseman, #CSE610, CNC422920-422923 (1♂ 3♀, CNC).

Comments. This new species is externally unremarkable, but has a large, dark, clavate distiphallus and two spines on the surstylus that allow for confident diagnosis. Other species with a similar phallus include the European *L. furva* Spencer and the western North American *L. bellissima* (Spencer) (Figs 249–251), but the former is smaller (1.3mm), the frons around the base of the inner vertical seta is yellow, the femora have brown streaks and the scutum is shining (description from Spencer (1976)), and the latter is larger (2.0–2.5mm) and heavily pigmented across the head, thorax and legs. The dark phallus and surstylus are superficially similar to those of the *Lantana*-feeding *L. brassicae* (known from California), although the distiphallus is much wider apically and not constricted, and like *L. brassicae*, the lateral margin of the frons is sometimes narrowly brown.

Liriomyza ptarmicae **de Meijere**
Figs 187–194

Liriomyza ptarmicae de Meijere 1925: 286. Spencer 1976: 263, 1981: 258; Spencer & Steyskal 1986: 121; Lonsdale 2011: 85.
Liriomyza millefolii Hering 1927: 185; Hendel 1931–1936: 233. Syn. Spencer (1976).
Liriomyza chrysanthemi Hering 1956: 116. Syn. Spencer (1976).
Liriomyza pilosa Spencer 1969: 182. Sehgal 1971: 336. Syn. Spencer (1981).

Wing length 1.6–1.9mm (♂), 1.7–2.0mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.5–3.4; vein dm-cu sometimes absent. Eye height divided by gena height: 3.1–5.4. Scutum shining. First flagellomere sometimes relatively large and ovate with long marginal hairs (some USA and most Canadian specimens)

Chaetotaxy: Two ori with anterior seta minute to absent, two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin brown. First flagellomere yellow (western specimens sometimes with segment deeper yellow, or even brownish to brown from southern BC south into the USA); posterolateral corner of frons narrowly brown, not reaching base of outer vertical seta (spot sometimes widely or closely spaced to seta base); clypeus, back of head and ocellar triangle brown. Scutum with yellow lateral stripe interrupted subbasally. Scutellum yellow with lateral corner brown. Katatergite and anatergite variable; metanotum brown. Anepisternum brown with dorsal 1/3 and sometimes posterior half yellow, although usually entirely yellow with small anteroventral spot; anepimeron with anterior stripe; katepisternum brown (yellow around base of seta) with dorsomedial margin and sometimes faded vertical anterior stripe yellow; meron brown with dorsum yellow. Legs yellow with base of coxae and femora brown, brown dorsal mottling on femora faded or extensive, tibiae brown (paler ventrally) with faded to extensive yellow mottling on mid and hind legs, and tarsi brown, becoming paler to base. Abdomen brown with lateral and posterior margin of tergites yellow.

Genitalia: (Figs 187–191) Epandrium produced and elongate ventrally, ending in broadly rounded point; inner surface flanked by plate with one or two spines. Surstylus narrow along length and with short ventroapical spine. Left and right distal margins of basiphallus with elongate, broad, truncated, lightly-sclerotized extensions. Swollen apical section of ejaculatory duct broad and rounded basally, becoming narrow with sides slightly converging distally. Paraphallus small and rod-like. Hypophallus elongate and with long dorsal hairs on distal half. Length of mesophallus more than twice width, strongly angled dorsally and partially fused to distiphallus; width half that of distiphallus. Distiphallus with short basal neck and broad apical chamber enclosing paired fringed structures. Ejaculatory apodeme with base broad, extending to duct; blade elongate with centre paler with minute annulations, and distal margin with irregular dark band; sperm pump with sclerotized venter extending as round lobes laterally and connecting to sclerotized base of ejaculatory duct.

Variation: NT, eastern specimens and some AB specimens differs as follows: only one ori; first flagellomere entirely yellow; katatergite only brown posteroventrally; anepisternum only with small anteroventral spot; dorsal ¼ of katepisternum yellow including seta base; femora entirely yellow; fore and mid tibiae yellow with dorsum brownish and hind tibia yellow with light brown mottling; male genitalia (Figs 192–194) with two spines on surstylus and distiphallus (lateral view) sometimes thicker with apical bowl more strongly angled. ON specimens with smaller brown spot on anepisternum, pigment brighter overall with fore and mid tibiae entirely brown and abdominal tergites more broadly yellow laterally and narrowly yellow along posterior margin. AK specimens sometimes with reduced anterior ori, slightly larger anepisternal spot, with hind femur narrowly brown dorsobasally and mid femur with similar paler spot, and tibiae brown dorsally with pigment on anterior legs weaker. NY female as described for ON specimens except abdomen only narrowly yellow laterally.

Hosts. Asteraceae—*Achillea*, *Anthemis*, *Chrysanthemum*, *Leucanthemum* (Benavent-Corai *et al.* 2005); *Artemisia** (*A. alaskana* Rydb., *A. Artemisia ludoviciana* Nutt. ssp. *ludoviciana* (=*herriotii*), *Artemisia* sp.).

Range. Canada. AB, BC*, ON*, NS*, NT*, YT*. **USA.** CA, CO, OR, WA, WN. Europe.

Syntype [*ptarmicae*]: Poland or Germany. "Aus Achillea ptarmica, Deutschland, Hering leg." (?, ZMHU). [Not examined]

Holotype [*millefolii*]: Germany. Bredow near Nauen (1♀, ZMHU). [Not examined]

Holotype [*chrysanthemi*]: Germany. Oberlausitz, Buchholz, between Biehain and Horka (1♂, BMNH). [Not examined]

Holotype [*pilosa*]: Canada. AB: Edmonton, Univ. campus, 20.vi.1966, K.A. Spencer, Type No. 16129 (1♂, CNC), Aspen Beach, O. Peck, 22.vii.1944 (1♂, CNC), 25.viii.1944 (1♀, CNC).

Additional material examined. Canada. AB: Edmonton, White Mud Creek, 30.vi.1975, larva on *Artemisia herriotii*, emerged 15–16.vii.1975, G.C.D. Griffiths, E234 (4♂ 3♀[with puparia], UASM), Elk Island National Park, 1–9.vii.1971, larva on *Achillea sibirica*, emerged 23.vii.1971, G.C.D. Griffiths, E77 (1♀[with puparium], UASM), Elk Island National Park, 20.vii.1975, larva on *Achillea sibirica*, emerged 7–13.viii.1975, G.C.D. Griffiths, E259 (18♂ 22♀[with puparia], UASM; 3♂ 3♀[with puparia], CNC), **BC:** Kinbasket Lake, BC Hydro drawdown study, Cooper, Beauchesne & Assoc. Ltd., Malaise trap, 29–30.vii.2009 (1♂ 1♀, CNC), **ON:** Bradford, 21.v.1958, D.H. Pengelley (1♂, DEBU), St. Ignace II, Sturgeon Bay, 22.v.1959, J.G. Chillcott (1♂, CNC), 7mi E Griffith, 1.viii.1982, B.E. Cooper (3♂, CNC), 2mi N Metcalfe, 28.vi.1982, B.E. Cooper (1♀, CNC), Midland, 30.vii.1956, J.G. Chillcott (1♀, CNC), Marmora, 25.viii.1952, C. Boyle (1♀, CNC), Ottawa, 25.vii.1959, J.R. Vockeroth, swept from *Philadephus coronatus* (1♀, CNC), Manitoulin Distr., Manitoulin I., Carter Bay, 45°36′23″N, 82°08′27″W, 13–22.vii.2003, dunes by stream, Malaise, M. Buck (1♀, DEBU), Perth Road, 28.vii.1964, J.R. Vockeroth (1♂, CNC), **NS:** CBHNt. Pk., Mackenzie Mt., 13.vii.1984 (1♂, CNC), CBHNt. Pk., Mackenzie Mtn., 400m, 8.vi.1984, birch & fir, B.E. Cooper (1♂, CNC), Cape Breton Island, St. Ann, 46°12.4′N, 60°37.4′W, swp vegetation along path in open boreal forest, 22.vii.2002, J. Forrest & T. Wheeler (1♂, LEM), **NS:** Sable Island, 11–15.ix.1967, W.R.M. Mason (1♂ 1♀, CNC), **NT:** Ft. McPherson, 2.vii.1957, S.D. Hicks (1♀, CNC), **YT:** Near S end Kluane Lake, 2800–4200′, 22–25.vii.1972, larva on *Artemisia alaskana*, emerged 20–21.v.1973, G.C.D. Griffiths, KL29 (1♂ 1♀ 1?[with puparium], UASM). **USA. AK:** Ketchum Creek, near Central (Steese Hwy.), 18.vii.1968, larva on *Achillea sibirica*, emerged 9–20.ix.1968, G.C.D. Griffiths, C11 (3♂ 1♀[with puparia], UASM), Umiat, 24.vii.1959, R. Madge (1♀, CNC), **CO:** Echo Lake, 10600′, Mt. Evans, 25.vii.1961, C.H. Mann (1♀, CNC), Grand Co., Frazer, 9500′, 7.vii.1961, J.G. Chillcott (1♂, CNC).

Comments. At least eight species of Canadian *Liriomyza* have some representatives of one or both sexes with pale hairs on the first flagellomere that are at least as long as the width of the base of the arista (not shorter, as is typical of the rest of the genus). These longer hairs are sometimes restricted to the distal margin of the first flagellomere, but they may also extend to the basal 1/3 of the segment, creating a "bushy" appearance. Most of these species appear to be related, belonging to that group of taxa with the anterior ori reduced to absent, a dark cylindrical mesophallus, and a short distiphallus with a dorsoventrally compressed stem dominated by the bulging apical chamber. Of the closest northern relatives of this group—*L. eboni* (Fig. 143), *L. pilicornis* (Figs 153–157), *L. minor* (Figs 179–181), *L. ptarmicae* (Figs 187–194), *L. taraxaci* (Figs 168–178) and *L. orilliensis* (Figs 182)—the last four (sometimes excluding *L. minor*) have the vertical setae surrounded by yellow, and the first four often have the first flagellomere pigmented, with that of *L. eboni* being entirely light brown. *Liriomyza orilliensis* is readily identifiable in having the clypeus and the posterior margin of the scutum yellow. Specimens of two other putative taxa identified by Spencer—*L.* "Edmonton" and *L.* "Constance Bay", which are deposited in the CNC—have

similarly haired antennae, and the former could be treated as *L. taraxaci* as outlined here (a variable species likely composed of multiple taxa), but they are known only from females and not dealt with further here. Many other similar females could not be confidently identified to species. *Liriomyza sinuata* has a similarly haired antenna, but it has a small, pale mesophallus, and a distiphallus with a shallow basal bowl and one pair of long, clear, distal tubules (Fig. 40), a light dusting of grey pruinosity on the scutum and only two rows of acrostichal setulae (not four). A small minority of Canadian *L. helianthi* (Figs 277–284) and *L. sativae* (Figs 303–306) males have also been found with slightly longer hairs on the first flagellomere.

Liriomyza quadrisetosa (Malloch)

Figs 341–346

Agromyza quadrisetosa Malloch 1913: 332.
Liriomyza quadrisetosa. Frick 1952a: 405, 1959: 409; Spencer 1969: 183; Spencer & Steyskal 1986: 114; Lonsdale 2011: 87.

Description. Wing length 2.2–2.5mm (♂), 2.5mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.8–2.6. Eye height divided by gena height: 2.1–2.7. Epistoma large. Parafacial and orbital plate (anteriorly) prominent and projecting. Scutum glossy to subshining.

Chaetotaxy: Five ori; one ors. Acrostichal setulae in two irregular rows.

Colouration: Calypter margin dark brown. Head with orbital plate dark to base of fronto-orbital setae, and face, ocellar tubercle, back of head, first flagellomere, clypeus and palpus dark brown. Thorax dark with postpronotum (excluding anterior spot), notopleuron, supra-alar spot and dorsal margin of anepisternum (dorsal 1/5, with yellow stripe becoming broader posteriorly) yellow. Legs entirely dark. Abdomen dark with posterior margin of tergites 2–5 yellow; posterior margin of tergite 6 yellow in female.

Genitalia: (Figs 341–346) Epandrium heavily setose posteriorly and with inner-distal margin lined with small tubercle-like setae. Surstylus large, truncated and with scattered tubercle-like setae on inner face. Subepandrial sclerite relatively dark and small with pronounced anteromedial process. Hypandrium elongate with pointed inner-medial process and long, tapered apex. Basiphallus fused to phallophorus, with dorsobasal surface minutely haired, with shallow outer-distal lobes. Hypophallus densely haired, broad to base and with tapering, posteriorly-directed medial process. Side of phallus with broad membranous "wings". Mesophallus elongate and subcylindrical, with complete ventral suture. Distiphallus composed of two stout tubules that diverge at base and are medially surrounded by haired collar.

Hosts. Unknown, possibly *Clematis* (Ranunculaceae) (Spencer & Steyskal 1986).

Range. USA: CA, IN, NY, TX, UT. **Canada:** BC*, QC.

Holotype: USA. TX: San Antonio, 8.iv.1907, F.C. Pratt, Type No. 15957 (1♀, USNM).

Paratype examined: USA. TX: "Brnsville", Jones 7 Pratt (1♀, USNM).

Additional material examined. Canada. BC: Oliver, UBC Geology Camp, 27.vii.1990, S.G. Cannings, Malaise trap, hawthorn thicket edge (1♂, UBCZ), Osoyoos, Mt. Kobau, el. 560m, 14.vii–23.viii.1991, D. Blades & C. Maier (1♂, RBCM), **QC:** Beech Grove, 18.vii.1951, J.F. McAlpine (1♂, CNC).

Comments. The robust, haired and bifid phallus, and the stout, heavily spinose surstylus and epandrium are highly diagnostic of this species. Although a spinose epandrium and surstyli are also seen in related genera, these often have smaller, discreet rows of larger spines, and do not have a pigmented ejaculatory duct. The additional fronto-orbitals, reduced acrostichals, and large epistoma and wing size are also characteristic.

Liriomyza ranunculoides Spencer

Liriomyza ranunculoides Spencer 1969: 183.

Wing length 1.8mm (♀). Male unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 2.2. Eye height divided by gena height: 4.3. Scutum covered with pruinosity (not grey).

Chaetotaxy: Two ori, two ors (one ors on left side). Acrostichal setulae in two rows.

Colouration: Calypter margin grey. Head yellow with ocellar tubercle, clypeus and back of head brown. Lateral margin of scutum with complete yellow stripe; posterior margin yellow with pointed medial emargination

that is broad and subquadrate at base. Scutellum yellow with lateral corner brown. Katatergite brown posteroventrtally; anatergite brown with posterodorsal corner yellow; mediotergite dark brown. Anepisternum with irregular, oblique anteroventral spot; anepimeron with mottling on anterior half; meron brown ventrally; katepisternum brown on ventral 2/3 (not including seta base). Legs yellow with base of coxae brown, hind femur narrowly brown dorsobasally and tibiae and tarsi light brown (tarsi darker apically). Abdomen brown medially on tergites 1–5 and anteromedially on tergite 6.

Host. Ranunculaceae—*Ranunculus* sp., possibly *R. acris* L.

Range. Canada. ON.

Holotype: Canada. ON: Dunrobin, em. 1.viii.1967, mine *Ranunculus acris* 19.vii.1967, Type No. 16130 (1♀[with puparium], CNC).

Comments. *Liriomyza ranunculoides* is known from a single female collected in Dunrobin, west of Ottawa. It was described on the basis of slight unspecified differences from *L. assimilis* specimens that were reared from *Helianthus*. Additional rearing data might prove this taxon to be synonymous with either *L. assimilis* or a species with long apical tubules on the distiphallus.

***Liriomyza rigaudensis* spec. nov.**
Figs 295–298

Wing length 1.8mm (♂), 1.7–1.8mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 3.4–4.4. Eye height divided by gena height: 3.8–4.4. Scutum grey pruinose. Orbital plate, parafacial and cheek slightly pronounced, forming a ring around eye.

Chaetotaxy: Two ori (anterior ori sometimes reduced), two ors. Acrostichal setulae in two rows; almost no setulae lateral to dorsocentral rows. Dorsocentral setae strongly decreasing in length anteriorly. First flagellomere with slightly longer hairs along anterior margin.

Colouration: Calypter margin yellow. Head yellow with first flagellomere sometimes orange on distal 2/3, venter of gena with brownish line, ocellar tubercle and posterolateral corner of frons lateral to vertical setae brown, and clypeus and back of head brown; brown spot reaching posterior margin of eye in eastern specimens. Scutum with complete yellow lateral stripe, and posterolateral margin of brown disc with narrow separate stripe sometimespartially differentiated. Anepisternum with short brown subventral stripe; anepimeron brown mottled; meron mostly brown; katepisternum brown on ventral ¾, not including seta base. Legs yellow with fore coxa brown at base, mid and hind coxae brown on basal half with remainder of posterior surface of hind coxae brownish, femora brown at base and fore femur with very light dorsolateral streaking, tibiae brown (paler on anterior legs) and tarsi brown (paler to base); pigment on legs sometimes faded with femora mostly yellow. Abdomen brown; male abdomen yellow laterally, posteriorly on tergite 1, on longitudinal medial line on tergite 2, and posteriorly on tergite 6.

Genitalia: (Figs 295–298) Surstylus with one strong subapical spine. Basiphallus sclerotized dorsally. Ejaculatory duct gradually widening at base. Hypophallus well-developed. Paraphalli subrectangular with apex widest, narrowly connected dorsally. Mesophallus well sclerotized dorsally, slightly longer than wide, carinate ventrally along suture and fused to distiphallus. Distiphallus cup-like, weakly scleritized with margins narrow, outline nearly square when viewed ventrally (slightly shorter than wide in eastern specimens), and enclosing one pair of fringed structures. Ejaculatory apodeme with dark stem that widens to well-developed, pale blade, with darker marginal to submarginal band; sclerite of sperm pump well-developed with lateral margins truncated and dark.

Etymology. The specific epithet refers to the Quebec collection locality.

Host. Unknown.

Range. Canada. AB, MB, QC, SK.

Holotype. QC: Mont Rigaud, sweep grassy area at mid-hill, 18.viii.2005, H. Varady-Szabo (1♂, LEM).

Paratypes: Canada. AB: 15km NE Onefour, Sage Creek (49˚09.0′N, 110˚15.1′W), sweep dry prairie at roadside, 10.vii.2000, V. Crecco & T.A. Wheeler (1♂, LEM), Kananaskis, Sheep River Prov. Pk., 7km W Sandy McNabbcampgrnd (50˚38.9′N, 114˚37′W), swp open forest and field, 28.vii.2003, S. Boucher (3♂ 3♀, LEM), **MB:** 5mi SW Shilo, 22.vii.1958, J.G. Chillcott (1♂, CNC), **QC:** Mont Rigaud, sweep grassy area at mid-hill,

18.viii.2005, H. Varady-Szabo (1♀, LEM), A. Grégoire Taillefer (1♀, LEM), Mont Rigaud, sweep open area at base of hill, 18.viii.2005, A. Grégoire Taillefer (2♀, LEM), **SK:** Cypress Hills Prov Pk. East boundary (49˚40.2′N, 109˚27.5′W), sweep meadow near mixed forest, 10.vii.2000, V. Crecco & T.A. Wheeler (3♂, LEM).

Additional material examined. Canada. SK: Cypress Hills Prov Pk. East boundary (49˚40.2′N, 109˚27.5′W), sweep meadow near mixed forest, 10.vii.2000, V. Crecco & T.A. Wheeler (1♂, LEM).

Comments. The phallus of *Liriomyza rigaudensis* is superficially similar to that of *L. helianthi* (Figs 277–284), particularly when viewed laterally, because the mesophallus is relatively long, narrow and fused to a short, pale distiphallus, but the distiphallus is subquadrate in ventral view (not rounded) and the paraphallus is only slightly wider apically (usually much wider apically in *L. helianthi*). The first flagellomere of some *L. helianthi* also has longer apical hairs as seen here (but neither are very long and "bushy" as in other species such as *L. ptarmicae*), although the segment is not largely orange in colour, and no *L. helianthi* has two rows of acrostichal setulae, grey pruinosity on the scutum, a yellow calypter or vertical setae surrounded by yellow at the base. Also see comments for *Liriomyza gibsoni.*

Liriomyza sabaziae **Spencer**

Figs 299–302

Liriomyza sabaziae Spencer 1963: 366. Spencer 1973: 60, 1981: 262, 1983: 58, 1984: 23; Spencer & Steyskal 1986: 126; Lonsdale 2011: 89.

Wing length 1.8–2.1mm (♂), 2.1–2.3 (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.1–2.8. Eye height divided by gena height: 4.2–5.4. Scutum subshining.

Chaetotaxy: Two ori (rarely with three on one side), two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin grey. First flagellomere yellow; posterolateral margin of frons dark to outer vertical seta and brown to base of inner vertical; back of head, ocellar triangle and clypeus dark brown; remainder light yellow. Scutum with complete lateral yellow stripe. Scutellum yellow with lateral corner narrowly brown to light brown. Katatergite yellow with posteroventral corner sometimes brown; anatergite brown with dorsum yellow; mediotergite dark brown. Pleuron usually predominantly yellow with brown ventral and lateral vittae on anepisternum sometimes expanding to encompass ventral ¾ of sclerite (including in all Canadian specimens), mottling on anepimeron and meron (meron sometimes entirely brown), katepisternum brown on ventral 2/3 and behind seta or seta base enclosed within brown spot (including Canadian specimens), meron mostly brown and anepimeron mottled brown. Legs yellow with base of fore coxa brown, mid and hind coxae light brown with yellow mottling, tarsi brown and tibiae brown with base of fore tibia yellow; base of femora sometimes narrowly brown and apex of hind femur sometimes brown in specimens from United States. Abdomen dark brown with lateral margin of tergites yellow.

Genitalia: (Figs 299–302) Surstylus apically setose and with two subapical to medial spines. Basiphallus with right and left distal margins slightly produced; sclerotized on apical half and along left lateral margin. Paraphallus small if present. Hypophallus narrow, well-developed. Mesophallus slightly longer than wide and partially fused to distiphallus; distiphallus and mesophallus with complete ventral suture. Distiphallus slightly longer than wide, base narrower and rounded, and distal half thin-walled and enclosing paired fringed projections; translucent with base darker. Ejaculatory apodeme with blade narrow, gradually blending into stem, and pale with distal margin clear; base of duct lightly pigmented; sperm pump with venter well-sclerotized, reaching sclerotized section of duct.

Hosts. Asteraceae—*Baccharis*, *Bidens pilosa* L., *Carduus pycnocephalus* L., *Cirsium arvense* (L.) Scop., *C. edule* Nutt., *C. scariosum Nutt.* [=*C. congdonii*, *C. tioganum*], *C. vulgare* (SAvi) Ten., *Dahlia*, *Galinsoga urticaefolia* (Kunth) Benth. [=*Sabazia urticaefolia* (H.B.K.) DC], *Galinsoga* sp., *Gnaphalium*, *Salvia mellifera* Greene, *Silybum marianum* (L.) Gaertn.. "Marigold" [*Calendula* or *Tagetes*].

Range. Canada. BC*, MB*. **USA.** CA, WA. Colombia. Costa Rica. Venezuela.

Holotype: Venezuela. Caracas nr. Humboldt Hotel, em. 22.xii.1958, from leaf-mine on *Sabazia urticaefolia* (H.B.K.) DC, found 3.xii.1958 (1♂, BMNH). [Not examined]

Additional material examined. Canada. BC: Robson, H.R. Foxlee, 27.ix.1958 (1♂, UBCZ), 9.vi.1969 (1♂, UBCZ), **MB:** near LaSalle La Barriere Park, (49˚43.2′N, 97˚110.7′W), sweep in oak savanna near river, 15.vi.1999, T.A. Wheeler (1♂, LEM).

Comments. *Liriomyza sabaziae* is here recorded for the first time in Canada, further extending the known western distribution of this species in North America.

Liriomyza sativae **Blanchard**

Figs 8, 303–306

Liriomyza sativae Blanchard 1938: 354. Frick 1959: 405; Spencer 1973: 219, 1984: 23; Spencer & Steyskal 1986: 292; Rauf *et al*. 2000: 257; Scheffer & Lewis 2005: 181; Lonsdale 2011: 93.
Liriomyza subpusilla Frost 1943: 255 [preoccupied by Malloch, 1914].
Liriomyza verbenicola Hering 1951: 43. Syn. Spencer & Steyskal (1986).
Liriomyza pullata Frick 1952b: 509. Syn. Spencer (1973).
Liriomyza canomarginis Frick 1952b: 511. Syn. Spencer (1973).
Liriomyza minutiseta Frick 1952b: 512. Syn. Spencer (1973).
Liriomyza propepusilla Frost 1954: 73 [replacement name for *subpusilla*]. Frick 1957: 62. Syn. Steyskal (1973).
Liriomyza munda Frick 1957: 61. Syn. Spencer (1973).
Liriomyza pictella (Thompson). Misidentification, in part. Frick 1957: 66.
Liriomyza guytona Freeman 1958: 344. Syn. Steyskal (1964) [as syn. *L. munda*].

Description. Wing length 1.3–1.6mm (♂), 1.4–1.8mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.6–4.0. Eye height divided by gena height: 4.4–5.8. Scutum shining to subshining.

Chaetotaxy: Two ori (anterior seta sometimes reduced to absent), sometimes three; two ors. Acrostichal setulae in four irregular rows.

Colouration: (Fig. 8) Calypter margin grey. Posterolateral corner of frons brown, usually fading to yellow at base of outer or inner vertical seta; few western specimens with narrow brown margin along orbital plate tapering to anterior ori; back of head above foramen, ocellar tubercle and clypeus brown; venter of gena with narrow brownish stripe that sometimes fades posteriorly; anterior margin of first flagellomere rarely appearing lightly infuscated. Scutum with complete lateral yellow stripe, sometimes with brown mottling posteriorly. Scutellum yellow with lateral corner dark brown. Katatergite sometimes with posterior margin to posterior half brown; anatergite brown; mediotergite dark brown. Pleuron yellow with ventral 2/3 of katepisternum, meron, small spot(s) on anepimeron and anteroventral corner of anepisternum brown; anepisternum sometimes predominantly brown along ventral margin; specimens from western North America sometimes darker with only dorsal 1/4 of anepisternum (as well as deep posterodorsal emargination), meron and katepisternum yellow; if only dorsal margin of anepisternum narrowly yellow (rare), lateral margin of frons infuscated, femora more extensively mottled dorsally or only yellow apically and distoventrally, lateral margin of scutum sometimes brownish postsuturally, metanotum darker and abdominal tergites entirely brown. Legs yellow with tibiae, tarsi and base of coxae light brown; base or dorsal base of hind and (less commonly) mid femora sometimes brown (if so, base of fore femur occasionally also brown); fore femur, and much less commonly mid and hind femora sometimes with outer-dorsal striations. Abdomen brown with lateral and sometimes posterior margins yellow (sometimes widely on tergite 5); epandrium dark with dorsum and perianal region usually yellowish.

Genitalia: (Figs 303–306) Surstylus lobate with one apical spine. Phallophorus well-developed with high dorsum. Basiphallus sclerotized along most of left-lateral and dorsomedial surfaces, leaving distal section of duct exposed. Hypophallus linear, narrow, with several apical hairs. Paraphallus small, linear. Mesophallus separate from distiphallus, small, narrow, subcylindrical with slight ventral carina along suture. Distiphallus simple, cup-like, narrowed basally; with apical, basal and ventral surfaces more well-sclerotized, forming weak C-shape in profile. Ejaculatory apodeme pale and with base of blade and stem relatively dark and narrow, sometimes broader apically with corners more pointed.

Hosts. Hosts of the polyphagous *L. sativae* are discussed in Lonsdale (2011).

Range. Canada: ON (likely to be widespread in southern Canada and in greenhouses, although the cold climate will likely prevent it from ever becoming a serious pest on outdoor crops). **USA:** TX to CA, CO and SC, and further north in greenhouses (OH, MD, PA). Neotropics. Introduced globally throughout growing regions.

Holotype [*sativae*]: Argentina. "las larvas producen galerias en las hojas de la alfalfa en General Pico, Pampa; halladas por mi excelente colabodaro Juan Williason, xi.1937", ex. *Medicago sativa* (1♀, Museu de la Plata, Buenos Aries, Argentina). [Not examined]

Holotype [*canomarginis*]: USA. HI: Oahu, Kaimuki, 12.iv.1921, O.H. Swezey, ex. *Indigofera* sp. (1♀, BPBM). [Not examined]

Holotype [*guytona*]: USA. AL: Auburn, 20.iv.1957, ex. beans, C.C. Freeman (1♂, USNM).

Holotype [*minutiseta*]: USA. HI: Oahu, Honolulu, 7.ix.1951, W.C. Mitchell, ex. tomato (1♀, BPBM). [Not examined]

Holotype [*munda*]: USA. AL: San Joaquin Co. Tracy, 22.ix.1949, L.L. Lewallen, ex. leaf of tomato (1♂, USNM).

Holotype [*subpusilla*]: USA. KS: Manhattan, 14.x.1933, C.W. Sabrosky (1♂, USNM).

Holotype [*pullata*]: USA. HI: Kanoa, Molokai, 3.iii.1929, O.H. Swezey, ex. *Datura* sp. (1♀, BPBM). [Not examined]

Holotype [*verbenicola*]: USA. NM: Las Cruces, ex. *Verbena* sp. (1♀, ZMHU). [Not examined]

Paratypes examined [*munda*]: USA. CA: San Joaquin Co., Tracy, 28.ix.1948, ex. larva *Lycopersicon esculentum*, Lot No. 175-1, L.L. Lewallen (2♂ 2♀, EMEC).

Paratypes examined [*agraria*]: USA. CA: Fresno Co., Oro Loma, 17.ix.1948, ex. larva Cucumis melo, Lot No. 158-1, K.E. Frick (3♂ 1♀, EMEC).

Paratypes examined [*guytona*]: USA. AL: Lee Co., Auburn, 25.iv.1957, *Phaseolus* sp. (2♂, EMEC).

Additional material examined. Canada. ON: Vineland Station, 1.vi.1937 (1♀, DEBU), 12.vii.1937 (1♀, DEBU), 14.vii.1937 (1♀, DEBU), Haliburton, Gooderham, Burnt River Shore sweep, 16.vii.1994, E. Barr (1♂, DEBU), Gooderham, Burnt River, Malaise, E.R. Barr, 16.vi.1993 (1♂ 1♀, DEBU), 17.vii.1993 (1♂ 2♀, DEBU), Bruce Co., FON alvar nr. Dyers Bay Rd. & Hwy. 6, alvar, pan #5, 26–31.v.2000, C.S. Onodera (1♂, DEBU), St. Jean Nature Reserve, alvar, pan #2, 27.v–1.vi.2000, C.S. Onodera (1♂, DEBU), Bruce Pen. N.P., Singing Sands, fen, pan #6, 1.v–8.vi.2000, C.S. Onodera (1♂, DEBU), Essex Co., Windsor, Ojibway Prairie, sweeps, 16.vi.2001, S.A. Marshall (4♂ 1♀, DEBU), Wellington Co., Guelph, U of G Arboretum (south), Malaise trap at edge of pine/orchard, 3–7.vii.1993, D.C. Caloren (2♂, DEBU), Guelph, Arboretum, Nat. Res., 6.vii.1992, R.W. Burgess (1♀, DEBU), Guelph, 14.vi.1989, U of Guelph Arboretum, net, I.T. Anagnostopoulos (1♂, DEBU), Rockwood, 29.v.1957, D.H. Pengelly (2♂, DEBU), Lambton Co., Port Franks, Karner Blue Sanctuary, 6–8.vi.1996, J. Skevington (1♂, DEBU), Algoma Dist., Hilton Beach, 46°15′N, 83°53′W, 5.vii.1992, edge of hardwood forest & field, Malaise, J.E. Swann (2♀, DEBU), Hilton Beach, maltp at edge of hardwood forest of field, 30.vi.1992, J.E. Swann (4♂, DEBU), Hilton Beach, Malaise, J. Swann, forest, 23.vi.1992 (1♂, DEBU), forest edge, 9.vi.1992 (2♀, DEBU), 16.vi.1992 (1♂, DEBU), 3.vii.1992 (1♂, DEBU), 7.vii.1992 (3♂ 1♀, DEBU), 30.vii.1992 (1♀, DEBU).

Comments. *Liriomyza sativae* is highly variable in external colouration and can be mistaken for a number of other taxa, often necessitating male genitalic dissections for confident identification.

Liriomyza senecionivora Sehgal

Figs 311–313

Liriomyza senecionivora Sehgal 1971: 336.

Wing length 2.3mm (♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 2.2–2.9. Eye height divided by gena height: 3.9–4.4. Scutum subshining.

Chaetotaxy: Two ori (sometimes with small additional ori anteriorly), two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin brown. Head yellow with ocellar triangle, clypeus and back of head dark brown; first flagellomere darker yellow; posterolateral corner of frons dark brown to base of inner vertical seta, sometimes paler between base of verticals. Scutum with complete lateral yellow stripe. Scutellum dark in lateral corner. Katatergite brown posteroventrally; anatergite brown with dorsum broadly yellow; mediotergite dark brown. Anepisternum brown on ventral 2/3; anepimeron with brown mottling that is less extensive posteriorly; meron brown with dorsum yellow; katepisternum brown behind seta base and on ventral 2/3 (not including seta base). Legs yellow with basal half of fore coxa brown, mid coxa mottled brown, hind coxa brown, base of femora brown, and tibiae and tarsi brown. Abdominal colour unknown.

Genitalia: (Figs 311–313) Surstylus with two subapical spines. Phallophorus with narrow, dark dorsal

extension, venter short. Basiphallus sclerotized along left lateral and dorsoapical surfaces; left distal margin produced as weakly sclerotized point. Hypophallus narrow with short apical hairs. Paraphallus absent (holotype) or atrophied (paratype). Mesophallus short with dorsal surface thicker-walled; venter with complete suture that is strongly produced as very high carina. Distiphallus relatively short, as wide as long, thick-walled on basal half; paratype with internally-directed spines on inner-distal margin. Ejaculatory apodeme with stout dark stem and reduced blade.

Host. Asteraceae—*Packera pauciflora* (Pursh) Á. Löve & D. Löve.

Range. Canada. AB.

Holotype: Canada. AB: Jasper N.P., nr Medecine Lake, coll. 16.vii.1969, em. 30.vii.1969, G.C.D. Griffiths, from leaf mines *Senecio pauciflorus* Pursh. composite, Type No. 12071 (1♂[with puparium], CNC).

Paratype examined: Canada. AB: Blairmore, 26.vi.1966, V.K. Sehgal (1♂, CNC).

Comments. *Liriomyza senecionivora* is a relatively large species almost identical in external appearance to *L. eupatorii* (Figs 264–270) and *L. temperata* (Figs 314–320), although the latter species has a very small gena (eye 6.7–8.0 times higher) and the posterolateral spot on the frons only barely reaches the base of the outer vertical seta. The phallus is also similar to that of these two other species, but the paraphallus is atrophied to absent, the left lateral extension of the basiphallus is better sclerotized, the hypophallus is longer, the distiphallus is smaller, the mesophallus has a pronounced ventral carina and the surstylus has two spines (only one in *L. eupatorii*).

Liriomyza septentrionalis **Sehgal**

Figs 9, 107–111

Liriomyza septentrionalis Sehgal 1968: 70. Spencer 1969: 184, 1981: 271; Sehgal 1971: 337; Spencer & Steyskal 1986: 122; Zlobin 1997: 103; Lonsdale 2011: 95.

Liriomyza flaveola (Fallén). Misidentification. Frost 1943: 254; Frick 1952a: 403, 1959: 405.

Wing length mm 1.5–2.7 (♂), 2.3–3.5mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.7–1.9. Eye height divided by gena height: 4.2. Scutum shining.

Chaetotaxy: Two ori (sometimes only one on one side), two ors. Acrostichal setulae in four rows.

Colouration: (Fig. 9) Calypter margin and hairs brown. First flagellomere usually entirely yellow, but sometimes lightly infuscated or deeper yellow on anterior margin; posterolateral corner of frons variably dark, with dark region reaching nearly to base of outer vertical seta or to base of inner vertical (if surrounded by brown, vertical setae always with narrow yellowish spot surrounding base); clypeus, ocellar triangle and back of head dark brown; ventral margin of gena with pale brownish line. Scutum with complete lateral yellow stripe. Metanotum light brown, darker on mediotergite. Pleuron dark brown with dorsal 1/5–1/4 of anepisternum and katepisternum (sometimes on dorsomedially) yellow. Legs dark brown with apex of femora and base of tibiae (narrowly) yellow. Abdomen dark with lateral margin of tergites yellow, with yellow margin broad and easily viewed dorsally on tergites 1–3.

Genitalia: (Figs 107–111) Epandrium without spine. Surstylus-like process subtriangular with one long, narrow, curved apical seta. True surstylus absent. Basiphallus with dark bar on left ventroapical surface; base of distiphallus flanked by dark, scaled membrane that is often broken off or missing on one or both sides. Swollen apical section of duct short and with strong ventral curve, deformed by apical depression of basiphallus. Hypophallus long-haired and fused to ventral process of mesophallus. Mesophallus relatively narrow, fused and perpendicular to stem of distiphallus. Distiphallus very large and directed dorsally, with narrowe basal stem and large cup-like apical section; distal cup enclosing spines and one pair of narrow, flat, dark medial processes. Sclerite of sperm pump dark, large and dome-like laterally with ends strongly produced, blending into dark, narrow duct; ejaculatory apodeme with blade broad, becoming paler and annulated with minute apical striations.

Hosts. Poaceae—*Bromus*, *Hordeum*, *Lolium*.

Range. Canada. AB, BC. **USA.** AK*, AZ, CA, CO, ID*, NV, OR, SD*, UT*, WA*, WY.

Holotype: Canada. AB: Banff, 28.vi.1966, V.K. Sehgal, Type No. 12056 (1♂, CNC).

Paratypes examined: Canada. AB: Same collection as holotype (1♀[allotype], CNC), Waterton Lk., 7.ix.1966, V.K. Sehgal (1♂, CNC), Jasper, 17.vi.1966, V.K. Sehgal (1♀, CNC).

Additional material examined. Canada. AB: Onefour, 13.vi.1956, O. Peck (1♂, CNC), Kananaskis Field

Stn., 51°01′49″N, 115°02′01″W, Malaise trap in aspen, 3–10.ix.1998, S. Bouchard (2♂, LEM), Kananaskis Field Stn., 51°01′49″N, 115°02′01″W, Malaise, bog, 19–25.viii.1998, M.A.P. Whittaker (1♂ 1♀, LEM), Kananaskis Field Stn., 51°01′49″N, 115°02′01″W, Malaise trap, 13–23.ix.1998, M.A.P. Whittaker (3♂ 1♀, LEM), High River, 25.vi.1927, O. Bryant (1♀, USNM), Laggan, O. Bryant, 16.vii.1928 (1♀, USNM), 26.vii.1928 (1♂, USNM), **BC:** Moosehorn Lake, 26.vii.1960, 132˚07′, 58˚10′, 4500′, R. Pilfrey (1♂, CNC), Pacific Rim N.P., Green Pt. Campground, 20mi S Tofino, 6.vii.1990, J.M. Cumming, ex. sweeping along edge of mixed forest (1♂, CNC), Horseshoe Bay, 0–300′, 30.v.1961, J.R. Vockeroth (1♂, CNC), Thompson Community Park, 7km ENE of Cultus Lake, along trail nr beaver dammed pond, 49°04′48″N, 121°52′49″W, el. 80m, 26.vi.2005, sweep, C.J. Borkent (1♂, LEM), 9km E of Cultus Lake, townsite, nr Tamihi Cr. Forestry campsite, 49°04′18”N, 121°50′35″W, el. 115m, 15.vi.2005, ex. *Gernaium* beds at roadside, sweep, C.J. Borkent (2♂, LEM), Vancouver, Wreck Beach, 49°15.8′N, 123°15.7′W, bare sand and wrack on upper beach, 17.viii.2001, J. Forrest & T. Wheeler (1♀, LEM), Cottonwood Lk. Regional Park, 8km S of Nelson, E side of lake on old forestry Rd., 49°25′51″N, 117°15′18″W, el. 890m, 18.vii.2004, J.C. Borkent (1♂, LEM), Hector, 19.vi.1932, O. Bryant (1♂, USNM), Satuma Island, Narvaez Bay, 48°46.8′N, 123°06.7′W, 12.v.2004, el. 20m, C.J. Borkent (1♂, RBCM), Vernon, 26.iv.1927, M.H. Ruhmann (1♀, RBCM), Vancouver, 12.v.1934, J.K. Jacob (1♂, RBCM), Vancouver, Point Grey, J.R. Vockeroth, 19.vii.1973 (1♂, CNC), 30.vii.1973 (1♂ 1♀, CNC), Penticton, West Beach, 11.vii.1986, R.A. Cannings (1♂, RBCM), Robson, H.R. Foxlee, 14.viii.1952 (1♂, UBCZ), 18.v.1954 (1♂, UBCZ), 2.viii.1964 (1♂, UBCZ), 28.vii.1966 (1♂, UBCZ), 29.vi.1968 (1♂, UBCZ), 14.vii.1968 (1♂, UBCZ), 11.vi.1969 (1♂, UBCZ), Kinbasket Lake, BC Hydro drawdown study, Cooper, Beauchesne & Assoc. Ltd., Malaise trap, 4.vii.2010 (1♂ 2♀, CNC), 27–28.vi.2009 (1♀, CNC). **USA. AK:** Healy, 26.vi.1921, J.M. Aldrich (1♀, USNM), **AZ:** Graham Co., Coronado Nat. For., Stockton Pass, 31.v.1991, B.J. Sinclair (1♂, CNC), **CA:** Palm Springs, 11.iv.1955, W.R.M. Mason (1♀, CNC), Mt. Shasta, McBride Spr. Cpgd., 5200′, 20.vii.1968, D.D. Munroe (1♂, CNC), Strawberry Can., Berkeley, 14.iv.1968, D.D. Munroe (1♂, CNC), Snow Creek, 1500′, White Water, W.R.M. Mason, 8.iii.1955 (1♂ 4♀, CNC), 22.iii.1955 (17♂ 14♀ 1?, CNC), Lafayette, D.D. Munroe, 6.iv.1968 (1♀, CNC), 18.iv.1968 (1♂, CNC), Hopland, 3.iv.1968, D.D. Munroe (1♂, CNC), Marin Co., Lily Pond, Alpine Lk., Malaise trap, 1500′, “22.1.71” (1♂, CNC), San Bernardino Co., Baldy Mesa nr. Phelan, “11.81”, J.T. Huber (5♂ 1♀ 1?, CNC), Claremont, Baker, 6943 (1♂, USNM), Berkeley, 9.vii.1917, J.M. Aldrich (1♂, USNM), 6.ix.1915 (1♀, USNM), Twin Lks, “Je.20.51”, Lindsley (1♂, USNM), Temecula, “Mr.10.50”, A.H. Sturtevant (1♀, USNM), Palo Alto, A.H. Sturtevant, x.1920 (1♀, USNM), 22.ii.1921 (1♂, USNM), 3–20.iii.1921 (2♂ 4♀, USNM), 27.iii.1921 (1♀, USNM), 12–19.v.1921 (1♀, USNM), Palo Alto, 3.iv.1906, J.M. Aldrich (1♀, USNM), Mono Lake, 21.vii.1911 (2♂ 1♀, USNM), Smith River, vii.1917, J.M. Aldrich (1♀, USNM), Pacific Grove, A.H. Sturtevant, 2.vi.1920 (1♀, USNM), 13–30.vi.1920 (1♂, USNM), Stan U, 11.iv.1906, J.M. Aldrich (2♂, USNM), Borrego, “Mr.9.50”, A.H. Sturtevant (1♀, USNM), Alviso, 13.v.1921, A.H. Sturtevant (1♀, USNM), **CO:** Idaho Springs, 3mi SW, 27.vii.1961, 8000′, J.G. Chillcott (1♂ 1♀, CNC), Mt. Vernon Cn. Nr. Golden, 31.vii.1961, 7200′, C.H. Mann (1♂, CNC), State Bridge, nr. Bond, 7000′, 24–25.vi.1961, C.H. Mann (1♀, CNC), Nederland, 5.vii.1961, 8300′, J.G. Chillcott, dry upland meadow (2♀, CNC), Echo L., 10600′, Mt. Evans, 23.vii.1961, C.H. Mann (1♀, CNC), Mt. Evans, 10.viii.1961, 11300′, marshy clearing, J.G. Chillcott (1♀, CNC), Eldora, 2mi NW, 2.vii.1961, J.G. Chillcott, along wooded stream (2♂, CNC), Eldora, 3.vii.1961, J.G. Chillcott (1♂, CNC), Doolittle Ranch, 9800′, Mt. Evans, J.G. Chillcott, 23.viii.1961 (1♂ 1♀, CNC), 3.viii.1961 (1♀, CNC), 6.viii.1961 (1♀, CNC), Doolittle Ranch, 9800′, Mt. Evans, C.H. Mann, 8.vii.1961 (1♀, CNC), 31.vii.1961 (1♀, CNC), Jackson Co., Rabbit Ears Pass, 7.vii.1961, J.G. Chillcott (1♂, CNC), Loveland Pass, W slope, 9850’, 8.viii.1963, C.H. Mann (1♂, CNC), Clear Cr. Co., Chicago Cr., 8800’, 2.viii.1961, C.H. Mann (1♂, CNC), **ID:** Moores Lake, 10.vii.1907, J.M. Aldrich (1♂, USNM), Viola, 26.vi.1912, J.M. Aldrich (1♂, USNM), **NV:** Angel Lk., 12mi SW Wells, 11.vii.1961, 8400′, J.G. Chillcott (1♂, CNC), **OR:** Josephine Co., 8.5mi W Galice, 18.vii.1989, cascading stream, B.J. Sinclair (1♂, CNC), Forest Grove, “12/26/39”, M.M. Reeher (1♂ 4♀, USNM), **SD:** 2mi S Sylvan L., Black Hills, 11.vii.1961, H.&A. Howden (1♂, CNC), **UT:** Big Brush Cr., 22mi N of Vernal, 8.vii.1961, 8000′, J.G. Chillcott (3♂ 1♀, CNC), **WA:** Asotin, 13.vi.1930, J.M. Aldrich (1♀, USNM), Longmire’s Springs, Mt. Rainier, 2.vii.1905, J.M. Aldrich (1♂, USNM), **WY:** Teton Pass, E side, 74–8400′, 16.vii.1961, J.G. Chillcott (1♂ 1♀, CNC).

Comments. See comments for *Liriomyza flaveola.*

***Liriomyza singula* Spencer**
Figs 288–290

Liriomyza singula Spencer 1969: 184. Sehgal 1971: 338.

Wing length 1.5mm (♂). Female unknown. Vein dm-cu absent. Eye height divided by gena height: 4.0. Scutum subshining.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin grey. Head yellow with ocellar triangle, back of head and clypeus dark brown; first flagellomere deep yellow; posterolateral corner of frons dark brown to region between vertical setae and lighter to base of inner vertical; lateral margin of orbital plate very narrowly brown from posterior margin almost to level of posterior ori; gena venter with light brown stripe. Scutum with complete lateral yellow stripe. Lateral corner of scutellum brown. Metanotum brown with most of dorsal 2/3 of katatergite yellow. Anepisternum brown on ventral 2/3, becoming darker on ventral and posterior margins; anepimeron brown with yellow mottling; katepisternum brown at and below seta base; meron brown with dorsum yellow. Legs yellow with base of fore and mid coxae brown, hind coxa brown, femora with brown base and dorsal streaking, and tibiae and tarsi brown with base of fore tibia yellow. Colour of abdomen unknown.

Genitalia: (Figs 288–290) Surstylus with one subapical spine. Epandrium with one spine. Basiphallus sclerotized along left lateral and dorsal surfaces. Hypophallus well-developed. Paraphallus pale, short and pointed. Distiphallus+mesophallus pale, with long narrow stem with slight medial constriction and short, dilated apical chamber enclosing one pair of small fringed structures. Ejaculatory apodeme with narrow stem and broad blade with dark margin.

Host. Unknown.

Range. Canada. AB.

Holotype: Canada. AB: Edmonton, Elk Is. Park, 7.vi.1966, K.A. Spencer, Type No. 16131 (1♂, CNC).

Comments. See comments for *Liriomyza helianthi.*

***Liriomyza sinuata* Sehgal**
Fig. 40

Liriomyza sinuata Sehgal 1971: 338.

Wing length 1.7mm (♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 2.8. Eye height divided by gena height: approximately 3.0 in holotype, 3.2 in non-types. Scutum dusted with light grey pruinosity. First flagellomere relatively large and with long hairs. Head missing in holotype.

Chaetotaxy: Two ori (sometimes only one on one side), two ors. Acrostichal setulae in two rows.

Colouration: Calypter margin brown. Head yellow with posterolateral corner of frons dark to base of inner vertical seta, venter of gena with brownish line, and ocellar tubercle, clypeus and back of head dark brown. Scutellum brown in lateral corner. Anatergite brown along anterior, posterior and ventral margins; mediotergite dark brown. Anepisternum with narrow posteromedial line and short, oblique anteroventral stripe; anepimeron with brown mottling including broad posterior spot; meron brown with dorsum yellow; katepisternum brown on ventral 2/3 (not including base of seta). Legs yellow with base of fore and mid coxa brown, hind coxa brown with pale ventral mottling, tibiae brown (venter paler) with base of fore tibia yellow and anterior legs less strongly pigmented. Andomen yellow with epandrium and broad dorsal stripe (narrowing posteriorly) on tergites brown.

Genitalia: (Fig. 40) Surstylus with one subapical spine. Basiphallus sclerotized along left lateral and dorsoapical surfaces. Hypophallus long. Paraphallus weakly-defined, narrowing to base. Mesophallus very short dorsally due to fusion with dorsally-angled distiphallus; mesophallus and distiphallus with ventral suture produced as strong ventral carina. Distiphallus with clear, mostly smooth basal bowl and one pair of long apical tubules that are slightly longer than remainder of phallus, sinuate on basal half and with apex directed dorsoapically. Ejaculatory apodeme well-developed with stem and margin of blade dark; sperm pump with sclerite well-developed with lateral margins thicker and produced.

Host. Unknown.

Range. Canada. AB, MB*, ON*.

Holotype: Canada. AB: Banff, 28.vi.1966, V.K. Sehgal, Type No. 12072 (1♂, CNC).

Additional material examined. Canada. MB: 5km N Gardenton Tallgrass Prairie Preserve, (49˚10.71′N, 96˚40.76′W), sweep in tallgrass prairie, 13.vii.2000, T.A. Wheeler (1♂, LEM), **ON:** Bruce Co., Dorcas Bay Dunes, Malaise, S.A. Marshall, 11–20.vii.1999 (1♂, DEBU), 2–25.viii.1999 (1♂, DEBU)

Comments. The material collected in Ontario around dunes at the northern end of the Bruce Peninsula greatly extends known distribution of this species. The sinuate distiphallus, which emerges from a smooth, bowl-like base, best diagnoses this aptly names species, which is also relatively pale in colouration, has two rows of acrostichal setulae and a large, bright first flagellomere with long marginal hairs.

Liriomyza smilacinae Spencer

Figs 6, 56–59

Liriomyza smilacinae Spencer 1969: 186. Sehgal 1971: 339; Spencer 1981: 273; Spencer & Steyskal 1986: 135; Lonsdale 2011: 98.

Wing length 1.8–2.1mm (♂), 1.8–2.2mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.0–2.5. Eye height divided by gena height: 2.3–4.0. Scutum with greyish pruinosity. Parafacial, cheek and orbital plate sometimes projecting. Epistoma small to pronounced.

Chaetotaxy: Two ori, two ors; sometimes two or three ori and one ors. Acrostichal setulae in two sparse anterior rows or entirely absent; some AB specimens with three to four rows. Anterior two dorsocentral setae postsutural and small, less than half length of second dorsocentral.

Colouration: (Fig. 6) Calypter margin white to brownish. Head light yellow with anterior margin of first flagellomere yellow, ocellar triangle brownish, back of head brown, and clypeus light brown to brown; posterolateral margin of frons brownish behind vertical setae, infrequently with pigment extending to base of outer vertical (some of these with three or four rows of acrostichal setulae). Scutum with complete lateral yellow stripe. Katatergite yellow; anatergite brown with dorsum yellow; mediotergite dark brown. Anepisternum yellow with anteroventral spot; anepimeron with extensive brown mottling; meron largely brown with yellow mottling; katepisternum brown along posterior margin and on ventral 2/3. Legs yellow with base of coxae brown, fore femur sometimes brown dorsobasally, base of mid and hind femora brown dorsally, scraper on hind leg sometimes brown, basal ¾ of mid tibia brownish excluding base (sometimes only subapically), hind tibia brown to dark brown on basal ¾ excluding base (sometimes only medially), and tarsi yellow to brownish with apical segments darker; femora entirely yellow if calypter margin brownish.

Genitalia: (Figs 56–59) Surstylus tapering apically and with one subapical spine. Paraphallus narrow, sometimes slightly asymmetrical. Hypophallus narrow and pale with short apical hairs. Mesophallus cylindrical, projecting into base of distiphallus. Distiphallus with broad, bulbous textured basal bowl and short, broad, distal membranous tubules, each enclosing a small, pale, fringed structure. Ejaculatory apodeme with blade broad, semicircular and with irregular distal margin; sperm pump well-sclerotized, produced and thickly sclerotized laterally, meeting basal sclerotized section of duct. Dissected Canadian material with distiphallus slightly more bulbous and minutely textured ventrally.

Variation: Males reared from *M. canadense* darker: calypter margin brownish; antenna brownish at base of arista; posterolateral corner of frons brown to base of outer vertical; katatergite brownish; anepisternum with longer stripe; fore femur with light dorsal streaking; tibiae dark brown with base paler.

Hosts. Liliaceae—*Maianthemum* (*M. canadense* Desf.*, *M. stellatum* (L.) Link, *M. trifolium* (L.) Sloboda) (formerly treated as *Smilacina*), "*Smilacina* sp."

Range. Canada. AB, MB, NB*, NS*, ON, QC*. **USA.** CA.

Holotype: Canada. AB: Edmonton, White Mud Park, mine *Smilacina*, 15.vii.1966, K.A. Spencer, Type No. 10416 (1♂[with puparium], CNC).

Paratype examined: Canada. MB: Brandon, 15.vii.1958, J.G. Chillcott (1♀, CNC).

Additional material examined. Canada. AB: Edmonton, White Mud Creek, 10.vi.1968, on *Smilacina stellata*, G.C.D. Griffiths (1♂ 2♀[with puparia], UASM), emerged 20–22.v.1969 (1♂ 1♀[with puparia], UASM), Spruce Grove, near Edmonton, 53˚34'N, 113˚49'W, 8.viii.1976, larva on *Smilacina trifolia*, emerged 10–

14.v.1977, G.C.D. Griffiths, E310 (1♂ 1♀[with puparia], UASM), 5mi W Writing-on-Stone P.P., Milk River Valley, 15.vii.1980, sweeping, G. Gibson (1♀, DEBU), **MB:** 5km N Gardenton Tallgrass Prairie Preserve, (49˚10.71′ N, 96˚40.76′W), sweep roadside vegetation, 13.vii.2000, T.A. Wheeler (1♂, LEM), **NB:** Kouchibouguac N.P., J.R. Vockeroth, 8.vi.1977 (1♀, CNC), 25.vi.1977 (2♂, CNC), 30.vi.1977 (5♂, CNC), 11.vii.1977 (1♂, CNC), Kouchibouguac N.P., 9.vii.1977, J.F. McAlpine (1♀, CNC), Chamcook, G.E. Shewell, 30.vi.1965 (1♂, CNC), 13.vii.1965 (1♂, CNC), 13.viii.1965 (1♂, CNC), Chamcook, Glebe Road, 14.vii.1965, G.E. Shewell (1♂, CNC), **NS:** CBHNt. Pk., Pleasant Bay, 6.vi.1984, mixed forest, B.E. Cooper (1♂, CNC), **ON:** Grimsby, 14.vi.1977, W.A. Atwater (1♀, DEBU), Creiff Bog, 3k W Puslinch, 21–27.v.1987, D. Blades (1♂, DEBU), Puslinch, 3.vii.1996, field sweep, D. Macwilliam (1♀, DEBU), Pinery P.P., Grand Bend, 14.vii.1980, K.N. Barber (1♂, DEBU), Iroquois Falls, 30.vi.1987, J.R. Vockeroth (1♂, CNC), Marmora, Long Swamp, 19.v.1952, J.R. Vockeroth (1♂, CNC), Metcalfe, 17.vi.1993, Malaise trap, B.E. Cooper (1♂, CNC), Richmond Fen, 29.v.1987, B.E. Cooper (1♂, CNC), **QC:** Sleeping Giant P.P., Marie Louise Lk. Campground, 48°21’47”N, 88°47’53”W, bog, yellow pans, 9–14.vii.2002, M. Buck (7♂, DEBU), James BayRte. Km567.3, 53°28’22”N, 77°35’31”W, sphagnum bog, yellow pans, 9–15.vii.2001, M.&B. Buck (1♂, DEBU), James bay Rte. Km307, Pontax II River, 51°46’31”N, 77°25’27”W, open black spruce, yellow pans, 8–16.vii.2001, M.&B. Buck (1♂ 2♀, DEBU). **USA. ME:** Hancock Co., Castine, Rene Henderson Preserve, 21.vi.2014, C.S. Eiseman, ex. *Maianthemum canadense* em. 4.vii.2014, #CSE1151, CNC384888, CNC384889 (1♂ 1♀, CNC), **MA:** Plymouth Co., West Bridgewater, 42°0′28.40″N 71°2′55.27″W, 7.viii.2014, C.S. Eiseman, ex. *Maianthemum canadense* em. 12.iii.2014, #CSE1002, CNC384731 (1♂, CNC).

Comments. *Liriomyza smilacinae* is widespread in Canada, known from Alberta to Nova Scotia, and since material has also been found in California it is likely that it is also occurs widely in the northern United States. The New Hampshire records provided in Lonsdale (2011) are removed following re-examination of the male terminalia—these may represent an undescribed species closer to *L. assimilis*.

Liriomyza socialis **Spencer**

Figs 60–63

Liriomyza socialis Spencer 1969: 186. Sehgal 1971: 339.

Wing length 1.6mm (♂). Length of ultimate section of vein CuA_1 divided by penultimate section: 3.1. Eye height divided by gena height: 3.6. Scutum subshining.

Chaetotaxy: Two ori, two ors (sometimes reduced to one ors on one or both sides). Acrostichal setulae in two rows; setulae absent postsuturally lateral to dorsocentral row.

Colouration: Calypter margin grey. Head yellow with ocellar tubercle, clypeus and back of head dark brown; first flagellomere widely infuscated on dorsal and anterior margins, with inner surface more widely pigmented; posterolateral corner of frons dark brown to base of outer vertical seta and brown to base of inner vertical. Scutum with small posterolateral spot. Scutellum brown in lateral corner. Metanotum brown with katatergite sometimes yellow dorsally and anteriorly, anatergite brown with dorsum yellowish, and mediotergite dark brown. Anepisternum largely brown with dorsal margin irregularly yellow and brown region with pale posterodorsal emargination; amepimeron and meron mostly brown; katepisternum dark with narrow yellow marking along dorsomedial margin. Legs brown with distal half of fore coxa and apex of mid coxa yellow, apices of femora yellow (broader on anterior legs), venter of fore and mid tibiae yellowish and tarsi paler towards base. Abdomen brown.

Genitalia: (Figs 60, 63) Surstylus with one subapical spine. Basiphallus sclerotized along left lateral and dorsal surfaces, and with left distal margin produces as short, clear lobe. Swollen apical section of ejaculatory duct broad with apex strongly tapering. Hypophallus well-developed. Paraphallus absent. Length of mesophallus more than twice width, narrowing and fused to base of distiphallus. Distiphallus with very broad, shallow, pale basal bowl surrounding one pair of short, wide membranous tubules. Ejaculatory apodeme with extremely narrow stem and broad, pale, ovate blade with dark margin; sclerite of sperm pump broad and pale.

Variation. (Figs 61, 62) BC male: only 1 ori on both sides; first flagellomere more evenly brown with basal margin yellowish; lateral margin of frons brownish along eye on posterior half and around base of fronto-orbitals;

distiphallus with basal cup slightly deeper with minute shallow spinules along inner subapical margin (similar to *L. fricki*), and apical tubules slightly more sclerotized.

Host. Fabaceae—*Lathyrus japonicus* Willd. var. *maritimus* (L.) Kartesz & Gandhi*, *Oxytropis monticola* A. Gray* [=*Oxytropis campestris gracilis*].

Range. Canada. AB, BC*, YT*. **USA.** AK*.

Holotype: Canada. AB: S-Alta, Blairmore, 26.vi.1966, K.A. Spencer, Type No. 16132 (1♂, CNC).

Additional material examined. Canada. BC: Vancouver Island, Bamberton Park, 8–9.v.1968, woodland, G.C.D. Griffiths (2♂, UASM), **YT:** Lake Teslin, 12–13.viii.1968, larva on *Oxytropis campestris gracilis*, emerged 18.v.1969, G.C.D. Griffiths, C498, T16 (1♂[with puparium], CNC). **USA. AK:** Chilkat Peninsula near Haines, 26.vi.1968, larva on *Lathyrus maritimus*, emerged 20.v.1969, G.C.D. Griffiths, H17 (1♂[with puparium], UASM).

Comments. The dark colouration of *Liriomyza socialis* differentiates it from most other *Liriomyza* with two rows of acrostichal setulae, although the darker representatives of *L. fricki* from AB and YT have similar colouration and male genitalia—one of these darker *L. fricki* was even described as the sole CNC paratype of *L. socialis*. *Liriomyza socialis*, however, has brown femora with only the apices yellow, the antenna is paler, the surstylus has only one spine (a minute additional spine is not present) and the distiphallus has a narrower basal bowl and apical tubules of the distiphallus.

Liriomyza sylvatica Sehgal

Figs 13, 128–131

Liriomyza sylvatica Sehgal 1971: 339.

Wing length 1.9–2.3mm (♂), 2.3mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.1–2.9. Eye height divided by gena height: 3.1–5.0. Scutum subshining. First flagellomere with slight anterodorsal point.

Chaetotaxy: (Fig. 13) Two ori, two ors; sometimes small additional anterior ori present or anterior ori reduced. Acrostichal setulae in four rows.

Colouration: Calypter margin brown to grey. Head yellow with ocellar triangle, clypeus, back of head and posterolateral corner of frons to base of inner vertical seta dark brown; first flagellomere sometimes lemon-yellow; venter of gena with pale brown line; lateral margin of male orbital plate brown to level of ori. Scutum with complete lateral yellow stripe. Lateral corner of scutellum brown. Metanotum brown with mediotergite dark brown and posterodorsal corner of anatergite sometimes yellowish. Pleuron brown with dorsal margin to dorsal 1/4 of anepisternum and dorsomedial margin of katepisternum yellow; anepimeron with limited yellow mottling; meron yellow dorsally. Legs yellow with coxae brown, sometimes with apices of mid and hind coxa and distal 1/3 of fore coxa yellow, base of femora brown, tibiae brown and tarsi brown with base paler. Abdominal tergites yellow laterally.

Genitalia: (Figs 128–131) Surstylus-like structure nearly vestigial, with one long apical seta. Epandrium without spine. Phallophorus elongate. Basiphallus directed ventrally, sclerotized dorsally and laterally, produced anterolaterally as long points, and with anterodorsal fold that deforms relatively large swollen apical section of ejaculatory duct. Hypophallus reduced to line of hairs on membrane between extensions of basiphallus. Paraphallus membranous and fin-like with margin sclerotized. Mesophallus indistinct, fused to distiphallus, slightly longer than wide. Distiphallus widening apically, branching before apical C-shaped sclerite with row of short, stout spines. Ejaculatory apodeme with thick, stout base, short stem and wide, irregularly sclerotized blade with marginal striations; sclerite of sperm pump produced laterally as shallow cones that are most heavily sclerotized apically.

Host. Unknown. Likely Poaceae.

Range. Canada. AB, MB*, NT*, ON*, QC*, YT*.

Holotype: Canada. AB: St. Albert, nr. Edmonton, 18.vi.1967, V.K. Sehgal, Type No. 12073 (1♂, CNC).

Additional material examined. Canada. AB: Elk Island N.P., Wood Bison Trail, wetland alongside aspen forest, lots of tall grass, 53.5666˚N, 112.8514˚W, 720m, BIOBus, 29.vi.2012, BIOUG06430-E02 (1♂, CNC), 1.vii.2012, BIOUG06725-C10 (1♂, CNC), **MB:** Ninette, 24.v.1958, J.F. McAlpine (1♀, CNC), Aweme, Criddle

farm, (49˚42.5′N, 99˚36.1′W), sweep grasses near house, 19.vi.1999, J. Perusse (1♂, LEM), near LaSalle, La Barriere Park, sweep vegetation near river, 15.vi.1999, S. Boucher (1♀, LEM), **NT:** Ft. McPherson, 2.vii.1957, S.D. Hicks (1♂, CNC), Aklavik, 10.viii.1931, Bryant (1♂, USNM), **ON:** Guelph, 22.v.1979, W.A. Attwater (1♂, DEBU), Puslinch, Property of Bob Hanner, hardwood forest, 43.4464˚N, 80.2512˚W, 3.viii.2008, T. Terzin, 08TTML-0783 (1♂, CNC), **QC:** Ste-Anne-de-Bellevue, Stoneycroft Pond, 45°25.8′N, 73°56.4′W, Malaise trap, 26.v–1.vi.1999, S.E. Brooks (2♀, LEM), Ste-Anne-de-Bellevue, Stoneycroft Pond, 45°25.8′N, 73°56.4′W, sweeping grass, J. Forrest, 1.vi.2000 (2♀, LEM), 7.vi.2000 (1♀, LEM), 13.vi.2000, J. Forrest (1♀, LEM), 28.v.2000, 1830hrs (2♂, LEM), 17.v.2000, J. Savage (1♀, LEM), 17.v.2000, T.A. Wheeler (1♀, LEM), 1.vi.2000, T.A. Wheeler (2♀, LEM), 1.vi.2000, S. Boucher (1♀, LEM), 1.vi.2000, H. Varady-Szabo (1♀, LEM), 12.v.1998, J. Perusse (1♀, LEM), sweep grasses nr pond, 6.vi.2003, S. Boucher (1♀, LEM), sweep grass/sedges, 28.v.1998, F. Beaulieu (1♀, LEM), Beechgrove, 45º39′, 75º8′, 21.v.1964, J.R. Vockeroth (1♂, CNC), **YT:** Otter Lake, 130°25′, 62°30′, 4000′, 15.vii.1960, J.E.H. Martin (1♂, CNC), Rampart House, 17.vii.1951, J.E.H. Martin (1♀, CNC).

Comments. While the pleuron and orbital plate are relatively dark and the first flagellomere is pointed, the terminalia of *Liriomyza sylvatica* are most diagnostic and not easily mistaken for those of any other Nearctic agromyzid. Previously known only from Alberta, this species is here recorded from southern Ontario to the Northwest and Yukon territories. The immediate sister taxa are the European *L. pusio* (Meigen) and *L. graminivora* Hering, which both feed on Poaceae and have very similar genitalia.

Liriomyza taraxaci **Hering**

Figs 19, 168–178

Liriomyza taraxaci Hering 1927: 184. Hendel 1931–36: 252; Spencer 1969: 188, 1976: 274; Sehgal 1971: 340; Spencer & Steyskal 1986: 294.

Liriomyza millefolii Hering. Misidentification. Spencer 1969: 178; Sehgal 1971: 335.

Wing length 1.6–1.9mm (♂), 1.9–2.1mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.6–3.5. Eye height divided by gena height: 2.5–3.9. Scutum subshining. First flagellomere ovate to relatively large and circular; sometimes with hairs along apical margin or most of segment as long as width of arista base.

Chaetotaxy: (Fig. 19) One ori (sometimes additional small anterior ori also present), two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin brown. Head yellow with ocellar tubercle, back of head (excluding venter), ocellar tubercle and clypeus dark brown; posterolateral corner of frons usually mostly yellow with brown mark often reaching posterior margin of eye. Scutum with complete lateral yellow stripe. Scutellum brown laterally. Katatergite brown along posterior margin, venter and anteroventral corner (only posteroventral corner in specimens in and east of Ontario); anatergite brown with posterodorsal corner yellow; mediotergite dark brown. Anepisternum with venter and large anteroventral spot brown, sometimes with dark stripe along most of posterior margin (sometimes reduced, including all specimens in and east of Manitoba); anepimeron yellow or brown posteriorly and with brown mottling and stripes anteriorly; meron brown with dorsum yellow; katepisternum brown on ventral ¾, not including base of seta. Legs yellow with base of fore coxa, basal half of mid coxa and most of hind coxa brown; base of femora narrowly brown (wider on fore femur) and fore femur with brown dorsal streaking; tibiae light brown to dark brown with base yellow and venter often paler, and fore tibia sometimes entirely yellow; tarsi light brown to brown, sometimes with basal segments paler. Abdomen dark brown with lateral and posterolateral margins of pregenitalic tergites yellow.

Genitalia: (Figs 168, 169, 175, 176) Surstylus not tapering apically and with one large subapical spine. Inner surface of epandrium flanked by one pair of dark bars with terminal spine. Basiphallus sclerotized along left lateral and dorsal surfaces, and with distolateral margins produced as membranous lobes with paraphalli fused to basal margin. Hypophallus well-developed. Mesophallus cylindrical and with length at least three to four times width; mesophallus and distiphallus with complete ventral suture that is more widely split on distiphallus. Distiphallus as long as wide, slightly narrowing basally, with slight dorsoventral compression on short basal “stem”, three small ventrodistal lobes and one pair of short fringed structures in small apical chamber. Ejaculatory apodeme large, well-developed.

Variation: Specimens from British Columbia and Alberta sometimes with paler dorsal streaking on mid and

hind femora, katepisternum brown to seta base, lateral yellow margin on abdominal tergites narrower and brown spot in posterolateral corner of frons wider (but never touching base of outer vertical). Eastern specimens slightly smaller, with wing lengths of 1.6–1.9mm (♂), 1.6–1.8mm (♀); specimens from Ontario with length of ultimate section of vein CuA_1 divided by penultimate section 3.3–3.9, eye height divided by gena height 3.4–4.2, and femora entirely yellow. Nova Scotia specimens with pruinosity on scutum slightly denser and more silvery. Illinois male with distiphallus longer and more broadly rounded basally, similar to *L. minor.*

Variation—Elkwater, *AB*: (Fig. 170) Males with two ori and one ors; female slightly smaller (wing length 1.6–1.8mm), and acrostichal setulae mostly in two rows; eye height divided by gena height 3.3–4.3; tibiae yellow with dorsum brownish; male tergite 5 only with large anteromedial spot.

Variation—Onefour, *AB*: (Figs 177, 178) Two ori and one ors; anepisternum with larger anteroventral spot confluent with posterior stripe, and paler regions on ventral ¾ light brown (not yellow); anepimeron brown posteriorly; katepisternum with brown spot behind seta; mid and hind femora with light brown spot dorsoapically; mesophallus much narrower with length 4.9 times width; distiphallus with base narrower and slightly longer.

Variation—Wakefield, *QC*: (Figs 173, 174) Wing length 1.9–2.1mm; length of ultimate section of vein CuA_1 divided by penultimate section 2.4–2.9; eye height divided by gena height 4.3–5.2; anterior ori present, small; first flagellomere with long hairs along apical margin; scutum slightly more shining; posterolateral corner of frons with broad brown spot confluent with posterior margin of eye, but not reaching base of verticals; anepisternum yellow with minute anteroventral brown spot; anepimeron yellow with single brown anterior stripe; femora entirely yellow and tibiae faintly brownish; mesophallus slender, not expanded apically, length 4.9 times width; distiphallus with base narrower and slightly longer, similar to specimens from Onefour, Alberta.

Host. Asteraceae—*Aposeris*, *Arnoseris*, *Leontodon*, *Sonchus*, *Taraxacum* (Benavent-Corai *et al*. 2005). Spencer, (1969) also attributes leaf mines on Ottawa *Cichorium intybus* L. to this species.

Range. Canada. AB, BC*, MB*, NB*, ON, QC, SK, YT*. **USA.** AK*, IL*, WA, WN [leaf mine only]. Europe.

Holotype: Germany. "Bredow b. Nauen" (1♂ ZMHU). [Not examined]

Additional material examined. Canada. AB: Edmonton, 18.viii.1974, larva on *Taraxacum officinale* agg., emerged 5.v.1974, G.C.D. Griffiths, E199 (1♂[with puparium], UASM), Elkwater, O. Peck, 11.vi.1956 (1♂, CNC), Onefour, 13.vi.1956, O. Peck (1♂, CNC), Gilchrist Ranch, Aden, 25.vi.1956, O. Peck (1♀, CNC), Lethbridge, 6.vii.1956, O. Peck (1♂, CNC), Scandia, 11.vii.1956, O. Peck (1♀, CNC), Banff, 4.vii.1925, O. Bryant, Norquay Mt., meadows, 5000–6000 ft. (1♂, USNM), Banff, 4.vi.1925, O. Bryant, Cascade Mt., Amphitheatre, 7000ft. (1♂, USNM), Banff N.P., Storm Mountain, low alpine dry slope, adjacent to train track and Bow River, 1455m, BIOBus, 20.vi.2012, BIOUG03524-C05 (1♂, CNC), BIOUG03524-D04 (1♂, CNC), 16.vi.2012, BIOUG03780-E11 (1♂, CNC), Jasper N.P., Whistlers Cmpgrd., pine forest, 52.8425˚N, 118.0715˚W, 1074m, 5.viii.2010, BIOBus, 10BBCDIP-3122 (1♂, CNC), 10km NW Whitecourt, Hwy 32 at Sakwatamau River, (54˚10′N, 115˚42′W), sweep vegetation at river edge, 15.vii.1997, T.A. Wheeler (1♂, LEM), **BC:** Okanagan Valley, 5m. N. of Summerland, 11.v.1968, G.C.D. Griffiths (1♂, UASM), 6km Enderby, 5.v.1992, A. Borkent (1♂, CNC), Terrace, 8.vi.1960, J.G. Chillcott, along railroad (1♂, CNC), 3km E Salmon Arm, 4.v.1992, A. Borkent (1♂, CNC), **MB:** 9mi N Forrest, 29.vii.1958, R.L. Hurley (1♂, CNC), Ninette, 13.v.1958, J.F. McAlpine (1♂, CNC), near LaSalle, La Barierre Park, sweep vegetation near river, 15.vi.1999, S. Boucher (1♂, LEM), **NB:** Woodstock, 46°09′N, 67°35′W, sweeping, 28.vii.2001, M. Giroux (2♂, LEM), **NS:** West end Sable Island, D.M. Wood, 6.vii.1967 (1♂, CNC), 10.vii.1967 (1♀, CNC), **ON:** Ottawa, 14.v.1973, P.M. Nash (1♂, CNC), Ottawa, J.R. Vockeroth, 25.v.1959 (1♂, CNC), 25.vii.1959 (1♂, CNC), 2mi N, Metcalfe, B.E. Cooper, 9.vi.1982 (1♂, CNC), 17.vi.1982 (1♂, CNC), 21.vi.1982 (1♂, CNC), Ottawa, Dow's Swamp, 5.vii.1947, W.H. Mason (1♂, CNC), Pukaskwa N.P., SW of admin. Bldg., 48°36′06″N, 86°17′19″W, *Vaccinium*/lichen clearing, yellow pans, 19–22.vii.2001, M.&B. Buck (1♂, DEBU), Guelph, 8.viii.1978, W.A. Attwater (3♂, DEBU), Guelph, 6.vi.1978, K.N. Barber (1♂, DEBU), Priceville, 5.vi.1962, D.H. Pengelly (1♂, DEBU), Rondeau P.P., Rondeau Park, 15.viii.1980, K. Barber (1♀, DEBU), Guelph, 11.viii.1979, K. Barber (1♀, DEBU), 8.viii.1978, W.A. Attwater (1♀, DEBU), Algonquin P.P., Swan Lk. Stn. Scott Lk. survey, D2 Maltp, 15.viii.1994 (1♀, DEBU), Grand Bend, 14.vii.1939, G.E. Shewell (1?, CNC), Ottawa, 11.ix.1947, G.E. Shewell (1♀, CNC), Lindsay, 30.viii.1954, C.D. Miller (1♂, CNC), Sleeping Giant P.P., Marie Louise Lk. Campground, 48°21′47″N, 88°47′53″W, forest trail, white pans, 9–14.vii.2002, M. Buck (1♂, DEBU), Waterloo Reg., Blair, RARE, Resource House, 43°22'53"N, 80°21′28″W, sweeps, 15.viii.2006, M.D. Bergeron (1♀, DEBU), Lambton Co., Port Franks, Walton Property nr Lake, Malaise, J. Skevington, 10–13.vi.1996 (1♀,

DEBU), 2–4.vii.1996 (1♀, DEBU), **QC:** Ste-Anne-de-Bellevue, Stoneycroft Pond, 45°25.8′N, 73°56.4′W, sweep grass, 20.vii.2004, S. Boucher (1♂, LEM), Wakefield, 26.vi.1946, G.E. Shewell (2♂, CNC), Gaspe, ZEC York-Baillargeon, (48˚49′N, 64˚52′W), forest edge near Lac Pauline, 26.vii.2000, H. Varady-Szabo (1♂, LEM), **YT:** 67°58′N, 136°29′W, basecamp, Erebia Creek, S.A. Marshall, 8.vii.1987, pan near carrion (1♂, DEBU), 10.vii.1987, FIT, dry tundra (1♂, DEBU). **Germany.** Berlin, Dahlem, 18.[?], 1962, Hering, Z., mine aus *Taraxacum officinale* (1♀, CNC). **USA. AK:** Fairbanks, Birch Hill, 4.vii.1948, S. Lienk, Alaska Ins Project (1♀, USNM), **IL:** 5mi S Bath, 21.v.1959, J.F. McAlpine (1♂, CNC).

Comments. *Liriomyza taraxaci* and many other Nearctic species including *L. apilaca*, *L. elevaster*, *L. minor* and *L. ptarmicae* belong to a difficult, widespread and predominantly north temperate species group requiring rigorous global analysis. Species have a unique phallic type and differ subtly from each other in the dimensions of the mesophallus and distiphallus, body size, hair length on the first flagellomere, and often in minor or overlapping colour states and host preferences.

The variation inherent in Canadian *Liriomyza taraxaci* is very broad compared to related species, encompassing both external colour and male genitalic characters, and highly suggestive of the presence of additional sister taxa that cannot be confidently differentiated here. A conservative approach is therefore maintained here, including all variants as conspecific with *L. taraxaci*, with differences detailed and illustrated. The wide variety of host genera listed for Palaearctic representatives (Benavent-Corai *et al.* 2005) is also possibly supportive of the presence of additional cryptic species.

Some *Liriomyza taraxaci* are similar to the Palaearctic and economically important species *Liriomyza endiviae* Hering, occurring on *Cichorium*, *Lactuca* and *Sonchus*, allowing for the possible risk of an undetected North American introduction. This Old World species—based on the examination of a female paratype deposited in the CNC (Label data: Spain. Torre d. Mar, b. Malaga, Hering S., "4.33", Mine an *Sonchus oleraceus*, Nr. 4158)—differs most significantly in that eye height divided by gena height is 2.8, the first flagellomere is clothed in short hairs only, and there is an orange tint on the distal 2/3 of the segment with the dorsum brown.

Spencer & Steyskal (1986) recorded *Liriomyza endiviae* in Maryland in leaf mines of *Lactuca* cf. *serricola* and in Washington State ex *Lactuca sativa* L. *Liriomyza endiviae* from Washington has been examined (Figs 164–166) and is likely not actually *L. endiviae*—the first flagellomere is entirely pale and clothed with long hairs, and in females it is enlarged and circular, the eye height divided by gena height is 3.3–4.0, the clypeus is light brown to yellowish, the anepisternum has a minute brown anteroventral spot (several times larger in the paratype), the femora are entirely yellow (bases brown with light dorsal streaking in paratype), and the tibiae are light brown dorsally with the base and venter yellow (paratype with fore tibia light brown with dorsum darker, and mid and hind tibiae brown). The phallus of the Washington specimens is also somewhat similar to that of *L. minor* (readily differentiated by a darker first flagellomere that is always swollen, enlarged and long-haired) and the Illinois male of *L. taraxaci* (Figs 171, 172), but the mesophallus is narrower with only the base and apex slightly wider, the distiphallus is more weakly sclerotized with the base rounder and longer than the wider apical section (sections subequal and more strongly compartmentalized in *L. minor*), and the distoventral process of the distiphallus, that projects between the ventral suture is uniquely narrow and almost spindle-shaped (much broader and ovate to lobed in *L. minor* and other related taxa). A series of Canadian specimens from Manitoba (La Barriere Park) agrees with the Washington material except the clypeus is darker, and one male from Quebec only differs in having the eye 5 times higher than the gena, the clypeus is yellowish laterally and the anepisternum has a larger spot forming a short, oblique stripe. The phallus of these specimens, tentatively identified as *Liriomyza taraxaci*, is also similar to that of the Palaearctic *L. sonchi* (Spencer 1990: figs 990, 991), but the apex of the distiphallus of this species is narrower and *Lactuca* is resistant to its attack (Peschken & Derby 1988). Label data for these specimens are as follows:

Canada. MB: near LaSalle, La Barriere Park, sweep oak savanna near river, 15.vi.1999, J. Perusse (16♂ 2♀, LEM), 13.vii.2000, V. Crecco & T.A. Wheeler (1♂, LEM), **QC:** Ste-Anne-de-Bellevue, Stoneycroft Pond, (45˚25.8′N, 73˚56.4′W), sweep grass, 20.vii.2004, S. Boucher (1♂, LEM). **USA. WA:** Benton Co., Prosser, K.E. Frick, ex larva *Lactuca sativa* L., 27.vii.1950 (1♀, CASC), 28.vii.1950 (1♀, CASC), 13.viii.1950 (1♂, CASC), 26.viii.1949 (1♂ 2♀, CASC), ex larva *Lactuca scariola* L., 19.vi.1949 (1♀, CASC), 22.vi.1949 (1♂, CASC), 22.vii.1950 (2♀, CASC), 7.viii.1949 (1♀, CASC), Yakima Co., Buena, ex larva *Lactuca scariola* var. *integrata*, G&G, 6.vi.1949 (1♀, CASC).

Liriomyza taraxaci is also externally similar to *L. ptarmicae* (Figs 187–194; also Holarctic), having a largely

yellow head and a large, hairy first flagellomere, although in *L. taraxaci* the ventroapical corner of the epandrium is not as strongly produced, the anterolateral extensions of the basiphallus are not as well-developed, the paraphallus is absent, the mesophallus is directed distally (not posterodorsally), and the distiphallus is brown (not yellow), it does not have a thick basal "stem" and it is not longer than the mesophallus.

***Liriomyza taraxanox* spec. nov.**
Figs 160, 161

Wing length 1.9–2.0mm (♂), 1.8–2.0mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.1–2.7. Eye height divided by gena height: 3.1–3.5. Scutum subshining with a slight dusting of pruinosity. First flagellomere ovate, slightly higher than long, with short hairs. Cheek, parafacial and orbital plate slightly produced to form narrow ring around eye.

Chaetotaxy: One or two ori, two ors. Acrostichal setulae in four scattered rows anteriorly, reduced to two rows at and behind suture.

Colouration: Calypter margin brown. Head yellow with ocellar triangle, clypeus and back of head dark brown; posterolateral corner of frons brownish lateral to vertical setae; orbital plate brownish laterally along eye margin and with minute faded spots around base of setae and setulae; face light brown, at least medially; venter of gena with narrow brownish line. Scutum with complete yellow lateral stripe. Scutellum yellow with lateral corner brown. Katatergite brownish with midline or dorsum yellow; anatergite brown with posterodorsal corner yellow; mediotergite dark brown. Anepisternum brown with dorsal ¼ yellow and deep anterior and dorsomedial emarginations yellowish (palest specimens with most of anteroventral half brown and with posterior margin of sclerite with brown line; absent in similar *L. taraxaci*); anepimeron and meron largely brown; katepisternum brown with dorsal ¼–1/3 yellow. Legs yellow with base of coxae brown, femora with dark dorsal streaking, tibiae brown dorsally with anterior legs paler, and tarsi brown. Abdomen brown, narrowly yellow laterally.

Genitalia: (Figs 160, 161) Surstylus darkly pigmented, not tapering apically and with one large subapical spine. Inner surface of epandrium flanked by one pair of dark bars with terminal spine. Basiphallus sclerotized along left lateral and dorsal surfaces, and with distolateral margins produced as membranous lobes with vestigial paraphalli fused to margin. Hypophallus well-developed. Mesophallus cylindrical and with length approximately twice width; mesophallus and distiphallus with complete ventral suture. Distiphallus approximately as long as wide, with base tapered and with slight dorsoventral compression on short "stem" basal to shallow apical chamber enclosing one pair of fringed structures; ventral suture with margins thickly sclerotized, dividing apically to reveal wide, prominent lobed plate. Ejaculatory apodeme large and dark with blade broad, margin dark, and stem short with rounded lobe extending from one side; sclerite of sperm pump wide and with ends heavily sclerotized and truncated.

Variation: western specimens as described for Quebec specimens except as follows: orbital plate yellow laterally; streaking on femora slightly paler; seen ventrally, mesophallus slightly less narrowed medially and apically, and base somewhat less bulbous.

Etymology. The specific epithet compounds the name of the highly similar Holarctic species *L. taraxaci*, and the Latin for night (*nox*—"night"), referring to the dark colour of this species.

Host. Asteraceae—*Taraxacum* sp., *Crepis elegans* Hook., *C. nana* Richardson.

Range. Canada. QC, YT. **USA.** AK.

Holotype: Canada. QC: Payne Bay, 10.viii.1958, W.R.M. Mason (1♂, CNC),

Paratypes: Canada. QC: Payne Bay, 27.vii.1958, W.R.M. Mason (1♂, CNC), **YT:** near S end Kluane Lake, 3500', 22.vii.1972, larva on *Crepis nana*, emerged 19–21.v.1973, G.C.D. Griffiths, KL64 (2♂[with puparia] CNC, 2♀[with puparia], UASM, CNC), near S end Kluane Lake, 3500′, 22.vii.1972, larva on *Crepis elegans*, emerged 24.v.1973, G.C.D. Griffiths, KL51 (1♀[with puparium], UASM). **USA. AK:** Harding Lake near Fairbanks, 29.vii.1968, larva on *Taraxacum* sp., emerged 12–29.xi.1968 or 20–22.v.1969, G.C.D. Griffiths, F21 (4♂ 7♀[with puparia], UASM; 3♂ 3♀[with puparia], CNC).

Comments. *Liriomyza taraxanox* is highly similar to *L. taraxaci* (Figs 168–178) and a number of related species characterized by yellow around the base of the verticals and a unique distiphallus at the end of a dark, cylindrical mesiphallus. Unlike these species, however, *L. taraxanox* has a brown face (at least medially), a darker

katepisternum that is brown to the seta base and with a spot in the posterodorsal corner, a darker anepisternum with the anterior spot ususally broadly confluent with a stripe along the posterior margin, extensively pigmented femora, and a small, ovate first flagellomere covered by very short hairs (not enlarged or with longer hairs). The mesophallus is also quite short, being only slightly longer than the distiphallus, which is quite broad, tapered basally, and with a broad ventroapical lobe emerging from between the thickened margins of the ventral suture. Only *L. apilaca* (Figs 158, 159) has a comparable mesophallus, but in that species the mesophallus is only as long as the distiphallus and narrowest basally, and the ventrodistal lobe on the broadly rounded distiphallus is much narrower; that species is also much paler and has a larger, longer-haired first flagellomere.

***Liriomyza taraxanuda* spec. nov.**
Figs 162, 163

Wing length 1.5mm (♂). Female unknown. Length of ultimate section of vein CuA_1 divided by penultimate section: 3.2. Eye height divided by gena height: 2.5. Scutum subshining. First flagellomere slightly longer than high, ovate, with relatively long hairs (not as pronounced as in *L. minor* or *L. ptarmicae*).

Chaetotaxy: Two ori (anterior seta half length of posterior ori or setula-like), two ors. Acrostichal setulae in four rows. Postverticals missing in specimen.

Colouration: Calypter margin brownish. Head yellow with first flagellomere brownish with dorsum slightly darker, ocellar tubercle and clypeus dark brown, back of head dark brown with venter and one pair of spots lateral to ocelli yellow, and venter of gena with brownish line; posterolateral corner of frons with brownish spot touching eye margin far from base of vertical setae. Scutum with complete lateral yellow stripe. Scutellum brown laterally. Metanotum brown with posterodorsal corner of anatergite yellowish and mediotergite dark brown. Anepisternum mostly brown with dorsal margin yellow (thinly except for larger yellow posterior emargination approximately ¼ height of sclerite) and brownish vertical submarginal region posteriorly; anepimeron brown with limited yellow mottling; katepisternum brown with dorsal margin narrowly yellow; meron brown with dorsum yellow. Coxae brown with distal half of fore coxa, distal 1/3 of mid coxa and apex of hind coxa yellow; femora yellow with bases brown (wider on fore leg), fore femur with strong dorsal streaking, and mid and hind femora with distal 3/5 (except apex) strongly brown marked; fore tibia brown, becoming yellow to base and with venter paler, mid tibia dark brown with venter paler and hind tibia dark brown; tarsi brown to dark brown with base of fore tarsus yellowish. Abdomen brown dorsally with lateral margin yellow and epandrium and surstylus dark brown.

Genitalia: (Figs 162, 163) Epandrium with posterodistal margin shallowly pointed. Surstylus slightly tapered apically and with one subapical spine. Basiphallus sclerotized along most of dorsal and left lateral surfaces with left distal margin slightly produced as weakly sclerotized lobe. Swollen section of ejaculatory duct relatively narrow apically. Hypophallus with weakly sclerotized base and developed apical tuft of hairs. Paraphallus absent. Mesophallus dark and cylindrical, length nearly three times width, with complete ventral suture. Distiphallus short and broad with width approximately 1.5 times length; approximately 2.5 times width of mesophallus; ventral suture broadly divided medially; without distoventral plate (related species such as *L. taraxaci* with small sclerite exposed apically between suture); seen laterally, with constricted basal stem and apical chamber enclosing one pair of broad, short fringed processes that are slightly angled dorsally.

Etymology. The specific epithet compounds the name of the highly similar Holarctic species *L. taraxaci*, and the Latin for naked, exposed (*nudus*), referring to the diagnostic ventral split of the distiphallus, which exposes the inside of the segment.

Host. Unknown.

Range. Canada. AB.

Holotype: Canada. AB: Onefour, 49°6′, 110°24′, 7.vi.1955, J.R. Vockeroth (1♂, CNC).

Comments. The genitalia of this species are highly similar to those of related species such as *Liriomyza taraxaci* (Figs 168–178) or *L. taraxanox* (Figs 160, 161), but the distiphallus is distinctly shorter and broader with a very widely split ventral suture that exposes an empty spot where a small sclerotized plate would otherwise be. The brownish first flagellomere and extensively dark pleurites and femora are also diagnostic.

***Liriomyza temperata* Spencer**
Figs 314–320

Liriomyza temperata Spencer, In Spencer & Steyskal 1986: 294.

Wing length 2.4mm (♂), 2.1–2.7mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.1–2.9. Eye height divided by gena height: 3.8–6.9 [head missing in holotype]. Scutum subshining.

Chaetotaxy: Two ori, two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin brown. Head yellow with ocellar triangle and back of head dark brown; lateral corner of frons dark brown, becoming paler to base of outer vertical seta; clypeus dark brown with centre sometimes paler. Scutum with complete yellow stripe laterally. Lateral corner of scutellum with small brown spot. Katatergite brown posteriorly; anatergite brown with dorsum yellow; mediotergite dark brown. Anepisternum with brown stripe across ventral half; anepimeron yellow with brown streaking (paler posteriorly); meron brown with dorsum yellow; ventral 2/3 of katepisternum brown. Legs yellow with base of coxae brown, tibiae and tarsi brown (anterior legs paler); hind femur sometimes brown dorsobasally, and if so, fore and mid femora sometimes also similarly brown. Abdomen dark brown with lateral margin of tergites yellow.

Genitalia: (Figs 314–320) Surstylus broad with two long posterobasal spines (not apical to subapical). Phallophorus with long, narrow dorsal process that is sharply bent ventrally. Basiphallus with left lateral and dorsoapical surfaces sclerotized. Hypophallus short with long subapical hairs. Paraphallus pale and narrow with venter darker. Mesophallus short, thick-walled dorsally, narrowed basally and distally; mesophallus and distiphallus with complete ventral suture. Distiphallus cup-shaped, slightly compressed dorsoventrally towards darkened base; with few spines along distal margin of shallow medial and apical chambers. Ejaculatory apodeme with narrow stem and clear marginal band; sclerite of sperm pump highly reduced.

Variation: Non-type males differ as follows: wing length 1.9–2.2mm; eye height divided by gena height 6.7–8.0; two ori and ors; femora entirely yellow; stripe on anepisternum sometimes narrower; extension on the left distal margin of the basiphallus shorter and narrower; paraphallus slightly thicker; mesophallus approximately 1/3 shorter; distiphallus higher, stouter, with more conspicuously delimited short medial chamber and with base broader (apparently shorter with more rounded base in illustration in original publication, but this may be an artifact); ejaculatory apodeme more weakly sclerotized marginally on blade and not more heavily sclerotized on lateral margin of blade furthest from duct; sclerite of sperm pump weaker and not produced laterally.

Host. Unknown.

Range. Canada. ON*. **USA.** NC, TN, VA*.

Holotype: USA. NC: "Gr. Sm. Mt. Nat Park, Tenn.", 6600′, Clingman's Dome, 22.viii.1957, J.G. Chillcott (1♂[head missing], CNC).

Paratypes examined: USA. NC: Same data as holotype (1♀, CNC), Gr. Smoky Mt. Nat. Pk., N.C., Clingman's Dome, 6300–6642′, 28.v.1957, J.R. Vockeroth (2♀, CNC), Devil's Court House, Blue Ridge Parkway, 2.viii.1957, W.R. Richards (1♀, CNC), Mitchell Co., Roan Mtn., 6200′, 13.viii.1957, J.G. Chillcott (2♀, CNC), **TN:** Gr. Smoky Mt. Nat. Pk., Tenn., 20.v.1957, J.R. Vockeroth, Indian Gap, 5200′ (2♀, CNC).

Additional material examined. Canada. ON: Ottawa, 26.vii.1959, J.R. Vockeroth (1♂, CNC). **USA. NC:** Highlands, 20.vii.1957, W.R. Richards (1♂, CNC), Haywood Co., Pisgah Nat. Forest, Chestnut Bald, 2.viii.1957, J.G. Chillcott (1♂, CNC), **VA:** Brush Mt., 2800′, Blacksburg, 27.v.1962, J.R. Vockeroth (1♂, CNC).

Comments. The non-type material listed above appears to be most similar to the type series of *Liriomyza temperata*, although there are some discrepancies suggesting that they may belong to an undescribed species. The female types may also prove to belong outside of this species—or at least some of the smaller females collected outside of the Great Smoky Mountains National Park—since the only reliable diagnostic characters are those of the male genitalia. The Ottawa record is the first known occurrence of this species in Canada.

Liriomyza temperata is most similar genitalically to *L. tricornis* Lonsdale (Lonsdale 2011: figs 210–213), an uncommon species only known from California that also has one pair of basal spines on the surstylus (although these are floating in a basal desclerotized region), a paraphallus that is almost as narrow, a cup-shaped, basally pigmented distiphallus (although the distiphallus is not as large or as strongly compartmentalized) and a weakly developed sclerite on the sperm pump. The Californian species differs, however, in having a narrower mesophallus that is widest on the basal half, a basally rounded distiphallus (seen ventrally) and a submarginal band on the

ejaculatory apodeme. Externally, there is one ors on both sides of the frons (not two) and the posterolateral corner of the frons is light brown to the base of the inner vertical seta. Most other pale species with a cup-shaped distiphallus, such as *L. eupatorii* (Figs 264–270) and *L. sativae* (Figs 303–306), have only a single spine on the surstylus, although *L. sabaziae* (Figs 299–302), *L. specifica* Spencer (Lonsdale 2011: figs 218–220) and *L. trixivora* Lonsdale (Lonsdale 2011: figs 240–243) also have two spines (albeit subapical on the surstylus, not basal) and can be differentiated by having a distiphallus that is narrower and rounded basally.

Liriomyza togata **(Melander)**

Figs 201–204

Antineura togata Melander 1913: 250.
Haplomyza togata. Hendel 1914: 73; Frick 1952a: 410, 1957: 204 [lectotype designation], 1959: 413.
Liriomyza togata. Steyskal 1980: 141; Spencer & Steyskal 1986: 134; Lonsdale 2011: 102.
Liriomyza douglasii Spencer 1981: 228. Syn. Spencer & Steyskal (1986).

Wing length 1.6mm (♂), 1.7mm (♀). Vein dm-cu sometimes absent (uncommonly absent on only one side); if present, length of ultimate section of vein CuA_1 divided by penultimate section: 2.9. Eye height divided by gena height: 2.1–3.2. Scutum dusted with pruinosity. Orbital plate slightly, and parafacial and cheek strongly produced. First flagellomere of Canadian specimens sometimes with anterodorsal corner angled.

Chaetotaxy: Two ori (sometimes three), one ors. Acrostichal setulae in two rows.

Colouration: Calypter margin grey, sometimes paler or even yellow. Head light yellow with ocellar triangle brown and clypeus and back of head dark brown. Scutum with complete yellow lateral stripe. Katatergite with small brown posteroventral spot; anatergite brown with dorsum yellow; mediotergite dark brown. Anepisternum yellow with small posteroventral and anteroventral stripes; anepimeron yellow with anterior mottling and posterior margin brown; katepisternum brown below (and not touching) seta and with small spot behind seta; meron brown with dorsal margin yellow. Legs yellow with base of fore coxa, basal half of mid coxa and basal ¾ of hind coxa brown, base of femora infrequently brown and dorsum of fore femur sometimes with faint to relatively distinct dorsal streaking, fore tibia light brown with base fading to yellow, mid tibia brown dorsally with venter slightly paler, hind tibia dark brown with venter paler, and tarsi brown, becoming paler to base. Abdomen brown with narrow medial stripe on tergite 2, and posterior and broad lateral margin on tergites yellow.

Genitalia: (Figs 201–204) Surstylus slightly darker than epandrium and with one apical spine sometimes accompanied by a smaller additional spine. Basiphallus curved ventrally but mesophallus directed dorsally; left and right distal margins with long, dark bar, being especially pronounced and pointed on left side (SK specimens sometimes with left distal margin more evenly sclerotized and rounded); distiphallus+mesophallus approximately 2/3 length basiphallus. Paraphallus flat, lobate and directed laterally from base of mesophallus; half length of mesophallus. Hypophallus with broad membranous base and short subapical hairs. Mesophallus narrowing apically, with ventral suture, and length approximately twice width. Distiphallus globular with narrowed base; distal half relatively dark and enclosing one pair of fringed structures. Ejaculatory apodeme small but well-developed, blade dark and semicircular with distal margin thickly-sclerotized; sclerite of sperm pump with thick, heavily sclerotized lateral margins.

Hosts. Asteraceae—*Baccharis douglasii* (Spencer 1981), *Artemisia douglasiana* (Spencer & Steyskal 1986).

Range. Canada. AB, MB*, NS*, ON*, QC*, SK. **USA.** CA, WA.

Lectotype [*togata*]: USA. WA: Pullman, 12.v.1912, A.L. Melander, "Lectotype Antineura togata Mel., Frick 1957" [red label] (1♂, USNM).

Holotype [*douglasii*]: USA. CA: Nevada Co., Sagehen Creek, near Hobart Mills, 15.vii.1964, sweeping, M. Irwin (1♂, CASC).

Additional material examined. Canada. AB: Onefour, 2.viii.1980, sweeping, G. Gibson (2♂, DEBU), Drumheller, 14.vi.1946, W.R.M. Mason (1♂, CNC), Edmonton, 24.v.1946, W.R.M. Mason (1♂, CNC), Elkwater L., 21.vii.1956, swept from range grass, O. Peck (1♂, CNC), Kluskin Hill, 55°15.540′N, 118°30.620′W, swp vegetation in badlands, 21.vii.2003, S. Boucher (2♀, LEM), Kananaskis, Sheep River P.P., 7km W Sandy McNabb camp, 50°38.9′N, 114°37′W, swp open forest and field, 28.vii.2003, S. Boucher (1♀, LEM), Bilby, 1.vi.1924, O. Bryant (1♀, USNM), Slave Lake, 14.viii.1924, O. Bryant (2♂ 1♀, USNM), 15km NE Onefour, Sage Creek,

(49˚09.0′N, 110˚15.1′W), sweep sedges near creek, 10.vii.2000, V. Crecco & T.A. Wheeler (1♂, LEM), **MB:** 5mi SW Shilo, J.G. Chillcott, 11.vii.1958 (1♂, CNC), 22.vii.1978 (1♂, CNC), 5km N Gardenton Tallgrass Prairie Preserve, (49˚10.71′N, 96˚40.76′W), sweep in tallgrass prairie, 17.viii.1999, T.A. Wheeler (1♂, LEM), 13.vii.2000 (1♂, LEM), **ON:** Arkell, 6.vi.1978, N. Pierce (1♂, DEBU), **QC:** Lac Vert, St Ambroise, 48°34′N, 71°23′W, sweeping, 3.viii.2001, M. Giroux (1♂, LEM), **SK:** Almonte, Burnt Lands, 45°15.5′N, 76°09.1′W, sweep vegetation in alvar, 14.vi.2007, J. Mlynarek (1♂, LEM), 8km W Ogema, (49˚33.2′N, 105˚01.4′W), sweep dry prairie along roadside, 9.vii.2000, V. Crecco & T.A. Wheeler (3♂, LEM).

Comments. See comments for *Liriomyza lima*.

Liriomyza trifoliearum Spencer

Figs 11, 329–332

Liriomyza pictella. Misidentification. Frick 1959: 408.

Liriomyza trifoliearum Spencer In Spencer & Stegmaier 1973: 107. Spencer & Steyskal 1986: 296; Scheffer *et al.* 2007: 772; Lonsdale 2011: 104.

Description. Wing length 1.8–2.3mm (♂), 1.8–2.2mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.5–4.0. Eye height divided by gena height: 2.8–3.2. Scutum subshining.

Chaetotaxy: Two ori (sometimes three on one side), two ors. Acrostichal setulae in four or five irregular rows.

Colouration: (Fig. 11) Calypter margin and hairs dark. Head mostly yellow; ocellar triangle, back of head, clypeus and posterolateral margin of frons to base of inner vertical seta dark brown; orbital plate brown to base of posterior or anterior ors (fading anteriorly), or with light mottling at base of setae; face light brown to yellow; posteroventral margin of gena with narrow brownish stripe; first flagellomere sometimes with distal margin infuscated. Scutum with complete lateral yellow stripe that is sometimes brown posteriorly. Scutellum yellow with lateral corner brown. Metanotum brown, usually with katatergite partially yellow dorsally. Pleuron brown with dorsal ¼ or less of anepisternum, mottling on anepimeron, dorsal margin of meron and dorsal or dorsomedial margin of katepisternum yellow; katepisternal seta usually enclosed by brown but sometimes on yellow border. Coxae (sometimes excluding apex to distal 2/3 of fore coxa), tibiae and tarsi brown; base of femora brown (sometimes only dorsally in eastern material or with mid femur entirely yellow), remainder of segment variably patterned, but usually paler on fore or mid femora, and infrequently entirely brown with only apex and anteroventral surface yellow. Abdomen brown, sometimes with posterior margin of tergites 2–5 yellow.

Genitalia: (Figs 329–332) Surstylus slightly narrowing distally and with two subapical spines with outer spine slightly smaller. Apical membrane of basiphallus produced into one pair of pointed paraphalli. Hypophallus absent or present as small offset sclerotized plate. Mesophallus slightly longer than wide, most heavily sclerotized laterally and dorsally; mesophallus and distiphallus with complete ventral suture. Distiphallus short, entirely divided medially with halves narrow, weakly sclerotized apically and with several inner-marginal points. Ejaculatory apodeme narrow and poorly developed with venter of sperm pump broadly sclerotized.

Hosts. Fabaceae—*Coronilla*, *Medicago sativa* L., *Phaseolus vulgaris* L., *Pisum*, *Trifolium repens* L. (Spencer & Steyskal 1986; Dempewolf 2004), *Lupinus**. Solanaceae—*Solanum physalifolium* Rusby [=*Solanum sarachoides*] (Spencer & Steyskal 1986).

Range. Canada: AB*, BC*, NB*, NS*, ON*, PE, QC*, SK*. **USA:** AZ*, CA, DE*, FL, MA, MD, NM, NY, OH*, OR, PA, UT, VA*, WA, WI, WV*.

Holotype: USA. FL: Gainesville, 24.iv.1964, ex. *Trifolium repens*, D.H. Habeck (1♂, USNM).

Paratypes examined: USA. FL: Gainesville, em. 11.iv.1964, ex. *Trifolium incarnatum*, " leg. 8.6.64", J.H. Habeck (1♂ 1♀[same pin], CNC).

Additional material examined. Canada. AB: Kananaskis Field Stn., 51°01′27″N, 115°01′26″W, M.A.P. Whittaker, Malaise, bog, 19–25.viii.1998 (1♂, LEM), Malaise trap, 13–23.ix.1998 (1♂, LEM), **BC:** Squamish, Diamond Head Trail, 3200', 28.viii.1953, G.J. Spencer (2♂, CNC), **NB:** St. John Co., Irving Nature Park, 45˚13'20"N, 66˚07'41"W, 2.viii.2011, O. Lonsdale, ex *Lupinus polyphyllus* Lindley (7♂ 5♀, CNC), Kouchibouguac N.P., 9.vii.1977, J.F. McAlpine (1♀, CNC), Sackville, nr Mt. Allison Univ., (45˚53.9′N, 64˚22.5′W), reared from leaf mine on *Lupinus* in old garden, 19.vii.2002, emerged 21.vii.2002, T. Wheeler (2♂ 1♀, LEM), **NS:** Hebron, on: *Lupinus* sp., em: 21–25.viii.1964, C.D.F. Miller (4♂ 1♀, CNC; 2♂, BMNH), Wood

Harbour, on: *Lupinus* sp., em. 21–25.viii.1964, C.D.F. Miller (4♂ 2♀ 2?, CNC; 2♀, BMNH), Crescent Beach, 44°13.8′N, 64°23.2′W, sweep dune vegetation, 24.vii.2002, J. Forrest & T. Wheeler (3♂, LEM), **ON:** Ottawa, C.E.F., viii.1971, leaf mine in *Medicago* (5♂ 11♀, CNC), Thornhill, 5.ix.1964, J.R. Vockeroth (1♂, CNC), St. Lawrence Is. N.P., Grenadier I. Centre, 6.viii.1975, Malaise trap, E. Sigler (1♀, CNC), Kingsville, 8.vii.1977, W.A. Atwater (1♂, DEBU), Walpole Is., 11.vii.1977, K. Barber (1♀, DEBU), Erin, 25.vi.1979, J. Ernst (1♂, DEBU), Belwood, 25.vi.1968, D.H. Pengelley (1♂, DEBU), River Canard, 10.vii.1977, W.A. Atwater (1♂ 1♀, DEBU), Spencer Gorge Wilderness Area, oak bluff, sweep of big blue stem, 18.viii.1993, D.C. Caloren (1♀, DEBU), Wellington Co., Guelph, 1.vii.1977, B.K. Akey (1♂, DEBU), Guelph, 10.x.1971, K.J.G. Deacon (1♂ 1♀, DEBU), Guelph, 17.ix.1979, J.A. Carson (1♂ 1♀, DEBU), Guelph, D.J. Aspinall, 18.viii.1976 (1♂, DEBU), 18.viii.1976 (1♂, DEBU), Bruce Co., Dunks Bay, dune, Malaise, 5–12.vii.1999, S.A. Marshall (1♂, DEBU), **PE:** vii.1970, L.S. Thompson, leaf mine in cultivated pea (1♂, CNC), Upton, viii.1976, L.S. Thompson (1♂, CNC), Kingston, viii.1976, L.S. Thompson (1♂, CNC), C[illegible], vii.19[?], L.S. Thompson (1♀, CNC), **QC:** Ste-Anne-de-Bellevue, Stoneycroft, 45°25.8′N, 73°56.4′W, sweep *Solidago*, 4.viii.2000, T.A. Wheeler (2♂ 4♀, LEM), 26.vii.2000 (4♂, LEM), Mont-St-Bruno, (45˚32.894′N, 73˚18.595′W), sweep open slope and forest, 7.vii.2011, S. Boucher (2♂ 4♀, LEM), **SK:** S of Moosomin Pipestone Creek, 50˚01′57.96″N, 101˚40′36.60″W, 570m, prairie habitat, 2.vi.2007, Goulet, Boudreault & Fernandez, CNC315626 (1♂, CNC).**USA. AZ:** Tempe, V.L. Wildermuth, "May 24-12" (3♂ 4♀, USNM), **DE:** Lum's Pond, 17.vii.1974 (1♂, USNM), **OH:** Wooster,reared ex. celery, 25.vii.1978, D. Simonet (1♂ 2♀, USNM), **VA:** Montgomery Co., 20.vi.1974, P.W. Larkins (1?, USNM), **WV:** Great Cacapon to Largent, 2–3.vii.1977, W.W. Wirth (1♂, USNM), Preston Co., vi.1971, J.E. Weaver (2♂ 2♀, USNM).

Comments. While presently known from only the Nearctic, the relatively broad distribution and host range on ornamental and food crops of *Liriomyza trifoliearum* suggests that the potential for global introduction is comparatively high. The most diagnostic feature of this species, one of the most commonly encountered of the darkly pigmented Canadian *Liriomyza*, is the paraphallus, which is produced as a pointed triangular lobe lateral to the distiphallus with the apex darkly pigmented.

Liriomyza trifolii (Burgess)

Figs 12, 25, 307–310

Oscinis trifolii Burgess 1880: 201.
Agromyza trifolii. Coquillett 1898: 78; Malloch 1913: 278 [as syn. *Agromyza pusilla* Meigen].
Liriomyza trifolii. De Meijere 1925: 282; Hendel 1931: 213; Frick 1952a: 405, 1959: 410; Spencer 1965: 37 [neotype designation], 1973: 226, 1984: 25; Spencer & Steyskal 1986: 296; Stegmaier 1966: 75; Scheffer & Lewis 2006: 991; Scheffer *et al.* 2007: 772; Lonsdale 2011: 106.
Liriomyza phaseolunata Frost 1943: 256. Frick 1952a: 404, 1959: 408. Syn. Spencer & Steyskal (1986).
Liriomyza alliovora Frick 1955: 88. Frick 1959: 401. Syn. Spencer (1973).

Description. Wing length 1.2–1.7mm (♂), 1.5–1.9mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.7–3.1. Eye height divided by gena height: 2.1–3.0. Scutum with light greyish pruinosity, rarely subshining. First flagellomere rounded or with slight anterodorsal angle.

Chaetotaxy: (Fig. 12) Two ori, two ors. Acrostichal setulae in two to four scattered rows.

Colouration: (Fig. 25) Calypter margin brownish. Head yellow with back of head above foramen, ocellar tubercle, clypeus, and posterolateral margin of frons (not reaching base of outer vertical seta) brown. Scutum with complete lateral yellow stripe. Scutellum yellow with lateral corner brown. Metanotum brown with sclerites lateral to scutellum paler, sometimes with katatergite entirely yellow. Pleuron yellow with large ventral spots on katepisternum (not including seta base) and meron, and anepisternum and anepimeron with small anteroventral spots. Legs yellow with base of fore coxa sometimes brown, fore femur sometimes with dorsal mottling, base of mid and hind femora sometimes partially brown dorsally, and tibiae and tarsi brown (paler on fore legs). Abdomen brown with lateral margin broadly yellow and posterior margin of tergites (1)2–4 yellow; tergites 2–4 sometimes with yellow posteromedial emargination (sometimes forming complete line on tergite 4) and tergite 6 with anteromedial spot; epandrium brown, often with dorsum light brown to yellow; tergite 2 sometimes yellow along midline in females; if male abdomen entirely brown (some South American material), only two rows of acrostichal setulae present and most of anepisternum brown.

Genitalia: (Figs 307–310) Surstylus subtriangular, apex slightly truncated and with small inner-distal spine. Basiphallus sclerotized along left lateral margin and partially along dorsal margin; largely recessed distally where swollen section of ejaculatory duct dominates. Paraphallus narrow, weakly sclerotized. Hypophallus small, narrow. Mesophallus narrow, pale, slightly longer than wide and weakly fused to distiphallus. Distiphallus small, cup-shaped with subapical constriction; apex with characteristic minute triangular-shaped sclerotizations. Ejaculatory apodeme small with base curved and apex relatively narrow and clear; sperm pump with transverse sclerotization.

Range. Widespread in North and South America, Europe and Asia.

Known hosts. *L. trifolii* is a highly polyphagous species. A complete list of host genera is provided in Lonsdale (2011).

Neotype [*trifolii*]: USA. IN: Lafayette, from Alfalfa, 3.ix.1913, J.M. Aldrich (1♂, USNM).

Holotype [*phaseolunata*]: USA. NJ: Bridgeton, 24.viii.1942, B.B. Pepper (1♂, Lost).

Holotype [*alliovora*]: USA. IO: Ames, 8.vi.1932, H.M. Harris, ex. leaf of onion (1♂, USNM).

Additional material examined. Canada. AB: Lethbridge, 29.v.1929, J.H. Pepper (1♂, CNC), Scandia, 11.vii.1956, O. Peck, swept from alfalfa (1♀, CNC), Kananaskis, For. Exp. Sta. Seebe, 3.vii.1968, H.J. Teskey (1♂, CNC), Onefour, 2.viii.1980, sweeping, G. Gibson (1♂ 1♀, DEBU), **BC:** Salmon Arm, A.A. Dennys, 22.vi.1925 (1♂ 1♀[in copula], CNC), 28.vii.1925 (1♀, CNC), Robson, 12.vii.1949, H.R. Foxlee (1♂, CNC), Sydney, 30.viii.1983, D. Gillespie (4♂, CNC), Langley, viii.1987, J. Nelson, em. 26.viii.1986 (1♂, CNC), Summit Lake, Mi392, Alaska Hwy., 8.vii.1959, 4500′, R.E. Leech (1♂, CNC), **NS:** Woodville, H.J. Herbert Agr. Centre, taken on Chrysanthemum (1♂, CNC), H.J. Herbert Agr. Centre, Kentville, reared Chrysanthemum, i.1981 (3♀, CNC), ii.1981 (3♂ 5♀, CNC), iii.1981 (3♀, CNC), **ON:** Vineland, 4.ix.1991, lab colony, P. Richards (3♂ 3♀, DEBU), Vineland Sta., 31.x.1966, W.L. Putnam (1♀, DEBU), Ottawa, 26.vii.1955, J.G. Chillcott (1♀, CNC), Vineland Sta., 31.x.1966, W.L. Putnam, host: greenhouse tomato (1♂ 1♀, CNC), Windsor, 26.iv.1961, Pl. Prot. Intercept, ex. Chrysanthemum (1♂ 3♀, CNC), Chatham, 7.vii.1953, G.F. Mason, host plant: potato leaf miner (4♂ 2♀, CNC), Harrow, 13.ix.1961, host: lima bean in greenhouse (3♂ 7♀, CNC), Lincoln, 2007, Chrysanthemum greenhouse, L. Conway (U. Gue.) (4♂ 2♀[with puparia], CNC), Merivale, 2.viii.1951, R. Lambert (1♂, CNC), **QC:** Gt. Whale R., 3.viii.1949, leaf mine in *Lathyrus maritimus*, J.R. Vockeroth (1♀, CNC), **SK:** Saskatoon, 15.viii.1915, King (1♀, CNC). **USA. CA:** White Water, 27.iii.1955, W.R. Richards (1♂, CNC), **FL:** Miami, 14.viii.1962, mine *Tridax procumbens*, K.A. Spencer (1♂, CNC), Hialeah, 8.ii.1963, ex. lettuce cult., K.A. Spencer (3♂ 2♀, CNC), Sanford, em. 9.i.1964, ex. *Apium graveolens*, 26.xii.1963, K.A. Spencer (1♂ 1♀, CNC), Cape Sable, 31.iii.1953, W.R.M. Mason (1♀, CNC), L. Matecumbe Key, 31.iii.1952, J.R. Vockeroth (1♀, CNC), Homestead, 3.iv.1952, J.R. Vockeroth (1♂, CNC), Homestead, G.S. Walley, 28.iii.1952 (6♂ 5♀ 2?, CNC), 3.iv.1952 (1♀, CNC), 5.iv.1952 (1♀, CNC), Florida City, 30.iii.1953, W.R.M. Mason (1♂ 1?, CNC), Ft. Ogden, 8.vi.1962, O. Peck (2♂, CNC), Lake Co., Alexander Springs, 26.iii.2013, ex *Hydrocotyle verticillata*, em. 12–20.iv.2013, C.S. Eiseman, #CSE275, CNC358471 (1♂, CNC), **IN:** Lafayette, J.M. Aldrich (1♂, CNC), **NC:** Gr. Smoky Mt. N.P., Clingman's Dome, 6300′ 6642′, 28.v.1957, J.R. Vockeroth (1♂, CNC), **NY:** L.I. Veg. Res. Fm., Riverhead, 7–20.viii.1938, at light (1♂, CNC).

Comments. The host range of *Liriomyza trifolii* is among the largest of any agromyzid (see Lonsdale (2011)), having been reared from species in over 160 plant genera in 41 families, primarily in the Asteraceae and Fabaceae, and is frequently encountered on *Chrysanthemum*. It can be differentiated from other common agricultural pests by having reduced rows of acrostichal setulae, a pruinose scutum and the base of the vertical setae surrounded by yellow.

***Liriomyza tryssos* spec. nov.**
Figs 321–325

Wing length 1.1–1.2mm (♂). Female unknown. Vein dm-cu absent. Eye height divided by gena height: 3.1. Scutum with light grey pruinosity. Arista short, approximately 1.5 times length first flagellomere. Parafacial and anterior region of orbital plate projecting, continuing under eye as narrow cheek.

Chaetotaxy: Three ori, one ors. Postvertical absent (possible artifact of preservation). Vibrissa small, narrow. Only one well-developed posterior dorsocentral visible; remaining dorsocentrals highly reduced with anterior setae not much larger than surrounding setulae. Acrostichal setulae in two irregular rows.

Colouration: Calypter margin and hairs yellow, slightly greyish. Head mostly light yellow, including posterolateral corner of frons and entire eye margin; ocellar tubercle dark brown, with region towards vertex light brown; clypeus dark brown; back of head dark brown with venter yellow. Scutum yellow with three dark brown stripes that are nearly confluent around suture, including one thick medial stripe between dorsocentral rows that end anterior to posterior dorsocentral and one pair of narrower lateral floating stripes; one additional pair of very narrow posterolateral stripes. Scutellum yellow with lateral brown spot sometimes touching lateral seta. Metanotum yellow with posteroventral region of katatergite and most of anatergite excluding anterodorsal corner brown; mediotergite dark brown. Pleuron yellow with small oblique spot on anepisternum, anepimeron with anteromedial spot, meron brown with dorsum yellow, and katepisternum brown with dorsal ¼ yellow, including region around seta base. Legs yellow with base of coxae narrowly brown, tibiae brown (paler on anterior leg and darker on posterior leg) with venter yellow, and tarsi brown. Abdomen yellow with tergite 1 brownish, tergite 2 with brown transverse stripe narrowly broken medially and tergites 3–6 with one pair of large brown dorsal spots narrowly divided medially where there is limited dark brown mottling; epandrium and surstylus dark brown.

Genitalia: (Figs 321–325) Surstylus with one apical spine; slightly flattened. Epandrium with few setae posteriorly. Basiphallus weakly sclerotized and not produced apically, with dark basal region. Hypophallus well-developed with basal plate and medial ridge produced into apical hairs. Paraphallus small, ovate, clear distally, and partially fused basally with mesophallus. Mesophallus dark, cylindrical and produced posteroventrally as short carina with minute fossa. Distiphallus as long as mesophallus, somewhat cup-shaped with additional medial fold, with thick walls; internal fringed tubules atrophied. Ejaculatory apodeme reduced, with narrow base and stem, and small, clear apical blade; sperm pump without sclerotized regions.

Etymology. The specific epithet is Greek for "delicate".

Host. Unknown.

Range. Canada: SK.

Holotype: Canada. SK: Cypress Hills Prov. Pk. East boundary, (49˚40.2′N, 109˚27.5′W), sweep meadow near mixed forest, 10.vii.2000, V. Crecco & T.A. Wheeler (1♂, LEM).

Paratype: Canada. SK: same collection as holotype (1♂, CNC).

Comments. This new species is of uncertain position in the genus, and does not appear to be related to other species with a short, divided distiphallus such as *Liriomyza huidobrensis* (Figs 333–336), or small, pale species with a vittate scutum such as *L. blechi* or *L. borealis*.

Liriomyza undulata **Spencer**

Figs 41, 42

Liriomyza undulata Spencer 1969: 190. Sehgal 1971: 340.

Wing length 1.8–1.9mm (♂), 2.2mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.3–4.1. Eye height divided by gena height: 2.4–4.2. Scutum lightly dusted with pruinosity.

Chaetotaxy: Two ori (sometimes 1 or 3 on one side), one ors. Acrostichal setulae in two rows, becoming much sparser postsuturally. Anterior two dorsocentral setae abruptly smaller than second dorsocentral.

Colouration: Calypter margin grey. Head yellow, dark brown on ocellar tubercle and on back of head. Scutum with complete lateral yellow stripe. Scutellum yellow with lateral corner brown. Metanotum yellow with posteroventral margin of katatergite, anatergite excluding large posterodorsal region and mediotergite brown. Anepisternum with small, faint stripe anteroventrally; anepimeron with single brown anterior stripe; meron brown with dorsum yellow; katepisternum brown on ventral 2/3 (not including base of seta). Legs yellow with base of hind coxa brown, mid tibia brownish dorsally, hind tibia light brown dorsally and tarsi light brown (becoming paler to base). Abdomen brown with lateral margins of tergites and posterior margin of tergite 6 yellow.

Genitalia: (Figs 41, 42) Surstylus with one subapical spine. Venter of epandrium with short pointed apex and one spine. Basiphallus sclerotized along left lateral and dorsoapical surfaces. Hypophallus well-developed. Paraphallus narrow. Mesophallus approximately as long as wide, fused to base of distiphallus and with widely separated ventral suture. Distiphallus with small basal bowl and one pair of long apical tubules that are doubly sinuate along length before curving dorsally over hypandrium with ends pointing posteriorly. Ejaculatory apodeme

small with marginal sclerotized bands; sclerite of ejaculatory apodeme continuous with lightly sclerotized base of duct and with lateral margins slightly produced and thickened.

Variation: Male from Kinbasket Lake with faint dorsal streaking on all femora and tibiae brown with fore tibia much paler; head slightly damaged, but eye apparently two times higher than gena; length of ultimate section of vein CuA_1 divided by penultimate section 1.8.

Host. Unknown.

Range. Canada. AB, BC, MB*, NT*, ON*, QC*, SK*, YT*. **USA.** AK*.

Holotype: Canada. AB: Edmonton, Whitemud Park, 29.vi.1966, K.A. Spencer, in cop., Type No. 16133 (1♂, CNC).

Additional material examined. Canada. BC: Kinbasket Lake, BC Hydro drawdown study, Cooper, Beauchesne & Assoc. Ltd., Malaise trap, 13.vi.2008 (2♂, CNC), 12.vi.2010 (1♂, CNC), **MB:** Fort Churchill, 11.viii.1952, J.G. Chillcott (1♂, CNC), **NT:** Yellowknife, Rd. nr. Stock Lake, 16.vi.1966, G.E. Shewell (1♂, CNC), Norman Wells, 25.vi.1969, G.E. Shewell (1♂, CNC), **ON:** Iroquois Falls, 29.vi.1987, J.R. Vockeroth, swept along small cold mossy stream (1♂ 1♀, CNC), **QC:** James Bay Rte. km307, Pontax II River, 51°46′31″N, 77°25′27″W, open black spruce, yellow pans, 8–16.vii.2001, M.&B. Buck (1♀, DEBU), **SK:** Beaver Creek Cons. Area, ~13km S Saskatoon, 12.vii.1999, K.N. Barber, sweeps, mostly grasses under *Betula/Populus*, 51°58.6′N, 106°43.0′W (1♂ 1♀, DEBU), **YT:** North Fork Pass, Ogilvie Mts., 7.vii.1962, P.J. Skitsko (1♂, CNC). **USA. AK:** Fairbanks, 20.vi.1921, J.M. Aldrich (1♂, USNM).

Comments. While external character can diagnose *Liriomyza undulata*, it is recommended that the male genitalia be examined for confirmation—the distiphallus is doubly sinuate along its length, and usually arches over the bridge of the hypandrium. Previously known from British Columbia and Alberta, this species is now known to occur in localities throughout much of Canada east to Ontario and Quebec, and for the first time, in the United States (Alaska).

Liriomyza veluta **Spencer**

Figs 183–186

Liriomyza veluta Spencer 1969: 190. Sehgal 1971: 341.

Wing length 1.8–2.0mm (♂), 1.9mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.6–3.2. Eye height divided by gena height: 5.1–6.4. Scutum subshining to lightly dusted with pruinosity.

Chaetotaxy: Two ori (anterior ori setula-like to half length of posterior ori), two ors. Acrostichal setulae in four rows.

Colouration: Calypter margin brown. Head yellow with back of head, clypeus, ocellar tubercle and posterolateral corner of frons (not including base of vertical setae) brown. Scutum with complete lateral yellow stripe. Scutellum brown laterally. Metanotum yellow with posteroventral margin of katatergite, anatergite excluding large posterodorsal region and mediotergite brown. Anepisternum with narrow to broad oblique brown ventral stripe that is strongly faded in non-types; anepimeron with limited mottling on anterior half; venter of meron brown; katepisternum brown ventral to seta. Legs yellow with base of coxae brown (broader on hind legs), base of femora brown dorsally, fore femur with dorsal streaking, tibiae and tarsi brown with anterior legs paler, base of tibiae yellow and tarsi becoming paler basally. Abdomen brown with lateral margin of tergites yellow.

Genitalia: (Figs 183–186) Surstylus short and rounded with one subapical spine. Inner surface of epandrium flanked by short dark bar with one apical spine and one additional floating spine. Basiphallus sclerotized along dorsoapical surface. Hypophallus plate-like with small tuft of short hairs. Paraphallus absent. Mesophallus narrow, dark and with length approximately three times width; mesophallus and distiphallus with complete ventral suture. Distiphallus approximately as long as wide, slightly bilobed with apical chamber enclosing one pair of dorsolaterally directed fringed structures, and with ventrobasal sclerotized band. Ejaculatory apodeme small with stem gradually widening into pale blade, which has longitudinal striations on distal half and dark margin; sclerite of sperm pump narrow, continuous with lightly sclerotized base of duct and with lateral margins slightly produced and thickened.

Host. Unknown.

Range. Canada. AB.

Holotype: Canada. AB: Edmonton, Whitemud Park, 15.vi.1966, K.A. Spencer, Type No. 10417 (1♂, CNC).

Paratypes examined: Canada. AB: Same collection as holotype (1♂ 1♀, CNC).

Additional material examined. Canada. AB: Elkwater, 9.vi.1956, O. Peck (1♂, CNC), Lethbridge, 7.vi.1956, O. Peck (2♂, CNC).

Comments. The male genitalia of *Liriomyza veluta* are very similar to those of relatives such as *L. lathryi* (Figs 144–148), in that there is a single spine on the surstylus, the distiphallus is of similar orientation and dimensions and the mesophallus is narrow, dark and cylindrical. However, there is no outer covering on the distiphallus (that is, the inner processes are exposed), the hypophallus is plate-like and the dark bar flanking the inner surface of the epandrium is reduced. Externally, the gena is shallower and the femora are brown basally with the fore femur streaked.

***Liriomyza violivora* (Spencer) comb. nov.**
Figs 136–142

Galiomyza violivora Spencer In Spencer & Steyskal 1986: 298. Scheffer *et al.* 2007: 773.

Description. Wing length 1.7–2.2mm (♂), 1.8–2.0mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 1.9–2.5. Eye height divided by gena height: 2.5–3.4. Orbital plate visible laterally and slightly projecting anteriorly. Clypeus broad anteriorly. Notum subshining.

Chaetotaxy: Two ors, two to three ori. Postvertical and ocellar setae as long as ors. Orbital setulae dark, pronounced and reclinate. Four dorsocentrals, one presutural, decreasing in length anteriorly with anterior two subequal. Acrostichal setulae in four scattered rows.

Colouration: Calypter margin dark. Head light brown to dirty yellow, with clypeus, palpus, back of head, face, and lower margin of gena (very dark and shiny) brown; lunule darker ventrally, broad and shallow; frons yellow with orbital plate dark brown; first flagellomere brownish to brown with dorsum darker and base yellowish (paler on inner surface); entire antenna dark brown in USA specimens. Scutum with complete yellow lateral stripe. Scutellum and metanotum dark brown. Pleuron brown with sutures yellowish (widest on anepimeron). Legs brown with femora apices light brown.

Genitalia: (Figs 136–142) Epandrium with single spine (sometimes two on one side). Surstylus without spine, completely fused to epandrium. Basiphallus sclerotized on dorsal and left lateral surfaces, and with narrow sclerotized extension on right lateral surface; left and right apical margins produced into narrow extensions. Hypophallus membranous, without hairs. Mesophallus cylindrical, approximately as long as, but narrower than swollen section of ejaculatory duct. Paraphallus narrow basally but broadly expanded apically and with inner margin arched inwards and narrowly fused to ventral suture on mesophallus. Distiphallus half length of mesophallus, darker than mesophallus, and entirely bifid with halves cup-shaped, tapering to base and with several minute spinules on inner surface. Ejaculatory apodeme with narrow blade expanding from short stem; sperm pump with hemispherical sclerotization.

Variation: Dorsal margin of anepisternum yellow in Canadian specimens. USA specimens with fore coxa yellow and scutellum sometimes mostly to entirely dark brown.

Hosts. Violaceae—*Viola*.

Range. Canada: AB*. **USA:** MD, MS, NC, PA.

Holotype: USA. MS: Washington Co., Leland, emerged 4.vi.1979, G. McMinn (1♂, USNM).

Additional material examined. Canada. AB: Scotford Sandhills 5 miles west of Bruderheim, 20.vi.1971, larva on *Viola adunca*, emerged 20.vii.1971, G.C.D. Griffiths, E61 (1♀[with puparium], UASM), Jasper National Park, Maligne River Valley, 4200′, 26.viii.1973, larva on *Viola adunca*, emerged 13.vi.1974, G.C.D. Griffiths, J67 (1♂[with puparium], CNC), C.E. Lee Sanctuary, Devon sandhills, 15.vii.1979, larva on *Viola nephrophylla*, emerged 13.v–8.viii.1980, G.C.D. Griffiths, E379 (2♀[with puparium], UASM, CNC], N shore Cooking L., 53˚26–27′N, 113˚00–01′W, 17.vi.1977, larva on *Viola adunca*, emerged 14–16.vii.1977, G.C.D. Griffiths, E326 (3♀[with puparia], UASM). **USA. MS:** Washington Co., Leland (1♀, USNM), Washington Co., Leland, emerged 4.vi.1979, G. McMinn, Frick 79-13, reared ex. *Viola* sp. (8♂ [one missing from pin] 3♀, USNM).

Comments. *Liriomyza violivora*, newly transferred from *Galiomyza* (synonymized with *Liriomyza* above), is

similar externally to other dark species of "typical" *Liriomyza*, but it can be reliably differentiated on minor features of morphology and colouration. The male genitalia is relatively distinct, however—the surstylus does not have a spine, and while the distiphallus resembles that of *L. huidobrensis* and *L. trifoliearum*, the large, arched and medially expanded / plate-like paraphallus is characteristic.

***Liriomyza virgo* (Zetterstedt)**
Figs 90–93

Agromyza virgo Zetterstedt 1838: 789. Hendel 1931–6: 260.
Phytomyza pallicornis Zetterstedt 1948: 2827. Syn. Spencer (1976).
Liriomyza arcticola Spencer 1969: 167. Syn. Spencer (1976).
Liriomyza virgo. Spencer 1976: 275.

Wing length 1.9–2.2mm (♂), 2.0–2.4mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.1–3.0. Eye height divided by gena height: 1.3–5.0. Scutum subshining. First flagellomere with slight to distinct anterodorsal angle (rounded in material from AK and NT).

Chaetotaxy: Two ori (anterior ori sometimes reduced), two ors. Acrostichal setulae in four irregular rows.

Colouration: Calypter margin brown. Head yellow with ocellar tubercle, clypeus, back of head and posterolateral corner of frons to base of inner vertical seta dark brown, and first flagellomere usually darker than frons or with orange tint; orbital plate brown to base of fronto-orbitals; venter of gena with light brown line. Lateral margin of scutum with complete yellow lateral stripe excluding small brown spot in posterolateral corner. Pleuron brown with dorsal 1/5–1/4 of anepisternum yellow, anepimeron with limited yellow mottling, dorsum of meron yellowish and dorsal margin of katepisternum yellow. Legs yellow with basal 1/3 of fore coxa brown, mid and hind coxae brown with ventral yellow mottling, femora brown dorsobasally, and tibiae and tarsi brown. Abdomen brown.

Variation: AB male with orbital plate entirely yellow and anterior ori absent; MB male with only lateral margin of orbital plate light brown and base of fronto-orbitals with light mottling; some NT specimens with brown tint along facial sutures. ON specimens with posterolateral corner of scutum yellow (without spot), katepisternal seta surrounded by yellow and femora with pattern faded.

Genitalia: (Figs 190–193) Surstylus narrowing apically and with one small apical spine. Basiphallus sclerotized along left lateral surface. Hypophallus short with few, long apical hairs. Paraphalli narrow, subrectangular and nearly meeting dorsally. Mesophalus narrow, slightly longer than wide and fused to distiphallus. Distiphallus nearly as long as remainder of phallus and appearing bifid, although membranously connected along length and with single apical opening; tubules thicker and better sclerotized towards base. Ejaculatory apodeme relatively small with short, narrow blade with medial transverse striations; sclerite of sperm pump well-developed.

Host. Equisetaceae—*Equisetum fluviatile* L., *E. palustre* L.*; possibly other *Equisetum* spp. (Spencer 1976).

Range. Canada. AB*, BC*, MB*, NT*, ON*, QC*. **USA.** AK. Europe.

Syntypes [*virgo*]: Sweden. "in Lapponia Umensi rarisime; in graminosis ad Umenaes d. 7 Jul. inventa. (Lapponia meridionalis.)" (?♀, ZIL).

Holotype [*arcticola*]: USA. AK: King Salmon, Naknek R., 11.vii.1952, W.R. Mason, Type No. 10408 (1♂, CNC).

Additional material examined. Canada. AB: Swan Hills, 3 miles N townsite, 4150', 25.vii.1973, larvae and puparia on *Equisetum palustre*, emerged 1–9.viii.1973, G.C.D. Griffiths, SW8 (10♂16♀[with puparia], UASM; 2♂ 2♀[with puparia], CNC), Dunvegan, north shore of Peace River, sweep vegetation along shoreline, 12.vii.1997, T.A. Wheeler (19♂ 9♀, LEM), Dunvegan, north shore of Peace River, sweep grasses at edge of agricultural field, 13.vii.1997, T.A. Wheeler (1♂, LEM), 10km NW Whitecourt, Hwy 32 at Sakwatamau River, 54°10′N, 115°42′W, sweep vegetation at river edge, 15.vii.1997, T.A. Wheeler (1♂, LEM), **BC:** Kinbasket Lake, BC Hydro drawdown study, Cooper, Beauchesne & Assoc. Ltd., Malaise trap, 12.vi.2010 (4♂, CNC), 13.vi.2008 (2♂, CNC), pan trap, 21.vi.2010 (1♂, CNC), **MB:** Churchill, 26.vi.1948, G.E. Shewell (1♂, CNC), **NT:** Yellowknife, rd. nr. Stock Lake, 16.vi.1966, G.E. Shewell (2♂, CNC), Yellowknife, Kam Lake, 20.vi.1966, G.E. Shewell (8♂ 4♀, CNC), Norman Wells, G.E. Shewell, 23.vi.1969 (2♀, CNC), 25.vi.1969 (3♂ 4♀, CNC), 27.vi.1969 (1♀, CNC), 1.vii.1969 (3♂ 4♀,

CNC), Aklavik, 5.viii.1930, Bryant (1♂, USNM), **ON:** 10km S Richmond, 29.v.1987, J.M. Cumming, ex. fen (1♂, CNC), Carleton Co., 8km S Richmond, 7.vi.1987, J.M. Cumming, ex. fen (1♂, CNC), Ottawa, Mer Bleue, 25.vi.1964, J.R. Vockeroth (2♂, CNC), 10km S of Richmond, sweeping fen, 15.vii.1999, S. Brooks (1♂, LEM), Wellington Co., Guelph, 7.ix.1973, G.M. Eden (1♂, DEBU), Pancake Bay P.P., 46˚58.11′N, 84˚42.72′W, 24.ii.2004, K.N. Barber, sweeps from boardwalk, mostly emergent sedges / *Equisetum* (8♂ 3♀, DEBU), **QC:** Ste-Anne-de-Bellevue, Stoneycroft, (45˚25.8′N, 73˚56.4′W), sweep *Solidago*, 26.vii.2000, T.A. Wheeler (1♂, LEM). **USA. AK:** Big Delta, 5.vi.1951, W.R.M. Mason (2♂, CNC).

Comments. *Liriomyza virgo*, newly discovered for Canada, is a widespread holarctic species collected more frequently towards the north, although the Ontario records listed here suggest that this species may be more widespread in southern locations (although more uncommonly encountered or patchily distributed). Compared to most *Liriomyza*, this species is darkly pigmented on the legs, thorax and orbital plate, but the long, slender male phallus wihtout a surrounding basal bowl is most diagnostic.

The phallus of *Liriomyza flavonigra* (Coquillett) (Utah and New Mexico) is similar to that of the northern *L. virgo*, although it is slightly longer and more strongly curved, but these two species are also readily differentiated based on external characters (based on Spencer & Steyskal (1986)): body length 2.3–2.75mm; calypter margin and hairs yellow; 2 ors and 3 ori; parafacial prominent; frons paler; scutum yellow posteriorly.

Liriomyza wachtli **Hendel**

Figs 64–66

Liriomyza Wachtli Hendel 1920: 142. Hendel 1931: 261.
Liriomyza opaca Hendel 1931: 236. Syn. Spencer (1976).
Liriomyza veratri Groschke 1955: 171. Syn. Spencer (1976).
Liriomyza wachtli. Spencer 1976: 278, 1990: 331.

Wing length 1.9–2.0mm (♂), 2.1mm (♀). Length of ultimate section of vein CuA_1 divided by penultimate section: 2.4. Eye height divided by gena height: 2.8. Scutum with grey pruinosity. First flagellomere thick and well-developed, slightly enlarged with apical margin more straight than rounded. Parafacial pronounced, continuing under eye as distinct cheek; orbital plate less pronounced than parafacial.

Chaetotaxy: Two ori (anterior ori reduced in AB male, sometimes duplicated in Palaearctic specimens), two ors. Acrostichal setulae in two rows (posterior pair cruciate).

Colouration: Calypter margin and hairs brown. Head yellow with ocellar tubercle, clypeus and back of head dark brown; space behind tubercle brownish; posterolateral corner of frons with margin narrowly brown lateral to vertical setae; antenna deep yellow. Lateral margin of scutum with complete yellow line. Scutellum brown laterally. Metanotum brown with most of katatergite yellow. Pleuron mostly yellow with brown spots covered with slight greyish pruinosity: anepisternum with small subtriangular spot anteroventrally and smaller spot posteroventrally, anepimeron with slight mottling anteriorly, katepisternum brown on basal 2/3 (not including seta base), meron mostly brown posteroventrally. Legs yellow with base of fore and mid coxae brown and basal half of hind coxa brown; base of femora brown dorsally and fore femur with extensive dorsal mottling tibiae brown (fore tibia paler and hind tibia darker) with base and venter paler, and tarsi brown. Abdomen yellow with broad brown dorsal stripe, tapering to a large spot on tergite 5; terminalia brown.

Genitalia: (Figs 64–66) Surstylus narrowing apically and with single spine. Epandrium with venter slightly produced. Basiphallus sclerotized along left lateral and dorsoapical surfaces. Hypophallus with broad, membranous base supporting long setose medial process. Paraphallus narrow, rod-like, pointed distoventrally, and with apex slightly expanded and partially membranous. Mesophallus dark, slightly longer than wide, narrowing apically, and with produced ventral suture. Distiphallus with stout, dark bowl-like base that is produced dorsally as narrow bilobed process, and ventrally as smooth shield; only inner surface of shallow lateral surface with minute texturing; emerging from bowl is one pair of broad, extensively fused, membranous tubules that are dorsally curved, lightly sclerotized on basal half to basal 2/3, and with slightly more sclerotized and delimited lateral plate that is similarly curved. Ejaculatory apodeme large, well-developed [lost following dissection].

Host. Liliaceae—*Veratrum album* L., *V. nigrum* L., [in leafs and seed capsules]; *Zigadenus elegans* Pursh ssp. *elegans**.

Range. Canada: AB*. Austria. Germany. Finland. Russia.

Syntypes [*wachtli*]: AUSTRIA. Niederosterreich, Wachtl, ex *Veratrum nigrum* (26♂♀, NMW). [Not examined]

Syntypes [*opaca*]: FINLAND. Kusomen, Frey (2♂ 1♀, NMW). [Not examined]

Holotype [*veratri*]: GERMANY. Bavaria: Oberbayern, Schongau, ex *Veratrum album* (1♂, SMNS). [Not examined]

Additional material examined. Canada. AB: Kananaskis Valley, E Barrier Lake, 4600′, 5.ix.1976, larva on *Zygadenus elegans*, emerged 13.v.1977, G.C.D. Griffiths, K29 (1♂[with puparium], UASM).

Comments. Spencer's description of this species indicates additional mottling on the mid and hind legs of European representatives, and his (Spencer 1976) genitalic illustration slightly differs in the some dimensions, but overall morphology and host family support conspecificity of the Alberta specimen.

The terminalia of *Liriomyza wachtli* reveals a close relationship to *L. smilacinae* (Figs 56–59), which occurs from Alberta to the Maritimes and is also found on Liliaceae, and *L. alaskensis* (Figs 53–55), known from southwestern Alaska. *Liriomyza alaskensis* is most ready differentiated, as a yellow vittate species with one pair of dark, deeply bifid sclerites on the tubules of the distiphallus; *L. smilacinae* is more similar externally, but can be identified by a larger, darker and more bulbous distiphallus that is more extensively textured on the inner surface of the "bowl".

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Permission to reprint figures originally printed in Lonsdale (2011) was provided by Z.-Q. Zhang (Zootaxa): *L. artemisiae* (figs 30, 31); *L. baccharidis* (figs 33–36); *L. baptisiae* (figs 37–39); *L. belissima* (fig. 41); *L. equiseti* (figs 88–91); *L. eupatorii* (figs 85–87); *L. helianthi* (figs 120, 123, 124); *L. huidobrensis* (figs 126–128); *L. merga* (figs 144–146); *L. minor* (figs 152–154); *L. ptarmicae* (figs 189–193); *L. sabaziae* (figs 200–203); *L. sativae* (figs 6–9); *L. septentrionalis* (figs 214–217) ; *L. togata* (figs 225–228) ; *L. trifoliearum* (figs 236–239); *L. trifolii* (figs 232–235). No response was received from requests to reprint figures originally appearing in Spencer (1969): *L. alaskensis* (fig. 282); *L. edmontonensis* (fig. 300); *L. peleensis* (figs 316, 317); *L. singula* (figs 332, 333); *L. veluta* (figs 344, 345). Permission to reprint figures originally appearing in Spencer (1981) was granted by the Regents of the University of California: *L. bellissima* (figs 296–297). Permission to reprint figures originally appearing in Spencer & Steyskal (1986) was provided M. Chung (USDA-ARS Information Staff): *L. temperata* (fig. 806). Permission to reprint figures originally appearing in Sehgal (1971) was provided by D. Shpeley (Quaestionnes Entomologicae): *L. senecionivora* (figs 60, 61).

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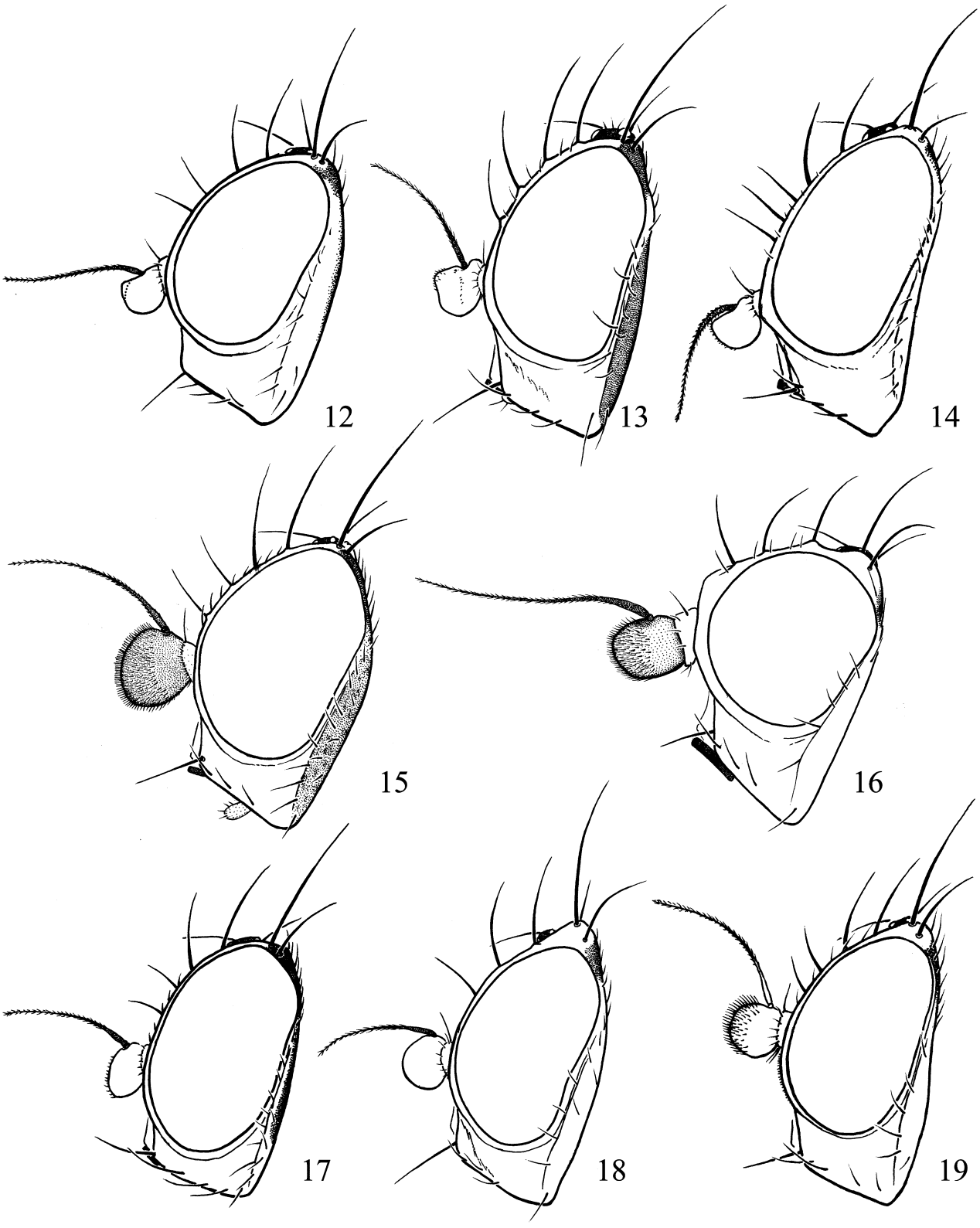
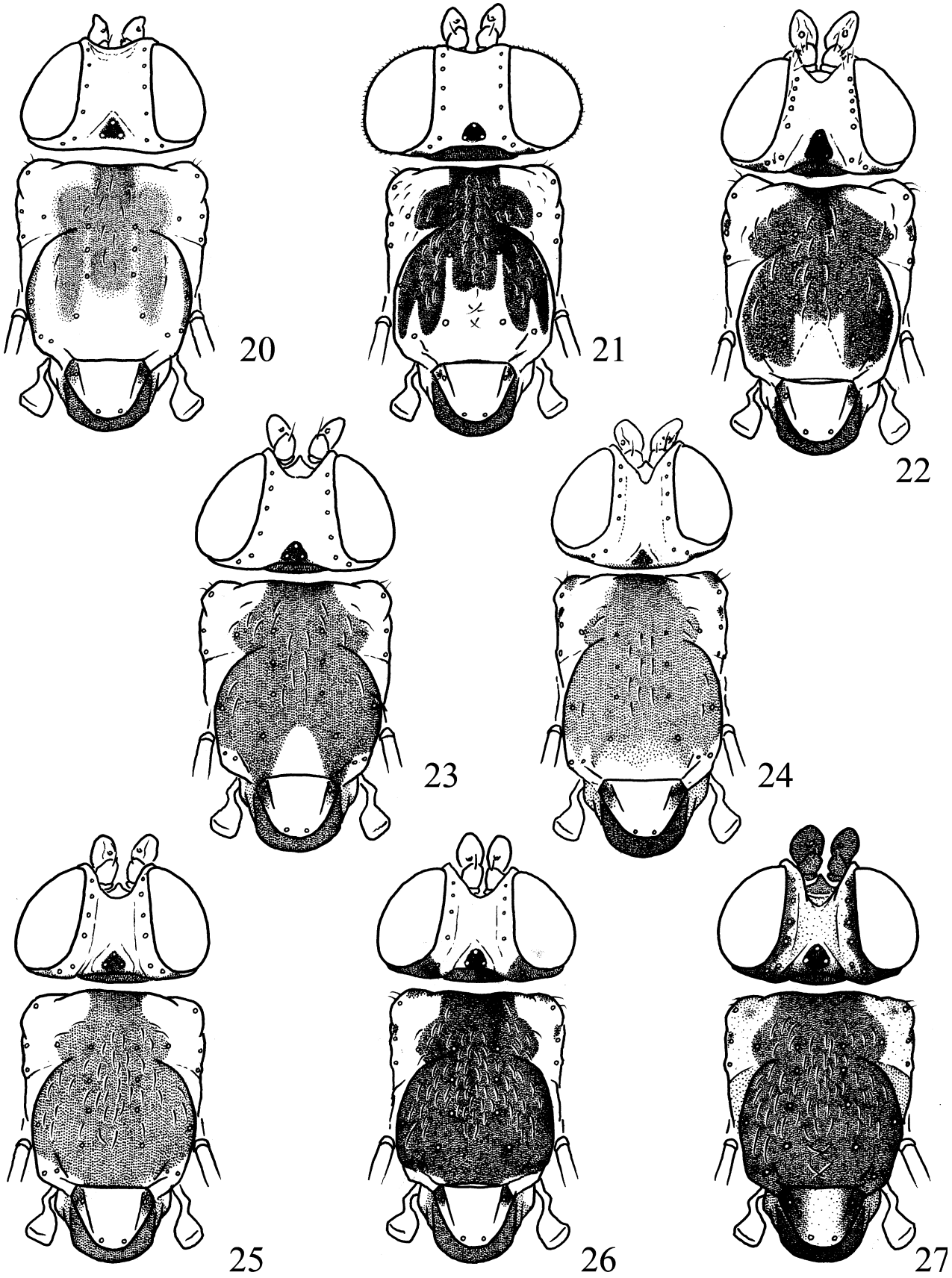
FIGURES 1–6: *Liriomyza* photos; **1:** *L. blechi* Spencer; **2**: *Liriomyza* sp. ♀ ovipositing on leaf, Pelham, Hampshire County, Massachusetts; 3**:** *L. fricki* Spencer; **4:** *L. pilicornis* spec. nov.; **5**: *L. pistilla* spec. nov.; **6:** *L. smilacinae* Spencer.

FIGURES 7–10: *Liriomyza* photos; **7**: *Liriomyza galiivora* (Spencer); **8:** *L. sativae* Blanchard; **9:** *L. septentrionalis* Sehgal; **10:** *L. bellissima* (Spencer); **11**: *L. trifoliearum* Spencer.



FIGURES 12–19: *Liriomyza* heads, left lateral; **12**: *L. trifolii* (Burgess); **13**: *L. sylvatica* Sehgal; **14**: *L. angulicornis* (Malloch); **15**: *L. pilicornis* spec. nov.; **16**: *L. minor* Spencer; **17**: *L. eupatorii* (Kaltenbach); **18**: *L. fricki* Spencer; **19**: *L. taraxaci* Hering.



FIGURES 20–27: *Liriomyza* thorax and head, dorsal; **20:** *L. borealis* (Malloch); **21:** *L. blechi* Spencer; **22:** *L. angulicornis* (Malloch); **23:** *L. assimilis* (Malloch); **24:** *L. agrios* spec. nov.; **25:** *L. trifolii* (Burgess); **26:** *L. eupatorii* (Kaltenbach); **27:** *L. baptisiae* (Frost).

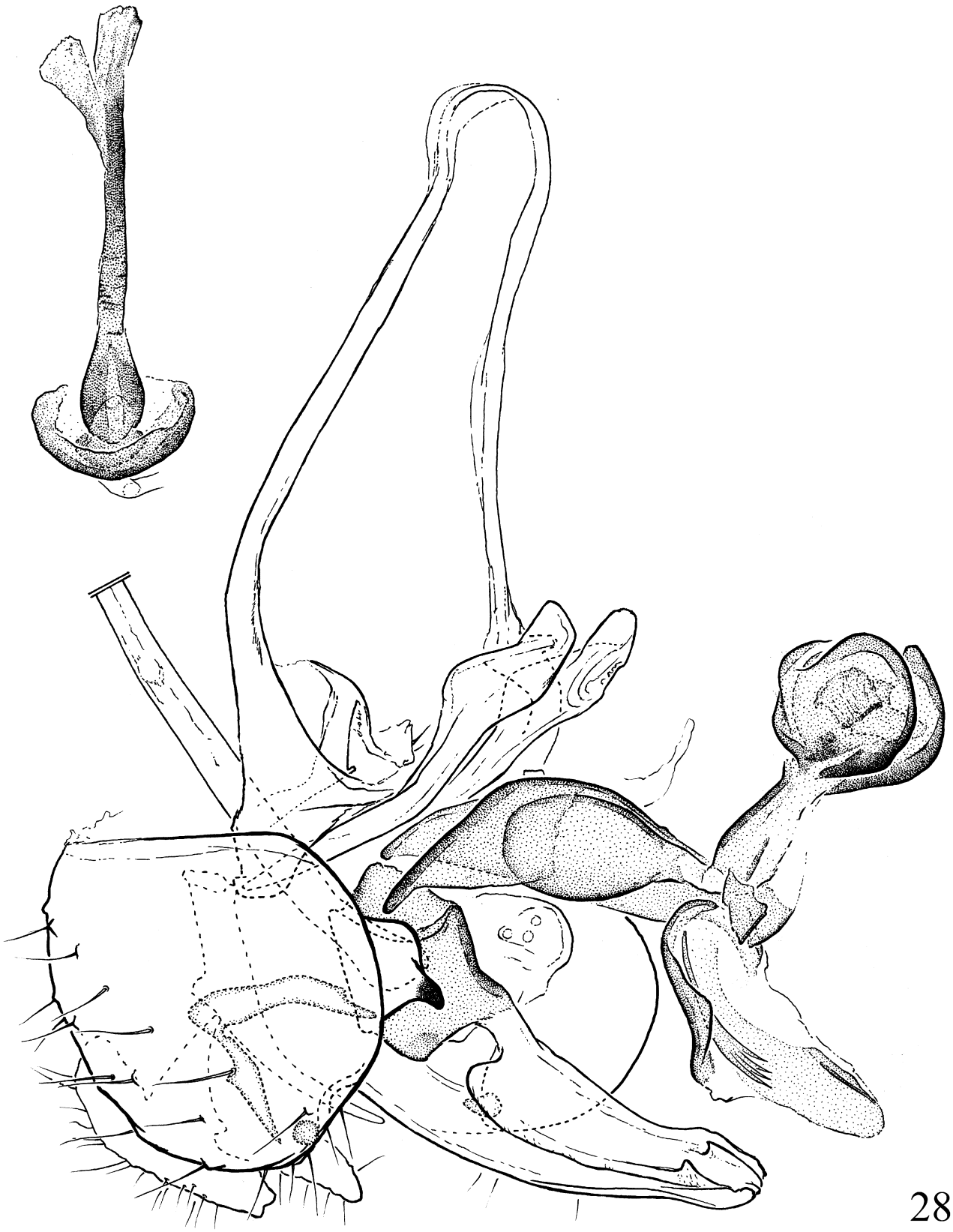
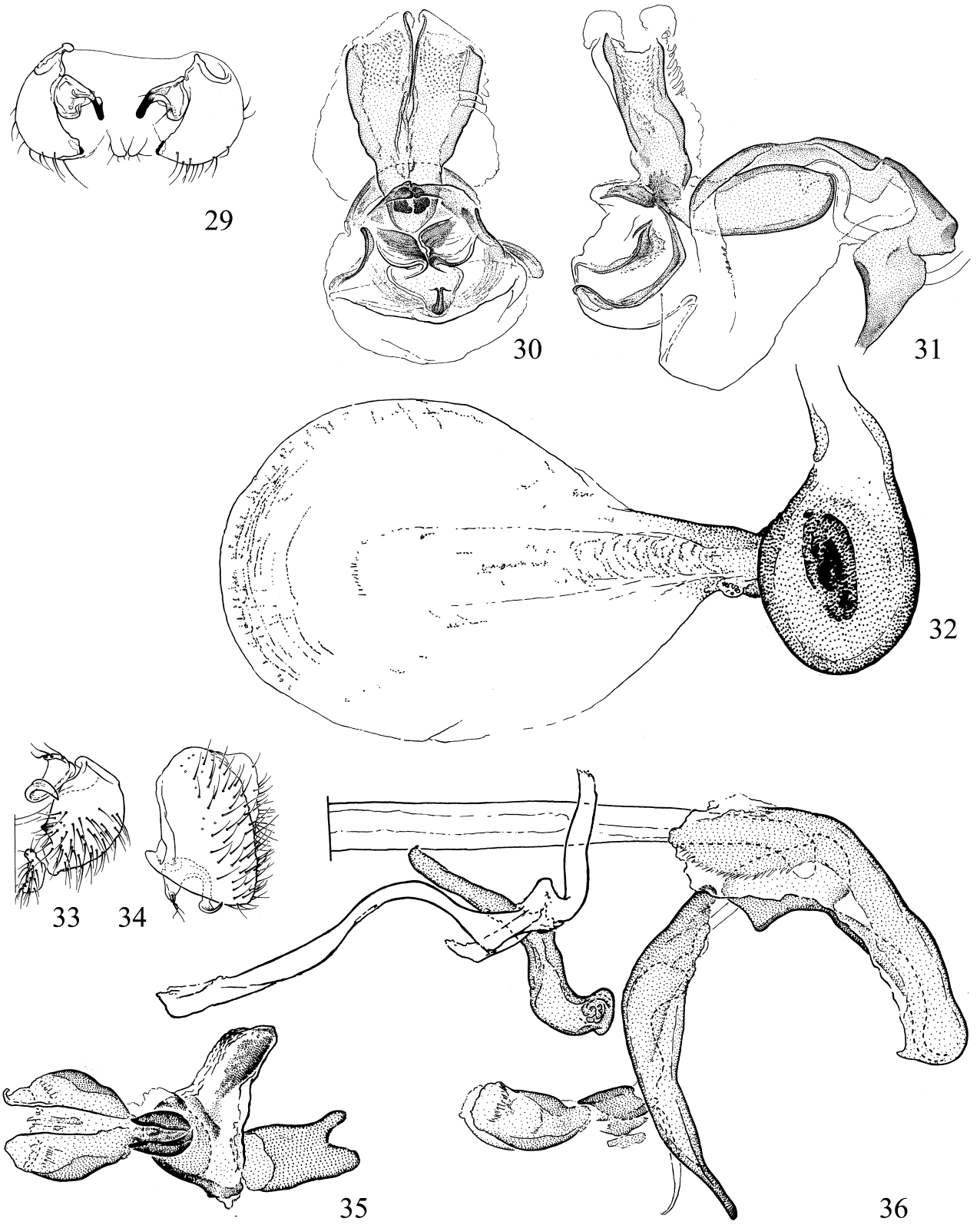
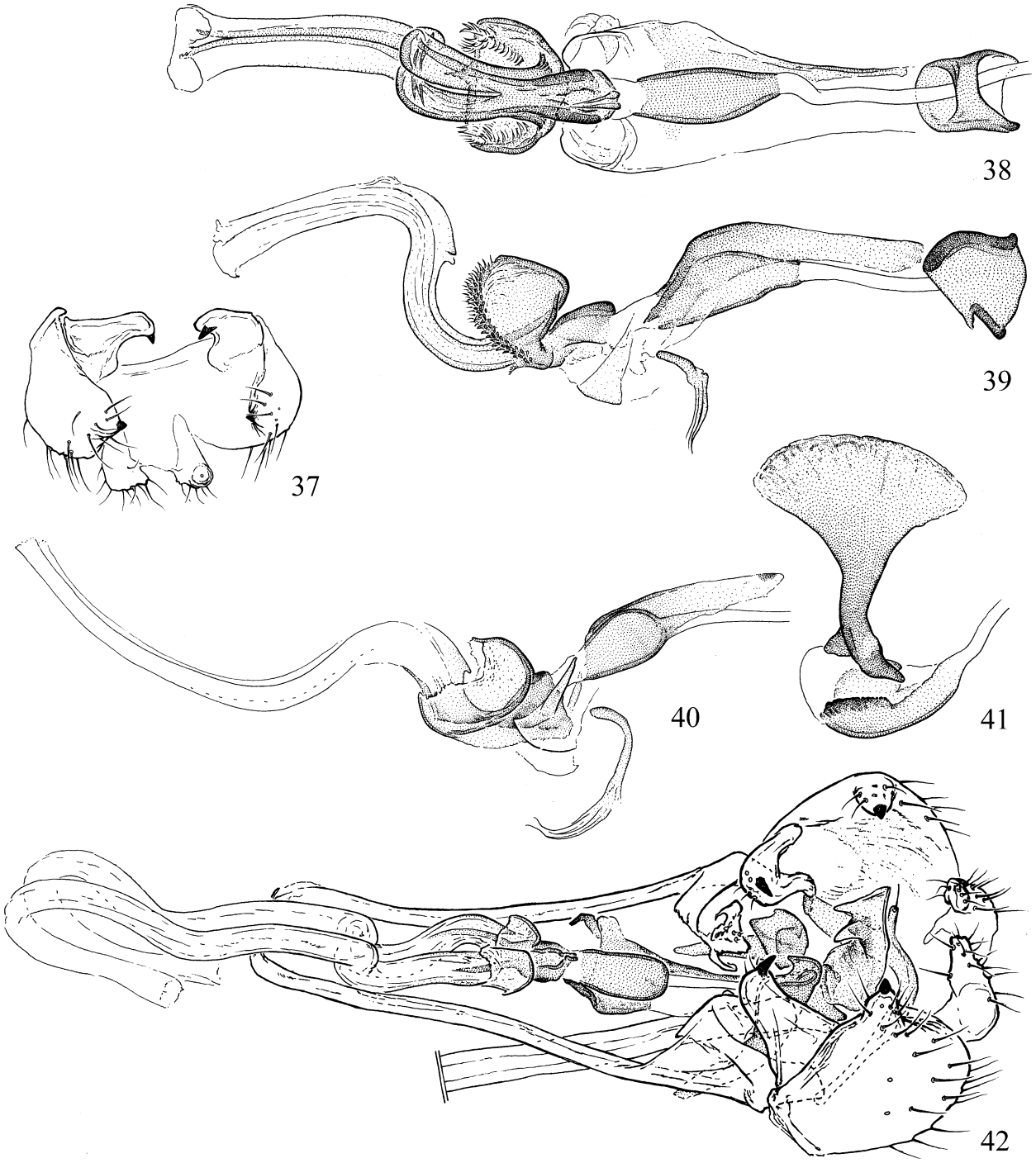


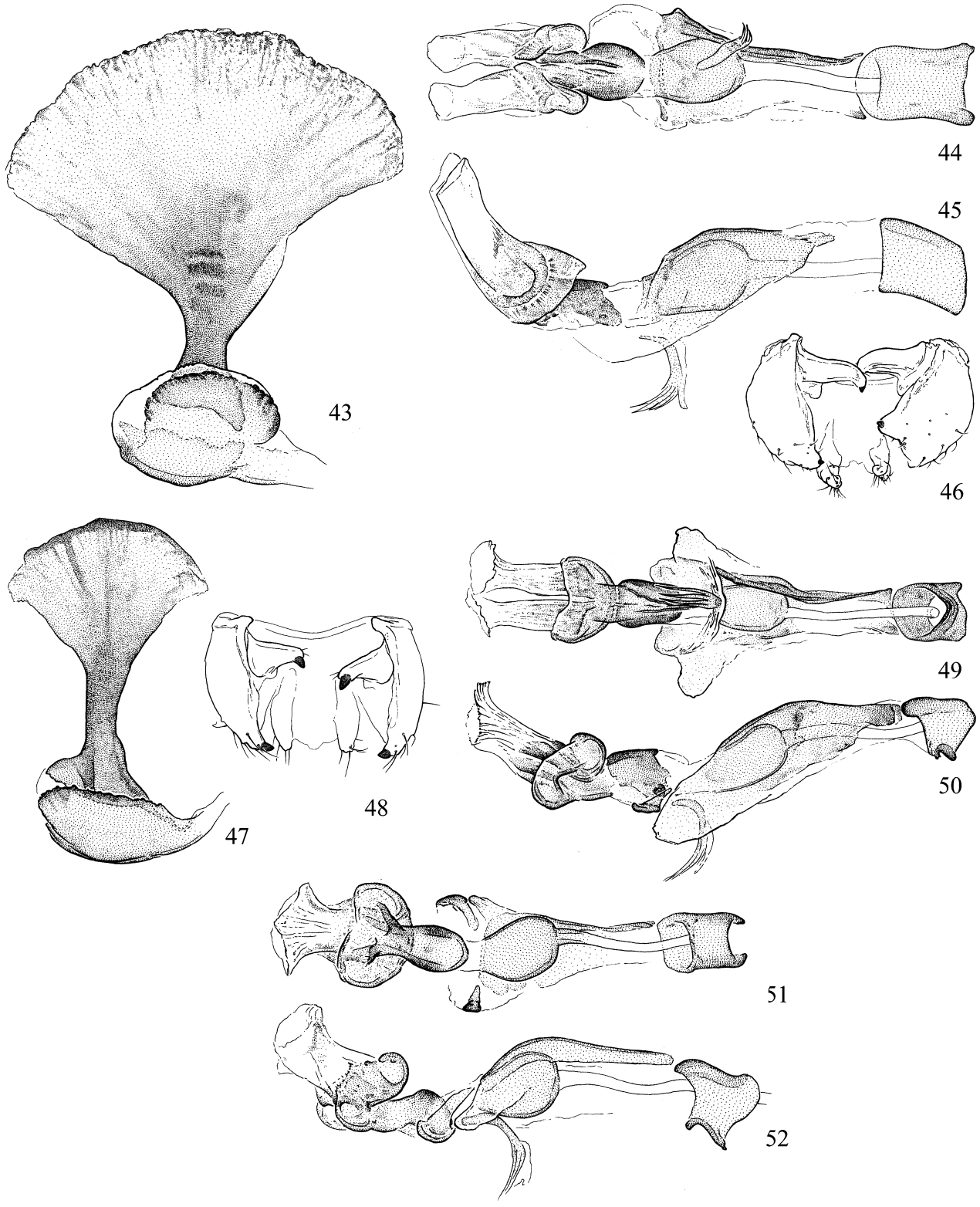
FIGURE 28: *Liriomyza morio* Brischke, male genitalia, right frontolateral aspect.



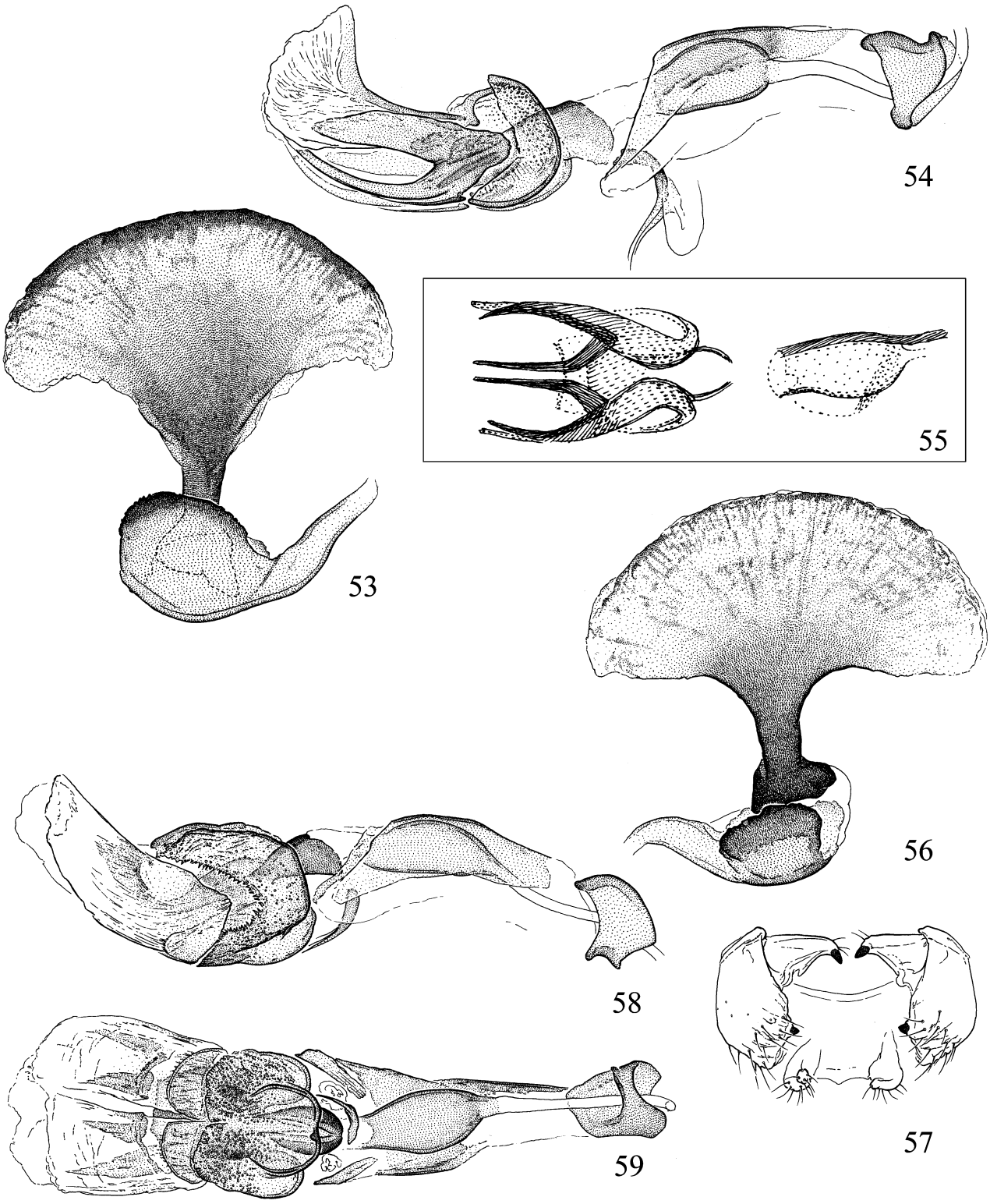
FIGURES 29–32: *Liriomyza blechi* Spencer, male genitalia; **29**: external components, ventral; **30**: phallus, ventral; **31**: phallus, left lateral; **32**: ejaculatory apodeme. **FIGURES 33–36:** *L. philadelphivora* Spencer, male genitalia; **33**: external components, ventral; **34**: external components, left lateral; **35**: phallus, ventral; **36**: hypandrial complex, left lateral.



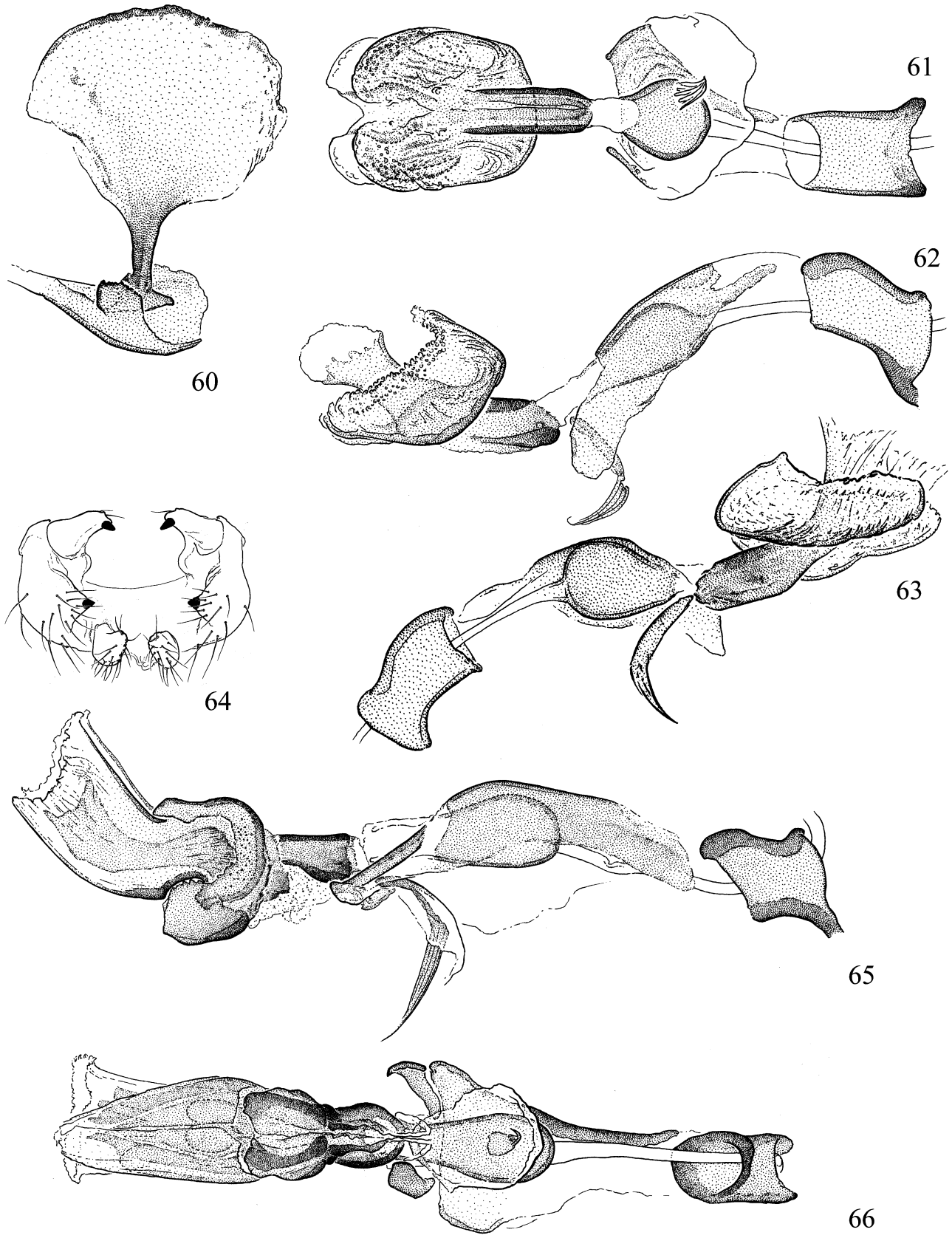
FIGURES 37–39: *Liriomyza nordica* Spencer, male genitalia; **37**: holotype external components, ventral; **38**: holotype phallus, ventral; **39**: phallus, left lateral. **Fig 40:** *L. sinuata* Sehgal, holotype phallus, left lateral. **FIGURES 41, 42:** *L. undulata* Spencer holotype; **41**: ejaculatory apodeme; **42**: remainder of male genitalia, right ventrolateral.



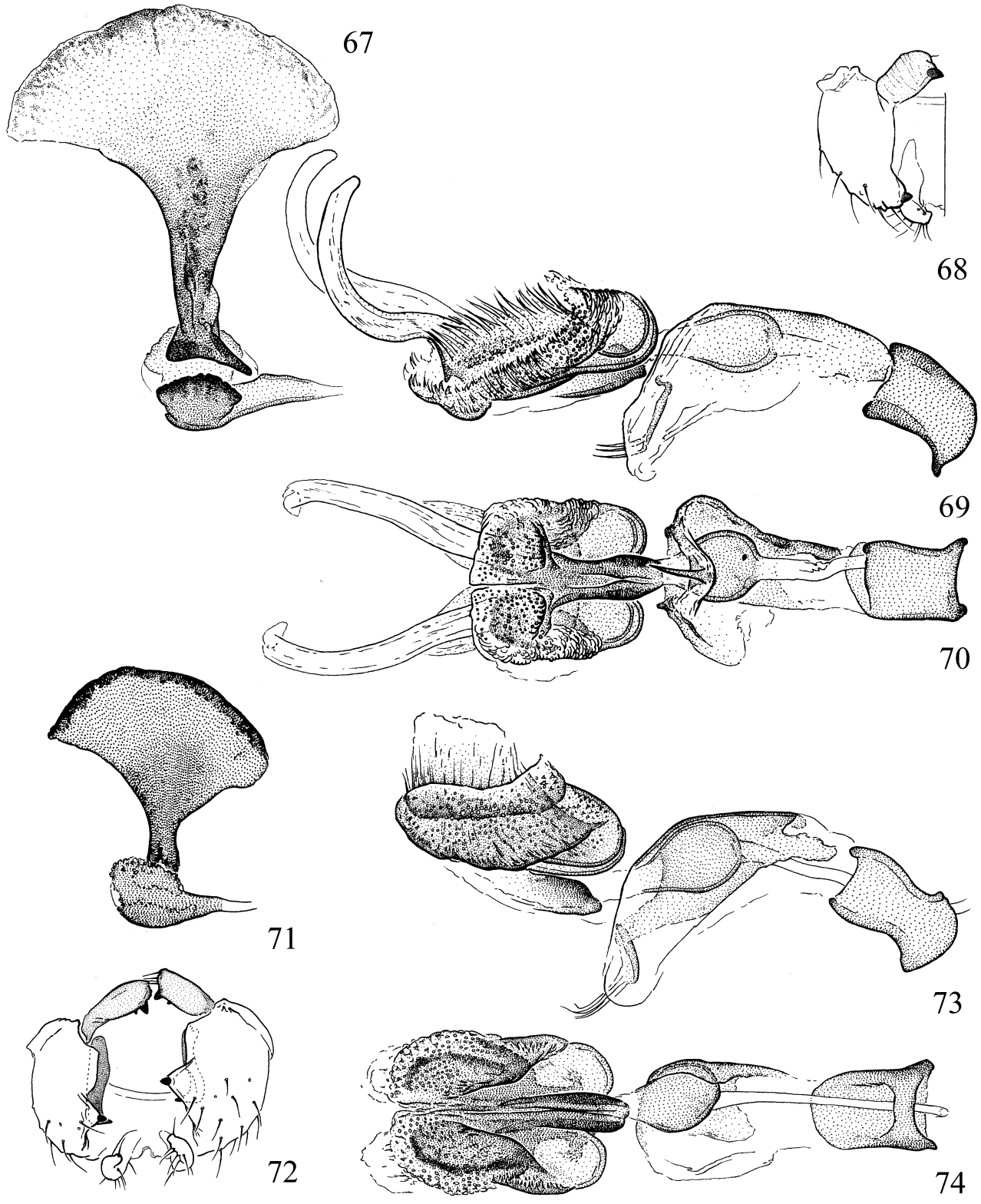
FIGURES 43–46: *Liriomyza angulicornis* (Malloch), male genitalia; **43**: ejaculatory apodeme; **44**: phallus, ventral; **45**: phallus, left lateral; **46**: external components, ventral. **FIGURES 47–50:** *L. assimilis* (Malloch), male genitalia; **47**: ejaculatory apodeme; **48**: external components, ventral; **49**: phallus, ventral; **50**: phallus, left lateral. **FIGURES 51, 52:** *L. atrassimilis* spec. nov., holotype male genitalia; **51**: phallus, ventral; **52**: phallus, left lateral.



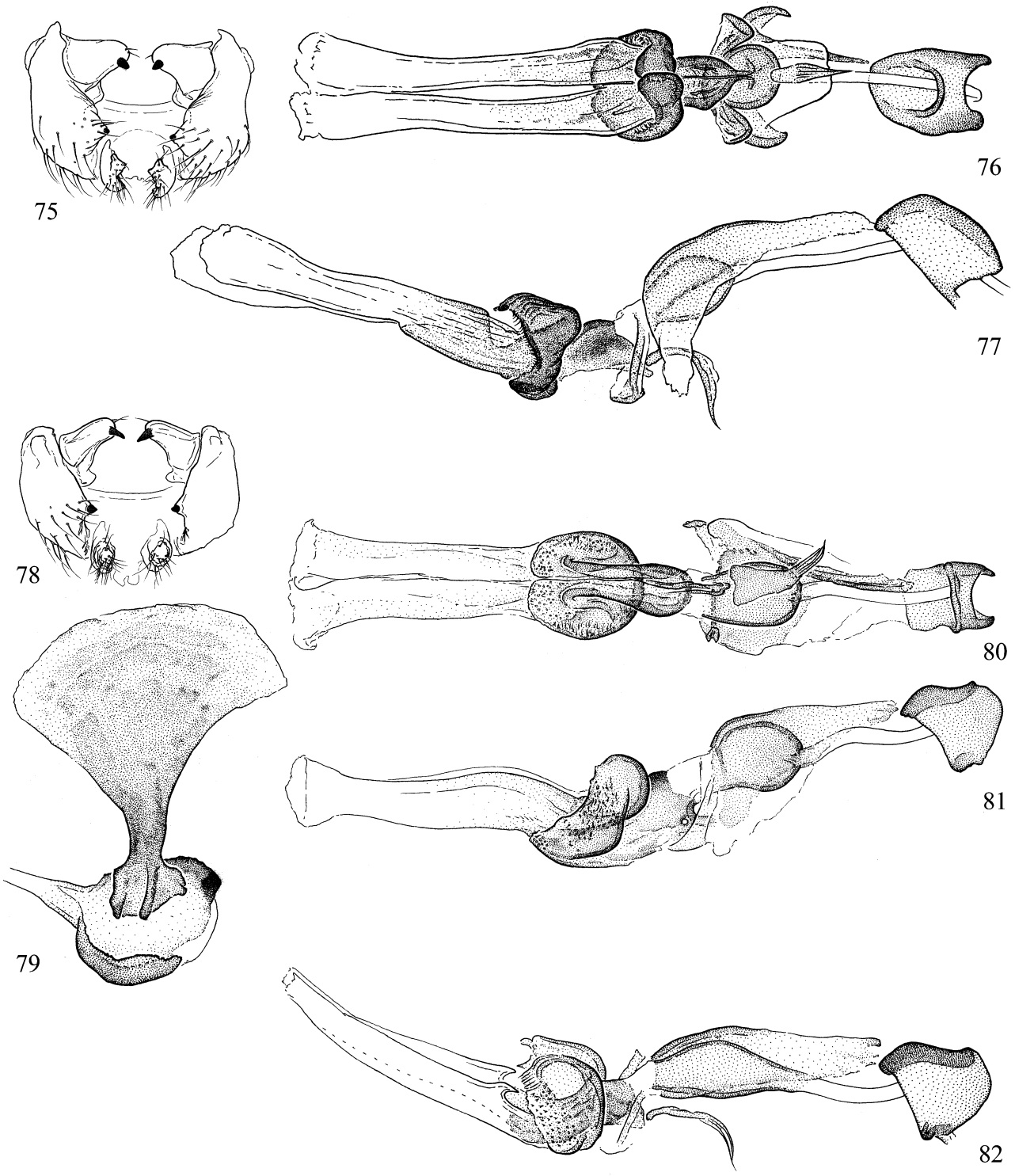
FIGURES 53–55: *Liriomyza alaskensis* Spencer, holotype male genitalia; **53**: ejaculatory apodeme; **54**: phallus, left lateral; **55**: phallus, ventral (Spencer, 1969: fig. 282). **FIGURES 56–59:** *L. smilacinae* Spencer, Canadian male genitalia; **56**: ejaculatory apodeme; **57**: external components, ventral; **58**: phallus, left lateral; **59**: phallus, ventral.



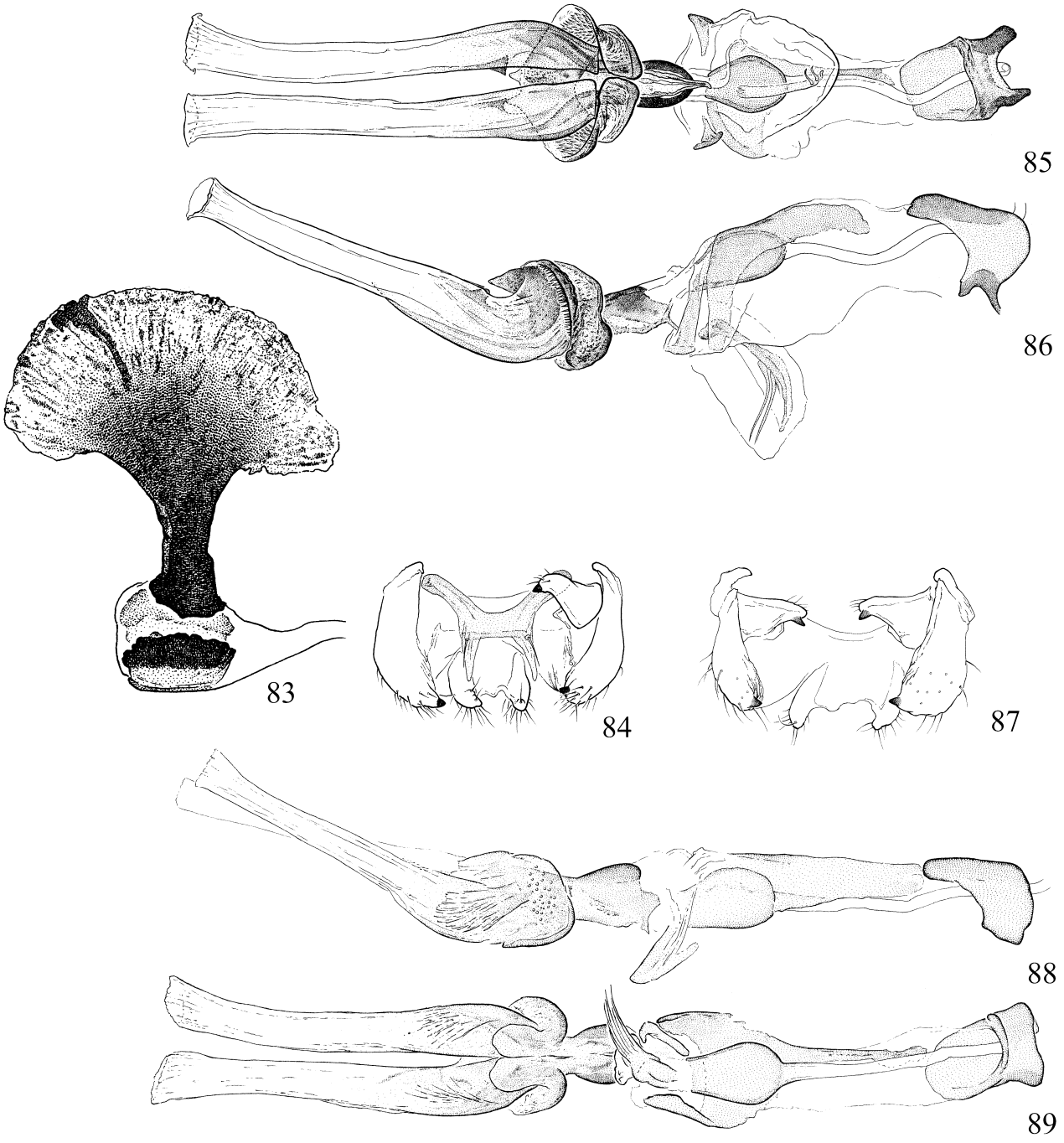
FIGURES 60–63: *Liriomyza socialis* Spencer, male genitalia; **60**: ejaculatory apodeme, holotype; **61**: phallus, ventral; **62**: phallus, left lateral; **63**: holotype phallus, right lateral. **FIGURES 64–66:** *L. wachtli* Hendel, male genitalia; **64**: external components, ventral; **65**: phallus, left lateral; **66**: phallus, ventral.



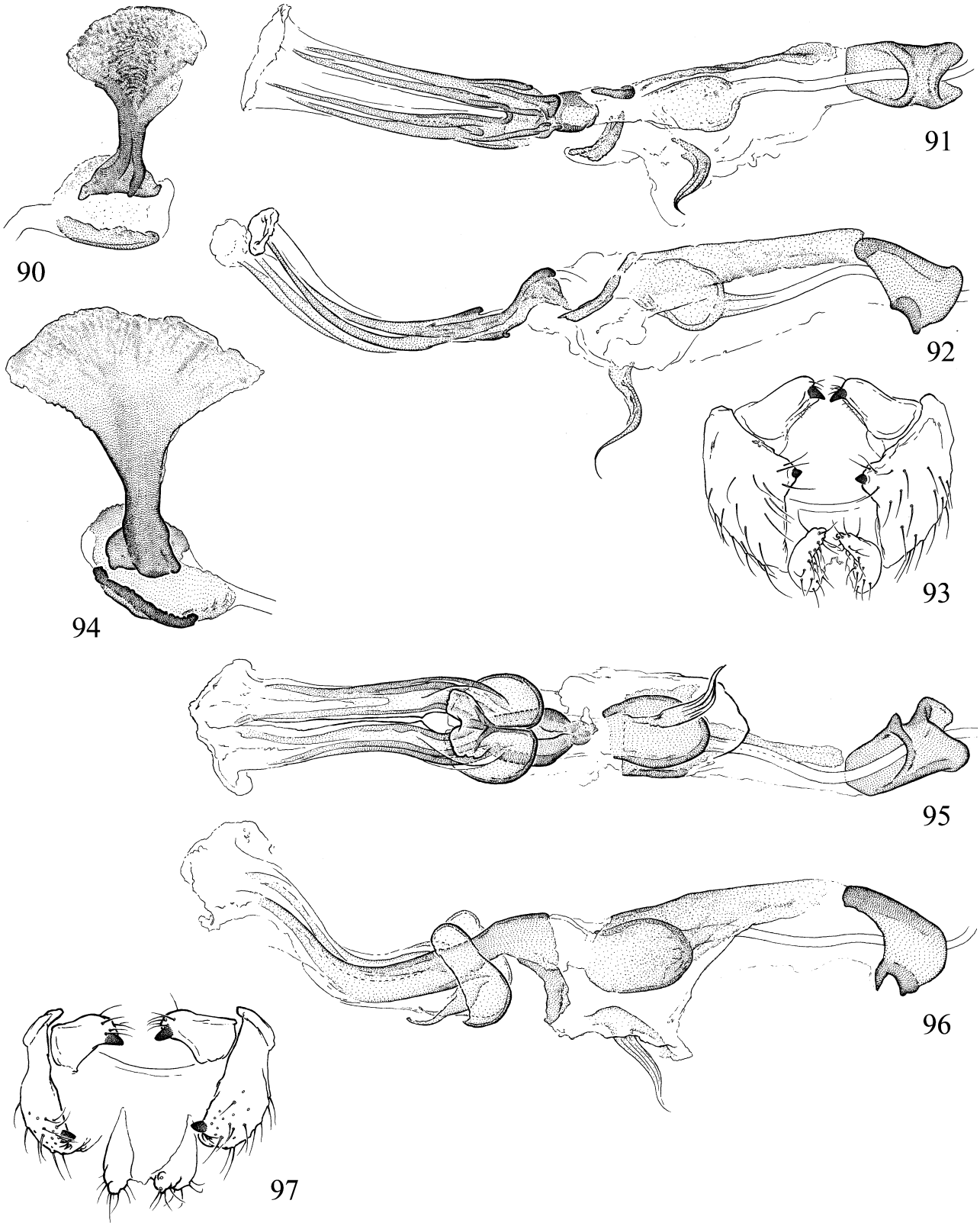
FIGURES 67–70: *Liriomyza bifurcata* Sehgal, male genitalia; **67**: ejaculatory apodeme; **68**: external components, ventral; **69**: phallus, left lateral; **70**: phallus, ventral. **FIGURES 71–74:** *L. fricki* Spencer, male genitalia; **71**: ejaculatory apodeme; **72**: external components, ventral; **73**: phallus, left lateral; **74**: phallus, ventral.



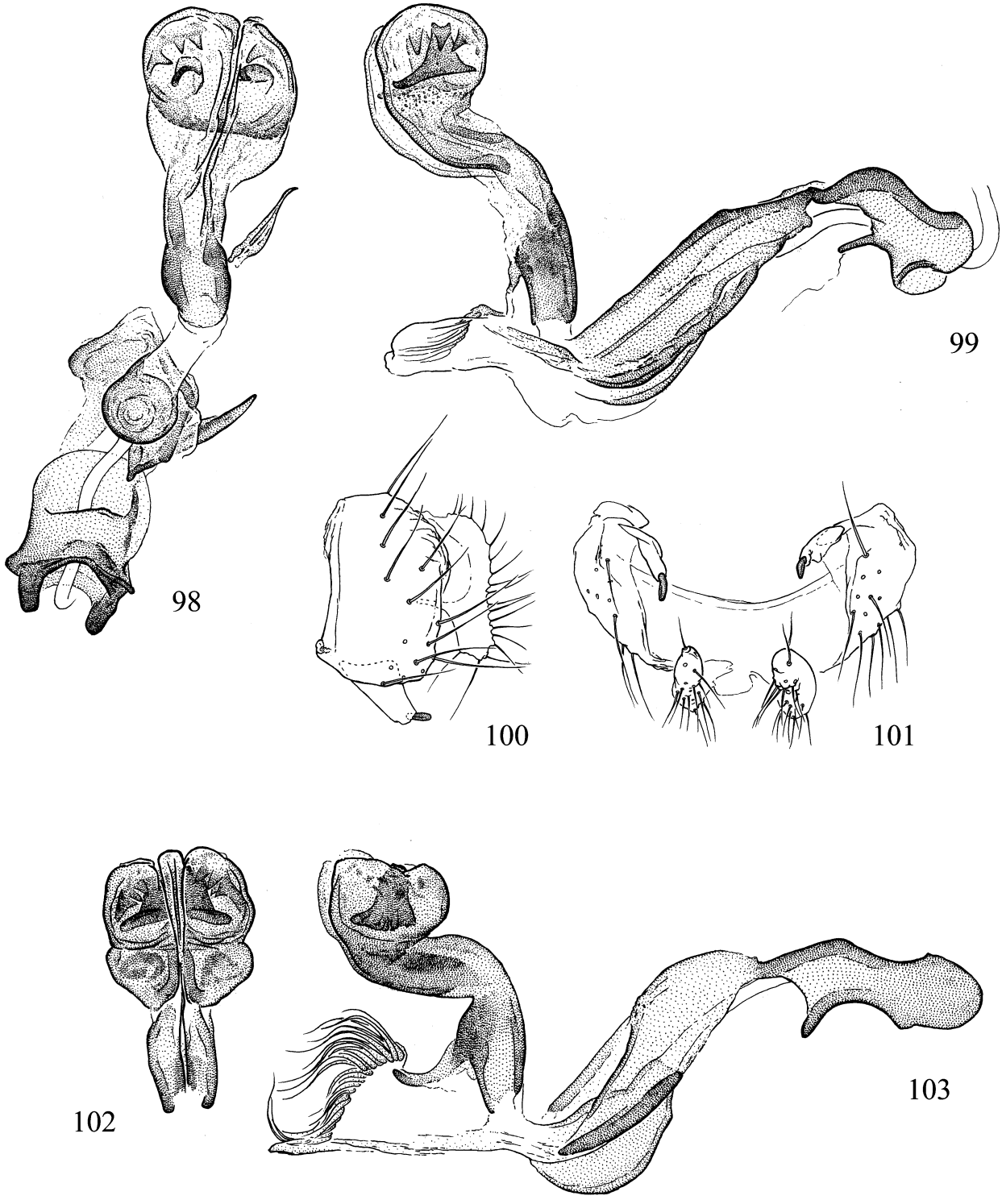
FIGURES 75–77: *Liriomyza aphila* spec. nov., holotype male genitalia; **75**: external components, ventral; **76**: phallus, ventral; **77**: phallus, left lateral. **FIGURES 78–81:** *L. aquapolis* spec. nov., holotype male genitalia; **78**: external components, ventral; **79**: ejaculatory apodeme; **80**: phallus, ventral; **81**: phallus, left lateral. **Fig 82:** *L. balcanicoides* Sehgal, phallus, left lateral.



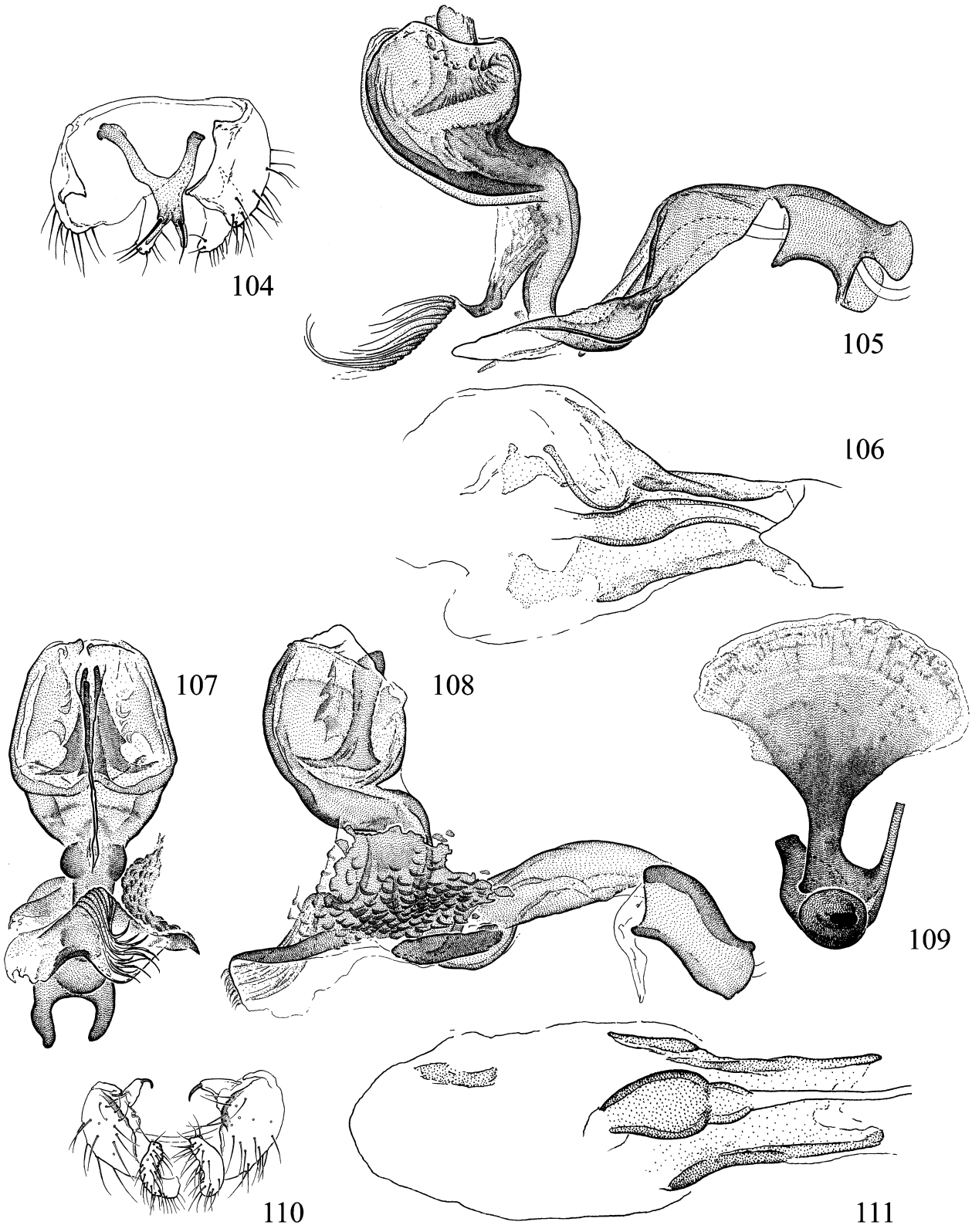
FIGURES 83–86: *Liriomyza bicolumbis* spec. nov., holotype male genitalia; **83**: ejaculatory apodeme; **84**: external components, ventral; **85**: phallus, ventral; **86**: phallus, left lateral. **FIGURES 87–89:** *L. merga* Lonsdale, male genitalia (Lonsdale 2011: **FIGURES** 144–146); **87**: external components, ventral; **88**: phallus, left lateral; **89**: phallus, ventral.



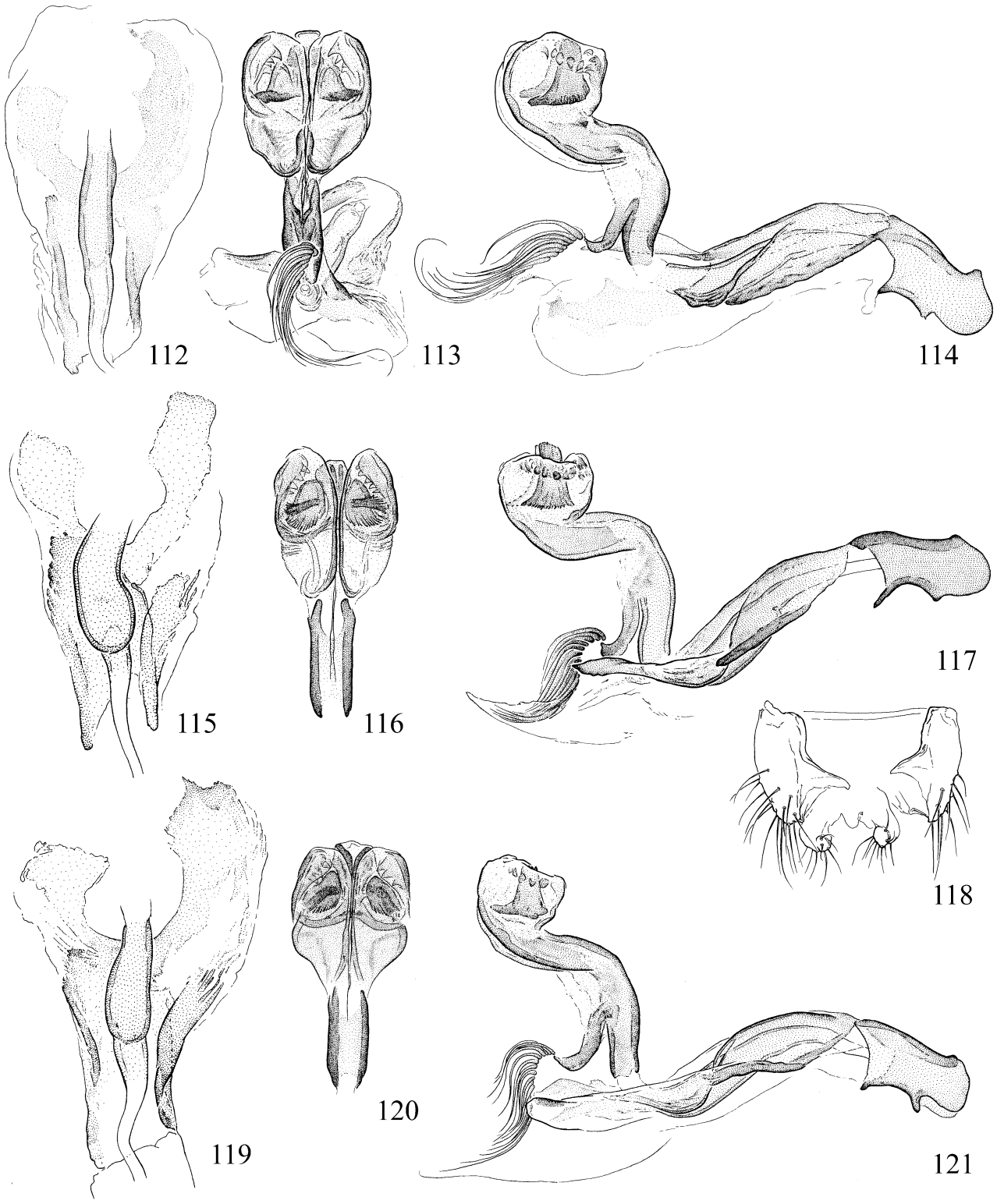
FIGURES 90–93: *Liriomyza virgo* (Zetterstedt), male genitalia; **90**: ejaculatory apodeme; **91**: phallus, ventral; **92**: phallus, left lateral; **93**: external components, ventral. **FIGURES 94–97:** *L. equiseti* de Meijere, male genitalia (Lonsdale 2011: **FIGURES** 88–91); **94**: ejaculatory apodeme; **95**: phallus, ventral; **96**: phallus, left lateral; **97**: external components, ventral.



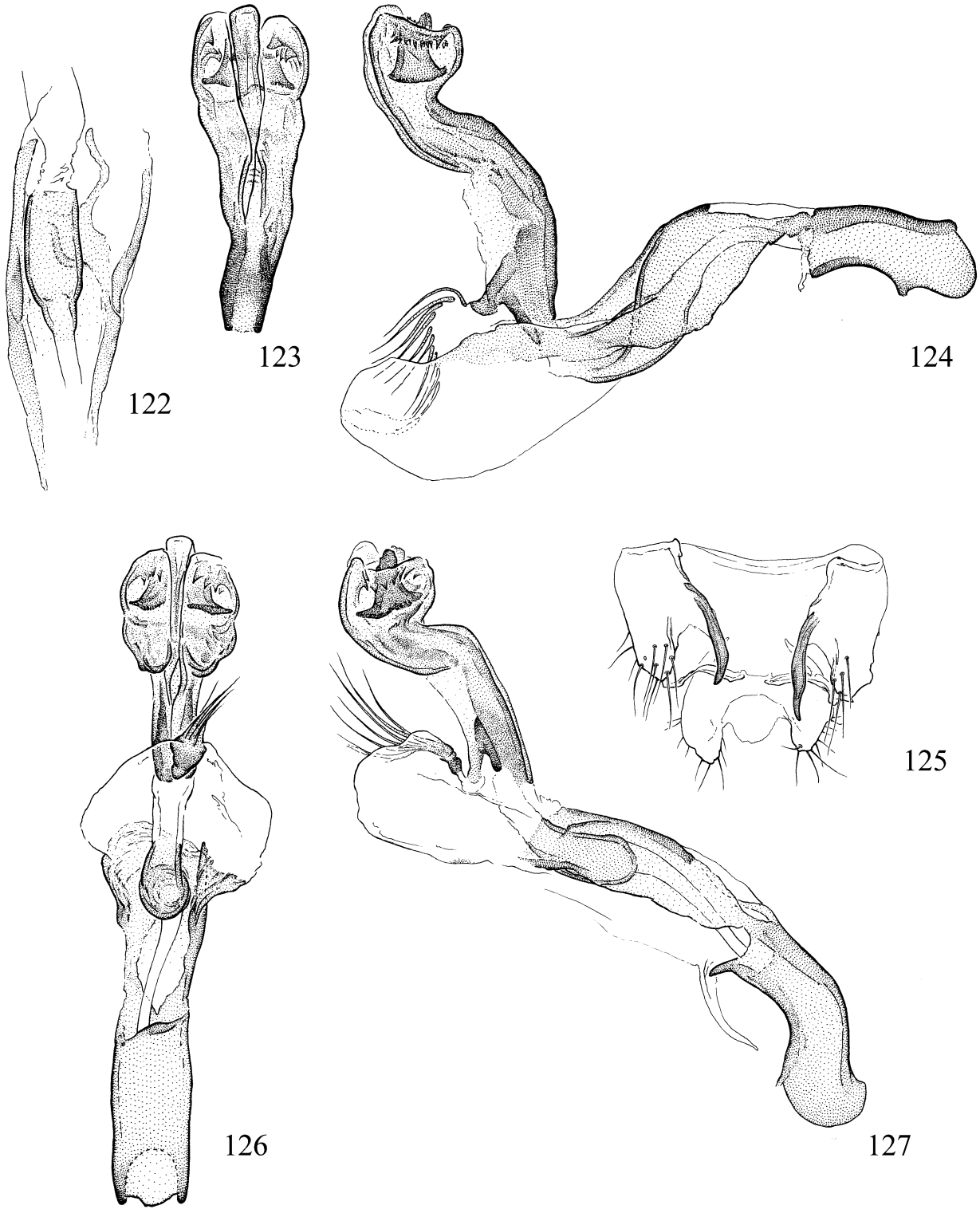
FIGURES 98–101: *Liriomyza anatolis* spec. nov., paratype male genitalia; **98**: phallus, ventral; **99**: phallus, left lateral; **100**: external components, left lateral; **101**: external components, ventral. **FIGURES 102, 103:** *L. mesocanadensis* spec. nov., holotype male genitalia; **102**: mesophallus and distiphallus, ventral; **103**: phallus, left lateral.



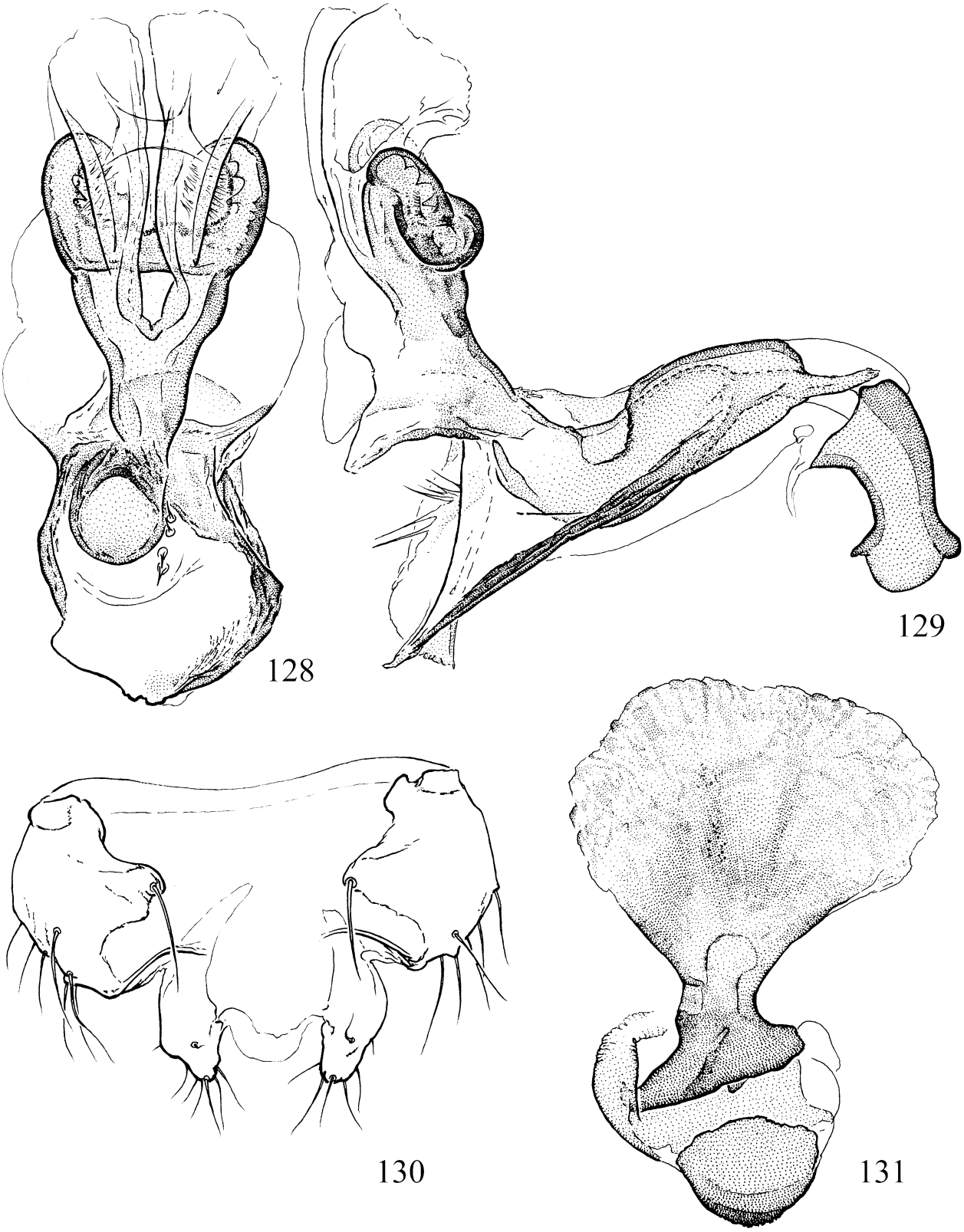
FIGURES 104–106: *Liriomyza cordillerana* Sehgal, male genitalia; **104**: external components, ventral; **105**: paratype phallus, left lateral; **106**: basiphallus, ventral. **FIGURES 107–111:** *L. septentrionalis* Sehgal, male genitalia (Lonsdale 2011: figs 107–110); **107**: phallus, ventral; **108**: phallus, left lateral; **109**: ejaculatory apodeme; **110**: external components, ventral; **111**: basiphallus, ventral.



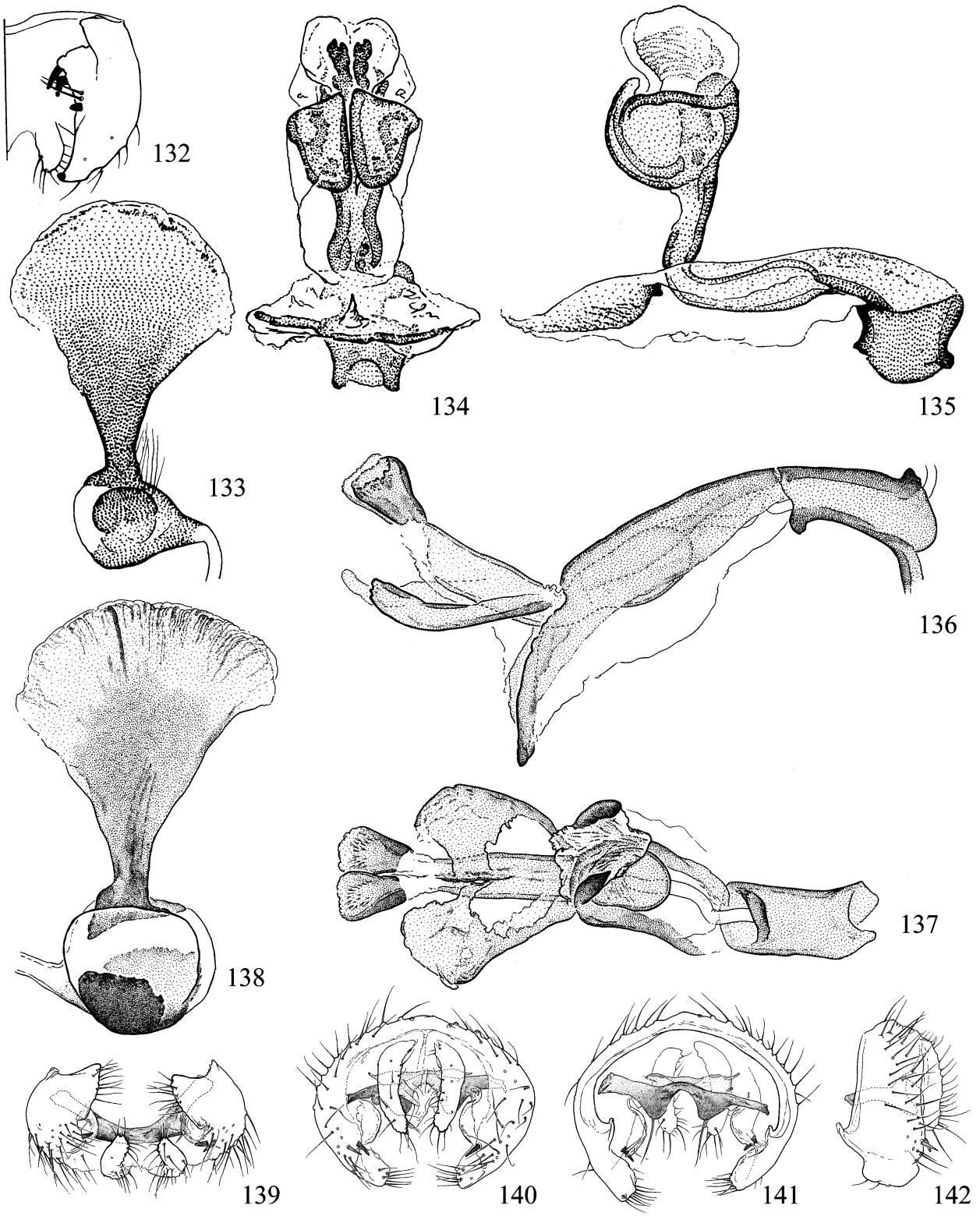
FIGURES 112–114: *Liriomyza flaveola* (Fallén), genitalia, Swedish male; **112**: basiphallus, ventral; **113**: phallus, ventral; **114**: phallus, left lateral. **FIGURES 115–118:** *L. flaveola*, genitalia eastern North American male; **115**: basiphallus, ventral; **116**: mesophallus and distiphallus, ventral; **117**: phallus, left lateral; **118**: external components, ventral. **FIGURES 119–121:** *L. flaveola*, genitalia, western North American male; **119**: basiphallus, ventral; **120**: mesophallus and distiphallus, ventral; **121**: phallus, left lateral.



FIGURES 122–124: *Liriomyza montana* Sehgal, male genitalia; **122**: basiphallus, ventral; **123**: mesophallus and distiphallus, ventral; **124**: holotype phallus, left lateral. **FIGURES 125–127:** *L. fumeola* spec. nov., holotype male genitalia; **125**: external components, ventral; **126**: phallus, ventral; **127**: phallus, left lateral.



FIGURES 128–131: *Liriomyza sylvatica* Sehgal, male genitalia; **128**: phallus, ventral; **129**: phallus, left lateral; **130**: external components, ventral; **131**: ejaculatory apodeme.



FIGURES 132–135: *Liriomyza galiivora* (Spencer), male genitalia; **132**: external components, ventral; **133**: ejaculatory apodeme; **134**: phallus, ventral; **135**: phallus, left lateral. **FIGURES 136–142:** *L. violivora* (Spencer), male genitalia; **136**: phallus, left lateral; **137**: phallus, ventral; **138**: ejaculatory apodeme; **139**: external components, ventral; **140**: same, posterior; **141**: same, anterior; **142**: same, left lateral.

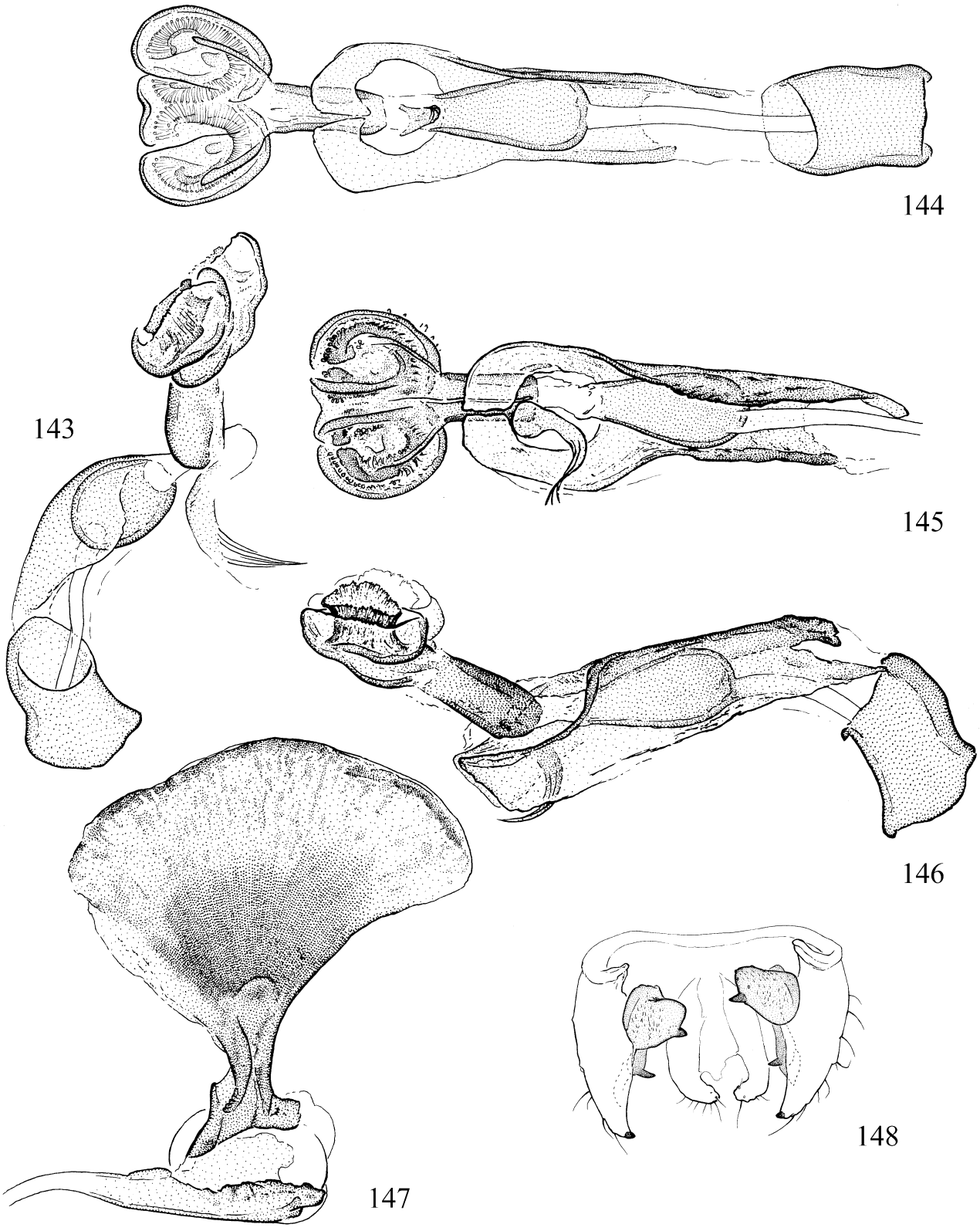
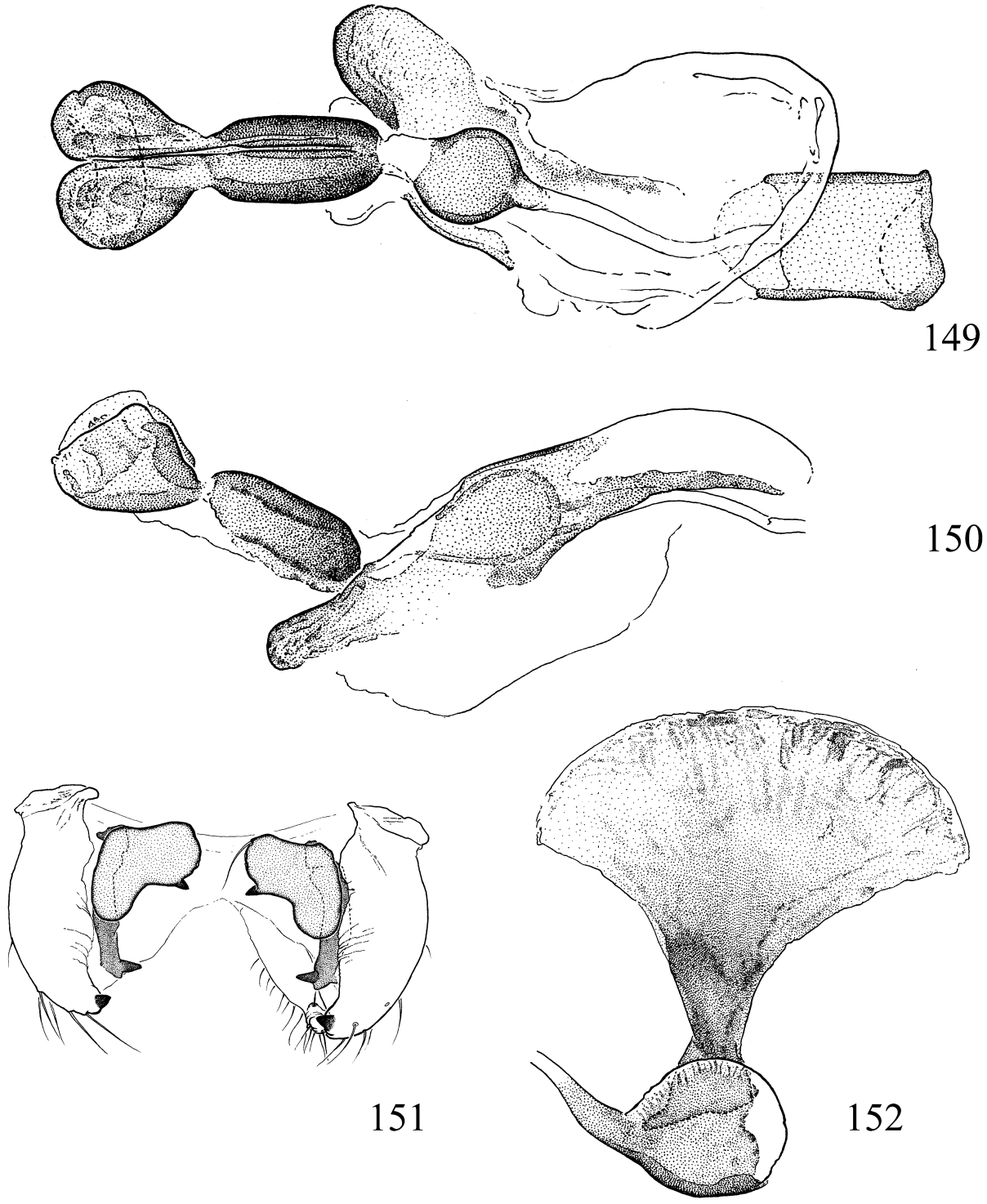
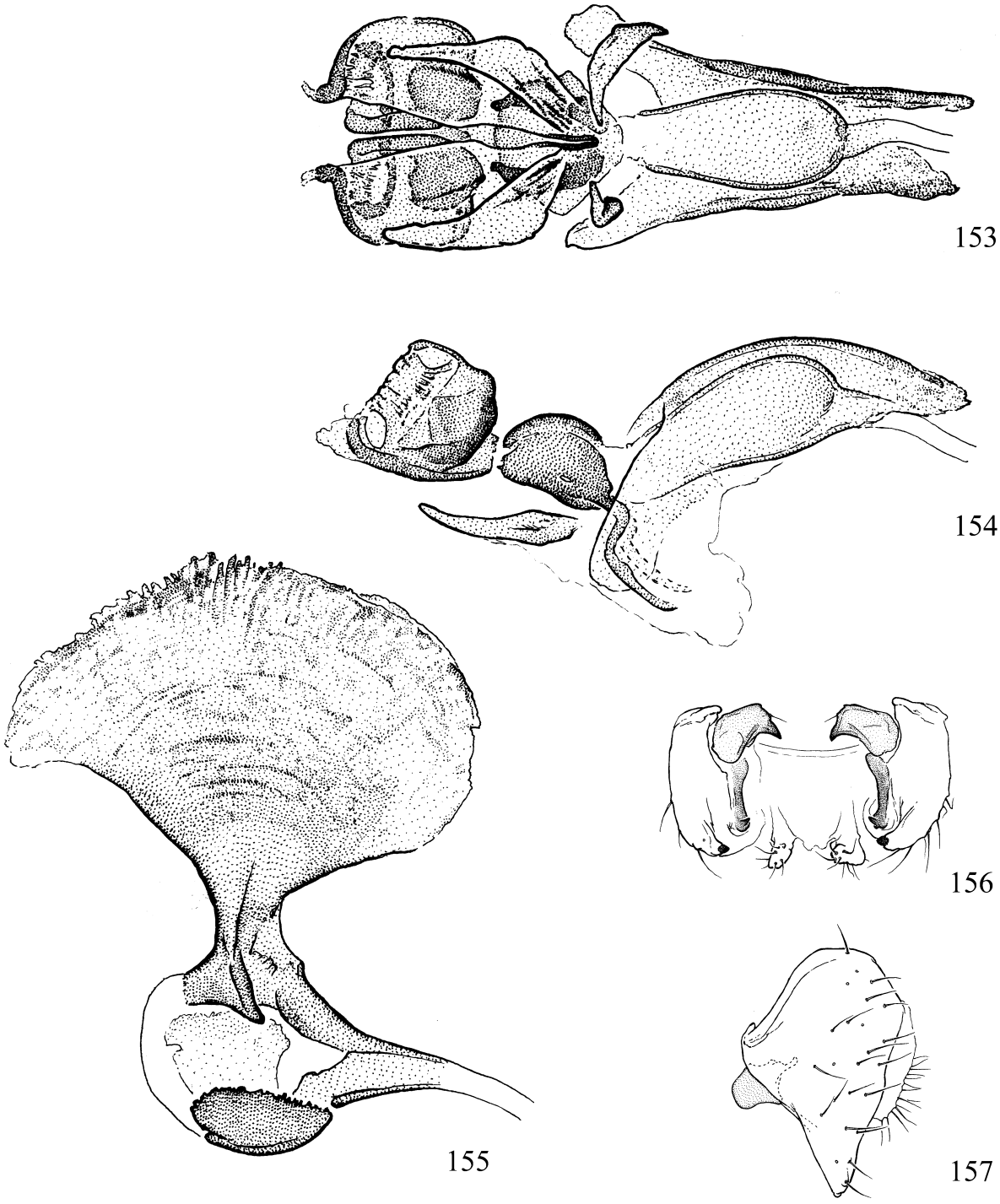


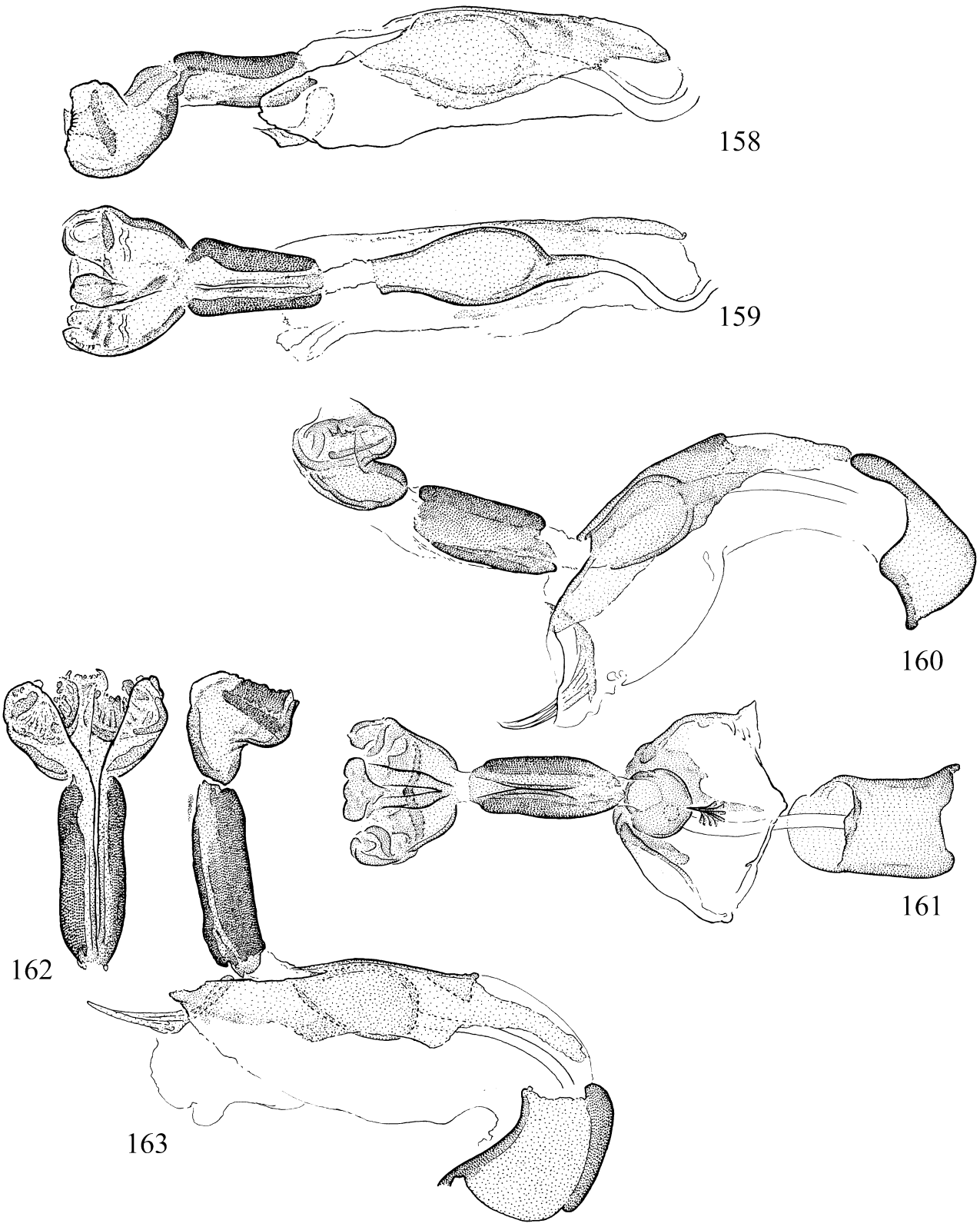
FIGURE 143: *Liriomyza eboni* Spencer, holotype, phallus, right ventrolateral. **FIGURES 144–148:** *L. lathryi* Sehgal, male genitalia; **144**: holotype phallus, ventral; **145**: phallus, ventral; **146**: phallus, left lateral; **147**: ejaculatory apodeme; **148**: external components, ventral.



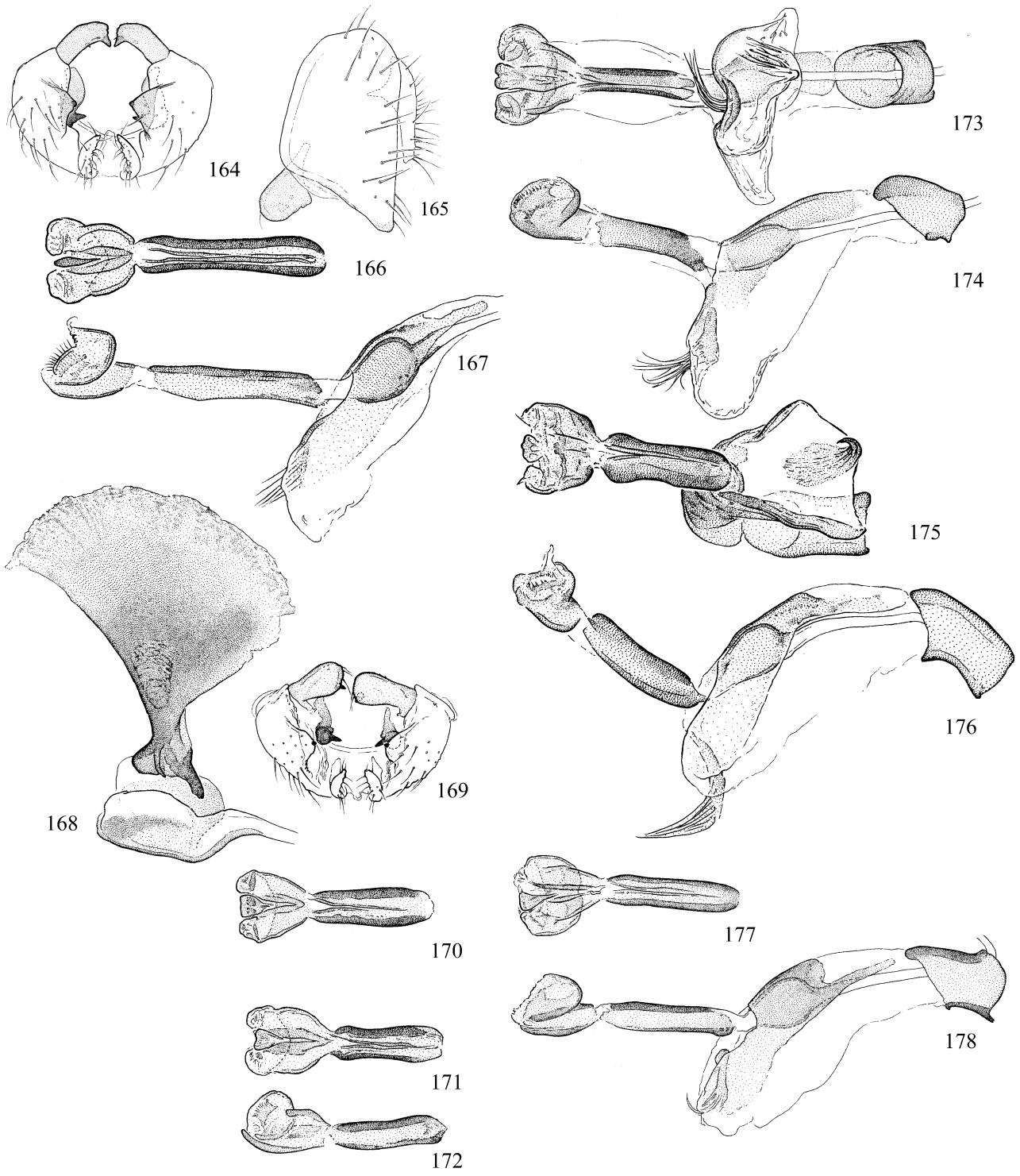
FIGURES 149–152: *Liriomyza elevaster* spec. nov., holotype male genitalia; **149**: phallus, ventral; **150**: phallus, left lateral; **151**: external components, ventral; **152**: ejaculatory apodeme.



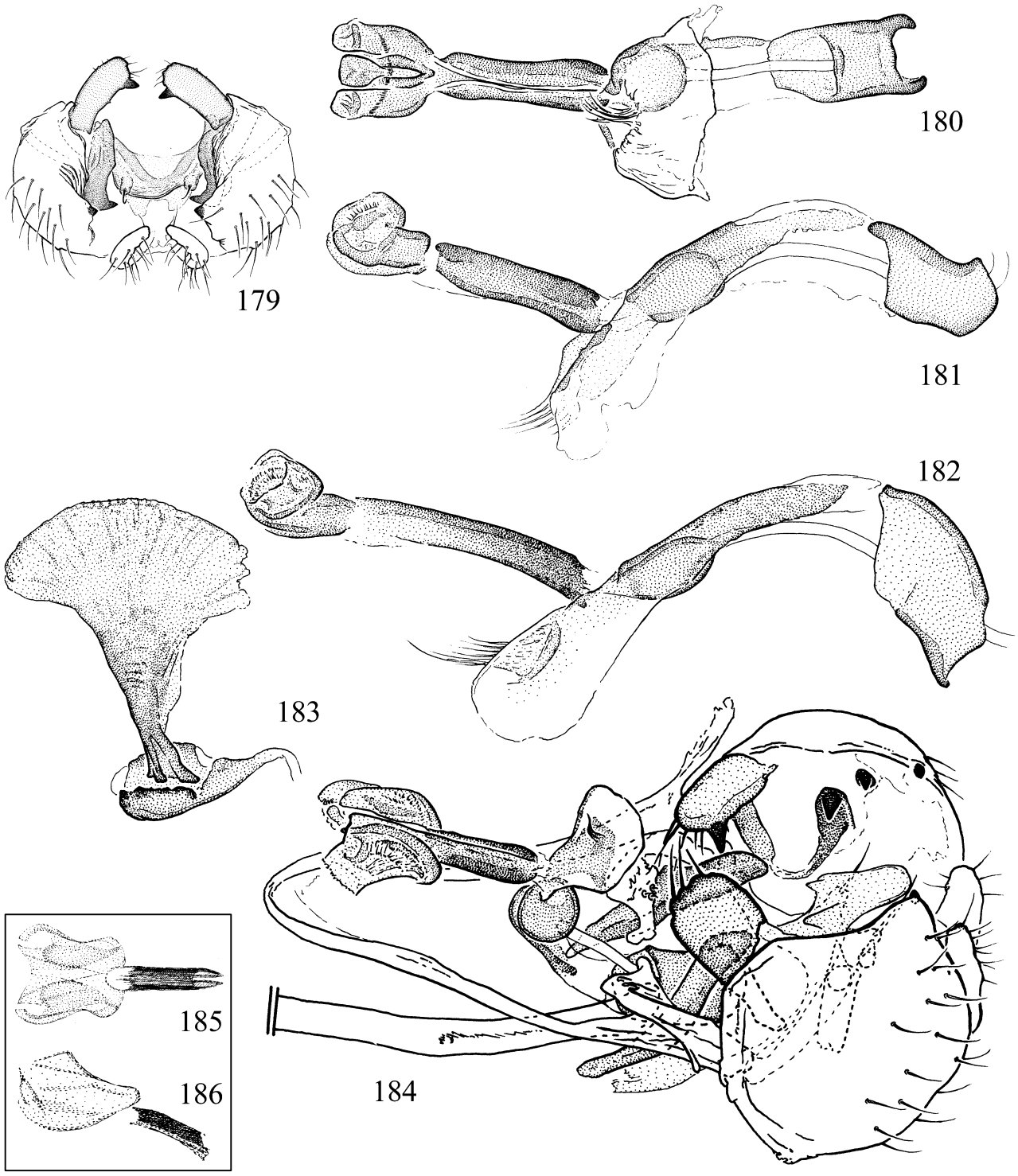
FIGURES 153–157: *Liriomyza pilicornis* spec. nov., holotype male genitalia; **153**: phallus, ventral; **154**: phallus, left lateral; **155**: ejaculatory apodeme; **156**: external components, ventral; **157**: external components, left lateral.



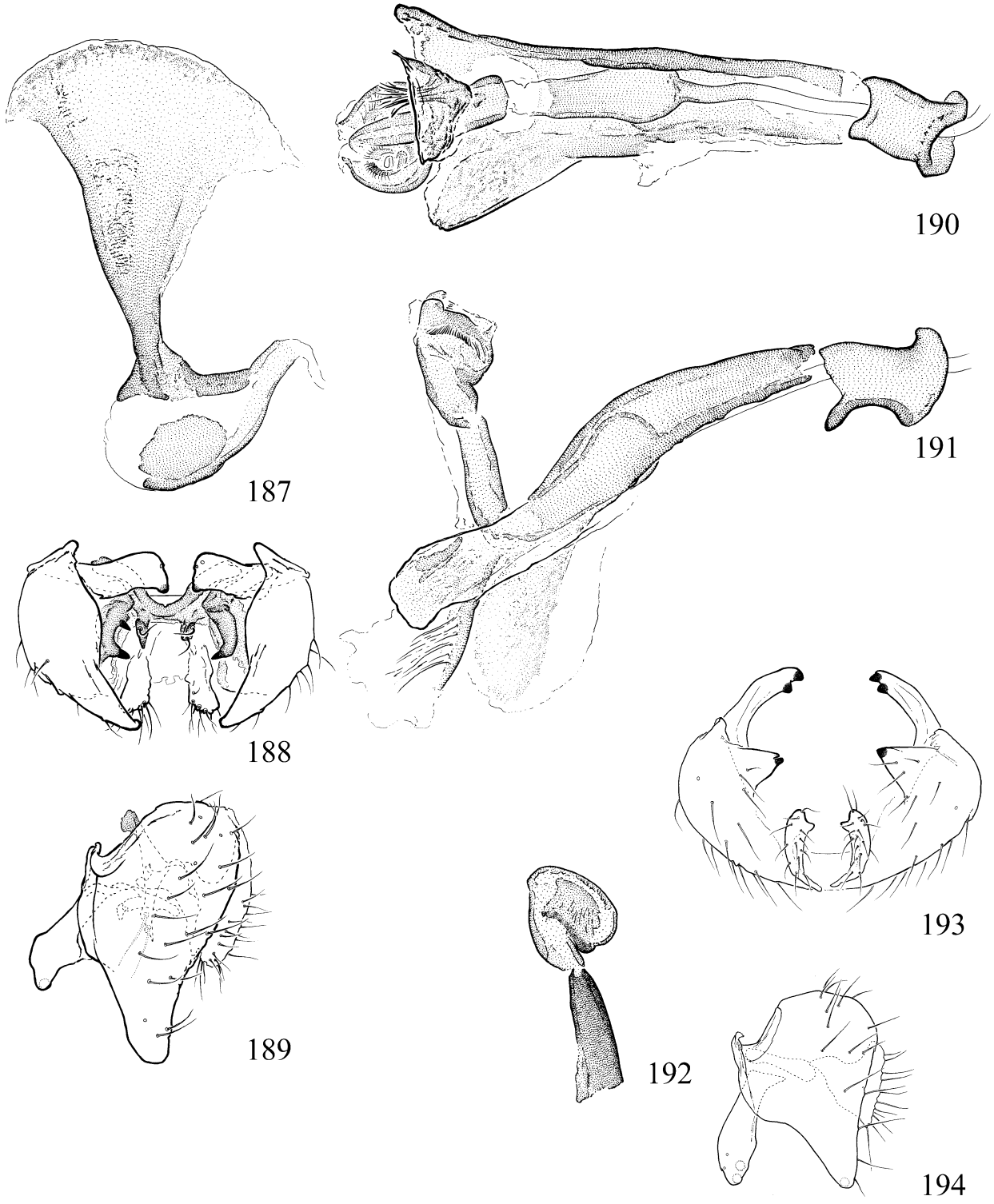
FIGURES 158, 159: *Liriomyza apilaca* spec. nov., paratype male genitalia; **158**: phallus, left lateral; **159**: phallus, ventral. **FIGURES 160, 161:** *L. taraxanox* spec. nov., holotype male genitalia; **160**: phallus, left lateral; **161**: phallus, ventral. **FIGURES 162, 163:** *L. taraxanuda* spec. nov., holotype male genitalia; **162**: mesophallus and distiphallus, ventral; **163**: phallus, left lateral.



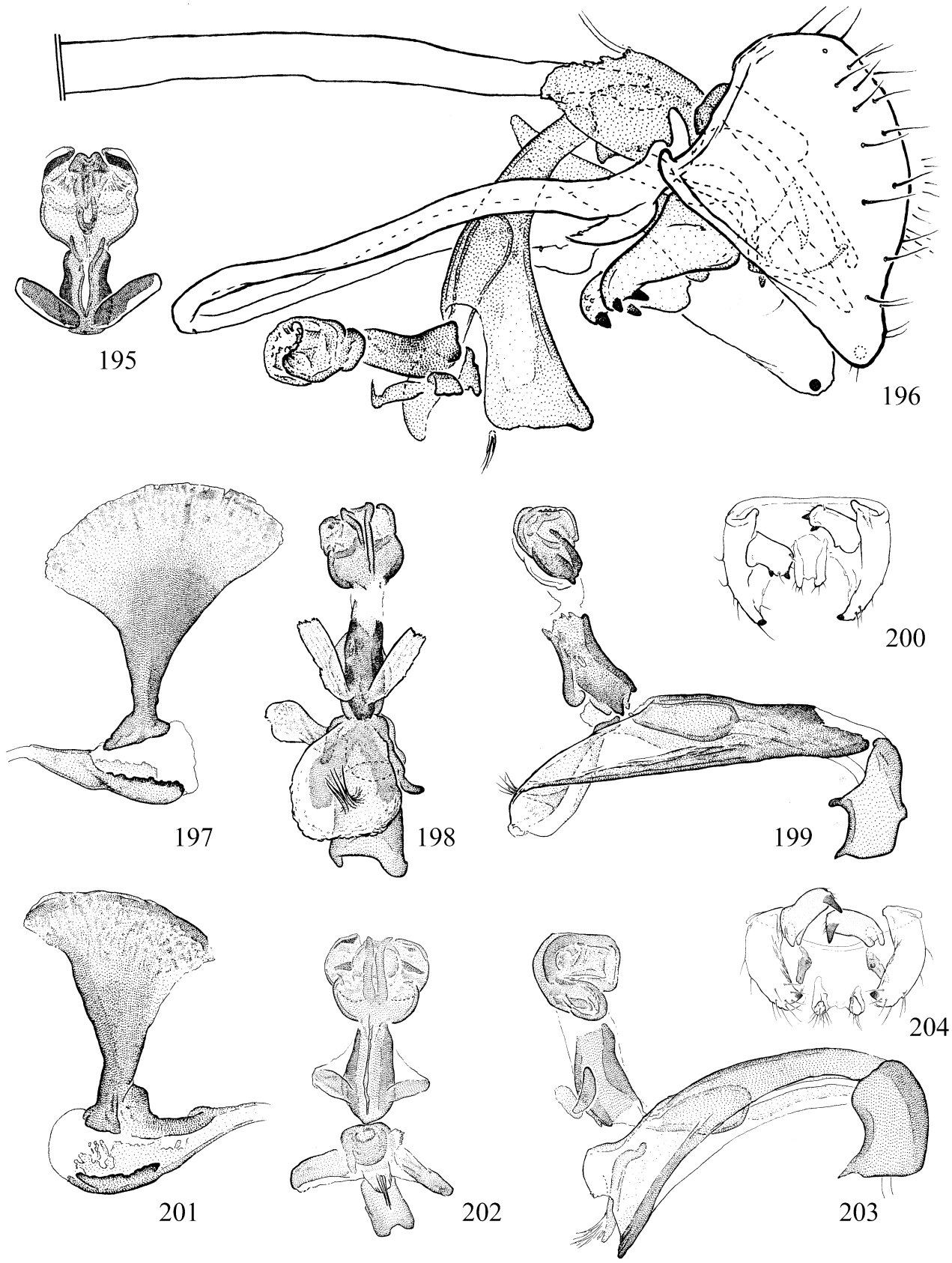
FIGURES 164–166: *Liriomyza* sp, WA male identified previously as *L. endiviae* Hering, male genitalia; **164**: external components, ventral; **165**: same, left lateral; **166:** mesophallus and distiphallus, ventral; **167**: phallus, left lateral. **FIGURES 168–178:** *L. taraxaci* Hering, male genitalia; **168**: ejaculatory apodeme; **169**: external components, ventral; **170**: Elkwater, AB, mesophallus and distiphallus, ventral; **171**: IL male, mesophallus and distiphallus, ventral; **172**: same, left lateral; **173**: Wakefield, QC, phallus, ventral; **174**: same, left lateral; **175**: "typical" ON male, phallus, ventral; **176**: same, left lateral; **177**: Onefour, AB, mesophallus and distiphallus, ventral; **178**: same, phallus, left lateral.



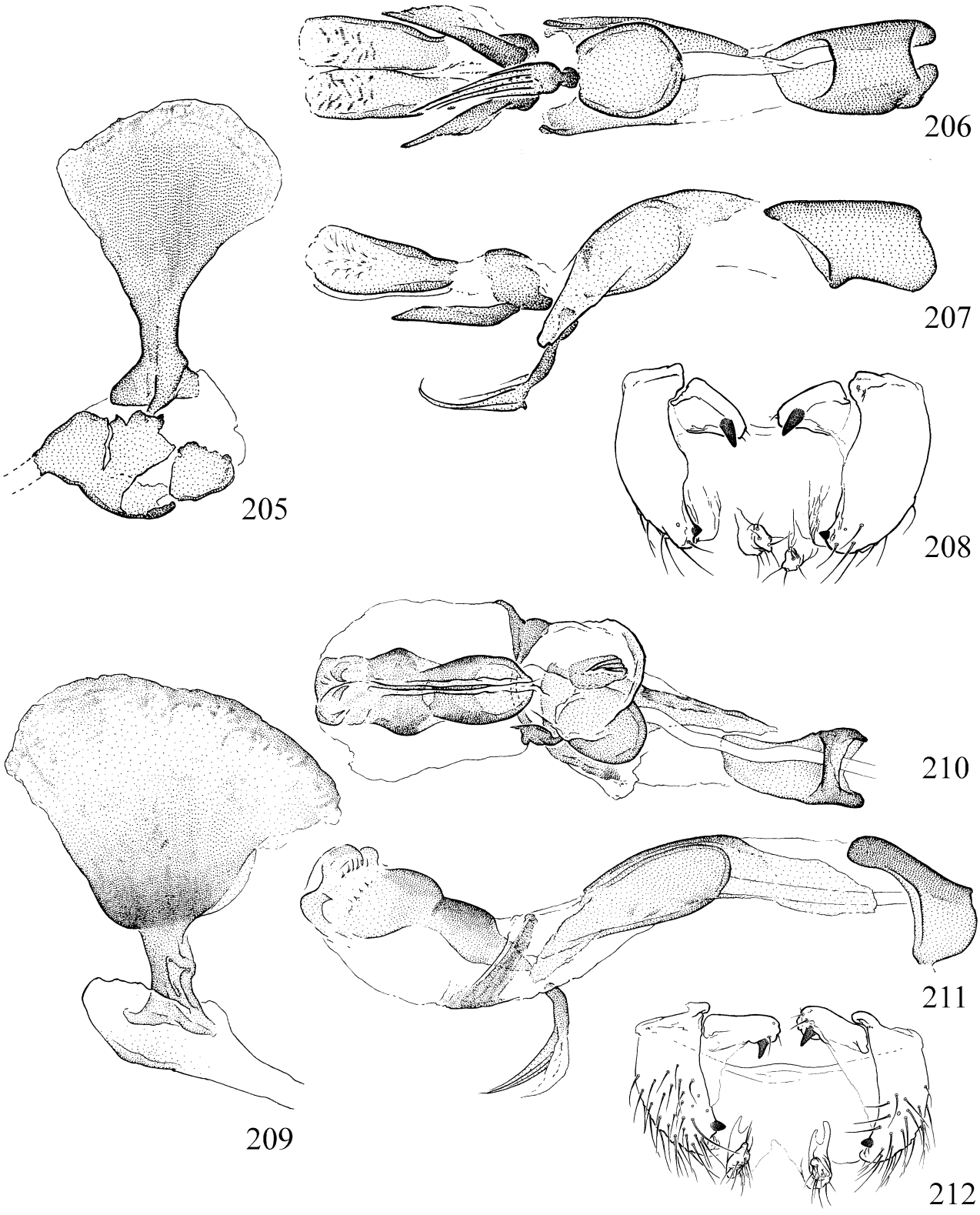
FIGURES 179–181: *Liriomyza minor* Spencer, male genitalia (Lonsdale 2011: **FIGURES** 152–154); **179**: external components, ventral; **180**: phallus, ventral; **181**: holotype phallus, left lateral. **Fig. 182:** *L. orilliensis* Spencer, holotype phallus, left lateral. **FIGURES 183–186:** *L. veluta* Spencer, holotype male genitalia; **183**: ejaculatory apodeme; **184**: genitalia, ventrolateral; **185**: mesophallus and distiphallus, ventral (Spencer, 1969: fig. 345); **186**: same, left lateral (Spencer, 1969: fig. 344).



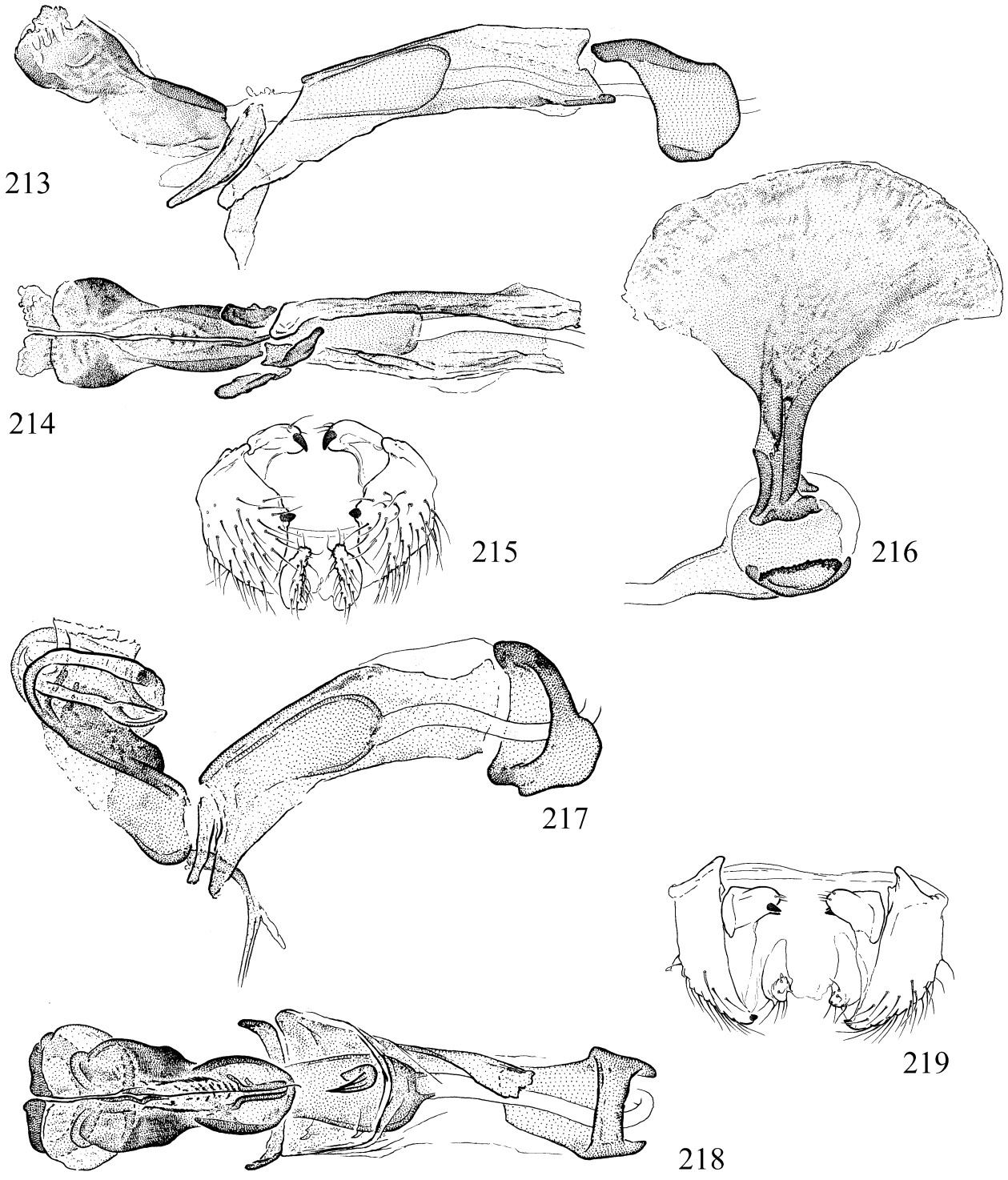
FIGURES 187–191: *Liriomyza ptarmicae* de Meijere,"typical" male genitalia (Lonsdale 2011: **FIGURES** 189–193); **187**: ejaculatory apodeme; **188**: external components, ventral; **189**: same, left lateral **190**: phallus, ventral; **191**: phallus, left lateral. **FIGURES 192–194:** *L. ptarmicae*, Alberta male ex *Achillea*; **192**: mesophallus and distiphallus, left lateral; **193**: external components, ventral; **194**: same, left lateral.



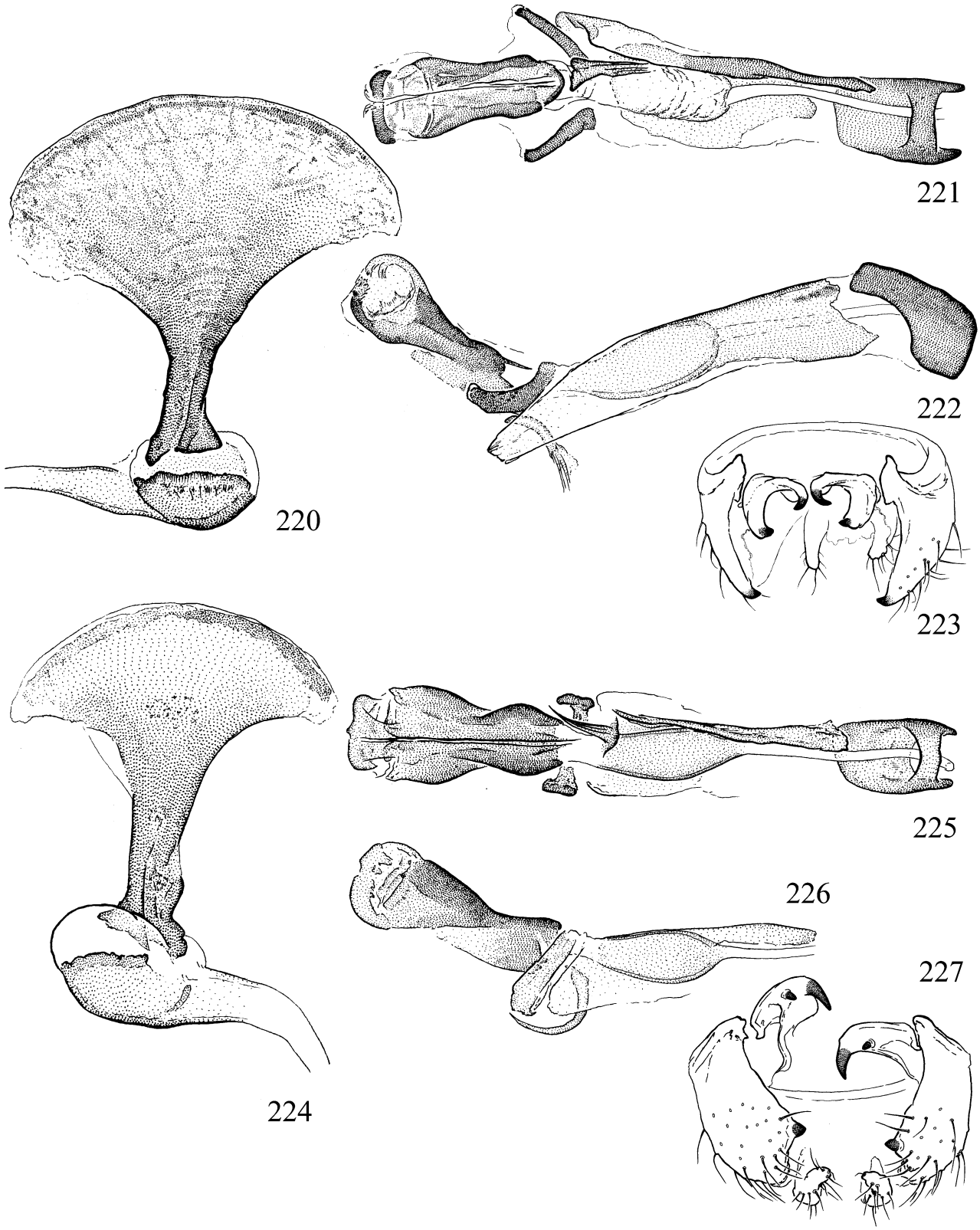
FIGURES 195, 196: *Liriomyza lima* (Melander), male genitalia; **195**: mesophallus and distiphallus, ventral; **196**: genitalia, left lateral. **FIGURES 197**–**200:** *L. limopsis* spec. nov., paratype male genitalia; **197**: ejaculatory apodeme; **198**: phallus, ventral; **199**: phallus, left lateral; **200**: external components, ventral. **FIGURES 201**–**204:** *L. togata* (Melander), male genitalia (Lonsdale 2011: **FIGURES** 225–228); **201**: ejaculatory apodeme; **202**: phallus, ventral; **203**: phallus, left lateral; **204**: external components, ventral.



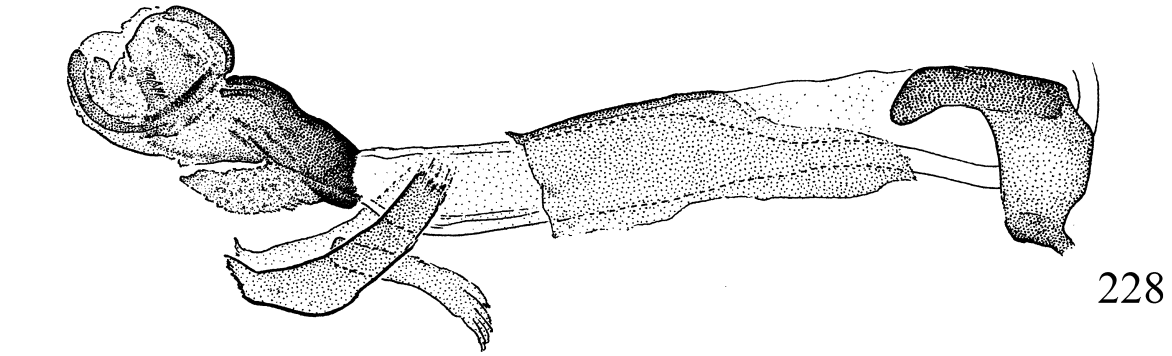
FIGURES 205–208: *Liriomyza agrios* spec. nov., holotype male genitalia; **205**: ejaculatory apodeme; **206**: phallus, ventral; **207**: phallus, left lateral; **208**: external components, ventral. **FIGURES 209–212:** *L. albispina* spec. nov., holotype male genitalia; **209**: ejaculatory apodeme; **210**: phallus, ventral; **211**: phallus, left lateral; **212**: external components, ventral.

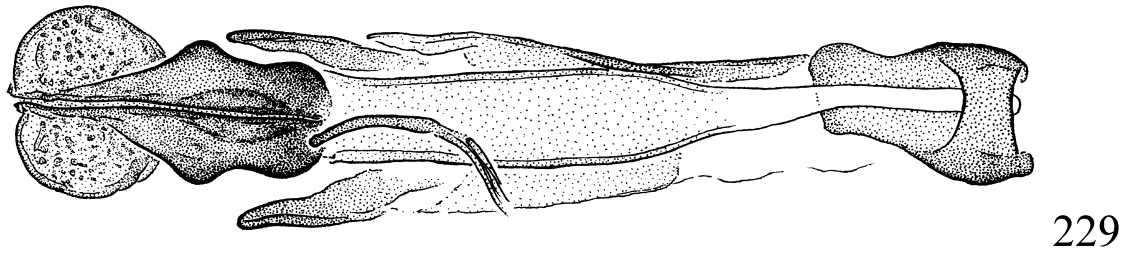


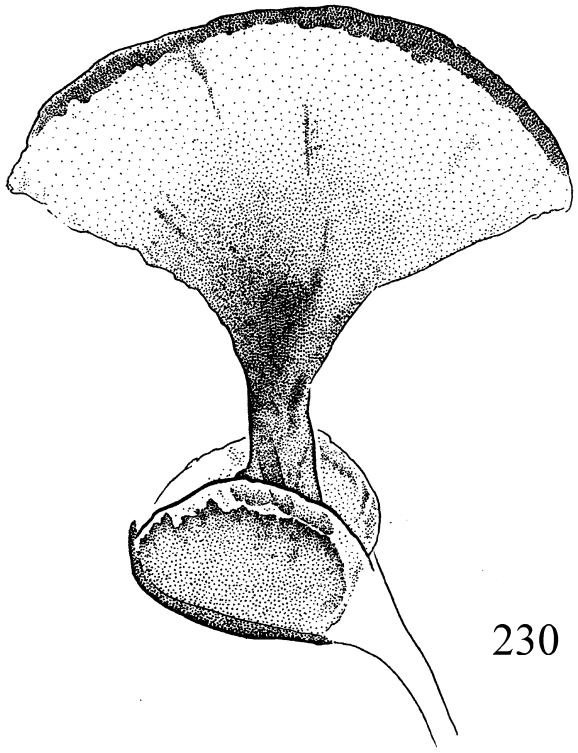
FIGURES 213–216: *Liriomyza arctii* Spencer, male genitalia; **213**: phallus, left lateral; **214**: holotype phallus, ventral; **215**: external components, ventral; **216**: ejaculatory apodeme. **FIGURES 217–219:** *L. asclepiadis* Spencer, male genitalia; **217**: holotype phallus, left lateral; **218**: phallus, ventral; **219**: external components, ventral

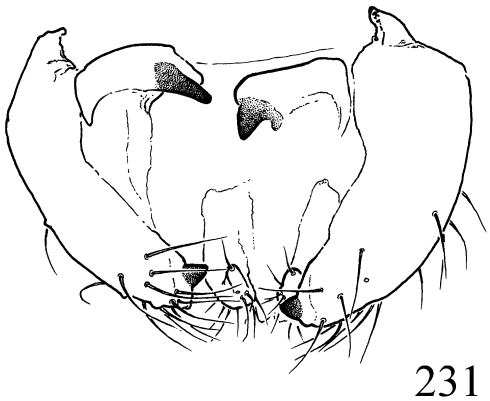


FIGURES 220–223: *Liriomyza baccharidis* Spencer, male genitalia (Lonsdale 2011: **FIGURES** 30–36); **220**: ejaculatory apodeme; **221**: phallus, ventral; **222**: phallus, left lateral; **223**: external components, ventral. **FIGURES 224–227:** *L. brassicae* (Riley), ON male genitalia; **224**: ejaculatory apodeme; **225**: phallus, ventral; **226**: phallus, left lateral; **227**: external components, ventral.

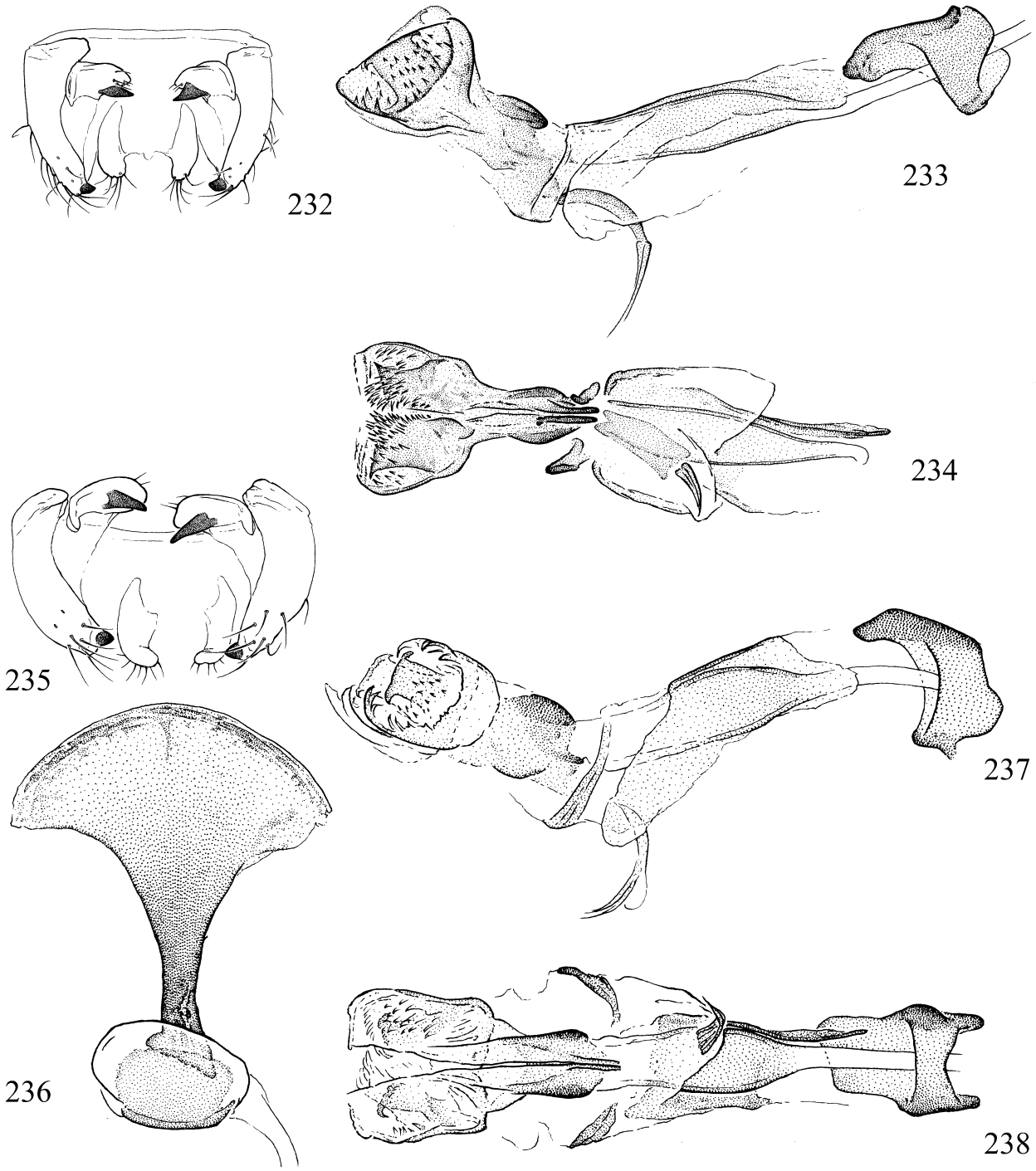




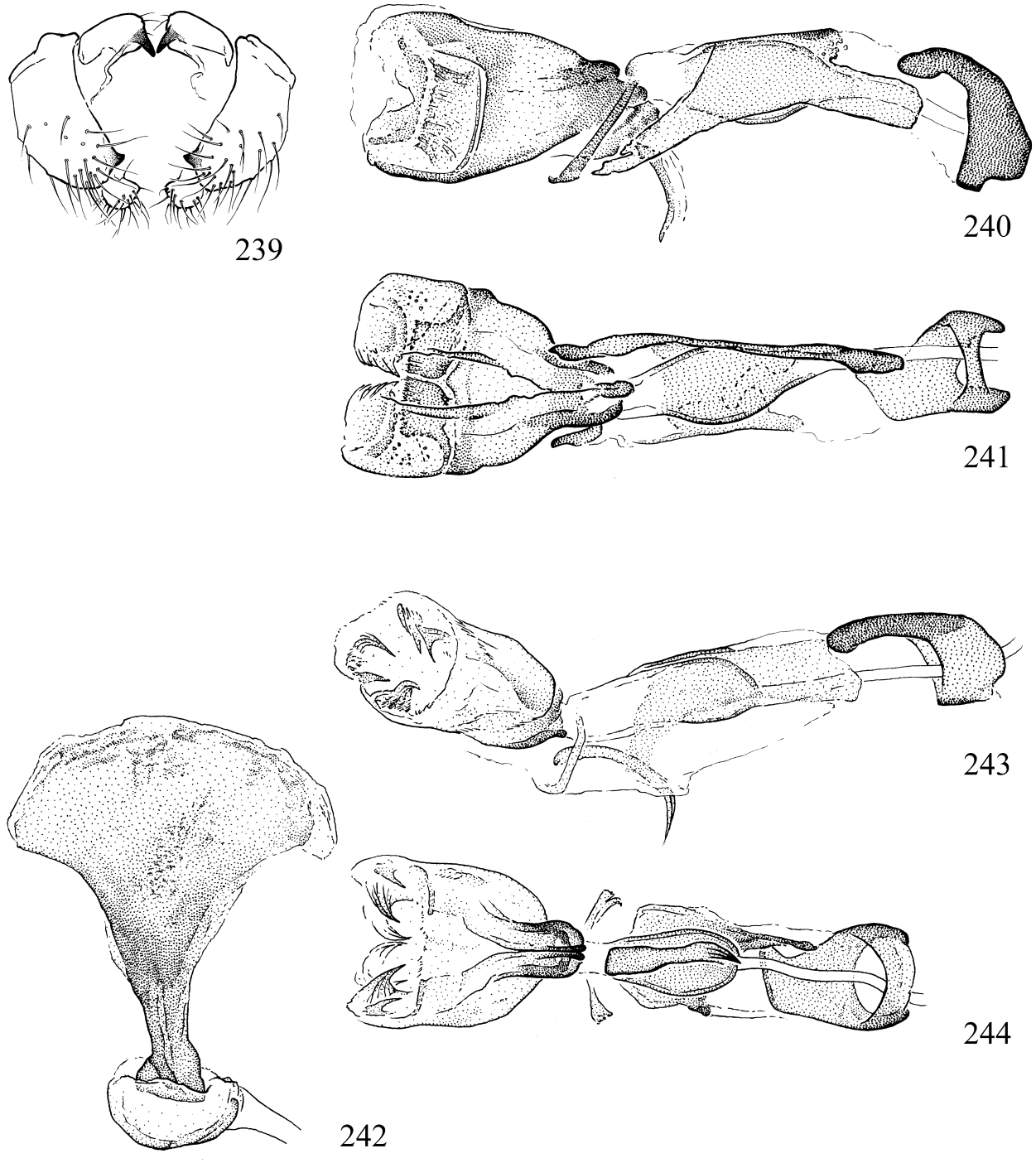




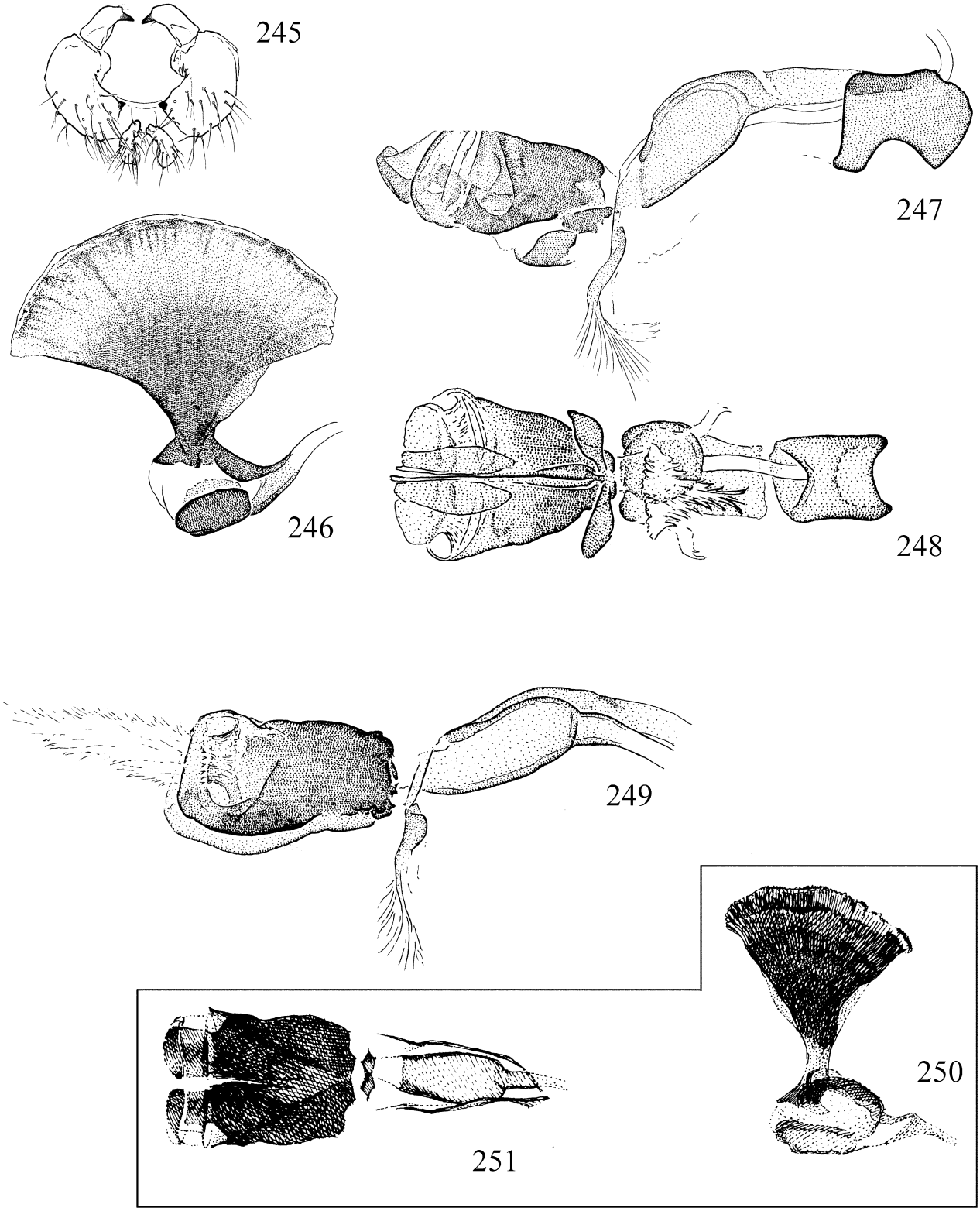
FIGURES 228–231: *Liriomyza emaciata* spec. nov., paratype male genitalia; **228**: phallus, left lateral; **229**: phallus, ventral; **230**: ejaculatory apodeme; **231**: external components, ventral.



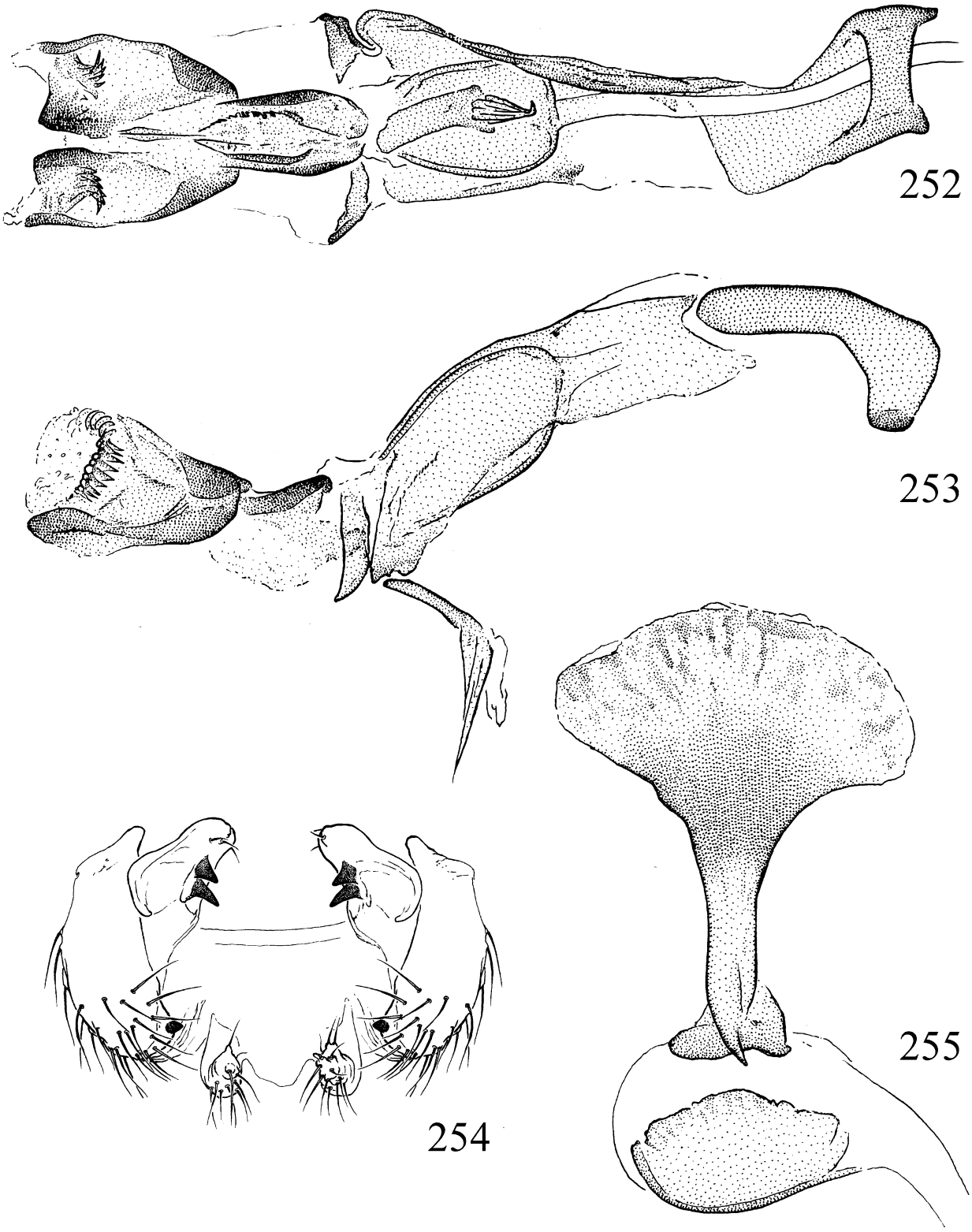
FIGURES 232–234: *Liriomyza arenarium* spec. nov., holotype male genitalia; **232**: external components, ventral; **233**: phallus, left lateral; **234**: phallus, ventral. **FIGURES 235–238:** *L. gibsoni* spec. nov., holotype male genitalia; **235**: external components, ventral; **236**: ejaculatory apodeme; **237**: phallus, left lateral; **238**: phallus, ventral.



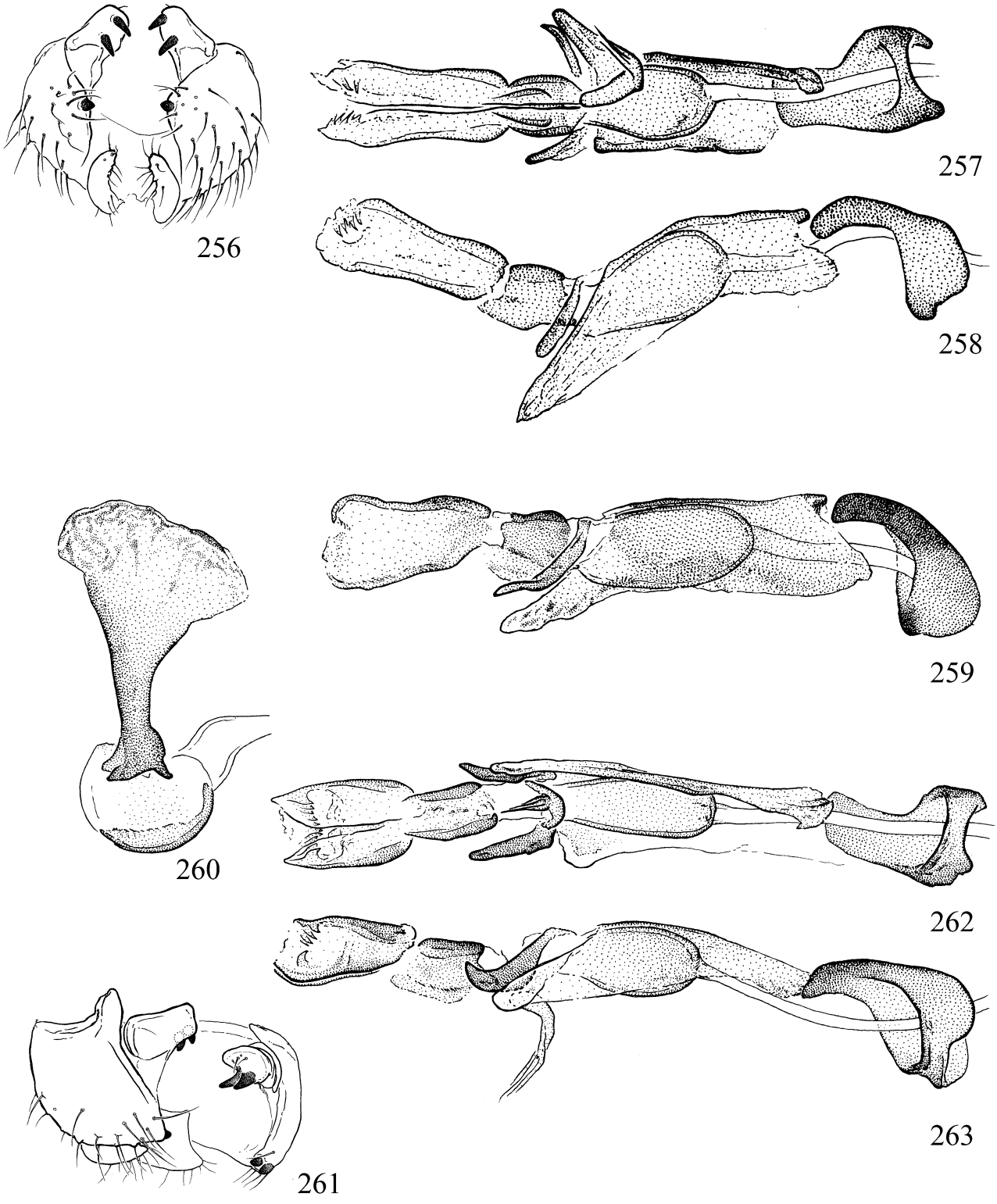
FIGURES 239–241: *Liriomyza artemisiae* Spencer, male genitalia; **239**: external components, ventral; **240**: phallus, left lateral (Lonsdale 2011: fig. 31); **241**: phallus, ventral (Lonsdale 2011: fig. 30). **FIGURES 242–244:** *L. borealis* (Malloch), male genitalia; **242**: ejaculatory apodeme; **243**: phallus, left lateral; **244**: phallus, ventral.



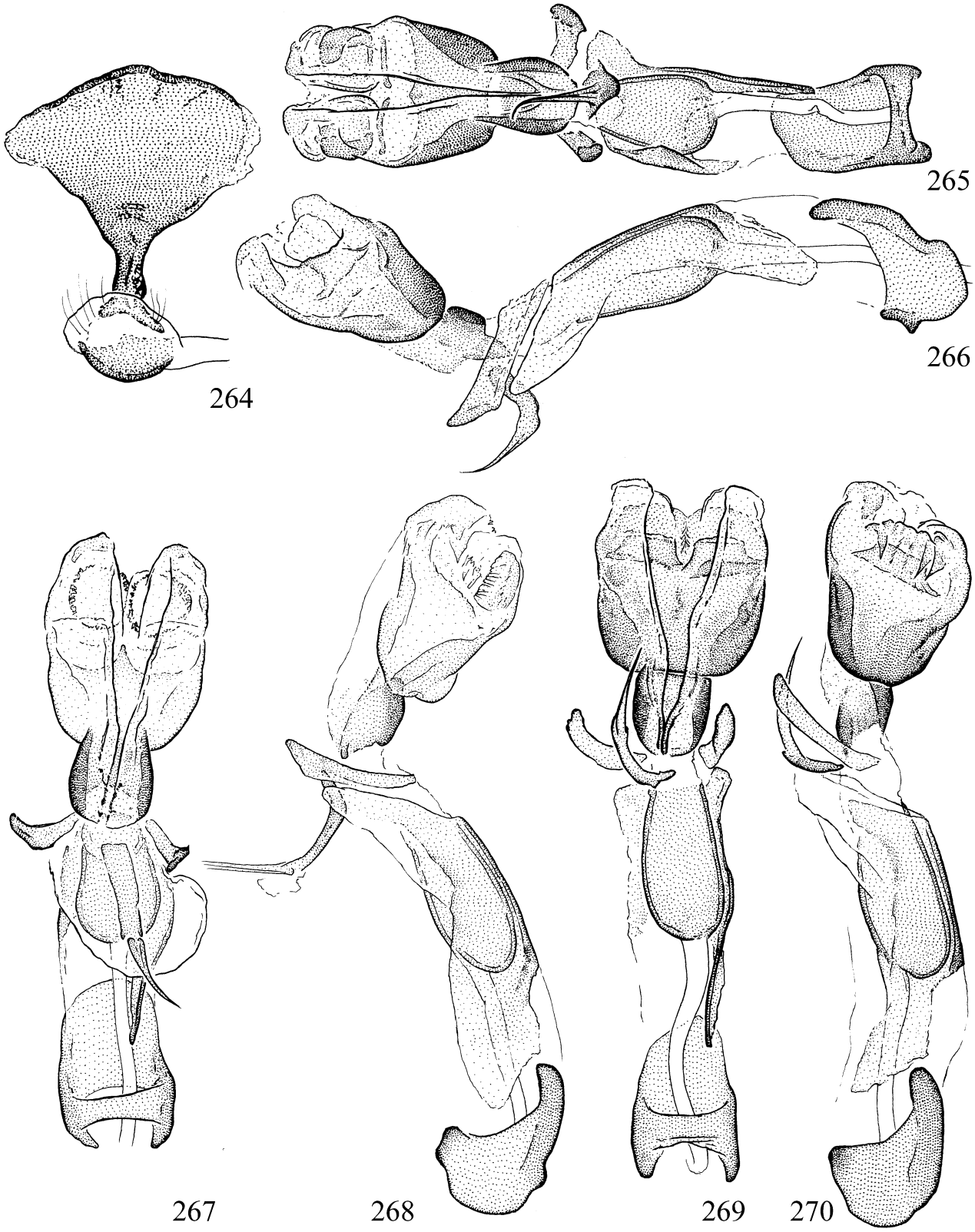
FIGURES 245–248: *Liriomyza baptisiae* (Frost), male genitalia (Lonsdale 2011: figs 37–40); **245**: external components, ventral; **246**: ejaculatory apodeme; **247**: phallus, left lateral; **248**: phallus, ventral. **FIGURES 249–252:** *L. bellisima* (Spencer), male genitalia; **249**: phallus, left lateral (Lonsdale 2011: fig. 41); **250**: ejaculatory apodeme (Spencer, 1981: fig. 297); **251**: phallus, ventral (Spencer, 1981: fig. 296).



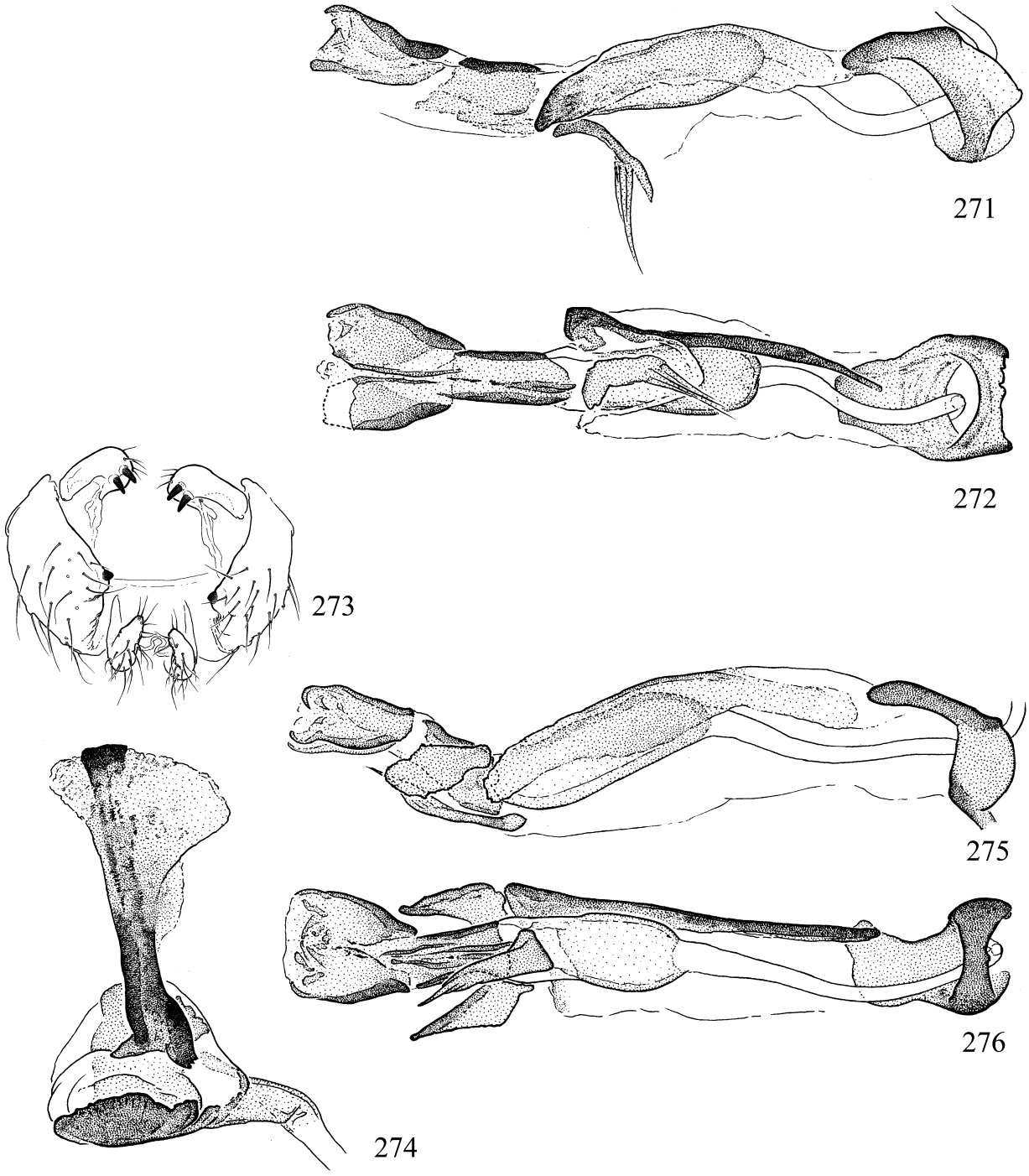
FIGURES 252–255: *Liriomyza charada* spec. nov., holotype male genitalia; **252**: phallus, ventral; **253**: phallus, left lateral; **254**: external components, ventral; **255**: ejaculatory apodeme.



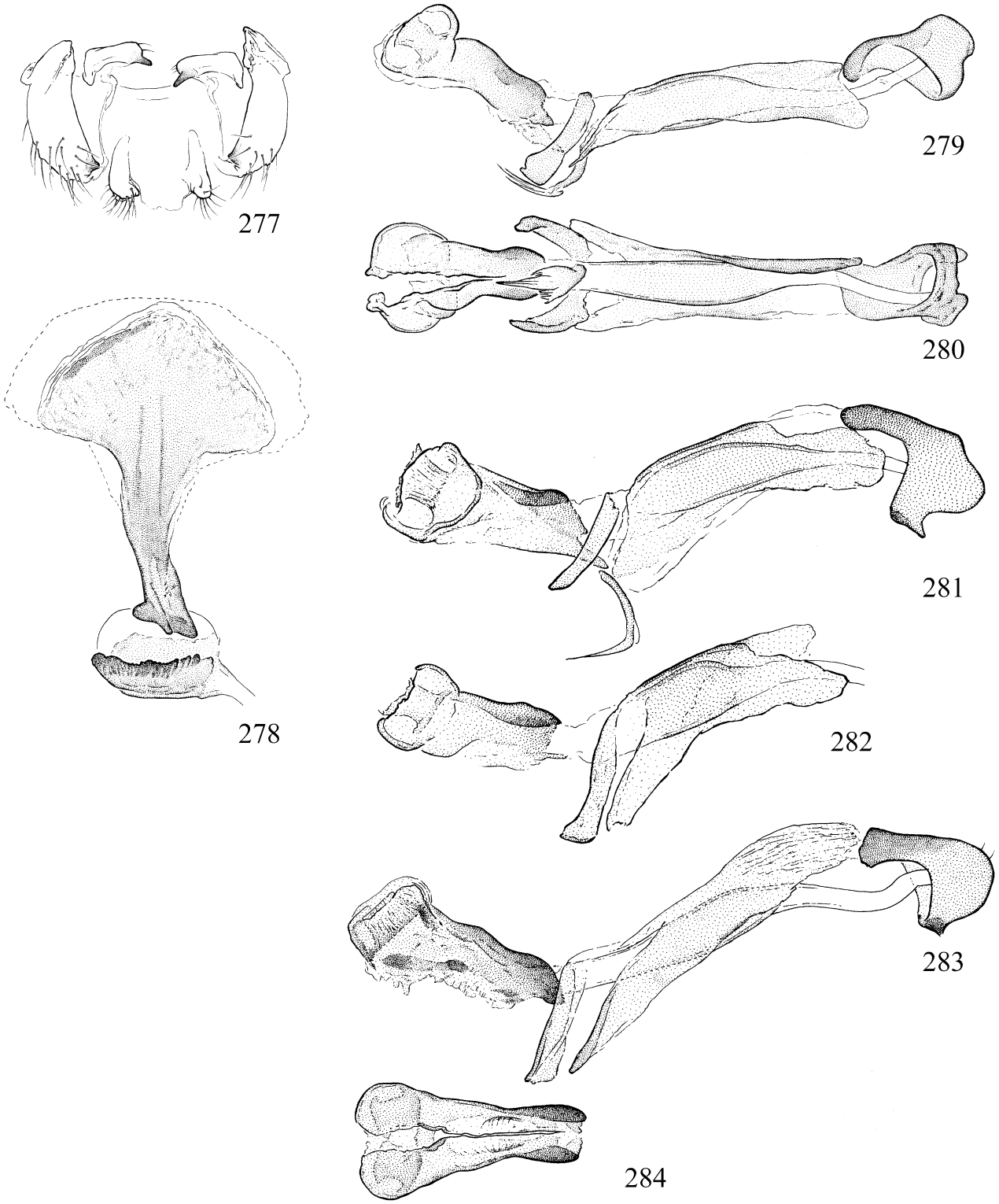
FIGURES 256–258: *Liriomyza cracentis* spec. nov., "Type 1" male genitalia, holotype; **256**: external components, ventral; **257**: phallus, ventral; **258**: phallus, left lateral. **Fig. 259:** *L. cracentis* "Type 2" phallus, left lateral. **FIGURES 260–263:** *L. cracentis* "Type 3" male genitalia; **260**: ejaculatory apodeme; **261**: external components, ventral; **262**: phallus, ventral; **263**: phallus, left lateral.



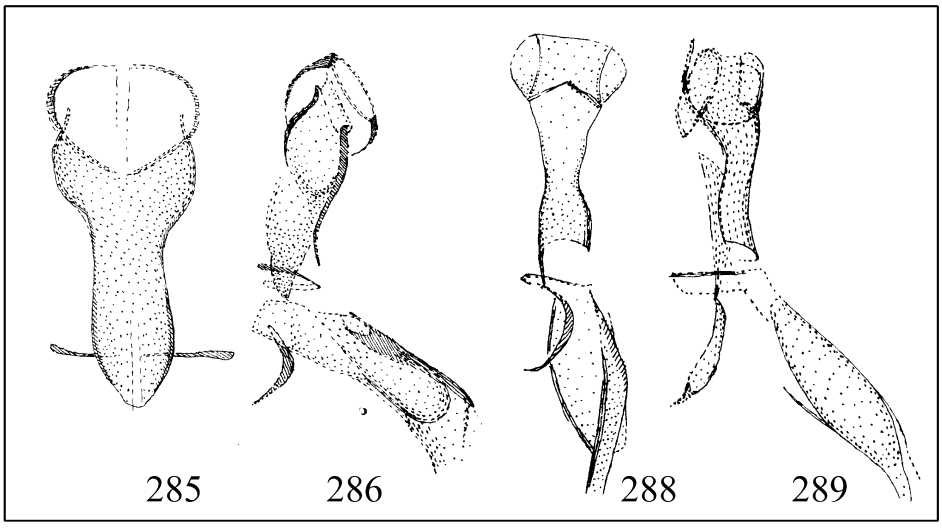
FIGURES 264–266: *Liriomyza eupatorii* (Kaltenbach), "typical" male genitalia (Lonsdale 2011: figs 85–87); **264**: ejaculatory apodeme; **265**: phallus, ventral; **266**: phallus, left lateral. **FIGURES 267, 268:** *L. eupatorii*, male genitalia, Elkwater Lake, AB [labeled "Elkwater 1"]; **267**: phallus, ventral; **268**: phallus, left lateral. **FIGURES 269, 270:** *L. eupatorii*, male genitalia, Elkwater Lake, AB [labeled "Elkwater 2"]; **269**: phallus, ventral; **270**: phallus, left lateral.

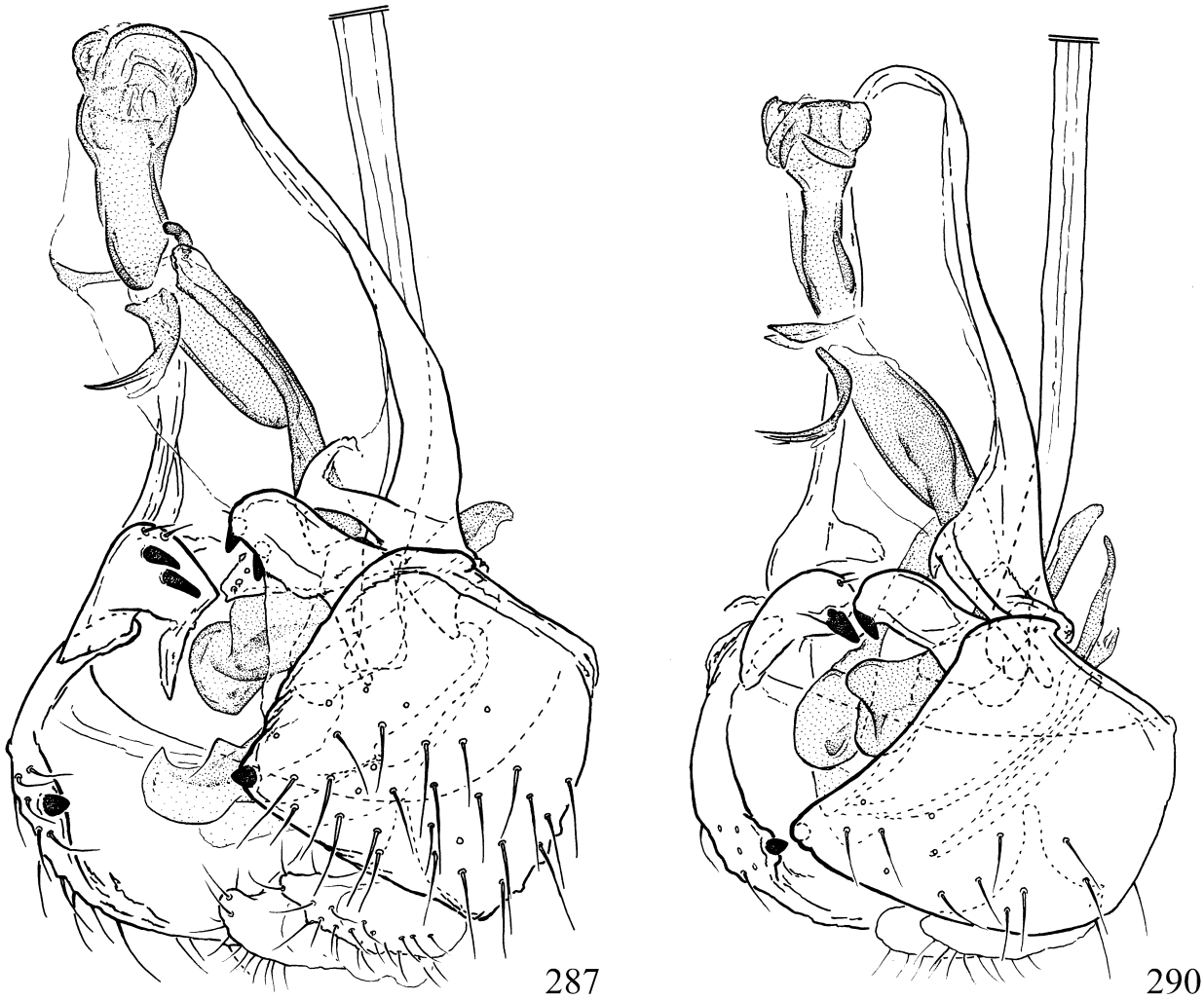


FIGURES 271, 272: *Liriomyza griffithsi* spec. nov., holotype male genitalia; **271**: phallus, left lateral; **272**: phallus, ventral. **FIGURES 273–276:** *L. helenii* Spencer, Canadian male genitalia; **273**: external components, ventral**; 274**: ejaculatory apodeme**; 275**: phallus, left lateral; **276**: phallus, ventral.

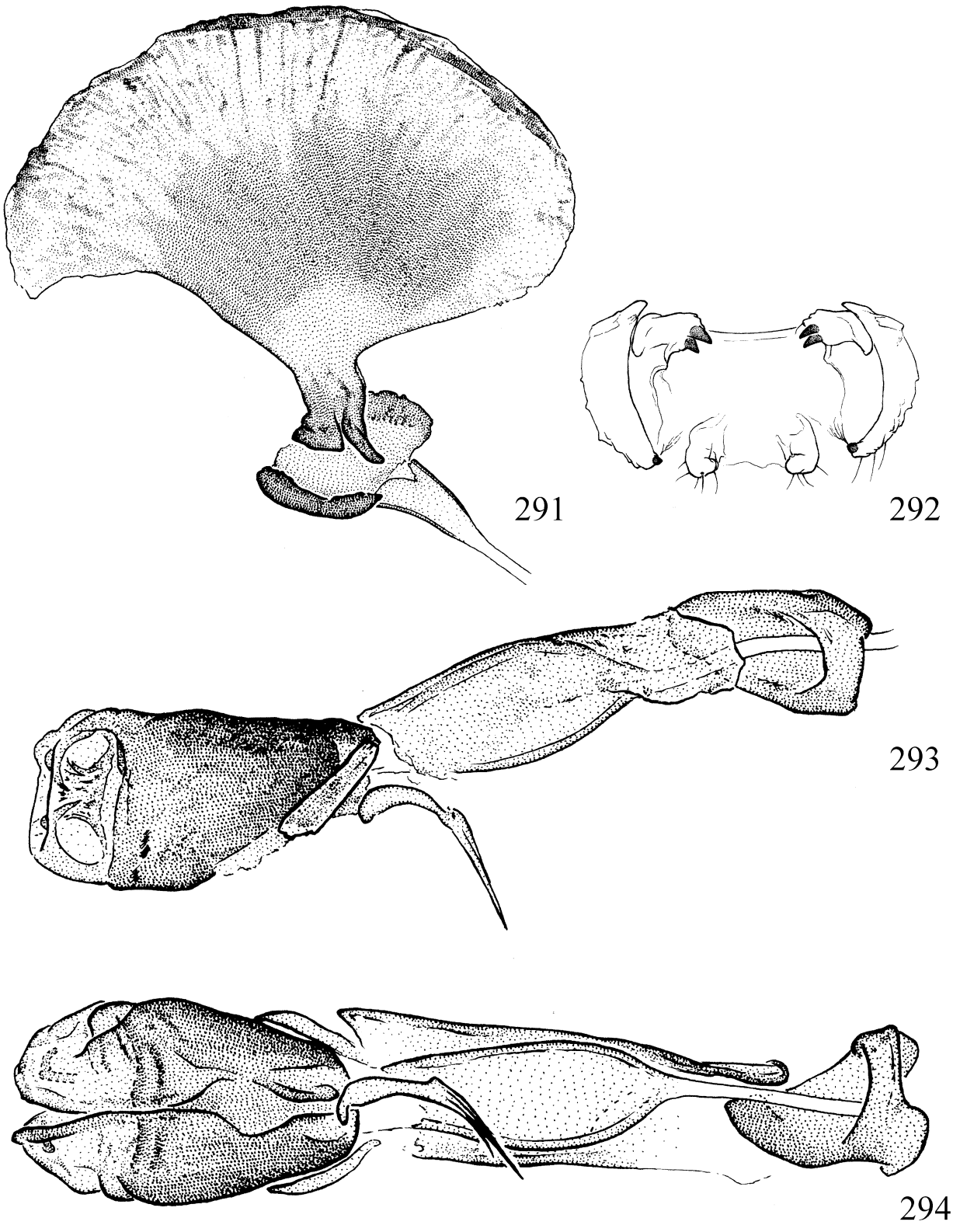


FIGURES 277–284: *Liriomyza helianthi* Spencer, male genitalia; **277**: CA male, external components, ventral (Lonsdale 2011: fig. 121); **278**: same, ejaculatory apodeme (Lonsdale 2011: fig. 120); **279**: same, phallus, left lateral (Lonsdale 2011: fig. 123); **280**: same, phallus, ventral (Lonsdale 2011: fig. 124); **281**: Shilo, MB, phallus, left lateral; **282**: Pleasant Bay, NS, phallus, left lateral; **283**: Mt. Kobau, BC, phallus, left lateral; **284**: same, mesophallus and distiphallus, ventral.

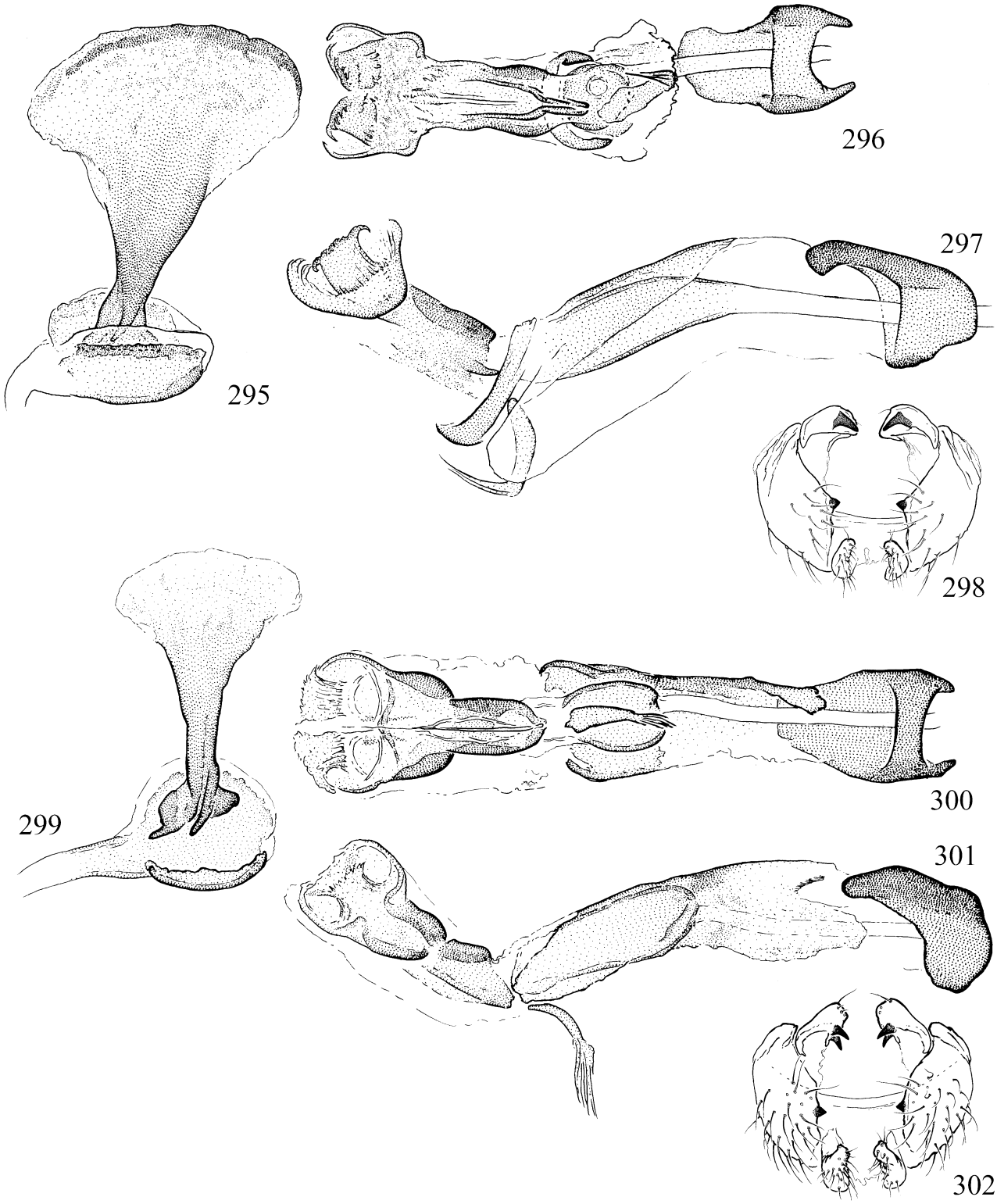




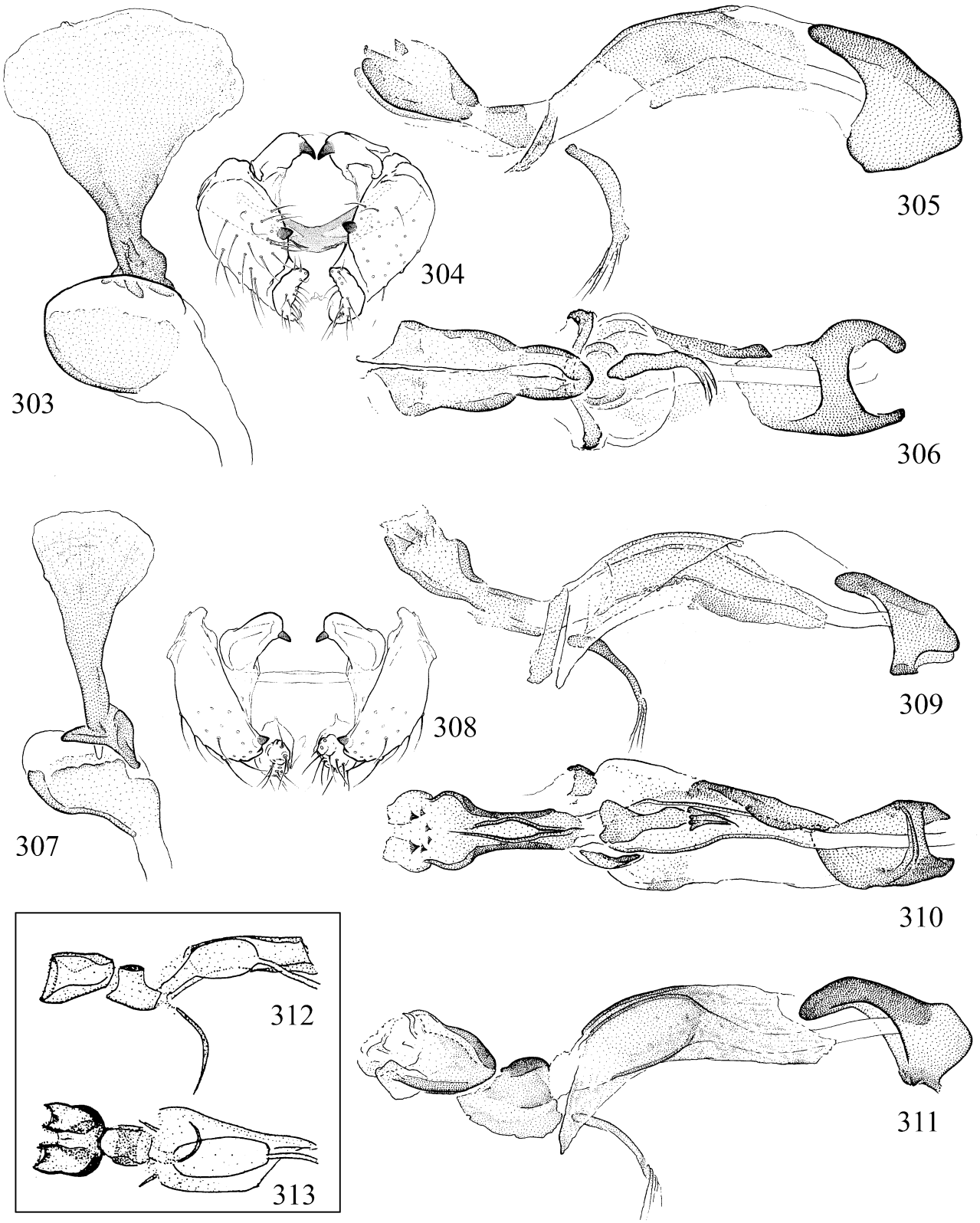
FIGURES 285–287: *Liriomyza peleensis* Spencer, holotype male genitalia; **285**: mesophallus and distiphallus, ventral (Spencer, 1969: fig. 317); **286**: phallus, left lateral (Spencer, 1969: fig. 316); **287**: genitalia, ventrolateral. **FIGURES 288–290:** *L. singula* Spencer, holotype male genitalia; **288**: phallus, ventral (Spencer, 1969: fig. 333); **289**: phallus, left lateral (Spencer, 1969: fig. 332); **290**: genitalia, ventrolateral.



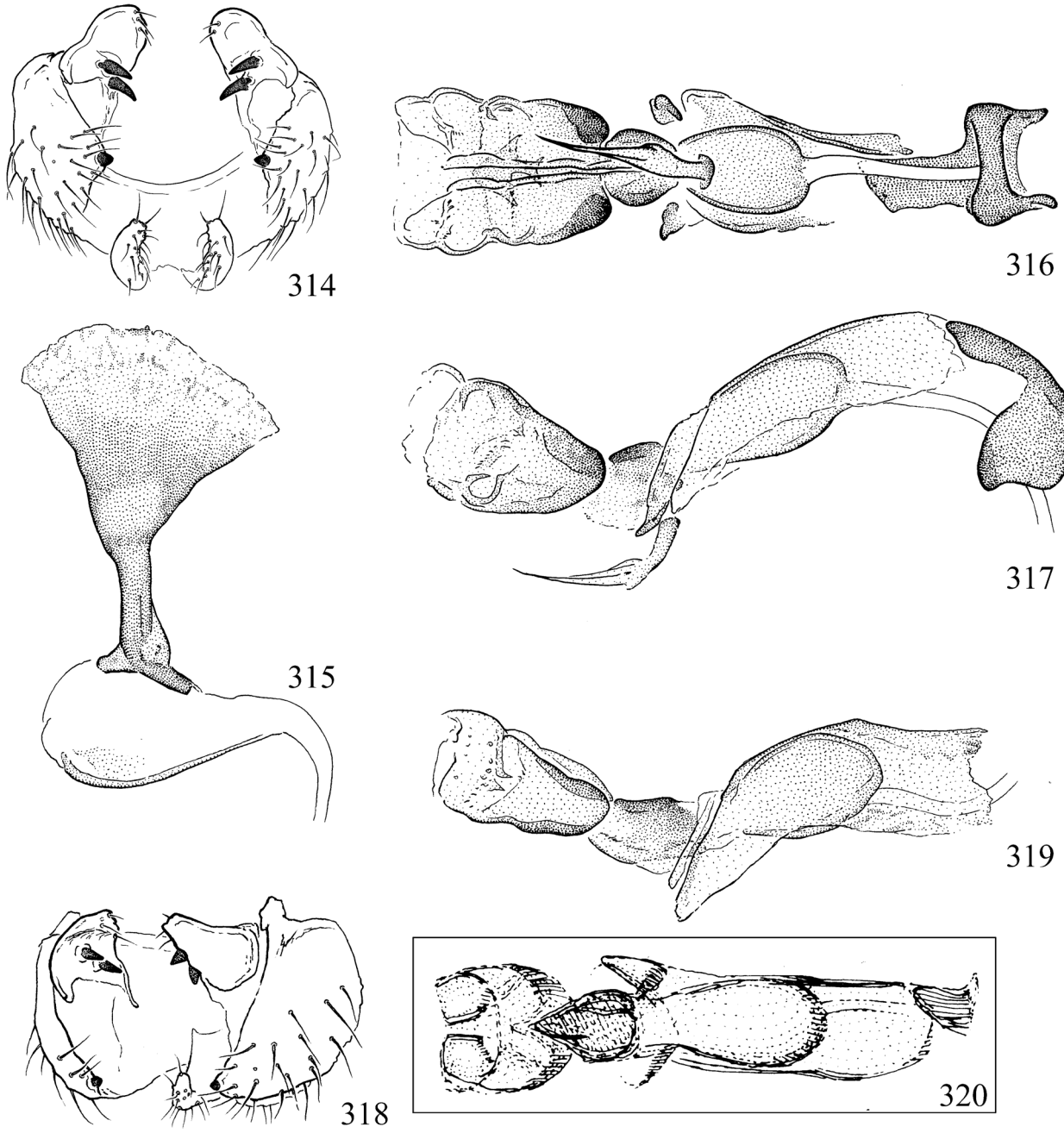
FIGURES 291–294: *Liriomyza pistilla* spec. nov., holotype male genitalia; **291**: ejaculatory apodeme; **292**: external components, ventral; **293**: phallus, left lateral; **294**: phallus, ventral.



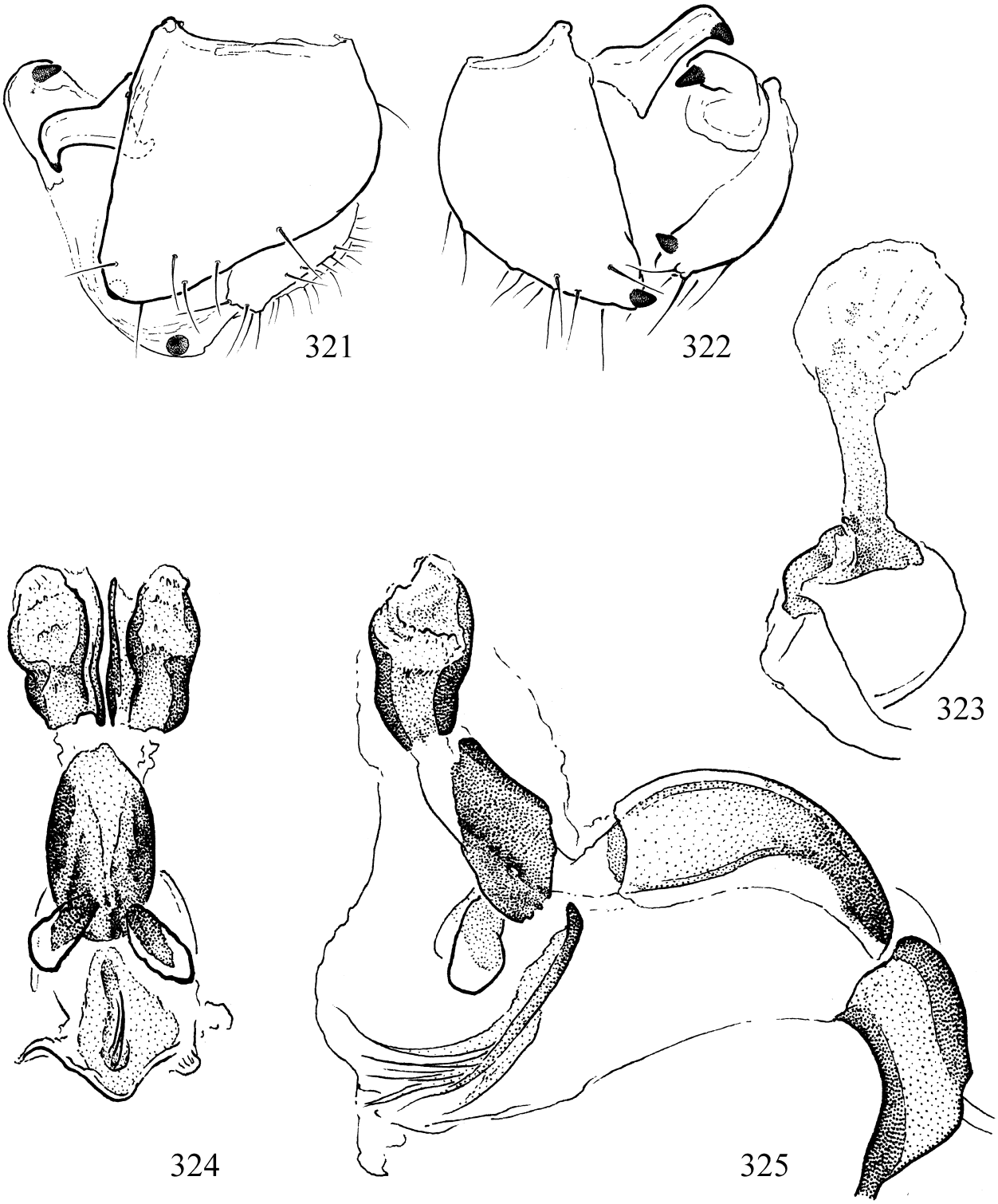
FIGURES 295–298: *Liriomyza rigaudensis* spec. nov., holotype male genitalia; **295**: ejaculatory apodeme; **296**: phallus, ventral; **297**: phallus, left lateral; **298**: external components, ventral. **FIGURES 299–302:** *L. sabaziae* Spencer, male genitalia (Lonsdale 2011: figs 200–203); **299**: ejaculatory apodeme; **300**: phallus, ventral; **301**: phallus, left lateral; **302**: external components, ventral.



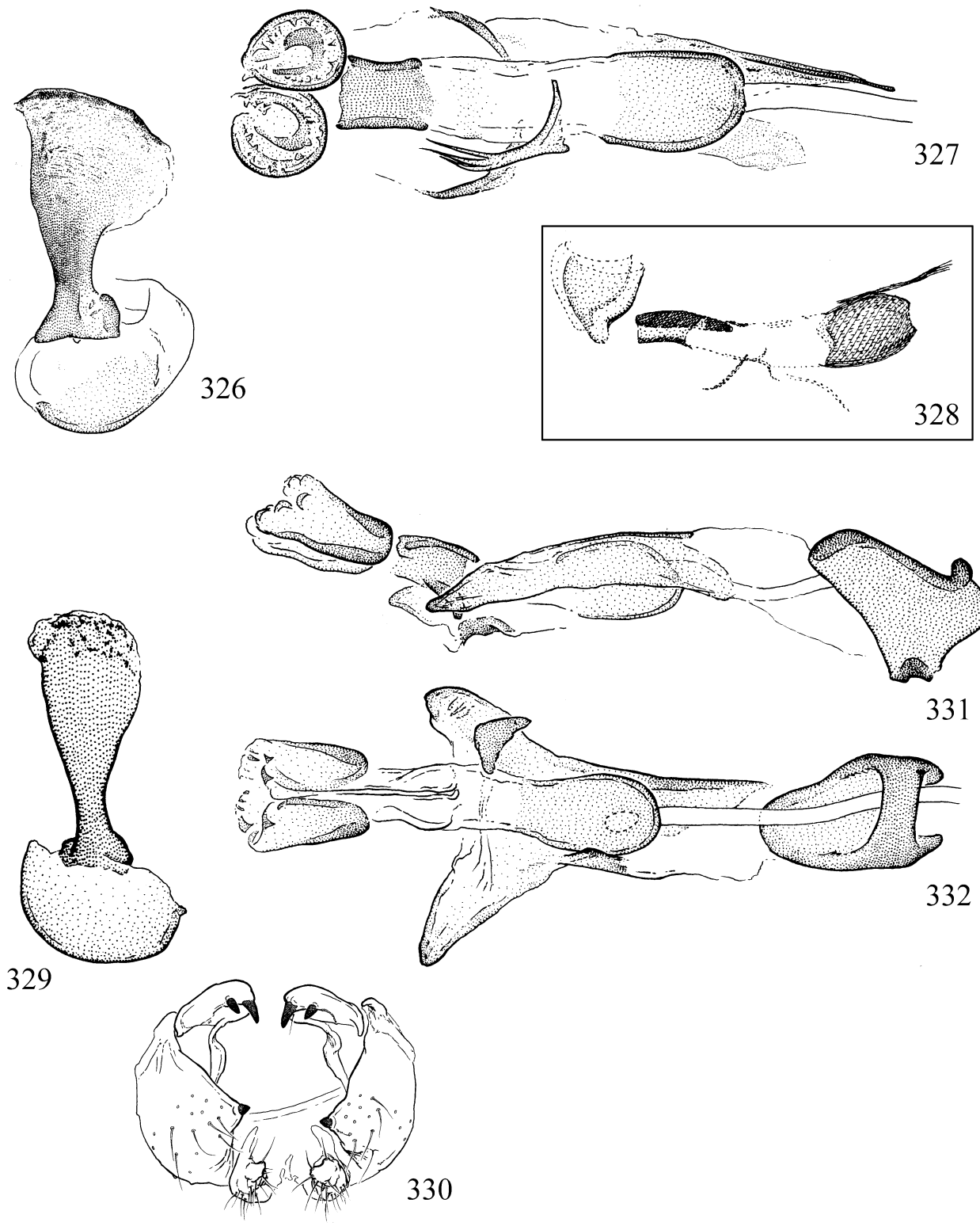
FIGURES 303–306: *Liriomyza sativae* Blanchard, male genitalia (Lonsdale 2011: figs 6–9); **303**: ejaculatory apodeme; **304**: external components, ventral; **305**: phallus, left lateral; **306**: phallus, ventral. **FIGURES 307–310:** *L. trifolii* (Burgess), male genitalia (Lonsdale 2011: figs 232–235); **307**: ejaculatory apodeme; **308**: external components, ventral; **309**: phallus, left lateral; **310**: phallus, ventral. **FIGURES 311–313:** *L. senecionivora* Sehgal, holotype male genitalia; **311**: phallus, left lateral; **312**: phallus, left lateral (Sehgal, 1971: fig. 60); **313**: phallus, ventral (Sehgal, 1971: fig. 61).



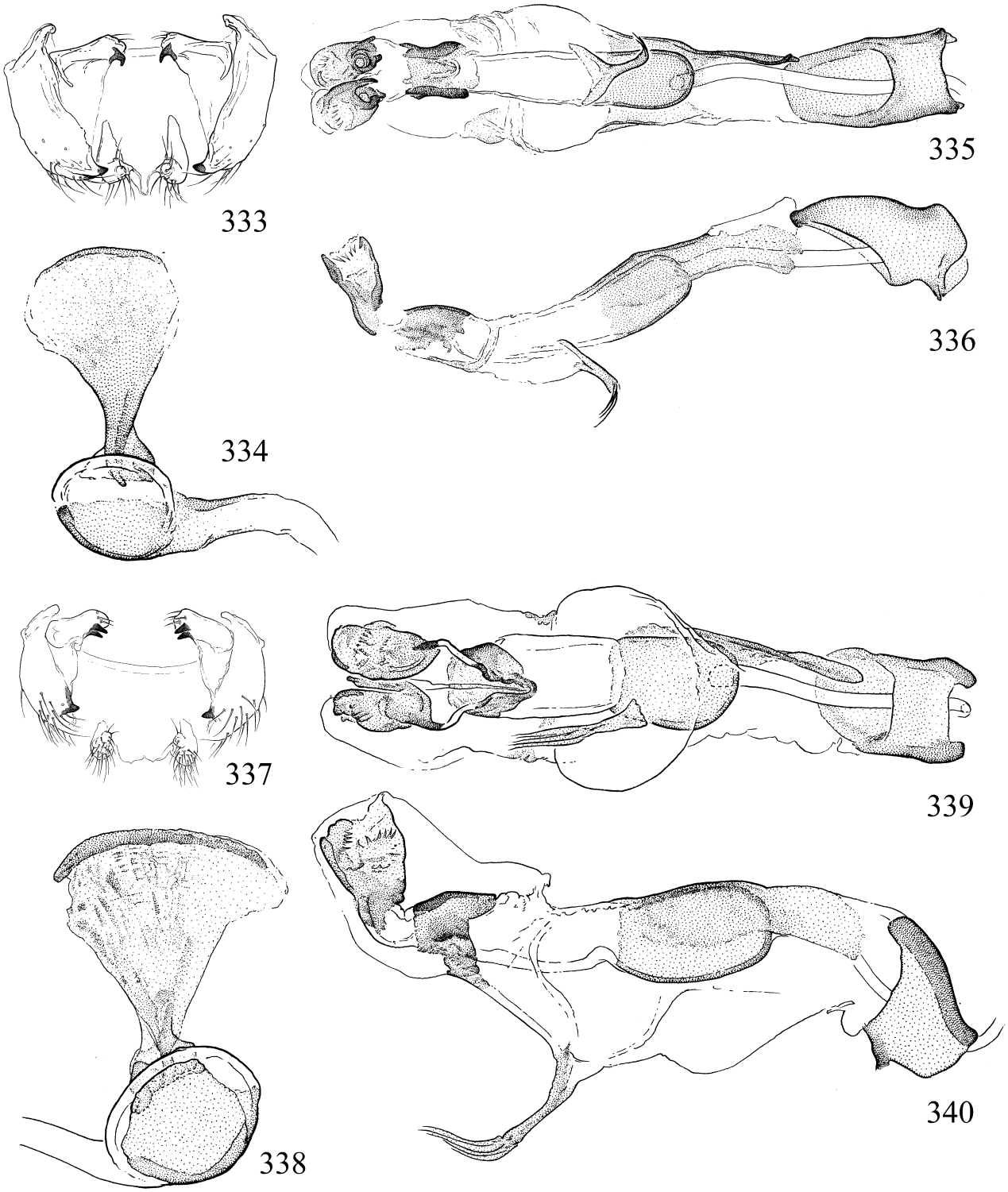
FIGURES 314–320: *Liriomyza temperata* Spencer, male genitalia; **314**: Brush Mt., VA, external components, ventral; **315**: same, ejaculatory apodeme; **316**: same, phallus, ventral; **317**: same, phallus, left lateral; **318**: holotype, external components, ventral; **319**: same, phallus, left lateral; **320**: same, phallus, ventral (Spencer & Steyskal 1986: fig. 806).



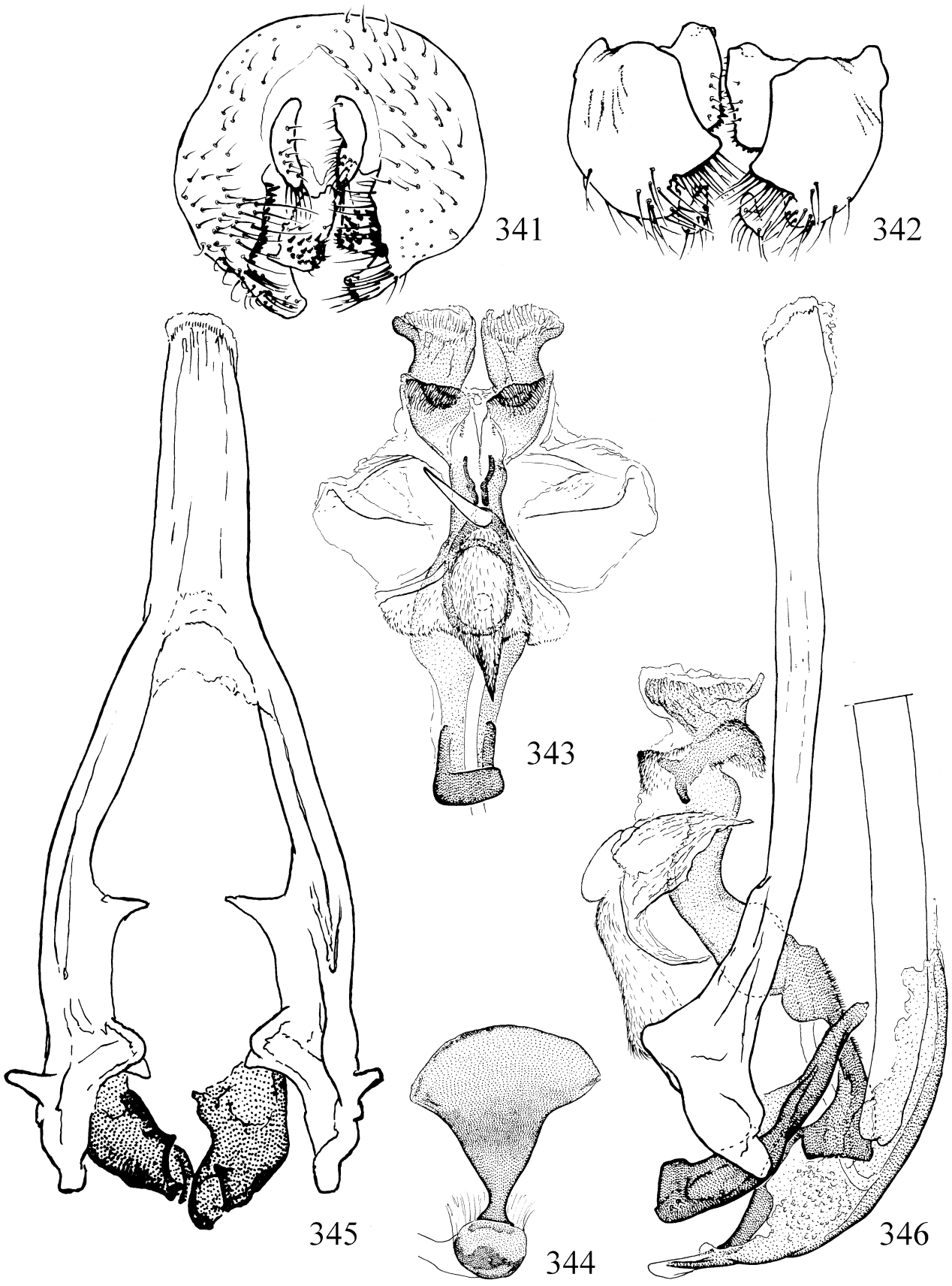
FIGURES 321–325: *Liriomyza tryssos* spec. nov., holotype male genitalia; **321**: external components, left lateral; **322**: external components, ventral; **323**: ejaculatory apodeme; **324**: phallus, ventral; **325**: phallus, left lateral.



FIGURES 326–328: *Liriomyza edmontonensis* Spencer, holotype male genitalia; **326**: ejaculatory apodeme; **327**: phallus, ventral; **328**: phallus, left lateral (Spencer, 1969: fig. 300). **FIGURES 329–332:** *L. trifoliearum* Spencer, male genitalia (Lonsdale 2011: figs 236–239); **329**: ejaculatory apodeme; **330**: external components, ventral; **331**: phallus, left lateral; **332**: phallus, ventral.



FIGURES 333–336: *Liriomyza huidobrensis* (Blanchard), male genitalia (Lonsdale 2011: figs 125–128); **333**: external components, ventral; **334**: ejaculatory apodeme; **335**: phallus, ventral; **336**: phallus, left lateral. **FIGURES 337–340:** *L. hilairensis* spec. nov, holotype male genitalia; **337**: external components, ventral; **338**: ejaculatory apodeme; **339**: phallus, ventral; **340**: phallus, left lateral.



FIGURES 341–346: *Liriomyza quadrisetosa* (Malloch), male genitalia; **341**: external components, posterior; **342**: same, ventral; **343**: phallus, ventral; **344**: ejaculatory apodeme; **345**: hypandrium and postgonite, ventral; **346**: hypandrial complex, left lateral.