# New Agromyzidae from Japan VII*

(with record of several little-known species)

By

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**Agromyza duchesneae sp. nov.**

Male and female. *Head* : Front including orbits at line on anterior ocellus 1⅓ times as wide as either eye, about ⅔ length between vertical angle and bases of antennae, its lateral sides slightly converging ventrally ; parafrontals very slightly convex, shiny, about 1/6 width of front, swollen slightly at bases of *or*-bristles, sides almost parallel, more or less narrowing ventrad. Ocellar triangle not so convex as parafrontals, equilateral, ventral tip almost located on level of first *ors*, dorsal side about ⅗ width of front, with nine to fifteen setulae; ventral angle of triangle containing three ocelli about 90°, length between dorsal two ocelli ⅓ width of front. Frontal lunule almost flattened, with convex dorsal arch of frontalia, middle line narrowly concave and contiguous to carina, somewhat lower than semicircular, its height lower than ⅓ length between its dorsal margin and ventral ocellus, ventral width ⅓ width between eyes on its level. Fronto-orbital bristles four pairs; *ors* two, first *ors* directed up- and outward, second upward and somewhat outward, located behind middle level of front; *ori* two (rarely three on one side), approximating to orbits than *ors*, first *ori* directed upward, second in- and upward, located on level of dorsal margin of lunule; length between first *ors* and *vti* as long as or slightly longer than length between first and second *ors*. Orbital hairs minute, arranged in a row, directed dorsally. In profile (Fig. 1, a) parafrontals and parafacials not visible; face weakly concave and slightly beyond on facial ridge, vibrissal angle very weakly prominent; subcranial margin short, more or less curved ventrally ; cheeks in middle part about 1/10 eye height; eyes oval, with very sparse minute hairs. Face as heigh as width between eyes on level of bases of antennae ; carina narrow, less than ½ height of face ; parafacials linear. Vibrissae long, peristomal setae arranged in two rows, ventral row with three setae, anterior one relatively long and posteriorly shortening, dorsal row usually with five setulae and approximating to ventral row. Antennae in profile located on middle level of eyes, bases slightly separated from each other by a carina; third antennal segment almost as long as broad, with microscopic pile; arista about 2½ times as long as antennae, basal one-sixth swollen, with minute microscopic

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pubescence. Palpi normal, with two short setae at tip; proboscis normal.

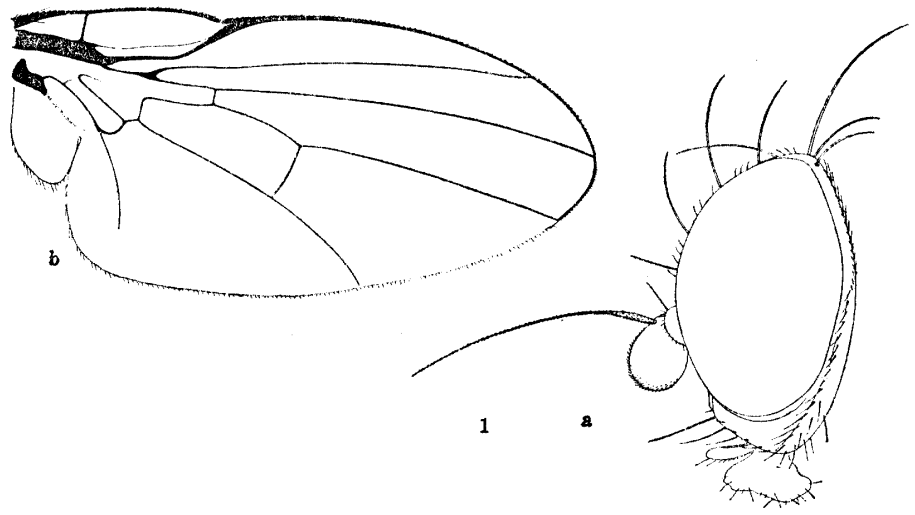



Fig. 1. *Agromyza duchesneae* n. sp., a : head in profile ; b : wing.

*Thorax* : Mesonotum with only two *dc* behind transverse suture, second shorter than first and almost located on level of a paired *sa*; *acr* arranged densely in ten rows, almost regularly, but number of rows gradually decreasing posteriorly from second *dc* and inner four rows of them ending just before line of a paired *prsc*; *prsc* about ½ length of first *dc*; five to six rows of setulae arranged between *dc* and *ia*; *ia* one, accompanying with two short setae before it ; *pa* two, inner *pa* less than ⅓ length of outer. Mesopleura with a long *mspl*, two short setae, four to seven posteriorly directed setulae along caudal margin and eight to ten dorsally directed setulae below dorsal margin; sternopleura with a long *stpl*, four (rarely five) relative long setae (anterior one short) and seven to eight setulae.

Wing : Costa reaching to the termination of $m_{1+2}$ (Fig. 1, b); length of second, third and fourth sections of costa about 3 : 1 : 0.7; wing tip located between $r_{4+5}$ and $m_{1+2}$ but distinctly nearer to $r_{4+5}$ than $m_{1+2}$ ; $r_{2+3}$ slightly curved at middle part, $r_{4+5}$ and $m_{1+2}$ curved; $m_{1+2}$ diverging from $r_{4+5}$; *ia* situated slightly before the level of termination of $r_1$ and distinctly before middle of Cd; ultimate section of $m_{1+2}$ more than 2½ times as long as the penultimate, ultimate section of $m_{3+4}$ about ¾ length of penultimate.

Leg : $t_1$ with a posterodorsal bristle, $t_2$ with two distinct posterodorsal bristles.

*Abdomen* : Oval; marginal setae longer; sixth tergite of male almost as long as the fifth but that of female slightly longer than fifth.

Genitalia : Ninth tergite ½ length of sixth tergite ; surstyli turned inward, with about twenty-five short spines on inner side ; cerci large, about ⅘ height of ninth

tergite, slightly constricted at middle part and broadened ventrally.

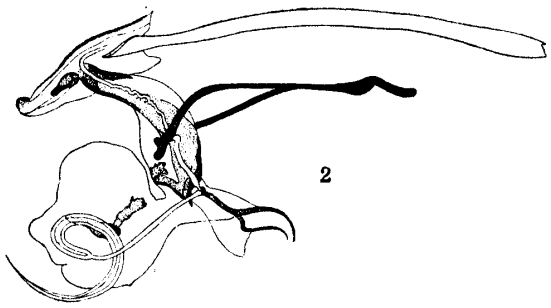



Fig. 2. Male genitalia of *Agromyza duchesneae* n. sp.

Aedeagal apodeme anteriorly extending to middle of third segment; aedeagal hood bearing minute spines on dorsal tip (Fig. 2). Phalls moderately long; basal section long, ventral processes distinct; median section short; distal section long, forked and dorsally curved. Pregonites broadly united to ninth sternite, bearing two sensory pores. Postgonites with five sensory pores at basal part and a setula near at tip. Ninth sternite curved dorsally, hypandrial apodeme slightly elongate, subtriangular.

Basal segment of ovipositor trapezoidal, dorsal side 1/3 and ventral 3/5 length of sixth tergite; cerci with several setulae.

*Coloration* : Head black; frontalia soot-black, somewhat brownish; ocellar triangle and parafrontals shining black, also occiput, face and subcranial margin black. Frontal lunule black in ground color, glimmering with silver colour; face somewhat shiny; cheeks brownish black. Antennae black, arista brownish. Palpi black; proboscis brown.

Thorax black, densely dusted with gray, slightly shiny. Pleura also black, gray-dusted, mesopleural suture and base of wing brown. Wings hyaline, veins brown; calypteres dirty white, with margin and fringes brownish black; halteres with knob pale yellow, but stem pale brown. Legs black, proximal end of tibiae slightly brownish.

Abdomen black, shiny, sparsely gray-dusted than mesonotum. Ninth tergite of male and basal segment of ovipositor shiny black; cerci of male brownish black and that of female pale brown.

*Length* : Body 2.5 (♂)-2.9 (♀) mm.; wing 2.6 (♂)-3.0 (♀) mm.

*Larva* : Dark yellow, 2.7 to 3.0 mm. in length, about 0.8 mm. in width. Cephalopharyngeal sclerites (Fig. 3, a) black; mandibles each with two strong teeth, almost equal in size; paraclypeal phragma brownish black, with dorsal horn broadened, dorsal arm curved, ventral arm almost straight, each arm approximating posteriorly, ventral horn pale brown, distinctly shorter than dorsal. Anterior spiracles small, knoblike, each with six to seven bulbs (Fig. 3, b); posterior spiracles moderately large, each with about ten bulbs in circular (Fig. 3, c). Abdominal cuticular processes pointed, directed posteriorly, arranged in about four rows, processes of anterior two rows large

but that of posterior two small. Posterior end with two pairs of small rounded tubercles ventrad of posterior spiracles.

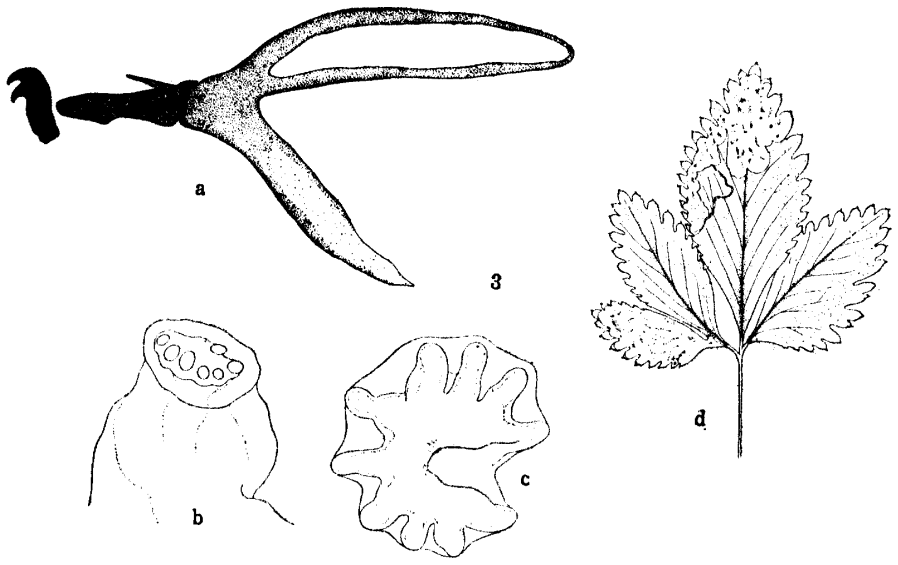



Fig. 3. Larval characters of *A. duchesneae* n. sp., a : cephalopharyngeal sclerites ; b : anterior spiracle ; c : posterior spiracle ; d : mines of *A. duchesneae* on leaves of *Duchesnea indica* F.

Puparium : Dark brown, 2.5 to 3 mm. in length, 1.0 to 1.2 mm. in width of third abdominal segment; oval, in profile dorsal side arched, ventral flattened, segmentation distinct; anterior and posterior spiracles prominent, two pairs of anal small tubercles slightly prominent.

Habitat : Japan (Honshu, Hokkaido).

Holotype : 1 ♂ ; May 31, 1954, Katsura, Kyoto. Allotopotype : 1 ♀ ; June 3, 1954 ; paratypes : 2 ♂♂, 3 ♀♀, May 31, 1954 ; 6 ♂♂, 10 ♀♀, June 1-3, 1954, same locality of holotype ; 1 ♀, June 11, 1954, Ashoro, Hokkaido.

The present new species is related to *A. igniceps* HENDEL from Europe and *quercus* SASAKAWA from Japan in having the gray-dusted thorax and the calypteres with margin and fringes blackish brown. But the key points 7 of HENDEL'S Table (*in* Lindner, Die Flieg. pal. Reg., 59 (54), p. 94) is modified by the addition of two species as follows :

7. Schüppchen dunkel gerandet und gewimpert .....7a.
- Schüppchen hell gerandet und gewimpert, weisslich bis ockergelb .....8.
7a. Mesonotum mit 3+1 dc. Mittelschienenbörstchen fehlen. r-m etwas jenseits der Mitte der Cd stehend .....*igniceps* HEND.
- Mesonotum mit nur 2 dc hinter der Naht. $t_2$ posterodorsal mit 2 abstehenden Börstchen. r-m vor der Cd-Mitte .....7b.
7b. Strieme schwarzbraun. Backen in der Mitte 1/15 eines Auges hoch. Sternopleure mit 1 starken und 1 schwachen Oberrandborsten .....*quercus* SASA.
- Strieme russig schwarz. Backen ca. 1/10 eines Auges hoch. Sternopleure mit 1 starken und 4 schwachen Borsten .....*duchesneae* n. sp.

*Ecological notes* : The larvae of this species mine on the leaves of *Duchesnea indica* FOCKE (Fig. 3, d). The mine is greenish white in color, linear-blotch and upper surface type, first linear mine is 0.3 to 1.5 mm. in width, broadening gradually, 40 to 50 mm. in length. At first, the larva mines towards the centre of leaf or along the margin of leaf, because the egg is laid at near the leaf margin. Before the mine changes into the irregular blotch type, it is approximating to each other such as the intestine. The grains of frass are sparsely scattered, but sometimes continued as a row in the linear mine. The full-grown larva abandons his mine to transform and the pupation is taken place in the ground. A mine is seen on a single leaf. The larvae are found early in May and late in June.

**Phytomyza kisakai sp. nov.**

Female. *Head* : Front at line on anterior ocellus 1⅔ times as wide as either eye and almost as long as the length between vertical angle and bases of antennae (15 : 14.5), its lateral sides distinctly converging ventrally, front on level of bases of antennae ⅗ its dorsal width and as wide as either eye; parafrontals slightly convex, width on upper part about ¼ width of front, sides distinctly narrowing ventrally. Ocellar triangle convex, dorsal side about ½ width of front, ventral tip obtuse and beyond the level of first *ors*, ventral ocellus situated behind level of first *ors*; *oc* long, almost equal in size with second *ors* ; three setulae bearing between each ocellus. Frontal lunule small, semicircular, its height ¼ the length between its dorsal margin and ventral ocellus, ventral width about ½ width between eyes on its level. Fronto-orbital bristles four pairs, arranged on middle line of parafrontals; *ors* two, first pair ⅘ length of second, directed up- and outward, second pair directed upward, located behind middle level of front; *ori* two, first pair directed in- and upward, second inward, located on level of dorsal margin of lunule; length between first *ors* and *vti* almost as long as the length between first and second *ors* or second *ors* and first *ori* (3.3:3). Orbital hairs arranged in a row between first *ors* and second *ori*, directed downward. In profile (Fig. 4, a) dorsal half of parafrontals slightly beyond linearly on eye but parafacials near bases of antennae not visible ; epistoma visible on facial ridge, vibrissal angle weakly prominent, subcranial margin inclined steeply to ventral angle of occiput; cheeks in middle part abut ⅙ eye height; eyes oval, with sparse microscopic hairs. Face deeply concave, lower than width between eyes on level of bases of antennae; antennal grooves concave; epistoma small. Parafacials linear below antennae. Vibrissae long, accompanying with a setula above it and five peristomal setae along subcranial margin. Antennae in profile located on middle level of eyes,

bases approximating to each other; third segment small, rounded, almost as long as broad, with microscopic pile; arista about 1⅔ times as long as antennae, swollen on basal one-third, with microscopic pubescence. Palpi normal, with two setae at tip; proboscis small.

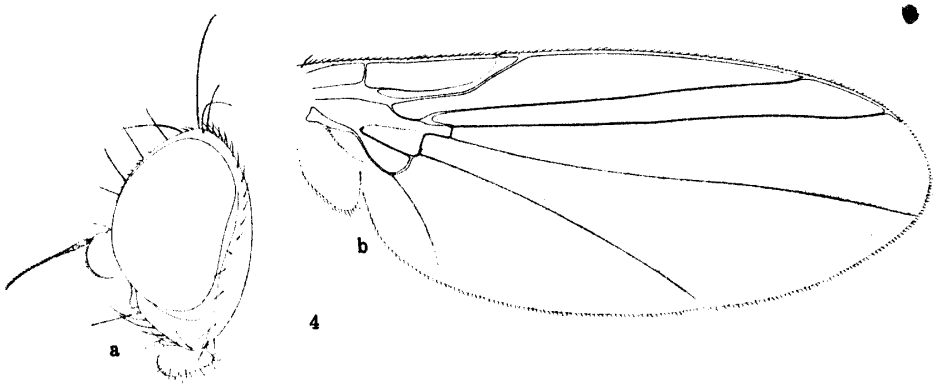



Fig. 4. *Phytomyza kisakai* n. sp., a : head in profile; b : wing.

*Thorax* : Mesonotum with 3 + 1 *dc*; third and fourth *dc* about ½ length of first, second *dc* slightly before level of paired *sa*, length between first and second *dc* 1⅓ times as long as length between second and third, fourth before level of *prs*; *acr* in four irregular rows extending posteriorly just behind the level of second *dc*, but four to five rows arranged irregularly before level of fourth *dc*; *ia* short, six setulae in three rows behind transverse suture; *sa* long, with two setulae before it; *pa* two, inner *pa* about ½ length of outer; *h* one, accompanying with four to six setulae. Mesopleura with a long *mspl* and two posteriorly directed setulae along caudal margin, and with seven to eight dorsally directed setulae below dorsal margin; sternopleura with a long *stpl* and a setula before it; *ppl* one; *npl* two, posterior one slightly shorter than anterior.

Wing : About 2⅖ times as long as wide; wing tip located between $r_{4+5}$ and $m_{1+2}$ but distinctly nearer to $m_{1+2}$ than $r_{4+5}$; length of sections 2, 3 and 4 of costa about 2.8 : 1 : 1.2, $r_{2+3}$ almost straight, $m_{1+2}$ slender, diverging from $r_{4+5}$ (Fig. 4,b).

Leg : $t_2$ without posterodorsal bristle.

*Abdomen* : Suboval; each tergite with sparse setae, longer marginal setae arranged sparsely; sixth tergite longer than fifth. Basal segment of ovipositor conical, as long as sixth tergite, distal one-half with short setae.

*Coloration* : Head black; front, ocellar triangle, occiput, lunule, face and antennae black, genae and arista brownish black; palpi black, proboscis sombre white.

Mesonotum, scutellum and pleurae black, densely dusted with gray, only dorsal and caudal margins of mesopleura and wing base white. Wings hyaline, veins brown; calypteres dirty white, slightly brownish, with margin and fringes blackish; halteres

whitish yellow. Legs black, distal end of $f_1$ distinctly yellowish, those of $f_2$ and $f_3$ slightly brownish, proximal end of tibiae slightly yellowish.

Abdomen concolor with mesonotum, but caudal one-third of sixth tergite white; basal segment of ovipositor shining black.

*Length* : Body about 2 mm. ; wing 2⅓ mm.

*Larva* : Yellow in color; about 3 mm. in length, 1⅕ mm. in diameter. Antennae and palpi brown. Cephalopharyngeal sclerites (Fig. 5, a) black; mandibles black, each with two teeth, apical tooth larger than basal one, alternated, right mandible distinctly larger than left one; paraclypeal phragma with dorsal arm of dorsal horn 3⅕ times the length of labial sclerite, slightly curved dorsally, gradually narrowing posteriorly and becoming paler, ventral arm very slender and short; ventral horn weakly brownish colored, about ⅔ length of dorsal horn, nearly straight. Anterior spiracles small mushroom-shaped in lateral view, bases approximating to each other, each with twenty bulbs (Fig. 5, b). Posterior spiracles relatively large, slightly projecting, each with thirty-nine to forty-four bulbs divided into ten groups (Fig. 5, c). Abdominal cuticular processes minute; bands narrow. Posterior end truncate; anal lobes rounded.

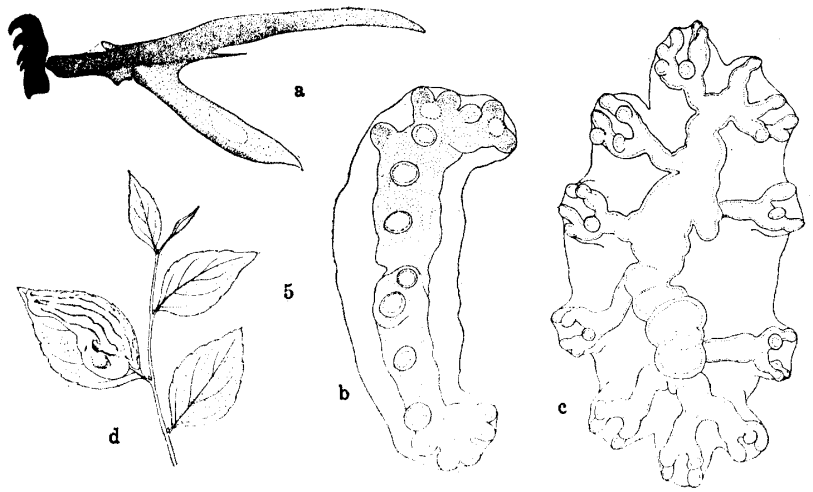



Fig. 5. Larval characters of *P. kisakai* n. sp., a : cephalopharyngeal sclerites; b : anterior spiracle; c : posterior spiracle; d : mine on a leaf of *Styrax japonica* S.-Z.

*Puparium* : Dark brown, 1.8 to 1.9 mm. in length, 1.0 to 1.2 mm. in width of third abdominal segment; oval, prothoracic segment prominent in conic, each anterior spiracle projecting on its cephalolateral angles, in profile ventral side flattened, dorsal arched; segmentation distinct, stems of posterior spiracles projected and diverged from each other.

Habitat : Japan (Honshu).

Holotype : 1 ♀, April 6, 1953, Mt. Daihi, Kyoto; reared by myself, dry, deposited in the Entomological Laboratory of Saikyo University.

The new species is allied to the leaf-miner on *Medicago*, *P. medicaginis* HERING and also Japanese species on *Ilex*, *P. jucunda* FROST et SASAKAWA, but may be easily separated from those allied species by the following points : (HENDEL'S Table, *in* Lindner, Flieg. pal. Reg., 59 (94), p. 509)

164. Hinter der Naht 6–11 ia-Härchen. Flügelwurzel und Pleuralnähte bleichgelb···164a.
— nur 1 ia-Härchen. Flügelwurzel und Pleuralnähte bräunlichgelb·····
····· *periclymeni* de MEIJ.
164a. acr etwa 6reihig. Mesopleure mit 3–4 aufgebogenen Härchen unter dem Oberrande. Vorderknie etwas rötlich gefärbt·····164b.
— acr 4reihig. Mesopleure mit 7–8 aufgebogenen Härchen. Vorderknie deutlich gelb.
····· *kisakai* n. sp.
164b. Hintere ors kürzer als die vordere; 2 ori. Backen + Wangen in der Mitte ¼ eines Auges hoch. Fühler schwarz····· *medicaginis* HERING
— Beide ors von gleicher Länge; 3 ori. Backen + Wangen ⅓ eines Auges hoch. Fühler schwarzbraun.····· *jucunda* FROST et SASAKAWA

This species is named in honor of Mr. RYOJI KISAKA.

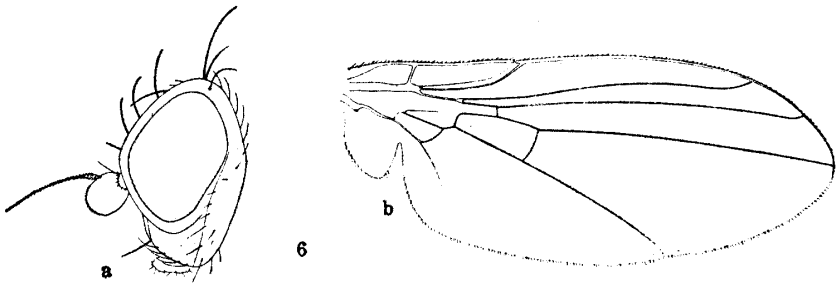
*Ecological notes* : The larvae mine on the leaves of *Styrax japonica* SIEB. et Zucc. (Fig. 5, d). The mine is a characteristic stigmatonome, upper surface type, somewhat physonome, whitish in color, it will be able to distinguish from the epidermal linear mine of *Melanagromyza styricicola* SASAKAWA on the same host-plant. It begins near at margin of leaf, runs along the margin and turns back closing beside each other like an intestine. The black line of grains of frass is short at first and is longer later on. The mature larvae abandon their mines to transform. A larva occupying a single leaf throughout the entire larval stage.

**Liriomyza cardamines sp. nov.**

Male. *Head* : Front including orbits at line on anterior ocellus 1⅘ times as wide as either eye, narrower than length between vertical angle and bases of antennae, its lateral sides converging ventrad, on level of bases of antennae 1½ times as wide as either eye; parafrontals about ¼ width of front, its sides parallel to level of second *ori*. Ocellar triangle convex, equilateral, dorsal side about ½ width of front, ventral tip reached or not to level of first *ors*. Frontal lunule small, semicircular, deeply concave, its height about ¼ length between its dorsal margin and ventral ocellus, ventral width less than ½ width between eyes on its level. Fronto-orbital bristles four pairs; *ors* two, directed upwards but second somewhat pointing inward, second

located before middle level of front; *ori* two, first *ori* directed in- and slightly upward, second shorter than first, directed inward and located on level of dorsal margin of lunule; length between first *ors* and *vti* about 1⅗ times between first and second *ors*. Orbital hairs minute, sparse, arranged in a row, erect, somewhat directed dorsally. In profile (Fig. 6, a) parafrontals and parafacials beyond on eye; face slightly visible on facial ridge, vibrissal angle weakly prominent; subcranial margin somewhat curved ventrally but inclined obliquely to ventral angle of occiput; cheeks in middle part about ⅓ eye height; eyes oval, bare. Face concave, lower than width between eyes on level of bases of antennae; antennal grooves deeply concave; epistoma small. Parafacials near base of antennae about ½ width of first antennal segment. Vibrissae long, accompanying with three to five short peristomal setae. Antennae in profile located below the middle level of eyes, bases approximate; third antennal segment rounded at apex, as long as broad, margin with microscopic pile; arista about 1⅔ times as long as antennae, basal one-sixth swollen in spindle-form, with minute microscopic pubescence slightly longer than pile on third segment. Palpi normal, two short setae bear at tip; proboscis small.

*Thorax* : Mesonotum with 3+1 *dc*, anterior two relative short, first *dc* longest and before level of *pa*, length between first and second *dc* 1½ times as long as between second and third *dc*, third and fourth as far apart as second and third, second *dc* before level of *sa*, fourth on level of *prs*; *acr* in two regular rows extending posteriorly to second *dc*, somewhat three rows between third and fourth *dc*; *ia* short, subequal to *acr*, accompanying with two setulae behind transverse suture; *sa* one, long; *pa* two, inner *pa* about ½ length of outer; *h* one, long, sometimes with a setula.

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Flg. 6. *Liriomyza cardamines* n. sp., a : head in profile; b : wing.

Mesopleura with a long *mspl* and two posteriorly directed setulae, and sometimes with a dorsally directed setula below dorsal margin; sternopleura with one long *stpl* and one to two dorsally directed setulae below dorsal margin; *ppl* one; *npl* two, posterior one shorter than anterior.

Wing : More than twice as long as wide (Fig. 6, b); costa terminating at wing tip, second section of costa about 3½ times as long as third or fourth section, which are of equal length or fourth slightly shorter than third; $r_{2+3}$ distinctly, $r_{4+5}$ and $m_{1+2}$ slightly curved; r-m situated before level of termination of $r_1$ and at middle of Cd; ultimate section of $m_{1+2}$ about 7 times as long as the penultimate; ultimate section of $m_{3+4}$ 2⅓ times as long as the penultimate.

Leg : $t_2$ without posterodorsal bristle.

*Abdomen* : Elongate oval; marginal setae longer, about ¾ of tergal length; sixth tergite as long as or slightly longer than fifth.

Genitalia : Ninth tergite subtriangular in lateral view, narrowing dorsally and dorsal angle somewhat prominent above sixth tergite; surstyli with five setae and a tuberculiform tooth curving inward. Cerci slender, with slender setae densely on ventral margin. Aedeagal apodeme extending posteriorly within ninth tergite; aedeagal hood relatively large and broad; epiphallus moderately large, slightly curved. Phallophore slightly extending anteriorly along aedeagal apodeme. Basal section of phallus long, tubular, with hook-shaped processes bifurcating near the apex; median section short, tubular; distal section expanded in spherical form.

*Coloration* : Head yellow, frontalia, parafrontals, lunule and antennae darker; ocellar triangle black, its dorsal side contiguous to black occiput; black of occiput reaching eye margin in short length dorsad of the median posterior curve and not reaching ventrally to its ventral margin; both *vt*-bristles arising from the yellow area of vertex, but *vte* just before the edge of black area; face and cheeks pale yellow; arista dark brown; anteclypeus pale brown; palpi and proboscis yellow.

Mesonotum shiny black, faintly dusted with whitish-gray, extending laterally to humeri, *prs* and *sa*-bristles, *prs* growing at the edge of black area, *sa* arising from black; black of mesonotum extending in a curve from outer *pa*-bristles to scutellum, so that both *pa* on the boundary between black and yellow areas and the posterolateral angles of mesonotum broadly yellow; humeral callus with a small brown spot, *h* and setula on yellow; lateral stripe from notopleura to outer *pa* yellow. Scutellum yellow, with lateral black triangles small, both *sc*-bristles arising from the yellow. Pleura yellow; mesopleura with a small brown triangle about one-fourth its anterior height and one-third its ventral width, pale brown lines running faintly on anterior half and narrowly along base of *mspl*; sternopleura with an equilateral black triangle about four-fifths its height; pteropleura with an elongate posteriorly curving pale brown stripe below the wing base; hypopleura posteriorly about one-half black. Wings hyaline, veins brown; calypteres whitish yellow, with margin and fringes black-

ish. Legs with coxae and femora yellow but pale brownish spots in places, tibiae and tarsi pale brown but hind-tibiae darker, proximal end of tibiae yellow.

Abdomen shining blackish brown, all tergites laterally yellow, yellow caudal margin broadest in sixth tergite (about ½), about ⅖ in fifth and gradually narrowing anteriorly, almost linear in first and second segments; male genitalia shining dark brown, cerci pale yellow.

*Length* : Body 1⅗ mm.; wing 1⅔ mm.

Habitat : Japan (Honshu).

Holotype : 1 ♂, May 25, 1953, Kibune, Kyoto; paratype : 1 ♂, same date as holotype; reared by myself, dry, deposited in the Entomological Laboratory of Saikyo University.

This new species is allied to *L. congesta* BECKER in having the both *vt*-bristles arising from the yellow area of the vertex and two black triangles of the sterno- and hypo-pleura are broadly separated from each other by the yellow area above coxae. But this species may be separated from the allied species by the parafrontals and parafacials in profile distinctly visible beyond on eye, second *dc*-bristle one and one-half times as far from the first as the third is from the second, humeral callus usually without setula, ultimate section of $m_{3+4}$ two and one-third times as long as the penultimate, sixth tergite almost as long as the fifth, and dorsal half of postorbits with short distance black. Also, *L. centaureana* HERING is closely similar to *congesta* but *cardamines* may be distinguished by the inner *pa*-bristles growing on the boundary between yellow and black areas from the former.

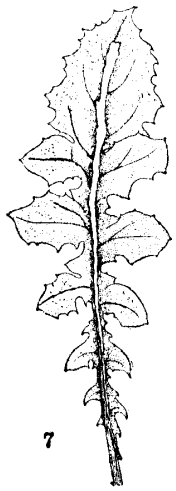


Fig. 7. Mine of *L. cardamines* n. sp. on a leaf of *Cardamine scutata* THUNB.

*Ecological notes* : The larvae mine on the leaves of *Cardamine scutata* THUNB. (Fig. 7) and are found twice : the middle of April and early in June. The type of mine is asteronome such as *L. strigata* MG., but may be distinguished by the following points from the latter : the mine running directly above the middle vein throughout its mining life and not forking at the points where lateral veins branch off ; isolated grains of frass are scattered in the center of mine. The mine is 6 to 8 cm. in length, 1 to 2 mm. in width and is whitish in color. The mature larva pupate in the end of mine and pupa is white in colour.

**Liriomyza takakoae sp. nov.**

Male and female. *Head* : Front including orbits at line on anterior ocellus about 1½ times as wide as either eye, slightly narrower than length between vertical

angle and bases of antennae (12 : 13), its lateral sides evidently converging ventrad, on level of bases of antennae slightly broader than or as wide as the width of eye; parafrontals slightly convex, about 1/5 width of front, sides somewhat converging ventrally from level of first *ori*. Ocellar triangle convex, equilateral, dorsal side 1/2 width of front, ventral tip not reached to level of first *ors*. Frontal lunule deeply concave below its surrounding margin of frontalia, its height about 1/2 length between its dorsal margin and ventral ocellus, ventral width 1/2 width between eyes on its level. Fronto-orbital bristles four pairs; *ors* two, directed up- and slightly outward, first *ors* somewhat shorter than second, second located slightly before middle level of front; *ori* two(rarely three), approximating to orbits than *ors*, directed in- and upward, second short; length between first *ors* and *vti* 1 3/5 times to twice the length between first and second *ors*. Orbital hairs minute, arranged sparsely in a row from first *ors* down to beyond second *ori*, erect, somewhat directed dorsally. In profile (Fig. 8, a) parafrontals very slightly beyond on eye, parafacials nearly not visible; face weakly concave and beyond on facial ridge, vibrissal angle weakly prominent; subcranial margin fall back obliquely on ventral angle of occiput; cheeks in middle part 1/6 eye height; eyes oval, with very sparse minute hairs. Face as heigh as width between eyes on level of bases of antennae; carina narrow, not distinct. Parafacials line-like, near bases of antennae about 1/5 width of face. Vibrissae long, accompanying with a row of four to six short peristomal setae mingled with one or two setulae. Antennae in profile located near by middle level of eyes, bases approximating to each other; third antennal segment subspherical, margin with microscopic pile; arista about twice as long as antennae, basal one-fifth swollen, with minute microscopic pubescence. Palpi normal, two short setae bear at tip; proboscis small.

*Thorax* : Mesonotum with 3+1 *dc*, anterior two relative short, length between first and second *dc* 1 3/5 times as long as between second and third *dc*, fourth *dc* before level of *prs*; *acr* in four rows extending regularly to second *dc*, two to five setulae of outer two rows ending before level of first *dc* and directed inward; *ia* short, about 2/3 length of fourth *dc*, with six to nine setulae in irregular two rows behind transverse suture ; *prsc* absent; *sa* one, long accompanying with a setula before it; *pa* two, inner *pa* distinctly shorter than outer; *h* one, long, with three to six setulae. Mesopleura with a long *mspl*, two posteriorly directed setulae and about eight (6-10) dorsally directed setulae below dorsal margin; sternopleura with a long *stpl* and one to two setulae; *ppl* one; *npl* two, posterior one shorter than anterior.

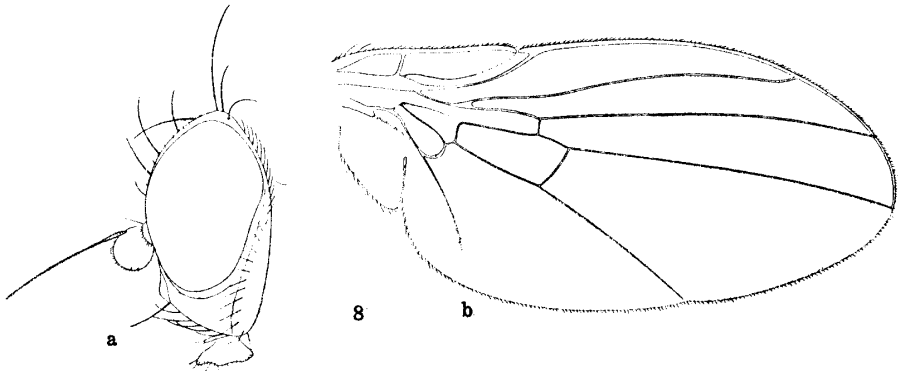



Fig. 8. *Liriomyza takakoae* n. sp., a : head in profile; b : wing.

Wing : Costa reaching to $m_{1+2}$, length of sections 2, 3 and 4 of costa about 3 : 1 : 0.8; $r_{2+3}$ curved on distal three-fourths; $r_{4+5}$ and $m_{1+2}$ slightly curved; $m_{1+2}$ diverging from $r_{4+5}$ and ending at wing tip; r-m situated almost under the termination of $r_1$ and far beyond middle of Cd; ultimate section of $m_{1+2}$ about 9 times as long as the penultimate; ultimate section of $m_{3+4}$ about twice as long as the penultimate (Fig. 8, b).

Leg : $t_2$ without posterodorsal bristle.

*Abdomen* : Elongate oval; with many setae, marginal setae longer; sixth tergite longer than fifth (♂, ♀).

Genitalia : Ninth tergite in profile subrectangular, with a short spine on each posterolateral angle; a heavy long spine united within ninth tergite by membrane projecting on each posteromesal part; surstyli separated from ninth tergite by a suture, directed inward, bearing many short setae; cerci slender, ½ height of ninth

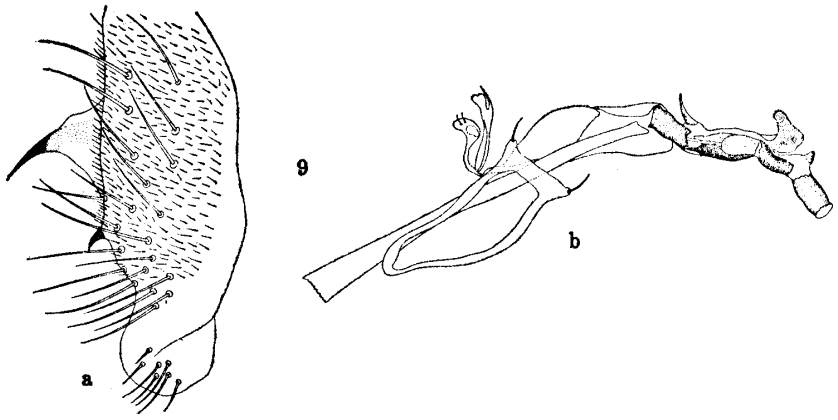



Fig. 9. Male genitalia of *L. takakoae* n. sp., a : ninth tergite, lateral view; b : phallus.

tergite. Aedeagal apodeme extending anteriorly to anterior margin of fourth tergite; epiphallus large, slightly curved; aedeagal hood large, anterior part broad. Phallophore small, tubular; phallus moderately sclerotized, basal section long, tubular, with a spine on posterior membrane and a tubercle bearing numerous minute spines on

anterior membrane, median section short, tubular, with a small tubercle, distal section tubular. Ninth sternite curved vertically, anterior end curved dorsally and posterior slightly curved ventrally, V-shaped. Pregonites broadly united to ninth sternite, each with a distinct seta; postgonites with inner processes broadened ventrally, bear two setulae.

Basal segment of ovipositor conical, shorter than sixth tergite, its apical margin and ventral side setigerous.

*Coloration* : Head yellow; frontalia orangish yellow; both *vt*-bristles arising from the dark brown area and this area contiguous to the same color between base of *or*-bristles and orbits but becomes paller gradually ventrad from first *ori*; lunule brownish yellow, antennae yellow, and margin of third segment slightly orangish; cheeks yellow, subcranial margin dark brown; face and arista dark brown, epistoma whitish yellow narrowly; occiput black, reaching eye margin immediately dorsad of median posterior curve and extending dorsally to vertex, but narrow part between eyes and row of postorbital setae ventrad of its median curve yellow; palpi yellow, with its tip brownish; proboscis pale yellow.

Mesonotum shiny black, slightly dusted with gray, extending laterally nearly to humeri, slightly beyond *prs* and far beyond *sa*; humeral callus with base of *h* and a number of setulae brown, lateral stripe from dorsal and ventral margins of humeri to caudolateral angles of mesonotum yellow, but laterad of *sa* dark brown, outer *pa* growing on the boundary between black and yellow areas but inner *pa* on black area. Scutellum yellow, with lateral brownish black triangles, basal *sc*-bristles arising from the edge of this triangles, but on the black. Pleura black, dorsal and caudal margins of mesopleura narrowly yellow; sternopleura entirely black; metapleural callus blackish brown. Wings hyaline, veins brown, but origins of costa and radius yellow; calypteres yellowish white, with margin and fringes blackish brown; halteres yollow. Legs brownish black, all knees yellowish, tarsi brownish.

Abdomen shining blackish brown, lateral and caudal margins of anterior five tergites very narrowly whitish, caudal yellow margin of sixth tergite of female more broader than that of other tergites but male without yellow margin; pleural membrane yellow.

*Length* : Body 2 mm.; wing 1⅘ mm.

*Larva* : Yellow; about 3 mm. in length, 0.7 mm. in broadest segment. Cephalopharyngeal sclerites (Fig. 10, a) black; mandibles with two teeth on each, terminal tooth somewhat stronger, alternating; paraclypeal phragma with dorsal arm of dorsal horn brown, anterior one-third black, narrow, slightly curved and ventral arm very

slender, almost straight; ventral horn slightly brownish, 5/8 length of dorsal horn. Longitudinal sclerite broad; antennae, maxillary palpus and sensory pores pale brown. A patch of circular processes bearing a sharp-pointing setulae arranged dorsad of longitudinal sclerite.

Anterior spiracles pale brown, small, knoblike, each with five to six bulbs (Fig. 10, b); posterior spiracles brown, each with three bulbs, dorsal two bulbs oval, ventral one distinctly elongated ventrad, falcate, and about two times as long as dorsal one (Fig. 10, c). Abdominal cuticular processes small (Fig. 10, d), those on lateral sides blackish brown, distinct, more or less larger than those on other sides; usually three rows on anterior margin of each segment, processes of anterior row more larger

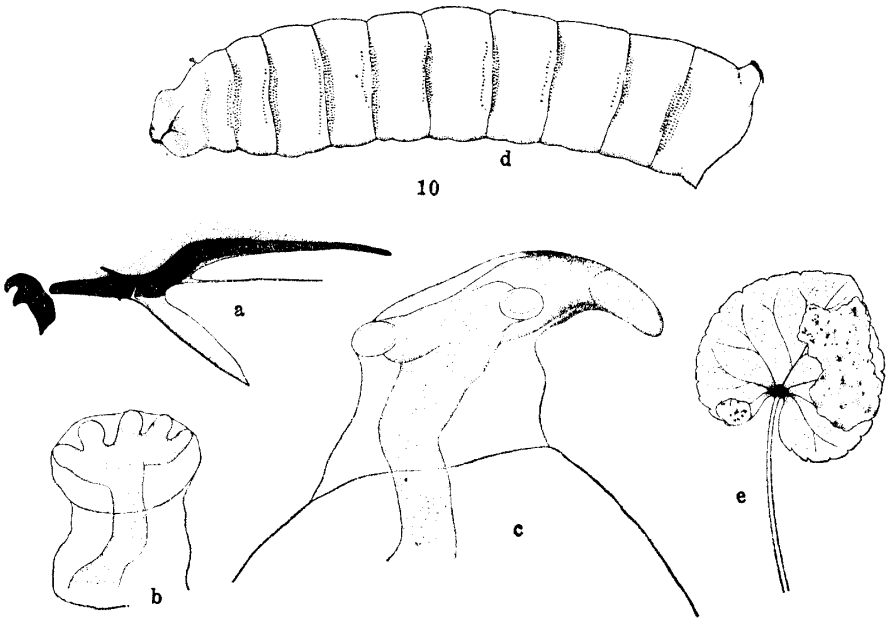



Fig. 10. Larval characters of *L. takakoae* n. sp., a : cephalopharyngeal sclerites; b : anterior spiracle; c : posterior spiracle; d : full grown larva, lateral view; e : mines on a leaf of *Viola nipponica* M.

than those of other rows, posterior ones smallest; one row on posterior margin but two rows on third thoracic and eighth abdominal segments, those processes as large as those of middle row on anterior margin. Posterior end without tubercles; anal lobes rounded, papillate.

*Puparium* : Dark brown; oval, in profile ventral side weakly curved; intersegmental constriction distinct; each spiracle and anal papilla projected, bases of anterior spiracles separating from each other, stems of posterior spiracles diverging caudad, hook-shaped in profile.

Habitat : Japan (Honshu).

Holotype : 1 ♂ ; July 3, 1954, Kibune, Kyoto. Allotopotype : 1 ♀ ; July 2, 1954;

paratypes : 5 ♂♂, July 2-4, 1954, 3♂♂ 3♀♀, July 7, 1954, same locality as holotype; 1♀, June 29, 1953, Mt. Omine, Nara Pref., reared by myself, dry, deposited in the Entomological Laboratory of Saikyo University.

The present new species is most closely related to *L. pedestris* HENDEL and has in common with it the *vt*- and *or*-bristles growing on the black ground, and femora and metapleural callus black. But, in HENDEL'S Table (1931, *in* Lindner, Die Flieg. pal. Reg., 59 (58), p. 200), it will be throw in the following point with the characters of this new species :

32. Beide vt auf schwarzbraunem Grunde, davor die Stirnorbiten±gebräunt. Metapleuralcallus schwarz.....32aa.
— Höchstens vte auf schwarzbraunem Grunde. Orbiten oben gelb. Matapleuralcallus gelb .....32a.
32aa. Gesicht gelb. Mesopleuren mit breitem gelben Oberrande (in ⅓-¼ der Pleurenhöhe). Letzter Abschnitt der $m_{3+4}$ 2½- bis 3mal so lang wie der vorletzte ..... ..... *pedestris* HEND.
— Gesicht schwarzbraun. Mesopleuren schwarz, nur oben und hinten linienartig gelb gesäumt. Letzter Abschnitt der $m_{3+4}$ ca. 2mal so lang wie der vorletzte..... .....*takakoae* n. sp.

The new species also differs from the known three *Viola*-miners from Europe by the following their characters : in *L. strigata* MEIG., orbits and femora yellow; in *violae* CURTIS, femora sulphuric in color on the underside, ultimate section of $m_{3+4}$ 2½ times as long as penultimate and r-m situated almost on middle of discal cell; in *violiphaga* HENDEL, front blackish brown and humeral callus entirely black.

This species is named in memory of birth of my baby, TAKAKO SASAKAWA.

*Ecological notes* : The larvae of this species make a blotch mines on the leaves of *Viola nipponica* MAXIM. (Fig. 10, e). Usually two or more larvae mine on a single leaf, thereby their mines unite with each other forming a very large mine which sometimes covers almost the entire surfaces of the leaf. The mines are usually on the upper surface, but the lower surface at places and are easily visible from the lower side and are whitish or green-whitish in color. The frass are scattered, but often the mines are filled with moisture and the frass become massed together in places, resulting in a darkened messy area. The full-grown larvae abandon their mines to transform. They make their exit through semicircular slits at the end of the mines, on the under surface of the leaf.

The mines of other species are produced on the host-plants belonging to the same genus *Viola* are differ very much from that of this species in the following points: in *L. strigata*, the mines are characteristic asteronome, they begin on the lower sur-

face near the margin of leaf and extending to the middle vein of leaf and more forking at the points where the lateral veins branch off; in *violiphaga*, they are the ophistigmatonome, the mature larvae abandon through the slits on the upper surface of leaf.

There are at least two generation during the summer. About the first of June the flies emerged from the overwintering puparia begin laying eggs. The larvae of the first generation may be seen maturing in their mines to the middle of June. About the end of June the adults of first generation begin to emergence and begin laying eggs for a second generation.

## Unrecorded species from Japan

### *Agromyza spiraeae* KALTENBACH

*Agromyza spiraeae* KALTENBACH, 1867, Verh. naturh. Ver. preuss. Rheinl. u. Westphal., 21 : 101; HENDEL, 1920, Arch. Naturgesch., A, 81 : 122; de MEIJERE, 1925, Tijdschr. Entom., 68 : 231; HERING, 1927, Tierw. Deutschl., 6 : 24; FRICK, 1952, Univ. Calif. publ. Ent., 8 (8) : 374.

*Agromyza potentillae* KALTENBACH, 1861, Verh. naturh. Ver. preuss. Rheinl. u. Westphal., 21 : 351 (as *Phytomyza*).

*Agromyza carbonaria* BRISCHKE, 1881 (*nec* ZETTERSTEDT, 1848), Schrift. Naturf. Ges. Danzig, 5 : 17, 19.

*Agromyza fragariae* MALLOCH, 1913, Ann. Ent. Soc. Amer., 6 : 307.

*Agromyza sanguisorbae* HENDEL, 1931, in Lindner : Die Flieg. pal. Reg. 59(56) : 149.

*Head* : Front including orbits at line on anterior ocellus 1⅗ times as wide as either eye, as long as the length between vertical angle and bases of antennae; parafrontals about ¼ width of front, sides almost parallel. Ocellar triangle with ventral tip almost on level of paired first *ors*, dorsal side ½ width of vertex. Frontal lunule concave, ⅓ length between its dorsal margin and anterior ocellus, its dorsal convex arch of frontalia bearing a row of minute hairs. Fronto-orbitals four to five pairs; *ors* two, first *ors* directed up- and outward, second up- and inward; *ori* two to three, first *ori* directed in- and upward, second and third inward. Orbital hairs arranged in a row, directed upward. In profile (Fig. 11) parafrontals and parafacials distinctly beyond on eye; cheeks in middle part about ⅕ eye height ; parafacials near bases of antennae as wide as the width of first antennal segment; carina distinct. Antennae with bases separated from each other; third segment subspherical, shorter than broad; arista about 1½ times as long as antennae.

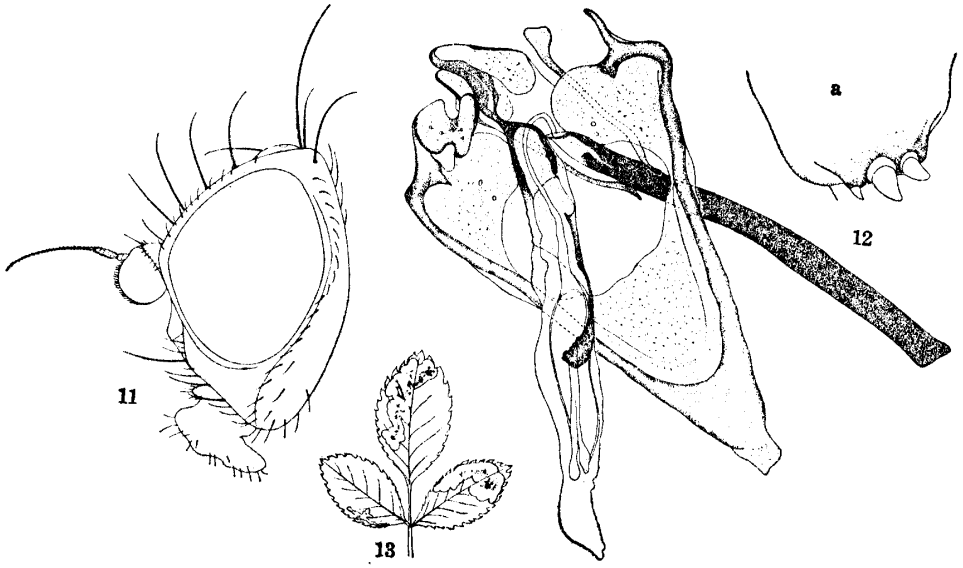
*Thorax* : Mesonotum with 3 + 1 *dc*, fourth *dc* before the level of paired *prs* and second on level of *sa*; six rows of *acr* arranged between third *dc*, four rows of them extending posteriorly to level of paired *prsc*, *prsc* long, *ia* one, *sa* one, *pa* two.

Mesopleura with a long *mspl*, two to three posteriorly directed short setae and eleven to twelve dorsally directed setulae; sternopleura with a long *stpl* and three to four setulae.

Wing : Costa reaching to $m_{1+2}$, second section of costa 4½ times as long as third; r-m located slightly beyond middle of Cd ; ultimate section of $m_{1+2}$ 3 to 3⅘ times as long as penultimate; ultimate section of $m_{3+4}$ about ¾ of penultimate and distinctly longer than length between two cross-veins (25 : 19).

Leg : $t_2$ without posterodorsal bristle.

*Abdomen* : Oval, with sparse setae, marginal setae longer; sixth tergite (♂, ♀) shorter than fifth. Cerci small; surstyli (Fig. 12, a) with three large spines. Basal segment of ovipositor trapezoidal, shorter than sixth tergite.




Figs. 11-13. *Agromyza spiraeae* KALT., 11 : head in profile; 12 : male genitalia, ventral view, a : surstylus, lateral view ; 13 : mines on leaves of *Rosa multiflora* T.

*Coloration* : Frontalia and cheeks reddish dark brown, parafrontals, occiput and face black, gray-dusted; parafacials blackish brown to black. Ocellar triangle shiny black; lunule whitish brown. Antennae brownish black, anterior margin of second segment and basal part of third somewhat brown; palpi black.

Thorax black, densely dusted with gray. Legs brownish black to black, knees of $f_2$ brown broadly but those of $f_1$ and $f_3$ slightly brownish, distal part of tibiae brown. Wings hyaline ; calypteres white, with margin and fringes dark brown ; halteres yellowish white.

Abdomen shiny black, slightly gray-dusted; sixth tergite with caudal margin brownish. Basal segment of ovipositor and ninth tergite shiny; cerci blackish brown.

Length : Body 2⅕ - 2⅘ mm.; wing 2½ - 3 mm.

Specimens examined : 2 ♂♂, 3 ♀♀, Feb. 9-10, 1952; 1 ♀, Nov. 12, 1952, Dogo, Matsuyama, Shikoku, T. Yano leg.

*Remarks* : My specimens on *Rosa multiflora* THUNB. were determined by Dr. HERING. He advised that Hendel described the true *spiraeae* KALT. (on *Sanguisorba*, *Filipendula*, *Potentila* etc.) as *sanguisorbae* n. sp. (*in* Lindner : Die Flieg. pal. Reg., 1931, 59 (56) : 149), because of he believed the true *spiraeae* is the species mining in the leaves of the genus *Spiraea* by the Kaltenbach's description. So that, *sanguisorbae* is the synonym of *spiraeae* KALT., and *spiraeae* KALT. mining only on the leaves of the subfamily Rosoideae (Fig. 13).

### *Melanagromyza pulicaria* MEIGEN

*Agromyza pulicaria* MEIGEN, 1830, Syst. Beschr. bekann. eur. zweifl. Insekt., 6 : 170.
*Melanagromyza pulicaria* (MEIGEN) : HENDEL, Arch. Naturgesch., A, 81 : 127; HERING, 1927, Tierw. Deutsch., 6 : 33; de MEIJERE, 1928, Tijdschr. Entom., 71 : 149; FRICK, 1952, Univ. Calif. Pub. Ent., 8(8) : 379.
*Melanagromyza morionella* SCHINER p.p., 1864 (*nec* ZETTERSTEDT, 1848), Fauna Austr., Fieg., 2 : 305; MELANDER, 1913, Jour. N. Y. Ent. Soc., 21 : 252.
*Melanagromyza olgae* HERING, 1922, Deutsch. ent. Zeitschr., 1922 : 424; HENDEL, 1923, Konowia, 2 : 142.

This species had been recorded from Europe, Siberia, Persia, China and western North America.

The larva of this species produces a characteristic mine which is limited to the middle vein of leaf of *Taraxacum officinale* L. and *Sonchus oleraceus* L. A single specimen was reared from the pupa on the leaf of *Lactuca debilis* MAXIM. by the author, but was identified by the comparison with a pair of European specimens was identified by Prof. Dr. E. M. HERING.

Head black; front including orbits about 1⅓ times as wide as either eye and slightly broader than length between vertical angle and bases of antennae. Ocellar triangle with ventral tip on middle level of front, not quite reached to level of paired second *ors*. Frontal lunule concave under convex dorsal margin of frontalia, its height about ¼ length between its dorsal margin and ventral ocellus. Fronto-orbital bristles four pairs; *ors* two, first *ors* directed up- and outward, second directed up- and inward, located before middle level of front; *ori* two, each directed up- and inward. Orbital hairs arranged densely in a row, directed upward. In profile parafrontals and parafacials not visible; vibrissal angle not prominent, subcranial margin curved ventrally; cheeks black, in middle part ⅛ eye height. Antennae black, in profile located somewhat below middle level of eyes, bases

approximating to each other ; third segment subspherical, with microscopic pile; arista about twice as long as antennae, swollen gradually on basal one-fourth, with microscopic pubescence.

Mesonotum shining black, with two *dc* behind transverse suture, second *dc* located almost on level of paired *sa* ; *acr* arranged densely, in eight rows before level of second *dc* and six rows of them extending posteriorly before level of first *dc*; *ia* one, long; *sa* one; *pa* two, inner *pa* about ⅓ length of outer; *h* one, long, with seven to eight setulae. Mesopleura with a long *mspl* and two posteriorly directed short setae along caudal margin, and with about nine setulae arranged in two rows obliquely from anterodorsal angle to base of *mspl*; sternopleura with two long *stpl* below dorsal margin and two setulae along caudal margin.

Wings hyaline; costa ending at termination of $m_{1+2}$; wing tip located between $r_{4+5}$ and $m_{1+2}$ but distinctly nearer to $r_{4+5}$; length of sections 2, 3 and 4 of costa about 5 : 1.5 : 1 ; r-m situated far beyond middle of Cd; ultimate section of $m_{1+2}$ 4⅗ times as long as penultimate, ultimate section of $m_{3+4}$ slightly shorter than penultimate; calypteres dirty white, with margin and fringes blackish; halteres black.

Legs black; $t_2$ with two distinct posterodorsal bristles.

Abdomen shining black; each tergite with dense setae, marginal setae long; sixth tergite 1⅓ times as long as fifth.

Genitalia : Ninth tergite nearly circular in caudal view, ⅓ length of sixth tergite, with three to five sensory pores on ventrocaudal part; surstyli with about thirty sharp spines. Cerci ½ height of ninth tergite, with long slender setae on ventral part. Aedeagal hood broad and chitinized, bearing numerous spines. Phallophore relatively long; phallus not elongate, basal section composed of a pair of sclerites, median section sclerotized, broadly doubled back dorsally, with a pair of long ventral processes. Ninth sternite subtriangular, sidepieces narrow, hypandrial apodeme present, relatively long. Postgonites with three sensory pores.

Length : Body 2⅓ mm.

Specimen examined : 1♂, May 5, 1953, Kibune, Kyoto Pref., M. Sasakawa leg.

### *Melanagromyza tokunagai* SASAKAWA

*Melanagromyza tokunagai* SASAKAWA, 1953, Sci. Rep. Saikyo Univ., Agr., 4 : 10.

The larvae of this species mine towards the stem from the flower-bad of *Cymbidium virescens* LINDL. The pupation are taken place beneath the surface of stem and a pair of anterior spiracles are projected on the surface.

Puparium (Fig. 14, a, b) : Blackish brown, shiny; 3.0 to 3.3 mm. in length, 1.3

to 1.5 mm. in width; almost cylindrical, dorsal and ventral sides slightly flattened; segmentation distinct by the band of cuticular processes but not constricted. Cephalopharyngeal sclerites (Fig. 14, c) black, large; mandibles subtriangular, each with a large tooth and three undistinct small saw-teeth below it; labial sclerite brownish black, broad; paraclypeal phragma with dorsal horn dark brown, dorsal arm narrow and curved, ventral arm broad; ventral horn as long as dorsal horn. Anterior spiracles (Fig. 14, d) claviform, each with usually fourteen bulbs; posterior spiracles (Fig, 14, e) large, each with nineteen to twenty bulbs in circular. Abdominal cuticular processes (Fig. 14, f) moderately large, arranged about four rows on lateral side and also short two rows behind said rows on dorsal side, processes of posterior row largest.

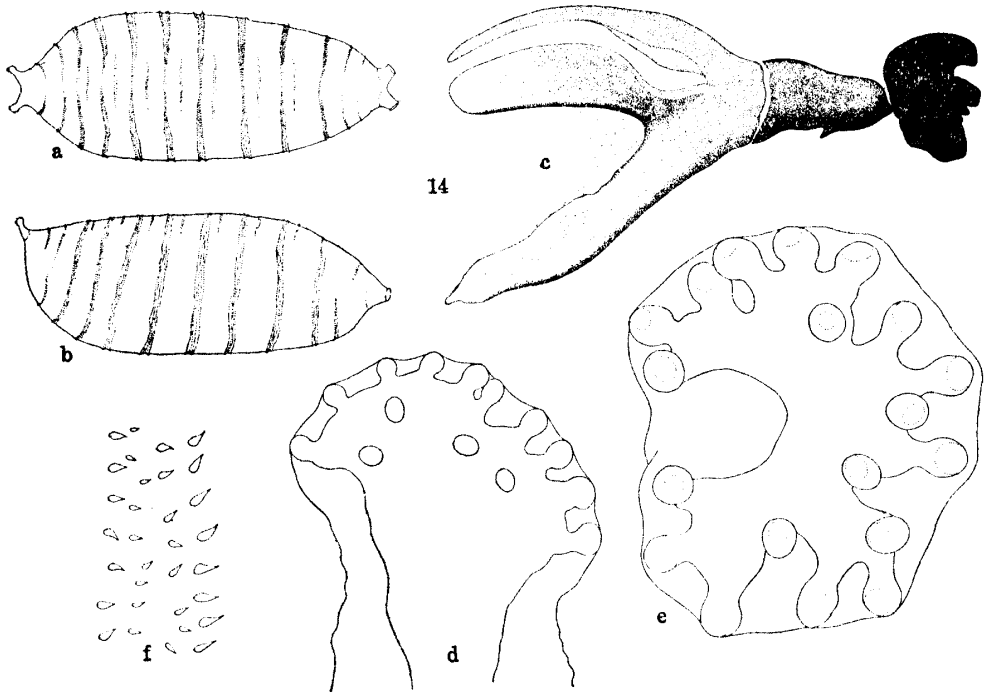



Fig. 14. Pupal characters of *Melanag. tokunagai* SASA., a : puparium, dorsal view , b : lateral view ; c : cephalopharyngeal sclerites ; d : anterior spiracle ; e : posterior spiracle ; f : abdominal cuticular processes.

### *Liriomyza fasciola* MEIGEN

*Liriomyza fasciola* MEIGEN, 1838, Syst. Beschr. bekann. eur. zweifl. Insekt., 7 : 402 (as *Agromyza*).

*Liriomyza bellidis* de MEIJERE, 1924, Tijdschr. v. Entom., 67 : 142 ; HERING, 1927, Tierw. Deutschl., 6 : 71 ; STARÝ, 1930, Act. Soc. Sci. Nat. Morav., 6 (6) : 33.

*Liriomyza fasciola* de MEIJERE, 1925, Tijdschr. Ent., 68:283; RYDÉN, 1926, Ent. Tidskr., 123 ; HERING, 1927, Tierw. Deut., 6 : 72 ; HENDEL, 1931, Flieg. palaearkt. Reg., 59 (58) : 218; SÉGUY, 1933-1934, Encyc. Entom., B, 2 : 216; SÉGUY, 1934, Faune de France, 28 : 581.

My specimen is identical with the original description. This species is widely distributed in Europe and the larva mines in the leaf of *Bellis perennis* L. I have

reared from the mines in the leaves of *Aster indicus* L.

The mine is a characteristic intricate linear type, usually the heliconome is formed in the early stage. At first, the larva is running at near top and margin of leaf and is unable to cross the stronger leaf veins. The black grains of frass are evidently arranged into a line on one side of mine. When the larva is full-grown it abandons the leaf to pupate. The larvae are found in May and October.

Specimens examined : 1 ♀ , Morioka, Iwate Pref., 26. IV. 1953; 2 ♀♀ , Kibune, Kyoto Pref., 29. IV. 1953; M. Sasakawa leg.

### *Liriomyza solani* MACQUART

*Liriomyza solani* MACQUART, 1856, Les Plantes herbac. d'Europe et leurs Ins., III : 50 (as *Agromyza*).

*Liriomyza solani* HENDEL, 1931, Flieg. pal. Reg., 59 : 247 ; SÉGUY, 1933–1934, Encyc. Ent., B, II, 7 : 218 ; 1934, Faune de France, 28 : 586.

*Liriomyza solani* HERING, 1927, Zeitschr. angew. Ent., 181 ; 1927, Tierw. Deut., 6 : 74 ; de MEIJERE, 1928, Tijdschr. v. Entom., 71 : 161 ; 1937, ibid, 80 : 197 ; STARÝ, 1930, Act. Soc. Sci. Nat. Morav., 6 (6) : 33.

Head yellow; front yellow, about twice as long as either eye, narrower than length (13 : 15), sides converging ventrally. Parafrontals yellow, sides parallel, about ¼ width of front. Frontal lunule semicircular, about ⅓ length between its dorsal margin and ventral ecellus. Black color of occiput extending dorsally to posterior side of black ocellar triangle and reaching eye margin in short distance dorsad of median posterior curve, but both *vt*-bristles arising from the yellow area. Fronto-orbitals four pairs; *ors* equal in size, each directed upward, second *ors* located on middle level of front ; *ori* two, directed inward. Orbital hairs minute, arranged in a row,erect. In profile parafrontals and parafacials narrowly beyond on eye; cheeks yellow, in middle part about ¼ eye height; parafacials yellow, near bases of antennae slightly narrower than width of first antennal segment, narrowing ventrally. Antennae yellow, bases approximating to each other ; third segment subspherical ; arista about twice antennae, basal one-fifth swollen. Vibrissae long; peristomal setae four in a row.

Thorax with black of mesonotum shiny, *dc* 3+1, anterior two short, second *dc* before level of paird *sa*, fourth on level of paired *prs*, length between first and second *dc* twice as long as between second and third; irregular four rows of *acr* extending posteriorly to about midway between first and second *dc*; three to four setulae in *ia* row behind transverse suture; *pa* two, inner *pa* ½ length of outer (Hendel : "haarförmig"); a long *h* with one to two or without setulae. Mesopleura with small black triangle on anterior half along ventral margin and bearing always one dorsally direct-

ed setula (though Hendel described "Auf den Mesopleuren fehlen gewöhnlich aufgebogene Härchen"). Wings hyaline, second section of costa 3½ to 4 times as long as third; r-m located slightly beyond middle of Cd; ultimate section of $m_{3+4}$ about twice as long as the penultimate; calypteres with margin and fringes blackish brown. Legs with femora yellow, tibiae and tarsi brownish yellow.

Abdomen shiny black, all tergites posteriorly narrowly and also laterally broadly yellow; sixth tergite as long as fifth.

Body 1½ to 2 mm. in length.

Specimens examined; 3 ♂♂, 4 ♀♀, June 1954, Kyoto, I. Ito leg.

This species are widely distributed in Europe and reported the larvae mine in the leaves of the *Solanum* and *Lycium* spp. The author obtained the specimens are reared from the larvae on *Primula auricula* L. The larval characters and mining habits were identical with those of *solani* MACQ.

The mine is long linear and upper surface type, and black grains of frass are continued in a long line on the right or left sides of the mine. The pupation taken place in the ground.

### *Phytomyza lappae* ROBINEAU - DESVOIDY

*Phytomyza lappae* ROBINEAU-DESVOIDY, 1851, Rev. Mag. Zool., 3 : 399; GOUREAU, 1851, Ann. Soc. Ent. France, 9 (2) : 159; HENDEL, 1920, Arch. f. Naturg., A, 7 : 159; de MEIJERE, 1926, Tijdschr. v. Ent., 69 : 268; de MEIJERE, 1928, ibid, 71 : 172; RYDÉN, 1926, Ent. Tidskr., 129; HERING, 1927, Tierw. Deutschl., 6 : 117; STARÝ, 1930, Act. Soc. Nat. Morav., 6 (6) : 164; VIMMER, 1931, Arch. Čech., 18 (1) : 81; SÉGUY, 1933-1934, Encyc. Entom., B, II : 228; SÉGUY, 1934, Faune d. France, 28 : 616.

*Phytomyza albiceps* SCHOLTZ (*nec* MEIGEN), 1849, Zeitschr. f. Ent., 9 : 11.

*Phytomyza arctii* KALTENBACH, 1856, Verh. naturh Ver. preuss. Rheinl. und Westphal., 13 : 231; 1858, ibid, 15 : 180.

*Phytomyza fallaciosa* BRISCHKE, 1881, Schrift. Naturf. Ges. Danzig, 5 : 33; LINNANIEMI, 1913, Act. Soc. Faun. Flor. Fenn., 37 : 112.

*Phytomyza femoralis* v. ROSER, 1840, Württ. landw. ver. korresp., 8, Heft 1 : 63; BECKER, 1903, Jahresh. Ver. vaterl. Naturk. Württ., 59 : 65.

*Phytomyza bipunctata* BRASCHNIKOW, 1897, Ann. Inst. agron. Moscou, 3 : 29.

Head whitish yellow, front including orbits almost twice as wide as either eye, as wide as long ; parafrontals ⅕ width of front, sides parallel. Oceller triangle blackish brown; black of occiput extending dorsally to posterior margin of ocellar triangle and reaching immediately to eye margin dorsad of median posterior curve, outer *vt* arising at edge of black area but inner *vt* on yellow area. Lunule more than ½ length between its dorsal mgrgin and anterior ocellus. Fronto-orbitals four

pairs; *ors* two, first *ors* almost 4/5 length of second, second almost on middle level of front; *ori* two, sometimes only one side bearing three; orbital hairs arranged in a row. In profile parafrontals linearly visible beyond eye ; cheeks whitish yellow, about 1/5 eye height. Antennae black, but first segment yellow, second brownish; third subspherical, with microscopic pile; arista more than twice as long as antennae, basal one-fourth swollen; antennal grooves pale brown. Vibrissae one, long; peristomal setae five to seven.

Thorax shiny black, more or less gray-dusted; mesonotum with lateral stripe yel lowish white, *prs* at edge of black area, humeri with center pale brown ; *dc* 3+1, (rarely 4+1); *acr* arranged in five to six irregular rows, usually extending posteriorly to level of first *dc* ; *ia* short, five to seven behind transverse suture; *sa* one, *pa* two; *h* long, with five to six setulae. Pleura black; mesopleura with dorsal half yellowish white, with one to two dorsally directed setulae; sternopleura with dorsal margin yellowish brown; base of wing and center of pteropleura white; metapleura yellowish. Wings hyaline; second section of costa 3½ to 5 times as long as third; calypteres with fringes dark brown; halteres yellowish white. Legs black, all knees yellow, tibiae and tarsi of fore-legs yellowish brown, those of other legs pale brown. Abdomen shiny brownish black, with lateral margin yellow; sixth tergite with caudal margin broadly white, slightly longer than fifth. Hypopygium brownish black, cerci dark brown; basal segment of ovipositor shiny black, longer than sixth tergite.

Body about 2½ mm. in length.

Specimens examined : 1 ♂, 6 ♀♀, June 4-6, 1954, Kibune, Kyoto Pref., M. Sasakawa leg.

A widespread species, having been reported from many countries in Central and Northern Europe, Montenegro, Albania, Rumania and Kamchatka. The following list of the food-plants have been recorded for this species :

*Arctium lappa* L., *tomentosum* MILL., *minus* HILL. and *nemorosum* LEJ. et COURT. (Hendel); *Diervillea* sp., *Eupatorium cannabinum* L.; *Senecio Fuchsii* GMEL., and *nemorensis* L. (Séguy); *Adenocaulon adhaerescens* MAXIM. (the writer).

Larva yellowish white, about 3 mm. in length; head with a claviform process, band of minute cuticular processes above antennae; cephalopharyngeal sclerites black, mandibles each with two teeth, paraclypeal phragma with dorsal arm of dorsal horn slightly curved, ventral arm short, ventral horn 2/3 length of dorsal. Anterior spiracles each with about twelve bulbs; posterior spiracles each with twenty-two to twenty-nine bulbs in three groups. Abdominal cuticular processes arranged in many rows, all almost equal in size.

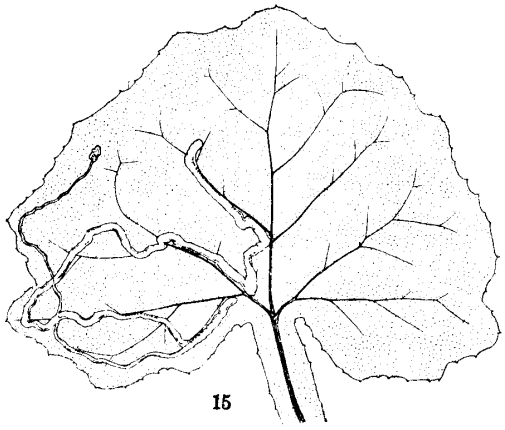



Fig. 15. Mine of *P. lappae* R.-D. on the leaf of *Adenocaulon adhaerescens*.

Puparium black, about 2 mm. in length.

Mine (Fig. 15) is whitish in colour, very long (15 to 27 cm.) linear type and occurs on the upper surface of leaf, gradually broadening to 2mm.; at first, somewhat heliconome near at the oviposited puncture and runs along near the margin of leaf because of the larva is unable to cross the stronger leaf veins and later it runs along the leaf veins. The black grains of frass are arranged in a short line on the right or left sides in mine. The mature larva abandons the leaf for the pupation through a semicircular slit made on the upper surface of mine.

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