

New Agromyzidae from Japan IX*

Six new species of the genus *Phytomyza*

By

MITSUHIRO SASAKAWA

The genus *Phytomyza* contains the largest number of species in the genera of Agromyzidae. The Japanese species of this genus are known comparatively little now, only fifteen species having been reported. Eight species of them have been described by the writer. More Japanese species, however, will be found in the future according to the progress of the study. At present twenty-nine species including eight palaeartic species, *Phytomyza aconiti* HEND., *angelicae* KALT., *homogyneae* HEND., *minuscule* GOUR., *plantaginis* R.-D., *saxifragae* HER., *tenella* MEIG. and *tharictricola* HEND., are found out by me. This paper includes the descriptions of six new species reared by Mr. Y. NISHIJIMA in Hokkaido. All the type-specimens are preserved in the collection of the Entomological Laboratory, Saikyo University.

Before going further I wish to express my thanks to Prof. Dr. TEISO ESAKI, Prof. Dr. KEIZO YASUMATSU of the Kyushu University and Prof. Dr. MASAOKI TORUNAGA in our laboratory for their constant interest and many helpful suggestions. I am greatly indebted to Prof. Dr. ERICH M. HERING of the Berlin Zoological Museum, has kindly made comparisons with the type material in his trust and has supplied valuable information, and to Mr. YUTAKA NISHIJIMA of the Hokkaido University, has given the opportunity to examine many materials from Hokkaido.

Phytomyza araliae sp. nov.

♂, ♀. *Head*: Front including orbits twice as wide as either eye, almost as broad as length between vertical angle and antennal base, its lateral sides evidently converging ventrally; each

parafrontal $\frac{1}{2}$ width between eyes, slightly converging ventrally; distance between posterior ocelli $\frac{1}{6}$ width of front and longer than distance between posterior and anterior ocelli, *oc* long. Lunule flattened, its height about $\frac{1}{2}$ length between its dorsal margin and anterior ocellus. Fronto-orbital bristles four pairs; *ors* two, first pair about $\frac{1}{2}$ length of second, rarely absent, directed up- and slightly outward, second upward and located slightly behind middle of front; *ori* two, first pair directed up- and inward, second very short, inward; orbital hairs arranged in a row between first *ors* and first *ori*. As viewed in profile parafrontals raised above eye margin, parafacials near antennal bases slightly visible and $\frac{1}{3}$ width of first antennal segment; epistoma extremely beyond on facial ridge; cheeks in middle part $\frac{1}{2}$ to $\frac{1}{6}$ eye height; eyes nearly bare, but pubescence more or less denser in female than in male. Face almost as high as (♂) or lower than (♀) distance between eyes on level of antennal bases. Vibrissae long, accompanying with four to seven peristomal setae. Antennae with bases separated from each other by a carina; third segment almost as long as broad, with minute pile; arista $1\frac{1}{2}$ times as long as antennae, basal one-fifth swollen in spindle form, with pubescence.

Thorax: Mesonotum with 3+1 *dc*, fourth *dc* before level of *prs*; *acr* arranged in three to four rows between third and fourth *dc*, but becoming sparser posteriorly, about two rows of them ending before level of first *dc*; *ia* three to four setulae behind transverse suture; *pa* two, inner *pa* about $\frac{1}{2}$ length of outer; *sa* one, long; *npl* two, posterior one shorter than anterior.

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Mesopleura with one to two dorsally directed setulae; sternopleura with two setulae before *stpl*. Wing: Length of second section of costa $3\frac{1}{8}$ to $3\frac{3}{8}$ times as long as the third, third section as long as fourth; r_{4+5} slightly curved on distal half, m_{1+2} diverging from r_{4+5} .

Abdomen: Tergites rather sparsely covered with short setae, marginal setae long; sixth tergite longer than fifth (7:5). Genitalia: Ninth tergite of male almost circular in caudal view; surstyli incurved, with many setae; cerci about $\frac{1}{3}$ as high as ninth tergite. Aedeagal apodeme curved dorsally; phallus with a pair of claw-like, membranous processes bearing with numerous hairs on dorsal side of basal section, distal section forked, very long, as long as the length of sclerites of basal section. Ninth sternite V-shaped, side pieces not curved; postgonites with a seta. Basal segment of ovipositor conical, as long as sixth tergite, with pubescence on proximal half.

Colouration: Head pale yellow; occiput black, blackish brown of occiput reaching eye margin immediately dorsad of median posterior curve on posterior margin, both *vt* bristles arising from dark brown area but *vti* at edge of pale brown; ocellar triangle blackish brown; lunule yellow, face including carina yellow, antennal grooves pale brown but yellow at places; antennae black but first segment brownish yellow; palpi black; anteclypeus pale brown. Mesonotum black, grey-dusted, faintly shining, lateral stripes brown, postlateral angles before scutellum slightly whitish; pleura dark brown, mesopleura with dorsal one-fifth and base of wing yellow. Wings hyaline; calypter white, with margin darkened and fringe brown; halteres yellow. Legs blackish brown, knees of f_1 distinctly yellow but those of other femora undistinct. Abdomen shiny dark brown but becoming yellowish posteriorly, first to second tergites laterally narrowly yellow, sixth tergite of female with caudal one-third yellow; ninth tergite of male brown, cerci pale brown; basal segment of ovipositor shiny brownish black.

Length: Body about 2 mm.; wing $2\frac{1}{8}$ – $2\frac{3}{8}$

mm.

Puparium: Dark brown, oval, $1\frac{2}{3}$ mm. in length, about 1 mm. in width of third abdominal segment; dorsal side arched but ventral flattened; segmental constriction distinct; anterior spiracles slightly separated at the base, each two-horned in lateral view and with thirteen to fourteen bulbs; posterior spiracles with stem broad and each divergened, each with fifteen to sixteen bulbs.

Habitat: Japan (Hokkaido).

Holotype: ♀, allotype: ♂, Kamuikotan, Hokkaido, VII. 1947; paratypes: 1 ♂, 1 ♀, Sapporo, 18. VII. 1946, Y. Nishijima leg.

According to Hendel's key of the palaeartic species, this species runs to the couplet 102. But it will be easily separated from *Phytomyza sphondylii* ROBINEAU-DESVOIDY, *pastinacae* HENDEL and *conii* HERING in having the dark brown or blackish face with carina, though they have the yellow dorsal margin ($\frac{1}{8}$ – $\frac{1}{4}$ in height) on the mesopleura.

Ecological notes: The larvae make the ophi-stigmatonome on the leaves of *Aralia elata* SEEM., which differ very much from large ophiogenous stigmatonome produced by the Trypetid, *Pseudacidia longistigma* SHIRAKI on the same host. Any Agromyzid may occur on the same host-plant had not been reported. The mine is whitish in color, at first short linear (about 1 cm. in length) in form, later on it becomes broader at the extremity, somewhat swollen blister-like and occurs on the upper surface of the leaf. The grains of frass are arranged in two rows in the first linear mine but in later stigmatonome they scattered in the centre. It is common to find more than one mine on a leaflet and a single larva occupies a mine. The full-grown larvae abandon their mines and fall to the ground to transform.

Phytomyza fimbriata sp. nov.

♀. **Head:** Front about twice as wide as either eye, as broad as long, its lateral sides distinctly converging ventrally; each parafrenal in upper

part about $\frac{1}{4}$ width between eyes, sides gradually converging ventrally; *oc* long. Frontal lunule deeply concave, its height about $\frac{1}{2}$ length between its dorsal margin and anterior ocellus. Fronto-orbitals four pairs; *ors* two, directed upwards; first pair $\frac{3}{4}$ length of second, located more nearer to second than to *vti*, second located at middle of front; *ori* two, inwards, second short; a pair of anteriorly directed setulae ventrad of second *ori*; orbital hairs arranged in a sparse row. In profile parafrontals and parafacials not visible; cheeks in middle part about $\frac{1}{2}$ eye height; subcranial margin more or less curved; epistoma extremely beyond on facial ridge; eyes with minute hairs. Parafacials very narrow, linear; face with carina concave. Vibrissae long, with three to four peristomal setae. Antennae with bases approximated each together; third segment as long as broad, with pile longer than those on arista and distinctly longer than basal arista thickness; arista longer than antennae, with basal quarter somewhat swollen, pubescent. Palpi of normal size.

Thorax: Mesonotum with 3+1 *dc*, fourth *dc* before level of *prs*, more than twice as far from transverse suture as the third from it; *acr* arranged in irregular three to four sparse rows and extending posteriorly to middle between first and second *dc*; *ia* in length subequal to *acr* setae, five to six in two rows behind suture extending behind level of *sa*; *pa* two, inner *pa* $\frac{1}{4}$ length of outer; humeri each with five to six setulae plus *h*. Mesopleura without dorsally directed setula. Wing: Lengths of second, third and fourth sections of costa about 4:1:1.2; r_{4+5} very slightly curved; m_{1+2} slender, almost straight, diverging from r_{4+5} .

Abdomen: Each tergite with sparse setae, marginal setae longer; sixth tergite slightly longer than fifth; basal segment of ovipositor with pubescence on basal one-third.

Coloration: Head pale yellow; ocellar triangle and occiput dark brown, brown of occiput reaching eye margin dorsad of median posterior curve and extending to bases of *vt* bristles, *vti* at edge of brown; face yellow, but median part with

carina pale brown; antennae black, but first segment yellow, arista dark brown; palpi and anteclypeus brownish black. Mesonotum and scutellum brownish black, dusted with gray, lateral stripes whitish yellow, but humeri each with a brown spot at bases of *h* and setulae, *prs* and outer *pa* at edge of black; mesonotum with posterolateral angles before scutellum whitish but not extending to *pa* bristles. Pleura dark brown, gray-dusted; mesopleura with dorsal one-third and base of wing whitish yellow. Wings hyaline, veins brown, bases of costa and radius whitish; calypter white, with margin and fringe brown; halteres whitish yellow. Legs blackish brown, knees of f_1 and f_2 yellow but those of f_3 only paler brown. Abdomen shiny dark brown; basal segment of ovipositor brownish black.

Length: Body $1\frac{2}{3}$ mm., wing $1\frac{1}{2}$ mm.

Puparium: Brownish black, shiny; oval, ventral side in profile somewhat flattened, converging with dorsal side anteriorly; segmental constriction distinct; anterior spiracles small, two-horned; posterior spiracles large, broader than stems, oval, each with eighteen to twenty bulbs; abdominal cuticular processes arranged in many rows, all equal in size; anal end without tubercles.

Habitat: Japan (Hokkaido).

Holotype: ♀, Sapporo, Hokkaido, 3. VII. 1946, Y. Nishijima leg.

In general appearance this species is somewhat intermediate between *P. adenostylis* HERING and *albiceps* MEIGEN, with both of which it agrees in having the lateral stripes of mesonotum and dorsal one-third to one-half of mesopleura whitish yellow and *vt* bristles on the dark brown area of vertex. There is, however, a very definite difference in the distinct long pile on the third antennal segment instead of short one as in two allied species.

Ecological notes: The larvae produce the ophiomyine on the leaves of *Impatiens noli-tangere* L. (Balsaminaceae). The mines should not be confused with those produce on the same host by *Liriomyza impatientis* BRISCHKE in Europe.

In the latter species the larvae make large ophistigmatonome. The mines of *P. fimbriata*, on the other hand, are much smaller; $\frac{1}{2}$ mm. in width at first but broadening gradually to $\frac{2}{3}$ mm., after they run to about 3 cm. in length they change into small stigmatonome (0.3–0.4 cm²) and again run in the linear type about 0.6 mm. in length. The black grains of frass in the ophionome are continued as a short line on either right or left sides of mine, but in the stigmatonome they are scattered. More than two larvae are found in a single leaf. The pupation takes place in the ground.

Phytomyza flavofemoralis sp. nov.

♂, ♀. *Head*: Front including orbits twice as wide as either eye, almost as broad as long, its lateral sides slightly converging ventrally (♂ 12:11; ♀ 13:11); each parafrontal in upper part $\frac{1}{4}$ width between eyes, sides slightly converged ventrally from level of *ori*; frontal lunule somewhat concave, its height $\frac{1}{2}$ length between its dorsal margin and anterior ocellus. Fronto-orbitals three pairs; *ors* two, equal in size, directed upward and somewhat outward, first pair located nearer to second than to *vti*, second slightly before middle of front; *ori* one, directed inward; orbital hairs arranged in a row extending below *ori* and above first *ors*. In profile parafrontals produced beyond eye, parafacials slightly so, linearly near bases of antennae but broadened ventrally; cheeks in middle part about $\frac{1}{3}$ eye height; eyes higher than broad, with very sparse minute hairs. Antennae with bases evidently separated from each other, third segment enlarged to the foreborder and with pile longer than those on arista or basal arista thickened, arista longer than antennae, basal quarter swollen. Vibrissae long, peristomal setae three; palpi of normal size.

Thorax: Mesonotum with 3+1 *dc*, fourth *dc* before level of *prs*; *acr* arranged in two to three rows between third and fourth *dc*, but sparse two rows of them ending on or just behind level of second *dc*; *ia* one to two behind transverse suture; *pa* two, inner *pa* $\frac{1}{2}$ length of outer;

humeri each with three to eight setulae plus a long *h*. Mesopleura with two dorsally directed setulae; sternopleura with two setulae before *stpl*. Wing: Second, third and fourth costal sections as 2.9:0.8:1; r_{4+5} very slightly curved but near distal end straight.

Abdomen: Each tergite with sparse setae, marginal setae longer; sixth tergite longer than fifth (5:4). Genitalia: Ninth tergite small, surstyli bearing many setae; cerci $\frac{2}{7}$ height of ninth tergite. Aedeagal hood large; epiphallus moderately large. Basal section of phallus long, about 5 times as long as phallophore, a pair of ventral processes forming a large lobe, median section short, distal section bifurcated. Postgonites with a seta and a spine on ventral side near tip. Basal segment of ovipositor with pubescence on basal one-half.

Coloration: Head whitish yellow; frontalia somewhat darkened on ventral part, parafrontals whitish; ocellar triangle brownish black; brownish black of occiput extending to posterior side of triangle and outer *vt* bristles, reaching eye margin immediately dorsad of median posterior curve of eyes, *vti* growing on faintly darkened area; lunule, face and cheeks whitish yellow; antennal grooves somewhat darker. Antennae black but first segment yellow, second brownish; palpi blackish brown. Mesonotum black, densely dusted with gray; lateral stripes pale yellow, only *h* plus many setulae growing on pale brown spot; *sa* arising from black, *prs* and outer *pa* at edge of black; caudolateral angles of mesonotum before scutellum faintly yellow, but inner *pa* growing on black; scutellum with yellow on dorsal side, becoming brownish laterally, lateral sides brown, slightly gray-dusted, lateral *sc* growing on brown but apical *sc* on yellow or at edge of brown. Pleura dark brown, gray-dusted; mesopleura with dorsal about a quarter and base of wing whitish yellow, sternopleura with margin dorsad of *stpl* and anterior margin of hypopleura yellowish. Wings hyaline, veins brown, bases of costa and radius whitish yellow; calypteres whitish, with fringe brown; halteres whitish yellow. Legs yellowish brown; cx_2 more paler than

others, cx_1 with distal end yellow; femora yellow, with pale brownish stripes at places, especially in f_3 distinct; t_1 yellow excepting distal part, but t_2 and t_3 yellowish brown.; tarsi brown. Abdomen brown, slightly shiny and gray-dusted, tergites of male paler than those of female and becoming yellow posteriorly and laterally broadly, but in female not distinct, only sixth tergite yellow-brown and with yellow caudal margin as in male. Ninth tergite of male pale brown, its anteroventral margin, surstyli and cerci yellowish; basal segment of ovipositor shining brownish black.

Length: Body $1\frac{1}{2}$ (δ) - $2\frac{1}{2}$ (φ) mm.; wing 2 (δ) - $2\frac{2}{5}$ (φ) mm.

Puparium: Yellowish brown; 2.0 to 2.3 mm. in length, 0.8 to 1.2 mm. in width; oval, dorsal side very slightly arched, ventral side flattened; segmentation distinct but only slightly constricted. Mandibles each with two teeth, dorsal tooth stronger than ventral one; paraclypeal phragma with dorsal arm of dorsal horn slightly curved, ventral arm slender and short. Anterior spiracles projecting in V-form, each somewhat two-horned, and with fifteen to eighteen bulbs; posterior spiracles with stem separated from each other at base and directed up- and outward, each two-horned, and with about three bulbs on small basal dorsal horn, about ten bulbs on elongated apical horn. Abdominal cuticular processes arranged in many rows on each side, small but those of posterior two rows relatively large. Posterior end without tubercle.

Habitat: Japan (Hokkaido).

Holotype: 1 δ , allotype: 1 φ , 5. VII. 1949, Zyozankei, Hokkaido, Y. Nishijima leg. Paratopotypes: 3 φ , 5-9. VII. 1949 (1 φ i. c. Hering).

The present new species is closely related to the European species, *P. anemones* HERING on *Anemone* spp. and *Ranunculus* sp. and also Japanese species, *paniculatae* SASAKAWA on *Clematis*. But in Hering's Table it will be throw in the couplet 15b with its characters are as follow:

15. Mesopleura oben und hinter der Diagonale, also etwa zur Hälfte gelb. 4-5 postsuturale ia-Härchen. *hellebori* KALT.

- Mesopleura oben $\frac{1}{3}$ - $\frac{1}{4}$ gelb. 1-3 postsuturale ia-Härchen 15b.

15b. 3. Fühlerglied am Rande lang und dicht gewimpert. f gelb, höchstens mit braunen Längswischen oder Flecken.

..... *flavofemoralis* n. sp.

- 3. Fühlerglied kurz gewimpert. f schwarzbraun bis schwarz. 15c.

15c. Stirne so lang wie breit, parallelrandig.

2. Fühlerglied braun. *anemones* HER.

- Stirne länger als breit, vorne verschmälert.

2. Fühlerglied schwarz. *paniculatae* SASAK.

The larval characters of *flavofemoralis* with the shape of anterior spiracles and the abdominal cuticular processes are very similar to those of *anemones*, but the posterior spiracles of *flavofemoralis* are characteristic as mentioned above, while in *anemones* they are only elongated one-horned in shape and each with about eighteen bulbs.

Ecological notes: The larva makes a ophiome, somewhat visceronome near the leaf margin on the leaves of *Anemone yezoensis* Koidz. The mines are whitish in color, very narrow at first but broadening to 1 mm. in width, upper surface type, the black grains of frass are continued as a short line or broken line at middle of mine. The full-grown larva mines towards the spongy parenchyma and makes a pupal blister (1.5 mm. in width). The pupae are placed with the ventral side beneath the surface of leaf and a pair of anterior spiracles are projecting in V-form on the surface, the surface of leaf is evidently swollen. The larvae are found twice in the early summer: the middle of June and late of July.

Phytomyza helianthi sp. nov.

δ . **Head:** Front twice as wide as either eye, almost as broad as long, its lateral sides converging ventrally; parafrontals each about $\frac{1}{2}$ width of front, gradually narrowing ventrad. Frontal lunule slightly concave, semicircular, its height $\frac{1}{2}$ length between its dorsal margin and anterior ocellus. Fronto-orbitals four pairs; *ors* two, first pair always present, about $\frac{1}{2}$ length of second, directed out- and upwards, second located

at middle of front and upwards; *ori* two, directed inwards, second short; a row of orbital hairs arranged sparsely; *oc* long. In profile parafrontals slightly beyond on eye, but parafacials not visible, almost linear; cheeks in middle part $\frac{1}{4}$ eye height; eyes bare. Vibrissae long, accompanying with five peristomal setae. Antennae with bases slightly separated from each other by carina; third segment almost as long as broad, with dense pile; arista longer than antennae, basal quarter swollen in spindle form, pubescent.

Thorax: Mesonotum with 3+1 *dc*, fourth *dc* before level of *prs*; about four rows of *acr* ending just behind level of second *dc*; *ia* behind transverse suture two to four in a row; *pa* two, inner *pa* $\frac{1}{4}$ length of outer; *sa* one, long, with three to four setulae before or behind it; humerus with three to seven setulae plus a long *h*. Meso- and sternopleura each with one or two dorsally directed setulae. Wing: Second, third and fourth costal sections as 3 : 0.9 : 1; r_{4+5} curved extremely on distal part but straight in distal short distance; m_{1+2} very slightly curved, diverging from r_{4+5} .

Abdomen: Each tergite with sparse setae, marginal setae long; sixth tergite longer than fifth. Genitalia: Cerci small; surstyli incurved, bearing many setae. Aedeagal apodeme broadening extremely at basal end. Basal section of phallus long, about $\frac{3}{4}$ length of aedeagal apodeme, narrow rod-like, bearing a row of spines on dorsal membranous side, ventral processes forming into inverted U-shape and bearing a horn near each base; median section short, only slightly sclerotized; distal section consisted of a pair of dorsally projecting pieces and anterior pieces which are bifurcated. Sidepieces of ninth sternite broadening anteriorly. Ejaculatory apodeme plectrumshaped.

Coloration: Front, lunule and cheeks whitish yellow; ocellar triangle dark brown but posterior side paler and contiguous to blackish brown of occiput; dark brown of occiput reaching eye margin dorsad of median posterior curve and extending to both *vt* bristles, inner *vt* growing at edge of brown area; face with carina brown but

oral margin whitish yellow; antennae, palpi and anteclypeus black, only first antennal segment brown. Mesonotum and scutellum black, dusted with grey, slightly shiny; whitish lateral stripes extending to humeri from notopleura but humeri with brown spot extending anteriorly from base of *h*; *prs* growing at edge of black, *sa* on black and dark brown laterally from *sa*; caudolateral angles of mesonotum before scutellum slightly yellowish; dorsal quarter of mesopleura, mesopleural suture and base of wing whitish yellow. Wings hyaline, veins pale brown; calypter dirty white, with margin and fringe dark brown; halteres yellowish white. Legs brownish black, knees of f_1 yellow, those of others yellowish brown, proximal end of t_1 yellow, tarsi dark brown. Abdomen shiny brown, first to fourth tergites laterally yellow and anterior five tergites posteriorly very narrowly yellow; male terminalia dark brown, cerci brown.

Length: Body $1\frac{1}{5}$ mm., wing 2 mm.

Habitat: Japan (Hokkaido).

Holotype: ♂, paratype: ♂, Kotoni, Sapporogun, Hokkaido, 15. VII. 1947, Y. Nishijima leg., reared from larvae mining leaves of *Helianthus tuberosus* L.

In the Hendel's Table of the palaeartic species, this species runs to the couplet 102 as in *araliae* SASAKAWA and so that his key will be modified by the addition of two new species as follows:

102. Mesopleura oben zu $\frac{1}{5}$ – $\frac{1}{4}$ ihrer Höhe gelb gerandet.102a.
 – Mesopleura oben nur schmal gelb gerandet106.
 102a. Gesicht samt Kiel dunkelbraun.103.
 – Gesichtskiel gelb.*araliae* SASAKAWA
 103. r_{4+5} an seiner Mündung gerade.103a.
 – r_{4+5} an seiner Mündung wellig geschwungen. 104.
 103a. 2. Flügelrandabschnitt über 4mal so lang wie der 4; 4–6 postsuturale ia-Härchen.*sphondylü* R. D.
 – nur 3mal so lang wie der 4; 2–4 postsuturale ia-Härchen. *helianthi* n. sp.

Phytomyza nishijimai sp. nov.

♂, ♀, *Head*: Front including orbits $1\frac{2}{3}$ times

as wide as either eye, almost as broad as long (12:11), its lateral sides converging ventrally; each parafrenal in upper part about $\frac{1}{3}$ width between eyes, slightly converging ventrally; distance between posterior two ocelli $\frac{1}{4}$ width of front, *oc* long. Frontal lunule deeply concave, its height about $\frac{1}{2}$ length between its dorsal margin and anterior ocellus. Fronto-orbitals four pairs; *ors* two, directed upward, first pair about $\frac{2}{3}$ length of second, second located before middle of front; *ori* two, directed fore- and inwards, second short; orbital hairs arranged in a very sparse row. In profile parafrenals slightly beyond on eye but parafacials not visible, almost linear; epistoma extremely beyond on facial ridge; cheeks in middle part almost $\frac{1}{3}$ eye height; eyes with minute sparse hairs. Face as high as distance between eyes on level of antennae. Vibrissae long, accompanying with five to seven peristomal setae. Antennae slightly separated at bases by a narrow carina; third segment somewhat longer than broad, with pile slender, less than basal arisal thickness in length; arista $1\frac{2}{3}$ times as long as antennae, with basal quarter swollen, pubescent. Palpi distinctly dilated before the end.

Thorax: Mesonotum with 3+1 *dc*, fourth *dc* before level of *prs*; *acr* arranged in irregular four rows between third and fourth *dc*, but becoming sparser posteriorly and ending at level of second *dc*, but a pair of them just behind second; *ia* three to six setulae behind transverse suture; *pa* two, inner *pa* $\frac{1}{2}$ length of outer. Mesopleura with two to four dorsally directed setulae; sternopleura with usually two (2-3) setulae cephalad to *stpl*. Wing: Second, third and fourth costal sections as 3.3:0.7:1; r_{4+5} and m_{1+2} slightly curved, m_{1+2} diverging from r_{4+5} .

Abdomen: Each tergite with marginal setae long; sixth tergite as long as (♀) or longer than (♂) fifth. Genitalia: Ninth tergite of male almost as long as fifth tergite, almost circular in caudal view, cerci $\frac{2}{3}$ as high as ninth tergite; phallus with paired ventral processes of basal section relatively long, distal section fork-

ed. Basal segment of ovipositor with pubescence on basal one-third, distal part shining.

Coloration: Head pale yellow; ocellar triangle and occiput black, black of occiput reaching eye margin dorsad of median posterior curve, both *vt* bristles arising from dark brown area but *vti* at edge of brown; face yellow, but antennal grooves and dorsal half of carina brown; antennae and palpi black but first antennal segment brown, second brownish black, arista brown; anteclypeus dark brown. Mesonotum brownish black, scutellum dark brown, dusted with grey, faintly shining, lateral stripes and posterolateral angles before scutellum dark brown; mesopleura with dorsal one-sixth, mesopleural suture and base of wing yellow; hypopleura yellowish brown. Wings hyaline, veins pale brown; calypter dirty white, with margin and fringe brownish black; halteres yellow. Legs brownish black, knees of f_1 narrowly yellow but those of f_2 and f_3 becoming paler only, proximal end of tibiae yellowish brown, tarsi dark brown. Abdomen shiny dark brown, first and second tergites laterally broadly and posteriorly narrowly yellow, sixth tergite of female broadly yellow; ninth tergite of male blackish brown, cerci pale brown; basal segment of ovipositor shiny blackish brown.

Length: Body about 2 mm., wing $2\frac{1}{2}$ mm.

Habitat: Japan (Hokkaido).

Holotype: ♂, allotype: ♀, Sapporo, Hokkaido, I. V. 1950; paratypes: 3 ♂♂, 1 ♀, same date as holotype, Y. Nishijima leg., all reared from larvae mining leaves of *Cornus kousa* BUERG.

This species is named in honor of Mr. Y. Nishijima.

This new species resembles closely *P. haracleana* HERING, but the palpi are a definite difference between them. Other two European species, *P. agromyzina* MEIG. and *corni* KALT. had been reported from *Cornus*, but they differ from the present species in having the head dark brown in color. Also, KALTENBACH (1859) recorded the following mining characters on the leaves of *Cornus sanguinea*: "..... von den süssschlingenden Maden in vielfach geschlingelten obersei-

tigen Gängen miniert werden. Dies schwarzen Puppen liegen am Ausgange der Mine an der unteren Blattfläche.....". Such the characters are quite differ from those of *nishijimai*. Mr. NISHIJIMA kindly informed me of the following characters of the present species: (1) The mine is pale green to dark green, and stigmatonome, full depth type, usually four to six larvae mine on a single leaf, thereby their mines unite with each other forming a large stigmatonome. (2) The black grains of frass are arranged in a broad line. (3) The pupation takes place in the ground. (4) The larva is yellow in colour and the puparium reddish brown.

Phytomyza oenanthos sp. nov.

This species related to two leaf-miners of the Compositae, Japanese species *P. japonica* SASAKAWA and German species *P. achilleae* HERING and have in common the first *ors* bristles are absent, the *acr* are arranged in about two rows and the lateral stripes of mesonotum are dark brown in color. Comparing with types, this is very distinctly new to science. The larvae of this species mine on the leaves of *Oenanthe stolonifera* DC. (Umbelliferae).

♂, ♀. *Head*: Front about twice as wide as either eye, slightly broader than long but in the above allied species those are extremely broader, its lateral sides evidently converging ventrally. Lunule slightly concave, as high as length between its dorsal margin and anterior ocellus. Fronto-orbitals three pairs; second *ors* directed upwards, located slightly behind middle level of front; *ori* two, inwards, second very short; orbital hairs arranged in a row. Parafacials linear, so that not visible above eye margin when viewed in profile, but those of allied species more broader ($\frac{1}{8}$ width of first antennal segment) and somewhat beyond on margins of eyes. Cheeks in middle part about a quarter eye height, while in the allied species one-third eye height. Antennae with bases approximated each together, while in allied species separated from each other, and arista slightly swollen in basal one-fifth as in *japonica*. Eyes oval, almost bare.

Thorax: Mesonotum with 3+1 *dc*, fourth *dc* more approximated to third *dc* than in *achilleae*; *acr* arranged in two rows, usually four pairs of setulae ending at level of second *dc*, in *achilleae* only five to six setulae in two rows and in *japonica* more densely; *ia* two to three behind transverse suture but in *achilleae* four to five; *h* accompanying with three to four setulae. Mesopleura with 0-2 dorsally directed setulae. Wing: The second costal section about four times as long as the third, while in allied species 3 to $3\frac{2}{8}$ times.

Abdomen: Each tergite with sparse setae, marginal setae long; sixth tergite distinctly (♂) or slightly (♀) longer than fifth, but in allied species not elongated. Genitalia: Male terminalia shown in Fig. 17; characteristic structures are shape of ninth sternite, six spines on dorsal membranous side and a pair of strong spines on each posterior end of basal section of phallus, and semicircular median section with serrated margin.

Coloration: Front and cheeks pale yellow; ocellar triangle dark brown; both *vt* bristles arising from dark brown area and its area extending ventrally to orbits as paler brown, but all *or* bristles growing on yellow as in *achilleae*; face, antennal grooves, palpi and subcranial margin dark brown; parafacials near bases of antennae and anteclypeus pale brown; antennae black, first antennal segment not whitish, only pale brown. Thorax brownish black, grey-dusted; caudo- and ventral margins of humeri, notopleural suture before base of wing and mesopleural suture yellowish; dorsal one-fifth of mesopleura yellow. Wings hyaline; calypteres whitish, with fringe brown; halteres yellow. Legs dark brown but tibiae and tarsi somewhat pale; knees of *f*₁ distinctly yellow, but those of others pale brown. Abdomen brown, becoming paler posteriorly but not so white linearly as in *japonica*, only caudal margins of fifth tergite of male and sixth of female distinctly yellow; ninth tergite of male brown, cerci pale brown; basal segment of ovipositor shiny black.

Length: Body $1\frac{1}{5}$ - $1\frac{1}{2}$ mm.; wing $1\frac{1}{2}$ -2 mm.

Puparium : Blackish brown, shiny ; oval, $1\frac{1}{2}$ mm. in length and 0.9–1 mm. in width of third abdominal segment ; ventral side flattened ; segmentation distinct. Mandibles each with two teeth, equal in size ; dorsal horn of paraclypeal phragma almost straight, only both ends curved, ventral horn about $\frac{3}{5}$ length of dorsal. Each spiracle projected ; anterior spiracles two-horned in lateral view, each with ten to twelve bulbs (15 to 20 bulbs in *japonica*) ; posterior spiracles with stems projecting more laterally, each with thirty-one to thirty-two bulbs and most of bulbs arranged in ventral horn (38 to 44 bulbs in *japonica*).

Habitat : Japan (Hokkaido).

Holotype : ♂, 13. VII. 1947, allotype : ♀, 15. VII. 1947, Fûren, Hokkaido ; paratopotypes : 1 ♂, 2 ♀, 13–15. VII. 1947, Y. Nishijima leg.

De Meijere (1926) described that the larvae of *P. anthrisci* HEND. mine on the leaves of *Oenanthe phellandrii*. The number of teeth of mandible and bulbs of anterior spiracle of *oenanthes* are similar to those of *anthrisci*, but bulbs of posterior spiracle are much more in number than in *anthrisci* (16–20 bulbs).

ILLUSTRATIONS

PLATE 1

Figs. 1–6. Head in profile.

- Fig. 1. *Phytomyza araliae* sp. nov.
 2. *Phytomyza fimbriata* sp. nov.
 3. *Phytomyza flavofemoralis* sp. nov.
 4. *Phytomyza helianthi* sp. nov.

5. *Phytomyza nishijimai* sp. nov.

6. *Phytomyza oenanthes* sp. nov.

Figs. 7–9. Wing.

7. *Phytomyza araliae* sp. nov.

8. *Phytomyza helianthi* sp. nov.

9. *Phytomyza nishijimai* sp. nov.

PLATE 2

Fig. 10. *Phytomyza araliae* sp. nov., anterior spiracle of larva, a : dorsal aspect ; b : lateral aspect.

11. *Phytomyza araliae* sp. nov., posterior spiracle of larva, dorsal aspect.

12. *Phytomyza fimbriata* sp. nov., posterior spiracle of larva, dorsal aspect.

13. Mines of *P. fimbriata* on leaf of *Impatiens noli-tangere* L.

14. *Phytomyza flavofemoralis* sp. nov., a : cephalopharyngeal sclerites of larva, lateral aspect ; b : anterior spiracle, lateral aspect ; c : posterior spiracle, lateral aspect ; d : abdominal cuticular processes.

15. Mine of *P. flavofemoralis* on leaf of *Anemone yezoensis* KOIDZ.

16. *Phytomyza helianthi* sp. nov., male genitalia, lateral aspect.

17. *Phytomyza oenanthes* sp. nov., male genitalia, lateral aspect.

18. *Phytomyza oenanthes* sp. nov., a : mandible of larva ; b : anterior spiracle of larva, lateral aspect ; c : posterior spiracle, lateral aspect.

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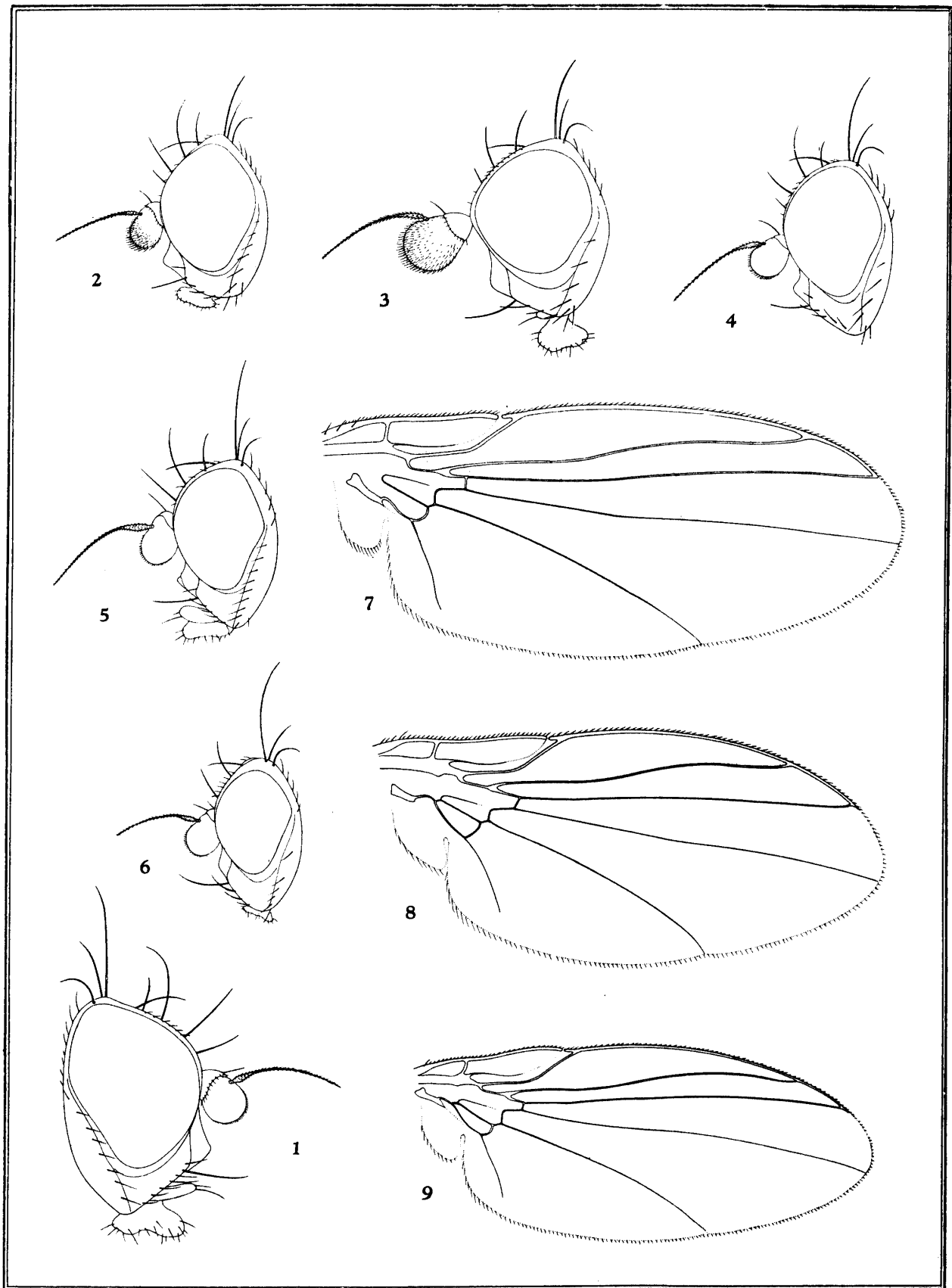


PLATE 2

