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Supplements to the Species of Agromyzinae (Diptera: Agromyzidae) from Taiwan, with Notes on Three New Records

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ABSTRACT

This article deals with 11 species of Agromyzinae (Diptera: Agromyzidae) from Taiwan; among them, 8 species are re-described and illustrated in more detail, and 3 species, *Agromyza panici*, *Melanagromyza malayensis*, and *Tropicomyia pilosa*, are recorded as new to Taiwan. A checklist of previously recorded species in this subfamily is included. Remarks on morphology, taxonomy, host plants, or geographic distribution issues are also provided.

Key words: taxonomy, Agromyzinae, Agromyzidae, new records, Taiwan.

Introduction

The family Agromyzidae (Diptera) is commonly divided into two subfamilies, Agromyzinae and Phytomyzinae, and these are now accepted by most of workers in this field. Although this two-subfamily system lacks strong evidence from systematic or evolutionary aspects, it was still suggested to be retained for practical purposes by Spencer (1987). The most distinct morphological differences between these two subfamilies are on the differing course of the vein subcosta (coalescing with R_1 before reaching the costa or not) and on the upper cornua of larval pharyngeal sclerite (bifurcated or single). In general, the family Agromyzidae was believed to be a monophyletic group that originally evolved from a temperate area; and the great numbers of species (about 70% of species as mentioned by Spencer (1987)) were found especially in temperate areas of the Northern Hemisphere. However, the distributions of some genera still have significant differences between temperate and tropical areas, especially from the viewpoint of the two-subfamily system. For instance, in the genus *Phytomyza* Fallén of the subfamily Phytomyzinae, the largest genus in the family is quite dominant in the Palaearctic and Nearctic regions but obviously reduced in the tropics and Southern Hemisphere. On the other hand, the genus *Melanagromyza* Hendel in subfamily Agromyzinae is otherwise dominant in the tropics (Spencer, 1987); and moreover, the genus *Tropicomyia* Spencer probably only occurs in tropical areas. All of these suggest that the theoretical basis and biological significance of this two-subfamily system need to be re-examined after further studies.

The taxonomy of Taiwanese Agromyzidae has been studied by Malloch (1914),

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Hennig (1941), Spencer (1961, 1962, 1966 b,c), Sasakawa (1963a, 1972, 1977), Lin (1983), Sasakawa and Fan (1985), Shiao and Wu (1989, 1995, 1996), and Shiao *et al.* (1991); and up to present, the agromyzid fauna of Taiwan consists of 87 species in 15 genera. Among them, only 38 species in 5 genera belong to the subfamily Agromyzinae (see the checklist below).

Checklist of Taiwanese Agromyzinae

(1) Genus *Agromyza* Fallén

1. *Agromyza comosa* Spencer, 1962
2. *Agromyza latipennis* Malloch, 1914
3. *Agromyza obesa* Malloch, 1914
4. *Agromyza penniseti* Spencer, 1959
5. *Agromyza plebeia* Malloch, 1914
6. *Agromyza vitrinervis* Malloch, 1915

(2) Genus *Japanagromyza* Sasakawa

7. *Japanagromyza setigera* (Malloch, 1914)
8. *Japanagromyza tristella* (Thomson, 1869)
9. *Japanagromyza yanoi* (Sasakawa, 1955)
10. *Japanagromyza yoshimotoi* Sasakawa, 1963

(3) Genus *Melanagromyza* Hendel

11. *Melanagromyza albisquama* (Malloch, 1927)
12. *Melanagromyza alternata* Spencer, 1961
13. *Melanagromyza declinata* Sasakawa, 1963
14. *Melanagromyza dolichostigma* de Meijere, 1922
15. *Melanagromyza lasiops* (Malloch, 1914)
16. *Melanagromyza metallica* (Thomson, 1869)
17. *Melanagromyza obtusa* (Malloch, 1914)
18. *Melanagromyza oculata* Sasakawa, 1963
19. *Melanagromyza piliseta* (Malloch, 1914)
20. *Melanagromyza provecta* (de Meijere, 1910)
21. *Melanagromyza sauteri* (Malloch, 1914)
22. *Melanagromyza sojae* (Zehntner, 1900)
23. *Melanagromyza specifica* Spencer, 1963
24. *Melanagromyza subfusca* (Malloch, 1914)

(4) Genus *Ophiomyia* Braschnikov

25. *Ophiomyia anguliceps* (Malloch, 1914)
26. *Ophiomyia centrosematis* (de Meijere, 1940)
27. *Ophiomyia conspicua* (Spencer, 1961)
28. *Ophiomyia kwansonis* Sasakawa, 1961
29. *Ophiomyia lantanae* (Froggatt, 1919)
30. *Ophiomyia phaseoli* (Tryon, 1892)
31. *Ophiomyia ricini* (de Meijere, 1922)
32. *Ophiomyia scaevolana* Shiao & Wu, 1996
33. *Ophiomyia setituberosa* Sasakawa, 1972
34. *Ophiomyia spinicauda* Sasakawa, 1972

(5) Genus *Tropicomyia* Spencer

35. *Tropicomyia alocasiae* Shiao & Wu, 1996
36. *Tropicomyia atomella* (Malloch, 1914)
37. *Tropicomyia passiflorella* Shiao & Wu, 1996
38. *Tropicomyia theae* (Cotes, 1896)

Recently, we examined some specimens from the collections of the Department of Entomology, National Taiwan University. The materials upon which this paper is based were collected by Tung-Ching Hsu (T. C. Hsu) and Wen-Jer Wu (W. J. Wu) during the early 1980s, by Tokuichi Shiraki (T. Shiraki) in 1917, and some recent collections by Liang-Yih Chou (L. Y. Chou), and the authors. Eight species are herein re-described and illustrated in more detail, and 3 species are recorded as new to Taiwan. Genitalia were dissected after treatment with 15% KOH solution and then mounted on slides

using Euparal. External morphology was drawn with a drawing tube on a stereomicroscope (Leica Wild M3Z); that of the genitalia using a phase-contrast microscope (Olympus BH-2) with a TV camera and computer-based image enhancement system. Scale units of all illustrations are in millimeters. Terminology used here basically follows that of Sasakawa (1961) and Spencer (1973).

***Agromyza latipennis* Malloch, 1914** (Figs. 1～11)

Agromyza latipennis Malloch, 1914: Ann. Hist. Nat. Mus. Hung. 12: 321; Sasakawa, 1972: Sci. Rep. Kyoto Pref. Univ., Agric. 24: 46.

Black medium-sized species; wing length 2.6 mm in male. Eye face orange to red tinged. Frons narrow. Orbital bristles 4 pairs; upper 1 pair obviously directed upwards, lower 3 pairs slightly inclinate. Vibrissae predominant. Post-sutural dorsocentral bristles 2 pairs strong. Acrostichals in about 8 rows. Halter yellow. Costa extending to R_{4+5}; R_{4+5} near wing tip; proportion of 2nd to 4th costal sections, 3.5: 1: 0.9. Squama brown with long dark fringes. Male terminalia: surstylus bearing 12～13 short spines. Cercus covered with long hairs. Sperm pump small but with larger basal bulb. Phallus length about 0.4 mm; basiphallus with 1 pair of medium-sized membranous process, each with 4-5 tiny spines on tip; distiphallus and mesophallus well developed, distiphallus paired round in ventral view. Female genitalia: 9th sternite with 1 pair of marginal setae. Cercus with 8 long setae and 3 tactile sensilla on tip.

Material examined: TAIPEI HSIEN: Hsintien: Kueishan Rd.(龜山路), 1 male 1 female, 28-III-1981, T. C. Hsu; Hsiaotsukeng (小粗坑), 3 males, 25-V-1984, T. C. Hsu.

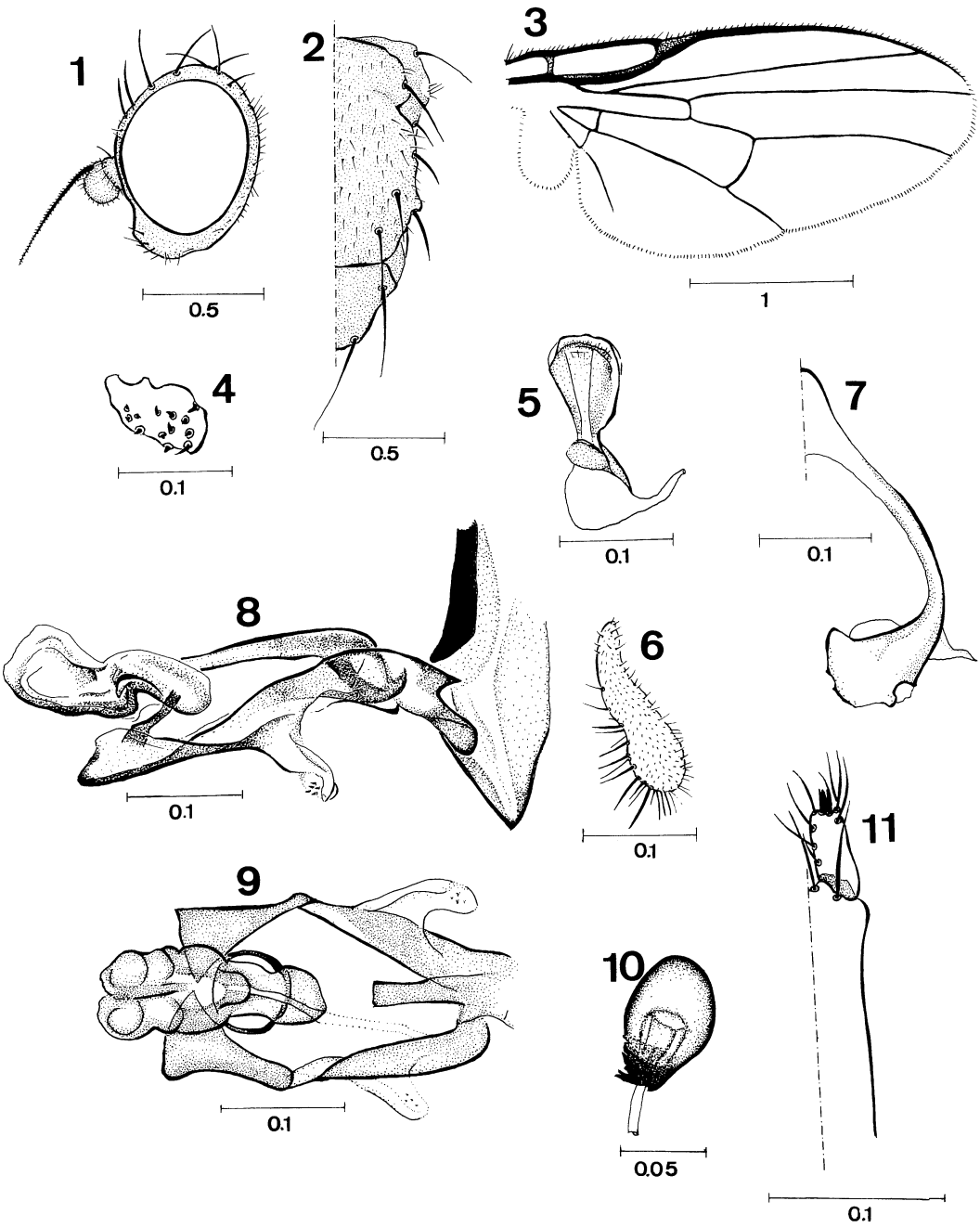
Distribution: Taiwan.

Remarks: This species was first recorded from Kaohsiung by Malloch (1914), and then collected from Chiai by Sasakawa (1972); here is the first record from northern Taiwan, but still no host plant data has been mentioned. And so far, this species is only known from Taiwan. External morphology on these present specimens is closer to the original description in Malloch (1914) than that in Sasakawa (1972). The male genitalia belong to the kind of typical of this genus which has the symmetrical basiphallus beyond the level of mesophallus and a symmetrical distiphallus closely fused with mesophallus. Although the membranous processes on basiphallus were sometimes ignored by some authors, we believe that this structure should be treated as an important character for grouping species. For instance, *A. comosa* or *A. panici* with similar processes could be considered closely related to *A. latipennis*. Another key attribute on male genitalia is the shape of distiphallus; roughly, we can divide them into two main directions, one evolved into the elongated and tubular shape, the other became a more rounded and condensed complex. This species belongs to the latter, but careful examinations are needed both from lateral and ventral sides for separating it from other related species.

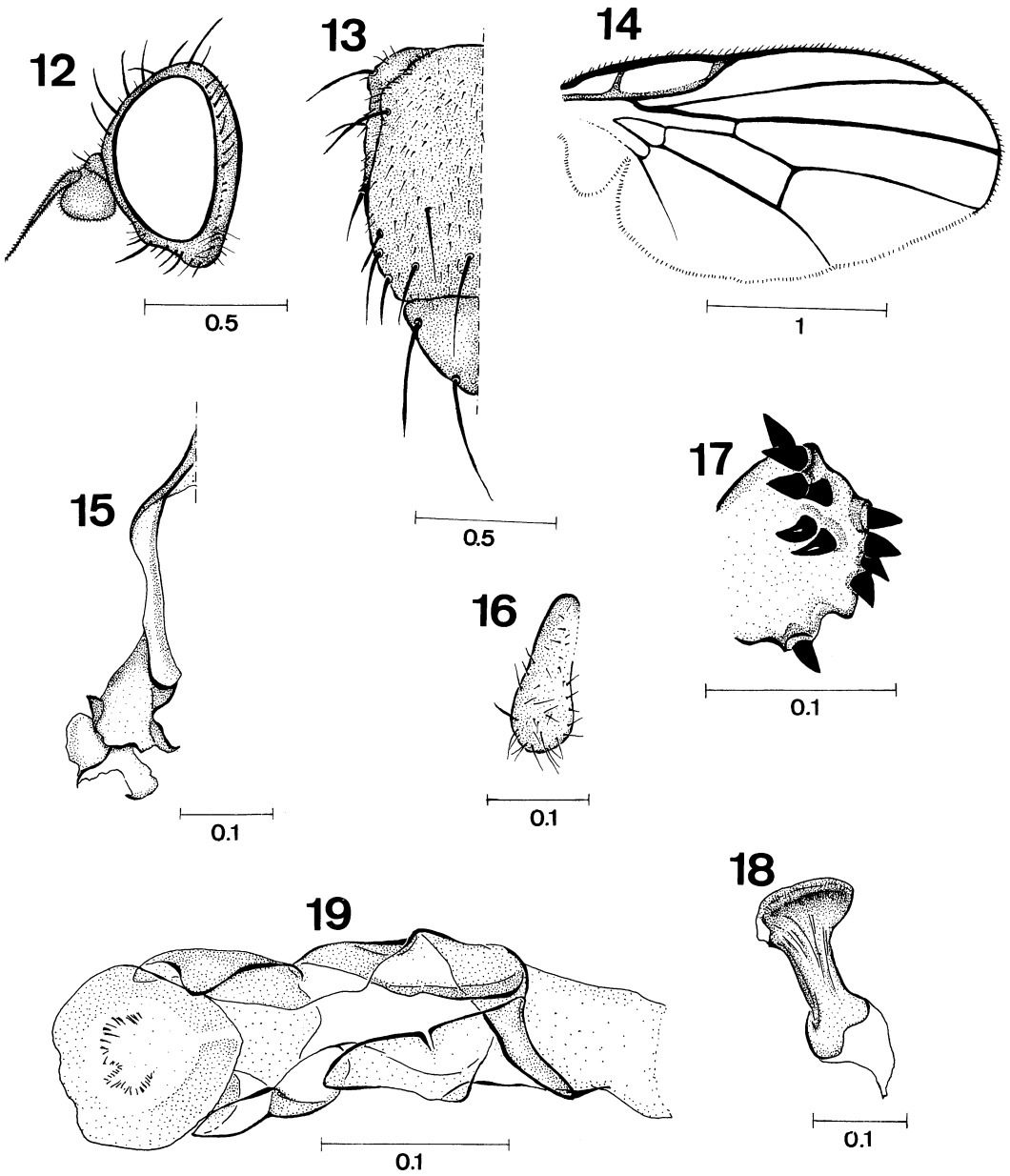
***Agromyza obesa* Malloch, 1914** (Figs. 12～19)

Agromyza obesa Malloch, 1914: Ann. Hist. Nat. Mus. Hung. 12: 322; Sasakawa, 1972: Sci. Rep. Kyoto Pref. Univ., Agric. 24: 46-48.

Frons brown and narrow, about 0.9 times as wide as eye. Gena and occiput gray, postgena light brown. Orbital bristles 4 pairs, lower 2 pairs inclinate. Oribital setulae 3-5 pairs. Antenna light brown, touching each other at base. Dorsocentral bristles 2 pairs strong. Acrostichals in 8 irregular rows. Prescutellar bristles 1 pair obviously. Wing length about 2.4 mm in male. Costa extending to M_{1+2}; R_{4+5} near wing tip; proportion of 2nd to 4th costal sections, 2.6: 1: 0.7. Halter yellow tinged. Tergite shinning black.



Figs. 1～11. *Agromyza latipennis*; 1, head of male, lateral view; 2, right half of male thorax, dorsal view; 3, wing of male; 4, surstylus, posteroventral view; 5, sperm pump; 6, cercus of male; 7, half of hypandrium; 8, phallus, lateral view; 9, phallus, ventral view; 10, spermatheca; 11, half of female 9th tergite and sternite with cercus.



Figs. 12～19. *Agromyza obesa*; 12, head of male, lateral view; 13, left half of male thorax, dorsal view; 14, wing of male; 15, half of hypandrium; 16, cercus of male; 17. Surstylus, posteroventral view; 18, sperm pump; 19, phallus, ventral view.

Male terminalia: surstylus with 10 stout spines in about two rows and 1 spine on posteroventral margin. Cercus short and pubescent. Phallus length about 0.34 mm; distiphallus rounded in ventral view, with a ring of small spinulae; basiphallus broad but not extending in both sides from ventral view.

Material examined: CHIAI HSIEN: Alishan (=Arisan) (阿里山), 1 male, 21-IV-1917, T. Shiraki.

Distribution: Taiwan.

Remarks: Sasakawa (1972) formerly determined this specimen we used here. The holotype was based on a single male specimen collected from Sokotsu (=Sokutsu?) (probably in the present Kaohsiung Hsien) in 1912 by Malloch (1914); not a female as Sasakawa mentioned in 1972. The distiphallus of this species presents as a more condensed structure and can not be detected as a paired structure from ventral aspect; the broad basiphallus is also characteristic from most of the other *Agromyza* species. This species is known only from Taiwan, but no host plant has been recorded.

***Agromyza panici* de Meijere, 1934** (Figs. 20～23)

Agromyza panici de Meijere, 1934: Tijdschr. Entomol. 77: 248; Spencer, 1986: Proc. Indian Acad. Sci. 95: 488-489.

Frons narrow. Antenna and arista light brown, finely pubescent. Orbital bristles 5 pairs; upper 2 pairs directed slightly upwards, lower 2 pairs inclinate. Dorsocentral bristles 0+3 type, anterior first pair small. Acrostichals in about 6 rows. Wing length 1.9 mm in male. Costa extending to M_{1+2}; inner cross vein at about middle of discal cell; proportion of 2nd to 4th costal sections, 2.9: 1: 0.7. Halter light yellow. Squama white to pale. Male terminalia: surstylus with about 10 stout spines and 3-4 sensory hairs on posteroventral tip. Sperm pump small, length about 0.08 mm. Phallus length about 0.36 mm; basiphallus symmetrical, with small membranous process on each basal arm; end of distiphallus forming a pair of bulb structures with some tiny spinulae from lateral view, and arc-shaped on terminal from ventral view.

Material examined: TAIPEI HSIEN: Hsintien: Hsiaotsukeng, 1 male, 25-V-1984, T. C. Hsu.

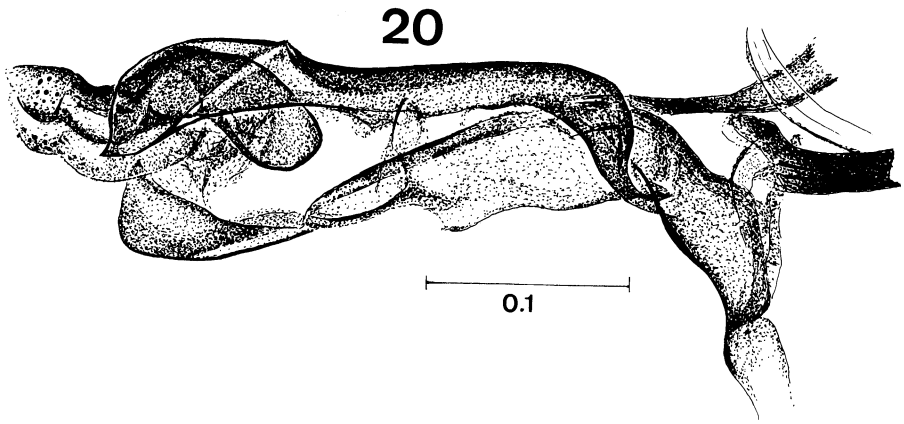
Distribution: Java, Malaysia, Thailand, **New to Taiwan.**

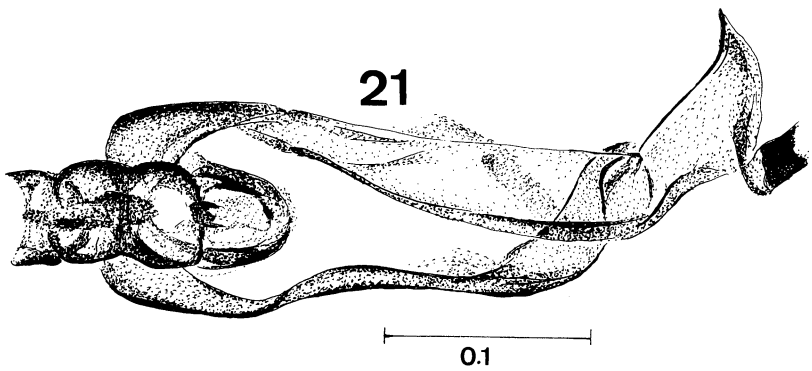
Remarks: This species was first recorded and bred from leaf mines on *Panicum palmifolium* Poir. (Gramineae) (de Meijere, 1934), and then Spencer (1986) caught and described it from Thailand. The Malaysian record was reported by Sasakawa (1990) based on a female specimen. The shape of male genitalia also belongs to the kind of genus typification; but with a more characteristic distiphallus, especially from a ventral view. We believe *A. panici* is probably a typical Oriental-distributed species; however, more collections in this region are required to reconfirm this point.

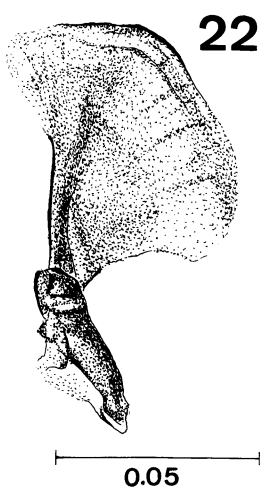
***Melanagromyza malayensis* Sasakawa, 1963** (Figs. 24～28)

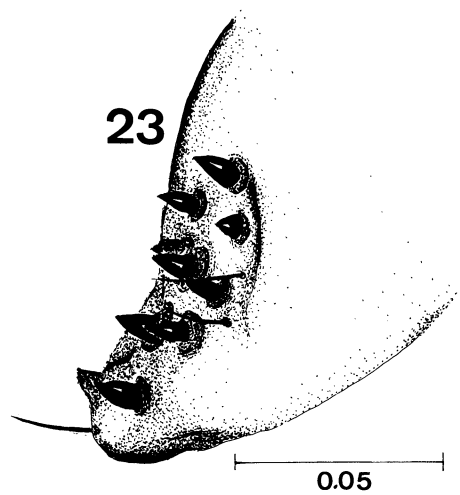
Melanagromyza malayensis Sasakawa, 1963a: Pacific Insects 5: 35-36.

Frons mat black. Eye face orange tinged. Gena, postgena, and occiput black. Lunule mat gray. Orbit (parafrontalia) and ocellar triangle shining black. Antenna brown, touching each other at base. Orbital bristles 4 pairs, upper 3 pairs directed slightly upwards, lower 1 pair obviously inclinate. Orbital setulae 15-20 in a row. Thorax shining with green and blue metallic color. Dorsocentral bristles 0+2 type. Acrostichals in about 8-10 rows. Wing length about 2.25 mm in male. Costa extending to M_{1+2}; inner cross vein near middle of discal cell; proportion of 2nd to 4th costal sections, 3.6: 1: 0.8. Halter black. Squama milky white, with margin and fringes brown. Male terminalia: surstylus with 13 slender setae on tip of

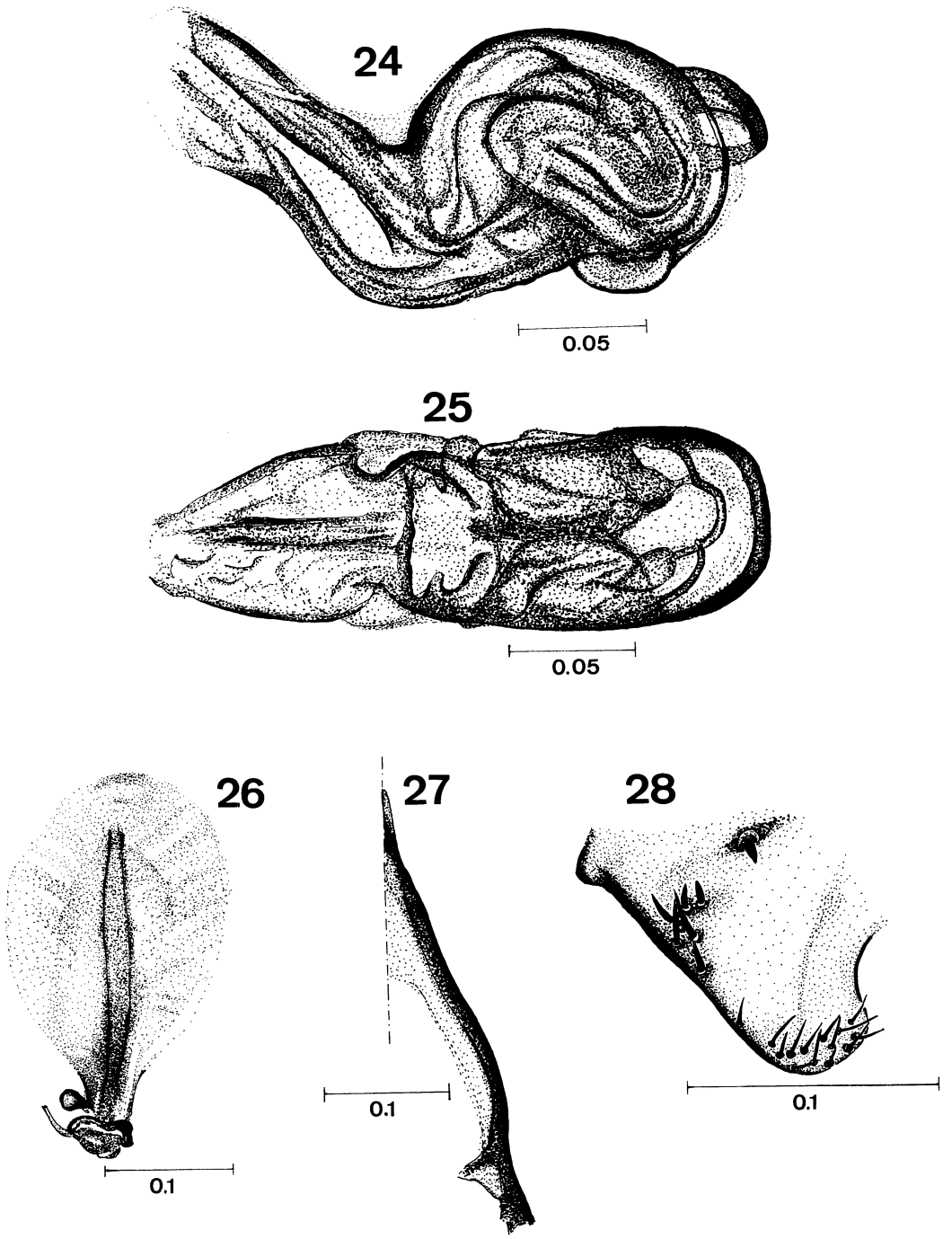








Figs. 20~23. *Agromyza panici*; 20, phallus, lateral view; 21, phallus, ventral view; 22, sperm pump; 23, surstylus, posteroventral view.



Figs. 24～28. *Melanagromyza malayensis*; 24, phallus, lateral view; 25, phallus, ventral view; 26, sperm pump; 27, half of hypandrium; 28, surstylus, posteroventral view.

ventral projection, and 7-8 stronger spines on inner lateral side. Sperm pump rounded with small basal bulb. Phallus length 0.24 mm; basiphallus short, arched; mesophallus and distiphallus closely combined as a coil-shaped complex in lateral view.

Material examined: TAIPEI HSIEN: Hsintien: Hsiaotsukeng, 1 male, 25-V-1984, T. C. Hsu.

Distribution: Malaysia, **New to Taiwan.**

Remarks: *M. malayensis* was first recorded from Selangor, Malaysia by Sasakawa (1963a); since the male genitalia is quite similar to *M. ipomoeavora* (recorded from Truk and Guam), Spencer (1990) pointed out that they probably belong to the same species group. The host plant of *M. ipomoeavora* was recorded as *Ipomoea*, but this is still questionable (Spencer, 1990); and the host of *M. malayensis* is also unknown. Anyway, the complexity and unique shape of phallus make it easier to be separated from other *Melanagromyza* species; besides, we herein predict its distributions should be much wider after additional specialized collecting of nearby areas is completed.

***Melanagromyza metallica* (Thomson, 1869)** (Figs. 29～33)

Agromyza metallica Thomson, 1869: Eugenies Resa Dipt.: 609.

Melanagromyza metallica (Thomson, 1869): Spencer, 1959: Trans. R. Entomol. Soc. Lond. 111: 278; Sasakawa, 1963a: Pacific Insects 5: 36; Sasakawa, 1972: Sci. Rep. Kyoto Pref. Univ., Agric. 24: 54.

Frons narrow, mat black. Lunule high, brown. Eye face gray tinged, covered with small hairs. Ocellar triangle large, shinning black. Orbit slightly shining. Orbital bristles 4 pairs, upper 3 pairs directed slightly upwards, lower 1 pair inclinate. Thorax greenish shining with metallic coloration. Dorsocentral bristles 0+2 type. Acrostichals in 9-10 rows. Wing length 2.1 mm. Costa extending beyond M_{1+2} (or near M_{1+2}); inner cross vein close to outer cross vein at about 1/3 of discal cell; proportion of 2nd to 4th costal sections, 3.3: 1: 0.8; R_{4+5} reaching wing tip. Squama and fringes light yellow to white. Halter dark brown. Male terminalia: surstylus bearing some longer setae and about 15 short spines on posteroventral tip, and 3 longer spines on inner ventral side. Sperm pump with basal bulb small. Phallus length 0.23 mm; mesophallus symmetrical and strong; distiphallus U-shaped with some strong but short processes on both arms in ventral view.

Material examined: NANTOU HSIEN: Chunghsinghsintsun (中興新村), 1 male, 20-XII-1980, W. J. Wu. TAIPEI CITY: Chingmei (景美仙跡岩), 3 males, 3-X-1981. T. C. Hsu.

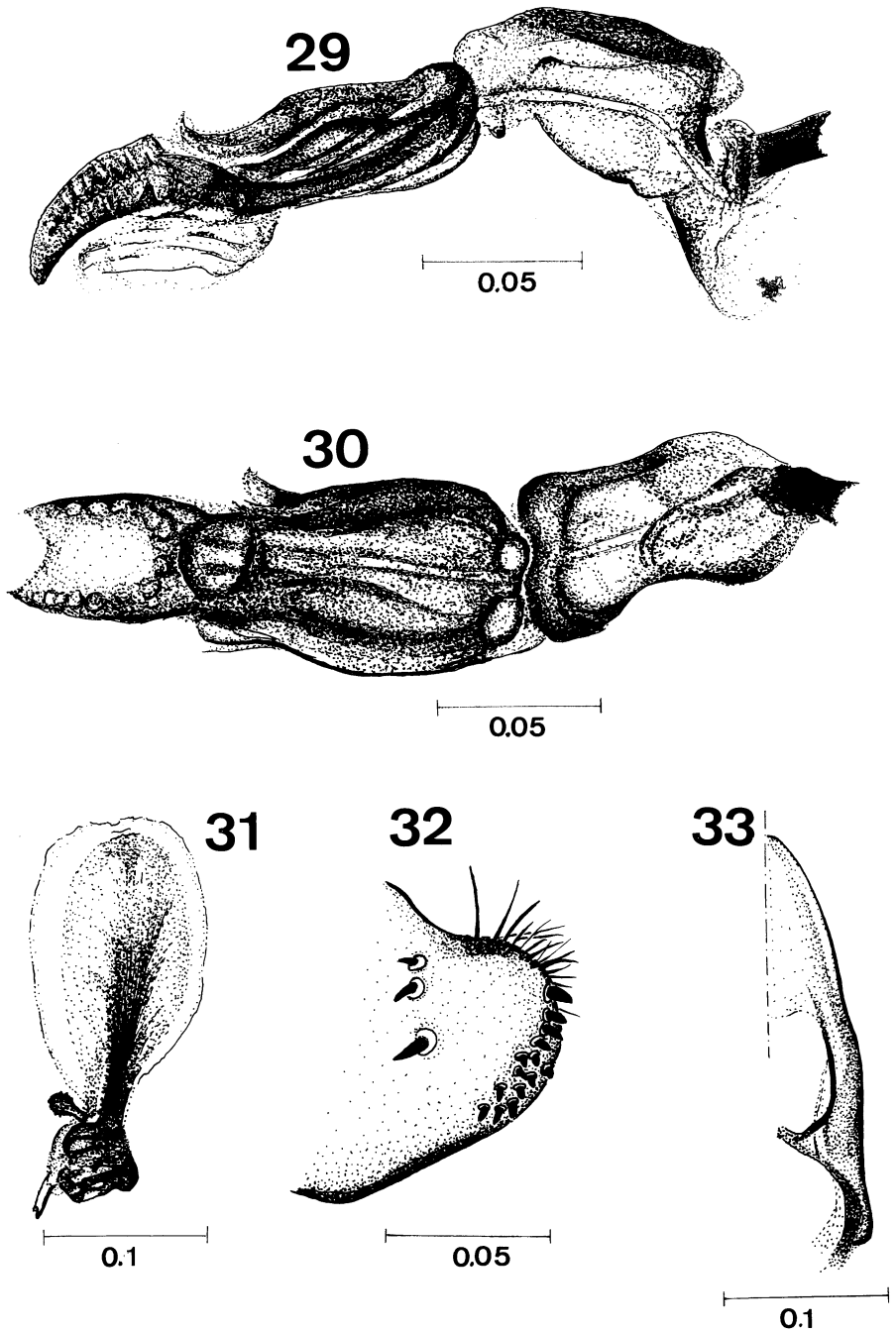
Distribution: Africa, Asia (India, Indonesia, Nepal, Philippines, Ryukyu, Taiwan, Thailand, Vietnam), Australia, Flores Is., New Guinea, Oceania (Solomons, Micronesia, New Hebrides), Seychelles.

Remarks: *M. metallica* is a widespread species; according to the present records, it is distributed throughout the Old World tropics from Africa, southern Asia, Oriental regions to northern Australia. Moreover, Sasakawa's (1972) and our records also suggest this species is commonly distributed throughout Taiwan. *Ageratum* and *Bidens* (Compositae) has been confirmed as hosts, but Spencer (1990) thought its host range should be wider. Due to the similarity of external morphology, Spencer (1990) has mentioned that examining the male genitalia is the only way to reliably identify this kind of shining greenish species.

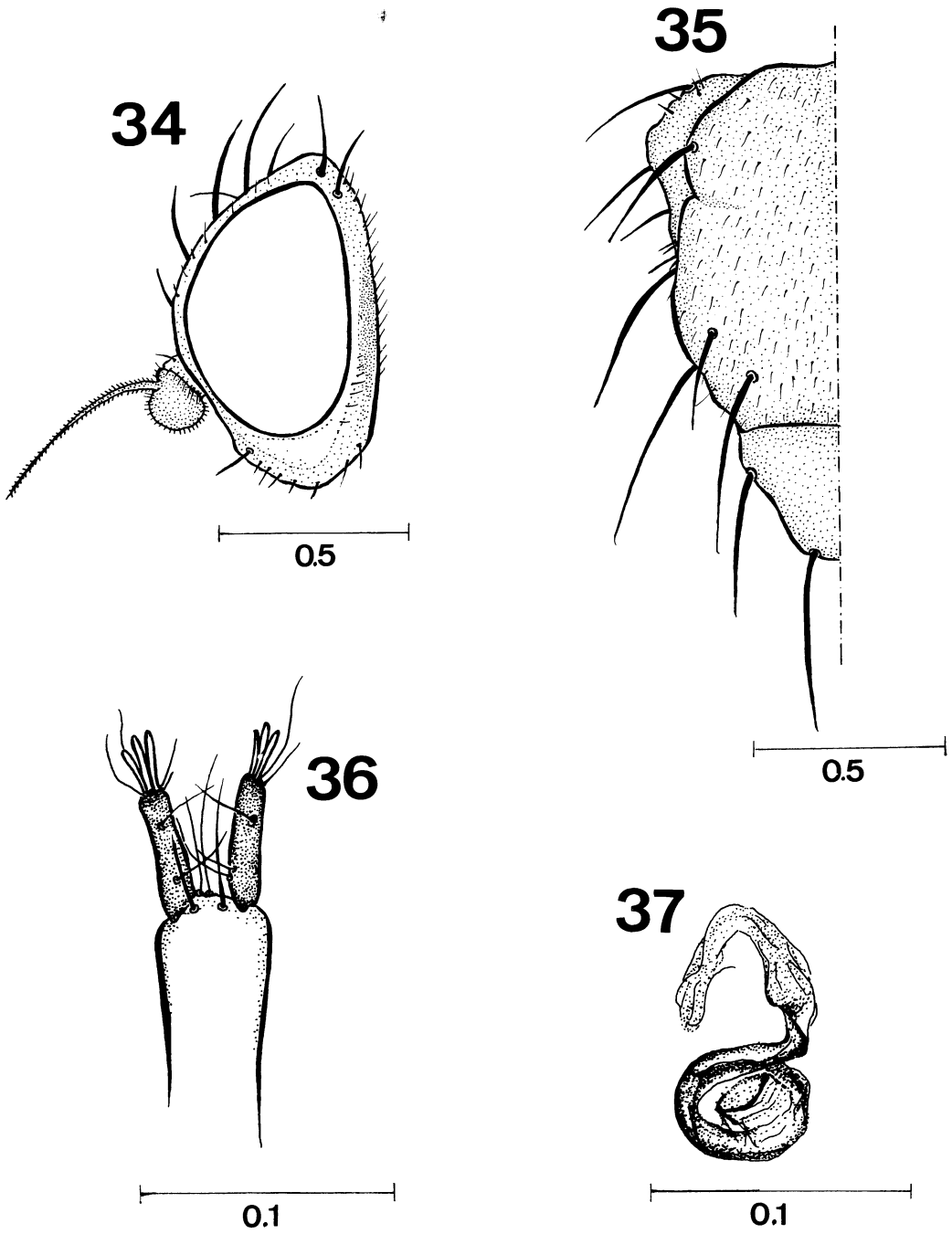
***Melanagromyza provecta* (de Meijere, 1910)** (Figs. 34～37)

Agromyza provecta de Meijere, 1910: Tijdschr. Entomol. 53: 161.

Melanagromyza provecta (de Meijere, 1910): de Meijere, 1922: Bijdr. Dierk.



Figs. 29～33. *Melanagromyza metallica*; 29, phallus, lateral view; 30, phallus, ventral view; 31, sperm pump; 32, surstylus, posteroventral view; 33, half of hypandrium.



Figs. 34~37. *Melanagromyza provecta*; 34, head of female, lateral view; 35, left half of female thorax, dorsal view; 36, half of female 9th tergite and sternite with cercus; 37, ventral receptacle.

22: 22; Spencer, 1961: Trans. R. Entomol. Soc. Lond. 113: 76; Sasaksawa, 1972: Sci. Rep. Kyoto Pref. Univ., Agric. 24: 54-55.

Melanagromyza nigrisquama (Malloch, 1914): Hennig, 1941: Entomol. Beihefte 8: 174. (Synonymy established by Spencer, 1977b: Beitr. Entomol. Berlin 27: 234.)

Melanagromyza communis Spencer, 1959: Trans. R. Entomol. Soc. Lond. 111: 265. (Synonymy established by Spencer, 1963: J. Entomol. Soc. S. Afr. 26: 104.)

Orbital bristles 4 pairs, all directed slightly upwards and inclinate. Dorsocentral bristles 0+2 type. Acrostichals in 10-12 rows. Female genitalia: 9th sternite with 1 marginal seta. Cercus with 6-7 long setae, and 3 blunt and rounded tactile sensillae.

Material examined: CHIAI HSIEN: Alishan, 1 female, 4-V-1917, T. Shiraki.

Distribution: Africa (Ethiopia, Mozambique, South Africa, Tanzania, Zaire, Zimbabwe), Flores Is., Indonesia (Krakatau, Lombok, Sumbawa), Taiwan.

Remarks: This specimen was previously examined and determined as *M. provecta* by Sasakawa in 1972. Due to the poor condition of the specimen and based only on a female specimen, we have no stronger or further direct evidence to confirm its status; so herein we retain Sasakawa's identification. The illustration of male genitalia was provided by Spencer (1977b). Previously, he had commented that it is closely related to *conspicua* from the similarity of male genitalia; but later he transferred *conspicua* to the genus *Ophiomyia* (see the following species description). The previous host recording, stem gall maker on *Abutilon indicum*, was also pointed out to be a misidentification (Spencer, 1977b).

***Ophiomyia conspicua* (Spencer, 1961)** (Figs. 38～44)

Melanagromyza conspicua Spencer, 1961: Trans. R. Entomol. Soc. Lond. 113: 71.

Melanagromyza joycei Sasakawa, 1963b: Pacific Insects 5: 417.

Melanagromyza latifrons Garg, 1971: Oriental Insects Suppl. 1: 191. (Synonymy established by Sasakawa, 1977: A Catalog of Diptera of the Oriental Region, Vol. III: 248.)

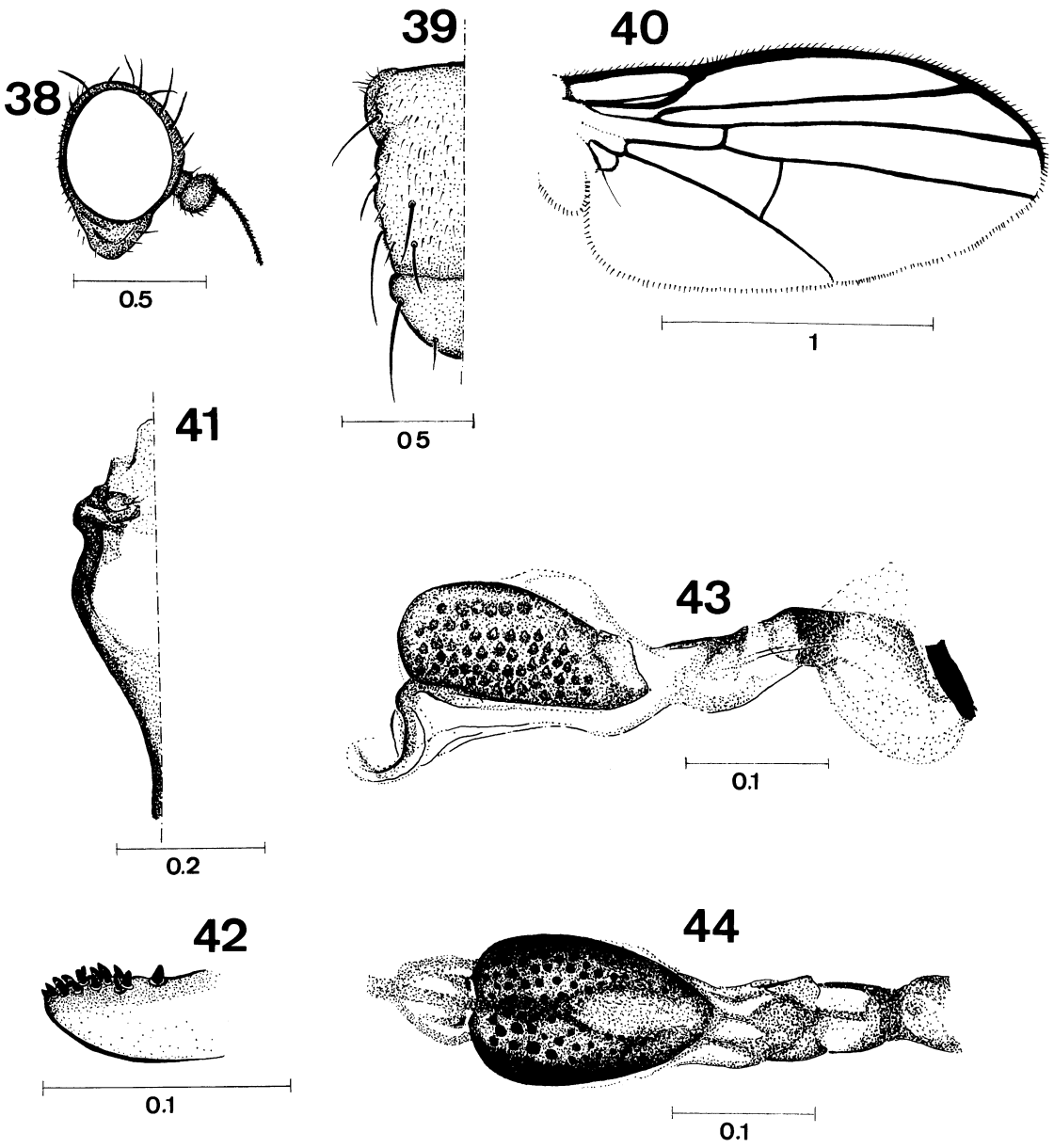
Melanagromyza spiniphallata Garg, 1971: Oriental Insects Suppl. 1: 198. (Synonymy established by Sasakawa, 1977: A Catalog of Diptera of the Oriental Region, Vol. III: 248.)

Ophiomyia conspicua (Spencer, 1963): Spencer, 1977a: Pacific Insects 17: 349.

Frons and gena mat brown. Lunule light brown. Ocellar triangle, orbit, postgena, and occiput slightly shining black with metallic coloration. Antenna black with 3rd segment pale and obviously pubescent. Arista finely pubescent. Orbital bristles 4 pairs, upper 2 pairs directed slightly upwards, lower 2 pairs inclinate. Orbital setulae over 20 pairs about in 1 row. Thorax coppery to black shining except whitish on wing base. Dorsocentral bristles 0+2 type. Acrostichals in 8 rows. Wing length 1.9 mm in male. Costa extending beyond R_{4+5} but not reaching M_{1+2}; inner cross vein near middle of discal cell but slightly close to outer cross vein; proportion of 2nd to 4th costal sections, 3.1: 1: 0.6. Squama whitish with margin and fringes dark brown. Halter mat black with stalk pale. Male terminalia: surstylus with about 14-16 stout but short spines on inner margin. Phallus length about 0.44 mm; basiphallus short; mesophallus and distiphallus forming a compact complex with a curved tail (probably the extended tubular pair originating from the mesophallus) from lateral view; distiphallus covered with short processes on surface.

Material examined: TAIPEI CITY: Kungkuan: NTU campus (公館台大農場), 1 male, 23-II-1981. T. C. Hsu.

Distribution: Australia, India, New



Figs. 38～44. *Ophiomyia conspicua*; 38, head of male, lateral view; 39, left half of male thorax, dorsal view; 40, wing of male; 41, half of hypandrium; 42, surstylus, posterior view; 43, phallus, lateral view; 44, phallus, ventral view.

Britain, New Guinea, New Caledonia, New Hebrides, Philippines, Singapore, Sri Lanka, Taiwan.

Remarks: The host plants of *O. conspicua* have been recorded as *Eclipta alba* and *Sigesbeckia orientalis* from India, and *Bidens* sp. from New Guinea; all of these host data indicate that this species seems to be a composite feeder. Even though *O. conspicua* does not have the typical external morphological characters of this genus, such as antennae divided by a facial keel or vibrissal horn distinct in the male, Spencer (1977a) still transferred it from the previous genus *Melanagromyza* into the present *Ophiomyia* based on the male genitalia. From our viewpoint, basically, the most distinctive shape difference of the phallus between *Melanagromyza* and *Ophiomyia* is whether the basiphallus is symmetrical or not; the basiphallus of *Melanagromyza* is usually symmetrical, but that of *Ophiomyia* is not. Unfortunately, we can not confirm this point with certainty due to the short basiphallus in this sample.

***Ophiomyia phaseoli* (Tryon, 1895)** (Figs. 45～53)

Oscinis phaseoli Tryon, 1895: Trans. Nat. Hist. Soc. Qd. 1: 4.

Oscinis fabae Tryon, 1897: Rep. Dept. Agric. Qd. 1896-97: 21.

Agromyza phaseoli Coquillett, 1899: Proc. Linn. Soc. N.S.W. 24: 128.

Agromyza fabalis Jack, 1913: Rhodesia Agric. J. 10: 545.

Agromyza destructor Malloch, 1916: Proc. Entomol. Soc. Wash. 18: 93.

Ophiomyia gangetica Garg, 1971: Oriental Insects Suppl. 1: 188. (Synonymy established by Sasakawa, 1977: A Catalog of Diptera of the Oriental Region Vol. III: 254.)

Ophiomyia phaseoli (Tryon, 1895): Spencer, 1973: Agromyzidae (Diptera) of Economic Importance: 61-68.

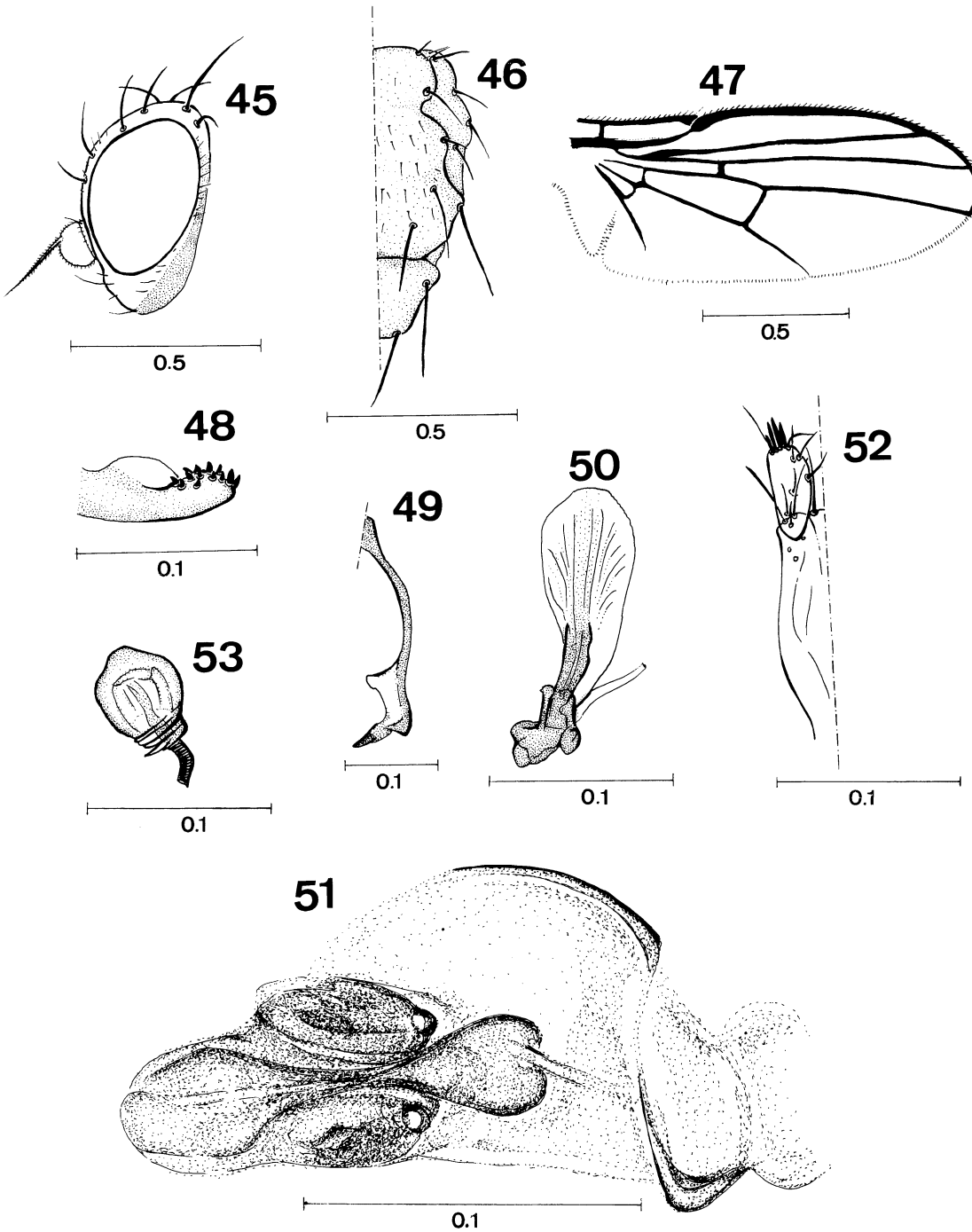
Ophiomyia sanctuarii Singh and Ipe, 1973: Mem. Sch. Entomol., St. John's College 1: 62. (Synonymy established by Sasakawa, 1977: A Catalog of Diptera of the Oriental Region Vol. III: 254.)

Frons mat gray. Gena and postgena lightly brown tinged. Ocellar triangle long and shining black to brown. Orbit slightly shining. Orbital bristles 4 pairs, upper 3 pairs directed upwards, lower 1 pair slightly inclinate. Orbital setulae few, about 3-4 pairs between 2nd to 3rd orbital bristles. Dorsocentral bristles 0+2 type. Acrostichals in 6-7 irregular rows. Wing length about 1.45 mm in male, 1.65 mm in female. Wing tip between end of R_{4+5} and M_{1+2}; costa extending to M_{1+2}; proportion of 2nd to 4th costal sections, 3. 6: 1: 0.8. Halter, squama, and fringes milky white. Male genitalia: surstylus bearing 12-14 short spines on posteroventral margin. Phallus length about 0.2 mm; basiphallus highly asymmetrical; mesophallus and distiphallus complex forming a pair of rolled lobes in middle from ventral view, each with a tiny hole on basal lobe. Female genitalia: 9th sternite with 2 pairs of marginal setae. Cercus with 4 stronger tactile sensillae on tip; and with about 7-8 setae, inner 1 pair on tip obviously bent inwards.

Material examined: TAINAN HSIEN: Hsenhua (善化), 3 males 1 female, 11-VII-1988, S. F. Shiao, ex *Glycine max* (L.) Merr. (Leguminosae).

Distribution: Africa (Burundi, Egypt, Ethiopia, Kenya, Libya, Malawi, Mali, Mauritius, Nigeria, Rwanda, Senegal, South Africa, Sudan, Tanzania, Uganda, Zaire, Zambia, Zimbabwe), Asia (Burma, China, India, Indonesia, Israel, Japan, Malaysia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam), Oceania (Fiji, Guam, Hawaii, Micronesia), Australia, New Hebrides, Papua New Guinea.

Remarks: *O. phaseoli* is well known as an important leguminous pest that probably occurs throughout the entire tropical and subtropical areas. This species is now confirmed as oligophagous on Legu-



Figs. 45~53. *Ophiomyia phaseoli*; 45, head of male, lateral view; 46, right half of male thorax, dorsal view; 47, wing of male; 48, surstylus, posterior view; 49, half of hypandrium; 50, sperm pump; 51, phallus, ventral view; 52, half of female 9th tergite and sternite with cercus; 53, spermatheca.

minosae (Spencer, 1990). Talekar (1990) pointed out that *O. phaseoli* has the widest distribution and host range among the 6 important agromyzid pest species of food legumes; therefore, it causes the maximum damage and also is the most-studied species. The materials we examined here were all bred from the mines on cotyledons of soybean. The male genitalia seems easier to identify from the ventral view rather than the lateral view, the lateral view is sometimes too simple to recognize any representative characters; so we don't think the lateral view of phallus could itself be treated as a reliable diagnostic attribute.

***Tropicomyia alocasiae* Shiao and Wu, 1996**
(Figs. 54, 55)

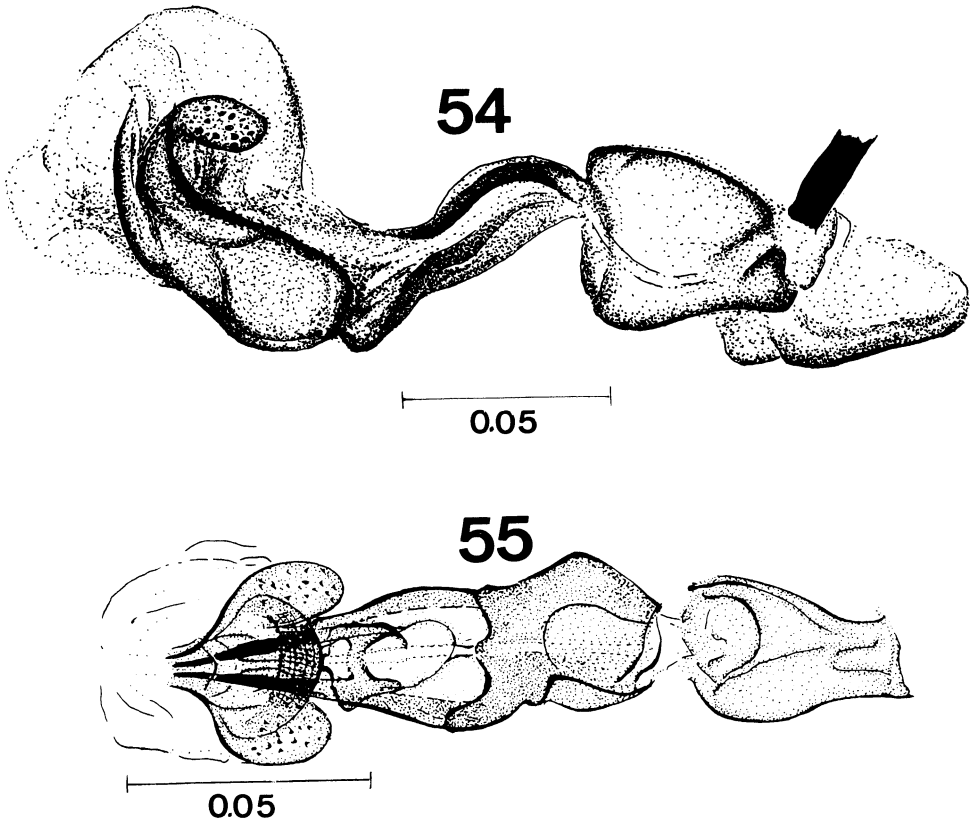
Tropicomyia alocasiae Shiao and Wu, 1996: Trans. Am. Entomol. Soc. 122: 217-219.

Material examined: TAIPEI HSIEN: Hsintien: Hsiaotsukeng, 1 male, 25-V-1984, T. C. Hsu. TAIPEI CITY: Kungkuan (公館), 2 males, 10-II-1999, S. F. Shiao, ex *Alocasia macrorrhiza* (L.) Schott & Endl. (Araceae).

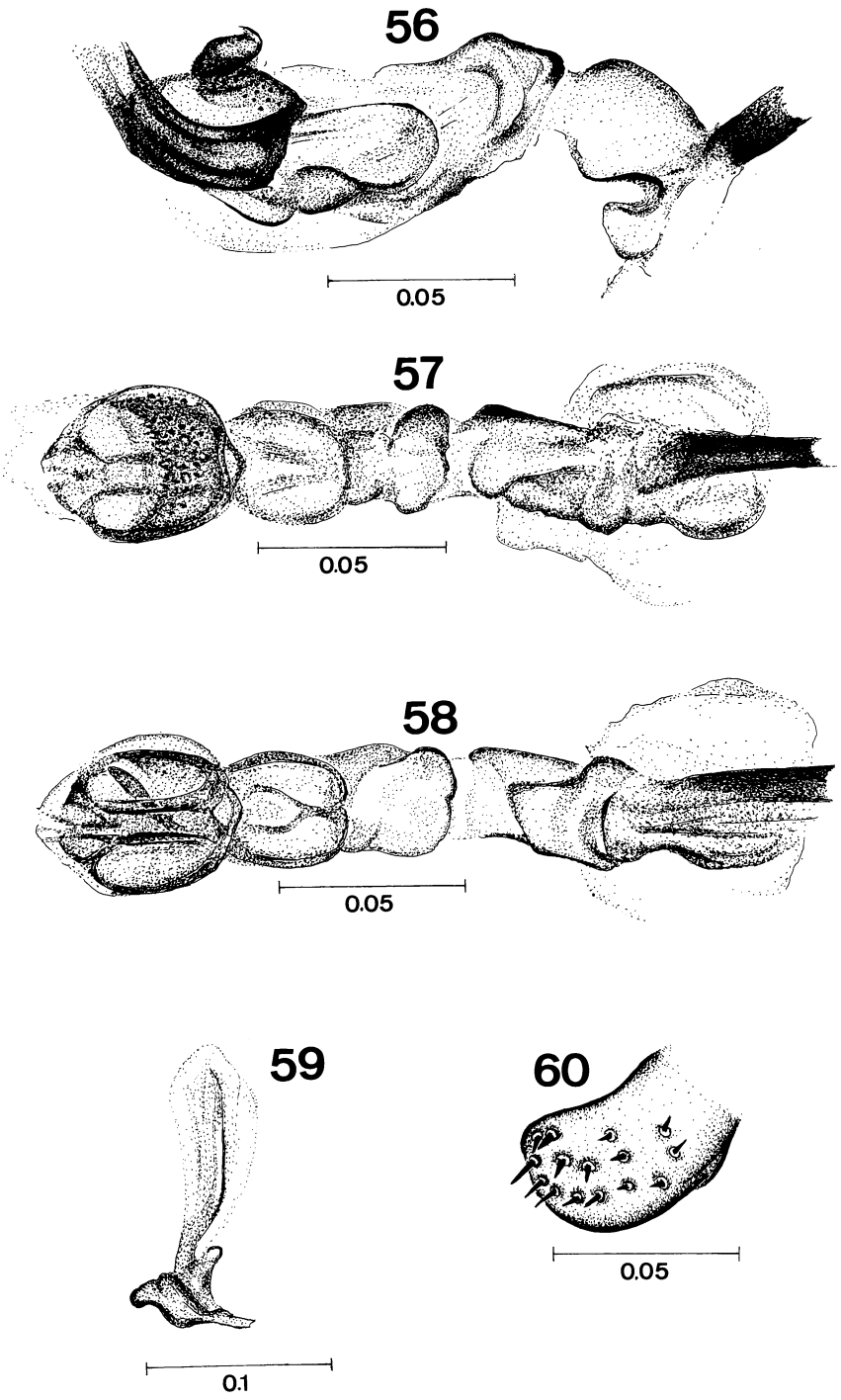
Distribution: Taiwan.

Remarks: We have previously described this new species from Taiwan (Shiao and Wu, 1996); here we provide an additional illustration of the phallus from lateral view (Fig. 54) for supplement. However, the lateral view of phallus seems not as characteristic as the ventral view (Fig. 55); and it shows common and typical features similar to those of many other congeneric species. Until now, this species was reared from the epidermal mines on *Alocasia macrorrhiza*.

***Tropicomyia atomella* (Malloch, 1914)**
(Figs. 56~60)



Figs. 54~55. *Tropicomyia alocasiae*; 54, phallus, lateral view; 55, phallus, ventral view (after Shiao and Wu, 1996).



Figs. 56~60. *Tropicomyia atomella*; 56, phallus, lateral view; 57, phallus, ventral view; 58, phallus, dorsal view; 59, sperm pump; 60, surstylus, posteroventral view.

Agromyza atomella Malloch, 1914: Ann. Hist. Nat. Mus. Hung. 12: 331.

Melanagromyza atomella Hennig, 1941: Spencer, 1961: Trans. R. Entomol. Soc. Lond. 113: 67; Spencer, 1966a: Beitr. Entomol. 16: 7; Singh and Beri, 1971: J. Nat. Hist. 5: 245.

Melanagromyza styricicola Sasakawa, 1954: Trans. Shikoku Entomol. Soc. 4: 42.

Tropicomyia atomella (Malloch, 1914): Spencer, 1973: Agromyzidae (Diptera) of Economic Importance: 181-184.

Melanagromyza latigena Garg, 1971: Oriental Insects Suppl. 1: 193. (Synonymy established by Sasakawa, 1977: A Catalog of the Diptera of the Oriental Region Vol. III: 252.)

Frons mat black. Gena narrow, mat brown. Ocellar triangle, orbit, postgena and occiput moderately shining black. Orbital bristles 4 pairs, upper 3 pairs directed slightly upwards, lower 1 pairs inclinate. Orbital setulae few, mainly distributed between 2nd to 3rd orbital bristles. Antenna brown with arista long and finely pubescent. Thorax moderately shining black with coppery coloration. Dorsocentral bristles 0+2 type. Acrostichals in about 6-7 irregular rows. Wing length about 1.2 mm in male. R_{4+5} reaching near wing tip; costa extending to M_{1+2}; proportion of 2nd to 4th costal sections, 3.7: 1: 0.9; inner cross vein at about middle of discal cell, but slightly close to outer cross vein. Halter brown to black. Squama and fringes mat black. Male genitalia: surstylus bearing 15 short spines. Sperm pump small with relatively larger basal bulb. Phallus length about 0.16 mm; distiphallus with a bowl-shaped structure wholly covered with tiny processes on surface from ventral view.

Material examined: NANTOU HSIEN: Chichi (集集), 1 male, 3-III-1999, L. Y. Chou, ex *Sapindus mukorossii* Gaertn. (Spindaceae). TAINAN HSIEN: Tsengwen (曾文水庫), 1 male, 24-II-1999, L. Y. Chou, ex *Acalypha wilkesiana* Muell. -Arg. (Euphorbiaceae).

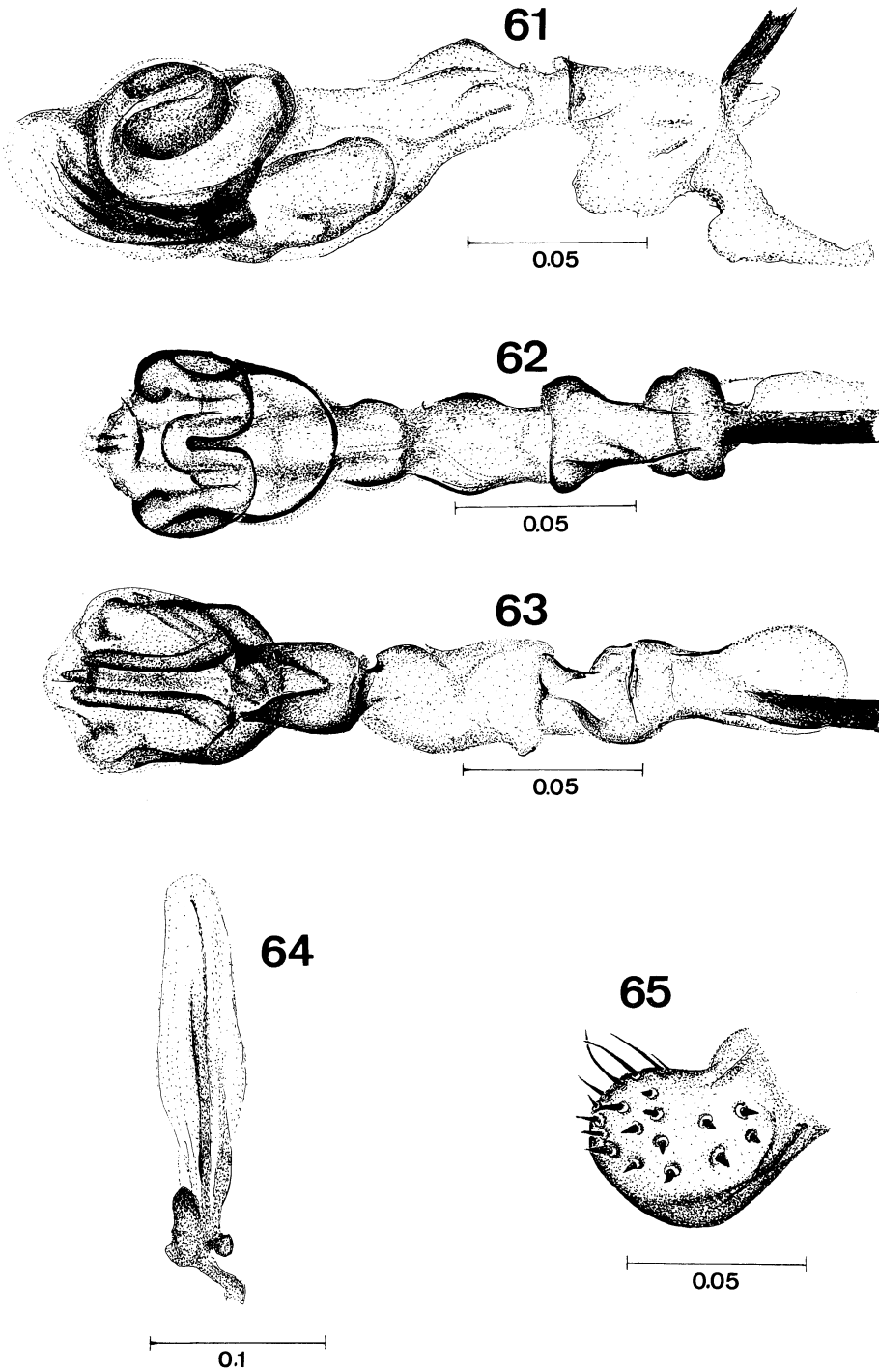
Distribution: India, Philippines, Sri Lanka, Taiwan.

Remarks: *T. atomella* is a polyphagous species whose host range has now been recorded to be as wide as 12 plant families (Spencer, 1990). Even though this polyphagous species has the potential to become a pest, however, we have received no damage report to date. We have mentioned that drawings of the phallus of the same *Tropicomyia* species by different authors are sometimes quite different (Shiao and Wu, 1996). And now we believe this is, at least in part, caused by confusion about the "ventral" and "dorsal" view during examinations with light microscopes. We herein provide illustrations of the phallus from both the ventral and dorsal views; and now it seems clear that the ventral view is more characteristic than the dorsal view. The dorsal view of the phallus, which has one pair of long tubular processes, seems to be a common type in this group. Anyway, some species that have been thought to be closely related previously, especially based on the morphology of the phallus, require additional review. On the other hand, the phallus of *T. atomella* is quite similar to those of *T. polyphaga*, *T. polyphyta*, and even the new species we recently published, *T. passiflorella* (Shiao and Wu, 1996). All of these species have a similar bowl-shaped structure on the distiphallus; the relationships between them and whether they can be treated as distinctly different species, are still questionable.

***Tropicomyia pilosa* Spencer, 1986** (Figs. 61～65)

Tropicomyia pilosa Spencer, 1986: Proc. Indian Acad. Sci. (Anim. Sci.) 95: 494 -495.

Frons wide, mat brown. Gena gray. Ocellar triangle, orbit, and occiput slightly shining black. Orbital bristle 4 pairs, upper 3 pairs directed slightly upwards,



Figs. 61~65. *Tropicomyia pilosa*; 61, phallus, lateral view; 62, phallus, ventral view; 63, phallus, dorsal view; 64, sperm pump; 65, surstylus, posteroventral view.

lower 1 pair obviously inclinate. Orbital setulae about 4-6 pairs. Antenna small, kidney-shaped laterally. Arista long, finely pubescent. Wing length 1.6 mm in male. Wing tip between end of R_{4+5} and M_{1+2}. Costa extending to R_{4+5} and weakly contiguous to M_{1+2}; inner cross vein near outer cross vein at about 3/4 of discal cell; proportion of 2nd to 4th costal sections, 3.6: 1: 08. Halter black. Squama black to brown with fringes lightly tinged. Male terminalia: surstylus with about 14-16 short spines on posteroventral side, and 4-5 longer setae on margin. Sperm pump elongated with small basal bulb. Phallus length about 0.18 mm; distiphallus with a special twisted tubular structure, forming a W-shape from ventral view.

Material examined: NANTOU HSIEN: Chichi, 3 males, 3-III-1999, L. Y. Chou, ex *Drypetes littoralis* (C. B. Rob.) Merr. (Euphorbiaceae).

Distribution: Thailand, **New to Taiwan.**

Remarks: This species was first described by Spencer (1986), and those specimens (1 male, 1 female) were collected from northern Thailand. Spencer depicted the host plant as "unidentified bush", and we herewith first provided the exact host plant data. *T. pilosa* has the typical morphological type of phallus of this genus, but it is readily recognized by examining the ventral view. As we just mentioned in the preceding species' remarks, the ventral view of the phallus is easily confused with the dorsal view under high magnification of transmission light microscopes; so we herein also provide illustrations of both the ventral and dorsal aspects. After all, these two aspects are quite different in this species, and should be noted and carefully differentiated.

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臺灣產潛蠅亞科(雙翅目：潛蠅科)種類之補述，兼述三新記錄種

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摘 要

本文記載11種臺灣產潛蠅亞科種類（雙翅目：潛蠅科）；其中8種爲重新描述並提供較爲詳盡之特徵繪圖，另外亦描述3種新發現於臺灣之記錄種：*Agromyza panici*、*Melanagromyza malayensis* 及 *Tropicomyia pilosa*。文中並整理先前已發表之潛蠅亞科種類名錄。各種類描述後之附記並討論形態學、分類學、寄主植物或地理分布等相關主題。

關鍵詞：分類學、潛蠅亞科、潛蠅科、新記錄種、臺灣。

*抽印本索取及論文聯繫之負責人