

Seven Species of Non-gall Making Cecidomyiids (Diptera: Cecidomyiidae) New to Korea

Daseul Ham and Yeon Jae Bae*

Department of Environmental Science and Ecological Engineering, Graduate School, Korea University, Seoul, Korea

*Correspondence

Yeon Jae Bae, Division of Environmental Science and Ecological Engineering, College of Life Sciences and Biotechnology, Korea University, Seoul 02841, Republic of Korea
E-mail: yjbae@korea.ac.kr

Received 20 October 2016
Accepted 5 November 2016

Abstract

Seven species of non-gall making cecidomyiids (Cecidomyiidae: Porricondylinae, Lestremiinae, and Micromyinae) are newly recorded in Korea: *Coccopsilis marginata* (Mejere), *Divellepidosis rotundata* (Yukawa), *Divellepidosis separate* (Yukawa), *Anaretella defecta* (Winnertz), *Lesremia cinerea* Macquart, *Lestremia leucophaea* (Meigen), and *Peromyia spinosa* Jaschhof. Diagnoses and material data of the species are provided.

Key words: Cecidomyiidae, Porricondylinae, Lestremiinae, Micromyinae, new distributional records, Korea

Introduction

Among the six subfamilies of the gall-midge family Cecidomyiidae, Cecidomiinae includes the majority of the known species (3/4 of 6,000 known species) and most of them induce galls on diverse host plants (Gagné & Jaschhof 2014). The other subfamilies (Catotrichinae, Lestremiinae, Micromyinae, Winnerziinae, and Porricondylinae) are saprophagous or mycophagous inhabiting litter, soil, rotten leaves, barks or trunks (Gagné & Jaschhof 2014). Recently, 46 cecidomyiid species are known in Korea, but only three of them are non-gall making species (Paek *et al.* 2010, Shin *et al.* 2011): *Camptomyia corticalis* (Loew), 1851 and *Camptomyia heterobia* Mamaev belonging to Porricondylinae are known mycophagous and *Lestremia yasukunii* Shinji belonging to Lestremiinae are known saprophagous. The purpose of this study is to additionally record non-gall making cecidomyiids in Korea.

Materials and methods

Cecidomyiid adults were collected by Malaise traps, light traps, and sweep nets from 2009 to 2016 in South Korea and preserved in 80% or 95% ethanol. Majority specimens were collected by Malaise traps set at the Gapyeong Ecological Research Center (GERC) (N37°58'33.49", E127°26'28.73") located in Gyeonggi-do, Gapyeong-gun, Buk-myeon, Jeokmok-ri, Garim. Microscopic images of the specimens were

taken using a stereomicroscope (ZEISS V12, Germany).

Morphological terminology follows Yukawa (1971). Examined specimens are deposited in the Korea University Entomological Museum (KU) in Seoul and National Institute of Biological Resources (NIBR) in Incheon, Korea.

Taxonomic accounts

Order Diptera 파리목
Family Cecidomyiidae 흑파리과
Subfamily Porricondylinae 곧은흑파리아과
Genus *Coccopsilis* Mejere, 1901 알흑파리속(신칭)

Coccopsilis marginata (Mejere, 1901)

알흑파리(신칭) (Fig. 1)
Coccopsilis marginata Mejere, 1901.

Dimension. Antenna scapus 0.05 mm in length, 1.6× longer than pedicel; basal enlargement of 5th flagellar 0.05 mm in length, 0.5× as long as stem; basal enlargement of terminal flagellar 0.06 mm in length, 1.5× as long as stem. Forewings 1.65 mm in length. Middle leg coxa 0.12 mm, trochanter 0.06 mm, femur 0.88 mm, and tibia 0.69 mm; middle leg 1st, 2nd, 3rd, 4th, and 5th tarsal segment 0.1 mm, 0.74 mm, 0.32 mm, 0.17 mm, and 0.08 mm, respectively.

Diagnosis. Antennae (Fig. 1A) with 2 + 13 segments; terminal flagellar subconical. Palpus with 1 + 4 segments. Forewings (Fig. 1B): costa with break beyond *R*₅; *R*_s and *rm-m*

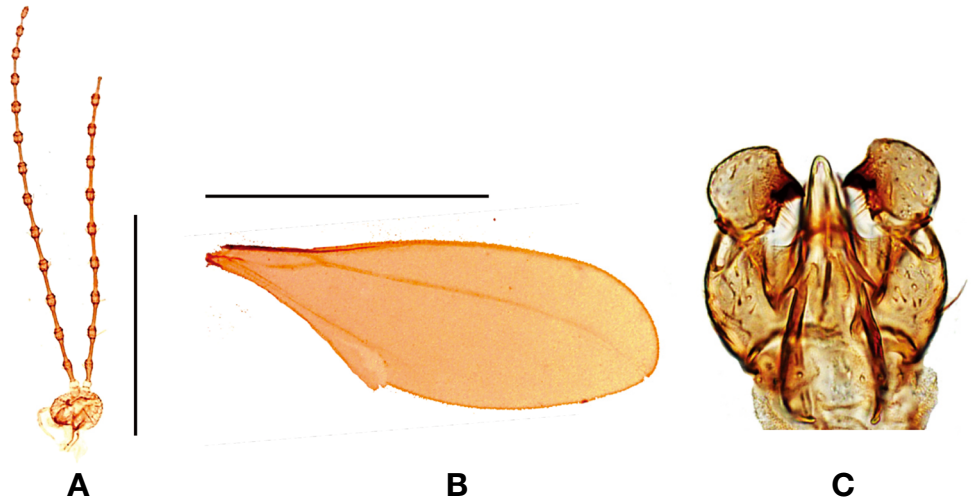


Figure 1. *Coccopsilis marginata* (Mejiere), male. A. head and antenna; B. forewing; C. genitalia. Scale bars = 1 mm (A, B), 0.1 mm (C).

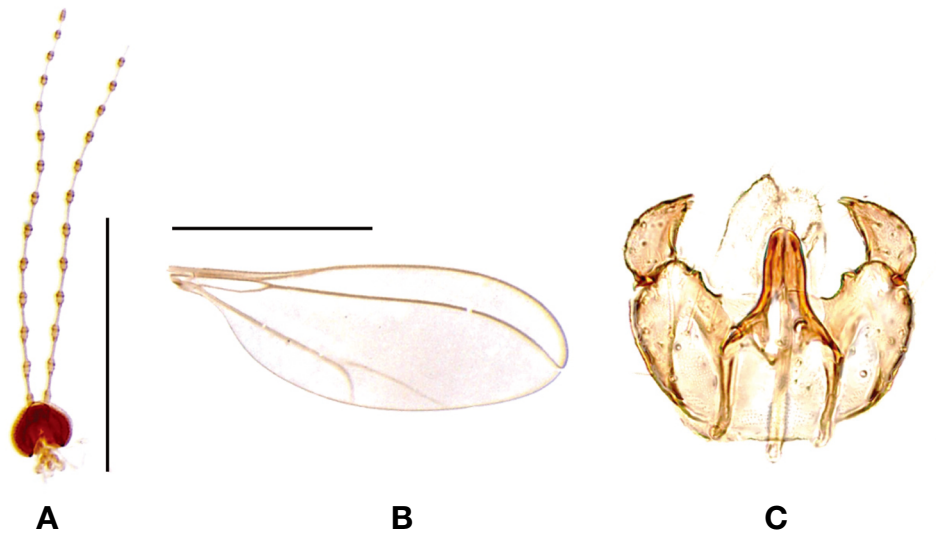


Figure 2. *Divellepidosis rotundata* (Yukawa), male. A. head and antenna; B. forewing; C. genitalia. Scale bars = 1 mm (A, B), 0.1 mm (C).

forming rather small angles with R_5 ; $rm-m$ slightly S-curved; Cu becoming faint distally. First tarsal segment of all legs distinctly shorter than 2nd segment. Genitalia (Fig. 1C): gonostylus stout, semicircle with brush teeth; gonocoxite slightly longer than wide; transverse bridge not visible; tegmen well developed, sclerotized, narrower distally.

Specimen examined. 1♂ (on slide, HDS-212), Jeollabuk-do, Buan-gun, 8-14.iv.2015, Coll. J.C. Jung (KU).

Distribution. South Korea, Japan, widespread in Europe.

Remarks. Panelius (1965) described 12 flagellomeres of *C. marginata*, however, we identified 13 flagellomeres in the examined specimen in this study.

Genus *Divellepidosis* Fedotova & Sidorenko, 2007
 따로혹파리속 (신칭)

***Divellepidosis rotundata* (Yukawa, 1971)**
 따로혹파리 (신칭) (Fig. 2)
Porricondyla rotundata Yukawa, 1971.

Dimension. Antenna scapus 0.06 mm in length, 1.5× longer than pedicel; basal enlargement of 5th flagellar 0.06 mm in length, 0.55× as long as stem; basal enlargement of terminal flagellar 0.06–0.07 mm in length, 1.4–1.5× as long as stem. Forewings 1.70–2.16 mm in length, 2.3–2.9× of width. Foreleg coxa 0.09 mm, trochanter 0.08 mm, femur

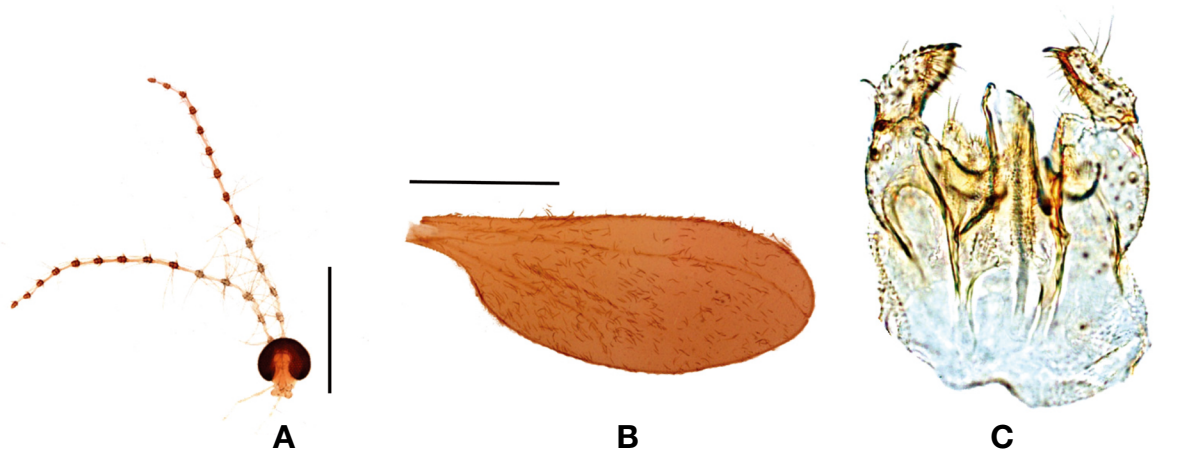


Figure 3. *Divellepidosis separate* (Yukawa), male. A. head and antenna; B. forewing; C. genitalia. Scale bars = 1 mm (A, B), 0.1 mm (C).

0.92 mm, and tibia 0.88 mm; foreleg 1st, 2nd, 3rd, 4th, and 5th tarsal segment 0.08 mm, 0.81 mm, 0.41 mm, 0.25 mm, and 0.11 mm, respectively.

Diagnosis. Antennae (Fig. 2A) with 2 + 14 segments; terminal flagellar subconical. Palpus with 1 + 4 segments. Forewings (Fig. 2B): *Rs* in same direction as *R5*; *Cu* forming a fork with *M*₃₊₄. First tarsal segment of all legs distinctly shorter than 2nd segment; claw bifid in all legs; empodium as long as claw. Genitalia (Fig. 2C): cerci bilobed; subanal plate split distally; gonostylus with 2 or 3 spines apically; gonocoxite with a pair of setose lobes; tegmen well sclerotized and narrower apically; genital rod simple.

Specimen examined. 2♂ (on slides, HDS-13, 14), GERC, 17.v.2016, Coll. Y.J. Bae (NIBR); 1♂ (on slides, HDS-40), Gangwon-do, Wonju-si, Mt. Chiak (N 37°17'10.13", E128°5'3.25"), 1.v.2016, Coll. D. Ham (KU); 1♂ (on slide, HDS-78), Seoul, Sungbuk-gu, Anam-dong, Mt. Gaeun (N37°35'44.98", E127°1'42.52"), 27.v.2016, Coll. D. Ham (KU).

Distribution. South Korea, Japan (Kyushu).

Divellepidosis separata (Yukawa, 1971)

두발톱흑파리 (신칭) (Fig. 3)

Porricondyla separata Yukawa, 1971.

Dimension. Antenna scapus 0.08 mm in length, 2× longer than pedicel; basal enlargement of 5th flagellar 0.06 mm in length, 0.47× as long as stem; basal enlargement of terminal flagellar 0.07 mm in length, as long as stem. Forewings 2.74 mm in length, 2.6× of width. Middle leg coxa 0.08 mm, trochanter 0.10 mm, femur 1.29 mm, and tibia 1.17 mm; middle leg 1st, 2nd, 3rd, 4th, and 5th tarsal segment 0.11 mm, 0.99 mm, 0.51 mm, 0.29 mm, and 0.12 mm, respectively.

Diagnosis. Antennae (Fig. 3A) with 2 + 14 segments; terminal flagellar subconical. Palpus with 1 + 4 segments. Forewings (Fig. 3B): *Rs* in same direction as *R5*; *rm-m* weakly curved. First tarsal segment of all legs distinctly shorter than

2nd segment; claws bifid in all legs; empodium as long as claw. Genitalia (Fig. 3C): cerci and subanal plate bilobed; gonostylus with 2 claws apically; gonocoxite caved inwardly as U-shape, with a pair of setose lobes; tegmen split into 2 distally; genital rod simple.

Specimen examined. 2♂ (on slides, HDS-75, 76), Gangwon-do, Wonju-si, Mt. Chiak (N37°17'38.64", E128°4'8.29"), 4.vi.2016, Coll. D. Ham (NIBR).

Distribution. South Korea, Japan (Kyushu).

Subfamily Lestremiinae 마흑파리아과

Genus *Anaretella* (Winnertz, 1870) 둥근날개흑파리속 (신칭)

Anaretella defecta (Winnertz, 1870)

둥근날개흑파리 (신칭) (Fig. 4)

Lestremia defecta Winnertz, 1870.

Dimension. Antenna scapus 0.04 mm in length, 1.33× longer than pedicel; basal enlargement of 5th flagellar 0.04 mm in length, 0.8× as long as stem; basal enlargement of terminal flagellar 0.05 mm in length, 5× longer than stem. Forewings 0.59 mm in width. Middle leg coxa 0.12 mm, trochanter 0.04 mm, femur 0.52 mm, and tibia 0.57 mm; middle leg 1st, 2nd, 3rd, 4th, and 5th tarsal segment 0.36 mm, 0.15 mm, 0.10 mm, 0.07 mm, and 0.07 mm, respectively.

Diagnosis. Antennae (Fig. 4A) with 2 + 14 segments; terminal flagellar subconical. Palpus with 1 + 4 segments. Forewings (Fig. 4B): *M*₁₊₂ forked; *M*₃₊₄ free, not arising from *M*, not forming a fork with *Cu*. First tarsal segment of all legs longer than 2nd segment and shorter than femur or tibia; claws of all legs bent nearly at right angle; empodium shorter than ca. 1/2 of claw. Genitalia (Fig. 4C): gonocoxite slightly broader basally; gonostylus slightly narrower distally with indistinct small two points; tegmen club-shaped gently.

Specimen examined. 1♂ (on slide, HDS-124), GERC, 14-

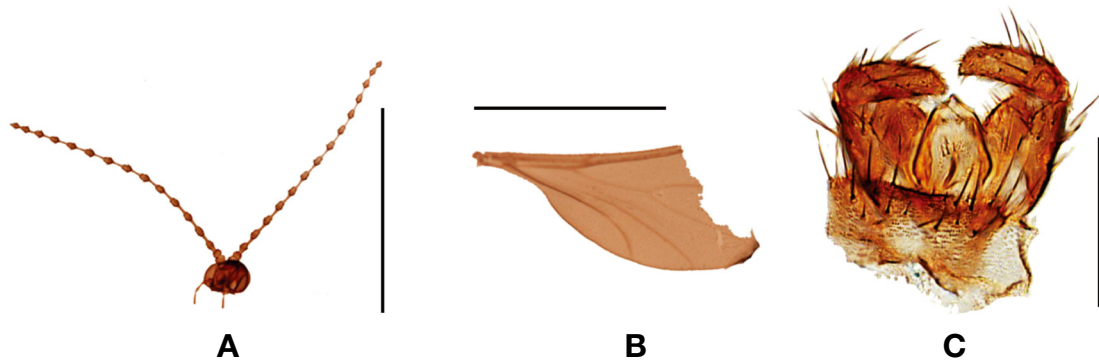


Figure 4. *Anaretella defecta* (Winnertz), male. A. head and antenna; B. forewing; C. genitalia. Scale bars = 1 mm (A, B), 0.1 mm (C).

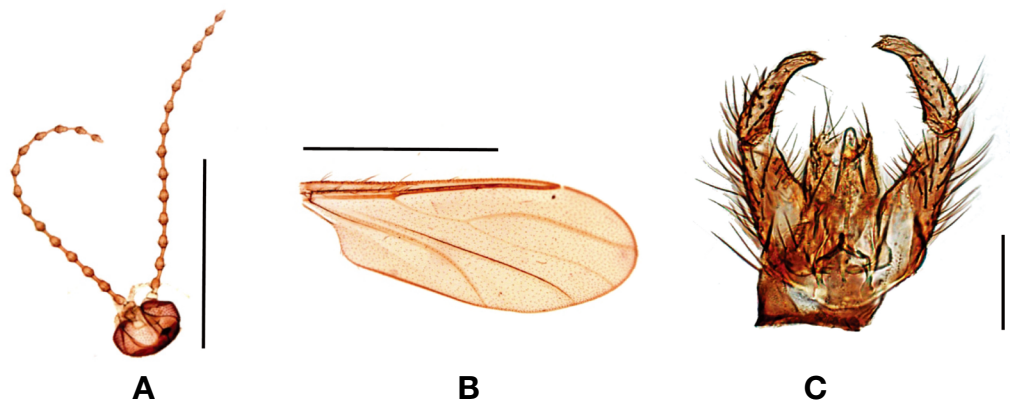


Figure 5. *Lestremia cinerea* Macquart, male. A. head and antenna; B. forewing; C. genitalia. Scale bars = 1 mm (A, B), 0.1 mm (C).

21.v.2016, Coll. Y.J. Bae (KU).

Distribution. South Korea, Cosmopolitan.

Genus *Lestremia* Macquart, 1826 마혹파리속

***Lestremia cinerea* Macquart, 1826**

갯빛혹파리(신칭) (Fig. 5)

Lestremia cinerea Macquart, 1826.

Dimension. Antenna scapus 0.07 mm in length, 1.75 × longer than pedicel; basal enlargement of 5th flagellar 0.06 mm in length, as long as stem; basal enlargement of terminal flagellar 0.06 mm in length, 2 × longer than stem. Forewings 2.00 mm in length, 2.6 × longer than wide. Middle leg coxa 0.13 mm, trochanter 0.08 mm, femur 0.87 mm, and tibia 1.00 mm; middle leg 1st, 2nd, 3rd, 4th, and 5th tarsal segment 0.61 mm, 0.28 mm, 0.21 mm, 0.13 mm, and 0.10 mm, respectively.

Diagnosis. Antennae (Fig. 5A) with 2 + 14 segments; terminal flagellar subconical. Palpus with 1 + 4 segments. Forewings (Fig. 5B): costa with break beyond R_5 ; M_{1+2} forked;

medial fork longer than stem with genital curve; M_{3+4} free, not arising from M, not forming a fork with Cu. First tarsal segment of all legs longer than 2nd segment; claws of all legs bent nearly at right angle; empodium shorter than 1/2 of claw. Genitalia (Fig. 5C): gonocoxite rather narrower distally with long setae; gonostylus slightly curved inwardly with 2 small claws; tegmen wrapped by subanal plate, densely pubescent; tegmen tapering distally; genital rob with small circular part apically.

Specimen examined. 1♂ (on slide, HDS-1), GERC, 17.v.2015, Coll. Y.J. Bae (NIBR); 1♂ (on slide, HDS-101), GERC, 5–14.v.2016, Coll. Y.J. Bae (KU); 1♂ (on slide, HDS-122), GERC, 14–21.v.2016, Coll. Y.J. Bae (KU); 1♂ (on slide, HDS-121), GERC, 11–18.vi.2016, Coll. Y.J. Bae (NIBR).

Distribution. South Korea, widespread in Holarctic region, Chile, Hawaiian Is, New Zealand.

***Lestremia leucophaea* (Meigen, 1818)**

흰혹파리(신칭) (Fig. 6)

Sciara leucophaea Meigen, 1818.

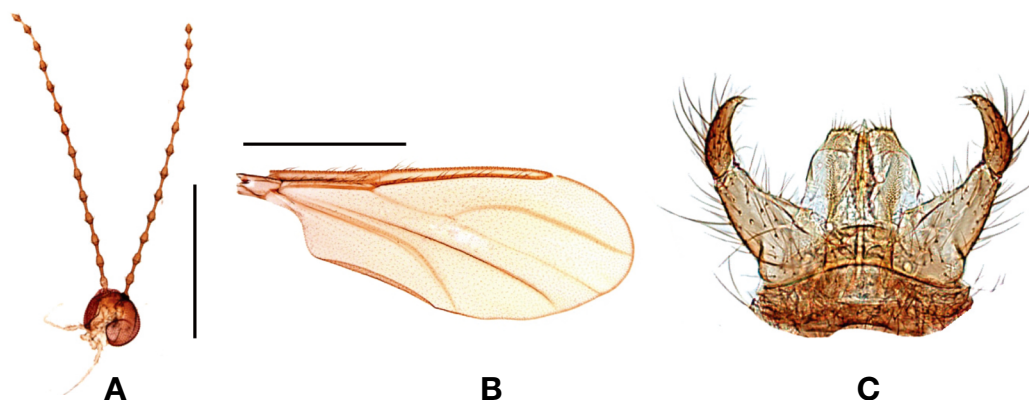


Figure 6. *Lestremia leucophaea* (Meigen), male. A. head and antenna; B. forewing; C. genitalia. Scale bars = 1 mm (A, B), 0.1 mm (C).

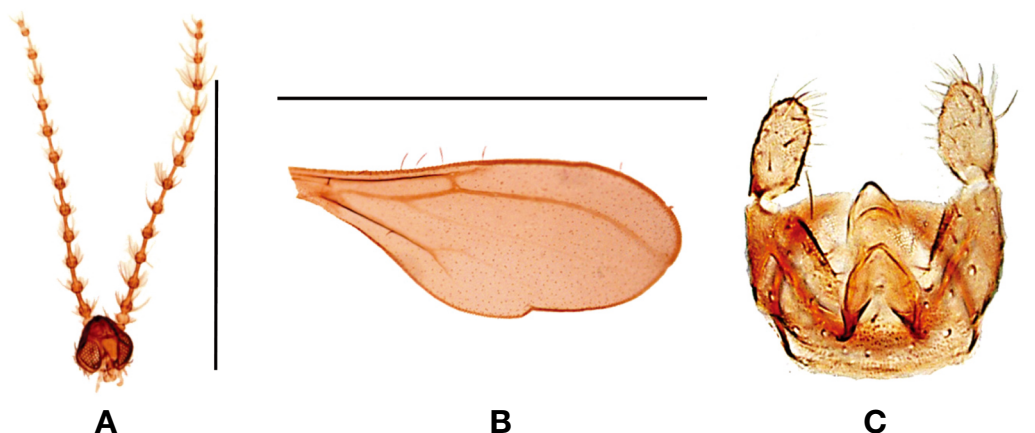


Figure 7. *Peromyia spinosa* Jaschhof, male. A. head and antenna; B. forewing; C. genitalia. Scale bars = 1 mm (A, B), 0.1 mm (C).

Diagnosis. Antenna scapus 0.06 mm in length, $1.5 \times$ longer than pedicel; basal enlargement of 5th flagellar 0.07 mm in length, as long as stem; basal enlargement of terminal flagellar 0.16 mm in length, $2 \times$ longer than stem. Forewings 2.50 mm, $2.65 \times$ longer than wide. Middle leg coxa 0.24 mm, trochanter 0.09 mm, femur 1.03 mm, and tibia 1.18 mm; middle leg 1st, 2nd, 3rd, 4th, and 5th tarsal segment 0.8 mm, 0.32 mm, 0.28 mm, 0.18 mm, and 0.12 mm, respectively.

Diagnosis. Antennae (Fig. 6A) with 2 + 14 segments; terminal flagellar subconical. Palpus with 1 + 4 segments. Forewings (Fig. 6B): costa break beyond R_5 ; M_{1+2} forked; medial fork longer than stem; M_{3+4} free, not arising from M, not forming a fork with Cu. First tarsal segment of all legs longer than 2nd tarsal segment; claws of all legs bent nearly at right angle with several small teeth inwardly; empodium shorter than 1/2 of claw. Genitalia (Fig. 6C): gonocoxite broad with long setae; gonostylus weakly curved inwardly with a single point; cerci bilobed; tegmen tapering; aedeagus simple.

Specimen examined. 1♂ (on slide, HDS-79), Gangwon-do,

Yeongwol-gun, Samok-ri (N37°13'41.05", E128°30'34.40"), 5–12.vi.2016, Coll. D.A. Yi (KU).

Distribution. South Korea, widespread in Holarctic region, Hawaiian Is, New Zealand.

Subfamily Micromyinae 애혹파리아과(신칭)
Genus *Peromyia* Kieffer, 1894 어리아혹파리속(신칭)

***Peromyia spinosa* Jaschhof, 2001**

어리아혹파리(신칭) (Fig. 7)

Peromyia spinosa Jaschhof, 2001.

Dimension. Antenna scapus 0.04 mm in length, as long as pedicel; basal enlargement of 5th flagellar 0.04 mm in length, $0.8 \times$ as long as stem; basal enlargement of terminal flagellar 0.07 mm in length, $1.4 \times$ longer than stem. Forewings 0.9 mm in length, $2.43 \times$ longer than wide. Middle leg coxa 0.08 mm, trochanter 0.04 mm, femur 0.28 mm, and tibia 0.17 mm; middle leg 1st, 2nd, 3rd, 4th, and 5th tarsal segment 0.7 mm, 0.04 mm, 0.04 mm, 0.03 mm, and 0.04 mm, respective-

ly.

Diagnosis. Antennae (Fig. 7A) with 2 + 12 segments; terminal flagellar constricted at mid-length, with subconical segment. Palpus with 1 + 3 segments. Forewings (Fig. 7B): M_{1+2} simple; M_{3+4} forming a fork with Cu . First tarsal segment of all legs longer than 2nd segment and shorter than femur or tibia; claws of all legs simple; empodium ca. 4/5 as long as claw. Genitalia (Fig. 7C): gonostylus ca. 2 × longer than wide, broadly rounded apically and densely covered with setae; tegmen tapering; tegmen and cerci bilobed with setae.

Specimen examined. 1♂ (on slide, HDS-115), GERC, 28.v.-4.vi.2016, Coll. Y.J. Bae (NIBR); 1♂ (on slide, HDS-20), Gangwon-do, Jeongseon-gun, Mt. Gariwang, 5.vii.-2.ix.2009, Coll. W.Y. Cho, B.S. Kim & Y.W. Lee (KU).

Distribution. South Korea, Sweden, Japan (widespread).

Acknowledgments

We sincerely thank Prof. Junichi Yukawa (Kyushu University) and Dr. Wanggyu Kim (Korean Entomological Institute, Korea University) for their kind assistance in identifying Korean cecidomyiids. This work was supported by a grant from the National Institute of Biological Resources (NIBR

201601203) and partially Korea National Park Research Institute (KNPS), funded by the Ministry of Environment of the Republic of Korea.

References

- Gagné RJ, Jaschhof M (2014) A Catalog of the Cecidomyiidae (Diptera) of the World. 3rd ed. Digital version 2.
- Paek MK, Hwang JM, Jung KS, Kim TW, Kim MC, Lee YJ, Cho YB, Park SW, Lee HS, Ku DS, Jeong JC, Kim KG, Choi DS, Shin EH, Hwang JH, Lee JS, Kim SS, Bae YS (2010) Checklist of Korean insects. pp. 218–228. In: Paek MK & Cho YK (eds). Nature & Ecology Academic Series 2, Nature & Ecology, Korea.
- Panelius S (1965) A revision of the European gall midges of the subfamily Porricondylinae (Diptera, Itonididae). *Acta Zoologica Fennica* **113**: 1–157.
- Shin SG, Lee HS, Lee SG (2011) Two cecidomyiid gall midge (Diptera: Cecidomyiidae) pests of shiitake mushrooms (Agaricales: Marasmiaceae). *Journal of Asia-Pacific Entomology* **14**: 387–391.
- Yukawa J (1971) A revision of the Japanese gall midges (Diptera: Cecidomyiidae). *Memoirs of the Faculty of Agriculture, Kagoshima University* **8**: 1–203.