

Two Unrecorded Species of the Genus *Atherigona* (Diptera: Muscidae) from Korea

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ABSTRACT

Larvae of shoot flies are known to live on decaying plants or to infest the stems of wild and crop plants. Among them, some species are economically very important pests that damage fruits or cereal crops in Old world tropics and subtropics. In Korea, three species, *Atherigona orientalis*, *A. oryzae*, and *A. soccata*, are managed as quarantine pests. To date, a total of five species, *A. (Acritochaeta) orientalis* Schiner, *A. (Atherigona) bifurca* Suh and Kwon, *A. (A.) biseta* Karl, *A. (A.) falcata* (Thomson) and *A. (A.) oryzae* Malloch, including two quarantine pests, have been recorded in Korean fauna. During the survey of Korean houseflies, the authors discovered two new unrecorded species, *A. (A.) miliaceae* Malloch and *A. (A.) reversura* Villeneuve. The diagnoses and illustrations of these species are provided in addition to the key to the Korean *Atherigona* species.

Keywords: Shoot fly, *Atherigona miliaceae*, *Atherigona reversura*, Korea

INTRODUCTION

The shoot flies belong to the genus *Atherigona* Rondani are the saprophagous or phytophagous muscoid flies that live on decaying plants or even animal material, or that bore and attack plant stems.

In addition, many species belonging to this genus are known as important pests for cereal and fruit crops in Old world tropics and subtropics. In Korea, three species reported to cause great damage to crops, such as *A. (A.) soccata* Rondani, *A. (A.) oryzae* Malloch, and *A. (Acritochaeta) orientalis* Schiner, are designated and managed as control pests for plant quarantine.

The first known record of this genus in Korea was made by Suh and Kwon (2016), who reported *A. (Acritochaeta) orientalis* Schiner in tomato greenhouses, as an invasive quarantine pest fly. Suh and Kwon (2018a) also recorded *A. (Atherigona) oryzae* Malloch, which is managed as a kind of quarantine pests in Korea. Suh and Kwon (2018b) taxonomically arranged five species of Korean *Atherigona*, including *A. (A.) bifurca* Suh et Kwon, *A. (A.) biseta* Karl and *A. (A.) falcata* (Thomson).

In this paper, we report *A. (A.) miliaceae* Malloch, 1925 and *A. (A.) reversura* Villeneuve, 1936 for the first time in Korea. The diagnoses and illustrations of these species are provided in addition to a key to the Korean *Atherigona* species.

MATERIALS AND METHODS

Morphological characteristics of adults and genitals were observed under a stereoscopic microscope (Olympus SZX 16, Japan) or a compound microscope (Olympus BX50). Photographs of the specimens were taken using the Michrome 16 CMOS camera (Tucsen, Fujian, China). All voucher specimens examined in the present study are deposited in the collection of the School of Applied Biosciences at Kyungpook National University, Daegu, Korea.

SYSTEMATIC ACCOUNTS

Order Diptera Linnaeus, 1758

Superfamily Muscoidea Latreille 1802

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Family Muscidae Latreille, 1802
Subfamily Atherigoninae Fan, 1965

Key to the species of the Korean *Atherigona* (based on Suh and Kwon, 2018b)

1. Basal lateral setula of scutellum almost or half as long as the sub-basal lateral seta; *r-m* beyond middle of cell *dm*; male fore femur with a shallow dorsal preapical excavation; in male, hypopygial prominence and trifoliate process absent; female ovipositor without a pair of anterior plates on tergite 8 (Subgenus *Acritochaeta*)..... ***orientalis* Schiner**
- Basal lateral setula of scutellum at most one-third as long as the sub-basal lateral seta; crossvein *r-m* always well in basal half of cell *dm*; fore femur without a dorsal preapical excavation; male with a trifoliate process and usually a hypopygial prominence; female ovipositor with a pair of small anterior plates on tergite 8 (Subgenus *Atherigona*) 2
2. Frontal vitta black or strikingly bicolored 3
- Frontal vitta entirely yellow to orange-yellow 4
3. Frontal vitta strikingly bicolored, yellow to orange below and brown to black above ***reversura* Villeneuve**
- Frontal vitta uniformly brown to black ... ***oryzae* Malloch**
4. Palpus brown to black 5
- Palpus yellow 6
5. Male fore leg mainly yellow, tibia increasingly darker towards metatarsus ***bifurca* Suh and Kwon**
- Male fore leg mainly dark except at extreme base of femur and knee ***biseta* Karl**
6. Fore tarsus with some long erect anterodorsal setae on tarsomeres 3–5 and at the tip of tarsomere 2 ***falcata* (Thomson)**
- Fore tarsus without some erect anterodorsal setae on tarsomeres 3–5 ***miliaceae* Malloch**

¹*Atherigona* (*Atherigona*) *miliaceae* Malloch, 1925 (Figs. 1, 2)

Atherigona miliaceae Malloch, 1925: 118 (type locality: India, Pusa).

Material examined. Korea: 2♂4♀, Jeollabuk-do: Gimje-si, Gwanghwal-myeon, Okpo-ri, 35.810768°N, 126.728168°E, 20 Sep 2019, Suh SJ coll. (KNU); 5♂, Gimje-si, Gwanghwal-myeon, Changje-ri, 35.836169°N, 126.700491°E, 20 Sep 2019, Suh SJ coll. (KNU); 3♂7♀, Gimje-si, Gwanghwal-myeon, Changje-ri, 35.840958°N 126.696862°E, 19 Aug 2022, Suh SJ coll. (KNU).

Male. Head yellow in ground color with silver pollen; fron-

tal vitta yellow to orange-yellow; 1 reclinate orbital and 4 inclinate frontal setae present. Antennae dark; basal 2 antennal segments yellow to dark brown; postpedicel dark except for yellow to dark yellow inner basal margin, about 2.2–2.3 times as high as width; arista brown to dark brown, short pubescent. Palpus entirely yellow. Prementum dark brown (Fig. 1A, B). Thorax largely black in ground color with gray pollen, except for yellow postpronotal lobe; mesonotum usually without vitta. Postpronotal lobe with 3 setae, the last almost as long as posterior notopleural seta. Basal scutellar seta slightly less than one-third of lateral seta; discal scutellar seta slightly less than half of lateral seta. Posterior notopleural seta slightly longer than half of anterior one. Proepisternum with 2 setae and 1 setula; proepimeron with 1 fine seta and 0-1 setula; anepimeron and meron bare. Legs mainly yellow. Fore leg yellow from coxa to basal half of tibia, and the rest increasingly darker towards last tarsomere; femur with 4 posterodorsal and 1 strong preapical posteroventral setae. Mid and hind legs mainly yellow; mid femur with 1 preapical posterodorsal seta; mid tibia with 1 posterodorsal seta in middle, and robust apical anteroventral and posteroventral setae; hind tibia with 1 preapical dorsal, 1 anterodorsal, 1 anteroventral and 1 posterodorsal setae, and anteroventral and posteroventral setae. Wing hyaline; crossvein *r-m* at slightly ahead of basal half of cell *dm*. Calypter and knob of halter light yellow. Abdomen yellow to brown in ground color; tergites 1-2 unmarked; tergite 3-4 with a pair of oval black spots; tergite 5 without spot (Fig. 1D). Hypopygial prominence rectangular with only a depression along middle of dorsal surface in anterior view (Fig. 1C). In trifoliate processes, lateral piece bean-shaped with small finger-shaped inner lobe; median piece spatulate in dorsal view (Fig. 1E-G). Surstylus bifurcate apically and expanded around middle (Fig. 1H, I).

Female. Differ from male as follows. Frontal vitta yellowish brown. Palpus yellow, filiform (Fig. 2A, B). Fore leg mainly black except for whitish yellow coxa, basal half of femur yellow, and basal part of tibia narrowly yellow. Abdomen dull yellow; pattern of tergite varies depending on the individual, but generally a narrow median vitta and a pair of black spots on tergites 3-4 respectively (Fig. 2C). Ovipositor as in figures; anterior plate of tergite 8 connected to lateral lobe (Fig. 2D, E).

Body length: Male, 3.1–3.7 mm; female, 3.7–4.7 mm.

Wing length: Male, 2.9–3.3 mm; female, 3.1–3.9 mm.

Hosts. *Echinochloa* sp., *Eleusine coracana*, *Isachne* sp., *Panicum antidotale*, *P. miliaceum* and *Setaria* sp. (Pont, 1973: 80; Gahukar and Jotwani, 1980; Davies and Seshu Reddy, 1981; Pont and Magpayo, 1995).

Korean name: ¹*기장줄기집파리 (신칭)

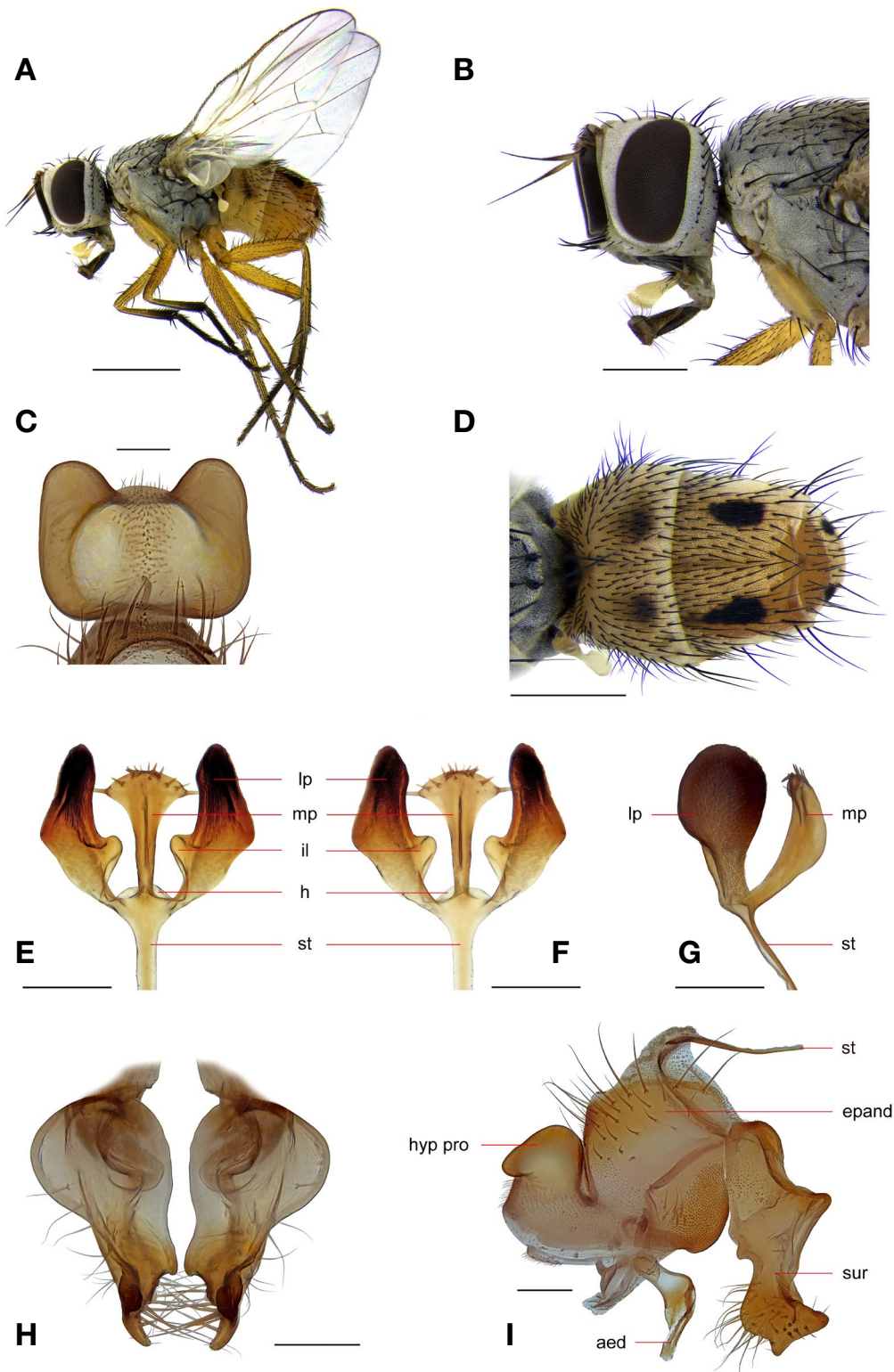


Fig. 1. *Atherigona (Atherigona) miliaceae* Malloch, male. A, Habitus; B, Head; C, Hypopygial prominence, anterior view; D, Abdomen, dorsal view; E, Trifoliate, dorsal view; F, Trifoliate, ventral view; G, Trifoliate, lateral view; H, Surstylus, dorsal view; I, Terminalia, lateral view. aed, aedeagus; epand, epandrium; h, hood; hyp pro, hypopygial prominence; il, inner lobe; lp, lateral plate; mp, median plate; st, stalk; sur, surstylus. Scale bars: A=1 mm, B-D=0.5 mm, E-I=0.1 mm.

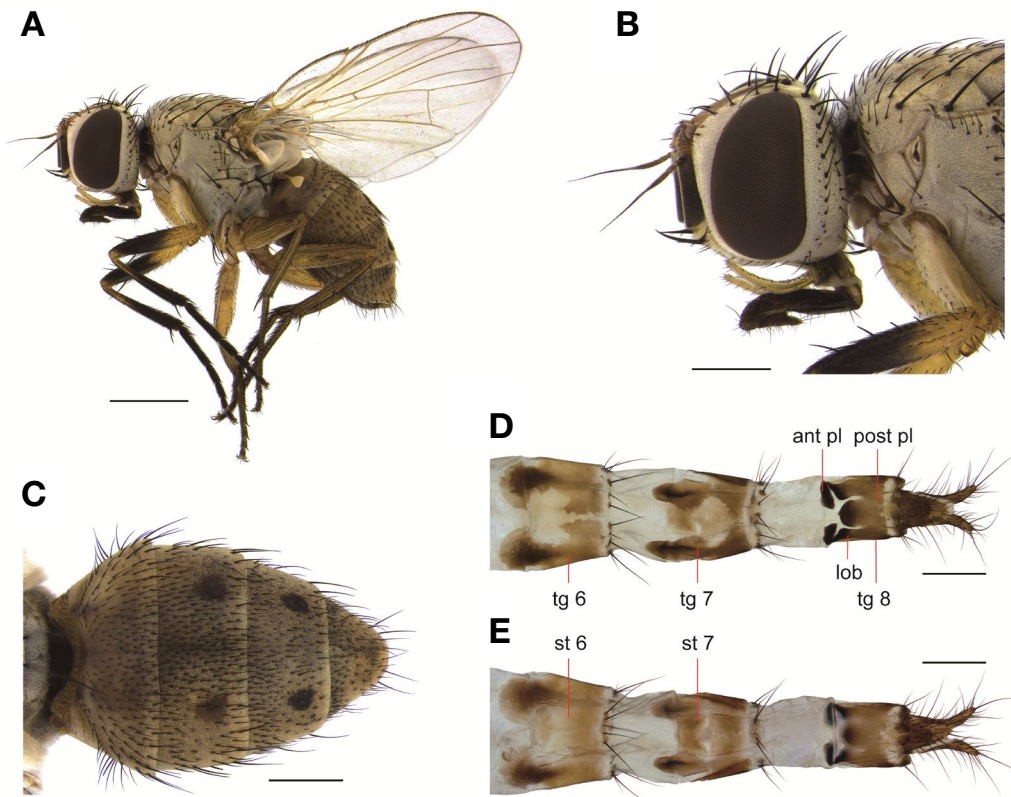


Fig. 2. *Atherigona (Atherigona) miliaceae* Malloch, female. A, Habitus; B, Head; C, Abdomen, dorsal view; D, Ovipositor, dorsal view; E, Ovipositor, ventral view. ant pl, anterior plate; lob, lobe; post pl, posterior plate; tg, tergite; st, sternite. Scale bars: A=1 mm, B, C=0.5 mm, D, E=0.1 mm.

^{2*}*Atherigona (Atherigona) reversura* Villeneuve, 1936
(Figs. 3, 4)

Atherigona reversura Villeneuve, 1936: 11 (type locality: China, Sichuan).

Atherigona bella sinobella Fan, 1965: 69 (type locality: China, Shanghai).

Material examined. Korea: 3♂3♀, Daegu-si: Buk-gu, Sangyeok-dong, KNU campus, 35.890136°N, 128.607904°E, 11 Jul 2017, Suh SJ coll. (KNU); 10♂15♀, Buk-gu, Sangyeok-dong, KNU campus, 35.890136°N, 128.607904°E, 16 Jul 2017, Suh SJ coll. (KNU); 1♂, Buk-gu, Sangyeok-dong, KNU campus, 35.890136°N, 128.607904°E, 25 Aug 2017, Suh SJ coll. (KNU).

Male. Head yellow in ground color; fronto-orbital plate, upper occiput and vertex dark with gray pruinescence and orange tint; upper of frontal vitta dark with gray pruinescence and the rest yellow to orange; parafacialia, face and cheek yellow with light gray pruinescence; 1 reclinate orbital seta

and 4 inclinate frontal setae present. Antennae dark brown to dark; basal 2 antennal segments yellow to dark brown; postpedicel and arista dark brown to dark except for yellow to dark yellow inner basal part of postpedicel; arista short pubescent; postpedicel about 2.8–3.0 times as high as width. Palpus entirely yellow. Prementum dark brown (Fig. 3A, B). Thorax black in ground color on dorsum with gray pollen, except for yellow postpronotal lobe and tip of scutellum; pleura largely yellow with gray pruinescence; mesonotum usually with 3 narrow dark vittae on *ac* and *dc*. Postpronotal lobe with 3 setae, the last almost as long as anterior notopleural seta. Basal scutellar seta slightly less than one-third of lateral seta; discal scutellar seta slightly less than half of lateral seta. Posterior notopleural seta slightly longer than half of anterior one. Proepisternum with 2 setae and 1 setula; proepimeron with 1 fine seta and 0-1 setula; anepimeron and meron bare. Legs mainly yellow. Fore leg yellow from coxa to bases of tibia, and the rest dark; femur with 3 posterodorsal and a strong preapical posteroventral setae;

Korean name: ^{1*}우산잔디줄기집파리 (신칭)

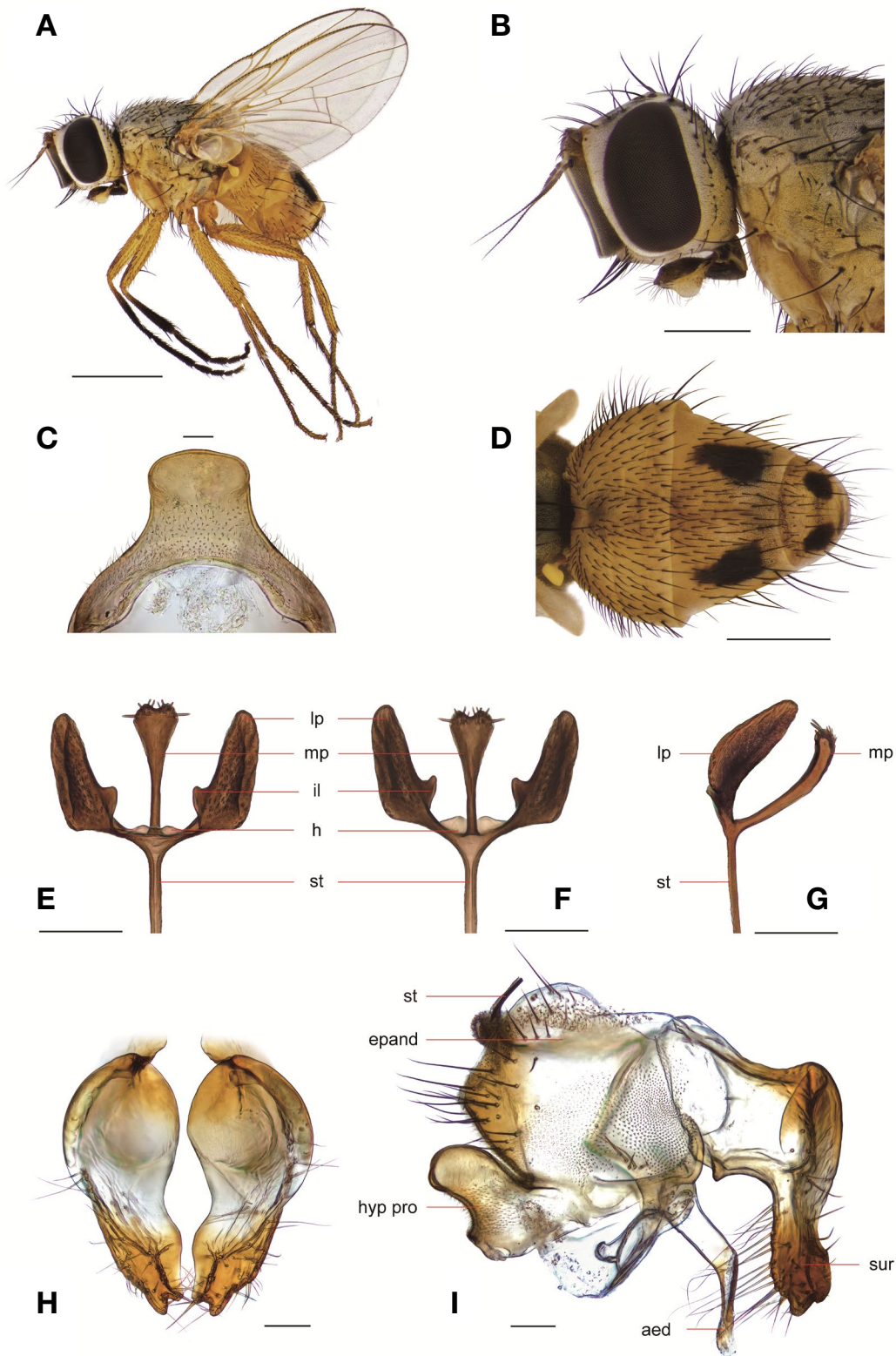


Fig. 3. *Atherigona (Atherigona) reversura* Villeneuve, male. A, Habitus; B, Head; C, Hypopygial prominence, anterior view; D, Abdomen, dorsal view; E, Trifoliate, dorsal view; F, Trifoliate, ventral view; G, Trifoliate, lateral view; H, Surstylus, dorsal view; I, Terminalia, lateral view. aed, aedeagus; epand, epandrium; h, hood; hyp pro, hypopygial prominence; il, inner lobe; lp, lateral plate; mp, median plate; st, stalk; sur, surstylus. Scale bars: A=1 mm, B-D=0.5 mm, E-I=0.1 mm.

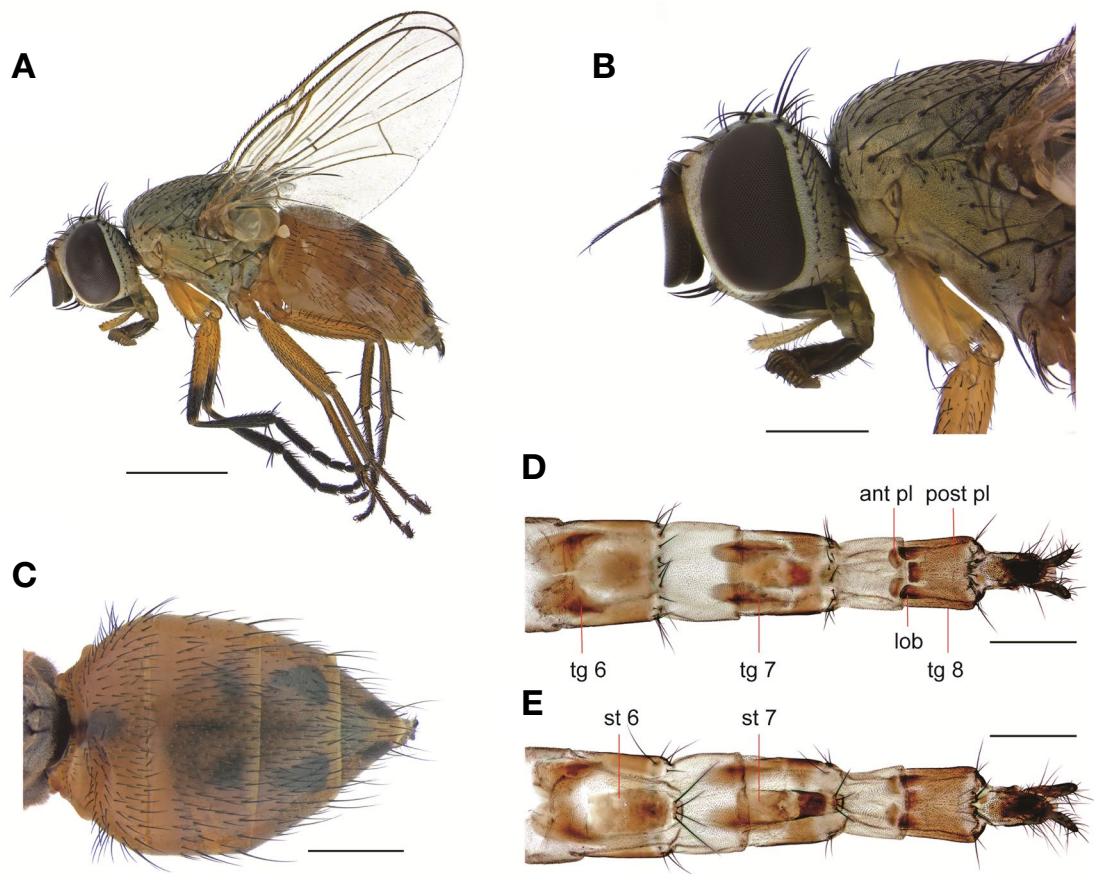


Fig. 4. *Atherigona (Atherigona) reversura* Villeneuve, female. A, Habitus; B, Head; C, Abdomen, dorsal view; D, Ovipositor, dorsal view; E, Ovipositor, ventral view. ant pl, anterior plate; lob, lobe; post pl, posterior plate; tg, tergite; st, sternite. Scale bars: A=1 mm, B, C=0.5 mm, D, E=0.1 mm.

first tarsomere with several fine anteroventral and posteroventral setulae much longer than tarsal width. Mid and hind legs mainly yellow, tarsi increasingly darker towards last tarsomere; mid femur with 1 preapical posterodorsal seta; mid tibia with 1 posterodorsal seta in middle, and robust apical anteroventral and posteroventral setae; hind tibia with 1 preapical dorsal, 1 anterodorsal, 1 anteroventral and 1 posterodorsal setae, and apical anteroventral and posteroventral setae. Wing hyaline; crossvein *r-m* at slightly ahead of basal half of cell *dm*. Calypter and knob of halter light yellow. Abdomen yellow to brown in ground color; tergites 4-6 more darkened with yellowish hind margins. Tergites 1-2 unmarked; tergite 3 yellow with faint dark median vitta and a pair of elongate round-rectangular black spots; tergite 4 with a pair of oval black spots (Fig. 3D). Hypopygial prominence rectangular with rounded dorsal margin in anterior view (Fig. 3C). In trifoliate processes, lateral piece bean-shaped with small finger-shaped inner lobe; median piece club-shaped with slightly depressed tip (Fig. 3E-G). Sursty-

lus bifurcate apically and expanded around middle (Fig. 3H, I).

Female. Differ from male as follows. Frontal vitta and palpus sometimes dark brown to black. Palpus filiform (Fig. 4A, B). Fore femur mainly yellow, and dark on up to apical 1/3; tibia largely dark, and narrowly yellow at basal part; pattern of tergite varies depending on the individual, but generally a rather wide median vitta on tergite 1 + 2, and a narrow median vitta and a pair of black spots on tergites 3-5 respectively (Fig. 4C). Ovipositor as in figures; anterior plate of tergite 8 separate from lobes (Fig. 4D, E).

Body length: Male, 3.1–3.3 mm; female, 3.5–4.3 mm.

Wing length: Male, 2.8–2.9 mm; female, 3.0–3.1 mm.

Hosts. *Cynodon dactylon*, *Echinochloa colona*, *Eleusine coracana*, *Eriochloa procera*, *Sehima nervosum*, *Sorghum bicolor* and *Zea mays* (Pont, 1973; Seshu Reddy and Davies, 1977; Davies et al., 1980; Davies and Seshu Reddy, 1981; Hardy, 1981; Pont and Magpayo, 1995).

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CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

ACKNOWLEDGMENTS

This Research was supported by Kyungpook National University Research Fund, 2022.

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Received January 6, 2023

Revised June 2, 2023

Accepted June 9, 2023