

Three Newly Recorded Species of the Genus *Dohrniphora* (Diptera: Phoridae) from Korea

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ABSTRACT

Three species of the genus *Dohrniphora*, viz., *D. cornuta*, *D. malaysiae*, and *D. prescherweberae* were newly recorded from Korea. These newly recorded species can be easily identified by the characteristic that inner face of male hind femur equipped with a group of peg-like stout setae on basal sensory area. Peg-like setae are arranged perpendicularly in *D. cornuta* whereas linear in *D. malaysiae* and somewhat arched in *D. prescherweberae*. Also, concave area near the peg-like setae is also well developed in male which is smooth in *D. cornuta*, on the other hand, there is well developed distal carina in *D. malaysiae* and with groups of microtrichia in *D. prescherweberae*. In this study, detailed descriptions with photographs of three newly recorded species and a key to males of all Korean *Dohrniphora* species are provided.

Keywords: Diptera, *Dohrniphora*, Korea, Phoridae, scuttle fly, taxonomy

INTRODUCTION

The genus *Dohrniphora* Dahl is a diverse group of scuttle flies (Diptera: Phoridae) containing more than 320 species from the world (Liu, 2015). The lifestyle of the most species is largely unknown, but some are known as scavenger, facultative predator, kleptoparasites and parasitoids associated with ants and termites (Brown and Kung, 2010). Members of the genus *Dohrniphora* are distributed worldwide, but about three-quarters of species have been described from Neotropical region (Kung and Brown, 2005, 2006; Brown and Kung, 2007, 2010; Brown, 2008). Little attention was given to species diversity of the *Dohrniphora* in Far East Asia except 27 Chinese species reviewed by Liu (2015). Only two species, *D. leei* Disney, 2005 and *D. modesta* Disney and Michailovskaya, 2000, have been described from Korea (Disney, 2005). In this study, three species, *D. cornuta* (Bigot, 1857), *D. malaysiae* Green, 1997, and *D. prescherweberae* Liu, 2001, are newly described from Korea. Among them, *D. cornuta*, is a cosmopolitan, synanthropic species spread by human, and the other two species are distributed in Malaysia and China, respectively. Detailed descriptions with photographs of three newly recorded species and a key to males of all Korean

Dohrniphora species are provided for the first time in Korea.

MATERIALS AND METHODS

Specimens used in this study were collected with aspirator and Malaise traps. Malaise traps were installed at several sites in deep forest located in Korea National Arboretum (KNA), Pocheon, Korea. Collected specimens were preserved in 80% ethanol. Male midlegs and hind legs were dissected and cleared in 10% potassium hydroxide (KOH) solution in 70°C for 5–10 min, and subsequently mounted in a drop of glycerin on a microscope or concave slide to examine mid-tibial hair palisade, peg-like setae and additional structures on inner face of hind femur and hind coxal lobe. Female head was prepared as slide by same methods to examine the apex of labrum. External morphologies were examined under an Olympus SZX10 dissecting microscope (Olympus, Tokyo, Japan). Consecutive digital images of habitus were taken in different focal planes with a Sony a6000 digital camera (Sony, Tokyo, Japan) attached to the Olympus microscope and Z-stacked using Helicon Focus software (Helicon Soft Ltd., Kharkov, Ukraine). Slide preparations of male hind legs

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and female head were examined under an Olympus BX53 compound microscope (Olympus) and Z-stacked digital images were taken with a Koptic HK6E3 digital camera (Koptic, Yongin, Korea) attached to the microscope, accompanied with imaging software (HK Basic; Koptic). Terminology used in description mostly followed Liu (2015). Costal index was calculated as Disney (1994), by dividing the length of costal vein by wing length. Costal ratios, defined by ratios of the lengths of costal sections 1–3 (costal section 1: distance from humeral crossvein to apex of vein R₁; costal section 2: distance from apex of R₁ to apex of vein R₂₊₃; costal section 3: distance from apex of R₂₊₃ to apex of vein R₄₊₅), were given as “C1:C2:C3” with C3 at a value of 1 (Disney, 1994). Voucher specimens including slide preparations are deposited at the Arthropod Collections of the Applied Biology Program, Division of Bio-resource Sciences, College of Agriculture and life sciences, Kangwon National University, Chuncheon, Korea (KNU).

SYSTEMATIC ACCOUNTS

Order Diptera Linnaeus, 1758
Family Phoridae Curtis, 1833
Subfamily Phorinae Rondani, 1856

Genus *Dohrniphora* Dahl, 1898

Dohrniphora Dahl, 1898: 188. Type species: *Dohrniphora dohrni* Dahl, 1898 (by monotypy).

Diploneura (Dohrniphora) Schmitz, 1929: 107.

Crepidopachys Enderlein, 1912a: 16. Type species: *Crepidopachys longirostrata* Enderlein, 1912 (by original designation).

Pronomiiorpha Enderlein, 1912b: 46. Type species: *Pronomiiorpha rostrata* Enderlein, 1912 (by original designation).

Diagnosis for genus (modified from Kung and Brown, 2005). Frons with a pair of reclinate supra-antennal bristles. Anterior thoracic spiracle lateral in position. Anepisternum undivided, upper part setose. Fore tibia with three to eight anterodorsal setae, without dorsal hair palisade. Midtibia with a pair of bristles on basal half (one anterodorsal, one posterodorsal), an anterodorsal bristle subapically, and an incomplete dorsal hair palisade extending about one third to three-quarter of midtibial length. Inner face of male hind femur usually with a group of peg-like stout setae on basal sensory area. Hind tibia with or without isolated bristle, a dorsal hair palisade present. Wings and halteres present. Vein R₂₊₃ present. Male terminalia with dorsally incomplete epandrial ring between epandrium and anal tube. Male anal tube erected. Female abdominal tergite 7 extended laterally, the middle portion absent and re-

maining a pair of lateral sclerites.

Dohrniphora cornuta (Bigot, 1857) (Figs. 1, 2)

Phora cornuta Bigot, 1857: 348. Type locality: Cuba.

Diploneura (Dohrniphora) cornuta: Schmitz, 1926: 44.

Dohrniphora cornuta: Borgmeier, 1960: 277 (taxonomy).

Phora navigans Frauenfeld, 1867: 454. Type locality: Brazil (synonymization).

Phora cleghorni Bigot, 1890: 191. Type locality: India (synonymization).

Phora chlorogastra Becker, 1901: 32. Type locality: Croatia (synonymization).

Phora mordax Brues, 1911: 531. Type locality: Taiwan (synonymization).

Dohrniphora bequaerti Schmitz, 1914: 105. Type locality: South Africa (synonymization).

Apocephalus flaviventris Silva Figueroa, 1916: 15. Type locality: Chile (synonymization).

Dohrniphora divaricata var. *basalis* Santos Abreu, 1921: 11. Type locality: Canary Islands (synonymization).

Dohrniphora divaricata var. *obscura* Santos Abreu, 1921: 11. Type locality: Canary Islands (synonymization).

Dohrniphora fulva Santos Abreu, 1921: 12. Type locality: Canary Islands (synonymization).

Dohrniphora opposita Borgmeier, 1925: 107. Type locality: Brazil (synonymization).

Dohrniphora crockeri Van Duzee, 1933: 70. Type locality: Galapagos Islands (synonymization).

Dohrniphora willowsi Van Duzee, 1933: 70. Type locality: Galapagos Islands (synonymization).

Dohrniphora venusta: Malloch, 1912: 432 (misidentification).

Dohrniphora cavifemur, nec Borgmeier, 1969: 1 (allotype male only, misidentification).

Material examined. Korea: 1♂, Gyeonggi-do: Yeoncheon-gun, Cheongsan-myeon, Jangtan-ri, on the wall of the artificial building, 38°01'37"N, 126°04'35"E, 23 Jul 2017, Lee JH, hand collecting (KNU); 4♀, Gangwon-do: Chuncheon-si, Hyoja-dong, on garbage bin in the house, 37°52'21"N, 127°44'26"E, 7 Jul 2020, Han D, hand collecting (KNU); 20♂ 6♀, Seoul: Gangseo-gu, Hwagok-dong, in a cage of rearing stag beetles and rhinoceros beetles in Chungwoo Insect Museum, 37°32'21"N, 126°50'30"E, 8 Jul 2020, Lee JH, hand collecting (KNU); 1♂ 3♀, ditto, on decaying cricket cadavers, Lee JH, hand collecting (KNU).

Diagnosis. This species can be distinguished from other *Dohrniphora* species by the combination of following characteristics: scutum dark brown; midtibia with a dorsal hair palisade extending about one third of midtibial length; male hind coxal lobe round-shaped, protruded posteriorly; inner face of male hind femur with 4–6 peg-like setae grouped to-

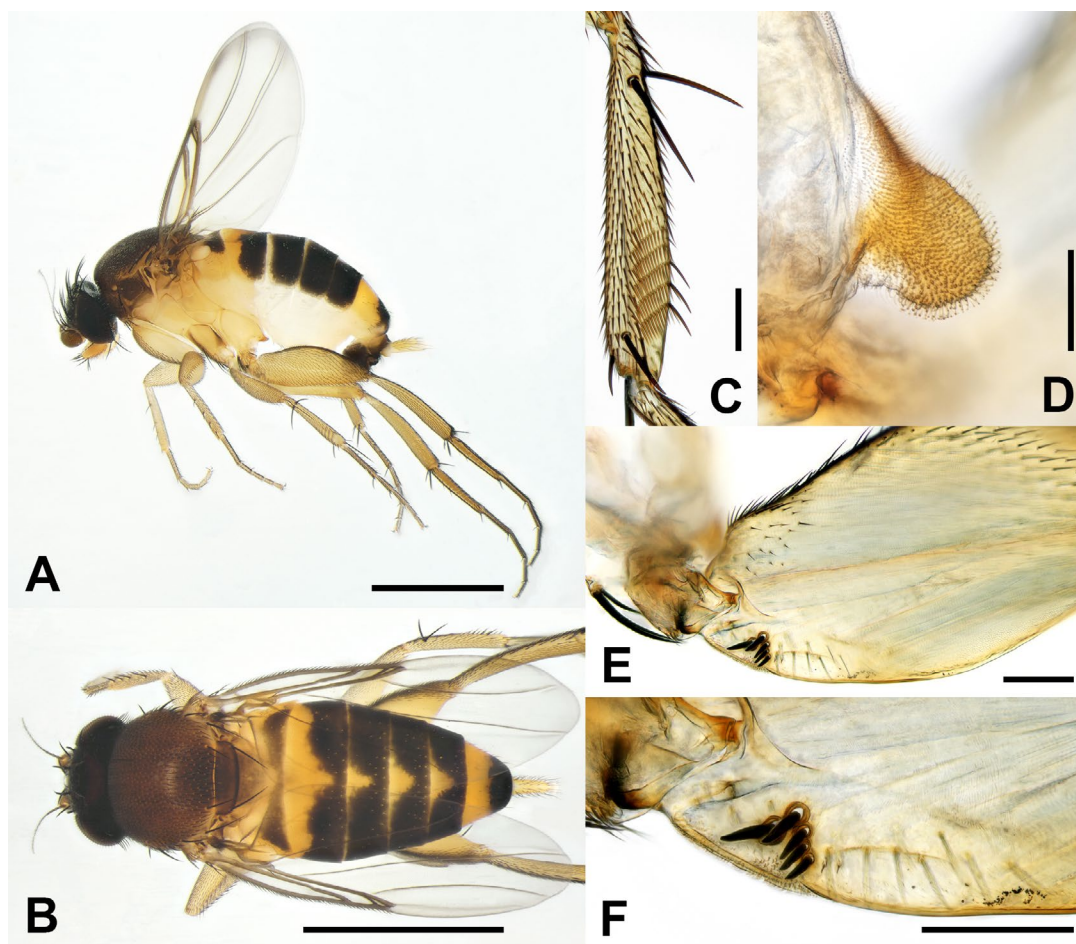


Fig. 1. Male of *Dohrniphora cornuta*. A, Body, lateral view; B, Body, dorsal view; C, Midtibia, lateral view; D, Hind coxal lobe, lateral view; E, Inner face of hind femur; F, Basal sensory area at inner face of hind femur. Scale bars: A, B=1 mm, C, E, F=0.1 mm, D=0.05 mm.

gether on basal sensory area and about 10–20 fine hairs near the dorsobasal margin.

Description. Male (Fig. 1) Body length (Fig. 1A) 2.26–2.86 mm ($n = 10$). Head (Fig. 1A). Frons dark brown, second row of bristles slightly concave. Postpedicel brown, subglobose, slightly pointed apically. Palpus yellow, cylindrical, about twice as long as width. Labrum pale yellow. Thorax (Fig. 1A, B). Scutum dark brown. Scutellum dark brown with an anterior pair of short setae and a posterior pair of long bristles. Pleuron yellow except brown anepisternum and proepisternum. Legs yellow except hind femur slightly brown at dorsal margin. Fore tibia with 4 dorsal setae. Midtibia (Fig. 1C) with a pair of dorsal bristle near the base and a dorsal hair palisade extending about one third of midtibial length. Hind coxal lobe (Fig. 1D) light brown, flat, round-shaped, protruded posteriorly, densely covered by short hooked hairs. Inner face of hind femur (Fig. 1E, F) with 4–6

peg-like setae arranged perpendicularly; concave area near the peg-like setae on basal sensory area about twice as wide as peg-like setal group; about 10–20 short, fine hairs sparsely arranged near the dorsobasal margin of hind femur. Hind tibia without isolated bristle, with a dorsal hair palisade and a row of 10 posterodorsal short setae. Wing (Fig. 1A). 1.73–1.96 mm long ($n = 10$). Costal index 0.50–0.53. Costal ratios 7.75–10.00 : 2.00–2.57 : 1. Costal setae of costal section 3 0.03 mm long. Base of Rs with a short hair. Vein pale brown. Single alular seta present, 0.11–0.13 mm long. Wing membrane hyaline with yellow tinge. Halter pale yellow. Abdomen (Fig. 1B). Abdominal tergite 1 yellowish brown except dark brown posterior margin; tergite 2 yellowish brown on anterior half and dark brown on posterior half; tergites 3–5 dark brown with yellowish brown inverted triangular-shaped markings anteromedially; tergite 6 yellowish brown anteriorly and dark brown posteriorly. Venter of

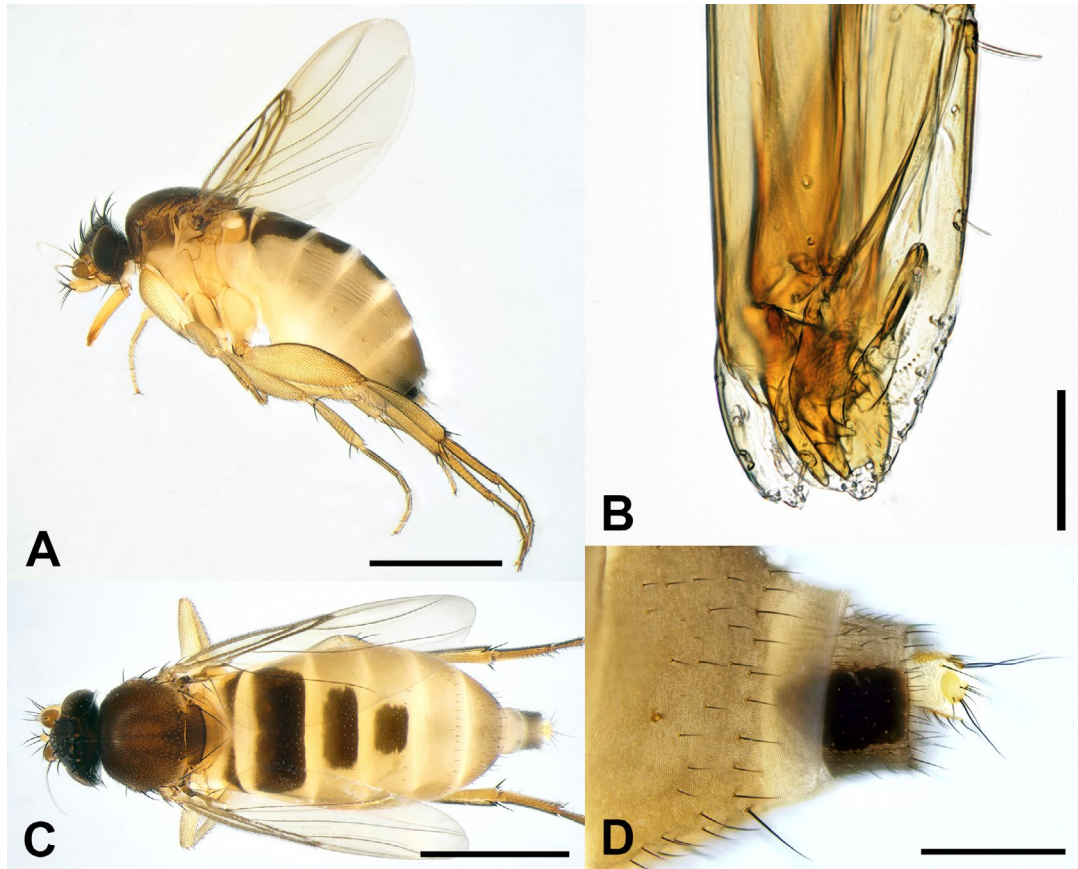


Fig. 2. Female of *Dohrniphora cornuta*. A, Body, lateral view; B, Apex of labrum, frontolateral view; C, Body, dorsal view; D, Posterior end of abdomen, lateral view. Scale bars: A, C=1 mm, B=0.05 mm, D=0.2 mm.

abdomen pale yellow, with short hairs on segments 3–4 and longer hairs on segment 5. Epandrium dark brown with long hairs near the anal tube. Hypandrium dark brown. Anal tube yellow.

Female (Fig. 2). Body length (Fig. 2A) 2.87–3.70 mm ($n=10$). Head (Fig. 2A) similar to male, except flat palpus and elongated labrum. Labrum (Fig. 2B) about 2.4 \times as long as palpal length, with 3 teeth between labella. Thorax (Fig. 2C) similar to male. Legs similar to male, except without hind coxal lobe and hind femoral peg-like setae and additional structures. Wing (Fig. 2A) similar to male, 1.79–2.11 mm long ($n=10$). Costal index 0.54–0.57. Costal ratios 7.45–9.38 : 2.00–2.56 : 1. Costal setae of costal section 3 0.03–0.04 mm long. Single alular seta present, 0.10–0.15 mm long. Halter pale yellow. Abdomen (Fig. 2C). Abdominal tergites 1–4 well developed, dark brown, gradually narrowed posteriorly; tergites 5–6 absent; tergite 7 extended laterally, the middle portion absent and remaining a pair of lateral sclerites (Fig. 2D); tergite 8 faint, yellowish brown, with a pair of long hairs and a number of shorter hairs on

posterior margin. Venter of abdomen membranous except sternite 8, grayish yellow with minute hairs; sternite 8 faint, yellowish brown, with long hairs posteriorly. Cerci 1.5 \times as long as wide, with single long hair and some shorter hairs apically.

Ecology. This species is known to be introduced and spread worldwide by human activities. They can be easily found from urban vicinity. They are known as polyphagous scavenger, and sometimes predate on larvae of moth flies in sewage as a facultative predator (Disney, 1994). In Korea, many adults were found from garbage, rearing cages for stag beetles and rhinoceros beetles and from decaying cricket cadaver. Larvae mainly lived in moist environment and fed on partly degraded coconut fiber for stag beetle rearing.

Distribution. Cosmopolitan, including Korea (new record).

***Dohrniphora malaysiae* Green, 1997 (Fig. 3)**

Dohrniphora malaysiae Green, 1997: 159. Type locality: Malaysia.

Dohrniphora rectilinearis Liu, 2001: 104. Type locality: Chi-

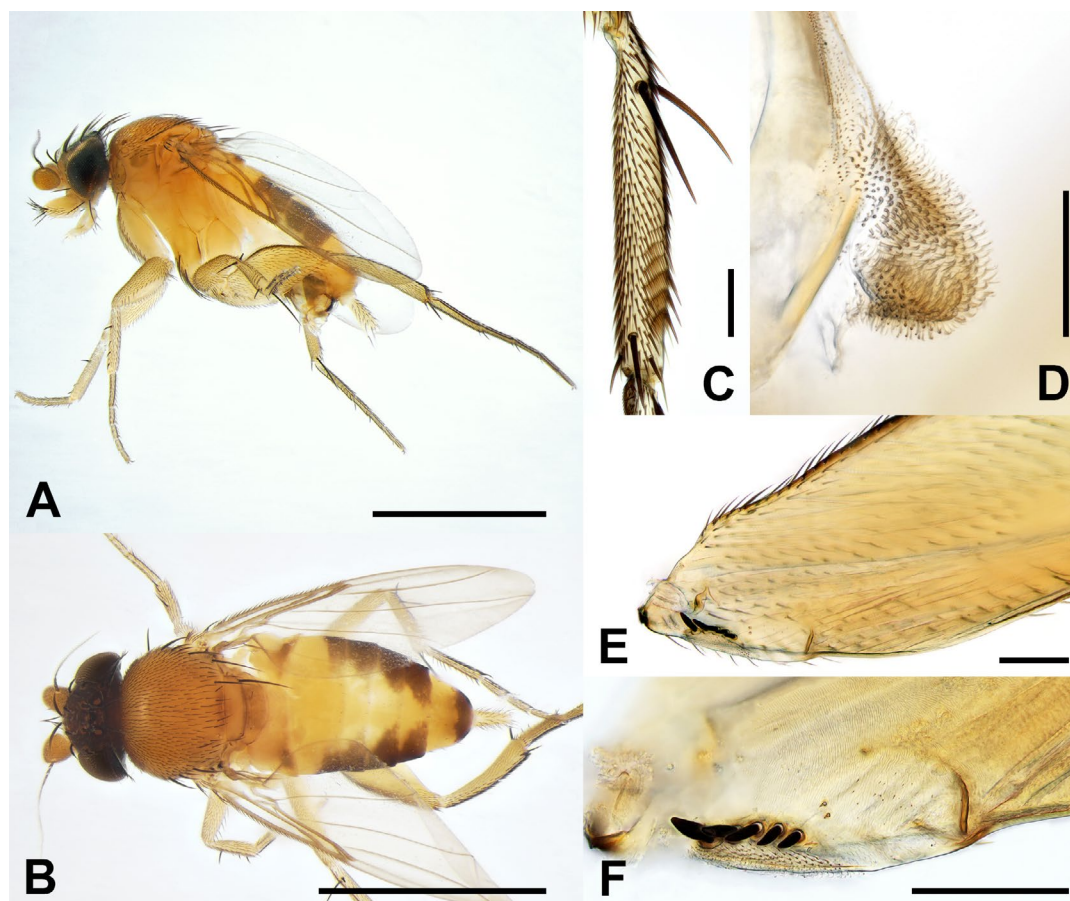


Fig. 3. Male of *Dohrniphora malaysiae*. A, Body, lateral view; B, Body, dorsal view; C, Midtibia, lateral view; D, Hind coxal lobe, lateral view; E, Inner face of hind femur; F, Basal sensory area at inner face of hind femur. Scale bars: A, B=1 mm, C, E, F=0.1 mm, D=0.05 mm.

na (synonymization).

Material examined. Korea: 1♂, Gyeonggi-do: Pocheon-si, Soheul-eup, Korea National Arboretum (KNA), 37°45'22"N, 127°09'49"E, 4 Aug 2014, KNA, Malaise trap (KNU); 1♂, ditto, 29 Aug 2014, KNA, Malaise trap (KNU); 1♂, Uijeongbu-si, Millak-dong, near Mt. Soribong, 37°45'02"N, 127°08'33"E, 15 Jul 2014, KNA, Malaise trap (KNU).

Diagnosis. This species can be distinguished from other *Dohrniphora* species by the combination of following characteristics: scutum yellowish brown; midtibia with a dorsal hair palisade extending half of midtibial length; male hind coxal lobe yellowish brown, rounded, densely covered with hooked hairs; inner face of male hind femur with a row of 5–6 (rarely 4) peg-like setae, a few microtrichia and a short longitudinal carina on distal margin of basal sensory area, lacking fine hairs near the dorsobasal margin of hind femur.

Description. Male (Fig. 3). Body length (Fig. 3A) 2.07–2.34 mm (n=3). Head (Fig. 3A). Frons dark brown, second

row of bristles slightly concave. Postpedicel brown, subglobose, slightly pointed apically. Palpus yellow, cylindrical, about twice as long as wide. Labrum pale yellow. Thorax (Fig. 3A, B). Scutum yellowish brown. Scutellum yellowish brown with an anterior pair of short setae and a posterior pair of long bristles. Pleuron yellow except yellowish brown proepisternum and upper half of anepisternum. Legs yellow except the hind femur slightly brown at dorsal margin. Fore tibia with 4–6 dorsal setae. Midtibia (Fig. 3C) with a pair of dorsal bristle near the base and a dorsal hair palisade extending about half of midtibial length. Hind coxal lobe (Fig. 3D) yellowish brown, rounded, densely covered with hooked hairs. Inner face of hind femur (Fig. 3E, F) with a row of linear-arranged 5–6 (rarely 4) peg-like setae; concave area, with a few sparsely arranged microtrichia and a well-developed longitudinal carina on distal margin of basal sensory area, 1.3 × as wide as peg-like setal group; lacking fine hairs near the dorsobasal margin of hind femur. Hind tibia without isolated bristle, with a dorsal hair palisade

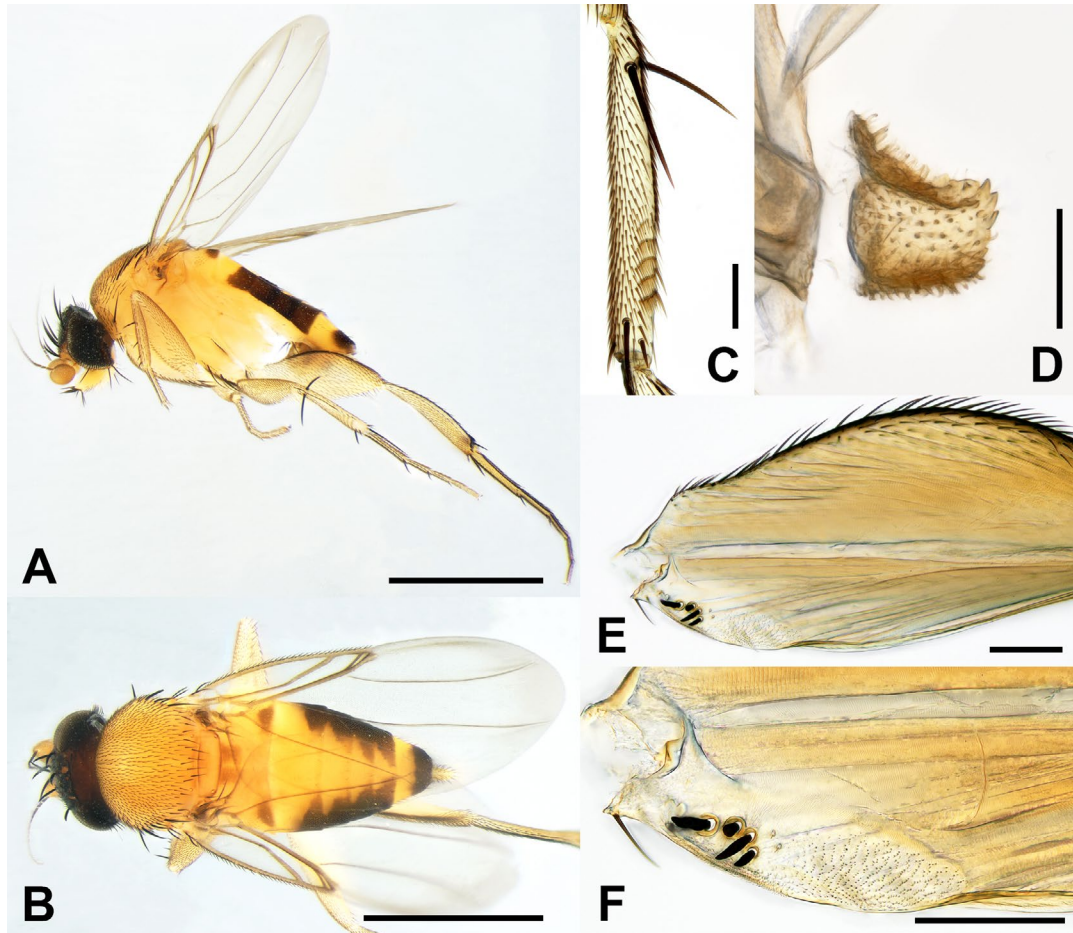


Fig. 4. Male of *Dohrniphora prescherweberae*. A, Body, lateral view; B, Body, dorsal view; C, Midtibia, lateral view; D, Hind coxal lobe, lateral view; E, Inner face of hind femur; F, Basal sensory area at inner face of hind femur (second peg-like seta broken). Scale bars: A, B=1 mm, C, E, F=0.1 mm, D=0.05 mm.

and a row of 10 short posterodorsal setae. Wing (Fig. 3B). 1.52–1.82 mm long ($n=3$). Costal index 0.47–0.51. Costal ratios 8.29–11.40 : 2.29–3.00 : 1. Costal setae of section 3 0.02–0.03 mm long. Base of Rs with a short hair. Vein pale brown. Single alular seta present, 0.09–0.12 mm long. Wing membrane hyaline with yellow tinge. Halter pale yellow. Abdomen (Fig. 3B). Abdominal tergites basically yellowish brown, tergites 1–2 with dark brown markings at postero-lateral margin; tergites 3–5 with dark brown markings at lateral margin; tergite 6 dark brown posteriorly. Venter of abdomen pale yellow, with short hairs on segments 3–4 and longer hairs on segment 5. Epandrium yellowish brown except brown lower half, with long hairs near the anal tube. Hypandrium brown. Anal tube pale yellow.

Female. Unknown from Korea.

Ecology. According to Green (1997), this species was attracted to surface of freshly felled bamboo shoot. Further ecological information is largely unknown.

Distribution. Korea (new record), China, Malaysia.

***Dohrniphora prescherweberae* Liu, 2001 (Fig. 4)**

Dohrniphora prescherweberae Liu, 2001: 110. Type locality: China.

Dohrniphora microspinosa Shen & Liu, 2009: 801. Type locality: China (synonymization).

Material examined. Korea: 1♂, Gyeonggi-do, Pocheon-si, Soheul-eup, Korea National Arboretum (KNA), 37°45'22"N, 127°09'49"E, 29 Aug 2014, KNA, Malaise trap (KNU).

Diagnosis. This species can be distinguished from other *Dohrniphora* species by the combination of following characteristics: scutum yellowish brown; midtibia with a dorsal hair palisade extending half of midtibial length; male hind coxal lobe yellowish brown, nearly square-shaped, densely covered with hooked hairs, toothed apically; inner face of hind femur with 4–5 peg-like setae and a concave area with

densely arranged microtrichia near the peg-like setae on basal sensory area, lacking hairs near the dorsobasal margin of hind femur.

Description. Male (Fig. 4). Body length (Fig. 4A) 2.02 mm (n = 1). Head (Fig. 4A). Frons dark brown, second row of bristles slightly concave. Postpedicel brown, subglobose, slightly pointed apically. Palpus pale yellow, cylindrical, about twice as long as wide. Labrum pale yellow. Thorax (Fig. 4A, B). Scutum light yellowish brown. Scutellum light yellowish brown with an anterior pair of short setae and a posterior pair of long bristles. Pleuron pale yellowish brown except darker proepisternum and upper half of anepisternum. Legs yellow except hind femur slightly brown at dorsal margin. Fore tibia with 4 dorsal setae. Midtibia (Fig. 4C) with a pair of dorsal bristles near the base and a dorsal hair palisade extending about three fifth of midtibial length. Hind coxal lobe (Fig. 4D) yellowish brown, nearly square-shaped, densely covered with hooked hairs, toothed apically. Inner face of hind femur (Fig. 4E, F) with slightly arch-arranged 4–5 peg-like setae; concave area, with densely arranged microtrichia near the group of peg-like setae on basal sensory area, 3 times as wide as peg-like setal group; lacking hairs near dorsobasal margin of hind femur. Hind tibia without isolated bristle, with a dorsal hair palisade and a row of 10 posterodorsal short setae. Wing (Fig. 4B) 1.73 mm long (n = 1). Costal index 0.50. Costal ratios 9.50 : 2.33 : 1. Costal setae of section 3 0.02 mm long. Base of Rs with a short hair. Vein pale brown. Single alular seta present, 0.10 mm long. Wing membrane hyaline with yellow tinge. Halter pale yellow. Abdomen (Fig. 4B). Abdominal tergites basically light yellowish brown, tergites 1–2 with dark brown markings at posterolateral margin; tergites 3–5 with dark brown markings at lateral margin; tergite 6 dark brown posteriorly. Venter of abdomen pale yellow, with short hairs on segments 3–4 and longer hairs on segment 5. Epandrium brown with long hairs near the anal tube. Hypandrium brown. Anal tube pale yellow.

Female. Unknown from Korea.

Ecology. Ecological information for the species is largely unknown.

Distribution. Korea (new record), China.

A key to males of all Korean *Dohniphora* species

1. Entire body brown; palpus inflated (see Disney and Michailovskaya, 2000: figs. 1, 2) *Dohniphora modesta*
Body coloration not entirely brown, but the combination of yellowish brown and dark brown; palpus not inflated 2
2. Scutum and scutellum dark brown; abdominal tergites mostly dark brown with yellowish brown markings; Inner face of hind femur with fine hairs near the dorsobasal margin (Fig. 1) 3
Scutum and scutellum yellowish brown; abdominal terg-

- ites mostly yellowish brown with dark brown markings; Inner face of hind femur without fine hairs near the dorsobasal margin (Fig. 3) 4
3. Midtibial hair palisade extended about one third of midtibial length; Hind coxal lobe not curved upward; Inner face of hind femur with about 10–20 hairs near the dorsobasal margin (Fig. 1) *Dohniphora cornuta*
Midtibial hair palisade extended about half of midtibial length; Hind coxal lobe curved upward; Inner face of hind femur with about 1–3 hairs near the dorsobasal margin (see Disney, 2005: fig. 2) *Dohniphora leei*
4. Hind coxal lobe round-shaped; Inner face of hind femur with linear-arranged 5–6 (rarely 4) peg-like setae; a few sparsely arranged microtrichia on concave area near the peg-like setae on basal sensory area; longitudinal carina at the distal margin of basal sensory area present (Fig. 3) *Dohniphora malaysiae*
Hind coxal lobe nearly square-shaped; Inner face of hind femur with a slightly arched row of 4–5 peg-like setae; concave area near the peg-like setae on basal sensory area with densely arranged microtrichia; longitudinal carina at the distal margin of basal sensory area absent (Fig. 4) *Dohniphora prescherweberae*

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CONFLICTS OF INTEREST

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

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