

Discovery of Four Unrecorded Species of *Colpotrochia* (Hymenoptera: Ichneumonidae: Metopiinae) from South Korea

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ABSTRACT

Four species, *Colpotrochia bifasciata*, *C. munda*, *C. pilosa sinensis*, and *C. uchidai*, are newly recognized in South Korea. The genus *Colpotrochia* Holmgren, 1856 is a large group of the subfamily Metopiinae, in Ichneumonidae, and contains 62 described species worldwide. Among them, nine species have been recorded from South Korea. The South Korean *Colpotrochia* was started from by Uchida in 1930. A comprehensive historical review of the faunal study of this genus in South Korea have been done by Kim and Japanese entomologists in the period of 1955–1966. In this study, diagnoses of four unrecorded species and illustrations of diagnostic characters are provided. The current total is 13 species of this genus known from South Korea.

Keywords: key, new record, *Colpotrochia bifasciata*, *C. munda*, *C. sinensis*, *C. uchidai*, taxonomy

INTRODUCTION

The genus *Colpotrochia* is a relatively large group of the subfamily Metopiinae, contains 62 described species worldwide, with the species richness of this genus being highest in the Neotropic region (24 species), 22 species in the Palaearctic region, 17 species in the Oriental region, four species in the Nearctic and one species in the Australasian region (Yu et al., 2016). Förster (1869) assigned it a genus based on *Ichneumon elegantulus* (Holmgren, 1856).

The present paper adds four newly recorded species to the South Korean fauna. The diagnoses, photographs, and a key to species of South Korean *Colpotrochia* are provided.

MATERIALS AND METHODS

The terminology used followed that of Townes (1969) and Broad et al. (2018). The images were using a Leica MC190 HD Camera attached to a Leica M125 Microscope (Leica Microsystems, Germany), processed by LEICA LAS X software (Leica). All examined specimens were deposited in the

Insect Inquiry · Education Institute, Daegu National University of Education (DNUE-IEI) and the National Institute of Biological Resources, Incheon (NIBR).

The abbreviations of the South Korean regions and type depository are as follows: CB, Chungcheongbuk-do; CN, Chungcheongnam-do; GB, Gyeongsangbuk-do; GG, Gyeonggi-do; GN, Gyeongsangnam-do; GW, Gangwon-do; JB, Jollabuk-do; JN, Jollanam-do; ASIZ, Academia Sinica, Institute of Zoology, Beijing, China; HU, Hokkaido University, Faculty of Agriculture, Entomological Institute, Sapporo, Japan; MOMOI, Kobe University, Faculty of Agriculture, Entomological Laboratory, Kobe, Japan (S. Momoi private collection.); TS, type species; TD, type depository; TL, type locality.

SYSTEMATIC ACCOUNTS

¹Order Hymenoptera Linnaeus, 1758

²Family Ichneumonidae Latreille, 1802

³Subfamily Metopiinae Förster, 1869

Korean name: ¹벌목, ²맵시벌과, ³줄몽톡맵시벌아과

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¹Genus *Colpotrochia* Holmgren, 1856

Colpotrochia Holmgren, 1856: 80. TS: *Ichneumon elegantulus* Holmgren.

Exochoides Cresson, 1868: 37. TS: *Exochoides mexicana* Cresson.

Alcocerus Förster, 1869: 161. TS: *Tryphon trifasciatus* Förster.

Scallama Cameron, 1899: 216. TS: *Scallama trilineata* Cameron.

Aithris Cameron, 1900: 106. TS: *Aithris coenutus* Cameron.

Ischyrocnemopsis Ashmead, 1900: 172. TS: *Exochoides texana* Ashmead.

Inoresa Cameron, 1909: 724. TS: *Inoresa pilosa* Cameron.

Sychnoleteroides Brèthes, 1909: 229. TS: *Sychnoleteroides flavus* Brèthes.

Colpotrochioides Uchida, 1930: 263. TS: *Colpotrochioides orientalis* Uchida.

Diagnosis. Face evenly and weakly convex. Interantennal process extending upwards to just below median ocellus, with a median longitudinal groove; clypeal apical margin convex; first metasomal tergite narrow basally, with a dorso-lateral longitudinal keel usually extending from the base to the spiracle.

Key to the Korean species of the genus *Colpotrochia* (modified from Momoi, 1966 and Kusigemati, 1971)

1. Hind wing with nervellus reclivous or vertical; fore wing without areolet 2
 - Hind wing with nervellus inclivous; fore wing with areolet 9
2. Propodeum with straight pleural carinae, not touching spiracle, but very close spiracle, not sinuate below spiracle 3
 - Propodeum with pleural carinae touching spiracle, strongly sinuate just below spiracle 5
3. Second and third metasomal tergites entirely blackish, sometimes the latter being yellowish on apical part. Hind tibia with black part occupying less than half length of the tibia *C. munda*
 - Second metasomal tergite black with yellow on apical half; third tergite entirely yellow, or only blackish basally. Hind tibia with black part occupying much more than half length of the tibia (except for some specimens of *fusca*) 4
4. Scutellum yellow with half of basal area black. First metasomal tergite stouter, 1.7–2.1 times as long as wide at apex; third tergite yellow with basal part blackish *C. bifusciata*

- Scutellum almost entirely black, sometimes the apex tinged with dark brown. First metasomal tergite more slender, 2.0–2.6 times as long as wide at apex; third tergite entirely yellow or yellow with blackish basal part *C. fusca*
5. Scutellum black, with apical margin narrowly yellow. Pronotum, propodeum and first metasomal tergite entirely black. Inter antennal process angularly arched, thickening towards the top in dorsal view of head, its horizontal rim thick *C. jozankeana*
 - Scutellum almost entirely yellow. Pronotum, propodeum and first metasomal tergite conspicuously marked with yellow or reddish brown. Inter antennal process strongly arrowing towards the top in dorsal view of head, its horizontal rim thin 6
 6. Mesooscutum with four longitudinal yellow stripes. Pronotum yellow along the upper margin. Propodeum with lateral longitudinal carina with a small but distinct angulation towards basal area of propodeum *C. nipponensis*
 - Mesooscutum entirely black. Pronotum not marked with yellow along the upper margin. Propodeum with lateral longitudinal carina without median angulation towards basal area of propodeum 7
 7. Apical half apex of scutellum yellow. First metasomal tergite black dorsally and rest yellowish brown up to fourth tergite. All femora partially or wholly black, mid and hind tibiae yellow medially *C. cincta*
 - Apical apex of scutellum yellow. Second to third metasomal tergites broadly yellow at their apices both above and below black. Fore femur yellow whereas rest partially black, mid tibia wholly yellow except apically black from one side 8
 8. Propodeum black without yellow color, or sometimes with a pair of small yellow spots in front of the petiolar area. Postscutellum yellow. Third metasomal tergite yellow *C. pilosa sinensis*
 - Propodeum with a broad postmedian yellow band usually covering about or more than half basal area of propodeum. Postscutellum black. Apical half of third metasomal tergite yellow *C. pilosa pilosa*
 9. Propodeum without lateral longitudinal carinae 10
 - Propodeum with lateral longitudinal carinae 11
 10. Head and thorax yellow with undefined brownish markings. Legs yellowish brown to reddish brown. Second metasomal tergite with epipleuron very wide, 2/5 as wide as the tergite at apex *C. uchidai*
 - Head black with face and clypeus yellowish brown. Mesosoma black. Legs bicoloured, black and yellow. Second metasomal tergite with epipleuron very narrow, 1/5

Korean name: ¹화장몽톡맵시벌속

- as wide as the tergite at apex.....*C. kurisuei*
11. Propodeum without median longitudinal carinae. Pronotum on upper margin, scutellum on apical and lateral margin and postscutellum yellow. Propodeum black with apical yellow markings*C. osuzensis*
- Propodeum with median longitudinal carinae more or less present. Pronotum, scutellum, postscutellum and propodeum entirely black 12
12. Mandibular teeth approximately equal in length. Propodeum with apical transverse carina incomplete. Propodeal spiracle large, elliptic, not touching pleural carina. Last segment of hind tarsus without subbasal, ventral tooth. Second and third metasomal tergites yellow. Hairs on subgenital plate short and vertical.....*C. orientalis*
- Mandible with upper tooth larger and longer than the lower. Propodeum with transverse carina complete and strong. Propodeal spiracle small, circular and touching to pleural carina. Hairs on subgenital plate long and slanted backwards. Metasomal tergites entirely black.....*C. nigra*

¹**Colpotrochia bifasciata* Momoi, 1966

Colpotrochia (Colpotrochia) bifasciata Momoi, 1966: 21.
Type: ♂; TL: Japan; TD: MOMOI.

Material examined. South Korea: CB: 1♂, Geoisan-gun, Chilseong-myeon, Gallon-ri, Sallon valley, Songisan National Park, 36°43'51.72"N, 127°51'48.89"E, 22 Aug–27 Oct 2011, Jeong JC (DNUE-IIIEI); CN: 1♂, Buyeo-gun, Oesan-myeon, Samsan-ri Munsusan, 19 May 2011, Kim TS (DNUE-IIIEI); GN: 1♂, Geochang-gun, Buksang-myeon, Wolseong-ri, Wolseong valley, Deokyusan National Park, 13 Jun 2012, Jeong JC (DNUE-IIIEI).

Diagnosis. Body black and yellow (Fig. 1A, B). Head width 0.84 times as long as its median length. Face closely punctate, upper face with vertical groove. Apical margin of clypeus round (Fig. 1C). Mandible reddish brown. Malar space 0.65 times as long as basal mandibular width. Antenna brown, antennal scape yellowish brown, with 57–61 flagellomeres. Ratio of first to fifth antennal flagellomeres 13 : 7.5 : 7 : 6 : 6. Frons finely punctate, with one strong longitudinal ridge (Fig. 1D). The shortest distance between posterior ocelli (POL) 1.75 times as long as distance between posterior ocellus and compound eye (OOL). Pronotum sunkened (Fig. 1D); mesoscutum densely punctate, without notaulus; tegula yellow. Scutellum yellow, with lateral carinae on apical part (Fig. 1G). Propodeum with lateral longitudinal and pleural carinae; propodeum with long and dense hairs except the median area (Fig. 1G); propodeal spiracle linear;

metapleuron finely punctate. Fore wing without areolet (Fig. 1H); hind wing with 16 distal hamuli. All coxae black; fore leg yellow, basal half of fore femur black (Fig. 1E); mid and hind femora black, apical half of mid and hind tibiae dark brown (Fig. 1A). Ratio of hind tarsi 39 : 19 : 15 : 10 : 26. First metasomal tergite with narrow median longitudinal carinae (Fig. 1F); second metasomal tergite with one yellow band on the 1/3 of apical part; third metasomal tergite with one yellow band on two thirds of apical part (Fig. 1F).

Distribution. South Korea (new record), Japan.

Host. Unknown.

²**Colpotrochia munda* Momoi, 1966

Colpotrochia (Colpotrochia) munda Momoi, 1966: 25.
Type: ♀, TL: Japan; TD: MOMOI.

Material examined. South Korea: CB: 1♀, Danyang-gun, Cheongdong-ri, Mt. Sobaeksan, 13 Aug–3 Sep 2006, Lee JW (DNUE-IIIEI); 1♀, Danyang-gun, Cheongdong-ri, Mt. Sobaeksan National Park, Bukbusamuso, 2 Aug–14 Sep 2005, Lee JW (DNUE-IIIEI); 1♀, Danyang-gun, Gasamunhak-myeon, Pungam-ri, 35°10'31.12"N, 127°03'42.45"E, 16–30 Aug 2020, Choi MJ (DNUE-IIIEI); CN: 1♀, Jeongang-myeon, Muncheon-ri, 360-14 (M.T.), 36°38'24.9"N, 127°38'24.9"E, 17 Jun–1 Jul 2020, Bae YS (DNUE-IIIEI); GB: 1♀, Cheongdo-gun, Maejeon-myeon, Hapyeong-ri, Baksilgil, Seoneulsan, 35°41'06.7"N, 128°49'09.2"E, 14 May 2016, Lee JW (DNUE-IIIEI); 1♀, Gyeongsan-si, Namcheon-myeon, Hado-ri, Hadojeosuji, Seoneulsan, 35°43'11.4"N, 128°44'31.6"E, 18 May 2016, Lee JW (DNUE-IIIEI); 3♀♀, Gunwi-gun, Bukye-myeon, Dongsan-ri, San 75, 36°01'29.04"N, 128°41'31.11"E, 12 Jun–14 Jul 2014, Lee JW (DNUE-IIIEI); 1♀, Yeongju-si, Punggi-eup, Jungnyeong, 3–14 Jul 2009, Lee JW (DNUE-IIIEI); GN: 1♀, Hapcheon-gun, Bongsan-myeon, Apgok-ri, San 150-3, 4 Jun–10 Jul 2014, Lee JW (DNUE-IIIEI); 3♀♀, Uiryeong-gun, Bongsu-myeon, Jukjeon-ri, 1356, 7 Jun–10 Aug 2014, Lee JW (DNUE-IIIEI); *ditto*, 15 Aug–15 Sep 2014, Lee JW (DNUE-IIIEI); GW: 1♀, Donghae-si, Samhwa-dong, Mureung valley (M.T.), 16–28 Jun 2005, Lee JW (DNUE-IIIEI); JB: 2♀♀, Namwon-si, Inwol-myeon, Junggun-ri, 310-1, 35°25'45.9"N, 127°36'10.4"E, 22 Jun–11 Jul 2020, Jeon JA (DNUE-IIIEI).

Diagnosis. Body generally black (Fig. 2A, B). Head width 0.72 times as long as its median length. Face moderately punctate, upper face densely punctate more than lower (Fig. 2C). Apical margin of clypeus round. Mandible teeth sharp, apical teeth black, basal part reddish brown. Malar space 0.82 times as long as basal mandibular width. Anten-

Korean name: ¹*두줄화장몽톡맵시벌 (신칭), ²*문다검정화장몽톡맵시벌 (신칭)

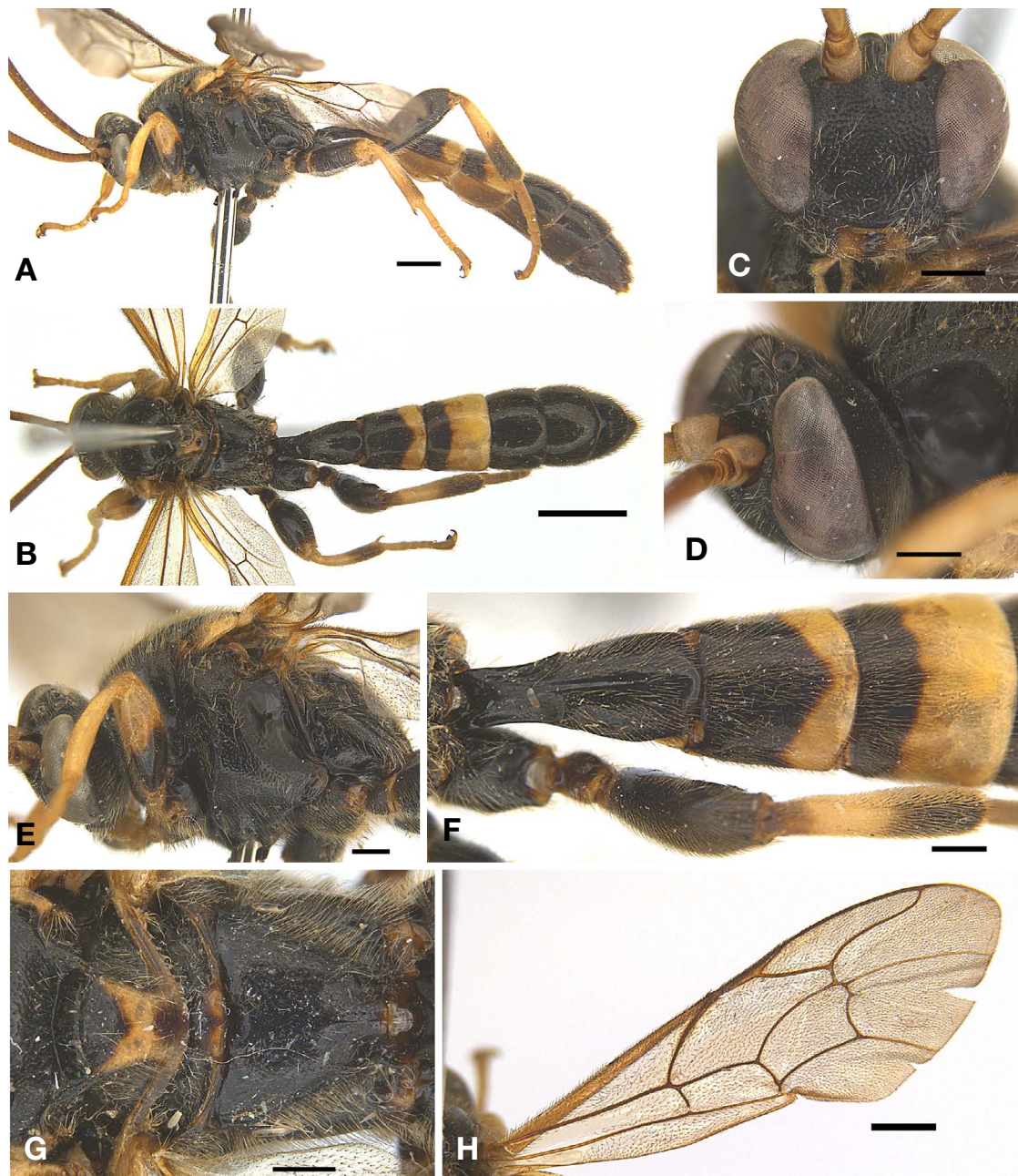


Fig. 1. *Colpotrochia bifasciatus*. A, Habitus in lateral view; B, Habitus in dorsal view; C, Head in frontal view; D, Head in lateral view; E, Head and mesosoma in lateral view; F, First to third metasomal tergites in dorsal view; G, Scutellum and propodeum; H, Fore wing. Scale bars: A, H=1.0 mm, B=2.0 mm, C-G=0.5 mm.

na with 52–54 flagellomeres. Antenna brown, scape yellow. Ratio of first to fifth antennal flagellomeres 12 : 7 : 8.5 : 8.5 : 6.5. Frons with one strong longitudinal ridge. The shortest distance between posterior ocelli (POL) 1.90 times as long as distance between posterior ocellus and compound eye (OOL). Mesosoma with long and dense hairs. Pronotum sunken and impunctate (Fig. 2D). Tegula black, margin of

tegula brown. Scutellum with lateral carinae on apical part. Propodeum without median longitudinal and transverse carinae; propodeum with long and dense hairs except median area; propodeal spiracle linear, reach pleural carina. Fore wing without areolet; hind wing with 10–12 distal hamuli. All coxae black; fore leg brown, half of fore femur black; mid and hind legs black, except basal half of tibiae and

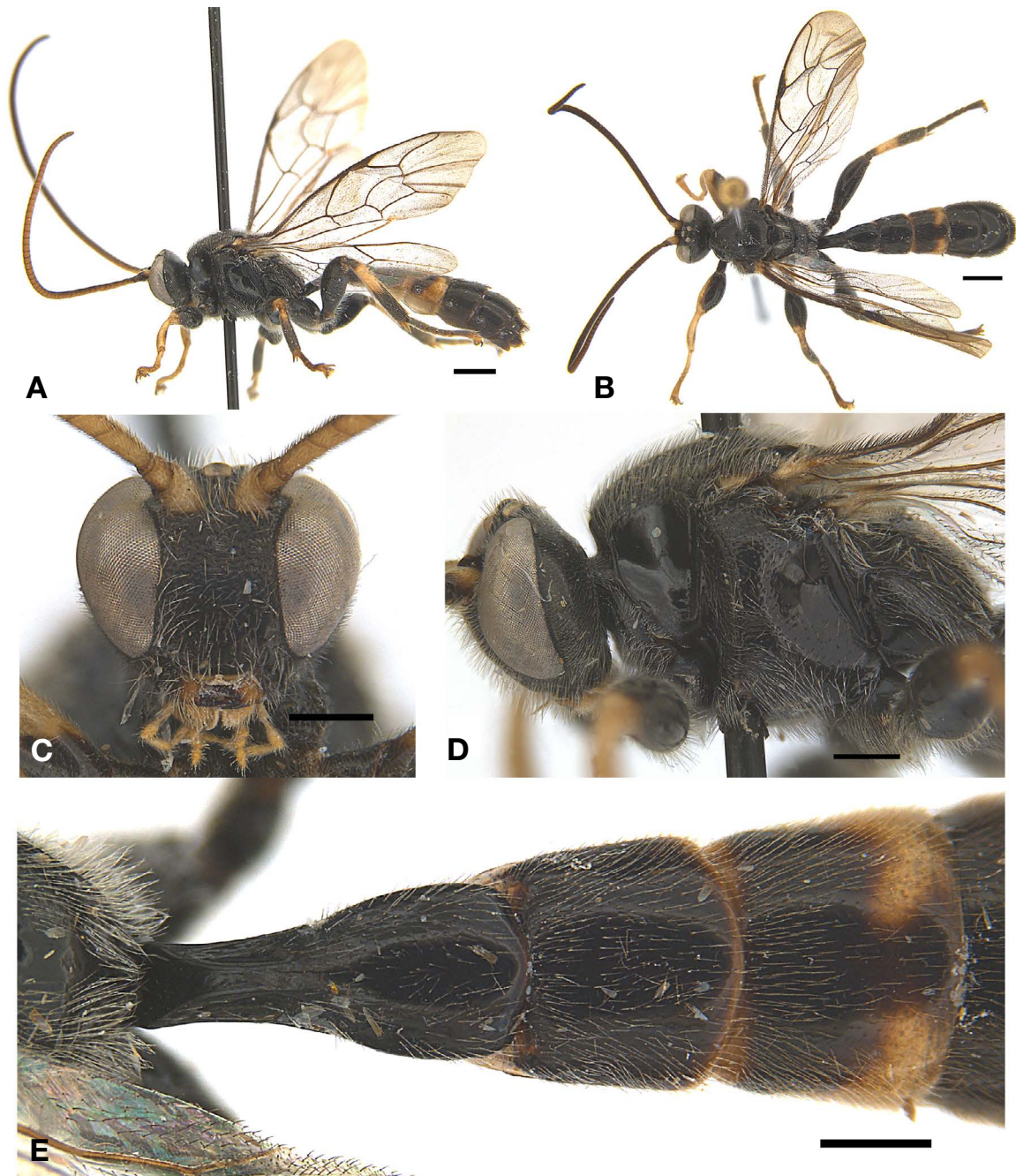


Fig. 2. *Colpotrochia munda*. A, Habitus in lateral view; B, Habitus in dorsal view; C, Head in frontal view; D, Head and mesosoma in lateral view; E, First to third metasomal tergites in dorsal view. Scale bars: A, B=1.0 mm, C-E=0.5 mm.

mid tarsi brown. Ratio of hind tarsi 16.6 : 7 : 6 : 5 : 15. Third metasomal tergite of some specimens with yellow apical lines (Fig. 2E).

Distribution. South Korea (new record), China, Japan, Russia.

Host. Unknown.

¹**Colpotrochia pilosa sinensis* Uchida, 1940
Colpotrochia pilosa sinensis Uchida, 1940: 129. Type: ♀,
 TL: China; TD: ASIZ.

Korean name: ¹*털보붉은화장몽톡맵시벌 (신칭)

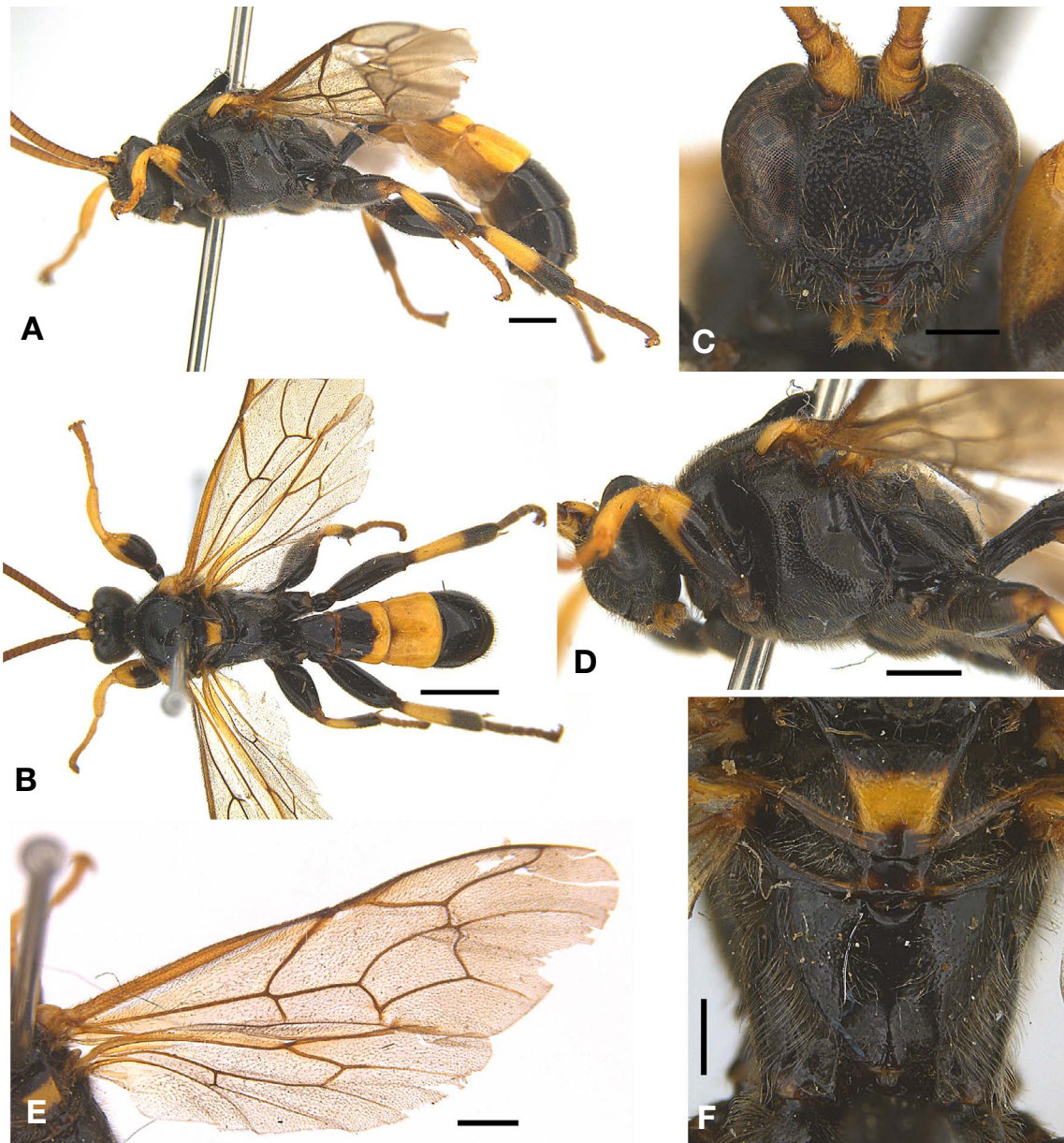


Fig. 3. *Colpotrochia pilosa siensis*. A, Habitus in lateral view; B, Habitus in dorsal view; C, Head in frontal view; D, Head and mesosoma in lateral view; E, Wings; F, Scutellum and propodeum. Scale bars: A=1.0 mm, B=2.0 mm, C-F=0.5 mm.

Material examined. South Korea: CN: 1 ♀, Buyeo-gun, Gyuam-myeon, Sumok-ri, 1–15 Jun 2005, Lee JW (DNUE-IIIEI); 1 ♀, *ditto*, 13 Jul–17 Aug 2005, Lee JW (DNUE-IIIEI); 1 ♀, Seosan-si, Haemi-myeon, Daegok-ri, Hanseo Univ., 36°41'24"N, 126°34'18"E, 20 Jul–24 Aug 2011, Kim JG (DNUE-IIIEI); GB: 1 ♀, Pohang-si, Jukjang-myeon, Haok-ri, 23 Jun 2004, Baek MG (DNUE-IIIEI); 2 ♀♀, Cheongdo-gun, Unmun-myeon, Mt. Unmunsan, U5, 20 Jul–2 Aug 2016, Lee JW (DNUE-IIIEI); 1 ♀, Gyeongsan-si, Daehak-ro, 280, Yeungnam Univ., 35°49'28.7"N, 128°45'44.2"E, 30 Jun–15 Jul

2017, Lee JW (DNUE-IIIEI); 1 ♀, *ditto*, 29 Jun–29 Jul 2015, Lee JW (DNUE-IIIEI); 1 ♀, Gyeongsan-si, Yongseong-myeon, Gweujae, 21 Sep 2012, Choi JK, Lee SM (DNUE-IIIEI); GG: 1 ♀, Yeoncheon-gun, Yeoncheon-eup, 23 Aug 1997, Lim EA (DNUE-IIIEI); 1 ♀, Namyangju-si, Choan-myeon, Songcheon-ri, Mt. Ungilsan, Alt. 134 m, 37°34'43.3"N, 127°18'37.5"E, 18 Aug–4 Sep 2009, Lim JO (DNUE-IIIEI); 1 ♀, Anyang-si, Manan-gu, Kwanag Arb., Alt. 148 m, 25 Sep–15 Oct 2008, Lim JO (DNUE-IIIEI); 1 ♀, *ditto*, Alt. 140 m, 5–19 Jul 2007, Lim JO (DNUE-IIIEI); 1 ♀, *ditto*, Alt. 126

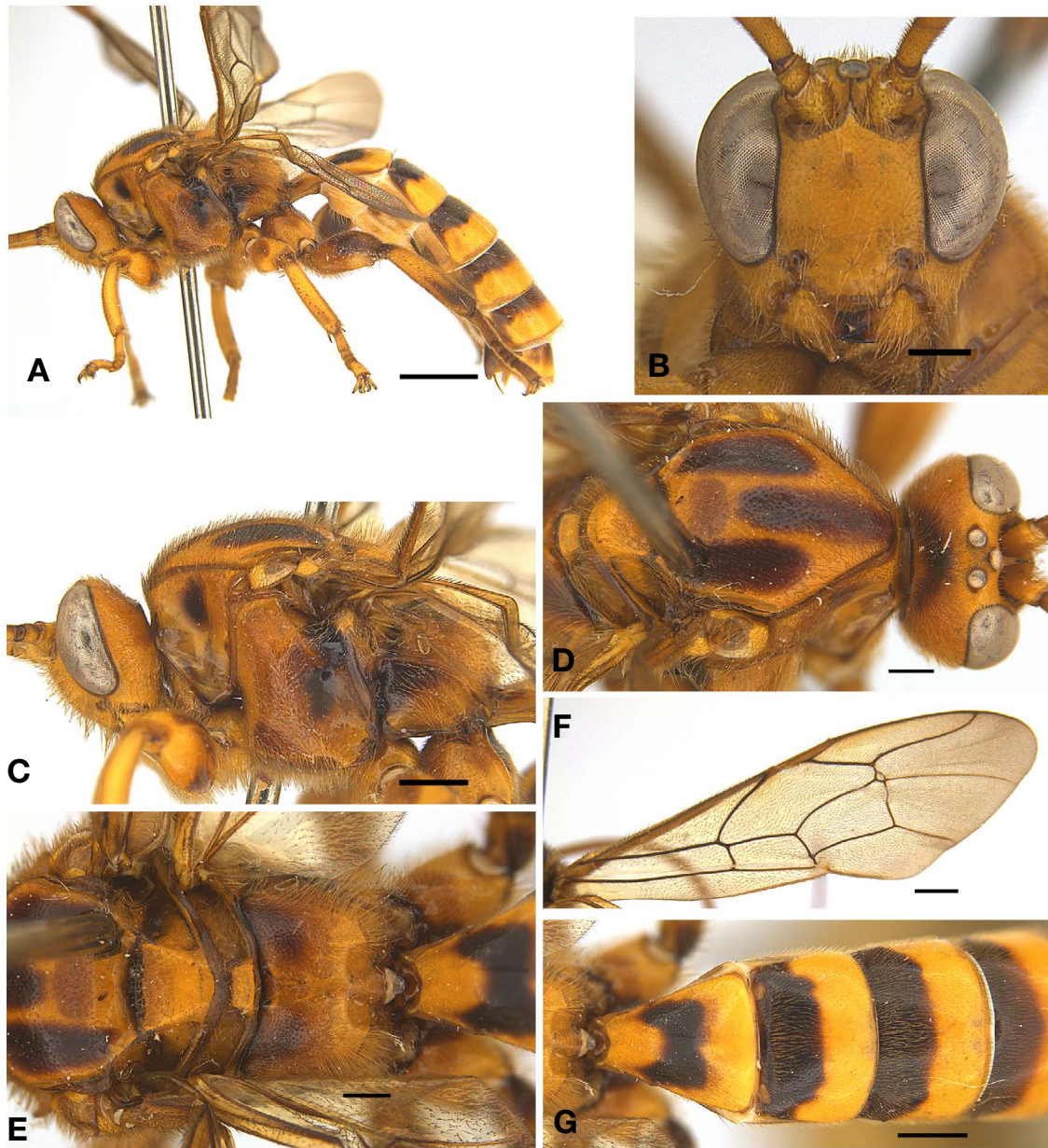


Fig. 4. *Colpotrochia uchidai*. A, Habitus in lateral view; B, Head in frontal view; C, Head and mesosoma in lateral view; D, Head and mesoscutum in dorsal view; E, Scutellum and propodeum; F, Fore wing; G, First to third metasomal tergites in dorsal view. Scale bars: A=2.0 mm, B, D, E=0.5 mm, C, F, G=1.0 mm.

m, 37°25'15.6"N, 126°56'44.3"E, 26 Jul–7 Aug 2008, Lim JO (DNUE-IIIEI); GN: 1♀, Gajisan, Seoknamsa, 25 May 2001, Baek JJ (DNUE-IIIEI); GW: 2♀♀, Chuncheon-si, Dong-myeon, Jinae-ri, 1–8 Aug 2005, Jang SJ (DNUE-IIIEI); JN: 1♀, Jeongeup-si, Ssangam-dong, Seoraebong, 29 Aug 2004, Han JG (DNUE-IIIEI).

Diagnosis. Body black and yellow (Fig. 3A, B). Head width 0.85 times as long as its median length. Face moderately punctate, upper face with vertical groove (Fig. 3C). Man-

dible dark brown, apical teeth and basal part black. Malar space 0.47 times as long as basal mandibular width. Antenna brown, scape yellow, with 56–61 flagellomeres. Ratio of first to fifth antennal flagellomeres 23 : 14 : 13.5 : 12 : 11. Frons sparsely punctate, with one strong longitudinal ridge; vertex punctures closer than frons. The shortest distance between posterior ocelli (POL) 1.60 times as long as distance between posterior ocellus and compound eye (OOL). Pronotum sunken and glabrous. Tegula yellow. Scutellum

yellow, with lateral carinae on basal part (Fig. 3F); post-scutellum black and reddish brown. Propodeum with lateral longitudinal and pleural carinae; propodeal spiracle linear, reach pleural carina; metapleuron finely punctate. Fore wing without areolet (Fig. 3E); hind wing with 14–16 distal hamuli. Fore leg yellow, with one black spot on fore femur (Fig. 3D); mid and hind legs yellowish brown to black, mid and hind femora black, hind tibia with apical black band. Ratio of hind tarsi 25 : 11 : 9 : 6 : 16.6. First and second metasomal tergites with one apical yellow band; third metasomal tergite yellow.

Distribution. South Korea (new record), China, Japan.

Host. Unknown.

Remarks. This subspecies is similar to *C. pilosa pilosa*, but it can be distinguished from the latter by the color of propodeum, postscutellum, and metasomal tergites. GenBank Accession no. of *COI* barcode sequences of *C. pilosa pilosa* are as follows PP133794-PP133796.

¹**Colpotrochia uchidai* Townes, 1973

Colpotrochia uchidai Townes, 1973: 1–416.

Colpolrochioides flavus Uchida, 1931: 145. Type: ♂, TL: Japan; TD: HU. New name for secondary homonym.

Material examined. South Korea: CB: 1♀, Cheongju-si, Sangdang-gu, Gadeok-myeon, Gyesan-ri, Alt. 212 m, 10–24 Jul 2020, Lee HG, Yun MD (DNUE-IIIEI); GB: 1♂, Gyeongsan-si, Dae-dong, Yeungsan Univ., 30 May 1987, Cha JY (DNUE-IIIEI), 36°43'51.72"N, 127°51'48.89"E, 22 Aug–27 Oct 2011, Jeong JC (DNUE-IIIEI); 1♀, Cheongdo-gun, Unmun-myeon, Mt. Unmunsan, 35°38'50"N, 128°58'19"E, 14 Aug–6 Sep 2009, Lee JW (DNUE-IIIEI); GG: 1♀, Anyang-si, Manan-gu, Kwangag, 9–24 Jun 2007, Lim JO (DNUE-IIIEI); 1♀, *ditto*, 37°25'14"N, 126°57'1"E, Alt. 175 m, 26 Jun–4 Jul 2007, Lim JO (DNUE-IIIEI).

Diagnosis. Body yellow to dark brown (Fig. 4A). Head width 0.88 times as long as its median length. Face yellow, closely punctate. Mandible yellow, apical teeth black, basal area wider than malar space (Fig. 4B). Malar space 0.60 times as long as basal mandibular width. Antenna brown, with 57 flagellomeres. Ratio of first to fifth antennal flagellomeres 16 : 9 : 8.5 : 8 : 8. Frons shiny, with one strong longitudinal ridge. Hind vertex with one dark brown spot (Fig. 4D). The shortest distance between posterior ocelli (POL) 1.50 times as long as distance between posterior ocellus and compound eye (OOL). Mesosoma with several black spots on pronotum, mesopleuron, metapleuron, and propodeum (Fig. 4C); pronotum sunken and impunctate; mesoscutum with three black marks, notaulus absent. Tegula pale yellow.

Scutellum without lateral carina. Propodeum without costula, median longitudinal and transverse carinae; propodeal spiracle reach pleural carina (Fig. 4E). Fore wing with small areolet and petiole (Fig. 4F); hind wing with 13 distal hamuli. All legs yellow with several reddish brown spots, all femora with large reddish brown spots; outer sides of all tibiae with short spines. Ratio of hind tarsi 30 : 12.5 : 10 : 7 : 23. First metasomal tergite yellow, with one black transverse band on the median area, basal half of the second to sixth metasomal tergites blackish brown (Fig. 4G).

Distribution. South Korea (new record), China, Japan.

Host. Unknown.

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CONFLICTS OF INTEREST

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

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