

Four newly recorded species of the genus *Exochus* (Hymenoptera: Ichneumonidae: Metopiinae) from South Korea

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Four species of the genus *Exochus* belonging to the subfamily Metopiinae, family Ichneumonidae, are reported in South Korea for the first time. The subfamily Metopiinae was recorded by Förster in 1869 based on genus *Metopius* and more than 870 described species have been reported worldwide. Among the genera of Metopiinae, genus *Exochus* is the largest, which is cosmopolitan and comprises more than 290 described species worldwide (Choi *et al.*, 2016; Yu *et al.*, 2016). A taxonomic study of South Korean *Exochus* was initiated by Choi *et al.* (2014), who reported four species. Until now, 10 species have been described as new species and 25 species were recorded as new records of this genus from South Korea (Choi *et al.*, 2014, 2016). In the present study, the following four species are reported in South Korea: *Exochus latiareolus* Tolkanitz, 2003, *E. ornatus* Momoi & Kusigemati, 1970, *E. pictus* Holmgren, 1858, and *E. yasumatsui* Momoi, Kusigemati & Nakanishi, 1968. In addition, we provide the diagnoses of these four species along with diagnostic photographs.

Keywords: *Exochus*, Korea, new record, parasitoids, taxonomy

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INTRODUCTION

The subfamily Metopiinae (Hymenoptera: Ichneumonidae) is a cosmopolitan group, which was first reported by Förster in 1869. This subfamily comprises 27 genera with more than 870 species (Yu *et al.*, 2016). Most species for which biological information is known are koinobiont endoparasitoids, they oviposit into lepidopteran larvae and emerging as adults from the host pupae (Broad and Shaw, 2005). To date, 96 species belonging to 13 genera of Metopiinae in South Korea have been recorded by Korean taxonomists.

The genus *Exochus* Gravenhorst, 1829 is a large genus comprising more than 290 valid species worldwide, but mainly inhabit the Holarctic region. In the Eastern Palearctic, 116 species of this genus have been recorded (35 from South Korea) (Choi *et al.*, 2016; Yu *et al.*, 2016).

In the present study, we provide diagnoses and photos of diagnostic characters of four newly recorded species, *Exochus latiareolus* Tolkanitz, 2003, *E. ornatus* Momoi & Kusigemati, 1970, *E. pictus* Holmgren, 1858, and *E. yasumatsui* Momoi, Kusigemati & Nakanishi, 1968.

MATERIALS AND METHODS

The materials used in this study were collected by Malaise trapping and were deposited in the Insect Inquiry Education Institute, Daegu National University of Education (DNUE-IIEI, Daegu, South Korea) and National Institute of Biological Resources (NIBR, Incheon, South Korea). Morphological terminology follows Gauld (1991), and distributional data follows Yu *et al.* (2016). The specimens were examined using a Leica MC190 HD camera attached to a Leica M125 Microscope (Leica Microsystems, Germany) with images, processed using LAS X software (Leica). Abbreviations used in the type depositories are as follows: HU, Hokkaido University, Faculty of Agriculture, Entomological Institute, Sapporo, Japan; KU, Kyushu University, Entomological Laboratory, Fukuoka, Kyushu, Japan. (A. Nakanishi collection.); SIZ, Schmalhausen Institute of Zoology, Bogdan Khmelnytsky Street, Kiev, Ukraine.

SYSTEMATIC ACCOUNTS

Family Ichneumonidae Latreille, 1802 맵시벌과
Subfamily Metopiinae Förster, 1869 줄몽툽맵시벌아과

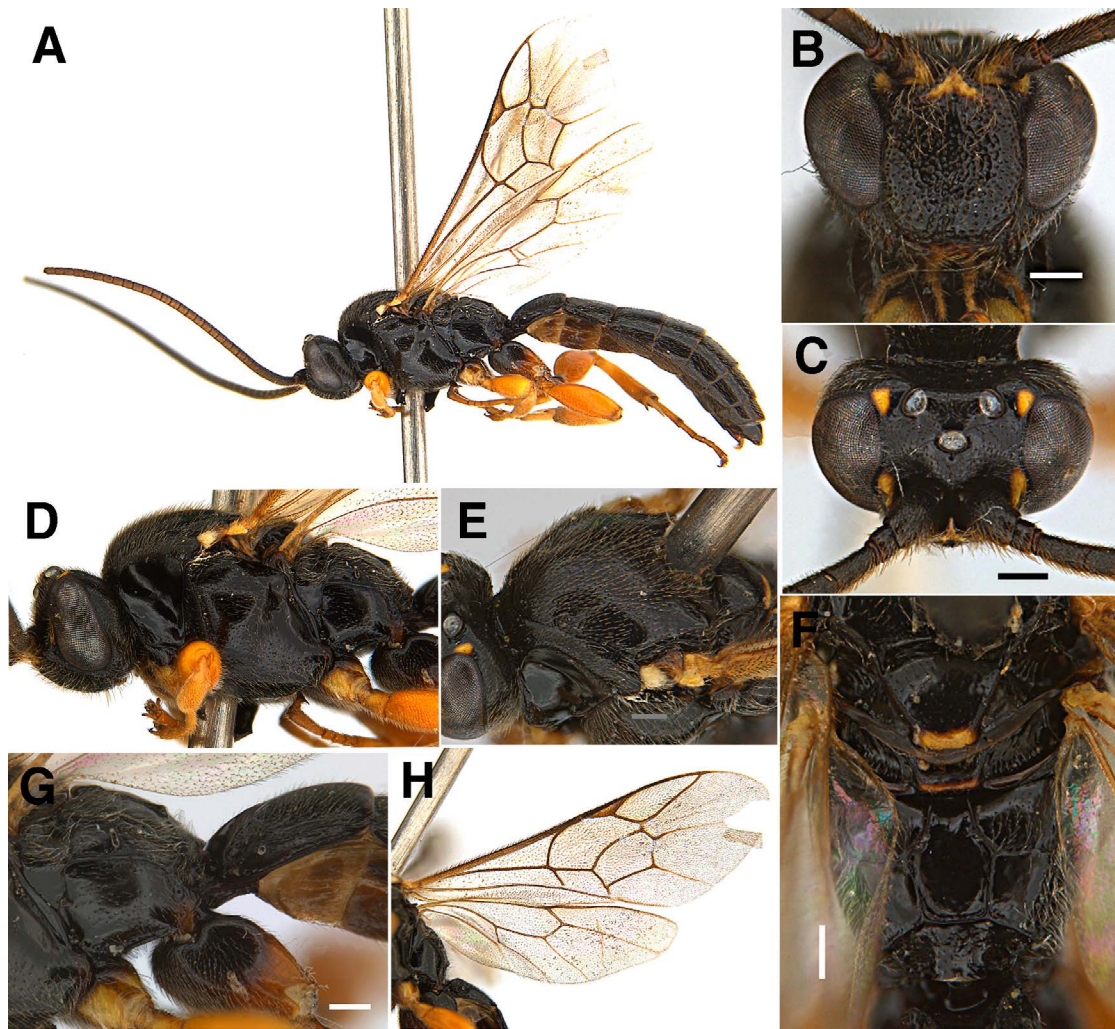


Fig. 1. *Exochus latiareolus* Tolkanitz, 2003. A. habitus of male in lateral view; B. head in frontal view; C. head in dorsal view; D. head and mesosoma in lateral view; E. mesoscutum; F. scutellum and propodeum in dorsal view; G. propodeum in lateral view; H. wings. Scale bars: 0.2 mm.

Genus *Exochus* Gravenhorst, 1829 볼록몽툽맵시벌속
Exochus Gravenhorst, 1829: 328. Type species: *Ichneumon gravipes* Gravenhorst, 1829
Amesolytus Förster, 1869: 161. Type species: *Amesolytus ferrugineus* Förster, 1869
Mima Davis, 1897: 206. Type species: *Mima washingtonensis* Davis, 1897
Xanthexochus Morley, 1913: 292. Type species: *Xanthexochus scutellatus* Morley, 1913

1. *Exochus latiareolus* Tolkanitz, 2003 (Fig. 1)

아름경포볼록몽툽맵시벌 (신칭)

Exochus latiareolus Tolkanitz, 2003: 85–87. Type: male; type depository: SIZ.

Diagnosis. Generally black (Fig. 1A). Face finely punctate with dense hairs, face black with yellow horn on

upper face (Fig. 1B); inner orbits with one pair of yellow spots each frons and vertex (Fig. 1C); occipital carina present. Antenna with 34+ flagellomeres and blackish brown, ventral part of scape yellowish brown. Pronotum with distinct epomia and shiny; mesoscutum sparsely punctate with distinct notaulus only anterior part; tegula yellow and brown (Fig. 1D, E); mesoscutellum and post-scutellum with yellow lines on the posterior area (Fig. 1F); basal and areola area not separated and glabrous, costula present; spiracle oval, not reach to pleural carina (Fig. 1G). Hind wing with six distal hamuli. Fore and mid legs yellowish brown, basal of coxae dark brown; hind leg brown, basal half of coxa black. Hind tarsal claw simple.

Material examined. SOUTH KOREA: Gyeongsangbuk-do, Andong-si, Pungcheon-myeon, Gilsan-ri, Gudam Bridge, N36°53'89.12", E128°46'42.88", 16.v.2015, J.W.

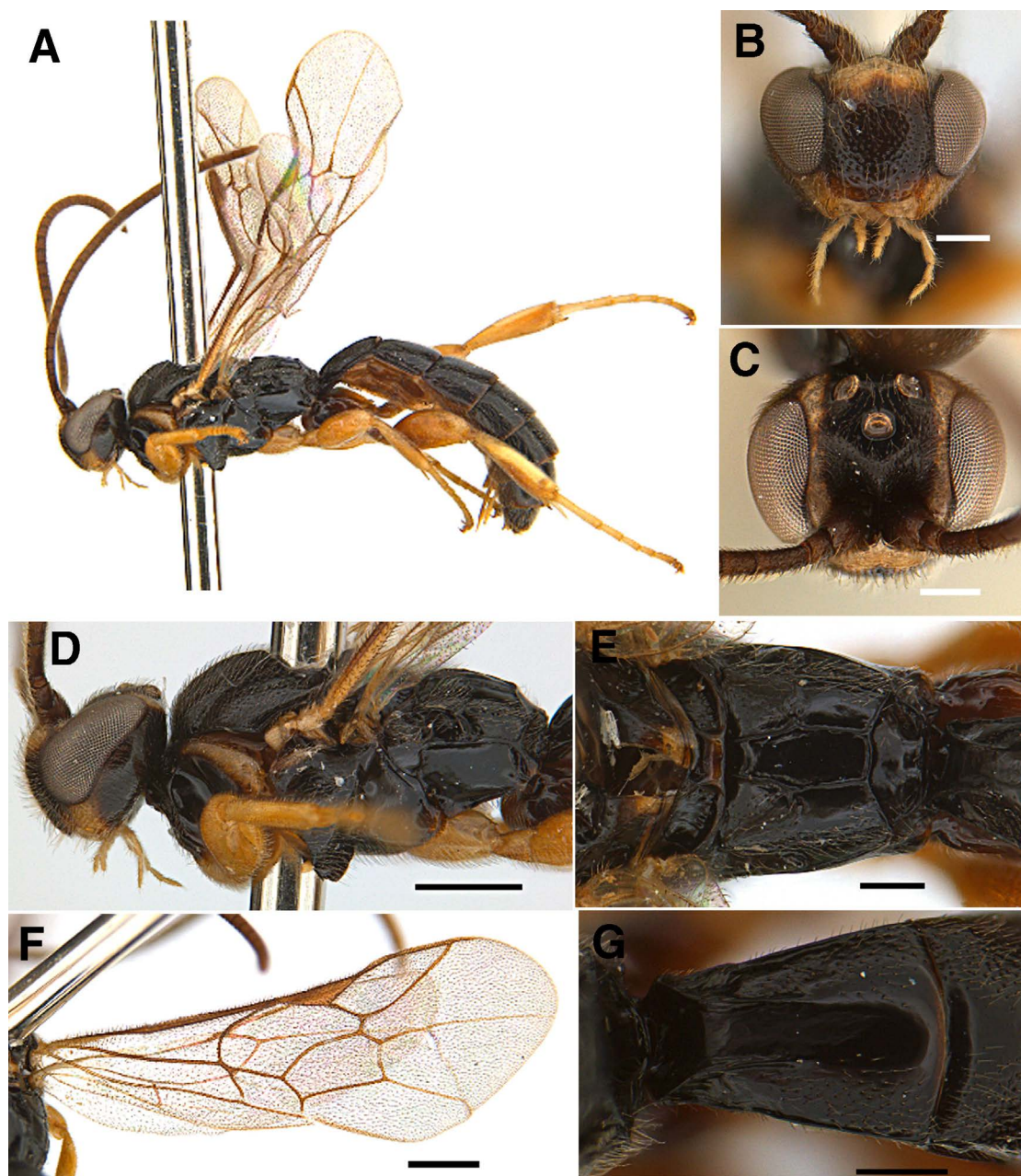


Fig. 2. *Exochus ornatus* Momoi & Kusigemati, 1970. A. habitus of female in lateral view; B. head in frontal view; C. head in dorsal view; D. head and mesosoma in lateral view; E. scutellum and propodeum in dorsal view; F. wings; G. tergite I in dorsal view. Scale bars: B, C, F, G, 0.2 mm; D, F, 0.5 mm.

Lee, 1♂ (Deposited in NIBR).

Distribution. South Korea (new record), Russia, Ukraine.

Region. Eastern and Western Palearctic.

Host record. Unknown.

2. *Exochus ornatus* Momoi & Kusigemati, 1970 (Fig. 2)

고운볼록몽톡맵시벌 (신칭)

Exochus ornatus Momoi & Kusigemati, 1970: 401–415.

Type: female; type depository: HU.

Diagnosis. Generally black (Fig. 2A). Face sparsely punctate with dense hairs, face dark brown and upper face pale yellow (Fig. 2B); apical margin of clypeus round and brown; malar space and mandible pale yellow; inner orbits with pale yellow line from frons to vertex (Fig. 2C); occipital carina present. Antenna with 29–31 flagellomeres and dark. Pronotum with distinct epomia, black, shiny; upper area with yellow line (Fig. 2D); mesoscutum finely punctate with notaulus; tegula yellow; mesoscutel-

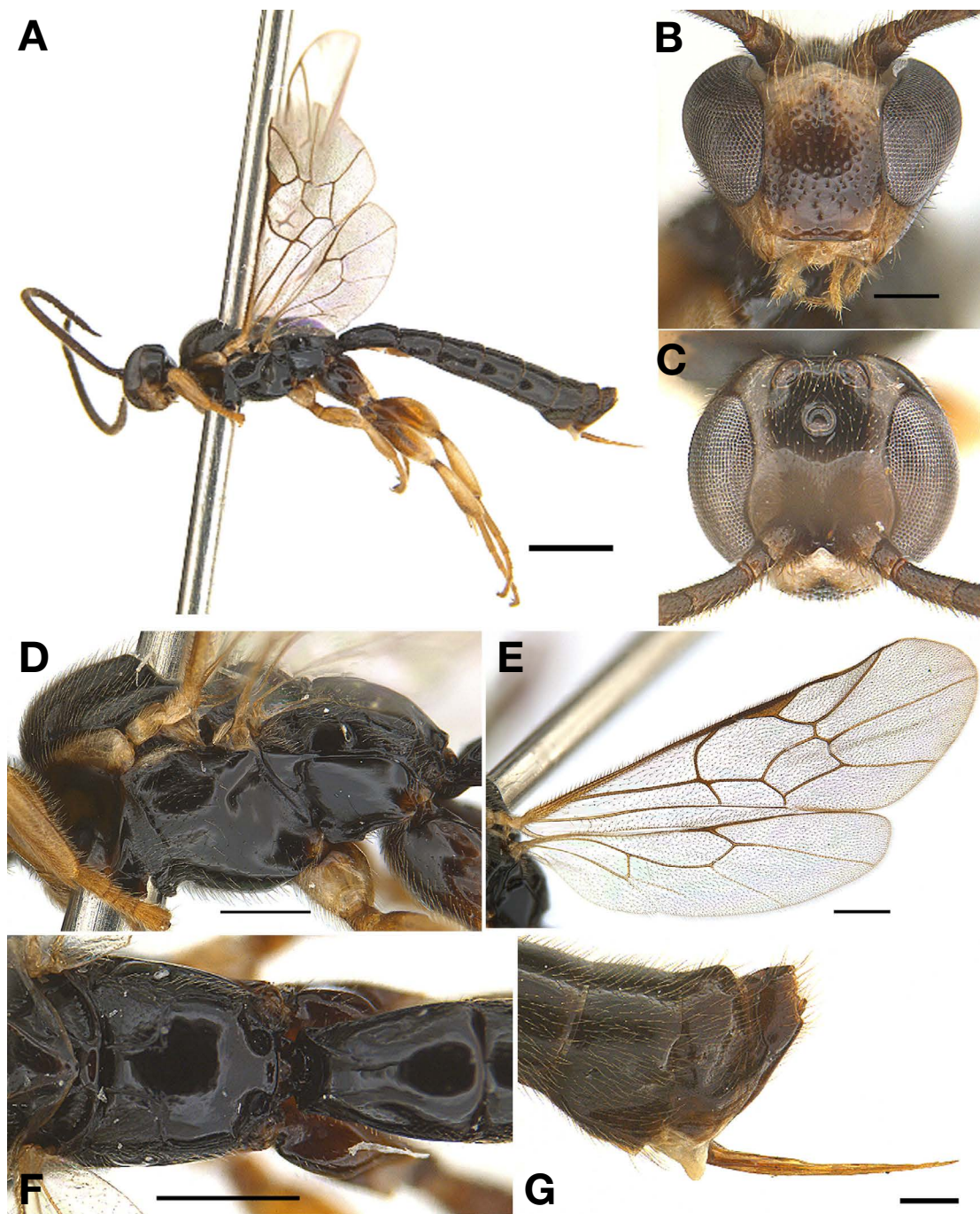


Fig. 3. *Exochus pictus* Holmgren, 1858. A. habitus of female in lateral view; B. head in frontal view; C. head in dorsal view; D. mesosoma in lateral view; E. wings; F. propodeum; G. ovipositor. Scale bars: A, 1.0 mm; B, C, G, 0.2 mm; D-F, 0.5 mm.

lum and postscutellum dark brown; basal and areola area not separated and glabrous (Fig. 2E), costula weak, median longitudinal carinae complete; spiracle linear, not reach to pleural carina; metapleuron grabrous. Hind wing with five distal hamuli. Legs yellowish brown, hind coxa dark reddish brown. Hind tarsal claw simple. Ovipositor shorter than hind tibia.

Material examined. SOUTH KOREA: Jollabuk-do, Jeongeup-si, Yongsan-dong, M.T., 1 site, 21.iv–22.v.2004, M.K. Yun, 1 ♀ (Deposited in NIBR); ditto, 1 ♀ (Deposited in DNUE-IIIEI); Gyeonggi-do, Namyangju-si, Choanmyeon, Songchon-ri, Mt. Ungilsan, Alt. 99 m, M.T., N37°34'43.2", E127°18'40.1", 1–26.v.2009, J.O. Lim, 1 ♀ (Deposited in DNUE-IIIEI).

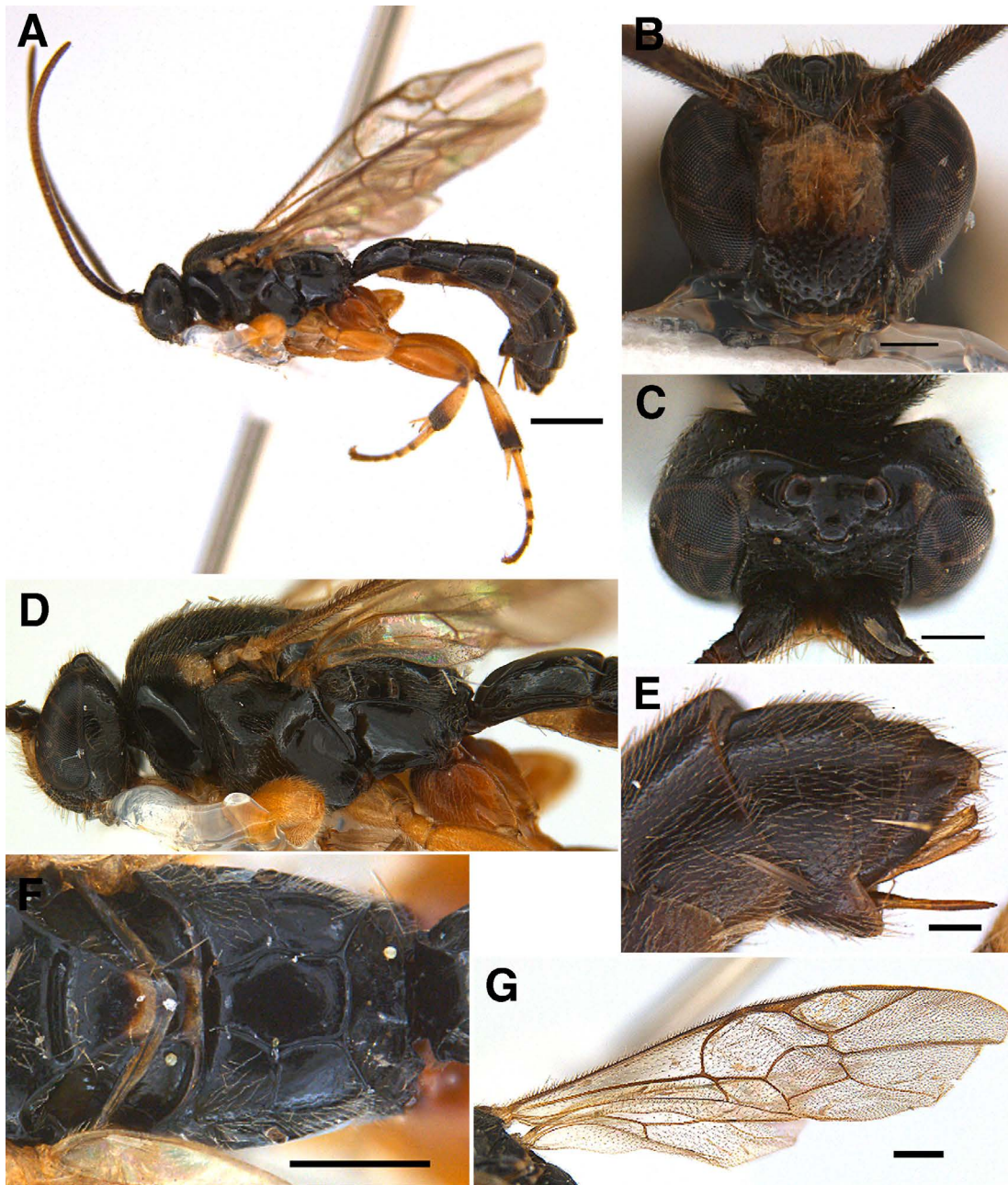


Fig. 4. *Exochus yasumatsui* Momoi, Kusigemati & Nakanishi, 1968. A. habitus of female in lateral view; B. head in frontal view; C. head in frontal view; D. head and mesosoma in lateral view; E. ovipositor; F. scutellum and propodeum; G. wings. Scale bars: A, 1.0 mm; B, C, E, 0.2 mm; F, G, 0.5 mm.

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

Region. Eastern Palearctic, Oriental.

Host record. Unknown.

3. *Exochus pictus* Holmgren, 1858 (Fig. 3)

등매끈볼록뿔맵시벌 (신칭)

Exochus pictus Holmgren, 1858: 305–394. Type: unknown.

Diagnosis. Generally black (Fig. 3A). Face sparsely punctate with dense hairs, face pale yellow with large brown spot on the middle of face (Fig. 3B); apical margin of clypeus truncate, corner of clypeus round; malar space and mandible pale yellow; inner orbits with yellow line from frons to vertex (Fig. 3C); occipital carina present; hind head and temple shiny. Antenna with 24 flagellomeres and blackish brown with dense hairs. Pronotum black and

shiny, upper area with yellow line (Fig. 3D); mesoscutum sparsely punctate with notaulus only anterior part; tegula yellow; mesoscutellum and postscutellum dark brown; basal and areola area not separated and glabrous, costula present, median longitudinal carinae incomplete (Fig. 3F); spiracle oval, not reach to pleural carina; metapleuron glabrous. Hind wing with eight distal hamuli. Fore and mid legs yellow; hind leg brown, coxa darken. Hind tarsal claw simple. Ovipositor as long as hind tibia and longer than width of apical tergite (Fig. 3G).

Material examined. SOUTH KOREA: Daegu-si, Dalseong-gun, Youga-myeon, Yong-ri, Mt. Biseulsan, 20.ix.1997, 1♀ (Deposited in NIBR); BULGARIA: Madjarovo, 200 m, 21.x.2000, leg. J. Kolarov, 1♀ (Deposited in DNUE-IIIEI).

Distribution. South Korea (new record), Austria, Azerbaijan, Belgium, Bulgaria, Canada, Czech Republic, Czechoslovakia, Finland, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Netherlands, Norway, Poland, Romania, Russia, Spain, Sweden, U.S.A., Ukraine, United Kingdom.

Region. Eastern and Western Palearctic, Nearctic.

Host record. *Heterarthrus nemoratus* (Hymenoptera: Symphyta) (Townes and Townes, 1959).

4. *Exochus yasumatsui*

Momoi, Kusigemati & Nakanishi, 1968 (Fig. 4)

다리점무늬볼록뿔특맵시벌 (신칭)

Exochus yasumatsui Momoi, Kusigemati & Nakanishi, 1968: 201–214. Type: female; type depository: KU.

Diagnosis. Generally black (Fig. 4A). Face rugosely punctate with dense hairs, upper half of face yellowish brown and lower face black (Fig. 4B); apical margin of clypeus round; malar space black and mandible yellow brown; inner orbits with yellow spots on vertex (Fig. 4C); occipital carina present. Antenna with 35 flagellomeres and blackish brown with dense hairs. Pronotum black and shiny, upper corner with yellow spot (Fig. 4D); mesoscutum finely punctate with notaulus on anterior part; tegula yellow; posterior of mesoscutellum and postscutellum yellowish brown (Fig. 4F); basal and areola area not separated and glabrous, areola area broader than basal area; costula present, median longitudinal carinae distinct; spiracle liner, reach to pleural carina; metapleuron glabrous. Hind wing with eight distal hamuli. Legs yellowish brown to brown; hind tibia yellow, basal and apical parts with black bands; hind tarsi I–III with apical dark brown bands, hind tarsi IV–V dark brown (Fig. 4A). Hind tarsal claw simple. Ovipositor shorter than hind tibia and width of apical tergite (Fig. 4E).

Material examined. SOUTH KOREA: Gangwon-do, Mt. Taebaeksan, Uilsa, M.T., 20.vi–11.vii.1999, D.S. Ku, 1♀ (Deposited in NIBR); Gyeongsangbuk-do, Uljin-gun, Mt.

Baekamsan, M.T., 14.v–19.vi.1999, D.S. Ku, 1♀ (Deposited in DNUE-IIIEI).

Distribution. South Korea (new record), Japan.

Region. Eastern Palearctic.

Host record. *Udea ferrugalis* (Lepidoptera: Crambidae) (Kusigemati, 1971).

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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