

## New Records of the Genus *Exochus* (Hymenoptera: Ichneumonidae: Metopiinae) from Korea, China and Mongolia

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### ABSTRACT

We report two new records of Korean fauna of genus *Exochus*, as well as two newly recorded species from China and Mongolia each. Specifically *Exochus suborbitalis* Schmiedeknecht, 1924 and *Exochus thomsoni* Schmiedeknecht, 1924 from Korea, *Exochus kusigemati* Tolkanitz, 2007 and *Exochus suborbitalis* Schmiedeknecht, 1924 from Mongolia and *Exochus semilividus* Vollenhoven, 1875 and *Exochus thomsoni* Schmiedeknecht, 1924 from China are reviewed. The genus *Exochus* have been reported 19 species from China and 21 species from Mongolia. Diagnosis of the four unrecorded species, host information, distributions and illustrations of external characters are provided.

**Keywords:** Eastern Palaearctic, *Exochus suborbitalis*, *Exochus thomsoni*, *Exochus kusigemati*, *Exochus semilividus*, taxonomy

### INTRODUCTION

The subfamily Metopiinae is a medium sized ichneumonid composed of 26 genera and 836 species worldwide (Yu et al., 2012). The Korean Metopiinae fauna reports were made by Uchida (1930, 1955), Kim (1955), Townes et al. (1961, 1965), Momoi (1966), Lee and Cha (2000), Cha and Lee (2000), Cha et al. (2000) and Tolkanitz (2007b). New records of the genus *Exochus* included new species is in process (Choi et al. unpublished). The species of the subfamily Metopiinae are koinobiont endoparasitoids in lepidopterous larvae, and the usual hosts are among the pyraloids and tortricoids. The parasites emerge from the host pupa (Baltazar, 1964).

The genus *Exochus* is the largest group of Metopiinae. A study conducted by Choi et al. (unpublished), revealed 16 species of *Exochus* from Korea. And the genus *Exochus* have been reported 19 species from China (Uchida, 1932, 1942, 1952; He and Ma, 1983; He et al., 1992, 1996, 2004, etc.) and 21 species from Mongolia (Sedivy, 1971; Kusigemati, 1984; Tolkanitz, 1993, 2001, 2007a, 2007b).

In this study, we report two newly recorded species, *Exo-*

*chus suborbitalis* Schmiedeknecht, 1924 and *Exochus thomsoni* Schmiedeknecht, 1924, from Korea, as well as two newly recorded species each from China and Mongolia. We provide diagnosis of the four species, host information, distributions and digital images of external characters.

Materials used in this study were collected by sweep and malaise traps, after which they were deposited in the animal systematic laboratory of Yeungnam University (YNU, Gyeongsan, Korea). Specimens were examined using an AxioCam MRc5 camera attached to a stereo microscope (Zeiss SteREO Discovery. V20; Carl Zeiss, Göttingen, Germany), processed with the AxioVision SE64 software (Carl Zeiss), and optimized with a Delta imaging system (i-solution; IMT i-Solution Inc., Vancouver, Canada).

Abbreviations are as follows. TD, type depository; TS, type species; HU, Hokkaido University, Faculty of Agriculture, Entomological Institute, Sapporo, Japan; ZI, Zoologiska Institutionen, Helgonavägen 3, S-223 62 Lund, Sweden; GG, Gyeonggi-do; GW, Gangwon-do; GB, Gyeongsangbuk-do; GN, Gyeongsangnam-do; CB, Chungcheongbuk-do; JB, Jeollabuk-do.

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## SYSTEMATIC ACCOUNTS

Order Hymenoptera

Family Ichneumonidae Latreille, 1802

Subfamily Metopiinae Förster, 1869

<sup>1</sup>\*Genus *Exochus* Gravenhorst, 1829

*Exochus* Gravenhorst, 1829: 328. TS: *Ichneumon gravipes* Gravenhorst.

*Amesolytus* Förster, 1869: 161. TS: *Amesolytus ferrugineus* Ashmead.

*Mima* Davis, 1897: 206. TS: *Mima washingtonensis* Davis.

*Xanthexochus* Morley, 1913: 292. TS: *Xanthexochus scutellatus* Morley.

<sup>2</sup>\**Exochus thomsoni* Schmiedeknecht, 1924

(Fig. 1A, E, F)

*Exochus crassicornis* Thomson, 1894: 2080–2137. Type: lost.

*Exochus thomsoni* Schmiedeknecht, 1924: 103–112. Type: unknown; TD: unknown.

**Material examined.** Korea: 1 female, GW: Hongcheon-gun, Bukbang, Gwangwon Prov. Environment Research Park, 15–29 Jun 2009, Jang SJ; 1 female, GB: Cheongdo-gun, Gakbuk-myeon, Namsan3-ri, 35°41'N, 128°35'E, 29 Jun–6 Jul 2008, Lee JW; 1 female, ditto, 28 Apr–27 May 2013; 1 male, ditto, 20 Jun 2007; 1 male, ditto, 29 Jun–6 Jul 2008; 1 female, GB: Gyeongsan-si, Dae-dong, Yeungnam Univ., 17–24 Apr 2009, Lee JW; 1 female, ditto, 12 May 2010; 1 female, Gunwi-gun, Goro-myeon, Geumyang, 14 May 2003; 1 female, CB: Jecheon-si, Hansu-myeon, Songgye-ri, Woraksan National Park, 20 May–3 Jun 2006, Jeong JC; China: 2 females, Gillimseong, Yeongilsu, Hanamga, Yeongjoro, Sinpung, 2dae Yeonbyeonteugsanyeonguso, 42°54'24"N, 129°30'41"E, 17–30 Jul 2008, Lee JW; 1 male, ditto, 1 female, ditto, 11–19 Aug 2008; 1 male, ditto.

**Diagnosis. Male:** Body length 7.0–8.0 mm; flagella with 36–39 segments. Head convex and black, upper face with large yellow long projection and recurved; between antennal sockets with vertical ridge; dorsal margin of eyes with triangular yellow spots, not connected to the margin of the between antennal socket and eye. Malar space yellow. Pronotum strong sunken and glabrous. Anterior half of scutellum black, posterior half yellow and postscutellum yellow. Propodeum without areola; anterior externa area with hair; dentiparal area without hair; spiracle of propodeum ellipse; metapleurum polished, center glabrous. Nervellus intercepted at the lower 0.3, with discoidella. 1st tergum with broad dorsal lon-

gitudinal carina, reaching the central area of 1st tergum, up-curved in basal area; median longitudinal area of 1st and 2nd terga without hair. 3rd tergum with semicircular epipleuron. **Female:** Body length 6.0–7.0 mm; flagella with 33–35 segments. Face black, only margin of projection on upper face yellow. Malar space blackish brown to black.

**Host.** Unknown.

**Distribution.** Korea (new record), China (new record), Finland, Hungary, Kazakhstan, Mongolia, Netherlands, Poland, Romania, Russia, Sweden, Turkey and Ukraine.

<sup>3</sup>\**Exochus suborbitalis* Schmiedeknecht, 1924

(Fig. 1B, G)

*Exochus suborbitalis* Schmiedeknecht, 1924: 103–112. Type: unknown; TD: unknown.

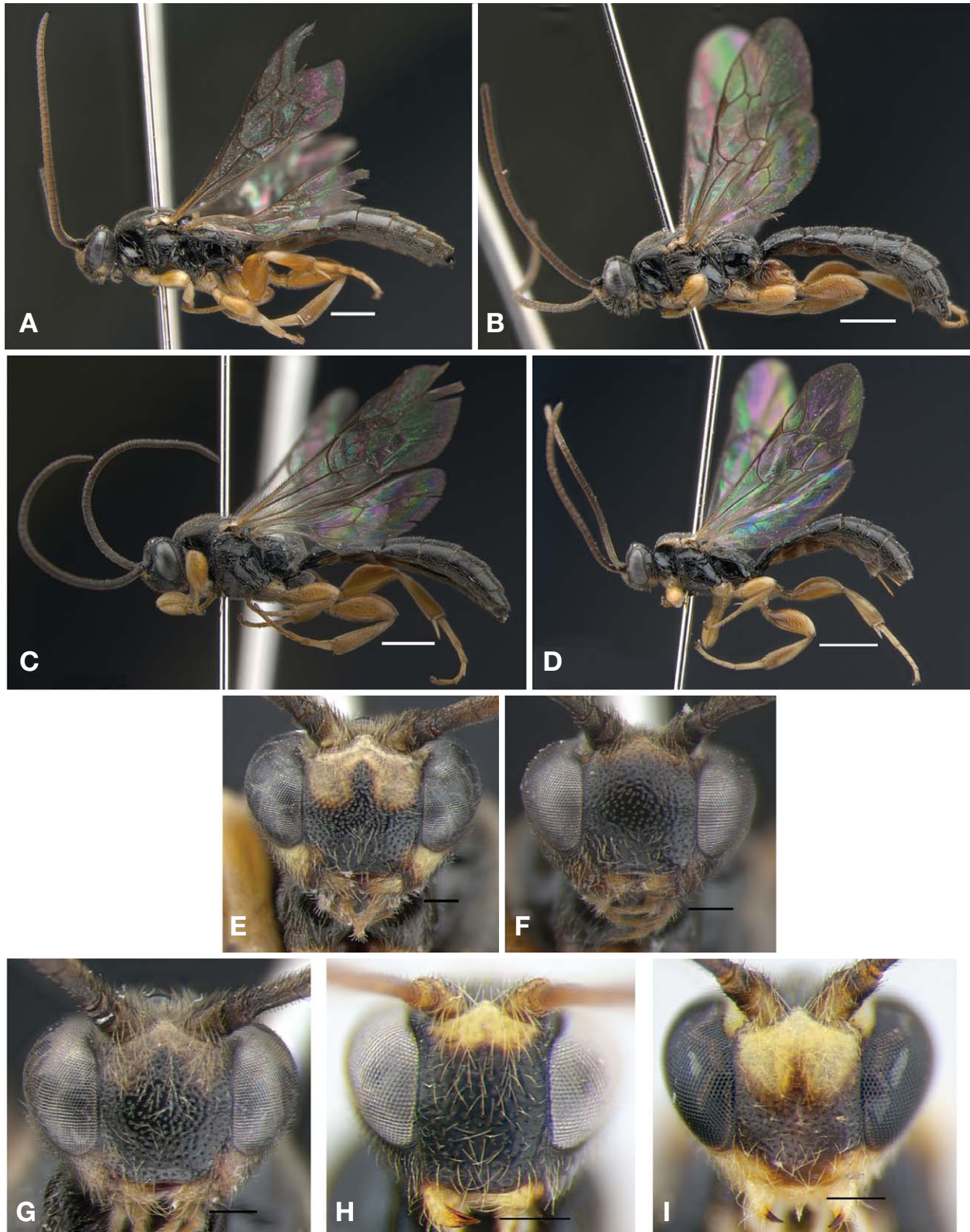
**Material examined.** Korea: 1 male, GW: Chuncheon-si, Sang-dong, Gwangwon Prov. Arboretum, alt. 81 m, 37°55'23.7"N, 127°43'31.7"E, 14–27 Jun 2012, Lee GY; 2 males, GB: Gunwi-gun, Goro-myeon, Geumyang-ri, 14 May 2003; 1 female, Gyeongsan-si, Dae-dong, Yeungnam Univ., 16–25 Sep 2006, Lee JW; 1 female, ditto, 29 Apr–7 May 2008; 1 female, ditto, 12 Jul–2 Aug 2011; 1 female, GB: Cheongdo-gun, Gakbuk-myeon, Namsan3-ri, 7 Jun–12 Jul 2009, Lee JW; 1 female, H., 1 Apr–9 May 1991; Mongolia: 3 males, Ulan Bator by Chinggis Khaan International Airport, 47°51'23.25"N, 106°45'45.84"E, 1 Jun–18 Jul 2009, Lee JW; 1 female, Hustai National Park, alt. 1,392 m, 47°41'21.7"N, 105°53'32.3"E, 5 Aug 2009, Lee JW; 1 female, Mongolia National Univ. research forest, 47°92'N, 106°92'E, 3 Aug 2012, Lee JW.

**Diagnosis.** Body length 5.0–8.0 mm; flagella with 35–39 segments. Head convex, upper face with short projection and recurved; between antennal sockets with vertical ridge; dorsal margin of eyes with triangular yellow spots, not connected to the margin of the between antennal socket and eye. Malar space black. Pronotum strong sunken. Scutellum and postscutellum yellow and black partly. Propodeum without areola; anterior externa area with hairs; dentiparal area with hairs partly; spiracle of propodeum ellipse; metapleurum polished. Nervellus intercepted at lower 0.25, without discoidella. 1st tergum with broad dorsal longitudinal carina, reaching the central area of 1st tergum; median longitudinal area of 1st tergum without hair. 3rd tergum with semicircular epipleuron.

**Host.** Unknown.

**Distribution.** Korea (new record), Mongolia (new record), Bulgaria, Czechoslovakia, France, Germany, Hungary, Kazakhstan, Latvia, Lithuania, Moldova, Poland, Romania, Russia,

Korean name: <sup>1</sup>\*불룩뿔뿔맵시벌속(신칭), <sup>2</sup>\*툽스뿔뿔뿔맵시벌(신칭), <sup>3</sup>\*금양뿔뿔뿔맵시벌(신칭)



**Fig. 1.** A–D, General habitus in lateral view; A, *Exochus thomsoni*; B, *E. suborbitalis*; C, *E. kusigematii*; D, *E. semilividus*; E–I, Head in frontal view; E, *E. thomsoni* (male); F, *E. thomsoni* (female); G, *E. suborbitalis*; H, *E. kusigematii*; I, *E. semilividus*. Scale bars: A–D=1 mm, E–I=0.2 mm.

Turkey and Ukraine.

<sup>1</sup>\**Exochus kusigematii* Tolkanitz, 2007 (Fig. 1C, H)

*Exochus kusigematii* Tolkanitz, 2007a: 348.

*Exochus erythropus* Kusigematii, 1971: 279. Type: female; TD: HU.

**Material examined.** Korea: 1 female, GB: Gyeongsan-si, Yeungnam Univ., 1 Jul 1986, Lee JW; 1 female, GN: Jinju-si, Gajoa-dong, 8 Jul 1980, Kim JK; 1 female, Ulju-gun, Sangbuk-myeon, 28 Jun 1989, Kim JK; Mongolia: 2 males, Bornuur region, 48° 27'50.72"N, 106° 15'08.25"E, 1 Jun–6 Jul 2009, Lee JW.

**Diagnosis.** Body length 4.5–5.0 mm; flagella with 26–30 segments. Head strongly convex, upper face with long projection and recurved; between antennal sockets without vertical ridge; dorsal margin of eyes with small triangular yellow spots. Malar space black. Pronotum sunken. Notaulus very short but distinct as pit. Scutellum and postscutellum black. Propodeum without areola, anterior transverse carina incomplete; anterior externa area with hairs; dentiparal area with sparse hairs; spiracle of propodeum small and oval, not connected pleural carina; metapleurum glabrous. Nervellus intercepted at lower 0.1, with trace of discoidella. 1st tergum with short dorsal longitudinal carina, reaching the central area of 1st tergum, upcurved in basal area; between dorsal longitudinal carinae without hairs. Median area of 1st and 2nd terga glabrous. 3rd tergum with semicircular epipleuron.

**Host.** Unknown.

**Distribution.** Mongolia (new record), Korea, Japan and Russia.

<sup>2</sup>\**Exochus semilividus* Vollenhoven, 1875 (Fig. 1D, E)

*Exochus longicornis* Thomson 1887: 193–218. Type: female; TD: ZI.

*Exochus semilividus* Vollenhoven, 1875: 68.

**Material examined.** Korea: 3 females, GG: Mt. Cheonggye-san, 4 Jul 1989, Kim JK; 1 female, GW: Soraksan Heungryeongsungsen, 18 Aug 1987, Kim JK; 1 female, Donghaesi, Samhwa-dong, Mureung Valley (M.T.), 37° 27'52"N, 129° 01'26"E, 27 Sep–5 Oct 2007; 1 female, GB: Ulreung, Naribunji, 17 Oct 2001, Jeong JC; 1 female, JB: Jeongeup-si, Yongsan-dong, 35° 30'N, 126° 51'E, 19 May 2004, Lee JW; China: 1 male, Jirin-seong, Helong-si, Xicheng-jin, Mingyan-chon, 42° 32'48"N, 129° 00'38"E, 10–17 Aug 2009, Lee JW.

**Diagnosis.** Body length 5.0 mm; flagella with 32 segments. Head convex, upper face with short projection and recurved; between antennal sockets with vertical ridge but indistinct;

dorsal margin of eyes with triangular yellow spots, connected to the margin between antennal socket and eye. Malar space yellow. Pronotum weak sunken. Scutellum and postscutellum yellow. Propodeum without areola; anterior externa area with hairs; dentiparal area with hairs partly; spiracle of propodeum ellipse; metapleurum glabrous. Nervellus intercepted at lower 0.25, without discoidella. 1st tergum with broad dorsal longitudinal carina, reaching the central area of 1st tergum, upcurved in basal area; median longitudinal area of 1st and 2nd terga without hairs. 3rd tergum with semicircular epipleuron.

**Host.** [Lepidoptera]: Tortricidae; *Argyrotaenia ljunghiana* (Dzhanelidze, 1969).

**Distribution.** China (new record), Korea, Armenia, Austria, Azerbaijan, Belgium, Bulgaria, France, Georgia, Germany, Hungary, Italy, Latvia, Lithuania, Netherlands, Poland, Russia, Sweden, Switzerland, Turkey and Ukraine.

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