

Taxonomic Review of *Chrysis smaragdula* Group (Hymenoptera: Chrysididae) from Korea

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ABSTRACT

A taxonomic review of the Korean *Chrysis smaragdula* group (Hymenoptera: Chrysididae), characterized by the six apical teeth (including lateral angles or obtuse protuberances) of metasomal tergum 3, is presented. Three species, namely *Chrysis daphne*, *C. equestris*, *C. principalis*, are included herein. Of these, *C. equestris* is recorded from Korea for the first time. *Chrysis daphne* is a corrected name for the previous Korean records under the name of *C. fasciata*. A determination key to species complemented with illustrations is made. Additional diagnoses including color variations and descriptions of male genitalia (unavailable in *C. equestris*) based on Korean materials are also provided.

Keywords: Cuckoo wasps, Chrysidini, *Chrysis equestris*, correction, new record

INTRODUCTION

The genus *Chrysis* Linnaeus, 1761 is the most speciose in the family Chrysididae, including over 1,000 species worldwide. *Chrysis smaragdula* group can be easily separated from other congeners by the six apical teeth (including obtuse lateral protuberances or angles as in Fig. 1A, D) of metasomal tergum 3 (Kimsey and Bohart, 1990). The Korean fauna of this group has been represented by two species, *Chrysis fasciata* and *C. principalis* (Ha et al., 2008; Korean Society of Applied Entomology and The Entomological Society of Korea, 2021). However, taxonomic interpretation in relation to the former is still messy in the Far East as discussed by Rosa et al. (2019). Particularly, two species, *C. zetterstedti* and *C. daphne* often considered subspecies or synonym of *C. fasciata*, were recently revealed as discrete valid species (Paukkunen et al., 2014; Rosa et al., 2019).

In this study, authors review *Chrysis smaragdula* group from Korea. Three species are identified, including *C. equestris* new to Korea. At present, it is pretty reasonable that *C. daphne* is a proper name for the previous Korean records under the name of *C. fasciata*. The species *C. zetterstedti* is not found in Korea. A determination key to species com-

plemented by illustrations is made. Additional diagnoses including male genital structures and color variations shown in Korean materials are also provided.

Synonym lists of species just include taxonomic information of original citation, related primary taxonomic issues and justifiable records for occurrences in Korea.

Abbreviations for body parts are as follows: F, flagellomere; T, metasomal tergum; S, metasomal sternum. Provincial names of South Korea abbreviated as follows: CB, Chungcheongbuk-do; CN, Chungcheongnam-do; DG, Daejeon Metropolitan City; DJ, Daejeon Metropolitan City; IC, Incheon Metropolitan City; GB, Gyeongsangbuk-do; GG, Gyeonggi-do; GN, Gyeongsangnam-do; GW, Gangwon-do; JB, Jeollabuk-do; JN, Jeollanam-do.

SYSTEMATIC ACCOUNTS

Order Hymenoptera Linnaeus, 1758

Family Chrysididae Latreille, 1802

Genus *Chrysis* Linnaeus, 1767

¹*Chrysis daphne* Smith, 1874

Chrysis fasciata var. *daphne* Smith, 1874a: 399, ♀ (holo-

Korean name: ¹줄육니청벌

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- type), Japan: “Hiogo” [Hyogo] (Natural History Museum, London).
- Chrysis (Hexachrysis) zetterstedti* Dhalbom: Uchida, 1927: 152 (incl. Korea in distribution); Sugihara, 1936: 34 (incl. Korea in distribution).
- Chrysis (Hexachrysis) fasciata zetterstedti* Dahlbom: Tsuneki, 1948: 50, 52; 1953a: 60 (incl. Korea in distribution); 1953b: 28, ♀♂, the Korean Peninsula: Seoul, Soyosan, Godaesan, Gomyeongsan, Donae.
- Chrysis (Hexachrysis) fasciata daphne* Smith: Tsuneki, 1963: 1 (in key), 8 (♀♂, Korea: Seoul, Soyosan).
- Chrysis (Pyria) fasciata daphne* Smith: Tsuneki, 1970: 49 (in key, incl. Korea in distribution); Kim, 1970: 502, ♀, Korea: Ui-dong, pl. 42, fig. 557.
- Chrysis fasciata daphne* Smith: Yamane, 1999: 87 (incl. Korea in distribution); Terayama et al., 2005 (incl. Korea in distribution); 2010: 8 (incl. Korea in distribution); 2016: 396 (incl. Korea in distribution).
- Chrysis fasciata* Olivier: Ha et al., 2009: 74 (incl. Korea in distribution).
- Material examined.** Korea: GG: ♀, Gwangju-si, Opo-myeon, Mt. Baekmasan, 23 Sep 2001, Choi DS et al; ♀, Suwon-si, Mt. Gwanggyosan, 26 May 2003, Kim YH; ♂, Anyang-si, Anyang Arboretum, 3 Sep 2005, Lee W, Kang S; 2 ♀♀, Gapyeong-gun, Ha-myeon, Taebong-ri, 1 Sep 2006, Ha SB; GW: ♀, Wonju-si, Maeji-ri, Yonsei Univ. campus, 22 Sep 1996, Han HY, Byun HW; ♀, same locality, 23 May 1997, Kang D, Yun HJ; ♀, same locality, 5 Oct 2010, Lee YB, Lee HS; 3 ♀♀, 2 ♂♂, Honcheon-gun, Nam-myeon, Myeongdong-ri, Apr–Jun 2004, Kim JG; ♀, Chuncheon-si, Hwachon-myeon, Guseongpo-ri, 23 Sep 2006, Kim JK; ♀, Chuncheon-si, Buksan-myeon, Jogyo-ri, 24 Sep 2006, Ha SB; ♀, Chuncheon-si, Dong-myeon, Wolgok-ri, 24 Sep 2006, Han SP; ♀, Chuncheon-si, Hyoja-dong, Gangwon Univ., Aug 2017, Jeong MG; ♀, Yeongwol-gun, Jungdong-myeon, Hwawon-ri, 37°09′06.85″N, 128°38′07.03″E, 27 Sep–11 Oct 2017, Kim J-K; 2 ♀♀, Hwacheon-gun, Hanam-myeon, Samhwa-ri, 38°3′35.76″N, 127°43′46.53″E, 30 May–12 Jun 2018, Yang S; ♀, same locality, 12–30 Jun 2018, Yang S; ♂, Gangleung-si, Sacheon-myeon, Sagimak-ri, 37°47′18.63″N, 128°47′51.52″E, 16 Apr–1 May 2018, Yang S; ♀, ditto, 9–28 Jul 2018, ♀, Yang S; ♀, same locality, 21 Aug–4 Sep 2018, Yang SW; ♀, Hongcheon-gun, Bukbang-myeon, Neungpyeong-ri, 37°72′875N, 127°8357778E, 17 Jul 2020, Oh KS; CN: ♀, Seosan-si, Haemi-myeon, Daegok-ri, Mt. Gayasan, 22 May 2007, Kim IN; ♀, same locality, 6 Jul 2007, Kim IN; ♀, Yeongi-gun, Jeoneui-myeon, Seojeong-ri, 20 Sep 2007, Lee JS; 6 ♀♀, Gongju-si, Uidang-myeon, Jungheung-ri, 20 Sep 2007, Hwang IC, Kim JK, Ha SB; ♂, Seosan-si, Haemi-myeon, Hanseo Univ., 19 May 2009, Song TI; ♀, Boryeong-si, Seongju-myeon, Seongju-ri, 16 Sep 2013, Kwon OC; ♀, Gongji-si, Sagok-myeon, Hoehak-ri, 17 Sep 2017, Lee JS; ♀, Taean-gun, Sowon-myeon, Songhyeon-ri, 36°46′51.78″N, 126°10′31.39″E, 14–28 Oct 2018, Hwang I; ♂, Seocheon-gun, Maseo-myeon, Songnae-ri, 36°1′47.50″N, 126°43′36.00″E, 16–30 May 2018, Kwon O-C; ♂, same locality, 16–25 Jul 2018, Kwon O-C; ♀, ditto, 14–21 Oct 2019, Kwon OC; DJ: 2 ♂♂, Yuseong-gu, Jijok-dong, 25 Jun 2017, Jeong MG; CB: ♀, Chungju-si, Angseong-myeon, Jidan-ri, 22 Jul 2007, Hwang IC; ♀, Chungju-si, Gageum-myeon, Bonghwa-ri, Mt. Eulgungsan, 21 Sep 2007, Hwang IC; ♀, Boeun-gun, Sokrisan-myeon, Sangpan-ri, 36°30′54.14″N, 127°48′33.13″E, 17–30 Apr 2018, Kwon O; ♀, same locality, 30 May–14 Jun 2018, Yang S; GB: ♀, Cheongdo-gun, Unmunsa, 23 Jul 1989, Kim HG; ♀, Chilgok-gun, Buksam-myeon, Yul-ri, 15 May 2007, Lee JS; ♀, Euiseong-gun, Angye-myeon, Dodeok-ri, 36°25′49.02″N, 128°27′35.70″E, 16–29 Aug 2017, Kwon O-C; ♀, Gyeongju-si, Gangdong-myeon, Dangu-ri, 36°03′48.06″N, 129°16′16.25″E, 25 May–19 Jun 2017, Kwon O-C; 3 ♀♀, same locality, 17 Jul–10 Aug 2017, Kwon O-C; 3 ♀♀, same locality, 10 Aug–11 Sep 2017, Kwon O-C; ♀, same locality, 11 Sep–13 Oct 2017, Kwon O-C; JB: ♀, Jeongeup-si, Ssangam-dong, Jukrim, 19 Jun 2004, Lee JW; ♀, Jeongeup-si, Yongsan-dong, 27 Jul 2004, Yun MK; ♀, Buan-gun, Sangseo-myeon, Gamgyo-ri, 26 Jul 2013, Kim JK; ♀, Gochang-gun, Gosu-myeon, Eunsa-ri, 22 Sep 2013, Kim JK; ♀, Jeongeup-si, Chilbo-myeon, Banggok-ri, 13 May 2013, Jeong IW; 2 ♀♀, same locality, 23 Sep 2013, Kim JK; JN: ♀, Gangjin-gun, Gundang-myeon, Deokcheon-ri, 34°37′12.43″N, 126°50′09.94″E, 24 Apr–8 May 2017, Kwon O-C; ♀, Hwasun-gun, Chunyang-myeon, Gabong-ri, 8–22 May 2017, Kwon O-C; ♀, same locality, 19 Jun–3 Jul 2017, Kwon O; ♀, Suncheon-si, Sokhyeon-dong, 34°58′56.59″N, 127°27′40.56″E, 20 Jun–3 Jul 2017, Kwon O-C; ♀, same locality, 18–30 Jul 2017, Kwon O-C; ♀, Gurye-gun, Gwanggui-myeon, Ondang-ri, 36°17′20.61″N, 127°26′41.76″E, 20–27 Sep 2018, Kwon OC.
- Description.** Small to medium-sized species, body length 6.5–10.5 mm in females, 5.5–9.0 mm in males.
- Almost entire specimens herein (collected from almost all over the South Korea) have reddish golden apical band of T2 (sometimes T1–3 as in Fig. 1A, or T2–3 as in Fig. 1E). Only one female and two males have greenish golden apical band on T1–3 (Fig. 1F). Dorsum of head and mesosoma usually primarily greenish and partially darkened blue (Fig. 1A), but sometimes blue and green (Fig. 1B). In both sexes, front below transverse carina golden green (Fig. 1C).
- Genitalia (Fig. 1I): Gonostyle as long as cuspis; apical tip of aedeagus in the same height of gonostyle; median notch

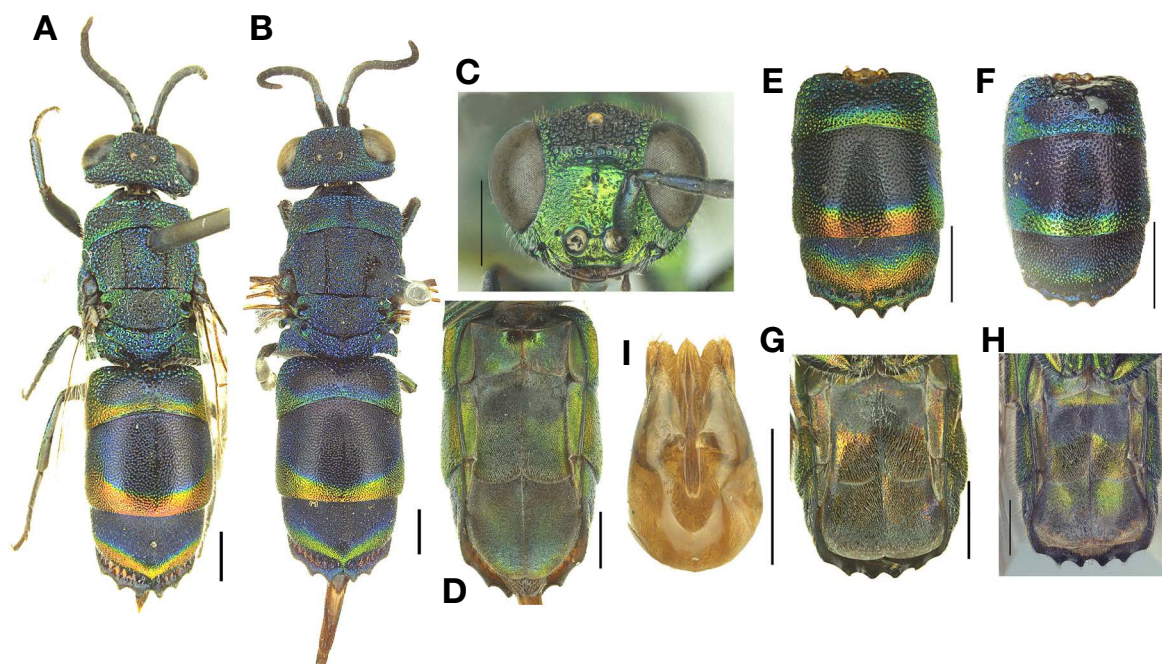


Fig. 1. *Chrysis daphne* Smith. A, Habitus in dorsal view, ♀; B, Habitus in dorsal view, ♂; C, Head in frontal view, ♀; D, S1-3 in ventral view, ♀; E, T1-3 in dorsal view, ♂; F, T1-3 in dorsal view, ♂; G, S1-3 in ventral view, ♂; H, S1-3 in ventral view, ♂; I, Genitalia in dorsal view, ♂. Scale bars: A-I=1 mm.

between parameres subparallel-sided, very slightly broadened posteriorly.

Distribution. Korea (GG, GW, CB, CN, DJ, GB, JB, JN), Russian Far East (Primorskii Terr.), Japan.

Notes. Four trans-palaearctic species, *C. daphne*, *C. equestris*, *C. fasciata*, and *C. zetterstedti* that were taxonomically confused for a long time, are currently considered as valid species (Paukkunen et al., 2014, 2015; Rosa et al., 2019). Genitalic structure herein also support the discrete specific status of *C. daphne* in relation to *C. equestris* and *C. zetterstedt*. Gonostyle is almost as long as cuspis in *C. daphne* (Fig. 1), while gonostyle much longer than cuspis in the latter two species (refer to figs. 134 and 135 in Paukkunen et al., 2015). In addition to the characteristics in the key, conspecificity of the two color forms that are different in apical bands on metasomal terga (Fig. 1E vs. F) is also confirmed by the comparison of male genitalia.

¹**Chrysis equestris* Dahlbom, 1854

Chrysis equestris Dahlbom, 1854: 307, ♀ (holotype), locality unknown [most likely Sweden] (Stockholm).

Material examined. Korea: GW: ♀, Hongcheon-gun, Dongmyeon, Nocheon-ri, 26 Jul 2010, Jeong EY; ♀, Yanggu-

gun, Hae-an-myeon, Korea National Arboretum, DMZ Native Botanic Garden, 13 Aug 2015, collector not stated; ♀, Hwacheon-gun, Dongchon-ri, 28 May 2019, Jeong MG; ♀, Yanggu-gun, Bangsan-myeon, Geumak-ri, 16 Jun 2019, Jeong MG; 2 ♀♀, Chuncheon-si, Nam-myeon, Banggok-ri, 15 Sep 2019, Jeong MG; DJ: 2 ♀♀, Yuseong-gu, Jijok-dong, 4 Jun 2017, Jeong MG.

Description. Medium-sized species, body length 8–11 mm in females. Body comparatively slender, particularly as shown in S3 longer than broad (Fig. 2C, G).

Face greenish golden, dorsum of head and mesosoma primarily green and partially blue to violet, terga blue with greenish golden apical bands on T1–3, ground color of metasomal sterna green (Fig. 2A–D); in one female, face greenish blue, dorsum of head and mesosoma primarily violet and partially blue, T2 blackish violet, and apical bands of terga blue, ground color of metasomal sterna blue (Fig. 2E–G). The color form with reddish golden apical bands on terga is not found in Korean materials.

Distribution. Trans-Palaearctic: western Europe (Estonia, Finland, Lithuania, Norway, Sweden) to Russian Far East (Sakhalin) and Korea (GW, DJ; new record).

Notes. This species is likely to be not common in Korea. Unfortunately, Korean male material of this species is not

Korean name: ¹가는육니청벌 (신칭)

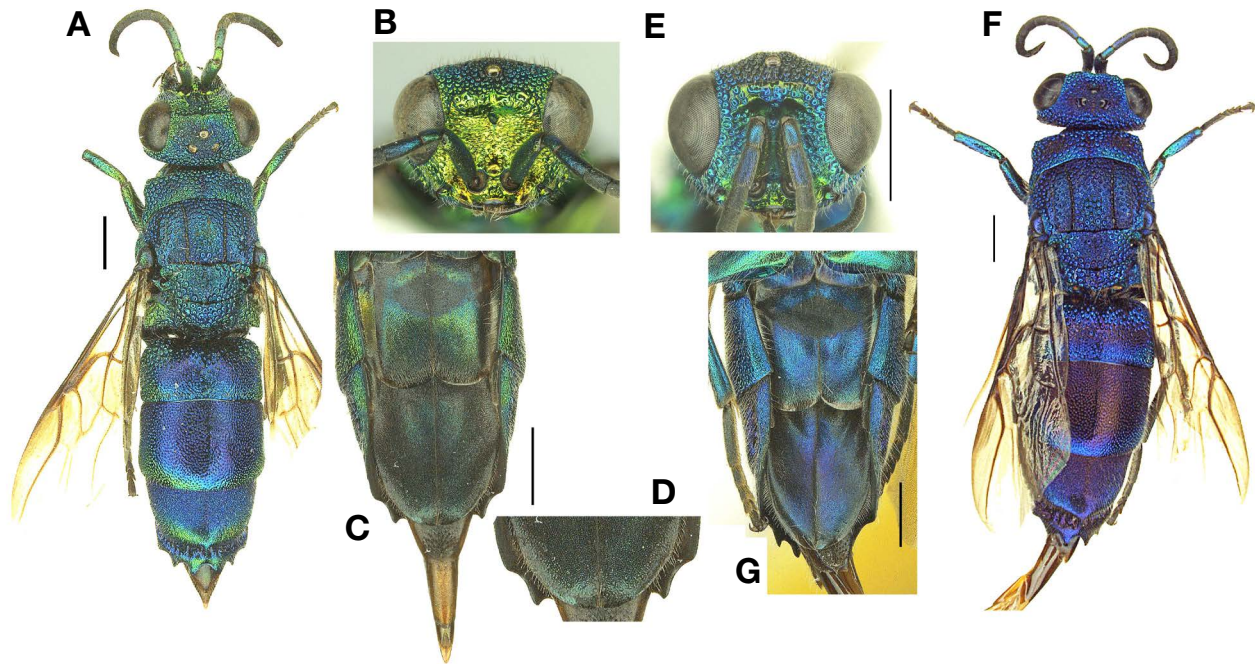


Fig. 2. *Chrysis equestris* Dahlbom, ♀. A, Habitus in dorsal view; B, Head in frontal view; C, S2-3 in ventral view; D, apical margin of S3 in ventral view; E, Head in frontal view; F, Habitus in dorsal view; G, S2-3 in ventral view. Scale bars: A-G=1 mm.

available at present. For the definite identification of this species in Korea, further examination of male genitalia is needed. The genitalia of this species is distinct in having broad median notch between parameres and long (much exceeding gonostyle), apically curved cuspis (fig. 134 in Paukunen et al., 2015).

¹*Chrysis principalis* Smith, 1874

Chrysis principalis Smith, 1874b: 461, ♀ (holotype), China: Shanghai (Oxford University Museum, England); Kim, 1970: 502; ♀, Korea: Gwangleung, pl. 42, fig. 556; Kimsey and Bohart, 1990: 450 (incl. Korea in distribution); Yamane, 1999: 87 (incl. Korea in distribution); Ha et al., 2008: 75 (incl. Korea in Distribution); Terayama et al., 2005: 26 (incl. Korea in distribution); 2010: 8 (incl. Korea in distribution); 2016: 397 (incl. Korea in distribution); Rosa et al., 2014: 60 (incl. Korea in distribution).

Chrysis (Hexachrysis) principalis Smith: Uchida, 1927: 152 (incl. Korea in distribution); Tsuneki, 1953b: 28, ♀♂, the Korean Peninsula: Seoul, Hwasan, Suwon, Soyosan, Godaesan, "Samei"; Tsuneki, 1961: 377 (incl. Korea in distribution); 1963: 1 (in key), 2 (♀♂, Korea: Seoul, Soyosan, "Koryo").

Material examined. Korea: IC: ♂, Gyeyang-gu, Gyesan-

dong, Mt. Gyeyangsan, 5 Jun 2009, Ha HH; ♀, Gwanghwado, 10 Aug 2017, Kim JK; GG: ♂, Gwangju-si, Docheok 95 trap, 5 Jun 1996, Lee HS; ♀, Yangsu-ri, 5 Jul 1999, Jeong JC; ♀, same locality, 9 Jun 2001, collector not stated; ♀, Gwangju-si, Toechon-myeon, Gwaneum-ri, 21 May 2005, Hwang DG; ♀, Chuncheon-si, Hwacho-myeon, Guseongpo-ri, 23 Sep 2006, Han SP; ♀, Chuncheon-si, Seo-myeon, Wolseong-ri, 24 Sep 2006, Lee JS; ♀, Gapyeong-gun, Baekyang-myeon, Eundalmal-ri, 1 Oct 2006, Lee JS; 2♂♂, Namyangju-si, Jinjeop-eup, Palya-ri, 20 Jun 2007, Ha SB; ♀, Yeosu-si, Geangcheon-myeon, Georeun-ri, 4 Sep 2007, Kim JK; 2♀♀, 2♂♂, Gapyeong-gun, Guk-myeon, Mt. Myeonggisang, 24 Jun 2009, Ha HH; 6♀♀, Gwangju-si, Docheok-myeon, Mt. Taehwasan, 28 Jun 2011, Kim JK; ♀, Anseong-si, Bogae-myeon, Nampung-ri, 6 Jul 2011, Kim JK; ♀, Pocheon-si, Korean National Arboretum (Gwangleung), 37°45'19"N, 127°08'34"E, 15 Jun 2015, Kim JK; ♀, same locality, 15 Jul 2015; ♀, same locality, 12 Jun 2017, Kim JK; GW: ♂, Yeongwol-gun, Ssangyoung-myeon, Changwon3-ri, 8 Jul 1999, Kim MA; ♀, Wonju-si, Maeji-ri, Yonsei Univ., 15 Aug 2001, Lee HS; ♀, Chuncheon-si, Seo-myeon, Wolseong-ri, 24 Sep 2006, Ha SB; 2♀♀, Jeongseon-gun, Gulam-ri, 27 Jun 2007, Ha SB; ♀, Yeonwol-gun, Jungdong-myeon, Nakjeon-ri, 2 Jul 2011, Ha HH; ♀, Goseong-gun, Hyeonnae-myeon, Yongho-ri, 29 Jun

Korean name: ¹육니청벌

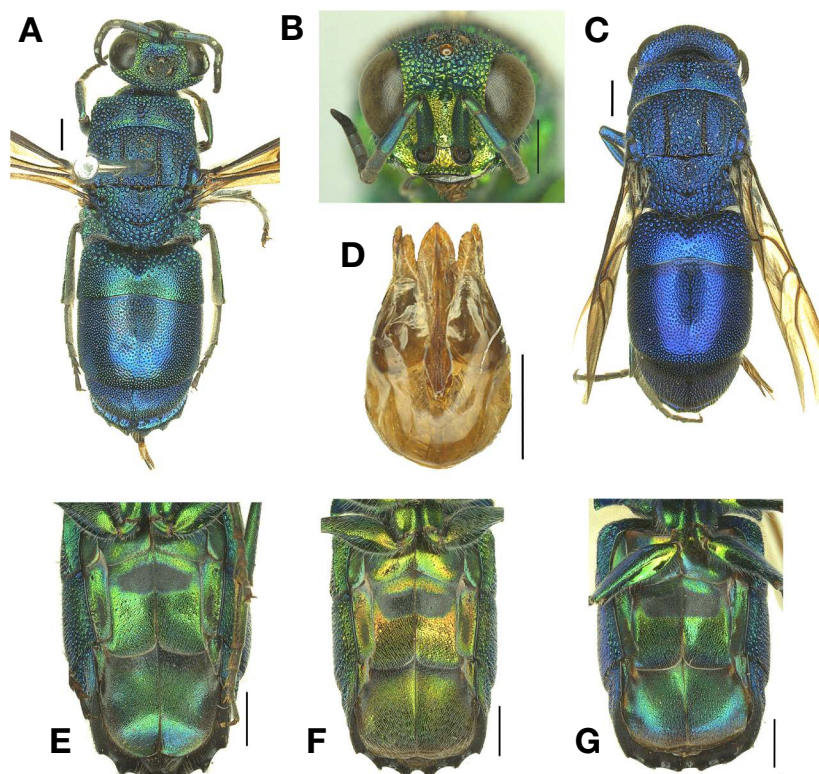


Fig. 3. *Chrysis principalis* Smith. A, Habitus in dorsal view, ♀; B, Head in frontal view, ♀; C, Habitus in dorsal view, ♀; D, Genitalia, ♂; E, S1-3 in ventral view, ♀; F, S1-3 in ventral view, ♂; G, S1-3 in ventral view, ♂. Scale bars: A-G=1 mm.

2012, Kim JK; ♀, Gangleung-si, Sacheon-myeon, Sagimak-ri, 37°47'18.63"N, 128°47'51.52"E, 14–29 May 2018, Yang S; 2 ♀♀, same locality, 29 May–11 Jun 2018, Yang S; ♀, same locality, 23 Jul–6 Aug, Yang S; ♀, same locality, 6–21 Aug 2018, Yang S; ♀, Goseong-gun, Jukwang-myeon, Obong-ri, 29 May–12 Jun 2018, Yang S; ♀, Hongcheon-gun, Hwacheon-myeon, Yasidae-ri, 127.9590833N, 37.82827778E, 16 Jul 2020, Oh KS; CN: 2 ♀♀, Seosan-si, Haemi-myeon, Daegok-ri, Mt. Gayasan, 11 Jun 1986, Won HJ; ♀, same locality, 6 Jul 2007, Kim IN; 2 ♀♀, same locality, 18 Jul 2007, Kim IN; ♀, same locality, 20 Jul 2007, Kim IN; 2 ♀♀, Yesan-si, Deoksan-myeon, Okgye reservoir, 17 Jun 2007, Hwang I, Kim JK; ♀, Asan-si, Yeomchi-myeon, Sanyang-ri, Mt. Yeonginsan, 25 Aug 2007, Hwang IC; ♀, Gongju-si, Yuga-myeon, Nakcheon-ri, 11 Sep 2007, Hwang IC; ♀, Yeongi-gun, Jeoneui-myeon, Sejeong-ri, 20 Sep 2007, Lee JS; 4 ♀♀, Gongju-si, Uidang-myeon, Jungheung-ri, 29 Sep 2007, Kim JK; ♀, Seosan-si, Haemi-myeon, Hwangrak-ri, 11 Jun 2008, Lee AR; ♂, Boryeong-si, Mt. Oseosan, 20 Jul 1999, Han H-Y; 2 ♂♂, Seosan-si, Unsan-myeon, Sinchang-ri, Mt. Sangwangsan, 17 Jun 2011, Ha HH; 2 ♀♀, Dangjin-gun, Songsan-myeon, Bugok-ri, 12 Oct 2014, Kim JK; 2 ♀♀, Seocheon-gun, Maseo-myeon,

Songnae-ri, National Institute of Ecology, 36°1'47.21"N, 126°43'36.02"E, 16 Jun–5 Jul 2017, Kwon O-C; 2 ♀♀, same locality, 12–27 Aug 2017, Kwon O-C; 2 ♀♀, same locality, 30 May–14 Jun 2018, Kwon O-C; ♀, same locality, 14–27 Jun 2018, Kwon O-C; ♀, same locality, 8–27 Aug 2018, Kwon O-C; 2 ♀♀, same locality, 17–23 Jun 2019, Kwon OC; ♀, Boeun-gun, Sokrisan-myeon, Sangpan-ri, 9–23 Jul 2018, Yang S; DJ: ♀, Yuseong, 29 Jun 1987, Park EG; ♀, Yongeun-dong, 1 Jun 1993, Kim JG; ♀, Mt. Bomunsan, 3 Jun 1994, Paik EY; GB: 2 ♀♀, Dongha-si, Samhwa-dong, Muleung-gyegok, 15 Jul–1 Aug 2005, collector not stated; ♀, Uiseong-gun, Angye-myeon, Dodeok-ri, 36°25'49.02"N, 128°27'35.70"E, 24 May–6 Jun 2017, Kwon O-C; ♀, same locality, 6–21 Jun 2017, Kwon O-C; ♀, same locality, 5–19 Jul 2017, Kwon O-C; 2 ♀♀, same locality, 2–16 Aug 2017, Kwon O-C; ♀, same locality, 16–23 Aug, Kwon O-C; DG: ♀, Dong-gu, Sinmu-dong, 11 Jun 2014, Lee JW; GN: 2 ♀♀, Hapcheon-gun, Daeyang-myeon, Osan-ri, 5 Aug 2008, Lee MG; 2 ♀♀, Tongyeong-si, Saryang-myeon, Mt. Chilhyeonsan, 23 Jun 2009, Ha HH; 2 ♀♀, Jinyang-gun, Daepyeong-myeon, Hachon-ri, 4 Jul 1992, Gu DS; ♀, Hapcheon-gun, Daeyang-myeon, Osan-ri, 6 Aug 2008, Kim IN; JB: ♀, Namwon-si, Uijeon-ri, Cheonhwangbong, 14 Jun

1999, Kim JK; 3 ♀♀, Gochang-gun, Asan-myeon, Samin-ri, 19 Sep 2013, Jeong EY; 2 ♀♀, Gochang-gun, Gosu-myeon, Eunsa-ri, 22 Sep 2013, Kim JK; ♀, Buan-gun, Jusan-myeon, Sasan-ri, 26 Jul 2013, Kwon OC; ♀, Wanju-gun, Daea Arboretum, 1 Jun 2014, Park JM; ♀, same locality, 16 Aug 2013, Park JM; JN: ♀, Boseong-gun, Bongnae-myeon, Bongnae-ri, 20 Jul 2007, Ha SB; 2 ♀♀, Jangsaeong-gun, Nam-myeon, Nokjin-ri, 1 Jun 2008, Hwang IC; ♀, Yeongam-gun, Gaesani-ri, 18 Sep 2010, Kim JK; 2 ♀♀, Sinan-gun, Dongchon-myeon, Mannyeong-ri, 23 Jun 2012, Kim JK; ♂, Hwasun-gun, Chunyang-myeon, Gabong-ri, 34°55'47.64"N, 126°57'49.37"E, 22 May–9 Jun 2017, Kwon OC; 2 ♀♀, 1 ♂, same locality, 9–19 Jun 2017, Kwon O-C; ♀, same locality, 3–17 Jul 2017, Kwon O-C; ♀, Gurye-gun, Gwanggui-myeon, Ondang-ri, 36°17'20.61"N, 127°26'41.76"E, 3–18 Sep 2018, Kwon OC.

Description. Robust and large species, body length 10–13.5 mm in females, 8.7–11.5 mm in males.

In the majority of specimens of both sexes, dorsum of body green and blue, with greenish golden apical bands on T1–3 (sometimes one on T1 lost) (Fig. 3A). But in some specimens, dorsum of body almost completely violet without apical band on metasomal terga (Fig. 3C). Ground color of metasomal sterna usually green (Fig. 3E, G), but sometimes reddish golden (Fig. 3F).

Black spot on S2 transverse rhombus separating from lateral margin of S2 (Fig. 3E) or narrowly touching in females; band-like narrowly touching lateral margin of S2 in males (Fig. 3F, G).

Male genitalia (Fig. 3D): gonostyle slightly longer than cuspis; aedeagus broad in dorsal view, much broader than cuspis; apical tip of aedeagus slightly exceeding over gonostyle; median notch between parameres broadened at mid length, long oval to long rhomboid in shape.

Distribution. Korea (IC, GG, CN, DJ, GB, DG, GN, JB, JN), China (Liaoning, Beijing, Shanxi, Jiangsu, Shanghai, Jiangxi), Taiwan, India, Sri Lanka, Sumatra, Java, Celebes, Siam, Aru Is.

Notes. In addition to the characteristics in the key, conspicuity of the two color forms stated above (greenish- and blue-form) is also confirmed by the comparison of male genitalia.

Key to the species of *Chrysis smaragdula* group occurring in Korea

(Characteristics applicable to both sexes, if sex not stated)

1. Head in frontal view less transverse ca. $1.2\times$ as high as broad (Fig. 3B). F1 ca. $2.0\times$ as long as pedicel (Fig. 3B). In females, apical median notch of S3 distinct (Fig. 3E) *C. principalis* Smith

- Head in frontal view much transverse, ca. $1.4\times$ as high as broad (Figs. 1C, 2B, 2E). F1 ca. $1.5\times$ as long as pedicel (Fig. 2E). In females, S3 with very weak apical median notch (Fig. 1D), or without (Fig. 2D) 2
2. Black spot on S2 thick band-like, largely touching lateral margins of S2 (Fig. 1D, G, H). In females, S3 with very weak apical median notch (Fig. 1D) *C. daphne* Smith
- Black spot on S2 transverse rhombus separating from or narrowly touching lateral margins of S2 (Fig. 2C, G). In females, S3 apically rounded, without apical median notch (Fig. 1D) *C. equestris* Dahlbom

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CONFLICTS OF INTEREST

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

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