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Notes on *Cassida ferruginea* and *Cassida mongolica* in Japan, with descriptions of their reproductive systems (Coleoptera: Chrysomelidae: Cassidinae)

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ABSTRACT. *Cassida ferruginea* GOEZE is recorded from Japan for the first time. This species was previously misidentified and noted under name *C. panzeri* WEISE. Occurrence of *Cassida mongolica* BOHEMAN in Japan is confirmed based on new material. Male and female reproductive systems are redescribed for *C. ferruginea* and described for the first time for *C. mongolica*.

Key words: entomology, faunistics, Chrysomelidae, Cassidinae, *Cassida mongolica*, *Cassida ferruginea*, Japan.

INTRODUCTION

CHÛJÔ (1934) was the first to comprehensively study Japanese and Taiwanese Cassidinae (s. str.); he listed 34 species. YASUTOMI (1952) listed 24 species of Cassidinae (s. str.) from Japan. KIMOTO (1966) revised Japanese Cassidinae and listed 27 species. KIMOTO (1994) treated records of *C. mongolica* from Japan as misidentification of *C. fuscicornis*, *Thlaspidia formosae* as the synonym of *T. biramosa*, and listed 25 species from Japan. OTSUKA (1994) recorded *C. mongolica* from Japan again. BOROWIEC (1999) resurrected *C. japana* and *C. crucifera* from the synonym. KOMIYA (2002) described *Notosacantha nishiyamai* from Okinawa, Japan. Presently 29 species of Cassidinae (s. str.) are known from Japan.

For a long time the male and female genitalia of Cassidinae have not been considered in identifying species and in systematics. BORDY (1995a, b) and SEKERKA (2005, 2006) studied genital structures of Cassidinae, and the taxonomic and phylogenetic

importance of the male and female genitalia has been considered for many groups (BORDY & DOGUET 1987, BORDY 2000, BOROWIEC & ŚWIETOJAŃSKA 2001, ŚWIETOJAŃSKA 2001, BOROWIEC & SKUZA 2004, SASSI & BOROWIEC 2006, BOROWIEC & OPALIŃSKA 2007, BOROWIEC & POMORSKA 2009). However, the male and female genitalia of Japanese Cassidinae have never been studied. The male genitalia and the female genitalia of *C. ferruginea* were described and illustrated in BORDY (1997), WARCHALOWSKI (1978), BROVDII (1983) and BORDY & DOGUET (1987). The male and female genitalia of *C. mongolica* have never been studied.

In the present study, *Cassida ferruginea* GEOZE, 1777 is recorded from Japan for the first time. This species has been previously misidentified as *C. panzeri* WEISE, 1907 (KIMOTO 1993). A new record of *C. mongolica* is also given. Male and female reproductive systems are redescribed for *C. ferruginea* and described for the first time for *C. mongolica*.

MATERIAL AND METHODS

The specimens of adult and the wing were mounted on cards. Adult reproductive systems were preserved in glycerin. The female reproductive systems were fixed in preparation of slide glass.

To prepare drawings of the adult reproductive systems, the abdomens of adults were separated from body, and boiled in 10% KOH solution at 60°C, cleared in distilled water, and mounted on a slide glass with glycerin. The slides were examined using a stereomicroscope (Nikon EMZ800), and figures were drawn using a microscope (Olympus BX40) with the drawing device. Photographs were taken using a stereomicroscope with CCD camera (Nikon DS-Fi1).

The materials used in this study are deposited in the following collections:

- EUMJ Ehime University Museum, Matsuyama, Ehime, Japan (M. SAKAI & H. YOSHITOMI).
- HSC H. SUENAGA's private collection, Kurashiki, Okayama, Japan.
- KUM Kyushu University Museum, Fukuoka, Fukuoka, Japan (M. Maruyama)
- SEHU Systematic Entomology, Hokkaido University, Sapporo, Hokkaido, Japan (M. ÔHARA).
- YTC Y. TOMIOKA's collection, Kawaguchi, Saitama, Japan.

Cassida ferruginea GOEZE, 1777

(Figs. 1, 2, 7, 8, 13)

Cassida ferruginea GOEZE, 1777: 213.

Cassida stigmatica: YASUTOMI and TOMIOKA 1990: 23 [Aomori, Japan]; YASUTOMI, TOMIOKA and GOTO 2011: 1 [Iwate, Japan].

Cassida panzeri: KIMOTO 1993: 100, 1994: 348; YASUTOMI 2002: 37; BOROWIEC and SEKERKA 2010: 376 (misidentifications).

REDESCRIPTION OF GENITALIA

Male genitalia (Figs. 7, 8, 11, 12): aedeagus blackish brown, slightly widened to apex dorsally, slightly narrowed to apex laterally; apex truncate sharply (Figs. 7, 8). Ejaculatory apodeme (Fig. 12) small, short and strongly asymmetric. Ejaculatory duct fine and long (Fig. 11).



1, 2. *Cassida ferruginea*, male: 1 – dorsal view, 2 – ventral view; 3, 4. *Cassida mongolica*, male: 3 – dorsal view, 4 – ventral view (scale = 1 mm)

Female genitalia (Fig. 13): the vasculum of spermatheca sclerotized and pigmented entirely, sickle-shaped, with apical part elongate, obviously wider than basal half. Ampulla slightly shorter than vasculum, very broad, at the base forming a sharp bend, concave ventrad, almost straight except for apical part. Ductus long, very tightly spiral.

MATERIAL EXAMINED

2 males 2 females (YTC), Nishiwaga-machi, Iwate Pref., VIII. 2010, Yasuhiro Tomioka leg.

DISTRIBUTION

Japan (Honshu: Aomori Pref. and Iwate Pref.); Europe (excluding Iberian Peninsula), Algeria.

HOST PLANTS

Inula ciliaris and *Carpesium abrotanoides* (Asteraceae) (YASUTOMI et al. 2011).

BIOLOGY

Adults appear once a year in June to August in the wetlands of northern Japan. Larvae and pupae are not described for the Japanese population (YASUTOMI et al. 2011) but were described from Europe (RUPERTSBERGER 1876, BORDY 2000).

NOTE

YASUTOMI and TOMIOKA (1990) firstly recorded this species under name of *C. stigmatica* SUFFRIAN, 1844 from Aomori Pref., Japan on basis of GRESSITT (1952) and the original description. KIMOTO (1993) suggested that the identification of YASUTOMI and TOMIOKA (1990) was incorrect, and identified it as *C. panzeri* based on the specimen of *C. panzeri* in the collection of Natural History Museum, London. In the present study, I identified the species as *C. ferruginea* judging from an examination of specimens of *C. ferruginea* collected in Europe, descriptions of male and female genitalia of BORDY & DOGUET (1987), BORDY (1997) and the key of SEKERKA (2010). *C. ferruginea* is distinguished from *C. stigmatica* and *C. panzeri* by the following characters: 1) Body green with black and triangle spot on basal 1/3 part of elytra, 2) humeral angles weakly protruding, 3) elytra with convex disc, narrow and moderately declivous explanate margin, 4) femora black except for apical part, 5) ejaculatory apodeme small, short and strongly asymmetric, 6) ampulla slightly shorter than vasculum, very broad, almost straight except for apical part, 7) spermathecal duct long.

C. ferruginea is a common species in Europe east to Russia. It was recorded also from Algeria but never noted from eastern part of the Palaearctic region (BOROWIEC and SEKERKA 2010). Distribution of *C. ferruginea* has a broad disjunction between European and Japanese localities. However, all characters, including male and female reproductive systems, of *C. ferruginea* of Japan agree well with the European population of *C. ferruginea*. This suggests that *C. ferruginea* is either widely distributed in the Palaearctic region.

***Cassida mongolica* BOHEMAN, 1854**

(Figs. 3-6, 9, 10, 14)

Cassida mongolica BOHEMAN, 1854: 449; SPAETH and REITTER 1926: 35 [Japan]; ASAI 1961: 16 [Kumamoto Pref., Japan]; OTSUKA 1994: 29 [Kumamoto Pref., Japan], 1996: 305 [Kumamoto Pref., Japan]; NISHIDA 1996: 39 [Oita Pref. and Okayama Pref., Japan]; TSUTSUMIUCHI 2005: 17 [Oita Pref., Japan]; TOMISHIMA 2011: 30 [Kumamoto Pref., Japan]; BOROWIEC and SEKERKA 2010: 376 [Japan]; IMASAKA and OTSUKA 2011: 2.

Cassida fuscicornis: KIMOTO 1994: 348; misidentification.

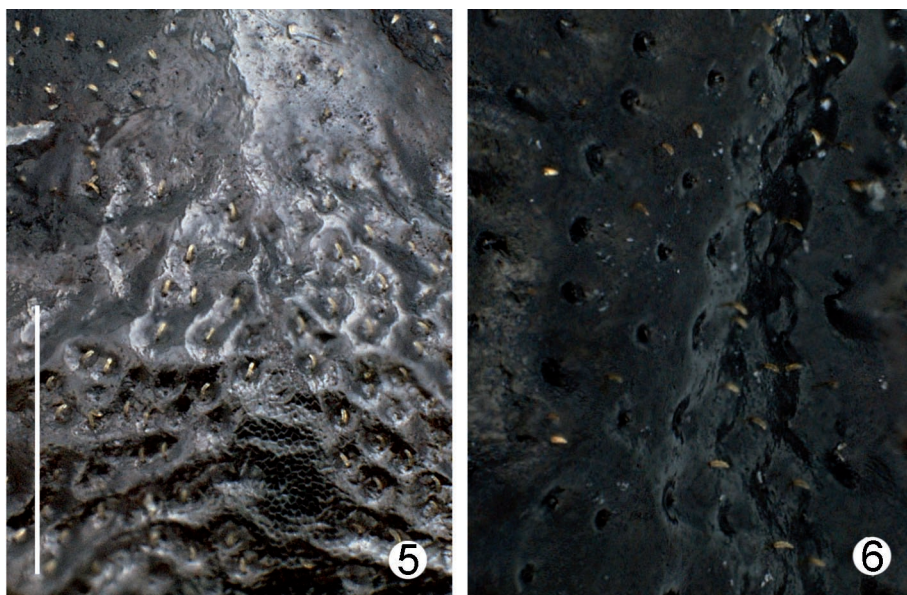
REDESCRIPTION

Male genitalia (Figs. 9, 10): aedeagus blackish brown; subparallel-sided in dorsal side, slightly narrowed to apex in lateral side; apex sharply truncated.

Female genitalia (Fig. 14): the vasculum of spermatheca entirely sclerotized and pigmented, sickle-shaped, with apical part robust. Ampulla obviously shorter than vasculum, very broad, at the base forming a sharp bend, concave ventrad. Ductus robust and short, tightly spiral.

MATERIAL EXAMINED

JAPAN: Kumamoto – 1 ex. (KUM), Nagasakihana, Soyô-machi, 31. V. 1993, Isao Otsuka leg.; 1 male (KUM), ditto, 3-VI-1993, I. Otsuka leg.; 4exs. (KUM), ditto, 28. V. 1995, I. Otsuka leg.; 1 male 1 female (KUM), Chûsaka-toge, Soyô-machi, 1. VI. 1985, I. Otsuka leg.; 1 male (KUM), Matoishi, Aso-machi, 11. VI. 1995, I. Otsuka leg.; 2 males (KUM), Ogaishi, Aso-machi, 13. VI. 1995, I. Otsuka leg.; 1 male (KUM), ditto,



5, 6. *Cassida mongolica*: male: 5 – surface of pronotum, 6 – surface of elytra (scale = 1 mm)

13. VI. 1995, I. Otsuka leg.; 1 male 1 female (KUM), Kamishikimi, Takamori-machi, 19. VI. 1995, I. Otsuka leg.; 1 male (KUM), Yunotani, Chôyô-mura, 20. VI. 1995, I. Otsuka leg.; 3 males 2 females (HSC), Senomoto-kogen, Minamioguni-machi, 31. VII – 12. VIII. 2010, Shôichi Imasaka leg.

DISTRIBUTION

Japan (Honshu: Okayama Pref., Kyushu: Kumamoto Pref. and Oita Pref.); Mongolia, China (Hebei, Jiangsu, Shaanxi, Shandong), Russian Far East (BOROWIEC and SEKERKA 2010).



7-10. Median lobe of male genitalia, 7, 9 – dorsal view, 8, 10 – lateral view: 7, 8 – *Cassida ferruginea*, 9, 10 – *Cassida mongolica* (scale = 1 mm); 11, 12. Male reproductive system of *Cassida ferruginea*: 11 – median lobe and ejaculatory ductus, 12 – ejaculatory apodeme (scale = 1 mm)

HOST PLANT

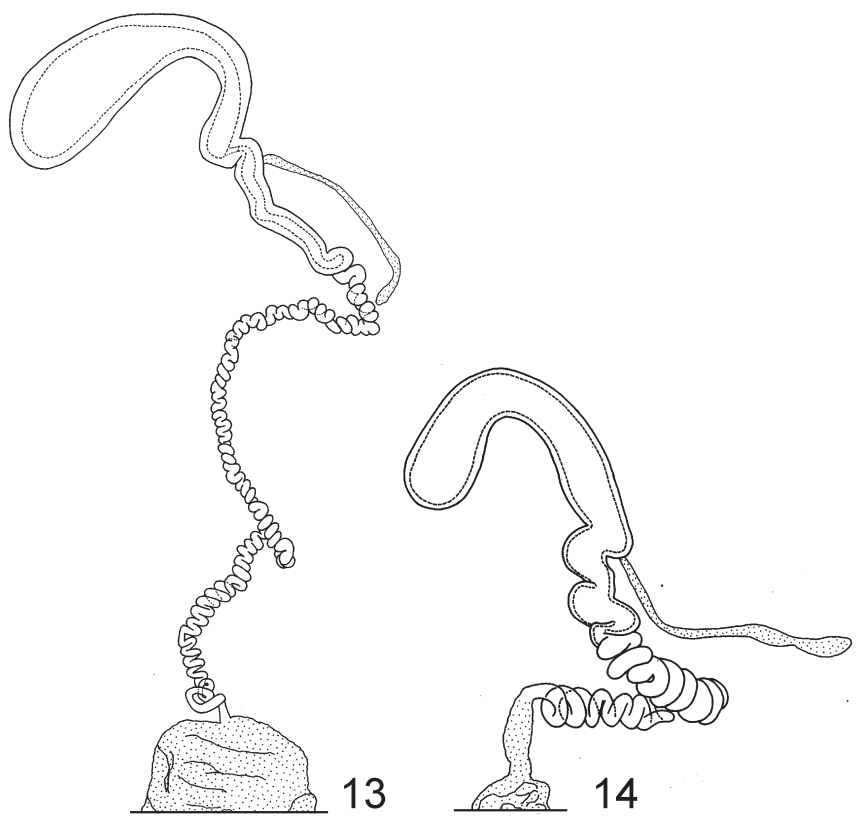
Cirsium japonicum (Asteraceae) (OTSUKA 1996).

BIOLOGY

Adults appear twice a year, May to July and September in grasslands. They feed on *Cirsium japonicum*. Larvae and pupae are unknown from Japan. All localities of *C. mongolica*, "Aso" and "Kujû", Kyushu and "Hiruzen", Honshu, Japan were old grasslands maintained by seasonally controlled burning by human. Several continental Chrysomelid species are present in such grasslands e.g. *Smaragdina mandzhura* (JACOBSON) which are rare species in other areas of Japan, and *C. mongolica* is one of such continental species.

NOTE

SPAETH and REITTER (1926) recorded *C. mongolica* from Japan firstly. ASAI (1961) additionally recorded *C. mongolica* from Kyushu, Japan. But, KIMOTO (1994) treated the record of SPAETH and REITTER (1926) as a misidentification of *C. fuscicornis* without



13, 14. Spermathecae: 13 – *C. ferruginea*, 14 – *C. mongolica* (scale = 0.5 mm)

adequate explanation. Thus, records of *C. mongolica* from Japan had been supposed the misidentification of *C. fusciorufa*. But, OTSUKA (1994, 1996) recorded it from Kyushu, Japan again. NISHIDA (1996), TSUTSUMIUCHI (2005) and TOMISHIMA (2011) additionally recorded it from Honshu and Kyushu, Japan with color photographs. IMASAKA and OTSUKA (2011) also recorded it from Kyushu with report on their biology. In this study, I examined specimens of *C. mongolica* which were collected from Kyushu, and identified them as *C. mongolica* based on the following characters: 1) Body black with weak luster, 2) a pair of yellowish brown triangle spots on anterior margin of pronotum (Fig. 2), 3) pronotum (Fig. 3a) and elytra (Fig. 3b) with short setae. *C. mongolica* is distinguished easily from *C. fusciorufa* by the body color and the presence of setae on elytra.

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