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New Record of *Chelonus formosanus* Sonan, 1932 (Hymenoptera: Braconidae: Cheloninae) from Japan, Emerged from *Spodoptera frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae) on Sugar Cane in Nansei Islands

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Abstract The braconid wasp, *Chelonus formosanus* Sonan, 1932, originally described from Taiwan, is recorded from Japan for the first time. It was collected in Nansei Islands (Amami-ôshima Is., Kikai Is., Okinawa-hontô Is., Ishigaki Is.), to the north of Taiwan, in 2010 and later. *Spodoptera frugiperda* (J.E. Smith) on sugar cane and *S. exempta* (Walker) (Lepidoptera: Noctuidae) are recorded as its hosts in Japan.
ZooBank LSID: https://zoobank.org/References/DD4F858C-227B-4DDF-AF99-0169BE7DCBFF

A braconid wasp, *Chelonus formosanus* Sonan, 1932, was first described from Taiwan (Formosa) as an egg-larval parasitoid of *Mythimna* (= *Cirphis*, *Leucania*) *loreyi* (Duponchel) and *Spodoptera* (= *Prodenia*) *litura* (Fabricius) (Lepidoptera: Noctuidae) (Sonan, 1932). Thereafter, it has been recorded from China and India as being a parasitoid of *Spodoptera frugiperda* (J. E. Smith) and other noctuid pests (Yu *et al*., 2016; Gupta *et al*., 2020), but not yet from Japan (Fujie & Maeto, 2020). Here, we record *C. formosanus* from Nansei Islands, the southwestern islands of Japan, to the north of Taiwan.

The materials examined are deposited in the following collections: Ehime University Museum, Matsuyama, Japan (EUMJ), Insect Museum of National Agriculture and Food Research Organization, Tsukuba, Japan (NARO), and Osaka Museum of Natural History, Osaka, Japan (OMNH). Multi-focus photographs were taken by a digital microscope (VHX-1000, Keyence, Osaka) with a 10 — 130X lens and stacked using the software incorporated. Archived images of a cotype (female) of *C. formosanus* were also observed (Digital Insect of Taiwan Agricultural Research Institute (TARI), 2023).

Chelonus formosanus Sonan, 1932

(Figs. 1–6)

[Japanese name: Taiwan-tsuno-kourakomayubachi]

Chelonus formosanus Sonan, 1932: 70 (type locality: Taihoku, Taiwan); Watanabe, 1934: 196; Watanabe, 1937: 73; Gupta *et al*., 2020: 2522.

Specimens examined. JAPAN: 1♂, Tomori, Kasari, Amami-ôshima Is., 8. X. 2021, Host: *Spodoptera frugiperda* on sugar cane, Y. Ikenoue leg. (EUMJ); 1♀2♂♂, same locality, host, and collector, 20–21. X. 2021 (EUMJ); 2♀♀3♂♂, Hyakunodai, Kikai Is., host larvae collected on 9. X. 2010, Host: *Spodoptera exempta*, T. Yuda leg. (NARO); 1♀, Tôme, Yaese Town, Okinawa-hontô Is., 1. I. 2020, H. Yoshitake leg. (Figs. 1–6) (EUMJ); 7♂♂, Makabe, Itoman City, Okinawa-hontô Is., host larvae collected on 8.I.2020, wasps emerged on 4–5. II. 2020, Host: *S. frugiperda* on sugar cane, N. Arakaki leg. (OMNH, NARO); 2♂♂, Ôhama, Ishigaki City, Ishigaki Is., alt. ca. 50 m, 24.818N/ 124.199E, 19. X. 2022, R. Itô leg. (OMNH).

Diagnosis. Body length 5.3–6.9 mm; fore wing length 3.9–4.6 mm. Face strongly and coarsely reticulate-rugose (Fig. 2); frons with a bidentate horn between antennae (Fig. 3); antenna shorter than the body, with 24–26 (female) or 27–30 (male) segments. Propodeum with a pair of strong latero-apical tubercles (Fig. 4). Vein SR1 of fore wing slightly curved medially (Fig. 5). Metasomal carapace 1.5–1.8 times (female) or twice (male) as long as wide, without an apical fissure. Head including antennae and mesosoma black (Fig. 1). Hind leg black or dark brown with apex of hind femur, basal two third of tibia, tibial spurs and basal half of tibia yellowish white (Fig. 1). Wings slightly infuscated, pterostigma and parastigma entirely dark brown (Fig. 5). Metasomal carapace black, with a pair of subbasal yellow lateral spots (Fig. 6).

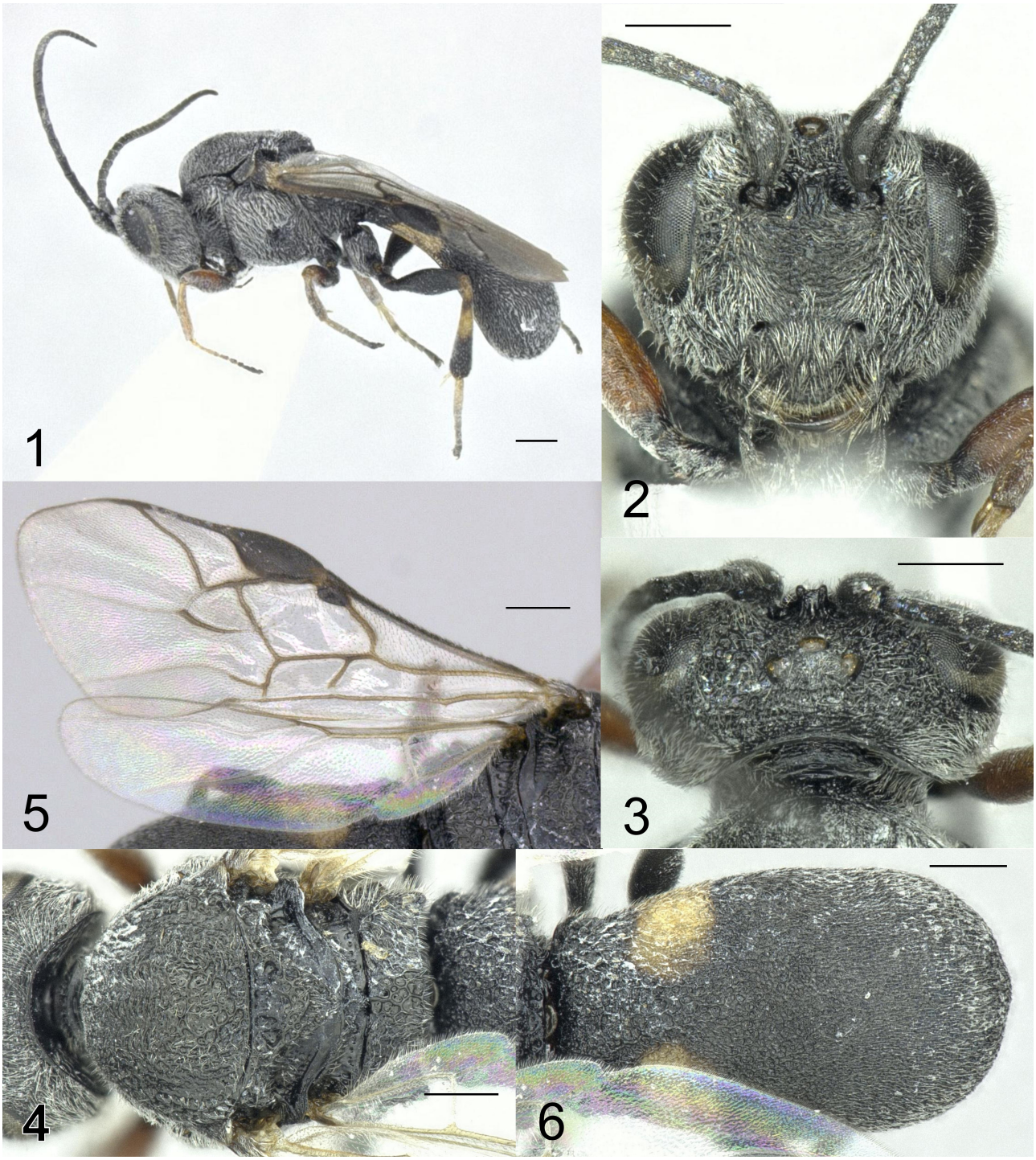
Distribution. China (Guangdong, Hainan Island, Zhejiang), India, Taiwan (Yu *et al*., 2016; Gupta *et al*., 2020), and Japan. Records from Barbados and Trinidad & Tobago (referred in Molina-Ochoa *et al*., 2003) will need reconfirmation. New to Japan.

Distribution within Japan. Nansei Islands: Amami-ôshima Is., Kikai Is., Okinawa-hontô Is., and Ishigaki Is.

Hosts. *Spodoptera frugiperda* and *S. exempta* Walker (Noctuidae) in Japan. Other than *S. frugiperda* on sugar cane (Gupta *et al*., 2020), *Helicoverpa armigera* (Hübner), *M. loreyi*, *S. exigua* (Hübner), and *S. litura* have been known as hosts in Asia (Sonan, 1932; Yu *et al*., 2016). *Spodoptera exempta* is the first host record of this species.

Remarks. In Japan, this species resembles *Chelonus moriokensis* Watanabe, 1937 in having the strongly and coarsely reticulate-rugose face, the antennae shorter than the body, and the black hind femur (Watanabe, 1937), but can be distinguished from it by the bidentate frontal spine (no frontal spine in *C. moriokensis*), the female antennae with 24 or more segments (with 21 segments in *C. moriokensis*), and the only slightly curved vein SR1 of fore wing (distinctly curved in *C. moriokensis*).

This species is close to *C. insularis* Cresson, 1865 having



Figs. 1–6. *Chelonus formosanus* Sonan, female, from Okinawa-hontô Is., Japan. — 1, Habitus, lateral view; 2, head, frontal view; 3, head, dorsal view; 4, mesosoma, dorsal view; 5, fore and hind wings; 6, metasoma, dorsal view. Scale bars: 0.5 mm.

the bidental frontal horn, which is a common parasitoid of *S. frugiperda* in the Americas (Molina-Ochoa *et al*., 2003), but differs from it by the black or dark brown hind femur (yellow in *C. insularis*) (Gupta *et al*., 2020). Also, Shen *et al*. (2023) has recently revealed close similarities between *C. formosanus* and *C. bifoveolatus* Szépligeti, 1914 attacking *Spodoptera* spp. in Africa, both of which have the bidentate frontal horn and black hind femur in common and very similar mtCOI DNA sequences. Further studies are necessary to solve taxonomic problems of the species complex, including *C. bifoveolatus*, *C. formosanus* and *C. insularis*.

Adult wasps and parasitized host larvae were collected only in October or early January in Nansei Islands, while they were collected throughout the year in Taiwan (Sonan, 1932; Watanabe, 1934, 1937). Wintering ability and life cycles of this species in Japan should be investigated.

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