

New Records of the Two Genera of Parasitoid Wasps (Hymenoptera: Ichneumonoidea) from South Korea

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한국산 미기록 기생벌 2속(벌목: 맵시벌상과)에 대한 보고

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ABSTRACT: Two genera with two species of the superfamily Ichneumonoidea, *Testudobracon pleuralis* Ashmead 1906 and *Diadromus subtilicornis* Gravenhorst 1829, are reported for the first time from South Korea. Diagnosis, distribution, and illustration are provided.

Key words: Braconidae, Ichneumonidae, Natural enemy, New genus, Unrecorded species

초 록: 맵시벌상과에 속하는 *Testudobracon pleuralis* Ashmead, 1906, *Diadromus subtilicornis* Gravenhorst 1829 2속 및 2종을 한국에서 처음으로 보고한다. 본 종의 형태진단, 분포, 삽화를 수록한다.

검색어: 고치벌과, 맵시벌과, 천적, 한국 미기록속, 미기록종

The superfamily Ichneumonoidea is one of the largest groups in the world, containing 44,350 species in 2,650 genera (Yu et al., 2016, Kittel, 2016, Broad et al., 2018), which is subdivided into two families, Braconidae and Ichneumonidae (Wharton et al., 1997). The two families, Braconidae and Ichneumonidae, are renowned as having plenty of parasitoid wasp species parasitizing into almost insects and some spiders, which are characterized by endoparasitism, ectoparasitism, hyperparasitism and superparasitism. Because there are many species attacking the agricultural pests, these two families traditionally have been used for biological control (Townes, 1958, Wharton et al., 1997,

Abd-Rabou, 2006).

The genus *Testudobracon* Quicke, 1986 belonging to the family Braconidae is recorded in South Korea for the first time. There are 16 *Testudobracon* species that have been reported worldwide and are mainly distributed in the Australian, East Palearctic, and Oriental regions. The species belonging to *Testudobracon* are parasitic on the cecidomyiid dipterans (Quicke, 1986, Yu et al., 2016, Sheeba et al., 2017) and *Asphondylia*, in which *Testudobracon* is parasitic, can be a biological controls that prevents the indiscriminate spread of Australian acacias (Kolesik et al., 2010, Sheeba et al., 2017). Thus, the presence of natural enemies increases the possibility of use as a safe control product. In this study, *Testudobracon pleuralis* is reported for the first time from South Korea, which has formerly been documented in China and Japan (Yu et al., 2016). The genus

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Received July 6 2020; Revised September 28 2020

Accepted October 9 2020

Diadromus Wesmael, 1845 belonging to the family Ichneumonidae has been recorded 80 species worldwide. The distribution of *Diadromus* has a wide range of Afrotropical, Australasian, Eastern Palearctic, Europe, Nearctic, Neotropical, Oceanic, Oriental, and Western Palearctic regions. *Diadromus* species are parasitic on the lepidopterans mainly in Tortricidae and Acrolepiidae. In particular, they are parasitic to diamondback moths, which cause serious damage to cruciferous crops, and are now used as biological controls (Tran and Takasu, 2000). *Diadromus subtilicornis* Gravenhorst 1829 is firstly discovered in South Korea through this study. This species is distributed in Eastern Palearctic, Europe, Nearctic and Western Palearctic regions, and also has been recorded in Japan (Yu et al., 2016).

Materials and Methods

Materials of the ichneumonoids were collected by sweeping and Malaise trap, which were preserved in 90% ethyl alcohol for DNA and in 75% ethyl alcohol for dried specimens. The species studied are deposited in Kunsan National University (KNU). The terminology used for morphological characters follows Sharkey and Wharton (1997). For observation and photography, LEICA DMC2900 digital camera and LEICA M205 C microscope (Leica Geosystems AG) were used. Images were stacked by using Helicon software (Helicon Soft).

Systematic Accounts

Superfamily Ichneumonoidea Latreille, 1802 뱀시벌상과

Family Braconidae Nees, 1811 고치벌과

Subfamily Braconinae Nees, 1811 고치벌아과

Genus *Testudobracon* Quicke, 1986 흑파리살이고치벌속 (신칭)

Testudobracon Quicke 1986: 25–27; Quicke 1987: 133.

Generic Diagnosis

The diagnosis for this genus was described by Sheeba et al (2017) as follows. Head transverse; face with a distinct mid longitudinal ridge dorsally; frons with a mid-longitudinal groove. Middle lobe of mesoscutum with a pair of submedial longitudinal grooves anteriorly. Notauli deeply impressed along entire length

of mesoscutum. Propodeum with a complete mid longitudinal carina. Second submarginal cell of fore wing short and narrowing distally. Second metasomal tergite produced antero-ventrally and with a small area of reduced sculpture midbasally. Third to sixth metasomal tergites roundly produced posterolaterally. Sixth metasomal tergite deeply emarginated medially. Ovipositor with a pre-apical dorsal nodus and ventral serrations (Sheeba et al., 2017).

***Testudobracon pleuralis* Ashmead, 1906 끝검은다리고치벌 (신칭) (Fig. 1)**

Chelonogastra pleuralis Ashmead, 1906 30:169-201.

Diagnosis

Morphology. Length of body 3.14-3.43 mm, length of forewing 3.13-3.45 mm (Fig. 1A). Head with antenna 25 segmented; covered with whitish setae (Fig. 1B), ocellus distinct; length of ocello-ocular line 0.59-0.60 times length of eye, frons and face smooth, mandible slender and dark brown, occipital carina absent (Fig. 1D). Mesosoma gloss; brown; length of mesosoma 0.35-0.36 times length of forewing, notaulus complete with setae, propodium areola absent and propodium edge with spine (Fig. 1E). Wing covered with whitish setae, parastigma groove, stigma widely with leaf shape, vein 1-SR short; r-m incompletely present; CUIa completely present, hind wing vein 2-M distinct present (Fig. 1C). Hind leg speckled; brownish, length of hind leg femur 0.76-0.77 times length of hind leg tibia, telotarsus darkish. Metasoma brownish; dorsal and lateral darkish speckled, length of metasoma 1.33-1.34 times length of mesosoma, dorsal carina distinct, ovipositor sharp with reddish brown and long, ovipositor sheath overall covered with yellowish setae (Fig. 1F).

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

Biology. This species is parasitic to *Asphondylia* of Diptera and *Etiella* of Lepidoptera (Yu et al., 2016).

Specimens examined. South Korea, 2 ♀ (KSNU): Kunsan National University, Miryongdong, Gunsan, Jeonbuk, 27. IX. 2014, Hyojoong Kim.

Family Ichneumonidae Latreille, 1802 뱀시벌과

Subfamily Ichneumoninae Latreille, 1802 뱀시벌아과

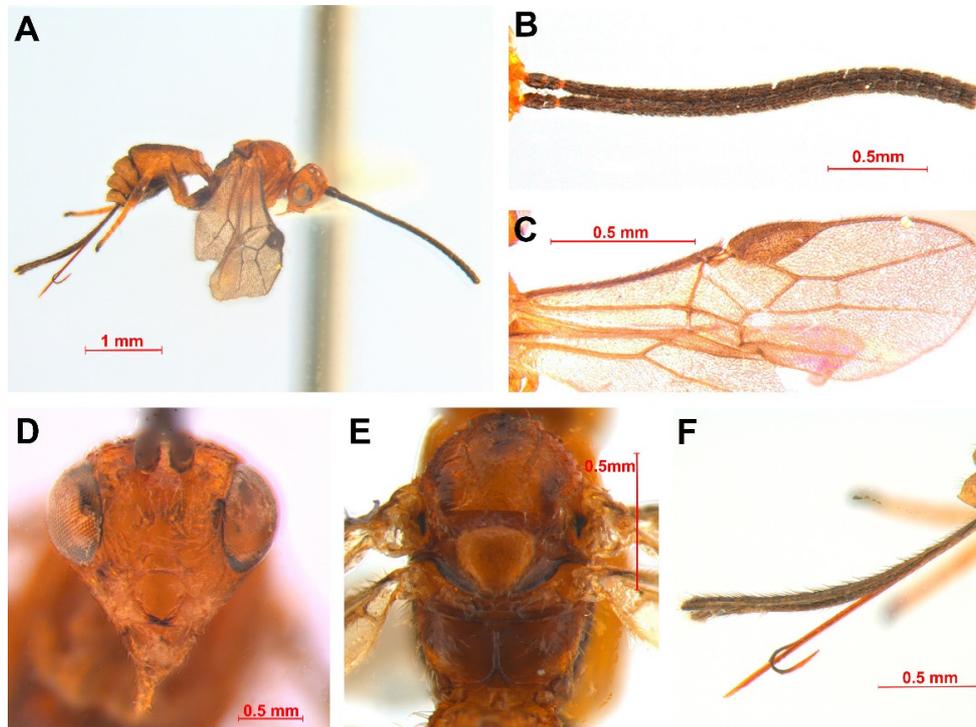


Fig. 1. Habitus of *Testudobracon pleuralis* Ashmead, 1906: A, whole body in lateral view; B, antenna; C, forewing; D, head; E, mesosoma in dorsal view; F, ovipositor.

Genus *Diadromus* Wesmael, 1845 좀나방살이맴시벌속(신칭)
Thyraeella Holmgren, 1890 3(1889):341-466.

Generic Diagnosis

The diagnosis for this genus was described by Rouse and Simon van Noort (2013) as follows. Head with mandible bidentate, triangular and evenly narrowed towards apex, with a weak ventral flange, upper tooth twice as long as lower tooth; face transverse, wider than high; clypeus distinctly transverse, lenticular, hardly separated from face medially, its ventral margin somewhat impressed; occipital carina complete; occipital and hypostomal carinae joining at mandibular base; flagellum of female moderately enlarged and flattened beyond middle, flagellum of male without tyloids; epomia present and strong. Mesoscutum steeply elevated above pronotum; postpectal carina complete and strong; propodeum moderately short, basal half about horizontal and apical half sloping down in lateral view; carination complete and strong, spiracle quite round; fore wing with areolet pentagonal, closed, 3Rs-m non-tubular and faintly pigmented; hind wing with distal abscissa of Cu1 faint; gastrocoeli

large and moderately deep; tarsal claws simple; thyridiae moderately weak but distinct, transverse and wide with interval narrow, distant from anterior margin by more than their width; hypopygium hiding base of ovipositor sheath; ovipositor very shortly projecting beyond metasomal apex (Rouse and Simon van Noort, 2013).

***Diadromus subtilicornis* Gravenhorst, 1829 얼굴주름맴시벌(신칭) (Fig. 2)**

- Diadromus arcticus* Thomson, 1891 1603-1656.
- Diadromus dolosus* Berthoumieu, 1899 135-138.
- Diadromus imbellis* Wesmael, 1845 18(1944):1-239.
- Diadromus ustulatus* Holmgren, 1890 3(1889):341-466.
- Herpestomus plutellæ* Ashmead, 1890 12:387-451.
- Phaeogenes nigrinus* Berthoumieu, 1901 320-323.
- Phaeogenes japonicus* Ashmead, 1906 30:169-201.

Diagnosis

Morphology. Length of body 4.85 mm, length of forewing 2.71 mm (Fig. 2A). Head Black; antenna 22 segmented; covered

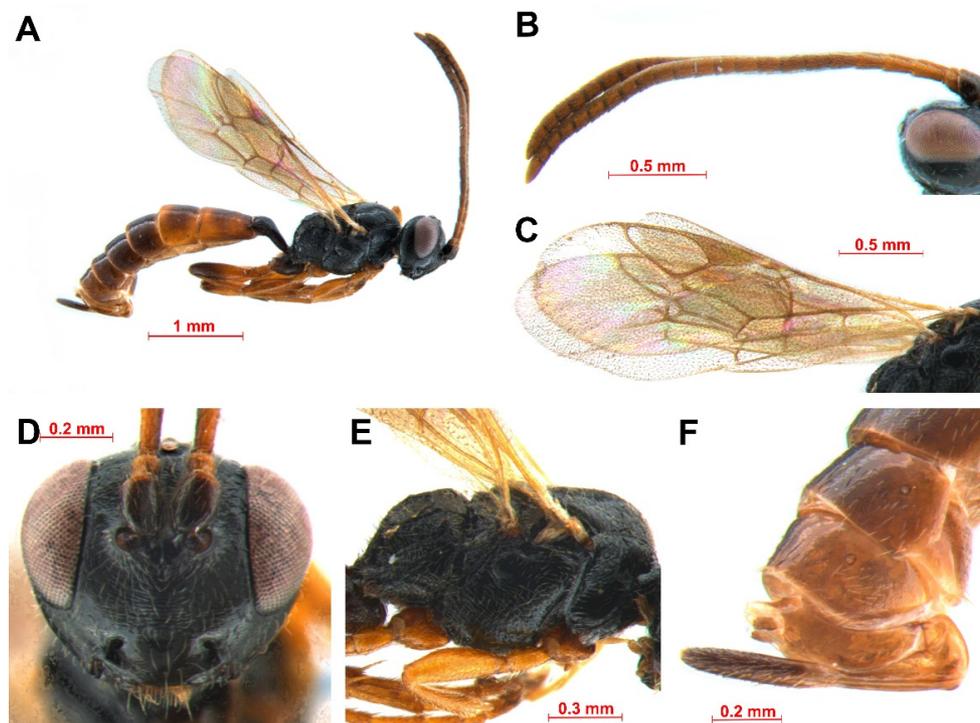


Fig. 2. Habitus of *Diadromus subtilicornis* Gravenhorst, 1829: A, whole body in lateral view; B, antenna; C, forewing; D, head; E, mesosoma in lateral view; F, ovipositor.

with yellowish setae (Fig. 2B), ocellus distinct; length of ocellular line 0.43 times length of eye, face smooth with wrinkle, malar suture nearly absent, gena concave, anterior tentorial pit large and distinct, occipital carina complete (Fig. 2D). Mesosoma black; length of mesosoma 0.42 times length of forewing, notaulus exist, epicnemial carina and postpectal carina distinct, propodium areola absent with wrinkle (Fig. 2E). Wing yellowish; overall covered with yellowish setae, third submarginal cell and third discal cell incomplete with indistinct 2M, vein rs-m indistinct (Fig. 2C). Hind leg brownish; femur and tibia half black; length of hind leg femur 0.83 times length of hind leg tibia. Metasoma brownish; petiole harden with black, length of metasoma 2.28 times length of mesosoma, metasomal tergum mottle, ovipositor blunt and upward with dark-brown (Fig. 2F).

Distribution. South Korea (new), China, Japan, France, Hungary, Italy, Germany.

Biology. This species is parasitic to lepidopterans in Acrolepiidae and Plutellidae (Yu et al., 2016).

Specimens examined. South Korea, 1 ♀ (KSNU): Kunsan National University, Miryongdong, Gunsan, Jeonbuk, 27. IX.

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Acknowledgments

This research was supported by a grant from the Korea Environment Industry & Technology Institute (KEITI) through Exotic Invasive Species Management Program (2018002270005) and a grant from the National Institute of Biological Resources (NIBR201601203), funded by Korea Ministry of Environment (MOE). It was also supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2018R1D1A3B0 7044298).

Statements for Authorship Position & contribution

Yu, Y.: Kunsan National University, Student in Ph.D.; Designed the research, wrote the manuscript and conducted the experiments

Choi, S.: Chungnam National University, Student in Ph.D.;

Collected and examined specimens
Shon, J: Kunsan National University, Student in Ph.D;
Collected and examined specimens
Han, H.-W.: Wonkwang University, Researcher, Ph.D; Wrote
and corrected the manuscript
Kim, H.: Kunsan National University, Professor, Ph.D;
Examined specimens and designed the research
All authors read and approved the manuscript.

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