

A New Record of Aphid Parasitoid Wasp *Ephedrus lacertosus* (Hymenoptera: Braconidae: Aphidiinae) from South Korea

Sangjin Kim¹, Yeongmo Kim¹, Hyojoong Kim^{1,*}

¹Animal Systematics Lab., Department of Biological Science, Kunsan National University, Gunsan 54150, Korea

ABSTRACT

The genus *Ephedrus* Haliday, 1833 is a large taxon of Aphidiinae, consisting of 48 valid species in the world. This genus is considered to be important as a biological control agency, which includes solitary koinobiont parasitoids on aphids. One of its interesting characteristics is both male and female have 11-segmented antennae. In previous study, this genus was subdivided into three subgenus, *Breviephedrus*, *Ephedrus* and *Fovephedrus*, based on molecular and morphological characters. In this study, one *Ephedrus* species is firstly recorded from South Korea. Since it has been collected from Geumsan-gun in 2005 and deposited as dried specimen at Naturalis Biodiversity Center in Netherland, we recently confirmed it. Description and illustrations of the *E. lacertosus* are provided.

Keywords: Ichneumonoidea, morphology, unrecorded species

INTRODUCTION

The genus *Ephedrus* Haliday, 1833 is one of the large genera in subfamily Aphidiinae with 48 species worldwide (Petrović et al., 2016; Yu et al., 2016; Tomanović et al., 2020) and five species in South Korea (National Institute of Biological Resources, 2021). Although the genera *Aphidius* and *Ephedrus* share the biological feature as solitary koinobiont on aphids, coloration of their mummy is different, normally shiny brown and black, respectively (Starý and Schlinger, 1967; Mackauer and Chow, 2012; Tomanović et al., 2020).

Interestingly, this genus is characterized by having 11-segmented antenna in both sexes. In addition, based on forewing venation, it is normally considered to be basal within Aphidiinae phylogeny (Belshaw and Quicke, 1997; Sanchis et al., 2000; Derocles et al., 2012) but is still uncertain.

In previous studies, *Ephedrus* was subdivided into the three subgenera, *Breviephedrus*, *Lysephedrus*, and *Ephedrus* (Gärdenfors, 1986). However, in recent study, subgenus *Lysephedrus* Starý, 1958 was synonymised as a junior synonym of the subgenus *Ephedrus* Haliday, 1833 and *persicae* species group was raised to the new subgenus *Fovephedrus* Chen, 1986 on the basis of molecular and morphological characters (Kocić et al., 2019).

In this study, *Ephedrus lacertosus* is newly recorded in South Korea, with provision of illustrations, description and diagnosis.

MATERIALS AND METHODS

Sample was collected from Gangwon-do in 2003 by Malaise trap and is deposited in Naturalis Biodiversity Center (Leiden, Netherland) as dried specimen.

Specimen morphological identification was based on Starý (1976), Gärdenfors (1986), Tobias (1995), Chen and Shi (2001), and Tomanović et al. (2009). External structure is studied and measurements taken with a LEICA M205 C phase-contrast microscope and a LEICA DMC 2900 camera (Germany). Stacking photos used by Helicon Focus 7 software (Helicon Soft, Ukraine). Morphological terminology used in this paper regarding diagnostic characters is based on that of Gärdenfors (1986).

SYSTEMATIC ACCOUNTS

Order Hymenoptera Linnaeus, 1758
Family Braconidae Nees von Esenbeck, 1811

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***To whom correspondence should be addressed**
Tel: 82-63-469-4586, Fax: 82-63-469-7421
E-mail: hkim@kunsan.ac.kr

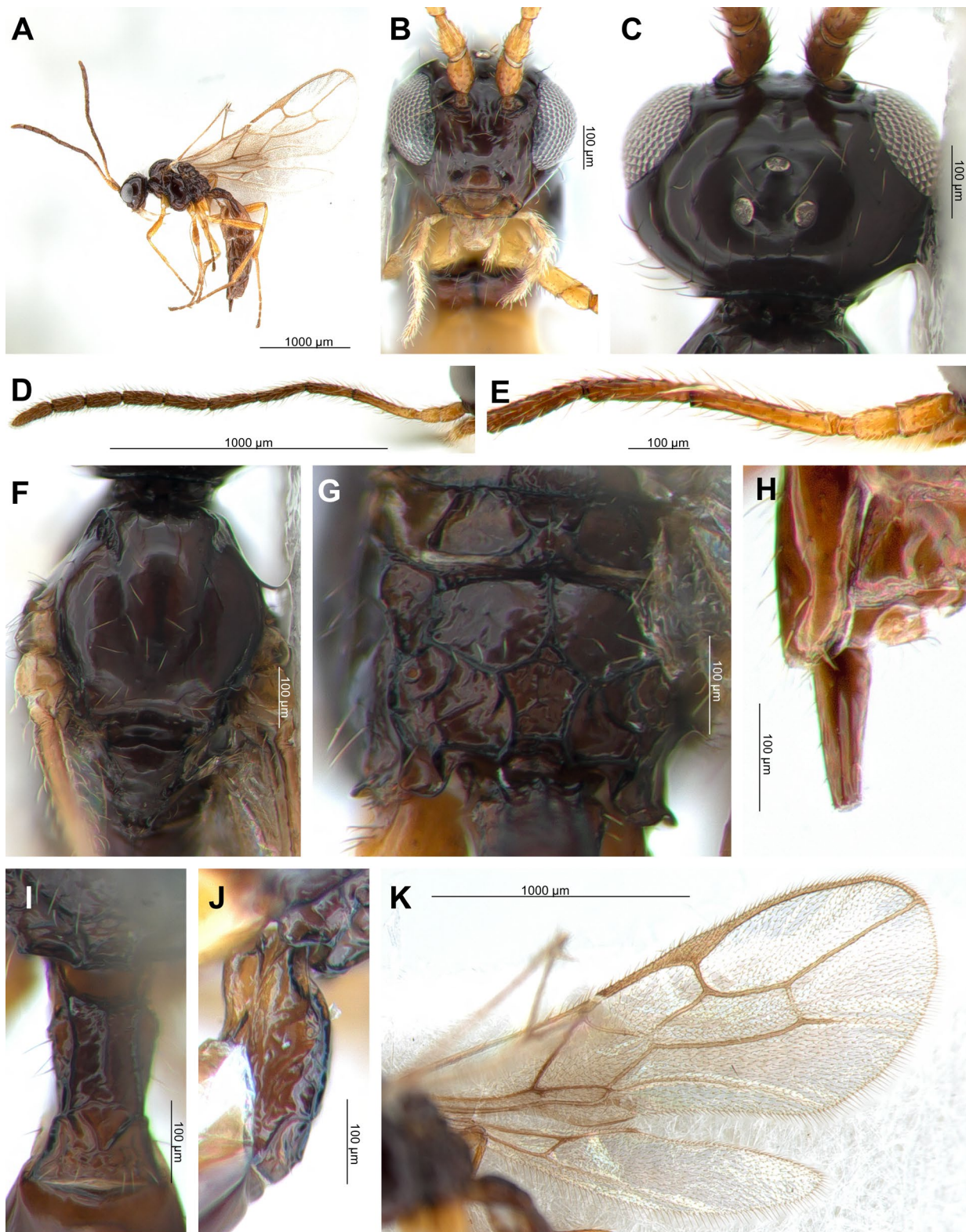


Fig. 1. *Ephedrus lacertosus* Haliday 1833, female. A, Habitus; B, Face; C, Dorsal view of head; D, Antennae; E, Flagellomere F1-F2; F, Mesoscutum; G, Propodeum; H, Ovipositor; I, Dorsal view of petiole; J, Lateral view of petiole; K, Forewing. Scale bars: A, D, K=1 mm, B, C, E-J=100 µm.

Subfamily Aphidiinae Haliday, 1833

¹*Geuns *Ephedrus* Haliday, 1833

Subgenus *Ephedrus* Haliday, 1833: 264–485.

Lysephedrus Starý, 1958: 53–96.

²**Ephedrus lacertosus* (Fig. 1A–K)

Ephedrus lacertosus Haliday, 1833: 486–487.

Ephedrus muesebecki Smith, 1944: 20, 21.

Etymology of Korean name. This species has very long flagellomere 1 (F₁).

Material examined. Korea: 1♀, Chungcheongnam-do, Geumsan-gun, Nami-myeon, Seokdong-ri, Pohyeonsa (36°3'N, 127°27'E), 1–8 Jun 2005, P. Tripotin (Malaise trap).

Description. Female (Fig. 1A): Length of body 2.63 mm (Fig. 1A). Length of forewing 2.18 mm (Fig. 1K).

Head (Fig. 1B, C). Transverse, rounded, bearing sparse setae. Tentorial index (tentoriocular line/intertentorial line) 0.65. Malar space equal to 0.37 of longitudinal eye diameter. Maxillary palpi with four palpomeres, labial palpi with two palpomeres. Antenna 11-segmented (Fig. 1D). Flagellomere 1 (F₁) (Fig. 1E) clearly longer than F₂ (F₁/F₂ length 1.47) and 6.25 times as long as its maximum width at the base. F₁ and F₂ with no longitudinal placodes (Fig. 1E).

Mesosoma. Mesoscutum smooth, rounded. Notaulices distinct in very short ascendent portion of anterolateral margin, with two rows of long setae along the dorsolateral part of mesoscutum (Fig. 1F). Scutellar sulcus present, not divided. Propodeum (Fig. 1G) areolated with large central areola. Forewing (Fig. 1K) densely pubescent, with long marginal setae. Pterostigma elongated, 5.95 times as long as its width (Fig. 1G). Forewing 2RS vein subequal with 3RSa vein (2RS/3RSa = 0.92).

Metasoma. Petiole (Fig. 1I) slender, 2.29 times its width at the base of spiracles, with 4 long setae along each side. Central and lateral longitudinal carina is prominent (Fig. 1I, K). Ovipositor sheath elongated, 2.90 times as long as wide (Fig. 1H).

Coloration. General body color dark brown to yellow. Scape, pedicel and one-third of F₁ from base is yellow, remaining antennal parts brown. Mouthparts brown. Head dark brown. Mesoscutum, propodeum, petiole, other metasomal terga light brown dark brown. Legs yellow with brown apices. Ovipositor sheath yellow.

Diagnosis. This species is morphologically similar to *E. longistigmus* and *E. trichosiphoniellae* in having slender pterostigma and long with filiform antennae. However, it

clearly differs from *E. longistigmus* in length of 2RS and 3RS (the 2RS vein subequal or shorter than 3RS vein in *E. lacertosus*, while the 2RS vein clearly longer than 3RS vein in *E. longistigmus*). It differs from *E. trichosiphoniellae* in flagellomere 1 (F₁) length and ratio of F₁ and F₂ (F₁ length is 6 times as long as its maximum width at the base and ratio of F₁ and F₂ is 1.5 in *E. lacertosus*, while the F₁ length is 4 times as long as its maximum width at the base and ratio of F₁ and F₂ is 1.2 in *E. trichosiphoniellae*).

Biology. *Acyrtosiphon malvae* [*Geranium* sp., *G. caeruleatum*], *A. pisum* [*Trifolium pratense*], *Amphorophora idaei* [*Rubus idaeus*], *A. rubi* [*Rubus idaeus*], *Aphis fabae*, *A. oxycanthae*, *A. pomi*, *A. rumicis*, *Aspidophorodon* sp. [*Lupinus* sp.], *Aulacorthum* sp. [*Vaccinium myrtillus*], *A. majanthemi* [*Maianthemum bifolium*], *Brachysiphoniella montana* [*Panicum paludosum*], *Cinara juniperi* [*Juniperus communis*], *C. mordvilkoii* [*Juniperus communis*], *Cryptomyzus ribis*, *Dysaphis crataegi*, *D. plantaginea*, *D. pyri*, *Ericaphis gentneri* [*Spiraea densiflora*], *Hyalopteroides humilis* [*Dactylis glomerata*], *Hyalopterus pruni*, *Illinoia maxima*, *Impatiens balsamines* [*Impatiens noli-tangere*], *Macromyzus woodwardiae* [*Woodwardia* sp.], *Macrosiphoniella absinthii* [*Artemisia argy*], *M. usquertensis* [*Achillea millefolium*], *Macrosiphum* sp. [*Oplopanax horridus*], *M. agrimoniella*, *M. albifrons* [*Lupinus* sp.], *M. cholodkovskiyi* [*Filipendula ulmaria*], *M. euphorbiae* [*Cynoglossum grande*], *M. funestum* [*Rubus* sp.], *M. gei* [*Geum urbanum*], *M. lisae* [*Epilobium angustifolium*], *M. polanense* [*Cicerbita alpina*], *M. rosae* [*Rosa canina*, *R. multiflora*], *Metopolophium* sp. [*Lupinus* sp.], *Microlophium carnosum* [*Urtica dioica*, *U. urens*], *Myzus cerasi* [*Galium aparine*, *Prunus pseudocerasus*], *Rhopalosiphoninus* sp. [*Oxalis acetosella*], *Rhopalosiphum padi* [*Padus avium*], *Sitobion* sp. [*Dicentra formosa*], *S. avenae* [*Triticum aestivum*], *S. equiseti* [*Equisetum sylvaticum*], *S. miscanthi*, *Takecallis affinis*, *Tetraneura ulmi*, *Uroleucon gravicorne*, *U. jaceae* [*Centaurea micranthos*], *U. minatii* [*Delphinium* sp.].

ORCID

Sangjin Kim: <https://orcid.org/0000-0001-8395-8019>

Yeongmo Kim: <https://orcid.org/0000-0001-6895-9873>

Hyojoong Kim: <https://orcid.org/0000-0002-1706-2991>

CONFLICTS OF INTEREST

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

Korean name: ¹*검정진디고치벌 (신칭), ²*긴마디검정진디벌 (신칭)

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