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Short communication

Three Seed Beetles (Coleoptera: Chrysomelidae: Bruchinae) New to South Korea, with DNA Barcoding Data

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ABSTRACT

Three species of seed beetles, *Acanthoscelides pallidipennis* (Motschulsky, 1874), *Bruchidius terrenus* (Sharp, 1886), and *Kytorhinus senilis* Solsky, 1869, from South Korea are reported for the first time. These three species can be morphologically distinguished from other Korean bruchid species by the distinctive color pattern of the elytra, presence of subapical spines on hind femur, and exposed last three tergites of abdomen, respectively. In this study, partial sequences of mitochondrial cytochrome c oxidase subunit I from Korean specimens of these species were generated. In addition, host plants, distribution maps, and photographs of the dorsal habitus and live specimens of each species are also included.

Keywords: *Acanthoscelides*, *Bruchidius*, *Kytorhinus*, new record, morphology, molecular analysis

INTRODUCTION

The subfamily Bruchinae, commonly known as seed beetles or bean weevils, is the only group within the family Chrysomelidae in which the species develop inside bean seeds. Approximately 1,650 valid species in 70 recognized genera from most parts of the world, with the highest species diversity in the dry subtropics (Morse, 2014), have been reported to date. Several species are economically significant pests of stored leguminous seeds and are cosmopolitan because of the international seed trade (Kingsolver, 2004).

Notably, eight genera and 21 species of the subfamily Bruchinae, including four introduced species, have been recorded from the Korean Peninsula (Cho and An, 2020). Unrecorded species of Bruchinae, including *Acanthoscelides pallidipennis* (Motschulsky, 1874), *Bruchidius terrenus* (Sharp, 1886), and *Kytorhinus senilis* Solsky, 1869, are found to be new to South Korea while examining specimens of beetles collected from several areas in South Korea.

DNA barcoding was performed to identify Korean species of seed beetles. Genomic DNA was extracted from leg tissues using the DNeasy Blood and Tissue Kit (QIAGEN, Germany). The PCR conditions and primers for the mitochondrial cytochrome c oxidase subunit I (*COI*) gene were as described by Folmer et al. (1994). Sequence divergence (*p*-distances) between species was calculated using MEGAX software (ver. 11.0.11.) (Kumar et al., 2018).

Photographs of live samples were captured using a Nikon D500 or Olympus Stylus TG-4 Tough digital camera (Japan), whereas those of mounted specimens were captured using a Nikon D750 digital camera attached to a Leica S8APO microscope. Images were stacked using Helicon Focus image stacking software and edited using Adobe Photoshop CC 2020. Scientific data for distribution maps were obtained from the online community of naturalists, Gonchungnara-Sikmoolnara (https://cafe.naver.com/lovessym) in South Korea. The examined specimens were deposited in the entomological collection of the National Institute of Agricultural Science, Jeonju, South Korea (NIAS) and the private collection of H.-W. Cho, Yecheon, South Korea (HCC).

RESULTS

Order Coleoptera Linnaeus, 1758
Family Chrysomelidae Latreille, 1802

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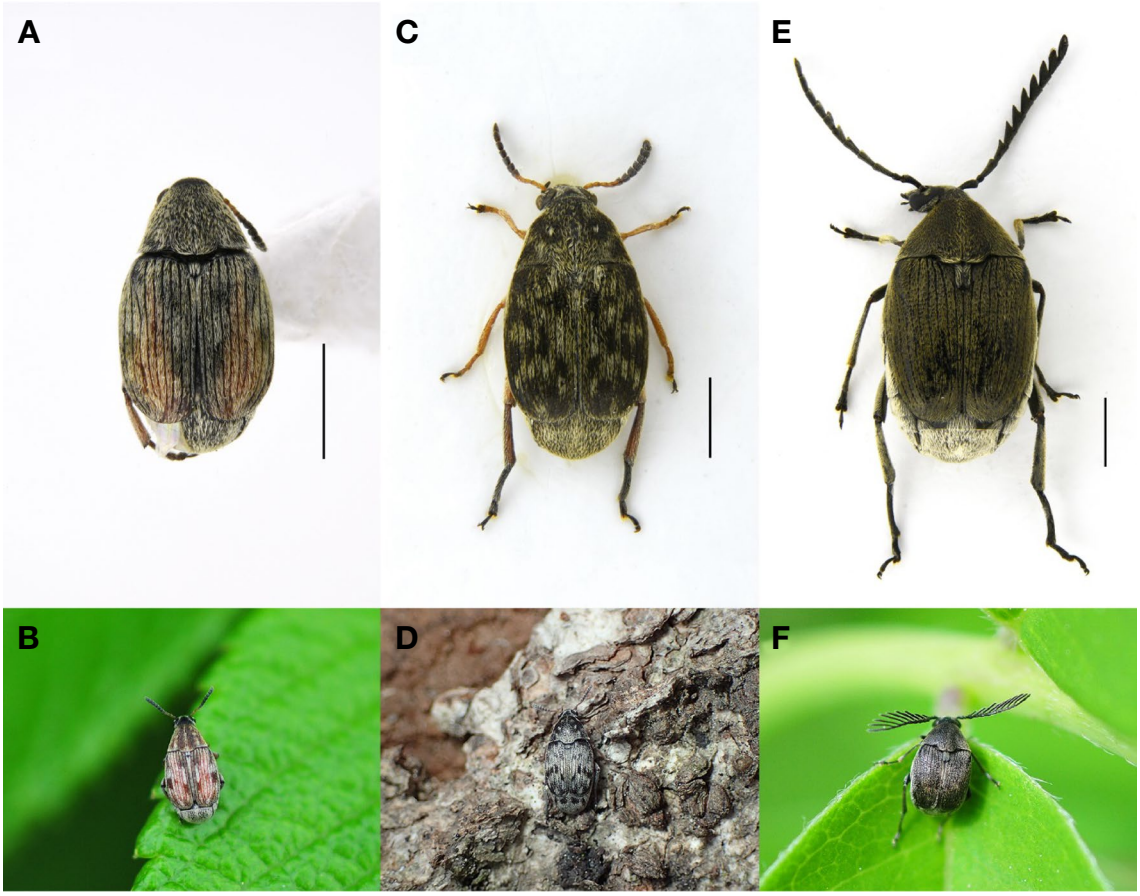

Fig. 1. Dorsal habitat and live sample of seed beetles in South Korea. A, B, *Acanthoscelides pallidipennis*; C, D, *Bruchidius terrenus*; E, F, *Kytorhinus senilis*. Scale bars: A, C, E = 1.0 mm.

Subfamily Bruchinae Latreille, 1802
Tribe Bruchini Latreille, 1802
Genus *Acanthoscelides* Schilsky, 1905

***Acanthoscelides pallidipennis* (Motschulsky, 1874) (Figs. 1A, B, 2A)**

Bruchus pallidipennis Motschulsky, 1874: 210.
Acanthoscelides pallidipennis: Kingsolver, 1979: 341.

Material examined. South Korea: 5 exx., Gyeonggi-do: Siheung-si, Jeongwang-dong, 30 Jul 2003, Sohn JC (NIAS); 4 exx., Yangpyeong-gun, Yangseo-myeon, Yangsu-ri, Dumulmeori, 20 May 2009, Han TM (NIAS); 14 exx., Gangwon-do: Goseong-gun, Jugwang-myeon, Oho-ri, Songji Lake, 3 Jun 2023, Cho HW (HCC).

Diagnosis. Body length 1.1–2.7 mm and oval-shaped (Fig. 1A). Head and pronotum black (Fig. 1B). Elytra black, often pigmented reddish-brown in variable patterns. Integument covered with white hairs. Antennae short. Frons with sharp median carina. Pronotum conical to subcampanulate. This species differs from other Korean Bruchinae species based on the presence of subapical spines in the external and internal carina of the hind femur.

Host plant. Fabaceae: *Amorpha fruticosa* L.

Distribution. Native to North America. Introduced into the Palaearctic region with its host plant (Armenia, Austria, Azerbaijan, Bulgaria, China, Croatia, the Czech Republic, France, Germany, Greece, Hungary, Italy, Japan, Macedonia, North Korea, Russia, Slovakia, Switzerland, Serbia, Montenegro, Tajikistan, and new to South Korea) (Fig. 2A).

Genus *Bruchidius* Schilsky, 1905

[1]***Bruchidius terrenus* (Sharp, 1886) (Figs. 1C, D, 2B)**

Bruchus terrenus Sharp, 1886: 35.
Bruchidius terrenus: Chûjô, 1937: 194.

Korean name: [1]*자귀나무콩바구미 (신칭)

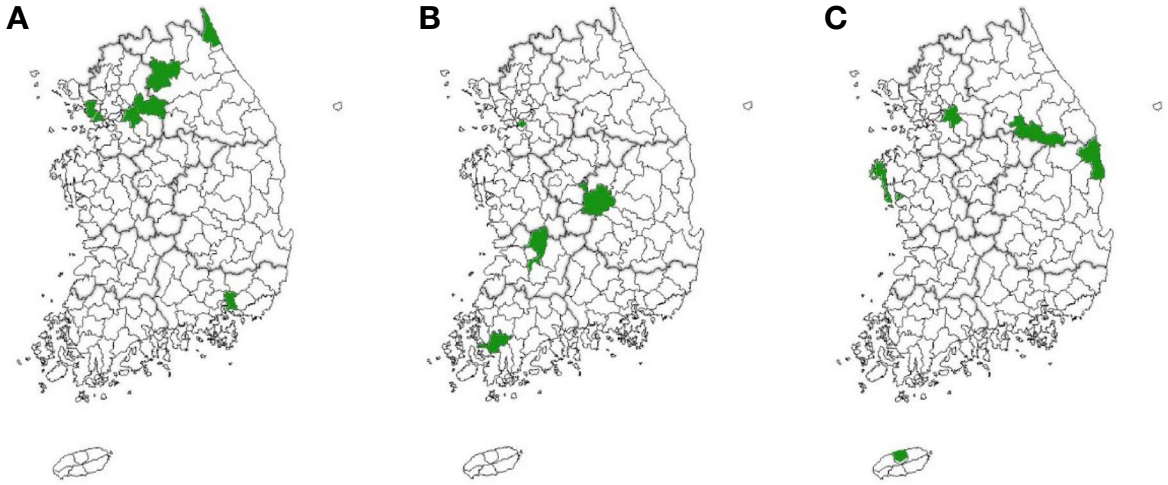

Fig. 2. Distribution map of seed beetles in South Korea. A, *Acanthoscelides pallidipennis*; B, *Bruchidius terrenus*; C, *Kytorhinus senilis*.

Table 1. Mean sequence divergence (*p*-distance) among nine bruchid species calculated using the MEGAX software

Species	1	2	3	4	5	6	7	8	9	Accession No.
1. *Acanthoscelides pallidipennis*	–									OR515235
2. *Acanthoscelides pallidipennis*	0.012	–								OR515236
3. *Bruchidius terrenus*	0.168	0.168	–							OR515237
4. *Kytorhinus senilis*	0.189	0.186	0.177	–						OR515238
5. *Bruchus rufimanus*	0.770	0.763	0.740	0.726	–					AY997313
6. *Bruchus brachialis*	0.768	0.761	0.740	0.720	0.144	–				MH020270
7. *Bruchus pisorum*	0.763	0.756	0.731	0.715	0.114	0.136	–			NC_080283
8. *Bruchus affinis*	0.779	0.772	0.743	0.731	0.093	0.143	0.126	–		MH020263
9. *Callosobruchus chinenensis*	0.740	0.738	0.708	0.681	0.188	0.218	0.186	0.200	–	AY625416

Material examined. South Korea: 13 exx., Gyeongsangbuk-do: Sangju-si, Naeseo-myeon, Seoman-ri, 28 Feb 2020, Cho HW (HCC); 10 exx., *ditto*, 12 Mar 2020 (HCC); 1 ex., Jeollanam-do: Yeongam-gun, Yeongam-eup, Gaesin-ri, Mt. Wolchulsan, 9 May 2001, Kim MA (NIAS).

Diagnosis. Body length 2.4–4.1 mm and oval-shaped (Fig. 1C). Body black with antennae and legs reddish-brown to black (Fig. 1D). Integument covered with white or dark brown hairs, forming patterns of light and dark spots on elytra. Antennae short, not reaching pronotal base. Pronotum without lateral carina. This species differs from other Korean species of *Bruchidius* in its distinctive color pattern of elytra.

Host plant. Fabaceae: *Albizia julibrissin* Durraz.

Distribution. Native to the eastern Palaearctic region (China, Japan, and new to the Korean Peninsula) (Fig. 2B). Recently introduced into Europe and North America with its host plant (Bulgaria, Crimean Peninsula, France, Greece, Hungary, Italy, Serbia, Spain, Turkey, and the United States) (Martynov et al., 2018).

Tribe Kytorhinini Bridwell, 1932

Genus *Kytorhinus* Fischer von Waldheim, 1809

***Kytorhinus senilis* Solsky, 1869 (Figs. 1E, F, 2C)**

Kytorhinus senilis Solsky, 1869: 310.

Material examined. South Korea: 10 exx., Gangwon-do: Yeongwol-gun, Buk-myeon, Mungok-ri, 18 Jun 2022, Cho HW (HCC); 1 ex., Gyeongsangbuk-do: Uljin-gun, Geunnam-myeon, Sugok-ri, 8 Jul 2022, Cho HW (HCC).

Diagnosis. Body length 3.5–4.5 mm, strongly convex and oval-shaped (Fig. 1E). Body entirely black, covered with white or brown hairs (Fig. 1F). Antennae pectinate in male and serrate in female. Pronotum campaniform without lateral carina. Scutellum elongate. Elytra with 10th stria abbreviated. Hind femur slender without spines. This species differs from other Korean species of Bruchinae in the structure of its abdomen, with the last three tergites not covered by elytra.

Host plant. Fabaceae: *Sophora flavescens* Ait.

Distribution. The eastern Palaearctic species (China, Japan, North Korea, the Russian Far East, and new to South Korea) (Fig. 2C).

DNA barcoding analysis. Partial *COI* gene sequences (435 bp) from three specimens (*A. pallidipennis*, *B. terrenus*, and *K. senilis*) were deposited in GenBank (accession nos. OR515235–OR515238). The average interspecific variation within the three Bruchinae genera ranged from 1.20% to 77.0% (Table 1). The range of variation among individuals of the genus *Acanthoscelides* is 1.20%. *Bruchidius*, *Kytorhinus* vs. *Acanthoscelides* showed 16.8%–18.9% variation. The interspecific variation within *Bruchus* ranged from 9.3% to 14.4%.

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CONFLICTS OF INTEREST

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

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