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Discovery of *Epicroesa chromatorhoea* Diakonoff & Arita, 1979 (Lepidoptera: Heliodinidae) from Korea

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The species diversity of microlepidoptera remains poorly understood. In particular, diurnal and weak phototactic species are difficult to collect because they are less likely to be attracted to light at night. Collecting and rearing microlepidopteran larvae is essential for accurately documenting their diversity. In this study, *Epicroesa chromatorhoea* Diakonoff & Arita, 1979, which was previously recorded only in Japan, was recorded in Korea based on adults reared from larvae collected from the leaves of *Kalopanax septemlobus* (Araliaceae). This represents the first record of Heliodinidae in Korea. Photographs of the adult moth and male and female genitalia are presented, and the DNA barcode sequences of the Korean and Japanese specimens are compared.

Keywords: Araliaceae, DNA barcode region, Gangwon-do, *Kalopanax septemlobus*, new record

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Introduction

The order Lepidoptera is a major component of terrestrial arthropod diversity, and its species contribute to the ecosystem by functioning as selective herbivores, pollinators, and prey for higher trophic levels (Summerville *et al*., 2004; Lopez-Vaamonde *et al*., 2019). Among these, microlepidoptera, a term commonly used for small moths, represent a major component of lepidopteran diversity (Kristensen *et al*., 2007). However, the species diversity of microlepidopterans remains poorly understood and is often underrepresented in biodiversity assessment studies (Lopez-Vaamonde *et al*., 2019). This is due to the difficulty in identifying them, the general lack of taxonomic expertise, and the need for specialized technical skills for mounting and dissecting specimens (Kristensen *et al*., 2007).

Light trapping is a widely used and effective method for sampling moths (Spalding and Parsons, 2004; Wölfling *et al*., 2016) because many lepidopteran species are nocturnal. However, light-trapping can be biased because moth species differ in their responsiveness to light and capture efficiency (Wölfling *et al*., 2016; Kawahara *et al*., 2018; Montgomery *et al*., 2021). Consequently, diurnal taxa and weak phototactic species appear to be underrepresented. For example, numerous species of Heliodinidae fly during the day; the adults visit flowers, and only a few species come to light, and their activity is often restricted to the immediate vicinity of larval host plants (Hsu and Powell, 2005). Field inventories have shown that some species

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have been documented for the first time via larval collections, despite intensive light-trap surveys (Bodner *et al*., 2010). Therefore, collecting larval stages from host plants and rearing adults is essential for revealing the overlooked microlepidopteran diversity.

The family Heliodinidae, a group of the small, elegant moths, comprises 13 genera and approximately 70 species, distributed mainly in the tropical regions of the New-World (Hsu and Powell, 2005; Nieukerken *et al*., 2011). In contrast, only two species have been recognized in the Palearctic region, *Heliodines roesella* (Linnaeus, 1758) and *Epicroesa chromatorhoea* Diakonoff & Arita, 1979.

The Old-World genus *Epicroesa* Meyrick, 1907, is distributed across Australia, the Palearctic region (Japan), the Oriental region (Taiwan), and the Afrotropical region (Seychelles Islands) (Hsu and Powell, 2005). Members of this genus have elegant forewings tinged with deep purple and variously mottled with metallic green, pink, silver, or orange, sometimes concentrated to form bands or markings, and often metallic orange with silver spots distally (Hsu and Powell, 2005). Most larvae feed on *Pisonia* (Nyctaginaceae), and only the larvae of *E. chromatorhoea* feed on *Kalopanax septemlobus* (Araliaceae) (Diakonoff and Arita, 1979; Floater, 1995; Hsu and Powell, 2005).

In May 2025, the larvae of *E. chromatorhoea* were collected from the leaves of *K. septemlobus* on Mount Chiak, Gangwon Province. This species was previously recorded only from Japan, and represents the first record from mainland Eurasia and the first record of Heliodinidae in Korea. In this study, the adult moth, and male and female genitalia are presented, and the DNA barcode sequences of Korean and Japanese specimens are compared.

Materials and Methods

Materials and observations

All specimens were obtained by rearing larvae on *K. septemlobus*. Korean specimens were deposited at the National Institute of Biological Resources, Environmental Research Complex (NIBR), and Japanese specimens were deposited at the Entomological Laboratory of Kyushu University (ELKU). The morphological characteristics were observed using a Leica S9D stereoscopic microscope (Leica, Wetzlar, Germany). The genitalia were dissected, stained with chlorazol black E and/or mercurochrome, and mounted in Euparal (Waldeck GmbH & Co. KG, Münster, Germany). The wings were stained with Double Stain (lignin pink, acid fuchsin, glacial acetic acid, lactic acid, and phenol) and mounted in Euparal.

DNA analysis

The specimens used for DNA analysis are listed in Table 1. Total DNA was extracted from the abdomen. For detailed DNA analysis methods, see Yagi *et al*. (2024). We amplified the fragment of the partial mitochondrial cytochrome c oxidase subunit I (COI-5P) gene using the primer sets LCO1490/HCO2198 (Folmer *et al*., 1994) and the KOD One® PCR Master Mix -Blue- (TOYOBO CO., LTD., Osaka, Japan), following manufacturer protocol, except for the annealing temperature, which was set to 50°C. For more degraded DNA, we used the internal primers mLepF1 (GCT TTCCCACGAATAAATAATA) and mLepR1 (CCTGTTC CAGCTCCATTTT) (Hajibabaei *et al*., 2006).

The DNA barcode sequences were deposited in GenBank using the BOLD Systems database under the accession numbers mentioned in Table 1. Intraspecific uncorrected pairwise distances (p-distances) were calculated using MEGA 7.0.26 (Kumar *et al*., 2016). Similar sequences were searched using the BOLD identification engine to identify similar species (https://www.boldsystems.org/index.php/IDS_OpenIdEngine).

Results

Genus *Epicroesa* Meyrick, 1907: 94.

Epicroesa chromatorhoea Diakonoff & Arita, 1979 (Figs. 1, 2)

Material examined. [Korea] 2♂, Gangwon Province, Panbu-myeon, Wonju-si, Chiak Recreation Forest (37.2493N, 128.0276E), 28. V. 2025. (em. 9. VI. 2025), S. Yagi leg.,

Table 1. Sample information of *Epicroesa* used for DNA analysis.

Species	Sample ID	Process ID	Location	GenBank accession number	Primer sets
Epicroesa chromatorhoea	TaO191	LJPKR004-25	Korea, Gangwon-do	PX894892	LCO1490/HCO2198
Epicroesa chromatorhoea	TaO192	LJPKR005-25	Korea, Gangwon-do	PX894889	LCO1490/HCO2198
Epicroesa chromatorhoea	TaO143	LJPKR003-25	Japan, Hokkaido Pref.	PX894890	LCO1490/mLepR1, mLepF1/HCO2198
Epicroesa chromatorhoea	Jo000121	LJPKR001-25	Japan, Hiroshima Pref.	PX894888	LCO1490/HCO2198
Epicroesa chromatorhoea	Jo000122	LJPKR002-25	Japan, Hiroshima Pref.	PX894891	LCO1490/HCO2198

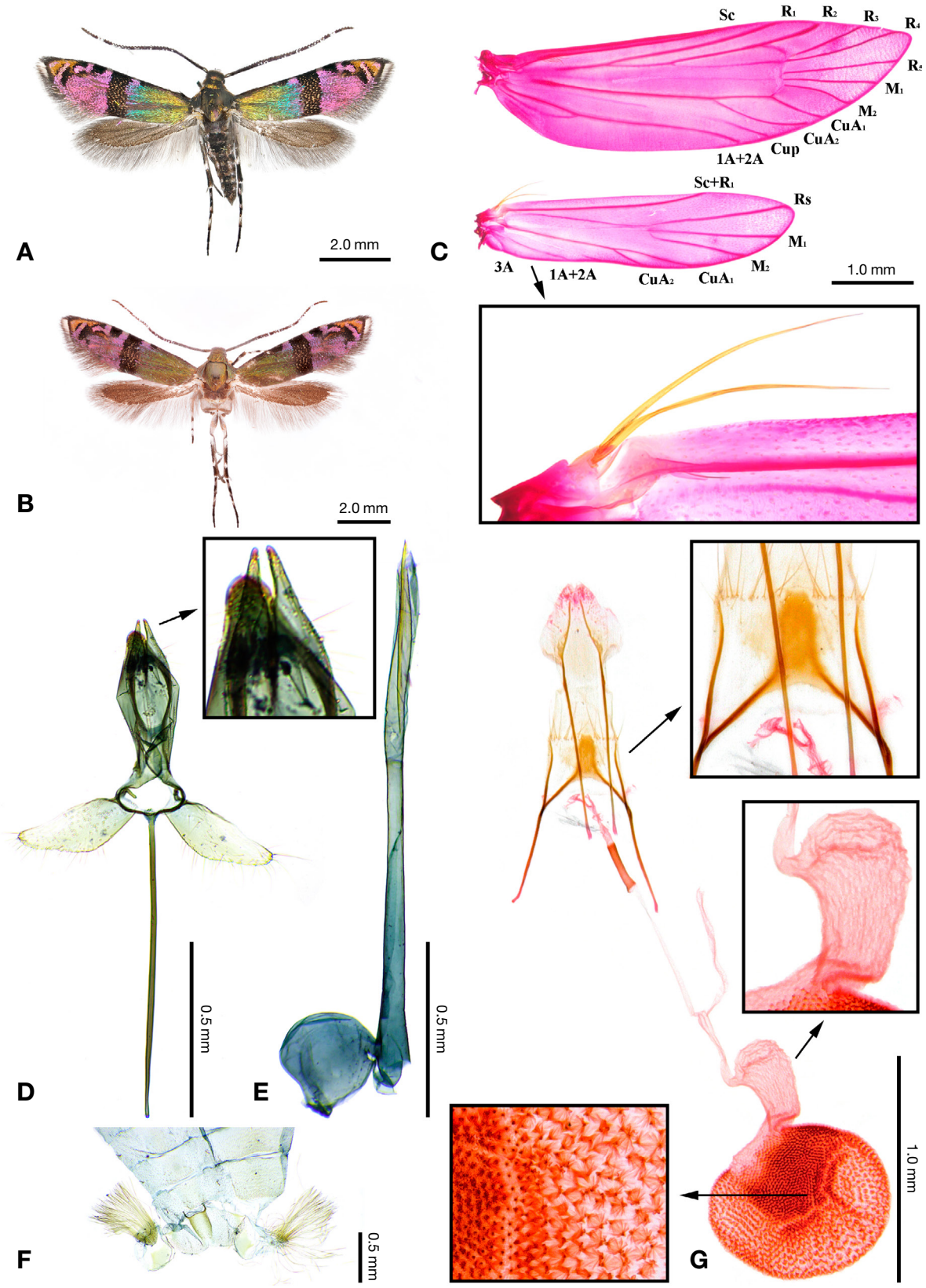

Fig. 1. *Epicroesa chromatorhoea*. A, dorsal habitus, male from Korea (NIBRIN0001077188 in NIBR); B, dorsal habitus, female from Japan (ELKU-I-L-000226 in ELKU); C, venation, female, slide no. KJM0567; D, male genitalia except for phallus, slide no. TO24-10; E, phallus, slide no. TO24-10; F, posterior part of abdomen, slide no. TO24-10; G, female genitalia, slide no. KJM0566.

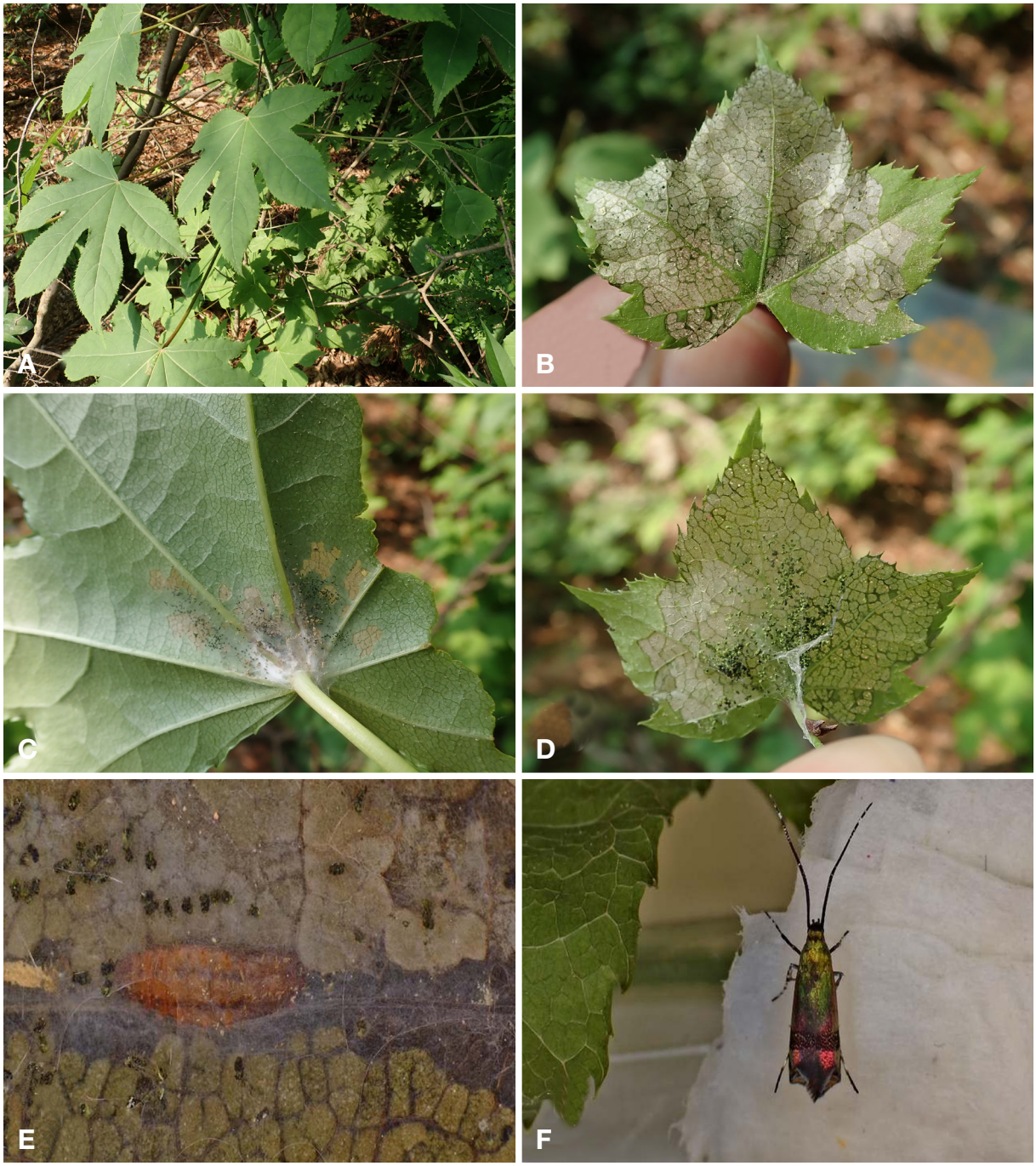

Fig. 2. Ecological photographs of *Epicroesa chromatorhoea*. A, host plant (*Kalopanax septemlobus*); B, damaged leaf, adaxial view; C, D, damaged leaf, abaxial view; E, pupa; F, emerged adult.

genitalia slide nos./Sample ID/NIBR specimen nos.: TO24-10/TaO191/NIBRIN0001077188, −/TaO192/NIBRIN0001077189; 1♀, same data, genitalia slide no. KJM0566; wings slide, no. KJM0567; NIBR specimen no. NIBRIN0001077190. All the samples were deposited at NIBR.

[Japan] 1♂, Hokkaido Pref., Chitose-shi, Komasato, 11. VI. 2011, H. Kogi, sample ID: TaO143, deposited at ELKU; 1♂1♀, Hiroshima Pref., Akiota-cho, Yokogo, Uchigurotoge (34.5968N, 132.1771E), 11. VI. 2022, S. Yagi, sample ID: Jo000121 (♂), Jo000122 (♀), deposited at ELKU.

Diagnosis. This species is characterized by metallic forewing markings: a green sheen on the basal half, a fuscous fascia, a pink sheen on the apical half, and an orange apex.

Although the genitalia of only a few Heliodinidae spe-

cies have been described, this species is similar to *E. metallifera* Meyrick, 1907, particularly in having coremata with long hairs and a relatively broad valva in the male genitalia. However, it can be distinguished by a subtriangular valva (suboval in *E. metallifera*) and a vesica bearing a thin, elongated, rod-like cornutus (composed of numerous spines in *E. metallifera*). In the female genitalia, this species is similar to *E. metallifera* in that the walls of the corpus bursae are sculptured by a patch of minute sclerotized granules. However, they can be distinguished by the shape of the corpus bursae: a globular anterior part and a thickened tubular posterior part (oval in *E. metallifera*).

Description (Fig. 1). See Diakonoff and Arita (1979).

DNA data. The COI barcode region was sequenced for two samples from Korea and three samples from Hiroshima Prefecture (Honshu) and Hokkaido Prefecture in Japan. No differences were observed among sequences from the same location or between sequences from Hiroshima and Hokkaido prefectures in Japan. The pairwise distance between Korean and Japanese specimens was 0.61%. No similar sequences for this species were retrieved based on the results of the BOLD identification engine, and all interspecific pairwise distances exceeded 9%.

Distribution. Korea (Gangwon Province) and Japan (Hokkaido, Honshu, and Sadogashima Islands) (Diakonoff and Arita, 1979; Sato and Hirano, 2024).

Host plant (Fig. 2). *Kalopanax septemlobus* (Thunb.) Koidz. (Araliaceae) (Diakonoff and Arita, 1979).

Biology (Fig. 2). The larvae feed on the leaves of the host plant, skeletonize the undersides of the leaves, and live under the loose silk thread structures.

Remarks. This is the first report of *E. chromatorhoea* from Korea. The host plant, *K. septemlobus*, is distributed not only in Korea and Japan but also in China and the Russian Far East (POWO, 2019); thus, this species could likely be distributed in these countries.

Conflicts of Interest

The authors of this paper have no affiliation with any interests and are solely responsible for the paper.

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