

A Tenebrionid Beetle, *Platydema takeii* Nakane (Coleoptera: Tenebrionidae), Attacking Cultivated Wood Ear Mushroom (*Auricularia auricula-judae*) in Jeju, Korea

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제주진주거저리(*Platydema takeii* Nakane)의 목이버섯 가해

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ABSTRACT: An investigation of the severe destruction of wood ear mushroom (*Auricularia auricula-judae*), which were commercially cultivated in a plastic house in Hwabuk-myeon, Jeju-si, South Korea from April to August 2021, revealed a tenebrionid beetle subsequently identified as *Platydema takeii* Nakane, 1956 (Coleoptera: Tenebrionidae: Diaperinae). To the best of our knowledge, this is the first report of a tenebrionid species infesting commercially cultivated mushrooms in South Korea. The damage symptoms and diagnosable characteristics of adults and larvae of *P. takeii* are provided in this study.

Key words: *Platydema*, Tenebrionidae, wood ear mushroom, Korea

초록: 2021년 4월부터 8월에 제주시의 비닐하우스에서 재배되는 목이버섯에서 거저리 일종이 발견되었으며, 그를 동정한 결과 제주진주거저리 (*Platydema takeii* Nakane, 1956)로 확인되었다. 상업적으로 재배되는 버섯에 있어서 거저리 해충으로 인한 우리나라의 첫 번째 피해 사례이다. 여 기서는 이 해충의 피해 증상과 성충 및 유충의 진단형질을 제공하고자 한다.

검색어: 진주거저리속, 거저리과, 목이버섯, 버섯, 한국

The genus *Platydema* Laporte & Brullé, 1831 belongs to the tribe Diaperini in the family Tenebrionidae, which contains 281 described species worldwide (Gebien, 1940), with approximately 51 species reported in the Palearctic region (Löbl et al., 2008). The following features characterize members of the *Platydema* genus: body oval, glabrous, and strongly convex dorsally; head mostly with a pair of straight horns in males and a pair of blunt tubercles in females or rarely absent in males and females (Chûjô, 1982; Jung, 2012).

Most of the *Platydema* species have become host specific to macrofungi, including Basidiomycetes or mycelina, which are food for the fungivorous tenebrionids (Leschen, 1990; Jung and Lee, 2011). In Korea, *Platydema* species are usually obligatory inhabitants of perennial and woody bracket fungi. Adults and larvae of fungivorous tenebrionids spend their entire lives in the fruiting bodies of bracket fungi (Jung and Lee, 2011). Ten *Platydema* species have been previously recorded in Korea (Jung, 2015).

Of these, *Platydema takeii* Nakane, causes serious damage to wood ear mushroom (*Auricularia auricula-judae*), which is commercially cultivated in a plastic house in Jeju-si, South Korea. This study provides the damage symptoms and diag-

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nosable characteristics of adults and larvae of *P. takeii*.

Materials and Methods

The examined specimens were collected from wood ear mushrooms commercially cultivated in a plastic house at Hwabuk-myeon, Jeju-si, South Korea from April to August 2021. Some of the larvae were reared in the laboratory. Images were captured with a digital microscope camera (USB 3.0, DMC-2900, Leica Biosystems, Buffalo Grove, IL, USA) attached to a Leica M125 stereo microscope (Leica Biosystems). The pictures were stacked using the Leica Application Suite software version 4.8 (Leica Biosystems).

Results

Taxonomic account

Family Tenebrionidae Latreille, 1802 (거저리과)

Subfamily Diaperinae Latreille, 1802 (르위스거저리아과)

Genus *Platydema* Laporte & Brullé, 1831

Platydema Laporte & Brullé, 1831, Ann. Sci. Nat. 23: 350.

[Type species: *Platydema dejeanii* Laporte & Brullé, 1831].

Anisochara Gebien, 1925, Phil. J. Sci. 28: 101. [Type species:

Anisochara gynadromorpha Gebien, 1925]

Histeropsis Chevrolat 1878, Pet. Nouv. Entomol. 2: 221. [Type species: *Platydema americanum* Laporte & Brullé, 1831].

Typhobia Pascoe 1869, Ann. Mag. Nat. Hist. (4)3: 279. [Type species: *Typhobia fuliginea* Pascoe, 1869]

Keys to the Korean *Platydema* species (Jung, 2017)

1. Body extremely convex, metallicly shining, with weak iridescence *P. higonium*
- Body moderately or strongly convex, shining, without iridescence 2
2. Elytra with brownish yellow markings at the sub-basal part *P. subfascia*
- Elytra without brownish-yellow markings at the sub-basal part 3

3. Clypeal anterior margin with a small tubercle
..... *P. celatum*
- Clypeal anterior margin without a tubercle 4
4. Frons without horns or tubercles on the inner ocular area in both sexes 5
- Frons with a pair of horns or tubercles on the inner ocular area in both sexes 7
5. Body shining; pronotum widely triangular
..... *P. lynceum*
- Body not shining; pronotum moderately triangular 6
6. Body length approximately 7.0 mm; male middle and hind tibiae not curved at the middle part inwardly; ocular distance almost equal to the eye diameter
..... *P. fumosum*
- Body length > 10.0 mm; male middle and hind tibia curved inward at the middle part (Ando, 1985); ocular distance closed, narrower than the eye diameter
..... *P. umbratum*
7. Frons with a pair of long, slender horns, reaching beyond the head in males; frons at the base of horns shallowly concave in both sexes *P. reticorne*
- Frons with a pair of short, stout, or rarely slender horns, mostly not reaching beyond the head in males; frons at the base of horns deeply concave in both sexes 8
8. Elytra shallowly and weakly striated, with small punctures *P. takeii*
- Elytra deeply and strongly striated with moderate punctures 9
9. Pronotum strongly transverse and abruptly narrowing near apex *P. kurama*
- Pronotum not transverse and gradually narrowing near apex 10
10. Body length > 5.5 mm; elytral interstriae strongly convex and densely punctate *P. marseuli*
- Body length < 5.0 mm; elytral interstriae strongly or weakly convex and not densely punctate 11.
11. Elytral interstriae strongly convex with sparse and minute punctures *P. koreanum*
- Elytral interstriae weakly convex with moderately sparse and minute punctures. *P. nigroaeneum*

Platydema takeii Nakane, 1956 제주진주거저리

Platydema takeii Nakane, 1956:165 [TL: Japan]; Jung, 2017: 49-50, Fig. 1, 3 [Korea-Jeju].

Diagnosis

Adult (modified from Jung, 2017): Body length approximately 5.5 mm in females and 5.2 mm in males. Body

oval-oblong, strongly shining, and mostly black; antennae, mouthpart, horns (partly), and legs reddish brown. Head with tiny punctures. Antennae moniliform, 1st to 3rd antennomeres cylindrical, 4th to 11th antennomeres moniliform, and enlarged transversely. Pronotum strongly convex with small regular punctures. Scutellum triangular. Elytra strongly convex. All tibiae and tarsi relatively slender and long. Male (Fig. 1A-B): frons with a pair of moderately long horns, horns gradually thin

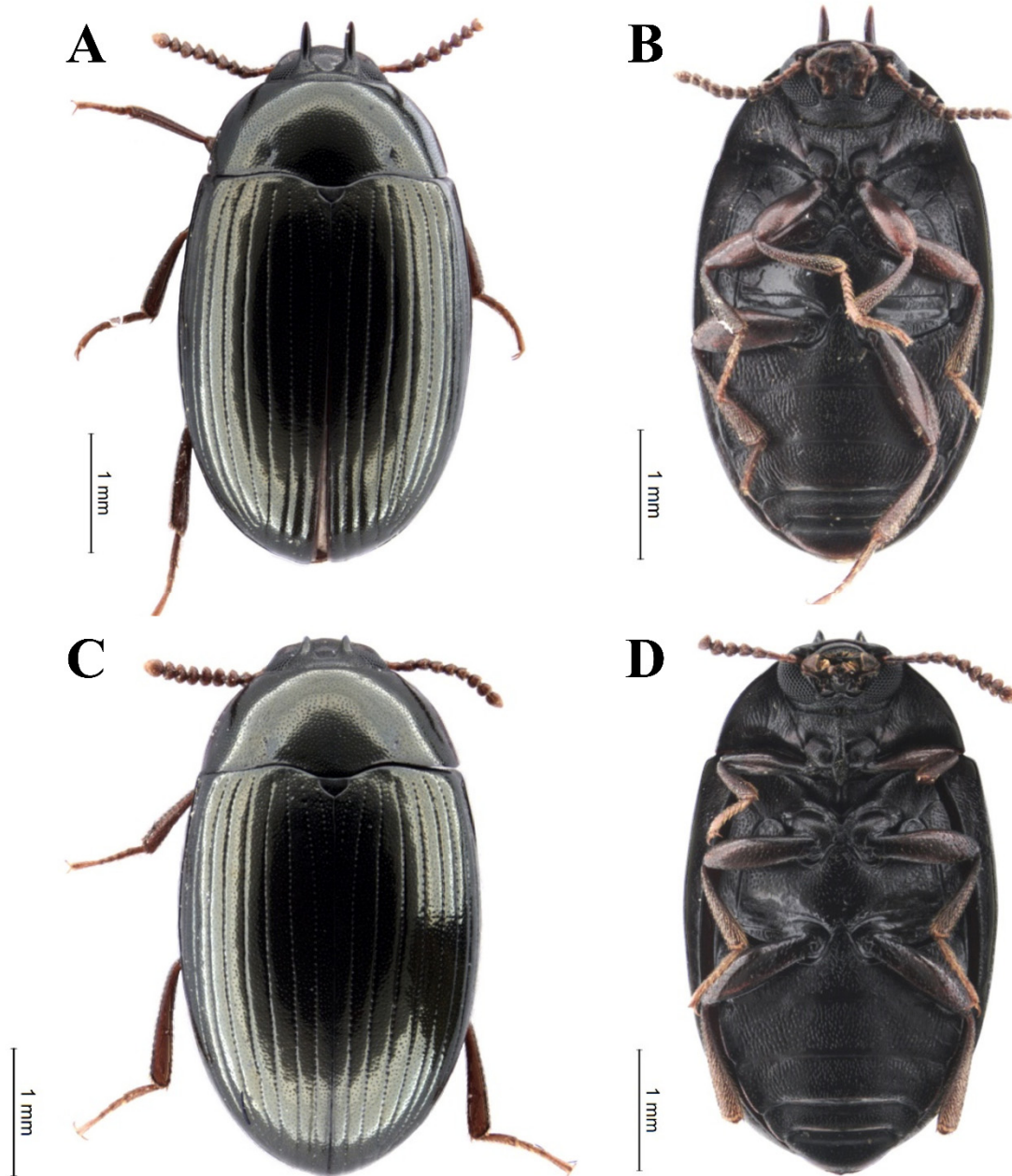


Fig. 1. *Platydema takeii* Nakane. A: male dorsal view; B: male ventral view; C: female dorsal view; D: female ventral view.

apically, brownish black at basal 3/5, and reddish brown at apical 2/5. Female (Fig. 1C-D): frons with a pair of short and blunt horns, approximately twice shorter than those of males.

Larva (Fig. 2A-B): Last instar is cylindrical and strongly sclerotized on its surface, with well-developed anal tube in the ninth abdominal tergite.

Pupa (Fig. 2C): Typical tenebrionid pupal shape.

Material examined: 6♂♂, 10♀♀, 3 larvae, 2 pupa, Hwabuki-dong, Jeju-si, 8.IV.2021, 31.VIII.2021 in the wood ear mushrooms commercially cultivated in a plastic house, K.J. Hong leg.

Distribution: Korea (Jeju-si), Japan, and Taiwan (Masumoto et al., 2013).

Food material: *Auricularia polytricha* (Mont.) Sacc. (Jung,

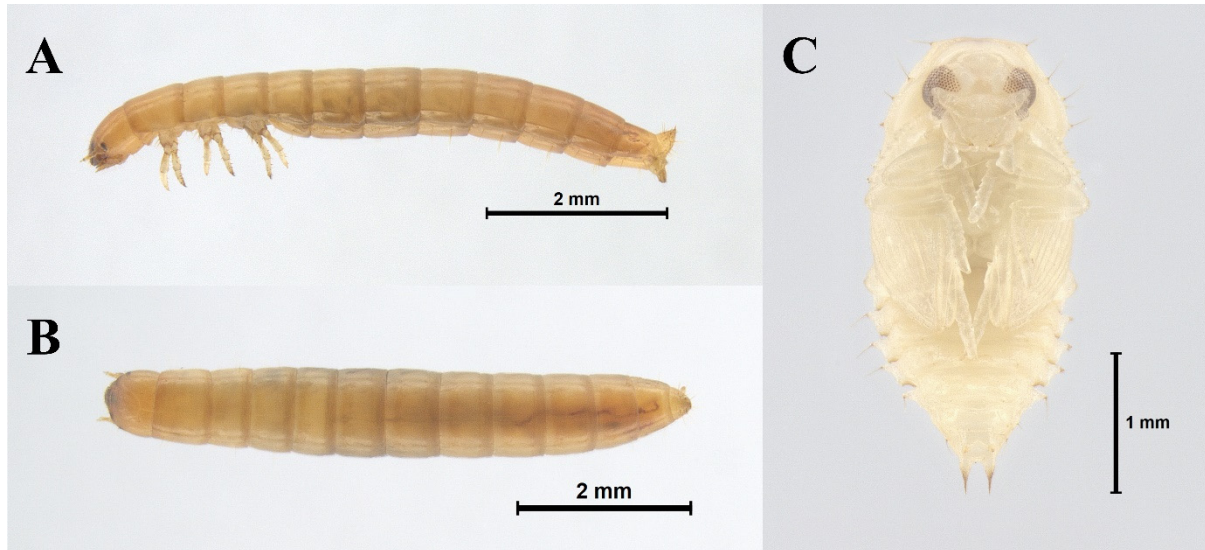


Fig. 2. *Platydema takeii* Nakane. A: mature larva lateral view; B: mature larva dorsal view; C: pupa ventral view.

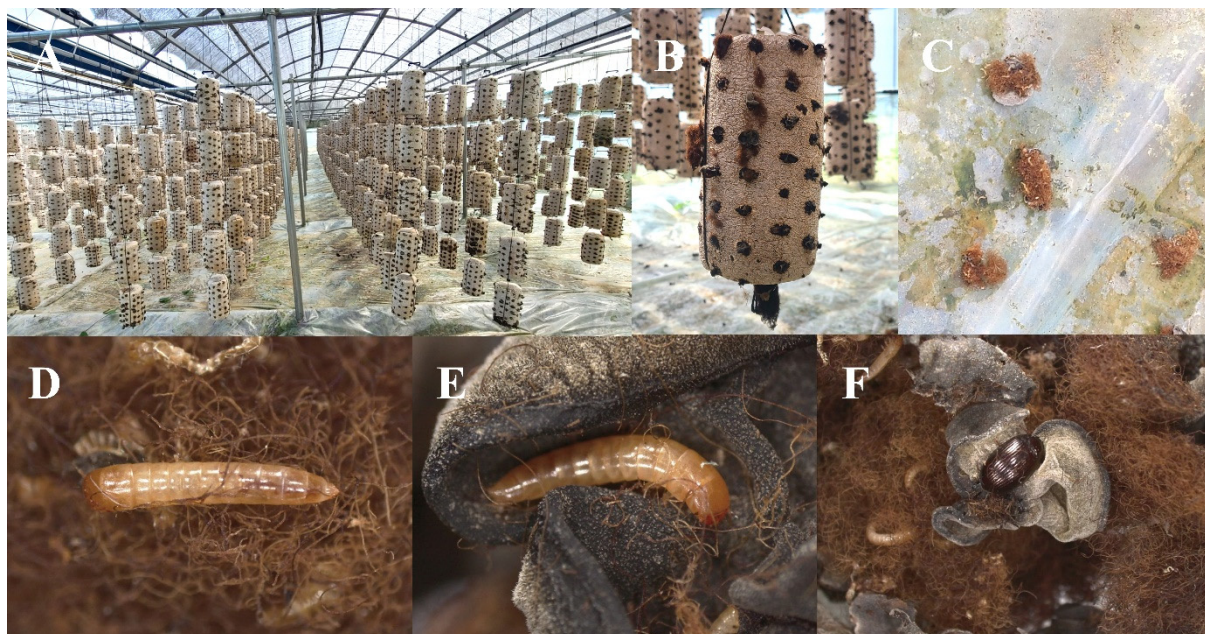


Fig. 3. *Platydema takeii* Nakane damage symptoms. A: approximately 100% infestation of wood ear mushroom (*Auricularia auricula-judae*) cultivated in a plastic house; B: infestation symptoms; C: Larvae-fed fruiting bodies falling in thread-like bundles; D-E: mature larvae after feeding within wood ear mushrooms; F: adult infesting the mushroom fruiting body.

2017) and *A. auricula-judae* (Fr.) Quel. (Auriculariaceae).

Damage symptoms

Larvae and adults of *P. takeii* attack wood ear mushrooms; however, the immature stages of *P. takeii* cause the most damage. They mostly feed on the fruiting bodies of wood ear mushrooms. During feeding, larvae emit thread-like bundle residuals, inside which they may hide (Fig 3). Larvae are quite active; they crawl very quickly when exposed from their hiding place or in danger. Damage to the basal area of the mushroom may result in the dropping of fruiting bodies from the culture compost bag. In severe cases, a complete loss of the cultivated mushrooms may occur.

Discussion

A tenebrionid beetle that caused severe destruction of wood ear mushrooms cultivated in eco-friendly plastic greenhouses was identified as *P. takeii* Nakane. This pest is a fungivorous tenebrionid commonly found in Jeju-si as an endemic species.

To the best of our knowledge, this is the first report of a fungivorous tenebrionid causing serious economic damage to commercial mushrooms. As the number of eco-friendly farms cultivating mushrooms increases, damage reports are expected to continue in the future. Therefore, control measures are required.

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Statements for Authorship Positions and Contributions

Jeong, K.-J.: Suncheon National University, Researcher; Designed the research, wrote the manuscript and conducted the experiments

Nguyen, N.H.: Suncheon National University, Researcher, Ph.D; Collected and examined specimens
Hong, K.-J.: Suncheon National University, Professor, Ph.D; Examined specimens and designed the research

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