

A newly Recorded Species of the Genus *Hallodapus* (Hemiptera: Heteroptera: Miridae) from the Korean Peninsula

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Abstract

A species, *Hallodapus kyushuensis* is first reported from the Korean Peninsula. Morphological information including the redescription, diagnosis, and a key to the Korean *Hallodapus* species are provided.

Key Words: heteroptera, Korean peninsula, new record, plant bugs, taxonomy

Introduction

To study the taxonomy and the diversity of the arthropod is important to the forest ecosystem (e.g., Eidt 1995; Schowalter 2017). Even though the role of these groups is unknown and these seem not to be relevant in the forest, to understand the diversity and biology may be a hint for the various forestry researches, given the conception of the biodiversity and the perspective of the ecologists indicated in Kim et al. (2010). For example, the animals living in the leaf litter play a key role in the recycling of nutrients within the system in the forest, which is relevant to the plant production (Rahman et al. 2013).

As the one of the plant bug tribes, Hallodapini Van Duzee, 1916 is sister to all remaining phyline groups (Menard et al. 2014), in which some groups possess the myrmecomorphic dorsum such as the type genus *Hallodapus* Fieber, 1858 and the genus *Systellonotus* Fieber, 1858. *Hallodapus* comprises a total of 50 described species worldwide (Schuh 2002-2013; Yasunaga et al. 2019), and the three *Hallodapus* species are currently recognized from the Korean Peninsula: *H. centrimaculatus* (Poppius 1914), *H. linnavuori* Miyamoto, 1966, and *H. pumilus* Horváth, 1901 (Aukema and Rieger 1999; Aukema et al. 2013; Duwal et al. 2014).

The biology of the *Hallodapus* is almost unknown; in

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some species the habitats and the host plants were recognized such as the European *H. rufescens* (Burmeister 1835) and *H. costae* (Reuter 1890) (Linnavuori 1961; Wagner 1961). *H. linnavuori* was sometimes found on the layer of shade leaf mold under the dense live plants (J. Kim personal observation), which is similar to the habitats of *Hallodapus* species shown in Yasunaga et al. (2019). The attraction to the artificial light trap was reported (Duwal et al. 2014). Recently, Yasunaga et al. (2019) reported that *H. trimaculatus* and *H. ravenar* produced the sounds during courtship behavior and provided the sound pattern of each species. However, the biological information to collect these bugs is still concealed; therefore, the traps such as the malaise trap may be more effective than the general collecting methods (e.g. using net), especially for the epigeic bugs as mentioned in Yasunaga et al. (2019).

In the present paper, one newly recorded hallodapine species, *H. kyushuensis* collected by the Malaise trap is first presented from the Korean Peninsula. Redescription, diagnosis, and a key to the Korean *Hallodapus* species are presented.

Material and Methods

The specimen was examined under the light stereomicroscope Nikon SMZ 800, and measurements were taken using software program (ToupView) provided the camera BKONV300 combined with a microscope. All measurements are given in millimetres (mm). Terminology mainly follows Schuh (1974) and Schuh and Weirauch (2020). The specimen examined is deposited at National Institute of Ecology (NIE). Depository for the type specimen is in the Entomological Laboratory, Faculty of Agriculture, Kyushu University (ELKU), Fukuoka, Japan. Countries marked with an asterisk (*) at the distribution subsection indicate the first record of the species.

Results and Discussion

Taxonomy

Genus *Hallodapus* Fieber

Hallodapus Fieber, 1858: 307. Type species: *Capsus corizoides* Herrich-Schaeffer, 1839.

Plagiorhamma Fieber, 1870: 250 (syn. Carvalho, 1952: 70).

Type species: *Capsus suturalis* Herrich-Schaeffer, 1837. *Tyraquellus* Distant, 1904: 471 (syn. Carvalho, 1952: 70).

Type species: *Leptomerocoris? albofasciatus* Motschulsky, 1863.

Trichofulvius Poppius, 1909: 41 (syn. Schuh, 1984: 117).

Type species: *Trichofulvius fasciatus* Poppius, 1909.

Serebaeus Distant, 1910: 11 (syn. Carvalho, 1952: 70).

Type species: *Serebaeus discriminates* Distant, 1910.

Rodriguaria China, 1925: 165 (syn. Carvalho, 1952: 70).

Type species: *Chaetocapsus scotti* China, 1924.

Eremachrus Lindberg, 1959: 105 (syn. Schuh, 1974: 301).

Type species: *Eremachrus graminum* Lindberg, 1959.

Diagnosis

Recognized by the body small to medium in size, generally brown to dark brown; head somewhat prognathous; hemelytra brown with pale pattern(s); flattened pronotal collar; left paramere enlarged, densely covered with heavy setae; endosoma with a well-developed secondary gonopore. See Schuh (1974) and Duwal et al. (2017) for the detailed diagnosis.

Hallodapus kyushuensis Miyamoto, 1966 (Fig. 1)

Hallodapus kyushuensis Miyamoto, 1966: 436; Schuh, 1984: 126; Mu et al., 2012: 138; Duwal et al., 2017.

Diagnosis

Recognized by the following combination of characters: body relatively large in size, more than 3 mm; head mostly dark brown; antennae partly brown to dark brown; first antennal segment mostly dark brown with pale line on lateral side; other segments brown; pronotum and scutellum en-

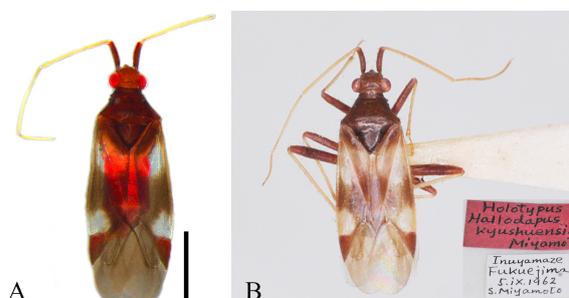


Fig. 1. Dorsal habitus (A) and the type specimen (B) of the *Hallodapus kyushuensis*. scale bar: 1 mm.

tirely dark brown; cuneus tinged with red.

Redescription

Male: Body elongate, length 3.12. coloration: partly pale and dark brown (Fig. 1A). Head: entirely dark brown; antennae partly pale and dark brown; first segment mostly dark brown with yellow line on inner lateral side; other segments pale brown. Thorax: pronotum and scutellum entirely dark brown; hemelytra pale and dark brown, with transverse pale pattern at anterior part, dark narrow triangular marking at base, and pale circular marking posteriorly; cuneus tinged with reddish brown; membrane grayish, vein grayish brown; legs mostly dark brown; all femora mostly dark brown; all tibiae pale brown; tarsus mostly pale brown. Abdomen: mostly dark brown. surface and vestiture: body glossy, covered with short setae; head somewhat dull; pronotum, scutellum and hemelytra glossy; hemelytra with small punctures. structure: Head: somewhat prognathous, anterior margin rounded in dorsal view, width more than length; vertex more than compound eye width, subequal to first antennal segment; first antennal segment thicker than others; second segment cylindrical, subequal to third segment; apex of labium reaching hind-coxae. Thorax: pronotum trapezoid, posterior margin carinated, longitudinal length subequal to 1/2 basal pronotal width; scutellum equilateral, mesoscutum broad; lateral margin of hemelytra slightly rounded; cuneal fracture well developed; membrane with two cells; legs generally slender. Abdomen: rounded, reaching to base of cuneus.

Genitalia

See the description with illustrations in Duwal et al. (2017).

Measurements (in mm)

Male (n=1): Body length 3.12; head length (excluding neck) 0.31; head width (including eyes) 0.52; vertex width 0.27; lengths of antennal segments I–IV respectively 0.33: 0.93: 0.91: 0.47; mesal pronotal length 0.33; basal pronotal width 0.81; scutellum width: 0.62; scutellum length: 0.63; hemelytra maximum length: 1.96; maximum width across hemelytra 0.53.

Specimen examined

[NIE] 1♂, Geomjeong-ri, Gonyang-myeon, Sacheon-si, Gyeongsangnam-do, Korea, by Malaise trap, 14.vii.2021, S. Jung leg.; [ELKU] Holotype: 1♂, Inuyamaze, Fukuejima, Goto Islands, 5.ix.1962, S. Miyamoto leg. (Fig. 1B).

Distribution

Korea*, China, Japan.

Remarks

Although the specimen we examined has no legs, the other diagnostic characters are clear for identification, given that these characters such as the mostly dark first antennal segment and the pattern on hemelytra (Fig. 1) are not variable within the genus *Hallodapus* as indicated in the known species in the previous studies (e.g. Schuh 1974; Duwal et al. 2017). This species seemed to have the southern island distribution in accordance with the previous studies (Miyamoto 1966; Mu et al. 2012; Duwal et al. 2017); however, this species was collected in inland in this study, which suggests the possibility that this species is distributed in the northern area as well.

Key to Korean *Hallodapus* species

1. Body large, more than 3 mm; first antennal segment mostly dark brown ······ *H. kyushuensis*
 - Body relatively small, less than 3 mm; first antennal segment mostly pale or mostly dark brown ······ 2
2. First antennal segment dark mostly dark brown; pronotum relatively smooth; hemelytra brown with large continuous pale pattern at subbasal area, but narrow in the middle area ······ *H. linnavuori*
 - First antennal segment mostly pale brown with dark apices; pronotum with irregular wrinkles ······ 3
3. Hemelytra brown with large continuous pale pattern at subbasal area, but broad in the middle area ······ *H. centrimaculatus*
 - Hemelytra brown with narrow and inconspicuous pale patterns at subbasal area ······ *H. pumillus*

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