

## First Record of the Lace Bug Genus *Dulinius* Distant (Hemiptera: Heteroptera: Tingidae) from Taiwan

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**Abstract.** The lace bug genus *Dulinius* Distant, 1903 is native to the Afrotropical and Oriental Regions, whereas only a single species, *D. conchatus* Distant, 1903, has been recorded in the Oriental Region. This species invaded Japan proper, which is located in the Palaearctic Region, at the end of the 20th century. *Dulinius conchatus* occurs in China, India, Indonesia (Java Island), Japan (Honshu, Shikoku, Kyushu), Laos, Malaysia, the Philippines (Luzon Island, Negros Island, Palawan Island), Sri Lanka, Thailand, and Vietnam, but has not been recorded in Taiwan. In this study, *Dulinius* and *D. conchatus* are recorded from Taiwan for the first time.

**Keywords:** alien species, biology, East Asia, Oriental Region, Rubiaceae

### Introduction

The lace bug genus *Dulinius* Distant, 1903 (Hemiptera: Heteroptera: Tingidae) comprises 12 species from the Afrotropical and Oriental Regions: *D. bellus* Drake, 1948, *D. burgeoni* Schouteden, 1953, *D. conchatus* Distant, 1903, *D. congruus* Drake, 1953, *D. distinctus* Duarte Rodrigues, 1982, *D. explanatus* Duarte Rodrigues, 1987, *D. fasciatipennis* Linnavuori, 1977, *D. inflatus* Duarte Rodrigues, 1979, *D. kraussi* Drake, 1953, *D. maculatus* Duarte Rodrigues, 1979, *D. pulchrus* (Schouteden, 1916), and *D. unicolor* (Signoret, 1861) (Drake & Ruhoff, 1965; Linnavuori, 1977; Duarte Rodrigues, 1979, 1982, 1987). However, in the Oriental Region, only a single species, *D. conchatus* Distant, 1903, has been recorded from China, India, Indonesia (Java Island), Laos, Malaysia, Philippines (Luzon Island, Negros Island, Palawan Island), Sri Lanka, Thailand, and Vietnam (Drake & Ruhoff, 1965; Péricart, 1986, 1992; Guibert, 2007; Guilbert & Guidoti, 2018; Guilbert et al., 2018). This Oriental lace bug invaded Japan proper (Honshu, Shikoku, Kyushu) located in the Palaearctic Region at the end of the 20th century (Tomokuni & Saito, 1998; Yamada & Ishikawa, 2016) and is a pest of *Morinda tinctoria* Roxb. (Rubiaceae) in India (Dhanasekaran et al., 2008). Therefore, the distribution of *D. conchatus* needs to be monitored to take prompt action when it becomes an alien species or a pest.

Recently, the second author collected an indeterminate species of *Dulinius* from *Paederia foetida* L. (Rubiaceae) in Taipei, Taiwan. After careful morphological examination, the first author concluded that it represents *D. conchatus*. In this study, we recorded *Dulinius* and *D. conchatus* from Taiwan for the first time.

### Materials and methods

Dried specimens were used to observe and measure the morphological characteristics under a stereoscopic microscope (SZ60; Olympus, Tokyo, Japan) equipped with an ocular grid. Measurements were obtained using a micrometer on an ocular grid. The specimens were photographed using a digital microscope (Dino-Lite Premier M, Opto Science, Tokyo, Japan), and image stacks were processed using Adobe Photoshop 2021 ver.22.5.1. Photographs of the labels were taken with a compact digital camera (Tough TG-6, Olympus, Tokyo, Japan).

All specimens used in this study are deposited in the Entomological Laboratory Faculty of Agriculture, Kyushu University, Fukuoka, Japan (ELKU), the Kyushu University Museum, Fukuoka, Japan (KUM), and National Museum of Natural Science, Taichung, Taiwan (NMNS).

## Results

### *Dulinius conchatus* Distant, 1903

(Figs 1, 2)

*Dulinius conchatus* Distant, 1903a: 48. Syntypes, Sri Lanka: Batticaloa; British Museum of Natural History, London, United Kingdom (BMNH).

**References.** Distant (1903b: 133) (record, habitus, description); Distant (1910: 110) (record, distribution, host); Drake & Ruhoff (1965: 201) (catalog); Péricart (1986: 649) (distribution); Péricart (1992: 48) (distribution); Tomokuni & Saito (1998: 23) (distribution); Pemberton et al. (2005: 81) (record, bionomics, host plant, biological control); Guilbert (2007: 14) (distribution); Dhanasekaran et al. (2008: 147) (pest); Yamada & Yukinari (2009: 53) (record, habitus, distribution); Yamada & Ishikawa (2016: 431) (checklist: Japan); Guilbert & Guidoti (2018: 290) (distribution); Guilbert et al. (2018: 596) (distribution).

**Material examined.** Non-types (5 ♂♂ 13 ♀♀), **TAIWAN: TAIPEI CITY:** Da'an District, on abaxial surface of leaves of *Paederia foetida*, 25°00'44.8"N 121°32'47.2"E, 5.x.2021, leg. Y.-J. Tsai (7 ♀♀, NMNS). **NANTOU COUNTY:** Shuli Forest Station of National Taiwan University (台灣大學實驗林水里營林區), 23°45'57.9"N 120°51'21.6"E, alt. 404 m, 15.vii.2016, leg. H.T. Yeh, Malaise trap (1 ♂, NMNS); same locality and method, 18.viii.2016 (1 ♂, NMNS); Lugu, NTU Qingshuigou Experimental Forest Station (台灣大學實驗林鹿谷清水溝樹木標本園), 23°45'41.4"N 120°47'33.8"E, alt. 434 m, 2.viii.2016, leg. H.T. Yeh, Malaise trap (1 ♀, NMNS). **JAPAN:** Kanagawa-ken, Atsugi-shi, Funako, 35°25'58.3"N 139°20'48.6"E, 10.vi.2017, leg. J. Souma (5 ♂♂ 5 ♀♀, ELKU). **MALAYSIA:** Taiping (lowland), 18.viii.1991, leg. S. Kamitani (1 ♀, KUM).

**Diagnosis.** Recognized among other species of *Dulinius* by a combination of the following characters (Figs 1, 2): rostrum reaching posterior margin of metasternum; hood with 4 rows of areolae at highest part; paranotum strongly reflexed upward, with 4 rows of areolae at widest part; median carina laminate in posterior part and ridge-shaped in remaining parts, with 2 rows of areolae at highest part; lateral carinae combining each other to form a semi-globose, with 3 rows of areolae at highest part; costal area of hemelytron with 3 rows of areolae at widest part; subcostal area with a single row of areolae throughout its length; discoidal area with a single row of areolae throughout its length; and sutural area with 2 rows of areolae at widest part.

**Measurements.** Taiwanese population (n = 7): body length with hemelytra 3.1–3.4 mm; maximum width across hemelytra 2.0–2.2 mm; pronotal length 1.5–1.7 mm; pronotal width across paranota 1.7–1.9 mm; hemelytral length 2.1–2.3 mm; hemelytral width 1.1–1.2 mm; length of antennal segments I to IV 0.2 mm, 0.1 mm, 0.8 mm, and 0.7 mm, respectively.

**Remarks.** The seven specimens from Taiwan recorded above (Fig. 1) correspond well to the Japanese and Malaysian specimens (Fig. 2) and the original description (Distant, 1903a) of *Dulinius conchatus* in terms of morphological characteristics. In conclusion, the first author identified Taiwanese specimens as *D. conchatus*.

**Distribution.** Taiwan (new record); China; India; Indonesia (Java Island); Japan (Honshu, Shikoku, Kyushu) (invaded); Laos; Malaysia; Philippines (Luzon Island, Negros Island, Palawan Island); Sri Lanka; Thailand; Vietnam.

**Host plant.** *Morinda tinctoria* Roxb. (Rubiaceae); *Morinda* sp.; *Paederia foetida* L. (Rubiaceae).

**Bionomics.** In Taiwan, *Dulinius conchatus* feeds on the abaxial surface of leaves of *Paederia foetida*, similar to many tingids (Schuh & Weirauch, 2020). Adults were collected in July, August and October in Taiwan.

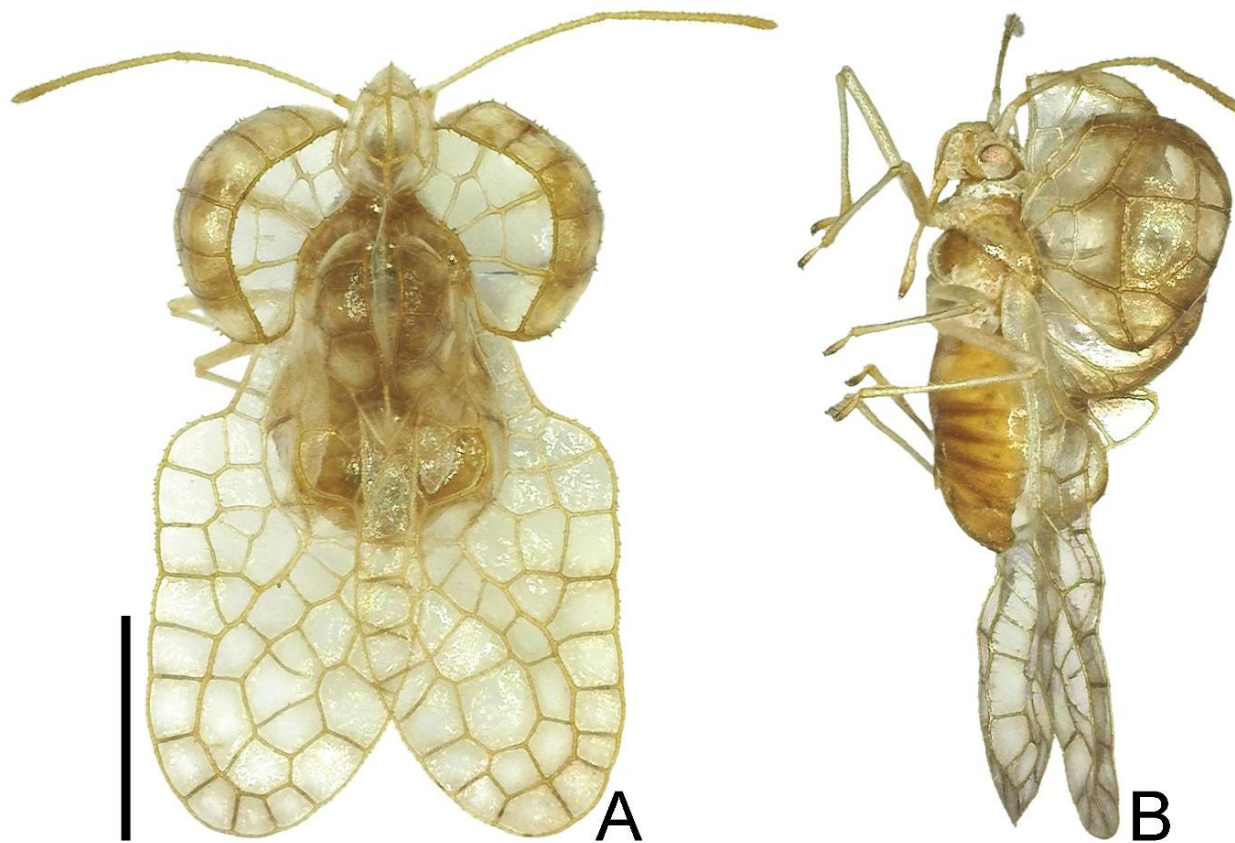


Figure 1. Habitus of *Dulinius conchatus* Distant, 1903 from Taiwan. A: female, dorsal view, B: female, lateral view. Scale bar: 1.0 mm.

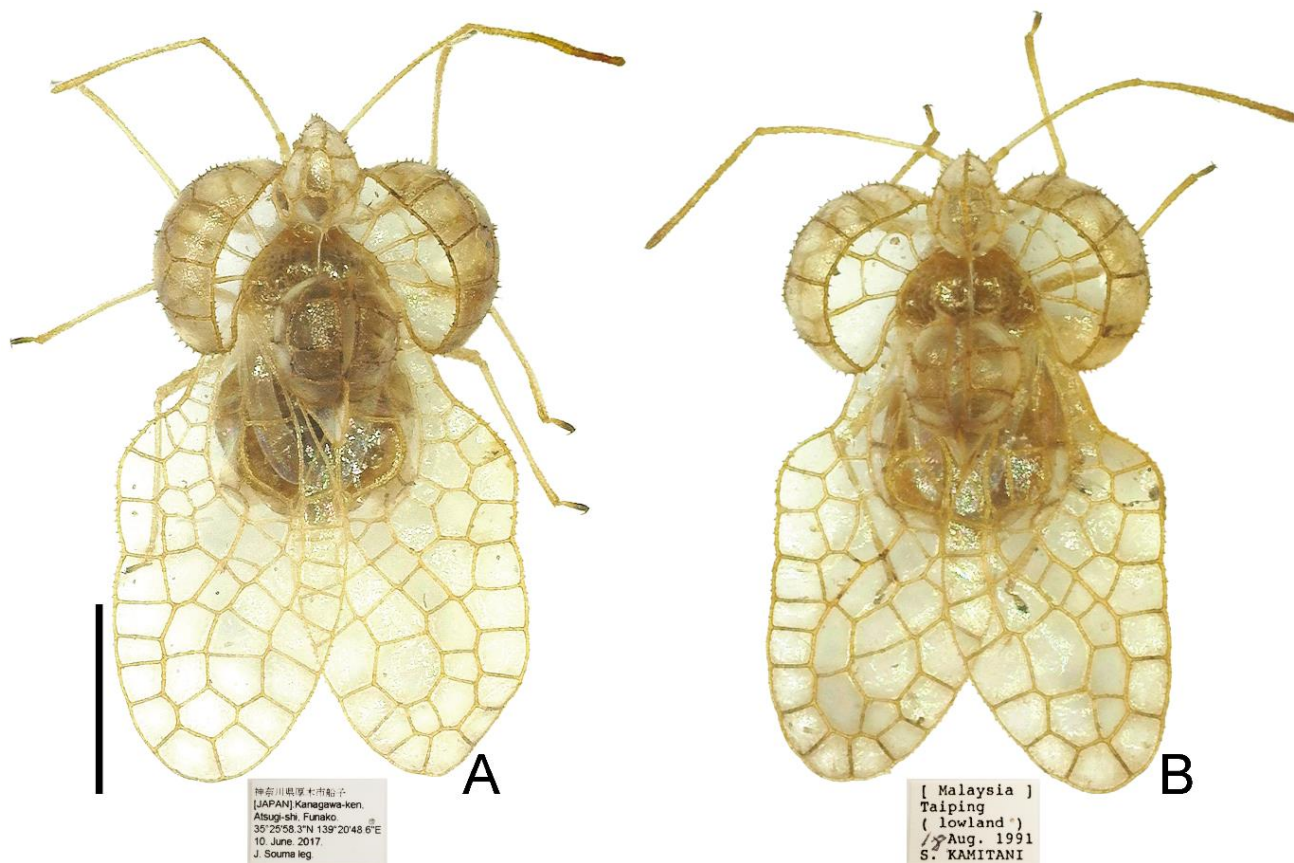


Figure 2. Dorsal habitus and label of *Dulinius conchatus* Distant, 1903. A: female from Japan, B: female from Malaysia. Scale bar: 1.0 mm.

## Discussion

*Dulinius conchatus* is recorded from Taiwan for the first time. It has been collected from *Paederia foetida* in urban areas of Taipei City, whereas no specimen has been found in natural environments to date. Therefore, this lace bug may be an alien species that invaded and expanded its distribution at least a few years ago. We propose further taxonomic and faunistic studies are required to verify the origin of Taiwanese *D. conchatus* and its distribution range in Taiwan.

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## 臺灣貝肩網蝽屬首次紀錄（半翅目：網蝽科）

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**摘要：**貝肩網蝽屬 (*Dulinius* Distant, 1903) 已知分佈於舊熱帶區及東方區，東方區僅記錄貝肩網蝽 (*D. conchatus* Distant, 1903) 一種，而該物種於 20 世紀末時入侵位於古北區在日本。至今為止，貝肩網蝽的分布已知有中國、印度、印度尼西亞 (爪哇島)、日本 (本州、四國、九州)、寮國、馬來西亞、菲律賓 (呂宋島、內格羅斯島、巴拉望島)、斯里蘭卡、泰國和越南，而臺灣目前尚無分布紀錄。本研究提供 *Dulinius* 與 *D. conchatus* 在臺灣的首次紀錄。

**關鍵詞：**外來種、生物學、東亞、東洋界、茜草科