



A New Record of Latridiidae (Coleoptera), *Eufallia seminivea* (Motschulsky), from Taiwan, with Notes on Its Occurrence

Mei-Ling Chan*, Kwen-Shen Lee

Department of Biology, National Museum of Natural Science, Taichung, Taiwan

* Corresponding email: meiling@mail.nmns.edu.tw

Received: 7 November 2016

Accepted: 14 December 2016

Available online: 6 March 2017

ABSTRACT

Latridiids are mycophagous that in their adult as well as in their larval stage feed on fungal spores and hyphae. Neither a faunistic study nor any basic biological research on the Latridiidae has been conducted in Taiwan in the past. The Genus *Eufallia* and the species *E. seminivea* (Motschulsky) were discovered in Taiwan. This article presents the morphological characters and scanning electronic microscope (SEM) photographs of the adults. A checklist and key to Taiwanese Latridiid species is provided. The occurrence of *E. seminivea* in a fluid-preserved collection room is also discussed.

Key words: Latridiidae, *Eufallia seminivea*, new record, checklist, fluid-preserved collection storage

Introduction

The family Latridiidae, well known as minute brown scavenger beetles or plaster beetles, are tiny brown to black beetles characterized primarily by their small size (1-3 mm), having an elongated oval body, antennae with 10-11 segments, the antennal club having 2-3 segments, with an elytra wider than the head and thorax, a dorsal surface strongly punctuated or impunctate, and a tarsal formula of 3-3-3. Some of the Latridiidae species are covered by a thick waxy exudate, and most species are flightless (Robinson, 2005; Hartley and McHugh, 2010; Lord *et al.*, 2010; Evans, 2014).

In their adult and larval stage Latridiidae are mainly mycophagous, feeding on fungal

spores and hyphae, especially molds. Latridiids have been reported to feed on fungi in the genera *Hypoxydon*, *Ustilago*, *Myxomycetes*, *Polysaccum*, *Arcticum*, *Trichothecium*, *Lycoperdon*, *Tilletia*, *Mucor*, *Aspergillus*, *Botrytis*, *Helminthosporium*, *Alternaria* and *Penicillium* (Gordon, 1938; Hinton, 1941; Chandler, 1983; Robinson, 2005). Robinson (2005) mentioned that some species prefer *Penicillium* mold. However, the food preferences for most latridiid species have not yet been determined (Hartley and McHugh, 2010).

These minute brown scavenger beetles favor a damp environment and can be found in leaf litter, on the bark of dead trees, in foliage, rotten wood, in bird, mammal, ant and termite nests, and in stored products (Bousquet, 1990; Robinson, 2005; Majka *et al.*, 2009). Some

species are cosmopolitan and are associated with stored products or households. The presence of latridiids indicates a moldy condition or a poor storage condition, often causing hygienic issues (Robinson, 2005; Savoldelli and Bruschi, 2010). Some species are known to be potential pests of air-conditioning systems, where they spread fungal spores and contaminate stored food (Carlton, 1988; Robinson, 2005).

In 2014, numerous beetle corpses (Fig. 1D) were found above and below the emergency light in the fluid-preserved collection room of the National Museum of Natural Science (NMNS) in Taiwan, and therefore the authors started to pay attention to this occurrence. We found this species presents a phototactic behavior and is often found hovering around a light. Living individuals were observed crawling on the wall, shelves, floor, cartons, cardboard storage boxes, and on the top of the specimen containers etc. They were identified as *Eufallia seminivea* (Motschulsky). Their occurrence and food preference require further investigation.

In the past, neither faunistic study nor basic biological research on the Latridiidae was conducted in Taiwan. In this article, we review the pertinent literature and list 8 species recorded from Taiwan. The genus *Eufallia* and the species *E. seminivea* which we were first to discover in the fluid-preserved collection storage room in the National Museum of Natural Science (NMNS) are new to Taiwan. In this study, we provide the morphological information of this species, an annotated checklist from the literature, and the key to the genera known from Taiwan. In addition, the occurrence of *E. seminivea* in the fluid-preserved collection storage room, as well as the relationship between this species and the fungi they feed on are discussed.

Materials and Methods

Specimens for morphological observation were collected and preserved in 75% alcohol. Colored photographs were taken with a Leica S8 APO stereomicroscope or Zeiss Axioskop 2. Specimens used for SEM photographs had their white waxy exudate removed by first using a minuten pin, were then dried by means of a series of ethanol baths (75%, 95% and 100%),

and were then fixed on the stand and then ion-beam sputter-coated with platinum (Hitachi Model E101). Further observations were made and photos were taken with a scanning electron microscope (Hitachi VP-SEM SU1510). The terminology follows that used by Hartley *et al.* (2007). All specimens were deposited in the NMNS, Taichung, Taiwan.

Results

Annotated checklist of Latridiidae from Taiwan

Subfamily Latridiinae Erichson, 1842

1. *Cartodere (Cartodere) constricta* (Gyllenhal, 1827) (Fig. 3)

Distribution: Cosmopolitan.

Note: This species was caught by Yao *et al.* (2011) in imported brown rice storage facilities, and he mentioned that it might not be a native species.

2. *Eufallia seminivea* (Motschoulsky, 1866) (Figs. 1, 2)

Distribution: Malta, Bermuda, Canada, USA, Mexico, Puerto Rico, Cuba, Japan, Hong Kong, China (Hilburn & Gordon, 1989; Feng *et al.*, 2015; Johnson, 2007), and Taiwan.

Note: A remark and biological note on the description of this species that follows.

Subfamily Corticariinae Curtis, 1829

3. *Corticaria fasciata* Reitt. 1877

Distribution: New Zealand, Russia, Japan, China, Taiwan (Johnson, 2007).

Note: Grouvelle (1913) mentioned that the specimen found in Formosa presented a prothorax shorter than the specimens collected from Japan, but that this character was not sufficient to establish it as a new species. However, the author only listed the collecting locality as Kamagawa, a city in Japan, and no collecting specimen from Taiwan was provided, thus making the record of this species in Taiwan questionable.

4. *Corticarina bhutanensis* Johnson, 1977

Distribution: Bhutan, China, India, Taiwan (Johnson, 2007).

Note: Johnson (1977) mentioned that this species was distributed only in Bhutan, with no further distribution information update since then. Johnson (2007) listed this species



Fig. 1. *Eufallia seminivea*. (A) habitus with waxy exudate; (B) habitus without waxy exudate; (C) male genitalia; (D) corpses collected from fluid-preserved collection storage; (E) skeleton of *Eretmochelys imbricata* with fungi; (F) fungi (pale grey area) and feces (black powder) of *E. seminivea* on the skeleton of *Er. imbricata*.

occurring in Taiwan, but did not provide any information as to the location in order to support its occurrence.

5. *Corticarina clareae* Johnson, 1972

Distribution: Bhutan, China, India, Nepal, Taiwan (Johnson, 2007).

Note: Johnson (1972) mentioned this species as being distributed only in India, with no further distribution information update since then. Johnson (2007) listed this species as occurring in Taiwan, but did not provide any information as to the location to support its occurrence.

6. *Corticarina minuta* (Fabricius, 1792)

Distribution: Belgium, Belarus, Croatia, Russia, Czech Republic, Denmark, Estonia, Finland, France, Great Britain, Georgia,

Hungary, Ireland, Italy, Latvia, Lithuania, The Netherlands, Norway, Poland, Romania, Slovakia, Spain, Switzerland, Ukraine, Canary Island, Afghanistan, Kazakhstan, Mongolia, China, Nearctic Region (Johnson, 2007), and Taiwan.

Note: Grouvelle (1913) listed 2 specimens of *Melanophthalma fuscula* (Gyllenhal) collected from Hoozan (Fengshan, Kaohsiung city), and Rucker (2015) listed this species as a synonym of *Corticarina minuta* (Fabricius).

7. *Corticarina gibbosa* (Herbst, 1793)

Distribution: Azerbaijan, Austria, Belgium, Bulgaria, Belarus, Croatia, Russia, Czech Republic, Denmark, Estonia, Finland, France, Great Britain, Germany, Georgia, Greece, Hungary, Ireland, Italy, Latvia, Liechtenstein,

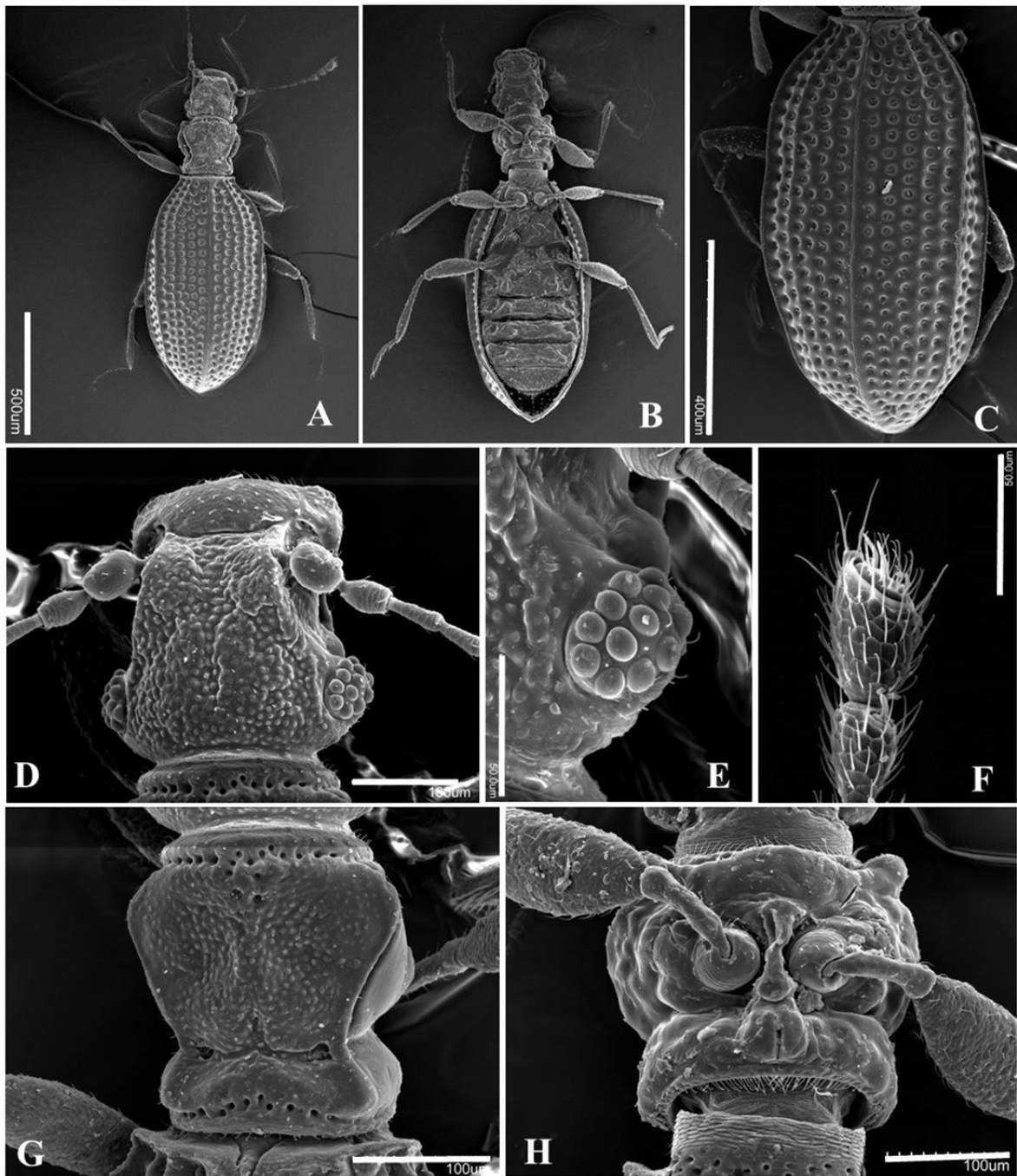


Fig. 2. SEM of *Eufallia seminivea*. (A) habitus, dorsal; (B) ditto; (C) elytra; (D) head, dorsal; (E) head, ventral; (F) last two segments of antenna; (G) pronotum; (H) prosternum.

Lithuania, The Netherlands, Norway, Russia, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine, Afghanistan, Bhutan, China, Japan, Taiwan, India, Mongolia, North Korea, Nepal, Pakistan, Hong Kong, the Afrotropical Region, the Nearctic Region, and the Oriental Region (Johnson, 2007).

Note: Hisamatsu (1965) listed 2 specimens of this species collected from Taiwan, one from Oiwake-Tattaka (Tsui-feng-Sungkang,

Nantou County), and the other from Musha (Wushe, Nantou County).

8. *Melanophthalma* (*Melanophthalma*) *americana* (Mannerheim, 1844)

Distribution: USA, Canada, Taiwan (Cotton and Good, 1937; Majka *et al.*, 2009).

Note: Grouvelle (1913) listed 2 specimens of *M. americana* collected from Hoozan (Fengshan, Kaohsiung city). Cotton and Good (1937) mentioned that this species was distributed in Taiwan, and found in flour

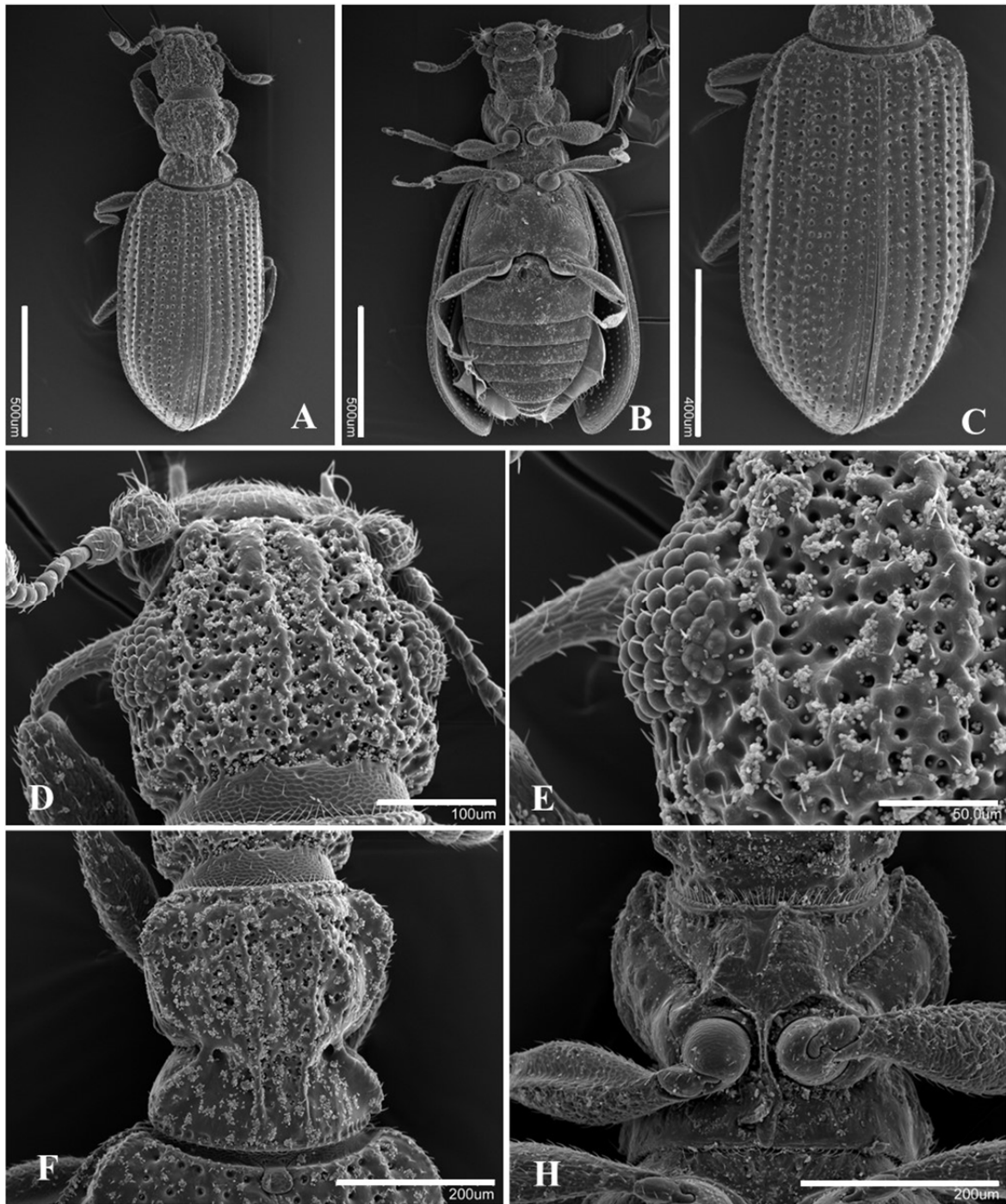


Fig. 3. SEM of *Cartodere (Cartodere) constricta*. (A) habitus, dorsal; (B) ditto; (C) elytra; (D) head, dorsal; (E) head, ventral; (F) pronotum; (G) prosternum.

mills in Virginia. Johnson (2007) listed this species in a synonymy under *Corticarina minuta* (Fabricius). However, Majka *et al.* (2009) designated lectotype and paralectotypes of *M. americana* (Mannerheim), and R cker (2015) also treated it as a valid species, and therefore, we listed this species here.

Key to the genera of Latridiidae known from Taiwan

1. Head usually with a longitudinal furrow medially; procoxae divided by a prosternal process; lateral margin of pronotum usually parallel or constricted behind the middle; elytra often with carinations; some species with head and thorax covered by a waxy exudate**Subfamily Latridiinae. 2**

- Head without a furrow medially; procoxae contiguous, not divided by a prosternal process; pronotum nearly rounded and toothed; elytra without carinations; head and thorax not covered by a waxy exudate **Subfamily Corticariinae. 3**
- 2. Antennae 11-segments with two-segmented club; eyes well developed, distinct, facets more than 20, trochanter short, less than four times longer than wide **Cartodere**
- Antennae 11-segments with three-segmented club; eyes small, facets less than 20, trochanter four times longer than wide **Eufallia**
- 3. Mentum and submentum not fused; pronotum with transverse impression near the base; first abdominal ventrite with two diverging coxal lines **Melanophthalma**
- Mentum and submentum fused; pronotum without above impression; first abdominal ventrite without coxal lines **4**
- 4. Pronotum with an angulate projection at posterior angles; first metatarsomere produced ventrally, extended nearly to apex of second tarsomere; female with six abdominal ventrites **Corticarina**
- Pronotum obtuse at posterior angles or slightly denticulate at lateral margin; first metatarsomere not produced ventrally; female with five abdominal ventrites **5**
- 5. Pronotum with lateral margins slightly curved, obtuse at posterior angles; male with five abdominal ventrites; first metatarsomere longer than second tarsomere... **Corticaria**
- Pronotum with lateral margins usually round and finely denticulate; male with six abdominal ventrites; prosternum with fovea anterior to coxa; elytra oblong oval, convex, near middle with a transverse band **Corticaria**

Morphology

Genus *Eufallia* Muttkowski 1910, New to Taiwan

Belonia Fall, Trans. Am. Ent. Soc. 1899: 142.

Eufallia Muttkowski, Bull. Wisconsin Nat. Hist. Soc. 1910: 162.

Diagnosis. Eyes reduced, with fewer than 20 facets, antennae long and slender, 11 segments with three-segmented club; elytra fused; legs with remarkable elongate, cylindrical trochanters,

trochanters four times longer than wide; tarsi three tarsomeres, last tarsomere much longer than others.

Remark: This genus was first discovered from Taiwan. To date there are only two species, *E. seminivea* and *E. africanus*, recorded in this genus worldwide (Rücker, 2015).

***Eufallia seminivea* (Motschoulsky, 1866) (Figs. 1, 2)**

Aridius seminiveus Motschulsky, Bull. Soc. Nat. Mosc. 1866: 265.

Cartodere unicastata Belon, Rev. Ent. Fr. 1887: 225.

Belonia unicastata (Belon): Fall, 1899: 142.

Eufallia unicastata (Belon): Hoffman, 1940: 810; Tanaka & Tahira, 1995: 37.

Eufallia seminiveus (Motschoulsky): Leng, 1920: 208; Hilburn & Gordon, 1989: 685; Feng *et al.*, 2015: 45.

Eufallia seminivea (Motschoulsky): Parsons, 1969: 15; Rücker, 2015: 6.

Description: Length: 1.01-1.63 mm. Width: 0.33-0.56 mm. General body yellowish brown (Fig. 1A, B), eyes black, head and thorax reddish brown, antennae, elytra, and legs yellowish brown. Body (Figs. 1A, B, 2A) elongate and glabrous, rounded at apex. Head and thorax often covered with whitish waxy exudate (Fig. 1A), sometimes extending to abdominal segments. Head (Fig. 2D) longer than wide, narrower than pronotum, surface bumpy irregularly, shallowly impressed medially; clypeus broad, impunctate, pubescent, narrower than width of head; eyes (Fig. 2D, E) small, strongly convex, 13 facets coarsely separated; tempora about one-half length of eye; hind angles nearly straight; antennae 11 segments, with a three segmented club, distant from the eyes, reaching posterior of pronotum, antennomere I ellipsoidal, longer than wide, II elongate-oval, slightly little narrower than I, III-VIII nearly filiform, all longer than wide, IX-XI form club, elongate trapezoid, each with sensilla at apex (Fig. 2F), IX two time longer than wide, X shorter than IX, XI wider than IX-X. Pronotum (Fig. 2G) longer than wide, nearly same width as head including the eyes, surface bumpy, narrower than elytra, lateral margins marginate, widest at anterior

quarter, constricted at posterior quarter, posterior pronotal fovea distinct, located on narrowest part near margins, connected by a shallow transverse impression, with punctures along with anterior and posterior margin transversely; procoxae (Fig. 2H) narrowly separated; distance between mesocoxae slightly wider, metacoxae much widely separated, trochanters elongate, cylindrical, four times longer than wide, tarsi 3-3-3, apical tarsomere longer than other 2 combined. Scutellum small, distinct. Elytra (Fig. 2C) fused, elongate-oval, slightly concave before middle, broader than thorax, narrowest at base and rounded at apex, humeri small, rectangular, eight longitudinal puncture striae, only five puncture striae visible from dorsal view, interstriae between five and six strongly carinate, striae interspaces narrow, glabrous, epipleuron complete, narrowing apically; metathoracic wings lacking. Undersurface subglabrous (Fig. 2B); mentum (Fig. 2H) with punctures scattered, submentum impunctate; mesosternum with punctures anteriorly, metasternum shorter than abdominal ventrite I, with transverse arched groove anterior to metacoxae; ventrite I much longer than other abdominal ventrites, ventrites II-V with a deep anterior groove extending nearly to lateral margin. Aedeagus as figure (Fig. 1C).

Remark: Both species of Latridiinae, *E. seminivea* and *C. constricta* (Fig. 3) occur in an indoor environment. This species differs from *C. constricta* as follows: head in dorsal view rugose (Fig. 2D) without dense punctures (Fig. 3D), eyes distant from antennae (Fig. 2D, 3D), with fewer large facets (Fig. 2E) than *C. constricta* (Fig. 3E), humeri rectangle (Fig. 2C) not slightly curved (Fig. 3C), trochanter four times longer than wide (Fig. 2H, 3G), and *C. constricta* without waxy exudate as *E. seminivea* (Fig. 3F).

Material examined: TAIWAN: TAICHUNG: NMNS, exhibition hall, 1 ♀, 13-VIII-2012, M. L. Chan, on wooden material; fluid-preserved collection storage, over 100 ♂ 100 ♀ (corpses on emergency light), 23-III-2014; 3 ♂ 8 ♀, 23-IV-2014; 10 ♂ 14 ♀, 10-VI-2014; 22 ♂ 27 ♀, X-2014; 63 ♂ 36 ♀, 15-XI-2014; 2 ♂ 4 ♀, 20-I-2015, M. L. Chan. TAINAN: Nanhua Junior high school (NHJH), 7 ♂ 3 ♀, 20-I-2016, M. L. Chan & C. M. Jang, on skeleton of hawksbill turtle (*Eretmochelys*

imbricata (Linnaeus)).

Biological Notes

Adults of *E. seminivea* first found in fluid-preserved collection storage were attracted to the emergency light, and often gathered around the light. Latridiids could be found on walls, shelves, cartons etc., and were also observed climbing up on the wall. Waxy exudate of adults could be found on head, thorax, and even ventral abdomen. Sometimes, the thickness of waxy exudate of adults is about that of their body. The function of the waxy exudate remains unknown, but it might be related to the condition of the nutrient (first author, personal observation). Adults found on *Er. imbricata* fed on *Aspergillus* fungi growing on the skeleton, resulting in a seemingly huge amount of fecal matter (Figs. 1E, F).

Discussion

Hoffman (1940) reported that this species was found in Puerto Rico on the walls of rooms painted with casein paint, and the larvae and adults fed on the fungi growing on the paint. Parson (1969) described three persons in one family in Florida that were bitten by *E. seminivea* resulting in pea-sized red papules, but he also mentioned that actually only one of the beetles was discovered on the skin surface and that the people involved were not conscious of being bitten. Without direct evidence that the papules were caused by bites from *E. seminivea* made the presumption questionable. When collecting, we were never being bitten by these creatures. Hilburn and Gordon (1989) found *E. seminivea* in wicker baskets, and reported it as being new to Bermuda but not established yet. Tanaka and Tahira (1995) pointed out that this species was found on a bamboo basket imported from China and was new to Japan, however there was no record of this species in China. Feng *et al.* (2015) reported this species discovered in China as a new record and mentioned that hundreds of specimens of *E. seminivea* had been observed in a newly decorated room, where they found that some of the wood of the ceiling was covered with fungi. This is quite similar to the situation in Taiwan.

Fluid-preserved collections generally do not suffer from pest problems, their presence

indicates that the storage area environment needs to be improved (Simmons, 1999). Although the occurrence of *E. seminivea* may not directly result in any damage to the collection, it may increase the number of predators or parasites as well as detritus feeders, and cause a hygiene problem. At the NMNS the fluid-preserved collection storage is located underground, with the temperature being kept between 22~25°C, and with a relative humidity of 55~70%, which is neither hot nor very humid comparing the annual average relative humidity in Taiwan. The light turns on only when there is staff working there. What makes this environment a great place for *E. seminivea* to live needs further study.

The skeleton of *Er. imbricata* was covered with plenty of *Aspergillus* sp. mold and feces of *E. seminivea*. However, *Penicillium brocae* was isolated from the feces of *E. seminivea* collected from the fluid-preserved collection storage (Wang and Chan, 2015) indicating a close relationship between *E. seminivea* and *Penicillium*. Do *Aspergillus* and/or *Penicillium* provide the main nutrients for the development and growth of *E. seminivea*? More evidence is required to confirm this hypothesis.

Acknowledgments

The authors would like to thank Dr. Mei-Chi Yao and Dr. Chung-Hsiang Chang for kindly offering the latridiid specimens for our study. We also thank Dr. Yei-Jen Wang for her identification of the fungi on the skeleton of *Er. imbricata*, and Dr. Chi-Feng Lee for his advice. Finally, the authors wish to express their sincerest appreciation to the two anonymous reviewers and editor for their constructive comments and corrections.

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一種姬薪蟲科之新記錄種及其發生記述

詹美鈴*、李坤瑄

國立自然科學博物館生物學組 40453 台中市北區館前路 1 號

* 通訊作者 email: meiling@mail.nmns.edu.tw

收件日期：2016 年 11 月 7 日 接受日期：2016 年 12 月 14 日 線上刊登日期：2017 年 3 月 6 日

摘 要

姬薪蟲科為菌食性昆蟲，成蟲與幼蟲皆以真菌孢子為食。在臺灣迄今尚無任何針對姬薪蟲科進行全面性的分類調查與生物學研究。長轉姬薪蟲屬 (*Eufallia*) 與半白長轉姬薪蟲 (*Eufallia seminivea* (Motschulsky, 1866)) 為首次記錄於臺灣。本文提供姬薪蟲科之名錄、屬檢索表、和半白長轉姬薪蟲成蟲形態與電子顯微構造描述，以及在博物館浸液標本庫發生之記述。

關鍵詞：姬薪蟲科、半白長轉姬薪蟲、新記錄種、名錄、浸液標本庫