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Description of *Lucanus yulaoensis* sp. nov. a new species stag beetle from northern Taiwan (Coleoptera, Lucanidae)

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Keywords:

Coleoptera; *miwai*;
Lucanidae; taxonomy;
Lucanus; new species;
yulaoensis; Taiwan.

Abstract. – A new species is described in Taiwan: *Lucanus yulaoensis* sp. nov. This is the tenth species of *Lucanus* in Taiwan, and the fourth species having diurnal flight behavior in northern Taiwan.

Lin J.-Z., 2021. – Description of *Lucanus yulaoensis* sp. nov., a new species stag beetle from northern Taiwan (Coleoptera, Lucanidae). *Faunitaxys*, 9(2): 1 – 5.

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Introduction

About 9 taxa of the genus *Lucanus* Scopoli, 1763 are known from Taiwan so far including as listed (Wang & Ko, 2018):

- *Lucanus swinhoei* Parry, 1874;
- *Lucanus formosanus* Planet, 1899;
- *Lucanus taiwanus* Miwa, 1936;
- *Lucanus kanoi* Kurosawa, 1966;
- *Lucanus miwai* Kurosawa, 1966;
- *Lucanus datunensis* Hashimoto, 1984;
- *Lucanus ogakii* Imanishi, 1990;
- *Lucanus kurosawai* Sakaino, 1995;
- *Lucanus chengyuani* Wang & Ko, 2018.

Unexpectedly, the species that used to be thought of as *L. miwai* in northern Taiwan actually is a new species. The author has always questioned the discontinuous distribution of the two origins of *L. miwai* and there are obvious differences in characteristics, but they are regarded as the same species. Therefore, the specimens from two places of origin were examined and compared for diagnosis. In the present paper, a new species, *Lucanus yulaoensis* sp. nov., is described and illustrated from Hsinchu County, northern Taiwan. Its diagnosis from congeneric species is provided. And the new species is compared to the related species, *L. miwai* with some selected but important morphological characters which are illustrated with color plates.

The type specimens are deposited in the following public and private collections:

- **ACT**: Academia Sinica, Taiwan;
- **JZLT**: Private collection of Jing-Zhi Lin, Taipei, Taiwan;
- **FLYT**: Private collection of Fu-Lin Yang, Taipei, Taiwan.

Materials and methods

In total, 59 specimens were studied (all wild-collected). The holotype of *Lucanus miwai* is in Japan, but it can not be inspected because of the epidemic situation (COVID-19). Therefore, this

study uses the photos of holotype in the original published literature of *Lucanus miwai* and all the samples from the same origin of holotype for comparison. The specimens were examined through naked eye observation, or/and with a stereomicroscope. Specimens were relaxed and softened in hot water for 24 hours, and then transferred to distilled water to clean. Dissection of male genitalia was made by extraction with forceps through an aperture between tergite VI and the propygidium. The parameters were then glued on a card and pinned below the specimens. Each specimen of the type series of the new species bears a red label: "*Lucanus yulaoensis* sp. nov. / [Holotypus] Paratypus / Lin. The morphological terminology follows Fujita (2010) and Huang & Chen (2010, 2013, 2017).

Measurement criteria in millimetres (mm) are as follows:

- **Body length**: length between the apex of mandible and the elytral apex along the midline;
- **Pronotal width**: widest part of pronotum;
- **Elytral width**: widest part of both elytra combined;
- **Elytral length**: length between the basal border and the apex of elytra along suture;
- **Head width**: widest part of head (including eyes);
- **Mandible length**: length from the apex of mandible to its base;
- **Pronotal length**: length of the pronotum along the midline;
- **Head length**: length between the anterior apex of clypeus and the posterior margin of occiput along the midline.

Results

Genus *Lucanus* Scopoli, 1763

(Chinese vernacular name: 深山鍬形蟲屬)

Lucanus yulaoensis sp. nov.

(Chinese vernacular name: 宇老深山鍬形蟲)

(Fig. 1)

ZooBank : <http://zoobank.org/7A0A6D6A-22EA-4B3D-84C8-2809EDD73DD1>

Holotype, ♂ (ACT): Taiwan, Hsinchu County, Jianshi Township, Yulao [尖石鄉宇老], 1450 m, 15. IV. 2013, J.-Z. Lin leg.

Paratypes (27 ex.)

- 4 ♂♂ (JZLT), same data as holotype;
- 19 ♂♂ (JZLT), Hsinchu County, Jianshi Township, Yulao, 1450 m, 05-19. IV. 2020, J.-Z. Lin leg.;
- 2 ♂♂ (FLYT), Hsinchu County, Jianshi Township, Yulao, 1400 m, 23. IV. 2004, F.-L. Yang leg.;
- 1 ♀ (FLYT), Hsinchu County, Jianshi Township, Yulao, 1400 m, 19. IV. 2003, F.-L. Yang leg.;
- 1 ♀ (JZLT), Hsinchu County, Jianshi Township, Yulao, 1450 m, 19. IV. 2020, J.-Z. Lin leg.

Description and diagnosis**Dimensions** (mm).

– **Holotype** (Fig. 1), size small for the genus.

Total length, 33.2;

Length of different body parts:

- Head, 3.7;
- Mandible, 6.8;
- Pronotum, 5.2;
- Elytra, 11.4;

Width:

- Head, 8.1;
- Pronotum, 8.6;
- Elytra, 9.8.

Paratypes

♂♂, total length: 26.5-32.6;

♀♀, total length: 24.5-28.0.

Coloration. – Head reddish dorsally, reddish ventrally but reddish brown in the middle. – Mandible red dorsally and ventrally, but reddish brown at base. – Clypeus reddish. – Pronotum red. – Prosternal process red with dark brown longitudinal carina medially. – Elytra reddish brown, with black lateral margins. – Scutellum red. – Prosternum black with prosternal process red with dark brown at base. – Mesosternum red. – Legs black with yellow markings. – Abdominal ventrites red.

Head. – Transverse, twice as wide as long, widest at margins of eyes, nearly as wide as pronotum, laterally ridged. – Mat, finely, densely granulate-punctate, covered by sparsely appressed yellowish pubescence. – Anterolateral cephalic angles moderate protruding. – Ocular canthus lateral process short and narrow, less than one third as long as eye's diameter. – Mandible feebly shining, short, moderately robust, gradually curved from base to apex; distinctly punctate proximally and dorsally, sparsely punctate distally and dorsally, with densely erect yellowish hairs basally; evenly punctate ventrally; proximal 1/2 with a small and weak basal tooth; with 3-4 irregularly small inner denticles distally. – Mandible for weakly developed, upper apical tooth longer than lower apical tooth.

Elytra. – Shining, finely and moderately densely punctate, microreticulate, coated with sparse yellowish pubescence.

Legs. – Protibia with 5 spines laterally and 1 spur at apex. – Mesotibia with 4 spines and 2 spurs at apex. – Metatibia with 3 spines laterally and 2 spurs at apex.

Abdomen. – Abdominal pleurite IX (Fig. 5E) narrowly separated dorsally; abdominal sternite IX (Fig. 5D).

Genitalia ♂ (Fig. 5A-C). – With transverse membranous area in the lateral of the basal part. – Median lobe markedly wider, nearly two thirds as long as parameres.

Etymology. – The name of the new species is indicating the collecting site, Yulao of Taiwan. It comes from a special term of the Atayal people in Taiwan, meaning "saddle of a hill".

Distribution. – This new species is known only from Taiwan.

Field observations. – Mating of *Lucanus yulaoensis* sp. nov. in, Jianshi Township, Yulao (Taiwan) as shown in (Fig. 6).

Remarks.

– The habitats of *L. yulaoensis* sp. nov. and *L. miwai* are discontinuous and the altitude is obviously different. The *L. yulaoensis* sp. nov. is distributed in Yulao, Hsinchu County north Taiwan (1450 m), while *L. miwai* is in Songgang, Nantou County central Taiwan (2044 m). In external features so far this new species has been found only in northern Taiwan, like the other three Taiwan species *L. miwai*, *L. datunensis* and *L. chengyuani* (Wang & Ko, 2018).

– This new species also has diurnal flight behavior. This is the fourth record of diurnal *Lucanus* species in Taiwan. The habitat which males appear is the open area in the forest with some miscellaneous trees and herbaceous plants. During the monsoon season in April in Hsinchu. So far it has not been observed to be attracted to light traps.

– So far, adult in the field observations not recorded feeding behavior.

– The males of this new species are rather similar to *Lucanus miwai* (Kurosawa, 1966). In the past, both were considered to be the same species, but by the following combination of external morphological characters can distinguish different.

Male characteristics (Fig. 2).

- Body rather stout and less elongate, shining reddish colour;
- Mandibles flattened, strongly incurved at about middle with a blunt protuberance just behind the tip;
- Elytra shining reddish, less elongated;
- Base pronotum- elytral humeru width obviously narrower than *L. miwai*;
- Apical fork of male mandible more obvious, with lower branch markedly longer than in *L. miwai*, in the same sized males;
- Major tooth of mandible markedly more flattened and shorter and connected inner margin of male mandible with the series of denticles so continuous not like an interrupted by apparent gap as in *L. miwai*;
- Pubescence shorter and denser on both sides of the entire body; shorter than in *L. miwai*;
- Clypeolabrum constantly longer, top more flatted;
- Pronotum more densely and stronger punctured, more shining;
- Posterior angles of pronotum more smoother;

Female characteristics (Fig. 4)

- Reddish colour elytra and dark reddish prothorax (characteristics very stable);
- Mandible and pronotum different from *L. miwai* (Fig. 4);

Key to the males of *Lucanus miwai* and *L. yulaoensis* sp. nov.

1. Mandible without an apical fork. Clypeolabrum brown with dark brown margin; transverse apically *L. miwai* Kurosawa, 1966
- Mandible have apical fork. Clypeolabrum reddish with dark brown margin; Posterior angles of pronotum more smoother *L. yulaoensis* sp. nov.

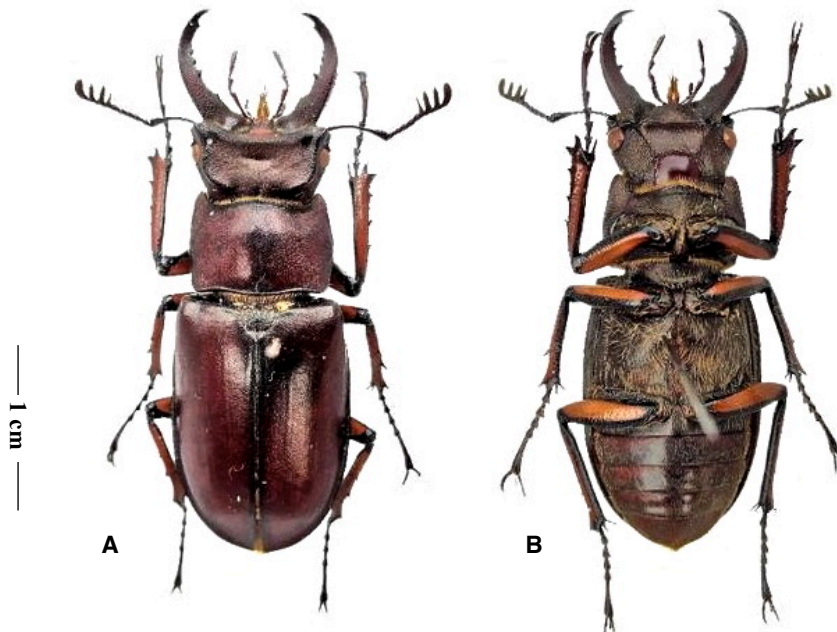


Fig. 1. Habitus of *L. yulaoensis* sp. nov., holotype (33.2 mm), dorsal (A) and ventral (B) view.

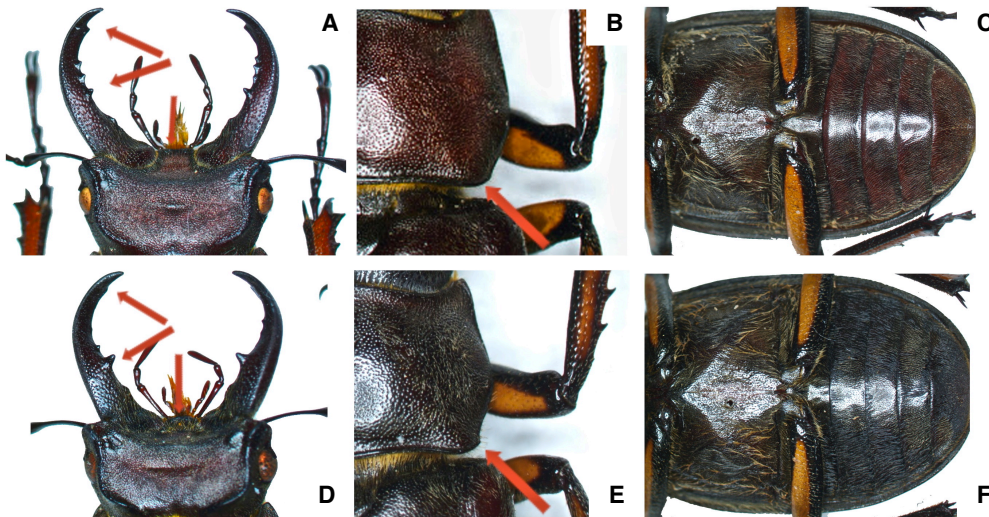


Fig. 2. Comparison of male *L. yulaoensis* sp. nov. & *L. miwai* habitus at the same scale with some parts enlarged (red arrows directed to important characters).

A-C) *L. yulaoensis* sp. nov.: A) Mandible; B) Pronotum; C) Abdomen underside.

D-F) *L. miwai*: D) Mandible; E) Pronotum; F) Abdomen underside.

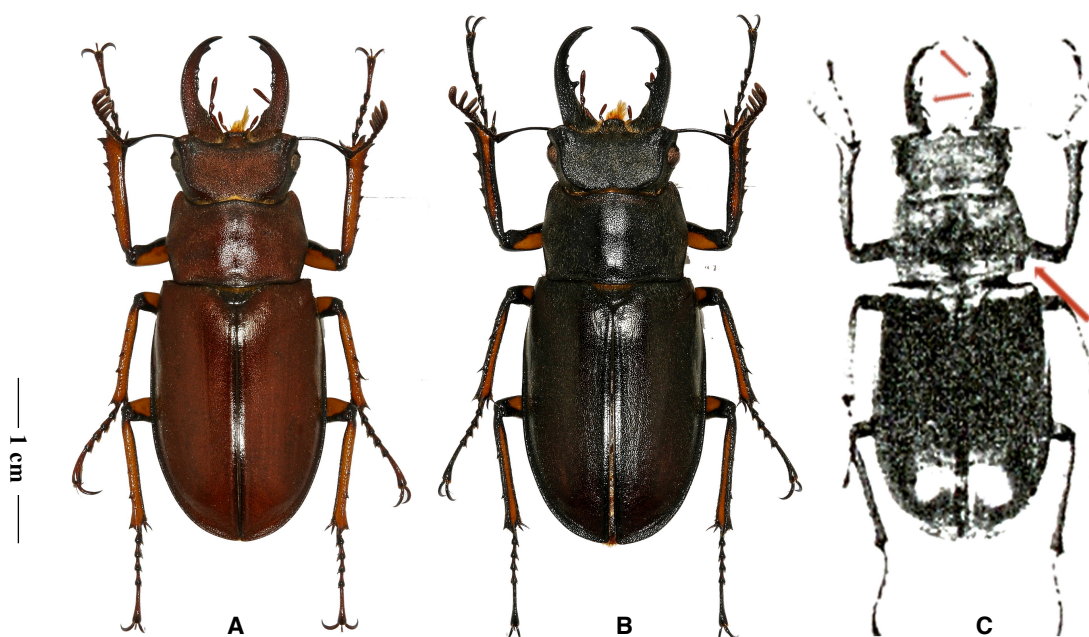


Fig. 3. Male habitus, dorsal view (red arrows directed to important characters).

A) *L. yulaoensis* sp. nov., paratype (30 mm); B) *L. miwai* (31 mm); C) *L. miwai*, holotype (30 mm) (after Kurosawa, 1966).

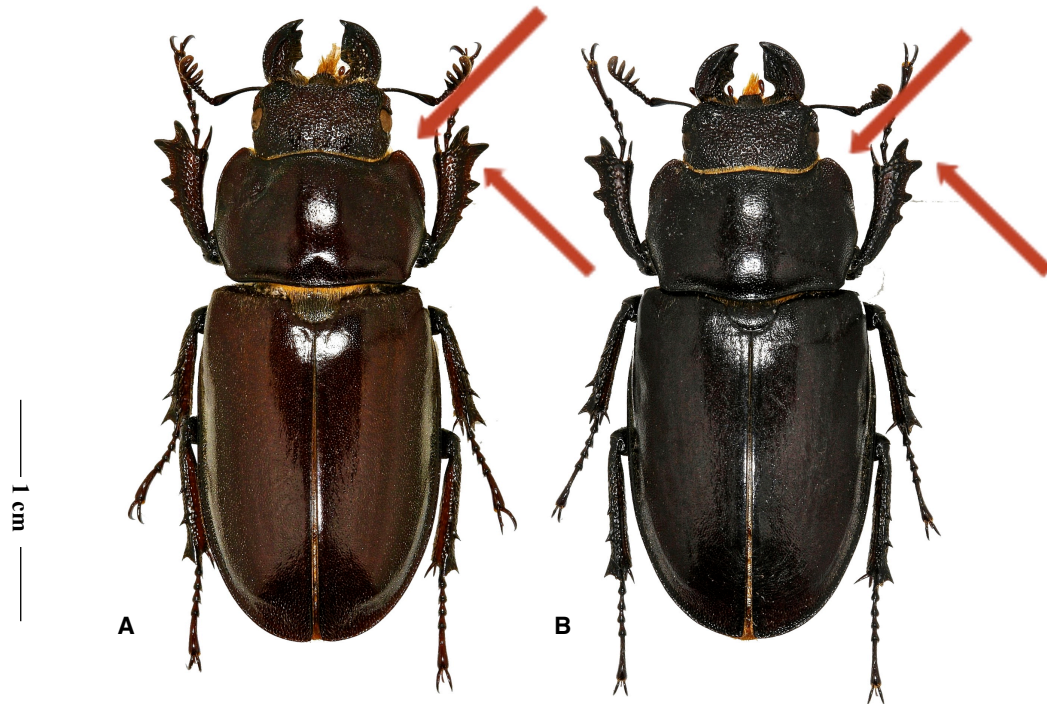


Fig. 4. Female habitus, dorsal view (red arrows directed to important characters).
 A) *L. yulaoensis* sp. nov., paratype (28 mm); B) *L. miwai* (27 mm).



Fig. 5-1. *L. yulaoensis* sp. nov., holotype. A-C) Male genitalia: A) Ventral; B) Dorsal; C) Lateral. D-E) Abdominal segment IX: D) Ventral; E) Dorsal.

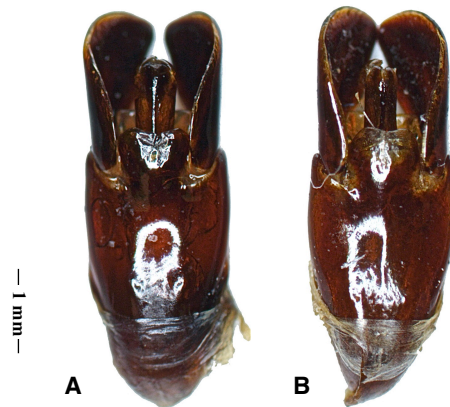


Fig. 5-2. A-B) Male genitalia, dorsal view: A) *L. yulaoensis* sp. nov., holotype; B) *L. miwai*. The new species median lobe of male genitalia is markedly wider.

- *Pronotum* with lateral margin entirely different from that of *L. miwai*, the new species less broadly rounded at anterior third than in *L. miwai*;
- More expanded *apex* of the *protibia*;
- *Elytra* more luster and brighter.

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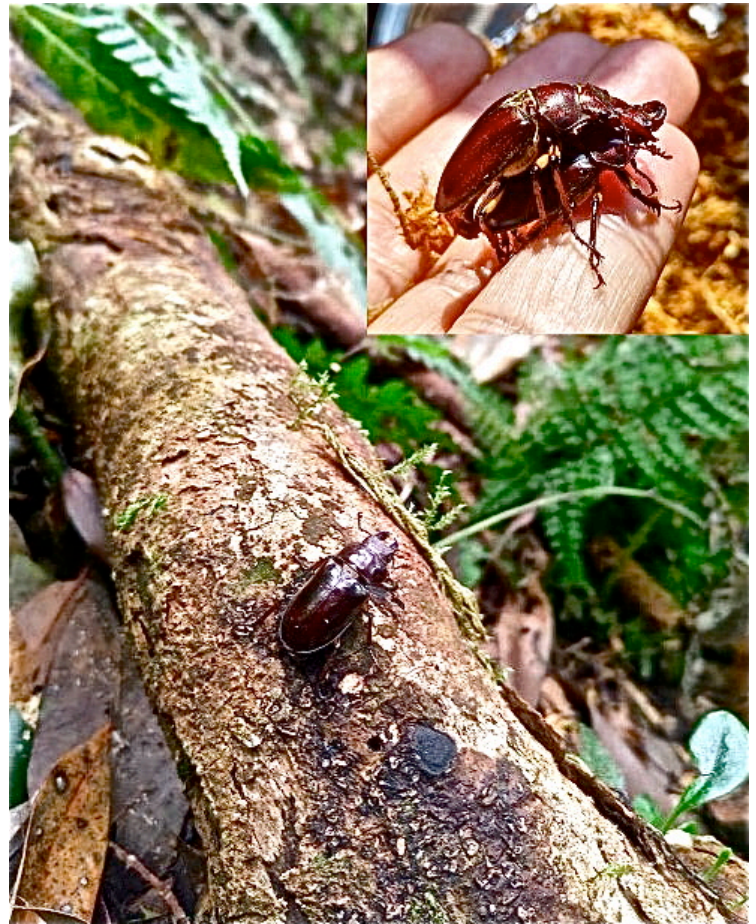


Fig. 6. Field observations (Taiwan, Hsinchu County) of the mating behavior of *L. yulaoensis* **sp. nov.**

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Résumé

Lin J.-Z., 2021. – Description de *Lucanus yulaoensis* **sp. nov.**, un nouveau lucane du nord de Taiwan (Coleoptera, Lucanidae). *Faunitaxys*, 9(2): 1 – 5.

Une nouvelle espèce est décrite de Taiwan: *Lucanus yulaoensis* **sp. nov.** C'est la dixième espèce connue du genre *Lucanus* de Taiwan, et la quatrième espèce au comportement diurne du nord de Taiwan.

Mots clés. – Coleoptera, Lucanidae, *Lucanus*, *yulaoensis*, taxonomie, nouvelle espèce, Taiwan.

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Illustration de la couverture : Habitat of *L. yulaoensis* **sp. nov.**. A typical Machilus-Castanopsis zone, Taiwan, Hsinchu County, 1450 m.

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