Far Eastern Entomologist

Number 451: 19-28 ISSN 1026-051X (print edition) ISSN 2713-2196 (online edition) March 2022

https://doi.org/10.25221/fee.451.4
http://zoobank.org/References/C32BE046-9542-4634-B64A-CC00A5A7985D

A NEW SPECIES OF THE GENUS *NIGIDIUS* MACLEAY (COLEOPTERA: LUCANIDAE) FROM THE GREEN ISLAND, EASTERN TAIWAN

J.-Z. Lin

2F., No. 3, Aly. 152, Ln. 68, Yangguang St., Neihu Dist., Taipei City 114, Taiwan (R.O.C.).
E-mail: leslie9562@gmail.com

Summary. *Nigidius wushuae* **sp. n.** described from the Green Island (Eastern Taiwan). New species belongs to *Nigidius distinctus* species group. The new species is similar to *N. lewisi* Boileau, 1905 and *N. lohi* Kawahara, Toguchi et Ochi 2019 but differs from both species in the shape of pronotum and female genitalia. Diagnostic characters of *Nigidius distinctus* species group are illustrated, compared, and a key to species is provided.

Key words: stag beetles, taxonomy, new species, key, Green Island, Taiwan, East Asia.

И. Ж. Линь. Новый вид рода *Nigidius* MacLeay (Coleoptera: Lucanidae) с острова Зеленый, восточный Тайвань // Дальневосточный энтомолог. 2022. N 451. С. 19-28.

Резюме. С острова Зеленый (Восточный Тайвань) описан *Nigidius wushuae* Lin, **sp. n.** Новый вид относится к группе видов *Nigidius distinctus* и наиболее близок к *N. lewisi* Boileau, 1905 и *N. lohi* Kawahara, Toguchi et Ochi 2019, но отличается от них формой переднеспинки и гениталий самки. Диагностические признаки видов группы *Nigidius distinctus* сравнены и иллюстрированы; предложена определительная таблица этих видов.

INTRODUCTION

The genus *Nigidius* MacLeay, 1819 (Lucaninae: Figulini) consists of 89 robust species with indistinct sexual dimorphism and, unusually for stag beetles, with both sexes having a strong dorsal ramus or branch on each mandible that is more typically restricted to males of other genera. It is difficult to distinguish males and females by solely using the external morphology without checking genitalia. In majority subfamilies of Lucanidae, the female genital character is one of the species diagnoses, and it should also be beneficial to identify each species within related congeners of the tribe Figulini (Ochi *et al*., 2019; Paulsen, 2018; Holloway, 2006; Fujita, 2010).

Members of the *Nigidius distinctus* species group can be readily separated from other Southeast Asian *Nigidius* species by a deeply emarginate canthus. This group includes *N. distinctus*, *N. lewisi*, *N. lohi*, and *N. sinicus*. The specimens collected in Taiwan's main island and Green Island has been identified as *N. lewisi* (Chang, 1993; Tanikado, 1993; Mizunuma & Nagai, 1994; Fujita, 2010), a species described from Ryukyu Islands in Japan (Boileau, 1905). Recently *N. lohi* was described from Taiwan's main island based on the differences in female genitalia and external characteristics (Ochi *et al*., 2019). However, the specimens from

Green Island was not dissected and examined by Japanese researchers. A new species of *Nigidius* from Green Island is described and illustrated below. A key to the *Nigidius distinctus* species group is also provided.

MATERIAL AND METHODS

In total, 64 specimens of the genus *Nigidius* were studied including 45 type specimens of a new species. The specimens were examined with a stereomicroscope. Specimens were relaxed and softened in hot water for 12 hours, and then transferred to distilled water to clean. Dissection of genitalia was made by extraction with forceps through an aperture between tergite VI and the propygidium. In order to examine the genitalia, the abdomen was detached and treated with a 10% solution of potassium hydroxide for 36 hours, then transferred to distilled water to flush the remaining KOH and stop any further bleaching and use alcohol to dehydrate. The parameters were then glued on a card and pinned below the specimens.

Specimens studied are deposited in the following collections: Biodiversity Research Museum, Academia Sinica, Taiwan (ASIZHX); National Museum of Nature and Science, Tokyo, Japan (NMNS); Muséum national d'Histoire naturelle, Paris, France (MNHN), the private collections of Jing-Zhi Lin, Taipei, Taiwan (JZLT), Wen-I Chou, Taitung, Taiwan (WICT), and Zhihong Zhan, Wisconsin, USA (CZZHM).

The morphological terminology follows Huang & Chen (2017) and Ochi *et al*. (2019). In *Nigidius* species, the dorsal ramus of the mandibles could give false total length measurements if confused with the true mandibular apex, therefore lengths given are measured from the apex of the clypeus to the elytral apex. The greatest width is measured across the pronotum.

TAXONOMY

Subfamily Lucaninae MacLeay, 1819

Tribe Figulini Burmeister, 1847

Genus *Nigidius* Macleay, 1819

***Nigidius wushuae* Lin, sp. n.**

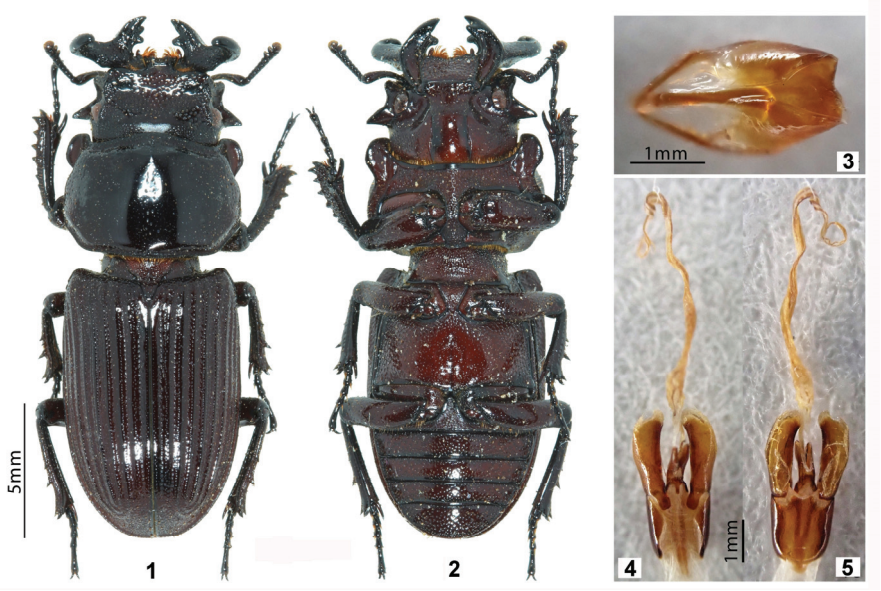
http://zoobank.org/NomenclaturalActs/939E58E2-6B05-4C44-BECB-C9F1E5018561

Figs 1–5, 13–15, 24, 27, 30, 31

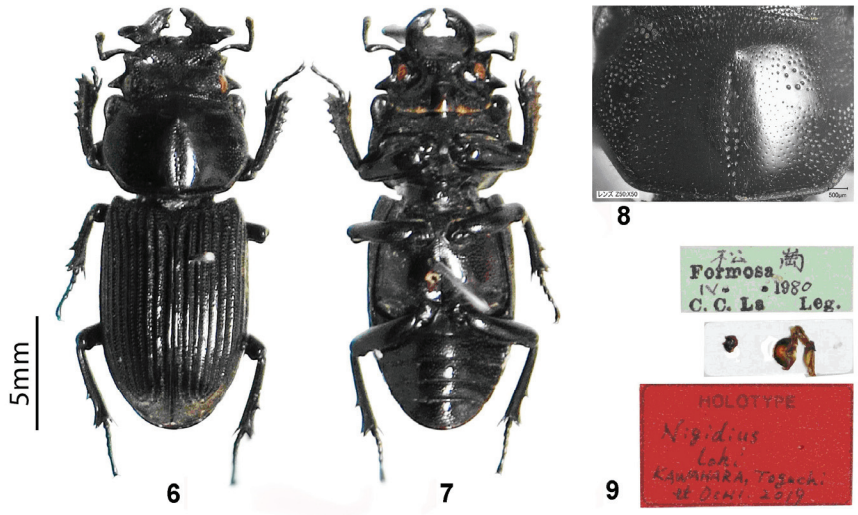
TYPE MATERIAL. Holotype: ♂, **Taiwan**: Taitung County, Green Island, 180 m, 15.IX 2021, leg. J.-Z. Lin (ASIZHX). Paratypes: 10♂, 2♀, same data as the holotype (JZLT); Taitung County, Green Island, VIII 2008, 9♂, 1♀, leg. T.-H. Hou (JZLT).

MATERIAL USED FOR COMPARISON. ***Nigidius lohi* Kawahara,Toguchi et Ochi 2019**: Taiwan: Pingtung County, Shouka, 500 m, 02.II 2018, 2♀, leg. Y.-F. Tsai (JZLT); Kaohsiung, Tengzhi, 1300 m, VIII 1992, 1♀, leg. K.-H.Yeh, det. W.-Y. Chou (WICT); Taitung County, Nanhui, 460 m, 19.VI 2019, 1♂, leg. S.-C. Yu; Pingtung County, Mt. Dahan, 1100 m, 12.VII 2017, 1♂, leg. J.-Z. Ling; Chiayi County, Alishan Township, 1220 m, 11.VI 2019, 1♂, leg. J.-Z. Ling; Hualien County Fuli Township, 800 m, 20.VII 2017, 1♀, leg. J.-Z. Ling (JZLT). ***Nigidius lewisi* Boileau, 1905**: Japan: Okinawa Prefecture, Nago City, 120 m, 21.VII 2020, 17♂, 3♀, leg. local collector (JZLT). ***Nigidius sinicus* Schenk, 2011**: China: Guangdong Province, Guangzhou City, 80 m, 16.VI 2021, 1♂, leg. local collector (CZZHM); Hong Kong, 05.VII 2011, 2♂, 1♀, leg. local collector (JZLT). ***Nigidius distinctus* Parry, 1873**: China: Yunnan Province, Yingjiang County, Mangyun, 1200 m, 26.VII 2019, 1♂, leg. local collector (CZZHM).

DESCRIPTION. Male (holotype). Length: 20.2 mm (including mandibles). Width: 6.6 mm. Body strongly convex dorsally, cylindrical and fairly elongate; dorsal and ventral surfaces strongly polished. Color piceous black; legs and antennae also black, though club segments of the somewhat reddish.

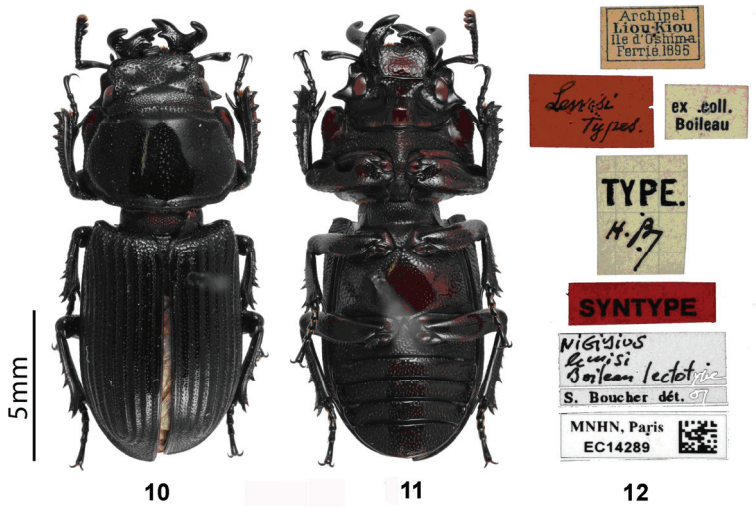


Figs 1–5. *Nigidius wushuae* sp. n. 1 – male holotype, habitus, dorsal view; 2 – the same, ventral view; 3 – abdominal segment IX, dorsal view; 4 – aedeagus, ventral view; 5 – the same, dorsal view.



Figs 6–9. *Nigidius lohi*, holotype. 6 – habitus, dorsal view; 7 – the same, ventral view; 8 – pronotal punctation; 9 – labels. (Photo by Shuhei Nomura, NMNS).

Head punctate, punctures with long setae anteriorly; transversely quadrate in general appearance; clypeus bi-arcuate and distinctly separated by a transverse carina whose basal portion is fairly broadly quadrate, rather long, *ca*. 0.3 mm length. Eyes: canthus well developed, strongly concave at middle, with anterior corner slightly produced outward as an angular lobe and posterior one very strongly produced outward as a fairly sharply pointed projection, *ca*. 1.2 mm width. Mandibles shorter than head, simply formed at postero-basal portion, with an upright process which is simply formed and without an implicit inner tooth, evenly and circularly incurved, and rounded distally; left mandible with two small obtuse teeth below and above at middle of inner margin, right one bearing a small obtuse tooth at the same place, with apex scarcely tumid at inner portion. Mentum slightly transverse, with anterior margin notched in widely opened at middle and forming arcuate lobe on each side, densely, coarsely and shallowly punctate, the punctures partly becoming aspirate, partly chained and forming irregular transverse sculptures. Antennae with 10 segments, 3rd to 7th one successively and very slightly broadened apically, club segments ordinary in size.



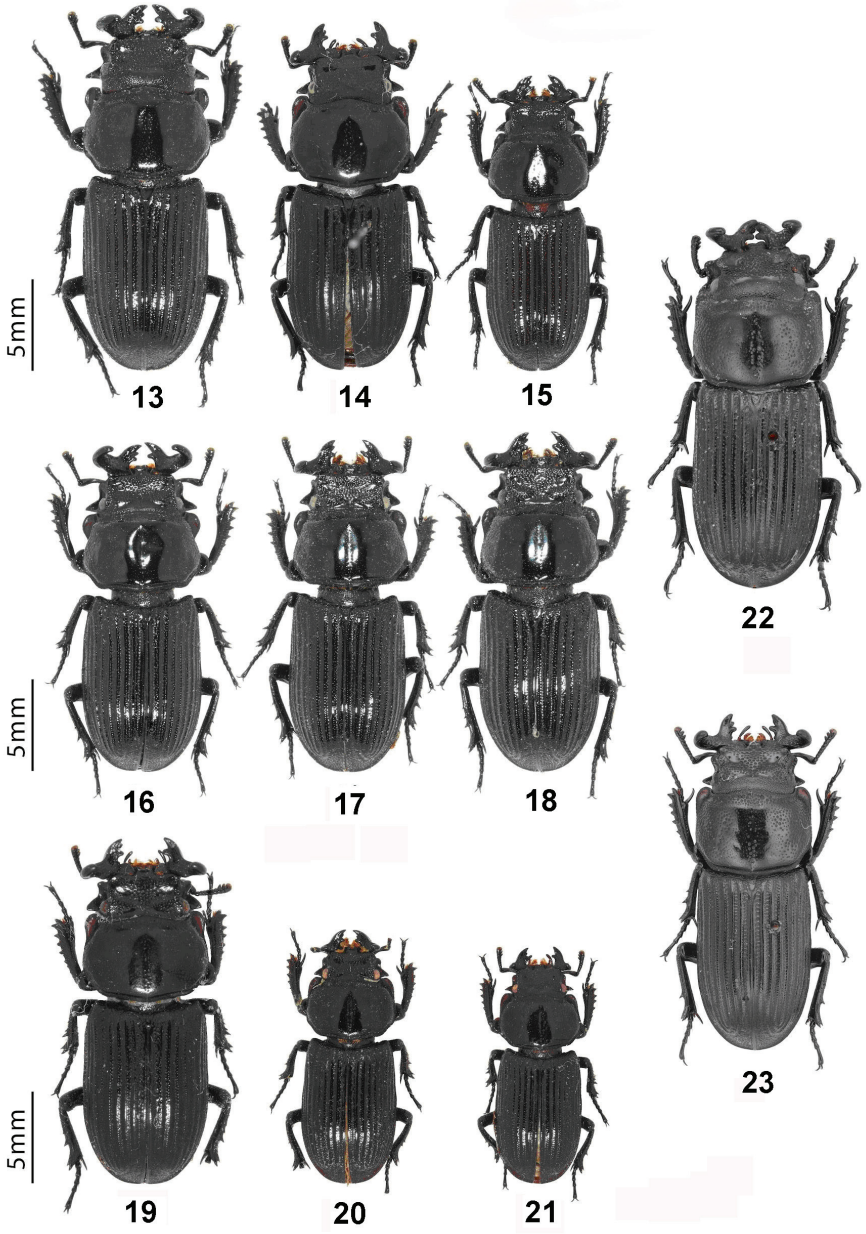
10 11 12

Figs 10–12. *Nigidius lewisi*, syntype. 10 – habitus, dorsal view; 11 – the same, ventral view; 10 – labels. (Photo by Christophe Rivier, MNHN).

Pronotum strongly convex dorsally, distinctly long and elongate, *ca*. 1.4 times as wide as long, wider than elytra; median longitudinal groove along midline not strong. Pronotal punctuation more uniformly punctate, rounded in middle and obliquely truncated behind, with marginal border thick, anterior angles a little expanded laterally as rounded lobe; posterior angles obliquely truncated; basal margin gently rounded in middle and very weakly sinuous on each side, with marginal border thick, scarcely serrate have a minute central process at posterior carina.

Scutellum tongue-shaped, rounded at apex, smooth marginally, very densely and strongly punctate medially.

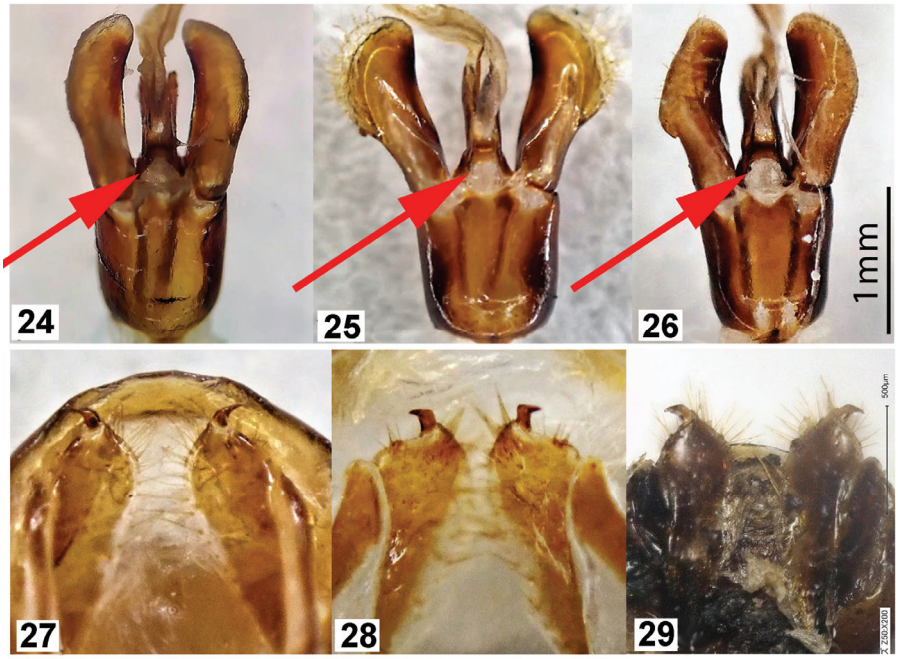
Elytra somewhat reddish, *ca*. 1.4 times as long as wide, strongly convex dorsally, with humeral tooth weak, but not sharply pointed; disc of each elytron with nine striae and 9 intervals; striae broadly and rather shallowly grooved, 1st to 8th stria arranged with a longitudinal row of coarse punctures which are dense or partly chained, distinctly invading both margins of intervals and circular to semicircular in shape, 9th stria very broad, surface shiny.



Figs 13–23. Habitus of *Nigidius* spp., dorsal view. 13–15 – *N. wushuae* sp. n.; 16–18 – *N. lewisi*; 19–21 – *N. lohi*; 22 – *N. distinctus*; 23 – *N. sinicus*.

Legs. Protibia with 7 acute teeth decreasing in size proximally, slightly yellowish. Meso- and metatibiae with 1 large external tooth below middle with 2–3 smaller accessory teeth proximally.

Male genitalia (Figs 3–5) with transverse membranous area in the lateral of the basal part. Abdominal pleurite IX narrowly separated dorsally; abdominal sternite IX with apical expansion relatively slender; rounded at anterior margin; basal stalk not extended laterally; genitalia with permanently everted internal sac (flagellum) long, about 1.7 times as long as parameters, with lateral margins more or less straight when manually extended. Median lobe relatively narrow, moderately widened in apical part; uncolored band transverse; caudal ventral plate of basal piece shorter and bifurcate not obvious.



Figs 24–29. Male (24–26) and female (27–29) genitalia of *Nigidius* spp. 24, 27 – *N. wushuae* sp. n.; 25, 28 – *N. lewisi*; 26, 29 – *N. lohi* (holotype).

Female similar to male in general appearance but differs in the following characters: the corner lobe of the pronotum in males are more rounded and more developed than in females, but this characteristic can be found in large individuals. If it is a small individual, it needs to be dissected to distinguish the gender.

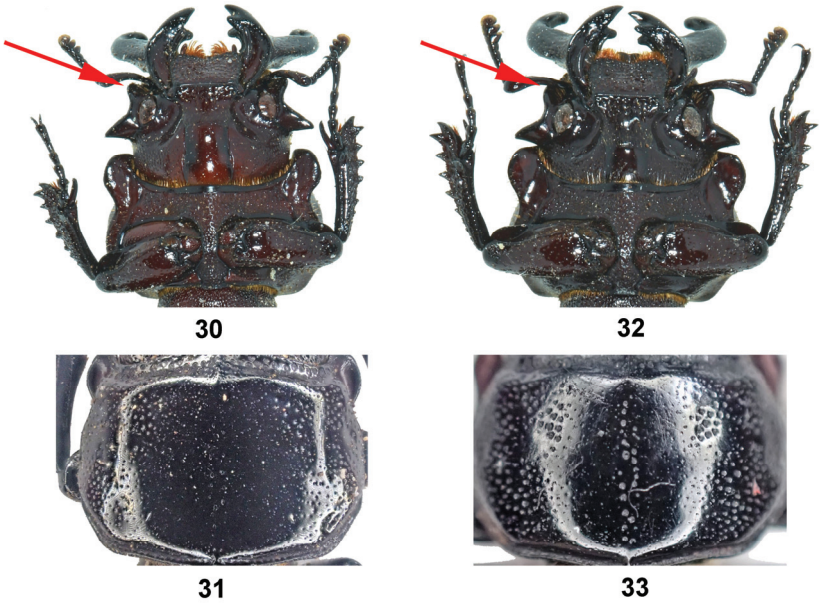
Female genitalia. Each apex of hemisternite triangularly produced apically, with sharply hooked, rather long and well sclerotized stylus which is situated a little outside of triangular distal end (Fig. 27).

DIAGNOSIS. The new species is similar to *Nigidius lewisi* from Japan, but can be distinguished from the latter by the following characteristics: 1) body somewhat larger, *ca.* 13.0–20.6 mm, whereas in *N. lewisi ca*. 12.0–18.0 mm; 2) body distinctly longer and slenderer,

especially in elytra, whereas in *N. lewisi* it is relatively shorter and wider; 3) canthus well developed, with posterior margin very strongly produced outward as a fairly sharply pointed projection, whereas in *N. lewisi* it is less developed, with posterior margin more weakly produced;4) female genitalia with stylus distinctly longer and situated at triangular distal end, while in *N. lewisi* genitalia with clearly slender and very sharp stylus. New species is also similar to *N. lohi* from Taiwan main island, but can be distinguished from the latter by the following characteristics: 1) pronotal punctuation surface more uniformly punctate, whereas in *N. lohi* surface variable with almost impunctate and coarsely punctate areas; 2) canthus with posterior margin very strongly produced outward as a fairly sharply pointed projection (in *N. lohi*, canthus relatively shorter). Moreover, *N. lohi* in Taiwan live at an altitude of 500–1300 meters, while *N. wushuae* sp. n. in Green Island lives below 200 meters above sea level.

DISTRIBUTION. The species is known only from the Green Island, East Taiwan.

ETYMOLOGY. The new species is named after the author's grandmother Mrs. Lin Wu Shu. She passed away during the author's research on this new species, take this to commemorate her.



Figs 30–33. Head and pronotum of *Nigidius* spp. 30, 31 – *N. wushuae* sp. n.: 30 – cantus; 31 – pronotal punctuation; 32 – *N. lewisi*, cantus; 33 – *N. lohi*, pronotal punctuation.

DISCUSSION

Chang (2006) and Mizunuma & Nagai (1994) gave an exceptionally wide distribution for *Nigidius lewisi*, encompassing the range of all species in the group, as well as Japan, Taiwan, Green Island, Hong Kong, Guangdong, and Hainan Island. However, Schenk (2011) treated the specimens from Guangdong (China) as separate species *N. sinicus*. The true *N. lewisi* is thus far known only from Japan and shares the similar morphology of the male genitalia as

the other mainland Asian species of the group *distinctus*. However, the differences of the female genitalia stylus in different species are obvious (Figs 27–29). I requested an image of the holotype of *N. lewisi* from the MNHN (Figs 10–12), which confirmed differences of Taiwan and Green Island specimens. Specimens from Japan and Taiwan share similarities in the overall male genitalia form (Figs 24–26) but comprise two distinct species based on obvious differences in the pronotal punctation, the form of the anterolateral margin of the pronotum and stylus of female genitalia. In original description of *N. lohi* (Ochi *et al*., 2019), two female specimens from the mid-altitude region of central Taiwan were dissected and illustrated. I examined the holotype of *N. lohi* from NMNS (Figs 6–9) as well as several specimens from different localities in southern Taiwan. I believe that *N. lohi* and *N*. *lewisi* are a good species distributed in Taiwan and Japan, respectively. A key to *Nigidius distinctus* species group is given below.

Key to the species of the *Nigidius distinctus* species group from East Asia

1. Canthus with outer margin entirely outside of the eye laterally. Pronotum without a minute central process at posterior carina. Myanmar, China: Yunnan. (Fig. 22) .... ***N. distinctus***
– Bottom of the emargination of the canthus inside of the outer limit of the eye. Pronotum have a minute central process at posterior carina 2
2. Canthus posterior angles more horizontal, with the processes at anterior and posterior angles more subequal in length. Corner lobe of the pronotum is placed more anteriorly than laterally; pronotum distinctly serrate in front. Female genitalia with stylus noticeably stouter and situated at a little prior to the gently rounded distal end. China: Hong Kong, Guangdong, Hainan. (Fig. 23) ..... ***N. sinicus***
– Canthus with the process at posterior angle much longer than that at anterior angle. Corner lobe of the pronotum is placed more laterally than anteriorly, with a straight, convex or waved inner border on the pronotum. Stylus of female genitalia placed at the inner apex of the hemisternite 3
3. Canthus less developed, with posterior margin more weakly produced. Pronotum with lateral margin distinctly to sinuous in middle. Body relatively shorter and wider. Female genitalia with clearly slender and very sharp stylus. Japan. (Figs 10–12, 16–18, 25, 28, 32) ..... ***N. lewisi***
– Canthus well developed. Pronotum with lateral weak sinuous in middle 4
4. Pronotum surface variable with almost impunctate and coarsely punctate areas. Elytra shorter. Female genitalia with strongly hooked and short stylus. Taiwan: main island. (Figs 6–9, 19–21, 26, 29, 33) ..... ***N. lohi***
– Pronotum surface more uniformly punctate. Elytra distinctly longer and slender. Female genitalia with stylus distinctly longer and situated at triangular distal end. – Canthus with posterior margin very strongly produced outward as a fairly sharply pointed projection. Taiwan: Green Island. (Fig. 34) ..... ***N. wushuae* sp. n.**

ACKNOWLEDGEMENTS

The author would like to express his sincere gratitude to Tsung-Hsien Hou (Taipei, Taiwan), Wen-Yi Chou (Taitung, Taiwan), Yu-Fang Tsai (Taipei, Taiwan), Fu-Lin Yang (Taipei, Taiwan), Michele Zilioli (Italy), Shih-Chun Yu (Keelung, Taiwan), Liang-Chuan Lee (Xinzhuang, Taiwan), Shuhei Nomura (National Museum of Nature and Science, Japan),

Katsumi Akita (Mie Prefecture, Japan), Masakazu Kawahara (Osaka, Japan), Christophe Rivier, Olivier Mantilleri and Stéphane Boucher (Muséum national d'Histoire naturelle, Paris, France) for their considerable help in my study. Tsung-Ying Hsieh (Taipei, Taiwan) helps in photo typesetting. I also thank Chang-Chin Chen (Tianjin, China), Jen-Pan Huang (Academia Sinica, Taiwan) who excite the author's enthusiasm for taxonomy. Many friends must be thanked for their enthusiastic help to complete this article. The author is grateful to his parents and grandmother for their support over the years and put up with his interest.

Fig 34. Type locality and habitat of *Nigidius wushuae* sp. n.

REFERENCES

Parry, F.J.S. 1873.Characters of seven nondescript Lucanoid Coleoptera, and remarks upon the genus *Lissotes*, *Nigidius* and *Figulus*. *Transactions of the Royal Entomological Society of London*, 3: 335–345.

Boileau, M. H. 1905. Description de Coléoptères nouveaux. *Le Naturaliste*, 27(431): 47–48.

Tanikado, M. 1993. Record of *Nigidius lewisi* Boileau (Coleoptera, Lucanidae) from Taiwan. *Gekkan-Mushi*, 268: 16–19. [In Japanese]

Chang, Y.J. 1993. *Stag beetles of Taiwan*. Newton Press, Taipei. 111 pp.

Chang, Y.J. 2006: *Stag beetles 54*. Yuan-Liou Publishing Company, Taipei. 160 pp.

Fujita, H. 2010. *The lucanid beetles of the world Mushi-sha's Iconographic series of Insect. Vol. 6*. Mushisha, Tokyo. 472 pp.

Schenk, K. D., 2011. Notes on the stag beetles of Asia and description of two new taxa (Coleoptera, Lucanidae). *Beetles World*, 5: 1–10.

Holloway, B. A. 2007. *Lucanidae (Insecta: Coleoptera). Fauna of New Zealand. No. 61*. Lincoln, Canterbury, New Zealand. 254 pp.
Mizunuma, T. 2000. *Stag beetles II (Lucanidae). Endless Collection Series. Vol. 5*. Toshitsugu Endo, Tokyo, Japan. 101 pp.
Huang, H. & Chen, C.-C. 2017. *Stag Beetles of China III.* Formosa Ecological Company, Taipei, 524 pp.
Mizunuma, T. & Nagai, S. 1994. *The Lucanid beetles of the world*. Mushi-sha Iconographic series of Insects, Volume 1. Tokyo, Japan. 1338 pp.
Paulsen, M.J. 2018. Revision of the *obesus* species group of the stag beetle genus *Nigidius* MacLeay (Coleoptera: Lucanidae: Lucaninae: Figulini). *Insecta Mundi*, 624: 1–13.
Ochi, T., Kawahara, M. & Toguchi, H. 2019. A new *Nigidius* species from Taiwan (Coleoptera, Lucanidae). *Kogane*, (22): 62–66.

© **Far Eastern entomologist (Far East. entomol.)** Journal published since October 1994.
Editor-in-Chief: S.Yu. Storozhenko
Editorial Board: A.S. Lelej, S.A. Belokobylskij, M.G. Ponomarenko, V.A. Mutin, E.A. Beljaev, E.A. Makarchenko, A.V. Gorochov, T.M. Tiunova, M.Yu. Proshchalykin, S.A. Shabalin, V.M. Loktionov
Address: Federal Scientific Center of the East Asia Terrestrial Biodiversity (former Institute of Biology and Soil Science), Far East Branch of the Russian Academy of Sciences, 690022, Vladivostok-22, Russia.
E-mail: storozhenko@biosoil.ru web-site: http://www.biosoil.ru/fee