

## First Record of *Xylotrupes socrates tonkinensis* Minck, 1920 (Coleoptera: Scarabaeidae: Dynastinae) from the Matsu Islands, Taiwan, with Notes on Its Taxonomy

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### Abstract

This study reports the first confirmed record of the rhinoceros beetle *Xylotrupes socrates tonkinensis* Minck, 1920 from the Matsu Islands, Taiwan. Specimens collected from Beigan and Dongju Islands were identified based on male external morphology. Although recent molecular research suggests that phenotypic variations within the *X. siamensis/socrates* complex may represent clinal variation under an isolation-by-distance model, this study adopts the taxonomic framework established in the latest published monograph of the genus, which maintains the validity of this subspecies based on morphological consistency. This discovery extends the known northern distribution limit of the taxon in the Taiwan Strait from the Kinmen Archipelago to the Matsu Islands, providing critical empirical data for future taxonomic revisions and biogeographical studies of the genus in East Asia. An updated checklist and a key to the genus *Xylotrupes* in Taiwan are also provided.

**Keywords:** *Xylotrupes*, Matsu Islands, Lienchiang County, Dynastinae, new record, Taiwan.

## Introduction

Taxonomic delineation of the Asian rhinoceros beetle genus *Xylotrupes* Hope, 1837 particularly concerning the *X. siamensis* Minck, 1920 species complex, has been historically contentious. According to the morphological framework established by Silvestre (2003), which emphasizes male horn characters, the short-horned populations distributed from Indochina to coastal South China should be classified as *X. socrates tonkinensis* Minck, 1920. However, Rowland (2011) argued that male horn morphology is highly variable within species and, focusing on the more conserved characters of male genitalia, advocated for the inclusion of this group within *X. siamensis*.

More recently, an integrative study employing multi-locus genetic data (mitochondrial *COI*, nuclear *ITS2* and *H3*), ecological niche modeling, and approximate Bayesian computation provided new molecular insights (Morgan & Huang, 2021). This research revealed that despite pronounced phenotypic divergence in male horn morphology across populations, the underlying genetic population structure does not correspond to these morphotypes. Instead, genetic differentiation is predominantly correlated with geographical distance, supporting an isolation-by-distance (IBD) model and providing evidence for intraspecific geographic divergence.

In Taiwan, two species of *Xylotrupes* are currently documented: *X. philippinensis peregrinus* Rowland, 2006 found on Orchid Island; Green Island, and *X. siamensis* (Chang, 2017), known from the Kinmen archipelago.

The Matsu Islands, situated in the northwest Taiwan Strait and comprising Dongyin, Beigan, Nangan, Dongju, and Xiju, share a strong faunal affinity with southern China due to their geographical proximity to the mainland. Recent frequent discoveries of new records of Coleoptera in Matsu (e.g., *Serrognathus titanus platymelus* (Saunders, 1854); Lin, 2025) highlight the high potential for biodiversity research in the region and suggest the existence of long-overlooked dispersal routes or community assembly processes among East Asian islands.

In August 2025, the author discovered and collected several *Xylotrupes* specimens during a field survey in the Matsu Islands. This paper aims to: 1) formally report this new distributional record, which extends the northern limit of the genus in the Taiwan Strait; and 2) based on the most recent comprehensive taxonomic monograph (Kim & Moon, 2024), identify the Matsu population as *X. socrates tonkinensis* and discuss the implications of this taxonomic treatment.

## Materials & Methods

All specimens were collected from non-protected general areas in accordance with applicable regulations. Surveys were conducted by road sampling at night (19:00–24:00). Collected specimens were preserved as dry-mounted pinned specimens. Digital images were taken with an Olympus TG-6 camera, with minimal adjustments for clarity and contrast made using Adobe Photoshop CS5. Records relying exclusively on photographic evidence are listed separately as

“Photographed observations.”

Species identification was conducted primarily by examining the external morphology of adult males, with reference to the taxonomic keys, descriptions, and diagnostic characters provided in the comprehensive monograph “*Xylotrupes* of the World.” (Kim & Moon, 2024). Voucher specimens are deposited in the following collections:

**JZLC** Jing-Zhi Lin’s private collection, Taipei, Taiwan.

**NTM** National Taiwan Museum, Taipei, Taiwan.

## Results

### *Xylotrupes socrates tonkinensis* Minck, 1920 (Fig. 1-2)

*Xylotrupes tonkinensis* Minck, 1920

*Xylotrupes socrates tonkinensis* Silvestre, 2003; Kim & Moon, 2024.

*Xylotrupes siamensis* Minek: Rowland, 2011; Chang, 2017; Morgan & Huang, 2021 (molecular evidence suggesting "Tonkinensis-form" as an intraspecific geographic variant of *X. siamensis*).

**Specimens examined.** TAIWAN: Lienchiang County: 2 males, Beigan Island, 30-VIII-2025, leg. J.-Z. Lin (deposited in JZLC, NTM).

**Photographed observations.** TAIWAN: Lienchiang County: 1 male (field observation), Beigan Island, 29-VIII-2025, obs. J.-Z. Lin; 1 male, Dongju Island, 29-VII-2025, obs. C.-L. Chu.

**Diagnosis.** The male specimens from Matsu exhibit the typical “Tonkinensis” phenotype: a relatively short and robust cephalic horn with a pronounced upward curvature, and short, broad pronotal projections. The body coloration is dark brownish-black with moderate elytral luster. This morphology aligns with the subspecies description by Kim and Moon (2024) and is consistent with specimens recorded from Dadan Island (Kinmen) and the coastal regions of southern China (Chang, 2017; S. Moon, personal communication, 2025).

### Key to the Genus *Xylotrupes* in Taiwan

1. **Male:** Cephalic horn robust and exhibiting a pronounced upward curvature; pronotal horn typically short; body and elytra predominantly dark brownish-black with a subdued luster (matte to semi-glossy); body size generally smaller (total length often < 50 mm).  
**Female:** Elytral punctures coarse, often coalescing into irregular longitudinal striae or rugae; mesoventrite typically covered with sparse, short, yellowish-brown setae; abdominal ventrites with conspicuous, deep punctures; overall surface sculpture relatively coarse.

..... *X. socrates tonkinensis* Minck, 1920

- **Male:** Cephalic horn relatively slender, displaying a gentler upward arc; pronotal horn often well-developed; body and elytra predominantly reddish-brown with a strong, glossy luster; body size generally larger (total length often > 50 mm). **Female:** Elytral punctures fine and

dense, surface appearing relatively smooth and lacking distinct striae; mesoventrite typically glabrous or with only minute, inconspicuous setae; abdominal ventrites with fine, shallow punctures; overall surface sculpture more polished and refine.

..... *X. philippinensis peregrinus* Rowland, 2006

## Checklist of the Genus *Xylotrupes* in Taiwan

The following list enumerates the species and subspecies of the genus *Xylotrupes* currently formally recorded from Taiwan and its affiliated islands. The entries are structured in accordance with standard taxonomic practice and incorporate the new distribution records from this study.

### 1. *Xylotrupes socrates tonkinensis* Minck, 1920 翹角姬兜蟲

Distribution in Taiwan: Lienchiang County (Matsu Islands: Beigan Island, Dongju Island new record); Kinmen County (Kinmen Island, Lieyu, Dadan, Erdan).

### 2. *Xylotrupes philippinensis peregrinus* Rowland, 2006 蘭嶼姬兜蟲

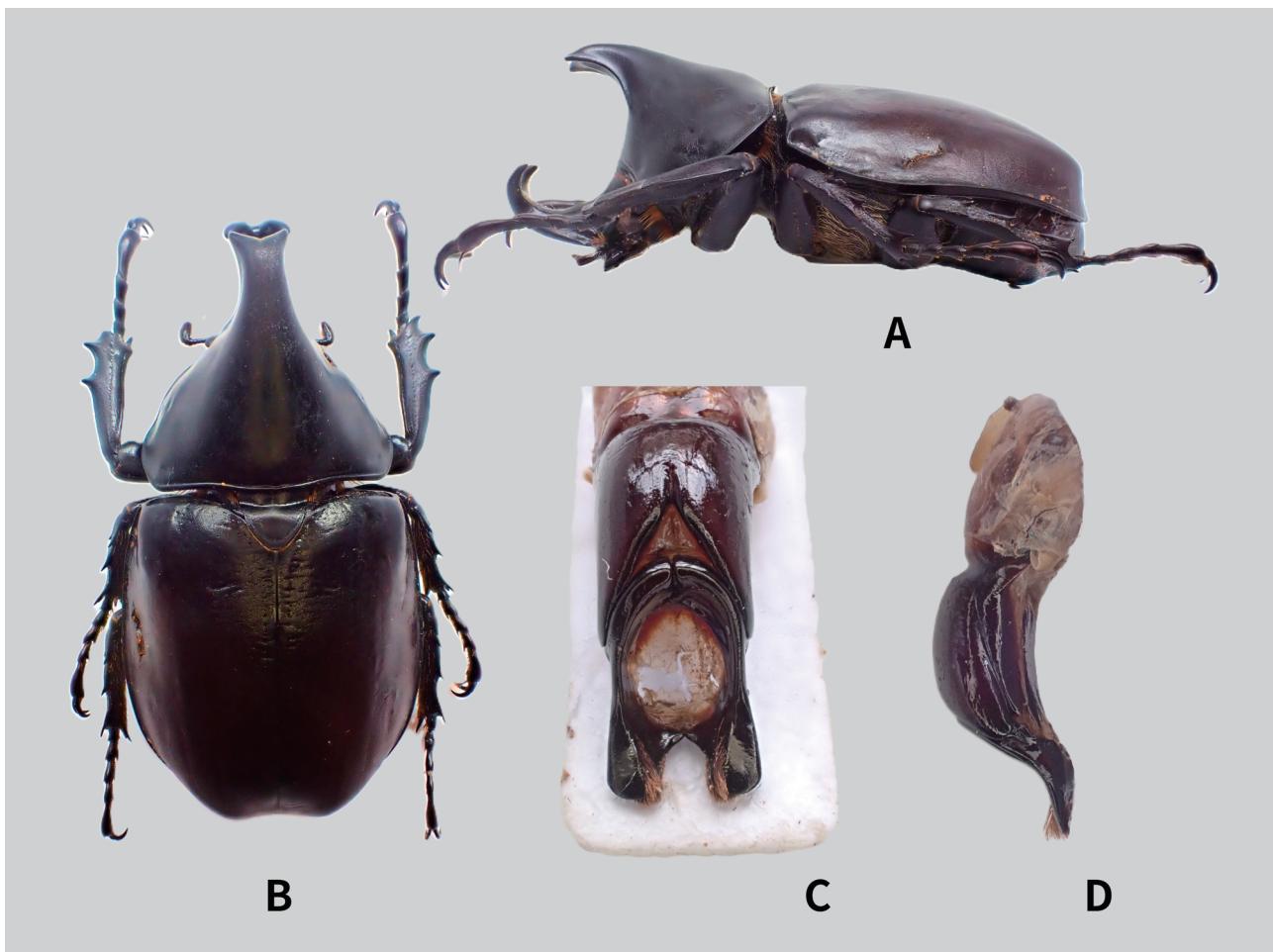
Distribution in Taiwan: Taitung County (Orchid Island; Green Island).

## Discussion

This study provisionally identifies the specimens from the Matsu and Kinmen archipelagos as *X. socrates tonkinensis*, based on the diagnostic keys and morphological descriptions provided in the monograph *Xylotrupes* of the World (Kim & Moon, 2024). This determination follows the current taxonomic framework presented in that work, which recognizes *X. socrates* as distinct from *X. siamensis*.

The stability of this taxonomic framework, however, is questioned by emerging evidence. A leading authority on the genus has noted that the presence or absence of specific projections on the male cephalic horn—a character historically used for species delineation—appears inconsistent, as the "long-horned" and "short-horned" morphs are found in sympatry at multiple localities (Moon, S., personal communication, 2025). Furthermore, key morphological structures, such as the male genitalia, are reported to be highly similar across these forms. These morphological observations align with a phylogeographic study concluding that genetic differentiation among populations is primarily correlated with geographical distance IBD and does not support the current species-level classification based on horn phenotype (Morgan & Huang, 2021).

Collectively, this evidence suggests that the prevailing species boundaries may not accurately represent evolutionary relationships. Consequently, a comprehensive taxonomic revision, integrating broader morphological and genetic datasets, is likely to propose changes to the current nomenclature and status of this group. Within this context, the use of *X. s. tonkinensis* in this paper represents a provisional application of the most recent morphological taxonomy, with the understanding that its status remains subject to clarification by future research. The first



**Figure 1.** Male voucher specimen of *Xylotrupes socrates tonkinensis* from the Matsu Archipelago. (A) Lateral habitus, illustrating the pronotal horn. (B) Dorsal habitus. (C) Aedeagus, anterior view. (D) Aedeagus, lateral view.

record of this population from the Matsu Islands provided here constitutes essential baseline data and a precise geographical datum for informing that necessary future revision.

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**Figure 2.** Field records of male *Xylotrupes socrates tonkinensis* from the Matsu Archipelago. (A) An individual from Dongju Island (photograph by Chin-Lan Chu). (B) An individual from Beigan Island. (C) An in-situ record of a road-killed individual from Beigan Island.

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