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Discovery of a new species of *Dorcus* MacLeay, 1819 from southern Xizang, China (Coleoptera: Lucanidae)

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Abstract: *Dorcus zhaoyangi* **sp. nov.** is described from Zhari, Longzi, southern Xizang, China. The new species is sister to and allopatric with *D. cuonaensis* Huang & Chen, 2013, but can be distinguished from the latter by the following characters: relatively longer tibiae in similarly sized males; smoother and less punctate elytral surfaces around the suture in small-sized males and females; a wider non-pigmented medial patch on the last tergite in both sexes; a longer flagellum (permanently everted internal sac) in the male genitalia; a longer median lobe of the aedeagus; and a completely pigmented caudal ventral lobe of the basal piece. The Kimura 2-parameter distance in the barcode fragment of the mitochondrial COI gene (658 bp) between the two species exceeds 0.10, which is markedly larger than the distances observed among several well-accepted species within the genus. Additionally, on the mtDNA COI tree, the divergence between *Dorcus zhaoyangi* **sp. nov.** and *D. cuonaensis* is significantly greater than that among populations of *D. cuonaensis* from different localities.

Keywords: China, *Dorcus*, Lucanidae, new species

中国藏南发现的大锹属一新种记述（鞘翅目：锹甲科）

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摘要：本文记述了采自中国西藏南部隆子县扎日地区的 *Dorcus zhaoyangi* **sp. nov.**（昭阳大锹）新种。该新种与 *D. cuonaensis* Huang & Chen, 2013（错那大锹）互为姊妹种，呈异域分布，但可通过以下特征与后者区分：在体型相近的雄性个体中，胫节相对较长；小型雄性和雌性的鞘翅缝周围表面较光滑、刻点较稀疏；两性最后一节背板上的中部无色斑块较宽；雄性外生殖器之外翻囊较长；阳茎中叶较长；以及阳茎基片后腹突完整无分裂。两物种线粒体 COI 基因条形码片段（658 bp）的 Kimura 双参数距离大于 0.10，显著大于该属内一些公认物种间的距离。此外，在线粒体 COI 基因树上，这两个物种之间的遗传分化明显大于 *D. cuonaensis* 不同地理种群之间的分化程度。

关键词：中国，大锹属，锹甲科，新种

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Introduction

In March 2025, the third author collected a series of lucanid larvae from decaying wood in Lhozhag County and Longzi County in the Shannan region of Xizang (Tibet), China. These larvae were reared to adulthood in July and were identified as belonging to two *Dorcus* species: one as *Dorcus cuonaensis* Huang & Chen, 2013, and the other as an undescribed species highly similar in appearance to *Dorcus cuonaensis*. The specimens were submitted to the second author for preliminary study, during which some male individuals were dissected, and muscle tissue samples were taken from most specimens for mitochondrial DNA COI barcoding sequencing, conducted by Dr. Shu-Ping Wu. The specimens were then forwarded to the first author for comprehensive study. The results confirmed that the specimens collected from Lhozhag County belong to *Dorcus cuonaensis*, whereas those collected from Longzi County represent an undescribed species, which is described herein.

Taxonomy

Dorcus cuonaensis Huang & Chen, 2013 错那大锹

Figs 2, 4, 6, 9, 11, 13, 15, 17, 18, 20, 22, 24, 26, 28

Material: 2 ♂♂ & 2 ♀♀ (collection of CC Chen, Tianjin), China, Xizang, Shannan Region, Lhozhag, 2595-2597 m, larvae collected on 24.III.2025, CM Xiao leg., emerged in VII.2025; 1 ♂ & 1 ♀ (collection of CC Chen, Tianjin), China, Xizang, Shannan Region, Cuona, Lebu, 2676 m, 28-29.VII.2025, CM Xiao leg.; 3 ♂♂ (collection of CC Chen, Tianjin), China, Xizang, Shannan Region, Cuona, Lebu, 2800 m, 22.VI.2013 & 25-26.VII.2018, XD Yang leg.

Remarks. Specimens collected from Lhozhag show no morphological differences from the typical population of *D. cuonaensis* from Cuona. However, the Kimura 2-parameter distance calculated from the barcode fragment of the mitochondrial COI gene (658 bp) between the two populations exceeds 0.03.

Dorcus zhaoyangi sp. nov. 昭阳大锹

https://zoobank.org/B945261C-DB7A-486E-B98A-D8F71288EA4D

Figs 1, 3, 5, 7, 8, 10, 12, 14, 16, 19, 21, 23, 25, 27, 29

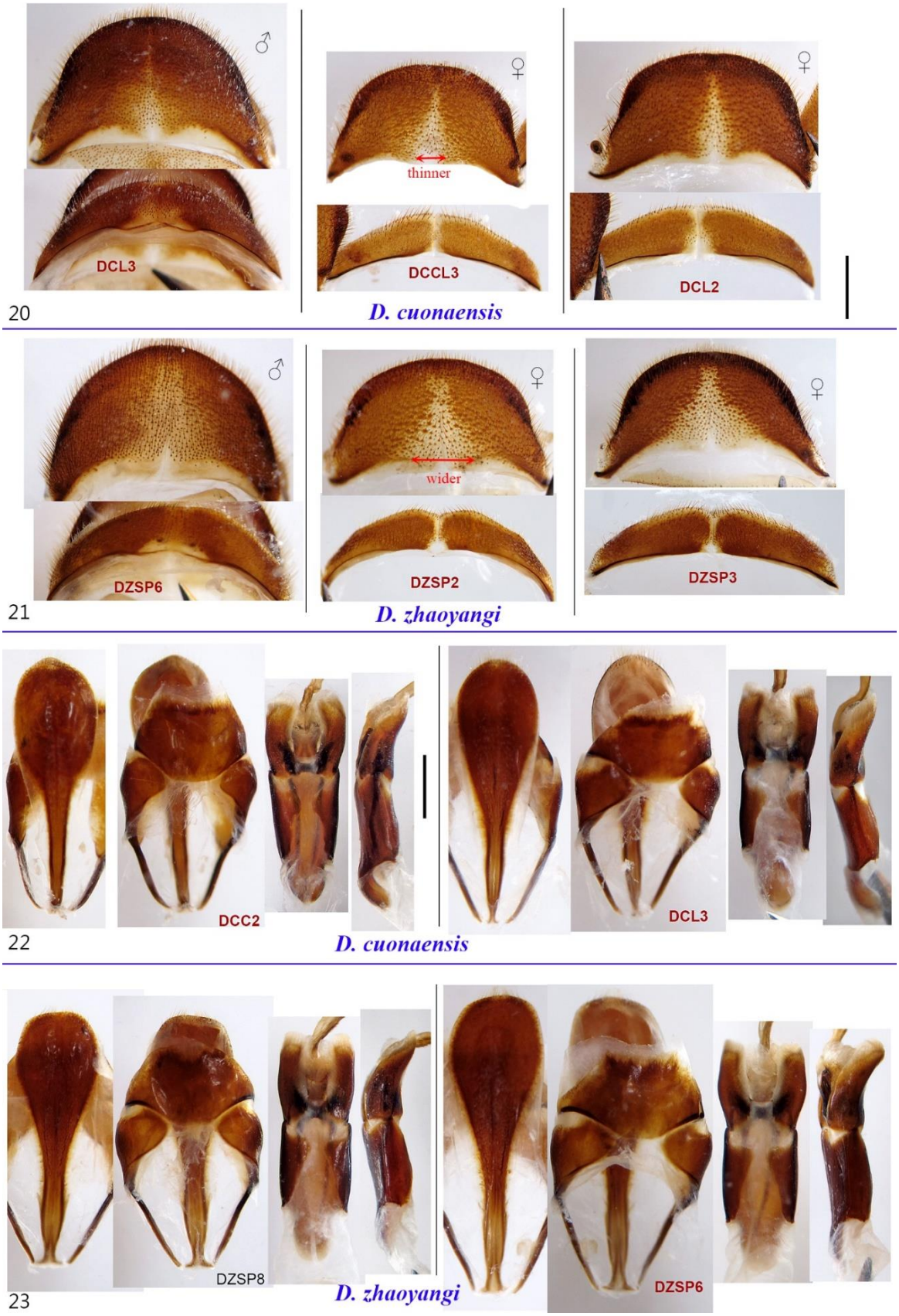
Holotype: ♂ (Length of body including mandibles: 37.5 mm): China, Xizang, Shannan Region, Longzi County, Zhari, 2691 m, larva collected on 27–28.III.2025, CM Xiao leg., emerged in VII.2025. Deposited in the Biological Laboratory of Shanghai Normal University, Shanghai, China. **Paratypes**: 4 ♂♂, 8 ♀♀ (collection of CC Chen, Tianjin), same data as holotype; 1 ♀ (collection of CC Chen, Tianjin), same locality as holotype, 11.VII.2018, XD Yang leg.

Etymology. The species is named after Mr. Zhao-Yang Tang (唐昭阳). The name is treated as a noun in the genitive case.

Diagnosis. This new species is most similar to *Dorcus cuonaensis* Huang & Chen, 2013, but can be distinguished from the latter by the following combination of characters:

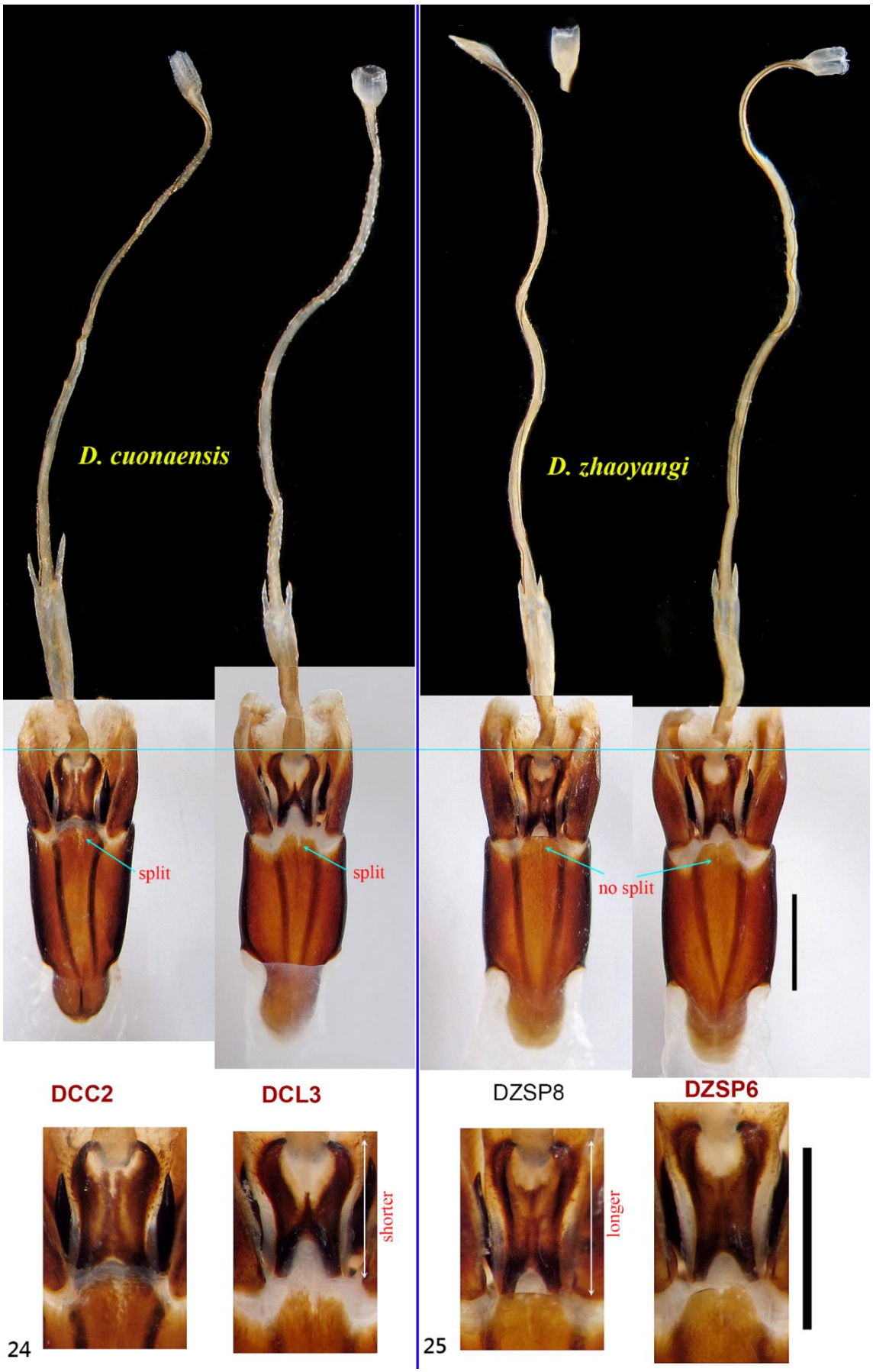
1) Tibiae markedly longer in same-sized individuals of males (Figs 8–19). **2)** Elytra of small-sized males smoother and less punctured in the medial region around the suture (Figs 12–13). **3)** Elytra of females only weakly punctured, with no deep grooves, and with the medial region around the suture rather smooth and with only a few incomplete series of punctures there (recalling *D. yaksha yaksha* Gravely, 1915) (Figs 14–19). **4)** Last tergite in both sexes with a markedly wider non-pigmented medial patch (Figs 20–21). **5)** Flagellum (permanently everted internal sac) of male genitalia slightly longer (Figs 24–27). **6)** Median lobe of aedeagus markedly longer (Figs 24–25). **7)** Caudoventral lobe of the basal piece of aedeagus fully pigmented, without a central non-pigmented split (Figs 24–25).

FIGURES 18-19. Comparison of *Dorcus zhaoyangi* **sp. nov.** and *D. cuonaensis*, females, showing left elytron, elytron apex, head and pronotum, and mentum and gula.

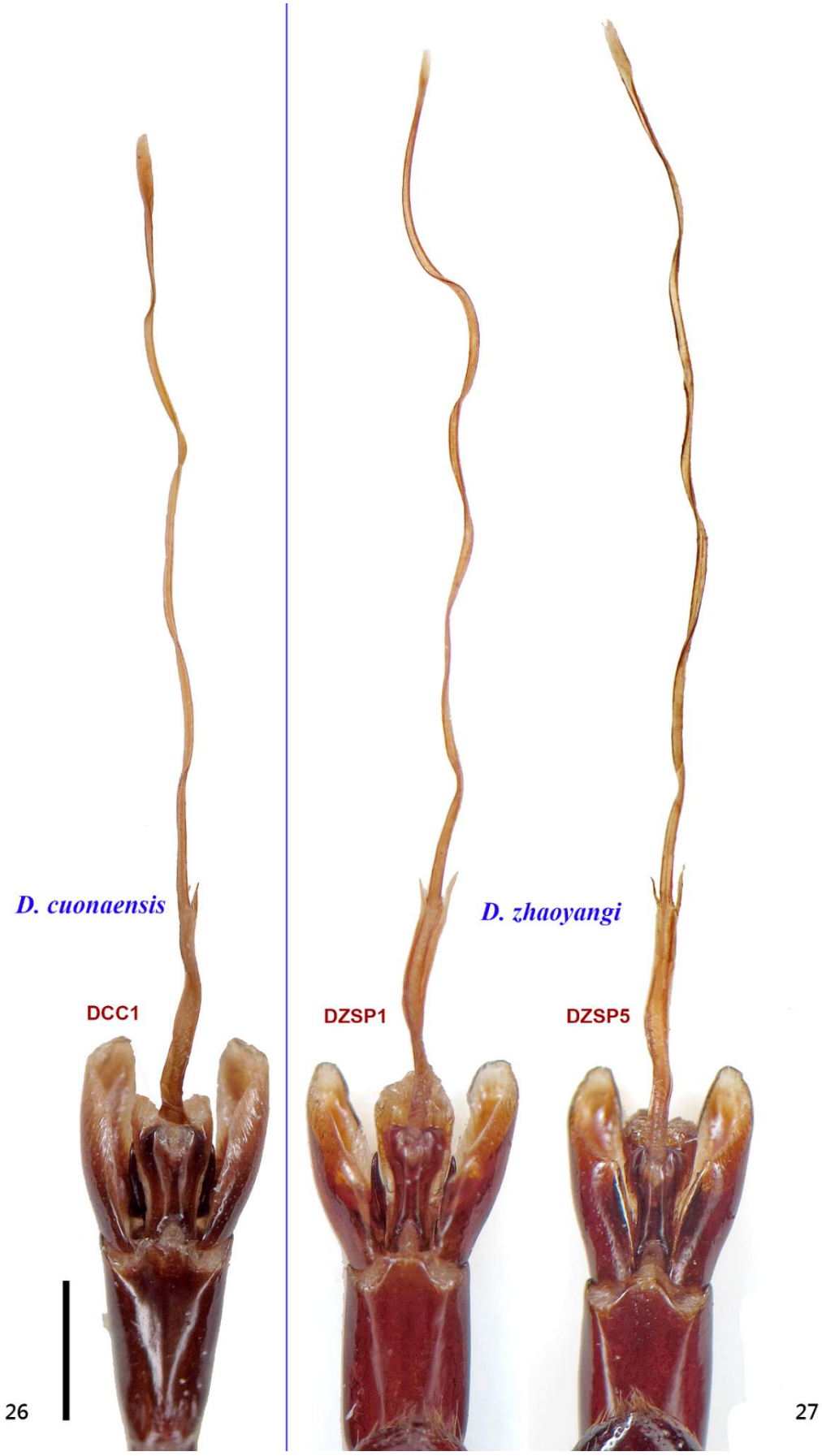


FIGURES 20-21. Comparison of *Dorcus zhaoyangi* **sp. nov.** and *D. cuonaensis*, last tergite and last ventrite in both sexes. Scale bar = 1 mm.

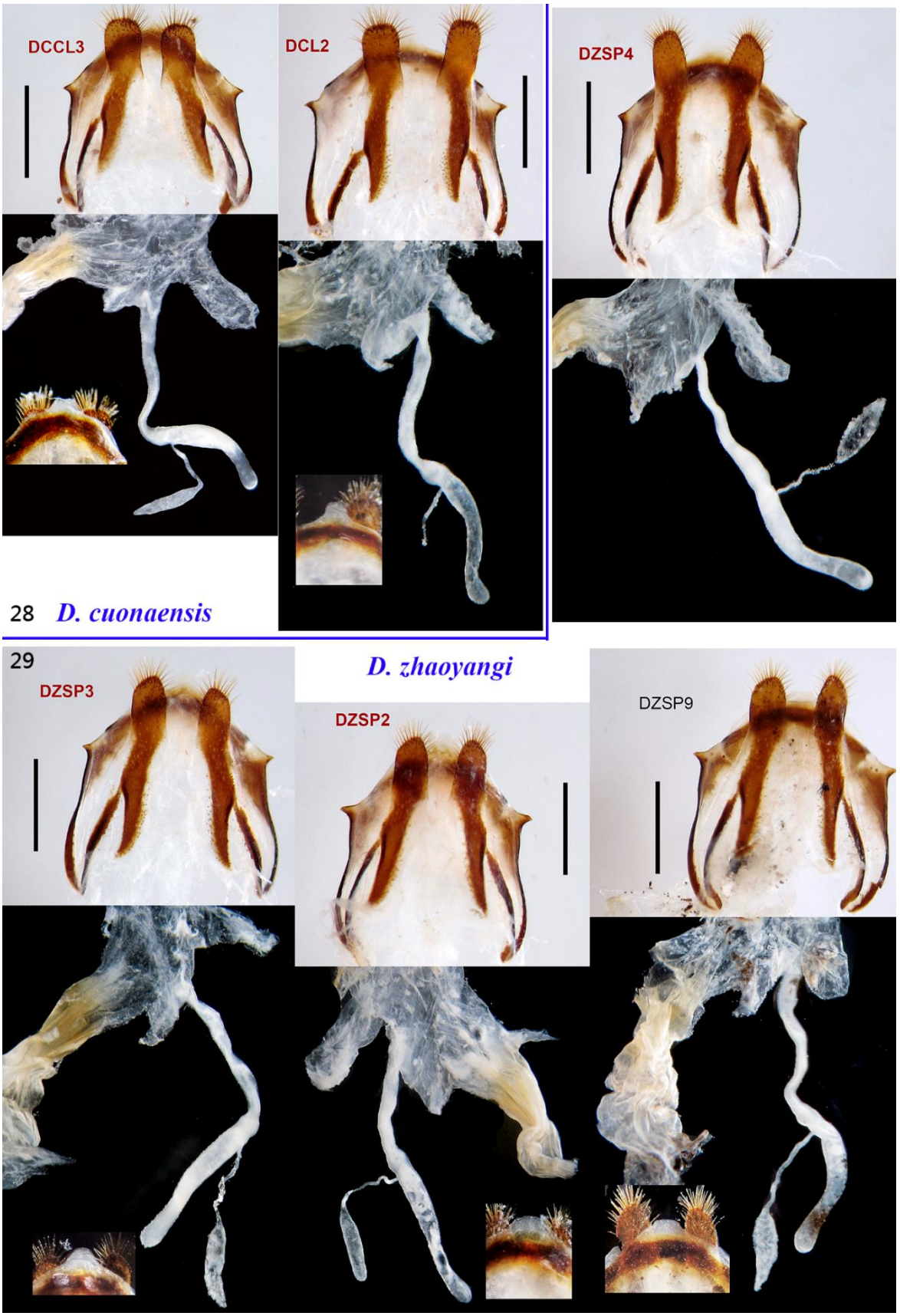
FIGURES 22-23. Comparison of *Dorcus zhaoyangi* **sp. nov.** and *D. cuonaensis*, 9th abdominal segment in ventral and dorsal views, and aedeagus in dorsal and lateral views. Scale bar = 1 mm.



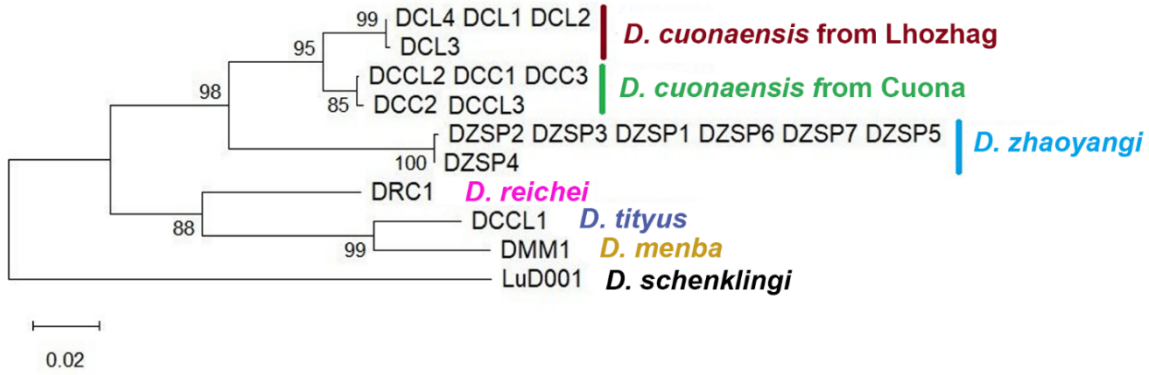
FIGURES 24-25. Comparison of *Dorcus zhaoyangi* **sp. nov.** and *D. cuonaensis*, male genitalia in ventral view, with median lobe enlarged. Scale bar = 1 mm.



FIGURES 26-27. Comparison of *Dorcus zhaoyangi* **sp. nov.** and *D. cuonaensis*, male genitalia in ventral view. Scale bar = 1 mm.



FIGURES 28-29. Comparison of *Dorcus zhaoyangi* **sp. nov.** and *D. cuonaensis*, female genitalia and supra anal projection. Scale bar = 1 mm.



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	1	2	3	4	5	6	7	
1. DZSP1 DZSP2 DZSP3 DZSP5 DZSP6 DZSP7								*D. zhaoyangi*
2. DZSP4	0.00152							*D. zhaoyangi*
3. DCCL3 DCC2	0.10995	0.10804						*D. cuonaensis*
4. DCC1 DCC3 DCCL2	0.10602	0.10413	0.00305					*D. cuonaensis*
5. DCL1 DCL2 DCL4	0.10777	0.10587	0.03011	0.03008				*D. cuonaensis*
6. DCL3	0.10979	0.10789	0.03177	0.03174	0.00152			*D. cuonaensis*
7. DCCL1	0.17808	0.18038	0.16037	0.16015	0.16957	0.17206		*D. tityus*

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FIGURE. 30. mtDNA gene tree of *Dorcus zhaoyangi* **sp. nov.** and *D. cuonaensis* reconstructed by ML method using IQ-TREE based on COI barcode fragment with bootstrap support values.
FIGURE. 31. The Kimura 2-parameter distance between populations of *Dorcus zhaoyangi* **sp. nov.** and *D. cuonaensis*.

Discussion. The new species can be easily distinguished from all other *Dorcus* species, as can *D. cuonaensis*. These two species are so similar to each other that they share most external and genitalic characters, except for the slight differences noted in the Diagnosis section above. The male genitalia of the two species differ only slightly in the length of the flagellum and the median lobe, while no consistent differences are observed in the female genitalia (Figs 28–29). It is evident that the two species represent allopatric sister species. The species boundary between them is supported primarily by molecular analysis, which reveals a rather high divergence in the mtDNA COI gene (Figs 30–31). The genetic distance between them exceeds that commonly found among some well-accepted species of *Dorcus*.

The female of this new species has a distinctive elytral appearance, with the area around the suture partly smooth and the outer lateral half and apical fourth more strongly punctured, somewhat resembling that of *D. yaksha yaksha* Gravely, 1915. However, the two species can be readily separated by their different body length-to-width ratio and pronotal shape; they also differ markedly in male characters as well as in both male and female genitalia. There is no doubt that the new species belongs to the *Dorcus zhangmuensis* group (Huang & Chen, 2013), within which the member *D. nosei* Nagai, 2000 should be replaced by *D. chayuensis* Huang & Chen, 2017 (Huang & Chen, 2017). It is worth noting that *D. nosei* and its closest ally, *D. wuchaoi* Huang & Chen, 2024, do not belong to this group.

Recently described taxa of *Dorcus* were summarized by Huang & Chen (2024) and Huang et al. (2025), with the exception of the very recent one described by Qi et al. (2025). One of the Himalayan taxa described by Schenk (2023) warrants further discussion. *Dorcus hartmanni* Schenk, 2023 from western Nepal shows some similarity to

the new species described herein, but can be distinguished by having, in similarly sized males, a longer inner tooth of the mandible with a markedly narrower base, and by having the lateral margin of the pronotum evenly rounded, without an indentation at the anterior fourth.

Range. Southern Xizang (Zhari of Longzi).

Acknowledgements

Dr. Shu-Ping Wu contributed to this study by conducting the sequencing of the mtDNA COI barcode fragment and performing the molecular analysis.

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Additional information

Author contributions: First author: Conducted all research work, including morphological comparisons, species description, and manuscript preparation. Second author: Specimen preparation and part of dissection. Third author: Collected the type material.

Conflict of interest: The authors declare that they have no competing interests.

Data availability: All of the data that support the findings of this study are available in the main text.

Ethical statement: No ethical statement was reported.

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